**Confidential draft #2 as confidentially submitted to the Securities and Exchange Commission on May 10, 2019.**
**This draft registration statement has not been publicly filed with the**
**Securities and Exchange Commission and all information herein remains strictly confidential.**

**Registration No. 333-**

# UNITED STATES
# SECURITIES AND EXCHANGE COMMISSION

**Washington, D.C. 20549**

# FORM S-1
# REGISTRATION STATEMENT

***UNDER***
***THE SECURITIES ACT OF 1933***

# PERSONALIS, INC.

(Exact name of Registrant as specified in its charter)

| **Delaware** | **8071** | **27-5411038** |
|---|---|---|
| **(State or other jurisdiction of incorporation or organization)** | **(Primary Standard Industrial Classification Code Number)** | **(I.R.S. Employer Identification Number)** |

**Personalis, Inc.**
**1330 O'Brien Drive**
**Menlo Park, CA 94025**
**(650) 752-1300**
**(Address, including zip code, and telephone number, including area code, of Registrant's principal executive offices)**

**John West**
**President and Chief Executive Officer**
**Personalis, Inc.**
**1330 O'Brien Drive**
**Menlo Park, CA 94025**
**(650) 752-1300**
**(Name, address, including zip code, and telephone number, including area code, of agent for service)**

*Copies to:*

| | |
|---|---|
| **James C. Kitch**<br>**Michael Tenta**<br>**Peter N. Mandel**<br>**Cooley LLP**<br>**3175 Hanover Street**<br>**Palo Alto, CA 94304**<br>**(650) 843-5000** | **Alan F. Denenberg**<br>**Stephen Salmon**<br>**Davis Polk & Wardwell LLP**<br>**1600 El Camino Road**<br>**Menlo Park, CA 94025**<br>**(650) 752-2000** |

**Approximate date of commencement of proposed sale to the public:** As soon as practicable after this Registration Statement is declared effective.

If any of the securities being registered on this form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, check the following box. ☐

If this form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

| | |
|---|---|
| Large accelerated filer ☐ | Accelerated filer ☐ |
| Non-accelerated filer ☒ | Smaller reporting company ☐ |
| | Emerging growth company ☒ |

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act. ☒

**CALCULATION OF REGISTRATION FEE**

| **Title of Each Class of Securities To Be Registered** | **Proposed Maximum Aggregate Offering Price(1)(2)** | **Amount of Registration Fee** |
|---|---|---|
| Common Stock, $0.0001 par value per share | $ | $ |

(1) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(o) under the Securities Act of 1933, as amended.
(2) Includes the aggregate offering price of additional shares that the underwriters have the option to purchase to cover over-allotments, if any.

**The Registrant hereby amends this Registration Statement on such date or dates as may be necessary to delay its effective date until the Registrant shall file a further amendment which specifically states that this Registration Statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933 or until the Registration Statement shall become effective on such date as the Commission, acting pursuant to said Section 8(a), may determine.**

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**The information in this preliminary prospectus is not complete and may be changed. We may not sell these securities until the registration statement filed with the Securities and Exchange Commission is effective. This prospectus is not an offer to sell these securities and we are not soliciting offers to buy these securities in any jurisdiction where the offer or sale is not permitted.**

*PRELIMINARY PROSPECTUS (Subject to Completion)*
*Issued , 2019*

# *Shares*


*COMMON STOCK*

***Personalis, Inc. is offering shares of its common stock. This is our initial public offering and no public market currently exists for shares of our common stock. We anticipate that the initial public offering price will be between $ and $ per share.***

***We intend to apply to list our common stock on The Nasdaq Global Market under the symbol "PSNL."***

***We are an "emerging growth company" as defined under the U.S. federal securities laws and, as such, have elected to comply with certain reduced public company reporting requirements.***

***Investing in our common stock involves risks. See the section titled "Risk Factors" beginning on page 13 to read about factors you should consider before buying shares of our common stock.***

*PRICE $ A SHARE*

| | ***Price to Public*** | ***Underwriting Discounts and Commissions(1)*** | ***Proceeds to Personalis*** |
|---|---|---|---|
| *Per Share* | *$* | *$* | *$* |
| *Total* | *$* | *$* | *$* |

*(1) See the section titled "Underwriters" for a description of the compensation payable to the underwriters.*

*We have granted the underwriters the right to purchase up to additional shares of common stock to cover over-allotments.*

*The Securities and Exchange Commission and state securities regulators have not approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.*

*The underwriters expect to deliver the shares of common stock to purchasers on , 2019.*

*MORGAN STANLEY* *BofA MERRILL LYNCH* *COWEN*

*OPPENHEIMER & CO.*

*, 2019.*

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**Through and including , 2019 (the 25th day after the date of this prospectus), all dealers effecting transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This is in addition to a dealer's obligation to deliver a prospectus when acting as an underwriter and with respect to an unsold allotment or subscription.**

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We have not authorized anyone to provide you with any information or to make any representations other than those contained in this prospectus or in any free writing prospectuses we have prepared. We and the underwriters take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. We are offering to sell, and seeking offers to buy, shares of our common stock only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date of this prospectus, regardless of the time of delivery of this prospectus or of any sale of our common stock. Our business, financial condition, results of operations, and future growth prospects may have changed since that date.

For investors outside the United States: Neither we nor any of the underwriters have done anything that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons outside of the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of the shares of our common stock and the distribution of this prospectus outside of the United States.

## PROSPECTUS SUMMARY

*This summary highlights selected information contained elsewhere in this prospectus. This summary does not contain all of the information you should consider before investing in our common stock. You should read this entire prospectus carefully, including the sections titled "Risk Factors," "Management's Discussion and Analysis of Financial Condition and Results of Operations," and our consolidated financial statements and the related notes included elsewhere in this prospectus, before making an investment decision. Our fiscal year ends on December 31. Unless the context otherwise requires, all references in this prospectus to "we," "us," "our," "our company," and "Personalis" refer to Personalis, Inc.*

## PERSONALIS, INC.

### Overview

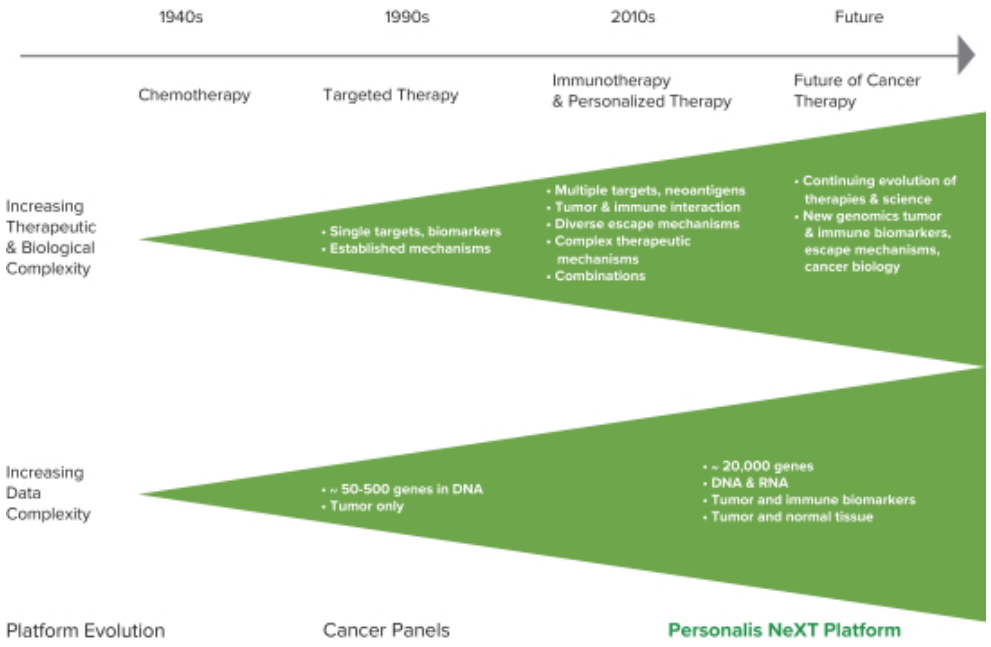
We are a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. We designed our NeXT Platform to adapt to the complex and evolving understanding of cancer, providing our biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes. We are also developing a complementary liquid biopsy assay that analyzes all human genes versus the more narrowly focused liquid biopsy assays that are currently available. By combining technological innovation, operational scale, and regulatory differentiation, our NeXT Platform is designed to help our customers obtain new insights into the mechanisms of response and resistance to therapy as well as new potential therapeutic targets. Our platform enhances the ability of biopharmaceutical companies to unlock the potential of conducting translational research in the clinic rather than with pre-clinical animal models or cancer cell lines. We are also planning to release a diagnostic based on our NeXT Platform that we envision being used initially by biopharmaceutical customers and clinical collaborators. Since inception, we have provided our services to more than 45 biopharmaceutical customers, including several of the largest pharmaceutical companies in the world.

In the past decade, the biopharmaceutical community has achieved major advances in the treatment of cancer, including approval of therapies capable of targeting specific genetic drivers of cancer and novel immunotherapies that empower the immune system to attack cancer cells. Despite these advances, the substantial majority of currently available cancer therapies have significant limitations, including efficacy only in certain subsets of patients, limited long-term survival rates, and significant toxicities. Moreover, the current research and development paradigm in oncology is beset by significant inefficiencies and substantial costs, with the average cost per patient in clinical trials reaching approximately $60,000. While tumor molecular profiling technologies have enhanced research and development efforts, most current tumor biopsy and liquid biopsy tests analyze a relatively narrow set of roughly 50 to 500 tumor genes, missing key genes and immune mechanisms underlying cancer therapy. With the lack of a comprehensive profiling solution, biopharmaceutical companies often attempt to use a disparate array of tests to compensate, resulting in a fragmented view of the tumor biology, insufficient tumor sample, logistical complexities, and increased costs. The resulting data heterogeneity makes it difficult to mine for new biological insights across cohorts of patients in clinical trials. These piecemeal approaches to tumor molecular profiling often result in solutions that are difficult to use at scale, especially in a clinical or therapeutic setting where simplicity, cost, turnaround time, and validation are important.

Our platform helps biopharmaceutical companies seeking to develop more efficacious therapies by comprehensively interrogating a patient's tumor and immune cells in detail, both to discover tumor vulnerabilities and elucidate potential therapeutic alternatives. To meet the demands of our customers, we built our NeXT Platform to be cost-effective and scalable with rapid turnaround times for tissue sample data and

analytics. NeXT represents the next step of our existing ACE platform, allowing customers to move up the value chain by gaining more information from a single sample. We believe that our platform has the potential to enable a research, development, and treatment paradigm that is dynamic and adaptive to the evolving genomic and immune system landscape of patients' tumors over time. We believe our technology will drive this evolving paradigm, which will enable our customers to develop safer and more efficacious therapeutics (see Figure 1). As the clinical utility of our platform increases, we expect to grow our diagnostic capabilities, including the ability to guide therapy based on a patient's changing tumor and immune system, supporting the commercialization of therapeutics developed by our biopharmaceutical customers.

*Figure 1. Personalis NeXT Platform addresses the increasingly complex understanding of cancer.*




**Personalis: The Genomics Engine for Next-Generation Cancer Therapies**

Biopharmaceutical customers use our comprehensive platform across a diverse set of therapeutic approaches to cancer. We generate and analyze data from patients who participated in clinical trials, which we believe will enable these customers to develop more effective therapies.

The information we generate is important to our customers developing three major classes of next-generation therapeutics: immunotherapies, targeted therapies, and personalized cancer therapies. Based on the approximately 195,000 patients who are currently expected to enroll in the over 1,600 immunotherapy, targeted therapy, and personalized therapy clinical trials that commenced in 2018, we estimate the total addressable market for multiple time point comprehensive tissue and liquid biopsy testing in clinical trials is over $5.0 billion annually. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate.

- **Immunotherapies:** Over the past decade, a number of drugs have emerged based on the discovery that the immune system plays a key role in addressing cancer. Checkpoint inhibitors, a specific type of immunotherapy, generated worldwide sales of over $16.6 billion in 2018, up from approximately $1.4 billion in 2014. The commercial success of these drugs has shown the potential of

immunotherapy; however, the development of new therapies in this category has been challenged by difficulties understanding the precise interaction between cancer and the immune system. The number of clinical trials in this space involving at least one cancer immunotherapy drug has grown from 123 that started in 2012 to 1,000 that started in 2018. Since our platform provides comprehensive insights on tumor and immune biology, including in both innate and adaptive immune cells, we believe it will enable biopharmaceutical companies to better understand how therapeutics are working in patients.

- **Targeted Therapies:** A growing category of successful cancer treatments consists of therapies that target specific genes or molecular mechanisms of cancer. These drugs are not designed to influence the immune system directly, but the success of immunotherapies has brought acknowledgment that the immune system has a significant effect on their efficacy. Many of these targeted therapies are proposed to be tested in combination with immunotherapies. These therapies have grown to represent a considerable share of the overall oncology therapeutics market today. Comprehensively understanding each patient's genomic and immune profile is critical to understanding which of these therapies a patient may respond to. We believe that more comprehensive coverage of all of the approximately 20,000 genes positions us competitively against existing cancer panels that cover roughly 50 to 500 genes. We are positioning our company to be a leading provider of the complex information that we believe will continue to inform the development of targeted cancer therapies.
- **Personalized Cancer Therapies:** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches to developing these therapies including neoantigen-based vaccines and T-cell therapies, all of them can potentially benefit from the data and analytics that our platform can generate about a patient's tumor. Given the more than 700,000 cancer patients projected to be diagnosed with late-stage disease in the United States in 2019, we estimate that the total addressable market for our data and analytics for personalized cancer therapy could reach as much as $20 billion in the United States and as much as $40 billion worldwide. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate. Many of our customers have leveraged our U.S. Food and Drug Administration (the "FDA") Device Master File as a component of their investigational new drug ("IND") filings with the FDA. We anticipate that if drugs are approved that used our platform in the clinical trials forming the basis for approval, we may be able to derive revenue in connection with the sale of these drugs. We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies.

We anticipate that as the clinical utility of our platform is validated, we will have opportunities in connection with diagnostics and the commercialization of cancer therapeutics, which are significantly larger than our initial clinical-trial focused markets. Over time, we expect our biopharmaceutical customers and research collaborators to build evidence of clinical utility for our platform as a diagnostic for advanced cancer therapies. Separately, we are also acquiring samples and are building a database which will hold value for our biopharmaceutical customers and may ultimately allow us to discover new mechanisms of cancer treatment.

**The NeXT Platform**

Our NeXT Platform is designed to provide comprehensive analysis of both a tumor and its immune microenvironment from a single limited tissue sample. Our platform covers the deoxyribonucleic acid ("DNA") sequence of all of the approximately 20,000 human genes. We also report on the entire transcriptome of a tumor, which encompasses ribonucleic acid ("RNA") expression across the approximately 20,000 human genes, allowing us to more accurately determine which of the many genomic mutations might actually be driving tumor progression. Furthermore, our platform analyzes elements of the immune cells that have infiltrated a tumor both from the adaptive immune system and the innate immune system.

Given the practical challenges in obtaining high-quality tumor samples via biopsy, we have developed our platform to work with a limited tumor tissue sample. Biopharmaceutical companies face significant challenges in attempting to divide samples to ship to multiple service providers to perform different tests. If a biopharmaceutical company is successful in acquiring results from multiple service providers, it is challenging to compare the results across multiple data platforms from multiple service providers. Our platform is composed of multiple proprietary technologies, many of which we have developed from the ground up. The breadth of the assays that we have integrated into our platform, our proprietary sample preparation process, and the comprehensiveness of our platform allow us to maximize the utility of often limited tumor tissue samples that our customers have from their clinical trials.

We have also shown that our technology can analyze cell-free DNA ("cfDNA") obtained from blood plasma, also known as a liquid biopsy. As with a tissue biopsy, we plan to analyze all of the approximately 20,000 human genes in each plasma sample, in contrast to currently marketed liquid biopsy panels. We expect this cfDNA to be obtained by a blood draw concurrently with a tissue sample. Together, the two samples can be used to provide a more comprehensive initial characterization of the tumor. Additionally, we expect to monitor changes in tumor genetics that arise in response to therapy through serial measurements using cfDNA samples collected across multiple time points. In 2020, we plan to launch our first liquid biopsy assay designed to analyze all human genes so as to detect potential neoantigens and tumor escape mechanisms that arise under therapeutic pressure. Although we believe our cfDNA test will offer new insights, we believe it will be most useful for our biopharmaceutical customers alongside our primary tumor biopsy product, given that a tumor biopsy is required to analyze gene expression and elucidate tumor-infiltrating lymphocytes, which are critical to understanding cancer's interaction with the immune system.

**Robust Operational Infrastructure to Scale with Our Customers**

We have invested significant resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands. Our NeXT Platform is complemented by our enterprise-grade software and bespoke information management systems that we tailor to meet our customers' unique needs and integrate with their workflows. Moreover, our infrastructure provides customers with visibility and control over processes, ensures consistency across all components used for the duration of each clinical trial, is traceable for compliance purposes, and allows us to scale while maintaining rapid turnaround times.

We designed our proprietary informatics system, the Symphony Enterprise Informatics System ("Symphony"), as a flexible and scalable enterprise-grade system used to manage the unique complexities and challenges of our genomics laboratory. Symphony integrates laboratory information management systems and bioinformatics systems to connect laboratory operations with downstream data analysis. Symphony orchestrates all operational activities from our laboratory starting with sample receipt to the reporting of results of the genomic profiling and data delivery. We also use machine learning and artificial intelligence approaches to generate substantial performance advantages for our algorithms, such as neoantigen binding prediction.

We are sequencing and analyzing up to 100 trillion bases of DNA per week in our facility. We believe this capacity is already larger than most cancer genomics companies and we are building the automation and other infrastructure to scale further as demand increases and in support of the planned 2020 launch of our NeXT liquid biopsy assay.

Since 2012, we have been contracted to provide DNA sequencing and data analysis services to the U.S. Department of Veterans Affairs' (the "VA") Million Veteran Program (the "VA MVP"). The VA MVP began collecting samples in 2011 and is a landmark research effort aimed at better understanding how genetic variations affect health. Up to a million veterans are expected to enroll in the VA MVP study by 2021. With approximately

750,000 enrollees to date, the VA MVP exceeds the enrollment numbers of any single VA study or research program in the past, and is in fact one of the largest research cohorts of its kind. In September 2017, we entered into a one-year contract with three one-year renewal option periods with the VA for the VA MVP, and received orders under this contract in September 2017 and 2018. This relationship with the VA MVP has enabled us to innovate, scale our operational infrastructure, and achieve greater efficiencies in our lab. It has also supported our development of industry-leading, large-scale cancer genomic testing. The substantial experience that we have and expect to continue to develop in whole genome sequencing also optimally positions us for what we anticipate to be the longer-term strategic direction of the cancer genomics industry, which may include whole genome sequencing of tumors.

We believe our platform is well positioned to scale rapidly and substantially as the field of personalized cancer therapies matures. We believe that our platform could be essential to the composition and manufacture of any personalized cancer therapy developed using our platform. Furthermore, we expect that patients would be tested at multiple time points during the course of treatment: first to design a therapy according to an initial genomic profile generated from a tissue and/or liquid biopsy, and then as follow-up testing via liquid biopsy to detect any changes that would require therapy modifications after initial therapeutic interventions. If a therapy that uses our NeXT Platform achieves regulatory approval, we believe that our commercial opportunity may increase substantially.

**Personalis is Valuable to Biopharmaceutical Companies**

We believe that our platform is valuable to our customers because:

- **Our tumor and immune molecular profiling capabilities provide an unprecedented breadth of data from a single limited tumor sample.** We provide information on all of the approximately 20,000 human genes, as well as gene expression, the immune system, and other elements of cancer biology, in contrast to other currently marketed panels that cover a limited range of roughly 50 to 500 genes and do not focus on immune cells.
- **Our platform enhances the opportunity to conduct translational research by analyzing tumor tissues from patients in clinical trials, rather than animal models or in vitro cancer cell lines, which have historically limited cancer research.** While conventional pre-clinical model systems, such as animal models and cancer cell lines, have been instrumental in early-stage cancer research and drug development, translation of results to the clinic has been limited and remains a significant barrier to progress, in part because these models do not sufficiently reflect the complexity of human cancer and the human immune system. Over recent years, tools used to study tissue from patients have improved and the utilization of tissue from trials has increased. We believe our platform represents the next step in this transition by further enabling biopharmaceutical companies to address the historical limitations of analyzing patient tissue comprehensively.
- **The information we provide to personalized cancer therapy companies can be used to design therapeutics.** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches to developing these therapies including neoantigen-based vaccines and T-cells therapies, all of them can potentially benefit from the data and analytics that our platform can generate about a patient's tumor.
- **Our enterprise-grade operational infrastructure is scalable, enables rapid turnaround times, and is tailored to meet the unique workflow needs of our customers.** We have invested significant resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands.

- **We are developing a complementary liquid biopsy test, which also offers broad 20,000-gene coverage versus more narrowly focused liquid biopsy tests that are currently available.** While tumor biopsies are necessary to provide tumor immune microenvironment and gene expression information that current liquid biopsy panels do not provide, we believe a comprehensive liquid biopsy test used in concert with our tissue test can provide complementary information across multiple time points.

**Our Strategy**

Our mission is to transform the development of next generation cancer therapies by providing more comprehensive molecular data about each patient's tumor. To achieve this mission, our strategy is to:

- **Drive adoption of our platform by establishing and expanding relationships with leading developers of oncology therapeutics;**
- **Invest in new product innovations and enhancements to maintain our leading position;**
- **Continue to build a body of evidence demonstrating the utility of comprehensive genomic data;**
- **Continue to grow our relationship with the VA MVP to innovate and scale our operational infrastructure;**
- **Leverage a growing body of evidence from our platform to develop a diagnostic; and**
- **Build out a comprehensive tumor-genomics database.**

**Our Team**

We have assembled a multidisciplinary team of experienced industry leaders to drive continuous innovation. Scientific and operational excellence is a guiding principle for our employees. We have invested not only in the technology to provide information of sufficient quality for clinical use, but also in the people to continuously innovate for the industry's growing and changing demands.

Our President and Chief Executive Officer, John West, co-founded our company in 2011 in conjunction with four Stanford professors, Euan Ashley, M.D., Ph.D., Atul Butte, M.D., Ph.D., Russ Altman, M.D., Ph.D., and Michael Snyder, Ph.D. More broadly, our executive officers and management team members have had previous experience at a variety of genomics, pharmaceuticals, biotechnology, diagnostics, data analytics, service, enterprise software, and technology companies including Agilent Technologies, Inc., Applied Biosystems Inc., ARMO Biosciences, Inc., Illumina, Inc., Informatica LLC, Ingenuity Systems, Inc., Lumentum Holdings Inc., Merck & Co., Inc., Molecular Dynamics, Inc., Natera, Inc., Novartis Pharmaceuticals Corp., Pacific Biosciences of California, Inc., RainDance Technologies, Inc., and Solexa, Ltd.

**Financial Highlights**

Our revenues have grown rapidly as our penetration of clinical trials in advanced oncology therapeutics has expanded, consistent with our reputation as a leader in the field. We generated revenues of $9.4 million, $37.8 million, and $14.1 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively. We also incurred net losses of $23.6 million, $19.9 million, and $5.7 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively.

As of March 31, 2019, we had $33.2 million of cash and cash equivalents, an increase of $11.4 million from March 31, 2018. Our revenues are primarily generated through sales of our services to biopharmaceutical companies and the VA MVP. Unlike diagnostic or therapeutic companies, we have not sought reimbursement through traditional healthcare payors. We have raised $89.6 million in preferred stock equity financing to date.

**Risk Factors Summary**

Investing in our common stock involves numerous risks, including the risks described in the section titled "Risk Factors" and elsewhere in this prospectus. You should carefully consider these risks before making an investment. The following are some of these risks, any of which could have an adverse effect on our business financial condition, operating results, or prospects.

- We have a history of losses, and as our costs increase, we expect to incur significant losses for the foreseeable future and may not be able to generate sufficient revenue to achieve or sustain profitability.
- If we are unable to increase sales of our current services or successfully develop and commercialize other services, our revenues will be insufficient for us to achieve profitability.
- Certain of our customers prepay us for a portion of the services that they expect to order from us in the future, and we may be required to refund some or all of those prepayments if a customer cancels its contract with us or reduces the level of services that it expects to receive.
- If we are unable to execute our sales and marketing strategy for our services and are unable to gain sufficient acceptance in the market, we may be unable to generate sufficient revenue to sustain our business.
- If we cannot compete successfully with our competitors, we may be unable to increase or sustain our revenues or achieve and sustain profitability.
- Our inability to raise additional capital on acceptable terms in the future may limit our ability to continue to operate our business and further expand our operations.
- We will need to invest in our infrastructure in advance of increased demand for our services, and our failure to accurately forecast demand would have a negative impact on our business and our ability to achieve and sustain profitability.
- We have substantial customer concentration, with a limited number of customers accounting for a substantial portion of our 2018 revenues and accounts receivable.
- Our tests may be subject to regulatory action if regulatory agencies determine that our tests do not appropriately comply with statutory and regulatory requirements enforced by the FDA and/or CLIA requirements for quality laboratory testing.
- Litigation or other proceedings or third-party claims of intellectual property infringement, misappropriation or other violations may require us to spend significant time and money, and could in the future prevent us from selling our tests or impact our stock price, any of which could have a material adverse effect.
- We have identified a material weakness in our internal control over financial reporting and may identify additional material weaknesses in the future or otherwise fail to maintain an effective system of internal controls, which may result in material misstatements of our financial statements or cause us to fail to meet our periodic reporting obligations.
- Insiders will exercise significant control over our company and will be able to influence corporate matters.

**Corporate Information**

We were incorporated under the laws of the state of Delaware in February 2011 under the name Personalis, Inc. Our principal executive offices are located at 1330 O'Brien Drive, Menlo Park, California 94025. Our telephone number is (650) 752-1300. Our website address is https://www.personalis.com. Information contained on, or that can be accessed through, our website is not incorporated by reference into this prospectus, and you should not consider information on our website to be part of this prospectus.

Personalis, the Personalis logo, and our other registered or common law trade names, trademarks, or service marks appearing in this prospectus are the property of Personalis, Inc. Trade names, trademarks, and service marks of other companies appearing in this prospectus are the property of their respective owners.

**Implications of Being an Emerging Growth Company**

As a company with less than $1.07 billion in revenues during our last fiscal year, we qualify as an "emerging growth company" as defined in the Jumpstart Our Business Startups Act (the "JOBS Act"), enacted in April 2012. An emerging growth company may take advantage of reduced reporting requirements that are otherwise applicable to public companies. These provisions include, but are not limited to:

- not being required to comply for a certain period of time with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended;
- reduced disclosure obligations regarding executive compensation in our periodic reports, proxy statements, and registration statements; and
- exemptions from the requirements of holding a stockholder advisory vote on executive compensation and any golden parachute payments not previously approved.

We may take advantage of these provisions until the last day of our fiscal year following the fifth anniversary of the date of the first sale of our common stock in this offering. However, if certain events occur prior to the end of such five-year period, including if (i) we become a "large accelerated filer," with at least $700 million of equity securities held by non-affiliates; (ii) our annual gross revenues exceed $1.07 billion; or (iii) we issue more than $1.0 billion of non-convertible debt in any three-year period, we will cease to be an emerging growth company prior to the end of such five-year period.

We have elected to take advantage of certain of the reduced disclosure obligations in the registration statement of which this prospectus is a part and may elect to take advantage of other reduced reporting requirements in future filings. As a result, the information that we provide to our stockholders may be different than you might receive from other public reporting companies in which you hold equity interests.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. This provision allows an emerging growth company to delay the adoption of some accounting standards until those standards would otherwise apply to private companies. We have irrevocably elected not to avail ourselves of this exemption and, therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

**THE OFFERING**

| | |
|---|---|
| Common stock offered by us | shares |
| Common stock to be outstanding after this offering | shares |
| Over-allotment option of common stock offered by us | shares |
| Use of proceeds | We estimate that the net proceeds from the sale of our common stock in this offering will be approximately $ million (or approximately $ million if the underwriters exercise their over-allotment option in full), based on the assumed initial public offering price of $ per share and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.<br><br>The principal purposes of this offering are to increase our capitalization and financial flexibility and create a public market for our common stock. We currently intend to use the net proceeds we receive from this offering for expanded research and development, infrastructure expansion, facilities expansion, headcount growth, sales and marketing expenditures, public company costs, other capital expenditures, and working capital. See the section titled "Use of Proceeds" for additional information. |
| Risk factors | See the section titled "Risk Factors" for additional information. |
| Proposed trading symbol on The Nasdaq Global Market | "PSNL" |

The number of shares of our common stock that will be outstanding after this offering is based on 87,318,814 shares of our common stock (including shares of our redeemable convertible preferred stock on an as-converted basis, and assuming the exercise of a warrant to purchase 754,573 shares of our common stock) outstanding as of March 31, 2019, and excludes:

- 17,527,536 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Equity Incentive Plan (the "2011 Plan"), and outstanding as of March 31, 2019, with a weighted-average exercise price of $0.9049 per share;
- 1,453,788 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan after March 31, 2019, with an exercise price of $3.30 per share;
- 338,341 shares of our redeemable convertible preferred stock issuable upon the exercise of warrants to purchase shares of our redeemable convertible preferred stock outstanding as of March 31, 2019, with a weighted-average exercise price of $1.7836 per share;
- 262,008 shares of our common stock issuable upon the exercise of a warrant to purchase shares of our common stock outstanding as of March 31, 2019, with an exercise price of $2.29 per share;

- shares of our common stock reserved for future issuance under our 2019 Equity Incentive Plan (the "2019 Plan"), (including shares of our common stock reserved for issuance under our 2011 Plan that will be added to our 2019 Plan reserve upon its effectiveness) which includes an annual evergreen increase and will become effective in connection with this offering; and
- shares of our common stock reserved for future issuance under our 2019 Employee Stock Purchase Plan (the "ESPP"), which includes an annual evergreen increase and will become effective in connection with this offering.

Unless otherwise indicated, the information in this prospectus assumes:

- an initial public offering price of $ per share, which is the midpoint of the estimated offering price range set forth on the cover page of this prospectus;
- the automatic conversion of all outstanding shares of our redeemable convertible preferred stock into 73,898,975 shares of our common stock immediately prior to the closing of this offering;
- no exercise of the outstanding options described above;
- the cash exercise of an outstanding warrant to purchase 754,573 shares of our common stock;
- no exercise of the outstanding warrants to purchase shares of our redeemable convertible preferred stock described above and the automatic conversion of such warrants into warrants exercisable for 338,341 shares of our common stock;
- no exercise of an outstanding warrant to purchase 262,008 shares of our common stock described above;
- no exercise of the underwriters' option to purchase up to an additional shares of common stock to cover over-allotments; and
- the filing and effectiveness of our amended and restated certificate of incorporation and the adoption of our amended and restated bylaws, each of which will occur prior to the closing of this offering.

## SUMMARY CONSOLIDATED FINANCIAL DATA

The summary consolidated statements of operations data for the years ended December 31, 2017 and 2018 has been derived from our audited consolidated financial statements included elsewhere in this prospectus. The summary consolidated statements of operations and comprehensive loss data for the three months ended March 31, 2018 and 2019 and the summary consolidated balance sheet data as of March 31, 2019 are derived from our unaudited interim condensed consolidated financial statements included elsewhere in this prospectus. We have prepared the unaudited interim condensed consolidated financial statements on the same basis as the audited financial statements and have included, in our opinion, all adjustments, consisting only of normal recurring adjustments that we consider necessary for a fair statement of the financial information set forth in those statements. You should read the consolidated financial data set forth below in conjunction with our consolidated financial statements and the accompanying notes and the information in the section titled "Management's Discussion and Analysis of Financial Condition and Results of Operations" contained elsewhere in this prospectus. Our historical results are not necessarily indicative of the results that may be expected for any other period in the future and our interim results for the three months ended March 31, 2019 are not necessarily indicative of results to be expected for the full year ending December 31, 2019, or any other period.

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| | (in thousands, except share and per share data) | | | |
| **Consolidated Statements of Operations Data:** | | | | |
| Revenues | $ 9,393 | $ 37,774 | $ 4,164 | $ 14,075 |
| Costs and expenses | | | | |
| Costs of revenues(1) | 11,736 | 25,969 | 4,065 | 10,091 |
| Research and development(1) | 9,919 | 14,304 | 2,949 | 5,245 |
| Selling, general, and administrative(1) | 9,901 | 11,271 | 2,313 | 4,170 |
| Total costs and expenses | 31,556 | 51,544 | 9,327 | 19,506 |
| Loss from operations | (22,163) | (13,770) | (5,163) | (5,431) |
| Interest income | 100 | 293 | 61 | 84 |
| Interest expense | (1,303) | (1,894) | (622) | (184) |
| Loss on debt extinguishment | — | (4,658) | — | — |
| Other (expense) income, net | (227) | 150 | 351 | (152) |
| Loss before income taxes | (23,593) | (19,879) | (5,373) | (5,683) |
| Provision for income taxes | (5) | (7) | (2) | (2) |
| Net loss | $ (23,598) | $ (19,886) | $ (5,375) | $ (5,685) |
| Net loss per share, basic and diluted(2) | $ (1.95) | $ (1.62) | $ (0.44) | $ (0.46) |
| Weighted-average shares outstanding, basic and diluted(2) | 12,126,544 | 12,252,629 | 12,206,325 | 12,365,371 |
| Pro forma net loss per share, basic and diluted (unaudited)(2) | | $ (0.24) | | $ (0.06) |
| Pro forma weighted-average shares outstanding, basic and diluted (unaudited)(2) | | 81,934,173 | | 87,018,919 |

(1) Includes stock-based compensation as follows:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| | (in thousands) | | | |
| Costs of revenues | $ 74 | $ 177 | $ 24 | $ 85 |
| Research and development | 225 | 429 | 64 | 164 |
| Selling, general, and administrative | 454 | 711 | 81 | 360 |
| Total stock-based compensation expense | $ 753 | $ 1,317 | $ 169 | $ 609 |

(2) See the consolidated statements of operations and Note 15 to our consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to compute the historical and pro forma net loss per share and the number of shares used in the computation of the per share amounts.

| | As of March 31, 2019 | | |
|---|---|---|---|
| | Actual | Pro Forma(1) | Pro Forma as Adjusted(2)(3) |
| | | (unaudited) (in thousands) | |
| **Consolidated Balance Sheet Data:** | | | |
| Cash and cash equivalents | $ 33,237 | $ 33,245 | $ |
| Working capital(4) | (15,348) | (15,340) | |
| Total assets | 57,647 | 57,655 | |
| Redeemable convertible preferred stock warrant liability | 817 | — | |
| Additional paid-in capital | 10,666 | 101,778 | |
| Accumulated deficit | (121,190) | (122,080) | |
| Total stockholders' deficit | (110,523) | (20,294) | |

(1) The pro forma consolidated balance sheet data gives effect to (i) the automatic conversion of all of our outstanding shares of redeemable convertible preferred stock as of March 31, 2019 into 73,898,975 shares of our common stock immediately prior to the closing of this offering, (ii) the assumed cash exercise of a warrant to purchase 754,573 shares of our common stock, (iii) the automatic conversion of two warrants to purchase an aggregate of 338,341 shares of our redeemable convertible preferred stock, outstanding as of March 31, 2019, into warrants to purchase an equivalent number of shares of our common stock, and the related reclassification of redeemable convertible preferred stock warrant liability to stockholders' equity, (iv) stock-based compensation expense of $0.9 million associated with outstanding stock options subject to a performance condition for which the service-based vesting condition was satisfied as of March 31, 2019 and which we will recognize in connection with this offering, and (v) the filing and effectiveness of our amended and restated certificate of incorporation that will be in effect immediately prior to the closing of this offering. For additional information, see Note 1 to our consolidated financial statements included elsewhere in this prospectus.

(2) The pro forma as adjusted consolidated balance sheet data gives effect to (i) the pro forma items described in footnote (1) above and (ii) the issuance and sale by us of shares of our common stock in this offering at the assumed initial public offering price of $ per share, after deducting the underwriting discounts and commissions and estimated offering expenses payable by us and the use of proceeds to satisfy the withholding tax obligations described in the footnote above.

(3) The pro forma as adjusted consolidated balance sheet data is illustrative only and will change based on the actual initial public offering price and other terms of this offering determined at pricing. Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share would increase (decrease) each of our pro forma as adjusted cash and cash equivalents, working capital, total assets, additional paid-in capital and total stockholders' deficit by $ million, assuming the number of shares of common stock offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting the underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of 1.0 million shares in the number of shares of common stock offered by us would increase (decrease) each of our pro forma as adjusted cash and cash equivalents, working capital, total assets, additional paid-in capital, and total stockholders' deficit by approximately $ million, assuming the assumed initial public offering price of $ per share remains the same, and after deducting the underwriting discounts and commissions and estimated offering expenses payable by us.

(4) Working capital is defined as total current assets less total current liabilities. See our consolidated financial statements and the related notes included elsewhere in this prospectus for further details regarding our current assets and current liabilities.

## RISK FACTORS

*Investing in our common stock involves a high degree of risk. You should consider and read carefully all of the risks and uncertainties described below, as well as other information included in this prospectus, including our consolidated financial statements and related notes appearing at the end of this prospectus, before making an investment decision. The occurrence of any of the following risks or additional risks and uncertainties not presently known to us or that we currently believe to be immaterial could materially and adversely affect our business, financial condition, or results of operations. In such case, the trading price of our common stock could decline, and you may lose all or part of your original investment. This prospectus also contains forward-looking statements and estimates that involve risks and uncertainties. Our actual results could differ materially from those anticipated in the forward-looking statements as a result of specific factors, including the risks and uncertainties described below.*

### Risks Related to Our Business and Strategy

***We have a history of losses, and as our costs increase, we expect to incur significant losses for the foreseeable future and may not be able to generate sufficient revenue to achieve or sustain profitability.***

We have incurred net losses since our inception. For the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, we had net losses of $23.6 million, $19.9 million, and $5.7 million, respectively. As of March 31, 2019, we had an accumulated deficit of $121.2 million. To date, we have not generated sufficient revenue to achieve profitability, and we may never achieve or sustain profitability. In addition, we expect to continue to incur net losses for the foreseeable future, and we expect our accumulated deficit to continue to increase as we focus on scaling our business and operations. Our efforts to sustain and grow our business may be more costly than we expect, and we may not be able to increase our revenue sufficiently to offset our higher operating expenses. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital. Our failure to achieve and sustain profitability in the future would negatively affect our business, financial condition, results of operations, and cash flows, and could cause the market price of our common stock to decline.

***If we are unable to increase sales of our current services or successfully develop and commercialize other services or products, our revenues will be insufficient for us to achieve profitability.***

We currently derive substantially all of our revenues from sales of our services. We began offering our services through our Clinical Laboratory Improvement Amendments of 1988 ("CLIA")-certified, College of American Pathologists ("CAP")-accredited, and state-licensed laboratory in 2013. We are in varying stages of research and development for other services and products that we may offer. If we are unable to increase sales of our existing services or successfully develop and commercialize other services and products, we will not generate sufficient revenues to become profitable.

***Certain of our customers prepay us for a portion of the services that they expect to order from us in the future and we may be required to refund some or all of those prepayments if a customer cancels its contract with us or reduces the level of services that it expects to receive.***

Certain of our customers prepay us for a portion of the services that they expect to order from us before they place purchase orders and we deliver those services. In some cases, this prepayment can be substantial and may be paid months or a year or more in advance of these customers providing samples to us and before our delivery of the services to which some or all of the deposit relates. As of March 31, 2019, we had approximately $44.3 million in customer deposits, including $39.6 million from one customer. However, as of that date, we had only $33.2 million of cash and cash equivalents. We are generally not required by our contracts to retain these deposits in cash or otherwise and we have generally used these deposits to make capital expenditures and fund our operations. If a customer that has prepaid us for future services cancels its contract with us or reduces the

level of services that it expects to receive, we would generally be required to repay that customer's deposit with little or no notice. We may not have the cash or other available resources to satisfy that repayment obligation. Even if we are able to satisfy the repayment obligation from available resources (including potentially a portion of the net proceeds of this offering), we may need to seek additional sources of capital to fund our operations, which funding may not be available when needed or on acceptable terms. In either of those circumstances, our business, financial condition, results of operations, and reputation would be materially and adversely affected. Furthermore, in the future customers may elect not to prepay us for our services in which case we would have to find other sources of funding for our capital expenditures and operations, which would be costly relative to the aforementioned cost-free customer deposit funding and which may not be available when needed or on acceptable terms.

***If we are unable to execute our sales and marketing strategy for our services and are unable to gain sufficient acceptance in the market, we may be unable to generate sufficient revenues to sustain our business.***

We are a growing genomics company and have engaged in targeted sales and marketing activities for our services. Although we have had revenues from sales of our services since 2013, our services may never gain significant acceptance in the marketplace and therefore may never generate substantial revenues or permit us to become profitable. We will need to further establish and grow the market for our services through the expansion of our current relationships and development of new relationships with biopharmaceutical customers. Gaining acceptance in medical communities can be supported by, among other things, publications in leading peer-reviewed journals of results from studies using our services. The process of publication in leading medical journals is subject to a peer review process and peer reviewers may not consider the results of our studies sufficiently novel or worthy of publication. Failure to have our studies published in peer-reviewed journals would limit the adoption of our services.

Our ability to successfully market our services that we have developed, and may develop in the future, will depend on numerous factors, including:

- our ability to demonstrate the utility and value of our services to our customers;
- the success of our sales force;
- whether biopharmaceutical companies accept that our services are sufficiently sensitive and specific;
- our ability to convince biopharmaceutical companies of the utility of the comprehensiveness of our services and of testing patients at multiple time points;
- our ability to continue to fund sales and marketing activities;
- whether our services are considered superior to those of our competitors;
- any negative publicity regarding our or our competitors' services resulting from defects or errors;
- our success obtaining and maintaining patent and trade secret protection for our services and technologies; and
- our success enforcing and defending intellectual property rights and claims.

Failure to achieve broad market acceptance of our services would materially harm our business, financial condition, and results of operations.

***If we cannot compete successfully with our competitors, we may be unable to increase or sustain our revenues or achieve and sustain profitability.***

Our principal competition comes from commercial and academic organizations using established and new laboratory tests to produce information that is similar to the information that we generate for our customers.

These commercial and academic organizations may not utilize our services or may not believe them to be superior to those tests that they currently use or others that are developed. Further, it may be difficult to convince our customers to use our comprehensive test rather than simpler panels provided by our competitors. For example, the information that we provide may be more challenging or require additional resources for our customers to interpret than the information provided by our competitors' less comprehensive assays.

Some of our present and potential competitors, including Guardant Health, Inc., Foundation Medicine, Inc., which was acquired by Roche Holdings, Inc. in July 2018, Roche Molecular Systems, Inc., NanoString Technologies, Inc., Personal Genome Diagnostics, Inc., and Adaptive Biotechnologies Corporation, may have widespread brand recognition and substantially greater financial and technical resources and development, production capacities, and marketing capabilities than we do. They may be able to devote greater resources to the development, promotion, and sale of their products and services than we do or sell their products and services at prices designed to win significant levels of market share. In addition, competitors may be acquired by, receive investments from, or enter into other commercial relationships with larger, well-established, and well-financed companies. Others may develop lower-priced, less complex products and services that pharmaceutical companies could view as functionally equivalent to our current or planned future services, which could force us to lower the price of our services and impact our operating margins and our ability to achieve and maintain profitability. In addition, companies or governments that control access to genetic testing and related services through umbrella contracts or regional preferences could promote our competitors or prevent us from performing certain services. In addition, technological innovations that result in the creation of enhanced products or diagnostic tools that are more sensitive or specific than ours may enable other clinical laboratories, hospitals, physicians, or medical providers to provide specialized products or services similar to ours in a more patient-friendly, efficient, or cost-effective manner than is currently possible. If we cannot compete successfully against current or future competitors, we may be unable to ensure or increase market acceptance and sales of our current or planned future services, which could prevent us from increasing or sustaining our revenues or achieving or sustaining profitability.

We expect that biopharmaceutical companies will increasingly focus attention and resources on the targeted and personalized cancer diagnostic sector as the potential and prevalence of molecularly targeted oncology therapies approved by the U.S. Food and Drug Administration (the "FDA") along with companion diagnostics increases. For example, the FDA has approved several such targeted oncology therapies that use companion diagnostics, including the anaplastic lymphoma kinase FISH test from Abbott Laboratories, Inc. for use with Xalkori® from Pfizer Inc., the BRAF kinase V600 mutation test from Roche Molecular Systems, Inc. for use with Zelboraf® from Daiichi-Sankyo/Genentech/Roche, and the BRAF kinase V600 mutation test from bioMerieux for use with Tafinlar® from GlaxoSmithKline. Since companion diagnostic tests are part of FDA labeling, non-FDA cleared tests, such as the ones we currently offer as part of our services, would be considered an off-label use and this may limit our access to this market segment.

Additionally, projects related to cancer diagnostics and particularly genomics have received increased government funding, both in the United States and internationally. As more information regarding cancer genomics becomes available to the public, we anticipate that more products aimed at identifying targeted treatment options will be developed and that these products may compete with our services. In addition, competitors may develop their own versions of our current or planned future services in countries where we did not apply for or receive patents and compete with us in those countries, including encouraging the use of their products or services by biopharmaceutical companies in other countries.

***Our inability to raise additional capital on acceptable terms in the future may limit our ability to continue to operate our business and further expand our operations.***

We expect capital expenditures and operating expenses to increase over the next several years as we continue to operate our business and expand our infrastructure, commercial operations, and research and development activities. Additionally, if we decide to grow our business by developing in vitro diagnostic tests,

our capital expenditures and operating expenses would significantly increase. We may seek to raise additional capital through equity offerings, debt financings, collaborations, or licensing arrangements. Additional funding may not be available to us on acceptable terms, or at all.

The various ways we could raise additional capital carry potential risks. If we raise funds by issuing equity securities, dilution to our stockholders would result. Any equity securities issued may also provide for rights, preferences, or privileges senior to those of holders of our common stock. In addition, the issuance of additional equity securities by us, or the possibility of such issuance, may cause the market price of our common stock to decline. If we raise funds by issuing debt securities, those debt securities would have rights, preferences, and privileges senior to those of holders of our common stock. The terms of debt securities issued or borrowings pursuant to a credit agreement, if available, could impose significant restrictions on our operations. The incurrence of additional indebtedness or the issuance of certain equity securities could result in increased fixed payment obligations and could also result in restrictive covenants, such as limitations on our ability to incur additional debt or issue additional equity, limitations on our ability to acquire or license intellectual property rights, and other operating restrictions that could adversely affect our ability to conduct our business. In the event that we enter into collaborations or licensing arrangements to raise capital, we may be required to accept unfavorable terms. These agreements may require that we relinquish or license to a third party on unfavorable terms our rights to tests we otherwise would seek to develop or commercialize ourselves, or reserve certain opportunities for future potential arrangements when we might be able to achieve more favorable terms.

If we are not able to secure additional funding when needed, we may have to delay, reduce the scope of or eliminate one or more research and development programs or sales and marketing initiatives. In addition, we may have to work with a partner on one or more aspects of our tests or market development programs, which could lower the economic value of those tests or programs to us. While we believe our existing cash and cash equivalents, and the anticipated proceeds from this offering, will be sufficient to meet our anticipated cash requirements for at least the next 12 months, we cannot assure you that we will generate sufficient revenues from commercial sales to adequately fund our operating needs or achieve or sustain profitability.

***We will need to invest in our infrastructure in advance of increased demand for our services, and our failure to accurately forecast demand would have a negative impact on our business and our ability to achieve and sustain profitability.***

In order to execute our business model, we need to invest in scaling our infrastructure, including hiring additional personnel, expanding our internal quality assurance program, and expanding laboratory capacity. We will also need to purchase additional equipment, some of which can take several months or more to procure, setup, and validate, and increase our software and computing capacity to meet increased demand. There is no assurance that any of these increases in scale, expansion of personnel, equipment, software, and computing capacities, or process enhancements will be successfully implemented, or that we will have adequate space in our laboratory facility to accommodate such required expansion. We expect that much of this growth will be in advance of increased demand for our services. Our current and projected future expense levels are to a large extent fixed and are largely based on our current investment plans and our estimates of future test volume. As a result, if revenues do not meet our expectations we may not be able to promptly adjust or reduce our spending to levels commensurate with our revenues. If we fail to generate demand commensurate with our infrastructure growth or if we fail to scale our infrastructure sufficiently in advance of demand to successfully meet such demand, our business, prospects, financial condition, and results of operations could be adversely affected.

As we commercialize additional services or products, we may need to incorporate new equipment, implement new technology systems and laboratory processes, or hire new personnel with different qualifications. Failure to manage this growth or transition could result in turnaround time delays, higher costs, declining service and/or product quality, deteriorating customer service, and slower responses to competitive challenges. A failure in any one of these areas could make it difficult for us to meet market expectations for our services, and could damage our reputation and the prospects for our business.

***We have substantial customer concentration, with a limited number of customers accounting for a substantial portion of our 2018 revenues and accounts receivable.***

Like other genomics profiling companies that sell to the pharmaceutical industry, we have customer concentration. We currently derive a significant portion of our revenues from the U.S. Department of Veterans Affairs (the "VA") Million Veteran Program (the "VA MVP"), which accounted for more than 49% of our revenues in 2018, and 59% of our revenues in the three months ended March 31, 2019. Our top five customers, including the VA MVP, accounted for 82% of our revenues in 2018 and 90% of our revenues for the three months ended March 31, 2019. There are inherent risks whenever a large percentage of revenues are concentrated with a limited number of customers. It is not possible for us to predict the future level of demand for our services that will be generated by these customers. In addition, revenues from our larger customers have historically fluctuated and may continue to fluctuate based on the commencement and completion of clinical trials or other projects, the timing of which may be affected by market conditions or other facts, some of which may be outside of our control. Further, while we have long-term contractual arrangements with certain of our customers, these customers are not required to purchase a minimum number of analyses. If any of these customers suspend or terminate clinical trials, receive less funding, experience declining or delayed sales, or otherwise chose to reduce or eliminate their use of our services, we could be pressured to reduce the prices we charge for our services which would have an adverse effect on our margins and financial position, and which would likely negatively affect our revenues and results of operations. In particular, if the VA MVP terminates our services for convenience, which it is permitted to do, such termination would have a material adverse effect on our revenues, cash position, and results of operations. Further, if our largest customers were to cease using or stop payment for our services, it would have a material adverse effect on our accounts receivable, increasing our credit risk. The failure of these customers to pay their balances, or any customer to pay future outstanding balances, would result in an operating expense and reduce our cash flows.

***We currently derive a substantial portion of our revenues from DNA sequencing and data analysis services that we provide to our largest customer, the VA MVP. If the VA MVP's demand for and/or funding for our DNA sequencing and data analysis services is substantially reduced, our business, financial condition, operating results, and cash flows would be materially harmed.***

We derive a substantial portion of our current and expected future revenues from sales of our DNA sequencing and data analysis services to the VA MVP. In September 2017, we entered into a one-year contract with three one-year option renewal periods with the VA for the VA MVP, pursuant to which we received orders from the VA MVP in September 2017 and 2018.

The VA MVP's orders for DNA sequencing and data analysis services are subject to the availability of funding, enrollment of veterans in the VA MVP study, and the VA MVP's continued demand for our services. We have no certainty that funding will be made available for our services. If the priorities of the VA, the VA MVP, or the U.S. government change, funding for our services may be limited or not available, and our business, financial condition, and operating results and cash flows would be materially harmed. The success of our business and our future operating results are significantly dependent on the VA MVP's receipt of funding for use of our services and the terms of our sales to the VA MVP, including the price per sample, the number of samples and the timing of the VA MVP's deliveries of samples.

***If we cannot maintain our current customer relationships, or fail to acquire new customers, our revenue prospects will be reduced. Many of our customers are biopharmaceutical companies engaged in clinical trials of new drug candidates, which are expensive, can take many years to complete, and their outcome is inherently uncertain.***

Our customers other than the VA MVP are primarily biopharmaceutical companies that use our services to support clinical trials. Our future success is substantially dependent on our ability to maintain our customer relationships and to establish new ones. Many factors have the potential to impact our customer relations, including the type of support our customers and potential customers require and our ability to deliver it, our

customers' satisfaction with our services, and other factors that may be beyond our control. Furthermore, our customers may decide to decrease or discontinue their use of our services due to changes in research and product development plans, failures in their clinical trials, financial constraints, or utilization of internal testing resources or tests performed by other parties, or other circumstances outside of our control.

We engage in conversations with customers regarding potential commercial opportunities on an ongoing basis in the event that one of these customers' drug candidates is approved. There is no assurance that any of these conversations will result in a commercial agreement, or if an agreement is reached, that the resulting relationship will be successful or that clinical studies conducted as part of the engagement will produce successful outcomes. Speculation in the industry about our existing or potential relationships with biopharmaceutical companies could be a catalyst for adverse speculation about us, our services, and our technology, which can adversely affect our reputation and our business. In addition, the termination of these relationships could result in a temporary or permanent loss of revenue.

Our customers' clinical trials are expensive, can take many years to complete, and their outcome is inherently uncertain. Failure can occur at any time during the clinical trial process. Product candidates in later stages of clinical trials may fail to show the desired safety and efficacy traits despite having progressed through pre-clinical studies and early clinical trials. Many of the biopharmaceutical companies that are our customers do not have products approved for commercial sale and are not profitable. These customers must continue to raise capital in order to continue their development programs and to potentially continue as our customers. If our customers' clinical trials fail or they are unable to raise sufficient capital to continue investing in their clinical programs, our revenues from these customers may decrease or cease entirely, and our business may be harmed. Furthermore, even if these customers have a drug approved for commercial sale, they may not choose to use our services as a companion diagnostic with their drug, thereby limiting our potential revenues.

***The size of the potential future market for our services is an estimate and may be smaller than we believe.***

Our estimate of the potential future market for our services is based on a number of internal and third-party estimates. While we believe these factors have historically provided and will continue to provide us with effective tools in estimating the total market for our services, these estimates may not be correct and the conditions supporting our estimates may change at any time, thereby reducing the predictive accuracy of these underlying factors. As a result, our estimates of the total addressable market for our services may prove to be incorrect. If the actual number of patients who would benefit from our services and the total addressable market for our services is smaller than we have estimated, our future growth could be adversely impacted. See the section titled "Market, Industry, and Other Data" for additional information regarding our estimates.

***We rely on a limited number of suppliers, or in some cases, a sole supplier, for some of our laboratory instruments and materials, and we may not be able to find replacements or immediately transition to alternative suppliers should we need to do so.***

We rely on a limited number of suppliers for sequencers and other equipment and materials that we use in our laboratory operations. For example, we rely on Illumina, Inc. ("Illumina") as the sole supplier of sequencers and various associated reagents, and as the sole provider of maintenance and repair services for these sequencers. Our master subcontractor agreement with Illumina is set to expire in August 2021, and our various pricing agreements with Illumina are set to expire on various dates from June 2019 to December 2022. Any disruption in Illumina's operations, or our inability to negotiate an extension to our agreements with Illumina on acceptable terms, or at all, could impact our supply chain and laboratory operations and our ability to conduct our business and generate revenue. Our suppliers could cease supplying these materials, reagents, and equipment at any time, or fail to provide us with sufficient quantities of materials or materials that meet our specifications. Our laboratory operations could be interrupted if we encounter delays or difficulties in securing equipment, materials, reagents, or sequencers, or if we cannot obtain an acceptable substitute. Any such interruption could significantly affect our business, financial condition, results of operations, and reputation.

We believe that there are only a few manufacturers other than Illumina that are currently capable of supplying and servicing the equipment necessary for our laboratory operations, including sequencers and various associated reagents. The use of equipment or materials provided by these replacement suppliers would require us to alter our laboratory operations. Transitioning to a new supplier would be time-consuming and expensive, may result in interruptions in our laboratory operations, could affect the performance specifications of our laboratory operations, or could require that we revalidate our tests. We cannot assure you that we will be able to secure alternative equipment, reagents, and other materials, and bring such equipment, reagents, and materials on line and revalidate them without experiencing interruptions in our workflow. If we encounter delays or difficulties in securing, reconfiguring, or revalidating the equipment and reagents we require for our services, our business, financial condition, results of operations, and reputation could be adversely affected.

In addition, the Device Master File that we have filed with the FDA, which is focused on the technology, quality management, and validation of our platform, specifically on its use for the development of personalized immuno-therapies, is predicated on our use of specified equipment and processes, including Illumina sequencers and related equipment. The detailed information in the Device Master File is not shared with our customers, but with our permission they can reference our FDA file number in their Investigational New Drug filings with the FDA. If we were required to transition to a new supplier of sequencers or certain other equipment or processes in our laboratory, our Device Master File would need to be replaced or updated, and until such time as that occurred, customers for which we deliver services after the transition would not be able to reference our Device Master File, which would cause us to lose a competitive advantage.

***If our sole laboratory facility becomes damaged or inoperable, or we are required to vacate the facility, our ability to sell and provide our services and pursue our research and development efforts may be jeopardized.***

We currently derive our revenues from our genomic analysis conducted in our laboratory. We do not have any clinical reference laboratory facilities other than our facility in Menlo Park, California. Our facilities and equipment could be harmed or rendered inoperable by natural or man-made disasters, including fires, earthquakes, flooding, and power outages, which may render it difficult or impossible for us to sell or perform our services for some period of time. Northern California has recently experienced serious fires and the San Francisco Bay Area is considered to lie in an area with earthquake risk. The inability to sell or to perform our diagnostic and other services, or the backlog of samples that could develop if our facility is inoperable for even a short period of time, may result in the loss of customers or harm to our reputation or relationships with scientific or clinical collaborators, and we may be unable to regain those customers or repair our reputation or such relationships in the future. Furthermore, our facilities and the equipment we use to perform our services and our research and development work could be costly and time-consuming to repair or replace.

Additionally, a key component of our research and development process involves using biological samples as the basis for the development of our services. In some cases, these samples are difficult to obtain. If the parts of our laboratory facility where we store these biological samples were damaged or compromised, our ability to pursue our research and development projects, as well as our reputation, could be jeopardized. We carry insurance for damage to our property and the disruption of our business, but this insurance may not be sufficient to cover all of our potential losses and may not continue to be available to us on acceptable terms, if at all.

Further, if our laboratory became inoperable, we would likely not be able to license or transfer our technology to another facility with the necessary qualifications, including state licensure and CLIA certification, under the scope of which our current and our planned future services could be performed. Even if we find a facility with such qualifications to perform our services, it may not be available to us on commercially reasonable terms.

***Our internal information technology systems, or those of our third-party vendors, contractors, or consultants, may fail or suffer security breaches, loss or leakage of data, and other disruptions, which could result in a material disruption of our services, compromise sensitive information related to our business, or prevent us from accessing critical information, potentially exposing us to liability or otherwise adversely affecting our business.***

We are increasingly dependent upon information technology systems, infrastructure, and data to operate our business. In the ordinary course of business, we collect, store, and transmit confidential information (including but not limited to intellectual property, proprietary business information, and personal information). It is critical that we do so in a secure manner to maintain the confidentiality and integrity of such confidential information. We also have outsourced elements of our operations to third parties, and as a result we manage a number of third-party vendors and other contractors and consultants who have access to our confidential information.

Despite the implementation of security measures, given the size and complexity of our internal information technology systems and those of our third-party vendors and other contractors and consultants, and the increasing amounts of confidential information that they maintain, our such information technology systems are potentially vulnerable to breakdown or other damage or interruption from service interruptions, system malfunction, natural disasters, terrorism, war, and telecommunication and electrical failures, as well as security breaches from inadvertent or intentional actions by our employees, third-party vendors, contractors, consultants, business partners, and/or other third parties, or from cyber-attacks by malicious third parties (including the deployment of harmful malware, ransomware, denial-of-service attacks, social engineering, and other means to affect service reliability and threaten the confidentiality, integrity, and availability of information), which may compromise our system infrastructure, or that of our third-party vendors and other contractors and consultants, or lead to data leakage. The risk of a security breach or disruption, particularly through cyber-attacks or cyber intrusion, including by computer hackers, foreign governments, and cyber terrorists, has generally increased as the number, intensity, and sophistication of attempted attacks and intrusions from around the world have increased. We may not be able to anticipate all types of security threats, and we may not be able to implement preventive measures effective against all such security threats. The techniques used by cyber criminals change frequently, may not be recognized until launched, and can originate from a wide variety of sources, including outside groups such as external service providers, organized crime affiliates, terrorist organizations, or hostile foreign governments or agencies. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or those of our third-party vendors and other contractors and consultants, or inappropriate disclosure of confidential or proprietary information, we could incur liability and reputational damage and the further development and commercialization of our services could be delayed. The costs related to significant security breaches or disruptions could be material and exceed the limits of the cybersecurity insurance we maintain against such risks. If the information technology systems of our third-party vendors and other contractors and consultants become subject to disruptions or security breaches, we may have insufficient recourse against such third parties and we may have to expend significant resources to mitigate the impact of such an event, and to develop and implement protections to prevent future events of this nature from occurring.

While we have not experienced any such system failure, accident, or security breach to date, and believe that our data protection efforts and our investment in information technology reduce the likelihood of such incidents in the future, we cannot assure you that our data protection efforts and our investment in information technology will prevent significant breakdowns, data leakages, breaches in our systems, or those of our third-party vendors and other contractors and consultants, or other cyber incidents that could have a material adverse effect upon our reputation, business, operations, or financial condition. For example, if such an event were to occur and cause interruptions in our operations, or those of our third-party vendors and other contractors and consultants, it could result in a material disruption of our programs and the development of our services and technologies could be delayed. Furthermore, significant disruptions of our internal information technology systems or those of our third-party vendors and other contractors and consultants, or security breaches could result in the loss, misappropriation, and/or unauthorized access, use, or disclosure of, or the prevention of access to, confidential information (including trade secrets or other intellectual property, proprietary business

information, and personal information), which could result in financial, legal, business, and reputational harm to us. For example, any such event that leads to unauthorized access, use, or disclosure of personal information, including personal information regarding our customers or employees, could harm our reputation directly, compel us to comply with federal and/or state breach notification laws and foreign law equivalents, subject us to mandatory corrective action, and otherwise subject us to liability under laws and regulations that protect the privacy and security of personal information, which could result in significant legal and financial exposure and reputational damages that could potentially have an adverse effect on our business.

***Security breaches, loss of data, and other disruptions could compromise sensitive information related to our business or prevent us from accessing critical information and expose us to liability, which could adversely affect our business and our reputation.***

In the ordinary course of our business, we collect and store sensitive data, including protected health information ("PHI"), personally identifiable information ("PII"), credit card and other financial information, intellectual property, and proprietary business information owned or controlled by ourselves or our customers, payors, and other parties. We manage and maintain our applications and data utilizing a combination of on-site systems and cloud-based data centers. We utilize external security and infrastructure vendors to manage parts of our data centers. We also communicate sensitive data, including patient data, electronically, and through relationships with multiple third-party vendors and their subcontractors. These applications and data encompass a wide variety of business-critical information, including research and development information, patient data, commercial information, and business and financial information. We face a number of risks relative to protecting this critical information, including loss of access risk, inappropriate use or disclosure, inappropriate modification, and the risk of our being unable to adequately monitor, audit, and modify our controls over our critical information. This risk extends to the third-party vendors and subcontractors we use to manage this sensitive data.

The secure processing, storage, maintenance, and transmission of this critical information are vital to our operations and business strategy, and we devote significant resources to protecting such information. Although we take measures to protect sensitive data from unauthorized access, use or disclosure, our information technology and infrastructure may be vulnerable to attacks by hackers or viruses or breached due to employee error, malfeasance, or other malicious or inadvertent disruptions. Any such breach or interruption could compromise our networks and the information stored there could be accessed by unauthorized parties, manipulated, publicly disclosed, lost, or stolen. Any such access, breach, or other loss of information could result in legal claims or proceedings, liability under federal or state laws that protect the privacy of personal information, such as the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") and the Health Information Technology for Economic and Clinical Health Act ("HITECH"), and regulatory penalties. Notice of breaches must be made to affected individuals, the Secretary of the Department of Health and Human Services ("HHS"), and for extensive breaches, notice may need to be made to the media or state attorneys general. Such a notice could harm our reputation and our ability to compete. Although we have implemented security measures and a formal, dedicated enterprise security program to prevent unauthorized access to patient data, such data is currently accessible through multiple channels, and there is no guarantee we can protect our data from breach. Unauthorized access, loss, or dissemination could also damage our reputation or disrupt our operations, including our ability to conduct our analyses, deliver test results, process claims and appeals, provide customer assistance, conduct research and development activities, collect, process, and prepare company financial information, provide information about our tests and other patient and physician education and outreach efforts through our website, and manage the administrative aspects of our business.

Penalties for violations of these laws vary. For instance, penalties for failure to comply with a requirement of HIPAA and HITECH vary significantly, and include significant civil monetary penalties and, in certain circumstances, criminal penalties with fines up to $250,000 per violation and/or imprisonment. In addition, numerous breach incidents could lead to possible penalties in excess of $1.68 million. A person who knowingly obtains or discloses individually identifiable health information in violation of HIPAA may face a criminal penalty of up to $50,000 and up to one-year imprisonment. The criminal penalties increase if the wrongful

conduct involves false pretenses or the intent to sell, transfer or use identifiable health information for commercial advantage, personal gain or malicious harm.

Further, various states, such as California and Massachusetts, have implemented similar privacy laws and regulations, such as the California Confidentiality of Medical Information Act, that impose restrictive requirements regulating the use and disclosure of health information and other personally identifiable information. These laws and regulations are not necessarily preempted by HIPAA, particularly if a state affords greater protection to individuals than HIPAA. Where state laws are more protective, we have to comply with the stricter provisions. In addition to fines and penalties imposed upon violators, some of these state laws also afford private rights of action to individuals who believe their personal information has been misused. California's patient privacy laws, for example, provide for penalties of up to $250,000 and permit injured parties to sue for damages. The interplay of federal and state laws may be subject to varying interpretations by courts and government agencies, creating complex compliance issues for us and data we receive, use and share, potentially exposing us to additional expense, adverse publicity and liability. Further, as regulatory focus on privacy issues continues to increase and laws and regulations concerning the protection of personal information expand and become more complex, these potential risks to our business could intensify. Changes in laws or regulations associated with the enhanced protection of certain types of sensitive data, such as PHI or PII, for the treatment of genetic data, along with increased customer demands for enhanced data security infrastructure, could greatly increase our cost of providing our services, decrease demand for our services, reduce our revenues and/or subject us to additional liabilities.

In addition, the interpretation and application of consumer, health-related and data protection laws, especially with respect to genetic samples and data, in the United States, the European Union (the "EU"), and elsewhere are often uncertain, contradictory and in flux. For example, the EU-wide General Data Protection Regulation (EU) 2016/679 ("GDPR") became applicable on May 25, 2018, replacing data protection laws issued by of each EU member state based on the Directive 95/46/EC (the "Directive"). Unlike the Directive, which needed to be transposed at a national level, the GDPR text is directly applicable in each EU member state, resulting in a more uniform application of data privacy laws across the EU. The GDPR imposes onerous accountability obligations requiring data controllers and processors to maintain a record of their data processing and policies. It requires data controllers to implement more stringent operational requirements for processors and controllers of personal data, including, for example, transparent and expanded disclosure to data subjects (in a concise, intelligible and easily accessible form) about how their personal information is to be used, imposes limitations on retention of information, increases requirements pertaining to health data and pseudonymized (i.e., key-coded) data, introduces mandatory data breach notification requirements and sets higher standards for data controllers to demonstrate that they have obtained valid consent for certain data processing activities. Fines for non-compliance with the GDPR will be significant—the greater of €20 million or 4% of global turnover. The GDPR provides that EU member states may introduce further conditions, including limitations, to make their own further laws and regulations limiting the processing of genetic, biometric or health data, which could limit our ability to collect, use and share European data, or could cause our compliance costs to increase, ultimately having an adverse impact on our business, and harm our business and financial condition. It is possible that these laws may be interpreted and applied in a manner that is inconsistent with our practices. If so, this could result in government-imposed fines or orders requiring that we change our practices, which could adversely affect our business. Further, the United Kingdom's vote in favor of exiting the EU, often referred to as Brexit, has created uncertainty with regard to data protection regulation in the United Kingdom. In particular, it is unclear whether the United Kingdom will enact data protection legislation equivalent to the GDPR and how data transfers to and from the United Kingdom will be regulated.

Compliance with U.S. and international data protection laws and regulations could cause us to incur substantial costs or require us to change our business practices and compliance procedures in a manner adverse to our business. Moreover, complying with these various laws could require us to take on more onerous obligations in our contracts, restrict our ability to collect, use and disclose data, or in some cases, impact our ability to operate in certain jurisdictions. We rely on our customers to obtain valid and appropriate consents from data

subjects whose genetic samples and data we process on such customers' behalf. Given that we do not obtain direct consent from such data subjects and we do not audit our customers to ensure that they have obtained the necessary consents required by law, the failure of our customers to obtain consents that are in compliance with applicable law could result in our own non-compliance with privacy laws. Such failure to comply with U.S. and international data protection laws and regulations could result in government enforcement actions (which could include civil or criminal penalties), private litigation and/or adverse publicity and could negatively affect our operating results and business. Claims that we have violated individuals' privacy rights, failed to comply with data protection laws, or breached our contractual obligations, even if we are not found liable, could be expensive and time consuming to defend, could result in adverse publicity and could have a material adverse effect on our business, financial condition and results of operations.

***Our success depends on our ability to provide reliable, high-quality genomic data and analyses and to rapidly evolve to meet our customers' needs.***

Errors, including if our tests fail to accurately detect gene variants, or mistakes, including if we fail to or incompletely or incorrectly identify the significance of gene variants, could have a significant adverse impact on our business. We classify variants in accordance with guidelines that are subject to change and subject to our interpretation. There can also be flaws in the databases, third-party tools, algorithms we use, and in the software that handle automated parts of our classification protocol. If we receive poor quality or degraded samples, our tests may be unable to accurately detect gene variants or we may fail to or incompletely or incorrectly identify the significance of gene variants, which could have a significant adverse impact on our business.

Inaccurate results or misunderstandings of, or inappropriate reliance on, the information we provide to our customers could lead to, or be associated with, side effects or adverse events in patients who use our tests, including treatment-related death, and could lead to termination of our services or claims against us. A product liability or professional liability claim could result in substantial damages and be costly and time-consuming for us to defend.

Although we maintain liability insurance, including for errors and omissions, and professional liability, we cannot assure you that our insurance would be sufficient to protect us from the financial impact of defending against these types of claims, or any judgments, fines or settlement costs arising out of any such claims. Any liability claim, including an errors and omissions liability claim, brought against us, with or without merit, could increase our insurance rates or prevent us from securing insurance coverage in the future. Additionally, any liability lawsuit could cause injury to our reputation or cause us to suspend sales of our tests or cause a suspension of our license to operate. The occurrence of any of these events could have an adverse effect on our business, reputation and results of operations.

***If we cannot develop services and products to keep pace with rapid advances in technology, medicine and science, or experience delays in developing such services and products, our operating results and competitive position could be harmed.***

In recent years, there have been numerous advances in technologies relating to the diagnosis and treatment of cancer. Several new cancer drugs have been approved, and a number of new drugs are in pre-clinical and clinical development. There have also been advances in methods used to identify patients likely to benefit from these drugs based on analysis of biomarkers. We must continuously develop new services and products, enhance any existing services, and avoid delays in such developments and enhancements to keep pace with evolving technologies on a timely and cost-effective basis. Our current services and our planned future services and products (such as our planned liquid biopsy test) could become obsolete unless we continually innovate and expand them to demonstrate benefit in the diagnosis, monitoring, or prognosis of patients with cancer. New cancer therapies typically have only a few years of clinical data associated with them, and much of that data may not be disclosed by the pharmaceutical company that conducted the clinical trials. This could limit our ability to develop services and products based on, for example, biomarker analysis related to the appearance or

development of resistance to those therapies. If we cannot adequately demonstrate the clinical utility of our services and our planned future services and products to new treatments, sales of our services could decline, which would have a material adverse effect on our business, financial condition, and results of operations.

***We are researching and developing improvements to our tests and test features on a continuous basis, but we may not be able to make these improvements on a timely basis, and even if we do, we may not realize the benefits of these efforts in our financial results.***

To remain competitive, we must continually research and develop improvements to our tests or test features. However, we cannot assure you that we will be able to develop and commercialize the improvements to our tests or test features on a timely basis. Our competitors may develop and commercialize competing or alternative tests and improvements faster than we are able to do so. In addition, we must expend significant time and funds in order to conduct research and development, further develop and scale our laboratory processes, and further develop and scale our infrastructure. We may never realize a return on investment on this effort and expense, especially if our improvements fail to perform as expected. If we are not able to realize the benefits of our efforts to improve our tests or test features, it could have an adverse effect on our business, financial condition, and results of operations.

***Personalized cancer therapies represent new therapeutic approaches that could result in heightened regulatory scrutiny, delays in clinical development, or delays in or inability to achieve regulatory approval, commercialization, or payor coverage, any of which could adversely affect our business.***

We currently work with certain companies developing personalized cancer therapies, and our future success will in part depend on our personalized cancer customers obtaining regulatory approval for and commercializing their product candidate. Because personalized cancer therapies represent a new approach to immunotherapy for the treatment of cancer and other diseases, developing and commercializing personalized cancer therapies is subject to a number of challenges.

Actual or perceived safety issues, including adoption of new therapeutics or novel approaches to treatment, may adversely influence the willingness of subjects to participate in clinical studies, or if approved by applicable regulatory authorities, of physicians to subscribe to the novel treatment mechanics. The FDA or other applicable regulatory authorities may ask for specific post-market requirements, and additional information regarding benefits or risks of our services may emerge at any time prior to or after regulatory approval.

Physicians, hospitals, and third-party payors often are slow to adopt new products, technologies, and treatment practices that require additional upfront costs and training. Physicians may not be willing to undergo training to adopt personalized cancer therapies, may decide that such therapies are too complex to adopt without appropriate training or not cost-efficient, and may choose not to administer these therapies. Based on these and other factors, hospitals and payors may decide that the benefits of personalized cancer therapies do not or will not outweigh their costs.

***The loss of key members of our executive management team could adversely affect our business.***

Our success in implementing our business strategy depends largely on the skills, experience, and performance of key members of our executive management team and others in key management positions, including John West, our Chief Executive Officer, Richard Chen, our Chief Scientific Officer, Clinton Musil, our Chief Business Officer, and Aaron Tachibana, our Chief Financial Officer. The collective efforts of each of these persons and others working with them as a team are critical to us as we continue to develop our technologies, services, products, and research and development programs. As a result of the difficulty in locating qualified new management, the loss or incapacity of existing members of our executive management team could adversely affect our operations. If we were to lose one or more of these key employees, we could experience difficulties in finding qualified successors, competing effectively, developing our technologies, and implementing our business

strategy. Each member of our executive management team has an employment agreement; however, the existence of an employment agreement does not guarantee retention of members of our executive management team and we may not be able to retain those individuals. We do not maintain "key person" life insurance on any of our employees.

In addition, we rely on collaborators, consultants, and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our collaborators, consultants, and advisors are generally employed by employers other than us and may have commitments under agreements with other entities that may limit their availability to us.

The loss of a key employee, the failure of a key employee to perform in his or her current position, or our inability to attract and retain skilled employees could result in our inability to continue to grow our business or to implement our business strategy.

***We rely on highly skilled personnel in a broad array of disciplines and if we are unable to hire, retain, or motivate these individuals, or maintain our corporate culture, we may not be able to maintain the quality of our services or grow effectively.***

Our performance, including our research and development programs and laboratory operations, largely depends on our continuing ability to identify, hire, develop, motivate, and retain highly skilled personnel for all areas of our organization. Competition in our industry for qualified employees is intense, and we may not be able to attract or retain qualified personnel in the future, including bioinformatic scientists, bioinformatic engineers, software engineers, statisticians, variant curators, clinical laboratory scientists, and genetic counselors, due to the competition for qualified personnel among life science businesses, technology companies, as well as universities and public and private research institutions, particularly in the San Francisco Bay Area. All of our U.S. employees are at-will, which means that either we or the employee may terminate their employment at any time. In addition, our compensation arrangements, such as our equity award programs, may not always be successful in attracting new employees and retaining and motivating our existing employees, including due to movements in our stock price. If we are not able to attract and retain the necessary personnel to accomplish our business objectives, we may experience constraints that could adversely affect our ability to scale our business and support our research and development efforts and our laboratory operations. We believe that our corporate culture fosters innovation, creativity, and teamwork. However, as our organization grows, we may find it increasingly difficult to maintain the beneficial aspects of our corporate culture. This could negatively impact our ability to retain and attract employees and our future success.

***We may not be able to manage our future growth effectively, which could make it difficult to execute our business strategy.***

Our expected future growth could create a strain on our organizational, administrative, and operational infrastructure, including laboratory operations, quality control, customer service, marketing and sales, and management. We may not be able to maintain the quality of or expected turnaround times for our tests, or satisfy customer demand as our test volume grows. Our ability to manage our growth properly will require us to continue to improve our operational, financial, and management controls, as well as our reporting systems and procedures. As a result of our growth, our operating costs may escalate even faster than planned, and some of our internal systems may need to be enhanced or replaced. If we are unable to manage our growth effectively, it may be difficult for us to execute our business strategy and our business could be harmed.

***We depend on our information technology systems, and any failure of these systems could harm our business.***

We depend on information technology and telecommunications systems for significant elements of our operations, including our laboratory information management system, our bioinformatics analytical software

systems, our database of information relating to genetic variations and their role in disease process, our clinical report systems, our billing systems, our business intelligence systems, our logistics and customer relationship systems, our customer-facing web-based software, our customer reporting, and our family history and risk assessment tools. We have installed, and expect to expand, a number of enterprise software systems that affect a broad range of business processes and functional areas, including, for example, systems handling human resources, financial reporting and controls, customer relationship management, regulatory compliance, and other infrastructure operations.

Although we invest substantially in the backup/restore, high-availability architecture, monitoring and reporting, documentation and preventive security controls of our systems, all information technology and telecommunications systems are vulnerable to damage from a variety of sources, including telecommunications or network failures, malicious or inadvertent human acts and natural disasters. Our servers are potentially vulnerable to physical or electronic break-ins, employee errors, computer viruses and similar disruptive problems. Despite the precautionary measures we have taken to prevent unanticipated problems that could affect our information technology and telecommunications systems, failures or significant downtime of our information technology or telecommunications systems or those used by our third-party service providers could prevent us from conducting tests, preparing and providing reports to our customers, billing customers, collecting revenue, handling inquiries from our customers, conducting research and development activities, and managing the administrative aspects of our business. For example, in the first quarter of 2018, we experienced downtime in our information technology systems in connection with the adoption of certain new information technology, and experienced an adverse effect to our results of operations in the first and second quarters of 2018 were adversely affected as a result. Any disruption or loss of information technology or telecommunications systems on which critical aspects of our operations depend could have an adverse effect on our business.

Additionally, we have internally developed, and expect to continue to invest in and expand, proprietary informatics and software systems that are designed to manage the unique aspects and challenges of our genomics laboratory and on which we depend. Any disruption of failure of our internally developed informatics and software systems could have an adverse effect on our business.

***Our employees may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements, which could cause significant liability for us and harm our reputation.***

We are exposed to the risk of employee fraud or other misconduct, including intentional failures to comply with government regulations, including federal and state healthcare fraud and abuse laws and regulations, to misuse information, including patient information, and to report financial information or data accurately or disclose unauthorized activities to us. Such misconduct could also involve the improper use of information obtained in the course of clinical studies, which could result in regulatory sanctions and cause serious harm to our reputation. We have a code of conduct and ethics for our directors, officers and employees, but it is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business and results of operations, including the imposition of significant administrative, civil and criminal penalties, damages, fines, imprisonment, exclusion from government healthcare programs, contractual damages, refunding of payments received by us, reputational harm, additional reporting, or oversight obligations if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with the law and curtailment or restructuring of our operations. Whether or not we are successful in defending against such actions or investigations, we could incur substantial costs, including legal fees, and divert the attention of management in defending ourselves against any of these claims or investigations.

***We may acquire businesses or assets, form joint ventures, or make investments in other companies or technologies that could harm our operating results, dilute our stockholders' ownership, or cause us to incur debt or significant expense.***

As part of our business strategy, we may pursue acquisitions of complementary businesses or assets, as well as technology licensing arrangements. We may also pursue strategic alliances that leverage our core technology and industry experience to expand our offerings or distribution, or make investments in other companies. As an organization, we have limited experience with respect to acquisitions as well as the formation of strategic alliances and joint ventures. We may not identify or complete these transactions in a timely manner, on a cost-effective basis, or at all, and we may not realize the anticipated benefits of any acquisition, technology license, strategic alliance, joint venture or investment. In addition, we may not be able to find suitable partners or acquisition candidates, and we may not be able to complete such transactions on favorable terms, if at all. Any future acquisitions by us also could result in significant write-offs or the incurrence of debt and contingent liabilities, any of which could harm our operating results. If we make any acquisitions in the future, we may not be able to integrate these acquisitions successfully into our existing business, and we could assume unknown or contingent liabilities. Integration of an acquired company or business also may require management resources that otherwise would be available for ongoing development of our existing business.

To finance any acquisitions or investments, we may choose to raise additional funds. The various ways we could raise additional funds carry potential risks. See "—Our inability to raise additional capital on acceptable terms in the future may limit our ability to continue to operate our business and further expand our operations." Once we become a public company, if the price of our common stock is low or volatile, we may not be able to acquire other companies using stock as consideration. Alternatively, it may be necessary for us to raise additional funds for these activities through public or private financings. Additional funds may not be available on terms that are favorable to us, or at all.

***We rely on commercial courier delivery services to transport specimens to our laboratory facility in a timely and cost-efficient manner, and if these delivery services are disrupted, our business would be harmed.***

Our business depends on our ability to quickly and reliably deliver test results to our customers. Disruptions in delivery service, whether due to labor disruptions, bad weather, natural disaster, terrorist acts, or threats or for other reasons could adversely affect specimen integrity and our ability to process specimens in a timely manner and service our customers, and ultimately our reputation and our business. In addition, if we are unable to continue to obtain expedited delivery services on commercially reasonable terms, our operating results may be adversely affected.

***Ethical, legal, and social concerns related to the use of genetic information could reduce demand for our tests.***

Genetic testing has raised ethical, legal, and social concerns regarding privacy and the appropriate uses of the resulting information. Governmental authorities have, through the Genetic Information Nondisclosure Act, and could further, for social or other purposes, limit or regulate the use of genetic information or genetic testing or prohibit testing for genetic predisposition to certain conditions, particularly for those that have no known cure. Ethical and social concerns may also influence governmental authorities to deny or delay the issuance of patents for technology relevant to our business. Similarly, these concerns may lead patients to refuse to use, or clinicians to be reluctant to order, genetic tests even if permissible. These and other ethical, legal, and social concerns may limit market acceptance of our tests or reduce the potential markets for our tests, either of which could have an adverse effect on our business, financial condition, or results of operations.

***The December 2017 tax reform law could adversely affect our business and financial condition.***

On December 22, 2017, President Trump signed into law comprehensive tax legislation (the "Tax Cuts and Jobs Act") that significantly revised the Internal Revenue Code of 1986, as amended (the "Code"). The Tax Cuts

and Jobs Act, among other things, contained significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense to 30% of adjusted taxable income (except for certain small businesses), limitation of the deduction for net operating losses incurred after 2017 to 80% of current year taxable income and elimination of net operating loss carrybacks, one-time taxation of offshore earnings at reduced rates regardless of whether they are repatriated, elimination of U.S. tax on foreign earnings (subject to certain important exceptions), immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits. Notwithstanding the reduction in the corporate income tax rate, the overall impact of the Tax Cuts and Jobs Act is uncertain and our business and financial condition could be adversely affected. In addition, it is uncertain if and to what extent various states will conform to the Tax Cuts and Jobs Act. The impact of this tax reform on holders of our common stock is also uncertain and could be adverse. We urge our stockholders to consult with their legal and tax advisors with respect to this legislation and the potential tax consequences of investing in or holding our common stock.

***Our effective tax rate may fluctuate, and we may incur obligations in tax jurisdictions in excess of accrued amounts.***

We are subject to taxation in numerous U.S. states and territories. As a result, our effective tax rate is derived from a combination of applicable tax rates in the various places that we operate. In preparing our financial statements, we estimate the amount of tax that will become payable in each of such places. Nevertheless, our effective tax rate may be different than experienced in the past due to numerous factors, including passage of the Tax Cuts and Jobs Act, changes in the mix of our profitability from state to state, the results of examinations and audits of our tax filings, our inability to secure or sustain acceptable agreements with tax authorities, changes in accounting for income taxes and changes in tax laws. Any of these factors could cause us to experience an effective tax rate significantly different from previous periods or our current expectations and may result in tax obligations in excess of amounts accrued in our financial statements.

**Risks Related to Government Regulation**

***Our tests may be subject to regulatory action if regulatory agencies determine that our tests do not appropriately comply with statutory and regulatory requirements enforced by the U.S. Food and Drug Administration, and/or CLIA requirements for quality laboratory testing.***

The laws and regulations governing the marketing of clinical laboratory tests are extremely complex and in many instances there are no significant regulatory or judicial interpretations of these laws and regulations. The Federal Food, Drug and Cosmetic Act (the “FDC Act”) defines a medical device to include any instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent or other similar or related article, including a component, part, or accessory, intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment or prevention of disease, in man or other animals. Some of our tests may be considered by the FDA to be in vitro diagnostic products that are subject to regulation as medical devices. Among other things, pursuant to the FDC Act and its implementing regulations, the FDA regulates the research, testing, manufacturing, safety, labeling, storage, recordkeeping, premarket clearance or approval, marketing and promotion, and sales and distribution of medical devices in the United States to ensure that medical products distributed domestically are safe and effective for their intended uses. In addition, the FDA regulates the import and export of medical devices.

Although the FDA has statutory authority to assure that medical devices are safe and effective for their intended uses, the FDA has generally exercised its enforcement discretion and not enforced applicable regulations with respect to laboratory developed tests (“LDTs”), which are a subset of in vitro diagnostic devices that are intended for clinical use and designed, manufactured and used entirely within a single laboratory. We currently market our tests as LDTs and, therefore, we believe that they are not currently subject to the FDA’s enforcement of its medical device regulations and the applicable FDC Act provisions. Despite the FDA’s historic

enforcement discretion policy with respect to LDTs, in November 2017, the FDA finalized a classification order setting out the regulatory requirements that apply to certain genetic health risk tests and revised a separate classification order exempting certain carrier screening tests from FDA premarket clearance and approval requirements when certain regulatory requirements are met. None of our tests comply with these classification orders because we market our tests as LDTs that are subject to the FDA's policy of enforcement discretion. However, the FDA may find that our tests do not fall within the definition of an LDT, and may determine that our tests are subject to the FDA's enforcement of its medical device regulations, including the recent classification orders, and the applicable FDC Act provisions. While we believe that we are currently in material compliance with applicable laws and regulations, we cannot assure you that the FDA or other regulatory agencies would agree with our determination, and a determination that we have violated these laws, or a public announcement that we are being investigated for possible violations of these laws, could adversely affect our business, prospects, results of operations or financial condition. If the FDA determines that our tests are subject to enforcement as medical devices, we could be subject to enforcement action, including administrative and judicial sanctions, and additional regulatory controls and submissions for our tests, all of which could be burdensome. See "—Failure to comply with federal, state, and foreign laboratory licensing requirements and the applicable requirements of the FDA or any other regulatory authority, could cause us to lose the ability to perform our tests, experience disruptions to our business or become subject to administrative or judicial sanctions."

Moreover, LDTs may in the future become subject to more onerous regulation by the FDA. A significant change in any of the laws, regulations or policies may require us to change our business model in order to maintain regulatory compliance. At various times since 2006, the FDA has issued documents outlining its intent to require varying levels of FDA oversight of many types of LDTs. In October 2014, the FDA issued two non-binding draft guidance documents that set forth a proposed risk-based regulatory framework that would apply varying levels of FDA oversight to LDTs. The FDA indicated that it did not intend to implement its proposed framework until the draft guidance documents are finalized. The FDA was expected to finalize its proposal for the oversight of LDTs before the end of 2016, but in November 2016, the FDA announced that it would halt finalizing of the guidance documents and continue to work with stakeholders, the incoming administration and Congress on the approach to LDT regulation. This announcement was followed by the issuance of an information discussion paper on January 13, 2017, in which the FDA outlined a substantially revised "possible approach" to the oversight of LDTs. The discussion paper explicitly states that it is not a final version of the 2014 draft guidance and that it is not enforceable and does not represent the FDA's "formal position." It is unclear at this time if or when the FDA will finalize its plans to end enforcement discretion for LDTs, and even then, whether the new regulatory requirements are expected to be phased-in over time. However, the FDA may decide to regulate certain LDTs on a case-by-case basis at any time, which could result in delay or additional expense in offering our tests and tests that we may develop in the future.

Legislative proposals addressing oversight of genetic testing and LDTs have been introduced in previous Congresses, and we expect that new legislative proposals will be introduced from time to time in the future. We cannot provide any assurance that FDA regulation, including pre-market review, will not be required in the future for our tests, whether through finalization of guidance issued by the FDA, new enforcement policies adopted by the FDA or new legislation enacted by Congress. It is possible that legislation will be enacted into law or guidance could be issued by the FDA which may result in increased regulatory burdens for us to continue to offer our tests or to develop and introduce new tests. This legislative and regulatory uncertainty exposes us to the possibility of enforcement action or additional regulatory controls and submissions for our tests, both of which could be burdensome. We cannot be certain that the FDA will not enact rules or guidance documents which could impact our ability to purchase certain materials necessary for the performance of our tests, such as products labeled for research use only. Should any of the reagents obtained by us from suppliers and used in conducting our tests be affected by future regulatory actions, our business could be adversely affected by those actions, including increasing the cost of testing or delaying, limiting or prohibiting the purchase of reagents necessary to perform testing.

Additionally, the Centers for Medicare & Medicaid Services ("CMS"), and certain state agencies regulate the performance of LDTs (as authorized under CLIA and state law, respectively). Our tests are developed in compliance with CLIA requirements. However, if our laboratory fails to comply with the prescribed quality requirements for laboratory testing or other requirements for CLIA, we could lose CLIA certification. That in turn would impact our ability to operate our laboratory and provide results to our customers, which could negatively impact our business operations.

***If the FDA determines that our services are subject to enforcement as medical devices, we could incur substantial costs and time delays associated with satisfying statutory and regulatory requirements such as pre-market clearance or approval and we could incur additional expense in offering our tests and tests that we may develop in the future.***

If the FDA determines that our tests and associated software do not fall within the definition of an LDT, or there are regulatory or legislative changes, we may be required to obtain premarket clearance for our tests and associated software under Section 510(k) of the FDC Act or approval of a premarket approval application ("PMA"). We would also be subject to ongoing regulatory requirements such as registration and listing requirements, medical device reporting requirements, and quality control requirements. If our tests are considered medical devices not subject to enforcement discretion, the regulatory requirements to which our tests are subject would depend on the FDA's classification of our tests. The FDA has issued regulations classifying over 1,700 different generic types of medical devices into one of three regulatory control categories (Class I, Class II, or Class III) depending on the degree of regulation that the FDA finds necessary to provide reasonable assurance of their safety and effectiveness. The class into which a device is placed determines the requirements that a medical device manufacturer must meet both pre- and post-market.

Generally, Class I devices do not require premarket authorization, but are subject to a comprehensive set of regulatory authorities referred to as general controls. Class II devices, in addition to general controls, generally require special controls and premarket clearance through the submission of a section 510(k) premarket notification. Class III devices are subject to general controls and special controls, and also require premarket approval prior to commercial distribution, which is a more rigorous process than premarket clearance. Under the FDC Act, a device that is first marketed after May 28, 1976 is by default a Class III device requiring premarket approval unless it is within a type of generic device class that has been classified as Class I or Class II. Even if a device falls under an existing Class II, non-exempt, device classification, the product must also be shown to be "substantially equivalent" to a legally marketed predicate device through submission of a section 510(k) premarket notification. If after reviewing a firm's 510(k) premarket notification, the FDA determines that a device is not substantially equivalent to a legally marketed predicate device, the new device is classified into Class III, requiring premarket approval. It is possible for a manufacturer to obtain a Class I or Class II designation without an appropriate predicate by submitting a *de novo* request for reclassification.

The process for submitting a 510(k) premarket notification and receiving FDA clearance usually takes from three to twelve months, but it can take significantly longer and clearance is never guaranteed. The process for submitting and obtaining FDA approval of a PMA is much more costly, lengthy, and uncertain. It generally takes from one to three years or even longer and approval is not guaranteed. PMA approval typically requires extensive clinical data and can be significantly longer, more expensive and more uncertain than the 510(k) clearance process. Despite the time, effort and expense expended, there can be no assurance that a particular device ultimately will be cleared or approved by the FDA through either the 510(k) clearance process or the PMA process on a timely basis, or at all.

If our tests are considered medical devices not subject to enforcement discretion, one classification regulation that could be relevant to one or more of our tests is a recently finalized classification for genetic health risk ("GHR"), assessment tests. On April 6, 2017, in response to a *de novo* request for reclassification submitted by another company, the FDA issued an order classifying genetic tests known as genetic health risk assessment systems ("GHR tests") as Class II devices subject to premarket notification and specified special controls

requirements. On November 7, 2017, the FDA codified this classification at 21 C.F.R. § 866.5950. If our tests are considered medical devices that are not subject to enforcement discretion and one or more of our tests is considered to fall under the 21 C.F.R. § 866.5950 classification regulation for GHR tests, or under another Class II classification that is subject to a premarket notification requirement, we would be required to obtain marketing clearance for such tests. Further, if considered to fall under the 21 C.F.R. § 866.5950 classification for GHR tests, our tests would be required to adhere to specified special controls, such as labeling and testing specifications and information about the test to be posted on the manufacturer's website. Although the FDA has also issued a proposal for a simplified path to market GHR tests that would amend the classification regulation at 21 C.F.R. § 886.5950 such that manufacturers would only be subject to a one-time marketing review to ensure that they meet the applicable FDA requirements prior to selling GHR tests in the market, the FDA has yet to finalize this proposal, and we do not know if and when finalization will occur. Even if the FDA finalizes the proposed limited exemption for GHR tests, if any of our current or pipeline tests are not considered by the FDA to be GHR tests or do not qualify for the limited exemption (if and when finalized), or if any of our tests fall under a different non-exempt classification or are unclassified, we could be required to obtain 510(k) clearance or approval of a PMA for such test in the future.

If premarket review of our tests is required, the premarket review process may involve, among other things, successfully completing additional clinical trials. If we are required to conduct premarket clinical trials, whether using prospectively acquired samples or archival samples, delays in the commencement or completion of clinical testing could significantly increase our product development costs, delay commercialization of any future products, and interrupt sales of our current products. Many of the factors that may cause or lead to a delay in the commencement or completion of clinical trials may also ultimately lead to delay or denial of regulatory clearance or approval. The commencement of clinical trials may be delayed due to insufficient patient enrollment, which is a function of many factors, including the size of the patient population, the concerns around genetic testing, the nature of the protocol, the proximity of patients to clinical sites and the eligibility criteria for the clinical trial.

If we are required to conduct clinical trials, we and any third-party contractors we engage would be required to comply with good clinical practices ("GCPs"), which are regulations and guidelines enforced by the FDA, for products in clinical development. The FDA enforces these GCPs through periodic inspections of trial sponsors, principal investigators and trial sites. If we or any third-party contractor fails to comply with applicable GCPs, the clinical data generated in clinical trials may be deemed unreliable and the FDA may require us to perform additional clinical trials before clearing or approving our marketing applications. A failure to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory clearance or approval process. In addition, if these parties do not successfully carry out their contractual duties or obligations or meet expected deadlines, or if the quality, completeness or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols or for other reasons, our clinical trials may have to be extended, delayed or terminated. Many of these factors would be beyond our control. We may not be able to enter into replacement arrangements without undue delays or considerable expenditures. If there are delays in testing or approvals as a result of the failure to perform by third parties, our research and development costs would increase, and we may not be able to obtain regulatory clearance or approval for our tests. In addition, we may not be able to establish or maintain relationships with these parties on favorable terms, if at all. Each of these outcomes would harm our ability to market our tests or to achieve or sustain profitability.

The FDA requires medical device manufacturers to comply with, among other things, current good manufacturing practices for medical devices, set forth in the Quality System Regulation at 21 C.F.R. Part 820, which requires manufacturers to follow elaborate design, testing, control, documentation and other quality assurance procedures during the manufacturing process; the medical device reporting regulation, which requires that manufacturers report to the FDA if their device or a similar device they market may have caused or contributed to a death or serious injury or malfunctioned in a way that would likely cause or contribute to a death or serious injury if it were to recur; labeling regulations, including the FDA's general prohibition against promoting products for unapproved or "off-label" uses; the reports of corrections and removals regulation, which requires manufacturers to report to the FDA if a device correction or removal was initiated to reduce a risk to

health posed by the device or to remedy a violation of the FDC Act caused by the device which may present a risk to health; and the establishment registration and device listing regulation.

Moreover, there can be no assurance that any cleared or approved labeling claims will be consistent with our current claims or adequate to support continued adoption of our products. If premarket review is required for some or all of our products, the FDA may require that we stop selling our products pending clearance or approval, which would negatively impact our business. Even if our products are allowed to remain on the market prior to clearance or approval, demand for our products may decline if there is uncertainty about our products, if we are required to label our products as investigational by the FDA, or if the FDA limits the labeling claims we are permitted to make for our products. As a result, we could experience significantly increased development costs and a delay in generating additional revenues from our services, or from other services or products now in development.

In addition, any clearance or approval we obtain for our products may contain requirements for costly post-market testing and surveillance to monitor the safety or efficacy of the product. The FDA has broad post-market enforcement powers, and if unanticipated problems with our products arise, or if we or our suppliers fail to comply with regulatory requirements following FDA clearance or approval, we may become subject to enforcement actions such as:

- restrictions on manufacturing processes;
- restrictions on product marketing;
- warning letters;
- withdrawal or recall of products from the market;
- refusal to approve pending PMAs, 510(k)s, or supplements to approved PMAs or cleared 510(k)s that we submit;
- fines, restitution or disgorgement of profits or revenue;
- suspension or withdrawal of regulatory clearances or approvals;
- limitation on, or refusal to permit, import or export of our products;
- product seizures;
- injunctions; or
- imposition of civil or criminal penalties.

Moreover, the FDA strictly regulates the promotional claims that may be made about medical devices. In particular, a medical device may not be promoted for uses that are not approved by the FDA as reflected in the device's approved labeling. However, companies may share truthful and not misleading information that is otherwise consistent with the product's FDA approved labeling. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant civil, criminal and administrative penalties.

***Failure to comply with federal, state, and foreign laboratory licensing requirements and the applicable requirements of the FDA or any other regulatory authority, could cause us to lose the ability to perform our tests, experience disruptions to our business, or become subject to administrative or judicial sanctions.***

We are subject to CLIA, a federal law that regulates clinical laboratories that perform testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention, or treatment of disease. CLIA regulations establish specific standards with respect to personnel qualifications, facility

administration, proficiency testing, quality control, quality assurance, and inspections. We have a current CLIA certificate to conduct our tests at our laboratory in Menlo Park, California. To renew this certificate, we are subject to survey and inspection every two years. Moreover, CLIA inspectors may make random inspections of our clinical reference laboratory.

We are also required to maintain a license to conduct testing in California. California laws establish standards for day-to-day operation of our clinical reference laboratory in Menlo Park, including the training and skills required of personnel and quality control. Several other states in which we operate also require that we hold licenses to test specimens from patients in those states, under certain circumstances. For example, our clinical reference laboratory is required to be licensed on a product-specific basis by New York as an out-of-state laboratory, and our products, as LDTs, must be approved by the New York State Department of Health (the "NYDOH") on a product-by-product basis before they are offered in New York. We are subject to periodic inspection by the NYDOH and are required to demonstrate ongoing compliance with NYDOH regulations and standards. To the extent NYDOH identified any non-compliance and we are unable to implement satisfactory corrective actions to remedy such non-compliance, the State of New York could withdraw approval for our tests. Additionally, states such as Maryland, Pennsylvania, and Rhode Island may also require us to maintain out-of-state licenses. Other states may have similar requirements or may adopt similar requirements in the future. Although we have obtained licenses from states where we believe we are required to be licensed, we may become aware of other states that require out-of-state laboratories to obtain licensure in order to accept specimens from the state, and it is possible that other states currently have such requirements or will have such requirements in the future. We may also be subject to regulation in foreign jurisdictions as we seek to expand international utilization of our tests or such jurisdictions adopt new licensure requirements, which may require review of our tests in order to offer them or may have other limitations such as restrictions on the transport of human blood necessary for us to perform our tests that may limit our ability to make our tests available outside of the United States. Complying with licensure requirements in new jurisdictions may be expensive and/or time-consuming, may subject us to significant and unanticipated delays, or may be in conflict with other applicable requirements.

Failure to comply with applicable clinical laboratory licensure requirements may result in a range of enforcement actions, including license suspension, limitation, or revocation, directed plan of action, onsite monitoring, civil monetary penalties, and criminal sanctions as well as significant adverse publicity. Any sanction imposed under CLIA, its implementing regulations or state or foreign laws or regulations governing clinical laboratory licensure, or our failure to renew our CLIA certificate, a state or foreign license or accreditation, could have a material adverse effect on our business, financial condition and results of operations. Even if we were able to bring our laboratory back into compliance, we could incur significant expenses and potentially lose revenues in doing so.

Although we market our tests as LDTs that are currently subject to the FDA's exercise of enforcement discretion, if we fail to operate within the conditions of that exercise of enforcement discretion, or if any of our products otherwise fail to comply with FDA regulatory requirements as enforced, we would be subject to the applicable requirements of the FDC Act and the FDA's implementing regulations. The FDA is empowered to impose sanctions for violations of the FDC Act and the FDA's implementing regulations, including warning letters, civil and criminal penalties, injunctions, product seizure or recall, import bans, restrictions on the conduct of our operations and total or partial suspension of production. Any of the aforementioned sanctions could cause reputational damage, undermine our ability to maintain and increase our revenues, and harm our business, financial condition, and results of operations. In particular, if we or the FDA discover that any of our products have defects that call into question the accuracy of their results, we may be required to undertake a retest of all results and analyses provided during the period relevant to the defect, or recall the affected products. The direct costs incurred in connection with such a recall in terms of management time, administrative and legal expenses and lost revenue, together with the indirect costs to our reputation could harm our business, financial condition and results of operations, and our ability to execute our business strategy. While we believe that we are currently in material compliance with applicable laws and regulations as currently enforced, the FDA or other regulatory

agencies may not agree, and a determination that we have violated these laws or a public announcement that we are being investigated for possible violations of these laws could adversely affect our business, financial condition, results of operations, and prospects.

***Complying with numerous statutes and regulations pertaining to our business is an expensive and time- consuming process, and any failure to comply could result in substantial penalties.***

Our operations may be subject to other extensive federal, state, local, and foreign laws and regulations, all of which are subject to change. These laws and regulations currently include, among others:

- the federal Anti-Kickback Statute, which prohibits knowingly and willfully offering, paying, soliciting, or receiving remuneration, directly or indirectly, overtly or covertly, in cash or in kind, in return for or to induce such person to refer an individual, or to purchase, lease, order, arrange for, or recommend purchasing, leasing or ordering, any good, facility, item or service that is reimbursable, in whole or in part, under a federal healthcare program. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation. In addition, the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the false claims statutes;
- the federal Stark physician self-referral law, which prohibits a physician from making a referral for certain designated health services covered by the Medicare program, including laboratory and pathology services, if the physician or an immediate family member has a financial relationship with the entity providing the designated health services, and prohibits that entity from billing or presenting a claim for the designated health services furnished pursuant to the prohibited referral, unless an exception applies. Failure to refund amounts received as a result of a prohibited referral on a timely basis may constitute a false or fraudulent claim under the False Claims Act;
- the "Anti-Markup Rule" and similar state and similar state laws, among other things, prohibits a physician or supplier billing the Medicare program from marking up the price of a purchased diagnostic service performed by another laboratory or supplier that does not "share a practice" with the billing physician or supplier. Penalties may apply to the billing physician or supplier if Medicare or another payer is billed at a rate that exceeds the performing laboratory's charges to the billing physician or supplier, and the performing laboratory could be at risk under false claims laws, described below, for causing the submission of a false claim;
- the federal civil and criminal false claims laws, including the False Claims Act, which impose liability on any person or entity that, among other things, knowingly presents, or causes to be presented, a false or fraudulent claim for payment to the federal government. These laws can apply to entities that provide information on coverage, coding, and reimbursement of their products and assistance with obtaining reimbursement to persons who bill payors. Private individuals can bring False Claims Act "qui tam" actions, on behalf of the government and such individuals, commonly known as "whistleblowers," may share in amounts paid by the entity to the government in fines or settlement;
- the federal Civil Monetary Penalties Law, which prohibits, among other things, the offering or transfer of remuneration to a Medicare or state healthcare program beneficiary if the person knows or should know it is likely to influence the beneficiary's selection of a particular provider, practitioner, or supplier of services reimbursable by Medicare or a state healthcare program, unless an exception applies;
- the federal Physician Payments Sunshine Act, which requires certain manufacturers of drugs, biologicals, and medical devices or supplies that require premarket approval by or notification to the FDA, and for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program ("CHIP") to report annually to CMS information related to (i) payments and other transfers of value to physicians and teaching hospitals, and (ii) ownership and investment interests held by physicians and their immediate family members;

- the HIPAA fraud and abuse provisions, which created federal civil and criminal statutes that prohibit, among other things, defrauding healthcare programs, willfully obstructing a criminal investigation of a healthcare offense and falsifying or concealing a material fact or making any materially false statements in connection with the payment for healthcare benefits, items or services. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- the Eliminating Kickbacks in Recovery Act of 2018 ("EKRA"), which prohibits payments for referrals to recovery homes, clinical treatment facilities, and laboratories. EKRA's reach extends beyond federal health care programs to include private insurance (i.e., it is an "all payer" statute);
- other federal and state fraud and abuse laws, such as anti-kickback laws, prohibitions on self-referral, fee-splitting restrictions, insurance fraud laws, prohibitions on the provision of tests at no or discounted cost to induce physician or patient adoption, and false claims acts, which may extend to services reimbursable by any payer, including private insurers;
- the prohibition on reassignment of Medicare claims, which, subject to certain exceptions, precludes the reassignment of Medicare claims to any other party;
- state laws that prohibit other specified practices, such as billing physicians for testing that they order; waiving coinsurance, copayments, deductibles, and other amounts owed by patients; billing a state Medicaid program at a price that is higher than what is charged to one or more other payors employing, exercising control over, licensed professionals in violation of state laws prohibiting corporate practice of medicine and other professions, and prohibitions against the splitting of professional fees with licensed professionals; and
- similar foreign laws and regulations that apply to us in the countries in which we operate or may operate in the future.

As a clinical laboratory, our business practices may face additional scrutiny from government regulatory agencies such as the Department of Justice, the HHS Office of Inspector General (the "OIG") and CMS. Certain arrangements between clinical laboratories and referring physicians have been identified in fraud alerts issued by the OIG as implicating the Anti-Kickback Statute. The OIG has stated that it is particularly concerned about these types of arrangements because the choice of laboratory, as well as the decision to order laboratory tests, typically are made or strongly influenced by the physician, with little or no input from patients. Moreover, the provision of payments or other items of value by a clinical laboratory to a referral source could be prohibited under the Stark Law unless the arrangement meets all criteria of an applicable exception. The government has been active in enforcement of these laws as they apply to clinical laboratories.

The growth of our business and our expansion outside of the United States may increase the potential of violating these laws or our internal policies and procedures. The risk of our being found in violation of these or other laws and regulations is further increased by the fact that many have not been fully interpreted by the regulatory authorities or the courts, and their provisions are open to a variety of interpretations. Any action brought against us for violation of these or other laws or regulations, even if we successfully defend against it, could cause us to incur significant legal expenses and reputational harm and divert our management's attention from the operation of our business. If our operations are found to be in violation of any of these laws and regulations, we may be subject to any applicable penalty associated with the violation, including significant administrative, civil and criminal penalties, damages, fines, imprisonment, exclusion from participation in federal healthcare programs, refunding of payments received by us, integrity oversight and reporting obligations, and curtailment or cessation of our operations. Any of the foregoing consequences could seriously harm our business and our financial results.

***If we decide to grow our business by developing in vitro diagnostic tests, we may be subject to reimbursement challenges.***

The coverage and reimbursement status of newly approved or cleared laboratory tests is uncertain. If we develop in vitro diagnostic tests and decide to seek reimbursement, and if such tests are inadequately covered by insurance and ineligible for such reimbursement, this could limit our ability to market any such future tests. The commercial success of future products in both domestic and international markets may depend in part on the availability of coverage and adequate reimbursement from third-party payors, including government payors, such as the Medicare and Medicaid programs, managed care organizations, and other third-party payors. The government and other third-party payors are increasingly attempting to contain health care costs by limiting both insurance coverage and the level of reimbursement for new diagnostic tests. As a result, they may not cover or provide adequate payment for any future in vitro diagnostic tests that we develop. These payors may conclude that our products are less safe, less effective, or less cost-effective than existing or later-introduced products. These payors may also conclude that the overall cost of using one of our tests exceeds the overall cost of using a competing test, and third-party payors may not approve any future in vitro diagnostic tests we develop for insurance coverage and adequate reimbursement.

***We could be adversely affected by violations of the Foreign Corrupt Practices Act of 1977, as amended (the "FCPA"), and other worldwide anti-bribery laws.***

We are subject to the FCPA, which prohibits companies and their intermediaries from making payments in violation of law to non-U.S. government officials for the purpose of obtaining or retaining business or securing any other improper advantage. Other U.S. companies in the medical device and pharmaceutical fields have faced criminal penalties under the FCPA for allowing their agents to deviate from appropriate practices in doing business with these individuals. We are also subject to similar anti-bribery laws in the jurisdictions in which we operate, including the United Kingdom's Bribery Act of 2010, which also prohibits commercial bribery and makes it a crime for companies to fail to prevent bribery. These laws are complex and far-reaching in nature, and, as a result, we cannot assure you that we would not be required in the future to alter one or more of our practices to be in compliance with these laws or any changes in these laws or the interpretation thereof. Any violations of these laws, or allegations of such violations, could disrupt our operations, involve significant management distraction, involve significant costs and expenses, including legal fees, and could result in a material adverse effect on our business, prospects, financial condition or results of operations. We could also incur severe penalties, including criminal and civil penalties, disgorgement, and other remedial measures.

***Expansion into international markets would subject us to increased regulatory oversight and regulatory, economic, social and political uncertainties, which could cause a material adverse effect on our business, financial position, and results of operations.***

We may in the future expand our business and operations into international jurisdictions in which we have limited operating experience, including with respect to seeking regulatory approvals and marketing and selling products and services. If we expand internationally, our operations in these jurisdictions may be adversely affected by general economic conditions and economic and fiscal policy, including changes in exchange rates and controls, interest rates and taxation policies, increased government regulation, social stability and political, economic or diplomatic developments in the future. Certain jurisdictions have, from time to time, experienced instances of civil unrest and hostilities, both internally and with neighboring countries. Rioting, military activity, terrorist attacks, or armed hostilities could cause our operations in such jurisdictions to be adversely affected or suspended. We generally do not have insurance for losses and interruptions caused by terrorist attacks, military conflicts and wars. In addition, anti-bribery and anti-corruption laws may conflict with some local customs and practices in foreign jurisdictions. Our international operations may subject us to heightened scrutiny under the FCPA, the UK Bribery Act and similar anti-bribery laws, and could subject us to liability under such laws despite our best efforts to comply with such laws. As a result of our policy to comply with the FCPA, the UK Bribery Act and similar anti-bribery laws, we may be at a competitive disadvantage to competitors that are not subject to,

or do not comply with, such laws. Further, notwithstanding our compliance programs, there can be no assurances that our policies will prevent our employees or agents from violating these laws or protect us from any such violations. Additionally, we cannot predict the nature, scope or impact of any future regulatory requirements that may apply to our international operations or how foreign governments will interpret existing or new laws. Alleged, perceived or actual violations of any such existing or future laws by us or due to the acts of others, may result in criminal or civil sanctions, including contract cancellations or debarment, and damage to our reputation, any of which could have a material adverse effect on our business.

***Changes in health care policy could increase our costs, decrease our revenues, and impact sales of and reimbursement for our tests.***

In March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (the "ACA"), became law. This law substantially changed the way health care is financed by both commercial payers and government payers, and significantly impacts our industry. The ACA contains a number of provisions that are expected to impact the business and operations of our customers, some of which in ways we cannot currently predict, including those governing enrollment in state and federal health care programs, reimbursement changes and fraud and abuse, which will impact existing state and federal health care programs and will result in the development of new programs.

Among other things, the ACA:

- imposed an annual excise tax of 2.3% on any entity that manufactures or imports medical devices offered for sale in the United States, with limited exceptions, although the effective rate paid may be lower. Under the Consolidated Appropriations Act of 2016, the excise tax was suspended through December 31, 2017, and under the continuing resolution on appropriations for fiscal year 2018, signed by President Trump on January 22, 2018, was further suspended through December 31, 2019;
- expanded eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for individuals with income at or below 133% of the federal poverty level, thereby potentially increasing manufacturers' Medicaid rebate liability;
- established a new Patient-Centered Outcomes Research Institute to oversee and identify priorities in comparative clinical efficacy research in an effort to coordinate and develop such research; and
- established a Center for Medicare & Medicaid Innovation at CMS to test innovative payment and service delivery models to lower Medicare and Medicaid spending.

Some of the provisions of the ACA have yet to be implemented, and there have been judicial and Congressional challenges to certain aspects of the ACA, as well as recent efforts by the Trump administration to repeal or replace certain aspects of the ACA. Since January 2017, President Trump has signed two Executive Orders and other directives to delay the implementation of certain requirements of the ACA. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, it has enacted laws that modify certain provisions of the ACA such as removing penalties, starting January 1, 2019, for not complying with the ACA's individual mandate to carry health insurance and delaying the implementation of certain ACA-mandated fees including, without limitation, the medical device excise tax. On December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Cuts and Jobs Act. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA and our business. Additional legislation may be enacted that further amends, or repeals, the ACA, which could result in lower numbers of insured individuals, reduced coverage for insured individuals and adversely affect our and our customers' business.

In addition, other legislative changes have been proposed and adopted since the Affordable Care Act was enacted. On August 2, 2011, the Budget Control Act of 2011 was signed into law, which, among other things, reduced Medicare payments to providers by 2% per fiscal year, effective on April 1, 2013 and, due to subsequent legislative amendments to the statute, will remain in effect through 2027 unless additional Congressional action is taken. On January 2, 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, reduced Medicare payments to several providers, including hospitals, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. The Medicare Access and CHIP Reauthorization Act of 2015, enacted on April 16, 2015 ("MACRA"), repealed the formula by which Medicare made annual payment adjustments to physicians and replaced the former formula with fixed annual updates and a new system of incentive payments scheduled to begin in 2019 that are based on various performance measures and physicians' participation in alternative payment models such as accountable care organizations.

In April 2014, Congress passed the Protecting Access to Medicare Act of 2014 ("PAMA"), which included substantial changes to the way in which clinical laboratory services are paid under Medicare. Under PAMA, laboratories that receive the majority of their Medicare revenue from payments made under the Medicare Clinical Laboratory Fee Schedule, or the Physician Fee Schedule are required to report to CMS, beginning in 2017 and every three years thereafter (or annually for "advanced diagnostic laboratory tests"), private payer payment rates and volumes for their tests. CMS will use this data to calculate a weighted median payment rate for each test, which will be used to establish revised Medicare reimbursement rates for the tests. Laboratories that fail to report the required payment information may be subject to substantial civil monetary penalties. It is unclear what impact new quality and payment programs, such as MACRA, or new pricing structures, such as those adopted under PAMA, may have on our business, financial condition, results of operations, or cash flows.

We anticipate there will continue to be proposals by legislators at both the federal and state levels, regulators and private payers to reduce costs while expanding individual healthcare benefits. Certain of these changes could impose additional limitations on the prices we will be able to charge for our tests, the coverage of or the amounts of reimbursement available for our tests from payers, including commercial payers and government payers.

***If we use hazardous materials in a manner that causes injury, we could be liable for resulting damages.***

Our activities currently require the use of hazardous chemicals and biological material. We cannot eliminate the risk of an accidental environmental release or injury to employees or third parties from the use, storage, handling, or disposal of these materials. In the event of an environmental release or injury, we could be held liable for any resulting damages, and any liability could exceed our resources or any applicable insurance coverage we may have. Additionally, we are subject on an ongoing basis to federal, state and local laws and regulations governing the use, storage, handling and disposal of these materials and specified waste products. The cost of maintaining compliance with these laws and regulations may become significant, and our failure to comply may result in substantial fines or other consequences, and either could negatively affect our operating results.

**Risks Related to Our Intellectual Property**

***Litigation or other proceedings or third-party claims of intellectual property infringement, misappropriation or other violations may require us to spend significant time and money, and could in the future prevent us from selling our tests or impact our stock price, any of which could have a material adverse effect.***

Our commercial success will depend in part on our avoiding infringement of patents and infringement, misappropriation or other violations of other proprietary rights of third parties, including for example the intellectual property of competitors. There is extensive intellectual property litigation involving the

biotechnology and pharmaceutical industries and genetic sequencing technology. Our activities may be subject to claims that we infringe or otherwise violate patents owned or controlled by third parties. Numerous U.S. and foreign patents and pending patent applications exist in the genetic testing market and are owned by third parties. We cannot assure you that our operations do not, or will not in the future, infringe existing or future patents. For example, we are aware of several third-party issued U.S. patents and pending patent applications with claims relating to genetic sequencing technology and methodology that may be asserted against us and may be construed to encompass our products and services, including ACE ImmunoID and ImmunoID NeXT technology. In order to avoid infringing these third-party patents, we may find it necessary to or prudent to initiate invalidity proceedings against such patents or to obtain licenses from such third-party intellectual property holders. If we are not able to invalidate such patents or obtain or maintain a license on commercially reasonable terms and such third parties assert infringement claims against us, we may be prevented from exploiting our technology and our business, financial condition, results of operations, and prospects may be materially and adversely affected. We may also be unaware of patents that a third party, including for example a competitor in the genetic testing market, might assert are infringed by our business. There may also be patent applications that, if issued as patents, could be asserted against us. Patent applications in the United States and elsewhere are typically published approximately 18 months after the earliest filing for which priority is claimed, with such earliest filing date being commonly referred to as the priority date. Certain U.S. patent applications that will not be filed outside the United States can remain confidential until patents issue. Therefore, patent applications covering our products, services, or technologies could have been filed by third parties without our knowledge. Additionally, pending patent applications that have been published can, subject to certain limitations, be later amended in a manner that could cover our products, services, technologies, and their use. The scope of a patent claim is determined by an interpretation of the law, the written disclosure in a patent and the patent's prosecution history and can involve other factors such as expert opinion. Our interpretation of the relevance or the scope of claims in a patent or a pending application may be incorrect, which may negatively impact our ability to market our products and services. Further, we may incorrectly determine that our technologies, products, or services are not covered by a third-party patent or may incorrectly predict whether a third party's pending patent application will issue with claims of relevant scope. Our determination of the expiration date of any patent in the United States or abroad that we consider relevant may be incorrect, which may negatively impact our ability to develop and market our products or services.

Third-party intellectual property right holders may also actively bring infringement or other intellectual property-related claims against us, even if we have received patent protection for our technologies, products, and services. Regardless of the merit of third parties claims against us for infringement, misappropriation or violations of their intellectual property rights, such third parties may seek and obtain injunctive or other equitable relief, which could effectively block our ability to perform our tests. Further, if a patent infringement suit were brought against us, we could be forced to stop or delay our development or sales of any tests or other activities that are the subject of such suit. Defense of these claims, even if such claims are resolved in our favor, could cause us to incur substantial expenses and be a substantial diversion of our employee resources even if we are ultimately successful. Any adverse ruling or perception of an adverse ruling in defending ourselves could have a material adverse impact on our cash position and stock price. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios.

As we continue to commercialize our tests in their current or an updated form, launch different and expanded tests and enter new markets, other competitors might claim that our tests infringe, misappropriate or violate their intellectual property rights as part of business strategies designed to impede our successful commercialization and entry into new markets. If such a suit were brought, regardless of merit, there is no assurance that a court would find in our favor on questions of infringement, validity, enforceability or priority. Even if we are successful in defending against such suit, we could incur substantial costs and diversion of the

attention of our management and technical personnel in defending ourselves against such claims. A court of competent jurisdiction could hold that third-party patents asserted against us are valid, enforceable, and infringed, which could materially and adversely affect our ability to commercialize any products, services or technologies we may develop and any other technologies covered by the asserted third-party patents and any adverse ruling or perception of an adverse ruling in defending ourselves could have a material adverse impact on our cash position and stock price. If we are found to infringe, misappropriate or otherwise violate a third party's intellectual property rights, and we are unsuccessful in demonstrating that such rights are invalid or unenforceable, we may be required to pay substantial damages, including treble damages and attorneys' fees for willful infringement; obtain one or more licenses from third parties in order to continue developing and marketing our products and technology, which may not be available on commercially reasonable terms (if at all) or may be non-exclusive, thereby giving our competitors and other third parties access to the same technologies licensed to us; pay substantial royalties and other fees; and redesign any infringing tests or other activities, which may be impossible or require substantial time and monetary expenditure, or be prohibited from commercializing certain tests, all of which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Where we collaborate with third parties in the development of technology, our collaborators may not properly maintain or defend our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our intellectual property or proprietary information. Further, collaborators may infringe the intellectual property rights of third parties, which may expose us to litigation and potential liability. Also, we may be obligated under our agreements with our collaborators, licensors, suppliers and others to indemnify and hold them harmless for damages arising from intellectual property infringement by us.

***If we cannot license rights to use technologies on reasonable terms, we may not be able to commercialize new products in the future.***

In the future, we may identify additional third-party intellectual property we may need to license in order to engage in our business, including to develop or commercialize new products or services. However, such licenses may not be available on acceptable terms or at all. Even if such licenses are available, we may be required to pay the licensor substantial royalties based on sales of our products and services. Such royalties are a component of the cost of our products or services and may affect the margins on our products and services. In addition, such licenses may be nonexclusive, which could give our competitors access to the same intellectual property licensed to us. If we are unable to enter into the necessary licenses on acceptable terms or at all, if any necessary licenses are subsequently terminated, if our licensors fail to abide by the terms of the licenses, if our licensors fail to prevent infringement by third parties, or if the licensed patents or other rights are found to be invalid or unenforceable, our business, financial condition, results of operations, and prospects could be materially and adversely affected.

If licenses to third-party intellectual property rights are or become required for us to engage in our business, the rights may be non-exclusive, which could give our competitors access to the same technology or intellectual property rights licensed to us. Moreover, we could encounter delays in the introduction of tests while we attempt to develop alternatives. Defense of any lawsuit or failure to obtain any of these licenses on favorable terms could prevent us from commercializing tests, which could materially affect our ability to grow and thus adversely affect our business and financial condition.

***Developments or uncertainty in the patent statute, patent case law or U.S. Patent and Trademark Office ("USPTO"), rules and regulations may impact the validity, scope or enforceability of our patent rights, thereby impairing our ability to protect our products.***

Our patent rights, their associated costs, and the enforcement or defense of such patent rights may be affected by developments or uncertainty in the patent statute, patent case law or USPTO rules and regulations.

There are a number of recent changes to the patent laws that may have a significant impact on our ability to protect our technology and enforce our intellectual property rights. For example, the Leahy-Smith America Invents Act (the "AIA") enacted within the last several years involves significant changes in patent legislation. These include provisions that affect the way patent applications will be prosecuted and may also affect patent litigation. As an example, assuming that other requirements for patentability are met, prior to March 2013, in the United States, the first to invent the claimed invention was entitled to the patent, while outside the United States, the first to file a patent application was entitled to the patent. On or after March 16, 2013, under the AIA, the United States transitioned to a first inventor to file system in which, assuming that other requirements for patentability are met, means that the party that is first to file in the United States generally is awarded the patent rights, regardless of whether such party invented the claimed invention first.

The AIA also includes a number of significant changes that affect the way patent applications will be prosecuted and also may affect patent litigation. These include allowing third party submission of prior art to the USPTO during patent prosecution and additional procedures to attack the validity of a patent by USPTO administered post-grant proceedings, including post-grant review, *inter partes* review, and derivation proceedings. Because of a lower evidentiary standard in USPTO proceedings compared to the evidentiary standard in United States federal courts necessary to invalidate a patent claim, a third party could potentially provide evidence in a USPTO proceeding sufficient for the USPTO to hold a claim invalid even though the same evidence would be insufficient to invalidate the claim if first presented in a district court action. Accordingly, a third party may attempt to use the USPTO procedures to invalidate our patent claims that would not have been invalidated if first challenged by the third party as a defendant in a district court action. The AIA and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents, all of which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Further, the standards applied by the USPTO and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in biotechnology patents. As such, we do not know the degree of future protection that we will have on our technologies, products, and services. While we will endeavor to try to protect our technologies, products, and services with intellectual property rights such as patents, as appropriate, the process of obtaining patents is time-consuming, expensive, and sometimes unpredictable.

In addition, the patent position of companies engaged in the development and commercialization of diagnostic tests is particularly uncertain. Various courts, including the Supreme Court have rendered decisions that affect the scope of patentability of certain inventions or discoveries relating to certain diagnostic tests and related methods. These decisions state, among other things, that a patent claim that recites an abstract idea, natural phenomenon or law of nature (for example, the relationship between particular genetic variants and cancer) are not themselves patentable. Precisely what constitutes a law of nature or abstract idea is uncertain, and it is possible that certain aspects of genetic diagnostics tests would be considered natural laws. Accordingly, the evolving case law in the United States may adversely affect our ability to obtain patents and may facilitate third-party challenges to any owned or licensed patents. The laws of some foreign countries do not protect intellectual property rights to the same extent as the laws of the United States, and we may encounter difficulties in protecting and defending such rights in foreign jurisdictions. The legal systems of many other countries do not favor the enforcement of patents and other intellectual property protection, particularly those relating to biotechnology, which could make it difficult for us to stop the infringement of our patents in such countries. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of our business.

***Patent terms may be inadequate to protect our competitive position for an adequate amount of time.***

Patents have a limited lifespan. In the United States, the natural expiration of a patent is generally 20 years after its first effective non-provisional filing date. Although various extensions may be available, the life of a

patent, and the protection it affords, is limited. Even if patents covering our technologies, products, and services are obtained, once the patent life has expired, we may be open to competition from competitive products. Our issued patents will expire on dates ranging from 2033 to 2035, subject to any patent extensions that may be available for such patents. If patents are issued on our pending patent applications, the resulting patents are projected to expire on dates ranging from 2033 to 2038. In addition, although upon issuance in the United States a patent's life can be increased based on certain delays caused by the USPTO, this increase can be reduced or eliminated based on certain delays caused by the patent applicant during patent prosecution. If we do not have sufficient patent life to protect our technologies, products and services, our competitive position, business, financial condition, results of operations, and prospects will be adversely affected.

***If we are not able to obtain and enforce patent protection for any products we develop and for our technologies, or if the scope of patent protection obtained is not sufficiently broad, our competitors and other third parties could develop and commercialize products and technology similar or identical to ours, and our ability to successfully commercialize our products, services, and technologies may be adversely affected.***

We have applied, and we intend to continue applying, for patents covering such aspects of our technologies as we deem appropriate. However, the patent process is expensive, time consuming and complex, and we may not be able to apply for patents on certain aspects of our services, products, and other technologies in a timely fashion, at a reasonable cost, in all jurisdictions or at all, and any potential patent coverage we obtain may not be sufficient to prevent substantial competition.

Moreover, the patent position of biotechnology companies can be highly uncertain because it involves complex legal and factual questions for which important legal principles remain unresolved. No consistent policy regarding the breadth of claims allowed in such companies' patents has emerged to date in the United States or elsewhere. Courts frequently render opinions in the biotechnology field that may affect the patentability of certain inventions or discoveries, including opinions that may affect the patentability of methods for analyzing nucleic acid sequences.

Others may independently develop similar or alternative technologies or design around technologies for which we may not be able to obtain patent protection. In addition, any patent applications we file may be challenged and may not result in issued patents or may be invalidated, rendered unenforceable or narrowed in scope after they are issued, and there is no guarantee any of our issued patents include or will include claims that are sufficiently broad to cover our products, services and other technologies or to provide meaningful protection from our competitors. Consequently, we do not know whether any of our platform advances, products, services and other technologies will be protectable or remain protected by valid and enforceable patents. Our competitors or other third parties may be able to circumvent our patents by developing similar or alternative technologies or products in a non-infringing manner.

Even if they are unchallenged, our patents and patent applications may not adequately protect our intellectual property, provide exclusivity for our technologies, products, and services, or prevent others from designing around our claims. Any finding that our patents or applications are invalid, unpatentable or unenforceable could harm our ability to prevent others from practicing the related technology, and a finding that others have inventorship or ownership rights to our patents and applications could require us to obtain certain rights to practice related technologies, which may not be available on favorable terms, if at all. If we initiate lawsuits to protect or enforce our patents, or litigate against third-party claims, which would be expensive, and, if we lose, we may lose some of our intellectual property rights. Furthermore, these lawsuits may divert the attention of our management and technical personnel. Any of the foregoing could have a material adverse effect on our competitive position, business, financial condition, results of operations, and prospects

Once granted, patents may remain open to opposition, interference, re-examination, post-grant review, *inter partes* review, nullification or derivation action in court or before patent offices or similar proceedings for a

given period after allowance or grant, during which time third parties can raise objections against such initial grant. In the course of such proceedings, which may continue for a protracted period of time, the patent owner may be compelled to limit the scope of the granted claims thus attacked, or may lose the granted claims altogether. An adverse determination in any such proceeding or litigation could reduce the scope of, or invalidate, our patent rights, allow third parties to commercialize our technology or products and compete directly with us, without payment to us, or result in our inability to commercialize our products, services and technologies without infringing third-party patent rights. Such proceedings also may result in substantial cost and require significant time from our scientists and management, even if the eventual outcome is favorable to us. If the breadth or strength of protection provided by our patents and patent applications is threatened, regardless of the outcome, it could dissuade companies from collaborating with us to license, develop or commercialize current or future products or technologies. In addition, there can be no assurance that:

- others will not or may not be able to make, use, offer to sell, or sell tests that are the same as or similar to our products or services but that are not covered by the claims of the patents that we own or license;
- we or our future licensors or collaborators are the first to make the inventions covered by each of our issued patents and pending patent applications that we own or license;
- we or our future licensors or collaborators are the first to file patent applications covering certain aspects of our inventions;
- others will not independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights;
- a third party may not challenge our patents and, if challenged, a court would hold that our patents are valid, enforceable, and infringed;
- any issued patents that we own or may license will provide us with any competitive advantages, or will not be challenged by third parties;
- we may develop or in-license additional proprietary technologies that are patentable;
- pending patent applications that we own or may license will lead to issued patents;
- the patents of others will not have a material or adverse effect on our business, financial condition, results of operations, and prospects; and
- our competitors do not conduct research and development activities in countries where we do not have enforceable patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets.

The issuance of a patent is not conclusive as to its inventorship, scope, validity, or enforceability. Some of our patents or patent applications may be challenged at a future point in time in opposition, derivation, reexamination, *inter partes* review, post-grant review, or interference proceedings. Any successful opposition to these patents or any other patents owned by or, if applicable in the future, licensed to us could deprive us of rights necessary for the practice of our technologies or the successful commercialization of any products or technologies that we may develop, which could lead to increased competition to our business and harm our business. Since patent applications in the United States and most other countries are confidential for a period of time after filing, we cannot be certain that we or our licensors were the first to file any patent application related to our technologies, products, or services. Furthermore, an interference proceeding can be provoked by a third party or instituted by the USPTO to determine who was the first to invent any of the subject matter covered by the patent claims of our applications for any application with an effective filing date before March 16, 2013.

Where we obtain licenses from or collaborate with third parties, in some circumstances, we may not have the right to control the preparation, filing, and prosecution of patent applications, or to maintain the patents, covering technology that we license from third parties. We may also require the cooperation of our licensors and collaborators to enforce any licensed patent rights, and such cooperation may not be provided. Therefore, these

patents and applications may not be prosecuted and enforced in a manner consistent with the best interests of our business. Moreover, if we do obtain necessary licenses, we will likely have obligations under those licenses, and any failure to satisfy those obligations could give our licensor the right to terminate the license. Termination of a necessary license could have a material adverse impact on our business.

It is also possible that we fail to file patent applications covering inventions made in the course of development and commercialization activities before a competitor or another third party files a patent application covering, or publishes information disclosing, a similar, independently-developed invention. Such competitor's patent application may pose obstacles to our ability to obtain or limit the scope of patent protection we may obtain. Although we enter into non-disclosure and confidentiality agreements with parties who have access to confidential or patentable aspects of our research and development output, such as our employees, collaborators, contract manufacturers, consultants, advisors, and other third parties, any of these parties may breach the agreements and disclose such output before a patent application is filed, thereby jeopardizing our ability to seek patent protection. In addition, publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we or our licensors were the first to make the inventions claimed in our owned or licensed patents or pending patent applications, or were the first to file for patent protection of such inventions. To determine the priority of these inventions, we may have to participate in interference proceedings, derivation proceedings, *inter partes* review proceedings, or other post-grant proceedings declared by the USPTO that could result in substantial cost to us. The outcome of such proceedings is uncertain. No assurance can be given that other patent applications will not have priority over our patent applications. In addition, changes to the patent laws of the United States allow for various post-grant opposition proceedings, such as *inter partes* review proceedings, that have not been extensively tested, and their outcome is therefore uncertain. An unfavorable outcome could require us to cease using the related technology or to attempt to license rights to it from the prevailing party. Our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms or at all, or if a non-exclusive license is offered and our competitors gain access to the same technology. Furthermore, if third parties bring these proceedings against our patents, we could experience significant costs and management distraction.

***We may become involved in lawsuits to protect or enforce our patents or other intellectual property, which could be expensive, time consuming, and unsuccessful.***

Competitors may also infringe our patents or the patents of our licensing partners. In addition, our patents or the patents of our licensors may become involved in inventorship, priority, or validity disputes. To counter or defend against such claims can be expensive and time consuming. In an infringement proceeding, a court may refuse to stop the other party from using the technology at issue on the grounds that our owned and in-licensed patents do not cover the technology in question. Further in such proceedings, the defendant could counterclaim that our asserted patent covering our product is invalid or unenforceable, and the court may agree that our asserted patent is invalid or unenforceable. In patent litigation in the United States, defendant counterclaims alleging invalidity or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, including lack of novelty, obviousness or non-enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with the prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during prosecution. Third parties may also raise similar claims before administrative bodies in the United States or abroad, even outside the context of litigation. Such mechanisms include re-examination, post grant review, *inter partes* review, and equivalent proceedings in foreign jurisdictions (e.g., opposition proceedings). Such proceedings could result in revocation or amendment to our patents in such a way that they no longer cover our product. The outcome following legal assertions of invalidity and unenforceability is unpredictable. With respect to the validity question, for example, we cannot be certain that there is no invalidating prior art, of which we and the patent examiner were unaware during prosecution. An adverse result in any litigation or other proceeding could put one or more of our owned or in-licensed patents at risk of being invalidated or interpreted narrowly. Such a loss of patent protection could have a material adverse impact on our business. Furthermore, because of the substantial

amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation.

Even if resolved in our favor, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses and could distract our personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions, or other interim proceedings or developments, and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

***If we are unable to protect the confidentiality of our trade secrets and know-how, our business and competitive position would be harmed.***

We seek protection for certain aspects of our technologies, products and services through the filing of patents, registration of copyrights and use of non-disclosure agreements. In addition, we also expect to rely on trade secrets and proprietary know-how protection for our confidential and proprietary information, and we have taken security measures to protect this information. These measures, however, may not provide adequate protection for our trade secrets, know-how, or other confidential information. Among other things, we seek to protect our trade secrets, know-how, and confidential information by entering into confidentiality agreements with parties who have access to them, such as our employees, collaborators, contract manufacturers, consultants, advisors, and other third parties. We cannot guarantee that we have entered into such agreements with each party that may have or have had access to our trade secrets or proprietary technology and processes. Moreover, there can be no assurance that any confidentiality agreements that we have with our employees, consultants, or other third parties will provide meaningful protection for our trade secrets, know-how, and confidential information or will provide adequate remedies in the event of unauthorized use or disclosure of such information. Despite these efforts, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Monitoring unauthorized uses and disclosures is difficult, and we do not know whether the steps we have taken to protect our proprietary technologies will be effective. Accordingly, there also can be no assurance that our trade secrets or know-how will not otherwise become known or be independently developed by competitors.

Enforcing a claim that a party illegally disclosed or misappropriated a trade secret can be difficult, expensive, and time-consuming, and the outcome is unpredictable. In addition, trade secrets may be independently developed by others in a manner that could prevent legal recourse by us. If any of our confidential or proprietary information, such as our trade secrets, were to be disclosed or misappropriated, or if any such information was independently developed by a competitor, our competitive position would be materially and adversely harmed.

Trade secrets and know-how can be difficult to protect as trade secrets and know-how will over time be disseminated within the industry through independent development, the publication of journal articles, and the movement of personnel skilled in the art from company to company or academic to industry scientific positions. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor or other third party, we would have no right to prevent such competitor from using that technology or information to compete with us, which could harm our competitive position. Because from time to time we expect to rely on third parties in the development, manufacture and distribution of our products and provision of our services, we must, at times, share trade secrets with them. We seek to protect our proprietary technology in part by entering into confidentiality agreements and, if applicable, material transfer agreements, license agreements, collaboration

agreements, supply agreements, consulting agreements or other similar agreements with our advisors, employees, collaborators, licensors, suppliers, third-party contractors, and consultants prior to beginning research or disclosing proprietary information. These agreements typically limit the rights of the third parties to use or disclose our confidential information, including our trade secrets and know-how. Despite the contractual provisions employed when working with third parties, the need to share trade secrets, know-how, and other confidential information increases the risk that such trade secrets and know-how become known by our competitors, are inadvertently incorporated into the technology of others, or are disclosed or used in violation of these agreements. Given that our proprietary position is based, in part, on our know-how and trade secrets, a competitor's discovery of our trade secrets or know-how, or other unauthorized use or disclosure would impair our competitive position and may have an adverse effect on our business and results of operations.

In addition, these agreements typically restrict the ability of our advisors, employees, collaborators, licensors, suppliers, third-party contractors, and consultants to publish data potentially relating to our trade secrets or know-how, although our agreements may contain certain limited publication rights. Despite our efforts to protect our trade secrets and know-how, our competitors may discover our trade secrets or know-how, either through breach of our agreements with third parties, independent development, or publication of information by any of our third-party collaborators. A competitor's discovery of our trade secrets or know-how would impair our competitive position and have a material adverse impact on our business.

***We may not be able to enforce our intellectual property rights throughout the world.***

Filing, prosecuting, maintaining, defending, and enforcing patents on our products, services, and technologies in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and, further, may export otherwise infringing products to territories where we have patent protection or licenses but enforcement is not as strong as that in the United States. These products may compete with our products, and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing. In addition, the laws of some foreign countries do not protect proprietary rights to the same extent as the laws of the United States, and many companies have encountered significant challenges in establishing and enforcing their proprietary rights outside of the United States. These challenges can be caused by the absence or inconsistency of the application of rules and methods for the establishment and enforcement of intellectual property rights outside of the United States. In addition, the legal systems of some countries, particularly developing countries, do not favor the enforcement of patents and other intellectual property protection, especially those relating to healthcare. This could make it difficult for us to stop the infringement of our patents, if obtained, or the misappropriation of our other intellectual property rights. For example, many foreign countries, including European Union countries, India, Japan, and China, have compulsory licensing laws under which a patent owner may be compelled under specified circumstances to grant licenses to third parties. In addition, many countries limit the enforceability of patents against third parties, including government agencies or government contractors. In these countries, patents may provide limited or no benefit given that we may have limited remedies available if patents are infringed or if we are compelled to grant a license to a third party, which could materially diminish the value of those patents and limit our potential revenue opportunities. Furthermore, patent protection must ultimately be sought on a country-by-country basis, which is an expensive and time-consuming process with uncertain outcomes. Accordingly, we may choose not to seek patent protection in certain countries, and we will not have the benefit of patent protection in such countries.

Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business. Accordingly, our efforts to protect our intellectual property rights in such countries may be inadequate. In addition, changes in the law and legal decisions by courts in the United States and foreign countries may affect our ability to obtain adequate protection for our products, services and other technologies and the enforcement of intellectual property. Any of the foregoing could have a material adverse effect on our competitive position, business, financial condition, results of operations, and prospects.

***Obtaining and maintaining patent protection depends on compliance with various procedural, document submission, fee payment and other requirements imposed by governmental patent agencies, and our patent protection could be reduced or eliminated for non-compliance with these requirements.***

The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent application and prosecution process. Periodic maintenance fees, renewal fees, annuity fees, and various other governmental fees on patents and/or applications will be due to be paid to the USPTO and various other governmental patent agencies outside of the United States in several stages over the lifetime of the patents and/or applications. We employ reputable professionals and rely on such third parties to help us comply with these requirements and effect payment of these fees with respect to the patents and patent applications that we own. Noncompliance events that could result in abandonment or lapse of a patent or patent application include failure to respond to official communications within prescribed time limits, non-payment of fees and failure to properly legalize and submit formal documents. In many cases, an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules. However, there are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case, which could have a material adverse effect on our competitive position, business, financial condition, results of operations, and prospects.

***Third parties may assert that our employees or consultants have wrongfully used or disclosed confidential information or misappropriated trade secrets.***

We employ individuals who were previously employed or otherwise engaged with universities or genetic testing, diagnostic or other healthcare companies, including our competitors or potential competitors.

Although we have policies to ensure that our employees and consultants do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or our employees or consultants have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of a former employer or other third parties. Further, we may be subject to ownership disputes in the future arising, for example, from conflicting obligations of consultants or others who are involved in developing our intellectual property. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees. Such claims could have a material adverse effect on our business, financial condition, results of operations, and prospects.

In addition, while it is our policy to require our employees and contractors who may be involved in the conception or development of intellectual property to execute agreements assigning such intellectual property to us, we may be unsuccessful in executing such an agreement with each party who, in fact, conceives or develops intellectual property that we regard as our own. The assignment of intellectual property rights may not be self-executing, or the assignment agreements may be breached, and we may be forced to bring claims against third parties, or defend claims that they may bring against us, to determine the ownership of what we regard as our intellectual property. Such claims could have a material adverse effect on our business, financial condition, results of operations, and prospects.

***Our use of "open source" software could subject our proprietary software to general release, adversely affect our ability to sell our products and services, and subject us to possible litigation.***

A portion of the products or technologies licensed, developed, and/or distributed by us incorporate so-called "open source" software and we may incorporate open source software into other products in the future. Such open source software is generally licensed by its authors or other third parties under open source licenses. Some

open source licenses contain requirements that we disclose source code for modifications we make to the open source software and that we license such modifications to third parties at no cost. In some circumstances, distribution of our software in connection with open source software could require that we disclose and license some or all of our proprietary code in that software, as well as distribute our products or provide our services that use particular open source software at no cost to the user. We monitor our use of open source software in an effort to avoid uses in a manner that would require us to disclose or grant licenses under our proprietary source code; however, there can be no assurance that such efforts will be successful. Open source license terms are often ambiguous and such use could inadvertently occur. There is little legal precedent governing the interpretation of many of the terms of these licenses, and the potential impact of these terms on our business may result in unanticipated obligations regarding our products and technologies. Companies that incorporate open source software into their products have, in the past, faced claims seeking enforcement of open source license provisions and claims asserting ownership of open source software incorporated into their product. If an author or other third party that distributes such open source software were to allege that we had not complied with the conditions of an open source license, we could incur significant legal costs defending ourselves against such allegations. In the event such claims were successful, we could be subject to significant damages or be enjoined from the distribution of our products. In addition, if we combine our proprietary software with open source software in certain ways, under some open source licenses, we could be required to release the source code of our proprietary software, which could substantially help our competitors develop products that are similar to or better than ours and otherwise adversely affect our business. These risks could be difficult to eliminate or manage, and, if not addressed, could have a material adverse effect on our business, financial condition, and results of operations.

***If we fail to comply with our obligations under license or technology agreements with third parties, we may be required to pay damages and we could lose license rights that are critical to our business.***

We license certain intellectual property that is important to our business, and in the future we may enter into additional agreements that provide us with licenses to valuable intellectual property or technology. For example, our agreements with third parties, such as Illumina, include certain non-exclusive license rights that are essential to the operation of our business as it is currently conducted. If we fail to comply with any of the obligations under our license agreements, we may be required to pay damages and the licensor may have the right to terminate the license. Termination by the licensor would cause us to lose valuable rights, and could prevent us from selling our products and services, or inhibit our ability to commercialize future products and services. Our business would suffer if any current or future licenses terminate, if the licensors fail to abide by the terms of the license, if the licensors fail to enforce licensed patents against infringing third parties, if the licensed patents or other rights are found to be invalid or unenforceable, or if we are unable to enter into necessary licenses on acceptable terms. In addition, our rights to certain technologies, including those of Illumina, are licensed to us on a non-exclusive basis. The owners of these non-exclusively licensed technologies are therefore free to license them to third parties, including our competitors, on terms that may be superior to those offered to us, which could place us at a competitive disadvantage. Moreover, our licensors may own or control intellectual property that has not been licensed to us and, as a result, we may be subject to claims, regardless of their merit, that we are infringing or otherwise violating the licensor's rights.

***Any collaboration arrangements that we may enter into in the future may not be successful, which could adversely affect our ability to develop and commercialize our products.***

Any future collaborations that we enter into may not be successful. The success of our collaboration arrangements will depend heavily on the efforts and activities of our collaborators. Collaborations are subject to numerous risks, which may include that:

- collaborators have significant discretion in determining the efforts and resources that they will apply to collaborations;
- collaborators may not pursue development and commercialization of our products or may elect not to continue or renew development or commercialization programs based on trial or test results, changes in

their strategic focus due to the acquisition of competitive products, availability of funding, or other external factors, such as a business combination that diverts resources or creates competing priorities;

- collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our products;
- collaborators with marketing, manufacturing, and distribution rights to one or more products may not commit sufficient resources to or otherwise not perform satisfactorily in carrying out these activities;
- we could grant exclusive rights to our collaborators that would prevent us from collaborating with others;
- collaborators may not properly maintain or defend our intellectual property rights or may use our intellectual property or proprietary information in a way that gives rise to actual or threatened litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to potential liability;
- disputes may arise between us and a collaborator that causes the delay or termination of the research, development, or commercialization of our current or future products or that results in costly litigation or arbitration that diverts management attention and resources;
- collaborations may be terminated, and, if terminated, may result in a need for additional capital to pursue further development or commercialization of the applicable current or future products;
- collaborators may own or co-own intellectual property covering our products that results from our collaborating with them, and in such cases, we would not have the exclusive right to develop or commercialize such intellectual property; and
- collaborators' sales and marketing activities or other operations may not be in compliance with applicable laws resulting in civil or criminal proceedings.

If we are unable to successfully obtain rights to required third-party intellectual property rights or maintain the existing intellectual property rights we have, we may have to abandon development of that program and our business and financial condition could suffer.

***We may be subject to claims challenging the inventorship of our patents and other intellectual property.***

We or our licensors may be subject to claims that former employees, collaborators, or other third parties have an interest in our patents, trade secrets, or other intellectual property as an inventor or co-inventor. For example, we or our licensors may have inventorship disputes arise from conflicting obligations of employees, consultants, or others who are involved in developing our products, services, or technologies. Litigation may be necessary to defend against these and other claims challenging inventorship or our licensors' ownership of our owned or in-licensed patents, trade secrets, or other intellectual property. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, intellectual property that is important to our products, services, or technologies. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees. Any of the foregoing could have a material adverse effect on our business, financial condition, results of operations, and prospects.

***If our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our markets of interest and our business may be adversely affected.***

Our trademarks or trade names may be challenged, infringed, circumvented, or declared generic or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential partners or customers in our markets of interest. During trademark registration proceedings, we may receive

rejections. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, in the USPTO and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, and our trademarks may not survive such proceedings. If we are unable to establish brand name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected.

**Risks Related to Being a Public Company**

***The requirements of being a public company may strain our resources, result in litigation and divert management's attention.***

As a public company, we will be subject to the reporting requirements of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), the Sarbanes-Oxley Act of 2002, as amended (the "Sarbanes-Oxley Act"), the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of the stock exchange on which we will list, and other applicable securities rules and regulations. Complying with these rules and regulations has increased and will increase our legal and financial compliance costs, make some activities more difficult, time-consuming, or costly and increase demand on our systems and resources, particularly after we are no longer an "emerging growth company" as defined in the Jumpstart our Business Startups Act of 2012 (the "JOBS Act"). The Exchange Act requires, among other things, that we file annual, quarterly, and current reports with respect to our business and operating results. The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal control over financial reporting. We are required to disclose changes made in our internal control and procedures on a quarterly basis. In order to maintain and, if required, improve our disclosure controls and procedures and internal control over financial reporting to meet this standard, significant resources and management oversight may be required. As a result, management's attention may be diverted from other business concerns, which could adversely affect our business and operating results. We will need to hire additional employees or engage outside consultants to comply with these requirements, which will increase our costs and expenses.

In addition, changing laws, regulations, and standards relating to corporate governance and public disclosure are creating uncertainty for public companies, increasing legal and financial compliance costs and making some activities more time-consuming. These laws, regulations, and standards are subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices. We intend to invest resources to comply with evolving laws, regulations, and standards, and this investment will result in increased general and administrative expenses and a diversion of management's time and attention from revenue-generating activities to compliance activities. If our efforts to comply with new laws, regulations and standards differ from the activities intended by regulatory or governing bodies due to ambiguities related to their application and practice, regulatory authorities may initiate legal proceedings against us and our business may be adversely affected. By disclosing information in this prospectus and in filings required of a public company, our business and financial condition will become more visible, which we believe may result in threatened or actual litigation, including by competitors and other third parties. If those claims are successful, our business could be seriously harmed. Even if the claims do not result in litigation or are resolved in our favor, the time and resources needed to resolve them could divert our management's resources and seriously harm our business.

We also expect that being a public company and these new rules and regulations will make it more expensive for us to obtain director and officer liability insurance and, in the future, we may be required to accept reduced coverage or incur substantially higher costs to obtain coverage. These factors could also make it more difficult for us to attract and retain qualified members of our board of directors, particularly to serve on our audit committee and compensation committee, and qualified executive officers.

In addition, as a result of our disclosure obligations as a public company, we will have reduced strategic flexibility and will be under pressure to focus on short-term results, which may materially and adversely affect our ability to achieve long-term profitability.

***We are an emerging growth company, and any decision on our part to comply only with certain reduced reporting and disclosure requirements applicable to emerging growth companies could make our common stock less attractive to investors.***

We are an "emerging growth company," as defined in the JOBS Act, and, for as long as we continue to be an emerging growth company, we may choose to take advantage of exemptions from various reporting requirements applicable to other public companies but not to emerging growth companies, including:

- not being required to have our independent registered public accounting firm audit our internal control over financial reporting under Section 404 of the Sarbanes-Oxley Act;
- reduced disclosure obligations regarding executive compensation in our periodic reports and annual report on Form 10-K; and
- exemptions from the requirements of holding non-binding advisory votes on executive compensation and stockholder approval of any golden parachute payments not previously approved.

We could be an emerging growth company for up to five years following the closing of this offering. Our status as an emerging growth company will end as soon as any of the following takes place:

- the last day of the fiscal year in which we have more than $1.07 billion in annual revenue;
- the date we qualify as a "large accelerated filer," with at least $700 million of equity securities held by non-affiliates;
- the date on which we have issued, in any three-year period, more than $1.0 billion in non-convertible debt securities; or
- the last day of the fiscal year ending after the fifth anniversary of the closing of this offering.

We cannot predict if investors will find our common stock less attractive if we choose to rely on any of the exemptions afforded emerging growth companies. If some investors find our common stock less attractive because we rely on any of these exemptions, there may be a less active trading market for our common stock and the market price of our common stock may be more volatile.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this accommodation and, therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

***Material weaknesses in our internal control over financial reporting may cause us to fail to timely and accurately report our financial results or result in a material misstatement of our financial statements.***

Management evaluates our internal control systems, processes, and procedures for compliance with the requirements of a smaller reporting company under Section 404 of the Sarbanes-Oxley Act of 2002 ("Section 404"). This evaluation includes disclosure of any material weaknesses identified by our management in our internal control over financial reporting. A "material weakness" is a deficiency, or a combination of deficiencies, in internal control over financial reporting such that there is a reasonable possibility that a material misstatement of our annual or interim financial statements will not be prevented or detected on a timely basis.

In connection with preparation of our financial statements for the years ended December 31, 2017 and 2018, management identified a material weakness in our internal controls due to a lack of sufficient full-time

accounting staff with requisite experience and deep technical accounting knowledge to (i) identify and resolve complex accounting issues under generally accepted accounting principles in the United States ("GAAP") and (ii) allow for appropriate segregation of duties. The identified material weakness could result in misstatements to our consolidated financial statements that would be material and would not be prevented or detected on a timely basis.

We are evaluating and implementing additional procedures to remediate this material weakness, however, we cannot assure you that these or other measures will fully remediate the material weakness in a timely manner or prevent future material weaknesses from occurring. As part of our remediation plan to address the material weakness identified above, we hired a new Chief Financial Officer in March 2019 and are actively working to hire additional accounting employees with the specific technical accounting and financial reporting experience necessary for a public company. We will continue to assess the adequacy of our accounting personnel and resources, and will add additional personnel, as well as adjust our resources, as necessary, commensurate with any increase in the size and complexity of our business.

If we identify future material weaknesses in our internal controls over financial reporting or fail to meet the demands that will be placed upon us as a public company, including the requirements of the Sarbanes-Oxley Act, we may be unable to accurately report our financial results or report them within the timeframes required by law or stock exchange regulations. Failure to comply with Section 404 could also potentially subject us to sanctions or investigations by the U.S. Securities and Exchange Commission (the "SEC") or other regulatory authorities. If additional material weaknesses exist or are discovered in the future, and we are unable to remediate any such material weakness, our reputation, financial condition, and operating results could suffer.

***Our disclosure controls and procedures may not prevent or detect all errors or acts of fraud.***

Upon closing of this offering, we will have implemented disclosure controls and procedures designed to provide reasonable assurance that information we must disclose in reports we file or submit under the Exchange Act is accumulated and communicated to management and recorded, processed, summarized, and reported within the time periods specified in the rules and forms of the SEC. However, any disclosure controls and procedures, no matter how well-conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met.

These inherent limitations include the realities that judgments in decision-making can be faulty and that breakdowns can occur because of simple errors or mistakes. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people or by an unauthorized override of the controls. As a result, because of these inherent limitations in our control system, misstatements or omissions due to error or fraud may occur and may not be detected, which could result in failures to file required reports in a timely manner and filing reports containing incorrect information. Any of these outcomes could result in SEC enforcement actions, monetary fines or other penalties, damage to our reputation, and harm to our financial condition.

**Risks Related to This Offering and Our Common Stock**

***An active trading market for our common stock may never develop or be sustained.***

Prior to this offering, there has been no public market for our common stock. We intend to apply to list our common stock on the Nasdaq Global Market under the symbol "PSNL." However, we cannot assure you that an active trading market for our common stock will develop on that exchange or elsewhere or, if developed, that any market will be sustained. Accordingly, we cannot assure you of the likelihood that an active trading market for our common stock will develop or be maintained, the liquidity of any trading market, your ability to sell your shares of our common stock when desired, or the prices that you may obtain for your shares. Further, an inactive market may also impair our ability to raise capital by selling our common stock and may impair our ability to enter into strategic partnerships or acquire businesses, products, or technologies using our common stock as consideration.

***The market price of our common stock may be volatile or may decline steeply or suddenly regardless of our operating performance and we may not be able to meet investor or analyst expectations. You may not be able to resell your shares at or above the initial public offering price and may lose all or part of your investment.***

The initial public offering price for our common stock will be determined through negotiations between the underwriters and us, and may vary from the market price of our common stock following this offering. If you purchase shares of our common stock in this offering, you may not be able to resell those shares at or above the initial public offering price. We cannot assure you that the market price following this offering will equal or exceed prices in privately negotiated transactions of our shares that have occurred from time to time before this offering. The market price of our common stock may fluctuate or decline significantly in response to numerous factors, many of which are beyond our control, including:

- actual or anticipated fluctuations in our operating results;
- failure to meet or exceed financial estimates and projections of the investment community or that we provide to the public;
- issuance of new or updated research reports by securities analysts or changed recommendations for our stock;
- competition from existing tests or new tests that may emerge;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures, collaborations, capital commitments, or by or pertaining to our customers, particularly the VA MVP;
- the timing and amount of our investments in the growth of our business;
- actual or anticipated changes in regulatory oversight of our business or issues we may face with regulators;
- additions or departures of key management or other personnel;
- inability to obtain additional funding;
- sales of our common stock by us or our stockholders in the future;
- disputes or other developments related to our intellectual property or other matters, including litigation; and
- general economic, industry, and market conditions, including factors unrelated to our operating performance or the operating performance of our competitors.

In addition, the stock market in general, and the market for life sciences companies in particular, has experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of those companies. Broad market and industry factors may seriously affect the market price of our common stock, regardless of our actual operating performance. These fluctuations may be even more pronounced in the trading market for our stock shortly following this offering. In addition, in the past, following periods of volatility in the overall market and the market price of a particular company's securities, securities class action litigation has often been instituted against these companies. This litigation, if instituted against us, could result in substantial costs and a diversion of our management's attention and resources.

Moreover, because of these fluctuations, comparing our operating results on a period-to-period basis may not be meaningful. You should not rely on our past results as an indication of our future performance. This variability and unpredictability could also result in our failing to meet the expectations of industry or financial analysts or investors for any period. If our revenues or operating results fall below the expectations of analysts or investors or below any forecasts we may provide to the market, or if the forecasts we provide to the market are

below the expectations of analysts or investors, the price of our common stock could decline substantially. Such a stock price decline could occur even when we have met any previously publicly stated revenues or earnings forecasts that we may provide.

***Our quarterly results may fluctuate significantly, which could adversely impact the value of our common stock.***

Our quarterly results of operations, including our revenue, gross margin, profitability, and cash flows, may vary significantly in the future, and period-to-period comparisons of our operating results may not be meaningful. Accordingly, our quarterly results should not be relied upon as an indication of future performance. Our quarterly financial results may fluctuate as a result of a variety of factors, many of which are outside of our control. For example, the VA and other large customers are not obliged to deliver tissue samples to us at any particular time or at all. The rate at which we receive tissue samples can vary dramatically from quarter to quarter, and is difficult or impossible for us to accurately forecast. Our receipt and processing of tissue samples from our customers leads to our recognition of revenue, and as such the variable rates of delivery of customer samples will lead to variations in our revenues from quarter to quarter. Fluctuations in quarterly results may adversely impact the value of our common stock. Factors that may cause fluctuations in our quarterly financial results include, without limitation, those listed elsewhere in this "Risk Factors" section. We also may face competitive pricing pressures, and we may not be able to maintain our pricing in the future, which would adversely affect our operating results.

***Insiders may exercise significant control over our company and will be able to influence corporate matters.***

Our directors, executive officers, and 5% or greater stockholders and their affiliates beneficially owned, in the aggregate, approximately 75.9% of our outstanding capital stock as of March 31, 2019. Upon the closing of this offering, this same group will hold approximately % of our outstanding capital stock. As a result, these stockholders will be able to exercise significant influence over all matters submitted to our stockholders for approval, including the election of directors and approval of significant corporate transactions, such as a merger or sale of our company or its assets. This concentration of ownership may have the effect of delaying or preventing a third party from acquiring control of our company and could adversely affect the market price of our common stock, and may not be in the best interests of our other stockholders.

***Future sales of shares by existing stockholders, or the perception that such sales could occur, could cause our stock price to decline.***

If our existing stockholders sell, or indicate an intent to sell, substantial amounts of our common stock in the public market after the 180-day contractual lock-up and other legal restrictions on resale discussed in this prospectus lapse, the trading price of our common stock could decline significantly and could decline below the initial public offering price. Based on 87,318,814 shares outstanding as of March 31, 2019 (and assuming the exercise in full of a warrant exercisable for 754,573 shares of common stock), upon the closing of this offering, we will have outstanding shares of common stock. Of these shares, the shares of common stock sold in this offering, plus any shares sold pursuant to the underwriters' option to purchase additional shares, will be immediately freely tradable, without restriction, in the public market, unless they are purchased in this offering by our affiliates, as that term is defined in Rule 144 under the Securities Act of 1933, as amended (the "Securities Act"). Morgan Stanley & Co. LLC, Merrill Lynch, Pierce, Fenner & Smith Incorporated, and Cowen and Company, LLC, however, may, in their discretion, permit our officers, directors, and other stockholders who have entered to lock-up agreements in connection with this offering to sell shares prior to the expiration of the lock-up agreements.

After the lock-up agreements pertaining to this offering expire, substantially all of such shares will be eligible for sale in the public market. In addition, upon issuance, the 17,527,536 shares of common stock subject

to outstanding options under our stock option plans as March 31, 2019 will become eligible for sale in the public market in the future, subject to certain legal and contractual limitations. Moreover, 180 days after the closing of this offering, holders of up to an aggregate of 75,163,941 shares of our common stock (including an aggregate of 510,393 shares issuable upon the exercise of warrants that were outstanding as of March 31, 2019) will have the right to require us to register these shares under the Securities Act pursuant to an investors' rights agreement. If our existing stockholders sell substantial amounts of our common stock in the public market, or if the public perceives that such sales could occur, this could have an adverse effect on the market price of our common stock.

We also intend to register shares of our common stock that we may issue under our equity incentive plans, totaling shares subject to outstanding options and additional shares reserved for issuance as of the closing of this offering. Once we register these shares, they will be freely tradable in the public market upon issuance, subject to volume and manner of sale limitations applicable to affiliates and other legal and contractual limitations.

***We have broad discretion in how we may use the net proceeds from this offering, and we may not use them effectively.***

We cannot specify with any certainty the particular uses of the net proceeds that we will receive from this offering. Our management will have broad discretion in applying the net proceeds we receive from this offering for any of the purposes described in section titled "Use of Proceeds." You will not have the opportunity, as part of your investment decision, to assess whether we are using the net proceeds appropriately, and you will be relying on the judgment of our management regarding the use of these net proceeds. Our management may not apply the net proceeds in ways that increase the value of your investment. If our management fails to use these funds effectively, our business could be seriously harmed. Pending their use, the net proceeds from this offering may be invested in a way that does not produce income or that loses value.

***We do not currently intend to pay dividends on our common stock and, consequently, your ability to achieve a return on your investment will depend on appreciation of the value of our common stock.***

We have never declared or paid cash dividends on our capital stock. We currently intend to retain any future earnings to finance the operation and expansion of our business, and we do not expect to pay any cash dividends on our common stock in the foreseeable future. In addition, our ability to pay cash dividends on our capital stock is limited by our credit agreement and may be prohibited or limited by the terms of any future debt financing arrangement. As a result, any investment returns on our common stock will depend upon increases in the value for our common stock, which are not certain.

***Our ability to use net operating losses to offset future taxable income may be subject to limitations.***

As of December 31, 2018, we had federal and state net operating loss carryforwards of approximately $87 million and approximately $48.6 million, respectively. Certain of our federal and state net operating loss carryforwards will begin to expire, if not utilized, beginning in 2031. These net operating loss carryforwards could expire unused and be unavailable to offset future income tax liabilities. Under the Tax Cuts and Jobs Act, federal net operating losses incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal net operating losses is limited. It is uncertain if and to what extent various states will conform to the Tax Cuts and Jobs Act. In addition, under Section 382 of the Code, and corresponding provisions of state law, if a corporation undergoes an "ownership change," which is generally defined as a greater than 50% change, by value, in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes (including certain tax credits) to offset its post-change income or taxes may be limited. It is possible that we have experienced an ownership change or that we will experience one in connection with this offering. We may experience ownership changes in the future as a result of subsequent shifts in our stock ownership, some of which may be outside of our control. If an ownership change occurs and our ability to use our net operating loss carryforwards is materially limited, it would harm our future operating results by effectively increasing our future tax obligations.

***Purchasers in this offering will experience immediate and substantial dilution in the book value of their investment.***

The initial public offering price of our common stock is substantially higher than the net tangible book value per share of our common stock as of March 31, 2019. Therefore, if you purchase our common stock in this offering, you will incur immediate dilution of $ per share, based on an assumed initial public offering price of $ per share, which is the midpoint of the price range on the cover page of this prospectus. This dilution is due to the substantially lower price paid by our investors who purchased shares prior to this offering as compared to the price offered to the public in this offering, and any previous exercise of stock options granted to our service providers. In addition, as of March 31, 2019, options to purchase 17,527,536 shares of our common stock with a weighted-average exercise price of approximately $0.9049 per share were outstanding. The exercise of any of these options would result in additional dilution. As a result of the dilution to investors purchasing shares in this offering, investors may receive less than the purchase price paid in this offering, if anything, in the event of our liquidation. In addition, new investors who purchase shares in this offering will contribute approximately % of the total amount of equity capital raised by us through the date of this offering, but will only own approximately % of the outstanding equity capital. For a detailed description of the dilution that you will experience immediately after this offering, see the section titled “Dilution.”

***Future sales and issuances of our common stock or rights to purchase common stock, including pursuant to our equity incentive plans, could result in additional dilution of the percentage ownership of our stockholders and could cause the stock price of our common stock to decline.***

We may issue additional securities following the closing of this offering. In the future, we may sell common stock, convertible securities, or other equity securities in one or more transactions at prices and in a manner we determine from time to time. We also expect to issue common stock to employees, directors, and consultants pursuant to our equity incentive plans. If we sell common stock, convertible securities, or other equity securities in subsequent transactions, or common stock is issued pursuant to equity incentive plans, investors may be materially diluted. New investors in such subsequent transactions could gain rights, preferences, and privileges senior to those of holders of our common stock, including the holders of shares of our common stock sold in this offering.

***If securities or industry analysts do not publish research or reports about our business, or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.***

The trading market for our common stock will depend in part on the research and reports that equity research analysts publish about us and our business. We do not control these analysts or the content and opinions included in their reports. Securities analysts may elect not to provide research coverage of our company after the closing of this offering, and such lack of research coverage may adversely affect the market price of our common stock. The price of our common stock could also decline if one or more equity research analysts downgrade our common stock or issue other unfavorable commentary or cease publishing reports about us or our business. If one or more equity research analysts cease coverage of our company, we could lose visibility in the market, which in turn could cause our stock price to decline.

***Holders of our common stock could be adversely affected if we issue preferred stock.***

Pursuant to our amended and restated certificate of incorporation, our board of directors is authorized to issue up to shares of preferred stock without any action on the part of our stockholders. Our board of directors will also have the power, without stockholder approval, to set the terms of any series of preferred stock that may be issued, including voting rights, dividend rights, preferences over our common stock with respect to dividends or in the event of a dissolution, liquidation, or winding up, and other terms. In the event that we issue preferred stock in the future that has preferences over our common stock with respect to payment of dividends or upon our liquidation, dissolution, or winding up, or if we issue preferred stock that is convertible into our common stock at greater than a one-to-one ratio, the voting and other rights of the holders of our common stock or the market price of our common stock could be adversely affected.

***Delaware law and provisions in our amended and restated certificate of incorporation and amended and restated bylaws that will be in effect on the closing of this offering could make a merger, tender offer, or proxy contest difficult, thereby depressing the trading price of our common stock.***

Our amended and restated certificate of incorporation and amended and restated bylaws that will be in effect on the closing of this offering contain provisions that could depress the trading price of our common stock by acting to discourage, delay or prevent a change of control of our company or changes in our management that the stockholders of our company may deem advantageous. These provisions include the following:

- establish a classified board of directors so that not all members of our board of directors are elected at one time;
- authorize the issuance of "blank check" preferred stock that our board of directors could use to implement a stockholder rights plan;
- permit the board of directors to establish the number of directors and fill any vacancies and newly-created directorships;
- provide that directors may only be removed for cause;
- require super-majority voting to amend some provisions in our certificate of incorporation and bylaws;
- eliminate the ability of our stockholders to call special meetings of stockholders;
- prohibit stockholder action by written consent, which requires all stockholder actions to be taken at a meeting of our stockholders;
- provide that the board of directors is expressly authorized to make, alter, or repeal our bylaws;
- restrict the forum for certain litigation against us to Delaware; and
- establish advance notice requirements for nominations for election to our board of directors or for proposing matters that can be acted upon by stockholders at annual stockholder meetings.

Any provision of our amended and restated certificate of incorporation or amended and restated bylaws, each of which will be in effect on the closing of this offering or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock. For information regarding these and other provisions, see the section titled "Description of Capital Stock—Anti-Takeover Effects of Delaware Law and Our Certificate of Incorporation and Bylaws."

***Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will provide that the Court of Chancery of the State of Delaware and the federal district courts of the United States will be the exclusive forums for substantially all disputes between us and our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers, or employees.***

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will provide that the Court of Chancery of the State of Delaware is the exclusive forum for the following types of actions or proceedings under Delaware statutory or common law:

- any derivative action or proceeding brought on our behalf;
- any action asserting a breach of fiduciary duty;
- any action asserting a claim against us arising under the Delaware General Corporation Law, our amended and restated certificate of incorporation, or our amended and restated bylaws; and
- any action asserting a claim against us governed by the internal affairs doctrine.

This provision would not apply to suits brought to enforce a duty or liability created by the Exchange Act or any other claim for which the U.S. federal courts have exclusive jurisdiction.

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will further provide that the federal district courts of the United States will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, subject to and contingent upon a final adjudication in the State of Delaware of the enforceability of such exclusive forum provision.

These exclusive-forum provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers, or other employees, which may discourage lawsuits against us and our directors, officers, and other employees. If a court were to find either exclusive-forum provision in our amended and restated certificate of incorporation that will be in effect on the closing of this offering to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving the dispute in other jurisdictions, which could seriously harm our business. For example, the Court of Chancery of the State of Delaware recently determined that a provision stating that U.S. federal district courts are the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act is not enforceable. However, this decision may be reviewed and ultimately overturned by the Delaware Supreme Court.

## SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements about us and our industry that involve substantial risks and uncertainties. All statements other than statements of historical facts contained in this prospectus, including statements regarding our future results of operations, financial condition, business strategy and plans, and objectives of management for future operations, including our statements regarding the benefits and timing of the roll-out of new technology, are forward-looking statements. In some cases, you can identify forward-looking statements because they contain words such as “anticipate,” “believe,” “contemplate,” “continue,” “could,” “estimate,” “expect,” “intend,” “may,” “plan,” “potential,” “predict,” “project,” “should,” “target,” “will,” or “would,” or the negative of these words or other similar terms or expressions. Forward-looking statements in this prospectus include, but are not limited to, statements about:

- the evolution of cancer therapies and market adoption of our services;
- estimates of our total addressable market, future revenue, expenses, capital requirements, and our needs for additional financing;
- our ability to compete effectively with existing competitors and new market entrants;
- our ability to scale our infrastructure;
- our ability to manage and grow our business by expanding our sales to existing customers or introducing our products to new customers;
- expectations regarding our relationship with the VA MVP;
- our ability to establish and maintain intellectual property protection for our products or avoid claims of infringement;
- potential effects of extensive government regulation;
- our ability to hire and retain key personnel;
- our ability to obtain additional financing in this or future offerings;
- the volatility of the trading price of our common stock;
- our belief that FDA approval of personalized cancer therapies may drive benefits to our business;
- our expectation regarding the time during which we will be an emerging growth company under the JOBS Act; and
- our expectations regarding uses of proceeds from this offering.

You should not rely on forward-looking statements as predictions of future events. We have based the forward-looking statements contained in this prospectus primarily on our current expectations and projections about future events and trends that we believe may affect our business, financial condition, and operating results. The outcome of the events described in these forward-looking statements is subject to risks, uncertainties, and other factors described in the section titled “Risk Factors” and elsewhere in this prospectus. Moreover, we operate in a very competitive and rapidly changing environment. New risks and uncertainties emerge from time to time, and it is not possible for us to predict all risks and uncertainties that could have an impact on the forward-looking statements contained in this prospectus. The results, events, and circumstances reflected in the forward-looking statements may not be achieved or occur, and actual results, events, or circumstances could differ materially from those described in the forward-looking statements.

In addition, statements that “we believe” and similar statements reflect our beliefs and opinions on the relevant subject. These statements are based on information available to us as of the date of this prospectus. While we believe that information provides a reasonable basis for these statements, that information may be limited or incomplete. Our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all relevant information. These statements are inherently uncertain, and investors are cautioned not to unduly rely on these statements.

The forward-looking statements made in this prospectus relate only to events as of the date on which the statements are made. We undertake no obligation to update any forward-looking statements made in this prospectus to reflect events or circumstances after the date of this prospectus or to reflect new information or the occurrence of unanticipated events, except as required by law. We may not actually achieve the plans, intentions, or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures, or investments.

## MARKET, INDUSTRY, AND OTHER DATA

This prospectus contains estimates and information concerning our industry and our business, including estimated market size, projected growth rates of the markets in which we participate, and the prevalence of certain medical conditions. Unless otherwise expressly stated, we obtained this industry, business, market, medical, and other information from reports, research surveys, studies, and similar data prepared by third parties, industry, medical, and general publications, government data, and similar sources.

This information involves a number of assumptions and limitations, and you are cautioned not to give undue weight to these estimates. We have not independently verified any third-party information and cannot assure you of its accuracy or completeness. Although we are responsible for all of the disclosure contained in this prospectus and we believe the market position, market opportunity, market size, and medical information included in this prospectus is reliable, such information is inherently imprecise. In addition, projections, assumptions, and estimates of our future performance and the future performance of the industry in which we operate are necessarily subject to a high degree of uncertainty and risk due to a variety of factors, including those described in the section titled “Risk Factors.” These and other factors could cause results to differ materially from those expressed in these publications and reports.

Certain information in the text of this prospectus is contained in independent industry publications. The source of these independent industry publications is provided below:

- U.S. National Library of Medicine, *ClinicalTrials.gov*, January 2019.
- Public Health Faculty Publications, *SEER Cancer Statistics Review*, 1975-2015.
- American Cancer Society, *Cancer Facts and Figures 2019*, 2019.
- American Cancer Society, *Cancer Facts and Figures 2018*, 2018.
- BIO Industry Analysis, *Clinical Development Success Rates 2006-2015*, June 2016.
- European Journal of Cancer, *Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018*, August, 9 2018.
- World Health Organization, Latest global cancer data: *Cancer burden rises to 18.1 million new cases and 9.6 million cancer deaths in 2018*, September 12, 2018.
- World Health Organization, *World’s health ministers renew commitment to cancer prevention and control*, 2017.

We use multiple sources and assumptions to estimate the total addressable market for tissue and liquid biopsy testing in clinical trials for immunotherapy, targeted cancer therapy, and personalized cancer therapy. Our estimates of the number of patients and clinical trials are based on data from the U.S. National Library of Medicine, *ClinicalTrials.gov*, January 2019. We assume that patients in such clinical trials will receive one tumor biopsy test and three liquid biopsy tests over the course of a clinical trial, and the cost of tumor and liquid biopsy tests will be $5,000 and $7,000 on average, respectively.

We also use multiple sources and assumptions to estimate the total addressable market for tissue and liquid biopsy testing in personalized cancer therapy. Our estimate of the number of cancer patients that are projected to be diagnosed with late-stage disease in 2019 is based on a combination of data derived from Public Health Faculty Publications, *SEER Cancer Statistics Review*, 1975-2015 (only data relating to cancer cases diagnosed—and the respective stage of disease upon diagnosis—from 2008 to 2014 was used for our purposes), American Cancer Society, *Cancer Facts and Figures 2018*, 2018, American Cancer Society, *Cancer Facts and Figures 2019*, 2019, and a review article from the European Journal of Cancer, *Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018*, August 9, 2018. We assume that personalized cancer therapy patients will receive one tumor biopsy test and three liquid biopsy tests over the

course of a clinical trial or treatment, with the average cost per test being the same as is outlined above in the United States and $3,000 and $4,200 on average per test, respectively, in the European Union.

We also use multiple sources and assumptions to estimate the total addressable market for oncology clinical diagnostic testing for advanced cancer therapies. Our estimate of the number of cancer patients that are projected to be diagnosed in 2019 is based on a combination of data derived from the American Cancer Society, *Cancer Facts and Figures 2018*, 2018, American Cancer Society, *Cancer Facts and Figures 2019*, 2019, and a review article from the European Journal of Cancer, *Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018*, August 9, 2018. We assume that pre-diagnosis cancer patients will receive one oncology clinical diagnostic test to inform their treatment strategy or to identify clinical trial enrollment opportunities, and the cost per test will be $3,000 on average, which we believe is in line with current cancer panels.

Certain monetary amounts, percentages, and other figures included elsewhere in this prospectus have been subject to rounding adjustments. Accordingly, figures shown as totals in certain tables or charts may not be the arithmetic aggregation of the figures that precede them, and figures expressed as percentages in the text may not total 100% or, as applicable, when aggregated may not be the arithmetic aggregation of the percentages that precede them.

## USE OF PROCEEDS

We estimate that we will receive net proceeds from this offering of approximately $ million (or approximately $ million if the underwriters exercise their over-allotment option in full) based on the assumed initial public offering price of $ per share of common stock, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share of common stock would increase (decrease) the net proceeds to us from this offering by approximately $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions. Similarly, each increase (decrease) of 1.0 million shares in the number of shares of common stock offered by us would increase (decrease) the net proceeds to us from this offering by approximately $ million, assuming the assumed initial public offering price of $ per share of common stock remains the same, and after deducting estimated underwriting discounts and commissions.

The principal purposes of this offering are to increase our capitalization and financial flexibility, and create a public market for our common stock. We currently intend to use the net proceeds we receive from this offering for expanded research and development, infrastructure expansion, facilities expansion, headcount growth, sales and marketing expenditures, public company costs, capital expenditures, and working capital. We cannot specify with certainty all of the particular uses for the remaining net proceeds to us from this offering. We may also use a portion of the net proceeds for acquisitions or strategic investments in complementary businesses, services, products, or technologies. However, we do not have agreements or commitments to enter into any such acquisitions or investments at this time. We will have broad discretion over how to use the net proceeds to us from this offering. We intend to invest the net proceeds we receive from this offering in a variety of capital-preservation investments, including short- and intermediate-term, interest-bearing, investment-grade securities and government securities.

## DIVIDEND POLICY

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all available funds and future earnings, if any, to fund the development and expansion of our business, and we do not anticipate paying any cash dividends in the foreseeable future. Any future determination regarding the declaration and payment of dividends will be at the discretion of our board of directors and will depend on then-existing conditions, including our financial condition, operating results, contractual restrictions, capital requirements, business prospects, and other factors our board of directors may deem relevant. In addition, we may enter into agreements in the future that could contain restrictions on payments of cash dividends.

## CAPITALIZATION

The following table sets forth our cash and cash equivalents and our capitalization as of March 31, 2019 as follows:

- on an actual basis;
- on a pro forma basis, giving effect to (i) the automatic conversion of all outstanding shares of our redeemable convertible preferred stock as of March 31, 2019 into 73,898,975 shares of common stock immediately prior to the closing of this offering, (ii) the cash exercise of a warrant to purchase 754,573 shares of our common stock, outstanding as of March 31, 2019, in full, (iii) the automatic conversion of two warrants to purchase an aggregate of 338,341 shares of our redeemable convertible preferred stock, outstanding as of March 31, 2019, into warrants to purchase an equivalent number of shares of our common stock, and the related reclassification of redeemable convertible preferred stock warrant liability to stockholders' equity, (iv) stock-based compensation expense of $0.9 million associated with outstanding stock options subject to a performance condition for which the service-based vesting condition was satisfied as of March 31, 2019 and which we will recognize in connection with this offering, and (v) the filing and effectiveness of our amended and restated certificate of incorporation that will be in effect prior to the closing of this offering; and
- on a pro forma as adjusted basis, giving effect to (i) the pro forma adjustments set forth above and (ii) the issuance and sale of shares of common stock in this offering at the assumed initial public offering price of $ per share, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The pro forma and pro forma as adjusted information below is illustrative only, and our capitalization following the closing of this offering will be adjusted based on the actual initial public offering price and other terms of this offering determined at pricing. You should read this information in conjunction with our consolidated financial statements and the related notes included in this prospectus and the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section and other financial information contained in this prospectus.

| | As of March 31, 2019 | | |
|---|---|---|---|
| | Actual | Pro Forma | Pro Forma as Adjusted(1) |
| | (unaudited) | | |
| | (in thousands, except share and per share data) | | |
| Cash and cash equivalents | $ 33,237 | $ 33,245 | $ |
| Long-term debt | $ 18,941 | $ 18,941 | $ |
| Convertible preferred stock warrant liability | $ 817 | $ — | $ |
| Series A redeemable convertible preferred stock, $0.0001 par value—31,250,00 shares authorized, 31,249,991 shares issued and outstanding, actual; no shares authorized, issued, or outstanding, pro forma and pro forma as adjusted (unaudited) | 20,261 | — | |
| Series B redeemable convertible preferred stock, $0.0001 par value—19,288,150 shares authorized, 19,198,194 shares issued and outstanding, actual; no shares authorized, issued, or outstanding, pro forma and pro forma as adjusted (unaudited) | 22,047 | — | |
| Series C redeemable convertible preferred stock, $0.0001 par value—24,700,000 shares authorized, 23,450,790 shares issued and outstanding, actual; no shares authorized, issued, or outstanding, pro forma and pro forma as adjusted (unaudited) | 47,096 | — | |
| Total redeemable convertible preferred stock | $ 90,221 | $ — | $ |
| Stockholders' deficit: | | | |
| Preferred stock, $0.0001 par value—no shares authorized, issued, or outstanding, actual; shares authorized, no shares issued or outstanding, pro forma and pro forma as adjusted (unaudited) | — | — | |
| Common stock, $0.0001 par value—105,700,000 shares authorized, 12,665,266 shares issued and outstanding, actual; shares authorized, 87,318,814 shares issued and outstanding, pro forma (unaudited); shares authorized, shares issued and outstanding, pro forma as adjusted (unaudited) | 1 | 8 | |
| Additional paid-in capital | 10,666 | 101,778 | |
| Accumulated other comprehensive income | — | — | |
| Accumulated deficit | (121,190) | (122,080) | |
| Total stockholders' deficit | (110,523) | (20,294) | |
| Total capitalization | $ (1,361) | $ (1,353) | $ |

(1) Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share of common stock, would increase (decrease) the pro forma as adjusted amount of each of cash and cash equivalents, total stockholders' deficit and total capitalization by approximately $ , assuming that the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions. Similarly, each increase (decrease) of 1.0 million shares in the number of shares offered by us at the assumed initial public offering price per share would increase (decrease) the pro forma as adjusted amount of each of cash and cash equivalents, total stockholders' deficit and total capitalization by approximately $ , assuming the assumed initial public offering price of

$ per share of common stock remains the same, and after deducting estimated underwriting discounts and commissions. The pro forma and pro forma as adjusted information discussed above is illustrative only and will change based on the actual initial public offering price and other terms of this offering determined at pricing.

The outstanding share information in the table above is based on 87,318,814 shares of our common stock (including shares of our redeemable convertible preferred stock on an as-converted basis, and assuming the exercise of a warrant to purchase 754,573 shares of our common stock) outstanding as of March 31, 2019, and excludes:

- 17,527,536 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan and outstanding as of March 31, 2019, with a weighted-average exercise price of $0.9049 per share;
- 1,453,788 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan after March 31, 2019, with an exercise price of $3.30 per share;
- 338,341 shares of our redeemable convertible preferred stock issuable upon the exercise of warrants to purchase shares of our redeemable convertible preferred stock outstanding as of March 31, 2019, with a weighted-average exercise price of $1.7836 per share;
- 262,008 shares of our common stock issuable upon the exercise of a warrant to purchase shares of our common stock outstanding as of March 31, 2019, with an exercise price of $2.29 per share;
- shares of our common stock reserved for future issuance under our 2019 Plan, (including shares of our common stock reserved for issuance under our 2011 Plan that will be added to our 2019 Plan reserve upon its effectiveness) which includes an annual evergreen increase and will become effective in connection with this offering; and
- shares of our common stock reserved for future issuance under our ESPP, which includes an annual evergreen increase and will become effective in connection with this offering.

## DILUTION

If you invest in our common stock in this offering, your ownership interest will be immediately diluted to the extent of the difference between the initial public offering price per share and the pro forma as adjusted net tangible book value per share of our common stock after this offering.

As of March 31, 2019, we had a pro forma net tangible book value (deficit) of $(20.3) million, or $(0.23) per share. Pro forma net tangible book value per share represents the amount of our total tangible assets less our total liabilities, divided by the number of shares of our common stock outstanding as of March 31, 2019, after giving effect to the automatic conversion of all shares of our redeemable convertible preferred stock outstanding as of March 31, 2019 into 73,898,975 shares of our common stock and assuming the exercise of a warrant to purchase 754,573 shares of our common stock.

After giving further effect to the sale of shares of common stock that we are offering at the assumed initial public offering price of $ per share, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, our pro forma as adjusted net tangible book value as of March 31, 2019 would have been approximately $ million, or approximately $ per share. This amount represents an immediate increase in pro forma net tangible book value of $ per share to our existing stockholders and an immediate dilution in pro forma net tangible book value of approximately $ per share to new investors purchasing shares of common stock in this offering.

Dilution per share to new investors is determined by subtracting pro forma as adjusted net tangible book value per share after this offering from the initial public offering price per share paid by new investors. The following table illustrates this dilution (without giving effect to any exercise by the underwriters of their over-allotment option):

| | | |
|---|---|---|
| Assumed initial public offering price per share | | $ |
| Pro forma net tangible book value (deficit) per share as of March 31, 2019 | $(0.23) | |
| Increase in pro forma net tangible book value per share attributable to this offering | | |
| Pro forma as adjusted net tangible book value per share after this offering | | |
| Dilution per share to new investors in this offering | | $ |

Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share would increase (decrease) the pro forma as adjusted net tangible book value per share after this offering by approximately $ , and dilution in pro forma net tangible book value per share to new investors by approximately $ , assuming that the number of shares of common stock offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions. Each increase (decrease) of 1.0 million shares in the number of shares of common stock offered by us would increase (decrease) our pro forma as adjusted net tangible book value per share after this offering by approximately $ per share and decrease (increase) the dilution to investors participating in this offering by approximately $ per share, assuming that the assumed initial public offering price remains the same, and after deducting estimated underwriting discounts and commissions.

If the underwriters exercise their over-allotment option in full, the pro forma as adjusted net tangible book value after the offering would be $ per share, the increase in pro forma net tangible book value per share to existing stockholders would be $ per share and the dilution per share to new investors would be $ per share, in each case assuming an initial public offering price of $ per share.

The following table summarizes on the pro forma as adjusted basis described above, as of March 31, 2019, the differences between the number of shares of common stock purchased from us by our existing

stockholders and common stock by new investors purchasing shares in this offering, the total consideration paid to us in cash and the average price per share paid by existing stockholders for shares of common stock issued prior to this offering and the price to be paid by new investors for shares of common stock in this offering. The calculation below is based on the assumed initial public offering price of $ per share, before deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

| | Shares Purchased | | Total Consideration | | Average Price Per Share |
|---|---|---|---|---|---|
| | Number | Percent | Amount | Percent | |
| Existing stockholders | | % | $ | % | $ |
| New investors | | | | | $ |
| Total | | 100% | $ | 100% | |

The outstanding share information in the table above is based on 87,318,814 shares of our common stock (including shares of our redeemable convertible preferred stock on an as-converted basis, and assuming the exercise of a warrant to purchase 754,573 shares of our common stock) outstanding as of March 31, 2019, and excludes:

- 17,527,536 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan and outstanding as of March 31, 2019, with a weighted-average exercise price of $0.9049 per share;
- 1,453,788 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan after March 31, 2019, with an exercise price of $3.30 per share;
- 338,341 shares of our redeemable convertible preferred stock issuable upon the exercise of warrants to purchase shares of our redeemable convertible preferred stock outstanding as of March 31, 2019, with a weighted-average exercise price of $1.7836 per share;
- 262,008 shares of our common stock issuable upon the exercise of a warrant to purchase shares of our common stock outstanding as of March 31, 2019, with an exercise price of $2.29 per share;
- shares of our common stock reserved for future issuance under our 2019 Plan, (including shares of our common stock reserved for issuance under our 2011 Plan that will be added to our 2019 Plan reserve upon its effectiveness) which includes an annual evergreen increase and will become effective in connection with this offering; and
- shares of our common stock reserved for future issuance under our ESPP, which includes an annual evergreen increase and will become effective in connection with this offering.

To the extent any outstanding options are exercised, there will be further dilution to new investors. If all of such outstanding options had been exercised as of March 31, 2019, the pro forma as adjusted net tangible book value per share after this offering would be $ , and total dilution per share to new investors would be $ .

If the underwriters exercise their over-allotment option in full, our existing stockholders would own % and the investors purchasing shares of our common stock in this offering would own % of the total number of shares of our common stock outstanding immediately after closing of this offering.

## SELECTED CONSOLIDATED FINANCIAL DATA

We derived the selected consolidated statements of operations data and consolidated balance sheets data for the fiscal years ended December 31, 2017 and 2018 from our audited consolidated financial statements included elsewhere in this prospectus. The summary consolidated statements of operations and comprehensive loss data for the three months ended March 31, 2018 and 2019 and the summary consolidated balance sheet data as of March 31, 2019 are derived from our unaudited interim condensed consolidated financial statements included elsewhere in this prospectus. We have prepared the unaudited interim condensed consolidated financial statements on the same basis as the audited financial statements and have included, in our opinion, all adjustments, consisting only of normal recurring adjustments that we consider necessary for a fair statement of the financial information set forth in those statements. The summary financial data included in this section are not intended to replace the financial statements and related notes included elsewhere in this prospectus. You should read the selected consolidated financial data set forth below in conjunction with our consolidated financial statements, the notes to our consolidated financial statements and "Management's Discussion and Analysis of Financial Condition and Results of Operations" contained elsewhere in this prospectus. Our historical results are not necessarily indicative of our future performance, and our interim results for the three months ended March 31, 2019 are not necessarily indicative of results to be expected for the full year ending December 31, 2019, or any other period.

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| | (in thousands, except share and per share data) | | | |
| Revenues | $ 9,393 | $ 37,774 | $ 4,164 | $ 14,075 |
| Costs and expenses | | | | |
| Costs of revenues[1] | 11,736 | 25,969 | 4,065 | 10,091 |
| Research and development[1] | 9,919 | 14,304 | 2,949 | 5,245 |
| Selling, general, and administrative[1] | 9,901 | 11,271 | 2,313 | 4,170 |
| Total costs and expenses | 31,556 | 51,544 | 9,327 | 19,506 |
| Loss from operations | (22,163) | (13,770) | (5,163) | (5,431) |
| Interest income | 100 | 293 | 61 | 84 |
| Interest expense | (1,303) | (1,894) | (622) | (184) |
| Loss on debt extinguishment | — | (4,658) | — | — |
| Other (expense) income, net | (227) | 150 | 351 | (152) |
| Loss before income taxes | (23,593) | (19,879) | (5,373) | (5,683) |
| Provision for income taxes | (5) | (7) | (2) | (2) |
| Net loss | $ (23,598) | $ (19,886) | $ (5,375) | $ (5,685) |
| Net loss per share, basic and diluted[2] | $ (1.95) | $ (1.62) | $ (0.44) | $ (0.46) |
| Weighted-average shares outstanding, basic and diluted[2] | 12,126,544 | 12,252,629 | 12,206,325 | 12,365,371 |
| Pro forma net loss per share, basic and diluted (unaudited)[2] | | $ (0.24) | | $ (0.06) |
| Pro forma weighted-average shares outstanding, basic and diluted (unaudited)[2] | | 81,934,173 | | 87,018,919 |

(1) Includes stock-based compensation as follows:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| | (in thousands) | | | |
| Costs of revenues | $ 74 | $ 177 | $ 24 | $ 85 |
| Research and development | 225 | 429 | 64 | 164 |
| Selling, general, and administrative | 454 | 711 | 81 | 360 |
| Total stock-based compensation expense | $ 753 | $ 1,317 | $ 169 | $ 609 |

(2) See the consolidated statements of operations and Note 15 to our consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to compute the historical and pro forma net loss per share and the number of shares used in the computation of the per share amounts.

| | As of December 31, | | As of March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| | (in thousands) | | | |
| **Consolidated Balance Sheet Data:** | | | | |
| Cash and cash equivalents | $ 22,617 | $ 19,744 | $ 21,844 | $ 33,237 |
| Working capital(1) | (22,262) | (28,291) | (29,162) | (15,348) |
| Total assets | 33,563 | 41,670 | 35,302 | 57,647 |
| Redeemable convertible preferred stock warrant liability | 292 | 683 | 292 | 817 |
| Additional paid-in capital | 3,025 | 9,131 | 3,220 | 10,666 |
| Accumulated deficit | (95,619) | (115,505) | (100,995) | (121,190) |
| Total stockholders' deficit | (92,603) | (106,388) | (97,780) | (110,523) |

(1) Working capital is defined as total current assets less total current liabilities. See our consolidated financial statements and the related notes included elsewhere in this prospectus for further details regarding our current assets and current liabilities.

## MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

*The following Management's Discussion and Analysis of Financial Condition and Results of Operations should be read together with our consolidated financial statements and accompanying notes included elsewhere within this prospectus. This discussion includes both historical information and forward-looking information that involves risk, uncertainties, and assumptions. Our actual results may differ materially from management's expectations as a result of various factors, including, but not limited to, those discussed in the section titled "Risk Factors."*

### Overview

We are a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. We designed our NeXT Platform to adapt to the complex and evolving understanding of cancer, providing our biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes. We are also developing a complementary liquid biopsy assay that analyzes all human genes versus the more narrowly focused liquid biopsy assays that are currently available. By combining technological innovation, operational scale, and regulatory differentiation, our NeXT Platform is designed to help our customers obtain new insights into the mechanisms of response and resistance to therapy as well as new potential therapeutic targets. Our platform enhances the ability of biopharmaceutical companies to unlock the potential of conducting translational research in the clinic rather than with pre-clinical animal models or cancer cell lines. We are also planning to release a diagnostic based on our NeXT Platform that we envision being used initially by biopharmaceutical customers and clinical collaborators. Since inception, we have provided our services to more than 45 biopharmaceutical customers, including several of the largest pharmaceutical companies in the world.

We have focused on human genome sequencing since our inception in 2011. In 2013, we introduced our patented ACE Exome technology, providing enhanced and more complete coverage over all of the approximately 20,000 human genes. The superior performance of ACE Exome technology compared to other exomes was described in Genome Medicine and Nature Review publications.

In November 2016, we launched our ACE ImmunoID product, the first generation of our immuno-oncology genomics platform that combined our ACE exome and transcriptome technology with analytics to provide a more comprehensive tumor profiling solution for biopharma customers conducting cancer clinical trials and translational research. With ACE ImmunoID for Personalized Cancer Therapy, we further enhanced the platform for personalized cancer therapy customers with additional neoantigen analytics, improved turnaround times, and access to a Device Master File that we filed with the U.S. Food and Drug Administration. With the ACE ImmunoID for Biomarkers, we extended the platform further with ImmunogenomicsID, a broad immuno-genomics biomarker analysis engine. In November 2018, we announced ImmunoID NeXT, our universal cancer immunogenomics platform, which is the first technology to enable comprehensive analysis of both a tumor and its immune microenvironment from a single sample and provides utility across immuno-oncology, targeted, and personalized therapies. We expect to do a full commercial launch of ImmunoID NeXT in 2019.

In parallel with the work described above, we also developed multiple clinical diagnostic tests. Clinical diagnostic testing has remained a small portion of our business, primarily because we have elected not to expend the time and resources necessary to secure third-party reimbursement, choosing instead to pursue more immediate revenue opportunities. Nevertheless, it has helped us to develop important capabilities that do not depend on third-party reimbursement. In June 2015, we launched our ACE CancerPlus Test based on a 1,400-gene panel. We plan to build on this experience in 2019 by introducing a clinical diagnostic test based on our ImmunoID NeXT Platform, which will include all of the approximately 20,000 human genes and will be targeted initially to biopharmaceutical customers.

In parallel with the development of our platform technology, we have also provided DNA sequencing and analysis services under contract with the U.S. Department of Veterans Affairs (the "VA") Million Veteran Program (the "VA MVP"), beginning in 2012. This relationship with the VA MVP has enabled us to innovate, scale our operational infrastructure, and achieve greater efficiencies in our lab.

Our customers include large-cap pharmaceutical companies, emerging biotechnology companies, universities, non-profit medical research institutes, and government entities. We generated revenues of $9.4 million and $37.8 million for the years ended December 31, 2017 and 2018, respectively, and $4.2 million and $14.1 million for the three months ended March 31, 2018 and 2019, respectively. In 2018, 49% of our revenues were generated from VA MVP. Non-VA MVP revenues increased by 114% in 2018 compared to 2017. For the three months ended March 31, 2019, 59% of our revenues were generated from VA MVP. Non-VA MVP revenues increased by 162% in the three months ended March 31, 2019 compared to the three months ended March 31, 2018. Our top five customers represented 45% and 82% of revenues in 2017 and 2018, respectively, and 76% and 90% of revenues for the three months ended March 31, 2018 and 2019, respectively.

We also incurred net losses of $23.6 million and $19.9 million for the years ended December 31, 2017 and 2018, respectively, and net losses of $5.4 million and $5.7 million for the three months ended March 31, 2018 and 2019, respectively.

As of March 31, 2019, we had $33.2 million in cash and cash equivalents. From inception through March 31, 2019, we have funded our operations primarily through cash from operations, redeemable convertible preferred stock issuances, and debt issuances. After giving effect to the anticipated net proceeds from this offering, we expect that our existing cash and cash equivalents, anticipated cash flow from operations, and our $20.0 million financing facility will provide sufficient funds to sustain operations through at least the next 12 months. We have based these estimates on assumptions that may prove to be wrong, and we could exhaust our available capital resources sooner than we expect. See the section titled "Liquidity and Capital Resources; Plan of Operations."

**Factors Affecting Our Performance**

We believe there are several important factors that have impacted and that we expect will impact our operating performance and results of operations, including:

- **The continued development of the market for genomic-based tests.** Our performance depends on the willingness of biopharmaceutical customers to continue to seek more comprehensive molecular information to develop more efficacious cancer therapies.
- **Increasing adoption of our products and solutions by existing customers.** Our performance depends on our ability to retain and broaden adoption with existing customers. Because our technology is novel, some customers begin using our platform by initiating pilot studies involving a small number of samples to gain experience with our service. As a result, historically a significant portion of our revenues has come from existing customers. We believe that our ability to convert initial pilots into larger orders from existing customers has the potential to drive substantial long-term revenue. We expect there may be some variation in the number of samples they choose to test each quarter.
- **Adoption of our products and solutions by new customers.** While new customers initially may not account for significant revenues, we believe that they have the potential to grow substantially over the long term as they gain confidence in our service. Our ability to engage new customers is critical to our long-term success. Our publications, posters and presentations at scientific conferences lead to engagement at the scientific level with potential customers who often make the initial decision to gain experience with our platform. Accessing these new customers through scientific engagement and marketing to gain initial buy-in is critical to our success and gives us the opportunity to demonstrate the utility of our platform.

- **Our revenues and costs are affected by the volume of samples we receive from customers from period to period.** The timing and size of sample shipments received after orders have been placed is variable. Since sample shipments can be large, and are often received from a third party, the timing of arrival can be difficult to predict over the short term. Although our long-term performance is not affected, we do see quarter-to-quarter volatility due to these factors. Samples arriving later than expected may not be processed in the quarter proposed and result in revenue the following quarter. Since many of our customers request defined turnaround times, we employ project managers to coordinate and manage the complex process from sample receipt to sequencing and delivery of results. Our business can be seasonal, as we historically have received fewer samples during July and August.
- **Investment in product innovation to support commercial growth.** Investment in research and development, including the development of new products is critical to establish and maintain our leading position. In particular, we have invested in NeoantigenID, a neoantigen characterization report, ImmunogenomicsID, a broad biomarker report, and ImmunoID NeXT, our universal cancer immunogenomics platform. We are also collaborating with investigators from academic cancer centers, such as Inova Health System, Stanford Medicine, and the Parker Institute for Cancer Immunotherapy, to support the utility of our platform. We believe this work is critical to gaining customer adoption and expect our investments in these efforts to increase. We believe utility for our product may result in additional expenditures to develop and market new products, including a diagnostic or database.
- **Leverage our operational infrastructure.** We have invested significantly, and will continue to invest, in our sample processing capabilities and commercial infrastructure. With our current operating model and infrastructure, we can increase our production and commercialize new generations of our platform, but as our volumes continue to increase we will ultimately need to invest in additional production capabilities. We expect to grow our revenues and spread our costs over a larger volume of services. In addition, we may invest significant amounts in infrastructure to support new products resulting from our research and development activities.

## Components of Operating Results

### *Revenues*

We derive our revenues primarily from sequencing and data analysis services to support the development of next-generation cancer therapies. We support our customers by providing high-accuracy, validated genomic sequencing and advanced analytics. Many of these analytics are related to state-of-the-art biomarkers, including those relevant to immuno-oncology therapeutics such as checkpoint inhibitors.

Our revenues are primarily generated through contracts with companies in the pharmaceutical industry, healthcare organizations, and government entities. Our ability to increase our revenues will depend on our ability to further penetrate this market. To do this, we are developing a growing set of additional state-of-the-art products, advancing our operational infrastructure, building our regulatory credentials and expanding our targeted marketing efforts. Unlike diagnostic or therapeutic companies, we have not to date sought reimbursement through traditional healthcare payors. We sell through a small direct sales force.

We have one reportable segment from the sale of sequencing and data analysis services. Substantially all of our revenues to date have been derived from sales in the United States.

*Revenues by customer type*

Revenues by customer type were as follows:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | (in thousands) | | | |
| VA MVP | $ 421 | $18,601 | $1,977 | $ 8,343 |
| All other customers | 8,972 | 19,173 | 2,187 | 5,732 |
| Total | $9,393 | $37,774 | $4,164 | $14,075 |

*Revenues concentration*

Our top five customers represented 45% and 82% of revenues in 2017 and 2018, respectively. Our top five customers represented 76% and 90% of revenues for the three months ended March 31, 2018 and 2019, respectively. Customers that accounted for equal to or greater than 10% of revenues in 2017 or 2018 and for the three months ended March 31, 2018 and 2019 were as follows:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| VA MVP | * | 49% | 47% | 59% |
| Merck & Co., Inc. | 11% | 12% | 12% | * |
| Pfizer Inc. | * | 10% | * | 17% |
| Customer A | 13% | * | * | * |
| Customer B | 10% | * | * | * |

* Less than 10% of revenues.

*Accounts receivable concentration*

As of December 31, 2017 and 2018 and as of March 31, 2018 and 2019, customers that accounted for greater than 10% of accounts receivable were as follows:

| | As of December 31, | | As of March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| Pfizer Inc. | 13% | 33% | 11% | 47% |
| Customer A | * | 17% | * | * |
| Merck & Co., Inc. | 38% | 10% | 22% | * |
| Customer B | * | 10% | * | * |
| Customer C | 13% | * | * | 20% |
| VA MVP | * | * | 38% | * |

* Less than 10% of accounts receivable.

***Costs and Expenses***

*Costs of revenues*

Costs of revenues consist of production material costs, personnel costs (salaries, bonuses, benefits, and stock-based compensation), costs of consumables, laboratory supplies, depreciation and service maintenance on capitalized equipment, and information technology (“IT”) and facility costs. We expect the costs of revenues to increase as our revenues grow, but the cost per unit of data delivered to decrease over time due to economies of scale we may gain as volume increases, automation initiatives, and other cost reductions.

*Research and development expenses*

Research and development expenses consist of costs incurred for the development of our products. These expenses consist primarily of payroll and personnel costs (salaries, bonuses, benefits, and stock-based compensation), costs of consumables, laboratory supplies, depreciation and service maintenance on capitalized equipment, and IT and facility costs. These expenses also include costs associated with our collaborations, which we expect to increase over time.

We expense our research and development expenses in the period in which they are incurred. We expect to increase our research and development expenses as we continue to develop new products.

*Selling, general, and administrative expenses*

Selling expenses consist of personnel costs, customer support expenses, direct marketing expenses, educational and promotional expenses, and market research. Our general and administrative expenses include costs for our executive, accounting, finance, legal, and human resources functions. These expenses consist of personnel costs, audit and legal expenses, consulting costs, and IT and facility costs. We expense all selling, general, and administrative expenses as incurred.

We expect our selling expenses will continue to increase in absolute dollars, primarily driven by our efforts to expand our commercial capability and to expand our brand awareness and customer base through targeted marketing initiatives with an increased presence both within and outside the United States. We also expect general and administrative expenses will increase as we scale our operations. In addition, we expect to incur additional accounting, legal, director and officer insurance, and other expenses as a public company that we did not incur as a private company.

***Interest Income***

Interest income consists primarily of interest earned on our cash and cash equivalents.

***Interest Expense***

Interest expense primarily consists of cash and non-cash interest costs related to our term loan, convertible promissory notes, and revolving loan. We record costs incurred in connection with the issuance of debt as a direct deduction from the debt liability. We amortize these costs over the term of our debt agreements as interest expense in our consolidated statements of operations.

***Loss on Debt Extinguishment***

We incurred a loss on debt extinguishment in 2018 resulting from changes in the maturity dates of the convertible notes issued in 2017. See Note 6 to our consolidated financial statements included elsewhere in this prospectus.

***Other Income (Expense), Net***

Other income (expense), net consists of changes in the fair value of the compound derivative instrument, changes in fair value of convertible preferred stock warrant liability, and foreign currency exchange gains and losses. We expect our foreign currency gains and losses to continue to fluctuate in the future due to changes in foreign currency exchange rates.

## Results of Operations

### *Comparison of the Years Ended December 31, 2017 and 2018 and the Three Months Ended March 31, 2018 and 2019*

The following table summarizes our results of operations for the periods indicated:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| | (in thousands, except share and per share data) | | | |
| Revenues | $ 9,393 | $ 37,774 | $ 4,164 | $ 14,075 |
| Costs and expenses | | | | |
| Costs of revenues | 11,736 | 25,969 | 4,065 | 10,091 |
| Research and development | 9,919 | 14,304 | 2,949 | 5,245 |
| Selling, general, and administrative | 9,901 | 11,271 | 2,313 | 4,170 |
| Total costs and expenses | 31,556 | 51,544 | 9,327 | 19,506 |
| Loss from operations | (22,163) | (13,770) | (5,163) | (5,431) |
| Interest income | 100 | 293 | 61 | 84 |
| Interest expense | (1,303) | (1,894) | (622) | (184) |
| Loss on debt extinguishment | — | (4,658) | — | — |
| Other (expense) income, net | (227) | 150 | 351 | (152) |
| Loss before income taxes | (23,593) | (19,879) | (5,373) | (5,683) |
| Provision for income taxes | (5) | (7) | (2) | (2) |
| Net loss | $ (23,598) | $ (19,886) | $ (5,375) | $ (5,685) |
| Net loss per share, basic and diluted | $ (1.95) | $ (1.62) | $ (0.44) | $ (0.46) |
| Weighted-average shares outstanding, basic and diluted | 12,126,544 | 12,252,629 | 12,206,325 | 12,365,371 |
| Pro forma net loss per share, basic and diluted (unaudited) | | $ (0.24) | | $ (0.06) |
| Pro forma weighted-average shares outstanding, basic and diluted (unaudited) | | 81,934,173 | | 87,018,919 |

#### *Revenues*

*Comparison of the Years Ended December 31, 2017 and 2018*

Revenues were $9.4 million for the year ended December 31, 2017 compared to $37.8 million for the year ended December 31, 2018, an increase of $28.4 million, or 302%. This increase in revenues was primarily due to an increase in the volume of samples we tested in relation to the sequencing and data analysis services we provided to our customers. The increase in samples tested was primarily due to additional volume from both existing and new customers, including an increase in the number of projects per customer. For the year ended December 31, 2018, revenues from existing customers and existing projects accounted for 58% of total revenues, and the remaining 42% of revenues was generated from new projects from our existing customers and new customers acquired in 2018.

*Comparison of the Three Months Ended March 31, 2018 and 2019*

Revenues were $4.2 million for the three months ended March 31, 2018 compared to $14.1 million for the three months ended March 31, 2019, an increase of $9.9 million, or 236%. This increase in revenues was primarily due to an increase in the volume of samples we tested in relation to the sequencing and data analysis services we provided to our customers. The increase in samples tested was primarily due to additional volume from both existing and new customers, including an increase in the number of projects per customer. For the three months ended March 31, 2019, revenues from existing customers and existing projects accounted for 10% of total revenues, and the remaining 90% of revenues was generated from new projects from our existing customers and new customers acquired in 2018 and 2019.

***Costs of Revenues***

*Comparison of the Years Ended December 31, 2017 and 2018*

Costs of revenues were $11.7 million for the year ended December 31, 2017 compared to $26.0 million for the year ended December 31, 2018, an increase of $14.3 million, or 121%. This increase was primarily due to the increase in revenues discussed above. The cost components related to the increase in costs of revenues were an increase in production materials of $9.6 million, an increase in depreciation and service maintenance on capitalized equipment of $2.0 million, an increase in expensed equipment, consumables, and laboratory supplies of $1.2 million, an increase related to personnel costs including salaries, bonuses, benefits, and stock-based compensation expenses of $1.0 million, and an increase in IT and facility costs of $0.5 million.

*Comparison of the Three Months Ended March 31, 2018 and 2019*

Costs of revenues were $4.1 million for the three months ended March 31, 2018 compared to $10.1 million for the three months ended March 31, 2019, an increase of $6.0 million, or 146%. This increase was primarily due to the increase in revenues discussed above. The cost components related to the increase in costs of revenues were an increase in production materials of $3.7 million, an increase related to personnel costs including salaries, bonuses, benefits, and stock-based compensation expenses of $1.1 million, an increase in depreciation and service maintenance on capitalized equipment of $0.6 million, an increase in the consumption cost of expensed equipment, consumables, and laboratory supplies of $0.4 million, and an increase in IT and facility costs of $0.2 million.

***Research and Development Expenses***

*Comparison of the Years Ended December 31, 2017 and 2018*

Research and development expenses were $9.9 million for the year ended December 31, 2017 compared to $14.3 million for the year ended December 31, 2018, an increase of $4.4 million, or 44%. This was primarily due to increased development activities for new product offerings, lab and automation development costs, and IT and facility costs. Research and development expenses increased due to an increase of $2.3 million in personnel-related expenses, including salaries, bonuses, benefits, and stock-based compensation expenses, a $1.1 million increase in IT and facility costs, a $0.8 million increase in laboratory and automation supplies consumed and equipment, and a $0.2 million increase in other costs.

*Comparison of the Three Months Ended March 31, 2018 and 2019*

Research and development expenses were $2.9 million for the three months ended March 31, 2018 compared to $5.2 million for the three months ended March 31, 2019, an increase of $2.3 million, or 79%. This was primarily due to increased development activities for new product offerings, lab and automation

development costs, and IT and facility costs. Research and development expenses increased due to an increase of $0.9 million in personnel-related expenses, including salaries, bonuses, benefits, and stock-based compensation expenses, a $0.9 million increase in laboratory and automation supplies consumed and equipment, a $0.3 million increase in depreciation and service maintenance on capitalized equipment and a $0.2 million increase in IT and facility costs.

***Selling, General, and Administrative Expenses***

*Comparison of the Years Ended December 31, 2017 and 2018*

Selling, general, and administrative expenses were $9.9 million for the year ended December 31, 2017 compared to $11.3 million for the year ended December 31, 2018, an increase of $1.4 million, or 14%. Selling, general, and administrative expenses increased due to a $1.0 million increase in personnel-related expenses including salaries, bonuses, benefits, and stock-based compensation expenses, a $0.2 million increase in professional services, and a $0.2 million increase in other costs.

*Comparison of the Three Months Ended March 31, 2018 and 2019*

Selling, general, and administrative expenses were $2.3 million for the three months ended March 31, 2018 compared to $4.2 million for the three months ended March 31, 2019, an increase of $1.9 million, or 83%. Selling, general, and administrative expenses increased due to a $1.3 million increase in personnel-related expenses including salaries, bonuses, benefits, and stock-based compensation expenses, a $0.5 million increase in professional services, and a $0.1 million increase in other costs.

***Other Income (Expenses), Net***

| | Year Ended December 31, | | Change | Three Months Ended March 31, | | Change |
|---|---|---|---|---|---|---|
| | 2017 | 2018 | $ | 2018 | 2019 | $ |
| | (in thousands) | | | (unaudited) | | |
| Changes in fair values of warrants for Series B and Series C convertible preferred stock | $ (64) | $ (391) | $ (327) | $ — | $ 134 | $ 134 |
| Changes in fair value of the compound derivative instrument | (162) | 574 | 736 | 353 | — | (353) |
| Other | (1) | (33) | (32) | (2) | 18 | 20 |
| Total other (expenses) income, net | $(227) | $ 150 | $ 377 | $ 351 | $ 152 | $ (199) |

*Comparison of the Years Ended December 31, 2017 and 2018*

We had other expense, net of $0.2 million for the year ended December 31, 2017, compared to other income, net of $0.2 million for the year ended December 31, 2018, an increase of approximately $0.4 million, or 166.1%. This increase was driven by a decrease in the fair value of a compound derivative instrument of approximately $0.7 million in 2018, partially offset by an increase in the fair values of warrants for Series B and Series C redeemable convertible preferred stock of approximately $0.3 million.

*Comparison of the Three Months Ended March 31, 2018 and 2019*

We had other income, net of $0.4 million for the three months ended March 31, 2018, compared to other income, net of $0.2 million for the three months ended March 31, 2019. The decrease was primarily driven by a $0.4 million decrease in fair value of the compound derivative instrument partially offset by a $0.1 million increase in the fair values of warrants for Series B and Series C redeemable convertible preferred stock.

**Liquidity and Capital Resources; Plan of Operations**

***Sources of Liquidity***

From our inception through March 31, 2019, we have funded our operations primarily from $89.6 million from issuance of redeemable convertible preferred stock, as well as cash from operations and debt financing. In the year ended December 31, 2017, we received $12.2 million in gross cash proceeds from the issuance of convertible notes, and $5.0 million in gross cash proceeds from a revolving loan. On March 22, 2019, we received $20.0 million in gross cash proceeds from a growth capital loan. As of March 31, 2019, we had cash and cash equivalents in the amount of $33.2 million.

***Future Funding Requirements***

We have incurred net losses since our inception. For the years ended December 31, 2017 and 2018, we had net losses as of $23.6 million and $19.9 million, respectively, and for the three months ended March 31, 2018 and 2019, we had net losses of $5.4 million and $5.7 million, respectively, and we expect to incur additional losses in future periods. As of March 31, 2019, we had an accumulated deficit of $121.2 million. We believe that our existing cash, cash investments and anticipated cash flow from operations will provide sufficient funds to sustain operations through at least the next 12 months. See Note 16 to our audited consolidated financial statements included elsewhere in this prospectus.

We have based these future funding requirements on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we expect. If our available cash balances, net proceeds from this offering and anticipated cash flow from operations are insufficient to satisfy our liquidity requirements including because of lower demand for our services or other risks described in this prospectus, we may seek to sell additional common or preferred equity or convertible debt securities, enter into an additional credit facility or another form of third-party funding or seek other debt financing. The sale of equity and convertible debt securities may result in dilution to our stockholders and, in the case of preferred equity securities or convertible debt, those securities could provide for rights, preferences or privileges senior to those of our common stock. The terms of debt securities issued or borrowings pursuant to a credit agreement could impose significant restrictions on our operations. Additional capital may not be available on reasonable terms, or at all.

The expected use of the net proceeds from this offering represents our intentions based upon our current plans and business conditions. However, we have based these estimates on assumptions that may prove to be wrong, and we could use our capital resources sooner than we expect.

***Term Loan***

In September 2014, we entered into a loan and security agreement with a bank (the “Term Loan”), to borrow up to $3.0 million under an equipment loan secured by the equipment financed. On October 3, 2014, we borrowed $2.4 million under this loan agreement. The Term Loan required 12 interest-only payments, followed by 36 equal monthly installments of principal, plus interest, which began on October 3, 2015.

In connection with the Term Loan, we issued a 10-year warrant to purchase 89,956 shares of our Series B redeemable convertible preferred stock at an exercise price of $1.15 per share.

On September 30, 2018, the Term Loan was repaid in full.

***Revolving Loan***

In June 2017, we entered into a $10.0 million revolving loan and security agreement (the “Revolving Loan”) with TriplePoint Capital LLC (“TriplePoint”). Borrowings under the Revolving Loan had an interest rate of

prime, plus 6.75%. The Revolving Loan also had a 5.5% end of term loan payment on the highest outstanding principal amount. The Revolving Loan required monthly interest-only payments until the maturity date. The Revolving Loan's original maturity date was December 31, 2018 and in December 2018 the maturity date was further extended until March 22, 2019. See Note 16 to our consolidated financial statements included elsewhere in this prospectus. The maturity date of the extension of the Revolving Loan was not deemed substantial therefore we accounted for the transaction as a debt modification.

As of both December 31, 2017 and 2018, our outstanding principal under the Revolving Loan was $5.0 million and $5.0 million was available to borrow.

In connection with the Revolving Loan, we issued a warrant to purchase up to 248,385 shares of our Series C redeemable convertible preferred stock at an exercise price of $2.013 per share. See Note 5 to our consolidated financial statements included elsewhere in this prospectus.

The Revolving Loan had an effective interest rate of 19.22% per year. The Revolving Loan interest expenses for the years ended December 31, 2017 and 2018 were $0.4 million and $0.9 million, respectively.

In March 2019, we entered into an amendment to the Revolving Loan with TriplePoint that provided for a $20.0 million growth capital loan facility (the "Growth Capital Loan"). In March 2019, we used $5.3 million of the Growth Capital Loan to repay all amounts owing in respect of the Revolving Loan.

***Growth Capital Loan***

On March 22, 2019, we entered into the Growth Capital Loan with TriplePoint to provide for a $20.0 million growth capital loan facility and as of March 31, 2019, had drawn down the full $20.0 million available under the facility. We used $5.3 million of the Growth Capital Loan to repay, in its entirety, all amounts outstanding under the Revolving Loan. Borrowings under the Growth Capital Loan bear interest at a floating rate of prime rate plus 5.00% for borrowings up to $15.0 million and the prime rate plus 6.50% for borrowing greater than $15.0 million; provided, however, that in an event of default, as defined in the loan and security agreement, the interest rate applicable to borrowings under such agreement will be increased by 5.0%. Under the agreement, we are required to make monthly interest-only payments through April 1, 2020 and are required to make 36 equal monthly payments of principal, plus accrued interest, from April 1, 2020 through March 1, 2023, when all unpaid principal and interest becomes due and payable. We may voluntarily prepay all, but not part, of the outstanding principal at any time prior to the maturity date, subject to a prepayment fee of 1% of the outstanding balance, if prepaid in months one through 12 of the loan term. If prepaid after month 12 of the loan term of any growth capital loan, no additional prepayment premium shall be due. In addition to the final payment, we will pay an amount equal to 2.75% of each principal amount drawn under this growth capital loan facility. In connection with the Growth Capital Loan, we issued a warrant to purchase 262,008 shares of common stock to the lender at an exercise price of $2.29 per share. We recorded the issuance-date fair value of the warrant of $0.6 million and fees paid to the lender of $0.3 million as a debt discount which is amortized over the term of the Growth Capital Loan using the effective interest rate method.

Upon issuance, the Growth Capital Loan had an effective interest rate of 15.23% per year.

***Convertible Notes***

On June 29, 2017, we entered into a convertible promissory note agreements (the "Convertible Notes") with certain existing redeemable convertible preferred stockholders and third parties (the "Investors") for the issuance of convertible promissory notes with a face value of $12.2 million. Under the terms of the Convertible Notes agreement, the Convertible Notes bear interest of 8% per annum, with a maturity date of June 28, 2018. In the event that we issued and sold shares of its equity securities (the "Equity Securities") to Investors on or before the maturity date in an equity financing with total proceeds to us of not less than $10 million (including the conversion of the Convertible Notes or other convertible securities issued for capital raising purposes) (a

"Qualified Financing"), then the outstanding principal amount of the Convertible Notes and any unpaid accrued interest would have automatically converted in whole without any further action by the holder into such Equity Securities sold in the Qualified Financing at a conversion price equal to the price paid per share for Equity Securities by the Investors in the Qualified Financing multiplied by 0.8. If we consummated a change of control while the Convertible Notes remained outstanding, we would have repaid the holders in cash an amount equal to 150% of the outstanding principal amount of the Convertible Notes, plus any unpaid accrued interest on the original principal. The Convertible Notes had customary events of default.

The conversion options of the Convertible Notes did not meet the requirements for separate accounting as an embedded derivative. However, the redemption features of the Convertible Notes met the requirements for separate accounting and were accounted for as a single, compound derivative instrument (see Note 9). The compound derivative instrument was recorded at fair value at inception and was subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations. The estimated fair value of the compound derivative instrument at issuance was recorded as a reduction in the carrying value of the Convertible Notes and as a single compound derivative liability. The Convertible Notes carrying value reduction was accreted using the effective interest method as interest expense over the Convertible Notes contractual period of one year. The Convertible Notes had an effective interest rate of 12.69% per year.

On May 31, 2018, the original maturity date for the Convertible Notes was extended to June 28, 2019 (previously June 28, 2018). The maturity date extension was deemed substantial and was accounted for as a debt extinguishment under Accounting Standards Codification ("ASC") Topic 470, *Debt*. In connection with the debt extinguishment on May 31, 2018, the fair value of the Convertible Notes was allocated between the carrying amount of the Convertible Notes and accrued interested of $13.1 million, a compound derivative asset of $0.6 million, and an equity component of $3.9 million, which was credited to additional paid-in capital within the consolidated statements of redeemable convertible preferred stock and stockholders' deficit. The transaction also resulted in a $3.3 million loss recorded as debt extinguishment in the accompanying consolidated statements of operations. The new carrying value of the Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of 1.1 years.

On August 20, 2018, the maturity date for the Convertible Notes was changed to September 20, 2018 (previously June 28, 2019). The term change was deemed substantial and was accounted for as a debt extinguishment under ASC Topic 470. In connection with the debt extinguishment on August 20, 2018, the fair value of the Convertible Notes was allocated between the new carrying amount of the Convertible Notes and accrued interest of $13.4 million, and an equity component of $0.8 million, which resulted in an additional credit to additional paid-in capital. The transaction also resulted in a $0.8 million loss recorded as debt extinguishment in the accompanying consolidated statements of operations. The new carrying value of the Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of one month.

On September 20, 2018, upon the maturity of the Convertible Notes, the carrying amount, including accrued interest of $13.4 million was converted into 6,671,990 shares of our Series C redeemable convertible preferred stock at a conversion price equal to $2.013 per share. No gain or loss was recorded on the conversion.

The interest expense on the Convertible Notes for the years ended December 31, 2017 and 2018, was $0.7 million and $0.9 million, respectively.

***Summary Consolidated Statements of Cash Flows***

The following table sets forth the primary sources and uses of cash and cash equivalents for each of the periods presented below:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | (in thousands) | (unaudited) | |
| Net cash provided by operating activities | $ 290 | $ 5,572 | $ 723 | $ 66 |
| Net cash used in investing activities | (5,158) | (7,852) | (1,309) | (960) |
| Net cash provided by (used in) financing activities | 16,404 | (591) | (189) | 14,386 |

*Net Cash Provided by Operating Activities*

Net cash provided by operating activities during the year ended December 31, 2017 was $0.3 million, which resulted from a net loss of $23.6 million, offset by non-cash charges of $3.1 million and net change in our operating assets and liabilities of $20.8 million. Non-cash charges primarily consisted of $1.2 million of depreciation and amortization expense, $0.8 million of stock-based compensation expense, and $1.2 million of non-cash interest expense, change in fair value of compound derivative instrument and convertible preferred stock warrant liability. The net change in our operating assets and liabilities was primarily the result of a $19.1 million increase in customer deposits related to customer prepayments, a $3.3 million increase in accounts payable and accrued liabilities to support inventory and general expenses, partially offset by a $1.2 million increase in accounts receivables related to increases in revenue, a $0.5 million increase in inventory and deferred cost balances, and a decrease of $0.2 million in prepaid expense and other assets.

Net cash provided by operating activities during the year ended December 31, 2018 was $5.6 million, which resulted from a net loss of $19.9 million, offset by non-cash charges of $10.0 million and net change in our operating assets and liabilities of $15.4 million. Non-cash charges primarily consisted of $4.7 million of loss of debt extinguishment, $3.1 million of depreciation and amortization expense, $1.3 million of stock-based compensation expense, and $1.2 million of accretion of noncash interest, partially offset by $0.2 million of change in fair value of compound derivative instrument and convertible preferred stock warrant liability. The net change in our operating assets and liabilities was primarily the result of a $18.2 million increase in customer deposits related to customer prepayments, a $3.2 million increase in accounts payable and accrued liabilities to support inventory, and general expenses, partially offset by a $2.5 million increase in accounts receivables related to increases in revenue, a $2.1 million increase in inventory and deferred cost balances, and a $1.3 million decrease in prepaid expense and other assets.

Net cash provided by operating activities during the three months ended March 31, 2018 was $0.7 million, which resulted from a net loss of $5.4 million, offset by non-cash charges of $0.7 million and net change in our operating assets and liabilities of $5.3 million. Non-cash charges primarily consisted of $0.5 million of depreciation and amortization expense, $0.2 million of stock-based compensation expense, and $0.5 million of accretion of noncash interest, partially offset by $0.4 million of change in fair value of compound derivative instrument and convertible preferred stock warrant liability. The net change in our operating assets and liabilities was primarily the result of a $6.3 million increase in customer deposits related to customer prepayments, a $0.2 million decrease in accounts payable and accrued liabilities to support inventory, and general expenses, partially offset by a $0.2 million increase in accounts receivables related to increases in revenue, and a $1.0 million decrease in inventory and other deferred cost balances.

Net cash provided by operating activities during the three months ended March 31, 2019 was $0.1 million, which resulted from a net loss of $5.7 million, offset by non-cash charges of $2.0 million and net change in our operating assets and liabilities of $3.7 million. Non-cash charges primarily consisted of $1.0 million of depreciation and amortization expense, $0.6 million of stock-based compensation expense, $0.2 million of change in fair value of convertible preferred stock warrant liability and change in accretion of noncash interest and debt reduction and $0.2 million of change in noncash lease expense. The net change in our operating assets and liabilities was primarily the result of a $1.4 million increase in customer deposits related to customer prepayments, a $0.8 million increase in accounts payable and accrued liabilities to support inventory, and general expenses, partially offset by a $1.3 million increase in accounts receivables related to increase in revenues, a $0.6 million increase in inventory and other deferred cost balances, and a $0.4 million decrease in prepaid expense and other assets.

*Net Cash Used in Investing Activities*

Net cash used in investing activities for 2017 was $5.2 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services.

Net cash used in investing activities for 2018 was $7.9 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services and facility expansion to support expanded operations.

Net cash used in investing activities for the three months ended March 31, 2018 was $1.3 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services and facility expansion to support expanded operations.

Net cash used in investing activities for the three months ended March 31, 2019 was $1.0 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services and facility expansion to support expanded operations.

*Net Cash Provided by (Used in) Financing Activities*

Net cash provided by financing activities was $16.4 million for the year ended December 31, 2017, which primarily consisted of $5.0 million borrowings under the Revolving Loan and $12.2 million from the Convertible Notes, partially offset by $0.8 million in debt repayment.

Net cash used in financing activities was $0.6 million for the year ended December 31, 2018, which primarily consisted of debt repayment.

Net cash used in financing activities was $0.2 million for the three months ended March 31, 2018, which primarily consisted of debt repayment.

Net cash provided by financing activities was $14.4 million for the three months ended March 31, 2019, which primarily consisted of $20.0 million borrowings under the Growth Capital Loan and $0.4 million from proceeds of exercise of stock options, partially offset by $5.0 million in debt repayment, $0.5 million in debt issuance costs, and $0.5 million in payment costs related to our initial public offering.

### Contractual Obligations and Commitments

The following table summarizes our non-cancelable contractual obligations and commitments as of December 31, 2018:

| | Payments Due by Period | | | | |
|---|---|---|---|---|---|
| | Less than 1 year | 1 to 3 years | 3 to 5 years | More than 5 years | Total |
| | (in thousands) | | | | |
| Debt obligations(1) | $ 5,270 | $ — | $ — | $ — | $ 5,270 |
| Operating lease obligations(2) | 1,091 | 1,030 | — | — | 2,121 |
| Purchase obligation(3) | 17,073 | — | — | — | 17,073 |
| Total | $ 23,434 | $ 1,030 | $ — | $ — | $ 24,464 |

(1) In June 2017, we entered into the Revolving Loan. Amount reflects the contractually required principal and interest payments. See Note 6 to our consolidated financial statements included elsewhere in this prospectus.

(2) We lease our facility under a non-cancelable operating lease. In February 2015, we entered into a lease for our current laboratory and office space that commenced in May 2015 and expires in November 2020. The minimum lease payments above do not include any related common area maintenance charges or real estate taxes. In November 2020, we may extend the lease at the then-current market rates.

(3) On November 22, 2017, we entered into a pricing agreement with Illumina to purchase certain consumables and equipment. As of December 31, 2018, in accordance with the contract, we had a purchase commitment of $17.1 million by June 30, 2019. On March 26, 2019, we entered into a new pricing agreement with this vendor, which replaced in its entirety the agreement dated November 22, 2017. The new pricing agreement has a commitment to purchase $1.7 million of equipment by June 30, 2019.

The contractual commitment amounts in the table above are associated with agreements that are enforceable and legally binding. Obligations under contracts that we can cancel without a significant penalty are not included in the table above.

We received $20.0 million in gross proceeds from the issuance of the Growth Capital Loan in March 2019, which is not included in the above table. Interest on the unpaid principal balance of the Growth Capital Loan accrues from the date of issuance, and compounds monthly at the effective rate of 15.23% per year.

The amounts in the table above do not include approximately $42.9 million and $44.3 million in customer deposits as of December 31, 2018 and March 31, 2019, respectively. These amounts included $37.3 million and $39.6 million from one customer as of December 31, 2018 and March 31, 2019, respectively, that we may be required to refund under certain circumstances. While customers have not historically required us to return prepaid amounts, if a customer that has prepaid us for future services cancels its contract with us or reduces the level of services that it expects to receive, we would generally be required to repay that customer's deposit with little or no notice. Because the requirement to return any deposits and the timing of any such repayments is uncertain, they have been excluded from the table above. If required to refund a deposit, we may not have the cash or other available resources to satisfy these repayment obligations. Even if we are able to satisfy the repayment obligation from available resources (including potentially a portion of the net proceeds of this offering), we may need to seek additional sources of capital to fund our operations which funding may not be available when needed or on acceptable terms. In either of those circumstances, our business, financial condition, results of operations, and reputation would be materially and adversely affected.

### Quantitative and Qualitative Disclosures About Market Risk

#### *Interest Rate Sensitivity*

The market risk inherent in our financial instruments and in our financial position represents the potential loss arising from adverse changes in interest rates or exchange rates.

As of December 31, 2017 and 2018 and March 31, 2019, we had cash and cash equivalents of $22.6 million, $19.7 million and $33.2 million, respectively, consisting of cash held in bank accounts and money market funds denominated in U.S. dollars. A 100 basis point change in interest rates would not have a material effect on the fair market value of our cash and cash equivalents.

As of December 31, 2018, we are also exposed to market risk from changes in interest rates as a result of our indebtedness under the Revolving Loan, which matures on March 31, 2019. At December 31, 2017 and 2018, we had $5.0 million principal amount outstanding under the Revolving Loan. The interest rate associated with the Revolving Loan is the prime lending rate plus 6.75%. An immediate 100 basis point change in the prime interest rate would not result in a material impact on our results of operations for 2017 and 2018. See Note 6 to our consolidated financial statements for further description of the Revolving Loan.

We are also exposed to market risk from changes in interest rates as a result of our indebtedness under the Growth Capital Loan. At March 31, 2019, we had $20.0 million principal amount outstanding under the Growth Capital Loan. Borrowings under the Growth Capital Loan bear interest at a floating rate per annum equal to the prime rate plus 5.00% for borrowings up to $15.0 million and the prime rate plus 6.50% for borrowing greater than $15.0 million. An immediate 100 basis point change in the prime interest rate would not result in a material impact on our results of operations for the three months ended March 31, 2019. See Note 6 to our consolidated financial statements for further description of the Growth Capital Loan.

***Foreign Currency Risk***

The majority of our revenues is generated in the United States. As of December 31, 2017 and 2018 and March 31, 2018 and 2019, we had generated an insignificant amount of revenues denominated in foreign currencies. As we expand our presence in the international market, our results of operations and cash flows are expected to increasingly be subject to fluctuations due to changes in foreign currency exchange rates and may be adversely affected in the future due to changes in foreign exchange rates.

**Critical Accounting Policies and Estimates**

Our consolidated financial statements have been prepared in accordance with U.S. generally accepted accounting principles (“GAAP”). The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the consolidated financial statements, as well as the reported expenses incurred during the reporting periods. Our estimates are based on our historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions. We believe that the accounting policies discussed below are critical to understanding our historical and future performance, as these policies relate to the more significant areas involving management’s judgments and estimates.

While our significant accounting policies are described in the notes to our consolidated financial statements, we believe that the following critical accounting policies are most important to understanding and evaluating our reported financial results.

***Revenue Recognition***

*Adoption of ASC Topic 606, “Revenue from Contracts with Customers”*

On January 1, 2017, we early adopted the new accounting standard ASC Topic 606 using the full retrospective method. Results for reporting periods beginning after January 1, 2017, are presented under ASC Topic 606. The impact of adopting ASC Topic 606 was not material on our consolidated financial statements.

*Revenue Recognition*

We generate our revenues from selling sequencing and data analysis services. We agree to provide services to our customers through a contract, which may be in the form of a combination of a signed agreement, statement of work and/or a purchase order.

Upon adoption of ASC Topic 606, we have evaluated the performance obligations contained in contracts with customers to determine whether any of the performance obligations are distinct, such that the customers can benefit from the obligations on their own, and whether the obligations can be separately identifiable from other obligations in the contract. For all of our contracts to date, the customer orders a specified quantity of a sequencing; therefore, the delivery of the ordered quantity per the purchase order is accounted for as one performance obligation. Our contracts include only one performance obligation—the delivery of the sequencing and data analysis services to the customer.

Fees for our sequencing and data analysis services are predominantly based on a fixed price per sample. The fixed prices identified in the arrangements only change if a pricing amendment is agreed with a customer. In limited cases we provide our customers a discount if samples received are above a certain volume are purchased. In such cases, the discount applies prospectively. We have analyzed such discounts if they represent a material right provided to a customer. We have concluded that such discounts do not represent a material right provided to a customer since they are not deemed to be incremental to the pricing offered to the customer, or are not enforceable options to acquire additional goods. As a result, these discounts do not constitute a material right and do not meet the definition of a separate performance obligation. We do not offer retrospective discounts or rebates. Accordingly, all of the transaction price, net of any discounts, is allocated to one performance obligation. Therefore, upon delivery of the services, there are no remaining performance obligations.

Contracts that contain multiple distinct performance obligations would require an allocation of the transaction price to each performance obligation based on a relative stand-alone selling price basis. Sometimes we deliver sequencing results in two or more batches; however, since the quantity delivered per batch of each individual test per sales order in these instances is in the same ratio as in the original sales order, allocating the transaction price on the a relative stand-alone selling price basis would have no impact on the revenue recognized in any period presented.

We recognize revenue when control of the promised services is transferred to our customers. Management applies judgment in evaluating when a customer obtains control of the promised service, which is when the sequencing and data analysis service results are delivered to customers, at an amount that reflects the consideration to which we expect to be entitled to in exchange for those services. Revenue is recorded net of sales or other transaction taxes collected from clients and remitted to taxing authorities.

A customer contract liability will arise when we have received payments from its customers in advance, but has not yet provided genome and exome sequencing and data analysis services to a customer and satisfied its performance obligations. We record a customer contract liability for performance obligations outstanding related to payments received in advance for customer deposits. We expect to satisfy these remaining performance obligations and recognize the related revenues upon providing sequencing and data analysis services.

All of our revenues and trade receivables are generated from contracts with customers and substantially all of our revenues are derived from U.S. domestic operations. The following section describes the accounting policies that we believe have significant judgment, or changes in judgment, as a result of adopting ASC Topic 606.

*Payment Terms*

Payment terms and conditions vary by contract and customer. Our standard payment terms are typically less than 90 days from the date of invoice. In instances where the timing of our revenue recognition differs from the

timing of its invoicing, we have determined that our contracts do not include a significant financing component. The primary purposes of our invoicing terms are to provide customers with simplified and predictable ways of purchasing our services and provide payment protection for us.

***Redeemable Convertible Preferred Stock***

We record all shares of redeemable convertible preferred stock at their respective fair values on the dates of issuance, net of issuance costs. In the event of our voluntary or involuntary, liquidation, dissolution, or winding up, or a liquidation event such as a merger, acquisition and sale of all or substantially all of our assets, each of which we refer to as a deemed liquidation event, proceeds will be distributed in accordance with the liquidation preferences set forth in the amended and restated certificate of incorporation unless the holders of redeemable convertible preferred stock have converted their redeemable convertible preferred shares into common stock. Therefore, the redeemable convertible preferred stock is classified outside of permanent equity on the consolidated balance sheets as events triggering the liquidation preferences are not solely within our control. We have not adjusted the carrying values of the redeemable convertible preferred stock to the liquidation preferences of such shares because it is uncertain whether or when an event would occur that would obligate us to pay the liquidation preferences to holders of shares of redeemable convertible preferred stock. Subsequent adjustments to the carrying values to the liquidation preferences will be made only when it becomes probable that such a liquidation event will occur.

***Convertible Preferred Stock Warrants***

We account for warrants to purchase shares of our redeemable convertible preferred stock as liabilities at their estimated fair value because these warrants may obligate us to transfer assets to the holders at a future date upon a deemed liquidation event. The warrants are recorded at fair value upon issuance and are subject to remeasurement to fair value at each period end, with any fair value adjustments recognized in the consolidated statements of operations and comprehensive loss. We will continue to adjust the warrant liability for changes in fair value until the earlier of the exercise or expiration of the convertible preferred stock warrants, the completion of a deemed liquidation event, or the conversion of redeemable convertible preferred stock into common stock, or until holders of the redeemable convertible preferred stock can no longer trigger a deemed liquidation event. In connection with this offering, the convertible preferred stock warrants will be automatically converted into warrants to purchase shares of our common stock.

***Common Stock Warrants***

Our common stock warrants are classified as equity as they meet all criteria for equity classification. The common stock warrants are recorded at fair value upon issuance as additional paid-in-capital in the consolidated balance sheets. The common stock warrants are not remeasured after the issuance date. In connection with an initial public offering, the common stock warrants will remain outstanding unless voluntarily exercised by the holder.

***Convertible Instruments***

We evaluate and account for conversion options embedded in convertible instruments in accordance with ASC Topic 815, *Derivatives and Hedging Activities*. Applicable GAAP requires companies to bifurcate conversion options from their host instruments and account for them as freestanding derivative financial instruments according to certain criteria. The criteria include circumstances in which (a) the economic characteristics and risks of the embedded derivative instrument are not clearly and closely related to the economic characteristics and risks of the host contract, (b) the hybrid instrument that embodies both the embedded derivative instrument and the host contract is not remeasured at fair value under other GAAP with changes in fair value reported in earnings as they occur, and (c) a separate instrument with the same terms as the embedded derivative instrument would be considered a derivative instrument.

***Stock-Based Compensation***

We account for stock-based compensation arrangements with employees, using a fair value-based method, for costs related to all stock-based payments including stock options and stock awards. Our determination of the fair value of stock options on the date of grant utilizes the Black-Scholes option-pricing model.

The fair value of the option granted is recognized over the period during which an optionee is required to provide services in exchange for the option award, known as the requisite service period which usually is the vesting period, on a straight-line basis.

Estimating the fair value of equity-settled awards as of the grant date using valuation models, such as the Black-Scholes option-pricing model, is affected by assumptions regarding a number of complex variables. Changes in the assumptions can materially affect the fair value and ultimately how much stock-based compensation expense is recognized. These inputs are subjective and generally require significant analysis and judgment to develop.

- *Expected Term*—The expected term assumption represents the weighted-average period that the stock-based awards are expected to be outstanding. We have elected to use the "simplified method" for estimating the expected term of the options, whereby the expected term equals the arithmetic average of the vesting term and the original contractual term of the option.
- *Expected Volatility*—For all stock options granted to date, the volatility data was estimated based on a study of publicly traded industry peer companies. For purposes of identifying these peer companies, we considered the industry, stage of development, size, and financial leverage of potential comparable companies.
- *Expected Dividend*—The Black-Scholes option-pricing valuation model calls for a single expected dividend yield as an input. We currently have no history or expectation of paying cash dividends on its common stock.
- *Risk-Free Interest Rate*—The risk-free interest rate is based on the yield available on U.S. Treasury zero-coupon issues similar in duration to the expected term of the equity-settled award.

We estimated the fair value of the time-based employee stock options using the Black-Scholes option-pricing model based on the date of grant with the following assumptions:

***Common Stock Valuations***

The estimated fair value of the common stock underlying our stock options was determined at each grant date by our board of directors, with input from management. All options to purchase shares of our common stock are intended to be exercisable at a price per share not less than the per-share fair value of our common stock underlying those options on the date of grant.

In the absence of a public trading market for our common stock, on each grant date, we develop an estimate of the fair value of our common stock based on the information known to us on the date of grant, upon a review of any recent events and their potential impact on the estimated fair value per share of the common stock, and in part on input from an independent third-party valuation firm. As provided in Section 409A of the U.S. Internal Revenue Code of 1986, as amended (the "Code"), we generally rely on our valuations for up to twelve months unless we have experienced a material event that would have affected the estimated fair value per common share.

Our valuations of our common stock were determined in accordance with the guidelines outlined in the American Institute of Certified Public Accountants Practice Aid, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation* (the "Practice Aid"). The methodology to determine the fair value of our common stock included estimating the fair value of the enterprise using the "backsolve" method, which estimates the fair value of our company by reference to the value and preferences of our last round of financing, as well as our capitalization.

The assumptions used to determine the estimated fair value of our common stock are based on numerous objective and subjective factors, combined with management's judgment, including external market conditions affecting the pharmaceutical and biotechnology industry and trends within the industry:

- our stage of development;
- the rights, preferences, and privileges of our redeemable convertible preferred stock relative to those of our common stock;
- the prices at which we sold shares of our redeemable convertible preferred stock;
- our financial condition and operating results, including our levels of available capital resources;
- the progress of our research and development efforts, our stage of development, and business strategy;
- equity market conditions affecting comparable public companies; and
- general U.S. market conditions and the lack of marketability of our common stock.

The Practice Aid identifies various available methods for allocating enterprise value across classes and series of capital stock to determine the estimated fair value of common stock at each valuation date. In accordance with the Practice Aid, we considered the following methods:

- *Income approach.* The income approach attempts to value an asset or security by estimating the present value of the future economic benefits it is expected to produce. These benefits can include earnings, cost savings, tax deductions, and disposition proceeds from the asset. An indication of value may be developed in this approach by discounting expected cash flows to their present value at a rate of return that incorporates the risk-free rate for the use of funds, the expected rate of inflation over the asset's holding period, and the risks associated with realizing the cash flows in the amounts and at the times projected. The discount rate selected is typically based on rates of return available from alternative investments of similar type and quality as of the valuation date. The most commonly employed income approach to valuation is the discounted cash flow analysis.
- *Market Approach.* The market approach attempts to value an asset or security by examining observable market values for similar assets or securities. Sales and offering prices for comparable assets are adjusted to reflect differences between the asset being valued and the comparable assets, such as, location, time and terms of sale, utility, and physical characteristics. When applied to the valuation of equity, the analysis may include consideration of the financial condition and operating performance of the company being valued relative to those of publicly traded companies or to those of companies acquired in a single transaction, which operate in the same or similar lines of business.
- *Cost Approach.* The cost approach to valuation is based upon the concept of replacement cost as an indicator of value and the notion that an investor would pay no more for an asset than what it would cost to replace the asset with one of equal utility. The cost approach estimates value based upon the estimated cost of replacing or reproducing the asset, less adjustments for physical deterioration and functional obsolescence, if relevant. When applied to an enterprise, a type of cost approach referred to as the Net Asset Method is sometimes employed. This method measures the value of equity as the sum of the values of its assets reduced by the sum of the values of its liabilities. The resulting equity is reflective of a 100% ownership interest in the business. This approach is frequently used in valuing holding companies.

Based on our early stage of development and other relevant factors, we considered all three approaches and have chosen to apply both income and market approaches in our analyses. We determined these approaches were the most appropriate methods for allocating our enterprise value to determine the estimated fair value of our common stock for valuations performed for periods as of December 31, 2018 or earlier. In determining the estimated fair value of our common stock, our board of directors also considered the fact that our stockholders could not freely trade our common stock in the public markets. Accordingly, we applied discounts to reflect the

lack of marketability of our common stock based on the weighted-average expected time to liquidity. The estimated fair value of our common stock at each grant date reflected a non-marketability discount partially based on the anticipated likelihood and timing of a future liquidity event.

Following the completion of this offering, our board of directors intends to determine the fair value of our common stock based on the closing quoted market price of our common stock on the date of grant.

***Income Taxes***

We account for income taxes under the asset and liability method. Deferred tax assets and liabilities are determined based on differences between the financial statement reporting and tax bases of assets and liabilities and net operating loss and credit carryforwards and are measured using the enacted tax rates and laws that will be in effect when such items are expected to reverse. Deferred income tax assets are reduced, as necessary, by a valuation allowance when management determines it is more likely than not that some or all of the tax benefits will not be realized.

We assess all material positions taken in any income tax return, including all significant uncertain positions, in all tax years that are still subject to assessment or challenge by relevant taxing authorities. Assessing an uncertain tax position begins with the initial determination of the position's sustainability and is measured at the largest amount of benefit that is greater than 50% likely of being realized upon ultimate settlement.

We have elected to account for the tax on Global Intangible Low-Taxed Income, enacted as part of the Tax Cuts and Jobs Act as a component of tax expense in the period in which the tax is incurred.

**Off-Balance Sheet Arrangements**

Since our inception, we have not engaged in any off-balance sheet arrangements, as defined in the rules and regulations of the Securities and Exchange Commission.

**JOBS Act Accounting Election**

We are an emerging growth company, as defined in the Jumpstart Our Business Startups Act (the "JOBS Act"). Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards, and therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

**Recent Accounting Pronouncements**

See the sections titled "Summary of Significant Accounting Policies—Recent Accounting Pronouncements" and "—Recent Accounting Pronouncements Not Yet Adopted" in Note 2 to our consolidated financial statements for additional information.

# BUSINESS

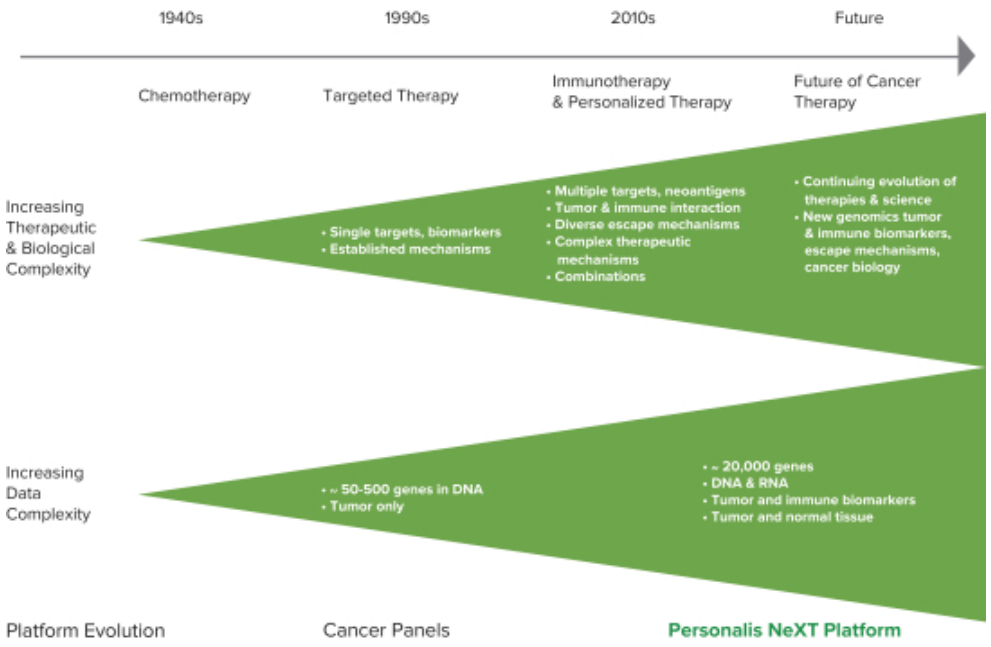
## Overview

We are a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. We designed our NeXT Platform to adapt to the complex and evolving understanding of cancer, providing our biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes. We are also developing a complementary liquid biopsy assay that analyzes all human genes versus the more narrowly focused liquid biopsy assays that are currently available. By combining technological innovation, operational scale, and regulatory differentiation, our NeXT Platform is designed to help our customers obtain new insights into the mechanisms of response and resistance to therapy as well as new potential therapeutic targets. Our platform enhances the ability of biopharmaceutical companies to unlock the potential of conducting translational research in the clinic rather than with pre-clinical animal models or cancer cell lines. We are also planning to release a diagnostic based on our NeXT Platform that we envision being used initially by biopharmaceutical customers and clinical collaborators. Since inception, we have provided our services to more than 45 biopharmaceutical customers, including several of the largest pharmaceutical companies in the world.

In the past decade, the biopharmaceutical community has achieved major advances in the treatment of cancer, including approval of therapies capable of targeting specific genetic drivers of cancer and novel immunotherapies that empower the immune system to attack cancer cells. Despite these advances, the substantial majority of currently available cancer therapies have significant limitations, including efficacy only in certain subsets of patients, limited long-term survival rates, and significant toxicities. Moreover, the current research and development paradigm in oncology is beset by significant inefficiencies and substantial costs, with the average cost per patient in clinical trials reaching approximately $60,000. While tumor molecular profiling technologies have enhanced research and development efforts, most current tumor biopsy and liquid biopsy tests analyze a relatively narrow set of roughly 50 to 500 tumor genes, missing key genes and immune mechanisms underlying cancer therapy. With the lack of a comprehensive profiling solution, biopharmaceutical companies often attempt to use a disparate array of tests to compensate, resulting in a fragmented view of the tumor biology, insufficient tumor sample, logistical complexities, and increased costs. The resulting data heterogeneity makes it difficult to mine for new biological insights across cohorts of patients in clinical trials. These piecemeal approaches to tumor molecular profiling often result in solutions that are difficult to use at scale, especially in a clinical or therapeutic setting where simplicity, cost, turnaround time, and validation are important.

Our platform helps biopharmaceutical companies seeking to develop more efficacious therapies by comprehensively interrogating a patient's tumor and immune cells in detail, both to discover tumor vulnerabilities and elucidate potential therapeutic alternatives. To meet the demands of our customers, we built our NeXT Platform to be cost-effective and scalable with rapid turnaround times for tissue sample data and analytics. NeXT represents the next step of our existing ACE platform, allowing customers to move up the value chain by gaining more information from a single sample. We believe that our platform has the potential to enable a research, development, and treatment paradigm that is dynamic and adaptive to the evolving genomic and immune system landscape of patients' tumors over time. We believe our technology will drive this evolving paradigm, which will ultimately enable our customers to develop safer and more efficacious therapeutics (see Figure 1). As the clinical utility of our platform increases, we expect to grow our diagnostic capabilities, including the ability to guide therapy based on a patient's changing tumor and immune system, and supporting the commercialization of therapeutics developed by our biopharmaceutical customers.

*Figure 1. Personalis NeXT Platform addresses the increasingly complex understanding of cancer.*




**Personalis: The Genomics Engine for Next-Generation Cancer Therapies**

Biopharmaceutical customers use our comprehensive platform across a diverse set of therapeutic approaches to cancer. We generate and analyze data from patients who participated in clinical trials, which we believe will enable these customers to develop more effective therapies. These opportunities represent a significant end market that is much larger than our initial clinical-trial focused market, as the spending on cancer therapies and supportive care drugs for cancer increased to $133 billion globally in 2017.

The information we generate is important to our customers developing three major classes of next-generation therapeutics: immunotherapies, targeted therapies, and personalized cancer therapies. Based on the approximately 195,000 patients who are currently expected to enroll in the over 1,600 immunotherapy, targeted therapy, and personalized therapy clinical trials that commenced in 2018, we estimate the total addressable market for multiple time point comprehensive tissue and liquid biopsy testing in clinical trials is over $5.0 billion annually. See the section titled “Market, Industry, and Other Data” for additional information regarding the data, sources, and assumptions we used for this estimate.

- **Immunotherapies:** Over the past decade, a number of drugs have emerged based on the discovery that the immune system plays a key role in addressing cancer. Checkpoint inhibitors, a specific type of immunotherapy, generated worldwide sales of over $16.6 billion in 2018, up from approximately $1.4 billion in 2014. The commercial success of these drugs has shown the potential of immunotherapy; however, the development of new therapies in this category has been challenged by difficulties understanding the precise interaction between cancer and the immune system. The number of clinical trials in this space involving at least one cancer immunotherapy drug has grown from 123 that started in 2012 to 1,000 that started in 2018. Since our platform provides comprehensive insights on tumor and immune biology, we believe it will enable biopharmaceutical companies to better understand how therapeutics are working in patients.
- **Targeted Therapies:** A growing category of successful cancer treatments consists of therapies that target specific genes or molecular mechanisms of cancer. These drugs are not designed to influence the

immune system directly but the success of immunotherapies has brought acknowledgment that the immune system has a significant effect on their efficacy. Many of these targeted therapies are proposed to be tested in combination with immunotherapies. These therapies have grown to represent a considerable share of the overall oncology therapeutics market today. Comprehensively understanding each patient's genomic and immune profile is critical to understanding which of these therapies a patient may respond to. We believe that more comprehensive coverage of all of the approximately 20,000 genes positions us competitively against existing cancer panels that cover roughly 50 to 500 genes. We are positioning our company to be a leading provider of the complex information that we believe will continue to inform the development of targeted cancer therapies.

- **Personalized Cancer Therapies:** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches to developing these therapies, including neoantigen-based vaccines and T-cell therapies, all of them can potentially benefit from the data and analytics that our platform can generate about a patient's tumor. Given the more than 700,000 cancer patients projected to be diagnosed with late-stage disease in the United States in 2019, we estimate that the total addressable market for our data and analytics for personalized cancer therapy could reach as much as $20 billion in the United States and as much as $40 billion worldwide. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate. Many of our customers have leveraged our U.S. Food and Drug Administration (the "FDA") Device Master File as a component of their investigational new drug ("IND") filings with the FDA. We anticipate that if drugs are approved that used our platform in the clinical trials forming the basis for approval, we may be able to derive revenue in connection with the sale of these drugs. We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies.

We anticipate that as the clinical utility of our platform is validated, we will have opportunities in connection with diagnostics and the commercialization of cancer therapeutics, which are significantly larger than our initial clinical-trial focused markets. Over time, we expect our biopharmaceutical customers and research collaborators to build evidence of clinical utility for our platform as a diagnostic for advanced cancer therapies. Separately, we are also acquiring samples and are building a database which will hold value for our biopharmaceutical customers and may ultimately allow us to discover new mechanisms of cancer treatment.

**The NeXT Platform**

Our NeXT Platform is designed to provide comprehensive analysis of both a tumor and its immune microenvironment, from a single limited tissue sample. Our platform covers the deoxyribonucleic acid ("DNA") sequence of all of the approximately 20,000 human genes. We also report on the entire transcriptome of a tumor, which encompasses ribonucleic acid ("RNA") expression across the approximately 20,000 human genes, allowing us to more accurately determine which of the many genomic mutations might actually be driving tumor progression. Furthermore, our platform analyzes elements of the immune cells that have infiltrated a tumor both from the adaptive immune system and the innate immune system.

Given the practical challenges in obtaining high-quality tumor samples via biopsy, we have developed our platform to work with a limited tumor tissue sample. Biopharmaceutical companies face significant challenges in attempting to divide samples to ship to multiple service providers to perform different tests. If a biopharmaceutical company is successful in acquiring results from multiple service providers, it is challenging to compare the results across multiple data platforms from multiple service providers. Our sequencing approach, validated with orthogonal technologies, allows us to run multiple analyses on a single sample. Our platform is composed of multiple proprietary technologies, many of which we have developed from the ground up. The breadth of the assays that we have integrated into our platform, our proprietary sample preparation process, and

the comprehensiveness of our platform allow us to maximize the utility of often limited tumor tissue samples that our customers have from their clinical trials.

We have also shown that our technology can analyze cell-free DNA ("cfDNA") obtained from blood plasma, also known as a liquid biopsy. As with a tissue biopsy, we plan to analyze all of the approximately 20,000 human genes in each plasma sample, in contrast to currently marketed liquid biopsy panels. We are not aware of any other company that has publicly announced that they are developing a cell-free DNA ("cfDNA") platform that analyzes all of the approximately 20,000 human genes. We expect this cfDNA to be obtained by a blood draw concurrently with a tissue sample. Together, the two samples can be used to provide a more comprehensive initial characterization of the tumor. Additionally, we expect to monitor changes in tumor genetics that arise in response to therapy through serial measurements using cfDNA samples collected across multiple time points. In 2020, we plan to launch our first liquid biopsy assay designed to analyze all human genes so as to detect potential neoantigens and tumor escape mechanisms that arise under therapeutic pressure. Although we believe our cfDNA test will offer new insights, we believe it will be most useful for our biopharmaceutical customers alongside our primary tumor biopsy product, given that a tumor biopsy is required to analyze gene expression and elucidate tumor-infiltrating lymphocytes which are critical to understanding cancer's interaction with the immune system.

Our NeXT Platform was announced in late 2018, and the first revenues from this platform are expected in 2019.

**Robust Operational Infrastructure to Scale with Our Customers**

We have invested significant resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands. Our NeXT Platform is complemented by our enterprise-grade software and bespoke information management systems that we tailor to meet our customers' unique needs and integrate with their workflows. Moreover, our infrastructure provides customers with visibility and control over processes, ensures consistency across all components used for the duration of each clinical trial, is traceable for compliance purposes, and allows us to scale while maintaining rapid turnaround times.

We designed our proprietary informatics system, the Symphony Enterprise Informatics System ("Symphony"), as a flexible and scalable enterprise-grade system used to manage the unique complexities and challenges of our genomics laboratory. Symphony integrates laboratory information management systems ("LIMS") and bioinformatics systems to connect laboratory operations with downstream data analysis. Symphony orchestrates all operational activities from our laboratory starting with sample receipt to the reporting of results of the genomic profiling and data delivery. We also use machine learning and artificial intelligence approaches to generate substantial performance advantages for our algorithms, such as neoantigen binding prediction.

We are sequencing and analyzing up to 100 trillion bases of DNA per week in our facility. We believe this capacity is already larger than most cancer genomics companies and we are building the automation and other infrastructure to scale further as demand increases and in support of the planned 2020 launch of our NeXT liquid biopsy assay.

Since 2012, we have been contracted to provide DNA sequencing and data analysis services to the United States Veterans Administration's (the "VA") Million Veteran Program (the "VA MVP"). The VA MVP began collecting samples in 2011 and is a landmark research effort aimed at better understanding how genetic variations affect health. Up to a million veterans are expected to enroll in the VA MVP study by 2021. With approximately 750,000 enrollees to date, the VA MVP exceeds the enrollment numbers of any single VA study or research program in the past, and is in fact one of the largest research cohorts of its kind. In September 2017, we entered into a one-year contract with three one-year renewal option periods with the VA for the VA MVP, and received orders under this contract in September 2017 and 2018. We are currently contracted to deliver approximately

80,000 genome sequence data sets to the VA MVP, and we expect revenue from the contracts awarded to date to continue into 2021. This relationship with the VA MVP has enabled us to scale our operational infrastructure and achieve greater efficiencies in our lab. It has also supported our development of industry-leading, large-scale cancer genomic testing. The substantial experience that we have and expect to continue to develop in whole genome sequencing also optimally positions us for what we anticipate to be the longer-term strategic direction of the cancer genomics industry, which may include whole genome sequencing of tumors.

We believe our platform is well positioned to scale rapidly and substantially as the field of personalized cancer therapies matures. We believe that our platform could be essential to the composition and manufacture of any personalized cancer therapy developed using our platform. Furthermore, we expect that patients would be tested at multiple time points during the course of treatment: first to design a therapy according to an initial genomic profile generated from a tissue and/or liquid biopsy, and then as follow-up testing via liquid biopsy to detect any changes that would require therapy modifications after initial therapeutic interventions. If a therapy that uses our NeXT Platform achieves regulatory approval, we believe that our commercial opportunity may increase substantially.

**Personalis is Valuable to Biopharmaceutical Companies**

We believe that our platform is valuable to our customers because:

- **Our tumor and immune molecular profiling capabilities provide an unprecedented breadth of data from a single limited tumor sample.** We provide information on all of the approximately 20,000 human genes, as well as gene expression, the immune system, and other elements of cancer biology, in contrast to other currently marketed panels that cover a limited range of roughly 50 to 500 genes and do not focus on immune cells. The commercial success of immunotherapy drugs has demonstrated the need to better understand the immune system. Unfortunately, development of new therapies in this category has been challenged by difficulties understanding the precise interaction between cancer and the immune system. Since our platform provides comprehensive insights on tumor and immune biology, including in both innate and adaptive immune cells, we believe it will enable drug companies to better understand the biological effect of therapeutics in patients.
- **Our platform enhances the opportunity to conduct translational research by analyzing tumor tissues from patients in clinical trials, rather than animal models or in vitro cancer cell lines, which have historically limited cancer research.** While conventional pre-clinical model systems, such as animal models and cancer cell lines, have been instrumental in early-stage cancer research and drug development, translation of results to the clinic has been limited and remains a significant barrier to progress, in part because these models do not sufficiently reflect the complexity of human cancer and the human immune system. Over recent years, tools used to study tissue from patients have improved and the utilization of tissue from trials has increased. We believe our platform represents the next step in this transition by further enabling biopharmaceutical companies to address the historical limitations of analyzing patient tissue comprehensively.
- **The information we provide to personalized cancer therapy companies is used to design therapeutics.** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches towards developing these therapies including neoantigen therapeutics, peptide-based vaccines, RNA and DNA vaccines, virally or bacterially encoded vaccines, and adoptive cell therapies, all of them benefit from the data and analytics that our platform can generate about a patient's tumor. We anticipate that drugs approved based on these therapeutic strategies may specify the use of our platform, enabling us to derive revenue in connection with the sale of commercial drugs, including the data generation and information processing required to treat each patient. We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies.

- **Our enterprise-grade operational infrastructure is scalable, enables rapid turnaround times, and is tailored to meet the unique workflow needs of our customers.** We have invested significant resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands. Moreover, our infrastructure provides customers with visibility and control over processes, ensures consistency across all components used for the duration of each clinical trial, is fully traceable for compliance purposes, and allows us to scale while maintaining rapid turnaround times.
- **We are developing a complementary liquid biopsy test, which also offers broad 20,000-gene coverage versus more narrowly focused liquid biopsy tests that are currently available.** We have also shown that our technology can analyze DNA obtained from blood plasma, also known as a liquid biopsy. As with a tissue biopsy, we analyze all of the approximately 20,000 human genes. We are not aware of any other company developing a cfDNA platform that analyzes all of the approximately 20,000 human genes. We expect this cfDNA to be obtained by a blood draw concurrently with a tissue sample. Together, the two samples can be used to provide a more comprehensive initial characterization of the tumor. Additionally, we expect to monitor changes in tumor genetics that arise in response to therapy through serial measurements using cfDNA samples collected across multiple time points. In 2020, we plan to launch our first liquid biopsy assay designed to monitor known neoantigens and detect novel neoantigens and tumor escape mechanisms that arise under therapeutic pressure.

**Our Strategy**

Our mission is to transform the development of next-generation cancer therapies by providing more comprehensive molecular data about each patient's tumor. To achieve this mission, our strategy is to:

- **Drive adoption of our platform by establishing and expanding relationships with leading developers of oncology therapeutics.** We believe that we can address the leading companies in oncology therapeutics with a small team of sales representatives and highly targeted marketing efforts. We augment this team with Ph.D.-level Field Application Specialists that provide deep understanding and expertise in the areas of oncology and genomics applications, allowing us to develop sciences-based dialog with our customers. We plan to continue to enter into partnerships and pursue a publication strategy that further demonstrates the utility of our platform.
- **Invest in new product innovations and enhancements to maintain our leading position.** We will continue to make investments in new products that enhance our platform and further our competitive advantages. As the breadth of data used in drug development and cancer treatment becomes more and more complex, we believe our biopharmaceutical customers will look to our platform as a complete solution to drive efficiency in research and development. In 2020 we expect to launch a liquid biopsy test, which also offers broad 20,000-gene coverage versus the more narrowly focused liquid biopsy tests that are currently available.
- **Continue to build a body of evidence demonstrating the utility of comprehensive genomic data.** We expect the actionable information that customers gain from our platform will increase demand for our services. We intend to align ourselves with our customers, enabling them to develop better cancer therapeutics, which in turn demonstrates the utility of our platform. We expect this supportive cycle to increase our penetration into pharmaceutical and biotechnology enterprises over time.
- **Continue to grow our relationship with the VA MVP.** In addition to providing a stable source of revenue, our relationship with the VA MVP has enabled us to innovate, scale our operational infrastructure, and achieve greater efficiencies in our lab. The substantial experience that we have and expect to continue to develop in whole genome sequencing also optimally positions us for what we anticipate to be the longer-term strategic direction of the cancer genomics industry.
- **Leverage a growing body of evidence from our platform to develop a diagnostic.** It is estimated that over 70% of oncology therapeutics in development are classified as personalized medicines, which

require specific diagnostic testing prior to administration. We see a growing long-term diagnostic opportunity for NeXT as a one-stop, universal tumor profiling test for cancer patients. We are planning to release a diagnostic based on our NeXT Platform that we envision being used with biopharmaceutical and clinical partners.

- **Build out a comprehensive tumor-genomics database**. We also see a growing long-term opportunity to generate rich databases of content across a large number of cancer patients. Most current diagnostic based databases built using cancer panels cover just a small fraction of genes and miss information about the immune system whereas our platform will provide comprehensive information. This database would serve as a valuable tool to discover new cancer biology, new biomarkers, and potential therapeutic targets. It may include integration with other sources of real-world data ("RWD"), such as electronic health records, which can generate real-world evidence ("RWE") that may be used to reduce risk in early discovery by helping to identify biomarkers of response, improve trial execution through external control arms, expand indications for therapy, reduce trial size, and improve trial design.

**Our Team**

We have assembled a multidisciplinary team of experienced industry leaders to drive continuous innovation. Scientific and operational excellence is a guiding principle for our employees. As we have grown to over 145 employees, we have invested not only in the technology to provide information of sufficient quality for clinical use, but also in the people to continuously innovate for the industry's growing and changing demands.

Our President and Chief Executive Officer, John West, co-founded our company in 2011 in conjunction with four Stanford professors, Euan Ashley, M.D., Ph.D., Atul Butte, M.D., Ph.D., Russ Altman, M.D., Ph.D., and Michael Snyder, Ph.D. More broadly, our executive officers and management team members have had previous experience at a variety of genomics, pharmaceuticals, biotechnology, diagnostics, data analytics, service, enterprise software, and technology companies including Agilent Technologies, Inc., Applied Biosystems Inc., ARMO Biosciences, Inc., Illumina, Inc., Informatica LLC, Ingenuity Systems, Inc., Lumentum Holdings Inc., Merck & Co., Inc., Molecular Dynamics, Inc., Natera, Inc., Novartis Pharmaceuticals Corp., Pacific Biosciences of California, Inc., RainDance Technologies, Inc., and Solexa, Ltd.

**Financial Highlights**

Our revenues have grown rapidly as our penetration of clinical trials in advanced oncology therapeutics has expanded, consistent with our reputation as a leader in the field. We generated revenues of $9.4 million, $37.8 million, and $14.1 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively. We also incurred net losses of $23.6 million, $19.9 million, and $5.7 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively.

As of March 31, 2019, we had $33.2 million of cash and cash equivalents, an increase of $11.4 million from March 31, 2018. Our revenues are primarily generated through sales of our services to biopharmaceutical companies and the VA MVP. Unlike diagnostic or therapeutic companies, we have not sought reimbursement through traditional healthcare payors. We have raised $89.6 million in preferred stock equity financing to date.

**Our Industry**

Despite the large sums invested in research and despite new treatments, cancer remains a major challenge for modern medicine and a source of high unmet medical need. According to a 2018 American Cancer Society report, "Cancer Facts & Figures," as of January 1, 2016, there were more than 15.5 million people in the United States who were suffering from cancer or who had previously suffered from cancer, and more than 1.7 million people were expected to be diagnosed with the disease in 2018. Cancer prevalence is increasing globally as well. The World Health Organization (the "WHO") predicted in its September 2018 estimates on the global prevalence of cancer that there would be 18.1 million new cancer cases and nearly 10 million cancer deaths globally in 2018. According to the WHO, the total economic impact of healthcare expenditure and loss of productivity resulting from cancer worldwide was approximately $1.2 trillion in 2010.

***Improving Cancer Treatment is Increasingly About Leveraging Molecular Data***

Despite the rapid evolution of cancer therapies, the current research and development paradigm in oncology is beset by significant inefficiencies and costs. Cancer therapeutics have one of the lowest clinical trial success rates of all major diseases. According to a study of 7,455 drug development programs during 2006 to 2015, the overall likelihood of FDA approval from Phase I clinical trial for oncology developmental candidates was 5.1%. The majority of currently available cancer therapeutics have serious limitations, including efficacy only in certain subsets of patients, limited long-term survival rates, and significant toxicities. The mechanisms underlying the success or failure of clinical trials are often poorly understood. To develop more efficacious cancer treatments, the biopharmaceutical community is faced with multiple key questions for a given therapeutic approach:

- Why do some patients respond to treatment and others do not?
- What are the underlying mechanisms of treatment resistance?
- Are there additional therapeutic targets or alternative pathways that can improve outcomes?
- What therapeutic combinations can improve outcomes?
- Are there ways to increase patient response through personalized therapeutics?
- Are there ways to reduce toxicity?

There is a growing recognition that there is a tremendous amount of untapped molecular data that can be derived from analyzing tumors from large numbers of cancer patients, whether in cancer clinical trials or post-commercialization, that can help answer some of these seminal questions and accelerate therapeutic development. The threefold increase in probability of FDA approval from Phase I clinical trial for therapies with biomarkers across all diseases and therapeutic types provides an indication of the benefits of leveraging molecular data.

***Current Tumor Molecular Profiling Solutions Have Not Kept Pace with New Cancer Therapies***

Biopharmaceutical companies are increasingly turning to tumor molecular profiling across large cohorts of patients to generate the data needed to answer these questions. Unfortunately, current tumor molecular profiling methods have not kept pace with new therapy development and overlook crucial elements of our evolving understanding of cancer biology.

*Current tumor molecular profiling falls short for new cancer immunotherapies*

Most current tumor molecular profiling panels were designed with a focus on targeted therapies, which, along with chemotherapy, have been used for cancer treatment for the past several decades. Targeted therapies treat cancers based on the specific genomic alterations driving their growth. Some targeted therapies have been developed to target specific molecules that are overexpressed or mutated in cancer cells. Because targeted therapies focus on cancer driver genes, the vast majority of tumor molecular profiling panels today, whether tissue or liquid biopsy based, typically sequence the DNA of between 50 to 500 genes, just a small fraction of the approximately 20,000 human genes.

Recently, however, transformational new approaches to cancer therapy that have been developed to harness the patient's own immune system have changed the treatment paradigm and our understanding of cancer biology. These new immunotherapies have dramatically improved the treatment of certain tumors that have previously been difficult to treat. Among these new immunotherapies, checkpoint inhibitors of the CTLA-4 and PD-1/PD-L1 genes are particularly effective. These therapies help "take the brakes off" the immune system and elicit a stronger immune response against the tumor. Patients can also be treated by adoptive cell therapy, in which the patient's immune system is supplemented with cytotoxic cells that have been programmed to attack cells expressing specific antigens on their tumors. There are also new opportunities for personalized cancer therapies where a new therapeutic vaccine or cell therapy is developed for each patient. Despite early success, the majority of patients today still do not respond to immunotherapy, underscoring the importance of gathering data that can help biopharmaceutical companies understand factors governing response and resistance to therapy.

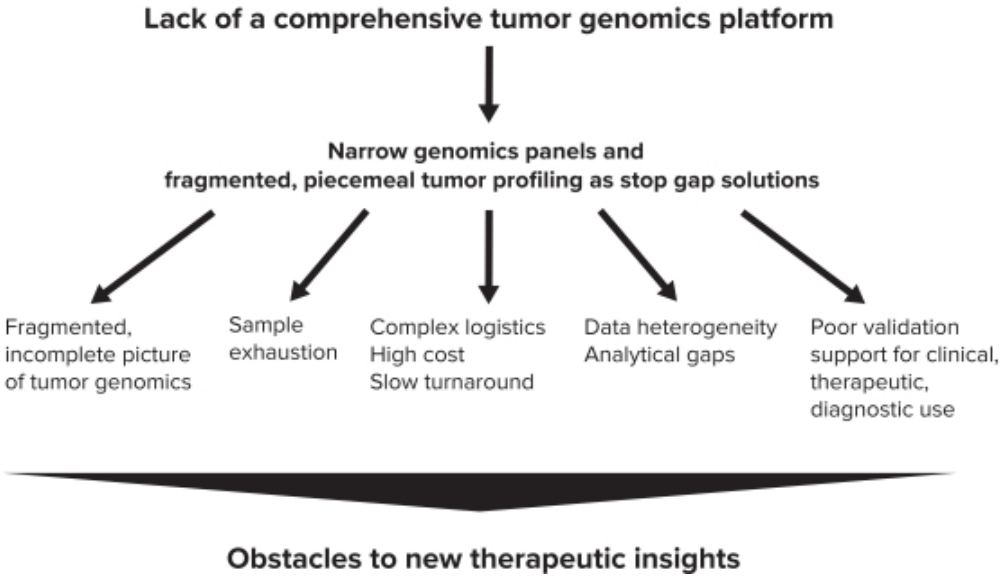
With these new immunotherapies and our rapidly evolving understanding of cancer biology, we believe the data needed to inform therapeutic development goes far beyond the typical 50 to 500 genes on current tumor molecular profiling panels. The paradigm has shifted from the need to understand mechanisms behind a single gene target to a dynamic, systems biology view involving complex interactions between thousands of genes in the tumor and the immune system in the pathogenesis of cancer and cancer drug response (see Figure 1).

Information about all of the approximately 20,000 human genes allows deeper insight into the biology of cancer, identifying novel or patient-specific therapeutic targets, including neoantigens, and predictive biomarkers of response to therapy. Understanding the immune cell signatures in the tumor microenvironment and immune repertoire changes is critical for understanding drug response. In addition to DNA, comprehensive RNA expression information from the tumor is needed to analyze complex pathways that may be activated in the tumor. It is important to identify the increasingly complex mechanisms of tumor response and resistance to cancer therapy, such as neoantigen burden, tumor antigens, deficient antigen presentation, oncogenic pathways, immune evasion pathways, HLA mutations, T-cell clonality, immune infiltration, and others. Table 1 describes some of the biological gaps in current panels. Most of these elements go beyond the capabilities of today's tumor molecular profiling panels.

*Table 1. Most current tumor tissue and liquid biopsy profiling panels miss critical tumor and immune biology.*

| Key Gaps in Tumor Molecular Profiling Panels | Description |
|---|---|
| Too few genes sequenced, missed mutations | Most tumor molecular profiling panels (both tissue and liquid biopsy panels) focus on DNA sequencing of roughly 50 to 500 cancer driver genes, a fraction of the approximately 20,000 human genes that can harbor tumor mutations. |
| Lack of RNA coverage | RNA expression signatures are important biomarkers of therapy response. |
| No immune repertoire | The immune repertoire of the tumor helps in understanding responses to cancer therapies. |
| No germline genome | The normal ("germline") genome can contain pertinent information for understanding therapy response and providing a clear view of which mutations are only in the cancer. |
| Missed neoantigens | Neoantigens are tumor-specific antigens that can trigger an immune response against a tumor. |
| Missed tumor escape mechanisms, biomarkers | Tumor escape mechanisms may be critical to new immunotherapies and personalized therapies. This includes HLA mutations, MSI, TCR clonality, antigen processing machinery pathways, immune signatures, and other immuno-modulators. |
| Limited view of the innate immune system | Immune cell expression signatures are important biomarkers of therapy response. |

*Figure 2. Lack of a comprehensive tumor molecular profiling platform leads to major challenges for cancer therapy development.*




*Fragmented tumor molecular profiling approaches result in a fragmented view of biology and limited insights*

With the lack of a comprehensive profiling solution, biopharmaceutical companies often turn to fragmented, piecemeal approaches to tumor molecular profiling as a stopgap measure (see Figure 2).

Those fragmented tumor molecular profiling approaches lead to major problems for therapeutic development. Limitations in available tumor samples, including liquid biopsies, force scientists to pick and choose which profiling platforms to include and which to omit, resulting in a fragmented picture of the biology. Fragmented profiling solutions also result in inconsistent profiling from patient to patient, and clinical trial to clinical trial. This results in data heterogeneity that makes it difficult to mine for new biological insights across cohorts of patients in trials. Finally, these piecemeal approaches to tumor molecular profiling result in solutions that often are difficult to use at scale in a clinical or therapeutic setting where logistical simplicity, cost, turnaround time, and validation are important.

*Current tumor molecular profiling panels can become antiquated with evolving science*

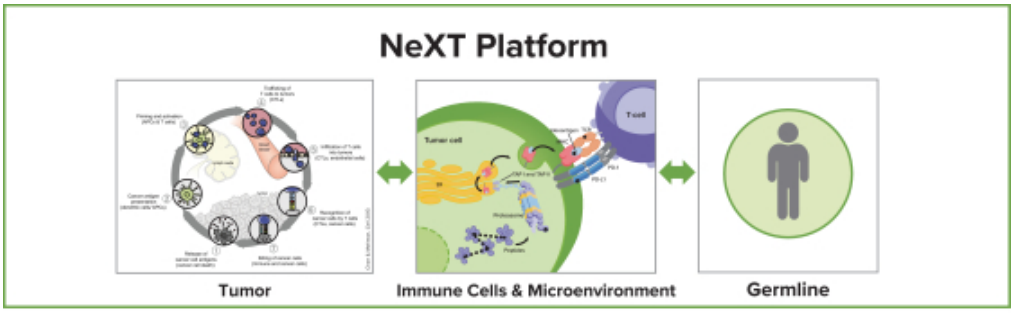
With the explosion of immunotherapy and advances in our understanding of cancer, new insights into the underlying mechanisms of response and resistance have emerged. New putative genetic or immune biomarkers of response are regularly identified for different therapies in the context of different cancers. For instance, new biomarkers have been identified including tumor mutational burden, neoantigens, HLA type, B2M mutations, TGFß, JAK1/JAK2 mutations, expression signatures, cytotoxicity signatures, and T-cell clonality, among others. A recent Nature Medicine review identified 18 different categories of biomarkers correlating with immunotherapy response spanning tumor, immune cells, and the tumor microenvironment. Due to the limited coverage of most cancer panels, they may miss new biomarkers. We believe this problem will continue as research uncovers new insights into cancer.

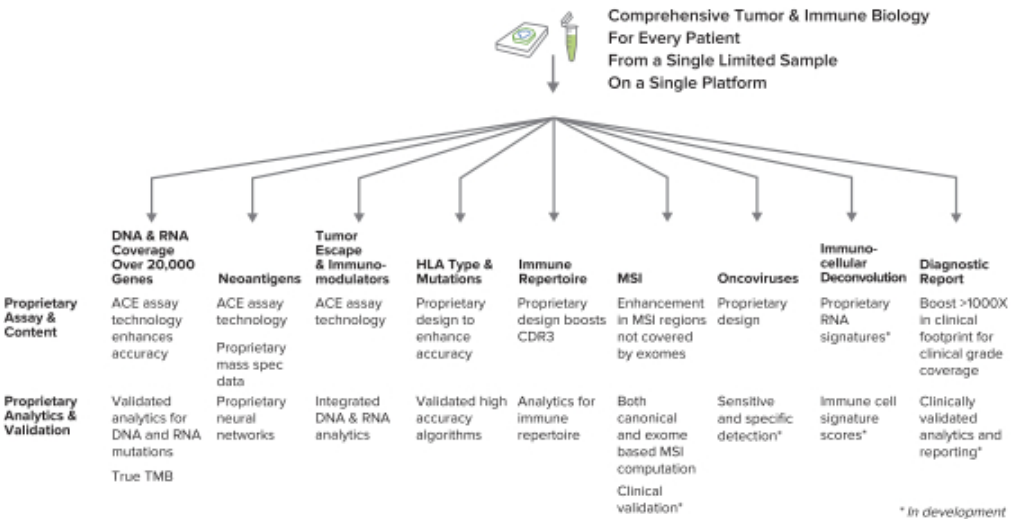
**Our Platform: Advanced Tumor Molecular Profiling Built for the Future of Cancer Therapy**

Our NeXT Platform ushers in a new paradigm for tumor molecular profiling by looking beyond the roughly 50 to 500 genes that limit current tumor profiling solutions. NeXT is designed to elucidate both the tumor genomics and its immune microenvironment simultaneously, representing a major step forward in tumor molecular profiling. Our platform interrogates all of the approximately 20,000 human genes in each tumor, generating more comprehensive molecular information than current profiling panels, from a single limited tumor sample. We have built NeXT to not only address the complex biology of new immunotherapies, but also to be broad enough to accommodate our rapidly evolving and increasingly complex understanding cancer. Finally, through technology innovation, we have made comprehensive tumor molecular profiling cost-efficient and scalable, enabling its use for large-scale profiling of cancer patients.

NeXT enables a paradigm where each cancer patient can benefit from comprehensive tumor molecular profiling, providing important data for cancer therapy development, personalized therapies, therapy selection, and diagnostics. Our platform enables biopharmaceutical customers to increase the insights generated from each tumor sample, reduce data heterogeneity, and simplify the process of tumor analysis. Our platform can be used to advance therapeutic development by elucidating diverse mechanisms of tumor escape, detecting neoantigens, identifying novel biomarker signatures, and characterizing the immune response.

*Figure 3. The NeXT Platform generates the most comprehensive view of the tumor and immune biology today, all from a single limited sample.*




| | DNA & RNA Coverage Over 20,000 Genes | Neoantigens | Tumor Escape & Immuno-modulators | HLA Type & Mutations | Immune Repertoire | MSI | Oncoviruses | Immuno-cellular Deconvolution | Diagnostic Report |
|---|---|---|---|---|---|---|---|---|---|
| **Proprietary Assay & Content** | ACE assay technology enhances accuracy | ACE assay technology<br>Proprietary mass spec data | ACE assay technology | Proprietary design to enhance accuracy | Proprietary design boosts CDR3 | Enhancement in MSI regions not covered by exomes | Proprietary design | Proprietary RNA signatures* | Boost >1000X in clinical footprint for clinical grade coverage |
| **Proprietary Analytics & Validation** | Validated analytics for DNA and RNA mutations<br>True TMB | Proprietary neural networks | Integrated DNA & RNA analytics | Validated high accuracy algorithms | Analytics for immune repertoire | Both canonical and exome based MSI computation<br>Clinical validation* | Sensitive and specific detection* | Immune cell signature scores* | Clinically validated analytics and reporting* |

* *In development*

**NeXT Platform: Overview of Key Features & Differentiators**

**Comprehensive tumor and immune genomics from a single limited sample**

- Sequencing and analyzing all of the approximately 20,000 human genes generates more comprehensive molecular information than current tumor tissue and liquid biopsy panels focused on roughly 50 to 500 genes
- Covers a much broader set of biomarkers for new immunotherapies and traditional targeted therapies
- Analysis of both tumor DNA and RNA expression
- Analysis of both tumor and normal tissue
- Analysis of non-human species such as oncoviruses (analytics in development)
- NeXT liquid biopsy, which we plan to launch in 2020, will target approximately 20,000 genes, enabling testing at multiple time points
- Proprietary technology enables superior sequencing quality and advanced analytics

**Makes single, comprehensive tumor molecular profiling practical for cancer patients**

- Tumor and immune molecular profiling from one limited tumor sample
- Engineered to be cost-effective and scalable, with rapid turnaround times, making it suitable for large-scale profiling of cancer patients
- Overcomes the need for fragmented tumor testing
- One platform for both research and clinical use

**Platform anticipates future cancer biomarkers that will come with evolving science**

- NeXT overcomes the limitations of small panels that become out of date when new genetic biomarkers or therapeutic targets are identified
- Comprehensive coverage of all genes, DNA and RNA, tumor and normal tissue, and immune biology enables our platform to accommodate new genetic biomarkers and signatures as they are published

**Generates comprehensive, harmonized data across patients to enable large-scale database creation and insight**

- Comprehensive profiling for large cohorts of patients leads to more useful databases for biopharmaceutical customers using our platform and our internal database
- Opportunity for integration with other sources of RWD such as electronic health records to generate RWE that may be used by biopharmaceutical customers to inform and accelerate therapeutic development
- Data harmonization, analytics, and machine learning maximize therapeutic insight
- Comprehensive nature of the platform provides long-lasting data relevance, yielding new insights over time as new biomarkers are identified

***NeXT Platform: Advanced Tumor Molecular Profiling Built for Present and Future Cancer Therapies***

To elucidate the complexity of tumor and immune biology, we have developed many new technologies that enable our platform to generate and analyze an order of magnitude more genomic data than most other cancer panels (see Figure 4). Our proprietary technologies and innovations span the entire NeXT Platform, including sample sparing preparation, advanced genomic sequencing, and new analytics with machine learning algorithms. We have also developed proprietary software and automation to integrate and scale the data, complex assays, analytics, and workflows underlying the platform (see Figure 5).

*Figure 4. The order of magnitude increase in biological complexity, data size and analytical complexity has required innovation throughout the entire NeXT Platform.*

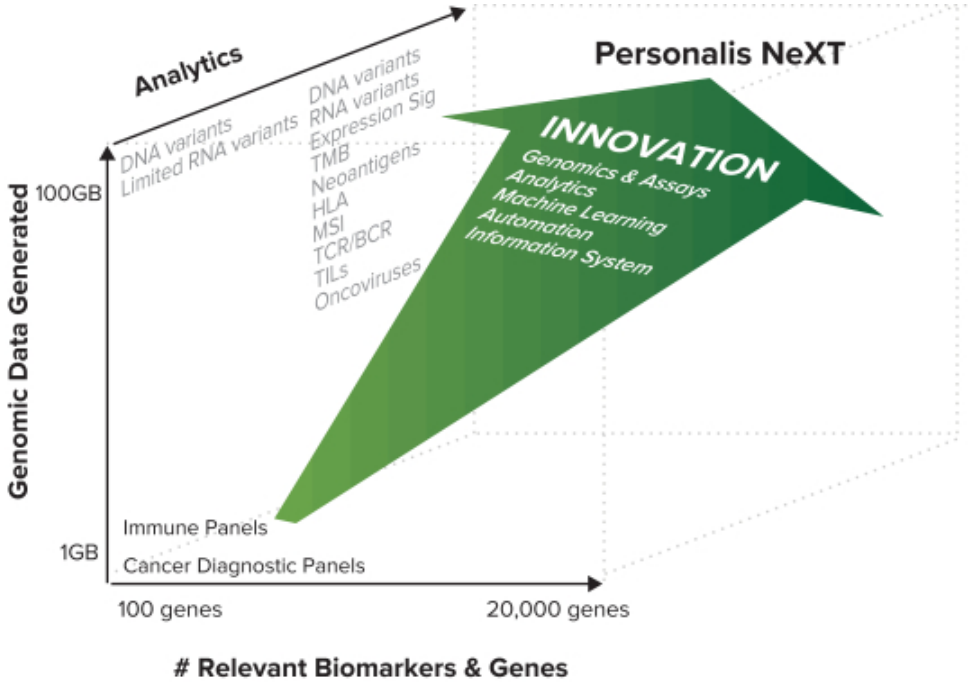
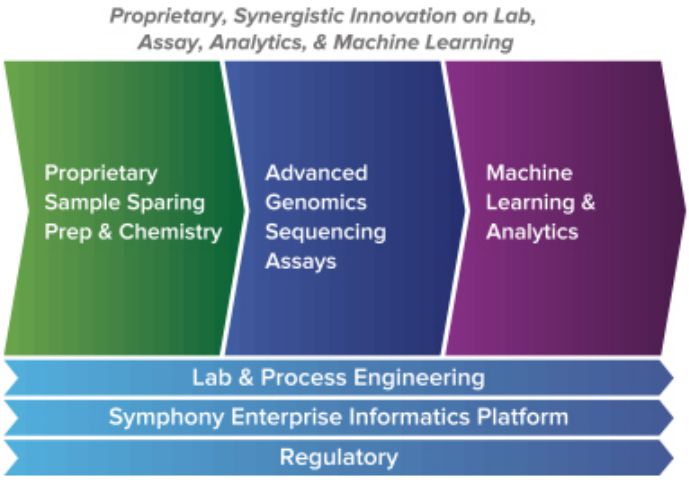
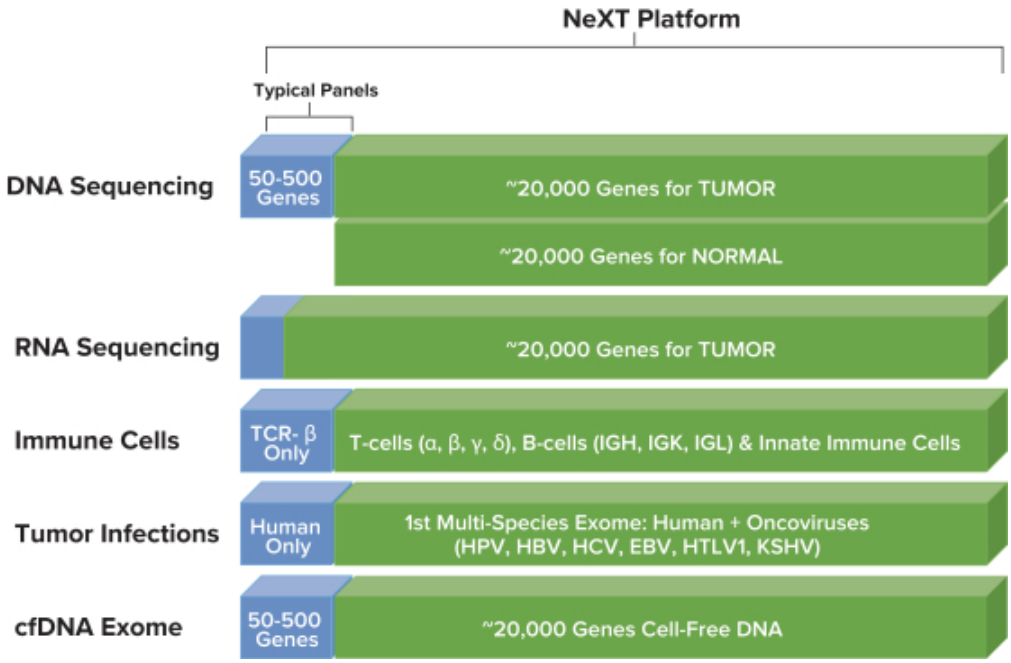



*Figure 5: Areas of innovation across the NeXT Platform.*



Through our technology innovation, proprietary methods, and intellectual property, our platform is capable of detecting mutations across all of the approximately 20,000 human genes in both DNA and RNA, immune repertoire for TCR a, ß, g, d and BCR l, k, immune signatures, diverse tumor escape mechanisms, and oncoviruses (in development). Compared to traditional cancer panels, our platform is broader in multiple dimensions.

*Figure 6. NeXT generates broader biological insight than existing panel approaches.*




*Covers Biomarkers for Current and Future Therapies Through Broad Sequencing and Analysis of Approximately 20,000 Human Genes*

Far beyond current cancer panels focused on roughly 50 to 500 genes, our platform sequences all of the approximately 20,000 human genes, enabling a broader view of tumor and immune genomics. Mutations of all types including single nucleotide variants, insertion-deletions, fusions, and copy number variations have been implicated in tumor resistance and response mechanisms for both targeted cancer therapies and immunotherapies, and thousands of these mutations can occur in each tumor. Our platform can identify crucial tumor and immune biomarkers, including in the tumor microenvironment, related biomarkers and critical alterations in the antigen presenting machinery, DNA repair and replication, immune checkpoint modulation, tumor associated antigens, immune response, microsatellite instability, cytokines and chemokines, and cytotoxicity.

*Simultaneously Provides Both Tumor and Immune Insights, including T and B Cell Repertoire*

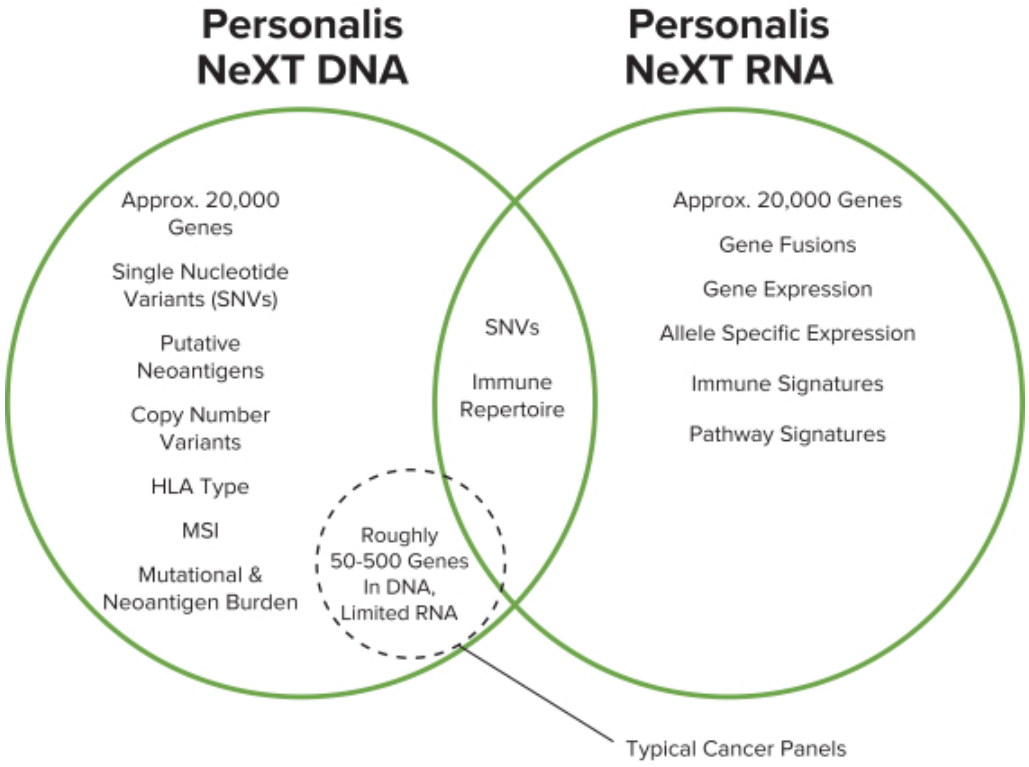
Simultaneously understanding both the tumor cells and the immune cells is critical for a deeper understanding of patient response to therapy. Unlike most cancer profiling panels that are focused on the tumor or immune repertoire alone, NeXT interrogates both the tumor and immune repertoire simultaneously. This is crucial as both the tumor and immune microenvironment can impact therapy response. Our platform sequences the broad immune repertoire including TCR a, b, g, d and BCR l, k from tumor FFPE (and fresh frozen) samples. The immune repertoire specific sequencing data derived from the NeXT assay is processed by our analytics, and a report is generated providing key metrics such as clonality, CDR3 nucleotide and amino acid

sequences, clonotype quantitation, distribution, and frequency, V, D, and J gene segments usage and overlap, and CDR3 nucleotide sequence length. These deliverables enable researchers to investigate the immune repertoire's potential as a predictive biomarker of response to immunotherapies and combination therapies.

*Analyzes Both DNA and RNA for a Patient's Tumor*

In contrast to most cancer diagnostic panels, the NeXT Platform sequences and analyzes both the DNA and RNA, which is extracted from the same limited sample. As shown in Figure 7, DNA and RNA sequencing data yields complementary insights into the tumor and immune genomics, providing a more complete view of tumor features that can impact cancer therapy. Furthermore, by simultaneously looking at both, there are new opportunities to combine information to improve analytical results for neoantigens and other advanced biomarkers, which can include multi-gene signatures.

*Figure 7. DNA and RNA from our platform yield different but synergistic insights into the tumor and immune genomics.*




*Analyzing Both Tumor and Normal Tissue*

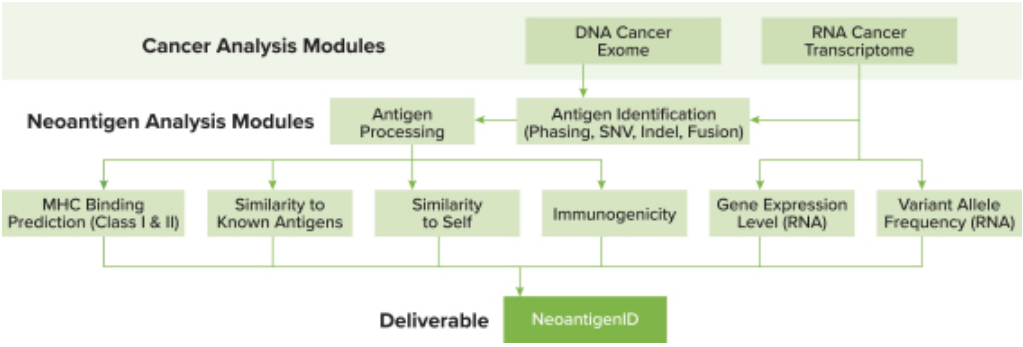
Most cancer panels do not sequence the genome of the patient's non-cancer tissue ("normal tissue"), which can contain pertinent information for understanding therapy response. By analyzing the normal tissue from the patient (typically blood samples), we improve the accuracy of identifying cancer specific mutations by using genetic variants found in the normal tissue as a reference point. Panels that do not utilize the normal tissue as a reference point can mistake germline mutations for cancer mutations. Furthermore, the normal tissue can yield additional genetic information that may be relevant to interpreting cancer therapy response. One example of this is HLA type, which has been correlated with response to immunotherapy. Germline mutations can also predispose patients to cancer.

*Analysis of Neoantigens with Proprietary Assay Design and Machine Learning Algorithms*

Neoantigens are derived from tumor-specific mutations that vary from patient to patient and can potentially trigger an immune response to the tumor. When neoantigens bind to and are presented on the major histocompatibility complex ("MHC") on cells, they can be recognized as "foreign" by the immune system and elicit an immune response to the tumor. Because of this, neoantigens have attracted strong biopharmaceutical interest as both a therapeutic target for personalized therapies and a biomarker for drug response. The predicted neoantigen burden in tumors has also been reported to be a biomarker of response of immunotherapies in certain cancers. Many neoantigens are missed by narrow cancer panels because they can arise from mutations in any of the approximately 20,000 human genes.

To enable these applications, we have developed proprietary methods to better identify and characterize neoantigens from a patient tumor sample. We have designed proprietary assay and algorithmic elements in NeXT including enhanced DNA and RNA sequencing technology, HLA typing, MHC-binding prediction, similarity-to-self, similarity-to-known antigens, and immunogenicity that are all used to improve detection and characterization of potential neoantigens.

*Figure 8. Our neoantigen prediction engine combines proprietary assay design and proprietary analytics to identify and characterize neoantigens.*




The MHC-binding prediction for each candidate neoantigen is a particularly critical step in the neoantigen characterization process. There are multiple variants ("alleles") of MHC proteins present in any individual and these alleles also vary between individuals. Each MHC variant has a unique set of peptides or neoantigens that it can present to the immune system. If an individual does not have an MHC allele that can bind to a particular neoantigen it will not be able to trigger an immune response to the tumor.

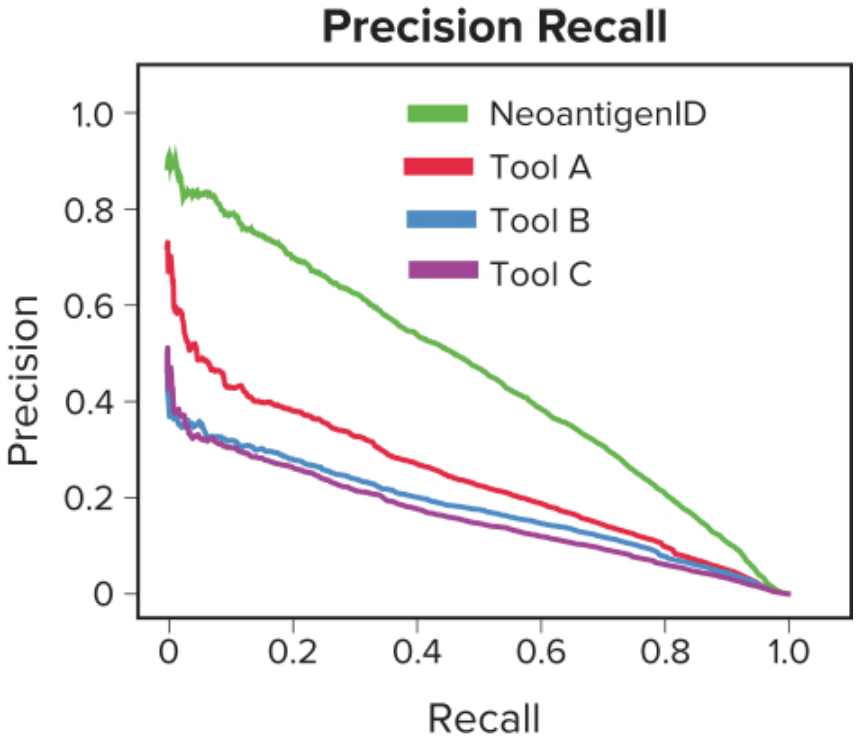
While academic groups have developed machine learning algorithms that can help predict the binding of peptides to individual MHC alleles, these algorithms were built upon data that was obtained from many different sources and was of limited quantity and varying quality. To address the limitations of existing tools, we have generated our own MHC binding data and used this high quality, systematically collected data as the basis for training our machine learning algorithms.

We have engineered proprietary cell lines that express only one MHC allele at a time and used a combination of chromatography and mass spectrometry to determine which peptides are bound to each allele. We believe we have one of the most comprehensive databases of peptide binding to specific MHCs of this type. We use this data and our computational tools to build proprietary peptide binding predictions that are individualized for each MHC allele.

As seen in Figure 9, our MHC neoantigen binding predictions perform more accurately than the best publicly available prediction tools. A good prediction algorithm should be able to accurately identify peptides

that are well known to bind to a specific MHC receptor. There are two ways to measure the power of a neoantigen prediction algorithm: the ability to accurately identify a given neoantigen as binding to a specific MHC, known as precision (which is a measure of how likely the predicted binding is to be correct, meaning true positives divided by true positives plus false positives), and the ability to find all known neoantigens that bind to that MHC, known as recall (which is a measure of how likely binders will be found, meaning true positives divided by true positives plus false negatives). We attribute the increased accuracy of our predictions to the high quality of the data we have generated, as well as our proprietary machine learning algorithms.

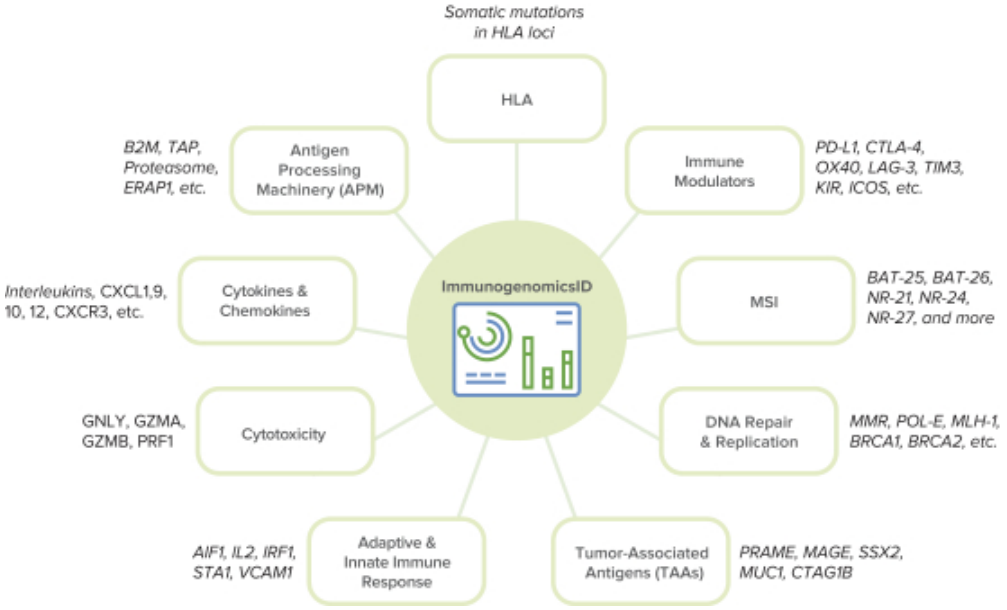
*Figure 9. Predictive power of our MHC neoantigen binding method compared to standard methods.*




*Elucidating a Broad Set of Biomarkers Spanning Tumor and Immune Biology*

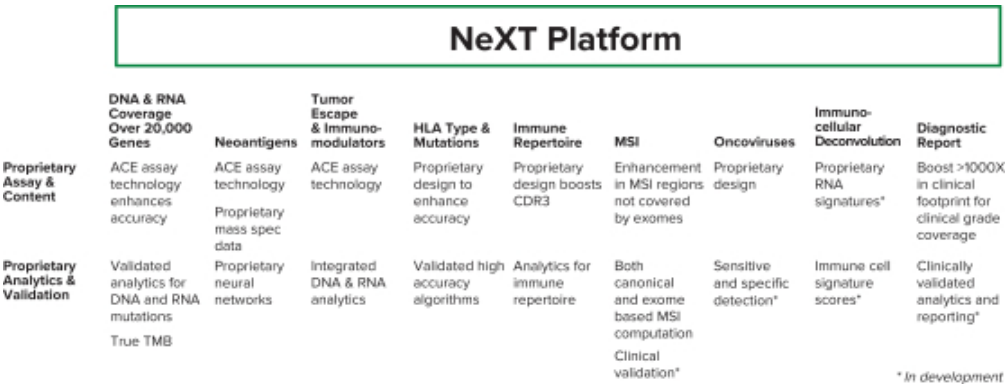
Since we offer a more comprehensive platform than others, we enable a broader analysis of key genomic biomarkers and signatures across multiple tumor and immune biomarker categories, such as neoantigens, HLA, immune modulator, DNA repair and replication, tumor-associated antigens, immune signatures, cytotoxicity, cytokines and chemokines, antigen processing machinery, and others (see Figure 10). Many of these biomarkers require both simultaneous assay and analytical technology development.

*Figure 10. Broad biomarkers enabled by our platform give a comprehensive view of the biology.*




In contrast to traditional approaches where assays are designed independently from the analytics, we have co-optimized our genomic assay design and analytics simultaneously to enable both unique analytical capabilities and enhanced performance for key biomarkers. Figure 11 summarizes some of the approaches we developed to achieve superior performance and comprehensiveness in our platform across a broad range of biomarkers:

*Figure 11. Proprietary genomic assay and analytical innovations to enable NeXT.*




| | DNA & RNA Coverage Over 20,000 Genes | Neoantigens | Tumor Escape & Immuno-modulators | HLA Type & Mutations | Immune Repertoire | MSI | Oncoviruses | Immuno-cellular Deconvolution | Diagnostic Report |
|---|---|---|---|---|---|---|---|---|---|
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* In development

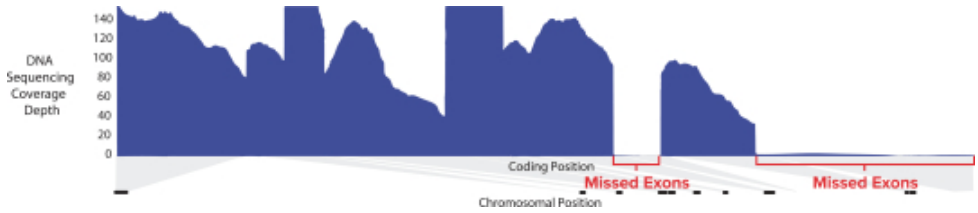
**Superior Sequencing Quality and Coverage**

Next generation sequencing (“NGS”) is the technological basis for many tumor molecular profiling platforms today. NGS rapidly sequences nucleic acids and then uses a computationally intensive process to reconstruct gene sequences from millions of short sequence segments. These segments are processed in parallel, an approach that greatly increases the speed that the sequence data can be generated. However, because the segments come from random locations in the genome, reassembling the original sequence is both a technically

and computationally challenging process. A key objective is to ensure that every portion of the genes being sequenced is covered by at least one sequence segment. The average number of sequence segments representing a gene is referred to as the sequence depth. The deeper the coverage, the greater fraction of the gene is likely to be covered and the higher confidence that low-frequency variants can be found.

However, even when sequenced to high depth, typical NGS approaches can leave uneven, poor coverage in genes with mutations linked to cancer and cancer therapy. Many of these regions cannot be fully covered by simply sequencing to higher depth because their sequencing coverage deficits are due to inherent limitations of the NGS platform. Regions of high guanine-cytosine ("GC") content or repetitive sequence regions are two such examples of regions that are difficult to cover with standard NGS assays. This can leave gaps in coverage of therapeutically important genes (see Figure 12). This is particularly problematic in cancer, where there can be significant heterogeneity in the tumor samples that can make it even harder to see mutations in regions of poor coverage.

*Figure 12. Coverage of SKT11 gene with standard NGS techniques leaves gaps in critical exonic regions.*




To address the limitations of typical NGS-based assay, we have developed our patented Accuracy and Content Enhanced ("ACE") technology for next-generation sequencing. ACE improves nucleic acid preparation processes and combines it with patented assay and sequencing methods to achieve superior, high-fidelity, clinical-grade sequencing quality that ensures high sensitivity for mutations that can inform clinical and therapeutic applications such as neoantigen prediction, biomarker identification, and novel drug target selection.

Our NeXT Platform uses our ACE technology to provide coverage of difficult-to-sequence gene regions across all of the approximately 20,000 human genes, filling in key gaps left by other NGS approaches. ACE technology provides superior and uniform coverage of difficult genomic regions, such as high GC content areas, and fills gaps and inconsistencies in sequencing to achieve an optimal output (see Figure 13). ACE is able to deliver more comprehensive coverage not by simply generating more data, but by generating higher quality data. We and others have shown in two publications that our ACE technology achieves superior gene sequencing coverage and finishing (see Figure 14).

*Figure 13. Coverage of SKT11 with our ACE sequencing process.*

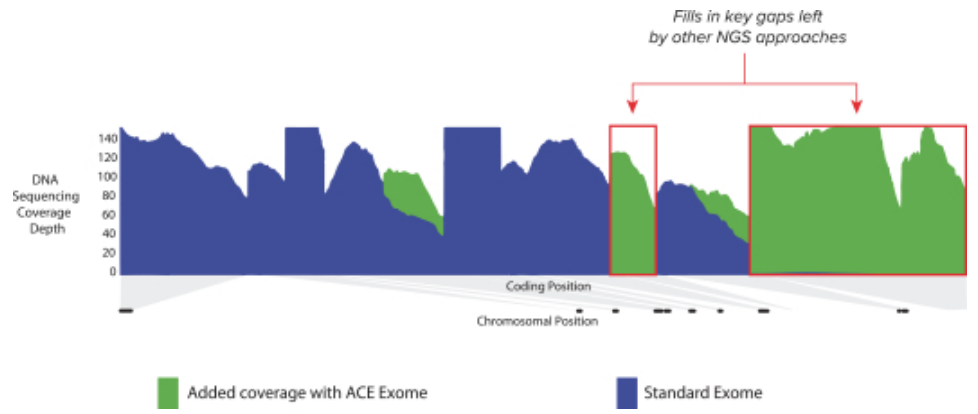
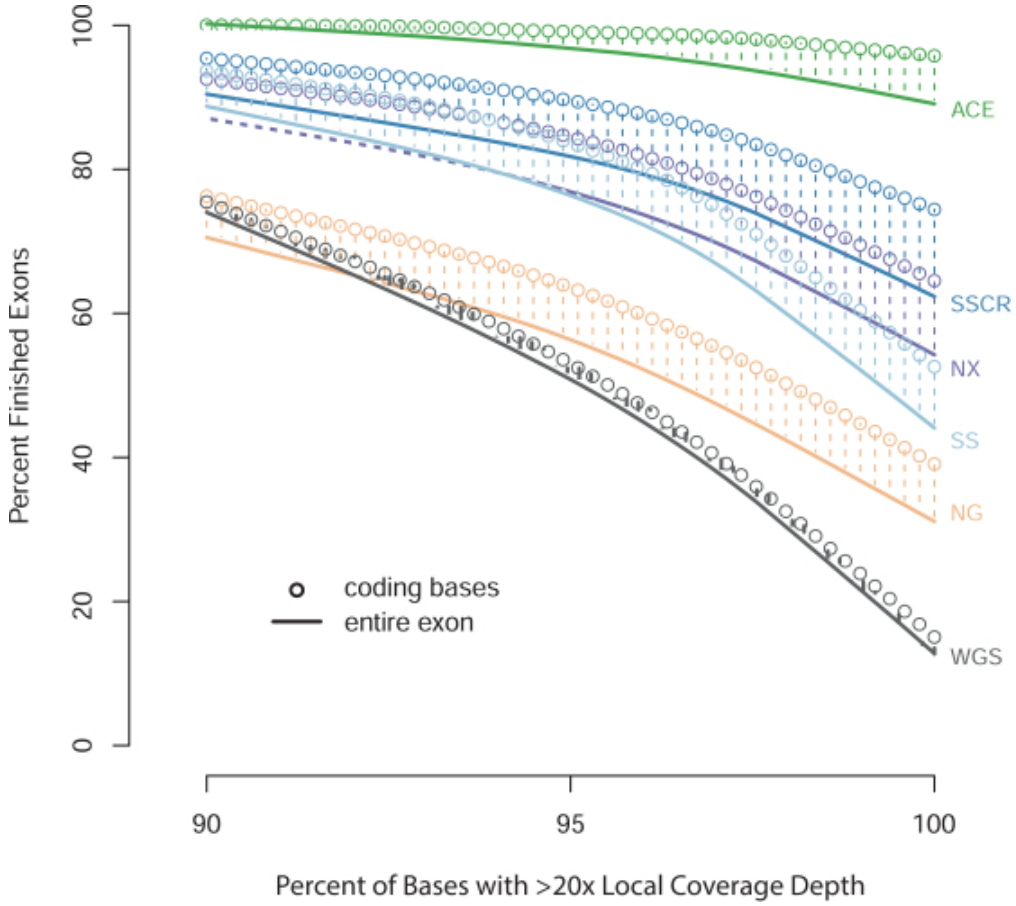


*Figure 14. Personalis' ACE technology achieves superior sequencing coverage and gene finishing. (Patwardhan et al Genome Med. 2015)*

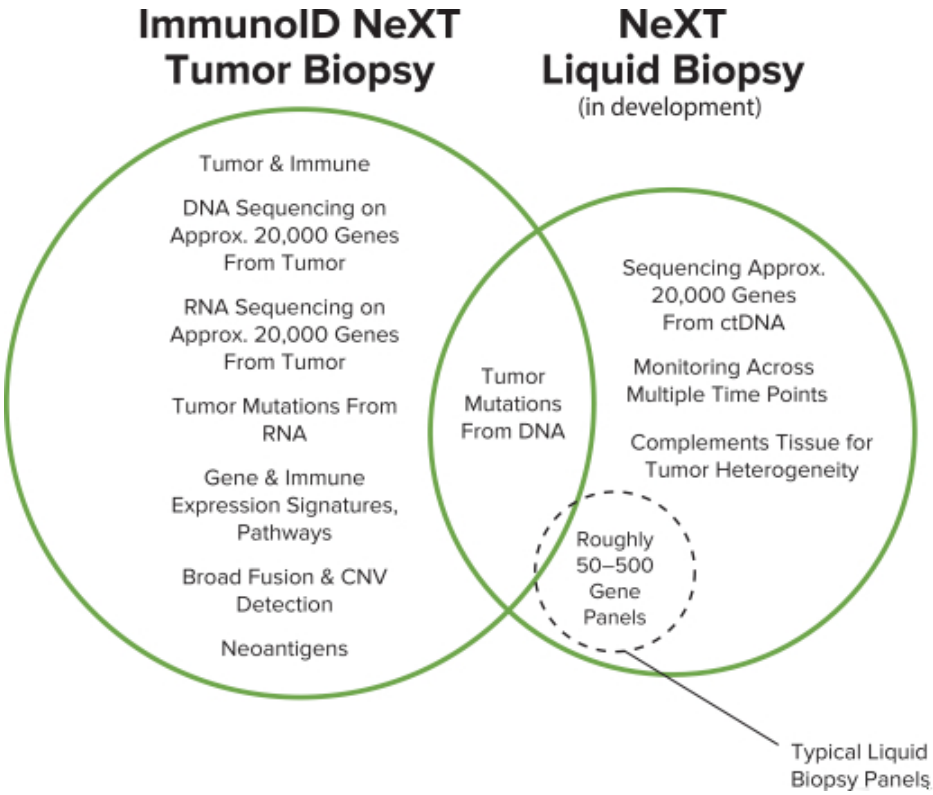



**Liquid Biopsy Capabilities**

Liquid biopsy approaches look at cfDNA in plasma samples derived from the blood. cfDNA is DNA that is released into circulation by cells, including tumor cells, as a result of cell death. This cfDNA can be obtained by a blood draw and can be used to monitor changes in tumor genetics.

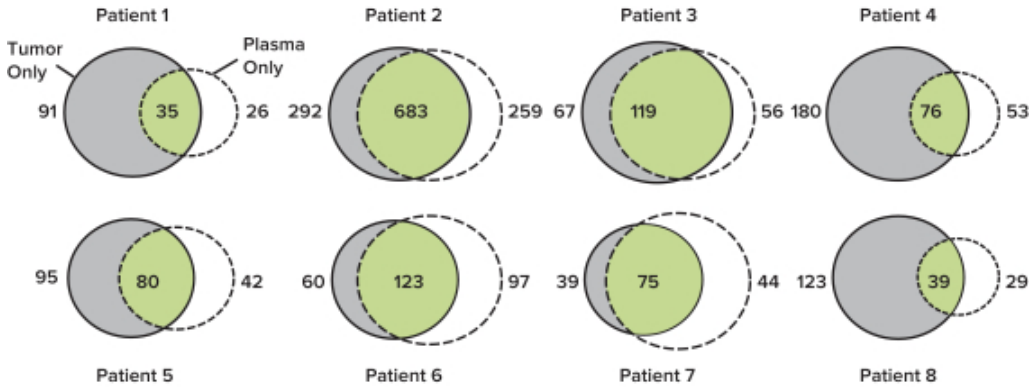
We believe tumor biopsy and liquid biopsy approaches to tumor molecular profiling can provide complementary information for each patient. Tumor biopsies provide tumor immune microenvironment and tumor gene expression information that current liquid biopsy panels do not provide. Liquid biopsies can be useful for providing additional DNA mutation information, especially for monitoring therapy response across different time points when tumor biopsies are not feasible. Unlike typical liquid biopsy panel approaches focused on roughly 50 to 500 driver genes, we are designing our cfDNA approach, NeXT Liquid Biopsy, which is currently in development, to sequence all of the approximately 20,000 genes in the human genome. Our broader liquid biopsy approach will help biopharmaceutical customers identify biological changes across multiple time points for each patient in their trials that they would otherwise miss with the current, narrowly focused liquid biopsy panels. We also believe broader coverage will enable better neoantigen prediction, broader biomarker coverage, and higher potential to identify new drug targets.

*Figure 15: ImmunoID NeXT tumor biopsy and NeXT liquid biopsy (in development) yields complementary data.*




We believe that combining tumor biopsies with cfDNA can provide a more complete picture of the spectrum of mutations found in a cancer patient. As an example of this, we compared the mutations found in eight late-stage colorectal tumor biopsy samples with those found in the plasma taken at the same time. We found a range of overlap between tumor biopsy-identified sequence variations and the sequences generated using cfDNA. These observations show that, while there was significant overlap between the tumor and liquid biopsy results, there were also mutations unique to tumor biopsy and vice versa (see examples of this in Figure 16). This observation underscores the concept that tissue and liquid biopsies may be complementary, and when combined, may provide a more complete picture of the patient's disease.

*Figure 16. Overlap of sequence variations detected in matched tumor and blood plasma.*




**Numbers indicate variants detected in the tumor only, plasma only, or in both.**

We anticipate that our liquid biopsy approach will have many applications, including monitoring of tumor response to therapy over many time points, detecting new genetic variants from evolution of the tumor under therapeutic pressure, detecting acquired mechanisms of resistance, and identifying neoantigens.

***NeXT makes comprehensive tumor molecular profiling practical for cancer patients at scale***

To deliver a comprehensive immune-genomic assessment of a tumor, we invested substantial resources to engineer NeXT to provide data and analysis that would otherwise be unavailable or require many individual technologies, which collectively present significant costs and logistical impracticalities. With NeXT, we built a proprietary platform that is comprehensive, cost-effective, and scalable and enables a short turnaround time, making it practical to profile cancer patients at scale. This has required innovation on a number of fronts.

**Comprehensive tumor and immune molecular profiling from a single limited tumor sample**

The quality and quantity of tumor sample available for each patient is often very limited. We have developed proprietary techniques to overcome the challenges of working with these samples.

Tumor tissue biopsies, fine needle aspirates (“FNAs”), core biopsies, surgical resections, and blood specimens collected from cancer patients’ samples are typically stored as fresh frozen (“FF”) or formalin-fixed, paraffin-embedded (“FFPE”) tissue. In both cases, there is typically limited tumor tissue available for molecular profiling. This can make it challenging, if not impossible, to achieve a comprehensive picture of the biology for each patient.

The quality of the tumor samples can also be a significant challenge. The best type of tumor sample for DNA and RNA sequencing and analysis is widely recognized to be FF biopsies. However, FF biopsies are not routinely collected because FFPE material is the specimen of choice for histopathological diagnosis. In almost every case, DNA extracted from FFPE specimens is degraded due to specimen processing, resulting in nucleic acid fragmentation, DNA crosslinks, random loss of nucleotide bases, localized DNA denaturation, strand breaks, and modification of bases leading to mutation artifacts which impede downstream sequencing analysis. Conversely, FF samples are expensive to store and difficult to collect for large-scale studies. FFPE samples’ quality issues exacerbate the issue of limited sample availability because when tissue is degraded, more of it is needed to generate sufficient sequencing data.

We have a simplified process using a dual simultaneous extraction of both DNA and RNA from challenging FFPE samples in a tissue-sparing manner. This allows us to use less tissue biopsy overall while preserving the

quality of the extraction. When combined with our comprehensive assay, we are able to generate much more comprehensive data from a single limited sample than other platforms.

We have also developed techniques to overcome the challenges of working with difficult and degraded samples, including FFPE, FNAs, FF, PBMCs, and plasma. We are able to achieve high success rate with our customers. For prospectively collected FFPE samples with our personalized therapy partners, we achieve a greater than 95% success rate for obtaining high-quality data from tumor samples received from personalized cancer therapy customers due to our optimized nucleic acid extraction protocols.

**Our proprietary software and operational infrastructure**

We leverage Symphony, laboratory automation and protocols, and other technological improvements to power our NeXT Platform.

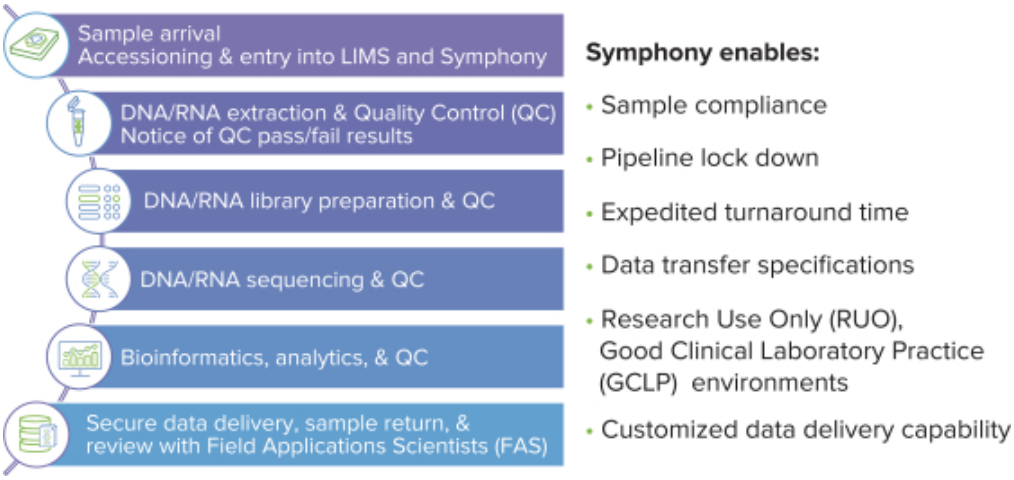
***Symphony Enterprise Informatics Platform***

Symphony is a flexible and scalable enterprise-grade system designed to manage the unique complexity and challenges of our large-scale genomics and analytics.

Symphony also integrates our LIMS and bioinformatics systems to connect laboratory operations with downstream data analysis. Symphony orchestrates all operational activities from the laboratory starting with sample receipt to the reporting of results of the tumor molecular profiling and data delivery. We developed Symphony to address the specific challenges associated with genomic data. Genomic data is unique in its size and complexity, even at the level of a single patient. The complexity is driven by data heterogeneity, such as DNA mutations, expression data, T-cell repertoire, and other sources, and the multifaceted workflows required to derive this data.

When scaled to the tens of thousands of samples per year, the complexity of genomic data grows and presents immense software engineering challenges. Since we did not identify any commercially available enterprise software system capable of addressing these challenges, we custom built Symphony from the ground up to address these specific challenges. In addition, Symphony manages multiple data and reporting streams with transparent versioning and traceability. This infrastructure allows us to meet the needs of all of our customers and provides a robust framework for future expansion as our customers anticipate clinical approval of their products.

*Figure 17. Key customer benefits of Symphony.*



***Laboratory scale and automation***

We have developed robust standard operating protocols and workflows that enable the accurate and efficient processing of samples from acquisition to data reporting. The combination of these standard protocols with dedicated staff and laboratory robotics has allowed us to develop an infrastructure that is designed to operate at scale. Our sequencing capacity has significantly increased each year since 2016, and we have an anticipated capacity of sequencing over 100,000 whole-genome length samples a year. Our high-performance computing infrastructure is capable of processing and storing the vast amount of data we generate with thousands of CPUs and petabytes of storage.

***Enabling rapid turnaround time***

Given the therapeutic and diagnostic applications of our platform, our customers require rapid turnaround times. The above technologies, which we have developed over years of engineering and optimization, allow us to achieve rapid turnaround times consistent with our customers' expectations, while also addressing the data complexity and achieving the level of comprehensiveness discussed above. For our personalized therapy partners, for example, we routinely deliver data and analytics in less than two weeks from sample receipt. Reductions in turnaround time have also required optimization of our laboratory processes. Our approach incorporates staffing of multiple shifts and over the weekends, so that each sample continues movement towards completion as rapidly as possible. We have purchased and installed highly parallel laboratory instruments, high-performance computing equipment, and multiple laboratory robots, developed laboratory workflow automation software, and invested in a significant multi-year research and development effort to integrate these pieces.

***Delivering value to our customers***

To deliver a comprehensive immuno-genomics assessment of a tumor, NeXT combines many elements that would previously have been individual assays, each with significant cost. These include a exome-scale sequencing assay that covers approximately 20,000 genes at high depth of sequence coverage, a transcriptome, a focused panel of cancer driver genes, a T-cell repertoire assay, a B-cell repertoire assay, an HLA typing assay, a microsatellite instability assay and several separate oncoviral assays. Although it has taken us several years to develop, optimize and validate, NeXT can now deliver all of these in a single platform, from a single sample. This is a major simplification of the testing process requiring fewer samples to be collected from each tumor. We offer NeXT at a cost that is competitive with tests that only address a single aspect of the spectrum of results NeXT delivers.

**Breaking down the traditional separation between research and clinical platforms**

Key parts of our platform have been analytically validated to support use in clinical trials, personalized therapies, and diagnostics.

We have actively differentiated our company and our services by building our ability to support our customers' regulatory filings, particularly with an eye toward personalized cancer therapeutics. In personalized cancer therapeutics, DNA sequencing and the associated data analysis are an integral part of each therapy and are a required element of the regulatory submission to obtain marketing approval. In addition to achieving CLIA licensing, CAP accreditation, and New York state certification for our laboratory over several years, starting in early 2017, we also began working with the FDA on filing a Device Master File. Our Device Master File is a document focused on the technology, quality management, and validation of our platform, specifically focused on its use for the development of personalized cancer therapies. This detailed information is not shared with our customers, but with our permission they can reference our FDA file number in their IND filings. We also provide support if the FDA has questions on our Device Master File. A growing number of clinical trials from a growing number of biopharmaceutical companies have been approved by the FDA that reference our Device Master File. To our knowledge, we are the only company with such a track record.

***NeXT anticipates future cancer biomarkers that will be identified by rapidly evolving science***

Existing narrow cancer panels can become outdated when new genetic biomarkers are identified. Given the rapid pace at which new cancer biomarkers and biology are being elucidated, this will continue to be a growing problem.

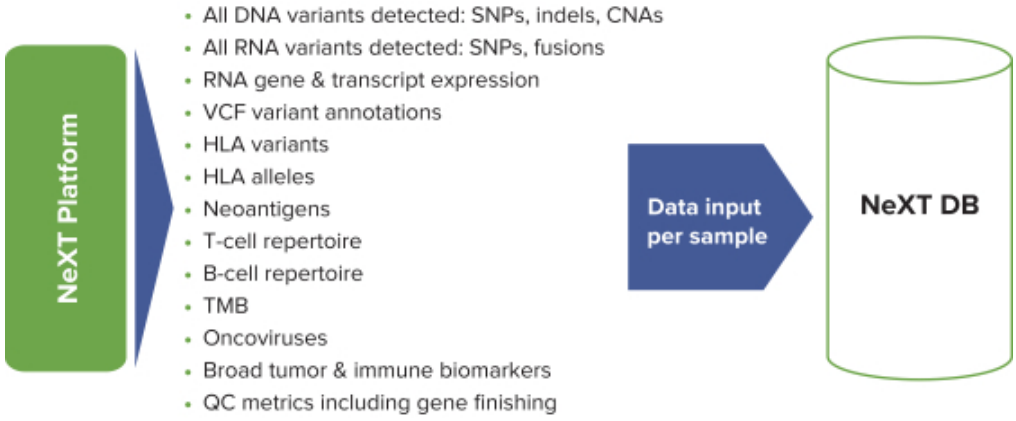
By covering all genes, DNA and RNA, tumor and normal tissue, tumor and immune biology, our platform can readily accommodate many of the new genetic biomarkers and signatures as they are published. This capability also allows the data generated from our platform to continue to yield new therapeutic insights even as our understanding of cancer and immune biology evolves. For example, just in the past few years, with immunotherapy, new tumor resistance biomarkers, such as HLA, JAK1/JAK2, B2M, and tumor mutational burden, and new gene expression signatures correlating with response have been published. By design, our platform already included these genes when the biomarkers were discovered.

***NeXT generates comprehensive, harmonized data across patients to enable large-scale database creation and insight***

As cancer therapy development becomes increasingly data driven, large databases aggregating information for many patients can be mined for new biomarkers and new potential therapeutic targets. By enabling comprehensive, harmonized data to be collected across large numbers of cancer patients, NeXT is setting the stage for new large-scale databases with unprecedented richness of tumor and immune data for each patient. Personalis is starting to build internal databases based on NeXT called NeXT DB (see Figure 18), as well as enabling our biopharmaceutical customers to build their own databases based on NeXT. With NeXT, we expect to solve many of the major challenges confronting biopharmaceutical companies trying to build these databases. In particular, our ability to solve the problem of data heterogeneity is important because it allows for more effective data mining and enables machine learning applications needed to analyze patient data within and across trials.

We also see a longer-term opportunity to enhance the value of a comprehensive tumor genomics database. This may include integration with other sources of RWD, such as electronic health records, which can generate RWE that may be used to reduce risk in early discovery by helping to identify biomarkers of response, improve trial execution through external control arms, expand indications for therapy, reduce trial size, and improve trial design. In December 2018, the FDA published a framework for evaluating RWD and RWE for use in regulatory decisions. This includes the potential use of RWD and RWE by biopharmaceutical companies to provide additional support for drug product effectiveness, serve as an external control for clinical trials, and provide data for observational studies.

*Figure 18. Comprehensive genomic data for each sample can be structured and inputted into NeXT DB.*



**Our Platform Provides Value Across Many Therapeutic and Diagnostic Applications**

We work closely with biopharmaceutical companies who are advancing new therapies in three major areas: immunotherapies, targeted therapies, and personalized cancer therapies. We have a critical role in generating new data and biological insights from patients in those clinical trials. We also see a long-term diagnostic opportunity for NeXT. Here, we describe some of the key products and applications of our platform.

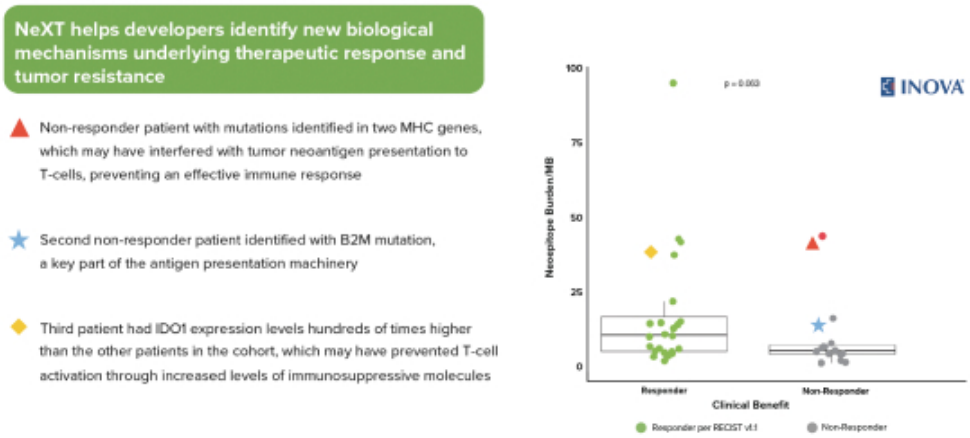
***Cancer Immunotherapy Applications***

Over the prior decade, a number of drugs have been approved by the FDA based on the discovery that the immune system plays a key role in fighting cancer. Checkpoint inhibitors, a specific type of immunotherapy, generated worldwide sales of over $16.6 billion in 2018, up from approximately $1.4 billion in 2014. Despite the medical and commercial success of these drugs showing the transformational potential of immunotherapy, the majority of patients do not respond to immune checkpoint inhibitors. The explosion in immunotherapy clinical trials across different immunotherapy modalities has also seen major challenges. The development of new therapies in this category is challenged by difficulties understanding the precise interaction between cancer and the immune system.

Our NeXT product is the newest version of our ImmunoID Platform aimed at immunotherapy development in translational research and clinical trials. NeXT enables immunotherapy translational and clinical researchers to comprehensively analyze both a tumor and its immune microenvironment from a single limited tissue sample. These samples are typically tumor tissue samples coming from patients enrolled in clinical trials. Our NeXT Platform can be used to investigate key areas of tumor biology, from elucidating mechanisms of tumor escape and detecting neoantigens, to identifying novel biomarker signatures and characterizing the immune repertoire. Since our platform provides comprehensive insights on tumor and immune biology, including in both innate and adaptive immune cells, we believe it will enable drug companies to identify biomarkers of response, mechanisms of resistance, and better understand how immunotherapies are working in patients.

Our collaboration with Inova Health System, a non-profit health organization based in Virginia, demonstrates how immunotherapy developers could use our platform to identify potential mechanisms of resistance. In this study, we applied our platform to generate profiles of the patients' tumors and to correlate those with the observed clinical responses. A cohort of the first 19 late-stage melanoma patients in this study were treated with anti-PD-1 checkpoint inhibitor immunotherapy. Consistent with prior research, the patients in our study with higher neoantigen burden were more likely to respond to checkpoint therapy, compared to those with lower neoantigen burden.

*Figure 19. Neoantigen burden versus response to PD-1 checkpoint inhibitors in 19 late-stage melanoma patients and putative tumor escape mechanisms of outliers.*



However, there were three outlier patients with high neoantigen burden whose response to checkpoint therapy was weaker than expected. Data from our platform helped provide putative mechanisms of tumor resistance. One patient had mutations in two MHC genes that may have caused this patient to be unable to properly present neoantigens found in the tumor to T-cells and thus prevented an effective immune response. A second non-responder patient had a mutation in the B2M gene which is a key part of the antigen presentation machinery. The third patient had expression levels of a gene called indoleamine 2,3-dioxygenase 1 ("IDO1") that were hundreds of times higher than the other patients in the cohort. The high levels of IDO1 in this patient may have therefore prevented T-cell activation through increased levels of these immunosuppressive molecules. This study highlights how this type of data can help immunotherapy developers identify new biological mechanisms that may be responsible for variable response to therapy.

We also believe our NeXT liquid biopsy (in development) has a strong application in biopharmaceutical clinical trials. With coverage of approximately 20,000 genes compared to smaller liquid biopsy panels focused on roughly 50 to 500 genes, we believe our liquid biopsy approach will allow our customers to see biological changes when monitoring tumor response to therapy.

***Targeted Cancer Therapies Applications***

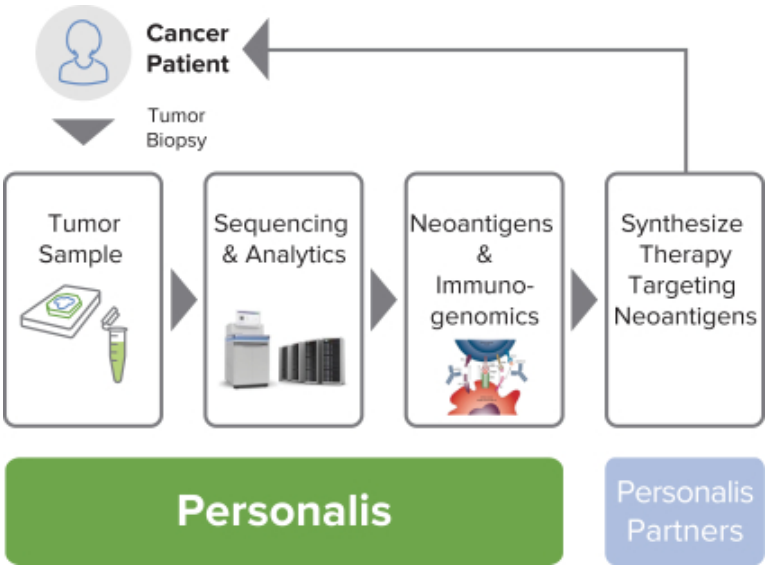
Another growing category of successful cancer treatments consists of therapies that target specific genes or molecular mechanisms of cancer. These drugs are not designed to influence the immune system directly, but the success of immunotherapies has brought acknowledgment that the immune system has a significant effect on their efficacy. These therapies have grown to represent a considerable share of the overall oncology therapeutics market today. Much like for immunotherapy, our ImmunoID NeXT Platform helps targeted therapy developers better understand each patient's tumor and immune genomics more comprehensively, leading to insights that can help drive development of more successful therapies. We have customers developing solid tumor and hematological tumor-targeted therapies that are utilizing our platform as part of their drug development. We are positioning our company to be a leading provider of the detailed information that we believe will continue to drive targeted cancer therapy.

***Personalized Cancer Therapy Applications***

Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches towards developing these therapies including neoantigen therapeutics, peptide-based vaccines, RNA and DNA vaccines, virally or bacterially encoded vaccines, and adoptive cell therapies, all of them benefit from the data and analytics that our platform can generate about a patient's tumor. Given the more than 700,000 cancer patients projected to be diagnosed with late-stage disease in the United States in 2019, we estimate that the total addressable market for our data and analytics for personalized cancer therapy could reach as much as $20 billion in the United States and as much as $40 billion worldwide. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate. Many of our customers have leveraged our FDA Device Master File as a component of their IND filings with the FDA. We anticipate that if drugs are approved whose design and clinical trials involved the use of our platform, we may be able to derive revenue in connection with the sale of these drugs, including the data generation and information processing required to treat each patient.

We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies. We work with companies developing both neoantigen-based personalized vaccines and personalized cell therapies for patients. Our platform serves as the genomics engine for many of these companies to generate comprehensive information required to identify potential neoantigens which can be used in personalized therapies. In addition, we generate other genomic information potentially useful in their therapy design process (see Figure 20).

*Figure 20. Our platform is the genomics engine for the majority of personalized therapy companies today.*




Our platform helps address key challenges for our personalized therapy partners:

- **The ability to identify more potential neoantigens.** With our platform, we use our proprietary technology to fill in sequencing gaps in genes so more neoantigens are detected. Furthermore we sequence approximately 20,000 genes to high depth in both DNA and RNA to increase sensitivity for mutations that can lead to neoantigens. We are also developing our NeXT liquid biopsy approach to identify additional and monitor existing neoantigens for personalized therapies.
- **The ability to better predict which putative neoantigens will trigger an immune response.** We have developed an analytical pipeline that helps identify putative neoantigens by synthesizing data from our platform. We also have developed proprietary mass spectrometry data and machine learning algorithms that improve accuracy of neoantigen-to-MHC binding prediction.
- **The ability to assess the MHC Class I and II HLA types for patients.** We have designed our assay specifically to augment HLA regions to enable high-accuracy HLA typing, a key input into the neoantigen prediction process for personalized therapies. This allows some of our customers to avoid separate HLA testing for each patient in their trial, simplifying logistics, and reducing turnaround time.
- **Broad characterization of other tumor immunogenomic modifiers that can impact patient response.** With our ImmungenomicsID report, we analyze both the DNA and RNA expression data for tumor and immune biomarkers that can inform the design of a personalized therapy.
- **High success rate on patient tumor samples.** With our proprietary methods and processes, we have been able to achieve a high success rate with samples from our personalized therapy customers. This is particularly critical for these clinical trials because if the tumor molecular profiling fails, these patients cannot receive the personalized therapy.
- **Rapid turnaround time.** The patients in clinical trials of these novel cancer therapeutics are often in the late-stages of disease. A therapy needs to be administered quickly to have the best chance of therapeutic benefit. This poses a challenge for personalized therapeutics. While a standard cancer therapy might be administered starting shortly after a patient is diagnosed, a personalized therapy will face a delay. This is the time required to obtain a sample from a patient, analyze the genetics of that individual tumor, and design, manufacture, and perform quality control on the therapy. Getting

comprehensive tumor molecular profiling data from our platform is a key component of the overall time to personalized therapeutic delivery. With technology innovation, laboratory automation, and operational optimization, we have been able to achieve rapid turnaround time for our partners of less than two weeks in most cases, and for some in as few as seven days. Our ability to achieve rapid turnaround provides a large benefit to customers in this area.

- **Proactive approach with the FDA.** Because the area of personalized therapy is still being defined from a regulatory standpoint, we have taken a proactive approach to working with the FDA. To enable our partners in this space, we have filed a Device Master File with the FDA that our customers can refer to in their IND submissions. This document details the technology underlying our platform as well as the validation that has been performed.

**Diagnostic Applications**

Over time, we also expect to work with our biopharmaceutical customers and research collaborators to build evidence of clinical utility for our platform as a diagnostic for advanced cancer therapies. We see a growing long-term diagnostic opportunity for NeXT as a one-stop, universal tumor molecular profiling test for cancer patients covering all of the approximately 20,000 human genes compared to the roughly 50 to 500 genes covered by many currently marketed panels. We are planning to release a diagnostic based on our NeXT Platform that we envision being used with biopharmaceutical and clinical partners. This product analyzes FFPE tumor samples with our NeXT Platform and returns a CLIA diagnostic report for physicians that details the therapeutic options for patient-based on the tumor mutations identified from our analysis of the sample. We also see this product as one that will help us build our internal NeXT database over time. We estimate that the total addressable market in the United States and the European Union for oncology clinical diagnostic testing was $14.4 billion in 2018. See the section titled “Market, Industry, and Other Data” for additional information regarding the data, sources, and assumptions we used for this estimate.

**Commercialization Strategy**

We commercialize our products in the United States and Europe through our targeted sales organization. In 2018, we derived substantially all of our revenues from our customers in the United States. Our sales representatives have extensive experience in enterprise/consultative selling in the genomics space. We augment this team with Ph.D.-level Field Application Specialists that provide deep understanding and expertise in the areas of oncology and genomics applications, ensuring top-quality pre- and post-sales customer support. Our commercial efforts are focused on demonstrating the value proposition of the NeXT Platform to biopharmaceutical customers with the goal of both increasing utilization of the product at existing accounts and to drive adoption in new targeted accounts. Our entire commercial organization promotes our ability to support biopharmaceutical customers across several application areas including biomarker discovery, new target discovery, therapy development, and treatment monitoring.

We anticipate that patients in clinical trials for cancer therapies will increasingly be tested pre-treatment and periodically afterwards to understand response to treatment in deep molecular detail, as their tumors evolve under therapeutic pressure. Although the majority of our revenues come from single time point testing, we believe our revenues from multiple time point testing will continue to grow. We also derive revenues from analysis of multiple customer samples from the same patient and time point to assess genetic differences between the primary tumor and metastases. Given the value of comprehensive genomic information from multiple time points or samples, we anticipate that our revenue, and the available market, will continue to grow.

As the clinical utility of advanced biomarkers is further established, we expect there to be a patient-centered diagnostic opportunity whereby some patients would be guided to personalized therapies. We believe that our platform’s ability to support biomarkers for a broad range of therapeutics positions us to be a leader in therapy selection for patients. We are currently developing this diagnostic and we anticipate launch, initially for use in biopharmaceutical clinical trials, in 2019.

**Material Agreements**

***VA MVP Agreement***

On September 28, 2017, we entered into a contract with the VA for the VA MVP to provide them with a combination of whole genome sequencing services (the "VA MVP Agreement"). The performance period for the services includes a base period of one year (September 2017 to August 2018), with three one-year renewal option periods that may be exercised upon discretion of the VA MVP (September 2018 to August 2019; September 2019 to August 2020; and September 2020 to August 2021). Each task order issued against the VA MVP Agreement has a separate period of performance and is subject to the terms and conditions of the VA MVP Agreement. Funds are obligated by the VA MVP under each task order based on actual needs.

All materials and samples utilized during the course of the VA MVP Agreement and all data first produced or delivered under the VA MVP Agreement are the sole property of the VA MVP. Under the VA MVP Agreement, we are subject to confidentiality and security obligations, as well as various obligations upon events of default.

The VA MVP may terminate the VA MVP Agreement, or any part thereof, at its sole convenience. Subject to the terms of the VA MVP Agreement, we shall be paid a percentage of the contract price reflecting the percentage of the work performed prior to the notice of termination, plus reasonable charges that we can demonstrate have resulted from the termination.

The VA MVP may terminate the VA MVP Agreement, or any part thereof, for cause in the event of any default by us, or if we fail to comply with any contract terms and conditions, or fail to provide the VA MVP, upon request, with adequate assurances of future performance. In the event of termination for cause, the VA MVP shall not be liable to us for any amount for supplies or services not accepted, and we shall be liable to the VA MVP for any and all rights and remedies provided by law. If it is determined that the VA MVP improperly terminated this contract for default, such termination shall be deemed a termination for convenience.

***Agreements with Illumina***

On March 21, 2017 we received a quotation for supply of genetic analysis products (the "Quote") from Illumina. The Quote provided information as to the cost of five Illumina® Product Care NovaSeq®6000 Comprehensive Plans and five NovaSeq™6000 Sequencing System instruments. The term of the Quote extended through March 31, 2017. On March 31, 2017, we submitted a purchase order to Illumina for five NovaSeq™6000 Sequencing System instruments, all of which we have received. On March 1, 2019, we received another quotation for supply of genetic analysis products (the "Second Quote") from Illumina. The Second Quote provided information as to the cost of five Illumina® Product Care NovaSeq®6000 Comprehensive Plans and five NovaSeq™6000 Sequencing System instruments. The term of the Second Quote extended through March 31, 2019. On March 20, 2019, we submitted a purchase order to Illumina for five NovaSeq™6000 Sequencing System instruments, one of which we have received and four of which will be received on or before the due date of March 23, 2023.

On November 1, 2017, we entered into a master services subcontract agreement (the "Subcontract Agreement") with Illumina. Under the terms of the Subcontract Agreement, we engaged Illumina as our subcontractor to perform certain genotyping services (the "Services") on our behalf pursuant to written purchase orders in fulfillment of our VA MVP Agreement. The price for Illumina's Services set forth in the Subcontract Agreement is effective through December 31, 2021, or later if the VA MVP Agreement is extended.

The Subcontract Agreement extends through the last day of the VA MVP Agreement, currently August 2021 but as may be extended, unless it is otherwise terminated early pursuant to its terms. All or part of the Subcontract Agreement may be terminated at our convenience in the event that the VA MVP terminates the VA MVP Agreement or terminates the part of the VA MVP Agreement that affects the Services provided by

Illumina. Each party may terminate the Subcontract Agreement for default in the event that the other party materially fails to perform any of the provisions of the Subcontract Agreement, materially fails to make progress so as to endanger performance of the Subcontract Agreement in accordance with its terms, or becomes financially or legally incapable of completing the work and does not provide a plan of correction or recovery within the provided period of time to cure such failure. The Subcontract Agreement may be renewed for subsequent one-year terms as agreed by the parties subject to a four-year limit.

On November 22, 2017, we entered into a pricing agreement with Illumina. The pricing agreement provided pricing terms for the NovaSeq™ 5000/6000 S4 Reagent Kit (each, a "Kit"). On March 26, 2019, we entered into a new pricing agreement with Illumina, which replaced in its entirety the agreement dated November 22, 2017. The new pricing agreement has a purchase commitment of $1.7 million by June 30, 2019 to purchase these Kits. The term of the pricing agreement extends through December 31, 2022.

On December 13, 2017, we received a Fast Track genetic analysis services agreement (the "Services Agreement") from Illumina that provides pricing information for the Infinium Global Screening Array V2.0 Fast Track Service. The term of the Services Agreement extends through June 30, 2019.

On February 22, 2019 we received a quotation for supply of genetic analysis products (the "Master Quote") from Illumina that provides for additional pricing terms on Illumina products. The term of the Master Quote extends through February 14, 2020.

**Competition**

We provide a comprehensive, exome-scale analysis of both a tumor and its microenvironment, including the immune cells, from a single tissue sample.

Our primary competition comes from companies offering genomic profiling services for either the tumor or the immune microenvironment. These companies offer services that implement various technological approaches including next-generation sequencing and microarray analyses. These competitors include Guardant Health, Inc., Foundation Medicine, Inc., which was acquired by Roche Holdings, Inc. in July 2018, Roche Molecular Systems, Inc., NanoString Technologies, Inc., Personal Genome Diagnostics, Inc., and Adaptive Biotechnologies Corporation.

Competitors within the broader genomics profiling space include laboratory companies such as Laboratory Corporation of America Holdings, Quest Diagnostics, Inc., Caris Life Sciences, Inc., Myriad Genetics, Inc., Tempus, Inc., InVitae Corp., BGI Group, Macrogen, Inc., Natera, Inc., Illumina, Thermo Fisher Scientific Inc., and MedGenome Inc. Additionally, several companies develop next-generation sequencing platforms that can be used for genomic profiling for biopharmaceutical research and development applications. These include Illumina, Thermo Fisher Scientific Inc., and other organizations that specialize in the development of next-generation sequencing instrumentation that can be sold directly to biopharmaceutical companies, clinical laboratories, and research centers. Separate from their instrumentation product lines, both Illumina and Thermo Fisher Scientific Inc., for example, currently market next-generation sequencing clinical oncology kits that are sold to customers who have bought and operate their respective sequencing instruments.

We believe that we compete favorably because of the integrity and comprehensiveness of the data generated by our NeXT Platform. Maximizing insights into both the tumor- and immune-related components of the tumor microenvironment is essential in identifying and understanding the reasons why certain cancer patients respond more favorably to oncology therapies than others. It is via access to such a comprehensive dataset for each patient that our customers can begin to discover new, clinically relevant biomarkers for the immunotherapy era, and ultimately improve cancer patient outcomes with the development of more efficacious therapeutics.

**Intellectual Property**

Protection of our intellectual property is fundamental to the long-term success of our business. Specifically, our success is dependent on our ability to obtain and maintain proprietary protection for our technology and the know-how related to our business, defend and enforce our intellectual property rights, and operate our business without infringing, misappropriating, or otherwise violating valid and enforceable intellectual property rights of others. We seek to protect our investments made into the development of our technology by relying on a combination of patents, trademarks, copyrights, trade secrets, know-how, confidentiality agreements and procedures, non-disclosure agreements with third parties, employee disclosure and invention assignment agreements, and other contractual rights.

Our patent strategy is focused on seeking coverage for our core technology, our ACE assay, and specific follow-on applications and implementations for enhancing sequencing coverage of certain genomic regions and analyzing cell-free nucleic acids. In addition, we file for patent protection on our ongoing research and development, particularly other novel assay technologies which may be applicable in cancer cases and other diseases.

Notwithstanding these efforts, we cannot be sure that patents will be granted with respect to any patent applications we have filed or may license or file in the future, and we cannot be sure that any patents we have or may be licensed or granted to us in the future, will not be challenged, invalidated, or circumvented, or that such patents will be commercially useful in protecting our technology. Moreover, we rely, in part, on trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection. However, trade secrets can be difficult to protect. While we take steps to protect and preserve our trade secrets, including by entering into confidentiality agreements with our employees, consultants, scientific advisors, and contractors, and maintaining physical security of our premises and physical and electronic security of our information technology systems, such measures can be breached, and we may not have adequate remedies for any such breach. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. For more information regarding the risks related to our intellectual property, please see “Risk Factors—Risks Related to Our Intellectual Property.”

Our patent portfolio is comprised of patents and patent applications owned by the company. These patents and patent applications generally fall into four broad categories:

- our ACE assay technology, including claims directed to methods for enriching sample nucleic acids based on differences in GC-content, molecular size, presence of genetic variations or rearrangements, epigenetic modifications, and species-origin (e.g., human and non-human);
- hybrid exome-genome technologies, including claims directed to methods for combining exome and genome sequencing data generated from a sample to identify polymorphisms;
- liquid biopsy methods, including claims directed to methods of analyzing sequenced cell-free and leukocyte-derived nucleic acids in a blood sample to identify a tissue source, or recommend a drug treatment; and
- clinical interpretation methods, including claims directed to methods of ranking genes associated with a phenotype and inheritance pattern.

As of May 9, 2019, we own ten issued U.S. and foreign patents in China and the United Kingdom and several pending U.S. and foreign patent applications. Issued U.S. patents in our portfolio of company-owned patents and patent applications are expected to expire between 2033 and 2035, excluding any additional term for patent term adjustments or patent term extensions.

## Government Regulations

### *Federal and State Laboratory Licensing Requirements*

Under the Clinical Laboratory Improvement Amendments of 1988 ("CLIA"), a laboratory is any facility that performs laboratory testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention or treatment of disease, or the impairment of or assessment of health. CLIA requires that a laboratory hold a certificate applicable to the type of laboratory examinations it performs and that it complies with, among other things, standards covering operations, personnel, facilities administration, quality systems and proficiency testing, which are intended to ensure, among other things, that clinical laboratory testing services are accurate, reliable and timely.

To renew our CLIA certificate, we are subject to survey and inspection every two years to assess compliance with program standards. Because we are a College of American Pathologists ("CAP") accredited laboratory, the Centers for Medicare & Medicaid Services ("CMS") does not perform this survey and inspection and relies on our CAP survey and inspection. We also may be subject to additional unannounced inspections. Laboratories performing high complexity testing are required to meet more stringent requirements than laboratories performing less complex tests. In addition, a laboratory that is certified as "high complexity" under CLIA may develop, manufacture, validate, and use proprietary tests referred to as laboratory developed tests ("LDTs"). CLIA requires analytical validation including accuracy, precision, specificity, sensitivity, and establishment of a reference range for any LDT used in clinical testing. The regulatory and compliance standards applicable to the testing we perform may change over time, and any such changes could have a material effect on our business.

CLIA provides that a state may adopt laboratory regulations that are more stringent than those under federal law, and a number of states have implemented their own more stringent laboratory regulatory requirements. State laws may require that nonresident laboratories, or out-of-state laboratories, maintain an in-state laboratory license to perform tests on samples from patients who reside in that state. As a condition of state licensure, these state laws may require that laboratory personnel meet certain qualifications, specify certain quality control procedures or facility requirements, or prescribe record maintenance requirements. Because our laboratory is located in the state of California, we are required to and do maintain a California state laboratory license. We also maintain licenses to conduct testing in other states where nonresident laboratories are required to obtain state laboratory licenses. We maintain a current license with the New York State Department of Health for our laboratory. Other states may currently have or adopt similar licensure requirements in the future, which may require us to modify, delay, or stop its operations in those states.

Failure to comply with CLIA certification and state clinical laboratory licensure requirements may result in a range of enforcement actions, including certificate or license suspension, limitation, or revocation, directed plan of action, onsite monitoring, civil monetary penalties, criminal sanctions, and revocation of the laboratory's approval to receive Medicare and Medicaid payment for its services, as well as significant adverse publicity.

### *Regulatory framework for medical devices in the United States*

Pursuant to its authority under the Federal Food, Drug and Cosmetic Act (the "FDC Act"), the FDA has jurisdiction over medical devices, which are defined to include, among other things, in vitro diagnostic devices ("IVDs"). The FDA regulates, among other things, the research, design, development, pre-clinical and clinical testing, manufacturing, safety, effectiveness, packaging, labeling, storage, recordkeeping, pre-market clearance or approval, adverse event reporting, marketing, promotion, sales, distribution, and import and export of medical devices. Unless an exemption applies, each new or significantly modified medical device we seek to commercially distribute in the United States will require either a premarket notification to the FDA requesting permission for commercial distribution under Section 510(k) of the FDC Act, also referred to as a 510(k) clearance, or approval from the FDA of a PMA. Both the 510(k) clearance and PMA processes can be resource intensive, expensive, and lengthy, and require payment of significant user fees.

*FDA Regulation of Laboratory Developed Tests*

Although the FDA regulates medical devices, including IVDs, the FDA has historically exercised its enforcement discretion and not enforced applicable provisions of the FDC Act and FDA regulations with respect to LDTs, which are a subset of IVDs that are intended for clinical use and developed, validated, and offered within a single laboratory for use only in that laboratory. We currently intend to market a diagnostic test based on the NeXT Platform as an LDT. As a result, we believe our diagnostic services are not currently subject to the FDA's enforcement of its medical device regulations and the applicable FDC Act provisions.

Legislative and administrative proposals addressing oversight of LDTs were introduced in recent years and we expect that new legislative and administrative proposals will be introduced from time to time. It is possible that legislation could be enacted into law or regulations or guidance could be issued by the FDA, which may result in new or increased regulatory requirements for us to continue to offer our LDTs or to develop and introduce new tests as LDTs. For example, in 2014 the FDA issued two draft guidance documents proposing a risk-based framework with respect to applying the FDA's oversight over LDTs. The framework guidance stated that the FDA intended to modify its policy of enforcement discretion with respect to LDTs in a risk-based manner consistent with the existing classification of medical devices. Thus, the FDA planned to begin to enforce its medical device requirements, including premarket submission requirements, on LDTs that have historically been marketed without FDA premarket review and oversight. In November 2016, the FDA announced its intention not to finalize the 2014 draft guidance to allow for further public discussion on an appropriate oversight approach to LDTs and to give congressional authorizing committees the opportunity to develop a legislative solution. In January 2017, the FDA issued a discussion paper on possible approaches to the regulation of LDTs.

***Federal and State Fraud and Abuse Laws***

We are subject to federal fraud and abuse laws such as the federal Anti-Kickback Statute (the "AKS"), the federal prohibition against physician self-referral (the "Stark Law"), and the federal false claims law, or the False Claims Act (the "FCA"). We are also subject to similar state and foreign fraud and abuse laws.

The AKS prohibits, among other things, knowingly and willfully offering, paying, soliciting, or receiving remuneration, directly or indirectly, overtly or covertly, in cash or in kind, in return for or to induce such person to refer an individual, or to purchase, lease, order, arrange for, or recommend purchasing, leasing, or ordering, any good, facility, item, or service that is reimbursable, in whole or in part, under a federal healthcare program.

The Stark Law and similar state laws, including California's Physician Ownership and Referral Act, generally prohibit, among other things, clinical laboratories and other entities from billing a patient or any governmental or commercial payer for any diagnostic services when the physician ordering the service, or any member of such physician's immediate family, has a direct or indirect investment interest in or compensation arrangement with us, unless the arrangement meets an exception to the prohibition.

Other federal fraud and abuse laws to which we are subject include, but are not limited to, the federal civil and criminal false claims laws including the FCA, which imposes liability on any person or entity that, among other things, knowingly presents, or causes to be presented, a false or fraudulent claim for payment to the federal government, and the federal Civil Monetary Penalties Law, which prohibits, among other things, the offering or transfer of remuneration to a Medicare or state healthcare program beneficiary if the person knows or should know it is likely to influence the beneficiary's selection of a particular provider, practitioner, or supplier of services reimbursable by Medicare or a state healthcare program, unless an exception applies. Under the FCA, private citizens can bring claims on behalf of the government through qui tam actions. We must also operate within the bounds of the fraud and abuse laws of the states in which we do business which may apply to items or services reimbursed by non-governmental third-party payers, including private insurers.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, imprisonment, exclusion from government-funded healthcare programs, such as Medicare and Medicaid, disgorgement, contractual damages, reputational harm, diminished profits and future earnings, additional reporting, or oversight obligations if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with the law and the curtailment or restructuring of our operations. If any of the physicians or other healthcare providers or entities with whom we do business is found to be not in compliance with applicable laws, they may be subject to significant criminal, civil or administrative sanctions, including exclusions from government-funded healthcare programs.

***HIPAA and HITECH***

Under the administrative simplification provisions of the Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), as amended by the Health Information Technology for Economic and Clinical Health Act "HITECH"), the U.S. Department of Health and Human Services ("HHS") issued regulations that establish uniform standards governing the conduct of certain electronic healthcare transactions and requirements for protecting the privacy and security of protected health information ("PHI"), used or disclosed by covered entities and business associates. Covered entities and business associates are subject to HIPAA and HITECH. Our subcontractors that create, receive, maintain, transmit, or otherwise process PHI on behalf of us are HIPAA "business associates" and must also comply with HIPAA as a business associate.

HIPAA and HITECH include privacy and security rules, breach notification requirements, and electronic transaction standards.

The Privacy Rule covers the use and disclosure of PHI by covered entities and business associates. The Privacy Rule generally prohibits the use or disclosure of PHI, except as permitted under the Rule. The Privacy Rule also sets forth individual patient rights, such as the right to access or amend certain records containing his or her PHI, or to request restrictions on the use or disclosure of his or her PHI.

The Security Rule requires covered entities and business associates to safeguard the confidentiality, integrity, and availability of electronically transmitted or stored PHI by implementing administrative, physical, and technical safeguards. Under HITECH's Breach Notification Rule, a covered entity must notify individuals, the Secretary of the HHS, and in some circumstances, the media of breaches of unsecured PHI.

In addition, we may be subject to state health information privacy and data breach notification laws, which may govern the collection, use, disclosure, and protection of health-related and other personal information. California, for example, has enacted the Confidentiality of Medical Information Act, which sets forth standards in addition to HIPAA and HITECH with which all California health care providers like us must abide. State laws may be more stringent, broader in scope, or offer greater individual rights with respect to PHI than HIPAA, and state laws may differ from each other, which may complicate compliance efforts.

Entities that are found to be in violation of HIPAA as the result of a failure to secure PHI, a complaint about our privacy practices or an audit by HHS, may be subject to significant civil and criminal fines and penalties and additional reporting and oversight obligations if such entities are required to enter into a resolution agreement and corrective action plan with HHS to settle allegations of HIPAA non-compliance.

***U.S. Healthcare Reform***

In the United States, there have been a number of legislative and regulatory changes at the federal and state levels that seek to reduce healthcare costs and improve the quality of healthcare. For example, in March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (collectively, the "ACA"), became law. This law substantially changed the way health care is financed by both commercial payers and government payers, and significantly impacted our industry. The ACA contained a number of provisions expected to impact the clinical laboratory industry, such as changes governing enrollment in state and federal health care programs, reimbursement changes, and fraud and abuse.

Some of the provisions of the ACA have yet to be implemented, and there have been judicial and Congressional challenges to certain aspects of the ACA, as well as recent efforts by the Trump administration to repeal or replace certain aspects of the ACA. Since January 2017, President Trump has signed two executive orders and other directives designed to delay the implementation of certain provisions of the ACA. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, it has enacted laws that modify certain provisions of the ACA such as removing penalties, starting January 1, 2019, for not complying with the ACA's individual mandate to carry health insurance and delaying the implementation of certain ACA-mandated fees. On December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Cuts and Jobs Act of 2017. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA.

We anticipate there will continue to be proposals by legislators at both the federal and state levels, regulators and commercial payers to reduce costs while expanding individual healthcare benefits. Certain of these changes could impose additional limitations on the prices we will be able to charge for our tests, the coverage of or the amounts of reimbursement available for our tests from payers, including commercial payers and government payers.

**Our Employees**

As of March 31, 2019, we had 147 full-time employees, with 64 in research and development, 47 in laboratory operations, 19 in commercial operations and 17 in general and administrative functions. Of these full-time employees, 144 are located in the United States (including 135 who work at our corporate headquarters in Menlo Park, California and 9 who work remotely) and three are located in the United Kingdom and Germany. As of March 31, 2019, more than 60 of our full-time employees had completed a Ph.D. or other advanced science or medical degree.

None of our employees is represented by a labor union or covered by collective bargaining agreements, and we have not experienced any work stoppages. We consider our relations with our employees to be good.

**Our Facilities**

Our corporate headquarters are located in Menlo Park, California, and comprise approximately 31,280 square feet of space, pursuant to an operating lease that expires in 2020. This lease includes an option to extend for an additional three years, at market rates that prevail at the time of our election to extend. Our CLIA-certified laboratory is located in this facility.

We believe that this facility is sufficient to meet our current needs. We also believe we will be able to obtain additional space, as needed, on commercially reasonable terms.

**Legal Proceedings**

From time to time, we are involved in various legal proceedings arising from the normal course of business activities. We are not presently a party to any litigation the outcome of which, we believe, if determined adversely to us, would individually or taken together have a material adverse effect on our business, operating results, cash flows, or financial condition. Defending such proceedings is costly and can impose a significant burden on management and employees, we may receive unfavorable preliminary or interim rulings in the course of litigation, and there can be no assurances that favorable final outcomes will be obtained.

## MANAGEMENT

The following table sets forth information for our executive officers and directors as of March 31, 2019:

| Name | Age | Position |
|---|---|---|
| ***Executive Officers*** | | |
| John West | 62 | President, Chief Executive Officer and Director |
| Richard Chen, M.D., M.S. | 48 | Chief Scientific Officer |
| Clinton Musil | 38 | Chief Business Officer |
| Aaron Tachibana | 58 | Chief Financial Officer |
| ***Non-Employee Directors*** | | |
| Patrick Balthrop | 62 | Director |
| A. Blaine Bowman | 73 | Director |
| Alan Colowick, M.D. | 56 | Director |
| Kenneth Ludlum | 65 | Director |
| Jonathan MacQuitty, Ph.D. | 66 | Chairman of the Board |
| Paul Ricci | 62 | Director |

(1) Member of the audit committee.
(2) Member of the compensation committee.
(3) Member of the nominating and corporate governance committee.

### Executive Officers

***John West.*** Mr. West is one of our founders and has served as Chief Executive Officer and as a member of our board of directors since August 2011. From May 2009 to July 2011, Mr. West served as Chief Executive Officer of ViaCyte, Inc., a regenerative medicine company. From August 2004 to January 2008, Mr. West served in various roles, including Chief Executive Officer from August 2004 to March 2005 at Solexa, Ltd., a DNA sequencing company, which became Solexa, Inc., Chief Executive Officer from March 2005 to January 2007 at Solexa, Inc., and Senior Vice President of DNA Sequencing from January 2007 to January 2008 at Illumina, Inc., a biotechnology company, after the sale of Solexa, Inc. to Illumina, Inc. Mr. West's earlier career included positions related to DNA sequencing automation. Mr. West holds a B.S. in Nuclear Engineering and an M.S. in Mechanical Engineering from Massachusetts Institute of Technology and an M.B.A. from the Wharton School at the University of Pennsylvania. Mr. West was selected to serve on our board of directors because of the perspective and experience he brings as our Chief Executive Officer and his operating and management experience in the healthcare technology industry, particularly related to DNA sequencing and its applications.

***Richard Chen, M.D., M.S.*** Dr. Chen has served as our Chief Scientific Officer since November 2011. Since September 2011, Dr. Chen has served on the clinical faculty at Stanford University School of Medicine where he leads process and technology innovation for improved health care delivery. In August 1997, Dr. Chen co-founded Ingenuity Systems, a genomic data software company, and served on its board of directors from August 1997 to June 2008. Dr. Chen holds a B.S. in Computer Science from Stanford University, an M.S. in Medical Informatics from Stanford University School of Medicine, and an M.D. from Stanford University School of Medicine.

***Clinton Musil.*** Mr. Musil has served as our Chief Business Officer since December 2018. From September 2017 to July 2018, Mr. Musil served as Vice President, Corporate Development at ARMO Biosciences, an immuno-oncology company that was acquired by Eli Lilly and Company. From July 2017 to September 2017, Mr. Musil served as a Managing Director at Hercules Capital, an investment firm. From September 2014 to

March 2017, Mr. Musil served as a Vice President in the Healthcare Investment Banking Group at Deutsche Bank AG, an investment bank. From July 2013 to July 2014, Mr. Musil served as a Vice President in the Healthcare Investment Banking Group at Wells Fargo & Company, an investment bank. Earlier in his career, Mr. Musil was an investor at Essex Woodlands, a healthcare-focused investment fund. Mr. Musil holds a B.S. in Molecular and Cellular Biology from the University of Arizona and an M.B.A. from Harvard Business School.

***Aaron Tachibana.*** Mr. Tachibana has served as our Chief Financial Officer since March 2019. From August 2015 to September 2018, Mr. Tachibana served as Chief Financial Officer at Lumentum Holdings Inc., a designer and manufacturer of optical and photonic products. From November 2013 to July 2015, Mr. Tachibana served as Vice President, Finance and Corporate Controller at JDS Uniphase Corp., subsequently renamed Viavi Solutions Inc., a network test, measurement, and assurance technology company. From March 2010 to October 2013, Mr. Tachibana served as Chief Financial Officer at Pericom Semiconductor Corp., a supplier of high-performance connectivity and timing solutions. Mr. Tachibana holds a B.S. in Business Administration and Finance from San Jose State University.

**Non-Employee Directors**

***Patrick Balthrop*.** Mr. Balthrop has served on our board of directors since July 2015. Since February 2016, Mr. Balthrop has served on the board of directors of Oxford Immunotec Global PLC, a diagnostics company. Since January 2015, Mr. Balthrop has been the Founding Principal of Apalachee Ventures, LLC, an investment and advisory firm. From September 2004 to October 2014, Mr. Balthrop served on the board of directors and as Chief Executive Officer, President, and Director of Luminex Corporation, a diagnostics, tools, and devices company. Mr. Balthrop holds a B.S. in Biology from Spring Hill College and an M.B.A. from the Kellogg School of Management at Northwestern University. Mr. Balthrop was selected to serve on our board of directors because of his management experience in the healthcare and medical device industry.

***A. Blaine Bowman.*** Mr. Bowman has served on our board of directors since May 2019. Beginning in 2006, Mr. Bowman served on the board of directors of Solexa, Inc., a DNA sequencing company, until its sale to Illumina, Inc., a biotechnology company, after which Mr. Bowman continued to serve on the board of directors until May 2018. From March 1977 to August 2005, Mr. Bowman served in various roles at Dionex Corporation, a manufacturer of analytical instruments, including Chairman of the board of directors, President, and Chief Executive Officer, and he served on the board of directors until its sale to Thermo Fisher Scientific Inc. in May 2011. From July 2012 to December 2015, Mr. Bowman served on the board of directors of Altera Corporation, a programmable logic devices company. Mr. Bowman holds a B.S. in Physics from Brigham Young University and an M.B.A. from the Stanford Graduate School of Business. Mr. Bowman was selected to serve on our board of directors because of his experience in executive roles and his experience serving on the boards of directors of various instrumentation and biotechnology companies.

***Alan Colowick, M.D.*** Dr. Colowick has served on our board of directors since May 2019. Since May 2017, Dr. Colowick has served as a Partner at Sofinnova Investment, Inc., a clinical stage life sciences venture capital firm. From February 2010 to April 2017, Dr. Colowick held various positions, including Executive Vice President, at Celgene Corporation, a pharmaceutical company. From February 2008 to January 2010, Dr. Colowick served as the Chief Executive Officer of Gloucester Pharmaceuticals Inc., an early stage cancer pharmaceutical company, until its acquisition by Celgene Corporation in January 2010. From 2006 to 2008, Dr. Colowick served as President, Oncology at Geron Corporation, an early stage pharmaceutical company. Earlier in his career, Dr. Colowick served in various capacities at Amgen Inc., a biopharmaceutical company, and Harvard Medical School. Dr. Colowick has served on the board of directors of Human Longevity, Inc., a genomics-based health intelligence company, since June 2016, and has served on the board of directors of Principia Biopharma Inc., a biopharmaceutical company, since February 2017. Dr. Colowick previously served on the board of directors of Achaogen, Inc., a biopharmaceutical company, from August 2015 to August 2017, and on the board of directors of Dimension Therapeutics, Inc., a biopharmaceutical company, from August 2015 to November 2017. Dr. Colowick holds a B.S. in Molecular Biology from the University of Colorado, an M.D.

from Stanford University School of Medicine, and an M.P.H. from the Harvard School of Public Health. Dr. Colowick was selected to serve on our board of directors because of his educational background in sciences, as well as financial understanding of the biotechnology industry gained from his investing experience.

***Kenneth Ludlum.*** Mr. Ludlum has served on our board of directors since July 2015. Since January 2002, Mr. Ludlum has served on the board of directors of NATUS Medical, Inc., a medical device and equipment company. From February 2014 to April 2016, Mr. Ludlum served as Chief Financial Officer at CareDx, a molecular diagnostics company. Mr. Ludlum holds a B.S. in Business Administration from Lehigh University and an M.B.A. from Columbia Business School. Mr. Ludlum was selected to serve on our board of directors because of his experience working for and with healthcare, medical device, biotechnology, and diagnostic companies and his expertise in finance, accounting, and general management.

***Jonathan MacQuitty, Ph.D.*** Dr. MacQuitty has served on our board of directors since June 2011, presently serves as Chairman of our board of directors, and previously served as Chairman of our board of directors from November 2011 to February 2019. Since July 2018, Dr. MacQuitty has served on the board of directors of and as Chief Executive Officer of D2G Oncology, Inc., an oncology biotechnology company. Since April 2016, Dr. MacQuitty has served as a Venture Partner at Lightspeed Venture Partners, an early-stage technology venture capital firm. From May 2015 to April 2017, Dr. MacQuitty served as Chief Executive Officer of Forty Seven, Inc., an immuno-oncology company. From May 1999 to December 2014, Dr. MacQuitty served in various roles, including Partner, at Abingworth Management Inc., a trans-Atlantic bio-investment firm. Dr. MacQuitty holds a B.A. and M.A. in Chemistry from Oxford University, a Ph.D. in Chemistry from the University of Sussex, and an M.B.A. from the Stanford Graduate School of Business. Dr. MacQuitty was selected to serve on our board of directors because of his operational experience in life science companies.

***Paul Ricci.*** Mr. Ricci has served on our board of directors since February 2019 and previously served as Chairman of our board of directors from February 2019 to May 2019. Since October 2018, Mr. Ricci has served as an Advisor to Lightspeed Venture Partners, an early-stage technology venture capital firm. Since September 2018, Mr. Ricci has served as an Advisor to Warburg Pincus, a private equity firm. Mr. Ricci served as Chief Executive Officer of Nuance Communications, Inc., a computer software technology company, from August 2000 to March 2018 and as its Chairman from March 1999 to February 2018. Mr. Ricci holds a B.A. and an M.A. in Economics from Stanford University. Mr. Ricci was selected to serve on our board of directors because of his management abilities and experience.

**Composition of Our Board of Directors**

Our business and affairs are managed under the direction of our board of directors. We currently have seven directors. The current members of our board of directors were elected pursuant to our current certificate of incorporation, as amended, and under the provisions of our amended and restated voting agreement, which requires the stockholders who are party to the agreement to vote their respective shares of our capital stock to elect directors as follows:

- John West, as the individual serving as our Chief Executive Officer and elected by the holders of our common stock;
- A. Blaine Bowman, as the individual designated by Abingworth Bioventures V LP and elected by the holders of our preferred stock;
- Jonathan MacQuitty, Ph.D., as the individual designated by Lightspeed General Partner VIII, L.P. and elected by the holders of our preferred stock;
- Paul Ricci, as the individual jointly designated by Abingworth Bioventures V LP and Lightspeed General Partner VIII, L.P. and elected by the holders of our preferred stock; and
- Patrick Balthrop, Alan Colowick, M.D., and Kenneth Ludlum, as independent individuals designated by our board of directors and elected by the holders of our capital stock.

The provisions of our amended and restated voting agreement relating to the election of our directors will terminate and the provisions of our current certificate of incorporation by which our directors were elected will be amended and restated in connection with this offering. After the closing of this offering, the number of directors will be fixed by our board of directors, subject to the terms of our amended and restated certificate of incorporation and amended and restated bylaws that will become effective immediately prior to the closing of this offering. Each of our current directors will continue to serve as a director until the election and qualification of their successor, or until their earlier death, resignation, or removal.

Our board of directors may establish the authorized number of directors from time to time by resolution. In accordance with our amended and restated certificate of incorporation that will be in effect on the closing of this offering, immediately after this offering our board of directors will be divided into three classes with staggered three-year terms. At each annual general meeting of stockholders, the successors to directors whose terms then expire will be elected to serve from the time of election and qualification until the third annual meeting following election. Our directors will be divided among the three classes as follows:

- the Class I directors will be and , and their terms will expire at our first annual meeting of stockholders following this offering;
- the Class II directors will be and , and their terms will expire at our second annual meeting of stockholders following this offering; and
- the Class III directors will be , , and , and their terms will expire at our third annual meeting of stockholders following this offering.

We expect that any additional directorships resulting from an increase in the number of directors will be distributed among the three classes so that, as nearly as possible, each class will consist of one third of the directors. The division of our board of directors into three classes with staggered three-year terms may delay or prevent a change of our management or a change in control.

**Director Independence**

Our board of directors has undertaken a review of the independence of each director. Based on information provided by each director concerning his background, employment, and affiliations, our board of directors has determined that Messrs. Balthrop, Bowman, Ludlum, and Ricci and Drs. Colowick and MacQuitty do not have relationships that would interfere with the exercise of independent judgment in carrying out the responsibilities of a director and that each of these directors is "independent" as that term is defined under the applicable listing standards. In making these determinations, our board of directors considered the current and prior relationships that each non-employee director has with our company and all other facts and circumstances our board of directors deemed relevant in determining their independence, including the beneficial ownership of our shares held by each non-employee director and the transactions described in the section titled "Certain Relationships and Related Party Transactions."

**Committees of Our Board of Directors**

Our board of directors has established an audit committee, a compensation committee, and a nominating and corporate governance committee. The composition and responsibilities of each of the committees of our board of directors are described below. Members serve on these committees until their resignation or until otherwise determined by our board of directors. Our board of directors may establish other committees as it deems necessary or appropriate from time to time.

***Audit Committee***

Our audit committee consists of Messrs. , and . Our board of directors has determined that each member of the audit committee satisfies the independence requirements under the Nasdaq

listing standards and Rule 10A-3(b)(1) of the Exchange Act. The chair of our audit committee is Mr. . Our board of directors has determined that Mr. Ludlum is an "audit committee financial expert" within the meaning of SEC regulations. Each member of our audit committee can read and understand fundamental financial statements in accordance with applicable requirements. In arriving at these determinations, our board of directors has examined each audit committee member's scope of experience and the nature of their employment.

The primary purpose of the audit committee is to discharge the responsibilities of our board of directors with respect to our corporate accounting and financial reporting processes, systems of internal control and financial statement audits, and to oversee our independent registered public accounting firm. Specific responsibilities of our audit committee include:

- helping our board of directors oversee our corporate accounting and financial reporting processes;
- managing the selection, engagement, qualifications, independence, and performance of a qualified firm to serve as the independent registered public accounting firm to audit our financial statements;
- discussing the scope and results of the audit with the independent registered public accounting firm, and reviewing, with management and the independent accountants, our interim and year-end operating results;
- developing procedures for employees to submit concerns anonymously about questionable accounting or audit matters;
- reviewing related person transactions;
- obtaining and reviewing a report by the independent registered public accounting firm at least annually that describes our internal quality control procedures, any material issues with such procedures, and any steps taken to deal with such issues when required by applicable law; and
- approving or, as permitted, pre-approving, audit and permissible non-audit services to be performed by the independent registered public accounting firm.

Our audit committee will operate under a written charter, to be effective prior to the closing of this offering, that satisfies the applicable listing standards of Nasdaq.

***Compensation Committee***

Our compensation committee consists of Messrs. , and . The chair of our compensation committee is Mr. . Our board of directors has determined that each member of the compensation committee is independent under the listing standards of Nasdaq, and a "non-employee director" as defined in Rule 16b-3 promulgated under the Exchange Act.

The primary purpose of our compensation committee is to discharge the responsibilities of our board of directors in overseeing our compensation policies, plans and programs and to review and determine the compensation to be paid to our executive officers, directors and other senior management, as appropriate. Specific responsibilities of our compensation committee include:

- reviewing and recommending to our board of directors the compensation of our chief executive officer and other executive officers;
- reviewing and recommending to our board of directors the compensation of our directors;
- administering our equity incentive plans and other benefit programs;
- reviewing, adopting, amending, and terminating incentive compensation and equity plans, severance agreements, profit sharing plans, bonus plans, change-of-control protections, and any other compensatory arrangements for our executive officers and other senior management; and

- reviewing and establishing general policies relating to compensation and benefits of our employees, including our overall compensation philosophy.

Our compensation committee will operate under a written charter, to be effective prior to the closing of this offering, that satisfies the applicable listing standards of Nasdaq.

***Nominating and Corporate Governance Committee***

Our nominating and corporate governance committee consists of Messrs. and . The chair of our nominating and corporate governance committee is Mr. . Our board of directors has determined that each member of the nominating and corporate governance committee is independent under the listing standards of Nasdaq.

Specific responsibilities of our nominating and corporate governance committee include:

- identifying and evaluating candidates, including the nomination of incumbent directors for reelection and nominees recommended by stockholders, to serve on our board of directors;
- considering and making recommendations to our board of directors regarding the composition and chairmanship of the committees of our board of directors;
- developing and making recommendations to our board of directors regarding corporate governance guidelines and matters; and
- overseeing periodic evaluations of the board of directors' performance, including committees of the board of directors.

Our nominating and corporate governance committee will operate under a written charter, to be effective prior to the closing of this offering, that satisfies the applicable listing standards of Nasdaq.

**Code of Business Conduct and Ethics**

We have adopted a code of business conduct and ethics that applies to our directors, officers, and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. Upon the closing of this offering, our code of business conduct and ethics will be available under the Corporate Governance section of our website at https://www.personalis.com. In addition, we intend to post on our website all disclosures that are required by law or the listing standards of Nasdaq concerning any amendments to, or waivers from, any provision of the code. The reference to our website address does not constitute incorporation by reference of the information contained at or available through our website, and you should not consider it to be a part of this prospectus.

**Compensation Committee Interlocks and Insider Participation**

None of the members of the compensation committee is currently or has been at any time one of our officers or employees. None of our executive officers currently serves, or has served during the last year, as a member of the board of directors or compensation committee of any entity that has one or more executive officers serving as a member of our board of directors or compensation committee.

**Non-Employee Director Compensation**

During fiscal 2018, we did not pay cash compensation to any of our non-employee directors for service on our board of directors.

In April 2018, the board of directors granted a stock option to purchase 50,000 shares of our common stock to Mr. Balthrop at an exercise price per share of $0.95. The shares underlying the option vest in 12 equal monthly installments measured from August 17, 2018, subject to Mr. Balthrop's continuous service with us as of each such vesting date. In April 2018, the board of directors granted a stock option to purchase 50,000 shares of our common stock to Mr. Ludlum at an exercise price per share of $0.95. The shares underlying the option vest in 12 equal monthly installments measured from June 20, 2018, subject to Mr. Ludlum's continuous service with us as of each such vesting date. In April 2018, the board of directors granted a stock option to purchase 75,000 shares of our common stock to Dr. MacQuitty at an exercise price per share of $0.95. The shares underlying the option vest in 12 equal monthly installments measured from February 1, 2018, subject to Dr. MacQuitty's continuous service with us as of each such vesting date.

Upon a change in control (as defined in the 2011 Plan), the vesting of each option described above shall accelerate in full.

In addition, we have reimbursed and will continue to reimburse all of our non-employee directors for their reasonable out-of-pocket expenses incurred in attending board of directors and committee meetings.

The following table sets forth information regarding the compensation earned by or paid to our directors during the year ended December 31, 2018, other than John West, our President and Chief Executive Officer, who is also a member of our board of directors but did not receive any additional compensation for service as a director. The compensation of Mr. West as a named executive officer is set forth below under "Executive Compensation—Summary Compensation Table." Because each of A. Blaine Bowman, Alan Colowick, and Paul Ricci joined our board of directors in 2019 and did not earn or receive any compensation from us in 2018, Mr. Bowman, Dr. Colowick, and Mr. Ricci are not included in the following table.

| Name | Fees Earned or Paid in Cash ($) | Option Awards ($)(1) | Total ($) |
|---|---|---|---|
| Patrick Balthrop | — | 26,146 | 26,146 |
| Kenneth Ludlum | — | 26,146 | 26,146 |
| Jonathan MacQuitty, Ph.D. | — | 39,276 | 39,276 |
| Vincent Miles, Ph.D.(2) | — | — | — |
| Christopher Schaepe(3) | — | — | — |

(1) The amounts reported represent the aggregate grant date fair value of the stock options granted during fiscal 2018 under our 2011 Plan, computed in accordance with Financial Accounting Standards Board Accounting Standards Codification, Topic 718 ("ASC Topic 718"). The assumptions used in calculating the grant date fair value of the stock options reported in this column are set forth in the notes to our consolidated financial statements included elsewhere in this prospectus. This amount does not reflect the actual economic value that may be realized by the non-employee director.

(2) Dr. Miles resigned as a member of our board of directors on May 1, 2019.

(3) Mr. Schaepe resigned as a member of our board of directors on March 21, 2019.

## EXECUTIVE COMPENSATION

Our named executive officers for the fiscal year ended December 31, 2018, consisting of our principal executive officer and the next two most highly compensated executive officers, were:

- John West, our President and Chief Executive Officer;
- Clinton Musil, our Chief Business Officer; and
- Richard Chen, M.D., M.S., our Chief Scientific Officer.

### Summary Compensation Table

The following table presents all of the compensation awarded to, earned by, or paid to our named executive officers during the fiscal year ended December 31, 2018:

| Name | Year | Salary ($) | Bonus ($) | Option Awards ($)(1) | Non-Equity Incentive Plan Compensation(2) ($) | All Other Compensation ($) | Total ($) |
|---|---|---|---|---|---|---|---|
| John West<br>*President and Chief Executive Officer* | 2018 | 421,750 | — | 879,452 | 190,250(3) | — | 1,491,452 |
| Clinton Musil<br>*Chief Business Officer* | 2018(4) | 13,542 | — | 1,053,204 | — | — | 1,066,746 |
| Richard Chen, M.D., M.S.<br>*Chief Scientific Officer* | 2018 | 370,031 | — | 335,934 | 135,000 | — | 840,965 |

(1) The amounts disclosed represent the aggregate grant date fair value of the stock options granted to our named executive officers during fiscal 2018 under our 2011 Plan, computed in accordance with ASC Topic 718. The assumptions used in calculating the grant date fair value of the stock options are set forth in the notes to our audited consolidated financial statements included elsewhere in this prospectus. This amount does not reflect the actual economic value that may be realized by the named executive officer.

(2) The amount disclosed represents the executive officer's total performance bonus earned for fiscal 2018 as described below under "—Annual Bonus Plan."

(3) The amount disclosed represents the grant date fair value of a stock option granted to Mr. West in 2019 in lieu of a performance-based cash bonus earned with respect to fiscal 2018 performance as described below under "—Annual Bonus Plan."

(4) Mr. Musil began serving as our Chief Business Officer in December 2018.

### Annual Bonus Plan

Our executive officers are eligible to receive performance-based cash bonuses, which are designed to provide appropriate incentives to our executives to achieve defined performance goals and to reward our executives for individual achievement toward these goals. The performance-based bonus each executive officer is eligible to receive is generally based on the extent to which we achieve the corporate goals that our board or compensation committee establishes and is paid annually. Annually, the compensation committee of our board of directors reviews the company's performance and determines the actual bonus payout to be awarded to each of our eligible executive officers.

Bonuses based on fiscal 2017 performance were paid in April 2018. Because the compensation committee of our board of directors determined that the performance goals with respect to the fiscal 2017 bonuses were achieved at the 100% level, the 2017 bonuses were paid at the 100% level. Mr. West earned a bonus for fiscal 2017 performance based on our achievement of the relevant performance targets for Mr. West. At the request of

Mr. West, the board of directors determined to pay his 2017 bonus in the form of a fully vested stock option grant exercisable for 100,000 shares of common stock. Because Mr. Musil began his employment with us in December 2018, he was not eligible for any fiscal 2017 bonus. Dr. Chen earned a bonus for fiscal 2017 performance based on our achievement of the relevant performance targets for Dr. Chen and his 2017 bonus was paid in cash.

For fiscal 2018, Mr. West was eligible to receive a bonus at an annual target of 50% of salary earned during the year. For fiscal 2018, Dr. Chen was eligible to receive a bonus at an annual target of 30% of salary earned during the year.

**Employment Agreements**

We have entered into an employment agreement or offer letter with each of our named executive officers. Prior to the closing of this offering, we will enter into revised employment agreements with each of our named executive officers setting forth the terms and conditions of such executive's employment with us. In addition, each of our named executive officers has executed our standard proprietary information and invention assignment agreement. Any potential payments and benefits due upon a termination of employment or change in control are described and quantified below in "— Potential Payments upon Termination or Change in Control."

***John West***

We entered into an initial employment agreement with Mr. West, our Chief Executive Officer, dated August 3, 2011, which set forth the initial terms and conditions of his employment with us. Prior to the closing of this offering, we will enter into a revised employment agreement with Mr. West, which will replace and supersede Mr. West's prior employment agreement. Pursuant to the new agreement, Mr. West's base salary will be $ per year. Mr. West's employment is at will and may be terminated at any time, with or without cause.

***Clinton Musil***

We entered into an initial offer letter with Mr. Musil, our Chief Business Officer, dated December 14, 2018, which set forth the initial terms and conditions of his employment with us. Prior to the closing of this offering, we will enter into an employment agreement with Mr. Musil, which will replace and supersede Mr. Musil's prior offer letter. Pursuant to the new agreement, Mr. Musil's base salary will be $ per year. Mr. Musil's employment is at will and may be terminated at any time, with or without cause.

***Richard Chen, M.D., M.S.***

We entered into an initial offer letter with Dr. Chen, our Chief Scientific Officer, dated November 23, 2011, which set forth the initial terms and conditions of his employment with us. Prior to the closing of this offering, we will enter into an employment agreement with Dr. Chen, which will replace and supersede Dr. Chen's prior offer letter. Pursuant to the new agreement, Dr. Chen's base salary will be $ per year. Dr. Chen's employment is at will and may be terminated at any time, with or without cause.

**Potential Payments upon Termination or Change in Control**

Regardless of the manner in which a named executive officer's service terminates, each named executive officer is entitled to receive amounts earned during his or her term of service, including unpaid salary and unused vacation.

We have entered into an agreement with each of our named executive officers with respect to potential payments and benefits due upon a termination of employment or change in control. Prior to the closing of this

offering, we will enter into revised executive severance agreements with each of our named executive officers setting forth the terms and conditions of such potential payments and benefits due upon a termination of employment or change in control.

In addition, each of our named executive officers' stock options are subject to the terms of the 2011 Plan and form of share option agreement thereunder. A description of the termination and change in control provisions in the 2011 Plan and stock options granted thereunder is provided below under "—Equity Incentive Plans."

**Outstanding Equity Awards as of December 31, 2018**

The following table presents the outstanding equity incentive plan awards held by each named executive officer as of December 31, 2018.

| | Option Awards(1) | | | | |
|---|---|---|---|---|---|
| Name | Grant Date | Number of Securities Underlying Unexercised Options Exercisable | Number of Securities Underlying Unexercised Options Unexercisable | Option Exercise Price Per Share(2) | Option Expiration Date |
| John West | 3/7/2012(3) | 2,250,000 | — | $ 0.11 | 3/7/2022 |
| | 11/13/2013(3) | 750,000 | — | 0.46 | 11/13/2023 |
| | 12/11/2013(3) | 257,722 | — | 0.46 | 12/11/2023 |
| | 3/12/2014(3) | 180,244 | — | 0.46 | 3/12/2024 |
| | 4/15/2015(3) | 60,061 | — | 1.26 | 4/15/2025 |
| | 5/11/2016(3) | 60,000 | — | 0.71 | 5/11/2026 |
| | 5/24/2017(4) | 395,833 | 604,167 | 0.61 | 5/24/2027 |
| | 7/26/2017(3) | 60,000 | — | 0.61 | 7/26/2027 |
| | 4/25/2018(3) | 100,000 | — | 0.95 | 4/25/2028 |
| | 4/25/2018(5) | 111,111 | 388,889 | 0.95 | 4/25/2028 |
| | 12/24/2018(6) | — | 600,000 | 1.83 | 12/24/2028 |
| Clinton Musil | 12/24/2018(7) | — | 1,023,357 | 1.83 | 12/24/2028 |
| Richard Chen, M.D., M.S. | 3/7/2012(3) | 1,157,000 | — | 0.11 | 3/7/2022 |
| | 11/13/2013(3) | 220,000 | — | 0.46 | 11/13/2023 |
| | 5/24/2017(8) | 158,333 | 241,667 | 0.61 | 5/24/2027 |
| | 4/25/2018(9) | 33,333 | 116,667 | 0.95 | 4/25/2028 |
| | 12/14/2018(10) | — | 250,000 | 1.83 | 12/14/2028 |

(1) All of the option awards were granted under the 2011 Plan, the terms of which plan is described below under "—Equity Incentive Plans."
(2) All of the option awards were granted with a per share exercise price equal to the fair market value of one share of our common stock on the date of grant, as determined in good faith by our board of directors or compensation committee.
(3) Fully vested as of December 31, 2018.
(4) The shares subject to the option vest in 48 equal monthly installments measured from May 1, 2017, subject to continuous service as of each such vesting date.
(5) The shares subject to the option vest in 36 equal monthly installments measured from May 1, 2018, subject to continuous service as of each such vesting date.
(6) The shares subject to the option vest in 48 equal monthly installments measured from December 14, 2018, subject to continuous service as of each such vesting date.
(7) 20% of the shares subject to the option vest upon the closing of this offering, 20% of the shares subject to the option vest on December 17, 2019, and the remaining shares vest in 36 equal monthly installments thereafter, subject to continuous service as of each such vesting date.

(8) The shares subject to the option vest in 48 equal monthly installments measured from May 1, 2017, subject to continuous service as of each such vesting date.
(9) The shares subject to the option vest in 36 equal monthly installments measured from May 1, 2018, subject to continuous service as of each such vesting date.
(10) The shares subject to the option vest in 48 equal monthly installments measured from December 14, 2018, subject to continuous service as of each such vesting date.

**Other Compensation and Benefits**

All of our current named executive officers are eligible to participate in our employee benefit plans, including our medical, dental, vision, life, disability, and accidental death and dismemberment insurance plans, in each case on the same basis as all of our other employees. We pay the premiums for the life, disability, and accidental death and dismemberment insurance for all of our employees, including our named executive officers. We generally do not provide perquisites or personal benefits to our named executive officers.

Our named executive officers did not participate in, or earn any benefits under, any nonqualified deferred compensation plan sponsored by us during the fiscal year ended December 31, 2018. Our board of directors may elect to provide our officers and other employees with nonqualified deferred compensation benefits in the future if it determines that doing so is in our best interests.

Our named executive officers did not participate in, or otherwise receive any benefits under, any pension or retirement plan sponsored by us during fiscal 2018.

**Employee Benefit and Stock Plans**

The principal features of our equity incentive plans and 401(k) plan are summarized below. These summaries are qualified in their entirety by reference to the actual text of the plans, which, other than the 401(k) plan, are filed as exhibits to the registration statement of which this prospectus is a part.

***2019 Equity Incentive Plan***

Our board of directors adopted and our stockholders approved our 2019 Equity Incentive Plan (the "2019 Plan") on , 2019, and , 2019, respectively. The 2019 Plan will become effective, and no stock awards may be granted under the 2019 Plan until, immediately prior to the execution of the underwriting agreement related to this offering. Once the 2019 Plan is effective, no further grants will be made under the 2011 Plan.

*Stock Awards.* The 2019 Plan provides for the grant of incentive stock options ("ISOs") within the meaning of Section 422 of the Code, nonstatutory stock options ("NSOs"), stock appreciation rights, restricted stock awards, restricted stock unit awards, performance-based stock awards, and other forms of equity compensation, which are collectively referred to as stock awards. Additionally, the 2019 Plan provides for the grant of performance cash awards. ISOs may be granted only to our employees and to any of our parent or subsidiary corporation's employees. All other awards may be granted to employees, including officers, and to non-employee directors and consultants of ours and any of our affiliates.

*Share Reserve.* Initially, the aggregate number of shares of our common stock that may be issued pursuant to stock awards under the 2019 Plan is the sum of (i) shares plus (ii) the number of shares reserved, and remaining available for issuance, under our 2011 Plan at the time our 2019 Plan became effective and (iii) the number of shares subject to stock options or other stock awards granted under our 2011 Plan that would have otherwise returned to our 2011 Plan (such as upon the expiration or termination of a stock award prior to vesting). The number of shares of our common stock reserved for issuance under our 2019 Plan will automatically increase on January 1 of each year, beginning on January 1, 2020 and continuing through and

including January 1, 2029, by % of the total number of shares of our capital stock outstanding on December 31 of the preceding calendar year, or a lesser number of shares determined by our board of directors. The maximum number of shares that may be issued upon the exercise of ISOs under our 2019 Plan is shares.

If a stock award granted under the 2019 Plan expires or otherwise terminates without being exercised in full, or is settled in cash, the shares of our common stock not acquired pursuant to the stock award again will become available for subsequent issuance under the 2019 Plan. In addition, the following types of shares under the 2019 Plan may become available for the grant of new stock awards under the 2019 Plan: (1) shares that are forfeited to or repurchased by us prior to becoming fully vested; (2) shares withheld to satisfy income or employment withholding taxes; or (3) shares used to pay the exercise or purchase price of a stock award. Shares issued under the 2019 Plan may be previously unissued shares or reacquired shares bought by us on the open market.

The maximum number of shares of common stock subject to stock awards granted under the 2019 Plan or otherwise during any one calendar year to any non-employee director, taken together with any cash fees paid by us to such non-employee director during such calendar year for service on the board of directors, will not exceed $ in total value (calculating the value of any such stock awards based on the grant date fair value of such stock awards for financial reporting purposes), or, with respect to the calendar year in which a non-employee director is first appointed or elected to our board of directors, $ .

*Administration.* Our board of directors, or a duly authorized committee thereof, has the authority to administer the 2019 Plan. Our board of directors may also delegate to one or more of our officers the authority to (1) designate employees (other than other officers) to be recipients of certain stock awards, (2) determine the number of shares of common stock to be subject to such stock awards, and (3) specify the other terms and conditions, including the strike price or purchase price and vesting schedule, applicable to such awards. Subject to the terms of the 2019 Plan, our board of directors or the authorized committee, referred to as the plan administrator, determines recipients, dates of grant, the numbers and types of stock awards to be granted, and the terms and conditions of the stock awards, including the period of their exercisability and the vesting schedule applicable to a stock award. Subject to the limitations set forth below, the plan administrator will also determine the exercise price, strike price, or purchase price of stock awards granted and the types of consideration to be paid for the stock award.

The plan administrator has the authority to modify outstanding stock awards under our 2019 Plan. Subject to the terms of our 2019 Plan, the plan administrator has the authority, without stockholder approval, to reduce the exercise, purchase, or strike price of any outstanding stock award, cancel any outstanding stock award in exchange for new stock awards, cash, or other consideration, or take any other action that is treated as a repricing under generally accepted accounting principles, with the consent of any adversely affected participant.

*Stock Options.* ISOs and NSOs are evidenced by stock option agreements adopted by the plan administrator. The plan administrator determines the exercise price for a stock option, within the terms and conditions of the 2019 Plan, provided that the exercise price of a stock option generally cannot be less than 100% of the fair market value of our common stock on the date of grant. Options granted under the 2019 Plan vest at the rate specified by the plan administrator.

The plan administrator determines the term of stock options granted under the 2019 Plan, up to a maximum of 10 years. Unless the terms of an option holder's stock option agreement provide otherwise, if an option holder's service relationship with us, or any of our affiliates, ceases for any reason other than disability, death, or cause, the option holder may generally exercise any vested options for a period of three months following the cessation of service. The option term will automatically be extended in the event that exercise of the option following such a termination of service is prohibited by applicable securities laws or our insider trading policy. If an option holder's service relationship with us or any of our affiliates ceases due to disability or death, or an option holder dies within a certain period following cessation of service, the option holder or a beneficiary may generally exercise any vested options for a period of 12 months in the event of disability and 18 months in the

event of death. In the event of a termination for cause, options generally terminate immediately. In no event may an option be exercised beyond the expiration of its term.

Acceptable consideration for the purchase of common stock issued upon the exercise of a stock option will be determined by the plan administrator and may include (1) cash, check, bank draft or money order, (2) a broker-assisted cashless exercise, (3) the tender of shares of our common stock previously owned by the option holder, (4) a net exercise of the option if it is an NSO, and (5) other legal consideration approved by the plan administrator.

Unless the plan administrator provides otherwise, options generally are not transferable except by will, the laws of descent and distribution, or pursuant to a domestic relations order. An option holder may designate a beneficiary, however, who may exercise the option following the option holder's death.

*Tax Limitations on ISOs.* The aggregate fair market value, determined at the time of grant, of our common stock with respect to ISOs that are exercisable for the first time by an option holder during any calendar year under all of our stock plans may not exceed $100,000. Options or portions thereof that exceed such limit will be treated as NSOs. No ISOs may be granted to any person who, at the time of the grant, owns or is deemed to own stock possessing more than 10% of our total combined voting power or that of any of our parent or subsidiary corporations, unless (1) the option exercise price is at least 110% of the fair market value of the stock subject to the option on the date of grant and (2) the term of the ISO does not exceed five years from the date of grant.

*Restricted Stock Awards.* Restricted stock awards are evidenced by restricted stock award agreements adopted by the plan administrator. Restricted stock awards may be granted in consideration for (1) cash, check, bank draft, or money order, (2) services rendered to us or our affiliates, or (3) any other form of legal consideration. Common stock acquired under a restricted stock award may, but need not, be subject to a share repurchase option in our favor in accordance with a vesting schedule as determined by the plan administrator. Rights to acquire shares under a restricted stock award may be transferred only upon such terms and conditions as set by the plan administrator. Except as otherwise provided in the applicable award agreement, restricted stock awards that have not vested will be forfeited upon the participant's cessation of continuous service for any reason.

*Restricted Stock Unit Awards.* Restricted stock unit awards are evidenced by restricted stock unit award agreements adopted by the plan administrator. Restricted stock unit awards may be granted in consideration for any form of legal consideration or for no consideration. A restricted stock unit award may be settled by cash, delivery of stock, a combination of cash and stock as deemed appropriate by the plan administrator, or in any other form of consideration set forth in the restricted stock unit award agreement. Additionally, dividend equivalents may be credited in respect of shares covered by a restricted stock unit award. Rights under a restricted stock unit award may be transferred only upon such terms and conditions as set by the plan administrator. Restricted stock unit awards may be subject to vesting as determined by the plan administrator. Except as otherwise provided in the applicable award agreement, restricted stock units that have not vested will be forfeited upon the participant's cessation of continuous service for any reason.

*Stock Appreciation Rights.* Stock appreciation rights are evidenced by stock appreciation grant agreements adopted by the plan administrator. The plan administrator determines the strike price for a stock appreciation right, which generally cannot be less than 100% of the fair market value of our common stock on the date of grant. Upon the exercise of a stock appreciation right, we will pay the participant an amount in cash or stock equal to (1) the excess of the per share fair market value of our common stock on the date of exercise over the strike price, multiplied by (2) the number of shares of common stock with respect to which the stock appreciation right is exercised. A stock appreciation right granted under the 2019 Plan vests at the rate specified in the stock appreciation right agreement as determined by the plan administrator.

The plan administrator determines the term of stock appreciation rights granted under the 2019 Plan, up to a maximum of 10 years. Unless the terms of a participant's stock appreciation right agreement provides otherwise,

if a participant's service relationship with us or any of our affiliates ceases for any reason other than cause, disability, or death, the participant may generally exercise any vested stock appreciation right for a period of three months following the cessation of service. The stock appreciation right term will be further extended in the event that exercise of the stock appreciation right following such a termination of service is prohibited by applicable securities laws. If a participant's service relationship with us, or any of our affiliates, ceases due to disability or death, or a participant dies within a certain period following cessation of service, the participant or a beneficiary may generally exercise any vested stock appreciation right for a period of 12 months in the event of disability and 18 months in the event of death. In the event of a termination for cause, stock appreciation rights generally terminate immediately upon the occurrence of the event giving rise to the termination of the individual for cause. In no event may a stock appreciation right be exercised beyond the expiration of its term.

Unless the plan administrator provides otherwise, stock appreciation rights generally are not transferable except by will, the laws of descent and distribution, or pursuant to a domestic relations order. A stock appreciation right holder may designate a beneficiary, however, who may exercise the stock appreciation right following the holder's death.

*Performance Awards.* Our 2019 Plan permits the grant of performance-based stock and cash awards. The performance goals that may be selected include one or more of the following: (1) earnings (including earnings per share and net earnings); (2) earnings before interest, taxes, and depreciation; (3) earnings before interest, taxes, depreciation, and amortization; (4) total stockholder return; (5) return on equity or average stockholder's equity; (6) return on assets, investment, or capital employed; (7) stock price; (8) margin (including gross margin); (9) income (before or after taxes); (10) operating income; (11) operating income after taxes; (12) pre-tax profit; (13) operating cash flow; (14) sales or revenue targets; (15) increases in revenue or product revenue; (16) expenses and cost reduction goals; (17) improvement in or attainment of working capital levels; (18) economic value added (or an equivalent metric); (19) market share; (20) cash flow; (21) cash flow per share; (22) share price performance; (23) debt reduction; (24) customer satisfaction; (25) stockholders' equity; (26) capital expenditures; (27) debt levels; (28) operating profit or net operating profit; (29) workforce diversity; (30) growth of net income or operating income; (31) billings; (32) implementation or completion of projects or processes; (33) financing; (34) regulatory milestones; (35) stockholder liquidity; (36) corporate governance and compliance; (37) product commercialization; (38) intellectual property; (39) personnel matters; (40) progress of internal research or clinical programs; (41) progress of partnered programs; (42) partner satisfaction; (43) budget management; (44) clinical achievements; (45) completing phases of a clinical study (including the treatment phase); (46) announcing or presenting preliminary or final data from clinical studies, in each case, whether on particular timelines or generally; (47) timely completion of clinical trials; (48) submission of Device Master File(s) and other regulatory achievements; (49) partner or collaborator achievements; (50) internal controls, including those related to the Sarbanes-Oxley Act of 2002; (51) research progress, including the development of programs; (52) investor relations, analysts, and communication; (53) manufacturing achievements (including obtaining particular yields from manufacturing runs and other measurable objectives related to process development activities); (54) strategic partnerships or transactions (including in-licensing and out-licensing of intellectual property); (55) establishing relationships with commercial entities with respect to the marketing, distribution and sale of our products and services (including with group purchasing organizations, distributors and other vendors); (56) supply chain achievements (including establishing relationships with manufacturers, suppliers and other services providers of our products and services); (57) co-development, co-marketing, profit sharing, joint venture, or other similar arrangements; (58) individual performance goals; (59) corporate development and planning goals; and (60) other measures of performance selected by our board of directors or any committee thereof.

The performance goals may be based on company-wide performance or performance of one or more business units, divisions, affiliates, or business segments, and may be either absolute or relative to the performance of one or more comparable companies or the performance of one or more relevant indices. Unless specified otherwise in the award agreement at the time the award is granted or in such other document setting forth the performance goals at the time the goals are established, we will appropriately make adjustments in the

method of calculating the attainment of performance goals as follows: (1) to exclude restructuring and/or other nonrecurring charges; (2) to exclude exchange rate effects; (3) to exclude the effects of changes to generally accepted accounting principles; (4) to exclude the effects of any statutory adjustments to corporate tax rates; (5) to exclude the effects of any items that are unusual in nature or occur infrequently as determined under generally accepted accounting principles; (6) to exclude the dilutive effects of acquisitions or joint ventures; (7) to assume that any business divested by us achieved performance objectives at targeted levels during the balance of a performance period following such divestiture; (8) to exclude the effect of any change in the outstanding shares of our common stock by reason of any stock dividend or split, stock repurchase, reorganization, recapitalization, merger, consolidation, spin-off, combination or exchange of shares, or other similar corporate change, or any distributions to common stockholders other than regular cash dividends; (9) to exclude the effects of stock-based compensation and the award of bonuses under our bonus plans; (10) to exclude costs incurred in connection with potential acquisitions or divestitures that are required to be expensed under generally accepted accounting principles; (11) to exclude the goodwill and intangible asset impairment charges that are required to be recorded under generally accepted accounting principles; and (12) to exclude the effect of any other unusual, nonrecurring gain or loss or other extraordinary item. In addition, we retain the discretion to adjust or eliminate the compensation or economic benefit due upon attainment of the goals. The performance goals may differ from participant to participant and from award to award.

*Other Stock Awards.* The plan administrator may grant other awards based in whole or in part by reference to our common stock. The plan administrator will set the number of shares under the stock award and all other terms and conditions of such awards.

*Changes to Capital Structure.* In the event that there is a specified type of change in our capital structure, such as a stock split or recapitalization, appropriate adjustments will be made to (1) the class and maximum number of shares reserved for issuance under the 2019 Plan, (2) the class and maximum number of shares by which the share reserve may increase automatically each year, (3) the class and number of shares that may be issued upon the exercise of ISOs, and (4) the class and number of shares and exercise price, strike price, or purchase price, if applicable, of all outstanding stock awards.

*Corporate Transactions.* In the event of certain specified significant corporate transactions, the plan administrator has the discretion to take any of the following actions with respect to stock awards:

- arrange for the assumption, continuation, or substitution of a stock award by a surviving or acquiring entity or parent company;
- arrange for the assignment of any reacquisition or repurchase rights held by us to the surviving or acquiring entity or parent company;
- accelerate the vesting of the stock award and provide for its termination prior to the effective time of the corporate transaction;
- arrange for the lapse of any reacquisition or repurchase right held by us;
- cancel or arrange for the cancellation of the stock award in exchange for such cash consideration, if any, as our board of directors may deem appropriate; or
- make a payment equal to the excess of (1) the value of the property the participant would have received upon exercise of the stock award over (2) the exercise price or strike price otherwise payable in connection with the stock award.

Our plan administrator is not obligated to treat all stock awards, even those that are of the same type, in the same manner.

Under the 2019 Plan, a significant corporate transaction is generally the consummation of (1) a sale or other disposition of all or substantially all of our consolidated assets, (2) a sale or other disposition of at least 50% of

our outstanding securities, (3) a merger, consolidation or similar transaction following which we are not the surviving corporation, or (4) a merger, consolidation, or similar transaction following which we are the surviving corporation but the shares of our common stock outstanding immediately prior to such transaction are converted or exchanged into other property by virtue of the transaction.

*Change in Control.* The plan administrator may provide, in an individual award agreement or in any other written agreement between a participant and us, that the stock award will be subject to additional acceleration of vesting and exercisability or settlement in the event of a change in control. Under the 2019 Plan, a change in control is generally (1) the acquisition by a person or entity of more than 50% of our combined voting power other than by merger, consolidation or similar transaction, (2) a consummated merger, consolidation, or similar transaction immediately after which our stockholders do not own more than 50% of the combined voting power of the surviving entity (or its parent company), (3) a consummated sale, lease or exclusive license or other disposition of all or substantially all of our consolidated assets, and (4) certain dissolutions, liquidations and changes in the board of directors.

*Amendment and Termination.* Our board of directors has the authority to amend, suspend, or terminate our 2019 Plan, provided that such action does not materially impair the existing rights of any participant without such participant's written consent and provided further that certain types of amendments will require the approval of our stockholders. No ISOs may be granted after the tenth anniversary of the date our board of directors adopts our 2019 Plan.

***2019 Employee Stock Purchase Plan***

Our board of directors adopted the 2019 Employee Stock Purchase Plan (the "ESPP") in , 2019, and our stockholders approved the ESPP in , 2019. The ESPP will become effective immediately prior to and contingent upon the date of the underwriting agreement related to this offering. The purpose of the ESPP is to secure the services of new employees, to retain the services of existing employees and to provide incentives for such individuals to exert maximum efforts toward our success and that of our affiliates. The ESPP is intended to qualify as an "employee stock purchase plan" within the meaning of Section 423 of the Code.

*Share Reserve*. Following this offering, the ESPP will authorize the issuance of shares of our common stock pursuant to purchase rights granted to our employees or to employees of any of our designated affiliates. The number of shares of our common stock reserved for issuance will automatically increase on January 1 of each calendar year, from January 1, 2020 (assuming the ESPP becomes effective in 2019) through January 1, 2029, by the lesser of (1) % of the total number of shares of our common stock outstanding on December 31 of the preceding calendar year, and (2) shares; *provided*, that prior to the date of any such increase, our board of directors may determine that such increase will be less than the amount set forth in clauses (1) and (2).

*Administration*. Our board of directors intends to delegate concurrent authority to administer the ESPP to our compensation committee. The ESPP is implemented through a series of offerings under which eligible employees are granted purchase rights to purchase shares of our common stock on specified dates during such offerings. Under the ESPP, we may specify offerings with durations of not more than 27 months, and may specify shorter purchase periods within each offering. Each offering will have one or more purchase dates on which shares of our common stock will be purchased for employees participating in the offering. An offering under the ESPP may be terminated under certain circumstances.

*Payroll Deductions*. Generally, all regular employees, including executive officers, employed by us or by any of our designated affiliates, may participate in the ESPP and may contribute, normally through payroll deductions, up to 15% of their earnings (as defined in the ESPP) for the purchase of our common stock under the ESPP. Unless otherwise determined by our board of directors, common stock will be purchased for the accounts of employees participating in the ESPP at a price per share equal to the lower of (a) 85% of the fair market value

of a share of our common stock on the first trading date of an offering or (b) 85% of the fair market value of a share of our common stock on the date of purchase.

*Limitations.* Employees may have to satisfy one or more of the following service requirements before participating in the ESPP, as determined by our board of directors, including: (1) being customarily employed for more than 20 hours per week; (2) being customarily employed for more than five months per calendar year; or (3) continuous employment with us or one of our affiliates for a period of time (not to exceed two years). No employee may purchase shares under the ESPP at a rate in excess of $25,000 worth of our common stock based on the fair market value per share of our common stock at the beginning of an offering for each year such a purchase right is outstanding. Finally, no employee will be eligible for the grant of any purchase rights under the ESPP if immediately after such rights are granted, such employee has voting power over 5% or more of our outstanding capital stock measured by vote or value pursuant to Section 424(d) of the Code.

*Changes to Capital Structure*. In the event that there occurs a change in our capital structure through such actions as a stock split, merger, consolidation, reorganization, recapitalization, reincorporation, stock dividend, dividend in property other than cash, large nonrecurring cash dividend, liquidating dividend, combination of shares, exchange of shares, change in corporate structure, or similar transaction, the board of directors will make appropriate adjustments to (1) the number of shares reserved under the ESPP, (2) the maximum number of shares by which the share reserve may increase automatically each year, (3) the number of shares and purchase price of all outstanding purchase rights, and (4) the number of shares that are subject to purchase limits under ongoing offerings.

*Corporate Transactions*. In the event of certain significant corporate transactions, including (1) a sale of all or substantially all of our assets, (2) the sale or disposition of 50% of our outstanding securities, (3) the consummation of a merger or consolidation where we do not survive the transactions, and (4) the consummation of a merger or consolidation where we do survive the transaction but the shares of our common stock outstanding immediately prior to such transaction are converted or exchanged into other property by virtue of the transaction, any then-outstanding rights to purchase our stock under the ESPP may be assumed, continued, or substituted for by any surviving or acquiring entity (or its parent company). If the surviving or acquiring entity (or its parent company) elects not to assume, continue, or substitute for such purchase rights, then the participants' accumulated payroll contributions will be used to purchase shares of our common stock within 10 business days prior to such corporate transaction, and such purchase rights will terminate immediately.

*ESPP Amendments, Termination*. Our board of directors has the authority to amend or terminate our ESPP, provided that except in certain circumstances such amendment or termination may not materially impair any outstanding purchase rights without the holder's consent. We will obtain stockholder approval of any amendment to our ESPP, as required by applicable law or listing requirements.

***2011 Equity Incentive Plan***

Our board of directors adopted our 2011 Plan in October 2011, and our stockholders approved our 2011 Plan in November 2011. Our 2011 Plan has been periodically amended, most recently in February 2019. Our 2011 Plan will be terminated prior to the closing of this offering, and thereafter we will not grant any additional awards under our 2011 Plan. However, our 2011 Plan will continue to govern the terms and conditions of the outstanding awards previously granted thereunder, which include options and restricted stock awards.

*Share Reserve*. As of December 31, 2018, stock options covering 16,440,521 shares with a weighted-average exercise price of $0.7866 per share were outstanding, and 1,686,250 shares of our common stock remained available for the future grant of awards under our 2011 Plan. Any shares of our common stock remaining available for issuance under our 2011 Plan at the time our 2019 Plan becomes effective will become available for issuance under our 2019 Plan. In addition, any shares subject to options that expire or terminate prior to exercise or are withheld to satisfy tax withholding obligations with respect to or the exercise price of an

option, and any shares of restricted stock that are forfeited to or repurchased by us due to failure to vest, will be added to the number of shares then available for issuance under our 2019 Plan.

*Administration*. Our board of directors or a committee delegated by our board of directors administers our 2011 Plan. Subject to the terms of our 2011 Plan, the administrator has the power to, among other things, determine who will be granted awards, to determine the terms and conditions of each award (including the number of shares, exercise price, if any, and any vesting conditions), to lower or reduce the exercise price of outstanding options, to accelerate the time(s) when an award may vest or be exercised, and to construe and interpret the terms of our 2011 Plan and awards granted thereunder.

*Options and Restricted Stock*. Options and restricted stock granted under our 2011 Plan are subject to terms and conditions generally similar to those described above with respect to options and restricted stock that may be granted under our 2019 Plan.

*Changes to Capital Structure.* In the event that there is a specified type of change in our capital structure, such as a stock split or recapitalization, appropriate adjustments will be made to (1) the class and maximum number of shares reserved for issuance under the 2011 Plan, (2) the class and maximum number of shares that may be issued upon the exercise of ISOs, and (3) the class and number of shares and price per share, if applicable, of all outstanding awards.

*Corporate Transactions.* In the event of certain specified significant corporate transactions, the administrator has the discretion to take any of the following actions with respect to awards:

- arrange for the assumption, continuation, or substitution of an award by a surviving or acquiring entity or parent company;
- arrange for the assignment of any reacquisition or repurchase rights held by us to the surviving or acquiring entity or parent company;
- accelerate the vesting of the award and provide for its termination prior to the effective time of the corporate transaction;
- arrange for the lapse of any reacquisition or repurchase right held by us;
- cancel or arrange for the cancellation of the award in exchange for such cash consideration, if any, as our board of directors may deem appropriate; or
- make a payment equal to the excess of (1) the value of the property the participant would have received upon exercise of the award over (2) the exercise price payable in connection with the award.

The administrator is not obligated to treat all awards, even those that are of the same type, in the same manner.

Under our 2011 Plan, a significant corporate transaction is generally the consummation of (1) a sale or other disposition of all or substantially all of our consolidated assets, (2) a sale or other disposition of at least 90% of our outstanding securities, (3) a merger, consolidation or similar transaction following which we are not the surviving corporation, or (4) a merger, consolidation or similar transaction following which we are the surviving corporation but the shares of our common stock outstanding immediately prior to such transaction are converted or exchanged into other property by virtue of the transaction.

*Change in Control*. The administrator may provide, in an individual award agreement or in any other written agreement between a participant and us that the award will be subject to additional acceleration of vesting and exercisability upon or after a change in control. Under our 2011 Plan, a change in control is generally (1) the acquisition by a person or entity of more than 50% of our combined voting power other than by merger, consolidation or similar transaction, (2) a consummated merger, consolidation or similar transaction immediately

after which our stockholders do not own more than 50% of the combined voting power of the surviving entity (or its parent company), (3) a consummated sale, lease or exclusive license or other disposition of all or substantially all of our consolidated assets, and (4) certain changes in our board of directors.

*Plan Amendment or Termination*. Our board of directors may amend, alter, suspend or terminate our 2011 Plan at any time, subject to stockholder approval to the extent required by applicable law. No amendment to our 2011 Plan may impair the rights of any award holder unless mutually agreed otherwise between the award holder and us. As discussed above, we will terminate our 2011 Plan prior to the closing of this offering and no new awards will be granted thereunder following such termination.

***401(k) Plan***

We maintain a 401(k) plan that provides eligible U.S. employees with an opportunity to save for retirement on a tax-advantaged basis. Eligible employees are able to defer eligible compensation up to certain Code limits, which are updated annually. We have the ability to make matching and discretionary contributions to the 401(k) plan. Currently, we do not make matching contributions or discretionary contributions to the 401(k) plan. The 401(k) plan is intended to be qualified under Section 401(a) of the Code, with the related trust intended to be tax exempt under Section 501(a) of the Code. As a tax-qualified retirement plan, contributions to the 401(k) plan are deductible by us when made, and contributions and earnings on those amounts are not generally taxable to the employees until withdrawn or distributed from the 401(k) plan.

**Limitations of Liability and Indemnification Matters**

On the closing of this offering, our amended and restated certificate of incorporation will contain provisions that limit the liability of our current and former directors for monetary damages to the fullest extent permitted by Delaware law. Delaware law provides that directors of a corporation will not be personally liable for monetary damages for any breach of fiduciary duties as directors, except liability for:

- any breach of the director's duty of loyalty to the corporation or its stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- unlawful payments of dividends or unlawful stock repurchases or redemptions; or
- any transaction from which the director derived an improper personal benefit.

Such limitation of liability does not apply to liabilities arising under federal securities laws and does not affect the availability of equitable remedies such as injunctive relief or rescission.

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will authorize us to indemnify our directors, officers, employees, and other agents to the fullest extent permitted by Delaware law. Our amended and restated bylaws that will be in effect on the closing of this offering will provide that we are required to indemnify our directors and officers to the fullest extent permitted by Delaware law and may indemnify our other employees and agents. Our amended and restated bylaws that will be in effect on the closing of this offering will also provide that, on satisfaction of certain conditions, we will advance expenses incurred by a director or officer in advance of the final disposition of any action or proceeding, and permit us to secure insurance on behalf of any officer, director, employee, or other agent for any liability arising out of his or her actions in that capacity regardless of whether we would otherwise be permitted to indemnify him or her under the provisions of Delaware law. We have entered and expect to continue to enter into agreements to indemnify our directors and executive officers. With certain exceptions, these agreements provide for indemnification for related expenses, including attorneys' fees, judgments, fines, and settlement amounts incurred by any of these individuals in connection with any action, proceeding, or investigation. We believe that these amended and restated certificate of incorporation and amended and restated bylaw provisions and indemnification agreements are necessary to attract and retain qualified persons as directors and officers. We also maintain customary directors' and officers' liability insurance.

The limitation of liability and indemnification provisions in our amended and restated certificate of incorporation and amended and restated bylaws may discourage stockholders from bringing a lawsuit against our directors for breach of their fiduciary duty. They may also reduce the likelihood of derivative litigation against our directors and officers, even though an action, if successful, might benefit us and other stockholders. Further, a stockholder's investment may be adversely affected to the extent that we pay the costs of settlement and damage awards against directors and officers as required by these indemnification provisions.

Insofar as indemnification for liabilities arising under the Securities Act of 1933, as amended (the "Securities Act"), may be permitted for directors, executive officers, or persons controlling us, we have been informed that, in the opinion of the SEC, such indemnification is against public policy as expressed in the Securities Act and is therefore unenforceable.

## CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS

Other than compensation arrangements for our directors and executive officers, which are described elsewhere in this prospectus, below we describe transactions since January 1, 2016 and each currently proposed transaction in which:

- we have been or are to be a participant;
- the amounts involved exceeded or will exceed $120,000; and
- any of our directors, executive officers, or holders of more than 5% of our outstanding capital stock, or any immediate family member of, or person sharing the household with, any of these individuals or entities, had or will have a direct or indirect material interest.

### Convertible Promissory Note Financing

In June 2017, our board of directors approved and we sold and issued $12,225,000 principal amount of convertible promissory notes to certain investors, including certain holders of more than 5% of our outstanding capital stock as set forth in the table below. The convertible promissory notes carried an 8% interest rate per annum. The notes were amended with the consent of Lightspeed Venture Partners VIII, L.P. and Abingworth Bioventures V, LP in May 2018 and August 2018. Pursuant to these amendments, in September 2018, the outstanding principal balance of and unpaid accrued interest on the notes converted into an aggregate total of 6,671,990 shares of our Series C redeemable convertible preferred stock at a price per share of $2.013, including a total of 2,728,836 shares that were issued to certain holders of more than 5% of our outstanding capital stock as set forth in the table below.

| Stockholder | Principal Amount of Notes | Number of Conversion Shares |
|---|---|---|
| Entities affiliated with Lightspeed Venture Partners(1)(2) | $ 2,179,000 | 1,189,227 |
| Abingworth Bioventures V LP(3) | 1,886,500 | 1,029,590 |
| MDV IX, L.P., as nominee for itself and MDV ENF IX, L.P. | 934,500 | 510,019 |

(1) Entities associated with Lightspeed Venture Partners holding our securities whose shares are aggregated for purposes of reporting share ownership information are Lightspeed Venture Partners Select, L.P. and Lightspeed Venture Partners VIII, L.P.

(2) Christopher Schaepe, a member of our board of directors until his resignation on March 21, 2019, was a general partner at Lightspeed Venture Partners at the time of these transactions.

(3) Vincent Miles, Ph.D., a member of our board of directors until his resignation on May 1, 2019, is a general partner at Abingworth Bioventures V LP.

### Investor Rights Agreement

We are party to an amended and restated investor rights agreement (the “IRA”) with certain holders of our capital stock, including the holders of more than 5% of our outstanding capital stock, such as Lightspeed Venture Partners VIII, L.P., Lightspeed Venture Partners Select, L.P., Abingworth Bioventures V LP, MDV IX, L.P. and its affiliates, and certain affiliates of The Board of Trustees of the Leland Stanford Junior University. The IRA provides the holders of our redeemable convertible preferred stock with certain registration rights, including the right to demand that we file a registration statement or request that their shares be covered by a registration statement that we are otherwise filing. The IRA also provides these stockholders with information rights, which will terminate on the closing of this offering, and a right of first refusal with regard to certain issuances of our capital stock, which will not apply to the shares issued pursuant to this offering and which will terminate on the closing of this offering. After the closing of this offering, the holders of up to an aggregate of 75,163,941 shares of our common stock (including an aggregate of 510,393 shares issuable upon the exercise of warrants that were

outstanding as of March 31, 2019) will be entitled to rights with respect to the registration of their shares under the Securities Act under this agreement. For a description of these registration rights, see the section titled "Description of Capital Stock—Registration Rights."

**Voting Agreement**

We are party to an amended and restated voting agreement under which certain holders of our capital stock, including the holders of more than 5% of our outstanding capital stock, such as Lightspeed Venture Partners VIII, L.P., Lightspeed Venture Partners Select, L.P., Abingworth Bioventures V LP, MDV IX, L.P. and its affiliates, and certain affiliates of The Board of Trustees of the Leland Stanford Junior University, have agreed as to the manner in which they will vote their shares of our capital stock on certain matters, including with respect to the election of directors. Upon the closing of this offering, the amended and restated voting agreement will terminate, and none of our stockholders will have any special rights regarding the election or designation of members of our board of directors.

**Indemnification Agreements**

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will contain provisions limiting the liability of directors, and our amended and restated bylaws that will be in effect on the closing of this offering will provide that we will indemnify each of our directors and officers to the fullest extent permitted under Delaware law. Our amended and restated certificate of incorporation and amended and restated bylaws that will be in effect on the closing of this offering will also provide our board of directors with discretion to indemnify our employees and other agents when determined appropriate by the board.

In addition, we have entered into an indemnification agreement with each of our directors and executive officers, which requires us to indemnify them. For more information regarding these agreements, see the section titled "Executive Compensation—Limitations of Liability and Indemnification Matters."

**Policies and Procedures for Related Person Transactions**

Prior to the closing of this offering, our board of directors will adopt a related person transaction policy setting forth the policies and procedures for the identification, review, and approval or ratification of related person transactions. This policy covers, with certain exceptions set forth in Item 404 of Regulation S-K under the Securities Act, any transaction, arrangement, or relationship, or any series of similar transactions, arrangements, or relationships, in which we and a related person were or will be participants and the amount involved exceeds $120,000, including purchases of goods or services by or from the related person or entities in which the related person has a material interest, indebtedness, and guarantees of indebtedness. In reviewing and approving any such transactions, our audit committee will consider all relevant facts and circumstances as appropriate, such as the purpose of the transaction, the availability of other sources of comparable products or services, whether the transaction is on terms comparable to those that could be obtained in an arm's length transaction, management's recommendation with respect to the proposed related person transaction, and the extent of the related person's interest in the transaction.

## PRINCIPAL STOCKHOLDERS

The following table sets forth information with respect to the beneficial ownership of our capital stock as of March 31, 2019, as adjusted to reflect the sale of our common stock offered by us in this offering assuming no exercise of the underwriters' option to purchase additional shares, for:

- each of our named executive officers;
- each of our directors;
- all of our executive officers and directors as a group; and
- each person or group of affiliated persons known by us to beneficially own more than 5% of our common stock.

We have determined beneficial ownership in accordance with the rules and regulations of the SEC, and the information is not necessarily indicative of beneficial ownership for any other purpose. Except as indicated by the footnotes below, we believe, based on information furnished to us, that the persons and entities named in the table below have sole voting and sole investment power with respect to all shares that they beneficially own, subject to applicable community property laws.

Applicable percentage ownership before the offering is based on 87,318,814 shares of common stock outstanding as of March 31, 2019, assuming the automatic conversion of all outstanding shares of our redeemable convertible preferred stock into shares of common stock upon the closing of this offering and assuming the exercise of a warrant to purchase 754,573 shares of our common stock. Applicable percentage ownership after the offering is based on shares of common stock outstanding immediately after the closing of this offering, assuming no exercise by the underwriters of their over-allotment option. In computing the number of shares beneficially owned by a person and the percentage ownership of such person, we deemed to be outstanding all shares subject to options held by the person that are currently exercisable, or exercisable within 60 days of March 31, 2019. However, except as described above, we did not deem such shares outstanding for the purpose of computing the percentage ownership of any other person.

Unless otherwise indicated, the address of each beneficial owner listed below is c/o Personalis, Inc., 1330 O'Brien Drive, Menlo Park, California 94025. We believe, based on information provided to us, that each of the stockholders listed below has sole voting and investment power with respect to the shares beneficially owned by the stockholder unless noted otherwise, subject to community property laws where applicable.

| | Shares Beneficially Owned Prior to Offering | | Shares Beneficially Owned After Offering | |
|---|---|---|---|---|
| Name of Beneficial Owner | Number | Percentage | Number | Percentage |
| ***5% Stockholders*** | | | | |
| Entities affiliated with Lightspeed Venture Partners(1) | 24,305,980 | 27.8% | | % |
| Abingworth Bioventures V LP(2) | 21,797,178 | 25.0% | | |
| Entities affiliated with MDV(3) | 10,423,367 | 12.0% | | |
| Entities affiliated with The Board of Trustees of the Leland Stanford Junior University(4) | 5,708,886 | 6.5% | | |
| ***Directors and Named Executive Officers*** | | | | |
| John West(5) | 6,461,082 | 7.0% | | |
| Richard Chen, M.D., M.S.(6) | 1,757,207 | 2.0% | | |
| Clinton Musil(7) | 204,671 | * | | |
| Patrick Balthrop(8) | 191,666 | * | | |
| A. Blaine Bowman | — | * | | |
| Alan Colowick, M.D. | — | * | | |
| Kenneth Ludlum(9) | 200,000 | * | | |
| Jonathan MacQuitty, Ph.D. | — | — | | |
| Paul Ricci(10) | 500,000 | * | | |
| All directors and executive officers as a group (10 persons)(11) | 31,111,804 | 33.0% | | |

* Represents beneficial ownership of less than 1%.

(1) Consists of (i) 16,471,075 shares held of record by Lightspeed Venture Partners VIII, L.P. ("Lightspeed VIII") and (ii) 7,834,905 shares held of record by Lightspeed Venture Partners Select, L.P. ("Lightspeed Select"). Lightspeed General Partner VIII, L.P. ("Lightspeed GP") is the general partner of Lightspeed VIII. Lightspeed Ultimate General Partner VIII, Ltd. ("Lightspeed UGP") is the general partner of Lightspeed GP. Barry Eggers, Ravi Mhatre, and Peter Nieh are the directors of Lightspeed UGP and share voting and dispositive power with respect to the shares held by Lightspeed VIII. Lightspeed General Partner Select, L.P. ("Lightspeed Select GP") is the general partner of Lightspeed Select. Lightspeed Ultimate General Partner Select, Ltd. ("Lightspeed Select UGP") is the general partner of Lightspeed Select GP. Barry Eggers, Jeremy Liew, Ravi Mhatre, and Peter Nieh are the directors of Lightspeed Select UGP and share voting and dispositive power with respect to the shares held by Lightspeed Select GP. The address for these entities is 2200 Sand Hill Road, Menlo Park, California 94025.

(2) Consists of (i) 21,042,605 shares held of record by Abingworth Bioventures V, LP ("ABV V") and Abingworth LLP ("ALLP"), the investment manager of ABV V, and (ii) 754,573 shares subject to a warrant exercisable within 60 days of March 14, 2019. Abingworth Bioventures V GP LP, a Scottish limited partnership ("ABV GP"), serves as the general partner of ABV V. Abingworth Bioventures V GP Limited, an English company ("ABV GP Limited"), serves as the general partner of ABV GP. ABV GP has delegated to ALLP all investment and dispositive power over the securities held by ABV V. An investment committee of Abingworth, composed of Timothy J. Haines, Genghis Lloyd-Harris, Kurt von Emster, Shelley Chu, and Stephen W. Bunting, approves investment and voting decisions by a majority vote, and no individual member has the sole control or voting power over the securities held by ABV V. Each of ABV GP, ABV GP Limited, ALLP, Timothy J. Haines, Genghis Lloyd-Harris, Kurt von Emster, Shelley Chu, and Stephen W. Bunting disclaims beneficial ownership of the securities held by ABV V. The address for these entities is 38 Jermyn Street, London SW1Y 6DN, United Kingdom.

(3) Consists of (i) 9,832,841 shares held of record by MDV IX, L.P. (“MDV IX”), (ii) 80,507 shares held of record by MDV ENF IX, L.P. (“ENF IX”), and (iii) 510,019 shares held of record by MDV IX, L.P., as nominee for MDV IX, L.P. and MDV ENF IX, L.P. (“IX Funds”). Ninth MDV, LLC is the general partner of each of MDV IX, ENF IX, and IX Funds. Jonathan Feiber and William Ericson are the managing members of Ninth MDV, LLC, and either are deemed to have sole voting and dispositive power with respect to the shares held by MDV IX, ENF IX, and IX Funds. The address for these entities is 777 Mariners Island Boulevard, Suite 550, San Mateo, California 94404.

(4) Consists of (i) 50,527 shares held of record by The Board of Trustees of the Leland Stanford Junior University (DAPER I) (“DAPER”), (ii) 395,534 shares held of record by The Board of Trustees of the Leland Stanford Junior University (OTL) (“OTL”), (iii) 5,212,298 shares held of record by The Board of Trustees of the Leland Stanford Junior University (PVF) (“PVF”), and (iv) 50,527 shares held of record by The Board of Trustees of the Leland Stanford Junior University (SBST) (“SBST”). The Board of Trustees of the Leland Stanford Junior University is the sole beneficiary of the shares held by DAPER, OTL, PVF and SBST. The address for these entities is 635 Knight Way, Stanford, California 94305.

(5) Consists of (i) 2,000,000 shares held of record by Mr. West and (ii) 4,461,082 shares subject to options exercisable within 60 days of March 31, 2019.

(6) Consists of (i) 100,000 shares held of record by Dr. Chen and (ii) 1,657,207 shares subject to options exercisable within 60 days of March 31, 2019.

(7) Consists of 204,671 shares subject to an option, which shares vest and become exercisable upon the closing of this offering, which will occur within 60 days of March 31, 2019.

(8) Consists of (i) 54,167 shares held of record by Patrick Balthrop and Mariteres Balthrop Trust, for which Mr. Balthrop is a trustee, and (ii) 137,499 shares subject to options exercisable within 60 days of March 31, 2019.

(9) Consists of (i) 183,333 shares held of record by Mr. Ludlum and (ii) 16,667 shares subject to options exercisable within 60 days of March 31, 2019.

(10) Consists of 500,000 shares subject to options exercisable within 60 days of March 31, 2019.

(11) Consists of (i) 23,380,105 shares held by our current directors and executive officers, (ii) 754,573 shares subject to a warrant exercisable within 60 days of March 31, 2019, and (iii) 6,977,126 shares subject to options exercisable within 60 days of March 31, 2019.

# DESCRIPTION OF CAPITAL STOCK

## General

The following is a summary of the rights of our common and preferred stock and some of the provisions of our amended and restated certificate of incorporation and amended and restated bylaws, which will each become effective upon the closing of this offering, the IRA, and relevant provisions of the Delaware General Corporation Law (the "DGCL"). The descriptions herein are qualified in their entirety by our amended and restated certificate of incorporation, amended and restated bylaws, and the IRA, copies of which have been filed as exhibits to the registration statement of which this prospectus is a part, as well as the relevant provisions of the DGCL.

Upon the closing of this offering, our authorized capital stock will consist of shares, all with a par value of $0.0001 per share, of which:

- shares are designated as common stock; and
- shares are designated as preferred stock.

## Common Stock

As of March 31, 2019, there were 87,318,814 shares of our common stock outstanding and held of record by 184 stockholders, assuming the automatic conversion of all outstanding shares of our preferred stock into shares of common stock, which will automatically occur immediately prior to the closing of this offering.

Holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of stockholders, including the election of directors, and do not have cumulative voting rights. Accordingly, the holders of a majority of the outstanding shares of common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they so choose, other than any directors that holders of any preferred stock we may issue may be entitled to elect. Subject to preferences that may be applicable to any then-outstanding preferred stock, holders of common stock are entitled to receive ratably those dividends, if any, as may be declared by the board of directors out of legally available funds. In the event of our liquidation, dissolution, or winding up, the holders of common stock will be entitled to share ratably in the assets legally available for distribution to stockholders after the payment of or provision for all of our debts and other liabilities, subject to the prior rights of any preferred stock then-outstanding. Holders of common stock have no preemptive or conversion rights or other subscription rights and there are no redemption or sinking funds provisions applicable to the common stock. All outstanding shares of common stock are, and the common stock to be outstanding upon the closing of this offering will be, duly authorized, validly issued, fully paid, and nonassessable. All authorized but unissued shares of our common stock will be available for issuance by our board of directors without any further stockholder action, except as required by the listing standards of Nasdaq. The rights, preferences, and privileges of holders of common stock are subject to and may be adversely affected by the rights of the holders of shares of any series of preferred stock that we may designate and issue in the future.

## Preferred Stock

As of March 31, 2019, there were 73,898,975 shares of redeemable convertible preferred stock outstanding. Immediately upon the closing of this offering, each outstanding share of redeemable convertible preferred stock will convert into one share of common stock, and no shares of preferred stock will be outstanding.

Upon the closing of this offering, our board of directors may, without further action by our stockholders, fix the rights, preferences, privileges and restrictions of up to an aggregate of shares of redeemable convertible preferred stock in one or more series and authorize their issuance. These rights, preferences, and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation

preferences, sinking fund terms, and the number of shares constituting any series or the designation of such series, any or all of which may be greater than the rights of our common stock. The issuance of our redeemable convertible preferred stock could adversely affect the voting power of holders of our common stock, and the likelihood that such holders will receive dividend payments and payments upon liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring, or preventing a change of control or other corporate action.

**Options**

As of March 31, 2019, we had outstanding options under our equity compensation plans to purchase an aggregate of 17,527,536 shares of our common stock with a weighted-average exercise price of $0.9049 per share.

**Warrants**

As of March 31, 2019, we had two outstanding warrants to purchase an aggregate of up to 1,016,581 shares of our common stock with a weighted-average exercise price of $0.5976 per share.

As of March 31, 2019, we had two outstanding warrants to purchase an aggregate of up to 338,341 shares of our preferred stock with a weighted-average exercise price of $1.7836 per share. One such warrant provides for automatic, cashless exercise prior to its expiration date on September 25, 2024 under certain circumstances. Unless earlier exercised, the other warrant will expire upon the later of (i) June 28, 2024 or (ii) five years after the closing of this offering. Upon the closing of this offering and unless earlier exercised, both of these warrants will together become exercisable for up to 338,341 shares of our common stock with a weighted-average exercise price of $1.7836 per share.

**Registration Rights**

We are party to an IRA that provides that certain stockholders, including certain holders of at least 5% of our outstanding capital stock, have certain registration rights as set forth below. The registration of shares of our common stock by the exercise of registration rights described below would enable the holders to sell these shares without restriction under the Securities Act when the applicable registration statement is declared effective. We will pay the registration expenses, other than underwriting discounts and commissions, of the shares registered pursuant to the demand, piggyback, and Form S-3 registration rights described below.

Generally, in an underwritten offering, the managing underwriter, if any, has the right, subject to specified conditions, to limit the number of shares such holders may include. The demand, piggyback, and Form S-3 registration rights described below will expire three years after the closing of this offering, of which this prospectus is a part, or with respect to any particular stockholder, at such time after the closing of this offering that such stockholder holds less than 1% of our outstanding common stock and such stockholder can sell all of its shares entitled to registration rights under Rule 144 of the Securities Act during any 90-day period.

***Demand Registration Rights***

The holders of up to an aggregate of 74,901,933 shares of our common stock (including 248,385 shares issuable upon the exercise of a warrant that was outstanding as of March 31, 2019) will be entitled to certain demand registration rights. At any time beginning 180 days after the closing of this offering, the holders of a majority of these shares may request that we register all or a portion of their shares. We are obligated to effect only two such registrations. Such request for registration must cover shares with an anticipated aggregate offering price, net of underwriting discounts and commissions, of at least $20 million.

***Piggyback Registration Rights***

In connection with this offering, the holders of an aggregate of 74,653,548 shares of our common stock were entitled to, and the necessary percentage of holders waived, their rights to notice of this offering and to include their shares of registrable securities in this offering. After this offering, in the event that we propose to register any of our securities under the Securities Act, either for our own account or for the account of other security holders, the holders of up to an aggregate of 75,163,941 shares of our common stock (including an aggregate of 510,393 shares issuable upon the exercise of warrants that were outstanding as of March 31, 2019) will be entitled to certain piggyback registration rights allowing the holder to include their shares in such registration, subject to certain marketing and other limitations. As a result, whenever we propose to file a registration statement under the Securities Act, other than with respect to (i) a registration statement relating to any employee benefit plans, (ii) a registration relating to a corporate reorganization or other Rule 145 transaction, (iii) a registration relating to stock issued upon conversion of debt securities, or (iv) a registration on any registration form that does not permit secondary sales, the holders of these shares are entitled to notice of the registration and have the right to include their shares in the registration, subject to limitations that the underwriters may impose on the number of shares included in the offering.

***Form S-3 Registration Rights***

The holders of up to an aggregate of 74,901,933 shares of our common stock (including 248,385 shares issuable upon the exercise of a warrant that was outstanding as of March 31, 2019) will be entitled to certain Form S-3 registration rights. The holders of at least 20% of these shares can make a request that we register their shares on Form S-3 if we are qualified to file a registration statement on Form S-3 and if the reasonably anticipated aggregate gross proceeds of the shares offered would equal or exceed $1 million. We will not be required to effect more than two registrations on Form S-3 within any 12-month period.

**Anti-Takeover Effects of Delaware Law and Our Certificate of Incorporation and Bylaws**

Some provisions of Delaware law, our amended and restated certificate of incorporation, and our amended and restated bylaws contain or will contain provisions that could make the following transactions more difficult: an acquisition of us by means of a tender offer; an acquisition of us by means of a proxy contest or otherwise; or the removal of our incumbent officers and directors. It is possible that these provisions could make it more difficult to accomplish or could deter transactions that stockholders may otherwise consider to be in their best interest or in our best interests, including transactions which provide for payment of a premium over the market price for our shares.

These provisions, summarized below, are intended to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed to encourage persons seeking to acquire control of us to first negotiate with our board of directors. We believe that the benefits of the increased protection of our potential ability to negotiate with the proponent of an unfriendly or unsolicited proposal to acquire or restructure us outweigh the disadvantages of discouraging these proposals because negotiation of these proposals could result in an improvement of their terms.

***Stockholder Meetings***

Our amended and restated bylaws will provide that a special meeting of stockholders may be called only by our chairman of the board, chief executive officer or president, or by a resolution adopted by a majority of our board of directors.

***Requirements for Advance Notification of Stockholder Nominations and Proposals***

Our amended and restated bylaws will establish advance notice procedures with respect to stockholder proposals to be brought before a stockholder meeting and the nomination of candidates for election as directors, other than nominations made by or at the direction of the board of directors or a committee of the board of directors.

***Elimination of Stockholder Action by Written Consent***

Our amended and restated certificate of incorporation and amended and restated bylaws will eliminate the right of stockholders to act by written consent without a meeting.

***Staggered Board***

Our board of directors will be divided into three classes. The directors in each class will serve for a three-year term, one class being elected each year by our stockholders. For more information on the classified board, see the section titled "Management—Composition of Our Board of Directors." This system of electing and removing directors may tend to discourage a third party from making a tender offer or otherwise attempting to obtain control of us, because it generally makes it more difficult for stockholders to replace a majority of the directors.

***Removal of Directors***

Our amended and restated certificate of incorporation will provide that no member of our board of directors may be removed from office by our stockholders except for cause and, in addition to any other vote required by law, upon the approval of not less than two-thirds of the total voting power of all of our outstanding voting stock then entitled to vote in the election of directors.

***Stockholders Not Entitled to Cumulative Voting***

Our amended and restated certificate of incorporation will not permit stockholders to cumulate their votes in the election of directors. Accordingly, the holders of a majority of the outstanding shares of our common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they choose, other than any directors that holders of our preferred stock may be entitled to elect.

***Delaware Anti-Takeover Statute***

We are subject to Section 203 of the DGCL, which prohibits persons deemed to be "interested stockholders" from engaging in a "business combination" with a publicly held Delaware corporation for three years following the date these persons become interested stockholders unless the business combination is, or the transaction in which the person became an interested stockholder was, approved in a prescribed manner or another prescribed exception applies. Generally, an "interested stockholder" is a person who, together with affiliates and associates, owns, or within three years prior to the determination of interested stockholder status did own, 15% or more of a corporation's voting stock. Generally, a "business combination" includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. The existence of this provision may have an anti-takeover effect with respect to transactions not approved in advance by the board of directors.

***Choice of Forum***

Our amended and restated certificate of incorporation will provide that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the exclusive forum for the following types of actions or proceedings under Delaware statutory or common law: (1) any derivative action or proceeding brought on our behalf; (2) any action asserting a claim of breach of a fiduciary duty or other wrongdoing by any of our directors, officers, employees, or agents to us or our stockholders; (3) any action asserting a claim against us arising pursuant to any provision of the DGCL or our certificate of incorporation or bylaws; (4) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or bylaws; or (5) any action asserting a claim governed by the internal affairs doctrine. This provision would not apply to suits brought to enforce a duty or liability created by the Exchange Act or any other claim for which the U.S. federal courts have exclusive jurisdiction. Our amended and restated certificate of incorporation further

provides that the federal district courts of the United States of America will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, subject to and contingent upon a final adjudication in the State of Delaware of the enforceability of such exclusive forum provision. Our amended and restated certificate of incorporation will also provide that any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock will be deemed to have notice of and to have consented to these choice of forum provisions. It is possible that a court of law could rule that the choice of forum provisions to be contained in our amended and restated certificate of incorporation are inapplicable or unenforceable if they are challenged in a proceeding or otherwise.

***Amendment of Charter Provisions***

The amendment of any of the above provisions, except for the provision making it possible for our board of directors to issue preferred stock, would require approval by holders of at least two-thirds of the total voting power of all of our outstanding voting stock.

The provisions of Delaware law, our amended and restated certificate of incorporation, and our amended and restated bylaws could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they may also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions may also have the effect of preventing changes in the composition of our board and management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders may otherwise deem to be in their best interests.

**Transfer Agent and Registrar**

The transfer agent and registrar for our common stock upon the closing of this offering will be .

**Exchange Listing**

Our common stock is currently not listed on any securities exchange. We intend to apply to have our common stock listed on The Nasdaq Global Market (“Nasdaq”) under the symbol “PSNL.”

## SHARES ELIGIBLE FOR FUTURE SALE

Prior to this offering, there has been no public market for our common stock. Future sales of substantial amounts of common stock in the public market, or the perception that such sales may occur, could adversely affect the market price of our common stock. Although we intend to apply to have our common stock listed on Nasdaq, we cannot assure you that there will be an active public market for our common stock.

Following the closing of this offering, based on the number of shares of our common stock outstanding as of March 31, 2019 and assuming (1) the issuance of shares of common stock in this offering, (2) the conversion of all outstanding shares of our redeemable convertible preferred stock into shares of our common stock, which will automatically occur immediately prior to the closing of the offering, (3) the exercise of a warrant to purchase 754,573 shares of our common stock, and (4) no exercise of the underwriters' over-allotment option, we will have an aggregate of approximately shares of common stock outstanding.

Of these shares, all shares of common stock sold in this offering will be freely tradable without restriction or further registration under the Securities Act, except for any shares of common stock purchased by our "affiliates," as that term is defined in Rule 144 under the Securities Act. Shares purchased by our affiliates would be subject to the Rule 144 resale restrictions described below, other than the holding period requirement.

The remaining shares of common stock outstanding after this offering will be "restricted securities," as that term is defined in Rule 144 under the Securities Act. These restricted securities are eligible for public sale only if they are registered under the Securities Act or if they qualify for an exemption from registration under Rule 144 or Rule 701 under the Securities Act, each of which is summarized below. We expect that all of these shares will be subject to a 180-day lock-up period under the lock-up and market stand-off agreements described below.

We may issue shares of common stock from time to time as consideration for future acquisitions, investments, or other corporate purposes. In the event any such acquisition, investment, or other transaction is significant, the number of shares of common stock that we may issue may also be significant. We may also grant registration rights covering those shares of common stock issued in connection with any such acquisition, investment, or other transaction.

In addition, shares of common stock that are either subject to outstanding options or warrants or reserved for future issuance under our equity incentive plans will become eligible for sale in the public market to the extent permitted by the provisions of various vesting schedules, the lock-up agreements described below, and Rules 144 and 701 under the Securities Act.

### Lock-Up Agreements

We, along with our directors, executive officers, and substantially all of our other stockholders and optionholders, have agreed with the underwriters that for a period of 180 days, after the date of this prospectus, subject to specified exceptions as detailed further in "Underwriters" below, we or they will not, except with the prior written consent of the representatives, offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to sale of, or otherwise dispose of or transfer any shares of common stock or any securities convertible into or exercisable or exchangeable for shares of common stock, request or demand that we file a registration statement related to our common stock, or enter into any swap or other agreement that transfers to another, in whole or in part, directly or indirectly, the economic consequence of ownership of the common stock. All of our stockholders are subject to a market stand-off agreement with us which imposes similar restrictions.

Upon expiration of the lock-up period, certain of our stockholders will have the right to require us to register their shares under the Securities Act. See "—Registration Rights" below and the section titled "Description of Capital Stock—Registration Rights."

Upon the expiration of the lock-up period, substantially all of the shares subject to such lock-up restrictions will become eligible for sale, subject to the limitations discussed above.

**Rule 144**

In general, under Rule 144 as currently in effect, once we have been subject to public company reporting requirements of Section 13 or Section 15(d) of the Exchange Act for at least 90 days, an eligible stockholder is entitled to sell such shares without complying with the manner of sale, volume limitation, or notice provisions of Rule 144, subject to compliance with the public information requirements of Rule 144. To be an eligible stockholder under Rule 144, such stockholder must not be deemed to have been one of our affiliates for purposes of the Securities Act at any time during the 90 days preceding a sale and must have beneficially owned the shares proposed to be sold for at least six months, including the holding period of any prior owner other than our affiliates. If such a person has beneficially owned the shares proposed to be sold for at least one year, including the holding period of any prior owner other than our affiliates, then such person is entitled to sell such shares without complying with any of the requirements of Rule 144, subject to the expiration of the lock-up agreements described above.

In general, under Rule 144, as currently in effect, our affiliates or persons selling shares on behalf of our affiliates are entitled to sell shares on expiration of the lock-up agreements described above. Beginning 90 days after the date of this prospectus, within any three-month period, such stockholders may sell a number of shares that does not exceed the greater of:

- 1% of the number of shares of our common stock then outstanding, which will equal approximately shares immediately after this offering; or
- the average weekly trading volume in our common stock on Nasdaq during the four calendar weeks preceding the filing of a notice on Form 144 with respect to such sale.

Sales under Rule 144 by our affiliates or persons selling shares on behalf of our affiliates are also subject to certain manner of sale provisions and notice requirements and to the availability of current public information about us.

**Rule 701**

Rule 701 generally allows a stockholder who was issued shares under a written compensatory plan or contract and who is not deemed to have been an affiliate of our company during the immediately preceding 90 days, to sell these shares in reliance on Rule 144, but without being required to comply with the public information, holding period, volume limitation, or notice provisions of Rule 144. Rule 701 also permits affiliates of our company to sell their Rule 701 shares under Rule 144 without complying with the holding period requirements of Rule 144. All holders of Rule 701 shares, however, are required by that rule to wait until 90 days after the date of this prospectus before selling those shares under Rule 701, subject to the expiration of the lock-up agreements described above.

**Form S-8 Registration Statement**

We intend to file one or more registration statements on Form S-8 under the Securities Act to register all shares of common stock subject to outstanding stock options and common stock issued or issuable under the 2011 Plan, the 2019 Plan, and the ESPP. We expect to file the registration statement covering shares offered pursuant to these stock plans shortly after the date of this prospectus, permitting the resale of such shares by non-affiliates in the public market without restriction under the Securities Act and the sale by affiliates in the public market subject to compliance with the resale provisions of Rule 144.

**Registration Rights**

As of March 31, 2019, holders of up to an aggregate of 75,163,941 shares of our common stock, which includes all of the shares of common stock issuable upon the automatic conversion of our redeemable convertible preferred stock immediately prior to the closing of this offering, or their transferees, and the shares issuable upon the exercise of warrants to purchase up to an aggregate of 1,264,966 shares of our common stock (on an as-converted basis), will be entitled to various rights with respect to the registration of these shares under the Securities Act upon the closing of this offering and the expiration of lock-up agreements. Registration of these shares under the Securities Act would result in these shares becoming fully tradable without restriction under the Securities Act immediately upon the effectiveness of the registration, except for shares purchased by affiliates. See the section titled “Description of Capital Stock—Registration Rights” for additional information. Shares covered by a registration statement will be eligible for sale in the public market upon the expiration or release from the terms of the lock-up agreement.

## MATERIAL U.S. FEDERAL INCOME TAX CONSEQUENCES TO NON-U.S. HOLDERS OF OUR COMMON STOCK

The following summary describes the material U.S. federal income tax consequences of the acquisition, ownership, and disposition of our common stock acquired in this offering by Non-U.S. Holders (as defined below). This discussion is not a complete analysis of all potential U.S. federal income tax consequences relating thereto, and does not deal with foreign, state, and local consequences that may be relevant to Non-U.S. Holders in light of their particular circumstances, nor does it address U.S. federal tax consequences (such as gift and estate taxes) other than income taxes. Special rules different from those described below may apply to certain Non-U.S. Holders that are subject to special treatment under the Internal Revenue Code of 1986, as amended (the "Code"), such as financial institutions, insurance companies, tax-exempt organizations, broker-dealers and traders in securities, U.S. expatriates, "controlled foreign corporations," "passive foreign investment companies," corporations that accumulate earnings to avoid U.S. federal income tax, corporations organized outside of the United States, any state thereof or the District of Columbia that are nonetheless treated as U.S. taxpayers for U.S. federal income tax purposes, persons that hold our common stock as part of a "straddle," "hedge," "conversion transaction," "synthetic security" or integrated investment or other risk reduction strategy, persons who acquire our common stock through the exercise of an option or otherwise as compensation, persons subject to the alternative minimum tax or federal Medicare contribution tax on net investment income, persons subject to special tax accounting rules under Section 451(b) of the Code, "qualified foreign pension funds" as defined in Section 897(l)(2) of the Code and entities all of the interests of which are held by qualified foreign pension funds, partnerships and other pass-through entities or arrangements, and investors in such pass-through entities or arrangements. Such Non-U.S. Holders are urged to consult their own tax advisors to determine the U.S. federal, state, local, and other tax consequences that may be relevant to them. Furthermore, the discussion below is based upon the provisions of the Code, and Treasury Regulations, rulings, and judicial decisions thereunder as of the date hereof, and such authorities may be repealed, revoked, or modified, perhaps retroactively, so as to result in U.S. federal income tax consequences different from those discussed below. We have not requested a ruling from the U.S. Internal Revenue Service (the "IRS") with respect to the statements made and the conclusions reached in the following summary, and there can be no assurance that the IRS will agree with such statements and conclusions. This discussion assumes that the Non-U.S. Holder holds our common stock as a "capital asset" within the meaning of Section 1221 of the Code (generally, property held for investment).

This discussion is for informational purposes only and is not tax advice. Persons considering the purchase of our common stock pursuant to this offering should consult their own tax advisors concerning the U.S. federal income, estate, and other tax consequences of acquiring, owning, and disposing of our common stock in light of their particular situations as well as any consequences arising under the laws of any other taxing jurisdiction, including any state, local, or foreign tax consequences.

For the purposes of this discussion, a "Non-U.S. Holder" is, for U.S. federal income tax purposes, a beneficial owner of common stock that is neither a U.S. Holder, nor a partnership (or other entity treated as a partnership for U.S. federal income tax purposes regardless of its place of organization or formation). A "U.S. Holder" means a beneficial owner of our common stock that is for U.S. federal income tax purposes any of the following:

- an individual who is a citizen or resident of the United States;
- a corporation or other entity treated as a corporation for U.S. federal income tax purposes created or organized in or under the laws of the United States, any state thereof, or the District of Columbia;
- an estate the income of which is subject to U.S. federal income taxation regardless of its source; or
- a trust if it (1) is subject to the primary supervision of a court within the United States and one or more U.S. persons have the authority to control all substantial decisions of the trust or (2) has a valid election in effect under applicable U.S. Treasury Regulations to be treated as a U.S. person.

**Distributions**

Distributions, if any, made on our common stock to a Non-U.S. Holder to the extent made out of our current or accumulated earnings and profits (as determined under U.S. federal income tax principles) generally will constitute dividends for U.S. tax purposes and will be subject to withholding tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty, subject to the discussions below regarding effectively connected income, backup withholding, and foreign accounts. To obtain a reduced rate of withholding under a treaty, a Non-U.S. Holder generally will be required to provide us with a properly executed IRS Form W-8BEN (in the case of individuals) or IRS Form W-8BEN-E (in the case of entities), or other appropriate form, certifying the Non-U.S. Holder's entitlement to benefits under that treaty. This certification must be provided to us or our paying agent prior to the payment of dividends and must be updated periodically. In the case of a Non-U.S. Holder that is an entity, Treasury Regulations and the relevant tax treaty provide rules to determine whether, for purposes of determining the applicability of a tax treaty, dividends will be treated as paid to the entity or to those holding an interest in that entity. If a Non-U.S. Holder holds stock through a financial institution or other agent acting on the holder's behalf, the holder will be required to provide appropriate documentation to such agent. The holder's agent will then be required to provide certification to us or our paying agent, either directly or through other intermediaries. If you are eligible for a reduced rate of U.S. federal withholding tax under an income tax treaty and you do not timely file the required certification, you may be able to obtain a refund or credit of any excess amounts withheld by timely filing an appropriate claim for a refund with the IRS.

We generally are not required to withhold tax on dividends paid to a Non-U.S. Holder that are effectively connected with the Non-U.S. Holder's conduct of a trade or business within the United States (and, if required by an applicable income tax treaty, are attributable to a permanent establishment or fixed base that such holder maintains in the United States) if a properly executed IRS Form W-8ECI, stating that the dividends are so connected, is furnished to us (or, if stock is held through a financial institution or other agent, to such agent). In general, such effectively connected dividends will be subject to U.S. federal income tax, on a net income basis at the regular rates applicable to U.S. residents. A corporate Non-U.S. Holder receiving effectively connected dividends may also be subject to an additional "branch profits tax," which is imposed, under certain circumstances, at a rate of 30% (or such lower rate as may be specified by an applicable treaty) on the corporate Non-U.S. Holder's effectively connected earnings and profits, subject to certain adjustments. Non-U.S. Holders should consult their tax advisors regarding any applicable income tax treaties that may provide for different rules.

To the extent distributions on our common stock, if any, exceed our current and accumulated earnings and profits, they will first reduce the Non-U.S. Holder's adjusted basis in our common stock, but not below zero, and then will be treated as gain to the extent of any excess amount distributed, and taxed in the same manner as gain realized from a sale or other disposition of common stock as described in the next section.

**Gain on Disposition of Our Common Stock**

Subject to the discussions below regarding backup withholding and foreign accounts, a Non-U.S. Holder generally will not be subject to U.S. federal income tax with respect to gain realized on a sale or other disposition of our common stock unless (a) the gain is effectively connected with a trade or business of such holder in the United States (and, if required by an applicable income tax treaty, is attributable to a permanent establishment or fixed base that such holder maintains in the United States), (b) the Non-U.S. Holder is a nonresident alien individual and is present in the United States for 183 or more days in the taxable year of the disposition and certain other conditions are met, or (c) we are or have been a "United States real property holding corporation" within the meaning of Code Section 897(c)(2) at any time within the shorter of the five-year period preceding such disposition or such holder's holding period. In general, we would be a United States real property holding corporation if our interests in U.S. real estate comprise (by fair market value) at least half of our business assets. We believe that we have not been and we are not, and do not anticipate becoming, a United States real property holding corporation. Even if we are treated as a United States real property holding corporation, gain realized by a Non-U.S. Holder on a disposition of our common stock will not be subject to U.S. federal income

tax so long as (1) the Non-U.S. Holder owned, directly, indirectly and constructively, no more than 5% of our common stock at all times within the shorter of (i) the five-year period preceding the disposition or (ii) the holder's holding period and (2) our common stock is regularly traded on an established securities market. There can be no assurance that our common stock will continue to qualify as regularly traded on an established securities market. If any gain on your disposition is taxable because we are a United States real property holding corporation and your ownership of our common stock exceeds 5%, you will be taxed on such disposition generally in the manner as gain that is effectively connected with the conduct of a U.S. trade or business (subject to the provisions under an applicable income tax treaty), except that the branch profits tax generally will not apply.

If you are a Non-U.S. Holder described in (a) above, you will be required to pay tax on the net gain derived from the sale at regular U.S. federal income tax rates, and corporate Non-U.S. Holders described in (a) above may be subject to the additional branch profits tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty. Gain described in (b) above will be subject to U.S. federal income tax at a flat 30% rate or such lower rate as may be specified by an applicable income tax treaty, which gain may be offset by certain U.S.-source capital losses (even though you are not considered a resident of the United States), provided that the Non-U.S. Holder has timely filed U.S. federal income tax returns with respect to such losses.

**Information Reporting Requirements and Backup Withholding**

Generally, we must report information to the IRS with respect to any dividends we pay on our common stock (even if the payments are exempt from withholding), including the amount of any such dividends, the name and address of the recipient, and the amount, if any, of tax withheld. A similar report is sent to the holder to whom any such dividends are paid. Pursuant to tax treaties or certain other agreements, the IRS may make its reports available to tax authorities in the recipient's country of residence.

Dividends paid by us (or our paying agents) to a Non-U.S. Holder may also be subject to U.S. backup withholding. U.S. backup withholding generally will not apply to a Non-U.S. Holder who provides a properly executed IRS Form W-8BEN, IRS Form W-8BEN-E, or IRS Form W-ECI, or otherwise establishes an exemption. Notwithstanding the foregoing, backup withholding may apply if the payor has actual knowledge, or reason to know, that the holder is a U.S. person who is not an exempt recipient.

U.S. information reporting and backup withholding requirements generally will apply to the proceeds of a disposition of our common stock effected by or through a U.S. office of any broker, U.S. or foreign, except that information reporting and such requirements may be avoided if the holder provides a properly executed IRS Form W-8BEN or IRS Form W-8BEN-E or otherwise meets documentary evidence requirements for establishing non-U.S. person status or otherwise establishes an exemption. Generally, U.S. information reporting and backup withholding requirements will not apply to a payment of disposition proceeds to a Non-U.S. Holder where the transaction is effected outside the United States through a non-U.S. office of a non-U.S. broker. Information reporting and backup withholding requirements may, however, apply to a payment of disposition proceeds if the broker has actual knowledge, or reason to know, that the holder is, in fact, a U.S. person. For information reporting purposes, certain brokers with substantial U.S. ownership or operations will generally be treated in a manner similar to U.S. brokers.

Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules may be credited against the tax liability of persons subject to backup withholding, provided that the required information is timely furnished to the IRS.

**Foreign Accounts**

Sections 1471 through 1474 of the Code (commonly referred to as FATCA) impose a U.S. federal withholding tax of 30% on certain payments, including dividends paid on, and the gross proceeds of a disposition

of, our common stock paid to a foreign financial institution (as specifically defined by applicable rules) unless such institution enters into an agreement with the U.S. government to withhold on certain payments and to collect and provide to the U.S. tax authorities substantial information regarding U.S. account holders of such institution (which includes certain equity holders of such institution, as well as certain account holders that are foreign entities with U.S. owners). FATCA also generally imposes a federal withholding tax of 30% on certain payments, including dividends paid on, and the gross proceeds of a disposition of, our common stock to a non-financial foreign entity unless such entity provides the withholding agent with either a certification that it does not have any substantial direct or indirect U.S. owners or provides information regarding substantial direct and indirect U.S. owners of the entity. An intergovernmental agreement between the United States and an applicable foreign country may modify those requirements. The withholding tax described above will not apply if the foreign financial institution or non-financial foreign entity otherwise qualifies for an exemption from the rules.

The withholding provisions described above currently apply to payments of dividends, and, subject to the recently released proposed Treasury Regulations described below, will apply to payments of gross proceeds from a sale or other disposition of common stock on or after January 1, 2019.

The U.S. Treasury Department recently released proposed regulations which, if finalized in their present form, would eliminate the federal withholding tax of 30% applicable to the gross proceeds of a disposition of our common stock. In its preamble to such proposed regulations, the U.S. Treasury Department stated that taxpayers may generally rely on the proposed regulations until final regulations are issued. Holders are encouraged to consult with their own tax advisors regarding the possible implications of FATCA on their investment in our common stock.

**EACH PROSPECTIVE INVESTOR SHOULD CONSULT ITS OWN TAX ADVISOR REGARDING THE TAX CONSEQUENCES OF PURCHASING, HOLDING, AND DISPOSING OF OUR COMMON STOCK, INCLUDING THE CONSEQUENCES OF ANY RECENT OR PROPOSED CHANGE IN APPLICABLE LAW.**

## UNDERWRITERS

Under the terms and subject to the conditions in an underwriting agreement dated the date of this prospectus, the underwriters named below, for whom Morgan Stanley & Co. LLC, Merrill Lynch, Pierce, Fenner & Smith Incorporated, and Cowen and Company, LLC are acting as representatives, have severally agreed to purchase, and we have agreed to sell to them, severally, the number of shares indicated below:

| Name | Number of Shares |
|---|---|
| Morgan Stanley & Co. LLC | |
| Merrill Lynch, Pierce, Fenner & Smith Incorporated | |
| Cowen and Company, LLC | |
| Oppenheimer & Co. Inc. | |
| Total: | |

The underwriters and the representatives are collectively referred to as the "underwriters" and the "representatives," respectively. The underwriters are offering the shares of common stock subject to their acceptance of the shares from us and subject to prior sale. The underwriting agreement provides that the obligations of the several underwriters to pay for and accept delivery of the shares of common stock offered by this prospectus are subject to the approval of certain legal matters by their counsel and to certain other conditions. The underwriters are obligated to take and pay for all of the shares of common stock offered by this prospectus if any such shares are taken. However, the underwriters are not required to take or pay for the shares covered by the underwriters' over-allotment option described below.

The underwriters initially propose to offer part of the shares of common stock directly to the public at the offering price listed on the cover page of this prospectus and part to certain dealers. After the initial offering of the shares of common stock, the offering price and other selling terms may from time to time be varied by the representatives.

We have granted to the underwriters an option, exercisable for 30 days from the date of this prospectus, to purchase up to additional shares of common stock at the public offering price listed on the cover page of this prospectus, less underwriting discounts and commissions. The underwriters may exercise this option solely for the purpose of covering over-allotments, if any, made in connection with the offering of the shares of common stock offered by this prospectus. To the extent the option is exercised, each underwriter will become obligated, subject to certain conditions, to purchase about the same percentage of the additional shares of common stock as the number listed next to the underwriter's name in the preceding table bears to the total number of shares of common stock listed next to the names of all underwriters in the preceding table.

The following table shows the per share and total public offering price, underwriting discounts and commissions, and proceeds before expenses to us. These amounts are shown assuming both no exercise and full exercise of the underwriters' option to purchase up to an additional shares of common stock.

| | | Total | |
|---|---|---|---|
| | Per Share | No Exercise | Full Exercise |
| Public offering price | $ | $ | $ |
| Underwriting discounts and commissions to be paid by us: | $ | $ | $ |
| Proceeds, before expenses, to us | $ | $ | $ |

The estimated offering expenses payable by us, exclusive of the underwriting discounts and commissions, are approximately $ . We have agreed to reimburse the underwriters for expenses relating to clearance of this offering with the Financial Industry Regulatory Authority and compliance with state securities or "blue sky" laws.

The underwriters have informed us that they do not intend sales to discretionary accounts to exceed 5% of the total number of shares of common stock offered by them.

We intend to apply to list our common stock on The Nasdaq Global Market under the trading symbol “PSNL.”

We and all directors, officers, and the holders of substantially all of our outstanding stock and stock options have agreed that, without the prior written consent of the representatives on behalf of the underwriters, we and they will not, during the period ending 180 days after the date of this prospectus (the “restricted period”):

- offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend, or otherwise transfer or dispose of, directly or indirectly, any shares of common stock or any securities convertible into or exercisable or exchangeable for shares of common stock;
- file any registration statement with the Securities and Exchange Commission relating to the offering of any shares of common stock or any securities convertible into or exercisable or exchangeable for common stock; or
- enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of the common stock.

whether any such transaction described above is to be settled by delivery of common stock or such other securities, in cash or otherwise. In addition, we and each such person agrees that, without the prior written consent of the representatives on behalf of the underwriters, we or such other person will not, during the restricted period, make any demand for, or exercise any right with respect to, the registration of any shares of common stock or any security convertible into or exercisable or exchangeable for common stock.

The restrictions described in the immediately preceding paragraph to do not apply to our directors, officers, or holders of our outstanding common stock or other securities in certain circumstances, including (i) transactions by any person other than us relating to shares of our common stock or other securities acquired in this offering or in open market transactions after the closing of this offering, provided that no filing under Section 16(a) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”) would be required or voluntarily made in connection with subsequent sales of the common stock or other securities acquired in such open market transactions; (ii) transfers of our common stock as bona fide gifts, by will, to an immediate family member or to certain trusts provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made; (iii) distributions of our common stock to another corporation, partnership, limited liability company, trust, or other business entity that is an affiliate, or to an entity controlled or managed by an affiliate provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made; (iv) distributions of our common stock to the stockholders, partners, or members of such holders provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made; (v) the exercise of options or other equity awards granted under a stock incentive plan or other equity award plan described in this prospectus, or the exercise of warrants outstanding described in this prospectus provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made within 60 days after the date of the final prospectus; (vi) transfers of our common stock to us for the net exercise of options, settlement of warrants granted pursuant to our equity incentive plans, or to cover tax withholding for grants pursuant to our equity incentive plans, provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made within 60 days after the date of the final prospectus; (vii) the establishment by such holders of trading plans under Rule 10b5-1 under the Exchange Act provided that such plan does not provide for the transfer of common stock during the restricted period; (viii) transfers of our common stock pursuant to a domestic order, divorce settlement, or other court order; (ix) transfers of our common stock to us pursuant to any right to repurchase or any right of first refusal we may have over such shares; (x) conversion of our outstanding redeemable convertible preferred stock into common stock in connection with the closing of this offering; and (xi) transfers of our

common stock pursuant to a bona fide third-party tender offer, merger, consolidation, or other similar transaction that is approved by our board of directors. These restrictions also do not apply to us in certain circumstances.

The representatives, in their sole discretion, may release the common stock and other securities subject to the lock-up agreements described above in whole or in part at any time.

In order to facilitate the offering of the common stock, the underwriters may engage in transactions that stabilize, maintain, or otherwise affect the price of the common stock. Specifically, the underwriters may sell more shares than they are obligated to purchase under the underwriting agreement, creating a short position. A short sale is covered if the short position is no greater than the number of shares available for purchase by the underwriters under the over-allotment option described above. The underwriters can close out a covered short sale by exercising the over-allotment option or purchasing shares in the open market. In determining the source of shares to close out a covered short sale, the underwriters will consider, among other things, the open market price of shares compared to the price available under the over-allotment option. The underwriters may also sell shares in excess of the over-allotment option, creating a naked short position. The underwriters must close out any naked short position by purchasing shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the common stock in the open market after pricing that could adversely affect investors who purchase in this offering. As an additional means of facilitating this offering, the underwriters may bid for, and purchase, shares of common stock in the open market to stabilize the price of the common stock. These activities may raise or maintain the market price of the common stock above independent market levels or prevent or retard a decline in the market price of the common stock. The underwriters are not required to engage in these activities and may end any of these activities at any time.

We and the underwriters have agreed to indemnify each other against certain liabilities, including liabilities under the Securities Act.

A prospectus in electronic format may be made available on websites maintained by one or more underwriters, or selling group members, if any, participating in this offering. The representatives may agree to allocate a number of shares of common stock to underwriters for sale to their online brokerage account holders. Internet distributions will be allocated by the representatives to underwriters that may make Internet distributions on the same basis as other allocations.

**Other Relationships**

The underwriters and their respective affiliates are full service financial institutions engaged in various activities, which may include securities trading, commercial and investment banking, financial advisory, investment management, investment research, principal investment, hedging, financing, and brokerage activities. Certain of the underwriters and their respective affiliates have, from time to time, performed, and may in the future perform, various financial advisory and investment banking services for us, for which they received or will receive customary fees and expenses.

In addition, in the ordinary course of their various business activities, the underwriters and their respective affiliates may make or hold a broad array of investments and actively trade debt and equity securities (or related derivative securities) and financial instruments (including bank loans) for their own account and for the accounts of their customers and may at any time hold long and short positions in such securities and instruments. Such investment and securities activities may involve our securities and instruments. The underwriters and their respective affiliates may also make investment recommendations or publish or express independent research views in respect of such securities or instruments and may at any time hold, or recommend to clients that they acquire, long or short positions in such securities and instruments.

**Pricing of the Offering**

Prior to this offering, there has been no public market for our common stock. The initial public offering price will be determined by negotiations between us and the representatives. Among the factors considered in determining the initial public offering price were our future prospects and those of our industry in general, our sales, earnings, and certain other financial and operating information in recent periods, and the price-earnings ratios, price-sales ratios, market prices of securities, and certain financial and operating information of companies engaged in activities similar to ours.

**Selling Restrictions**

***Notice to Prospective Investors in Canada***

The shares of our common stock may be sold only to purchasers purchasing, or deemed to be purchasing, as principal that are accredited investors, as defined in National Instrument 45-106 Prospectus Exemptions or subsection 73.3(1) of the Securities Act (Ontario), and are permitted clients, as defined in National Instrument 31-103 Registration Requirements, Exemptions and Ongoing Registrant Obligations. Any resale of the shares of our common stock must be made in accordance with an exemption from, or in a transaction not subject to, the prospectus requirements of applicable securities laws.

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if this prospectus (including any amendment thereto) contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser's province or territory. The purchaser should refer to any applicable provisions of the securities legislation of the purchaser's province or territory for particulars of these rights or consult with a legal advisor.

Pursuant to section 3A.3 (or, in the case of securities issued or guaranteed by the government of a non-Canadian jurisdiction, section 3A.4) of National Instrument 33-105 Underwriting Conflicts (NI 33-105), the underwriters are not required to comply with the disclosure requirements of NI 33-105 regarding underwriter conflicts of interest in connection with this offering.

***Notice to Prospective Investors in the European Economic Area***

In relation to each Member State of the European Economic Area which has implemented the Prospectus Directive (each, a "Relevant Member State") an offer to the public of any shares of our common stock may not be made in that Relevant Member State, except that an offer to the public in that Relevant Member State of any shares of our common stock may be made at any time under the following exemptions under the Prospectus Directive, if they have been implemented in that Relevant Member State:

(a) to any legal entity which is a qualified investor as defined in the Prospectus Directive;

(b) to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the 2010 PD Amending Directive, 150, natural or legal persons (other than qualified investors as defined in the Prospectus Directive), as permitted under the Prospectus Directive, subject to obtaining the prior consent of the representatives for any such offer; or

(c) in any other circumstances falling within Article 3(2) of the Prospectus Directive, provided that no such offer of shares of our common stock shall result in a requirement for the publication by us or any underwriter of a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer to the public" in relation to any shares of our common stock in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and any shares of our common stock to be offered so as to enable

an investor to decide to purchase any shares of our common stock, as the same may be varied in that Member State by any measure implementing the Prospectus Directive in that Member State, the expression "Prospectus Directive" means Directive 2003/71/EC (and amendments thereto, including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member State), and includes any relevant implementing measure in the Relevant Member State, and the expression "2010 PD Amending Directive" means Directive 2010/73/EU.

***Notice to Prospective Investors in the United Kingdom***

Each underwriter has represented and agreed that:

(a) it has only communicated or caused to be communicated and will only communicate or cause to be communicated an invitation or inducement to engage in investment activity (within the meaning of Section 21 of the Financial Services and Markets Act 2000 ("FSMA") received by it in connection with the issue or sale of the shares of our common stock in circumstances in which Section 21(1) of the FSMA does not apply to us; and

(b) it has complied and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to the shares of our common stock in, from or otherwise involving the United Kingdom.

***Notice to Prospective Investors in Switzerland***

The shares may not be publicly offered in Switzerland and will not be listed on the SIX Swiss Exchange ("SIX") or on any other stock exchange or regulated trading facility in Switzerland. This document has been prepared without regard to the disclosure standards for issuance prospectuses under art. 652a or art. 1156 of the Swiss Code of Obligations or the disclosure standards for listing prospectuses under art. 27 ff. of the SIX Listing Rules or the listing rules of any other stock exchange or regulated trading facility in Switzerland. Neither this document nor any other offering or marketing material relating to the shares or the offering may be publicly distributed or otherwise made publicly available in Switzerland.

Neither this document nor any other offering or marketing material relating to the offering, Personalis, Inc., or the shares have been or will be filed with or approved by any Swiss regulatory authority. In particular, this document will not be filed with, and the offer of shares will not be supervised by, the Swiss Financial Market Supervisory Authority FINMA ("FINMA"), and the offer of shares has not been and will not be authorized under the Swiss Federal Act on Collective Investment Schemes ("CISA"). The investor protection afforded to acquirers of interests in collective investment schemes under the CISA does not extend to acquirers of shares.

***Notice to Prospective Investors in the Dubai International Financial Centre***

This prospectus relates to an Exempt Offer in accordance with the Offered Securities Rules of the Dubai Financial Services Authority ("DFSA"). This prospectus is intended for distribution only to persons of a type specified in the Offered Securities Rules of the DFSA. It must not be delivered to, or relied on by, any other person. The DFSA has no responsibility for reviewing or verifying any documents in connection with Exempt Offers. The DFSA has not approved this prospectus nor taken steps to verify the information set forth herein and has no responsibility for the prospectus. The shares to which this prospectus relates may be illiquid and/or subject to restrictions on their resale. Prospective purchasers of the shares offered should conduct their own due diligence on the shares. If you do not understand the contents of this prospectus you should consult an authorized financial advisor.

***Notice to Prospective Investors in Australia***

No placement document, prospectus, product disclosure statement or other disclosure document has been lodged with the Australian Securities and Investments Commission ("ASIC"), in relation to the offering. This

prospectus does not constitute a prospectus, product disclosure statement or other disclosure document under the Corporations Act 2001 (the "Corporations Act"), and does not purport to include the information required for a prospectus, product disclosure statement or other disclosure document under the Corporations Act.

Any offer in Australia of the shares may only be made to persons (the "Exempt Investors") who are "sophisticated investors" (within the meaning of section 708(8) of the Corporations Act), "professional investors" (within the meaning of section 708(11) of the Corporations Act) or otherwise pursuant to one or more exemptions contained in section 708 of the Corporations Act so that it is lawful to offer the shares without disclosure to investors under Chapter 6D of the Corporations Act.

The shares applied for by Exempt Investors in Australia must not be offered for sale in Australia in the period of 12 months after the date of allotment under the offering, except in circumstances where disclosure to investors under Chapter 6D of the Corporations Act would not be required pursuant to an exemption under section 708 of the Corporations Act or otherwise or where the offer is pursuant to a disclosure document which complies with Chapter 6D of the Corporations Act. Any person acquiring shares must observe such Australian on-sale restrictions.

This prospectus contains general information only and does not take account of the investment objectives, financial situation or particular needs of any particular person. It does not contain any securities recommendations or financial product advice. Before making an investment decision, investors need to consider whether the information in this prospectus is appropriate to their needs, objectives and circumstances, and, if necessary, seek expert advice on those matters.

***Notice to Prospective Investors in Hong Kong***

The shares have not been offered or sold and will not be offered or sold in Hong Kong, by means of any document, other than (a) to "professional investors" as defined in the Securities and Futures Ordinance (Cap. 571) of Hong Kong and any rules made under that Ordinance; or (b) in other circumstances which do not result in the document being a "prospectus" as defined in the Companies Ordinance (Cap. 32) of Hong Kong or which do not constitute an offer to the public within the meaning of that Ordinance. No advertisement, invitation, or document relating to the shares has been or may be issued or has been or may be in the possession of any person for the purposes of issue, whether in Hong Kong or elsewhere, which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted to do so under the securities laws of Hong Kong) other than with respect to shares which are or are intended to be disposed of only to persons outside Hong Kong or only to "professional investors" as defined in the Securities and Futures Ordinance and any rules made under that Ordinance.

***Notice to Prospective Investors in Japan***

The shares have not been and will not be registered under the Financial Instruments and Exchange Law of Japan (Law No. 25 of 1948, as amended) and, accordingly, will not be offered or sold, directly or indirectly, in Japan, or for the benefit of any Japanese Person or to others for re-offering or resale, directly or indirectly, in Japan or to any Japanese Person, except in compliance with all applicable laws, regulations, and ministerial guidelines promulgated by relevant Japanese governmental or regulatory authorities in effect at the relevant time. For the purposes of this paragraph, "Japanese Person" shall mean any person resident in Japan, including any corporation or other entity organized under the laws of Japan.

***Notice to Prospective Investors in Singapore***

This prospectus has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, the shares were not offered or sold or caused to be made the subject of an invitation for subscription or purchase and will not be offered or sold or caused to be made the subject of an invitation for subscription or

purchase, and this prospectus or any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the shares, has not been circulated or distributed, nor will it be circulated or distributed, whether directly or indirectly, to any person in Singapore other than (i) to an institutional investor (as defined in Section 4A of the Securities and Futures Act (Chapter 289) of Singapore, as modified or amended from time to time (the "SFA")) pursuant to Section 274 of the SFA, (ii) to a relevant person (as defined in Section 275(2) of the SFA) pursuant to Section 275(1) of the SFA, or any person pursuant to Section 275(1A) of the SFA, and in accordance with the conditions specified in Section 275 of the SFA, or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

Where the shares are subscribed or purchased under Section 275 of the SFA by a relevant person, which is:

(a) a corporation (which is not an accredited investor (as defined in Section 4A of the SFA)), the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or

(b) a trust (where the trustee is not an accredited investor), whose sole purpose is to hold investments and each beneficiary of the trust is an individual who is an accredited investor,

securities or securities-based derivatives contracts (each term as defined in Section 2(1) of the SFA) of that corporation or the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferred within six months after that corporation or that trust has acquired the shares pursuant to an offer made under Section 275 of the SFA, except:

(a) to an institutional investor or to a relevant person, or to any person arising from an offer referred to in Section 275(1A) or Section 276(4)(i)(B) of the SFA;

(b) where no consideration is or will be given for the transfer;

(c) where the transfer is by operation of law; or

(d) as specified in Section 276(7) of the SFA.

## LEGAL MATTERS

The validity of the shares of common stock being offered by this prospectus will be passed upon for us by Cooley LLP, Palo Alto, California. Davis Polk & Wardwell LLP, Menlo Park, California, has acted as counsel to the underwriters in connection with this offering.

## EXPERTS

The consolidated financial statements included in this prospectus have been audited by Deloitte & Touche LLP, an independent registered public accounting firm, as stated in their report appearing herein. Such consolidated financial statements are included in reliance upon the report of such firm given upon their authority as experts in accounting and auditing.

## CHANGES IN INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

In November 2018, our Board of Directors dismissed Moss Adams LLP ("Moss Adams") as our independent registered public accounting firm and engaged Deloitte & Touche LLP. Moss Adams' report on our financial statements for 2016 did not contain an adverse opinion or disclaimer of opinion and was not qualified or modified as to uncertainty, audit scope, or accounting principles. There were (i) no disagreements with Moss Adams on any matter of accounting principles or practices, financial statement disclosure, or auditing scope or procedures, which disagreements, if not resolved to the satisfaction of Moss Adams, would have caused Moss Adams to make reference to the subject matter of the disagreements in connection with its reports and (ii) no reportable events of the type listed in paragraphs (A) through (D) of Item 304(a)(1)(v) of Regulation S-K issued by the SEC, in connection with the audit of our financial statements for 2016 and the subsequent period through the replacement of Moss Adams with Deloitte & Touche LLP.

Neither we nor anyone acting on our behalf consulted with Deloitte & Touche LLP at any time prior to their retention by us as our independent registered public accounting firm regarding any of the matters described in Item 304(a)(2)(i) or Item 304(a)(2)(ii) of Regulation S-K.

We have provided Moss Adams with a copy of the disclosures set forth under the heading "Changes in Independent Registered Public Accounting Firm" included in this prospectus and have requested that Moss Adams furnish a letter addressed to the SEC stating whether or not Moss Adams agrees with statements related to them made by us under the heading "Changes in Independent Registered Public Accounting Firm" in this prospectus. A copy of that letter is filed as Exhibit 16.1 to the registration statement of which this prospectus forms a part.

## WHERE YOU CAN FIND MORE INFORMATION

We have filed with the SEC a registration statement on Form S-1, including exhibits and schedules, under the Securities Act, with respect to the shares of common stock being offered by this prospectus. This prospectus, which constitutes part of the registration statement, does not contain all of the information in the registration statement and its exhibits. For further information with respect to us and the common stock offered by this prospectus, we refer you to the registration statement and its exhibits. Statements contained in this prospectus as to the contents of any contract or any other document referred to are not necessarily complete, and in each instance, we refer you to the copy of the contract or other document filed as an exhibit to the registration statement. Each of these statements is qualified in all respects by this reference.

You can read our SEC filings, including the registration statement, over the Internet at the SEC's website at www.sec.gov.

Upon the closing of this offering, we will be subject to the information reporting requirements of the Securities Exchange Act of 1934 and we will file reports, proxy statements, and other information with the SEC. These reports, proxy statements and other information will be available for inspection at the web site of the SEC referred to above. We also maintain a website at https://www.personalis.com, at which, following the closing of this offering, you may access these materials free of charge as soon as reasonably practicable after they are electronically filed with, or furnished to, the SEC. Information contained on or accessible through our website is not a part of this prospectus, and the inclusion of our website address in this prospectus is an inactive textual reference only.

**PERSONALIS, INC. AND SUBSIDIARY**

**INDEX TO CONSOLIDATED FINANCIAL STATEMENTS**

## REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the stockholders and the Board of Directors of Personalis, Inc.

### Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Personalis, Inc. and subsidiary (the "Company") as of December 31, 2017 and 2018, and the related consolidated statements of operations, comprehensive loss, redeemable convertible preferred stock and stockholders' deficit, and cash flows, for each of the two years in the period ended December 31, 2018, and the related notes (collectively, the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2017 and 2018, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.

### Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (the "PCAOB") and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB and in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits, we are required to obtain an understanding of internal control over financial reporting, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ DELOITTE & TOUCHE LLP
San Jose, California
March 27, 2019

We have served as the Company's auditor since 2018.

**PERSONALIS, INC. AND SUBSIDIARY**
**CONSOLIDATED BALANCE SHEETS**
**(in thousands, except share and per share data)**

| | As of December 31, | | As of March 31, 2019 | Pro Forma March 31, 2019 |
|---|---|---|---|---|
| | 2017 | 2018 | (unaudited) | (unaudited) |
| **Assets** | | | | |
| Current assets | | | | |
| Cash and cash equivalents | $ 22,617 | $ 19,744 | $ 33,237 | $ 33,245 |
| Accounts receivable | 1,937 | 4,457 | 3,110 | 3,110 |
| Inventory and other deferred costs | 1,364 | 3,432 | 2,884 | 2,884 |
| Prepaid expenses and other current assets | 808 | 1,926 | 3,692 | 3,692 |
| Total current assets | 26,726 | 29,559 | 42,923 | 42,931 |
| Property and equipment, net | 6,342 | 11,452 | 12,218 | 12,218 |
| Operating lease right-of-use assets | — | — | 1,537 | 1,537 |
| Other long-term assets | 495 | 659 | 969 | 969 |
| **Total assets** | $ 33,563 | $ 41,670 | $ 57,647 | $ 57,655 |
| **Liabilities, Redeemable Convertible Preferred Stock, and Stockholders' Deficit** | | | | |
| Current liabilities | | | | |
| Accounts payable | $ 4,035 | $ 6,565 | $ 7,997 | $ 7,997 |
| Accrued and other current liabilities | 2,757 | 3,392 | 5,959 | 5,959 |
| Contract liabilities | 24,690 | 42,897 | 44,315 | 44,315 |
| Short-term debt | 17,506 | 4,996 | — | — |
| Total current liabilities | 48,988 | 57,850 | 58,271 | 58,271 |
| Redeemable convertible preferred stock warrant liability | 292 | 683 | 817 | — |
| Compound derivative instrument | 671 | — | — | — |
| Long-term debt | — | — | 18,941 | 18,941 |
| Other long-term liabilities | 220 | 121 | 737 | 737 |
| Total liabilities | 50,171 | 58,654 | 78,766 | 77,949 |
| Commitments and contingencies (see Note 11) | | | | |
| Total redeemable convertible preferred stock: | | | | |
| Series A redeemable convertible preferred stock, $0.0001 par value—31,250,00 shares authorized and 31,249,991 shares issued and outstanding (liquidation preference of $0.656) as of December 31, 2017, December 31, 2018, and March 31, 2019; no shares authorized, issued, or outstanding, pro forma | 20,261 | 20,261 | 20,261 | — |
| Series B redeemable convertible preferred stock, $0.0001 par value—19,288,150 shares authorized and 19,198,194 shares issued or outstanding (liquidation preference of $1.150) as of December 31, 2017, December 31, 2018, and March 31, 2019; no shares authorized, issued, or outstanding, pro forma | 22,047 | 22,047 | 22,047 | — |
| Series C redeemable convertible preferred stock, $0.0001 par value—18,000,000 shares authorized and 16,778,800 shares issued and outstanding (liquidation preference of $2.013) as of December 31, 2017; 24,700,000 shares authorized and 23,450,790 shares issued and outstanding (liquidation preference of $2.013) as of December 31, 2018 and March 31, 2019; no shares authorized, issued, or outstanding, pro forma | 33,687 | 47,096 | 47,096 | — |
| Stockholders' deficit | | | | |
| Common stock, $0.0001 par value—96,000,000 shares authorized and 12,205,868 shares issued and outstanding as of December 31, 2017; 102,700,000 shares authorized and 12,341,229 shares issued and outstanding as of December 31, 2018; 105,700,000 shares authorized and 12,665,266 shares issued and outstanding as of March 31, 2019; 105,700,000 shares authorized and 87,318,814 shares issued and outstanding, pro forma | 1 | 1 | 1 | 8 |
| Additional paid-in capital | 3,025 | 9,131 | 10,666 | 101,778 |
| Accumulated other comprehensive loss | (10) | (15) | — | — |
| Accumulated deficit | (95,619) | (115,505) | (121,190) | (122,080) |
| Total stockholders' deficit | (92,603) | (106,388) | (110,523) | (20,294) |
| **Total liabilities, redeemable convertible preferred stock, and stockholders' deficit** | $ 33,563 | $ 41,670 | $ 57,647 | $ 57,655 |

See accompanying notes to consolidated financial statements.

**PERSONALIS, INC. AND SUBSIDIARY**
**CONSOLIDATED STATEMENTS OF OPERATIONS**
**(in thousands, except share and per share data)**

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| Revenues | $ 9,393 | $ 37,774 | $ 4,164 | $ 14,075 |
| Costs and expenses | | | | |
| Costs of revenues | 11,736 | 25,969 | 4,065 | 10,091 |
| Research and development | 9,919 | 14,304 | 2,949 | 5,245 |
| Selling, general, and administrative | 9,901 | 11,271 | 2,313 | 4,170 |
| Total costs and expenses | 31,556 | 51,544 | 9,327 | 19,506 |
| Loss from operations | (22,163) | (13,770) | (5,163) | (5,431) |
| Interest income | 100 | 293 | 61 | 84 |
| Interest expense | (1,303) | (1,894) | (622) | (184) |
| Loss on debt extinguishment | — | (4,658) | — | — |
| Other (expense) income, net | (227) | 150 | 351 | (152) |
| Loss before income taxes | (23,593) | (19,879) | (5,373) | (5,683) |
| Provision for income taxes | (5) | (7) | (2) | (2) |
| Net loss | $ (23,598) | $ (19,886) | $ (5,375) | $ (5,685) |
| Net loss per share, basic and diluted | (1.95) | (1.62) | (0.44) | (0.46) |
| Weighted-average shares outstanding, basic and diluted | 12,126,544 | 12,252,629 | 12,206,325 | 12,365,371 |
| Pro forma net loss per share, basic and diluted (unaudited) | | $ (0.24) | | $ (0.06) |
| Pro forma weighted-average shares outstanding, basic and diluted (unaudited) | | 81,934,173 | | 87,018,919 |

See accompanying notes to consolidated financial statements.

**PERSONALIS, INC. AND SUBSIDIARY**
**CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS**
**(in thousands)**

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| Net loss | $(23,598) | $(19,886) | $(5,375) | $(5,685) |
| Other comprehensive income (loss) | | | | |
| Foreign currency translation adjustment | 7 | (5) | 3 | 15 |
| Comprehensive loss | $(23,591) | $(19,891) | $(5,372) | $(5,670) |

See accompanying notes to consolidated financial statements.

**PERSONALIS, INC. AND SUBSIDIARY**
**CONSOLIDATED STATEMENTS OF REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' DEFICIT**
**(in thousands, except share data)**

| | Series A Redeemable Convertible Preferred Stock | | Series B Redeemable Convertible Preferred Stock | | Series C Redeemable Convertible Preferred Stock | | Total | Common Stock | | Additional Paid-in Capital | Accumulated Other Comprehensive Loss | Accumulated Deficit | Total Stockholders' Deficit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Shares | Amount | Shares | Amount | Shares | Amount | Amount | Shares | Amount | | | | |
| **Balances at December 31, 2016** | 31,249,991 | $20,261 | 19,198,194 | $22,047 | 16,778,800 | $33,687 | $75,995 | 12,083,370 | $ 1 | $ 2,196 | $ (17) | $ (72,021) | $ (69,841) |
| Repurchase of early exercise stock options | | | | | | | | (7,783) | — | | | | |
| Proceeds from exercise of stock options | | | | | | | | 122,498 | — | 76 | | | 76 |
| Stock-based compensation expense | | | | | | | | | | 753 | | | 753 |
| Translation adjustments | | | | | | | | | | | 7 | | 7 |
| Net loss | | | | | | | | | | | | (23,598) | (23,598) |
| **Balances at December 31, 2017** | 31,249,991 | 20,261 | 19,198,194 | 22,047 | 16,778,800 | 33,687 | 75,995 | 12,198,085 | $ 1 | 3,025 | (10) | (95,619) | (92,603) |
| Convertible Notes conversion on September 20, 2018 (see Note 6), net of issuance cost | | | | | 6,671,990 | 13,409 | 13,409 | | | | | | |
| Equity component credited to additional paid-in capital upon Convertible Notes modifications on May 31, 2018 and August 20, 2018 (see Note 6) | | | | | | | | | | 4,690 | | | 4,690 |
| Proceeds from exercise of stock options | | | | | | | | 134,580 | — | 99 | | | 99 |
| Stock-based compensation expense | | | | | | | | | | 1,317 | | | 1,317 |
| Translation adjustments | | | | | | | | | | | (5) | | (5) |
| Net loss | | | | | | | | | | | | (19,886) | (19,886) |
| **Balances at December 31, 2018** | 31,249,991 | $20,261 | 19,198,194 | $22,047 | 23,450,790 | $47,096 | $89,404 | 12,332,665 | $ 1 | $ 9,131 | $ (15) | $ (115,505) | $ (106,388) |

See accompanying notes to consolidated financial statements.

**PERSONALIS, INC. AND SUBSIDIARY**
**CONSOLIDATED STATEMENTS OF REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' DEFICIT**
**(in thousands, except share data)**

| | Series A Redeemable Convertible Preferred Stock | | Series B Redeemable Convertible Preferred Stock | | Series C Redeemable Convertible Preferred Stock | | Total | Common Stock | | Additional Paid-in Capital | Accumulated Other Comprehensive Loss | Accumulated Deficit | Total Stockholders' Deficit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Shares | Amount | Shares | Amount | Shares | Amount | Amount | Shares | Amount | | | | |
| **Balances at December 31, 2017** | 31,249,991 | $20,261 | 19,198,194 | $22,047 | 16,778,800 | $33,687 | $75,995 | 12,198,085 | $ 1 | $ 3,025 | $ (10) | $ (95,619) | $ (92,603) |
| Stock-based compensation expense | | | | | | | | | | 172 | | | 172 |
| Proceeds from exercise of stock options | | | | | | | | 50,625 | — | 23 | | | 23 |
| Translation adjustments | | | | | | | | | | | 3 | | 3 |
| Net loss | | | | | | | | | | | | (5,375) | (5,375) |
| **Balances at March 31, 2018** | 31,249,991 | $20,261 | 19,198,194 | $22,047 | 16,778,800 | $33,687 | $75,995 | 12,248,710 | $ 1 | $ 3,220 | $ (7) | $ (100,994) | $ (97,780) |
| | | | | | | | | | | | | | |
| **Balances at December 31, 2018** | 31,249,991 | $20,261 | 19,198,194 | $22,047 | 23,450,790 | $47,096 | $89,404 | 12,332,665 | $ 1 | $ 9,131 | $ (15) | $ (115,505) | $ (106,388) |
| Stock-based compensation expense | | | | | | | | | | 609 | | | 609 |
| Proceeds from exercise of stock options | | | | | | | | 332,601 | — | 354 | | | 354 |
| Issuance of common stock warrants (Note 8) | | | | | | | | | | 572 | | | 572 |
| Translation adjustments | | | | | | | | | | | 15 | | 15 |
| Net loss | | | | | | | | | | | | (5,685) | (5,685) |
| **Balances at March 31, 2019** | 31,249,991 | $20,261 | 19,198,194 | $22,047 | 23,450,790 | $47,096 | $89,404 | 12,665,266 | $ 1 | $ 10,666 | $ (0) | $ (121,190) | $ (110,523) |

**PERSONALIS, INC. AND SUBSIDIARY**
**CONSOLIDATED STATEMENTS OF CASH FLOWS**
**(in thousands)**

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| **Cash flows from operating activities:** | | | | |
| Net loss | $ (23,598) | $ (19,886) | $ (5,375) | $ (5,685) |
| Adjustments to reconcile net loss to net cash provided by operating activities | | | | |
| Depreciation and amortization | 1,216 | 3,066 | 471 | 1,047 |
| Noncash lease expense | — | — | — | 214 |
| Stock-based compensation expense | 753 | 1,317 | 169 | 609 |
| Loss on debt extinguishment | — | 4,658 | — | — |
| Change in fair value of convertible preferred stock warrant liability | 64 | 391 | — | 134 |
| Change in fair value of compound derivative instrument | 162 | (574) | (353) | — |
| Accretion of noncash interest and debt reduction | 928 | 1,188 | 475 | 22 |
| Other | 6 | (5) | 5 | 13 |
| Changes in operating assets and liabilities | | | | |
| Accounts receivable | (1,203) | (2,519) | 177 | 1,346 |
| Inventories and other deferred costs | (539) | (2,068) | (967) | 548 |
| Prepaid expenses and other current assets | 177 | (1,265) | 22 | (108) |
| Accounts payable | 2,635 | 2,164 | (732) | (820) |
| Accrued and other current liabilities | 684 | 997 | 529 | 1,587 |
| Contract liabilities | 19,072 | 18,207 | 6,322 | 1,419 |
| Other long-term liabilities | (67) | (99) | (20) | (260) |
| Net cash provided by operating activities | 290 | 5,572 | 723 | 66 |
| **Cash flows from investing activities:** | | | | |
| Purchase of property and equipment | (5,158) | (7,852) | (1,309) | (960) |
| Net cash used in investing activities | (5,158) | (7,852) | (1,309) | (960) |
| **Cash flows from financing activities:** | | | | |
| Borrowings | 17,225 | — | — | 20,000 |
| Payments of costs related to initial public offering | | | | (477) |
| Debt issuance cost | (63) | — | — | (490) |
| Repayments under borrowing arrangements | (823) | (645) | (212) | (5,000) |
| Series C redeemable convertible preferred stock issuance costs | 0 | (22) | — | — |
| Proceeds from exercise of stock options | 65 | 76 | 23 | 353 |
| Net cash provided by (used in) financing activities | 16,404 | (591) | (189) | 14,386 |
| Effect of exchange rates on cash and cash equivalents | 4 | (2) | 2 | 1 |
| Net increase (decrease) in cash and cash equivalents | 11,540 | (2,873) | (773) | 13,493 |
| Cash and cash equivalents, beginning of the period | 11,077 | 22,617 | 22,617 | 19,744 |
| **Cash and cash equivalents, end of the period** | $ 22,617 | $ 19,744 | $ 21,844 | $ 33,237 |
| **Supplemental disclosures of cash flow information:** | | | | |
| Cash paid for interest | $ 321 | $ 698 | $ 145 | $ 375 |
| Income taxes paid | 5 | 7 | — | — |
| Supplemental disclosures of noncash investing and financing activities: | | | | |
| Property and equipment costs incurred but not paid | 521 | 323 | 930 | 854 |
| Convertible Notes conversion on September 20, 2018 (see Note 6) | — | 13,431 | — | — |
| Recognition of operating lease right-of-use asset | — | — | — | 1,750 |
| Unpaid initial public offering costs | — | — | — | 1,487 |

See accompanying notes to consolidated financial statements.

**PERSONALIS, INC. AND SUBSIDIARY**
**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**

## Note 1. Company and Nature of Business

### *Description of Business*

Personalis, Inc. (the "Company") was incorporated in Delaware on February 21, 2011, and began operations in September 2011. The Company formed a wholly owned subsidiary, Personalis (UK) Ltd., in August 2013.

The Company is a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. The Company designed its NeXT Platform to adapt to the complex and evolving understanding of cancer, providing its biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes.

### *Significant Risks and Uncertainties*

Since inception, the Company has been engaged in developing its complete sequencing technology, raising capital, and recruiting personnel. The Company has incurred net operating losses and negative cash flows from operations every year. At December 31, 2017 and 2018, the Company had an accumulated deficit of $95.6 million and $115.5 million, respectively, and $121.2 million for the three months ended March 31, 2019 (unaudited). The Company believes that its existing sources of liquidity will satisfy its working capital and capital requirements for at least 12 months. Failure to generate sufficient revenues, achieve planned gross margins, or control operating costs will require the Company to raise additional capital through equity or debt financing. Such additional financing may not be available on acceptable terms, or at all, and could require the Company to modify, delay, or abandon some of its planned future expansion or expenditures or reduce some of its ongoing operating costs, which could harm its business, operating results, financial condition, and ability to achieve its intended business objectives.

## Note 2. Summary of Significant Accounting Policies

### *Basis of Presentation*

The accompanying consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America ("GAAP") and include all adjustments necessary for the fair presentation of the Company's consolidated financial position, results of operations, and cash flows as of and for the years ended December 31, 2017 and 2018. The Company's consolidated financial statements include the accounts of the Company and its wholly owned subsidiary, Personalis (UK), Ltd. All intercompany balances and transactions have been eliminated in consolidation.

### *Unaudited Interim Financial Information*

The accompanying consolidated balance sheet as of March 31, 2019, the consolidated statements of operations and of cash flows for the three months ended March 31, 2018 and 2019, and the consolidated statement of redeemable convertible preferred stock and stockholders' deficit for the three months ended March 31, 2019 are unaudited. The unaudited interim consolidated financial statements have been prepared on the same basis as the audited annual consolidated financial statements and, in the opinion of management, reflect all adjustments, which include only normal recurring adjustments, necessary for the fair statement of the Company's financial position as of March 31, 2019 and the results of its operations and its cash flows for the three months ended March 31, 2018 and 2019. The financial data and other information disclosed in these notes related to the three months ended March 31, 2018 and 2019 are also unaudited. The results for the three months ended March 31, 2019 are not necessarily indicative of results to be expected for the year ending December 31, 2019, any other interim periods, or any future year or period.

***Unaudited Pro Forma Information***

The March 31, 2019 unaudited consolidated pro forma balance sheet has been prepared assuming the following capital transactions will occur in connection with the Company's offering: (i) the automatic conversion of all outstanding shares of redeemable convertible preferred stock into shares of common stock; (ii) the automatic conversion of two warrants to purchase an aggregate of 338,341 shares of our redeemable convertible preferred stock, outstanding as of March 31, 2019, into warrants to purchase an equivalent number of shares of our common stock, and the related reclassification of redeemable convertible preferred stock warrant liability to stockholders' equity, (iii) the exercise of a warrant to purchase 754,573 shares of common stock, and (iv) stock-based compensation expense of $0.9 million associated with outstanding stock options subject to a performance condition for which the service-based vesting condition was satisfied as of March 31, 2019 and which the Company will recognize in connection with this offering.

The unaudited pro forma stockholders' deficit does not assume any proceeds from the offering.

The unaudited pro forma basic and diluted net loss per share have been computed to give effect to the automatic conversion of the redeemable convertible preferred stock into shares of common stock and the exercise of a warrant to purchase 754,573 shares of common stock as of the beginning of the respective period or the date of issuance, if later.

***Use of Estimates***

The preparation of consolidated financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, and disclosure of contingent assets and liabilities, at the date of the consolidated financial statements and the reported amounts of revenues and expense during the reporting period. The estimates include, but are not limited to, useful lives assigned to long-lived assets, the valuation of common and convertible redeemable preferred stock and related warrants and options, the valuation of the compound derivative instrument, the valuation of stock-based awards, and provisions for income taxes and contingencies. Actual results could differ from these estimates, and such differences could be material to the Company's consolidated financial position and results of operations.

***Segments***

The Company determined its reporting and operating segments in accordance with Financial Accounting Standards Board ("FASB") Accounting Standards Codification ("ASC") Topic 280, *Segment Reporting*. The Company identifies an operating segment as an entity component that has its own discrete financial information, which is available and regularly reviewed by the chief operating decision maker or decision-making group when making decisions regarding resource allocation and performance assessment. The Company operates and manages its business as one reportable operating segment, which is the business of advanced genomics. The Company's chief executive officer, who is the chief operating decision maker, reviews financial information on an aggregate basis for purposes of allocating resources and evaluating financial performance.

***Fair Value Measurements***

The Company's financial instruments consist of cash and cash equivalents, accounts receivable, accounts payable, accrued liabilities, redeemable convertible preferred stock and convertible note liability, compound derivative instrument, and short-term and long-term debt. The Company states accounts receivable, accounts payable, and accrued liabilities at their carrying value, which approximates fair value due to the short time to the expected receipt or payment. The carrying amount of the Company's short-term debt approximates its fair value as the effective interest rate approximates market rates currently available to the Company. The convertible preferred stock warrant liability and compound derivative instrument associated with the Company's convertible note discussed in Note 5 are carried at fair value based on unobservable market inputs.

***Cash and Cash Equivalents***

The Company considers all highly liquid investments with original maturities of three months or less at the time of purchase to be cash and cash equivalents. Cash and cash equivalents consist primarily of amounts invested in money market funds.

***Accounts Receivable***

Trade accounts receivable are recorded at the invoiced amount and are noninterest bearing. At each reporting period, management reviews all outstanding customer balances to determine if the facts and circumstances of each customer relationship indicate the need for a reserve. The Company did not have any bad debt expense or allowance for doubtful accounts at December 31, 2017 and 2018 and March 31, 2019 (unaudited).

***Inventories and Other Deferred Costs***

Inventories, consisting of supplies used in the Company's genomic analysis contracts, are valued at the lower of cost or market value; cost is determined using actual costs, on a first-in, first-out basis. Market value is determined as the lower of replacement cost or net realizable value.

Other deferred costs relate to work in process for costs incurred on genomic analysis contracts that have not been completed or recognized as revenues. Other deferred costs represent materials used in sequencing services, labor, and overhead allocations.

***Property and Equipment***

Property and equipment are recorded at cost, less accumulated depreciation, and are depreciated on a straight-line basis over the estimated useful lives of the related assets, which is generally three to five years for computer equipment, two years for software, three years for furniture and equipment, and five years for machinery and equipment. Leasehold improvements are depreciated over the shorter of the lease term or the estimated useful life of the related asset. Upon retirement or sale, the cost and related accumulated depreciation and amortization are removed from the consolidated balance sheet, and the resulting gain or loss is reflected in the consolidated statements of operations. Maintenance and repairs that are not considered improvements and do not extend the useful lives of the assets are charged to operations as incurred.

Construction-in-process assets consist primarily of computer equipment and machinery and equipment that have not yet been placed in service. These assets are stated at cost and are not depreciated. Once the assets are placed into service, assets are reclassified to the appropriate asset class based on their nature and depreciated in accordance with the useful lives above.

Internally used software, whether purchased or developed, is capitalized at cost and amortized on a straight-line basis over its estimated useful life. Costs associated with internally developed software are expensed until the point at which the project has reached the development stage. Subsequent additions, modifications or upgrades to internal-use software are capitalized only to the extent that they provide additional functionality. Software maintenance and training costs are expensed in the period in which they are incurred. The capitalization of software requires judgment in determining when a project has reached the development stage and the period over which the Company expects to benefit from the use of that software.

***Deferred Offering Costs***

On March 27, 2019, the Company submitted an initial registration statement with the U.S. Securities and Exchange Commission. As of March 31, 2019 (unaudited), deferred offering costs related to the filing totaling $2.0 million were capitalized and are included in "Prepaid expenses and other current assets".

***Redeemable Convertible Preferred Stock***

The redeemable convertible preferred stock is recorded outside of permanent equity because while it is not mandatorily redeemable, in the event of certain events considered not solely within the Company's control, such as a merger, acquisition, and sale of all or substantially all of the Company's assets (each, a "deemed liquidation event"), the redeemable convertible preferred stock will become redeemable at the option of the holders of at least a majority of the then-outstanding such shares. The Company has not adjusted the carrying values of the redeemable convertible preferred stock to the liquidation preferences of such shares because it is uncertain whether or when a deemed liquidation event would occur that would obligate the Company to pay the liquidation preferences to holders of shares of redeemable convertible preferred stock. Subsequent adjustments to the carrying values of the liquidation preferences will be made only when it becomes probable that such a deemed liquidation event will occur.

***Common Stock Warrant***

The Company's common stock warrant is classified in equity as it meets all criteria for equity classification. The common stock warrant is recorded at fair value upon issuance as additional paid-in capital in the consolidated balance sheets. The common stock warrant is not remeasured after the issuance date.

***Convertible Preferred Stock Warrants***

The Company's convertible preferred stock warrants require liability classification and accounting as the underlying convertible preferred stock is considered contingently redeemable and may obligate the Company to transfer assets to the holders at a future date upon occurrence of a deemed liquidation event. The warrants are recorded at fair value upon issuance and are subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations. The Company will continue to adjust the warrant liability for changes in fair value until the earlier of the exercise or expiration of the convertible preferred stock warrants, occurrence of a deemed liquidation event, or conversion of convertible preferred stock into common stock.

***Compound Derivative Instrument***

The convertible notes issued in June 2017 (see Note 6) contain embedded features that provide the lenders with multiple settlement alternatives. Certain of these settlement features provide the lenders a right to a fixed number of the Company's shares upon conversion of the notes (the "conversion option"). Other settlement features provide the lenders the right or the obligation to receive cash or a variable number of shares upon the completion of a capital-raising transaction, change of control, or default of the Company (the "redemption features").

Certain conversion and redemption features of the convertible notes met the requirements for separate accounting and were accounted for as a single, compound derivative instrument. The compound derivative instrument was recorded at fair value at inception and was subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations (see Note 9).

***Concentration of Credit Risk and Other Risks and Uncertainties***

Financial instruments that subject the Company to concentration of credit risk consist of cash and cash equivalents. The Company's cash and cash equivalents are deposited with a high-quality financial institution. Deposits at this institution may, at times, exceed federally insured limits. Management believes that this financial institution is financially sound and, accordingly, that minimal credit risk exists. The Company has not experienced any losses on its deposits of cash and cash equivalents.

The Company purchases various reagents and sequencing materials from sole source suppliers. Any extended interruption in the supply of these materials could result in the Company's inability to secure sufficient materials to conduct business and meet customer demand.

The Company routinely assesses the creditworthiness of its customers. The Company has not experienced any material losses related to receivables from individual customers, or groups of customers. The Company does not require collateral. Due to these factors, no additional credit risk is believed by management to be probable in the Company's accounts receivable.

As of December 31, 2017 and 2018 and as of March 31, 2018 and 2019, customers representing greater than 10% of accounts receivable were as follows:

| | As of December 31, | | As of March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| Pfizer Inc. | 13% | 33% | 11% | 47% |
| Customer A | * | 17% | * | * |
| Merck & Co., Inc. | 38% | 10% | 22% | * |
| Customer B | * | 10% | * | * |
| Customer C | 13% | * | * | 20% |
| VA MVP | * | * | 38% | * |

* Less than 10% of accounts receivable.

For the years ended December 31, 2017 and 2018 and for the three months ended March 31, 2018, and 2019, customers representing equal to or greater than 10% of revenues were as follows:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| VA MVP | * | 49% | 47% | 59% |
| Merck & Co., Inc. | 11% | 12% | 12% | * |
| Pfizer Inc. | * | 10% | * | 17% |
| Customer A | 13% | * | * | * |
| Customer B | 10% | * | * | * |

* Less than 10% of revenues.

***Revenue Recognition***

The Company applies the revenue recognition guidance in accordance with FASB ASC Topic 606, *Revenue from Contracts with Customers*.

*Revenue Recognition*

The revenue guidance provides a five-step framework through which revenue is recognized when control of promised goods or services is transferred to a customer at an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. To determine revenue recognition for arrangements that the Company concludes are within the scope of the new revenue recognition standard, management performs the following five steps: (i) identifies the contract(s) with a customer; (ii) identifies the performance obligations in the contract(s); (iii) determines the transaction price, including whether there are any constraints on variable consideration; (iv) allocates the transaction price to the performance obligations; and (v) recognizes revenue when (or as) the Company satisfies a performance obligation. At contract inception, once a contract is determined to be within the scope of the new revenue standard, the Company assesses whether

individual goods or services promised within each contract are distinct and, therefore, represent separate performance obligation.

The Company derives revenues from sequencing and data analysis services to support the development of personalized cancer vaccines and other next-generation cancer immunotherapies. The Company's contracts are in the form of a combination of signed agreements, statements of work, and/or purchase orders. Under ASC Topic 606, the Company accounts for a contract with a customer when there is approval and commitment from both parties, the rights of the parties are identified, payment terms are identified, the contract has commercial substance, and it is probable that the Company will collect substantially all of the consideration to which it will be entitled.

The sequencing and data analysis services are the only distinct services that meet the definition of a performance obligation and are accounted for as one performance obligation under ASC Topic 606. The Company recognizes revenue from such services at the point in time when control of the test results is transferred to the customer. The Company has elected to exclude all sales and value added taxes from the measurement of the transaction price. Sequencing and data analysis services are based on a fixed price per test.

Payment terms and conditions vary by contract and customer. The Company's standard payment terms are less than 90 days from the invoice date. In instances where the timing of the Company's revenue recognition differs from the timing of its invoicing, the Company does not assess whether a contract has a significant financing component if the expectation at contract inception is such that the period between payment by the customer and the transfer of the promised services to the customer will be one year or less. The Company assessed each of its revenue-generating arrangements in order to determine whether a significant financing component exists and concluded that a significant financing component does not exist in any of its arrangements. The primary purpose of the Company's invoicing terms is to provide customers with simplified and predictable ways of purchasing the Company's services and provides payment protection for the Company.

*Practical Expedients and Exemptions*

As a practical expedient, the Company recognizes the incremental costs of obtaining contracts, such as sales commissions, as an expense when incurred since the amortization period of the asset the Company otherwise would have recognized is one year or less. Sales commissions are recorded within selling, general, and administrative expenses in the consolidated statements of operations.

***Costs of Revenues***

The Company's costs of revenues primarily consist of production materials, personnel costs (e.g., salaries, bonuses, benefit, and stock-based compensation), cost of expensed equipment, consumables and laboratory supplies, information technology ("IT") and facility costs, and depreciation and service maintenance contracts on capitalized equipment.

***Research and Development Expenses***

The Company incurs research and development expenses for costs it incurs in research aimed at developing new product offerings, including lab and automation development costs. The expenses primarily consist of employee-related costs (including stock-based compensation), laboratory and automation supplies and equipment, and related depreciation and amortization expenses.

***Stock-Based Compensation***

For options granted to employees, non-employees, and directors, stock-based compensation is measured at grant date based on the fair value of the award. The Company determines the grant-date fair value of the options using the Black-Scholes option-pricing model and records forfeitures as they occur. The fair value of options granted to non-employees is amortized over the vesting period.

***Fair Value of Common Stock***

The fair value of the Company's common stock is determined by the board of directors with assistance from management and, in part, on input from an independent third-party valuation firm. The board of directors determines the fair value of common stock by considering a number of objective and subjective factors, including valuations of comparable companies, sales of redeemable convertible preferred stock, operating and financial performance, the lack of liquidity of the Company's common stock and the general and industry-specific economic outlook.

***Foreign Currency Translation***

The functional currency of the Company's foreign subsidiary is the British pounds sterling. In preparing its consolidated financial statements, the Company is required to translate the financial statements of this subsidiary from British pounds sterling to U.S. dollars. Accordingly, monetary assets and liabilities of the Company's subsidiary are remeasured using exchange rates in effect at the end of the period. Costs in the local currency are remeasured using average exchange rates for the period, except for costs related to those consolidated balance sheet items that are remeasured using historical exchange rates. Since the Company's functional currency is deemed to be the local currency, any gain or loss associated with the translation of its consolidated financial statements is included, as a component of stockholders' deficit, in accumulated other comprehensive income (loss).

***Comprehensive Loss***

Comprehensive loss includes all changes in equity (net assets) during the period from nonowner sources. The Company's comprehensive loss consists of its net loss and its cumulative translation adjustments.

***Income Taxes***

The Company uses the asset and liability method under ASC Topic 740, *Income Taxes*, in accounting for income taxes. Deferred tax assets and liabilities are recognized for the estimated future tax consequences attributable to differences between the consolidated financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. Deferred tax expenses or benefits are the result of changes in the deferred tax assets and liabilities. Valuation allowances are established when necessary to reduce deferred tax assets where it is more likely than not that the deferred tax assets will not be realized.

ASC Topic 740 clarifies the accounting for uncertainty in income taxes recognized in the financial statements. ASC Topic 740 provides that a tax benefit from an uncertain tax position may be recognized when it is more likely than not that the position will be sustained upon audit, including resolutions of any related appeals or litigation processes, based on the technical merits of the position. ASC Topic 740 also provides guidance on measurement, derecognition, classification, interest and penalties, accounting in interim periods, disclosure, and transition.

The Company recognizes interest and penalties related to unrecognized tax benefits within the income tax expense line in the accompanying consolidated statements of operations. Accrued interest and penalties are included within the related liability line in the consolidated balance sheets.

***Net Loss per Share Attributable to Common Stockholders***

Basic net loss per common share is calculated by dividing the net loss attributable to common stockholders by the weighted-average number of shares of common stock outstanding during the period, without consideration

of potentially dilutive securities. Diluted net loss per share is computed by dividing the net loss attributable to common stockholders by the weighted-average number of shares of common stock and potentially dilutive securities outstanding for the period. For purposes of the diluted net loss per share calculation, the redeemable convertible preferred stock, convertible preferred stock warrants, common stock warrants, common stock subject to repurchase, and stock options are considered to be potentially dilutive securities. Basic and diluted net loss attributable to common stockholders per share is presented in conformity with the two-class method required for participating securities as the redeemable convertible preferred stock is considered a participating security. The Company's participating securities do not have a contractual obligation to share in the Company's losses. As such, the net loss is attributed entirely to common stockholders. Because the Company has reported a net loss for the reporting periods presented, the diluted net loss per common share is the same as basic net loss per common share for those periods.

***Recent Accounting Pronouncements***

From time to time, new accounting pronouncements are issued by the FASB or other standard-setting bodies and adopted by the Company as of the specified effective date, unless otherwise discussed below. The Company will meet the definition of a public business entity and will adopt recently issued accounting pronouncements in accordance with the transition provisions and effective dates for public business entities. Below is a summary of the recently issued accounting pronouncements that will be relevant to the Company.

***Recently Adopted Accounting Pronouncements***

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*. Subsequently, the FASB also issued ASU No. 2015-14, *Revenue from Contracts with Customers (Topic 606)*, which adjusted the effective date of ASU No. 2014-09; ASU No. 2016-08, *Revenue from Contracts with Customers (Topic 606): Principal versus Agent Considerations (Reporting Revenue Gross versus Net)*, which amends the principal-versus-agent implementation guidance and illustrations in ASU No. 2014-09; ASU No. 2016-10, *Revenue from Contracts with Customers (Topic 606): Identifying Performance Obligations and Licensing*, which clarifies identifying performance obligation and licensing implementation guidance and illustrations in ASU No. 2014-09; and ASU No. 2016-12, *Revenue from Contracts with Customers (Topic 606): Narrow-Scope Improvements and Practical Expedients*, which addresses implementation issues and is intended to reduce the cost and complexity of applying the new revenue standard in ASU No. 2014-09 (collectively, the "Revenue ASUs").

The Revenue ASUs provide an accounting standard for a single comprehensive model for use in accounting for revenue arising from contracts with customers and supersedes most current revenue recognition guidance. The accounting standard is effective for interim and annual periods beginning after December 15, 2017. The guidance permits two methods of adoption: retrospectively to each prior reporting period presented (the full retrospective method), or retrospectively with the cumulative effect of initially applying the guidance recognized at the date of initial application (the modified retrospective method). The Company performed a detailed review of its revenue agreements and assessed the differences in accounting for such contracts under this guidance compared with previous revenue accounting standards. On January 1, 2017, the Company early adopted ASU No. 2014-09 using the full retrospective method. The adoption of this standard did not have a material impact on the Company's consolidated financial statements. Results for all periods presented are under ASC Topic 606.

In June 2018, the FASB issued ASU No. 2018-07, *Improvements to Nonemployee Share-Based Payment Accounting*. ASU No. 2018-07 simplifies the accounting for share-based payments to nonemployees by aligning it with the accounting for share-based payments to employees, with certain exceptions. For all entities, the amendments are effective for annual periods beginning after December 15, 2019, and interim periods within annual periods beginning after December 15, 2020. Early adoption is permitted for any entity in any interim or annual period for which consolidated financial statements have not been issued or made available for issuance, but not before an entity adopts ASC Topic 606. The Company early adopted this guidance on January 1, 2017, which did not result in a material impact on its consolidated financial statements and related disclosures.

In February 2016, the FASB issued ASU No. 2016-02, *Leases (Topic 842)*. In July 2018, the FASB issued ASU No. 2018-10, *Codification Improvements to Topic 842, Leases*, which provides clarification to ASU 2016-02. These ASUs (collectively, the "new lease standard") require an entity to recognize a lease liability and a right-of-use ("ROU") asset on the balance sheet for leases with lease terms of more than twelve months. Lessor accounting is largely unchanged, while lessees will no longer be provided with a source of off-balance sheet financing. This guidance is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. In July 2018, the FASB issued ASU No. 2018-11, *Leases (Topic 842)—Targeted Improvements*, which allows entities to elect a modified retrospective transition method where entities may continue to apply the existing lease guidance during the comparative periods and apply the new lease requirements through a cumulative effect adjustment in the period of adoptions rather than in the earliest period presented.

On January 1, 2019, the Company adopted Accounting Standard Update ("ASU") No. 2016-02, Leases (Topic 842), and its associated amendments using the modified retrospective transition method by applying the new standard to all leases existing at the date of initial application and not restating comparative periods. There was no cumulative-effect adjustment recorded to retained earnings upon adoption. Under the standard, a lessee is required to recognize a lease liability and ROU asset for all leases. The new guidance also modified the classification criteria and requires additional disclosures to enable users of financial statements to understand the amount, timing, and uncertainty of cash flows arising from leases. Consistent with current guidance, a lessee's recognition, measurement, and presentation of expenses and cash flows arising from a lease continues to depend primarily on its classification. The Company elected the package of practical expedients permitted under the transition guidance, which allowed the Company to carryforward its historical lease classification, its assessment on whether a contract was or contains a lease, and its initial direct costs for any leases that existed prior to January 1, 2019. In addition, the Company elected the short-term lease exception as a practical expedient.

At the date of adoption (unaudited), the Company derecognized a deferred rent liability in the amount of $0.3 million, and recognized a ROU asset and respective lease liability in the amount of $1.7 million and $2.0 million, respectively. As of March 31, 2019 (unaudited), lease liabilities in the amount of $1.0 million and $0.7 million are included in "Accrued and other current liabilities" and "Other long-term liabilities," respectively.

***New Accounting Pronouncements Not Yet Adopted***

In July 2017, the FASB issued ASU No. 2017-11, *Earnings Per Share (Topic 260) Distinguishing Liabilities from Equity (Topic 480) Derivatives and Hedging (Topic 815) (Part I) Accounting for Certain Financial Instruments with Down Round Features, (Part II) Replacement of the Indefinite Deferral for Mandatorily Redeemable Financial Instruments of Certain Nonpublic Entities and Certain Mandatorily Redeemable Noncontrolling Interests with a Scope Exception*. This ASU simplifies the accounting for certain financial instruments with down round features, a provision in an equity-linked financial instrument (or embedded feature) that provides a downward adjustment of the current exercise price based on the price of future equity offerings. Down round features are common in warrants, preferred shares, and convertible debt instruments issued by private companies and early stage public companies. This ASU requires companies to disregard the down round feature when assessing whether the instrument is indexed to its own stock for purposes of determining liability or equity classification. The provisions of this ASU related to down round feature are effective for public entities for fiscal years and interim periods within those fiscal years, beginning after December 15, 2018. Early adoption is permitted. The amendments in Part I should be applied (1) retrospectively to outstanding financial instruments with down round features by means of a cumulative-effect adjustment to the consolidated balance sheets as of the beginning of the first fiscal year and interim periods and (2) retrospectively to outstanding financial instruments with down round features for each prior reporting period presented. The Company is currently evaluating the impact the adoption of this standard will have on its consolidated financial statements and related disclosures.

**Note 3. Revenues**

The following table presents the Company's revenues disaggregated by customer type (in thousands):

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| VA MVP | $ 421 | $18,601 | $1,977 | $ 8,343 |
| All other customers | 8,972 | 19,173 | 2,187 | 5,732 |
| Total | $9,393 | $37,774 | $4,164 | $14,075 |

Countries outside of the United States, based on the billing addresses of customers, represented less than 2% and 3% of the Company's revenues for the years ended December 31, 2017 and 2018, respectively, and less than 4% and 2% for the three months ended March 31, 2018 and 2019 (unaudited), respectively.

***Contract Assets and Liabilities***

The Company had no contract assets as of December 31, 2017 and 2018 and March 31, 2019 (unaudited), respectively.

The Company's contract liabilities consist of customer deposits in excess of revenues recognized and are presented as current liabilities in the consolidated balance sheets.

The balance of customer deposits associated with advances received from customers at January 1, 2017 was $5.6 million. The balance of contract liabilities was $24.7 million and $42.9 million at December 31, 2017 and 2018, respectively. Contract liabilities of $1.1 million and $16.0 million were recognized in revenues during the years ended December 31, 2017 and 2018, respectively.

The balance of contract liabilities was $44.3 million at March 31, 2019 (unaudited). Contract liabilities of $1.6 million and $7.8 million were recognized in revenues during the three months ended March 31, 2018 and 2019 (unaudited), respectively.

As of December 31, 2018, the remaining performance obligations under contracts for which revenues are expected to be recognized over a period of more than one year is $73 million. Management expects to recognize such revenues over a three-year period.

The Company does not disclose remaining performance obligations under its other contracts since contract terms are less than a year and are recognized over a term of less than 12 months.

**Note 4. Consolidated Balance Sheets**

Inventory and other deferred costs consist of the following (in thousands):

| | Year Ended December 31, | | Three Months Ended |
|---|---|---|---|
| | 2017 | 2018 | March 31, 2019 |
| | | | (unaudited) |
| Raw materials | $ 822 | $2,134 | $ 2,245 |
| Other deferred costs | 542 | 1,298 | 639 |
| Total inventory and other deferred costs | $1,364 | $3,432 | $ 2,884 |

Property and equipment, net consists of the following (in thousands):

| | Year Ended December 31, | | Three Months Ended March 31, 2019 (unaudited) |
|---|---|---|---|
| | 2017 | 2018 | |
| Computer equipment | $ 2,138 | $ 6,822 | $ 7,093 |
| Computer software | 248 | 202 | 202 |
| Furniture and fixtures | 150 | 150 | 157 |
| Machinery and equipment | 6,129 | 7,951 | 9,508 |
| Leasehold improvements | 235 | 1,016 | 1,248 |
| Capitalized software costs | — | 182 | 252 |
| Construction in process | 710 | 333 | 9 |
| | 9,610 | 16,656 | 18,469 |
| Less: accumulated depreciation and amortization | (3,268) | (5,204) | (6,251) |
| Property and equipment, net | $ 6,342 | $11,452 | $ 12,218 |

Depreciation and amortization expense for the years ended December 31, 2017 and 2018 was $1.2 million and $3.1 million, respectively. Depreciation and amortization expense for the three months ended March 31, 2018 and 2019 (unaudited) was $0.5 million and $1.0 million, respectively.

Accrued and other current liabilities consist of the following (in thousands):

| | Year Ended December 31, | | Three Months Ended March 31, 2019 (unaudited) |
|---|---|---|---|
| | 2017 | 2018 | |
| Accrued compensation | $1,913 | $2,843 | $ 3,646 |
| Accrued liabilities | 88 | 59 | 2,065 |
| Deferred rent | 67 | 99 | — |
| Accrued interest | 563 | 207 | 19 |
| Deferred revenues | 18 | 3 | 8 |
| Accrued taxes | 108 | 181 | 221 |
| Total accrued and other current liabilities | $2,757 | $3,392 | $ 5,959 |

**Note 5. Fair Value Measurements**

Financial assets and liabilities are recorded at fair value. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability (an exit price) in an orderly transaction between market participants at the reporting date. The authoritative guidance establishes a three-level valuation hierarchy that prioritizes the inputs to valuation techniques used to measure fair value based upon whether such inputs are observable or unobservable. Observable inputs reflect market data obtained from independent sources, while unobservable inputs reflect market assumptions made by the reporting entity.

The three-level hierarchy for the inputs to valuation techniques is briefly summarized as follows:

Level 1—Unadjusted quoted prices in active markets that are accessible to the reporting entity at the measurement date for identical assets and liabilities.

Level 2—Inputs other than quoted prices in active markets for identical assets and liabilities that are observable either directly or indirectly for substantially the full term of the asset or liability. Level 2 inputs include the following:

- Quoted prices for similar assets and liabilities in active markets

- Quoted prices for identical or similar assets or liabilities in markets that are not active
- Observable inputs other than quoted prices that are used in the valuation of the asset or liabilities (e.g., interest rate and yield curve quotes at commonly quoted intervals)
- Inputs that are derived principally from or corroborated by observable market data by correlation or other means

Level 3—Unobservable inputs for the assets or liabilities (i.e., supported by little or no market activity). Level 3 inputs include management's own assumptions about the assumptions that market participants would use in pricing the asset or liability (including assumptions about risk).

This hierarchy requires the Company to use observable market data, when available, and to minimize the use of unobservable inputs when determining fair value.

The following table represents the fair value hierarchy for the Company's financial assets and financial liabilities measured at fair value on a recurring basis (in thousands):

| | As of December 31, 2017 | | | |
|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | Total |
| Assets | | | | |
| Money market funds | $21,650 | $ — | $ — | $ 21,650 |
| Total assets measured at fair value | $21,650 | $ — | $ — | $ 21,650 |
| Liabilities | | | | |
| Compound derivative liability | — | — | $ (671) | $ (671) |
| Convertible preferred stock warrants liability | $ — | $ — | 292 | 292 |
| Total liabilities measured at fair value | $ — | $ — | $ (379) | $ (379) |

| | As of December 31, 2018 | | | |
|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | Total |
| Assets | | | | |
| Money market funds | $18,142 | $ — | $ — | $ 18,142 |
| Total assets measured at fair value | $18,142 | $ — | $ — | $ 18,142 |
| Liabilities | | | | |
| Convertible preferred stock warrants liability | $ — | $ — | $ 683 | $ 683 |
| Total liabilities measured at fair value | $ — | $ — | $ 683 | $ 683 |

| | As of March 31, 2019 (unaudited) | | | |
|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | Total |
| Assets | | | | |
| Money market funds | $28,698 | $ — | $ — | $28,698 |
| Total assets measured at fair value | $28,698 | $ — | $ — | $28,698 |
| Liabilities | | | | |
| Convertible preferred stock warrants liability | $ — | $ — | $ 817 | $ 817 |
| Total liabilities measured at fair value | $ — | $ — | $ 817 | $ 817 |

The fair value of the compound derivative instrument has been estimated at the date of inception in June 2017 and at each subsequent consolidated balance sheet date using a hybrid method that combines probability-

weighted and with-or-without methods using unobservable inputs, which are classified as Level 3 within the fair value hierarchy. The primary inputs for this approach included the probability of achieving various settlement scenarios that provide the lenders the right or the obligation to receive cash or a variable number of shares upon the completion of a capital transaction. The probability assumptions related to estimating various settlement scenarios as of December 31, 2017 and 2018, and the inception date ranged between 0.2% and 70%, and a discount rate of 35.1% was applied to estimated future cash flows.

After the initial measurement, changes in the fair value of this compound derivative were recorded in other income (expense), net. The net derivative liability was reported within accrued and other current liabilities in the Company's consolidated balance sheets.

The Black-Scholes option-pricing model was used to estimate the fair value of the convertible preferred stock warrants. Under this option-pricing model, convertible preferred stock warrants were valued by creating a series of call options with exercise prices based on the liquidation preferences and conversion terms of each equity class. The values of the redeemable convertible preferred stock and common stock are inferred by analyzing these options.

The fair value of each convertible preferred stock warrant was estimated on the date of grant using the Black-Scholes option-pricing model with the assumptions described below. For the periods indicated the Company has limited historical volatility information available, and the expected volatility was based on actual volatility for comparable public companies projected over the expected terms of the warrants. The Company did not apply a forfeiture rate to the warrants as there is not enough historical information available to estimate such a rate. The risk-free interest rate was based on the U.S. Treasury yield curve at the time of the grant over the expected term of the warrants.

| | Year Ended December 31, | | Three Months Ended March 31, 2019 |
|---|---|---|---|
| | 2017 | 2018 | (unaudited) |
| Expected term (in years) | 6.75 - 7.50 | 5.17 - 7.0 | 5.50 - 7.00 |
| Volatility | 56.07% - 69.87% | 55.56% - 56.42% | 56.89% - 57.24% |
| Risk-free interest rate | 1.97% - 2.33% | 2.58% - 3.01% | 2.25% - 2.31% |
| Dividend yield | 0% | 0% | 0% |

The following table sets forth a summary of the changes in the fair value of the Company's Level 3 financial instruments (in thousands):

| | Warrant Liability | Derivative Asset | Derivative Liability |
|---|---|---|---|
| Balance—December 31, 2016 | $ 59 | $ — | $ — |
| Issuance of convertible preferred stock warrants | 169 | — | — |
| Initial fair value of derivative liability | — | — | 509 |
| Change in fair value | 64 | — | 162 |
| Balance—December 31, 2017 | 292 | — | 671 |
| Initial fair value of derivative asset | — | 623 | — |
| Change in fair value | 391 | (97) | (671) |
| Elimination as a result of debt extinguishment | — | (526) | — |
| Balance—December 31, 2018 | 683 | — | — |
| Change in fair value | 134 | — | — |
| Balance—March 31, 2019 (unaudited) | $ 817 | $ — | $ — |

**Note 6. Borrowings**

Amounts outstanding under the Company's financing arrangements consisted of the following (in thousands):

| | Year Ended December 31, | | Three Months Ended March 31, |
|---|---|---|---|
| | 2017 | 2018 | 2019 (unaudited) |
| Credit agreement | | | |
| Term Loan | $ 753 | $ — | $ — |
| Revolving Loan | 5,000 | 5,000 | — |
| Convertible Promissory Note | 12,225 | — | — |
| Growth Capital Loan | — | — | 20,000 |
| Total principal payments due | 17,978 | 5,000 | 20,000 |
| Less reduction in carrying value | (472) | (4) | (1,059) |
| Total amounts outstanding | 17,506 | 4,996 | 18,941 |
| Less: Current portion | (17,506) | (4,996) | — |
| Long-Term portion | $ — | $ — | $ 18,941 |

The repayment schedule relating to the Company's long-term debt as of March 31, 2019 is as follows (in thousands):

| | March 31, (unaudited) |
|---|---|
| 2019 (remaining nine months) | $ — |
| 2020 | 4,395 |
| 2021 | 6,463 |
| 2022 | 7,212 |
| 2023 | 1,930 |
| Thereafter | — |
| Total | $ 20,000 |

*Term Loan*

In September 2014, the Company entered into a loan and security agreement with Silicon Valley Bank (the "Term Loan"), to borrow up to $3.0 million under an equipment loan that will be secured with the equipment financed. On October 3, 2014, the Company borrowed $2.4 million under this loan agreement. The Term Loan required 12 interest-only payments, followed by 36 equal monthly installments of principal, plus interest, which began on October 3, 2015.

In connection with the Term Loan, the Company issued to the bank a 10-year warrant to purchase 89,956 shares of the Company's Series B redeemable convertible preferred stock (see Note 9).

The estimated fair value of the warrants upon draw down, of $0.1 million was based on the Black-Scholes option-pricing model. The Company recorded the fair value of the warrant at issuance as a reduction in the debt-carrying value and as a warrant liability. The debt-carrying value reduction is being accreted using the effective interest method as additional interest expense over the contractual period of four years for the Term Loan.

On September 30, 2018, this Term Loan was repaid in full.

*Revolving Loan*

In June 2017, the Company entered into a $10.0 million revolving loan and security agreement (the "Revolving Loan"). Borrowings under the Revolving Loan bear an interest rate of prime, plus 6.75%. The Revolving Loan also has a 5.5% end of term loan payment on the highest outstanding principal amount. The Revolving Loan requires monthly interest-only payments until the maturity date. The Revolving Loan's original maturity date was December 31, 2018, and in December 2018 the maturity date was further extended until March 22, 2019 (see Note 16). Upon determining that the change in cash flows between the previous and current credit facility was not greater than 10%, the Company accounted for the transaction as a debt modification.

As of December 31, 2017 and 2018, the Company's outstanding principal under the Revolving Loan was $5.0 million and $5.0 million was available to borrow.

In connection with the Revolving Loan, the Company issued a warrant to purchase up to 248,385 shares of the Company's Series C redeemable convertible preferred stock (see Note 9).

The estimated fair value of the warrant upon draw down, of $0.1 million was based on the Black-Scholes option-pricing model. The Company recorded the fair value of the warrant at issuance as a reduction in the debt-carrying value and as a warrant liability. The debt-carrying value reduction is being accreted using the effective interest method as additional interest expense over the contractual period of 1.5 years for the Revolving Loan.

The Revolving Loan had an effective interest rate of 19.22% per year. The Revolving Loan interest expense for the years ended December 31, 2017 and 2018, was $0.4 million and $0.9 million, respectively.

The Company accrued $0.1 million and $0.2 million, as of December 31, 2017 and 2018, respectively, related to accretion of final payment due at maturity per agreement using the effective interest rate method.

On March 22, 2019, this Revolving Loan was repaid in full.

*Growth Capital Loan (unaudited)*

On March 22, 2019, the Company entered into a growth capital loan with TriplePoint Capital LLC to provide for a $20.0 million growth capital loan facility and as of March 31, 2019 had drawn down the full $20.0 million available under the facility. The Company used $5.3 million of the growth capital loan facility to repay, in its entirety, all amounts outstanding under the Revolving Loan. Borrowings under the growth capital loan bear interest at a floating rate of prime rate plus 5.00% for borrowings up to $15.0 million and the prime rate plus 6.50% for borrowing greater than $15.0 million; provided, however, that in an event of default, as defined in the loan and security agreement, the interest rate applicable to borrowings under such agreement will be increased by 5.0%. Under the agreement, the Company is required to make monthly interest-only payments through April 1, 2020 and is required to make 36 equal monthly payments of principal, plus accrued interest, from April 1, 2020 through March 1, 2023, when all unpaid principal and interest becomes due and payable. The Company may voluntarily prepay all, but not part, of the outstanding principal at any time prior to the maturity date, subject to a prepayment fee of 1% of the outstanding balance, if prepaid in months one through 12 of the loan term. If prepaid after month 12 of the loan term of any growth capital loan, no additional prepayment premium shall be due. In addition to the final payment, the Company will pay an amount equal to 2.75% of each principal amount drawn under this growth capital loan facility. In connection with the growth capital loan facility, the Company issued a warrant to purchase 262,008 shares of common stock to the lender at an exercise price of $2.29 per share. The Company recorded the issuance-date fair value of the warrant of $0.6 million and fees paid to the lender of $0.3 million as a debt discount which is amortized over the term of the growth capital loan using the effective interest rate method.

Upon issuance, the growth capital loan had an effective interest rate of 15.23% per year.

*Convertible Notes*

On June 29, 2017, the Company entered into a convertible promissory note agreement with certain existing redeemable convertible preferred stockholders and third parties (the "Investors") for the issuance of convertible promissory notes with a face value of $12.2 million (the "Convertible Notes"). Under the terms of the Convertible Notes agreement, the Convertible Notes bear interest of 8% per annum, with a maturity date of June 28, 2018. In the event that the Company issued and sold shares of its equity securities (the "Equity Securities") to Investors on or before the maturity date in an equity financing with total proceeds to the Company of not less than $10 million (including the conversion of the Convertible Notes or other convertible securities issued for capital raising purposes) (a "Qualified Financing"), then the outstanding principal amount of the Convertible Notes and any unpaid accrued interest would have automatically converted in whole without any further action by the holder into such Equity Securities sold in the Qualified Financing at a conversion price equal to the price paid per share for Equity Securities by the Investors in the Qualified Financing multiplied by 0.8. If the Company consummated a change of control while the Convertible Notes remained outstanding, the Company would have repaid the holders in cash an amount equal to 150% of the outstanding principal amount of the Convertible Notes, plus any unpaid accrued interest on the original principal. The Convertible Notes had customary events of default.

Certain conversion and redemption features of the Convertible Notes met the requirements for separate accounting and were accounted for as a single, compound derivative instrument (see Note 10). The compound derivative instrument was recorded at fair value at inception and was subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations. The estimated fair value of the compound derivative instrument at issuance was recorded as a reduction in the carrying value of the Convertible Notes and as a single compound derivative liability. The Convertible Notes carrying value reduction was accreted using the effective interest method as interest expense over the Convertible Notes contractual period of one year. The Convertible Notes had an effective interest rate of 12.69% per year.

On May 31, 2018, the original maturity date for the Convertible Notes was extended to June 28, 2019 (previously June 28, 2018). The maturity date extension was deemed substantial and was accounted for as a debt extinguishment under ASC 470, *Debt*. In connection with the debt extinguishment on May 31, 2018, the fair value of the Convertible Notes was allocated between the carrying amount of the Convertible Notes and accrued interested of $13.1 million, a compound derivate asset of $0.6 million, and an equity component of $3.9 million, which was credited to additional paid-in capital within the consolidated statements of redeemable convertible preferred stock and stockholders' deficit. A $3.3 million loss on debt extinguishment was also recorded in the accompanying consolidated statements of operations. The new carrying value of the Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of 1.1 years.

On August 20, 2018, the maturity date for the Convertible Notes was changed to September 20, 2018 (previously June 28, 2019). The term change was deemed substantial and was accounted for as a debt extinguishment under ASC 470. In connection with the debt extinguishment on August 20, 2018, the fair value of the Convertible Notes was allocated between the new carrying amount of the Convertible Notes and accrued interest of $13.4 million, and an equity component of $0.8 million, which resulted in an additional credit to additional paid-in capital. A $0.8 million loss on debt extinguishment was also recorded in the accompanying consolidated statements of operations. The new carrying value of Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of one month.

On September 20, 2018, upon the maturity of the Convertible Notes, the carrying amount, including accrued interest of $13.4 million was converted into 6,671,990 shares of the Company's Series C redeemable convertible preferred stock at a conversion price equal to $2.013 per share. No gain or loss was recorded on the conversion.

The interest expense on the Convertible Notes for the years ended December 31, 2017 and 2018, was $0.7 million and $0.9 million, respectively.

**Note 7. Income Taxes**

For financial reporting purposes, loss before provision for income taxes, includes the following components (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2017 | 2018 |
| Domestic | $ (23,613) | $ (19,897) |
| Foreign | 20 | 18 |
| Loss before income taxes | $ (23,593) | $ (19,879) |

***Provision for Income Taxes***

The provision for income taxes consists of the following (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2017 | 2018 |
| **Current:** | | |
| Federal | $ — | $ — |
| State | 1 | 2 |
| Foreign | 4 | 5 |
| Total current | 5 | 7 |
| Provision for income taxes | $ 5 | $ 7 |

Income tax provision related to continuing operations differ from the amounts computed by applying the statutory income tax rate of 34% to pretax loss in 2017 and 21% in 2018 as follows (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| **U.S. Federal provision** | 2017 | 2018 |
| At statutory rate | $ (8,022) | $ (4,175) |
| State taxes | (1,674) | (589) |
| Valuation allowance | (2,109) | 4,188 |
| Foreign tax differential | (3) | 2 |
| Rate impact due to tax reform | 11,934 | — |
| Research and development credit | (547) | (564) |
| Debt extinguishment | — | 871 |
| Other | 426 | 274 |
| Total | $ 5 | $ 7 |

**Tax Law Changes**

The U.S. Tax Cuts and Jobs Act (the “Tax Act”) was enacted on December 22, 2017. The Tax Act reduced the U.S. federal corporate tax rate from 35% in 2017 to 21% in 2018, required companies to pay a onetime transition tax on earnings of certain foreign subsidiaries that were previously tax deferred, and created new taxes on certain foreign sourced earnings. For the year ended December 31, 2017, the Company remeasured its deferred tax assets and liabilities based on the change in the federal rate to 21%. At December 31, 2018, the Company had completed its accounting for the Tax Act, which, other than the decrease in its gross deferred tax assets, did not have a material impact on the Company’s financial statements.

**Deferred Tax Assets and Liabilities**

Deferred income taxes reflect the net tax effects of loss and credit carryforwards and temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Significant components of the Company's deferred tax assets for federal and state income taxes are as follows (in thousands):

| | Year Ended December 31, | |
|---|---|---|
| | 2017 | 2018 |
| **Deferred tax assets:** | | |
| Net operating loss carryforwards | $ 22,783 | $ 22,441 |
| Research and development credits | 3,535 | 4,634 |
| Deferred revenue | 1,475 | 4,839 |
| Fixed assets | (875) | (751) |
| Accruals and reserves | 434 | 460 |
| Stock-based compensation | 167 | 297 |
| Inventory | 43 | 42 |
| Other intangibles | 518 | 458 |
| Other | (140) | 3 |
| Total gross deferred tax assets | 27,940 | 32,423 |
| *Less: Valuation allowance* | (27,940) | (32,423) |
| Total deferred tax assets | $ — | $ — |

Realization of our deferred tax assets is dependent upon future earning, if any, the timing and amount of which are uncertain. Because of our lack of U.S. earnings history, the net U.S. deferred tax assets have been fully offset by a valuation allowance. The valuation allowance decreased by $1.8 million for the year ended December 31, 2017, and increased by $4.5 million for the year ended December 31, 2018.

**Net Operating Loss and Tax Credit Carryforwards**

As of December 31, 2018, the Company had net operating loss carryforwards for federal income tax purposes of approximately $87.0 million, portions of which will begin to expire in 2031. The Company had a total state net operating loss carryforward of approximately $48.6 million, which will begin to expire in 2031. Utilization of some of the federal and state net operating loss and credit carryforwards are subject to annual limitations due to the "change in ownership" provisions of the Internal Revenue Code of 1986, as amended, and similar state provisions. The annual limitations may result in the expiration of net operating losses and credits before utilization for federal and state income tax purposes, respectively. The federal and state net operating loss carryforwards begin expiring in 2032, if not utilized.

The Company has federal credits of approximately $2.8 million, which will begin to expire in 2031 and state research credits of approximately $3.0 million which have no expiration date. These tax credits are subject to the same limitations discussed above.

**Unrecognized Tax Benefits**

The Company has incurred net operating losses since inceptions and does not have any significant unrecognized tax benefits. The Company's policy is to include interest and penalties related to unrecognized tax benefits, if any, within the provision for taxes in the consolidated statements of operations. If the Company is eventually able to recognize its uncertain positions, its effective tax rate would be reduced. The Company currently has a full valuation allowance against its net deferred tax asset, which would impact the timing of the effective tax rate benefit should any of these uncertain tax positions be favorably settled in the future. Any adjustments to the Company's uncertain tax positions would result in an adjustment of its net operating loss or tax credit carryforwards rather than resulting in a cash outlay.

The Company files income tax returns in the U.S. federal and various state income tax returns. Because of net operating losses and research credit carryovers, substantially all of the Company's tax years remain open to examination.

The Company has the following activity relating to unrecognized tax benefits (in thousands):

| | As of December 31, | |
|---|---|---|
| | 2017 | 2018 |
| Beginning balance | $ 708 | $ 917 |
| Gross increase—tax position in current period | 209 | 275 |
| Ending balance | $ 917 | $ 1,192 |

Although it is reasonably possible that certain unrecognized tax benefits may increase or decrease within the next 12 months due to tax examination changes, settlement activities, expirations of statute of limitations, or the impact on recognition and measurement considerations related to the results of published tax cases or other similar activities, the Company does not anticipate any significant changes to unrecognized tax benefits over the next 12 months. During the years ended December 31, 2017 and 2018, no significant interest or penalties were required to be recognized relating to unrecognized tax benefits.

**Note 8. Common Stock Warrants**

In connection with the sale of Series A redeemable convertible preferred stock in August 2011, the Company issued a warrant to purchase 754,573 shares of common stock to an investor who purchased Series A redeemable convertible preferred stock in August 2011 at an exercise price of $0.01 per share. The common stock warrant expires in August 2021 and remained outstanding as of December 31, 2018.

In connection with the growth capital loan agreement (unaudited, see Note 6), the Company issued a warrant to purchase 262,008 shares of common stock to the lender at an exercise price of $2.29 per share. The Company recorded the issuance-date fair value of the warrant of $0.6 million in equity as the warrant met all criteria for equity classification.

**Note 9. Convertible Preferred Stock Warrants**

In September 2014, in connection with the Term Loan (see Note 6), the Company issued a warrant to purchase 89,956 shares of its Series B redeemable convertible preferred stock at an exercise price of $1.15 per share. The Series B convertible preferred stock warrant expires in September 2024 and remained outstanding as of March 31, 2019 (unaudited).

As of December 31, 2018, the remaining term of the Series B convertible preferred stock warrant was 6.75 years. The estimated fair value of the Series B convertible preferred stock warrant on the date of issuance of $0.1 million was recorded as a debt reduction. As of the issuance date, the fair value of the Series B convertible preferred stock warrant was calculated using the Black-Scholes option-pricing model and was based on a contractual term of ten years, a risk-free interest rate of 2.52%, expected volatility of 66.53%, and 0% expected dividend yield.

As of March 31, 2019 (unaudited), the remaining term of the Series B convertible preferred stock warrant was 5.5 years.

In June 2017, as additional consideration for the Revolving Loan (see Note 6), the Company issued a warrant to purchase up to 248,385 shares of its Series C redeemable convertible preferred stock at an exercise price of $2.013, subject to certain adjustments, such as any stock splits, stock dividends, recapitalizations, reclassifications, combinations, or similar transactions.

The remaining term of the Series C convertible preferred stock warrant is the greater of (i) seven years from June 28, 2017, or (ii) five years from the effective date of the Company's initial public offering.

The estimated fair value of the Series C convertible preferred stock warrant on the date of issuance of $0.1 million was recorded as a debt reduction. As of the issuance date, the fair value of the Series C convertible preferred stock warrant was calculated using the Black-Scholes option-pricing model and was based on a contractual term of seven years, a risk-free interest rate of 1.97%, expected volatility of 64.33%, and 0% expected dividend yield.

At initial recognition, the convertible preferred stock warrants were recorded at their estimated fair values and were subject to remeasurement at each consolidated balance sheet date, with changes in fair value recognized as a component of net income. As of December 31, 2017 and 2018 and March 31, 2019 (unaudited), the fair values of the convertible preferred stock warrants were calculated to be $0.3 million, $0.7 million, and $0.8 million, respectively.

**Note 10. Compound Derivative Instrument**

Certain conversion and redemption features embedded in the Convertible Notes (see Note 6) were bifurcated from the notes and accounted for as separate compound derivative instrument. The Company remeasured the value of the compound derivative instrument on a recurring basis, with the change in fair value reflected as other income (expense) in the consolidated statements of operations. The compound derivative instrument was recorded as a compound derivative liability at fair value, which was $0.5 million as of the issuance date and $0.7 million and $0 as of December 31, 2017 and 2018, respectively (see Note 5).

Upon modification of the Convertible Notes on August 20, 2018 (see Note 6), the compound derivative asset was eliminated.

**Note 11. Commitments and Contingencies**

*Operating Lease Obligations*

In February 2015, the Company entered into a noncancelable operating lease for approximately 31,280 square feet of office space, which expires on November 30, 2020.

The Company recognizes rent expense on a straight-line basis over the noncancelable lease term. The Company's rent expense was $1.1 million for the years ended December 31, 2017 and 2018.

The Company adopted ASC 842 as of January 1, 2019. In determining the present value of lease payments, the Company uses its incremental borrowing rate based on the information available at the lease commencement date if the rate implicit in the lease is not readily determinable. At the date of adoption of ASC 842, the Company determined the amounts of lease liability using a discount rate of 8%, which represents the Company's incremental borrowing rate. The Company determines its incremental borrowing rate for lease liability using its current borrowing rate, adjusted for various factors including level of collateralization and term. Lease cost for the three-month period ended March 31, 2019 (unaudited) was $0.2 million. Cash paid for operating lease liabilities, included in cash flow from operating activities in the Consolidated Statement of Cash Flows, was $0.3 million for the three-month period ended March 31, 2019 (unaudited). As of March 31, 2019 (unaudited), the remaining lease term for the lease is 1.7 years.

Future minimum lease payments at December 31, 2018 under this noncancelable operating lease were as follows (in thousands):

| | Amount |
|---|---|
| 2019 | $1,091 |
| 2020 | 1,030 |
| Total future minimum lease payments | $2,121 |

Future minimum lease payments at March 31, 2019 (unaudited) under the lease were as follows (in thousands):

| | Amount |
|---|---|
| 2019 (excluding the three months ended March 31, 2019) | $ 824 |
| 2020 | 1,030 |
| Total future minimum lease payments | 1,854 |
| Less: imputed interest | (115) |
| Present value of future minimum lease payments | 1,739 |
| Less: current portion of operating lease liability | (1,001) |
| Operating lease liabilities - noncurrent | $ 738 |

*Contingencies*

The Company is subject to claims and assessments from time to time in the ordinary course of business. Accruals for litigation and contingencies are reflected in the consolidated financial statements based on management's assessment, including the advice of legal counsel, of the expected outcome of litigation or other dispute resolution proceedings and/or the expected resolution of contingencies. Liabilities for estimated losses are accrued if the potential losses from any claims or legal proceedings are considered probable and the amounts can be reasonably estimated. Significant judgment is required in both the determination of probability of loss and the determination as to whether the amount can be reasonably estimated. Accruals are based only on information available at the time of the assessment due to the uncertain nature of such matters. As additional information becomes available, management reassesses potential liabilities related to pending claims and litigation and may revise its previous estimates, which could materially affect the Company's consolidated results of operations in a given period. As of December 31, 2017 and 2018 and March 31, 2019 (unaudited), the Company was not involved in any material legal proceedings.

*Indemnification*

In the normal course of business, the Company enters into contracts and agreements that contain a variety of representations and warranties and provide for general indemnifications. The Company's exposure under these agreements is unknown because it involves claims that may be made against the Company in the future, but that have not yet been made. To date, the Company has not paid any claims or been required to defend any action related to its indemnification obligations. However, the Company may record charges in the future as a result of these indemnification obligations.

**Note 12. Redeemable Convertible Preferred Stock**

The Company's certificate of incorporation, as amended, authorizes it to issue 75,238,150 shares of $0.0001 par value redeemable convertible preferred stock, with 31,250,000 shares of preferred stock designated as Series A redeemable convertible preferred stock, 19,288,150 shares of redeemable preferred stock designated as Series B redeemable convertible preferred stock, and 24,700,000 shares of preferred stock designated as Series C redeemable convertible preferred stock.

Redeemable convertible preferred stock at December 31, 2017, consisted of the following (in thousands, except share and per share data):

**As of December 31, 2017**

| Series | Shares Authorized | Shares Outstanding | Liquidation Amount | Issuance Costs | Original Issuance Price |
|---|---|---|---|---|---|
| Series A redeemable convertible preferred stock | 31,250,000 | 31,249,991 | $ 20,500 | $ 82 | $ 0.656 |
| Series B redeemable convertible preferred stock | 19,288,150 | 19,198,194 | 22,078 | 31 | 1.150 |
| Series C redeemable convertible preferred stock | 18,000,000 | 16,778,800 | 33,776 | 89 | 2.013 |
| | 68,538,150 | 67,226,985 | $ 76,354 | $ 202 | |

Redeemable convertible preferred stock at December 31, 2018, consisted of the following (in thousands, except share and per share data):

**As of December 31, 2018**

| Series | Shares Authorized | Shares Outstanding | Liquidation Amount | Issuance Costs | Original Issuance Price |
|---|---|---|---|---|---|
| Series A redeemable convertible preferred stock | 31,250,000 | 31,249,991 | $ 20,500 | $ 82 | $ 0.656 |
| Series B redeemable convertible preferred stock | 19,288,150 | 19,198,194 | 22,078 | 31 | 1.150 |
| Series C redeemable convertible preferred stock | 24,700,000 | 23,450,790 | 47,206 | 110 | 2.013 |
| | 75,238,150 | 73,898,975 | $ 89,784 | $ 223 | |

Redeemable convertible preferred stock at March 31, 2019, consisted of the following (in thousands, except share and per share data):

**As of March 31, 2019 (unaudited)**

| Series | Shares Authorized | Shares Outstanding | Liquidation Amount | Issuance Costs | Issuance Price |
|---|---|---|---|---|---|
| Series A redeemable convertible preferred stock | 31,250,000 | 31,249,991 | $ 20,500 | $ 82 | $ 0.656 |
| Series B redeemable convertible preferred stock | 19,288,150 | 19,198,194 | 22,078 | 31 | 1.150 |
| Series C redeemable convertible preferred stock | 24,700,000 | 23,450,790 | 47,206 | 110 | 2.013 |
| | 75,238,150 | 73,898,975 | $ 89,784 | $ 223 | |

The rights and preferences of holders of the redeemable convertible preferred stock are as follows:

*Dividends*

Holders of the redeemable convertible preferred stock are entitled to receive, prior and in preference to any declaration or payments of any dividend on the common stock, noncumulative dividends out of any assets legally available at the per annum rate of 8% of the original issuance price of the redeemable convertible preferred stock, when and if declared by the board of directors.

No dividends shall be paid on any common stock until dividends to the holders of the redeemable convertible preferred stock have been paid. After payment of dividends to holders of the redeemable convertible preferred stock, any additional dividends, when, as, and if declared by the board of directors, shall be distributed among all holders of common stock and all holders of redeemable convertible preferred stock pro rata based on the number of shares of common stock held by each holder on an as-converted basis. As of December 31, 2018, no dividends have been declared or paid to the holders of redeemable convertible preferred stock.

*Voting Rights*

Each share of redeemable convertible preferred stock has voting rights equal to an equivalent number of shares of common stock into which it is convertible and votes together as one class with the common stock. As long as 1,000,000 shares of redeemable convertible preferred stock remain outstanding, the Company must obtain approval from the holders of a majority of the then-outstanding redeemable convertible preferred stock in order to alter the certificate of incorporation; increase or decrease the authorized number of shares of common stock or redeemable convertible preferred stock; authorize or designate any new class or series of stock or any other securities convertible into equity securities of the Company ranking on parity with or senior to the redeemable convertible preferred stock in redemption, liquidation preference, voting or dividend rights, or any increase in the authorized or designated number of any such class or series; effect any liquidation, dissolution, winding-up, recapitalization, reorganization, or change in control of the Company; change the number of authorized directors of the Company; or declare or pay any dividends on the common stock.

*Liquidation Rights*

In the event of any liquidation, dissolution, or winding-up of the Company, either voluntary or involuntary, holders of the redeemable convertible preferred stock shall be entitled to receive, prior to and in preference to any distribution of any of the assets to the holders of the common stock of the Company, an amount per share equal to the sum of the original issue price of the redeemable convertible preferred stock and all declared and

unpaid dividends on such shares of redeemable convertible preferred stock. If upon the occurrence of such an event, the assets and funds distributed among the holders of the redeemable convertible preferred stock are insufficient to permit the payment to such holders of the redeemable convertible preferred stock, then the entire assets and funds of the Company legally available for distribution shall be distributed ratably among the holders of the redeemable convertible preferred stock in proportion to the full amount such holders are otherwise entitled to have received pursuant to the entitlement as noted above.

After the payment in full to holders of the redeemable convertible preferred stock as noted above, the remaining assets, if any, shall be distributed ratably to the holders of the common stock.

*Conversion rights*

Each share of redeemable convertible preferred stock is convertible, at the option of the holder, at any time after the date of issuance of such share for such redeemable convertible preferred stock. Each share of redeemable convertible preferred stock shall be convertible into the number of shares of common stock determined by dividing the original issuance price by the conversion price. The initial conversion price for each share of redeemable convertible preferred stock is the original issuance price for such share of redeemable convertible preferred stock.

Each share of redeemable convertible preferred stock automatically converts into the number of shares of common stock into which such shares are convertible at the then-effective conversion ratio (i) at any time upon the affirmative election of the holders of a majority of the outstanding shares of the redeemable convertible preferred stock or (ii) upon closing of a public offering of common stock in which the gross cash proceeds to the Company are at least $30.0 million.

**Note 13. Stockholders' Deficit**

The Company's certificate of incorporation, as amended, authorizes it to issue 105,700,000 shares of $0.0001 par value common stock. Common stockholders are entitled to dividends, subject to redeemable convertible preferred stock dividends, when and if declared by the board of directors. There have been no dividends declared to date. The holder of each common share is entitled to one vote.

**Note 14. Stock Option Plan**

In 2011, the Company established its 2011 stock option plan (the "2011 Plan") that provides for the granting of stock options to employees and nonemployees of the Company. Under the 2011 Plan, the Company has the ability to issue incentive stock options ("ISOs"), nonstatutory stock options, stock appreciation rights, restricted stock awards, and restricted stock unit awards. Options under the 2011 Plan may be granted for periods of up to 10 years. The ISOs will be granted at a price per share not less than the fair value at the date of grant. The exercise price of an ISO granted to a 10% stockholder shall not be less than 110% of the estimated fair value of the shares on the date of grant, as determined by the board of directors. Options granted to new hires generally vest over a four-year period, with 25% vesting at the end of one year and the remaining vesting monthly thereafter; options granted as merit awards generally vest monthly over a four-year period. At December 31, 2018 and March 31, 2019 (unaudited), there were 18,591,357 shares and 21,802,734 shares, respectively, of common stock available for issuance under the 2011 Plan.

*Early Exercise of Stock Options*

For stock option grants issued prior to December 31, 2015, the Company allowed employees to exercise options granted under the 2011 Plan prior to vesting. The unvested shares are subject to the Company's repurchase rights at the original purchase price. Initially, the proceeds were recorded as an accrued liability from the early exercise of stock options and reclassified to common stock as the Company's repurchase rights lapse. There were 8,854 and 1,048 unvested shares subject to the Company's repurchase rights as of December 31, 2017 and 2018, respectively. There were 267 unvested shares subject to the Company's repurchase rights as of March 31, 2019 (unaudited).

| | Outstanding Options | | | |
|---|---|---|---|---|
| (in thousands, except share and per share data) | Number of Shares | Weighted-Average Exercise Price | Weighted-Average Remaining Contractual Term (in years) | Aggregate Intrinsic Value |
| **Balance—December 31, 2016** | 8,449,577 | $ 0.44 | 6.41 | $ 2,451 |
| Options granted | 3,594,042 | 0.61 | | |
| Options exercised | (122,498) | 0.53 | | 15 |
| Options canceled | (383,010) | 0.80 | | |
| **Balance—December 31, 2017** | 11,538,111 | 0.48 | 6.61 | 5,860 |
| Options authorized | | | | |
| Options granted | 5,545,857 | 1.42 | | |
| Options exercised | (137,705) | 0.70 | | 96 |
| Options canceled | (505,742) | 0.74 | | |
| **Balance—December 31, 2018** | 16,440,521 | 0.79 | 6.94 | 24,716 |
| Options authorized | — | | | |
| Options granted | 1,446,000 | 2.29 | | |
| Options exercised | (324,037) | 1.09 | | |
| Options canceled | (34,948) | 0.86 | | |
| **Balance—March 31, 2019 (unaudited)** | 17,527,536 | $ 0.90 | 6.94 | $ 41,980 |
| Options vested and expected to vest as of December 31, 2018 | 16,440,552 | 0.79 | 6.94 | 24,716 |
| Options vested and exerciseable as of December 31, 2018 | 9,289,971 | 0.45 | 5.12 | 17,043 |
| Options vested and expected to vest as of March 31, 2019 (unaudited) | 17,527,536 | 0.90 | 6.94 | 41,980 |
| Options vested and exercisable as of March 31, 2019 (unaudited) | 9,496,126 | 0.46 | 5.00 | 26,923 |

The weighted-average grant date fair values of options granted in the years ended December 31, 2017 and 2018, were $0.61 and $1.42, respectively. There were no options granted in the three months ended March 31, 2018 (unaudited). The weighted-average grant date fair values of options granted in the three months ended March 31, 2019 (unaudited) was $1.94. The total fair values of options vested during the years ended December 31, 2017 and 2018, were $0.6 million and $0.8 million, respectively. The total fair values of options vested during March 31, 2018 and 2019 (unaudited) were $0.1 million and $0.4 million, respectively. As of March 31, 2019 (unaudited), the unrecognized stock-based compensation of unvested options was $9.3 million, which is expected to be recognized over a weighted-average period of 3.5 years.

The Company estimated the fair value of stock options using the Black-Scholes option-pricing model. The fair value of stock options is recognized on a straight-line basis over the requisite service periods of the awards. The fair value of stock options was estimated using the following weighted-average assumptions:

| | Year Ended December 31, | | Three Months Ended March 31, |
|---|---|---|---|
| | 2017 | 2018 | 2019 (unaudited) |
| Expected term (in years) | 5.97 - 6.95 | 5.98 - 6.35 | 6.87 |
| Volatility | 56.05 - 65.78% | 56.20 - 65.91% | 56.20% |
| Risk-free interest rate | 1.88 - 2.10% | 2.77 - 2.87% | 2.49% - 2.52% |
| Dividend yield | 0% | 0% | 0% |

*Expected Term*

The expected term is calculated using the simplified method, which is available if there is insufficient historical data about exercise patterns and post-vesting employment termination behavior. The simplified method is based on the vesting period and the contractual term for each grant, or for each vesting tranche for awards with graded vesting. The midpoint of the vesting date and the maximum contractual expiration date is used as the expected term under this method. For awards with multiple vesting tranches, the times from grant until the midpoints for each of the tranches may be averaged to provide an overall expected term.

*Expected Volatility*

The Company used an average historical stock price volatility of a peer group of publicly traded companies to be representative of its expected future stock price volatility, as the Company did not have any trading history for its common stock. For purposes of identifying these peer companies, the Company considered the industry, stage of development, size, and financial leverage of potential comparable companies. For each grant, the Company measured historical volatility over a period equivalent to the expected term.

*Risk-Free Interest Rate*

The risk-free interest rate is based on the implied yield currently available on U.S. Treasury zero-coupon issues with remaining terms equivalent to the expected term of a stock award.

*Expected Dividend Rate*

The Company has not paid and does not anticipate paying, any dividends in the near future. Accordingly, the Company has estimated the dividend yield to be zero.

As of March 31, 2019 (unaudited), the Company had outstanding 269,671 stock options with performance vesting conditions granted to several of its employees. The awards are subject to two vesting criteria: (i) a time-based service criterion, and (ii) a performance criterion of an initial public offering. Until both conditions have been met, shares are not considered to be vested. As of March 31, 2019 (unaudited), the awards' underlying conditions were not considered probable of occurrence and, therefore, no compensation cost was recognized. If an initial public offering had occurred on March 31, 2019 (unaudited), the Company would have recognized $0.9 million of stock-based compensation expense for all such outstanding options.

The following is a summary of stock-based compensation expense by function (in thousands):

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| Costs of revenues | $ 74 | $ 177 | $ 24 | $ 85 |
| Research and development | 225 | 429 | 64 | 164 |
| Selling, general, and administrative | 454 | 711 | 81 | 360 |
| Total stock-based compensation expense | $753 | $1,317 | $ 169 | $ 609 |

**Note 15. Net Loss per Share Attributable to Common Stockholders**

Basic net loss per share is computed by dividing the net loss by the weighted-average number of common shares outstanding for the period. Because the Company reported a net loss for 2017 and 2018 and the three months ended March 31, 2018 and 2019, the number of shares used to calculate diluted net loss per common share is the same as the number of shares used to calculate basic net loss per common share for those periods presented because the potentially dilutive shares would have been antidilutive if included in the calculation.

The following table sets forth the computation of basic and diluted net loss per share attributable to common stockholders (in thousands, except share and per share data):

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| Numerator: | | | | |
| Net loss attributable to common stockholders | $ (23,598) | $ (19,886) | $ (5,375) | $ (5,685) |
| Denominator: | | | | |
| Weighted-average shares outstanding | 12,143,164 | 12,254,067 | 12,207,239 | 12,366,018 |
| Less weighted-average shares subject to repurchase | (16,620) | (1,438) | (914) | (647) |
| Weighted-average shares outstanding used in computing net loss per share attributable to common stockholders—basic and diluted | 12,126,544 | 12,252,629 | 12,206,325 | 12,365,371 |
| Net loss per share attributable to common stockholders—basic and diluted | $ (1.95) | $ (1.62) | $ (0.44) | $ (0.46) |

The following outstanding shares of potentially dilutive securities were excluded from the computation of diluted net loss per share attributable to common stockholders for the periods presented because including them would have been antidilutive:

| | Year Ended December 31, | | Three Months Ended March 31, | |
|---|---|---|---|---|
| | 2017 | 2018 | 2018 | 2019 |
| | | | (unaudited) | |
| Redeemable convertible preferred stock | 67,226,985 | 73,898,975 | 67,226,985 | 73,898,975 |
| Conversion of Convertible Notes[1] | 6,320,605 | — | 6,440,402 | — |
| Common stock warrant | 754,573 | 754,573 | 754,573 | 1,016,581 |
| Series B preferred stock warrant | 89,956 | 89,956 | 89,956 | 89,956 |
| Series C preferred stock warrant | 248,385 | 248,385 | 248,385 | 248,385 |
| Options to purchase common stock | 11,538,111 | 16,440,521 | 11,347,515 | 17,527,537 |
| Unvested early exercised common stock options | 8,854 | 1,048 | 2,083 | 4,064 |
| Total | 86,187,469 | 91,433,458 | 86,109,899 | 92,785,498 |

(1) Calculated as $12.2 million principal and $0.5 million accrued but unpaid interest as of December 31, 2017. Calculated as $12.2 million principal and $0.7 million accrued but unpaid interest as of March 31, 2018 (unaudited).

*Unaudited Pro Forma Net Loss per Share*

Unaudited pro forma basic and diluted net loss per share was computed to give effect to the automatic one-for-one conversion of all outstanding shares of redeemable convertible preferred stock into shares of common stock in connection with a qualified initial public offering, using the if-converted method as though the conversion had occurred as of the beginning of the period presented or the date of issuance.

Unaudited pro forma basic and diluted loss per share is computed as follows (in thousands, except share and per share data):

| | Year Ended December 31, 2018 | Three Months Ended March 31, 2019 (unaudited) |
|---|---|---|
| **Numerator:** | | |
| Net loss attributable to common stockholder | $ (19,886) | $ (5,685) |
| Adjust: Change in fair value of convertible preferred stock warrants | 391 | 134 |
| Pro forma net loss | $ (19,495) | $ (5,551) |
| **Denominator:** | | |
| Weighted-average shares outstanding used in computing net loss per share attributable to common stockholders—basic and diluted | 12,252,629 | 12,365,371 |
| Adjust: Conversion of redeemable convertible preferred stock | 68,926,971 | 73,898,975 |
| Adjust: Conversion of common stock warrants | 754,573 | 754,573 |
| Weighted-average shares outstanding used in computing pro forma net loss per share—basic and diluted | 81,934,173 | 87,018,919 |
| **Pro forma net loss per share—basic and diluted (unaudited)** | $ (0.24) | $ (0.06) |

**Note 16. Subsequent Events**

The Company evaluated subsequent events through March 27, 2019, the date on which the consolidated financial statements were available for issuance.

For the three months ended March 31, 2019, subsequent events were evaluated through May 10, 2019, the date on which the unaudited interim consolidated financial statements were available for issuance.

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## PART II

## INFORMATION NOT REQUIRED IN PROSPECTUS

### Item 13. Other Expenses of Issuance and Distribution.

The following table indicates the expenses to be incurred in connection with the offering described in this registration statement, other than underwriting discounts and commissions, all of which will be paid by us. All amounts are estimated except the SEC registration fee, the Financial Industry Regulatory Authority, Inc. ("FINRA") filing fee, and the exchange listing fee.

| | Amount |
|---|---|
| SEC registration fee | $ * |
| FINRA filing fee | * |
| Exchange listing fee | * |
| Accountants' fees and expenses | * |
| Legal fees and expenses | * |
| Transfer Agent's fees and expenses | * |
| Printing and engraving expenses | * |
| Miscellaneous | * |
| Total expenses | $ * |

* To be provided by amendment.

### Item 14. Indemnification of Directors and Officers.

Section 145 of the Delaware General Corporation Law authorizes a court to award, or a corporation's board of directors to grant, indemnity to directors and officers in terms sufficiently broad to permit such indemnification under certain circumstances for liabilities, including reimbursement for expenses incurred, arising under the Securities Act. Our amended and restated certificate of incorporation that will be in effect on the closing of this offering permits indemnification of our directors, officers, employees, and other agents to the maximum extent permitted by the Delaware General Corporation Law, and our amended and restated bylaws that will be in effect on the closing of this offering provide that we will indemnify our directors and officers and permit us to indemnify our employees and other agents, in each case to the maximum extent permitted by the Delaware General Corporation Law.

We have entered into indemnification agreements with our directors and officers, whereby we have agreed to indemnify our directors and officers to the fullest extent permitted by law, including indemnification against expenses and liabilities incurred in legal proceedings to which the director or officer was, or is threatened to be made, a party by reason of the fact that such director or officer is or was a director, officer, employee, or agent of Personalis, Inc., provided that such director or officer acted in good faith and in a manner that the director or officer reasonably believed to be in, or not opposed to, the best interest of Personalis, Inc. At present, there is no pending litigation or proceeding involving a director or officer of Personalis, Inc. regarding which indemnification is sought, nor is the registrant aware of any threatened litigation that may result in claims for indemnification.

We maintain insurance policies that indemnify our directors and officers against various liabilities arising under the Securities Act and the Exchange Act that might be incurred by any director or officer in his or her capacity as such.

**Item 15. Recent Sales of Unregistered Securities.**

Since January 1, 2016, we have issued the following unregistered securities:

(1) In June 2017, we issued $12,225,000 million in principal amount of convertible promissory notes to a total of 37 accredited investors (including certain holders of 5% or more of our capital stock and entities affiliated with certain of our directors), which notes were subsequently amended and converted into an aggregate of 6,671,990 shares of our Series C redeemable convertible preferred stock in September 2018 at a price of $2.013 per share.

(2) In June 2017, we issued a warrant exercisable for up to 248,385 shares of our Series C redeemable convertible preferred stock at a price of $2.013 per share.

(3) In March 2019, we issued a warrant exercisable for up to 262,008 shares of our common stock at a price of $2.29 per share.

(4) From January 1, 2016 through May 10, 2019, we granted to certain employees, consultants and directors options to purchase an aggregate of 12,712,645 shares of our common stock under our 2011 Plan at exercise prices ranging from $0.61 to $3.30 per share.

(5) From January 1, 2016 through May 10, 2019, we issued an aggregate of 1,024,665 shares of our common stock upon the exercise of options granted under our 2011 Plan, at exercise prices ranging from $0.11 to $1.32 per share, for an aggregate exercise price of $711,080.13.

None of the foregoing transactions involved any underwriters, underwriting discounts, or commissions, or any public offering. Unless otherwise stated, the sales of the above securities were deemed to be exempt from registration under the Securities Act in reliance on Section 4(a)(2) of the Securities Act (and Regulation D or Regulation S promulgated thereunder) or Rule 701 promulgated under Section 3(b) of the Securities Act as transactions by an issuer not involving any public offering or pursuant to benefit plans and contracts relating to compensation as provided under Rule 701. The recipients of the securities in each of these transactions represented their intentions to acquire the securities for investment only and not with a view to or for sale in connection with any distribution thereof, and appropriate legends were placed on the share certificates issued in these transactions. All recipients had adequate access, through their relationships with us, to information about us. The sales of these securities were made without any general solicitation or advertising.

**Item 16. Exhibits and Financial Statement Schedules.**

(a) Exhibits.

| Exhibit Number | Description of Exhibit |
|---|---|
| 1.1* | Form of Underwriting Agreement. |
| 3.1+ | Amended and Restated Certificate of Incorporation of the Registrant, as amended, as currently in effect. |
| 3.2+ | Bylaws of the Registrant, as currently in effect. |
| 3.3* | Form of Amended and Restated Certificate of Incorporation of the Registrant, to be in effect prior to the closing of this offering. |
| 3.4* | Form of Amended and Restated Bylaws of the Registrant, to be in effect prior to the closing of this offering. |
| 4.1* | Form of common stock certificate of the Registrant. |
| 4.2* | Amended and Restated Investor Rights Agreement by and among the Registrant and certain of its stockholders, dated December 16, 2014. |

| Exhibit Number | Description of Exhibit |
|---|---|
| 4.3+ | Warrant to purchase capital stock of the Registrant, issued to Silicon Valley Bank, dated September 25, 2014. |
| 4.4+ | Warrant to purchase capital stock of the Registrant, issued to TriplePoint Capital LLC, dated June 28, 2017. |
| 4.5+ | Warrant to purchase capital stock of the Registrant, issued to TriplePoint Capital LLC, dated March 22, 2019. |
| 5.1* | Opinion of Cooley LLP. |
| 10.1 | Personalis, Inc. 2011 Equity Incentive Plan, as amended, and forms of agreements thereunder. |
| 10.2* | Personalis, Inc. 2019 Equity Incentive Plan and forms of agreements thereunder. |
| 10.3* | Personalis, Inc. 2019 Employee Stock Purchase Plan and forms of agreements thereunder. |
| 10.4* | Form of Indemnification Agreement entered into by and between the Registrant and each director and executive officer. |
| 10.5* | Amended and Restated Employment Agreement, by and between John West and the Registrant, dated , 2019. |
| 10.6* | Employment Agreement, by and between Clinton Musil and the Registrant, dated , 2019. |
| 10.7* | Employment Agreement, by and between Dr. Richard Chen and the Registrant, dated , 2019. |
| 10.8* | Employment Agreement, by and between Aaron Tachibana and the Registrant, dated , 2019. |
| 10.9+ | Lease, by and between MENLO PREHC I, LLC, MENLO PREPI I, LLC, TPI Investors 9, LLC and the Registrant, dated February 2, 2015. |
| 10.10# | Contract No. VA240-17-D-0103, by and between the U.S. Department of Veterans Affairs and the Registrant, dated September 28, 2017. |
| 10.11# | Quotation for Supply of Genetic Analysis Products No. 4079884, by and between Illumina, Inc. and the Registrant, dated March 21, 2017. |
| 10.12# | Purchase Order No. P11405, by and between Illumina, Inc. and the Registrant, dated March 31, 2017. |
| 10.13# | Master Services Subcontract Agreement, by and between Illumina, Inc. and the Registrant, dated November 1, 2017. |
| 10.14# | Pricing Agreement, by and between Illumina, Inc. and the Registrant, dated November 22, 2017. |
| 10.15# | Fasttrack Genetic Analysis Services Agreement No. MQ-20171213CG100, by and between Illumina, Inc. and the Registrant, dated December 13, 2017. |
| 10.16# | Quotation for Supply of Genetic Analysis Products No. SQ-20190214CG102, by and between Illumina, Inc. and the Registrant, dated February 22, 2019. |
| 10.17* | Quotation for Supply of Genetic Analysis Products No. 4192031, by and between Illumina, Inc. and the Registrant, dated March 1, 2019. |
| 10.18* | Purchase Order No. P11405, by and between Illumina, Inc. and the Registrant, dated March 20, 2019. |
| 10.19# | Pricing Agreement, by and between Illumina, Inc. and the Registrant, dated March 26, 2019. |
| 10.20 | Plain English Revolving Loan and Security Agreement, by and between TriplePoint Capital LLC and the Registrant, dated June 28, 2017. |

| Exhibit Number | Description of Exhibit |
|---|---|
| 10.21 | First Amendment to Plain English Revolving Loan and Security Agreement, by and between TriplePoint Capital LLC and the Registrant, dated March 22, 2019. |
| 10.22 | Form of convertible promissory note of the Registrant. |
| 10.23 | Amendment No. 1 to the convertible promissory note of the Registrant. |
| 10.24 | Amendment No. 2 to the convertible promissory note of the Registrant. |
| 16.1+ | Letter from Moss Adams LLP to the Securities and Exchange Commission, dated March 27, 2019. |
| 21.1 | List of subsidiaries of the Registrant. |
| 23.1* | Consent of Deloitte & Touche LLP, independent registered public accounting firm. |
| 23.2* | Consent of Cooley LLP (included in Exhibit 5.1). |
| 24.1 | Power of Attorney (included on signature page). |

* To be filed by amendment.
\+ Previously filed.
\# Portions of this exhibit (indicated by asterisks) have been omitted as the Registrant has determined that (i) the omitted information is not material and (ii) the omitted information would likely cause competitive harm to the Registrant if publicly disclosed.

(b) Financial Statement Schedules.

All financial statement schedules are omitted because the information required to be set forth therein is not applicable or is shown in the consolidated financial statements or the notes thereto.

**Item 17. Undertakings.**

The undersigned Registrant hereby undertakes to provide to the underwriters at the closing specified in the underwriting agreement, certificates in such denominations and registered in such names as required by the underwriters to permit prompt delivery to each purchaser.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the Registrant pursuant to the foregoing provisions, or otherwise, the Registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

The undersigned Registrant hereby undertakes that:

(1) For purposes of determining any liability under the Securities Act of 1933, the information omitted from the form of prospectus filed as part of this Registration Statement in reliance upon Rule 430A and contained in a form of prospectus filed by the Registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act shall be deemed to be part of this Registration Statement as of the time it was declared effective.

(2) For the purpose of determining any liability under the Securities Act of 1933, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial *bona fide* offering thereof.

(3) For the purpose of determining liability of the registrant under the Securities Act of 1933 to any purchaser in the initial distribution of the securities: The undersigned registrant undertakes that in a primary offering of securities of the undersigned registrant pursuant to this registration statement, regardless of the underwriting method used to sell the securities to the purchaser, if the securities are offered or sold to such purchaser by means of any of the following communications, the undersigned registrant will be a seller to the purchaser and will be considered to offer or sell such securities to such purchaser:

(i) Any preliminary prospectus or prospectus of the undersigned registrant relating to the offering required to be filed pursuant to Rule 424;

(ii) Any free writing prospectus relating to the offering prepared by or on behalf of the undersigned registrant or used or referred to by the undersigned registrant;

(iii) The portion of any other free writing prospectus relating to the offering containing material information about the undersigned registrant or its securities provided by or on behalf of the undersigned registrant; and

(iv) Any other communication that is an offer in the offering made by the undersigned registrant to the purchaser.

(4) If the registrant is subject to Rule 430C, each prospectus filed pursuant to Rule 424(b) as part of a registration statement relating to an offering, other than registration statements relying on Rule 430B or other than prospectuses filed in reliance on Rule 430A, shall be deemed to be part of and included in the registration statement as of the date it is first used after effectiveness. Provided, however, that no statement made in a registration statement or prospectus that is part of the registration statement or made in a document incorporated or deemed incorporated by reference into the registration statement or prospectus that is part of the registration statement will, as to a purchaser with a time of contract of sale prior to such first use, supersede or modify any statement that was made in the registration statement or prospectus that was part of the registration statement or made in any such document immediately prior to such date of first use.

## SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the registrant has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Menlo Park, State of California, on , 2019.

**PERSONALIS, INC.**

By: _____
John West
President and Chief Executive Officer

## POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints John West and Aaron Tachibana, and each one of them, as his or her true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution, for him or her and in their name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this registration statement, and to sign any registration statement for the same offering covered by this registration statement that is to be effective on filing pursuant to Rule 462(b) under the Securities Act of 1933, as amended, and all post-effective amendments thereto, and to file the same, with all exhibits thereto and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents or any of them, or his or her substitute or substitutes, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities and on the dates indicated.

| Signature | Title | Date |
|---|---|---|
| John West | President, Chief Executive Officer and Director *(Principal Executive Officer)* | , 2019 |
| Aaron Tachibana | Chief Financial Officer *(Principal Financial and Accounting Officer)* | , 2019 |
| Patrick Balthrop | Director | , 2019 |
| A. Blaine Bowman | Director | , 2019 |
| Alan Colowick, M.D. | Director | , 2019 |
| Kenneth Ludlum | Director | , 2019 |
| Jonathan MacQuitty, Ph.D. | Director | , 2019 |
| Paul Ricci | Director | , 2019 |

**PERSONALIS, INC.**

**2011 EQUITY INCENTIVE PLAN**

**ADOPTED BY THE BOARD OF DIRECTORS: OCTOBER 18, 2011**
**APPROVED BY THE STOCKHOLDERS: NOVEMBER 2, 2011**
**AMENDED BY THE BOARD OF DIRECTORS: SEPTEMBER 30, 2013**
**AMENDMENT APPROVED BY THE STOCKHOLDERS: OCTOBER 1, 2013**
**AMENDED BY THE BOARD OF DIRECTORS: DECEMBER 10, 2014**
**AMENDMENT APPROVED BY THE STOCKHOLDERS: DECEMBER 15, 2014**
**AMENDED BY THE BOARD OF DIRECTORS: MAY 11, 2016**
**AMENDMENT APPROVED BY THE STOCKHOLDERS: JUNE 6, 2016**
**AMENDED BY THE BOARD OF DIRECTORS: JUNE 6, 2018**
**AMENDMENT APPROVED BY THE STOCKHOLDERS: JUNE 15, 2018**
**AMENDED BY THE BOARD OF DIRECTORS: DECEMBER 14, 2018**
**AMENDMENT APPROVED BY THE STOCKHOLDERS: DECEMBER 24, 2018**
**TERMINATION DATE: OCTOBER 18, 2021**

## 1. GENERAL.

**(a) Eligible Stock Award Recipients.** The persons eligible to receive Stock Awards are Employees, Directors and Consultants.

**(b) Available Stock Awards.** The Plan provides for the grant of the following Stock Awards: (i) Incentive Stock Options, (ii) Nonstatutory Stock Options, (iii) Stock Appreciation Rights, (iv) Restricted Stock Awards, and (v) Restricted Stock Unit Awards.

**(c) Purpose.** The Company, by means of the Plan, seeks to secure and retain the services of the group of persons eligible to receive Stock Awards as set forth in Section 1(a), to provide incentives for such persons to exert maximum efforts for the success of the Company and any Affiliate, and to provide a means by which such eligible recipients may be given an opportunity to benefit from increases in value of the Common Stock through the granting of Stock Awards.

## 2. ADMINISTRATION.

**(a) Administration by Board.** The Board shall administer the Plan unless and until the Board delegates administration of the Plan to a Committee or Committees, as provided in Section 2(c).

**(b) Powers of Board.** The Board shall have the power, subject to, and within the limitations of, the express provisions of the Plan:

**(i)** To determine from time to time (A) which of the persons eligible under the Plan shall be granted Stock Awards; (B) when and how each Stock Award shall be granted; (C) what type or combination of types of Stock Award shall be granted; (D) the provisions of each Stock Award granted (which need not be identical), including the time or times when a person shall be permitted to receive cash or Common Stock pursuant to a Stock Award; (E) the number of shares of Common Stock with respect to which a Stock Award shall be granted to each such person; and (F) the Fair Market Value applicable to a Stock Award.

**(ii)** To construe and interpret the Plan and Stock Awards granted under it, and to establish, amend and revoke rules and regulations for administration of the Plan. The Board, in the exercise of this power, may correct any defect, omission or inconsistency in the Plan or in any Stock Award Agreement, in a manner and to the extent it shall deem necessary or expedient to make the Plan or Stock Award fully effective.

**(iii)** To settle all controversies regarding the Plan and Stock Awards granted under it.

**(iv)** To accelerate the time at which a Stock Award may first be exercised or the time during which a Stock Award or any part thereof will vest in accordance with the Plan, notwithstanding the provisions in the Stock Award stating the time at which it may first be exercised or the time during which it will vest.

**(v)** To suspend or terminate the Plan at any time. Suspension or termination of the Plan shall not impair rights and obligations under any Stock Award granted while the Plan is in effect except with the written consent of the affected Participant.

**(vi)** To amend the Plan in any respect the Board deems necessary or advisable, including, without limitation, amendments relating to Incentive Stock Options and certain nonqualified deferred compensation under Section 409A of the Code and/or to bring the Plan or Stock Awards granted under the Plan into compliance therewith, subject to the limitations, if any, of applicable law. However, except as provided in Section 9(a) relating to Capitalization Adjustments, to the extent required by applicable law, stockholder approval shall be required for any amendment of the Plan that either (A) materially increases the number of shares of Common Stock available for issuance under the Plan, (B) materially expands the class of individuals eligible to receive Stock Awards under the Plan, (C) materially increases the benefits accruing to Participants under the Plan or materially reduces the price at which shares of Common Stock may be issued or purchased under the Plan, (D) materially extends the term of the Plan, or (E) expands the types of Stock Awards available for issuance under the Plan. Except as provided above, rights under any Stock Award granted before amendment of the Plan shall not be impaired by any amendment of the Plan unless (1) the Company requests the consent of the affected Participant, and (2) such Participant consents in writing.

**(vii)** To submit any amendment to the Plan for stockholder approval, including, but not limited to, amendments to the Plan intended to satisfy the requirements of Section 422 of the Code regarding Incentive Stock Options.

**(viii)** To approve forms of Stock Award Agreements for use under the Plan and to amend the terms of any one or more Stock Awards, including, but not limited to, amendments to provide terms more favorable to the Participant than previously provided in the Stock Award Agreement, subject to any specified limits in the Plan that are not subject to Board discretion; *provided however,* that, the rights under any Stock Award shall not be impaired by any such amendment unless (i) the Company requests the consent of the affected Participant, and (ii) such

Participant consents in writing. Notwithstanding the foregoing, subject to the limitations of applicable law, if any, and without the affected Participant's consent, the Board may amend the terms of any one or more Stock Awards if necessary to maintain the qualified status of the Stock Award as an Incentive Stock Option or to bring the Stock Award into compliance with Section 409A of the Code.

**(ix)** Generally, to exercise such powers and to perform such acts as the Board deems necessary or expedient to promote the best interests of the Company and that are not in conflict with the provisions of the Plan or Stock Awards.

**(x)** To adopt such procedures and sub-plans as are necessary or appropriate to permit participation in the Plan by Employees, Directors or Consultants who are foreign nationals or employed outside the United States.

**(xi)** To effect, at any time and from time to time, with the consent of any adversely affected Participant, (A) the reduction of the exercise price (or strike price) of any outstanding Option or SAR under the Plan, (B) the cancellation of any outstanding Option or SAR under the Plan and the grant in substitution therefore of (1) a new Option or SAR under the Plan or another equity plan of the Company covering the same or a different number of shares of Common Stock, (2) a Restricted Stock Award, (3) a Restricted Stock Unit Award, (4) cash and/or (5) other valuable consideration (as determined by the Board, in its sole discretion), or (C) any other action that is treated as a repricing under generally accepted accounting principles; *provided, however*, that no such reduction or cancellation may be effected if it is determined, in the Company's sole discretion, that such reduction or cancellation would result in any such outstanding Option becoming subject to the requirements of Section 409A of the Code.

**(c) Delegation to Committee.** The Board may delegate some or all of the administration of the Plan to a Committee or Committees. If administration of the Plan is delegated to a Committee, the Committee shall have, in connection with the administration of the Plan, the powers theretofore possessed by the Board that have been delegated to the Committee, including the power to delegate to a subcommittee of the Committee any of the administrative powers the Committee is authorized to exercise (and references in this Plan to the Board shall thereafter be to the Committee or subcommittee), subject, however, to such resolutions, not inconsistent with the provisions of the Plan, as may be adopted from time to time by the Board. The Board may retain the authority to concurrently administer the Plan with the Committee and may, at any time, revest in the Board some or all of the powers previously delegated.

**(d) Delegation to an Officer.** The Board may delegate to one or more Officers of the Company the authority to do one or both of the following: (i) designate Officers and Employees of the Company or any of its Subsidiaries to be recipients of Options and Stock Appreciation Rights (and, to the extent permitted by applicable law, other Stock Awards) and the terms thereof, and (ii) determine the number of shares of Common Stock to be subject to such Stock Awards granted to such Officers and Employees; *provided, however,* that the Board resolutions regarding such delegation shall specify the total number of shares of Common Stock that may be subject to the Stock Awards granted by such Officer and that such Officer may not grant a Stock Award to himself or herself. Notwithstanding the foregoing, the Board may not delegate authority to an Officer to determine the Fair Market Value pursuant to Section 13(t) below.

**(e) Effect of Board's Decision.** All determinations, interpretations and constructions made by the Board in good faith shall not be subject to review by any person and shall be final, binding and conclusive on all persons.

## 3. SHARES SUBJECT TO THE PLAN.

**(a) Share Reserve**. Subject to the provisions of Section 9(a) relating to Capitalization Adjustments, the aggregate number of shares of Common Stock that may be issued pursuant to Stock Awards beginning on the Effective Date shall not exceed nineteen million nine hundred sixty eight thousand (19,968,000) shares (the ***"Share Reserve"***). Furthermore, if a Stock Award (i) expires or otherwise terminates without having been exercised in full or (ii) is settled in cash (*i.e.*, the holder of the Stock Award receives cash rather than stock), such expiration, termination or settlement shall not reduce (or otherwise offset) the number of shares of Common Stock that may be issued pursuant to the Plan. For clarity, the limitation in this Section 3(a) is a limitation in the number of shares of Common Stock that may be issued pursuant to the Plan. Accordingly, this Section 3(a) does not limit the granting of Stock Awards except as provided in Section 7(a).

**(b) Reversion of Shares to the Share Reserve**. If any shares of Common Stock issued pursuant to a Stock Award are forfeited back to the Company because of the failure to meet a contingency or condition required to vest such shares in the Participant, then the shares which are forfeited shall revert to and again become available for issuance under the Plan. Also, any shares reacquired by the Company pursuant to Section 8(g) or as consideration for the exercise of an Option shall again become available for issuance under the Plan. Notwithstanding the provisions of this Section 3(b), any such shares shall not be subsequently issued pursuant to the exercise of Incentive Stock Options.

**(c) Incentive Stock Option Limit.** Notwithstanding anything to the contrary in this Section 3(c), subject to the provisions of Section 9(a) relating to Capitalization Adjustments, the aggregate maximum number of shares of Common Stock that may be issued pursuant to the exercise of Incentive Stock Options shall be ten million forty eight thousand (19,968,000) shares of Common Stock.

**(d) Source of Shares.** The stock issuable under the Plan shall be shares of authorized but unissued or reacquired Common Stock, including shares repurchased by the Company on the open market or otherwise.

## 4. ELIGIBILITY.

**(a) Eligibility for Specific Stock Awards**. Incentive Stock Options may be granted only to employees of the Company or a "parent corporation" or "subsidiary corporation" thereof (as such terms are defined in Sections 424(e) and (f) of the Code). Stock Awards other than Incentive Stock Options may be granted to Employees, Directors and Consultants; *provided, however,* Nonstatutory Stock Options and SARs may not be granted to Employees, Directors and Consultants who are providing Continuous Service only to any "parent" of the Company, as such term is defined in Rule 405, unless the stock underlying such Stock Awards is treated as "service recipient stock" under Section 409A of the Code because the Stock Awards are granted pursuant to a corporate transaction (such as a spin off transaction) or unless such Stock Awards comply with the distribution requirements of Section 409A of the Code.

**(b) Ten Percent Stockholders**. A Ten Percent Stockholder shall not be granted an Incentive Stock Option unless the exercise price of such Option is at least one hundred ten percent (110%) of the Fair Market Value on the date of grant and the Option is not exercisable after the expiration of five (5) years from the date of grant.

**(c) Consultants. A Consultant shall not be eligible for the grant of a Stock Award if, at the time of grant, either the offer or the sale of the Company's securities to such Consultant is not exempt under Rule 701 because of the nature of the services that the Consultant is providing to the Company, because the Consultant is not a natural person, or because of any other provision of Rule 701, unless the Company determines that such grant need not comply with the requirements of Rule 701 and will satisfy another exemption under the Securities Act as well as comply with the securities laws of all other relevant jurisdictions.**

**5. PROVISIONS RELATING TO OPTIONS AND STOCK APPRECIATION RIGHTS.**

Each Option or SAR shall be in such form and shall contain such terms and conditions as the Board shall deem appropriate. All Options shall be separately designated Incentive Stock Options or Nonstatutory Stock Options at the time of grant, and, if certificates are issued, a separate certificate or certificates shall be issued for shares of Common Stock purchased on exercise of each type of Option. If an Option is not specifically designated as an Incentive Stock Option, then the Option shall be a Nonstatutory Stock Option. The provisions of separate Options or SARs need not be identical; *provided*, *however*, that each Option Agreement or Stock Appreciation Right Agreement shall conform to (through incorporation of provisions hereof by reference in the applicable Stock Award Agreement or otherwise) the substance of each of the following provisions:

**(a) Term.** Subject to the provisions of Section 4(b) regarding Ten Percent Stockholders, no Option or SAR shall be exercisable after the expiration of ten (10) years from the date of its grant or such shorter period specified in the Stock Award Agreement.

**(b) Exercise Price.** Subject to the provisions of Section 4(b) regarding Incentive Stock Options granted to Ten Percent Stockholders, the exercise price (or strike price) of each Option or SAR shall be not less than one hundred percent (100%) of the Fair Market Value of the Common Stock subject to the Option or SAR on the date the Option or SAR is granted. Notwithstanding the foregoing, an Option or SAR may be granted with an exercise price (or strike price) lower than one hundred percent (100%) of the Fair Market Value of the Common Stock subject to the Option or SAR if such Option or SAR is granted pursuant to an assumption of or substitution for another option or stock appreciation right pursuant to a Corporate Transaction and in a manner consistent with the provisions of Sections 409A and 424(a) of the Code (whether or not such Stock Awards are Incentive Stock Options). Each SAR will be denominated in shares of Common Stock equivalents.

**(c) Consideration for Options.** The purchase price of Common Stock acquired pursuant to the exercise of an Option shall be paid, to the extent permitted by applicable law and as determined by the Board in its sole discretion, by any combination of the methods of payment set forth below. The Board shall have the authority to grant Options that do not permit all of the following methods of payment (or otherwise restrict the ability to use certain methods) and to grant Options that require the consent of the Company to utilize a particular method of payment. The permitted methods of payment are as follows:

**(i)** by cash, check, bank draft or money order payable to the Company;

**(ii)** pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board that, prior to the issuance of the stock subject to the Option, results in either the receipt of cash (or check) by the Company or the receipt of irrevocable instructions to pay the aggregate exercise price to the Company from the sales proceeds;

**(iii)** by delivery to the Company (either by actual delivery or attestation) of shares of Common Stock;

**(iv)** if the Option is a Nonstatutory Stock Option, by a "net exercise" arrangement pursuant to which the Company will reduce the number of shares of Common Stock issuable upon exercise by the largest whole number of shares with a Fair Market Value that does not exceed the aggregate exercise price; *provided, however,* that the Company shall accept a cash or other payment from the Participant to the extent of any remaining balance of the aggregate exercise price not satisfied by such reduction in the number of whole shares to be issued; *provided, further,* that shares of Common Stock will no longer be subject to an Option and will not be exercisable thereafter to the extent that (A) shares issuable upon exercise are reduced to pay the exercise price pursuant to the "net exercise," (B) shares are delivered to the Participant as a result of such exercise, and (C) shares are withheld to satisfy tax withholding obligations;

**(v)** according to a deferred payment or similar arrangement with the Optionholder; *provided, however*, that interest shall compound at least annually and shall be charged at the minimum rate of interest necessary to avoid (A) the imputation of interest income to the Company and compensation income to the Optionholder under any applicable provisions of the Code, and (B) the classification of the Option as a liability for financial accounting purposes; or

**(vi)** in any other form of legal consideration that may be acceptable to the Board.

**(d) Exercise and Payment of a SAR.** To exercise any outstanding Stock Appreciation Right, the Participant must provide written notice of exercise to the Company in compliance with the provisions of the Stock Appreciation Right Agreement evidencing such Stock Appreciation Right. The appreciation distribution payable on the exercise of a Stock Appreciation Right will be not greater than an amount equal to the excess of (A) the aggregate Fair Market Value (on the date of the exercise of the Stock Appreciation Right) of a number of shares of Common Stock equal to the number of Common Stock equivalents in which the Participant is vested under such Stock Appreciation Right, and with respect to which the Participant is exercising the Stock Appreciation Right on such date, over (B) the strike price that will be determined by the Board at the time of grant of the Stock Appreciation Right. The

appreciation distribution in respect to a Stock Appreciation Right may be paid in Common Stock, in cash, in any combination of the two or in any other form of consideration, as determined by the Board and contained in the Stock Appreciation Right Agreement evidencing such Stock Appreciation Right.

**(e) Transferability of Options and SARs.** The Board may, in its sole discretion, impose such limitations on the transferability of Options and SARs as the Board shall determine. In the absence of such a determination by the Board to the contrary, the following restrictions on the transferability of Options and SARs shall apply:

**(i) Restrictions on Transfer.** An Option or SAR shall not be transferable except by will or by the laws of descent and distribution and shall be exercisable during the lifetime of the Participant only by the Participant; *provided*, *however*, that the Board may, in its sole discretion, permit transfer of the Option or SAR to such extent as permitted by Rule 701 and in a manner consistent with applicable tax and securities laws upon the Participant's request.

**(ii) Domestic Relations Orders.** Notwithstanding the foregoing, an Option or SAR may be transferred pursuant to a domestic relations order; *provided, however,* that if an Option is an Incentive Stock Option, such Option may be deemed to be a Nonstatutory Stock Option as a result of such transfer.

**(iii) Beneficiary Designation.** Notwithstanding the foregoing, the Participant may, by delivering written notice to the Company, in a form provided by or otherwise satisfactory to the Company and any broker designated by the Company to effect Option exercises, designate a third party who, in the event of the death of the Participant, shall thereafter be entitled to exercise the Option or SAR and receive the Common Stock or other consideration resulting from such exercise. In the absence of such a designation, the executor or administrator of the Participant's estate shall be entitled to exercise the Option or SAR and receive the Common Stock or other consideration resulting from such exercise.

**(f) Vesting Generally.** The total number of shares of Common Stock subject to an Option or SAR may vest and therefore become exercisable in periodic installments that may or may not be equal. The Option or SAR may be subject to such other terms and conditions on the time or times when it may or may not be exercised (which may be based on the satisfaction of performance goals or other criteria) as the Board may deem appropriate. The vesting provisions of individual Options or SARs may vary. The provisions of this Section 5(f) are subject to any Option or SAR provisions governing the minimum number of shares of Common Stock as to which an Option or SAR may be exercised.

**(g) Termination of Continuous Service.** Except as otherwise provided in the applicable Stock Award Agreement or other agreement between the Participant and the Company, in the event that a Participant's Continuous Service terminates (other than upon the Participant's death or Disability), the Participant may exercise his or her Option or SAR (to the extent that the Participant was entitled to exercise such Stock Award as of the date of termination of Continuous Service) but only within such period of time ending on the earlier of (i) the date three (3) months following the termination of the Participant's Continuous Service (or such longer or shorter period specified in the Stock Award Agreement, which period shall not be less

than thirty (30) days if necessary to comply with applicable state laws or (ii) the expiration of the term of the Option or SAR as set forth in the Stock Award Agreement. If, after termination of Continuous Service, the Participant does not exercise his or her Option or SAR within the time specified herein or in the Stock Award Agreement (as applicable), the Option or SAR shall terminate.

**(h) Extension of Termination Date.** Except as otherwise provided in the applicable Stock Award Agreement or other agreement between the Participant and the Company, if the exercise of an Option or SAR following the termination of the Participant's Continuous Service (other than upon the Participant's death or Disability) would be prohibited at any time solely because the issuance of shares of Common Stock would violate the registration requirements under the Securities Act, then the Option or SAR shall terminate on the earlier of (i) the expiration of a period of three (3) months after the termination of the Participant's Continuous Service during which the exercise of the Option or SAR would not be in violation of such registration requirements, or (ii) the expiration of the term of the Option or SAR as set forth in the Stock Award Agreement. In addition, unless otherwise provided in a Participant's Award Agreement, if the sale of any Common Stock received upon exercise of an Option or SAR following the termination of the Participant's Continuous Service would violate the Company's insider trading policy, then the Option or SAR shall terminate on the earlier of (i) the expiration of a period equal to the applicable post-termination exercise period after the termination of the Participant's Continuous Service during which the exercise of the Option or SAR would not be in violation of the Company's insider trading policy, or (ii) the expiration of the term of the Option or SAR as set forth in the applicable Stock Award Agreement.

**(i) Disability of Participant.** Except as otherwise provided in the applicable Stock Award Agreement or other agreement between the Participant and the Company, in the event that a Participant's Continuous Service terminates as a result of the Participant's Disability, the Participant may exercise his or her Option or SAR (to the extent that the Participant was entitled to exercise such Option or SAR as of the date of termination of Continuous Service), but only within such period of time ending on the earlier of (i) the date twelve (12) months following such termination of Continuous Service (or such longer or shorter period specified in the Stock Award Agreement, which period shall not be less than six (6) months if necessary to comply with applicable state laws), or (ii) the expiration of the term of the Option or SAR as set forth in the Stock Award Agreement. If, after termination of Continuous Service, the Participant does not exercise his or her Option or SAR within the time specified herein or in the Stock Award Agreement (as applicable), the Option or SAR shall terminate.

**(j) Death of Participant.** Except as otherwise provided in the applicable Stock Award Agreement or other agreement between the Participant and the Company, in the event that (i) a Participant's Continuous Service terminates as a result of the Participant's death, or (ii) the Participant dies within the period (if any) specified in the Stock Award Agreement after the termination of the Participant's Continuous Service for a reason other than death, then the Option or SAR may be exercised (to the extent the Participant was entitled to exercise such Option or SAR as of the date of death) by the Participant's estate, by a person who acquired the right to exercise the Option or SAR by bequest or inheritance or by a person designated to exercise the Option or SAR upon the Participant's death, but only within the period ending on the earlier of (i) the date eighteen (18) months following the date of death (or such longer or shorter period

specified in the Stock Award Agreement, which period shall not be less than six (6) months if necessary to comply with applicable state laws), or (ii) the expiration of the term of such Option or SAR as set forth in the Stock Award Agreement. If, after the Participant's death, the Option or SAR is not exercised within the time specified herein or in the Stock Award Agreement (as applicable), the Option or SAR shall terminate.

**(k) Termination for Cause.** Except as explicitly provided otherwise in a Participant's Stock Award Agreement, if a Participant's Continuous Service is terminated for Cause, the Option or SAR shall terminate upon the termination date of such Participant's Continuous Service, and the Participant shall be prohibited from exercising his or her Option or SAR from and after the time of such termination of Continuous Service.

**(l) Non-Exempt Employees**. No Option or SAR granted to an Employee who is a non-exempt employee for purposes of the Fair Labor Standards Act of 1938, as amended, shall be first exercisable for any shares of Common Stock until at least six months following the date of grant of the Option or SAR. Notwithstanding the foregoing, consistent with the provisions of the Worker Economic Opportunity Act, in the event of the Participant's death or Disability, upon a Corporate Transaction or a Change in Control in which the vesting of such Options or SARs accelerates, or upon the Participant's retirement (as such term may be defined in the Participant's Stock Award Agreement or in another applicable agreement or in accordance with the Company's then current employment policies and guidelines) any such vested Options and SARs may be exercised earlier than six months following the date of grant. The foregoing provision is intended to operate so that any income derived by a non-exempt employee in connection with the exercise or vesting of an Option or SAR will be exempt from his or her regular rate of pay.

**(m) Early Exercise of Options.** An Option may, but need not, include a provision whereby the Optionholder may elect at any time before the Optionholder's Continuous Service terminates to exercise the Option as to any part or all of the shares of Common Stock subject to the Option prior to the full vesting of the Option. Subject to the "Repurchase Limitation" in Section 8(l), any unvested shares of Common Stock so purchased may be subject to a repurchase right in favor of the Company or to any other restriction the Board determines to be appropriate. Provided that the "Repurchase Limitation" in Section 8(l) is not violated, the Company shall not be required to exercise its repurchase right until at least six (6) months (or such longer or shorter period of time required to avoid classification of the Option as a liability for financial accounting purposes) have elapsed following exercise of the Option unless the Board otherwise specifically provides in the Option Agreement.

**(n) Right of Repurchase**. Subject to the "Repurchase Limitation" in Section 8(l), the Option or SAR may include a provision whereby the Company may elect to repurchase all or any part of the vested shares of Common Stock acquired by the Participant pursuant to the exercise of the Option or SAR.

**(o) Right of First Refusal**. The Option or SAR may include a provision whereby the Company may elect to exercise a right of first refusal following receipt of notice from the Participant of the intent to transfer all or any part of the shares of Common Stock received upon the exercise of the Option or SAR. Such right of first refusal shall be subject to the "Repurchase Limitation" in Section 8(l). Except as expressly provided in this Section 5(o) or in the Stock Award Agreement, such right of first refusal shall otherwise comply with any applicable provisions of the Bylaws of the Company.

**6. PROVISIONS OF RESTRICTED STOCK AWARDS AND RESTRICTED STOCK UNITS.**

**(a) Restricted Stock Awards.** Each Restricted Stock Award Agreement shall be in such form and shall contain such terms and conditions as the Board shall deem appropriate. To the extent consistent with the Company's Bylaws, at the Board's election, shares of Common Stock may be (x) held in book entry form subject to the Company's instructions until any restrictions relating to the Restricted Stock Award lapse; or (y) evidenced by a certificate, which certificate shall be held in such form and manner as determined by the Board. The terms and conditions of Restricted Stock Award Agreements may change from time to time, and the terms and conditions of separate Restricted Stock Award Agreements need not be identical; *provided, however*, that each Restricted Stock Award Agreement shall conform to (through incorporation of the provisions hereof by reference in the agreement or otherwise) the substance of each of the following provisions:

**(i) Consideration**. A Restricted Stock Award may be awarded in consideration for (A) cash or cash equivalents, (B) past or future services actually or to be rendered to the Company or an Affiliate, or (C) any other form of legal consideration that may be acceptable to the Board in its sole discretion and permissible under applicable law.

**(ii) Vesting**. Subject to the "Repurchase Limitation" in Section 8(l), shares of Common Stock awarded under the Restricted Stock Award Agreement may be subject to forfeiture to the Company in accordance with a vesting schedule to be determined by the Board.

**(iii) Termination of Participant's Continuous Service**. If a Participant's Continuous Service terminates, the Company may receive through a forfeiture condition or a repurchase right, any or all of the shares of Common Stock held by the Participant that have not vested as of the date of termination of Continuous Service under the terms of the Restricted Stock Award Agreement.

**(iv) Transferability**. Rights to acquire shares of Common Stock under the Restricted Stock Award Agreement shall be transferable by the Participant only upon such terms and conditions as are set forth in the Restricted Stock Award Agreement, as the Board shall determine in its sole discretion, so long as Common Stock awarded under the Restricted Stock Award Agreement remains subject to the terms of the Restricted Stock Award Agreement.

**(v) Dividends.** A Restricted Stock Award Agreement may provide that any dividends paid on Restricted Stock will be subject to the same vesting and forfeiture restrictions as apply to the shares subject to the Restricted Stock Award to which they relate.

**(b) Restricted Stock Unit Awards.** Each Restricted Stock Unit Award Agreement shall be in such form and shall contain such terms and conditions as the Board shall deem appropriate. The terms and conditions of Restricted Stock Unit Award Agreements may change from time to time, and the terms and conditions of separate Restricted Stock Unit Award Agreements need not be identical, *provided, however,* that each Restricted Stock Unit Award Agreement shall conform to (through incorporation of the provisions hereof by reference in the Agreement or otherwise) the substance of each of the following provisions:

**(i) Consideration.** At the time of grant of a Restricted Stock Unit Award, the Board will determine the consideration, if any, to be paid by the Participant upon delivery of each share of Common Stock subject to the Restricted Stock Unit Award. The consideration to be paid (if any) by the Participant for each share of Common Stock subject to a Restricted Stock Unit Award may be paid in any form of legal consideration that may be acceptable to the Board in its sole discretion and permissible under applicable law.

**(ii) Vesting.** At the time of the grant of a Restricted Stock Unit Award, the Board may impose such restrictions or conditions to the vesting of the Restricted Stock Unit Award as it, in its sole discretion, deems appropriate.

**(iii) Payment**. A Restricted Stock Unit Award may be settled by the delivery of shares of Common Stock, their cash equivalent, any combination thereof or in any other form of consideration, as determined by the Board and contained in the Restricted Stock Unit Award Agreement.

**(iv) Additional Restrictions.** At the time of the grant of a Restricted Stock Unit Award, the Board, as it deems appropriate, may impose such restrictions or conditions that delay the delivery of the shares of Common Stock (or their cash equivalent) subject to a Restricted Stock Unit Award to a time after the vesting of such Restricted Stock Unit Award.

**(v) Dividend Equivalents.** Dividend equivalents may be credited in respect of shares of Common Stock covered by a Restricted Stock Unit Award, as determined by the Board and contained in the Restricted Stock Unit Award Agreement. At the sole discretion of the Board, such dividend equivalents may be converted into additional shares of Common Stock covered by the Restricted Stock Unit Award in such manner as determined by the Board. Any additional shares covered by the Restricted Stock Unit Award credited by reason of such dividend equivalents will be subject to all the terms and conditions of the underlying Restricted Stock Unit Award Agreement to which they relate.

**(vi) Termination of Participant's Continuous Service.** Except as otherwise provided in the applicable Restricted Stock Unit Award Agreement, such portion of the Restricted Stock Unit Award that has not vested will be forfeited upon the Participant's termination of Continuous Service.

**(vii) Compliance with Section 409A of the Code.** Notwithstanding anything to the contrary set forth herein, any Restricted Stock Unit Award granted under the Plan that is not exempt from the requirements of Section 409A of the Code shall contain such provisions so that such Restricted Stock Unit Award will comply with the requirements of Section 409A of the Code. Such restrictions, if any, shall be determined by the Board and contained in the Restricted Stock Unit Award Agreement evidencing such Restricted Stock Unit Award. For example, such restrictions may include, without limitation, a requirement that any Common Stock that is to be issued in a year following the year in which the Restricted Stock Unit Award vests must be issued in accordance with a fixed pre-determined schedule.

**7. COVENANTS OF THE COMPANY.**

**(a) Availability of Shares.** During the terms of the Stock Awards, the Company shall keep available at all times the number of shares of Common Stock reasonably required to satisfy such Stock Awards.

**(b) Securities Law Compliance.** The Company shall seek to obtain from each regulatory commission or agency having jurisdiction over the Plan such authority as may be required to grant Stock Awards and to issue and sell shares of Common Stock upon exercise of the Stock Awards; *provided, however,* that this undertaking shall not require the Company to register under the Securities Act the Plan, any Stock Award or any Common Stock issued or issuable pursuant to any such Stock Award. If, after reasonable efforts, the Company is unable to obtain from any such regulatory commission or agency the authority that counsel for the Company deems necessary for the lawful issuance and sale of Common Stock under the Plan, the Company shall be relieved from any liability for failure to issue and sell Common Stock upon exercise of such Stock Awards unless and until such authority is obtained. A Participant shall not be eligible for the grant of a Stock Award or the subsequent issuance of Common Stock pursuant to the Stock Award if such grant or issuance would be in violation of any applicable securities law.

**(c) No Obligation to Notify.** The Company shall have no duty or obligation to any Participant to advise such holder as to the time or manner of exercising such Stock Award. Furthermore, the Company shall have no duty or obligation to warn or otherwise advise such holder of a pending termination or expiration of a Stock Award or a possible period in which the Stock Award may not be exercised. The Company has no duty or obligation to minimize the tax consequences of a Stock Award to the holder of such Stock Award.

**8. MISCELLANEOUS.**

**(a) Use of Proceeds from Sales of Common Stock.** Proceeds from the sale of shares of Common Stock pursuant to Stock Awards shall constitute general funds of the Company.

**(b) Corporate Action Constituting Grant of Stock Awards.** Corporate action constituting a grant by the Company of a Stock Award to any Participant shall be deemed completed as of the date of such corporate action, unless otherwise determined by the Board, regardless of when the instrument, certificate, or letter evidencing the Stock Award is communicated to, or actually received or accepted by, the Participant.

**(c) Stockholder Rights.** No Participant shall be deemed to be the holder of, or to have any of the rights of a holder with respect to, any shares of Common Stock subject to such Stock Award unless and until (i) such Participant has satisfied all requirements for exercise of the Stock Award pursuant to its terms, if applicable, and (ii) the issuance of the Common Stock subject to such Stock Award has been entered into the books and records of the Company.

**(d) No Employment or Other Service Rights.** Nothing in the Plan, any Stock Award Agreement or any other instrument executed thereunder or in connection with any Stock Award granted pursuant thereto shall confer upon any Participant any right to continue to serve

the Company or an Affiliate in the capacity in effect at the time the Stock Award was granted or shall affect the right of the Company or an Affiliate to terminate (i) the employment of an Employee with or without notice and with or without cause, (ii) the service of a Consultant pursuant to the terms of such Consultant's agreement with the Company or an Affiliate, or (iii) the service of a Director pursuant to the Bylaws of the Company or an Affiliate, and any applicable provisions of the corporate law of the state in which the Company or the Affiliate is incorporated, as the case may be.

**(e) Incentive Stock Option $100,000 Limitation.** To the extent that the aggregate Fair Market Value (determined at the time of grant) of Common Stock with respect to which Incentive Stock Options are exercisable for the first time by any Optionholder during any calendar year (under all plans of the Company and any Affiliates) exceeds one hundred thousand dollars ($100,000), the Options or portions thereof that exceed such limit (according to the order in which they were granted) shall be treated as Nonstatutory Stock Options, notwithstanding any contrary provision of the applicable Option Agreement(s).

**(f) Investment Assurances.** The Company may require a Participant, as a condition of exercising or acquiring Common Stock under any Stock Award, (i) to give written assurances satisfactory to the Company as to the Participant's knowledge and experience in financial and business matters and/or to employ a purchaser representative reasonably satisfactory to the Company who is knowledgeable and experienced in financial and business matters and that he or she is capable of evaluating, alone or together with the purchaser representative, the merits and risks of exercising the Stock Award; and (ii) to give written assurances satisfactory to the Company stating that the Participant is acquiring Common Stock subject to the Stock Award for the Participant's own account and not with any present intention of selling or otherwise distributing the Common Stock. The foregoing requirements, and any assurances given pursuant to such requirements, shall be inoperative if (x) the issuance of the shares upon the exercise or acquisition of Common Stock under the Stock Award has been registered under a then currently effective registration statement under the Securities Act, or (y) as to any particular requirement, a determination is made by counsel for the Company that such requirement need not be met in the circumstances under the then applicable securities laws. The Company may, upon advice of counsel to the Company, place legends on stock certificates issued under the Plan as such counsel deems necessary or appropriate in order to comply with applicable securities laws, including, but not limited to, legends restricting the transfer of the Common Stock.

**(g) Withholding Obligations.** Unless prohibited by the terms of a Stock Award Agreement, the Company may, in its sole discretion, satisfy any federal, state or local tax withholding obligation relating to a Stock Award by any of the following means or by a combination of such means: (i) causing the Participant to tender a cash payment; (ii) withholding shares of Common Stock from the shares of Common Stock issued or otherwise issuable to the Participant in connection with the Stock Award; *provided*, *however*, that no shares of Common Stock are withheld with a value exceeding the minimum amount of tax required to be withheld by law (or such lesser amount as may be necessary to avoid classification of the Stock Award as a liability for financial accounting purposes); (iii) withholding payment from any amounts otherwise payable to the Participant; (iv) withholding cash from a Stock Award settled in cash; or (v) by such other method as may be set forth in the Stock Award Agreement.

**(h) Electronic Delivery**. Any reference herein to a "written" agreement or document shall include any agreement or document delivered electronically or posted on the Company's intranet.

**(i) Deferrals.** To the extent permitted by applicable law, the Board, in its sole discretion, may determine that the delivery of Common Stock or the payment of cash, upon the exercise, vesting or settlement of all or a portion of any Stock Award may be deferred and may establish programs and procedures for deferral elections to be made by Participants. Deferrals by Participants will be made in accordance with Section 409A of the Code. Consistent with Section 409A of the Code, the Board may provide for distributions while a Participant is still an employee or otherwise providing services to the Company. The Board is authorized to make deferrals of Stock Awards and determine when, and in what annual percentages, Participants may receive payments, including lump sum payments, following the Participant's termination of Continuous Service, and implement such other terms and conditions consistent with the provisions of the Plan and in accordance with applicable law.

**(j) Compliance with Section 409A.** To the extent that the Board determines that any Stock Award granted hereunder is subject to Section 409A of the Code, the Stock Award Agreement evidencing such Stock Award shall incorporate the terms and conditions necessary to avoid the consequences specified in Section 409A(a)(1) of the Code. To the extent applicable, the Plan and Stock Award Agreements shall be interpreted in accordance with Section 409A of the Code.

**(k) Compliance with Exemption Provided by Rule 12h-1(f)**. If: (i) the aggregate of the number of Optionholders and the number of holders of all other outstanding compensatory employee stock options to purchase shares of Common Stock equals or exceeds five hundred (500), and (ii) the assets of the Company at the end of the Company's most recently completed fiscal year exceed $10 million, then the following restrictions shall apply during any period during which the Company does not have a class of its securities registered under Section 12 of the Exchange Act and is not required to file reports under Section 15(d) of the Exchange Act: (A) the Options and, prior to exercise, the shares of Common Stock acquired upon exercise of the Options may not be transferred until the Company is no longer relying on the exemption provided by Rule 12h-1(f) promulgated under the Exchange Act ("***Rule 12h-1(f)***"), except: (1) as permitted by Rule 701(c) promulgated under the Securities Act, (2) to a guardian upon the disability of the Optionholder, or (3) to an executor upon the death of the Optionholder (collectively, the "***Permitted Transferees***"); *provided*, *however*, the following transfers are permitted: (i) transfers by the Optionholder to the Company, and (ii) transfers in connection with a change of control or other acquisition involving the Company, if following such transaction, the Options no longer remain outstanding and the Company is no longer relying on the exemption provided by Rule 12h-1(f); *provided further*, that any Permitted Transferees may not further transfer the Options; (B) except as otherwise provided in (A) above, the Options and shares of Common Stock acquired upon exercise of the Options are restricted as to any pledge, hypothecation, or other transfer, including any short position, any "put equivalent position" as defined by Rule 16a-1(h) promulgated under the Exchange Act, or any "call equivalent position" as defined by Rule 16a-1(b) promulgated under the Exchange Act by the Optionholder prior to exercise of an Option until the Company is no longer relying on the exemption provided by Rule 12h-1(f); and (C) at any time that the Company is relying on the

exemption provided by Rule 12h-1(f), the Company shall deliver to Optionholders (whether by physical or electronic delivery or written notice of the availability of the information on an internet site) the information required by Rule 701(e)(3), (4), and (5) promulgated under the Securities Act every six (6) months, including financial statements that are not more than one hundred eighty (180) days old; *provided*, *however*, that the Company may condition the delivery of such information upon the Optionholder's agreement to maintain its confidentiality.

**(l) Repurchase Limitation**. The terms of any repurchase right shall be specified in the Stock Award Agreement. The repurchase price for vested shares of Common Stock shall be the Fair Market Value of the shares of Common Stock on the date of repurchase. The repurchase price for unvested shares of Common Stock shall be the lower of (i) the Fair Market Value of the shares of Common Stock on the date of repurchase or (ii) their original purchase price. However, the Company shall not exercise its repurchase right until at least six (6) months (or such longer or shorter period of time necessary to avoid classification of the Stock Award as a liability for financial accounting purposes) have elapsed following delivery of shares of Common Stock subject to the Stock Award, unless otherwise specifically provided by the Board.

## 9. ADJUSTMENTS UPON CHANGES IN COMMON STOCK; OTHER CORPORATE EVENTS.

**(a) Capitalization Adjustments**. In the event of a Capitalization Adjustment, the Board shall appropriately and proportionately adjust: (i) the class(es) and maximum number of securities subject to the Plan pursuant to Section 3(a), (ii) the class(es) and maximum number of securities that may be issued pursuant to the exercise of Incentive Stock Options pursuant to Section 3(c), and (iii) the class(es) and number of securities and price per share of stock subject to outstanding Stock Awards. The Board shall make such adjustments, and its determination shall be final, binding and conclusive.

**(b) Dissolution or Liquidation**. Except as otherwise provided in the Stock Award Agreement, in the event of a dissolution or liquidation of the Company, all outstanding Stock Awards (other than Stock Awards consisting of vested and outstanding shares of Common Stock not subject to a forfeiture condition or the Company's right of repurchase) shall terminate immediately prior to the completion of such dissolution or liquidation, and the shares of Common Stock subject to the Company's repurchase rights or subject to a forfeiture condition may be repurchased or reacquired by the Company notwithstanding the fact that the holder of such Stock Award is providing Continuous Service, *provided*, *however,* that the Board may, in its sole discretion, cause some or all Stock Awards to become fully vested, exercisable and/or no longer subject to repurchase or forfeiture (to the extent such Stock Awards have not previously expired or terminated) before the dissolution or liquidation is completed but contingent on its completion.

**(c) Corporate Transaction.** The following provisions shall apply to Stock Awards in the event of a Corporate Transaction unless otherwise provided in the instrument evidencing the Stock Award or any other written agreement between the Company or any Affiliate and the holder of the Stock Award or unless otherwise expressly provided by the Board at the time of grant of a Stock Award. Except as otherwise stated in the Stock Award Agreement, in the event of a Corporate Transaction, then, notwithstanding any other provision of the Plan, the Board shall take one or more of the following actions with respect to Stock Awards, contingent upon the closing or completion of the Corporate Transaction:

**(i)** arrange for the surviving corporation or acquiring corporation (or the surviving or acquiring corporation's parent company) to assume or continue the Stock Award or to substitute a similar stock award for the Stock Award (including, but not limited to, an award to acquire the same consideration paid to the stockholders of the Company pursuant to the Corporate Transaction);

**(ii)** arrange for the assignment of any reacquisition or repurchase rights held by the Company in respect of Common Stock issued pursuant to the Stock Award to the surviving corporation or acquiring corporation (or the surviving or acquiring corporation's parent company);

**(iii)** accelerate the vesting, in whole or in part, of the Stock Award (and, if applicable, the time at which the Stock Award may be exercised) to a date prior to the effective time of such Corporate Transaction as the Board shall determine (or, if the Board shall not determine such a date, to the date that is five (5) days prior to the effective date of the Corporate Transaction), with such Stock Award terminating if not exercised (if applicable) at or prior to the effective time of the Corporate Transaction;

**(iv)** arrange for the lapse of any reacquisition or repurchase rights held by the Company with respect to the Stock Award;

**(v)** cancel or arrange for the cancellation of the Stock Award, to the extent not vested or not exercised prior to the effective time of the Corporate Transaction, in exchange for such cash consideration, if any, as the Board, in its sole discretion, may consider appropriate; and

**(vi)** make a payment, in such form as may be determined by the Board equal to the excess, if any, of (A) the value of the property the holder of the Stock Award would have received upon the exercise of the Stock Award, over (B) any exercise price payable by such holder in connection with such exercise.

The Board need not take the same action with respect to all Stock Awards or with respect to all Participants.

**(d) Change in Control.** A Stock Award may be subject to additional acceleration of vesting and exercisability upon or after a Change in Control as may be provided in the Stock Award Agreement for such Stock Award or as may be provided in any other written agreement between the Company or any Affiliate and the Participant, but in the absence of such provision, no such acceleration shall occur.

## 10. TERMINATION OR SUSPENSION OF THE PLAN.

**(a) Plan Term.** The Board may suspend or terminate the Plan at any time. Unless sooner terminated by the Board pursuant to Section 2, the Plan shall automatically terminate on the day before the tenth (10th) anniversary of the earlier of (i) the date the Plan is adopted by the Board, or (ii) the date the Plan is approved by the stockholders of the Company. No Stock Awards may be granted under the Plan while the Plan is suspended or after it is terminated.

**(b) No Impairment of Rights.** Suspension or termination of the Plan shall not impair rights and obligations under any Stock Award granted while the Plan is in effect except with the written consent of the affected Participant.

**11. EFFECTIVE DATE OF PLAN.**

This Plan shall become effective on the Effective Date.

**12. CHOICE OF LAW.**

The law of the State of Delaware shall govern all questions concerning the construction, validity and interpretation of this Plan, without regard to that state's conflict of laws rules.

**13. DEFINITIONS.** As used in the Plan, the following definitions shall apply to the capitalized terms indicated below:

**(a)** "***Affiliate***" means, at the time of determination, any "parent" or "majority-owned subsidiary" of the Company, as such terms are defined in Rule 405 of the Securities Act. The Board shall have the authority to determine the time or times at which "parent" or "majority-owned subsidiary" status is determined within the foregoing definition.

**(b)** "***Board***" means the Board of Directors of the Company.

**(c)** "***Capitalization Adjustment***" means any change that is made in, or other events that occur with respect to, the Common Stock subject to the Plan or subject to any Stock Award after the Effective Date without the receipt of consideration by the Company (through merger, consolidation, reorganization, recapitalization, reincorporation, stock dividend, dividend in property other than cash, stock split, liquidating dividend, combination of shares, exchange of shares, change in corporate structure, or any similar equity restructuring transaction, as that term is used in Statement of Financial Accounting Standards No. 123 (revised). Notwithstanding the foregoing, the conversion of any convertible securities of the Company shall not be treated as a Capitalization Adjustment.

**(d)** "***Cause***" shall have the meaning ascribed to such term in any written agreement between the Participant and the Company defining such term and, in the absence of such agreement, such term means with respect to a Participant, the occurrence of any of the following events: (i) such Participant's commission of any felony or any crime involving fraud, dishonesty or moral turpitude under the laws of the United States or any state thereof; (ii) such Participant's attempted commission of, or participation in, a fraud or act of dishonesty against the Company; (iii) such Participant's intentional, material violation of any contract or agreement between the Participant and the Company or of any statutory duty owed to the Company; (iv) such Participant's unauthorized use or disclosure of the Company's confidential information or trade secrets; or (v) such Participant's gross misconduct. The determination that a termination of the Participant's Continuous Service is either for Cause or without Cause shall be made by the Company in its sole discretion. Any determination by the Company that the Continuous Service of a Participant was terminated with or without Cause for the purposes of outstanding Stock Awards held by such Participant shall have no effect upon any determination of the rights or obligations of the Company or such Participant for any other purpose.

**(e)** "***Change in Control***" means the occurrence, in a single transaction or in a series of related transactions, of any one or more of the following events:

**(i)** any Exchange Act Person becomes the Owner, directly or indirectly, of securities of the Company representing more than fifty percent (50%) of the combined voting power of the Company's then outstanding securities other than by virtue of a merger, consolidation or similar transaction. Notwithstanding the foregoing, a Change in Control shall not be deemed to occur (A) on account of the acquisition of securities of the Company directly from the Company, (B) on account of the acquisition of securities of the Company by an investor, any affiliate thereof or any other Exchange Act Person that acquires the Company's securities in a transaction or series of related transactions the primary purpose of which is to obtain financing for the Company through the issuance of equity securities or (C) solely because the level of Ownership held by any Exchange Act Person (the "***Subject Person***") exceeds the designated percentage threshold of the outstanding voting securities as a result of a repurchase or other acquisition of voting securities by the Company reducing the number of shares outstanding, provided that if a Change in Control would occur (but for the operation of this sentence) as a result of the acquisition of voting securities by the Company, and after such share acquisition, the Subject Person becomes the Owner of any additional voting securities that, assuming the repurchase or other acquisition had not occurred, increases the percentage of the then outstanding voting securities Owned by the Subject Person over the designated percentage threshold, then a Change in Control shall be deemed to occur;

**(ii)** there is consummated a merger, consolidation or similar transaction involving (directly or indirectly) the Company and, immediately after the consummation of such merger, consolidation or similar transaction, the stockholders of the Company immediately prior thereto do not Own, directly or indirectly, either (A) outstanding voting securities representing more than fifty percent (50%) of the combined outstanding voting power of the surviving Entity in such merger, consolidation or similar transaction or (B) more than fifty percent (50%) of the combined outstanding voting power of the parent of the surviving Entity in such merger, consolidation or similar transaction, in each case in substantially the same proportions as their Ownership of the outstanding voting securities of the Company immediately prior to such transaction;

**(iii)** there is consummated a sale, lease, exclusive license or other disposition of all or substantially all of the consolidated assets of the Company and its Subsidiaries, other than a sale, lease, license or other disposition of all or substantially all of the consolidated assets of the Company and its Subsidiaries to an Entity, more than fifty percent (50%) of the combined voting power of the voting securities of which are Owned by stockholders of the Company in substantially the same proportions as their Ownership of the outstanding voting securities of the Company immediately prior to such sale, lease, license or other disposition; or

**(iv)** individuals who, on the date this Plan is adopted by the Board, are members of the Board (the "***Incumbent Board***") cease for any reason to constitute at least a majority of the members of the Board; *provided, however,* that if the appointment or election (or nomination for election) of any new Board member was approved or recommended by a majority vote of the members of the Incumbent Board then still in office, such new member shall, for purposes of this Plan, be considered as a member of the Incumbent Board.

Notwithstanding the foregoing definition or any other provision of this Plan, (A) the term Change in Control shall not include a sale of assets, merger or other transaction effected exclusively for the purpose of changing the domicile of the Company, and (B) the definition of Change in Control (or any analogous term) in an individual written agreement between the Company or any Affiliate and the Participant shall supersede the foregoing definition with respect to Stock Awards subject to such agreement; *provided, however,* that if no definition of Change in Control or any analogous term is set forth in such an individual written agreement, the foregoing definition shall apply.

**(f)** "***Code***" means the Internal Revenue Code of 1986, as amended, as well as any applicable regulations and guidance thereunder.

**(g)** "***Committee***" means a committee of one (1) or more Directors to whom authority has been delegated by the Board in accordance with Section 2(c).

**(h)** "***Common Stock***" means the common stock of the Company.

**(i)** "***Company***" means Personalis, Inc., a Delaware corporation.

**(j)** "***Consultant***" means any person, including an advisor, who is (i) engaged by the Company or an Affiliate to render consulting or advisory services and is compensated for such services, or (ii) serving as a member of the board of directors of an Affiliate and is compensated for such services. However, service solely as a Director, or payment of a fee for such service, shall not cause a Director to be considered a "Consultant" for purposes of the Plan.

**(k)** "***Continuous Service***" means that the Participant's service with the Company or an Affiliate, whether as an Employee, Director or Consultant, is not interrupted or terminated. A change in the capacity in which the Participant renders service to the Company or an Affiliate as an Employee, Director, or Consultant or a change in the Entity for which the Participant renders such service, provided that there is no interruption or termination of the Participant's service with the Company or an Affiliate, shall not terminate a Participant's Continuous Service; *provided, however*, if the Entity for which a Participant is rendering service ceases to qualify as an Affiliate, as determined by the Board in its sole discretion, such Participant's Continuous Service shall be considered to have terminated on the date such Entity ceases to qualify as an Affiliate. For example, a change in status from an employee of the Company to a consultant of an Affiliate or to a Director shall not constitute an interruption of Continuous Service. To the extent permitted by law, the Board or the chief executive officer of the Company, in that party's sole discretion, may determine whether Continuous Service shall be considered interrupted in the case of (i) any leave of absence approved by the Board or chief executive officer, including sick leave, military leave or any other personal leave, or (ii) transfers between the Company, an Affiliate, or their successors. Notwithstanding the foregoing, a leave of absence shall be treated as Continuous Service for purposes of vesting in a Stock Award only to such extent as may be provided in the Company's leave of absence policy, in the written terms of any leave of absence agreement or policy applicable to the Participant, or as otherwise required by law.

**(l)** "***Corporate Transaction***" means the occurrence, in a single transaction or in a series of related transactions, of any one or more of the following events:

**(i)** the consummation of a sale or other disposition of all or substantially all, as determined by the Board in its sole discretion, of the consolidated assets of the Company and its Subsidiaries;

**(ii)** the consummation of a sale or other disposition of at least ninety percent (90%) of the outstanding securities of the Company;

**(iii)** the consummation of a merger, consolidation or similar transaction following which the Company is not the surviving corporation; or

**(iv)** the consummation of a merger, consolidation or similar transaction following which the Company is the surviving corporation but the shares of Common Stock outstanding immediately preceding the merger, consolidation or similar transaction are converted or exchanged by virtue of the merger, consolidation or similar transaction into other property, whether in the form of securities, cash or otherwise.

**(m)** "***Director***" means a member of the Board.

**(n)** "***Disability***" means the inability of a Participant to engage in any substantially gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than twelve (12) months as provided in Sections 22(e)(3) and 409A(a)(2)(c)(i) of the Code and shall be determined by the Board on the basis of such medical evidence as the Board deems warranted under the circumstances.

**(o)** "***Effective Date***" means the effective date of this Plan, which is the earlier of (i) the date that this Plan is first approved by the Company's stockholders, or (ii) the date this Plan is adopted by the Board.

**(p)** "***Employee***" means any person employed by the Company or an Affiliate. However, service solely as a Director, or payment of a fee for such services, shall not cause a Director to be considered an "Employee" for purposes of the Plan.

**(q)** "***Entity***" means a corporation, partnership, limited liability company or other entity.

**(r)** "***Exchange Act***" means the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

**(s)** "***Exchange Act Person***" means any natural person, Entity or "group" (within the meaning of Section 13(d) or 14(d) of the Exchange Act), except that "Exchange Act Person" shall not include (i) the Company or any Subsidiary of the Company, (ii) any employee benefit

plan of the Company or any Subsidiary of the Company or any trustee or other fiduciary holding securities under an employee benefit plan of the Company or any Subsidiary of the Company, (iii) an underwriter temporarily holding securities pursuant to a registered public offering of such securities, (iv) an Entity Owned, directly or indirectly, by the stockholders of the Company in substantially the same proportions as their Ownership of stock of the Company; or (v) any natural person, Entity or "group" (within the meaning of Section 13(d) or 14(d) of the Exchange Act) that, as of the Effective Date, is the Owner, directly or indirectly, of securities of the Company representing more than fifty percent (50%) of the combined voting power of the Company's then outstanding securities.

**(t)** "***Fair Market Value***" means, as of any date, the value of the Common Stock determined by the Board in compliance with Section 409A of the Code or, in the case of an Incentive Stock Option, in compliance with Section 422 of the Code.

**(u)** "***Incentive Stock Option***" means an option that qualifies as an "incentive stock option" within the meaning of Section 422 of the Code and the regulations promulgated thereunder.

**(v)** "***Nonstatutory Stock Option***" means an Option that does not qualify as an Incentive Stock Option.

**(w)** "***Officer***" means any person designated by the Company as an officer.

**(x)** "***Option***" means an Incentive Stock Option or a Nonstatutory Stock Option to purchase shares of Common Stock granted pursuant to the Plan.

**(y)** "***Option Agreement***" means a written agreement between the Company and an Optionholder evidencing the terms and conditions of an Option grant. Each Option Agreement shall be subject to the terms and conditions of the Plan.

**(z)** "***Optionholder***" means a person to whom an Option is granted pursuant to the Plan or, if applicable, such other person who holds an outstanding Option.

**(aa)** "***Own***," "***Owned***," "***Owner***," "***Ownership***" A person or Entity shall be deemed to "Own," to have "Owned," to be the "Owner" of, or to have acquired "Ownership" of securities if such person or Entity, directly or indirectly, through any contract, arrangement, understanding, relationship or otherwise, has or shares voting power, which includes the power to vote or to direct the voting, with respect to such securities.

**(bb)** "***Participant***" means a person to whom a Stock Award is granted pursuant to the Plan or, if applicable, such other person who holds an outstanding Stock Award.

**(cc)** "***Plan***" means this Personalis, Inc. 2011 Equity Incentive Plan.

**(dd)** "***Restricted Stock Award***" means an award of shares of Common Stock which is granted pursuant to the terms and conditions of Section 6(a).

**(ee)** "***Restricted Stock Award Agreement***" means a written agreement between the Company and a holder of a Restricted Stock Award evidencing the terms and conditions of a Restricted Stock Award. Each Restricted Stock Award Agreement shall be subject to the terms and conditions of the Plan.

**(ff)** "***Restricted Stock Unit Award***" means a right to receive shares of Common Stock which is granted pursuant to the terms and conditions of Section 6(b).

**(gg)** "***Restricted Stock Unit Award Agreement***" means a written agreement between the Company and a holder of a Restricted Stock Unit Award evidencing the terms and conditions of a Restricted Stock Unit Award grant. Each Restricted Stock Unit Award Agreement shall be subject to the terms and conditions of the Plan.

**(hh)** "***Rule 405***" means Rule 405 promulgated under the Securities Act.

**(ii)** "***Rule 701***" means Rule 701 promulgated under the Securities Act.

**(jj)** "***Securities Act***" means the Securities Act of 1933, as amended.

**(kk)** "***Stock Appreciation Right***" or "***SAR***" means a right to receive the appreciation on Common Stock that is granted pursuant to the terms and conditions of Section 5.

**(ll)** "***Stock Appreciation Right Agreement***" means a written agreement between the Company and a holder of a Stock Appreciation Right evidencing the terms and conditions of a Stock Appreciation Right grant. Each Stock Appreciation Right Agreement shall be subject to the terms and conditions of the Plan.

**(mm)** "***Stock Award***" means any right to receive Common Stock granted under the Plan, including an Incentive Stock Option, a Nonstatutory Stock Option, a Restricted Stock Award, a Restricted Stock Unit Award, or a Stock Appreciation Right.

**(nn)** "***Stock Award Agreement***" means a written agreement between the Company and a Participant evidencing the terms and conditions of a Stock Award grant. Each Stock Award Agreement shall be subject to the terms and conditions of the Plan.

**(oo)** "***Subsidiary***" means, with respect to the Company, (i) any corporation of which more than fifty percent (50%) of the outstanding capital stock having ordinary voting power to elect a majority of the board of directors of such corporation (irrespective of whether, at the time, stock of any other class or classes of such corporation shall have or might have voting power by reason of the happening of any contingency) is at the time, directly or indirectly, Owned by the Company, and (ii) any partnership, limited liability company or other entity in which the Company has a direct or indirect interest (whether in the form of voting or participation in profits or capital contribution) of more than fifty percent (50%) .

**(pp)** "***Ten Percent Stockholder***" means a person who Owns (or is deemed to Own pursuant to Section 424(d) of the Code) stock possessing more than ten percent (10%) of the total combined voting power of all classes of stock of the Company or any Affiliate.

**PERSONALIS, INC.**
**STOCK OPTION GRANT NOTICE**
**2011 EQUITY INCENTIVE PLAN**

Personalis, Inc. (the "***Company***"), pursuant to its 2011 Equity Incentive Plan (the "***Plan***"), hereby grants to Optionholder an option to purchase the number of shares of the Company's Common Stock set forth below. This option is subject to all of the terms and conditions as set forth herein and in the Option Agreement, the Plan, and the Notice of Exercise, all of which are attached hereto and incorporated herein in their entirety.

| | |
|---|---|
| Optionholder: | _____ |
| Date of Grant: | _____ |
| Vesting Commencement Date: | _____ |
| Number of Shares Subject to Option: | _____ |
| Exercise Price (Per Share): | _____ |
| Total Exercise Price: | _____ |
| Expiration Date: | _____ |

**Type of Grant:** ☐ Incentive Stock Option[1] ☐ Nonstatutory Stock Option

**Exercise Schedule:** ☐ Same as Vesting Schedule ☐ Early Exercise Permitted

**Vesting Schedule:** 1/4th of the shares vest one year after the Vesting Commencement Date; the balance of the shares vest in a series of thirty-six (36) successive equal monthly installments measured from the first anniversary of the Vesting Commencement Date.

**Payment:** By one or a combination of the following items (described in the Option Agreement):

☒ By cash or check
☒ Pursuant to a Regulation T Program if the Shares are publicly traded
☒ By delivery of already-owned shares if the Shares are publicly traded
☐ By deferred payment
☐ By net exercise[2]

**Additional Terms/Acknowledgements:** The undersigned Optionholder acknowledges receipt of, and understands and agrees to, this Stock Option Grant Notice, the Option Agreement and the Plan. Optionholder acknowledges and agrees that this Stock Option Grant Notice and the Option Agreement may not be modified, amended or revised except in a writing signed by Optionholder and a duly authorized officer of the Company. Optionholder further acknowledges that as of the Date of Grant, this Stock Option Grant Notice, the Option Agreement, and the Plan set forth the entire understanding between Optionholder and the Company regarding the acquisition of stock in the Company and supersede all prior oral and written agreements, promises and/or representations on that subject with the exception of (i) options previously granted and delivered to Optionholder under the Plan, and (ii) the following agreements only:

**OTHER AGREEMENTS:** _____

_____

1 If this is an Incentive Stock Option, it (plus other outstanding Incentive Stock Options) cannot be first *exercisable* for more than $100,000 in value (measured by exercise price) in any calendar year. Any excess over $100,000 is a Nonstatutory Stock Option.

2 An Incentive Stock Option may not be exercised by a net exercise arrangement.

| **PERSONALIS, INC.** | **OPTIONHOLDER:** |
| --- | --- |
| By: _____ | _____ |
| Signature | Signature |
| Title: _____ | Date: _____ |
| Date: _____ | |

**ATTACHMENTS**: Option Agreement, 2011 Equity Incentive Plan and Notice of Exercise

**PERSONALIS, INC.**

**2011 EQUITY INCENTIVE PLAN**

**OPTION AGREEMENT**
**(INCENTIVE STOCK OPTION OR NONSTATUTORY STOCK OPTION)**

Pursuant to your Stock Option Grant Notice ("***Grant Notice***") and this Option Agreement, Personalis, Inc. (the "***Company***") has granted you an option under its 2011 Equity Incentive Plan (the "***Plan***") to purchase the number of shares of the Company's Common Stock indicated in your Grant Notice at the exercise price indicated in your Grant Notice. Defined terms not explicitly defined in this Option Agreement but defined in the Plan shall have the same definitions as in the Plan.

The details of your option are as follows:

**1. VESTING.** Subject to the limitations contained herein, your option will vest as provided in your Grant Notice, provided that vesting will cease upon the termination of your Continuous Service.

**2. NUMBER OF SHARES AND EXERCISE PRICE.** The number of shares of Common Stock subject to your option and your exercise price per share referenced in your Grant Notice may be adjusted from time to time for Capitalization Adjustments.

**3. EXERCISE RESTRICTION FOR NON-EXEMPT EMPLOYEES.** In the event that you are an Employee eligible for overtime compensation under the Fair Labor Standards Act of 1938, as amended (*i.e.*, a "***Non-Exempt Employee***"), you may not exercise your option until you have completed at least six (6) months of Continuous Service measured from the Date of Grant specified in your Grant Notice, notwithstanding any other provision of your option.

**4. EXERCISE PRIOR TO VESTING ("EARLY EXERCISE").** If permitted in your Grant Notice (*i.e.*, the "Exercise Schedule" indicates "Early Exercise Permitted") and subject to the provisions of your option, you may elect at any time that is both (i) during the period of your Continuous Service and (ii) during the term of your option, to exercise all or part of your option, including the unvested portion of your option; *provided, however,* that:

**a.** a partial exercise of your option shall be deemed to cover first vested shares of Common Stock and then the earliest vesting installment of unvested shares of Common Stock;

**b.** any shares of Common Stock so purchased from installments that have not vested as of the date of exercise shall be subject to the purchase option in favor of the Company as described in the Company's form of Early Exercise Stock Purchase Agreement;

**c.** you shall enter into the Company's form of Early Exercise Stock Purchase Agreement with a vesting schedule that will result in the same vesting as if no early exercise had occurred; and

**d.** if your option is an Incentive Stock Option, then, to the extent that the aggregate Fair Market Value (determined at the time of grant) of the shares of Common Stock with respect to which your option plus all other Incentive Stock Options you hold are exercisable for the first time by you during any calendar year (under all plans of the Company and its Affiliates) exceeds one hundred thousand dollars ($100,000), your option(s) or portions thereof that exceed such limit (according to the order in which they were granted) shall be treated as Nonstatutory Stock Options.

**5. METHOD OF PAYMENT.** Payment of the exercise price is due in full upon exercise of all or any part of your option. You may elect to make payment of the exercise price in cash or by check or in any other manner ***permitted by your Grant Notice,*** which may include one or more of the following:

**a.** Provided that at the time of exercise the Common Stock is publicly traded and quoted regularly in *The Wall Street Journal*, pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board that, prior to the issuance of Common Stock, results in either the receipt of cash (or check) by the Company or the receipt of irrevocable instructions to pay the aggregate exercise price to the Company from the sales proceeds.

**b.** Provided that at the time of exercise the Common Stock is publicly traded and quoted regularly in *The Wall Street Journal*, by delivery to the Company (either by actual delivery or attestation) of already-owned shares of Common Stock that are owned free and clear of any liens, claims, encumbrances or security interests, and that are valued at Fair Market Value on the date of exercise. Notwithstanding the foregoing, you may not exercise your option by tender to the Company of Common Stock to the extent such tender would violate the provisions of any law, regulation or agreement restricting the redemption of the Company's stock.

**c.** Pursuant to the following deferred payment alternative:

**1)** Not less than one hundred percent (100%) of the aggregate exercise price, plus accrued interest, shall be due four (4) years from date of exercise or, at the Company's election, upon termination of your Continuous Service.

**2)** Interest shall be compounded at least annually and shall be charged at the minimum rate of interest necessary to avoid (1) the treatment as interest, under any applicable provisions of the Code, of any amounts other than amounts stated to be interest under the deferred payment arrangement and (2) the classification of your option as a liability for financial accounting purposes.

**3)** In order to elect the deferred payment alternative, you must, as a part of your written notice of exercise, give notice of the election of this payment alternative and, in order to secure the payment of the deferred exercise price to the Company hereunder, if the Company so requests, you must tender to the Company a promissory note and a pledge agreement covering the purchased shares of Common Stock, both in form and substance satisfactory to the Company, or such other or additional documentation as the Company may request.

**6. WHOLE SHARES.** You may exercise your option only for whole shares of Common Stock.

**7. SECURITIES LAW COMPLIANCE.** Notwithstanding anything to the contrary contained herein, you may not exercise your option unless the shares of Common Stock issuable upon such exercise are then registered under the Securities Act or, if such shares of Common Stock are not then so registered, the Company has determined that such exercise and issuance would be exempt from the registration requirements of the Securities Act. The exercise of your option also must comply with other applicable laws and regulations governing your option, and you may not exercise your option if the Company determines that such exercise would not be in material compliance with such laws and regulations.

**8. TERM.** You may not exercise your option before the commencement or after the expiration of its term. The term of your option commences on the Date of Grant and expires upon the earliest of the following:

**a.** three (3) months after the termination of your Continuous Service for any reason other than your Disability or death, provided that if during any part of such three (3) month period your option is not exercisable solely because of the condition set forth in the section above relating to "Securities Law Compliance," your option shall not expire until the earlier of the Expiration Date or until it shall have been exercisable for an aggregate period of three (3) months after the termination of your Continuous Service;

**b.** twelve (12) months after the termination of your Continuous Service due to your Disability;

**c.** eighteen (18) months after your death if you die during your Continuous Service;

**d.** the Expiration Date indicated in your Grant Notice; or

**e.** the day before the tenth (10th) anniversary of the Date of Grant.

Notwithstanding the foregoing, if you die during the period provided in Section 8(a) or 8(b) above, the term of your option shall not expire until the earlier of eighteen (18) months after your death, the Expiration Date indicated in your Grant Notice, or the day before the tenth ($10^{th}$) anniversary of the Date of Grant.

If your option is an Incentive Stock Option, note that to obtain the federal income tax advantages associated with an Incentive Stock Option, the Code requires that at all times beginning on the date of grant of your option and ending on the day three (3) months before the date of your option's exercise, you must be an employee of the Company or an Affiliate, except in the event of your death. The Company has provided for extended exercisability of your option under certain circumstances for your benefit but cannot guarantee that your option will necessarily be treated as an Incentive Stock Option if you continue to provide services to the Company or an Affiliate as a Consultant or Director after your employment terminates or if you otherwise exercise your option more than three (3) months after the date your employment with the Company or an Affiliate terminates.

**9. EXERCISE.**

**a.** You may exercise the vested portion of your option (and the unvested portion of your option if your Grant Notice so permits) during its term by delivering a Notice of Exercise (in a form designated by the Company) together with the exercise price to the Secretary of the Company, or to such other person as the Company may designate, during regular business hours, together with such additional documents as the Company may then require.

**b.** By exercising your option you agree that, as a condition to any exercise of your option, the Company may require you to enter into an arrangement providing for the payment by you to the Company of any tax withholding obligation of the Company arising by reason of (1) the exercise of your option, (2) the lapse of any substantial risk of forfeiture to which the shares of Common Stock are subject at the time of exercise, or (3) the disposition of shares of Common Stock acquired upon such exercise.

**c.** If your option is an Incentive Stock Option, by exercising your option you agree that you will notify the Company in writing within fifteen (15) days after the date of any disposition of any of the shares of the Common Stock issued upon exercise of your option that occurs within two (2) years after the date of your option grant or within one (1) year after such shares of Common Stock are transferred upon exercise of your option.

**d.** By exercising your option you agree that you shall not sell, dispose of, transfer, make any short sale of, grant any option for the purchase of, or enter into any hedging or similar transaction with the same economic effect as a sale, any shares of Common Stock or other securities of the Company held by you, for a period of one hundred eighty (180) days following the effective date of a registration statement of the Company filed under the Securities Act or such longer period as necessary to permit compliance with NASD Rule 2711 or NYSE Member Rule 472 and similar rules and regulations (the "***Lock-Up Period***"); *provided, however*, that nothing contained in this section shall prevent the exercise of a repurchase option, if any, in favor of the Company during the Lock-Up Period. You further agree to execute and deliver such other agreements as may be reasonably requested by the Company and/or the underwriter(s) that are consistent with the foregoing or that are necessary to give further effect thereto. In order to enforce the foregoing covenant, the Company may impose stop-transfer instructions with respect to your shares of Common Stock until the end of such period. The underwriters of the Company's stock are intended third party beneficiaries of this Section 9(d) and shall have the right, power and authority to enforce the provisions hereof as though they were a party hereto.

**10. TRANSFERABILITY.** Your option is not transferable, except by will or by the laws of descent and distribution, and is exercisable during your life only by you. Notwithstanding the foregoing, by delivering written notice to the Company, in a form satisfactory to the Company, you may designate a third party who, in the event of your death, shall thereafter be entitled to exercise your option. In addition, if permitted by the Company you may transfer your option to a trust if you are considered to be the sole beneficial owner (determined under Section 671 of the Code and applicable state law) while the option is held in the trust, provided that you and the trustee enter into a transfer and other agreements required by the Company.

**11. RIGHT OF FIRST REFUSAL.** Shares of Common Stock that you acquire upon exercise of your option are subject to any right of first refusal that may be described in the Company's bylaws in effect at such time the Company elects to exercise its right; *provided, however,* that if your option is an Incentive Stock Option and the right of first refusal described in the Company's bylaws in effect at the time the Company elects to exercise its right is more beneficial to you than the right of first refusal described in the Company's bylaws on the Date of Grant, then the right of first refusal described in the Company's bylaws on the Date of Grant shall apply. The Company's right of first refusal shall expire on the first date upon which any security of the Company is listed (or approved for listing) upon notice of issuance on a national securities exchange or quotation system.

**12. RIGHT OF REPURCHASE.** To the extent provided in the Company's bylaws in effect at such time the Company elects to exercise its right, the Company shall have the right to repurchase all or any part of the shares of Common Stock you acquire pursuant to the exercise of your option.

**13. OPTION NOT A SERVICE CONTRACT.** Your option is not an employment or service contract, and nothing in your option shall be deemed to create in any way whatsoever any obligation on your part to continue in the employ of the Company or an Affiliate, or of the Company or an Affiliate to continue your employment. In addition, nothing in your option shall obligate the Company or an Affiliate, their respective stockholders, Boards of Directors, Officers or Employees to continue any relationship that you might have as a Director or Consultant for the Company or an Affiliate.

**14. WITHHOLDING OBLIGATIONS.**

**a.** At the time you exercise your option, in whole or in part, or at any time thereafter as requested by the Company, you hereby authorize withholding from payroll and any other amounts payable to you, and otherwise agree to make adequate provision for (including by means of a "cashless exercise" pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board to the extent permitted by the Company), any sums required to satisfy the federal, state, local and foreign tax withholding obligations of the Company or an Affiliate, if any, which arise in connection with the exercise of your option.

**b.** Upon your request and subject to approval by the Company, in its sole discretion, and compliance with any applicable legal conditions or restrictions, the Company may withhold from fully vested shares of Common Stock otherwise issuable to you upon the exercise of your option a number of whole shares of Common Stock having a Fair Market Value, determined by the Company as of the date of exercise, not in excess of the minimum amount of tax required to be withheld by law (or such lower amount as may be necessary to avoid classification of your option as a liability for financial accounting purposes). If the date of determination of any tax withholding obligation is deferred to a date later than the date of exercise of your option, share withholding pursuant to the preceding sentence shall not be permitted unless you make a proper and timely election under Section 83(b) of the Code, covering the aggregate number of shares of Common Stock acquired upon such exercise with respect to which such determination is otherwise deferred, to accelerate the determination of such tax withholding obligation to the date of exercise of your option. Notwithstanding the filing

of such election, shares of Common Stock shall be withheld solely from fully vested shares of Common Stock determined as of the date of exercise of your option that are otherwise issuable to you upon such exercise. Any adverse consequences to you arising in connection with such share withholding procedure shall be your sole responsibility.

**c.** You may not exercise your option unless the tax withholding obligations of the Company and/or any Affiliate are satisfied. Accordingly, you may not be able to exercise your option when desired even though your option is vested, and the Company shall have no obligation to issue a certificate for such shares of Common Stock or release such shares of Common Stock from any escrow provided for herein unless such obligations are satisfied.

**15. TAX CONSEQUENCES**. You hereby agree that the Company does not have a duty to design or administer the Plan or its other compensation programs in a manner that minimizes your tax liabilities. You shall not make any claim against the Company, or any of its Officers, Directors, Employees or Affiliates related to tax liabilities arising from your option or your other compensation. In particular, you acknowledge that this option is exempt from Section 409A of the Code only if the exercise price per share specified in the Grant Notice is at least equal to the "fair market value" per share of the Common Stock on the Date of Grant and there is no other impermissible deferral of compensation associated with the option. Because the Common Stock is not traded on an established securities market, the Fair Market Value is determined by the Board, perhaps in consultation with an independent valuation firm retained by the Company. You acknowledge that there is no guarantee that the Internal Revenue Service will agree with the valuation as determined by the Board, and you shall not make any claim against the Company, or any of its Officers, Directors, Employees or Affiliates in the event that the Internal Revenue Service asserts that the valuation determined by the Board is less than the "fair market value" as subsequently determined by the Internal Revenue Service.

**16. NOTICES.** Any notices provided for in your option or the Plan shall be given in writing and shall be deemed effectively given upon receipt or, in the case of notices delivered by mail by the Company to you, five (5) days after deposit in the United States mail, postage prepaid, addressed to you at the last address you provided to the Company.

**17. GOVERNING PLAN DOCUMENT.** Your option is subject to all the provisions of the Plan, the provisions of which are hereby made a part of your option, and is further subject to all interpretations, amendments, rules and regulations, which may from time to time be promulgated and adopted pursuant to the Plan. In the event of any conflict between the provisions of your option and those of the Plan, the provisions of the Plan shall control.

**NOTICE OF EXERCISE**

Personalis, Inc.
1330 O'Brien Drive
Menlo Park, CA 94025

Date of Exercise:_____

Ladies and Gentlemen:

This constitutes notice under my stock option that I elect to purchase the number of shares for the price set forth below.

| | | |
|---|---|---|
| Type of option (check one): | Incentive ☐ | Nonstatutory ☐ |
| Stock option dated: | _____ | |
| Number of shares as to which option is exercised: | _____ | |
| Certificates to be issued in name of: | _____ | |
| Total exercise price: | $_____ | |
| Cash payment delivered herewith: | $_____ | |
| Promissory note delivered herewith: | $_____ | |

By this exercise, I agree (i) to provide such additional documents as you may require pursuant to the terms of the 2011 Equity Incentive Plan, (ii) to provide for the payment by me to you (in the manner designated by you) of your withholding obligation, if any, relating to the exercise of this option, and (iii) if this exercise relates to an incentive stock option, to notify you in writing within fifteen (15) days after the date of any disposition of any of the shares of Common Stock issued upon exercise of this option that occurs within two (2) years after the date of grant of this option or within one (1) year after such shares of Common Stock are issued upon exercise of this option.

I hereby make the following certifications and representations with respect to the number of shares of Common Stock of the Company listed above (the "***Shares***"), which are being acquired by me for my own account upon exercise of the Option as set forth above:

I acknowledge that the Shares have not been registered under the Securities Act of 1933, as amended (the "***Securities Act***"), and are deemed to constitute "restricted securities" under Rule 701 and Rule 144 promulgated under the Securities Act. I warrant and represent to the Company that I have no present intention of distributing or selling said Shares, except as permitted under the Securities Act and any applicable state securities laws.

I further acknowledge that I will not be able to resell the Shares for at least ninety days (90) after the stock of the Company becomes publicly traded (*i.e.*, subject to the reporting requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934) under Rule 701 and that more restrictive conditions apply to affiliates of the Company under Rule 144.

I further acknowledge that all certificates representing any of the Shares subject to the provisions of the Option shall have endorsed thereon appropriate legends reflecting the foregoing limitations, as well as any legends reflecting restrictions pursuant to the Company's Articles of Incorporation, Bylaws and/or applicable securities laws.

I further agree that, if required by the Company (or a representative of the underwriters) in connection with the first underwritten registration of the offering of any securities of the Company under the Securities Act, I will not sell, dispose of, transfer, make any short sale of, grant any option for the purchase of, or enter into any hedging or similar transaction with the same economic effect as a sale, any shares of Common Stock or other securities of the Company for a period of one hundred eighty (180) days following the effective date of a registration statement of the Company filed under the Securities Act or such longer period as necessary to permit compliance with NASD Rule 2711 or NYSE Member Rule 472 and similar rules and regulations (the "***Lock-Up Period***"). I further agree to execute and deliver such other agreements as may be reasonably requested by the Company and/or the underwriter(s) that are consistent with the foregoing or that are necessary to give further effect thereto. In order to enforce the foregoing covenant, the Company may impose stop-transfer instructions with respect to securities subject to the foregoing restrictions until the end of such period.

Very truly yours,

_____

Address:_____

_____

**PERSONALIS, INC.**

**EARLY EXERCISE STOCK PURCHASE AGREEMENT**
**UNDER THE 2011 EQUITY INCENTIVE PLAN**

**THIS AGREEMENT** is made by and between PERSONALIS, INC.**,** a Delaware corporation (the "***Company***"), and _____ ("***Purchaser***").

**WITNESSETH:**

**WHEREAS,** Purchaser holds a stock option dated _____ to purchase shares of common stock ("***Common Stock***") of the Company (the "***Option***") pursuant to the Company's 2011 Equity Incentive Plan (the "***Plan***"); and

**WHEREAS**, the Option consists of a Stock Option Grant Notice and a Stock Option Agreement; and

**WHEREAS,** Purchaser desires to exercise the Option on the terms and conditions contained herein; and

**WHEREAS,** Purchaser wishes to take advantage of the early exercise provision of Purchaser's Option and therefore to enter into this Agreement;

**NOW, THEREFORE, IT IS AGREED** between the parties as follows:

**18. INCORPORATION OF PLAN AND OPTION BY REFERENCE.** This Agreement is subject to all of the terms and conditions as set forth in the Plan and the Option. If there is a conflict between the terms of this Agreement and/or the Option and the terms of the Plan, the terms of the Plan shall control. If there is a conflict between the terms of this Agreement and the terms of the Option, the terms of the Option shall control. Defined terms not explicitly defined in this Agreement but defined in the Plan shall have the same definitions as in the Plan. Defined terms not explicitly defined in this Agreement or the Plan but defined in the Option shall have the same definitions as in the Option.

**19. PURCHASE AND SALE OF COMMON STOCK.**

**a. Agreement to purchase and sell Common Stock.** Purchaser hereby agrees to purchase from the Company, and the Company hereby agrees to sell to Purchaser, shares of the Common Stock of the Company in accordance with the Notice of Exercise duly executed by Purchaser and attached hereto as Exhibit A.

**b. Closing**. The closing hereunder, including payment for and delivery of the Common Stock, shall occur at the offices of the Company immediately following the execution of this Agreement, or at such other time and place as the parties may mutually agree; *provided, however,* that if stockholder approval of the Plan is required before the Option may be exercised, then the Option may not be exercised, and the closing shall be delayed, until such stockholder approval is obtained. If such stockholder approval is not obtained within the time limit specified in the Plan, then this Agreement shall be null and void.

**20. UNVESTED SHARE REPURCHASE OPTION.**

**a. Repurchase Option**. In the event Purchaser's Continuous Service terminates, then the Company shall have an irrevocable option (the "***Repurchase Option***") for a period of six (6) months after said termination (or in the case of shares issued upon exercise of the Option after such date of termination, within six (6) months after the date of the exercise), or such longer period as may be agreed to by the Company and Purchaser, to repurchase from Purchaser or Purchaser's personal representative, as the case may be, those shares that Purchaser received pursuant to the exercise of the Option that have not as yet vested as of such termination date in accordance with the Vesting Schedule indicated on Purchaser's Stock Option Grant Notice (the "***Unvested Shares***"). For convenience, the Vesting Schedule set forth in the Stock Option Grant Notice.

**b. Share Repurchase Price.** The Company may repurchase all or any of the Unvested Shares at the lower of (i) the Fair Market Value of the such shares (as determined under the Plan) on the date of repurchase, or (ii) the price equal to Purchaser's Exercise Price for such shares as indicated on Purchaser's Stock Option Grant Notice (the "***Repurchase Price***"). No interest shall be paid with respect to and no other adjustments (other than adjustments in accordance with the Plan to reflect stock splits and similar changes in capitalization) shall be made to the Repurchase Price. The closing of any repurchase under this Section 3 shall be at a date to be specified by the Company, such date to be no later than 90 days after Purchaser's termination date. The Repurchase Price shall be paid at the closing in the form of a check or by cancellation of money purchase indebtedness.

**c.** To exercise the Repurchase Option, the Company shall give written notice thereof to Purchaser (the "***Repurchase Notice***"). The Repurchase Notice is irrevocable by the Company and shall (i) be in writing and signed by an authorized officer of the Company, (ii) set forth the Company's intent to exercise the Repurchase Option and contain the total number of Unvested Shares to be sold to the Company pursuant to the exercise of the Repurchase Option, (iii) be mailed or delivered to Purchaser at Purchaser's address reflected or last reflected on the Company's payroll records or delivered to Purchaser in person, and (iv) be so mailed or delivered no later than the ninetieth ($90^{th}$) day following Purchaser's termination date. If mailed, the Repurchase Notice shall be enclosed in a properly sealed envelope, addressed as aforesaid, and deposited (postage prepaid) in a post office or branch post office regularly maintained by the United States Government. The Repurchase Notice shall be deemed to have been duly given as of the date mailed or delivered in accordance with the foregoing provisions.

**d.** Upon a repurchase of any Unvested Shares by the Company, such repurchased Unvested Shares shall be automatically transferred to the Company, without any further action by Purchaser (or Purchaser's beneficiary or personal representative, as the case may be). The Company may exercise its powers under this Early Exercise Stock Purchase Agreement and take any other action necessary or advisable to evidence such transfer. Purchaser (or Purchaser's beneficiary or personal representative, as the case may be) must deliver any additional documents of transfer that the Company may request to confirm the transfer of such repurchased Unvested Shares to the Company.

**e.** If Purchaser (or any permitted transferee who is an employee of the Company or any Affiliate) ceases to be an employee of the Company or any of its Affiliates and holds Unvested Shares as to which the Company's Repurchase Option has been exercised, Purchaser shall be entitled to payment in respect of such Unvested Shares in accordance with the foregoing provisions of this Section 3, but (unless otherwise required by law) shall no longer be entitled to participation in the Company or other rights as a stockholder with respect to the Unvested Shares subject to the repurchase. To the maximum extent permitted by law, Purchaser's rights following the exercise of the Repurchase Option shall, with respect to the repurchase and the Unvested Shares covered thereby, be solely the rights that Purchaser has as a general creditor of the Company to receive payment of the amount specified above in this Section 3.

**21. EXERCISE OF REPURCHASE OPTION.** The Repurchase Option shall be exercised by written notice signed by such person as designated by the Company, and delivered or mailed as provided herein. Such notice shall identify the number of shares of Common Stock to be purchased and shall notify Purchaser of the time, place and date for settlement of such purchase, which shall be scheduled by the Company within the term of the Repurchase Option set forth above. The Company shall be entitled to pay for any shares of Common Stock purchased pursuant to its Repurchase Option at the Company's option in cash or by offset against any indebtedness owing to the Company by Purchaser, or by a combination of both. Upon delivery of such notice and payment of the purchase price in any of the ways described above, the Company shall become the legal and beneficial owner of the Common Stock being repurchased and all rights and interest therein or related thereto, and the Company shall have the right to transfer to its own name the Common Stock being repurchased by the Company, without further action by Purchaser.

**22. CAPITALIZATION ADJUSTMENTS TO COMMON STOCK.** In the event of a Capitalization Adjustment, then any and all new, substituted or additional securities or other property to which Purchaser is entitled by reason of Purchaser's ownership of Common Stock shall be immediately subject to the Repurchase Option and be included in the word "Common Stock" for all purposes of the Repurchase Option with the same force and effect as the shares of the Common Stock presently subject to the Repurchase Option, but only to the extent the Common Stock is, at the time, covered by such Repurchase Option. While the total Option Price shall remain the same after each such event, the Option Price per share of Common Stock upon exercise of the Repurchase Option shall be appropriately adjusted.

**23. CORPORATE TRANSACTIONS.** In the event of a Corporate Transaction, then the Repurchase Option may be assigned by the Company to the successor of the Company (or such successor's parent company), if any, in connection with such Corporate Transaction. To the extent the Repurchase Option remains in effect following such Corporate Transaction, it shall apply to the new capital stock or other property received in exchange for the Common Stock in consummation of the Corporate Transaction, but only to the extent the Common Stock was at the time covered by such right. Appropriate adjustments shall be made to the price per share payable upon exercise of the Repurchase Option to reflect the Corporate Transaction upon the Company's capital structure; *provided, however,* that the aggregate price payable upon exercise of the Repurchase Option shall remain the same.

**24. ESCROW OF UNVESTED COMMON STOCK.** As security for Purchaser's faithful performance of the terms of this Agreement and to insure the availability for delivery of Purchaser's Common Stock upon exercise of the Repurchase Option herein provided for, Purchaser agrees, at the closing hereunder, to deliver to and deposit with the Secretary of the Company or the Secretary's designee ("***Escrow Agent***"), as Escrow Agent in this transaction, three (3) stock assignments duly endorsed (with date and number of shares blank) in the form attached hereto as Exhibit B, together with a certificate or certificates evidencing all of the Common Stock subject to the Repurchase Option; said documents are to be held by the Escrow Agent and delivered by said Escrow Agent pursuant to the Joint Escrow Instructions of the Company and Purchaser set forth in Exhibit C, attached hereto and incorporated by this reference, which instructions also shall be delivered to the Escrow Agent at the closing hereunder.

**25. RIGHTS OF PURCHASER.** Subject to the provisions of the Option, Purchaser shall exercise all rights and privileges of a stockholder of the Company with respect to the shares deposited in escrow. Purchaser shall be deemed to be the holder of the shares for purposes of receiving any dividends that may be paid with respect to such shares and for purposes of exercising any voting rights relating to such shares, even if some or all of such shares have not yet vested and been released from the Company's Repurchase Option.

**26. LIMITATIONS ON TRANSFER.** In addition to any other limitation on transfer created by applicable securities laws, Purchaser shall not sell, assign, hypothecate, donate, encumber or otherwise dispose of any interest in the Common Stock while the Common Stock is subject to the Repurchase Option. After any Common Stock has been released from the Repurchase Option, Purchaser shall not sell, assign, hypothecate, donate, encumber or otherwise dispose of any interest in the Common Stock except in compliance with the provisions herein and applicable securities laws. Furthermore, the Common Stock shall be subject to any right of first refusal in favor of the Company or its assignees that may be contained in the Company's Bylaws.

**27. RESTRICTIVE LEGENDS.** All certificates representing the Common Stock shall have endorsed thereon legends in substantially the following forms (in addition to any other legend which may be required by other agreements between the parties hereto):

**a.** "THE SHARES REPRESENTED BY THIS CERTIFICATE ARE SUBJECT TO AN OPTION SET FORTH IN AN AGREEMENT BETWEEN THE COMPANY AND THE REGISTERED HOLDER, OR SUCH HOLDER'S PREDECESSOR IN INTEREST, A COPY OF WHICH IS ON FILE AT THE PRINCIPAL OFFICE OF THIS COMPANY. ANY TRANSFER OR ATTEMPTED TRANSFER OF ANY SHARES SUBJECT TO SUCH OPTION IS VOID WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF THE COMPANY."

**b.** “THE SHARES REPRESENTED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933 AS AMENDED. THEY MAY NOT BE SOLD, OFFERED FOR SALE, PLEDGED OR HYPOTHECATED IN THE ABSENCE OF AN EFFECTIVE REGISTRATION STATEMENT AS TO THE SECURITIES UNDER SAID ACT OR AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED.”

**c.** “THE SHARES REPRESENTED BY THIS CERTIFICATE ARE SUBJECT TO A RIGHT OF FIRST REFUSAL OPTION IN FAVOR OF THE COMPANY AND/OR ITS ASSIGNEE(S) AS SET FORTH IN AN AGREEMENT WITH THE COMPANY, A COPY OF WHICH IS ON FILE AT THE PRINCIPAL OFFICE OF THE COMPANY.”

**d.** “THE SHARES REPRESENTED BY THIS CERTIFICATE WERE ISSUED PURSUANT TO THE EXERCISE OF **[**AN INCENTIVE STOCK OPTION/ A NONSTATUTORY STOCK OPTION**]**.

**e.** Any legend required by appropriate blue sky officials.

**28. INVESTMENT REPRESENTATIONS.** In connection with the purchase of the Common Stock, Purchaser represents to the Company the following:

**a.** Purchaser is aware of the Company’s business affairs and financial condition and has acquired sufficient information about the Company to reach an informed and knowledgeable decision to acquire the Common Stock. Purchaser is acquiring the Common Stock for investment for Purchaser’s own account only and not with a view to, or for resale in connection with, any “distribution” thereof within the meaning of the Securities Act.

**b.** Purchaser understands that the Common Stock has not been registered under the Securities Act by reason of a specific exemption therefrom, which exemption depends upon, among other things, the bona fide nature of Purchaser’s investment intent as expressed herein.

**c.** Purchaser further acknowledges and understands that the Common Stock must be held indefinitely unless the Common Stock is subsequently registered under the Securities Act or an exemption from such registration is available. Purchaser further acknowledges and understands that the Company is under no obligation to register the Common Stock. Purchaser understands that the certificate evidencing the Common Stock will be imprinted with a legend that prohibits the transfer of the Common Stock unless the Common Stock is registered or such registration is not required in the opinion of counsel for the Company.

**d.** Purchaser is familiar with the provisions of Rules 144 and 701, under the Securities Act, as in effect from time to time, which, in substance, permit limited public resale of “restricted securities” acquired, directly or indirectly, from the issuer thereof (or from an affiliate of such issuer), in a non-public offering subject to the satisfaction of certain conditions. Rule 701 provides that if the issuer qualifies under Rule 701 at the time of issuance of the securities, such issuance will be exempt from registration under the Securities Act. In the event the Company becomes subject to the reporting requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the securities exempt under Rule 701 may be sold by Purchaser ninety (90) days thereafter, subject to the satisfaction of certain of the conditions specified by Rule 144 and the market stand-off provision described in Purchaser’s Stock Option Agreement.

**e.** In the event that the sale of the Common Stock does not qualify under Rule 701 at the time of purchase, then the Common Stock may be resold by Purchaser in certain limited circumstances subject to the provisions of Rule 144, which requires, among other things: (i) the availability of certain public information about the Company, and (ii) the resale occurring following the required holding period under Rule 144 after Purchaser has purchased, and made full payment of (within the meaning of Rule 144), the securities to be sold.

**f.** Purchaser further understands that at the time Purchaser wishes to sell the Common Stock there may be no public market upon which to make such a sale, and that, even if such a public market then exists, the Company may not be satisfying the current public current information requirements of Rule 144 or 701, and that, in such event, Purchaser would be precluded from selling the Common Stock under Rule 144 or 701 even if the minimum holding period requirement had been satisfied.

**g.** Purchaser further warrants and represents that Purchaser has either (i) preexisting personal or business relationships, with the Company or any of its officers, directors or controlling persons, or (ii) the capacity to protect his own interests in connection with the purchase of the Common Stock by virtue of the business or financial expertise of Purchaser or of professional advisors to Purchaser who are unaffiliated with and who are not compensated by the Company or any of its affiliates, directly or indirectly. Purchaser further warrants and represents that Purchaser's purchase the Common Stock was not accomplished by the publication of any advertisement.

**29. MARKET STAND-OFF AGREEMENT.** By exercising the Option, Purchaser agrees not to sell, dispose of, transfer, make any short sale of, grant any option for the purchase of, or enter into any hedging or similar transaction with the same economic effect as a sale, any shares of Common Stock or other securities of the Company held by Purchaser, for a period of one hundred eighty (180) days following the effective date of a registration statement of the Company filed under the Securities Act or such longer period as necessary to permit compliance with NASD Rule 2711 or NYSE Member Rule 472 and similar rules or regulations (the "***Lock-Up Period***"); *provided, however*, that nothing shall prevent the exercise of the Repurchase Option during the Lock-Up Period. Purchaser further agrees to execute and deliver such other agreements as may be reasonably requested by the Company and/or the underwriter(s) that are consistent with the foregoing or that are necessary to give further effect thereto. In order to enforce the foregoing covenant, the Company may impose stop-transfer instructions with respect to Purchaser's shares of Common Stock until the end of such period. The underwriters of the Company's stock are intended third party beneficiaries of this Section 12 and shall have the right, power and authority to enforce the provisions hereof as though they were a party hereto.

**30. SECTION 83(b) ELECTION.** Purchaser understands that Section 83(a) of the Code taxes as ordinary income the difference between the amount paid for the Common Stock and the fair market value of the Common Stock as of the date any restrictions on the Common Stock lapse. In this context, "restriction" includes the right of the Company to buy back the Common Stock pursuant to the Repurchase Option set forth above. Purchaser understands that Purchaser may elect to be taxed at the time the Common Stock is purchased, rather than when and as the Repurchase Option expires, by filing an election under Section 83(b) (an "***83(b) Election***") of the Code with the Internal Revenue Service within thirty (30) days of the date of purchase. Even if

the fair market value of the Common Stock at the time of the execution of this Agreement equals the amount paid for the Common Stock, the 83(b) Election must be made to avoid income under Section 83(a) in the future. Purchaser understands that failure to file such an 83(b) Election in a timely manner may result in adverse tax consequences for Purchaser. Purchaser further understands that Purchaser must file an additional copy of such 83(b) Election with his or her federal income tax return for the calendar year in which the date of this Agreement falls. Purchaser acknowledges that the foregoing is only a summary of the effect of United States federal income taxation with respect to purchase of the Common Stock hereunder, and does not purport to be complete. Purchaser further acknowledges that the Company has directed Purchaser to seek independent advice regarding the applicable provisions of the Code, the income tax laws of any municipality, state or foreign country in which Purchaser may reside, and the tax consequences of Purchaser's death. Purchaser assumes all responsibility for filing an 83(b) Election and paying all taxes resulting from such election or the lapse of the restrictions on the Common Stock.

**31. REFUSAL TO TRANSFER.** The Company shall not be required (a) to transfer on its books any shares of Common Stock of the Company which shall have been transferred in violation of any of the provisions set forth in this Agreement, or (b) to treat as owner of such shares or to accord the right to vote as such owner or to pay dividends to any transferee to whom such shares shall have been so transferred.

**32. NO EMPLOYMENT RIGHTS.** This Agreement is not an employment contract and nothing in this Agreement shall affect in any manner whatsoever the right or power of the Company or its Affiliates to terminate Purchaser's employment for any reason at any time, with or without cause and with or without notice.

**33. MISCELLANEOUS.**

**a. Notices.** All notices required or permitted hereunder shall be in writing and shall be deemed effectively given: (a) upon personal delivery to the party to be notified, (b) when sent by confirmed facsimile if sent during normal business hours of the recipient, and if not during normal business hours of the recipient, then on the next business day, (c) five (5) calendar days after having been sent by registered or certified mail, return receipt requested, postage prepaid, or (d) one (1) business day after deposit with a nationally recognized overnight courier, specifying next day delivery, with written verification of receipt. All communications shall be sent to the other party hereto at such party's address hereinafter set forth on the signature page hereof, or at such other address as such party may designate by ten (10) days advance written notice to the other party hereto.

**b. Successors and Assigns.** This Agreement shall inure to the benefit of the successors and assigns of the Company and, subject to the restrictions on transfer herein set forth, be binding upon Purchaser, Purchaser's successors, and assigns. The Company may assign the Repurchase Option hereunder at any time or from time to time, in whole or in part.

**c. Attorneys' Fees; Specific Performance.** Purchaser shall reimburse the Company for all costs incurred by the Company in enforcing the performance of, or protecting its rights under, any part of this Agreement, including reasonable costs of investigation and

attorneys' fees. It is the intention of the parties that the Company, upon exercise of the Repurchase Option and payment for the shares repurchased, pursuant to the terms of this Agreement, shall be entitled to receive the Common Stock, *in specie*, in order to have such Common Stock available for future issuance without dilution of the holdings of other stockholders. Furthermore, it is expressly agreed between the parties that money damages are inadequate to compensate the Company for the Common Stock and that the Company shall, upon proper exercise of the Repurchase Option, be entitled to specific enforcement of its rights to purchase and receive said Common Stock.

**d. Governing Law; Venue.** This Agreement shall be governed by and construed in accordance with the laws of the State of California. The parties agree that any action brought by either party to interpret or enforce any provision of this Agreement shall be brought in, and each party agrees to, and does hereby, submit to the jurisdiction and venue of, the appropriate state or federal court for the district encompassing the Company's principal place of business.

**e. Further Execution.** The parties agree to take all such further action(s) as may reasonably be necessary to carry out and consummate this Agreement as soon as practicable, and to take whatever steps may be necessary to obtain any governmental approval in connection with or otherwise qualify the issuance of the securities that are the subject of this Agreement.

**f. Independent Counsel.** Purchaser acknowledges that this Agreement has been prepared on behalf of the Company by Cooley LLP, counsel to the Company and that Cooley LLP does not represent, and is not acting on behalf of, Purchaser. Purchaser has been provided with an opportunity to consult with Purchaser's own counsel with respect to this Agreement.

**g. Entire Agreement; Amendment.** This Agreement constitutes the entire agreement between the parties with respect to the subject matter hereof and supersedes and merges all prior agreements or understandings, whether written or oral. This Agreement may not be amended, modified or revoked, in whole or in part, except by an agreement in writing signed by each of the parties hereto.

**h. Severability.** If one or more provisions of this Agreement are held to be unenforceable under applicable law, the parties agree to renegotiate such provision in good faith. In the event that the parties cannot reach a mutually agreeable and enforceable replacement for such provision, then (i) such provision shall be excluded from this Agreement, (ii) the balance of the Agreement shall be interpreted as if such provision were so excluded and (iii) the balance of the Agreement shall be enforceable in accordance with its terms.

**i. Counterparts.** This Agreement may be executed in two or more counterparts, each of which shall be deemed an original and all of which together shall constitute one instrument.

**IN WITNESS WHEREOF,** the parties hereto have executed this Agreement as of _____.

**Personalis, Inc.**

By _____
Title _____
Address: 1330 O'Brien Drive
Menlo Park, California 94025

_____
Purchaser

Address: _____
_____

**JOINT ESCROW INSTRUCTIONS**

Cooley LLP
3175 Hanover Street
Palo Alto, California 94304

Dear Sir or Madam:

As Escrow Agent for both Personalis, Inc., a Delaware corporation ("Company"), and the undersigned purchaser of Common Stock of the Company ("Purchaser"), you are hereby authorized and directed to hold the documents delivered to you pursuant to the terms of that certain Early Exercise Stock Purchase Agreement ("Agreement"), dated _____ to which a copy of these Joint Escrow Instructions is attached as Exhibit C, in accordance with the following instructions:

**1.** In the event the Company or an assignee shall elect to exercise the Repurchase Option set forth in the Agreement, the Company or its assignee will give to Purchaser and you a written notice specifying the number of shares of Common Stock to be purchased, the purchase price, and the time for a closing hereunder at the principal office of the Company. Purchaser and the Company hereby irrevocably authorize and direct you to close the transaction contemplated by such notice in accordance with the terms of said notice.

**2.** At the closing you are directed (a) to date any stock assignments necessary for the transfer in question, (b) to fill in the number of shares being transferred, and (c) to deliver same, together with the certificate evidencing the shares of Common Stock to be transferred, to the Company against the simultaneous delivery to you of the purchase price (which may include suitable acknowledgment of cancellation of indebtedness) of the number of shares of Common Stock being purchased pursuant to the exercise of the Repurchase Option.

**3.** Purchaser irrevocably authorizes the Company to deposit with you any certificates evidencing shares of Common Stock to be held by you hereunder and any additions and substitutions to said shares as specified in the Agreement. Purchaser does hereby irrevocably constitute and appoint you as the Purchaser's attorney-in-fact and agent for the term of this escrow to execute with respect to such securities and other property all documents of assignment and/or transfer and all stock certificates necessary or appropriate to make all securities negotiable and complete any transaction herein contemplated.

**4.** This escrow shall terminate and the shares of stock held hereunder shall be released in full upon the later of (a) the expiration or exercise in full of the Repurchase Option, whichever occurs first, and (b) the payment in full of all principal and interest due and payable under the promissory note attached to the Agreement, if any.

**5.** If at the time of termination of this escrow you should have in your possession any documents, securities, or other property belonging to Purchaser, you shall deliver all of same to Purchaser and shall be discharged of all further obligations hereunder; *provided, however,* that if at the time of termination of this escrow you are advised by the Company that the property subject to this escrow is the subject of a pledge or other security agreement, you shall deliver all such property to the pledgeholder or other person designated by the Company.

**6.** Except as otherwise provided in these Joint Escrow Instructions, your duties hereunder may be altered, amended, modified or revoked only by a writing signed by all of the parties hereto.

**7.** You shall be obligated only for the performance of such duties as are specifically set forth herein and may rely and shall be protected in relying or refraining from acting on any instrument reasonably believed by you to be genuine and to have been signed or presented by the proper party or parties or their assignees. You shall not be personally liable for any act you may do or omit to do hereunder as Escrow Agent or as attorney-in-fact for Purchaser while acting in good faith and any act done or omitted by you pursuant to the advice of your own attorneys shall be conclusive evidence of such good faith.

**8.** You are hereby expressly authorized to disregard any and all warnings given by any of the parties hereto or by any other person or corporation, excepting only orders or process of courts of law, and are hereby expressly authorized to comply with and obey orders, judgments or decrees of any court. In case you obey or comply with any such order, judgment or decree of any court, you shall not be liable to any of the parties hereto or to any other person, firm or corporation by reason of such compliance, notwithstanding any such order, judgment or decree being subsequently reversed, modified, annulled, set aside, vacated or found to have been entered without jurisdiction.

**9.** You shall not be liable in any respect on account of the identity, authority or rights of the parties executing or delivering or purporting to execute or deliver the Agreement or any documents or papers deposited or called for hereunder.

**10.** You shall not be liable for the outlawing of any rights under any statute of limitations with respect to these Joint Escrow Instructions or any documents deposited with you.

**11.** Your responsibilities as Escrow Agent hereunder shall terminate if you shall cease to be the Company's legal counsel or if you shall resign by written notice to the Company. In the event of any such termination, the Secretary of the Company shall automatically become the successor Escrow Agent unless the Company shall appoint another successor Escrow Agent, and Purchaser hereby confirms the appointment of such successor as Purchaser's attorney-in-fact and agent to the full extent of your appointment.

**12.** If you reasonably require other or further instruments in connection with these Joint Escrow Instructions or obligations in respect hereto, the necessary parties hereto shall join in furnishing such instruments.

**13.** It is understood and agreed that should any dispute arise with respect to the delivery and/or ownership or right of possession of the securities, you are authorized and directed to retain in your possession without liability to anyone all or any part of said securities until such dispute shall have been settled either by mutual written agreement of the parties concerned or by a final order, decree or judgment of a court of competent jurisdiction after the time for appeal has expired and no appeal has been perfected, but you shall be under no duty whatsoever to institute or defend any such proceedings.

**14.** Any notice required or permitted hereunder shall be given in writing and shall be deemed effectively given upon personal delivery, including delivery by express courier or five days after deposit in the United States Post Office, by registered or certified mail with postage and fees prepaid, addressed to each of the other parties hereunto entitled at the following addresses, or at such other addresses as a party may designate by ten days' advance written notice to each of the other parties hereto:

| | |
|---|---|
| **COMPANY:** | Personalis, Inc.<br>1330 O'Brien Drive<br>Menlo Park, California 94025 |
| **PURCHASER:** | _____<br>_____<br>_____ |
| **ESCROW AGENT:** | Cooley LLP<br>Attn: James C. Kitch<br>3175 Hanover Street<br>Palo Alto, California 94304 |

**15.** By signing these Joint Escrow Instructions you become a party hereto only for the purpose of said Joint Escrow Instructions; you do not become a party to the Agreement.

**16.** You shall be entitled to employ such legal counsel and other experts (including without limitation the firm of Cooley LLP) as you may deem necessary properly to advise you in connection with your obligations hereunder. You may rely upon the advice of such counsel, and may pay such counsel reasonable compensation therefor. The Company shall be responsible for all fees generated by such legal counsel in connection with your obligations hereunder.

**17.** This instrument shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns. It is understood and agreed that references to "you" or "your" herein refer to the original Escrow Agent and to any and all successor Escrow Agents. It is understood and agreed that the Company may at any time or from time to time assign its rights under the Agreement and these Joint Escrow Instructions in whole or in part.

**18.** This Agreement shall be governed by and interpreted and determined in accordance with the laws of the State of California, as such laws are applied by California courts to contracts made and to be performed entirely in California by residents of that state.

Very truly yours,

**PERSONALIS, INC.**

By _____

Title _____

**PURCHASER:**

_____

**ESCROW AGENT:**

**COOLEY LLP**

_____

James C. Kitch

**ASSIGNMENT SEPARATE FROM CERTIFICATE**

FOR VALUE RECEIVED and pursuant to that certain Early Exercise Stock Purchase Agreement between the undersigned ("Purchaser") and Personalis, Inc. (the "Company") dated _____ (the "Agreement"), Purchaser hereby sells, assigns and transfers unto the Company _____ (_____) shares of the Common Stock of the Company standing in Purchaser's name on the Company's books and represented by Certificate No. ____, and does hereby irrevocably constitute and appoint _____ to transfer said stock on the books of the Company with full power of substitution in the premises. THIS ASSIGNMENT MAY ONLY BE USED AS AUTHORIZED BY THE AGREEMENT AND THE EXHIBITS THERETO.

Dated: _____

Signature:

_____
Stockholder

_____
Spouse of Stockholder (if applicable)

Instruction: Please do not fill in any blanks other than the signature line. The purpose of this assignment is to enable the Company to exercise its repurchase option set forth in the Agreement without requiring additional signatures on the part of Purchaser.

**ACKNOWLEDGMENT AND STATEMENT OF DECISION**
**REGARDING SECTION 83(b) ELECTION**

The undersigned has entered a stock purchase agreement with Personalis, Inc., a Delaware corporation (the "Company"), pursuant to which the undersigned is purchasing _____ shares of Common Stock of the Company (the "Shares"). In connection with the purchase of the Shares, the undersigned hereby represents as follows:

1. The undersigned has carefully reviewed the stock purchase agreement pursuant to which the undersigned is purchasing the Shares.

2. The undersigned either [check and complete as applicable]:

(a)____ has consulted, and has been fully advised by, the undersigned's own tax advisor, _____, whose business address is _____, regarding the federal, state and local tax consequences of purchasing the Shares, and particularly regarding the advisability of making elections pursuant to Section 83(b) of the Internal Revenue Code of 1986, as amended (the "Code") and pursuant to the corresponding provisions, if any, of applicable state law; or

(b)____ has knowingly chosen not to consult such a tax advisor.

3. The undersigned hereby states that the undersigned has decided [check as applicable]:

(a)____ to make an election pursuant to Section 83(b) of the Code, and is submitting to the Company, together with the undersigned's executed Common Stock Purchase Agreement, an executed form entitled "Election Under Section 83(b) of the Internal Revenue Code of 1986;" or

(b)____ not to make an election pursuant to Section 83(b) of the Code.

4. Neither the Company nor any subsidiary or representative of the Company has made any warranty or representation to the undersigned with respect to the tax consequences of the undersigned's purchase of the Shares or of the making or failure to make an election pursuant to Section 83(b) of the Code or the corresponding provisions, if any, of applicable state law.

Date: _____

_____
Stockholder

Date: _____

_____
Spouse of Stockholder

**ELECTION UNDER SECTION 83(b)**
**OF THE INTERNAL REVENUE CODE OF 1986**

The undersigned taxpayer hereby elects, pursuant to Section 83(b) of the Internal Revenue Code, to include in taxpayer's gross income or alternative minimum taxable income, as applicable, for the current taxable year, the amount of any income that may be taxable to taxpayer in connection with taxpayer's receipt of the property described below:

1. The name, address, taxpayer identification number and taxable year of the undersigned are as follows:

   NAME OF TAXPAYER:

   NAME OF SPOUSE:

   ADDRESS:

   IDENTIFICATION NO. OF TAXPAYER:

   IDENTIFICATION NO. OF SPOUSE:

   TAXABLE YEAR:

2. The property with respect to which the election is made is described as follows:

   _____ shares of the Common Stock of Personalis, Inc., a Delaware corporation (the "Company").

3. The date on which the property was transferred is: _____

4. The property is subject to the following restrictions:

   Repurchase option at cost in favor of the Company upon termination of taxpayer's employment or consulting relationship.

5. The fair market value at the time of transfer, determined without regard to any restriction other than a restriction which by its terms will never lapse, of such property is: $____.

6. The amount (if any) paid for such property: $____.

The undersigned has submitted a copy of this statement to the person for whom the services were performed in connection with the undersigned's receipt of the above-described property. The transferee of such property is the person performing the services in connection with the transfer of said property.

The undersigned understands that the foregoing election may not be revoked except with the consent of the Commissioner.

Dated: _____

_____
Taxpayer

Dated: _____

_____
Spouse of Taxpayer

**[***] = Certain information contained in this document, marked by brackets, has been omitted because it is both not material and would be competitively harmful if publicly disclosed.**

**SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS**
**OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24 & 30**

1. REQUISITION NO. 101-17-2-335-0009 101-17-2-335-0010 | PAGE 1 of 89

| 2. CONTRACT NO. | 3. AWARD/EFFECTIVE DATE | 4. ORDER NO. | 5. SOLICITATION NUMBER | 6. SOLICITATION ISSUE DATE |
|---|---|---|---|---|
| VA240-17-D-0103 | 9/28/2017 | | VA240-17-R-0102 | 07-14-2017 |

| 7. FOR SOLICITATION INFORMATION CALL: | a. NAME | b. TELEPHONE NO. (No Collect Calls) | 5. OFFER DUE DATE/LOCAL TIME |
|---|---|---|---|
| | [***] | [***] | 08-29-2017 12:00 PM |

9. ISSUED BY CODE 36c240

US Department of Veterans Affairs
Veterans Health Administration
Service Area Office (SAO) East
323 North Shore Drive, Suite 500
Pittsburgh PA 15212-5319

10. THIS ACQUISITION IS ☐UNRESTRICTED OR ☒ SET ASIDE 100 % FOR

☒SMALL BUSINESS

☐HUBZONE SMALL BUSINESS

☐SERVICE-DISABLED VETERAN-OWNED SMALL BUSINESS

☐WOMEN-OWNED SMALL BUSINESS (WOSB) ELIGIBLE UNDER THE WOMEN-OWNED SMALL BUSINESS PROGRAM

NAICS: 541380

☐EDW058

☐S(A) Y

SIZE STANDARD: $15 Million

11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED

☒ SEE SCHEDULE

12. DISCOUNT TERMS
See volume 4

☐13a. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)

13B. RATING
N/A

14. METHOD OF SOLICITATION
☐ RFG ☐ IFS ☒RFP

15. DELIVER TO CODE

Department of Veterans Affairs
1100 First Street NE

Washington DC 20002

16. ADMINISTERED BY CODE 36c240e

US Department of Veterans Affairs
Veterans Health Administration
Service Area Office (SAO) East
323 North Shore Drive, Suite 500
Pittsburgh PA 15212-5319

17a. CONTRACT/OFFEROR CODE 7377-1 FACILITY CODE

Personalis Inc
1330 O'Brien Drive
Menlo Park
CA 94025

TELEPHONE NO 650-752-1330 DUNS 078325220 DUNS -4

18a. PAYMENT WILL BE MADE BY CODE 36c24e

US Department of Veterans Affairs
Financial Services Center (FSC)

P.O. Box 149971
Austin TX 78734-8971

PHONE: FAX:

☐ 17b. CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER

18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a UNLESS BLOCK BELOW IS CHECKED
☐ SEE ADDENDUM

| 19. ITEM NO. | 20. SCHEDULE OF SUPPLIES/SERVICES | 21. QUANTITY | 22. UNIT | 23. UNIT PRICE | 24. AMOUNT |
|---|---|---|---|---|---|
| | Whole Genome Sequencing IAM Statement of Work<br><br>See Volume 4 of proposal for schedule<br><br>(Use Reverse and/or Attach Additional Sheets as Necessary) | | | | |

25. ACCOUNTING AND APPROPRIATION DATA

26. TOTAL AWARD AMOUNT (For Govt. Use Only)
$.0.00

☐ 27a. SOLICITATION INCORPORATES BY REFERENCE FAR 52.212-1. 52.212-4. FAR 52.212-3 AND 52.212-5 ARE ATTACHED. ADDENDA ☒ ARE ☐ ARE NOT ATTACHED.

☒ 27b. CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212-4. FAR 52-212-5 IS ATTACHED. ADDENDA. ☒ ARE ☐ ARE NOT ATTACHED.

☒ 28. CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 1 COPIES TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED

☒ 29. AWARD OF CONTRACT: REF. Personalis proposal OFFER DATED 8/28/2017 YOUR OFFER ON SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH HEREIN IS ACCEPTED AS TO ITEMS.

30a. SIGNATURE OF OFFEROR/CONTRACTOR

/s/ Carol J Tillis, VP Finance

31a. UNITED STATES OF AMERICA (SIGNATURE OF CONTRACTING OFFICER)

/s/ Keith Costantino

| 30b. NAME AND TITLE OF SIGNER (TYPE OR PRINT) | 30c. DATE SIGNED | 31b. NAME OF CONTRACTING OFFICER (TYPE OR PRINT) | 31c. DATE SIGNED |
|---|---|---|---|
| Carol J Tillis, VP Finance | 08/28/17 | Keith Costantino | 9/28/2017 |

AUTHORIZED FOR LOCAL REPRODUCTION
PREVIOUS EDITION IS NOT USABLE

STANDARD FORM 1449 (Rev. 2/2012)
Prescribed by GSA – FAR (48CRF) 53.212

**SECTION B - CONTINUATION OF SF 1449 BLOCKS**

**B.1 CONTRACT ADMINISTRATION DATA**

(continuation from Standard Form 1449, block 18A.)

1. Contract Administration: All contract administration matters will be handled by the following individuals:

a. CONTRACTOR:

b. GOVERNMENT: Contracting Officer 36C24E Keith Costantino

US Department of Veterans Affairs

Veterans Health Administration

Service Area Office (SAO) East

323 North Shore Drive, Suite 500

Pittsburgh PA 15212-5319

2. CONTRACTOR REMITTANCE ADDRESS: All payments by the Government to the contractor will be made in accordance with:

[X] 52.232-34, Payment by Electronic Funds Transfer—Other Than System For Award Management, or

[ ] 52.232-36, Payment by Third Party

3. INVOICES: Invoices shall be submitted in arrears:

a. Quarterly [ ]

b. Semi-Annually [ ]

c. Other [ ] As directed by Task Order

4. GOVERNMENT INVOICE ADDRESS: All Invoices from the contractor shall be submitted electronically in accordance with VAAR Clause 852.232-72 Electronic Submission of Payment Requests.

US Department of Veterans Affairs

Financial Services Center (FSC)

P.O. Box 149971

Austin TX 78714-8971

ACKNOWLEDGMENT OF AMENDMENTS: The offeror acknowledges receipt of amendments to the Solicitation numbered and dated as follows:

| AMENDMENT NO | DATE |
|---|---|

**B.2 LIMITATIONS ON SUBCONTRACTING— MONITORING AND COMPLIANCE (JUN 2011)**

This solicitation includes FAR 52.219-14 Limitations on Subcontracting. Accordingly, any contract resulting from this solicitation will include this clause. The contractor is advised in performing contract administration functions, the CO may use the services of a support contractor(s) retained by VA to assist in assessing the contractor's compliance with the limitations on subcontracting or percentage of work performance requirements specified in the clause. To that end, the support contractor(s) may require access to contractor's offices where the contractor's business records or other proprietary data are retained and to review such business records regarding the contractor's compliance with this requirement. All support contractors conducting this review on behalf of VA will be required to sign an "Information Protection and Non-Disclosure and Disclosure of Conflicts of Interest Agreement" to ensure the contractor's business records or other proprietary data reviewed or obtained in the course of assisting the CO in assessing the contractor for compliance are protected to ensure information or data is not improperly disclosed or other impropriety occurs. Furthermore, if VA determines any services the support contractor(s) will perform in assessing compliance are advisory and assistance services as defined in FAR 2.101, Definitions, the support contractor(s) must also enter into an agreement with the contractor to protect proprietary information as required by FAR 9.505-4, obtaining access to proprietary information, paragraph (b). The contractor is required to cooperate fully and make available any records as may be required to enable the CO to assess the contractor's compliance with the limitations on subcontracting or percentage of work performance requirement.

**B.3 SUBCONTRACTING COMMITMENTS—MONITORING AND COMPLIANCE (JUN 2011)**

This solicitation includes VAAR 852.215-70, Service-Disabled Veteran-Owned and Veteran-Owned Small Business Evaluation Factors, and VAAR 852.215-71, Evaluation Factor Commitments. Accordingly, any contract resulting from this solicitation will include these clauses. The contractor is advised in performing contract administration functions, the CO may use the services of a support contractor(s) to assist in assessing contractor compliance with the subcontracting commitments incorporated into the contract. To that end, the support contractor(s) may require access to the contractor's business records or other proprietary data to review such business records regarding contract compliance with this requirement. All support contractors conducting this review on behalf of VA will be required to sign an "Information Protection and Non-Disclosure and Disclosure of Conflicts of Interest Agreement" to ensure the contractor's business records or other proprietary data reviewed or obtained in the course of assisting the CO in assessing the contractor for compliance are protected to ensure information or data is not improperly disclosed or other impropriety occurs. Furthermore, if VA determines any services the support contractor(s) will perform in assessing compliance are advisory and assistance services as defined in FAR 2.101, Definitions, the support contractor(s) must also enter into an agreement with the contractor to protect proprietary information as required by FAR 9.505-4, obtaining access to proprietary

information, paragraph (b). The contractor is required to cooperate fully and make available any records as may be required to enable the CO to assess the contractor compliance with the subcontracting commitments.

## STATEMENT OF WORK

Contractor shall furnish services to provide Whole Genome sequencing for human DNA samples for the Department of Veterans Affairs (VA) Veterans Health Administration (VHA), Office of Research and Development's Million Veteran Program.

### 1.0 BACKGROUND/SCOPE/QUALIFICATIONS

The VHA provides healthcare services for the nations' Veteran population. One of the charges of the VHA is to promote research and development dedicated to improving the health and lives of Veterans. The Office of Research and Development (ORD) created the Genomic Medicine Program (GMP) in 2006 to support and lead VA as it moves into the venue of genomic or precision medicine.

The field of genomics and particularly genomic medicine is a new and rapidly evolving one. The VA stands at this cutting edge and needs resources to ensure that the Veterans receive the benefit of the latest technology and research.

This Statement of Work is to secure a combination of WHOLE GENOME sequencing services to support the objectives of the VA's Million Veteran Program (MVP).

MVP is a national research program begun in 2011 that is creating a resource of genetic information of one million consented Veteran volunteers (who receive their health care from the VA) linked with information from self-reported survey instruments and their electronic health records. There are currently 51 Veteran Affairs Medical Centers (VAMC) enrolling participants into MVP, and over 550,000 participants have fully consented and provided a blood sample to MVP. It is one of the world's largest genetic resources of its kind.

### 1.1 GENERAL SCOPE

The VHA Million Veteran Program requires the services of High-throughput human whole genome sequencing.

The human DNA samples shall be sent by the VA to the contractor facility from the MAVERIC Biorepository in Boston or another VA biorepository.

### 1.2 CONTRACTOR QUALIFICATIONS

The contractor shall have the following qualifications, capabilities, and be able to document the following:

a. Headquarters and laboratory facilities where work to be conducted in is located within the Continental United States. No work shall be performed outside of the United States or in any locality outside of the jurisdiction of the laws of the United States.

b. Ability to conduct high-throughput WHOLE GENOME sequencing (for research purposes ONLY) of up to 2500 VA human DNA samples at average >30x depth over 90% of the mutually agreed upon reference genome per month utilizing a sequencing by synthesis method within the contract period. THIS IS A CRITICAL REQUIREMENT.

c. OR, Ability to conduct high-throughput WHOLE GENOME sequencing (for research purposes ONLY) of up to 900 VA human tumor DNA samples at average >100x depth over 90% of the mutually agreed upon reference genome per month utilizing a sequencing by synthesis method within the contract period for somatic samples. THIS IS A CRITIAL REQUIREMENT.

d. Ability for Sample tracking and management utilizing bar coding to ensure security & traceability of VA samples.

e. Ability to produce documentation of sample handling and processing attributes/audit trail, etc. that would address sample mixing and sample error tracking.

f. The contractor shall demonstrate that they are certified in Good Laboratory Practice (GLP) and CLIA certification

g. Contractors shall be required to submit for a NACI low level background investigation and security clearance in accordance with the VA IT Security Clause and complete the required training and procedures to comply with these requirements.

**2.0 TASKS/REQUIREMENTS.**

**Tasks**: The contractor shall provide a detailed Project Management Plan in their proposal to address the following tasks necessary to complete the whole genome sequencing, and shall address the capabilities to provide specific requirements:

Additionally, the contractor shall not propose primary and alternative methods within a single proposal. If alternate methodologies are going to be proposed, it is suggested that the contractor submit multiple proposals.

Task 1: Provide a detailed DNA Sample Security and Data Security Plan:

1. All materials and samples utilized during the course of the contract are the property of the Department of Veterans Affairs and must be handled in a confidential and secure manner.
2. The contractor shall outline in their response: their planned lab Standard Operating Procedures (SOPs) methods for handling and securing of samples including paper and electronic documents, the methods, assurances and processes for destruction of samples and data, details of proposed shipping requirements like method/conditions for shipping, receipt & acknowledgement of shipments, encryption of hard drives (if that is the VA requested delivery method); documentation of security of electronic data delivery (if that is VA requested delivery method) as well as the contractors ability to perform in accordance with and subject to:
    a. VA Handbook 6500.1 - Electronic Media Sanitization, VA Directive 6300 – Records and Information Management and its Handbook 6300.1 Records management Procedures, National Archives and Records Administration(NARA), FISMA, HIPAA, NIST, and related VA security and privacy control requirements applicable with provisions and clauses within this requirement.
3. This plan shall address how the contractor plans to meet these requirements and shall be required at the time of submitting the proposal. Simply stating or acknowledging the references is unacceptable.

Task 2: Attend an initial post-award contract kick-off meeting, and attend as needed meetings through the life of the contract.

1. A kick off meeting will be held in Washington, DC at the Department of Veterans Affairs within 14 days after contract award and shall be attended by all key personnel staff on contract. This meeting may take place via teleconference if preferred.
2. The contractor shall be required to communicate with Program staff on an as needed basis throughout the life of the contract via teleconference or videoconference.

Task 3: Receipt and storage of VA DNA samples for sequencing

1. The contractor shall include in proposal in their response to this SOW the outer boundaries of needed DNA sample quality, quantity and shipping requirement which will then be discussed and finalized at the Kick-off meeting.
2. VA will provide the contractor with coded human DNA samples. The samples shall be stored by the contractor at -20 degrees Celsius in locked upright or chest freezers (with emergency back-up power) until the samples are processed for sequencing. Any unused samples are to be destroyed by the contractor as specified by VA policies. (See task 6 for detailed instructions on unused DNA and sequence data)
3. Sample tracking and management process shall be in place to ensure security of VA samples.

Task 4: Whole Genome Sequencing

1. Contractor shall test DNA for quality sufficient to proceed with vendor sequencing procedures, and to confirm quality from VA reporting sent with samples, and to identity match samples before and after sequencing.
2. Contractor shall provide the following services when a task order is issued for RESEARCH specimens:

    A. Research Whole Genome Sequencing ( at average >30x depth of >90% of current, bilaterally agreed upon reference genome)

        i. DNA alignments and quality scores (Phred) of variants relative to a human genome reference sequence provided by the contractor in FASTQ or similar output file format, OR complete raw sequence files in FASTQ format, depending upon the specific requests of the task order

        ii. Variant calls (if requested in task order)

        iii. BAM files of each sequenced genome (if requested in task order)

        iv. Genotype array data file for each sample.

B. Research Whole genome sequencing of tumor DNA samples (at average >100x of current, bilaterally agreed upon reference genome)

i. DNA alignments and quality scores (Phred) of variants relative to a human genome reference sequence provided by the contractor in FASTQ or similar output file format, OR complete raw sequence files in FASTQ format, depending upon the specific requests of the task order

ii. Variant calls (if requested in task order)

iii. BAM files of each sequenced genome (if requested in task order)

v. Genotype array data file for each sample.

Task 5: Provide reports and required Data

1. Monthly Written Report:

This report shall be delivered electronically via email no later than the 1st business day of the following month. The report shall track parameters, including:

1. Number of samples completed to desired parameters as requested per the task order
2. Average depth of sequencing for each sample
3. Quality control measurements of sequence data (including number of samples that did not meet QC measurement standards)
4. These reports will include any non-compliance issues, to include if and the number of DNA samples that do not meet contractor's QC standards.
5. And, in accordance with the most current industry standards, any other data that may be deemed beneficial to VA by contractor.

2. Required Sequenced Data

Contractor shall supply completed whole genome sequence data for the VA samples including the data requirements in Task 4, and generated in a secure manner in one or all of the requested formats below. Delivery shall occur within 30 days of completion of sequencing for each task order :

1. VA approved encrypted hard drives. Encryption shall be in accordance with VA security standards, VA Handbook 6500.6, by shipment of encrypted physical hard drives to VA location (provided by COR) by courier or overnight shipping, and including signature delivery confirmation. Currently the approved drive is 40TB (RAID 0) CSE-40TB4-SU3 (https://www.buslink.com/product.php?prod_id=442).
2. or by secure electronic transfer to VA approved secure cloud storage location;
3. or by secure electronic transfer to VA approved federal partner location.

Electronic Data and/or physical hard drives shall be sent to the VA or to approved cloud location or federal partner location within one week upon completion of each task order unless a specific schedule is mentioned in the individual task order.

The vendor should have the capacity to begin shipments of task orders with the approved encrypted hard drives, but be able to switch to electronic data delivery within the contract period,

Task 6: Destruction of Unused DNA and sequence data

1. The contractor shall destroy or return unused DNA samples, in compliance with relevant sections of VA Handbook 6500.1 and per direction with written approval of the Contracting Officer's Representative or Contracting Officer. The acceptable method of destroying DNA samples is by bleaching and certified to that effect.
2. The contractor shall destroy all data associated with VA sample as per direction and with approval of the VA COR/Contracting Officer and in full compliance of the VA Handbook 6500.1 specifically paragraphs 5 and 6. Once the data is received, the VA COR will notify the vendor in writing of the same. The data on the vendor's end shall be destroyed by the vendor after documented completion of initial QC checks by the VA. The vendor should be able to store the raw data for up to 12 months.

**3.0 PLACE OF PERFORMANCE**

The performance of this work shall be at the contractors facility, which shall meet the qualifications listed in this SOW. All certifications and assurances shall be provided to the CO and COR prior to initiation of work. The contractor will not be required to perform sample gathering at a government location, however the contractor will be required to demonstrate that the selected worksite meets all security requirements for the use of research coded samples. This will include the use of encrypted computers and an established system of information management in accordance with all federal and VA-specific security standards established by Federal law and regulation and VA-specific policy.

The contractor shall be required to complete and submit a Contractor Security Control Assessment within 30 days of award of a contract, and annually thereafter, in accordance with VA Handbook 6500.6.

No work shall be performed outside of the United States or in any locality outside of the jurisdiction of the laws of the United States.

**4.0 GOVERNMENT FURNISHED EQUIPMENT INFORMATION**

The Department of Veterans Affairs shall furnish the following Government Property for completion of the desired task

- Coded DNA samples
- Any required information necessary for sample processing and sequencing, to include manifest of samples and documentation of DNA quality and concentration.

**5.0 TRAVEL**

Contractor travel may be required for this contract, not exceeding 2 days to travel to VA Central Office in Washington, DC for kick-off meeting. Travel costs are the responsibility of the contractor.

## 6.0 PERFORMANCE PERIOD

The performance period for these services shall be for a base period of 1 year, with 3 option periods which may be exercised upon discretion of the VA.

Base period: September 2017 – August 2018
Option 1: FY 18 September 2018 – August 2019
Option 2: FY 19 September 2019 – August 2020
Option 3: FY 20 September 2020– August 2021

## 7.0 DELIVERABLES

| Deliverable | Reference | Delivery Date 1st Occurrence | Frequency of Delivery | Destination |
|---|---|---|---|---|
| **Project Management Plan** | Tasks | Submit with response to solicitation. | With solicitation proposal and updated after contract award. | Contracting Officer (CO) |
| **DNA Sample Security Plan** | Task 1 | Submit with response to solicitation | With solicitation proposal and updated after contract award. | CO |
| **Good Laboratory Practice Certification** | Qualifications | Submit with response to solicitation | Update and timely redelivery as events require | CO |
| **CLIA certification** | Qualifications | Submit with response to solicitation | Update and timely redelivery as events require | CO |
| **Monthly Written Report** | Task 6 | 1st day of following month. | Monthly | Contracting Officer's Representative (COR) |
| **Whole Genome Sequence Data** | Task 4 | Delivery shall occur within 30 days of completion of sequencing for each task order | Per task order | Secure physical shipment to designated VA location or electronic transfer to VA approved secure cloud storage location or federal partner location |
| **Contractor Security Control Assessment** | Qualifications | Within 30 days of contract award. | Within 30 days of award, and annually on the renewal date of contract. | COR |

**7.1 Schedule for Deliverables**: If for any reason, any deliverable cannot be delivered within the time schedule indicated in the approved project schedule, the contractor shall provide a written explanation (within 5 business days prior the due date) to the Contracting Officer, with a copy to the COTR. This written transmittal shall include a firm commitment of when the work shall be completed. This notice to the Contracting Officer shall cite the reasons for the delay, and the impact on the overall project. The Contracting Officer shall then review the facts and issue a response in accordance with applicable regulations.

## 8.0 Confidentiality and Non-Disclosure

All samples and data provided by the Government and all data first produced or delivered during this contract is the sole property of the VA. The contractor recognizes that in the performance of this contract it may receive or have access to sensitive or confidential information, including personal information of VA employees and information proprietary in nature by system contractors, equipment manufacturers and other private or public entities. The contractor shall restrict access to sensitive or confidential information to the minimum number of employees necessary for contract performance.

The contractor shall indoctrinate its employees and all subcontractor employees working on this contract on the laws, rules and regulations governing access to sensitive and/or confidential information. All persons concerned shall understand that unauthorized access to or use of sensitive or confidential information related to this contract shall result in immediate termination of the individual or individuals from the contract and be subject to legal prosecution to the fullest extent of the law.

The contractor shall conduct an appropriate background investigation on all of its employees and subcontractor employees working on this contract and who require access to government computer systems.

## 9.0 Contract Administration

Notwithstanding the Contractor's responsibility for total management during the performance of this contract, the administration of the contract will require maximum coordination between the Government and the Contractor. The following individuals will be the Government's points of contact during the performance of this contract:

**Contracting Officer's Representative (COR):**
[***],
Million Veteran Program
Office of Research and Development, VACO
Email: [***]

The COR shall be designated on the authority of the Contracting Officer at the time of contract award to monitor all technical aspects of the contract. In no event is the COR empowered to change any of the terms and conditions of the contract. Changes in any section of this contract shall be made only by the Contracting Officer pursuant to a properly executed modification. The types of actions within the purview of the COR's authority are to ensure that the Contractor performs the technical requirements of the contract, and to notify both the Contractor and the Contracting Officer of any deficiencies observed. A memorandum of designation shall be issued to the COR and a copy shall be sent to the Contractor at the time of contract award setting forth in full the responsibilities and limitations of the COR.

**10.0 Contract Type**

A Requirements Contract provides for filling all actual requirements of designated Government activities for services during a specified contract period with time or duration to be scheduled by placing task orders with the contractor. Each task order issued against this contract shall have a separate period of performance. Funds will be obligated for under a separate task order based on actual needs. The information below depicts the government's realistic estimate for anticipated number of tests over the base and option years. However, these are only estimates and task orders will be awarded based on actual needs.

REALISTIC ESTIMATE IAW FAR 16.503

| | Estimated Number of Samples for Whole Genome Sequence [***] |
|---|---|
| Base Period September 2017 through August 2018 (estimated) | [***] |
| Option Year 1 Period September 2018 through August 2019 (estimated) | [***] |
| Option Year 2 Period September 2019 through August 2020 (estimated) | [***] |
| Option Year 3 Period September 2020 through August 2021 (estimated) | [***] |
| TOTAL | [***] |

**VA INFORMATION AND INFORMATION SYSTEM SECURITY/PRIVACY LANGUAGE FOR INCLUSION INTO CONTRACTS, AS APPROPRIATE**

**1. GENERAL**

Contractors, contractor personnel, subcontractors, and subcontractor personnel shall be subject to the same Federal laws, regulations, standards, and VA Directives and Handbooks as VA and VA personnel regarding information and information system security.

**2. ACCESS TO VA INFORMATION AND VA INFORMATION SYSTEMS**

a. A contractor/subcontrator shall request logical (technical) or physical access to VA information and VA information systems for their employees, subcontractors, and affiliates only to the extent necessary to perform the services specified in the contract, agreement, or task order.

b. All contractors, subcontractors, and third-party servicers and associates working with VA information are subject to the same investigative requirements as those of VA appointees or employees who have access to the same types of information. The level and process of background security investigations for contractors must be in accordance with VA Directive and Handbook 0710, *Personnel Suitability and Security Program*. The Office for Operations, Security, and Preparedness is responsible for these policies and procedures.

c. Contract personnel who require access to national security programs must have a valid security clearance. National Industrial Security Program (NISP) was established by Executive Order 12829 to ensure that cleared U.S. defense industry contract personnel safeguard the classified information in their possession while performing work on contracts, programs, bids, or research and development efforts. The Department of Veterans Affairs does not have a Memorandum of Agreement with Defense Security Service (DSS). Verification of a Security Clearance must be processed through the Special Security Officer located in the Planning and National Security Service within the Office of Operations, Security, and Preparedness.

d. Custom software development and outsourced operations must be located in the U.S. to the maximum extent practical. If such services are proposed to be performed abroad andare not disallowed by other VA policy or mandates, the contractor/subcontractor must state where all non-U.S. services are provided and detail a security plan, deemed to be acceptable by VA, specifically to address mitigation of the resulting problems of communication, control, data protection, and so forth. Location within the U.S. may be an evaluation factor.

e. The contractor or subcontractor must notify the Contracting Officer immediately when an employee working on a VA system or with access to VA information is reassigned or leaves the contractor or subcontractor’s employ. The Contracting Officer must also be notified immediately by the contractor or subcontractor prior to an unfriendly termination.

**3. VA INFORMATION CUSTODIAL LANGUAGE**

a. Information made available to the contractor or subcontractor by VA for the performance or administration of this contract or information developed by the contractor/subcontractor in performance or administration of the contract shall be used only for those purposes and shall not be used in any other way without the prior written agreement of the VA. This clause expressly limits the contractor/subcontractor’s rights to use data as described in Rights in Data - General, FAR 52.227-14(d) (1).

b. VA information should not be co-mingled, if possible, with any other data on the contractors/subcontractor’s information systems or media storage systems in order to ensure VA requirements related to data protection and media sanitization can be met. If co-mingling must be allowed to meet the requirements of the business need, the contractor must ensure that VA’s information is returned to the VA or destroyed in accordance with VA’s sanitization requirements. VA reserves the right

to conduct on site inspections of contractor and subcontractor IT resources to ensure data security controls, separation of data and job duties, and destruction/media sanitization procedures are in compliance with VA directive requirements.

c. Prior to termination or completion of this contract, contractor/subcontractor must not destroy information received from VA, or gathered/created by the contractor in the course of performing this contract without prior written approval by the VA. Any data destruction done on behalf of VA by a contractor/subcontractor must be done in accordance with National Archives and Records Administration (NARA) requirements as outlined in VA Directive 6300, *Records and Information Management* and its Handbook 6300.1 *Records Management Procedures*, applicable VA Records Control Schedules, and VA Handbook 6500.1, *Electronic Media Sanitization*. Self-certification by the contractor that the data destruction requirements above have been met must be sent to the VA Contracting Officer within 30 days of termination of the contract.

d. The contractor/subcontractor must receive, gather, store, back up, maintain, use, disclose and dispose of VA information only in compliance with the terms of the contract and applicable Federal and VA information confidentiality and security laws, regulations and policies. If Federal or VA information confidentiality and security laws, regulations and policies become applicable to the VA information or information systems after execution of the contract, or if NIST issues or updates applicable FIPS or Special Publications (SP) after execution of this contract, the parties agree to negotiate in good faith to implement the information confidentiality and security laws, regulations and policies in this contract.

e. The contractor/subcontractor shall not make copies of VA information except as authorized and necessary to perform the terms of the agreement or to preserve electronic information stored on contractor/subcontractor electronic storage media for restoration in case any electronic equipment or data used by the contractor/subcontractor needs to be restored to an operating state. If copies are made for restoration purposes, after the restoration is complete, the copies must be appropriately destroyed.

f. If VA determines that the contractor has violated any of the information confidentiality, privacy, and security provisions of the contract, it shall be sufficient grounds for VA to withhold payment to the contractor or third party or terminate the contract for default or terminate for cause under Federal Acquisition Regulation (FAR) part 12.

g. If a VHA contract is terminated for cause, the associated BAA must also be terminated and appropriate actions taken in accordance with VHA Handbook 1600.01, *Business Associate Agreements*. Absent an agreement to use or disclose protected health information, there is no business associate relationship.

h. The contractor/subcontractor must store, transport, or transmit VA sensitive information in an encrypted form, using VA-approved encryption tools that are, at a minimum, FIPS 140-2 validated.

i. The contractor/subcontractor’s firewall and Web services security controls, if applicable, shall meet or exceed VA’s minimum requirements. VA Configuration Guidelines are available upon request.

j. Except for uses and disclosures of VA information authorized by this contract for performance of the contract, the contractor/subcontractor may use and disclose VA information only in two other situations: (i) in response to a qualifying order of a court of competent jurisdiction, or (ii) with VA's prior written approval. The contractor/subcontractor must refer all requests for, demands for production of, or inquiries about, VA information and information systems to the VA contracting officer for response.

k. Notwithstanding the provision above, the contractor/subcontractor shall not release VA records protected by Title 38 U.S.C. 5705, confidentiality of medical quality assurance records and/or Title 38 U.S.C. 7332, confidentiality of certain health records pertaining to drug addiction, sickle cell anemia, alcoholism or alcohol abuse, or infection with human immunodeficiency virus. If the contractor/subcontractor is in receipt of a court order or other requests for the above mentioned information, that contractor/subcontractor shall immediately refer such court orders or other requests to the VA contracting officer for response.

l. For service that involves the storage, generating, transmitting, or exchanging of VA sensitive information but does not require C&A or an MOU-ISA for system interconnection, the contractor/subcontractor must complete a Contractor Security Control Assessment (CSCA) on a yearly basis and provide it to the COR.

**4. INFORMATION SYSTEM DESIGN AND DEVELOPMENT**

a. Information systems that are designed or developed for or on behalf of VA at non-VA facilities shall comply with all VA directives developed in accordance with FISMA, HIPAA, NIST, and related VA security and privacy control requirements for Federal information systems. This includes standards for the protection of electronic PHI, outlined in 45 C.F.R. Part 164, Subpart C, information and system security categorization level designations in accordance with FIPS 199 and FIPS 200 with implementation of all baseline security controls commensurate with the FIPS 199 system security categorization (reference Appendix D of VA Handbook 6500, *VA Information Security Program*). During the development cycle a Privacy Impact Assessment (PIA) must be completed, provided to the COR, and approved by the VA Privacy Service in accordance with Directive 6507, *VA Privacy Impact Assessment*.

b. The contractor/subcontractor shall certify to the COR that applications are fully functional and operate correctly as intended on systems using the VA Federal Desktop Core Configuration (FDCC), and the common security configuration guidelines provided by NIST or the VA. This includes Internet Explorer 7 configured to operate on Windows XP and Vista (in Protected Mode on Vista) and future versions, as required.

c. The standard installation, operation, maintenance, updating, and patching of software shall not alter the configuration settings from the VA approved and FDCC configuration. Information technology staff must also use the Windows Installer Service for installation to the default "program files" directory and silently install and uninstall.

d. Applications designed for normal end users shall run in the standard user context without elevated system administration privileges.

e. The security controls must be designed, developed, approved by VA, and implemented in accordance with the provisions of VA security system development life cycle as outlined in NIST Special Publication 800-37, *Guide for Applying the Risk Management Framework to Federal Information Systems*, VA Handbook 6500, *Information Security Program* and VA Handbook 6500.5, *Incorporating Security and Privacy in System Development Lifecycle*.

f. The contractor/subcontractor is required to design, develop, or operate a System of Records Notice (SOR) on individuals to accomplish an agency function subject to the Privacy Act of 1974, (as amended), Public Law 93-579, December 31, 1974 (5 U.S.C. 552a) and applicable agency regulations. Violation of the Privacy Act may involve the imposition of criminal and civil penalties.

g. The contractor/subcontractor agrees to:

(1) Comply with the Privacy Act of 1974 (the Act) and the agency rules and regulations issued under the Act in the design, development, or operation of any system of records on individuals to accomplish an agency function when the contract specifically identifies:

(a) The Systems of Records (SOR); and

(b) The design, development, or operation work that the contractor/subcontractor is to perform;

(2) Include the Privacy Act notification contained in this contract in every solicitation and resulting subcontract and in every subcontract awarded without a solicitation, when the work statement in the proposed subcontract requires the redesign, development, or operation of a SOR on individuals that is subject to the Privacy Act; and l. All other vulnerabilities shall be remediated as specified in this paragraph in a timely manner based on risk, but within 60 days of discovery or disclosure. Exceptions to this paragraph (e.g. for the convenience of VA) shall only be granted with approval of the contracting officer and the VA Assistant Secretary for Office of Information and Technology.

**5. INFORMATION SYSTEM HOSTING, OPERATION, MAINTENANCE, OR USE**

a. For information systems that are hosted, operated, maintained, or used on behalf of VA at non-VA facilities, contractors/subcontractors are fully responsible and accountable for ensuring compliance with all HIPAA, Privacy Act, FISMA, NIST, FIPS, and VA security and privacy directives and handbooks. This includes conducting compliant risk assessments, routine vulnerablity scanning, system patching and change management procedures, and the completion of an acceptable contingency plan for each system. The contractor’s security control procedures must be equivalent, to those procedures used to secure VA systems. A Privacy Impact Assessment (PIA) must also be provided to the COR and approved by VA Privacy Service prior to operational approval. All external Internet connections to VA’s network involving VA information must be reviewed and approved by VA prior to implementation.

b. Adequate security controls for collecting, processing, transmitting, and storing of Personally Identifiable Information (PII), as determined by the VA Privacy Service, must be in place, tested, and approved by VA prior to hosting, operation, maintenance, or use of the information system, or systems by or on behalf of VA. These security controls are to be assessed and stated within the PIA and if these controls are determined not to be in place, or inadequate, a Plan of Action and Milestones (POA&M) must be submitted and approved prior to the collection of PII.

c. Outsourcing (contractor facility, contractor equipment or contractor staff) of systems or network operations, telecommunications services, or other managed services requires certification and accreditation (authorization) (C&A) of the contractor's systems in accordance with VA Handbook 6500.3, *Certification and Accreditation* and/or the VA OCS Certification Program Office. Government-owned (government facility or government equipment) contractor-operated systems, third party or business partner networks require memorandums of understanding and interconnection agreements (MOU-ISA) which detail what data types are shared, who has access, and the appropriate level of security controls for all systems connected to VA networks.

d. The contractor/subcontractor's system must adhere to all FISMA, FIPS, and NIST standards related to the annual FISMA security controls assessment and review and update the PIA. Any deficiencies noted during this assessment must be provided to the VA contracting officer and the ISO for entry into VA's POA&M management process. The contractor/subcontractor must use VA's POA&M process to document planned remedial actions to address any deficiencies in information security policies, procedures, and practices, and the completion of those activities. Security deficiencies must be corrected within the timeframes approved by the government. Contractor/subcontractor procedures are subject to periodic, unannounced assessments by VA officials, including the VA Office of Inspector General. The physical security aspects associated with contractor/subcontractor activities must also be subject to such assessments. If major changes to the system occur that may affect the privacy or security of the data or the system, the C&A of the system may need to be reviewed, retested and re-authorized per VA Handbook 6500.3. This may require reviewing and updating all of the documentation (PIA, System Security Plan, Contingency Plan). The Certification Program Office can provide guidance on whether a new C&A would be necessary.

e. The contractor/subcontractor must conduct an annual self assessment on all systems and outsourced services as required. Both hard copy and electronic copies of the assessment must be provided to the COR. The government reserves the right to conduct such an assessment using government personnel or another contractor/subcontractor. The contractor/subcontractor must take appropriate and timely action (this can be specified in the contract) to correct or mitigate any weaknesses discovered during such testing, generally at no additional cost.

f. VA prohibits the installation and use of personally-owned or contractor/subcontractor owned equipment or software on VA's network. If non-VA owned equipment must be used to fulfill the requirements of a contract, it must be stated in the service agreement, SOW or contract. All of the security controls required for government furnished equipment (GFE) must be utilized in approved other equipment (OE) and must

be funded by the owner of the equipment. All remote systems must be equipped with, and use, a VA-approved antivirus (AV) software and a personal (host-based or enclave based) firewall that is configured with a VA approved configuration. Software must be kept current, including all critical updates and patches. Owners of approved OE are responsible for providing and maintaining the anti-viral software and the firewall on the non-VA owned OE.

g. All electronic storage media used on non-VA leased or non-VA owned IT equipment that is used to store, process, or access VA information must be handled in adherence with VA Handbook 6500.1, *Electronic Media Sanitization* upon: (i) completion or termination of the contract or (ii) disposal or return of the IT equipment by the contractor/subcontractor or any person acting on behalf of the contractor/subcontractor, whichever is earlier. Media (hard drives, optical disks, CDs, back-up tapes, etc.) used by the contractors/subcontractors that contain VA information must be returned to the VA for sanitization or destruction or the contractor/subcontractor must self-certify that the media has been disposed of per 6500.1 requirements. This must be completed within 30 days of termination of the contract.

h. Bio-Medical devices and other equipment or systems containing media (hard drives, optical disks, etc.) with VA sensitive information must not be returned to the vendor at the end of lease, for trade-in, or other purposes. The options are:

(1) Vendor must accept the system without the drive;

(2) VA's initial medical device purchase includes a spare drive which must be installed in place of the original drive at time of turn-in; or

(3) VA must reimburse the company for media at a reasonable open market replacement cost at time of purchase.

(4) Due to the highly specialized and sometimes proprietary hardware and software associated with medical equipment/systems, if it is not possible for the VA to retain the hard drive, then;

(a) The equipment vendor must have an existing BAA if the device being traded in has sensitive information stored on it and hard drive(s) from the system are being returned physically intact; and

(b) Any fixed hard drive on the device must be non-destructively sanitized to the greatest extent possible without negatively impacting system operation. Selective clearing down to patient data folder level is recommended using VA approved and validated overwriting technologies/methods/tools. Applicable media sanitization specifications need to be preapproved and described in the purchase order or contract.

(c) A statement needs to be signed by the Director (System Owner) that states that the drive could not be removed and that (a) and (b) controls above are in place and completed. The ISO needs to maintain the documentation.

**6. SECURITY INCIDENT INVESTIGATION**

a. The term “security incident” means an event that has, or could have, resulted in unauthorized access to, loss or damage to VA assets, or sensitive information, or an action that breaches VA security procedures. The contractor/subcontractor shall immediately notify the COR and simultaneously, the designated ISO and Privacy Officer for the contract of any known or suspected security/privacy incidents, or any unauthorized disclosure of sensitive information, including that contained in system(s) to which the contractor/subcontractor has access.

b. To the extent known by the contractor/subcontractor, the contractor/subcontractor’s notice to VA shall identify the information involved, the circumstances surrounding the incident (including to whom, how, when, and where the VA information or assets were placed at risk or compromised), and any other information that the contractor/subcontractor considers relevant.

c. With respect to unsecured protected health information, the business associate is deemed to have discovered a data breach when the business associate knew or should have known of a breach of such information. Upon discovery, the business associate must notify the covered entity of the breach. Notifications need to be made in accordance with the executed business associate agreement.

d. In instances of theft or break-in or other criminal activity, the contractor/subcontractor must concurrently report the incident to the appropriate law enforcement entity (or entities) of jurisdiction, including the VA OIG and Security and Law Enforcement. The contractor, its employees, and its subcontractors and their employees shall cooperate with VA and any law enforcement authority responsible for the investigation and prosecution of any possible criminal law violation(s) associated with any incident. The contractor/subcontractor shall cooperate with VA in any civil litigation to recover VA information, obtain monetary or other compensation from a third party for damages arising from any incident, or obtain injunctive relief against any third party arising from, or related to, the incident.

**7. LIQUIDATED DAMAGES FOR DATA BREACH**

a. Consistent with the requirements of 38 U.S.C. §5725, a contract may require access to sensitive personal information. If so, the contractor is liable to VA for liquidated damages in the event of a data breach or privacy incident involving any SPI the contractor/subcontractor processes or maintains under this contract.

b. The contractor/subcontractor shall provide notice to VA of a “security incident” as set forth in the Security Incident Investigation section above. Upon such notification, VA must secure from a non-Department entity or the VA Office of Inspector General an independent risk analysis of the data breach to determine the level of risk associated with the data breach for the potential misuse of any sensitive personal information involved in the data breach. The term ‘data breach’ means the loss, theft, or other unauthorized access, or any access other than that incidental to the scope of employment, to data containing sensitive personal information, in electronic or printed form, that results in the potential compromise of the confidentiality or integrity of the data. Contractor shall fully cooperate with the entity performing the risk analysis. Failure to cooperate may be deemed a material breach and grounds for contract termination.

c. Each risk analysis shall address all relevant information concerning the data breach, including the following:

(1) Nature of the event (loss, theft, unauthorized access);

(2) Description of the event, including:

(a) date of occurrence;

(b) data elements involved, including any PII, such as full name, social security number, date of birth, home address, account number, disability code;

(3) Number of individuals affected or potentially affected;

(4) Names of individuals or groups affected or potentially affected;

(5) Ease of logical data access to the lost, stolen or improperly accessed data in light of the degree of protection for the data, e.g., unencrypted, plain text;

(6) Amount of time the data has been out of VA control;

(7) The likelihood that the sensitive personal information will or has been compromised (made accessible to and usable by unauthorized persons);

(8) Known misuses of data containing sensitive personal information, if any;

(9) Assessment of the potential harm to the affected individuals;

(10) Data breach analysis as outlined in 6500.2 Handbook, *Management of Security and Privacy Incidents*, as appropriate; and

(11) Whether credit protection services may assist record subjects in avoiding or mitigating the results of identity theft based on the sensitive personal information that may have been compromised.

d. Based on the determinations of the independent risk analysis, the contractor shall be responsible for paying to the VA liquidated damages in the amount of $37.50 per affected individual to cover the cost of providing credit protection services to affected individuals consisting of the following:

(1) Notification;

(2) One year of credit monitoring services consisting of automatic daily monitoring of at least 3 relevant credit bureau reports;

(3) Data breach analysis;

(4) Fraud resolution services, including writing dispute letters, initiating fraud alerts and credit freezes, to assist affected individuals to bring matters to resolution;

(5) One year of identity theft insurance with $20,000.00 coverage at $0 deductible; and

(6) Necessary legal expenses the subjects may incur to repair falsified or damaged credit records, histories, or financial affairs.

**8. SECURITY CONTROLS COMPLIANCE TESTING**

On a periodic basis, VA, including the Office of Inspector General, reserves the right to evaluate any or all of the security controls and privacy practices implemented by the contractor under the clauses contained within the contract. With 10 working-day's notice, at the request of the government, the contractor must fully cooperate and assist in a government-sponsored security controls assessment at each location wherein VA information is processed or stored, or information systems are developed, operated, maintained, or used on behalf of VA, including those initiated by the Office of Inspector General. The government may conduct a security control assessment on shorter notice (to include unannounced assessments) as determined by VA in the event of a security incident or at any other time.

**9. TRAINING**

a. All contractor employees and subcontractor employees requiring access to VA information and VA information systems shall complete the following before being granted access to VA information and its systems:

(1) Sign and acknowledge (either manually or electronically) understanding of and responsibilities for compliance with the *Contractor Rules of Behavior*, Appendix E relating to access to VA information and information systems;

(2) Successfully complete the *VA Cyber Security Awareness and Rules of Behavior* training and annually complete required security training;

(3) Successfully complete the appropriate VA privacy training and annually complete required privacy training; and

(4) Successfully complete any additional cyber security or privacy training, as required for VA personnel with equivalent information system access *[to be defined by the VA program official and provided to the contracting officer for inclusion in the solicitation document – e.g., any role-based information security training required in accordance with NIST Special Publication 800-16, Information Technology Security Training Requirements.]*

b. The contractor shall provide to the contracting officer and/or the COR a copy of the training certificates and certification of signing the Contractor Rules of Behavior for each applicable employee within 1 week of the initiation of the contract and annually thereafter, as required.

c. Failure to complete the mandatory annual training and sign the Rules of Behavior annually, within the timeframe required, is grounds for suspension or termination of all physical or electronic access privileges and removal from work on the contract until such time as the training and documents are complete.

**CONTRACTOR RULES OF BEHAVIOR**

This User Agreement contains rights and authorizations regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with the Department of Veterans Affairs (VA). This User Agreement covers my access to all VA data whether electronic or hard copy ("Data"), VA information systems and resources ("Systems"), and VA sites ("Sites"). This User Agreement incorporates Rules of Behavior for using VA, and other information systems and resources under the contract.

**1. GENERAL TERMS AND CONDITIONS FOR ALL ACTIONS AND ACTIVITIES UNDER THE CONTRACT:**

a. I understand and agree that I have no reasonable expectation of privacy in accessing or using any VA, or other Federal Government information systems.

b. I consent to reviews and actions by the Office of Information & Technology (OI&T) staff designated and authorized by the VA Chief Information Officer (CIO) and to the VA OIG regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with the VA. These actions may include monitoring, recording, copying, inspecting, restricting access, blocking, tracking, and disclosing to all authorized OI&T, VA, and law enforcement personnel as directed by the VA CIO without my prior consent or notification.

c. I consent to reviews and actions by authorized VA systems administrators and Information Security Officers solely for protection of the VA infrastructure, including, but not limited to monitoring, recording, auditing, inspecting, investigating, restricting access, blocking, tracking, disclosing to authorized personnel, or any other authorized actions by all authorized OI&T, VA, and law enforcement personnel.

d. I understand and accept that unauthorized attempts or acts to access, upload, change, or delete information on Federal Government systems; modify Federal government systems; deny access to Federal government systems; accrue resources for unauthorized use on Federal government systems; or otherwise misuse Federal government systems or resources are prohibited.

e. I understand that such unauthorized attempts or acts are subject to action that may result in criminal, civil, or administrative penalties. This includes penalties for violations of Federal laws including, but not limited to, 18 U.S.C. §1030 (fraud and related activity in connection with computers) and 18 U.S.C. §2701 (unlawful access to stored communications).

f. I agree that OI&T staff, in the course of obtaining access to information or systems on my behalf for performance under the contract, may provide information about me including, but not limited to, appropriate unique personal identifiers such as date of birth and social security number to other system administrators, Information Security Officers (ISOs), or other authorized staff without further notifying me or obtaining additional written or verbal permission from me.

g. I understand I must comply with VA's security and data privacy directives and handbooks. I understand that copies of those directives and handbooks can be obtained from the Contracting Officer's Technical Representative (COR). If the contractor believes the policies and guidance provided by the COR is a material unilateral change to the contract, the contractor must elevate such concerns to the Contracting Officer for resolution.

h. I will report suspected or identified information security/privacy incidents to the COR and to the local ISO or Privacy Officer as appropriate.

**2. GENERAL RULES OF BEHAVIOR**

a. Rules of Behavior are part of a comprehensive program to provide complete information security. These rules establish standards of behavior in recognition of the fact that knowledgeable users are the foundation of a successful security program. Users must understand that taking personal responsibility for the security of their computer and the information it contains is an essential part of their job.

b. **The following rules apply to all VA contractors**. I agree to:

(1) Follow established procedures for requesting, accessing, and closing user accounts and access. I will not request or obtain access beyond what is normally granted to users or by what is outlined in the contract.

(2) Use only systems, software, databases, and data which I am authorized to use, including any copyright restrictions.

(3) I will not use other equipment (OE) (non-contractor owned) for the storage, transfer, or processing of VA sensitive information without a VA CIO approved waiver, unless it has been reviewed and approved by local management and is included in the language of the contract. If authorized to use OE IT equipment, I must ensure that the system meets all applicable 6500 Handbook requirements for OE.

(4) Not use my position of trust and access rights to exploit system controls or access information for any reason other than in the performance of the contract.

(5) Not attempt to override or disable security, technical, or management controls unless expressly permitted to do so as an explicit requirement under the contract or at the direction of the COR or ISO. If I am allowed or required to have a local administrator account on a government-owned computer, that local administrative account does not confer me unrestricted access or use, nor the authority to bypass security or other controls except as expressly permitted by the VA CIO or CIO's designee.

(6) Contractors' use of systems, information, or sites is strictly limited to fulfill the terms of the contract. I understand no personal use is authorized. I will only use other Federal government information systems as expressly authorized by the terms of those systems. I accept that the restrictions under ethics regulations and criminal law still apply.

(7) Grant access to systems and information only to those who have an official need to know.

(8) Protect passwords from access by other individuals.

(9) Create and change passwords in accordance with VA Handbook 6500 on systems and any devices protecting VA information as well as the rules of behavior and security settings for the particular system in question.

(10) Protect information and systems from unauthorized disclosure, use, modification, or destruction. I will only use encryption that is FIPS 140-2 validated to safeguard VA sensitive information, both safeguarding VA sensitive information in storage and in transit regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with the VA.

(11) Follow VA Handbook 6500.1, *Electronic Media Sanitization* to protect VA information. I will contact the COR for policies and guidance on complying with this requirement and will follow the COR's orders.

(12) Ensure that the COR has previously approved VA information for public dissemination, including e-mail communications outside of the VA as appropriate. I will not make any unauthorized disclosure of any VA sensitive information through the use of any means of communication including but not limited to e-mail, instant messaging, online chat, and web bulletin boards or logs.

(13) Not host, set up, administer, or run an Internet server related to my access to and use of any information assets or resources associated with my performance of services under the contract terms with the VA unless explicitly authorized under the contract or in writing by the COR.

(14) Protect government property from theft, destruction, or misuse. I will follow VA directives and handbooks on handling Federal government IT equipment, information, and systems. I will not take VA sensitive information from the workplace without authorization from the COR.

(15) Only use anti-virus software, antispyware, and firewall/intrusion detection software authorized by VA. I will contact the COR for policies and guidance on complying with this requirement and will follow the COR's orders regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with VA.

(16) Not disable or degrade the standard anti-virus software, antispyware, and/or firewall/intrusion detection software on the computer I use to access and use information assets or resources associated with my performance of services under the contract terms with VA. I will report anti-virus, antispyware, firewall or intrusion detection software errors, or significant alert messages to the COR.

(17) Understand that restoration of service of any VA system is a concern of all users of the system.

(18) Complete required information security and privacy training, and complete required training for the particular systems to which I require access.

**3. ADDITIONAL CONDITIONS FOR USE OF NON- VA INFORMATION TECHNOLOGY RESOURCES**

a. When required to complete work under the contract, I will directly connect to the VA network whenever possible. If a direct connection to the VA network is not possible, then I will use VA approved remote access software and services.

b. Remote access to non-public VA information technology resources is prohibited from publicly-available IT computers, such as remotely connecting to the internal VA network from computers in a public library.

c. I will not have both a VA network line and any kind of non-VA network line including a wireless network card, modem with phone line, or other network device physically connected to my computer at the same time, unless the dual connection is explicitly authorized by the COR.

d. I understand that I may not obviate or evade my responsibility to adhere to VA security requirements by subcontracting any work under any given contract or agreement with VA, and that any subcontractor(s) I engage shall likewise be bound by the same security requirements and penalties for violating the same.

**4. STATEMENT ON LITIGATION**

This User Agreement does not and should not be relied upon to create any other right or benefit, substantive or procedural, enforceable by law, by a party to litigation with the United States Government.

**5. ACKNOWLEDGEMENT AND ACCEPTANCE**

I acknowledge receipt of this User Agreement. I understand and accept all terms and conditions of this User Agreement, and I will comply with the terms and conditions of this agreement and any additional VA warning banners, directives, handbooks, notices, or directions regarding access to or use of information systems or information. The terms and conditions of this document do not supersede the terms and conditions of the signatory’s employer and VA.

Print or type your full name

Signature

Last 4 digits of SSN Date

Office Phone Position Title

Contractor’s Company

Name

**Please complete and return the original signed document to the COR within the timeframe stated in the terms of the contract.**

**Description of Services**

**Base Period September 2017 through August 2018**

Average [***] over all genomes in a single batch including all high quality reads

[***] SAMPLES = [***]

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Average [***] over all genomes in a single batch including all high quality reads

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**Option Year 1 Period September 2018 through August 2019**
Average [***] over all genomes in a single batch including all high quality reads

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Average [***] over all genomes in a single batch including all high quality reads

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**Option Year 2 Period September 2019 through August 2020**
Average [***] over all genomes in a single batch including all high quality reads

[***] SAMPLES = [***]

[***] SAMPLES = [***]
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Average [***] over all genomes in a single batch including all high quality reads

[***] SAMPLES = [***]
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**Option Year 3 Period September 2020 through August 2021**
Average [***] over all genomes in a single batch including all high quality reads

[***] SAMPLES = [***]

[***] SAMPLES = [***]
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Average [***] over all genomes in a single batch including all high quality reads

[***] SAMPLES = [***]

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**SECTION C - CONTRACT CLAUSES**

**C.1 52.212-4 CONTRACT TERMS AND CONDITIONS—COMMERCIAL ITEMS (JAN 2017)**

(a) *Inspection/Acceptance.* The Contractor shall only tender for acceptance those items that conform to the requirements of this contract. The Government reserves the right to inspect or test any supplies or services that have been tendered for acceptance. The Government may require repair or replacement of nonconforming supplies or reperformance of nonconforming services at no increase in contract price. If repair/replacement or reperformance will not correct the defects or is not possible, the Government may seek an equitable price reduction or adequate consideration for acceptance of nonconforming supplies or services. The Government must exercise its post-acceptance rights—

(1) Within a reasonable time after the defect was discovered or should have been discovered; and

(2) Before any substantial change occurs in the condition of the item, unless the change is due to the defect in the item.

(b) *Assignment*. The Contractor or its assignee may assign its rights to receive payment due as a result of performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency in accordance with the Assignment of Claims Act (31 U.S.C. 3727). However, when a third party makes payment (e.g., use of the Governmentwide commercial purchase card), the Contractor may not assign its rights to receive payment under this contract.

(c) *Changes*. Changes in the terms and conditions of this contract may be made only by written agreement of the parties.

(d) *Disputes*. This contract is subject to 41 U.S.C. chapter 71, Contract Disputes. Failure of the parties to this contract to reach agreement on any request for equitable adjustment, claim, appeal or action arising under or relating to this contract shall be a dispute to be resolved in accordance with the clause at FAR 52.233-1, Disputes, which is incorporated herein by reference. The Contractor shall proceed diligently with performance of this contract, pending final resolution of any dispute arising under the contract.

(e) *Definitions*. The clause at FAR 52.202-1, Definitions, is incorporated herein by reference.

(f) *Excusable delays*. The Contractor shall be liable for default unless nonperformance is caused by an occurrence beyond the reasonable control of the Contractor and without its fault or negligence such as, acts of God or the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, unusually severe weather, and delays of common carriers. The Contractor shall notify the Contracting Officer in writing as soon as it is reasonably possible after the commencement of any excusable delay, setting forth the full particulars in connection therewith, shall remedy such occurrence with all reasonable dispatch, and shall promptly give written notice to the Contracting Officer of the cessation of such occurrence.

(g) *Invoice*.

(1) The Contractor shall submit an original invoice and three copies (or electronic invoice, if authorized) to the address designated in the contract to receive invoices. An invoice must include—

(i) Name and address of the Contractor;

(ii) Invoice date and number;

(iii) Contract number, line item number and, if applicable, the order number;

(iv) Description, quantity, unit of measure, unit price and extended price of the items delivered;

(v) Shipping number and date of shipment, including the bill of lading number and weight of shipment if shipped on Government bill of lading;

(vi) Terms of any discount for prompt payment offered;

(vii) Name and address of official to whom payment is to be sent;

(viii) Name, title, and phone number of person to notify in event of defective invoice; and

(ix) Taxpayer Identification Number (TIN). The Contractor shall include its TIN on the invoice only if required elsewhere in this contract.

(x) Electronic funds transfer (EFT) banking information.

(A) The Contractor shall include EFT banking information on the invoice only if required elsewhere in this contract.

(B) If EFT banking information is not required to be on the invoice, in order for the invoice to be a proper invoice, the Contractor shall have submitted correct EFT banking information in accordance with the applicable solicitation provision, contract clause (e.g., 52.232-33, Payment by Electronic Funds Transfer—System for Award Management, or 52.232-34, Payment by Electronic Funds Transfer—Other Than System for Award Management), or applicable agency procedures.

(C) EFT banking information is not required if the Government waived the requirement to pay by EFT.

(2) Invoices will be handled in accordance with the Prompt Payment Act (31 U.S.C. 3903) and Office of Management and Budget (OMB) prompt payment regulations at 5 CFR part 1315.

(h) *Patent indemnity*. The Contractor shall indemnify the Government and its officers, employees and agents against liability, including costs, for actual or alleged direct or contributory infringement of, or inducement to infringe, any United States or foreign patent, trademark or copyright, arising out of the performance of this contract, provided the Contractor is reasonably notified of such claims and proceedings.

(i) Payment.—

(1) *Items accepted*. Payment shall be made for items accepted by the Government that have been delivered to the delivery destinations set forth in this contract.

(2) *Prompt payment*. The Government will make payment in accordance with the Prompt Payment Act (31 U.S.C. 3903) and prompt payment regulations at 5 CFR part 1315.

(3) *Electronic Funds Transfer (EFT)*. If the Government makes payment by EFT, see 52.212-5(b) for the appropriate EFT clause.

(4) *Discount*. In connection with any discount offered for early payment, time shall be computed from the date of the invoice. For the purpose of computing the discount earned, payment shall be considered to have been made on the date which appears on the payment check or the specified payment date if an electronic funds transfer payment is made.

(5) *Overpayments*. If the Contractor becomes aware of a duplicate contract financing or invoice payment or that the Government has otherwise overpaid on a contract financing or invoice payment, the Contractor shall—

(i) Remit the overpayment amount to the payment office cited in the contract along with a description of the overpayment including the—

(A) Circumstances of the overpayment (e.g., duplicate payment, erroneous payment, liquidation errors, date(s) of overpayment);

(B) Affected contract number and delivery order number, if applicable;

(C) Affected line item or subline item, if applicable; and

(D) Contractor point of contact.

(ii) Provide a copy of the remittance and supporting documentation to the Contracting Officer.

(6) *Interest.*

(i) All amounts that become payable by the Contractor to the Government under this contract shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in 41 U.S.C. 7109, which is applicable to the period in which the amount becomes due, as provided in (i)(6)(v) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid.

(ii) The Government may issue a demand for payment to the Contractor upon finding a debt is due under the contract.

(iii) *Final decisions*. The Contracting Officer will issue a final decision as required by 33.211 if—

(A) The Contracting Officer and the Contractor are unable to reach agreement on the existence or amount of a debt within 30 days;

(B) The Contractor fails to liquidate a debt previously demanded by the Contracting Officer within the timeline specified in the demand for payment unless the amounts were not repaid because the Contractor has requested an installment payment agreement; or

(C) The Contractor requests a deferment of collection on a debt previously demanded by the Contracting Officer (see 32.607-2).

(iv) If a demand for payment was previously issued for the debt, the demand for payment included in the final decision shall identify the same due date as the original demand for payment.

(v) Amounts shall be due at the earliest of the following dates:

(A) The date fixed under this contract.

(B) The date of the first written demand for payment, including any demand for payment resulting from a default termination.

(vi) The interest charge shall be computed for the actual number of calendar days involved beginning on the due date and ending on—

(A) The date on which the designated office receives payment from the Contractor;

(B) The date of issuance of a Government check to the Contractor from which an amount otherwise payable has been withheld as a credit against the contract debt; or

(C) The date on which an amount withheld and applied to the contract debt would otherwise have become payable to the Contractor.

(vii) The interest charge made under this clause may be reduced under the procedures prescribed in 32.608-2 of the Federal Acquisition Regulation in effect on the date of this contract.

(j) *Risk of loss*. Unless the contract specifically provides otherwise, risk of loss or damage to the supplies provided under this contract shall remain with the Contractor until, and shall pass to the Government upon:

(1) Delivery of the supplies to a carrier, if transportation is f.o.b. origin; or

(2) Delivery of the supplies to the Government at the destination specified in the contract, if transportation is f.o.b. destination.

(k) *Taxes*. The contract price includes all applicable Federal, State, and local taxes and duties.

(l) *Termination for the Government's convenience*. The Government reserves the right to terminate this contract, or any part hereof, for its sole convenience. In the event of such termination, the Contractor shall immediately stop all work hereunder and shall immediately cause any and all of its suppliers and subcontractors to cease work. Subject to the terms of this contract, the Contractor shall be paid a percentage of the contract price reflecting the percentage of the work performed prior to the notice of termination, plus reasonable charges the Contractor can demonstrate to the satisfaction of the Government using its standard record keeping system, have resulted from the termination. The Contractor shall not be required to comply with the cost accounting standards or contract cost principles for this purpose. This paragraph does not give the Government any right to audit the Contractor's records. The Contractor shall not be paid for any work performed or costs incurred which reasonably could have been avoided.

(m) *Termination for cause*. The Government may terminate this contract, or any part hereof, for cause in the event of any default by the Contractor, or if the Contractor fails to comply with any contract terms and conditions, or fails to provide the Government, upon request, with adequate assurances of future performance. In the event of termination for cause, the Government shall not be liable to the Contractor for any amount for supplies or services not accepted, and the Contractor shall be liable to the Government for any and all rights and remedies provided by law. If it is determined that the Government improperly terminated this contract for default, such termination shall be deemed a termination for convenience.

(n) *Title*. Unless specified elsewhere in this contract, title to items furnished under this contract shall pass to the Government upon acceptance, regardless of when or where the Government takes physical possession.

(o) *Warranty*. The Contractor warrants and implies that the items delivered hereunder are merchantable and fit for use for the particular purpose described in this contract.

(p) *Limitation of liability*. Except as otherwise provided by an express warranty, the Contractor will not be liable to the Government for consequential damages resulting from any defect or deficiencies in accepted items.

(q) *Other compliances*. The Contractor shall comply with all applicable Federal, State and local laws, executive orders, rules and regulations applicable to its performance under this contract.

(r) *Compliance with laws unique to Government contracts*. The Contractor agrees to comply with 31 U.S.C. 1352 relating to limitations on the use of appropriated funds to influence certain Federal contracts; 18 U.S.C. 431 relating to officials not to benefit; 40 U.S.C. chapter 37, Contract Work Hours and Safety Standards; 41 U.S.C. chapter 87, Kickbacks; 41 U.S.C. 4712 and 10 U.S.C. 2409 relating to whistleblower protections; 49 U.S.C. 40118, Fly American; and 41 U.S.C. chapter 21 relating to procurement integrity.

(s) *Order of precedence*. Any inconsistencies in this solicitation or contract shall be resolved by giving precedence in the following order:

(1) The schedule of supplies/services.

(2) The Assignments, Disputes, Payments, Invoice, Other Compliances, Compliance with Laws Unique to Government Contracts, and Unauthorized Obligations paragraphs of this clause;

(3) The clause at 52.212-5.

(4) Addenda to this solicitation or contract, including any license agreements for computer software.

(5) Solicitation provisions if this is a solicitation.

(6) Other paragraphs of this clause.

(7) The Standard Form 1449.

(8) Other documents, exhibits, and attachments

(9) The specification.

(t) *System for Award Management (SAM)*.

(1) Unless exempted by an addendum to this contract, the Contractor is responsible during performance and through final payment of any contract for the accuracy and completeness of the data within the SAM database, and for any liability resulting from the Government’s reliance on inaccurate or incomplete data. To remain registered in the SAM database after the initial registration, the Contractor is required to review and update on an annual basis from the date of initial registration or subsequent updates its information in the SAM database to ensure it is current, accurate and complete. Updating information in the SAM does not alter the terms and conditions of this contract and is not a substitute for a properly executed contractual document.

(2)(i) If a Contractor has legally changed its business name, “doing business as” name, or division name (whichever is shown on the contract), or has transferred the assets used in performing the contract, but has not completed the necessary requirements regarding novation and change-of-name agreements in FAR subpart 42.12, the Contractor shall provide the responsible Contracting Officer a minimum of one business day’s written notification of its intention to (A) change the name in the SAM database; (B) comply with the requirements of subpart 42.12; and (C) agree in writing to the timeline and procedures specified by the responsible Contracting Officer. The Contractor must provide with the notification sufficient documentation to support the legally changed name.

(ii) If the Contractor fails to comply with the requirements of paragraph (t)(2)(i) of this clause, or fails to perform the agreement at paragraph (t)(2)(i)(C) of this clause, and, in the absence of a properly executed novation or change-of-name agreement, the SAM information that shows the Contractor to be other than the Contractor indicated in the contract will be considered to be incorrect information within the meaning of the “Suspension of Payment” paragraph of the electronic funds transfer (EFT) clause of this contract.

(3) The Contractor shall not change the name or address for EFT payments or manual payments, as appropriate, in the SAM record to reflect an assignee for the purpose of assignment of claims (see Subpart 32.8, Assignment of Claims). Assignees shall be separately registered in the SAM database. Information provided to the Contractor’s SAM record that indicates payments, including those made by EFT, to an ultimate recipient other than that Contractor will be considered to be incorrect information within the meaning of the “Suspension of payment” paragraph of the EFT clause of this contract.

(4) Offerors and Contractors may obtain information on registration and annual confirmation requirements via SAM accessed through https://www.acquisition.gov.

(u) *Unauthorized Obligations*.

(1) Except as stated in paragraph (u)(2) of this clause, when any supply or service acquired under this contract is subject to any End User License Agreement (EULA), Terms of Service (TOS), or similar legal instrument or agreement, that includes any clause requiring the Government to indemnify the Contractor or any person or entity for damages, costs, fees, or any other loss or liability that would create an Anti-Deficiency Act violation (31 U.S.C. 1341), the following shall govern:

(i) Any such clause is unenforceable against the Government.

(ii) Neither the Government nor any Government authorized end user shall be deemed to have agreed to such clause by virtue of it appearing in the EULA, TOS, or similar legal instrument or agreement. If the EULA, TOS, or similar legal instrument or agreement is invoked through an “I agree” click box or other comparable mechanism (e.g., “click-wrap” or “browse-wrap” agreements), execution does not bind the Government or any Government authorized end user to such clause.

(iii) Any such clause is deemed to be stricken from the EULA, TOS, or similar legal instrument or agreement.

(2) Paragraph (u)(1) of this clause does not apply to indemnification by the Government that is expressly authorized by statute and specifically authorized under applicable agency regulations and procedures.

(v) *Incorporation by reference*. The Contractor's representations and certifications, including those completed electronically via the System for Award Management (SAM), are incorporated by reference into the contract.

(End of Clause)

ADDENDUM to FAR 52.212-4 CONTRACT TERMS AND CONDITIONS—COMMERCIAL ITEMS

Clauses that are incorporated by reference (by Citation Number, Title, and Date), have the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

The following clauses are incorporated into 52.212-4 as an addendum to this contract:

**C.2 52.204-10 REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS (OCT 2016)**

(a) *Definitions*. As used in this clause:

"Executive" means officers, managing partners, or any other employees in management positions.

"First-tier subcontract" means a subcontract awarded directly by the Contractor for the purpose of acquiring supplies or services (including construction) for performance of a prime contract. It does not include the Contractor's supplier agreements with vendors, such as long-term arrangements for materials or supplies that benefit multiple contracts and/or the costs of which are normally applied to a Contractor's general and administrative expenses or indirect costs.

"Month of award" means the month in which a contract is signed by the Contracting Officer or the month in which a first-tier subcontract is signed by the Contractor.

"Total compensation" means the cash and noncash dollar value earned by the executive during the Contractor's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

(1) *Salary and bonus*.

(2) *Awards of stock, stock options, and stock appreciation rights*. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Financial Accounting Standards Board's Accounting Standards Codification (FASB ASC) 718, Compensation-Stock Compensation.

(3) *Earnings for services under non-equity incentive plans*. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.

(4) *Change in pension value*. This is the change in present value of defined benefit and actuarial pension plans.

(5) *Above-market earnings on deferred compensation which is not tax-qualified.*

(6) Other compensation, if the aggregate value of all such other compensation (e.g., severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds $10,000.

(b) Section 2(d)(2) of the Federal Funding Accountability and Transparency Act of 2006 (Pub. L. 109– 282), as amended by section 6202 of the Government Funding Transparency Act of 2008 (Pub. L. 110– 252), requires the Contractor to report information on subcontract awards. The law requires all reported information be made public, therefore, the Contractor is responsible for notifying its subcontractors that the required information will be made public.

(c) Nothing in this clause requires the disclosure of classified information.

(d)(1) *Executive compensation of the prime contractor*. As a part of its annual registration requirement in the System for Award Management (SAM) database (FAR provision 52.204–7), the Contractor shall report the names and total compensation of each of the five most highly compensated executives for its preceding completed fiscal year, if—

(i) In the Contractor's preceding fiscal year, the Contractor received—

(A) 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and subgrants), cooperative agreements, and other forms of Federal financial assistance; and

(B) $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and subgrants), cooperative agreements, and other forms of Federal financial assistance; and

(ii) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at *http://www.sec.gov/answers/execomp.htm*.).

(2) *First-tier subcontract information*. Unless otherwise directed by the contracting officer, or as provided in paragraph (g) of this clause, by the end of the month following the month of award of a first-tier subcontract with a value of $30,000 or more, the Contractor shall report the following information at *http://www.fsrs.gov* for that first-tier subcontract. (The Contractor shall follow the instructions at *http://www.fsrs.gov* to report the data.)

(i) Unique entity identifier for the subcontractor receiving the award and for the subcontractor's parent company, if the subcontractor has a parent company.

(ii) Name of the subcontractor.

(iii) Amount of the subcontract award.

(iv) Date of the subcontract award.

(v) A description of the products or services (including construction) being provided under the subcontract, including the overall purpose and expected outcomes or results of the subcontract.

(vi) Subcontract number (the subcontract number assigned by the Contractor).

(vii) Subcontractor's physical address including street address, city, state, and country. Also include the nine-digit zip code and congressional district.

(viii) Subcontractor's primary performance location including street address, city, state, and country. Also include the nine-digit zip code and congressional district.

(ix) The prime contract number, and order number if applicable.

(x) Awarding agency name and code.

(xi) Funding agency name and code.

(xii) Government contracting office code.

(xiii) Treasury account symbol (TAS) as reported in FPDS.

(xiv) The applicable North American Industry Classification System code (NAICS).

(3) *Executive compensation of the first-tier subcontractor*. Unless otherwise directed by the Contracting Officer, by the end of the month following the month of award of a first-tier subcontract with a value of $30,000 or more, and annually thereafter (calculated from the prime contract award date), the Contractor shall report the names and total compensation of each of the five most highly compensated executives for that first-tier subcontractor for the first-tier subcontractor's preceding completed fiscal year at *http://www.fsrs.gov*, if—

(i) In the subcontractor's preceding fiscal year, the subcontractor received—

(A) 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and subgrants), cooperative agreements, and other forms of Federal financial assistance; and

(B) $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and subgrants), cooperative agreements, and other forms of Federal financial assistance; and

(ii) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at *http://www.sec.gov/answers/execomp.htm*.)

(e) The Contractor shall not split or break down first-tier subcontract awards to a value less than $30,000 to avoid the reporting requirements in paragraph (d) of this clause.

(f) The Contractor is required to report information on a first-tier subcontract covered by paragraph (d) when the subcontract is awarded. Continued reporting on the same subcontract is not required unless one of the reported data elements changes during the performance of the subcontract. The Contractor is not required to make further reports after the first-tier subcontract expires.

(g)(1) If the Contractor in the previous tax year had gross income, from all sources, under $300,000, the Contractor is exempt from the requirement to report subcontractor awards.

(2) If a subcontractor in the previous tax year had gross income from all sources under $300,000, the Contractor does not need to report awards for that subcontractor.

(h) The FSRS database at *http://www.fsrs.gov* will be prepopulated with some information from SAM and FPDS databases. If FPDS information is incorrect, the contractor should notify the contracting officer. If the SAM database information is incorrect, the contractor is responsible for correcting this information.

(End of Clause)

**C.3 52.203-99 PROHIBITION ON CONTRACTING WITH ENTITIES THAT REQUIRE CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS (DEVIATION) (FEB 2015)**

(a) The Contractor shall not require employees or contractors seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or subcontractors from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(b) The contractor shall notify employees that the prohibitions and restrictions of any internal confidentiality agreements covered by this clause are no longer in effect.

(c) The prohibition in paragraph (a) of this clause does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(d)(1) In accordance with section 743 of Division E, Title VII, of the Consolidated and Further Continuing Resolution Appropriations Act, 2015 (Pub. L. 113-235), use of funds appropriated (or otherwise made available) under that or any other Act may be prohibited, if the Government determines that the Contractor is not in compliance with the provisions of this clause.

(2) The Government may seek any available remedies in the event the contractor fails to comply with the provisions of this clause.

(End of Clause)

**C.4 52.216-18 ORDERING (OCT 1995)**

(a) Any supplies and services to be furnished under this contract shall be ordered by issuance of delivery orders or task orders by the individuals or activities designated in the Schedule. Such orders may be issued from the effective date of the contract through the end of the effective period.

(b) All delivery orders or task orders are subject to the terms and conditions of this contract. In the event of conflict between a delivery order or task order and this contract, the contract shall control.

(c) If mailed, a delivery order or task order is considered “issued” when the Government deposits the order in the mail. Orders may be issued orally, by facsimile, or by electronic commerce methods only if authorized in the Schedule.

(End of Clause)

**C.5 52.216-19 ORDER LIMITATIONS (OCT 1995)**

(a) *Minimum order*. When the Government requires supplies or services covered by this contract in an amount of less than 0, the Government is not obligated to purchase, nor is the Contractor obligated to furnish, those supplies or services under the contract.

(b) *Maximum order*. The Contractor is not obligated to honor—

(1) Any order for a single item in excess of 500 Whole Genome, and 1000 Exome samples per month;

(2) Any order for a combination of items in excess of 500 Whole Genome, and 1000 Exome samples per month; or

(3) A series of orders from the same ordering office within 30 days days that together call for quantities exceeding the limitation in paragraph (b) (1) or (2) of this section.

(c) If this is a requirements contract (i.e., includes the Requirements clause at subsection 52.216-21 of the Federal Acquisition Regulation (FAR)), the Government is not required to order a part of any one requirement from the Contractor if that requirement exceeds the maximum-order limitations in paragraph (b) of this section.

(d) Notwithstanding paragraphs (b) and (c) of this section, the Contractor shall honor any order exceeding the maximum order limitations in paragraph (b), unless that order (or orders) is returned to the ordering office within 5 days after issuance, with written notice stating the Contractor's intent not to ship the item (or items) called for and the reasons. Upon receiving this notice, the Government may acquire the supplies or services from another source.

(End of Clause)

**C.6 52.216-21 REQUIREMENTS (OCT 1995)**

(a) This is a requirements contract for the supplies or services specified, and effective for the period stated, in the Schedule. The quantities of supplies or services specified in the Schedule are estimates only and are not purchased by this contract. Except as this contract may otherwise provide, if the Government's requirements do not result in orders in the quantities described as "estimated" or "maximum" in the Schedule, that fact shall not constitute the basis for an equitable price adjustment.

(b) Delivery or performance shall be made only as authorized by orders issued in accordance with the Ordering clause. Subject to any limitations in the Order Limitations clause or elsewhere in this contract, the Contractor shall furnish to the Government all supplies or services specified in the Schedule and called for by orders issued in accordance with the Ordering clause. The Government may issue orders requiring delivery to multiple destinations or performance at multiple locations.

(c) Except as this contract otherwise provides, the Government shall order from the Contractor all the supplies or services specified in the Schedule that are required to be purchased by the Government activity or activities specified in the Schedule.

(d) The Government is not required to purchase from the Contractor requirements in excess of any limit on total orders under this contract.

(e) If the Government urgently requires delivery of any quantity of an item before the earliest date that delivery may be specified under this contract, and if the Contractor will not accept an order providing for the accelerated delivery, the Government may acquire the urgently required goods or services from another source.

(f) Any order issued during the effective period of this contract and not completed within that period shall be completed by the Contractor within the time specified in the order. The contract shall govern the Contractor's and Government's rights and obligations with respect to that order to the same extent as if the order were completed during the contract's effective period; provided, that the Contractor shall not be required to make any deliveries under this contract after .

(End of Clause)

**C.7 52.217-9 OPTION TO EXTEND THE TERM OF THE CONTRACT (MAR 2000)**

(a) The Government may extend the term of this contract by written notice to the Contractor within 10 days of contract expiration; provided that the Government gives the Contractor a preliminary written notice of its intent to extend at least 15 days before the contract expires. The preliminary notice does not commit the Government to an extension.

(b) If the Government exercises this option, the extended contract shall be considered to include this option clause.

(c) The total duration of this contract, including the exercise of any options under this clause, shall not exceed five (5) years.

(End of Clause)

**C.8 52.232-19 AVAILABILITY OF FUNDS FOR THE NEXT FISCAL YEAR (APR 1984)**

Funds are not presently available for performance under this contract beyond September 30th, 2014. The Government's obligation for performance of this contract beyond that date is contingent upon the availability of appropriated funds from which payment for contract purposes can be made. No legal liability on the part of the Government for any payment may arise for performance under this contract beyond September 30th, 2014, until funds are made available to the Contracting Officer for performance and until the Contractor receives notice of availability, to be confirmed in writing by the Contracting Officer.

(End of Clause)

**C.9 VAAR 852.203-70 COMMERCIAL ADVERTISING (JAN 2008)**

The bidder or offeror agrees that if a contract is awarded to him/her, as a result of this solicitation, he/she will not advertise the award of the contract in his/her commercial advertising in such a manner as to state or imply that the Department of Veterans Affairs endorses a product, project or commercial line of endeavor.

(End of Clause)

**C.10 VAAR 852.203-71 DISPLAY OF DEPARTMENT OF VETERAN AFFAIRS HOTLINE POSTER (DEC 1992)**

(a) Except as provided in paragraph (c) below, the Contractor shall display prominently, in common work areas within business segments performing work under VA contracts, Department of Veterans Affairs Hotline posters prepared by the VA Office of Inspector General.

(b) Department of Veterans Affairs Hotline posters may be obtained from the VA Office of Inspector General (53E), P.O. Box 34647, Washington, DC 20043-4647.

(c) The Contractor need not comply with paragraph (a) above if the Contractor has established a mechanism, such as a hotline, by which employees may report suspected instances of improper conduct, and instructions that encourage employees to make such reports.

(End of Clause)

**C.11 VAAR 852.215-71 EVALUATION FACTOR COMMITMENTS (DEC 2009)**

The offeror agrees, if awarded a contract, to use the service-disabled veteran-owned small businesses or veteran-owned small businesses proposed as subcontractors in accordance with 852.215-70, Service-Disabled Veteran-Owned and Veteran-Owned Small Business Evaluation Factors, or to substitute one or more service-disabled veteran-owned small businesses or veteran-owned small businesses for subcontract work of the same or similar value.

(End of Clause)

**C.12 VAAR 852.232-72 ELECTRONIC SUBMISSION OF PAYMENT REQUESTS (NOV 2012)**

(a) *Definitions.* As used in this clause—

(1) *Contract financing payment* has the meaning given in FAR 32.001.

(2) *Designated agency office* has the meaning given in 5 CFR 1315.2(m).

(3) *Electronic form* means an automated system transmitting information electronically according to the Accepted electronic data transmission methods and formats identified in paragraph (c) of this clause. Facsimile, email, and scanned documents are not acceptable electronic forms for submission of payment requests.

(4) *Invoice payment* has the meaning given in FAR 32.001.

(5) *Payment request* means any request for contract financing payment or invoice payment submitted by the contractor under this contract.

(b) *Electronic payment requests.* Except as provided in paragraph (e) of this clause, the contractor shall submit payment requests in electronic form. Purchases paid with a Government-wide commercial purchase card are considered to be an electronic transaction for purposes of this rule, and therefore no additional electronic invoice submission is required.

(c) *Data transmission*. A contractor must ensure that the data transmission method and format are through one of the following:

(1) VA's Electronic Invoice Presentment and Payment System. (See Web site at *http://www.fsc.va.gov/einvoice.asp*.)

(2) Any system that conforms to the X12 electronic data interchange (EDI) formats established by the Accredited Standards Center (ASC) and chartered by the American National Standards Institute (ANSI). The X12 EDI Web site (*http://www.x12.org*) includes additional information on EDI 810 and 811 formats.

(d) *Invoice requirements*. Invoices shall comply with FAR 32.905.

(e) *Exceptions*. If, based on one of the circumstances below, the contracting officer directs that payment requests be made by mail, the contractor shall submit payment requests by mail through the United States Postal Service to the designated agency office. Submission of payment requests by mail may be required for:

(1) Awards made to foreign vendors for work performed outside the United States;

(2) Classified contracts or purchases when electronic submission and processing of payment requests could compromise the safeguarding of classified or privacy information;

(3) Contracts awarded by contracting officers in the conduct of emergency operations, such as responses to national emergencies;

(4) Solicitations or contracts in which the designated agency office is a VA entity other than the VA Financial Services Center in Austin, Texas; or

(5) Solicitations or contracts in which the VA designated agency office does not have electronic invoicing capability as described above.

(End of Clause)

**C.13 VAAR 852.237-70 CONTRACTOR RESPONSIBILITIES (APR 1984)**

The contractor shall obtain all necessary licenses and/or permits required to perform this work. He/she shall take all reasonable precautions necessary to protect persons and property from injury or damage during the performance of this contract. He/she shall be responsible for any injury to himself/herself, his/her employees, as well as for any damage to personal or public property that occurs during the performance of this contract that is caused by his/her employees fault or negligence, and shall maintain personal liability and property damage insurance having coverage for a limit as required by the laws of the State of TBD. Further, it is agreed that any negligence of the Government, its officers, agents, servants and employees, shall not be the responsibility of the contractor hereunder with the regard to any claims, loss, damage, injury, and liability resulting there from.

(End of Clause)

**C.14 52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)**

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

http://www.acquisition.gov/far/index.html
http://www.va.gov/oal/library/vaar/

(End of Clause)

| FAR Number | Title | Date |
|---|---|---|
| 52.204-9 | PERSONAL IDENTITY VERIFICATION OF CONTRACTOR PERSONNEL | JAN 2011 |
| 52.224-1 | PRIVACY ACT NOTIFICATION | APR 1984 |
| 52.224-2 | PRIVACY ACT | APR 1984 |
| 52.203-17 | CONTRACTOR EMPLOYEE WHISTLEBLOWER RIGHTS AND REQUIREMENT TO INFORM EMPLOYEES OF WHISTLEBLOWER RIGHTS | APR 2014 |
| 52.204-18 | COMMERCIAL AND GOVERNMENT ENTITY CODE MAINTENANCE | JUL 2016 |

**C.15 52.227-14 RIGHTS IN DATA—GENERAL (MAY 2014)**

(a) *Definitions*. As used in this clause—

“Computer database” or “database” means a collection of recorded information in a form capable of, and for the purpose of, being stored in, processed, and operated on by a computer. The term does not include computer software.

“Computer software”—

(1) Means

(i) Computer programs that comprise a series of instructions, rules, routines, or statements, regardless of the media in which recorded, that allow or cause a computer to perform a specific operation or series of operations; and

(ii) Recorded information comprising source code listings, design details, algorithms, processes, flow charts, formulas, and related material that would enable the computer program to be produced, created, or compiled.

(2) Does not include computer databases or computer software documentation.

“Computer software documentation” means owner’s manuals, user’s manuals, installation instructions, operating instructions, and other similar items, regardless of storage medium, that explain the capabilities of the computer software or provide instructions for using the software.

“Data” means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

“Form, fit, and function data” means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, and data identifying source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements. For computer software it means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithms, processes, formulas, and flow charts of the software.

“Limited rights” means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of paragraph (g)(3) if included in this clause.

“Limited rights data” means data, other than computer software, that embody trade secrets or are commercial or financial and confidential or privileged, to the extent that such data pertain to items, components, or processes developed at private expense, including minor modifications.

“Restricted computer software” means computer software developed at private expense and that is a trade secret, is commercial or financial and confidential or privileged, or is copyrighted computer software, including minor modifications of the computer software.

“Restricted rights”, as used in this clause, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of paragraph (g) if included in this clause, or as otherwise may be provided in a collateral agreement incorporated in and made part of this contract, including minor modifications of such computer software.

“Technical data”, means recorded information (regardless of the form or method of the recording) of a scientific or technical nature (including computer databases and computer software documentation). This term does not include computer software or financial, administrative, cost or pricing, or management data or other information incidental to contract administration. The term includes recorded information of a scientific or technical nature that is included in computer databases. (See 41 U.S.C. 116).

“Unlimited rights” means the rights of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(b) Allocation of rights.

(1) Except as provided in paragraph (c) of this clause, the Government shall have unlimited rights in—

(i) Data first produced in the performance of this contract;

(ii) Form, fit, and function data delivered under this contract;

(iii) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under this contract; and

(iv) All other data delivered under this contract unless provided otherwise for limited rights data or restricted computer software in accordance with paragraph (g) of this clause.

(2) The Contractor shall have the right to—

(i) Assert copyright in data first produced in the performance of this contract to the extent provided in paragraph (c)(1) of this clause;

(ii) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (d) of this clause;

(iii) Substantiate the use of, add, or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (f) of this clause; and

(iv) Protect from unauthorized disclosure and use those data that are limited rights data or restricted computer software to the extent provided in paragraph (g) of this clause.

(c) Copyright—

(1) Data first produced in the performance of this contract.

(i) Unless provided otherwise in paragraph (d) of this clause, the Contractor may, without prior approval of the Contracting Officer, assert copyright in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings, or similar works. The prior, express written permission of the Contracting Officer is required to assert copyright in all other data first produced in the performance of this contract.

(ii) When authorized to assert copyright to the data, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402, and an acknowledgment of Government sponsorship (including contract number).

(iii) For data other than computer software, the Contractor grants to the Government, and others acting on its behalf, a paid- up, nonexclusive, irrevocable, worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly by or on behalf of the Government. For computer software, the Contractor grants to the Government, and others acting on its behalf, a paid- up, nonexclusive, irrevocable, worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly (but not to distribute copies to the public) by or on behalf of the Government.

(2) *Data not first produced in the performance of this contract*. The Contractor shall not, without the prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract unless the Contractor—

(i) Identifies the data; and

(ii) Grants to the Government, or acquires on its behalf, a license of the same scope as set forth in paragraph (c)(1) of this clause or, if such data are restricted computer software, the Government shall acquire a copyright license as set forth in paragraph (g)(4) of this clause (if included in this contract) or as otherwise provided in a collateral agreement incorporated in or made part of this contract.

(3) *Removal of copyright notices*. The Government will not remove any authorized copyright notices placed on data pursuant to this paragraph (c), and will include such notices on all reproductions of the data.

(d) *Release, publication, and use of data*. The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except—

(1) As prohibited by Federal law or regulation (e.g., export control or national security laws or regulations);

(2) As expressly set forth in this contract; or

(3) If the Contractor receives or is given access to data necessary for the performance of this contract that contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless specifically authorized otherwise in writing by the Contracting Officer.

(e) Unauthorized marking of data.

(1) Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in paragraph (g)(3) or (g) (4) if included in this clause, and use of the notices is not authorized by this clause, or if the data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may at any time either return the data to the Contractor, or cancel or ignore the markings. However, pursuant to 41 U.S.C. 4703, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The Contracting Officer will make written inquiry to the Contractor affording the Contractor 60 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 60-day period (or a longer time approved in writing by the Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in paragraph (e)(1)(i) of this clause, the Contracting Officer will consider such written justification and determine whether or not the markings are to be cancelled or ignored. If the Contracting Officer determines that the markings are authorized, the Contractor will be so notified in writing. If the Contracting Officer determines, with concurrence of the head of the contracting activity, that the markings are not authorized, the Contracting Officer will furnish the Contractor a written determination, which determination will become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer’s decision. The Government will continue to abide by the markings under this paragraph (e)(1)(iii) until final resolution of the matter either by the Contracting Officer’s determination becoming final (in which instance the Government will thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedures set forth in paragraph (e)(1) of this clause may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

(3) Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Contractor is not precluded by paragraph (e) of the clause from bringing a claim, in accordance with the Disputes clause of this contract, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this contract.

(f) Omitted or incorrect markings.

(1) Data delivered to the Government without any restrictive markings shall be deemed to have been furnished with unlimited rights. The Government is not liable for the disclosure, use, or reproduction of such data.

(2) If the unmarked data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer in writing for good cause shown) after delivery of the data, permission to have authorized notices placed on the data at the Contractor's expense. The Contracting Officer may agree to do so if the Contractor—

(i) Identifies the data to which the omitted notice is to be applied;

(ii) Demonstrates that the omission of the notice was inadvertent;

(iii) Establishes that the proposed notice is authorized; and

(iv) Acknowledges that the Government has no liability for the disclosure, use, or reproduction of any data made prior to the addition of the notice or resulting from the omission of the notice.

(3) If data has been marked with an incorrect notice, the Contracting Officer may—

(i) Permit correction of the notice at the Contractor's expense if the Contractor identifies the data and demonstrates that the correct notice is authorized; or

(ii) Correct any incorrect notices.

(g) Protection of limited rights data and restricted computer software.

(1) The Contractor may withhold from delivery qualifying limited rights data or restricted computer software that are not data identified in paragraphs (b)(1)(i), (ii), and (iii) of this clause. As a condition to this withholding, the Contractor shall—

(i) Identify the data being withheld; and

(ii) Furnish form, fit, and function data instead.

(2) Limited rights data that are formatted as a computer database for delivery to the Government shall be treated as limited rights data and not restricted computer software.

(3) [Reserved]

(h) *Subcontracting*. The Contractor shall obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government those rights, the Contractor shall promptly notify the Contracting Officer of the refusal and shall not proceed with the subcontract award without authorization in writing from the Contracting Officer.

(i) *Relationship to patents or other rights*. Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

(End of Clause)

**C.16 52.227-16 ADDITIONAL DATA REQUIREMENTS (JUN 1987)**

(a) In addition to the data (as defined in the clause at 52.227-14, Rights in Data—General clause or other equivalent included in this contract) specified elsewhere in this contract to be delivered, the Contracting Officer may, at any time during contract performance or within a period of 3 years after acceptance of all items to be delivered under this contract, order any data first produced or specifically used in the performance of this contract.

(b) The Rights in Data—General clause or other equivalent included in this contract is applicable to all data ordered under this Additional Data Requirements clause. Nothing contained in this clause shall require the Contractor to deliver any data the withholding of which is authorized by the Rights in Data— General or other equivalent clause of this contract, or data which are specifically identified in this contract as not subject to this clause.

(c) When data are to be delivered under this clause, the Contractor will be compensated for converting the data into the prescribed form, for reproduction, and for delivery.

(d) The Contracting Officer may release the Contractor from the requirements of this clause for specifically identified data items at any time during the 3-year period set forth in paragraph (a) of this clause.

(End of Clause)

**C.17 52.227-17 RIGHTS IN DATA—SPECIAL WORKS (DEC 2007)**

(a) *Definitions*. As used in this clause—

“Data” means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

“Unlimited rights” means the rights of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(b) Allocation of Rights.

(1) The Government shall have—

(i) Unlimited rights in all data delivered under this contract, and in all data first produced in the performance of this contract, except as provided in paragraph (c) of this clause.

(ii) The right to limit assertion of copyright in data first produced in the performance of this contract, and to obtain assignment of copyright in that data, in accordance with paragraph (c)(1) of this clause.

(iii) The right to limit the release and use of certain data in accordance with paragraph (d) of this clause.

(2) The Contractor shall have, to the extent permission is granted in accordance with paragraph (c)(1) of this clause, the right to assert claim to copyright subsisting in data first produced in the performance of this contract.

(c) Copyright—

(1) Data first produced in the performance of this contract.

(i) The Contractor shall not assert or authorize others to assert any claim to copyright subsisting in any data first produced in the performance of this contract without prior written permission of the Contracting Officer. When copyright is asserted, the Contractor shall affix the appropriate copyright notice of 17 *U.S.C. 401 or 402* and acknowledgment of Government sponsorship (including contract number) to the data when delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. The Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all delivered data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

(ii) If the Government desires to obtain copyright in data first produced in the performance of this contract and permission has not been granted as set forth in paragraph (c)(1)(i) of this clause, the Contracting Officer shall direct the Contractor to assign (with or without registration), or obtain the assignment of, the copyright to the Government or its designated assignee.

(2) *Data not first produced in the performance of this contract*. The Contractor shall not, without prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract and that contain the copyright notice of 17 U.S.C. 401 or 402, unless the Contractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in paragraph (c)(1) of this clause.

(d) *Release and use restrictions*. Except as otherwise specifically provided for in this contract, the Contractor shall not use, release, reproduce, distribute, or publish any data first produced in the performance of this contract, nor authorize others to do so, without written permission of the Contracting Officer.

(e) *Indemnity*. The Contractor shall indemnify the Government and its officers, agents, and employees acting for the Government against any liability, including costs and expenses, incurred as the result of the violation of trade secrets, copyrights, or right of privacy or publicity, arising out of the creation, delivery, publication, or use of any data furnished under this contract; or any libelous or other unlawful matter contained in such data. The provisions of this paragraph do not apply unless the Government provides notice to the Contractor as soon as practicable of any claim or suit, affords the Contractor an opportunity under applicable laws, rules, or regulations to participate in the defense of the claim or suit, and obtains the Contractor’s consent to the settlement of any claim or suit other than as required by final decree of a court of competent jurisdiction; and these provisions do not apply to material furnished to the Contractor by the Government and incorporated in data to which this clause applies.

(End of Clause)

| FAR Number | Title | Date |
|---|---|---|
| 52.232-40 | PROVIDING ACCELERATED PAYMENTS TO SMALL BUSINESS SUBCONTRACTORS | DEC 2013 |

(End of Addendum to 52.212-4)

**C.18 52.212-5 CONTRACT TERMS AND CONDITIONS REQUIRED TO IMPLEMENT STATUTES OR EXECUTIVE ORDERS—COMMERCIAL ITEMS (JAN 2017)**

(a) The Contractor shall comply with the following Federal Acquisition Regulation (FAR) clauses, which are incorporated in this contract by reference, to implement provisions of law or Executive orders applicable to acquisitions of commercial items:

(1) 52.203-19, Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements (JAN 2017) (section 743 of Division E, Title VII, of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L. 113-235) and its successor provisions in subsequent appropriations acts (and as extended in continuing resolutions)).

(2) 52.209-10, Prohibition on Contracting with Inverted Domestic Corporations (NOV 2015).

(3) 52.233-3, Protest After Award (Aug 1996) (31 U.S.C. 3553).

(4) 52.233-4, Applicable Law for Breach of Contract Claim (Oct 2004) (Public Laws 108-77 and 108-78 (19 U.S.C. 3805 note)).

(b) The Contractor shall comply with the FAR clauses in this paragraph (b) that the Contracting Officer has indicated as being incorporated in this contract by reference to implement provisions of law or Executive orders applicable to acquisitions of commercial items:

[X] (1) 52.203-6, Restrictions on Subcontractor Sales to the Government (Sept 2006), with Alternate I (Oct 1995) (41 U.S.C. 4704 and 10 U.S.C. 2402).

[X] (2) 52.203-13, Contractor Code of Business Ethics and Conduct (OCT 2015) (41 U.S.C. 3509).

[ ] (3) 52.203-15, Whistleblower Protections under the American Recovery and Reinvestment Act of 2009 (JUN 2010) (Section 1553 of Pub. L. 111-5). (Applies to contracts funded by the American Recovery and Reinvestment Act of 2009.)

[X] (4) 52.204–10, Reporting Executive Compensation and First-Tier Subcontract Awards (OCT 2016) (Pub. L. 109–282) (31 U.S.C. 6101 note).

[ ] (5) [Reserved]

[ ] (6) 52.204–14, Service Contract Reporting Requirements (OCT 2016) (Pub. L. 111–117, section 743 of Div. C).

[ ] (7) 52.204–15, Service Contract Reporting Requirements for Indefinite-Delivery Contracts (OCT 2016) (Pub. L. 111–117, section 743 of Div. C).

[X] (8) 52.209-6, Protecting the Government’s Interest When Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment. (OCT 2015) (31 U.S.C. 6101 note).

[X] (9) 52.209-9, Updates of Publicly Available Information Regarding Responsibility Matters (Jul 2013) (41 U.S.C. 2313).

[ ] (10) [Reserved]

[ ] (11)(i) 52.219-3, Notice of HUBZone Set-Aside or Sole-Source Award (NOV 2011) (15 U.S.C. 657a).

[ ] (ii) Alternate I (NOV 2011) of 52.219-3.

[ ] (12)(i) 52.219-4, Notice of Price Evaluation Preference for HUBZone Small Business Concerns (OCT 2014) (if the offeror elects to waive the preference, it shall so indicate in its offer) (15 U.S.C. 657a).

[ ] (ii) Alternate I (JAN 2011) of 52.219-4.

[ ] (13) [Reserved]

[X] (14)(i) 52.219-6, Notice of Total Small Business Set-Aside (NOV 2011) (15 U.S.C. 644).

[ ] (ii) Alternate I (NOV 2011).

[ ] (iii) Alternate II (NOV 2011).

[ ] (15)(i) 52.219-7, Notice of Partial Small Business Set-Aside (June 2003) (15 U.S.C. 644).

[ ] (ii) Alternate I (Oct 1995) of 52.219-7.

[ ] (iii) Alternate II (Mar 2004) of 52.219-7.

[X] (16) 52.219-8, Utilization of Small Business Concerns (NOV 2016) (15 U.S.C. 637(d)(2) and (3)).

[ ] (17)(i) 52.219-9, Small Business Subcontracting Plan (JAN 2017) (15 U.S.C. 637(d)(4)).

[ ] (ii) Alternate I (NOV 2016) of 52.219-9.

[ ] (iii) Alternate II (NOV 2016) of 52.219-9.

[ ] (iv) Alternate III (NOV 2016) of 52.219-9.

[ ] (v) Alternate IV (NOV 2016) of 52.219-9.

[X] (18) 52.219-13, Notice of Set-Aside of Orders (NOV 2011) (15 U.S.C. 644(r)).

[X] (19) 52.219-14, Limitations on Subcontracting (JAN 2017) (15 U.S.C. 637(a)(14)).

[ ] (20) 52.219-16, Liquidated Damages—Subcontracting Plan (Jan 1999) (15 U.S.C. 637(d)(4)(F)(i)).

[ ] (21) 52.219-27, Notice of Service-Disabled Veteran-Owned Small Business Set-Aside (NOV 2011) (15 U.S.C. 657f).

[X] (22) 52.219-28, Post Award Small Business Program Rerepresentation (Jul 2013) (15 U.S.C 632(a)(2)).

[ ] (23) 52.219-29, Notice of Set-Aside for, or Sole Source Award to, Economically Disadvantaged Women-Owned Small Business Concerns (DEC 2015) (15 U.S.C. 637(m)).

[ ] (24) 52.219-30, Notice of Set-Aside for, or Sole Source Award to, Women-Owned Small Business Concerns Eligible Under the Women-Owned Small Business Program (DEC 2015) (15 U.S.C. 637(m)).

[X] (25) 52.222-3, Convict Labor (June 2003) (E.O. 11755).

[ ] (26) 52.222–19, Child Labor—Cooperation with Authorities and Remedies (OCT 2016) (E.O. 13126).

[X] (27) 52.222-21, Prohibition of Segregated Facilities (APR 2015).

[X] (28) 52.222–26, Equal Opportunity (SEP 2016) (E.O. 11246).

[X] (29) 52.222-35, Equal Opportunity for Veterans (OCT 2015) (38 U.S.C. 4212).

[X] (30) 52.222-36, Equal Opportunity for Workers with Disabilities (JUL 2014) (29 U.S.C. 793).

[X] (31) 52.222-37, Employment Reports on Veterans (FEB 2016) (38 U.S.C. 4212).

[X] (32) 52.222-40, Notification of Employee Rights Under the National Labor Relations Act (DEC 2010) (E.O. 13496).

[X] (33)(i) 52.222-50, Combating Trafficking in Persons (MAR 2015) (22 U.S.C. chapter 78 and E.O. 13627).

[ ] (ii) Alternate I (MAR 2015) of 52.222-50 (22 U.S.C. chapter 78 and E.O. 13627).

[X] (34) 52.222-54, Employment Eligibility Verification (OCT 2015). (E. O. 12989). (Not applicable to the acquisition of commercially available off-the-shelf items or certain other types of commercial items as prescribed in 22.1803.)

[ ] (35) 52.222-59, Compliance with Labor Laws (Executive Order 13673) (OCT 2016). (Applies at $50 million for solicitations and resultant contracts issued from October 25, 2016 through April 24, 2017; applies at $500,000 for solicitations and resultant contracts issued after April 24, 2017).

**Note to paragraph (b)(35)**: By a court order issued on October 24, 2016, 52.222-59 is enjoined indefinitely as of the date of the order. The enjoined paragraph will become effective immediately if the court terminates the injunction. At that time, DoD, GSA, and NASA will publish a document in the **Federal Register** advising the public of the termination of the injunction.

[X] (36) 52.222-60, Paycheck Transparency (Executive Order 13673) (OCT 2016).

[ ] (37)(i) 52.223-9, Estimate of Percentage of Recovered Material Content for EPA-Designated Items (May 2008) (42 U.S.C.6962(c)(3)(A)(ii)). (Not applicable to the acquisition of commercially available off-the-shelf items.)

[ ] (38) 52.223-11, Ozone-Depleting Substances and High Global Warming Potential Hydrofluorocarbons (JUN 2016) (E.O. 13693).

[ ] (39) 52.223-12, Maintenance, Service, Repair, or Disposal of Refrigeration Equipment and Air Conditioners (JUN 2016) (E.O. 13693).

[ ] (ii) Alternate I (MAY 2008) of 52.223-9 (42 U.S.C. 6962(i)(2)(C)). (Not applicable to the acquisition of commercially available off-the-shelf items.)

[ ] (40)(i) 52.223-13, Acquisition of EPEAT®-Registered Imaging Equipment (JUN 2014) (E.O.s 13423 and 13514).

[ ] (ii) Alternate I (OCT 2015) of 52.223-13.

[ ] (41)(i) 52.223-14, Acquisition of EPEAT®-Registered Televisions (JUN 2014) (E.O.s 13423 and 13514).

[ ] (ii) Alternate I (JUN 2014) of 52.223-14.

[ ] (42) 52.223-15, Energy Efficiency in Energy-Consuming Products (DEC 2007)(42 U.S.C. 8259b).

[ ] (43)(i) 52.223-16, Acquisition of EPEAT®-Registered Personal Computer Products (OCT 2015) (E.O.s 13423 and 13514).

[ ] (ii) Alternate I (JUN 2014) of 52.223-16.

[X] (44) 52.223-18, Encouraging Contractor Policies to Ban Text Messaging While Driving (AUG 2011)

[ ] (45) 52.223-20, Aerosols (JUN 2016) (E.O. 13693).

[ ] (46) 52.223-21, Foams (JUN 2016) (E.O. 13693).

[ ] (47) (i) 52.224-3, Privacy Training (JAN 2017) (5 U.S.C. 552a).

[ ] (ii) Alternate I (JAN 2017) of 52.224-3.

[ ] (48) 52.225-1, Buy American—Supplies (MAY 2014) (41 U.S.C. chapter 83).

[ ] (49)(i) 52.225-3, Buy American—Free Trade Agreements—Israeli Trade Act (MAY 2014) (41 U.S.C. chapter 83, 19 U.S.C. 3301 note, 19 U.S.C. 2112 note, 19 U.S.C. 3805 note, 19 U.S.C. 4001 note, Pub. L. 103-182, 108-77, 108-78, 108-286, 108-302, 109-53, 109-169, 109-283, 110-138, 112-41, 112¬42, and 112-43.

[ ] (ii) Alternate I (MAY 2014) of 52.225-3.

[ ] (iii) Alternate II (MAY 2014) of 52.225-3.

[ ] (iv) Alternate III (MAY 2014) of 52.225-3.

[ ] (50) 52.225–5, Trade Agreements (OCT 2016) (19 U.S.C. 2501, et seq., 19 U.S.C. 3301 note).

[X] (51) 52.225-13, Restrictions on Certain Foreign Purchases (JUN 2008) (E.O.'s, proclamations, and statutes administered by the Office of Foreign Assets Control of the Department of the Treasury).

[ ] (52) 52.225–26, Contractors Performing Private Security Functions Outside the United States (OCT 2016) (Section 862, as amended, of the National Defense Authorization Act for Fiscal Year 2008; 10 U.S.C. 2302 Note).

[ ] (53) 52.226-4, Notice of Disaster or Emergency Area Set-Aside (Nov 2007) (42 U.S.C. 5150).

[ ] (54) 52.226-5, Restrictions on Subcontracting Outside Disaster or Emergency Area (Nov 2007) (42 U.S.C. 5150).

[ ] (55) 52.232-29, Terms for Financing of Purchases of Commercial Items (Feb 2002) (41 U.S.C. 4505, 10 U.S.C. 2307(f)).

[ ] (56) 52.232-30, Installment Payments for Commercial Items (JAN 2017) (41 U.S.C. 4505, 10 U.S.C. 2307(f)).

[ ] (57) 52.232-33, Payment by Electronic Funds Transfer—System for Award Management (Jul 2013) (31 U.S.C. 3332).

[X] (58) 52.232-34, Payment by Electronic Funds Transfer—Other than System for Award Management (Jul 2013) (31 U.S.C. 3332).

[ ] (59) 52.232-36, Payment by Third Party (MAY 2014) (31 U.S.C. 3332).

[ ] (60) 52.239-1, Privacy or Security Safeguards (Aug 1996) (5 U.S.C. 552a).

[ ] (61) 52.242-5, Payments to Small Business Subcontractors (JAN 2017)(15 U.S.C. 637(d)(12)).

[ ] (62)(i) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (Feb 2006) (46 U.S.C. Appx. 1241(b) and 10 U.S.C. 2631).

[ ] (ii) Alternate I (Apr 2003) of 52.247-64.

(c) The Contractor shall comply with the FAR clauses in this paragraph (c), applicable to commercial services, that the Contracting Officer has indicated as being incorporated in this contract by reference to implement provisions of law or Executive orders applicable to acquisitions of commercial items:

[ ] (1) 52.222-17, Nondisplacement of Qualified Workers (MAY 2014) (E.O. 13495).

[X] (2) 52.222-41, Service Contract Labor Standards (MAY 2014) (41 U.S.C. chapter 67).

[X] (3) 52.222-42, Statement of Equivalent Rates for Federal Hires (MAY 2014) (29 U.S.C. 206 and 41 U.S.C. chapter 67).

Employee Class Monetary Wage-Fringe Benefits

[X] (4) 52.222-43, Fair Labor Standards Act and Service Contract Labor Standards—Price Adjustment (Multiple Year and Option Contracts) (MAY 2014) (29 U.S.C. 206 and 41 U.S.C. chapter 67).

[ ] (5) 52.222-44, Fair Labor Standards Act and Service Contract Labor Standards—Price Adjustment (MAY 2014) (29 U.S.C 206 and 41 U.S.C. chapter 67).

[ ] (6) 52.222-51, Exemption from Application of the Service Contract Labor Standards to Contracts for Maintenance, Calibration, or Repair of Certain Equipment—Requirements (MAY 2014) (41 U.S.C. chapter 67).

[ ] (7) 52.222-53, Exemption from Application of the Service Contract Labor Standards to Contracts for Certain Services—Requirements (MAY 2014) (41 U.S.C. chapter 67).

[X] (8) 52.222-55, Minimum Wages Under Executive Order 13658 (DEC 2015).

[X] (9) 52.222-62, Paid Sick Leave Under Executive Order 13706 (JAN 2017) (E.O. 13706).

[ ] (10) 52.226-6, Promoting Excess Food Donation to Nonprofit Organizations (MAY 2014) (42 U.S.C. 1792).

[ ] (11) 52.237-11, Accepting and Dispensing of $1 Coin (SEP 2008) (31 U.S.C. 5112(p)(1)).

(d) Comptroller General Examination of Record. The Contractor shall comply with the provisions of this paragraph (d) if this contract was awarded using other than sealed bid, is in excess of the simplified acquisition threshold, and does not contain the clause at 52.215-2, Audit and Records—Negotiation.

(1) The Comptroller General of the United States, or an authorized representative of the Comptroller General, shall have access to and right to examine any of the Contractor's directly pertinent records involving transactions related to this contract.

(2) The Contractor shall make available at its offices at all reasonable times the records, materials, and other evidence for examination, audit, or reproduction, until 3 years after final payment under this contract or for any shorter period specified in FAR Subpart 4.7, Contractor Records Retention, of the other clauses of this contract. If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement. Records relating to appeals under the disputes clause or to litigation or the settlement of claims arising under or relating to this contract shall be made available until such appeals, litigation, or claims are finally resolved.

(3) As used in this clause, records include books, documents, accounting procedures and practices, and other data, regardless of type and regardless of form. This does not require the Contractor to create or maintain any record that the Contractor does not maintain in the ordinary course of business or pursuant to a provision of law.

(e)(1) Notwithstanding the requirements of the clauses in paragraphs (a), (b), (c), and (d) of this clause, the Contractor is not required to flow down any FAR clause, other than those in this paragraph (e)(1) in a subcontract for commercial items. Unless otherwise indicated below, the extent of the flow down shall be as required by the clause—

(i) 52.203-13, Contractor Code of Business Ethics and Conduct (OCT 2015) (41 U.S.C. 3509).

(ii) 52.203-19, Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements (JAN 2017) (section 743 of Division E, Title VII, of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L. 113-235) and its successor provisions in subsequent appropriations acts (and as extended in continuing resolutions)).

(iii) 52.219-8, Utilization of Small Business Concerns (NOV 2016) (15 U.S.C. 637(d)(2) and (3)), in all subcontracts that offer further subcontracting opportunities.

(iv) 52.222-17, Nondisplacement of Qualified Workers (MAY 2014) (E.O. 13495). Flow down required in accordance with paragraph (l) of FAR clause 52.222-17.

(v) 52.222-21, Prohibition of Segregated Facilities (APR 2015).

(vi) 52.222–26, Equal Opportunity (SEP 2016) (E.O. 11246).

(vii) 52.222-35, Equal Opportunity for Veterans (OCT 2015) (38 U.S.C. 4212).

(viii) 52.222-36, Equal Opportunity for Workers with Disabilities (JUL 2014) (29 U.S.C. 793).

(ix) 52.222-37, Employment Reports on Veterans (FEB 2016) (38 U.S.C. 4212).

(x) 52.222-40, Notification of Employee Rights Under the National Labor Relations Act (DEC 2010) (E.O. 13496). Flow down required in accordance with paragraph (f) of FAR clause 52.222-40.

(xi) 52.222-41, Service Contract Labor Standards (MAY 2014) (41 U.S.C. chapter 67).

(xii)(A) 52.222-50, Combating Trafficking in Persons (MAR 2015) (22 U.S.C. chapter 78 and E.O. 13627).

(B) Alternate I (MAR 2015) of 52.222-50 (22 U.S.C. chapter 78 and E.O. 13627).

(xiii) 52.222-51, Exemption from Application of the Service Contract Labor Standards to Contracts for Maintenance, Calibration, or Repair of Certain Equipment—Requirements (MAY 2014) (41 U.S.C. chapter 67).

(xiv) 52.222-53, Exemption from Application of the Service Contract Labor Standards to Contracts for Certain Services—Requirements (MAY 2014) (41 U.S.C. chapter 67).

(xv) 52.222-54, Employment Eligibility Verification (OCT 2015) (E. O. 12989).

(xvi) 52.222-55, Minimum Wages Under Executive Order 13658 (DEC 2015).

(xvii) 52.222-59, Compliance with Labor Laws (Executive Order 13673) (OCT 2016) (Applies at $50 million for solicitations and resultant contracts issued from October 25, 2016 through April 24, 2017; applies at $500,000 for solicitations and resultant contracts issued after April 24, 2017).

**Note to paragraph (e)(1)(xvii)**: By a court order issued on October 24, 2016, 52.222-59 is enjoined indefinitely as of the date of the order. The enjoined paragraph will become effective immediately if the court terminates the injunction. At that time, DoD, GSA, and NASA will publish a document in the **Federal Register** advising the public of the termination of the injunction.

(xviii) 52.222-60, Paycheck Transparency (Executive Order 13673) (OCT 2016)).

(xix) 52.222-62 Paid Sick Leave Under Executive Order 13706 (JAN 2017) (E.O. 13706).

(xx)(A) 52.224-3, Privacy Training (JAN 2017) (5 U.S.C. 552a).

(B) Alternate I (JAN 2017) of 52.224-3.

(xxi) 52.225–26, Contractors Performing Private Security Functions Outside the United States (OCT 2016) (Section 862, as amended, of the National Defense Authorization Act for Fiscal Year 2008; 10 U.S.C. 2302 Note).

(xxii) 52.226-6, Promoting Excess Food Donation to Nonprofit Organizations (MAY 2014) (42 U.S.C. 1792). Flow down required in accordance with paragraph (e) of FAR clause 52.226-6.

(xxiii) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (Feb 2006) (46 U.S.C. Appx. 1241(b) and 10 U.S.C. 2631). Flow down required in accordance with paragraph (d) of FAR clause 52.247-64.

(2) While not required, the Contractor may include in its subcontracts for commercial items a minimal number of additional clauses necessary to satisfy its contractual obligations.

(End of Clause)

**C.19 MANDATORY WRITTEN DISCLOSURES**

Mandatory written disclosures required by FAR clause 52.203-13 to the Department of Veterans Affairs, Office of Inspector General (OIG) must be made electronically through the VA OIG Hotline at http://www.va.gov/oig/contacts/hotline.asp and clicking on “FAR clause 52.203-13 Reporting.” If you experience difficulty accessing the website, call the Hotline at 1-800-488-8244 for further instructions.

**[***] = Certain information contained in this document, marked by brackets, has been omitted because it is both not material and would be competitively harmful if publicly disclosed.**

**QUOTATION FOR SUPPLY OF GENETIC ANALYSIS PRODUCTS**

Prepared by:

Illumina, Inc.
5200 Illumina Way
San Diego CA 92122

Hereinafter referred to as “Illumina”

Prepared for:

[***]

**Personalis**

Hereinafter referred to as “ Personalis ” or “Customer”

| | |
|---|---|
| **Quotation Number:** | [***] |
| **Quotation Date:** | **Mar 21, 2017** |
| **Expiration Date:** | **Mar 31, 2017** |
| **Prepared By:** | [***] |
| **Phone Number:** | [***] |
| **Email:** | [***] |

| | | | |
|---|---|---|---|
| **QUOTATION NUMBER** | [***] | **PREPARED BY** | [***] |
| **QUOTATION DATE** | Mar 21, 2017 | **TEL** | [***] |
| **EXPIRATION DATE** | Mar 31, 2017 | **EMAIL** | [***] |
| **CURRENCY** | USD | | |

## I. CUSTOMER INFORMATION

| | |
|---|---|
| Company or Institution Name: | Personalis |
| Customer Number: | [***] |
| Address: | Personalis<br>1330 Obrien Dr<br>Menlo Park CA 94025-1436 |
| Contact Name: | [***] |
| Phone: | [***] |
| E-Mail: | [***] |
| Shipping address: | Personalis<br>1330 Obrien Dr<br>Menlo Park CA 94025-1436 |

## II PRODUCT & PRICING INFORMATION

| Catalog# | Product Description | [***] | [***] | [***] | [***] | Subtotal (USD) |
|---|---|---|---|---|---|---|
| 20016095 | Illumina®Product Care NovaSeq®6000 Comprehensive Plan :<br>Includes full coverage for parts, labor and travel; Reagent replacement upon HW failures; 1 PM; Remote Technical Support; 3 business day average on-site response; HW/SW updates; On-site applications support; Discounts on advanced training. This is the most popular full-service plan balancing performance, productivity and cost. | [***] | [***] | [***] | [***] | [***] |
| 20012850 | NovaSeq™6000 Sequencing System :<br>The NovaSeq 6000 Sequencing System is an integrated ultrahigh throughput system performing onboard cluster generation and sequencing. This system includes installation and training and 12 months warranty (including parts and labor). | [***] | [***] | [***] | [***] | [***] |
| Subtotal | | | | | | [***] |
| Estimated Shipping and Insurance | | | | | | [***] |
| Tax | | | | | | [***] |
| **Final Investment (including shipping and insurance)** | | | | | | [***] |

**Notes:** Tax is an estimate and is subject to change upon invoicing based upon the appropriate tax regulations.

| | | | |
|---|---|---|---|
| **QUOTATION NUMBER** | [***] | **PREPARED BY** | [***] |
| **QUOTATION DATE** | Mar 21, 2017 | **TEL** | [***] |
| **EXPIRATION DATE** | Mar 31, 2017 | **EMAIL** | [***] |
| **CURRENCY** | USD | | |

**Post Pricing Message:**

This quote for Blanket PO for [***] NovaSeq 6000 instruments is offered contingent upon Personalis winning the award for the VA Million Veterans Project FY 18. Should Personalis not receive the VA's Million Veterans Project FY 18 contract award by November 1, 2017, this Blanket PO can be cancelled at that time. Should Personalis win the the Million Veterans FY 18 award, these additional [***] NovaSeq 6000 instruments will be delivered within [***] months of the date of this Blanket Purchase Order. Reagent discount pricing will be given as outlined in the NovaSeq S2 Reagent Standing Quote [***] and in keeping with the NovaSeq S4 Reagent Agreement as signed by Illumina and Personalis. Remaining Service Contracts may be credited towards an On-Site FSE at the time that Personalis elects to covert from Comprehensive Level Product Care to On-Site FSE and an On-Site FSE is hired.

| | | | |
|---|---|---|---|
| **QUOTATION NUMBER** | [***] | **PREPARED BY** | [***] |
| **QUOTATION DATE** | Mar 21, 2017 | **TEL** | [***] |
| **EXPIRATION DATE** | Mar 31, 2017 | **EMAIL** | [***] |
| **CURRENCY** | USD | | |

**Special Condition of Sale**

Customer’s purchase of this product is based on currently published specifications as provided in NovaSeq 5000/6000 Specification Sheet (http://www.illumina.com/content/dam/illumina- marketing/documents/products/datasheets/novaseq-series-specification-sheet-770-2016-025.pdf) and not conditioned on future performance characteristics or applications, whether or not realized. The determination, timing and delivery of future performance characteristics, if any, if ever, remains at Illumina’s sole discretion and customers’ rights to publicly announced upgrades and other marketed upgrades are expressly limited. Customer acknowledges it has not relied on any information outside of published specifications in making the purchase contemplated in this quotation or purchase order.

| | | | |
|---|---|---|---|
| **QUOTATION NUMBER** | [***] | **PREPARED BY** | [***] |
| **QUOTATION DATE** | Mar 21, 2017 | **TEL** | [***] |
| **EXPIRATION DATE** | Mar 31, 2017 | **EMAIL** | [***] |
| **CURRENCY** | USD | | |

## III. CONDITIONS OF SALE

By submitting an order, Customer accepts and agrees that the Terms and Conditions is the sole and exclusive agreement between Customer and Illumina with respect to the Illumina products and/or services as described above and accepts all other terms of this quotation. NOTWITHSTANDING THE FOREGOING, IF ILLUMINA AND CUSTOMER HAVE ENTERED INTO A VALID AND ENFORCEABLE AGREEMENT GOVERNING THE ILLUMINA PRODUCTS AND/OR SERVICES DESCRIBED ABOVE, THE ORDER OF PRECEDENCE BETWEEN THE AGREEMENT AND THE TERMS AND CONDITIONS SHALL BE AS FOLLOWS: IN THE EVENT OF A CONFLICT BETWEEN THE TERMS OF THE AGREEMENT AND THE TERMS AND CONDITIONS, OR IF THE AGREEMENT INCLUDES ADDITIONAL TERMS NOT ADDRESSED IN THE TERMS AND CONDITIONS, THE AGREEMENT SHALL GOVERN WITH RESPECT TO SUCH TERMS. Illumina does not supply plastics such as microplates or pipette tips for use in the listed assays and these are not included in the consumables pricing provided; however, as a result of the highly multiplexed nature of all assays, plastics alone contribute minimally to the final cost. Customer and Illumina agree as follows: • Customer's purchase of the products referenced in this Quotation is not conditioned on future performance characteristics or applications, whether or not realized. • Unless otherwise agreed by Illumina in writing, Illumina will not assist Customer in developing, testing, or validating unsupported applications. • Illumina will not replace any consumables or reagent kits if the cause of any performance failure is due to unsupported applications. • Illumina is unable to provide any assurances or guarantee that the performance of the products referenced in this Quotation will match published specifications when used for unsupported applications.

## IV. SHIP HOLD

In cases where this Quotation does not include a pre-defined ship schedule, the following ship hold terms shall apply:

- All orders must have a defined ship schedule. The initial ship date must be no later than three (3) months from the date the purchase order is received by Illumina (as provided in the Order Confirmation) and the entire order must be shipped complete within twelve (12) months from Illumina's receipt of the purchase order.
- Any exceptions to these ship hold terms must be agreed to in writing by Illumina and the Customer must pre-pay at least fifty percent (50%) of the purchase order amount of the affected shipments.
- Customers may request two (2) shipment delays for any single purchase order. The total months of delayed shipment for shipments associated with a single purchase order shall not exceed six (6) months.
- If Customer has requested a delayed shipment, Illumina reserves the right to change the lead time necessary to initiate Customer's first shipment (which may be longer than the lead time quoted at the time of the order placement).
- If Customer cannot take shipment in accordance with these terms, Illumina reserves the right to cancel the order in its entirety without any liability to the Customer.

## V. HOW TO ORDER

| | |
|---|---|
| For all consumable orders: Please submit your order online through MyIllumina (http://my.illumina.com). | For all other orders: Please submit your institutional Purchase Order and a complete copy of this quotation to the attention of:<br>Illumina Customer Service<br>customerservice@illumina.com<br>Phone: +1.858.202.4566<br>Toll Free: +1.800.809.ILMN (4566)<br>Fax: +1.858.202.4766 |

### Order Confirmation

You will receive an e-mail confirmation containing your order number within 1 business day. Another email will be sent to notify you when your order has been shipped.

| | | | |
|---|---|---|---|
| **QUOTATION NUMBER** | [***] | **PREPARED BY** | [***] |
| **QUOTATION DATE** | Mar 21, 2017 | **TEL** | [***] |
| **EXPIRATION DATE** | Mar 31, 2017 | **EMAIL** | [***] |
| **CURRENCY** | USD | | |

## VI. EXPIRATION OF OFFER

The offer contained in this document is revocable at the sole discretion of Illumina if not executed by Customer and a purchase order received by Illumina before 5:00 pm Pacific Time on the expiration date shown on page 1 of this quotation.

### Terms and Conditions

By this quotation, Illumina conditionally offers to Customer the Illumina products and/or services as described above. This offer is conditional on, and may only be accepted by, Customer's agreement that Illumina's terms and conditions located at

http://www.illumina.com/content/dam/illumina-marketing/documents/terms-conditions/united-states/usa-terms-and-conditions-of-sale-general.pdf.

Additionally, if Customer is purchasing Illumina professional consulting services as relate to instruments, Customer environment or workflows (in all cases, excluding instrument warranty services) ("Professional Services"), Customer agrees such Professional Services are exclusively governed by the Terms and Conditions - Services (Professional Services) located here:

http://www.illumina.com/content/dam/illumina-marketing/documents/company/terms-and-conditions-services.pdf

("Terms and Conditions") is the sole and exclusive agreement between Customer and Illumina with respect to the Illumina products and/or services as described above.

**Exhibit 10.12**

**[***] = Certain information contained in this document, marked by brackets, has been omitted because it is both not material and would be competitively harmful if publicly disclosed.**

Personalis

Personalis, Inc.
1330 O'Brien Drive
Menlo Park, CA 94025
United States
Phone: 650-752-1300
Fax: 650-752-1301
Send invoice to ap@personalis.com

| Purchase Order | Revision | Order Date |
|---|---|---|
| P11405 | 0 | 3/31/17 |
| Supplier | | Print Date |
| 110138 | | 3/31/17 |

**Purchase Order**

Supplier
Illumina, Inc.
Attn: Accounts Receivable
12864 Collections Center Drive
Chicago, IL 60693
United States
831-595-4438

Ship To
Personalis, Inc.
1330 O'Brien Drive
Menlo Park, CA 94025
United States
650-752-1300

Contact

Ship Via
Ground

Payment Terms
Net 60 Days

Incoterms

Remarks Quote# [***]

SUBJECT TO EXHIBIT A ATTACHED
Completed Form BOE-230-M REV 1(11-14) State of California BOE,
Partial Exemption Certificate for Mfg, R&D Equipment is attached to PO

| Line | Item Number | Rev | Due Date | Qty | Qty Open | UM | T | Unit Cost | Extended Cost |
|---|---|---|---|---|---|---|---|---|---|
| 1 | NovaSeq 6000<br>Sequencing Systems<br>Supplier Item: 20012850 | | [***] | 5 | [***] | | Y | [***] | [***] |

| | | |
|---|---|---|
| USD | Line Total | [***] |
| | Total Tax | [***] |
| | Total Amount | [***] |

**Exhibit 10.13**

**[***] = Certain confidential information contained in this document, marked by brackets, is filed with the Securities and Exchange Commission pursuant to Rule 406 of the Securities Act of 1933, as amended.**

# MASTER SERVICES SUBCONTRACT AGREEMENT

THIS AGREEMENT, made effective as of the 1st day of November 2017 ("**Effective Date**") entered into by and between Personalis, Inc. a corporation organized and existing under the laws of the State of California with offices at 1330 O'Brien Drive, Menlo Park, CA 94025 (hereinafter referred to as the "**Company**" or "**Personalis**"), and Illumina, Inc. a corporation organized and existing under the laws of the State of Delaware with offices at 5200 Illumina Way, San Diego, CA 92122 (hereinafter referred to as the "**Subcontractor**").

WITNESS THAT

WHEREAS, Company has entered into Contract Number [***] ("**Client Contract**") with the US Department of Veterans Affairs ("**Client**") and,

WHEREAS, the Subcontractor is willing to undertake the performance of the sequencing activities as subcontractor for Company under the Client Contract as set forth in the applicable Appendices, and

NOW THEREFORE the parties hereby agree as follows:

## ARTICLE 1 - THE WORK (SERVICES)

1.1 **Work to be Performed:** The Subcontractor shall provide all labor, materials, tools, machinery, equipment and other items and services necessary to properly perform the work (hereinafter referred to as the "**Services**") as set forth in writing between the parties under this Master Services Subcontract Agreement, including attachments, appendices and amendments thereto ("**Agreement**"). The Services shall be carried out in accordance with the Subcontract Documents in a diligent and workmanlike manner utilizing qualified personnel and good and sufficient materials and equipment. The Services shall be performed on a fixed price basis as set forth in the Appendices.

1.2 **Ordering Provisions:** The parties agree that the provisions of this Agreement apply to all of the Services performed by Subcontractor in support of the referenced Client Contract.

1.3 **Ordering Agreements and Understandings:**

1.3.1 Company shall issue written purchase orders for Services ("Purchase Orders") to be performed pursuant to this Agreement. Unless otherwise set forth in this Agreement, Purchase Orders are non-cancelable and shall be accepted by Subcontractor so long as they comply with the terms and conditions of this Agreement.

1.3.2 Intentionally Omitted.

1.3.3 Services Assignment Method

(a) Company will issue one or more Purchase Orders for the Services to be completed by Subcontractor under this Agreement. Upon receipt of a Purchase Order, Subcontractor will complete Services in accordance with the schedule set forth in Appendix B.

(b) Except as otherwise provided in this Agreement, there is no limit to the number of Purchase Orders that may be issued under this Agreement. Multiple Purchase Orders may be issued providing for Services with overlapping delivery schedules. Purchase Orders will be numbered consecutively.

(c) Any Purchase Order issued during the term of this Agreement and not completed within the term of this Agreement shall nevertheless be completed within the time specified in Appendix B unless the parties agree to a different schedule in writing. This Agreement shall govern the rights and obligations of the parties with respect to that Purchase Order to the same extent as if it were completed within the Agreement's term.

(d) Each Purchase Order issued hereunder, including any changes or terminations of any Purchase Order shall be incorporated into this Agreement and shall be subject to the terms and conditions of this Agreement.

**ARTICLE 2 - SUBCONTRACT DOCUMENTS**

2.1 **Documents:** The documents listed in 2.2.1 through 2.2.5 together with any modifications issued in accordance with Article 12 of this Agreement constitute the "**Subcontract Documents**" of this Agreement which shall apply to any Purchase Order and this Agreement. Any terms and conditions on any forms used by Subcontractor or Company in connection with this Agreement that are not expressly incorporated into this Agreement shall be void and shall not act to supplement, modify or replace the terms and conditions of this Agreement, unless mutually agreed to in writing by both parties.

2.2 **Precedence:** In the event of any conflict or inconsistency between any of the Subcontract Documents, the following order of precedence shall prevail:

2.2.1 Appendix B – Subcontract Pricing

2.2.2 Appendix A – Client Flowdown Clauses

2.2.3 This Master Services Subcontract Agreement

2.2.4 Appendix B – Services Description

2.3 **Client Flowdown Clauses:** Subject to the terms and conditions of this Agreement, the Subcontractor agrees to be bound to the Company in the same manner and to the same extent as Company is bound to the Client with respect to Client Flowdown Clauses, to the extent the provisions at Appendix A are applicable to the Services to be provided under this Agreement. The Subcontractor agrees to flow down these requirements to all lower tier Subcontractors that provide any services or work, to the extent required by the terms of the clauses.

**ARTICLE 3 - SUBCONTRACT TERM**

3.1 **Term:** The term of this Agreement shall be from the Effective Date of this Agreement ending on the last day of the Client Contract (currently August 2021 but as may be extended), unless terminated sooner in as set forth in Section 14.2. Thereafter, this Agreement may be renewed for subsequent one (1) year terms as they mutually agree in writing.

3.2 **Schedule:** The Subcontractor shall provide the Services called for by the Purchase Order in accordance with the terms of this Agreement. All Services shall be fully completed no later than the delivery periods specified in the Appendix B, unless sooner terminated or extended as provided herein.

3.3 **Delays:** Except with respect to Company's payment obligations to Subcontractor, neither Party shall be liable to the other for delays or failure to perform caused directly or indirectly by circumstances beyond that Party's control, including but not limited to, acts of God, fire, flood, war, sabotage, accident, labor dispute, shortage, government action including regulatory requirements, changed conditions, or delays resulting from actions or inactions of Client provided, and only to the extent, such delays are not the result of the negligence of the party claiming the delay. Should any of the above occur, then the date for completion or any other milestone date shall be adjusted through a negotiation of the parties, provided where the Subcontractor is claiming delay, the Subcontractor reports the delay to the Company within a reasonable time of its discovery.

**ARTICLE 4 - SUBCONTRACT PRICE**

4.1 **Consideration:** In consideration for performing the Services, the Company shall pay to the Subcontractor the sum specified in each Purchase Order in accordance with the payment provisions of this Agreement and such Purchase Order.

**ARTICLE 5 - PAYMENT PROVISIONS**

5.1 **Payment:** Payments will be made as set forth in this Agreement and the Purchase Order. Invoices shall be prepared and submitted to the Company in the manner and format specified in Article 5.4. Payment shall be made within [***] calendar days of receipt of Subcontractor's invoice. Subcontractor shall promptly notify Company of any overpayment. Any amounts not paid when due will accrue interest at the rate of [***], or the maximum amount allowed by law, if lower.

5.2 **Retention:** [INTENTIONALLY OMITTED AND RESERVED.]

5.3 **Travel:** Local travel will be at the Subcontractor's expense. Local travel is hereby defined as travel within a 50-mile radius of the Subcontractor's local office. All other travel for which Subcontractor requests to be reimbursed must be approved in advance and in writing. Such approved travel required during the performance of this Agreement will be subject to the terms and conditions and applicable rates as set forth in the Federal Travel Regulations and only as negotiated in the individual Purchase Order as a separate expense or as part of the fixed price.

5.4 **Invoicing Instructions:** The Subcontractor will submit invoices for each Results (defined below) shipped hereunder and with at least the following information: All invoices must clearly indicate the name and address of the Subcontractor, the invoice date and number, purchase order number, name and address of Subcontractor official to whom payment is to be sent, description, quantity, unit of measure, unit price and extended price of Results (defined below) shipped under the applicable Purchase Order. By submitting an invoice under this Agreement, Subcontractor is certifying that all payments requested are correct and in accordance with the terms of the Agreement and that payment has not been received. Invoices will be addressed as follows:

Invoices to: **Personalis, Inc.**
Attn: [***]

5.5 **Final Invoice:** Notwithstanding any other provision in this Agreement to the contrary, Subcontractor is required to submit the final invoice under each Purchase Order not later than [***] days after completion of the Services required by such Purchase Order. Any invoices received after that time will not be paid by the Company. No new claims for additional compensation will be considered after submittal of the final invoice under each Purchase Order.

**ARTICLE 6 - COMMUNICATIONS**

6.1 **Agreement Administration:** Subcontractor contacts with the Company regarding prices, terms, financial actions, etc., or any contacts which purport to modify any term of this Agreement, or Subcontractor or Company obligations, shall be made only with the Company's designated Subcontract Administrator. Agreement(s) and/or actions taken by the Subcontractor or Company which by their nature effect a change to this Agreement shall only be binding upon the Company and Subcontractor when such agreement or action is specifically authorized in writing by an authorized representative of each of the parties. All notices between the Subcontractor and the Company and Company and Subcontractor shall be addressed to the following and be sent via registered mail or overnight courier. For purposes of this Agreement, the following individual is designated as the Company's Subcontract Administrator:

Name: [***]
Title: [***]
Address: 1330 O'Brien Drive, Menlo Park, CA 94025

Phone: 650-752-1330
Fax: 650-752-1301

Illumina, Inc.
Name [***]
Title: [***]
Address: 5200 Illumina Way
San Diego, CA 92122
Phone:
Fax:

6.2 **Communications with Client**: All of Subcontractor's written or oral communication with or to Client, or with Federal, State, or local agencies relative to work under this Agreement must be through or with the authorization of the Company's designated Technical Representative. Unless an alternative contact is identified in a Purchase Order or as otherwise provided by written notice from the Company, for the purposes of this Agreement, the Company's Technical Representative is:

Name: [***]
Title: [***]
Address: 1330 O'Brien Drive, Menlo Park, CA 94025
Phone:
Fax:

**ARTICLE 7– SAMPLES/RESULTS/RESEARCH USE ONLY**

7.1 **Ownership of Samples.** Company represents and warrants that it owns or otherwise controls the sample(s) to be provided by Company to Subcontractor as described in the applicable Purchase Order ("**Samples**") and that it has the right to provide the Samples to Subcontractor for the purpose described therein. Subcontractor shall use the Samples solely for the purpose of performing this Agreement. Unless instructed otherwise in writing by Company, Subcontractor agrees that it will promptly return any unused Samples or portions thereof following the delivery of the Results (defined below). As between Company and Subcontractor, Company shall at all times retain all right, title, and interest in the Samples provided hereunder. Company shall provide all Samples and any related information in de-identified form and Company shall not provide Subcontractor any information that might allow Subcontractor to re-identify the donor of the Samples.

7.2 **Ownership of Results.** The data that are generated through performance of the Services and the deliverables as described in this Agreement and any Purchase Order ("**Results**") shall be owned by Company; provided that, the Results do not include Improvements. "**Improvements**" means any improvements, modifications, or changes to the Illumina Technology whether they are made prior to, during, or after performance under this Agreement. Such improvements may result from, among other things, the analysis of the Results in the aggregate with other genomic information in Illumina's possession and with similar information from other Illumina customers (e.g., comparing whole genome sequences in order to calculate allele frequencies, detect systematic errors, improving variant caller and aligners, etc.). "**Illumina Technology**" means the technology, tools, instruments, reagents, and software including, without limitation, the processes, workflows, recipes, methods, information, bioinformatics tools and techniques used to perform under this Agreement. This Agreement does not give Subcontractor any ownership interest in or to the Results. **For the avoidance of doubt, the Results are the sole deliverable under this Agreement and will be physically shipped on hard drives (or via electronic means if agreed to by the parties).**

7.3 **Research Use Only.** The services are provided for research use only and are not being performed in a clinical laboratory (e.g., the services are not being performed in a CLIA-certified laboratory). The services are not a test or kit designed to diagnose, treat, or prevent a disease or medical condition, and the Results are not intended to be medical advice. The services have not been cleared by any country's medical regulatory agency, including the United States Food and Drug Administration, for diagnostic use or any other purpose.

7.4 **Information Transfer; Samples.** In order to ensure timely and satisfactory performance of the services, it is critical that Company provide all relevant information and materials in a timely manner to Subcontractor. Company agrees to provide the Samples and all other information and materials as specified in the Purchase Order in accordance with the guidelines set forth in this Agreement. Any failure to provide the Samples, information, and any other materials in accordance with the Purchase Order or this Agreement may result in delays in the project. See the Appendix B for additional information concerning Sample quality requirements.

7.5 **Delivery of Results.** Delivery of Results shall have occurred by one of the following means, to be determined by mutual agreement of the parties: (a) if Results are to be delivered electronically, once Subcontractor has transmitted an electronic file containing all or a portion of the Results to Subcontractor's FTP web site or other site as mutually agreed and has notified Company that such file is available, or (b) if Results are to be delivered in one or more hard drive(s) or other physical material, upon shipment FOB origin of such hard drive(s) or material containing all or a portion of the Results.

**ARTICLE 8 - INSURANCE AND RISK ALLOCATION**

8.1 **Insurance:** The Subcontractor shall purchase and maintain through the course of performing the Services (and for a minimum of two years following completion or termination of this Agreement for all "claims made" policies), such insurances as will protect the Subcontractor, Client and Company from claims which may arise out of or result from its operations hereunder (whether by itself, any Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable):

8.1.1 **Coverage:** Minimum insurance requirements are:

8.1.1.1 Commercial General Liability, with limits of [***] per occurrence for bodily injury and property damage and including contractual liability, premises/operations, completed operations, personal and advertising injury liability. (Policy shall be endorsed to name Personalis as an Additional Insured.) Products liability is [***] in the aggregate.

8.1.1.2 Business automobile liability (owned, leased, non-owned, hired, and employee non-owned vehicles), [***] combined single limit each occurrence for bodily injury and property damage.

8.1.1.3 Workers' Compensation Insurance with statutory limits, as required by the state in which the work is to be performed, and Employer's Liability Insurance of not less than [***]. (Policy is to be endorsed to provide a waiver of subrogation in favor of Personalis.)

8.1.1.4 Professional Liability or Errors & Omissions Liability with limits of [***] per occurrence including coverage for errors & omissions liability. Network security and privacy limits are [***] in the aggregate.

8.1.1.5 Umbrella Liability insurance with limits of [***] per occurrence.

8.1.2 **Certificates:** Upon written request, Certificates of insurance shall be furnished by the Subcontractor evidencing that the coverage is in effect and will continue to be in effect throughout the performance of the Services and will not be canceled or materially changed until at least thirty (30) days prior written notice has been given to the Company. The insurance coverage at 8.1.1.1 and 8.1.1.2 above shall name Client and Personalis, Inc., their employees, officers, and directors as additional insured with respect to the Services to be provided under this Agreement. The insurance provided by Subcontractor is primary with respect to the interests of the Client and Company and any other

insurance acquired or maintained by them. Client and Company's insurance shall be excess and non-contributory. Subcontractor and insurers agree to waive any and all rights of subrogation against the Client and Company.

8.1.3 **Lower tier Subcontractors:** The Subcontractor agrees to flow down these insurance requirements to all lower tier Subcontractors and Subcontractors that provide any services or work, if subcontracting is permitted by Company.

8.2 **Indemnification:** The Subcontractor shall defend, indemnify, and hold harmless the Company, and its agents, officers, directors, and employees from and against any and all claims, suits, liability, losses, cost or expenses, including attorney's fees arising out of a claim brought by a third party against Company and arising out of the negligence or willful misconduct of the Subcontractor, its officers, agents, employees, lower tier Subcontractors, and anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except to the extent such claims, liability, losses, cost or expenses arise out of (a) the negligence or willful misconduct of Company, its officers, agents or employees or (b) Company's material breach of this Agreement. This indemnification obligation shall not be limited in any way by required, actual, or available insurance coverage. The Company shall defend, indemnify, and hold harmless the Subcontractor, and its agents, officers, directors, and employees from and against any and all claims, suits liability, losses, cost or expenses, including attorney's fees arising out of a claim brought by a third party against Subcontractor and arising out of the (y) the negligence or willful misconduct of Company, its officers, agents or employees (z) Company's material breach of this Agreement except to the extent such claims, liability, losses, cost or expenses arise out of (a) the negligence or willful misconduct of Subcontractor, its officers, agents or employees or (b) Subcontractor's material breach of this Agreement. This indemnification obligation shall not be limited in any way by required, actual, or available insurance coverage.

8.3 **Intellectual Property Rights:** The Subcontractor warrants, with no duty to investigate, that it is not aware of any copyright, patent, trademark, trade secret or other proprietary right that would actually be infringed as a result of providing the Services required under this Agreement. The Subcontractor shall defend, indemnify, and hold harmless the Company from and against any and all claims, suits, liability, losses, costs, or expenses, including attorney's fees arising out of a claim brought by a third party against Company that alleges infringement of any copyright, patent, trademark, trade secret or other proprietary right of such third party arising from the methods, materials, or processes used by Illumina to provide the Services.

8.4 **Intentionally Omitted.**

8.5 **Time of Essence:** Company and Subcontractor recognize that time is of the essence with respect to the performance of this Agreement and there is potential that Company may be found in breach of the Client Contract in the event that the Subcontractor fails to complete the Services within the time specified in the Purchase Orders. Therefore, in the event Subcontractor fails to deliver the Results to Company within the timeframes specified in the Purchase Orders and such failure by Subcontractor directly results in the Company being late in making its deliveries to the Client as promised under the Client Contract and such failure by Company directly results in the Client either terminating the Client Contract or otherwise exercising Client's rights under the Client Contract against Company with respect to any provision of the contract pertaining to on-time delivery in the Client Contract, Subcontractor agrees to be liable to the Company to the same extent that Company is liable to the Client. Accordingly, if Client is legally entitled to recover damages or reimbursements from Company pursuant to the terms of the Client Contract ("**Late Delivery Damages**") then Subcontractor shall reimburse Company for 100% of any Late Delivery Damages that Company actually pays to Client.

8.6 **Indemnification Conditions.** Each party's indemnification obligations under this Agreement are subject to the indemnified party (i) notifying the indemnifying party promptly in writing of such action, (ii) giving the indemnifying party exclusive control and authority over the defense and settlement of such action, (iii) not admitting infringement of any intellectual property right without the indemnifying party's prior written consent, (iv) not entering into any settlement or compromise of any such action without the indemnifying

party's prior written consent, and (v) providing all reasonable assistance to the indemnifying party (provided that the indemnifying party reimburses the indemnified party for its reasonable out-of-pocket expenses incurred in providing such assistance).

8.7 **Limited Liability.** EXCEPT WITH RESPECT TO THE REMEDIES AVAILABLE UNDER SECTIONS 14.2.2(4) and (5) IN NO EVENT WILL EITHER PARTY BE LIABLE TO THE OTHER PARTY OR ANY THIRD PARTY FOR COSTS OF PROCUREMENT OF SUBSTITUTE SERVICES, LOST PROFITS, DATA OR BUSINESS, OR FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL, EXEMPLARY, OR PUNITIVE DAMAGES INCURRED BY SUCH PARTY ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT (OR THE TERMINATION HEREOF), HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY (WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE) STRICT LIABILITY OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, THE LOSS OF PROSPECTIVE PROFITS OR ANTICIPATED SALES, OR ON ACCOUNT OF EXPENSES, INVESTMENTS, OR COMMITMENTS IN CONNECTION WITH THE BUSINESS OR GOODWILL OR OTHERWISE.

EXCEPT FOR A BREACH OF THE CONFIDENTIALITY OR INFRINGEMENT INDEMNITY PROVISION OF THIS AGREEMENT NEITHER PARTY'S TOTAL AND CUMULATIVE LIABILITY TO THE OTHER PARTY OR ANY THIRD PARTY ARISING UNDER OR IN CONNECTION WITH THIS AGREEMENT, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, SHALL IN NO EVENT EXCEED [***]. THE LIMITATIONS SET FORTH IN THIS SECTION SHALL APPLY EVEN IF A PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.

**ARTICLE 9 - SUBCONTRACTOR'S RESPONSIBILITIES**

9.1 **Employees of the Subcontractor:** The Subcontractor shall be subject to and operate under all applicable Federal and State laws regarding employers' liability, workmen's compensation, Federal social security, and unemployment compensation insurance; and the Subcontractor expressly agrees that it is an independent contractor and its employees engaged in the Services are not and shall not be treated or considered employees of the Company. Employees of Subcontractor shall at a minimum be lawfully eligible to work at the location they are employed by Subcontractor and shall satisfy any Client requirements for citizenship, work eligibility, or other similar status specified by the Subcontract Documents.

9.2 **Safety:** In performing the Services, the Subcontractor shall comply with all applicable laws, ordinances, rules, regulations, and lawful authorities or any public authority having jurisdiction for the safety of persons or property and protect the same from damage, injury, or loss. The Subcontractor shall take all reasonable precautions to prevent injury or loss to all persons performing services hereunder, and Client Company or other personnel visiting the work site. Precautions shall also be taken to prevent damage to the Services, all materials and equipment utilized therein, and all other property at the site of the Services and adjacent thereto. Finally, the Subcontractor will note any changes in site conditions and/or scope of work that may introduce potential hazard agent(s).

9.3 **Proprietary Information:** The parties agree that the Confidentiality Agreement executed October 3, 2012 ("**Confidentiality Agreement**") shall apply to this Agreement with the following modifications:

9.3.1 The Stated Purpose of the Confidentiality Agreement shall be modified to include the exchange of INFORMATION (as defined in the Confidentiality Agreement) under this Agreement.

9.3.2 COMPANY INFORMATION under this Agreement, shall include confidential and proprietary technical, business, marketing, financial, intellectual property, now-how and other information of the Client.

9.3.3 The term of the Confidentiality Agreement, for purposes of this Agreement, is extended to terminate [***] after the effective date of expiration or termination of this Agreement or [***] after the expiration or termination date of any Purchase Order issued hereunder, whichever is later.

9.3.4 The restricted use agreed to under the Confidentiality Agreement shall expire [***] after the expiration or termination of this Agreement.

9.3.5 The final sentence of Paragraph 10 of the Confidentiality Agreement shall not apply to any Client information that is required to be returned to the Client or is required by the Client to be destroyed.

9.3.6 Paragraphs 11 and 12 of the Confidentiality Agreement are not applicable to this Agreement.

9.3.7 Paragraph 16(b) of the Confidentiality Agreement is modified to say, "Except as expressly agreed to in the Master Services Subcontract Agreement, this Agreement contains the entire agreement between the parties regarding confidential treatment and restricted use of INFORMATION disclosed in connection with the Stated Purpose, and supersedes all other prior oral arguments and understandings with respect thereto."

9.4 **Publications:** The Subcontractor shall not publish or publicly disseminate the Results or any information or data derived or obtained from the Samples or the Results, without the prior written consent of the Company or the Client. The preceding sentence does not apply to Improvements or the Illumina Technology.

9.5 **Technical Data:** The Results and all information or data derived or obtained from the Samples or the Results produced by the Subcontractor pursuant to this Agreement shall be considered proprietary technical data belonging to the Company and shall be subject to the provisions of Articles 8.3 and 9.3. The preceding sentence does not apply to Improvements or the Illumina Technology.

9.6 **Permits and Licenses:** Except as specifically otherwise provided by the Subcontract Documents, the Subcontractor has or will have, prior to the commencement of any Services, all necessary business and professional licenses, permits, and other necessary Federal, State, County, Municipal, or other licenses as may be required by law or regulation to enable the Subcontractor to perform the services required hereunder.

**ARTICLE 10 - WORK BY OTHERS**

[INTENTIONALLY OMITTED AND RESERVED.]

**ARTICLE 11 - COMPANY RESPONSIBILITIES AND AUTHORITY**

11.1 **Inspection:** The Company, through any authorized representatives that has signed a non-disclosure agreement reasonably acceptable to Subcontractor, shall have the right no more than [***] to inspect, or otherwise evaluate the quality or any other aspect of the Services performed or the safety measures employed in the work being performed hereunder and the premises in which it is being performed. If any inspection or evaluation is made by the Company on the premises of the Subcontractor or a lower tier Subcontractor, the Subcontractor shall provide, and shall require his lower tier Subcontractors to provide, all reasonable facilities and assistance for the safety and convenience of the Company representatives in the performance of their duties. All inspections and evaluations shall be performed in such a manner as will not unnecessarily delay performance of the Services.

11.2 **Audit:** Upon written request of the Company and no more than [***], the records maintained by the Subcontractor directly related to the performance of the Services specified herein shall be made available for audit by an independent public accounting firm not retained on a contingency fee basis that has signed a non-disclosure agreement reasonably acceptable to Subcontractor, selected by the Company or by cognizant government agency. In addition, the Company may have such an audit performed, under similar terms as above, [***] following the completion or termination of Services specified herein or more often if and as required for Company to comply with its obligations under FAR 52.212-5(d). Nothing herein limits the Government's audit rights, if available and required by law, as set forth in FAR 52.212-5(d).

**ARTICLE 12 - CHANGES AND CLAIMS**

12.1 Changes in the terms and conditions of this Agreement may be made only by written agreement of the parties.

**ARTICLE 13 - WARRANTY AND GUARANTEE**

13.1 **Responsibility of the Subcontractor; Services:** The Subcontractor shall be responsible for the professional quality, technical accuracy, and the coordination of all Services furnished by the Subcontractor under this Agreement. Accordingly, the parties agree to the following:

13.1.1 Except as expressly stated otherwise in Sections 8.5 and 13.1.2, as Company's sole remedy and Subcontractor's sole obligation in the event the Results do not conform to the Specifications, the Subcontractor shall, without additional compensation, correct, or revise any errors or deficiencies ("**Defects**") in the Results, which are discovered within [***] of the date the Results are delivered (on a Results-by-Results basis).

13.1.2 Company shall provide written notice of Defects in the Results within [***] of discovering such Defects. If after receipt of such written notice Subcontractor has not corrected the Defects in a timely manner, the Company may cause such Defects to be corrected and charge Subcontractor the actual costs incurred by Company to correct such Defects and Subcontractor shall reimburse Company within [***] of receipt of invoice for such actual costs.

13.2 **Responsibility of Subcontractor; Equipment and Supplies:** Subcontractor warrants that the Results delivered or furnished under this Agreement shall conform to the Specifications (defined in Appendix B). EXCEPT AS EXPRESSLY SET FORTH IN THIS SECTION 13 THE RESULTS ARE PROVIDED TO CUSTOMER ON AN "AS IS" BASIS, AND ILLUMINA, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EXPRESSLY DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED.

13.3 **Warranties Run to Company and Client:** Subcontractor's warranties together with any Services warranties shall run to the Company and the Client. Subcontractor warrants and agrees that any supplier/subcontractor warranty provided with the Results shall flow to Company and Client.

**ARTICLE 14 - SUSPENSION AND TERMINATION**

14.1 **Suspension of Work:** Subcontractor will, upon written notice from Company's Subcontract Administrator, suspend, delay, or interrupt all or a part of the performance of the Services under a Purchase Order to the extent directed by Company. In such event, Subcontractor will resume work upon the suspended activities only upon written notice from Company's Subcontract Administrator that is provided to Subcontractor's Administrator. Where appropriate, an extension of the time for performance and pricing will be negotiated by the parties. Notwithstanding the foregoing, once Subcontractor has begun preparing a Sample for sequencing, that Sample may not be suspended. Subcontractor must provide supporting documentation regarding Samples that Subcontractor identifies as being not subject to suspension.

14.2 **Termination:**

14.2.1 **Termination for Convenience:** All or part of this Agreement and/or any individual Purchase Orders may be terminated by Company for its convenience in the event the Client terminates the Client Contract (or the part of the Client Contract that affects the individual Purchase Order(s) that Company is terminating hereunder) for Client's convenience. In the event the Company terminates the Agreement, or one or more Purchase Orders after Subcontractor has begun preparing a Sample for sequencing, the Company will be charged a cancellation fee equal to the costs reasonably incurred by Illumina up to that point and for which payment has not been received, including but not limited to Illumina's then current list price of all materials used or produced, including, without limitation, flow cells and reagents. In no event shall Subcontractor's cancellation fee exceed the amount it would have received for sequencing of each Sample terminated.

14.2.2 **Termination for Default:**

(1) Company shall make a commercially reasonable effort to keep Subcontractor informed of any complaints or concerns regarding the Services that Company is providing to the Client. Company shall make a commercially reasonable effort to provide Subcontractor notice of any Client complaints or concerns that could be related to the Services Subcontractor provides to Company. Further, the parties will work together in good-faith and jointly negotiate with the Client so as to avoid the Client finding Company in default under any terms and conditions of the Client Contract that may result from Subcontractor's actual or alleged default under any terms and conditions of this Agreement.

(2) Company and Subcontractor may, by written notice to the other, terminate the whole or any part of the Agreement for default in the event that the other party (i) materially fails to perform any of the provisions of this Agreement, or (ii) materially fails to make progress so as to endanger performance of the Agreement in accordance with its terms, or, (iii) in the reasonable opinion of the party giving notice of default, becomes financially or legally incapable of completing the work and does not provide a plan of correction or recovery that is reasonably acceptable to the other party within a period of [***] after receipt of written notice from the party specifying such failure.

(3) In the event of termination of the entire Agreement by Subcontractor for Company's default pursuant to Section 14.2.2(2), Subcontractor will be entitled to a cancellation fee equal to the costs reasonably incurred by Illumina up to that point and for which payment has not been received, including but not limited to Illumina's then current list price of all materials used or produced, including, without limitation, flow cells and reagents. In no event shall Subcontractor's cancellation fee exceed the amount it would have received for sequencing of each Sample terminated, but not until completion of the project and the assessment of all costs associated with its completion.

(4) Cost of Cover. In the event Company terminates for a default by Subcontractor under this Section 14.2.2, the Company may acquire similar services by subcontract in order to complete the work, complete the work itself, or otherwise complete the work in any other reasonable manner. Illumina will reimburse Company for the difference between the actual costs incurred by Company in completing the work that was not completed by Subcontractor, as a direct result of Subcontractor's default, during the remainder of the term of the applicable Purchase Order(s) and the amount Subcontractor would have charged Company had it completed such work (the "**Cost of Cover**"). Company shall invoice Illumina for such Cost of Cover amount within [***] of the effective date of termination and Illumina shall pay such invoice within [***] of its receipt.

(5) Client Damages. In the event Company terminates for a default by Subcontractor under this Section 14.2.2 and such default by Subcontractor directly results in the Company being in material default of the Client Contract and such material default by Company directly results in the Client either terminating the Client Contract or otherwise exercising Client's rights under the Client Contract against Company with respect to such material default by Company, Subcontractor agrees to be liable to the Company to the same extent that Company is liable to the Client. Accordingly, if Client is legally entitled to recover damages or reimbursements from Company pursuant to the terms of the Client Contract for such material default ("**Default Damages**") then Subcontractor shall reimburse Company for 100% of any Default Damages that Company actually pays to Client.

(6) Exclusive and Non-Cumulative Remedies. Paragraphs (4) and (5) of this Section 14.2.2 are Company's only remedies available in the event of termination of all or part of this Agreement due to Subcontractor's default. Further, Company is only entitled to elect one of the remedies.

For clarity, Company must choose the remedy available under paragraph (4) or paragraph (5), but not both paragraphs.

(7) If, after notice of termination for default, it is determined for any reason that Subcontractor was not in default or that the default was excusable, the rights and obligations of the parties will be the same as if the notice of termination had been issued pursuant to termination for convenience.

**ARTICLE 15 - MISCELLANEOUS PROVISIONS**

15.1 **Subcontract:** The Subcontractor shall not further subcontract any Services to be performed under this Agreement without prior written authorization from the Company. Neither this Agreement nor any lower tier Subcontract will create any contractual relationship between any lower tier Subcontractor and Client or Company, nor any liability of Client or Company to any lower tier Subcontractor.

15.2 **Assignment:** The Subcontractor and Company shall not transfer, assign or hypothecate its interest in this Agreement without the written consent of the other, which shall not be unreasonably withheld. However, no consent shall be required for any assignment in connection with any merger, acquisition or the sale of all or substantially all of the stock or assets of either party to a party that agrees in writing to be bound by the terms and conditions of this Agreement; provided that, Company may not assign this Agreement to any party that, in Subcontractor's reasonable judgment, is a competitor of Subcontractor. Any attempted transfer, assignment, or hypothecation without such written consent shall be void and confer no rights upon any third person and shall constitute a default hereunder.

15.3 **Third Party Liability:** This Agreement does not create any rights or benefits to parties other than Company and the Subcontractor. No third party beneficiaries are intended by this Agreement.

15.4 **Rights and Remedies:**

15.4.1 No failures of or delay by the Company or Subcontractor in the exercise of any right under this Agreement shall constitute a waiver thereof, nor shall any single or partial exercise of any such right preclude other or further exercise thereof or of any other such right. The waiver by the Company or Subcontractor of any breach of any provision of this Agreement shall not be deemed to be a waiver of any subsequent breach or of any other provision of this Agreement.

15.4.2 Neither the Company's nor the Client's review, approval, nor payment for, any of the services required under this Agreement shall be construed to have operated as a waiver of any rights arising under this Agreement or of any cause of action arising out of the performance of this Agreement.

15.4.3 The rights and remedies of the Company and the Subcontractor provided for under this Agreement are in addition to any other rights and remedies provided by law, unless expressly stated otherwise in this Agreement.

15.5 **Dispute Resolution:** During the pendency of any controversy or claim hereunder, the Subcontractor shall proceed diligently with the performance of the Subcontract and in accordance with the direction of the Company. The preceding does not apply to Company's payment obligations to Subcontractor or any remedies available to Illumina as a result of Company's undisputed breach.

15.6 **Priority Rating:**

[INTENTIONALLY OMITTED AND RESERVED.]

15.7 **Applicable Law:** In the performance of the work provided by this Agreement, the Subcontractor and Company shall comply with all applicable Federal, State and local laws, rules, ordinances, codes, and regulations (collectively "**Laws**") that are applicable to the subject matter of, and source of funding for (but only to the extent the laws applicable to the source of funding require that such Laws be imposed on the

Subcontractor), this Agreement. This Agreement is shall be construed, interpreted and applied in accordance with the laws of the State of California (without reference to conflicts of laws provisions). Subcontractor agrees to release, defend, indemnify and hold Company harmless against any and all liability or loss which may arise in connection with any failure to comply with applicable law, regulations and rules as outlined above.

15.8 **Entire Agreement, Modifications, Headings, Severability:** The parties acknowledge that this Agreement constitutes the entire Agreement between them and supersedes all prior representations, warranties, agreements, and understandings oral or written between the parties with respect to its subject matter. Unless stated otherwise in this Agreement, this Agreement may not be modified except in writing signed by both parties. The headings to this Agreement are for convenience and reference purposes only and shall not constitute a part of the Agreement. If any element of this Agreement is later held to violate the law or a regulation, that element shall be deemed void, and all remaining provisions shall continue in force.

**ARTICLE 16 - EXPORT COMPLIANCE**

16.1 This Article 16 applies where this Agreement involves any export to a non-U.S. country, to a foreign person within the U.S. or from one non-U.S. country to another.

16.2 Subcontractor and Company will conduct its business operations in accordance with all applicable U.S. and foreign laws, ordinances, codes and regulations. Subcontractor shall comply with all applicable export laws, restrictions and regulations of any United States, European Union or other foreign agency or authority and agrees not to import, export or re-export, or allow the import, export or re-export of, any product, technology or information it obtains or learns pursuant to this Agreement (or any direct product thereof) in violation of any such laws, restrictions or regulations.

**Company and Subcontractor confirm reading this document in full and confirm that they understand the terms of this Agreement. Company and Subcontractor freely enter into this Agreement. The Agreement becomes effective on the latest date of execution indicated below.**

**SUBCONTRACTOR:**
**Illumina, Inc.**

By: /s/ Mark Van Oene
Title: Sr. Vice President & General Mgr.
Date: 1/25/18

**COMPANY:**
**Personalis, Inc.**

By: /s/ Carol Tillis
Title: VP Finance & Administration
Date: 1/25/18

**APPENDIX A – CUSTOMER FLOWDOWN CLAUSES**

All costs associated with the obligations set forth herein shall be the responsibility of the subcontractor unless expressly stated otherwise in an SOW.

**SECTION I – CONTRACT SECURITY**

**This Section I (Contract Security) and its applicability shall be interpreted based upon the following:**

The VA has clarified that: (i) a System of Records is not being designed, developed, or operated under the Contract, (ii) Subcontractor will not have logical (technical) or physical access to any VA Information System, (iii) Subcontractor is not designing, developing, or operating a VA Information System, and (iv) DNA samples proved by the VA under the Contract are not themselves considered by the VA to be VA Sensitive Information.

With respect to Section A.3(b) of this Section 1 (Contract Security), relating to co-mingling of data, (i) VA and Subcontractor are under the understanding that Subcontractor's production and data management process does not represent co-mingling of data as defined by the section, and (ii) VA and Subcontractor have established that Subcontractor's data segregation and separation practices are adequate since (a) the data for each DNA sample is located in a folder structure unique to that DNA sample, (b) no data from other DNA samples of other customers of Subcontractor reside in the same folder, and (c) the data for each DNA sample is 100% tracked by a dedicated database that associates each DNA sample with its project.

**A. VA INFORMATION AND INFORMATION SYSTEM SECURITY/PRIVACY**

1. GENERAL

Contractors, contractor personnel, subcontractors, and subcontractor personnel shall be subject to the same Federal laws, regulations, standards, and VA Directives and Handbooks as VA and VA personnel regarding information and information system security.

2. ACCESS TO VA INFORMATION AND VA INFORMATION SYSTEMS

a. A contractor/subcontractor shall request logical (technical) or physical access to VA information and VA information systems for their employees, subcontractors, and affiliates only to the extent necessary to perform the services specified in the contract, agreement, or task order.

b. All contractors, subcontractors, and third-party servicers and associates working with VA information are subject to the same investigative requirements as those of VA appointees or employees who have access to the same types of information. The level and process of background security investigations for contractors must be in accordance with VA Directive and Handbook 0710, Personnel Suitability and Security Program. The Office for Operations, Security, and Preparedness is responsible for these policies and procedures.

c. Contract personnel who require access to national security programs must have a valid security clearance. National Industrial Security Program (NISP) was established by Executive Order 12829 to ensure that cleared U.S. defense industry contract personnel safeguard the classified information in their possession while performing work on contracts, programs, bids, or research and development efforts. The Department of Veterans Affairs does not have a Memorandum of Agreement with Defense Security Service (DSS). Verification of a Security Clearance must be processed through the Special Security Officer located in the Planning and National Security Service within the Office of Operations, Security, and Preparedness.

d. Custom software development and outsourced operations must be located in the U.S. to the maximum extent practical. If such services are proposed to be performed abroad and are not disallowed by other VA policy or mandates, the contractor/subcontractor must state where all non-U.S. services are provided and detail a security plan, deemed to be acceptable by VA, specifically to address mitigation of the resulting problems of communication, control, data protection, and so forth. Location within the U.S. may be an evaluation factor.

e. The contractor or subcontractor must notify the Contracting Officer immediately when an employee working on a VA system or with access to VA information is reassigned or leaves the contractor or subcontractor's employ. The Contracting Officer must also be notified immediately by the contractor or subcontractor prior to an unfriendly termination.

3. VA INFORMATION CUSTODIAL LANGUAGE

a. Information made available to the contractor or subcontractor by VA for the performance or administration of this contract or information developed by the contractor/subcontractor in performance or administration of the contract shall be used only for those purposes and shall not be used in any other way without the prior written agreement of the VA. This clause expressly limits the contractor/subcontractor's rights to use data as described in Rights in Data - General, FAR 52.227-14(d) (1).

b. VA information should not be co-mingled, if possible, with any other data on the contractors/ subcontractor's information systems or media storage systems in order to ensure VA requirements related to data protection and media sanitization can be met. If co-mingling must be allowed to meet the requirements of the business need, the contractor must ensure that VA's information is returned to the VA or destroyed in accordance with VA's sanitization requirements. VA reserves the right to conduct on site inspections of contractor and subcontractor IT resources to ensure data security controls, separation of data and job duties, and destruction/media sanitization procedures are in compliance with VA directive requirements.

c. Prior to termination or completion of this contract, contractor/subcontractor must not destroy information received from VA, or gathered/created by the contractor in the course of performing this contract without prior written approval by the VA. Any data destruction done on behalf of VA by a contractor/ subcontractor must be done in accordance with National Archives and Records Administration (NARA) requirements as outlined in VA Directive 6300, Records and Information Management and its Handbook 6300.1 Records Management Procedures, applicable VA Records Control Schedules, and VA Handbook 6500.1, Electronic Media Sanitization. Self-certification by the subcontractor that the data destruction requirements above have been met must be sent to the VA Contracting Officer within 30 days of termination of the contract.

d. The contractor/subcontractor must receive, gather, store, back up, maintain, use, disclose and dispose of VA information only in compliance with the terms of the contract and applicable Federal and VA information confidentiality and security laws, regulations and policies. If Federal or VA information confidentiality and security laws, regulations and policies become applicable to the VA information or information systems after execution of the contract, or if NIST issues or updates applicable FIPS or Special Publications (SP) after execution of this contract, the parties agree to negotiate in good faith to implement the information confidentiality and security laws, regulations and policies in this contract.

e. The contractor/subcontractor shall not make copies of VA information except as authorized and necessary to perform the terms of the agreement or to preserve electronic information stored on contractor/subcontractor electronic storage media for restoration in case any electronic equipment or data used by the contractor/subcontractor needs to be restored to an operating state. If copies are made for restoration purposes, after the restoration is complete, the copies must be appropriately destroyed.

f. If VA determines that the contractor has violated any of the information confidentiality, privacy, and security provisions of the contract, it shall be sufficient grounds for VA to withhold payment to the contractor or third party or terminate the contract for default or terminate for cause under Federal Acquisition Regulation (FAR) part 12.

g. If a VHA contract is terminated for cause, the associated BAA must also be terminated and appropriate actions taken in accordance with VHA Handbook 1600.01, Business Associate Agreements. Absent an agreement to use or disclose protected health information, there is no business associate relationship.

h. The contractor/subcontractor must store, transport, or transmit VA sensitive information in an encrypted form, using VA-approved encryption tools that are, at a minimum, FIPS 140-2 validated.

i. The contractor/subcontractor's firewall and Web services security controls, if applicable, shall meet or exceed VA's minimum requirements. VA Configuration Guidelines are available upon request.

j. Except for uses and disclosures of VA information authorized by this contract for performance of the contract, the contractor/subcontractor may use and disclose VA information only in two other situations: (i) in response to a qualifying order of a court of competent jurisdiction, or (ii) with VA's prior written approval. The contractor/subcontractor must refer all requests for, demands for production of, or inquiries about, VA information and information systems to the VA contracting officer for response.

k. Notwithstanding the provision above, the contractor/subcontractor shall not release VA records protected by Title 38 U.S.C. 5705, confidentiality of medical quality assurance records and/or Title 38 U.S.C. 7332, confidentiality of certain health records pertaining to drug addiction, sickle cell anemia, alcoholism or alcohol abuse, or infection with human immunodeficiency virus. If the contractor/subcontractor is in receipt of a court order or other requests for the above mentioned information, that contractor/subcontractor shall immediately refer such court orders or other requests to the VA contracting officer for response.

I. For service that involves the storage, generating, transmitting, or exchanging of VA sensitive information but does not require C&A or an MOU-ISA for system interconnection, the contractor/subcontractor must complete a Contractor Security Control Assessment (CSCA) on a yearly basis and provide it to the COR.

4. INFORMATION SYSTEM DESIGN AND DEVELOPMENT

SECTION 4 REMOVED

5. INFORMATION SYSTEM HOSTING, OPERATION, MAINTENANCE, OR USE

SECTION 5 REMOVED

6. SECURITY INCIDENT INVESTIGATION

a. The term "security incident" means an event that has, or could have, resulted in unauthorized access to, loss or damage to VA assets, or sensitive information, or an action that breaches VA security procedures. The contractor/subcontractor shall immediately notify the COR and simultaneously, the designated ISO and Privacy Officer for the contract of any known or suspected security/privacy incidents, or any unauthorized disclosure of sensitive information, including that contained in system(s) to which the contractor/subcontractor has access.

b. To the extent known by the contractor/subcontractor, the contractor/subcontractor's notice to VA shall identify the information involved, the circumstances surrounding the incident (including to whom, how, when, and where the VA information or assets were placed at risk or compromised), and any other information that the contractor/subcontractor considers relevant.

c. With respect to unsecured protected health information, the business associate is deemed to have discovered a data breach when the business associate knew or should have known of a breach of such information. Upon discovery, the business associate must notify the covered entity of the breach. Notifications need to be made in accordance with the executed business associate agreement.

d. In instances of theft or break-in or other criminal activity, the contractor/subcontractor must concurrently report the incident to the appropriate law enforcement entity (or entities) of jurisdiction, including the VA OIG and Security and Law Enforcement. The contractor, its employees, and its subcontractors and their employees shall cooperate with VA and any law enforcement authority responsible for the investigation and prosecution of any possible criminal law violation(s) associated with any incident. The contractor/subcontractor shall cooperate with VA in any civil litigation to recover VA information, obtain monetary or other compensation from a third party for damages arising from any incident, or obtain injunctive relief against any third party arising from, or related to, the incident.

7. LIQUIDATED DAMAGES FOR DATA BREACH

a. Consistent with the requirements of 38 U.S.C. §5725, a contract may require access to sensitive personal information. If so, the contractor is liable to VA for liquidated damages in the event of a data breach or privacy incident involving any SP1the contractor/subcontractor processes or maintains under this contract.

b. The contractor/subcontractor shall provide notice to VA of a “security incident” as set forth in the Security Incident Investigation section above. Upon such notification, VA must secure from a non-Department entity or the VA Office of Inspector General an independent risk analysis of the data breach to determine the level of risk associated with the data breach for the potential misuse of any sensitive personal information involved in the data breach. The term ‘data breach’ means the loss, theft, or other unauthorized access, or any access other than that incidental to the scope of employment, to data containing sensitive personal information, in electronic or printed form, that results in the potential compromise of the confidentiality or integrity of the data. Contractor shall fully cooperate with the entity performing the risk analysis. Failure to cooperate may be deemed a material breach and grounds for contract termination.

c. Each risk analysis shall address all relevant information concerning the data breach, including the following:

(1) Nature of the event (loss, theft, unauthorized access);

(2) Description of the event, including:

(a) date of occurrence;

(b) data elements involved, including any PII, such as full name, social security number, date of birth, home address, account number, disability code;

(3) Number of individuals affected or potentially affected;

(4) Names of individuals or groups affected or potentially affected;

(5) Ease of logical data access to the lost, stolen or improperly accessed data in light of the degree of protection for the data, e.g., unencrypted, plain text;

(6) Amount of time the data has been out of VA control;

(7) The likelihood that the sensitive personal information will or has been compromised (made accessible to and usable by unauthorized persons);

(8) Known misuses of data containing sensitive personal information, if any;

(9) Assessment of the potential harm to the affected individuals;

(10) Data breach analysis as outlined in 6500.2 Handbook, Management of Security and Privacy Incidents, as appropriate; and

(11) Whether credit protection services may assist record subjects in avoiding or mitigating the results of identity theft based on the sensitive personal information that may have been compromised.

d. Based on the determinations of the independent risk analysis, the contractor shall be responsible for paying to the VA liquidated damages in the amount of $37.50 per affected individual to cover the cost of providing credit protection services to affected individuals consisting of the following:

(1) Notification;

(2) One year of credit monitoring services consisting of automatic daily monitoring of at least 3 relevant credit bureau reports;

(3) Data breach analysis;

(4) Fraud resolution services, including writing dispute letters, initiating fraud alerts and credit freezes, to assist affected individuals to bring matters to resolution;

(5) One year of identity theft insurance with $20,000.00 coverage at $0 deductible; and

(6) Necessary legal expenses the subjects may incur to repair falsified or damaged credit records, histories, or financial affairs.

8. SECURITY CONTROLS COMPLIANCE TESTING

On a periodic basis, VA, including the Office of Inspector General, reserves the right to evaluate any or all of the security controls and privacy practices implemented by the contractor under the clauses contained within the contract. With 10 working-days' notice, at the request of the government, the contractor must fully cooperate and assist in a government-sponsored security controls assessment at each location wherein VA information is processed or stored, or information systems are developed, operated, maintained, or used on behalf of VA, including those initiated by the Office of Inspector General. The government may conduct a security control assessment on shorter notice (to include unannounced assessments) as determined by VA in the event of a security incident or at any other time.

9. TRAINING

a. All contractor employees and subcontractor employees requiring access to VA information and VA information systems shall complete the following before being granted access to VA information and its systems:

(1) Sign and acknowledge (either manually or electronically) understanding of and responsibilities for compliance with the Contractor Rules of Behavior, Appendix E relating to access to VA information and information systems;

(2) Successfully complete the VA Cyber Security Awareness and Rules of Behavior training and annually complete required security training;

(3) Successfully complete the appropriate VA privacy training and annually complete required privacy training; and

(4) Successfully complete any additional cyber security or privacy training, as required for VA personnel with equivalent information system access [to be defined by the VA program official and provided to the contracting officer for inclusion in the solicitation document – e.g., any role-based information security training required in accordance with NIST Special Publication 800-16, Information Technology Security Training Requirements.]

b. The subcontractor shall provide to the contracting officer and/or the COR a copy of the training certificates and certification of signing the Contractor Rules of Behavior for each applicable employee within 1 week of the initiation of the contract and annually thereafter, as required.

c. Failure to complete the mandatory annual training and sign the Rules of Behavior annually, within the timeframe required, is grounds for suspension or termination of all physical or electronic access privileges and removal from work on the contract until such time as the training and documents are complete.

CONTRACTOR RULES OF BEHAVIOR

This User Agreement contains rights and authorizations regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with the Department of Veterans Affairs (VA). This User Agreement covers my access to all VA data whether electronic or hard copy (“Data”), VA information systems and resources (“Systems”), and VA sites (“Sites”). This User Agreement incorporates Rules of Behavior for using VA, and other information systems and resources under the contract.

1. GENERAL TERMS AND CONDITIONS FOR ALL ACTIONS AND ACTIVITIES UNDER THE CONTRACT:

a. I understand and agree that I have no reasonable expectation of privacy in accessing or using any VA, or other Federal Government information systems.

b. I consent to reviews and actions by the Office of Information & Technology (OI&T) staff designated and authorized by the VA Chief Information Officer (CIO) and to the VA OIG regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with the VA. These actions may include monitoring, recording, copying, inspecting, restricting access, blocking, tracking, and disclosing to all authorized Ol&T, VA, and law enforcement personnel as directed by the VA CIO without my prior consent or notification.

c. I consent to reviews and actions by authorized VA systems administrators and Information Security Officers solely for protection of the VA infrastructure, including, but

not limited to monitoring, recording, auditing, inspecting, investigating, restricting access, blocking, tracking, disclosing to authorized personnel, or any other authorized actions by all authorized Ol&T, VA, and law enforcement personnel.

d. I understand and accept that unauthorized attempts or acts to access, upload, change, or delete information on Federal Government systems; modify Federal government systems; deny access to Federal government systems; accrue resources for unauthorized use on Federal government systems; or otherwise misuse Federal government systems or resources are prohibited.

e. I understand that such unauthorized attempts or acts are subject to action that may result in criminal, civil, or administrative penalties. This includes penalties for violations of Federal laws including, but not limited to, 18 U.S.C. §1030 (fraud and related activity in connection with computers) and 18 U.S.C. §2701 (unlawful access to stored communications).

f. I agree that Ol&T staff, in the course of obtaining access to information or systems on my behalf for performance under the contract, may provide information about me including, but not limited to, appropriate unique personal identifiers such as date of birth and social security number to other system administrators, Information Security Officers (ISOs), or other authorized staff without further notifying me or obtaining additional written or verbal permission from me.

g. I understand I must comply with VA's security and data privacy directives and handbooks. I understand that copies of those directives and handbooks can be obtained from the Contracting Officer's Technical Representative (COR). If the contractor believes the policies and guidance provided by the COR is a material unilateral change to the contract, the contractor must elevate such concerns to the Contracting Officer for resolution.

h. I will report suspected or identified information security/privacy incidents to the COR and to the local ISO or Privacy Officer as appropriate.

2. GENERAL RULES OF BEHAVIOR

a. Rules of Behavior are part of a comprehensive program to provide complete information security. These rules establish standards of behavior in recognition of the fact that knowledgeable users are the foundation of a successful security program. Users must understand that taking personal responsibility for the security of their computer and the information it contains is an essential part of their job.

b. The following rules apply to all VA contractors. I agree to:

(1) Follow established procedures for requesting, accessing, and closing user accounts and access. I will not request or obtain access beyond what is normally granted to users or by what is outlined in the contract.

(2) Use only systems, software, databases, and data which I am authorized to use, including any copyright restrictions.

(3) I will not use other equipment (OE) (non-contractor owned) for the storage, transfer, or processing of VA sensitive information without a VA CIO approved waiver, unless it has been reviewed and approved by local management and is included in the language of the contract. If authorized to use OE IT equipment, I must ensure that the system meets all applicable 6500 Handbook requirements for OE.

(4) Not use my position of trust and access rights to exploit system controls or access information for any reason other than in the performance of the contract.

(5) Not attempt to override or disable security, technical, or management controls unless expressly permitted to do so as an explicit requirement under the contract or at the direction of the COR or ISO. If I am allowed or required to have a local administrator account on a government-owned computer, that local administrative account does not confer me unrestricted access or use, nor the authority to bypass security or other controls except as expressly permitted by the VA CIO or CIO's designee.

(6) Contractors' use of systems, information, or sites is strictly limited to fulfill the terms of the contract. I understand no personal use is authorized. I will only use other Federal government information systems as expressly authorized by the terms of those systems. I accept that the restrictions under ethics regulations and criminal law still apply.

(7) Grant access to systems and information only to those who have an official need to know.

(8) Protect passwords from access by other individuals.

(9) Create and change passwords in accordance with VA Handbook 6500 on systems and any devices protecting VA information as well as the rules of behavior and security settings for the particular system in question.

(10) Protect information and systems from unauthorized disclosure, use, modification, or destruction. I will only use encryption that is FIPS 140-2 validated to safeguard VA sensitive information, both safeguarding VA sensitive information in storage and in transit regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with the VA.

(11) Follow VA Handbook 6500.1, Electronic Media Sanitization to protect VA information. I will contact the COR for policies and guidance on complying with this requirement and will follow the COR's orders.

(12) Ensure that the COR has previously approved VA information for public dissemination, including e-mail communications outside of the VA as appropriate. I will not make any unauthorized disclosure of any VA sensitive information through the use of any means of communication including but not limited to e-mail, instant messaging, online chat, and web bulletin boards or logs.

(13) Not host, set up, administer, or run an Internet server related to my access to and use of any information assets or resources associated with my performance of services under the contract terms with the VA unless explicitly authorized under the contract or in writing by the COR.

(14) Protect government property from theft, destruction, or misuse. I will follow VA directives and handbooks on handling Federal government IT equipment, information, and systems. I will not take VA sensitive information from the workplace without authorization from the COR.

(15) Only use anti-virus software, antispyware, and firewall/intrusion detection software authorized by VA. I will contact the COR for policies and guidance on complying with this requirement and will follow the COR's orders regarding my access to and use of any information assets or resources associated with my performance of services under the contract terms with VA.

(16) Not disable or degrade the standard anti-virus software, antispyware, and/or firewall/intrusion detection software on the computer I use to access and use information assets or resources associated with my performance of services under the contract terms

with VA. I will report anti-virus, antispyware, firewall or intrusion detection software errors, or significant alert messages to the COR.

(17) Understand that restoration of service of any VA system is a concern of all users of the system.

(18) Complete required information security and privacy training, and complete required training for the particular systems to which I require access.

3. ADDITIONAL CONDITIONS FOR USE OF NON- VA INFORMATION TECHNOLOGY RESOURCES

a. When required to complete work under the contract, I will directly connect to the VA network whenever possible. If a direct connection to the VA network is not possible, then I will use VA approved remote access software and services.

b. Remote access to non-public VA information technology resources is prohibited from publicly-available IT computers, such as remotely connecting to the internal VA network from computers in a public library.

c. I will not have both a VA network line and any kind of non-VA network line including a wireless network card, modem with phone line, or other network device physically connected to my computer at the same time, unless the dual connection is explicitly authorized by the COR.

d. I understand that I may not obviate or evade my responsibility to adhere to VA security requirements by subcontracting any work under any given contract or agreement with VA, and that any subcontractor(s) I engage shall likewise be bound by the same security requirements and penalties for violating the same.

4. STATEMENT ON LITIGATION

This User Agreement does not and should not be relied upon to create any other right or benefit, substantive or procedural, enforceable by law, by a party to litigation with the United States Government.

5. ACKNOWLEDGEMENT AND ACCEPTANCE

I acknowledge receipt of this User Agreement. I understand and accept all terms and conditions of this User Agreement, and I will comply with the terms and conditions of this agreement and any additional VA warning banners, directives, handbooks, notices, or directions regarding access to or use of information systems or information. The terms and conditions of this document do not supersede the terms and conditions of the signatory's employer and VA.

Print or type your full name

Signature

Last 4 digits of SSN

Date

Office Phone

Position Title

Contractor's Company Name

Please complete and return the original signed document to the COR within the timeframe stated in the terms of the contract.

CONTRACTOR AND SUBCONTRACTOR PERSONNEL SECURITY REQUIREMENTS:

As stated above, all costs associated with the obligations set forth herein shall be the responsibility of the subcontractor unless expressly stated otherwise in a task order. To the extent that contractor incurs expense on behalf of subcontractor under this section, contractor may retain the amounts for the expenses incurred from payments due to subcontractor or, at contractor's option, may invoice subcontractor for these expenses.

**SECTION II – CONFIDENTIALITY AND NON-DISCLOSURE**

All samples and data provided by the Government and all data first produced or delivered during this contract is the sole property of the VA. The subcontractor recognizes that in the performance of this subcontract it may receive or have access to sensitive or confidential information, including personal information of VA employees and information proprietary in nature by system contractors, equipment manufacturers and other private or public entities. The subcontractor shall restrict access to sensitive or confidential information to the minimum number of employees necessary for subcontract performance.

The subcontractor shall indoctrinate its employees and all lower-tier subcontractor employees working on this subcontract on the laws, rules and regulations governing access to sensitive and/or confidential information. All persons concerned shall understand that unauthorized access to or use of sensitive or confidential information related to this subcontract shall result in immediate termination of the individual or individuals from the subcontract and be subject to legal prosecution to the fullest extent of the law.

The contractor is required to conduct an appropriate background investigation on all of its employees and subcontractor employees working on this contract and who require access to government computer systems.

**SECTION III – ADDITIONAL FLOWDOWN CLAUSES**

The clauses from the prime contract have been modified by contractor to reflect the contractual relationship between the contractor and subcontractor and to reflect the applicable obligations.

**52.204-10 REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS (OCT 2016)** Subcontractor shall provide the information required for contractor to submit the information required under (d)(2) of this clause and will provide information required under (d)(3) if the circumstances in (d)(3)(i) and (ii) are applicable.

**52.203-99 PROHIBITION ON CONTRACTING WITH ENTITIES THAT REQUIRE CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS (DEVIATION) (FEB 2015)**

(a) The subcontractor shall not require employees or subcontractors seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or subcontractors from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(b) The subcontractor shall notify employees that the prohibitions and restrictions of any internal confidentiality agreements covered by this clause are no longer in effect.

(c) The prohibition in paragraph (a) of this clause does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(d)(1) In accordance with section 743 of Division E, Title VII, of the Consolidated and Further Continuing Resolution Appropriations Act, 2015 (Pub. L. 113-235), use of funds appropriated (or otherwise made available) under that or any other Act may be prohibited, if the Government determines that the Contractor is not in compliance with the provisions of this clause.

(2) The Government may seek any available remedies in the event the contractor fails to comply with the provisions of this clause.

(End of Clause)

**52.216-19 ORDER LIMITATIONS (OCT 1995)**

(a) Minimum order. When the contractor requires supplies or services covered by this contract in an amount of less than 1 each, the contractor is not obligated to purchase, nor is the subcontractor obligated to furnish, those supplies or services under the contract.

(b) Maximum order. The subcontractor is not obligated to honor—

(1) Any order for a single item in excess of 500 each per month;

(2) Any order for a combination of items in excess of 500 each per month; or

(3) A series of orders from the same ordering office within 30 days that together call for quantities exceeding the limitation in paragraph (b)(1) or (2) of this section.

(c) RESERVED

(d) Notwithstanding paragraphs (b) and (c) of this section, the subcontractor shall honor any order exceeding the maximum order limitations in paragraph (b), unless that order (or orders) is returned to the contractor within 2 days after issuance, with written notice stating the subcontractor's intent not to ship the item (or items) called for and the reasons. Upon receiving this notice, the contractor or the Government may acquire the supplies or services from another source.
(End of Clause)

**52.217-9 OPTION TO EXTEND THE TERM OF THE CONTRACT (MAR 2000)**

(a) The contractor may extend the term of this subcontract by written notice to the subcontractor within 45 days, which must be mutually approved by both parties.

(b) If the contractor exercises this option, the extended subcontract shall be considered to include this option clause.

(c) The total duration of this subcontract, including the exercise of any options under this clause, shall not exceed five (5) years.
(End of Clause)

**VAAR 852.203-70 COMMERCIAL ADVERTISING (JAN 2008)**

The subcontractor agrees that it will not advertise the award of the subcontract in his/her commercial advertising in such a manner as to state or imply that Personalis or the Department of Veterans Affairs endorses a product, project or commercial line of endeavor.

**52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)**

This subcontract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. The full text of a clause may be accessed electronically at this/these address(es): http://www.acquisition.gov/far/index.html
http://www.va.gov/oal/library/vaar/

52.204-9 PERSONAL IDENTITY VERIFICATION OF CONTRACTOR PERSONNEL (JAN 2011) (required only if Subcontractor requires routine physical access to a Federally-controlled facility and/or routine access to a Federally-controlled information system)

52.203-17 CONTRACTOR EMPLOYEE WHISTLEBLOWER RIGHTS AND REQUIREMENT TO INFORM EMPLOYEES OF WHISTLEBLOWER RIGHTS (APR 2014)

52.227-14 RIGHTS IN DATA—GENERAL (MAY 2014)

(This clause is applicable to Subcontractor to the extent that it is applicable to Contractor. Subcontractor shall provide the data and rights therein necessary to fulfill Contractor's prime contract obligations.)

52.227-16 ADDITIONAL DATA REQUIREMENTS (JUN 1987)

(This clause is applicable to Subcontractor to the extent that it is applicable to Contractor. Subcontractor shall provide the data and rights therein necessary to fulfill Contractor's prime contract obligations.)

52.203-13 Contractor Code of Business Ethics and Conduct (OCT 2015) (Pub. L. 110-252, Title VI, Chapter 1 (41 U.S.C. 251 note))

Mandatory written disclosures required by FAR clause 52.203-13 to the Department of Veterans Affairs, Office of Inspector General (OIG) must be made electronically through the VA OIG Hotline at http://www.va.gov/oig/contacts/hotline.asp and clicking on "FAR clause 52.203-13 Reporting." If you experience difficulty accessing the website, call the Hotline at 1-800-488-8244 for further instructions.

52.203-19, Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements (JAN 2017) (section 743 of Division E, Title VII, of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L. 113-235) and its successor provisions in subsequent appropriations acts (and as extended in continuing resolutions)).

52.219-8, Utilization of Small Business Concerns (NOV 2016) (15 U.S.C. 637(d)(2) and (3)), in all subcontracts that offer further subcontracting opportunities.

52.222-17, Nondisplacement of Qualified Workers (MAY 2014) (E.O. 13495). Flow down required in accordance with paragraph (1) of FAR clause 52.222-17.

52.222-21, Prohibition of Segregated Facilities (APR 2015).

52.222-26 Equal Opportunity (SEP 2016) (E.O. 11246)

52.222-35 Equal Opportunity for Veterans (OCT 2015) (38 U.S.C. 4212)

52.222-36 Affirmative Action for Workers with Disabilities (Oct 2010) (29 U.S.C. 793)

52.222-37, Employment Reports on Veterans (FEB 2016) (38 U.S.C. 4212).

52.222-40 Notification of Employee Rights Under the National Labor Relations Act (DEC 2010) (E.O. 13496). Flow down required in accordance with paragraph (1) of FAR clause 52.222-40.

52.222-41 Service Contract Labor Standards (MAY 2014) (41 U.S.C. chapter 67).

52.222-50 Combating Trafficking in Persons (MAR 2015) (22 U.S.C. chapter 78 and E.O. 13627), Alternate I (MAR 2015) of 52.222-50 (22 U.S.C. chapter 78 and E.O. 13627).

52.222-51, Exemption from Application of the Service Contract Labor Standards to Contracts for Maintenance, Calibration, or Repair of Certain Equipment—Requirements (MAY 2014) (41 U.S.C. chapter 67).

52.222-53, Exemption from Application of the Service Contract Labor Standards to Contracts for Certain Services—Requirements (MAY 2014) (41 U.S.C. chapter 67).

52.222-54 Employee Eligibility Verification (OCT 2015) (E. O. 12989).

52.222-55, Minimum Wages Under Executive Order 13658 (DEC 2015).

52.222-59, Compliance with Labor Laws (Executive Order 13673) (OCT 2016) (Applies at $50 million for solicitations and resultant contracts issued from October 25, 2016 through April 24, 2017; applies at $500,000 for solicitations and resultant contracts issued after April 24, 2017).

Note to paragraph (e)(1)(xvii): By a court order issued on October 24, 2016, 52.222-59 is enjoined indefinitely as of the date of the order. The enjoined paragraph will become effective immediately if the court terminates the injunction. At that time, DoD, GSA, and NASA will publish a document in the Federal Register advising the public of the termination of the injunction.

52.222-60, Paycheck Transparency (Executive Order 13673) (OCT 2016)).

52.222-62 Paid Sick Leave Under Executive Order 13706 (JAN 2017) (E.O. 13706).

52.224-3, Privacy Training (JAN 2017) (5 U.S.C. 552a), Alternate I (JAN 2017) of 52.224-3.

52.226-6, Promoting Excess Food Donation to Nonprofit Organizations (MAY 2014) (42 U.S.C. 1792). Flow down required in accordance with paragraph (e) of FAR clause 52.226-6.

52.247-64 Preference for Privately Owned U.S.-Flag Commercial Vessels (Feb 2006) (46 U.S.C. Appx. 1241(b) and 10 U.S.C. 2631). Flow down required in accordance with paragraph (d) of FAR clause 52.247-64.

**52.227-17 RIGHTS IN DATA - SPECIAL WORKS (DEC 2007)**

(a) Definitions. As used in this clause—

“Data” means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to subcontract administration, such as financial, administrative, cost or pricing, or management information. “Unlimited rights” means the rights of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(b) Allocation of Rights.

(1) The Government and contractor shall have—

(i) Unlimited rights in all data delivered under this subcontract, and in all data first produced in the performance of this subcontract, except as provided in paragraph (c) of this clause.

(ii) The right to limit assertion of copyright in data first produced in the performance of this subcontract, and to obtain assignment of copyright in that data, in accordance with paragraph (c)(1) of this clause.

(iii) The right to limit the release and use of certain data in accordance with paragraph (d) of this clause.

(2) The subcontractor shall have, to the extent permission is granted in accordance with paragraph (c)(1) of this clause, the right to assert claim to copyright subsisting in data first produced in the performance of this contract.

(c) Copyright—

(1) Data first produced in the performance of this contract.

(i) The subcontractor shall not assert or authorize others to assert any claim to copyright subsisting in any data first produced in the performance of this subcontract without prior written permission of the Contracting Officer. When copyright is asserted, the subcontractor shall affix the appropriate copyright notice of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including prime contract number) to the data when delivered to the contractor for delivery to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. The subcontractor grants to the Government, contractor and others acting on their behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all delivered data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government or contractor.

(ii) If the Government desires to obtain copyright in data first produced in the performance of this contract and permission has not been granted as set forth in paragraph (c)(1)(i) of this clause, the Contracting Officer (through the contractor) shall direct the subcontractor to assign (with or without registration), or obtain the assignment of, the copyright to the Government or its designated assignee.

(2) Data not first produced in the performance of this contract. The subcontractor shall not, without prior written permission of the Subcontract Administrator, incorporate in data delivered under this contract any data not first produced in the performance of this contract and that contain the copyright notice of 17 U.S.C. 401 or 402, unless the subcontractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in paragraph (c)(1) of this clause.

(d) Release and use restrictions. Except as otherwise specifically provided for in this contract, the subcontractor shall not use, release, reproduce, distribute, or publish any data first produced in the performance of this contract, nor authorize others to do so, without written permission of the Contracting Officer or contractor.

(e) Indemnity. The Contractor shall indemnify the Government and contractor and their officers, agents, and employees acting for them against any liability, including costs and expenses, incurred as the result of the violation of trade secrets, copyrights, or right of privacy or publicity, arising out of the creation, delivery, publication, or use of any data furnished under this subcontract; or any libelous or other unlawful matter contained in such data. The provisions of this paragraph do not apply unless the Government or contractor provides notice to the subcontractor as soon as practicable of any claim or suit, affords the subcontractor an opportunity under applicable laws, rules, or regulations to participate in the defense of the claim or suit, and obtains the subcontractor’s consent to the settlement of any claim or suit other than as required by final decree of a court of competent jurisdiction; and these provisions do not apply to material furnished to the subcontractor by the Government and incorporated in data to which this clause applies.

**Appendix B**
Subcontractor Pricing and Services Description

**I. SUBCONTRACT PRODUCT& PRICING INFORMATION**

| Catalog# | Product Description | [***] | [***] | [***] | [***] | Subtotal (USD) |
|---|---|---|---|---|---|---|
| 20005138 | Infinium®Global Screening Array-24 v1.0 Kit Fasttrack Service :<br>Infinium®Global Screening Array-24 v1.0 Kit (FTS) | [***] | [***] | [***] | [***] | [***] |
| **Subtotal** | | | | | | [***] |
| **Total Maximum Subcontract Price (including shipping and insurance)** | | | | | | **[***]** |

All prices are inclusive of shipping and taxes; provided that, Company is responsible for the costs of shipping the Samples to Subcontractor.

The pricing stated above commencing on the Effective Date of the Agreement and valid through December 31, 2021 or later if the US Department of Veteran Affair Contract # VA240-17-D-0107 is extended.

Subcontractor Qualifications

The Subcontractor shall have the following qualification, capabilities, and be able to document the following:

1. Headquarters and laboratory facilities where work to be conducted in is located within the Continental United States. **No work shall be performed outside of the United States or in any locality outside of the jurisdiction of the laws of the United States.**
2. Ability for Sample tracking and management utilizing bar coding to ensure security & traceability of VA samples.
3. Ability to produce documentation of sample handling and processing attributes/audit trail, etc. that would address sample mixing and sample error tracking.
4. The contractor shall demonstrate that they are certified in Good Laboratory Practice (GLP) and CLIA certification
5. Contractors shall be required to submit for a NACI low level background investigation and security clearance in accordance with the VA IT Security Clause and complete the required training and procedures to comply with these requirements.

**FastTrack Genotyping Services Description and Specifications:**

**1. Samples**. Customer agrees to supply Illumina with a complete and accurate sample manifest in accordance with Section 5 of this Service Description.

If Illumina determines in its sole discretion that any of the Samples do not meet the criteria set forth in this Service Description, Illumina will so inform Customer. At such time, Customer will be provided the option to (a) replace such Samples, or (b) proceed with such Samples as-is. In both (a) and (b), Customer shall pay Illumina full price for the Services to be performed with respect to such Samples, even if no successful Results are obtained for those Samples.

**2. Results**. IIlumina shall deliver to Customer the Results as described below: SNP genotyping calls and scores for the assays performed on each Sample.

**3. Delivery Dates**. The delivery date(s) for the Results will be established at the start of the project, based on the number of Samples and current laboratory queue.

3.1 **Delivery Timeframes:**

3.1.1 The following are minimum time frames for delivery of results:

3.1.2 For Infinium iSelect custom genotyping assays, within 90 days once a purchase order, loci selection and samples have all been received.

3.1.5 For standard genotyping studies using the Infinium assay, within 60 days of receipt of purchase order and samples, whichever occurs last. For studies larger than 1,000 samples, delivery date of the Results will be established at the start of the project, based on the current laboratory queue.

**4. SNP Selection Process**. For any custom assays that are to be developed by Illumina for supply of genotyping data, Customer agrees that, within 14 days of receipt of the purchase order, it will identify for Illumina a set of SNP loci ("Loci") in accordance with the SNP Selection guidelines set forth in Section 5 of in this Service Description. Illumina and Customer must mutually agree upon the final Loci. Illumina will attempt to develop a functional SNP assay for each SNP locus provided by the Customer and agreed upon by Illumina. Upon the delivery of Loci by the Customer to Illumina, the Customer shall identify any of such Loci which are not publicly available.

**5. Sample Requirements**. Illumina's experience shows that Samples conforming to the following requirements are likely to yield excellent genotyping data.

**5.1 SampleManifest**

**5.1.1** To ensure that high quality data is produced, the Customer should submit a manifest of Sample characteristics. Illumina's laboratory uses standard operating procedures, and it is important to identify any variation in Sample preparation as early as possible. For each Sample, provide the gender, parental identification, and replicate sample identification. Please use the following format for the Sample Manifest.

Manifest Columns:

| | |
|---|---|
| DNA-plate barcode (e.g., GS0000777-DNA for GoldenGate, WG0000888-DNA for Infinium)<br>Well position of the Sample (e.g., A05)<br>Customer Sample ID (e.g., GS0000777-DNAAO5_Name) Species of the sample (e.g., Homo sapiens)<br>Gender of the individual (F: female, M: male, U: unknown) Comments<br>Volume in the well (e.g., 40µL). | DNA concentration (50ng/µL or greater) measured by PicoGreen<br>Tissue source (e.g., cell line)<br>Extraction Method (e.g., Phenol/Chloroform)<br>WGA Method (if applicable, e.g., REPLI-g)<br>Mass of DNA used in WGA (if applicable, e.g., 50ng)<br>Mother (e.g., GS000777-DNAA06_Name1)<br>Father (e.g., G5000777-DNAA07_Name2)<br>Replicate(s) (e.g., GS0000777-DNAA08_Name3) |

**Before shipping your Samples to Illumina, please forward a file containing the Sample Manifest to your Illumina contact for review.**

**5.1.2** To retain anonymity of the individuals from whom the Samples originated, Illumina provides barcoded microtiter plates and references the Samples by the plate number and well position. This allows a seamless interface with our robotic processes and the LIMS database. The Samples are placed into the supplied plates, sealed with a silicone cap, frozen, and shipped on dry ice. It is imperative that the DNA remain solidly frozen during shipping to avoid the possibility of cross contamination or degradation.

### 5.2 DNASample Criteria

**5.2.1** DNA should be quantified using a double stranded, DNA specific method such as PicoGreen fluorescence.)

**5.2.2** All DNAs must be at a concentration of 50 ng/µL or greater. The total amount of DNA required is dependent on the number of SNPs to be studied and is defined for each project. A table with typical DNA requirements is provided below.

**5.2.3** DNA must be diluted in 10mM Tris/1mM EDTA.

**5.2.4** A brief description of the DNA extraction protocol(s) should be included.

**5.2.5** As a preliminary test, we ask for a few representative samples. We evaluate these test DNAs for performance quality on the Illumina genotyping platform. These samples are not part of the project and will be destroyed once evaluated.

### 5.3 DNARequirements

| Assay | Project Type | Min. µg per sample | µL per sample |
|---|---|---|---|
| Infinium | Test Samples | 1.75 | 35 |
| Infinium | Standard and iSelect | 1.75 | 35 |

### 5.4 MicrotiterPlate Configuration

**5.4.1** Illumina will provide barcoded, midi plates with corresponding lids.

**5.4.2** Wells A01 and Al2 must remain empty for Illumina DNA controls.

**5.4.3** The lids must be sealed tightly and completely. We suggest the use of devices such as the MJ Research Roller for Microseal Film; catalog number MSR-0001 or the Corning Storage Mat Applicator; catalog number 3081.

**5.4.4** Customer is responsible for maintaining a map of the DNA positions on each microtiter plate. The genotyping data will reference the barcode and well position of each DNA.

**5.4.5** DNA must be solidly frozen prior to packing and shipment, and remain frozen. Plates must be shipped on sufficient dry ice to ensure that the samples remain frozen.

**5.4.6** DNA should be shipped overnight express.

### 5.5 IlluminaSNP Selection and Submission Requirements for Custom Genotyping Projects

#### 5.5.1 Illumina SNP Format Guidelines

Queries for SNP selection can be submitted to obtain designability information. In addition, for human studies, data from the currently supported dbSNP version will be returned. The following input file types are supported:

5.5.1.1 SNP list. Customers can submit SNPs for human studies using the RS identifiers.

5.5.1.2 Gene list. Gene lists (and distance upstream and downstream from the designated gene) can be used as an input to obtain a list of SNPs within the gene region for human studies.

5.5.1.3 Region list. A list of markers that act as “start” and “stop” region identifiers

can be used to query SNPs for human studies. As with the gene list, the distance upstream and downstream (in base pairs) can also be designated in the input format.

5.5.1.4 Sequence List. For human studies and a supported list of species (e.g., mouse, dog, chicken, ...), a list of sequences, chromosomal designations and coordinates can be input. Assays for non- supported species can be designed as well using this submission format. Sequence lists require the use of IUPAC code for any neighboring polymorphisms with the targeted SNP in brackets (e.g., [A/G]) with a minimum of 50bp of sequence on either side of the targeted SNP.

**5.5.2 SNP Selection Additional Support**

In addition to data on designability and minor allele frequency provided through Illumina's Assay Design Tool (ADT), Illumina's Fast-Track Genotyping Services is able to provide the following additional support in SNP selection:

5.5.2.1 Tag Selection. We use genotype data from Phase I+II of the International HapMap Project to complete a tag selection. User inputs include overall regions to target, SNPs per bin (based on r^2 threshold), minor allele frequency minimum, and population of interest (CEU, CHB, JPT,YRI).

5.5.2.2 Spacing Optimization. Illumina's automated spacing selection tool can help target the SNPs within a list that give optimal spacing balanced with minor allele frequency (and, if desired, mandatory SNPs).

5.5.2.3 Annotation. Illumina can provide annotation (contig, refseq genes, and distance to the closet intron/exon boundary on any RS list in human studies.

**5.5.3 SNP Analysis and Selection Process**

As part of the SNP selection process, SNP sequences are analyzed for assay fitness. Examples of some criteria considered for assay design ability include:

5.5.3.1 The SNP sequences are not from duplicated sequences within the genome.

5.5.3.2 The SNP sequence is not in a repeated element.

5.5.3.3 The AT and GC content is acceptable.

5.5.3.4 Tm is acceptable.

**5.5.4 A note regarding iSelect Custom Infinium SNP selection**

All SNP classes use the Infinium chemistry. The following SNPs require a minimum of one bead type: A/C, A/G, T/C, and T/G. SNPs requiring two bead types include A/T and C/G SNPs

After analysis Customer will receive a file of the markers and their design score for the Illumina assay along with minor allele frequency and any additional supported information requested (e.g., annotation or tag selection) when available. The Customer will be given the opportunity to review, approve and edit the selected SNPs.

After Customer approval of the SNPs, oligo manufacturing will begin. The number of SNPs present in the final data set will depend on the assay conversion rate. It is expected that some assays will fail, and therefore no data will be delivered for these SNPs.

For Custom Infinium projects, the minimum manufacturing locus conversion rate is 80%. The assay success rate depends on the markers that are selected during the design phase. If a majority of chosen markers have previously been validated on the Infinium platform (design score of 1.1) the final locus conversion rate may be very high. Selected markers with low design scores will however reduce the locus conversion rate.

**Exhibit 10.14**

**[***] = Certain information contained in this document, marked by brackets, has been omitted because it is both not material and would be competitively harmful if publicly disclosed.**

# PRICING AGREEMENT

This Pricing Agreement ("Agreement") is entered into as of the date of last signature ("Effective Date") by and between Personalis, Inc. (hereinafter "Personalis"), a California corporation, having a place of business at 1330 Obrien Dr., Menlo Park CA 94025-1436, and Illumina, Inc., a Delaware corporation, having a place of business at 5200 IIlumina Way, San Diego, CA 92122 (hereinafter "Seller") referred to individually as "Party" and collectively as "Parties."

WHEREAS, Personalis has requested from Seller certain product pricing, with such pricing to become effective if and when the products become commercially available; and

WHEREAS, Seller has provided such product pricing to Personalis, with such pricing to become effective if and when the products become commercially available;

NOW THEREFORE, in consideration of the mutual promises set forth herein, the Parties hereby agree to the terms and conditions of the Agreement as follows:

## 1. Products and Pricing

If and when the Product is made commercially available, the Product shall be made available to Personalis for purchase pursuant to the pricing listed in Table 1.0.

"Product" or "Kit" means NovaSeg™ 5000/6000 S4 Reagent Kit (300 cycles) (Catalog number to be determined)

"Fiscal Year" or "FY" means January 1 through December 31 of the current calendar year (as defined in Table 1.0).

Table 1.0

| **Pricing per Kit Based on Volume Commitment For Fiscal Year (FY)** | | | | | | |
|---|---|---|---|---|---|---|
| **Number of Genomes** | **# S4 Kits** | **10/11/17 - 06/30/19** | **07/01/19 - 12/31/19** | **01/01/20 - 12/31/20** | **01/01/21- 12/31/21** | **01/01/22 - 12/31/22** |
| [***] | | | | | | |
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| | | | | | | |
| **[***]** | | | | | | |
| [***] | | | | | | |
| | | | | | | |
| | | | | | | |

If and when the Product is made commercially available, and on an annual basis thereafter, Seller will issue Personalis an annual standing quote that will represent pricing for the Products made available to Personalis, consistent with Table 1.0 for the applicable Fiscal Year ("Annual Standing Quote"). The Annual Standing Quote will be valid during the Fiscal Year. With respect to such Annual Standing Quote, for Products shipped during each Fiscal Year referenced in Table 1.0, Illumina shall make available to Customer the price corresponding to the number of Kits for which Customer has committed to Illumina that Customer would purchase and take delivery of during such Fiscal Year ("Purchase Commitment"). Purchase orders for Products shall be issued against the appropriate standing quote provided by Seller to Personalis. In the event Customer does not meet the applicable Purchase Commitment for a Fiscal Year, Customer may opt for (i) Customer to take delivery of and pay Illumina for additional Kits such that Customer meets the applicable Purchase Commitment, or (ii) Illumina to invoice Customer and Customer shall pay to Illumina the difference between the pricing that Illumina made available to Customer during the applicable Fiscal Year and the pricing Customer should have received based on the actual purchases of Kits during the applicable Fiscal Year.

Pricing offered in Table 1.0 is conditioned upon the following:

[***]

**2. Terms and Conditions**

If and when the Product is made commercially available, the Product shall be made available to Personalis for purchase exclusively pursuant to Seller's then-current terms and conditions located at:
**https://www.illumina.com/content/dam/illumina-marketing/documents/terms-conditions/united-states/usa-terms-and-conditions-of-sale-general.pdf**.

**3. Payment Terms**

Seller will invoice upon shipment. For purchases against this Agreement only, all payments are due within [ ] days of the date of the invoice. All amounts due shall be paid in the currency found on the invoice. If payment is made by wire or other electronic funds transfer, Personalis is solely responsible for any bank or other fees charged, and will reimburse Seller for any such fees. If any payment is not made by the due date Seller may exercise all rights and remedies available by law. Personalis shall pay for all costs (including reasonable attorneys' fees) incurred by Seller in connection with the collection of late payments. Each purchase order is a separate, independent transaction, and Personalis has no right of set-off against other purchase orders or other transactions with Seller. Seller will determine payment terms on a per-order basis and may modify credit terms in its discretion. Any amounts not paid when due will accrue interest at the rate of [ ], or the maximum amount allowed by law, if lower.

The Parties indicate their agreement by their signatures of their respective authorized representatives.

**PERSONALIS**

| | |
|---|---|
| By: | /s/ Carol J. Tillis |
| Name: | Carol J. Tillis |
| Title: | VP Finance & Administration |
| Date: | 11/22/2017 |

**ILLUMINA, INC.**

| | |
|---|---|
| By: | /s/ Nicole Berry |
| Name: | Nicole Berry |
| Title: | VP, AMR Sales |
| Date: | 11/21/2017 |

**[***] = Certain information contained in this document, marked by brackets, has been omitted because it is both not material and would be competitively harmful if publicly disclosed.**

**FASTTRACK GENETIC ANALYSIS SERVICES AGREEMENT**

Prepared by:
**Illumina, Inc.**
5200 Illumina Way
San Diego, CA 92122, USA
Hereinafter referred to as “Illumina”

Prepared for:
[***]
**Personalis**
Hereinafter referred to as “**Personalis**” or “Customer”

| | |
|---|---|
| Quotation Number: | [***] |
| Quotation Date: | **December 13, 2017** |
| Expiration Date: | **June 30, 2019** |
| Prepared By: | [***] |
| Phone Number: | [***] |
| Email: | [***] |

**FOR SMOOTH PROCESSING OF YOUR ORDER, ILLUMINA ASKS THAT YOU PLEASE REFERENCE THE ABOVE QUOTATION NUMBER ON ANY PURCHASE ORDER SUBMITTED AGAINST THIS QUOTATION.**

## I. CUSTOMER INFORMATION

| | |
|---|---|
| Company or Institution Name: | **Personalis** |
| Address: | 1330 Obrien Dr Menlo Park CA 94025-1436 |
| Contact Name: | [***] |
| Phone: | [***] |
| Email: | [***] |

## II. GENETIC ANALYSIS SERVICES PRICING INFORMATION

| Catalog# | Product Description | [***] | [***] | [***] | [***] | Subtotal (USD) |
|---|---|---|---|---|---|---|
| **20023496** | **Infinium Global Screening Array - 24 V2.0 Kit Fast Track Service: BDCHP, CNSM, GSCA-24v2-0** | [***] | [***] | [***] | [***] | [***] |
| Subtotal | | | | | | [***] |
| **Final Investment (Including shipping and insurance)** | | | | | | [***] |

**Post Pricing Message:**

- Customer understands that the Infinium Global Screening Array - 24 V2.0 Kit Fast Track Service (20023496) is not yet available for ordering. Illumina will not accept orders against this Quotation and any purchase order placed against this Quotation for Infinium Global Screening Array - 24 V2.0 Kit Fast Track Service (20023496) will be non-binding on Illumina. Customer will be notified once the Infinium Global Screening Array - 24 V2.0 Kit Fast Track Service (20023496) is available for purchase and Illumina may issue a final quotation at that time based upon any updates to the product catalog number and delivery timeframes.
- This Quotation is for informational purposes only and does not represent a commitment from Illumina on any product specifications or features, kits, or delivery date.
- Customer agrees not disclose this pre-release quote or pricing to any third party until it is available for ordering.
- [***] towards fulfillment of [***] and is only valid upon receipt of a purchase order for the full value of this Quotation and a fully executed subcontract and Pricing Agreement
- Net 60 Payment terms shall apply to this Personalis subcontract with Illumina Fast Track Services

**Pricing:** Subject to the attached Terms and Conditions (Document 070-2003-010 31Jan08), upon delivery of the Results, Customer shall pay Illumina the amount listed above for each sample.

## III. CONDITIONS OF SALE

By this quotation Illumina offers to Customer the above-described Illumina Genetic Analysis Services. By submitting an order, Customer accepts the terms of this quotation, including Illumina's terms and conditions attached.

## IV. HOW TO ORDER

To process this order, please email or fax the following:

1. This **Quotation** in its entirety
    a. Please ensure that the Customer Information details are accurate on page 2
2. Your institutional **Purchase Order** referencing this quotation

(to the attention of):
Sales Contract Administration
Fax: +1.858.736.8410
Alt. Fax: +1.858.202.4515
Phone: +1.858.202.4566
ContractAdmin@illumina.com
Illumina will confirm receipt of the order within 24 hours

## V. EXPIRATION OF OFFER

The offer contained in this document is revocable at the sole discretion of Illumina if not executed by Customer and a purchase order received by Illumina before 5:00 pm Pacific Time on the expiration date shown on page 1 of this quotation.

**Appendix 1**

**FastTrack Genotyping Services**
**Service Description**

**1. Samples.** Customer agrees to supply Illumina with a complete and accurate sample manifest in accordance with Section 0 of this Service Description.

If Illumina determines in its sole discretion that any of the Samples do not meet the criteria set forth in this Service Description, Illumina will so inform Customer. At such time, Customer will be provided the option to (a) replace such Samples, or (b) proceed with such Samples as-is. In both (a) and (b), Customer shall pay Illumina full price for the Services to be performed with respect to such Samples, even if no successful Results are obtained for those Samples.

**2. Results.** Illumina shall deliver to Customer the Results as described below: SNP genotyping calls and scores for the assays performed on each Sample.

**3. Delivery Dates.** The delivery date(s) for the Results will be established at the start of the project, based on the number of Samples and current laboratory queue.

**3.1 Delivery Timeframes:**

3.1.1 The following are minimum time frames for delivery of results:

3.1.2 For Infinium iSelect custom genotyping assays, within 90 days once a purchase order, loci selection and samples have all been received.

3.1.5 For standard genotyping studies using the Infinium assay, within 60 days of receipt of purchase order and samples, whichever occurs last. For studies larger than 1,000 samples, delivery date of the Results will be established at the start of the project, based on the current laboratory queue.

**4. SNP Selection Process.** For any custom assays that are to be developed by Illumina for supply of genotyping data, Customer agrees that, within 14 days of receipt of the purchase order, it will identify for Illumina a set of SNP loci ("Loci") in accordance with the SNP Selection guidelines set forth in Section 5 of in this Service Description. Illumina and Customer must mutually agree upon the final Loci. Illumina will attempt to develop a functional SNP assay for each SNP locus provided by the Customer and agreed upon by Illumina. Upon the delivery of Loci by the Customer to Illumina, the Customer shall identify any of such Loci which are not publicly available.

**5. Sample Requirements.** Illumina's experience shows that Samples conforming to the following requirements are likely to yield excellent genotyping data.

**5.1 Sample Manifest**

5.1.1 To ensure that high quality data is produced, the Customer should submit a manifest of Sample characteristics. Illumina's laboratory uses standard operating procedures, and it is important to identify any variation in Sample preparation as early as possible. For each Sample, provide the gender, parental identification, and replicate sample identification. Please use the following format for the Sample Manifest.

Manifest Columns:
DNA-plate barcode (e.g., GS0000777-DNA for GoldenGate, WG0000888-DNA for Infinium)
Well position of the Sample (e.g., A05)
Customer Sample ID (e.g., GS0000777-DNAA05_Name)
Species of the sample (e.g., Homo sapiens)
Gender of the individual (F: female, M: male, U: unknown) Comments
Volume in the well (e.g., 40 µL).
DNA concentration (50ng/µL or greater) measured by PicoGreen
Tissue source (e.g., cell line)
Extraction Method (e.g., Phenol/Chloroform)
WGA Method (if applicable, e.g., REPLI-g)
Mass of DNA used in WGA (if applicable, e.g., 50ng)
Mother (e.g., GS000777-DNAA06_Name1)
Father (e.g., GS000777-DNAA07_Name2)
Replicate(s) (e.g., GS0000777-DNAA08_Name3)

**Before shipping your Samples to Illumina, please forward a file containing the Sample Manifest to your Illumina contact for review.**

5.1.2 To retain anonymity of the individuals from whom the Samples originated, Illumina provides barcoded microtiter plates and references the Samples by the plate number and well position. This allows a seamless interface with our robotic processes and the LIMS database. The Samples are placed into the supplied plates, sealed with a silicone cap, frozen, and shipped on dry ice. It is imperative that the DNA remain solidly frozen during shipping to avoid the possibility of cross contamination or degradation.

## 5.2 DNA Sample Criteria

5.2.1 DNA should be quantified using a double stranded, DNA specific method such as PicoGreen fluorescence.)

5.2.2 All DNAs must be at a concentration of 50 ng/µL or greater. The total amount of DNA required is dependent on the number of SNPs to be studied and is defined for each project. A table with typical DNA requirements is provided below.

5.2.3 DNA must be diluted in 10mM Tris/1mM EDTA.

5.2.4 A brief description of the DNA extraction protocol(s) should be included.

5.2.5 As a preliminary test, we ask for a few representative samples. We evaluate these test DNAs for performance quality on the Illumina genotyping platform. These samples are not part of the project and will be destroyed once evaluated.

## 5.3 DNA Requirements

| Assay | Project Type | Min. µg per sample | µL per sample |
|---|---|---|---|
| Infinium | Test Samples | 1.75 | 35 |
| Infinium | Standard and iSelect | 1.75 | 35 |

## 5.4 Microtiter Plate Configuration

5.4.1 Illumina will provide barcoded, midi plates with corresponding lids.

5.4.2 Wells A01 and A12 must remain empty for Illumina DNA controls.

5.4.3 The lids must be sealed tightly and completely. We suggest the use of devices such as the MJ Research Roller for Microseal Film; catalog number MSR-0001 or the Corning Storage Mat Applicator; catalog number 3081.

5.4.4 Customer is responsible for maintaining a map of the DNA positions on each microtiter plate. The genotyping data will reference the barcode and well position of each DNA.

5.4.5 DNA must be solidly frozen prior to packing and shipment, and remain frozen. Plates must be shipped on sufficient dry ice to ensure that the samples remain frozen.

5.4.6 DNA should be shipped overnight express.

## 5.5 Illumina SNP Selection and Submission Requirements for Custom Genotyping Projects

### 5.5.1 lllumina SNP Format Guidelines

Queries for SNP selection can be submitted to obtain designability information. In addition, for human studies, data from the currently supported dbSNP version will be returned. The following input file types are supported:

5.5.1.1 SNP list. Customers can submit SNPs for human studies using the RS identifiers.

5.5.1.2 Gene list. Gene lists (and distance upstream and downstream from the designated gene) can be used as an input to obtain a list of SNPs within the gene region for human studies.

5.5.1.3 Region list. A list of markers that act as “start” and “stop” region identifiers can be used to query SNPs for human studies. As with the gene list, the distance upstream and downstream (in base pairs) can also be designated in the input format.

5.5.1.4 Sequence List. For human studies and a supported list of species (e.g., mouse, dog, chicken, …), a list of sequences, chromosomal designations and coordinates can be input. Assays for non- supported species can be designed as well using this submission format. Sequence lists require the use of IUPAC code for any neighboring polymorphisms with the targeted SNP in brackets (e.g., [A/G]) with a minimum of 50bp of sequence on either side of the targeted SNP.

### 5.5.2 SNP Selection Additional Support

In addition to data on designability and minor allele frequency provided through Illumina's Assay Design Tool (ADT), Illumina's Fast-Track Genotyping Services is able to provide the following additional support in SNP selection:

5.5.2.1 Tag Selection. We use genotype data from Phase I+II of the International HapMap Project to complete a tag selection. User inputs include overall regions to target, SNPs per bin (based on r^2 threshold), minor allele frequency minimum, and population of interest (CEU, CHB, JPT, YRI).

5.5.2.2 Spacing Optimization. Illumina's automated spacing selection tool can help target the SNPs within a list that give optimal spacing balanced with minor allele frequency (and, if desired, mandatory SNPs).

5.5.2.3 Annotation. Illumina can provide annotation (contig, refseq genes, and distance to the closet intron/exon boundary on any RS list in human studies.

### 5.5.3 SNP Analysis and Selection Process

As part of the SNP selection process, SNP sequences are analyzed for assay fitness. Examples of some criteria considered for assay design ability include:

5.5.3.1 The SNP sequences are not from duplicated sequences within the genome.

5.5.3.2 The SNP sequence is not in a repeated element.

5.5.3.3 The AT and GC content is acceptable.

5.5.3.4 Tm is acceptable.

### 5.5.4 A note regarding iSelect Custom Infinium SNP selection

All SNP classes use the Infinium chemistry. The following SNPs require a minimum of one bead type:

A/C, A/G, T/C, and T/G. SNPs requiring two bead types include A/T and C/G SNPs

After analysis Customer will receive a file of the markers and their design score for the Illumina assay along with minor allele frequency and any additional supported information requested (e.g., annotation or tag selection) when available. The Customer will be given the opportunity to review, approve and edit the selected SNPs. After Customer approval of the SNPs, oligo manufacturing will begin. The number of SNPs present in the final data set will depend on the assay conversion rate. It is expected that some assays will fail, and therefore no data will be delivered for these SNPs.

For Custom Infinium projects, the minimum manufacturing locus conversion rate is 80%. The assay success rate depends on the markers that are selected during the design phase. If a majority of chosen markers have previously been validated on the Infinium platform (design score of 1.1) the final locus conversion rate may be very high. Selected markers with low design scores will however reduce the locus conversion rate.

**ILLUMNA TERMS AND CONDITIONS – SERVICES**
(NON-CLINICAL LABORATORY SERVICES)

**1. Definitions.** "Agreement" means either (i) the Quotation, including these terms and conditions and the applicable Service Description which form a part thereof; (ii) all electronic information and terms of Illumina referenced during an Electronic Order, including these terms and conditions and the applicable Service Description which form a part thereof in the case of an Electronic Order; or (iii) all terms referenced in an Order Confirmation, including these terms and conditions and the applicable Service Description which form a part thereof in the case of an order placed without a Quotation and that is not an Electronic Order. "Customer" means the purchaser of the Services hereunder. "Electronic Order" means an order placed by Customer utilizing Illumina's electronic commerce system (e.g., iCom). "Illumina Technology" means the technology, tools, instruments, reagents, and software including, without limitation, the processes, workflows, recipes, methods, information, bioinformatics tools and techniques used to perform the Services. "Improvements" means any improvements, modifications, or changes to the Illumina Technology whether they are made prior to, during, or after performance of the Services. Such improvements may result from, among other things, the analysis of the Results in the aggregate with other genomic information in Illumina's possession and with similar information from other Illumina customers (e.g., comparing whole genome sequences in order to calculate allele frequencies, detect systematic errors, improving variant caller and aligners, etc.). "Intellectual Property Rights" means all patent rights, copyrights, trade secrets, knowhow, trademark, service mark and trade dress rights and other intellectual property rights, current or future, under the laws of any jurisdiction, together with all applications therefore and registrations thereto. "Order Confirmation" means a sales order confirmation document provided by Illumina. "Quotation" means a written quotation provided by Illumina to Customer. "Results" are the data that are generated through performance of the Services as specifically described in the applicable Service Description. The Results do not include Improvements to Illumina Technology. "Sample(s)" means the sample(s) to be provided by Customer to Illumina as described in the applicable Service Description and/or Quotation. "Sample Requirements" means the quantity, quality, and other requirements for each Sample as specified in the applicable Service Description and required in order for Services to be successfully performed on a given Sample. "Services" as used herein refers to the activities to be performed hereunder as described in and subject to the specific terms found in the Service Description. "Service Description" means the document that describes the Services (e.g., FastTrack Genotyping, FastTrack Sequencing, Whole Genome Sequencing, etc.). "Specifications" means the written specifications for Services that are contained in the Services Description.

**2. Applicability of Terms and Conditions.** This Agreement shall exclusively govern the ordering, purchase and provision of the Services, and shall override any conflicting, amending and/or additional terms contained in any purchase orders, invoices or similar documents, which are hereby rejected and shall be null and void. Illumina's failure to object to any such terms shall not constitute a waiver by Illumina, nor constitute acceptance by Illumina of such terms and conditions.

**3. Information Transfer; Samples.** In order to ensure timely and satisfactory performance of the Services, it is critical that Customer provide all relevant information and materials in a timely manner to Illumina. Customer agrees to provide the Samples and all other information and materials as specified in the Service Description in accordance with the guidelines set forth therein. Customer acknowledges that any failure to provide the Samples, information, and any other materials in accordance with the Service Description may result in delays in the project. After receipt of the purchase order from Customer, Customer shall promptly provide to Illumina the number of Samples as set forth in the Quotation in accordance with the Sample Requirements set forth in the applicable Service Description. Customer acknowledges that each Sample shall meet the Sample quality criteria established by Illumina that applies to such Service. Illumina reserves the right to change the Sample quality criteria in its sole, but reasonable discretion, and Illumina will provide Customer with written notification of any such changes. See the applicable Service Description for additional information concerning Sample quality requirements.

**4. Delivery.** Delivery shall have occurred by one of the following means, to be determined by mutual agreement of the parties: (a) if Results are to be delivered electronically, once Illumina has transmitted an electronic file containing all or a portion of the Results to Illumina's FTP web site or other site as mutually agreed and has notified Customer that such file is available, or (b) if Results are to be delivered in one or more hard drive(s) or other physical material, upon shipment FOB origin of such hard drive(s) or material containing all or a portion of the Results. Note that Illumina does not typically retain a copy of the Results beyond Delivery and therefore does not guarantee that Results can be recovered after Delivery. In the event of loss of the Results after Delivery, Illumina will attempt to retrieve the Results for Customer, but cannot guarantee success of such recovery efforts.

**5. Pricing; Payment.** Prices for the Services shall be as specified in the Quotation and are valid solely during the period set forth therein. Unless otherwise specified in the Quotation, prices specified in the Quotation are for the number of Samples and specific Services stated therein. Any changes to the number of Samples or the Services will affect pricing, and will therefore require mutual written agreement of the parties. Illumina will send invoices to Customer upon delivery of Results or portions thereof. All invoices, except for orders with Customers in Japan, shall be paid in full by the Customer within thirty (30) days from the date of invoice. All invoices for orders with Customers in Japan shall be made in full within sixty (60) days from the date of invoice. Any amounts not paid when due will accrue interest at the rate of one and one half percent (1.5%) per month, or the maximum amount allowed by law, if lower. In the event that any payment is not made within the time period specified in this Agreement, Illumina may suspend providing the Services and delivering the Results until all payments are made current. Customer shall pay for all costs (including reasonable attorneys' fees) incurred by Illumina in connection with the collection of late payments. The amount of credit authorized by Illumina may be changed or entirely withdrawn at any time, and Illumina reserves the right to require alternative payment terms, including but not limited to a letter of credit or full or partial payment in advance.

All amounts payable to Illumina are exclusive of and are payable without deduction for all sales, use, excise, value added, withholding and other taxes, and all customs duties and tariffs claimed or imposed by any governmental authority upon the performance of the Services or delivery of the Results. Any such charges will be added to the price or subsequently invoiced to the Customer where permitted by law. In those countries where Illumina is not permitted to add such charges to the invoice or collect those charges on behalf of Customer, Customer is responsible for remitting payment of such amounts to the appropriate body.

Customer shall pay the total price as set forth in the Quotation, in U.S. dollars unless otherwise specified. Each accepted purchase order is a

separate, independent transaction, and Customer has no right of set-off against other purchase orders or other transactions with Illumina.

In the event the Customer terminates the Agreement prior to the delivery of all the Results, the Customer will be charged a cancellation fee equal to the costs reasonably incurred by Illumina up to that point and for which payment has not been received, including but not limited to Illumina's then current list price of all materials used or produced, including, without limitation, flow cells and reagents.

**6. Ownership of Samples.** Customer represents and warrants that it owns or otherwise controls the Samples and that it has the right to provide the Samples to Illumina for the purpose described herein, including without limitation, obtaining informed consents and complying with IRBs, where applicable. Illumina shall use the Samples solely for the purpose of performing the Services. Illumina agrees that it will promptly return any unused Samples or portions thereof following the delivery of the Results. Customer shall at all times retain all right, title, and interest in the Samples provided hereunder.

**7. Ownership of Results.** The Results shall be owned by Customer and Illumina claims no ownership interest in or to the Results.

8. Research Use Only. Customer acknowledges that the Services are provided for research use only and are not being performed in a clinical laboratory (e.g., the Services are not being performed in a CLIA-certified laboratory). The Services are not a test or kit designed to diagnose, treat, or prevent a disease or medical condition, and the Results are not intended to be medical advice. The Services have not been cleared by any country's medical regulatory agency, including the United States Food and Drug Administration, for diagnostic use or any other purpose.

**9. Limited Warranty**. Illumina warrants to Customer that all Results delivered by Illumina hereunder shall conform to the Specifications. EXCEPT AS EXPRESSLY SET FORTH IN THIS SECTION 9 THE RESULTS ARE PROVIDED TO CUSTOMER ON AN "AS IS" BASIS, AND ILLUMINA, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EXPRESSLY DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY, UTILITY, OR NON INFRINGEMENT WITH RESPECT THERETO.

**10. Indemnification.** Illumina shall indemnify and hold harmless Customer, its directors, officers, employees, agents, successors, and assigns from and against any liabilities, expenses, or costs arising out of any claim, complaint, suit, proceedings, or cause of action brought by a third party pertaining to infringement of such third party's valid and enforceable Intellectual Property Rights resulting from the methods, materials, or processes specified by Illumina and used by Illumina in performance of the Services and Illumina shall pay all settlements entered into, and all final judgments and costs (including reasonable attorneys' fees) awarded against Customer (and Illumina, as the case may be) in connection with any such action.

Customer shall indemnify and hold harmless Illumina, its directors, officers, employees, agents, successors, and assigns from and against any liabilities, expenses, or costs arising out of any claim, complaint, suit, proceedings or cause of action brought by a third party pertaining to (i) infringement of such third party's valid and enforceable Intellectual Property Rights resulting from Customer's (a) providing the Samples, (b) specification or selection of any methods, materials, or processes to be used in the performance of the Services, other than those methods, materials, or processes that are specified by Illumina and used by Illumina in performing the Service, and (c) specification or selection of the SNP loci in the case of genotyping or regions of interest in the case of targeted sequencing, and (ii) or arising out of any actions Customer has taken based on its analysis, interpretation, or use of the Results and any other information provided by Illumina under this Agreement and Customer shall pay all settlements entered into, and all final judgments and costs (including reasonable attorneys' fees) awarded against Illumina (and Customer, as the case may be) in connection with any such action.

Each party's indemnification obligation pursuant to this Section 10 is subject to the indemnified party (i) notifying the indemnifying party promptly in writing of such action, (ii) giving the indemnifying party exclusive control and authority over the defense and settlement of such action, (iii) not admitting infringement of any Intellectual Property Right without the indemnifying party's prior written consent, (iv) not entering into any settlement or compromise of any such action without the indemnifying party's prior written consent, and (v) providing all reasonable assistance to the indemnifying party (provided that the indemnifying party reimburses the indemnified party for its reasonable out-of-pocket expenses incurred in providing such assistance).

**11. Limited Liability.** TO THE EXTENT PERMITTED BY LAW, IN NO EVENT WILL EITHER PARTY BE LIABLE TO THE OTHER FOR COSTS OF PROCUREMENT OF SUBSTITUTE SERVICES, LOST PROFITS, DATA OR BUSINESS, OR FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL, EXEMPLARY, OR PUNITIVE DAMAGES INCURRED BY SUCH PARTY ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT (OR THE TERMINATION HEREOF), HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY (WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE) STRICT LIABILITY OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, THE LOSS OF PROSPECTIVE PROFITS OR ANTICIPATED SALES, OR ON ACCOUNT OF EXPENSES, INVESTMENTS, OR COMMITMENTS IN CONNECTION WITH THE BUSINESS OR GOODWILL OR OTHERWISE. ILLUMINA'S TOTAL AND CUMULATIVE LIABILITY ARISING UNDER OR IN CONNECTION WITH THIS AGREEMENT, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, SHALL IN NO EVENT EXCEED THE AMOUNT RECEIVED BY ILLUMINA FROM CUSTOMER UNDER THIS AGREEMENT. THE LIMITATIONS SET FORTH IN THIS SECTION SHALL APPLY EVEN IF A PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.

12. Privacy. Customer acknowledges that Illumina deems of utmost importance the privacy and anonymity of any individual that is the subject of the Samples. Therefore Customer shall not disclose or provide to Illumina in any format, any information that might identify the source of a Sample, shall comply with all legal, regulatory, and contractual obligations with respect to the privacy of the individual that is the subject of such Sample, and shall inform Illumina in a timely manner of any requirements applicable to Illumina's provision of these Services. Illumina shall not sell, trade or otherwise share with any other customer of Illumina any account information of Customer. Customer acknowledges and agrees that Illumina may maintain and use a database of orders and account information pertaining to Customer for purposes of order processing, maintaining records and assisting with future orders of Customer.

**13. Confidential Information.** Except as provided herein, each party shall maintain in confidence, and shall not use for any other purpose or disclose to any third party, information disclosed by the other party in writing and marked "Confidential" (or in a similar manner to indicate its confidential nature) or that is disclosed orally as confidential and confirmed in writing within thirty (30) days following such disclosure (collectively, "Confidential Information"). However, the source and identity of Samples, the Results, and the details of the assay used in the performance of the Services which, by their very nature, would reasonably be deemed confidential, shall be considered Confidential Information whether or not so marked. Each party also agrees not to disclose to any third party any financial terms of this Agreement without the consent of the other party, except as required by securities or other applicable laws, in which case the disclosing party shall seek confidential treatment to the extent available, under conditions that reasonably protect the confidentiality thereof.

Confidential Information shall not include any information that is: (i) already known to the receiving party at the time of disclosure hereunder, (ii) now or hereafter becomes publicly known other than through breach of this Agreement, (iii) is disclosed to the receiving party by a third party that the disclosing party reasonably concluded was under no obligation of confidentiality to the disclosing party with respect thereto, or (iv) is independently developed by or for the receiving party without reliance on the Confidential Information of the disclosing party. The obligations of confidentiality contained in this Section 13 shall remain in force for a period of no less than three (3) years from the delivery of all the Results, which shall in all events survive its earlier termination.

**14. Survival.** All provisions of this Agreement that by their nature should survive termination shall survive including without limitation Sections 1-15 and all payment obligations incurred hereunder. All other rights and obligations of the parties under this Agreement shall cease upon termination or expiration of this Agreement.

**15. Miscellaneous.**

a. Customer acknowledges and agrees that any future products and/or services ("Unreleased Products") are subject to new part numbers, pricing, and specifications. Customer agrees that its purchase of the Services hereunder is not in reliance on the availability of any Unreleased Products.

b. If any provision of this Agreement is held invalid or unenforceable, such provision shall be enforced to the maximum extent permissible so as to effect the intent of the parties, and the remainder of this Agreement will continue in full force and effect. The failure of either party to exercise any right granted herein or to require any performance of any term of this Agreement or the waiver by either party of any breach of this Agreement shall not prevent a subsequent exercise or enforcement of, or be deemed a waiver of any subsequent breach of, the same or any other term of this Agreement. Nothing in this Agreement shall constitute or create a joint venture, partnership, or any other similar arrangement between the parties. No party is authorized to act as agent for the other party hereunder except as expressly stated in this Agreement.

c. All notices required or permitted under this Agreement shall be in writing and shall be deemed received when (a) delivered

personally; (b) five (5) days after having been sent by registered or certified mail, return receipt requested, postage prepaid (or ten (10) days for international mail); or (c) one (1) day after deposit with a commercial express courier specifying next day delivery or, for international courier packages, two (2) days after deposit with a commercial express courier specifying 2-day delivery, with written verification of receipt.

d. Customer shall not assign or transfer this Agreement or any rights or obligations under this Agreement, whether voluntary, by operation of law or otherwise, without the prior written consent of Illumina; provided, however, that no consent shall be required for any assignment in connection with any merger, acquisition or the sale of all or substantially all of the stock or assets of Customer to a party that (i) agrees in writing to be bound by the terms and conditions of this Agreement, and (ii) is not, in Illumina's reasonable judgment, a competitor of Illumina. Illumina may assign or transfer this agreement to any (i) successor by way of merger, acquisition or sale of all or substantially all of its stock or assets relating to this Agreement, (ii) of its affiliated entities. Illumina or any successor may assign all or part of the right to payments under this Agreement. Any assignment or transfer of this Agreement made in contravention of the terms hereof shall be null and void. Subject to the foregoing, this Agreement shall be binding on and inure to the benefit of the parties' respective successors and permitted assigns.

e. This Agreement and performance by the parties hereunder shall be construed in accordance with the laws of the State of California, U.S.A., without regard to provisions on the conflicts of laws.

f. Illumina shall not be responsible for any failure to perform or delay attributable in whole or in part to any cause beyond its reasonable control, including but not limited to acts of God, fire, flood, tornado, earthquake, hurricane, lightning, government actions, actual or threatened acts of war, terrorism, civil disturbance or insurrection, sabotage, labor shortages or disputes, failure or delay in delivery by Illumina's suppliers or subcontractors, transportation difficulties, shortage of energy, raw materials or equipment, or Customer's fault or negligence. In the event of any such delay the delivery date shall be deferred for a period equal to the time lost by reason of the delay.

g. This Agreement exclusively govern the ordering, purchase and provision of Services provided to Customer by Illumina hereunder, and shall override any conflicting, amending, and/or additional terms contained in any purchase orders, invoices, or similar documents which are hereby rejected and shall be null and void. Illumina's failure to object to any such terms shall not constitute a waiver by Illumina, nor constitute acceptance by Illumina of such terms and conditions.

**[***] = Certain information contained in this document, marked by brackets, has been omitted because it is both not material and would be competitively harmful if publicly disclosed.**

QUOTATION FOR SUPPLY OF GENETIC ANALYSIS PRODUCTS

Prepared by:

**Illumina, Inc.**
**5200 Illumina Way**
**San Diego, CA 92122-4616 , US**

Hereinafter referred to as “Illumina”

Prepared For:

Personalis

Hereinafter referred to as “ Personalis ”

| | |
|---|---|
| Quotation Number: | [***] |
| Quotation Date: | February 22, 2019 |
| Expiration Date: | February 14, 2020 |
| Prepared By: | [***] |
| Phone Number: | [***] |
| Email: | [***] |

## I. CUSTOMER INFORMATION

| | |
|---|---|
| Company or Institution Name: | Personalis |
| Address: | 1330 Obrien Dr, Menlo Park CA 94025-1436. |

## II. PRODUCT & PRICING INFORMATION

**Customer receives the following [***] on the product families listed below (excludes [***] consumables, software, hardware or new instrument purchases). For [***] to apply, Customer must agree to the following:**

- This Master Quote, which can be used for multiple purchases, will only be valid until 5:00pm on the expiration date listed on page 1.
- All Customer Purchase Orders received by Illumina [***] must be in the quoted currency and reference this quotation.
- [***]. Illumina shall at its sole discretion, adjust [***] for future products or for any [***] to the products offered on this Quotation.
- The pricing and terms of this offer are kept confidential except as needed to execute the purchase.
- [***] for consumables applies only to the product families specified in the table herein.
- Customer understands that product pricing stated herein is not inclusive of any applicable shipping, freight and/or taxes. Any estimated shipping and freight charges listed on this quotation may differ from actual charges. Any shipping/freight costs will be pre-paid and charged back to Customer. Customer accepts responsibility for any actual incurred shipping/freight costs.

| **[***]** | **[***]** |
|---|---|
| [***] | [***] |
| | |
| | |
| | |

| **[***]** | | |
|---|---|---|
| **[***]** | **[***]** | **[***]** |
| [...***...] | [...***...] | [...***...] |

[***]

**III. CONDITIONS OF SALE**

By submitting an order, Customer accepts and agrees that the Terms and Conditions is the sole and exclusive agreement between Customer and Illumina with respect to the Illumina products and/or services as described above and accepts all other terms of this quotation. NOTWITHSTANDING THE FOREGOING, IF ILLUMINA AND CUSTOMER HAVE ENTERED INTO A VALID AND ENFORCEABLE AGREEMENT GOVERNING THE ILLUMINA PRODUCTS AND/OR SERVICES DESCRIBED ABOVE, THE ORDER OF PRECEDENCE BETWEEN THE AGREEMENT AND THE TERMS AND CONDITIONS SHALL BE AS FOLLOWS: IN THE EVENT OF A CONFLICT BETWEEN THE TERMS OF THE AGREEMENT AND THE TERMS AND CONDITIONS, OR IF THE AGREEMENT INCLUDES ADDITIONAL TERMS NOT ADDRESSED IN THE TERMS AND CONDITIONS, THE AGREEMENT SHALL GOVERN WITH RESPECT TO SUCH TERMS. Illumina does not supply plastics such as microplates or pipette tips for use in the listed assays and these are not included in the consumables pricing provided; however, as a result of the highly multiplexed nature of all assays, plastics alone contribute minimally to the final cost.

Customer and Illumina agree as follows:

- Customer's purchase of the products referenced in this Quotation is not conditioned on future performance characteristics or applications, whether or not realized.
- Unless otherwise agreed by Illumina in writing, Illumina will not assist Customer in developing, testing, or validating unsupported applications.
- Illumina will not replace any consumables or reagent kits if the cause of any performance failure is due to unsupported applications.
- Illumina is unable to provide any assurances or guarantee that the performance of the products referenced in this Quotation will match published specifications when used for unsupported applications.

**IV. SHIP HOLD**

In cases where this Quotation does not include a pre-defined ship schedule, the following ship hold terms shall apply:

- All orders must have a defined ship schedule. The initial ship date must be no later than three (3) months from the date the purchase order is received by Illumina (as provided in the Order Confirmation) and the entire order must be shipped complete within twelve (12) months from Illumina's receipt of the purchase order.
- Any exceptions to these ship hold terms must be agreed to in writing by Illumina and the Customer must pre-pay at least fifty percent (50%) of the purchase order amount of the affected shipments.
- Customers may request two (2) shipment delays for any single purchase order. The total months of delayed shipment for shipments associated with a single purchase order shall not exceed six (6) months.
- If Customer has requested a delayed shipment, Illumina reserves the right to change the lead time necessary to initiate Customer's first shipment (which may be longer than the lead time quoted at the time of the order placement).
- If Customer cannot take shipment in accordance with these terms, Illumina reserves the right to cancel the order in its entirety without any liability to the Customer.

## V. HOW TO ORDER

**RUO & DX Goods, Instruments and Warranty Coverage (including BlueGnome)**

| | |
|---|---|
| For all consumable orders:<br><br>Please submit your order online through MyIllumina (http://my.illumina.com). | For all other orders:<br><br>Please submit your institutional Purchase Order and a complete copy of this quotation to the attention of:<br><br>Illumina Customer Service<br><br>customerservice@illumina.com<br><br>Phone: +1.858.202.4566<br>Toll Free: +1.800.809.ILMN (4566)<br>Fax: +1.858.202.4766 |

## VI. EXPIRATION OF OFFER

The offer contained in this document is revocable at the sole discretion of Illumina if not executed by Customer and a purchase order received by Illumina before 5:00 pm Pacific Time on the expiration date shown on page 1 of this quotation.

http://www.illumina.com/content/dam/illumina-marketing/documents/terms-conditions/united-states/usa-terms-and-conditions-of-sale-general.pdf. Additionally, if Customer is purchasing Illumina professional consulting services as relate to instruments, Customer environment or workflows (in all cases, excluding instrument warranty services) ("Professional Services"), Customer agrees such Professional Services are exclusively governed by the Terms and Conditions - Services (Professional Services) located here: http://www.illumina.com/content/dam/ illumina-marketing/ documents/company/terms-and-conditions-services.pdf

**[***] = Certain confidential information contained in this document, marked by brackets, has been omitted because it is both not material and would be competively harmful if publicly disclosed.**

**Exhibit 10.19**

**PRICING AGREEMENT**

This Pricing Agreement ("Agreement") replaces Pricing Agreement dated November 22, 2017 in its entirety and is entered into as of the date of last signature ("Effective Date")by and between Personalis, Inc. (hereinafter "Personalis"), a California corporation, having a place of business at 1330 O'Brien Dr., Menlo Park CA 94025-1436, and Illumina, Inc., a Delaware corporation, having a place of business at 5200 Illumina Way, San Diego, CA 92122 (hereinafter "Seller") referred to individually as "Party" and collectively as "Parties."

**WHEREAS**, Personalis has requested from Seller certain product pricing, with such pricing to become effective if and when the products become commercially available; and

**WHEREAS**, Seller has provided such product pricing to Personalis, with such pricing to become effective if and when the products become commercially available;

**NOW THEREFORE**, in consideration of the mutual promises set forth herein, the Parties herby agree to the terms and conditions of the Agreement as follows:

**1. Products and Pricing**

Products shall be made available to Personalis for purchase pursuant to the pricing listed in Table 1.0.

"Product" or "Kit" means NovaSeq™ 5000/6000 S4 Reagent Kit.

"'Specified Time Period' means the applicable stated time period per Table 1.0."

**Table 1.0**

**S4 Kit Pricing per Specified Time Period:**

| # Genomes | # of S4 Kits | 10/11/17 - 06/30/19 | 07/01/19 - 12/31/20 | 01/01/21- 12/31/21 | 01/01/22 - 12/31/22 |
|---|---|---|---|---|---|
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |

| | | | | | |
|---|---|---|---|---|---|
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |
| [***] | [***] | $[***] | $[***] | $[***] | $[***] |

On annual basis, Seller will issue Personalis a standing quote that will represent pricing for the Products made available to Personalis, consistent with Table 1.0 for the applicable Specified Time Period ("Standing Quote'").

Standing Quotes will be valid during the Specified Time Period. With respect to such Standing Quote, for Products shipped during each Specified Time Period referenced in Table 1.0, Illumina shall make available to Customer the price corresponding to the number of Kits for which Customer has committed to use good faith efforts to purchase and take delivery of during such Specified Time Period. Purchase orders for Products shall be issued against the appropriate standing quote provided by Seller to Personalis.

**Pricing offered in Table 1.0 is conditioned upon the following:**

[***]

**2. Terms and Conditions**

If and when the Product is made commercially available, the Product shall be made available to Personalis for purchase exclusively pursuant to Seller's then-current terms and conditions located at: https://www.illumina.com/content/dam/illumina-marketing/documents/terms-conditions/united-states/usa-terms-and-conditions-of-sale-general.pdf .

**3. Payment Terms**

Seller will invoice upon shipment. For purchases against the Agreement only, all payments are due within [***] days of the date of the invoice. All amounts due shall be paid in the currency found on the invoice. If payment is made by wire or other electronic funds transfer, Personalis is solely responsible for any bank or other fees charged and will reimburse Seller for any such fees. If any payment is not made by the due date Seller may exercise all right and remedies available by law. Personalis shall pay for all costs (including reasonable attorneys' fees) incurred by Seller in connection with the collection of late payments. Each purchase order is a separate, independent transaction, and Personalis has no right of set-off against other purchase orders or other transactions with Seller. Seller will determine payment terms on a per-order basis and may modify credit terms in its discretion. Any amounts not paid when due will accrue interest at the rate of [***], or the maximum amount allowed by law, if lower.

The Parties indicate their agreement by their signatures of their respective authorized representatives.

| PERSONALIS | | ILLUMINA, INC. | |
|---|---|---|---|
| By: | /s/ Carol J. Tillis | By: | /s/ David Daly |
| Name: | Carol J. Tillis | Name: | David Daly |
| Title: | VP Finance and Administration | Title: | Sr. Vice President & General Manager |
| Date: | 3/26/2019 | Date: | 3/26/2019 |

**PLAIN ENGLISH REVOLVING LOAN AND SECURITY AGREEMENT**

This is a **PLAIN ENGLISH REVOLVING CAPITAL LOAN AND SECURITY AGREEMENT** dated as of June 28, 2017 by and between PERSONALIS, INC., a Delaware corporation, as a borrower, and any other Person that executes a Joinder Agreement to become a borrower under this Agreement, and TRIPLEPOINT CAPITAL LLC, a Delaware limited liability company, as lender.

The words "We", "Us", and "Our" refer to TRIPLEPOINT CAPITAL LLC. Unless otherwise specified, the words "You" and "Your" refer to each of and all of PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under this Agreement, and, not to any individual, and PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under this Agreement, shall be jointly and severally liable for any and all of Your agreements and obligations under this Agreement. The words "the Parties" refers to each of and all of TRIPLEPOINT CAPITAL LLC, PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under this Agreement. This Plain English Revolving Loan and Security Agreement may be referred to as the "Agreement".

The Parties agree to the following mutual agreements and conditions listed below:

**REVOLVING LOAN FACILITY INFORMATION**

| **Facility Number** | **Commitment Amount** | **Minimum Advance Amount** |
|---|---|---|
| Part 1: 1115-RV-01 | Part 1: $10,000,000 upon satisfaction of the Part 1 Milestone, as further set forth in Section 3. | None |

| **Availability Period** | **Revolving Loan Maturity Date** | **Loan Term** | **Interest Rate** |
|---|---|---|---|
| Part 1: Closing Date through December 31, 2018 | Part 1: December 31, 2018 | Part 1: The number of months from the Closing Date through December 31, 2018 | Part 1: Prime Rate plus 6.75%, subject to adjustment as set forth in Section 9.<br><br>(Prime Rate as published in the Wall Street Journal, however, in no event shall the Prime Rate be less than 4.0%) |

| **Security Interest** | **End Of Term Payment** | **Facility Fee** | **Right To Invest** |
|---|---|---|---|
| First priority security interest in all Collateral; negative pledge on Intellectual Property | Part 1: 5.5% of the highest outstanding principal amount during the Loan Term. | Part 1: $62,500 due on Closing Date; additional $62,500 due upon availability of Tranche B, as further set forth in Section 3. | You grant Us the right to invest up to $250,000 in Your next round of equity financing per Section 19 |

**OUR CONTACT INFORMATION**

| Name | Address For Notices | Contact Person |
|---|---|---|
| TriplePoint Capital LLC | 2755 Sand Hill Rd., Ste. 150<br>Menlo Park, CA 94025<br>Tel: (650) 854-2090<br>Fax: (650) 854-1850 | Sajal Srivastava, President<br>Tel: (650) 233-2102<br>Fax: (650) 854-1850<br>email: legal@triplepointcapital.com |

**YOUR CONTACT INFORMATION**

| Customer Name | Address For Notices | Contact Person |
|---|---|---|
| Personalis, Inc. | 1330 O'Brien Drive<br>Menlo Park, CA 94025 | Carol Tillis, VP Finance & Administration<br>Tel: (650) 752-1330<br>Fax: (650) 752-1301<br>email: carol.tillis@personalis.com |

Capitalized terms defined in the Table of Terms shall have the meanings given to those terms in such table, and other capitalized terms not otherwise defined in the body of this Agreement are defined in Section 21. Any accounting term not specifically defined herein shall be construed in accordance with GAAP, and all calculations shall be made in accordance with GAAP. The term "financial statements" shall include the accompanying notes and schedules.

## 1. WHAT THE PARTIES AGREE TO FINANCE; DESIGNATION OF LEAD BORROWER

Provided that the conditions in Sections 4 and 5 and elsewhere in this Agreement are met, We will lend to You the Parts of the Commitment Amount as reflected in the Table of Terms and You agree to use such proceeds to finance any of Your general corporate needs. We will make one monthly Advance under the Revolving Loan (each an "**Advance**") in minimum amounts as set forth in the Table of Terms up to a maximum of the Commitment Amount as provided in the Table of Terms. Our obligation to fund Advances under each Part of the Commitment Amount under this Agreement will end on the last day of the Availability Period noted in the Table of Terms for such Part.

Any Person that executes a Joinder Agreement to become a borrower under this Agreement hereby designates **PERSONALIS, INC.** as its representative and agent on its behalf for the purposes of giving and receiving all Advance Requests and all other notices and consents under this Agreement or under any of the other Loan Documents and taking all other actions (including in respect of compliance with covenants) on behalf of any Person that executes a Joinder Agreement to become a borrower under this Agreement, under this Agreement and the other Loan Documents. **PERSONALIS, INC.** hereby accepts such appointment. We may regard any notice or other communication pursuant to this Agreement or any other Loan Document from **PERSONALIS, INC.** as a notice or communication from all of You, and may give any notice or communication required or permitted to be given to any of You hereunder to **PERSONALIS, INC.** on behalf of each of You. Each of You agrees that each notice, election, representation and warranty, covenant, agreement and undertaking made on Your behalf by **PERSONALIS, INC.** shall be deemed for all purposes to have been made by each of You and shall be binding upon and enforceable against each of You to the same extent as if the same had been made directly by each of You.

## 2. YOU WILL ENTER INTO A PROMISSORY NOTE

The Plain English Revolving Loan Promissory Note in the form of **Exhibit A** ("**Promissory Note**") is the form of document the Parties will enter into upon the availability of each Tranche/Commitment Amount. The Promissory Note evidences the Revolving Loan and all of the terms and conditions of this Agreement are incorporated in and made a part of the Promissory Note. For any Part that is not available on the Closing Date, the Parties will enter into a Promissory Note when such Part becomes available.

## 3. YOUR LOAN FACILITY COMMITMENT AMOUNT MAY BE DIVIDED INTO PARTS

The Commitment Amount and/or its corresponding parts (if any) will be noted in the Table of Terms ("**Parts**"). For purposes of this Agreement, references to the Commitment Amount shall mean the Part or Parts which are available and in effect. Certain terms or conditions associated with the availability of such Part are listed in the Table of Terms. As to any Part that is available "**Upon Request and Additional Approval**", You are required to make a request to utilize that additional Part in writing to Us (the "**Commitment Increase Request Notice**"), prior to Your submission of a corresponding Advance Request. After Our receipt of the Commitment Increase Request Notice, We will review the information available to Us and conduct any legal and business due diligence deemed necessary by Us in connection with Our attempt to obtain Our requisite credit approvals and such approval shall be in Our sole discretion. Our agreement to consider providing the additional Part is not, and is not to be construed as, a commitment, offer, or agreement to provide such additional Part.

**Part 1 Milestone:** The availability of the Part 1 Commitment Amount is as follows: (a) an initial $5,000,000 of the Part 1 Commitment Amount shall be available subject to confirmation satisfactory to Us that You have completed the Part 1 Milestone, as determined in Our sole discretion ("Tranche A") and (b) the remaining $5,000,000 of the Part 1 Commitment Amount shall be available upon confirmation in writing that subsequent to the Closing Date the Department of Veteran Affairs has awarded to You the the contract related to the Million Veteran Program (the "VA Contract") or Upon Request and Additional Approval in the event You are not awarded the VA Contract ("Tranche B").

## 4. HOW WILL YOU REQUEST ADVANCES

In addition to the requirements of Section 5 set forth below, You agree to follow the procedures listed below to have Us extend an Advance to You:

- You will submit to Us (by facsimile, mail or electronic mail) a completed Advance Request in the form attached as **Exhibit B** signed by Your Chief Executive Officer, President or Vice President-Finance. The Advance Request shall be irrevocable.
- Such Advance Request must be submitted and received by Us no later than 5:00 p.m. PT **five (5)** Business Days prior to the last day of the applicable Availability Period. Any Advance Request submitted after 5:00 p.m. PT shall be considered received the following Business Day.
- Each Advance Request will state a requested funding date that is at least **five (5)** Business Days after the date such Advance Request is submitted to Us.

After We check and approve the information You provide in the Advance Request, upon Your initial Advance Request, We will prepare and provide to You a Promissory Note for Your signature. Upon receipt of the Promissory Note signed by Your authorized officer and confirmation by Us that all conditions to funding an Advance have been met, We will then advance the requested funds to You.

All the terms, conditions, and covenants of this Agreement shall apply to all Advances whether or not each Advance is evidenced by a Promissory Note. You agree that We may rely on, and shall be fully protected in relying upon, any notice or Advance Request given by any person We reasonably believe to be Your authorized representative without the necessity of Our conducting an independent investigation, including Your contact person listed in the Table of Terms.

## 5. CONDITIONS FOR US TO MAKE LOANS TO YOU

Our obligation to fund any Advance that You request under this Agreement is subject to satisfaction of each of the conditions set forth in Sections 4 and 18 and each of the following conditions:

- The representations and warranties in this Agreement and in the Warrant Agreement shall be true, complete and correct in all material respects on and as of the date(s) We fund each Advance with the same effect as though they were made on and as of such date, except to the extent such representations and warranties expressly relate to an earlier date, in which case they shall remain true, complete and correct in all material respects as of such date; provided, however, that such materiality qualifiers shall not be applicable to any representations and warranties that already are qualified or modified by materiality in the text thereof. Each Advance Request will constitute Your representation and warranty on the relevant Advance Date as to the matters provided in Sections 11 and 12 and as to the matters set forth in the Advance Request.

- You shall be in compliance with all the terms and provisions set forth in this Agreement, each Promissory Note and each other Loan Document, and at the time of and immediately after such Advance: (a) no Default or Event of Default shall have occurred and be continuing, and (b) no fact or conditions shall exist that would (or would with the passage of time, the giving of notice, or both) constitute a Default or an Event of Default under this Agreement or any other Loan Document.
- You shall provide Us with all appropriate assignments, notices and control agreements that are necessary or desirable to perfect or maintain Our first priority Lien in all of the Collateral.
- You shall have paid to Us the entire amount of the Facility Fee then due and payable as indicated in the Table of Terms relating to the Part under which such Advance is funded.
- No event or circumstance shall exist or have occurred that has had or could reasonably be expected to have a Material Adverse Effect.
- You shall have delivered to Us the Warrant Agreement.
- We shall have received all of the agreements, documents, instruments and other items set forth in the Schedule of Documents attached hereto as **Schedule 2**, each in form and substance reasonably satisfactory to Us.
- We shall have received certificates of insurance, endorsements and other documents evidencing Your compliance with Section 10 in form and substance reasonably acceptable to Us.
- You shall submit to Us any other documents and other information that We may request.

## 6. YOU MAY PREPAY YOUR PROMISSORY NOTE

You may at any time prepay any amounts outstanding under all of the Promissory Notes in part or in full, without premium or penalty, by paying: (a) the principal amount being prepaid and all accrued interest calculated as if the date of such prepayment occurred on the next scheduled monthly payment date per the respective Promissory Notes, (b) the End of Term Payment, prorated for any partial payment, and (c) all other Secured Obligations, if any, that shall have become due and payable, including interest at the Default Rate with respect to any past due amounts as of the date of prepayment.

## 7. THE MAXIMUM RATE OF INTEREST; DEFAULT RATE

**Maximum Rate of Interest.** It is not Our intent to receive interest at a rate greater than the maximum rate permissible by law, which We shall call the "maximum rate". If a court determines You have actually paid Us interest based on a rate that exceeds the maximum rate, then We shall apply the excess as follows: first, to the payment of the outstanding principal amount of the Secured Obligations; second, after all principal is repaid, to the payment of Our accrued interest and any other principal, interest, fees, costs or other amounts owed by You to Us in respect of the Secured Obligations; and third, after all amounts owed by You to Us are repaid, the excess (if any) shall be refunded to You.

**Default Interest.** In the event that You do not pay any interest when due, delinquent interest shall be added to principal and shall bear interest on interest, compounded at the rate set forth in the Table of Terms. Upon and during an Event of Default, all principal, interest or other amounts owed by You to Us shall bear interest at a rate per annum equal to the rate set forth in the Table of Terms plus five percent (5%) per annum (the "**Default Rate**").

## 8. YOU GRANT US A SECURITY INTEREST

Each of You grants to Us a first priority, continuing security interest in and Lien upon all of Your right, title and interest in each of the following whether now owned or hereinafter acquired and wherever located:

- All Receivables;
- All Equipment;
- All Fixtures;

- All General Intangibles;
- All Intellectual Property;
- All Inventory;
- All Investment Property;
- All Deposit Accounts;
- All Cash;
- All commercial tort claims, if any, as listed on **Exhibit C**;
- All Goods and personal property, whether tangible or intangible and whether now or hereinafter owned or existing, leased, consigned by or to or acquired and wherever located; and
- To the extent not otherwise included, all Proceeds of each of the foregoing and all accessions to, substitutions and replacements for, rents, profits, and products of each of the foregoing.

All the above listed items will be collectively called the "Collateral".

Notwithstanding the above, Collateral excludes Intellectual Property currently held or hereafter obtained, but includes Proceeds of Intellectual Property (including but not limited to all Receivables, rights to payment and General Intangibles arising from the sale, licensing or disposition of all or any part of, or rights in, the foregoing); provided, however, other than non-exclusive licenses or non-perpetual exclusive licenses with respect to geographic area, fields of use and customized products for specific customers that would not result in a transfer of title of the licensed property under applicable law, all given in the ordinary course of Your business, in the event any of You transfer, sell, assign, grant a security interest in, hypothecate, permit or suffer to exist any Lien, or otherwise transfer any interest in or encumber any portion of the Intellectual Property, either voluntarily or involuntarily, without Our prior written consent, Our security interest shall include (and shall be deemed to have a Lien in such assets included from the Closing Date) all Intellectual Property.

As of September 1, 2017, You may enter into a Working Capital Loan Facility (defined below) so long as the aggregate outstanding obligations and liabilities thereunder (including advances, bank services, letters of credit, contingent obligations and the like) at no time exceed $5,000,000 upon receipt and review by Us of the final documentation relating to such Working Capital Loan Facility and execution of an intercreditor agreement between Us and the lender under the Working Capital Loan Facility, with terms acceptable to Us. As used in this Agreement "**Working Capital Loan Facility**" means a revolving line of credit provided by a bank, commercial lender, or other financial institution regularly engaged in the business of lending money (excluding venture capital, investment banking or similar institutions which sometimes engage in lending activities but which are primarily engaged in investments in equity securities) (each, a "**Working Capital Lender**"), pursuant to which such Working Capital Lender makes advances based on the value of any of Your Accounts.

## 9. HOW AND WHAT WILL YOU PAY US

**Payments.** Except as set forth in Section 7 with respect to interest that accrues at the Default Rate, the principal balance of each Promissory Note shall accrue interest at the percentage per year as indicated in the Table of Terms, and shall be computed daily on the basis of a year consisting of 360 days for the actual number of days occurring in the period for which such interest is payable, and interest shall accrue from the date on which the Advance funded to any of You. Monthly installments of interest shall be payable on the last day of each month through the Revolving Loan Maturity Date (unless that date falls on a weekend or national holiday in which event such payment shall be due on the previous Business Day). In the event that the Prime Rate is changed from time to time during the term of this Agreement, the applicable rate of interest for the outstanding principal balance of the Advances shall be increased or decreased, effective as of the day the Prime Rate is changed, by an amount equal to such change in the Prime Rate. The first payment date for each Advance will be the last day of the month in which the Advance was funded. All outstanding principal and accrued interest shall be due on the Revolving Loan Maturity Date, if not sooner paid in full.

**Interest Rate Adjustment.** Immediately upon execution of a Working Capital Loan Facility the Interest Rate for all outstanding Advances and any new Advances shall increase by one percent (1%).

**Fees.** You shall pay to Us the following fees and expenses:

- **Facility Fees.** On or before the Closing Date, or upon availability of additional Commitment Amounts, as the case may be, the respective Facility Fee as indicated in the Table of Terms.

- **End of Term Payment.** Upon the earlier of the expiration of the Loan Term or last payment date for any Promissory Note, the End of Term Payments as indicated in the Table of Terms.

**Re-borrowing.** Any amounts that You repay on the Advances may be re-borrowed during the applicable Availability Period.

**Miscellaneous.** Payments are due electronically by automatic debit through Automated Clearing House (ACH) payment on or before the last day of each month. You agree to fill out and execute the electronic funds transfer/automatic debit Authorization form that We provide. If We do not receive any payments from You within two (2) Business Days after they are due, You will pay a late charge on the overdue amount. The late charge will be equal to five percent (5%) of the amount due for each month not paid when due and until such time as payment is received. All payments shall be free and clear of any taxes, withholdings, duties, impositions or other charges, to the end that We will receive the entire amount of any Secured Obligations payable under this Agreement, regardless of the source of payment. Any interest not paid when due shall be compounded by becoming a part of the Secured Obligations, and such interest shall then accrue interest at the rate then applicable under this Agreement and the applicable Promissory Note.

## 10. INSURANCE

So long as there are any Secured Obligations outstanding, You shall carry and maintain commercial general liability insurance, against risks customarily insured against in Your line of business. All such insurance shall be in form, with companies, and in amounts reasonably acceptable to Us. Such risks shall include the risks of bodily injury, including death, property damage, personal injury, advertising injury, and contractual liability. You must maintain a minimum of One Million Dollars ($1,000,000) of commercial general liability insurance for each occurrence. So long as there are any Secured Obligations outstanding, You shall also carry and maintain insurance upon the Collateral, insuring against all risks of physical loss or damage howsoever caused, including the perils of fire, windstorm, in an amount not less than the full replacement cost of the Collateral. .

You shall submit to Us certificates of insurance, which reflect Your compliance with Your insurance obligations in the above paragraph and the obligations contained in this Section. Your insurance certificate shall state that We are an additional insured for commercial general liability, an additional insured and a loss payee for all risk property damage insurance. . Attached to the certificates of insurance will be additional insured endorsements for liability and lender’s loss payable endorsements for all risk property damage insurance

The certificates of insurance will state that the commercial general liability coverage evidenced is primary and non-contributory to any insurance or Our self-insurance, and will further state that a waiver of subrogation in favor of Us has been agreed to. The commercial general liability and property insurance will provide for a minimum of thirty (30) days advance written notice to Us of cancellation, ten (10) days for nonpayment. Any failure by Us to scrutinize such insurance certificates for compliance is not a waiver of any of Our rights, all of which are reserved

## 11. REPRESENTATIONS AND WARRANTIES FROM YOU

You represent and warrant that:

- **Collateral Title.** You own all right, title and interest in and to the Collateral, free of all Liens whatsoever, except for Permitted Liens.
- **Granting of Lien.** You have the full power and authority to, and do grant and convey to Us, a Lien on the Collateral as security for the Secured Obligations, free of all Liens other than Permitted Liens and shall execute such notices, assignments, and control agreements, in connection herewith as We may reasonably request to perfect and obtain the priority of Our Lien on the Collateral. Except for Permitted Liens, the Collateral is not subject to any Liens. You are not presently a party to, nor bound by, any material lease, license, contract or agreement which prohibits You or any of Your Subsidiaries from granting a Lien on such lease, license, contract or other agreement (to the extent such prohibition is enforceable under applicable law).

- **Due Organization.** You are a corporation duly organized, legally existing and in good standing under the laws of the State of Delaware with corporate organization number **4943063** for Personalis, Inc. and are duly qualified as a foreign corporation in all jurisdictions in which the nature of Your business or location of Your properties require such qualifications and where the failure to be qualified could reasonably be expected to result in an event which, individually or together with any other event, would have a Material Adverse Effect.
- **Authorization, Validity and Enforceability.** Your execution, delivery and performance of the Promissory Notes, this Agreement, all financing statements, all other Loan Documents, and all Excluded Agreements, (i) have been duly authorized by all necessary corporate action, and (ii) will not result in the creation or imposition of any Lien upon the Collateral, other than the Liens created by this Agreement and the other related Loan Documents. The person or people executing this Agreement and other Loan Documents are duly authorized to do so, and the Loan Documents executed by or on behalf of any of You and each term and provision thereof are Your legal, valid and binding obligations, enforceable in accordance with their respective terms, subject to applicable bankruptcy, insolvency, reorganization or other similar laws generally affecting the enforcement of the rights of creditors and equitable principles (regardless of whether enforcement is sought in equity or at law).
- **Litigation.** There are no actions, suits or proceedings at law or in equity or by or before any governmental authority now pending or, to the knowledge of any of You, threatened against or affecting any of You or any of the business, property or rights of any of You (i) which involve any Loan Document or Excluded Agreement or (ii) as to which there is a reasonable possibility of an adverse determination and which, if adversely determined, could, individually or in the aggregate result in an event which individually or together with any other event, reasonably be expected to result in a Material Adverse Effect.
- **Compliance with Applicable Laws.** None of You are in violation of any law, rule or regulation or in default with respect to any judgment, writ, injunction or decree of any governmental authority, where such violation or default could reasonably be expected to result in a Material Adverse Effect.
- **Conflict.** Neither this Agreement nor any other Loan Document (a) violates any provisions of the articles or certificate of incorporation, or bylaws of any of You, or any law, regulation, order, injunction, judgment, decree or writ to which any of You are subject or (b) conflicts with or results in the breach or termination of, constitutes a default under or accelerates or permits the acceleration of any performance required by, any material lease, agreement or other contract to which any of You are a party or by which any of You or any of Your property is bound.
- **Further Consent.** The execution, delivery and performance of this Agreement and the other Loan Documents do not require the consent or approval of any other Person, including any regulatory authority, or governmental body of the United States or any State or any political subdivision of the United States or any state.
- **Material Adverse Effect.** Since March 31, 2017, no event that has had or could reasonably be expected to have a Material Adverse Effect has occurred or is continuing.
- **Other Defaults.** None of You is in default in any manner under any provision of any indenture or other agreement or instrument evidencing Indebtedness, or any other material agreement or instrument to which any of You are a party or by which any of You or any of the properties or assets of any of You are or may be bound, in each case where such default could result in an event which, individually or together with any other event, could reasonably be expected to have a Material Adverse Effect.
- **Other Agreement.** None of You is a party to any agreement or instrument or subject to any corporate restriction that has resulted or could reasonably be expected to result in a Material Adverse Effect.
- **Information Correct.** No information, report, Advance Request, financial statement, exhibit or schedule furnished by or on behalf of any of You to Us in connection with the negotiation of any Loan Document contains or will contain any material misstatement of fact or omitted, omits or will omit to state any material fact necessary to make the statements, in the light of circumstances under which they were, are or will be made, not misleading (it being recognized by Us that projections and estimates as to future events are not to be viewed as facts and that the actual results during the period or periods covered by any such projections and estimates may differ materially from projected or estimated results).
- **Filing of Taxes.** You have filed all required federal, state and local tax returns (or filed appropriate extensions for the filing of such returns), except to the extent such failure to file has not resulted in the creation of a Lien. Subject to Section 12, Paragraph “Taxes”, You have fully paid or You have reserved for and are contesting in

good faith all taxes or installments (including any interest or penalties). You have fully paid or reserved for and are contesting in good faith all tax assessments that any of You have received for the 3 years preceding the Closing Date.

- **ERISA Compliance.** You have met the minimum funding requirements of ERISA with respect to any employee benefit plans subject to ERISA. No event has occurred resulting from the failure by any of You to comply with ERISA that is reasonably likely to result in any of You incurring any liability that could reasonably be expected to have a Material Adverse Effect.

- **Hazardous Waste.** None of the properties or assets of any of You has ever been used by any of You or, to the knowledge of any of You, by previous owners or operators, in the disposal of, or to produce, store, handle, treat, release, or transport, any hazardous waste or hazardous substance other than in accordance with applicable law; to the knowledge of any of You, none of the properties or assets of any of You has ever been designated or identified in any manner pursuant to any environmental protection statute as a hazardous waste or hazardous substance disposal site, or a candidate for closure pursuant to any environmental protection statute; no Lien arising under any environmental protection statute has attached to any revenues or to any real or personal property owned by any of You; and none of You have received a summons, citation, notice, or directive from the Environmental Protection Agency or any other federal, state or other governmental agency concerning any action or omission by any of You resulting in the releasing, or otherwise disposing of hazardous waste or hazardous substances into the environment. You have at all times operated Your business in compliance in all material respects with all applicable provisions of federal, state and local statutes and ordinances dealing with the control, shipment, storage or disposal of hazardous materials or substances.

- **Operation of Business.** You own, possess, have access to, or can become licensed on reasonable terms under all patents, patent applications, trademarks, trade names, inventions, franchises, licenses, permits, computer software and copyrights necessary for the operation of Your business as now conducted, with no known infringement of, or conflict with, the rights of others. You have taken reasonable measures to avoid liability from infringement by third parties using Your facilities, in particular that You have complied with the requirements of the Digital Millennium Copyright Act for notice and takedown. You have at all times operated Your business in compliance in all material respects with all applicable provisions of the Federal Fair Labor Standards Act, as amended.

- **Trading with the Enemy Act; OFAC; Patriot Act.** Neither You nor any of Your Subsidiaries is an “enemy” or an “ally of the enemy” within the meaning of Section 2 of the Trading with the Enemy Act or any enabling legislation or executive order relating thereto. Neither You nor any of Your Subsidiaries is in violation of (a) the Trading with the Enemy Act, (b) any of the foreign assets control regulations of the United States Treasury Department (31 C.F.R., Subtitle B, Chapter V, as amended) or any enabling legislation or executive order relating thereto, or (c) the Patriot Act.

- **Investment Company Act.** Neither You nor any of Your Subsidiaries are (a) an “investment company” or is “controlled” by an “investment company”, as such terms are defined in, or subject to regulation under, the Investment Company Act of 1940, (b) otherwise subject to any other regulatory scheme limiting its ability to incur debt or requiring any approval or consent from, or registration or filing with, any governmental authority in connection with Your or its incurrence of debt, (c) and is not a “person” related to Us as described in Sections 57(b) or 57(e) of the Investment Company Act of 1940.

- **Your Information.** Your present name, former names (if any) used in the past 5 years, locations, and other information are correctly and completely stated on the Certificate of Perfection attached as **Exhibit C**.

- **Intellectual Property.** The Certificate of Perfection attached as **Exhibit C** contains a true, correct and complete list of each of Your Patents, Trademarks, Copyrights and Licenses, together with application or registration numbers, as applicable.

- **Accounts.** The Certificate of Perfection attached as **Exhibit C** contains a true, correct and complete list of (a) all banks and other financial institutions at which You maintain Deposit Accounts and (b) institutions at which You maintain accounts holding Investment Property owned by You, and such Certificate of Perfection correctly identifies the name, address and telephone number of each bank or other institution, the name in which the account is held, a description of the purpose of the account, and the complete account number therefore. None of the account debtors or other Persons obligated on any of the Collateral is a governmental authority covered by the Federal Assignment of Claims Act or like federal, state or local statute, rule, or law in respect of such Collateral.

## 12. YOUR COVENANTS TO US

So long as the Secured Obligations have not been fully and indefeasibly paid in cash in full or We have any obligation to make Advances, Each of You covenants to the following:

- **Legal Existence and Qualification.** Each of You will maintain Your, and each of Your Subsidiaries', legal existence and good standing in Your and their respective jurisdictions of formation or organization, and maintain qualifications to do business in all jurisdictions in which the nature of Your business or location of Your properties require such qualifications and where the failure to be qualified could reasonably be expected to result in an event which, individually or together with any other event, would have a Material Adverse Effect.
- **Compliance with Laws.** Each of You will, and will cause each of Your Subsidiaries to, comply with all laws (including, without limitation, environmental laws) rules, regulations applicable to, and all orders and directives of any governmental or regulatory authority having jurisdiction over, You, Your Subsidiaries or Your business, and with all material agreements to which You or any of Your Subsidiaries are a party, except where the failure to so comply could not reasonably be expected to have a Material Adverse Effect. None of You nor any of Your Subsidiaries shall become an "investment company" or controlled by an "investment company," within the meaning of the Investment Company Act of 1940, or become principally engaged in, or undertake as one of Your important activities, the business of extending credit for the purpose of purchasing or carrying margin stock, or use the proceeds of any loan for such purpose. None of You, nor any Your Subsidiaries shall fail to meet the minimum funding requirements of ERISA, permit a reportable event or prohibited transaction, as defined in ERISA, to occur, or fail to comply in all material respects with the Federal Fair Labor Standards Act.
- **Management Rights.** Each of You will permit any of Our authorized representatives and Our attorneys and accountants on reasonable notice to inspect, examine and make copies and abstracts of Your books of account and records at reasonable times and during normal business hours. In addition, We and Our agents, attorneys and accountants will have the right to meet with the management and officers of any of You to discuss such books of account and records. In addition, We will be entitled at reasonable times and intervals to consult with and advise the management and officers of any of You concerning significant business issues. Such consultations shall not unreasonably interfere with Your business operations. The Parties intend that the rights granted here shall constitute "management rights" within the meaning of 29 C.F.R Section 2510.3-101(d)(3)(ii), but that any advice, recommendations or participation with respect to any business issues will not be deemed to give Us, nor be deemed an exercise by Us or control over the management or policies of any of You. Further, each Party represents and warrants that We have offered to make available to each of You "significant managerial assistances" (as defined in Section 2(a)(47) of the Investment Company Act of 1940) and, to the extent You accept such offer from Us, the scope, terms and conditions of such significant managerial assistance shall be set forth in a separate agreement between You, Us and Our administrator.
- **Additional Documents and Assurances.** Each of You will from time to time execute, deliver and file, alone or with Us, any security agreements, or other documents to perfect or give first priority to Our Lien on the Collateral. Each of You will from time to time obtain any instruments or documents as We may request, and take all further action that may be reasonably necessary or desirable, or that We may reasonably request, to carry out the provisions and purposes of this Agreement or any other Loan Document or to confirm, perfect, preserve and protect the Liens granted to Us. In addition, each of You authorize Us to file at any time financing statements, continuation statements, and amendments thereto that (i) either specifically describe the Collateral or describe the Collateral as all of Your assets or words of similar effect, regardless of whether any particular asset comprised in the Collateral falls within the scope of Article 9 of the UCC of such jurisdiction, and (ii) contain any other information required by the UCC for the sufficiency of filing office acceptance of any financing statement, continuation statement, or amendment, including whether You are an organization, the type of organization and any organizational identification number issued to You, if applicable. Each of You hereby appoint Us as its lawful attorney-in-fact to sign Your name on any documents necessary to perfect or continue the perfection of any Lien regardless of whether an Event of Default has occurred until all Secured Obligations (other than inchoate indemnity obligations) have been satisfied in full and We are under no further obligation to make Advances. Our foregoing appointment as the attorney in fact for each of You, and all of Our rights and powers, coupled with an interest, are irrevocable until all Secured Obligations (other than inchoate indemnity obligations) have been fully repaid and performed and Our obligation to provide Advances terminates.

- **Protection of Our Lien.** Each of You will take or cause to be taken all actions necessary to protect and defend Your title to the Collateral and Our Lien on the Collateral. Each of You shall at all times keep the Collateral, and the assets and properties of each of Your Subsidiaries, free and clear from any legal process or Liens whatsoever (except for Permitted Liens) and shall give Us immediate written notice of any legal process affecting the Collateral or the assets and properties of Your Subsidiaries, or any Liens on the Collateral or the assets and properties of Your Subsidiaries.
- **Maintenance of Properties.** Each of You will maintain and protect Your properties, assets and facilities (and those of Your Subsidiaries), including Your equipment and fixtures, in good working order, repair and condition (taking into consideration ordinary wear and tear) and from time to time make or cause to be made all necessary and proper repairs, renewals and replacements and shall completely manage and care for Your property in accordance with prudent industry practices.
- **Financial Statements.** Each of You will provide monthly and yearly financial statements in accordance with Section 18 of this Agreement, and such financial statements will include reports of any material contingencies (including commencement of any material litigation by or against You) or any other occurrence that could reasonably be expected to have, individually or in the aggregate, a Material Adverse Effect.
- **Audits and Inspections.** Upon Our request, each of You will, during normal business hours, make the Inventory, Equipment, other Collateral, and books and records concerning the Collateral (including software used in Your business) available to Us for inspection at the place where it is located and shall make Your log and maintenance records pertaining to the Inventory and Equipment available to Us for inspection. You will take all action necessary to correctly and completely maintain such books, records, logs, and maintenance records.
- **Taxes.** Each of You will pay when due all federal income taxes, all state taxes imposed by each of Your states of organization and the state of Your principal place of business and all material taxes, fees or other charges of any nature whatsoever (together with any related interest or penalties) imposed or assessed against any of You, Us or the Collateral or upon Your ownership, possession, use, operation or disposition thereof or upon Your rents, receipts or earnings arising therefrom (excluding taxes imposed on Us based on Our net income or franchise taxes). Each of You shall file on or before the due date all federal, state and local tax returns including personal property tax returns in respect to the Collateral on or before the due date thereof. Notwithstanding the foregoing, each of You may contest, in good faith and by appropriate proceedings, taxes, fees and other charges for which You maintain adequate reserves in accordance with GAAP.
- **Intellectual Property.** Each of You will: (a) protect, defend and maintain the validity and enforceability of Your Intellectual Property; (b) promptly advise Us in writing of material infringements of Your Intellectual Property; (c) not allow any Intellectual Property material to Your business to be abandoned, forfeited or dedicated to the public without Our written consent; and (d) give Us written notice of any applications or registrations of Your Intellectual Property, including the date of such filings and the applicable application or registration numbers within thirty (30) days after the end of each calendar quarter.
- **Subsidiaries.** If at any time, any of You create or acquire any Subsidiary, You and such subsidiary will promptly notify Us of the creation or acquisition of such new Subsidiary and take all such action as We may reasonably require to cause such Subsidiary to guaranty the Secured Obligations and grant a continuing pledge and security interest in and to the assets of such Subsidiary, and You shall grant and pledge to Us a first priority, perfected security interest in the stock, units or other evidence of ownership of such Subsidiary.
- **Dispositions, Liens and Encumbrances.** None of You will nor will You permit any of Your Subsidiaries to, transfer, sell, assign, grant a security interest in, hypothecate, permit or suffer to exist any Lien, or otherwise transfer any interest in or encumber any portion of Your properties or assets (or those of any Subsidiary), including the Intellectual Property, either voluntarily or involuntarily, without Our prior written consent, other than: (a) Permitted Liens, (b) sales of Inventory in the ordinary course of business, (c) non-exclusive licenses or non-perpetual exclusive licenses with respect to geographic area, fields of use and customized products for specific customers that would not result in a transfer of title of the licensed property under applicable law, all given in the ordinary course of Your business, and (d) sales of worn-out or obsolete Equipment not financed by Us provided that the fair market value of such Equipment does not exceed $50,000 in any fiscal year. In addition, none of You will, nor will You permit any of Your Subsidiaries to, enter into any agreement with any Person (other than Us) that restricts Your ability, or the ability of any of Your Subsidiaries, to transfer, sell, assign, grant a security interest in, hypothecate, permit or suffer to exist any Lien, or otherwise transfer any interest in or encumber any portion of Your properties or assets or those of any of Your Subsidiaries, including Your Intellectual Property. Without limiting the generality of the foregoing, none of You will sell, transfer, encumber or otherwise dispose of any ownership interest that You may have in any subsidiary.

- **Mergers or Acquisitions.** None of You will, nor will You permit any of Your Subsidiaries to, liquidate, dissolve or enter into or consummate any Merger Event, and none of You will acquire all or substantially all of the capital stock or property of another Person, except that a Subsidiary (i) may merge into any of You or another Subsidiary of You, or (ii) liquidate or dissolve, provided that its assets are transferred to You.
- **Compromise of Accounts.** Without Our prior written consent, none of You will (a) grant any material extension of the time or payment of any of the Receivables, or General Intangibles, except in the ordinary course of business and consistent with customary industry practice, (b) to any material extent, compromise, compound or settle the same for less than the full amount, except in the ordinary course of business and consistent with customary industry practice, (c) release, wholly or partly, any Person liable for the payment, or (d) allow any credit or discount whatsoever other than trade discounts granted to You in the ordinary course of Your business and consistent with customary industry practice.
- **Other Indebtedness.** None of You will, nor will You permit any of Your Subsidiaries to, incur any Indebtedness without the prior written consent of Us other than Indebtedness evidenced by this Agreement and the Permitted Indebtedness.
- **Investments.** None of You will, nor will You permit any of Your Subsidiaries to, directly or indirectly make any Investment other than Permitted Investments.
- **Dividends and Distributions.** None of You will, without Our prior written consent, declare or pay any cash dividend or make a distribution on, or repurchase or redeem, any class of stock, other than (a) pursuant to repurchase plans upon an employee's, consultant's or director's death or termination of employment provided the aggregate amount of all such repurchases does not exceed One Hundred Thousand Dollars ($100,000) per fiscal year and (b) dividends payable solely in shares of Your common stock.
- **Collateral Locations; Name Changes.** None of You will relocate, nor will You permit any Subsidiary to relocate, Your (or such Subsidiary's) chief executive office or principal place of business or any item of the Collateral (or assets of any such Subsidiary) unless: (i) You have given Us no less than thirty (30) days prior written notice, (ii) You have obtained Our prior written consent, which consent shall not be unreasonably withheld; (iii) such relocation shall be within the continental United States, and (iv) such relocation does not adversely affect the perfection or priority of Our security interest in any of the Collateral. In addition, each of You will obtain and maintain such acknowledgments, consents, waivers and agreements from: (i) the owner, Lien holder, mortgagee and landlord with respect to any real property on which Collateral is located and (ii) from any Person in possession of Collateral, as We may require, all in form and substance reasonably satisfactory to Us. Without limiting the foregoing, where the Collateral is covered by a negotiable Document (such as a warehouse receipt), You shall deliver to Us possession of such Document. None of You will change Your name without providing Us at least 30 days' advance written notice. None of You will change Your type of organization or legal structure without Our prior written consent.
- **Line of Business.** None of You will engage in, nor will You permit any of Your Subsidiaries to engage in, any business other than the businesses currently engaged in by You and Your Subsidiaries or reasonably related thereto.
- **Change of Jurisdiction.** None of You will change Your state of organization unless You have obtained Our prior written consent, which consent shall not be unreasonably withheld. You must give Us no less than thirty (30) days prior written notice.
- **Deposit and Investment Accounts.** None of You will maintain, nor permit any of Your Subsidiaries to maintain, any Deposit Accounts or accounts holding Investment Property owned by any of You (or such Subsidiaries) except (i) accounts identified in the Certificate of Perfection attached as **Exhibit C** with respect to which We have a perfected security interest, and (ii) other accounts with respect to which We have a perfected security interest. You will give Us prior written notice of the creation of any Deposit Accounts or accounts holding Investment Property.
- **Transactions with Affiliates.** None of You will directly or indirectly enter into or permit to exist any material transaction with any of Your Affiliates except for (i) transactions that are in the ordinary course of Your business, upon fair and reasonable terms that are no less favorable to You than would be obtained in an arm's length transaction with a non-affiliated Person, and (ii) equity financings with Your existing investors that are otherwise permitted under this Agreement and (iii) unsecured bridge financings with Your existing investors that are otherwise permitted under this Agreement and that constitute Subordinated Indebtedness and are evidenced by a

subordination agreement on terms acceptable to Us in Our sole discretion. None of You will directly or indirectly make any payment or distribution on account of any intercompany liabilities or indebtedness other than the type described in item (h) of the definition of Permitted Indebtedness.

- **Subordinated Indebtedness.** You will not prepay, redeem or otherwise satisfy in any manner prior to the scheduled repayment thereof any Indebtedness (other than the Advances), and You shall not make or permit any payment on any Subordinated Indebtedness, except under the terms of the subordination, intercreditor, or other similar agreement to which such Subordinated Indebtedness is subject, or amend any provision in any document relating to the Subordinated Indebtedness which would increase the amount thereof or adversely affect the subordination thereof to Secured Obligations owed to Us.
- **OFAC and Patriot Act.** None of You will, directly or indirectly, use the proceeds of the Advances, or lend, contribute or otherwise make available such proceeds to any Subsidiary, Affiliate, joint venture partner or other Person, to fund any activities or business of or with any Person, or in any country or territory, that, at the time of such funding, is the subject of any sanctions administered by OFAC, or in any other manner that would result in a violation of OFAC sanctions by any Person, including any Person participating in any capacity in the Advances. You will not, and will not permit any of Your Subsidiaries to, (a) be or become subject at any time to any law, regulation or list of any governmental authority of the United States (including the OFAC list) that prohibits or limits Us from making any Advance or extension of credit to You or from otherwise conducting business with You, or (b) fail to provide certificates or documentary or other evidence of Your identity as may be requested by Us at any time to enable Us to verify Your identity or to comply with any applicable law or regulation, including Section 326 of the Patriot Act at 31 U.S.C. Section 5318.
- **Personalis (UK) Limited.** You shall not distribute any Cash or other investments to Personalis (UK) Limited other than ordinary expenses incurred by Personalis (UK) Limited pursuant to a cost plus arrangement between You and Personalis (UK) Limited. You agree with in thirty (30) days of Our request to enter into a Charge Over Shares in form and substance acceptable to Us.

## 13. YOU AGREE TO INDEMNIFY AND PROTECT US

You agree to indemnify and hold Us, Our officers, directors, employees, agents, attorneys, representatives and shareholders (each, an "**Indemnitee**") harmless from and against any and all claims, costs, expenses, damages and liabilities (including such claims, costs, expenses, damages and liabilities based on liability in tort, including strict liability in tort), including reasonable attorneys' fees and disbursements and other costs of investigation or defense (including those incurred upon any appeal), that may be instituted or asserted against or incurred by Us or any such Indemnitee as the result of credit having been extended, suspended or terminated under this Agreement and the other Loan Documents or the administration of such credit, or in connection with or arising out of the transactions contemplated or any actions or failures to act in connection with, or arising out of the disposition or utilization of the Collateral, excluding in all cases, claims, costs, expenses, damages and liabilities resulting solely from Our gross negligence or willful misconduct.

## 14. WHAT IS AN EVENT OF DEFAULT

The occurrence of any one or more of the following events shall constitute an "Event of Default" under this Agreement:

- **Payment.** You do not pay any principal, interest, fees, costs or other Secured Obligations under this Agreement, the Promissory Notes or any of the other related Loan Documents on the due date; or
- **Covenant.** Any of You fail to perform any covenant or Secured Obligations under this Agreement, the Promissory Notes or any of the other related Loan Documents, and You fail to cure such breach (to the extent that such breach is capable of being cured) within ten (10) days after the earlier of (i) We give You written notice or (ii) Your actual knowledge of such default; or
- **Misrepresentations.** Any of You or any Person acting for any of You makes any representation, warranty, or other statement now or later in this Agreement, any other Loan Document, or any Excluded Agreement or in any writing delivered to Us or to induce Us to enter this Agreement, any other Loan Document, or any Excluded Agreement, and such representation, warranty, or other statement is incorrect in any material respect when made, provided, however, that such materiality qualifier shall not be applicable to any representation, warranty or statement that already is qualified or modified by materiality in the text thereof; or

- **Bankruptcy; Attachment; Other.**

    - Any of You (i) assigns Your assets for the benefit of Your creditors, (ii) becomes insolvent or becomes unable to pay Your debts as they become due, or becomes unable to pay or perform Your obligations under the Loan Documents or Excluded Agreements, (iii) files a voluntary petition in bankruptcy, (iv) files any petition, answer, or document seeking for itself any reorganization, arrangement, composition, readjustment, liquidation, dissolution or similar relief under any present or future statute, law or regulation pertinent to such circumstances, (v) seeks or consents to or acquiesces in the appointment of any trustee, receiver, or liquidator of itself or of all or any substantial part of its assets or property, (vi) ceases operation of Your business as Your business has normally been conducted, or terminates substantially all of Your employees, or (vii) have Your directors or majority shareholders take any action initiating any of the foregoing actions described in this paragraph; or

    - Either (i) thirty (30) days shall have expired after the commencement of an involuntary action against any of You seeking reorganization, arrangement, composition, readjustment, liquidation, dissolution or similar relief under any present or future statute, law or regulation, without such action being dismissed or all orders or proceedings thereunder affecting Your operations or the business being stayed; or (ii) a stay of any such order or proceeding shall thereafter be set aside and the action setting it aside shall not be timely appealed; or (iii) any of You shall file any answer admitting or not contesting the material allegations of a petition filed against You in any such proceedings; or (iv) the court in which such proceedings are pending shall enter a decree or order granting the relief sought in any such proceedings; or

    - Thirty (30) days shall have expired after the appointment, without Your consent or acquiescence, of any trustee, receiver or liquidator of any of You or of all or any substantial part of the properties of any of You without such appointment being vacated; or

- **Agreements with Us.** The occurrence of any default under any other Loan Document, any Excluded Agreement, or any other agreement between any of You and/or any of Your Subsidiaries and Us (other than any default embodied in or covered by any clause of this Section 14) and such default continues for more than twenty (20) days after the earlier of (i) We have given notice of such default to You, or (ii) You have actual knowledge of such default; or

- **Other Agreements.** The occurrence of any default (other than any default embodied in or covered by any other clause of this Section 14) that has not been cured or waived within any applicable grace period under any lease, loan, or other agreement or obligation of any of You involving any obligation which aggregates more than $100,000, or which default could reasonably be expected to have a Material Adverse Effect; or

- **Judgments.** The entry of (a) any judgment or arbitration award against any of You involving an award in excess of $100,000 or that could reasonably be expected to have a Material Adverse Effect that is not covered by insurance by a solvent insurance carrier that has confirmed coverage in writing, has not been, discharged, bonded or stayed on appeal within ten (10) days; or (b) any judgment or arbitration award against You in which You are enjoined, restrained or in any way prevented from conducting all or any material part of Your business or affairs; or

- **Change of Control**. Except as otherwise permitted under this Agreement, the occurrence of any event or transaction, including the sale or exchange of outstanding shares of Your capital stock or the capital stock of any of Your Subsidiaries, or series of related events or transactions, resulting in (a) the holders of such outstanding capital stock immediately before consummation of such event or transaction, or series of related events or transactions, do not, immediately after consummation of such event or transaction or series of related events or transactions, retain, directly or indirectly, capital stock representing at least 50% of the voting power of the surviving Person of such event or transaction or series of related events or transactions, in each case without regard to whether You or any of Your Subsidiaries are the surviving Person, (b) any Person or "group" (other than a Person that is a stockholder on the Closing Date) shall obtain "beneficial ownership" (as such terms are defined under Section 13d-3 of and Regulation 13D under the Securities Exchange Act of 1934), either directly or indirectly, of more than 25% of Your outstanding capital stock having the right to vote for the election of directors under ordinary circumstances, or (c) You cease to own and control all of the economic and voting rights associated with all of the outstanding capital stock of Your Subsidiaries; or

- **Investor Support.** We have determined, in Our good faith judgment, that it is the intention of Your current equity investors to not continue to fund, or arrange for the funding of, You in the amounts and timeframe reasonably necessary to enable You to satisfy the Secured Obligations as they become due and payable; or

- **Officers.** The individuals holding the offices of Your Chief Executive Officer, President, or Chief Financial Officer as of the Closing Date shall for any reason cease to hold such offices or be actively engaged in Your day-to-day management, unless a successor reasonably acceptable to Us is appointed within ninety (90) days of such cessation; or

- **Guaranty Documents.** (a) Any guaranty of any Secured Obligations terminates or ceases for any reason to be in full force and effect; (b) any Guarantor does not perform any obligation or covenant under any guaranty of the Secured Obligations or any Event of Default occurs under any security agreement or other agreement between Us and any Guarantor; (c) any event or circumstance described in paragraphs 3 through 8 of this Section 14 occurs with respect to any Guarantor, or (d) the death, liquidation, administration, winding up, or termination of existence of any Guarantor (as applicable)**.**

## 15. WHAT HAPPENS UPON AN EVENT OF DEFAULT

If an Event of Default has occurred and is continuing, We can at Our option, and without notice to any of You:

- Terminate our commitment to make any future Advances under this Agreement;

- Terminate Our obligation to permit the principal, interest, fees, costs or other amounts owed by You to Us to remain outstanding;

- Recover all sums due and accelerate and demand payment of all or any part of the principal, interest, fees, costs or other amounts owed by any of You to Us and declare them to be immediately due and payable (provided, that upon the occurrence of a default of the type described in the fourth paragraph of Section 14 (i.e. "Bankruptcy; Attachment; Other"), the Promissory Notes and all of the principal, interest, fees, costs or other amounts owed by any of You to Us shall automatically be accelerated and made immediately due and payable, in each case without any further notice or act). Upon and after an Event of Default, the unpaid principal and accrued interest on the Promissory Notes and advances and all outstanding principal, interest, fees, costs or other amounts owed by any of You to Us, including all professional fees and expenses, shall thereafter bear interest at the Default Rate;

- Settle or adjust disputes and claims directly with the account debtors of any of You for amounts, upon terms and in whatever order that We reasonably consider to be advisable;

- Enter the premises of any of You, without notice and process of law and in compliance with Your security requirements, to remove and repossess the Collateral without being liable to any of You for damages due to the repossession, except those resulting from Our or Our assignees' negligence and charge You for the cost of repossession, storing and shipping the Collateral. With respect to any premises that any of You own, You hereby grant to Us a license to enter into possession of such premises and to occupy the same, without charge, in order to exercise any of Our rights or remedies provided herein, at law, in equity, or otherwise; and

- Pursue any other remedy permitted by law, equity or otherwise.

We may exercise all rights and remedies with respect to the Collateral under this Agreement or the other Loan Documents or otherwise available to Us under the UCC and other applicable law, including the right to release, hold, sell, lease, liquidate, collect, realize upon, or otherwise dispose of all or any part of the Collateral and the right to occupy, utilize, process and commingle the Collateral. Each of You hereby grants to Us a license and right, to use, without charge, the labels, patents, copyrights, rights of use of any name, trade secrets, trade names, trademarks, service marks, and advertising matter, or any property of a similar nature of any of You, as it pertains to the Collateral, in completing production of, advertising for sale, and selling any Collateral. In connection with Our exercise of Our rights under this Agreement and the other Loan Documents, each of the rights of any of You under all licenses and all franchise agreements shall inure to Our benefit. All Our rights and remedies shall be cumulative and not exclusive.

In addition to the power of attorney granted by each of You to Us in Section 12, effective only upon the occurrence and during the continuance of an Event of Default, each of You hereby irrevocably appoints Us (and any of Our designated officers, agents, attorneys or employees) as Your true and lawful attorney to: (a) send requests for verification of Receivables or notify account debtors of Our security interest in the Receivables; (b) endorse Your name on any checks or other forms of payment or security that may come into Our possession; (c) sign Your name on any invoice or bill of lading relating to any Receivable, drafts against account debtors, schedules and assignments of Receivables, verifications of Receivables, and notices to account debtors; (d) dispose of any Collateral; (e) make, settle, and adjust all claims under and decisions with respect to Your policies of insurance; (f) settle and adjust disputes and claims respecting the Accounts directly with account debtors, for amounts and upon terms which We determine to be reasonable. Our appointment as

the attorney in fact for each of You, and each and every one of Our rights and powers, being coupled with an interest, is irrevocable until all of the Secured Obligations (other than inchoate indemnity obligations) have been fully repaid and performed and Our obligation to provide Advances hereunder is terminated.

## 16. WHAT HAPPENS IF YOU ARE IN DEFAULT AND WE EXERCISE OUR REMEDIES

If an Event of Default has occurred and is continuing, We may, at any time or from time to time, apply, collect, liquidate, sell in one or more sales, lease or otherwise dispose of, any or all of the Collateral, in its then condition or following any commercially reasonable preparation or processing, in such order as We may elect. Any such sale may be made either at public or private sale at the place of business of any of You or elsewhere. Each of You agrees that any such public or private sale may occur upon Our ten (10) calendar days' prior written notice to You. We may require any of You to assemble the Collateral and make it available to Us at a place We designate that is reasonably convenient to Us. The proceeds of any sale, disposition or other realization upon all or any part of the Collateral shall be applied in the following order of priorities:

First, to Us in an amount sufficient to pay in full Our costs and professionals' and advisors' fees and expenses;

Second, to Us in an amount equal to the then unpaid amount of all the principal, interest, fees, costs or other amounts owed by any of You to Us, in such order and priority as We may choose in Our sole discretion; and

Finally, after the full, final, and indefeasible payment in Cash of all of the principal, interest, fees, costs or other amounts owed by any of You to Us, to any creditor holding a junior Lien on the Collateral, or to any of You or Your representatives or as a court of competent jurisdiction may direct.

## 17. CROSS-GUARANTY

**Cross-Guaranty.** Each of You hereby agrees that You are jointly and severally liable for, and hereby absolutely and unconditionally guarantees to Us and Our respective successors and assigns, the full and prompt payment (whether at stated maturity, by acceleration or otherwise) and performance of all Secured Obligations owed or hereafter owing to Us by the other of You. Each of You agrees that Your guaranty obligation hereunder is a continuing guaranty of payment and performance and not of collection, that Your obligations under this Section shall not be discharged until payment and performance, in full, of the Secured Obligations has occurred, and that Your obligations under this Section shall be absolute and unconditional, irrespective of, and unaffected by:

- the genuineness, validity, regularity, enforceability or any future amendment of, or change in, this Agreement, any other Loan Document or any other agreement, document or instrument to which any of You are or may become a party;
- the absence of any action to enforce this Agreement (including this Section) or any other Loan Document or the waiver or consent by Us with respect to any of the provisions thereof;
- the existence, value or condition of, or failure to perfect Our Lien against, any security for the Secured Obligations or any action, or the absence of any action, by Us in respect thereof (including the release of any such security);
- the insolvency of any of You; or
- any other action or circumstances that might otherwise constitute a legal or equitable discharge or defense of a surety or guarantor.

Each of You shall be regarded, and shall be in the same position, as principal debtor with respect to the Secured Obligations guaranteed hereunder.

**Waivers.** Each of You expressly waives all rights any of You may have now or in the future under any statute, or at common law, or at law or in equity, or otherwise, to compel Us to marshal assets or to proceed in respect of the Secured Obligations guaranteed hereunder against the other of You, any other party or against any security for the payment and performance of the Secured Obligations before proceeding against, or as a condition to proceeding against, You. It is agreed among each of You and Us that the foregoing waivers are of the essence of the transaction contemplated by this Agreement and the other Loan Documents and that, but for the provisions of this Section and such waivers, We would decline to enter into this Agreement.

**Benefit of Guaranty.** Each of You agrees that the provisions of this Section are for Our benefit and the benefit of Our respective successors, transferees, endorsees and assigns, and nothing herein contained shall impair, as between any other Person and Us, the obligations of such Person under the Loan Documents.

**Waiver of Subrogation, Etc.** Notwithstanding anything to the contrary in this Agreement or in any other Loan Document, and except as set forth herein, each of You hereby expressly and irrevocably waives any and all rights at law or in equity to subrogation, reimbursement, exoneration, contribution, indemnification or set off and any and all defenses available to a surety, guarantor or accommodation co-obligor. Each of You acknowledges and agrees that this waiver is intended to benefit Us and shall not limit or otherwise affect Your liability hereunder or the enforceability of this Section, and that We and Our respective successors and assigns are intended third party beneficiaries of the waivers and agreements set forth in this Section.

**Election of Remedies.** If We may, under applicable law, proceed to realize Our benefits under any of the Loan Documents giving Us a Lien upon any Collateral, whether owned by any of You or by any other Person, either by judicial foreclosure or by non judicial sale or enforcement, We may, at Our sole option, determine which of Our remedies or rights We may pursue without affecting any of Our rights and remedies under this Section. If, in the exercise of any of Our rights and remedies, We shall forfeit any of Our rights or remedies, including Our right to enter a deficiency judgment against any of You or any other Person, whether because of any applicable laws pertaining to "election of remedies" or the like, each of You hereby consents to such action by Us and waives any claim based upon such action, even if such action by Us shall result in a full or partial loss of any rights of subrogation that any of You might otherwise have had but for such action by Us. Any election of remedies that results in the denial or impairment of any right of Ours to seek a deficiency judgment against any of You shall not impair the respective obligations of the rest of You to pay the full amount of the Secured Obligations. In the event We shall bid at any foreclosure or trustee's sale or at any private sale permitted by law or the Loan Documents, We may bid all or less than the amount of the Secured Obligations and the amount of such bid need not be paid by Us but shall be credited against the Secured Obligations. The amount of the successful bid at any such sale, whether We are or any other party is the successful bidder, shall be conclusively deemed to be the fair market value of the Collateral and the difference between such bid amount and the remaining balance of the Secured Obligations shall be conclusively deemed to be the amount of the Secured Obligations guaranteed under this Section, notwithstanding that any present or future law or court decision or ruling may have the effect of reducing the amount of any deficiency claim to which We might otherwise be entitled but for such bidding at any such sale.

**Limitation**. Notwithstanding any provision herein contained to the contrary, the liability of each of You under this Section (which liability is in any event in addition to amounts for which You are primarily liable under this Agreement) shall be limited to an amount not to exceed as of any date of determination the greater of: (a) the net amount of the amounts advanced to the other of You under this Agreement and then re-loaned or otherwise transferred to, or for the benefit of, the other of You; and (b) the amount that could be claimed by Us from the other of You under this Section without rendering such claim voidable or avoidable under Section 548 of Chapter 11 of the Bankruptcy Code or under any applicable state Uniform Fraudulent Transfer Act, Uniform Fraudulent Conveyance Act or similar statute or common law after taking into account, among other things, Your right of contribution and indemnification from the other of You under this Section.

**Contribution with Respect to Guaranty Obligations**.

- To the extent that any of You shall make a payment under this Section of all or any of the Secured Obligations (a "Guarantor Payment") that, taking into account all other Guarantor Payments then previously or concurrently made by such Person, exceeds the amount that such Person would otherwise have paid if each of You had paid the aggregate Secured Obligations satisfied by such Guarantor Payment in the same proportion that such Person's Allocable Amount (as defined below) (as determined immediately prior to such Guarantor Payment) bore to the aggregate Allocable Amounts of all of You as determined immediately prior to the making of such Guarantor Payment, then, following indefeasible payment in full in cash of the Secured Obligations and termination of Our obligation to fund Advances, such Person shall be entitled to receive contribution and indemnification payments from, and be reimbursed by, the other of You for the amount of such excess, pro rata based upon their respective Allocable Amounts in effect immediately prior to such Guarantor Payment.
- As of any date of determination, the "Allocable Amount" of any of You shall be equal to the maximum amount of the claim that could then be recovered from such Person under this section without rendering such claim voidable or avoidable under Section 548 of Chapter 11 of the Bankruptcy Code or under any applicable state Uniform Fraudulent Transfer Act, Uniform Fraudulent Conveyance Act or similar statute or common law.

- This subsection is intended only to define the relative rights of each of You and nothing set forth in this subsection is intended to or shall impair the obligations of each of You, jointly and severally, to pay any amounts as and when the same shall become due and payable in accordance with the terms of this Agreement, including subsection "Cross-Guaranty" above. Nothing contained in this subsection shall limit the liability of any of You to pay the Advances made directly or indirectly to You and accrued interest, fees and expenses with respect thereto, for which You shall be primarily liable.
- The Parties hereto acknowledge that the rights of contribution and indemnification hereunder shall constitute assets of the Person to which such contribution and indemnification is owing.
- The rights of the indemnifying Persons against other Persons under this subsection shall be exercisable upon the full and indefeasible payment of the Secured Obligations and the termination of Our obligation to fund Advances.

**Liability Cumulative.** The liability of each of You under this Section is in addition to and shall be cumulative with all liabilities of each of You to Us under this Agreement and the other Loan Documents to which You are a party or in respect of any Secured Obligations or obligation of each of You, without any limitation as to amount, unless the instrument or agreement evidencing or creating such other liability specifically provides to the contrary.

## 18. DOCUMENTS YOU WILL PROVIDE US

***Upon signing this Agreement You will provide Us with each of the following documents on or before the Closing Date*:**

- Executed originals of this Agreement, and all other documents and instruments that We may reasonably require;
- Secretary's certificate of incumbency and authority for each of You;
- Certified copy of resolutions of each of Your boards of directors approving this Agreement, the associated Warrant Agreement(s) and the other Loan Documents and the transactions evidenced by this Agreement, the associated Warrant Agreement(s) and the other Loan Documents;
- Certified copy of Certificate of Incorporation and By-Laws for each of You, as amended through the Closing Date;
- A certificate of good standing from the State of incorporation of each of You, and similar certificates from all other jurisdictions where any of Your Subsidiaries do business and where the failure to be qualified, individually or collectively, could reasonably be expected to have a Material Adverse Effect;
- Payment of the Facility Fee for the Commitment Amount as denoted in the Table of Terms;
- Your budget and business plan of the current fiscal year;
- Executed Certificate of Perfection, attached as **Exhibit C**; and
- Any such other documents as We may reasonably request.

***On or before July 14, 2017, You shall provide a fully-executed copy by the Subordinated Lenders (as defined in the agreement referenced below) of the following:***

- That certain Subordination Agreement dated as of June 28, 2017 regarding convertible promissory notes in an amount up to $12,275,000.

***So long as there are any unpaid principal, interest, fees, costs or other amounts owed by any of You to Us, or We have any obligation to make any additional Advances, each of You shall provide Us with:***

**Financial Statements**. Within thirty (30) days after the end of each month, each of You will provide Us with (a) an unaudited income statement, statement of cash flows, and an unaudited balance sheet prepared in accordance with GAAP (except for the absence of footnotes and subject to year-end adjustments) accompanied by a report detailing

any material contingencies, and (b) copies of all board packages delivered to the board of directors of any of You in connection with board meetings or otherwise. Within one hundred eighty (180) days of the end of each fiscal year end, each of You will provide Us with audited financial statements accompanied by an audit report and an unqualified opinion of the independent certified public accountants. Within fifteen (15) days after approval by the Board of Directors, but no later than 60 days after the end of Your fiscal year, each of You will provide Us a budget and business plan for the next fiscal year. Each of You will provide Us any additional information (including, but not limited to, tax returns, income statements, balance sheets and names of principal creditors) as We reasonably believe are necessary to evaluate the continuing ability of each of You to meet Your financial obligations to Us. These statements should be emailed to Us at financials@triplepointcapital.com, or upon Our prior approval, sent by facsimile or mail to Us at the address listed in the Table of Terms.

**Certificate of Compliance.** Within five (5) Business Days after the end of each calendar quarter, each of You will provide Us with a Certificate of Compliance in the form attached as Exhibit D.

## 19. RIGHT TO INVEST

You grant Us (or at Our election, an Affiliate of Us) the right to invest up to Two Hundred Fifty Thousand and No/100 Dollars ($250,000), in the Next Round of Personalis, Inc., at Our sole discretion on the same terms and conditions as other investors in Your Next Round. You agree to provide Us with at least twenty (20) days prior written notice of the proposed date of the Next Round, which notice shall include the final terms, conditions and pricing of the Next Round and copies of draft equity documents no later than two (2) Business Days prior to the closing of the Next Round. The foregoing Right To Invest shall survive any termination or expiration of this Agreement and be in full force and effect until the consummation of Your Next Round.

## 20. OTHER LEGAL PROVISIONS YOU WILL ABIDE BY

**Continuation of Security Interest.** This is a continuing agreement and the grant of the security interest and Lien hereunder or any other Loan Document shall remain in full force and effect and all of Our rights, powers and remedies shall continue to exist until all of the principal, interest, fees, costs and other amounts owed by You to Us are fully and finally paid in cash, We have no further obligation to make Advances and We have executed a written termination statement. We shall file a termination statement and provide proof of filing to You within thirty (30) days after the full and final payment in cash of all of the principal, interest, fees, costs and other amounts owed by You to Us hereunder, reassigning to You, without recourse except for Our acts, the Collateral and all rights conveyed hereby and returning possession of the Collateral to You. Our rights, powers and remedies shall be in addition to all rights, powers and remedies given by statute or rule of law and are cumulative. The exercise of any one or more of the rights, powers and remedies provided herein or in any other Loan Document shall not be construed as a waiver of or election of remedies with respect to any of Our other rights, powers and remedies.

**Entire Agreement.** This Agreement and associated Promissory Notes supersede all other oral or written agreements or understandings between the Parties concerning the Collateral. ANY AMENDMENT OF THIS AGREEMENT OR A PROMISSORY NOTE MAY ONLY BE ACCOMPLISHED THROUGH A DOCUMENT WITH SIGNATURES FROM EACH OF THE PARTIES.

**Headings.** Headings used in this Agreement are for reference and convenience of the Parties only and shall have no substantive effect in the interpretation of this Agreement.

**No Waiver.** No action taken by Us or You will be deemed to constitute a waiver of compliance with any representation, warranty or covenant contained in this Agreement or Promissory Note. The waiver by Us of a breach of any provision of this Agreement or a Promissory Note will not operate or be construed as a waiver of any subsequent breach.

**Survival of Obligations.** The indemnification, obligations, representations and warranties contained in this Agreement, any Promissory Note or in any document delivered in connection with those agreements are for the benefit of the Parties and survive the execution, delivery, expiration or termination of this Agreement.

**Tax Indemnification**. Without limiting the generality of Section 13, You agree to pay, and to hold Us harmless from, any and all liabilities with respect to, or resulting from any delay in paying, any and all excise, sales, or other similar taxes (excluding taxes imposed on or measured by Our net income or franchise taxes) that may be payable or determined to be payable with respect to any of the Collateral or in connection with any of the transactions contemplated by this Agreement.

**Successors and Assigns.** The provisions of this Agreement and the other Loan Documents shall inure to the benefit of and be binding on each of You and Your permitted assigns (if any). None of You shall assign Your obligations under this Agreement, the Promissory Notes or any of the other Loan Documents without Our express prior written consent, and any such attempted assignment shall be void and of no effect. Each of You acknowledges and understands that We may sell and assign all or part of Our interest hereunder and under the Promissory Note(s) and all other related Loan Documents to any person or entity to be known as assignee. After such assignment the term "We" "Us" and "Our" as used in the Loan Documents will mean and include such assignee, and such assignee will be vested with all Our rights, powers and remedies hereunder and shall have Our duties with respect to the interest that each of You have granted Us; but with respect to any such interest not so transferred, We shall retain all rights, powers and remedies. No such assignment will relieve any of You of any of Your obligations. We agree that in the event of any transfer of the Promissory Note(s), We will denote on the Promissory Note a notation as to the portion of the principal and interest of the Promissory Note(s), which shall have been paid at the time of such transfer and the date of the transfer.

**Consent To Jurisdiction And Venue.** All judicial proceedings arising in or under or related to this Agreement, the Promissory Notes or any of the other Loan Documents may be brought in any state or federal court of competent jurisdiction located in the State of California. By execution and delivery of this Agreement, each Party hereto generally and unconditionally: (a) consents to personal jurisdiction in San Mateo County, State of California; (b) waives any objection as to jurisdiction or venue in San Mateo County, State of California; (c) agrees not to assert any defense based on lack of jurisdiction or venue in the aforesaid courts; and (d) irrevocably agrees to be bound by any judgment rendered thereby in connection with this Agreement, the Promissory Notes or the other Loan Documents. Service of process on any Party hereto in any action arising out of or relating to this Agreement shall be effective if given in accordance with the requirements for notice set forth in this Section, and shall be deemed effective and received as set forth therein. Nothing herein shall affect the right to serve process in any other manner permitted by law or shall limit the right of either Party to bring proceedings in the courts of any other jurisdiction.

**Mutual Waiver Of Jury Trial; Judicial Reference.** Because disputes arising in connection with complex financial transactions are most quickly and economically resolved by an experienced and expert person and the Parties wish applicable state and federal laws to apply (rather than arbitration rules), the Parties desire that their disputes be resolved by a judge applying such applicable laws. EACH OF THE PARTIES SPECIFICALLY WAIVES ANY RIGHT THEY MAY HAVE TO TRIAL BY JURY OF ANY CAUSE OF ACTION, CLAIM, CROSS-CLAIM, COUNTERCLAIM, THIRD PARTY CLAIM OR ANY OTHER CLAIM (COLLECTIVELY, "CLAIMS") ASSERTED BY ANY OF YOU AGAINST US OR OUR ASSIGNEE OR BY US OR OUR ASSIGNEE AGAINST ANY OF YOU. IN THE EVENT THAT THE FOREGOING JURY TRIAL WAIVER IS NOT ENFORCEABLE, ALL CLAIMS, INCLUDING ANY AND ALL QUESTIONS OF LAW OR FACT RELATING THERETO, SHALL, AT THE WRITTEN REQUEST OF ANY PARTY, BE DETERMINED BY JUDICIAL REFERENCE PURSUANT TO THE CALIFORNIA CODE OF CIVIL PROCEDURE ("REFERENCE"). THE PARTIES SHALL SELECT A SINGLE NEUTRAL REFEREE, WHO SHALL BE A RETIRED STATE OR FEDERAL JUDGE. IN THE EVENT THAT THE PARTIES CANNOT AGREE UPON A REFEREE, THE REFEREE SHALL BE APPOINTED BY THE COURT. THE REFEREE SHALL REPORT A STATEMENT OF DECISION TO THE COURT. NOTHING IN THIS SECTION SHALL LIMIT THE RIGHT OF ANY PARTY AT ANY TIME TO EXERCISE LAWFUL SELF-HELP REMEDIES, FORECLOSE AGAINST COLLATERAL OR OBTAIN PROVISIONAL REMEDIES. THE PARTIES SHALL BEAR THE FEES AND EXPENSES OF THE REFEREE EQUALLY UNLESS THE REFEREE ORDERS OTHERWISE. THE REFEREE SHALL ALSO DETERMINE ALL ISSUES RELATING TO THE APPLICABILITY, INTERPRETATION, AND ENFORCEABILITY OF THIS SECTION. THE PARTIES ACKNOWLEDGE THAT THE CLAIMS WILL NOT BE ADJUDICATED BY A JURY. THIS WAIVER EXTENDS TO ALL SUCH CLAIMS, INCLUDING CLAIMS THAT INVOLVE PERSONS OTHER THAN ANY OF YOU AND US; CLAIMS THAT ARISE OUT OF OR ARE IN ANY WAY CONNECTED TO THE RELATIONSHIP BETWEEN YOU AND US; AND ANY CLAIMS FOR DAMAGES, BREACH OF CONTRACT, SPECIFIC PERFORMANCE, OR ANY EQUITABLE OR LEGAL RELIEF OF ANY KIND, ARISING OUT OF THIS AGREEMENT, ANY OTHER LOAN DOCUMENT OR ANY OF THE EXCLUDED AGREEMENTS.

**Professional Fees**. Each of You promises to pay or reimburse on demand, any and all reasonable professional fees and expenses incurred by Us whether before or after the execution of this Agreement in connection with or related to: the Loan Documents, the Excluded Agreements, or the Secured Obligations; the administration, collection, or enforcement of the Secured Obligations; amendment or modification of the Loan Documents and the Excluded Agreements; any waiver, consent, release, or termination under the Loan Documents or Excluded Agreements; the protection, preservation, sale, lease, liquidation, inspection, audit or disposition of, or other action related to, the Collateral or the exercise of remedies with respect to the Collateral; or any legal, litigation, administrative, arbitration, or out of court proceeding in connection with or related to any of You or the Collateral, and any appeal or review thereof; and any bankruptcy, restructuring, reorganization, assignment for the benefit of creditors, workout, foreclosure, or other action related to any of You, the Collateral, the Loan Documents, or the Excluded Agreements, including representing Us in any adversary proceeding or contested matter commenced or continued by or on behalf of the estate of any of You, and any appeal or review thereof. Our professional fees and expenses shall include fees or expenses for Our attorneys, accountants, auditors, auctioneers, liquidators, appraisers, investment advisors, environmental and management consultants, or experts engaged by Us in connection with the foregoing. The promise of each of You to pay all of Our reasonable professional fees and expenses is part of the Secured Obligations under this Agreement.

**Revival of Secured Obligations**. This Agreement and the Loan Documents shall remain in full force and effect and continue to be effective if any petition is filed by or against any of You for liquidation or reorganization, if any of You become insolvent or make an assignment for the benefit of creditors, if a receiver or trustee is appointed for all or any significant part of the assets of any of You, or if any payment or transfer of Collateral is recovered from Us. The Loan Documents, the Secured Obligations and Our Lien on the Collateral shall continue to be effective, or shall be revived or reinstated, as the case may be, if at any time payment and performance of the Secured Obligations or any transfer of Collateral to Us, or any part thereof is rescinded, avoided or avoidable, reduced in amount, or must otherwise be restored or returned by, or is recovered from, Us or by any obligee of the Secured Obligations, whether as a "voidable preference," "fraudulent conveyance," or otherwise, all as though such payment, performance, or transfer of Collateral had not been made. In the event that any payment, or any part thereof, is rescinded, reduced, avoided, avoidable, restored, returned, or recovered, the Loan Documents and the Secured Obligations shall be deemed, without any further action or documentation, to have been revived and reinstated except to the extent of the full, final, and indefeasible payment to Us in cash.

**Notices.** Any notice, request or other communication to any of the Parties by any other will be given in writing and deemed received upon the earliest of (1) actual receipt, (2) three (3) days after mailing if mailed postage prepaid by regular or airmail to Us or You, at the address set out in the Table of Terms, and (3) one (1) day after it is sent by courier or overnight delivery.

**Applicable Law.** This Agreement and any Promissory Note will have been made, executed and delivered in the State of California and will be governed and construed for all purposes in accordance with the laws of the State of California, excluding conflict of laws principles that would cause the application of laws of any other jurisdiction.

**Counterparts.** This Agreement may be executed in any number of counterparts, each of which will be deemed an original, but all such counterparts together constitute one and the same instrument.

**Signatures.** This Agreement and any Promissory Note may be executed and delivered by facsimile or transmitted electronically in either Tagged Image Format Files ("**TIFF"**) or Portable Document Format ("**PDF"**) and, upon such delivery, the facsimile, TIFF or PDF signature, as applicable, will be deemed to have the same effect as if the original signature had been delivered to the other party.

**Confidentiality.** All financial information and other non-public information (other than any such information contained in periodic reports filed by any of You with the Securities and Exchange Commission) disclosed by any of You to Us shall be considered confidential for purposes of this Agreement. In handling any confidential information, We will exercise the same degree of care that We exercise for Our own proprietary information, but disclosure of information may be made (i) to Our subsidiaries or Affiliates in connection with their business with any of You, (ii) to prospective transferees or purchasers of any interest in the Loans (provided, however, We shall use best efforts in obtaining such prospective transferee's agreement of the terms of this provision and any purchaser shall be agreeing to assume the obligations hereunder and therefore agreeing to abide by the provisions hereof, including, without limitation, the provisions of this Section), (iii) as We deem necessary or appropriate to any bank, financial institution or other similar entity, provided, however, that such bank, financial institution or other similar entity agrees in writing to maintain the confidentiality of such information, (iv) to S&P, Moody's, Fitch and/or other ratings agency, as We deem necessary or appropriate, provided, however, that such financial institution or ratings agency shall be informed of the confidentiality of such, (v) as required by law, regulation, subpoena, or other order, (vi) to the extent requested

by any regulatory authority, (vii) as required in connection with Our examination or audit and (viii) as We consider appropriate exercising remedies under this Agreement. Confidential information does not include information that either: (a) is in the public domain or in Our possession when disclosed to Us, or becomes part of the public domain after disclosure to Us; or (b) is disclosed to Us by a third party, if We do not know that the third party is prohibited from disclosing the information. Notwithstanding the above, each of You hereby consents to the use by Us of the company name and logo of any of You for advertising, promotional and marketing purposes only. Such use may reference the type of credit facility but will not indicate the amount of the credit facility without Your prior written approval.

## 21. DEFINITIONS

Capitalized terms used in this Agreement shall have the following meanings:

**"Account"** means any "account," as such term is defined in the UCC, which any of You now own or acquire or in which any of You now hold or acquire any interest and in any event, shall include, without limitation, all accounts receivable, book debts and other forms of obligations (other than forms of obligations evidenced by Chattel Paper, Documents or Instruments) that any of You now own, receive or acquire or belongs or is owed or becomes belonging or owing to any of You (including, without limitation, under any trade name, style or division thereof) whether arising out of goods sold or services that any of You render or from any other transaction, whether or not the same involves the sale of goods or services by any of You (including, without limitation, any such obligation that may be characterized as an account or contract right under the UCC) and all of any of Your rights in, to and under all purchase orders or receipts now owned or acquired by any of You for goods or services, and all of any of Your rights to any goods represented by any of the foregoing (including, without limitation, unpaid seller's rights of rescission, replevin, reclamation and stoppage in transit and rights to returned, reclaimed or repossessed goods), and all monies due or to become due to any of You under all purchase orders and contracts for the sale of goods or the performance of services or both by any of You or in connection with any other transaction (whether or not yet earned by performance on the part of any of You), now in existence or occurring, including, without limitation, the right to receive the proceeds of said purchase orders and contracts, and all collateral security and guarantees of any kind given by any Person with respect to any of the foregoing.

**"Advance"** has the meaning given to it in Section 1.

**"Advance Date"** means the day on which We make an Advance to You.

"**Advance Request**" means any request for an Advance to be executed and delivered from time to time by You to Us in the form attached to this Agreement as **Exhibit B**.

**"Affiliate"** means, with respect to any Person, any Person that owns or controls directly or indirectly such Person, any Person that controls or is controlled by or is under common control with such Person, and each of such Person's senior executive officers, directors, and partners, and members.

**"Agreement"** has the meaning given to it in the Preamble.

**"Availability Period"** has the meaning set forth in the Table of Terms.

**"Business Day"** means any day other than a Saturday, Sunday or other day on which banking institutions in the State of California are authorized or required by law or other government action to close.

**"Cash"** means all cash, money, currency, and liquid funds, wherever held, which any of You own now, hold or acquire any right, title, or interest in.

**"Chattel Paper"** means any "chattel paper," as such term is defined in the UCC, now owned or acquired by any of You or in which any of You now hold or acquire any interest.

**"Closing Date"** means June 28, 2017.

**"Collateral"** has the meaning given to it in Section 8.

**"Commitment Amount"** has the meaning set forth in the Table of Terms.

"**Commitment Increase Request Notice"** has the meaning given to it in Section 3.

**"Copyright License"** means any written agreement granting to any of You any right to use any Copyright or Copyright registration in which agreement You now hold or hereafter acquire any interest.

**"Copyrights"** means all of the following now owned or acquired by any of You or in which any of You now hold or acquire any interest: (i) all copyrights and copyright rights, whether registered or unregistered, held pursuant to the laws of the United States, any State thereof, or of any other country, or pursuant to any convention or treaty; (ii) all registrations of, applications for registration. and recordings of any copyright rights in the United States Copyright Office or in any similar office or agency of the United States, any State thereof or any other country; (iii) all continuations, renewals or extensions of any copyrights and any registrations thereof; and (iv) any copyright registrations to be issued under any pending applications.

**"Default"** means any event that, with the passage of time or notice or both would, unless cured or waived, become an Event of Default.

**"Default Rate"** has the meaning given to it in Section 7.

**"Deposit Accounts"** means any "deposit accounts," as such term is defined in the UCC, now owned or acquired by any of You or in which any of You now hold or acquire any interest.

**"Documents"** means any "documents," as such term is defined in the UCC, now owned or acquired by any of You or in which any of You now hold or acquire any interest.

**"End of Term Payment"** has the meaning set forth in the Table of Terms.

**"Equipment"** means any "equipment," as such term is defined in the UCC, and any and all additions, upgrades, substitutions and replacements thereto or thereof, together with all attachments, components, parts, accessions and accessories installed thereon or affixed thereto, now owned or hereafter acquired by any of You or in which any of You now hold or acquire any interest.

**"ERISA"** means the Employee Retirement Income Security Act of 1974.

**"Event of Default"** has the meaning given to it in Section 14.

**"Excluded Agreements"** means (i) the Warrant Agreement; and (ii) any stock purchase agreement, options, or other warrants to acquire, or agreements governing the rights of, any capital stock or other equity security, or any common stock, preferred stock, or equity security issued to or purchased by Us or Our nominee or assignee**.**

**"Facility Fee"** has the meaning set forth in the Table of Terms.

**"Fixtures"** means any "fixtures," as such term is defined in the UCC, together with any of Your right, title and interest in and to all extensions, improvements, betterments, renewals, substitutes, and replacements thereof, and all additions and appurtenances thereto any, now owned or hereafter acquired by any of You or in which any of You now hold or acquire any interest.

"**GAAP**" means generally accepted accounting principles, consistently applied, as in effect from time to time.

**"General Intangibles"** means any "general intangibles," as such term is defined in the UCC, and, in any event, includes proprietary or confidential information (other than Intellectual Property); business records and materials (other than Intellectual Property); customer lists; interests in partnerships, joint ventures, corporations, limited liability companies and other business associations; permits; claims in or under insurance policies (including unearned premiums and retrospective premium adjustments); and rights to receive tax refunds and other payments and rights of indemnification, now owned or acquired by any of You or in which any of You may now or hereafter have any interest.

**"Goods"** means any "goods," as such term is defined in the UCC, now owned or hereafter acquired by any of You or in which any of You now hold or acquire any interest.

**"Guarantor"** means any Person who from time to time may guaranty or provide collateral or other credit support for all or any portion of the Secured Obligations.

**"Indebtedness"** means, of any Person, at any date, without duplication and without regard to whether matured or unmatured, absolute or contingent: (i) all obligations of such Person for borrowed money; (ii) all obligations of such Person evidenced by bonds, debentures, notes, or other similar instruments; (iii) all obligations of such Person to pay the deferred purchase price of property or services; (iv) all obligations of such Person as lessee under capital leases; (v) all obligations of such Person to reimburse or prepay any bank or other Person in respect of amounts paid under a letter of credit, banker's acceptance, or similar instrument, whether drawn or undrawn; (vi) all obligations of such Person to purchase securities which arise out of or in connection with the sale of the same or substantially similar securities; (vii) all obligations of such Person to purchase, redeem, exchange, convert or otherwise acquire for value any capital stock of such Person or any warrants, rights or options to acquire such capital stock, now or hereafter outstanding, except to the

extent that (A) such obligations remain performable solely at the option of such Person or (B) any such exchange or conversion is made solely for such capital stock; (viii) all obligations to repurchase assets previously sold (including any obligation to repurchase any accounts or chattel paper under any factoring, receivables purchase, or similar arrangement); (ix) obligations of such Person under interest rate swap, cap, collar or similar hedging arrangements; and (x) all obligations of others of any type described in clause (i) through clause (ix) above guaranteed by such Person.

**"Instruments"** means any "instrument," as such term is defined in the UCC, now owned or hereafter acquired by any of You or in which any of You now hold or acquire any interest.

**"Intellectual Property"** means all Copyrights; Trademarks; Patents; Licenses; source codes; trade secrets; inventions (whether or not patented or patentable); technical information, processes, designs, knowledge and know-how; data bases; models; drawings; websites, domain names, and URL's, and all applications therefor and reissues, extensions, or renewals thereof; together with the rights to sue for past, present, or future infringement of Intellectual Property and the goodwill associated with the foregoing.

**"Inventory"** means any "inventory," as such term is defined in the UCC, now owned or acquired by any of You or in which any of You now hold or acquire any interest, and, in any event, shall include, without limitation, all Goods and personal property that are held by or on any of Your behalf for sale or lease or are furnished or are to be furnished under a contract of service or that constitute raw materials, work in process or materials used or consumed or to be used or consumed in any of Your businesses, or the processing, packaging, promotion, delivery or shipping of the same, and all finished goods, whether or not the same is in transit or in any of Your constructive, actual or exclusive possession or is held by others for any of Your account, including, without limitation, all property covered by purchase orders and contracts with suppliers and all goods billed and held by suppliers and all such property that may be in the possession or custody of any carriers, forwarding agents, truckers, warehousemen, vendors, selling agents or other Persons.

**"Investment"** means any beneficial ownership (including stock, partnership or limited liability company interest or other securities) of any Person, or any loan, advance or capital contribution to any Person.

**"Investment Property"** means any "investment property," as such term is defined in the UCC, and includes any certificated security, uncertificated security, money market funds, bonds, mutual funds, and U.S. Treasury bills and notes now owned or hereafter acquired by any of You or in which any of You now hold or acquire any interest.

**"Joinder Agreement"** means a joinder agreement in substantially the form attached as **Exhibit E**.

**"Letter of Credit Rights"** means any "letter of credit rights," as such term is defined in the UCC, now owned or acquired by any of You or in which any of You now hold or acquire any interest, including any right to payment under any letter of credit.

**"License"** means any Copyright License, Patent License, Trademark License or other license of rights or interests now held or acquired by any of You or in which any of You now hold or acquire any interest and any renewals or extensions thereof.

**"Lien"** means any mortgage, deed of trust, pledge, hypothecation, assignment for security, security interest, encumbrance, levy, lien or charge of any kind, whether voluntarily incurred or arising by operation of law or otherwise, against any property, any conditional sale or other title retention agreement, any lease in the nature of a security interest, and the filing of any financing statement (other than a precautionary financing statement with respect to a lease that is not in the nature of a security interest) under the UCC or comparable law of any jurisdiction.

**"Loan Documents"** means this Agreement, the Promissory Notes, all UCC Financing Statements, and any other documents executed in connection with the Secured Obligations or the transactions contemplated hereby, including those documents described on the Schedule of Documents attached hereto as Schedule 2, as the same may from time to time be amended, modified, supplemented or restated; provided, that the Loan Documents shall not include any of the Excluded Agreements.

**"Loan Term"** has the meaning set forth in the Table of Terms.

"**Material Adverse Effect**" means a material adverse effect on (i) the business, operations, properties, prospects, assets or condition (financial or otherwise) of any of You or all of You as a whole, (ii) the ability of any of You to perform the Secured Obligations in accordance with the terms of the Loan Documents or Our ability to enforce any of Our rights and remedies with respect to the Secured Obligations in accordance with the terms of the Loan Documents, or (iii) the Collateral or Our Liens on the Collateral or the priority of such Liens.

"**Merger Event**" means (i) any reorganization, consolidation or merger (or similar transaction or series of transactions) by any of Your or any of Your subsidiaries, with or into any other Person; (ii) any transaction, including the sale or exchange of outstanding shares of Your capital stock, or the capital stock of any of Your Subsidiaries, in which the holders of such outstanding capital stock of the affected corporation immediately before consummation of such transaction or series of related transactions do not, immediately after consummation of such transaction or series of related transactions, retain capital stock representing at least 50.0% of the voting power of the surviving corporation of such transaction or series of related transactions (or the parent corporation of such surviving corporation if such surviving corporation is wholly owned by such parent corporation), in each case without regard to whether You or any of Your subsidiaries are the surviving corporation, or (iii) the sale, license or other disposition of all or substantially all of Your assets, or the assets of any of Your subsidiaries.

"**Next Round**" means the first equity financing, or extension of an existing round of equity financing, occurring after the Closing Date, in which You issue preferred stock for aggregate gross cash proceeds of at least Two Million Dollars ($2,000,000) (with aggregate proceeds to include the amounts that the investors in such financing have committed to invest, in accordance with the terms of the financing documents after the initial closing under such documents and to exclude any amounts receivable upon, or attributable to, conversion or cancellation of indebtedness), whether in a single or multiple closings and whether in related or unrelated financings.

**"OFAC"** means the United States Department of the Treasury's Office of Foreign Assets Control.

**"Part 1 Milestone"** means since the Closing Date You have entered into subordinated convertible debt financing with Your current investors, including Lightspeed Ventures, in which You have received net proceeds equal to Ten Million Dollars ($10,000,000).

**"Parts"** has the meaning given to it in Section 3.

"**Patent License**" means any written agreement granting to You any right with respect to any invention or Patent in which You now hold or acquire any interest.

**"Patents"** means all of the following now owned or acquired by any of You or in which any of You now hold or acquire any interest: (a) all patents, or rights corresponding thereto, issued or registered in the United States or any other county, (b) all applications for patents, or rights corresponding thereto in, the United States or any other country; (c) all reissues, reexaminations, continuations, divisions, continuations-in-part, or extensions of the foregoing patents and/or applications; (d) all patents to be issued under any of the foregoing applications; and (e) all foreign counterparts of the foregoing patents and/or applications.

**"Patriot Act"** means the USA PATRIOT Improvement and Reauthorization Act of 2005.

**"Permitted Indebtedness"** means (a) Indebtedness of any of You in favor of Us; (b) Indebtedness existing at the Closing Date and disclosed on Schedule 1; (c) Indebtedness incurred for the acquisition of services, supplies or inventory on normal trade credit in the ordinary course of business; (d) Indebtedness not to exceed Nine Million Dollars ($9,000,000) in the aggregate incurred during the term hereof, secured by a Lien described in clause (vii) of the defined term "Permitted Liens"; provided that such Indebtedness does not exceed the purchase price of the specific Equipment financed with such Indebtedness; (e) Indebtedness under the Working Capital Loan Facility so long as the aggregate outstanding amount thereof does not at any time exceed Five Million Dollars ($5,000,000) and subject to an intercreditor agreement acceptable to Us; (f) Subordinated Indebtedness, (g) extensions, refinancings, modifications, amendments and restatements of any item of Permitted Indebtedness (a) though (f) above, provided that the principal amount thereof is not increased; and (h) Indebtedness consisting of intercompany journal entries made in connection with cost sharing or transfer pricing transactions, provided that all such transactions are cashless.

**"Permitted Investment"** means (a) Investments that are in existence on the Closing Date and are approved in writing by Us; (b) Investments in domestic certificates of deposit issued by, and other domestic investments with, financial institutions organized under the laws of the United States or a state thereof, having at least One Hundred Million Dollars ($100,000,000) in capital and a rating of at least "investment grade" or "A" by Moody's or any successor rating agency; (c) Investments in marketable obligations of the United States of America and in open market commercial paper given the highest credit rating by a national credit agency and maturing not more than one year from the creation thereof; (d) so long as no Event of Default has occurred and is continuing, temporary advances to employees to cover incidental expenses to be incurred in the ordinary course of business, in an aggregate outstanding amount not to exceed $50,000 at any time; (e) Investments (including debt obligations) received in connection with the bankruptcy or reorganization of customers or suppliers and in settlement of delinquent obligations of, and other disputes with, customers or suppliers arising in the ordinary course of business; (f) indebtedness consisting of intercompany loans and advances

made by any of You to any Subsidiary (1) described on Schedule 3 or (2) made after the Closing Date in an aggregate amount pursuant to this clause (ii), for all Subsidiaries not to exceed $100,000 during any fiscal year; provided, that: (A) such Subsidiary shall have executed and delivered to You, prior to any such indebtedness being incurred, a demand note (each, an "**Intercompany Note**") to evidence any such intercompany indebtedness owing at any time by such Subsidiary to You, which Intercompany Note shall be in form and substance reasonably satisfactory to Us and shall be pledged and delivered to Us as additional Collateral for the Secured Obligations; (B) each of You and such Subsidiary shall record all intercompany transactions on its books and records in a manner reasonably satisfactory to Us; (C) at the time any such intercompany loan or advance is made by You to such Subsidiary and after giving effect thereto, each of You and such Subsidiary shall be Solvent; and (D) no Default or Event of Default would occur and be continuing after giving effect to any such proposed intercompany loan, and (g) Investments consisting of intercompany receivables, corresponding to amounts in item (h) of the definition of Permitted Indebtedness, consisting of intercompany journal entries made in connection with cost sharing or transfer pricing transactions, provided that all such transactions are cashless.

"**Permitted Liens**" means any and all of the following: (i) Liens in Our favor; (ii) Liens for taxes, fees, assessments or other governmental charges or levies, either not delinquent or being contested in good faith by appropriate proceedings, provided that such Liens do not have priority over any of Our Liens and You maintain adequate reserves in accordance with GAAP; (iii) Liens securing claims or demands of materialmen, artisans, mechanics, carriers, warehousemen, landlords and other like Persons arising in the ordinary course of Your business and imposed without action of such parties, provided that the payment thereof is not yet required and that such Liens do not have priority over any of Our Liens; (iv) Liens arising from judgments, decrees or attachments in circumstances which do not constitute an Event of Default hereunder; (v) the following deposits, to the extent made in the ordinary course of Your business: deposits under worker's compensation, unemployment insurance, social security and other similar laws, or to secure the performance of bids, tenders or contracts (other than for the repayment of borrowed money) or to secure indemnity, performance or other similar bonds for the performance of bids, tenders or contracts (other than for the repayment of borrowed money) or to secure statutory obligations (other than Liens arising under ERISA or environmental Liens) or surety or appeal bonds, or to secure indemnity, performance or other similar bonds; (vi) Liens on insurance proceeds in favor of insurance companies granted solely as security for financed premiums; (vii) purchase money Liens (including capital leases) securing Indebtedness not to exceed Nine Million Dollars ($9,000,000) (A) on Equipment acquired or held by any of You, incurred for financing the acquisition of that Equipment, or (B) existing on Equipment when acquired by You, so long as, in each case, the Lien is confined to the specific Equipment and the proceeds of the Equipment; (viii) Liens in favor of the Working Capital Lender arising under the Working Capital Loan Facility; (ix) Liens in favor of customs and revenue authorities arising as a matter of law to secure payments of custom duties in connection with the importation of goods; (x) Liens in favor of financial institutions arising in connection with deposit or securities accounts held at such financial institutions, provided that such Liens only secure fees and service charges and customary chargebacks or reversals of credits associated with such accounts; (xi) Liens existing on the Closing Date and disclosed on Schedule 1; and (xi) Liens incurred in connection with the extension, renewal or refinancing of the Indebtedness secured by Liens of the type described in clauses (i), (vi), (vii) and (viii) above, provided that any extension, renewal or replacement Lien shall be limited to the property encumbered by the existing Lien and the principal amount of the Indebtedness being extended, renewed or refinanced (as may have been reduced by any payment thereon) does not increase.

**"Person"** means any individual, sole proprietorship, partnership, joint venture, trust, unincorporated organization, association, corporation, limited liability company, institution, public benefit corporation, other entity or government (whether federal, state, county, city, municipal, local, foreign, or otherwise, including any instrumentality, division, agency, body or department thereof).

**"Proceeds"** means "proceeds," as such term is defined in the UCC and, in any event, shall include, without limitation, (a) any and all Accounts, Chattel Paper, Instruments, Cash or other proceeds payable to any of You from time to time in respect of the Collateral, (b) any and all proceeds of any insurance, indemnity, warranty or guaranty payable to any of You from time to time with respect to any of the Collateral, (c) any and all payments (in any form whatsoever) made or due and payable to any of You from time to time in connection with any requisition, confiscation, condemnation, seizure or forfeiture of all or any part of the Collateral by any governmental authority (or any Person acting under color of governmental authority), (d) the proceeds, damages, or recovery based on any claim of any of You against third parties (i) for past, present or future infringement of any Copyright, Copyright License, Patent or Patent License, or (ii) for past, present or future infringement or dilution of any Trademark or Trademark License or for injury to the goodwill associated with any Trademark, Trademark registration or Trademark licensed under any Trademark License; and (e) any and all other amounts from time to time paid or payable under or in connection with any of the Collateral.

**"Promissory Note"** has the meaning given to it in Section 2.

**"PT"** means Pacific Time.

**"Receivables"** means (i) all of any of the Accounts, Instruments, Documents, Cash, Chattel Paper, Supporting Obligations, letters of credit, proceeds of a letter of credit, and Letter of Credit Rights of any of You, and (ii) all customer lists, software, and related business records.

**"Revolving Loan"** means the loans in the maximum principal amount as stated in the Table of Terms under the caption "Commitment Amount" made to You by Us pursuant to the terms of this Agreement.

**"Revolving Loan Maturity Date"** means the earlier of (a) the date set forth on the Table of Terms under the caption "Revolving Loan Maturity Date", (b) the date of termination of Our obligation to permit the Revolving Loan to remain outstanding, and (c) the date of indefeasible payment in full by You of the Revolving Loan.

**"Right To Invest"** has the meaning set forth in the Table of Terms.

"**Secured Obligations**" means Your joint and several obligations to repay to Us all Advances (whether or not evidenced by any Promissory Note), together with all principal, interest, fees, costs, professional fees and expenses, and other liabilities or obligations for monetary amounts owed by any of You to Us, including the indemnity and insurance obligations in Sections 10, 13 and 20 hereof and including such amounts as may accrue or be incurred before or after default or workout or the commencement of any liquidation, dissolution, bankruptcy, receivership or reorganization by or against any of You, whether due or to become due, matured or unmatured, liquidated or unliquidated, contingent or non-contingent, and all covenants and duties of any kind or nature, present or future, arising under this Agreement, the Promissory Notes, or any of the other Loan Documents, as the same may from time to time be amended, modified, supplemented or restated, whether or not such obligations are partially or fully secured by the value of Collateral; provided, that the Secured Obligations shall not include any of the Indebtedness or obligations of any of You arising under or in connection with the Excluded Agreements.

**"Solvent"** means, with respect to any Person on a particular date, that on such date (a) the fair value of the property of such Person is greater than the total amount of liabilities, including contingent liabilities, of such Person; (b) the present fair salable value of the assets of such Person is not less than the amount that will be required to pay the probable liability of such Person on its debts as they become absolute and matured; (c) such Person does not intend to, and does not believe that it will, incur debts or liabilities beyond such Person's ability to pay as such debts and liabilities mature; and (d) such Person is not engaged in a business or transaction, and is not about to engage in a business or transaction, for which such Person's property would constitute an unreasonably small capital. The amount of contingent liabilities (such as litigation, guaranties and pension plan liabilities) at any time shall be computed as the amount that, in light of all the facts and circumstances existing at the time, represents the amount that can be reasonably be expected to become an actual or matured liability.

**"Subordinated Indebtedness"** means Indebtedness (i) approved by Us and (ii) subordinated to the Secured Obligations on terms and conditions acceptable to Us, including without limiting the generality of the foregoing, subordination of such Indebtedness in right of payment to the prior payment in full of the Secured Obligations, the subordination of the priority of any Lien at any time securing such Indebtedness to Our Liens in Your assets and properties, and the subordination of the rights of the holder of such Indebtedness to enforce its junior Lien following an Event of Default hereunder pursuant to a written subordination agreement approved by Us.

"**Subsidiary**" means, with respect to any Person, any Person of which more than 50% of the voting stock or other equity interests is owned or controlled, directly or indirectly, by such Person or one or more Affiliates of such Person.

**"Supporting Obligations"** means any "supporting obligations," as such term is defined in the UCC, now owned or acquired by any of You or in which any of You now hold or hereafter acquire any interest.

**"Table of Terms"** means the table of terms on Pages 1 and 2 of this Agreement.

**"Trademark License"** means any written agreement granting to You any right to use any Trademark or Trademark registration now owned or hereafter acquired by any of You or in which any of You now hold or hereafter acquire any interest.

**"Trademarks"** means all of the following property now owned or hereafter acquired by any of You or in which any of You now hold or hereafter acquire any interest: (a) all trademarks, trade names, corporate names, business names, trade styles, service marks, logos, other source or business identifiers, prints and labels on which any of the foregoing have appeared or appear, designs and general intangibles of like nature, now existing or hereafter adopted or acquired,

all registrations and recordings thereof, and any applications in connection therewith, including, without limitation, registrations, recordings and applications in the United States Patent and Trademark Office or in any similar office or agency of the United States, any State thereof or any other country or any political subdivision thereof and (b) reissues, extensions or renewals thereof.

**"Trading with the Enemy Act"** means the Trading with the Enemy Act of the United States of America (50 U.S.C. App. §§ 1 et seq.).

**"UCC"** means the Uniform Commercial Code as the same is, from time to time, in effect in the State of California; provided, that in the event that, by reason of mandatory provisions of law, any or all of the attachment, perfection or priority of, or remedies with respect to, Secured Party's Lien on any Collateral is governed by the Uniform Commercial Code as the same is, from time to time, in effect in a jurisdiction other than the State of California, the term "UCC" shall mean the Uniform Commercial Code as in effect, from time to time, in such other jurisdiction solely for purposes of the provisions thereof relating to such attachment, perfection, priority or remedies and for purposes of definitions related to such provisions. Unless otherwise defined herein or in the other Loan Documents terms that are defined in the UCC and used herein or in the other Loan Documents shall have the meanings given to them in the UCC.

**"Upon Request and Additional Approval"** has the meaning given to it in Section 3.

**"Warrant Agreement"** means the Warrant Agreement dated the date hereof between the Parties issued in connection with this Agreement and any other warrant agreement between the Parties issued in connection with this Agreement.

**"Working Capital Lender"** has the meaning given to it in Section 8.

**"Working Capital Loan Facility"** has the meaning given to it in Section 8.

Unless otherwise specified, all references in this Agreement or any Annex or Schedule hereto to a "Section," "subsection," "Exhibit," "Annex," or "Schedule" shall refer to the corresponding Section, subsection, Exhibit, Annex, or Schedule in or to this Agreement. The terms "herein," "hereof" and "hereunder" and other words of similar import refer to this Agreement as a whole, including all Exhibits, Annexes and Schedules, and not to any particular Section, subsection or other subdivision.

Wherever from the context it appears appropriate, each term stated in either the singular or plural shall include the singular and the plural, and pronouns stated in the masculine, feminine or neuter gender shall include the masculine, feminine and neuter genders. The words "including," "includes" and "include" shall be deemed to be followed by the words "without limitation," the word "or" is not exclusive; references to Persons include their respective successors and assigns (to the extent and only to the extent permitted by this Agreement and the Loan Documents) or, in the case of governmental Persons, Persons succeeding to the relevant functions of such Persons; and all references to statutes and related regulations shall include any amendments of the same and any successor statutes and regulations. Unless otherwise specifically provided herein, any accounting term used in this Agreement or the other Loan Documents shall have the meaning customarily given such term in accordance with GAAP, and all financial computations hereunder shall be computed in accordance with GAAP, consistently applied.

**(*Signatures to Follow*)**

**IN WITNESS WHEREOF**, the Parties have executed and delivered this Agreement as of the day and year first above written.

| | | |
|---|---|---|
| **BORROWER:** | **You:** | **PERSONALIS, INC.** |
| | Signature: | /s/ John West |
| | Print Name: | John West |
| | Title: | CEO |

**Accepted in Menlo Park, California:**

| | | |
|---|---|---|
| **LENDER:** | **Us:** | **TRIPLEPOINT CAPITAL LLC** |
| | Signature: | /s/ Sajal Srivastava |
| | Print Name: | Sajal Srivastava |
| | Title: | President |

**[SIGNATURE PAGE TO PLAIN ENGLISH REVOLVING LOAN AND SECURITY AGREEMENT]**

**EXHIBIT A**

**FORM OF PLAIN ENGLISH REVOLING LOAN PROMISSORY NOTE**

This is a Plain English Revolving Loan Promissory Note dated _____, 20 __ by and between TRIPLEPOINT CAPITAL LLC, as lender, and PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement, as borrowers (the "Promissory Note"). The words "We", "Us", and "Our", refer to TRIPLEPOINT CAPITAL LLC. Unless otherwise specified, the words "You" and "Your" refer to PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement, and not any individual, and PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement, shall be jointly and severally liable for any and all of Your agreements and obligations under this Promissory Note. The words "Parties" refers to each of and all of TRIPLEPOINT CAPITAL LLC, PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement.

This Promissory Note is the Promissory Note referred to in, and is executed and delivered in connection with, the Plain English Revolving Loan and Security Agreement dated as of June 28, 2017 by and between the Parties, as the same may from time to time be amended, modified or supplemented in accordance with its terms (the "Loan Agreement"), and is entitled to the benefit and security of that Loan Agreement and the other documents executed in connection with all principal, interest, fees or other liabilities owed by You under the Loan Agreement and other Loan Documents (as defined in the Loan Agreement). All terms defined in the Loan Agreement shall have the same definitions when used herein, unless otherwise defined herein.

**PROMISSORY NOTE INFORMATION**

| Facility Name | Facility Number | Promissory Note Number | Principal Amount |
|---|---|---|---|
| Revolving Loan Facility | 1115-RV-01 | 1115-RV-0__-0_ | Up to $_____ |
| **Revolving Loan Maturity Date** | **Loan Term** | **Interest Rate** | **End of Term Payment** |
| _____ | __ months | Prime Rate plus __%, however, in no event shall the Prime Rate be less than __% | 5.5% of the highest outstanding principal balance during the Loan Term. |

**CONTACT INFORMATION**

| Name | Address For Notices | Contact Person |
|---|---|---|
| TriplePoint Capital LLC | 2755 Sand Hill Rd., Ste. 150<br>Menlo Park, CA 94025<br>Tel: (650) 854-2090<br>Fax: (650) 854-1850 | Sajal Srivastava, President<br>Tel: (650) 233-2102<br>Fax: (650) 854-1850<br>email: legal@triplepointcapital.com |

| Customer Name | Central Billing Address | Contact Person |
|---|---|---|
| Personalis, Inc. | 1330 O'Brien Drive<br>Menlo Park, CA 94025 | Name, Title<br>Carol Tillis, VP Finance & Administration<br>Tel: (650) 752-1330<br>Fax: (650) 752-1301<br>email: carol.tillis@personalis.com |

**FOR VALUE RECEIVED**, Each of You, jointly and severally, hereby promise to pay to the order of TRIPLEPOINT CAPITAL LLC or the holder of this Promissory Note at 2755 Sand Hill Road, Ste. 150, Menlo Park, CA, 94025 or such other place of payment as the holder of this Promissory Note may specify from time to time in writing, in lawful money of the United States of America, the aggregate unpaid principal amount of all Advances made by Us to You in accordance with the terms and conditions of the Loan Agreement, up to a maximum principal amount of _____ Dollars ($_____) or so much thereof as may be advanced and remains unpaid together with interest at the rate and on the dates provided in the Loan Agreement from the date of this Promissory Note to the Revolving Loan Maturity. In addition to Your final payment, You will pay Us an amount equal to the End of Term Payment as set forth on Page 1 of this Promissory Note and as more fully described in the Loan Agreement. Interest shall be computed daily on the basis of a year consisting of 360 days for the actual number of days occurring in the period for which such interest is payable. Any payments made under this Promissory Note shall be available for re-borrowing.

The aggregate outstanding principal balance of this Promissory Note shall be due and payable in full in immediately available funds on the Maturity Date, if not sooner paid in full.

You waive presentment and demand for payment, notice of dishonor, protest and notice of protest under the UCC or any applicable law.

You will not, directly or indirectly, use the proceeds of any Advance(s) under this Promissory Note, or lend, contribute or otherwise make available such proceeds to any Subsidiary, Affiliate, joint venture partner or other Person, to fund any activities or business of or with any Person, or in any country or territory, that, at the time of such funding, is the subject of any sanctions administered by OFAC, or in any other manner that would result in a violation of OFAC sanctions by any Person, including any Person participating in any capacity in any Advance(s) under this Promissory Note.

This Promissory Note has been negotiated and delivered to Us and is payable in the State of California. This Promissory Note shall be governed by and construed and enforced in accordance with, the laws of the State of California, excluding any conflicts of law rules or principles that would cause the application of the laws of any other jurisdiction.

**BORROWERS**

**YOU:** **PERSONALIS, INC.**

Signature: _____

Print Name: _____

Title: _____

**EXHIBIT B**

**ADVANCE REQUEST**

**To:** TRIPLEPOINT CAPITAL LLC
2755 Sand Hill Road Ste 150
Menlo Park, CA 94025
Attention: Customer Administrations
Fax (650) 854-1850

**Date:** _____

PERSONALIS, INC. ("We" or "Us"), hereby request from TRIPLEPOINT CAPITAL LLC ("You") an Advance in the amount of ($_____) on _____, __ (at least five (5) Business Days from today) pursuant to the Plain English Revolving Loan and Security Agreement between the Parties (the "Loan Agreement").

**We instruct You to please:**

(a) Issue a check payable to Us _____

or

(b) Transfer Funds to our account _____

Bank:
Address:
ABA Number:
Account Number:
Account Name:

We represent, warrant and certify that:

- No event or circumstance has occurred or exists which individually or together with any other event or circumstance, has had or could reasonably be expected to have a Material Adverse Effect;
- The representations and warranties set forth in the Loan Agreement and in the associated Plain English Warrant Agreement are and shall be true, complete and correct in all material respects on and as of the date the requested Advance is funded with the same effect as though made on and as of such date, except to the extent such representations and warranties expressly relate to an earlier date (in which case, those representations and warranties remain true, complete and correct in all material respects as of such date), provided, however, that such materiality qualifiers shall not be applicable to any representations and warranties that already are qualified or modified by materiality in the text thereof;
- We are in compliance with all covenants set forth in Section 12 of the Loan Agreement.
- We are in compliance with all the terms and provisions set forth in any document related to this Advance (including, without limitation, Sections 4 and 5 of the Loan Agreement);
- As of the date hereof and the date of the funding of the requested Advance, no fact or condition exists that would (or would, with the passage of time, the giving of notice, or both, would) constitute an Event of Default under the Loan Agreement;
- We understand and acknowledge that You have the right to review the financial information supporting this representation and based upon such review in Your sole discretion You may decline to fund the requested Advance; and
- The Certificate of Perfection executed on _____, 20 __, is true and correct as of the date of this Advance Request. [Attach an updated Certificate of Perfection as needed and insert the date that the Certificate of Perfection was executed on].

Executed this __ day of _____, ____ by:

**YOU:** **PERSONALIS, INC.**

Signature: _____

Print Name: _____

Title: _____

**[SIGNATURE PAGE TO ADVANCE REQUEST]**

**EXHIBIT C**

**CERTIFICATE OF PERFECTION**

This Certificate of Perfection shall reference that certain Plain English Revolving Loan and Security Agreement dated as of June 28, 2017 by and between TRIPLEPOINT CAPITAL LLC, PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower thereunder (the "Loan Agreement"). All terms not defined in this Certificate of Perfection shall have the same meanings as in the Loan Agreement. Pursuant to the terms of the Loan Agreement, each of PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement hereby certifies, represents and warrants the following as of the date set forth below the signature to this Certificate of Perfection:

**1.** Our current names and organizational status are as follows:

Name: _____

Type of Organization: _____

State of Organization: _____

Organization File Number: _____

Federal Employer Tax Identification Number: _____

Name: _____

Type of Organization: _____

State of Organization: _____

Organization File Number: _____

Federal Employer Tax Identification Number: _____

**2.** Five (5) years prior to the date of this Certificate of Perfection, We did not do business under any other name or organization or form except the following:

Name: _____

Type of Organization: _____

State of Organization: _____

Organization File Number: _____

Federal Employer Tax Identification Number: _____

Dates of Existence: _____

**3.** Our fiscal year ends on _____.

**4.** Our current locations and the locations of all the Collateral are:

| | |
|---|---|
| Chief Executive Office: | |
| Principal Place of Business: | |
| Locations of Collateral: | |

**5.** The following is a list of any and all of Our Affiliates and subsidiaries:

| | |
|---|---|
| Name: | |
| Type of Organization: | |
| State of Organization: | |
| Organization File Number: | |
| Federal Employer Tax Identification Number: | |
| Your Ownership Interest: | |

**6.** We currently maintain Deposit Accounts, other accounts holding Investment Property owned by Us, and electronic accounts (such as PayPal or similar accounts) as follows:

| Bank Name/Address | Account Holder Name | Account (Type & Number) |
|---|---|---|

**7.** We currently have the following commercial tort claims: _____.

**8.** Attached is a current listing of all Patents, Patent Applications, Patent Licenses, Trademarks, Trademark Applications, Trademark Licenses, Copyright Registrations, Copyright Applications for Registration and Copyright Licenses of any of Us.

***(Signature Page to Follow)***

**PERSONALIS, INC.**

Signature: _____

Print Name: _____

Title: _____

Date: _____

**[SIGNATURE PAGE TO CERTIFICATE OF PERFECTION]**

**EXHIBIT D**

**CERTIFICATE OF COMPLIANCE**

This Certificate of Compliance shall reference that certain Plain English Revolving Loan and Security Agreement dated as of _____, 20 __, by and between TRIPLEPOINT CAPITAL LLC, PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower thereunder (the "Loan Agreement"). All terms not defined in this Certificate of Compliance shall have the same meanings as in the Loan Agreement. Pursuant to the terms of the Loan Agreement, each of PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement hereby certifies, the following as of the date set forth below the signature to this Certificate of Compliance:

- Each of Us is in compliance as of the date of this Certificate of Compliance with all required covenants unless otherwise noted and attached to this Certificate of Compliance.
- Except as noted an attached disclosure schedule, as of the date of this Certificate of Compliance all representations and warranties in the Loan Agreement are true and correct in all material respects except to the extent such representations and warranties expressly relate to an earlier date (in which case, those representations and warranties remain true as of such date).

  Disclosure schedule with respect to the representations and warranties in the Loan Agreement:

  ____ None

  ____ See attached
- Except as noted in an attached updated Certificate of Perfection, the Certificate of Perfection executed on _____, 20 __, is true and correct as of the date of this Certificate of Compliance.

  Updated Certificate of Perfection:

  ____ None

  ____ See attached

**PERSONALIS, INC.**

Signature: _____

Print Name: _____

Title: _____

Date: _____

JOINDER AGREEMENT

THIS JOINDER AGREEMENT (the "Agreement") is made and entered into as of , 20 , by , a ("Company") in favor of TRIPLEPOINT CAPTIAL LLC, a Delaware limited liability company (the "Lender").

**RECITALS**

A. PERSONALIS, INC. and [ , a , ] (collectively, the "Borrower") and Lender have entered into that certain Plain English Growth Capital Loan and Security Agreement dated as of , 20 (including all annexes, exhibits and schedules thereto, and as the same may be amended, restated, supplemented or otherwise modified from time to time, the "Loan Agreement"), pursuant to which Lender is providing loans and other financial accommodations to or for the benefit of the Borrower upon the terms and conditions contained therein. Capitalized terms used herein without definitions shall have the respective meanings provided in the Loan Agreement.

B. The Loan Agreement requires that upon execution and delivery by Company of this Agreement, Company will become a party to the Loan Agreement as a borrower, will become jointly and severally liable for payment of all Secured Obligations under the Loan Agreement and will grant to Lender a Lien in all of Company's personal property.

C. Company has agreed to execute and deliver this Agreement in order to become a party to the Loan Agreement and the other Loan Documents.

NOW, THEREFORE, in consideration of the premises and of the covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

**AGREEMENT**

1. Loan Agreement. By executing and delivering this Agreement to Lender, Company hereby becomes a party to the Loan Agreement as a borrower thereunder with the same force and effect as if originally named therein as a borrower and, without limiting the generality of the foregoing, hereby expressly assumes all obligations and liabilities of a borrower thereunder. Company hereby agrees to be bound by all of the terms and provisions of the Loan Agreement and the other Loan Documents, which are incorporated herein by reference as fully as though set forth herein verbatim. Each reference to "You" or borrower in the Loan Agreement and in any other Loan Document shall be deemed to include Company. Company agrees to be jointly and severally liable with the other borrowers under the Loan Agreement for payment of all Secured Obligations thereunder and hereby grants and joins in the grant of a Lien pursuant to **Section 8** of the Loan Agreement and the cross-guaranty pursuant to **Section 17** of the Loan Agreement.

2. Representations and Warranties. Company hereby represents and warrants to Lender that each of the representations and warranties contained in **Section 11** of the Loan Agreement is true and correct as of the date hereof and after giving effect to this Agreement.

3. Conditions to Advances to Company. Company hereby acknowledges that Lender's obligation to fund any Advance to Company under the Loan Agreement and this Agreement is subject to delivery of all of the following fully-executed documents to Lender:

(a) this Agreement;

(b) the executed Certificate of Perfection of Company, attached as Exhibit C to the Loan Agreement;

(d) secretary's certificate of incumbency and authority for Company;

(e) certified copy of resolutions of Company's board of directors or similar governing body approving this Agreement, the Loan Agreement and the other Loan Documents;

(f) certified copy of [Certificate of Incorporation] and [By-Laws] for Company, as amended through the date hereof;

(g) a certificate of good standing from the [State of ], and similar certificates from all other jurisdictions where Company does business and where the failure to be qualified could reasonably be expected to have a Material Adverse Effect; and

(h) the other documents, certificates and other information required under **Section 5** of the Loan Agreement.

4. Recitals. The recitals to this Agreement shall constitute a part of the agreement of the parties hereto.

5. Governing Law. This Agreement has been made, executed and delivered in the State of California and will be governed and construed for all purposes in accordance with the laws of the State of California, excluding conflict of laws principles that would cause the application of laws of any other jurisdiction.

6. Signatures. This Agreement may be executed in any number of counterparts, each of which will be deemed an original, but all such counterparts together constitute one and the same instrument. This Agreement may be executed and delivered by facsimile or transmitted electronically in either Tagged Image Format Files ("TIFF") or Portable Document Format ("PDF") and, upon such delivery, the facsimile, TIFF or PDF signature, as applicable, will be deemed to have the same effect as if the original signature had been delivered to the other party.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, the undersigned has caused this Agreement to be executed and delivered as of the date first above written.

[COMPANY]

By: _____
Name:
Title:

ACCEPTED BY:

TRIPLEPOINT CAPITAL LLC

By: _____
Name:
Title:

PERSONALIS, INC.

By: _____
Name:
Title:

**SCHEDULE 1**

**INDEBTEDNESS AND LIENS**

| Creditor | Type of Credit Facility | Security Interest/Lien Granted | Outstanding Amount |
|---|---|---|---|
| None | | | |

**SCHEDULE 2**

**(SCHEDULE OF DOCUMENTS)**

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**SCHEDULE OF DOCUMENTS — PERSONALIS, INC.**

| | |
|---|---|
| **LENDER** | **TRIPLEPOINT CAPITAL LLC** |
| **LENDER'S COUNSEL ("LC")** | **KEVIN THORNE, KERRIE DUNSTAN** |
| **BORROWER** | **PERSONALIS, INC.** |
| **BORROWER'S COUNSEL ("BC")** | **JOHN HALE, COOLEY LLP** |
| **ITEMS COMPLETED** | **"XX"** |

| Item | | Resp. Party | Status |
|---|---|---|---|
| I. | PRINCIPAL LOAN DOCUMENTS | | |
| 1. | Plain English Revolving Loan and Security Agreement, executed by Borrower and Lender, together with: | LC/BC | XX |
| 1.1 | Disclosure Schedules | BC | n/a |
| 1.2 | Exhibits | LC/BC | XX |
| 2. | Plain English Revolving Promissory Note, Trance A | LC/BC | XX |
| 3. | Warrant Agreement, 1115-W-01, executed by Borrower and Lender | LC/BC | XX |
| 4. | Subordination Agreement between Lender and Convertible Debt Providers acknowledged by Borrower | LC/BC | 2 main VCs signatures received; remainder due by 7/14 |
| II. | SECURITY DOCUMENTS | | |
| 5. | Charge Over Shares executed by Parent and Lender, pledging shares of: | | Deferred; Borrower shall execute in form acceptable to Lender upon 30 days written notice by Lender, if required. |
| (a) | Personalis (UK) Limited | LC/BC | |

| | | | |
|---|---|---|---|
| | 5.1 Schedules | BC | Deferred |
| | 5.2 Stock Transfer Form | BC | Deferred |
| 6. | Certificates of Perfection executed by Borrower | BC | Final |
| 7. | Deposit Account Control Agreements executed by Borrower, Lender and Bank: | | |
| | 7.1 SVB-8632 | LC/BC | DACA: XX |
| | 7.2 SVB Asset Mgt — 19-SV958 | | SAGA: XX |
| 8. | Landlord Waivers executed by the landlords party to the leases for the following locations: | | |
| | (a) 1330 O'Brien Dr., Menlo Park, CA | LC/BC | XX |
| 9. | Co-Location Agreement, executed by the bailee(s) for the following location(s) *if Necessary*: | | |
| | (a) SVColo | LC/BC | XX |
| 10. | [Bailee Letters, executed by bailees for the following inventory locations:] | | |
| | (a) No locations | LC/BC | n/a |
| III. | DUE DILIGENCE | | |
| 11. | Legal Due Diligence Questionnaire (Borrower) | BC | XX |
| 12. | Pre-Closing Lien Search Reports detailing the searches in those jurisdictions listed on Exhibit A attached hereto and a summary thereof | LC/BC | See Exhibit A |
| IV. | ANCILLARY DOCUMENTS | | XX |
| 13. | ACH Direct Payment Form | BC | XX |
| 14. | Advance Request | BC | XX |
| 15. | Proposal Letter among the Borrower and Lender | LC/BC | XX |
| 16. | Insurance Policies/Certificates naming Lender as additional insured/loss payee<br>• General Liability — (Additional Insured)<br>• Property Insurance — (Loss Payee)<br>* Endorsements must accompany each Certificate. | BC | XX |

Notice Address for Certificates
*TriplePoint Capital LLC*
*2755 Sand Hill Rd., Ste. 150*

| | | | |
|---|---|---|---|
| | 17. Termination Statements for : | BC | n/a |
| | 18. Facility Fee, Part 1: $125,000 | BORROWER | Deduct from advance |
| | 19. Legal Fees, TBD | BORROWER | Deduct from Advance |
| | 20. Diligence Fees, $10,000 | BORROWER | Deduct from Advance |
| | 21. Commitment Deposit, $20,000 | BORROWER | Rec'd 6/7/17 |
| V. | ORGANIZATIONAL DOCUMENTS | | |
| | 22. Borrower | | |
| | 22.1 Secretary's Certificate (including incumbency) | | |
| | (a) Exhibit A – Certificate of Incorporation certified by the Secretary of State of Delaware - xx | BC | XX |
| | (b) Exhibit B - By-Laws, as amended through the Closing Date - xx | | |
| | (c) Exhibit C - Resolutions (re: Loan Documents; Warrant Agreement) | | |
| | 22.2 Good Standing Certificates (tax and corporate) from: | BC | XX |
| | i. Delaware | | |
| | ii. California | | |
| VI. | EQUITY DOCUMENTS | | |
| | 23. Series C Preferred Stock Purchase Agreement | BC | XX |
| | 24. Investors' Rights Agreement | BC | XX |
| | 25. Capitalization Table | BC | XX |
| | 26. 409A Valuation Report | BC | XX |
| VII. | POST CLOSING OBLIGATIONS | | |
| | 27. File UCC Financing Statements | LC | XX |
| | 28. Post-Filing UCC Searches | LC | In process |

**EXHIBIT A**

Pre-Closing Lien Search Reports

| *Search Jurisdictions* | *Debtor* | *Received?* |
|---|---|---|
| Delaware | Personalis, Inc. | In process |
| California | Personalis, Inc. | Yes; 2 State Tax Liens; Company provided proof of termination |
| United Kingdom | Personalis (UK) Limited | Yes; Clean |

**FIRST AMENDMENT**
**TO PLAIN ENGLISH LOAN AND SECURITY AGREEMENT**

This is a **FIRST AMENDMENT TO PLAIN ENGLISH LOAN AND SECURITY AGREEMENT** dated as of March 22, 2019 (the "Amendment") by and between PERSONALIS, INC., a Delaware corporation, ("Borrower") and TRIPLEPOINT CAPITAL LLC, a Delaware limited liability company, ("Lender").

**RECITALS**

A. Borrower and Lender are parties to the Plain English Revolving Loan and Security Agreement dated as of June 28, 2017 (the "Loan Agreement"), pursuant to which Lender agreed to provide financial accommodations to or for the benefit of Borrower upon the terms and conditions contained in the Loan Agreement. Unless otherwise defined in this Amendment, capitalized terms and matters of construction defined in the Loan Agreement shall have the same meaning given to them in the Loan Agreement.

B. In connection with the Loan Agreement, Lender has made a certain Advances to Borrower which are evidenced by the Plain English Promissory Note 1115-RV-01-01 dated June 28, 2017 executed by Borrower in favor of Lender ("Note RV-01-01").

C. Borrower has requested that certain provisions of the Loan Agreement be amended, and that growth capital loans be made available to Borrower and in connection with such amendments made herein, Borrower and Lender wish to re-name the Loan Agreement, the "Plain English Loan and Security Agreement".

**AGREEMENT**

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are acknowledged, Borrower and Lender agree as follows:

## 1. RATIFICATION; LOAN DOCUMENTS REMAIN IN FULL FORCE AND EFFECT

Borrower hereby acknowledges, confirms and ratifies all of the terms and conditions set forth in, and all of its obligations under, the Loan Agreement and the other Loan Documents. Unless otherwise defined, all initially capitalized terms in this Amendment shall be as defined in the Agreement. Except as expressly set forth herein, the execution, delivery, and performance of this Amendment shall not operate as a waiver of, or as an amendment of, any right, power, or remedy of Lender under the Loan Agreement or any other Loan Document, as in effect prior to the date hereof.

## 2. AMENDMENTS TO LOAN AGREEMENT

**A. Name of Loan Agreement.** On and after the First Amendment Closing Date, all references in the Loan Documents to "Plain English Revolving Loan and Security Agreement" shall mean and refer to the "Plain English Loan and Security Agreement" as amended by this Amendment

**B. Growth Capital Loan Facility Information.** Provided that the conditions in this Amendment and the Loan Agreement are met, Lender will lend to Borrower the additional Growth Capital Loan Commitment Amounts as reflected in this Amendment and Borrower agrees to use such proceeds to finance any of Borrower's general corporate needs. Lender will lend to Borrower Advances in minimum amounts as set forth in this Amendment up to a maximum of the additional Commitment Amount as provided below.

**GROWTH CAPITAL LOAN FACILITY INFORMATION**

| **Facility Number** | **Commitment Amount** |
|---|---|
| Part 1: 1115-GC-01 | Part 1: $20,000,000 |

| **Minimum Advance Amount** | **Availability Period** | **Loan Term** | **Interest Rate** |
|---|---|---|---|
| Part 1: $5,000,000, which will be utilized to prepay in full the Note RV-01-01 | Part 1: First Amendment Closing Date through January 31, 2020 | Part 1: 48 Months<br>(1-12 interest only) | Part 1:<br>For each Advance which in the aggregate with all other Advances is less than or equal to $15,000,000, Prime Rate plus 5.00%<br>For each Advance which in the aggregate with all other Advances is greater than $15,000,000, Prime Rate plus 6.50%<br>(Prime Rate as published in the Wall Street Journal, however, in no event shall the Prime Rate be less than 5.50%) |

| **Security Interest** | **End Of Term Payment** | **Facility Fee** |
|---|---|---|
| First priority security interest in all Collateral; negative pledge on Intellectual Property | Part 1: 2.75% of each Advance | Part 1: $250,000 due on the First Amendment Closing Date |

**C. AMENDMENT TO PAYMENT OBLIGATIONS.** Notwithstanding anything in the Loan Agreement to the contrary, effective as of the date in which Borrower satisfies all conditions to effectiveness set forth in Section 3:

- The Maturity Date for the Note RV-01 -01 shall be extended and shall be the First Amendment Closing Date (the "Revised Maturity Date").
- During the period from December 31, 2018 through the Revised Maturity Date, the Secured Obligations will be repaid monthly in interest only payments payable on the last day of each month (unless that date falls on a weekend or national holiday in which event such payment shall be due on the previous Business Day), followed by all outstanding principal and accrued interest due on the Revised Maturity Date, if not sooner paid in full.

**D. WHAT THE PARTIES AGREE TO FINANCE; DESIGNATION OF LEAD BORROWER:** Section 1 is hereby amended amending by deleting the first paragraph and replacing it with the following:

Provided that the conditions in Sections 4 and 5 and elsewhere in this Agreement are met, We will lend to You the Parts of the Commitment Amount as reflected in the Table of Terms and You agree to use such proceeds to finance any of Your general corporate needs, including Equipment. We will make one monthly Advance under the Revolving Loan and other Advances under the Growth Capital Loan, as requested (each an "**Advance**") in minimum amounts as set forth in the Table of Terms up to a maximum of the Commitment Amount as provided in the Table of Terms. Our obligation to fund Advances under each Part of the Commitment Amount under this Agreement will end on the last day of the Availability Period noted in the Table of Terms for such Part.

**E. YOU WILL ENTER INTO MULTIPLE PROMISSORY NOTES:** Section 2 is hereby amended by deleting it in its entirety and replacing it with the following:

**Revolving Loan**

The Plain English Revolving Loan Promissory Note in the form of Exhibit A ("**Revolving Promissory Note**") is the form of document the Parties will enter into upon the availability of each Tranche/Commitment Amount of the Revolving Loan. The Revolving Promissory Note evidences the Revolving Loan and all of the terms and conditions of this Agreement are incorporated in and made a part of the Revolving Promissory Note. For any Part that is not available on the Closing Date, the Parties will enter into a Revolving Promissory Note when such Part becomes available.

**Growth Capital Loan**

The Plain English Growth Capital Promissory Note in the form of Exhibit 1 (the "**Growth Capital Promissory Note**", collectively with the Revolving Promissory Note, the "Promissory Note") is the document the Parties will enter into each time an Advance under the Growth Capital Loan is to be funded. The Growth Capital Promissory Note will contain the specific financial terms of the Advance (e.g. amount funded, interest rate, maturity date, Advance Date, payment due dates etc.) and all of the terms and conditions of this Agreement are incorporated in and made a part of each Growth Capital Promissory Note. There may be multiple Growth Capital Promissory Notes associated with this Agreement.

**F. HOW WILL YOU REQUEST ADVANCES:** Section 4 is hereby amended by deleting the second to last paragraph and replacing it with the following:

After We check and approve the information You provide in the Advance Request, (a) with respect to the Revolving Loan, upon Your initial Advance Request, We will prepare and provide to You a Revolving Promissory Note for Your signature and (b) with respect to the Growth Capital Loan, upon each Advance Request, We will prepare and provide to You a Growth Capital Promissory Note and an amortization schedule for Your signature. Upon receipt of the Promissory Note signed by Your authorized officer and confirmation by Us that all conditions to funding an Advance have been met, We will then advance the requested funds to You.

**G. CONDITIONS FOR US TO MAKE LOANS TO YOU:** Section 5 is hereby amended amending adding the following:

- The initial Advance under the Growth Capital Loan shall be used to prepay, in its entirety, all amounts owing in respect of Note RV-01-01.

**H. YOU MAY PREPAY PROMISSORY NOTES:** Section 6 is hereby amended by deleting it in its entirety and replacing it with the following:

**Revolving Loan**

You may at any time prepay any amounts outstanding under all of the Revolving Promissory Notes in part or in full, without premium or penalty, by paying: (a) the principal amount being prepaid and all accrued interest calculated as if the date of such prepayment occurred on the next scheduled monthly payment date per the respective Promissory Notes, (b) the End of Term Payment, prorated for any partial payment, and (c) all other Secured Obligations, if any, that shall have become due and payable, including interest at the Default Rate with respect to any past due amounts as of the date of prepayment.

**Growth Capital Loan**

You may at any time prepay any Growth Capital Promissory Note in full (but not in part), without premium or penalty, by (a) giving five (5) Business Days prior written notice, and (b) paying: (i) the remaining outstanding principal amount and all accrued interest calculated as if the date of such prepayment occurred on the next scheduled monthly payment date per the respective Promissory Note, (ii) the End of Term Payment, (iii) all other Secured Obligations, if any, that shall have become due and payable, including interest at the Default Rate with respect to any past due amounts as of the date of prepayment, and (iv) the Prepayment Fee.

**I. HOW AND WHAT WILL YOU PAY US:** Section 9 is hereby amended amending by deleting in its entirety and replacing it with the following:

**Revolving Loan**

**Payments.** Except as set forth in Section 7 with respect to interest that accrues at the Default Rate, the principal balance of each Revolving Loan Promissory Note shall accrue interest at the percentage per year as indicated in the Revolving Loan Facility Information in the Table of Terms, and shall be computed daily on the basis of a year consisting of 360 days for the actual number of days occurring in the period for which such interest is payable, and interest shall accrue from the date on which the Revolving Loan Advance funded to any of You. Monthly installments of interest shall be payable on the last day of each month through the Revolving Loan Maturity Date (unless that date falls on a weekend or national holiday in which event such payment shall be due on the previous Business Day). In the event that the Prime Rate is changed from time to time during the term of this Agreement, the applicable rate of interest for the outstanding principal balance of the Revolving Loan Advances shall be increased or decreased, effective as of the day the Prime Rate is changed, by an amount equal to such change in the Prime Rate. The first payment date for each Revolving Loan Advance will be the last day of the month in which the Revolving Loan Advance was funded. All outstanding principal and accrued interest shall be due on the Revolving Loan Maturity Date, if not sooner paid in full.

**Interest Rate Adjustment.** Immediately upon execution of a Working Capital Loan Facility the Interest Rate for all outstanding Revolving Loan Advances and any new Revolving Loan Advances shall increase by one percent (1%).

**Re-borrowing.** Any amounts that You repay on the Revolving Loan Advances may be re-borrowed during the applicable Availability Period.

**Growth Capital Loan**

**Payments.** The first payment date for each Growth Capital Loan Advance will be the first day of the month following the month in which the Growth Capital Loan Advance was funded, unless that Growth Capital Loan Advance is funded on the first day of that month, in which case the first payment date shall be the Advance Date.

Each Growth Capital Loan Advance shall be due in monthly installments consisting of that number of months of interest only as indicated in the Growth Capital Loan Facility Information in the Table of Terms followed by the remaining monthly installment payments, as indicated in the Table of Terms, of principal and interest. All payments are payable on the first day of each month through the last payment date (unless that date falls on a day that is not a Business Day in which event such payment shall be due on the previous Business Day). The outstanding balance of each Growth Capital Loan Advance shall be due and payable in full in immediately available funds on the Maturity Date (as defined in the applicable Growth Capital Promissory Note for such Growth Capital Loan Advance), if not sooner paid in full.

**Interest.** The principal balance of each Growth Capital Promissory Note shall accrue interest at the percentage per year as indicated in the Table of Terms, and shall be computed daily on the basis of a year consisting of 360 days for the actual number of days occurring in the period for which such interest is payable, and interest shall accrue in advance from the Advance Date. In the event that the Prime Rate is changed from time to time during the term of this Agreement, the applicable rate of interest for the outstanding principal balance of the Growth Capital Loan Advances shall be increased or decreased, effective as of the day the Prime Rate is changed, by an amount equal to such change in the Prime Rate.

**Interim Payment.** In the event a Growth Capital Loan Advance is made on any day other than the first day of the month, You shall make payment to Us on the Advance Date in an amount equal to the per diem interest for the time from the Advance Date through and including the last day of the month in which the Growth Capital Loan Advance is funded.

**Fees.** You shall pay to Us the following fees and expenses:

- **Facility Fees.** On or before the Closing Date or First Amendment Closing Date, or upon availability of additional Commitment Amounts, as the case may be, the respective Facility Fee as indicated in the Table of Terms.
- **End of Term Payment.** Upon the earlier of the expiration of the Loan Term or last payment date for any Promissory Note, the End of Term Payments as indicated in the Table of Terms.

- **Prepayment Fee.** An additional prepayment premium ("**Prepayment Fee**") shall be payable as follows:

  (a) If prepaid in months 1-12 of the Loan Term of any Growth Capital Promissory Note: 1.00% of the outstanding balance owing under such Promissory Note; and

  (b) If prepaid after month 12 of the Loan Term of any Growth Capital Promissory Note, no additional prepayment premium shall be due.

**Re-borrowing.** Any amounts that You repay on the Growth Capital Loan Advances may not be re-borrowed.

**Miscellaneous.** Payments are due electronically by automatic debit through Automated Clearing House (ACH) payment on or before the last day of each month in the case of a Revolving Loan or the first day of the month in the case of a Growth Capital Loan. You agree to fill out and execute the electronic funds transfer/automatic debit Authorization form that We provide. If We do not receive any payments from You within two (2) Business Days after they are due, You will pay a late charge on the overdue amount. The late charge will be equal to five percent (5%) of the amount due for each month not paid when due and until such time as payment is received. All payments shall be free and clear of any taxes, withholdings, duties, impositions or other charges, to the end that We will receive the entire amount of any Secured Obligations payable under this Agreement, regardless of the source of payment. Any interest not paid when due shall be compounded by becoming a part of the Secured Obligations, and such interest shall then accrue interest at the rate then applicable under this Agreement and the applicable Promissory Note.

**J. COVENANTS:** Section 12, "YOUR CONVENANTS TO US" is hereby amended by deleting subparagraph "Dispositions, Liens and Encumbrances" in its entirety and replacing it with the following:

**Dispositions, Liens and Encumbrances.** None of You will nor will You permit any of Your Subsidiaries to, transfer, sell, assign, grant a security interest in, hypothecate, permit or suffer to exist any Lien, or otherwise transfer any interest in or encumber any portion of Your properties or assets (or those of any Subsidiary), including the Intellectual Property, either voluntarily or involuntarily, without Our prior written consent, other than: (a) Permitted Liens, (b) sales of Inventory in the ordinary course of business, (c) non-exclusive licenses or non-perpetual exclusive licenses with respect to geographic area, fields of use and customized products for specific customers that would not result in a transfer of title of the licensed property under applicable law, all given in the ordinary course of Your business, and (d) sales of worn-out or obsolete Equipment not financed by Us provided that the fair market value of such Equipment does not exceed $50,000 in any fiscal year. In addition, none of You will, nor will You permit any of Your Subsidiaries to, enter into any agreement with any Person (other than Us) that restricts Your ability, or the ability of any of Your Subsidiaries, to transfer, sell, assign, grant a security interest in, hypothecate, permit or suffer to exist any Lien, or otherwise transfer any interest in or encumber any portion of Your properties or assets or those of any of Your Subsidiaries, including Your Intellectual Property. Without limiting the generality of the foregoing, none of You will sell, transfer, encumber or otherwise dispose of any ownership interest that You may have in any subsidiary. Notwithstanding the forgoing, nothing in this Agreement shall limit Your Subsidiaries from transferring any of such Subsidiaries properties or assets to You or any other borrower or Guarantor or such Subsidiary making any distributions to You or any other borrower or Guarantor.

**K. DEFINITIONS:** Section 21 is hereby amended by deleting the definitions of "Revolving Loan", "Revolving Loan Maturity Date" and "Table of Terms" and replacing them as follows:

**"Revolving Loan"** means the loans in the maximum principal amount as stated in the Table of Terms "Revolving Loan Facility Information" under the caption "Commitment Amount" made to You by Us pursuant to the terms of this Agreement.

**"Revolving Loan Maturity Date"** means the First Amendment Closing Date.

"**Table of Terms"** means the table of terms on Page 1 and 2 of the Loan Agreement, and Page 2 of the First Amendment.

**L. DEFINITIONS:** Section 21 is hereby amended by adding the following definitions in alphabetical order:

**"First Amendment"** means that certain First Amendment to Plain English Loan and Security Agreement by and between You and Us, dated as of March 22, 2019.

**"First Amendment Closing Date"** means March 22, 2019.

**"Growth Capital Loan"** means the loans in the maximum principal amount as stated in the Table of Terms "Growth Capital Loan Facility Information" under the caption "Commitment Amount" made to You by Us pursuant to the terms of this Agreement.

**"Prepayment Fee"** has the meaning given to it in Section 9.

**M. EXHIBITS:** Exhibit 1 attached hereto, shall be incorporated into and become a part of the Loan Agreement.

## 3. CONDITIONS TO EFFECTIVENESS

- Receipt by Lender of copies of this Amendment, duly executed by Borrower and Lender;
- Receipt by Lender of the Warrant Agreement of even date as this Amendment;
- Receipt by Lender of the Certificate of Perfection of even date as this Amendment;
- Receipt by Lender of the Growth Capital Loan Part 1 Facility Fee noted above;
- Receipt by Lender of a Certificate of Secretary regarding resolutions and incumbency;
- Receipt by Lender of certified copy of Certificate of Incorporation and By-Laws as amended through the date of this Amendment;
- The absence of any Default or Event of Default; and
- Such other documents as We may reasonably request.

## 4. REPRESENTATIONS AND WARRANTIES

Borrower represents and warrants that the representations and warranties contained in the Loan Agreement were true and correct in all material respects when made and, except to the extent (a) that a particular representation or warranty by its terms expressly applies only to an earlier date or (b) set forth in a Schedule of Exceptions attached hereto, if any, are true and correct in all material respects as of the date of this Amendment. Borrower further represents and warrants that there are no Defaults or Events of Default that have occurred and are continuing as of the date of this Amendment.

## 5. MISCELLANEOUS

- **Entire Agreement**. The terms and conditions of this Amendment shall be incorporated by reference in the Loan Agreement as though set forth in full in the Loan Agreement. In the event of any inconsistency between the provisions of this Amendment and any other provision of the Loan Agreement, the terms and provisions of this Amendment shall govern and control. Except to the extent specifically amended or superseded by the terms of this Amendment, all of the provisions of the Loan Agreement and the other Loan Documents shall remain in full force and effect to the extent in effect on the date of this Amendment. The Loan Agreement, as modified by this Amendment, together with the other Loan Documents, constitutes the complete agreement among the parties and supersedes any prior written or oral agreements, writings, communications or understandings of the parties with respect to the subject matter the Loan Agreement.
- **Headings**. Section headings used in this Amendment are for convenience of reference only, are not part of this Amendment, and are not to be taken into consideration in interpreting this Amendment.
- **Recitals**. The recitals set forth at the beginning of this Amendment are true and correct, and such recitals are incorporated into and are a part of this Amendment.
- **Governing Law**. This Amendment shall be governed by, and construed and enforced in accordance with, the laws of the State of California applicable to contracts made and performed in such state, without regard to the principles thereof regarding conflict of laws.
- **Effect**. Upon the effectiveness of this Amendment, from and after the date of this Amendment, each reference in the Loan Agreement to “this Agreement,” “hereunder,” “hereof,” or words of like import shall mean and be a reference to the Loan Agreement as amended by this Amendment and each reference in the other Loan Documents to the Loan Agreement, “thereunder,” “thereof,” or words of like import shall mean and be a reference to the Loan Agreement as amended by this Amendment.

- **No Novation**. Except as expressly provided in **Section 2** above, the execution, delivery, and effectiveness of this Amendment shall not (a) limit, impair, constitute a waiver of, or otherwise affect any right, power, or remedy of Lender under the Loan Agreement or any other Loan Document, (b) constitute a waiver of any provision in the Loan Agreement or in any of the other Loan Documents, or (c) alter, modify, amend, or in any way affect any of the terms, conditions, obligations, covenants, or agreements contained in the Loan Agreement, all of which are ratified and affirmed in all respects and shall continue in full force and effect.
- **Counterparts**. This Agreement may be executed in any number of counterparts, each of which will be deemed an original, but all such counterparts together constitute one and the same instrument.
- **Signatures**. This Agreement and any Promissory Note may be executed and delivered by facsimile or transmitted electronically in either Tagged Image Format Files ("**TIFF**") or Portable Document Format ("**PDF**") and, upon such delivery, the facsimile, TIFF or PDF signature, as applicable, will be deemed to have the same effect as if the original signature had been delivered to the other party.

***[SIGNATURE PAGE TO FOLLOW]***

**IN WITNESS WHEREOF**, The Parties have executed and delivered this Amendment as of the day and year first above written.

| | | |
|---|---|---|
| **BORROWER:** | **You:** | **PERSONALIS, INC.** |
| | Signature: | /s/ JOHN WEST |
| | Print Name: | JOHN WEST |
| | Title: | CEO |

**Accepted in Menlo Park, California:**

| | | |
|---|---|---|
| **LENDER:** | **Us:** | **TRIPLEPOINT CAPITAL LLC** |
| | Signature: | /s/ Andrew Olson |
| | Print Name: | Andrew Olson |
| | Title: | CFO |

**[SIGNATURE PAGE TO FIRST AMENDMENT TO PLAIN ENGLISH LOAN and SECURITY AGREEMENT]**

**EXHIBIT 1**

**PLAIN ENGLISH GROWTH CAPITAL PROMISSORY NOTE**

This is a Plain English Growth Capital Promissory Note dated , 20 by and between TRIPLEPOINT CAPITAL LLC, as lender, and PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement, as borrowers (the "Promissory Note"). The words "We", "Us", and "Our", refer to TRIPLEPOINT CAPITAL LLC. Unless otherwise specified, the words "You" and "Your" refer to PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement, and not any individual, and PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement, shall be jointly and severally liable for any and all of Your agreements and obligations under this Promissory Note. The words "Parties" refers to each of and all of TRIPLEPOINT CAPITAL LLC, PERSONALIS, INC. and any other Person that executes a Joinder Agreement to become a borrower under the Loan Agreement.

This Promissory Note is the Promissory Note referred to in, and is executed and delivered in connection with, the Plain English Loan and Security Agreement dated as of June 28, 2017, by and between the Parties, as the same may from time to time be amended, modified or supplemented in accordance with its terms (the "Loan Agreement"), and is entitled to the benefit and security of that Loan Agreement and the other documents executed in connection with all principal, interest, fees or other liabilities owed by You under the Loan Agreement and other Loan Documents (as defined in the Loan Agreement). All terms defined in the Loan Agreement shall have the same definitions when used herein, unless otherwise defined herein.

**PROMISSORY NOTE INFORMATION**

| **Facility Name** | **Facility Number** | **Promissory Note Number** | **Principal Amount** |
|---|---|---|---|
| Growth Capital Loan Facility | 1115-GC-0_ | 1115-GC-0_-0_ | $ |
| **Payment Amount** | **Loan Term** | **Interest Rate** | **End of Term Payment** |
| [Months 1-XX: interest only; Months XX-XX: $ ] | months | [Prime Rate plus %] | $[ %] |
| **Interim Payment** | **Funding Date** | **First Payment Date** | **Maturity Date** |
| $ | , 20 | , 20 | , 20 |

**CONTACT INFORMATION**

| **Name** | **Address For Notices** | **Contact Person** |
|---|---|---|
| TriplePoint Capital LLC | 2755 Sand Hill Rd., Ste. 150<br>Menlo Park, CA 94025<br>Tel: (650) 854-2090<br>Fax: (650) 854-1850 | Sajal Srivastava, President<br>Tel: (650) 233-2102<br>Fax: (650) 854-1850<br>email: legal@triplepointcapital.com |
| **Customer Name** | **Central Billing Address** | **Contact Person** |
| Personalis, Inc. | 1330 O'Brien Drive<br>Menlo Park, CA 94025 | Name, Title<br>Carol Tillis, VP Finance & Administration<br>Tel: (650) 752-1330<br>Fax: (650)752-1301<br>email: carol.tillis@personalis.com |

**FOR VALUE RECEIVED,** Each of You, jointly and severally, hereby promise to pay to the order of TriplePoint Capital LLC or the holder of this Promissory Note at 2755 Sand Hill Road, Ste. 150, Menlo Park, CA, 94025 or such other place of payment as the holder of this Promissory Note may specify from time to time in writing, in lawful money of the United States of America, the principal amount of /100 Dollars ($ ) together with interest at Prime Rate plus percent ( %) per annum, from the date of this Promissory Note to maturity of each installment on the principal remaining unpaid, such principal and interest to be paid as stated on Page 1 of this Promissory Note and as set forth in the Loan Agreement. In addition to Your final payment, You will pay Us an amount equal to percent ( %) of the principal amount of this Promissory Note. Interest shall be computed daily on the basis of a year consisting of 360 days for the actual number of days occurring in the period for which such interest is payable. Any payments made under this Promissory Note shall not be available for re-borrowing.

The aggregate outstanding principal balance of this Promissory Note shall be due and payable in full in immediately available funds on the Maturity Date, if not sooner paid in full.

You waive presentment and demand for payment, notice of dishonor, protest and notice of protest under the UCC or any applicable law.

You will not, directly or indirectly, use the proceeds of any Advance(s) under this Promissory Note, or lend, contribute or otherwise make available such proceeds to any Subsidiary, Affiliate, joint venture partner or other Person, to fund any activities or business of or with any Person, or in any country or territory, that, at the time of such funding, is the subject of any sanctions administered by OFAC, or in any other manner that would result in a violation of OFAC sanctions by any Person, including any Person participating in any capacity in any Advance(s) under this Promissory Note.

This Promissory Note has been negotiated and delivered to Us and is payable in the State of California. This Promissory Note shall be governed by and construed and enforced in accordance with, the laws of the State of California, excluding any conflicts of law rules or principles that would cause the application of the laws of any other jurisdiction.

**BORROWERS**

**YOU:** **PERSONALIS, INC.**

Signature: _____

Print Name: _____

Title: _____

THIS NOTE AND THE SECURITIES ISSUABLE UPON THE CONVERSION HEREOF HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "***ACT***"), OR UNDER THE SECURITIES LAWS OF ANY STATES IN THE UNITED STATES. THESE SECURITIES ARE SUBJECT TO RESTRICTIONS ON TRANSFERABILITY AND RESALE AND MAY NOT BE TRANSFERRED OR RESOLD EXCEPT AS PERMITTED UNDER THE ACT AND THE APPLICABLE STATE SECURITIES LAWS, PURSUANT TO REGISTRATION OR EXEMPTION THEREFROM. THE ISSUER OF THESE SECURITIES MAY REQUIRE AN OPINION OF COUNSEL IN FORM AND SUBSTANCE SATISFACTORY TO THE ISSUER TO THE EFFECT THAT ANY PROPOSED TRANSFER OR RESALE IS IN COMPLIANCE WITH THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS.

# CONVERTIBLE PROMISSORY NOTE

Note Series: 2017A
Date of Note:
Principal Amount of Note: $

For value received **PERSONALIS, INC.**, a Delaware corporation (the "***Company***") promises to pay to the undersigned holder or such party's assigns (the "***Holder***") the principal amount set forth above with simple interest on the outstanding principal amount at the rate of 8% per annum. Interest shall commence with the date hereof and shall continue on the outstanding principal until paid in full or converted. Interest shall be computed on the basis of a year of 365 days for the actual number of days elapsed. All unpaid interest and principal shall be due and payable upon request of the Requisite Holders on or after June 28, 2018 or such later date as may be determined by the Requisite Holders (the "***Maturity Date***").

## 1. BASIC TERMS.

**(a) Series of Notes**. This convertible promissory note (the "***Note***") is issued as part of a series of notes designated by the Note Series above (collectively, the "***Notes***") and issued in a series of multiple closings to certain persons and entities (collectively, the "***Holders***"). The Company shall maintain a ledger of all Holders.

**(b) Payments**. All payments of interest and principal shall be in lawful money of the United States of America and shall be made pro rata among all Holders. All payments shall be applied first to accrued interest, and thereafter to principal.

**(c) Prepayment**. The Company may not prepay this Note prior to the Maturity Date without the consent of Lightspeed Venture Partners VIII, L.P. and Abingworth Bioventures V, LP (the "***Requisite Holders***").

## 2. CONVERSION AND REPAYMENT.

**(a) Conversion upon a Qualified Financing**. In the event that the Company issues and sells shares of its equity securities (the "***Equity Securities***") to investors (the "***Investors***") on or before the Maturity Date in an equity financing with total proceeds to the Company of not less than $10,000,000 (excluding the conversion of the Notes and any other convertible securities issued for capital raising purposes (*e.g.*, Simple Agreements for Future Equity)) (a "***Qualified Financing***"), then the outstanding

principal amount of this Note and any unpaid accrued interest shall automatically convert in whole without any further action by the Holder into such Equity Securities sold in the Qualified Financing at a conversion price equal to the price paid per share for Equity Securities by the Investors in the Qualified Financing multiplied by 0.80. The issuance of Equity Securities pursuant to the conversion of this Note pursuant to this Section 2(a) shall be upon and subject to the same terms and conditions applicable to the Equity Securities sold in the Qualified Financing. Notwithstanding this paragraph, if the conversion price of the Notes as determined pursuant to this paragraph (the "***QF Conversion Price***") is less than the price per share at which Equity Securities are issued in the Qualified Financing, the Company may, solely at its option, elect to convert this Note into shares of a newly created series of preferred stock having the identical rights, privileges, preferences and restrictions as the Equity Securities issued in the Qualified Financing, and otherwise on the same terms and conditions, other than with respect to: (i) the per share liquidation preference and the conversion price for purposes of price-based anti-dilution protection, which will equal the QF Conversion Price; and (ii) the per share dividend, which will be the same percentage of the QF Conversion Price as applied to determine the per share dividends of new Investors in the Qualified Financing relative to the purchase price paid by such Investors.

**(b) Conversion upon other Financings**. In the event that the Company issues and sells Equity Securities to Investors on or before the Maturity Date in an equity financing that does not qualify as a Qualified Financing (a "***Non-Qualified Financing***"), then at the option of either (x) the Requisite Holders or (y) the Holder, the outstanding principal amount of this Note and any unpaid accrued interest shall automatically convert in whole without any further action by the Holder into such Equity Securities sold in the Non-Qualified Financing at a conversion price equal to the price paid per share for Equity Securities by the Investors in the Non-Qualified Financing multiplied by 0.80 (provided that in the event of conversion requested by the Requisite Holders, all of the Notes shall be converted upon the same terms). The issuance of Equity Securities pursuant to the conversion of this Note pursuant to this Section 2(b) shall be upon and subject to the same terms and conditions applicable to the Equity Securities sold in the Non-Qualified Financing. Notwithstanding this paragraph, if the conversion price of the Notes as determined pursuant to this paragraph (the "***NQF Conversion Price***") is less than the price per share at which Equity Securities are issued in the Non-Qualified Financing, then upon the conversion of this Note pursuant to this Section 2(b), the Company may, solely at its option, elect to convert this Note into shares of a newly created series of preferred stock having the identical rights, privileges, preferences and restrictions as the Equity Securities issued in the Non-Qualified Financing, and otherwise on the same terms and conditions, other than with respect to: (i) the per share liquidation preference and the conversion price for purposes of price-based anti-dilution protection, which will equal the NQF Conversion Price; and (ii) the per share dividend, which will be the same percentage of the NQF Conversion Price as applied to determine the per share dividends of new Investors in the Non-Qualified Financing relative to the purchase price paid by such Investors.

**(c) Maturity Date Conversion**. In the event that this Note remains outstanding on the Maturity Date, then the outstanding principal balance of this Note and any unpaid accrued interest shall upon the election of the Holder given prior to the Maturity Date, convert as of the Maturity Date into shares of a newly created series of the Company's preferred stock (the "***Series C-1 Preferred***") at a conversion price equal to the price paid per share for the Company's Series C Preferred Stock and which will have identical rights, privileges, preferences and restrictions as the Company's Series C Preferred Stock, other than the Series C-1 Preferred shall be entitled to no vote on any matters submitted to the Company's stockholders (the "***Maturity Date Conversion***"). The Series C-1 Preferred will be subject to the Amended and Restated Investor Rights Agreement, by and among the Company and the Investors party thereto, dated as of December 16, 2014 (the "***IRA***") and the Amended and Restated Voting Agreement, by and among the Company and the Investors party thereto, dated as of December 16, 2014 (the "***Voting Agreement***"), *provided*, *however*, that the Series C-1 Preferred will not be included in the voting or amendment thresholds under such agreements. In the event of a Maturity Date Conversion by any of the Holders of the Notes, the

Company and the Holder, and each of the Holder's affiliates that holds any shares of capital stock of the Company as of the date of such Maturity Date Conversion, shall amend the IRA, the Voting Agreement and the Company's certificate of incorporation to include the Series C-1 Preferred.

**(d) Change of Control**. If the Company consummates a Change of Control (as defined below) while this Note remains outstanding, the Company shall provide the Holder with at least ten (10) days' prior written notice thereof and shall repay the Holder in cash in an amount equal to 150% of the outstanding principal amount of this Note plus any unpaid accrued interest on the original principal; *provided however*, that, if requested in writing by (x) the Requisite Holders or (y) the Holder, in lieu of such repayment, the outstanding principal amount and unpaid accrued interest thereon shall convert into shares of the then-most recently issued series of preferred stock of the Company issued in a bona fide equity financing transaction at a conversion price equal to the lowest price paid per share by investors in such financing, which conversion shall take place immediately prior to the closing of such Change of Control (provided that in the event of conversion requested by the Requisite Holders, all of the Notes shall be converted upon the same terms). For purposes of this Note, a "***Change of Control***" means (i) a consolidation or merger of the Company with or into any other corporation or other entity or person, or any other corporate reorganization, other than any such consolidation, merger or reorganization in which the shares of capital stock of the Company immediately prior to such consolidation, merger or reorganization, continue to represent a majority of the voting power of the surviving entity immediately after such consolidation, merger or reorganization; (ii) any transaction or series of related transactions to which the Company is a party in which in excess of 50% of the Company's voting power is transferred; or (iii) the sale or transfer of all or substantially all of the Company's assets, or the exclusive license of all or substantially all of the Company's material intellectual property; *provided* that a Change of Control shall not include any transaction or series of transactions principally for bona fide equity financing purposes in which cash is received by the Company or any successor, indebtedness of the Company is cancelled, or converted or a combination thereof. The Company shall give the Holder notice of a Change of Control not less than 10 days prior to the anticipated date of consummation of the Change of Control. Any repayment pursuant to this paragraph in connection with a Change of Control shall be subject to any required tax withholdings, and may be made by the Company (or any party to such Change of Control or its agent) following the Change of Control in connection with payment procedures established in connection with such Change of Control.

**(e) Procedure for Conversion**. In connection with any conversion of this Note into capital stock, the Holder shall surrender this Note to the Company and deliver to the Company any documentation reasonably required by the Company (including, in the case of a Qualified Financing, all financing documents executed by other investors in connection with such Qualified Financing). The Company *shall* not be required to issue or deliver the capital stock into which this Note may convert until the Holder has surrendered this Note to the Company and delivered to the Company any such documentation. Upon the conversion of this Note into capital stock pursuant to the terms hereof, in lieu of any fractional shares to which the Holder would otherwise be entitled, the Company shall pay the Holder cash equal to such fraction multiplied by the price at which this Note converts.

**(f) Interest Accrual**. If a Change of Control or Qualified Financing is consummated, all interest on this Note shall be deemed to have stopped accruing as of a date selected by the Company that is not more than 10 days prior to the signing of the definitive agreement for the Change of Control or Qualified Financing.

**3. REPRESENTATIONS AND WARRANTIES.**

**(a) Representations and Warranties of the Company**. The Company hereby represents and warrants to the Holder as of the date the first Note was issued as follows:

**(i) Organization, Good Standing and Qualification**. The Company is a corporation duly organized, validly existing and in good standing under the laws of the State of Delaware. The Company has the requisite corporate power to own and operate its properties and assets and to carry on its business as now conducted and as proposed to be conducted. The Company is duly qualified and is authorized to do business and is in good standing as a foreign corporation in all jurisdictions in which the nature of its activities and of its properties (both owned and leased) makes such qualification necessary, except for those jurisdictions in which failure to do so would not have a material adverse effect on the Company or its business.

**(ii) Corporate Power**. The Company has all requisite corporate power to issue this Note and to carry out and perform its obligations under this Note. The Company's Board of Directors (the "***Board***") has approved the issuance of this Note based upon a reasonable belief that the issuance of this Note is appropriate for the Company after reasonable inquiry concerning the Company's financing objectives and financial situation.

**(iii) Authorization**. All corporate action on the part of the Company, the Board and the Company's stockholders necessary for the issuance and delivery of this Note has been taken. This Note constitutes a valid and binding obligation of the Company enforceable in accordance with its terms, subject to laws of general application relating to bankruptcy, insolvency, the relief of debtors and, with respect to rights to indemnity, subject to federal and state securities laws. Any securities issued upon conversion of this Note (the "***Conversion Securities***"), when issued in compliance with the provisions of this Note, will be validly issued, fully paid, nonassessable, free of any liens or encumbrances and issued in compliance with all applicable federal and securities laws.

**(iv) Governmental Consents**. All consents, approvals, orders or authorizations of, or registrations, qualifications, designations, declarations or filings with, any governmental authority required on the part of the Company in connection with issuance of this Note has been obtained.

**(v) Compliance with Laws**. To its knowledge, the Company is not in violation of any applicable statute, rule, regulation, order or restriction of any domestic or foreign government or any instrumentality or agency thereof in respect of the conduct of its business or the ownership of its properties, which violation of which would materially and adversely affect the business, assets, liabilities, financial condition, operations or prospects of the Company.

**(vi) Compliance with Other Instruments**. The Company is not in violation or default of any term of its certificate of incorporation or bylaws, or of any provision of any mortgage, indenture or contract to which it is a party and by which it is bound or of any judgment, decree, order or writ, other than such violation(s) that would not have a material adverse effect on the Company. The execution, delivery and performance of this Note will not result in any such violation or be in conflict with, or constitute, with or without the passage of time and giving of notice, either a default under any such provision, instrument, judgment, decree, order or writ or an event that results in the creation of any lien, charge or encumbrance upon any assets of the Company or the suspension, revocation, impairment, forfeiture, or nonrenewal of any material permit, license, authorization or approval applicable to the Company, its business or operations or any of its assets or properties. Without limiting the foregoing, the Company has obtained all waivers reasonably necessary with respect to any preemptive rights, rights of first refusal or similar rights, including any notice or offering periods provided for as part of any such rights, in order for the Company to consummate the transactions contemplated hereunder without any third party obtaining any rights to cause the Company to offer or issue any securities of the Company as a result of the consummation of the transactions contemplated hereunder.

**(vii) No "Bad Actor" Disqualification**. The Company has exercised reasonable care to determine whether any Company Covered Person (as defined below) is subject to any of the "bad actor" disqualifications described in Rule 506(d)(1)(i) through (viii), as modified by Rules 506(d)(2) and (d)(3), under the Act ("***Disqualification Events***"). To the Company's knowledge, no Company Covered Person is subject to a Disqualification Event. The Company has complied, to the extent required, with any disclosure obligations under Rule 506(e) under the Act. For purposes of this Note, "***Company Covered Persons***" are those persons specified in Rule 506(d)(1) under the Act; provided, however, that Company Covered Persons do not include (a) any Holder, or (b) any person or entity that is deemed to be an affiliated issuer of the Company solely as a result of the relationship between the Company and any Holder.

**(viii) Offering**. Assuming the accuracy of the representations and warranties of the Holder contained in subsection (b) below, the offer, issue, and sale of this Note and any Conversion Securities are and will be exempt from the registration and prospectus delivery requirements of the Act, and have been registered or qualified (or are exempt from registration and qualification) under the registration, permit or qualification requirements of all applicable state securities laws.

**(ix) Use of Proceeds**. The Company shall use the proceeds of this Note solely for the operation of its business, and not for any personal, family or household purpose.

**(b) Representations and Warranties of the Holder**. The Holder hereby represents and warrants to the Company as of the date hereof as follows:

**(i) Purchase for Own Account**. The Holder is acquiring this Note and the Conversion Securities (collectively, the "***Securities***") solely for the Holder's own account and beneficial interest for investment and not for sale or with a view to distribution of the Securities or any part thereof, has no present intention of selling (in connection with a distribution or otherwise), granting any participation in, or otherwise distributing the same, and does not presently have reason to anticipate a change in such intention.

**(ii) Information and Sophistication**. Without lessening or obviating the representations and warranties of the Company set forth in subsection (a) above, the Holder hereby: (A) acknowledges that the Holder has received all the information the Holder has requested from the Company and the Holder considers necessary or appropriate for deciding whether to acquire the Securities, (B) represents that the Holder has had an opportunity to ask questions and receive answers from the Company regarding the terms and conditions of the offering of the Securities and to obtain any additional information necessary to verify the accuracy of the information given the Holder and (C) further represents that the Holder has such knowledge and experience in financial and business matters that the Holder is capable of evaluating the merits and risk of this investment.

**(iii) Ability to Bear Economic Risk**. The Holder acknowledges that investment in the Securities involves a high degree of risk, and represents that the Holder is able, without materially impairing the Holder's financial condition, to hold the Securities for an indefinite period of time and to suffer a complete loss of the Holder's investment.

**(iv) Further Limitations on Disposition**. Without in any way limiting the representations set forth above, the Holder further agrees not to make any disposition of all or any portion of the Securities unless and until:

**(1)** There is then in effect a registration statement under the Act covering such proposed disposition and such disposition is made in accordance with such registration statement; or

**(2)** The Holder shall have notified the Company of the proposed disposition and furnished the Company with a detailed statement of the circumstances surrounding the proposed disposition, and if reasonably requested by the Company, the Holder shall have furnished the Company with an opinion of counsel, reasonably satisfactory to the Company, that such disposition will not require registration under the Act or any applicable state securities laws, provided that no such opinion shall be required for dispositions in compliance with Rule 144 under the Act, except in unusual circumstances.

**(3)** Notwithstanding the provisions of paragraphs (1) and (2) above, no such registration statement or opinion of counsel shall be necessary for a transfer by the Holder to a partner (or retired partner) or member (or retired member) of the Holder in accordance with partnership or limited liability company interests, or transfers by gift, will or intestate succession to any spouse or lineal descendants or ancestors, if all transferees agree in writing to be subject to the terms hereof to the same extent as if they were the Holders hereunder.

**(v) Accredited Investor Status**. The Holder is an "accredited investor" as such term is defined in Rule 501 under the Act.

**(vi) No "Bad Actor" Disqualification**. The Holder represents and warrants that neither (A) the Holder nor (B) any entity that controls the Holder or is under the control of, or under common control with, the Holder, is subject to any Disqualification Event, except for Disqualification Events covered by Rule 506(d)(2)(ii) or (iii) or (d)(3) under the Act and disclosed in writing in reasonable detail to the Company. The Holder represents that the Holder has exercised reasonable care to determine the accuracy of the representation made by the Holder in this paragraph, and agrees to notify the Company if the Holder becomes aware of any fact that makes the representation given by the Holder hereunder inaccurate.

**(vii) Foreign Investors**. If the Holder is not a United States person (as defined by Section 7701(a)(30) of the Internal Revenue Code of 1986, as amended (the "***Code***")), the Holder hereby represents that he, she or it has satisfied itself as to the full observance of the laws of the Holder's jurisdiction in connection with any invitation to subscribe for the Securities or any use of this Note, including (A) the legal requirements within the Holder's jurisdiction for the purchase of the Securities, (B) any foreign exchange restrictions applicable to such purchase, (C) any governmental or other consents that may need to be obtained, and (D) the income tax and other tax consequences, if any, that may be relevant to the purchase, holding, redemption, sale, or transfer of the Securities. The Holder's subscription, payment for and continued beneficial ownership of the Securities will not violate any applicable securities or other laws of the Holder's jurisdiction.

**(viii) Forward-Looking Statements**. With respect to any forecasts, projections of results and other forward-looking statements and information provided to the Holder, the Holder acknowledges that the Company represents to the Holder that such statements were prepared based upon assumptions deemed reasonable by the Company at the time of preparation. There is no assurance that such statements will prove accurate, and the Company has no obligation to update such statements.

**4. EVENTS OF DEFAULT.**

**(a)** If there shall be any Event of Default (as defined below) hereunder, at the option and upon the declaration of the Requisite Holders and upon written notice to the Company (which election and notice shall not be required in the case of an Event of Default under subsection (ii) or (iii) below), this Note shall accelerate and all principal and unpaid accrued interest shall become due and payable. The occurrence of any one or more of the following shall constitute an "***Event of Default***":

**(i)** The Company fails to pay timely any of the principal amount due under this Note on the date the same becomes due and payable or any unpaid accrued interest or other amounts due under this Note on the date the same becomes due and payable;

**(ii)** The Company files any petition or action for relief under any bankruptcy, reorganization, insolvency or moratorium law or any other law for the relief of, or relating to, debtors, now or hereafter in effect, or makes any assignment for the benefit of creditors or takes any corporate action in furtherance of any of the foregoing; or

**(iii)** An involuntary petition is filed against the Company (unless such petition is dismissed or discharged within 60 days under any bankruptcy statute now or hereafter in effect, or a custodian, receiver, trustee, assignee for the benefit of creditors (or other similar official) is appointed to take possession, custody or control of any property of the Company).

**(b)** In the event of any Event of Default hereunder, the Company shall pay all reasonable attorneys' fees and court costs incurred by the Holder in enforcing and collecting this Note.

**5. MISCELLANEOUS PROVISIONS.**

**(a) Waivers.** Company hereby waives demand, notice, presentment, protest and notice of dishonor.

**(b) Further Assurances**. The Holder agrees and covenants that at any time and from time to time the Holder will promptly execute and deliver to the Company such further instruments and documents and take such further action as the Company may reasonably require in order to carry out the full intent and purpose of this Note and to comply with state or federal securities laws or other regulatory approvals.

**(c) Transfers of Notes**. This Note may be transferred only upon its surrender to the Company for registration of transfer, duly endorsed, or accompanied by a duly executed written instrument of transfer in form satisfactory to the Company. Thereupon, this Note shall be reissued to, and registered in the name of, the transferee, or a new Note for like principal amount and interest shall be issued to, and registered in the name of, the transferee. Interest and principal shall be paid solely to the registered holder of this Note. Such payment shall constitute full discharge of the Company's obligation to pay such interest and principal.

**(d) Market Standoff**. The Holder hereby agrees that the Holder shall not sell, dispose of, transfer, make any short sale of, grant any option for the purchase of, or enter into any hedging or similar transaction with the same economic effect as a sale of, any shares of Common Stock (or other securities) of the Company held by the Holder (other than those included in the registration) during the 180-day period following the effective date of the initial public offering of the Company (or such longer period, not to exceed 34 days after the expiration of the 180-day period, as the underwriters or the Company shall request in order to facilitate compliance with FINRA Rule 2241 or NYSE Member Rule 472 or any successor or

similar rule or regulation). The Holder agrees to execute and deliver such other agreements as may be reasonably requested by the Company or the managing underwriters that are consistent with the foregoing or that are necessary to give further effect thereto. In addition, if requested by the Company or the representative of the underwriters of the Company's Common Stock (or other securities of the Company), the Holder shall provide, within 10 days of such request, such information as may be required by the Company or such representative in connection with the completion of any public offering of the Company's securities pursuant to a registration statement filed under the Act. The obligations described in this paragraph shall not apply to a registration relating solely to employee benefit plans on Form S-1 or Form S-8 or similar forms that may be promulgated in the future, or a registration relating solely to a transaction on Form S-4 or similar forms that may be promulgated in the future. In order to enforce the foregoing covenant, the Company may impose stop-transfer instructions with respect to such Common Stock (or other securities of the Company) until the end of such period. The Holder agrees that any transferee of any of the Securities (or other securities of the Company) held by the Holder shall be bound by this paragraph. The underwriters of the Company's stock are intended third-party beneficiaries of this paragraph and shall have the right, power and authority to enforce the provisions hereof as though they were a party hereto.

**(e) Amendment and Waiver**. Any term of this Note may be amended or waived with the written consent of the Company and the Requisite Holders. Upon the effectuation of such waiver or amendment with the consent of the Requisite Holders in conformance with this paragraph, such amendment or waiver shall be effective as to, and binding against the holders of, all of the Notes and the Company shall promptly give written notice thereof to the Holder if the Holder has not previously consented to such amendment or waiver in writing, provided that the failure to give such notice shall not affect the validity of such amendment or waiver.

**(f) Governing Law**. This Note shall be governed by and construed under the laws of the State of Delaware, as applied to agreements among Delaware residents, made and to be performed entirely within the State of Delaware, without giving effect to conflicts of laws principles.

**(g) Binding Agreement**. The terms and conditions of this Note shall inure to the benefit of and be binding upon the respective successors and assigns of the parties. Nothing in this Note, expressed or implied, is intended to confer upon any third party any rights, remedies, obligations, or liabilities under or by reason of this Note, except as expressly provided in this Note.

**(h) Counterparts**. This Note may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. Counterparts may be delivered via facsimile, electronic mail (including pdf or any electronic signature complying with the U.S. federal ESIGN Act of 2000, Uniform Electronic Transactions Act or other applicable law) or other transmission method and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes.

**(i) Titles and Subtitles**. The titles and subtitles used in this Note are used for convenience only and are not to be considered in construing or interpreting this Note.

**(j) Notices**. All notices required or permitted hereunder shall be in writing and shall be deemed effectively given: (i) upon personal delivery to the party to be notified, (ii) when sent by confirmed electronic mail or facsimile if sent during normal business hours of the recipient, if not, then on the next business day, (iii) five days after having been sent by registered or certified mail, return receipt requested, postage prepaid, or (iv) one day after deposit with a nationally recognized overnight courier, specifying next day delivery, with written verification of receipt. All communications to a party shall be sent to the party's address set forth on the signature page hereto or at such other address(es) as such party may designate by 10 days advance written notice to the other party hereto. A copy of any notice to the Company shall be sent to Cooley LLP, 3175 Hanover Street, Palo Alto, CA 94304-1130, Attn: James C. Kitch, e-mail: kitchjc@cooley.com.

**(k) Expenses**. The Company and the Holder shall each bear its respective expenses and legal fees incurred with respect to the negotiation, execution and delivery of this Note and the transactions contemplated herein.

**(l) Waiver of Conflicts**. Each party to this Note acknowledges that Cooley LLP ("***Cooley***"), outside general counsel to the Company, has in the past performed and is or may now or in the future represent the Holder or the Holder's affiliates in matters unrelated to the transactions contemplated by this Note (the "***Note Financing***"), including representation of the Holder or the Holder's affiliates in matters of a similar nature to the Note Financing. The applicable rules of professional conduct require that Cooley inform the parties hereunder of this representation and obtain their consent. Cooley has served as outside general counsel to the Company and has negotiated the terms of the Note Financing solely on behalf of the Company. The Company and the Holder hereby (i) acknowledge that they have had an opportunity to ask for and have obtained information relevant to such representation, including disclosure of the reasonably foreseeable adverse consequences of such representation; (ii) acknowledge that with respect to the Note Financing, Cooley has represented solely the Company, and not any Holder or any stockholder, Board member or employee of the Company or director, stockholder or employee of the Holder; and (iii) gives the Holder's informed consent to Cooley's representation of the Company in the Note Financing.

**(m) Delays or Omissions**. It is agreed that no delay or omission to exercise any right, power or remedy accruing to the Holder, upon any breach or default of the Company under this Note shall impair any such right, power or remedy, nor shall it be construed to be a waiver of any such breach or default, or any acquiescence therein, or of or in any similar breach or default thereafter occurring; nor shall any waiver of any single breach or default be deemed a waiver of any other breach or default theretofore or thereafter occurring. It is further agreed that any waiver, permit, consent or approval of any kind or character by the Holder of any breach or default under this Note, or any waiver by the Holder of any provisions or conditions of this Note, must be in writing and shall be effective only to the extent specifically set forth in writing and that all remedies, either under this Note, or by law or otherwise afforded to the Holder, shall be cumulative and not alternative. This Note shall be void and of no force or effect in the event that the Holder fails to remit the full principal amount to the Company within five calendar days of the date of this Note.

**(n) Entire Agreement**. This Note constitutes the full and entire understanding and agreement between the parties with regard to the subjects hereof and no party shall be liable or bound to any other party in any manner by any representations, warranties, covenants and agreements except as specifically set forth herein.

**(o) Exculpation among Holders**. The Holder acknowledges that the Holder is not relying on any person, firm or corporation, other than the Company and its officers and Board members, in making its investment or decision to invest in the Company.

**(p) Senior Indebtedness**. The indebtedness evidenced by this Note is subordinated in right of payment to the prior payment in full of any Senior Indebtedness in existence on the date of this Note or hereafter incurred. "***Senior Indebtedness***" shall mean, unless expressly subordinated to or made on a parity with the amounts due under this Note, all amounts due in connection with (i) indebtedness of the Company to banks or other lending institutions regularly engaged in the business of lending money (excluding venture capital, investment banking or similar institutions and their affiliates, which sometimes engage in lending activities but which are primarily engaged in investments in equity securities), and (ii) any such indebtedness or any debentures, notes or other evidence of indebtedness issued in exchange for such Senior Indebtedness, or any indebtedness arising from the satisfaction of such Senior Indebtedness by a guarantor.

**(q) Broker's Fees**. Each party hereto represents and warrants that no agent, broker, investment banker, person or firm acting on behalf of or under the authority of such party hereto is or will be entitled to any broker's or finder's fee or any other commission directly or indirectly in connection with the transactions contemplated herein. Each party hereto further agrees to indemnify each other party for any claims, losses or expenses incurred by such other party as a result of the representation in this subsection being untrue.

**(r) California Corporate Securities Law**. THE SALE OF THE SECURITIES WHICH ARE THE SUBJECT OF THIS AGREEMENT HAS NOT BEEN QUALIFIED WITH THE COMMISSIONER OF CORPORATIONS OF THE STATE OF CALIFORNIA AND THE ISSUANCE OF SUCH SECURITIES OR THE PAYMENT OR RECEIPT OF ANY PART OF THE CONSIDERATION THEREFOR PRIOR TO SUCH QUALIFICATION OR IN THE ABSENCE OF AN EXEMPTION FROM SUCH QUALIFICATION IS UNLAWFUL. PRIOR TO ACCEPTANCE OF SUCH CONSIDERATION BY THE COMPANY, THE RIGHTS OF ALL PARTIES TO THIS AGREEMENT ARE EXPRESSLY CONDITIONED UPON SUCH QUALIFICATION BEING OBTAINED OR AN EXEMPTION FROM SUCH QUALIFICATION BEING AVAILABLE.

***[Signature pages follow]***

The parties have executed this **CONVERTIBLE PROMISSORY NOTE** as of the date first noted above.

**COMPANY:**

**PERSONALIS, INC.**

By: /s/ John West
Name: John West
Title: Chief Executive Officer

E-mail:
Address: 1330 O'Brien Drive
Menlo Park, California 94025

SIGNATURE PAGE TO
PERSONALIS, INC.
CONVERTIBLE PROMISSORY NOTE

The parties have executed this **CONVERTIBLE PROMISSORY NOTE** as of the date first noted above.

**HOLDER (if an entity):**

Name of Holder: _____

By: _____
Name: _____
Title: _____

E-mail: _____

Address: _____
_____
_____

**HOLDER (if an individual):**

Name of Holder: _____

Signature: _____

E-mail: _____

Address: _____
_____
_____

**PERSONALIS, INC.**

**AMENDMENT TO**

**CONVERTIBLE PROMISSORY NOTES**

THIS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES (this "***Amendment***") is entered into as of May 31st, 2018 by and among **PERSONALIS, INC.**, a Delaware corporation ("***Company***"), and each of the individuals and entities set forth on the signature pages hereto (the "***Holders***")**.**

**RECITALS**

A. The Holders are holders of convertible promissory notes (each, a "***Note***" and collectively, the "***Notes***"), by and between the Company and the Holders named therein dated June 29, 2017 (the "***Agreement***") and constitute the Requisite Holders (as defined in the Notes).

B. The Notes provide that the terms of the Notes may be amended by the Requisite Holders.

C. The undersigned desire to amend the Notes to provide that the Maturity Date shall be extended to June 28, 2019.

**AGREEMENT**

The parties hereby agree as follows:

1. The Notes are hereby amended to extend the "Maturity Date" to June 28, 2019.

2. This Amendment shall be governed by and construed under the laws of the State of Delaware as applied to agreements among Delaware residents, made and to be performed entirely within the State of Delaware.

3. Except as provided herein, the Notes shall remain unamended and in full force and effect. This Amendment may be executed in one or more counterparts each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

[*Signature pages follow*]

**IN WITNESS WHEREOF**, the parties have executed this Amendment to Convertible Promissory Notes to be effective as of the date first above written.

**COMPANY:**

**PERSONALIS, INC.**

By: /s/ John West
Name: John West
Title: Chief Executive Officer

[SIGNATURE PAGE TO AMENDMENT TO NOTE AND WARRANT PURCHASE AGREEMENT – NOVEMBER 2017]

**IN WITNESS WHEREOF**, the parties have executed this Amendment to Convertible Promissory Notes to be effective as of the date first above written.

**HOLDERS:**

Abingworth Bioventures V, LP
(Print Name of Holder)

/s/ James Abell
(Signature of Holder or of Authorized Signatory)

James Abell
(Print Name And Title Of Authorized Signatory, If Applicable)

Address: 38 Jermyn Street
London
UK SW1Y6DN

Phone: +44 207 534 1500
Fax: +44 207 534 1539
Email: legal@abingworth.com

**IN WITNESS WHEREOF**, the parties have executed this Amendment to Convertible Promissory Notes to be effective as of the date first above written.

HOLDERS:

Lightspeed Venture Partners VIII, L.P.

By: Lightspeed General Partner VIII, L.P.,
Its general partner

By: Lightspeed Ultimate General Partner VIII, Ltd.,
Its general partner

/s/ Christopher Schaepe
(Signature of Holder or of Authorized Signatory)

Christopher Schaepe
(Print Name And Title Of Authorized Signatory, If Applicable)

Address: 2200 Sand Hill Road, Suite 100
Menlo Park, CA 94025

Phone:
Fax:
Email: cschaepe@lsvp.com

HOLDERS:

Lightspeed Venture Partners Select, L.P.

By: Lightspeed General Partner Select, L.P.,
Its general partner

By: Lightspeed Ultimate General Partner Select, Ltd.,
Its general partner

/s/ Christopher Schaepe
(Signature of Holder or of Authorized Signatory)

Christopher Schaepe
(Print Name And Title Of Authorized Signatory, If Applicable)

Address: 2200 Sand Hill Road, Suite 100
Menlo Park, CA 94025

Phone:
Fax:
Email: cschaepe@lsvp.com

**PERSONALIS, INC.**

**AMENDMENT TO**

**CONVERTIBLE PROMISSORY NOTES**

THIS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES (this ***"Amendment")*** is entered into as of August 20th, 2018 by and among **PERSONALIS, INC.,** a Delaware corporation ***("Company"),*** and each of the individuals and entities set forth on the signature pages hereto (the ***"Holders"***).

**RECITALS**

A. The Holders are holders of convertible promissory notes (each, a ***"Note"*** and collectively, the ***"Notes"),*** by and between the Company and the Holders named therein dated June 29, 2017, as amended, and constitute the Requisite Holders (as defined in the Notes).

B. The Notes provide that the terms of the Notes may be amended by the Requisite Holders.

C. The undersigned desire to amend the Notes as set forth below.

**AGREEMENT**

In consideration of the foregoing and for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the parties agree as follows:

1. The last sentence of the first paragraph of each of the Notes is hereby amended and restated in its entirety to read as follows:

"All unpaid interest and principal shall be due and payable upon request of the Requisite Holders on or after September 20, 2018 or such later date as may be determined by the Requisite Holders (the ***"Maturity Date"***)."

2. Section 2(c) of each of the Notes is hereby amended and restated in its entirety to read as follows:

**"(c) Maturity Date Conversion**. In the event that this Note remains outstanding on the Maturity Date, then the outstanding principal balance of this Note and any unpaid accrued interest shall upon the election of the Holder given prior to the Maturity Date, convert as of the Maturity Date into shares of the Company's Series C Preferred Stock (the ***"Series C Preferred")*** at a conversion price equal to the price paid per share for the Company's Series C Preferred Stock (the ***"Maturity Date Conversion"***)."

3. This Amendment shall be governed by and construed under the laws of the State of Delaware as applied to agreements among Delaware residents, made and to be performed entirely within the State of Delaware.

4. Except as provided herein, the Notes shall remain unamended and in full force and effect. This Amendment may be executed in one or more counterparts each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

[*Signature pages follow*]

**IN WITNESS WHEREOF**, the parties have executed this Amendment to Convertible Promissory Notes to be effective as of the date first above written.

**COMPANY:**

**PERSONALIS, INC.**

By: /s/ John West
Name: John West
Title: Chief Executive Officer

**IN WITNESS WHEREOF**, the parties have executed this Amendment to Convertible Promissory Notes to be effective as of the date first above written.

**HOLDERS:**

Abingworth Bioventures V, LP
(Print Name of Holder)

/s/ James Abell
(Signature of Holder or of Authorized Signatory)

James Abell
(Print Name And Title Of Authorized Signatory, If Applicable)

Address: 38 Jermyn Street
London
UK SW1Y6DN

Phone: +44 207 534 1500
Fax:
Email: legal@abingworth.com

**IN WITNESS WHEREOF,** the parties have executed this Amendment to Convertible Promissory Notes to be effective as of the date first above written.

**HOLDERS:**

Lightspeed Venture Partners VIII, L.P.

By: Lightspeed General Partner VIII, L.P.,
Its general partner

By: Lightspeed Ultimate General Partner VIII, Ltd.,
Its general partner

/s/ Christopher Schaepe

(Signature of Holder or of Authorized Signatory)

Christopher Schaepe

(Print Name And Title Of Authorized Signatory, If Applicable)

Address: 2200 Sand Hill Road, Suite 100
Menlo Park, CA 94025

Phone 650-561-0700

Fax: 650-234-8333

Email: cschaepe@lsvp.com

**HOLDERS:**

Lightspeed Venture Partners Select, L.P.

By: Lightspeed General Partner Select, L.P.,
Its general partner

By: Lightspeed Ultimate General Partner Select, Ltd.,
Its general partner

/s/ Christopher Schaepe

(Signature of Holder or of Authorized Signatory)

Christopher Schaepe
(Print Name And Title Of Authorized Signatory, If Applicable)

Address: 2200 Sand Hill Road, Suite 100
Menlo Park, CA 94025

Phone: 650-561-0700

Fax: 650-234-8333

Email: cschaepe@lsvp.com

**EXHIBIT 21.1**

**SUBSIDIARIES OF PERSONALIS, INC.**

None