ION GEOPHYSICAL CORP
Form 10-K
February 07, 2019

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549
Form 10-K
(Mark One)
þ ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the Fiscal Year Ended December 31, 2018
or
¨ TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
Commission file number 1-12691
ION Geophysical Corporation
(Exact Name of Registrant as Specified in Its Charter)

Delaware	22-2286646
(State or Other Jurisdiction of Incorporation or Organization)	(I.R.S. Employer Identification No.)

2105 CityWest Blvd
Suite 100
Houston, Texas 77042-2839
(Address of Principal Executive Offices, Including Zip Code)
(281) 933-3339
(Registrant's Telephone Number, Including Area Code)
Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	Name of Each Exchange on Which Registered
Common Stock, $0.01 par value	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act:
None
Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ¨ No þ
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act Yes ¨ No þ
Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes þ No ¨
Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes þ No ¨
Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ¨
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	o	Accelerated filer	x
Non-accelerated filer	o	Smaller reporting company	o
		Emerging growth company	o

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 13(a) of the Exchange Act. ¨

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ¨ No þ

As of June 30, 2018 (the last business day of the registrant's second quarter of fiscal 2018), the aggregate market value of the registrant's common stock held by non-affiliates of the registrant was $260.0 million based on the closing sale price per share ($24.30) on June 29, 2018 as reported on the New York Stock Exchange.

As of February 4, 2019, the number of shares of common stock, $0.01 par value, outstanding was 14,015,615 shares.

DOCUMENTS INCORPORATED BY REFERENCE

Document	Parts Into Which Incorporated
Portions of the registrant's definitive Proxy Statement for its Annual Meeting of Stockholders scheduled to be held on May 15, 2019, to be filed pursuant to Regulation 14A	Part III

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PART I

Preliminary Note: This Annual Report on Form 10-K contains "forward-looking statements" as that term is defined in the Private Securities Litigation Reform Act of 1995. Forward-looking statements should be read in conjunction with the cautionary statements and other important factors included in this Form 10-K. See Item 1A. "Risk Factors" for a description of important factors which could cause actual results to differ materially from those contained in the forward-looking statements.

In this Form 10-K, "ION Geophysical," "ION," "the company" (or, "the Company"), "we," "our," "ours" and "us" refer to ION Geophysical Corporation and its consolidated subsidiaries, except where the context otherwise requires or as otherwise indicated. Certain trademarks, service marks and registered marks of ION referred to in this Form 10-K are defined in Item 1. "Business — Intellectual Property."

Item 1. Business

We have been a technology leader for 50 years with a strong history of innovation. While the traditional focus of our cutting-edge technology has been on the exploration and production ("E&P") industry, we are now broadening and diversifying our business into relevant adjacent markets such as offshore logistics, military and marine robotics. Leveraging innovative technologies, we create value through data capture, analysis and optimization to enhance companies' critical decision-making abilities and returns. Our E&P offerings are focused on improving decision-making, enhancing reservoir management and optimizing offshore operations. They are designed to allow oil and gas companies to obtain higher resolution images of the Earth's subsurface to reduce their risk in hydrocarbon exploration and development. We acquire, process and interpret seismic data from seismic surveys on a multi-client or proprietary basis. Seismic surveys for our multi-client data library business are pre-funded, or underwritten, in part by our customers, and we contract with third party seismic data acquisition companies to acquire the seismic data, all of which is intended to minimize our risk exposure. We serve customers in most major energy producing regions of the world from strategically located offices in 21 cities on six continents.

Seismic imaging plays a fundamental role in hydrocarbon exploration and reservoir development by delineating structures, rock types and fluid locations in the subsurface. Our technologies, services and solutions are used by E&P companies to generate high-resolution images of the Earth's subsurface to identify hydrocarbons and pinpoint drilling locations for wells and to monitor production from existing wells.

We provide our services and products through three business segments - E&P Technology & Services, Operations Optimization (formerly referred to as E&P Operations Optimization), and Ocean Bottom Integrated Technologies (formerly referred to as Ocean Bottom Seismic Services). In addition, we have a 49% ownership interest in our INOVA Geophysical Equipment Limited joint venture ("INOVA Geophysical," or "INOVA").

The advanced technologies we currently offer include our Orca® and Gator™ command and control software systems, Full Waveform Inversion ("FWI") data processing technology, our OBS acquisition systems, and other technologies, each of which is designed to deliver improvements in image quality, safety and/or productivity. In 2015, we introduced Marlin™ to optimize operations offshore. In 2017, we introduced our new fully integrated nodal system, 4Sea™ which is designed to deliver a step change in economics, QHSE performance and final image delivery time, creating more value for clients by providing data in time for critical reservoir decision, such as determining drilling locations and informing enhanced recovery techniques.

We have approximately 500 patents and pending patent applications in various countries around the world. Approximately 42% of our employees are involved in technical roles and over 21% of our employees have advanced degrees.

E&P Technology & Services. Our E&P Technology & Services business provides three distinct service activities that often work together.

Our E&P Technology & Services creates digital data assets and delivers services to help E&P companies improve decision-making, reduce risk and maximize value. For example, E&P Technology & Services provides information to better understand new frontiers or complex subsurface geologies, how to maximize portfolio value, or how to optimize license round success and acreage values.

Our Ventures group leverages the world-class geoscience skills of both the Imaging Services and E&P Advisors groups to create global digital data assets that are licensed to multiple E&P companies to optimize their investment decisions. Our global data library consists of over 614,000 km of 2-D and over 224,000 sq. km of 3-D multi-client seismic data in virtually all major offshore petroleum provinces. Ventures provides services to manage multi-client or proprietary surveys, from survey planning and design to data acquisition and management, to final subsurface imaging and reservoir characterization. We focus on the technologically intensive components of the image development process, such as survey planning and design, and data

processing and interpretation, while outsourcing asset-intensive components (such as field acquisition) to experienced contractors.

Our Imaging Services group offers data processing and imaging services designed to maximize image quality, helping E&P companies reduce exploration and production risk, evaluate and develop reservoirs, and increase production. Imaging Services develops subsurface images by applying its processing technology to data owned or licensed by its customers. We maintain approximately 19 petabytes of digital seismic data storage in four global data centers, including two core data centers located in Houston and in the U.K.

Our E&P Advisors' strategy is to provide technical, commercial and strategic advice to host governments, E&P companies and private equity firms to evaluate and market oil and gas opportunities and/or assets worldwide, sharing in the value we create.

Operations Optimization. Our Operations Optimization segment develops mission-critical subscription offerings and provides engineering services that enable operational control and optimization offshore. This segment is comprised of our Optimization Software & Services and Devices offerings.

Our Optimization Software & Services group provides survey design and command and control software systems and related services for marine towed streamer and seabed operations. Our Orca software is installed on towed streamer marine vessels worldwide, and our Gator software is used by seabed crews. Our latest offering, Marlin is used to optimize offshore operations.

Our Devices group is engaged in the manufacture and repair of marine towed streamer positioning and control systems, analog geophone sensors and compasses which have been deployed in marine robotics, scientific, E&P and other commercial applications.

Ocean Bottom Integrated Technologies. Higher quality data can be acquired from the sea floor compared to the traditional method of acquiring it near the surface, which enables companies to have a better image and better understanding of the subsurface to make optimal reservoir decisions. ION provides a full suite of technology and services that includes survey design, planning, acquisition, data processing, interpretation and reservoir services to optimize image quality, operational efficiency and safety. ION's Ocean Bottom Integrated Technologies group integrates a variety of ION's advanced technologies to accelerate Ocean Bottom Seismic ("OBS") data capture and delivery for our clients' enhanced reservoir decision-making, and improved returns.

Our team develops re-deployable ocean bottom data acquisition technology. In 2017, we introduced 4Sea, our new fully integrated ocean bottom system. 4Sea is differentiated in its ability to deliver a step change in economics, QHSE performance and final image delivery time, creating more value for the client by providing information in time for critical decisions, such as determining drilling locations, fluid injections, and the like.

We have continued to evolve our strategy for our Ocean Bottom Integrated Technologies segment consistent with our asset light business model. The remaining elements of our next generation ocean bottom nodal system, 4Sea, will be commercialized in 2019. We are offering 4Sea components more broadly to the growing number of OBS service providers under recurring revenue commercial strategies that will enable us to share in the value our technology delivers. We may also license the right to manufacture and use the fully integrated system to a service provider on a value-based pricing model, such as a royalty stream. Such licensing would be recognized through the relevant segment, either E&P Technology & Services or Operations Optimization. While not our primary route to market, we continue to evaluate acquisition projects on a case-by-case basis that meet our long-term risk and return thresholds.

INOVA Geophysical. We conduct our land seismic equipment business through INOVA Geophysical, a joint venture with BGP Inc., a subsidiary of China National Petroleum Corporation ("CNPC"). BGP is generally regarded as the world's largest land geophysical service contractor. BGP owns a 51% equity interest in INOVA Geophysical, and we own the remaining 49% interest. INOVA manufactures land seismic data acquisition systems, digital sensors, vibroseis vehicles (i.e., vibrator trucks), and energy source controllers. We wrote our investment in INOVA down to zero as of December 31, 2014.

Seismic Industry Overview

1930s – 1970s. Since the 1930s, oil and gas companies have sought to reduce exploration risk by using seismic data to create an image of the Earth's subsurface. Seismic data is recorded when listening devices placed on the Earth's surface, ocean bottom floor, or carried within the streamer cable of a towed streamer vessel, measure how long it takes for

sound vibrations to echo off rock layers underground. For seismic data acquisition onshore, the acoustic energy producing the sound vibrations is generated by the detonation of small explosive charges or by large vibroseis (vibrator) vehicles. In marine acquisition, the energy is provided by a series of source arrays that deliver compressed air into the water column.

The acoustic energy propagates through the subsurface as a spherical wave front, or seismic wave. Interfaces between different types of rocks will both reflect and transmit this wave front. Onshore, the reflected signals return to the surface where they are measured by sensitive receivers that are analog coil-spring geophones. Offshore, the reflected signals are recorded by either hydrophones towed in an array behind a streamer acquisition vessel or by multicomponent geophones or MEMS sensors that are placed directly on the ocean floor. Once the recorded seismic energy is processed using advanced algorithms and workflows, images of the subsurface can be created to depict the structure, lithology (rock type), fracture patterns, and fluid content of subsurface horizons, highlighting the most promising places to drill for oil and natural gas. This processing also aids in engineering decisions, such as drilling and completion methods, as well as decisions affecting overall reservoir production and economic decisions relating to drilling risk and reserves in place.

Typically, an E&P company engages the services of a geophysical acquisition contractor to develop a seismic survey design, secure permits, coordinate logistics, and acquire seismic data in a selected area. The E&P company generally relies on third parties, such as ION, to provide the contractor with equipment, navigation and data management software, and field support services necessary for data acquisition. After the data is collected, the same geophysical contractor, a third-party data processing company, or the E&P company itself will process the data using proprietary algorithms and workflows to create a series of seismic images. Geoscientists then interpret the data by reviewing the images of the subsurface and integrating the geophysical data with other geological and production information such as well logs or core information.

During the 1960s, digital seismic data acquisition systems (which converted the analog output from the geophones into digital data for recording) and computers for seismic data processing were introduced. Using the new systems and computers, the signals could be recorded on magnetic tape and sent to data processors where they could be adjusted and corrected for known distortions. The final processed data was displayed in a form known as “stacked” data. Computer filing, storage, database management, and algorithms used to process the raw data quickly grew more sophisticated, dramatically increasing the amount of subsurface seismic information.

1980s. Until the early 1980s, the primary commercial seismic imaging technology was 2-Dimension (“2-D”). 2-D seismic data is recorded using a single line of receivers. Once processed, 2-D seismic data allows geoscientists to see only a thin vertical slice of the Earth, and that image may be distorted by reflections originating out of the place of the receiver line. A geoscientist using 2-D seismic technology must speculate on the characteristics of the Earth between the slices and attempt to visualize the true 3-Dimension (“3-D”) structure of the subsurface.

The commercial development of 3-D imaging technology in the early 1980s was an important technological milestone for the seismic industry. Previously, the high cost of 3-D seismic data acquisition techniques and the lack of computing power necessary to process, display, and interpret 3-D data on a commercial basis slowed its widespread adoption. Today’s 3-D seismic techniques record the reflected energy across a patch of receivers that collectively provide a more holistic, spatially-sampled depiction of geological horizons and, in some cases, rock and fluid properties, within the Earth.

3-D seismic data and the associated computer-based processing platforms enable geoscientists to generate more accurate subsurface maps than could be constructed from 2-D seismic lines. In particular, 3-D seismic data provided more detailed information about and higher-quality images of subsurface structures, including the geometry of bedding layers, salt structures, and fault planes. The improved 3-D seismic images enabled the oil and gas industry to discover new reservoirs, reduce finding and development costs, and lower overall hydrocarbon exploration risk. Driven by faster computers and more sophisticated mathematical equations to process the data, the technology advanced quickly.

1990s. As commodity prices decreased in the late 1990s and the pace of innovation in 3-D seismic imaging technology slowed, E&P companies slowed the commissioning of new seismic surveys. Also, business practices employed by geophysical contractors impacted demand for seismic data. In an effort to sustain higher utilization of existing capital assets, geophysical contractors increasingly began to collect speculative seismic data for their own data libraries in the hopes of selling it later to E&P companies. There became an abundance of speculative multi-client data in many regions. Additionally, since contractors incurred most of the costs of this speculative seismic data at the time of acquisition, contractors lowered prices to recover as much of their investment as possible, which drove

operating margins down. During the 1990's, the accuracy of 3-D seismic surveys improved to the point that a survey acquired after significant oil production could be compared to a pre-production survey, and a map of the drainage pattern of the reservoir could be produced. This technique became known as time lapse, or 4-D seismic.
2000s. The conditions from the 1990s continued to prevail until 2004-2005, when commodity prices began increasing and E&P companies increased capital spending programs, driving higher demand for our services and products. During this time, the use of horizontal drilling and hydraulic fracturing increased, as onshore North American production became economically viable with higher oil prices. These techniques, used to extract oil from and gas from unconventional reservoirs, made once "hard to produce" oil and gas accessible and caused an upsurge in North American onshore oil and gas activity. An increased use of the 4-D seismic technology has been noted during the 2000s where its value in reservoir management, increasing reserves, upping recovery and optimizing infill well locations has been established.

The financial crisis that occurred in 2008 and the resulting economic downturn drove hydrocarbon prices down sharply, reducing exploration activities in North America and in many parts of the world. However, crude oil prices rebounded and were fairly consistent from 2011-2014 exceeding $100 per barrel, and U.S. oil production exceeded even the most optimistic forecasts. In late 2014, however, oil prices began to decline significantly, dropping by approximately half and continued into 2015 and 2016 as signs emerged that non-U.S. demand was weakening. During 2017 and 2018, crude oil prices rebounded resulting from sustained production cut by Organization of the Petroleum Exporting Countries ("OPEC") that reduced the overall crude supply. In late 2018, crude oil prices began to decline again due to slower than expected pace of global demand growth and record level crude oil production growth. Since 2015, Oil companies have prioritized shareholder returns and cash flow generation over hydrocarbon resource growth, reducing discretionary spending and shifting their focus from exploration to production. This shift caused a contraction in E&P spending, especially on seismic data and services for exploration. In addition, E&P companies have tended to shift toward reprocessing existing seismic data as a more cost-effective alternative to acquiring new data where possible.

Our Strategy

The key elements of our business strategy are to:

- Leverage our key technologies to create value through data capture, analysis and optimization to enhance companies' critical decision-making abilities and returns. Decisions today are increasingly complex with huge amounts of data to comprehend. Companies capable of translating raw data into actionable insights gain a competitive edge and deliver superior returns. ION offerings are focused on improving E&P decision-making, enhancing reservoir management and optimizing offshore operations. E&P Technology & Services creates digital data assets and delivers services that improve decision-making, mitigate risk and maximize portfolio value for E&P companies, such as our multi-client programs that are licensed to multiple E&P companies to optimize their investment decisions. Operations Optimization develops mission-critical subscription offerings and engineering services that enable operational control and optimization offshore. Ocean Bottom Integrated Technologies integrates a variety of ION's advanced technologies to accelerate data capture and delivery. This information enables E&P companies to enhance their reservoir decision-making and improve their returns.
- Expand and globalize our E&P Technology & Services business. We seek to expand and grow our E&P Technology & Services business into new regions, with new customers and new offerings, including data processing services through our Imaging Services group and our Ventures multi-client and proprietary programs. Historically known for our 2-D programs, we entered the 3-D multi-client market in 2014 by acquiring and processing our first survey offshore Ireland. Since then, we have expanded our 3-D seismic data library considerably by purchasing existing seismic data and reimaging the data by using new data processing techniques and algorithms, such as our advanced FWI. For the foreseeable future, we expect to continue investing in research and development and computing infrastructure for our data processing business and to support our multi-client projects. We believe this focus better positions our company as a full-service technology company with an increasing proportion of revenues derived from E&P customers. In 2018, E&P companies accounted for approximately 77% of our total consolidated net revenues.
- Continue investing in advanced software and equipment technology to provide next generation services and products. We intend to continue investing in the development of new technologies for use by E&P companies. In particular, we intend to focus on the development of our next generation OBS technology, our Marlin operations optimization software, and derivative products and continued advancement of our FWI and ocean bottom nodal algorithms, with the goal of obtaining technical and market leadership in what we continue to believe are important and expanding markets. In 2018, our total investment in research and development and engineering was equal to approximately 10% of our total consolidated net revenues for the year.
- Collaborate with our customers to provide products and solutions designed to meet their needs. A key element of our business strategy has been to understand the challenges faced by E&P companies in seismic survey planning, data acquisition, processing, and interpretation. We will continue to develop and offer technology and services that enable us to work with E&P companies to solve their unique challenges around the world. We have found collaborating with E&P companies to better understand their imaging challenges and working with them to ensure the right technologies are properly applied, is the most effective method for meeting their needs. Helping solve the most difficult challenges

for our customers is an important element of our long-term business strategy, and we are implementing this partnership approach globally through local personnel in our regional organizations who understand the unique challenges in their areas. We formed an E&P Advisors group in 2015 designed to focus specifically on this element of our strategy.

- Expand our Operations Optimization business into relevant adjacent markets. While our traditional focus for technology has been on the E&P industry, we are broadening and diversifying our software and equipment businesses into relevant adjacent markets such as offshore logistics, military and marine robotics. Adjacent markets broaden our opportunity to better monetize our return on technology investments while reducing our susceptibility to E&P cycles. We intend to derive a significant portion of revenues from these non-E&P markets over the next 5 years.

Our Strengths

We believe that we are solidly positioned to successfully execute the key elements of our business strategy based on the following competitive strengths:

- We leverage our innovative technologies to create value through data capture, analysis and optimization to enhance companies' critical decision-making abilities and returns. Our cutting-edge data management and analysis platforms help derive insights from data we acquire to improve E&P decision-making, enhance reservoir management and optimize offshore operations. The data can be used to decide whether and how much to bid on a block, how to maximize production from a field, or how to optimize the safety and efficiency of complex maritime projects. Our operations optimization platform and imaging engine are the core underlying technology and we continually advance our complex algorithms to improve the resulting analysis.
- We focus on higher potential return offerings and creative business models to maximize shareholder value. We streamlined our business and focused on the areas with the highest potential returns because we believe every dollar invested should go further. In addition, we try to structure both the project financing and payment in a way to maximize profit, such as sharing in the success of a project.
- Our "asset light" strategy enables us to avoid significant fixed costs and remain financially flexible. We do not own a fleet of marine vessels and do not provide our own crews to acquire seismic data. We outsource seismic data acquisition activity to third parties that operate fleets of seismic vessels and equipment. This practice enables us to avoid fixed costs associated with these assets and personnel and to manage our business in a manner designed to afford us the flexibility to quickly scale up or down our capital investments based on E&P spending levels. We actively manage the costs of developing our multi-client data library business by having our customers partially pre-fund, or underwrite, the investment for any new project. Our target goal is to have a vast majority of the total cost of each new project's data acquisition to be underwritten by our customers. We believe this conservative approach to data library investment is the most prudent way to reduce the impact of any sudden reduction in the demand for seismic data, giving us the flexibility to aggressively reduce cash outflows as we have successfully implemented in the current industry downturn.
- Our global footprint and diversified portfolio approach enable us to offset regional downturns. Conducting business around the world has been and will continue to be a key component of our strategy. This global focus and diversified portfolio approach has been helpful in minimizing the impact of any regional or country-specific slowdown for short or extended periods of time. While the traditional focus of our cutting-edge technology has been on the E&P industry, we are now broadening and diversifying our business into relevant adjacent markets such as offshore logistics, military and marine robotics. Adjacent markets broaden our opportunity to better monetize our return on technology investments while reducing our susceptibility to E&P cycles.
- We have a diversified and blue chip customer base. We provide services and products to a diverse, global customer base that includes many of the largest oil and gas and geophysical companies in the world, including National Oil Companies ("NOCs") and International Oil Companies ("IOCs"). Over the past decade, we have made significant progress expanding our customer list and revenue sources. Whereas almost all of our revenues in the early 2000s were derived principally from seismic service providers, in 2018, E&P companies accounted for approximately 77% of our total consolidated net revenues.

Services and Products

E&P Technology & Services Segment

Our E&P Technology & Services segment includes the following:

Ventures — Our Ventures group provides complete seismic data services, from survey planning and design through data acquisition to final subsurface imaging and reservoir characterization. We work backwards through the seismic workflow, with the final image in mind, to select the optimal survey design, acquisition technology, and processing

techniques.

We offer our services to customers on both a proprietary and multi-client (non-exclusive) basis. In both cases, the customers generally pre-fund a majority of the survey costs. The period during which our multi-client surveys are being designed, acquired or processed is referred to as the "New Venture" phase. For proprietary services, the customer has exclusive ownership of the data. For multi-client surveys, we generally retain ownership of or long-term exclusive marketing rights to the data and receive ongoing revenue from subsequent data license sales.

Since 2002, we have acquired and processed a growing multi-client data library consisting of non-exclusive marine and ocean bottom data from around the world. The majority of the data licensed by ION consists of ultra-deep 2-D seismic data that E&P companies use to evaluate petroleum systems at the basin level, including insights into the character of source rocks and sediments, migration pathways, and reservoir trapping mechanisms. In some cases, we extend beyond seismic data to include magnetic, gravity, well log, and electromagnetic information, to provide a more comprehensive picture of the subsurface. Known as "BasinSPAN" programs, these geophysical surveys cover most major offshore basins worldwide and we continue to build on them. In addition to our 2-D multi-client programs, in 2013, we acquired our first 3-D marine proprietary program, then in 2014, in collaboration with Polarcus Limited, a marine geophysical company, we jointly acquired and processed our first 3-D survey offshore Ireland.

In 2016, we began a 3-D multi-client broadband reimaging program offshore Mexico in collaboration with Schlumberger leveraging Mexico's National Hydrocarbons Commission (CNH) data library. The successful Campeche program has since expanded due to customer demand and now consists of approximately 100,000 km^2 offshore southern Mexico. Since 2016, we have added an additional 216,000 km^2 of 3-D data offshore Mexico and in Brazil. Our programs in Brazil make up a significant portion of our backlog at December 31, 2018.

We also have a library of 3-D onshore reservoir imaging and characterization programs that provide E&P companies with the ability to better understand unconventional reservoirs to maximize production. Known as "ResSCAN™" programs, these 3-D multicomponent seismic data programs were designed, acquired and depth-imaged using advanced geophysical technology and proprietary processing techniques, resulting in high-definition images of the subsurface.

Imaging Services — Our Imaging Services group provides advanced marine and land seismic data processing and imaging. In addition to applying processing and imaging technologies to data we own or data licensed by our customers, we also provide our customers with seismic data acquisition support services, such as data pre-conditioning for imaging and quality control of seismic data acquisition.

We utilize a globally distributed network of Linux-cluster processing centers in combination with our major hubs in Houston and London to process seismic data using advanced, proprietary algorithms and workflows.

Our Imaging Services team has pioneered several differentiated processing and imaging solutions for both offshore and onshore environments including: Reverse Time Migration (RTM), Surface Related Multiple Elimination (SRME), and WiBand broadband deghosting. In 2013, we released FWI and non-parametric picking Tomography techniques to improve subsurface image resolution in areas with complex geologies. The advantages of these techniques are that they allow for the resolution of complex, small-scale velocity variations. We continue to research and develop processing and imaging technologies for commercial application, including our latest developments in Reflection FWI and Least Squares RTM. In addition to improving our algorithms, we also continue to optimize the efficiency of our proprietary software, Perseus, such that we can turnaround larger projects faster, e.g. a 42,000 km^2 fast track product in the Northern Campeche Basin in Mexico in just 6 weeks. Our continued investment in hardware infrastructure complements these research and development efforts, ensuring faster turnaround time and less expensive computational costs for clients, whether they are seeking 2-D, 3-D, proprietary, multi-client, towed streamer or seabed solutions.

At December 31, 2018, our E&P Technology & Services segment backlog, which consists of commitments for (i) data processing work and (ii) both multi-client New Venture and proprietary projects that have been underwritten, had decreased to $21.9 million compared with $39.2 million at December 31, 2017. The decrease in backlog is attributable to the timing of finalizing contracts. Our E&P Technology & Services segment's fiscal year-end backlog includes signed contracts that we can usually fulfill within approximately six months. Investments in our multi-client data library are dependent upon the timing of our New Venture projects and the availability of underwriting by our customers. Our asset light strategy enables us to scale our business to avoid significant fixed costs and to remain

financially flexible as we manage the timing and levels of our capital expenditures.

E&P Advisors — Our E&P Advisors group partners with E&P operators, energy industry regulators and capital institutions to capture and monetize E&P opportunities worldwide. This group provides technical, commercial and strategic advice across the exploration and production value chain, working at basin, prospect and field scales. E&P Advisors couples ION's proven technical capabilities with the industry's best commercial and strategic minds to deliver fit-for-purpose solutions, employing a variety of commercial models specific to our clients' needs.

Operations Optimization Segment

Our Operations Optimization segment combines our Optimization Software & Services and Devices offerings. Through this segment, we supply command and control software systems and related services for marine towed streamer and ocean bottom seismic operations. Software developed by our Optimizations Software & Services group is installed on marine towed streamer vessels and used by many ocean bottom survey crews. In addition, we recently began selling existing technology to new customers in scientific, military and academic industries. An advantage of our underlying software platform is that it provides common components from which to build other applications. This enables the acceleration of development and commercialization of new products as market opportunities are identified. Marlin, our newest software solution for optimizing offshore operations is an example where we leveraged the underlying software platform to quickly develop a new offering.

Products and services for our Optimizations Software & Services group include the following:

Towed Streamer Command & Control System — Our command and control software for towed streamer acquisition, Orca, integrates acquisition, planning, positioning, source and quality control systems into a seamless operation.

Ocean Bottom Command & Control System — Gator is our integrated navigation and data management system for multi-vessel OBS, electromagnetic and transition zone operations.

Survey Planning and Optimization — We offer consulting services for planning and supervising complex surveys, including for 4-D (time lapse) and wide-azimuth survey operations. Our acquisition expertise and in-field software platforms are designed to allow clients, including both E&P companies and seismic data acquisition contractors, to optimize these complex surveys, improving efficiencies, data quality and reducing costs. Our Orca and Gator systems are designed to integrate with our post-survey tools for processing, analysis and data quality control. Orca and Gator both have modules that enable in-field survey optimization. These modules are designed to enable improved, safer acquisition through analysis and prediction of sea currents and integration of the information into the acquisition plan.

Optimization Software — Marlin is a cloud-based software designed to maximize the safety and efficiency of complex offshore operations by automatically integrating a variety of data sources in real-time with operational plans to improve situational awareness and decision making. Akin to air traffic control systems, Marlin enables multiple stakeholders to share and visualize vessel route plans, foresee and avoid conflicts between vessels and fixed assets, optimize schedules safely within a rules-based environment, and measure and improve asset performance.

Products of our Devices group include the following:

Marine Positioning Systems — Our marine towed streamer positioning system includes streamer cable depth control devices, lateral control devices, compasses, acoustic positioning systems and other auxiliary sensors. This equipment is designed to control the vertical and horizontal positioning of the streamer cables and provides acoustic, compass and depth measurements to allow processors to tie navigation and location data to geophysical data to determine the location of potential hydrocarbon reserves. DigiBIRD II™ is designed to maintain streamers at pre-defined target depths more safely, efficiently, and cost effectively than ever before by eliminating workboat operations for battery changes on the majority of seismic surveys. DigiFIN® is an advanced lateral streamer control system that we commercialized in 2008. DigiFIN® is designed to maintain tighter, more uniform marine streamer separation along the entire length of the streamer cable, which allows for better sampling of seismic data and improved subsurface images. We believe DigiFIN® also enables faster line changes and minimizes the requirements for in-fill seismic work. In addition to manufacturing new marine positioning system devices, the Devices group also repairs its positioning equipment previously sold to its customers.

Analog Geophones — Analog geophones are sensors that measure acoustic energy reflected from rock layers in the Earth’s subsurface using a mechanical, coil-spring element. We manufacture and market a full suite of geophones and geophone test equipment that operate in most environments, including land surface, transition zone and downhole. Our geophones are used in other industries as well.

Ocean Bottom Integrated Technologies Segment

ION offers a fully-integrated OBS solution that includes expert survey design, planning and optimization, to maximize seismic image quality; safe, efficient data acquisition; superior imaging; and data processing, interpretation and reservoir services.

We believe the market for ocean bottom seismic imaging is growing. OBS provides more detailed reservoir imaging typically used for development rather than exploration objectives, leading E&P companies to prioritize in ocean bottom seismic activities, consistent with their desire for higher-quality seismic imaging for complex geological formations and more detailed reservoir characteristics. Since introducing our first ocean bottom acquisition system, VSO, in 2004, we have continued to develop advanced ocean bottom systems and continue to evolve our strategy which now includes licensing of our 4Sea™ technology making it available more broadly to all OBS service providers on a value-based pricing model. Such licensing will be recognized through the relevant segment, either E&P Technology & Services or Operations Optimization. This change in strategy resulted in a write down of $36.6 million for our cable-based ocean bottom acquisition technologies.

INOVA Geophysical Products

INOVA manufactures land acquisition systems, including the G3i® HD, ARIES® and Hawk® recording platforms, land source products, including the AHV-IV series, UNIVIB®, and UNIVIB 2 vibroseis vehicles, and source controllers and multicomponent sensors, including the VectorSeis® digital 3C receivers.

Product Research and Development

Our ability to compete effectively in the seismic market depends principally upon continued innovation in our underlying technologies. As such, the overall focus of our research and development efforts has remained on improving both the quality of the subsurface images we generate and the economics, efficiency and quality of the seismic data. In particular, we have concentrated on enhancing the nature and quality of the information that can be extracted from the subsurface images.

Research and development efforts in 2018 targeted the consolidation of key technologies across ION, together with the expansion of our portfolio of product offerings. A range of new technologies have been developed, including new and flexible seismic acquisition optimization and processing tools, in-water control devices which improve the operational efficiency of marine sources and the next generation ocean bottom nodal system.

The Optimization Software & Services group continued development of survey optimization and integration capabilities across the software portfolio as well as with products from the Devices group. Investment continued in the Marlin simultaneous operations tool including the aim of addressing alternative market opportunities.

Development within the Devices group was focused on the new in-water control device, SailWing™, including sea trials and integration with the Orca and Gator software products, as well as further development of the successful Digi family of products, including the automatic Streamer Recovery Device and rechargeable battery option. We continue to invest in the development of new sensors with applicability both within and outside the seismic business.

The Imaging Services group continued to invest in production efficiencies, leading-edge technologies and OBS capabilities. Research continued into advanced imaging techniques such as the extension of FWI to allow the use of reflection data as well as high-frequency FWI.

As many of these new services and products are under development and, as the development cycles from initial conception through to commercial introduction can extend over a number of years, their commercial feasibility or degree of commercial acceptance may not yet be established. No assurance can be given concerning the successful development of any new service or product, any enhancements to them, the specific timing of their release or their level of acceptance in the marketplace.

Markets and Customers

Our primary customers are E&P companies to whom we market and offer services, primarily multi-client seismic data programs from our Ventures group, imaging-related processing services from our Imaging Services group, as well as consulting services from our E&P Advisors and Optimization Software & Services group. In 2018, E&P companies accounted for approximately 77% of our total consolidated net revenues. Secondarily, seismic contractors purchase our towed streamer data acquisition systems and related equipment and software to collect data in accordance with their E&P company customers' specifications or for their own seismic data libraries.

A significant portion of our marketing effort is focused on areas outside of the United States. Foreign sales are subject to special risks inherent in doing business outside of the United States, including the risk of political instability, armed conflict, civil disturbances, currency fluctuations, embargo and governmental activities, customer credit risks and risk of non-compliance with U.S. and foreign laws, including tariff regulations and import/export restrictions.

We sell our services and products through a direct sales force consisting of employees and international third-party sales representatives responsible for key geographic areas. The majority of our foreign sales are denominated in U.S. dollars. During 2018, 2017 and 2016, sales to destinations outside of North America accounted for approximately 75%, 76% and 78% of our consolidated net revenues, respectively. Further, systems and equipment sold to domestic customers are frequently deployed internationally and, from time to time, certain foreign sales require export licenses.

Traditionally, our business has been seasonal, with strongest demand typically in the second half of our fiscal year. For information concerning the geographic breakdown of our consolidated net revenues, see Footnote 2 “Segment and Geographic Information” of Footnotes to Consolidated Financial Statements contained elsewhere in this Annual Report on Form 10-K for additional information.

Competition

Our Ventures group within our E&P Technology & Services segment faces competition in creating, developing and selling multi-client data libraries from a number of companies. CGG (an integrated geophysical company) and Schlumberger (a large integrated oilfield services company) are shifting to an asset light strategy, joining TGS-NOPEC Geophysical Company ASA and Spectrum ASA. PGS and Polarcus run acquisition crews and also compete in multi-client data acquisition. BGP operates in this space by primarily partnering with the aforementioned competitors to develop and sell multi-client data.

Our Imaging Services group within our E&P Technology & Services segment competes with companies that provide data processing services to E&P companies. See “Services and Products - E&P Technology & Services Segment.” While the barriers to enter this market are relatively low, we believe the barriers to compete at the higher end of the market - the advanced pre-stack depth migration market where our efforts are focused - are significantly higher. At the higher end of this market, CGG and Schlumberger are our two primary competitors for advanced imaging services. Both of these companies are significantly larger than ION in terms of revenue, processing locations and sales, marketing and financial resources.

In the OBS market, we compete with a number of companies, including Magseis Fairfield, Seabed Geosolutions (a joint venture of Fugro and CGG), and BGP. The OBS market primarily addresses the production end of the E&P business. This market is primarily vertically integrated with a variety of proprietary technologies, comprising both cable and nodal systems. Most companies operate one to three crews, and there have been four new entrants in the last few years.

The market for seismic services and products is highly competitive and characterized by frequent changes in technology. Our principal competitor for marine seismic equipment is Sercel (a manufacturing subsidiary of CGG). Sercel has the advantage of being able to sell its products and services to its parent company that operates both land and marine crews, providing it with a significant and stable internal market and a greater ability to test new technology in the field. The recent downturn in the industry has disrupted traditional buying patterns. We have seen a generally increasing trend of companies such as Petroleum GeoServices ASA (“PGS”) developing their own instrumentation to create a competitive advantage through products such as GeoStreamer. We also compete with other seismic equipment companies on a product-by-product basis. Our ability to compete effectively in the manufacture and sale of seismic instruments and data acquisition systems depends principally upon continued technological innovation, as well as pricing, system reliability, reputation for quality and ability to deliver on schedule.

Some seismic contractors design, engineer and manufacture seismic acquisition technology in-house (or through a network of third-party vendors) to differentiate themselves. Although this technology competes directly with our towed streamer, and ocean bottom equipment, it is not usually made available to other seismic acquisition contractors. However, the risk exists that other seismic contractors may decide to develop their own seismic technology, which would put additional pressure on the demand for our acquisition equipment.

In addition, we expect reductions in the market for spare parts and service of existing equipment as a result of the fleet reductions currently occurring in the marine seismic market. CGG and WesternGeco, who traditionally had large fleet market shares, have both announced their intention to move to an asset light business model.

In the land seismic equipment market, where INOVA competes, the principal competitors are Sercel and Geospace Technologies. INOVA is a joint venture with BGP as a majority stake owner. BGP purchases land seismic equipment from both INOVA and competing land equipment suppliers.

Intellectual Property

We rely on a combination of patent, copyright and trademark laws, trade secrets, confidentiality procedures and contractual provisions to protect our proprietary technologies. We have approximately 500 patents and pending patent applications, including filings in international jurisdictions with respect to the same kinds of technologies. Although our portfolio of patents is considered important to our operations, and particular patents may be material to specific

business lines, no one patent is considered essential to our consolidated business operations.

Our patents, copyrights and trademarks offer us only limited protection. Our competitors may attempt to copy aspects of our products despite our efforts to protect our proprietary rights, or may design around the proprietary features of our products. Policing unauthorized use of our proprietary rights is difficult, and we may be unable to determine the extent to which such use occurs. Our difficulties are compounded in certain foreign countries where the laws do not offer as much protection for proprietary rights as the laws of the United States, including the potential for adverse decisions by judicial or administrative bodies in foreign countries with unpredictable or corrupt judicial systems. From time to time, third parties inquire and claim that we have infringed upon their intellectual property rights and we make similar inquiries and claims to third parties. Material intellectual property litigation is discussed in detail in Item 3. "Legal Proceedings."

The information contained in this Annual Report on Form 10-K contains references to trademarks, service marks and registered marks of ION and our subsidiaries, as indicated. Except where stated otherwise or unless the context otherwise requires, the terms "VectorSeis," "ARIES II," "DigiFIN," "DigiCOURSE," "Hawk," "Orca," "G3i," "WiBand,","UN "VectorSeis" and "MESA" refer to the VECTORSEIS®, ARIES® II, DigiFIN®, DigiCOURSE®, HAWK®, ORCA®, G3I®, WiBand®, UNIVIB®, VectorSeis® and MESA® registered marks owned by ION or INOVA Geophysical or their affiliates, and the terms "BasinSPAN," "Calypso," "DigiSTREAMER," "Gator," "AHV-IV," "Vib Pro," "Shot Pro," "Optimise "Reflex," "ResSCAN," "PrecisION", "SailWing", "Marlin" and "4Sea," refer to the BasinSPAN™, Calypso™, DigiSTREAM GATOR™, AHV-IV™, Vib Pro™, Shot Pro™, Optimiser™, Reflex™, ResSCAN™, PrecisION™, SailWing™, Marlin™ and trademarks and service marks owned by ION or INOVA Geophysical or their affiliates.

Regulatory Matters

Our operations are subject to various international conventions, laws and regulations in the countries in which we operate, including laws and regulations relating to the importation of and operation of seismic equipment, currency conversions and repatriation, oil and gas exploration and development, taxation of offshore earnings and earnings of expatriate personnel, environmental protection, the use of local employees and suppliers by foreign contractors and duties on the importation and exportation of equipment. Our operations are subject to government policies and product certification requirements worldwide. Governments in some foreign countries have become increasingly active in regulating the companies holding concessions, the exploration for oil and gas and other aspects of the oil and gas industries in their countries. In some areas of the world, this governmental activity has adversely affected the amount of exploration and development work done by major oil and gas companies and may continue to do so. Operations in less developed countries can be subject to legal systems that are not as mature or predictable as those in more developed countries, which can lead to greater uncertainty in legal matters and proceedings (including the potential for adverse decisions by judicial or administrative bodies in foreign countries with unpredictable or corrupt judicial systems). We are required to consent to home country jurisdiction in many of our contracts with foreign state-owned companies, particularly those countries where our data are acquired.

Changes in these conventions, regulations, policies or requirements could affect the demand for our services and products or result in the need to modify them, which may involve substantial costs or delays in sales and could have an adverse effect on our future operating results. Our export activities are subject to extensive and evolving trade regulations. Certain countries are subject to trade restrictions, embargoes and sanctions imposed by the U.S. government. These restrictions and sanctions prohibit or limit us from participating in certain business activities in those countries.

Our operations are also subject to numerous local, state and federal laws and regulations in the United States and in foreign jurisdictions concerning the containment and disposal of hazardous materials, the remediation of contaminated properties and the protection of the environment. While the industry has experienced an increase in general environmental regulation worldwide and laws and regulations protecting the environment have generally become more stringent, we do not believe compliance with these regulations has resulted in a material adverse effect on our business or results of operations, and we do not currently foresee the need for significant expenditures in order to be able to remain compliant in all material respects with current environmental protection laws. Regulations in this area are subject to change, and there can be no assurance that future laws or regulations will not have a material adverse effect on us.

Our customers' operations are also significantly impacted in other respects by laws and regulations concerning the protection of the environment and endangered species. For instance, many of our marine contractors have been affected by regulations protecting marine mammals in the Gulf of Mexico. To the extent that our customers' operations are disrupted by future laws and regulations, our business and results of operations may be materially adversely affected.

Employees

As of December 31, 2018, we had 496 regular, full-time employees, 292 of whom were located in the U.S. From time to time and on an as-needed basis, we supplement our regular workforce with individuals that we hire temporarily or retain as independent contractors in order to meet certain internal manufacturing or other business needs. Our U.S. employees are not represented by any collective bargaining agreement, and we have never experienced a labor-related work stoppage. We believe that our employee relations are satisfactory.

Financial Information by Segment and Geographic Area

For a discussion of financial information by business segment and geographic area, see Footnote 2 “Segment and Geographic Information” of Footnotes to Consolidated Financial Statements.

Available Information

Our executive headquarters are located at 2105 CityWest Boulevard, Suite 100, Houston, Texas 77042-2839. Our telephone number is (281) 933-3339. Our home page on the Internet is www.iongeo.com. We make our website content available for information purposes only. Unless specifically incorporated by reference in this Annual Report on Form 10-K, information that you may find on our website is not part of this report.

In portions of this Annual Report on Form 10-K, we incorporate by reference information from parts of other documents filed with the Securities and Exchange Commission (“SEC”). The SEC allows us to disclose important information by referring to it in this manner, and you should review this information. We make our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, annual reports to stockholders, and proxy statements for our stockholders’ meetings, as well as any amendments, available free of charge through our website as soon as reasonably practicable after we electronically file those materials with, or furnish them to, the SEC.

You can learn more about us by reviewing our SEC filings on our website. Our SEC reports can be accessed through the Investor Relations section on our website. The SEC also maintains a website at www.sec.gov that contains reports, proxy statements, and other information regarding SEC registrants, including our company.

Item 1A. Risk Factors

This report contains or incorporates by reference statements concerning our future results and performance and other matters that are “forward-looking” statements within the meaning of Section 27A of the Securities Act of 1933, as amended (“Securities Act”), and Section 21E of the Securities Exchange Act of 1934, as amended (“Exchange Act”). These statements involve known and unknown risks, uncertainties and other factors that may cause our or our industry’s results, levels of activity, performance, or achievements to be materially different from any future results, levels of activity, performance, or achievements expressed or implied by such forward-looking statements. In some cases, you can identify forward-looking statements by terminology such as “may,” “will,” “would,” “should,” “intend,” “expec “plan,” “anticipate,” “believe,” “estimate,” “predict,” “potential,” or “continue” or the negative of such terms or other compara terminology. Examples of other forward-looking statements contained or incorporated by reference in this report include statements regarding:

- any additional damages or adverse rulings in the WesternGeco litigation and future potential adverse effects on our financial results and liquidity;
- future levels of capital expenditures of our customers for seismic activities;
- future oil and gas commodity prices;
- the effects of current and future worldwide economic conditions (particularly in developing countries) and demand for oil and natural gas and seismic equipment and services;
- future cash needs and availability of cash to fund our operations and pay our obligations;
- the effects of current and future unrest in the Middle East, North Africa and other regions;
- the timing of anticipated revenues and the recognition of those revenues for financial accounting purposes;
- the effects of ongoing and future industry consolidation, including, in particular, the effects of consolidation and vertical integration in the towed marine seismic streamers market;
- the timing of future revenue realization of anticipated orders for multi-client survey projects and data processing work in our E&P Technology & Services segment;
- future levels of our capital expenditures;
- future government laws or regulations pertaining to the oil and gas industry, including trade restrictions, embargoes and sanctions imposed by the U.S. government;
- future government actions that may result in the deprivation of our contractual rights, including the potential for adverse decisions by judicial or administrative bodies in foreign countries with unpredictable or corrupt judicial systems.
- expected net revenues, income from operations and net income;
- expected gross margins for our services and products;

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- future seismic industry fundamentals, including future demand for seismic services and equipment;
- future benefits to our customers to be derived from new services and products;
- future benefits to be derived from our investments in technologies, joint ventures and acquired companies;
- future growth rates for our services and products;
- the degree and rate of future market acceptance of our new services and products;
- expectations regarding E&P companies and seismic contractor end-users purchasing our more technologically-advanced services and products;
- anticipated timing and success of commercialization and capabilities of services and products under development and start-up costs associated with their development;
- future opportunities for new products and projected research and development expenses;
- expected continued compliance with our debt financial covenants;
- expectations regarding realization of deferred tax assets;
- expectations regarding the impact of the U.S. Tax Cuts and Jobs Act;
- anticipated results with respect to certain estimates we make for financial accounting purposes; and
- compliance with the U.S. Foreign Corrupt Practices Act and other applicable U.S. and foreign laws prohibiting corrupt payments to government officials and other third parties.

These forward-looking statements reflect our best judgment about future events and trends based on the information currently available to us. Our results of operations can be affected by inaccurate assumptions we make or by risks and uncertainties known or unknown to us. Therefore, we cannot guarantee the accuracy of the forward-looking statements. Actual events and results of operations may vary materially from our current expectations and assumptions. While we cannot identify all of the factors that may cause actual results to vary from our expectations, we believe the following factors should be considered carefully:

An unfavorable outcome in our pending litigation matter with WesternGeco could have a materially adverse effect on our financial results and liquidity.

In June 2009, WesternGeco L.L.C. (“WesternGeco”) filed a lawsuit against us in the United States District Court for the Southern District of Texas (the “District Court”). In the lawsuit, styled WesternGeco L.L.C. v. ION Geophysical Corporation, WesternGeco alleged that we had infringed several of their patents concerning marine seismic surveys. Trial began in July 2012, and the jury returned a verdict in August 2012. The jury found that we infringed the “claims” contained in four of WesternGeco’s patents by supplying our DigiFIN® lateral streamer control units from the United States, and awarded WesternGeco more than $100 million in damages. (In patent law, a “claim” is the technical legal term; an infringer infringes on one or more “claims” of a given patent.)

In May 2014, the District Court entered a Final Judgment against us in the amount of $123.8 million. This included the jury award ($12.5 million in reasonable royalties plus $93.4 million in lost profits), $10.9 million in pre-judgment interest on lost profits, and $9.4 million in supplemental damages that the judge imposed for DigiFIN® units that were supplied from the U.S. during the trial and during other periods that the jury did not consider. The Final Judgment also enjoined us from supplying DigiFINs or any parts unique to DigiFINs in or from the United States. We have conducted our business in compliance with the District Court’s orders, and have reorganized our operations such that we no longer supply DigiFINs or any parts unique to DigiFINs in or from the United States.

On July 2, 2015, the United States Court of Appeals for the Federal Circuit in Washington, D.C. (the “Court of Appeals”) reversed, in part, the District Court, holding that the lost profits, which were attributable to foreign seismic surveys, were not available to WesternGeco under the Patent Act. We had recorded a loss contingency accrual of $123.8 million because of the District Court’s ruling. As a result of the reversal by the Court of Appeals, we reduced the loss contingency accrual to $22.0 million.

On February 26, 2016, WesternGeco appealed the Court of Appeals’ decision to the Supreme Court, as to both lost profits and “enhanced” damages (damages which are available for willful infringement, and which neither the District Court nor the Trial Court awarded). On June 20, 2016, the Supreme Court vacated the Court of Appeals’ ruling, although it did not address lost profits at that time. Rather, in light of changes in case law regarding the standard of proof for willfulness in patent infringement, the Supreme Court remanded the case to the Court of Appeals for a determination of whether enhanced damages were appropriate.

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On November 14, 2016, the District Court ordered our sureties to pay principal and interest on the royalty damages previously awarded. On November 25, 2016, we paid WesternGeco the $20.8 million due pursuant to the order, and reduced our loss contingency accrual to zero.

On March 14, 2017, the District Court held a hearing on whether impose additional damages for willfulness. The Judge found that our infringement was willful, and awarded enhanced damages of $5.0 million to WesternGeco (WesternGeco had sought $43.6 million in such damages.) The District Court also ordered the appeal bond to be released and discharged. The Court's findings and ruling were memorialized in an order issued on May 16, 2017. On June 30, 2017, we and WesternGeco agreed that neither of us would appeal the District Court's award of $5.0 million in enhanced damages. Upon assessment of the enhanced damages, we accrued $5.0 million in the first quarter of 2017. As we have paid the $5.0 million, the accrual has been adjusted, and as of December 31, 2018, the loss contingency accrual was zero.

WesternGeco filed a second petition in the Supreme Court on February 17, 2017, appealing the lost profits issue again. On May 30, 2017, the Supreme Court called for the U.S. Solicitor General's views on whether or not the Supreme Court ought to hear WesternGeco's appeal. On December 6, 2017, the Solicitor General filed its brief, and took the position that the Supreme Court ought to hear the appeal and that foreign lost profits ought to be available. On January 12, 2018, the Supreme Court agreed to hear the appeal. The specific issue before the Supreme Court was whether lost profits arising from use of prohibited combinations occurring outside of the United States are categorically unavailable in cases where patent infringement is proven under 35 U.S.C. § 271(f)(2) (the statute under which we were held to have infringed WesternGeco's patents, and upon which the District Court and Court of Appeals relied in entering their rulings).

The Supreme Court heard oral arguments on April 16, 2018. We argued that the Court of Appeals' decision that eliminated lost profits ought to be affirmed. WesternGeco and the Solicitor General argued that the Court of Appeals' decision that eliminated lost profits ought to be reversed.

On June 22, 2018, the Supreme Court reversed the judgment of the Court of Appeals, held that the award of lost profits to WesternGeco by the District Court was a permissible application of Section 284 of the Patent Act, and remanded the case back to the Court of Appeals for further proceedings consistent with its (the Supreme Court's) opinion. On July 24, 2018, the Supreme Court issued the judgment that returned the case to the Court of Appeals.

On July 27, 2018, the Court of Appeals vacated its September 21, 2016 judgment with respect to damages, and ordered WesternGeco and us to submit supplemental briefing on what relief is appropriate in light of the Supreme Court's decision. We and WesternGeco each submitted briefing in accordance with the Court of Appeals' order (the last brief was filed on September 7, 2018).

We argued in our brief to the Court of Appeals that lost profits were not available to WesternGeco because the jury instructions required them to find that we had been WesternGeco's direct competitor in the survey markets where WesternGeco had lost profits, and that the jury could not have found so. Additionally, we argued that the award of lost profits and reasonable royalties ought to be vacated and retried on separate grounds due to the outcome of an Inter Partes Review ("IPR") filed with the Patent Trial and Appeal Board ("PTAB") of the Patent and Trademark Office. Until the Court of Appeals' January 11, 2019 decision issued (which is described below), the IPR was an administrative proceeding that was separate from the 2009 lawsuit. By means of the IPR, we joined a challenge to the validity of several of WesternGeco's patent claims that another company had filed. While the 2009 lawsuit was pending on appeal, the PTAB invalidated four of the six patent claims that formed the basis for the lawsuit judgment against us. WesternGeco appealed the PTAB's invalidation of its patents to the Court of Appeals. On May 7, 2018, the Court of Appeals affirmed the PTAB's invalidation of the patents, and on July 16, 2018, the Court of Appeals denied WesternGeco's petition for a rehearing. On December 13, 2018, WesternGeco filed a petition with the Supreme Court, arguing that the Court of Appeals ought to have overturned the decision of the PTAB. (As of February 7, 2019, the Supreme Court has not indicated whether it will, or will not, hear WesternGeco's appeal.)

In the same brief to the Court of Appeals in which we made our "direct competitor" argument, we argued that the Court of Appeals' affirmation of the PTAB's decision precluded WesternGeco's damages claims, and that the Court of Appeals should order a new trial as to the royalty damages already paid by us. We also argued that if the Court of Appeals did not find our "direct competitor" argument persuasive, the Court should nonetheless vacate the District

Court's award of royalty damages and lost profits damages and order a new trial as to both royalty damages and lost profits.

In its briefs to the Court of Appeals, WesternGeco argued that the only remaining issue was whether lost profits were unavailable to WesternGeco due to our "direct competitor" argument, and argued that the invalidation of four of its six patent claims by the PTAB (which was affirmed by the Court of Appeals) should have no effect on lost profits or on the royalty award already paid by us. WesternGeco also argued that lost profits should be available notwithstanding our "direct competitor" argument.

Oral arguments took place on November 16, 2018, and on January 11, 2019, the Court of Appeals issued its ruling. In its ruling, the Court of Appeals refused to disturb the award of reasonable royalties to WesternGeco (which we paid in 2016), and rejected our "direct competitor" argument, but vacated the District Court's award of lost profits damages and remanded the case back to the District Court to determine whether to hold a new trial as to lost profits. The Court of Appeals also ruled that its affirmance of the PTAB's decision eliminated four of the five patent claims that could have supported the award of lost profits, leaving only one remaining patent claim that could support an award of lost profits.

The Court of Appeals further held that the lost profits award can be reinstated by the District Court if the existing trial record establishes that the jury must have found that the technology covered by the one remaining patent claim was essential for performing the surveys upon which lost profits were based. To make such a finding, the District Court must conclude that the present trial record establishes that there was no dispute that the technology covered by the one remaining patent claim, independent of the technology of the now-invalid claims, was required to perform the surveys. The Court of Appeals ruling further provides that if, but only if, the District Court concludes that WesternGeco established at trial, with undisputed evidence, that the remaining claim covers technology that was necessary to perform the surveys, then the District Court may deny a new trial and reinstate lost profits.

We may not ultimately prevail in the litigation and we could be required to pay some or all of the lost profits that were awarded by the District Court, plus interest, if the District Court denies a new trial on lost profits, or if a new trial is granted and a new judgment issues. Our assessment that we do not have a loss contingency may change in the future due to developments at the Supreme Court, Court of Appeals, or District Court, and other events, such as changes in applicable law, and such reassessment could lead to the determination that a significant loss contingency is probable, which could have a material effect on the Company's business, financial condition and results of operations.

Our business depends on the level of exploration and production activities by the oil and natural gas industry. If capital expenditures by E&P companies decline, typically because of lower price realizations for oil and natural gas, the demand for our services and products would decline and our results of operations would be materially adversely affected.

Demand for our services and products depends upon the level of spending by E&P companies and seismic contractors for exploration and production activities, and those activities depend in large part on oil and gas prices. Spending by our customers on services and products that we provide is highly discretionary in nature, and subject to rapid and material change. Any decline in oil and gas related spending on behalf of our customers could cause alterations in our capital spending plans, project modifications, delays or cancellations, general business disruptions or delays in payment, or non-payment of amounts that are owed to us, any one of which could have a material adverse effect on our financial condition. Additionally, the recent increases in oil and gas prices may not increase demand for our services and products or otherwise have a positive effect on our financial condition or results of operations. E&P companies' willingness to explore, develop and produce depends largely upon prevailing industry conditions that are influenced by numerous factors over which our management has no control, such as:

- the supply of and demand for oil and gas;
- the level of prices, and expectations about future prices, of oil and gas;
- the cost of exploring for, developing, producing and delivering oil and gas;
- the expected rates of decline for current production;
- the discovery rates of new oil and gas reserves;
- weather conditions, including hurricanes, that can affect oil and gas operations over a wide area, as well as less severe inclement weather that can preclude or delay seismic data acquisition;
- domestic and worldwide economic conditions;
- changes in government leadership, such as the change in presidency in Mexico and its impact on the Mexican economy and offshore exploration programs;
- political instability in oil and gas producing countries;
- technical advances affecting energy consumption;
- government policies regarding the exploration, production and development of oil and gas reserves;
- the ability of oil and gas producers to raise equity capital and debt financing;

- merger and divestiture activity among oil and gas companies and seismic contractors; and
- compliance by members of the OPEC and non-OPEC members such as Russia, with agreements to cut oil production.

The level of oil and gas exploration and production activity has been volatile in recent years. Trends in oil and gas exploration and development activities have declined, together with demand for our services and products. Any prolonged substantial reduction in oil and gas prices would likely further affect oil and gas production levels and therefore adversely affect demand for the services we provide and products we sell.

Our operating results often fluctuate from period to period, and we are subject to cyclicality and seasonality factors.

Our industry and the oil and gas industry in general are subject to cyclical fluctuations. Demand for our services and products depends upon spending levels by E&P companies for exploration and production of oil and natural gas and, in the case of new seismic data acquisition, the willingness of those companies to forgo ownership of the seismic data. Capital expenditures by E&P companies for these activities depend upon several factors, including actual and forecasted prices of oil and natural gas and those companies' short-term and strategic plans.

Since 2015, E&P companies shifted their focus more to production activities and less on exploration due to declining oil and gas prices resulted in decreasing revenues and prompted cost reduction initiatives across the industry. The price of Brent crude oil increased to an average of $71 per barrel in 2018 due to the combination of robust global demand and sustained OPEC production cuts after a long period of unrestrained output relative to past periods. Before the end of 2018, Brent crude oil prices fell to nearly $50 per barrel and the U.S. Energy Information Administration ("EIA") forecasts the Brent crude oil spot price will average $61 per barrel in 2019 and $65 per barrel in 2020. The price decrease resulted from concerns of oversupply and slower than expected pace of oil demand growth. Energy prices, which include oil, natural gas and coal, are projected to stabilize overall in the near-term as demand and supply comes into equilibrium. As of December 31, 2018, our E&P Technology & Services segment backlog, consisting of commitments for data processing work and for underwritten multi-client New Venture and proprietary projects decreased by 44% compared to our existing backlog as of December 31, 2017. The decrease in our backlog is attributable to the timing of finalizing contracts.

Our operating results are subject to fluctuations from period to period as a result of introducing new services and products, the timing of significant expenses in connection with customer orders, unrealized sales, levels of research and development activities in different periods, the product and service mix of our revenues and the seasonality of our business. Because some of our products are technologically complex and tend to be relatively large investments, we generally experience long sales cycles for these types of products with a series of technical and commercial reviews by our customers and historically incur significant expense at the beginning of these cycles. In addition, the revenues can vary widely from period to period due to changes in customer requirements and demand. These factors can create fluctuations in our net revenues and results of operations from period to period. Variability in our overall gross margins for any period, which depend on the percentages of higher-margin and lower-margin services and products sold in that period, compounds these uncertainties. As a result, if net revenues or gross margins fall below expectations, our results of operations and financial condition will likely be materially adversely affected.

Additionally, our business can be seasonal in nature, with strongest demand typically in the second half of each year. Customer budgeting cycles at times result in higher spending activity levels by our customers at different points of the year.

Due to the high value of many of our products and seismic data libraries as they tend to be relatively large investments, our quarterly operating results have historically fluctuated from period to period due to the timing of orders and shipments and the mix of services and products sold. This uneven pattern makes financial predictions for any given period difficult, increases the risk of unanticipated variations in our quarterly results and financial condition, and places challenges on our inventory management. Delays caused by factors beyond our control can affect our E&P Technology & Services segment's revenues from its imaging and multi-client services from period to period. Also, delays in ordering products or in shipping or delivering products in a given period could significantly affect our results of operations for that period. Fluctuations in our quarterly operating results may cause greater volatility in the market price of our common stock.

Our indebtedness could adversely affect our liquidity, financial condition and our ability to fulfill our obligations and operate our business.

As of December 31, 2018, our total outstanding indebtedness (including capital lease obligations) was approximately $121.7 million, consisting primarily of approximately $120.6 million outstanding Second Lien Notes and $2.9 million

of capital leases, partially offset by $2.9 million of debt issuance costs. As of December 31, 2018, there was no outstanding indebtedness under our Credit Facility. Under our Credit Facility, as amended, the lender has committed $50.0 million of revolving credit, subject to a borrowing base. As of December 31, 2018, we have $41.9 million of borrowing base availability under the Credit Facility. The amount available will increase or decrease monthly as our borrowing base changes. We may also incur additional indebtedness in the future. See Item 7. “Management’s Discussion and Analysis of Financial Condition and Results of Operations.”

In October 2016, S&P Global Ratings (“S&P”) raised our corporate credit rating to CCC+ from SD and maintains a negative outlook. S&P continues to hold a negative outlook on our Company reflecting the high debt leverage, expected negative free cash flow and the potential for liquidity to weaken, if market conditions do not significantly improve. Following

the redemption of our Third Lien Notes in March 2018, Moody's Investors Service has withdrawn all assigned public credit ratings on our Company, including the Caa2 Corporate Family Rating.

Our high level of indebtedness could have negative consequences to us, including:

- we may have difficulty satisfying our obligations with respect to our outstanding debt;
- we may have difficulty obtaining financing in the future for working capital, capital expenditures, acquisitions or other purposes;
- we may need to use all, or a substantial portion, of our available cash flow to pay interest and principal on our debt, which will reduce the amount of money available to finance our operations and other business activities;
- our vulnerability to general economic downturns and adverse industry conditions could increase;
- our flexibility in planning for, or reacting to, changes in our business and in our industry in general could be limited;
- our amount of debt and the amount we must pay to service our debt obligations could place us at a competitive disadvantage compared to our competitors that have less debt;
- our customers may react adversely to our significant debt level and seek or develop alternative licensors or suppliers;
- we may have insufficient funds, and our debt level may also restrict us from raising the funds necessary to repurchase all of the Notes, as defined below, tendered to us upon the occurrence of a change of control, which would constitute an event of default under the Notes; and
- our failure to comply with the restrictive covenants in our debt instruments which, among other things, limit our ability to incur debt and sell assets, could result in an event of default that, if not cured or waived, could have a material adverse effect on our business or prospects.

Our level of indebtedness will require that we use a substantial portion of our cash flow from operations to pay principal of, and interest on, our indebtedness, which will reduce the availability of cash to fund working capital requirements, capital expenditures, research and development and other general corporate or business activities.

We are subject to intense competition, which could limit our ability to maintain or increase our market share or to maintain our prices at profitable levels.

Many of our sales are obtained through a competitive bidding process, which is standard for our industry. Competitive factors in recent years have included price, technological expertise, and a reputation for quality, safety and dependability. While no single company competes with us in all of our segments, we are subject to intense competition in each of our segments. New entrants in many of the markets in which certain of our services and products are currently strong should be expected. See Item 1. "Business – Competition." We compete with companies that are larger than we are in terms of revenues, technical personnel, number of processing locations and sales and marketing resources. A few of our competitors have a competitive advantage in being part of a large affiliated seismic contractor company. In addition, we compete with major service providers and government-sponsored enterprises and affiliates. Some of our competitors conduct seismic data acquisition operations as part of their regular business, which we have traditionally not conducted, and have greater financial and other resources than we do. These and other competitors may be better positioned to withstand and adjust more quickly to volatile market conditions, such as fluctuations in oil and natural gas prices, as well as changes in government regulations. In addition, any excess supply of services and products in the seismic services market could apply downward pressure on prices for our services and products. The negative effects of the competitive environment in which we operate could have a material adverse effect on our results of operations. In particular, the consolidation in recent years of many of our competitors in the seismic services and products markets has negatively impacted our results of operations.

There are a number of geophysical companies that create, market and license seismic data and maintain seismic libraries. Competition for acquisition of new seismic data among geophysical service providers historically has been intense and we expect this competition will continue to be intense. Larger and better-financed operators could enjoy an advantage over us in a competitive environment for new data.

Our OBS operations involve numerous risks.

Through our Ocean Bottom Integrated Technologies segment, we operate as a seismic acquisition contractor concentrating on OBS data acquisition. There can be no assurance that we will achieve the expected benefits from our acquisition projects and these projects may result in unexpected costs, expenses and liabilities, which may have a material adverse effect on our business, financial condition or results of operations. Our OBS operations exposed us to

operating risks:

- Seismic data acquisition activities in marine ocean bottom areas are subject to the risk of downtime or reduced productivity, as well as to the risks of loss to property and injury to personnel, mechanical failures and natural disasters. In addition to losses caused by human errors and accidents, we may also become subject to losses resulting from, among other things, political instability, business interruption, strikes and weather events; and
- Our OBS acquisition equipment and services may expose us to litigation and legal proceedings, including those related to product liability, personal injury and contract liability. We have in place insurance coverage against operating hazards, including product liability claims and personal injury claims, damage, destruction or business interruption and whenever possible, will obtain agreements from customers that limit our liability. However, we cannot provide assurance that the nature and amount of insurance will be sufficient to fully indemnify us against liabilities arising from pending and future claims or that its insurance coverage will be adequate in all circumstances or against all hazards, and that we will be able to maintain adequate insurance coverage in the future at commercially reasonable rates or on acceptable terms.
- increased costs associated with the operation of an OBS acquisition project and the management of geographically dispersed operations;
- Cash flows from OBS acquisition projects may be inadequate to realize the value of manufactured equipment for use in its OBS surveys;
- risks associated with our OBS acquisition technologies, including risks that the new technology may not perform as well as we anticipate;
- difficulties in retaining and integrating key technical, sales and marketing personnel and the possible loss of such employees and costs associated with their loss;
- the diversion of management’s attention and other resources from other business operations and related concerns;
- the requirement to maintain uniform standards, controls and procedures;
- our inability to realize operating efficiencies, cost savings or other benefits that we expect from OBS operations; and
- difficulties and delays in securing new business and customer projects.

The indentures governing the 9.125% Senior Secured Second-Priority Notes due 2021 (the “ Second Lien Notes”) contain a number of restrictive covenants that limit our ability to finance future operations or capital needs or engage in other business activities that may be in our interest.

The indenture governing the Second Lien Notes imposes, and the terms of any future indebtedness may impose, operating and other restrictions on us and our subsidiaries. Such restrictions affect, or will affect, and in many respects limit or prohibit, among other things, our ability and the ability of certain of our subsidiaries to:

- incur additional indebtedness;
- create liens;
- pay dividends and make other distributions in respect of our capital stock;
- redeem our capital stock;
- make investments or certain other restricted payments;
- sell certain kinds of assets;
- enter into transactions with affiliates; and
- effect mergers or consolidations.

The restrictions contained in the indenture governing the Second Lien Notes could:

- limit our ability to plan for or react to market or economic conditions or meet capital needs or otherwise restrict our activities or business plans; and
- adversely affect our ability to finance our operations, acquisitions, investments or strategic alliances or other capital needs or to engage in other business activities that would be in our interest.

A breach of any of these covenants could result in a default under the indenture governing the Second Lien Notes. If an event of default occurs, the trustee and holders of the Second Lien Notes could elect to declare all borrowings outstanding, together with accrued and unpaid interest, to be immediately due and payable. An event of default under the indenture governing the Second Lien Notes would also constitute an event of default under our Credit Facility. In addition, if we are unable to repay or extend the maturity of our Second Lien Notes prior to their scheduled maturity in 2021, the maturity of our Credit Facility, which currently matures in 2023, will accelerate to mature in 2021 which may cause us to face substantial liquidity problems and may force us to reduce or delay investments, dispose of material assets or operations, or issue additional debt or equity. See Footnote 5 “Long-term Debt and Lease Obligations” of the Footnotes to Consolidated Financial Statements appearing below in this Form 10-K.

As a technology-focused company, we are continually exposed to risks related to complex, highly technical services and products that are sometimes operated in dangerous marine environments.

We have made, and we will continue to make, strategic decisions from time to time as to the technologies in which we invest. If we choose the wrong technology, our financial results could be adversely impacted. Our operating results are dependent upon our ability to improve and refine our seismic imaging and data processing services and to successfully develop, manufacture and market our products and other services and products. New technologies generally require a substantial investment before any assurance is available as to their commercial viability. If we choose the wrong technology, or if our competitors develop or select a superior technology, we could lose our existing customers and be unable to attract new customers, which would harm our business and operations.

New data acquisition or processing technologies may be developed. New and enhanced services and products introduced by one of our competitors may gain market acceptance and, if not available to us, may adversely affect us. The markets for our services and products are characterized by changing technology and new product introductions. We must invest substantial capital to develop and maintain a leading edge in technology, with no assurance that we will receive an adequate rate of return on those investments. If we are unable to develop and produce successfully and timely new or enhanced services and products, we will be unable to compete in the future and our business, our results of operations and our financial condition will be materially and adversely affected. Our business could suffer from unexpected developments in technology, or from our failure to adapt to these changes. In addition, the preferences and requirements of customers can change rapidly.

The businesses of our E&P Technology & Services segment and Optimization Software & Services group within our Operations Optimization segment, being more concentrated in software, processing services and proprietary technologies, have also exposed us to various risks that these technologies typically encounter, including the following:

- future competition from more established companies entering the market;
- technology obsolescence;
- dependence upon continued growth of the market for seismic data processing;
- the rate of change in the markets for these segments’ technology and services;
- further consolidation of the participants within this market;
- research and development efforts not proving sufficient to keep up with changing market demands;
- dependence on third-party software for inclusion in these segments’ services and products;
- misappropriation of these segments’ technology by other companies;
- alleged or actual infringement of intellectual property rights that could result in substantial additional costs;
- difficulties inherent in forecasting sales for newly developed technologies or advancements in technologies;
- recruiting, training and retaining technically skilled, experienced personnel that could increase the costs for these segments, or limit their growth; and
- the ability to maintain traditional margins for certain of their technology or services.

Seismic data acquisition and data processing technologies historically have progressed rather rapidly and we expect this progression to continue. In order to remain competitive, we must continue to invest additional capital to maintain, upgrade and expand our seismic data acquisition and processing capabilities. However, due to potential advances in technology and the related costs associated with such technological advances, we may not be able to fulfill this strategy, thus possibly affecting our ability to compete.

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Our customers often require demanding specifications for performance and reliability of our services and products. Because many of our products are complex and often use unique advanced components, processes, technologies and techniques, undetected errors and design and manufacturing flaws may occur. Even though we attempt to assure that our systems are always reliable in the field, the many technical variables related to their operations can cause a combination of factors that can, and have from time to time, caused performance and service issues with certain of our products. Product defects result in higher product service, warranty and replacement costs and may affect our customer relationships and industry reputation, all of which may adversely impact our results of operations. Despite our testing and quality assurance programs, undetected errors may not be discovered until the product is purchased and used by a customer in a variety of field conditions. If our customers deploy our new products and they do not work correctly, our relationship with our customers may be materially and adversely affected.

As a result of our systems' advanced and complex nature, we expect to experience occasional operational issues from time to time. Generally, until our products have been tested in the field under a wide variety of operational conditions, we cannot be certain that performance and service problems will not arise. In that case, market acceptance of our new products could be delayed and our results of operations and financial condition could be adversely affected.

We also face exposure to product liability claims in the event that certain of our products, or certain components manufactured by others that are incorporated into our products, fail to perform to specification, which failure results, or is alleged to result, in property damage, bodily injury and/or death. Marine exploration in particular can present dangerous conditions to those conducting it. Any product liability claims decided adversely against us may have a material adverse effect on our results of operations and cash flows. While we maintain insurance coverage with respect to certain product liability claims, we may not be able to obtain such insurance on acceptable terms in the future, if at all, and any such insurance may not provide adequate coverage against product liability claims. In addition, product liability claims can be expensive to defend and can divert the attention of management and other personnel for significant periods of time, regardless of the ultimate outcome. Furthermore, even if we are successful in defending against a claim relating to our products, claims of this nature could cause our customers to lose confidence in our products and us.

We have invested, and expect to continue to invest, significant sums of money in acquiring and processing seismic data for our E&P Technology & Services' multi-client data library, without knowing precisely how much of this seismic data we will be able to license or when and at what price we will be able to license the data sets. Our business could be adversely affected by the failure of our customers to fulfill their obligations to reimburse us for the underwritten portion of our seismic data acquisition costs for our multi-client library.

We invest significant amounts in acquiring and processing new seismic data to add to our E&P Technology & Services' multi-client data library. The costs of most of these investments are funded by our customers, with the remainder generally being recovered through future data licensing fees. In 2018, we invested approximately $28.3 million in our multi-client data library. Our customers generally commit to licensing the data prior to our initiating a new data library acquisition program. However, the aggregate amounts of future licensing fees for this data are uncertain and depend on a variety of factors, including the market prices of oil and gas, customer demand for seismic data in the library, and the availability of similar data from competitors.

By making these investments in acquiring and processing new seismic data for our E&P Technology & Services' multi-client library, we are exposed to the following risks:

- We may not fully recover our costs of acquiring and processing seismic data through future sales. The ultimate amounts involved in these data sales are uncertain and depend on a variety of factors, many of which are beyond our control.
- The timing of these sales is unpredictable and can vary greatly from period to period. The costs of each survey are capitalized and then amortized as a percentage of sales and/or on a straight-line basis over the expected useful life of the data. This amortization will affect our earnings and, when combined with the sporadic nature of sales, will result in increased earnings volatility.
- Regulatory changes that affect companies' ability to drill, either generally or in a specific location where we have acquired seismic data, could materially adversely affect the value of the seismic data contained in our library. Technology changes could also make existing data sets obsolete. Additionally, each of our individual surveys has a

limited book life based on its location and oil and gas companies' interest in prospecting for reserves in such location, so a particular survey may be subject to a significant decline in value beyond our initial estimates.

- The value of our multi-client data could be significantly adversely affected if any material adverse change occurs in the general prospects for oil and gas exploration, development and production activities.

- The cost estimates upon which we base our pre-commitments of funding could be wrong. The result could be losses that have a material adverse effect on our financial condition and results of operations. These pre-commitments of funding are subject to the creditworthiness of our clients. In the event that a client refuses or is unable to pay its commitment, we could incur a substantial loss on that project.
- As part of our asset-light strategy, we routinely charter vessels from third-party vendors to acquire seismic data for our multi-client business. As a result, our cost to acquire our multi-client data could significantly increase if vessel charter prices rise materially.

Reductions in demand for our seismic data, or lower revenues of or cash flows from our seismic data, may result in a requirement to increase amortization rates or record impairment charges in order to reduce the carrying value of our data library. These increases or charges, if required, could be material to our operating results for the periods in which they are recorded.

A substantial portion of our seismic acquisition project costs (including third-party project costs) are underwritten by our customers. In the event that underwriters for such projects fail to fulfill their obligations with respect to such underwriting commitments, we would continue to be obligated to satisfy our payment obligations to third-party contractors.

We derive a substantial amount of our revenues from foreign operations and sales, which pose additional risks.

The majority of our foreign sales are denominated in U.S. dollars. Sales to customer destinations outside of North America represented 75%, 76% and 78% of our consolidated net revenues for 2018, 2017 and 2016, respectively. We believe that export sales will remain a significant percentage of our revenue. U.S. export restrictions affect the types and specifications of products we can export. Additionally, in order to complete certain sales, U.S. laws may require us to obtain export licenses, and we cannot assure you that we will not experience difficulty in obtaining these licenses.

Like many energy services companies, we have operations in and sales into certain international areas, including parts of the Middle East, West Africa, Latin America, India, Asia Pacific and Russia, that are subject to risks of war, political disruption, civil disturbance, political corruption, possible economic and legal sanctions (such as possible restrictions against countries that the U.S. government may in the future consider to be state sponsors of terrorism) and changes in global trade policies. Our sales or operations may become restricted or prohibited in any country in which the foregoing risks occur. In particular, the occurrence of any of these risks could result in the following events, which in turn, could materially and adversely impact our results of operations:

- disruption of E&P activities;
- restriction on the movement and exchange of funds;
- inhibition of our ability to collect advances and receivables;
- enactment of additional or stricter U.S. government or international sanctions;
- limitation of our access to markets for periods of time;
- expropriation and nationalization of assets of our company or those of our customers;
- political and economic instability, which may include armed conflict and civil disturbance;
- currency fluctuations, devaluations and conversion restrictions;
- confiscatory taxation or other adverse tax policies; and
- governmental actions that may result in the deprivation of our contractual rights, including the potential for adverse decisions by judicial or administrative bodies in foreign countries with unpredictable or corrupt judicial systems.

Our international operations and sales increase our exposure to other countries' restrictive tariff regulations, other import/export restrictions and customer credit risk.

In addition, we are subject to taxation in many jurisdictions and the final determination of our tax liabilities involves the interpretation of the statutes and requirements of taxing authorities worldwide. Our tax returns are subject to routine examination by taxing authorities, and these examinations may result in assessments of additional taxes, penalties and/or interest.

We may be unable to obtain broad intellectual property protection for our current and future products and we may become involved in intellectual property disputes; we rely on developing and acquiring proprietary data which we keep confidential.

We rely on a combination of patent, copyright and trademark laws, trade secrets, confidentiality procedures and contractual provisions to protect our proprietary technologies. We believe that the technological and creative skill of our employees, new product developments, frequent product enhancements, name recognition and reliable product maintenance are the foundations of our competitive advantage. Although we have a considerable portfolio of patents, copyrights and trademarks, these property rights offer us only limited protection. Our competitors may attempt to copy aspects of our products despite our efforts to protect our proprietary rights, or may design around the proprietary features of our products. Policing unauthorized use of our proprietary rights is difficult, and we are unable to determine the extent to which such use occurs. Our difficulties are compounded in certain foreign countries where the laws do not offer as much protection for proprietary rights as the laws of the United States.

Third parties inquire and claim from time to time that we have infringed upon their intellectual property rights. Many of our competitors own their own extensive global portfolio of patents, copyrights, trademarks, trade secrets and other intellectual property to protect their proprietary technologies. We believe that we have in place appropriate procedures and safeguards to help ensure that we do not violate a third party's intellectual property rights. However, no set of procedures and safeguards is infallible. We may unknowingly and inadvertently take action that is inconsistent with a third party's intellectual property rights, despite our efforts to do otherwise. Any such claims from third parties, with or without merit, could be time consuming, result in costly litigation, result in injunctions, require product modifications, cause product shipment delays or require us to enter into royalty or licensing arrangements. Such claims could have a material adverse effect on our results of operations and financial condition.

Much of our litigation in recent years have involved disputes over our and others' rights to technology. See Item 3. "Legal Proceedings."

To protect the confidentiality of our proprietary and trade secret information, we require employees, consultants, contractors, advisors and collaborators to enter into confidentiality agreements. Our customer data license and acquisition agreements also identify our proprietary, confidential information and require that such proprietary information be kept confidential. While these steps are taken to strictly maintain the confidentiality of our proprietary and trade secret information, it is difficult to ensure that unauthorized use, misappropriation or disclosure will not occur. If we are unable to maintain the secrecy of our proprietary, confidential information, we could be materially adversely affected.

If we do not effectively manage our transition into new services and products, our revenues may suffer.

Services and products for the geophysical industry are characterized by rapid technological advances in hardware performance, software functionality and features, frequent introduction of new services and products, and improvement in price characteristics relative to product and service performance. Among the risks associated with the introduction of new services and products are delays in development or manufacturing, variations in costs, delays in customer purchases or reductions in price of existing products in anticipation of new introductions, write-offs or write-downs of the carrying costs of inventory and raw materials associated with prior generation products, difficulty in predicting customer demand for new product and service offerings and effectively managing inventory levels so that they are in line with anticipated demand, risks associated with customer qualification, evaluation of new products, and the risk that new products may have quality or other defects or may not be supported adequately by application software. The introduction of new services and products by our competitors also may result in delays in customer purchases and difficulty in predicting customer demand. If we do not make an effective transition from existing services and products to future offerings, our revenues and margins may decline.

Furthermore, sales of our new services and products may replace sales, or result in discounting of some of our current product or service offerings, offsetting the benefits of a successful introduction. In addition, it may be difficult to ensure performance of new services and products in accordance with our revenue, margin and cost estimations and to achieve operational efficiencies embedded in our estimates. Given the competitive nature of the seismic industry, if any of these risks materializes, future demand for our services and products, and our future results of operations, may suffer.

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Global economic conditions and credit market uncertainties could have an adverse effect on customer demand for certain of our services and products, which in turn would adversely affect our results of operations, our cash flows, our financial condition and our stock price.

Historically, demand for our services and products has been sensitive to the level of exploration spending by E&P companies and geophysical contractors. The demand for our services and products will be lessened if exploration expenditures by E&P companies are reduced. During periods of reduced levels of exploration for oil and natural gas, there have been oversupplies of seismic data and downward pricing pressures on our seismic services and products, which, in turn, have limited our ability to meet sales objectives and maintain profit margins for our services and products. In the past, these then-prevailing industry conditions have had the effect of reducing our revenues and operating margins. The markets for oil and gas historically have been volatile and may continue to be so in the future.

Turmoil or uncertainty in the credit markets and its potential impact on the liquidity of major financial institutions may have an adverse effect on our ability to fund our business strategy through borrowings under either existing or new debt facilities in the public or private markets and on terms we believe to be reasonable. Likewise, there can be no assurance that our customers will be able to borrow money for their working capital or capital expenditures on a timely basis or on reasonable terms, which could have a negative impact on their demand for our services and products and impair their ability to pay us for our services and products on a timely basis, or at all.

Our sales have historically been affected by interest rate fluctuations and the availability of liquidity, and we and our customers would be adversely affected by increases in interest rates or liquidity constraints. This could have a material adverse effect on our business, results of operations, financial condition and cash flows.

The loss of any significant customer or the inability of our customers to meet their payment obligations to us could materially and adversely affect our results of operations and financial condition.

Our business is exposed to risks related to customer concentration. In 2018, we had two customers (ExxonMobil and Petrobras) with sales that each exceeded 10% of our consolidated net revenues. In 2017, we had one customer with sales that exceeded 10% of our consolidated net revenues and no single customer represented 10% or more of our consolidated net revenues for 2016. Our top five customers together accounted for approximately 39%, 34% and 50%, of our consolidated net revenues during 2018, 2017 and 2016. The loss of any of our significant customers or deterioration in our relations with any of them could materially and adversely affect our results of operations and financial condition.

During the last ten years, our traditional geophysical contractor customers have been rapidly consolidating, thereby consolidating the demand for our services and products. The loss of any of our significant customers to further consolidation could materially and adversely affect our results of operations and financial condition.

Our business is exposed to risks of loss resulting from nonpayment by our customers. Many of our customers finance their activities through cash flow from operations, the incurrence of debt or the issuance of equity. Declines in commodity prices, and the credit markets could cause the availability of credit to be constrained. The combination of lower cash flow due to commodity prices, a reduction in borrowing bases under reserve-based credit facilities and the lack of available debt or equity financing may result in a significant reduction in our customers' liquidity and ability to pay their obligations to us. Furthermore, some of our customers may be highly leveraged and subject to their own operating and regulatory risks, which increases the risk that they may default on their obligations to us. The inability or failure of our significant customers to meet their obligations to us or their insolvency or liquidity may adversely affect our financial results.

Our stock price has been volatile, declining and increasing from time to time.

The securities markets in general and our common stock in particular have experienced significant price and volume volatility in recent years. The market price and trading volume of our common stock may continue to experience significant fluctuations due not only to general stock market conditions but also to a change in sentiment in the market regarding our operations or business prospects or those of companies in our industry. In addition to the other risk factors discussed in this section, the price and volume volatility of our common stock may be affected by:

- operating results that vary from the expectations of securities analysts and investors;
- factors influencing the levels of global oil and natural gas exploration and exploitation activities, such as the decline in crude oil prices and depressed prices for natural gas in North America or disasters such as the Deepwater Horizon

incident in the Gulf of Mexico in 2010;
- the operating and securities price performance of companies that investors or analysts consider comparable to us;
- actions by rating agencies related to the Notes;
- announcements of strategic developments, acquisitions and other material events by us or our competitors; and

- changes in global financial markets and global economies and general market conditions, such as interest rates, commodity and equity prices and the value of financial assets.

To the extent that the price of our common stock declines, our ability to raise funds through the issuance of equity or otherwise use our common stock as consideration will be reduced. A low price for our equity may negatively impact our ability to access additional debt capital. These factors may limit our ability to implement our operating and growth plans. In addition, the volatility in the market price of our common stock affects the value of our stock appreciation rights ("SARs"). To the extent that the price of our common stock increases, the value of our SARs will increase and could have a negative impact on our earnings and cash flows.

Goodwill, intangible assets and other long-lived assets (multi-client data library and property, plant and equipment and seismic rental equipment) that we have recorded are subject to impairment evaluations. In addition, our product inventory may become obsolete or excessive due to future changes in technology, changes in market demand, or changes in market expectations. Write-downs of these assets may adversely affect our financial condition and results of operations.

Reductions in or an impairment of the value of our goodwill, intangible assets and other long-lived assets will result in additional charges against our earnings, which could have a material adverse effect on our reported results of operations and financial position in future periods. At December 31, 2018, our remaining goodwill, intangible assets, multi-client data library and property, plant and equipment and seismic rental equipment balances were $22.9 million, $0.5 million, $73.5 million and $13.0 million, respectively. For 2018, we recognized an impairment of $36.6 million in property, plant and equipment for our cable-based ocean bottom acquisition technologies.

Our services and products' technologies often change relatively quickly. Phasing out of old products involves estimating the amounts of inventories we need to hold to satisfy demand for those products and satisfy future repair part needs. Based on changing technologies and customer demand, we may find that we have either obsolete or excess inventory on hand. Because of unforeseen future changes in technology, market demand or competition, we might have to write off unusable inventory, which would adversely affect our results of operations.

Due to the international scope of our business activities, our results of operations may be significantly affected by currency fluctuations.

We derived approximately 75% of our 2018 consolidated net revenues from international sales, subjecting us to risks relating to fluctuations in currency exchange rates. Currency variations can adversely affect margins on sales of our products in countries outside of the United States and margins on sales of products that include components obtained from suppliers located outside of the United States. We operate in a wide variety of jurisdictions, including the United Kingdom, Brazil, Mexico, China, Canada, Russia, the United Arab Emirates, Egypt and other countries. Certain of these countries have experienced geopolitical instability, economic problems and other uncertainties from time to time. To the extent that world events or economic conditions negatively affect our future sales to customers in these and other regions of the world, or the collectability of receivables, our future results of operations, liquidity and financial condition may be adversely affected.

We currently require customers in certain higher risk countries to provide their own financing. We do not currently extend long-term credit through notes to companies in countries where we perceive excessive credit risk.

Our foreign subsidiaries receive their income and pay their expenses primarily in their local currencies. To the extent that transactions of these subsidiaries are settled in their local currencies, a devaluation of those currencies versus the U.S. dollar could reduce the contribution from these subsidiaries to our consolidated results of operations as reported in U.S. dollars. For financial reporting purposes, such depreciation will negatively affect our reported results of operations since earnings denominated in foreign currencies would be converted to U.S. dollars at a decreased value. In addition, since we participate in competitive bids for sales of certain of our services and products that are denominated in U.S. dollars, a depreciation of the U.S. dollar against other currencies could harm our competitive position relative to other companies. While we periodically employ economic cash flow and fair value hedges to minimize the risks associated with these exchange rate fluctuations, the hedging activities may be ineffective or may not offset more than a portion of the adverse financial impact resulting from currency variations. Accordingly, we cannot provide assurance that fluctuations in the values of the currencies of countries in which we operate will not materially adversely affect our future results of operations.

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We rely on highly skilled personnel in our businesses, and if we are unable to retain or motivate key personnel or hire qualified personnel, we may not be able to effectively operate our business.

Our performance is largely dependent on the talents and efforts of highly skilled individuals. Our future success depends on our continuing ability to identify, hire, develop, motivate and retain skilled personnel for all areas of our organization. We require highly skilled personnel to operate and provide technical services and support for our businesses. Competition for qualified personnel required for our data processing operations and our other businesses has intensified recently. Our growth has presented challenges to us to recruit, train and retain our employees while managing the impact of potential wage inflation and the lack of available qualified labor in some markets where we operate. A well-trained, motivated and adequately-staffed work force has a positive impact on our ability to attract and retain business. Our continued ability to compete effectively depends on our ability to attract new employees and to retain and motivate our existing employees.

Certain of our facilities could be damaged by hurricanes and other natural disasters, which could have an adverse effect on our results of operations and financial condition.

Certain of our facilities are located in regions of the United States that are susceptible to damage from hurricanes and other weather events, and, during 2005, were impacted by hurricanes or other weather events. Our Devices group leases 144,000 square feet of facilities located in Harahan, Louisiana, in the greater New Orleans metropolitan area. In late August 2005, we suspended operations at these facilities and evacuated and locked down the facilities in preparation for Hurricane Katrina. These facilities did not experience flooding or significant damage during or after the hurricane. However, because of employee evacuations, power failures and lack of related support services, utilities and infrastructure in the New Orleans area, we were unable to resume full operations at the facilities until late September 2005. In August 2017, we lost use of our offices located in the Houston metropolitan area for several days, as a result of Hurricane Harvey.

Future hurricanes or similar natural disasters that impact our facilities may negatively affect our financial position and operating results for those periods. These negative effects may include reduced production, product sales and data processing revenues; costs associated with resuming production; reduced orders for our services and products from customers that were similarly affected by these events; lost market share; late deliveries; additional costs to purchase materials and supplies from outside suppliers; uninsured property losses; inadequate business interruption insurance and an inability to retain necessary staff. To the extent that climate change increases the severity of hurricanes and other weather events, as some have suggested, it could worsen the severity of these negative effects on our financial position and operating results.

Our operations, and the operations of our customers, are subject to numerous government regulations, which could adversely limit our operating flexibility. Regulatory initiatives undertaken from time to time, such as restrictions, sanctions and embargoes, can adversely affect, and have adversely affected, our customers and our business.

In addition to the specific regulatory risks discussed elsewhere in this Item 1A. “Risk Factors” section, our operations are subject to other laws, regulations, government policies and product certification requirements worldwide. Changes in such laws, regulations, policies or requirements could affect the demand for our products or services or result in the need to modify our services and products, which may involve substantial costs or delays in sales and could have an adverse effect on our future operating results. Our export activities in particular are subject to extensive and evolving trade regulations. Certain countries (including Russia) are subject to restrictions, sanctions and embargoes imposed by the United States government. These restrictions, sanctions and embargoes also prohibit or limit us from participating in certain business activities in those countries. In addition, our operations are subject to numerous local, state and federal laws and regulations in the United States and in foreign jurisdictions concerning the containment and disposal of hazardous materials, the remediation of contaminated properties, and the protection of the environment. These laws have been changed frequently in the past, and there can be no assurance that future changes will not have a material adverse effect on us. In addition, our customers’ operations are also significantly impacted by laws and regulations concerning the protection of the environment and endangered species. Consequently, changes in governmental regulations applicable to our customers may reduce demand for our services and products. To the extent that our customers’ operations are disrupted by future laws and regulations, our business and results of operations may be materially and adversely affected.

Offshore oil and gas exploration and development recently has been a regulatory focus. Future changes in laws or regulations regarding such activities, and decisions by customers, governmental agencies or other industry participants in response, could reduce demand for our services and products, which could have a negative impact on our financial position, results of operations or cash flows. We cannot reasonably or reliably estimate that such changes will occur, when they will occur, or whether they will impact us. Such changes can occur quickly within a region, which may impact both the affected region and global exploration and production, and we may not be able to respond quickly, or at all, to mitigate these changes. In addition, these future laws and regulations could result in increased compliance costs or additional operating restrictions that may adversely affect the financial health of our customers and decrease the demand for our services and products.

Existing or future laws and regulations related to greenhouse gases and climate change could have a material adverse effect on our business, results of operations, and financial condition.

Changes in environmental requirements related to greenhouse gases and climate change may negatively impact demand for our services. For example, oil and natural gas exploration and production may decline as a result of environmental requirements. Local, state, and federal agencies have been evaluating climate-related legislation and other regulatory initiatives that would restrict emissions of greenhouse gases in areas in which we conduct business. Because our business depends on the level of activity in the oil and natural gas industry, existing or future laws and regulations related to greenhouse gases and climate change, including incentives to conserve energy or use alternative energy sources, could have a negative impact on our business if such laws or regulations reduce demand for oil and natural gas.

We have outsourcing arrangements with third parties to manufacture some of our products. If these third party suppliers fail to deliver quality products or components at reasonable prices on a timely basis, we may alienate some of our customers and our revenues, profitability and cash flow may decline. Additionally, current global economic conditions could have a negative impact on our suppliers, causing a disruption in our vendor supplies. A disruption in vendor supplies may adversely affect our results of operations.

Our manufacturing processes require us to purchase quality components. In addition, we use contract manufacturers as an alternative to our own manufacturing of products. We have outsourced the manufacturing of our products, including our towed marine streamers, geophone manufacturing. Certain components used in our towed marine manufacturing operations are currently provided by a single supplier. Without these sole suppliers, we would be required to find other suppliers who could build these components for us, or set up to make these parts internally. If, in implementing any outsource initiative, we are unable to identify contract manufacturers willing to contract with us on competitive terms and to devote adequate resources to fulfill their obligations to us or if we do not properly manage these relationships, our existing customer relationships may suffer. In addition, by undertaking these activities, we run the risk that the reputation and competitiveness of our services and products may deteriorate as a result of the reduction of our control over quality and delivery schedules. We also may experience supply interruptions, cost escalations and competitive disadvantages if our contract manufacturers fail to develop, implement, or maintain manufacturing methods appropriate for our products and customers.

Reliance on certain suppliers, as well as industry supply conditions, generally involves several risks, including the possibility of a shortage or a lack of availability of key components, increases in component costs and reduced control over delivery schedules. If any of these risks are realized, our revenues, profitability and cash flows may decline. In addition, the more we come to rely on contract manufacturers, we may have fewer personnel resources with expertise to manage problems that may arise from these third-party arrangements.

Additionally, our suppliers could be negatively impacted by current global economic conditions. If certain of our suppliers were to experience significant cash flow issues or become insolvent as a result of such conditions, it could result in a reduction or interruption in supplies to us or a significant increase in the price of such supplies and adversely impact our results of operations and cash flows.

Our business is subject to cybersecurity risks and threats.

Threats to our information technology systems associated with cybersecurity risk and cyber incidents or attacks continue to grow. It is also possible that breaches to our systems could go unnoticed for some period of time. Risks associated with these threats include, among other things, loss of intellectual property, disseminating of highly confidential information, impairment of our ability to conduct our operations, disruption of our customers' operations, loss or damage to our customer data delivery systems, and increased costs to prevent, respond to or mitigate cybersecurity events.

Our certificate of incorporation and bylaws, Delaware law and certain contractual obligations under our agreement with BGP contain provisions that could discourage another company from acquiring us.

Provisions of our certificate of incorporation and bylaws, Delaware law and the terms of our investor rights agreement with BGP may have the effect of discouraging, delaying or preventing a merger or acquisition that our stockholders may consider favorable, including transactions in which you might otherwise receive a premium for shares of our common stock. These provisions include:

- authorizing the issuance of "blank check" preferred stock without any need for action by stockholders;
- providing for a classified board of directors with staggered terms;

- requiring supermajority stockholder voting to effect certain amendments to our certificate of incorporation and bylaws;
- eliminating the ability of stockholders to call special meetings of stockholders;
- prohibiting stockholder action by written consent; and
- establishing advance notice requirements for nominations for election to the board of directors or for proposing matters that can be acted on by stockholders at stockholder meetings.

In addition, the terms of our INOVA Geophysical joint venture with BGP and BGP's investment in our company contain a number of provisions, such as certain pre-emptive rights granted to BGP with respect to certain future issuances of our stock, that could have the effect of discouraging, delaying or preventing a merger or acquisition of our company that our stockholders may otherwise consider to be favorable.

Failure to maintain effective internal controls in accordance with Section 404 of the Sarbanes-Oxley Act could have a material adverse effect on our stock price.

If, in the future, we fail to maintain the adequacy of our internal controls, as such standards are modified, supplemented or amended from time to time, we may not be able to ensure that we can conclude on an ongoing basis that we have effective internal controls over financial reporting in accordance with Section 404 of the Sarbanes-Oxley Act. Failure to achieve and maintain an effective internal control environment could have a material adverse effect on the price of our common stock.

Note: The foregoing factors pursuant to the Private Securities Litigation Reform Act of 1995 should not be construed as exhaustive. In addition to the foregoing, we wish to refer readers to other factors discussed elsewhere in this report as well as other filings and reports with the SEC for a further discussion of risks and uncertainties that could cause actual results to differ materially from those contained in forward-looking statements. We undertake no obligation to publicly release the result of any revisions to any such forward-looking statements, which may be made to reflect the events or circumstances after the date hereof or to reflect the occurrence of unanticipated events.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our principal operating facilities at December 31, 2018 were as follows:

Operating Facilities	Square Footage	Segment
Houston, Texas	210,000	Global Headquarters, E&P Technology & Services and Ocean Bottom Integrated Technologies
Harahan, Louisiana	144,000	Devices group within Operations Optimization
Chertsey, England	18,000	E&P Technology & Services
Edinburgh, Scotland	16,000	Optimization Software & Services group within Operations Optimization
	388,000	

Each of these operating facilities is leased by us under long-term lease agreements. These lease agreements have terms that expire ranging from 2018 to 2030. See Footnote 14 "Operating Leases" of Footnotes to Consolidated Financial Statements.

In addition, we lease offices in Dubai, UAE; Beijing, China; Rio de Janeiro, Brazil; and Moscow, Russia to support our global sales force. We lease offices for our seismic data processing centers in Port Harcourt, Nigeria; Luanda, Angola; Cairo, Egypt; Villahermosa, Mexico; and Rio de Janeiro, Brazil. Our executive headquarters is located at 2105 CityWest Boulevard, Suite 100, Houston, Texas. The machinery, equipment, buildings and other facilities owned and leased by us are considered by our management to be sufficiently maintained and adequate for our current operations.

Item 3. Legal Proceedings

WesternGeco

A more thorough treatment of history of this litigation is set forth above in Item 1.A, "Risk Factors". As noted in that section, in 2014, because a jury found that we infringed four WesternGeco patents, the United States District Court for the Southern District of Texas (the "District Court") entered a Final Judgment against us in the amount of $123.8 million ($12.5 million in reasonable royalties, $93.4 million in lost profits, $10.9 million in pre-judgment interest on lost profits, and $9.4 million in supplemental damages).

In 2015, the United States Court of Appeals for the Federal Circuit in Washington, D.C. (the "Court of Appeals") reversed, in part, the District Court, holding that the lost profits, which were attributable to foreign seismic surveys, were not available to WesternGeco under the Patent Act. We had recorded a loss contingency accrual of $123.8

million because of the District Court's ruling. As a result of the reversal by the Court of Appeals, we reduced the loss contingency accrual to $22.0 million.

On February 26, 2016, WesternGeco appealed the Court of Appeals' decision to the Supreme Court, as to both lost profits and "enhanced" damages (damages which are available for willful infringement, and which neither the District Court nor the Trial Court awarded). On June 20, 2016, the Supreme Court vacated the Court of Appeals' ruling, although it did not address lost profits at that time. Rather, in light of changes in case law regarding the standard of proof for willfulness in patent infringement, the Supreme Court remanded the case to the Court of Appeals for a determination of whether enhanced damages were appropriate.

On November 14, 2016, the District Court ordered our sureties to pay principal and interest on the royalty damages previously awarded. On November 25, 2016, we paid WesternGeco the $20.8 million due pursuant to the order, and reduced our loss contingency accrual to zero.

On March 14, 2017, the District Court held a hearing on whether impose additional damages for willfulness. The Judge found that our infringement was willful, and awarded enhanced damages of $5.0 million to WesternGeco (WesternGeco had sought $43.6 million in such damages.) The District Court also ordered the appeal bond to be released and discharged. The Court's findings and ruling were memorialized in an order issued on May 16, 2017. On June 30, 2017, we and WesternGeco agreed that neither of us would appeal the District Court's award of $5.0 million in enhanced damages. Upon assessment of the enhanced damages, we accrued $5.0 million in the first quarter of 2017. As we have paid the $5.0 million, the accrual has been adjusted, and as of December 31, 2018, the loss contingency accrual was zero.

WesternGeco filed a second petition in the Supreme Court on February 17, 2017, appealing the lost profits issue again. On May 30, 2017, the Supreme Court called for the U.S. Solicitor General's views on whether or not the Supreme Court ought to hear WesternGeco's appeal. On December 6, 2017, the Solicitor General filed its brief, and took the position that the Supreme Court ought to hear the appeal and that foreign lost profits ought to be available. On January 12, 2018, the Supreme Court agreed to hear the appeal. The specific issue before the Supreme Court was whether lost profits arising from use of prohibited combinations occurring outside of the United States are categorically unavailable in cases where patent infringement is proven under 35 U.S.C. § 271(f)(2) (the statute under which we were held to have infringed WesternGeco's patents, and upon which the District Court and Court of Appeals relied in entering their rulings).

The Supreme Court heard oral arguments on April 16, 2018. We argued that the Court of Appeals' decision that eliminated lost profits ought to be affirmed. WesternGeco and the Solicitor General argued that the Court of Appeals' decision that eliminated lost profits ought to be reversed.

On June 22, 2018, the Supreme Court reversed the judgment of the Court of Appeals, held that the award of lost profits to WesternGeco by the District Court was a permissible application of Section 284 of the Patent Act, and remanded the case back to the Court of Appeals for further proceedings consistent with its (the Supreme Court's) opinion. On July 24, 2018, the Supreme Court issued the judgment that returned the case to the Court of Appeals.

On July 27, 2018, the Court of Appeals vacated its September 21, 2016 judgment with respect to damages, and ordered WesternGeco and us to submit supplemental briefing on what relief is appropriate in light of the Supreme Court's decision. We and WesternGeco each submitted briefing in accordance with the Court of Appeals' order (the last brief was filed on September 7, 2018).

We argued in our brief to the Court of Appeals that lost profits were not available to WesternGeco because the jury instructions required them to find that we had been WesternGeco's direct competitor in the survey markets where WesternGeco had lost profits, and that the jury could not have found so. Additionally, we argued that the award of lost profits and reasonable royalties ought to be vacated and retried on separate grounds due to the outcome of an Inter Partes Review ("IPR") filed with the Patent Trial and Appeal Board ("PTAB") of the Patent and Trademark Office. Until the Court of Appeals' January 11, 2019 decision issued (which is described below), the IPR was an administrative proceeding that was separate from the 2009 lawsuit. By means of the IPR, we joined a challenge to the validity of several of WesternGeco's patent claims that another company had filed. While the 2009 lawsuit was pending on appeal, the PTAB invalidated four of the six patent claims that formed the basis for the lawsuit judgment against us. WesternGeco appealed the PTAB's invalidation of its patents to the Court of Appeals. On May 7, 2018, the Court of Appeals affirmed the PTAB's invalidation of the patents, and on July 16, 2018, the Court of Appeals denied WesternGeco's petition for a rehearing. On December 13, 2018, WesternGeco filed a petition with the Supreme Court,

arguing that the Court of Appeals ought to have overturned the decision of the PTAB. (As of February 7, 2019, the Supreme Court has not indicated whether it will, or will not, hear WesternGeco's appeal.)

In the same brief to the Court of Appeals in which we made our "direct competitor" argument, we argued that the Court of Appeals' affirmation of the PTAB's decision precluded WesternGeco's damages claims, and that the Court of Appeals should order a new trial as to the royalty damages already paid by us. We also argued that if the Court of Appeals did not find our "direct competitor" argument persuasive, the Court should nonetheless vacate the District Court's award of royalty damages and lost profits damages and order a new trial as to both royalty damages and lost profits.

In its briefs to the Court of Appeals, WesternGeco argued that the only remaining issue was whether lost profits were unavailable to WesternGeco due to our "direct competitor" argument, and argued that the invalidation of four of its six patent claims by the PTAB (which was affirmed by the Court of Appeals) should have no effect on lost profits or on the royalty award already paid by us. WesternGeco also argued that lost profits should be available notwithstanding our "direct competitor" argument.

Oral arguments took place on November 16, 2018, and on January 11, 2019, the Court of Appeals issued its ruling. In its ruling, the Court of Appeals refused to disturb the award of reasonable royalties to WesternGeco (which we paid in 2016), and rejected our "direct competitor" argument, but vacated the District Court's award of lost profits damages and remanded the case back to the District Court to determine whether to hold a new trial as to lost profits. The Court of Appeals also ruled that its affirmance of the PTAB's decision eliminated four of the five patent claims that could have supported the award of lost profits, leaving only one remaining patent claim that could support an award of lost profits.

The Court of Appeals further held that the lost profits award can be reinstated by the District Court if the existing trial record establishes that the jury must have found that the technology covered by the one remaining patent claim was essential for performing the surveys upon which lost profits were based. To make such a finding, the District Court must conclude that the present trial record establishes that there was no dispute that the technology covered by the one remaining patent claim, independent of the technology of the now-invalid claims, was required to perform the surveys. The Court of Appeals ruling further provides that if, but only if, the District Court concludes that WesternGeco established at trial, with undisputed evidence, that the remaining claim covers technology that was necessary to perform the surveys, then the District Court may deny a new trial and reinstate lost profits.

We may not ultimately prevail in the litigation and we could be required to pay some or all of the lost profits that were awarded by the District Court, plus interest, if the District Court denies a new trial on lost profits, or if a new trial is granted and a new judgment issues. Our assessment that we do not have a loss contingency may change in the future due to developments at the Supreme Court, Court of Appeals, or District Court, and other events, such as changes in applicable law, and such reassessment could lead to the determination that a significant loss contingency is probable, which could have a material effect on the Company's business, financial condition and results of operations. The Company's assessments disclosed in this Annual Report on Form 10-K or elsewhere are based on currently available information and involve elements of judgment and significant uncertainties.

Other Litigation

We have been named in various other lawsuits or threatened actions that are incidental to our ordinary business. Litigation is inherently unpredictable. Any claims against us, whether meritorious or not, could be time-consuming, cause us to incur costs and expenses, require significant amounts of management time and result in the diversion of significant operational resources. The results of these lawsuits and actions cannot be predicted with certainty. We currently believe that the ultimate resolution of these matters will not have a material adverse effect on our financial condition or results of operations.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Our common stock trades on the New York Stock Exchange ("NYSE") under the symbol "IO."

We have not historically paid, and do not intend to pay in the foreseeable future, cash dividends on our common stock. We presently intend to retain cash from operations for use in our business, with any future decision to pay cash dividends on our common stock dependent upon our growth, profitability, financial condition and other factors our board of directors consider relevant.

The terms of our Credit Facility contain covenants that restrict us from paying cash dividends on our common stock, or repurchasing or acquiring shares of our common stock, unless (i) there is no event of default under the Credit Facility, (ii) there is excess availability under the Credit Facility greater than $20.0 million (or, at the time that the borrowing base formula amount is less than $20.0 million, the borrowers' level of liquidity (as defined in the Credit Facility) is greater than $20.0 million) and (iii) the agent receives satisfactory projections showing that excess availability under the Credit Facility for the immediately following period of ninety (90) consecutive days will not be less than $20.0 million (or, at the time that the borrowing base formula amount is less than $20.0 million, the borrowers' level of liquidity is greater than $20.0 million). The aggregate amount of permitted cash dividends and stock repurchases may not exceed $10.0 million in any fiscal year or $40.0 million in the aggregate from and after the closing date of the Credit Facility.

The indenture governing the Second Lien Notes contains certain covenants that, among other things, limit our ability to pay certain dividends or distributions on our common stock or purchase, redeem or retire shares of our common stock, unless (i) no default under the indenture has occurred or would occur as a result of that payment, (ii) we would have, after giving pro forma effect to the payment, been permitted to incur at least $1.00 of additional indebtedness under a fixed charge coverage ratio test under the indenture, and (iii) the total cumulative amount of all such payments would not exceed a sum calculated by reference to, among other items, our consolidated net income, proceeds from certain sales of equity or assets, certain conversions or exchanges of debt for equity and certain other reductions in our indebtedness and in aggregate not to exceed at any one time $25.0 million.

On December 31, 2018, there were 567 holders of record of our common stock.

On November 30, 2018, the Company's stockholders approved certain amendments to the Company's Second Amended and Restated 2013 Long-term Incentive Plan (the "2013 LTIP") including increasing the total number of shares of common stock available for issuance under the 2013 LTIP by 1.2 million shares, for a total of approximately 1.7 million shares, eliminating the restriction on the number of shares in the 2013 LTIP that can be issued as full value awards and certain other technical updates and clarifications related to Section 162(m) of the internal revenue code, as amended.

On February 21, 2018, in connection with the Public Equity Offering (as described in Footnote 12 "Stockholders' Equity and Stock-based Compensation" of Footnotes to the Consolidated Financial Statements), we issued and sold 1,820,000 shares of common stock at a public offering price of $27.50 per share, and warrants to purchase an additional 1,820,000 shares of the Company's common stock. The net proceeds from this offering were $47.0 million, including transaction expenses. A portion of the net proceeds were used to retire the Company's $28.5 million Third Lien Notes in March 2018 (several weeks before their maturity date). The warrants have an exercise price of $33.60 per share, are immediately exercisable and currently expire on March 21, 2019.

On December 14, 2017, in connection with the Equity Investment Program (as described in Footnote 12 "Stockholders' Equity and Stock-based Compensation" of Footnotes to the Consolidated Financial Statements), we sold, in a private placement under Section 4(a)(2) of the Securities Act of 1933, as amended, 120,567 shares of our common stock at $13.05 per share (the closing price of the our common stock on the NYSE on such date).

Item 6. Selected Financial Data

Special Items Affecting Comparability

The selected consolidated financial data set forth below under "Historical Selected Financial Data" with respect to our consolidated statements of operations for 2018, 2017, 2016, 2015 and 2014, and with respect to our consolidated balance sheets at December 31, 2018, 2017, 2016, 2015 and 2014, have been derived from our audited consolidated

financial statements.

Our results of operations and financial condition have been affected by restructuring activities, legal contingencies, dispositions, debt refinancing and impairments and write-downs of assets during the periods presented, which affect the comparability of the financial information shown. In particular, our results of operations for the fiscal years ended December 31, 2014 – 2018 time period were impacted by the following items (before tax):

	Years Ended December 31,				
	2018	2017	2016	2015	2014
	(In thousands)				
Cost of sales:					
Write-down of multi-client data library	$—	$(2,304)	$—	$(399)	$(100,100)
Write-down of excess and obsolete inventory	$(665)	$(398)	$(429)	$(151)	$(6,952)
Operating expenses:					
Impairment of long-lived assets	$(36,553)	$—	$—	$—	$(23,284)
Write-down of receivables	$—	$—	$—	$—	$(8,214)
Accelerated vesting and cash exercise of stock appreciation right awards	$(2,105)	$(6,141)	$—	$—	$—
Other income (expense):					
Reversal of (accrual for) loss contingency related to legal proceedings	$—	$(5,000)	$1,168	$101,978	$69,557
Gain on sale of Source product line	$—	$—	$—	$—	$6,522
Gain on sale of cost method investments	$—	$—	$—	$—	$5,463
Recovery of INOVA bad debts	$—	$844	$3,983	$—	$—
Loss on bond exchange	$—	$—	$(2,182)	$—	$—
Equity in losses of INOVA investments	$—	$—	$—	$—	$(49,485)

The historical selected financial data shown below should not be considered as being indicative of future operations, and should be read in conjunction with Item 7. “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and the consolidated financial statements and the notes thereto included elsewhere in this Form 10-K.

Historical Selected Financial Data

	Years Ended December 31,				
	2018	2017	2016	2015	2014
	(In thousands, except for per share data)				
Statement of Operations Data:					
Net revenues	$180,045	$197,554	$172,808	$221,513	$509,558
Gross profit	59,620	75,639	36,032	8,003	62,223
Loss from operations	(54,272)	(8,699)	(43,171)	(100,632)	(117,929)
Net loss applicable to common shares	(71,171)	(30,242)	(65,148)	(25,122)	(128,252)
Net loss per basic share	$(5.20)	$(2.55)	$(5.71)	$(2.29)	$(11.72)
Net loss per diluted share	$(5.20)	$(2.55)	$(5.71)	$(2.29)	$(11.72)
Weighted average number of common shares outstanding	13,692	11,876	11,400	10,957	10,939
Weighted average number of diluted shares outstanding	13,692	11,876	11,400	10,957	10,939
Balance Sheet Data (end of year):					
Working capital	$20,105	$(8,628)[(a)]	$16,555	$93,160	$222,099
Total assets	244,749	301,069	313,216	435,088	617,257
Long-term debt [(b)]	121,741	156,744	158,790	182,992	190,594
Total equity	7,824	30,806	53,398	112,040	135,712
Other Data:					
Investment in multi-client data library	$28,276	$23,710	$14,884	$45,558	$67,785
Capital expenditures	1,514	1,063	1,488	19,241	8,264
Depreciation and amortization (other than multi-client data library)	8,763	16,592	21,975	26,527	27,656
Amortization of multi-client data library	48,988	47,102	33,335	35,784	64,374

(a) Working capital at December 31, 2017 is negative due to $28.5 million of Third Lien Notes (redeemed March 26, 2018) being reclassified from long-term to current.

(b) Includes current maturities of long-term debt.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

Note: The following should be read in conjunction with our Consolidated Financial Statements and related Footnotes to Consolidated Financial Statements that appear elsewhere in this Annual Report on Form 10-K. References to "Footnotes" in the discussion below refer to the numbered Footnotes to Consolidated Financial Statements.

Executive Summary

Our Business

The terms "we," "us" and similar or derivative terms refer to ION Geophysical Corporation and its consolidated subsidiaries, except where the context otherwise requires or as otherwise indicated.

We have been a technology leader for 50 years with a strong history of innovation. While the traditional focus of our cutting-edge technology has been on the E&P industry, we are now broadening and diversifying our business into relevant adjacent markets such as offshore logistics, military and marine robotics.

Leveraging innovative technologies, we create value through data capture, analysis and optimization to enhance companies' critical decision-making abilities and returns. Our E&P offerings are focused on improving decision-making, enhancing reservoir management and optimizing offshore operations. We provide our services and products through three business segments – E&P Technology & Services, Operations Optimization and Ocean Bottom Integrated Technologies.

For a full discussion of our business, see Part I, Item 1. "Business."

Macroeconomic Conditions

Demand for our services and products is cyclical and dependent upon activity levels in the oil and gas industry, particularly our customers' willingness to invest capital in the exploration for oil and natural gas. Our customers' capital spending programs are generally based on their outlook for near-term and long-term commodity prices, economic growth, commodity demand and estimates of resource production. Third-party reports now indicate that global exploration and production spending is expected to increase by 8% in 2019, consistent with 8% in 2018 and up from the 4% growth of 2017. This is an improvement from the double-digit declines sustained from 2014 to 2016. In addition, this is the second consecutive year that international spending is expected to increase, where our offerings are more relevant.

Shale production has dominated activity during the downturn due to its competitive break-even prices and short payback period compared to conventional exploration. However, we believe that investment in conventional resources during the next decade will be required to meet longer-term demand. We're starting to see increasing pressure for a resumption in offshore investment and exploration activity to replace reserves.

The following is a summary of recent oil and gas pricing trends:

	Brent Crude (per bbl)		West Texas Intermediate Crude (per bbl)		Henry Hub Natural Gas (per mcf)	
Quarter ended	High	Low	High	Low	High	Low
12/31/2018	$86.07	$50.57	$76.40	$44.48	$4.70	$3.10
9/30/2018	$82.72	$68.38	$74.19	$65.07	$3.12	$2.73
6/30/2018	$80.42	$66.04	$77.41	$62.03	$3.08	$2.74
3/31/2018	$71.08	$61.94	$66.27	$59.20	$6.24	$2.49
12/31/2017	$66.80	$55.29	$60.46	$49.34	$3.69	$2.60
9/30/2017	$59.77	$46.47	$52.14	$44.25	$3.18	$2.76
6/30/2017	$55.05	$43.98	$53.38	$42.48	$3.27	$2.85
3/31/2017	$56.34	$49.56	$54.48	$47.00	$3.71	$2.44

Source: EIA.

Crude oil prices can be volatile due to a number of factors. Significant downward price volatility in Brent crude oil began late in 2014 and reached a low average of $33 per barrel in early 2016 before improving to approximately $55 per barrel by the end of 2016. The prices for Brent crude oil increased to an average of $71 per barrel for the full year 2018. This represents an $18 per barrel improvement over the average crude oil prices for the full year 2017 of $53.

This price increase was due to robust global demand and sustained OPEC production cuts, the combination of which resulted in net inventory crude draws that reduced the overall crude surplus. Daily Brent crude oil spot prices reached a peak of $86 per barrel in October 2018, which was the highest level since October 2014, before falling to nearly $50 per barrel before the end of 2018. The price decrease in the latter part of 2018 reflected global oil inventory builds and record levels of production from the world’s three largest

producers - United States, Saudi Arabia and Russia. The EIA forecasts the Brent crude oil spot price will average $61 per barrel in 2019, $11 per barrel lower than 2018, resulting from concerns of oversupply and slower than expected pace of oil demand growth. In December 2018, OPEC and other non-OPEC participants such as Russia reached an agreement to cut their oil production for six months beginning January 2019 in response to increasing evidence that the global crude oil market could become oversupplied in 2019. This production cut is expected to keep global crude oil supply and demand in equilibrium, stabilizing prices. E&P spending is expected to increase over the near-term as crude oil prices are forecasted to remain more stable. In 2018, Mexico's new President has announced that the Mexican government will not offer any new license rounds for the next three years while assuring that existing contracts will not be cancelled. In the medium-term, global crude oil demand is expected to continue growing while the oil & gas industry is predicted to face a supply crunch due to unsustainably low levels of exploration investments. As a result, E&P companies are expected to increase their focus on offshore oil exploration to replenish reserves.

Given the historical volatility of crude prices, there is a continued risk that if prices do not continue to improve, or if they start to decline again due to high levels of crude oil production, there is a potential for slowing growth rates in various global regions and/or for ongoing supply/demand imbalances. If commodity prices do not continue to improve, or if they start to deteriorate again, demand for our services and products could decline.

Impact to Our Business

While our 2018 revenues were down compared to 2017, we are seeing signs of increasing activity in our business, primarily due to the strategic shift we made to move our offerings closer to the reservoir and the associated continued success of our 3-D multi-client programs as well as clients starting to renew interest in conventional reserve replacement and offshore exploration. Historically, our revenue and EBITDA generation is lower in the first part of the year as customers tend to set budgets in the first quarter, firm up plans through the year, and spend excess budget in the fourth quarter. Investments in our multi-client data library are dependent upon the timing of our New Venture projects and the availability of underwriting by our customers. We continue to maintain high standards for underwriting new projects. Our asset light strategy enables us to scale our business to market conditions avoiding significant fixed costs and maintaining flexibility to manage the timing and amount of our capital expenditures.

In our E&P Technology & Services segment, our New Venture revenues experienced significant declines compared to 2017. In the current disciplined spending environment, many clients wait to purchase data associated with a license round until a formal public announcement has been made by the government. Delays in license round announcements can materially impact the timing of sales in areas where our New Venture programs are underway. Our under performance was driven by the continued delay of the Panama license round announcement, the three-year moratorium on new upstream licensing in Mexico and the continued focus on cash preservation within E&P companies restricting exploration spending. Imaging Services revenues increased as a result of an increase in proprietary ocean bottom nodal imaging projects. Our data library sales increased in 2018 compared to 2017 due to sales of the recently completed phase of the Mexico and Brazil reimaging programs, along with sales of 2-D data libraries in Libya. We invested $28.3 million in our multi-client data library during 2018, approximately $4.6 million and $13.4 million more compared to 2017 and 2016, respectively.

At December 31, 2018, our E&P Technology & Services segment backlog, which consists of commitments for (i) data processing work, (ii) New Venture projects (both multi-client and proprietary) by our Ventures group underwritten by our customers and (iii) E&P Advisors projects, decreased 44% to $21.9 million, compared with $39.2 million at December 31, 2017. The majority of our backlog relates to our 3-D multi-client reimaging programs offshore Brazil and our proprietary Imaging Services and E&P Advisors work. We anticipate that the majority of our backlog will be recognized as revenue over the first half of 2019.

Within the Operations Optimization segment, the increase in Optimization Software & Services revenues was due to continued increase in sales of our Gator ocean bottom command and control system. Devices revenues continue to be impacted by reduced towed streamer seismic contractor activity and cash preservation focus.

We have continued to evolve our strategy for our Ocean Bottom Integrated Technologies segment consistent with our asset light business model. The remaining elements of our next generation ocean bottom nodal system, 4Sea, will be commercialized in 2019. We are offering 4Sea components more broadly to the growing number of OBS service providers under recurring revenue commercial strategies that will enable us to share in the value our technology

delivers. We may also license the right to manufacture and use the fully integrated system to a service provider on a value-based pricing model, such as a royalty stream. Such licensing would be recognized through the relevant segment, either E&P Technology & Services or Operations Optimization. While not our primary route to market, we continue to evaluate acquisition projects on a case-by-case basis that meet our long-term risk and return thresholds. In 2018, we recognized a write down of $36.6 million for our cable-based ocean bottom acquisition technologies. We continue to see significant long-term potential for our technologies to improve OBS safety, efficiency and data quality, and we expect demand for OBS surveys to continue increasing.

It is our view that technologies that add a competitive advantage through improved imaging, lower costs, higher productivity, or enhanced safety will continue to be valued in our marketplace. We believe that our newest technologies, such as Marlin and 4Sea, will continue to attract customer interest, because these technologies are designed to deliver those desirable attributes.

Key Financial Metrics

The tables below provide (i) a summary of our net revenues for our company as a whole, and by segment, for 2018, 2017 and 2016, and (ii) an overview of other certain key financial metrics for our company as a whole and our three business segments on a comparative basis for 2018, 2017 and 2016, as reported and as adjusted in all three years for the special items recorded for those years.

	Years Ended December 31,		
	2018	2017	2016
	(In thousands)		
Net revenues:			
E&P Technology & Services:			
New Venture	$69,685	$100,824	$27,362
Data Library	47,095	40,016	39,989
Total multi-client revenues	116,780	140,840	67,351
Imaging Services	19,740	16,409	25,538
Total	$136,520	$157,249	$92,889
Operations Optimization:			
Devices	$22,396	$23,610	$26,746
Optimization Software & Services	21,129	16,695	16,756
Total	$43,525	$40,305	$43,502
Ocean Bottom Integrated Technologies	$—	$—	$36,417
Total	$180,045	$197,554	$172,808

	Year Ended December 31, 2018			Year Ended December 31, 2017			Year Ended December 31, 201		
	As Reported	Special Items	As Adjusted	As Reported	Special Items	As Adjusted	As Reported	Special Items	As A
	(In thousands, except per share data)								
Gross profit:									
E&P Technology & Services	$43,369	$—	$43,369	$65,196	$—	$65,196	$4,708	$766	$5,4
Operations Optimization	22,293	—	22,293	20,076	—	20,076	21,745	188	21,9
Ocean Bottom Integrated Technologies	(6,042)	—	(6,042)	(9,633)	—	(9,633)	9,579	123	9,70
Total	$59,620	$—	$59,620	$75,639	$—	$75,639	$36,032	$1,077 [(d)]	$37,
Gross margin:									
E&P Technology & Services	32 %	— %	32 %	41 %	— %	41 %	5 %	1 %	6
Operations Optimization	51 %	— %	51 %	50 %	— %	50 %	50 %	— %	50
Ocean Bottom Integrated Technologies	— %	— %	— %	— %	— %	— %	27 %	— %	27
Total	33 %	— %	33 %	38 %	— %	38 %	21 %	— %	21
Income (loss) from operations:									
E&P Technology & Services	$21,758	$—	$21,758	$42,505	$—	$42,505	$(16,446)	$1,128	$(15
Operations Optimization	7,295	—	7,295	8,022	—	8,022	9,652	197	9,84
Ocean Bottom Integrated Technologies	(47,644)	36,553 [(a)]	(11,091)	(16,259)	—	(16,259)	(1,756)	504	(1,25
Support and other	(35,681)	2,105 [(b)]	(33,576)	(42,967)	6,141 [(b)]	(36,826)	(34,621)	180	(34,4
Total	$(54,272)	$38,658	$(15,614)	$(8,699)	$6,141	$(2,558)	$(43,171)	$2,009 [(d)]	$(41
Operating margin:									
E&P Technology & Services	16 %	— %	16 %	27 %	— %	27 %	(18)%	2 %	(16
Operations Optimization	17 %	— %	17 %	20 %	— %	20 %	22 %	1 %	23
	— %	— %	— %	— %	— %	— %	(5)%	2 %	(3

| | | |

(a) Represents a write-down of the cable-based ocean bottom acquisition technologies.

(b) Represents accelerated vesting and cash exercise of stock appreciation right awards.

(c) In addition to item (b), also impacting net loss applicable to common shares was a loss contingency accrual of $5.0 million related to legal proceedings.

(d) Represents severance and facility charges related to the Company’s 2016 restructuring.

(e) Represents a $3.9 million recovery of INOVA bad debts, partially offset by item (d).

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We intend that the following discussion of our financial condition and results of operations will provide information that will assist in understanding our consolidated financial statements, the changes in certain key items in those financial statements from year to year, and the primary factors that accounted for those changes.

For a discussion of factors that could impact our future operating results and financial condition, see Item 1A. “Risk Factors” above.

Results of Operations

Year Ended December 31, 2018 (As Adjusted) Compared to Year Ended December 31, 2017 (As Adjusted)

Our total net revenues of $180.0 million for 2018 decreased $17.6 million, or 9%, compared to total net revenues of $197.6 million for 2017. Our overall gross profit percentage for 2018 was 33%, compared to a gross profit percentage of 38% for 2017. Total operating expenses as a percentage of total net revenues for 2018 and 2017 were 42% and 40%, as adjusted, respectively. During 2018, our loss from operations was $15.6 million, as adjusted, compared to a loss of $2.6 million, as adjusted, for 2017.

Our net loss for 2018 was $32.5 million, as adjusted, or $(2.37) per share, compared to net loss of $19.1 million, as adjusted, or $(1.61) per share for 2017. As noted above, our net loss for 2018 and 2017 included other special items totaling $38.7 million and $11.1 million, respectively, impacting our loss per share by $2.83 and $0.94, respectively.

Net Revenues, Gross Profits and Gross Margins

E&P Technology & Services — Net revenues for 2018 decreased by $20.7 million, or 13%, to $136.5 million, compared to $157.2 million for 2017. Within the E&P Technology & Services segment, total multi-client revenues were $116.8 million, a decrease of 17%, with New Venture revenues experiencing significant declines during 2018. Partially offsetting the overall decline in New Venture revenues was an increase in Data Library revenues, attributable to sales of the recently completed phases of the Brazil and Mexico reimaging programs, along with sales of 2-D data libraries in Libya. The decrease in multi-client revenues was driven by the continued delay of the Panama license round announcement, the deferment of new E&P investments in Mexico and the continued focus on cash preservation within E&P companies restricting exploration spending. Imaging Services revenues were $19.7 million, a 20% increase, due to an increase in proprietary ocean bottom nodal imaging projects.

Gross profit decreased by $21.8 million to $43.4 million, representing a 32% gross margin, compared to $65.2 million, or 41% gross margin, for 2017. The decline in gross profit and margin were due to the decrease in New Venture revenues partly offset by the increases in Data Library and Imaging Services revenues, as noted above.

Operations Optimization — Net revenues for 2018 increased by $3.2 million, or 8%, to $43.5 million, compared to $40.3 million for 2017. Optimization Software & Services net revenues increased by $4.4 million, or 26%, to $21.1 million, compared to $16.7 million for 2017 due to increase in sales of our Gator ocean bottom command and control system. Devices revenues for 2018 decreased by $1.2 million, or 5%, to $22.4 million, compared to $23.6 million for 2017. This decrease was due to a decline in our repairs business due to seismic contractors focus on cash preservation and decrease in sales of our various product offerings. Operations Optimization gross profit for 2018 increased by $2.2 million to $22.3 million, in 2018, compared to $20.1 million, for 2017. Gross margin increased to 51% in 2018 from 50% in 2017.

Ocean Bottom Integrated Technologies — Net revenues for both 2018 and 2017 were zero. In line with our component strategy, revenues for the elements of fully integrated 4Sea system will be recognized in the relevant segment, either E&P Technology & Services or Operations Optimization. Gross loss was $6.0 million for 2018 compared to gross loss of $9.6 million for 2017. This decline was due to reduced depreciation expense as some assets were fully depreciated in late 2017 and early 2018.

Operating Expenses (As Adjusted)

The following table presents the “As Adjusted” in both 2018 and 2017, excluding other special items (in thousands):

	Year Ended December 31, 2018			Year Ended December 31, 2017		
	As Reported	Special Items	As Adjusted	As Reported	Special Items	As Adjusted
Operating expenses:						
Research, development and engineering	$18,182	$—	$18,182	$16,431	$—	$16,431
Marketing and sales	21,793	—	21,793	20,778	—	20,778
General, administrative and other operating expenses	37,364	(2,105)[a]	35,259	47,129	(6,141)[a]	40,988
Impairment of long-lived assets	36,553	(36,553)[b]	—	—	—	—
Total operating expenses	$113,892	$(38,658)	$75,234	$84,338	$(6,141)	$78,197

[a] Represents accelerated vesting and cash exercise of stock appreciation rights awards.

[b] Represents a write-down of the cable-based ocean bottom acquisition technologies.

Research, Development and Engineering — Research, development and engineering expense increased $1.8 million, or 11%, to $18.2 million, for 2018, compared to $16.4 million, for 2017. Increase is primarily driven by increased employment costs as we continue to invest in imaging algorithms and infrastructure, devices and software. We see significant long-term potential for investing in technologies that improve image quality, safety and productivity.

Marketing and Sales — Marketing and sales expense increased $1.0 million, or 5%, to $21.8 million, for 2018, compared to $20.8 million, for 2017. This increase was primarily due to increased marketing expenses to broaden and diversify our offerings into adjacent markets including consulting fees, partly offset by decrease in commission expense.

General, Administrative and Other Operating Expenses — General, administrative and other operating expenses decreased $5.7 million, or 14%, to $35.3 million, as adjusted, for 2018 compared to $41.0 million, as adjusted, for 2017. The decrease was driven by reductions in bonus expense due to current operating results.

Other Items

Interest Expense, net — Interest expense, net, of $13.0 million for 2018 compared to $16.7 million for 2017. The decrease in interest expense was a result of lower outstanding debt during 2018. For additional information, please refer to "— Liquidity and Capital Resources — Sources of Capital" below.

Other Expense — Other expense for 2018 was $0.4 million compared to other expense of $3.9 million for 2017. The difference primarily relates to changes in our accrual for loss contingency related to the WesternGeco legal proceedings. See further discussion at Footnote 8 "Legal Matters" and in Part 1, Item 3, "Legal Proceedings."

The following table reflects the significant items of other income (in thousands):

	Years Ended December 31,	
	2018	2017
Accrual for contingency related to legal proceedings (Footnote 8)	$—	$(5,000)
Recovery of INOVA bad debts	—	844
Other income (expense)	(436)	211
Total other income (expense)	$(436)	$(3,945)

Income Tax Expense — Income tax expense for 2018 was $2.7 million compared to less than $0.1 million for 2017. Our effective tax rates for 2018 and 2017 were 4.0% and 0.1%, respectively. The income tax expense for 2018 and 2017 primarily relates to profits generated by our non-U.S. businesses. Tax expense for 2018 and 2017 includes a $0.3 million and $1.3 million, respectively tax benefit for the release of the valuation allowance against refundable U.S. alternative minimum tax ("AMT") credits. Tax expense has not been offset by the tax benefits on losses within the U.S. and other jurisdictions, from which we cannot currently benefit. Our effective tax rate for 2018 was negatively impacted by the change in valuation allowance related to U.S. operating losses for which we cannot currently recognize a tax benefit. See further discussion of establishment of the deferred tax valuation allowance at Footnote 7 "Income Taxes" of Footnotes to Consolidated Financial Statements.

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Results of Operations

Year Ended December 31, 2017 (As Adjusted) Compared to Year Ended December 31, 2016 (As Adjusted)

Our total net revenues of $197.6 million for 2017 increased $24.8 million, or 14%, compared to total net revenues of $172.8 million for 2016. Our overall gross profit percentage for 2017 was 38%, compared to a gross profit percentage of 21%, as adjusted, for 2016. Total operating expenses as a percentage of net revenues for 2017 and 2016 were 40% and 45%, as adjusted, respectively. During 2017, our loss from operations was $2.6 million, as adjusted, compared to a loss of $41.2 million, as adjusted, for 2016.

Our net loss for 2017 was $19.1 million, as adjusted, or $(1.61) per share, compared to net loss of $66.1 million, as adjusted, or $(5.80) per share for 2016. As noted above, our net loss for 2017 and 2016 included restructuring charges and other special items totaling $11.1 million and $(1.0) million, respectively, impacting our earnings per share by $0.94 and $(0.09), respectively.

Net Revenues, Gross Profits and Gross Margins (As Adjusted for 2016)

E&P Technology & Services — Net revenues for 2017 increased by $64.4 million, or 69%, to $157.2 million, compared to $92.9 million for 2016. Within the E&P Technology & Services, total multi-client revenues were $140.8 million, an increase of 109%, driven by New Venture revenues from our 3-D multi-client reimaging programs offshore Mexico and Brazil, as well as revenues from a new 2-D multi-client program in Panama and other programs that have recently been launched. Imaging Services revenues were $16.4 million, a decrease of 36%, as result of the shift towards higher return multi-client programs during 2017. Revenues from Data Library sales were consistent year over year.

Gross profit increased by $59.7 million to $65.2 million, representing a 41% gross margin, compared to $5.5 million, as adjusted, or 6% gross margin, for 2016. These improvements in gross profit and margin were due to the increase in revenues and the mix of higher margin 3-D reimaging programs as noted above, as well as the full benefit of our cost control initiatives implemented in prior years. These increases were partially offset by higher sales-based amortization of our multi-client data library.

Operations Optimization — Net revenues for 2017 decreased by $3.2 million or 7% to $40.3 million compared to $43.5 million for 2016. Devices net revenues for 2017 decreased by $3.1 million, or 12%, to $23.6 million, compared to $26.7 million for 2016. This decrease was due to a decline in our repairs business, partially offset by sales of new product offerings during 2017. Optimization Software & Services net revenues remained flat at $16.7 million. Excluding the effect of foreign currencies, Optimization Software & Services revenues were up 4% in terms of local GBP currency. Operations Optimization gross profit for 2017 decreased by $1.9 million to $20.0 million, in 2017, compared to $21.9 million, as adjusted, for 2016. Gross margin remained flat at 50%.

Ocean Bottom Integrated Technologies — Net revenues for 2017 were zero compared to $36.4 million for 2016. The crew was idle throughout 2017 as we pursued additional OBS work. Gross loss was $9.6 million for 2017 compared to gross income of $9.7 million, as adjusted, for 2016. This decline was due to the decrease in revenues, partially offset by several cost control initiatives implemented in 2017, including the renegotiation of our vessel leases, which reduced our vessel lease costs.

Operating Expenses (As Adjusted)

The following table presents the “As Adjusted” in both 2017 and 2016, excluding other special items (in thousands):

	Year Ended December 31, 2017			Year Ended December 31, 2016		
	As Reported	Special Items[b]	As Adjusted	As Reported	Special Items[a]	As Adjusted
Operating expenses:						
Research, development and engineering	$16,431	$—	$16,431	$17,833	$(397)	$17,436
Marketing and sales	20,778	—	20,778	17,371	(262)	17,109
General, administrative and other operating expenses	47,129	(6,141)	40,988	43,999	(273)	43,726
Total operating expenses	$84,338	$(6,141)	$78,197	$79,203	$(932)	$78,271
Income (loss) from operations	$(8,699)	$6,141	$(2,558)	$(43,171)	$2,009	$(41,162)

[a] Includes severance affecting operating expenses.

[b] Represents accelerated vesting and cash exercise of stock appreciation rights awards.

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Research, Development and Engineering — Research, development and engineering expense decreased $1.0 million, or 6%, to $16.4 million, for 2017, compared to $17.4 million, as adjusted, for 2016. During the current down-cycle in E&P exploration spending, we have been selective in spending on research and development ("R&D") projects in order to reduce expenses without sacrificing our ability to develop our technologies. As discussed above, despite the extended market downturn and uncertainty, we see significant long-term potential for our technologies to improve OBS productivity. We continue to invest in our 4Sea system and we expect long-term demand for OBS production surveys (4-D) to increase.

Marketing and Sales —Marketing and sales expense increased $3.7 million, or 22%, to $20.8 million, for 2017, compared to $17.1 million, as adjusted, for 2016. This increase was primarily due to higher commissions driven by increased sales in the E&P Technology & Services segment.

General, Administrative and Other Operating Expenses — General, administrative and other operating expenses decreased $2.7 million, as adjusted, or 6%, to $41.0 million, as adjusted for 2017 compared to $43.7 million, as adjusted, for 2016. This decrease for 2017 was primarily due to the full benefit of our cost control initiatives implemented in prior years.

Other Items

Interest Expense, net — Interest expense, net, of $16.7 million for 2017 compared to $18.5 million for 2016. This improvement was primarily due to reduced debt caused by the bond exchange during 2016. For additional information, please refer to "— Liquidity and Capital Resources — Sources of Capital" below.

Other Income (Expense) — Other income (expense) for 2017 was $(3.9) million compared to other income of $1.4 million for 2016. The difference primarily relates to changes in our accrual for loss contingency related to a legal matter. See further discussion at Footnote 8 "Legal Matters" and in Part 1, Item 3, "Legal Proceedings."

The following table reflects the significant items of other income (in thousands):

	Years Ended December 31,	
	2017	2016
Reduction of (accrual for) loss contingency related to legal proceedings (Footnote 8)	$ (5,000)	$ 1,168
Recovery of INOVA bad debts	844	3,983
Loss on bond exchange	—	(2,182)
Other expense	211	(1,619)
Total other income	$ (3,945)	$ 1,350

Income Tax Expense — Income tax expense for 2017 was less than $0.1 million compared to $4.4 million for 2016. Our effective tax rates for 2017 and 2016 were (0.1)% and (7.3)%, respectively. The income tax expense for 2017 and 2016 primarily relates to results generated by our non-U.S. businesses. Tax expense for 2017 includes a $1.3 million tax benefit for the release of the valuation allowance against refundable U.S. alternative minimum tax ("AMT") credits. Tax expense has not been offset by the tax benefits on losses within the U.S. and other jurisdictions, from which we cannot currently benefit. Our effective tax rate for 2017 was negatively impacted by the change in valuation allowance related to U.S. operating losses for which we cannot currently recognize a tax benefit. See further discussion of establishment of the deferred tax valuation allowance at Footnote 7 "Income Taxes" of Footnotes to Consolidated Financial Statements.

Liquidity and Capital Resources

Sources of Capital

As of December 31, 2018, we had total liquidity of $75.5 million, consisting of $33.6 million in cash on hand and $41.9 million of available borrowing capacity under the Credit Facility. Our cash requirements include working capital requirements and cash required for our debt service payments, multi-client seismic data acquisition activities

and capital expenditures. As of December 31, 2018, we had working capital of $20.1 million. Working capital requirements are primarily driven by our investment in our (i) multi-client data library ($28.3 million in 2018) and royalty payments for multi-client sales. Also, our headcount has traditionally been a significant driver of our working capital needs. As a significant portion of our business is involved in the planning, processing and interpretation of seismic data, one of our largest investments is in our employees, which involves cash expenditures for their salaries, bonuses, payroll taxes and related compensation expenses, typically in advance of related revenue billings and collections.

Our working capital requirements may change from time to time depending upon many factors, including our operating results and adjustments in our operating plan in response to industry conditions, competition and unexpected events. In recent years, our primary sources of funds have been cash flows generated from operations, existing cash balances, debt and equity issuances and borrowings under our revolving credit facility.

Public Equity Offering and Retirement of Debt

On February 21, 2018, we announced our successful completion of a public equity offering to begin de-levering our balance sheet. We issued and sold 1,820,000 shares of common stock at a public offering price of $27.50 per share, and warrants to purchase an additional 1,820,000 shares of our common stock. The net proceeds from this offering were $47.0 million, including transaction expenses. A portion of the net proceeds were used to retire our $28.5 million Third Lien Notes in March 2018 (several weeks before their maturity date). The warrants have an exercise price of $33.60 per share, are immediately exercisable and expire on March 21, 2019.

Equity Investment Program

To encourage our executive officers and other key employees to purchase our common stock and further align their interests with those of our stockholders, the Board authorized and approved an equity investment program pursuant to which certain of our executive officers and other key employees are permitted, but not obligated, to purchase unregistered shares of our common stock directly from the Company at market prices. In connection with any such purchases, the Committee authorized and approved, on December 13, 2017, a grant by us to such purchasing executive officers and key employees of a certain number of shares of restricted stock. On December 13, 2017, the Committee also authorized and approved to grant to certain executive officers and key employees a certain number of shares of restricted stock in connection with certain purchases of shares of our common stock in the open market. On December 14, 2017, we sold, in a private placement under Section 4(a)(2) of the Securities Act of 1933, as amended, 120,567 shares of our common stock at $13.05 per share (the closing price of the our common stock on the NYSE on such date) and executive officers and other key employees purchased 219,346 shares in the open market.

Revolving Credit Facility

On August 16, 2018, we and our material U.S. subsidiaries; GX Technology Corporation, ION Exploration Products (U.S.A) and I/O Marine Systems, Inc. (the “Material U.S. Subsidiaries”), along with GX Geoscience Corporation, S. de R.L. de C.V., a limited liability company (Sociedad de Responsibilidad Limitada de Capital Variable) organized under the laws of Mexico, and a subsidiary of the Company (the “Mexican Subsidiary,”) (the Material U.S. Subsidiaries and the Mexican Subsidiary are collectively, the “Subsidiary Borrowers”, together with ION Geophysical Corporation are the “Borrowers”), the financial institutions party thereto, as lenders, and PNC Bank, National Association (“PNC”), as agent for the lenders, entered into that certain Third Amendment and Joinder to Revolving Credit and Security Agreement (the “Third Amendment”), amending the Revolving Credit and Security Agreement, dated as of August 22, 2014 (as previously amended by the First Amendment to Revolving Credit and Security Agreement, dated as of August 4, 2015 and the Second Amendment to Revolving Credit and Security Agreement, dated as of April 28, 2016, the “Credit Agreement”). The Credit Agreement, as amended by the First Amendment, the Second Amendment and the Third Amendment is herein called, the “Credit Facility”).

The Third Amendment amends the Credit Agreement to, among other things:

- extend the maturity date of the Credit Facility by approximately four years (from August 22, 2019 to August 16, 2023), subject to the retirement or extension of the maturity date of the Second Lien Notes, as defined below, which mature on December 15, 2021;
- increase the maximum revolver amount by $10 million (from $40 million to $50 million);
- increase the borrowing base percentage of the net orderly liquidation value as it relates to the multi-client data library (not to exceed $28.5 million, up from the previous maximum of $15 million for the multi-client data library component);
- include the eligible billed receivables of the Mexican Subsidiary up to a maximum of $5 million in the borrowing base calculation and joins the Mexican Subsidiary as a borrower thereunder (with a maximum exposure of $5 million) and require the equity and assets of the Mexican Subsidiary to be pledged to secure obligations under the Credit Facility;
- modify the interest rate such that the maximum interest rate remains consistent with the fixed interest rate prior to the Third Amendment (that is, 3.00% per annum for domestic rate loans and 4.00% per annum for LIBOR rate loans), but now lowers the range down to a minimum interest rate of 2.00% for domestic rate loans and 3.00% for LIBOR rate loans based on a leverage ratio for the preceding four-quarter period;
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decrease the minimum excess borrowing availability threshold which (if the Borrowers have minimum excess borrowing availability below any such threshold) triggers the agent's right to exercise dominion over cash and deposit accounts; and

- modify the trigger required to test for compliance with the fixed charge coverage ratio.

The borrowing base under the Credit Facility will increase or decrease monthly using a formula based on certain eligible receivables, eligible inventory and other amounts, including a percentage of the net orderly liquidation value of our multi-client

data library. As of December 31, 2018, the borrowing base under the Credit Facility was $41.9 million, and there was no outstanding indebtedness under the Credit Facility.

The Credit Facility requires us to maintain compliance with various covenants. At December 31, 2018, we were in compliance with all of the covenants under the Credit Facility. For further information regarding our Credit Facility see Footnote 5 “Long-term Debt and Lease Obligations” of Footnotes to Consolidated Financial Statements.

Senior Secured Notes

As of December 31, 2018, ION Geophysical Corporation’s 9.125% Senior Secured Second Priority Notes due December 2021 (the “Second Lien Notes”) had an outstanding principal amount of $120.6 million. Prior to its early redemption, ION Geophysical Corporation’s 8.125% Senior Secured Second-Priority Notes due May 2018 (the “Third Lien Notes”) had an aggregate principal amount of $28.5 million. In March 2018, ION Geophysical Corporation obtained consent from a majority of the Second Lien Notes holders and from PNC to redeem, in full, the Third Lien Notes prior to their stated maturity. On March 26, 2018, ION Geophysical Corporation redeemed the Third Lien Notes by paying the then outstanding principal amount, plus all accrued and unpaid interest through the redemption date.

The Second Lien Notes remain outstanding and are senior secured second-priority obligations guaranteed by the Material U.S. Subsidiaries and the Mexican Subsidiary. Interest on the Second Lien Notes accrues at the rate of 9.125% per annum and is payable semiannually in arrears on June 15 and December 15 of each year during their term, except that the interest payment otherwise payable on June 15, 2021 will be payable on December 15, 2021.

The April 2016 indenture governing the Second Lien Notes contains certain covenants that, among other things, limits or prohibits our ability and the ability of our restricted subsidiaries to take certain actions or permit certain conditions to exist during the term of the Second Lien Notes, including among other things, incurring additional indebtedness in excess of permitted indebtedness, creating liens, paying dividends and making other distributions in respect of our capital stock, redeeming our capital stock, making investments or certain other restricted payments, selling certain kinds of assets, entering into transactions with affiliates, and effecting mergers or consolidations. These and other restrictive covenants contained in the Second Lien Notes Indenture are subject to certain exceptions and qualifications. All of our subsidiaries are currently restricted subsidiaries.

As of December 31, 2018, we are in compliance with the covenants with respect to the Second Lien Notes.

On or after December 15, 2019, we may on one or more occasions redeem all or a part of the Second Lien Notes at the redemption prices set forth below, plus accrued and unpaid interest and special interest, if any, on the Second Lien Notes redeemed during the twelve-month period beginning on December 15th of the years indicated below:

Date	Percentage
2019	105.500%
2020	103.500%
2021 and thereafter	100.000%

Meeting our Liquidity Requirements

As of December 31, 2018, our total outstanding indebtedness (including capital lease obligations) was approximately $121.7 million, consisting primarily of approximately $120.6 million outstanding Second Lien Notes (maturing in December 2021) and $2.9 million of capital leases, partially offset by $2.9 million of debt issuance costs. As of December 31, 2018, there was no outstanding indebtedness under our Credit Facility.

For 2018, total capital expenditures, including investments in our multi-client data library, were $29.8 million. We currently expect that our capital expenditures, including investments in our multi-client data library, will be a range of $40.0 million to $60.0 million in 2019. Investments in our multi-client data library are dependent upon the timing of our New Venture projects and the availability of underwriting by our customers.

We believe that our existing cash balance, cash from operations and undrawn availability under our Credit Facility will be sufficient to meet our anticipated cash needs for at least the next 12 months. However, as described at Part I, Item 3. “Legal Proceedings,” there are possible scenarios involving an outcome in the WesternGeco lawsuit that could materially and adversely affect our liquidity.

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Cash Flow from Operations

Net cash provided by operating activities was $7.1 million for 2018, compared to $27.6 million for 2017. The decrease was driven by lower revenue activity compared to 2017, payment of $3.75 million damages payment for the WesternGeco lawsuit, reductions in accounts payable and accrued expenses and increase in our combined accounts and unbilled receivable balance.

Net cash provided by operating activities was $27.6 million for 2017, compared to $1.0 million for 2016. The increase in net cash provided by operations was due to a significant increase in New Venture revenues in 2017, compared to 2016 and due to $20.8 million damages payment in 2016 for the WesternGeco lawsuit, which was partially offset by increases in unbilled receivables as of December 31, 2017.

Cash Flow Used In Investing Activities

Net cash flow used in investing activities was $29.8 million for 2018, compared to $24.8 million for 2017. The principal uses of cash in our investing activities during 2018 were $28.3 million of investments in our multi-client data library and $1.5 million of investments in property, plant and equipment.

Net cash flow used in investing activities was $24.8 million for 2017, compared to $13.6 million for 2016. The principal uses of cash in our investing activities during 2017 were $23.7 million of investments in our multi-client data library and $1.1 million of investments in property, plant and equipment.

Cash Flow Used in Financing Activities

Net cash flow provided by financing activities was $3.8 million for 2018, compared to $3.6 million of net cash flow used in financing activities for 2017. The net cash flow provided by financing activities during 2018 was primarily related to $47.0 million of net cash received from our public equity offering, partially offset by $30.8 million of payments on long-term debt including equipment capital leases and a $10.0 million repayment of our Credit Facility.

Net cash flow used in financing activities was $3.6 million for 2017, compared to $21.6 million of net cash flow used in financing activities for 2016. The net cash flow used in financing activities during 2017 was primarily related to $4.8 million of payments on long-term debt related to equipment capital leases, partially offset by $1.6 million of proceeds from employee stock purchases.

Inflation and Seasonality

Inflation in recent years has not had a material effect on our costs of goods or labor, or the prices for our products or services. Traditionally, our business has been seasonal, with strongest demand typically in the second half of our fiscal year.

Future Contractual Obligations

The following table sets forth estimates of future payments of our consolidated contractual obligations, as of December 31, 2018 (in thousands):

Contractual Obligations	Total	Less Than 1 Year	1-3 Years	3-5 Years	More Than 5 Years
Long-term and short-term debt	$121,728	$ 1,159	$120,569	$ —	$ —
Interest on long-term debt obligations	34,901	11,344	23,236	321	—
Equipment capital lease obligations	2,938	1,069	1,869	—	—
Operating leases	68,938	13,248	34,753	13,914	7,023
Purchase obligations	2,908	2,908	—	—	—
Total	$231,413	$ 29,728	$180,427	$ 14,235	$ 7,023

The long-term and short-term debt at December 31, 2018 included $120.6 million of principal indebtedness outstanding under our Second Lien Notes that mature in December 2021. The $2.9 million of equipment capital lease obligations relates to Imaging Services' financing of computer and other equipment purchases.

The operating lease commitments at December 31, 2018 relate to our leases for certain equipment, offices, processing centers, and warehouse space. Our purchase obligations primarily relate to our committed inventory purchase orders under which deliveries of inventory are scheduled to be made in 2019.

Critical Accounting Policies and Estimates

The preparation of consolidated financial statements in conformity with generally accepted accounting principles in the United States requires management to make choices between acceptable methods of accounting and to use judgment in making estimates and assumptions that affect the reported amounts of assets and liabilities, disclosure of contingent assets and liabilities, and the reported amounts of revenue and expenses. The following accounting policies are based on, among other things, judgments and assumptions made by management that include inherent risk and uncertainties. Management's estimates are based on the relevant information available at the end of each period. We believe that all of the judgments and estimates used to prepare our financial statements were reasonable at the time we made them, but circumstances may change requiring us to revise our estimates in ways that could be materially adverse to our results of operations and financial condition. We describe our significant accounting policies more fully in Footnote 1 "Summary of Significant Accounting Policies" of Footnotes to Consolidated Financial Statements.

Revenue Recognition

On January 1, 2018, we adopted Accounting Standards Codification Topic 606 – Revenue from Contracts with Customers and all the related amendments, ("ASC 606") using the modified retrospective method. This standard applies to all contracts with customers, except for contracts that are within the scope of other standards, such as leases, insurance, collaborative arrangements and financial instruments. The adoption of ASC 606 did not have a material impact on our consolidated balance sheets or consolidated statements of operations for any of our reporting segments.

We derive revenue from the sale or license of (i) multi-client and proprietary data, imaging services and E&P Advisors consulting services within our E&P Technology & Services segment; (ii) seismic data acquisition systems and other seismic equipment, (iii) seismic command and control software systems and software solutions for operations management within our Operations Optimization segment; and (iv) a full suite of technology and services within our Ocean Bottom Integrated Technologies segment. All revenues of the E&P Technology & Services and Ocean Bottom Integrated Technologies segments and the services component of revenues for the Optimization Software & Services group as part of the Operations Optimization segment are classified as services revenues. All other revenues are classified as product revenues.

We use a five-step model to determine proper revenue recognition from customer contracts. Revenue is recognized when (i) a contract is approved by all parties; (ii) the goods or services promised in the contract are identified; (iii) the consideration we expect to receive in exchange for the goods or services promised is determined; (iv) the consideration is allocated to the goods and services in the contract; and (v) control of the promised goods or services is transferred to the customer. We do not disclose the value of contractual future performance obligations such as backlog with an original expected length of one year or less.

Multi-client and Proprietary Surveys, Imaging Services and E&P Advisors Services - As multi-client seismic surveys are being designed, acquired or processed (the "New Venture" phase), we enter into non-exclusive licensing arrangements with our customers, who pre-fund or underwrite these programs in part. License revenues from these surveys are recognized during the New Venture phase as the seismic data is acquired and/or processed on a proportionate basis as work is performed and control is transferred to the customer. Under this method, we recognize revenue based upon quantifiable measures of progress, such as kilometers acquired or surveys of performance completed to date. Upon completion of a multi-client seismic survey, it is considered "on-the-shelf," and licenses to the survey data are granted to customers on a non-exclusive basis.

We also perform seismic surveys, imaging and other services under contracts to specific customers, whereby the seismic data is owned by those customers. We recognize revenue as the seismic data is acquired and/or processed on a proportionate basis as work is performed. We use quantifiable measures of progress consistent with our multi-client seismic surveys.

Acquisition Systems and Other Seismic Equipment - For sales of seismic data acquisition systems and other seismic equipment, we recognize revenue when control of the goods has transferred to the customer. Transfer of control generally occurs when (i) we have a present right to payment; (ii) the customer has legal title to the asset; (iii) we have transferred physical possession of the asset; and (iv) the customer has significant rewards of ownership; or (v) the customer has accepted the asset.

Software - Licenses for our navigation, survey design and quality control software systems provide the customer with a right to use the software. We offer usage-based licenses under which we receive a monthly fee based on the number of vessels and licenses used. For these usage-based licenses, revenue is recognized as the performance obligations are performed over the contract term, which is generally two to five years. In addition to usage-based licenses, we offer perpetual software licenses as it exists when made available to the customer. Revenue from these licenses is recognized upfront at the point in time when the software is made available to the customer.

These arrangements generally include us providing related services, such as training courses, engineering services and annual software maintenance. We allocate consideration to each element of the arrangement based upon directly observable or estimated standalone selling prices. Revenue is recognized for these services as control transfers to the customer over time.

Ocean Bottom Integrated Technologies - We recognize revenue as the seismic data is acquired and control transfers to the customer. We use quantifiable measures of progress consistent with our multi-client surveys. In connection with acquisition contracts, we may receive revenues for preparation and mobilization of equipment and personnel, capital improvements to vessels, or demobilization activities. We defer the revenues earned and incremental costs incurred that are directly related to these activities and recognizes such revenues and costs over the primary contract term of the acquisition project as we transfer the goods and services to the customer. We recognize the costs of relocating vessels without contracts to more promising market sectors as such costs are incurred.

Multi-Client Data Library

Our multi-client data library consists of seismic surveys that are offered for licensing to customers on a non-exclusive basis. The capitalized costs include the costs paid to third parties for the acquisition of data and related activities associated with the data creation activity and direct internal processing costs, such as salaries, benefits, computer-related expenses and other costs incurred for seismic data project design and management. For 2018, 2017 and 2016, we capitalized, as part of our multi-client data library, $11.9 million, $12.7 million and $6.6 million, respectively, of direct internal processing costs.

Our method of amortizing the costs of an in-process multi-client survey (the period during which the seismic data is being acquired or processed, the New Venture phase) consists of determining the percentage of actual revenue recognized to the total estimated revenues (which includes both revenues estimated to be realized during the New Venture phase and estimated revenues from the licensing of the resulting “on-the-shelf” survey data) and multiplying that percentage by the total cost of the project (the sales forecast method). We consider a multi-client survey to be complete when all work on the creation of the seismic data is finished and that survey is available for licensing. Once a multi-client data survey is completed, the data survey is considered “on-the-shelf” and our method of amortization is then the greater of (i) the sales forecast method or (ii) the straight-line basis over a four-year period. The greater amount of amortization resulting from the sales forecast method or the straight-line amortization policy is applied on a cumulative basis at the individual survey level. Under this policy, we first record amortization using the sales forecast method. The cumulative amortization recorded for each survey is then compared with the cumulative straight-line amortization. The four-year period utilized in this cumulative comparison commences when the data survey is determined to be complete. If the cumulative straight-line amortization is higher for any specific survey, additional amortization expense is recorded, resulting in the accumulated amortization being equal to the cumulative straight-line amortization for that survey. We have determined the amortization period to be four years based upon our historical experience that indicates that the majority of our revenues from multi-client surveys are derived during the acquisition and processing phases and during the four years subsequent to survey completion.

Estimated sales are determined based upon discussions with our customers, our experience and our knowledge of industry trends. Changes in sales estimates may have the effect of changing the percentage relationship of cost of services to revenue. In applying the sales forecast method, an increase in the projected sales of a survey will result in lower cost of services as a percentage of revenue and higher earnings when revenue associated with that particular survey is recognized, while a decrease in projected sales will have the opposite effect. Assuming that the overall volume of sales mix of surveys generating revenue in the period was held constant in 2018, an increase of 10% in the sales forecasts of all surveys would have increased our amortization expense by approximately $1.5 million.

We estimate the ultimate revenue expected to be derived from a particular seismic data survey over its estimated useful economic life to determine the costs to amortize, if greater than straight-line amortization. That estimate is made by us at the project’s initiation. For a completed multi-client survey, we review the estimate quarterly. If during any such review, we determine that the ultimate revenue for a survey is expected to be materially more or less than the original estimate of total revenue for such survey, we decrease or increase (as the case may be) the amortization rate attributable to the future revenue from such survey. In addition, in connection with such reviews, we evaluate the recoverability of the multi-client data library, and, if required, record an impairment charge with respect to such data.

Reserve for Excess and Obsolete Inventories

Our reserve for excess and obsolete inventories is based on historical sales trends and various other assumptions and judgments, including future demand for our inventory, the timing of market acceptance of our new products and the risk of obsolescence driven by new product introductions. When we record a charge for excess and obsolete

inventories, the amount is applied as a reduction in the cost basis of the specific inventory item for which the charge was recorded. Should these assumptions and judgments not be realized for these or for other reasons, our reserve would be adjusted to reflect actual results. Our industry is subject to technological change and new product development that could result in obsolete inventory. Our reserve for inventory at December 31, 2018 and 2017 was $15.0 million.

Goodwill

Goodwill is allocated to our reporting units, which is either the operating segment or one reporting level below the operating segment. For purposes of performing the impairment test for goodwill, we established the following reporting units: E&P Technology & Services, Optimization Software & Services, Devices, and Ocean Bottom Integrated Technologies. To determine the fair value of our reporting units, we use a discounted future returns valuation method. If we had established different reporting units or utilized different valuation methodologies, our impairment test results could differ. Additionally, we compared the sum of the estimated fair values of the individual reporting units less consolidated debt to our overall market capitalization as reflected by our stock price.

We evaluate the carrying value of our goodwill at least annually for impairment, or more frequently if facts and circumstances indicate that it is more likely than not impairment has occurred. We formally evaluate the carrying value of our goodwill for impairment as of December 31 for each of our reporting units. We first perform a qualitative assessment by evaluating relevant events or circumstances to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If we are unable to conclude qualitatively that it is more likely than not that a reporting unit’s fair value exceeds its carrying value, then we will use a two-step quantitative assessment of the fair value of a reporting unit. If the carrying value of a reporting unit of an entity that includes goodwill is determined to be more than the fair value of the reporting unit, there exists the possibility of impairment of goodwill. An impairment loss of goodwill is measured in two steps by first allocating the fair value of the reporting unit to net assets and liabilities including recorded and unrecorded other intangible assets to determine the implied carrying value of goodwill. The next step is to measure the difference between the carrying value of goodwill and the implied carrying value of goodwill, and, if the implied carrying value of goodwill is less than the carrying value of goodwill, an impairment loss is recorded equal to the difference.

The goodwill balance as of December 31, 2018 was comprised of $20.0 million in our Optimization Software & Services and $2.9 million in our E&P Technology & Services reporting units. Based on our qualitative assessment performed as of December 31, 2018, we concluded it was more likely than not that the fair values of our E&P Technology & Services, and Optimization Software & Services reporting units exceeded their carrying values. Accordingly, no further testing was required and no impairment was recognized. However, if the market value of our shares declines for a prolonged period, and if management's judgments and assumptions regarding future industry conditions and operations diminish, it is reasonably possible that our expectations of future cash flows may decline and ultimately result in a goodwill impairment for our E&P Technology & Services and Optimization Software & Services reporting units.

Property, Plant, Equipment and Seismic Rental Equipment

Property, plant, equipment and seismic rental equipment are stated at cost. Depreciation expense is provided straight-line over their estimated useful lives.

Expenditures for renewals and betterments are capitalized; repairs and maintenance are charged to expense as incurred. The cost and accumulated depreciation of assets sold or otherwise disposed of are removed from the accounts and any gain or loss is reflected in operating expenses.

We evaluate the recoverability of our property, plant, equipment and seismic rental equipment, when indicators of impairment exist, relying on a number of factors including operating results, business plans, economic projections and anticipated future cash flows. Impairment in the carrying value of an asset held for use is recognized whenever anticipated future undiscounted cash flows from an asset are estimated to be less than its carrying value. The amount of the impairment recognized is the difference between the carrying value of the asset and its fair value. For 2018, we identified an indicator of impairment as it relates to our cable-based ocean bottom acquisition technologies. As a result, we recognized an impairment charge of $36.6 million.

Deferred Tax Assets

We established a valuation allowance on a substantial majority of our U.S. net deferred tax assets. A valuation allowance is established or maintained when it is “more likely than not” that all or a portion of deferred tax assets will not be realized. We will continue to record a valuation allowance for the substantial majority of all of our deferred tax assets until there is sufficient evidence to warrant reversal. In the event our expectations of future operating results change, an additional valuation allowance may be required to be established on our existing unreserved net U.S.

deferred tax assets. As a result of passage of the Tax Cut and Jobs Act (the "Act") on December 22, 2017, the Company's U.S. deferred tax assets, liabilities, and associated valuation allowance as of December 31, 2018 and 2017 have been re-measured at the new U.S. federal tax rate of 21%.

Stock-Based Compensation

We estimate the value of stock-based payment awards on the date of grant using an option pricing model such as Black-Scholes or Monte Carlo simulation. The determination of the fair value of stock-based payment awards is affected by our stock price as well as assumptions regarding a number of subjective variables. These variables include, but are not limited to, expected stock price volatility over the term of the awards, actual and projected stock-based instrument exercise behaviors, risk-free interest rate and expected dividends. Forfeitures are estimated at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. We recognize stock-based compensation expense on the straight-line basis over the requisite service period of each award that are ultimately expected to vest. As it relates to our SARs, in the event that the market price of our common stock increases, our expectation of participants' expected exercise behavior and risk free interest rate change in the future, we may have to recognize additional SARs expense that could ultimately affect our operating results and cash flows.

Foreign Sales Risks

For 2018, we recognized $68.9 million of sales to customers in Latin America, $31.1 million of sales to customers in Europe, $17.8 million of sales to customers in Asia Pacific, $10.8 million of sales to customers in Africa, $5.5 million of sales to customers in the Middle East and $1.4 million of sales to customers in the Commonwealth of Independent States, or former Soviet Union ("CIS"). The majority of our foreign sales are denominated in U.S. dollars. For 2018, 2017 and 2016, international sales comprised 75%, 76% and 78%, respectively, of total net revenues. The volatility in oil prices have continued to impact the global market through 2018. Our results of operations, liquidity and financial condition related to our operations in Russia are primarily denominated in U.S. dollars. To the extent that world events or economic conditions negatively affect our future sales to customers in many regions of the world, as well as the collectability of our existing receivables, our future results of operations, liquidity and financial condition would be adversely affected.

Off-Balance Sheet Arrangements

Variable interest entities. As of December 31, 2018, our investment in INOVA Geophysical constitutes an investment in a variable interest entity, as that term is defined in Accounting Standards Codification Topic 810-10 "Consolidation – Overall" and as defined in Item 303(a)(4)(ii) of SEC Regulation S-K. See Footnote 1 "Summary of Significant Accounting Policies-Equity Method Investments" of Footnotes to Consolidated Financial Statements included elsewhere in this Form 10-K for additional information.

Indemnification

In the ordinary course of our business, we enter into contractual arrangements with our customers, suppliers and other parties under which we may agree to indemnify the other party to such arrangement from certain losses it incurs relating to our products or services or for losses arising from certain events as defined within the particular contract. Some of these indemnification obligations may not be subject to maximum loss limitations. Historically, payments we have made related to these indemnification obligations have been immaterial.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

Market risk is the risk of loss from adverse changes in market prices and rates. Our primary market risks include risks related to interest rates and foreign currency exchange rates.

Interest Rate Risk

As of December 31, 2018, we had outstanding total indebtedness of approximately $121.7 million. As of December 31, 2018, all of this indebtedness, other than borrowings under our Credit Facility (described below) accrues interest at fixed interest rates.

As our borrowings under the Credit Facility are subject to variable interest rates, we are subject to interest rate risk to the extent we have outstanding balances under the Credit Facility. We are therefore impacted by changes in LIBOR and/or our bank's base rates. We may, from time to time, use derivative financial instruments to help mitigate rising interest rates under our Credit Facility. We do not use derivatives for trading or speculative purposes and only enter into contracts with major financial institutions based on their credit rating and other factors.

Foreign Currency Exchange Rate Risk

Our operations are conducted in various countries around the world, and we receive revenue from these operations in a number of different currencies with the most significant of our international operations using British Pounds Sterling. As such, our earnings are subject to movements in foreign currency exchange rates when transactions are denominated in currencies other than the U.S. dollar, which is our functional currency, or the functional currency of many of our subsidiaries, which is not necessarily the U.S. dollar. To the extent that transactions of these subsidiaries are settled in currencies other than the U.S. dollar, a devaluation of these currencies versus the U.S. dollar could reduce the contribution from these subsidiaries to our consolidated results of operations as reported in U.S. dollars. Through our subsidiaries, we operate in a wide variety of jurisdictions, including the United Kingdom, Brazil, Mexico, China, Canada, Russia, the United Arab Emirates, Egypt and other countries. Our financial results may be affected by changes in foreign currency exchange rates. Our consolidated balance sheets at December 31, 2018 reflected approximately $9.2 million of net working capital related to our foreign subsidiaries, a majority of which is within the United Kingdom and Brazil. Our foreign subsidiaries receive their income and pay their expenses primarily in their local currencies. To the extent that transactions of these subsidiaries are settled in the local currencies, a devaluation of these currencies versus the U.S. dollar could reduce the contribution from these subsidiaries to our consolidated results of operations as reported in U.S. dollars. For the year ended December 31, 2018, we recorded net foreign currency losses of approximately $0.4 million in other income, a majority of these losses are due to currency fluctuations related to our operations within Brazil and the United Kingdom.

Item 8. Financial Statements and Supplementary Data

The financial statements and related notes thereto required by this item begin at page F-1 hereof.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

Not applicable.

Item 9A. Controls and Procedures

(a) Evaluation of Disclosure Controls and Procedures. Disclosure controls and procedures are designed to ensure that information required to be disclosed in the reports we file with or submit to the SEC under the Securities Exchange Act of 1934, as amended (the “Exchange Act”), is recorded, processed, summarized and reported within the time period specified by the SEC’s rules and forms. Disclosure controls and procedures are defined in Rule 13a-15(e) under the Exchange Act, and they include, without limitation, controls and procedures designed to ensure that information required to be disclosed under the Exchange Act is accumulated and communicated to management, including the principal executive officer and the principal financial officer, as appropriate, to allow timely decisions regarding required disclosure.

Our management carried out an evaluation of the effectiveness of the design and operation of our disclosure controls and procedures as of December 31, 2018. Based upon that evaluation, our principal executive officer and principal financial officer have concluded that our disclosure controls and procedures were effective as of December 31, 2018.

(b) Management’s Report on Internal Control Over Financial Reporting. Our management is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Rules 13a-15(f) under the Exchange Act. Our internal control over financial reporting is designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Our internal control over financial reporting includes those policies and procedures that:

(i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of our company;

(ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of our company are being made only in accordance with authorizations of our management and directors; and

(iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become

inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, we assessed the effectiveness of our internal control over financial reporting as of December 31, 2018 based upon criteria established in the 2013 Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”).

The independent registered public accounting firm that has also audited our consolidated financial statements included in this Annual Report on Form 10-K has issued an audit report on our internal control over financial reporting. This report appears below.

(c) Changes in Internal Control over Financial Reporting. There was not any change in our internal control over financial reporting that occurred during the three months ended December 31, 2018, which has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

Board of Directors and Stockholders
ION Geophysical Corporation

Opinion on internal control over financial reporting
We have audited the internal control over financial reporting of ION Geophysical Corporation (a Delaware corporation) and subsidiaries (the "Company") as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by COSO.
We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated financial statements of the Company as of and for the year ended December 31, 2018, and our report dated February 7, 2019 expressed an unqualified opinion on those financial statements.
Basis for opinion
The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with 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 audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.
Definition and limitations of internal control over financial reporting
A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.
Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ GRANT THORNTON LLP
Houston, Texas
February 7, 2019

Item 9B. Other Information
Not applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Reference is made to the information appearing in the definitive proxy statement, under “Item 1 — Election of Directors,” for our annual meeting of stockholders to be held on May 15, 2019 (the “2019 Proxy Statement”) to be filed with the SEC with respect to Directors, Executive Officers and Corporate Governance, which is incorporated herein by reference and made a part hereof in response to the information required by Item 10.

Item 11. Executive Compensation

Reference is made to the information appearing in the 2019 Proxy Statement, under “Executive Compensation,” to be filed with the SEC with respect to Executive Compensation, which is incorporated herein by reference and made a part hereof in response to the information required by Item 11.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

Reference is made to the information appearing in the 2019 Proxy Statement, under “Item 1 — Ownership of Equity Securities of ION” and “Equity Compensation Plan Information,” to be filed with the SEC with respect to Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters, which is incorporated herein by reference and made a part hereof in response to the information required by Item 12.

Item 13. Certain Relationships and Related Transactions, and Director Independence

Reference is made to the information appearing in the 2019 Proxy Statement, under “Item 1 — Certain Transactions and Relationships,” to be filed with the SEC with respect to Certain Relationships and Related Transactions and Director Independence, which is incorporated herein by reference and made a part hereof in response to the information required by Item 13.

Item 14. Principal Accounting Fees and Services

Reference is made to the information appearing in the 2019 Proxy Statement, under “Principal Auditor Fees and Services,” to be filed with the SEC with respect to Principal Accountant Fees and Services, which is incorporated herein by reference and made a part hereof in response to the information required by Item 14.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(a) List of Documents Filed

(1) Financial Statements

The financial statements filed as part of this report are listed in the "Index to Consolidated Financial Statements" on page F-1 hereof.

(2) Financial Statement Schedules

The following financial statement schedule is listed in the "Index to Consolidated Financial Statements" on page F-1 hereof, and is included as part of this Annual Report on Form 10-K:

Schedule II — Valuation and Qualifying Accounts

All other schedules are omitted because they are not applicable or the requested information is shown in the financial statements or noted therein.

(3) Exhibits

3.1	Restated Certificate of Incorporation, as amended, filed on November 3, 2016 as Exhibit 3.1 to the Company's Quarterly Report on Form 10-Q and incorporated by reference.
3.2	Amended and Restated Bylaws of ION Geophysical Corporation filed on September 24, 2007 as Exhibit 3.5 to the Company's Current Report on Form 8-K and incorporated herein by reference.
4.1	Indenture, dated May 13, 2013, among ION Geophysical Corporation, the subsidiary guarantors named therein, Wilmington Trust, National Association, as trustee, and U.S. Bank National Association, as collateral agent, filed on May 13, 2013 as Exhibit 4.1 to the Company's Current Report on Form 8-K and incorporated herein by reference.
4.2	First Supplemental Indenture, dated as of April 28, 2016, to the Indenture, dated May 13, 2013, among ION Geophysical Corporation, the subsidiary guarantors named therein, Wilmington Savings Fund Society, FSB, as trustee, and U.S. Bank National Association, as collateral agent, filed on April 28, 2016 as Exhibit 4.3 to the Company's Current Report on Form 8-K and incorporated by reference.
4.3	Indenture, dated as of April 28, 2016, among ION Geophysical Corporation, the subsidiary guarantors named therein, Wilmington Savings Fund Society, FSB, as trustee and collateral agent filed on April 28, 2016 as Exhibit 4.1 to the Company's Current Report on Form 8-K and incorporated by reference.
4.4	Intercreditor Agreement, dated as of April 28, 2016, by and among PNC Bank, National Association, as first lien representative and first lien collateral agent for the first lien secured parties, and Wilmington Savings Fund Society, FSB, as second lien representative and second lien collateral agent for the second lien secured parties and as third lien representative for the third lien secured parties, and U.S. Bank National Association as third lien collateral agent for the third lien secured parties and acknowledged and agreed to by ION Geophysical Corporation and the other grantors named therein, filed on April 28, 2016 as Exhibit 10.1 to the Company's Current Report on Form 8-K and incorporated by reference.
**10.1	Form of Employee Stock Option Award Agreement for ARAM Systems Employee Inducement Stock Option Program, filed on November 14, 2008 as Exhibit 4.4 to the Company's Registration Statement on Form S-8 (Registration No. 333-155378) and incorporated herein by reference.
**10.2	Input/Output, Inc. 2003 Stock Option Plan, dated March 27, 2003, filed as Appendix B of the Company's definitive proxy statement filed with the SEC on April 30, 2003, and incorporated herein by reference.
**10.3	Sixth Amended and Restated - 2004 Long-Term Incentive Plan, filed as Appendix A to the definitive proxy statement for the 2011 Annual Meeting of Stockholders of ION Geophysical Corporation, filed on April 21, 2011, and incorporated herein by reference.
**10.4	Form of Employment Inducement Stock Option Agreement for the Input/Output, Inc. — GX Technology Corporation Employment Inducement Stock Option Program, filed on April 4, 2005 as Exhibit 4.1 to the Company's Registration Statement on Form S-8 (Reg. No. 333-123831), and incorporated herein by reference.
**10.5	—

ION Stock Appreciation Rights Plan dated November 17, 2008, filed as Exhibit 10.47 to the Company's Annual Report on Form 10-K for the year ended December 31, 2008, and incorporated herein by reference.

10.6	Stock Purchase Agreement dated as of March 19, 2010, by and between ION Geophysical Corporation and BGP Inc., China National Petroleum Corporation, filed on March 31, 2010 as Exhibit 10.1 to the Company's Current Report on Form 8-K, and incorporated herein by reference.
10.7	Investor Rights Agreement dated as of March 25, 2010, by and between ION Geophysical Corporation and BGP Inc., China National Petroleum Corporation, filed on March 31, 2010 as Exhibit 10.2 to the Company's Current Report on Form 8-K, and incorporated herein by reference.
10.8	Share Purchase Agreement dated as of March 24, 2010, by and among ION Geophysical Corporation, INOVA Geophysical Equipment Limited and BGP Inc., China National Petroleum Corporation, filed on March 31, 2010 as Exhibit 10.3 to the Company's Current Report on Form 8-K, and incorporated herein by reference.
10.9	Joint Venture Agreement dated as of March 24, 2010, by and between ION Geophysical Corporation and BGP Inc., China National Petroleum Corporation, filed on March 31, 2010 as Exhibit 10.4 to the Company's Current Report on Form 8-K, and incorporated herein by reference.
**10.10	Employment Agreement dated August 2, 2011, effective as of January 1, 2012, between ION Geophysical Corporation and R. Brian Hanson, filed on November 3, 2011 as Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarterly period ended September 30, 2011, and incorporated herein by reference.
10.11	First Amendment to Credit Agreement and Loan Documents dated May 29, 2012, filed on May 29, 2012 as Exhibit 10.1 to the Company's Current Report on Form 8-K, and incorporated herein by reference.
**10.12	Consulting Services Agreement dated January 1, 2013, between ION Geophysical Corporation and ThePeebler Group LLC, filed on January 4, 2013 as Exhibit 10.1 to the Company's Current Report on Form8-K, and incorporated herein by reference.
10.13	Third Amended and Restated 2013 Long-Term Incentive Plan filed on November 1, 2018 as Annex A to the Registrant's Proxy Statement on Schedule 14A and incorporated herein by reference.
10.14	Revolving Credit and Security Agreement dated as of August 22, 2014 among PNC Bank, National Association, as agent for lenders, the lenders from time to time party thereto, as lenders, and PNC Capital Markets LLC, as lead arranger and bookrunner, with ION Geophysical Corporation, ION Exploration Products (U.S.A.), Inc., I/O Marine Systems, Inc. and GX Technology Corporation, as borrowers, filed on November 6, 2014 as Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarterly period ended September 30, 2014, and incorporated herein by reference.
10.15	First Amendment to Revolving Credit and Security Agreement dated as of August 4, 2015 among PNC Bank, National Association, as lender and agent, the lenders from time to time party thereto, as lenders, with ION Geophysical Corporation, ION Exploration Products (U.S.A.), Inc., I/O Marine Systems, Inc. and GX Technology Corporation, as borrowers, filed on August 6, 2015 as Exhibit 10.1 to the Company's Current Report on Form 8-K, and incorporated herein by reference.
10.16	Second Amendment to the Revolving Credit and Security Agreement, dated as of April 28, 2016, among ION Geophysical Corporation and the subsidiary co-borrowers named therein, as borrowers, the financial institutions party thereto, as lenders, and PNC Bank, National Association, as agent for the lenders, filed on April 28, 2016 as Exhibit 10.2 to the Company's Current Report on Form 8-K and incorporated by reference.
**10.17	Employment Agreement dated effective as of November 13, 2014, between ION Geophysical Corporation and Steve Bate, filed as Exhibit 10.44 to the Company's Annual Report 10-K for the year ended December 31, 2014, and incorporated herein by reference.
**10.18	Form of Rights Agreement dated March 1, 2015 issued under the ION Stock Appreciation Rights Plan dated November 17, 2008, filed on May 7, 2015 as Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2015, and incorporated herein by reference.
**10.19	Form of Rights Agreement dated March 1, 2016 issued under the ION Stock Appreciation Rights Plan Dated November 17, 2008, and incorporated herein by reference.
**10.20	—

	Equity Investment Agreement dated December 14, 2017, issued under the Second Amended and Restated 2013 Long-Term Incentive Plan dated December 31, 2016, and incorporated herein by reference.
**10.21	~~E~~mployee Stock Purchase Plan dated May 26, 2010, and incorporated herein by reference.
10.22	Form of Warrant Agreement, filed on February 16, 2018 as Exhibit 10.1 to the Company's Current Report on Form 8-K, and incorporated herein by reference.
10.23	Third Amendment and Joinder to the Revolving Credit and Security Agreement, dated as of August 16, ~~2~~0~~2~~018, filed on August 21, 2018 as Exhibit 10.1 to the Company's Current Report on Form 8-K and incorporated herein by reference.
* **10.24	~~IO~~N Stock Appreciation Rights Plan dated November 30, 2018.

*	Form of Stock Appreciation Rights Agreement dated December 1, 2018 issued under the ION Stock
**10.25	Appreciation Rights Plans dated November 30, 2018.
*	Form of Restricted Stock Awards Agreement dated December 1, 2018 issued under the Third Amended
**10.26	and Restated 2013 Long-Term Incentive Plan dated November 1, 2018.
*21.1	Subsidiaries of the Company.
*23.1	Consent of Grant Thornton LLP.
*24.1	The Power of Attorney is set forth on the signature page hereof.
*31.1	Certification of Chief Executive Officer Pursuant to Rule 13a-14(a) or Rule 15d-14(a).
*31.2	Certification of Chief Financial Officer Pursuant to Rule 13a-14(a) or Rule 15d-14(a).
*32.1	Certification of Chief Executive Officer Pursuant to 18 U.S.C. §1350.
*32.2	Certification of Chief Financial Officer Pursuant to 18 U.S.C. §1350.
*101	The following materials are formatted in Extensible Business Reporting Language (XBRL): (i) Consolidated Balance Sheets at December 31, 2018 and 2017, (ii) Consolidated Statements of Operations for the years ended December 31, 2018, 2017 and 2016, (iii) Comprehensive Income (Loss) for the years ended December 31, 2018, 2017 and 2016, (iv) Consolidated Statements of Cash Flows for the years ended December 31, 2018, 2017 and 2016, (v) Consolidated Statements of Stockholders' Equity for the years ended December 31, 2018, 2017 and 2016, (vi) Footnotes to Consolidated Financial Statements and (vii) Schedule II – Valuation and Qualifying Accounts.

* Filed herewith.

** Management contract or compensatory plan or arrangement.

(b) Exhibits required by Item 601 of Regulation S-K.

Reference is made to subparagraph (a) (3) of this Item 15, which is incorporated herein by reference.

(c) Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized in the City of Houston, State of Texas, on February 7, 2019.

ION GEOPHYSICAL CORPORATION

By /s/ R. Brian Hanson
R. Brian Hanson
President and Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints R. Brian Hanson and Matthew Powers and each of them, as his or her true and lawful attorneys-in-fact and agents with full power of substitution and re-substitution for him or her and in his or her name, place and stead, in any and all capacities, to sign any and all documents relating to the Annual Report on Form 10-K for the year ended December 31, 2018, including any and all amendments and supplements 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 full power and authority to do and perform each and every act and thing requisite and necessary to be done in and about the premises, as fully as 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 their 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 Exchange Act of 1934, as amended, this Annual Report on Form 10-K has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

Name	Capacities	Date
/s/ R. BRIAN HANSON R. Brian Hanson	President, Chief Executive Officer and Director (Principal Executive Officer)	February 7, 2019
/s/ STEVEN A. BATE Steven A. Bate	Executive Vice President and Chief Financial Officer (Principal Financial Officer)	February 7, 2019
/s/ SCOTT SCHWAUSCH Scott Schwausch	Vice President and Corporate Controller (Principal Accounting Officer)	February 7, 2019
/s/ JAMES M. LAPEYRE, JR. James M. Lapeyre, Jr.	Chairman of the Board of Directors and Director	February 7, 2019
/s/ DAVID H. BARR David H. Barr	Director	February 7, 2019
Zheng HuaSheng	Director	February 7, 2019

Name	Capacities	Date
/s/ MICHAEL C. JENNINGS Michael C. Jennings	Director	February 7, 2019
/s/ FRANKLIN MYERS Franklin Myers	Director	February 7, 2019
/s/ S. JAMES NELSON, JR. S. James Nelson, Jr.	Director	February 7, 2019
/s/ JOHN N. SEITZ John N. Seitz	Director	February 7, 2019

ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
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Report of Independent Registered Public Accounting Firm

Board of Directors and Stockholders
ION Geophysical Corporation

Opinion on the financial statements
We have audited the accompanying consolidated balance sheets of ION Geophysical Corporation (a Delaware corporation) and subsidiaries (the "Company") as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive loss, stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and schedule included under Item 15(a) (collectively referred to as 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, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.
We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in the 2013 Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"), and our report dated February 7, 2019 expressed an unqualified opinion.
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 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. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. 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 supporting 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/ GRANT THORNTON LLP

We have served as the Company's auditor since 2014.

Houston, Texas
February 7, 2019

ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
CONSOLIDATED BALANCE SHEETS

	December 31,	
	2018	2017
	(In thousands, except share data)	
ASSETS		
Current assets:		
Cash and cash equivalents	$33,551	$52,056
Accounts receivable, net	26,128	19,478
Unbilled receivables	44,032	37,304
Inventories, net	14,130	14,508
Prepaid expenses and other current assets	7,782	7,643
Total current assets	125,623	130,989
Deferred income tax asset, net	7,191	1,753
Property, plant, equipment and seismic rental equipment, net	13,041	52,153
Multi-client data library, net	73,544	89,300
Goodwill	22,915	24,089
Other assets	2,435	2,785
Total assets	$244,749	$301,069
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Current maturities of long-term debt	$2,228	$40,024
Accounts payable	34,913	24,951
Accrued expenses	31,411	38,697
Accrued multi-client data library royalties	29,256	27,035
Deferred revenue	7,710	8,910
Total current liabilities	105,518	139,617
Long-term debt, net of current maturities	119,513	116,720
Other long-term liabilities	11,894	13,926
Total liabilities	236,925	270,263
Equity:		
Common stock, $0.01 par value; authorized 26,666,667 shares; outstanding 14,015,615 and 12,019,701 shares at December 31, 2018 and 2017, respectively.	140	120
Additional paid-in capital	952,626	903,247
Accumulated deficit	(926,092)	(854,921)
Accumulated other comprehensive loss	(20,442)	(18,879)
Total stockholders' equity	6,232	29,567
Noncontrolling interests	1,592	1,239
Total equity	7,824	30,806
Total liabilities and equity	$244,749	$301,069

See accompanying Footnotes to Consolidated Financial Statements.

ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF OPERATIONS

	Years Ended December 31,		
	2018	2017	2016
	(In thousands, except per share data)		
Service revenues	$139,038	$159,410	$130,640
Product revenues	41,007	38,144	42,168
Total net revenues	180,045	197,554	172,808
Cost of services	100,557	103,124	115,763
Cost of products	19,868	18,791	21,013
Gross profit	59,620	75,639	36,032
Operating expenses:			
Research, development and engineering	18,182	16,431	17,833
Marketing and sales	21,793	20,778	17,371
General, administrative and other operating expenses	37,364	47,129	43,999
Impairment of long-lived assets	36,553	—	—
Total operating expenses	113,892	84,338	79,203
Loss from operations	(54,272)	(8,699)	(43,171)
Interest expense, net	(12,972)	(16,709)	(18,485)
Other income (expense), net	(436)	(3,945)	1,350
Loss before income taxes	(67,680)	(29,353)	(60,306)
Income tax expense	2,718	24	4,421
Net loss	(70,398)	(29,377)	(64,727)
Net income attributable to noncontrolling interests	(773)	(865)	(421)
Net loss attributable to ION	$(71,171)	$(30,242)	$(65,148)
Net loss per share:			
Basic	$(5.20)	$(2.55)	$(5.71)
Diluted	$(5.20)	$(2.55)	$(5.71)
Weighted average number of common shares outstanding:			
Basic	13,692	11,876	11,400
Diluted	13,692	11,876	11,400

See accompanying Footnotes to Consolidated Financial Statements.

ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS

	Years Ended December 31,		
	2018	2017	2016
	(In thousands)		
Net loss	$(70,398)	$(29,377)	$(64,727)
Other comprehensive income (loss), net of taxes, as appropriate:			
Foreign currency translation adjustments	(1,563)	2,869	(6,967)
Comprehensive net loss	(71,961)	(26,508)	(71,694)
Comprehensive income attributable to noncontrolling interests	(773)	(865)	(421)
Comprehensive net loss attributable to ION	$(72,734)	$(27,373)	$(72,115)

See accompanying Footnotes to Consolidated Financial Statements.

ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS

	Years Ended December 31,		
	2018	2017	2016
	(In thousands)		
Cash flows from operating activities:			
Net loss	$(70,398)	$(29,377)	$(64,727)
Adjustments to reconcile net loss to net cash provided by operating activities:			
Depreciation and amortization (other than multi-client library)	8,763	16,592	21,975
Amortization of multi-client data library	48,988	47,102	33,335
Impairment of long-lived assets	36,553	—	—
Impairment of multi-client data library	—	2,304	—
Stock-based compensation expense	3,337	2,552	3,267
Accrual (reduction) of loss contingency related to legal proceedings	—	5,000	(1,168)
Loss on bond exchange	—	—	2,182
Write-down of excess and obsolete inventory	665	398	429
Deferred income taxes	(6,252)	(5,420)	(1,181)
Change in operating assets and liabilities:			
Accounts receivable	(7,024)	1,692	20,426
Unbilled receivables	(5,245)	(23,947)	6,543
Inventories	(353)	190	2,312
Accounts payable, accrued expenses and accrued royalties	(7,600)	1,443	(5,085)
Deferred revenue	(1,112)	5,131	(2,759)
Other assets and liabilities	6,776	3,952	(14,556)
Net cash provided by operating activities	7,098	27,612	993
Cash flows from investing activities:			
Investment in multi-client data library	(28,276)	(23,710)	(14,884)
Purchase of property, plant, equipment and seismic rental equipment	(1,514)	(1,063)	(1,458)
Proceeds from sale of cost method investments	—	—	2,698
Net cash used in investing activities	(29,790)	(24,773)	(13,644)
Cash flows from financing activities:			
Borrowings under revolving line of credit	—	—	15,000
Repayments under revolving line of credit	(10,000)	—	(5,000)
Payments on notes payable and long-term debt	(30,807)	(4,816)	(23,634)
Cost associated with issuance of debt	(1,247)	(53)	(6,744)
Net proceeds from issuance of stocks	46,999	—	—
Repurchase of common stock	—	—	(964)
Proceeds from employee stock purchases and exercise of stock options	214	1,619	—
Dividend payment to noncontrolling interest	(200)	(100)	—
Other financing activities	(1,151)	(243)	(252)
Net cash provided by (used in) financing activities	3,808	(3,593)	(21,594)
Effect of change in foreign currency exchange rates on cash, cash equivalents and restricted cash	319	(260)	1,386
Net decrease in cash, cash equivalents and restricted cash	(18,565)	(1,014)	(32,859)
Cash, cash equivalents and restricted cash at beginning of period	52,419	53,433	86,292
Cash, cash equivalents and restricted cash at end of period	$33,854	$52,419	$53,433

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The following table is a reconciliation of cash, cash equivalents and restricted cash:

	December 31,		
	2018	2017	2016
	(In thousands)		
Cash and cash equivalents	$33,551	$52,056	$52,652
Restricted cash included in prepaid expenses and other current assets	—	60	260
Restricted cash included in other long-term assets	303	303	521
Total cash, cash equivalents, and restricted cash shown in consolidated statements of cash flows	$33,854	$52,419	$53,433

See accompanying Footnotes to Consolidated Financial Statements.

ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(In thousands, except shares)	Common Stock Shares	Amount	Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Treasury Stock	Noncontrolling Interests	Total Equity
Balance at January 1, 2016 [a]	10,702,689	$ 107	$ 894,715	$ (759,531)	$ (14,781)	$ (8,551)	$ 81	$ 112,040
Net (loss) income	—	—	—	(65,148)	—	—	421	(64,727)
Translation adjustment	—	—	—	—	(6,967)	—	7	(6,960)
Stock-based compensation expense	—	—	3,267	—	—	—	—	3,267
Vesting of restricted stock units/awards	40,495	—	—	—	—	—	—	—
Purchase of treasury shares	(155,304)	(1)	—	—	—	(963)	—	(964)
Restricted stock cancelled for employee minimum income taxes	(4,973)	—	(22)	—	—	—	—	(22)
Issuance of stock for the ESPP	4,100	—	23	—	—	—	—	23
Issuance of stock in bond exchange	1,205,440	12	1,215	—	—	9,514	—	10,741
Balance at December 31, 2016	11,792,447	118	899,198	(824,679)	(21,748)	—	509	53,398
Net (loss) income	—	—	—	(30,242)	—	—	865	(29,377)
Translation adjustment	—	—	—	—	2,869	—	(35)	2,834
Dividend payment to noncontrolling interest	—	—	—	—	—	—	(100)	(100)
Stock-based compensation expense	—	—	2,552	—	—	—	—	2,552
Exercise of stock options	15,000	—	46	—	—	—	—	46
Vesting of restricted stock units/awards	115,576	1	(1)	—	—	—	—	—
Employee purchases of unregistered shares of common stock	120,567	1	1,572	—	—	—	—	1,573
Restricted stock cancelled for employee minimum income taxes	(23,889)	—	(120)	—	—	—	—	(120)
Balance at December 31, 2017	12,019,701	120	903,247	(854,921)	(18,879)	—	1,239	30,806
Net (loss) income	—	—	—	(71,171)	—	—	773	(70,398)
Translation adjustment	—	—	—	—	(1,563)	—	(220)	(1,783)
Dividend payment to noncontrolling interest	—	—	—	—	—	—	(200)	(200)
Stock-based compensation expense	—	—	3,337	—	—	—	—	3,337

Exercise of stock options	70,086	1	213	—	—	—	—	214
Vesting of restricted stock units/awards	151,852	1	(1)	—	—	—	—	—
Restricted stock cancelled for employee minimum income taxes	(46,024)	—	(1,151)	—	—	—	—	(1,151)
Public equity offering	1,820,000	18	46,981	—	—	—	—	46,999
Balance at December 31, 2018	14,015,615	$ 140	$ 952,626	$ (926,092)	$ (20,442)	$ —	$ 1,592	$ 7,824

(a) The figures for January 1, 2016, set forth in the tables above have been retroactively adjusted to reflect the one-for-fifteen reverse stock split completed on February 4, 2016.

See accompanying Footnotes to Consolidated Financial Statements.

ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
FOOTNOTES TO CONSOLIDATED FINANCIAL STATEMENTS

(1) Summary of Significant Accounting Policies

General Description and Principles of Consolidation

ION Geophysical Corporation and its subsidiaries offer a full suite of services and products for seismic data acquisition and processing. The consolidated financial statements include the accounts of ION Geophysical Corporation and its majority-owned subsidiaries (collectively referred to as the "Company" or "ION"). Intercompany balances and transactions have been eliminated. Certain reclassifications were made to previously reported amounts in the consolidated financial statements and notes thereto to make them consistent with the current period presentation.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Significant estimates are made at discrete points in time based on relevant market information. These estimates may be subjective in nature and involve uncertainties and matters of judgment and, therefore, cannot be determined with precision. Areas involving significant estimates include, but are not limited to, accounts and unbilled receivables, inventory valuation, sales forecasts related to multi-client data libraries, goodwill and intangible asset valuation and deferred taxes. Actual results could materially differ from those estimates.

Cash and Cash Equivalents

The Company considers all highly liquid investments with an original maturity of three months or less to be cash equivalents. The Company places its temporary cash investments with high credit quality financial institutions. At times such investments may be in excess of the Federal Deposit Insurance Corporation insurance limit. At December 31, 2018 and 2017, there was $0.3 million and $0.4 million, respectively, of long-term and short-term restricted cash used to secure standby and commercial letters of credit, which is included within "Other long-term assets" and "Prepaid expenses and other current assets" in the Consolidated Balance Sheets.

Accounts and Unbilled Receivables

Accounts and unbilled receivables are recorded at cost, less the related allowance for doubtful accounts. The Company considers current information and events regarding the customers' ability to repay their obligations, such as the length of time the receivable balance is outstanding, the customers' credit worthiness and historical experience. Unbilled receivables relate to revenues recognized on multi-client surveys, imaging services and devices equipment repairs on a proportionate basis, and on licensing of multi-client data libraries for which invoices have not yet been presented to the customer.

Inventories

Inventories are stated at the lower of cost (primarily first-in, first-out method) or net realizable value. The Company provides reserves for estimated obsolescence or excess inventory equal to the difference between cost of inventory and its estimated net realizable value based upon assumptions about future demand for the Company's products, market conditions and the risk of obsolescence driven by new product introductions.

Property, Plant, Equipment and Seismic Rental Equipment

Property, plant, equipment and seismic rental equipment are stated at cost. Depreciation expense is provided straight-line over the following estimated useful lives:

	Years
Machinery and equipment	3-7
Buildings	5-25
Seismic rental equipment	3-5
Leased equipment and other	3-10

Expenditures for renewals and betterments are capitalized; repairs and maintenance are charged to expense as incurred. The cost and accumulated depreciation of assets sold or otherwise disposed of are removed from the accounts and any gain or loss is reflected in operating expenses.

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The Company evaluates the recoverability of long-lived assets, including property, plant, equipment and seismic rental equipment, when indicators of impairment exist, relying on a number of factors including operating results, business plans, economic projections and anticipated future cash flows. Impairment in the carrying value of an asset held for use is recognized whenever anticipated future undiscounted cash flows from an asset are estimated to be less than its carrying value. The amount of the impairment recognized is the difference between the carrying value of the asset and its fair value. For 2018, the Company identified an indicator of impairment as it relates to its cable-based ocean bottom acquisition technologies. As a result, the Company recognized an impairment charge of $36.6 million.

Multi-Client Data Library

The multi-client data library consists of seismic surveys that are offered for licensing to customers on a non-exclusive basis. The capitalized costs include costs paid to third parties for the acquisition of data and related activities associated with the data creation activity and direct internal processing costs, such as salaries, benefits, computer-related expenses and other costs incurred for seismic data project design and management. For 2018, 2017 and 2016, the Company capitalized, as part of its multi-client data library, $11.9 million, $12.7 million and $6.6 million, respectively, of direct internal processing costs. At December 31, 2018 and 2017, multi-client data library costs and accumulated amortization consisted of the following (in thousands):

	December 31,	
	2018	2017
Gross costs of multi-client data creation	$972,309	$939,077
Less accumulated amortization	(776,860)	(727,872)
Less impairments to multi-client data library	(121,905)	(121,905)
Multi-client data library, net	$73,544	$89,300

The Company’s method of amortizing the costs of an in-process multi-client data library (the period during which the seismic data is being acquired and/or processed, referred to as the “New Venture” phase) consists of determining the percentage of actual revenue recognized to the total estimated revenues (which includes both revenues estimated to be realized during the New Venture phase and estimated revenues from the licensing of the resulting “on-the-shelf” data survey) and multiplying that percentage by the total cost of the project (the sales forecast method). The Company considers a multi-client data survey to be complete when all work on the creation of the seismic data is finished and that data survey is available for licensing. Once a multi-client data survey is complete, the data survey is considered “on-the-shelf” and the Company’s method of amortization is then the greater of (i) the sales forecast method or (ii) the straight-line basis over a four-year period. The greater amount of amortization resulting from the sales forecast method or the straight-line amortization policy is applied on a cumulative basis at the individual survey level. Under this policy, the Company first records amortization using the sales forecast method. The cumulative amortization recorded for each survey is then compared with the cumulative straight-line amortization. The four-year period utilized in this cumulative comparison commences when the data survey is determined to be complete. If the cumulative straight-line amortization is higher for any specific survey, additional amortization expense is recorded, resulting in accumulated amortization being equal to the cumulative straight-line amortization for such survey. The Company has determined the amortization period of four years based upon its historical experience that indicates that the majority of its revenues from multi-client surveys are derived during the acquisition and processing phases and during four years subsequent to survey completion.

The Company estimates the ultimate revenue expected to be derived from a particular seismic data survey over its estimated useful economic life to determine the costs to amortize, if greater than straight-line amortization. That estimate is made by the Company at the project’s initiation. For a completed multi-client survey, the Company reviews the estimate quarterly. If during any such review, the Company determines that the ultimate revenue for a survey is expected to be materially more or less than the original estimate of ultimate revenue for such survey, the Company decreases or increases (as the case may be) the amortization rate attributable to the future revenue from such survey. In addition, in connection with such reviews, the Company evaluates the recoverability of the multi-client data library, and, if required, records an impairment charge with respect to such data.

Equity Method Investment

The Company determined that INOVA Geophysical is a variable interest entity because the Company's voting rights with respect to INOVA Geophysical are not proportionate to its ownership interest and substantially all of INOVA Geophysical's activities are conducted on behalf of the Company and BGP, a related party to the Company. The Company is not the primary beneficiary of INOVA Geophysical because it does not have the power to direct the activities of INOVA Geophysical that most significantly impact its economic performance. Accordingly, the Company does not consolidate INOVA Geophysical, but instead accounts for INOVA Geophysical using the equity method of accounting. Under this method, an investment is carried at the acquisition cost, plus the Company's equity in undistributed earnings or losses since acquisition, less distributions received.

At December 31, 2014, the Company fully impaired its investment in INOVA reducing its equity investment in INOVA and its share of INOVA's accumulated other comprehensive loss, both to zero. As of December 31, 2018, the carrying value of this investment remains zero. The Company no longer records its equity in losses or earnings and has no obligation, implicit or explicit, to fund any expenses of INOVA Geophysical.

Noncontrolling Interests

The Company has non-redeemable noncontrolling interests. Non-redeemable noncontrolling interests in majority-owned affiliates are reported as a separate component of equity in "Noncontrolling interests" in the Consolidated Balance Sheets. Net income attributable to noncontrolling interests is stated separately in the Consolidated Statements of Operations. The activity for this noncontrolling interest relates to proprietary processing projects in Brazil.

Goodwill

Goodwill is allocated to reporting units, which are either the operating segment or one reporting level below the operating segment. For purposes of performing the impairment test for goodwill, the Company established the following reporting units: E&P Technology & Services, Optimization Software & Services, Devices and Ocean Bottom Integrated Technologies.

The Company is required to evaluate the carrying value of its goodwill at least annually for impairment, or more frequently if facts and circumstances indicate that it is more likely than not impairment has occurred. The Company formally evaluates the carrying value of its goodwill for impairment as of December 31 for each of its reporting units. The Company first performs a qualitative assessment by evaluating relevant events or circumstances to determine whether it is more likely than not that the fair value of a reporting unit exceeds its carrying amount. If the Company is unable to conclude qualitatively that it is more likely than not that a reporting unit's fair value exceeds its carrying value, then it will use a two-step quantitative assessment of the fair value of a reporting unit. To determine the fair value of these reporting units, the Company uses a discounted future returns valuation model, which includes a variety of level 3 inputs. The key inputs for the model include the operational three-year forecast for the Company and the then-current market discount factor. Additionally, the Company compares the sum of the estimated fair values of the individual reporting units less consolidated debt to the Company's overall market capitalization as reflected by the Company's stock price. If the carrying value of a reporting unit that includes goodwill is determined to be more than the fair value of the reporting unit, there exists the possibility of impairment of goodwill. An impairment loss of goodwill is measured in two steps by first allocating the fair value of the reporting unit to net assets and liabilities including recorded and unrecorded intangible assets to determine the implied carrying value of goodwill. The next step is to measure the difference between the carrying value of goodwill and the implied carrying value of goodwill, and, if the implied carrying value of goodwill is less than the carrying value of goodwill, an impairment loss is recorded equal to the difference. See further discussion below at Footnote 11 "Goodwill."

Revenue From Contracts With Customers

On January 1, 2018, the Company adopted Accounting Standards Codification Topic 606 - "Revenue from Contracts with Customers" and all the related amendments ("ASC 606"), using the modified retrospective method. This standard applies to all contracts with customers, except for contracts that are within the scope of other standards, such as leases, insurance, collaborative arrangements and financial instruments. The adoption of ASC 606 did not have a material impact on the Consolidated Balance Sheets or Consolidated Statements of Operations for any of our reporting segments. See further discussion below at Footnote 3 "Revenue from Contracts with Customers."

Research, Development and Engineering

Research, development and engineering costs primarily relate to activities that are designed to improve the quality of the subsurface image and overall acquisition economics of the Company's customers. The costs associated with these activities are expensed as incurred. These costs include prototype material and field testing expenses, along with the related salaries and stock-based compensation, facility costs, consulting fees, tools and equipment usage and other miscellaneous expenses associated with these activities.

Stock-Based Compensation

The Company accounts for all stock-based payment awards issued to employees and directors, including employee stock options, restricted stocks units, restricted stocks and stock appreciation rights under the provisions of ASC 718 "Compensation – Stock Compensation" ("ASC 718"). The Company estimates the value of stock-based payment awards on the date of grant using an option pricing model such as Black-Scholes or Monte Carlo simulation. The determination of the fair value of stock-based payment awards is affected by the Company's stock price as well as assumptions regarding a number of subjective variables. These variables include, but are not limited to, expected stock price volatility over the term of the awards, actual and projected stock-based instrument exercise behaviors, risk-free interest rate and expected dividends. Forfeitures are estimated at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. The Company recognizes stock-based compensation expense on the straight-line basis over the requisite service period of each award that are ultimately expected to vest.

Income Taxes

Income taxes are accounted for under the liability method. Deferred income tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases, including operating loss and tax credit carryforwards. Deferred income tax assets and liabilities are measured using enacted tax rates expected to apply in the years in which those temporary differences are expected to be recovered or settled. The Company records a valuation allowance when it is more likely than not that all or a portion of deferred tax assets will not be realized (see Footnote 7 "Income Taxes"). The effect on deferred income tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date.

Debt Issuance Costs

The Company presents debt issuance costs related to a debt liability as a direct deduction from the carrying amount of that debt liability on the Consolidated Balance Sheets and amortizes such costs using the effective interest method whereas debt issuance costs related to line of credit arrangement is presented within "Other assets" on the Consolidated Balance Sheets and amortized ratably over the term of the line of credit arrangement, regardless of whether there are any outstanding borrowings on the line of credit arrangement.

Foreign Currency Gains and Losses

Assets and liabilities of the Company's subsidiaries operating outside the United States that have a functional currency other than the U.S. dollar have been translated to U.S. dollars using the exchange rate in effect at the balance sheet date. Results of foreign operations have been translated using the average exchange rate during the periods of operation. Resulting translation adjustments have been recorded as a component of Accumulated Other Comprehensive Loss. Foreign currency transaction gains and losses, as they occur, are included in "Other income (expense), net" on the Consolidated Statements of Operations. Total foreign currency transaction losses were $0.4 million, $1.6 million and $3.3 million for 2018, 2017 and 2016, respectively.

Concentration of Foreign Sales Risk

The majority of the Company's foreign sales are denominated in U.S. dollars. For 2018, 2017 and 2016, international sales comprised 75%, 76% and 78%, respectively, of total net revenues. Since 2008, global economic problems and uncertainties have generally increased in scope and nature. The volatility in oil prices have continued to impact the global market throughout 2018. To the extent that world events or economic conditions negatively affect the Company's future sales to customers in many regions of the world, as well as the collectability of the Company's existing receivables, the Company's future results of operations, liquidity and financial condition would be adversely affected.

(2) Segment and Geographic Information

The Company evaluates and reviews its results based on three business segments: E&P Technology & Services, Operations Optimization, and Ocean Bottom Integrated Technologies. The Company measures segment operating results based on income (loss) from operations.

A summary of segment information follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Net revenues:			
E&P Technology & Services:			
New Venture	$69,685	$100,824	$27,362
Data Library	47,095	40,016	39,989
Total multi-client revenues	116,780	140,840	67,351
Imaging Services	19,740	16,409	25,538
Total	$136,520	$157,249	$92,889
Operations Optimization:			
Devices	$22,396	$23,610	$26,746
Optimization Software & Services	21,129	16,695	16,756
Total	$43,525	$40,305	$43,502
Ocean Bottom Integrated Technologies	$—	$—	$36,417
Total	$180,045	$197,554	$172,808
Gross profit (loss):			
E&P Technology & Services	$43,369	$65,196	$4,708
Operations Optimization	22,293	20,076	21,745
Ocean Bottom Integrated Technologies	(6,042)	(9,633)	9,579
Total	$59,620	$75,639	$36,032
Gross margin:			
E&P Technology & Services	32%	41%	5%
Operations Optimization	51%	50%	50%
Ocean Bottom Integrated Technologies	—%	—%	26%
Total	33%	38%	21%
Income (loss) from operations:			
E&P Technology & Services	$21,758	$42,505	$(16,446)
Operations Optimization	7,295	8,022	9,652
Ocean Bottom Integrated Technologies	(47,644) [(a)]	(16,259)	(1,756)
Support and other	(35,681)	(42,967)	(34,621)
Loss from operations	(54,272)	(8,699)	(43,171)
Interest expense, net	(12,972)	(16,709)	(18,485)
Other income (expense), net	(436)	(3,945)	1,350
Loss before income taxes	$(67,680)	$(29,353)	$(60,306)

[(a)] Includes a charge of $36.6 million to write-down the cable-based ocean bottom acquisition technologies associated with the Ocean Bottom Integrated Technologies segment. This impairment relates to property, plant, equipment and seismic rental equipment of $21.3 million within the Operations Optimization segment and $15.3 million within the Ocean Bottom Integrated Technologies segment.

	Years Ended December 31,		
	2018	2017	2016
Depreciation and amortization (including multi-client data library):			
E&P Technology & Services	$51,673	$53,663	$44,100
Operations Optimization	995	1,349	1,780
Ocean Bottom Integrated Technologies	4,231	7,001	7,511
Support and other	852	1,681	1,919
Total	$57,751	$63,694	$55,310

	December 31,	
	2018	2017
Total assets:		
E&P Technology & Services	$165,132	$156,555
Operations Optimization	51,783	74,361
Ocean Bottom Integrated Technologies	1,177	20,828
Support and other	26,657	49,325
Total	$244,749[(a)]	$301,069

[(a)] Balance is net of impairment charge of $36.6 million related to the cable-based ocean bottom acquisition technologies.

A summary of total assets by geographic area follows (in thousands):

	December 31,	
	2018	2017
North America	$86,614	$116,598
Latin America	69,418	55,661
Middle East	52,037	70,308
Europe	31,566	51,876
Other	5,114	6,626
Total	$244,749	$301,069

A summary of property, plant, equipment and seismic equipment less accumulated depreciation and impairment by geographic area follows (in thousands):

	December 31,	
	2018	2017
North America	$11,663	$10,609
Europe	1,140	20,725
Latin America	143	170
Middle East	36	20,543
Other	59	106
Total	$13,041[(a)]	$52,153

[(a)] Balance is net of impairment charge of $36.6 million related to the cable-based ocean bottom acquisition technologies.

Intersegment sales are insignificant for all periods presented. Support and other assets include all assets specifically related to support personnel and operation and a majority of cash and cash equivalents. Depreciation and amortization expense is allocated to segments based upon use of the underlying assets.

A summary of net revenues by geographic area follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Latin America	$68,871	$68,241	$24,090
North America	44,474	48,120	38,005
Europe	31,077	44,930	41,674
Asia Pacific	17,817	18,896	16,226
Africa	10,837	6,837	41,417
Middle East	5,526	2,308	9,467
Commonwealth of Independent States	1,443	8,222	1,929
Total	$180,045	$197,554	$172,808

Net revenues are attributed to geographic areas on the basis of the ultimate destination of the equipment or service, if known, or the geographic area imaging services are provided. If the ultimate destination of such equipment is not known, net revenues are attributed to the geographic area of initial shipment.

(3) Revenue from Contracts with Customers

The Company derives revenue from the sale or license of (i) multi-client and proprietary data, imaging services and E&P Advisors consulting services within its E&P Technology & Services segment; (ii) seismic data acquisition systems and other seismic equipment, (iii) seismic command and control software systems and software solutions for operations management within its Operations Optimization segment; and (iv) a full suite of technology and services within its Ocean Bottom Integrated Technologies segment. All revenues of the E&P Technology & Services and Ocean Bottom Integrated Technologies segments and the services component of revenues for the Optimization Software & Services group as part of the Operations Optimization segment are classified as services revenues. All other revenues are classified as product revenues.

The Company uses a five-step model to determine proper revenue recognition from customer contracts. Revenue is recognized when (i) a contract is approved by all parties; (ii) the goods or services promised in the contract are identified; (iii) the consideration the Company expects to receive in exchange for the goods or services promised is determined; (iv) the consideration is allocated to the goods and services in the contract; and (v) control of the promised goods or services is transferred to the customer. The Company does not disclose the value of contractual future performance obligations such as backlog with an original expected length of one year or less within the footnotes.

Multi-client and Proprietary Surveys, Imaging Services and E&P Advisors Services - As multi-client seismic surveys are being designed, acquired or processed (the “New Venture” phase), the Company enters into non-exclusive licensing arrangements with its customers, who pre-fund or underwrite these programs in part. License revenues from these surveys are recognized during the New Venture phase as the seismic data is acquired and/or processed on a proportionate basis as work is performed and control is transferred to the customer. Under this method, the Company recognizes revenue based upon quantifiable measures of progress, such as kilometers acquired or surveys of performance completed to date. Upon completion of a multi-client seismic survey, it is considered “on-the-shelf,” and licenses to the survey data are granted to customers on a non-exclusive basis.

The Company also performs seismic surveys, imaging and other services under contracts with specific customers, whereby the seismic data is owned by those customers. The Company recognizes revenue as the seismic data is acquired and/or processed on a proportionate basis as work is performed. The Company uses quantifiable measures of progress consistent with its multi-client seismic surveys.

Acquisition Systems and Other Seismic Equipment - For sales of seismic data acquisition systems and other seismic equipment, the Company recognizes revenue when control of the goods has transferred to the customer. Transfer of control generally occurs when (i) the Company has a present right to payment; (ii) the customer has legal title to the asset; (iii) the Company has transferred physical possession of the asset; and (iv) the customer has significant rewards of ownership; or (v) the customer has accepted the asset.

Software - Licenses for the Company’s navigation, survey design and quality control software systems provide the customer with a right to use the software. The Company offers usage-based licenses under which it receives a monthly fee based on the number of vessels and licenses used. For these usage-based licenses, revenue is recognized as the performance obligations are performed over the contract term, which is generally two to five years. In addition to usage-based licenses, the Company offers perpetual software licenses as it exists when made available to the customer. Revenue from these licenses is recognized upfront at the point in time when the software is made available to the customer.

These arrangements generally include the Company providing related services, such as training courses, engineering services and annual software maintenance. The Company allocates consideration to each element of the arrangement based upon directly observable or estimated standalone selling prices. Revenue is recognized for these services as control transfers to the customer over time.

Ocean Bottom Integrated Technologies - The Company recognizes revenue as the seismic data is acquired and control transfers to the customer. The Company uses quantifiable measures of progress consistent with its multi-client surveys. In connection with acquisition contracts, the Company may receive revenues for preparation and mobilization of equipment and personnel, capital improvements to vessels, or demobilization activities. The Company defers the revenues earned and incremental costs incurred that are directly related to these activities and recognizes

such revenues and costs over the primary contract term of the acquisition project as it transfers the goods and services to the customer. The Company recognizes the costs of relocating vessels without contracts to more promising market sectors as such costs are incurred.

Revenue by Segment and Geographic Area

See Footnote 2 “Segment Information” of Footnotes to Consolidated Financial Statements for revenue by segment and revenue by geographic area for the years ended December 31, 2018, 2017 and 2016. In 2018, the Company had two customers with sales that each exceeded 10% of the consolidated net revenues. Revenues related to these customers are included within the E&P Technology & Services segment. In 2017, the Company had one customer with sales that exceeded 10% of the consolidated net revenues and revenues related to this customer are included within the E&P Technology & Services segment. No single customer represented 10% or more of the consolidated net revenues for 2016.

Unbilled Receivables

Unbilled receivables relate to revenues recognized on multi-client surveys, imaging services and Devices equipment repairs on a proportionate basis, and on licensing of multi-client data libraries for which invoices have not yet been presented to the customer. The following table is a summary of unbilled receivables (in thousands):

	December 31,	
	2018	2017
New Venture	$38,430	$33,183
Imaging Services	5,075	4,121
Devices	527	—
Total	$44,032	$37,304

The changes in unbilled receivables were as follows (in thousands):

Unbilled receivables at December 31, 2017	$	37,304
Recognition of unbilled receivables	153,611	
Revenues billed to customers	(146,883	)
Unbilled receivables at December 31, 2018	$	44,032

Deferred Revenue

Billing practices are governed by the terms of each contract based upon achievement of milestones or pre-agreed schedules. Billing does not necessarily correlate with revenue recognized on a proportionate basis as work is performed and control is transferred to the customer. Deferred revenue represents cash received in excess of revenue not yet recognized as of the reporting period, but will be recognized in future periods. The following table is a summary of deferred revenues (in thousands):

	December 31,	
	2018	2017
New Venture	$5,797	$6,548
Imaging Services	307	676
Devices	626	633
Optimization Software & Services	980	1,053
Total	$7,710	$8,910

The changes in deferred revenues were as follows (in thousands):

Deferred revenue at December 31, 2017	$8,910
Cash collected in excess of revenue recognized	25,234
Recognition of deferred revenue [(a)]	(26,434)
Deferred revenue at December 31, 2018	$7,710

[(a)] The majority of deferred revenue recognized relates to Company’s Ventures group.

The Company expects to recognize all deferred revenue within the next 12 months.

(4) Recent Accounting Pronouncements

In February 2016, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2016-2, "Leases (Topic 842)" which introduces the recognition of lease assets and lease liabilities by lessees for those leases classified as operating leases under previous guidance. The guidance will be effective for annual reporting periods beginning after December 15, 2018 and interim periods within those fiscal years with early adoption permitted. The Company will adopt ASU 2016-2 on January 1, 2019 using the modified retrospective method. The Company has completed its evaluation of operating leases related to offices, processing centers, warehouse spaces and, to a lesser extent, certain equipment. The Company expects the adoption of the standard will result in approximately $50 million to $60 million in right-of-use assets and lease obligations on the Consolidated Balance Sheets. The Company expects the Income Statement recognition to appear similar to its current methodology. The Company will elect the practical expedients upon transition which will retain the lease classification for leases and any unamortized initial direct costs that existed prior to the adoption of the standard.

On January 1, 2018, the Company adopted ASC 606 and all the related amendments using the modified retrospective method. The adoption did not have a material impact to the Company's revenue recognition policy under the previous standard and adoption of the new standard did not result in an adjustment to the Company's beginning retained earnings balance.

On January 1, 2018, the Company adopted ASU 2016-18, Statement of Cash Flows "Restricted Cash (a consensus of the FASB Emerging Issues Task Force)", using a retrospective transition method to each period presented. The new standard no longer requires the Company to present transfers between cash and cash equivalents and restricted cash in the statements of cash flows. Adoption of the new standard resulted in a decrease of $0.4 million and $0.6 million in net cash provided by operating activities as previously reported for the years ended December 31, 2017 and 2016, respectively. See the Consolidated Statements of Cash Flows above which includes a reconciliation of cash and cash equivalents to total cash, cash equivalents, and restricted cash.

In June 2016, the FASB issued ASU No. 2016-13, "Financial Instruments - Credit Losses: Measurement of Credit Losses on Financial Instruments." The guidance will replace the incurred loss impairment methodology under current GAAP with a methodology that reflects expected credit losses and requires consideration of a broader range of reasonable and supportable information to inform credit loss estimates The guidance is effective for public companies for interim and annual periods beginning after December 15, 2019, with early adoption permitted for interim and annual periods beginning after December 15, 2018. The Company is in the initial stages of evaluating the impact of this standard on the Consolidated Financial Statements.

(5) Long-term Debt and Lease Obligations

The following is a summary of long-term debt and lease obligation (in thousands):

	December 31,	
	2018	2017
Senior secured second-priority lien notes (maturing December 15, 2021)	$120,569	$120,569
Senior secured third-priority lien notes (redeemed March 26, 2018)	—	28,497
Revolving credit facility (amended August 16, 2018, maturing August 16, 2023) [(a)]	—	10,000
Equipment capital leases	2,938	279
Other debt	1,159	1,382
Costs associated with issuances of debt	(2,925)	(3,983)
Total	121,741	156,744
Current portion of long-term debt and lease obligations	(2,228)	(40,024)
Non-current portion of long-term debt and lease obligations	$119,513	$116,720

[(a)] The maturity of the revolving credit facility will accelerate to December 15, 2021 if the Company is unable to repay or extend the maturity of the Second Lien Notes.

Revolving Credit Facility

On August 16, 2018, ION and its material U.S. subsidiaries; GX Technology Corporation, ION Exploration Products (U.S.A) Inc. and I/O Marine Systems Inc. (the "Material U.S. Subsidiaries"), along with GX Geoscience Corporation, S. de R.L. de C.V., a limited liability company (Sociedad de Responsibilidad Limitada de Capital Variable) organized

under the laws of Mexico, and a subsidiary of the Company (the “Mexican Subsidiary”), (the Material U.S. Subsidiaries and the Mexican Subsidiary are collectively, the “Subsidiary Borrowers”, together with ION Geophysical Corporation are the “Borrowers”), the financial institutions party thereto, as lenders, and PNC Bank, National Association (“PNC”), as agent for the lenders, entered into that certain Third Amendment and Joinder to Revolving Credit and Security Agreement (the “Third Amendment”), amending the Revolving Credit and Security Agreement, dated as of August 22, 2014 (as previously amended by the First

Amendment to Revolving Credit and Security Agreement, dated as of August 4, 2015 and the Second Amendment to Revolving Credit and Security Agreement, dated as of April 28, 2016, the "Credit Agreement"). The Credit Agreement, as amended by the First Amendment, the Second Amendment and the Third Amendment is herein called, the "Credit Facility").

The Credit Facility is available to provide for the Borrowers' general corporate needs, including working capital requirements, capital expenditures, surety deposits and acquisition financing.

The Third Amendment amends the Credit Agreement to, among other things:

- extend the maturity date of the Credit Facility by approximately four years (from August 22, 2019 to August 16, 2023), subject to the retirement or extension of the maturity date of the Second Lien Notes, as defined below, which mature on December 15, 2021;
- increase the maximum revolver amount by $10 million (from $40 million to $50 million);
- increase the borrowing base percentage of the net orderly liquidation value as it relates to the multi-client data library (not to exceed $28.5 million, up from the previous maximum of $15 million for the multi-client data library component);
- include the eligible billed receivables of the Mexican Subsidiary up to a maximum of $5 million in the borrowing base calculation and joins the Mexican Subsidiary as a borrower thereunder (with a maximum exposure of $5 million) and require the equity and assets of the Mexican Subsidiary to be pledged to secure obligations under the Credit Facility;
- modify the interest rate such that the maximum interest rate remains consistent with the fixed interest rate prior to the Third Amendment (that is, 3.00% per annum for domestic rate loans and 4.00% per annum for LIBOR rate loans), but now lowers the range down to a minimum interest rate of 2.00% for domestic rate loans and 3.00% for LIBOR rate loans based on a leverage ratio for the preceding four-quarter period;
- decrease the minimum excess borrowing availability threshold which (if the Borrowers have minimum excess borrowing availability below any such threshold) triggers the agent's right to exercise dominion over cash and deposit accounts; and
- modify the trigger required to test for compliance with the fixed charge coverage ratio, which is further described below.

The maximum amount under the Credit Facility is the lesser of $50.0 million or a monthly borrowing base. The borrowing base under the Credit Facility will increase or decrease monthly using a formula based on certain eligible receivables, eligible inventory and other amounts, including a percentage of the net orderly liquidation value of the Borrowers' multi-client data library. As of December 31, 2018, the borrowing base under the Credit Facility was $41.9 million and there was no outstanding indebtedness under the Credit Facility.

The obligations of Borrowers under the Credit Facility are secured by a first-priority security interest in 100% of the stock of the Subsidiary Borrowers and 65% of the equity interest in ION International Holdings L.P. and by substantially all other assets of the Borrowers. However, the first-priority security interest in the other assets of the Mexican Subsidiary is limited to a maximum exposure of $5.0 million.

The Credit Facility contains covenants that, among other things, limit or prohibit the Borrowers, subject to certain exceptions and qualifications, from incurring additional indebtedness in excess of permitted indebtedness (including capital lease obligations), repurchasing equity, paying dividends or distributions, granting or incurring additional liens on the Borrowers' properties, pledging shares of the Borrowers' subsidiaries, entering into certain merger transactions, entering into transactions with the Company's affiliates, making certain sales or other dispositions of the Borrowers' assets, making certain investments, acquiring other businesses and entering into sale-leaseback transactions with respect to the Borrowers' property.

The Credit Facility, requires that ION and the Subsidiary Borrowers maintain a minimum fixed charge coverage ratio of 1.1 to 1.0 as of the end of each fiscal quarter during the existence of a covenant testing trigger event. The fixed charge coverage ratio is defined as the ratio of (i) ION's EBITDA, minus unfunded capital expenditures made during the relevant period, minus distributions (including tax distributions) and dividends made during the relevant period, minus cash taxes paid during the relevant period, to (ii) certain debt payments made during the relevant period. A covenant testing trigger event occurs upon (a) the occurrence and continuance of an event of default under the Credit

Facility or (b) by a two-step process based on (i) a minimum excess borrowing availability threshold (excess borrowing availability less than $6.25 million for five consecutive business days or $5.0 million on any given business day, and (ii) the Borrowers' unencumbered cash maintained in a PNC deposit account is less that the Borrowers' then outstanding obligations. Prior to the Third Amendment, the test covenant compliance was tied to a total liquidity measure (liquidity less than $7.5 million for five consecutive days or $6.5 million on any given day).
As of December 31, 2018, the Company was in compliance with all of the covenants under the Credit Facility.

The Credit Facility, as amended, contains customary event of default provisions (including a "change of control" event affecting ION), the occurrence of which could lead to an acceleration of the Company's obligations under the Credit Facility.

Senior Secured Notes

As of December 31, 2018, ION Geophysical Corporation's 9.125% Senior Secured Second Priority Notes due December 2021 (the "Second Lien Notes") had an outstanding principal amount of $120.6 million. Prior to its early redemption, ION Geophysical Corporation's 8.125% Senior Secured Second-Priority Notes due May 2018 (the "Third Lien Notes") had an aggregate principal amount of $28.5 million. In March 2018, ION Geophysical Corporation obtained consent from a majority of the Second Lien Notes holders and from PNC to redeem, in full, the Third Lien Notes prior to their stated maturity. On March 26, 2018, ION Geophysical Corporation redeemed the Third Lien Notes by paying the then outstanding principal amount, plus all accrued and unpaid interest through the redemption date.

The Second Lien Notes remain outstanding and are senior secured second-priority obligations guaranteed by the Material U.S. Subsidiaries and the Mexican Subsidiary (each as defined above and herein below, with the reference to the Second Lien Notes, the "Guarantors"). Interest on the Second Lien Notes accrues at the rate of 9.125% per annum and is payable semiannually in arrears on June 15 and December 15 of each year during their term, except that the interest payment otherwise payable on June 15, 2021 will be payable on December 15, 2021.

The April 2016 indenture governing the Second Lien Notes contains certain covenants that, among other things, limits or prohibits ION Geophysical Corporation's ability and the ability of its restricted subsidiaries to take certain actions or permit certain conditions to exist during the term of the Second Lien Notes, including among other things, incurring additional indebtedness, creating liens, paying dividends and making other distributions in respect of ION Geophysical Corporation's capital stock, redeeming ION Geophysical Corporation's capital stock, making investments or certain other restricted payments, selling certain kinds of assets, entering into transactions with affiliates, and effecting mergers or consolidations. These and other restrictive covenants contained in the Second Lien Notes Indenture are subject to certain exceptions and qualifications. All of ION Geophysical Corporation's subsidiaries are currently restricted subsidiaries.

As of December 31, 2018, the Company was in compliance with the covenants with respect to the Second Lien Notes.

On or after December 15, 2019, the Company may on one or more occasions redeem all or a part of the Second Lien Notes at the redemption prices set forth below, plus accrued and unpaid interest and special interest, if any, on the Second Lien Notes redeemed during the twelve-month period beginning on December 15th of the years indicated below:

Date	Percentage
2019	105.500%
2020	103.500%
2021 and thereafter	100.000%

Equipment Capital Leases

The Company has entered into capital leases that are due in installments for the purpose of financing the purchase of computer equipment through 2021. Interest accrues under these leases at rates from 4.3% to 8.7% per annum, and the leases are collateralized by liens on the computer equipment. The assets are amortized over the lesser of their related lease terms or their estimated productive lives and such charges are reflected within depreciation expense.

A summary of future principal obligations under long-term debt and equipment capital lease obligations follows (in thousands):

Years Ending December 31,	Short-Term and Long-Term Debt	Capital Lease Obligations	Other Financing	Total
2019	$ —	$ 1,069	1,159	$2,228
2020	—	1,135	—	1,135
2021	120,569	734	—	121,303

Total	$ 120,569	$ 2,938	$ 1,159	$124,666

(6) Net Income (Loss) per Common Share

Basic net income (loss) per common share is computed by dividing net income (loss) applicable to common shares by the weighted average number of common shares outstanding during the period. Diluted net income (loss) per common share is determined based on the assumption that dilutive restricted stock and restricted stock unit awards have vested and outstanding dilutive stock options have been exercised and the aggregate proceeds were used to reacquire common stock using the average price of such common stock for the period. The total number of shares issuable under anti-dilutive options at December 31, 2018, 2017 and 2016 were 785,890, 890,341 and 847,635, respectively. All outstanding stock options for the twelve months ended December 31, 2018, 2017 and 2016 were anti-dilutive.

(7) Income Taxes

The sources of income (loss) before income taxes are as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Domestic	$(59,212)	$(12,487)	$(41,246)
Foreign	(8,468)	(16,866)	(19,060)
Total	$(67,680)	$(29,353)	$(60,306)

Components of income taxes are as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Current:			
Federal	$—	$(166)	$—
State and local	65	116	28
Foreign	8,905	5,494	5,574
Deferred:			
Federal	(346)	(1,263)	—
Foreign	(5,906)	(4,157)	(1,181)
Total income tax expense	$2,718	$24	$4,421

A reconciliation of the expected income tax expense on income (loss) before income taxes using the statutory federal income tax rate of 21% for 2018 and 35% for 2017 and 2016 to income tax expense follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Expected income tax expense at 21% for 2018 and 35% for 2017 and 2016	$(14,213)	$(10,274)	$(21,107)
Foreign tax rate differential	74	(2,914)	5,932
Foreign tax differences	4,703	(5,610)	(4,828)
Global intangible low tax income inclusion	3,443	—	—
State and local taxes	65	116	28
Nondeductible expenses	1,604	4,308	(259)
Change in U.S. tax rate	—	77,410	—
Expired capital loss	—	1,114	1,321
Valuation allowance:			
Valuation allowance on expiring capital losses	—	(1,114)	(1,321)
Valuation allowance on operations	7,042	(63,012)	24,655
Total income tax expense	$2,718	$24	$4,421

As a result of passage of the Tax Cut and Jobs Act (the "Act") in December 2017, the Company's U.S. deferred tax assets, liabilities, and associated valuation allowance as of December 31, 2018 and 2017 have been re-measured at the new U.S. federal tax rate of 21%.

The tax effects of the cumulative temporary differences resulting in the net deferred income tax asset (liability) are as follows (in thousands):

	December 31,	
	2018	2017
Deferred income tax assets:		
Accrued expenses	$1,126	$1,976
Allowance accounts	6,415	2,960
Net operating loss carryforward	96,854	87,705
Equity method investment	35,292	35,292
Original issue discount	8,073	9,624
Interest limitation	5,845	—
Basis in identified intangibles	4,146	9,408
Tax credit carryforwards	5,345	6,929
Contingency accrual	—	788
Other	4,600	4,035
Total deferred income tax asset	167,696	158,717
Valuation allowance	(160,505)	(153,463)
Net deferred income tax asset	7,191	5,254
Deferred income tax liabilities:		
Unbilled receivables	—	(3,501)
Total deferred income tax asset, net	$7,191	$1,753

As of December 31, 2018, the Company has a valuation allowance on substantially all net U.S. deferred tax assets. The valuation allowance was released in 2017 with respect to refundable U.S. alternative minimum tax ("AMT") credits that will be realized as a result of provisions in the Act. A valuation allowance is established or maintained when it is "more likely than not" that all or a portion of deferred tax assets will not be realized. The Company will continue to record a valuation allowance for the substantial majority of its deferred tax assets until there is sufficient evidence to warrant reversal.

At December 31, 2018, the Company had U.S. net operating loss carryforwards of approximately $274.4 million, expiring in 2034 and beyond, and net operating loss carryforwards outside of the U.S. of approximately $153.1 million, the majority of which expires beyond 2025.

As of December 31, 2018, the Company has approximately $0.4 million of unrecognized tax benefits and does not expect to recognize any significant increases in unrecognized tax benefits during the next twelve-month period. Interest and penalties, if any, related to unrecognized tax benefits are recorded in income tax expense. During 2018, 2017 and 2016, the aggregate changes in the Company's total gross amount of unrecognized tax benefits are summarized as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Beginning balance	$447	$1,299	$1,250
Increases in unrecognized tax benefits – current year positions	—	59	49
Decreases in unrecognized tax benefits – prior year position	—	(911)	—
Ending balance	$447	$447	$1,299

The Company's U.S. federal tax returns for 2015 and subsequent years remain subject to examination by tax authorities. The Company is no longer subject to Internal Revenue Service ("IRS") examination for periods prior to 2015, although carryforward attributes that were generated prior to 2015 may still be adjusted upon examination by the IRS if they either have been or will be used in a future period. In the Company's foreign tax jurisdictions, tax

returns for 2012 and subsequent years generally remain open to examination.

As of December 31, 2018, the Company considered the outside book-over-tax basis difference in its foreign subsidiaries to be in the amount of approximately $85.0 million. United States income taxes have not been provided on this basis difference as it is the Company's intention to reinvest the undistributed earnings of its foreign subsidiaries to the extent they cannot be remitted to the United States without incurring incremental tax as provided in the Act.

(8) Legal Matters

WesternGeco

A more thorough treatment of history of this litigation is set forth above in Item 1.A, “Risk Factors”. As noted in that section, in 2014, because a jury found that we infringed four WesternGeco patents, the United States District Court for the Southern District of Texas (the “District Court”) entered a Final Judgment against us in the amount of $123.8 million ($12.5 million in reasonable royalties, $93.4 million in lost profits, $10.9 million in pre-judgment interest on lost profits, and $9.4 million in supplemental damages).

In 2015, the United States Court of Appeals for the Federal Circuit in Washington, D.C. (the “Court of Appeals”) reversed, in part, the District Court, holding that the lost profits, which were attributable to foreign seismic surveys, were not available to WesternGeco under the Patent Act. The Company had recorded a loss contingency accrual of $123.8 million because of the District Court’s ruling. As a result of the reversal by the Court of Appeals, the Company reduced the loss contingency accrual to $22.0 million.

On February 26, 2016, WesternGeco appealed the Court of Appeals’ decision to the Supreme Court, as to both lost profits and “enhanced” damages (damages which are available for willful infringement, and which neither the District Court nor the Trial Court awarded). On June 20, 2016, the Supreme Court vacated the Court of Appeals’ ruling, although it did not address lost profits at that time. Rather, in light of changes in case law regarding the standard of proof for willfulness in patent infringement, the Supreme Court remanded the case to the Court of Appeals for a determination of whether enhanced damages were appropriate.

On November 14, 2016, the District Court ordered our sureties to pay principal and interest on the royalty damages previously awarded. On November 25, 2016, the Company paid WesternGeco the $20.8 million due pursuant to the order, and it reduced its loss contingency accrual to zero.

On March 14, 2017, the District Court held a hearing on whether impose additional damages for willfulness. The Judge found that the Company’s infringement was willful, and awarded enhanced damages of $5.0 million to WesternGeco (WesternGeco had sought $43.6 million in such damages.) The District Court also ordered the appeal bond to be released and discharged. The Court’s findings and ruling were memorialized in an order issued on May 16, 2017. On June 30, 2017, the Company and WesternGeco agreed that neither of them would appeal the District Court's award of $5.0 million in enhanced damages. Upon assessment of the enhanced damages, the Company accrued $5.0 million in the first quarter of 2017. As the Company have paid the $5.0 million, the accrual has been adjusted, and as of December 31, 2018, the loss contingency accrual was zero.

WesternGeco filed a second petition in the Supreme Court on February 17, 2017, appealing the lost profits issue again. On May 30, 2017, the Supreme Court called for the U.S. Solicitor General’s views on whether or not the Supreme Court ought to hear WesternGeco’s appeal. On December 6, 2017, the Solicitor General filed its brief, and took the position that the Supreme Court ought to hear the appeal and that foreign lost profits ought to be available.

On January 12, 2018, the Supreme Court agreed to hear the appeal. The specific issue before the Supreme Court was whether lost profits arising from use of prohibited combinations occurring outside of the United States are categorically unavailable in cases where patent infringement is proven under 35 U.S.C. § 271(f)(2) (the statute under which the Company were held to have infringed WesternGeco’s patents, and upon which the District Court and Court of Appeals relied in entering their rulings).

The Supreme Court heard oral arguments on April 16, 2018. The Company argued that the Court of Appeals’ decision that eliminated lost profits ought to be affirmed. WesternGeco and the Solicitor General argued that the Court of Appeals’ decision that eliminated lost profits ought to be reversed.

On June 22, 2018, the Supreme Court reversed the judgment of the Court of Appeals, held that the award of lost profits to WesternGeco by the District Court was a permissible application of Section 284 of the Patent Act, and remanded the case back to the Court of Appeals for further proceedings consistent with its (the Supreme Court’s) opinion. On July 24, 2018, the Supreme Court issued the judgment that returned the case to the Court of Appeals.

On July 27, 2018, the Court of Appeals vacated its September 21, 2016 judgment with respect to damages, and ordered WesternGeco and the Company to submit supplemental briefing on what relief is appropriate in light of the Supreme Court’s decision. The Company and WesternGeco each submitted briefing in accordance with the Court of Appeals’ order (the last brief was filed on September 7, 2018).

The Company argued in its brief to the Court of Appeals that lost profits were not available to WesternGeco because the jury instructions required them to find that the Company had been WesternGeco's direct competitor in the survey markets where WesternGeco had lost profits, and that the jury could not have found so. Additionally, we argued that the award of lost profits and reasonable royalties ought to be vacated and retried on separate grounds due to the outcome of an Inter Partes Review ("IPR") filed with the Patent Trial and Appeal Board ("PTAB") of the Patent and Trademark Office.

Until the Court of Appeals' January 11, 2019 decision issued (which is described below), the IPR was an administrative proceeding that was separate from the 2009 lawsuit. By means of the IPR, the Company joined a challenge to the validity of several of WesternGeco's patent claims that another company had filed. While the 2009 lawsuit was pending on appeal, the PTAB invalidated four of the six patent claims that formed the basis for the lawsuit judgment against the Company. WesternGeco appealed the PTAB's invalidation of its patents to the Court of Appeals. On May 7, 2018, the Court of Appeals affirmed the PTAB's invalidation of the patents, and on July 16, 2018, the Court of Appeals denied WesternGeco's petition for a rehearing. On December 13, 2018, WesternGeco filed a petition with the Supreme Court, arguing that the Court of Appeals ought to have overturned the decision of the PTAB. (As of February 7, 2019, the Supreme Court has not indicated whether it will, or will not, hear WesternGeco's appeal.)

In the same brief to the Court of Appeals in which the Company made its "direct competitor" argument, the Company argued that the Court of Appeals' affirmation of the PTAB's decision precluded WesternGeco's damages claims, and that the Court of Appeals should order a new trial as to the royalty damages already paid by the Company. The Company also argued that if the Court of Appeals did not find its "direct competitor" argument persuasive, the Court should nonetheless vacate the District Court's award of royalty damages and lost profits damages and order a new trial as to both royalty damages and lost profits.

In its briefs to the Court of Appeals, WesternGeco argued that the only remaining issue was whether lost profits were unavailable to WesternGeco due to the Company's "direct competitor" argument, and argued that the invalidation of four of its six patent claims by the PTAB (which was affirmed by the Court of Appeals) should have no effect on lost profits or on the royalty award already paid by the Company. WesternGeco also argued that lost profits should be available notwithstanding the Company's "direct competitor" argument.

Oral arguments took place on November 16, 2018, and on January 11, 2019, the Court of Appeals issued its ruling. In its ruling, the Court of Appeals refused to disturb the award of reasonable royalties to WesternGeco (which the Company paid in 2016), and rejected the Company's "direct competitor" argument, but vacated the District Court's award of lost profits damages and remanded the case back to the District Court to determine whether to hold a new trial as to lost profits. The Court of Appeals also ruled that its affirmance of the PTAB's decision eliminated four of the five patent claims that could have supported the award of lost profits, leaving only one remaining patent claim that could support an award of lost profits.

The Court of Appeals further held that the lost profits award can be reinstated by the District Court if the existing trial record establishes that the jury must have found that the technology covered by the one remaining patent claim was essential for performing the surveys upon which lost profits were based. To make such a finding, the District Court must conclude that the present trial record establishes that there was no dispute that the technology covered by the one remaining patent claim, independent of the technology of the now-invalid claims, was required to perform the surveys. The Court of Appeals ruling further provides that if, but only if, the District Court concludes that WesternGeco established at trial, with undisputed evidence, that the remaining claim covers technology that was necessary to perform the surveys, then the District Court may deny a new trial and reinstate lost profits.

Other

The Company has been named in various other lawsuits or threatened actions that are incidental to its ordinary business. Litigation is inherently unpredictable. Any claims against the Company, whether meritorious or not, could be time-consuming, cause the Company to incur costs and expenses, require significant amounts of management time and result in the diversion of significant operational resources. The results of these lawsuits and actions cannot be predicted with certainty. Management currently believes that the ultimate resolution of these matters will not have a material adverse impact on the financial condition, results of operations or liquidity of the Company.

(9) Other Income (Expense)

A summary of other income (expense) follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
(Accrual for) reduction of loss contingency related to legal proceedings (Footnote 8)	$—	$(5,000)	$1,168

Recovery of INOVA bad debts	—	844	3,983
Loss on bond exchange	—	—	(2,182)
Other income (expense)	(436)	211	(1,619)
Total other income (expense), net	$(436)	$(3,945)	$1,350

(10) Details of Selected Balance Sheet Accounts

Accounts Receivable

A summary of accounts receivable follows (in thousands):	December 31,	
	2018	2017
Accounts receivable, principally trade	$26,558	$20,050
Less allowance for doubtful accounts	(430)	(572)
Accounts receivable, net	$26,128	$19,478

Inventories

A summary of inventories follows (in thousands):	December 31,	
	2018	2017
Raw materials and purchased subassemblies	$20,011	$20,448
Work-in-process	1,032	1,146
Finished goods	8,111	7,953
Less reserve for excess and obsolete inventories	(15,024)	(15,039)
Inventories, net	$14,130	$14,508

Property, Plant, Equipment and Seismic Rental Equipment

A summary of property, plant, equipment and seismic rental equipment follows (in thousands):

	December 31,	
	2018	2017
Buildings	$15,707	$15,822
Machinery and equipment	132,135	145,654
Seismic rental equipment	1,423	1,677
Furniture and fixtures	3,859	3,869
Other	30,104	28,965
Total	183,228	195,987
Less accumulated depreciation	(133,634)	(143,834)
Less impairment of long-lived assets	(36,553)	—
Property, plant, equipment and seismic rental equipment, net	$13,041	$52,153

Total depreciation expense, including amortization of assets recorded under capital leases, for 2018, 2017 and 2016 was $7.6 million, $15.2 million and $20.3 million, respectively.

Accrued Expenses

A summary of accrued expenses follows (in thousands):	December 31,	
	2018	2017
Compensation, including compensation-related taxes and commissions	$14,502	$19,809
Accrued multi-client data library acquisition costs	3,746	5,104
Income tax payable	7,577	1,868
Accrual for loss contingency related to legal proceedings (Footnote 8)	—	3,750
Other	5,586	8,166
Total	$31,411	$38,697

Other Long-term Liabilities

A summary of other long-term liabilities follows (in thousands):	December 31,	
	2018	2017
Deferred lease liabilities	11,465	12,811
Other	429	1,115
Total	$11,894	$13,926

(11) Goodwill

On December 31, 2018, the Company completed the annual reviews of the carrying value of goodwill in its E&P Technology & Services and Optimization Software & Services reporting units and noted no impairments. The qualitative assessment concluded it was more likely than not that the fair values of the Company's E&P Technology & Services, and Optimization Software & Services reporting units exceeded their carrying values.

The following is a summary of the changes in the carrying amount of goodwill for the years ended December 31, 2018 and 2017 (in thousands):

	E&P Technology & Services	Optimization Software & Services	Total
Balance at January 1, 2017	$ 2,943	$ 19,265	$22,208
Impact of foreign currency translation adjustments	—	1,881	1,881
Balance at December 31, 2017	2,943	21,146	24,089
Impact of foreign currency translation adjustments	—	(1,174)	(1,174)
Balance at December 31, 2018	$ 2,943	$ 19,972	$22,915

(12) Stockholders' Equity and Stock-based Compensation

Public Equity Offering

On February 21, 2018, the Company completed the public equity offering (the "Offering") of its 1,820,000 shares of common stock at a public offering price of $27.50 per share, and warrants to purchase an additional 1,820,000 shares of the Company's common stock pursuant to the Registration Statement on Form S-3 (No. 33-213769) filed with the Securities and Exchange Commission under the Securities Act of 1933 and declared effective on December 2, 2016. The net proceeds from this Offering were $47.0 million, including transaction expenses. A portion of the net proceeds were used to retire the Company's $28.5 million Third Lien Notes in March 2018. The warrants have an exercise price of $33.60 per share, are immediately exercisable and expire on March 21, 2019.

Stock Option Plans

The Company has adopted stock option plans for eligible employees, directors and consultants, which provide for the granting of options to purchase shares of common stock. The options under these plans generally vest in equal annual installments over a four-year period and have a term of ten years. These options are typically granted at pre-established quarterly grant dates with an exercise price per share equal to or greater than the current market price and, upon exercise, are issued from the Company's unissued common shares.

Transactions under the stock option plans are summarized as follows:

	Option Price per Share	Outstanding	Vested	Available for Grant
January 1, 2016	$34.20 - $245.85	560,797	384,305	97,003
Increase in shares authorized	—	—	—	1,150,940
Granted	3.10	415,000	—	(415,000)
Vested	—	—	67,480	—
Cancelled/forfeited	3.10 - 245.85	(128,162)	(103,432)	18,895
Restricted stock granted out of option plans	—	—	—	(259,300)
Restricted stock forfeited or cancelled for employee minimum income taxes and returned to the plans	—	—	—	7,182
December 31, 2016	$3.10 - $245.85	847,635	348,353	599,720
Granted	13.15	156,000	—	(156,000)
Vested	—	—	149,537	—
Exercised	3.10	(15,000)	(15,000)	—
Cancelled/forfeited	3.10 - 245.85	(98,294)	(47,612)	82,118
Restricted stock granted out of option plans	—	—	—	(59,500)
Restricted stock forfeited or cancelled for employee minimum income taxes and returned to the plans	—	—	—	22,065
December 31, 2017	3.10 - 245.85	890,341	435,278	488,403
Increase in shares authorized	—	—	—	1,200,000
Granted	24.50	10,000	—	(10,000)
Vested	—	—	153,944	—
Exercised	3.10	(70,086)	(70,086)	—
Cancelled/forfeited	3.10 - 245.85	(44,365)	(44,231)	2,568
Restricted stock granted out of option plans	—	—	—	(996,775)
Restricted stock forfeited or cancelled for employee minimum income taxes and returned to the plans	—	—	—	48,524
December 31, 2018	$3.10 - $151.35	785,890	474,905	732,720

Stock options outstanding at December 31, 2018 are summarized as follows:

Option Price per Share	Outstanding	Weighted Average Exercise Price of Outstanding Options	Weighted Average Remaining Contract Life	Vested	Weighted Average Exercise Price of Vested Options
$3.10 - $57.90	558,997	$ 15.64	7.2 years	248,012	$ 24.32
$61.05 - $71.85	75,231	$ 62.17	4.7 years	75,231	$ 62.17
$81.60 - $99.60	108,610	$ 88.94	3.6 years	108,610	$ 88.94
$106.05 - $151.35	43,052	$ 108.84	2.3 years	43,052	$ 108.84
Totals	785,890	$ 35.33	5.4 years	474,905	$ 52.76

Additional information related to the Company's stock options follows:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Grant Date Fair Value	Weighted Average Remaining Contractual Life	Aggregate Intrinsic Value (000's)
Total outstanding at January 1, 2018	890,341	$ 36.17		6.4 years	$ 6,774
Options granted	10,000	$ 24.50	$ 15.23		
Options exercised	(70,086)	$ 3.10			
Options cancelled	(134)	$ 61.05			
Options forfeited	(44,231)	$ 100.85			
Total outstanding at December 31, 2018	785,890	$ 35.33		5.4 years	$ 572
Options exercisable and vested at December 31, 2018	474,905	$ 52.76		5 years	$ 213

The total intrinsic value of options exercised during 2018, 2017 and 2016 was $1.4 million, less than $0.1 million and less than $0.1 million, respectively. Cash received from option exercises under all share-based payment arrangements for 2018 and 2017 was $0.2 million and less than $0.1 million, respectively, and during 2016, there was no cash received. The weighted average grant date fair value for stock option awards granted during 2018, 2017 and 2016 was $15.23, $8.10 and $2.04 per share, respectively.

The Company calculated the fair value of each stock option on the date of grant using the Black-Scholes option pricing model. The following assumptions were used for each respective period:

	Years Ended December 31,		
	2018	2017	2016
Risk-free interest rates	2.78%	2.14%	1.3%
Expected lives (in years)	5.0	5.0	5.5
Expected dividend yield	—%	—%	—%
Expected volatility	73.67%	74.41%	78.76%

The computation of expected volatility during 2018, 2017 and 2016 was based on an equally weighted combination of historical volatility and market-based implied volatility. Historical volatility was calculated from historical data for a period of time approximately equal to the expected term of the option award, starting from the date of grant. Market-based implied volatility was derived from traded options on the Company's common stock having a term of six months. The Company's computation of expected life in 2018, 2017 and 2016 was determined based on historical experience of similar awards, giving consideration to the contractual terms of the stock-based awards, vesting schedules and expectations of future employee behavior. The risk-free interest rate assumption is based upon the U.S. Treasury yield curve in effect at the time of grant for periods corresponding with the expected life of the option.

Restricted Stock and Restricted Stock Unit Plans

On November 30, 2018, the Company's stockholders approved certain amendments to the Company's Second Amended and Restated 2013 Long-term Incentive Plan (the "2013 LTIP") including increasing the total number of shares of common stock available for issuance under the 2013 LTIP by 1.2 million shares, for a total of approximately 1.7 million shares, eliminating the restriction on the number of shares in the 2013 LTIP that can be issued as full value awards and certain other technical updates and clarifications related to Section 162(m) of the internal revenue code, as amended.

The Company has issued restricted stock and restricted stock units under the Company's 2013 LTIP, as amended and other applicable plans. Restricted stock units are awards that obligate the Company to issue a specific number of shares of common stock in the future if continued service vesting requirements are met. Non-forfeitable ownership of the common stock will vest over a period as determined by the Company in its sole discretion, generally in equal

annual installments over a three-year period. Shares of restricted stock awarded may not be sold, assigned, transferred, pledged or otherwise encumbered by the grantee during the vesting period.

On December 1, 2018, the Company issued 900,002 restricted stocks to selected employees with a grant date fair value $7.19, $6.51 and $5.89 for each of the tranches. The vesting of these restricted stocks is achieved through both a market condition and a service condition. The market condition is achieved, in part or in full, in the event that during the three-year period beginning on the date of grant the 20-day trailing volume-weighted average price of a share of common stock reaches or exceeds (i) $17.50 for the first 1/3 of the awards, (ii) $22.50 for the second 1/3 of the awards, and (iii) $27.50 for the final 1/3 of the awards. The service condition restricts the ability of the holders to exercise awards until certain service milestones have been reached such that (i) no more than 1/3 of the awards may be exercised, if vested, on and after the first anniversary of the date of grant, (ii) no more than 2/3 of the awards may be exercised, if vested, on and after the second anniversary of the date of grant and (iii) all of the awards may be exercised, if vested, on and after the third anniversary of the date of grant.

The status of the Company's restricted stock and restricted stock unit awards for 2018 follows:

	Number of Shares/Units
Total nonvested at January 1, 2018	201,702
Granted	996,775
Vested	(151,852)
Forfeited	(2,500)
Total nonvested at December 31, 2018	1,044,125

At December 31, 2018, 2017 and 2016, the intrinsic value of restricted stock and restricted stock unit awards was approximately $5.4 million, $4.0 million and $1.7 million, respectively. The weighted average grant date fair value for restricted stock and restricted stock unit awards granted during 2018, 2017 and 2016 was $10.60, $11.36 and $3.81 per share, respectively. The total fair value of shares vested during 2018, 2017 and 2016 was $3.8 million, $0.6 million and $0.2 million, respectively.

Stock Appreciation Rights Plan

The Company has adopted a stock appreciation rights plan which provides for the award of stock appreciation rights ("SARs") to directors and selected key employees and consultants. The awards under this plan are subject to the terms and conditions set forth in agreements between the Company and the holders. The exercise price per SAR is not to be less than one hundred percent of the fair market value of a share of common stock on the date of grant of the SAR. The term of each SAR shall not exceed ten years from the grant date. Upon exercise of a SAR, the holder shall receive a cash payment in an amount equal to the spread specified in the SAR agreement for which the SAR is being exercised. In no event will any shares of common stock be issued, transferred or otherwise distributed under the plan.

On December 1, 2018, the Company issued 960,009 SARs awards to selected employees with an exercise price of $8.85 ("2018 SARs"). None of these 2018 SARs were awarded to non-employee directors. The 2018 SARs have the same service and market vesting conditions as the restricted stocks issued on December 1, 2018, as described above. The maximum value of each 2018 SARs is capped at $18.65 (the spread between the share price cap of $27.50 and the $8.85 per award price).

The 2018 SARs are considered liability awards and as such, these amounts are accrued in the liability section of the consolidated balance sheets. The Company calculated the fair value of each 2018 SARs award as of December 31, 2018 using a Monte Carlo simulation model. The following assumptions were used:

Risk-free interest rates	3.0 %
Expected lives (in years)	5.31
Expected dividend yield	— %
Expected volatility	82.9%

On March 1, 2016, the Company issued 1,210,000 SARs awards to 15 selected key employees with an exercise price of $3.10 (“2016 SARs”). None of these 2016 SARs were awarded to non-employee directors. The vesting of these 2016 SARs is achieved through both a market condition and a service condition. The market condition is achieved, in part or in full, in the event that during the four-year period beginning on the date of grant the 20-day trailing volume-weighted average price of a share of common stock is (i) greater than 120% of the exercise price for the first 1/3 of the awards, (ii) greater than 125% of the exercise price for the second 1/3 of the awards and (iii) greater than 130% of the exercise price for the final 1/3 of the awards. The service condition restricts the ability of the holders to exercise awards until certain service milestones have been reached such that (i) no more than 1/3 of the awards may be exercised, if vested, on and after the first anniversary of the date of grant, (ii) no more than 2/3 of the awards may be exercised, if vested, on and after the second anniversary of the date of grant and (iii) all of the awards may be exercised, if vested, on and after the third anniversary of the date of grant. The maximum value of each 2016 SARs is capped at $19.40 (the spread between the share price cap of $22.50 and the $3.10 per award price).

On December 13, 2017, the Compensation Committee (the “Committee”) of the Board of Directors (the “Board”) of the Company authorized and approved the acceleration of the vesting date to December 13, 2017 for the second tranche of the Company’s outstanding 2016 SARs. The second tranche of the 2016 SARs awards was originally scheduled to vest on March 1, 2018. The vesting of the second tranche of the 2016 SARs awards was accelerated to facilitate the exercise by the 2016 SARs participants, if they so choose, of a larger portion of the 2016 SARs awards prior to year-end, as such an exercise would minimize the potential cash flow impact of any such exercise in the first quarter of 2018, would mitigate the ongoing mark to market accounting requirements for cash-settled 2016 SARs, and would afford the 2016 SARs participants liquidity to invest in common stock of the Company to further align their interests with those of the Company’s stockholders. Participants exercised 663,330 SARs awards at a $9.95 gain per share.

The 2016 SARs are considered liability awards and as such, these amounts are accrued in the liability section of the consolidated balance sheets. The Company calculated the fair value of each 2016 SARs award on the date of grant and remeasured at each reporting period using a Monte Carlo simulation model. However, as of December 31, 2018, the fair value of the 2016 SARs awards were derived using the intrinsic value method since the final tranche of the 2016 SARs awards vest on March 1, 2019, less than twelve months from the balance sheet date.

On March 1, 2015, the Company issued 207,207 SARs awards to 16 selected key employees with an exercise price of $34.20 (“2015 SARs”). None of these 2015 SARs were awarded to non-employee directors. The 2015 SARs awards number and exercise price have been retroactively adjusted to reflect the one-for-fifteen reverse stock split completed on February 4, 2016. The vesting of these 2015 SARs is achieved through both a market condition and a service condition. The market condition is achieved, in part or in full, in the event that during the four-year period beginning on the date of grant the 20-day trailing volume-weighted average price of a share of common stock is (i) greater than 120% of the exercise price for the first 1/3 of the awards, (ii) greater than 125% of the exercise price for the second 1/3 of the awards and (iii) greater than 130% of the exercise price for the final 1/3 of the awards. The exercise condition restricts the ability of the holders to exercise awards until certain service milestones have been reached such that (i) no more than 1/3 of the awards may be exercised, if vested, on and after the first anniversary of the date of grant, (ii) no more than 2/3 of the awards may be exercised, if vested, on and after the second anniversary of the date of grant and (iii) all of the awards may be exercised, if vested, on and after the third anniversary of the date of grant.

The 2015 SARs are considered liability awards and as such, these amounts are accrued in the liability section of the consolidated balance sheets. The Company calculated the fair value of each 2015 SARs award on the date of grant and remeasured at each reporting period using a Monte Carlo simulation model. As of December 31, 2018, the market condition had not been met for the 2015 SARs. If the market condition is not met by March 1, 2019, the 2015 SARs award will expire.

The Company recorded $0.8 million of share-based compensation expense during 2018, $6.6 million during 2017 and $0.5 million in 2016, related to employee SARs.

Additional information related to the Company's SARs follows:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Grant Date Fair Value	Weighted Average Remaining Contractual Life	Aggregate Intrinsic Value (000's)
Total outstanding at January 1, 2016	216,532	$ 34.67			
SARs granted	1,210,000	$ 3.10	$ 17.55		
SARs cancelled	(10,399)	$ 34.20			
Total outstanding at December 31, 2016	1,416,133	$ 7.70			
SARs exercised	(713,330)	$ 3.10			
SARs cancelled	(136,939)	$ 7.70			
Total outstanding at December 31, 2017	565,864	$ 13.49			
SARs granted	960,009	$ 8.85	8.85		
SARs exercised	(34,999)	$ 3.10			
SARs forfeited	(9,333)	$ 45.00			
Total outstanding at December 31, 2018	1,481,541	$ 10.53		8.1 years	$ 718
SARs exercisable and vested at December 31, 2018	—	$ —			

Stock-based Compensation Expense

The following tables summarizes stock-based compensation expense for the years ended December 31, 2018, 2017 and 2016 as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Stock-based compensation expense	$3,337	$2,552	$3,267
Tax benefit related thereto	(698)	(862)	(1,168)
Stock-based compensation expense, net of tax	$2,639	$1,690	$2,099

	Years Ended December 31,		
	2018	2017	2016
Stock appreciation rights expense	$822	$6,611	547
Tax benefit related thereto	(173)	(2,314)	(191)
Stock appreciation rights expense, net of tax	$649	$4,297	$356

Equity Investment Program

To encourage the Company's executive officers and other key employees to purchase common stock of the Company and further align their interests with those of the Company's stockholders, the Board authorized and approved an equity investment program (the "Program") pursuant to which certain of the executive officers and other key employees of the Company are permitted, but not obligated, to purchase unregistered shares of common stock of the Company directly from the Company at market prices. In connection with any such purchases, the Committee authorized and approved, on December 13, 2017, a grant by the Company to such purchasing executive officers and key employees of a certain number of shares of restricted stock. On December 13, 2017, the Committee also authorized and approved to grant to certain executive officers and key employees a certain number of shares of restricted stock in connection with certain purchases of shares of the Company's common stock in the open market.

Specifically, for each five (5) shares directly purchased from the Company or in the open market during a defined period (to expire no later than December 31, 2017), the Company will issue one (1) share of restricted stock, subject to

certain limitations as to the total number of restricted shares to be issued by the Company. Provided that an executive officer or key employee remains employed with the Company until March 1, 2018, the restricted stock will be granted as of March 1, 2018, will vest in full on the date that is 90 days after the grant date and will be subject to the other terms and conditions of the Company's form of restricted stock agreement and the Company's 2013 LTIP. The Company sold, in a private placement under Section 4(a)(2) of the Securities Act of 1933, as amended on December 14, 2017, 120,567 shares of Company common stock at $13.05 per share (the closing price of the Company's common stock on the NYSE on such date) and executive officers and

other key employees purchased 219,346 shares in the open market. On May 30, 2018, 43,865 shares of restricted stock vested at $24.75 per share.

(13) Supplemental Cash Flow Information and Non-Cash Activity

Supplemental disclosure of cash flow information follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Cash paid during the period for:			
Interest	$5,731	$14,181	$15,691
Income taxes	3,260	7,030	4,474
Non-cash items from investing and financing activities:			
Purchase of computer equipment financed through capital leases	3,297	—	—
Leasehold improvement paid by landlord	—	—	955
Issuance of stock in bond exchange	—	—	10,741
Transfer of inventory to property, plant and equipment	—	—	17,662 (a)
Investment in multi-client data library financed through trade payables	4,956	9,059	—

(a) This transfer of $17.7 million of inventory to property, plant, equipment and seismic rental equipment in December 2016, relates to ocean bottom seismic equipment manufactured by the Company to be deployed in the acquisition of ocean bottom seismic data.

(14) Operating Leases

Lessee. The Company leases certain equipment, offices and warehouse space under non-cancelable operating leases. Rental expense was $10.1 million, $11.4 million and $11.3 million for 2018, 2017 and 2016, respectively.

A summary of future rental commitments over the next five years under non-cancelable operating leases follows (in thousands):

Years Ending December 31,	
2019	$13,248
2020	12,857
2021	11,075
2022	10,821
2023	9,205
Total	$57,206

(15) Fair Value of Financial Instruments

Authoritative guidance on fair value measurements defines fair value, establishes a framework for measuring fair value and stipulates the related disclosure requirements. The Company follows a three-level hierarchy, prioritizing and defining the types of inputs used to measure fair value.

Due to their highly liquid nature, the amount of the Company’s other financial instruments, including cash and cash equivalents, restricted cash, accounts and unbilled receivables, short term investments, accounts payable and accrued multi-client data library royalties, represent their approximate fair value.

The carrying amounts of the Company’s long-term debt as of December 31, 2018 and 2017 were $124.7 million and $160.7 million, respectively, compared to its fair values of $120.7 million and $158.2 million as of December 31, 2018 and 2017, respectively. The fair value of the long-term debt was calculated using Level 1 inputs, including an active market price.

Fair value measurements are applied with respect to non-financial assets and liabilities measured on a non-recurring basis, which would consist of measurements primarily of goodwill, intangibles assets, multi-client data library and property, plant and equipment and seismic rental equipment.

(16) Benefit Plans

The Company has a 401(k) retirement savings plan, which covers substantially all employees. Employees may voluntarily contribute up to 60% of their compensation, as defined, to the plan. The Company matched the employee contribution at a rate of 50% of the first 6% of compensation contributed to the plan. Company contributions to the plans were $0.9 million, $0.8 million and $0.8 million, during 2018, 2017 and 2016, respectively.

(17) Selected Quarterly Information — (Unaudited)

A summary of selected quarterly information follows (in thousands, except per share amounts):

	Three Months Ended			
	March 31, 2018	June 30, 2018	September 30, 2018	December 31, 2018
Service revenues	$25,086	$15,752	$ 37,105	$ 61,095
Product revenues	8,422	8,991	10,095	13,499
Total net revenues	33,508	24,743	47,200	74,594
Gross profit (loss)	6,853	(1,517)	16,475	37,809
Loss from operations	(12,640)	(22,519)	(2,452)	(16,661)
Interest expense, net	(3,836)	(2,911)	(3,022)	(3,203)
Other income (expense), net	(791)	84	91	180
Income tax expense (benefit)	1,072	154	2,079	(587)
Net income attributable to noncontrolling interests	(87)	(366)	(74)	(246)
Net loss applicable to ION	$(18,426)	$(25,866)	$ (7,536)	$ (19,343)
Net loss per share:				
Basic	$(1.44)	$(1.86)	$ (0.54)	$ (1.38)
Diluted	$(1.44)	$(1.86)	$ (0.54)	$ (1.38)

	Three Months Ended			
	March 31, 2017	June 30, 2017	September 30, 2017	December 31, 2017
Service revenues	$23,828	$34,454	$ 52,615	$ 48,513
Product revenues	8,728	11,547	8,480	9,389
Total net revenues	32,556	46,001	61,095	57,902
Gross profit	6,101	15,618	30,109	23,811
Income (loss) from operations	(13,912)	(3,572)	9,936	(1,151)
Interest expense, net	(4,464)	(4,241)	(3,959)	(4,045)
Other income (expense), net	(5,068)	192	722	209
Income tax expense (benefit)	(418)	2,402	1,686	(3,646)
Net income attributable to noncontrolling interests	(316)	(418)	(78)	(53)
Net income (loss) applicable to ION	$(23,342)	$(10,441)	$ 4,935	$ (1,394)
Net income (loss) per share:				
Basic	$(1.98)	$(0.88)	$ 0.42	$ (0.12)
Diluted	$(1.98)	$(0.88)	$ 0.41	$ (0.12)

The sum of the quarterly per share information may not tie to per share information in the Consolidated Statements of Operations due to rounding.

(18) Certain Relationships and Related Party Transactions

For 2018, 2017 and 2016, the Company recorded revenues from BGP of $4.9 million, $4.4 million and $3.6 million, respectively. Receivables due from BGP were $1.6 million and $0.6 million at December 31, 2018 and 2017, respectively. BGP owned approximately 10.6% of the Company’s outstanding common stock as of December 31, 2018.

Mr. James M. Lapeyre, Jr. is the Chairman of the Board on ION's board of directors and a significant equity owner of Laitram, L.L.C. (Laitram), and he has served as president of Laitram and its predecessors since 1989. Laitram is a privately-owned, New Orleans-based manufacturer of food processing equipment and modular conveyor belts. Mr. Lapeyre and Laitram together owned approximately 8.8% of the Company's outstanding common stock as of December 31, 2018.

The Company acquired DigiCourse, Inc., the Company's marine positioning products business, from Laitram in 1998. In connection with that acquisition, the Company entered into a Continued Services Agreement with Laitram under which Laitram agreed to provide the Company certain bookkeeping, software, manufacturing and maintenance services. Manufacturing services consist primarily of machining of parts for the Company's marine positioning systems. The term of this agreement expired in September 2001 but the Company continues to operate under its terms. In addition, from time to time, when the Company has requested, the legal staff of Laitram has advised the Company on certain intellectual property matters with regard to the Company's marine positioning systems. During 2018 and 2017, the Company paid Laitram and its affiliates $0.4 million and $0.2 million, respectively, which consisted of manufacturing services and reimbursement of costs. During 2016, the Company paid less than $0.1 million for reimbursement for costs related to providing administrative and other back-office support services in connection with the Company's Louisiana marine operations. In addition, the Company is currently subleasing approximately 4,100 square feet of office space to Laitram. In the opinion of the Company's management, the terms of these services are fair and reasonable and as favorable to the Company as those that could have been obtained from unrelated third parties at the time of their performance.

(19) Condensed Consolidating Financial Information

The Second Lien Notes were issued by ION Geophysical Corporation, and are guaranteed by the Company's current material U.S. subsidiaries: GX Technology Corporation, ION Exploration Products (U.S.A.), Inc. and I/O Marine Systems, Inc. ("the Guarantors"), all of which are wholly-owned subsidiaries. The Guarantors have fully and unconditionally guaranteed the payment obligations of ION Geophysical Corporation with respect to these debt securities. In August 2018, as part of the Company entering into the Third Amendment to its Credit Agreement, the Company joined the Mexican Subsidiary as a guarantor with respect to the Second Lien Notes. All periods period presented below have been updated to include the Mexican Subsidiary within The Guarantors column. The following condensed consolidating financial information presents the results of operations, financial position and cash flows for:

- ION Geophysical Corporation and the Guarantors (in each case, reflecting investments in subsidiaries utilizing the equity method of accounting).
- All other subsidiaries of ION Geophysical Corporation that are non-guarantors.
- The consolidating adjustments necessary to present ION Geophysical Corporation's results on a consolidated basis.

This condensed consolidating financial information should be read in conjunction with the accompanying consolidated financial statements and footnotes. For additional information pertaining to the Notes, see Item 7. "Management's Discussion and Analysis of Financial Condition and Results of Operations" in Part 2 of this Form 10-K.

Balance Sheet	December 31, 2018 ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Consolidating Adjustments	Total Consolidated
	(In thousands)				
ASSETS					
Current assets:					
Cash and cash equivalents	$13,782	$47	$19,722	$—	$33,551
Accounts receivable, net	8	17,349	8,771	—	26,128
Unbilled receivables	—	12,697	31,335	—	44,032
Inventories	—	8,721	5,409	—	14,130
Prepaid expenses and other current assets	3,891	1,325	2,566	—	7,782
Total current assets	17,681	40,139	67,803	—	125,623
Deferred income tax asset	805	6,261	125	—	7,191
Property, plant, equipment and seismic rental equipment, net	489	8,922	3,630	—	13,041
Multi-client data library, net	—	70,380	3,164	—	73,544
Investment in subsidiaries	836,002	247,359	—	(1,083,361)	—
Goodwill	—	—	22,915	—	22,915
Intercompany receivables	—	305,623	66,021	(371,644)	—
Other assets	1,723	643	69	—	2,435
Total assets	$856,700	$679,327	$163,727	$(1,455,005)	$244,749
LIABILITIES AND EQUITY					
Current liabilities:					
Current maturities of long-term debt	$1,159	$1,069	$—	$—	$2,228
Accounts payable	2,407	29,602	2,904	—	34,913
Accrued expenses	7,011	10,036	14,364	—	31,411
Accrued multi-client data library royalties	—	29,040	216	—	29,256
Deferred revenue	—	6,515	1,195	—	7,710
Total current liabilities	10,577	76,262	18,679	—	105,518
Long-term debt, net of current maturities	117,644	1,869	—	—	119,513
Intercompany payables	721,817	—	—	(721,817)	—
Other long-term liabilities	430	5,698	5,766	—	11,894
Total liabilities	850,468	83,829	24,445	(721,817)	236,925
Equity:					
Common stock	140	290,460	47,776	(338,236)	140
Additional paid-in capital	952,626	180,700	203,908	(384,608)	952,626
Accumulated earnings (deficit)	(926,092)	390,691	(12,475)	(378,216)	(926,092)
Accumulated other comprehensive income (loss)	(20,442)	4,324	(22,023)	17,699	(20,442)
Due from ION Geophysical Corporation	—	(270,677)	(79,496)	350,173	—
Total stockholders' equity	6,232	595,498	137,690	(733,188)	6,232
Noncontrolling interests	—	—	1,592	—	1,592
Total equity	6,232	595,498	139,282	(733,188)	7,824
Total liabilities and equity	$856,700	$679,327	$163,727	$(1,455,005)	$244,749

Balance Sheet	December 31, 2017 ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Consolidating Adjustments	Total Consolidated
	(In thousands)				
ASSETS					
Current assets:					
Cash and cash equivalents	$39,344	$66	$12,646	$—	$52,056
Accounts receivable, net	50	12,496	6,932	—	19,478
Unbilled receivables	—	34,484	2,820	—	37,304
Inventories	—	8,686	5,822	—	14,508
Prepaid expenses and other current assets	2,427	4,530	686	—	7,643
Total current assets	41,821	60,262	28,906	—	130,989
Deferred income tax asset	1,264	336	153	—	1,753
Property, plant, equipment and seismic rental equipment, net	511	7,170	44,472	—	52,153
Multi-client data library, net	—	81,442	7,858	—	89,300
Investment in subsidiaries	693,679	321,934	—	(1,015,613)	—
Goodwill	—	—	24,089	—	24,089
Intercompany receivables	—	162,017	60,394	(222,411)	—
Other assets	686	1,811	288	—	2,785
Total assets	$737,961	$634,972	$166,160	$(1,238,024)	$301,069
LIABILITIES AND EQUITY					
Current liabilities:					
Current maturities of long-term debt	$39,774	$250	$—	$—	$40,024
Accounts payable	1,774	20,982	2,195	—	24,951
Accrued expenses	12,284	16,957	9,456	—	38,697
Accrued multi-client data library royalties	—	26,824	211	—	27,035
Deferred revenue	—	7,231	1,679	—	8,910
Total current liabilities	53,832	72,244	13,541	—	139,617
Long-term debt, net of current maturities	116,691	29	—	—	116,720
Intercompany payables	537,417	—	—	(537,417)	—
Other long-term liabilities	454	6,084	7,388	—	13,926
Total liabilities	708,394	78,357	20,929	(537,417)	270,263
Equity:					
Common stock	120	290,460	49,394	(339,854)	120
Additional paid-in capital	903,247	180,701	202,290	(382,991)	903,247
Accumulated earnings (deficit)	(854,921)	317,324	(9,247)	(308,077)	(854,921)
Accumulated other comprehensive income (loss)	(18,879)	4,372	(19,681)	15,309	(18,879)
Due from ION Geophysical Corporation	—	(236,242)	(78,764)	315,006	—
Total stockholders' equity	29,567	556,615	143,992	(700,607)	29,567
Noncontrolling interests	—	—	1,239	—	1,239
Total equity	29,567	556,615	145,231	(700,607)	30,806
Total liabilities and equity	$737,961	$634,972	$166,160	$(1,238,024)	$301,069

Income Statement	Year Ended December 31, 2018				
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Consolidating Adjustments	Total Consolidated
	(In thousands)				
Total net revenues	$—	$ 96,649	$ 83,396	$ —	$ 180,045
Cost of goods sold	—	85,186	35,239	—	120,425
Gross profit	—	11,463	48,157	—	59,620
Total operating expenses	32,888	29,235	51,769	—	113,892
Loss from operations	(32,888)	(17,772)	(3,612)	—	(54,272)
Interest expense, net	(13,010)	(136)	174	—	(12,972)
Intercompany interest, net	1,124	(12,137)	11,013	—	—
Equity in earnings (losses) of investments	(26,446)	37,219	—	(10,773)	—
Other income (expense)	(196)	116	(356)	—	(436)
Income (loss) before income taxes	(71,416)	7,290	7,219	(10,773)	(67,680)
Income tax expense (benefit)	(245)	(6,711)	9,674	—	2,718
Net income (loss)	(71,171)	14,001	(2,455)	(10,773)	(70,398)
Net income attributable to noncontrolling interests	—	—	(773)	—	(773)
Net income (loss) attributable to ION	$(71,171)	$ 14,001	$ (3,228)	$ (10,773)	$ (71,171)
Comprehensive net income (loss)	$(72,734)	$ 13,953	$ (4,797)	$ (8,383)	$ (71,961)
Comprehensive income attributable to noncontrolling interest	—	—	(773)	—	(773)
Comprehensive net income (loss) attributable to ION	$(72,734)	$ 13,953	$ (5,570)	$ (8,383)	$ (72,734)

Income Statement	Year Ended December 31, 2017				
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Consolidating Adjustments	Total Consolidated
	(In thousands)				
Total net revenues	$—	$ 148,590	$ 48,964	$ —	$ 197,554
Cost of goods sold	—	90,754	31,161	—	121,915
Gross profit	—	57,836	17,803	—	75,639
Total operating expenses	39,000	28,020	17,318	—	84,338
Income (loss) from operations	(39,000)	29,816	485	—	(8,699)
Interest expense, net	(16,729)	(107)	127	—	(16,709)
Intercompany interest, net	1,084	(6,613)	5,529	—	—
Equity in earnings (losses) of investments	27,696	67,290	—	(94,986)	—
Other income (expense)	(4,610)	(407)	1,072	—	(3,945)
Income (loss) before income taxes	(31,559)	89,979	7,213	(94,986)	(29,353)
Income tax expense (benefit)	(1,317)	(1,427)	2,768	—	24
Net income (loss)	(30,242)	91,406	4,445	(94,986)	(29,377)
Net income attributable to noncontrolling interests	—	—	(865)	—	(865)
Net income (loss) attributable to ION	$(30,242)	$ 91,406	$ 3,580	$ (94,986)	$ (30,242)
Comprehensive net income (loss)	$(27,373)	$ 91,358	$ 6,550	$ (97,043)	$ (26,508)
Comprehensive income attributable to noncontrolling interest	—	—	(865)	—	(865)
Comprehensive net income (loss) attributable to ION	$(27,373)	$ 91,358	$ 5,685	$ (97,043)	$ (27,373)

Income Statement	Year Ended December 31, 2016				
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Consolidating Adjustments	Total Consolidated
	(In thousands)				
Total net revenues	$—	$ 91,465	$ 81,343	$ —	$ 172,808
Cost of goods sold	—	87,660	49,116	—	136,776
Gross profit	—	3,805	32,227	—	36,032
Total operating expenses	31,438	27,279	20,486	—	79,203
Income (loss) from operations	(31,438)	(23,474)	11,741	—	(43,171)
Interest expense, net	(18,406)	(173)	94	—	(18,485)
Intercompany interest, net	978	(4,397)	3,419	—	—
Equity in earnings (losses) of investments	(19,756)	23,368	—	(3,612)	—
Other income (expense)	3,528	723	(2,901)	—	1,350
Income (loss) before income taxes	(65,094)	(3,953)	12,353	(3,612)	(60,306)
Income tax expense	54	1,337	3,030	—	4,421
Net income (loss)	(65,148)	(5,290)	9,323	(3,612)	(64,727)
Net income attributable to noncontrolling interests	—	—	(421)	—	(421)
Net income (loss) attributable to ION	$(65,148)	$ (5,290)	$ 8,902	$ (3,612)	$ (65,148)
Comprehensive net income (loss)	$(72,331)	$ (5,290)	$ 1,719	$ 4,208	$ (71,694)
Comprehensive income attributable to noncontrolling interest	—	—	(421)	—	(421)
Comprehensive net income (loss) attributable to ION	$(72,331)	$ (5,290)	$ 1,298	$ 4,208	$ (72,115)

Statement of Cash Flows	Year Ended December 31, 2018			
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Total Consolidated
	(In thousands)			
Cash flows from operating activities:				
Net cash provided by (used in) operating activities	$(37,659)	$ 39,407	$ 5,350	$ 7,098
Cash flows from investing activities:				
Investment in multi-client data library	—	(25,307)	(2,969)	(28,276)
Purchase of property, plant, equipment and seismic rental equipment	(392)	(959)	(163)	(1,514)
Net cash used in investing activities	(392)	(26,266)	(3,132)	(29,790)
Cash flows from financing activities:				
Repayments under revolving line of credit	(10,000)	—	—	(10,000)
Payments on notes payable and long-term debt	(30,169)	(638)	—	(30,807)
Cost associated with issuance of debt	(1,247)	—	—	(1,247)
Intercompany lending	7,983	(12,522)	4,539	—
Proceeds from employee stock purchases and exercise of stock options	214	—	—	214
Net proceeds from issuance of stocks	46,999	—	—	46,999
Dividend payment to noncontrolling interest	(200)	—	—	(200)
Other financing activities	(1,151)	—	—	(1,151)
Net cash provided by (used in) financing activities	12,429	(13,160)	4,539	3,808
Effect of change in foreign currency exchange rates on cash, cash equivalents and restricted cash	—	—	319	319
Net increase (decrease) in cash and cash equivalents	(25,622)	(19)	7,076	(18,565)
Cash, cash equivalents and restricted cash at beginning of period	39,707	66	12,646	52,419
Cash, cash equivalents and restricted cash at end of period	$14,085	$ 47	$ 19,722	$ 33,854

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The following table is a reconciliation of cash, cash equivalents and restricted cash:

	December 31, 2018			
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Total Consolidated
	(In thousands)			
Cash and cash equivalents	$13,782	$ 47	$ 19,722	$ 33,551
Restricted cash included in other long-term assets	303	—	—	303
Total cash, cash equivalents, and restricted cash shown in statements of cash flows	$14,085	$ 47	$ 19,722	$ 33,854

Statement of Cash Flows	Year Ended December 31, 2017			
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Total Consolidated
	(In thousands)			
Cash flows from operating activities:				
Net cash provided by (used in) operating activities	$(22,315)	$ 73,154	$ (23,227)	$ 27,612
Cash flows from investing activities:				
Investment in multi-client data library	—	(23,710)	—	(23,710)
Purchase of property, plant, equipment and seismic rental equipment	(165)	(817)	(81)	(1,063)
Net cash used in investing activities	(165)	(24,527)	(81)	(24,773)
Cash flows from financing activities:				
Payments on notes payable and long-term debt	(1,591)	(3,167)	(58)	(4,816)
Cost associated with issuance of debt	(53)	—	—	(53)
Intercompany lending	38,732	(45,609)	6,877	—
Proceeds from employee stock purchases and exercise of stock options	1,619	—	—	1,619
Dividend payment to noncontrolling interest	(100)	—	—	(100)
Other financing activities	(243)	—	—	(243)
Net cash provided by (used in) financing activities	38,364	(48,776)	6,819	(3,593)
Effect of change in foreign currency exchange rates on cash, cash equivalents and restricted cash	—	—	(260)	(260)
Net increase (decrease) in cash and cash equivalents	15,884	(149)	(16,749)	(1,014)
Cash, cash equivalents and restricted cash at beginning of period	23,823	215	29,395	53,433
Cash, cash equivalents and restricted cash at end of period	$39,707	$ 66	$ 12,646	$ 52,419

The following table is a reconciliation of cash, cash equivalents and restricted cash:

	December 31, 2017			
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Total Consolidated
	(In thousands)			
Cash and cash equivalents	$39,344	$ 66	$ 12,646	$ 52,056
Restricted cash included in prepaid expenses and other current assets	60	—	—	60
Restricted cash included in other long-term assets	303	—	—	303
Total cash, cash equivalents, and restricted cash shown in statements of cash flows	$39,707	$ 66	$ 12,646	$ 52,419

Statement of Cash Flows	Year Ended December 31, 2016			
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Total Consolidated
	(In thousands)			
Cash flows from operating activities:				
Net cash provided by (used in) operating activities	$(30,732)	$ 53,107	$ (21,382)	$ 993
Cash flows from investing activities:				
Investment in multi-client data library	—	(14,884)	—	(14,884)
Purchase of property, plant and equipment	(73)	(313)	(1,072)	(1,458)
Proceeds from sale of a cost-method investment	2,698	—	—	2,698
Net cash provided by (used in) investing activities	2,625	(15,197)	(1,072)	(13,644)
Cash flows from financing activities:				
Payments under revolving line of credit	(5,000)	—	—	(5,000)
Borrowings under revolving line of credit	15,000	—	—	15,000
Payments on notes payable and long-term debt	(17,070)	(6,316)	(248)	(23,634)
Cost associated with issuance of debt	(6,744)	—	—	(6,744)
Repurchase of common stock	(964)	—	—	(964)
Intercompany lending	31,867	(34,771)	2,904	—
Other financing activities	(252)	—	—	(252)
Net cash provided by (used in) financing activities	16,837	(41,087)	2,656	(21,594)
Effect of change in foreign currency exchange rates on cash, cash equivalents and restricted cash	—	—	1,386	1,386
Net decrease in cash and cash equivalents	(11,270)	(3,177)	(18,412)	(32,859)
Cash, cash equivalents and restricted cash at beginning of period	35,093	3,392	47,807	86,292
Cash, cash equivalents and restricted cash at end of period	$23,823	$ 215	$ 29,395	$ 53,433

The following table is a reconciliation of cash, cash equivalents and restricted cash:

	December 31, 2016			
	ION Geophysical Corporation	The Guarantors	All Other Subsidiaries	Total Consolidated
	(In thousands)			
Cash and cash equivalents	$23,042	$ 215	$ 29,395	$ 52,652
Restricted cash included in prepaid expenses and other current assets	260	—	—	260
Restricted cash included in other long-term assets	521	—	—	521
Total cash, cash equivalents, and restricted cash shown in statements of cash flows	$23,823	$ 215	$ 29,395	$ 53,433

SCHEDULE II
ION GEOPHYSICAL CORPORATION AND SUBSIDIARIES
VALUATION AND QUALIFYING ACCOUNTS

Year Ended December 31, 2016	Balance at Beginning of Year	Charged (Credited) to Costs and Expenses	Deductions	Balance at End of Year
	(In thousands)			
Allowances for doubtful accounts	$4,919	$ 1,834	$ (5,310)	$ 1,443
Allowances for doubtful notes receivable	4,000	—	—	4,000
Valuation allowance on deferred tax assets	194,255	23,334	—	217,589
Excess and obsolete inventory	24,475	429	(9,855)	15,049

Year Ended December 31, 2017	Balance at Beginning of Year	Charged (Credited) to Costs and Expenses	Deductions	Balance at End of Year
	(In thousands)			
Allowances for doubtful accounts	$1,443	$ 949	$ (1,820)	$ 572
Allowances for doubtful notes receivable	4,000	—	—	4,000
Valuation allowance on deferred tax assets	217,589	(64,126)	—	153,463
Excess and obsolete inventory	15,049	398	(408)	15,039

Year Ended December 31, 2018	Balance at Beginning of Year	Charged (Credited) to Costs and Expenses	Deductions	Balance at End of Year
	(In thousands)			
Allowances for doubtful accounts	$572	$ 222	$ (364)	$ 430
Allowances for doubtful notes receivable	4,000	—	—	4,000
Valuation allowance on deferred tax assets	153,463	7,042	—	160,505
Excess and obsolete inventory	15,039	665	(680)	15,024

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