

Filed on behalf of Petroleum Geo-Services, Inc.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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PETROLEUM GEO-SERVICES INC.  
Petitioner  
v.

WESTERNGECO LLC  
Patent Owner

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CASE IPR: Unassigned

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**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 6,691,038  
UNDER 35 U.S.C. §§ 311-319 and 37 C.F.R. §§ 42.1-.80, 42.100-.123**

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## **I. INTRODUCTION**

Pursuant to 35 U.S.C. § 311 and 37 C.F.R. § 42.100, Petroleum Geo-Services, Inc. (“Petitioner”) requests *Inter Partes* review of Claim 14 of U.S. Patent No. 6,691,038 (the “’038 Patent”), assigned to WesternGeco L.L.C. (“Patent Owner”). This Petition demonstrates that there is a reasonable likelihood that Petitioner will prevail with respect to Claim 14, and thus a trial for *Inter Partes* review must be instituted. Evidence in this petition establishes that Claim 14 is unpatentable under 35 U.S.C. §§ 102 and 103. Petitioner requests that Claim 14 of the ’038 Patent be judged unpatentable and canceled.

## **II. OVERVIEW**

The ’038 Patent is directed to marine seismic surveying technology. Marine seismic surveys use reflected sound waves to determine geological properties of the earth’s subsurface. Marine seismic surveys are carried out by survey boats or “vessels” that tow acoustic energy sources that fire “shots” of sound waves into the water. These sound waves travel through the seafloor and into the earth, reflect from the earth’s geological formations, and return to the water’s surface. The reflected signals are then recorded by acoustic sensors (“receivers” or “hydrophones”) that are towed in long cables known as seismic “streamers.” The ability to track and control the positions of seismic streamers with respect to time during the survey is necessary to create an accurate model of the earth’s

subsurface, and also leads to more efficient data acquisition. For these reasons, since the 1970s, practitioners in the art of marine seismic surveying have developed and used control systems capable of tracking and controlling the position of streamers during a seismic survey.

Claim 14 of the '038 Patent is directed to a particular embodiment of a streamer tracking and positioning system that is identical to those disclosed in the prior art. During prosecution of the '038 Patent, the examiner rejected the claim that ultimately issued as Claim 14 as anticipated by the streamer tracking and control system of PCT WO 00/20895 ("’895 Application"). WesternGeco then amended the claim to include language requiring positioning and control of streamers in both the "horizontal and vertical" dimensions, arguing that this language distinguished the '895 Application from the amended claim. As explained in this Petition, this argument is demonstrably wrong. The '895 Application explicitly—and repeatedly—discloses both horizontal and vertical positioning and control of seismic streamers.

In a recent District Court jury trial, WesternGeco did not even attempt to defend the novelty of Claim 14 over the '895 Application on the basis of the "horizontal and vertical" language relied upon during prosecution. Rather than mischaracterize the prior art again, WesternGeco attempted to rewrite Claim 14, arguing that it was limited to so called "four-dimensional ('4D') time-lapse"

seismic surveying, and that the '895 Application discloses only three-dimensional ("3D") seismic surveying. As demonstrated in this Petition, Claim 14 is not directed to 4D time-lapse seismic surveys. 4D time-lapse surveys are performed by repeating 3D surveys over the same area at different times to monitor any changes in the earth's geology. In stark contrast to other claims of the '038 Patent, Claim 14 contains no language directed to 4D seismic surveys or repeating 3D surveys over the same area. Claim 14 cannot be saved on this basis under any reasonable construction, let alone the broadest reasonable construction applicable in this proceeding.

Claim 14 could not survive even if re-drafted to require 4D surveys as WesternGeco proposed in the District Court. The applicability of streamer tracking and positioning systems to 4D time-lapse surveys—the distinction on which WesternGeco relied at trial—was disclosed by multiple prior art references and was well accepted by artisans working in the field before the priority date of the '038 Patent. Indeed, when it commercialized its embodiment of the prior art '895 Application well before the priority date of the '038 Patent, WesternGeco repeatedly touted—in prior art publications not asserted in the jury trial—the ability to use its product for 4D time-lapse seismic surveys in the same manner as it later deemed inventive in defending Claim 14 before the jury.

Based on the prior art as a whole, WesternGeco cannot credibly argue here



(as it did before the jury) that Claim 14 is valid because the challenger failed “to identify any prior art teachings of the 4D requirements of the [] ’038 Patent.” One of multiple such 4D “prior art teachings” that WesternGeco alleged not to exist is PCT WO 01/61380 A2 (“Canter PCT”). The Canter PCT, which was considered neither during prosecution nor during the prior litigation, anticipates Claim 14 even under WesternGeco’s improperly constricted interpretation. Canter explicitly disclosed 4D time-lapse seismic surveying using the very same streamer positioning and control technology disclosed in the ’895 Application and later claimed in the ’038 Patent.

In short, the ’895 Application and the Canter PCT both anticipate Claim 14. Even were those references not anticipatory, Claim 14 would have been obvious over the Canter PCT, the ’895 Application, and the references disclosing the ’895 Application’s applicability to 4D time-lapse surveying, either alone or in combination. In view of clear errors made during prosecution and at the District Court trial, and in view of the newly-presented grounds for unpatentability set forth herein, Petitioner requests *Inter Partes* review and cancellation of Claim 14.

### **III. GROUNDS FOR STANDING (37 C.F.R. § 42.104(a)); PROCEDURAL STATEMENT**

Petitioner certifies that (1) the ’038 Patent is available for *Inter Partes* review; and 2) Petitioner is not barred or estopped from requesting *Inter Partes* review of any claim of the ’038 Patent on the grounds identified in this Petition.

This Petition is filed in accordance with 37 CFR § 42.106(a). Concurrently filed herewith are a Power of Attorney and Exhibit List pursuant to § 42.10(b) and § 42.63(e), respectively. The Director is authorized to charge the fees specified by 37 C.F.R. § 42.15(a) to Deposit Account No. 506403.

#### **IV. MANDATORY NOTICES (37 C.F.R. § 42.8(a)(1))**

**Each Real Party-In-Interest (37 C.F.R. § 42.8(b)(1)):** Petroleum Geo-Services, Inc. (“Petitioner”).

**Notice of Related Matters (37 C.F.R. § 42.8(b)(2)):** *WesternGeco L.L.C. v. Petroleum Geo-Services, Inc. et al.*, 4:13-cv-03037 (S.D. Tex.); and *WesternGeco L.L.C. v. ION Geophysical Corp. et al.*, 4:09-cv-01827 (S.D. Tex.).

#### **Designation of Lead and Back-Up Counsel (37 C.F.R. § 42.8(b)(3)):**

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**Notice of Service Information (37 C.F.R. § 42.8(b)(4)):** Please direct all correspondence regarding this Petition to lead counsel at the address above.

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<sup>1</sup>Passed USPTO Registration Examination on March 18, 2014. Admission awaiting final approval.

Petitioner consents to service by email at: jberniker@wc.com.

**V. STATEMENT OF THE PRECISE RELIEF REQUESTED AND THE REASONS THEREFORE (37 C.F.R. § 42.22(a))**

Petitioner requests *Inter Partes* review under 37 CFR § 42.108 as to Claim 14 of the '038 Patent and a ruling that Claim 14 is unpatentable based on one or more of the grounds under 35 U.S.C. §§ 102 or 103 set forth herein. Petitioner's detailed statement of the reasons for the relief requested is set forth in § VII below.

**A. The '038 Patent - Background and Specification**

The '038 Patent discloses a seismic streamer tracking and control system. The specification acknowledges that the prior art “discloses a wide variety of towed marine seismic streamer tracking and positioning systems” in which the streamers are typically “controlled or guided by a central control system.” Ex. 1001 at 1:26-44.<sup>2</sup> The '038 Patent specifically identifies the prior art system disclosed in the '895 Application. *Id.* at 1:45-56. The '038 Patent does not cite or otherwise recognize the existence of the Canter PCT or other prior art relied upon in this Petition.

Regarding the prior art it does recognize, the '038 Patent asserts that “[t]here is no known seismic tracking and positioning system that enables independent and

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<sup>2</sup> Citations to “Ex. \_” in this Petition refer to PGS exhibits attached hereto.

relative positioning of individual seismic streamer array elements . . . to configure, manipulate and/or maintain a desired geometry of and within a towed seismic streamer array.” *Id.* at 2:3-9. The patent further asserts that “there is no known seismic tracking and positioning system that tracks the geometry of the seismic streamer array and the relative positions of the individual streamers comprising array elements with respect to time and with respect to the earth’s latitude and longitude so that towed seismic array data acquisition runs are repeatable,” which it asserts to “enabl[e] acquisition of four-dimensional geophysical data.” *Id.* at 2:16-23.

The ’038 Patent discloses that the responsibility for horizontal and vertical positioning and control of streamers is shared between a “master controller” on the vessel and “separate controllers” located on “ASPDs” (active streamer positioning devices) deployed along each streamer in the array. *Id.* at 7:13-19. In conjunction with the master controller, “[t]he vertically and horizontally steerable ASPDs 18 can be used to constrain and configure the shape of the seismic streamer . . . in the vertical (z or depth) and horizontal (x, y) directions.” *Id.* at 7:5-9.

The ’038 Patent discloses devices that measure the horizontal and vertical positions of the streamers and ASPDs throughout the seismic survey. Ex. 1001 at 9:4-12. The horizontal (“x and y”) positions are measured using either “acoustic position systems” or “satellite-based global positioning systems.” *Id.* The vertical

position (“z-depth”) of the streamers is determined using “pressure sensors.” *Id.*

The master controller compares this information representing the actual positions and desired positions of the ASPDs to determine positioning commands to be sent to the ASPDs. *Id.* at 8:29-37; 8:57–9:3. Upon receiving these positioning commands, the local control systems located on each ASPD steer the streamers from their actual positions to their desired positions. *Id.* at 7:24-26. The ’038 Patent asserts that its system thereby is able to “maintain desired array geometry and overall position” of the seismic array. *Id.* at 7:58-59.

As the ’038 Patent indicates, the “array geometry” is comprised of the collective “position[s] of each individual streamer” in the array. Ex. 1001 at 7:65-67 (“the entire array geometry comprising the individual streamers”); *id.* at 7:55-59 (“changing the position of each individual streamer [] maintain[s] desired array geometry and overall position”). By monitoring and controlling the position of each streamer in the array during the survey, the patent purports to provide “control of the horizontal, vertical and depth position of the entire array geometry comprising the individual streamers, with respect to time.” *Id.*

The ’038 Patent’s master controller can also receive data from “environmental sensors associated with the vessel,” including “wind speed and direction; tidal currents velocity and direction; ocean bottom depth/angle; local current velocity and direction; wave height and direction; and water temperature

and salinity.” Ex. 1001 at 7:41-46. In one embodiment, “[t]he maneuverability of the particular [streamer] cable, ASPD and vessel under the particular sensed environmental conditions are also factored into the active positioning commands.” *Id.* at 8:20-25. By accounting for these factors, the master controller is able to facilitate “maintenance of specific array position and geometry in the presence of variable environmental factors.” *Id.* at 3:15-40.

As noted above, the '038 Patent discloses that the vertical and horizontal positions of the streamers comprising the array are “controlled, tracked and stored with respect to time during each seismic data acquisition run.” Ex. 1001 at 2:55-67. The stored positional and environmental data from an initial survey is called “legacy data,” which in one embodiment can be used so that “a seismic data acquisition run can be duplicated at a later date to reproduce the same array geometry and path during subsequent data acquisition runs.” *Id.* at 3:50-59.

In a second survey in the 4D time-lapse context, the master controller and ASPDs operate in the same manner as in the initial survey, except that the “legacy data” from the first survey are used to designate the desired positions for the second survey. Ex. 1001 at 4:60-5:3. The master controller compares the measured position data with desired position data (the previous survey path derived from the legacy data), and then determines positioning commands to be sent to the ASPDs to “accurately repeat the array positioning and geometry during the second run.”

*Id.* at 10:5-8. In other words, “a particular seismic data acquisition operation is repeatable based on the legacy data, thereby enabling repeatable four-dimensional data [] gathering for multiple runs over a seismic target area.” *Id.* at 3:56-59.

**B. Claim 14 of the '038 Patent**

The '038 Patent specification discloses a seismic streamer positioning system having a number of components and operational characteristics that are not included in Claim 14. Claim 14 is directed to a particular implementation of the system that is indistinguishable from the prior art. Claim 14 reads as follows:

14.	A seismic streamer array tracking and positioning system comprising:
[1]	a towing vessel for towing a seismic array;
[2]	a seismic streamer array comprising a plurality of seismic streamers;
[3]	an active streamer positioning device (ASPD) attached to each seismic streamer for positioning each seismic streamer;
[4]	a master controller for issuing vertical and horizontal positioning commands to each ASPD for maintaining a specified array geometry;
[5]	an environmental sensor for sensing environmental factors which influence the towed path of the towed array;
[6]	a tracking system for tracking the streamer horizontal and vertical positions versus time during a seismic data acquisition run;
[7]	an array geometry tracking system for tracking the array geometry versus time during a seismic data acquisition run, wherein the master controller compares the vertical and horizontal positions of the streamers versus time and the array geometry versus time to desired streamer positions and array geometry versus time and issues positioning commands to the ASPDs to maintain the desired streamer positions and array geometry versus time.

Ex. 1001 at 12:14-39.

**C. Identification of the Prior Art**

Petitioner relies on the following invalidating prior art references:

**1. The '895 Application:**

PCT International Application No. WO 00/20895, entitled “Control System for Positioning of Marine Seismic Streamers,” was filed on September 28, 1999 and published April 13, 2000. Ex. 1003 ('895 Application). Because it was published more than one year before June 15, 2001, the earliest priority date for the '038 Patent, the '895 Application is prior art under 35 U.S.C. § 102(b).<sup>3</sup>

The '895 Application is directed to a seismic streamer array tracking and positioning system that tracks the horizontal (lateral) and vertical (depth) positions of the streamers throughout the survey and, when appropriate, steers the streamers horizontally and vertically using “streamer positioning devices” (*i.e.*, ASPDs) known as “birds.” Ex. 1003 at 6-7. Like the '038 Patent, the '895 Application discloses that horizontal positions of the streamers and ASPDs are measured throughout the survey using either “acoustic positioning systems” or “satellite-

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<sup>3</sup> This Petition should not be understood to suggest that the '895 Application disclosures were themselves novel. To the contrary, as Dr. Evans confirms in declarations relating to patents in the same family as the '895 Application, many of its purported innovations were themselves anticipated or obvious over the prior art.



based global positioning system[s],” and the vertical position of the streamers is determined using “pressure sensors.” *Id.* at 7.

As in the '038 Patent, the '895 Application discloses that the responsibility for tracking and maintaining desired streamer positions is shared between a “global control system” located on the vessel and “local control system[s]” on the birds affixed to the streamers. Ex. 1003 at 18. Working in conjunction with the global control system, the birds are “capable of controlling the position of the seismic streamers 12 in both the vertical and horizontal directions.” *Id.* at 9.

The global control system of the '895 Application compares the actual and desired positions of the birds to “regularly calculate updated desired vertical and horizontal forces the birds should impart on the seismic streamers 12 to move them from their actual positions to their desired positions.” Ex. 1003 at 7. Once these forces have been calculated, the global control system issues positioning commands to local control systems on each bird based on the horizontal and vertical forces required to move the streamers to the desired locations. *Id.* at 18. Upon receiving the positioning commands, the local control system within each bird adjusts the wings on the birds to move the streamers “in both the vertical (depth) and horizontal directions.” *Id.* at 6.

The '895 Application asserts that the precision of certain prior art systems is limited because they measure streamer positions only “every 5 to 10 seconds,” and

there may be an additional “5 second delay between the taking of measurements and the determination of actual streamer positions.” Ex. 1003 at 3. Because the streamers are constantly moving as they are towed, the ’895 Application asserts that the “delay period and relatively long cycle time between position measurements” prevents certain prior art systems from “rapidly and efficiently” controlling streamer positions. *Id.* The ’895 Application purports to overcome this limitation of certain prior art systems by disclosing a “more deterministic system” for tracking and controlling streamers with streamer positioning devices. *Id.* at 3.

The ’895 Application discloses a control system that “maintains a dynamic model of each of the seismic streamers” that is able to account for the continuous movement of the vessel and environmental factors that affect the path or shape of the streamers during a survey. Ex. 1003 at 7. To continuously and more accurately monitor the positions of the streamers as a function of time, the ’895 Application’s control system utilizes “position predictor software to estimate the actual locations” of streamers and streamer positioning devices during the five or ten second intervals between position measurements. *Id.* at 8.

The environmental factors measured in the ’895 Application’s system that affect the position or shape of the streamers include “vessel speed (m/s), vessel heading (degrees), current speed (m/s), [and] current heading (degrees).” Ex. 1003 at 8. By factoring these environmental data into the position prediction

calculation, the dynamic system is disclosed to account for “the behavior of each streamer and . . . the behavior of the complete streamer array.” *Id.* at 7-8.

The '895 Application's control system can be configured to operate in several control modes, whereby the control system sends positioning commands to the streamer positioning devices to maintain specified array geometries. *Id.* at 18-19. For example, in “feather angle control mode,” the control system “attempts to keep each streamer in a straight line offset from the towing direction by a certain feather angle.” *Id.* By sending positioning commands to “each bird 18 on each streamer 12 continuously during operation of the control system,” *id.* at 8, the control system attempts to maintain the specified “feather angle” array geometry and thereby prevent “deviations into this desired linear shape.” *Id.* at 1, 18-19.

**2. Hillesund, Bittleston, *et al.*, “Marine Seismic Cable Steering and Control,” EAGE 62nd Conference and Technical Exhibition – Glasgow, Scotland, May 29 – June 2, 2000**

In connection with a May, 2000 industry conference called EAGE, Oyvind Hillesund and Simon Bittleston, the inventors of the '895 Application, published a paper touting the benefits of the streamer tracking and control technology disclosed in the '895 Application. Ex. 1006 (“EAGE Paper”). The EAGE Paper was published more than a year before June 15, 2001, and is therefore prior art under at least § 102(b). It was neither considered by the Examiner nor asserted as prior art before the jury.

The EAGE Paper discloses that one of the benefits of the streamer tracking and control technology such as that described in the '895 Application is the ability to use the system for 4D time-lapse seismic surveying. The authors explain: “More accurate receiver positioning will . . . improve repeatability for time-lapse seismic.” *Id.* at 1. Specifically, Hillesund and Bittleston disclose that their streamer positioning and control system can use navigation data acquired in previous seismic surveys to achieve the repeatability necessary for accurate 4D surveying:

In addition to improving the quality and efficiency of current seismic surveys, active lateral steering enables new types of seismic products . . . . In current 4D surveys, the difference in the positioning of streamer cables from one survey to the next is one of the greatest sources of errors when it comes to repeatability. By making use of old navigation data, it is possible to steer the streamers towards the streamer positions in previous seismic surveys.

*Id.* at 4. The EAGE Paper demonstrates that it was known, before the critical date of the '038 Patent, that the streamer tracking and control system disclosed in the '895 Application could be used to perform 4D surveys.

**3. Morice *et al.*, “4D-ready marine seismic data,” 2000, 70th Annual International Meeting, SEG Expanded Abstracts, 1607-1614 SEG Expanded Abstracts (“Morice”)**

In connection with an Annual Meeting of the Society of Exploration Geophysicists (“SEG”) in August 2000, Steven Morice published an article entitled, “4D-ready marine seismic data,” which further demonstrates the well-

accepted applicability of streamer positioning and control systems for 4D seismic surveys. Ex. 1005 (“Morice”). Because Morice was published before the priority date of June 15, 2001, it is prior art to the ’038 Patent under 35 U.S.C. § 102(a).

Morice is directed to the use of streamer positioning and control systems to conduct “[t]ime-lapse (or 4D) seismic,” which had “emerged as a valuable technique.” *Id.* at 1067. Morice confirms the basic principle that 4D seismic data acquisition “requires better control of the seismic source signature, streamer geometry and recorded signal fidelity to ensure data repeatability and the reduction of the acquisition footprint.” *Id.* Indeed, Morice confirms that repeatability of the positions of the seismic streamer array “is regarded as a key requirement for 4D surveys.” *Id.* at 1069. For this reason, Morice explains that the most successful 4D surveys are conducted “using exacting repetition of the acquisition configurations between successive surveys,” including identical “streamer spread,” identical “cross-line separation” of streamers, and the “same streamer depth.” *Id.*

In order to achieve repeatability in successive surveys, Morice teaches the use of state-of-the-art streamer positioning and control systems: “[A] positioning and steering control system” for effective 4D seismic acquisition should include “integral streamer-mounted steering devices and an in-built fully-acoustic ranging system.” *Id.* at 1069. Morice further explains that “integral” to any effective 4D seismic system is “[a]ctive lateral and vertical streamer control [] using a ‘steerable

bird.’” *Id.* Although Morice does not reference the ’895 Application by name, it cites Hillesund and Bittleston’s EAGE Paper, and the particular features Morice identifies as “integral” to effective 4D streamer positioning systems are precisely the features disclosed in the ’895 Application. Ex. 1003 (’895 Application).

#### **4. The Canter PCT**

Peter Canter, a co-author of Hillesund and Bittleston’s EAGE Paper, filed a PCT application on February 13, 2001, directed to using prior art streamer positioning and control technology to “improve the repeatability of marine seismic surveys” for 4D time-lapse seismic surveys. Ex. 1004 (“Canter PCT”) at Abstract.

The Canter PCT has an international filing date of February 13, 2001, and was published on August 23, 2001. The international filing date of the Canter PCT is treated as its U.S. filing date under 35 U.S.C. § 102(e)(1), because the Canter PCT was (1) filed after November 29, 2000; (2) designated the United States; and (3) was published in English. *See* MPEP §§ 706.02(a), 2136.03. Because the Canter PCT’s effective U.S. filing date precedes the ’038 Patent’s June 15, 2001 priority date, its subsequent publication makes it § 102(e)(1) prior art. 35 U.S.C. § 102(e)(1) (2001) (noting that an applicant is not entitled to a patent where “the invention was described in . . . an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent”).

Canter recognizes the accepted concept that the key to effective 4D time-lapse seismic is precise repetition of streamer positions as a function of time: “the sets of seismic data signals which have been acquired at different times must be calibrated so they match each other”—*i.e.*, “the seismic data signals reflected from places where no geological parameter changes have taken place must appear substantially identical in the different seismic data signal sets.” Ex. 1004 at 2. Therefore, “to improve the repeatability of [4D] marine seismic surveys,” Canter discloses a system whereby the “source and streamer array used to perform surveys after the first are depth-controlled and steered laterally so that the source and at least some of the sensors in the streamers occupy at least some of the same positions as the source and sensors of the first survey.” *Id.* at Abstract.

The 4D marine seismic system of the Canter PCT achieves this goal by using “a plurality of ‘birds,’ . . . for controlling the streamers depth and steering it laterally.” Ex. 1004 at 5. As Canter explains, surveys conducted with prior art streamer tracking and control systems produce “a vast amount of positional data defining the respective positions of the source 15 and the hydrophone 32 for each shot produced by the source.” *Id.* at 6-7. From these data, “the shape of the path or track followed by each streamer 18 throughout the survey can be determined.” *Id.* at 7.

Canter discloses that these positional data from the first survey can be input

into a computer system prior to the second survey and used to enhance repeatability: “From the previous survey positional data stored in the system 14, the system continuously generates data defining the respective shape adopted by each streamer at each shot point in the previous survey.” Ex. 1004 at 7. Canter uses streamer steering to accomplish this goal, explaining that the control system in the ensuing, repeat survey “produces inputs based on the difference between the present and desired future positions” of the streamers, and a “steering controller” in turn produces “control signals for the birds 38, to cause them to laterally steer the streamer” so that the streamers “are as close as possible to their desired positions at the correct time . . . .” *Id.* By ensuring that the streamers occupy “substantially the same positions” in repeated 3D seismic surveys, Canter asserts that his system provides an improved method for 4D seismic data acquisition. *Id.* at 2-3.

#### **D. Summary of the Prosecution History of the '038 Patent**

The '038 Patent issued from Application No. 09/882,952, filed on June 15, 2001. In an Office Action mailed March 31, 2003, the examiner rejected Claim 14 as anticipated by the '895 Application and explained how and where the reference discloses every limitation of Claim 14. Ex. 1016 at 8-9.

In response, WesternGeco amended limitations [4], [6], and [7] of Claim 14 to recite (in marked up form):

[4] a master controller for issuing vertical and horizontal positioning commands to each ASPD for maintaining a specified array geometry;



[6] a tracking system for tracking the streamer horizontal and vertical positions versus time during a seismic data acquisition run;

[7] an array geometry tracking system for tracking the array geometry versus time during a seismic data acquisition run, wherein the master controller compares the vertical and horizontal positions of the streamers versus time and the array geometry versus time to desired streamer positions and array geometry versus time and issues positioning commands to the ASPDs to maintain the desired streamer positions and array geometry versus time.

Ex. 1014 at 4-5. WesternGeco argued that amended Claim 14 was not anticipated because the '895 Application "does not teach issuing vertical and horizontal positioning commands, or sensing environmental factors, or comparing the array geometry versus time." *Id.* at 21. Separately arguing other amended claims, WesternGeco repeatedly stated that the '895 Application "teaches only horizontal steering (p. 6, line 20) of the streamers. Vertical position is monitored [in the '895 Application] but not steered." *See, e.g., id.* at 18, 22, 23, 24, 26, 27, 28, 29. Subsequently, all claims were allowed. Ex. 1020 (Notice of Allowability) at 3.

#### **E. District Court Litigation Relating to the Validity of Claim 14**

In recent District Court litigation, WesternGeco alleged that Claim 14 of the '038 Patent was infringed by ION Geophysical Corporation ("ION"). In its defense, ION asserted that Claim 14 was anticipated by the '895 Application.

WesternGeco did not defend the novelty of Claim 14 in the District Court trial on the basis that the '895 Application teaches only horizontal positioning and control of streamers, or any of the other arguments it advanced during prosecution. Indeed, the two named inventors of the '895 Application testified unequivocally that the '895 Application taught both vertical and horizontal streamer positioning and control. Ex. 1010 (Bittleston Tr.) at 507 (“you can control both the sideways movement and the depth movement at the same time. So it’s really quite like a plane in terms of the way in which it moves.”); Ex. 1009 (Hillesund Tr.) at 3511:7-13.

Instead, WesternGeco’s defense focused on the 4D time-lapse teachings of the '038 Patent. It asserted that the '038 Patent covers “*repeat[ing]* the position versus time essentially of [a] 4D survey’ whereas the '895 Application ‘does not deal with 4D time lapse kind of concepts.’” Ex. 1011 (WesternGeco’s Sur-Reply To ION’s Mot. For a New Trial On Invalidity Under 35 U.S.C. §§ 102 and 103) at 4 (“WG Invalidity Sur-Reply”) (emphasis supplied). According to WesternGeco, “[t]he '895 application is the original application that led to the Bittleston patents-in-suit,” and the '038 Patent “built on this foundation and invented a system to *repeat surveys* over time to produce 4D images.” Ex. 1038 (WesternGeco’s Opposition To ION’s Mot. For a New Trial On Invalidity Under 35 U.S.C. §§ 102 and 103) at 12 (“WG Invalidity Mot.”) (emphasis supplied). WesternGeco argued

that because the '895 Application “bears no relation to *repeating* surveys over time to generate 4D data”—and because ION failed “to identify any prior art teaching of the 4D requirements of the Zajac '038 patent”—ION did not establish that Claim 14 was invalid. *Id.* at 14-15 (emphasis supplied).

The Court affirmed the jury verdict finding that Claim 14 was not proven invalid on the basis that “the '895 Publication does not disclose the 4D surveys claimed in the '038 Patent.” *See* Ex. 1012 (Order on Post Trial Motions) at 10.

## **VI. CLAIM CONSTRUCTION**

A claim in *Inter Partes* review is given its “broadest reasonable construction in light of the specification in which it appears.” 37 C.F.R. § 42.100(b). The broadest reasonable construction is the broadest reasonable interpretation of the claim language. *See In re Yamamoto*, 740 F.2d 1569, 1572 (Fed. Cir. 2004).

### **A. WesternGeco’s Proposed Claim Constructions in District Court**

Below is a list of the claim constructions for Claim 14 that WesternGeco proposed in the District Court litigation. *See* Ex. 1015 (WesternGeco’s Opening Claim Construction Brief) at 22-27 (“WG Claim Constructions”).

- **Active Streamer Positioning Device:** “a device for controlling the horizontal and/or vertical position of a seismic streamer.” *Id.* at 22.
- **A Master Controller:** “a controller that sends commands to other devices in a system.” *Id.* at 23.
- **The Master Controller:** “a master controller.” *Id.* at 24.

- **Positioning Commands:** “signals to control positioning.” *Id.* at 25.
- **Maintaining a specified array geometry:** “controlling the path or shape of the array.” *Id.* at 26.
- **Environmental Factors:** “external conditions (e.g., wind speed and direction, tidal currents velocity and direction, local currents velocity and directions, wave height and direction, water temperature, salinity, ocean bottom depth/angle, etc.).” *Id.* at 27.

WesternGeco’s proposed constructions for the foregoing claim terms will be used for the purpose of this Petition.<sup>4</sup> Any claim terms not included on this list will be given their broadest reasonable interpretation in light of the specification as commonly understood by a person of ordinary skill in the art as of June 15, 2001.

#### **B. Broadest Reasonable Construction of “Versus Time”**

The question of whether the prior art performed various streamer tracking and positioning functions “versus time” was the crux of the dispute in the District Court litigation regarding the validity of Claim 14. Yet the phrase never was presented for construction by the parties or construed by the court.

The ’038 specification reflects the clear meaning of the claim term “versus time” to a person of ordinary skill in the marine seismic surveying art. The specification recites that the data collected and used, like all industry standard data

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<sup>4</sup> Petitioner reserves the right to advocate a different claim interpretation in district court or another forum in accordance with the standards applied in such a forum.

(discussed below), include the horizontal (longitude and latitude) positions of the streamers referred to as “x and y”; and vertical or depth position of the streamers referred to as “z.” Ex. 1001 at 2:56, 7:9. It further explains that “[t]he three component (x,y,z) position of each streamer element . . . is controlled, tracked and stored *with respect to time* during each seismic data acquisition run.” *Id.* at 2:55-60.

The specification is clear that the position control, tracking, and storage of positional data “with respect to time” are synonymous with the control, tracking, and storage of the data “versus time.” The specification uses “with respect to time” and “versus time” synonymously and provides no indication whatsoever that “versus time” has a meaning other than “with respect to time.” Ex. 1001 at 2:17-21 (“system that tracks the geometry of the seismic streamer array . . . with respect to time”), 4:65-66 (tracking system for tracking the array geometry versus time”).

Where, as here, the meaning of a claim term in view of the specification comports with its plain meaning to a person of ordinary skill, that definition is correct. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). The attached declaration of Dr. Brian Evans, who has spent four decades working in the field of marine seismic surveys, confirms that a person of ordinary skill in the art would understand the claim term “versus time” to refer to the temporal aspect of streamer positioning and control that is a fundamental component of all seismic surveys.

As Dr. Evans explains, in marine seismic surveys, position measurements generally are taken approximately every 10 seconds, and the precise time of each measurement is recorded throughout the seismic survey. Ex. 1002 (Evans Decl.) at ¶¶31-35. Dr. Evans further explains that because marine seismic surveys are characterized by the dynamic nature of their components, “this time recording is important during a seismic survey and is necessary to interpret the data.” *Id.* at ¶31. Indeed, the association of positional data with respect to the time of measurement during a survey—the presentation of position data “with respect to time”—is so fundamental to the goal of marine seismic surveys that well before the priority date, it had been ensconced in the industry standard data format called “SEG-Y.” *Id.* at ¶35; Ex. 1008 (SEG-Y Publication). SEG-Y data reflects the horizontal positions (longitude (X) and latitude (Y)) and the vertical position (depth below the surface of the water) of the groups of seismic receivers on the streamers at the time each shot was fired, and also reflects the precise time of the shot’s firing. Ex. 1002 (Evans Decl.) at ¶35; Ex. 1008 (SEG-Y Publication) at 9-10.

A person of ordinary skill in the art would have understood this standard data format to record positional data “versus time” or “with respect to time.” Ex. 1002 (Evans Decl.) at ¶¶84-86. The consistent definition of “versus time” to mean “with respect to time” that emerges from the specification and comports with its usual meaning in the art is the correct definition. *Phillips*, 415 F.3d at 1312. Under

the “broadest reasonable interpretation” standard applicable here, any attempt to impose a narrower definition is especially unwarranted.

WesternGeco attempted to impose just such a narrower definition in the District Court. Although WesternGeco did not propose a definition of “versus time,” it argued in the context of validity that the “versus time” language in Claim 14 must be interpreted to refer to “*repeat[ing]* the position versus time”—essentially conducting a “4D survey.” Ex. 1011 (WG Invalidity Sur-Reply) at 4 (emphasis supplied). That interpretation is flatly contradicted by the specification, which makes clear that the disclosed system tracks and controls the streamer positions “with respect to time during *each* seismic data acquisition run.” Ex. 1001 (’038 Patent) at 2:55-60. While the specification discloses that “streamer positions versus time” may be stored in a legacy database “for *repeating* the positions versus time in a subsequent data acquisition” survey, *id.* at 4:64-65, the use of positional information “versus time” to repeat surveys for subsequent 4D data acquisition is just one embodiment of the patent. The specification clearly teaches that streamer positions are tracked and controlled “versus time” in “*each* seismic data acquisition run”—that is, regardless of whether that run ultimately is repeated. *Id.* at 2:55-60.

The plain language of the ’038 Patent claims precludes WesternGeco’s interpretation of “versus time” for several additional, independent reasons. First, Claim 14 recites “a tracking system for tracking the streamer horizontal and

vertical positions versus time during *a* seismic data acquisition run”—*i.e.*, a *single* data acquisition run. Ex. 1001 at 12:28-30. By arguing in the District Court that Claim 14 requires “*repeating* the position versus time essentially of [a] 4D survey,” WesternGeco improperly grafted a new limitation—*repeating* surveys for 4D seismic data acquisition—that is found nowhere in Claim 14. WesternGeco’s argument violates the fundamental rule against importing limitations from the specification into the claims. *Thorner v. Sony Computer Entertainment America, LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) (“We do not read limitations from the specification into claims”); *Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed. Cir. 1999) (“admonish[ing] against judicial rewriting of claims to preserve validity”).

Second, various other claims in the ’038 Patent are explicitly directed to 4D seismic data acquisition and recite language that would be rendered mere surplusage by WesternGeco’s proposed construction of “versus time” that requires repeated data acquisition. *Texas Instruments Inc. v. United States Int’l Trade Comm’n*, 988 F.2d 1165, 1171 (Fed. Cir. 1993) (rejecting construction that “would render the disputed claim language mere surplusage.”). Claim 3, for example, recites “storing the positions versus time in a legacy database for *repeating* the position versus time *in a subsequent data acquisition run*.” Ex. 1001 at 11:30-41. And Claim 28 recites “*repeating* the positions versus time *in a subsequent data acquisition*.” *Id.* at 14:23-34.



WesternGeco cannot credibly argue that the claim term “versus time” requires “repeating” positions or array geometry in a “subsequent data acquisition run.” If the “versus time” language itself conveyed repetition of a survey, then the additional limitations in Claims 3 and 28 directed to “repeating the positions” and “repeating the array geometry” in “subsequent data acquisition” would have been unnecessary. The unmistakable meaning of “versus time”—in claims directed to 3D and 4D seismic surveying alike—is that it refers to nothing more than the temporal component of positional measurements that is used in all seismic surveys. As the specification plainly states, the positions of the streamers “versus time” are tracked and controlled “with respect to time in *each* seismic data acquisition run”; and can either be used in subsequent surveys (as required by Claims 3 and 28) or simply be used in a single survey (as permitted by Claim 14). Ex. 1001 at 2:55-60.

## **VII. IDENTIFICATION OF CHALLENGE (37 C.F.R § 42.104(b))**

*Inter Partes* review of Claim 14 is requested on the grounds for unpatentability listed in the index below. Per 37 C.F.R. § 42.6(d), copies of the references are filed herewith. In support of the proposed grounds, this Petition is accompanied by a declaration of Dr. Brian Evans, a leading expert in the field of marine seismic surveys with over forty years of experience who has participated in over one-hundred marine seismic surveys. Ex. 1002 (“Evans Decl.”). Dr. Evans’ declaration supports the grounds in this petition showing that there is a reasonable

likelihood that Petitioner will prevail with respect to the challenged claim and that the challenged claim is not patentable. *See* 35 U.S.C. § 314(a).

Ground	35 USC	Challenge
1	§ 102(b)	Claim 14 is anticipated by the '895 Application (Ex. 1003).
2	§ 103(a)	Claim 14 is obvious over the '895 Application (Ex. 1003).
3	§ 103(a)	Claim 14 is obvious over the '895 Application (Ex. 1003) in view of Morice (Ex. 1005).
4	§ 103(a)	Claim 14 is obvious over the '895 Application (Ex. 1003) in view of the EAGE Paper (Ex. 1006).
5	§ 102(e)	Claim 14 is anticipated by the Canter PCT (Ex. 1004).
6	§ 103(a)	Claim 14 is obvious over the Canter PCT (Ex. 1004).
7	§ 103(a)	Claim 14 is obvious over the '895 Application (Ex. 1003) in view of the Canter PCT (Ex. 1004).
8	§ 103(a)	Claim 14 is obvious over the Canter PCT (Ex. 1004) in view of Morice (Ex. 1005).

#### **VIII. Ground 1: Claim 14 is Anticipated by the '895 Application.**

The '895 Application (Ex. 1003), titled “Control System for Positioning of Marine Seismic Streamers,” was published April 13, 2000. Thus, the '895 Application is prior art to the '038 Patent under at least 35 U.S.C. § 102(b).

##### **A. WesternGeco’s Argument During Prosecution Is Contradicted by the Plain Language of the '895 Application.**

Claim 14 never should have issued. The Examiner properly concluded the '895 application is anticipatory. WesternGeco’s subsequent “vertical and “horizontal” amendments and arguments that the '895 Application “does not teach issuing vertical and horizontal positioning commands”—and that “[v]ertical

position is monitored but not steered” in the ’895 Application—simply cannot withstand scrutiny. *See* Ex. 1014 (Response to Office Action) at 21-22.

The ’895 Application clearly teaches both horizontal and vertical streamer positioning and control in the same manner recited in Claim 14. The ’895 Application discloses that the “global control system 22 . . . utilizes the desired and actual positions of the birds 18 to regularly calculate updated desired *vertical and horizontal forces* the birds should impart on the seismic streamers 12 to move them from their actual positions to their desired positions.” Ex. 1003 (’895 Application) at 7 (emphasis supplied). After receiving the horizontal and vertical positioning commands from the global control system, the “local control system” within each bird then adjusts the wings of the birds to move the streamers from their actual positions to their desired positions. *Id.* at 18. Accordingly, the ’895 Application discloses that “the *vertically and horizontally steerable birds* 18 can be used to constrain the shape of the seismic streamer 12 . . . *in both the vertical (depth) and horizontal directions.*” *Id.* at 6 (emphasis supplied); *see also id.* at 9 (disclosing that the system is “capable of controlling the position of the seismic streamers 12 *in both the vertical and horizontal directions*”) (emphasis supplied).

Based on these clear disclosures, WesternGeco cannot credibly attempt to distinguish Claim 14 by arguing that the ’895 Application does not teach horizontal and vertical positioning and control, as it maintained during prosecution.

**B. The '895 Application Discloses Every Limitation of Claim 14.**

Claim 14 is anticipated by the '895 Application. The '038 Patent specification acknowledges that the '895 Application discloses a prior art “seismic streamer array tracking and positioning system.” Ex. 1001 ('038 Patent) at 1:45-49 (“One such tracking and positioning system for positioning and control of marine seismic streamers is taught in the international application published under the Patent Cooperation Treaty (PCT), International Publication Number WO 00/20895, international publication date Apr. 13, 2000.”). The seismic streamer array tracking and positioning system disclosed in the '895 Application includes each and every limitation of Claim 14.

**1. Limitation [1]: “towing vessel for towing a seismic array.”**

The '895 Application discloses that “[i]n Figure 1,” which is described as prior art even in the '895 Application, “a seismic survey vessel 10 is shown towing eight marine seismic streamers 12.” Ex. 1003 ('895 Application) at 5.

**2. Limitation [2]: “a seismic streamer array comprising a plurality of seismic streamers.”**

The '895 Application illustrates in Figure 1 a vessel towing eight seismic streamers, which it characterizes as an “array.” *Id.* at 5 (“The outermost streamers 12 in the *array* could be 700 meters apart”) (emphasis supplied).

**3. Limitation [3]: “An active streamer positioning device (ASPD) attached to each seismic streamer for positioning each seismic streamer.”**

As WesternGeco urged in litigation, and as a person of ordinary skill would understand, an “active streamer positioning device” or “ASPD” is a device capable of “controlling the vertical and/or horizontal position of the seismic streamer.” Ex. 1002 (Evans Decl.) at ¶¶83, 91; Ex. 1015 (WG Claim Constructions) at 22. The ’895 Application repeatedly discloses the use of active streamer positioning devices (called “birds”) that meet this definition. For example, it discloses that the birds are “rigidly attached . . . to the streamers 12,” and that “[p]referably the birds 18 are both vertically and horizontally steerable.” Ex. 1003 at 6, 12. It further explains that the birds are “capable of controlling the position of seismic streamers 12 in both the vertical and horizontal directions.” *Id.* at 9.

**4. Limitation [4]: “A Master controller for issuing vertical and horizontal positioning commands to each ASPD for maintaining a specified array geometry.”**

Consistent with WesternGeco’s construction and the understanding of a person of ordinary skill, a “master controller” is “a controller that sends commands to other devices in a system.” Ex. 1015 (WG Claim Constructions) at 23; Ex. 1002 (Evans Decl.) at ¶¶48, 92. The “global control system” of the ’895 Application meets this definition of the “master controller.” *Id.* at ¶92. Indeed, WesternGeco’s proposed construction for “master controller” in the ’038 Patent was *identical* to its construction of the “global control system” for patents in the same family (with the same substantive specifications) as the ’895 Application. Ex. 1015 (WG Claim

Constructions) at 24-25 (“master controller”); *id.* at 12 (“global control system”).

As explained above, the ’895 Application clearly discloses that the global control system issues both “horizontal and vertical positioning commands.” It discloses that the “global control system 22. . . utilizes the desired and actual positions of the bird 18 to regularly calculate updated desired *vertical and horizontal forces* the birds should impart on the seismic streamers 12 to move them from their actual positions to their desired positions.” Ex. 1003 at 7 (emphasis supplied).<sup>5</sup> The desired horizontal force and the desired vertical force are sent to the “local control system” on the birds “to calculate the magnitude and direction of the desired total force 46 that the global control system 22 has instructed the local control system to apply to the streamer 12.” *Id.* at 10. The “local control system 36 within each bird 18 is responsible for adjusting the wing [] angle to rotate the bird to the proper position,” *id.* at 18, thereby controlling “the shape of the seismic streamer 12 . . . *in both the vertical (depth) and horizontal directions.*” *Id.* at 6

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<sup>5</sup> In an alternative embodiment, the global control system transmits positioning commands to the birds in the form of “location information,” including positioning commands that set forth the “desired vertical depth” and the “desired horizontal position of the bird.” *Id.* at 11. This information likewise results in steering the bird to the desired vertical and horizontal position at the proper time.

(emphasis supplied).

The '895 Application further discloses issuing positioning commands to birds for maintaining a specified array geometry. As Dr. Evans explains and as confirmed by WesternGeco's proposed claim constructions in the District Court, the broadest reasonable interpretation of "maintaining array geometry" means to maintain or control "the shape or path of the array." Ex. 1002 (Evans Decl.) at ¶¶83, 94; Ex. 1015 (WG Claim Constructions) at 26. Like the "master controller" in Claim 14, the global control system in the '895 Application is utilized to maintain the "shape or path of the array": "the global control system 22 preferably calculates the desired vertical and horizontal forces based on the behavior of each streamer *and also takes into account the behavior of the complete streamer array.*" Ex. 1003 ('895 Application) at 7 (emphasis supplied); *see also* Ex. 1016 at 8-9 (Examiner's rejection stating that the "global control system" in the '895 Application "issue[s] command[s] to maintain the correct array geometry").

As an example of maintaining specified array geometry, the '895 Application's global control system can operate in a "feather angle control mode." When operating in this mode, the global control system maintains a specified "feather angle" array geometry by issuing vertical and horizontal positioning commands to position "each streamer in a straight line offset from the towing direction by a certain feather angle." Ex. 1003 at 18. The '895 Application's global

control system thereby maintains a specified array geometry—defined by straight lines at a constant feather angle—in precisely the manner later claimed in the '038 Patent. *Id.*; Ex. 1002 (Evans Decl.) at ¶¶94-95. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Accordingly, the '895 Application clearly discloses “a master controller for issuing vertical and horizontal positioning commands to each ASPD for maintaining a specified array geometry.” Ex. 1001 at 12:22-25.

**5. Limitation [5]: “an environmental sensor for sensing environmental factors which influence the towed path of the towed array.”**

Limitation [5] of Claim 14 requires a sensor to measure “environmental factors” that “influence the towed path of the array,” which are identified, both in the specification and by WesternGeco in litigation, to include “wind speed and direction, tidal currents velocity and direction, local currents velocity and directions, wave height and direction, water temperature, salinity, ocean bottom depth/angle, etc.” Ex. 1015 (WG Claim Constructions) at 27; Ex. 1001 ('038 Patent) at 9:18-20; Ex. 1002 (Evans Decl.) at ¶¶83, 98. The plain language of



Claim 14 does not require that information from the “environmental sensor” be used for any purpose, including to control streamer positions. *Id.* at 99. The claim simply requires the presence of the environmental sensor. *Id.*

The ’895 Application discloses an environmental sensor that meets limitation [5] of Claim 14. It discloses that “flowmeters . . . [and] other types of water velocity sensors [are] attached directly to the birds” to determine “crosscurrent velocity.” Ex. 1003 at 8-9. It further discloses that “current speed” and “current heading” are measured by the “vessel’s navigation system.” *Id.* Though not required by Claim 14, the ’895 Application explains that the global control system factors “crosscurrent velocity” into the positioning commands to compensate for environmental influences on the positions of the streamers and the array geometry. *Id.* at 8 (“The global control system 22 will preferably send the following values to the local bird controller: demanded vertical force, demanded horizontal force, towing velocity, and crosscurrent velocity.”); Ex. 1002 (Evans Decl.) at ¶100. Thus, the disclosures of the ’895 Application meet the “environmental sensor” limitation of Claim 14 under any reasonable construction.

**6. Limitation [6]: “a tracking system for tracking the streamer horizontal and vertical position versus time during a seismic data acquisition run.”**

The ’895 Application meets limitation [6] of Claim 14. It explains that the “global control system 22 is tasked with monitoring the positions of the streamers.”

Ex. 1003 ('895 Application) at 18. It also discloses monitoring of the horizontal and vertical positions of the streamers, whereby the global control system monitors the “horizontal positions of the birds” and the “vertical positions of the birds.” *Id.* at 7. As Dr. Evans explains, the birds are rigidly attached along the seismic streamers; thus, a system that monitors the horizontal and vertical positions of the birds monitors the horizontal and vertical positions of the streamers. *See* Ex. 1002 (Evans Decl.) at ¶¶101-102; Ex. 1003 ('895 Application) at 13.

The '895 Application also satisfies the requirement that the horizontal and vertical positions of the streamers are tracked “versus time.” Dr. Evans explains that *all* seismic systems before the priority date tracked the horizontal and vertical positions of the streamers versus time. Ex. 1002 at ¶103. This is a basic and necessary feature of marine seismic survey data; because (unlike in the land survey context) position varies as a function of time, both position and time must be measured and tracked throughout the survey. *Id.* at ¶¶31-35. Quite simply, in order to process seismic data to obtain the desired geophysical profile of the surveyed region, it is essential to know the precise time and position at which the acoustic data were obtained. *Id.* A marine seismic survey cannot achieve its purpose without this information. *Id.* For this reason, both before and after the priority date, all marine seismic surveys used an industry standard format for recording seismic data that reflects the horizontal and vertical positions of the seismic

equipment in the array with respect to time. *Id.* at ¶¶ 35, 62; *see also* Ex. 1008 (SEG-Y Publication) at 9-10.

The '895 Application demonstrates the acknowledged importance of tracking streamer positions “versus time” in marine seismic surveys. Its purported improvement over the prior art, according to its own disclosure, was to provide a more “deterministic” method for continuously tracking the position of seismic streamers during the brief time intervals when positional measurements are not recorded. Ex. 1003 at 3, 7-8. The control system of the '895 Application utilizes “position predictor software” to account for these short gaps between streamer position measurements, thereby continually monitoring the positions of streamer positioning devices as a function of time. *Id.* at 7-8. By doing so, the global control system “maintains a dynamic model of each of the seismic streamers.” *Id.* at 7. As Dr. Evans explains, and the contemporaneous prior art reflected, the use of “dynamic” models—as opposed to “static” models—was well-known in the industry as a method to continuously track streamer positions versus time. Ex. 1002 (Evans Decl.) at ¶¶ 51, 105; *see also* Ex. 1028 (Hydrographic Journal Article) at 15 (“[A] dynamic model represents the behaviour of the [seismic streamer] system as it varies with time.”). Accordingly, the '895 Application discloses “a tracking system for tracking the streamer horizontal and vertical position versus time during a seismic data acquisition run.” Ex. 1001 at 12:28-30.

7. **Limitation [7]: “an array geometry tracking system for tracking the array geometry versus time during a seismic data acquisition run, wherein the master controller compares the vertical and horizontal positions of the streamers versus time and the array geometry versus time to desired streamer positions and array geometry versus time and issues positioning commands to the ASPDs to maintain the desired streamer positions and array geometry versus time.”**

Limitation [7] distills the core aspects of the '895 Application in less than one sentence: The '895 Application is directed to tracking streamer positions and array geometries, making comparisons between actual and desired positions and array geometries, and issuing positioning commands to achieve and maintain the desired positions and array geometries. Like all seismic systems, these positional data are obtained and used with respect to time, and the '895 further discloses that the global control system maintains a dynamic model that continuously monitors and models the horizontal and vertical positions of the streamers versus time during the survey. Ex. 1003 at 7; Section VII(B)(6), *supra*.

The “array geometry” (defined as the “shape or path of the array”) is comprised of nothing more than the vertical and horizontal positions of the individual streamers that comprise the array. Ex. 1002 (Evans Decl.) at ¶108; Ex. 1001 ('038 Patent) at 7:65-67 (“the entire array geometry comprising the individual streamers”); *id.* at 7:55-59 (“changing the position of each individual streamer [] maintain[s] desired array geometry”). Thus, the positional tracking,

comparison, adjustment, and maintenance of the individual streamers' positions subsumes those functions with respect to the array as a whole. There can be no doubt that the '895 Application tracks "array geometry versus time." Indeed, it confirms that it tracks not only the streamer positions but the complete streamer array, explicitly noting that its streamer tracking and positioning system accounts for "*the behavior of each streamer and also takes into account the behavior of the complete streamer array.*" Ex. 1003 ('895 Application) at 7.

The '895 Application also meets the portion of limitation [7] reciting that the master controller compares the vertical and horizontal position of the streamers versus time and array geometry versus time with the desired position of the streamers and array geometry versus time:

The global control system 22 . . . utilizes the desired and actual positions of the birds 18 to regularly calculate updated desired vertical and horizontal forces the birds should impart on the seismic streamers 12 to move them from their actual positions to their desired positions.

Ex. 1003 at 7. As noted above, the '895 Application clarifies that the global control system issues these comparative positioning commands based on both streamer positions versus time and array geometry versus time. *Id.* (the global control system accounts for both "the behavior of each streamer" and "the behavior of the complete streamer array").

The '895 Application also discloses the portion of limitation [7] that recites

the master controller “issues positioning commands to the ASPDs to maintain the desired streamer positions and array geometry versus time.” Specifically, its global control system issues force or location positioning commands to move birds from their actual positions to their desired positions, *see* Ex. 1003 at 7,11, and it issues positioning commands to maintain the array geometry versus time in various modes, as previously discussed, such as a “feather angle mode.” *Id.* at 18-19. ■■■■■

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Accordingly, the '895 Application discloses every limitation of Claim 14.

**C. WesternGeco’s Defense of the '038 Patent in the District Court Litigation Is Contradicted By the Plain Language of Claim 14.**

WesternGeco did not defend Claim 14 in the District Court based on the “vertical and horizontal” distinction on which it relied during prosecution. WesternGeco instead tried to add a new limitation to Claim 14 that does not exist. WesternGeco argued that Claim 14 is limited to “‘*repeat[ing]* the position versus time essentially of [a] 4D survey’ whereas the '895 Application ‘does not deal with 4D time lapse kind of concepts.’” *See* Ex. 1011 (WG Invalidity Sur-Reply) at 4.

As discussed in the claim construction section above, the '038 Patent clearly

indicates when its claims are limited to 4D time-lapse seismic surveys. Claim 14 is not. Claim 14 includes no language directed to 4D time-lapse seismic or *repeating* 3D surveys. WesternGeco cannot import 4D concepts from the specification into Claim 14 in an effort to distinguish it from the '895 Application, as it managed to do in the District Court. WesternGeco must defend Claim 14 on its own terms. When judged on its own terms, Claim 14 is anticipated by the '895 Application.

**IX. Ground 2: Claim 14 is Obvious Over the '895 Application.**

Even if the “versus time” language of Claim 14 required 4D surveys, it would have been obvious to a person skilled in the art to use the streamer tracking and positioning system disclosed in the '895 Application for this 4D purpose.

Dr. Evans explains that performing 4D time lapse surveys was well established and was a growing trend by the mid-1990s. Ex. 1002 (Evans Decl.) at ¶¶62-63. In numerous publications, the industry recognized that the key requirement for 4D time-lapse seismic was the ability to repeat the streamer positions and array geometry as closely as possible. *Id.* at ¶62 (citing prior art publications). These prior art publications confirm that “design incentives and other market forces” already were moving practitioners in the direction of using streamer tracking and control systems to conduct 4D-time lapse surveys, and WesternGeco’s effort to claim that “predictable variation” of the system disclosed by the '895 Application cannot succeed. *KSR Int’l Co. v. Teleflex*, 550 U.S. 398,

401 (2007).

Accordingly, a person of ordinary skill in the art would have been motivated to use the streamer tracking and control system disclosed in the '895 Application for 4D seismic surveys well before the priority date of the '038 Patent. Ex. 1002 (Evans) at ¶¶117-119. Because the '895 Application discloses every other limitation of Claim 14—a position that WesternGeco did not refute in the District Court trial—Claim 14 is obvious over the '895 Application.

**X. Ground 3: Claim 14 is Obvious Over the '895 Application in View of Morice.**

The Morice article, entitled “4D-ready marine seismic data,” not only reflects the widely-known motivation to use streamer tracking and control systems for 4D seismic surveys (summarized above), but conclusively demonstrates that, before the priority date, the “design incentives and market forces” already had led skilled artisans to employ the embodiment of the '895 Application in the manner WesternGeco claimed was inventive in the District Court. *KSR Int’l Co.*, 550 U.S. at 401. Morice was published prior to June 15, 2001, and is therefore § 102(a) prior art.

Morice explains that “[o]f the published 4D case studies, some of the most successful have been conducted using exacting repetition of acquisition configurations between successive surveys.” Ex. 1005 at 1069. In order to replicate streamer positions from survey to survey, Morice emphasized that an



integral component of state-of-the-art 4D seismic acquisition systems is “positioning and steering control system[s] for towed-streamers, including integral streamer-mounted steering devices and an in-built fully-acoustic ranging system.” *Id.* For effective 4D seismic acquisition, Morice explained that “[a]ctive lateral and vertical streamer control is achieved using a ‘steerable bird.’” *Id.* In other words, the state-of-the-art 4D seismic data acquisition system Morice described is precisely what the ’895 Application disclosed. Ex. 1002 (Evans Decl.) at ¶122.

Therefore, it would have been obvious to a person of ordinary skill in the art to use (and, to the extent necessary, to modify successfully) the tracking and control system disclosed ’895 Application, in view of Morice, to repeat seismic surveys for 4D data acquisition. Ex. 1002 (Evans Decl.) at ¶¶120-22. Because the ’895 Application undeniably discloses each and every other limitation of Claim 14, Claim 14 is obvious over the ’895 Application in view of Morice.

**XI. Ground 4: Claim 14 is Obvious Over the ’895 Application in View of the EAGE Paper.**

The Board need look no further than WesternGeco’s own contemporaneous publications to confirm that applying the technology disclosed in the ’895 Application to 4D time-lapse seismic surveys (even if somehow required by claim 14) would have been obvious prior to June 15, 2001.

██

██

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

On August 6, 2000, after the commercial launch of the Q-Marine system, a press release was issued proclaiming that “Q-Marine Takes 4D Seismic to the Next Level.” Ex. 1007. The Q-Marine press release emphasized how its improved tracking and steering technology could be applied to 4D seismic surveying:

One area that will benefit particularly from the introduction of Q-Marine technology is the acquisition of 4D seismic surveys. *Q-Marine acquisition introduces new levels of control, which now enable the cost-effective towed streamer method to accurately fulfill the principal requirements of 4D ready data. With Q-Marine acquisition, we can now deliver 4D ready data . . . .*

*Id.* (emphasis supplied).

The '895 inventors, Hillesund and Bittleston, made the same point in their EAGE Paper: “More accurate receiver positioning will . . . improve repeatability for time-lapse seismic.” Ex. 1006 at 1. Specifically, they explained that their streamer positioning and control system can use navigational data acquired in previous surveys to achieve the repeatability necessary for accurate 4D surveying:

In addition to improving the quality and efficiency of current seismic surveys, active lateral steering enables new types of seismic products .

. . . In current 4D surveys, the difference in positioning of streamer cables from one survey to the next is one of the greatest sources of errors when it comes to repeatability. *By making use of old navigation data, it is possible to steer the streamers towards the streamer positions in previous seismic surveys.*

*Id.* at 4 (emphasis supplied).

The motivation to combine the disclosures of the '895 Application with the EAGE Paper is self-evident: the *same* inventors of the '895 Application discuss the desirability of using the *same* technology disclosed in the '895 Application for 4D seismic surveys. Even if WesternGeco were permitted to engraft onto Claim 14 a 4D or repeated survey limitation, the 2000 EAGE Paper demonstrates that applying the technology disclosed in the '895 Application for 4D time-lapse seismic would have been (and indeed was) obvious to a person of ordinary skill in the art prior to June 15, 2001. Ex. 1002 (Evans Decl.) at ¶126. Therefore, Claim 14 is obvious over the '895 Application in view of the EAGE Paper.

## **XII. Ground 5: Claim 14 is Anticipated by the Canter PCT.**

Claim 14 is anticipated by the Canter PCT. The Canter PCT has an international filing date of February 13, 2001 and published on August 23, 2001. Ex. 1004 (Canter PCT). Because the international filing date of the Canter PCT predates the priority date of the '038 Patent, it is § 102(e) prior art. *See* Section V(C)(4), *supra*.

**A. Canter Discloses the Use of Streamer Tracking and Control Systems for 4D Time-Lapse Marine Seismic.**

As noted above, WesternGeco defended the novelty of Claim 14 by arguing that the “versus time” limitations referred to 4D time-lapse surveys. WesternGeco contended that the ’895 Application “bears no relation to repeating surveys over time to generate 4D data”—that ION’s expert failed “to identify any prior art teaching of the 4D requirements of the Zajac ’038 patent”—and that therefore the ’895 Application did not anticipate Claim 14. Ex. 1038 at 14-15. The Canter PCT, which was not before the examiner during prosecution or before the jury in the District Court litigation, undeniably is just such a “prior art teaching of the 4D requirements of the Zajac ’038 Patent” that WesternGeco asserted was missing.

The Canter PCT confirms that the ’038 Patent did not invent the use of horizontal and vertical streamer positioning and control in time-lapse 4D seismic surveys. Canter’s abstract states that the purpose of his invention is to utilize a streamer tracking and control system in 4D time-lapse seismic surveys:

In order to improve the repeatability of marine seismic surveys carried out over the same subsurface area using a towed seismic source and a towed array of seismic streamers, the source and streamer array used to perform surveys after the first are depth-controlled and steered laterally so that the source and at least some of the sensors in the streamers occupy at least some of the same positions as the source and sensors of the first survey.

Ex. 1004 (Canter PCT) at Abstract.

Accordingly, WesternGeco cannot credibly argue here that Claim 14 is novel because it claims the use of seismic streamer positioning and control systems to facilitate 4D seismic surveys, as it successfully contended in the District Court.

**B. Canter Discloses Every Limitation of Claim 14.**

The seismic streamer array tracking and positioning system disclosed in the Canter PCT includes every limitation of Claim 14, either explicitly or inherently, and therefore anticipates. *Schering Corp. v. Geneva Pharmaceuticals*, 339 F.3d 1373, 1377 (Fed. Cir. 2003).

**1. Limitations [1] and [2] of Claim 14 Are Disclosed by Canter.**

Limitations [1] and [2] of Claim 14 recite “a towing vessel for towing a seismic array” and “a seismic streamer array comprising a plurality of seismic streamers,” respectively. Ex. 1001 at 12:16-18. Canter discloses “an array of marine seismic streamers” that is towed behind a “seismic survey vessel,” thereby satisfying limitations [1] and [2] of Claim 14. Ex. 1004 (Canter PCT) at 1.

**2. Limitation [3] of Claim 14 Is Disclosed by the Canter PCT.**

Limitation [3] of Claim 14 recites “an active streamer positioning device (ASPD) attached to each seismic streamer for positioning each seismic streamer.” Ex. 1001 at 12:19-21. Canter satisfies this limitation. Like the '038 Patent, Canter's streamer tracking and positioning system utilizes birds that are both vertically and horizontally steerable: “Each streamer 18 has a plurality of ‘birds’

38 . . . , distributed at 200 metre intervals therealong, for controlling the streamer's depth and steering it laterally.” Ex. 1004 at 5.

### **3. Limitation [4] of Claim 14 Is Disclosed by the Canter PCT.**

Limitation [4] recites “a master controller for issuing vertical and horizontal positioning commands to each ASPD for maintaining a specified array geometry.” Ex. 1001 at 12:22-24. Canter discloses a master control system that maintains a specified array geometry—*i.e.*, it maintains the “shape or path” of the array in the current (time-lapse) survey to ensure that it tracks the same shape and path of the array from the previous survey. Ex. 1004 (Canter PCT) at 7; Ex. 1002 (Evans Decl.) at ¶134.

Specifically, Canter discloses that the centralized control system, located on the vessel, “continuously generates data defining the respective shape adopted by each streamer at each shot point in the previous survey.” Ex. 1004 at 7. Using this legacy data from the previous survey, Canter’s system ensures that the streamers in the second survey are “towed along substantially the same path as was followed by the first [streamer] during the previous survey.” *Id.* at 3. By maintaining the path and shape of the streamers comprising the array, Canter’s system controls “the path or shape of the array” (*i.e.*, maintains “a specified array geometry”), as required by limitation [4]. *Id.* at 3, 7; Ex. 1002 (Evans Decl.) at ¶134.

Canter also clearly discloses that the specified shape or path of the array will

be maintained via a master controller that sends positioning commands. Canter's centralized control system located on the vessel produces "inputs based on the difference between the present and desired future positions of the [pre-selected points along each steamer 72] for a steering controller 74, which in turn produces at 76 control signals for the birds 38, to cause them to laterally steer the steamer 18 so that the [streamers] are as close as possible to their desired positions at the correct time." Ex. 1004 (Canter PCT) at 7.

Although the positioning commands (*i.e.*, "control signals") recited in this passage refer to horizontal steering of streamers, Canter discloses controlling streamer depth as well. In Canter's system, "the source and streamer array used to perform surveys after the first are *depth-controlled* and steered laterally so that the source and at least some of the sensors in the streamers occupy at least some of the same positions as the source and sensors of the first survey." *Id.* at Abstract. Moreover, Canter explains that each streamer has a plurality of birds "for controlling the streamer's *depth* and steering it laterally." *Id.* at 5. Finally, Canter discloses that preferably the birds used in his system are the type of birds disclosed in the '636 PCT Application, which are incorporated for that purpose.<sup>6</sup> *Id.* at 5;

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<sup>6</sup> Because Canter identifies with particularity the specific disclosures of the '636 Application it incorporates by reference—*i.e.*, "birds . . . for controlling the streamer's depth and steering it laterally"—those birds are incorporated into Canter

Ex. 1002 (Evans Decl.) at ¶136. As Dr. Evans explains, the '636 Application discloses birds that receive both horizontal and vertical positioning commands to “control the streamers lateral position, as well as its depth.” Ex. 1002 (Evans Decl.) at ¶¶48-49, 136; Ex. 1021 ('636 Application) at Abstract.

**4. Limitations [6] and [7] of Claim 14 Are Disclosed by the Canter PCT.**

Limitation [6] of Claim 14 recites “a tracking system for tracking the streamer horizontal and vertical positions versus time during a seismic data acquisition run.” Ex. 1001 at 12:27-29. Limitation [7] of Claim 14 recites “an array geometry tracking system for tracking the array geometry versus time during a seismic data acquisition run, wherein the master controller compares the vertical and horizontal positions of the streamers versus time and the array geometry versus time to desired streamer positions and array geometry versus time and issues positioning commands to the ASPDs to maintain the desired streamer positions and array geometry versus time.” *Id.* at 12:30-38.

Canter discloses the claimed tracking, comparing, and controlling limitations set forth in limitations [6] and [7] of Claim 14. With respect to tracking, Canter explains that 3D seismic surveys result in “a vast amount of positional data

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for anticipation purposes. *See, e.g., Southern Clay Prods., Inc. v. United Catalysts, Inc.*, 43 Fed. Appx. 379, 384 (Fed. Cir. 2002).



defining the respective positions of source 15 and hydrophones 32 for each shot produced by the source.” Ex. 1004 (Canter PCT) at 6-7. As discussed in Dr. Evans’ Declaration, this “positional data” referred to in Canter is acquired in all seismic surveys and, in order to be useful for marine subsurface imaging and to comply with the ubiquitously followed industry standard, includes both lateral and vertical (depth) location information, as well as the time associated with the positional data. *See* Ex. 1002 (Evans Decl.) at ¶35; Ex. 1008 (SEG-Y Publication) at 9-10.

From that data, Canter explains, “the shape of the *path or track* followed by each streamer 18 *throughout the survey* can be determined.” Ex. 1004 at 7. Canter thus discloses a tracking system for tracking the horizontal and vertical position of the streamers and array geometry versus time, as recited in limitations [6] and [7]. Ex. 1002 (Evans Decl.) at ¶138; Ex. 1015 (WG Claim Constructions) at 26 (“array geometry” construed as “the shape or path of the array”).

Canter also discloses the comparing and controlling portions of limitation [7]. When it is desired to use the vessel to perform a 4D time-lapse survey, Canter explains that “sufficient positional data from the previous survey is loaded into the system 14 to define the respective tracks followed by the vessel, source and streamers used in the previous survey.” Ex. 1004 at 7. The control system in Canter is then “used to cause the vessel 10 to follow as closely as possible the track followed by the vessel used in the previous survey, and the source 15 is also

steered to follow as closely as possible the track followed by the source of the previous survey.” *Id.* To repeat the time-lapse survey as accurately as possible, the control system 14 “produces inputs based on *the difference between the present and desired future positions* of [pre-selected points along the streamer] for a steering controller 74, which in turn produces *control signals* at 76 for the birds 38, to cause them to laterally *steer* the steamer 18 so that the [streamers] are as close as possible to their desired positions *at the correct time.*” *Id.* (emphasis supplied).

Accordingly, the Canter PCT discloses the tracking, comparing, and controlling limitations set forth in limitations [6] and [7] of Claim 14.

#### **5. Limitation [5] Is Inherently Disclosed by the Canter PCT.**

The only limitation of Claim 14 that is not recited explicitly by Canter is limitation [5]—*i.e.*, “an environmental sensor for sensing environmental factors which influence the towed path of the towed array.” Because such a sensor necessarily is present in every marine seismic survey system, including the one described in Canter, limitation [5] is disclosed inherently by Canter. *Rexnord Indus. v. Kappos*, 705 F.3d 1347, 1355 (Fed. Cir. 2013) (inherent anticipation appropriate where the prior art “must necessarily include the unstated limitation”).

As an initial matter, unlike other claims of the ’038 Patent (such as Claim 15), the plain language of Claim 14 does not require the “environmental sensor” or information from the sensor to be used for any purpose, for example, to control the

streamer positions. Ex. 1001 at 12:25-26; Ex. 1002 at ¶99. Claim 14 requires only the presence of an environmental sensor that senses environmental factors that “influence the towed path of the towed array.” *Id.*

Consistent with the specification and WesternGeco’s claim construction, numerous “environmental factors” influence the path of the towed arrays and thereby meet this limitation, including “wind speed and direction; tidal currents velocity and direction; ocean bottom depth/angle; local current velocity and direction; wave height and direction; and water temperature and salinity.” Ex. 1015 (WG Claim Constructions) at 27; Ex. 1001 at 7:42-46. Dr. Evans confirms that environmental sensors that measure some of these factors are standard and necessarily present on every seismic vessel that would conduct a survey. *See* Ex. 1002 (Evans Decl.) at ¶¶144-46. Such a sensor is so important for marine navigation that it hardly takes an expert in the field to know that an environmental sensor within the scope of Claim 14 is necessarily included on *any* marine vessel that operates a considerable distance off-shore, let alone sophisticated seismic vessels that tow expensive equipment whose positions must be tracked precisely at all times. *Id.* To use just one example cited by Dr. Evans, wind speed and direction sensors—which alone meet limitation [5]—would have been common on vessels dating back to the middle-ages and always would be present on seismic survey vessels at the priority date. *Id.* at ¶144.

In other words, the existence of an “environmental sensor” is inherent in Canter’s disclosure of a “seismic vessel.” As Dr. Evans confirms, a person of ordinary skill in the art would have had no doubt that the reason Canter does not explicitly reference the basic navigational feature of environmental sensors is that they are present on every vessel and, like the presence of wheels on an automobile, need not be mentioned when discussing some other aspect of the technology. Ex. 1002 (Evans Decl.) at ¶¶144-46. There can be no doubt that a person of ordinary skill would have understood that an environmental sensor within the scope of Claim 14 necessarily is present in Canter’s system. *Rexnord Indus.*, 705 F.3d at 1355.

Accordingly, because each and every limitation of Claim 14 is disclosed, either expressly or inherently, by Canter, Claim 14 is anticipated.

### **XIII. Ground 6: Claim 14 Is Obvious Over the Canter PCT.**

Even assuming *arguendo* that Canter does not anticipate Claim 14, it nevertheless renders the claim obvious. As discussed above, the only conceivable distinctions WesternGeco may try to draw between Canter and Claim 14 relate to the limitations of vertical positioning and the environmental sensor.

To the extent that Canter did not disclose depth tracking and control (it does), a person of ordinary skill would have been motivated to modify its system to track and control both the depth and lateral position of the streamers versus time.

Ex. 1002 (Evans Decl.) at ¶¶148-49. The purpose of Canter was to “improve the repeatability of multiple marine seismic surveys,” which its system accomplishes by using birds that are “*depth-controlled and steered laterally* so that the source and at least some of the sensors in the streamers occupy at least some of the same positions as the source and sensors of the first survey.” Ex. 1004 at 2, Abstract.

It was well known before the priority date that efficacy of 4D time-lapse surveys was enhanced by repeating precisely the “[i]dential streamer spread,” as well as the “same streamer depth,” from one survey to another. Ex 1005 (Morice) at 1609; Ex. 1002 (Evans Decl.) at ¶¶61-63. Canter recognizes as much, explaining that quality 4D data acquisition requires that seismic data acquired from the second survey “must appear substantially identical” to the seismic data acquired in the first survey—*i.e.*, the seismic data from the two runs must “match each other.” Ex. 1004 at 2. As Dr. Evans explains, seismic data varies substantially as a function of streamer depth; thus, data from a first seismic survey would not be “substantially identical” or “match” data from a second survey if the seismic receivers in the two surveys recorded signals at different depths. Ex. 1002 (Evans Decl.) at ¶148.

For these reasons, a person of ordinary skill would have been motivated to modify Canter’s system (if required) to control both the depth and horizontal positions of the streamers. Ex. 1002 (Evans Decl.) at ¶148. Given the well-recognized ability to steer streamers laterally and vertically, which Dr. Evans

summarizes in his declaration, a person of ordinary skill would have been certain that modifying Canter's system to include depth tracking and control would be successful. *Id.* at ¶149; Ex. 1003 ('895 Application) at 6 (“the *vertically and horizontally steerable birds* 18 can be used to constrain the shape of the seismic streamer 12 . . . in both the vertical (depth) and horizontal directions.”); Ex. 1021 ('636 Application) at 7. Indeed, were any further motivation required, the Canter PCT itself states that its system uses birds that can control both the depth and the horizontal positions of the streamers, including those of the '636 Application. Ex. 1004 at 5.

Similarly, even if one were to conclude that an “environmental sensor” was not inherent in the “seismic vessel” disclosed in Canter, it would have been trivial to modify Canter to include such a sensor. As noted above, environmental sensors were standard on every vessel that conducts seismic surveys. Indeed, as Dr. Evans explains, seismic vessels prior to June 15, 2001 invariably included sensors for a plurality of environmental factors that can affect the position of the streamer array, such as the water-velocity sensors disclosed in the '895 Application. Ex. 1002 (Evans Decl.) at ¶150. In short, there is nothing inventive about the inclusion of an environmental sensor on a survey vessel. Therefore, modifying Canter's disclosed seismic system to include that limitation of Claim 14 would have been obvious.

#### **XIV. Ground 7: Claim 14 Is Obvious Over the '895 Application in View of Canter.**

Along with being obvious based on the general knowledge in the field, the vertical positioning and the environmental sensor are disclosed explicitly in the '895 Application. Inversely, the 4D survey system that WesternGeco asserts to be missing from the '895 Application is disclosed by Canter. Therefore, these two references in combination undeniably teach every limitation of Claim 14, and the motivation to combine these two references is readily apparent.

It would have been obvious to a person of ordinary skill in the art to combine the streamer tracking and control system of the '895 Application with the 4D time-lapse teachings of Canter. Ex. 1002 (Evans Decl.) at ¶153. Performing 4D time-lapse surveys was well established and had become more frequent by the mid-1990s, and the industry recognized that improvements in the ability to track and control streamer positions would enhance repeatability and thereby yield more effective 4D surveys. *Id.* at ¶¶62-63. The motivation to combine the '895 Application streamer positioning and control technology with Canter's 4D time-lapse teachings is not only obvious—it was explicitly disclosed in the art. *See* Ex. 1006 (EAGE Paper); Ex. 1007 (Q-Marine Press Release); Ex. 1005 (Morice).

It likewise would have been obvious to combine Canter's 4D time-lapse system with the '895 Application. Ex. 1002 (Evans Decl.) at ¶153. The '895 Application clearly discloses both vertical positioning and an environmental

sensor. Given the clear benefits (and ubiquitous use) of both vertical positioning and environmental sensors for 4D time-lapse surveys, a person of ordinary skill in the art would have been motivated to incorporate these features in Canter and would have expected success in doing so. *Id.*; *KSR Int’l Co.*, 550 U.S. at 417.

**XV. Ground 8: Claim 14 Is Obvious Over Canter in View of Morice.**

Even if a person of ordinary skill in the art somehow failed to recognize the explicit depth control and positioning disclosures of Canter, he or she would have recognized that depth positioning and control would improve Canter’s 4D seismic system in view of Morice, which explicitly recites the widely-held understanding in the field that controlling streamers to maintain “same streamer depth” is an integral feature of an effective 4D seismic system. Ex. 1005 (Morice) at 1609.

Similarly, even if an environmental sensor were not inherent in Canter, a person of ordinary skill in the art would have been motivated to include such an environmental sensor in Canter’s system in view of Morice. Morice confirms that it was well-known in the art that “environmental effects” can “affect positioning accuracy and reliability, such as . . . the effect of water velocity variations across the positioning network.” Ex. 1005 at 3. Morice therefore resolves any doubt regarding the motivation and ability of a person of ordinary skill to successfully combine prior art environmental sensors and vertical positioning with Canter’s system. Ex. 1002 (Evans Decl.) at ¶¶154-56. Accordingly, Claim 14 is obvious

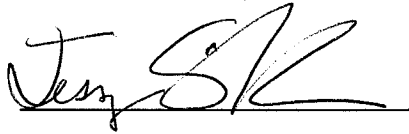


over Canter in view of Morice.

## **XVI. CONCLUSION**

Petitioner has established a reasonable likelihood of prevailing with respect to Claim 14. Petitioner respectfully requests that a trial for *Inter Partes* review of Claim 14 be instituted, and that Claim 14 be judged unpatentable and cancelled.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Jessamyn Berniker", written over a horizontal line.

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Date: April 23, 2014

**CERTIFICATE OF SERVICE**  
**(37 C.F.R. §§ 42.6(e) and 42.105(a))**

The undersigned hereby certifies that the above-captioned Petroleum Geo-Service Inc.'s "Petition for *Inter Partes* Review of U.S. Patent No. 6,691,038" and true copies of Exhibit Nos. 1001 to 1038 were served on this 23rd day of April, 2014, on the Patent Owner at the official correspondence address for the attorney of record for the '038 Patent as shown in USPTO PAIR via FedEx:

WesternGeco L.L.C.  
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## APPENDIX OF EXHIBITS

Exhibit No.	Description
PGS 1001	U.S. Patent No. 6,691,038 B2 ('038 Patent).
PGS 1002	Declaration of Dr. Brian J. Evans, Ph.D.
PGS 1003	PCT Publication WO 00/20895 ('895 Application).
PGS 1004	W0/01380 A2 (Canter PCT).
PGS 1005	Morice <i>et al.</i> , "4D-ready marine seismic data," 2000, 70th Annual International Meeting, SEG Expanded Abstracts, 1607-1614 (Morice).
PGS 1006	Hillesund, Bittleston, <i>et al.</i> , "Marine Seismic Cable Steering and Control," EAGE 62nd Conference and Technical Exhibition – Glasgow, Scotland, May 29 – June 2, 2000 (EAGE Paper).
PGS 1007	Aug. 7, 2000 Press Release, "Schlumberger Q-Marine Takes 4D Seismic to Next Level" (Q-Marine Press Release).
PGS 1008	Barry, K.M., Cavers, D.A. and Kneale, C.W., <i>Geophysics</i> , 40(2); pp. 344-352 (SEG-Y Publication).
PGS 1009	Oyvind Hillesund Deposition Transcript in re: <i>WesternGeco L.L.C. v. Ion Geophysical Corporation</i> , Civil Action No. 4:09-CV-01827, Aug. 7, 2012.
PGS 1010	Simon Bittleston Trial Transcript in re: <i>WesternGeco L.L.C. v. Ion Geophysical Corporation</i> , Civil Action No. 4:09-CV-01827, July 24, 2012.
PGS 1011	WesternGeco's Sur-Reply to Ion's Motion for A New Trial on Invalidity Under 35 U.S.C. §§ 102 and 103 in re: <i>WesternGeco L.L.C. v. Ion Geophysical Corporation</i> , Civil Action No. 4:09-CV-01827.
PGS 1012	Memorandum and Order in re: <i>WesternGeco L.L.C. v. Ion Geophysical Corporation</i> , Civil Action No. 4:09-CV-01827.
PGS 1013	Memorandum and Order in re: <i>WesternGeco L.L.C. v. Ion Geophysical Corporation</i> , Civil Action No. 4:09-CV-01827.
PGS 1014	'038 Patent file history, Response to Office Action Mailed March 31, 2003.
PGS 1015	WesternGeco's Opening Claim Construction Brief in re: <i>WesternGeco L.L.C. v. Ion Geophysical Corporation</i> , Civil Action No. 4:09-CV-01827.
PGS 1016	'038 Patent file history, Office Action Dated March 31, 2003.

PGS 1018	U.S. Patent No. 4,404,664 (Zachariadis).
PGS 1020	Notice of Allowability, dated September 24, 2003.
PGS 1021	PCT Application No. WO 98/28636 ('636 Application).
PGS 1022	Evans, A Handbook for Seismic Data Acquisition in Exploration (David V. Fitterman & William H. Dragoset, Jr. eds., 1977).
PGS 1023	U.S. Patent No. 3,581,273 (Hedberg).
PGS 1024	U.S. Patent No. 3,605,674 (Weese).
PGS 1025	U.S. Patent No. 4,809,005 A (Counselman).
PGS 1026	Society of Exploration Geophysicists 75th Anniversary, Virgil Kauffman Gold Medal Press Release, pages 25-27.
PGS 1027	Peter Canter <i>et al.</i> "Evolution of Positioning in Marine 3-D Seismic," SEG Expanded Abstracts 1984.
PGS 1028	David E. Allen <i>et al.</i> , "Centralized Marine Control System," SEG Annual Meeting, November 2-6, 1986.
PGS 1029	Gikas, V. <i>et al.</i> , The Hydrographic Journal.77; pp. 11-24 (1995).
PGS 1030	U.S. Patent No. 5,790,472 (Workman).
PGS 1031	U.S. Patent No. 5,050,133 (Buddery).
PGS 1032	U.S. Patent No. 6,011, 752 (Ambs)
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PGS 1037	<a href="http://www.merriam-webster.com/dictionary/monitor">http://www.merriam-webster.com/dictionary/monitor</a> .
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