BP's Summer 2012 Simpson Lagoon Ocean Bottom Cable Geophysical Operation

(Briefing Notes for Open Water Meeting, Anchorage, Alaska, 2013)

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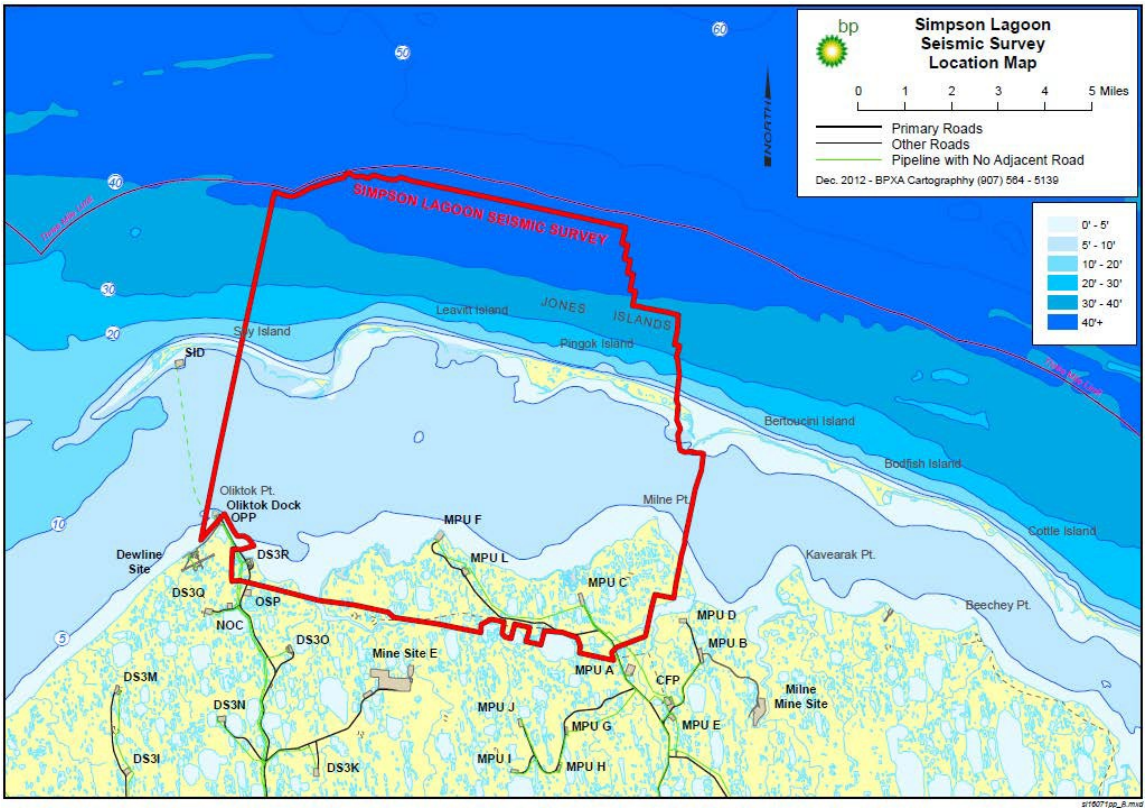
2. **Purpose of the Simpson Lagoon operation:** To collect information that will allow BP to more effectively manage a reservoir that is currently under production.



3. **General description:** An Ocean Bottom Cable shallow water seismic operation, with two relatively small source vessels each towing airgun arrays of 640 cubic inches, and a third with an airgun array of 320 cubic inches, done in accordance with the Conflict Avoidance Agreement and various permits and authorizations.
4. **Project area:** About 70 square miles of marine habitat, with about 42 square miles inside the barrier islands and 28 square miles outside the barrier islands. (An additional area of about 13 square miles, including barrier islands, was included in the project area.)

5. **Timing:** Seismic acquisition started on 29 July 2012. Acquisition outside the barrier islands was completed on 25 August 2012, and acquisition inside the barrier islands was completed on 7 September.
6. **Water depths:** Depths ranged from the shoreline to about 45 feet.
7. **Marine Mammal Observers:** Two marine mammal observers were on duty on each source boat at all times during acquisition. Standard ramp up and shut down procedures were used. Post-measurement mitigation radii are listed in the table below.

INSIDE BARRIER ISLANDS
Estimated Distances in meters to received SPL (rms)

Array volume	190 dB pinnipeds	180 dB cetaceans	160 dB	120 dB
320 in^3	300	500	1,550	5,700*
40 in^3	150	300	950	3,250

OUTSIDE BARRIER ISLANDS
Estimated Distances (m)

Array volume	190 dB pinnipeds	180 dB cetaceans	160 dB	120 dB
40 in^3	600	1,500	4,600	14,200
320 in^3	400	1,200	4,300	13,300
40 in^3	50	200	1,600	9,300

*This was a modeled value, rather than a measured value, due to concerns about the measured broadside value.

8. **MMO Shut-downs:** MMOs were on watch for 1,490 hours while airguns were firing. There were 45 pinniped sightings (47 individuals) and no cetacean sightings. There were 5 shut-downs (4 for seals within the estimated 190 dB isopleth and 1 for a seal approaching the estimated 190 dB isopleth), 3 power-downs, and 5 delayed ramp-ups for pinnipeds.
9. **Seal Exposures to >about 160dB:** The estimated maximum number of pinniped exposures to sound levels >about 160dB is 21. This is 14% of the allowable takes under the IHA.
10. **Fish Monitoring:** Long term fish monitoring has been conducted in the area for the past three decades and was conducted during the seismic operation. No influence of the seismic operation was noted.

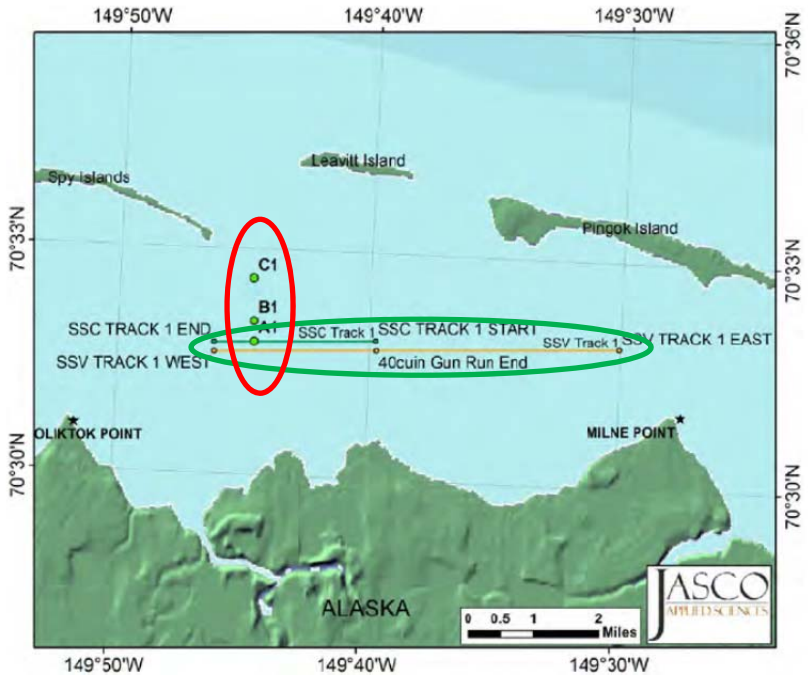
Acoustic Modeling and Monitoring, case study focusing on 120 dB re 1 µPa isopleth from 2012 shallow water seismic operation to make a point

1. **Somewhat different estimates based on different methods.**

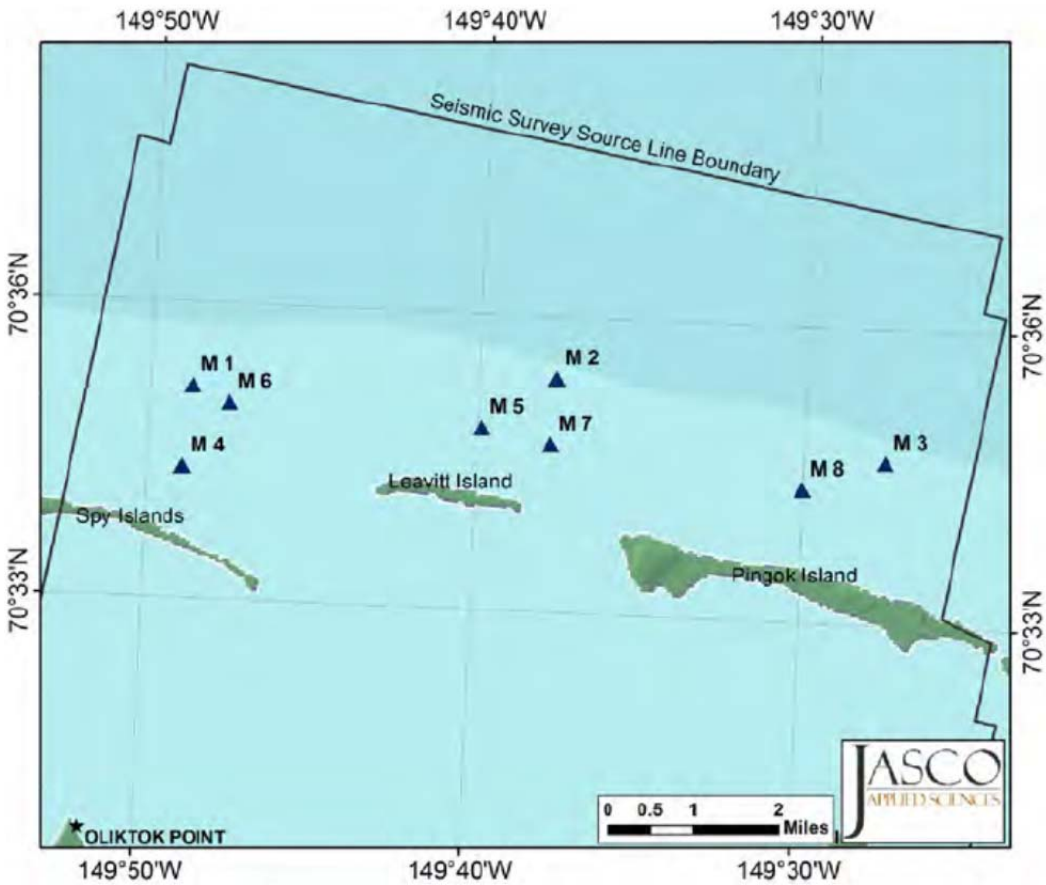
Table 1: Estimated distances to the 120 dB radius using different methods, in shallow water inside the barrier islands, with a 320 inch^3 array.

Method	Estimated distance (m)
Preseason modeled radii	5,700
Sound Source Characterization (endfire) (90%)	2,528
Sound Source Characterization (broadside) (90%)	16,598
Dipping hydrophones	No detections (4.4 km ≤ distances ≤ 14.1 km)
Long-duration recorders (AMARs)	~3 km

2. **Sound Source Characterization (endfire versus broadside, differences in method)**



3. **Dipping hydrophones**



Even though the measurements suggested that broadside pulses would not reach 120 dB for as much as 17 km, in fact "No seismic pulses were detected in the dipping hydrophone recordings."

4. **Long-duration Recorders (AMARs)**

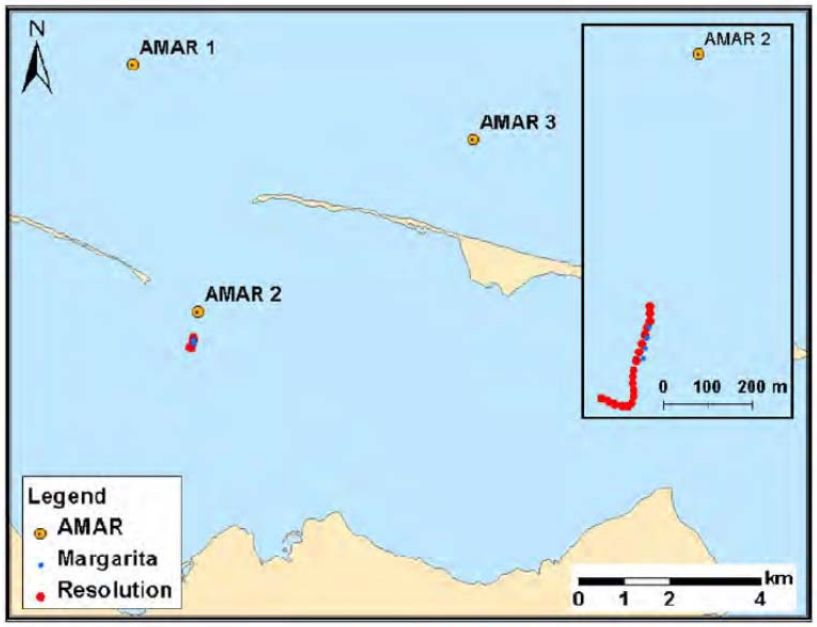


Figure 61. Track of the *Margarita* during 17:14-17:40 4 Aug 2012 AKDT and the *Resolution* during 13:52-13:55 7 Aug 2012 AKDT. For each period, the seismic vessel was operating its respective 320 in^3 airgun arrays.

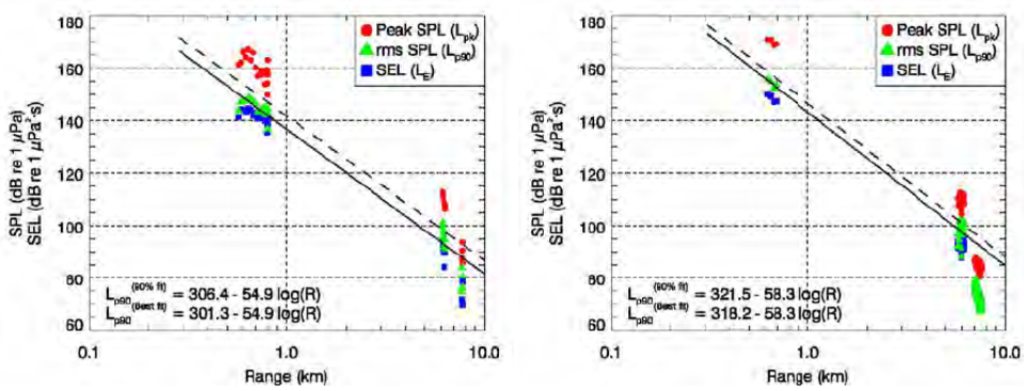


Figure 62. Peak SPL, rms SPL, and sound exposure level (SEL) versus range for the *Resolution's* 320 in^3 airgun array (left) and the *Margarita's* 320 in^3 airgun array (right) operating inside the barrier islands (Figure 61).Pulses at ranges less than 1 km were recorded inside the barrier islands on AMAR 2. Pulses at 6 km were recorded outside the barrier islands on AMAR 1 after propagating between two barrier islands. Pulses at 7-8 km were recorded outside the barrier islands on AMAR 3 after propagating through a barrier island. Best fit and 90% fit lines were made to pulse levels on AMARs 1 and 2.