

**SUMMARY OF SCIENTIFIC STUDY RESULTS SUPPORTING THE FEDERAL POSITION
ON MC-20 SITE
10-23-2018**

The united Federal position on the MC-20 site is as follows, with summaries of the studies relied upon to reach this position.

1. One or more wells are actively leaking oil and gas from the erosional pit near the former Dome C location.
 - a. Multiple side-scan surveys beginning in 2012 and continuing into 2018 have documented that the source of the oil reaching the surface at the MC-20 site are plumes being released from an erosional pit on the northeastern side of the jacket.
 - The NOAA R/V *Okeanos Explorer* conducted a vessel-of-opportunity multibeam sonar survey over the MC-20 site in June 2012 and detected a plume emanating from a pit on the northeastern side of the jacket (Exhibit 1A).¹
 - The Camilli (2017) Acoustics Report to the SSLWG included data from sonar surveys collected from 8 March to 8 April 2017 that consistently showed two plumes (most of the time) being released from a pit on the northeastern side of the jacket (Exhibits 1B, 1C).
 - The Norbit/BSEE survey conducted 10-16 September 2017 detected two plumes over the pit on the northeastern side of the jacket (Exhibit 1D).
 - The NOAA/BSEE survey in August-September 2018 detected four plumes emanating from the pit on the northeastern side of the jacket (described in more detail below).
 - b. Scott Stout, Ph.D., Expert Report to USDOJ (11 September 2018) concluded that “all evidence is consistent with the viable scenario that multiple wells are actively leaking”. Further, Dr. Stout refuted the statement by Camilli and Reddy (2018) in their “rum punch” memo that: *All evidence suggests that the sheen is being generated by remnant oil sparged from the sediments within the Dome C&D erosional pit.*

According to Dr. Stout:

- Sheens are variably biodegraded crude oils; this doesn’t indicate they are “old”.
- Sheens are not a single “genetic” type of oil; must be derived from multiple wells.
- Oils collected from the ROV deployed during the September 2017 Norbit survey funded by BSEE are heterogeneous indicating short-term variability in oil exiting the seafloor near the erosional pit.
- The Camilli and Reddy “Rum-Punch” hypothesis was based on two flawed premises and cannot therefore:
 - Suggest sheens are due to sparged remnant oil
 - Preclude that multiple wells are actively leaking

¹ This first detection of a water-column anomaly of oil and gas was controversial because the RP had the raw data re-analyzed by Dr. Rich Camilli who argued that the anomaly was coming from the top of the Subsea Containment Collector/Separator where collected gas would be vented into the water column, rather from the seabed. A subsequent Fugro sonar survey contracted by the RP in July 2012 did not detect any water-column anomalies near the jacket. Therefore, the source of the sheens was uncertain. This uncertainty led to the designation of the Sheen Source Location Working Group (SSLWG) in 2016. However, recent (2018) review of the NOAA R/V *Okeanos Explorer* data confirmed that the anomaly did originate from the seabed.

c. Overton and Reddy (2017) Forensics Report to the SSLWG. Concluded that the 2017 sheens are slightly to moderately weathered, heterogeneous, do not appear to be from a single well, and have the greatest similarity to the oiled sediments near Dome C and not those near the former well bay area.

d. USGS May 2017 sub-bottom profile (Exhibit 2):

Shows no shallow-gas disturbances in the mudflow deposit below the erosional pit, which discounts the RP's claims that the release of biogenic gas is the mechanism of oil release from the sediments, and could provide evidence that the buried conductor bundle is the likely anomaly that can be seen below the surface and terminating in the pit near the Dome C location.

e. Fugro seafloor analyses (FFMG 2006) detected the buried conductor bundle extending to the northeastern side of the jacket, indicating that it could be the source of continued oil releases after well intervention was complete in March 2011 (Exhibit 3).

f. Norbit/BSEE Survey, September 2017. During this survey, a camera-mounted mid-range ROV, sonar system, and a laser induced fluorescence unit were deployed. Two large plumes were detected coming from the erosional pit near the downed jacket, near the former Dome C location (Exhibit 1C). The droplets were confirmed to be oil by the laser fluorometer. Samples were collected and sent to the USCG Marine Safety Laboratory which also determined that the samples were crude oil.

g. NOAA/BSEE 2018 Survey. Key points from the preliminary results (final report expected in May 2019) briefed during the 5 October 2018 Federal Strategy Meeting include:

- Sonar surveys identified four plumes being released from the pit near Dome C, each with their own “mini-pit” at the seafloor (Exhibit 4). These plumes were stationary over the 8-day period of survey. The plume complex in the lower right, closest to the 4.0 m marking line, consisted of two closely spaced plumes and was composed of oil only. The single plume immediately adjacent to these was composed of oil only. Another plume, closer to the 8.0 m marking line and at 0.0° was composed of both oil and gas. A plume between the 12.0m-16.0 m marking lines and at ~355° was composed of only gas. These results indicate multiple and differing source of oil and gas release from the seafloor.
- The plumes were coming from the pit adjacent to the jacket, not from within the jacket.
- The bubbleometer video shows that the oil droplets being released from the oil-only plumes emanating from the erosional pit near the former Dome C location are abundant and large, often >1 cm (see representative screen shot of the video in Exhibit 5).
- The ROV video (Exhibit 6) in the oil-only plumes did not contain any significant amount of gas, further disputing biogenic gas as the release mechanism.

2. The worst-case estimate of the daily volume of release far exceed previous estimates and is in the order of hundreds of barrels per day.

- Oscar Pineda-Garcia, Ph.D., Expert Report to USDOJ (11 September 2018), conducted an independent analysis of the amount of oil being released at the MC-20 site based on detailed analysis of 258 satellite images since 2004, combined with field work conducted on-site where he estimated surface volumes of oil based in situ measurements and Bonn agreement thickness categories. He measured the residence time of the surface slicks using drifter

studies. The results of his work indicate that the estimated minimum daily volume discharge is 249 barrels with an estimated maximum of 697 barrels per day.

- b. In a July 2018 analysis, NOAA and BSEE estimated the amount of residual oil present in the sediments in the erosional pit near the former Dome C location, based on the four sediment cores (depth = 4 feet) collected by divers in 2013 and the oil content as reported in the Overton and Reddy (2017) oil forensics report to the SSLWG. Using conservative estimates of the diameter of the oiled sediments and a uniform oil content in the sediments to a depth of 69 feet, they calculated the oil content in the sediments to be 2,306- 8,236 barrels (considering oil contents in sediments ranging from 2.8-10%). These volumes are insufficient to be a source of the oil releases since well intervention was completed in March 2011.² As of 15 October 2018, it has been 2,763 days since the last well intervention was completed. If all the oil in the sediments was released over this period, the average daily release would be 0.83 barrels (35 gallons). Therefore, it is not feasible that the source of the oil sheens could be only remnant oil being released from the sediments only.
3. Temporary containment and recovery of oil being released at the site is needed and feasible while options are evaluated and selected for additional well intervention to stop the oil leakage.
 - The Camilli (2017) Acoustics Report to the SSLWG stated that the erosional pit near Dome C is the most likely source of the MC20 sheen. Sonar surveys from 8 March to 8 April 2017 indicates these plumes (usually 2) occur as highly frequent episodic eruptions of multiphase fluids (gas, oil-covered bubbles, and oil droplets).
 - The area covered by the plumes actively releasing oil is approximately 400 square feet (Exhibit 4), based on sonar data and images during the NOAA/BSEE survey in August-September 2018, making it feasible to deploy a containment system that could capture all the oil being released at the seafloor.
 - Current thinking is that the jacket would not have to be removed in order to effectively deploy containment and recovery equipment over the pit on the northeast side of the jacket. In fact, the jacket could be used to support the equipment.

² Camilli and Reddy (2018), in their “rum punch” memo estimated that the average oil content in the sediments was 2.8% by weight; thus, the sediments would contain, at the most, 2,306 barrels of oil

List of Exhibits

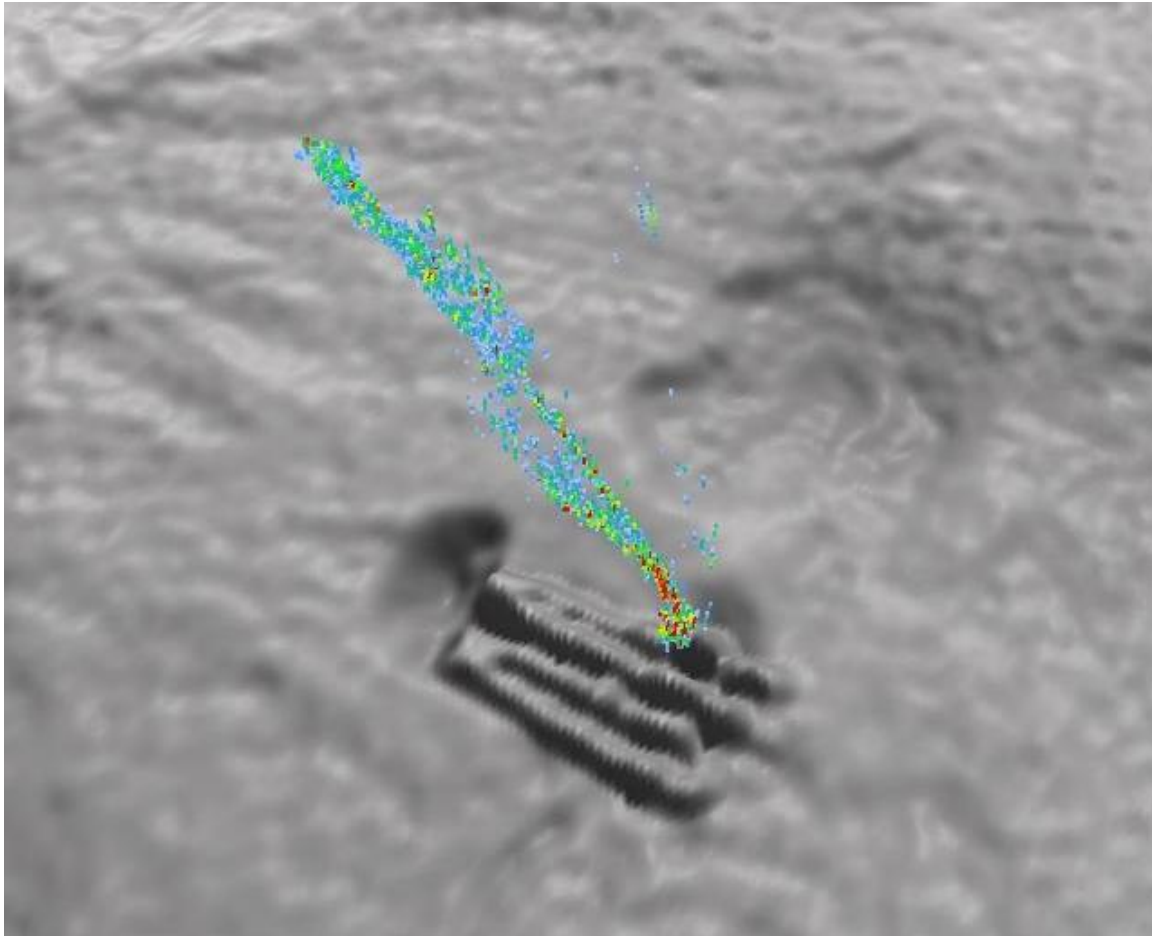


Exhibit 1A: Image from the NOAA R/V *Okeanos Explorer* vessel-of-opportunity multibeam sonar survey over the MC-20 site in June 2012, showing an oil and gas water-column anomaly over the northeastern side of the jacket.

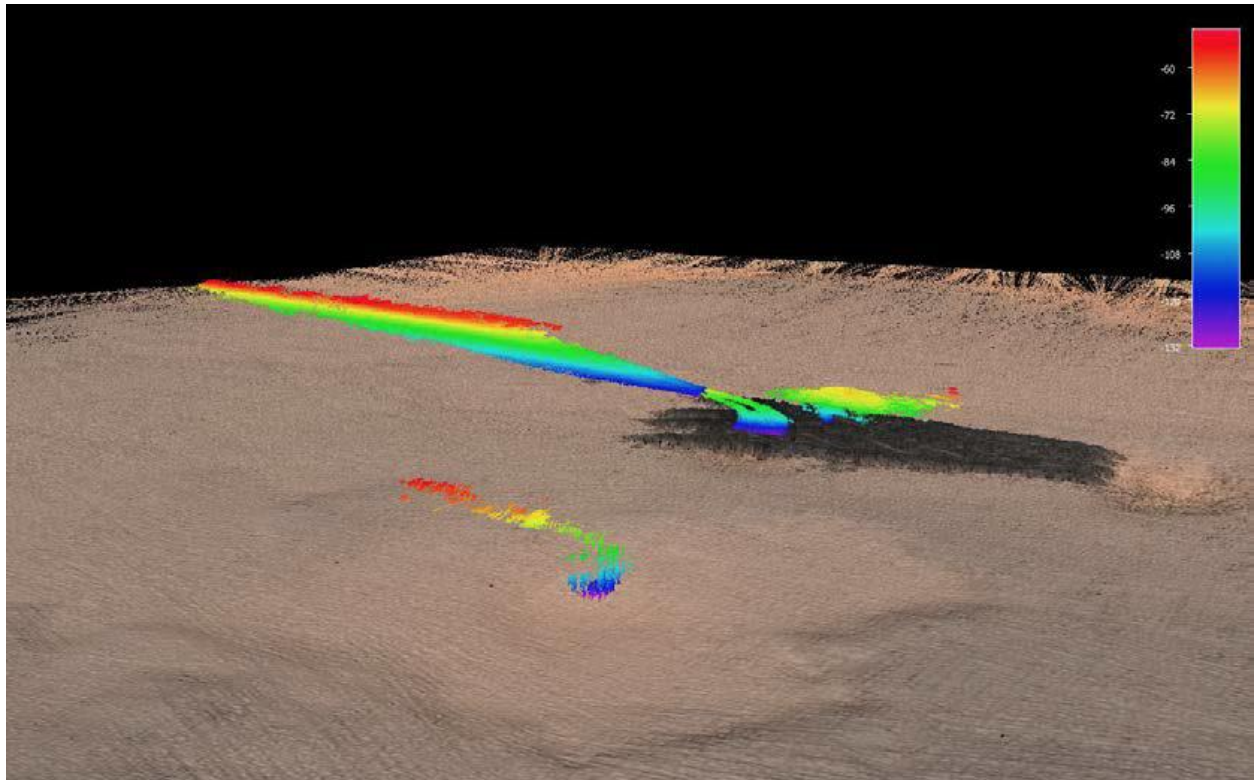


Exhibit 1B. (Top) Perspective view of water column anomalies (color bar describes water column anomaly depth in meters) on 21 March 2017. Bottom: Extrapolated water column anomaly source locations for the same date. From Camilli (2017).

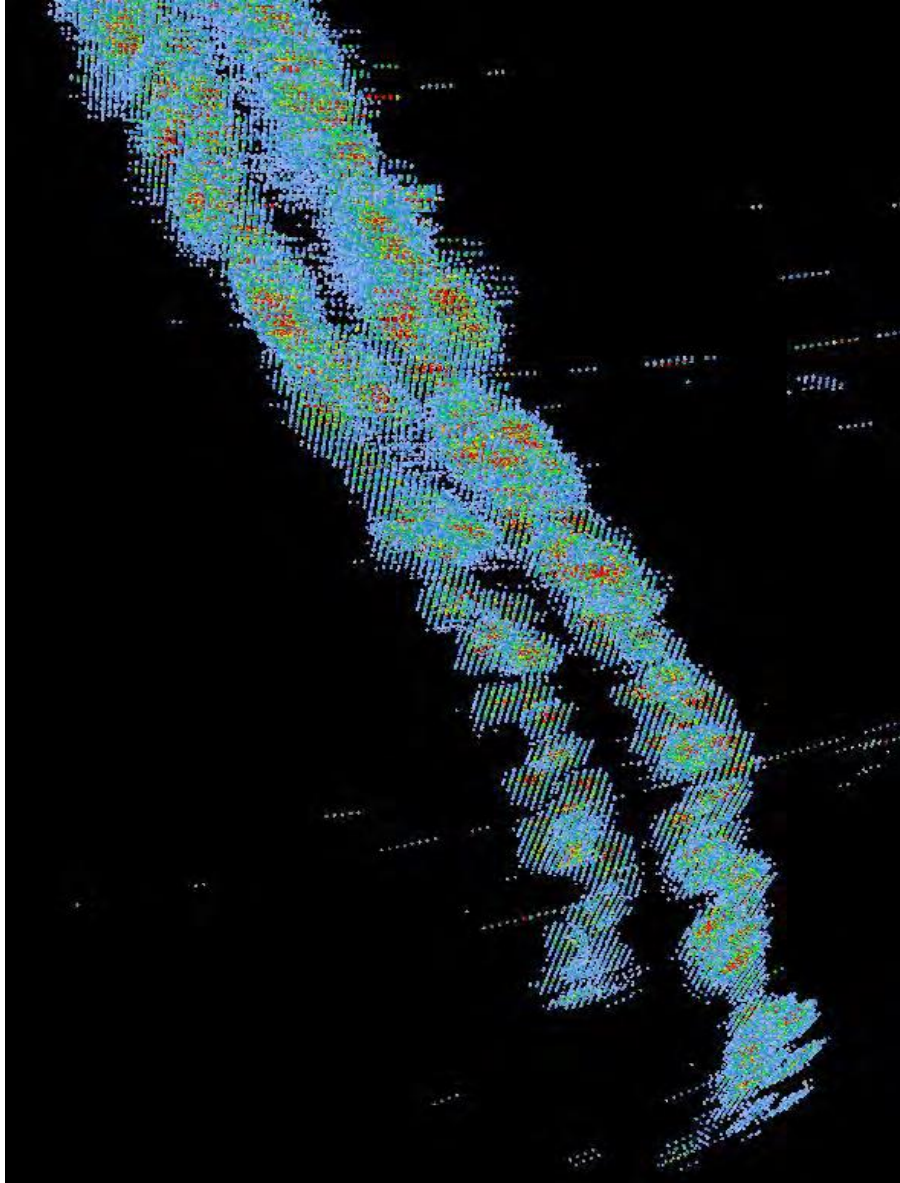


Exhibit 1C: 3D sonar reconstruction of two distinct acoustic anomaly plumes observed emanating from the vicinity of the containment dome C erosional pit area on March 16, 2017. These plumes each appear to be less than 20ft in diameter at their base and are separated from each other by approximately 30 ft. From Camilli (2017).

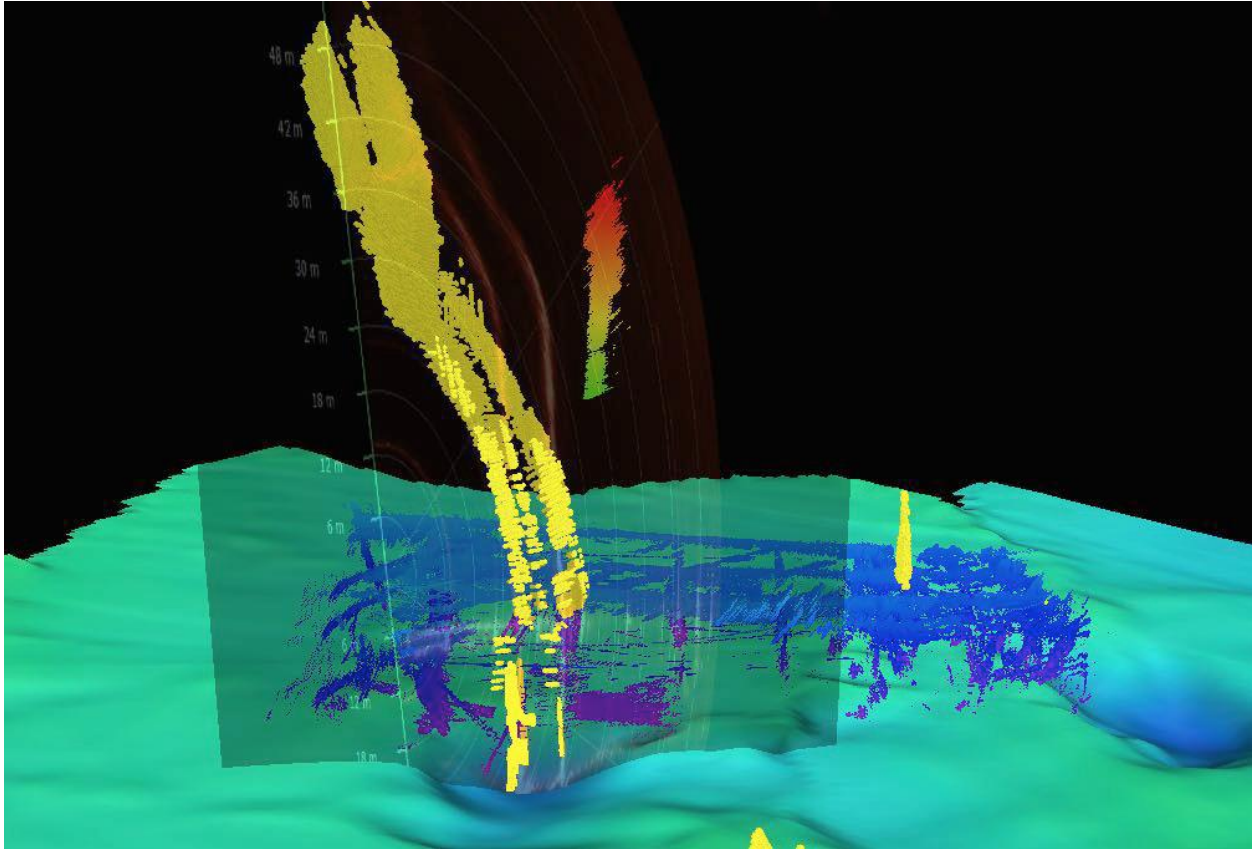


Exhibit 1D: Sonar image from the Norbit/BSEE survey conducted 10-16 September 2017 showing two plumes emanating from within the erosional pit on the northeastern side of the jacket. The droplets were confirmed to be oil by the laser fluorometer.

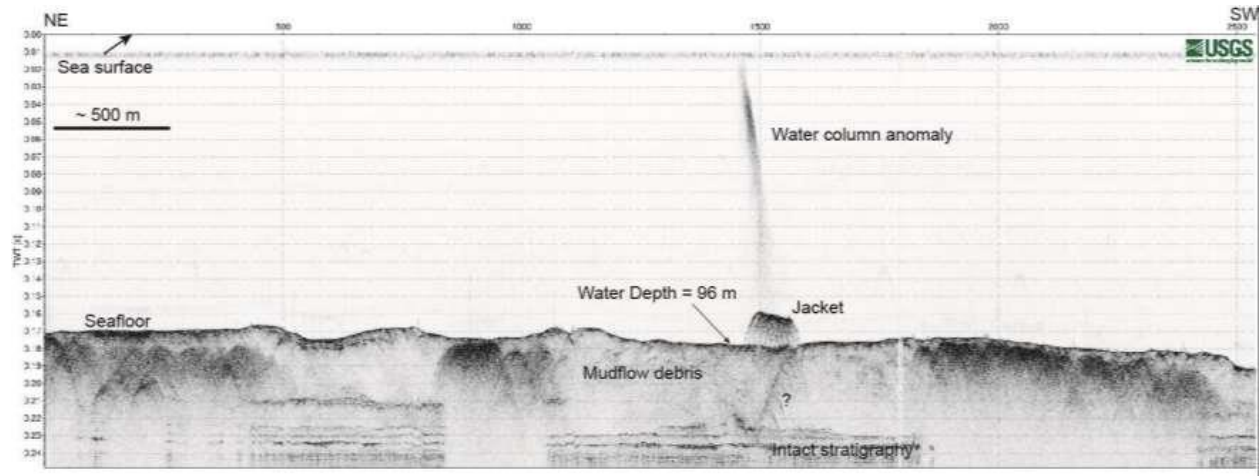


Exhibit 2: USGS May 2017 sub-bottom profile across the MC-20 site.

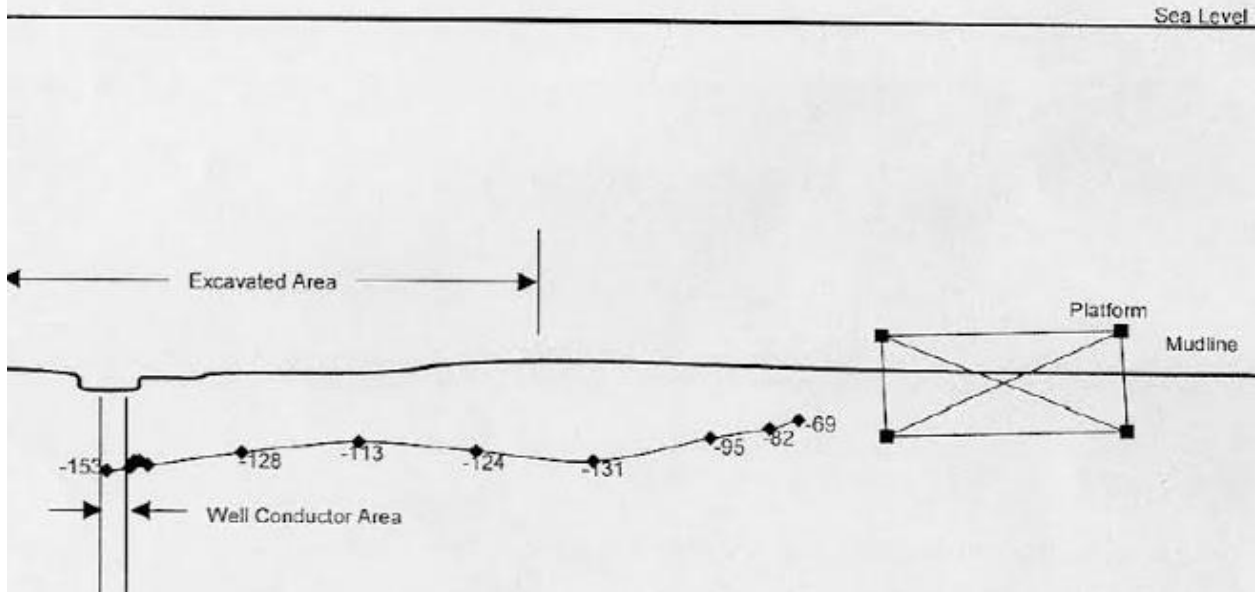


Exhibit 3: Figure from the Fugro Seafloor Analyses Report (FFMG 2006) showing the buried conductor bundle extending to the northeastern side of the jacket.

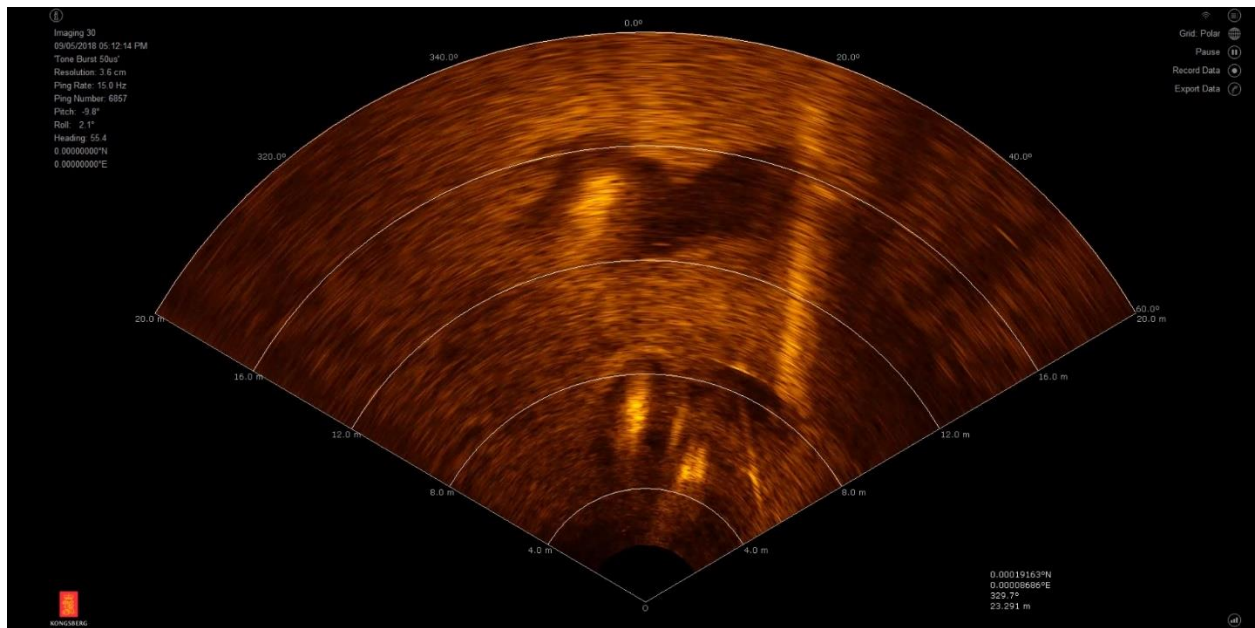


Exhibit 4: Sonar image from the NOAA/BSEE 2018 Cruise showing four plumes emanating from individual mini-pits within the pit on the northeastern side of the jacket. The number and location of plumes are detected in higher detail and spatial accuracy because the sonar system was on a ROV that was deployed very close to the seafloor.



Exhibit 5: Screen shot from the NOAA/BSEE 2018 bubblemeter video showing the oil droplets being released from the oil-only plumes emanating from the pit near Dome C. For reference, the pan-head machine screws shown in this figure were 1/4" (6.35 mm), and have 7/16" (11.11 mm) lock nuts on the inside of the housing. A video clip is attached separately.



Exhibit 6: Screen shot from the NOAA/BSEE 2018 ROV video in the oil-only plume. A video clip is attached separately.

References Cited

- Camilli, R. 2017. Final report describing spring 2017 acoustic survey operations, results, and interpretations. Final Report to the MC-20 Sheen Source Location Working Group. 89 pp.
- Camilli, R. and C. Reddy. 2018. Rum-Punch: Time series petroleum biomarker testing of the scenario that an actively leaking oil well is contributing to the MC20 sea surface sheen. Report Prepared for Unified Command. 10 pp.
- FFMG, 2006. FUGRO-McClelland Marine Geosciences, INC (FMMG). Seafloor Failure Analyses - MC 20-A Platform Block 20, Mississippi Canyon Area; Gulf of Mexico. FMMG Report No. 0201-5381-7 February 21, 2006
- Norbit. 2017. Final Report for BSEE Contract E117PC00013. Submitted to BSEE, New Orleans, LA. 26 pp.
- Overton, E.B. and C.M. Reddy. 2017. Forensic Analysis of Surface Sheens from the Sheen Source Location Working Group Field Acquisition Operations and a Comparison to Historical Samples at the MC20 site. Final Report to the MC-20 Sheen Source Location Working Group. 180 pp.
- Pineda-Garcia, O. 2018. Expert Report. Taylor Energy Company LLC v The United States of America, The United States Court of Federal Claims, Case No. 16-12C. 91 pp.
- Stout, S.A. 2018. Expert Report. Taylor Energy Company LLC v The United States of America, The United States Court of Federal Claims, Case No. 16-12C. 57 pp.