

Deepwater Horizon: Natural Resource Damage Assessment Toxicity Testing Program

Select Publications

Aquatic Toxicity

- 2018 Bridges, K., C.R. Lay, M.M. Alloy, M.L. Gielazyn, J.M. Morris, H.P. Forth, R. Takeshita, C. Travers, J.T. Oris, and A.P. Roberts. 2018. Estimating incident ultraviolet (UV) radiation exposure in the Northern Gulf of Mexico during the *Deepwater Horizon* oil spill. *Environmental Toxicology and Chemistry*. Available: <https://doi.org/10.1002/etc.4119>
- 2018 Bridges, K., M. Krasnec, J.T. Magnuson, J.M. Morris, M.L. Gielazyn, J.R. Chavez, A.P. Roberts. (In Press). Influence of UV and PAH exposure duration on survival of red drum (*Sciaenops ocellatus*) larvae. *Environmental Toxicology and Chemistry*.
- 2018 Damare, L., K. Bridges, T. Curran, B. Soulen, M. Alloy, H. Forth, C. Lay, J. Morris, J. Stoeckel, A. Roberts. (In Press). Photo-induced toxicity in early life stage fiddler crab (*Uca longisignalis*) following exposure to Deepwater Horizon oil. *Ecotoxicology*.
- 2018 Mager, E.M., C. Pasparakis, J.D. Stieglitz, R. Hoenig, J.M. Morris, D.D. Benetti, and M. Grosell. 2018. Combined effects of hypoxia or elevated temperature and *Deepwater Horizon* crude oil exposure on juvenile mahi swimming performance. *Marine Environmental Research* 139:129-135.
- 2018 O'Shaughnessy, K.A., Forth, H., Takeshita, R. and Chesney, E.J., 2018. Toxicity of weathered Deepwater Horizon oil to bay anchovy (*Anchoa mitchilli*) embryos. *Ecotoxicology and Environmental Safety* 148: 473-479.
- 2017 Alloy, M., T.R. Garner, K. Bridges, C. Mansfield, M. Carney, H. Forth, M. Krasnec, C. Lay, R. Takeshita, J. Morris, S. Bonnot, J. Oris, and A. Roberts. 2017. Co-exposure to sunlight enhances the toxicity of naturally weathered Deepwater Horizon oil to early lifestage red drum (*Sciaenops ocellatus*) and speckled seatrout (*Cynoscion nebulosus*). *Environmental Toxicology and Chemistry* 36(3):780-785. doi: 10.1002/etc.3640. Available: <http://onlinelibrary.wiley.com/wol1/doi/10.1002/etc.3640/full>.
- 2017 Bayha, K.M., N. Ortell, C.N. Ryan, K.J. Griffitt, M. Krasnec, J. Sena, T. Ramaraj, R. Takeshita, G.D. Mayer, F. Schilkey, and R.J. Griffitt. 2017. Crude oil impairs immune function and increases susceptibility to pathogenic bacteria in southern flounder. *PLoS ONE* 12(5): e0176559. Available: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0176559>.
- 2017 Brown-Peterson, N.J., M.O. Krasnec, C.R. Lay, J.M. Morris, and R.J. Griffitt. 2017. Responses of juvenile southern flounder exposed to Deepwater Horizon oil-contaminated sediments. *Environmental Toxicology and Chemistry* 36(4):1067-1076. doi: 10.1002/etc.3629. Available: <http://onlinelibrary.wiley.com/doi/10.1002/etc.3629/full>.

- 2017 Cheemalapati, S., H.P. Forth, H. Wang, K.R. Konnaiyan, J.M. Morris, and A.L. Pyayt. 2017. Measurement of thickness of highly inhomogeneous crude oil slicks. *Applied Optics* 56(11):E72-E76. doi: 10.1364/AO.56.000E72.
- 2017 Forth, H.P., C.L. Mitchelmore, J.M. Morris, and J. Lipton. 2017. Characterization of oil and water accommodated fractions used to conduct aquatic toxicity testing in support of the Deepwater Horizon oil spill natural resource damage assessment. *Environmental Toxicology and Chemistry* 36(6):1450–1459. doi: 10.1002/etc.3672. Available: <http://onlinelibrary.wiley.com/wol1/doi/10.1002/etc.3672/full>.
- 2017 Forth, H.P., C.L. Mitchelmore, J.M. Morris, C.R. Lay, and J. Lipton. 2017. Characterization of dissolved and particulate phases of water accommodated fractions used to conduct aquatic toxicity testing in support of the Deepwater Horizon natural resource damage assessment. *Environmental Toxicology and Chemistry* 36(6):1460–1472. Available: <http://onlinelibrary.wiley.com/wol1/doi/10.1002/etc.3803/full>.
- 2017 Garner, T.R., M.A. Hart, L.E. Sweet, H.T.J. Bagheri, J. Morris, J.A. Stoeckel, and A.P. Roberts. 2017. Effects of Deepwater Horizon spill oil on the migration and survival of marsh periwinkle snails (*Littoraria irrorata*). *Environmental Science and Technology* 51(15):8757–8762.
- 2017 Jones, E.R., C.J. Martyniuk, J.M. Morris, M.O. Krasnec, and R.J. Griffitt. 2017. Exposure to *Deepwater Horizon* oil and Corexit 9500 at low concentrations induces transcriptional changes and alters immune transcriptional pathways in sheepshead minnows. *Comparative Biochemistry and Physiology – Part D: Genomics and Proteomics* 23:8–16. doi: 10.1016/j.cbd.2017.05.001.
- 2017 Mager, E.M., C. Pasparakis, L.S. Schlenker, Z. Yao, C. Bodinier, J.D. Stieglitz, R. Hoenig, J.M. Morris, D.D. Benetti, and M. Grosell. 2017. Assessment of early life stage mahi-mahi windows of sensitivity during acute exposures to Deepwater Horizon crude oil. *Environmental Toxicology and Chemistry* 36(7):1887–1895. doi: 10.1002/etc.3713. Available: <http://onlinelibrary.wiley.com/doi/10.1002/etc.3713/full>.
- 2016 Esbaugh, A.J., E.M. Mager, J.D. Stieglitz, R. Hoenig, T.L. Brown, B.L. French, T.L. Linbo, C. Lay, H. Forth, N.L. Scholz, J.P. Incardona, J.M. Morris, D.D. Benetti, and M. Grosell. 2016. The effects of weathering and chemical dispersion on Deepwater Horizon crude oil toxicity to mahi-mahi (*Coryphaena hippurus*) early life stages. *Science of the Total Environment* 543(A):644–651. Available: <http://www.sciencedirect.com/science/article/pii/S0048969715310494>.
- 2016 Lotufo, G.R., J.D. Farrar, J.M. Biedenbach, J.G. Laird, M.O. Krasnec, C. Lay, J.M. Morris, and M.L. Gielazyn. 2016. Effects of sediment amended with Deepwater Horizon incident slick oil on the infaunal amphipod *Leptocheirus plumulosus*. *Marine Pollution Bulletin* 109(1):253–258. Available: <http://www.sciencedirect.com/science/article/pii/S0025326X16303939>.
- 2016 Vignier, J., P. Soudant, F.L.E. Chu, J.M. Morris, M.W. Carney, C.R. Lay, M.O. Krasnec, R. Robert, and A.K. Volety. 2016. Lethal and sub-lethal effects of *Deepwater Horizon* slick oil and dispersant on oyster (*Crassostrea virginica*) larvae. *Marine Environmental Research* 120:20–31.

- 2015 Brown-Peterson, N.J., M. Krasnec, R. Takeshita, C.N. Ryan, K.J. Griffitt, C. Lay, G.D. Mayer, K.M. Bayha, W.E. Hawkins, I. Lipton, J. Morris, and R.J. Griffitt. 2015. A multiple endpoint analysis of the effects of chronic exposure to sediment contaminated with Deepwater Horizon oil on juvenile Southern flounder and their associated microbiomes. *Aquatic Toxicology* 165:197–209. Available: <http://www.sciencedirect.com/science/article/pii/S0166445X15001733>.
- 2015 Vignier, J., L. Donaghy, P. Soudant, F.L.E. Chu, J.M. Morris, M.W. Carney, M. Krasnec, R. Robert, and A.K. Volety. 2015. Impacts of *Deepwater Horizon* oil and associated dispersant on early development of the Eastern oyster *Crassostrea virginica*. *Marine Pollution Bulletin* 100:426–437.

Avian and Wildlife Toxicity

- 2018 Harr, K., D. Reavill, K. Deak, S. Murawski, and R. Takeshita. 2018. Generation of red drum (*Sciaenops ocellatus*) hematology reference intervals with a focus on identified outliers. *Veterinary Clinical Pathology*. Available: <http://onlinelibrary.wiley.com/doi/10.1111/vcp.12569/full>.
- 2017 Alexander, C.R., M.J. Hooper, D. Cacela, K.D. Smelker, Caleshia S. Calvin, Karen M. Dean, Steve J. Bursian, Fred L. Cunningham, Katie C. Hanson-Dorr, K.E. Horak, J.P. Isanhart, J. Link, S.A. Shriner, and C.A.J. Godard-Codding. 2017. Reprint of: CYP1A protein expression and catalytic activity in double-crested cormorants experimentally exposed to Deepwater Horizon Mississippi Canyon 252 oil. *Ecotoxicology and Environmental Safety*. 146: 68-75.
- 2017 Bursian, S.J., K.M. Dean, K.E. Harr, L. Kennedy, J.E. Link, I. Maggini, C. Pritsos, K.L. Pritsos, R.E. Schmidt, and C.G. Guglielmo. 2017. Effect of oral exposure to artificially weathered Deepwater Horizon crude oil on blood chemistries, hepatic antioxidant enzyme activities, organ weights and histopathology in western sandpipers (*Calidris mauri*). *Ecotoxicology and Environmental Safety*. 146: 91-97.
- 2017 Bursian, S.J., C.R. Alexander, D. Cacela, F.L. Cunningham, K.M. Dean, B.S. Dorr, C.K. Ellis, C.A. Godard-Codding, C.G. Guglielmo, K.C. Hanson-Dorr, K.E. Harr, K.A. Healy, M.J. Hooper, K.E. Horak, J.P. Isanhart, L.V. Kennedy, J.E. Link, I. Maggini, J.K. Moye, C.R. Perez, C.A. Pritsos, S.A. Shriner, K.A. Trust, and P.L. Tuttle. 2017. Reprint of: Overview of avian toxicity studies for the Deepwater Horizon Natural Resource Damage Assessment. *Ecotoxicology and Environmental Safety*. 146:4-10.
- 2017 Cunningham, F., K. Dean, K. Hanson-Dorr, K. Harr, K. Healy, K. Horak, J. Link, S. Shriner, S. Bursian, and B. Dorr. 2017. Reprint of: Development of methods for avian oil toxicity studies using the double crested cormorant (*Phalacrocorax auritus*). *Ecotoxicology and Environmental Safety*. 146: 19-28.
- 2017 Daigneault, M., K.E. Harr, K.M. Dean, and S.J. Bursian. 2017. Reprint of: Assay Validation of the Cardiac Isoform of Troponin I in Double Crested Cormorant (*Phalacrocorax auritus*) Plasma for Diagnosis of Cardiac Damage. *Ecotoxicology and Environmental Safety*. 146: 129-133.

- 2017 Dean, K.M. and S.J. Bursian. 2017. Following the Deepwater Horizon oil spill: What we know about the effects of oil on birds? *Ecotoxicology and Environmental Safety*. 146:1-3.
- 2017 Dean, K.M., D. Cacela, M.W. Carney, F.L. Cunningham, C. Ellis, A.R. Gerson, C.G. Guglielmo, K.C. Hanson-Dorr, K.E. Harr, K.A. Healy, K.E. Horak, J.P. Isanhart, L.V. Kennedy, J.E. Link, I. Lipton, A.K. McFadden, J.K. Moye, C.R. Perez, C.A. Pritsos, K.L. Pritsos, T. Muthumalage, S.A. Shriner, and S.J. Bursian. 2017. Testing of an oral dosing technique for double-crested cormorants, *Phalacrocorax auritus*, laughing gulls, *Leucophaeus atricilla*, homing pigeons, *Columba livia*, and western sandpipers, *Calidris mauri*, with artificially weathered MC252 oil. *Ecotoxicology and Environmental Safety*. 146: 11-18.
- 2017 Harr, K. E., F.L. Cunningham, C.A. Pritsos, K.L. Pritsos, T. Muthumalage, B.S. Dorr, K.E. Horak, K.C. Hanson-Dorr, K.M. Dean, D. Cacela, A.K. McFadden, J.E. Link, K.A. Healy, P. Tuttle, and S.J. Bursian. 2017. Weathered MC252 crude oil-induced anemia and abnormal erythroid morphology in double-crested cormorants (*Phalacrocorax auritus*) with light microscopic and ultrastructural description of Heinz bodies. *Ecotoxicology and Environmental Safety*. 146: 29-39.
- 2017 Harr, K.E., D.R. Reavill, S.J. Bursian, D.Cacela, F.L. Cunningham, K.M. Dean, B.S. Dorr, K.C. Hanson-Dorr, K. Healy, K. Horak, J. E. Link, S. Shriner, and R.E. Schmidt. 2017. Organ weights and histopathology of double-crested cormorants (*Phalacrocorax auritus*) dosed orally or dermally with artificially weathered Mississippi Canyon 252 crude oil. *Ecotoxicology and Environmental Safety*. 146: 52-61.
- 2017 Harr, K.E., M. Rishniw, T.L. Rupp, D. Cacela, K.M. Dean, B.S. Dorr, K.C. Hanson-Dorr, K. Healy, K. Horak, J.E. Link, D. Reavill, S.J. Bursian, and F.L. Cunningham. 2017. Dermal exposure to weathered MC252 crude oil results in echocardiographically identifiable systolic myocardial dysfunction in double-crested cormorants (*Phalacrocorax auritus*). *Ecotoxicology and Environmental Safety*. 146: 76-82.
- 2017 Horak, K.E., S.J. Bursian, C.K. Ellis, K.M. Dean, J.E. Link, K.C. Hanson-Dorr, F.L. Cunningham, K.E. Harr, C.A. Pritsos, K.L. Pritsos, K.A. Healy, D. Cacela, and S.A. Shriner. 2017. Toxic effects of orally ingested oil from the Deepwater Horizon spill on laughing gulls. *Ecotoxicology and Environmental Safety*: 146: 83-90.
- 2017 K.M. Dean, S.J. Bursian, D. Cacela, M.W. Carney, F.L. Cunningham, B. Dorr, K.C. Hanson-Dorr, K.A. Healy, K.E. Horak, J.E. Link, I. Lipton, A.K. McFadden, M.A. McKernan, and K.E. Harr. 2017. Changes in white cell estimates and plasma chemistry measurements following oral or external dosing of double-crested cormorants, *Phalacrocorax auritus*, with artificially weathered MC252 oil. *Ecotoxicology and Environmental Safety*. 146: 40-51.
- 2017 Lauritsen, A.M., Dixon, P.M., Cacela, D., Brost, B., Hardy, R., MacPherson, S.L., Meylan, A., Wallace, B.P. and Witherington, B., 2017. Impact of the Deepwater Horizon oil spill on loggerhead turtle *Caretta caretta* nest densities in northwest Florida. *Endangered Species Research*. 33: 83-93.

- 2017 Maggini, I., L.V. Kennedy, K.H. Elliott, K.M. Dean, R. MacCurdy, A. Macmillan, C.A. Pritsos, and C.G. Guglielmo. 2017. Reprint of: Trouble on takeoff: Crude oil on feathers reduces escape performance of shorebirds. *Ecotoxicology and Environmental Safety*. 146:111-117.
- 2017 Maggini, I., L.V. Kennedy, S.J. Bursian, K.M. Dean, A.R. Gerson, K.E. Harr, J.E. Link, C.A. Pritsos, K.L. Pritsos, and C.G. Guglielmo. 2017. Toxicological and thermoregulatory effects of feather contamination with artificially weathered MC 252 oil in western sandpipers (*Calidris mauri*). *Ecotoxicology and Environmental Safety*. 146: 118-128.
- 2017 McDonald, T.L., Schroeder, B.A., Stacy, B.A., Wallace, B.P., Starcevich, L.A., Gorham, J., Tumlin, M.C., Cacela, D., Rissing, M., McLamb, D.B. and Ruder, E., 2017. Density and exposure of surface-pelagic juvenile sea turtles to Deepwater Horizon oil. *Endangered Species Research*. 33: 69-82.
- 2017 Perez, C.R., J.K. Moye, D. Cacela, K.M. Dean, and C.A. Pritsos. 2017. Body mass change in flying homing pigeons externally exposed to Deepwater Horizon crude oil. *Ecotoxicology and Environmental Safety*. 146: 104-110.
- 2017 Perez, C.R., J.K. Moye, D. Cacela, K.M. Dean, and C.A. Pritsos. 2017. Low level exposure to crude oil impacts avian flight performance: The Deepwater Horizon oil spill effect on migratory birds. *Ecotoxicology and Environmental Safety*. 146: 98-103.
- 2017 Pritsos, K.L., C.R. Perez, T. Muthumalage, K.M. Dean, D. Cacela, K. Hanson-Dorr, F. Cunningham, S.J. Bursian, J.E. Link, S. Shriner, K. Horak, and C.A. Pritsos. 2017. Dietary intake of Deepwater Horizon oil-injected live food fish by double-crested cormorants resulted in oxidative stress. *Ecotoxicology and Environmental Safety*. 146: 62-67.
- 2017 Stacy, N.I., Field, C.L., Staggs, L., MacLean, R.A., Stacy, B.A., Keene, J., Cacela, D., Pelton, C., Cray, C., Kelley, M. and Holmes, S., 2017. Clinicopathological findings in sea turtles assessed during the Deepwater Horizon oil spill response. *Endangered Species Research*. 33: 25-37.
- 2017 Takeshita, R., Sullivan, L., Smith, C., Collier, T., Hall, A., Brosnan, T., Rowles, T. and Schwacke, L., 2017. The Deepwater Horizon oil spill marine mammal injury assessment. *Endangered Species Research*. 33: 95-106.
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- 2017 Wallace, B.P., Brosnan, T., McLamb, D., Rowles, T., Ruder, E., Schroeder, B., Schwacke, L., Stacy, B., Sullivan, L., Takeshita, R. and Wehner, D., 2017. Effects of the Deepwater Horizon oil spill on protected marine species. *Endangered Species Research*. 33: 1-7.

Additional publications are pending.

Presentations available online

Morris, J.M., M. Krasnec, C. Lay, H. Forth, R. Takeshita, J. Lipton, and M. Gielazyn. 2016. Post-Settlement Conclusions of the Trustee Toxicity Testing Program Conducted in Support of the Deepwater Horizon Natural Resource Damage Assessment. 37th Annual Meeting of the Society of Environmental Toxicology and Chemistry (SETAC), Orlando, FL. November 6–10. Recorded presentation available:

<http://setac.sclivelearningcenter.com/index.aspx?PID=9484&SID=224566>

Reports available online

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<http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan>.

Garner, T.R., A.P. Roberts, M.A. Hart, J.A. Stoeckel, and J.M. Morris. 2016. Migration and Survival of Marsh Periwinkles (*Littoraria irrorata*) Exposed to *Deepwater Horizon* Oil. Prepared by University of North Texas, Denton, TX; Auburn University, Auburn AL; and Abt Associates, Boulder, CO, for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. January 7. Available: in Section 5.12.2 Technical Reports:

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Forth, H.P., D. Cacela, J.M. Morris, A. Pyayt, S. Cheemalapati, H. Wang, and K.R. Konnaiyan. 2015. Measurement of Slick Thickness by Light Attenuation. Technical Report. Prepared by Abt Associates, Boulder, CO and the University of South Florida for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. August 31. Available: in Section 5.12.2 Technical Reports:

<https://www.doi.gov/deepwaterhorizon/adminrecord>.

Forth, H.P., J.M. Morris, and D. Cacela. 2015. Explanation of Analytes Included in the Total Polycyclic Aromatic Hydrocarbon Sums Used by the *Deepwater Horizon* Natural Resource Damage Assessment Toxicity Group. Technical Report. Prepared by Abt Associates, Boulder, CO, for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. August 31. Available: in Section 5.12.2 Technical Reports:

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Forth, H.P., J.M. Morris, C.R. Lay, J. Lipton, C.L. Mitchelmore, and S.E. Suttles. 2015. Characterization of Oil and Water Accommodated Fractions Used to Conduct Aquatic Toxicity Testing in Support of the *Deepwater Horizon* Natural Resource Damage Assessment. Technical Report. Prepared by Abt Associates, Boulder, CO and Chesapeake Biological Laboratory, Solomons, MD, for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. August 31. Available: in Section 5.12.2 Technical Reports:

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Krasnec, M.O., H.P. Forth, M. Carney, J.M. Morris, R. Griffitt, and N. Brown-Peterson. 2015. Characterization of the Various Sediments Collected for Toxicity Testing in Support of the *Deepwater Horizon* Natural Horizon Damage Assessment. Technical Report. Prepared by Abt Associates, Boulder, CO and University of Southern Mississippi, Ocean Springs, MS, for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. August 31. Available: in Section 5.12.2 Technical Reports: <https://www.doi.gov/deepwaterhorizon/adminrecord>.

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Lay, C.R., J.M. Morris, R. Takeshita, H.P. Forth, C.L. Travers, A.P. Roberts, M. Alloy, T.R. Garner, and K. Bridges. 2015. Incident Ultraviolet (UV) Radiation and Extinction Coefficients in the Northern Gulf of Mexico during the *Deepwater Horizon* Oil Spill. Technical Report. Prepared by Abt Associates, Boulder, CO and University of North Texas, Denton, TX, for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. December 16. Available: in Section 5.12.2 Technical Reports: <https://www.doi.gov/deepwaterhorizon/adminrecord>.

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Mitchelmore, C.L. and C.L. Rowe. 2015. Examining the Effects of Ingested *Deepwater Horizon* Oil on Juvenile Red-Eared Sliders (*Trachemys scripta elegans*) and Common Snapping Turtles (*Chelydra serpentina*) as Surrogate Species for Sea Turtles. Technical Report. Prepared by University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory, Solomons, MD, for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. August 31. Available: in Section 5.12.2 Technical Reports: <https://www.doi.gov/deepwaterhorizon/adminrecord>.

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Ortell, N., K.M. Bayha, R. Takeshita, K.J. Griffitt, M. Krasnec, C. Lay, J.M. Morris, and R.J. Griffitt. 2015. The Immunotoxic Effects of *Deepwater Horizon* Oil on Coastal Gulf of Mexico Fish Species. Technical Report. Prepared by University of Southern Mississippi, Ocean Springs, MS, and Abt Associates, Boulder, CO, for the State of Louisiana Coastal Protection and Restoration Authority, Baton Rouge, LA. August 31. Available: in Section 5.12.2 Technical Reports: <https://www.doi.gov/deepwaterhorizon/adminrecord>.

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Travers, C., C. Wobus, J. Morris, C. Lay, M. Rissing, H. Forth, and J. Holmes. 2015. Mortality Estimates of Invertebrates and Early Life Stage Fish, and Other Injury Metrics in the Upper Mixed Layer of the Water Column during the *Deepwater Horizon* Oil Spill. Technical Report. Prepared by Abt Associates, Boulder, CO, for National Oceanic and Atmospheric Administration Assessment and Restoration Division, Seattle, WA. August 31. Available: in Section 5.9.2 Technical Reports: <https://www.doi.gov/deepwaterhorizon/adminrecord>.

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