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Date: May 24, 2019
To: Braxton Davis, Director, N.C. Division of Coastal Management
From: Stephen Murphey, Director, N.C. Division of Marine Fisheries
Subject: WesternGeco DCM Federal Consistency Determination for BOEM Permit E14-004- seismic survey in the mid and south Atlantic

WesternGeco submitted a consistency request to the Division of Coastal Management (DCM) on March 12, 2019 for their Bureau of Ocean Management (BOEM) application to conduct marine Geological and Geophysical (G&G) surveys in the Atlantic Ocean off of North Carolina's coast. On April 11, 2019, DCM found the submission to be insufficient, failing to include all necessary data and information required. This included a more detailed description of the proposed activity, including density, timing, and duration of surveys; measures to reduce impacts on Habitat Areas of Particular Concern (HAPC); information and analysis related to coastal effects, particularly cumulative effects from multiple and overlapping surveys conducted by all companies within the same area; and final proposed mitigation measures. WesternGeco did not resubmit supplemental information requested by DCM. Therefore, the Division of Marine Fisheries (DMF) is reviewing the original incomplete consistency request.

In 2015, the DMF previously reviewed consistency determinations for several companies proposing to conduct two-dimensional (2D) geophysical surveys off the coast of North Carolina. That review was based on the 2014 BOEM Atlantic Programmatic Environmental Impact Statement (PEIS). In light of newly published information (see Literature Cited), as well as Federal Register Notices issued by the National Marine Fisheries Service (NMFS) on June 6, 2017 (<https://www.gpo.gov/fdsys/pkg/FR-2017-06-06/pdf/2017-11542.pdf>) and BOEM on July 3, 2017 (<https://www.boem.gov/79-FR-34349/>), and at the request of DCM, DMF staff reviewed and updated those previous comments in 2017. Much of this review is based on the 2017 comments since WesternGeco state that their survey "is not materially different" than the previous proposed surveys within North Carolina.

The DMF is dedicated to ensuring sustainable marine and estuarine fisheries and habitats for the benefit and health of the people of North Carolina. In light of the additional information published since the previous review, as well as the number of concurrent, overlapping projects under consideration, staff remain concerned that the cumulative effects of the 2D geophysical survey activities will severely impact the biological, social and economic value of North Carolina's commercial and recreational fisheries.

General Description of Seismic Activities

Currently, five companies proposed conducting seismic surveys within the BOEM Mid-Atlantic and South Atlantic Planning Areas. All of the proposals included conducting these activities in waters offshore of North Carolina to collect regional and detailed 2D geophysical seismic data. While the permit areas and general duration of survey activities is available, proprietary information limits the DMF access to the exact locations and airgun configuration of each proposal for 2D geophysical seismic surveys. Therefore, this review addresses the impacts of seismic surveying for the entire North Carolina offshore region. The offshore area will be surveyed using transect lines of varying widths, depending on the detail required, while towing a proprietary configuration of airgun arrays and hydrophones. Typically, ships conducting 2D geophysical seismic surveys are 60-90 m (200-300 ft) long and tow a single source array 100-200 m (328-656 ft) behind the ship and about 5-10 m (16-33 ft) below the sea surface; with the source array usually consisting of three subarrays of six or seven airguns each. The airgun array is fired about every 10-16 seconds for a vessel traveling at 4.5 knots (average surveying speed) resulting in intermittent sounds of short duration and high intensity, approximately 250-dB. Surveying activity is usually conducted continuously, 24 hours a day and 7 days a week, until the project is complete.

According to the Atlantic PEIS, the known effects of seismic survey sounds on fish and fisheries include masking of other marine sounds, disturbance, stress, hearing or detection impairment, auditory tissue damage, non-auditory injury, mortality, and impediments to fishing activity. Concerns regarding the impacts from seismic surveying associated with the use of airgun arrays can be separated into impacts on commercial and recreational fisheries, potential catch effects and space-use conflict effects. While the DMF's review is limited to concerns related to fishery impacts, we note that direct impacts to specific fish habitats and populations can affect North Carolina's coastal resources and economy by altering fishery performance.

Commercial and Recreational Fisheries

North Carolina's coastal areas support industries vital to the state's coastal economy, including the commercial and recreational fishing industries. The potential effects to commercial and recreational fisheries, from one survey, are described as short-term, localized, and transitory. These potential effects will come to be long-term and widespread, with the possibility of five proposed surveys, many having spatially overlapping survey areas and durations. According to the Atlantic PEIS, the Wanchese-Stumpy Point port is ranked 55th in the nation for commercial fishing revenues. North Carolina also has 26 of the 108 fishing communities identified by the NMFS, the largest concentration from Delaware to Florida. With approximately 2,945 active commercial fishermen and 532 seafood dealers in 2017, the commercial fishing industry supported an estimated 7,685 jobs, \$178 million in income, and \$432 million in business sales in the state economy (DMF 2017). In 2016, approximately 1.8 million recreational anglers also took over 5.4 million fishing trips in North Carolina's coastal waters (NOAA 2017). The Atlantic PEIS ranks North Carolina as fifth in the nation for the total expenditures and durable goods expenditures related to recreational fishing and second in total number of saltwater angler trips occurring from Delaware to Florida. This coastal recreational fishing activity supported an estimated 41,743 jobs, \$1.5 billion in income, and \$3.9 billion in business sales in the state economy (DMF 2017). When commercial and recreational fishing activities are combined, the coastal fishing industry in North Carolina is estimated to support approximately 49,428 jobs, \$1.7 billion in income, and \$3.9 billion in business sales annually, with much of this economic

activity occurring in counties that have limited other sources of employment or revenue. The economic impacts of the state's fishing industry and the rich cultural heritage of our coastal areas demonstrate the immense importance of protecting and sustaining the natural resources of our coast.

Most commercial landings and value from the ocean are from otter trawls, longlines, hook-and-line, and gillnets. According to the Atlantic PEIS, commercial fisheries that use longlines and gillnets could be negatively affected by active acoustic sound from seismic equipment that can alter the behavior of targeted fish and their prey. In 2017, Atlantic croaker, spiny dogfish, summer flounder, snapper-grouper complex species, bluefish, sharks, tuna, coastal migratory pelagic species (king mackerel, Spanish mackerel, cobia, dolphin and wahoo), shrimp (brown, pink, white), swordfish and kingfishes comprised 91 percent of the landings and 94 percent of the value for fish landed from the ocean. From 2013 to 2017, commercial fisherman landed an average of 58,498,548 pounds of seafood with an average annual ex-vessel value of \$91,731,014 from North Carolina's waters. Approximately 31 percent of the average annual commercial landings and 34 percent of the value could be attributed to commercial landings from state and federal ocean waters. Although almost half of the ocean commercial landings (49 percent) occurred in state ocean waters, most of the value (70 percent) was from fisheries that occurred in federal waters (greater than three miles from shore). On average, a total of 9.4 million pounds of seafood valued at \$22 million dollars were landed in North Carolina from federal waters.

In the Commercial Fisheries section of the Atlantic PEIS and in Table 4-28, it would be more representative of potential impacts to list species by ex-vessel value than by total weight. The contribution of certain species groups, such as tuna, other coastal migratory pelagic species and snapper-grouper species, are more appropriately represented by value than weight. In particular, the extremely low allowable regional catch levels for some snapper-grouper species constrain harvests to quantities that may appear relatively minor but provide significant economic benefit to individual fishery participants as well as communities. For example, North Carolina trip ticket data show that in 2017 the months of October, November and December account for the highest landings value of seafood, \$12.2 million dollars, from state and federal ocean waters. Nearly 88 percent of the value came from six species groups (shrimp, snapper-grouper complex, summer flounder, swordfish, tuna and coastal migratory pelagics). In particular, species from the snapper-grouper complex landed in these months had a total estimated ex-vessel value of \$711,212 from 217,501 pounds; comparatively Atlantic croaker had a total estimated ex-vessel value of \$136,238 from 122,315 pounds. Therefore, harvest from several of these offshore fisheries catches has a relatively small weight but a high value per pound, increasing the economic impact to these fisheries should they be impeded by seismic survey activities.

The Atlantic PEIS states that anthropogenic noise associated with the use of seismic equipment could temporarily affect the behavior of pelagic fish and their prey that are important to the recreational and commercial industries. Catch rates have the potential to decline, especially if numerous vessels are conducting seismic surveys throughout important fishing grounds during the peak periods of activity. On average from 2013 to 2018, a total of 13,199,538 recreational trips occurred in ocean waters of North Carolina. Over 2 million of those trips were from nearshore ocean waters (less than three nautical miles), and 601,925 trips were from waters greater than three miles from shore. Average annual recreational landings from the ocean were 18,558,792 pounds for the years 2013-2018. Approximately 37 percent of recreational ocean

landings were from for-hire boats fishing in waters greater than three miles offshore, with peak activity occurring from May to October. May through October are also popular months for diving, with much of this activity occurring greater than three miles offshore. During peak times, species in the coastal migratory pelagics and snapper-grouper complex are the most targeted by ocean anglers, as evidenced by the many recreational and charter boat trips as well as tournaments targeting these species. These species include white marlin, blue marlin, sailfish, yellowfin tuna, dolphin, wahoo, Spanish mackerel, bluefish, king mackerel, black sea bass, greater amberjack and red porgy.

Several areas in the regional grid for the proposed survey activity are identified as Essential Fish Habitat (EFH) and a subset of these are HAPC. These areas experience annual closures effecting commercial and recreational fishermen. Area closures to gear and species, such as the Mid-Atlantic bottom longline closure and shallow water grouper spawning season closure, are in place to protect certain species from harvest during spawning periods in these EFH and HAPC areas. The commercial Mid-Atlantic bottom longline closure (January 1 – July 31) was established for the protection of the sandbar and dusky shark nursery and pupping areas and covers a large portion of the regional grid starting at the shoreline and extending to the 55-fathom mark, below Oregon Inlet to the Cape Fear River (Programmatic EIS Figure 4-23). This closure also limits the catch of demersal (bottom-dwelling) species to five percent of the total catch composition. Similarly, the shallow water grouper closure (recreational and commercial) from January 1 to April 30 prevents the harvest of gag, scamp, black grouper, red grouper, coney, graysby, red hind, rock hind, yellowmouth grouper and yellowfin grouper during their spawning season. This closure applies to all state and federal waters. Disturbance in these areas of concentrated fish use that results in displacement of fish could impact local fish abundance by deterring foraging, refuge, and spawning activities in preferred habitat areas. Impacting fish abundance would have a direct impact on catch when these areas reopen to commercial and recreational activity.

Additionally, offshore natural habitats and the 43 artificial reefs off North Carolina's coast are used for both recreational and commercial fishing, with as many as 45 fishing tournaments occurring annually (Table 1). Specific areas of recreational and commercial fishing interest to North Carolina fishermen include but are not limited to The Point; Ten Fathom Ledge; Big Rock; and the shoals of Cape Lookout, Cape Fear, and Cape Hatteras. These offshore natural and artificial habitats are also popular diving sites, with much of the activity occurring more than three miles offshore. Many of these offshore areas, such as The Point, experience year-round, heavy use by all user groups. Disturbance in these areas of concentrated fish use that results in displacement of fish could reduce catch and change distributions of fish in the water column, affecting economically valuable fisheries and operations throughout the regional survey area.

Potential Catch Effects

The Atlantic PEIS reports impacts to fish ranging from mortality to injury to behavioral responses. Section 4.2 and Appendix J of the Programmatic EIS describe the relevant research regarding effects of airguns on fish and note that there has been a minimal amount of research on these topics that makes drawing conclusions of any type of effect on fish populations problematic. According to Appendix J of the Programmatic EIS, sound plays a major role in the lives of all fishes, as it is attenuated at a much lower rate than other forms of energy, such as light. The lower frequencies of sound are important for communication and environmental

sensing. Using sound, fish are able to obtain a great deal of biotic (living) and abiotic (environmental) information, important for the detection of a reef or swimming predators. Boney fishes use sound for a wide range of behaviors including communication, mating and territorial interactions. Sound produced from anthropogenic sources, such as the array of airguns used in the proposed survey activities, can impede the ability of fishes to hear biologically relevant sounds, a phenomenon known as “masking”. Anthropogenic sound can have a direct impact on the catchability of fishes by altering normal behaviors possibly affecting the survival of individuals or populations.

Anthropogenic sound effects on fish specifically from seismic surveys can be described as physiological and behavioral. The most critical issue regarding the effect of anthropogenic sound on fishes is behavioral by potentially impacting fish over a broad area, impeding their ability to interpret and produce biologically relevant sounds, thus impacting catchability. A limited number of well-controlled studies on the effects of sound on fishes and fish species exist. It has been demonstrated both nationally and internationally that loud intermittent sounds have the potential to cause physiological injury or death if the animal is close to the source. They can also produce hearing impairment, masking, and behavioral effects at distances beyond those that would result in death or injury. Interim criteria for regulatory levels of sound arose on the U.S. West Coast out of concern about effects of pile driving activities on fish. The current interim criteria established a peak sound level of 206-dB and a sustained exposure level of 187-dB for individual fishes weighing more than two grams or 183-dB for fishes below two grams. These criteria are for the onset of easily identifiable physiological effects, rather than behavioral effects which occur at a much lower sound levels and are much harder to identify. The sound levels released from the arrays of the five proposed projects are expected to exceed these levels. The sound levels at the sea floor may be somewhat less due to some loss with propagation distance. The Programmatic EIS summarizes the radial distances in meters to the 160-dB and 180-dB received sound pressure level from a single pulse of a 2D airgun array (Programmatic EIS Table 4-8). The 180-dB radius ranges from 799 to 2,109 meters (0.5-1.1 nmi) and the 160-dB radius ranges from 5,184 to 15,305 meters (2.8-8.3 nmi). It should be noted that the threshold for Level B behavioral harassment on marine mammals is set at 160-dB; depending on water depth, this sound pressure level could be received by animals over 15,305 meters or eight nautical miles from the source. While the potential for physiological damage is lowered by fishes’ ability to move away from the high intensity seismic sound, behavioral studies have shown reduced catch rate lasting for several days after the termination of airgun use. The decline in catch rate was assumed to be from fish moving away from the fishing site, moving into deeper water or being killed. A recent study (Paxton et al. 2017) demonstrated a 78 percent decline in snapper grouper complex species abundance during evening hours at a reef habitat site off the central North Carolina coast after seismic testing occurred. During the three days prior to survey activity, fish habitat use was highest during those same hours based on analysis of video data. It is important to note that this site was not in a direct line with the survey track, and of the three sites in the study, was in fact the furthest away (7.9 km) from the survey track. Researchers also deployed hydrophones at the reef sites and noted that while noise levels exceeded 170 dB re 1 μ Pa, the peak levels were unknown as the noise levels overloaded the instruments. Both spherical and cylindrical spreading models were used to estimate peak noise levels at the sites closest to the survey track based on a sound source level of 258.6 dB re 1 μ Pa. Model results indicated the received sound levels ranged from 202-230 dB re 1 μ Pa. While the study was limited, the resultant reduction in abundance occurring from a single seismic survey is cause for concern,

given the multiple overlapping surveys under consideration and the extended timeframes over which they would occur. Such significant decreases in abundance can lead to reduced catch rates, especially during peak seasons for commercial and recreational fisheries, and will have a large impact on coastal communities that are dependent on the 22,500 jobs, \$787 million in income and \$1.96 billion in business sales annually generated by these industries. Seismic surveys occurring during October through December have the greatest potential to impact commercial fisheries, as these months represent the peak of commercial harvest, while surveys occurring from May through October have the most potential to impact recreational fisheries.

The reefs and continental shelf offshore of North Carolina are used year-round by eggs and larvae from commercially and recreationally important species (Tables 2 and 3). Eggs and larvae are considered stationary objects with regard to a moving sound source, because of their inability to move. Appendix J of the Atlantic PEIS suggests that some larval fishes find the reefs upon which they will settle using sounds from the reef (snapping shrimp, moving water, other fishes, etc.). If there is a sustained increase in anthropogenic noise, the larval fish would be less likely to hear the sounds of the reef. This could increase mortality and significantly impact the long-term survival of reef fish populations. There are few studies and no definitive conclusions describing the impact of high intensity sound on eggs and larvae of fishes and invertebrates. From these limited studies, impacts from high intensity sounds ranged from high mortality for eggs and larvae close to the sound source to normal survival. Further investigation is needed into the effects of sound on fish tissue, larval growth and the impedance of biologically relevant sounds used by larvae to find suitable habitat. The species listed in Table 2 and Table 3 are among the most economically important to the North Carolina commercial fishing industry, contributing to 77 percent of the value of commercial landings from estuarine and ocean waters. The potential impacts associated with high intensity sound from seismic surveys to eggs, larvae, forage and habitat of these economically important fishes, such as increased mortality and low recruitment, could have a dramatic effect on the coastal economies of North Carolina. With spawning activities occurring year-round in the offshore waters of North Carolina, the potential effects from multiple, overlapping seismic survey activities could be detrimental to eggs and larvae that are dependent on reef and continental shelf habitats for development. Disturbance in these areas important for egg and larval development or damage to eggs and larvae from seismic survey activities would have a direct impact on the commercial and recreational fishing industries. Increased mortality in eggs and larvae of economically important species would result in low recruitment to the stock, affecting species availability and catchability.

Other issues of concern regarding the effects of anthropogenic sound on the catchability of fish include increased production of stress hormones in fish, impacts on invertebrates and impacts from vessel noise. A study of Atlantic salmon subjected to up to 10 simulated seismic airgun explosions showed that exposure caused the release of primary stress hormones, adrenaline and cortisol, as a physiological and biochemical response. Even though the study recorded no mortalities and that fish returned to normal levels after 72 hours, the temporal impact of stress from seismic sound could affect catchability. Carroll et al. (2017) summarized documented effects to different life stages of fish to low-frequency seismic sounds. More studies have found physical, behavioral and physiological responses by juvenile and adult fish than eggs and larvae, although there have been fewer studies looking at these early life stages. Limited information and data exists on the hearing of aquatic invertebrates and the impacts from high intensity sound. It is thought that the chance of physiological damage is lowered due to the lack of resonating

sound structures in invertebrates, normally damaged by high intensity sounds. However, a recently published study (McCauley et al. 2017) designed to investigate the impacts of a single airgun (similar to those used in commercial arrays) on the local zooplankton field, demonstrated significant differences in both zooplankton abundance and mortality after airgun exposure. Comparison of control and exposed tows showed a greater than a 50 percent decrease in abundance in 58 percent of all individual zooplankton taxa. The distribution of abundance decreases between exposed and control tows for all taxa showed a median decrease in abundance of 64 percent. Additionally, comparison of control tows (e.g., those occurring prior to airgun blasts) between Day 1 and Day 2 of the study demonstrated a decrease in mean and median zooplankton abundance of 89 percent and 96 percent, respectively. Assessment of mortalities from each day of the study showed two to three-fold increases across all taxa as compared to controls. Finally, impact ranges (i.e., the distances at which no impact versus varying degrees of impact would be expected) were calculated for both abundance and mortality, and were found to be more than two orders of magnitude greater than previously assumed. The results of this study raise additional concerns regarding effects on fish eggs and larvae, given similar size ranges as the zooplankton in the above experiments, as well as potentially cascading impacts to the base of the food chain. It should be noted that larval fish are also briefly part of the zooplankton community. Both juveniles and species that are forage for higher trophic level fishes depend on zooplankton for their dietary needs.

Finally, there is growing concern with regard to increases in anthropogenic noise coming from the increasing number of commercial ships that are found over large geographic areas. Vessel noise produces sounds in the general hearing range of fishes. Sound produced by vessels can range from <150-dB to over 190-dB for the largest commercial vessels. Exposure to vessel noise has been shown to increase cortisol levels (associated with stress response), temporary hearing loss and a change in fish behavior.

Potential Space-Use Conflict Effects

Proposed projects usually maintain a vessel exclusion zone to protect airgun arrays and towed steamers from other vessel traffic, which can be extensive (e.g. measured in miles). Vessel exclusion zones primarily affect access to fishing/diving grounds and fishing/diving times. Offshore activity in North Carolina occurs year-round commercially and peaks recreationally from May to October. Several commercial gear types including pots/traps, gillnets and longlines have the highest potential of being disturbed by increased vessel traffic and towed survey gear, especially night fishing operations. Pots/traps, gillnets and longline commercial fishing operations contribute to 44 percent of landings and 29 percent of value from the ocean in 2017. Similarly, recreational fishing activities and tournaments in the region during survey times could also be disrupted, especially if survey activities occur on a weekend, when recreational fishing activity is generally at much higher levels than other days during the week. If commercial and recreational fishers temporarily lose access to fishing grounds or are required to terminate or change their fishing techniques, this may reduce catch and affect the quality of catch. Since there are many months where area, gear and species closures are in effect, additional restrictions of access to fishing grounds due to seismic survey activities will cause further burden to recreational and commercial fishermen. Depending on the time of year these additional area restrictions due to surveying could cause a significant impact to fisheries with very short seasons or small quotas. The predicted activity levels of one survey are short-term, localized, and transitory and the effects of space-use conflicts are expected to produce minimal effects on

recreational and commercial fisheries. With five surveys under consideration, many with overlapping areas, these effects could become widespread and continue into future years.

Other Concerns

In the Programmatic EIS, Table 4-29 lists the important commercial species for North Carolina as white shrimp, southern flounder, summer flounder, brown shrimp, Atlantic croaker and quahog clam which underestimates the importance of many other fisheries (blue crab, snapper-grouper complex, coastal migratory pelagics, tuna, bluefish, etc.) as noted earlier. Similarly, Tables 4-17 through 4-26 only include EFH designations for federally-managed species, and do not take into account the habitat needs of commercially and recreationally important state-managed species such as southern flounder within the area of interest. Southern flounder are thought to spawn off southern North Carolina through central Florida on nearshore reefs and in offshore Gulf Stream waters. The recreational and commercial fishery for southern flounder is one of the most popular and economically important fisheries in the State.

Alternative Technologies

The airgun configurations currently used by industry result in a substantial amount of acoustic energy that is unused. An airgun typically emits a short, high-amplitude pulse followed by a series of lower amplitude pulses from the decaying air bubble. While arrays are designed to focus sound downward in the vertical direction, a substantial amount of acoustic energy is propagated in a horizontal direction, providing no information regarding the geological characteristics under investigation. This excess energy can become trapped and travel long distances in the water column, and both the short-range and long-range potential impacts have been noted above. Duncan et al. (2017) describe an alternative technology to traditional airguns called “marine vibroseis” in which the short, high amplitude, wide-frequency bandwidth of an airgun array is replaced by a longer, lower-amplitude signal that contains the same acoustic energy in the bandwidth necessary for seismic surveying. The researchers modeled three configurations of a marine vibroseis (MV) concept array developed by an Australian company that included both low-frequency and high-frequency elements deployed at different depths within the array. They demonstrated that the configuration of the MV array is critical to minimizing the environmental footprint, and showed a 20-dB reduction in short range (100m) peak sound pressure as compared to a traditional airgun array. Furthermore, the MV technology resulted in lower broadband sound exposure levels, particularly at long ranges, and more rapid attenuation of sound signal in shallow water. Given that there is active and promising research on alternative technology that could result in fewer impacts to living marine resources, DMF strongly encourages that these be field-tested if future seismic exploration is permitted off North Carolina.

Conclusions

The economic impacts of North Carolina’s commercial and recreational fishing industries and the rich cultural heritage of our coastal areas demonstrate the immense importance of protecting and sustaining the natural resources of our coast. While the effects of one survey are described as short-term, the cumulative impacts to the state’s coastal resources and temporary loss of access to them could become long-term and widespread due to multiple seismic surveying operations being pursued off the coast of North Carolina. Sound produced from anthropogenic sources, such as the array of airguns used in the proposed survey activities, can impede the ability of fishes to hear biologically relevant sounds. Anthropogenic sound can have a direct impact on the

catchability of fishes by altering normal behaviors possibly effecting the survival of individuals or populations. Disturbance in areas of concentrated fish use that results in displacement of fish could impact local fish abundance by deterring foraging, refuge, and spawning activities in preferred habitat areas. Displacement of fish could reduce catch and change distributions of fish in the water column, affecting economically valuable fisheries and operations throughout the regional survey area. Changes in zooplankton abundance could have cascading impacts on various trophic levels within the food chain. There are limited studies available that establish objective criteria for determining the potential for adverse impacts to commercial and recreational fisheries. WesternGeoco stated that their survey “is not materially different” than the previous proposed surveys within North Carolina. However, specific operation details are lacking compared to previous proposed surveys. Without access to specific information on the location of survey lines, the time of year survey activities will occur, and the expected response of fish, the impacts of seismic activities to commercial and recreational fisheries cannot be fully assessed.

Without a response from WesternGeco to DCM’s incomplete consistency determination (April 11, 2019), DMF cannot adequately assess the potential impacts of G&G surveys to commercial and recreational fisheries. DMF would request the applicant fully review the recently published research and address if the impacts would be consistent with North Carolina’s enforceable policies. WesternGeoco stated that seismic operations are estimated to occur 208 days per year, and that while they will avoid operating within the Ten Fathom Ledge HAPC and will avoid a portion of The Point January - March, they will not avoid other HAPCs or MPAs within North Carolina, which includes Big Rock, cape shoals at Cape Lookout, Hatteras and Fear, Cape Lookout Lophelia Banks, Cape Fear Lophelia Bank Deep Water Coral HAPCs, Charleston Bump (extends into Onslow Bay), Coastal Migratory and Dolphin-Wahoo HAPC, and Snowy Wreck MPA. Refer to SAFMC EFH habitat map viewer for locations (<https://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=961f8908250a404ba99fac3aa37ac723>)

DMF requests establishing specific impact minimization measures for the protection of fish and areas highly utilized by them, similar to those for marine mammals. These measures should include operation scheduling to avoid and mitigate the negative impacts to fishery participants such as the use of alternative technologies, modifying survey schedule on a regional scale spatially and temporally based on documented priority seasons and times for fishery resources, fishing activity, and additional monitoring (e.g., collection of audio and video data to determine onsite impacts). The DMF requests review of specific minimization measures, as well as incorporating additional information on direct and cumulative impacts into the consistency request based on the most up-to-date published literature pertaining to this activity. Failure to take these steps to avoid impacts to fish and their habitat could have a negative impact on the recreational and commercial fisheries of the state impacting not only fish assemblages along our coast but a major economic engine for the coastal region of North Carolina.

Literature Cited

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Table 1. 2017 North Carolina Saltwater Fishing Tournaments

<u>2019 NORTH CAROLINA SALTWATER FISHING TOURNAMENTS</u>			
<u>DATES</u>	<u>TOURNAMENTS</u>	<u>WEIGH-IN LOCATION</u>	<u>FOR MORE INFORMATION:</u>
January 1 - December 31	NC Saltwater Fishing Tournament	Official Weigh Stations	DMF PO Box 769 Morehead City, NC 28557 252-726-7021 1-800-682-2632
April 12-24	Pleasure Island Surf Fishing Challenge	Contact Tournament for Info	Gary Hurley Fisherman's Post 1320 Audubon Blvd. Wilmington, NC 28403 910-452-6378 www.fishermanspost.com
April 20 - June 1	Far Out Shoot Out	Ocean Isle Fishing Center Ocean Isle Beach	Ocean Isle Fishing Center 65 Causeway Drive Ocean Isle Beach, NC 28469 910-575-3474 www.oifc.com
May 3-4	Reelin for Research	Morehead City Waterfront	www.reelinforresearch.org
May 14-18	Hatteras Village Offshore Open Governor's Cup Billfishing Series	Hatteras Harbor Marina Hatteras	PO Box 16 Hatteras, NC 27943 1-800-676-4939 www.hvoo.org
May 17-19	Hillsborough Offshore Challenge	Atlantic Beach Hatteras	Terry Rose 919-667-3508 www.hillsboroughsfc.com

May 23-26	Swansboro Rotary Memorial	Swansboro Rotary Civic Center	Swansboro Rotary
	Day Blue Water Fishing Tournament	Hammocks Beach State Park	PO Box 426
	Governor's Cup Billfishing Series	Swansboro	Swansboro, NC 28584
			252-422-9100
			www.swansbororotary.com
May 24-26	Cape Lookout Shootout	The Boathouse	capeshootout@gmail.com
		Beaufort	capeshootout.weebly.com/
May 29-June 1	Cape Fear Blue Marlin Tournament	Wrightsville Beach Marina	Cape Fear Blue Marlin Tournament
	Governor's Cup Billfishing Series	Wrightsville Beach	PO Box 554
			Wrightsville Beach, NC 28480
			910-575-3474
			www.capefearbluemarlintournament.com
<u>DATES</u>	<u>TOURNAMENTS</u>	<u>WEIGH-IN LOCATION</u>	<u>FOR MORE INFORMATION:</u>
May 30 - June 1	Fisherman's Post Inshore Challenge	Ocean Isle Fishing Center	Gary Hurley
		Ocean Isle	Fisherman's Post
			1320 Audubon Blvd.
			Wilmington, NC 28403
			910-452-6378
			www.fishermanspost.com
June 8-15	Big Rock Blue Marlin Tournament	Morehead City Waterfront	Big Rock Blue Marlin Tournament
	Governor's Cup Billfishing Series	Morehead City	PO Box 1673
			Morehead City, NC 28557
			252-247-3575
			www.thebigrock.com
June 13-16	Jolly Mon King Classic	Ocean Isle Fishing Center	Ocean Isle Fishing Center
		Ocean Isle Beach	65 Causeway Drive

			Ocean Isle Beach, NC 28469
			910-575-3474
			www.oifc.com
June 14-19	Wide Open Tech Spanish Mackerel Open	Motts Channel Seafood	Gary Hurley
		Wrightsville Beach	Fisherman's Post
			1320 Audubon Blvd.
			Wilmington, NC 28403
			910-452-6378
			www.fishermanspost.com
June 23-29	Annual Blue Marlin Release Tournament	Hatteras Marlin Club	Hatteras Marlin Club
		Hatteras	PO Box 218
			Hatteras, NC 27943
			252-986-2454
			www.hatterasmarlinclub.com
June 28-29	Topsail Island Inshore Challenge	Contact Tournament for Info	Gary Hurley
		Surf City	Fisherman's Post
			1320 Audubon Blvd.
			Wilmington, NC 28403
			910-452-6378
			www.fishermanspost.com
July 10-13	Hatteras Grand Slam	Village Marina	Hatteras Grand Slam
	Governor's Cup Billfishing Series	Hatteras	PO Box 484
			Hatteras, NC 27943
			http://hatterasgrandslam.com
<u>DATES</u>	<u>TOURNAMENTS</u>	<u>WEIGH-IN LOCATION</u>	<u>FOR MORE INFORMATION:</u>
July 12-13	CCCF Spanish Mackerel Challenge	The Boat House	Wes Daniels
		Beaufort	3505 Arendell Street
			Morehead City, NC 28557

			252-222-6222
July 12-14	The East Coast Got-Em-On Classic	Carolina Beach Boat Docks	PO Box 2003
		Carolina Beach	Carolina Beach, NC 28428
			910-470-1374
			www.gotemonliveclassic.com
July 17-20	Boys and Girls Club Billfish Classic	Beaufort Town Docks	www.billfishclassic.com
	Governor's Cup Billfishing Series	Beaufort	
July 18-21	Ducks Unlimited "Band the Billfish"	Morehead City Waterfront	Bob Lichauer / Mark Shouse
	Tournament	Morehead City	PO Box 1333
	Governor's Cup Billfishing Series		Morehead City, NC 28557
			336-880-3038
			http://www.ncdubillfish.com
July 20-22	Cape Lookout Shootout	The Boathouse	capeshootout@gmail.com
		Beaufort	capeshootout.weebly.com/
July 24-27	Carolina Boatbuilder's Tournament	Pirate's Cove	Pirate's Cove
		Manteo	2000 Sailfish Drive
			Manteo, NC 27954
			252-473-1015
			www.pcbgt.com
July 26-28	Annual Raleigh Saltwater Sportfishing	Jaycee Park	Raleigh Saltwater Sportfishing Club
	Club King Mackerel Tournament	Morehead City Waterfront	PO Box 33746
			Raleigh, NC 27603
			919-833-2800
July 26-27	Wrightsville Beach Inshore Challenge	Wrightsville Beach Marina	Gary Hurley
		Wrightsville Beach	Fisherman's Post
			1320 Audubon Blvd.
			Wilmington, NC 28403

			910-452-6378
			www.fishermanspost.com
August 11	Alice Kelly – (Ladies Only)	Pirate's Cove	Pirate's Cove
	Memorial Billfish Tournament	Manteo	2000 Sailfish Drive
			Manteo, NC 27954
			252-473-1015
			www.pcbgt.com
<u>DATES</u>	<u>TOURNAMENTS</u>	<u>WEIGH-IN LOCATION</u>	<u>FOR MORE INFORMATION:</u>
August 13-16	Pirate's Cove Billfish Tournament	Pirate's Cove	Pirate's Cove
	Governor's Cup Billfishing Series	Manteo	2000 Sailfish Drive
			Manteo, NC 27954
			252-473-1015
			www.pcbgt.com
August 17-18	Rotary Club of Sneads Ferry King	New River Marina	PO Box 487
	Mackerel Tournament	Sneads Ferry	Sneads Ferry, NC 28460-0487
			910-327-3953
			www.sneadsferrykmt.com
August 24-25	Southport Inshore Challenge	Southport Marina	Gary Hurley
		Southport	Fisherman's Post
			1320 Audubon Blvd.
			Wilmington, NC 28403
			910-452-6378
			www.fishermanspost.com
September 7-9	Cape Lookout Shootout	The Boathouse	capeshootout@gmail.com
		Beaufort	capeshootout.weebly.com/
September 13-14	Carolina Beach Inshore Challenge	Inlet Watch Marina	Gary Hurley
		Carolina Beach	Fisherman's Post
			1320 Audubon Blvd.
			Wilmington, NC 28403
			910-452-6378

			www.fishermanspost.com
September 16-30	Annual Flounder Surf Fishing Tournament	Bogue Inlet Pier	252-354-6350
		Emerald Isle	www.emeraldisle-nc.com
September 22	Emerald Isle Fall Fishing Tournament	Emerald Isle	https://emeraldislefishingtournament.com/
October 4-6	US Open King Mackerel Tournament	Southport Marina	Megan C Anny
		Southport	Chamber of Commerce
			4433 Long Beach Road, SE
			Southport, NC 28461
			910-457-5787
			www.usopenkmt.com
October 12-14	Cape Lookout Shootout	The Boathouse	capeshootout@gmail.com
		Beaufort	capeshootout.weebly.com/
<u>DATES</u>	<u>TOURNAMENTS</u>	<u>WEIGH-IN LOCATION</u>	<u>FOR MORE INFORMATION:</u>
October 11-12	Annual Davis Island Fishing Foundation	Cape Lookout	Mark Weir / DIFF
	Club (DIFF) Tournament (Surf Fishing)		PO Box 268
			Mooresville, NC 28115
			336-751-5135
			www.diffclub.com
October 16-19	NC Troopers Association Offshore - Inshore Saltwater Challenge	Morehead City	NCTA-KMT
			PO Box 2358
			Morehead City, NC 28557
			252-241-9798
			www.1042KMT.com
October 16-19	Swansboro Rotary King Mackerel Tournament	Hammocks Beach State Park	http://www.swansboro50.com/

October 18-20	Pleasure Island Surf Fishing Challenge	Carolina Beach	Gary Hurley
		Kure Beach	Fisherman's Post
		Fort Fisher	1320 Audubon Blvd.
			Wilmington, NC 28403
			910-452-6378
			www.fishermanspost.com
October 25-27	Fall Brawl King Classic	Ocean Isle Fishing Center	Ocean Isle Fishing Center
		Ocean Isle Beach	65 Causeway Drive
			Ocean Isle Beach, NC 28469
			910-575-3474
			www.oifc.com
November 2-4	Annual Cape Hatteras Anglers Club Team & Open Individual Invitational Tournaments	Cape Hatteras Anglers Club Buxton	Cape Hatteras Anglers Club 47231 Light Plant Road
			Buxton, NC 27920
			252-995-4253
			www.capehatterasanglersclub.org
November 1-3	Topsail Island Fall Surf Fishing Challenge	Contact Tournament for info	Gary Hurley
			Fisherman's Post
			1320 Audubon Blvd.
			Wilmington, NC 28403
			910-452-6378
			www.fishermanspost.com
November 9	Friendly City Speckled Trout Tournament	Casper's Marina Swansboro	Michael Geelhart PO Box 1301
			Swansboro, NC 28584
			910-389-0607

Table 2. Spawning seasons and average ex-vessel value for commercially important species in North Carolina offshore waters.

2013-2017 Average Commercial Ex-vessel Value	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
\$1,717,053	Atlantic Croaker												
\$28,856,744	Blue Crab												
\$20,369,675	Brown Shrimp												
	Pink Shrimp												
	White Shrimp												
\$6,651,771	Summer Flounder												
\$3,266,619	Wahoo												
	Dolphinfish												
	King Mackerel												
	Spanish Mackerel												
\$699,829	Bluefish												
\$230,396	Catfishes												
\$335,092	Spiny Dogfish												
\$3,731,096	Snapper-Grouper Complex												
\$3,620,521	Tuna												
\$69,478,796	(total)												

Table 3. Snapper-grouper complex spawning periods.

Stock	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Black sea bass												
Blueline tilefish												
Cubera Snapper												
Gag												
Gray triggerfish												
Greater amberjack												
Red grouper												
Red porgy												
Red snapper												
Scamp (NC)												
Scamp (FL)												
Scamp (29.95-32.95)												
Snowy grouper												
Speckled hind												
Tilefish												
Vermilion snapper												
White grunt												
Warsaw Grouper												

Spawning  Peak Spawning 