



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

AUG - 1 2012

W. David Noble
Department of the Navy
Director, Environmental Planning and Conservation
Navy Region, Mid-Atlantic
1510 Gilbert Street
Norfolk, VA 23511-2737

Re: Amendment to the July 13, 2012 Biological Opinion for shoreline restoration at the Joint Expeditionary Base Little Creek/Fort Story (JEB Fort Story).

Dear Mr. Noble,

We recently issued you a Biological Opinion for the shoreline restoration project at JEB Fort Story on July 13, 2012. In the Opinion, we concluded that the proposed project may adversely affect, but is not likely to jeopardize the continued existence of the Northwest Atlantic Ocean Distinct Population Segment (DPS) of loggerhead sea turtles; Kemp's ridley sea turtles; the Gulf of Maine (GOM) DPS of Atlantic sturgeon; New York Bight (NYB) DPS of Atlantic sturgeon; Chesapeake Bay (CB) DPS of Atlantic sturgeon; Carolina DPS of Atlantic sturgeon; or South Atlantic (SA) DPSs of Atlantic sturgeon, and is not likely to adversely affect leatherback or green sea turtles or right, humpback or fin whales.

Recently, it was brought to our attention that there is an error in the data presented in several tables in the Opinion (i.e., Section 7.1.2.1 Sea Turtle Entrainment, Table 7, and Section 7.1.2.2 Atlantic Sturgeon Entrainment, Table 9). The tables provide information on dredging projects in the United States Army Corps of Engineer's North Atlantic District (USACE NAD). The error in the table relates to information provided on a dredge project in Cape May, New Jersey. This dredge project operated during a period from 2004 to 2005, resulting in a total of 2,425,268 cubic yards of material removed at the end of the project in 2005. However, both tables recorded this value twice, once in 2004 and once in 2005 (i.e., as if they were two separate projects instead of one). This error affected the total volume of material removed for all USACE NAD projects being considered in table 7 (i.e., total volume went from 1.8 million cubic yards to 1.6 million cubic yards) and Table 9 (i.e., total volume went from 10.2 million cubic yards to 9.4 million cubic yards). As the number of interactions between dredge equipment and sea turtles and Atlantic sturgeon seem to be best associated with the volume of material removed, the information presented in these tables is used in estimating sea turtle and Atlantic sturgeon incidental takes for the action. This error has the potential to affect the estimate of sea turtle and Atlantic sturgeon incidental take provided in the 2012 Opinion; however, after consideration of these modifications, the estimated incidental take provided in the July 13, 2012 Opinion remains



the same and therefore, does not change our effects and jeopardy analyses presented in the July 13, 2012 Opinion, nor our original conclusion reached in this Opinion.

Although reinitiation of consultation is required and shall be requested by the Federal agency or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) if the amount or extent of incidental take is exceeded; (b) a new species is listed or critical habitat designated that may be affected by the identified action; (c) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (d) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, none of these triggers for reinitiation have been met and as such, the issuance of an entirely new Opinion is not warranted at this time. However, we are able to issue an amendment to the July 13, 2012 Opinion. The attachments to this letter will serve as the amendment to the sections of the Opinion (i.e., 7.1.2, 7.1.2.1, 7.1.2.2) which these modifications affect. Any future shoreline restoration at the Joint Expeditionary Base Little Creek/Fort Story incorporating the same dredging and disposal design criteria will be subject to these conditions.

The incidental take statement, and its associated reasonable and prudent measures and terms and conditions provided in the July 13, 2012 Opinion remain valid, and we expect the Navy to implement the reasonable and prudent measures and terms and conditions as outlined in the July 13, 2012 Opinion. The measures of the ITS are nondiscretionary and must be undertaken by the Navy for the incidental take exemption to apply. The incidental take statement is applicable for the duration of the Opinion (i.e., through 2020), or until reinitiation is warranted (see above).

We look forward to continuing to work cooperatively with your office to minimize the effect of dredging projects on listed species. For further information regarding any consultation requirements, please contact Danielle Palmer at (978) 282-8468 or by e-mail (Danielle.Palmer@noaa.gov). Thank you for working cooperatively with my staff throughout this consultation process.

Sincerely,

A handwritten signature in black ink, appearing to read 'D. Morris', with a long horizontal line extending to the right.

Daniel S. Morris
Acting Regional Administrator

Attachment 1 (Sections 7.1.2; 7.1.2.1; 7.1.2.2)

EC: McGinnis, Navy/Mid-Atlantic
Wikel, BOEM
Culbertson, BOEM
Steffey, ACOE/Norfolk
Palmer, NMFS/NER
O'Brien, NMFS/HCD

File Code: Section 7- 2012 Navy JEB Fort Story-Amendment to 2012 Opinion
PCTS: F/NER/2012/02020

Attachment 1

7.1.2 Entrainment

7.1.2.1 Sea Turtles

Because of their large size, leatherback sea turtles are not vulnerable to entrainment in hopper dredges. To date, no leatherback sea turtles have been documented entrained in any dredge operation along the U.S. Atlantic coast. Therefore, this section of the Opinion will only consider the effects of entrainment on loggerhead, Kemp's ridley and green sea turtles.

The National Research Council's Committee on Sea Turtle Conservation (1990) estimated that dredging mortalities, along with boat strikes, were second only to fishery interactions as a source of probable mortality of sea turtles. Experience has shown that injuries sustained by sea turtles entrained in hopper dredge dragheads are usually fatal. Mortality in hopper dredging operations most often occurs when turtles are entrained in the dredge draghead, pumped through the intake pipe and then killed as they cycle through the centrifugal pump and into the hopper. Because entrainment is believed to occur primarily as the dredge is being placed or removed from the bottom, creating suction in the draghead, or when the dredge is operating on an uneven or rocky substrate causing the draghead to rise off the bottom, it is likely that only those species feeding or resting on or near the bottom would be vulnerable to entrainment. Recent information from the USACE suggests that the risk of entrainment is highest when the bottom terrain is uneven or when the dredge is conducting "clean up" operations at the end of a dredge cycle when the bottom is trenched and the dredge is working to level out the bottom. In these instances, it is difficult for the dredge operator to keep the draghead buried in the sand and sea turtles near the bottom may be more vulnerable to entrainment. However, it is possible to operate the dredge in a manner that minimizes potential for such incidents as noted in the Monitoring Specifications for Hopper Dredges (Appendix B).

Sea turtles have been killed in hopper dredge operations along the East and Gulf coasts of the US. Documented turtle mortalities during dredging operations in the USACE South Atlantic Division (SAD; i.e., south of the Virginia/North Carolina border) are more common than in the USACE North Atlantic Division (NAD; Virginia-Maine) probably due to the greater abundance of turtles in these waters and the greater frequency of hopper dredge operations. For example, in the USACE SAD, over 467 sea turtles have been entrained in hopper dredges since 1980 and in the Gulf Region over 186 sea turtles have been killed since 1995. Records of sea turtle entrainment in the USACE NAD begin in 1994. Since this time, at least 72 sea turtles deaths (see Table 4) related to hopper dredge activities have been recorded in waters north of the North Carolina/Virginia border (USACE Sea Turtle Database).¹

¹ The USACE Sea Turtle Data Warehouse is maintained by the USACE's Environmental Laboratory and contains information on USACE dredging projects conducted since 1980 with a focus on information on interactions with sea turtles.

Table 4. Sea Turtle Takes in USACE NAD Dredging Operations

Project Location	Year of Operation	Cubic Yardage Removed	Observed Takes
York Spit, VA	2011	NA	1 Loggerhead
Thimble Shoal Channel	2009	NA	3 Loggerheads
York Spit	2007	608,000	1 Kemp's ridley
Cape Henry	2006	NA	3 Loggerheads
Thimble Shoal Channel	2006	300,000	1 Loggerhead
Delaware Bay	2005	50,000	2 Loggerheads
Thimble Shoal Channel	2003	1,828,312	7 Loggerheads 1 Kemp's ridley 1 unknown
Cape Henry	2002	1,407,814	6 Loggerheads 1 Kemp's ridley 1 green
VA Beach Hurricane Protection Project (Cape Henry)	2002	NA	1 Loggerhead
York Spit Channel	2002	911,406	8 Loggerheads 1 Kemp's ridley
Cape Henry	2001	1,641,140	2 loggerheads 1 Kemp's ridley
VA Beach Hurricane Protection Project (Thimble Shoals)	2001	NA	5 Loggerheads 1 unknown
Thimble Shoal Channel	2000	831,761	2 Loggerheads 1 unknown
York River Entrance Channel	1998	672,536	6 Loggerheads
Atlantic Coast of NJ	1997	1,000,000	1 Loggerhead
Thimble Shoal Channel	1996	529,301	1 Loggerhead
Delaware Bay	1995	218,151	1 Loggerhead
Cape Henry	1994	552,671	4 Loggerheads 1 unknown
York Spit Channel	1994	61,299	4 Loggerheads
Delaware Bay	1994	NA	1 Loggerhead
Cape May NJ	1993	NA	1 Loggerhead
Off Ocean City MD	1992	1,592,262	3 Loggerheads
			<i>TOTAL = 73 Turtles</i>

Official records of sea turtle mortality in dredging activities in the USACE NAD begin in the early 1990s. Before this time, endangered species observers were not required on board hopper dredges and dredge baskets were not inspected for sea turtles or sea turtle parts. The majority of sea turtle takes in the NAD have occurred in the Chesapeake Bay. This is largely a function of the large number of loggerhead and Kemp's ridley sea turtles that occur in the Chesapeake Bay each summer and the intense dredging operations that are conducted to maintain the Chesapeake Bay entrance channels and for beach nourishment projects at Virginia Beach. Since 1992, the take of 10 sea turtles (all loggerheads) has been recorded during hopper dredge operations in the Philadelphia, Baltimore and New York Districts. Hopper dredging is relatively rare in New England waters where sea turtles are known to occur, with most hopper dredge operations being completed by the specialized Government owned dredge Currituck which operates at low suction and has been demonstrated to have a very low likelihood of entraining or impinging sea turtles. To date, no hopper dredge operations (other than the Currituck) have occurred in the New England District in areas or at times when sea turtles are likely to be present.

Most of the available information on the effects of hopper dredging on sea turtles in the USACE NAD has come from operations in Virginia waters, particularly in the entrance channels to the Chesapeake Bay. Since 1994, 63 sea turtles mortalities have been observed on hopper dredges operating in Virginia waters. In Thimble Shoals Channel, maintenance dredging took several turtles during the warmer months of 1996 (1 loggerhead) and 2000 (2 loggerheads, 1 unknown). A total of 6 turtles (5 loggerhead, 1 unknown) were taken in association with dredging in Thimble Shoal Channel during 2001, and one turtle was taken in May 2002 (1 loggerhead). Nine sea turtle takes were reported during dredging conducted in September and October 2003 (7 loggerhead, 1 Kemp's ridley, 1 unknown) and one sea turtle take (1 loggerhead) was reported in the summer of 2006. Most recently, Thimble Shoals Channel was dredged in the spring of 2009, with 3 loggerheads killed during this operation.

Incidental takes have occurred in the Cape Henry and York Spit Channels as well. In May and June 1994, parts of at least five sea turtles were observed (at least 4 loggerheads and 1 unknown) during dredging at Cape Henry. In September and October 2001, 3 turtle takes were observed (1 Kemp's ridley and 2 loggerheads). Eight turtle takes were observed during dredging at Cape Henry in April, May, June and October 2002 (1 green, 1 Kemp's and 6 loggerhead). Three loggerheads were killed during the dredging of the Cape Henry Channel in the summer of 2006. At York Spit, four loggerheads were taken in dredging operations occurring during one week in June 1994. Nine turtles were taken in dredging operations at York Spit in 2002 (8 loggerheads, 1 Kemp's ridley). York Spit was last dredged in the summer of 2007, with the take of 1 Kemp's ridley reported. In 1998, dredging in the York River Entrance Channel took 5 loggerheads. No turtles had been observed in dredging operations in Rappahannock Shoal Channels or the Sandbridge Shoals borrow area.

It should be noted that the observed takes may not be representative of all the turtles killed during dredge operations. Typically, endangered species observers are required to observe a total of 50% of the dredge activity (i.e., 6 hours on watch, 6 hours off watch). As such, if the observer was off watch or the cage was emptied and not inspected or the dredge company either

did not report or was unable to identify the turtle incident, there is the possibility that a turtle could be taken by the dredge and go unnoticed. Additionally, in older Opinions (i.e., prior to 1995), NMFS frequently only required 25% observer coverage and monitoring of the overflows which has since been determined to not be as effective as monitoring of the intakes. These conditions may have led to sea turtle takes going undetected.

NMFS raised this issue to the USACE during the 2002 season, after several turtles were taken in the Cape Henry and York Spit Channels, and expressed the need for 100% observer coverage. On September 30, 2002, the USACE informed the dredge contractor that when the observer was not present, the cage should not be opened unless it is clogged. This modification was to ensure that any sea turtles that were taken and on the intake screen (or in the cage area) would remain there until the observer evaluated the load. The USACE's letter further stated "Crew members will only go into the cage and remove wood, rocks, and man-made debris; any aquatic biological material is left in the cage for the observer to document and clear out when they return on duty. In addition, the observer is the only one allowed to clean off the overflow screen. This practice provides us with 100% observation coverage and shall continue." Theoretically, all sea turtle parts were observed under this scheme, but the frequency of clogging in the cage is unknown at this time. Obviously, the most effective way to ensure that 100% observer coverage is attained is to have a NMFS-approved endangered species observer monitoring all loads at all times. This level of observer coverage would document all turtle interactions and better quantify the impact of dredging on turtle populations. More recently issued Opinions have required 100% observer coverage which increases the likelihood of takes being detected and reported.

Sea turtles have been found resting in deeper waters, which could increase the likelihood of interactions from dredging activities. In 1981, observers documented the take of 71 loggerheads by a hopper dredge at the Port Canaveral Ship Channel, Florida (Slay and Richardson 1988). This channel is a deep, low productivity environment in the Southeast Atlantic where sea turtles are known to rest on the bottom, making them extremely vulnerable to entrainment. The large number of turtle mortalities at the Port Canaveral Ship Channel in the early 1980s resulted in part from turtles being buried in the soft bottom mud, a behavior known as brumation. Since 1981, 77 loggerhead sea turtles have been taken by hopper dredge operations in the Port Canaveral Ship Channel, Florida. Chelonid turtles have been found to make use of deeper, less productive channels as resting areas that afford protection from predators because of the low energy, deep water conditions. While sea turtle brumation has not been documented in mid-Atlantic or New England waters, it is possible that this phenomenon occurs in these waters.

It is likely that not all sea turtles killed by dredges are observed onboard the hopper dredge. Several sea turtles stranded on Virginia shores with crushing type injuries from May 25 to October 15, 2002. The Virginia Marine Science Museum (VMSM) found 10 loggerheads, 2 Kemp's ridleys, and 1 leatherback exhibiting injuries and structural damage consistent with what they have seen in animals that were known dredge takes. While it cannot be conclusively determined that these strandings were the result of dredge interactions, the link is possible given the location of the strandings (e.g., in the southern Chesapeake Bay near ongoing dredging activity), the time of the documented strandings in relation to dredge operations, the lack of other ongoing activities which may have caused such damage, and the nature of the injuries (e.g.,

crushed or shattered carapaces and/or flipper bones, black mud in mouth). Additionally, in 1992, three dead sea turtles were found on an Ocean City, Maryland beach while dredging operations were ongoing at a borrow area located 3 miles offshore. Necropsy results indicate that the deaths of all three turtles were dredge related. It is unknown if turtles observed on the beach with these types of injuries were crushed by the dredge and subsequently stranded on shore or whether they were entrained in the dredge, entered the hopper and then were discharged onto the beach with the dredge spoils.

A dredge could crush an animal as it was setting the draghead on the bottom, or if the draghead was lifting on and off the bottom due to uneven terrain, but the actual cause of these crushing injuries cannot be determined at this time. Further analyses need to be conducted to better understand the link between crushed strandings and dredging activities, and if those strandings need to be factored into an incidental take level. More research also needs to be conducted to determine if sea turtles are in fact undergoing brumation in mid-Atlantic or New England waters. Regardless, it is possible that dredges are taking animals that are not observed on the dredge which may result in strandings on nearby beaches.

Due to the nature of interactions between listed species and dredge operations, it is difficult to predict the number of interactions that are likely to occur from a particular dredging operation. Projects that occur in an identical location with the same equipment year after year may result in interactions in some years and none in other years as noted in the examples of sea turtle takes above. Dredging operations may go on for months, with sea turtle takes occurring intermittently throughout the duration of the action. For example, dredging occurred at Cape Henry over 160 days in 2002 with 8 sea turtle takes occurring over 3 separate weeks while dredging at York Spit in 1994 resulted in 4 sea turtle takes in one week. In Delaware Bay, dredge cycles have been conducted during the May-November period with no observed entrainment and as many as two sea turtles have been entrained in as little as three weeks. Even in locations where thousands of sea turtles are known to be present (e.g., Chesapeake Bay) and where dredges are operating in areas with preferred sea turtle depths and forage items (as evidenced by entrainment of these species in the dredge), the numbers of sea turtles entrained is an extremely small percentage of the likely number of sea turtles in the action area. This is likely due to the distribution of individuals throughout the action area, the relatively small area which is affected at any given moment and the ability of some sea turtles to avoid the dredge even if they are in the immediate area.

The number of interactions between dredge equipment and sea turtles seems to be best associated with the volume of material removed, which is closely correlated to the length of time dredging takes, with a greater number of interactions associated with a greater volume of material removed and a longer duration of dredging. The number of interactions is also heavily influenced by the time of year dredging occurs (with more interactions correlated to times of year when more sea turtles are present in the action area) and the type of dredge plant used (sea turtles are apparently capable of avoiding pipeline and mechanical dredges as no takes of sea turtles have been reported with these types of dredges). The number of interactions may also be influenced by the terrain in the area being dredged, with interactions more likely when the draghead is moving up and off the bottom frequently. Interactions are also more likely at times

and in areas when sea turtle forage items are concentrated in the area being dredged, as sea turtles are more likely to be spending time on the bottom while foraging.

Few interactions with listed sea turtles have been recorded during dredging at offshore borrow areas. This is likely due to the transitory nature of most sea turtles occurring in offshore borrow areas as well as the widely distributed nature of sea turtles in offshore waters. This lack of information is also largely due to the infrequency of dredging in offshore borrow areas in the USACE NAD, which makes it even more difficult to predict the likely number of interactions between this action and listed sea turtles. However, as sea turtles have been documented in the action area and suitable habitat and forage items are present, it is likely that sea turtles will be present in the action area when dredging takes place. As sea turtles are likely to be less concentrated in the action area than they are while foraging in Virginia waters such as the entrance channels to the Chesapeake Bay, the level of interactions during this project are likely to be fewer than those recorded during dredging in the Chesapeake Bay area (i.e., the Thimble Shoals and Cape Henry projects noted above).

In the USACE Sea Turtle Database, records for 38 projects occurring during “sea turtle season” (i.e., April 1 – November 30) are available that report the cubic yardage removed during a project (see Table 5). As noted above, the most complete information is available for the Norfolk district. Records for 22 projects occurring in the April – November time frame that report cubic yards removed are available for channels in the Chesapeake Bay (see Table 6). NMFS has made calculations from that data which indicate that, in the Chesapeake Bay, an average of 1 sea turtle is killed for approximately every 387,000 cy removed. This calculation has been based on a number of assumptions including the following: that sea turtles are evenly distributed throughout all channels and borrow areas for which takes have occurred, that all dredges will take an identical number of sea turtles, and that sea turtles are equally likely to be encountered throughout the April to November time frame.

Table 5. Dredging projects in USACE NAD with recorded cubic yardage

Project Location	Year of Operation	Cubic Yards Removed	Observed Takes
York Spit/Thimble Shoals, VA	2011	1,630,713	0
Cape Henry, VA	2011	2,472,000	0
York Spit Channel, VA	2009	372,533	0
Dewey and Bethany Beach, DE	2009	397,956	0
York Spit, VA	2007	608,000	1 Kemp’s ridley
Atlantic Ocean Channel, VA	2006	1,118,749	0
Thimble Shoal Channel	2006	300,000	1 Loggerhead
Dewey Beach/Cape Henlopen (DE Bay)	2005	1,134,329	0
Delaware Bay	2005	50,000	2 Loggerheads
Cape May Point, NJ	2005	2,425,268	0
Thimble Shoal Channel, VA	2004	139,200	0
VA Beach Hurricane Protection Project	2004	844,968	0

Thimble Shoal Channel, VA	2003	1,828,312	7 Loggerheads 1 Kemp's ridley 1 unknown
York River Entrance Channel, VA	2003	343,092	0
Off Ocean City MD	2002	744,827	0
Cape Henry, VA	2002	1,407,814	6 Loggerheads 1 Kemp's ridley 1 green
York Spit Channel, VA	2002	911,406	8 Loggerheads 1 Kemp's ridley
Chincoteague Inlet, VA	2002	84,479	0
Cape Henry, VA	2001	1,641,140	2 Loggerheads 1 Kemp's ridley
Thimble Shoal Channel, VA	2000	831,761	2 loggerheads 1 unknown
Cape Henry, VA	2000	759,986	0
York River Entrance Channel, VA	1998	672,536	6 Loggerheads
Off Ocean City MD	1998	1,289,817	0
York Spit Channel, VA	1998	296,140	0
Cape Henry, VA	1998	740,674	0
Atlantic Coast of NJ	1997	1,000,000	1 Loggerhead
Thimble Shoal Channel, VA	1996	529,301	1 Loggerhead
Delaware Bay	1995	218,151	1 Loggerhead
Cape Henry Channel, VA	1995	485,885	0
Bethany Beach (DE Bay)	1994	184,451	0
York Spit Channel, VA	1994	61,299	4 Loggerheads
Cape Henry, VA	1994	552,671	4 Loggerheads 1 unknown
Dewey Beach (DE Bay)	1994	624,869	0
Off Ocean City MD	1994	1,245,125	0
Off Ocean City MD	1992	1,592,262	3 Loggerheads
Off Ocean City MD	1991	1,622,776	0
Off Ocean City MD	1990	2,198,987	0
	TOTAL	33,361,477 cy	57 Turtles

Table 6. Projects in USACE NAD with recorded cubic yardage – Chesapeake Bay Only

Project Location	Year of Operation	Cubic Yards Removed	Observed Takes
York Spit/Thimble Shoals	2011	1,630,713	0
Cape Henry	2011	2,472,000	0
York Spit Channel	2009	372,533	0
York Spit	2007	608,000	1 Kemp's Ridley
Atlantic Ocean Channel	2006	1,118,749	0
Thimble Shoal Channel	2006	300,000	1 Loggerhead
Thimble Shoal Channel	2004	139,200	0

Thimble Shoal Channel	2003	1,828,312	7 Loggerheads 1 Kemp's ridley 1 unknown
York River Entrance Channel	2003	343,092	0
Cape Henry	2002	1,407,814	6 Loggerheads 1 Kemp's ridley 1 green
York Spit Channel	2002	911,406	8 Loggerheads 1 Kemp's ridley
Cape Henry	2001	1,641,140	2 Loggerheads 1 Kemp's ridley
Cape Henry	2001	1,641,140	0
Thimble Shoal Channel	2000	831,761	2 Loggerheads 1 unknown
Cape Henry	2000	759,986	0
York River Entrance Channel	1998	672,536	6 Loggerheads
York Spit Channel	1998	296,140	0
Cape Henry	1998	740,674	0
Thimble Shoal Channel	1996	529,301	1 Loggerhead
Cape Henry Channel	1995	485,885	0
York Spit Channel	1994	61,299	4 Loggerheads
Cape Henry	1994	552,671	4 Loggerheads 1 unknown
	<i>TOTAL</i>	<i>19,344,352 cy</i>	<i>50 turtles</i>

As noted above, sea turtles are likely to be less concentrated in the action area for this consultation than they are in the Chesapeake Bay area. Based on this information, NMFS believes that hopper dredges operating in the offshore borrow areas are less likely to interact with sea turtles than hopper dredges operating in the Chesapeake Bay area. Based on habitat characteristics and geographic area, the level of interactions during this project may be more comparable to the level of interactions recorded for dredging projects in Delaware Bay or offshore New York and New Jersey (i.e., Cape May, Sea Girt, lower Delaware Bay).

Records for 17 projects occurring during "sea turtle season" (i.e., April 1 – November 30) in the Baltimore, Philadelphia and New York District (all offshore) are available that report the cubic yardage removed during a project; however an important caveat is that observer coverage at these projects has ranged from 0 to 50% (see Table 7).

As explained above, for projects prior to 1995, observers were only present on the dredge for every other week of dredging. For projects in 1995 to the present, observers were present on board the dredge full time and worked a 6-hour on, 6-hour off shift. The only time that cages

(where sea turtle parts are typically observed) were cleaned by anyone other than the observer was when there was a clog. If a turtle or turtle part was observed in such an instance, crew were instructed to inform the observer, even if off-duty. As such, it is reasonable to expect that even though there was only 50% observer coverage, an extremely small amount of biological material went unobserved. To make the data from the 1993 and 1994 dredge events when observers were only on board every other week, comparable to the 1995-2006 data when observers were on board full time, NMFS has assumed that an equal number of turtles were entrained when observers were not present. This calculation is reflected in Table 7 as "adjusted entrainment number."

Table 7. Projects in USACE NAD with recorded cubic yardage (with Chesapeake Bay projects removed)

Project Location	Year of Operation	Cubic Yards Removed	Observed Entrainment	Adjusted Entrainment Number
Dewey and Bethany Beach (DE)	2009	397,956	0	0
Dewey Beach/Cape Henlopen (DE Bay)	2005	1,134,329	0	0
Delaware Bay	2005	50,000	2 Loggerhead	2 Loggerhead
Cape May	2005	2,425,268	0	0
VA Beach Hurricane Protection Program	2004	844,968	0	0
Off Ocean City MD	2002	744,827	0	0
Chincoteague Inlet	2002	84,479	0	0
Offshore New Jersey	1997	1,000,000	1 Loggerhead	1 Loggerhead
Off Ocean City MD	1998	1,289,817	0	0
Delaware Bay	1995	218,151	1 Loggerhead	1 Loggerhead
Bethany Beach (DE Bay)	1994	184,451	0	0
Dewey Beach (DE Bay)	1994	624,869	0	0
Off Ocean City MD	1994	1,245,125	0	0
Off Ocean City MD	1992	1,592,262	3 Loggerheads	6 Loggerheads
Off Ocean City MD	1991	1,622,776	0	0
Off Ocean City MD	1990	2,198,987	0	0
	TOTAL	15,658,265 cy	7 Loggerheads	10 Loggerheads

As information available (number of days dredged, cubic yards removed) on projects outside of the Chesapeake Bay is incomplete and observer coverage has been relatively low, it is difficult to estimate the number of sea turtles likely to be taken in these areas. It is reasonable, based on the available information, to calculate the number of sea turtles entrained during projects where cubic yardage is available, not just for projects where entrainment has occurred (which would overestimate the likelihood of interactions). Using this method, and based on the adjusted

entrainment number in Table 7, an estimate of 1 sea turtle per 1.6 million cubic yards is calculated. As noted above, it is likely that including the Chesapeake Bay data would overestimate the number of interactions in offshore borrow areas likely due to the concentration of sea turtles in the Chesapeake Bay and differences in habitat between the Chesapeake Bay entrance channels and the offshore channels or borrow areas considered above. Based on this approach, we estimate that dredging in offshore borrow areas outside of the Chesapeake Bay is likely to result in the entrainment of 1 sea turtle for every 1.6 million cubic yards of material removed by a hopper dredge. This calculation is based on a number of assumptions including the following: that sea turtles are evenly distributed throughout all borrow areas, that all dredges have a similar entrainment rate, and that sea turtles are equally likely to be encountered throughout the April to November time frame.

Sea turtle species likely to be entrained

With the exception of one green turtle entrained in a hopper dredge operating in Chesapeake Bay, all other sea turtles entrained in dredges operating in the USACE NAD have been loggerheads and Kemp's ridley. Of these 73 sea turtles, 63 have been loggerhead, 5 have been Kemp's ridleys, 1 green and 4 unknown. Overall, of those identified to species, approximately 90% of the sea turtles taken in dredges operating in the USACE North Atlantic Division have been loggerheads. No Kemp's ridleys or greens have been entrained in dredge operations outside of the Chesapeake Bay area. The high percentage of loggerheads is likely due to several factors including their tendency to forage on the bottom where the dredge is operating and the fact that this species is the most numerous of the sea turtle species in Northeast and Mid-Atlantic waters. It is likely that the documentation of only one green sea turtle entrainment in Virginia dredging operations is a reflection of the low numbers of green sea turtles that occur in waters north of North Carolina. The low number of green sea turtles in the action area makes an interaction with a green sea turtle extremely unlikely to occur.

Based on the above information, we expect that 1 sea turtle is likely to be injured or killed for approximately every 1.6 million cy of material removed from the proposed borrow area and that at least 90% will be loggerheads. As described above, the proposed action will be undertaken in two phase (Phase 1 starting between 2012 to 2014; Phase 2 starting between 2017-2019), with 340,000 cy yards removed from the borrow area during Phase 1, and 410,000 cy of material removed from the borrow area during Phase 2. In total, 750,000 cy of material will be removed from the borrow area following completion of Phase 1 and 2 of the proposed action. Based on this information, we anticipate that no more than 1 sea turtle is likely to be entrained over the life of the proposed action (i.e., through 2020). Due to the nature of the injuries expected to result from entrainment, all of the turtles are expected to die.

NMFS expects that nearly all of the sea turtles will be loggerheads and that the entrainment of a Kemp's ridley during a particular dredge cycle will be rare; however, as Kemp's ridleys have been documented in the action area and have been entrained in hopper dredges, it is possible that this species will interact with the dredge over the course of the project life. As such, over the life of the proposed action either 1 loggerhead or 1 Kemp's ridley sea turtle could be killed in hopper dredging operations; however, it is likely that this one sea turtle will be a loggerhead sea turtle as approximately 90% of the sea turtles taken in dredges operating in the USACE NAD have been

loggerheads.

As explained in the Status of the Species section, it is likely that the sea turtles entrained in hopper dredges operating in the waters off Virginia originate from several of the recovery units, primarily from the PFRU, NRU, and GCRU, with smaller amounts possible from the DTRU and NGMRU. Based on the best available information on sea turtles in the action area, NMFS anticipates that a loggerhead entrained at the Sandbridge Shoal borrow site is likely to be either a benthic immature or sexually mature turtle. There is no information to suggest that either sex is disproportionately taken in hopper dredges. Therefore, either a male or female loggerhead may be entrained in the dredge.

7.1.2.2 Atlantic Sturgeon

Atlantic sturgeon are vulnerable to entrainment in hopper dredges. However, given the large size of adults (greater than 150cm) and the size of the openings on the dragheads, adults are unlikely to be vulnerable to entrainment. USACE reports that from 1990-2011, 30 interactions with sturgeon occurred during dredge operations. Of these, 17 were reported as Atlantic sturgeon, with 15 of these entrained in hopper dredges. Of the 7 Atlantic sturgeon for which size is available, all were juveniles. Information on these interactions is presented in Table 8. Most of these interactions occurred within rivers and harbors; however, to date, few records exist for interactions between hopper dredges and Atlantic sturgeon along coastal/offshore borrow sites (Table 9).

Table 8. USACE Atlantic Sturgeon Entrainment Records from Hopper Dredge Operations 1990-2011

Project Location	Corps Division/District*	Month/Year of Operation	Cubic Yards Removed	Observed** Entrainment
Winyah Bay, Georgetown (SC)	SAD/SAC	Oct-90	517,032	1
Savannah Harbor (GA)	SAD/SAS	Jan-94	2,202,800	1
Savannah Harbor	SAD/SAS	Dec-94	2,239,800	2
Wilmington Harbor, Cape Fear River (NC)	SAD/SAW	Sep-98	196,400	1
Charleston Harbor (SC)	SAD/SAC	Mar-00	5,627,386	2
Brunswick Harbor (GA)	SAD/SAS	Feb-12	1,459,630	1
Charleston Harbor	SAD/SAC	Jan-04	1,449,234	1
Brunswick Harbor	SAD/SAS	Mar-05	966,000	1
Brunswick Harbor	SAD/SAS	Dec-06	1,198,571	1
Savannah Entrance Channel	SAD/SAS	Nov-07	973,463	1
Sandy Hook Channel (NJ)	NAD/NANY	Aug-Nov-08	23,500	1

York Spit (VA)	NAD/NAN	Apr-11	700,000	2
		Total	17,553,816	15

* SAD= South Atlantic Division; NAD= North Atlantic Division; SAC=Charleston District; SAS=Savannah District; SAW=Wilmington District; NANY=New York District; NAN=Norfolk District.

** Records based on sea turtle observer reports which record listed species entrained , as well as all other organisms entrained during dredge operations.

Table 9: Atlantic Sturgeon Entrainment: Coastal/Offshore Projects in USACE NAD Since 1998 with Recorded Cubic Yardage

*a: 14 Atlantic sturgeon removed during pre-dredge trawl/relocation trawling (September and November, 2003).

*b: 1 Atlantic sturgeon removed during pre-dredge trawl/relocation trawling on 10/26/02.

*c: 1 Atlantic sturgeon removed during pre-dredge trawl/relocation trawling on 11/02/02.

Project Location	Year of Operation	Cubic Yards Removed	Observed Entrainment	Observed Entrainment
York Spit Channel, VA	2011	1,630,713	2	2
Cape Henry, VA	2011	2,472,000	0	0
York Spit Channel, VA	2009	372,533	0	0
Dewey and Bethany Beach, DE	2009	397,956	0	0
Sandy Hook Channel, NJ	2008	23,500	1	1
York Spit Channel, VA	2007	608,000	0	0
Atlantic Ocean Channel, VA	2006	1,118,749	0	0
Thimble Shoal Channel	2006	300,000	0	0
Dewey Beach/Cape Henlopen	2005	1,134,329	0	0
Cape May Point, NJ	2005	2,425,268	0	0
Thimble Shoal Channel, VA	2004	139,200	0	0
VA Beach Hurricane Protection Project	2004	844,968	0	0
Thimble Shoal Channel, VA (*a)	2003	1,828,312	0	0
Off Ocean City MD	2002	744,827	0	0
Cape Henry, VA (*b)	2002	1,407,814	0	0

York Spit Channel, VA (*c)	2002	911,406	0	0
Cape Henry, VA	2001	1,641,140	0	0
Thimble Shoal Channel, VA	2000	831,761	0	0
Cape Henry, VA	2000	759,986	0	0
Off Ocean City MD	1998	1,289,817	0	0
York Spit Channel, VA	1998	296,140	0	0
Cape Henry, VA	1998	740,674	0	0
Atlantic Coast of NJ	1997	1,000,000	0	0
Thimble Shoal Channel, VA	1996	529,301	0	0
Cape Henry Channel, VA	1995	485,885	0	0
Bethany Beach, DE	1994	184,451	0	0
York Spit Channel, VA	1994	61,299	0	0
Cape Henry, VA	1994	552,671	0	0
Dewey Beach, DE	1994	624,869	0	0
Off Ocean City MD	1994	1,245,125	0	0
Off Ocean City MD	1992	1,592,262	0	0
	TOTAL	28,194,956	3	3

* Records based on sea turtle observer reports which record listed species entrained as well as all other organisms entrained during dredge operations.

In the Northeast Region (Maine through Virginia), endangered species observers have been present on all hopper dredges operating between April 1 and November 30 since 1992. While the primary responsibility of observers is to document sea turtle interactions, observers document all biological material entrained in the dredges. As such, they record any interactions with sturgeon. Sturgeon interactions have routinely been reported to NMFS. Therefore, we expect that the "observed entrainment" numbers noted above are comprehensive and that any interactions with Atlantic sturgeon would be recorded. While observers have not operated on dredges working from December – March, in the Northeast Region, dredging during this time of year is rare (due to weather conditions), and we do not anticipate that there are many undocumented interactions between Atlantic sturgeon and hopper dredges. Dredging in the offshore environment, such as where this project will occur, is very rare in the winter months.

In general, entrainment of large mobile animals, such as sturgeon or sea turtles, is relatively rare. Several factors are thought to contribute to the likelihood of entrainment. In areas where animals

are present in high density, the risk of an interaction is greater because more animals are exposed to the potential for entrainment. It has also been suggested that the risk of entrainment is highest in areas where the movements of animals are restricted (e.g., in river channels) where there is limited opportunity for animals to move away from the dredge. Because dredging will occur in an open ocean environment, the movements of Atlantic sturgeon will not be restricted, and we anticipate that most Atlantic sturgeon will be able to avoid the dredge. Further, because Atlantic sturgeon are likely to be using the borrow sites as a migration corridor and are not aggregated in this area, the density of Atlantic sturgeon in this area is likely to be very low. The hopper dredge draghead operates on the bottom and is typically at least partially buried in the sediment. Sturgeon are benthic feeders and are often found at or near the bottom while foraging or while moving within rivers. Information suggests that Atlantic sturgeon migrating in the marine environment do not move along the bottom but move further up in the water column. If Atlantic sturgeon are up off the bottom while in offshore areas, such as the borrow areas, the potential for interactions with the dredge are further reduced. Based on this information, the likelihood of an interaction of an Atlantic sturgeon with a dredge operating under the proposed action is expected to be low.

However, because we know that entrainment is possible and that not all mobile animals will be able to escape from the dredge (as evidenced by past entrainment of sea turtles and sturgeon), we anticipate that entrainment is still possible and as such, effects of these interactions on Atlantic sturgeon must be assessed. As noted above, outside of rivers/harbors, only 3 Atlantic sturgeon have been observed entrained in a hopper dredge (see Table 9). The low level of interactions may be, in part, due to the use of pre-trawl/dredge relocation trawling (see Table 9; just because 0 Atlantic sturgeon were entrained in some locations, Atlantic sturgeon were still documented prior to dredging operations) or the infrequency of dredging offshore borrow/coastal areas in the USACE NAD. It is also possible that interactions with Atlantic sturgeon have occurred and not been reported to NMFS; however, based on information that has been provided to NMFS and discussions with observers, under-reporting is likely to be very rare.

Based on what we know about Atlantic sturgeon behavior in coastal/offshore areas such as the borrow areas, it is reasonable to consider that the risk of entrainment at these borrow areas is similar to that at other non-riverine/harbor areas. Some of the areas considered in this analysis (see Table 9) are closer to shore than the borrow areas and may be more heavily used than the borrow area. Thus, an estimate of interactions derived from this information is likely an overestimate. However, at this time, this is the best available information on the potential for interactions with Atlantic sturgeon in the borrow areas.

It is important to note that because observer coverage has been variable, observed interactions may not be representative of all Atlantic sturgeon injured or killed during dredge. As such, we have adjusted the entrainment numbers to account for any instances where observer coverage was less than 100%.

Past experience calculating the likelihood of interactions between hopper dredges and other species (i.e., sea turtles) indicates that there is a relationship between the number of animals entrained and the volume of material removed. The volume of material removed is correlated to

the amount of time spent dredging but is a more accurate measure of effort because reports often provide the total days of a project but may not provide information on the actual hours of dredging vs. the number of hours steaming to the disposal site or in port for weather or other delays. Thus, we will use information available for all non-riverine/harbor projects in the mid-Atlantic for which cubic yards of material removed are available to calculate the number of Atlantic sturgeon likely to be entrained during dredging operations. Using this method, and using the dataset presented in Table 9, we have calculated an entrainment rate of 1 Atlantic sturgeon is likely to be injured or killed for approximately every 9.4 million cy of material removed from the proposed borrow area. This calculation is based on a number of assumptions including the following: that Atlantic sturgeon are evenly distributed throughout the action area, that all dredges will have the same entrainment rate, and that Atlantic sturgeon are equally likely to be encountered throughout the time period when dredging will occur. While this estimate is based on several assumptions, it is reasonable because it uses the best available information on entrainment of Atlantic sturgeon from past dredging operations, including dredging operations in the vicinity of the action area, it includes multiple projects over several years, and all of the projects have had observers present which we expect would have documented any entrainment of Atlantic sturgeon.

As described above, the proposed action will be undertaken in two phase (Phase 1 starting between 2012 to 2014; Phase 2 starting between 2017-2019), with 340,000 cy yards removed from the borrow area during Phase 1, and 410,000 cy of material removed from the borrow area during Phase 2. In total, 750,000 cy of material will be removed from the borrow area following completion of Phase 1 and 2 of the proposed action. Based on this information, we anticipate that no more than 1 Atlantic sturgeon is likely to be entrained over the life of the proposed action (i.e., through 2020). Due to the nature of the injuries expected to result from entrainment the sturgeon is expected to die. As such, over the life of the project (i.e., up to 2020), NMFS anticipates that up to 1 Atlantic sturgeon could be killed. Because we expect that adult Atlantic sturgeon are too large to be vulnerable to entrainment and given the size of other sturgeon that have been entrained in other hopper dredging operations, we expect that this sturgeon will be a subadult.