United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
6669 Short Lane
Gloucester, Virginia 23061

MAR 31 2010

Colonel Andrew W. Backus
U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

Attn: Adrian Jennings, Regulatory Branch

Re: Biological Opinion for Jason Rowe (Gwynn's Island), Mathews County, Virginia, Corps Permit # 09-1529, Project # 2010-F-0044

Dear Colonel Backus:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the permit application for the proposed construction of two 130 foot long low profile stone groins on Gwynn's Island, Mathews County, Virginia, and its effects on the federally listed threatened northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*). This biological opinion is submitted in accordance with section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA). Formal consultation was initiated on December 9, 2009.

This biological opinion is based on information provided in the completed permit application package, received December 9, 2009; telephone conversations; field investigations; published peer reviewed literature; and other sources of information. A complete administrative record of this consultation is on file in this office.

CONSULTATION HISTORY

04-08-09 Initial notification about the proposed project received by the Service.

04-22-08 Service site visit with the U.S. Army Corps of Engineers (Corps), and receipt of Corps permit application package 09-v0163.

06-04-09 The Service sent a letter to the Corps acknowledging initiation of formal consultation.

08-18-09	The Service requested a three week extension to formal consultation from the Corps.
08-18-09	The Corps agreed to extend the completion date to September 25, 2009.
08-20-09	The Service received notification that the Mathews County Wetlands Board had denied the permit for the project. In response to the County's action the Corps withdrew the permit application.
10-29-09	The Corps provided the Service a new permit application (09-1529) for the construction of two groins with beach augmentation.
11-1-09 to 12-4-09	The Service and the Corps had multiple phone conversations and exchanged emails to understand the beach augmentation portion of the application. The Corps indicated that the applicant did not intend to conduct beach augmentation as described in the permit. The applicant removed beach augmentation from the proposed project to minimize potential impacts to the tiger beetle.
12-09-10	The Corps initiated formal consultation with the Service.
01-12-10	In response to Service recommendations, the applicant agreed to place sand excavated during groin construction channelward of mean low water (MLW) to avoid disturbance of potential larval tiger beetle habitat and aid in shoreline equilibration following construction.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The proposed project is located in Gwynn's Island, Mathews County, Virginia (Figures 1 and 2). The applicant proposes to construct two low-profile stone groins approximately 110 feet (ft) in length, extending from landward of the primary dune to 42 ft channelward of mean high water (MHW) (Figures 3 and 4). The original permit application included the placement of 7,200 ft^2 of beach nourishment between MHW and MLW. The applicant agreed to modify the proposed action by removing beach nourishment from the project and placing sand excavated from the footprint of the groins channelward of MLW. In addition, the applicant has agreed to complete the work outside the time-of-year restrictions (June 1 to September 15). Construction activities are expected to be limited to a 35 ft wide by 80 ft long stretch of beach extending from the back beach into the water beyond the intertidal beach at both groin sites. Each groin site has an upland access area that will avoid the need for construction vehicles to travel on the beach between the groins for construction purposes (Figure 5). A drainage ditch along the northern property line

will be redirected to a buried 12 inch corrugated pipe that will cross the property and be encased within the northern groin with the outflow at the terminus of the groin structure.

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The project area consists of approximately 300 ft of a 450 ft long remnant natural beach that has hardened shoreline structures to the north and south. To the north, there is a narrow remnant beach channelward of a revetment, and a groin and dock also lie to the north within 100 ft of the property boundary. The southern extent of this natural beach is demarcated by a rock revetment at water's edge with no beach fronting the structure. The Service has determined that the action area for this project is the 550 ft long stretch of beach extending from 100 ft north of the applicant's property boundary to the southern end of the 450 ft long natural beach, and extending from MLW to the former dune system, an area approximately 55,000 ft^2 in size.

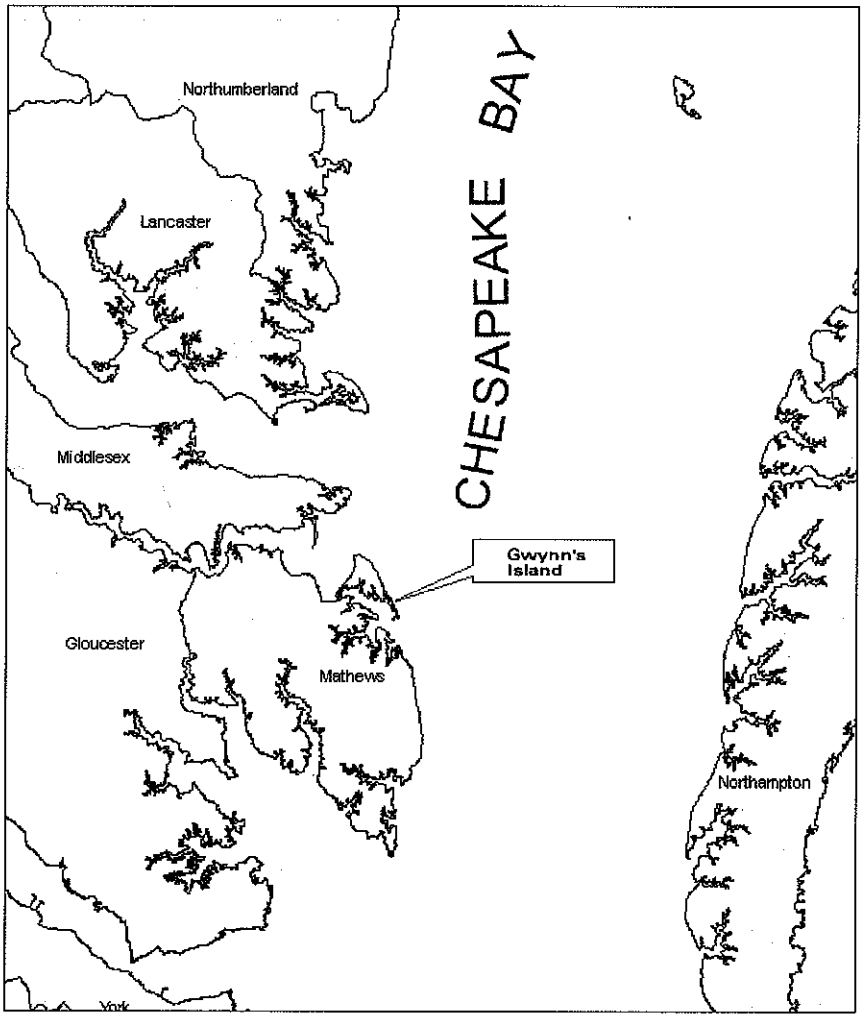

Figure 1. General area map showing Gwynn's Island, Mathews County, Virginia.

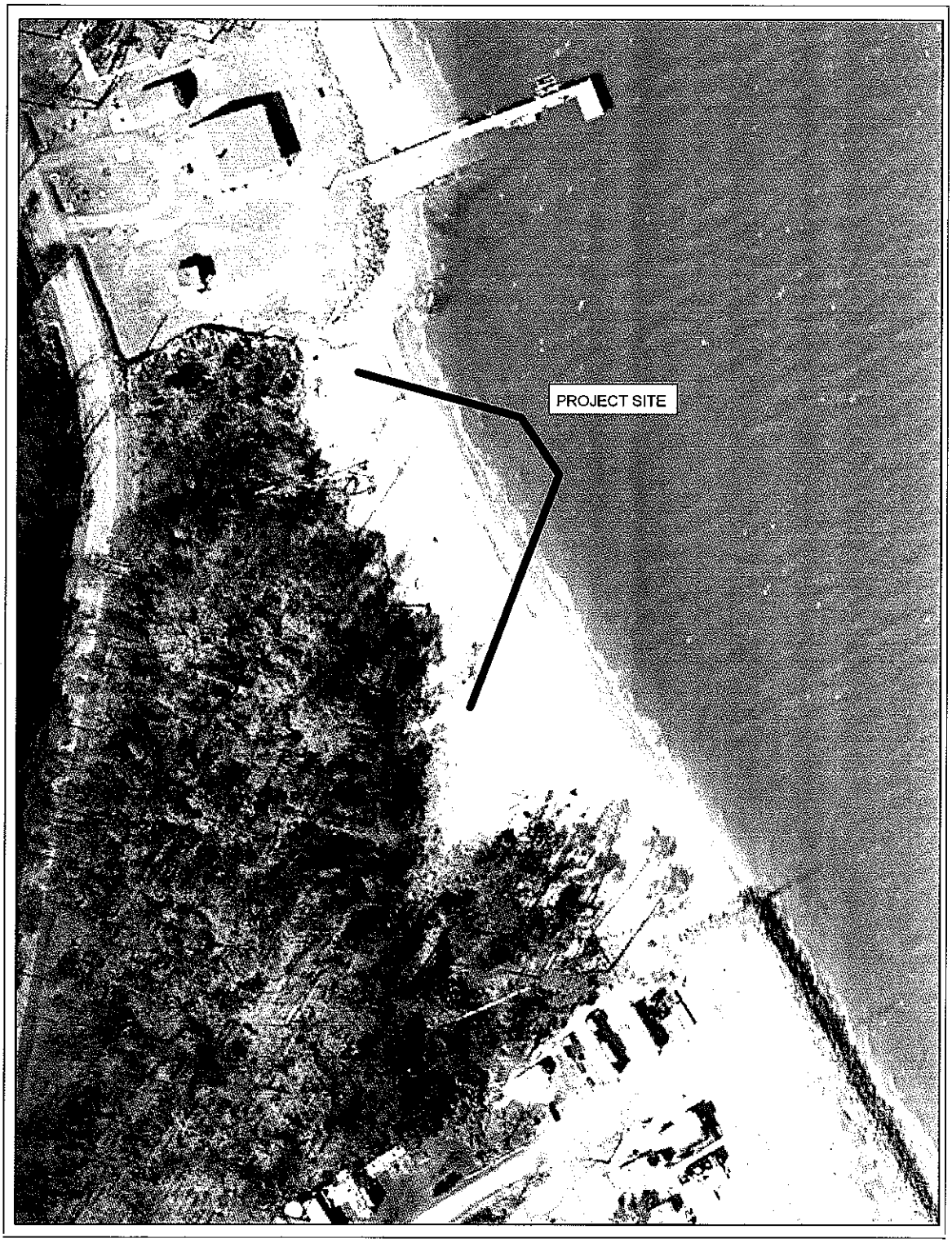

Figure 2. 2007 aerial photograph of project site, Gwynn's Island, Mathews County, Virginia.

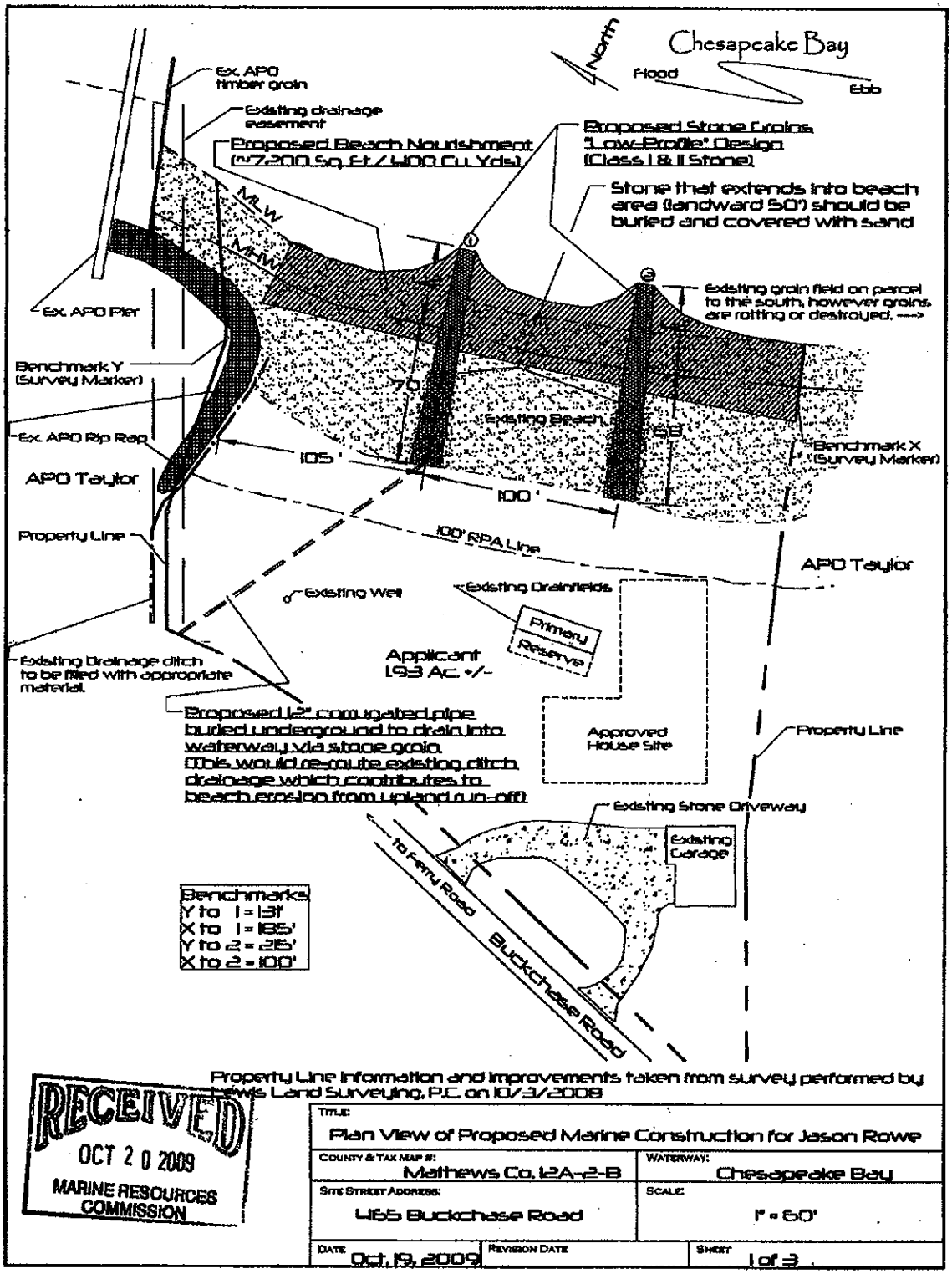

Figure 3. Plan view of proposed groin construction - Jason Rowe, Mathews County, Virginia. The revised project description has removed the beach nourishment shown in the figure.

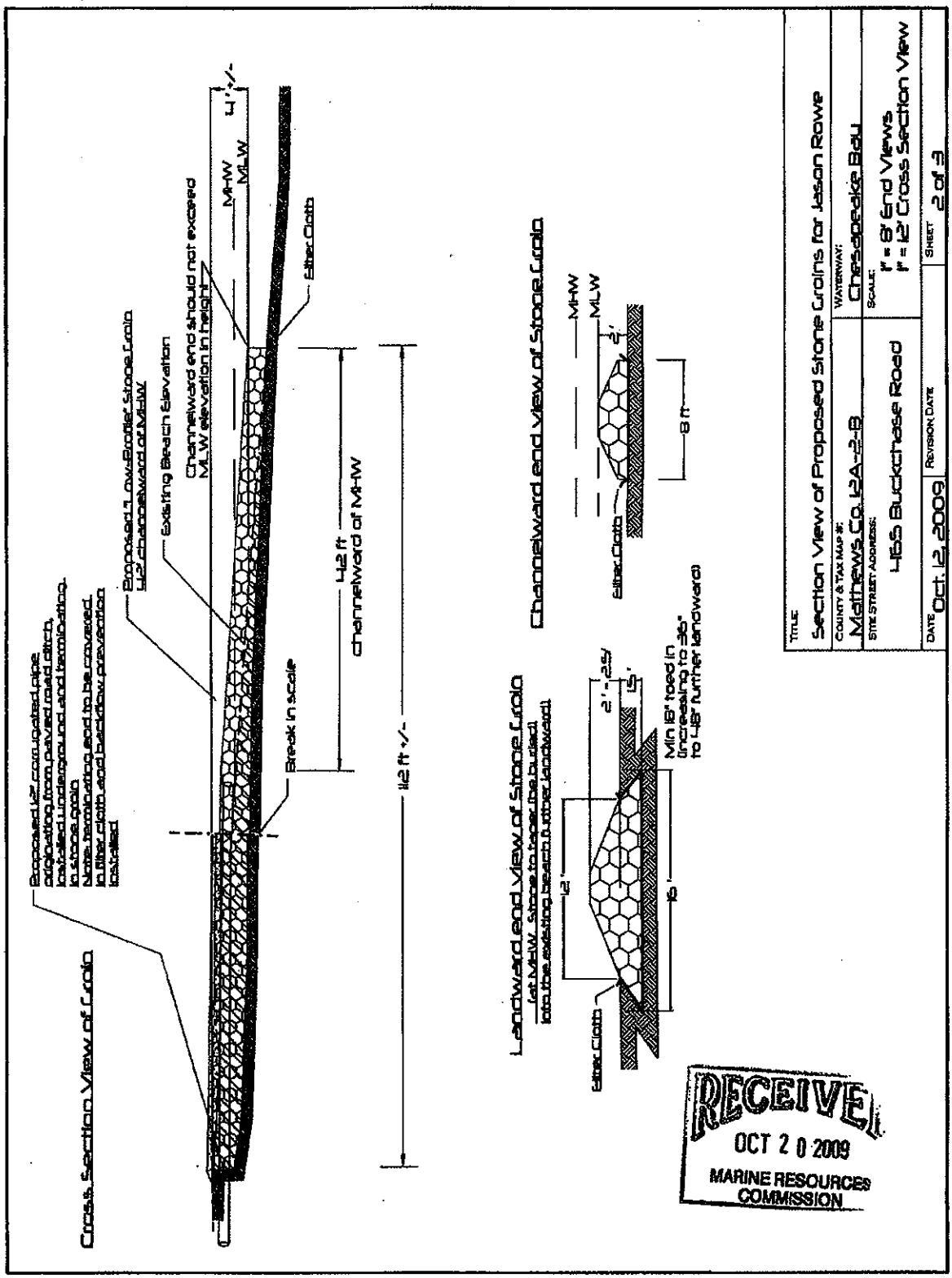

Figure 4. Section view of proposed groins - Jason Rowe, Mathews County, Virginia.

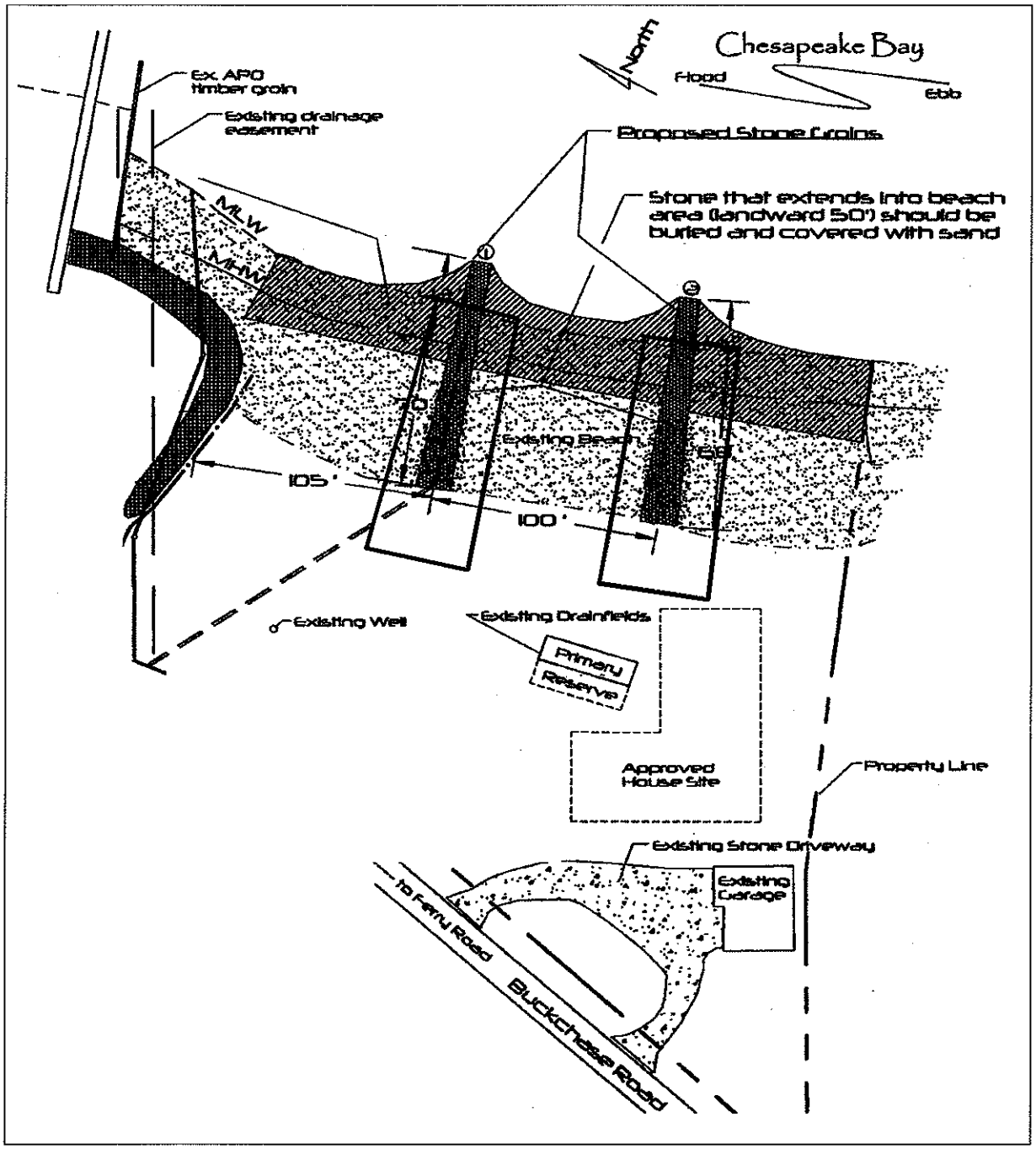

Figure 5. Access will be from the upland side using the work corridors outlined in blue (not drawn to scale).

STATUS OF THE SPECIES RANGEWIDE

Species Description and Life History - The northeastern beach tiger beetle is a beach-dwelling insect measuring approximately 1.3 centimeters (cm) (0.5 in) in length. It has white to light tan wing covers, often with several fine grayish-green lines, and a bronze-green head and thorax (Service 1994). Adult tiger beetles are active, diurnal surface predators. They forage along the water's edge on small amphipods, flies, and other beach arthropods, or scavenge on dead amphipods, crabs, and fish (Knisley et al. 1987; Service 1994). Most foraging occurs in the damp sand of the intertidal zone and scavenging has been observed to occur more often than predation (Knisley et al. 1987). Adult tiger beetles are present on beaches from early June through early September, and they spend most of the day along the water's edge (Knisley et al. 1987). Adults are active on warm, sunny days when they can be seen feeding, mating, or basking (Service 1994). They are less active on rainy, cool, or cloudy days because they cannot maintain their body temperature (C.B. Knisley, Randolph-Macon College, pers. comm. 1994). They rely on a variety of behaviors, such as foraging and basking, to maintain their high body temperatures (Knisley et al. 1987).

Adult beetles mate and lay eggs on the beach during the summer (starting in June and ending by mid July). Eggs are deposited on the beach near the sand surface or in shallow pits excavated by adults, usually within 1 inch of the beach surface (Knisley 1997b). The eggs hatch in 10-14 days, depending on soil moisture. Adequate moisture may allow a shorter hatch period (C.B. Knisley, pers. comm. 2008). Larvae pass through three instar stages, pupate, and emerge as adults two years following hatching (Knisley et al. 1987; Service 1994). However, some larvae that hatch early and find sufficient food may develop more rapidly and emerge as adults after only one year (Service 1994). Development through three larval stages and pupation takes place within a larval burrow (Knisley et al. 1987). First instars generally occur from late August through September, second instars from September to late fall, and third instars from late fall to early spring and through the second year (Knisley et al. 1987). Knisley et al. (1987) found that the distribution of first and second instars was similar and that highest densities of third instars were higher on the beach in the mid- to upper-tidal zone. Therefore, most burrows were underwater during high tide. Larvae can survive flooding for 3-6 days (Service 1994). Larval burrow depths ranged from 9-24 cm (3.5-9.5 in) and increased with distance from the water's edge, suggesting that burrow depth may be related to subsurface moisture (Knisley et al. 1987). Larvae lack a hard cuticle and are susceptible to desiccation. They tend to become inactive during hot, dry conditions (Service 1994). Larvae are active primarily at night and plug their burrows during most of the day. Generally, larval burrows are plugged and not visible when the sand is dry and warm.

Larvae feed by ambushing passing prey. Little is known about the precise types of microarthropods eaten by the beetle larvae, but prey that have been identified include beach fleas, lice, flies, ants, and other small insects (Pearson et. al. 2006, Knisley 2008). While little information

on the necessary prey abundance is known, lack of prey base may explain why the beetles are not found in certain areas.

Larvae typically occur in an area of beach 8-12 m (26-39 ft) wide within and above the intertidal zone. However, the area where larvae occur may be wider in areas of washover or where the upper beach is flat and is periodically inundated by high tides (Service 1994). Larvae have been documented on beaches less than 8 m (26 ft) wide. Larvae have been found crawling on the beach, apparently moving to dig a new burrow in a better location (Service 1994). This behavior is likely a response to variations in tide levels, soil moisture, or sand accretion and erosion patterns. Larvae overwinter in their burrows until mid-March, with low levels of activity when the sand is damp and cool (C.B. Knisley, pers. comm. 1994). Highest, most predictable periods of larval activity are from late August through early November. Larval activity is highly variable and greatly influenced by temperature, substrate moisture, tide levels, and season (Service 1994).

Knisley et al. (1987) found that first emergence of adults ranged from June 5-13 in Virginia. Rainfall appears to enhance emergence since numbers of adults usually increase after a rainfall. The number of adult beetles increases rapidly in June, peaks in mid-July, begins to decline through August, and few adults can be found in September.

There is a period of approximately two weeks after adults emerge when there is little to no dispersal (Hill and Knisley 1994). Then, a small number of adult beetles disperse to other sites. There is a regular dispersal phase after peak numbers emerge in early July (Knisley and Hill 1989; Service 1994). Mark-recapture studies have determined that adult tiger beetles may travel 8-19 kilometers (km) (Knisley and Hill 1989) from sites where they were marked, and some individuals may disperse up to 24 km (Knisley 1997a). In Northumberland County, Virginia a total of 10,131 adults were marked and released; 91 beetles dispersed to new sites (mainly between two close, large sites 1.5 km apart) (Hill and Knisley 1994). Large sites seem to serve as recruitment areas, while small sites serve as stop-overs during dispersal (Hill and Knisley 1994). "It is probable that feeding or resting occur at these smaller sites and that without them, the larger sites may not experience as much migration" (Hill and Knisley 1994). This dispersal serves to exchange genetic material, allow for the colonization of unoccupied sites, and enable beetles to leave eroding sites (Hill and Knisley 1994).

Survey data from 1998-2002 (Knisley and Hill 1998; Knisley and Hill 1999; Knisley 2001; Knisley 2002) indicate that beaches with a length of at least 100 m (328 ft), a width of at least 2 m (6.5 ft), and an adult population of at least 30, serve as breeding sites and larvae should be considered present. Optimal tiger beetle habitat is a beach greater than 5-8 m (16-26 ft) wide (C.B. Knisley, pers. comm. 1994). Preference for beaches between 2.5-6 m (8-20 ft) was found to be statistically significant, and beetles are rarely found on beaches less than 2 m (6.5 ft) in width (Drummond 2002). Adult and larval beetles are typically found on highly dynamic beaches with back beach vegetation, and they prefer long, wide beaches that have low human and vehicular activity, fine sand particle size, and a high degree of exposure (Knisley et al.1987).

Although narrow beach width is frequently the reason for lack of larvae, there are instances where larvae have variable densities or are absent on wide beaches. Knisley (1997b) found that the larvae are rare on sites with less than 5 degrees slope. Though not statistically significant, Drummond (2002) found indications that the beetles prefer beaches with slopes of 6.5 degrees and greater. Preliminary work indicates a correlation between the extent of shallow water fronting the beach and the number of tiger beetles present (the more sand bars, the more beetles) (Drummond 2002). A beetle with sedentary larvae is susceptible to wave impacts, and work by Rosen (1980) has shown that the greater the shallow zone fronting a beach, the lower the wave energy. There appears to be no beach aspect preference for the beetle (Drummond 2002).

Limited studies have been conducted to define the sand characteristics at sites where tiger beetles currently occur, and further studies are needed to accurately identify the sand characteristics that tiger beetles need to support all life stages. Knisley (1997b) found that larval densities were highly variable relative to sand particle size, and that larvae are rare at sites with greater than 60% coarse sand (defined as the percentage of sand particles too large to sieve through the 100-size mesh sieve) (Knisley 1997b). Drummond (2002) found that adults occupied beaches with 40-80% coarse sand. If the sand size is too coarse, too fine, or contains a high organic content, it appears unsuitable for the larvae to burrow and maintain a larval tube. Preliminary data indicate that the beetle is found on beaches with a narrow range of bulk density (2.25-2.75 grams/cubic centimeter) (Drummond 2002). Bulk density may impact beetle distribution in two ways: (1) stability of larval burrows, and (2) prey base availability (Drummond 2002). Bulk density affects microarthropod abundance and type (Blair et al 1994). During a study of two beach nourishment projects, Fenster et al. (2006) found that the tiger beetle prefers beaches with sands having a mean grain size of 0.5 to 0.6 mm, and with relatively compacted sediment. Mean grain size and sediment compaction are biologically important factors during oviposition and burrow building. Females oviposit in particular sediment types based on the shape of their ovipositor (Fenster et al. 2006). Larvae require sediments that they can build borrows in that do not collapse (Fenster et al. 2006).

Population Dynamics - Populations of the northeastern beach tiger beetle are highly variable from year to year because they are subject to local extirpations (from storm events impacting the larval stage) and are affected by movements (dispersal and recolonization) (Service 1994). Two- to three-fold year-to-year variation in numbers at a given site is common (Knisley and Hill 1989; Knisley and Hill 1990). The Service funded a population viability analysis (PVA) for the Chesapeake Bay populations of the tiger beetle, the purpose of which was to compare management strategies, not to estimate extinction probabilities, per se (Gowan and Knisley 2001). The PVA compared six management strategies and found that without increased protection of the most important tiger beetle populations, the extinction probability throughout its range over the next century is high (Gowan and Knisley 2001). The PVA concluded that protection of 25-50 subpopulations is necessary to reduce extinction risk for the tiger beetle throughout the Bay (Gowan and Knisley 2001). The difficulty lies in selecting sites that assure adequate geographic coverage (Gowan and Knisley 2001).

Northeastern beach tiger beetles in the Chesapeake Bay and Massachusetts are currently physically and genetically isolated from each other. Vogler et al. (1993) examined genetic variation in these populations. They found that the isolated Martha's Vineyard population and Chesapeake Bay populations had very low genetic variability. "The Martha's Vineyard population can be further distinguished by the presence of an allozyme allele . . . that has not been observed in the Chesapeake Bay beetles" (Service 1994). "Thus, although populations from these two areas represent the same subspecies, they should be considered as separate conservation units (Vogler and DeSalle 1994)" (Service 1994). Additional genetic work supports treating the Massachusetts population as a distinct group from the Chesapeake Bay populations with regards to species recovery and management (Vogler and Goldstein 1997).

Rangewide Status - Historically, the northeastern beach tiger beetle was a common inhabitant of coastal beaches from Cape Cod, Massachusetts to central New Jersey, and along the Chesapeake Bay, from Calvert County, Maryland south through Virginia. To facilitate the reestablishment of the species across its former range, the Northeastern beach tiger beetle recovery plan established nine Geographic Recovery Areas (GRAs) to provide a framework within which protection and population efforts could be ranked and implemented (Service 1994). Table 1 provides a summary of the status of each GRA.

Two tiger beetle populations occur in Massachusetts at Martha's Vineyard (GRA 1) and a site near Westport. The highest number of adult beetles observed at Martha's Vineyard was 2,300 in 2005, but declined to 1,000 in 2006. Despite changes in population size, this population appears to be stable (S. von Oettingen, Service, pers. comm. 2006, 2008). The Westport population was discovered in 1994 (152 adults observed) but declined to 10 adults in 1995 and to 2 adults in 2001. The tiger beetle has not been seen at the Westport site since 2001 and is likely extirpated (S. von Oettingen, pers. comm. 2001, 2008). An attempt to establish a new population at Monomoy NWR, in Chatham, Massachusetts, was initiated in 2000 with the translocation of larvae from Martha's Vineyard (Nothnagle 2001). Subsequent translocations occurred in 2001 (34 larvae), 2002 (33 larvae), and 2003 (23 larvae) (Davis 2007). In 2006, 90 adult beetles were counted, 19 were counted in 2007 (Davis 2007), and numbers increased to 179 in 2008 (S. von Oettingen, pers. comm. 2008). Detailed monitoring at this site was not conducted in 2009, but beetles were present (S. von Oettingen, pers. comm. 2010).

In 1990 when the beetle was listed, it was considered to be extirpated from Rhode Island, Connecticut, and New York (Long Island) (55 FR 32088) (GRA 2 and 3). In 1994, larvae collected from multiple sites in Virginia were released at two different sites on Sandy Hook, New Jersey (GRA 4), in the National Park Service's Gateway National Recreation Area. In summer 1995, adults were documented at both sites, and mating and foraging were observed (A. Scherer, Service, pers. comm. 1996). In autumn 1995, first instar larvae were documented; a result of reproduction from the reintroduced beetles. During autumn 1995, 367 additional larvae from Virginia were translocated (Knisley et al. 2001). During autumn 1995 and the subsequent winter of 1995/1996, severe erosion occurred and some tiger beetle sites were completely eroded. In

1996, little larval activity was documented and no further reintroduction took place. In spring 1997, 486 larvae from the Chesapeake Bay were released at Sandy Hook and during that summer, 178 adults were documented (Knisley et al. 2001). In April 1999, 585 larvae were translocated, and 260 adults were counted in July (Knisley et al. 2001). In 2000, 554 larvae were translocated in April, and 720 adults were counted in July (Knisley et al. 2001). The population increased to 749 adults in 2001, but the adult numbers dropped to 142 in 2002, 50 in 2003, and 2 in 2005 (A. Scherer, pers. comm. 2004, 2008). In 2006, an additional 480 larvae were released at Sandy Hook and 28 adults were observed in July. Only 2 adults were observed in the reintroduction area in 2007 (National Park Service 2007). The National Park Service conducted a limited survey effort in 2008, 7 adults were observed (A. Gluckstein, National Park Service, pers. comm. 2009). A survey in 2009 found no beetles at this site (Annette Scherer, pers. comm. 2009).

The tiger beetle populations in Maryland have declined and many of the occupied sites show a trend toward extirpation (C.B. Knisley, pers. comm. 2008). Between 1988 and 1993, the tiger beetle was documented at 10 sites in Calvert County, Maryland (GRA 5) (Service 1994). There have been many consecutive years of surveys on the following four sites in Calvert County: Scientific Cliffs, Western Shores/Calvert Beach, Flag Ponds, and Calvert Cliffs (C.B. Knisley, pers. comm. 2008). Western Shores/Calvert Beach and Flag Ponds are the only remaining populations, and Flag Ponds has experienced a major decline (only two adult beetles observed in 2008) and may be extirpated soon (C.B. Knisley, pers. comm. 2008). Scientific Cliffs supported a sizeable population for over five years but then gradually declined and was extirpated in 2004. The only site in Calvert County that may support a viable population is Western Shores/Calvert Beach, but it is showing a gradual decline in numbers from a high of 4,198 adult beetles in 1991 to 623 in 2005 (Knisley 2005b). The two tiger beetle sites in Maryland outside Calvert County and in GRA 6 (Janes and Cedar Islands), have shown steady or increasing numbers (Cedar Island - 1,095 beetles in 2004, and 1,298 in 2005; Janes Island - 369 in 2004, and 2,476 in 2005) (Knisley 2005b). The 2005 survey is the most recent survey data available for that area.

In 1999, 2002, 2005, and 2009, comprehensive adult surveys were conducted along the eastern shoreline of the Chesapeake Bay in Virginia (GRA 7). The 1999 survey found 32,143 adults (Knisley and Hill 1999), the 2002 survey found 33,469 adults (Knisley 2002), the 2005 survey found 38,498 adults (Knisley 2005a), and the 2009 survey found 46,082 adults (Knisley 2009). During the 2005 survey a site (Church Neck) was discovered with 2,297 adult beetles. From 2006-2008, surveys of the eastern shore were only conducted at sites owned by Department of Conservation and Recreation, The Nature Conservancy, and the Service, they indicated a relatively stable population for the eastern side of the Bay. The 2009 survey (Knisley 2009) further supports this trend with the highest numbers documented to date. Overall, the eastern shoreline shows an increase in numbers of adults, but the number of sites occupied is declining (Knisley 2009).

In 1998, 2001, 2004, and 2008, tiger beetle surveys were conducted along the western shoreline of the Chesapeake Bay in Virginia (GRA 8 and 9). In 1998, 26,685 adults were found (Knisley and Hill 1998). In 2001, 33,278 adults were found (Knisley et al. 2001). In 2003, Hurricane Isabel hit the Chesapeake Bay area and caused major impacts to beetle habitat on the western shoreline. In 2004, the Service completed a survey of the western shoreline to determine what impacts Hurricane Isabel may have had on the beetle (Knisley 2005c). The 2004 survey found 12,306 adult beetles (a 63% decline in numbers from the 2001 surveys). All beetles and habitat were lost at eight sites. In 2005, a survey found 19,430 adult beetles. The 2005 survey suggested that while beetles at a number of sites were recovering slowly, other sites showed no adults present, possibly indicating that all instar stages had been lost during the 2003 hurricane. In 2006, Hurricane Ernesto made landfall in Virginia and caused major impacts to beetle habitat on the western shoreline of the Chesapeake Bay. In 2007, as a result of information from landowners along the Potomac River that indicated that Hurricane Ernesto had caused major changes to the shoreline, the Service undertook a survey of this area to evaluate the impacts to the beetle and its habitat. The survey found that Hurricane Ernesto had caused a second major impact to beetle habitat along this shoreline area in a four year period (Service 2007). The 2008 survey of the western shoreline of the Chesapeake Bay found 9,933 adult beetles (approximately 30% of the numbers observed in the 2001 survey) (Service 2008).

In 2009, the Service finalized a 5-year status review of the tiger beetle. As a result of the continued loss of tiger beetle populations and habitat and the overall declining population trend described above, the Service recommended reclassifying the tiger beetle from threatened to endangered.

Table 1. Summary of the status of the beetle throughout its range.

GRA	State(s)	Status	Site Specific Comments
1	Coastal Massachusetts and Islands	Stable	• Beetle population at Westport, MA extirpated • Martha's Vineyard numbers appear stable • Monomoy NWR translocation - beetle numbers increasing (Protected)
2 & 3	Rhode Island, Block Island, Long Island Sound, and Long Island, New York	Extirpated	• At listing extirpated from RI and NY • No Potential suitable habitat known
4	Sandy Hook to Little Egg Inlet, New Jersey	Uncertain/ Extirpated	• Sandy Hook, NJ translocation site, 7 adults observed in 2008, status still uncertain

GRA	State(s)	Status	Site Specific Comments
5	Maryland -Calvert County	Declining	• 6 of 10 occupied sites extirpated, habitat lost or in very poor condition • 2 of 4 remaining sites with <5 beetles in 2005, these sites have marginal habitat • The 2 primary sites (Scientific Cliffs and Western Shores/Calvert Beach) have declined in numbers >75% since 2003 • one occupied site supports a large population, but it is not protected
6	Maryland - Tangier Sound	Stable	• Both sites in this GRA (Janes and Cedar Islands) are stable or may be increasing • Both sites support large populations (≥ 500 adults), and both are protected. • Only GRA that meets the delisting criteria.
7	Virginia – Eastern Shore	Stable to declining	• 2009 survey found the highest total count (46,082 adults) of adult beetles since the start of comprehensive surveys. • Increase was primarily the result of significant increases at 7 sites (Church Neck North, Occahannock Neck, Silver-Downings Beach, Tankards Beach, Scarborough Neck, Church Neck, and Hyslop Marsh). • 7 sites with no beetles compared to 2 in 2005. • Significant declines from 2005 have occurred at 4 sites (Picketts Harbor, Cape Charles, Elliots Creek South, and Kiptopeke), coincidental with increased shoreline modifications or other human impacts. • Largest decline was at Parkers Marsh (down from 12,554 in 2005, to 1,629 in 2009.

GRA	State(s)	Status	Site Specific Comments
8 & 9	Virginia – Western Shore	Declining	• Since 2001 there has been a 20% loss in occupied sites (12 of 58 occupied sites) • Habitat loss due to Hurricane Isabel and Ernesto • Total numbers declined 70% since 2001 • Since 2001, the 8 largest sites that support approximately 50% of the total beetles in 2001 have declined by 78% • GRA 8 has four occupied sites that support large populations, but none are protected. There is one "other" sized population that is protected, Hughlett Point (DCR). • GRA 9 has two occupied sites that support large populations and one protected, New Point Comfort (Mathews County and TNC). There is one "other" sized population that is protected, Bethel Beach (DCR).

Factors Affecting the Species - In 1990, the Service listed the northeastern beach tiger beetle as threatened because of its greatly reduced range and susceptibility to natural and human threats (55 FR 32088). Natural limiting factors include winter storms, beach erosion, flood tides, hurricanes (Stamatov 1972), and natural enemies. Anthropogenic threats to the tiger beetle include pollution, pesticides, high levels of recreational activity, off-road vehicular traffic, and shoreline alteration (Knisley et al. 1987; Knisley and Hill 1989; Knisley and Hill 1990; Service 1994). The extirpation of the tiger beetle from most of its range has been attributed primarily to destruction and disturbance of natural beach habitat from shoreline development, beach stabilization, and high levels of recreational use (Service 1994).

Storms batter the coast throughout the year with nor'easters occurring in the winter and hurricanes in the summer. Nor'easters affect beach habitats from Massachusetts to Virginia and can cause severe and prolonged flooding and beach erosion. Hurricanes also can cause significant erosion due to the high tides and water levels. In 2003, Hurricane Isabel hit the Chesapeake Bay area and had major impacts to beetle habitat on the western shoreline of Virginia. Knisley (2005c) determined that the first and second instar larvae from the 2003 adult cohort and the third instars from the 2002 cohort were likely washed out of their shallow burrows by erosion and concluded that the reduced number of adults in 2004 was likely the result of this hurricane. These storms are natural threats that affect tiger beetle populations, and the beetle's ability to disperse and recolonize sites, survive prolonged inundation, and other adaptations help their populations persist through these events. However, with increasing shoreline modification

and habitat alteration, the ability of beetle populations to withstand and recover from these threats has been reduced.

Erosion within the Chesapeake Bay has occurred for thousands of years from natural sea level rise and wave action. However, this process has been exacerbated by beach development activities that interfere with natural beach dynamics and longshore sand transport. Beach stabilization structures such as groins, jetties, rip-rap revetments, and bulkheads, which are designed to reduce erosion, may interrupt and capture sand from longshore transport and build up the beach around the structure but prevent sand from moving to the down-drift shoreline. Bulkheads and rip-rap typically result in reflection of wave energy back onto the forebeach, which ultimately narrows the beach and steepens the profile. Such changes in the beach profile can occur over periods of 1-30 years. These structures also prevent the back beach from supplying sand to the forebeach, and concentrate wave energy at the ends of the bulkhead or revetment, resulting in erosion at these points (Knisley 1997a). "Along a given length of shoreline, the first structure installed often has an adverse impact on the neighbor's shoreline (usually downstream of a longshore current), thus forcing a sequence of other shoreline modifications. Eventually, as shoreline modifications increase in number and amount of shoreline modified, the sand 'bank' is further depleted as erosion is halted and sand moves offshore into deeper channels. The long-term (50+ years) impacts of this scenario are unknown, but may eventually lead to a collapse of the natural beach habitat. . ." (Hill and Knisley 1995).

Knisley (1997a) conducted three years (1994-96) of research on the effects of shoreline stabilization structures on the distribution and abundance of the tiger beetle. A total of 24 sites (51 site sections) were surveyed for adult and larval beetles in Virginia. The sites were placed into one of the following categories: natural beach (14 sections), narrow beach (6 sections), groins (13 sections), groins/bulkheads (10 sections), and revetments (7 sections). The mean number of adults and larvae and beach width were greatest at natural beaches. Natural beaches and those with sand deposition supported the greatest number of larval and adult tiger beetles. Bulkheads and revetments had the greatest negative impact on tiger beetles. "Even though larvae were found at some bulkhead sites and at other modified or narrow sites, they probably have higher winter mortality than those at natural beaches. Because of a two-year life cycle, larvae are more likely to survive two falls and winters of erosion and beach narrowing when more beach width is available."

Monitoring of shoreline stabilization projects since the Knisley (1997a) study continue to show that shoreline hardening generally is detrimental to tiger beetles, though there is a lot of variability in the responses of habitat and tiger beetles depending on many other factors, including adjacent beach conditions, the design of the project, and site-specific characteristics.

Primary natural enemies of adult tiger beetles are wolf spiders (*Arctosa littoralis*), asilid flies (C.B. Knisley, pers. comm. 1994), and birds (Service 1994). Larvae are probably more vulnerable to habitat disruption than adults (Knisley et al. 1987), and similar to other tiger beetle

species, larval survivorship is low due to natural enemies and other limiting factors. "For example, only about 5% of the first instar larvae of several Arizona species reached adulthood" (Knisley 1987). "Habitat disturbances could further reduce survivorship" (Knisley et al. 1987) and ". . . can eliminate suitable habitat (due to shoreline modification), and when combined with natural mortality factors, could reduce populations to the point of extinction" (Knisley 1987). The primary natural larval enemy is a small, parasitoid wasp (*Methocha* sp.) that enters the larval burrow, paralyzes the larva with a sting, and lays an egg on the larvae. The egg hatches, and as it develops the larval wasp consumes the larval tiger beetle. Mites have also been found on larvae at Martha's Vineyard, but their effect, if any, is unknown (Service 1994).

Adult foraging, mating, and ovipositing can be disrupted by human activity (Knisley et al. 1987). However, larvae are probably more affected because they spend most of their time at the tops of their burrows waiting for prey, and may be disturbed by even relatively minor activities such as vibrations, movement, and shadows (Knisley et al. 1987). Knisley and Hill (1990) examined the effects of visitor use of Flag Ponds, a park in Maryland, on the tiger beetle. As human use increased, no reduction in the population of adult tiger beetles was found. However, human impact appeared to result in the lack of newly emerged adults on the public beach. Larval survivorship was significantly lower on the beach area with the greatest amount of human use. Areas that were firmly stomped, to simulate increased foot traffic, resulted in a 50-100% reduction in numbers of active larvae (Knisley and Hill 1989). In addition, 25% of the burrows did not reopen within 10 days of stomping, suggesting that larvae may have been dead (Knisley and Hill 1989). Negative effects of foot traffic apparently involve compaction or disruption of burrows or direct injury to larvae. Because larvae occur in the intertidal zone, burrows can be easily compacted or collapsed by vehicles or high levels of human activity (Knisley et al. 1987).

Oil slicks and use of pesticides for mosquito control may have contributed to the decline of this species (Stamatov 1972). Most of the large tiger beetle populations in Maryland and many of those in Virginia are threatened by activities associated with the increasing human population and all are subject to oil spills and beach erosion (Service 1994).

Beach nourishment may be destructive to larvae and may render beach habitat unsuitable for subsequent larval recruitment and development (Knisley 1991). However, deposition of dredged material may also create habitat in some cases (Knisley 1997a). Dredged sand was placed south of Cape Charles in Northampton County, Virginia, in 1987, and the number of adult beetles at this site increased from 700-800 to 2,000 in 1993 (Knisley 2002). Although the addition of sand may maintain the habitat in the long term, it is likely that its immediate effects would result in some larval mortality through crushing, smothering, or entombing (Service 1994). Sand deposition could also have negative effects on food (amphipod) availability (Service 1994). Fenster et al. (2006) determined that two beach nourishment projects on the western shoreline of the Chesapeake Bay had a short term positive effect on the beetle habitat. Within weeks of the sand placement, adults moved in and produced large numbers of larvae at both sites. The short- and long-term effects of beach nourishment on larvae need to be further investigated.

Non-jeopardy biological opinions anticipating take of tiger beetles completed since 1994 have included 3,945 m (12,943 ft) of shoreline hardening; 167 groins permanently covering 1,119 m^2 (12,045 ft^2) of tiger beetle habitat; 12 piers; and several projects involving breakwaters, beach nourishment, concentrated human use, and unusually large piers and groins. In addition to permanent loss of tiger beetle habitat, most of the projects have involved additional impacts, including mortality of beetles (primarily larvae) during construction. Fragmentation of remaining beetle habitat has also resulted from the installation of these structures.

In addition to these consultations, many additional shoreline hardening projects (particularly revetments and bulkheads) have been conducted by property owners when the projects do not require Corps permits. Furthermore, unpermitted activities may be contributing to the reduction of beetle habitat in Virginia as there appear to be more groins and other structures within beetle habitat than have been permitted (C.B. Knisley, pers. comm. 2004).

ENVIRONMENTAL BASELINE

Status of the Species Within the Action Area - In 2008, the Service documented 18 adult northeastern beach tiger beetles within the action area on Gwynn's Island (Service 2008). Detailed larval surveys have not been conducted recently in this area. Because suitable larval habitat is present on the site and adult beetles are present, beetle larvae are assumed to be present at the site. Surveys of adult beetles found 1 in 2005 (Knisley 2005a), 55 in 2004 (Knisley 2004), 742 in 2001 (Knisley 2001), and 46 in 1998 (Knisley and Hill 1998). Tiger beetle numbers from 1998 to 2005 indicate that numbers of adults at this site fluctuates greatly and that overall adult numbers have declined at this site since 2001 (Service 2008). It is likely that this decline is related to stochastic storm events (Hurricane Isabel in 2003 and Hurricane Ernesto in 2005) that changed the conditions and amount of adult and larval habitat present. These storms also resulted in prolonged inundation of these beaches, likely causing the death of beetle larvae (Service 2008) which limited the number of adult beetles in subsequent years.

Factors Affecting Species Habitat Within the Action Area – Historically there was over 13,000 linear feet of beach habitat along the Chesapeake Bay side of Gwynn's Island that supported the beetle. Over the years the majority of the shoreline of Gwynn's Island, including portions of the action area, has been hardened with riprap revetments, bulkheads, and groins, leaving little sandy shoreline for the beetle. The beach along this shoreline directly faces the Chesapeake Bay and is prone to severe storm surges and erosion due to the amount of fetch.

Land and vegetation clearing in the action area, including alteration of the remaining dune both prior to and following storm events has affected the beach. This activity generally destabilizes the beach and dune, and can result in increased detrimental effects to the beach resulting from accelerated wind transport of beach sand, increased likelihood and impacts of overwash, and increased beach erosion. At similar beaches where minor modifications have been made to the

narrow primary sand dune, it resulted in an accelerated loss of the dune, its vegetation, and a flatter topography which increased the threat of overwash, flooding, and erosion (Feagin et al. 2005).

The shoreline within the action area has seen increased erosion rates over the past few years, due the severity of storm events and sea level rise. Gwynn's Island is 38 miles from the mouth of the Bay, where sea level rise is currently 0.16 in/year (higher than the worldwide average) (U.S. Geological Survey [USGS] 1998). Increased sea levels will change the dynamics that maintain beach habitats, including increased shoreline erosion rates in some areas, and changes in sand deposition (USGS 1998).

EFFECTS OF THE ACTION

Direct Effects - Because the applicant has agreed to complete construction outside the time of year (June 1 to September 15) when adult beetles are most likely to be present, direct impacts to adult beetles during construction will be avoided.

Excavation for the groin footers, placement of the stone, and operation of equipment on the beach will directly impact larval beetles in the work area through crushing, dislodging, and entombment, resulting in injury or death. Additionally, larval beetles that are within or in close proximity to the work area may be prevented from feeding during construction due to their sensitivity to vibrations, movements, and shadows, resulting in injury and potentially death. The project will result in adverse effects to all beetle larvae within the two work corridors, a 1,750 ft^2 area (Figure 5). The project will also result in the loss of approximately 450 ft^2 of larval habitat and 2,000 ft^2 of adult foraging habitat due to the footprint of the two groins (Figure 5).

Indirect Effects – Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). Following the placement of the groins, it is anticipated that sand will accrete on the up-drift side of the structures (north side), resulting in increased amount of larval and adult habitat in the areas that accrete. However, the profile of the beach and sand characteristics within the accreting area may differ from those on a natural beach, and the suitability of habitat for larvae may be reduced. Some scour is also expected to occur on the down-drift side of the groins, resulting in reduction of adult and larval habitat in these areas. Because the beach is set back in a small baylet, the amount of accretion/scouring that will occur will be reduced compared to a similar beach that is not within a baylet (S. Hardaway, Virginia Institute of Marine Science, pers. comm. 2010).

Due to the complexity of the factors involved, it is difficult to accurately estimate the scour and accretion that will result from these structures. An estimated 750 ft^2 of accretion will occur to the northern side of each groin, while an estimated 250 ft^2 of scouring will occur on the southern side of each groin. This movement of sand will generally occur over a period of time that will allow any larvae present in these areas to move and adjust to the changes in the habitat. The beach

profile where scour occurs is expected to become steeper, and the areas of accretion are expected to have a flatter profile. These changes in beach profile affect the suitability of beach for larval beetles through changes in soil moisture and effects. Both the steeper and flatter beach profiles represent a reduction in habitat suitability for larval beetles. A total of 500 ft^2 of larval and adult foraging habitat will be lost as a result of post-construction scour, and a total of 1,500 ft^2 of adult foraging habitat will be created as a result of accretion adjacent to the groins.

Interrelated and Interdependent Actions - An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. No activities interrelated to and interdependent with the proposed action are known at this time.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. There are limited opportunities for future development or modification of beach habitat within the action area. The landowner intends to build a house behind the remnants of the dune at the site, and we anticipate an increase in recreational use of this beach and the potential for future development of ancillary structures such as boardwalks, decks, and similar features that would not require federal permitting. There is a vacant lot in the southern portion of the action area, and a landowner may propose a beach stabilization project and/or develop the site in the future. The addition of any of structures could result in adverse effects to beetles during construction, and further increase recreational use of the beach, resulting in additional adverse effects to beetles, including habitat loss and disturbance, and injury or death of larvae.

CONCLUSION

Adult, and possibly larval, beetle habitat is expected to remain at the action area and beetles are expected to continue to occur there in relatively low numbers. The site comprises a relatively small proportion of beetle habitat within GRA 9 and supports a small portion of the GRA 9 tiger beetle population and the tiger beetle population rangewide.

After reviewing the current status of the northeastern beach tiger beetle, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed project is not likely to jeopardize the continued existence of the northeastern beach tiger beetle. No critical habitat has been designated for this species; therefore, none will be affected.

In formulating this opinion, the Service analyzed the potential impacts from temporary habitat disturbance, permanent habitat loss, and pre- and post-construction activities. In analyzing these impacts, the Service assessed the population-level effects for tiger beetles, including the estimated mortality, and determined that these losses will not appreciably reduce the likelihood of survival and recovery of the tiger beetle.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps and become binding conditions of any permit issued by the Corps for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions, or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR Sec. 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service anticipates incidental take of northeastern beach tiger beetle larvae will be difficult to detect because any that are injured or killed during construction will be difficult to observe or locate due to their coloring, small body size, and tendency to remain in burrows beneath the surface of the sand. However, the level of take can be anticipated by the areal extent of the larval habitat affected. Based on the estimated amount of beach and intertidal area within the construction site, the Service anticipates that larvae may be crushed, buried, or prevented from feeding, ultimately resulting in injury or death, within a 1,750 ft^2 area (Figure 5). A total of 950 ft^2 of permanent loss of larval habitat will result from groin placement (450 ft^2) and post-

construction beach equilibration (500 ft^2). A total of 2,500 ft^2 of permanent loss of adult foraging habitat will result from groin placement (2,000 ft^2) and post-construction beach equilibration (500 ft^2).

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or adverse modification or destruction of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the northeastern beach tiger beetle:

1. Human activity, materials, and equipment on the beach must be minimized to reduce impacts to larval tiger beetles.

2. Beetle numbers, beetle habitat use, and amount of beetle habitat at the site must be monitored.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the ESA, the Corps and the applicant must comply with the following terms and conditions which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. No ground disturbance or use of vehicles or heavy equipment will occur on the beach outside of the two 20 ft construction corridors.

2. No refueling of equipment or vehicles will occur on the beach.

3. No equipment and/or building materials will be stockpiled on the beach.

4. Notify the Service before initiation of construction and upon completion of the project at the address below. Any additional information to be sent to the Service should be sent to the following address:

Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061
Phone: (804) 693-6694
Fax: (804) 693-9032

5. Annual surveys of adult beetles within the action area must be conducted, by an approved surveyor, for five years after construction is completed. Changes in the amount and condition of beetle habitat within the action area must be evaluated. Prior to construction a set of baseline photographs must be taken by the surveyor. After construction, photographs of the work area and the beach adjacent to the work area will be submitted annually to determine how the groins affect the beach width north and south of each groin. Photographs will be taken in a manner to allow direct comparison of the beach width and slope and any erosion/accretion adjacent to each groin to aid in evaluating the impacts of the project. This information must be submitted electronically.

6. Adult and larval tiger beetles are expected to occur at the project site after construction is complete and any construction or excavation on the beach may result in additional take that would violate section 9 of the ESA without appropriate permits. This serves as notification that any additional dune, beach, or sand alteration of any kind or amount may directly or indirectly impact beetle habitat and may result in take of the beetle. The Corps and the applicant should contact the Service if any such projects or actions are planned to ensure that necessary permits are sought and issued.

7. Care must be taken in handling any dead specimens of proposed or listed species that are found to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead specimen, notify the Service's Virginia Law Enforcement Office at 804-771-2883, 7721 South Laburnum Avenue, Richmond, Virginia 23231, and the Service's Virginia Field Office at 804-693-6694 at the address provided on the letterhead above.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

As the Corps continues to issue permits for shoreline alteration, the amount of habitat available for this species is decreasing. For recovery and delisting of the tiger beetle within the Chesapeake Bay area of Maryland and Virginia, at least 26 populations must be permanently protected at extant sites (Service 1994). In Virginia, 4 large (> 500 adults) populations and 4 other (100 to 499 adults) populations must be protected on the Eastern Shore; 3 large populations and 3 others must be protected on the western shore of the Chesapeake Bay north of the Rappahannock River; and 3 large populations and 3 others must be protected on the western shore of the Bay south of the Rappahannock River. Presently, there are 6 large (2 protected) and 6 other (3 protected) populations on the Eastern Shore; 9 large (2 protected) and 12 (1 protected) others on the western shore north of the Rappahannock; and 6 large (2 protected) and 6 (1 protected) others on the western shore south of the Rappahannock.

We recommend that the Corps establish a process to mitigate for habitat loss to shoreline projects. This could include a means to establish conservation easements for the protection of the beetle, restoration of beach habitat in areas where it has been altered significantly, or other appropriate measures. This would contribute to recovery efforts for the tiger beetle by formally protecting sites through conservation easements or natural areas. The Service requests notification of the implementation of any conservation recommendations to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in your request to initiate formal consultation. As provided in 50 CFR section 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates this opportunity to work with the Corps in fulfilling our mutual responsibilities under the ESA. If you have any questions, please contact Mike Drummond of this office at (804) 693-6694, extension 114.

Sincerely,

for Cindy Schulz
Supervisor
Virginia Field Office

cc: VDACS, Richmond, VA (Keith Tignor)
VDCR, DNH, Richmond, VA (René Hypes)

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Debbie – please upload this opinion to the Regional TEBO database. Thanks.

(Michael Drummond: 2-12-10)
(filename: P:\Endangered Species\OPINIONS\BEETLE\2010-F-0044 Jason Rowe (Mathews)\2009-F-0257 Jason Rowe (Gwynn's Island East) BO.doc