Draft

Environmental Assessment

Potomac River National Wildlife Refuge Complex
Occoquan Bay National Wildlife Refuge
Administrative Headquarters and Visitor Facility

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Approval Page

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Chapter 1: Purpose and Need

Purpose

The purpose of this environmental assessment (EA) is to evaluate alternative building sites for the Potomac River National Wildlife Refuge Complex (PRC) Administrative Headquarters and Visitor Facility (HQ/VC). A suitable site is one that: has safe, accessible pedestrian and vehicle access for the public and staff; occurs on an already disturbed site; facilitates administrative and management activities, including offices and storage for all staff, the Friends Group, and volunteers; provides access to a diversity of habitats and supports opportunities to interpret those habitats and their management; facilitates environmental educational activities, school and other group outreach events and activities; minimizes visual or physical intrusion to other parts of the refuge; and, accommodates green building technology.

The December 1997 Comprehensive Conservation Plan (CCP) for Occoquan Bay National Wildlife Refuge (Refuge) and the accompanying EA evaluated four alternative sites for a HQ/VC location. The Regional Director selected a building site after reviewing that analysis. The site selected is referred to in that CCP/EA as the "former bunker in the northeast corner of the refuge." The HQ/VC has never been built. Circumstances have changed since 1997, and given new information, a re-evaluation of the selected site was warranted. The intent of this EA is to describe and analyze new proposed HQ/VC sites and compare them to the bunker site selected in 1997.

Need for Action

The current Refuge Complex HQ, which is located off-site, is woefully inadequate to meet the operational and public use needs of the refuge (see description in "Background" below). The 1997 Occoquan Bay Refuge CCP states that a U.S Fish and Wildlife Service (Service) presence on-site is necessary to fulfill its mission. The bunker location in the northeast corner of the refuge was selected in the CCP in part because it would be adjacent to the Belmont Bay development and the proposed location for the Science Museum of Virginia's Life Science Center (museum).

Since the 1997 decision, changes have occurred affecting the circumstances supporting the original site selection. First, the road providing access through the adjacent Belmont Bay development to the refuge has a different routing than in 1997. Parts of it are now a private road and therefore can not be used as the main refuge entrance road as planned. As a result, the main entrance must now be off of Dawson Beach Rd (see Figure 1). Second, due to changes in the location and types of various buildings in the Belmont Bay development, utilities (other than possibly power) will not extend to the refuge. Third, the location of the museum was moved from immediately adjacent to the refuge, to a location .5 mile further away. This distance compromises the ease and flexibility in moving visitors from one venue to the other via walking trails, which was part of the original plan.

Finally, the need to construct a HQ/VC is a national priority for the U.S Fish and Wildlife Service (Service). In 2001, the agency assembled a national list of the top 20 priority needs for

new headquarters and/or visitor centers. The Potomac River Refuge Complex is on that top 20 list. The Service actively pursues funding for this project.

For these reasons, we determined there was a need to re-examine the 1997 decision selecting the bunker site in the northeast corner of the refuge for the HQ/VC.

Decision to be Made

Based on the information and analysis provided in this EA, our Regional Director will select an alternative to implement as the site for the Refuge Complex HQ/VC. The selected alternative may be the Proposed Action (Service-preferred alternative), one of the alternatives, or a modification of one of the alternatives. Selection will be based on an evaluation of the Service's mission, the purposes for which the refuge was established, legal mandates, and comments on this EA. In accordance with the National Environmental Policy Act (NEPA), our Regional Director must also determine whether the selected alternative will have a significant impact on the quality of the human environment. If there is a significant impact, additional analysis will be required in an Environmental Impact Statement (EIS). If there is no significant impact, the Regional Director can issue a Finding of No Significant Impact (FONSI). Once the FONSI and a Decision Memorandum are signed, we can begin implementing the decision.

Background

The Service administers Occoquan Bay NWR as a unit of the National Wildlife Refuge System. As part of the PRC, it is one of over 548 refuges in the National Wildlife Refuge System administered by the Service.

The Potomac River Refuge Complex consists of Elizabeth Hartwell Mason Neck, Occoquan Bay, and Featherstone refuges. Since 1974, headquarters for the Refuge and subsequently the Refuge Complex has been in a series of GSA rental spaces, primarily storefront spaces in small strip malls. The current office is in Prince William Plaza, on U.S. Route 1 in Woodbridge, Virginia. It can only house four staff and has no storage space. Vehicle and storage space are in an industrial park about a mile from the office. The office is situated about a mile and a half from Occoquan Bay and Featherstone refuges and eight miles from Mason Neck refuge. A maintenance worker is based at Mason Neck refuge in a converted residential two stall garage that serves as a maintenance shop and the refuge law enforcement officer is located in the visitor contact station at Occoquan Bay Refuge.

Elisabeth Hartwell Mason Neck NWR
This Refuge was established in 1969 under the authority of the Endangered Species Act and was the Nations first national wildlife refuge established for bald eagles. Located in Fairfax County, Virginia, this 2,277 acre refuge consists of mature oak-hickory forest, freshwater tidal marshes and almost 4.5 miles of shoreline along the Potomac River. One of the largest great blue heron rookeries in the mid-Atlantic area is on the refuge which also includes one of the largest fresh water tidal marshes in northern Virginia. Over four miles of hiking trail provide visitors opportunities to view and enjoy the over 200 species of birds, 31 species of mammals, and 44 species of reptiles.

Featherstone NWR
This refuge was established in 1979, the refuge is located in Prince William County, Virginia along the Potomac River between Occoquan Bay and Neabsco Creek. The refuge consists of 325 acres of upland forest and freshwater tidal marsh and streams. It was established to "protect the features of a contiguous wetland area". The refuge is closed to the public.

Occoquan Bay NWR
This refuge is located in Prince William County, Virginia, at the confluence of the Occoquan River and Potomac River. In 1972, the Department of Defense declared surplus 62.83 acres of creek and marshlands along the west side of its Woodbridge Research facility site. The Service acquired the property for its "particular value in carrying out the national migratory bird management program" and established Marumsco National Wildlife Refuge. In 1994, under the Base Realignment and Closure Act, the remaining 581 acres of the research facility was declared surplus. The property, transferred to the Service in 1998, was combined with Marumsco Refuge to create Occoquan Bay Refuge.

Refuge purposes for Occoquan Bay Refuge are:
1. As a refuge and breeding area for migratory birds, interjurisdictional fishes, and endangered species.
2. As an outdoor classroom to provide the public with educational opportunities relating to fish and wildlife resources.
3. For other compatible recreational uses including: fishing, wildlife observation, interpretation, and wildlife photography.

The Refuge Vision Statement (from the 1997 CCP)

Occoquan Bay NWR is envisioned to be a key refuge in the National Wildlife Refuge System. The grassland and wetland habitats are important to the Nation's wildlife in this highly urbanized area. Furthermore, the variety of habitat types accessible to refuge visitors and the refuge's proximity to the Nation's capitol provide unparalleled opportunities to demonstrate the role of national wildlife refuges, particularly the benefits of habitat management for wildlife.

Natural Resources – The refuge is managed for the primary benefit of migratory birds and threatened or endangered species, with an emphasis on early successional habitats and wetlands habitats. Habitat management is an active and interactive program which also serves as the focus for the education programs.

Visitor Use – Within an urban setting, the refuge demonstrates the importance of the natural world to the human quality of life, and the human role in preserving and enhancing wildlife habitat. Local communities enthusiastically identify the area as a destination for wildlife oriented public use that enhances the quality of like in the Potomac area. As a result of visiting the refuge, the public gains an appreciation of the co-existence of urban and natural areas. The refuge is a show case for the Service and other resource partners for environmental education and resource management. A flexible and dynamic learning environment is created in a natural

setting. Clean, safe, accessible, wildlife-compatible, and high quality experiences for diverse audiences, within the carrying capacity of the refuge, are provided.

Environmental Education (EE) – In collaboration with many partners, a wide range of innovative, stimulating, general public and environmental education programs and activities is provided. EE is the process of integrating environmental concepts and management with the educational activities of the Service. Activities such as wildlife resource programs, interpretation, outdoor classrooms, and educational assistance are provided as educational activities. When these activities deal with environmental concerns, incorporate basic ecological concepts, or focus on the role of humans in the ecosystem, they become forms of environmental education. Occoquan Bay activities are designed to promote an awareness of the basic ecological foundations for inter-relationships between human activities and the natural system. The primary objectives of the environmental education effort in the Service are to conserve and enhance our fish and wildlife resources, and to motivate citizens to learn the role of management in the maintenance of healthy ecosystems so they can effectively support wildlife conservation.

Facilities – The refuge provides safe, high quality facilities and visitor opportunities for both Service and non-Service programs, primarily for these activities not available in nearby areas.

Chapter 2: Alternatives

The Refuge Complex HQ/VC must be in a location best suited to support the needs of the refuge and staff, provide accessible and safe public access, and facilitate public use programs and management activities. Occoquan Bay Refuge is a small piece of land. For that reason, special emphasis has been placed on experiencing the refuge by foot, with minimal vehicular access. It is also important to keep in mind that a good facility site will provide access to a diversity of habitats, allow the interpretation of those habitats and their management, provide proximity to education and group event sites, minimize intrusion to other parts of the refuge, and accommodate green building technology.

Alternatives Considered

In preparing alternative site proposals, refuge staff compiled a list of factors commonly used to evaluate Service building sites in the Northeast Region, which is shown in Appendix 1. We also reviewed the public comments on the alternative building sites submitted during the CCP process. Next, we developed a list of alternative sites to consider, including those that were examined in developing the Occoquan Bay Refuge CCP. Two new sites identified by refuge staff and the public were also included (sites 4 and 5). The following identifies the specific sites and locations, which are shown on Figure 1.

Bunker (selected in CCP) – Site 1
Old homestead – Site 2
Central Parking Area – Site 3
Marumsco Creek – Site 4
Visitor Contact Station – Site 5

A table was put together which listed the pros and cons of the alternative sites. This comparison table is shown in Appendix 2. A group consisting of members of the Friends of Potomac River Refuges, the education specialist conducting environmental education programs on the refuge, and three refuge staff visited each site, discussed the pro's and con's and ranked the sites in order of preference. This ranking is shown in Appendix 3.

Alternatives Carried Forward for Detailed Analysis

In further reviewing the visitor contact station (site 5), additional land would need to be acquired from the county to facilitate the footprint of the building. Since the Service could not acquire the property, nor come to any arrangement to accommodate construction on the site, this alternative was dropped from further consideration.

We do provide detailed analysis in this EA for the remaining four alternatives: The No Action Alternative, which we define as the site selected in the CCP, or Site 1(Bunker), Site 2 (old Homestead), Site 3 (central parking area) and Site 4 (Marumsco Creek) which is our new proposed action and the Service-preferred alternative.

Table 1 ranks and compares the four alternative sites. Ranking criteria addressed site suitability for building design, construction, habitat impacts, and refuge programs. In the table several conditions are assumed to apply to all sites such as 1) there are no threatened or endangered species on the refuge, 2) there are not any critical habitat designations, and 3) all of the sites have been disturbed to some degree by previous land use; some have been disturbed extensively. Regardless of the extent of previous disturbance; however, the sites are all re-vegetated or have been restored. Construction of a facility at any site will result in the loss of habitat. Extent of habitat loss or disturbance is used as one of the ranking criteria.

Habitat loss was calculated using the following estimates: the Service standardized design for a administrative office and visitor contact facility is 10,455 sq ft for a single story and 8,022 for the two story. Allowing for any outside structures such as decks, kiosks, bathrooms, etc. a figure of ½ acre will be used. Parking is calculated at ½ acre which should accommodate parking for visitors, Service vehicles, and 2-3 buses. This is approximately 2/3 the size of the existing main parking lot. New roads will be calculated at 26 ft wide for two lane and 13 ft wide for one lane. Habitat disturbance for utility runs was calculated at 30 feet wide for the distance of the route.

RANKING CRITERIA FOR SITE COMPARISON

Criteria	Values (points)	Site 1 Bunker	Site 2 Homestead	Site 3 Central Parking	Site 4 Marumsco Creek
Site suitable for Service standardized facility designs/ options such as basement, decks, geothermal heating and cooling, solar, or wind	Suitable for design and options (10) Suitable for design with some option restrictions (5) Has multiple design or option restrictions. (0)	10	10	5	10
Distance to Utilities (power/water)	Less than .25 mile (10) Between .25 and .5 mile (5) Greater than .5 mile (0)	0	0	0	10
Sewer – Suitable for on site waste treatment such as septic systems.	Suitable for septic system or other waste treatment options(10) Requires public sewer hookup (5) Requires public sewer and additional infrastructure such as lift pumps (0)	10	10	0	10
Roads and Parking	Requires no new roads or parking areas (10) Requires new parking and/or upgrades to existing roads (5) Requires both new roads and parking (0)	5	5	10	0
Site construction – extent of grading or fill, known issues such as contaminants, buried debris, or archeological issues	Requires minimum site work, no construction issues (10) Requires moderate site work and/or minor known construction issues (5) Requires extensive site work and/or has known construction issues (0)	5	5	0	10
Habitat impacts – amount of habitat directly impacted by	Directly impacts .5 acres (10) Directly impacts .5 – 1	5	5	10	0

infrastructure	acre (5) Directly impacts 1-2 acres (0)				
Site accommodates a variety of new interpretive and EE programs and easy access to existing sites	Suitable for multiple new sites and close to existing sites(10) Suitable for at least one new site and/or close to existing sites (5) No new sites, not close to existing sites (0)	0	0	0	10
Traffic flow – allows easy access and exit of facility. Office traffic not required to traverse refuge.	Easy entrance and exit of site. Traffic does not traverse refuge or interfere with visitor traffic.(10) One way traffic flow – all visitors must traverse the refuge to access the building or to exit (0)	0	0	10	10
Aesthetics/view shed Setting is pleasing to visitors and primary viewing from front and rear of building is predominantly natural.	View is predominantly natural (10) View of some on refuge man made features such as parking areas or roads on one side of facility. (5) View of man made features off site. (0)	5	0	5	10
Noise or light intrusion from off site	Site has little intrusion from adjacent properties (10) Site has moderate intrusion which may be periodic or seasonal (5) Site exposed to continual or excessive intrusion. (0)	5	5	10	5
TOTAL SCORE		**45**	**40**	**50**	**75**

Using the ranking above, Site 4 has the highest total score, followed in order by Sites 3, 1 and 2.

Actions Common to all Alternatives

The building would be constructed using the Service standardized building design for a medium sized facility. Parking capacity would be the same for sites 1, 2, and 4. Parking for site 3 is

larger as it uses the existing parking area. The Service would pursue green construction technology when possible, including recycled and recyclable materials, geo-thermal heating and cooling, waste management, and solar and wind power generation.

Taylor Pt. Road on the refuge was planned in the CCP to be used as a part of a Regional bike trail network. Since the road will now be used for vehicle traffic, routing of the bike trail will have to be re-examined.

Alternative A: Site 1 - Bunker (No Action)

Site 1 (Bunker) is located in the northeast corner of the refuge and is the site selected in the CCP. As previously discussed, several factors influenced the selection of this site including the expected main access to the refuge, placement of the Science Museum, connection to utilities, traffic flow and walking access.

If the facility were to be built at this location, vehicle traffic would use the current entrance gate, and exit via the current back gate and Taylor Point Road after driving through the refuge on the wildlife drive (See Map A). This would mix the traffic of general refuge visitors, office visitors, staff, and deliveries. There would be a walking connection to the Belmont Bay development. The front of the proposed HQ/VC would likely face the Belmont development with the rear of the building and observation deck facing one of the grassland units of the refuge. The parking area would be located between the building and the golf course, which would shield it from the rest of the refuge. A short loop trail would be constructed which would run toward the river and around a small woodlot. This trail would provide a shorter walking experience to visitors who are unable or unwilling to use the longer trails.

Alternative B: Site 2 – Old Homestead

Site 2 (Old Homestead) is located on the top of the hill near the back gate of the wildlife drive.

If the facility were to be built at this location vehicle traffic would use the current entrance gate, and exit via the current back gate and Taylor Point Road after driving through the refuge on the wildlife drive (See Map B). This would mix the traffic of general refuge visitors, office visitors, staff, and deliveries. Parking would be placed between the building and the development or possibly on the opposite side of the current exit road. This site is one of the highest points on the refuge and would offer views of grasslands and the central marsh area of the refuge. There would be a walking connection to the Belmont Bay development. A loop trail could be developed along the existing road to the bunker (site 1) which would provide a shorter walking experience to visitors who are unable or unwilling to use the longer trails.

Alternative C: Site 3 – Central Parking Area

Site 3 is located at the central parking lot in the center of the refuge.

The HQ/VC would be located on the east side of the parking area. The front of the building would face the parking lot and the rear would face the grassland in the central area of the refuge. The existing parking would be utilized. Refuge traffic would remain as it currently exists. Traffic would enter at the current main gate and follow Dawson Beach Road to the office. Office visitors, staff, deliveries, etc would exit along the same route while refuge visitors would have the option of exiting via the current wildlife drive. (Map C).

Alternative D: Site 4 – Marumsco Creek (Service Preferred Alternative)

Site 4 (Marumsco Creek) is located in the southwest edge of the refuge along the woods bordering Marumsco Creek.

The HQ/VC would be situated along the edge of a grassland field at the leading edge of a forested upland knoll along Marumsco Creek. The front of the building would overlook grasslands and the pond and the back would face the upland forest. Parking would be situated in a linear fashion along the edge of the grassland just prior to the building. Traffic would enter the refuge at the current main gate (Map D). A new two lane road would be built to the site through the adjoining grassland which would wind up along the forest to a parking area and the office building. Office visitors, staff, and deliveries would exit along the same route. Refuge users could follow Dawson Beach Rd to the central parking area and exit the same way or continue to the wildlife drive and exit the refuge at Taylor Pt Road gate.. A new wildlife observation/interpretive trail would be developed along the knoll to a platform overlooking the

marsh. Another trail would be developed down to the marsh to a new EE site. The existing trail to the pond/EE area would be improved to provide easier access for schools and visitors.

Chapter 3: Affected Environment

Most of the following description was taken from the CCP. New information on some topics, such as soils and population updates, has been added to better describe the current setting.

Topography and Soils

The topography exhibits a gentle west to east slope of about 10 feet per mile, super-imposed on an even gentler north to south slope.

The refuge is located on unconsolidated sands, clays, and silts of the Atlantic Coastal Plain Physiographic Province. The Coastal Plain sediments begin at the Fall Line and thicken to the east and southeast. The sediment is composed primarily of terrace and alluvial deposits from this

and the ancestral Potomac River. The cobbles and gravels derive originally from the ancestral Potomac River and include a variety of cherts, rhyolite, silicified sand stone, and quartz. Tributary streams such as the Occoquan River and Marumsco Creek also carry this material as they cut through the adjacent cobble deposits and quartz float and veins of the Piedmont Plateau and Coastal Plain Physiographic Provinces. The sediments are underlain by undifferentiated Paleozoic meta-sedimentary and meta-igneous rocks.

The Army installed two wells into the lower Potomac aquifer in the central part of the refuge and encountered bedrock at a depth of approximately 150 feet below ground surface. Locally, the unconsolidated sediments include the Potomac Group of the Cretaceous age, which are overlain by terrace and alluvial deposits of Pleistocene and Holocene age. The refuge was not included in the Prince William County USDA Soil Survey 1989. In 2007, Louis Heidel, Soils Resource Specialist from the USDA, Natural Resources Conservation Service conducted a general soil survey of the Refuge. Mr. Heidel evaluated 24 borings across the Refuge describing approximate depths to seasonal high water tables and constructing a generalized soils map of the Refuge. A description of the soils is located in Appendix 4.

Hydrology and Water Quality

The refuge is located at the mouth of the Occoquan River. Occoquan Bay borders the facility to the south. Belmont Bay, which is located on the facility's northeast side, is mainly fed by the Occoquan River. Marumsco Creek borders the refuge to the southwest and drains into Occoquan Bay. The facility is also bisected by Catamount Creek originating from residential, partly industrialized, and golf course areas to the north. This creek flows through the refuge and is tidally influence in the southern half of the refuge. Several additional tidal drainages are found on the property.

The lithology of the bottom sediment within Marumsco Creek and the drainages located on the refuge is controlled by current-velocity distributions. Coarse-grained materials are typically found in the areas where current velocities are insufficient to transport them and yet sufficient to transport the fine-grained materials. Organic-rich, fine grained material settles out of suspension in more dormant areas of the creek and drainage ditches. Tidal currents in Belmont and Occoquan Bays are such that their bottom sediment is composed of sand which is coarser along the shoreline due to wave action.

Habitat/Vegetation

There are 20 vegetative communities at the refuge, with wetlands habitats covering about 50 percent of the site (Comprehensive Conservation Plan 1997). Habitat categorization, map delineations, and acreage calculations were completed during the CCP process. Transitions between vegetative communities on the refuge are largely the result of differing hydrological regimes. Tidal influences on the refuge are significant because 67 percent of the refuge lies below the 100-year flood plain elevation.

There have been over 600 species of plants documented on the refuge. None are federally or state listed as Endangered or Threatened.

Listed, Proposed, and Candidate Species

There is no Federal or State listed Threatened or Endangered species on the refuge.

Other Wildlife

The most current listing of species occurring on the refuge is provided by Waggener (2008).

To date, 75 species of butterflies, 38 species of dragonflies, and 21 species of damselflies have been documented on the refuge. None are on the Federal Threatened or Endangered List. Six species of Dragonfly and Damselfly are on the Natural Heritage Watch List as S3 – rare in the state.

Forty-eight species of mammals are known or expect to occur on the refuge (CCP 1997), with white-tailed deer (*Odocoileus virginianus*), eastern cottontail(*Sylvilagus floridanus*), red fox (*Vulpes vulpes*), beaver (*Castor canadensis*) and meadow voles (*Microtus pennsylvanicus*) commonly found.

Twelve species of salamanders, 15 species of toads and frogs, 8 species of turtles, 6 species of lizards, and 19 species of snakes are known or expected to occur on the refuge.

In 1987, a fish survey of nearby Gunston Cove identified several species of fish including white perch (*Morone americana*), blueback herring (*Alosa aestivalis*), bay anchovy (*Anchoa mitchilli*), spottail shiner (*Notropis hudsonius*, and pumpkin seed (*Lepomis gibbosus*). No extensive surveys were conducted for fish species in the proposed project area.

Birds

The refuge is a popular birding spot, especially because of its grassland-nesting and grassland-wintering birds, neo-tropical migrants, and raptors, many of whom are uncommon in the heavily developed Washington D.C./Northern Virginia region. The Refuge has over 200 species of breeding, wintering, or migrating birds, and more than 20 species found using the adjacent river and bays. Grassland breeding birds arrive at the end of April to set up territories. Raptors migrate through the Refuge in April and May. Waves of migrating songbirds, especially warblers, vireos, thrushes, and flycatchers pass through in May and again in late summer and early fall. In October and November, and into the winter months, dabbling ducks are found in shallow habitats adjacent to Refuge tidal marshes; diving ducks congregate in deeper waters adjacent to the Refuge in Occoquan and Belmont Bays. Wintering loons, grebes, red-breasted mergansers, and diving ducks are found along the bay sides of the Refuge.

The grassland/open-country breeding avian community at the Refuge is dominated by the Eastern Meadowlark (*Sturnella magna*) Common Yellowthroat (*Geothlypis trichas*), Red-winged Blackbird (*Ageliaius phoeniceus*), Indigo Bunting (*Passerina cyanea*), American Goldfinch (*Carduelis tristis*), Field Sparrow (*Spizella pusilla*), and Yellow Warbler (*Denroica petechia*). The most frequently observed birds migrating thorough the Refuge in the spring,

based upon four years of mist netting along the Marumsco Creek, were the Yellow-rumped Warbler (*Dendroica coronta*), White-throated Sparrow (*Zonotrichia albicollis*), and the Gray Catbird (*Dumetella carolinensis*) (J. Witt, pers. comm.).

Six species of birds are listed as tier II – very high conservation need in the Commonwealth of Virginia wildlife action plan. They are King rail, Least tern, Little blue heron, Yellow-crowned night heron, Bald eagle, and American black duck.

Land Use

Prince William County is one of the fastest growing counties in the Commonwealth of Virginia, with more than 371,178 residents. Since 2000 the population has increased 19%, making the county the second most populous county in the state of Virginia. The unemployment rate in 2006 was 2.1% and the labor force of the same year was 196,388. The county consists of 222,305 acres of land and 5,120 acres of water. Two incorporated cities are located near the refuge, Dumfries and Manassas, with the refuge being located in an unincorporated city of Woodbridge (Vicinity Map). Washington lies approximately 20 miles north of the refuge, and Richmond lies 90 miles south. The refuge is also within driving distance of several large urban concentrations. To the south is Richmond, VA, and to north are Washington, D.C., Baltimore, MD, and Philadelphia, PA.

The economic base within the vicinity of the refuge is dominated by military bases and defense-related activities with support related services and manufacturing. Small entrepreneur, trade, retail sales, and service industries are also important, and tourism is important as the refuge is relatively close to the Washington D.C. metropolitan area.

Cultural and Historic Resources

Historical records of the property which comprises the present-day refuge date back to the late 17th century when Martin Scarlet purchased approximately 700 acres (including the refuge) from Captain Edward Streator. The land (referred to as Deep Hole Point) was used primarily for tobacco farming for nearly a century. In 1765 the land was transferred to Colonel John Taylor in whose name the property remained until the Civil War. During the Civil War, Confederate artillery batteries were constructed in the vicinity of the refuge. When the war ended, the refuge land returned to farming, and farm residences and outbuildings were present on the site. Fishing ports were also located along the southern shoreline. In 1908, J. Lindsay Dawson purchased the farmland for raising cattle. Raising cattle and commercial fishing ended in 1950 when the Army acquired title to approximately 648 acres of land for use as a military radio station.

There was no consideration of wilderness designation for the Occoquan Bay Refuge. The conditions and setting of the refuge do not meet any minimum standards for the designation, according to the Wilderness Act of 1964 (determination made in CCP 1997).

Chapter 4: Environmental Consequences

Introduction

In this section, we analyze and describe the environmental consequences likely to result from building the HQ/VC at each of the alternative sites evaluated in detail.

Both direct and indirect effects are predicted for the foreseeable future. We use “temporary”, “short term”, “long term” and “permanent” to describe the length of time an action may affect a resource. Temporary refers to impacts that are of a short duration and that often end when the cause of the impact or disturbance ceases. Short term refers to impacts that last less than five years, although in most cases the impacts are of a much shorter duration. Long term refers to impacts that continue into the foreseeable future even after the activity ends – longer than five years. Permanent impacts extend beyond 15 years – essentially for the lifetime of the facility.

Impacts Common to All Alternatives

Air and Water Quality

Construction of a headquarters and visitor facility on the refuge will result in a greater number of visitors using the site. The exhaust emissions from an increased number of vehicles on the refuge may contribute to minor localized increases in air pollution. However, given the location of the refuge and the extent and type of surrounding development, contribution to air pollution from refuge users would be insignificant. No impacts to water quality are expected from the building. There will be limited runoff from parking areas and/or roads however this is predicted to be minor and the runoff will enter grasslands and would not reach any wetland areas.

Endangered Species

There are no known federally listed threatened or endangered species or state listed endangered species on the refuge.

Socio-economic
The headquarters/visitor facility and related management, education, and interpretive programs would draw large numbers of visitors to the refuge. Currently with no facilities on-site, the refuge receives about 20,000 visitors. This number would increase significantly with on-site facilities and provide increased educational opportunities.

Data is not available to calculate the economic impact of the construction of this facility. The 2007 Banking on Nature report showed that Elizabeth Hartwell Mason Neck Refuge (part of PRC) generated $1.50 for every $1 spent by the Service. This was based on the total Refuge Complex budget. With a new facility on-site, revenue generated by the refuge in the local community can be expected to significantly exceed that ratio found for Elizabeth Hartwell Mason Neck refuge. Construction of a facility on the refuge is predicted to have a long term positive economic benefit for the community.

With an increase in refuge visitation, traffic on local roads – primarily Dawson Beach Road would also increase. Some of this increase would be mitigated by the planned construction of the Route 1 interchange that would provide access for the neighboring development without using Dawson Beach road. The largest impact from the increased traffic would be to the industrial park located adjacent to the refuge entrance gate and to the County transitional housing which is located behind the current visitor contact station. As Dawson Beach Road is the only access to the refuge there are no options to mitigate the traffic issue. In the short term the traffic would likely not be a significant issue, however in the long term it may have a greater impact.

Soils
Ground disturbing activities associated with building excavation, parking lot construction, and connections of utilities, septic field, and road improvements would require removal of soil and rock in the construction zone. Soil removed would be used on site as fill if required. Debris free soil not needed on-site would be used on other parts of the refuge while remaining material would be removed from the site. Impacts to the construction zone where buildings and infrastructure are placed would be permanent. Any ground disturbance outside of the actual foot print of the facilities would be temporary as these areas would be rehabilitated after construction is completed.

Wildlife
Construction of the facility would permanently replace existing habitat. Migratory birds, mammals, reptiles, or invertebrates would be displaced from the actual foot print of the infrastructure. This impact, while permanent, has a minor overall effect on wildlife due to the small area affected. Additional impacts to wildlife would occur as increased human presence may cause disturbance to or avoidance behaviors by wildlife. More secretive species would avoid areas that people frequent while other species seem unaffected. Others become acclimated to disturbance depending on the level and frequency. The extent of the disturbance to species varies with habitat type, density, and structure. Disturbance could be mitigated by requiring visitors to stay on specific trails, locating trails and facilities in non-sensitive areas, or by closing access to areas during specific times of the year. Overall, disturbance to wildlife would increase as visitation increases and activities increase at the building site and on the refuge as a whole.

Disturbance of this type would be long term but would likely not significantly affect the population of any specific wildlife species.

Alternative A - Site 1 – Bunker (No Action Alternative)

Soils
In addition to those impacts described under "Impacts Common to All Alternatives" above, this site would require about .4 of a mile of existing roads to be upgraded. Construction at this site would require the removal of the existing "bunker" building however, this would not increase the area impacted.

Vegetation
There are no rare plants or plant communities in the construction zone. Area vegetation would be removed for construction of the building, parking area and road improvements. The vegetation is primarily grassland for the building and roads and grassland/shrub for the parking area. The area impacted would be about one acre for the building and parking lot with a smaller amount of vegetation impacted for improvements to the existing roads. These impacts would be permanent.

Additional vegetation would be impacted for the construction of the utility corridor. Up to three acres could be impacted depending on the type of utilities needing to be connected along Taylor Point Road. Vegetation adjacent to the construction site for construction trailers and material staging areas would also be impacted. These impacts would be temporary as the vegetation would regenerate or be restored after construction was completed.

Historic Resources
This site had been heavily used and modified by the military prior to transfer to the Service. There are no archeological resources of concern on the site.

Public Use
An on site building would improve the refuge's ability to support public use programs. This site would provide for a walking connection to the neighboring development that could reduce the number of vehicles entering the refuge. A short loop trail for wildlife observation could be constructed in the northeast corner for people who did not want to walk farther into the refuge. Opportunities for interpretation of habitats and management activities are limited to grasslands immediately adjacent to the building. There are no other nearby sites suitable for new environmental education programs. Existing EE sites are over one mile away and would require transport to the site by bus or vehicle.

Placement of the building at this site would require all traffic coming to the office or the visitor center to drive through the refuge, significantly increasing the amount of traffic on the refuge and the disturbance to refuge visitors using those same roads.

Construction
Utility runs would be extensive (.8 mile) and sewage lift stations would be required if the area is determined unsuitable for a septic or other type of waste treatment system. Periodic closures of

the wildlife drive would likely occur during construction to facilitate movement of equipment and materials. Removal of the "bunker" would occur as part of the site preparation. There are no other known issues that would cause potential problems with construction at this site.

Location
While the building would look out over one of the grassland units of the refuge, the other side would face the Belmont Bay development and golf course. The parking area would be located behind the building which would shield it from the rest of the refuge. Due to the topography of the site, the parking area would be at a lower elevation than the building and would necessitate accommodation to meet accessibility standards. The location is buffered to some degree from the adjacent development by a tree line. Even with this buffer, the tops of residential buildings are observable over the trees and there is some noise and light intrusion from the development. Such intrusion is light to moderate but would be expected to increase during times when events are held, such as the Occoquan River Festival, and when the planned hotel/conference center is constructed adjacent to the refuge.

Cumulative Impacts
Approximately one acre of habitat (grassland and shrub) would be permanently lost by the construction of the building and parking area. Additional habitat impacts due to construction would be temporary as vegetation either regenerates or is restored. Wildlife would be displaced by increased human disturbance around the facility. This impact would be either short term as wildlife adapts or would be minor in the long term as wildlife moves a further distance from the site of the disturbance, typically a short distance. It is not expected that any species population would be permanently displaced from the refuge.

Overall public use programs would be improved with a visitor facility providing greater opportunities for education and interpretive activities. The environmental education program would have a positive benefit through better on site support however the distance from EE sites will continue to be problematic. Visitor experiences will be enhanced but the value of the wildlife drive would decrease significantly as all general refuge traffic is directed along the same route. Refuge management activities and visitor and resource protection will be significantly improved by an on site location of offices and staff.

Alternative B – Site 2 – Old Homestead

Soils
No additional impacts other than those described in "Common to all Alternatives".

Vegetation
There are no rare plants or plant communities in the construction zone. Area vegetation would be removed for construction of the building and parking area. The vegetation is primarily grassland or grassland/shrub and would be about one acre. These impacts would be permanent.

Additional vegetation would be impacted for the construction of the utility corridor. Up to two acres could be impacted depending on the type of utilities needing to be connected along Taylor Point Road. Vegetation adjacent to the construction site for construction trailers and material

staging areas would also be impacted. These impacts would be temporary as the vegetation would regenerate or be restored after construction was completed.

Historic Resources
This site is the location of the Dawson family homestead. Buildings were removed by the Army and the area disturbed by military activities. It is not expected that significant historic resources remain at this site. However, additional archeology surveys would be required prior to construction to prevent impact to any possible remaining historic resources.

Public Use
An on site building would improve the refuge's ability to support public use programs. This site would provide for a walking connection to the neighboring development that could reduce the number of vehicles entering the refuge. A short loop trail for wildlife observation could be developed utilizing the existing road which runs by the bunker (Site 1) for people who did not want to walk farther into the refuge. Opportunities for interpretation of habitats and management activities are limited to grasslands immediately adjacent to the building. There are no other nearby sites suitable for new environmental education programs (the closest possible site being .4 mile away). Existing EE sites are over one mile away and would require transport to the site by bus or vehicle. Since the location of the Science Museum is no longer adjacent to the refuge, this site would provide no advantage to working with the Museum over any other site on the refuge.

Placement of the building at this site would require all traffic coming to the office or the visitor center to drive through the refuge, significantly increasing the amount of traffic on the refuge and increase the disturbance to refuge visitors using those same roads.

Construction
Utility runs would be extensive (.6 mile). The wildlife drive would be closed during construction. There are no known issues that would cause potential problems with construction at this site other than the historic resources.

Location
This is the highest point on the refuge and would offer the broadest views. The reverse is also true as the building would be observable from a greater number of locations on the refuge. One side of the building provides broad views of the refuge and the other presents a view of the Belmont Bay development and golf course. There is little buffer between this site and the development to shield this view or to mitigate any noise or light intrusion. Currently such intrusion is light to moderate but would be expected to increase during times when events are held, such as the Occoquan River Festival, and as construction of the Science Museum and hotel/conference center is completed.

Cumulative Impacts
Approximately one acre of habitat (grassland and shrub) would be permanently lost by the construction of the building and parking area. Additional habitat impacts due to construction would be temporary as vegetation either regenerates or is restored. Wildlife would be displaced by increased human disturbance around the facility. This impact would be either short term as

wildlife adapts or would be minor in the long term as wildlife moves a further distance from the site of the disturbance, typically a short distance. It is not expected that any species population would be permanently displaced from the refuge.

Overall public use programs would be enhanced with a visitor facility providing greater opportunities to provide education and interpretive activities. The environmental education program would have a positive benefit through better on site support however the distance from EE sites will continue to be problematic. Visitor experiences will be enhanced but the value of the wildlife drive would decrease significantly as all general refuge traffic is directed along the same route. Refuge management activities and visitor and resource protection will be significantly improved by an on site location of offices and staff.

Alternative C – Site 3 – Central Parking Lot

Soils
No additional impacts other than those described in "Common to all Alternatives".

Vegetation
There are no rare plants or plant communities in the construction zone. Area vegetation would be removed for construction of the building. The vegetation is primarily grassland or grassland/shrub and would be about 1/2 acre. These impacts would be permanent.

Additional vegetation would be impacted for the construction of the utility corridor. Up to four acres could be impacted for utility connections along Dawson Beach Road. Vegetation adjacent to the construction site for construction trailers and material staging areas would also be impacted. These impacts would be temporary as the vegetation would regenerate or be restored after construction was completed.

Historic Resources
This site had been heavily used and modified by the military prior to transfer to the Service. There are no archeological resources of concern on the site.

Public Use
An on site building would improve the refuge's ability to support public use programs. Grass and shrub land habitats would provide opportunities for interpretation of habitats and management activities. The adjacent small pond would provide wildlife viewing opportunities. There are no nearby sites suitable for new environmental education programs (the closest possible site being over .5 mile away). Existing EE sites are over .4 mile away and would require transport to the site by bus or vehicle. This location is at the hub of a majority of the current public use trails on the refuge providing easy access from the office/visitor building.

Traffic would enter at the current main gate and follow Dawson Beach Road to the office. Office visitors, staff, deliveries, etc would exit along the same route while refuge visitors would have the option of exiting via the current wildlife drive. The wildlife drive would remain and

would not be affected by traffic to/from the office. While this significantly reduces the amount of traffic driving through the refuge it also concentrates all use (staff, deliveries, office visitors, refuge users, and education groups) at one area. It is likely that as refuge visitation increases, the refuge would need to consider developing a secondary parking area to relieve the congestion.

Refuge visitors may have to use a temporary parking lot during the construction phase.

Construction
This site is the location of the military's office, lab, and maintenance buildings. The buildings were removed down to the foundations along with lighting and fencing. The foundations, roads, and utility runs were buried and the site re-vegetated. Any construction or digging for the building or utilities will encounter issues with these buried structures. The water table at this site and buried structures would likely preclude any type of on site waste treatment system requiring connection to public sewer and installation and maintenance of a sewage lift and pump station. These same factors create issues with the installation of a geo-thermal heating and cooling system and could require the use a of less energy efficient system. The water table would also prevent the option of having a basement for the building which will force the refuge to explore other options for storage of materials and small equipment. Utility runs would be extensive (.6 mile).

Location
This site is at the center of the refuge and therefore the farthest removed from any potential noise or light intrusion from off site sources. One side of the building would overlook the parking lot and adjoining shrub habitat unit. The other would face the center grassland unit with the small pond to the side.

Cumulative Impacts
Approximately one half acre of grassland habitat would be permanently lost by the construction of the building and parking area. Additional habitat impacts due to construction would be temporary as vegetation either regenerates or is restored. Wildlife would be displaced by increased human disturbance around the facility. This impact would be either short term as wildlife adapts or would be minor in the long term as wildlife moves a further distance from the site of the disturbance, typically a short distance. It is not expected that any species population would be permanently displaced from the refuge.

Overall public use programs would be improved with a visitor facility providing greater opportunities to provide education and interpretive activities. The environmental education program would have a positive benefit through better on site support however the distance from EE sites will continue to be problematic. Refuge management activities and visitor and resource protection will be significantly improved by an on site location of offices and staff.

Alternative D –Site 4 - Marumsco Creek (Service-preferred Alternative)

Soils
In addition to those impacts described under "Impacts Common to All Alternatives" above, this site would require the building of approximately 1,200 ft of two lane road. Any ground

disturbance outside of the actual foot print of the facilities would be temporary as these areas would be rehabilitated after construction is completed.

Vegetation
Area vegetation would be removed for construction of the building, parking area and road improvements. The vegetation is primarily grassland for the building, parking and roads. Building location could require the removal of some trees, however this impact would be kept to a minimum. The area impacted would be about one acre for the building and parking and up to one acre for the road depending on actual placement. These impacts would be permanent.

Additional vegetation would be impacted for the construction of the utility corridor. Up to 1.5 acres could be impacted depending on the routing of the utilities. Vegetation impacted would be primarily grassland. Vegetation adjacent to the construction site for construction trailers and material staging areas would also be impacted. These impacts would be temporary as the vegetation would regenerate or be restored after construction was completed.

Historic Resources
While surveys conducted by the military have shown no significant historic or cultural resources on the site, an archeological survey will be conducted to ensure the protection of any historic resources.

Public Use
An on site building significantly enhances the refuge's ability to support public use programs. This site would provide an opportunity for Service to interpret and for visitors to experience multiple habitats - woods, grassland, and marsh. The site provides the ability to expand activities (both environmental education and youth fishing) at the pond, and provide for new observation trails and interpretive sites along the woods and neighboring Marumsco marsh. A new wildlife observation/interpretive platform overlooking the marsh would be constructed behind the visitor center. Another trail would be developed down to the marsh to a new EE site. The existing trail to the pond/environmental education area would be improved to provide easier access for schools and visitors.

Placement of the building at this site would allow traffic to access the facility and exit the refuge without having to drive through the refuge. Visitors would be able to access the refuge without having to come to the office first. This would reduce the amount of vehicle use and or congestion at a specific site. The wildlife drive would remain and would not be affected by traffic to/from the office.

Construction
Utility runs would be the shortest of any site looked at on the refuge at approximately 1/4 mile. There are no known issues that would cause potential problems with construction at this site

Location
This site is along the tree line which borders Marumsco Creek. Veterans Park is located on the other side of the creek and has a number of baseball and soccer fields for youth leagues. Some of the baseball fields are lighted. There is a wooded buffer, averaging 50 yards in width on both

sides of the creek. The closest lighted field is 350 yards from this site. It is expected that the light intrusion from the park will be minimal.

Soccer fields are active year round and are used for football in the fall. Even though the fields are over 700 yards away from this site some noise intrusion will occur. There are times when sounds from games can be heard, especially along the western side of the refuge. While this is mostly on tournament weekends, noise intrusion can be expected to occur and could be moderate at times. There is a small industrial park which is between 450 and 500 yards from this site. Periodic minor noise intrusion from activities in the park can be expected.

Cumulative Impacts

Approximately two acres of habitat (grassland and shrub) would be permanently lost by the construction of the building and parking area. Additional habitat impacts due to construction would be temporary as vegetation either regenerates or is restored. Wildlife will be displaced by increased human disturbance around the facility. This impact would be either short term as wildlife adapts or will be minor in the long term as wildlife moves further from the site of the disturbance, typically a short distance. It is not expected that any species population will be permanently displaced from a large area.

Overall public use programs would be greatly enhanced with a visitor facility at this location providing greater opportunities to provide education and interpretive activities. The environmental education program would have a significant positive benefit due to facilities proximity to existing sites and development of new sites. Visitor experiences would be enhanced through the expanded opportunities to observe wildlife and participate in refuge programs. Refuge management activities and visitor and resource protection will be significantly improved by an on site location of offices and staff.

PUBLIC COMMENT

This plan can also be viewed at the following web site: Friends of Potomac River Refuges (http://www.foprr.org/refuges/OBNWR_EA.html). A copy of this plan can also be obtained by contacting the refuge office at 703-490-4979.

The public can provide written comments by sending them to:
Potomac River NWRC
14344 Jefferson Davis Highway
Woodbridge, VA 22191
Attn: HQ/VC Comments

Or by sending an email to: FW5RW_MSNNWR@fws.gov
Please mark the subject line as “HQ/VC comments.”

REFERENCES

Carver, Erin and James Caudill. 2007. The Economic Benefits to local communities of National Wildlife Refuge Visitation. U.S. Fish and Wildlife Service, Washington D.C.

U.S. Fish and Wildlife Service. 1997. Comprehensive Conservation Plan, Occoquan Bay National Wildlife Refuge. 90 pp.

Waggener, Jim. 2008. Checklist and related Materials on the Surveys for Birds and other Wildlife on and around the Occoquan Bay National Wildlife Refuge. Printed by the Friends of the Potomac River Refuges and the Audubon Society of Northern Virginia.

Appendix 1

Factors Used for Evaluating Building Sites

Construction

- Flood plain – is the site and planned infrastructure improvements in/near/well outside of the 100 yr flood plain?
- Suitable soils – are soils suitable for construction, waste water treatment, etc.?
- Water table – does water table depth present potential problems for construction, basement, drainage, septic, sewer, etc.?
- Utilities – location, distance, routing of utilities. Above or underground, special consideration such as additional pumps, lift stations, etc.?
- Sensitive sites – are they known or potential archeological sites?
- Alternative energy – is the site suitable for green technology such as geo-thermal heat/cooling, solar, wind generation?
- Roads – construction of new or use of existing roads and parking, routing of roads, placement of parking
- Site work – extent of grading, filling, known issues with buried debris or contaminants
- Topography – elevation of site and issues with accessibility or connections to interpretive and EE sites

Operations

- Traffic flow – how is auto and pedestrian traffic (both to the office and to/from existing sites) facilitated? Is vehicular traffic one or two way? Does exit traffic need to traverse the refuge?
- EE sites – proximity to established EE sites, interpretive activities, trails, event sites. Does the site offer new EE or interpretive opportunities?
- Habitat types – variety of habitat types easily accessed or interpreted from the site
- Visual intrusion of building and activities on other parts of refuge
- Aesthetics – is the building and location pleasing to visitors and staff? Is the view shed primarily natural?
- Surrounding landscape – is there any features of the neighboring landscape that detract from the location – noise, development, etc.?

Biological

- Presence or T&E species
- Presence of critical habitat
- Impacts to species of concern – are they temporary or long term?
- Impacts beyond the site – causes fragmentation of critical habitat blocks, projected zone of influence

APPENDIX 2

Site Comparisons	
Site	Pros and Cons
Current Visitor Center Location (Site 5) This location is outside the refuge gates. Habitat impacted = 0 acres.	To accommodate the footprint of the facility, additional lands would need to be obtained from Prince William County. Previous talks with the county have indicated no desire to let go of the property. The task of coordinating this effort would be time intensive with little expectation of achieving results. Pros: - Outside the refuge reducing habitat impacts on the refuge - Easy connection to existing utilities - No new roads required - HQ/VC traffic does not have to enter the refuge. Cons: - Requires removal of existing VCS which could be used for other purposes. - Sufficient parking questionable - Building is sandwiched between industrial park and transitional housing. - View from building is impacted by development on all sides - No opportunity for new interpretive sites or trails - Long distance from existing sites - Significant noise intrusion from surrounding development - Would have an uncontrolled public road to the housing development passing next to it. - Requires land acquisition to accommodate the building footprint.
Central Parking Lot Location (Site 3) This location is centered in the middle of the refuge and serves as a parking area for current visitors. Habitat impacted = .5 acres.	Pros: - Requires no new roads or parking. - Location is central to existing public use trails. - Allows for easy access and exit without routing vehicles through the refuge. - Farthest from surrounding development so noise intrusion is low. Cons: - Uses the current parking for both office visitors and refuge users. - Consolidates all current and future use at one location with little option to accommodate increase in refuge visitation. - Site is far from existing EE sites. One new site could be made at the small pond although this would not be preferable. - Limited options for new trails - Limited interpretive opportunities - Construction issues. Would not allow for a basement. Existing roads and foundations currently buried in the compound will be an issue. If constructed on the other side it would require moving the vault toilet, significant filling, and would be on the edge of the flood plain. Suitability for geothermal heating and cooling is questionable. - Requires very long utility runs (.6 mile), not suitable for on site waste treatment, requires connection to sewer and associated lift stations. - One side of the building will sit on the parking lot impacting the view and observational opportunities.

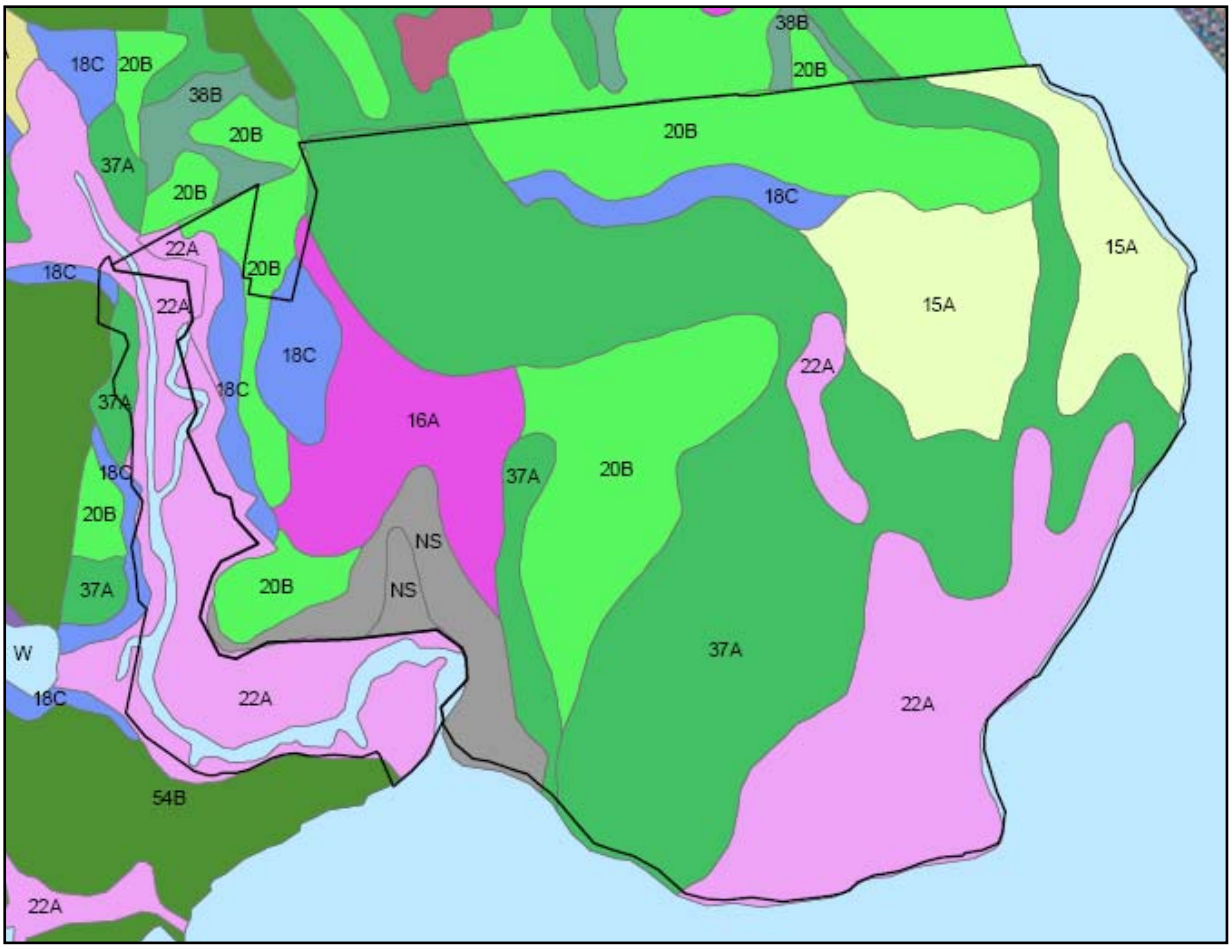
The Old Homestead (Site 2) This location is in the northern edge of the refuge near the back gate and is the site of the homestead of the Dawson family. Habitat impacted = 1 acre.	Pros: - Would accommodate building design and options. No known construction issues. - Would allow a walking connection to Belmont reducing traffic to the refuge. - Provides a view of the refuge from the highest point. - Does not require a new road. Cons: - Provides a visual impact to a greater portion of the refuge - Requires constructing a new parking area - All traffic would be routed through the refuge - Long distance to EE sites – no option for new ones. - Limited options for new trails - Limited interpretive opportunities - One side of building will face the Belmont development - Noise intrusion from adjacent development is greater - While the site is greatly disturbed – archeology concerns may present a problem. - Very long (.6 mile) utility runs.
Bunker (Site 1) This is the current site selected in the CCP. It is in the northeast corner of the refuge at the site of a small DOD test building and storage area. Habitat impacted = 1 acre.	Pros: - Would accommodate building design and options. No known construction issues. - Would allow a walking connection to Belmont reducing traffic to the refuge. - Does not require a new road although existing roads would need to be upgraded - Placement of parking lot would be shielded from the rest of the refuge Cons: - Utilities runs would be the longest (.8 mile) - Requires construction of parking area - All traffic would be routed through the refuge - Long distance to EE sites – no option for new ones. - Limited options for new trails - Limited interpretive opportunities - One side of building will face the Belmont development - Noise intrusion from adjacent development is greater - Requires more site work to accommodate parking lot - Requires removal of current building prior to construction

Marumsco Creek (Site 4) This site is on the west edge of the refuge along the wood line bordering the marsh. Habitat impacted = 2 acres.	Pros: - Would accommodate building design and options. No known construction issues - Allows for easy access and exit without routing vehicles through the refuge - Close to existing EE sites with easy connection - Potential new sites - Interpretation of multiple habitats - Options for new trails - Observation opportunities from both sides of building - Shortest utility runs < .25 mile Cons: - Requires construction of new parking area and road to site - On edge of refuge near neighboring park – moderate noise intrusion -

APPENDIX 3

Locations	Ranking												Average	Rank
1. Site 5 VCS	4	1	1	4	2	1	5	4	4	4	1	5	3.00	**3**
2. Site 4 Marumsco Creek	3	3	2	1	5	4	1	5	2	1	5	1	2.75	**1**
3. Site 3 Parking Lot	1	2	3	5	1	2	4	3	3	5	2	4	2.92	**2**
4. Site 1 Bunker	2	4	5	2	4	3	2	1	5	2	4	3	3.08	**4**
5. Site 2 Homestead	5	5	4	3	3	5	3	2	1	3	3	2	3.25	**5**

APPENDIX 4



Map unit descriptions for soils mapped for Occoquan Bay NWR during 2007 site visit.

Map symbol	Map Unit Name	Description
15A	Comus loam, 2-2 % slopes	Nearly level to gently sloping, well drained soil. Seasonal high water table depth >6 feet. Surface has moderate OM content.
16A	Delanco fine sandy loam, 0-4% slopes	Nearly level to moderately sloping, very deep, moderately well drained soil. Top of seasonal high water table is 21 inches. Surface has moderate OM content.
18C	Dumfries sandy loam, 7-15% slopes	Strongly sloping, moderately steep, very deep, well drained soil. Seasonal high water table depth > 6 feet. Surface has low OM content.
20B	Elsinboro sandy loam, 2-7% slopes	Gently sloping to moderately sloping, very deep, well drained soil. Seasonal high water table depth > 6 feet. Surface has moderate OM content.
22A	Featherstone mucky silt loam, 0-1% slopes	Nearly level, very deep, very poorly drained soil. Top of seasonal high water table is at the surface. Surface layer has a very high OM content.
37A	Marumsco loam, 0-4 % slopes	Nearly level to moderately sloping, very deep, moderately well drained soil. Top of seasonal high water table is at 15 inches. The surface has moderately low OM content.