6.0 Upland Dredged Material Disposal Sites

6.1 Contaminant Literature Search

In accordance with the Hazardous, Toxic and Radioactive Waste (HTRW) Guidance for Civil Works Projects, ER 1165-2-132, dated 26 June 1992, a literature search was conducted by Dynamac Corporation, under contract to the U.S. Army Corps of Engineers, Philadelphia District. The survey included four properties located in Gloucester County, New Jersey. Two properties are located in Logan Township and are identified as Raccoon Island and Site 15D; and two properties are located in West Deptford Township and are identified as Sites 17-G and 17-O. Site 17-O was eliminated from further consideration as 17G became available. Site 15-G was investigated by ERM, Inc. for the site owner, Sun Oil.

The purpose of the HTRW investigation was to research available information on past or present conditions or activities which may have resulted in the disposal or presence of HTRW on the subject sites.

Using the information obtained from the literature search, a preliminary assessment of areas 15-D, 17-G and Raccoon Island was performed by the Philadelphia District. The three disposal areas are very similar in that they all have been historically utilized as dredged material disposal areas. Past and present chemical analysis of the Delaware River sediments, conducted by the Philadelphia District, indicate that minor amounts of regulated substances exist in the proposed dredged material. Information pertaining to the chemical quality of Delaware River sediments can be found in Section 4.0 of this report.

According to information obtained for the Preliminary Environmental Assessment of Site 15G that was done for Sun Oil, the area within the site is being used for agricultural purposes. This site was also formerly used for the disposal of dredged material. There was no evidence found that would indicate that the property has ever been used for industrial purposes. Additionally, no evidence was found which would indicate that any industrially-derived HTRW has ever been generated, disposed of, stored, or treated at this site.

Although there is no evidence to suggest that any of the sites have been used for industrial purposes or that any HTRW has ever been generated, disposed of, stored, or treated at any of the sites, there are several areas of concern that were outlined in the Dynamac Corporation Literature search. Potentially contaminated areas included piles of 55-gallon drums at sites 17G, 15D, and Raccoon Island, an above ground storage tank at site 17G, and an abandoned ultralite plane and pickup truck at site 15D. No areas of concern were found on Site 15G. Consequently, as part of the preliminary assessment, chemical sampling was performed on the disposal areas in these localized

areas of concern. This chemical testing is discussed below.

In addition to investigating HTRW within the dredged material disposal areas, the potential for contamination from off-site sources was also evaluated using the information obtained as part of the literature search. As a result of this investigation, it was concluded that off-site impacts from nearby facilities pose a low risk to the groundwater regime under the proposed disposal areas. Although there are several facilities that are CERCLA (Comprehensive Environmental Response, Compensation and Liability Act of 1980) and RCRA (Resource Conservation and Recovery Act of 1976) listed within one mile of the areas, no impacts to the off-site groundwater have been reported.

As a result of the recommendations in the Preliminary Assessment, the Philadelphia District retained Black & Veatch Waste Science, Inc. to sample and analyze near surface soils from the dredged material disposal areas. The purpose of sampling and testing soils from the areas was to determine the level of constituents in background and debris areas described in the preliminary assessment. Soil samples were collected by use of a hand auger and shovel. The sampling locations were chosen based on their proximity to debris, drums, and other viable solid waste piles. Thirteen samples were taken at the four areas; their locations are shown on Plates 12 thru 15. All samples were taken within two feet of the ground surface. One background soil sample was analyzed by Toxicity Characteristic Leachate Procedure (TCLP), as well as for Target Analyte List (TAL), Volatile and Semi-Volatile Organic Compounds, Target Compound List (TCL), PCBs, pesticides, herbicides, total sulfur, total cyanide, and pH. The other nine samples were taken around areas of debris or drums. These samples were analyzed by TCLP (see Table 6-1).

Only three samples had compounds minimally above Federal or State regulatory levels. Background sample HTRW-13 in area 15G had an arsenic content of 22 mg/kg, which slightly exceeds the New Jersey Department of Environmental Protection (NJDEP) non residential cleanup criteria of 20 mg/kg. Sample HTRW-7 in area 17G had a TCLP lead level of 6 mg/l, which slightly exceeds the Federal Regulatory level of 5 mg/l set for toxicity characterization. Sample HTRW-10 in area 17G (duplicate) had a benzo(a)pyrene content of 674 ug/kg, which slightly exceeds the NJDEP non-residential soil cleanup criteria of 660 ug/kg. At most sampling locations, volatile and herbicide compounds were not detected. Relatively low levels of semi-volatile, pesticide, and metal compounds were detected.

Based upon the conducted literature search, preliminary environmental assessment, and subsequent chemical testing (ie. to detect contamination caused by localized dumping), the minimal exceedance of the stated regulatory levels, and the proposed use of the area as a dredged material disposal site, no additional testing or remediation of these areas is required. The pile of tires, drums, and any other solid waste on the site will be

Table 6-1. Chemical Sampling and Testing for Hazardous, Toxic and Chemical Waste (HTRW) at Upland Dredged Material Disposal Sites.

Sample Number	Location	Type	Analysis
HTRW-1	Raccoon Island	Soil - Debris Pile	TCLP only
HTRW-2	Raccoon Island	Soil - Debris Pile	TCLP only
HTRW-3	Raccoon Island	Soil - Background	TCLP & Bulk
HTRW-4	Area 17G	Soil - Debris Pile	TCLP only
HTRW-5	Area 17G	Soil - Debris Pile	TCLP only
HTRW-6	Area 17G	Soil - Debris Pile	TCLP only
HTRW-7	Area 17G	Soil - Debris Pile	TCLP only
HTRW-8	Area 17G	Soil - Debris Pile	TCLP only
HTRW-9	Area 17G	Soil - Debris Pile	TCLP only
HTRW-10	Area 17G	Soil - Background	TCLP & Bulk
HTRW-11	Area 15D	Soil - Debris Pile	TCLP only
HTRW-12	Area 15D	Soil - Background	TCLP & Bulk
HTRW-13	Area 15G	Soil - Background	TCLP & Bulk
RB-1	N.A.	Water	Bulk only
TB-1/TB-2	N.A.	Water	TCLP VOAs
HTRW-Dupl[2]	Area 17G	Soil - Background	TCLP & Bulk
HTRW-6QA[3]	Area 17G	Soil - Debris Pile	TCLP only

RB=Rinsate Blank
TB=Trip Blank
Dupl=Duplicate
QA=Quality Assurance

Notes:

1. Bulk analytes are Target Analyte List (TAL), Metals, Target Compound List (TCL) Volatile and Semivolatile Organic Compounds, (VOA) TCL PCBs and pesticides, herbicides, total sulfur, total cyanide, and pH.
2. Duplicate sample of HTRW-10
3. The QA sample location was specified by Corps

removed and disposed of in accordance with relevant environmental laws and regulations.

The planned use of sites 17G, 15D, 15G and Raccoon Island as disposal areas for the deepening of the Delaware River navigation channel will not have any adverse impacts on the groundwater or lands beneath or adjacent to the sites with respect to HTRW. However, prior to utilization of these sites for the project, all debris, drums, tires, and all other solid waste must be removed and disposed of in accordance with relevant environmental laws and regulations.

6.2 Wetland Delineations

Wetlands are those areas that are inundated or saturated to the surface by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands are those wetlands protected by Section 404 of the Clean Water Act, and/or those areas specified by state or local regulation. Wetlands in New Jersey, as specified by the New Jersey Freshwater Wetlands Act (NJAC 7-7:A), are those areas that satisfy the mandatory technical criteria set forth in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, Federal Interagency Technical Committee for Wetland Delineation (1989). The Corps of Engineers and other Federal agencies use the Corps of Engineers Wetlands Delineation Manual (U.S. Army Corps of Engineers. 1987) to delineate wetlands. Wetlands are identified by the presence and field identification of three wetland parameters: hydrophytic vegetation, hydric soils and wetland hydrology.

Wetlands generally include swamps, marshes, bogs and similar areas. Some areas that are only infrequently saturated or intermittently vegetated, or even routinely farmed may also be jurisdictional wetlands. Areas regulated as wetlands in New Jersey include vegetated channels and ditches excavated in otherwise dry ground, if the wetland hydrology parameter is identified. New Jersey also regulates a buffer area around the identified wetland perimeter as if it were also a wetland.

The width of this buffer, or transition area, is based on an assignment of a resource value to the wetland. New Jersey regulations include three resource value classes: exceptional, intermediate, and ordinary. Exceptional resource value wetlands, defined as containing or likely to contain rare, threatened, or endangered species, or high value communities, are assigned a 150-foot wide buffer. Ordinary resource value wetlands (ditches or wetlands less than 5,000 square feet in area) have no specified transition area. Intermediate value wetlands, those that are neither exceptional nor ordinary in resource value, are

assigned a 50-foot wide transition area. It is thus not uncommon that the protected transition areas for exceptional and intermediate resource value wetlands extend beyond the legal boundaries of the properties on which they are found.

Many activities conducted in jurisdictional wetlands (and transition areas) are regulated by law and normally require a permit from a state and/or a federal agency. In southern New Jersey, the regulatory agencies are the New Jersey Department of Environmental Protection (NJDEP), Division of Wetland Regulation, and the U.S. Army Corps of Engineers, Philadelphia District. Regulated activities may include dredging or filling, draining, grading, the removal or modification of vegetation, and/or the placement of structures of various kinds.

The type of permit needed or available is specified by NJAC 7-7:A, and Section 404 of the CWA, and possibly Section 10 of the Rivers and Harbors Act, if the wetland is at or below mean high water of a tidal water and/or ordinary high water of a non-tidal navigable waterway. Permitted impacts to wetlands often require mitigation of such impacts. Mitigation, as defined by the Council on Environmental Quality, may include (in order of preference) (1) avoidance of impacts; (2) minimization of impacts; (3) rectification by repairing, rehabilitating, or restoring the effected environment; (4) elimination or reduction of impacts over time; and (5) compensation through replacement. The primary mitigation measure recommended by both federal and state regulatory agencies is avoidance of impacts where possible and practicable.

Wetland delineations were performed for each of the four (4) upland disposal areas that have been selected for the project as part of environmental assessments (EA) that were done for each area [Dames and Moore. 1994 (a), (b), (c), and (d)]. The Dames and Moore EAs describe a larger area for each disposal site than was finally selected; therefore, the areas of wetlands described as impacted in the EA is generally larger than what will be actually impacted, as shown in Table 6-2. All of the upland disposal sites were formerly used for the disposal of dredged material.

6.2.1 General Site Characteristics

6.2.1.1 Physiography and Climate. The disposal sites are within the Atlantic Coastal Plain Physiographic Province, and are underlain by unconsolidated sediments consisting primarily of sand and gravel. The area experiences a typically humid and temperate climate that is influenced considerably by the Atlantic Ocean. The average annual precipitation of approximately 40 inches is well distributed throughout the year. The average daily maximum temperatures range from 41°F to 86°F, and the average daily minimum temperatures range from 24°F to 65°F. The

Table 6-2. Delaware River Main Channel Deepening Project
Upland Disposal Sites - Existing Wetlands

Site	Area	Wetland Type
15G	6 acres	Palustrine - Emergent [Primarily ditches or farmed]
17G	33 acres	Palustrine - Emergent [Primarily common reed dominated or farmed]
	1 acres	Palustrine - Forested/Shrub-Scrub
	34 acres	Total
Raccoon Island	289 acres	Palustrine - Emergent [Primarily common reed dominated]
	26 acres	Palustrine - Forested/Shrub-Scrub
	315 acres	Total
15D	37 acres	Palustrine - Emergent [Primarily common reed dominated or farmed]
	4 acres	Palustrine - Forested/Shrub-Scrub
	41 acres	Total

TOTAL WETLAND IMPACTS:

365 acres	Palustrine - Emergent [Primarily common reed dominated or farmed]
31 acres	Palustrine - Forested/Shrub-Scrub
396 acres	Total

soils freeze for short periods from November through March (SCS, 1969). The length of the frost-free period is approximately 190 days between mid- to late-April and mid- to late-October.

6.2.1.2 Soils. The majority of the upland disposal sites have been mapped as Made land that consists of dredged material from the Delaware River and its tributaries. Typically this material, which ranges in size from clay to boulders, was hydraulically dredged and pumped to diked containment areas. The larger materials, including sands, gravels and cobbles, would drop out quickly in the vicinity of the discharge pipe. Whereas, the silt and clay-sized particles would remain in suspension and gradually settle out in the lower elevation areas of the containment area. Depositional events would generally occur over a period of time with the discharge pipe being moved to different locations within the containment area. The deposits of fine and coarse-textured materials are therefore variable across the site and are typically stratified.

The thickness of the dredged material is approximately 10 to 20 feet, and it may cover a variety of native soil types, many of which were former tidal marshes. The coarse-grained dredged materials are generally low in organic content, low in water holding capacity, and highly permeable. The fine-grained dredged material is also low in organic content, but may retain some moisture and is generally low in permeability. These characteristics vary considerably from point to point across the site, and at different depths within the profile, because of the depositional characteristics described above; however, the great majority of the materials over the site consist mainly of fine-grained sediment. Since the surface soils consist of dredged material that developed under anaerobic conditions in the Delaware River, the soils commonly exhibit hydric characteristic based on color. Therefore, soil color is not particularly useful on these sites as a hydric soil indicator. Other indicators, such as manganese and iron concretions, and high organic content and organic streaking in sandy soils, proved to be much better indicators for determining hydric soil tendencies. Conditions conducive to the development of wetlands were created in locations where thick layers of finer-grained material remain within 1 to 2 feet of the present ground surface. This is especially apparent in subtle depressions where runoff seasonally collects.

6.2.2 Raccoon Island. The subject site is located in Logan Township, Gloucester County, New Jersey in the lower Delaware River basin. The wetlands that were delineated on Raccoon Island are shown on Plate 13. Note that the impacted wetlands are within the proposed berm line and amount to approximately 315 acres, most of which are dominated by common reed.

The primary hydrological regime of Raccoon Island is precipitation and overland flow. The drainage patterns of Raccoon Island are shown on Plate 21. Raccoon Island is divided

almost in half by Ferry Road which runs through the site in a northwest to southeast direction. The road is drained by two ditches that are located on both sides of the road. These ditches also drain the outer edges of nearby berms.

The southwestern half (west of Ferry Road) of Raccoon Island is almost completely enclosed by berms. The only obvious drainage in this area are four drainage pipes which breach the berm along the southern edge of the parcel. The exact area of drainage associated with these pipes is unknown.

The northeast half (east of Ferry Road) of Raccoon Island primarily drains northeast toward a tidal basin of the Delaware River. This basin is approximately 10 to 15 feet below the existing ground surface of the site. Unlike the southwestern half, there are no berms in this portion of Raccoon Island that completely enclose the area which may confine the hydrology and alter drainage.

Most of the natural plant communities have been altered and replaced with a ruderal community which consists of aggressive weedy species that are adapted to disturbed areas. This type of habitat includes roadsides, disturbed areas, waste places, etc. The majority of these disturbed areas are wetlands. For example, the berms surrounding the southwestern half of the site are laid out such that they retain water and create wetland hydrology.

Probably the most abundant species is common reed (Phragmites australis) which is ubiquitous in most of the unmanaged sites. This plant, even though it is listed as a facultative wetland species, seems to colonize any disturbed area, even habitats that are considered upland. For example, common reed was found growing on top of the adjacent berms. However, the community of common reed is not very vigorous in the dry habitat. In wet areas below the berms common reed is very vigorous and dense, creating a wetland monoculture (low vegetative diversity).

Other weedy species such as long-bristled smartweed (Polygonum cespitosum), Canada golden rod (Solidago canadensis), and wrinkled goldenrod (Solidago rugosa) are common throughout the site. There are some small upland forested areas within the site where black cherry (Prunus serotina), white mulberry (Morus alba), and black willow (Salix nigra) colonized island-like mounds of spoil material. The dominant herbaceous layer of these forests consists of nimble-will (Muhlenbergia schreberi), and stinging nettle (Urtica dioica). There are small areas of shrub-forested wetlands throughout the site dominated by black willow that amount to approximately 26 acres.

Federally-listed threatened and endangered plants and New Jersey plants of concern were not observed onsite.

6.2.3 Site 15G. The site is located in Oldmans Township, Salem County, New Jersey. The wetlands that were delineated on Site 15G are shown on Plate 15. Note that the impacted wetlands are

within the proposed berm line and amount to approximately 6 acres composed of ditches and farmland.

The drainage patterns of Site 15G are shown on Plate 23. Most of the water that is available to support wetland hydrologic conditions on Site 15G is delivered as precipitation and collects in depressional areas through sheet flow. The site's perimeter dike, which was originally constructed to contain the dredged material slurry, a north-south oriented interior berm, a man-made ditch, and subtle topographic features have defined four primary site drainage basins. Drainage is conducted via several constricted ditches.

Throughout the site, several small depressional areas are present that collect runoff, and perhaps receive shallow groundwater discharges. These depressional areas may retain water for periods of sufficient duration to create wetland hydrologic conditions. This is particularly true if the near-surface soils of the depressional area are fine grained and slowly permeable.

Most of the natural plant communities have been altered and replaced with agricultural crops which primarily consist of corn and soybeans. The fields are sprayed regularly to control crop pests and weedy vegetation. Although these fields are regularly maintained for crop production, invasive plant species that are typical of a ruderal community are also present.

Federally-listed threatened and endangered plants and New Jersey plants of concern were not observed onsite.

6.2.4 Site 15D. The site is located in Logan Township, Gloucester County, New Jersey. The wetlands that were delineated on Site 15D are shown on Plate 14. Note that the impacted wetlands are within the proposed berm line and amount to approximately 41 acres composed primarily of common reed dominated and farmland. There are approximately 4 acres of forested wetlands on the site.

The topographic relief at Site 15D is very subtle; the drainage patterns are shown on Plate 22. Eleven drainage ditches have been installed at evenly spaced intervals to intercept water and drain the site. Many of these ditches support wetlands within their banks where water is impounded during wet periods. In areas not drained by these ditches, gradual depressional areas are present that appear to collect precipitation and surface water runoff.

Most of the natural plant communities that occurred on Site 15D have either been altered or replaced by disturbance associated with placement of dredged material and/or current agricultural practices. Exotic plant species have also displaced native plants in former natural areas that have no overstory cover. During field surveys, no Federally-protected or plant species of

special concern were observed. The major plant community types are described below:

6.2.4.1 Ruderal Community. This type of habitat is usually found along roadsides, fields, lawns, and various waste places. On Site 15D, ruderal plants comprise most of the species found in wetlands located within the perimeter.

The most abundant species are common reed (Phragmites australis) and Asiatic tearthumb (Polygonum perfoliatum) which are ubiquitous in most of the unmanaged portions of the site. These plants, even though they are listed as facultative wetland species, seem to colonize any disturbed area, even habitats that are considered upland, such as the perimeter dike. For example, common reed and Asiatic tearthumb were found on the dike in association with upland species such as blackberry (Rubus sp.) and pokeweed (Phytolacca americana). In the lower lying areas, common reed and Asiatic tearthumb were associated with several wetland species such as soft rush (Juncus effusus), sensitive fern (Onoclea sensibilis), spatter dock (Nuphar luteum), and spotted touch-me-not (Impatiens capensis).

6.2.4.2 Agricultural. The dominant plant species that occurs in the agricultural fields is soybeans. Mixed in with the soybeans are many of the ruderal species of plants. An aggressive weed control program by the farmer, however, has kept the ruderal species in check during the growing season.

6.2.4.3 Woodlands. One small black willow (Salix nigra) dominated wetland of about 3.5 acres exists within the bermed area.

Federally-listed threatened and endangered plants and New Jersey plants of concern were not observed onsite.

6.2.5 Site 17G. The subject site is located in Woodbury Township, Gloucester County, New Jersey. The wetlands that were delineated on Site 17G are shown on Plate 12. Note that the impacted wetlands are within the proposed berm line and amount to approximately 34 acres composed primarily of common reed dominated wetland and farmland. There is approximately one (1) acre of forested and shrub-scrub wetlands on the site. Most water available to support wetland hydrological conditions is delivered as precipitation. The prevalent coarse-grained, high-permeability surface materials generally limit the formation of natural channels.

The topographic surface created by past fill events is generally flat, with only slight gradients (generally less than 2%) imposed to drain water away from specific activity areas. Intervening spaces have, as a result, often become topographic depressions. For the most part, discharge points have not been provided. The depressions collect run-off waters from higher areas (and perhaps shallow groundwater seepage) and retain it for periods sufficient

to create wetland hydrological conditions, if near-surface dredged material layers are fine-grained.

The interior berms (generally along dirt roads) within the site boundary have created five subsections that are hydrologically isolated from each other. These berms act as a barrier to surface water migration. The topography and drainage patterns are shown on Plate 20.

Several drainage tiles have been installed beneath the cultivated fields to drain surface water from the site. These subsurface tiles drain water from the cornfields and discharge it outside the perimeter berm via culverts. Field observations and discussions with the resident farmer indicate that the drainages have been very effective in drying out the site. Consequently, these drained areas of Site 17G have been converted from possible wetlands to upland habitat over the past 20-25 years.

The plant communities of Site 17G consist of a mosaic of woodlands, emergent marsh, and cultivated fields. Cultivated fields consisting of corn (Zea mays) and soybeans (Glycine max) dominate the landscape, covering over half the site. Several of these fields contain substantial areas of jurisdictional wetlands, particularly in areas of relatively low relief.

The second most prevalent cover type is common reed stands that occupy the berms, roadside edges, drainage ditches, and uncultivated "plains." Common reed dominates both wetland habitats and disturbed uplands.

Hardwood stands occupy portions of the spoil banks and fragmented patches of the interior. Mixed upland hardwoods occur on berm tops and slopes, while mixed wetland hardwoods occupy the more mesic zone. Common upland hardwood species on the site are black cherry (Prunus serotina), mulberry (Morus alba), and black locust (Robinia pseudoacacia). Dominant wetland hardwoods include red maple (Acer rubrum), box elder (Acer negundo), and green ash (Fraxinus pennsylvanica).

A tidal emergent marsh is prominent outside the berms along the Delaware River, within the tidal basin, and along Woodbury Creek. Dominant emergents include yellow cow-lily (Nuphar luteum), pickerel weed (Pontederia cordata) and various sedges and rushes.

One species found on Site 17G, Frank's sedge (Carex frankii), is listed in the special plants of New Jersey by the New Jersey National Heritage Program (1993). No State- protected or Federally-listed plants were observed.

6.3 Habitat Assessments

As was mentioned in the preceding section, all of the upland dredged material disposal areas were formerly used for the disposal of dredged material. Three of the areas (15D, 15G, and

17G) are mostly used for the production of row crops, primarily corn and soybeans. Raccoon Island is vegetated almost entirely by common reed (Phragmites communis) with some small patches of woodlands. Table 6-3 shows the areas of each habitat type that will be impacted, as well as the value rating for each habitat type. The habitats for each disposal area are described below.

6.3.1 Habitat Evaluation Criteria. Four criteria were used to evaluate the relative value of the habitats. These criteria are A) structural diversity, B) occurrence of species, C) presence of wildlife corridors, and D) occurrence of rare, threatened, and endangered species. These criteria are adapted from those used by the Natural Resources Advisory Board (1988), and details are presented in Dames and Moore (1994 a,b,c and d).

The wildlife habitat assessment criteria used to assign relative values for each cover type are discussed below. Each criterion was assigned a numerical score (3-high, 2-moderate, 1-low) according to its perceived value. Criteria scores were summed for each habitat type and divided by four to provide an average score.

6.3.1.1 Criterion A - Structural Diversity. This criterion considers the diversity in a cover type that results from layering or tiering of vegetation. Cover types with greater structural diversity generally provide habitat for a larger number of wildlife species.

> HIGH (3 points): Mixtures of scrub/shrub and forested wetland cover types, lower perennial and intermittent riverine cover types, limnetic and littoral cover types.
>
> MODERATE (2 points): Mixtures or monocultures of emergent aquatic wetlands, ponds, adjacent marshes, forests and tree/grasslands.
>
> LOW (1 point): Mixtures or monocultures of native and introduced grasses, croplands, pasturelands, wet meadows, and urban areas.

6.3.1.2 Criterion B - Species Occurrence. This criterion considers the ability of a cover type to provide habitat for the wildlife species expected to be potentially present based on the review of documents and communications with government wildlife biologists. The total number of bird and mammal species potentially inhabiting each cover type was divided by the potential number of species likely to occur regionally. The resulting percentage yields a comparative value of each habitat

Table 6-3. Delaware River Main Channel Deepening Project
Upland Dredged Material Disposal Sites
Habitat Type Area and Value Rating

HABITAT TYPE AND EVALUATION ELEMENT	RELATIVE VALUE	HABITAT VALUE RATING	TOTAL ACRES EXISTING	TOTAL ACRES WITH PROJECT
Woodlands (WO)		Moderate to high	48	0
Structural Diversity	2			
Species Occurrence	2			
Wildlife Movement Corridors	3			
Threatened and Endangered Species	2			
TOTAL RELATIVE VALUE (Sum/4)	2.25			
Common Reed (CR)		Low to moderate	469	0
Structural Diversity	1			
Species Occurrence	1			
Wildlife Movement Corridors	2			
Threatened and Endangered Species	1			
TOTAL RELATIVE VALUE (Sum/4)	1.25			
Non-Tidal Marsh (NTM)		Moderate to high	4	620
Structural Diversity	2			
Species Occurrence	2			
Wildlife Movement Corridors	2			
Threatened and Endangered Species	3			
TOTAL RELATIVE VALUE (Sum/4)	2.25			

Table 6-3. (continued) Delaware River Main Channel Deepening Project
Upland Dredged Material Disposal Sites
Habitat Value Rating

Agriculture (AG) Structural Diversity Species Occurrence Wildlife Movement Corridors Threatened and Endangered Species TOTAL RELATIVE VALUE (Sum/4)	 1 2 1 1 1.25	Low to moderate	685	0
Ruderal Area (RA) Structural Diversity Species Occurrence Wildlife Movement Corridors Threatened and Endangered Species TOTAL RELATIVE VALUE (Sum/4)	 1 1 1 1 1	Low	34	0
Active Dredge Disposal Area Structural Diversity Species Occurrence Wildlife Movement Corridors Threatened and Endangered Species TOTAL RELATIVE VALUE (Sum/4)	 1 1 2 1 1.25	Low to moderate	0	620
TOTALS			1240	1240

considered. Note that the total for all of the habitats may exceed 100 percent as some species utilize more than one habitat. Points were assigned based on the suitability of the cover type to support wildlife as shown below:

HIGH (3 points): Cover type provides habitat for 66 to 100 percent of the bird and mammal species potentially found in the area.

MODERATE (2 points): Cover type provides potential habitat for 33 to 66 percent of the bird and mammal species potentially found in the area.

LOW (1 point): Cover type provides potential habitat for less than 33 percent of the bird and mammal species potentially found in the area.

6.3.1.3 Criterion C - Wildlife Movement Corridors. This criterion considers the need for wildlife to have continuous cover to allow for unhindered movement between habitat areas. For example, forested areas provide corridors within which wildlife can move without being readily observed during much of the year. In contrast, open agricultural fields may expose wildlife to observations by humans or predators. Points were assigned as follows:

HIGH (3 points): Cover type is a component of a specified corridor for most of the year.

MODERATE (2 points): Cover type is not a component of a specified corridor but is located adjacent to an important corridor area.

LOW (1 point): Cover type has limited value as a wildlife corridor for most of the year.

6.3.1.4 Criterion D - Threatened and Endangered Species (TES). This criterion considers the ability of a habitat to support species which are recognized by Federal or State agencies as threatened, endangered or a candidate species. Points were assigned as follows:

HIGH (3 points): The cover type area provides potentially preferred habitat for a TES species, and a TES of wildlife has been confirmed as using the area; or the cover type area is known to support a TES of plant.

MODERATE (2 points): The cover type area provides potentially preferred habitat for TES, but such species is not confirmed at present to be using the cover type area.

LOW (1 points): The cover type does not provide any potentially preferred habitat for TES.

6.3.2 Habitat Descriptions. Most of the following habitat types are found on all the disposal areas; only Raccoon Island does not have agriculture. Habitat types were assessed and relative habitat values assigned using the criteria specified above. All habitat types have been affected by dredged material disposal and activities that have occurred on the assessment area over the past 50 years.

6.3.2.1 Woodland. Included in this unit are areas of lands dominated by woody vegetation within and in the immediate vicinity of the disposal site. For the most part, woody vegetation is confined to the berm areas and composed of monocultures or mixtures of early-successional hardwood species such as black locust(Robinia pseudoacacia), black willow (Salix nigra) and black cherry (Prunus serotina). White mulberry (Morus alba), sumac(Rhus sp.) and princess tree(Paulownia tomentosa) are common. The cherry/mulberry mixture provides an important seasonal food source for perching birds, small and medium-sized mammals and deer.

Woodlands often extend as corridors on exterior and interior berms as well as isolated islands surrounded by either agriculture or common reed. The berm-fringe woodlands are often contiguous and continuous with native woodlands and provide corridors to the large tidal marsh areas that are adjacent to all the proposed disposal areas. These conditions favor immigration of native wildlife species. This habitat was rated from moderate to high.

6.3.2.2 Common Reed. These areas are mostly monocultures of common reed (Phragmites australis), an aggressive invader species throughout the northern coastal plain region. This reed preferentially occupies disturbed ground in well-drained to regularly-flooded conditions. Once common reed becomes dominant it excludes most other species, lowering the food and cover value for most wildlife. Areas dominated by common reed can support a wide variety of wildlife species where the common reed is interspersed with shallow water and/or areas of tidal influence, and other species (particularly food plants) are present (U.S. Fish and Wildlife Service. 1995). However, most of the common reed areas in the disposal areas consist of monotypic stands with no standing water and provide low wildlife value. Shading by trees and grazing appear to be options for controlling common reed. If cut and bailed early in the season, common reed is usable as fodder. This habitat was rated from low to moderate.

6.3.2.3 Tidal Marsh. This is a regularly flooded, vegetated zone that serves as a feeding, breeding and spawning area for many wildlife species. The New Jersey Natural Heritage Program lists this community type as "Mixed Tidal Fresh Marsh" and considers it locally important as a generic habitat type. The tidal marsh component exists as a fringe area, adjacent to all of the proposed disposal sites; however, they are outside the areas that would be directly impacted by the disposal of dredged

material. The tidal marsh is comprised of a primarily herbaceous plant community of annual and perennial rooted and floating emergent species. Early in the season, arrowhead (Sagittaria latifolia), spatter-dock (Nuphar luteum) and pickerelweed (Pontederia cordata) dominate the community. Later, bulrushes (Scirpus spp.), marsh grasses and, particularly, native wild rice (Zizania aquatica) proliferate. Many of the tidal marshes that are adjacent to the CDFs are considered exceptional value to fish and wildlife resources (USFWS. 1995a).

6.3.2.4 Nontidal Marsh. The non-tidal marsh, like the tidal marsh, is comprised of a primarily herbaceous plant community of annual and perennial rooted and floating emergent plants. Species that would be expected to occur include arrowhead (Sagittaria latifolia), spatter-dock (Nuphar luteum), pickerelweed (Pontederia cordata), common reed (Phragmites communis), duckweeds (Lemna spp. and Spirodela spp.), waterlily (Nymphaea tetragona), and broad-leaved cattail (Typha latifolia). This habitat is rated from moderate to high.

6.3.2.5 Ruderal Area. Ruderal areas include areas of highly and recently disturbed soils that support only annual weeds such as buttonweed (Diodia teres), flannel mullien (Verbascum thapsus) and common mugwort (Limosella subulata). Often, substrates are coarse, excessively well-drained and nutrient impoverished materials that offer little upon which a perennial community can establish. Much of these areas remain barren for most of the growing season. It is expected that many years of weathering and deposition of organic materials will be necessary before normal succession can occur. According to Martin *et. al.* (1951), some weeds may provide a food source to some birds and small mammals. This habitat type is rated low in value.

6.3.2.6 Agricultural Area. The agricultural land that exists in the disposal areas is generally used for corn, wheat, and soybeans. It should be noted that cropped areas provide an inadvertent food source for many wildlife species throughout the growing season, especially when they border other wildlife habitats (Martin *et. al.*, 1951). This is especially valuable when the agricultural area exists adjacent to another habitat type that can provide cover for the times of year when the agricultural fields are bare. This habitat type is rated to have a low to moderate value.

6.3.2.7 Wildlife Species. Due to the similar habitats present on each of the disposal areas (except for the lack of agriculture on Raccoon Island), similar species were observed on each area.

The most abundant mammal species captured in the Sherman live traps was the white-footed mouse (Peromyscus leucopus). Although the white-footed mouse was not captured at each area, it, and the meadow vole (Microtus pennsylvanicus), which was also captured, would be expected to be wide spread. A more intensive sampling program would be needed to further identify and confirm the

presence of small mammals at the assessment areas.

Medium and large mammals expected to occur include the eastern cottontail (Sylvilagus floridanus), red fox (Vulpes fulva), raccoon (Procyon lotor), gray squirrel (Sciurus carolinensis), and white-tail deer (Odocoileus virginianus).

Species of birds that were either observed or expected to occur in the disposal areas include the Canada goose (Branta canadensis), willow flycatcher (Empidonax minimus), barn swallow (Hirundo rustica), gray catbird (Dumetella carolinensis), American robin (Turdus migratorius), yellow warbler (Dendroica petechia), red-winged blackbird (Agelaius phoeniceus), common grackle (Quiscalus quiscula), European starling (Sturnus vulgaris), song sparrow (Melospiza melodia), mourning dove (Zenaida macroura), eastern kingbird (Tyrannus tyrannus) and northern rough-winged swallow (Stelgidopteryx serripennis).

Reptiles and amphibians that are likely to occur in the disposal areas include the common snapping turtle (Chelydra serpentina), eastern box turtle (Terrapene carolina), eastern garter snake (Thamnophis sirtalis), Fowler's toad (Bufo woodhousii), and bull frog (Rana catesbeiana).

The NJDEP reports that the shortnose sturgeon (Acipenser brevirostrum), Atlantic sturgeon (Acipenser oxyrhynchus), American shad (Alosa sapidissima), white perch (Morone americana), striped bass (Morone saxatilis), and largemouth bass (Micropterus salmoides) occur in aquatic habitats in the immediate vicinity of the assessment area.

6.3.3 Assessments of Individual Dredged Material Disposal Areas.

Raccoon Island is mostly covered with common reed with small areas of woodlands, shrubs, ruderal area and non-tidal marsh interspersed. Tidal marsh exists adjacent to, but outside of the proposed disposal area (Plate 17). The osprey (Pandion haliaetus), a State-listed threatened species, occasionally forages in the tidal marsh habitat and nests adjacent to this site. The peregrine falcon (Falco peregrinus), a Federally-listed endangered species, may also use this habitat. Due to their high value to waterfowl, the marshes of Raccoon Creek have been designated by the USFWS (1995a) as focus areas for needed protection under the Atlantic Coast Joint Venture, an effort being undertaken pursuant to the North American Waterfowl Management Plan (NAWMP).

Sites 17G (Plate 16), 15D (Plate 18), and 15G (Plate 19) are primarily used for agricultural crops. Site 15G has the lowest habitat diversity, being composed almost entirely of one large agricultural field with a fringe of common reed, woodlands and ruderal areas. The bald eagle (Haliaeetus leucocephalus), a Federally-listed threatened species, may forage and/or roost in this area and in the adjacent tidal marsh. The State-listed

endangered pied-billed grebe (Podilymbus podiceps) may also inhabit the adjacent tidal marsh. Due to their high value to waterfowl, marshes of Oldmans Creek have also been designated by the USFWS (1995a) as focus areas for needed protection under the NAWMP. In addition, the wetland complex, including Site 15G and the adjacent tidal marsh, is designated a priority wetland by the USFWS under the Emergency Wetlands Resources Act (EWRA) because of its national ecological significance. This wetland complex is also a priority wetland as designated by the U.S. Environmental Protection Agency (U.S. Environmental Protection Agency. 1994) under the Clean Water Act (62 Stat. 1155, as amended; 33 U.S.C. 1251 *et seq.*). Oldmans Creek and adjacent marshes are of exceptional value to fish and wildlife resources.

Site 15D has slightly more habitat diversity than Site 15G, but is also primarily composed of large agricultural fields with small areas of common reed, woodlands and ruderal areas. The bald eagle, a Federally-listed threatened species, may forage and potentially roost in this area and in the adjacent tidal marsh. The State-listed threatened osprey (Pandion haliaetus) also forages in the adjacent tidal marshes. Due to their high value to waterfowl, marshes of Raccoon Creek have also been designated by the USFWS (1995a) as focus areas for needed protection under the Atlantic Coast Joint Venture. Site 15D is also adjacent to a priority wetland as designated by the U.S. Department of the Interior (DOI) under the Emergency Wetlands Resources Act (EWRA) (P.L. 99-645; 100 Stat. 3582). Raccoon Creek and adjacent marshes are of exceptional value to fish and wildlife resources.

Although Site 17G is primarily composed of agricultural areas and common reed, it has greater habitat diversity than either Site 15D or 15G because of greater interspersion of habitat types. The bald eagle, a Federally-listed threatened species, may forage and roost in this area, especially in the adjacent tidal marshes. The Delaware River, Woodbury Creek, and adjacent marshes are of exceptional value to fish and wildlife resources (FWS. 1995a).

6.4 Habitat Management During Operations

A summary of habitat management of the upland dredged material disposal areas is given below. A detailed description of the design and operation of these sites is given in Section 3.2.3.

One of the primary goals and objectives for these four CDFs is development, enhancement, and management of wildlife habitat through the beneficial uses of dredged material. In the past, the Delaware River CDFs have been managed with a primary goal of maximizing storage capacity. This normally requires that the sites be drained as quickly as possible following active placement operations, that they be trenched to hasten dewatering, and that the dried dredged material be borrowed from the interior of CDFs for upgrading dikes before the next dredging cycle. This overall management approach generally conflicts with management for wetlands and wildlife habitat.

An approach that provides for both is tied to extended cycles between uses. With extended cycles, portions of the sites can be used for temporary wetland habitat for several years, prior to the need for draining, dewatering, and dike upgrading to be ready for the next placement episode. This calls for rotation of placement between subdivisions within each CDF. The CDF sites have total surface areas ranging from 275 to 350 acres. The CDFs are amenable to subdivision into cells, each with a surface area on the order of 125 to 175 acres. A 3- to 4-yr cycle for use in any one site, and placement into one of the two cells for each cycle, means that each cell will be required for placement on a 6 to 8 year cycle. Assuming between 0.75 and 1.5 MCY for each event, the bulked lift thickness will be on the order of 4 to 8 feet. Material will be left in a wet condition or ponded with water if desired for a period of 3 to 4 years. During that time period, the cell will be managed as wetlands. However, some self weight consolidation would be taking place, bringing the lift thickness down to around 3 to 6 feet. This will require periodic adjustment of weirs to maintain the desired ponded area and water depths.

The lift thickness following self weight consolidation can be managed for dewatering and borrow for dike upgrading over the next time period of 3 to 4 years. Using this engineering method, each of four CDFs could have roughly half of the surface area managed for habitat at all times, with half the site being managed for dewatering and borrow for dike upgrading. With this approach, some use of the other 4 CDFs in the vicinity will be necessary.

The four new CDFs will be divided into two cells each. Each of these will have two weirs, allowing considerable flexibility for passive management through control of water depths between dredging cycles. Allowing water to remain on sites after dredging rather than allowing all freeboard and rainwater to flow off, coupled with active dewatering, will provide for appropriate Phragmites australis control and waterfowl/waterbird habitat.

The easiest habitat types to achieve will be non-forested, and will include primarily fresh water emergent and open water habitat. These wetlands will provide habitats for migratory and resident waterfowl, wading birds, as well as other birds, mammals, amphibians, and reptiles that need wetlands.

6.5 Habitat Management Subsequent to Use

All of the four sites lend themselves to some imaginative topographic relief for the sake of wildlife habitat during the life of the project, and especially after the project is completed. That is, the sculpting of ponds and islands within cells to provide more habitat diversity, and varying water depths after dredged material has been placed in cells over several rotational cycles and higher overall elevations are achieved. This approach is also expensive, and should not be undertaken

until the sites are no longer required for dredged material disposal purposes. There are several transitional, more upland habitat features that can be planned for two to three decades into project life that include more moist forest, more insular features, and perched ponds.

These four sites, along with the other eleven CDFs adjacent to the Delaware River, will be developed and filled. The sites will progress, and at the end of the project life in 2050, the four sites will have become broad flat hills in the landscape and be uplands rather than wetlands. The material in these sites is suitable for beneficial uses, and does not require any remediation after project life. Upland habitat will develop on these sites regardless of whether they are planted or not; natural colonization takes longer but the results are the same over time. The detailed management of these areas should be determined by the needs and priorities of the people who are living at the end of the project. It can be stated at this time that this area will be committed to open space/environmental uses.

6.6 Assessment of Impacts Associated With Use of Sites

6.6.1 Impacts to Wetlands

6.6.1.1 Avoiding Impacts

It will be impossible to avoid impacts to all existing habitats within the four CDFs. Those habitats that fall within the mainline dikes will be destroyed and regained repeatedly over the next 50 years. The re-alignment of the dikes to avoid existing forested and shrub areas is planned, and this will protect much of the quality wetlands and other forested habitat. Dike alignments will not protect those wetlands that are covered with Phragmites australis, but these will be replaced over time with higher quality wetlands.

6.6.1.2 Wetland Impacts

A determination of 396 acres of jurisdictional wetlands impacted on the four sites has been provided, all of which are manmade wetlands. The acreage of wetlands in each site is shown in Table 6-2. The most dominant type of manmade, jurisdictional wetland inside the four CDFs is 365 acres of Phragmites australis, or common reed, and farmed, which are approximately 90% of the wetlands present on the four sites. Table 6-4 shows the amounts and types of wetlands that presently occur on the disposal areas and what will be present with the proposed plan. There is a net increase of approximately 200 acres of wetlands. All of the wetlands that will occur in the disposal areas will be palustrine emergent, mostly non-tidal fresh marsh. The quality of these wetlands is expected to be better than the predominantly common reed dominated wetlands that presently occur. These wetlands will be less likely to be dominated by common reed because of the

water level manipulations that will be possible using the weirs that will be present at strategic locations.

There are only 4 acres of non-tidal marsh that is not common reed. Replacement of this habitat will be relatively easy on a temporary basis, as cells are filled and dewatered. Each dewatering cell generally has a shallow pond area remaining at the weir that vegetates in fresh marsh. Care must be taken to keep this final ponded area from growing in Phragmites australis; however, the ponding for several years in each cell in rotation will significantly retard growth and expansion of the reed.

Forested wetlands have been lost in large acreages throughout the New Jersey/Delaware/Pennsylvania area, resulting in requests for more attention to re-forestation and management of this habitat type. The forested wetland mitigation bank scheduled for the south end of CDF 17G is a good example. It is possible and generally recommended on the four sites to isolate and protect approximately 50 acres of existing shrub and tree areas for continued succession, and also to include additional upland areas along outer dike toes that can develop as shrub and tree areas, to compensate for and supplement the 39.54 acres of wet shrubs and trees being impacted. While the upland forest habitats within the CDFs are not subject to jurisdiction, efforts will be made to protect as much of the existing forest as possible. The entire 1240 acres will become uplands over time. It is also possible to include in a long-term management plan for parts of each CDF to be planted or colonized as moist forest (not wetland forest) at a later stage of development. While not wetlands, they can still provide considerable wildlife habitat as upland forest near an urban area.

6.6.2 Impacts to Wildlife

6.6.2.1 Environmental Windows. Environmental windows for nesting and migratory species that may occur on the four sites will generally be observed. Since a rotational management plan that will allow certain cells in CDFs to remain undisturbed is being considered, those cells and remaining existing wooded areas outside of cells will not be disturbed regardless of the dredging activity. Dike construction and upgrading are best carried out in late summer and fall months due to drier soil conditions, and those on-site activities are far more likely to have a potential impact on nesting or migratory species than the actual placement of the hydraulically-pumped material within the cell. Earth moving for dikes and land leveling totally removes existing habitat and nests, whereas pumping material will cover up nesting that may have begun prior to placement. This will not be a factor if pumping is begun before nesting season. Pumping material may require a few on-land personnel, but in general is not an intensive on-land activity like dike construction.

Table 6-4. Delaware River Main Channel Deepening Project, Upland Confined Dredged Material Disposal Sites - Wetland Impacts

Upland Dredged Material Disposal Sites	Site 17G (Acres)		Site 15D (Acres)		Site 15G (Acres)		Raccoon Island (Acres)		Totals (Acres)	
Wetland Type/ Wetland Acres*	Exist.	With Proj.	Exist.	With Proj.	Exist.	With Proj.	Exist.	With Proj.	Exist	With Proj.
Palustrine Emergent (PEM)	33[1]	145	37[1]	160	6[2]	135	289[3]	175	365[3]	615
Palustrine Forested/Shrub -Scrub	1		4				26		31	
Totals	34	145	41	160	6	135	315	175	396	615

* Area is rounded to the nearest acre.
1. Primarily common reed dominated or farmed.
2. Primarily ditches or farmed.
3. Primarily common reed dominated.

6.6.2.2 Impacts to Wildlife Habitat. Table 6-3 compares the types and area of habitats that presently exist on the 4 CDFs with what will occur when the sites are developed, and during the 50 year period that they will be used for the disposal of dredged material. Approximately 93% of the existing habitat is rated as low to moderate quality, consisting of common reed or agricultural land. Through the rotation of placement of dredged material between subdivisions within each CDF, approximately 600 acres or 50% of the area of the new CDFs will be maintained as shallow, non-tidal marsh with an expected habitat rating of moderate to high.

As previously noted, adverse impacts to most of the forested and shrub-scrub habitat within the CDFs will be avoided by aligning the new dike to avoid these areas. Nevertheless, 48 acres of this moderate to high rated habitat will be impacted by the project. However, approximately 372 acres of additional area outside of the CDFs will be purchased as part of the project due to real estate requirements. This area is presently a mosaic of habitat types consisting primarily of tidal marsh, woodlands, common reed, and ruderal areas. Much of this area is moderate to high quality wildlife habitat located adjacent to either the Delaware River or to tidal creeks including some tidal marshes that are considered exceptional value to fish and wildlife resources (FWS 1995a). This area will be maintained as undeveloped land, and it is likely that the habitat quality will increase as the woodlands mature and ruderal and common reed areas succeed to more valuable habitats such as woodlands. In conclusion, the overall habitat value of the 1612 acres that will be purchased for upland dredged material disposal areas will be greater during the 50 years of project life than what presently exists on this area.