WETLAND RESTORATION PLAN FOR

CHARLES CREEK PARK

Pasquotank County, North Carolina

Prepared for

Ecosystem Enhancement PROGRAM

S&EC Project No. 7281.D2

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S&EC

Soil & Environmental Consultants, PA

11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

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1.0 INTRODUCTION

Soil & Environmental Consultants, PA (S&EC) has been contracted by the North Carolina Ecosystem Enhancement Program (EEP) (formerly the Wetlands Restoration Program,WRP) to restore and enhance approximately 1.9 acres of riparian (stream-side) wetlands on the Charles Creek Park site in Elizabeth City, Pasquotank County, NC See Figure 1 for a site vicinity map.

In August 2003, S&EC prepared a Conceptual Restoration Plan to gain concurrence from then WRP, on our concept for the restoration and enhancement of these wetlands. At that time we solicited additional comment and input from then WRP for incorporation into this Restoration Plan.

This report presents our design rationale and documentation for our proposed Restoration Plan. Proposed site restoration includes the removal of fill, localized grading, and planting the site to restore its wetland hydrology and vegetation, and the resultant habitat. The interested reader is referred to the attached figures, appendices, and construction plan sheets for additional information.

Additional effort will be needed for the preparation of construction specifications, bid documents, construction and planting observation, preparation of record drawings, and first year monitoring requirements. S&EC is currently under contract to provide these services.

2.0 PROJECT GOALS

The specific goals of the Charles Creek Park wetland restoration effort are to:

1) Restore and enhance wetland function, vegetative structure, and wildlife habitat to approximately 1.9 acres of lower coastal plain bald cypress-gum swamp,

2) Incorporate the restoration effort into the site's surrounding areas in an aesthetically pleasing manner that does not mark a significant departure from similar nearby cypress-gum swampland,

3) Retain valuable natural onsite assets (i.e., large existing bald cypress individuals) and incorporate them into the site restoration, and

4) Incorporate the site into the Elizabeth City community in a manner that is conducive to fostering public interest in wetland restoration.

3.0 PROJECT LOCATION

The Charles Creek Park Wetland Restoration site is located in the Pasquotank River Basin, Hydrologic Cataloging Unit 03010205, along the southeast bank of Charles Creek near its confluence with the Pasquotank River in Pasquotank County, NC.

The site is situated immediately northeast of the intersection of Southern Avenue and Dawson Street in downtown Elizabeth City, NC. See the attached Site Location Map (Figure 1) and the attached 7.5 minute series USGS Topographic Map, Elizabeth City, NC (Figure 2) for specifics on directions to the site and its surrounding vicinity.

According to the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Water Quality (DWQ) website, Charles Creek (Stream Index Number 30-3-11) is classified as a Class C and Sw watercourse. The following definitions apply:

Class C – freshwaters protected for secondary recreation, fishing, aquatic life including propagation and survival , and wildlife

Class Sw – swamp waters which have low velocities and other natural characteristics which are different from adjacent streams

The site consists of a single tract, is currently owned by Elizabeth City, NC and functions as a City Park (see attached Sheet 3 - Existing Site Plan), and is comprised of approximately 1.9 acres.

4.0 WATERSHED INFORMATION

During our analyses we observe characteristics of the site and surrounding area, verify surface and channel flow conditions, and observe existing water conveyance structures. This section describes our evaluation of the project watershed.

4.1 Drainage Area

The watershed area for the project site is confined to the immediate project vicinity bounded by Southern Avenue to the west, Dawson Street to the south, Hunter Street to the east, and Tuscarora Avenue and Charles Creek itself to the north. These roads serve as the watershed boundary due to their elevation relative to the remainder of the site.

Existing surface drainage swales and two existing culverts (one under Dawson Street and one under Hunter Street) intercept or collect off-site runoff and direct it to two unnamed tributaries of Charles Creek which run through the project site.

4.2 Land Usage & Distribution

Approximately one-third of the parcel is maintained, mown lawn and landscaped, area. Notable site amenities include a small asphalt paved basketball court, a swing set and playground area, and a small dock/boardwalk structure along Charles Creek, all located on the west side of the tract. Immediately to the east of the basketball court, there is a large, open maintained grassed area enclosed by Dawson Street to the south, Charles Creek to the north, and one of the tributaries of Charles Creek to the east.

The remaining two-thirds of the property is predominately forested, with a narrow grassed area adjacent to Dawson Street until its intersection with Hunter St. This area has naturalized and primarily consists of multiple large diameter bald cypress with varying understory species located along Charles Creek and the two previously noted unnamed tributaries to the creek.

Topographically, the site is generally flat, sloped slightly near the Charles Creek waterline (see attached Existing Site Plan). Topographic abnormalities include landscaped/planted areas within the larger tract. Please refer to Appendix A for site photos. Land usage surrounding the project site consists of single family residential lots with intermixed commercial development.

4.3 Future Land Use

The project site is separated topographically, and in turn hydraulically from the surrounding vicinity and watershed. Surface and channel flow from the surrounding area is intercepted and routed through the site (described later in this report). Accordingly it is our opinion that future changes in surrounding land usage and resultant hydrologic changes are not likely to affect the site or the proposed restoration efforts.

5.0 EXISTING SITE CONDITIONS

Existing site hydraulic features consist of maintained grass-lined surface drainage swales, boundary culverts (transporting discharges from off-site), and Charles Creek and the two previously noted unnamed tributaries of Charles Creek. This section describes currently existing site conditions at Charles Creek Park. See attached Existing Site Plan.

5.1 Existing Hydraulic Features

Based on their size (ranging from roughly 6-inches to 18-inches in depth) and location, the existing swales were constructed to collect and remove local surface runoff from select portions of the site and the surrounding area. The first of these swales is located immediately to the east of the playground and basketball court and flows generally northward to its outfall into Charles Creek. The second swale parallels Dawson Street, immediately to the north, and flows generally eastward to its outfall into one of the unnamed tributaries of Charles Creek.

The two unnamed tributaries both enter the site from culverts beneath boundary streets. The first, culverted under Dawson Street through a 30-inch diameter corrugated metal pipe (CMP), runs generally northward bisecting the property. This channel, ranging from approximately 2.5 to 4.0 feet in depth (at top of bank) appears fairly stable with select points exhibiting localized erosion. The channel width varies from approximately 10 feet in width at the upstream culvert outfall to approximately 30 feet in width at its confluence with Charles Creek.

The second channel, while less defined at its upper end is culverted under Hunter Street through a small pipe of undetermined size. During our site visits we observed excessive sedimentation within the pipe partially burying the downstream end of the culvert. This channel runs generally westward paralleling Tuscarora Street. The channel, ranging from approximately 0.5 to 4.0 feet in depth (at top of bank) also appears fairly stable. Select points along the channel banks do exhibit localized erosion. The channel width varies from approximately 2 feet in width at the upstream culvert outfall to approximately 30 feet in width at its confluence with Charles Creek.

Charles Creek proper serves as a portion of the northern property boundary varying in width from roughly 50 feet to over 100 feet. The channel is tidally influenced with depths along this boundary, while not verified, estimated at roughly 4 to 6 feet at mean high water.

5.2 Site Soils

In the Pasquotank County Soil survey, on-site soils are mapped Mattapex fine sandy loam in upland areas, predominately in the grassed areas to the east of the basketball court (see Figure 3 – Site Soils Survey attached). Lower areas immediately adjacent to the stream feature entering the tract from the south are mapped "swamp." The area in the vicinity of

the drain entering the site from the east at Hunter Street is mapped Bibb soils. Hand auger borings and visual site assessment indicate that several inches of fill material overlays the residual site soils.

The USDA's taxonomic class for Mattapex is fine-silty, mixed, active, mesic Aquic Hapludults. Mattapex soils are moderately well drained and have moderately slow to moderate permeability. They are formed in silty eolian sediments that are underlain by coarser fluvial or marine sediments, and generally occur on gentle slopes bordering drainageways.

The USDA classification for Bibb soils is coarse-loamy, siliceous, active, acid thermic Typic Fluvaquents. Bibb soils are poorly drained and are moderately permeable, and are formed in stratified loamy and sandy alluvium. They generally occur along floodplains, and are frequently flooded, and are on the State and Federal hydric soils lists.

5.3 Existing Plant Community

In open areas onsite, crabgrass (*Digitaria spp.*) and fescue (*Festuca spp.*) predominate. In open areas east of the tributary dividing the property, few ornamental trees have been planted, including pecan (*Carya illinoensis*). There are several large bald cypress (*Taxodium distichuum*) trees along the Charles Creek waterline, which are also present in vegetated areas in the eastern portion of the site.

East of the tributary that enters Charles Creek from the south, there is a larger, contiguous forested area along the Charles Creek waterline. The canopy of this area is dominated by larger bald cypress trees. The shrub stratum, though not very dense, is composed of younger bald cypress individuals, Chinese privet (*Ligustrum sinense*), black willow (*Salix nigra*), wax myrtle (*Myrica cerifera*), few individuals of eastern red cedar (*Juniperus virginiana*), and red maple (*Acer rubrum*). Blackberry (*Rubus spp.*) and swamp rose (*Rosa palustris*) are also common. The herbaceous stratum is sparse, and primarily includes giant cane (*Arundinaria gigantean*) and needle rush (*Juncus spp.*). Just west of Hunter St. on the eastern edge of the property along the drainage feature, there is a small pocket of common reed (*Phragmites australis*).

5.4 Threatened and Endangered Species

In order to assess potential impacts to any federal and state threatened and/or endangered species the proposed restoration effort may pose, a review was conducted at the North Carolina Natural Heritage Program (NHP) office. A two-mile radius of the site was evaluated for known Elements of Occurrence (E.O.O.'s) of threatened/endangered animals, and a five-mile radius was evaluated for threatened/endangered plants.

No Elements of Occurrence of threatened or endangered federal and state species were located within the radii specified above. The closest Element of Occurrence of a threatened/endangered animal to the site is an active bald eagle (Haliaectus leucocephalus) nest approximately 3.5 miles east of the site across the Pasquotank River

in a marsh area. We believe that the proposed restoration work will have no adverse effect on bald eagle nesting habitat, and will likely help to enhance local habitat quality.

5.5 Nearby Areas of Historical Significance

In order to determine potential impacts as a result of the proposed restoration effort at Charles Creek Park to any nearby areas of historical significance, The State Historical Preservation Office (SHPO) was contacted. According to Renee Gledhill-Earley at SHPO, there are no nearby areas of historical significance that would be impacted by the proposed work.

6.0 WETLAND EVALUATION

In order to facilitate restoration plan development as well as support project goals, two off-site reference wetland areas were characterized. The reference wetland areas were qualitatively assessed, and species lists for each vegetative stratum (trees, shrubs, herbaceous, and vines) were recorded. This section describes our evaluation to date of reference wetlands, our on site jurisdictional waters delineation, and existing groundwater conditions.

6.1 Reference Wetlands

Both reference wetland areas occupy similar landscape positions to that of the Charles Creek Park site. Both references are situated adjacent to Charles Creek and located upstream of the restoration site.

6.1.1 Reference Wetland 1

Reference Wetland 1 is located east of Peartree Road behind Hollywood Cemetery near the intersection of Peartree Road and South Road Street near the Charles Creek Park site in Elizabeth City, NC. See Figure 4. This area appears to flood with a very high frequency, as several large areas of standing water (sloughs) were observed. In the Pasquotank County Soil survey, reference site soils are mapped as "swamp." In areas of no standing water, soils were typically saturated to the ground surface.

The canopy was dominated by bald cypress and few individuals of water tupelo (*Nyssa aquatica*), with larger trees nearing 48-inch diameter at breast height (dbh). Lower in the tree stratum, red maple and green ash (*Fraxinus pennsylvanica*) were co-dominates. The shrub stratum was very sparse, and was occupied primarily by arrow-wood (*Viburnum dentatum*) and highbush blueberry (*Vaccinium corymbosum*), as well as saplings from species in the tree stratum.

Due to obvious frequent flooding, the herbaceous stratum was severely underdeveloped, and only sparse upland grass species sprouts from the adjacent cemetery were present. Vines included poison ivy (*Toxicodendron radicans*), greenbrier (*Smilax rotundifolia*), laurel-leaved greenbrier (*Smilax laurifolia*), and trumpet creeper (*Campsis radicans*). Exotic/invasive species included Chinese privet in the shrub stratum and Japanese honeysuckle (*Lonicera japonica*).

6.1.2 Reference Wetland 2

Reference Wetland 2 is also located east of Peartree Road behind Oak Grove Cemetery approximately 2000 ft. north of SR 1152 (Halstead Boulevard). See Figure 4. This area appears to flood much less frequently than Reference Wetland 1, and although no areas of standing water were observed, soils were saturated to

the ground surface. In the Pasquotank County Soil survey, reference site soils are mapped as "swamp."

Bald cypress and green ash shared co-dominance in the tree stratum, with individuals sized approximately 18-24 inches dbh on average. Lower in the tree stratum, green ash shared co-dominance with American elm (*Ulmus americana*) and red maple.

The shrub stratum was occupied primarily by saplings from tree stratum species and highbush blueberry. Lizard's tail (*Saururus cernuus*) was dense in the herbaceous stratum, with broad-leaf arrow-head (*Saggitaria latifolia*) occurring to a lesser extent. Vines included poison ivy, trumpet creeper, greenbrier, and laurel-leaved greenbrier. Exotic/invasive species included Chinese privet and Japanese honeysuckle.

It should be noted that hydrologic reference conditions were identified on the Charles Creek Park site. Accordingly, as this data was immediately available on site, no monitoring of wetland hydrology was performed on either of the reference sites.

6.2 Site Wetland Delineation

On July 8, 2004, Soil & Environmental Consultants, PA, performed the jurisdictional waters delineation at the project site. Later that day we met with Ms. Tracey Wheeler of the U.S. Army Corps of Engineers, Wilmington District to confirm our boundaries and provide input. Based on that discussion we have prepared a sealed Wetland Delineation Map, dated August 2, 2004. This map has been forwarded to Ms. Wheeler for signature. A copy of this map is provided in Figure 5.

6.3 Site Groundwater Data

Our evaluation of site groundwater included the purchase, siting, and installation of a series of 40-inch groundwater monitoring gauges with data loggers. Gauge data was downloaded for design use and incorporation into our Restoration Plan.

A total of four (4) Infinities USA, Inc., data loggers (numbered PS 1 through PS 4) were originally installed on the project site on February 27, 2003. Of these gauges, three were installed to the east of Southern Avenue and one was installed to the west of Southern Avenue. The gauge to the west (PS 2) was subsequently removed when this parcel was removed from the area proposed for work by EEP. The location for each of the remaining installed gauges is shown on Sheet 3 – Existing Site Layout.

Of the three remaining gauges, two were installed in upland upland (presumed filled) portions of the site (PS1 and PS4). The third gauge, PS3, was installed as a local reference gauge based on the results of our site investigation. This gauge was later used in our determination of appropriate restoration activities (removal of fill and local grading) described later in this report. Since their installation, these gauges have been

downloaded on a quarterly basis. To date all gauges have remained functional. Data collected from these gauges is provided in Appendix C.

6.4 Site Rainfall Data

Our site work also included the purchase, siting, and installation of one (1) 6.5-inch diameter, 0.01-inch, self-emptying tipping bucket rain gauge data logger on site. The location of the installed rain gauge is shown on Sheet 3 – Existing Site Layout. Data collected from the rain gauge, also collected on a quarterly basis, is provided in Appendix D.

7.0 WETLAND RESTORATION PLAN

Restoration and enhancement of the site will be accomplished by re-grading previously filled wetland areas to their pre-disturbance grade and planting these and other denuded wetland areas with native vegetation, using the two reference wetland areas identified as a guideline. The interested reader is referred to Sheets 1 through 14 of the Restoration Plan.

7.1 Demolition Plan

Along the Charles Creek waterline, there are several areas of concrete, rubble, refuse, and other similar debris. Similar areas were also observed just within the normal high water line in eastern portions of the property, as well as along the stream bed of the tributary entering the site from the south. These areas of debris will be cleared and removed from the site. The fence posts demarcating the central area of the main tract as well as the landscaped/gravel area in the middle of the main tract will also be removed during the site preparation phase of the restoration effort. All removed concrete rubble and other material should be disposed of properly. Please refer to Sheet 4 - Demolition Plan sheet for details.

7.2 Planned Hydrologic Modifications

Site grading will proceed in accordance with the attached Grading Plan sheet. Grading will be performed in a manner to restore wetland hydrology by lowering existing site grade in selected areas closer to the existing water table, simultaneously enabling lateral surface flow into the site from Charles Creek.

Two general grades are proposed. The first will occupy an elevation approximately 0.5-1.0 ft (see Proposed Grading Plan sheet) which will be established adjacent to the Charles Creek waterline, and maintained adjacent to the draw entering the site from the east at Hunter Street. Planting unit A (see below and Planting Plan sheets) will occupy this grade. The second grade will be established at an elevation ranging from 1.0-2.0 ft., which will be occupied by planting unit B.

Some areas onsite already meet jurisdictional criteria (both hydrologic and vegetative) as described on the Wetland Delineation Map previously described. These areas include the area in the vicinity of the reference well (PS 3) and along the draw entering the site from the east. These areas will be demarcated with tree protection fencing (see attached Wetland Planting Plan and Grading Plan sheets) and will not be disturbed by grading activities.

The proposed grading activities are described on Sheet 5 – Grading Plan. The currently installed upland groundwater monitoring gauges and the rain gauge will be temporarily removed during construction operations. The reference groundwater gauge will remain

in place. The rain gauge will be temporarily relocated to allow for the collection of data throughout construction operations.

7.3 Vegetative Community Restoration

As proposed in the Restoration Plan previously submitted to NC-WRP, the site will be planted in a manner to reconstruct the vegetative community and structure similar to cypress-gum swamps described by Schafale and Weakley (1990)[1].

Two planting units (Unit A and Unit B) will be established on site. Additionally, a marsh fringe will also be planted along the Charles Creek waterline to aid in stabilizing the site following grading and enhance habitat by providing a transitional zone between the deepwater habitat in Charles Creek and the cypress-gum swamp onsite. Each of the units are discussed in further detail below.

7.3.1 Planting Units

The first planting unit will be established adjacent to the Charles Creek waterline on a contour approximately 0.5-1.0 ft. above the mean waterline. Several large existing bald cypress trees will be retained within the first planting unit. The second planting unit will be established on a contour approximately 0.5-1.0 ft. in elevation higher than the first planting unit, and thus, will flood less frequently.

Planting Unit A

Planting Unit A will be established along the Charles Creek waterline and carried along the backwater areas towards the eastern portions of the tract along the drainage feature entering the site from the east at Hunter Street (see Proposed Planting Plan). This unit will occupy the lower elevation established onsite via grading, and inundation is anticipated to occur frequently. Reference Wetland 1 (previously described) was used as a template when developing this planting unit, as bald cypress and water tupelo are the desired dominate species in the tree stratum. Table 1 displays the tree and shrub species that will be incorporated into Planting Unit A.

Micro-topographic complexity will be emphasized within this planting unit in order to maximize habitat diversity. Small, shallow backwater sloughs will be dug during grading, and later planted with the following floating and rooted aquatic species: White Water Lily (*Nymphaea odorata*), Broad-Leaf Arrow-Head (*Sagittaria latifolia*), Lizard's Tail (Saururus cernuus), Pickerel Weed (*Pontedaria cordata*), Yellow Cow-Lily (*Nuphar Luteum)*, and Stiff Arrow-Head (*Sagittaria Rigida)*.

[1] Schafale, M. P., Weakley, A. S. 1990. Classification of the natural communities or North Carolina. N.C. Department of Environment, Health, and Natural Resources

Trees	
Common Name	**Scientific Name**
Bald Cypress	*Taxodium distichuum*
Water Tupelo	*Nyssa aquatica*
Green Ash	*Fraxinus pennsylvanica*
Water Oak	*Quercus nigra*
Water Hickory	*Carya aquatica*
Shrubs	
Buttonbush	*Cephalanthus occidentalis*
Fetterbush	*Lyonia lucida*
Highbush Blueberry	*Vaccinium corymbosum*
Red Bay	*Persea borbonia*
Possumhaw	*Viburnum nudum*
Pepper Bush	*Clethra alnifolia*

Table 1: Tree and shrub species to be incorporated into planting unit A

Please refer to the attached Planting Plan, Planting Details, and Planting Schedules regarding quantities and other details for Planting Unit A and the slough areas.

Planting Unit B

This unit will be established on a topographic contour approximately 0.5-1.0 ft. higher in elevation than Planting Unit A, thereby likely decreasing flood frequency. Planted species will reflect the expected decreased frequency of inundation, and thus, the shrub stratum will be planted with a greater density than in Planting Unit A. Table 2 displays the tree and shrub species that will be incorporated into Planting Unit B.

Trees	
Common Name	**Scientific Name**
Bald Cypress	*Taxodium distichuum*
Water Tupelo	*Nyssa aquatica*
Green Ash	*Fraxinus pennsylvanica*
Willow Oak	*Quercus phellos*
Sweetbay Magnolia	*Magnolia virginiana*

Shrubs	
Buttonbush	*Cephalanthus occidentalis*
Fetterbush	*Lyonia lucida*
Red Bay	*Persea borbonia*
Pepper Bush	*Clethra alnifolia*
Highbush Blueberry	*Vaccinium corymbosum*
Arrow-Wood	*Viburnum dentatum*
Possumhaw	*Viburnum nudum*
Ti-Ti	*Cyrilla racemiflora*

Table 2: Tree and shrub species to be incorporated into planting unit B

Please refer to the attached Planting Plan, Planting Details, and Planting Schedule regarding quantities and other details for Planting Unit B.

NOTE: All plantings performed on site will adhere to the NC-WRP planting specifications.

7.3.2 Marsh Fringe

An approximately 10 to 15 ft. wide marsh fringe is proposed along the waterline of Charles Creek adjacent to planting unit A (see Proposed Planting Plan sheet). This area will be planted with live propagules and bare-root seedlings of Uptight Sedge (*Carex stricta)*, Soft Rush (*Juncus effusus)*, Olney's Bulrush *(Scirpus americanus),* Wool-Grass *(Scirpus Cyperinus),* and Soft-Stem Bulrush *(Scirpus Validus)*. Please refer to the marsh fringe Planting Schedule shown in the plan sheets for additional details.

7.3.3 Retention of Large Bald Cypress Trees

Retaining as many of the larger bald cypress trees onsite is a priority of the restoration effort. In order to assess the feasibility of performing grading work near the root systems of these trees without increasing the risk of mortality and/or disease, Dr. William Conner, a bald cypress silvics expert from Clemson University, was contacted. Dr. Conner recommended retaining as much root mass as possible in the vicinity of the retained trees, and limiting grading activity within the immediate vicinity.

As shown in the Planting Plan, an approximate 20-foot radius (40-foot diameter) around each of the bald cypress individuals to be retained along the Charles Creek waterline in the restoration plan has been established where grading work will be severely limited. The exact undisturbed area will vary by individual specimen and will be determined by the designer at the time of construction. And, while these areas are slightly higher in elevation, they will help to enhance microhabitat and micro-topographical complexity within the site. Such raised areas or hummocks are similar to those observed in natural undisturbed swamps within the

region. There are also several large bald cypress individuals in the eastern portion of the site that will be retained to the maximum extent possible, although many of the larger existing trees may not be shown on the Proposed Planting Plan.

Larger individual cypress trees to be retained as part of the restoration effort will be identified on site prior to construction. Tree protection fencing will be installed around the individuals to be retained as well as the larger areas of established cypress and other desirable native species in the eastern and northern portions of the site.

Details of the proposed restoration planting plan are included on Sheets 6, 8, 9, 10, and 11 of the attached plans.

7.4 Soil Restoration

During grading of site, topsoil will be removed and stockpiled. Topsoil is to be redistributed across planting areas during final grading. Topsoil will be stored in an appropriate manner by contractor to avoid erosion and off site sedimentation. Based on existing site uses and our understanding of previous site modifications we have no indication that underlying site soils are overly compacted. Accordingly current plans do not call for specific modification or soil restoration efforts (amendments and/or scarification) of the existing site soils once grading operations are complete. If however, upon completion of grading operations, areas of compacted soils are observed, localized restoration efforts may be employed i.e.: scarification, addition of topsoil, mulch, or other organics. Amendments will not be added to areas where inundation may occur and transport this material off site. Extreme care will be necessary so as not to disturb the root structure of the retained cypress trees described above.

7.5 Removal of Invasive or Undesirable Species

During site preparation, an effort will be made to remove existing exotic/invasive vegetation within project boundaries. Site-specific species targeted for removal primarily include common reed (*Phragmites spp.*), Chinese privet (*Ligustrum sinense*), and Japanese honeysuckle (*Lonicera japonica*). Invasive species will be field-identified by S&EC staff and mechanically removed and/or treated locally with a glyphosate-based herbicide (such as Rodeo®). Subsequent site visits should be performed following construction to evaluate Phragmites regrowth and perform spot treatments as needed.

7.6 Erosion & Sediment Control

Since the total disturbed/denuded area as a result of restoration plan implementation will exceed one (1.0) acre, a Erosion and Sediment (E&S) Control Permit will be required. Sediment and erosion control measures will be installed by the Contractor prior to commencing site grading activities. Due to the proximity of grading operations to Charles Creek, extra care should be employed by the contractor to check all E&S control measures at the end of each day and make necessary repairs or additions. Contractor

should also inspect all E&S control measures after periods of extended rainfall or significant rainfall events (>0.5 inches). Contractor should repair and stabilize exposed surfaces immediately, and remove and properly dispose of accumulated sediment in turbidity curtain, silt fence, etc. after these events. Site E&S control measures will include turbidity curtains, silt fence, rock check dams, matting, and temporary and permanent seeding. The contractor shall employ the following E&S control sequence prior to grading:

Erosion and Sedimentation Control Sequence

1. Establish staging area as directed by the Owner. Contractor will be responsible for installing necessary E&S control measures at staging area (parking area stabilization, silt fence, or other measures as contractor deems necessary). Establish temporary construction entrances to site.

2. Install sediment and erosion control measures including silt fencing and turbidity / silt curtain as shown on Sheet 12. Once tidal sloughs have been graded, silt fence crossing tidal sloughs will be contoured across the channel, and rock check dams will be hand placed by contractor as shown on Sheet 13.

3. Remove concrete debris, refuse, and other materials as specified in the site's demolition plan. Clear and grub in required areas for wetland area grading and planting.

4. Temporary seeding will be applied to areas that are not at final grade and will be exposed for greater than two (2) weeks.

5. After final grading is complete, permanent seeding will be applied to all exposed areas. Erosion control matting will be applied to all final graded sloped steeper than 2H:1V. Permanent seeding and matting will be installed incrementally as soon as an area reaches final grade.

6. Remove temporary sediment and erosion control measures. The contractor shall remove accumulated sediment prior to removal of turbidity curtain, silt fence, or other measures.

This E&S control sequence is also reflected in the plan sheets. Also refer to the Construction Sequence, Sediment and Erosion Control Plan, and Sediment and Erosion Control Details sheets attached.

7.7 Construction Sequence

All aspects of site construction and planting operations will be supervised by a qualified representative of Soil & Environmental Consultants, PA (S&EC). The daily sequence of events shall be determined and approved by S&EC professional staff. It will be the Contractor's responsibility to have the appropriate equipment and personnel on site to

perform the tasks based on the project schedule. If potential conflicts arise, the Contractor shall notify the Designer immediately so that adjustments can be made.

The following construction sequence shall be used during construction:

Construction Sequence

1. Obtain local authority approval for construction.

2. Contact NC One Call to locate and mark existing utilities on site.

3. Establish staging area as directed by the Owner. Contractor will be responsible for installing necessary E&S control measures at staging area (parking area stabilization, silt fence, or other measures as contractor deems necessary). Mobilize equipment and materials to the staging area. Establish temporary construction entrances to site.

4. Install sediment and erosion control measures including silt fencing and turbidity/silt curtain. Install tree protection fencing as directed by Designer.

5. Remove concrete debris, refuse, and other materials as specified in the site's Demolition Plan. Clear and grub in required areas for wetland area grading and planting. Remove trees as well as exotic and invasive species as directed by the Designer.

6. Verify grading depths and extents. Initiate grading of wetland areas starting along the Charles Creek waterline, working back towards Dawson and Hunter Streets. Extreme caution shall be used when working near existing bald cypress trees.

7. Apply temporary sediment and erosion control seeding measures.

8. Perform wetland planting. Apply permanent seeding measures.

9. Remove temporary sediment and erosion control measures after groundcover is established and site is stabilized.

10. Conduct final site inspection with the Contractor, Owner, and Designer.

7.8 Future Site Maintenance

A site tour should be performed after the completion of construction and permanent seeding and planting. Representatives from the design firm, EEP, and Elizabeth City should attend this tour to see the boundaries of site planting and discuss future site maintenance operations that will ensure the protection of trees, shrubs, and plants installed as part of this project.

8.0 WETLAND SUCCESS CRITERIA & MONITORING PLAN

This section includes information concerning hydrologic and vegetative success criteria, physical evaluation of the site, and the proposed monitoring schedule.

8.1 Hydrologic Success Criteria

In order to ensure hydrologic success, groundwater elevation monitoring will be conducted annually on site for a 5-year period. The monitoring period will commence immediately upon the completion of site construction and planting efforts.

As previously noted, the Infinities groundwater monitoring gages will remain in place or be re-installed immediately following the completion of site grading and planting operations. Three (3) gages will be installed on site, two (2) in the vicinity of their pre-monitoring period locations, and one (1) to be installed at a location determined after the completion of construction. One (1) gauge (PS 3) will remain in the hydrologic reference area already established on-site. The existing site rain gauge will be relocated and remain on site during the monitoring period.

In order to meet wetland hydrology, the groundwater table will need to be within the upper twelve (12) inches of the ground surface for a period of consecutive days equal to 8.5% of the growing season. According to the Pasquotank County Soil Survey, the average growing season (number of frost-free days) is approximately 208 days long, lasting from April 7th to November 1st. It should be noted that this system is primarily groundwater driven, however, we expect occasional, sporadic inundation from the adjacent surface waters (Charles Creek and its tributary).

Accordingly, a groundwater monitoring gauge will be considered to meet hydrologic success criteria if hydrology is met for a period of 18 straight days (rounded up from 17.7 days) during the growing season.

8.2 Vegetative Success Criteria

In order to ensure vegetative success, vegetative monitoring will be conducted annually on site for a 5-year period in accordance with the Stream Mitigation Guidelines (April 2003). The monitoring period will commence immediately upon the completion of site construction and planting efforts.

Three (3) 10-meter square sample plots will be established on site, each plot offset 2 meters from each gauge positioned within the restoration area. A single 10-meter square reference sample plot will be established on site coincident with the reference gauge.

Typically in order for the site to be considered a success, the survivability rate of planted vegetation should be 320 stems per acre through year three. A ten percent mortality rate is accepted in year four (288 stems per acre) and another ten percent in year five resulting

in a required survival rate of 260 5-year old stems per acre in year five with no one species comprising more than 20% of the total stem count. However, it is our opinion that owing to the inherent lack of diversity within natural cypress-gum swamp wetlands, the traditional vegetative success criteria (regarding species diversity) is not an appropriate metric by which to evaluate site criteria. Therefore we recommend that vegetative success be quantified differently for this project such that in addition to the stem count criteria of 260 5-year old stems per acre (at the end of the five year monitoring period) it is desired (but not required) that no one species should comprise more than 60% of the entire stem count. Exceeding the 60% threshold alone however will not serve as criteria for deeming the restoration unsuccessful.

A vegetative success criteria of 75% coverage will be required at the end of the 5-year period for the fringe marsh species. This coverage will be based on observation of the planted fringe zones.

During monitoring site visits an evaluation of Phragmites and other invasive or undesirable species will be performed and recommendations made regarding necessary removal or treatments.

8.3 Physical Success

An as-built engineering survey of the site will be conducted upon completion of the site restoration work to ensure that site grading and planting work was performed in a manner consistent with the approved Restoration Plan.

During site monitoring visits, the site will be walked and all graded areas will be inspected for stability. If areas of instability are observed, they will be noted and repair recommendations prepared. A photographic record of the site will be collected during each site visit. Photo points at key locations on site and at the corners of our vegetative monitoring plots.

8.4 Monitoring Schedule

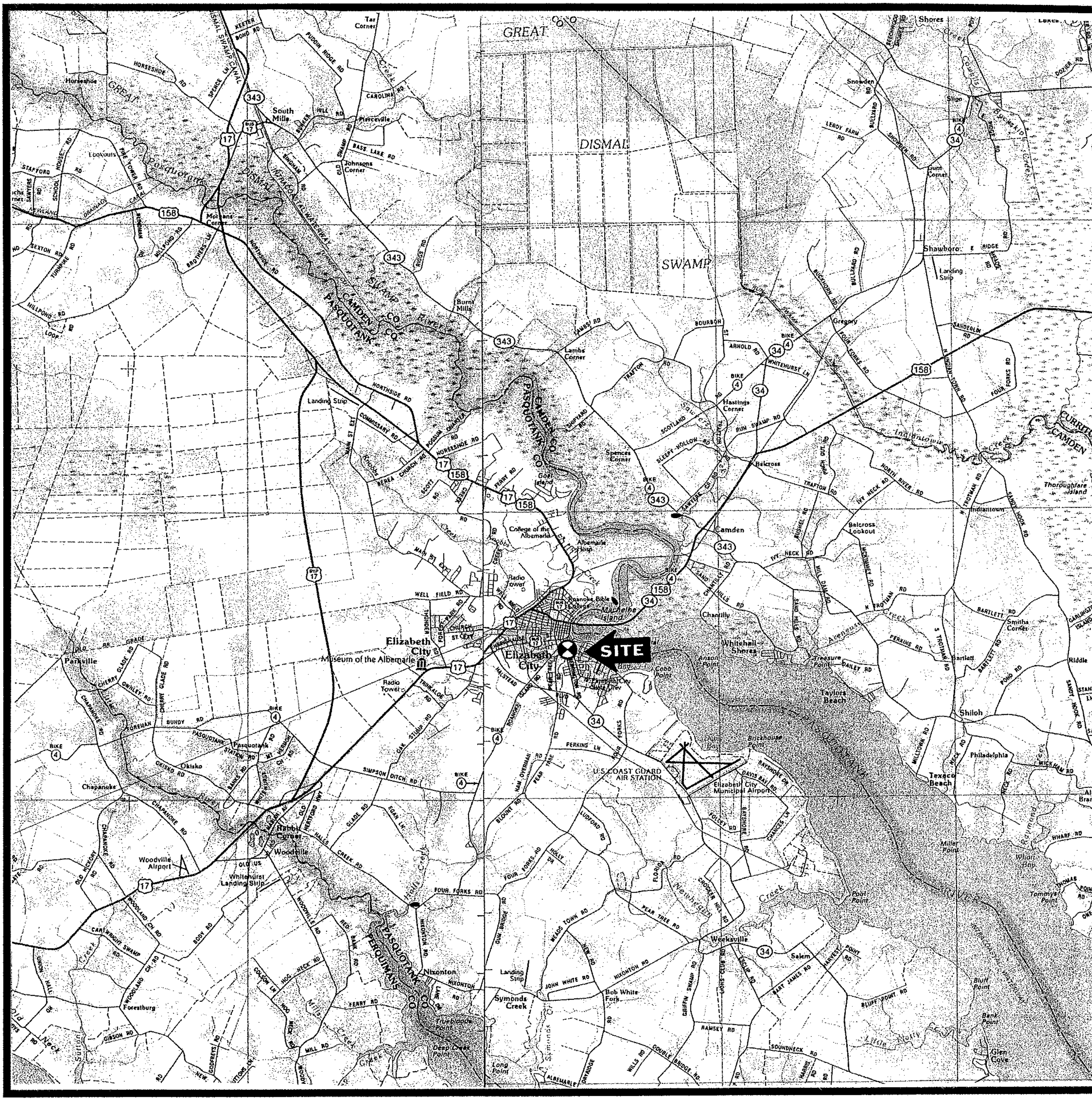
As previously described, to ensure hydrologic and vegetative success, success monitoring will be conducted annually on site for a period of five (5) years from the implementation of the restoration plan.

The site will be visited on a quarterly basis. During each of these site visits groundwater monitoring gauges and the rain gauge will be downloaded and gauges evaluated to ensure proper function. A plant survivability survey will be performed during the growing season (June to July timeframe) on each of the three plots (2 restoration plots and 1 reference plot) and the marsh fringe zones. During site visits a general evaluation (by observation) of the site will be performed and record photographs will be taken.

An Annual Monitoring Report will be prepared at the end of each year of monitoring. This report will be submitted to EEP for review not later than 60 days from the end of the

monitoring period (December 31 of the monitoring year). The monitoring report will summarize the general site conditions, the results of hydrologic and vegetative monitoring, and recommendations for necessary maintenance.

FIGURES



NORTH

PROJ. NO.: 7281.D2	MAP SOURCE: North Carolina Atlas & Gazetteer DeLorme - 2003	SHEET TITLE: FIGURE 1 - VICINITY MAP
PROJ. MGR.: PKS		PROJECT: CHARLES CREEK PARK WETLANDS RESTORATION
DRAWN: EGT	SCALE: 1" = 15,000'	
FIGURE: 1 OF 5	LOCATION: ELIZABETH CTY, NC	CLIENT: ECOSYSTEM ENHANCEMENT PROGRAM

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Soil & Environmental Consultants, PA
11010 Raven Ridge Road • Raleigh, North Carolina 27614
Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

NORTH

2000 1000 0 2000

CONTOUR INTERVAL = 10'

PROJ. NO.: 7281.D2	MAP SOURCE: USGS 7.5 MIN. QUAD. Elizabeth City, NC	SHEET TITLE: FIGURE 2 - USGS MAP	S&EC Soil & Environmental Consultants, PA
PROJ. MGR.: PKS		PROJECT: CHARLES CREEK PARK WETLANDS RESTORATION	11010 Raven Ridge Road • Raleigh, North Carolina 27614
DRAWN: EGT	SCALE: 1" = 2000'		Phone: (919) 846-5900 • Fax: (919) 846-9467
Figure No.: 2 OF 5	LOCATION: ELIZABETH CTY, NC	CLIENT: ECOSYSTEM ENHANCEMENT PROGRAM	www.SandEC.com

PROJ. NO.: 7281.D2	MAP SOURCE: PASQUOTANK COUNTY SOIL SURVEY-1949	SHEET TITLE: FIGURE 3 - SOIL SURVEY MAP	
PROJ. MGR.: PKS		PROJECT: CHARLES CREEK PARK WETLANDS RESTORATION	
DRAWN: EGT	SCALE: 1" = 1667'		
Figure No.: 3 OF 5	LOCATION: ELIZABETH CTY, NC	CLIENT: ECOSYSTEM ENHANCEMENT PROGRAM	

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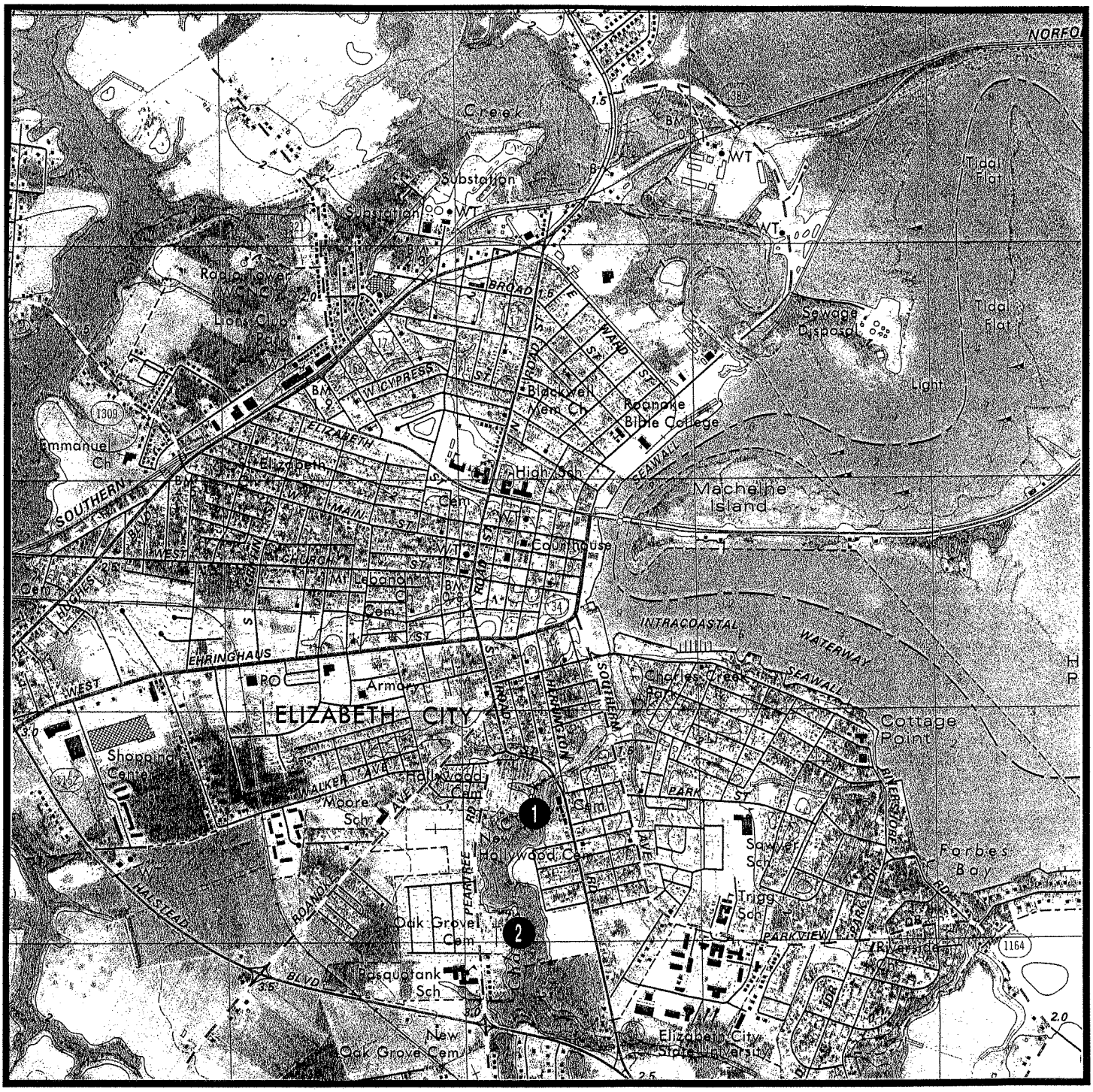


NORTH

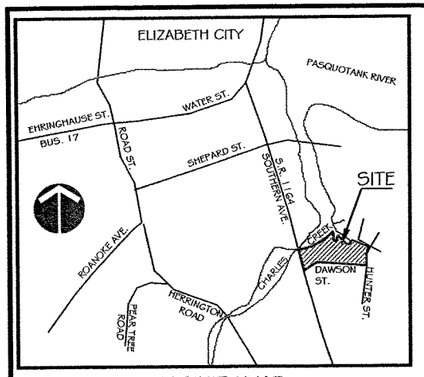
2000 1000 0 2000

CONTOUR INTERVAL = 10'

(1) REFERNCE WETLAND # 1

(2) REFERNCE WETLAND # 2

PROJ. NO.: 7281.D2	MAP SOURCE: USGS 7.5 MIN. QUAD. Elizabeth City, NC	SHEET TITLE: FIGURE 4 - REFERENCE WETLAND LOCATION MAP	S&EC Soil & Environmental Consultants, PA
PROJ. MGR.: PKS		PROJECT: CHARLES CREEK PARK WETLANDS RESTORATION	11010 Raven Ridge Road • Raleigh, North Carolina 27614
DRAWN: EGT	SCALE: 1" = 2000'		Phone: (919) 846-5900 • Fax: (919) 846-9467
Figure No.: 4 OF 5	LOCATION: ELIZABETH CTY, NC	CLIENT: ECOSYSTEM ENHANCEMENT PROGRAM	www.SandEC.com



VICINITY MAP
NOT TO SCALE

"THIS CERTIFIES THAT THIS COPY OF THIS PLAT IDENTIFIES AS WATERS OF THE U.S. OR WETLANDS ALL AREAS OF WATERS OF THE U.S., INCLUDING WETLANDS REGULATED PURSUANT TO SECTION 404 OF THE CLEAN WATER ACT AS DETERMINED BY THE UNDERSIGNED ON THIS DATE. UNLESS THERE IS A CHANGE IN LAW OR OUR PUBLISHED REGULATIONS, THIS DETERMINATION OF SECTION 404 JURISDICTION MAY BE RELIED UPON FOR A PERIOD NOT TO EXCEED FIVE YEARS FROM THIS DATE. THIS DETERMINATION WAS MADE UTILIZING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL."

NAME:_____

TITLE:_____

DATE:_____

AID #:_____

EXPIRATION DATE:_____

PRELIMINARY

STATE PLANE COORDINATES (NAD 83)

2	936951.925	2820304.861
3	936965.589	2820312.508
4	936987.298	2820323.367
5	937000.652	2820347.109
6	937034.126	2820349.574
7	937046.813	2820345.635
8	937058.447	2820325.449
9	937076.315	2820314.646
10	937074.139	2820303.859
11	937057.544	2820295.404
12	936938.407	2820415.522
13	936953.613	2820403.408
14	936989.384	2820408.082
15	936996.23	2820421.939
16	936978.391	2820447.488
17	936971.242	2820463.367
18	936975.996	2820483.311
19	936984.202	2820496.685
20	936983.661	2820526.15
21	936981.678	2820549.901
22	936955.567	2820588.135
23	937021.125	2820602.893
24	937042.074	2820601.634
25	937063.661	2820512.145
26	937075.951	2820458.439
27	937093.837	2820445.019

I, ELISABETH G. TURNER, HEREBY CERTIFY THAT THIS SURVEY WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS MAP DOES NOT REPRESENT A BOUNDARY SURVEY, AND IS NOT FOR RECORDATION. WITNESS MY ORIGINAL SIGNITURE, REGISTRATION NUMBER, AND SEAL THIS ___ DAY OF _____A.D., 2004.

This Document Originally Issued and Sealed by Elisabeth G. Turner, PLS-4440, on March 29th, 2004. This Medium Shall Not be Considered a Certified Document.

ELISABETH G. TURNER, PLS L-4440

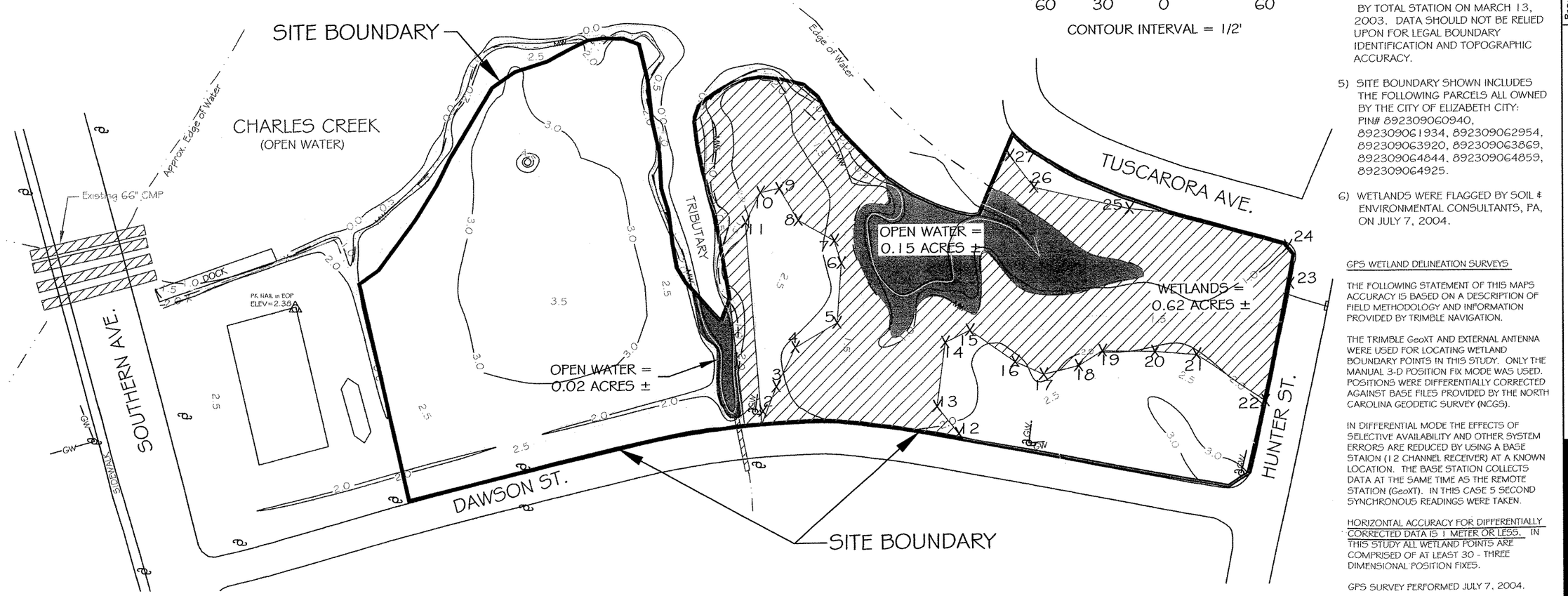
NOTE: THIS PLAT IS FOR THE SOLE PURPOSE OF SHOWING DELINEATED WETLAND ACREAGE; NOT PREVIOUSLY SURVEYED. THIS PLAT DOES NOT CONFORM TO GS 47-30 AS AMENDED AND IS NOT FOR RECORDATION, CONVEYANCE, OR SALES.

TOTAL ACREAGE: 1.93 ACRES ±
WETLANDS: 0.60 ACRES ±
OPEN WATER: 0.17 ACRES ±
TOTAL JURSIDICTIONAL AREA = 0.77 ACRES±

SCALE : 1" = 60'

60 30 0 60

CONTOUR INTERVAL = 1/2'



NOTES:

1) PARCEL BOUNDARIES PROVIDED BY PASQUOTANK COUNTY GIS DEPARTMENT AND WERE GENERATED FROM RECORDED DEEDS, PLATS, AND OTHER PUBLIC RECORDS. BOUNDARY DATA HAS NOT BEEN VERIFIED BY ACTUAL PROPERTY SURVEY.

2) THIS MAP IS NOT A CERTIFIED SURVEY & HAS NOT BEEN REVIEWED BY A LOCAL GOVERNMENT AGENCY FOR COMPLIANCE WITH ANY APPLICABLE LAND DEVELOPMENT REGULATIONS. THIS IS NOT A BOUNDARY SURVEY.

3) ELEVATION DATUM BASED ON NC GRID MONUMENT "WATER". ELEVATION = 6.17 FEET(NGVD 29).

4) ALL TOPOGRAPHIC DATA IS APPROXIMATE. DATA COLLECTED USING LIMITED ENGINEERING SURVEY BY TOTAL STATION ON MARCH 13, 2003. DATA SHOULD NOT BE RELIED UPON FOR LEGAL BOUNDARY IDENTIFICATION AND TOPOGRAPHIC ACCURACY.

5) SITE BOUNDARY SHOWN INCLUDES THE FOLLOWING PARCELS ALL OWNED BY THE CITY OF ELIZABETH CITY: PIN# 892309060940, 892309061934, 892309062954, 892309063920, 892309063869, 892309064844, 892309064859, 892309064925.

6) WETLANDS WERE FLAGGED BY SOIL & ENVIRONMENTAL CONSULTANTS, PA, ON JULY 7, 2004.

GPS WETLAND DELINEATION SURVEYS

THE FOLLOWING STATEMENT OF THIS MAPS ACCURACY IS BASED ON A DESCRIPTION OF FIELD METHODOLOGY AND INFORMATION PROVIDED BY TRIMBLE NAVIGATION.

THE TRIMBLE GeoXT AND EXTERNAL ANTENNA WERE USED FOR LOCATING WETLAND BOUNDARY POINTS IN THIS STUDY. ONLY THE MANUAL 3-D POSITION FIX MODE WAS USED. POSITIONS WERE DIFFERENTIALLY CORRECTED AGAINST BASE FILES PROVIDED BY THE NORTH CAROLINA GEODETIC SURVEY (NCGS).

IN DIFFERENTIAL MODE THE EFFECTS OF SELECTIVE AVAILABILITY AND OTHER SYSTEM ERRORS ARE REDUCED BY USING A BASE STAION (12 CHANNEL RECEIVER) AT A KNOWN LOCATION. THE BASE STATION COLLECTS DATA AT THE SAME TIME AS THE REMOTE STATION (GeoXT). IN THIS CASE 5 SECOND SYNCHRONOUS READINGS WERE TAKEN.

HORIZONTAL ACCURACY FOR DIFFERENTIALLY CORRECTED DATA IS 1 METER OR LESS. IN THIS STUDY ALL WETLAND POINTS ARE COMPRISED OF AT LEAST 30 - THREE DIMENSIONAL POSITION FIXES.

GPS SURVEY PERFORMED JULY 7, 2004.

Project: CHARLES CREEK PARK WETLAND RESTORATION
Location: PASQUOTANK CO., NC
Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
Sheet Title: WETLAND DELINEATION SURVEY
Project No.: 7281.02 | Drawn: EGT | Surveyed: EGT | Flagged: JMO | Scale: 1" = 60' | FIGURE: 5 of 5

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REV.	DESCRIPTION REVISIONS	DATE	APPROVED

S&EC

File: Sec/Jobs7-9/7281.02/drawings/Wetlands survey/WETLANDS SURVEY.dwg

APPENDIX A

Site Photographs

Photo 1. View from Dawson Street towards the northwest at the main tract. Groundwater monitoring gage PS1 and the rain gage can be seen in the distance.

Photo 2. View of the main tract of Charles Creek Park as viewed from Southern Ave. north of Charles Creek. Note large bald cypress trees along waterline.

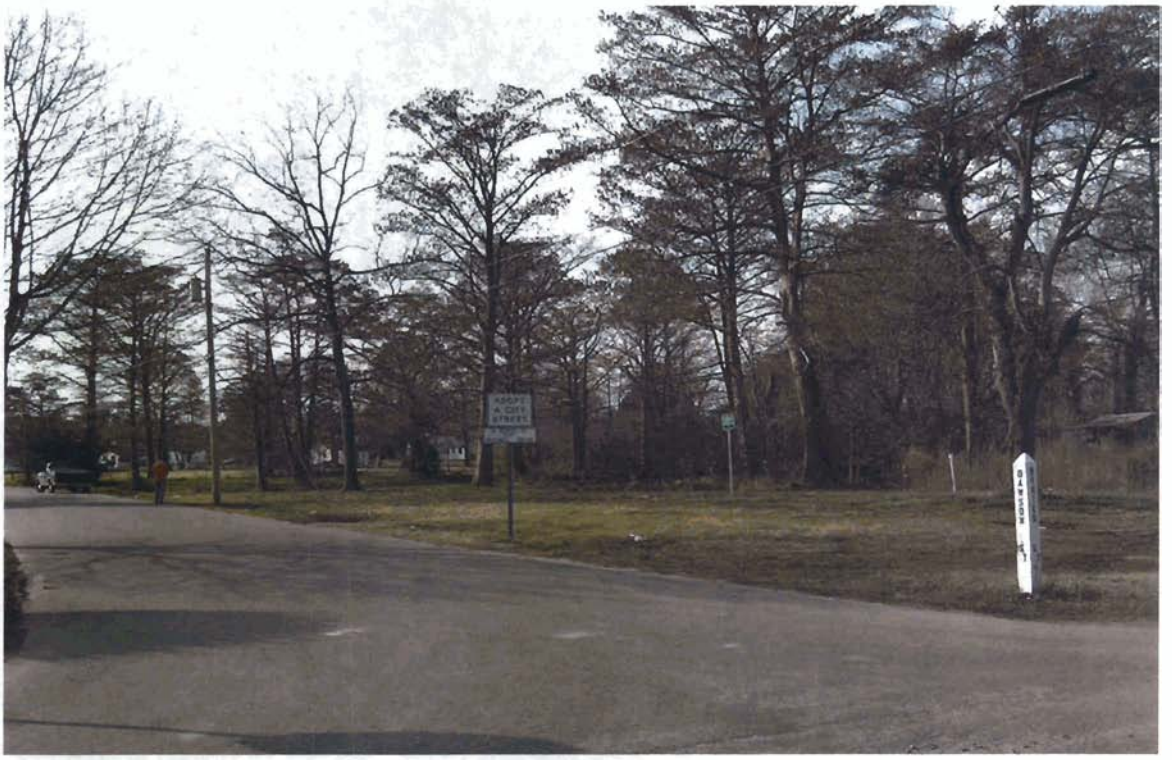


Photo 3. Southeastern corner of the main tract as viewed from the corner of Hunter and Dawson Streets. Groundwater monitoring gage PS4 is visible just to the left of the street marker.

Photo 4. Small area of *Phragmites* at the eastern border of the tract along the drain at Hunter Street.

Photo 5. View of the eastern portion of the main tract taken at the north side of Dawson St. where the tributary from the south enters the property. View is towards the ENE.

Photo 6. View of site in the vicinity of groundwater monitoring gage PS3. Note multiple cypress knees and cinder block rubble. View is towards the north.

APPENDIX B

Reference Wetland Photographs

Photo 1. Reference Wetland 1, characterized by its mature bald cypress canopy, sparse shrub and herbaceous strata, and frequent inundation.

Photo 2. Large backwater slough in Reference Wetland 1. Similar areas will be replicated at Charles Creek Park.

Photo 3. Reference Wetland 1, Large bald cypress individual with green ash present as a co-dominate lower in the canopy. Note green ash saplings in front of the bald cypress.

Photo 4. Reference Wetland 2, Note the slightly denser shrub and herbaceous strata than in Reference Wetland 1. A large bald cypress trunk is on the right, while lizard's tail blanketsground.

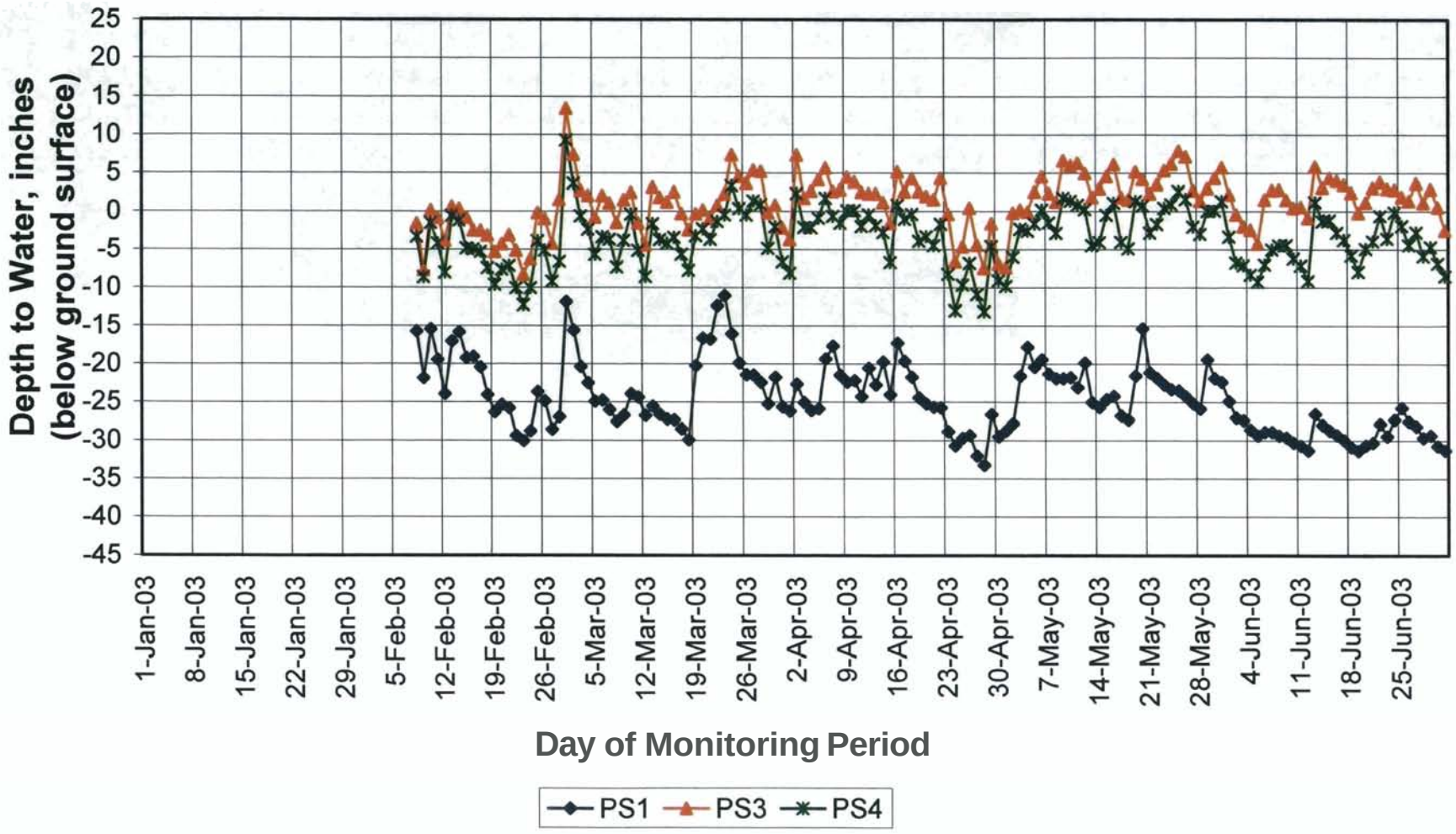
Photo 5. Reference Wetland 2, Denser shrub stratum in relative to Reference Wetland 1.

APPENDIX C

Groundwater Data

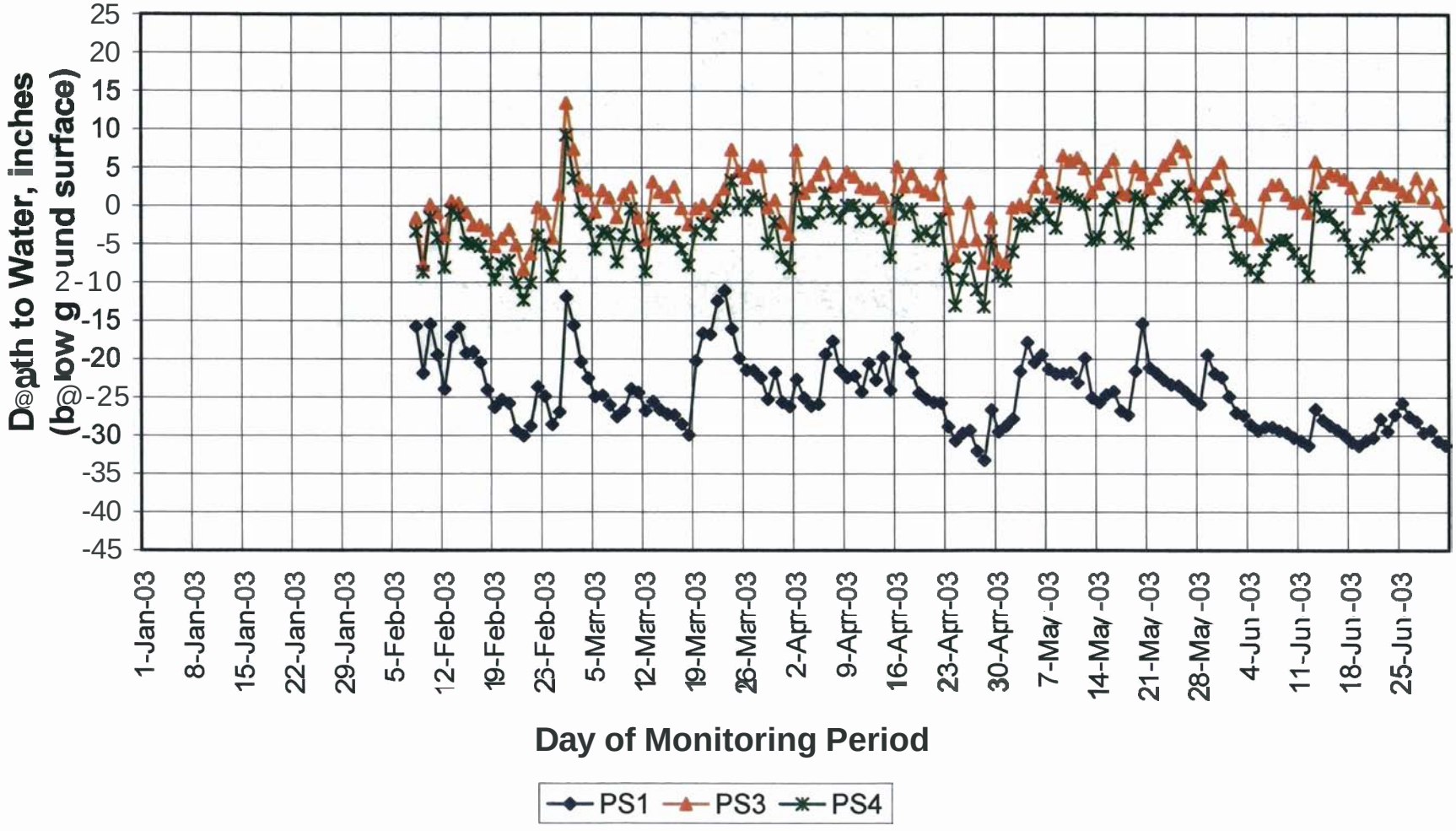
Charles Creek Park Wetland Restoration Site

Monitoring Gauge Data Comparison January 2003 to June 2003



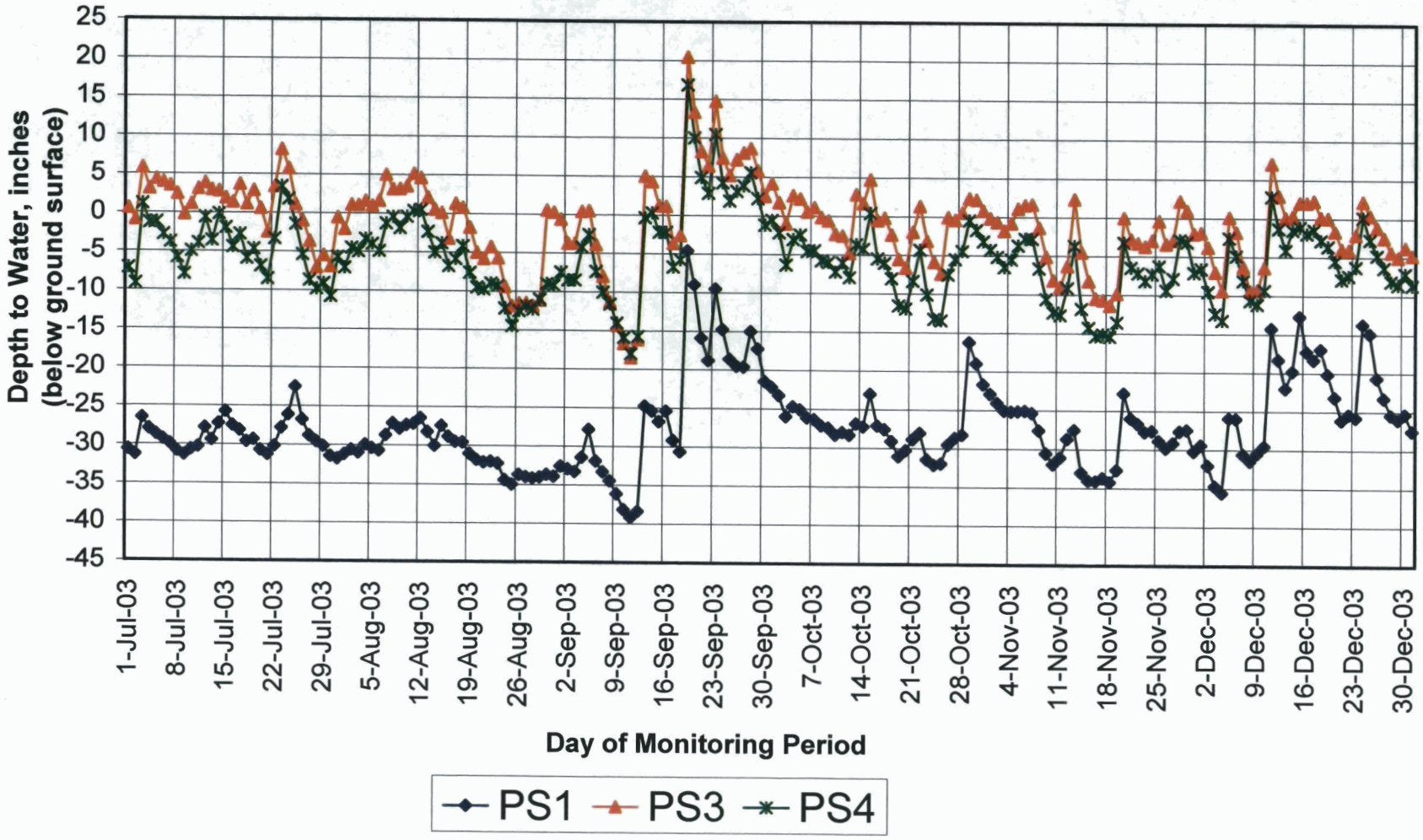
Charles Creek Park Wetland Restoration Site

Monitoring Gauge Data Comparison January 2003 to June 2003



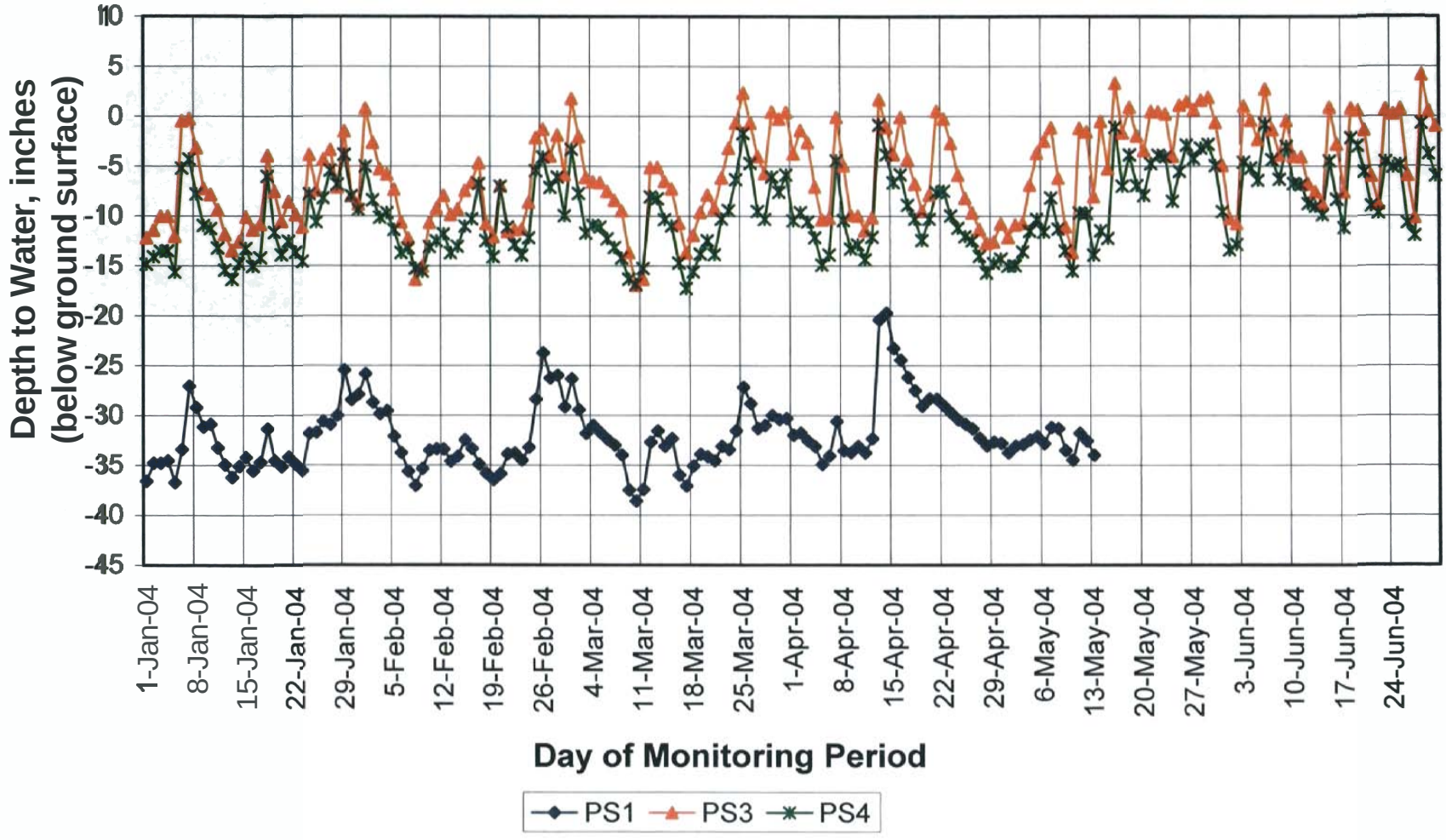
Charles Creek Park Wetland Restoration Site

Monitoring Gauge Data Comparison July 2003 to December 2003



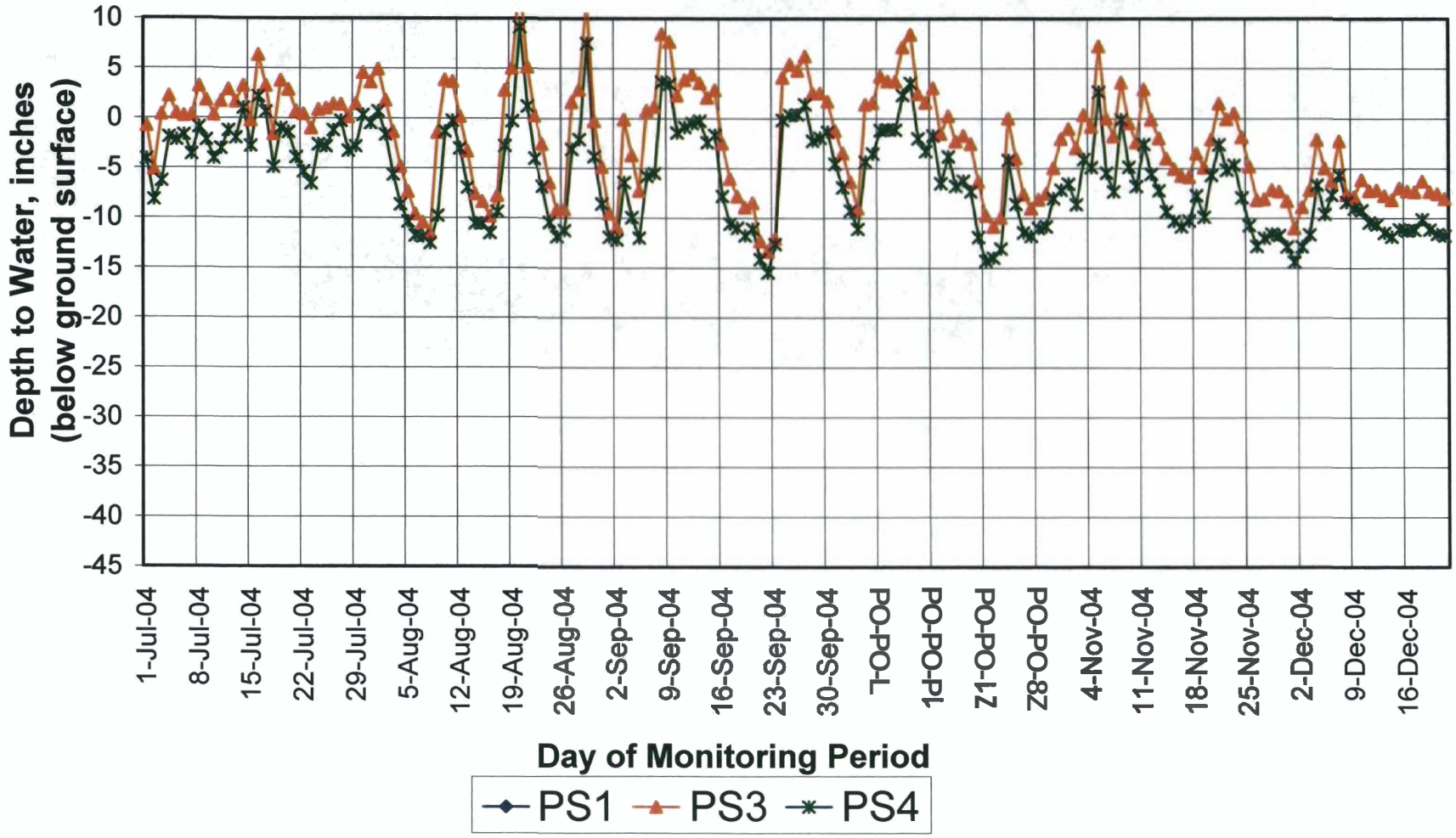
Charles Creek Park Wetland Restoration Site

Monitoring Gauge Data Comparison January 2004 to June 2004



Charles Creek Park Wetland Restoration Site

Monitoring Gauge Data Comparison July 2004 to December 2004

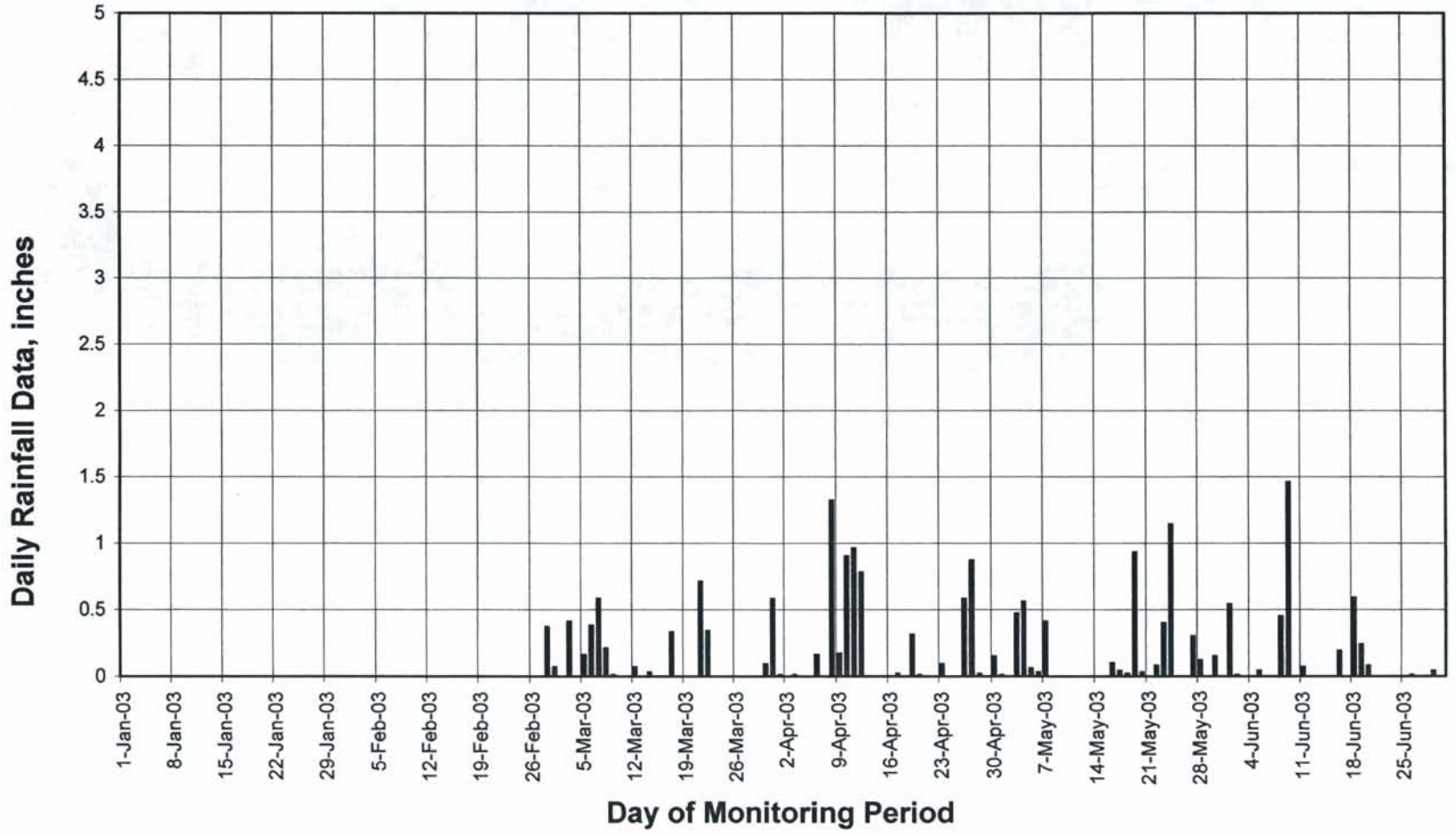


APPENDIX D

Rainfall Data

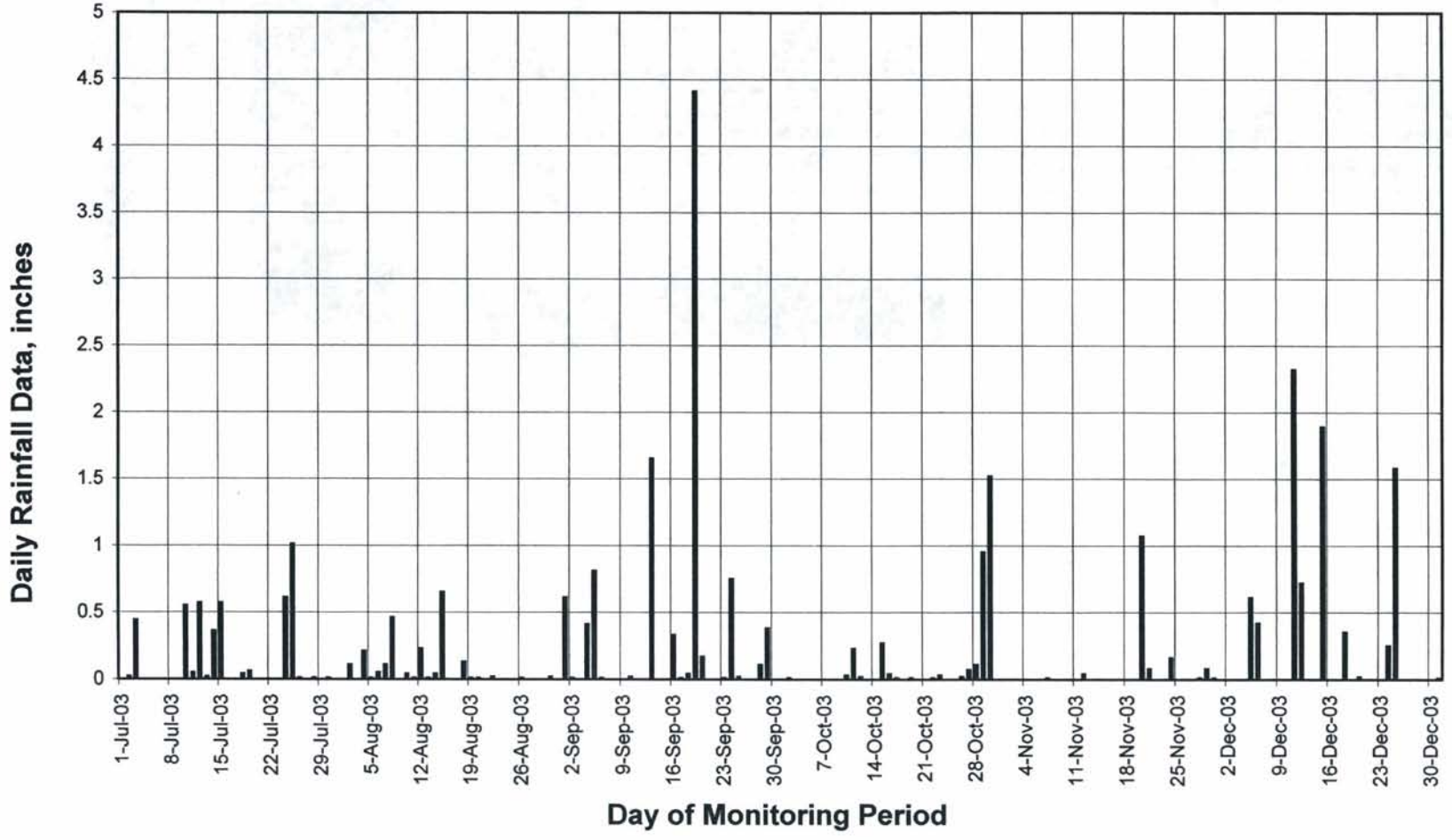
Charles Creek Park Wetland Restoration Site

Site Rainfall Data January 2003 to June 2003



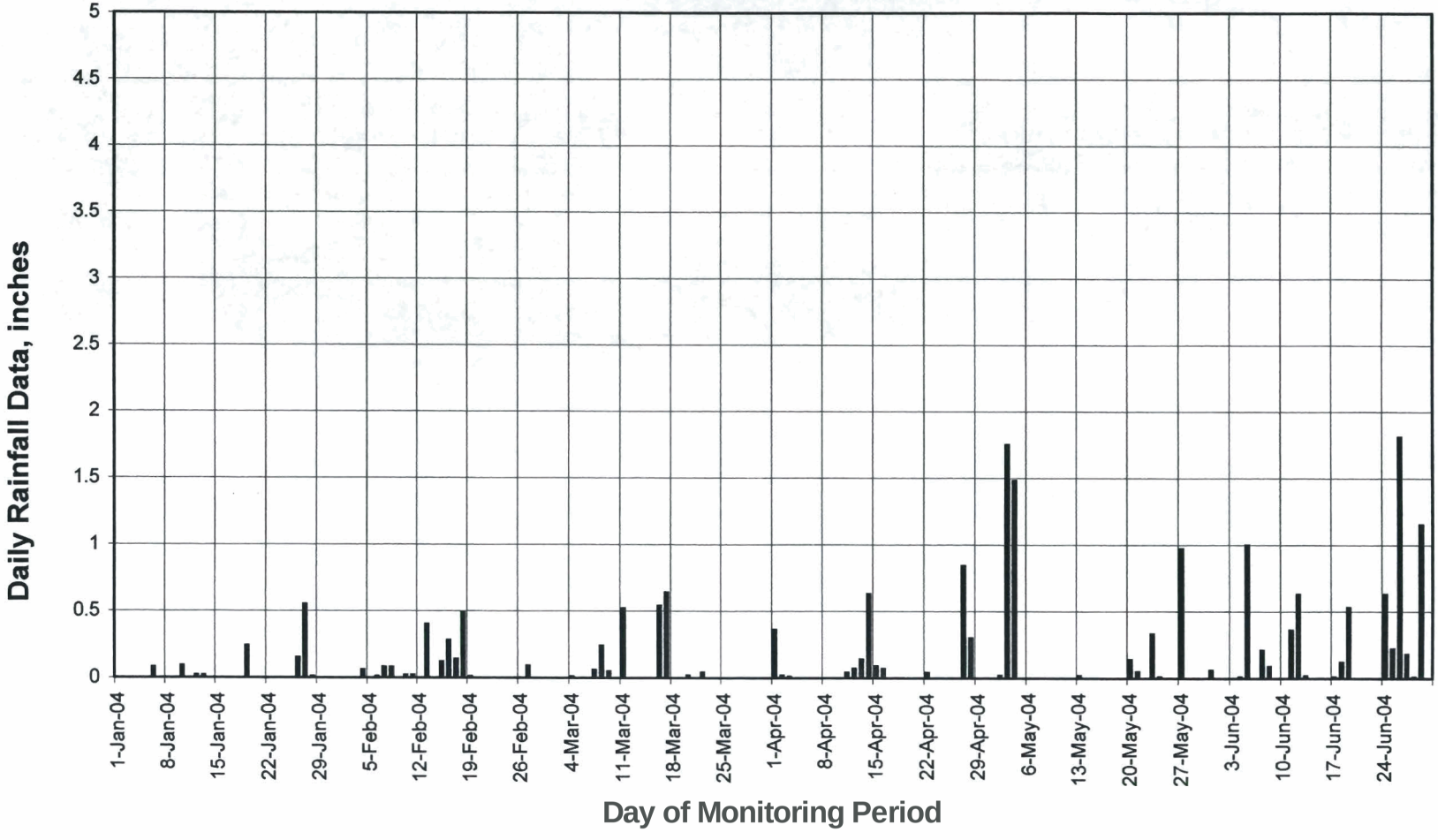
Charles Creek Park Wetland Restoration Site

Site Rainfall Data July 2003 to December 2003



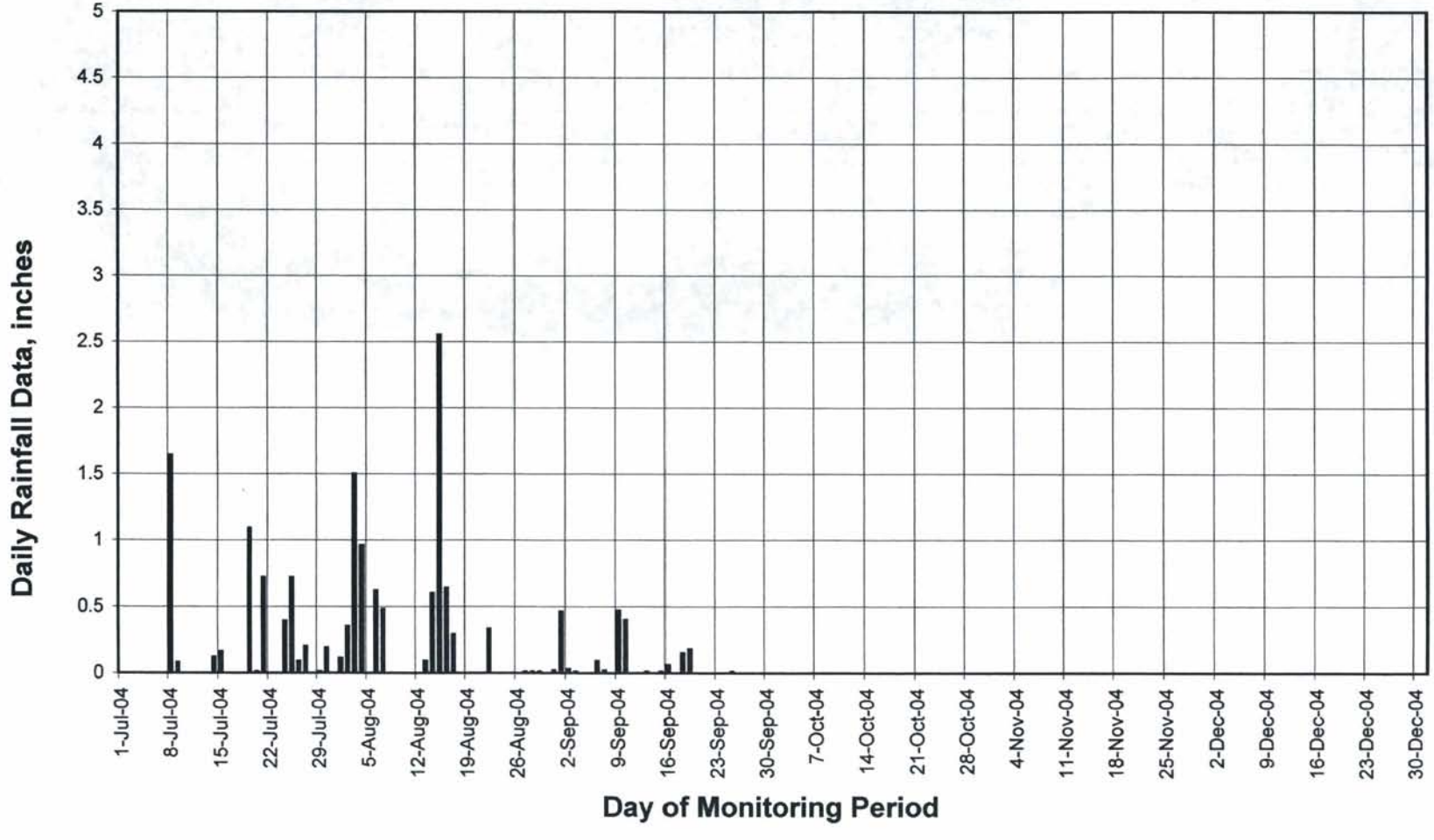
Charles Creek Park Wetland Restoration Site

Site Rainfall Data January 2004 to June 2004

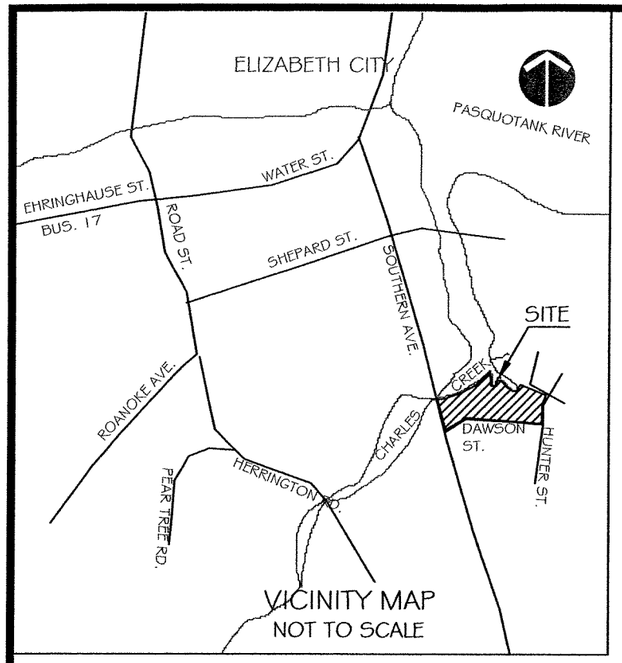


Charles Creek Park Wetland Restoration Site

Site Rainfall Data July 2004 to December 2004



PLAN SHEETS



CONSTRUCTION DRAWINGS FOR

CHARLES CREEK PARK

WETLAND RESTORATION

PASQUOTANK COUNTY, NC

ENVIRONMENTAL DESIGN FIRM:

SOIL & ENVIRONMENTAL
CONSULTANTS, PA
11010 Raven Ridge Road
Raleigh, NC 27614
(919) 846-5900

PREPARED FOR:

NORTH CAROLINA ECOSYSTEM
ENHANCEMENT PROGRAM
2728 Capital Blvd.
Suite 1H 103
Raleigh, NC 27606
(919) 715-1952

CONTENTS:

LICENSED SOIL SCIENTIST
JOSEPH MICHAEL ORTOSKY, JR.
STATE OF NORTH CAROLINA

NORTH CAROLINA
REGISTERED LANDSCAPE ARCHITECT
C-144
J. MICHAEL ORTOSKY, JR.

NORTH CAROLINA
PROFESSIONAL ENGINEER
SEAL
025325
PATRICK K. SMITH

Project No.: 7261.02 | Drawn: LGT
Designed: JMO, PKS | Scale: NO SCALE | Sheet No.: 1 of 14

Project: CHARLES CREEK PARK WETLAND RESTORATION
Location: PASQUOTANK CO., NC
Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
Sheet Title: COVER, CONTENTS, AND VICINITY MAP

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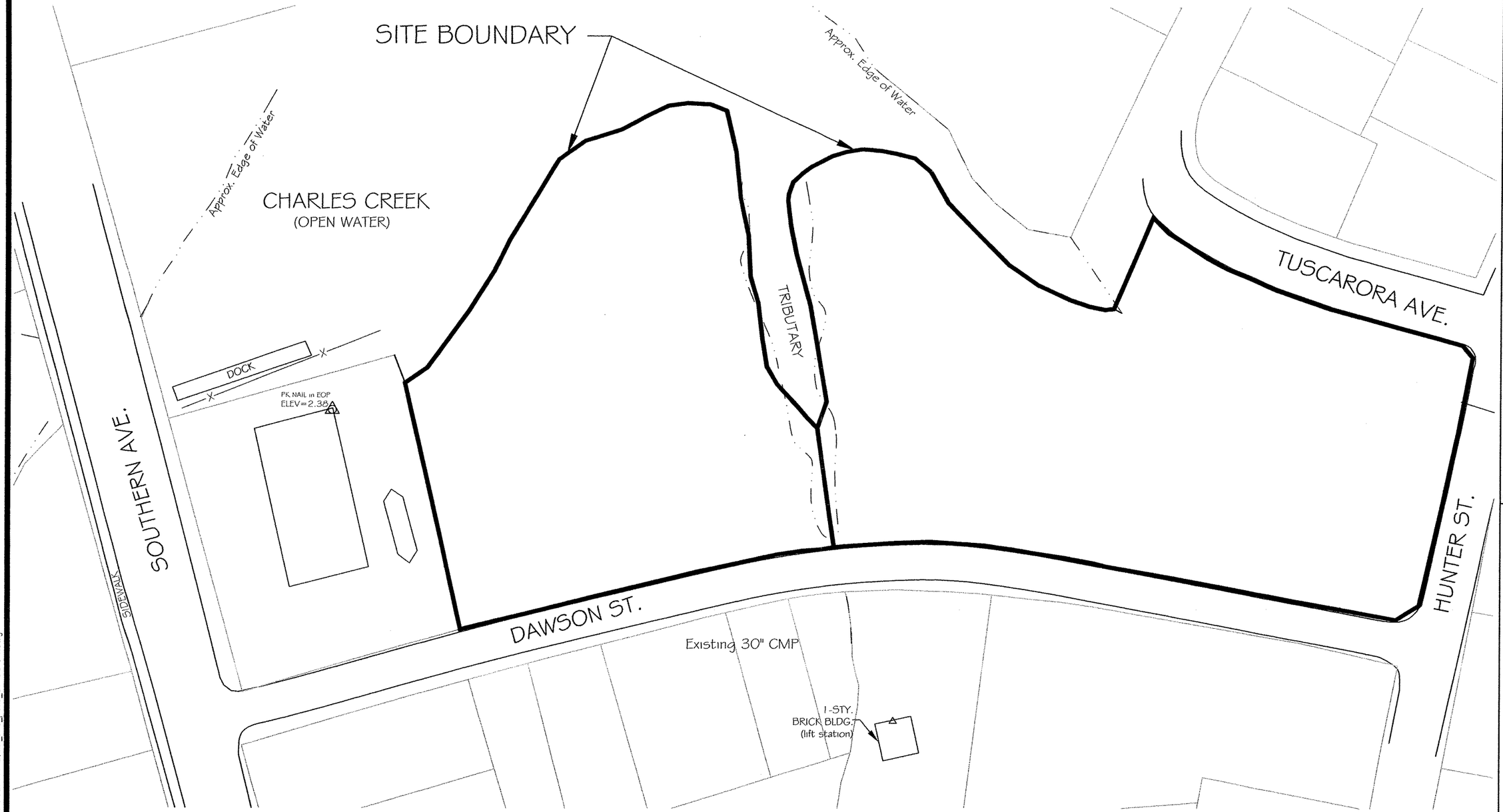
REV.	DESCRIPTION	DATE	APPROVED
0	Issued for Construction	12-07-04	JMO

S&EC

File: Sec\Jobs\7-9k\7261.02\drawings\construction dwgs\FINAL SUBMITTAL\final_site_plans_07-06-04.dwg



NOTES:

1) THIS MAP IS NOT A CERTIFIED SURVEY & HAS NOT BEEN REVIEWED BY A LOCAL GOVERNMENT AGENCY FOR COMPLIANCE WITH ANY APPLICABLE LAND DEVELOPMENT REGULATIONS. THIS IS NOT A BOUNDARY SURVEY.

SCALE

50 25 0 50

CONSTRUCTION SITE BOUNDARY

NORTH CAROLINA PROFESSIONAL SEAL 026525 ENGINEER PATRICK K. SMITH

Project No.: 7281.02 | Designed: JMO, PKS | Drawn: LGT | Scale: 1" = 50' | Sheet No.: 2 of 14

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: CONSTRUCTION SITE BOUNDARY

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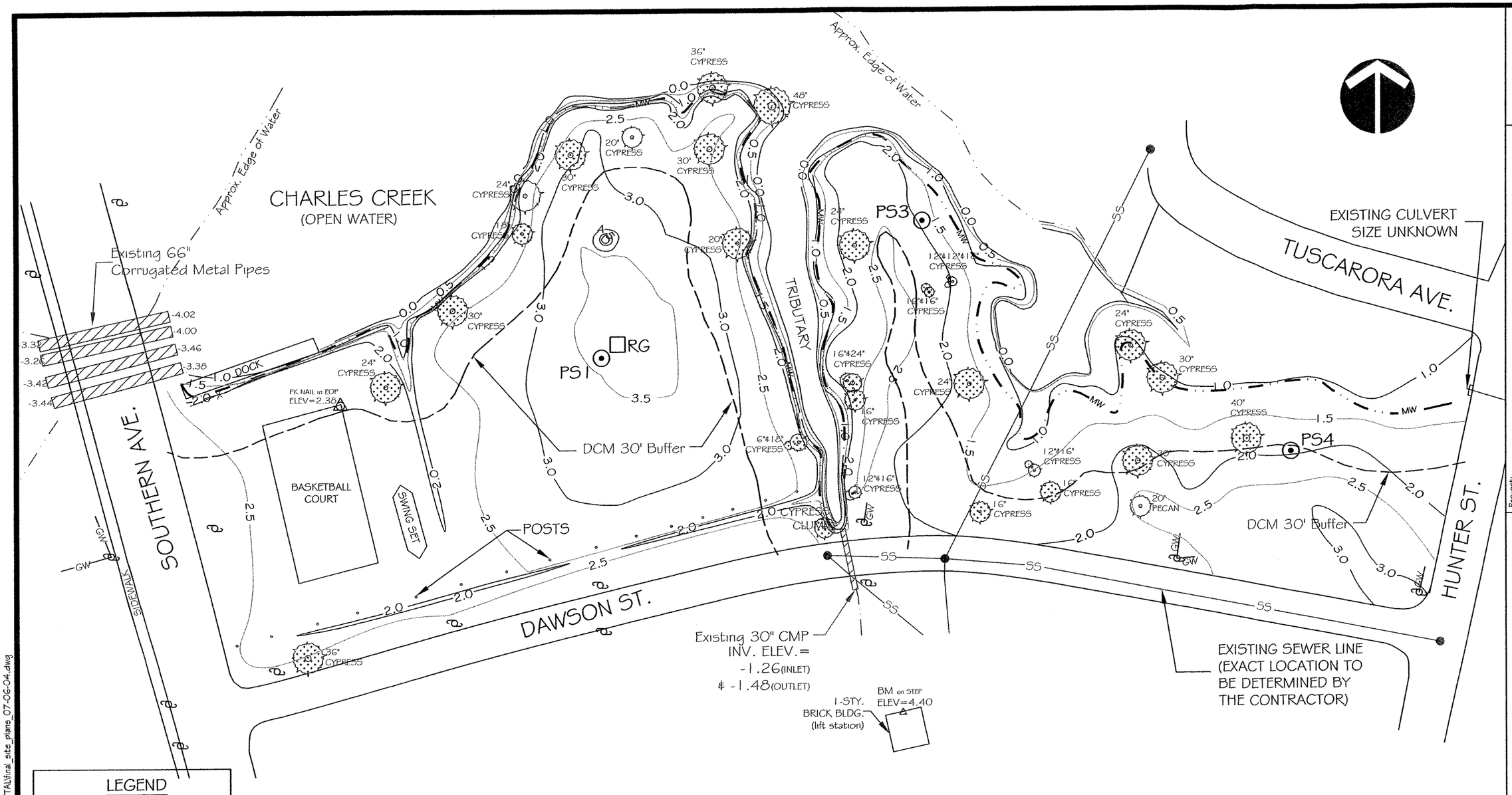

LEGEND

- POWER POLE
- GUY WIRE
- SANITARY SEWER
- EDGE OF WATER
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO REMAIN
- FENCELINE
- PS2 MONITORING GAGE
- RG RAIN GAGE

NOTES:

1) ELEVATION DATUM BASED ON NC GRID MONUMENT "WATER". ELEVATION = 6.17 FEET(NGVD 29).

2) ALL TOPOGRAPHIC DATA IS APPROXIMATE. DATA COLLECTED USING LIMITED ENGINEERING SURVEY BY TOTAL STATION ON MARCH 13, 2003. DATA SHOULD NOT BE RELIED UPON FOR LEGAL BOUNDARY IDENTIFICATION AND TOPOGRAPHIC ACCURACY.

SCALE

50 25 0 50

CONTOUR INTERVAL = 1/2'

EXISTING SITE LAYOUT

NORTH CAROLINA PROFESSIONAL SEAL 025525 ENGINEER PATRICK K. SMITH

Project No.: 7281.02 | Drawn: LGT
Designed: JMO, PKS | Scale: 1" = 50'
Sheet No.: 3 of 14

Project: CHARLES CREEK PARK WETLAND RESTORATION
Location: PASQUOTANK CO., NC
Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
Sheet Title: EXISTING SITE LAYOUT

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REV.	DESCRIPTION	DATE	APPROVED
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S&EC

File: Sec/Jobs7-9/7281.02/drawings/construction dwgs/FINAL SUBMITTAL/final_site_plans_07-06-04.dwg

CONCRETE, TRASH, REFUSE, AND OTHER RUBBLE TO BE REMOVED

Approx. Edge of Water

CHARLES CREEK
(OPEN WATER)

Existing 66" Corrugated Metal Pipes

-4.02
-4.00
-3.46
-3.38

DOCK

PK NAIL in EOP
ELEV=2.38

LANDSCAPED AREA AND BENCH TO BE REMOVED

TRIBUTARY

20" CYPRESS

24" CYPRESS

12"&12"&18" CYPRESS

24" CYPRESS

12"&16" CYPRESS

16" CYPRESS

30" CYPRESS

20" PECAN

40" CYPRESS

EXISTING CULVERT SIZE UNKNOWN

TUSCARORA AVE.

HUNTER ST.

SOUTHERN AVE.

SIDEWALK

BASKETBALL COURT

SWING SET

WOOD POSTS IN CONSTRUCTION AREA TO BE REMOVED AND RETAINED FOR REINSTALLATION AS DETERMINED BY ENGINEER AT THE TIME OF CONSTRUCTION.

DAWSON ST.

Existing 30" CMP
INV. ELEV.=
-1.26(INLET)
& -1.48(OUTLET)

1-STY. BRICK BLDG. (lift station)

BM on STEP
ELEV=4.40

SUSPECTED CONCRETE MASSES TO BE REMOVED IF THEY CONFLICT WITH FINAL SITE GRADE

EXISTING SEWER LINE (EXACT LOCATION TO BE DETERMINED BY THE CONTRACTOR)

LEGEND

- POWER POLE
- GW — GUY WIRE
- SS — SANITARY SEWER
- MW — EDGE OF WATER
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO REMAIN
- X — X — FENCELINE

NOTES:

1) UTILITIES HAVE NOT BEEN LOCATED ON-SITE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ALL UTILITIES PRIOR TO ANY EXCAVATION WORK.

2) THE CONTRACTOR SHALL NOTIFY THE APPROPRIATE UTILITY COMPANIES AND ELIZABETH CITY IF ANY EXCAVATIONS MAY INTERFERE WITH ON SITE UTILITIES.

SCALE
50 25 0 50

DEMOLITION PLAN

NORTH CAROLINA PROFESSIONAL SEAL 23625 ENGINEER PATRICK K. SMITH

File: Sec/Jobs7-9\7281.02\drawings/construction dwgs/FINAL SUBMITTAL/final_site_plans_07-06-04.dwg

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: DEMOLITION PLAN

Project No.: 7281.02 | Designed: JMO, PKS | Drawn: LGT | Scale: 1" = 50' | Sheet No.: 4 of 14

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CHARLES CREEK
(OPEN WATER)

Approx. Edge of Water

Approx. Edge of Marsh Fringe

Approx. Edge of Water

Existing 66" Corrugated Metal Pipes

TRIBUTARY

APPROXIMATE AREAS NOT TO BE DISTURBED (EXACT LOACATION TO BE MARKED AT TIME OF CONSTRUCTION)

EXISTING CULVERT SIZE UNKNOWN

TUSCARORA AVE.

SOUTHERN AVE.

SIDEWALK

1.5 - 1.0 DOCK - 2.0

PK NAIL in EOP ELEV=2.38

BASKETBALL COURT

SWING SET

DCM 30' Buffer

DCM 30' Buffer

DAWSON ST.

HUNTER ST.

Existing 30" CMP

EXISTING SEWER LINE (EXACT LOCATION TO BE DETERMINED BY THE CONTRACTOR)

POWER POLES, GUY WIRES, & OTHER UTILITIES TO BE AVOIDED DURING CONSTRUCTION

1-STY. BRICK BLDG. (lift station)

LEGEND

- POWER POLE
- GW — GUY WIRE
- SS — SANITARY SEWER
- EXISTING TREE
- TIDAL CHANNEL
- SLOUGH

NOTES:

1) CONTOURS SHOWN ARE APPROXIMATE. MODIFICATIONS MAY BE NECESSARY BASED ON SITE CONDITIONS AT TIME OF CONSTRUCTION.

2) OLDER SELECT TREES TO REMAIN TO BE DETERMINED BY THE DESIGNER AT TIME OF CONSTRUCTION.

3) MARSH FRINGE AREA TO BE GRADUALLY SLOPED TOWARDS WATERLINE WITH EXCAVATED FILL MATERIAL TO IMPROVE PLANTING CONDITIONS.

PROPOSED WETLAND ACREAGES:

RESTORATION	1.16 ACRES ±
ENHANCEMENT	0.60 ACRES ±
OPEN WATER	0.17 ACRES ±
TOTAL SITE WETLANDS:	1.93 ACRES ±

GRADING PLAN

NORTH CAROLINA PROFESSIONAL SEAL 023525 ENGINEER PATRICK K. SMITH

SCALE

50 25 0 50

CONTOUR INTERVAL = 1/2'

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Project No.: 7281.02 | Designed: JMO, PKS | Drawn: LGT | Scale: 1" = 50' | Sheet No.: 5 of 14

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: GRADING PLAN

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0	Modified Text as per NCEEP Request	08-01-05	PKS

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OLDER SELECT TREES TO REMAIN, LOCALIZED GRADING TO ALLOW FOR TIDAL CHANNEL FLOW

TIDAL CHANNELS, EXACT SIZE & LOCATION TO BE DETERMINED BY DESIGNER AT TIME OF CONSTRUCTION

SLOUGHS, EXACT SIZE, LOCATION & DEPTH TO BE DETERMINED BY DESIGNER AT TIME OF CONSTRUCTION

Approx. Edge of Water

Approx. Edge of Marsh Fringe

CHARLES CREEK
(OPEN WATER)

Existing 66" Corrugated Metal Pipes

PERIMETER PLANTING, BALD CYPRESS, B&B, APPROX. 30' CENTERS

TUSCARORA AVE.

Marsh Fringe

TRIBUTARY

DOCK

PK NAIL in EOP
ELEV=2.38

SOUTHERN AVE.

SIDEWALK

DAWSON ST.

HUNTER ST.

Existing 30" CMP

PERIMETER PLANTING, BALD CYPRESS, B&B, APPROX. 30' CENTERS

1-STY. BRICK BLDG. (lift station)

GW

SS

MW

30'

LEGEND

- TIDAL CHANNELS
- MARSH FRINGE
- PLANTING UNIT A
- PLANTING UNIT B
- SLOUGH

PLANTING AREAS:

MARSH FRINGE	9,775 SF (0.22 ACRE)
PLANTING UNIT A	25,954 SF (0.59 ACRE)
PLANTING UNIT B	33,424 SF (0.77 ACRE)

SCALE

50 25 0 50

WETLAND PLANTING PLAN

NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECT MICHAEL ORTOSKY, JR.

NORTH CAROLINA PROFESSIONAL SEAL 025525 ENGINEER PATRICK K. SMITH

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Project No.: 7281.02 | Designed: JMO, PKS | Drawn: LGT | Scale: 1" = 50'

Sheet Title: WETLAND PLANTING PLAN

Sheet No.: 6 of 14

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CONSTRUCTION SEQUENCE:

1. Obtain local authority approval for construction.

2. Contact NC One Call to locate & mark existing utilities on site.

3. Establish staging area as directed by the Owner. Contractor will be responsible for installing necessary E&S control measures at staging area (parking area stabilization, silt fence, or other measures as contractor deems necessary). Mobilize equipment and materials to the staging area. Establish temporary construction entrances to site.

4. Install sediment and erosion control measures including silt fencing and turbidity / silt curtain. Install tree protection fencing as directed by Designer.

5. Remove concrete debris, refuse, and other materials as specified in the site's demolition plan. Clear and grub in required areas for wetland area grading and planting. Remove trees as well as exotic and invasive species as directed by the Designer.

6. Verify grading depths and extents. Initiate grading of wetland areas starting along the Charles Creek waterline, working back towards Dawson and Hunter Streets. Extreme caution shall be used when working near existing bald cypress trees.

7. Apply temporary sediment and erosion control seeding measures.

8. Perform wetland planting. Apply permanent seeding measures.

9. Remove temporary sediment and erosion control measures.

10. Conduct final site inspection with the Owner and Designer.

EROSION AND SEDIMENTATION CONTROL SEQUENCE:

1. Establish staging area as directed by the Owner. Contractor will be responsible for installing necessary E&S control measures at staging area (parking area stabilization, silt fence, or other measures as contractor deems necessary). Establish temporary construction entrances to site.

2. Install sediment and erosion control measures including silt fencing and turbidity / silt curtain as shown on Sheet 12. Once tidal sloughs have been graded, silt fence crossing tidal sloughs will be contoured across the channel, and rock check dams will be hand placed by contractor as shown on Sheet 13.

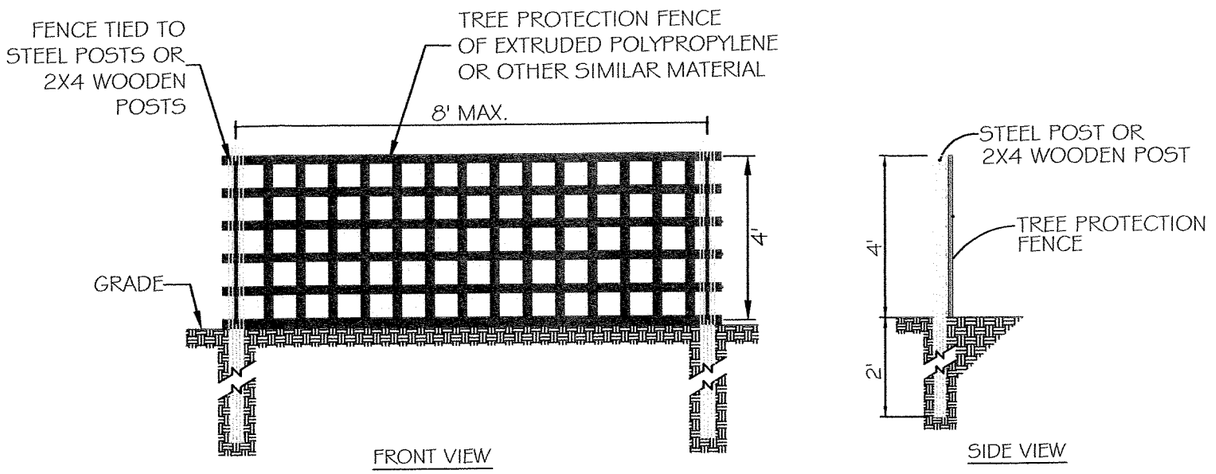
3. Remove concrete debris, refuse, and other materials as specified in the site's demolition plan. Clear and grub in required areas for wetland area grading and planting.

4. Temporary seeding will be applied to areas that are not at final grade and will be exposed for greater than two (2) weeks.

5. After final grading is complete, permanent seeding will be applied to all exposed areas. Erosion control matting will be applied to all final graded sloped steeper than 2H:1V. Permanent seeding and matting will be installed incrementally as soon as an area reaches final grade.

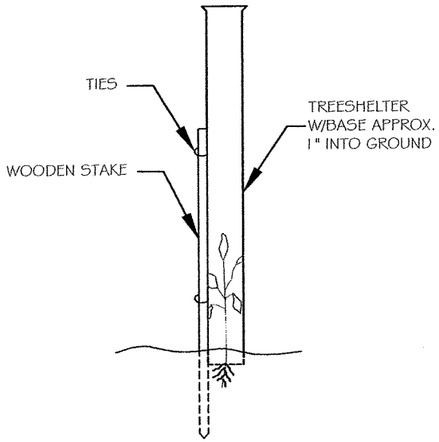
6. Remove temporary sediment and erosion control measures. The contractor shall remove accumulated sediment prior to removal of turbidity curtain, silt fence, or other measures.

• Due to the proximity of grading operations to Charles Creek, extra care should be employed by the contractor to check all E&S control measures at the end of each day and make necessary repairs. Contractor should also inspect all E&S control measures after periods of extended rainfall or significant rainfall events (>0.5 inches). Contractor should repair and stabilize exposed surfaces immediately, and remove and properly dispose of accumulated sediment turbidity curtain, silt fence, etc. after these events.



TREE PROTECTION FENCE

NOT TO SCALE



TREE SHELTER DETAIL

TO BE INSTALLED ON ALL BARE-ROOT AND CONTAINERIZED PLANTED TREES

NOT TO SCALE

NORTH CAROLINA PROFESSIONAL SEAL 025525 ENGINEER PATRICK K. SMITH

CONSTRUCTION SEQUENCE & PLANTING DETAILS 1

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Project No.: 7281.02 | Designed: JMO, PKS | Drawn: LGT | Scale: AS SHOWN | Sheet No.: 7 of 14

Sheet Title: CONSTRUCTION SEQUENCE & PLANTING DETAILS 1

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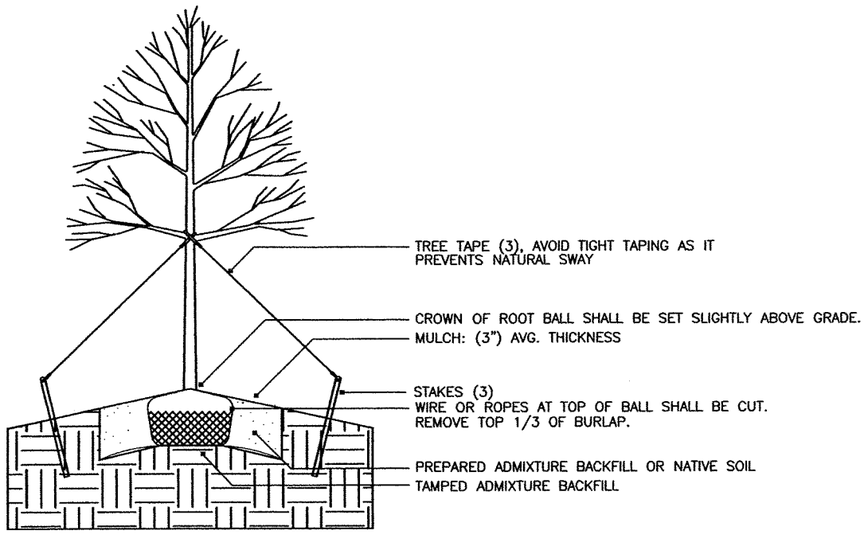
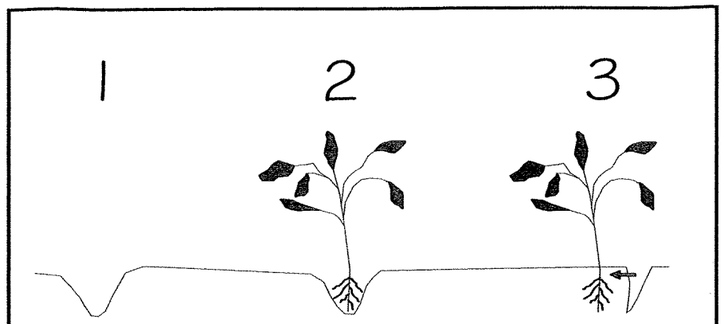
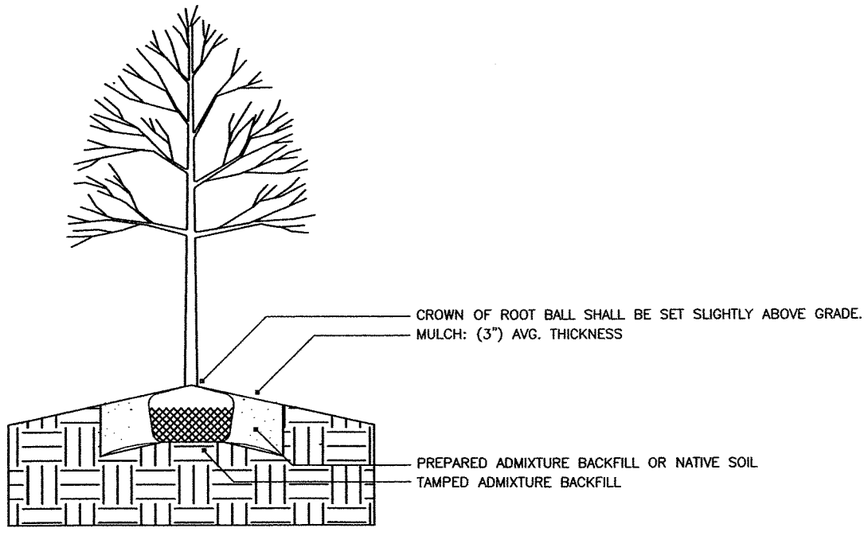


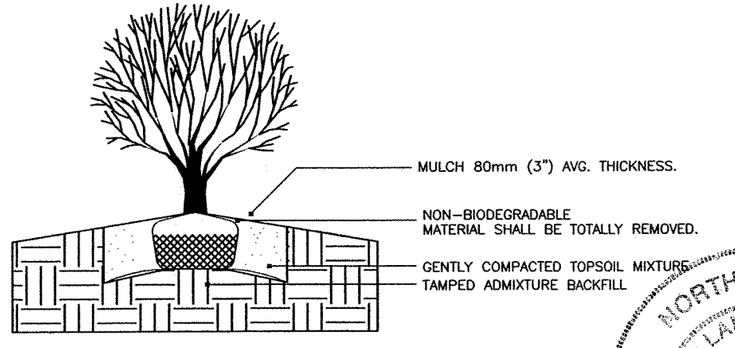
DECIDUOUS TREE PLANTING – BALL & BURLAP



BARE-ROOT SEEDLING PLANTING DETAIL
(NOT TO SCALE)



DECIDUOUS TREE PLANTING – CONTAINERIZED



SHRUB PLANTING – CONTAINERIZED

PLANTING DETAILS II

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NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECT J. MICHAEL ORTOSKY, JR.

NORTH CAROLINA PROFESSIONAL SEAL 25525 ENGINEER PATRICK K. SMITH

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: PLANTING DETAILS II

Project No.: 7281.02 | Designed: JMO, PKS | Drawn: LGT | Scale: AS SHOWN | Sheet No.: 8 of 14

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Species	Common Name	Total #	Remarks
Carya aquatica	Water Hickory	22	10x10 ft. spacing; 5 gal. container
Cephalanthus occidentalis	Buttonbush	142	6x6 ft. spacing and/or clumps of 3-4 trees; 3 gal. container
Clethra alnifolia	Pepper Bush	134	6x6 ft. spacing and/or clumps of 3-4 trees; 3 gal. container
Fraxinus pennsylvanica	Green Ash	22	10x10 ft. spacing; 5 gal. container
Lyonia lucida	Fetterbush	142	6x6 ft. spacing and/or clumps of 3-4 trees; 3 gal. container
Nyssa aquatica	Water Tupelo	91	10x10 ft. spacing; 5 gal. container
Persea borbonia	Red Bay	134	6x6 ft. spacing and/or clumps of 3-4 trees; 3 gal. container
Quercus nigra	Water Oak	19	10x10 ft. spacing; 5 gal. container
Taxodium distichum	Bald Cypress	182	10x10 ft. spacing; 5 gal. container AND 2-3" caliper B&B (see notes)
Vaccinium corymbosum	Highbush Blueberry	142	6x6 ft. spacing and/or clumps of 3-4 trees; 3 gal. container
Viburnum nudum	Possumhaw	142	6x6 ft. spacing and/or clumps of 3-4 trees; 3 gal. container

NOTES:

1) SUBSTITUTIONS MAY BE NECESSARY BASED ON AVAILABILITY.
2) TOTAL # FOR TAXODIUM DISTICHUM INCLUDES 31 BALL & BURLAP INDIVIDUALS FOR PERIMETER PLANTING.

NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECT 2030 V. MICHAEL ORTOSKY, JR.

NORTH CAROLINA PROFESSIONAL SEAL 023525 ENGINEER PATRICK K. SMITH

PLANTING SCHEDULE - UNIT A

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Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: PLANTING SCHEDULE - UNIT A

Project No.: 7281.D2 | Designed: JMO, PKS | Drawn: LGT | Scale: AS SHOWN | Sheet No.: 9 of 14

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Species	Common Name	Total #	Remarks
Cephalanthus occidentalis	Buttonbush	204	5X5 ft. spacing; 3 gal. container
Clethra alnifolia	Pepper Bush	188	5X5 ft. spacing; 3 gal. container
Cyrilla racemiflora	Ti-Ti	188	5X5 ft. spacing; 3 gal. container
Fraxinus pennsylvanica	Green Ash	71	10x10 ft. spacing; 5 gal. container
Lyonia lucida	Fetterbush	188	5X5 ft. spacing; 3 gal. container
Magnolia virginiana	Sweetbay Magnolia	71	10x10 ft. spacing; 5 gal. container
Nyssa aquatica	Water Tupelo	79	10x10 ft. spacing; 5 gal. container
Persea borbonia	Red Bay	204	5X5 ft. spacing; 3 gal. container
Quercus phellos	Willow Oak	75	10x10 ft. spacing; 5 gal. container
Taxodium distichum	Bald Cypress	98	10x10 ft. spacing; 5 gal. container
Vaccinium corymbosum	Highbush Blueberry	204	5X5 ft. spacing; 3 gal. container
Viburnum dentatum	Arrow-Wood	188	5X5 ft. spacing; 3 gal. container
Viburnum nudum	Possumhaw	204	5X5 ft. spacing; 3 gal. container

PLANTING SCHEDULE - UNIT B

NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECT J. MICHAEL ORTOSKY, JR.

NORTH CAROLINA PROFESSIONAL SEAL 15525 ENGINEER PATRICK K. SMITH

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: PLANTING SCHEDULE - UNIT B

Project No.: 7281.02 | Designed: JMO, PKS | Drawn: LGT | Scale: NO SCALE | Sheets No.: 10 of 14

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MARSH FRINGE

Species	Common Name	Total #	Remarks
Carex stricta	Uptight Sedge	450	dormant propagules
Juncus effusus	Soft Rush	450	bare-root seedlings
Scirpus americanus	Olney's Bulrush	450	dormant propagules
Scirpus Cyperinus	Wool-Grass	450	dormant propagules
Scirpus Validus	Soft-Stem Bulrush	450	dormant propagules

SLOUGHS

Species	Common Name	Total #	Remarks
Nymphaea odorata	White Water Lily	90	dormant propagules
Pontedaria cordata	Pickerel Weed	90	dormant propagules
Sagittaria latifolia	Broad-Leaf Arrow-Head	90	dormant propagules
Saururus cernuus	Lizard's Tail	90	dormant propagules
Nuphar Luteum	Yellow Cow-Lily	90	dormant propagules
Sagittaria Rigida	Stiff Arrow-Head	90	dormant propagules

NOTE:

1) SLOUGH PLANTING SCHEDULE BASED ON AN ESTIMATED TOTAL AREA OF 2800 SQ. FT.

NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECT J. MICHAEL PROFFITT, JR.

NORTH CAROLINA PROFESSIONAL SEAL 25525 ENGINEER PATRICK K. SMITH

PLANTING SCHEDULE - MARSH FRINGE & SLOUGHS

Project No.: 7281.02 | Drawn: LGT | Designed: JMO, PKS | Scale: NO SCALE | Sheet No.: 11 of 14

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: PLANTING SCHEDULE - MARSH FRINGE & SLOUGHS

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APPROXIMATE LOCATIONS OF TURBIDITY / SILT CURTAINS

APPROXIMATE AREAS NOT TO BE DISTURBED (EXACT LOACATION TO BE MARKED AT TIME OF CONSTRUCTION)

EXISTING CULVERT SIZE UNKNOWN

CHARLES CREEK
(OPEN WATER)

Approx. Edge of Water

Approx. Edge of Marsh Fringe

Marsh Fringe

TRIBUTARY

Existing 66" Corrugated Metal Pipes

DOCK

PK NAIL in EOP
ELEV=2.38

SILT FENCE

Existing 30" CMP

1-STY. BRICK BLDG. (lift station)

APPROXIMATE LOCATIONS OF TEMPORARY CONSTRUCTION ENTRANCES

SOUTHERN AVE.

SIDEWALK

DAWSON ST.

TUSCARORA AVE.

HUNTER ST.

LEGEND

- SF — SILT FENCE W/ NCDOT #57 STONE ANCHORING
- TURBIDITY / SILT CURTAIN
- DENUDED OR EXPOSED AREA APPROX. 1.8 ACRES

NOTES:

1) TEMPORARY STOCKPILE AREA LOCATION TO BE DETERMINED BY THE OWNER.

2) TEMPORARY STOCK PILE AREA TO BE SURROUNDED BY SILT FENCE.

SCALE

50 25 0 50

SEDIMENT & EROSION CONTROL PLAN

Project No.: 7281.02 | Drawn: LGT
Designed: JMO, PKS | Scale: 1" = 50'
Sheet No.: 12 of 14

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: SEDIMENT & EROSION CONTROL PLAN

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NORTH CAROLINA PROFESSIONAL SEAL 025525 ENGINEER PATRICK K. SMITH

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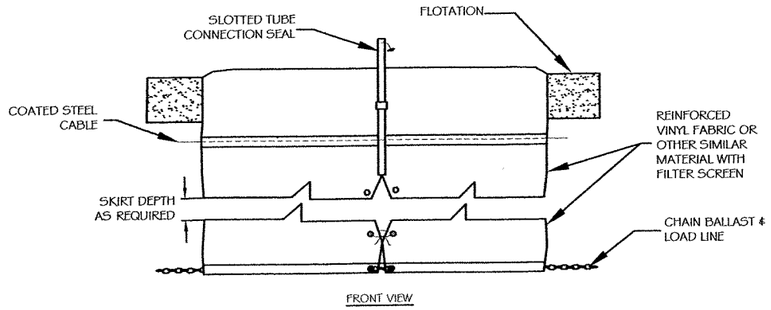
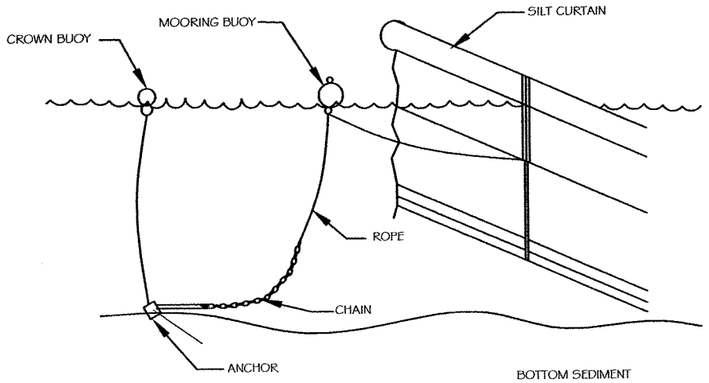
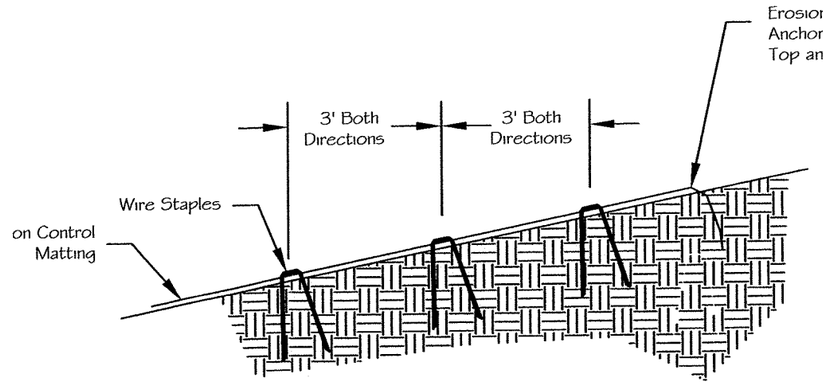


TURBIDITY / SILT CURTAIN
NOT TO SCALE

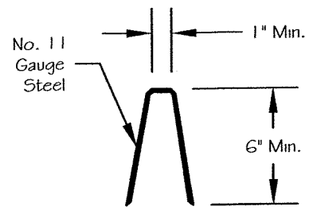


TURBIDITY / SILT CURTAIN ANCHORING DETAIL
NOT TO SCALE

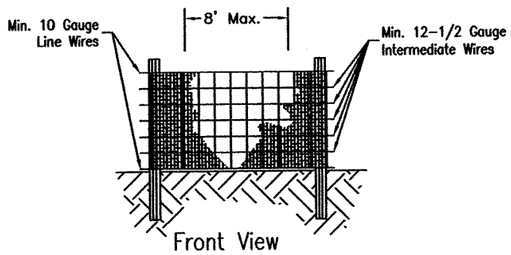
COIR MATTING DETAIL
(NOT TO SCALE)

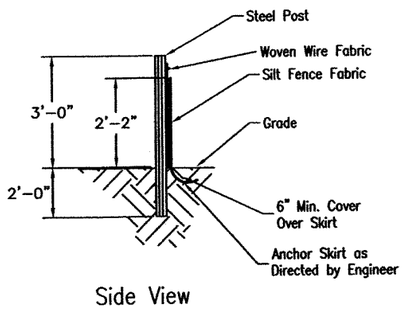


EROSION CONTROL MATTING ANCHORING DETAIL
NOT TO SCALE

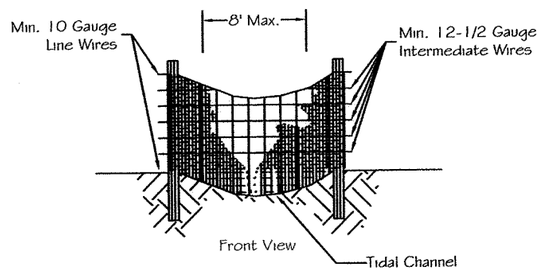


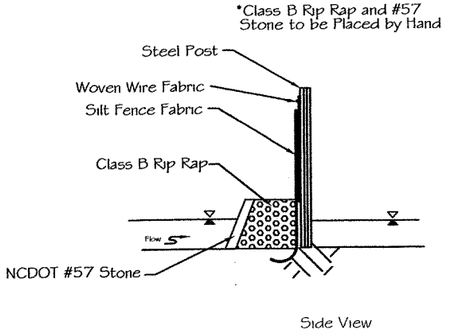
WIRE STAPLE DETAIL
NOT TO SCALE





STANDARD TEMPORARY SILT FENCE DETAIL
NOT TO SCALE





SILT FENCE W/ ROCK CHECK DAM @ TIDAL CHANNEL
NOT TO SCALE

NORTH CAROLINA PROFESSIONAL SEAL 016525 ENGINEER PATRICK K. SMITH

SEDIMENT & EROSION CONTROL DETAILS I

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Project No.: 7281.02 | Drawn: LGT | Designed: JMO, PKS | Scale: AS SHOWN | Sheet No.: 13 of 14

Project: CHARLES CREEK PARK WETLAND RESTORATION

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Location: PASQUOTANK CO., NC

Sheet Title: SEDIMENT & EROSION CONTROL DETAILS I

Soil & Environmental Consultants, PA
11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

REV.	DESCRIPTION	DATE	APPROVED
0	Issued for Construction	12-07-04	JMO
	REVISIONS		

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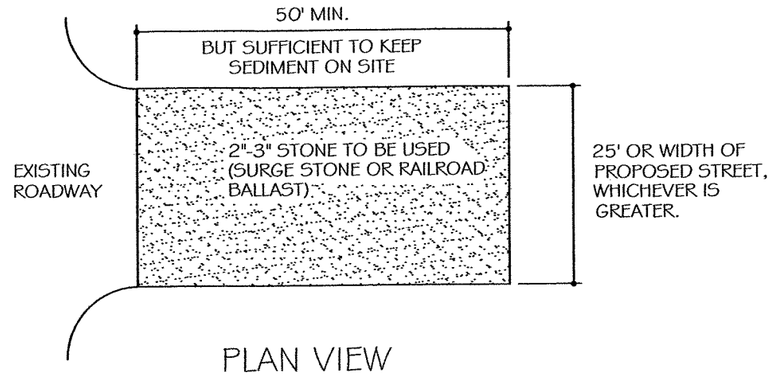
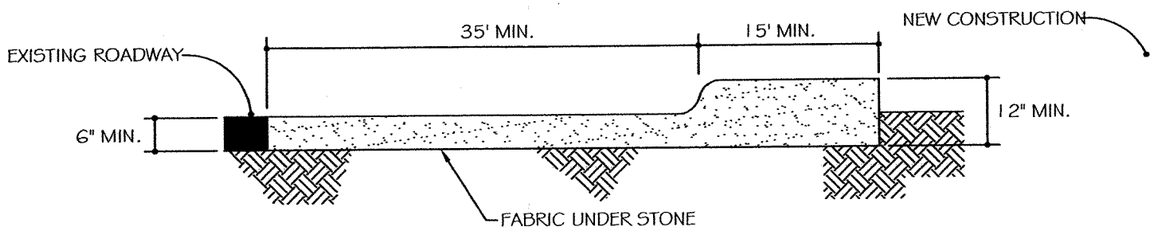


PLAN VIEW



CROSS-SECTION VIEW

TEMPORARY CONSTRUCTION ENTRANCE

NOT TO SCALE

NOTES:

1. PUT SILT FENCE OR TREE PROTECTION FENCE UP TO ENSURE CONSTRUCTION ENTRANCE IS USED.
2. IF CONSTRUCTION ON THE SITES ARE SUCH THAT THE MUD IS NOT REMOVED BY THE VEHICLE TRAVELING OVER THE STONE, THEN THE TIRES OF THE VEHICLES MUST BE WASHED BEFORE ENTERING THE PUBLIC ROAD.
3. IF A PROJECT CONTINUES TO PULL MUD AND DEBRIS ON TO THE PUBLIC ROAD, THE CONTRACTOR WILL WILL CLEAN THE AREA.

TEMPORARY SEEDING SPECIFICATIONS

Areas where no substantial or significant progress is made for more than 15 days should be temporarily seeded as shown below. All area should be seeded and mulched.
Incidental grading shall not constitute substantial or significant progress in construction activity. Seeding and mulching shall be done immediately following construction. All disturbed areas shall be dressed to a depth of 8 inches. The top 3 inches shall be pulverized to provide a uniform seedbed.

Seeding Dates	Seeding Species	Rate (lbs/acre)
April 15 - Aug. 15	German Millet	40
Aug. 15 - May 30	Rye (grain)	120

Soil Amendments

Follow recommendations of soil tests or apply 2,000 lbs/acre ground agricultural limestone and 750 lbs/acre 10-10-10 fertilizer.

Mulch & Matting

Mulching shall consist of small grain straw applied at a rate of 70 lbs./1000 sq.ft. Use jute, excelsior matting or similar channel lining material to cover exposed bottoms of ditches, channels, graded slopes, and areas of concentrated flow.

Maintenance

Inspect and repair mulch frequently. Refertilize and reseed as required to maintain vigorous temporary vegetative cover during construction.

PERMANENT SEEDING SPECIFICATIONS

All exposed areas at final grade should have permanent seeding and mulch applied.

Seeding Dates	Seeding Species	Rate (lbs/acre)
Dec. 1 - March 15	Panicum Virgatum	25
Dec. 1 - March 15	J&J Wetland Seed Mix (To be Mixed w/ Carrier)	2

Soil Amendments

Same as Temporary Seeding

Mulch & Matting

Same as Temporary Seeding

NORTH CAROLINA PROFESSIONAL SEAL 025625 ENGINEER PATRICK K. SMITH

SEDIMENT & EROSION CONTROL DETAILS II

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