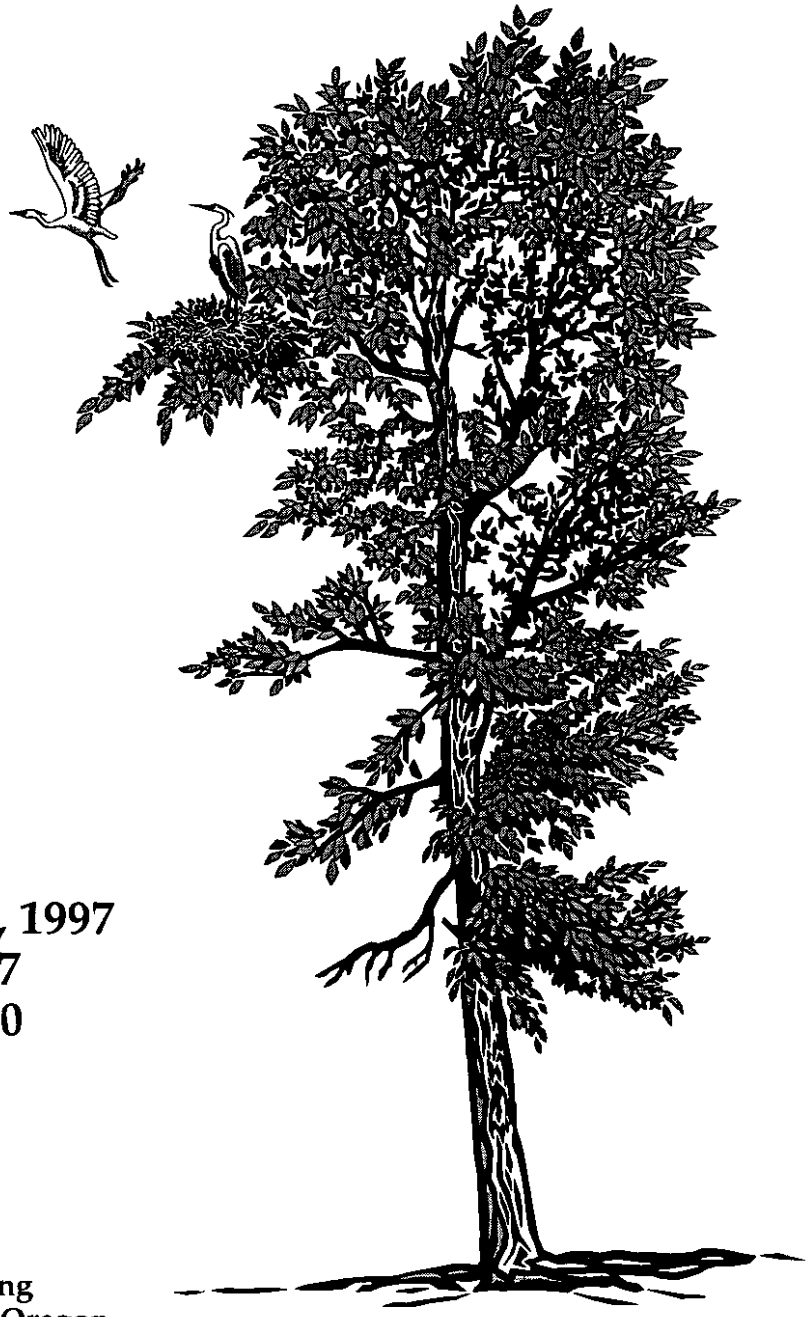
Natural Resources Management Plan for Peninsula Drainage District No. 1



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NATURAL RESOURCES MANAGEMENT PLAN FOR PENINSULA DRAINAGE DISTRICT NO. 1

Bureau of Planning
Portland, Oregon

July, 1997

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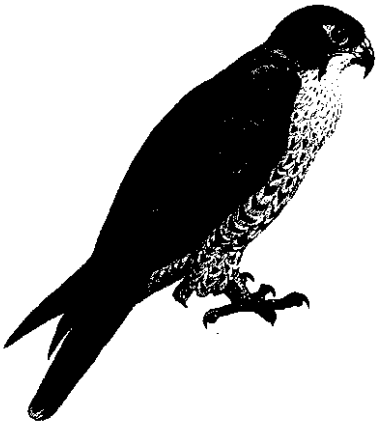


TABLE OF CONTENTS

Introduction and Plan Summary 8

Introduction 8
Organization 10
Plan Background 10
Summary of NRMP Findings and Management Objectives 11
Hydrologic Resources 11
Wetlands and Natural Resources 13
Land Use and Recreation 14

Chapter 1, Pen 1 Hydrology and Water Quality 16

Purpose 16
Process 17
The Study Area 17
Floodplain 18
Hydraulic Analysis 22
Hydrologic Assumptions and Flow Calculations 22
Pen 1 Drainage Basin Descriptions 22
Water Quality 27
Water Quality Regulatory Considerations 27
Water Quality Survey 28
Water Quality Drainage Basin Considerations 29
Water Quality Study Results 30
Water 31
Sediment 31
Hydrology and Water Quality Policies 32
Hydrology and Water Quality Management Objectives 33

Chapter 2, Inventory and Assessment of Wetlands, Natural Areas, and Wildlife Habitat 36

Introduction 36
Site Description and History 37
Inventory and Assessment Methods 37
Field Inventory 37
Results—Wetlands 40
Overview of Wetland Types 40
Soil and Hydrology 41
Open Water Wetlands 42
Emergent Wetlands 43
Forested Wetlands and Complexes 44
Disturbed Wetlands 45
Local Management Activities Affecting Wetlands 46
Urban Natural Area Characteristics and Wildlife Habitat 47
Wildlife and Habitat 47
Threatened and Endangered Species 49
Discussion of Natural Resource Issues 49
Pen 1 Enhancement/Mitigation Plan 50
Natural Resource Policies 55
Natural Resource Management Objectives 55

Chapter 3, Pen 1 Land Use and Recreation 58

Public Policy and Zoning 58
Public and Private Property Considerations 59
History 59
Public Access 59
Future Development Plans 60
Land Use and Recreation Policies 62
Management Objectives for Land Use and Recreation 62

Chapter 4, Natural Resources Management Plan Implementation 64

Introduction 64
NRMP Action Items 64
Procedures 68
A. Actions in Conformance with the Plan 68
B. Development Standards 70
C. Actions Subject to Chapter 33.430, Environmental Zones and Mitigation Requirements 70
D. Major and Minor Modifications of the Plan 72
E. Plan Amendments 73

Exhibits

EXHIBIT 1 Study Area ..... After p. 10
EXHIBIT 2 Current Zoning ..... After p. 10
EXHIBIT 3 Sub Basin Map ..... After p. 18
EXHIBIT 4 Proposed Diversion Structure 34
EXHIBIT 5 Diversion Structure Design 35
EXHIBIT 6 Wetlands and Inventory Locations ..... After p. 38
EXHIBIT 7 Historic Context, 1888 USC & GS Survey Map ..... After p. 38
EXHIBIT 8 Natural Areas and Habitat Inventory ..... After p. 42
EXHIBIT 9 Slough Bank Recontouring Typical Section 51
EXHIBIT 10 Pen 1 Opportunities for Enhancement and Mitigation ..... After p. 52
EXHIBIT 11 Proposed Public Access Improvements ..... After p. 60
EXHIBIT 12 Parks Maintenance Plan ..... After p. 62
EXHIBIT 13 Final Polishing Swale Proposed Typical Section 67

Tables

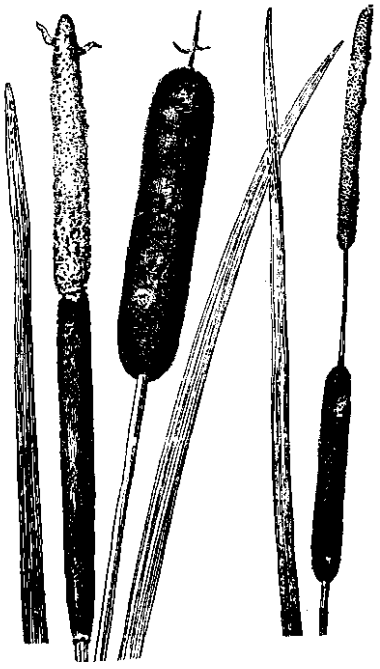
TABLE 1 100 YR Full Buildout Peak Flow Assumptions 20
TABLE 2 100 YR Full Buildout Floodplain 21
TABLE 3 Peak Flows at Key Points - Existing Conditions 23
TABLE 4 Runoff Volumes at Key Points - Existing Conditions 24
TABLE 5 Summary of System Hydraulics - Existing Conditions 25
TABLE 6 Results of the Generalized Wetland Functional Assessment for the Wetlands of the Pen 1 Area 39

Appendices Attached

APPENDIX 1 Native Plant List for the Peninsula Drainage District No. 1 74

Appendices Volume 2 (separate document)

APPENDIX 2 Corrected Environmental Zone Maps
APPENDIX 3 Revisions to Zoning Code Chapter 33.430, Environmental Zones
APPENDIX 4 Bibliography
APPENDIX 5 Summary of NWI and Wetland Functional Assessments
APPENDIX 6 Wetland and Wildlife Habitat Assessment Forms
APPENDIX 7 Wetland Sample Data Sheets
APPENDIX 8 Water and Sediment Tests, Lab Reports



INTRODUCTION AND PLAN SUMMARY

INTRODUCTION

The purpose of the Natural Resources Management Plan for Peninsula Drainage District No. 1 (NRMP) is:

- To manage the wetlands, wildlife habitat, and other natural resources located on both public and private land within the Peninsula Drainage District No. 1 (Pen 1) in a focused and coordinated manner.
- To evaluate the Pen 1 ecosystem as a whole and provide specific direction for protection and enhancement of the natural resources throughout the Pen 1 area.
- To provide a level of certainty in the environmental review process by identifying primary areas for mitigation for approved development projects that are consistent with the protection of resources within Pen 1.

Currently, development proposals that affect the natural resources of Pen 1 are subject to the regulations of the City of Portland's Environmental Overlay Zones. A specific plan for managing and improving the area's water resources and habitats and coordinating development proposals and mitigation has not been completed. In addition, public access and recreation has focused on the Portland International Raceway (PIR) and the Heron Lakes Golf Course without an emphasis on other forms of recreation.

This NRMP provides a mechanism to coordinate mitigation and enhancement activities within Pen1. Development projects that are approved on private or public land within environmental zones usually require mitigation. The NRMP identifies specific mitigation areas and provides clear ratios to be followed. This benefits property owners by providing an additional level of certainty to the environmental review process. It also ensures that mitigation is done in areas where it is most needed or has the most benefit. The NRMP also identifies public access and recreation improvements.

The study area of the NRMP is the entire drainage area of Pen 1 (see Exhibit 1, Study Area). It is about 900 acres in size, located entirely within the Columbia River floodplain. Approximately 75 percent of the study area is publicly owned land. The remaining 25 percent is privately owned land which is zoned for industrial development (see Exhibit 2, Current Zoning).

The area has seven property owners:

- The City of Portland, which owns Heron Lakes Golf Course and Portland International Raceway (which together comprise West Delta Park);
- Metro, which owns and operates the Portland Expo Center;
- James River Corporation;
- Excel Communications, owner of the Portland Radio transmitter site;
- SF Stockyards, LLC;
- Harbor Oil; and
- Peninsula Terminal Company, owner of the rail spur in the northwest corner of Pen 1.

The study area is protected from flooding by a system of levees controlled by Peninsula Drainage District No. 1 under a local cooperation agreement with the U. S. Army Corps of Engineers (Corps). It contains a series of small inter-connected sloughs, lakes, and wetlands, as well as large open uplands utilized for recreational purposes.

The study area was diked and drained in the early 1900s and formerly housed part of the Vanport community, which was devastated during the May 1948 flood. The Excel Communications property has a remnant cul-de-sac and street that were part of this community. Both prior to and after the flood, portions of the study area were filled to create housing sites and roads, to develop PIR and Heron Lakes Golf Course, or simply to store surplus soil from other projects.

The natural resources of Pen 1 provide significant habitat for wildlife, storage capacity for storm water, water quality benefits, recreational opportunities for the general public, and visual relief from the adjacent industrial areas and freeways. One of the more notable features is a blue heron rookery at the northwest corner of the study area. The potential for improvement of the resources within Pen 1 is substantial. Wetlands, wildlife habitat, water quality, and recreational opportunities can be greatly improved if coordinated with future development in the Pen 1 area.

ORGANIZATION

The NRMP is organized as follows:

- The Introduction and Plan Summary briefly describes the characteristics of Pen 1, explains the purpose of this plan, and summarizes the findings and management objectives.

- Chapters 1, 2, and 3 contain detailed discussions on the analysis, findings, and conclusions of the studies of the natural systems and land use issues. Chapter 1 addresses hydrology and water quality. Chapter 2 discusses wetlands, natural areas, and wildlife habitat. Chapter 3 focuses on land use and recreation issues. The relevant policies and management objectives—as established based on the analysis and findings—are listed at the end of each chapter. The policies are aspirational and are used to define the management objectives. The management objectives are specific and are used to create the NRMP implementation measures.

- Chapter 4 addresses the implementation of the NRMP. Action items that are derived from the Management Objectives are described in detail and are the operative portion of the NRMP. Action items are listed under the property where they are to be implemented or the property whose owner is primarily responsible for implementing them.

  This chapter also explains the relationship between the NRMP and the regulations in Chapter 33.430, Environmental Zones. The procedures section contains a matrix that describes what actions are required or voluntary, what actions are approved with the adoption of the Plan, and what requires environmental review. It explains the land use review procedures that apply in different situations and lists specific development standards and approval criteria. Lastly, it lists procedures for dealing with modifications and amendments to the NRMP.

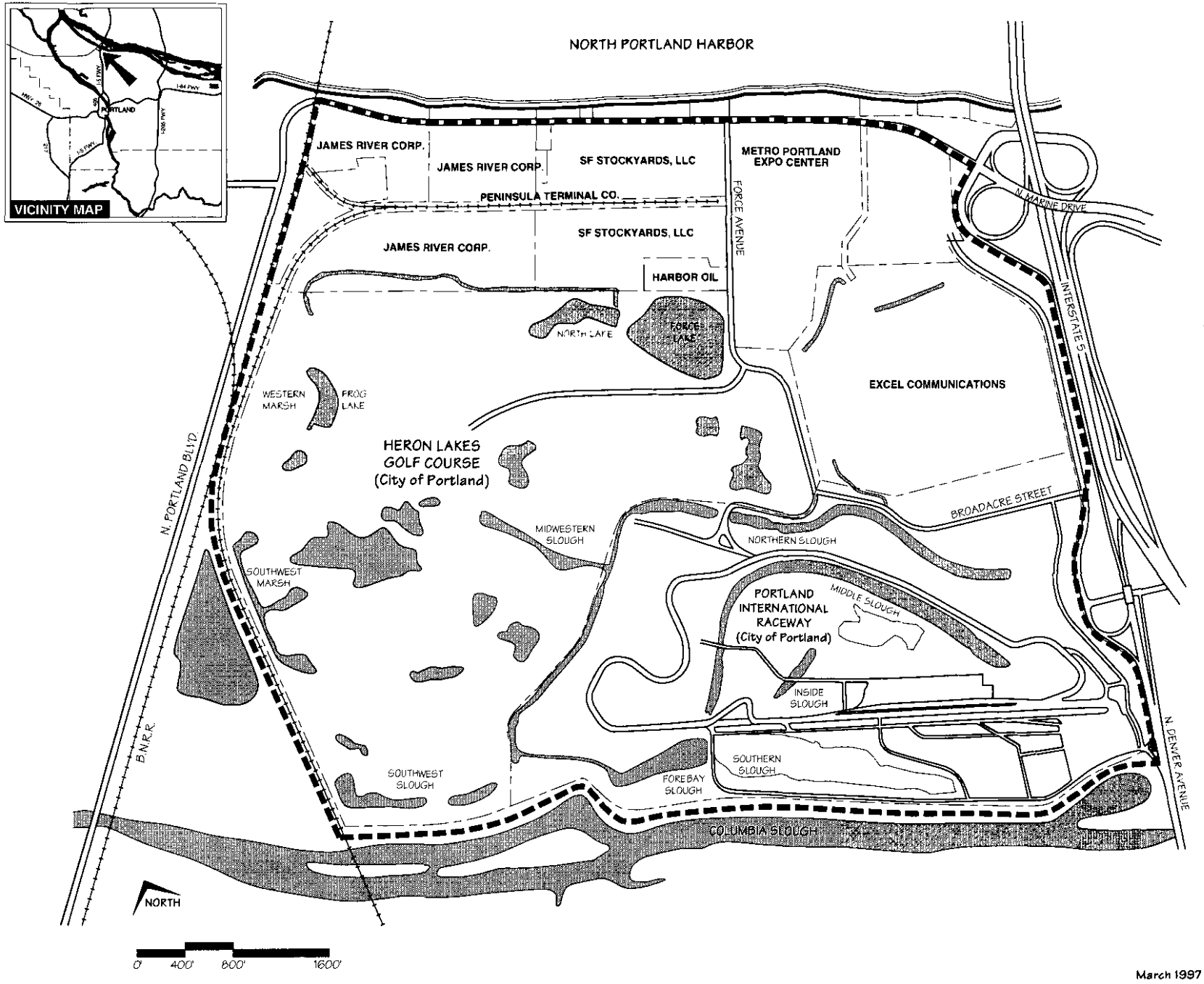
PLAN BACKGROUND

The NRMP was initiated at the request of the Portland Planning Bureau and the Kenton Neighborhood Association in 1992, with support from the Audubon Society of Portland. Pen 1 and the Kenton Neighborhood are lacking in developed recreational facilities other than Portland International Raceway and Heron Lakes Golf Course. Potential development pressures are increasing and water quality issues in the Columbia Slough and its tributaries are on the horizon.

Portland Parks and Recreation hired the firm Mitchell Nelson Welborn Reimann Partnership (MNWR) to initiate the study and create the NRMP. A consultant team was put together by MNWR to conduct the base studies. The team consisted of:

- MNWR for project coordination, land use issues and recreation;
- Oakley Engineering, Inc. for the hydrologic resources;
- Lynn Sharp and Fishman Environmental Services for wetlands and natural resources; and
- Century Testing Laboratories for water and sediment testing.

The consultant team submitted the first draft of the NRMP to Portland Parks and Recreation (Parks) in May of 1995. Parks then submitted the NRMP to the Planning Bureau for review and adoption. The Planning Bureau is responsible for review and submittal to the Portland Planning Commission and the Portland City Council. Once adopted the Planning Bureau is also responsible for the administration of the NRMP.



PENINSULA ONE
Natural Resources
Management Plan

Study Area

Legend

- Management Plan Area Boundary
- Property Boundaries

Exhibit 1

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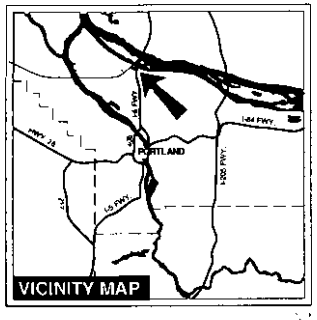

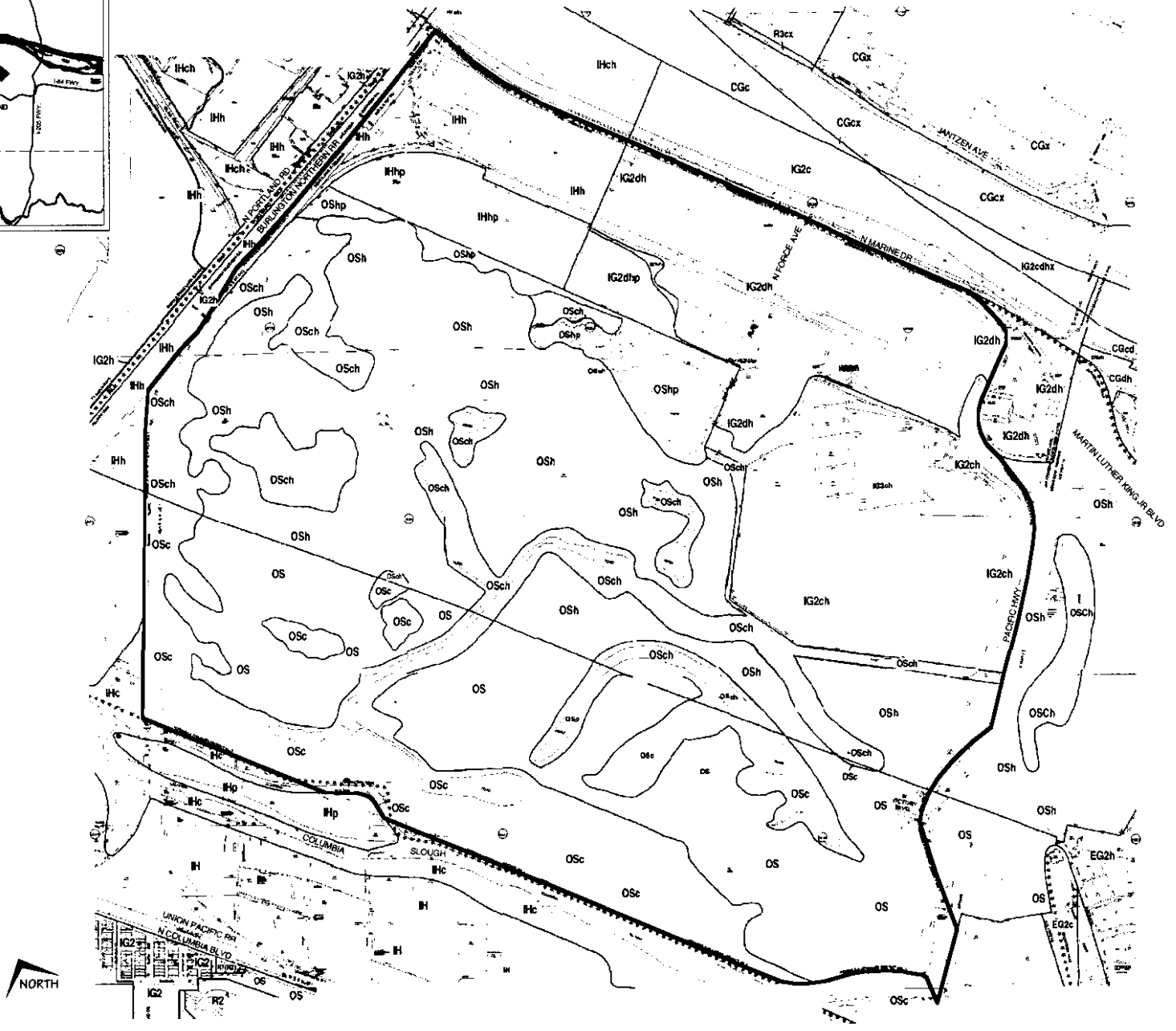

PENINSULA ONE
Natural Resources
Management Plan

Current Zoning

Legend

IH	Heavy Industrial
IG2	General Industrial
OS	Open Space
c	Environmental Conservation
h	Airport Height Overlay
p	Environmental Protection

☆☆☆☆ Trail Designation

Exhibit 2

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SUMMARY OF NRMP FINDINGS AND MANAGEMENT OBJECTIVES

Hydrologic Resources

The perimeter of the study area is a levee intended to protect the lands within Pen 1 from high water in the Columbia and Willamette Rivers. Because of this levee, all runoff generated within the study area must be pumped out of Pen 1 and into the Columbia Slough to control water levels in the internal sloughs. Responsibility for the drainage function of the sloughs and for operation of the pump station currently belongs to the Peninsula Drainage District No. 1, but through contract, management will transfer to the Multnomah County Drainage District No. 1 (MCDD1) in July of 1997.

The existing sloughs have a large flood storage value and are more than adequate to convey peak flows. In several areas where naturally occurring drainageways have been culverted and piped, flow is constricted.

Key hydrologic resources include Force Lake, the Excel Communications property, the wetland associated with the heron rookery area, the numerous lakes within the golf course, and the network of sloughs.

Force Lake was identified as having a small amount of in-flow from Force Avenue and wetlands to the north, which does little to help the water quality of the lake. The NRMP recommends that flow be augmented with relatively clean runoff from the Excel Communications property. Diverting flows from the Excel Communications property through Force Lake would improve water quality in the lake.

Untreated runoff from the Metro Portland Expo Center parking lot and from paved areas in PIR are a potential source of surface water contamination in the Pen 1 system. The passive treatment of these flows is a recommendation of this NRMP.

Heron Lakes Golf Course voluntarily conducted some baseline water quality testing in 1996, using sampling and analysis techniques specified by the Bureau of Environmental Services (BES), and found no pesticide or fertilizer problems associated with their runoff. The system of internal ponds on the golf course provides passive water quality treatment by functioning as wetponds and sedimentation ponds. The water quality function of these ponds and marshes can be maintained by continuing the practice of allowing native vegetation to grow along the edges and in some areas creating more shallow emergent wetland benches along pond edges.

The perimeter levees on the south and west sides of the study area, along the Lower Columbia Slough and Smith Lake, currently do not meet Corps standards. As a consequence, occupied buildings cannot be constructed within Pen 1 below the 100-year floodplain of the Columbia River, an elevation of 27.2 feet (National Geodetic Vertical Datum or NGVD). Since most of the topography within the study area is 12 to 18 feet in elevation (NGVD), development potential is limited until the levee is improved. The Corps will soon begin a project to upgrade these levee sections.

The Management Objectives for hydrologic resources are summarized below:

1. Route Additional Flow through Force Lake - This improvement will provide additional flow to improve water quality in Force Lake. The Excel Communications property represents a large catchment area of what appears to be relatively clean runoff. Currently rainfall discharges into the Northeast Drainageway which flows westward to Force Avenue. At the point where this drainageway currently enters a 36-inch culvert, a diversion structure should be added to divert low flows into a pipe which would discharge into Force Lake. Trickle flows and large flows could both continue to be routed south to Broadacre Street. Force Lake would then receive some enhanced flow without the hydraulic concern of high flows through the constricted drainage components downstream of Force Lake.

2. Construct a Final Polishing Swale - A final polishing swale constructed at the confluence of the Midwestern Slough and the Southern Slough—where the entire "A" and "B" drainage basins combine—may be necessary to meet DEQ or BES discharge water quality requirements. Its function would be to provide some final nutrient and pollutant removal from stormwater flow prior to discharge into the Columbia Slough. See Exhibit 3, Sub Basin Map for slough and basin locations.

3. Support BES efforts to conduct further water quality testing, sampling of fish tissue and aquatic invertebrates, and to develop with the Oregon Department of Environmental Quality (DEQ) the Total Maximum Daily Loads (TMDLs) for the Columbia Slough Watershed.

4. Obtain by acquisition, dedication or gift, the resource areas on the industrial properties north of Force Lake as a means of controlling inflow of contaminants from surface operations and groundwater. These sites may require significant remediation to remove existing contaminants, and to control inflow of contaminants into the waters of Pen 1.

5. Define drainageway maintenance requirements and activities so the waterways can be managed for multiple benefits. Adopt maintenance standards that provide for the continued conveyance of stormwater flows as well as provide for environmental benefits.

Wetlands and Natural Resources

The dominant wetland types found in the Pen 1 study area include emergent wetlands (marshes), open water sloughs, natural and constructed drainage channels, forested wetlands, and several complexes containing more than one of the above. Nearly all are influenced by the complex drainage system managed by Pen 1, and most (with the exception of most golf course ponds) are relics of the once extensive complex of lakes, channels, marshes, and forested wetlands that historically occupied the area between the Columbia River and the Columbia Slough. The types and extent of wetlands found generally corresponds with the U.S. Fish and Wildlife Service's National Wetlands Inventory map.

With one notable exception, the marshes are overwhelmed by a monoculture of reed canarygrass. The exception is the Northwest Marsh, adjacent to the Great Blue Heron Rookery, where there is a remarkable diversity of native emergent wetland plants. Open water sloughs are bordered by an overstory of black cottonwood and an understory of Himalayan blackberry, which in dense stands inhibits development of natural forest vegetation. Forested wetlands support a mixture of black cottonwood and willow, and a variety of shrubs and herbs. Force Lake supports a fringe of natural forested wetland along about half of its shoreline. The remaining golf course ponds are classified as disturbed wetlands.

The wetland functional assessment method used by the consultant team rated Force Lake, the Heron Rookery, Northwest Marsh, Southern Slough, Forebay Slough, Northern Slough, West Marsh and Southwest Marsh high or moderate. The golf course ponds, Central Marsh, Excel Communications Marsh, Northwest Drainageway, Midwestern Slough, and inside sloughs received moderate ratings. Disturbed wetlands received low ratings. Important functional values identified at one or more of the sites were active recreation, passive recreation, uniqueness, wildlife habitat, fisheries habitat, food chain support, nutrient retention/removal, sediment trapping, flood storage/synchronization, and groundwater modification.

No threatened or endangered plant species are known to occur in the study area. Bald eagles have been observed at Heron Lakes Golf Course and in cottonwoods at PIR. Most recently, bald eagles have been wintering at the Columbia Boulevard Sewage Treatment Plant, adjacent to Pen 1. Peregrine falcons have also been observed within Pen 1. A state-listed Sensitive species, the tri-colored blackbird, has been observed in Pen 1. The slough habitat of Pen1 is suitable for western pond turtles and they have historically been observed in Pen 1.

Currently, one of the most important wildlife resources within the study area is the Great Blue Heron Rookery in the northwest corner of Pen 1. A diversity of wildlife species, in addition to the herons, inhabit this site. This is clearly a reflection of the diversity of native plants and habitat structure at the site. In recent years the herons have begun to make use of other sites within Pen 1 for nesting, including near Force Lake and at PIR, demonstrating the cumulative value of all the lakes, sloughs, wetlands, and forests within Pen 1.

The diversity of plants and wildlife in the North Wetland Area provides a model for the enhancement of the remainder of the Pen 1 resource areas. The concentration of lakes, sloughs, wetlands, and forests within Pen 1 provides a great opportunity for future resource enhancement, particularly with the proximity of Pen 1 to the Smith and Bybee Lakes area, West Hayden Island, and the Columbia Slough.

Based on the wetland and natural resource inventories, the Pen1 Enhancement/Mitigation Plan was created. The Pen1 Enhancement/Mitigation Plan identifies opportunities for enhancement and mitigation within Pen 1 as well as ways to improve water flows and water quality. The final chapter of the NRMP ties mitigation that is required of development to the areas specified in the Enhancement /Mitigation plan.

The Management Objectives for wetlands and natural areas are summarized below:

1. Restore and enhance naturally vegetated interconnections between wetland areas and forested areas.

2. Work with Pen 1 and MCDD 1 to identify maintenance requirements for the drainageways within the study area. Where feasible, develop maintenance dredging activities that will have the least amount of impact to natural resources while still maintaining the required conveyance requirements for flood control purposes.

3. Restore riparian vegetation along sloughs and other wetlands by recontouring where possible, planting native species, and removing weedy invaders such as Himalayan blackberry and reed canarygrass.

4. Avoid future slough crossing to encourage and maintain vegetative and hydrological interconnections between habitat areas.

5. Enhance Western Pond Turtle habitat.

6. Continue Heron Lakes Golf Course maintenance practices that encourage the recovery of natural vegetation where possible.

7. Place and maintain nest boxes within the Pen 1 District to improve wildlife diversity and aid in mosquito control.

8. Conduct research on the North Wetland Area to determine the reason(s) that the emergent community located there is diverse and not dominated by reed canarygrass (which could assist in developing methods of controlling this highly invasive wetland species).

Land Use and Recreation

Public access to the natural areas within Pen 1 (limited at the present time), can be improved by a proposed trail system that provides lookouts with views of the area, connections to Tri-Met and future Light Rail facilities, and bicycle connections with Marine Drive. The Forty-Mile Loop Trail is planned for the North Dike along the Columbia Slough, providing connections to Delta Park. Heron Lakes Golf Course and Portland International Raceway will continue to be secured facilities with access available to users or spectators only. However, the PIR Master Plan does encourage public access to the sloughs within PIR when not in conflict with racing activities.

Force Lake represents a major recreational and scenic opportunity in the area. It is a major water body with convenient access to the shoreline. The improvement of recreational and education amenities at the lake through the addition of a trailhead and visitor information center would be a great public benefit.

With the exception of the James River Corporation, Peninsula Terminal Co., and Harbor Oil, property managers and staff representing the property owners expressed strong support for coordinating development proposals with the management of the area's natural resources. Most of the owners are already conducting planning studies for their properties. Little conflict was found with existing and proposed land uses.

The management objectives and implementation measures of the NRMP facilitate development proposals in a way that provides some advantage over the current City regulatory process while also benefiting the natural resources of Pen 1. A level of certainty is added to the development review process by linking approved development proposals directly to specific mitigation actions at specific locations, as described in the Pen 1 Enhancement/Mitigation Plan.

The Management Objectives for land use and recreation issues are summarized below:

1. Improve public access and recreation opportunities within the Pen 1 District and connect to the Forty-Mile Loop.

2. Establish Force Lake as a focal point for passive recreation through the development of a Visitors Information Center Trailhead with descriptions of the natural and historic resources within the Pen 1 District.

3. This plan identifies specific areas and actions within Pen1 for the enhancement of existing resources or for the mitigation of natural resources that are removed through an approved environmental review. Implement the mitigation aspect of the Pen 1 Enhancement/Mitigation Plan by linking it to the potential development of environmentally zoned properties within Pen 1.

4. Allow for the proposed drainage and water quality facility on the SF Stockyards, LLC property, which is a direct benefit to the resources of Pen 1.

5. With the next Metro Portland Expo Center expansion require water quality improvements for runoff entering the Pen 1 system from the Expo Center property. Passive on-site treatment is required with the option of the additional construction of a polishing wetland on the Excel Communications property.

CHAPTER 1

PEN 1 HYDROLOGY AND WATER QUALITY

PURPOSE

An analytical study was undertaken to evaluate hydrological and water quality aspects of the area within Pen 1, including Heron Lakes Golf Course, Portland International Raceway, the Metro Portland Expo Center, the Excel Communications property, and other lands within the watershed.

The study was conducted to develop conceptual management strategies for:

1. Operation and maintenance of drainageways;
2. Drainage improvements which may be required for conveyance of stormwater through the system;
3. Water quality strategies for the watershed; and
4. Wildlife habitat improvements.

Particular concerns were the water quality in Force Lake, the source of recharge to the Heron Rookery and the North Wetland area northwest of Force Lake, and the quality of water in the main sloughs and waterways which are discharged into the Columbia Slough.

NOTE: Elevations in this report are based upon National Geodetic Vertical Datum (NGVD). (The City of Portland Datum reads 1.38 feet higher for the equivalent elevation).

PROCESS

Existing hydraulic information on the study area is limited, but what is available was reviewed and site visits were made to examine existing conditions. Meetings were held with Ed Erickson, Manager of Pen 1. Drainage basins were delineated within the watershed based on mapped and observed flow patterns. Sub basins and drainage patterns within Pen1 are shown in Exhibit 3, Sub Basin Map With Sample Locations. Hydrologic modeling parameters were assigned to each of these basins and hydrologic computer models constructed to simulate existing and possible future development conditions. Flow rates, hydraulic conditions, and flood levels were then estimated using this model.

The drainage system was reviewed in a workshop setting with the other NRMP team members (MNWR, Lynn Sharp and Fishman Environmental Services) to determine the significance of natural resources within the study area. Identified hydrologic resources were considered with respect to their importance to storm water conveyance, hydrological support of wetland and habitat areas, flood storage, and capability to assimilate and remove storm water contaminants.

Meetings were held with Pen 1, the Corps, the Expo Center, Portland Parks and Recreation, and BES to review the concepts developed through the study and analysis.

Opportunities were identified to conserve elements of the hydrologic system, improve drainage functions, increase water quality treatment capabilities, and enhance habitat values through hydrologic modifications.

Very little information is available on historic or current water quality conditions in the Pen 1 District. Unpublished water quality information and data were obtained from other projects conducted within the drainage district. Information sources included the Force Lake Fishery Evaluation (Fishman Environmental Services 1989) and results of ongoing water quality and sediment analysis work in the Columbia Slough being conducted by BES.

The Study Area

The study area for this NRMP is defined as the area within the boundaries of Pen 1. Pen 1 is responsible for managing open water drainage systems and for flood protection within the District. Pen 1 is bounded by a perimeter levee intended to protect lands within the District from high waters of the Columbia River and the Columbia Slough. The I-5 embankment forms the levee to the east. Marine Drive is located on the levee to the north. The Burlington Northern Railroad embankment immediately west of Heron Lakes Golf Course forms the levee to the west. The levee on the south is located on the north bank of the Lower Columbia Slough.

Runoff generated within the levees drains through a series of lakes and sloughs. Eventually, it is routed to a single pump station located near the Forebay Slough on the south boundary of the District. The pump station discharges water from Pen 1 directly into the Lower Columbia Slough. The Columbia Slough is free-flowing to the Willamette River.

FLOODPLAIN

Levees along the west and south side of the District do not currently meet Corps standards for protection against the 100 year flood stage in the Columbia River. Consequently, the 100-year floodplain within Pen 1 is considered to be the 100-year water surface elevation of the Columbia River itself, adjacent to the district. This flood elevation is approximately 27.2 feet (NGVD). At this time, building permits cannot be issued for permanently occupied buildings lower than one foot above the 100-year floodplain. Because most of the land in Pen 1, except for the high ground along Marine Drive, is in the 12 to 20 foot range, very large amounts of fill would be required to build in most parts of Pen 1.

The Corps is preparing to implement a project that will reinforce the existing west levee and provide for a re-alignment of the pumping station discharge lines in the south levee, bringing them up to Corps flood standards. The City of Portland supports this improvement and has agreed to participate financially in its implementation. The dike improvement is expected to be completed in 1998.

With the levee improvements completed, a new local 100-year floodplain may be established. This local floodplain would be based on the Corps analysis of the improved levee system, local 100-year rainfall, the volume of flood storage in the Pen 1 sloughs, and the capacity of the pump station to discharge water from the District. An analysis of this information could then determine the maximum water levels that would be reached in the Pen 1 sloughs during the 100-year event.

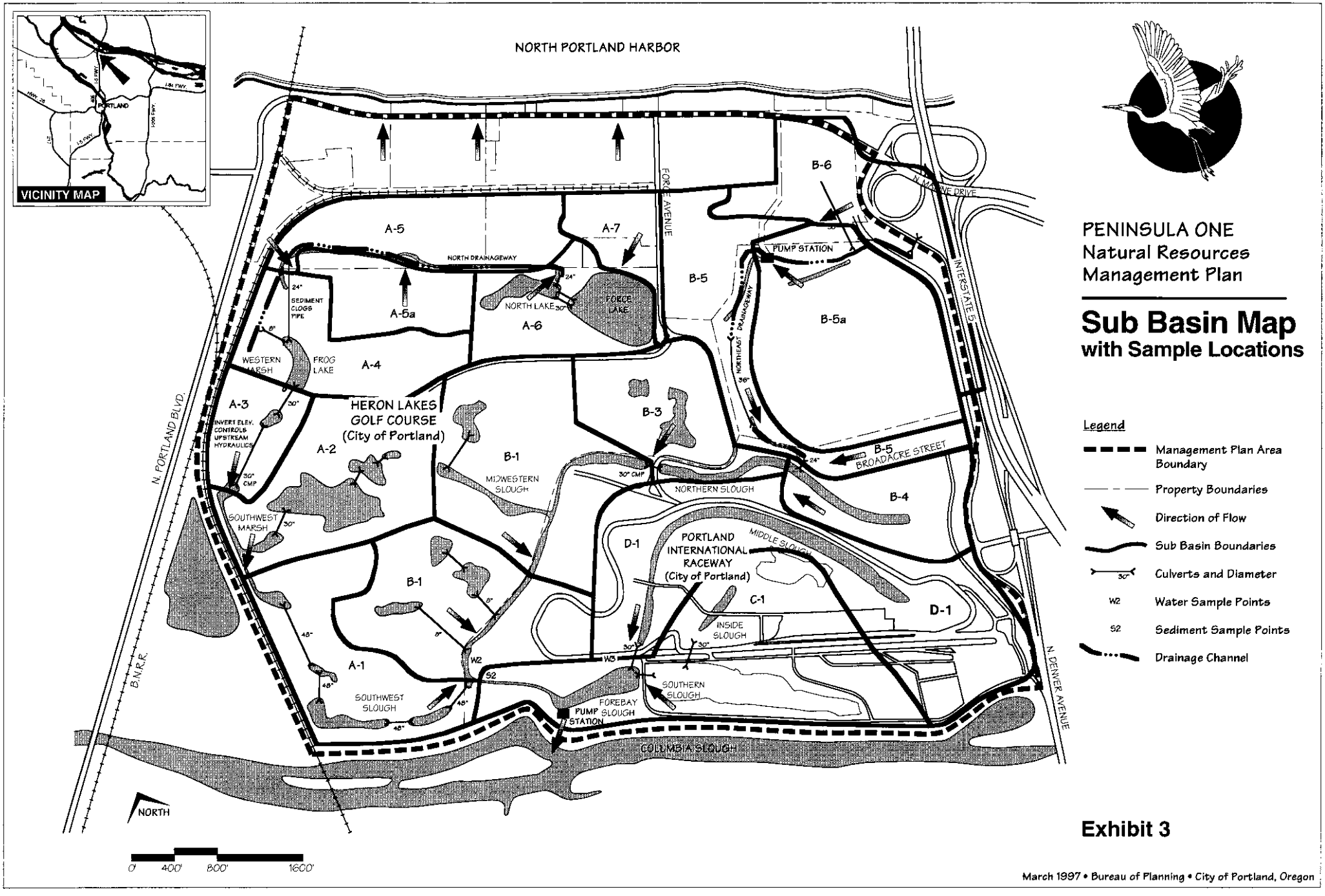
The Federal Emergency Management Agency (FEMA) is responsible for approving floodplain elevations and for implementing the Flood Insurance Study (FIS) program. Typically, the City of Portland (the local FEMA representative) in conjunction with Pen 1 (the local provider of floodplain protection services), would submit a floodplain analysis to FEMA for the drainage system within the levee.

The FEMA floodplain analysis must be based on the level of development, storage, and pumping conditions present at the time of the analysis. However, it is useful to estimate possible future development conditions in order to gain some understanding of what lands may be considered "buildable" once these improvements are completed.

A preliminary and brief "floodplain" analysis prepared by the consultant team assumed full buildout of sub-basin A-7, 30% buildout of the Excel Communications property (sub-basin B-5a), and development of sub-basin B-5 adjacent to Force Avenue. It also assumes full buildout input parameters and the resulting peak flows at key node points shown in Table 1.

Based on estimated 100-year flows under future development conditions, it was determined that 0.5-feet of head loss was required in the sloughs and channels to serve lands in the upper "B" Basin. An additional 2.5-feet of head loss is required to account for cumulative culvert crossings. This amount of head loss would require most culvert crossings in the main sloughs to be enlarged to 54-inch pipes to accommodate future flows.

Table 2 summarizes the estimated water level at the pump station and estimated floodplain in the District for various pumping rates. The large storage volumes in the sloughs require relatively large increases in pumping rates to lower the floodplain elevation. Based on this preliminary analysis, a floodplain elevation of approximately 12 feet is possible with the existing pump capacity of 16.5 Cubic Feet per Second (CFS). It would be expensive to attempt to establish a floodplain elevation of 11 feet or less because of the necessity for a significant upgrade of the pump stations current capacity.



PENINSULA ONE
Natural Resources
Management Plan

Sub Basin Map
with Sample Locations

Legend

- Management Plan Area Boundary
- Property Boundaries
- Direction of Flow
- Sub Basin Boundaries
- Culverts and Diameter
- W2 Water Sample Points
- S2 Sediment Sample Points
- Drainage Channel

Exhibit 3

March 1997 • Bureau of Planning • City of Portland, Oregon

Additional work needs to be done to the south dike in the location of the "dogleg" bend just west of the Pen 1 pump station where it was leaking badly during the storms of 1996. This activity is being reviewed separately from the NRMP but the south dike may need to be completely reconstructed before the new 100-year floodplain is established.

Another consideration for the reliability of the western levee section is the embankment along the Columbia Slough adjacent to Triangle Lake, just west of Pen 1. Currently, the Slough overtops the embankment and floods Triangle Lake at elevation 21 feet NGVD. Once this happens, pressure is placed on the western levee section. If the Slough embankment were raised to elevation 30 feet, the stress would be reduced on the western levee section of Pen 1.

The establishment of a new local 100-year floodplain requires the following actions to be completed:

1. Construct south and west levee improvements to Corps standards;

2. Investigate the structural integrity of the south dike just west of the Pen 1 pump station;

3. Analyze the rainfall, flood storage and pumping system with regard to the floodplain elevation;

4. Submit the analysis to FEMA for approval; and

5. Obtain FEMA approval of the floodplain analysis and the recommended new floodplain elevation.

TABLE 1 **100 Year Full Buildout Peak Flow Assumptions**

100 Year 24 Hour Precipitation = 5.28 inches

Node	Description	Cumulative Upstream Area	% of Area Impervious **	% of Area Mowed Grass/Lawn	% of Area Wetland/ Woods	Time of Concentration (Minutes)	Full Buildout 100 Year Peak Flow (CFS)
A - 1	Flow at outlet of W. Golf Course Slough	275	18%	66%	16%	96	82
B - 5	Flow through NE Drainage Ditch	173	46%	23%	31%	63	84
B - 1	Flow at outlet of Mid-Western Slough	347	33%	52%	16%	130	104
C - 1	Combined Flow, "C" and "D" Basins	169	39%	61%	0%	87	65
PS	Combined Flow at Pump Station	791	29%	59%	12%	N/A	250

** Includes Water Bodies

TABLE 2 **100 Year Full Buildout Flood Plain**

Pump Rate at Pump Station (CFS)	Modelled 100 Year Water Level at Pump Station	Estimated District Wide Flood Plain Elevation*	
16.5	9.2	12	**Existing Pump Rate**
33.0	8.8	11	**Double the Existing Pump Rate**
120	7.5	10	**Pump Rate Req'd to Reduce Flood Plain to Elev = 10.0**

*** Assumes necessary culverts are replaced to limit head losses throughout District to less than 2.5 ft. during the 100 year storm. This assumption is expected to require culvert diameters from 36" to 54" for existing pump rates. Culverts of up to 84" in diameter (or equiv. flow capacity) could be necessary for a pump rate of 120 cfs.**

HYDRAULIC ANALYSIS

Hydrologic Assumptions and Flow Calculations

For the purposes of this NRMP, the Pen 1 District was divided into four main drainage basins (labeled "A," "B," "C," and "D"), which were further divided into drainage sub-basins, as illustrated in Exhibit 3, Sub Basin Map With Sample Locations.

The following hydrologic modeling parameters were estimated for each drainage sub-basin using available mapping and site observations:

1. Drainage Area (in acres);

2. Impervious Area (as a percent of the sub-basin's total area, including water bodies as well as pavement/rooftop areas);

3. Soil Curve Number (CN) for pervious areas; and

4. Time of Concentration (the time difference between the peak rainfall intensity and the occurrence of peak runoff for each sub-basin).

The Santa Barbara Unit Hydrograph method was used to calculate flow hydrographs at key "node" points in the main drainageways.

Flows were calculated for the 1, 2, 5, and 25-year frequency events. Flows were also computed for the 0.36-inch rainfall event, which has been recently used as a standard rainfall when evaluating runoff for water quality purposes. The resulting peak flows for these events are shown in Table 3. Estimated runoff volumes for these events are shown in Table 4. For these calculations, a storm duration of 24 hours was assumed.

Pen 1 Drainage Basin Descriptions

The flow hydrographs described above and shown in Tables 3 and 4 were "routed" through three separate hydraulic "regions": 1) the main slough system, 2) the upper "A" basin, and 3) the upper "B" basin. Drainageways within each region were assumed to be connected and to behave as a single water body, with outflow restricted by a single hydraulic feature (culvert or pump).

Main Slough System - The "C" basin, "D" basin, the portion of the "A" basin below Node A-3 and the portion of the "B" basin below Node B-5 comprise the main slough system. The sloughs in this portion of the Pen 1 District contain most of the District's available flood storage capacity. Low flow velocities and nearly flat water surface gradients are anticipated in this portion of the study area. Because of these characteristics, the main slough system was modeled as one water body. Peak outflow from this basin is equal to the pumping rate of the District's main pump station.

Road crossings in the "B," "C," and "D" Basins are typically fully submerged 30-inch corrugated metal pipe (CMP) culverts. Head losses through these crossings, with a Pen 1 discharge pumping rate of 16.5 CFS, are estimated to be about 0.50 feet each. The lakes on the West Golf Course Slough are connected through 48-inch CMP culverts. Head losses through these culverts are estimated to be less than 0.2 feet each.

A summary of anticipated inflow and outflow conditions, storage volume used, and maximum water level reached in the main slough area are presented in Table 5A for the 1, 2, 5, 25-year and 0.36-inch (water quality) storm events.

TABLE 3 **Peak Flows at Key Points**
Existing Conditions

Node	Description	Cumulative Upstream Area	% of Area Impervious **	% of Area Mowed Grass/Lawn	% of Area Wetland/ Woods	Time of Concen-tration	Peak Flows (CFS)					
							Event	WQ	1 YR	2 YR	5 YR	25 YR
							24 HR	.36"	1.8"	2.4"	3.12"	4.12"
A - 7	Flow into Force Lake	17	70%	0%	30%	15	Precip.	0.1	5	7	9	14
A - 5	Flow through North Ditch	119	24%	42%	34%	53		0.7	7	13	21	37
A - 1	Flow at outlet of W. Golf Course Slough	275	17%	66%	17%	97		0.9	10	18	30	57
B - 6	Expo Parking Lot/Freeway Basin	46	50%	50%	0%	15		1.0	9	13	19	30
B - 5	Flow through NE Drainage Ditch	173	15%	38%	47%	63		0.6	7	13	24	45
B - 1	Flow at outlet of Mid-Western Slough	347	12%	65%	23%	130		0.7	9	17	30	58
C - 1	Combined Flow, "C" and "D" Basins	169	38.8%	61.2%	0.0%	87		1.3	13	19	29	48
PS	Combined Flow at Pump Station	791	19.6%	64.4%	16.0%	N/A		2.8	30	53	89	161

** Includes Water Bodies

TABLE 4 **Runoff Volumes at Key Points**
Existing Conditions

Node	Description	Cumulative Upstream Area	% of Area Impervious **	% of Area Mowed Grass/Lawn	% of Area Wetland/ Woods	Total Runoff Volume (AF) Event 24 HR.	WQ .36"	1 YR 1.8"	2 YR 2.4"
A - 7	Flow into Force Lake	17	70%	0%	30%	Precip.	0.4	1.9	2.7
A - 5	Flow through North Ditch	119	24%	42%	34%		1.1	6.4	10.1
A - 1	Flow at outlet of W. Golf Course Slough	275	17%	66%	17%		2.1	12.2	20.2
B - 6	Expo Parking Lot/Freeway Basin	46	50%	50%	0%		0.8	4	5.7
B - 5	Flow through NE Drainage Ditch	173	15%	38%	47%		1.2	7.6	12.7
B - 1	Flow at outlet of Mid-Western Slough	347	12%	65%	23%		2.1	13.4	23.1
C - 1	Combined Flow, "C" and "D" Basins	169	39%	61%	0%		2.3	12.1	17.9
PS	Combined Flow at Pump Station	791	19.6%	64.4%	16.0%		6.5	37.7	61.2

** Includes Water Bodies

TABLE 5 **Summary of System Hydraulics**
Existing Conditions

A. Primary Sloughs and Drainageways

Starting Water Surface Level (WSL) = 7.0

EVENT	Peak Inflow (cfs)	Peak Outflow (cfs)	Total Runoff Volume (AF)	Volume Stored (AF)	Max. WSL at Pump Sta.	Max. WSL at Node B-4
WQ	3	3	2.5	0	7.0	7.0
1	31	16.5	35	7	7.0	7.3
2	54	16.5	58	27	7.3	7.5
5	90	16.5	90	56	7.7	7.9
25	163	16.5	151	112	8.4	8.5

B. Force Lake

Starting Water Surface Level (WSL) = 7.6

EVENT	Peak Inflow (cfs)	Peak Outflow (cfs)	Total Runoff Volume (AF)	Volume Stored (AF)	Max. WSL Reached
WQ	0.5	0.0	0.2	0.2	7.6
1	5.0	0.0	1.7	1.7	7.7
2	7.0	0.4	2.5	2.4	7.9
5	9.0	0.5	3.4	3.0	8.2
25	14	0.9	5.0	4.0	9.4

C. North Ditch

Starting Water Survface Level (WSL) = 7.3

EVENT	Peak Inflow (cfs)	Peak Outflow (cfs)	Total Runoff Volume (AF)	Volume Stored (AF)	Max. WSL Reached
WQ	0.7	0	0.5	0.5	7.3
1	7	0	6	5.8	7.6
2	13	0	10	9.8	7.8
5	21	1	15	14.5	8.1
25	37	5	24	22	9.3

D. Northeast Ditch, At Broadacre St.

Starting Water Surface Level (WSL) = 7.0

EVENT	Peak Inflow (cfs)	Peak Outflow (cfs)	Total Runoff Volume (AF)	Volume Stored (AF)	Max. WSL Reached
WQ	0.6	0.6	0.4	0	7.2
1	7	6	7	0.2	7.5
2	13	11	12	0.6	8.1
5	24	15	19	1.8	9.3
25	45	22	33	5.6	11.7

Upper "A" Basin - The upper reaches of the "A" basin include some industrial areas at the northwest corner of the study area, Force Lake, the Heron Rookery, the North Wetland area, and portions of the Heron Lakes Golf Course. Hydraulic conditions in this portion of the District are critical in determining impacts to sensitive habitat areas.

The 30-inch CMP outfall at node A-3 has an outlet invert about 0.3 feet above the typical water levels downstream and hydraulically separates the upper "A" sub-basin from the downstream system for events less than the 2-year frequency storm. With the exception of Force Lake, water levels in most of the "A" drainageway above node A-3 appear to be controlled primarily by this 30-inch CMP outfall.

Hydraulic conditions in Force Lake are controlled by the 30-inch concrete sewer pipe (CSP) outlet from the Lake, which has an invert elevation about 0.8 feet higher than water levels throughout the rest of the upper "A" sub-basin.

An old 700 foot section of 24-inch CSP conveys flow from the North Drainageway to Frog Lake. Flow restrictions associated with this pipe in the past have been alleviated by adding a second parallel pipe and by the construction of an overflow drainageway that goes along the west side of the golf course and then into Frog Lake through an 8-inch CMP pipe.

Estimated inflow, outflow, volume stored, and resulting water levels for existing conditions in Force Lake and the North Wetland area are presented in Tables 5B and 5C. Water levels in the North Wetland area are typical of water levels throughout the upper "A" sub-basin.

Based on the limited topographic information available, the typical elevation of lands in the North Wetland area appears to be about 8.5 to 9.0 feet. Flooding of the North Wetland area due to backwater in the North Drainageway occurs infrequently—probably only during the 25-year (or greater) storm event. Based on estimated elevations in the North Drainageway for low flow events, the drainageway appears to be dewatering the North Wetland during normal flow conditions, and provides minimal recharge benefit during the high flow, but relatively short duration, of major storm events. Ponding and recharge in the North Wetland appear to be due to only local inflows and direct rainfall.

Upper "B" Basin - The upper "B" basin includes portions of I-5, portions of the Multnomah County Exposition Center site, and the Excel Communications property.

A majority of the runoff in the upper "B" basin comes from the impervious portions of sub-basin B-6, which includes portions of the Interstate Avenue/I-5 interchange and the Metro Portland Expo Center parking area. The remainder of the flow at the outlet of B-5 is due to runoff from the Excel Communications property and runoff from undeveloped portions of sub-basin B-5.

The Expo Center parking lot and portions of the I-5 interchange drain to the Northeast Drainageway which flows west along the north side of the Excel Communications property and then south along the west side of the Excel Communications property. At North Force Avenue, this drainageway enters a culvert which runs southward along the east side of Force Avenue and discharges into the drainage swale located to the northeast end of the Force Avenue/Broadacre Street intersection.

Water levels in the upper "B" basin were found to be primarily controlled by head loss through the 24-inch CMP culvert crossing at Broadacre Street (Node B-5).

The Excel Communications property, while lower in elevation than the surrounding lands, is hydraulically separated from the Northeast Drainageway by dikes and is available only for storage of direct rainfall. A small pump station (Exhibit 3, Sub Basin Map With Sample Locations)

maintains the water surface elevation within the Excel Communications property. The pump has a 6,500 gpm (14.4 CFS) capacity, which appears sufficient to convey the peak flows from the site into the Northeast Drainageway.

Estimated water surface levels for the area upstream of the Broadacre Street crossing are shown in Table 5D. The available storage in the Northeast Drainageway is relatively small and water levels are primarily the result of head loss through the Broadacre Street culvert.

WATER QUALITY

Water Quality Regulatory Considerations

The quality of storm water runoff has received increased regulatory interest in recent years. Portland's Columbia Slough has been identified for special consideration through its designation as a "water quality limited stream" by the Oregon Department of Environmental Quality (DEQ). Since runoff from the Pen 1 watershed is pumped into the Lower Columbia Slough, the quality of this discharge will receive careful attention.

Parallel regulatory requirements are forcing water quality actions in the Lower Columbia Slough: The first is the DEQ requirement that the City of Portland develop a Program Plan to meet Total Maximum Daily Loads (TMDL) in the Columbia Slough for certain pollutants. The other is the Environmental Protection Agency (EPA) National Pollution Discharge Elimination System (NPDES) requirement for storm water discharges.

The City recently engaged CH2MHill and previously HDR Engineering, Inc., to recommend pollutant loading (TMDL) standards for adoption by the DEQ. These standards, when approved by the DEQ will form the target concentrations for water quality in the Slough. The City is required to adopt a "Program Plan" to meet these standards. The Program Plan will likely include a combination of actions including a reduction in pollutant generation at the source, improvements to strip pollutants from the runoff stream, and beneficial alterations to the slough itself. BES is the lead agency within the City to administer the Program Plan.

Pen 1 is required to comply with federal NPDES regulations for municipal stormwater discharges. The Oregon Department of Environmental Quality issued a 5-year stormwater permit to Pen 1 in September 1995, as a co-permittee to the City of Portland's program. The permit conditions require implementation of a comprehensive stormwater management program including (1) a detailed stormwater management plan and (2) a long-term stormwater monitoring program. The management plan describes Best Management Practices (BMP's) to reduce the amount of pollutants discharged in stormwater, and the monitoring plans were originally designed to characterize stormwater quality.

These two parallel processes—the TMDL program and the NPDES permit process—will lead to improvement in the water quality of the Columbia Slough. While the Pen 1 watershed is not a principal source of pollutants to the Columbia Slough, BES has identified it as a target area which is an important source for improving the water quality within the lower Slough. Accordingly, BES will be working in the Pen 1 area to implement water quality improvements to benefit the lower slough. BES will conduct further testing of sediments and water quality and will provide tree planting for shading and some wetland creation and enhancement for pollutant reduction in the Pen 1 sloughs.

Water Quality Survey

Sample Parameter Selection - Previous studies of Force Lake (McHugh 1974, Fishman Environmental Services 1989) indicated the potential for contamination of both surface and groundwater by a wide range of organic and inorganic substances. The Dames and Moore (1991) work for BES in the Columbia Slough indicated an even wider range of pollutants contained in Slough sediments. The use of herbicides on slough banks and occasional pesticide use on the golf course indicated a need to look for the presence of these substances in both surface waters and sediments.

The primary objective of this study was to determine existing conditions within the Pen 1 District. Consequently, it was decided to sample for a wide range of water quality and sediment parameters, including contaminants likely to be found in the area and contaminants presenting potential health risk. Both sediment and water column samples were taken. Sample parameters included:

- General chemistry (pH, turbidity, conductivity, hardness, total phosphorus, ortho-phosphorus, nitrate nitrogen, total kjeldhal nitrogen (TKN),
- ammonia
- total solids
- total dissolved solids (TDS)
- total suspended solids (TSS)
- total coliform
- chemical oxygen demand (COD)
- biological oxygen demand (BOD)
- total organic carbon
- oil and grease (and total petroleum hydrocarbons)
- volatile organic compounds (VOAs)
- metals (total and toxicity characteristics leaching procedure)
- pesticides and polychlorinated biphenols (PCBs)
- herbicides, and
- semi-volatile organic compounds (BNAs).

Sample Site Selection - All samples, except VOA sediment samples, were collected on January 2, 1992. These samples reflect winter conditions and intermittent pumping of surface water from within the Pen 1 District to Columbia Slough. The VOA sediment samples were collected on February 6, 1992.

Sample sites were selected based on: 1) their proximity to potential sources of pollution, 2) their importance as areas of recreational use and animal habitat, and 3) representation of the different areas within the drainage district. Three areas were selected based on these criteria: 1) Force Lake; 2) near the intersection of Midwestern and Forebay Sloughs, and 3) at the eastern end of Forebay Slough. Sampling points are marked on Exhibit 3, Sub Basin Map with Sample Locations.

Force Lake is an important recreational use area within the drainage district. Of greatest concern is fishing in the lake. The lake has no major inlet of water which leads to a considerable buildup of organic and other sediments. It only receives surface runoff from the golf course, adjacent commercial and industrial sources, and roadways. Both water and sediment samples were collected from Force Lake.

The Forebay Slough and Midwestern Sloughs receive runoff from throughout the drainage district including roadways, Heron Lakes Golf Course, PIR, and the Excel Communications property. Sediment and water samples were collected from the intersection between the Midwestern Slough and the Forebay Slough. Water samples were also taken from the northeast corner of the Forebay Slough near the road crossing (Exhibit 3, Sub Basin Map with Sample Locations).

Field Methods - Sample kits containing sample bottles for each station were prepared prior to field sampling. A stainless steel 6-inch by 6-inch Ekman Dredge was used for sampling sediments. The dredge, water sampling bucket, and stainless steel spoon were washed in the laboratory prior to field sampling using Micro™ and rinsed with hexane. The sampling device, bucket, and the stainless steel spoon used to fill sample containers from the composite sample bucket were washed with Micro™ and rinsed with deionized water between each sampling station. The dredge and bucket were not decontaminated between the multiple grabs taken at each station.

Approximately 6 grabs of sediment samples were made at each of the Force Lake, the Midwestern/Forebay Slough and Forebay Slough sampling sites. The contents of each grab were placed in a plastic bucket to form a composite sample. Sample jars were filled by removing the composited sediments from the bucket with a stainless steel spoon.

Water sample bottles were filled from a composite sample taken with a bucket. The bucket was decontaminated between the three sampling stations as described previously.

Laboratory Methods - Laboratory analyses were performed by Century Testing Laboratories, Inc., Bend, Oregon. Individual analysis methodologies for each sample parameter are presented in the lab report in Appendix 7.

Water Quality Drainage Basin Considerations

Force Lake - Force Lake has a surface area of about 12 acres and an estimated storage volume of about 30 acre-feet. Outflows from Force Lake are much less than anticipated inflows for all events, and are minimal for storms less than the two year event. Consequently, pollutants conveyed to the lake by runoff from sub-basin A-7 will, without additional in-flow, remain in the Lake and not be transmitted downstream.

North Wetland and Heron Rookery Area - Environmental conditions in the North Wetland and Heron Rookery Area may be affected by both water quality and hydrologic conditions.

Roof drainage from the James River site meanders overland through densely vegetated (primarily grasses) portions of the North Wetland area. This drainage flow was not analyzed as part of this NRMP. The James River Corporation indicates that their biannual laboratory tests detect no contamination. Regardless, this roof discharge is expected to be effectively filtered by the dense vegetation.

The wetland character of the North Wetland Area and Heron Rookery areas may be diminished by the dewatering effect of the North Drainageway.

Upper "B" Drainage Area - Runoff from sub-basin B-6 is expected to contain some level of metals, sediment, oil, and grease due to activities in parking areas, access roads and interstate highway areas. The catch basins in the Expo parking area are not of the inverted siphon type and do not tend to retain contaminants.

The existing Northeast Drainageway, into which runoff from sub-basin B-6 flows, does not appear to provide adequate water quality filtering benefit due to the sparse vegetation in contact with drainageway flow during normal low flow conditions.

The Excel Communications property represents, in its current use, a relatively large source of collected rainfall. The potential for pollutant sources on the site is limited and, therefore, the collected storm water can be used as a source for diluting runoff from sub-basin B-6 or for flushing other problem areas downstream including Force Lake.

Heron Lakes Golf Course Drainageways - Golf courses have historically been suspected sources of pollutants, including nutrients from fertilization, insecticides, fungicides, and herbicides. With increased environmental concern and more regulatory scrutiny, recent studies have shown that many golf course operators now apply these chemicals with more knowledge, in more measured doses, and under more controlled conditions than is the case for residential areas with uncontrolled yard usage. Application of too much of these chemicals and/or application immediately before heavy rainfall events result in a loss of these chemicals into the runoff stream.

In the case of Heron Lakes Golf Course, the runoff from the golf course in sub-basins A-2, B-1, B-2, and B-3 is routed through numerous small ponds before entering the natural slough system. This runoff is expected to receive some water quality treatment from passage through these ponds. The permanent pool volume of the golf course ponds is estimated to be greater than 20 times larger than the anticipated runoff volume into the lakes from the 0.36-inch event and 4 times greater than the runoff volume from the 1-year event. These characteristics result in large retention times characteristic of constructed water quality "wetponds." If adequate vegetation is present, nutrient removal rates up to 60% can be expected. Some nutrient removal is expected but could be improved with additional bank vegetation and emergent vegetation.

Also, some golf course areas drain directly to the West Golf Course Slough or to Mud Slough and do not receive any significant water quality treatment before discharging to these water bodies. These lands occupy about 70 acres and are expected to contribute only about 5% of the total Pen 1 runoff expected during the 0.36-inch water quality event.

Primary Sloughs and Drainageways - The main slough system is expected to contain some concentrations of nutrients, metals, oils, and possibly organics based on upstream contributions and the more direct contributions from the adjacent Portland International Raceway (PIR) area.

Possible sources of contaminants include the impervious portions of PIR and discharge from the Northeast Drainageway containing pollutants from sub-basin B-6. It is estimated that the runoff volume from these two impervious sources during the 0.36-inch water quality event contributes only about 2% of the total volume of water typically present in the "C", "D" and "B" slough areas.

As discussed above, a majority of the pollutants from industrial areas in the upper "A" Basin are expected to be removed by sedimentation, vegetative uptake and volatilization in Force Lake, the North Wetland Area, the North Drainageway, and the West Golf Course drainageway before reaching the main slough system. A high percentage of the sediments and associated metals reaching the main slough system are expected to be deposited because of the low velocities and high retention times in the slough. Consequently, a large fraction of these particular types of pollutants are expected to remain within the watershed, rather than discharged into the Columbia Slough.

Nutrient loading is of concern for the Lower Columbia Slough. The Pen 1 watershed has potential sources of nutrients such as phosphorous and nitrogen. Some removal is expected within the golf course itself as described above, and some removal is expected through the extended detention times of the main slough system. Additional water quality facilities may be required to meet the expected standards for nutrient levels in the Lower Columbia Slough.

Water Quality Study Results

The water quality survey was conducted by the consultant team that produced the original NRMP for Portland Parks and Recreation. As part of the Planning Bureau review of the NRMP the water quality survey results were submitted to BES for evaluation. The following discussion represents the findings of BES using the original survey information.

Sediment and water quality data was gathered from three water samples and two sediment samples, as presented in Appendix 7. The data are grouped by analysis type—water, total sediment (listed as soil), and TCLP for the sediment (listed as soil TCLP). The water data was evaluated for water quality limitation using Table 20 from OAR 340.41 (ODEQ 1992). The sediment data was evaluated using the Oregon State Soil Remediations Guidelines which evaluate whether soils (not sediments) must be remediated for toxic contamination or handled as hazardous waste. These guidelines should not properly be used for sediments but they are the only guidelines currently available for soil-type material in Oregon. However, there are several draft guidelines that could also be referenced; these include the Environmental Protection Agency Draft Sediment Criteria, the Ontario Guidelines, and the Washington Marine Sediment Guidelines. Conversion of the sediment data to water quality data for comparison to standards is not possible given the amount of information collected from these sites.

Water

There were no semi-volatiles, volatiles, or herbicides above the detection limit (DL) for water samples W-2 and W-3. Sample W-1 had no semi-volatiles or volatiles above the DL but the herbicides were not reported. Samples W-1 and W-2 showed small levels of lindane (0.04 and 0.06 ppb respectively) which were well below the acute criteria for fresh water systems listed in Table 20 (100 ppb). No other analyzed pesticides were above the DL for the three water samples.

None of the samples had exceedances of water quality standards in pH, nitrates, ammonia, or phosphorus. The new Oregon Bacteria Standards for Water Quality are based on counts of E. coli not the total coliform counts made on these samples. If a conservative estimate is made that all the total coliforms detected were E. coli, the count was above the standard (400 counts/100 gm) in all samples (640, 2100 and 520 colonies/100 gm respectively). This should be recognized as a conservative assumption.

The only water quality exceedance in the metals tested was lead in sample W-1. In this sample lead is above the water quality standards for water and fish consumption but not above the acute criteria for aquatic life. This suggests that fish tissue may need to be sampled to determine if fish from this water should not be eaten due to lead levels. It also indicates the water may not legally be used as a drinking water source.

There were no total petroleum hydrocarbons above the DL in any of the water samples. There were detected levels of oil and grease in all three samples but there are no standards for oil and grease on Table 20.

Sediment

Sample S-2 showed a detected amount of acetone but this compound is not in the Oregon soil remediation criteria. None of the other volatiles or semi-volatiles in sample S-2 were above the detection limit (DL). However, due to the necessary sample dilution and therefore the higher method detection limit (MDL), the following compounds had to be considered as tentatively identified (TIC): 2,3-dihydro benzofuran, nonanoic acid, 1-(4-hydroxyphenyl) ethanone, and tritetraconane. There were no volatiles or semi-volatiles above the DL in sample S-1, however due to dilution and a consequently higher MDL, the following compounds had to be considered as TIC: 2,-methyl, 2-butanoic acid, nonanoic acid, 1-(4-hydroxyphenyl)d ethanone, tritetraconane, Tricarbonyl [N-(phenyl-2-pyridinyl-methleme)benzenamine-N, N'] iron, 1-dotriacontanol, and hexadecanal. None of the TICs in either S-1 or S-2 appear in the Oregon soil remediation criteria. Sample S-1 had a 4,4-DDD concentration that would, in soils, indicate a need for remediation (100 ppm), otherwise there were no pesticides or PCBs above the soil remediation criteria in either S-1 or S-2.

The nitrate-N was high in both sediment samples (33.3 and 15.8 ppm respectively). This data is unusual since the sediments should be anoxic which should increase the rate of denitrification and loss of nitrates from the sediments. In addition, the overlying water was low in nitrates and ammonia and the sediments were not particularly high in total kjeldahl nitrogen (TKN). Both samples also had high total coliform counts (47268 and 72857 colonies/100 gm respectively). However, there are no Oregon soil remediation criteria set for either nitrates or coliforms in sediments. The total lead concentration in S-1 was above the Oregon criteria indicating a need for soil remediation for this sample, otherwise there is not a problem with metals (either total concentrations or TCLP extractions) in either sample. There are no criteria listed in the Oregon soil remediation table for total petroleum hydrocarbons or oil and grease so this data adds no further limitations on disposal.

In summary, the data collected indicates that water sample W-1 is limited for water and fish consumption based on lead contamination and coliform counts. Otherwise, the water quality meets all current standards. Pen 1 water quality may not however, be in compliance with the TMDLs that will be determined for the Columbia Slough watershed in the near future.

The only current limitations, based on this data, for sediments would be potential remediation requirements at S-1 due to 4,4-DDD and lead contamination. However, a full understanding of the limitations due to sediment and water quality would require a risk assessment of the compounds of potential concern. Until then, it is not possible to rule out potential increased risks to humans or wildlife due to these contaminants.

The Bureau of Environmental Services will continue to monitor water and sediment quality within the Columbia Slough area as part of the on-going work on the Program Plan for DEQ. Monitoring of water and sediment quality within Pen 1 will be done by BES under agreement with Portland Parks and Recreation.

HYDROLOGY AND WATER QUALITY POLICIES

Policy No. 1 - Support the Army Corps of Engineers effort to improve the levees located along the southern and western boundaries of Pen 1 in order to decrease existing floodplain elevations within Pen 1.

Policy No. 2 - Establish, maintain or modify appropriate hydraulic conditions within the three Pen 1 hydraulic regions to achieve necessary drainage of accumulated stormwater through the District, and appropriate levels of water to retain wetlands and sensitive habitat areas.

Policy No. 3 - Minimize or eliminate entry of pollutants or contaminants into the Pen 1 hydraulic regions from properties, activities, or operations within Pen 1.

Policy No. 4 - Reduce levels of pollutants or contaminants entering into the Pen 1 hydraulic regions through vegetation filtration, bio-swales or other environmentally sensitive techniques, using remediation or removal actions only when required by law or when environmental solutions do not achieve acceptable results.

Policy No. 5 - Support the Bureau of Environmental Services and Portland Parks and Recreation in the management of water quality within Pen 1 to improve the natural resource values within Pen 1 and to reduce or eliminate any detrimental impacts on the water quality in the Columbia Slough caused by discharges into the slough from Pen 1.

HYDROLOGY AND WATER QUALITY MANAGEMENT OBJECTIVES

The following actions and alterations of the existing hydrology are suggested as a means to enhance habitat areas or to improve the water quality of the Pen 1 hydrologic system:

1. Route Additional Flow through Force Lake - This improvement will provide additional flow to improve water quality in Force Lake. The Excel Communications property represents a large catchment area of what appears to be relatively clean runoff. Currently rainfall discharges into the Northeast Drainageway which flows westward to Force Avenue. At the point where this drainageway currently enters the 36-inch culvert, a diversion structure should be added to divert low flows into a pipe which would discharge into Force Lake. Trickle flows and large flows could both continue to be routed south to Broadacre Street. Force Lake would then receive some enhanced flow without the hydraulic concern of high flows through the constricted drainage components downstream of Force Lake.

   A conceptual diversion structure for accomplishing this goal is shown in Exhibit 4, Proposed Diversion Structure and Exhibit 5, Diversion Structure Design.

2. Construct a Final Polishing Swale - A final polishing swale constructed at the confluence of the Midwestern Slough and the Southern Slough—where the entire "A" and "B" drainage basins combine—may be necessary to meet DEQ or BES discharge water quality requirements. Its function would be to provide some final nutrient and pollutant removal from stormwater flow prior to discharge into the Columbia Slough. See Exhibit 3, Sub Basin Map for slough and basin locations.

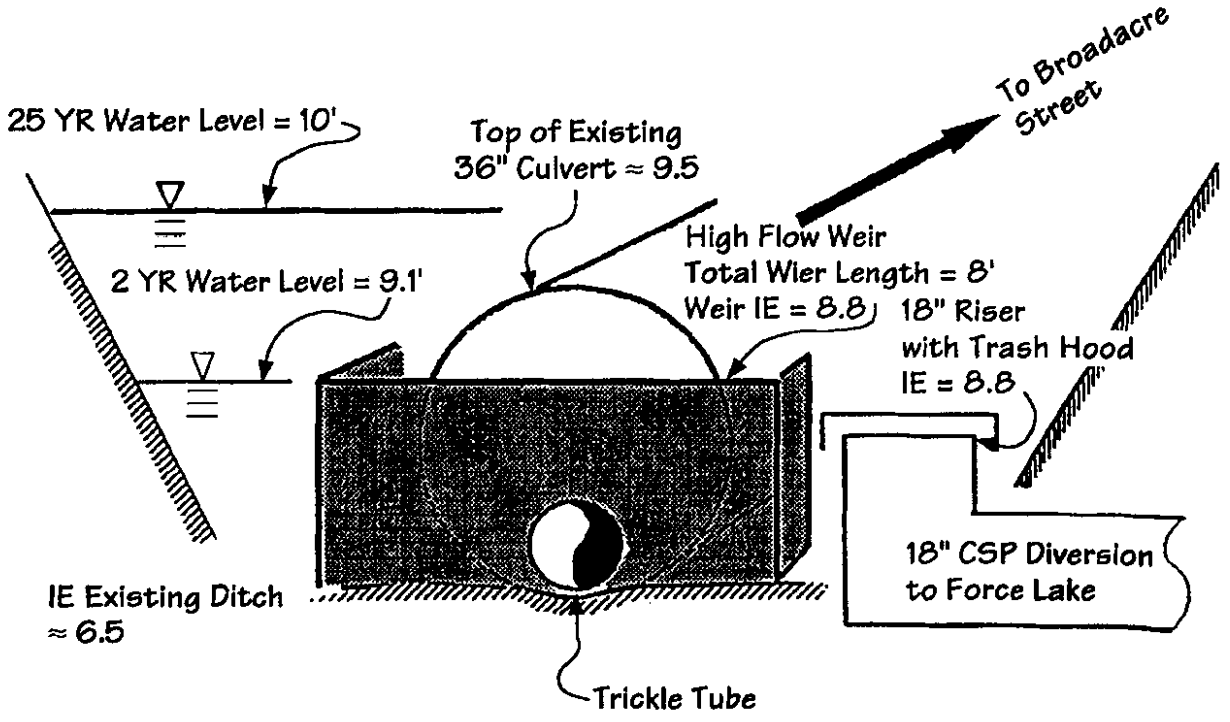
   See also Exhibit 13, Final Polishing Swale Proposed Typical Section, for a conceptual cross section of the drainage swale.

3. Support BES efforts to conduct further water quality testing, sampling of fish tissue and aquatic invertebrates, and to develop with DEQ the TMDLs for the Columbia Slough Watershed.

4. Obtain by acquisition, dedication or gift, the resource areas on the industrial properties north of Force Lake as a means of controlling inflow of contaminants from surface operations and groundwater. These sites may require significant remediation to remove existing contaminants, and to control inflow of contaminants into the waters of Pen 1.

5. Define drainageway maintenance requirements and activities so the waterways can be managed for multiple benefits. Adopt maintenance standards that provide for the continued conveyance of stormwater flows as well as provide for environmental benefits.

Proposed Diversion Structure NE Ditch to Force Lake



Resulting Hydraulic Characteristics

Event	WSL	Flow to Force Lake	Flow to NE Ditch
WQ	<8.1	<0.5 cfs	<0.1 cfs
1	8.7	3 cfs	1.5 cfs
2	9.1	4 cfs	6 cfs
5	9.5	5 cfs	17 cfs
25	10.0	6 cfs	36 cfs

EXHIBIT 4

Proposed Diversion Structure

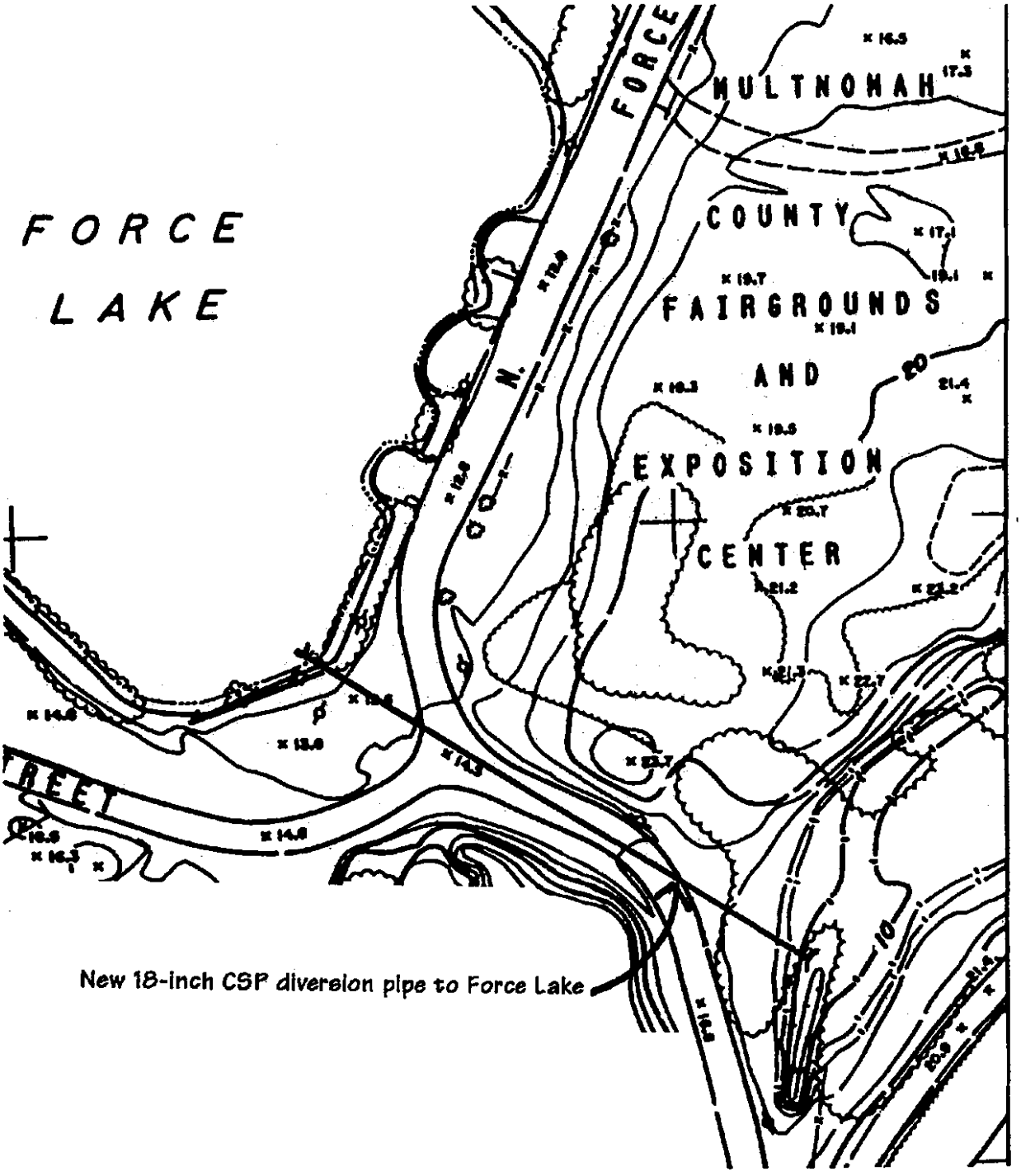
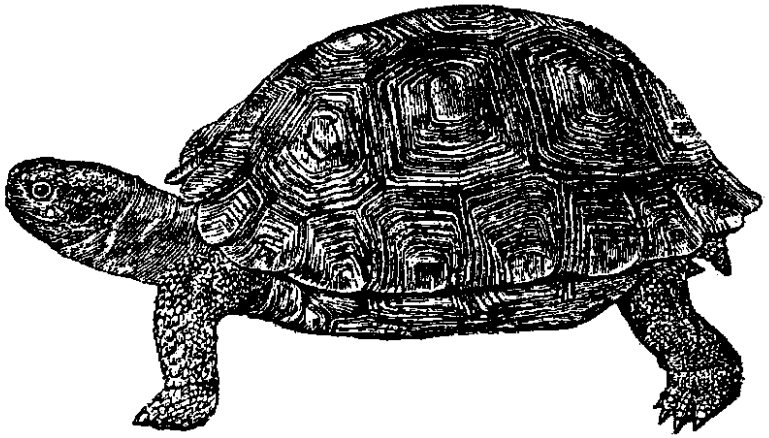


EXHIBIT 5

Diversion Structure Design



CHAPTER 2

INVENTORY AND ASSESSMENT OF WETLANDS, NATURAL AREAS, AND WILDLIFE HABITAT

INTRODUCTION

This section of the NRMP provides baseline information and descriptions of wetlands, natural areas, and wildlife habitat of the Pen 1 study area.

Within Pen 1, there are considerably more wetland and riparian resources than upland resources. The wetland areas are currently under the jurisdiction of the City, the Oregon Division of State Lands (DSL), and the Corps. All of these regulatory agencies require that wetlands be managed in a manner that, in order from highest to lowest priority, 1) avoids, 2) minimizes, and 3) if necessary, compensates for fill or removal of material from wetlands. The City also requires that uplands be managed in the same manner.

Wetlands are defined by the Corps and DSL as "areas that are inundated or saturated by surface or ground water 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" (33 CFR 323). Wetlands (whether marshes, bogs, wet meadows or bottomlands) can provide essential habitats for wildlife, provide flood protection through absorption of storm water, improve water quality by retention of sediments and add scenic diversity and aesthetic value to the landscape. To curb loss of wetland acreage, federal and state legislation exists to preserve wetland values and functions.

Wetlands in Oregon are regulated separately by the Corps and the DSL. The Corps' jurisdiction stems from Section 404 of the Clean Water Act, based on the premise that wetlands are part of the Waters of the United States. The DSL jurisdiction began in 1985 with the Oregon Removal/Fill law, which typically encompasses a wider variety of wetlands. Both agencies require that permits be obtained to place fill in a wetland. In addition, the DSL requires a permit to remove (or dredge) material from a wetland.

Locally, the City of Portland regulates wetlands and uplands through the requirements of the statewide planning goals. In particular, Goal 5 requires local planning authorities to plan for and protect significant natural resources within their jurisdiction. The City of Portland currently implements its Goal 5 program through the Environmental Overlay Zone, of which this NRMP is a part.

Site Description and History

Exhibit 6, Wetlands and Inventory Locations, shows the wetland areas studied. Pen 1 is located in an area that was originally part of a large, contiguous complex of wetlands, lakes, and sloughs that occupied the area between the Columbia River and the Columbia Slough, extending from the west end of Government Island to the mouth of the Willamette River (see Exhibit 7, Historic Context). The only substantial remnants of this complex are Smith and Bybee Lakes, which lies immediately to the west of the Pen 1 study area and Force Lake. The Smith and Bybee Lakes area is also protected by an NRMP.

An interesting historical note is that the area that is now the Excel Communications wetland was actually the original Force Lake. Survey maps from the late eighteen hundreds clearly mark Force Lake as the larger of two lakes in the northeast corner of the study area. Evidently, after the larger Force Lake was filled at the turn of the century the smaller lake took the name.

Inventory and Assessment Methods

Information Review. Existing published, unpublished, and file information on the study area was obtained and reviewed. This included U.S. Fish and Wildlife Service National Wetland Inventory Maps (U.S. Fish and Wildlife Service 1981); City of Portland Natural Resource Inventory information (City of Portland 1989); natural resource reports on the adjacent Heron Lakes Golf Course and vicinity (Scientific Resources Inc. 1989, Fishman Environmental Services 1990a, b, c); interviews with Portland Audubon Society representatives and members; interviews with other individuals familiar with the area; Soil Survey data and other soils reports (Green 1983); aerial photographs, topographic and hydrology information obtained by Oakley Engineering; information on local Drainage District maintenance guidelines and practices; and Corps reports on the Columbia Slough.

Field Inventory.

Wetlands - A field inventory was conducted in May and June of 1991 as part of a wetlands and natural resources project for the PIR portion of the study area. A second field inventory was conducted on February 18, 1992 to document soil and hydrology conditions within the remainder of the study area. A very detailed discussion of the review of the National Wetland Inventory Maps and wetland functional assessment is included in Appendix 4.

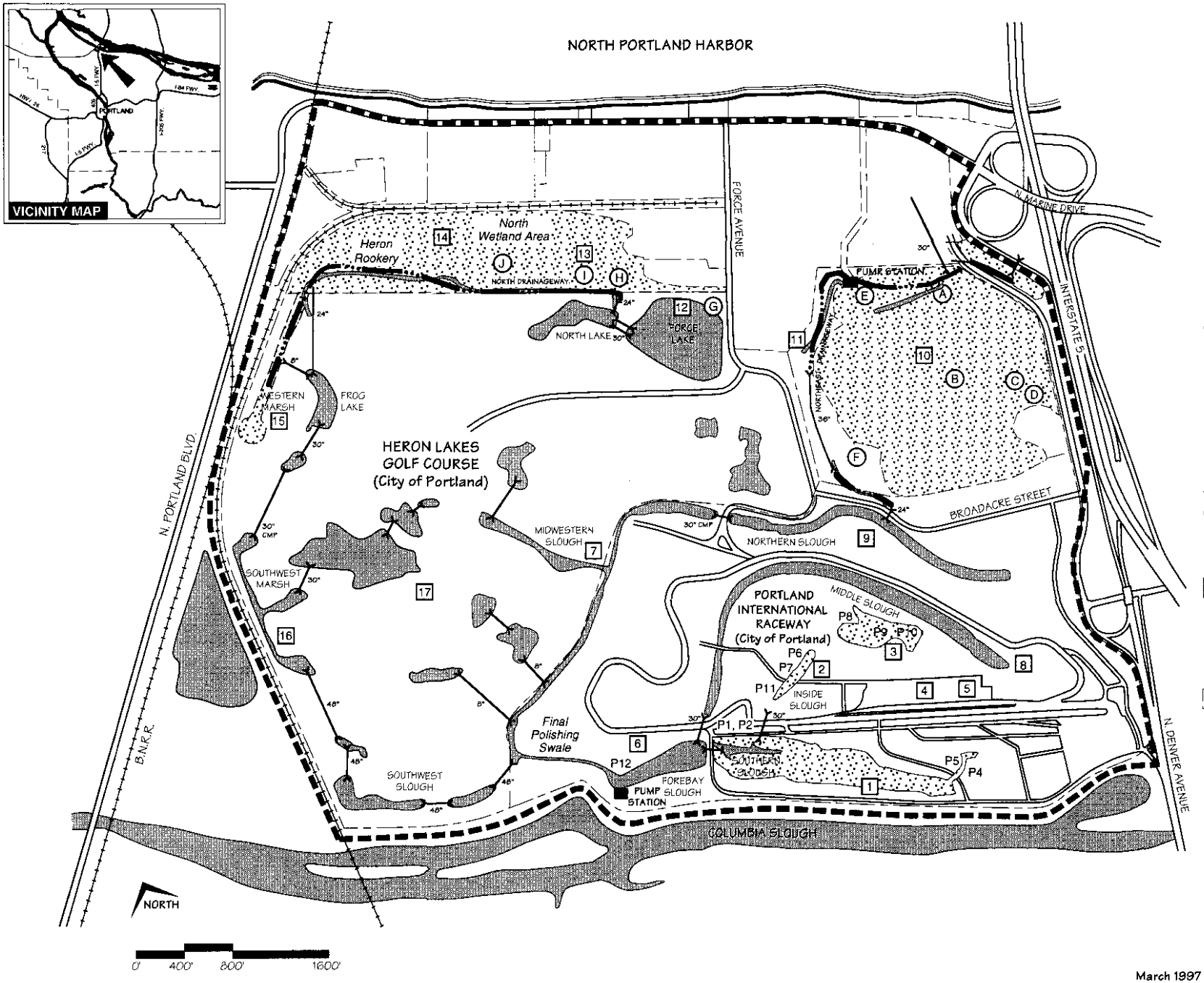
The sample sites are shown on Exhibit 6, Wetlands and Inventory Locations. The sample sites for the 1991 inventory are shown as P1 through P12. The sample sites for the 1992 inventory are shown as a circled A through J. A summary of the wetland functional assessment is included in Table 6 below. The sites listed on Table 6 as 1 through 17 are also shown on Exhibit 6, Wetlands and Inventory Locations, as the numbers 1 through 17 within a square.

Procedures followed the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (Federal Interagency Committee for Wetland Delineation 1989) and the *Corps of Engineers Wetlands Delineation Manual* (Waterways Experiment Station 1987) for routine level study. A formal staking and surveying of the wetland boundaries was not performed, because the results would be valid for only three years, whereas this NRMP has no set time limitation. A formal, intermediate-level delineation will be necessary if a specific need arises to fill or remove material from a wetland and a permit application is submitted to the regulatory agencies.

Wildlife Habitat - A field inventory of the District was conducted on January 2 and 9, 1992 by Lynn Sharp and Christie Galen to document existing habitat conditions and wildlife use. Three data forms were recorded for each site: Greenspaces Natural Area Information Database Form, Wildlife Habitat Assessment Form, and a Wetland Functional Values Assessment Form. Copies of these forms are included in Appendix 5.

The Greenspaces form was developed and used for the comprehensive urban natural area inventory coordinated by Metro in 1990-1992. It incorporates detailed habitat structure and species composition information, along with a diversity of information on location, land use, disturbance, etc. The Wildlife Habitat Assessment form is adapted from the Wildlife Habitat Assessment Form developed in 1983 by a group of private and agency biologists for Goal 5 inventory studies that addressed wildlife habitat. It includes a narrative description of site features, vegetation and wildlife species lists, and management recommendations. It also includes a numerical rating based on the quality of water, food, and cover resources, physical and biological disturbance, connectivity to other natural areas, and unique site features. The numerical value can be used to compare the quality of similar habitat types.

Wetland Functional Values - The Wetland Functional Values Assessment was based on a draft procedure developed by the U.S. EPA lab in Corvallis. Using the procedure, 12 functions were rated as low, medium, or high for each site. While this method does not represent the detail of the Adamus (WET II) method used for evaluating large wetlands, it requires the evaluator to examine the characteristics and conditions for the same major functional values.



PENINSULA ONE
Natural Resources Management Plan

Wetlands and Inventory Locations

Legend

- Management Plan Area Boundary
- Property Boundaries
- Open Water
- Wetland Survey Points (A-J, P1-P12)
- Wetland Areas Inventoried (1-17)
- Emergent Wetland Area
- Culverts
- Drainage Channel

Exhibit 6

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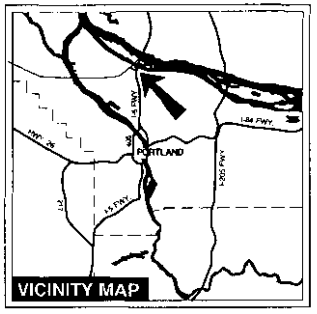

COLUMBIA RIVER

PENINSULA ONE
Natural Resources
Management Plan

Historic Context
USC & GS Map 1888

Legend

- Management Plan Area Boundary
- Open Water/Tidal Flats
- Prairie
- Riparian Forest
- Marsh
- Paths/Trails

0 400' 800' 1600'

Exhibit 7

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TABLE 6 **Generalized Wetland Functional Assessments for the Peninsula Area**

Wetland Functions	S. Slough Site 1	C. Marsh Site 2	MX Track Site 3	Small Ditch Site 4	Small Ditch Site 5	Forebay Slough Site 6	Mid-West Slough Site 7	Inside Slough Site 8	N. Slough Site 9	Portland Radio Marsh Site 10	NE Drainage Ditch Site 11	Force Lake Site 12	NW Marsh Area S. 13	Heron Rookery Site 14	W./SW. Marshes Site 15 16	Golf Course Ponds S. 17
Active Recreation	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	HIGH	Low	Low	Low	Low
Passive Recreation	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	HIGH	Med	HIGH	Low	Low
Endangered Species	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Uniqueness /Rareness*	Med	Low	Low	Low	Low	Med	Low	Low	Med	Low	Low	Med+	HIGH	HIGH	Med	Low
Wildlife Habitat	Med	Low	Low	Low	Low	Med	Low	Med	Med	Med	Med	Med+	Med	HIGH	Med	Low+
Fisheries Habitat	Low	Low	Low	Low	Low	Low +	Low	Low+	Low+	Low	Low	Med	Low+	Low+	Low	Low
Food Chain Support	Med	Med	Low	Low	Low	Med	Low	Low+	Med	Med	Med	Med	Med	Med	Low	Low
Nutrient Retention & Removal	Med	Med	Low	Low	Low	Med	Med	Low	Low	Low	Low	Low	Low	Low	Low	Med
Sediment Trapping	Med	Med	Low	Low	Low	Low	Low	Low	Med	Low	Low	HIGH	Low+	Low	Med	Med
Flood Storage /Synchroniz.	Med	Low	Low	Low	Low	Med	Med	Med	Med	Med	Med	Med	Low	Low	Med	Med
Groundwater Modification	Med	Low	Low	Low	Low	Med	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Shoreline Stabilization	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Med. Ratings	7	3	0	0	0	6+	2	2+	5+	3	3	5+	3+	1+	4	3+
High Ratings	0	0	0	0	0	0	0	0	0	0	0	3	1	3	0	0

RESULTS

WETLANDS

Overview of Wetland Types

Wetlands identified in the study area are shown on Exhibit 6, Wetlands and Inventory Locations. The areas shown in Exhibit 6 are those that exhibit wetland hydrology, hydric soils, and a prevalence of hydrophytic vegetation. Exhibit 6 should not be construed as showing specific, delineated wetland boundaries as this study only provides a determination that wetlands are present and documents the relative resource quality of each wetland identified. Specific boundaries need only to be identified if a proposed project is going to affect a wetland.

The wetlands that remain in Pen 1 today are mostly remnants or disturbed remnants of the original Columbia Corridor complex. A small portion of the wetlands were created by the drainage system which crosses Pen 1 in an effort to lower the regional ground water by pumping water out to the Columbia Slough. The hydrologic system of the wetlands in the study area is an interconnected complex of ponds, underground pipes, drainageways, and sloughs. Water drains by gravity to the District's pumping station, located at the Forebay Slough. The pump station is automated to maintain a water surface elevation of 7 feet above mean sea level. Removal of water to the Columbia Slough induces gravity flow through the drainage system.

The effect of recent and historic development in the Pen 1 District has resulted in smaller, fragmented wetlands, some with monocultures of invasive, weedy species. Other impacts include sediment accumulation, wetland loss by filling, pollution (particularly in Force Lake), and eutrophication. Given their urban location and regional context, these wetland and natural resources surprisingly have high values and provide important functions for wildlife and humans. The study area wetlands and natural resources also have connectivity to off-site wetlands on the east, west and north.

The study area has several dominant wetland communities. Nearly all of these wetlands are influenced by the complex drainage system managed by Pen 1, and all have sufficient ground water or soil saturation conditions to qualify as jurisdictional wetlands. The wetland communities found are:

- Open water wetlands, which can be sloughs, drainage channels, disturbed golf course ponds, and lakes. Specifically, this includes Force Lake, North Lake and the remaining golf course ponds, and numerous slough arms;

- Emergent wetlands, which are dominated by low vegetation such as grasses, rushes, sedges, and cattails. Specifically, this includes the Excel Communications property, Northwest Marsh, Southwest and West Marshes at Heron Lakes Golf Course, Southern Marsh, and the PIR Inside Slough;

- Forested wetlands, which are dominated by tree species such as willow and cottonwood. Specifically, portions of two areas along the Excel Communications pump drainage, and two north of Heron Lakes Golf Course; and

- Complexes, which contain elements of two or more of the above.

The depth of open water varies from 1 foot to greater than 6 feet, and the width varies from 2 feet to more than 200 feet (Force Lake). Disturbed wetlands are located at PIR and include the edges of the golf course ponds. Data sheets from ten sampling points are included in Appendix 6 for reference, and the sample point locations are shown on Exhibit 6, Wetlands and Inventory Locations.

The wetland indicator status of plants in the study area is based on the list prepared by the U.S. Fish and Wildlife Service (Reed 1988). The various indicator abbreviations are used with plant species names in the results section, and are listed and defined below:

1) Obligate Wetland (OBL) - Occur almost always (estimated probability >99%) under natural conditions in wetlands.

2) Facultative Wetland (FACW) - Usually occur in wetlands (estimated probability 67-99%), but occasionally found in nonwetlands.

3) Facultative (FAC) - Equally likely to occur in wetlands or nonwetlands (estimated probability 34-66%).

4) Facultative Upland (FACU) - Usually occur in nonwetlands (estimated probability 67-99%) but occasionally found in wetlands (estimated probability 1-33%).

5) Obligate Upland (UPL) - Occur in wetlands in another region of the U.S., but occur almost always (estimated probability >99%) under natural conditions in nonwetlands in the Pacific Northwest region. If a species does not occur in wetlands in any region, it is not on this list.

6) No Indicator (NI) - Insufficient information is available to determine an indicator status.

Soils and Hydrology

Soil types mapped by the Soil Conservation Service in the Soil Survey of Multnomah County (Green 1983) indicate most of the site is a Sauvie-Rafton-Urban land complex, 0-3% slopes (mapping unit 47A). The field study further refined the boundaries between the soil types grouped in this complex. Typically, the wetlands had Rafton silt loam, protected soils (mapping unit 40), which are dark gray-colored silty soils having very low permeability and seasonal ponding or soil saturation very close to the surface. The adjacent upland groves of cottonwood or open fields were usually situated on Sauvie silt loam, protected soils (mapping unit 45), which are better drained and may have only a perched water table in the winter months. Several areas, such as the southeast corner of the Excel Communications property or small inclusions in the North Wetland Area are considered urban lands due to the presence of old fill materials. All of the disturbed palustrine wetlands, interior fields of PIR, paved areas, filled areas and dike lands are considered urban lands. The substrate in the open water Slough wetlands is not usually classified due to the persistent (year-round) and deep water. Assessments of hydrologic conditions followed guidelines established by Langbein and Iseri (1960).

Open Water Wetlands

Open water wetlands include five sloughs or slough sections including the Southern Slough, Forebay Slough, Northern Slough, Middle Slough, Midwestern Slough, and Force Lake. The depth of open water varies from 1 foot to greater than 6 feet, and the width varies from 2 feet to more than 200 feet.

The **sloughs** generally have steep sloping banks created by dredging. One side of a slough is usually vegetated with a riparian canopy dominated by:
•black cottonwood (*Populus balsamifera ssp.trichocarpa*, FAC)
•Pacific willow (*Salix lasiandra*, FACW+)

The understory consists of scattered shrubs such as:
•willow •Himalayan blackberry (*Rubus discolor*, FACU+)
•teasel (*Dipsacus sylvestris*, NI) •snowberry (*Symphoricarpos alba*, FACU)
•redosier dogwood (*Cornus sericea ssp. sericea*, FACW)

Lower slopes are dominated by:
•reed canarygrass (*Phalaris arundinacea*, FACW)
•soft rush (*Juncus effusus*, FACW+) (a narrow band near the water margins).

Generally, the wetland boundary occurs at the abrupt edge of the water in the sloughs and the steeply-sloped edges. Prior to dredging during the fall of 1991, the Forebay Slough had moderate to gently-sloping sides typically overwhelmed by a monoculture of reed canarygrass (FACW). After dredging, the slopes were steep and bare of vegetation, although weedy cover rapidly reestablished itself by the summer of 1992.

A few sites had dense thickets of:
•Himalayan blackberry (FACU+) •teasel (NI)
•black cottonwood saplings (FAC) [sample point P12].

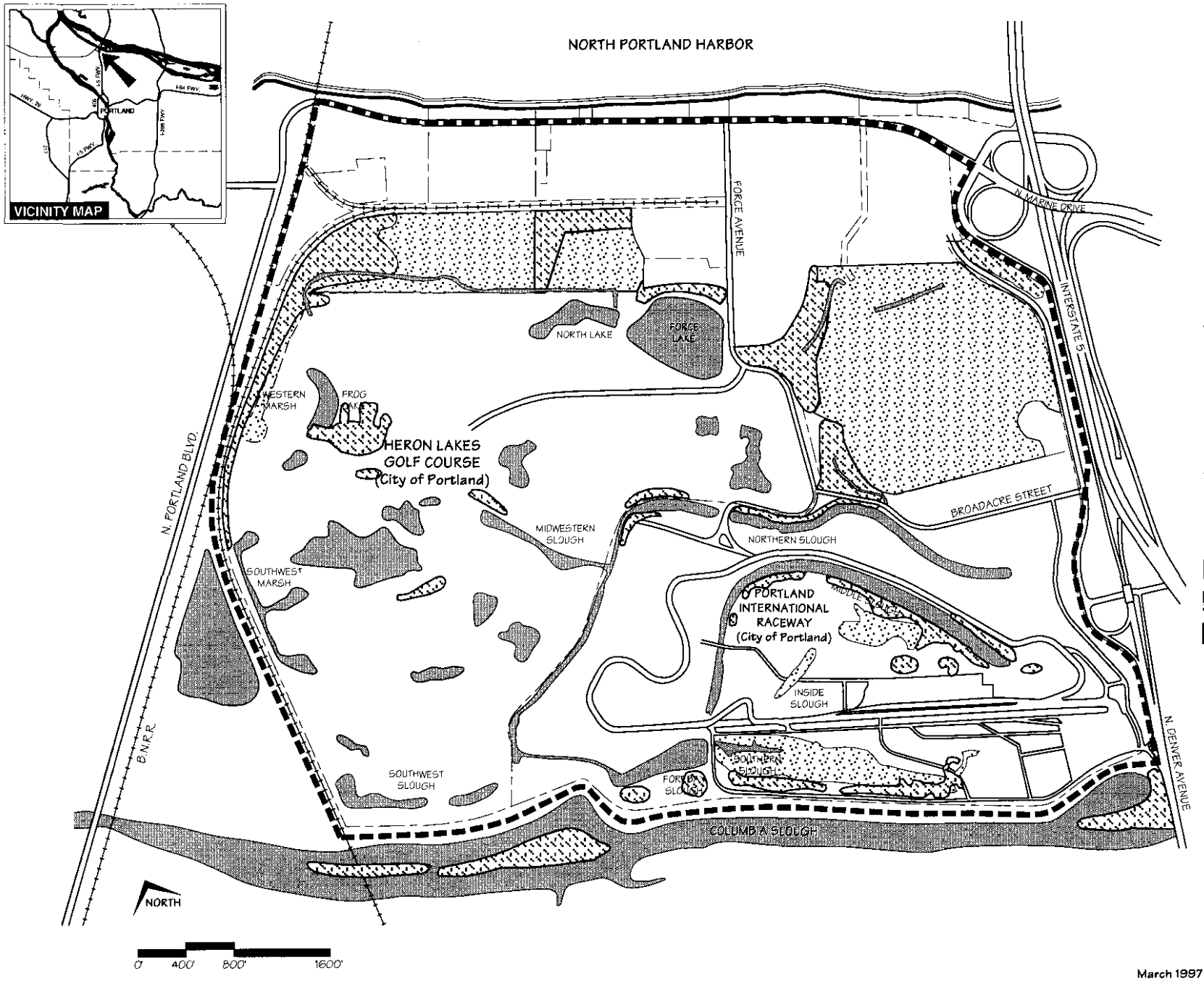
The **Northern Slough, Middle Slough** and **Midwestern Slough** each have steeply sloping sides that are predominantly overgrown by:
•Himalayan blackberry (FACU+) •black cottonwood (FAC)

Sub-dominants in the understory include:
•teasel (NI) •reed canarygrass (FACW)

Force Lake is generally round in shape. The water depth is less than 4 feet and the substrate consists of soft sediments. The lake fringe (sampling point G) consists mostly of:
•reed canarygrass (FACW) •soft rush (FACW+)

Approximately one-third of the bank vegetation is maintained to limit its height on the golf course side of the lake. The eastern one-third of the lakeside is an old stone wall adjacent to Force Avenue, and the northern one-third supports natural riparian vegetation including:
•reed canarygrass (FACW) •black cottonwood (FAC) •willows.

The **golf course ponds** and channels typically have more steeply sloping banks. Vegetation surrounding the golf course ponds is maintained to limit its height in some areas (see Exhibit 8, Natural Areas and Habitat Inventory). A minimum of five feet of vegetation is left around all golf course ponds. The fringe consists of:
•soft rush (FACW+) •reed canary grass (FACW)



PENINSULA ONE
Natural Resources
Management Plan

Natural Areas and Habitat Inventory

Legend

- Management Plan Area Boundary
- Property Boundaries
- Open Water
- Emergent Wetland Areas
- Forested Areas

Exhibit 8

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Emergent Wetlands

Predominately emergent wetlands in the study area include much of the Southern Slough, the Inside Slough, the Excel Communications property, the North Wetland Area, the Western Marsh, and the Southwest Marsh.

The **Southern Slough** (data point P1, Exhibit 6, Wetlands and Inventory Locations) has a relatively small area of open water, and gently sloping sides which are typically overwhelmed by a monoculture of reed canarygrass (FACW). Occasionally, sub-dominants like teasel (NI) and Himalayan blackberry (FACU) can be found at the edges. The wetland boundary generally coincides with abrupt elevation changes adjacent to the racetrack (due to added fill material, such as data point P2) or gradual transitions to upland cottonwood groves (P3).

The **Inside Slough** is similar to the Southern Slough in that it has a small area of open water channel and gently sloping sides. The Inside Slough (data point P7, Exhibit 6) and east end of the Southern Slough (P5) have slightly more diverse plant communities composed of:

- soft rush (FACW)
- reed canarygrass
- common velvetgrass (*Holcus lanatus*, FAC)
- horsetail (*Equisetum* spp).

In specific areas (P5, for example) under the cottonwood trees there were:

- willow
- elderberry (*Sambucus* spp.)
- nightshade (*Solanum* spp).
- redosier dogwood (FACW)
- stinging nettles (*Utrica diocia*, FAC+)

Gently-sloping to moderately-sloping sides typically distinguished these wetlands from adjacent uplands.

The **Excel Communications property**, bounded by North Broadacre Road to the south, North Expo Road to the east, and the Metro Portland Expo Center to the north, is used for radio transmission facilities consisting of two above-ground towers and two buried cable networks. Except in a few places, these bottomlands (sampling point A) are typically overwhelmed by a monoculture of reed canarygrass (FACW).

There is a circular depression (created for the radio tower, also sampling point B) around the eastern tower which has up to 18 inches of standing water and supports nightshade (*Solanum dulcamara*, FAC). Several edges of the bottomland also support:

- black cottonwood (FAC)
- redosier dogwood (FACW).
- willow

Generally, the wetland boundary occurs where the topography rises and the moisture conditions can no longer support hydrophytic plants. The transition zones (sampling point D) commonly support:

- reed canarygrass (FACW)
- soft rush (FACW+)
- spreading rush (*Juncus patens*, FACW)
- bulrush (*Scirpus* spp., usually OBL).

The adjacent upland areas (sampling point C, Exhibit 6) are typically dominated by:

- teasel (NI)
- bentgrass (*Agrostis* sp., FACW to FAC)
- Himalayan blackberry (FACU+)
- St. Johns Wort (*Hypericum perforatum*, NI)

If not controlled, the blackberry forms impenetrable brambles between the bottomland and low terrace habitats. The northeast edge of this bottomland is bordered by a low terrace that in the overstory supports:

- willow
- black cottonwood
- elderberry (*Sambucus* spp., FAC- to FACU)

The understory (sampling point E) supports:
•reed canarygrass
•nightshade (*Solanum* spp., FAC to FACU+)
•nettle (*Urtica dioica*, FAC)

The **North Wetland** Area (Site 13, Exhibit 6) extends from the northeast corner of Force Lake to the Heron Rookery. This area is much more diverse than the rest of the natural wetlands in the study area. At the east end, the plant community adjacent to Force Lake is composed of:
•reed canarygrass (FACW)
•soft rush (FACW+)
•willow
•black cottonwood (FAC)
with a few small areas of open water. Just north of the third tee of the golf course exists a unique complex of marsh communities (sample points H and J). Portions support monocultures of:
•cattails (*Typha latifolia*, OBL)
•reed canarygrass (FACW)
•soft rush (FACW)
•soft stem bulrush (*Scirpus validus*, OBL)
•beggar's tick (*Bidens*)
•speedwell (*Veronica americana*, OBL)
•sedges
and a variety of grasses.

A few areas having slightly higher elevation support:
•willow
•black cottonwood (FAC)
•redosier dogwood (FACW)
•elderberry (FAC- to FACU)
•stinging nettle (FAC+)
•Himalayan blackberry (FACU+)
•nightshade (*Solanum* spp)

Adjacent uplands (sample point I) were mostly differentiated by an abrupt change in topography which generally consisted of fill material to the north (industrial) or graded land to the south (golf course). Uplands were typically mowed grass or pavement.

The **Western Marsh** is a rather small area dominated by reed canarygrass (FACW), located at the western edge of the golf course, nearly due west of the clubhouse. It also includes small open channels, which are part of the golf course drainage system, scattered willows and other shrubs, and is adjacent to cottonwood forests to the north and south.

The **Southwestern Marsh** is also dominated by reed canarygrass (FACW) with fringes of willows and cottonwoods, and is located at the southwestern edge of the golf course. It is linked to the Western Marsh and areas to the south via groves of cottonwoods.

Forested Wetlands and Complexes

Forested wetlands in the study area include the forests bordering the Northeast Drainageway (Site 11, Exhibit 6), the forest along the northeast edge of Expo Road, and the site of the Heron Rookery (Site 14, Exhibit 6). There are also patches and strips of forest located within or adjacent to nearly all of the other sites described above, which contribute to their vegetative diversity and to their value as wildlife habitat. In particular, there is a strip of cottonwood forest that forms the southern boundary of the Southern Slough.

The **Northeast Drainageway** has sides that are moderately steep and riparian in composition, while the bottom is mostly flat wetland. The banks are dominated by:
•black cottonwood (FAC)
•Himalayan blackberry (FACU+)
•snowberry (FACU)
•teasel (NI)

In the bottom of the drainageways (depending on the degree of standing water and rate of flowing water) there are:
•willows
•reed canarygrass (FACW)
•redosier dogwood (FACW)
•elderberry

The adjacent uplands (above and away from the drainageways, sampling point F) appear to have been historically cleared, so they lack an overstory. They are dominated by:
•blackberry (FACU+)
•thistles (*Cirsium* spp.)
•mixed grasses (such as orchard grass [*Dactylis glomerata*], FACU)
•teasel (NI)
•tall fescue [*Festuca arundinacea*], FACU-)

In the **northwest corner of the golf course** is a multi-layered forest community containing the Heron Rookery. The area is a mosaic of uplands and wetlands and contains a central drainage channel.
The canopy is dominated by:
•black cottonwood (FAC)
•willow.

The shrub layer generally contains:
•snowberry (FACU)
•cottonwood (FAC) seedlings
•redosier dogwood (FACW)

The understory is dominated by:
•Himalayan blackberry
•teasel (NI)
•poison hemlock (*Conium maculatum*, FAC-)
•stinging nettle (FAC+).

Disturbed Wetlands

Several areas of disturbed palustrine wetlands were also identified. These are areas with sufficient ground water saturation and hydric soil characteristics, and sometimes support a prevalence of hydrophytic vegetation.

The **first area** is the extreme eastern extension of the Southern Slough, on the north side of an access road. This area is mowed, but generally has surface ponding for the first part of the growing season. These areas are dominated by:
•reed canarygrass (FACW)
•toad rush (*Juncus bufonius*, FACW)
•redtop (*Agrostis alba*, FACW)

Conversely, the non-wetland conditions (P4) tend to define upland meadow species such as:
•clover (*Trifolium* spp.)
•colonial bentgrass (*Agrostis tenuis*, NL)
•tall fescue (FACU)

The **second area** includes several drainageways adjacent to the paved area in the center part of the PIR site. These drainageways have seasonally flooded conditions that support:
•reed canarygrass (FACW)
•duckweed (*Lemna minor*, OBL)
•yellow watercress (*Rorippa curvisiliqua*, FACW)
•water plantain (*Alisma plantago-aquatica*, OBL)

Adjacent uplands (P6, P10) are dominated by:
•clover
•teasel (NI)
•wild rose (*Rosa* spp)
•Himalayan blackberry (FACU)
•reed canarygrass (FACW)
•vetch (*Vicia* spp),
•snowberry (FACU)
•black cottonwood (FAC).

The **third area** of disturbed palustrine wetland occurs in the middle of the motocross track in small depressions connected by drain pipe (P8). These areas surprisingly have some of the most diverse species composition including:

- spikerush (*Eleocharis* spp.)
- rush (*Juncus* spp)
- water plantain (OBL)
- smartweed (*Polygonum* spp)
- soft rush (FACW)

The water source appears to be the irrigation water applied to the motorcycle racetrack for dust control and compaction. Due to the configuration of the track and the elevation of the final discharge pipe to the Inside Slough, drainage is impeded. Adjacent upland conditions (P9) consist mostly of:

- reed canarygrass (FACW)
- bentgrass (*Agrostis* spp)
- clover
- Canada thistle (*Cirsium arvense*, FACU)
- teasel (NI)
- willow weed (*Epilobium* spp)
- plantain (*Plantago* spp)

The various **golf course ponds** are collectively identified as Site 17. These ponds are classified as disturbed palustrine wetlands—they have sufficient ground water saturation and hydric soil characteristics, but not necessarily hydrophytic vegetation.

Local Management Activities Affecting Wetlands

The Pen 1 District is currently responsible for maintaining drainage within the district boundary and preventing flooding of adjacent lands. The District maintains its drainageways by removing blackberries and mowing grasses along slough embankments, and by dredging accumulated sediments from slough channels. The frequency of dredging activity at any one area is approximately 3 to 4 years. In some areas, woody vegetation along slough banks is removed to permit access by dredging equipment. Dredging is usually done by a crane operating from the shoreline, often from openings in existing tree cover. Dredged material is sidecast onto adjacent uplands.

The drainage district operations are scheduled to be taken over by the Multnomah County Drainage District No. 1 (MCDD) in the summer of 1997. Land-based dredging will be replaced with a water-based system where feasible providing substantial opportunities for enhancement of riparian vegetation, water quality improvement, and wildlife habitat.

Mosquito control in the study area is conducted by Multnomah County Vector Control. The crash walls at the PIR track, which consist of old tires, are treated with insecticide two or three times per season, as needed. The sloughs are not treated because the water movement is sufficient enough to make them unsuitable to mosquitoes. The Southern Slough is treated in early spring with either BTI (a variant of *Bacillis thuringensis*, a bacteria that kills the mosquito larvae); or a light weight petroleum distillate if mosquito pupae are present. The two small drainageways at the east end of the PIR pit area are also treated in the same way.

URBAN NATURAL AREA CHARACTERISTICS AND WILDLIFE HABITAT

Wildlife and Habitat

Wildlife species commonly found in Pen 1 consist of a mixture of typical urban dwellers as well as those observed in less disturbed environments. The following were observed at Pen 1 by members of the consultant team:

Shrub-dominated areas provide habitat for:
- Bewick's wren
- common yellowthroat
- American goldfinch
- song sparrow
- mourning dove

Forested areas provide nest sites for:
- red-tailed hawk
- American crow
- tree swallow
- black-capped chickadee
- purple finch
- Swainson's thrush
- western wood peewee
- varied thrush (wintering)
- great horned owl
- northern flicker
- house wren
- other cavity-users
- black-headed grosbeak
- brown-headed cowbird
- cedar waxwing

The cottonwood forests in particular provide high habitat value because many wildlife species require a forest habitat along with open water, wetlands, shrubs, and meadow. The cottonwoods are used for nesting by a diversity of species including:
- great blue herons
- great horned owls
- red-tailed hawks

A unique feature of the Pen 1 forest habitat is the Blue Heron rookery in the northwest corner of the golf course. An urban rookery is unique and of extremely high wildlife and public interest value. This rookery is within the most urbanized site of all rookeries in the Portland Metropolitan area.

In recent years activity at the rookery has decreased. This is due to predation by American Crows and to the recent severe wind and ice storms which have knocked nests out of the cottonwoods. Consequently, the herons have started nesting on the fringes of Force Lake and at PIR. This points out the value of maintaining and enhancing all of the habitat areas of Pen 1 to allow for natural dynamic changes. This is why it is important to manage the habitats throughout Pen 1 in a coordinated manner.

Emergent wetlands are inhabited by a variety of species including:
- redwing blackbird
- marsh wren
- eastern cottontail
- bullfrog
- mallard
- nutria
- voles
- Pacific treefrog

The **remaining** mowed lawn areas, pavements, and bare areas comprise the majority of the Pen 1 site and provide foraging habitat for year-round residents such as:
- European starling
- American robin
- rock dove
- Brewer's blackbird
- killdeer
- great horned owl
- house sparrow
- American crow
- northern flicker
- gulls
- red-tailed hawk
- eastern cottontail

Red-tailed hawks have nested northeast of Force Lake about 200 meters away in black cottonwood trees for at least the past fifteen years. Eastern cottontails are probably the main food source for the red-tailed hawks and great horned owls of the vicinity. Beaver and nutria appear to be common in the sloughs. Raccoons, opossums, and ring-necked pheasants range throughout the area.

Waterfowl and waterbirds are present year round. A large number of ducks (particularly American widgeon and mallards) winter in the vicinity of the Portland International Raceway, Heron Lakes golf course, Force Lake, ponds and area sloughs. Some of the waterbirds which are attracted to the open water and short, nutritional grasses in the vicinity include:

- •common mergansers
- •buffleheads
- •gadwall
- •mallards
- •cinnamon teal
- •green-backed heron
- •northern shovelers
- •green-winged teal
- •ring-necked duck
- •wood ducks
- •great blue heron

Additional Species Observed at Pen 1

Additional information on wildlife observed at Pen 1 was submitted by Mike Houck, Urban Naturalist for the Audubon Society of Portland. The following are additional species known to occur at Pen 1:

Shrub-dominated and forest areas: band-tailed pigeon, willow flycatcher, northern orioles, Townsend's warbler, Wilson's warbler, black-throated gray warbler, orange-crowned warbler, yellow-rumped warbler, yellow warbler, winter wren, sharp-shinned hawk, Cooper's hawk, white-crowned sparrow, golden-crowned sparrow, dark-eyed junco, violet-green swallow, barn swallow, house finch, spotted (formerly rufous-sided) towhee, western tanager, hairy woodpecker, downy woodpecker, western scrub jay, golden-crowned kinglet, ruby-crowned kinglet, brown creeper, bushtit, evening grosbeak, warbling vireo, pine siskin.

In mowed grassy areas: savannah sparrow, barn swallow, violet-green swallow, tree swallow.

Observed on and around Force Lake: pied-billed grebe, horned grebe, double-crested cormorant, American bittern, great blue heron, green-backed heron, Canada goose, wood duck, green-winged teal, cinnamon teal, northern shoveler, gadwell, Eurasian wigeon, American wigeon, canvasback, lesser scaup, ring-necked duck, bufflehead, hooded merganser, common merganser, ruddy duck, sora, Virginia rail, American coot, greater and lesser yellowlegs, spotted sandpiper, ring-billed gull, glaucous-winged gull, western gull, band-tailed pigeon, Vaux's swift, downy woodpecker, belted kingfisher, tree swallow, violet-green swallow, barn swallow, northern rough-winged swallow, American crow, black-capped chickadee, bushtit, golden-crowned and ruby-crowned kinglet, American robin, cedar waxwing, orange-crowned warbler, common yellowthroat, fox sparrow, song sparrow, spotten towhee, white-crowned sparrow, dark-eyed junco, red-winged blackbird, and American goldfinch.

The staff at Heron Lakes Golf Couse has observed the following additional species: common cormorant, merlin, marsh hawk, western meadowlark, snow owl, buffalo head duck, pin tail duck, yellow crown balckbird, common goldeneye, cattle egret, great egret, western tananger, osprey, California quail, and barn owl.

Threatened and Endangered Species

Bald eagles have been observed perching, both on Heron Lakes Golf Course and PIR property and have been observed feeding on the Columbia Slough just south of Pen 1. In early 1997, four to five bald eagles were observed wintering at the Columbia Boulevard treatment plant, using the Columbia Slough and Triangle Lake, both of which are immediately adjacent to Pen 1. Peregrine falcons have been observed flying overhead at Pen 1.

Tri-colored blackbirds have been observed around the golf course by Heron Lakes staff. The tri-colored blackbird is state-listed Sensitive and a federal Species of Concern. The only known tri-colored blackbird colony in the Willamette Valley is near Pen 1. Pen 1 most likely provides foraging areas for this rare species and could potentially provide nesting habitat as the colonies are associated with open water marshes.

The slough habitat that exists in Pen 1 appears to be suitable for the western pond turtle. The US Fish and Wildlife Service has classified this turtle as a Category 2 which means that there is not enough known about the status of the species to determine whether or not it should be listed as Threatened or Endangered and therefore does not receive Federal protection. The western pond turtle is listed as endangered by the State of Oregon. Western pond turtles have been observed in the sloughs of Pen 1 over the last 20 years. However, none were observed during this inventory.

Discussion of Natural Resource Issues

In terms of wetland and wildlife habitat value, the larger sites (especially the forest and marsh complex on the north side of the golf course), and the five sloughs have the highest value. Other areas have moderate to minimal values taken on their own, but in combination with the other resources of Pen 1 they provide valuable interconnections with other high value sites within Pen 1 and important adjacent resource areas.

High priority should be given to the long-term protection of the heron rookery and the protection and enhancement of the resources near the rookery. These areas also provide nesting opportunities for red-tailed hawks and great horned owls and are a resource for environmental education (public interest) when viewed from Parks property.

The cottonwood forests are important habitat because they provide shelter, food, and/or breeding sites for most of the wildlife species inhabiting this area. The notably high diversity of native wetland emergent plants in the North Wetland Area is unique when compared to the near monocultures of reed canarygrass found in other emergent wetlands within Pen 1.

The North Wetland area could be a potential source of locally adapted genetic material for Pen 1 restoration efforts. A more detailed study of the soils and hydrology of this site could provide clues on how to restore the diversity of plant species elsewhere in the Columbia Slough watershed.

The wetlands and wildlife habitats of Pen 1 are widespread but interconnected; much of their value comes from the diversity of the habitat types and their interconnections. Critical interconnections can be found at:

- the intersection of the Middle Slough, Southern Slough, and Forebay Slough;
- the south edge of the golf course extending west along the Southwest Slough;
- the entire western boundary of the golf course;
- the area between Force Lake and the Northeast Drainageway to the east;
- the Northeast Drainageway south to the Northern Slough.

Protection and/or establishment of contiguous native vegetation in all these areas would enhance the entire system.

There are abundant opportunities for riparian and upland vegetation enhancement throughout Pen 1, nearly every open water area would benefit from a wider riparian vegetation buffer to improve water quality and wildlife habitat. Numerous opportunities exist to recontour the banks along the sloughs to provide more gentle slopes and shallow shelf areas capable of supporting wetland forest, shrub, and emergent vegetation, as shown in Exhibit 9, Slough Bank Recontouring Typical Section. There are also opportunities for wetland enhancement, creation, and restoration, upland forest planting, and enhancement of the areas of interconnection that would greatly enhance the habitat value and water quality benefits of Pen 1.

Pen 1 Enhancement/Mitigation Plan

The Pen1 Enhancement/Mitigation Plan is a central element of the NRMP and performs two functions. First, it identifies prime target areas for resource enhancement within Pen 1. Should City or private agencies, citizen groups or others wish to carry out enhancement projects within Pen 1 for water quality or habitat improvement, this plan identifies primary opportunity sites to get the greatest return. However, the designation of a site as an enhancement opportunity does not preclude the possibility of its development. The plan does not require enhancement. Some of the enhancement opportunities are identified on private properties. Anyone considering enhancement projects on private property would have to negotiate with the property owner for access through conservation easement or purchase.

Second, the identified enhancement opportunities also serve as designated mitigation sites. This aspect of the plan is implemented when and if proposals are approved for development within the resource area of an environmental zone in Pen1. Any mitigation required by an environmental review approval shall, as a first priority, take place in an area identified in the Pen 1 Enhancement/Mitigation Plan. However, if a development proposal requires more mitigation acreage than is available within Pen 1, the applicant may satisfy any mitigation requirements on property outside the boundary of the Pen 1 NRMP in compliance with PCC Chapter 33.430, Environmental Zones. Any off-site mitigation on private property would have to be negotiated with the property owner to gain access through conservation easement or purchase.

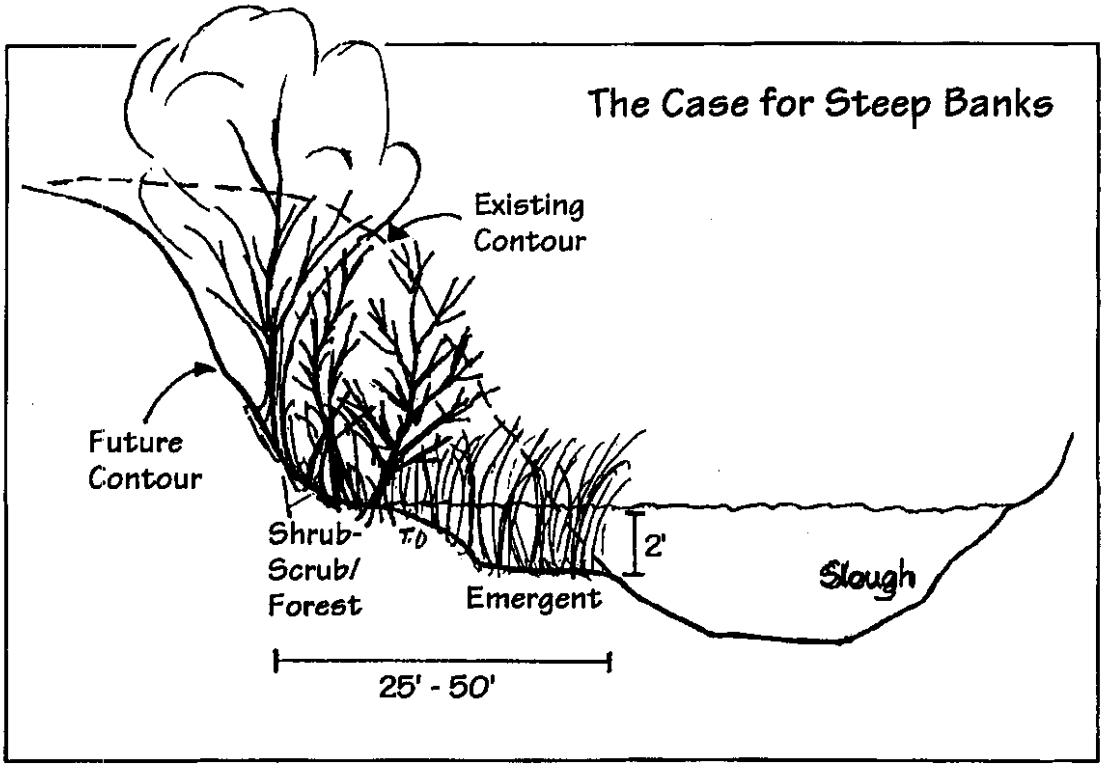
The benefits of the Enhancement/Mitigation Plan are made possible because of the area wide ecosystem approach of the NRMP. Normally with an environmental review, mitigation for each development proposal is dealt with individually. This plan allows for greater benefit to the Pen1 resource as a whole because the mitigation requirements of individual development proposals are tied to the overall enhancement plan for Pen1. Having each development reviewed independently could not accomplish these results. The benefits include:

1. Creation of important habitat links between Force Lake and the Northeast drainageway and its associated forested uplands, between Forebay Slough and the small lakes on the southern edge of the golf course, and in the southwest Marsh area;

2. Enhancement of existing low-value wetlands on the Excel Communications property as well as restoration of wetlands at sites with high habitat values and functions on adjoining wetlands and water areas;

3. Water quality improvements from the treatment of runoff from the Expo site, the introduction of clean water from the Excel Communications property into Force Lake, and the additional emergent wetlands on benches throughout the slough system; and

4. The provision of more certainty for development activities, implementing the purposes of the IG2 base zone and the economic development goals and policies of the Comprehensive Plan and the Albina Community Plan.



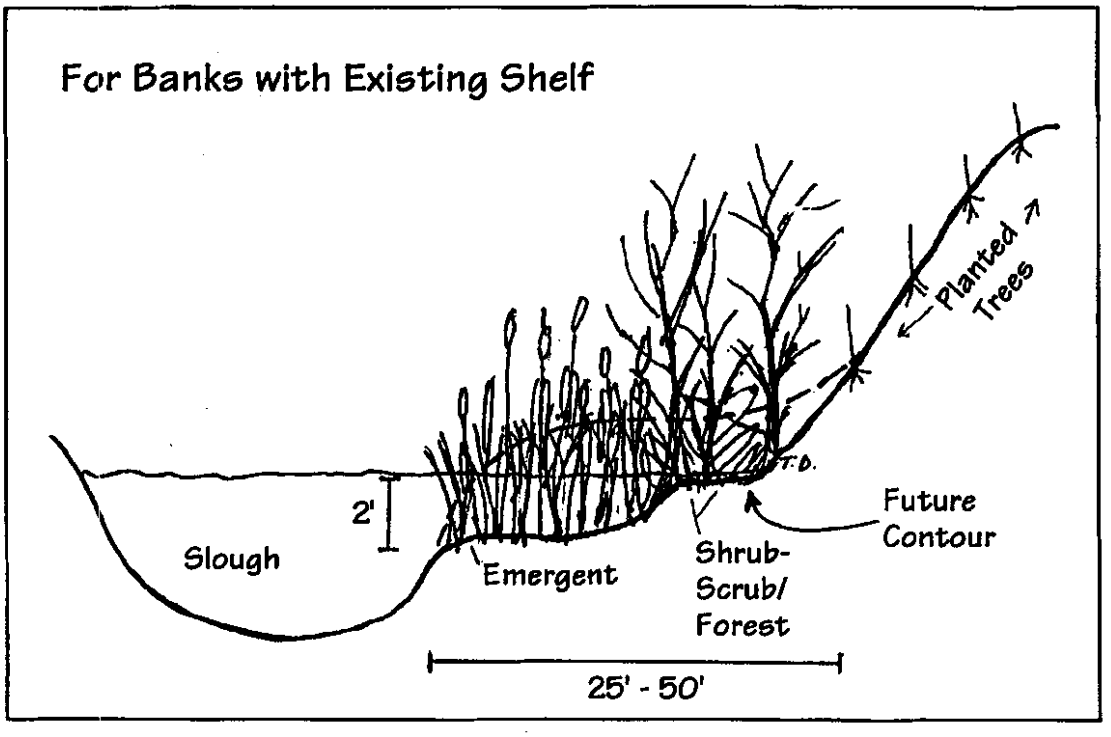


EXHIBIT 9

Slough Bank Recontouring Typical Section

The following is a description of the areas identified for enhancement/mitigation and the type of enhancement/mitigation envisioned. The descriptions are generalized. The details of each enhancement/mitigation project will be provided by the applicant as part of the permitting process. The assumptions about each site are based on the information gathered in the original inventory and historic aerial photos and maps. The presence of hydric soils indicates that the entire Pen 1 district was originally wetlands. Therefore, restoration of former wetlands and enhancement of existing wetlands are the types of wetland mitigation activities that would take place within Pen 1. Each potential enhancement/mitigation site is described below and shown on Exhibit 10, Pen 1 Opportunities for Enhancement and Mitigation.

A Excel Communications Restoration (13.6 Acres)

This area appears to have been graded and filled in pre-Vanport times, and on the basis of the historic USGS topographic map (Oregon Historical Society), was probably a wetland or tidal mud flat. It is a sloping area of upland vegetated by introduced pasture grasses and Himalayan blackberry. This area could be excavated to produce wetland hydrology (perhaps to the original surface if it can be found) and planted with diverse native trees, shrubs, and ground covers. Open water, emergent, scrub-shrub, and forested areas can be created in an oxbow pattern like the other remnant sloughs of Pen 1.

B Excel Communications Wetland Enhancement (71.8 Acres)

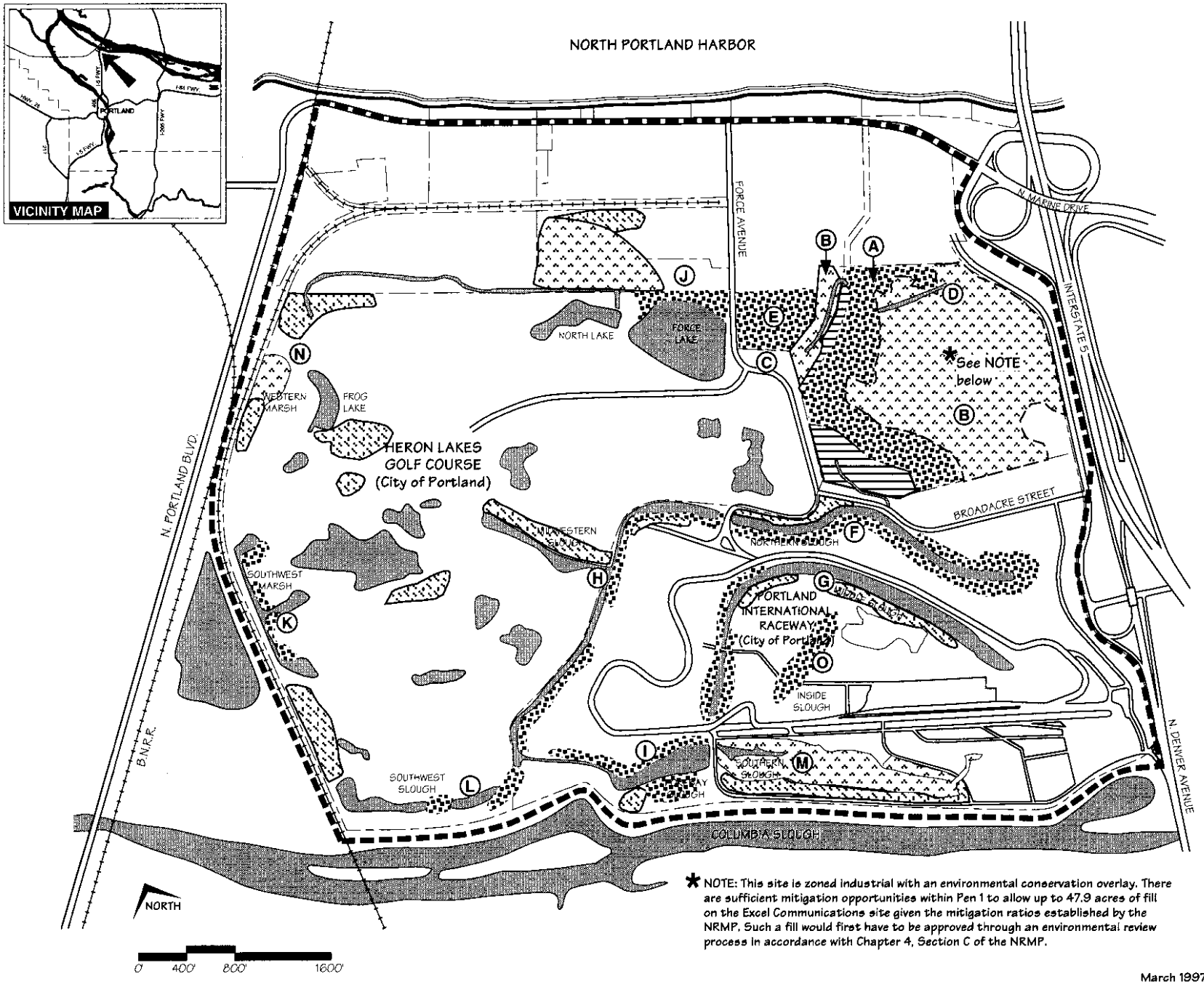
This wetland supports a monoculture of reed canarygrass. It appears to have originally been a shallow lake (the original Force Lake). Long ago it was recontoured to produce flat topography and wetland conditions for broadcast use. The site could be enhanced by the creation of more diverse topography including extensive open water up to six feet in depth (during high water) and the establishment of emergent, scrub-shrub, and forested wetlands. Enhancement of the Northeast Drainageway would only consist of the removal of non-native vegetation and planting additional native species.

C Excel Communications Water Diversion

A diversion structure could be installed where the Northeast Drainageway enters a 36-inch culvert for the purpose of diverting low flows into Force Lake. Pipe installation must take place on land managed by Portland Parks and Recreation and with minimal disturbance to existing upland and riparian forest areas. The design of the diversion structure shall substantially comply with that shown on Exhibit 4, Proposed Diversion Structure and Exhibit 5, Diversion Structure Design.

D Excel Communications Water Quality Swale

A water quality polishing swale could be constructed on the Excel Communications property in the location of the drainageway near the north property line, for purposes of providing secondary water treatment. The water quality polishing swale could be used for surface water runoff from any development approved for the Excel Communications property or for runoff from the Metro Portland Expo Center site, with appropriate agreements.



PENINSULA ONE
Natural Resources
Management Plan

Pen One Opportunities for Enhancement and Mitigation

Legend

- Management Plan Area Boundary
- Property Boundaries
- Open Water
- Wetland Enhancement (80.10 Acres)
- Wetland Restoration (38.40 Acres)
- Upland Forest Enhancement
- Preserved Upland
- (A) Site Descriptive Locator

★ NOTE: This site is zoned industrial with an environmental conservation overlay. There are sufficient mitigation opportunities within Pen 1 to allow up to 47.9 acres of fill on the Excel Communications site given the mitigation ratios established by the NRMP. Such a fill would first have to be approved through an environmental review process in accordance with Chapter 4, Section C of the NRMP.

Exhibit 10

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E Expo site Restoration (3.5 Acres)

This area was formerly part of a slough channel, a riparian forest, and a small lake (the current Force Lake). It has since been filled. The nonforested areas could be excavated to achieve wetland hydrology, and include an emergent/open water channel with borders of scrub-shrub and riparian forest vegetation.

F Northern Slough Wetland Restoration (3.4 Acres)

This area of upland next to the Northern Slough could be restored by excavation and planting to establish an emergent wetland bench with a shrub and riparian forest edge.

G Middle Slough Wetland Restoration (3.3 Acres)

Areas of the south and west end of the Middle Slough which are assumed to be former wetlands could be excavated for an emergent wetland bench and planted along shoreline areas currently lacking in forest vegetation.

H Midwestern Slough Wetland Restoration (2.8 Acres)

An area along the south and east shore of the northern part of the Midwestern Slough will be excavated for an emergent wetland bench and planted.

I Midwestern/Forebay Slough Wetland Restoration (3.2 Acres)

This is a large area of shoreline on the north and east sides of the Midwestern and Forebay Sloughs currently devoid of forest vegetation. Restoration could consist of an excavation for an emergent wetland bench and the replanting of native vegetation.

J Force Lake Wetland Restoration (2.8 Acres)

The vegetation on the northern shoreline of Force Lake could be restored in areas where forest does not now exist. A fringe of emergent vegetation could be planted along the north lake shore, followed by bands of scrub-shrub and then forest furthest north. Some excavation may be necessary to establish wetland hydrology.

K Southwest Marsh Wetland Restoration (1.8 Acres)

The eastern shoreline of the Southwest Marsh could be excavated and planted to establish a larger area of emergent native vegetation.

L Southwest Slough Remnant Wetland Restoration (0.8 Acres)

A direct surface connection could be established between the two remnant Southwest Sloughs themselves and between them and the Midwestern Slough. The remnant Southwest Sloughs could be connected by excavating and planting with emergent vegetation. Scrub-shrub and trees would be added along the banks where they do not interfere with golf play.

M Southern Slough Wetland Enhancement (9.1 acres)

A combination of excavation and recontouring to remove reed canarygrass, and planting of native species could be used to enhance wetland functional values in this area which is currently a monoculture of reed canarygrass. A non-functional weir structure is in place at the west end of the Southern Slough. The weir could be easily repaired to provide seasonal fluctuations in the water level of the Southern Slough that are beneficial to wildlife and native vegetation.

N Western Marsh Wetland Enhancement (1 acre)

A combination of excavation and recontouring to remove reed canarygrass, and planting of native species could be used to enhance wetland functional values in this area. A direct surface connection of emergent vegetation could be established between the wetland and the pond to the east necessitating a bridge or short open culvert crossing for the golf course path.

O Inside Slough Restoration (3.2 acres) and Enhancement (0.6 acres)

A combination of excavation and recontouring could be done to remove reed canarygrass in an existing 0.6-acre slough remnant and to restore wetland hydrology to the area adjacent to the remnant slough.

NATURAL RESOURCE POLICIES

Policy No. 1: - Enhance riparian vegetation and wildlife habitat within Pen 1. Forests and related shrub covers shall be preserved and restored, and new forest habitat shall be encouraged to provide wildlife habitat for great blue herons, red-tailed hawks, great horned owls, and a diversity of other species. Enhance wetland and wildlife habitat values through preservation, maintenance and enhancement of forest and wetland vegetative interconnections.

Policy No. 2: - The North Wetland Area should be preserved and enhanced as a diverse emergent wetland, and used as a source of locally adapted plant materials for wetland restoration efforts throughout Pen 1.

Policy No. 3: - Protect and manage all wetlands within the Pen 1 District to avoid, minimize, and, if necessary, compensate for fill or destruction of material from wetlands.

Policy No. 4: - Undertake further study to determine whether the Western Pond Turtle is resident within Pen 1. If evidence of their presence is confirmed, measures shall be undertaken to enhance the Western Pond Turtle habitat.

NATURAL RESOURCE MANAGEMENT OBJECTIVES

The following actions are suggested as a means to enhance and protect wildlife habitat areas within the Pen 1 area:

1. Restore and enhance naturally vegetated connections between wetland and forest areas. Create additional forest area to enhance wildlife habitat diversity. Establish patches of natural habitat between fairways and under groves of trees, to be in keeping with the "Scottish Golf Course" appearance where rough areas are actually rough.

2. Work with Pen 1 and MCDD 1 to identify maintenance requirements for the drainageways within the study area. Where feasible, develop maintenance dredging activities that will have the least amount of impact to natural resources while still maintaining the required conveyance requirements for flood control purposes.

3. Restore riparian vegetation along sloughs and other wetlands by recontouring in non-forested areas where possible, planting native species, and removing weedy invaders such as Himalayan blackberry. Along sloughs, recontour the banks to provide more gentle slopes and shallow shelf areas capable of supporting wetland forest, shrub, and emergent vegetation (see Exhibit 9, Slough Bank Recontouring Typical Section).

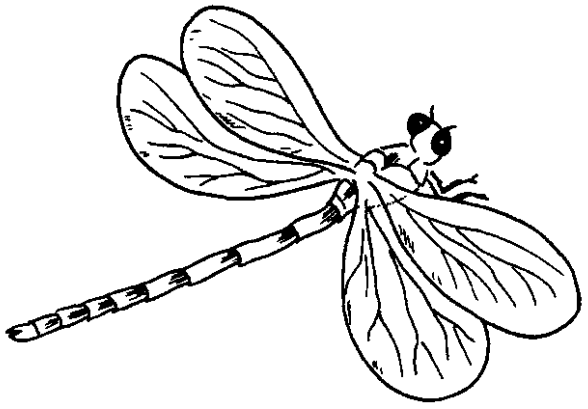
4. Avoid future crossings of the open water sloughs to prevent further fragmentation of existing corridors and reductions of open water areas. Necessary crossings should be mitigated by significantly improving wildlife and wetland corridors elsewhere.

5. Enhance western pond turtle habitat (as well as habitat for many other aquatic species) by placing stumps, logs, or rocks in sunny open water locations to provide basking sites. The placement of such materials should be coordinated with the Pen 1 District to ensure that they do not interfere with future water-based dredging activities in the sloughs.

6. Continue Heron Lakes Golf Course maintenance practices that encourage the recovery of natural vegetation where possible to protect water quality and improve wildlife and wetland habitat conditions. Restore and create fringes of healthy emergent, shrub, and forest wetland areas at the edges of all ponds and waterways within the restrictions on vegetation height along some of the ponds. Portland Parks and Recreation shall develop maintenance guidelines for natural areas and train personnel in the control of undesirable invasive plants, such as Himalayan blackberry.

7. Place and maintain nest boxes for swallows, purple martins, kestrels, and owls, and roosting boxes for bats in woodlands or woodland fringe areas to improve wildlife species diversity and provide enhanced natural mosquito control.

8. Conduct further research on the North Wetland area. Further study should be done on the soils and ground water conditions in the North Wetland Area, Excel Communications property, Southern Slough and Inside Slough to see if there are obvious reasons for the much higher plant species diversity and quality at the North Wetland Area. This could identify a means to successfully reduce the reed canarygrass dominance, allow for more plant species diversity and therefore wildlife habitat diversity and wetland quality in Pen 1 and possibly throughout the Portland area.



CHAPTER 3

PEN 1 LAND USE AND RECREATION

PUBLIC POLICY AND ZONING

The entire Pen 1 District lies within the City of Portland and is subject to the regulations and conditions of the Portland Comprehensive Plan and the provisions of the Portland Zoning Code. Currently, PIR and Heron Lakes Golf Course are zoned as Open Space with Environmental Conservation (EC-Zone), Environmental Protection (EP-Zone), and Aircraft Landing Zone (h) overlays. Other properties within the study area are zoned Heavy Industrial (IH) or General Industrial (IG2), also with EC and EP zones, and/or aircraft height overlays.

The locations of the Environmental Overlay zone lines have been adjusted as part of this NRMP to be more accurate. The current County base plat maps for the Pen 1 area are notoriously distorted. A project is currently underway to correct all of the City's base maps and the overlay zones will be adjusted accordingly. The zone line adjustments are based on up-to-date topography maps. The proposed topography corrected overlay zones are shown in Appendix 2. Adoption of these maps will carry out the conversion of the official City Zoning Maps to a Geographic Information System for the Pen 1 area.

The City of Portland Bureau of Buildings and Bureau of Planning administer the building and zoning codes and issue permits as they relate to proposed development. The Bureau of Planning and the Bureau of Environmental Services review water quality and environmental issues. The Bureau of Transportation reviews traffic and transportation related issues. Portland Parks and Recreation currently manages the golf course and Portland International Raceway (PIR), and is also responsible for issues relating to public access and recreation.

The Corps is the federal agency responsible for flood control and protection, but the Peninsula Drainage District No. 1 manages and maintains the drainage functions of the sloughs and the pumping system. However, the responsibility for the drainage system will transfer to the Multnomah County Drainage District in the summer of 1997. The Federal Emergency Management Agency (FEMA) administers changes and alterations to the designated 100-year flood level.

The Oregon Division of State Lands (DSL) and the Corps also require review and approval for alterations to wetlands that involve over 50 cubic yards of fill.

Other agencies having some degree of oversight of activities within Pen 1 include the Federal Aviation Administration (FAA) and the Oregon Department of Transportation (ODOT).

Although two-thirds of the Pen 1 District is within West Delta Park, public access and recreation is limited. PIR access is available only by ticket purchase or entry during "free" events. Heron Lakes Golf Course is available for golfers only and green fees are charged. Outside these designated grounds public access is available only along Broadacre Street and Force Avenue (which are Park driveways and not dedicated streets). Force Lake is popular for fishing despite a probable health risk.

PUBLIC AND PRIVATE PROPERTY CONSIDERATIONS

History

The land contained within the study area has been the subject of many planning efforts and proposed projects over the past fifty years. Two of the most ambitious were Vanport, a community largely constructed during World War II, and the Delta Dome, a failed proposal to construct a covered sports stadium complex advanced in the mid-1960s.

Vanport was built to house workers employed during the war years at the Kaiser shipyards in Vancouver and Portland. Following the war, it was Oregon's second largest city after Portland. During World War II, as Vanport was under construction, Japanese-Americans were interred at a camp at the site that now includes the Metro Portland Expo Center. Neither of these extraordinary historic occurrences is acknowledged or interpreted on their respective sites today.

Public Access

The City's Comprehensive Plan and Zoning maps indicate public access on top of the dike along the Columbia Slough. No other trails or public access are shown within the Pen 1 study area. The Kenton Neighborhood Plan and Kenton neighborhood representatives have urged improved public access, as have local environmental organizations (for viewing purposes), with the caution that uncontrolled human access could negatively affect habitat areas.

A public access trail plan around the perimeter of the Heron Lakes Golf Course, along the southern boundary of the Northern Slough, and along Force Avenue is shown on Exhibit 11, Proposed Public Access Improvements. The trail section shown along the southern and eastern edge of the Midwestern Slough is contingent upon the resolution of access and user conflicts that need to be addressed by Portland Parks and Recreation. The main sections of these trails will incorporate hard surface treatment to enable access by all persons regardless of mobility impairments pursuant to the American with Disabilities Act (ADA). Spurs and sections of trail in and near sensitive habitat areas will be improved with natural surfaces to reduce potential environmental impacts.

The alignment of recreational trails through wildlife habitat and wetlands shall comply with the applicable management objectives and implementation measures of this NRMP and will be restricted to publicly owned property. Public access also is recommended north to Marine Drive. This can be provided in the form of a bicycle lane and sidewalk along Force Avenue from Force Lake north to Marine Drive, to be constructed in accordance with the City of Portland standard bicycle lane and sidewalk construction detail.

Tri-Met bus access to West Delta Park is encouraged, as is support for a Light Rail station at the Interstate 5-Delta Park interchange. This access point could become an eastern "trail-head" for West Delta Park.

Future Development Plans

James River Corporation owns the highest quality wetland and wildlife habitat area including most of the North Wetland area and the heron rookery. The James River Corporation has not announced expansion or improvement plans for its properties.

The Excel Communications property was purchased by Excel Communications in January of 1997 from Embarcadero Media, Inc. This approximately 100 acre property is zoned IG2, General Industrial and is entirely within the environmental conservation overlay zone. This site is designated as open space in the Albina Community Plan's Concept Plan. However, the Albina Community Plan did not change the industrial base zoning so industrial development is a likely possibility. This property has also been identified as the first choice for the location of a new Multnomah County jail facility. Any potential development of this site must either meet the development standards of the environmental overlay zone or be approved through environmental review.

If an environmental review is approved for development of this property, any mitigation required must be done in accordance with the Enhancement/Mitigation Plan of the NRMP. As an example, there are sufficient mitigation opportunities within Pen 1 to allow up to 47.9 acres of fill on the Radio towers site given the mitigation ratios established by the Enhancement/Mitigation Plan. Such a fill would first have to be approved through an environmental review process. If over time there is insufficient acreage available within Pen 1 to satisfy the mitigation requirements for this property, mitigation outside the boundaries of Pen 1, in compliance with PCC Chapter 33.430, Environmental Zones, can be used to satisfy the mitigation requirement.

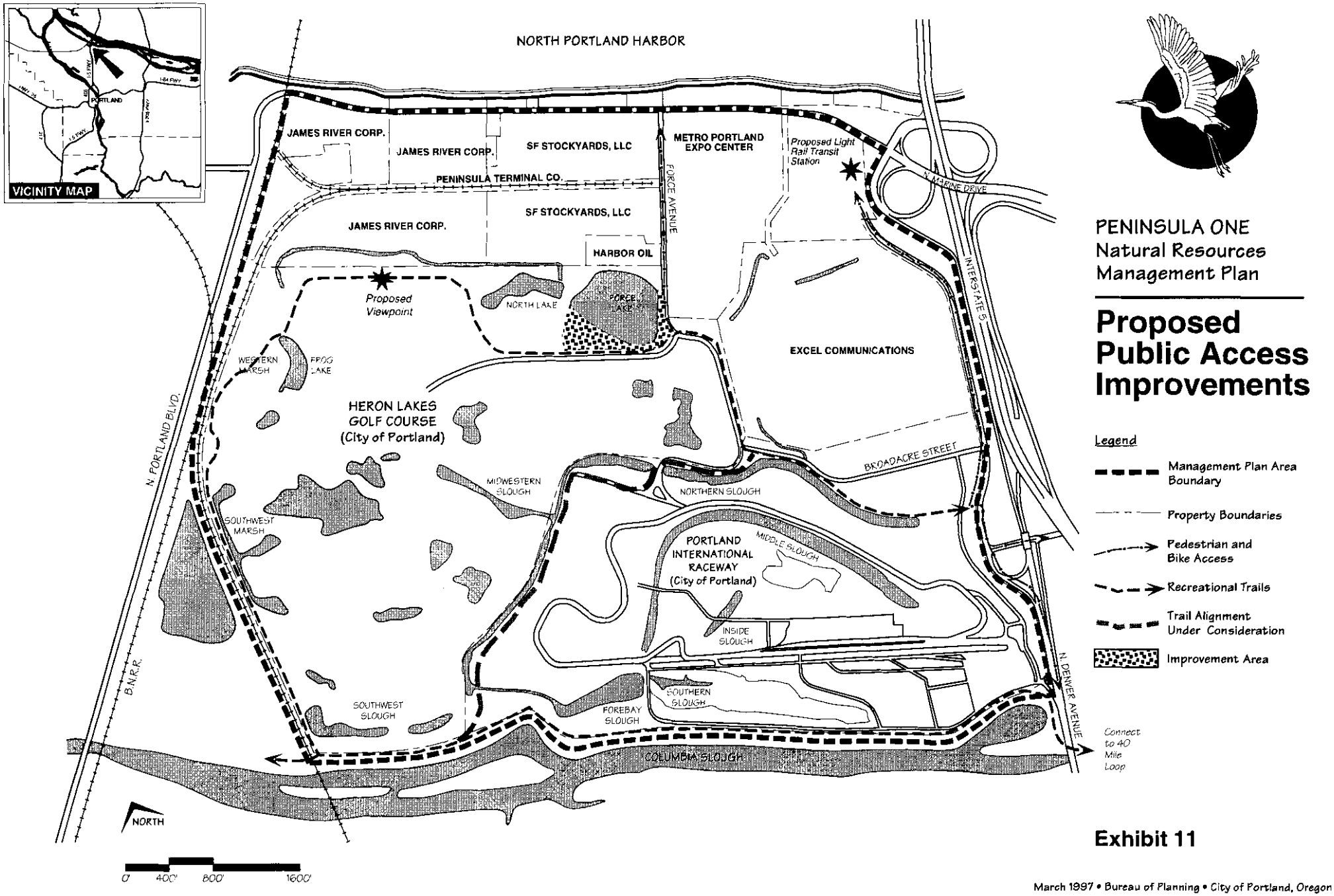
Mitigation may include the possible diversion of some of the surface flow off the Excel Communications property and into Force Lake. The details of the Enhancement/Mitigation Plan are discussed in Chapter 2, Wetlands, Natural Areas, and Wildlife Habitat. Any wetland fill at this site must also meet the requirements of the DSL and the Corps.

SF Stockyards, LLC acquired the Stockyards property in March of 1995 and plans to re-develop the existing industrial land. Nearly all of the re-development will take place outside the drainage area of the Pen 1 District and/or on currently developed (paved) land. Only one potential project will affect the Pen1 NRMP area. A drainage and water quality facility may be constructed at the southeast corner of the property just north of the Harbor Oil property. This facility would capture runoff from the development to the north and treat it (passive treatment) before discharging it to the wetland areas to the west.

Harbor Oil owns an oil processing facility just north of Force Lake. Harbor Oil has not indicated any specific development plans and has not shown any interest in participating the NRMP.

Peninsula Terminal Company owns the narrow band of railroad tracks that split the James River and SF Stockyards, LLC properties. They have recently added a spur track to the south of the existing tracks.

Metro—Portland Expo Center has a Master Plan for the Expo site that was developed by Multnomah County. The master plan has not yet been reviewed or approved by the City but it indicates continued operations on an expanded level. The hydrology report in Chapter 1 has identified the Expo site drainage as an issue. Because a portion of the Expo site now drains into the environmentally zoned area to the south and the runoff is not treated, future re-development of the site should include on-site water quality facilities. An on-site facility would provide primary initial treatment of stormwater before it enters the environmental zone. Secondary treatment in the form of a polishing swale/enhanced wetland would be allowed within the environmental zone.



PENINSULA ONE
Natural Resources
Management Plan

Proposed Public Access Improvements

Legend

- Management Plan Area Boundary
- Property Boundaries
- Pedestrian and Bike Access
- Recreational Trails
- Trail Alignment Under Consideration
- Improvement Area

Exhibit 11

March 1997 • Bureau of Planning • City of Portland, Oregon

PIR has completed a *10-Year Conditional Use Master Plan*, of which this Plan is a condition of approval. The PIR Master Plan has thoroughly addressed natural resources and water quality protection, and integrated these aspects with the recommendations of this Natural Resource Management Plan. As part of the Master Plan, PIR has proposed one development project involving 2.00 acres of wetland fill at the northeast end of the Southern Slough, which would have to be approved through a Type II environmental review. Currently, there are conflicts between the zoning at PIR and the proposed facility improvements. No fill or other expansion will be approved at PIR until the conflicts are resolved.

Portland Parks and Recreation has provided improvements to the south side of Force Lake, as part of the construction of the last nine-hole addition and entryway into Heron Lakes Golf Course. These improvements provide better public access to Force Lake, interpretive information, and natural resource enhancement of the lake shore. Additional recreation and access improvements are planned for this site.

Heron Lakes Golf Course is a New York Audubon Certified Cooperative Sanctuary. The Audubon Society of New York State recognizes and certifies golf courses around the country that meet their basic criteria of wildlife enhancement, water quality and water conservation, integrated pest management, public involvement, and environmental planning.

Maintenance practices at Heron Lakes Golf Course will continue to be low impact. The Course is a "Scottish style" course where the rough near fairways is allowed to grow with very little maintenance and the native understory is allowed to grow within the various tree groves on the golf course. Natural vegetation is maintained to the greatest extent possible around all lakes, sloughs, and wetlands, down to a minimum of five feet in areas of heavy golf play. In certain areas such as near tees, greens, or along fairways it is necessary to eliminate vegetation that grows over four feet in height in order allow for site distance and smooth golf play. The large numbers of waterfowl found on the course and the high traffic of golfers greatly affects the vegetation near some ponds despite the efforts of Parks staff to maintain a natural vegetative fringe. The areas where vegetative height limitations must be maintained are shown on Exhibit 12, Parks Maintenance Plan.

Peninsula Drainage District Number 1 will transfer operations over to the Multnomah County Drainage District in the summer of 1997. Land-based dredging will be replaced with water-based systems where feasible. Under this system, the regular clearing of woody vegetation along slough banks, and the steep bank configuration needed for dredge access (which erodes as sediment into the sloughs) will no longer be necessary. The MCDD has also indicated that the previous intensity of channel maintenance for conveyance is not necessary and is willing to work with local management agencies and advocates to maintain Pen 1 drainage facilities in ways that limit impacts to wetlands and wildlife.

LAND USE AND RECREATION POLICIES

Policy No. 1: - Provide a public recreation trails system within Pen 1 District and connect it to the Forty-Mile Loop.

Policy No. 2: - Create a passive recreational focal-point on the bank of Force Lake.

Policy No. 3: - Support a Max Light Rail Transit Station for West Delta Park that supports the activities at the Expo Center, PIR, and Heron Lakes Golf Course.

Policy No. 4: - Support development of properties within Pen 1 that conform to the other Policies of the NRMP and implement NRMP Management Objectives.

MANAGEMENT OBJECTIVES FOR LAND USE AND RECREATION

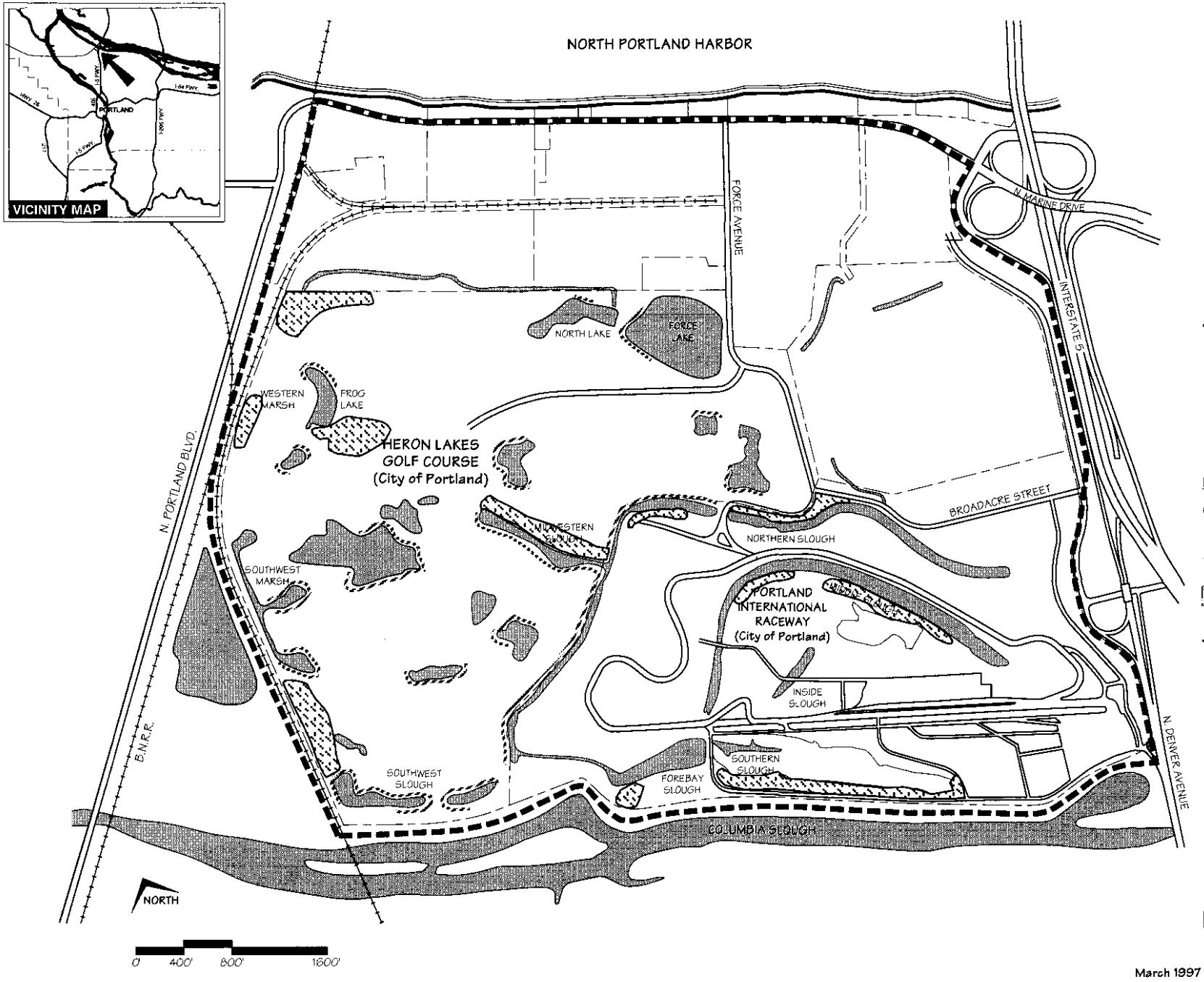
1. Improve public access and recreation opportunities through a system of bicycle and pedestrian trails that connect to the Forty-Mile Loop and include the site-specific projects shown on Exhibit 11, Proposed Public Access Improvements. The trail must incorporate hard surface treatment in appropriate locations to enable access by all persons regardless of mobility impairments pursuant to the American with Disabilities Act (ADA).

2. Establish Force Lake as a recreational focal point through the location of a trail-head kiosk and information center that describes the environment of the Lower Columbia in general and Delta Park specifically, outlines the history of the Vanport community and the Japanese internment camp, and provides a central park recreational access area complementing the golf course and PIR as shown on Exhibit 11, Proposed Public Access Improvements.

3. This NRMP identifies specific areas and actions within Pen1 for the enhancement of existing resources or for the mitigation of natural resources that are removed through an approved environmental review. Implement the mitigation aspect of the Pen 1 Enhancement/Mitigation Plan by linking it to future development of environmentally zoned properties within Pen 1.

4. Allow for the proposed drainage and water quality facility on the SF Stockyards, LLC property, which is a direct benefit to the resources of Pen 1.

5. With the next Metro Portland Expo Center expansion require water quality improvements for runoff entering the Pen 1 system from the Expo Center property. Passive on-site treatment is required with the option of the additional construction of a polishing wetland on the Excel Communications property.



PENINSULA ONE
Natural Resources
Management Plan

Parks Maintenance Plan

Legend

- Management Plan Area Boundary
- Property Boundaries
- Forest Understory Enhancement
- Vegetation Height Maintenance

Exhibit 12

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CHAPTER 4

NATURAL RESOURCES MANAGEMENT PLAN IMPLEMENTATION

INTRODUCTION

This Chapter establishes specific requirements to implement the NRMP. A list of action items has been generated based on the Management Objectives established in Chapters 1, 2, and 3. For the definition of terms used in this Chapter refer to the Portland Zoning Code Chapter 33.900, General Terms.

NRMP ACTION ITEMS

The following is a list of action items that implement the NRMP. The action items are organized under either the property where the action is to occur or under the property whose owner is primarily responsible for its implementation.

Portland Parks and Recreation

PPR1—Recreation Trails—Phase 1

The City must construct—as part of the next five year capital improvement plan developed after adoption of the NRMP—a system of trails within Pen 1 in substantial compliance with the system shown on Exhibit 11, Proposed Public Access Improvements. The trail system must include the following:

- A combination hard-surface and soft-surface trail system surrounding the perimeter of Heron Lakes Golf Course with a connection of the on-site trail system to the Forty-Mile Loop Trail located on the south levee. The main golf course trail must be a hard-surface trail. Soft-surface trails or viewing platforms will provide access to views into more environmentally-sensitive areas without adversely affecting wildlife habitat areas.

- A bicycle connection between the Marine Drive bike route and Force Lake. The connection will consist of a hard-surface bicycle path or if Force Avenue is improved to City standards a bike lane.

PPR2—Recreation Trails—Phase 2
The City must investigate the feasibility of completing phase 2 of the Pen 1 trail system as shown on Exhibit 11, Proposed Public Access Improvements. If phase 2 is feasible, the trail system must include the following:

- A hard-surface trail connection along the west perimeter of PIR with a connection to the Forty-Mile Loop Trail on the south levee, and Broadacre Street to the north.

PPR3—Dike Reinforcement
The City and the Corps of Engineers may jointly reinforce the dike structures on the west and south sides of the Heron Lakes Golf Course to provide for greater flood protection for the whole Pen 1 area. If done, this construction must conform to the following:

- No existing wetland areas may be disturbed.
- Forest resources may be removed or disturbed only on the dike slopes.
- Mitigation for any trees removed from the slopes is required. Each tree greater than 6-inches in diameter that is removed must be replaced with at least three trees and two shrubs selected from the native plants listed in Appendix 1. Replacement trees must be planted within the areas identified for upland forest enhancement on Exhibit 10, Pen 1 Opportunities for Enhancement and Mitigation. Planting must be done during the first growing season after the dike work is commenced.

PPR4—Parks Maintenance Plan
On the Heron lkaes Golf Course and the Portland International Raceway, Parks must continue maintenance practices that enhance existing riparian vegetation and allow for additional forest and shrub areas in compliance with the NRMP.

- Riparian vegetation must be restored through the creation of fringes of healthy emergent, shrub and forested wetlands along ponds and waterways in areas not identified for vegetative height maintenance (see Exhibit 12, Parks Maintenance Plan).
- Understory vegetation must be established in forested areas between fairways and under groves of trees.
- Parks must develop maintenance guidelines for natural areas and train maintenance personnel in the control of undesirable and invasive plants such as Himalayan blackberry.

PPR5—Forebay Polishing Swale
If water quality discharge standards for the Columbia Slough and tributaries are established by the Oregon Department of Environmental Quality then Portland Parks and Recreation and the Bureau of Environmental Services must investigate the feasibility or necessity of constructing a final polishing swale at the confluence of drainage basins A and B. The A and B basins join at the narrow drainageway between the Midwestern Slough and the Forebay Slough. The polishing swale in the narrow drainageway must be constructed in accordance with the typical section identified in Exhibit 13, Final Polishing Swale Proposed Typical Section.

PPR6—West Delta Park Recreation Plan
Parks must prepare a long range comprehensive recreation plan for West Delta Park incorporating recommendations contained in this NRMP with plans for Heron Lakes Golf Course, Portland International Raceway (PIR), Metro Portland Expo Center and other public agencies and private landowners. The recreation plan must identify a complete range of recreation activities, projected numbers of users, preliminary plans for site development, cost estimates and phasing projections.

SF Stockyards, LLC

SF1—Drainage And Water Quality Facility
A drainage and water quality facility may be constructed on the southern boundary of the SF Stockyards, LLC property south of the rail lines. If constructed, the facility must be outside of the Resource Area of the environmental zone. The system must be designed to the water quality standards of the Bureau of Environmental Services to prevent any additional contamination of Force Lake and the North Wetland Area.

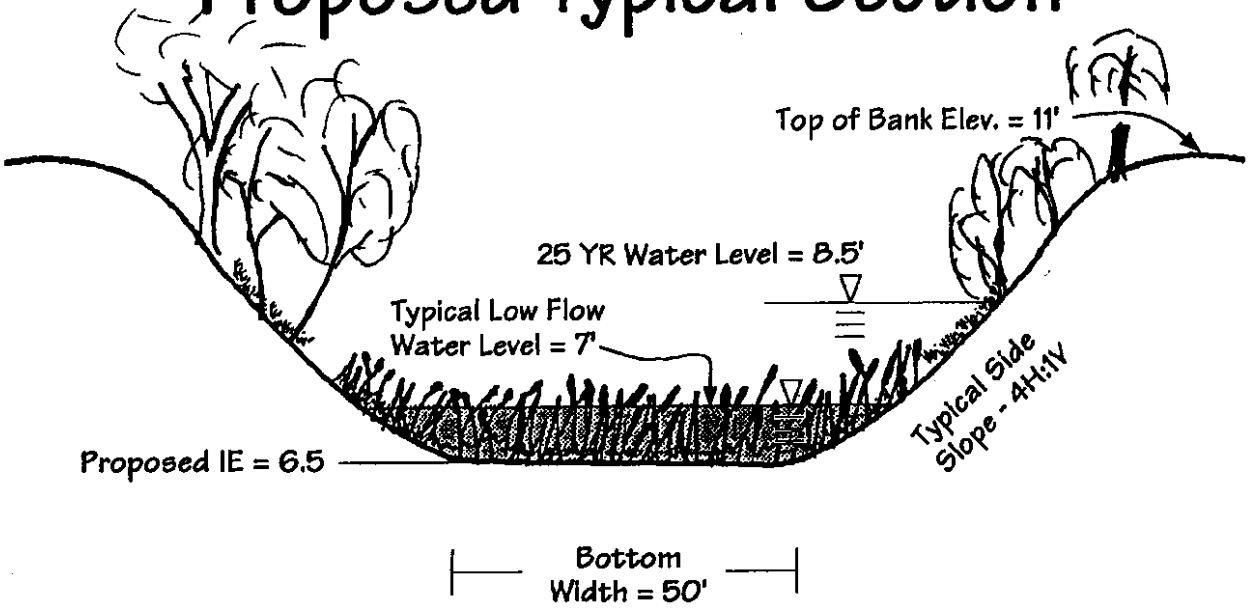
Drainage District

DD1—Drainageway Maintenance Standards
Define drainageway maintenance requirements and adopt maintenance standards that provide for the continued conveyance of stormwater flows as well as provide for environmental benefits. This includes phasing slough dredging and maintenance operations from land-based to water-based systems where feasible.

Pen 1 Generally

G1—Resource Enhancement
Resource enhancement projects that take place on sites identified in the Pen 1 Enhancement/Mitigation Plan must substantially conform to the enhancement specifications stated in the plan for that site.

Final Polishing Swale
Proposed Typical Section



Typical Low Flow Hydraulic Characteristics (Event < 2 YR Storm)

Flow = 16.5 CFS
Depth = 6 inches
Velocity =0.6 feet/sec
Head Loss = 0.2 feet

EXHIBIT 13

Final Polishing Swale
Proposed Typical Section

PROCEDURES

This section presents the implementation procedures of the NRMP and explains the relationship between the NRMP and the Zoning Code regulations in Chapter 33.430, Environmental Zones. Except where noted below, these procedures supersede the regulations of Chapter 33.430 and apply to all environmentally zoned land within the NRMP boundary as shown on the City's Official Zoning Maps.

A. Actions in Conformance with the Plan

1. Actions Allowed

A number of the action items listed at the beginning of this Chapter receive approval through adoption of this NRMP and require no further land use review. All projects identified below in the Actions Allowed column will require a development permit and must meet the development standards stated in subsection B, below. Any modification of projects listed as Actions Allowed or any deviation from the development standards is subject to the modification procedures outlined in subsection D below.

#	Actions in Conformance with the Plan	Time				Required Action	Implementors
		On-going	Adopt with Plan	Next 5 Yrs	6 to 20 Yrs		
	Actions Allowed						
PPR3	**Dike Reinforcement** The City and the Corps of Engineers may jointly reinforce the dike structures on the west and south sides of the Heron Lakes Golf Course to provide for greater flood protection for the whole Pen 1 area.		X			NO	PPR, Corps
PPR4	**Parks Maintenance Plan** On the Heron lkaes Golf Course and the Portland International Raceway, Parks must continue maintenance practices that enhance existing riparian vegetation and forest and shrub areas in compliance with Exhibit 12, Parks Maintenance Plan.	X				YES	PPR
SF1	**Drainage And Water Quality Facility** A drainage/water quality facility may be constructed on the southern boundary of the SF Stockyards, LLC property south of the rail lines. If constructed, the facility must be outside of the Resource Area of the environmental zone. The system must be designed to the standards of BES to prevent contamination of Force Lake and the North Wetland Area.		X			NO	SF Stockyards , LLC

2. Actions Needing Type I Environmental Review

Certain action items identified by the Plan require environmental review to be sure that the details of their implementation conform with the NRMP. These action items are processed through a Type I Environmental Review using approval criteria b, c, and d from the minor modifications procedure detailed below under subsection D.2. These action items must also meet the development standards stated in subsection B, below. The following projects are subject to the Type I procedure:

#	Actions in Conformance with the Plan	Time				Required Action	Implementors
		On-going	Adopt with Plan	Next 5 Yrs	6 to 20 Yrs		
	Actions Needing Type I Review						
PPR1	**Recreation Trails—Phase 1** The City must construct—as part of the next five year capital improvement plan—a system of trails within Pen 1 in substantial compliance with the system shown on Exhibit 11, Proposed Public Access Improvements.			X		YES	PPR and PDOT
PPR2	**Recreation Trails—Phase 2** If phase 2 of the recreational trail system is determined by Parks to be feasible then the City must construct phase 2 along the alignment shown on Exhibit 11, Proposed Public Access Improvements.				X	YES	PPR
PPR5	**Forebay Polishing Swale** When water quality discharge standards are established by DEQ, a final polishing swale may be necessary within the narrow channel between the Forebay Slough and the Midwestern Slough.			X		NO	PPR, BES
PPR6	**West Delta Park Recreation Plan** Parks must prepare a long range comprehensive recreation plan for West Delta Park incorporating recommendations contained in this NRMP with plans for Heron Lakes Golf Course, Portland International Raceway (PIR), Metro Portland Expo Center and other public agencies and private landowners.			X		YES	PPR
DD1	**Drainageway Maintenance Standards** Define drainageway maintenance requirements and adopt maintenance standards that provide for the continued conveyance of stormwater flows as well as provide for environmental benefits. This includes phasing slough dredging and maintenance operations from land-based to water-based systems where feasible.			X		YES	MCDD No. 1
G1	**Resource Enhancement** Resource enhancement projects that take place on sites identified in the Pen 1 Enhancement/Mitigation Plan must substantially conform to the enhancement specifications stated in the plan for that site.	X				NO	BES, PPR, other

B. Development Standards

All Actions in Conformance with the Plan listed under subsection A above must meet the development standards listed below:

1. No wetland creation may occur within existing forested uplands (see Exhibit 10, Pen 1 Opportunities for Enhancement and Mitigation).

2. Primary water quality treatment for any development site must take place within the proposed development site. For example, water quality swales located within a parking lot.

3. Each tree removed within a Resource Area of an Environmental Zone that is over 6 inches in diameter must be replaced with at least three trees and two shrubs selected from the plant list in Appendix 1. Tree replacement planting must take place within the Resource Area of an Environmental Zone.

4. All vegetation planted must be selected from the Pen 1 NRMP plant list in Appendix 1. Plants listed in Appendix 1 are native and consistent with the plant communities found within the Columbia River floodplain.

5. Planting plans must contain the following:
   a. A survey of existing native vegetation by location, type and size;
   b. A landscape plan prepared substantially in accordance with the requirements of Portland City Code Chapter 33.248, Landscaping and Screening; and
   c. A monitoring/reporting plan substantially in accordance with Portland City Code Section 33.248.090.E.

C. Actions Subject to Chapter 33.430, Environmental Zones and Mitigation Requirements

All other actions or development in environmental zones within the Plan boundary that are not specifically referred to under subsection A above, are subject to the regulations of Chapter 33.430, Environmental Zones. The approval standards of Chapter 33.430 supersede the requirements of the NRMP for development actions not identified in the Plan

Actions that are approved through an environmental review and require mitigation shall carry out one or more of the mitigation options listed in the Pen 1 Enhancement/Mitigation Plan in conformance with the following:

1. A construction timetable is required showing that the mitigation actions are to be undertaken concurrently with or prior to filling or development of the site.

2. Each mitigation site corresponds to those shown in Exhibit 10, Pen 1 Opportunities for Enhancement and Mitigation. However, if there are insufficient enhancement or mitigation areas remaining within Pen 1, an applicant may satisfy the provisions of the NRMP by using mitigation areas outside the boundaries of Pen 1.

3. The number of acres of wetlands that are required to be enhanced or restored in the Enhancement/Mitigation Plan are based on the following ratios—at a minimum:

   - A 1:1 ratio for wetland restoration.
   - A 3:1 ratio for wetland enhancement.
   - A 1.5: 1 ratio for wetland creation.

4. A minimum 5 year Monitoring and Maintenance plan is required that includes the following elements:

   - Clearly defined and obtainable success criteria.
   - Yearly monitoring reports that document progress towards meeting the success criteria.
   - An alternative or back-up plan that indicates the actions to be taken if the success criteria are not being met.

D. Major and Minor Modifications to the Plan

1. Modifications to the Plan

The NRMP Action Items that are in conformance with the Plan may—for unanticipated reasons—need to be modified. Such modifications require additional review.

The following types of modifications to the NRMP Action Items are considered minor modifications:

- Expansions of less than 50 percent of the site area in the original proposal for projects identified as allowed uses.
- Modifications to design or location of Plan projects identified as Allowed Uses.
- Modification of the time within which an NRMP Action Item identified in the tables above is to take place. Any modification in excess of twenty percent (20%) of the time permitted for compliance is processed as a major modification.
- Any modification of the technical characteristics of the trails required in PPR1.
- Modification of the maintenance operations at Heron Lakes Golf Course specified in PPR4.
- Any deviation from the development standards of Section B.
- Modification of the technical or functional characteristics of the final polishing swale specified in PPR5.

The following types of modifications to the NRMP Action Items are considered major modifications:

- Expansions of 50 percent or more of the site area in the original proposal for projects identified as Allowed Uses.
- All other Plan modifications except changes to Plan Policies and Management Objectives, which are processed as Plan Amendments.

2. Minor Modifications

Procedure.

Minor modifications to the Plan and are reviewed through a Type II environmental review procedure (see Zoning Code Chapter 33.430.210 through .240). Environmental reviews for minor modifications will be approved if the following approval criteria are met:

Approval Criteria.

a. There is a demonstrated need for the modification.
b. The proposed action is consistent with Peninsula Drainage District No. 1 Natural Resources Management Plan Policies and Management Objectives.
c. Alternative locations and design modifications were evaluated to show that the proposal or modification has the least significant detrimental environmental impact on identified Plan resources of all the practicable alternatives.
d. A construction management plan and a mitigation plan demonstrate that unavoidable impacts on identified Plan resources are fully mitigated within the Plan boundary, or outside the Plan boundary if no suitable mitigation sites remain within the boundary, and are in conformance with the Management Objectives for wetlands and natural resources (see Chapter 3).

3. Major Modifications

Procedure.

Major modifications to the Plan are reviewed through a Type III environmental review procedure (see Zoning Code Chapter 33.430.210 through .240). Environmental reviews for major modifications will be approved if the following approval criteria are met:

Approval Criteria.

a. The proposal meets all of the approval criteria for minor modifications.
b. The proposal is a park-related development, or no alternative locations exist outside of the Plan boundary.
c. There are no practicable alternative locations within the Plan boundary suitable for the use in which the development will have less adverse impact on identified resource values.
d. Any long-term adverse impacts of the proposed action on resource values are fully mitigated within the Plan boundary, or outside the Plan boundary if no suitable mitigation sites remain within the boundary.
e. The proposal is consistent with the conclusions of the ESEE analysis for the applicable Resource Site, as listed in the Columbia Corridor Industrial/Environmental Mapping Project document (effective 5/20/89).

E. Plan Amendments

Modifications to Plan Policies or Management Objectives are processed as plan amendments using a legislative procedure, as provided in Chapter 33.740, Legislative Procedure, of the Zoning Code.

APPENDIX 1

NATIVE PLANT LIST FOR THE PENINSULA DRAINAGE DISTRICT NO. 1

TREES	
Alnus rubra	Red Alder
Cretaegus douglasii or suksdorfii	Black Hawthorn
Fraxinus latifolia	Oregon Ash
Populus balsamifera ssp. trichocarpa	Black Cottonwood
Salix fluviatilis	Columbia River Willow
Salix lucida ssp. lasiandra	Pacific Willow
Salix scouleriana	Scouler Willow
Salix sitchensis	Sitka Willow
SHRUBS	
Amelancier alnifolia	Serviceberry
Cornus sericea ssp. sericea	Red-osier Dogwood
Oemleria cerasiformis	Indian Plum
Physocarpus capitatus	Pacific Ninebark
Ribes lobbii	Pioneer Gooseberry
Rosa gymnocarpa	Baldhip Rose
Rosa pisocarpa	Swamp Rose
Rubus spectabilis	Salmonberry
Sambucus mexicana	Blue Elderberry
Spirea douglasii	Douglas Spirea
Symphoricarpos albus	Snowberry
HERBACEAOUS	
Alisma plantago-aquatica	American Water-plantain
Alopecuris geniculatus	Water Foxtail
Angelica arguta	Sharptooth Angelica
Angelica genuflexa	Kneeling Angelica
Arnica Amplexicaulis	Clasping Arnica
Artemisia lindleyana	Columbia River Mugwort
Beckmania syzigachne	Slough Grass
Carex deweyana ssp. leptopoda	Dewey's Sedge
Carex obnupta	Slough Sedge
Carex aperta	Columbia Sedge
Cicuta douglasii	Douglas' Water Hemlock
Claytonia sibirica	Siberian Miner's-Lettuce
Deschampsia cespitosa	Tufted Hairgrass
Dicentra formosa	Pacific Bleedingheart
Eleocharis acicularis	Needle Spike-rush
Eleocharis macrostachya	Creeping Spike-rush
Elymus glaucus	Blue Wildrye
Festuca occidentalis	Western Fescue Grass
Galium aparine	Cleavers
Galium trifidum	Small Bedstraw
Glyceria elata	Fowl Mannagrass

Glyceria occidentalis	Northwest Mannagrass
Heracleum lanatum	Cow-parsnip
Juncus effusus	Common Rush
Myriophyllum spicatum	Water-milfoil
Oenanthe sarmetosa	Pacific Water-parsley
Potamogeton crispus	Curled Pondweed
Potamogeton natans	Broad-leaved Pondweed
Pteridium aquilinum	Bracken Fern
Rumex ocicdentalis	Western Dock
Sagittaria latifolia	Wapato
Scirpus acutus	Hardstem Bulrush
Scirpus microcarpus	Small-fruited Bulrush
Scirpus tabernaemonti	Softstem Bulrush
Sparganium angustifolium	Narrow-leaved Bur-reed
Sparganium emersum	Simplestem Bur-reed
Spirodela polyrhiza	Great Duckweed
Typha latifolia	Common Cattail
Urtica dioica	Stinging Nettle