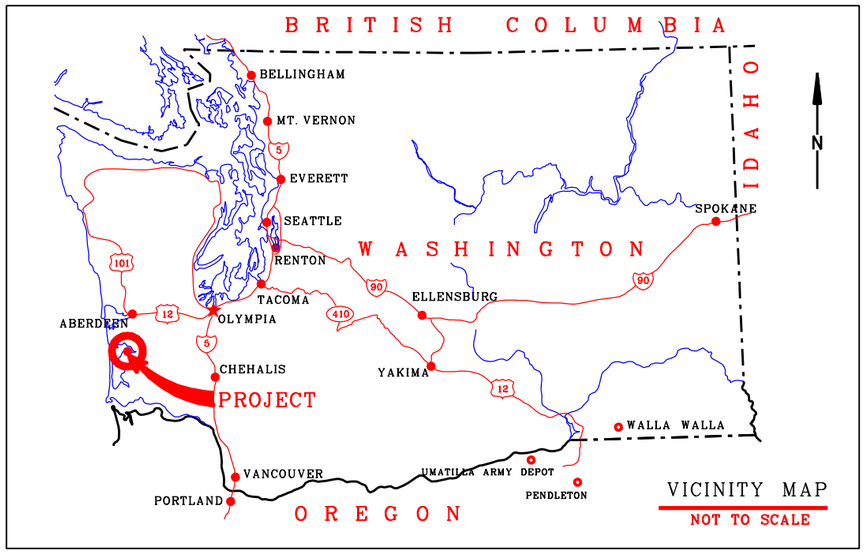
WILLAPA RIVER ESTUARINE RESTORATION

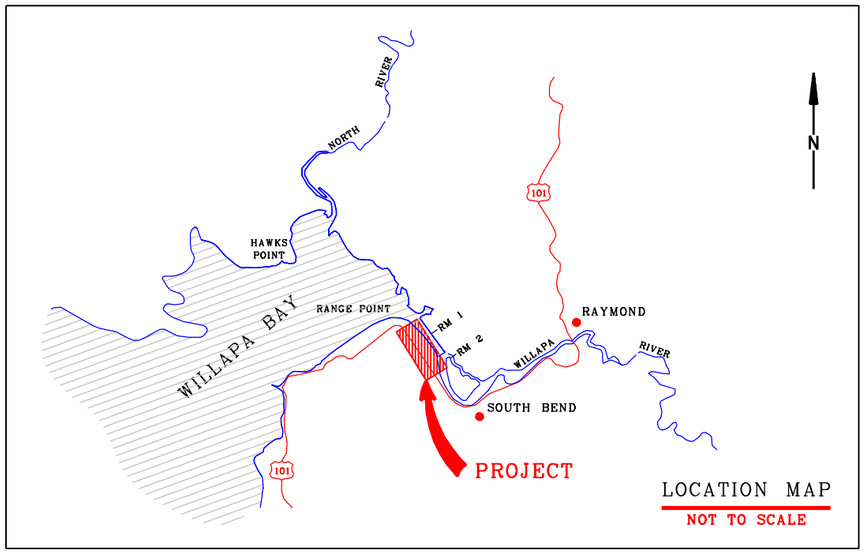
SECTION 1135

US ARMY CORPS
OF ENGINEERS
SEATTLE DISTRICT

PACIFIC COUNTY, WASHINGTON



VICINITY MAP
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

SHEET	PLATE	DESCRIPTION
1	T1	TITLE SHEET
2	B1	EXISTING AERIAL PLAN VIEW
3	B2	PROPOSED FEATURES PLAN VIEW
4	B3	TYPICAL CROSS SECTIONS & DETAILS
5	-	US 101 TURNOUT PLAN
6	-	FRESHWATER WATERFOWL HABITAT IMPROVEMENTS

SHEET INDEX

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

TETRA TECH INC. ISG
SEATTLE, WASHINGTON

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1	ISSUED FOR PERMIT	8/29/02	IP
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WILLAPA RIVER, SECTION 1135
TITLE SHEET

DESIGNED BY:	DRAWN BY:	DATE:	PLATE:	SHEET:
IP	JN	AUG 2002	T1	1

SCALE: 300' 0 300' 600'

N

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

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WILLAPA RIVER, SECTION 1135
EXISTING AERIAL PLAN VIEW

DESIGNED BY:	DRAWN BY:	DATE:	PLATE:	SHEET:
IP	JN	AUG 2002	B1	2

Figure 3
Historic Tidal Channels
on the Project Site
N
W
E
S
0
400
800
1,200
1,600
Feet
Aerial Photos from WDNR (2000)
Channel #1
Channel #2
Channel #5
Channel #5a
Channel #7
Channel #8

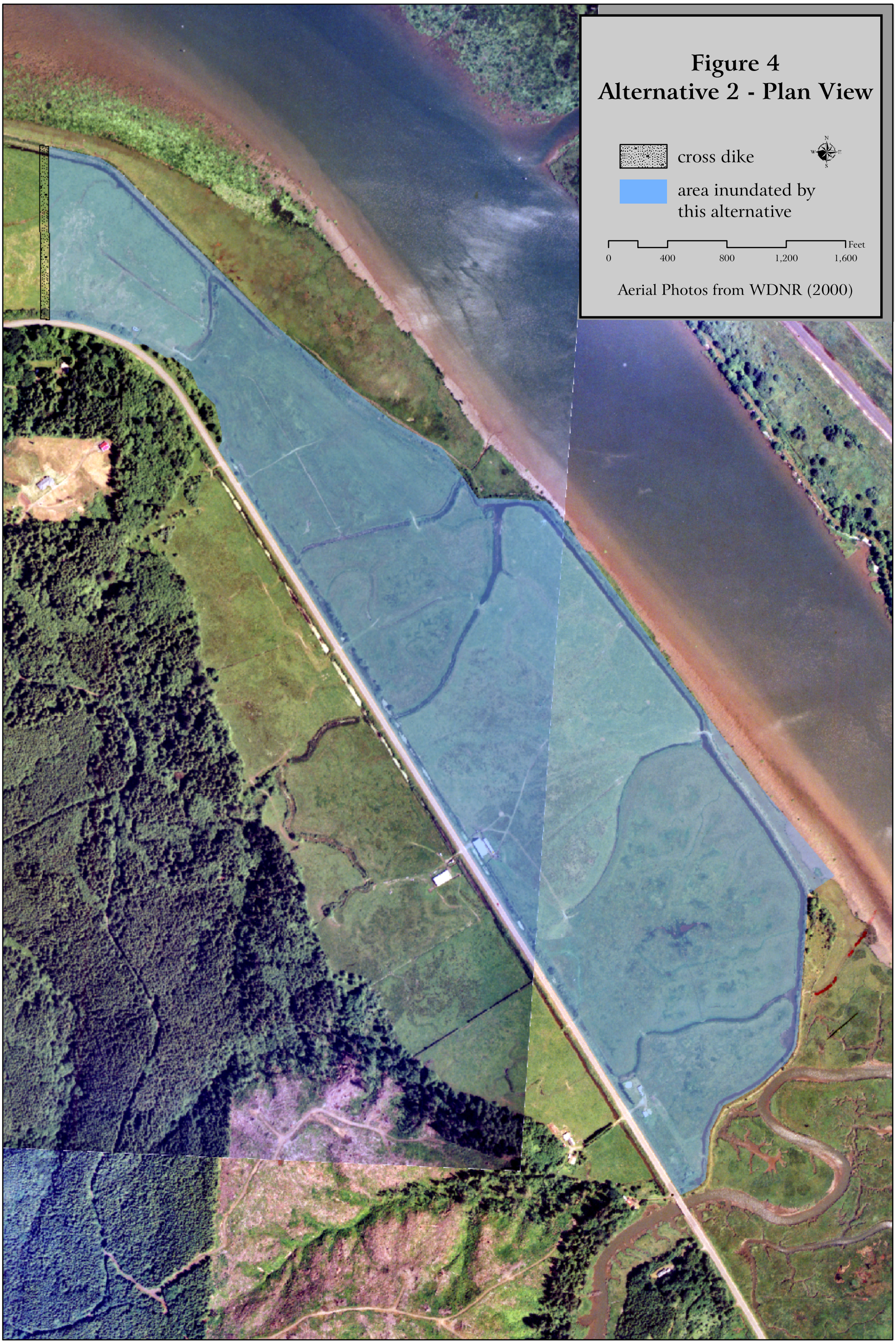


Figure 4
Alternative 2 - Plan View
cross dike
area inundated by
this alternative
N
W
E
S
0
400
800
1,200
1,600
Feet
Aerial Photos from WDNR (2000)

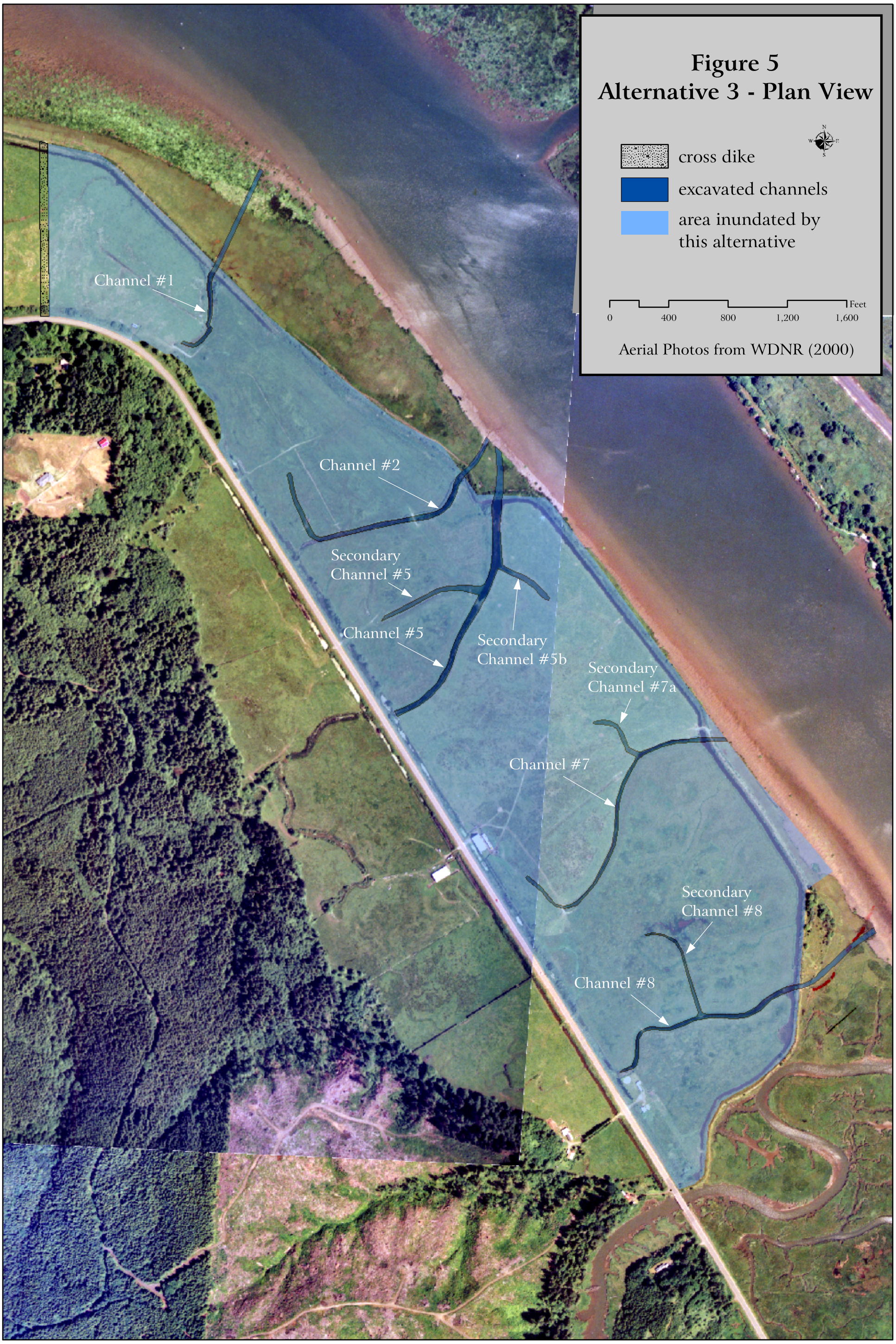


Figure 5
Alternative 3 - Plan View
cross dike
excavated channels
area inundated by this alternative
N
W
E
S
0
400
800
1,200
1,600
Feet
Aerial Photos from WDNR (2000)
Channel #1
Channel #2
Secondary Channel #5
Channel #5
Secondary Channel #5b
Secondary Channel #7a
Channel #7
Secondary Channel #8
Channel #8

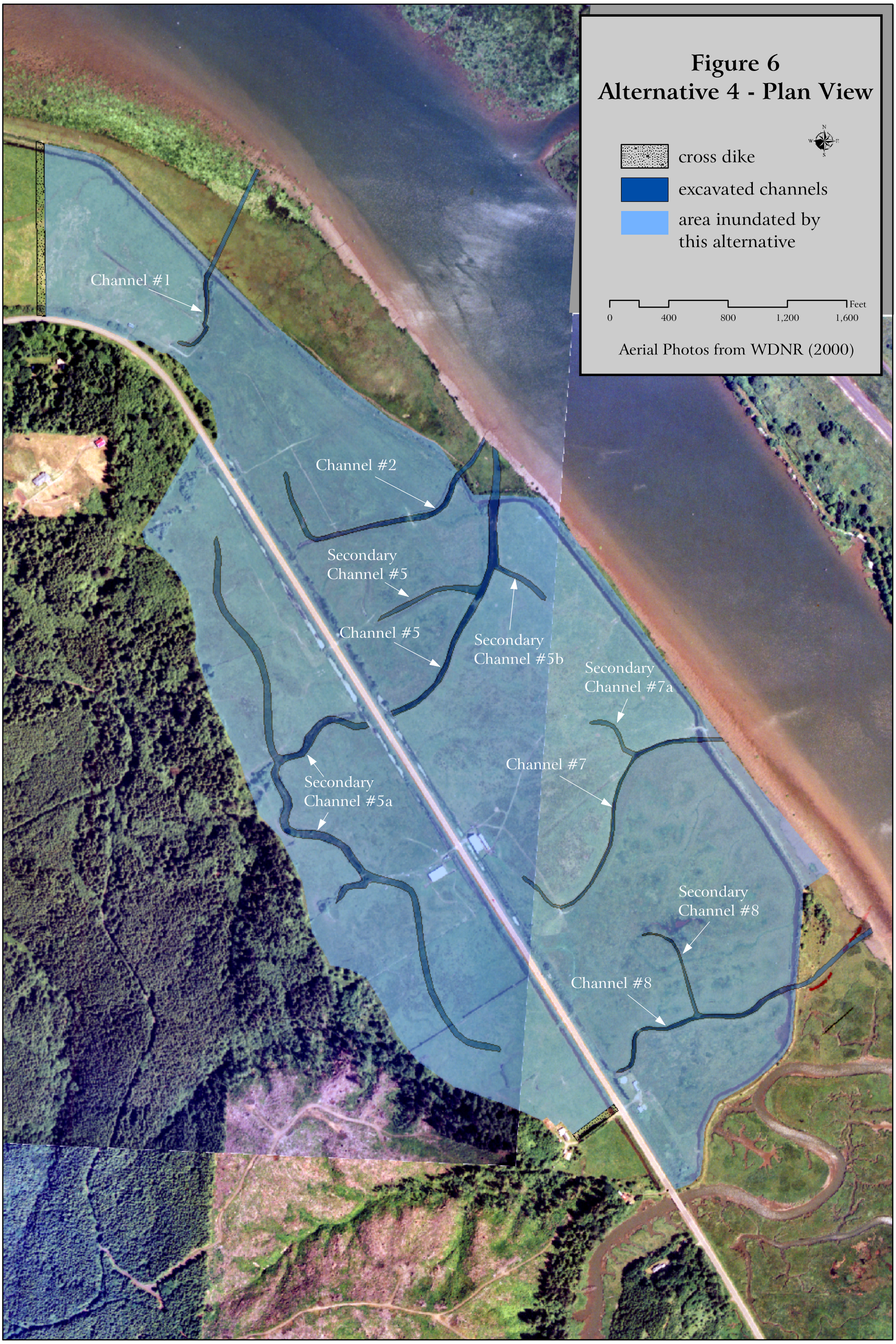


Figure 6
Alternative 4 - Plan View
cross dike
excavated channels
area inundated by this alternative
0
400
800
1,200
1,600
Feet
Aerial Photos from WDNR (2000)
Channel #1
Channel #2
Secondary Channel #5
Channel #5
Secondary Channel #5b
Secondary Channel #7a
Channel #7
Secondary Channel #5a
Secondary Channel #8
Channel #8

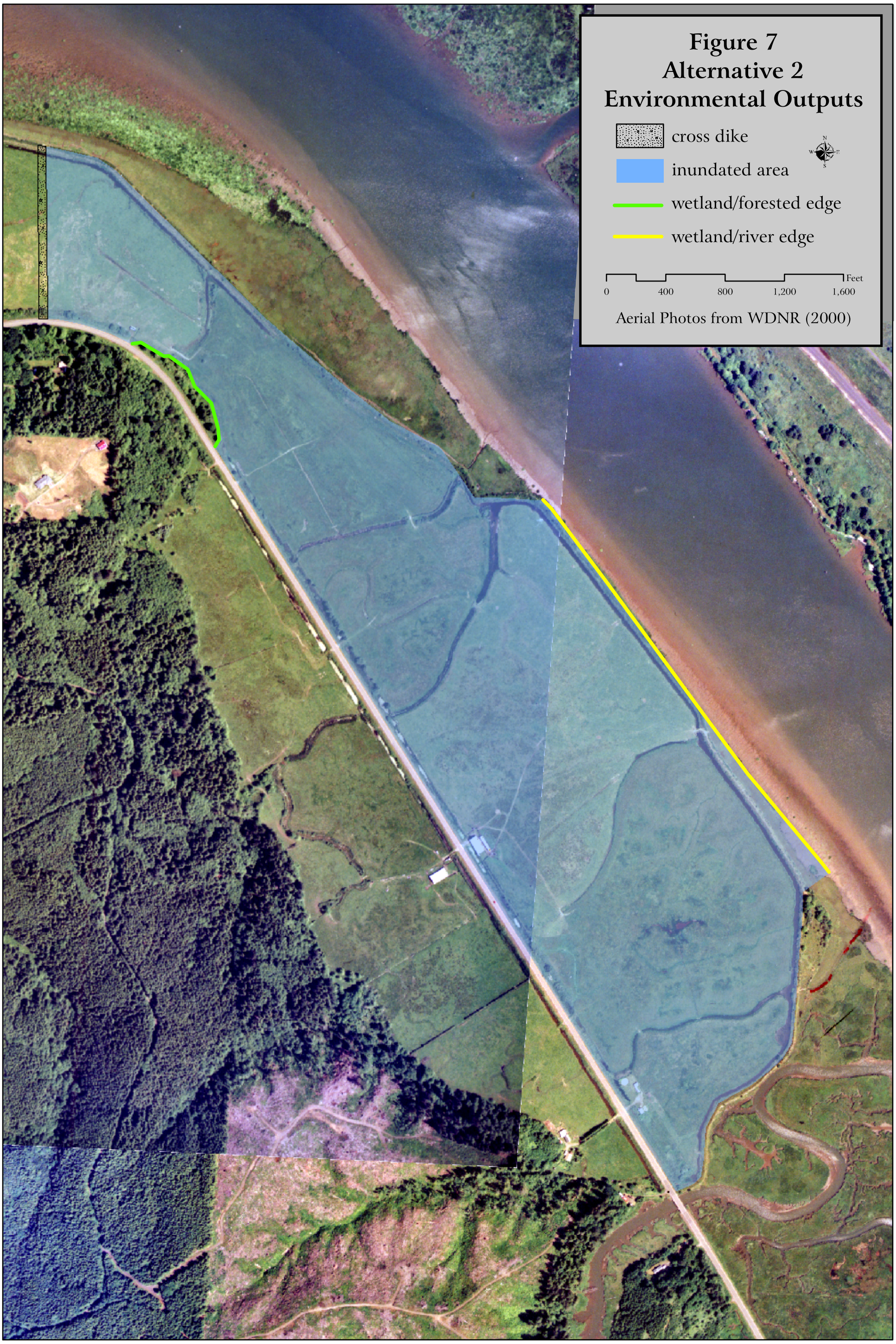


Figure 7
Alternative 2
Environmental Outputs
cross dike
inundated area
wetland/forested edge
wetland/river edge
N
W
E
S
0
400
800
1,200
1,600
Feet
Aerial Photos from WDNR (2000)

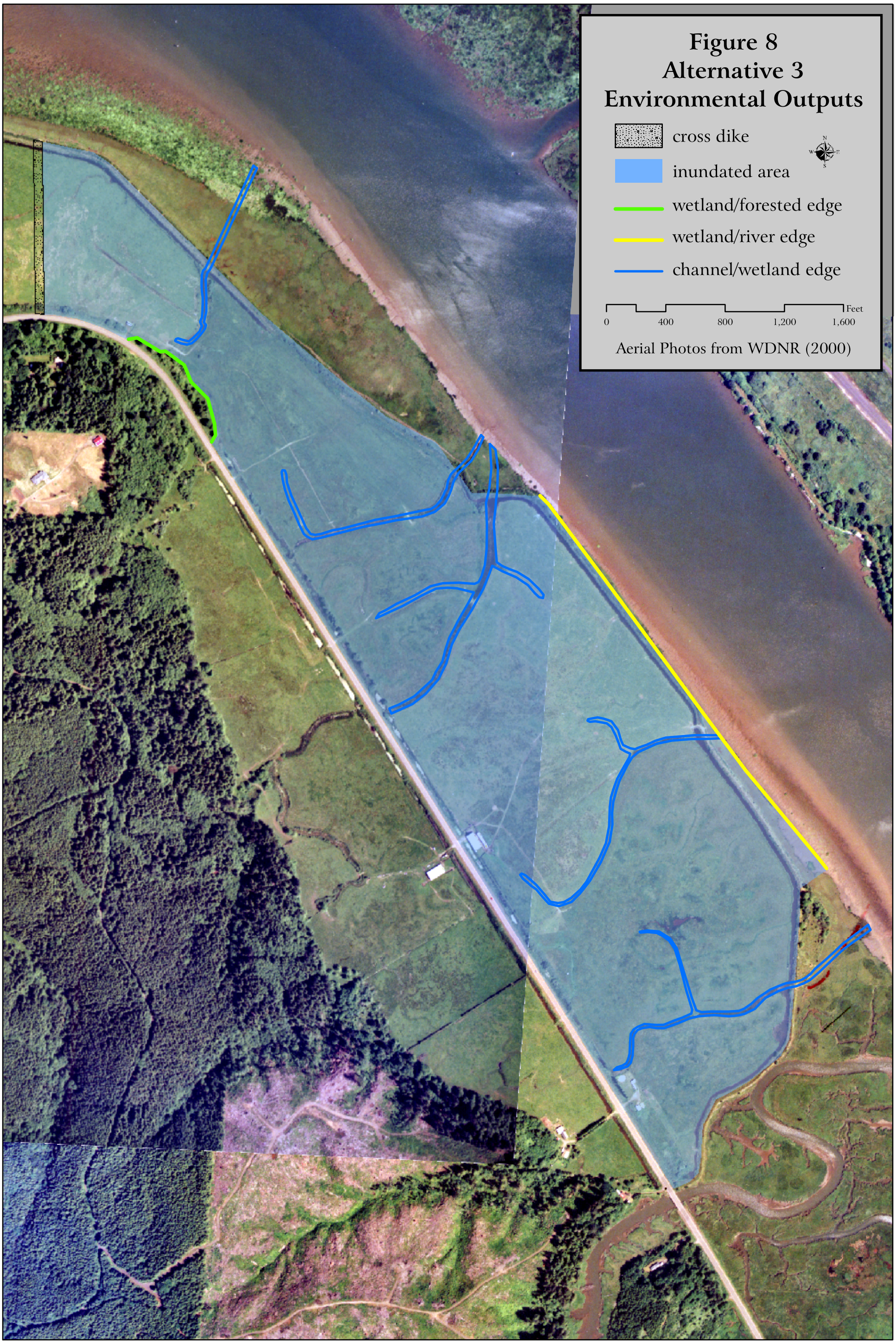


Figure 8
Alternative 3
Environmental Outputs
cross dike
inundated area
wetland/forested edge
wetland/river edge
channel/wetland edge
N
W
E
S
0
400
800
1,200
1,600
Feet
Aerial Photos from WDNR (2000)

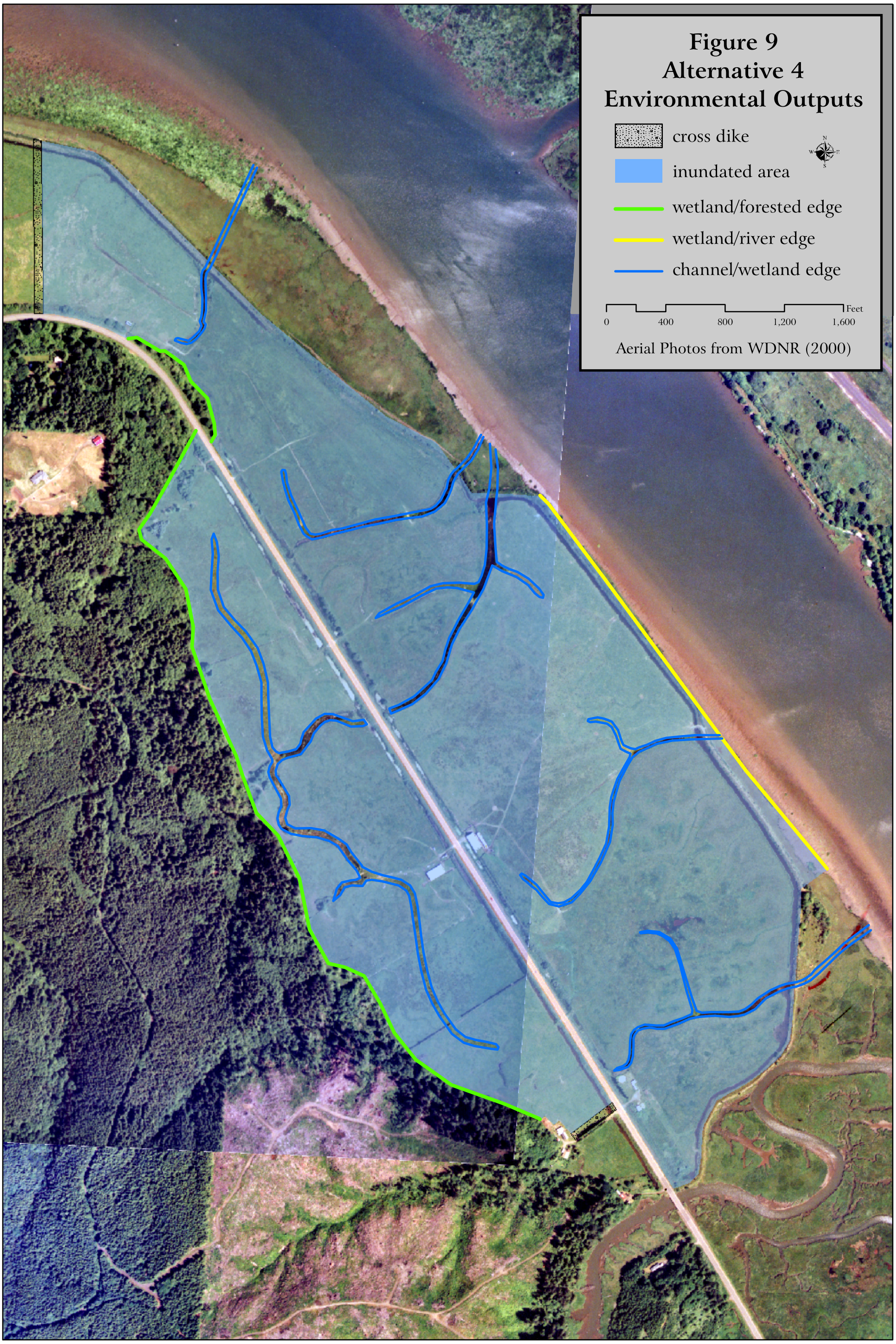
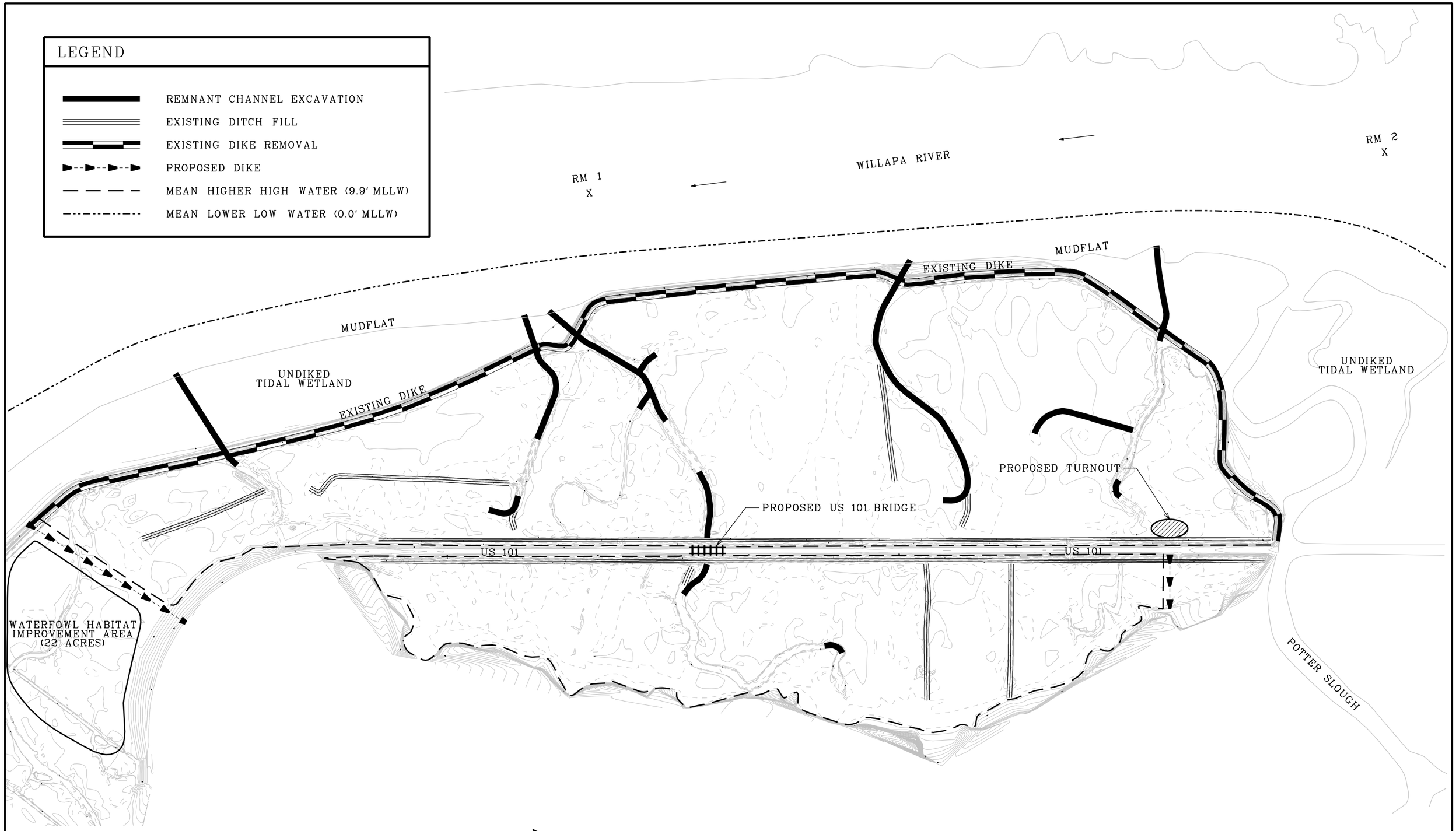


Figure 9
Alternative 4
Environmental Outputs
cross dike
inundated area
wetland/forested edge
wetland/river edge
channel/wetland edge
N
W
E
S
0
400
800
1,200
1,600
Feet
Aerial Photos from WDNR (2000)



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CORPS OF ENGINEERS
SEATTLE, WASHINGTON

TETRA TECH INC. ISG
SEATTLE, WASHINGTON

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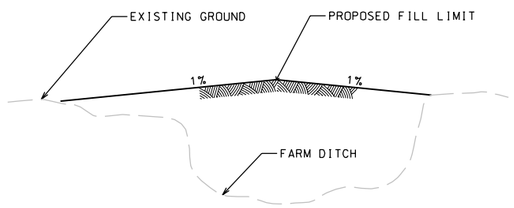
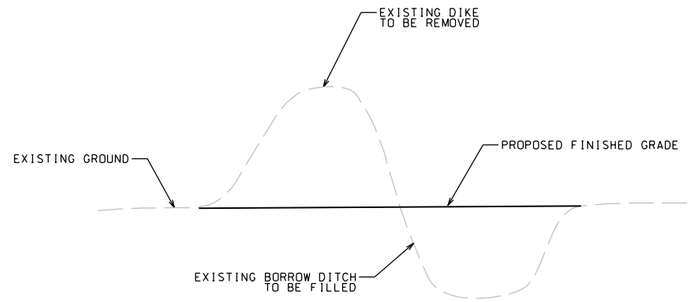
WILLAPA RIVER, SECTION 1135
PROPOSED FEATURES PLAN VIEW

DESIGNED BY:	DRAWN BY:	DATE:	PLATE:	SHEET:
IP	JN	AUG 2002	B2	3



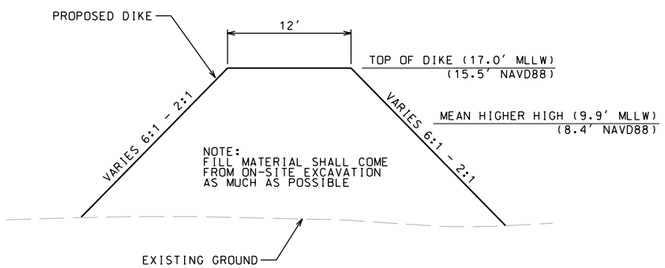
TYPICAL CROSS SECTION
FARM DITCH

NOT TO SCALE



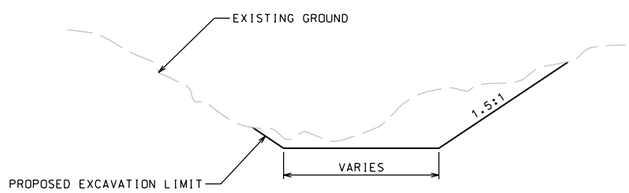
TYPICAL CROSS SECTION
EXISTING DIKE REMOVAL

NOT TO SCALE



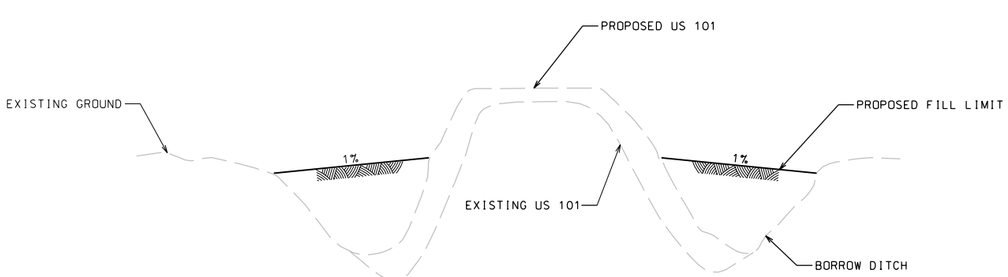
TYPICAL CROSS SECTION
PROPOSED DIKE

NOT TO SCALE



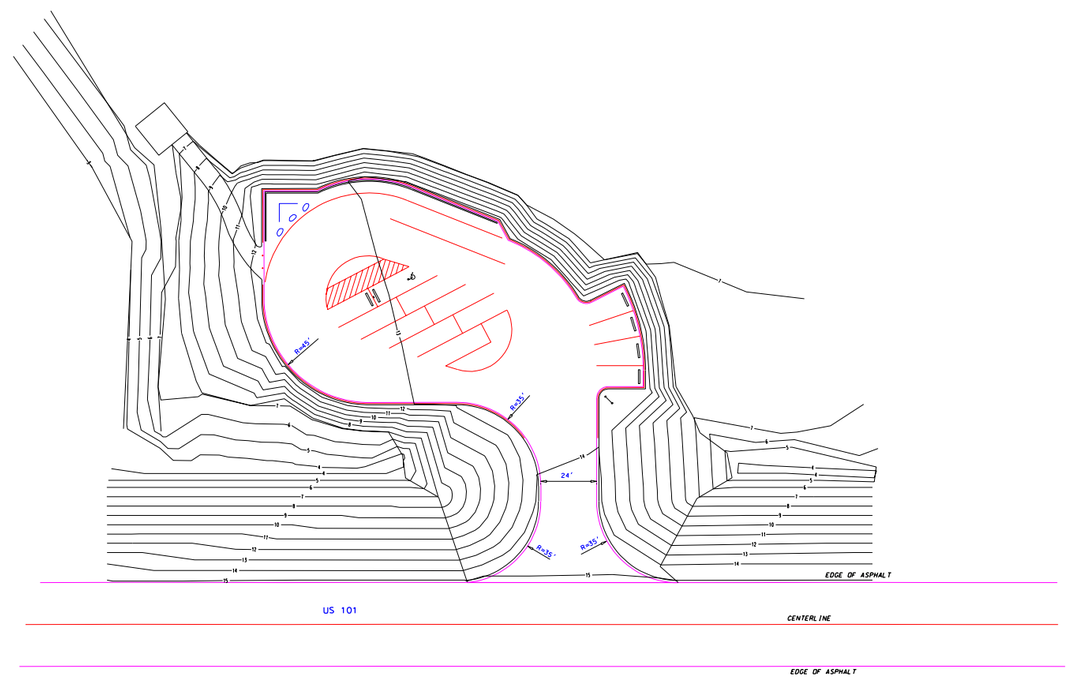
TYPICAL CROSS SECTION
CHANNELS

NOT TO SCALE



TYPICAL CROSS SECTION
BORROW DITCH

NOT TO SCALE



US 101 TURNOUT DETAIL

NOT TO SCALE

U.S. ARMY ENGINEER DISTRCT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

TETRA TECH INC. ISG
SEATTLE, WASHINGTON

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WILLAPA RIVER, SECTION 1135
TYPICAL CROSS SECTIONS & DETAILS

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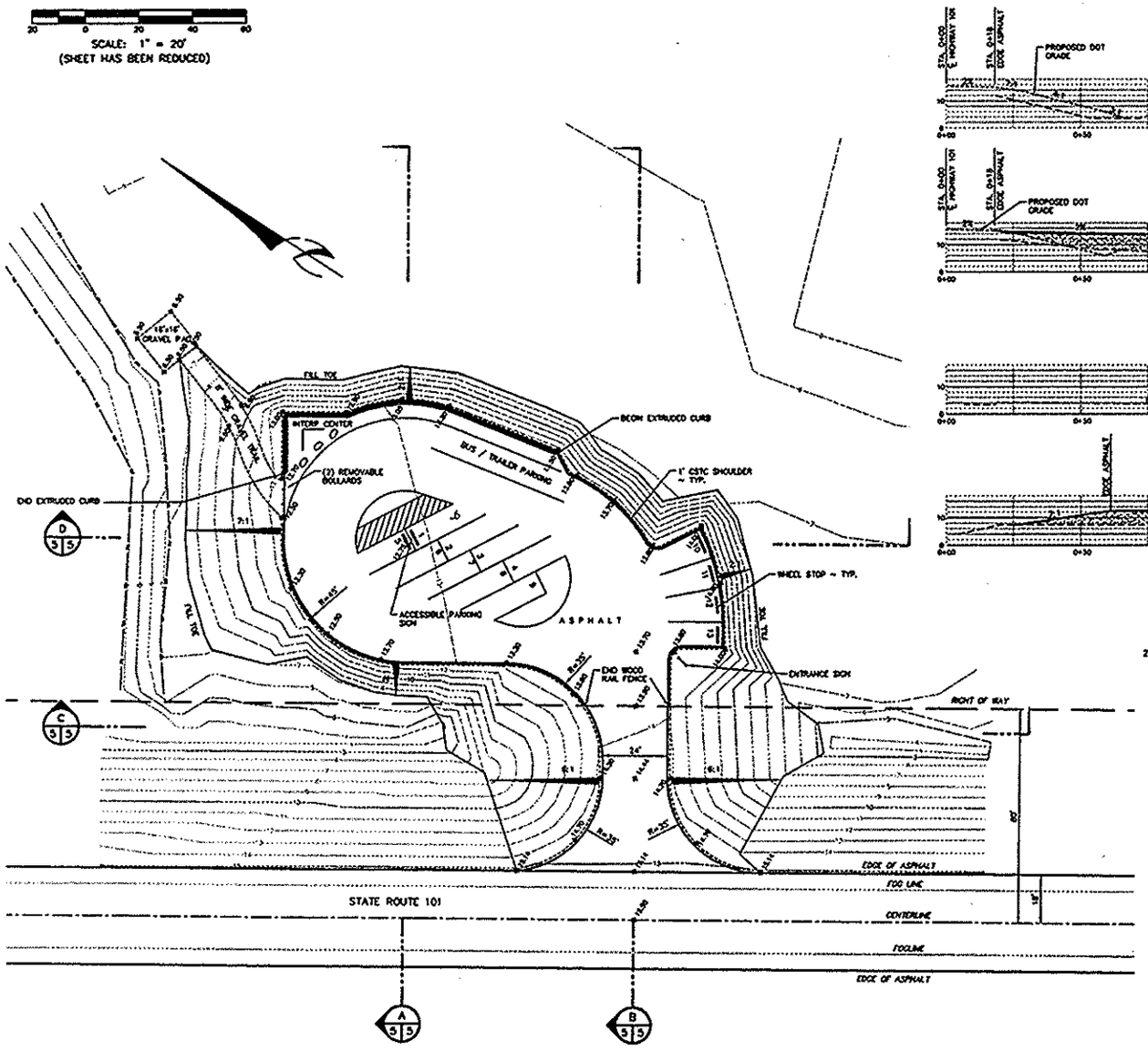
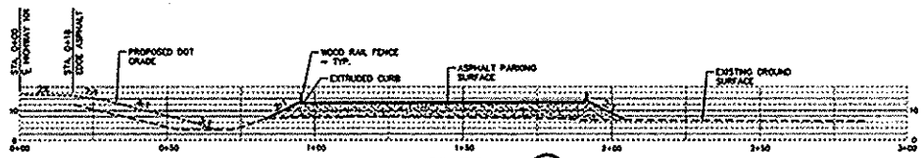
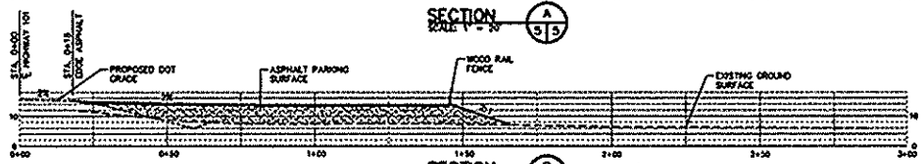
IP	JN	AUG 2002	B3	4

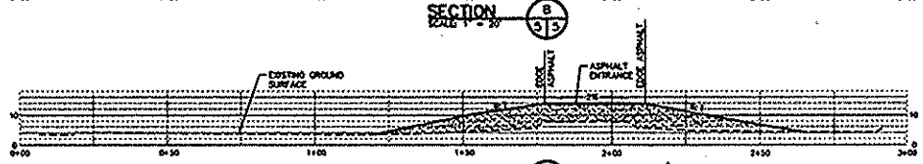




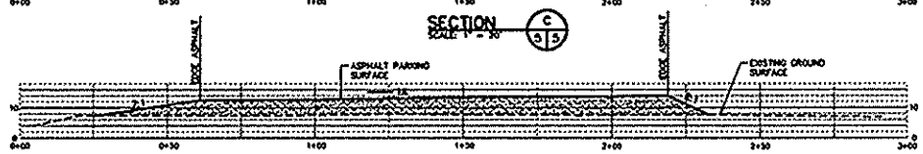
SECTION A 5/5
SCALE 1" = 20'



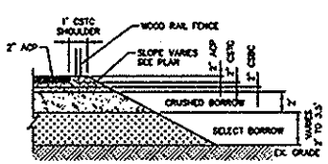
SECTION B 5/5
SCALE 1" = 20'



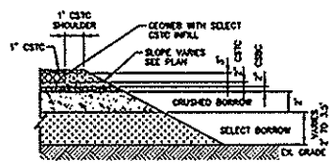
SECTION C 5/5
SCALE 1" = 20'



SECTION D 5/5
SCALE 1" = 20'



TYPICAL PAVEMENT SECTION
SCALE: NONE



TRAIL SECTION
SCALE: NONE

TYPICAL FILL SLOPE
SCALE: NONE

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

SYM	DATE	REVISION DESCRIPTION	BY

APPROVED AND RELEASED FOR CONSTRUCTION
ASST. CHIEF ENGINEER ..... DATE
PROGRAM ..... DATE

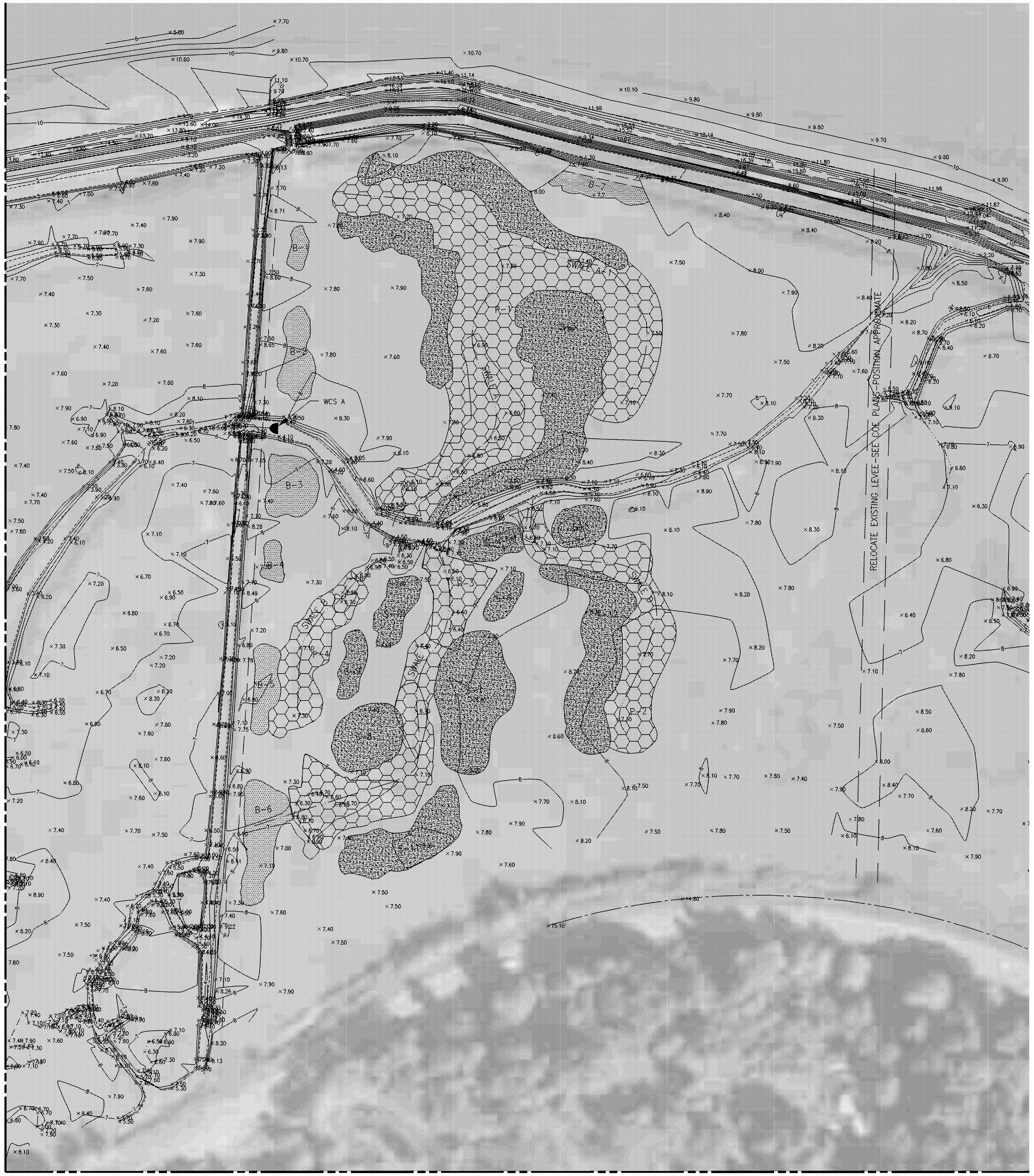
0 ——— 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

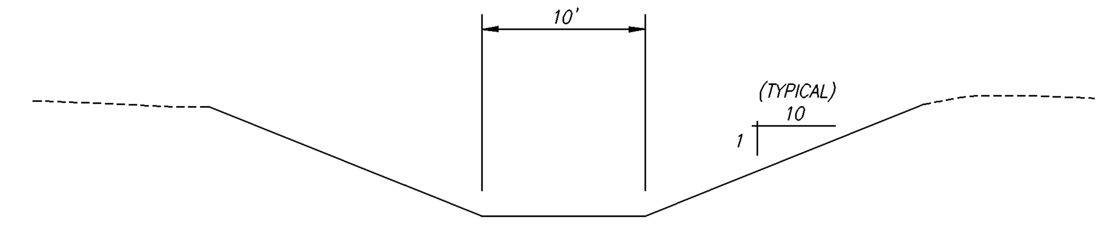
DESIGNED BY K. STOHR
CHECKED BY
DRAWN BY J. HANSEN
DATE 5/16/2001

WILLAPA ACCESS
HIGHWAY 101 TURNOUT
SITE PLAN

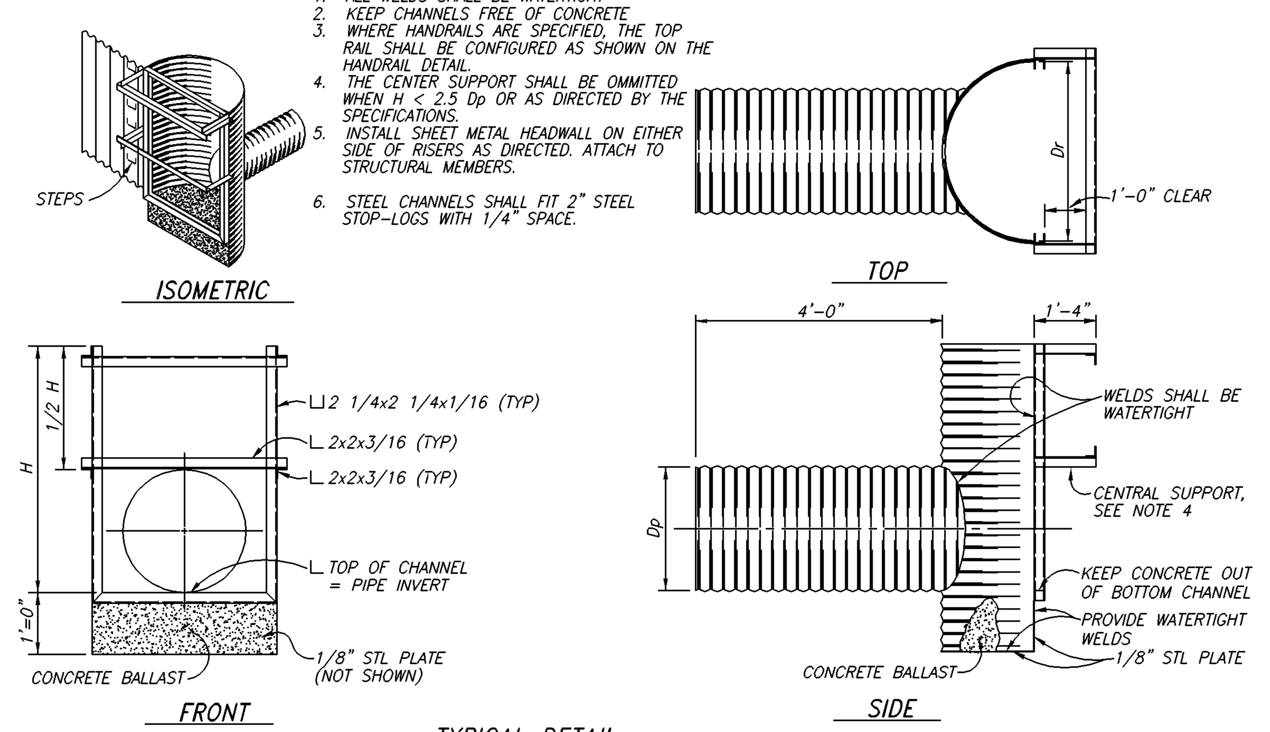
PROJECT NO.

SHEET 5 OF 6





1 TYPICAL SWALE
REF: LEVTYP.DWG NOT TO SCALE



NOTES:
1. ALL WELDS SHALL BE WATERTIGHT
2. KEEP CHANNELS FREE OF CONCRETE
3. WHERE HANDRAILS ARE SPECIFIED, THE TOP RAIL SHALL BE CONFIGURED AS SHOWN ON THE HANDRAIL DETAIL.
4. THE CENTER SUPPORT SHALL BE OMMITTED WHEN H < 2.5 Dp OR AS DIRECTED BY THE SPECIFICATIONS.
5. INSTALL SHEET METAL HEADWALL ON EITHER SIDE OF RISERS AS DIRECTED. ATTACH TO STRUCTURAL MEMBERS.
6. STEEL CHANNELS SHALL FIT 2" STEEL STOP-LOGS WITH 1/4" SPACE.

2 TYPICAL DETAIL
CMP HALF ROUND RISER
REF: HRNDCMP1.DWG NOT TO SCALE

LEGEND

SOD SPOILS AREA + 18"(MAX)

EMBANKMENT BORROW AREA

SOD REMOVAL / SWALE ENHANCEMENT-CUT 1'

PROPOSED LEVEE

SWALE CENTERLINE

N

BAR SCALE
0 100 200 300
SCALE: 1"=100'

UNAUTHORIZED CHANGES & USES
THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

REVISIONS			
REV. NO.	DESCRIPTION	DATE	APPROVED
5			
4			
3			
2			
1			

DUCKS UNLIMITED INC.
WESTERN REGIONAL OFFICE

PROJECT NO. WA-44-45
WILLAPA RIVER WRP
OLSEN UNIT

DESIGNED BY:	JDA
DRAWN BY:	DMC
SURVEYED BY:	DU/PS
CHECKED BY:	

DATE: 8/13/02 | SHEET NO. 6 OF 6 | APPROVED BY: | APPROVED BY:

Appendix B.

Engineering Report and Cost Estimate

Appendix C.

Environmental Outputs of the Restoration Alternatives

APPENDIX C
Environmental Outputs of the Restoration Measures

The environmental outputs—area inundated and total edge—for each restoration measure identified in Section 6.2 were calculated using FRAGSATS, a computer program for spatial pattern analysis. The rationale for using these metrics to quantify habitat benefits associated with the proposed project is described in Section 6.4.1. FRAGSTATS, developed by researchers at Oregon State University,[6] utilizes a GIS database to calculate several habitat metrics which characterize aspects of the landscape, including total edge.

The FRAGSTATS analysis of the project alternatives was conducted by a Seattle District GIS analyst, is described below.

Data sources:

- Grading Design Plan from Tetra Tech (dated November 2001)
- 2 Washington Department of Natural Resources aerial photos of the project area
- 1 Seattle District aerial photo (2000 flyover)

Procedural steps:

1. Aerial photos were scanned and georeferenced in ArcMap 8.2 by registering them to USGS quads in state plane coordinates, south zone, NAD 27.
2. Channel measure s were digitized (heads-up) as graphics using an aerial photo marked up with channel numbers and the grading plan CADD drawings as guides.
3. The CADD drawings were not georeferenced, but did have the same dimensional units (feet) as the georeferenced aerial photos. This, therefore, made it possible to move the graphics created in step 2 so that they coincided with remnant channels evident in the photos.
4. The shape of the digitized channels were modified to better match the remnant channels in the photos.
5. The graphics showing the channels were then converted to a shape file named "all_channels_line".
6. A shape file named "fs_boundary_line" was created to model the current condition, without channels. This shape file included the Fragstats analysis boundary as well as the boundaries between different land cover types.
7. The channels from "all_channels_line" were added one-by-one to form Measures 2 through 7 (named alt2_raw.shp, alt3_raw.shp, etc). These shape files were converted to ArcInfo line coverages and cleaned to form polygon coverages (named alt2_poly, alt3_poly, etc.). Measure 1 was treated similarly, except that no channels were added.

[6] K. McGarigal and B.J. Marks, Forest Science Department, Oregon State University (1994).

8. The ID field (e.g. alt1_poly_ID) was used to differentiate among landcover types for each alternative. Each polygon was assigned an ID using the following coding convention:

    1 = tidal channel
    2 = new tidal wetland created by the proposed project alternative
    3 = other (including upland, existing Spartina marsh, proposed levee footprints)
    4 = Willapa River
    5 = hill slope forested buffer
    6 = US 101

9. Each measure was dissolved in ArcInfo on the ID field, thereby eliminating any lines dividing polygons with the same ID. This is a prerequisite for running Fragstats. Resulting polygon coverages were named alt1_poly_d, alt2_poly_d, etc.

10. Fragstats analyses were run with the following steps/options:

    - Type "fragstats" at arc prompt
    - Select the workspace where the coverages exist
    - Select Fragstats|Wizard from the menu
    - Select the coverage of interest and its map units (feet)
    - OK
    - Fragstats automatically selected the ID field as the classification field
    - Next
    - Next (there are no background polygons in this case)
    - Select edge-based
    - Select edge weight file (weights_all_alternatives.wt), which were as follows:

        - Channel flowing through new or old wetland = 1
        - New wetland adjacent to the Willapa River = 0.5
        - New wetland adjacent to forested polygon = 0.25
        - All other edges = 0

    - Turn off "Display Maps" to speed up the analysis
    - Select Class and Landscape metrics
    - Provide a name for the fragstats run (e.g. willapa_alt2_12July02)

Outputs for the parameters of interest were summarized in Table 5 below.

Table 5. Environmental Outputs for Restoration Measures

		Area Inundated (acres)	Total Edge (feet)
Measure 1	Dike Removal	249	1,845
Measure 2	Primary Channel #5 Secondary Channels #5 and #5b	0	8,156
Measure 3	Primary Channel #1	0	2,831
Measure 4	Primary Channel #2	0	3,926
Measure 5	Primary Channel #7 Secondary Channel #7a	0	5,095
Measure 6	Primary Channel #8 Secondary Channel #8	0	5,728
Measure 7	US 101 Bridge Secondary Channel #5a	102	12,381
	Total for all Measures:	351 acres	39,962 feet

Appendix D.

Incremental Cost Analysis

Appendix E.

Real Estate

Appendix F.

Draft Fish and Wildlife Coordination Report

Appendix G.

Draft Finding of No Significant Impact

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

CENWS-PM-PL-ER

WILLAPA RIVER SECTION 1135 ESTUARINE HABITAT RESTORATION
PACIFIC COUNTY, WASHINGTON

FINDING OF NO SIGNIFICANT IMPACT

1. Background. During the late 1960s and early 1970s, the US Army Corps of Engineers, Seattle District (Corps) disposed of dredged material in diked intertidal mudflat and wetland habitat adjacent to the Federal Willapa River Navigation Channel. As a result, several hundred acres of productive estuarine habitat were lost. This reduction in the area and diversity of estuarine habitats has impacted Willapa Bay's capacity to support the variety of fish, bird, and shellfish species that were historically abundant.

2. Authority. Section 1135 of the Water Resources Development Act of 1986 (Public Law 99-662, as amended) allows the Corps of Engineers to modify the structure or operation of a Corps project to restore fish and wildlife habitat. The purpose of this habitat restoration project is to partially offset the loss of intertidal estuarine habitat caused by past Corps dredged material disposal practices.

3. Proposed Action. Major elements of the proposed Section 1135 project include: (1) removing approximately 10,000 linear feet of dikes; (2) backfilling the borrow ditches adjacent to the dikes; (3) filling of farm drainage ditches and borrow ditches along US 101; (4) excavation of remnant tidal channels; (5) construction of two cross dikes; (6) construction of a US 01 pull-out; and (7) control of the nuisance marsh grass *Spartina*.

4. Summary of Impacts. Pursuant the National Environmental Policy Act, an Environmental Assessment (EA) has been prepared for the proposed work. This document describes the environmental consequences of the proposed work, which are briefly summarized below.

Potential adverse impacts identified in the Environmental Assessment are associated with the construction phase of the project, so they would be temporary in nature. Over the long term, the effects of the project would be beneficial. Impacts should not be significant either individually or cumulatively. The Corps has partnered with State and Federal agencies to assure careful consideration of fish and wildlife resources. No adverse impacts to threatened or endangered species are anticipated. Impacts of the work on salmonids will be reduced and/or avoided through implementation of timing restrictions.

The proposed work complies with the policies, general conditions, and general activities specified in the Pacific County Shoreline Management Master Plan. A Section 404(b)(1) Evaluation has been prepared, and is included as an appendix to the EA.

A Memorandum of Agreement (MOA) outlining procedures for archaeological monitoring during construction has been negotiated with the State Historic Preservation Officer (SHPO), and the Shoalwater Bay Tribe.

5. Finding. Based on the analysis described above and provided in more detail in the EA, this project is not a major Federal action significantly affecting the quality of the human or natural environment, and therefore does not require preparation of an environmental impact statement.

_____	_____
Date	Ralph H. Graves Colonel, Corps of Engineers District Engineer

Appendix H.

Sponsor Letter of Support and

Draft Project Cooperation Agreement