

HABITAT RESTORATION USING DREDGED MATERIAL PLACEMENT WITHIN THE LOWER COLUMBIA RIVER (LCR) AT WOODLAND ISLANDS, WA

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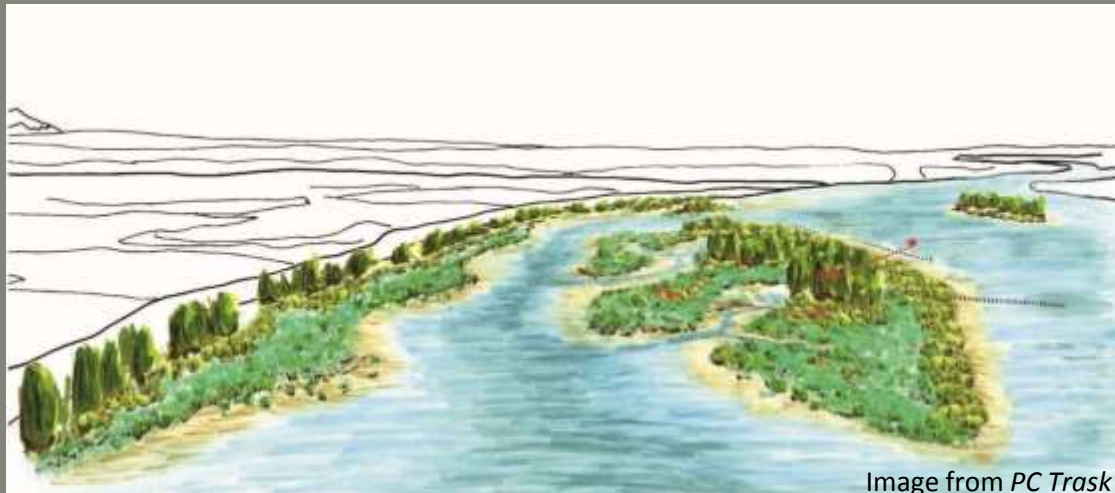


Image from *PC Trask*

US Army Corps of Engineers - Portland District

***PACIFIC CHAPTER - WESTERN DREDGING ASSOCIATION
FALL 2018 CONFERENCE 23-25 October***

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BACKGROUND & MOTIVATION

77% of the intertidal and riparian areas of Columbia River Estuary have been lost from the pre-settlement condition due to: diking, filling, and hydrology modification.

LCR NAVIGATION CHANNEL

Each Year, 6 to 8 million CY of sand is dredged from the LCR deep draft navigation channel (RM 6 to 105).

Distribution of Dredged Material Placement during 2014-2016:

Upland = 12-19% *

Shoreline = 9-14%

Inwater = 69-80 %

* UPLAND placement could increase to 50% (2003 CRCO EIS)

CHALLENGE: Provide Reliable Navigation within the LCR while sustaining.....

- *Sediment Resources*
- *Morphology*
- *Ecology*
- *Fisheries*

SOLUTION = Judicious Placement of Dredged Sediment

...and other river functions that depend on sediment

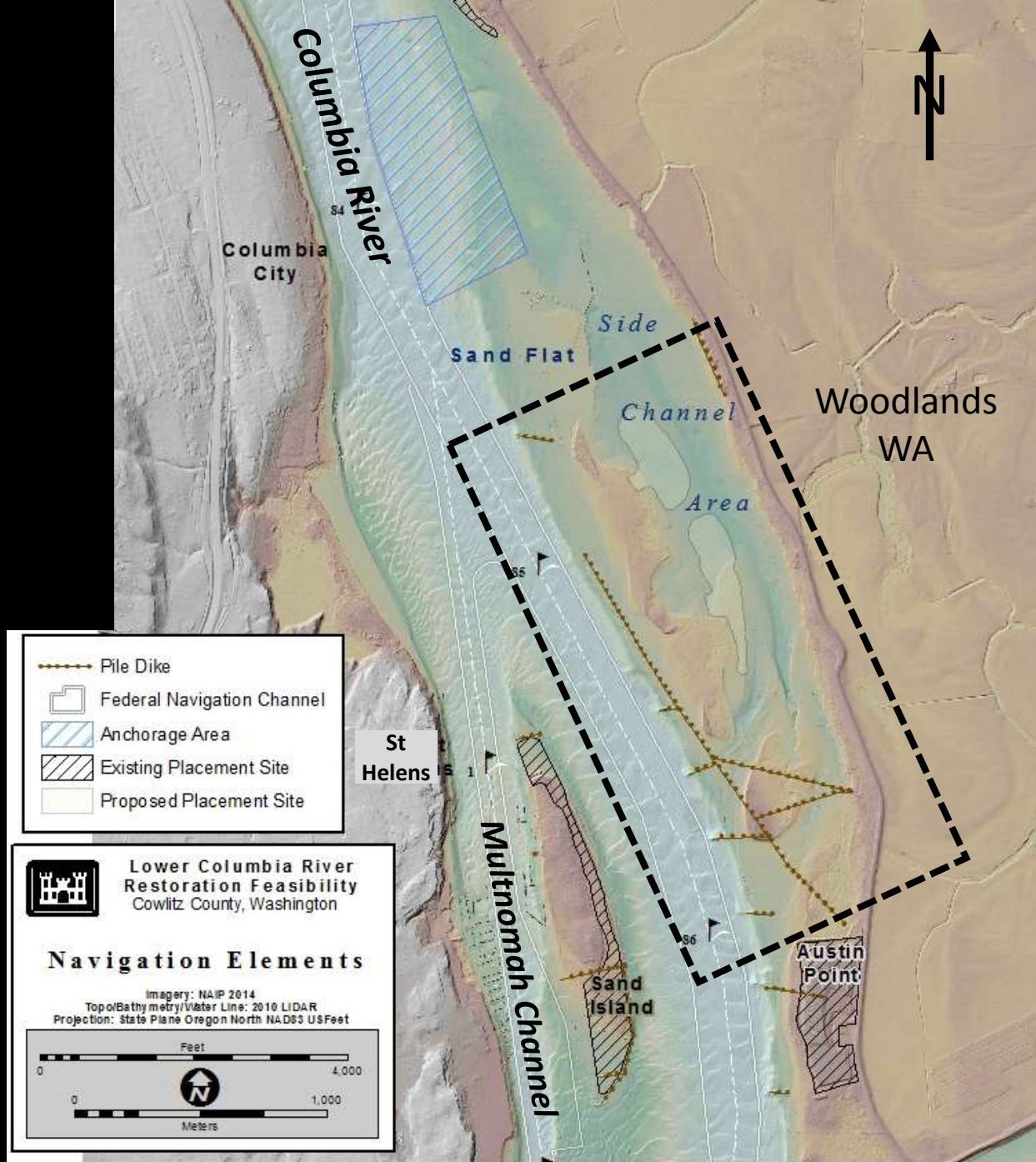
2017/10/26

CONSIDER THE PAST

at

Woodland Islands

CRM 85-86



Woodland Islands WA CRM 85

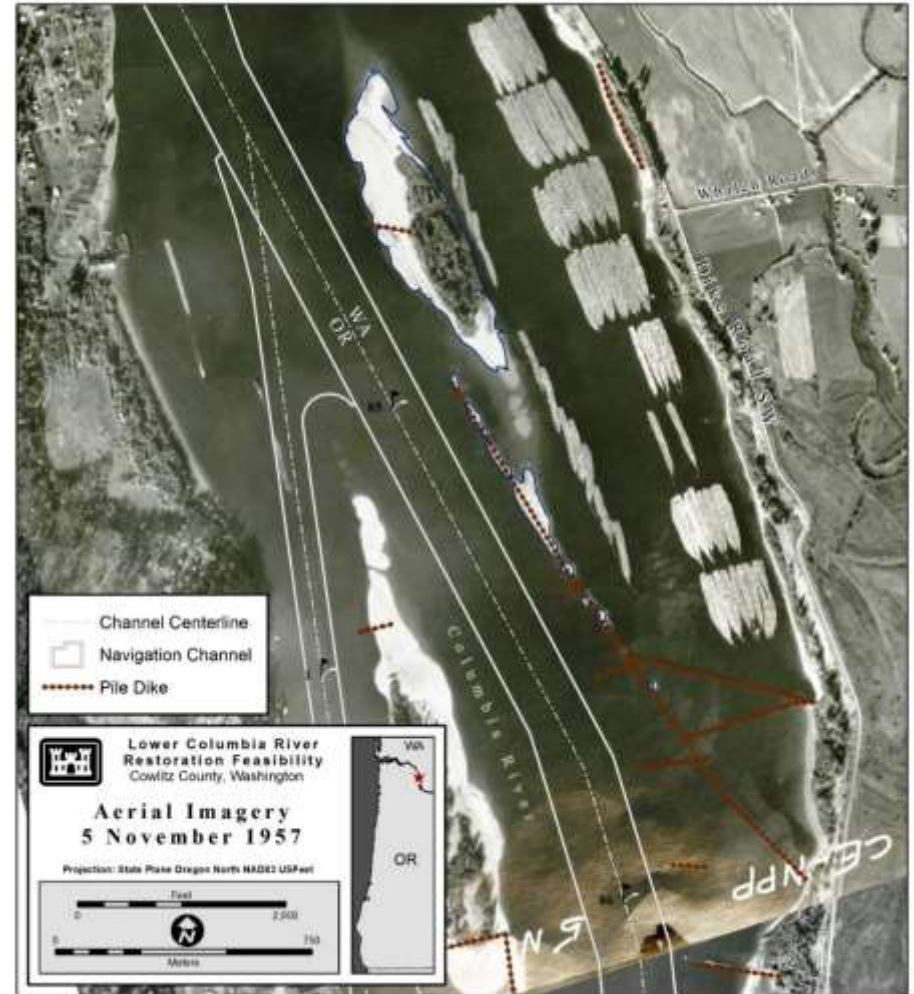
Across river from
St. Helens, OR

An area of continuous
navigation improvement
since 1870s.

Evolution of the Woodland Islands (1929-1957)



Pile Dike Construction



Dredged Material Placement

Evolution of the Woodland Islands (1973-1983)



Dredged Material Placement

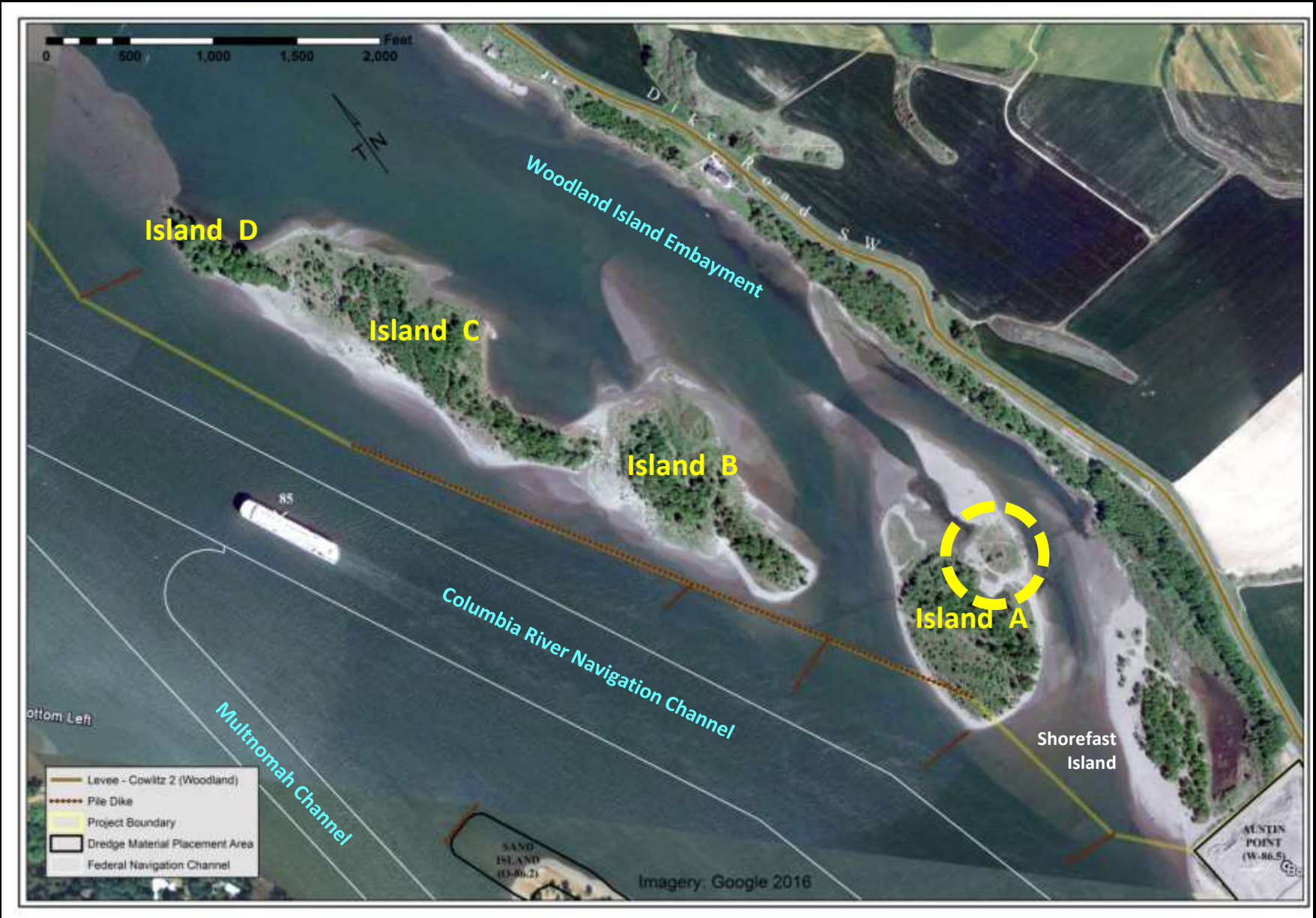


Evolution of Placed Dredged Material

Evolution of the Woodland Islands (1989-2011)



Evolution of Placed Dredged Material



WOODLAND ISLANDS, WA CRM 85 Present Condition

15 APR 2016

Large Cottonwood

Core #4

Button (local prominent topo expression)

Woodland Bay

Tidal slough within Island A

View to North

Core #3



Core #4 near Big Cottonwood tree. Top 6 inches of core was brown loose river overwash sand. Below 6 inches, material is progressively more grey coarse sand (dredged material).

Core #4 – Island A



Core #3 Below first inch, material becomes progressively more brown sand-based. At 24 inches below surface; material is grey coarse sand (dredged material).

Core #3 – Island A

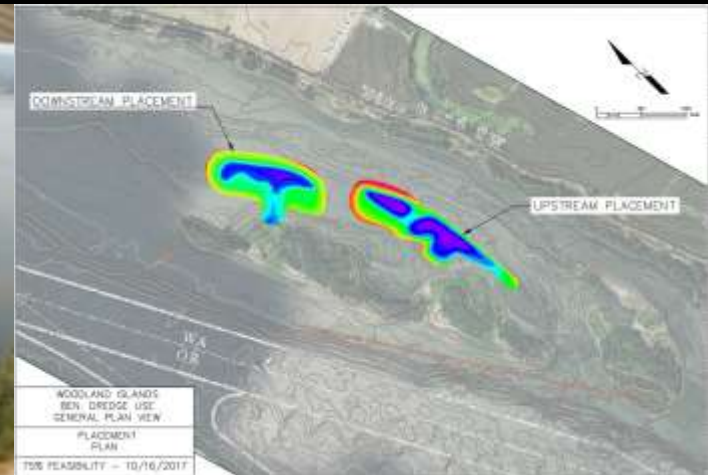
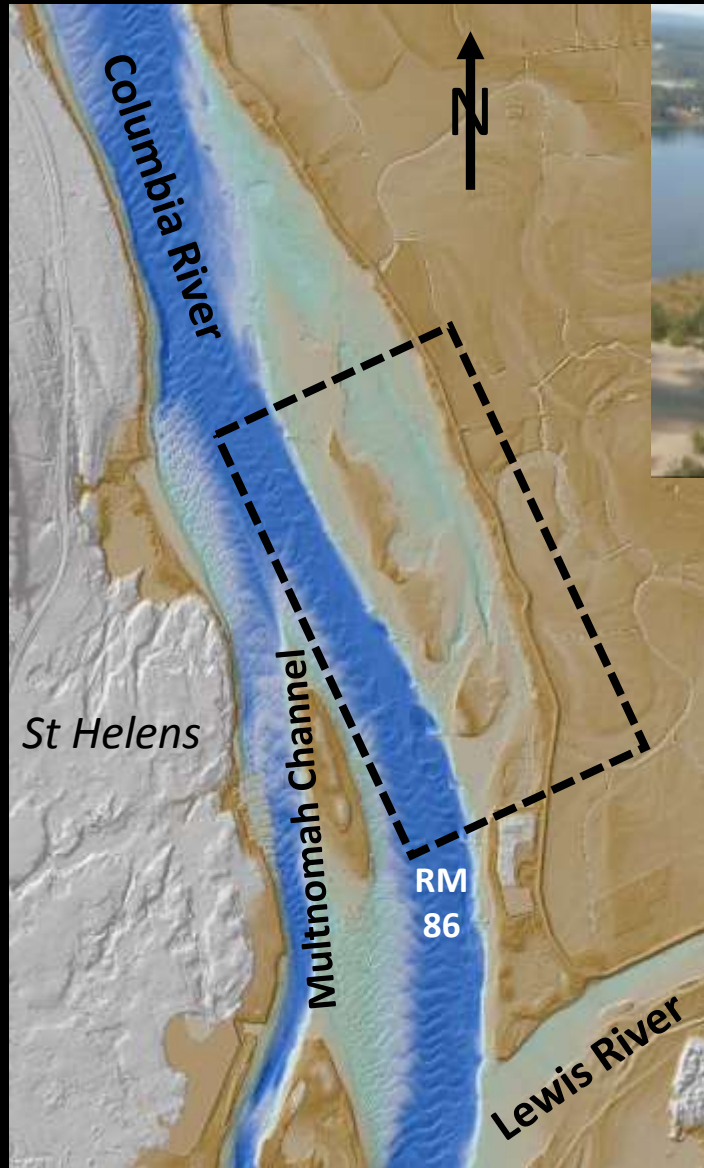


Core #3 taken on "Island A", near tidal slough. Top 1 inch of core was fines-sandy material mix.

View to West

Rising river stage (11 to 12 ft NAVD) was producing inbound flow to island interior.

Proposed Project: Woodland Islands *Habitat Restoration*



- Located near CRM 85 along WA shore
- Proximity to major confluences
- Moderate area for restoration (~30 ac)
- Close to productive shoal
- Relatively protected
 - Existing islands provide shelter from river thalweg
 - Existing pile dike network adds sheltering effect
 - Area is aggrading
- Existing habitats on site demonstrate potential
- Lack of major real estate obstacles

Planning Objectives for the Woodland Islands

Conduct CAP Section 204 study (beneficial use of dredged material). Apply a 50-year planning horizon:

- *Increase habitat for juvenile salmonids at Woodland Islands site*
- *Increase habitat for yellow warblers*
- *Increase flood refugia for juvenile and adult salmon at the Woodland Islands site*
- *Increase floodplain habitat complexity at the Woodland Islands site*
- *Increase the extent of quality riparian habitat at the Woodland Islands site*

Yellow warblers migrate through and nest within the LCR floodplains. Managing yellow warbler habitat to increase the regional population represents a significant habitat restoration objective.

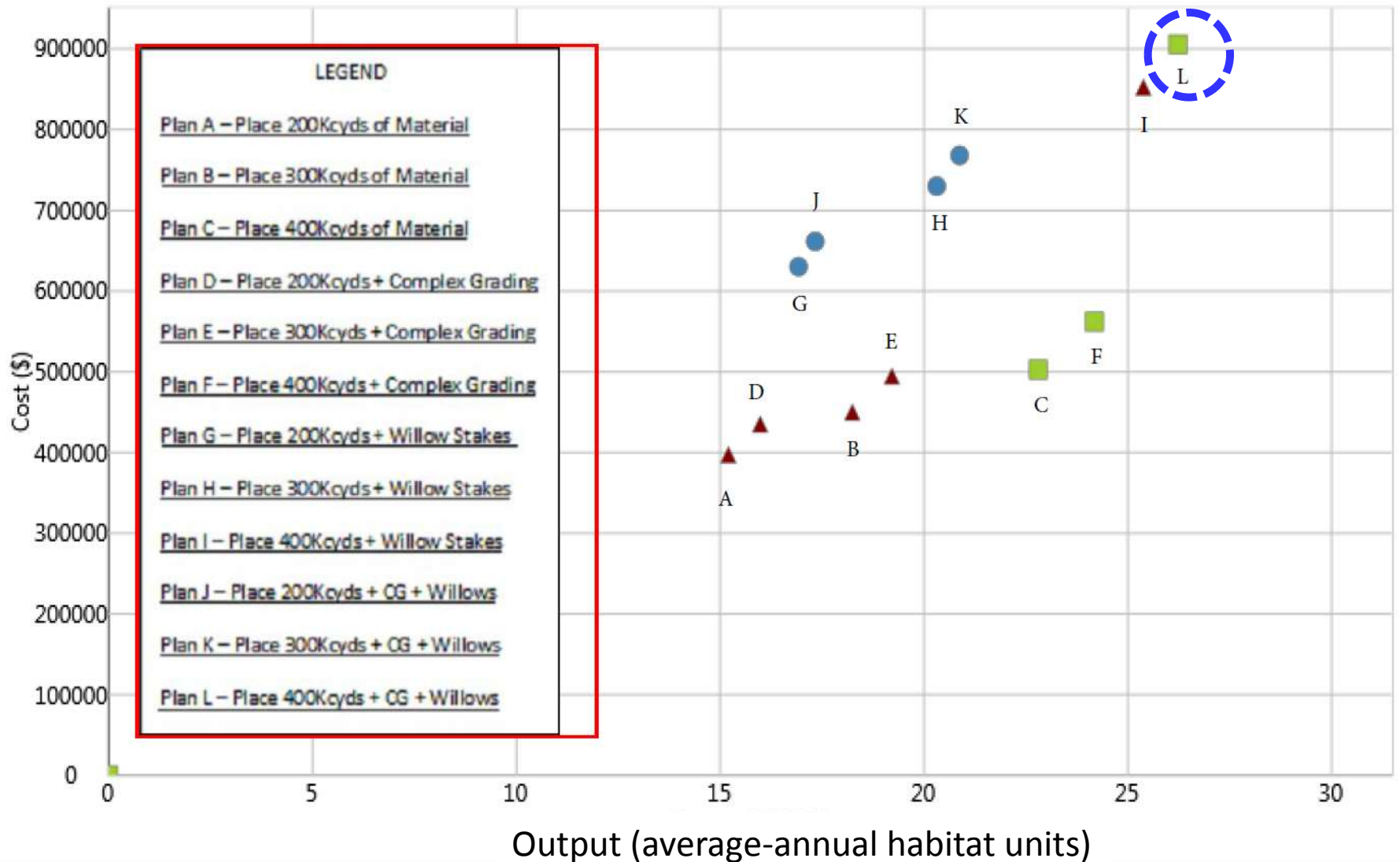
Alternatives Optimized using CE/ICA with HEP = Construct 2 Futures within Woodland Bay using 400,000 cy of sand dredged from St. Helens Bar. Project features will add terrain within elevation zone 0 ft to 14 ft NAVD. Features will be graded and planted.

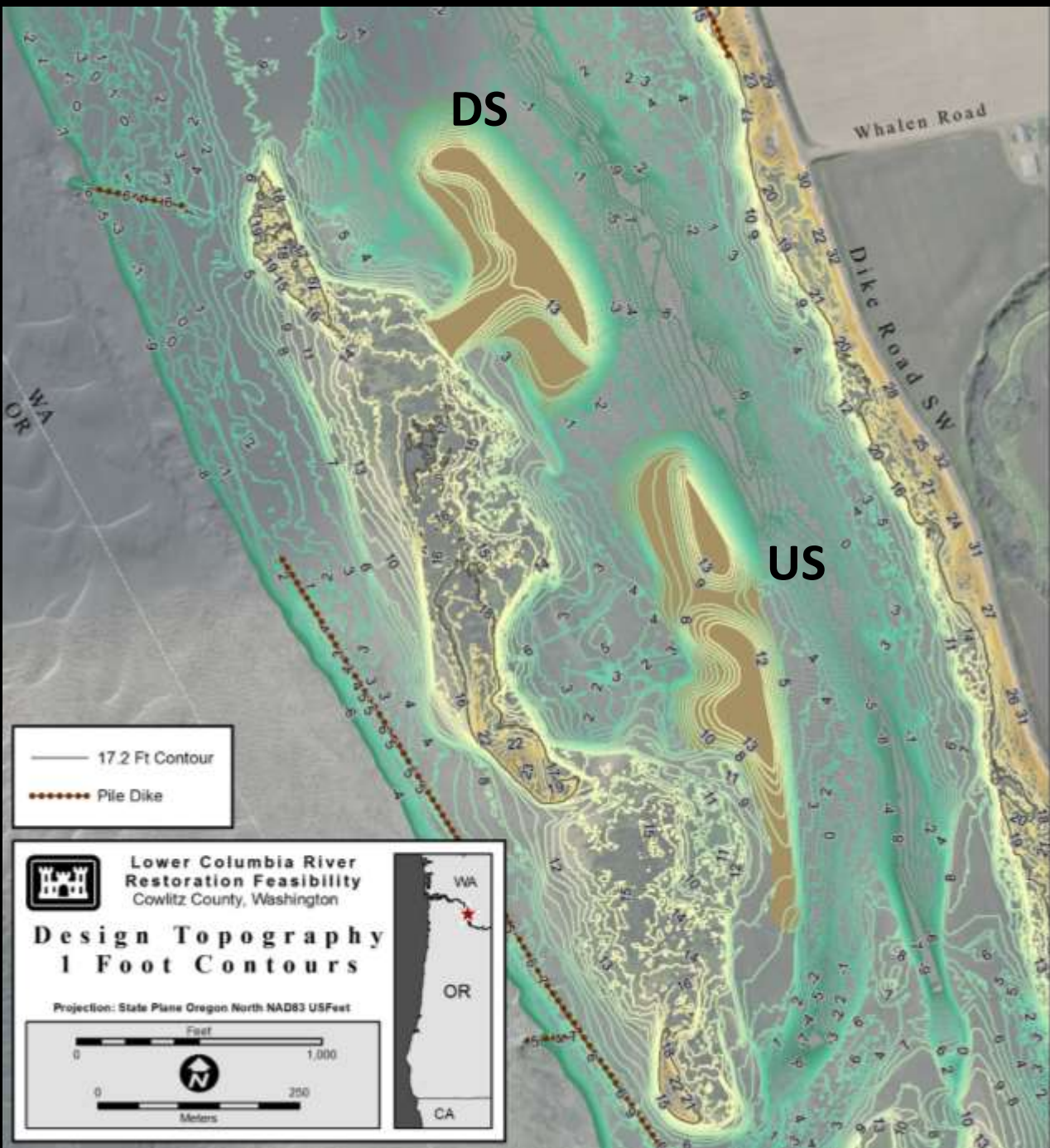
Planning Set 'Woodland Islands Section 204 CE-ICA' Cost and Output

All Plan Alternatives Differentiated by Cost Effectiveness

Cost-Effectiveness / Incremental Cost Analysis *USACE IWR*

- Non Cost Effective
- ▲ Cost Effective
- Best Buy





Alternative L (Preferred)

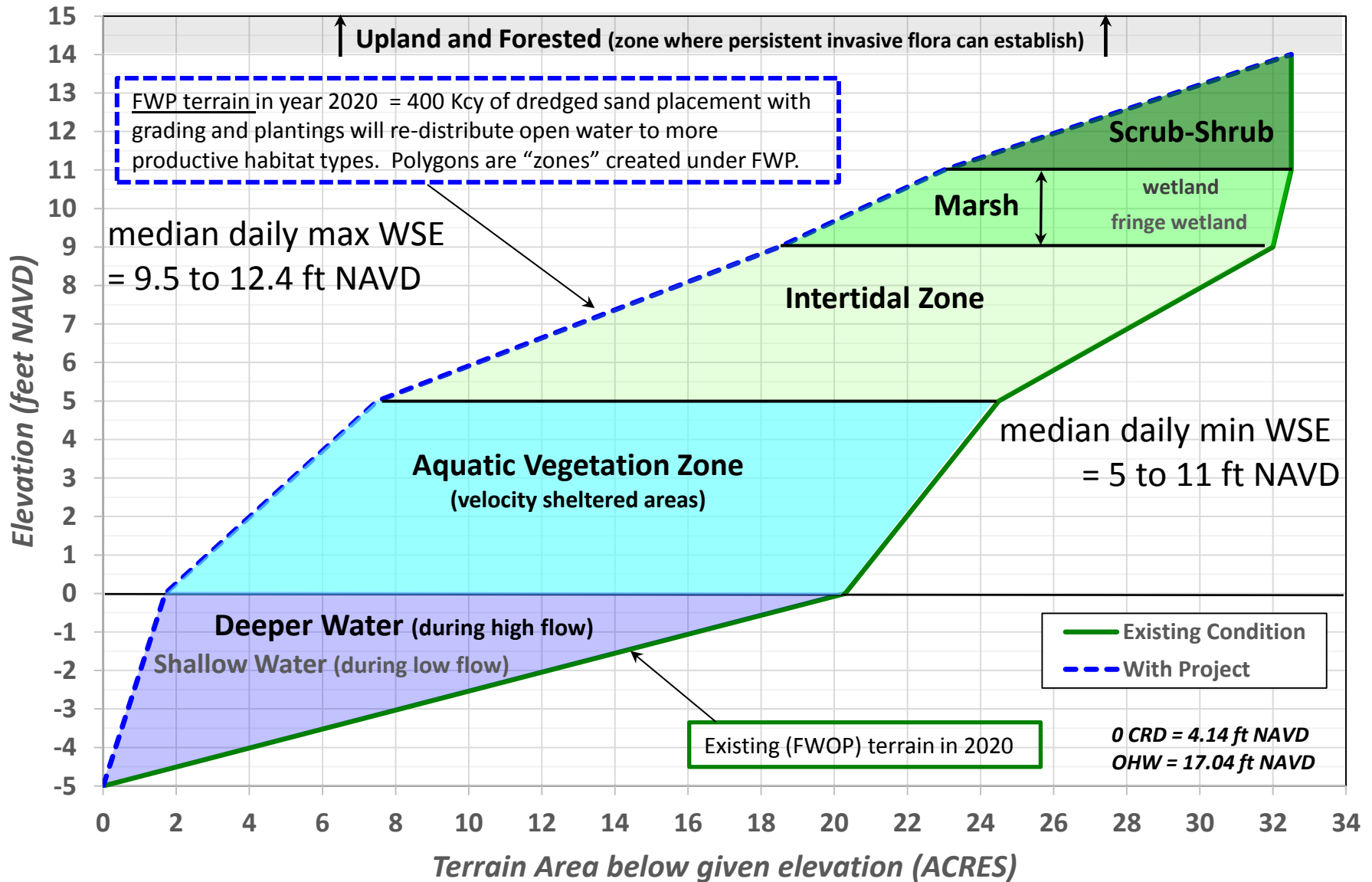
Base Measure:
placement of 400 kcy
dredged material.

Downstream Feature (DS)
= 250 Kcy

Upstream Feature (US)
= 150 Kcy

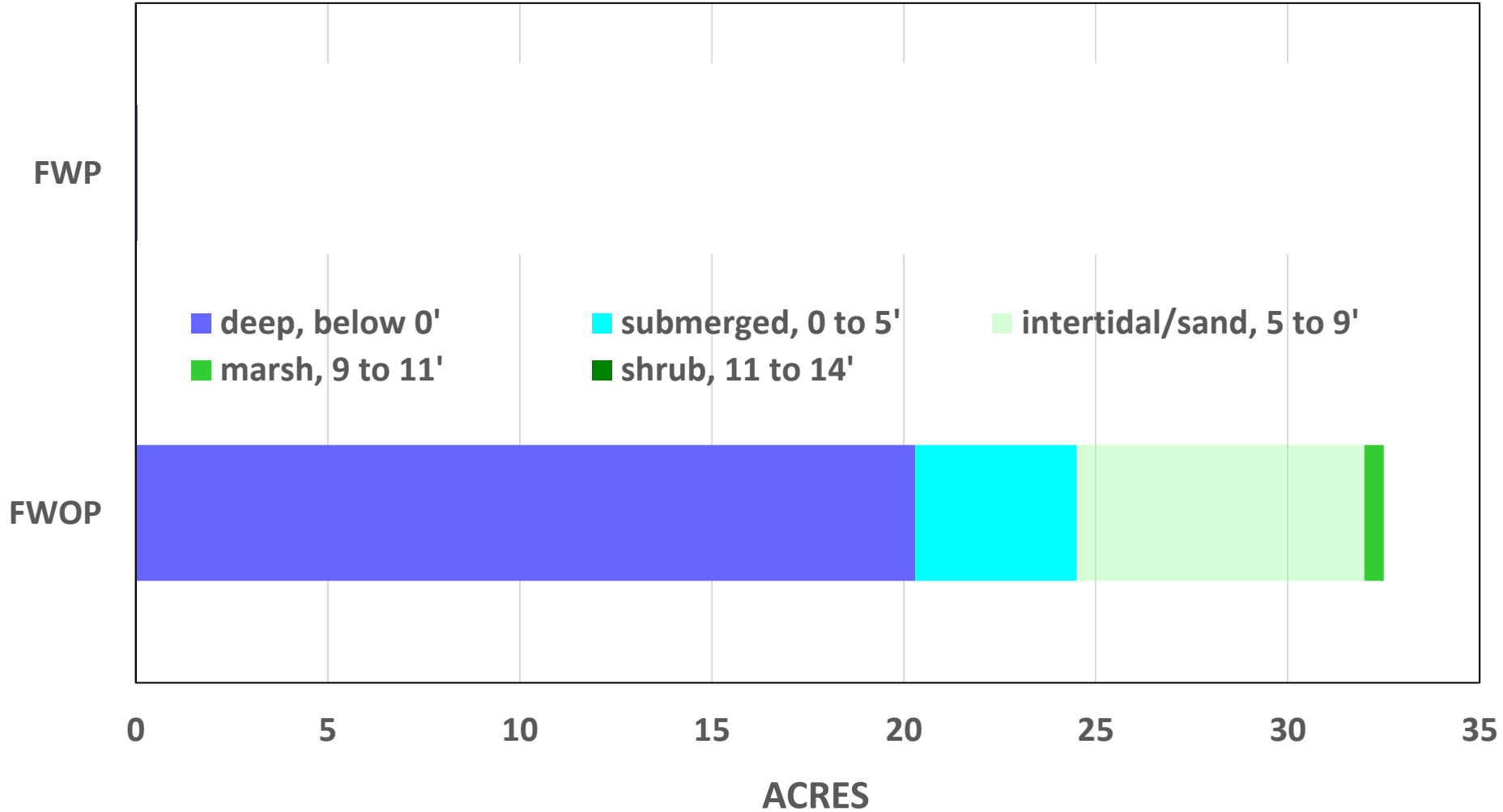
Additional Measures
Implement complex
grading and additional
planting of vegetation.

Terrain Area vs. Elevation for Existing Condition and Proposed Project



Acreage Distribution of Habitat Types: With-Project vs. Existing Condition

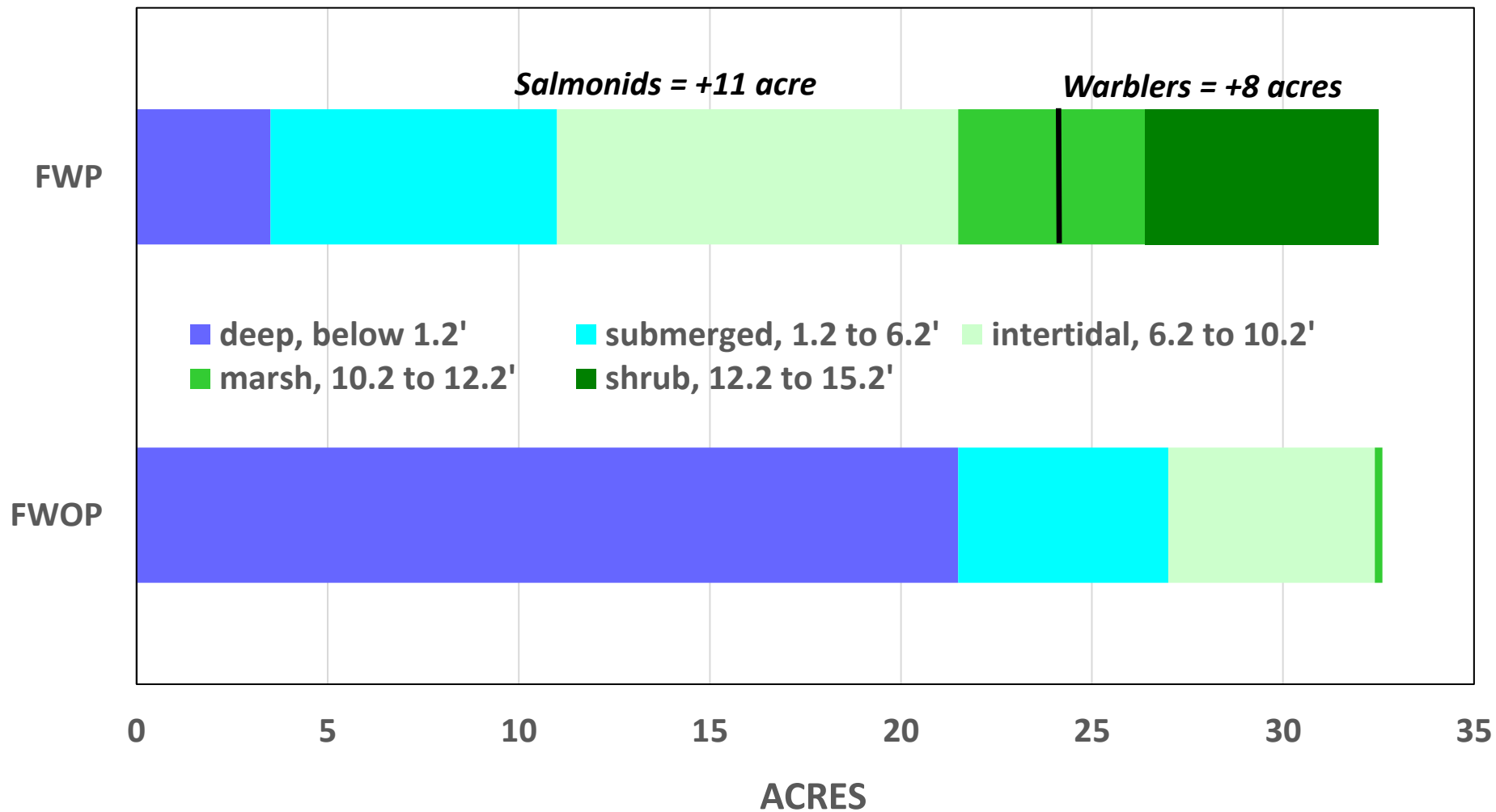
NO Effect of Sea Level Rise or Changed Hydrology



FWOP = future without project, FWP = future with project

Acreage Distribution of Habitat Types: With-Project vs. Existing Condition

2 ft Sea Level Rise at MCR = 1.2 ft Stage Increase at RM 86



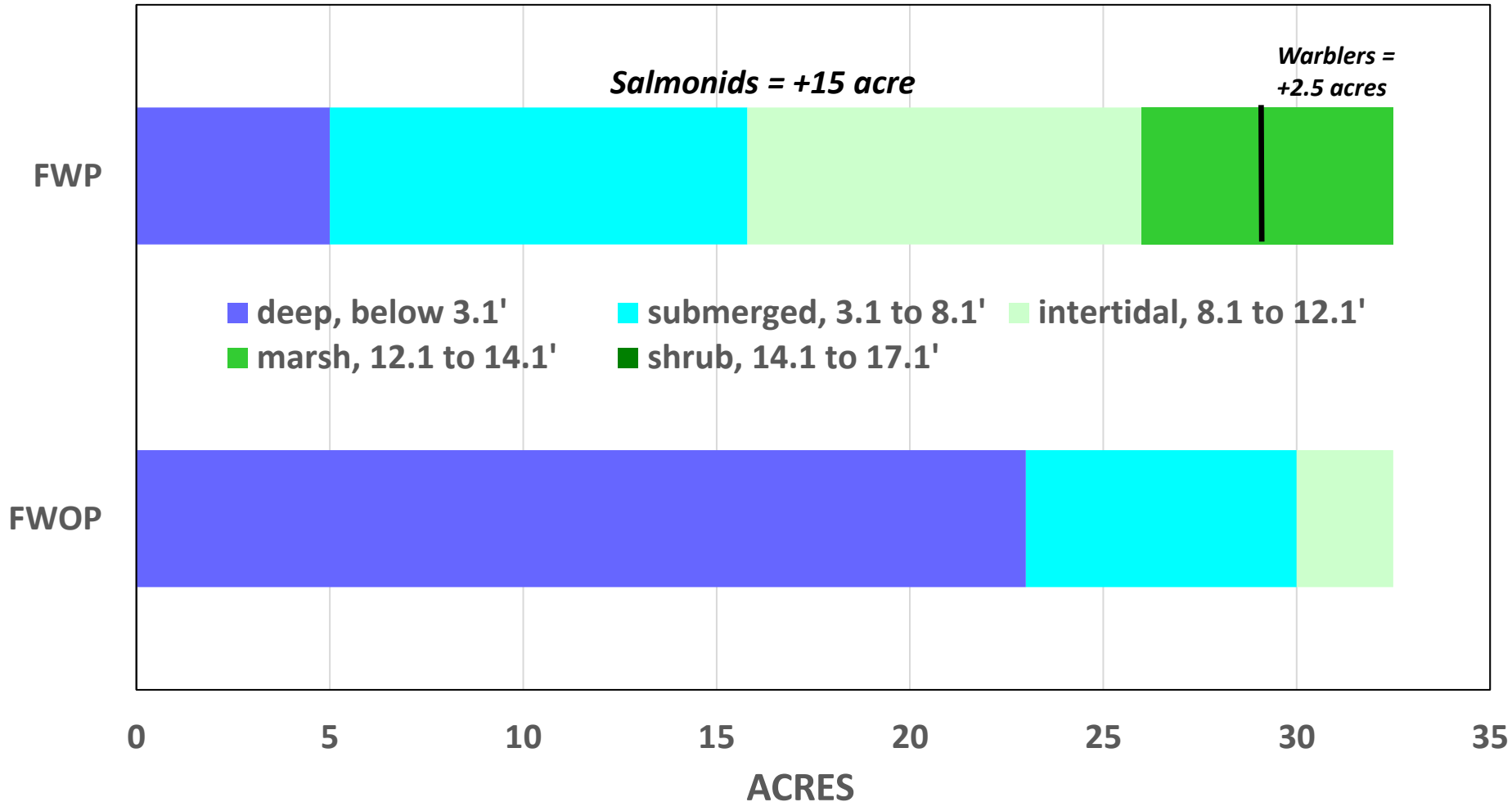
FWOP = future without project, FWP = future with project

Acreage Distribution of Habitat Types: With-Project vs. Existing Condition

15% Flow Increase for 0.5 AEP = 1.9 ft Stage Increase at RM 86

and

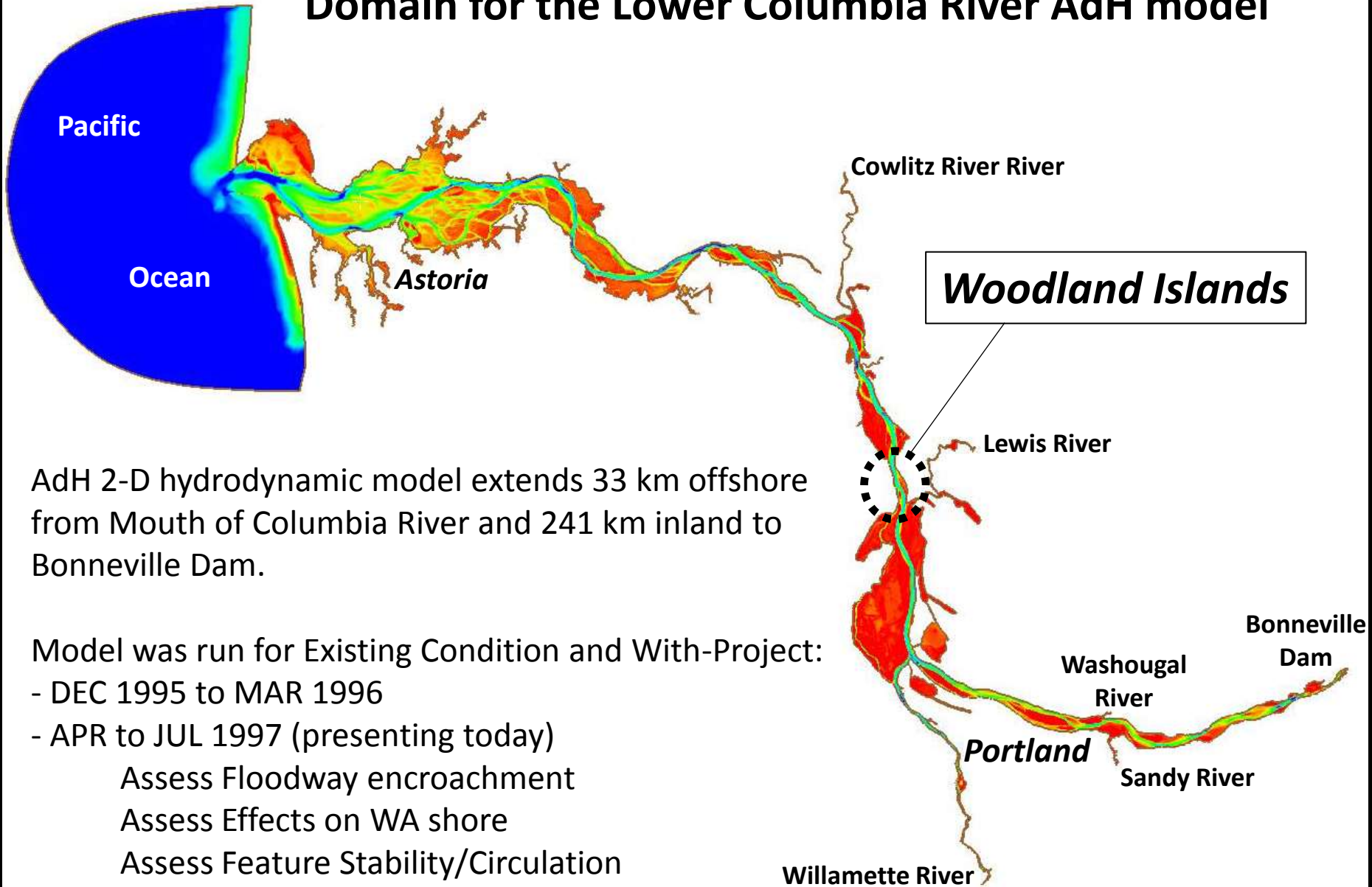
2 ft Sea Level Rise at MCR = 1.2 ft Stage Increase at RM 86



HYDRAULIC RESPONSE

present climate

Domain for the Lower Columbia River AdH model



AdH 2-D hydrodynamic model extends 33 km offshore from Mouth of Columbia River and 241 km inland to Bonneville Dam.

Model was run for Existing Condition and With-Project:

- DEC 1995 to MAR 1996
- APR to JUL 1997 (presenting today)
 - Assess Floodway encroachment
 - Assess Effects on WA shore
 - Assess Feature Stability/Circulation

Portland is 112 River Miles from Pacific Ocean

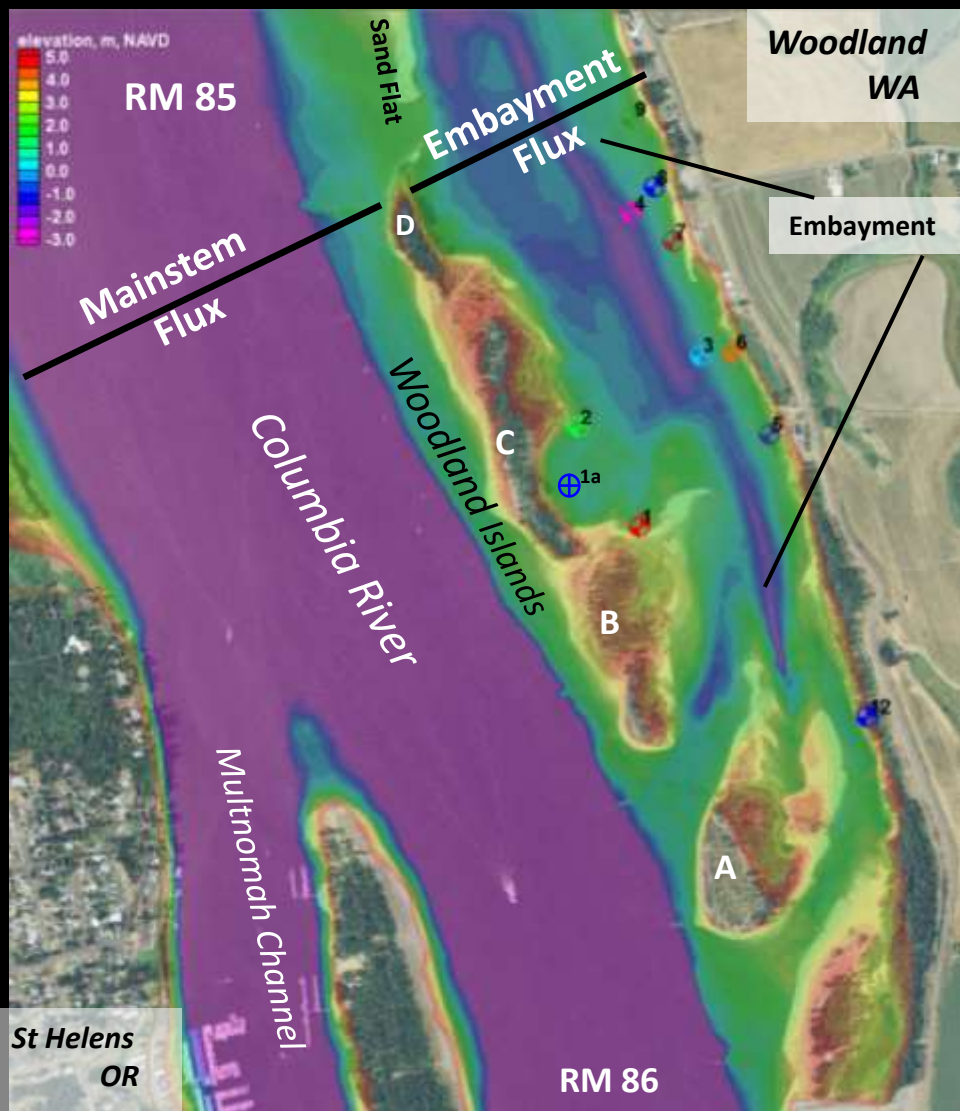


Figure H2a. Existing Condition Terrain elevation, background image obtained with river stage at 3.4 m NAVD (11 ft NAVD or 7 ft CRD). Islands are individual denoted as A to D. 1 ft = 0.3048 meter. River bed elevations < -3 m (-9.8 ft) NAVD are shown as “purple”.

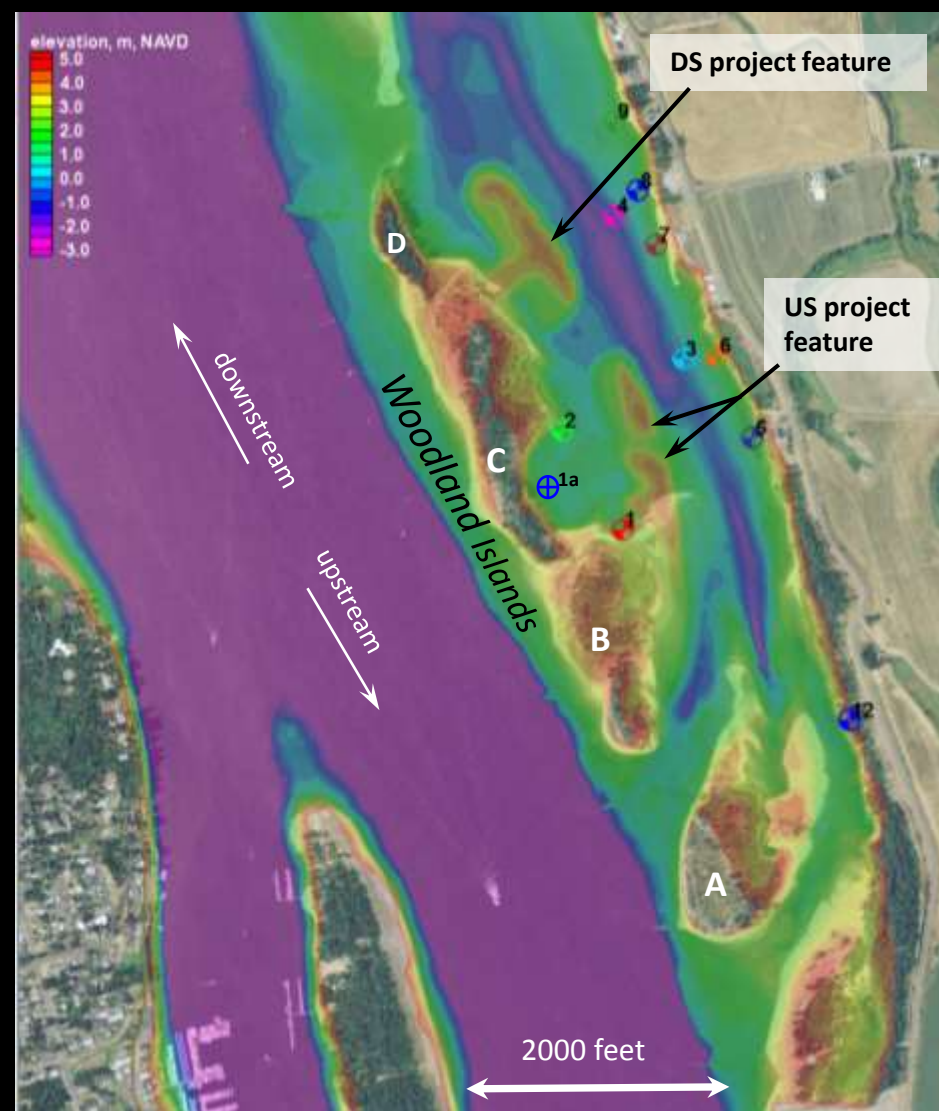
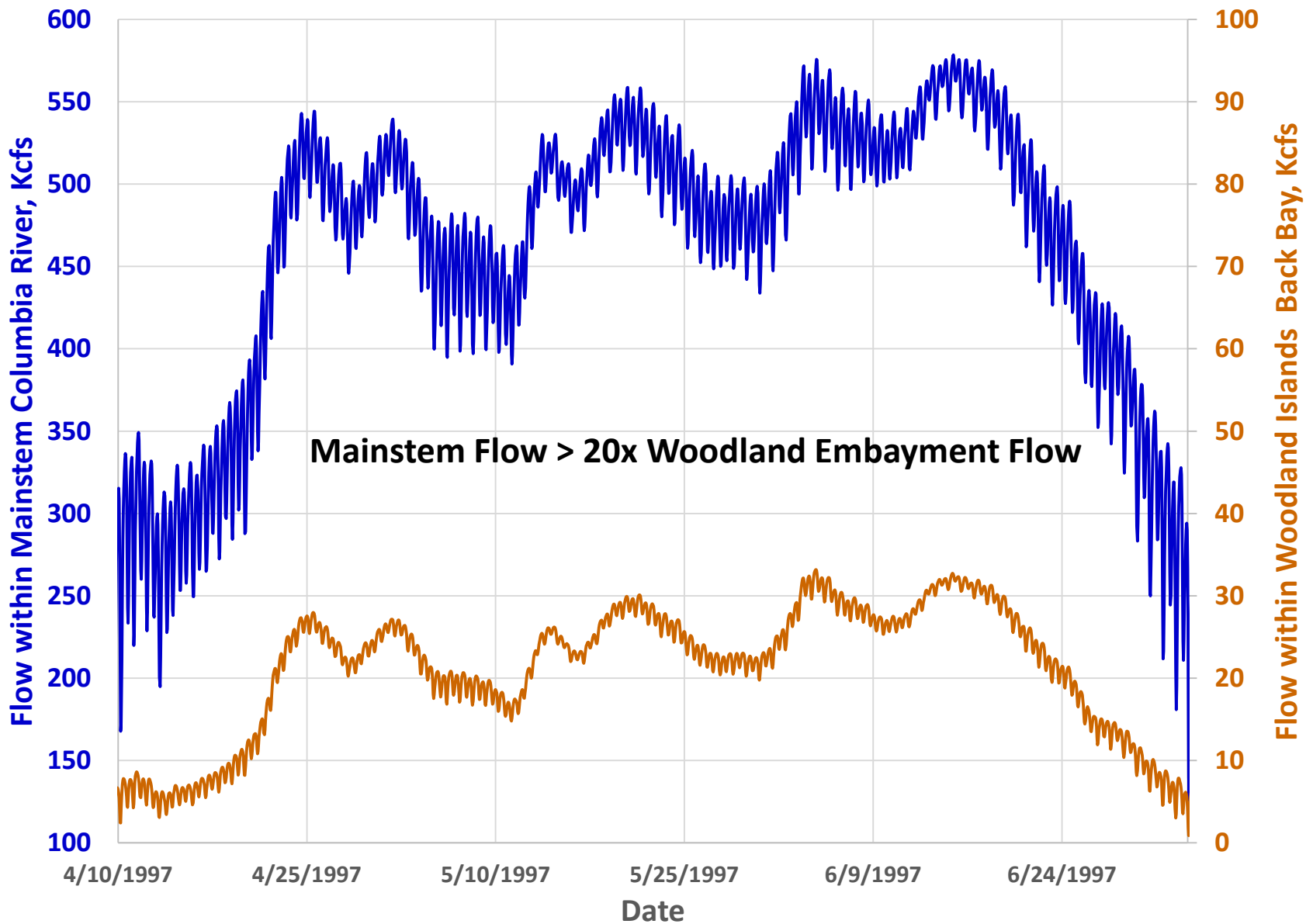


Figure H2b. Proposed With-Project Terrain Modification, spanning -1.8 to 4.1 m NAVD (-5.9 to +13.5 ft NAVD). Project features shown as upstream (US) and downstream (DS), to be created using controlled placement of sand dredged from the FNC near RM 86.5.

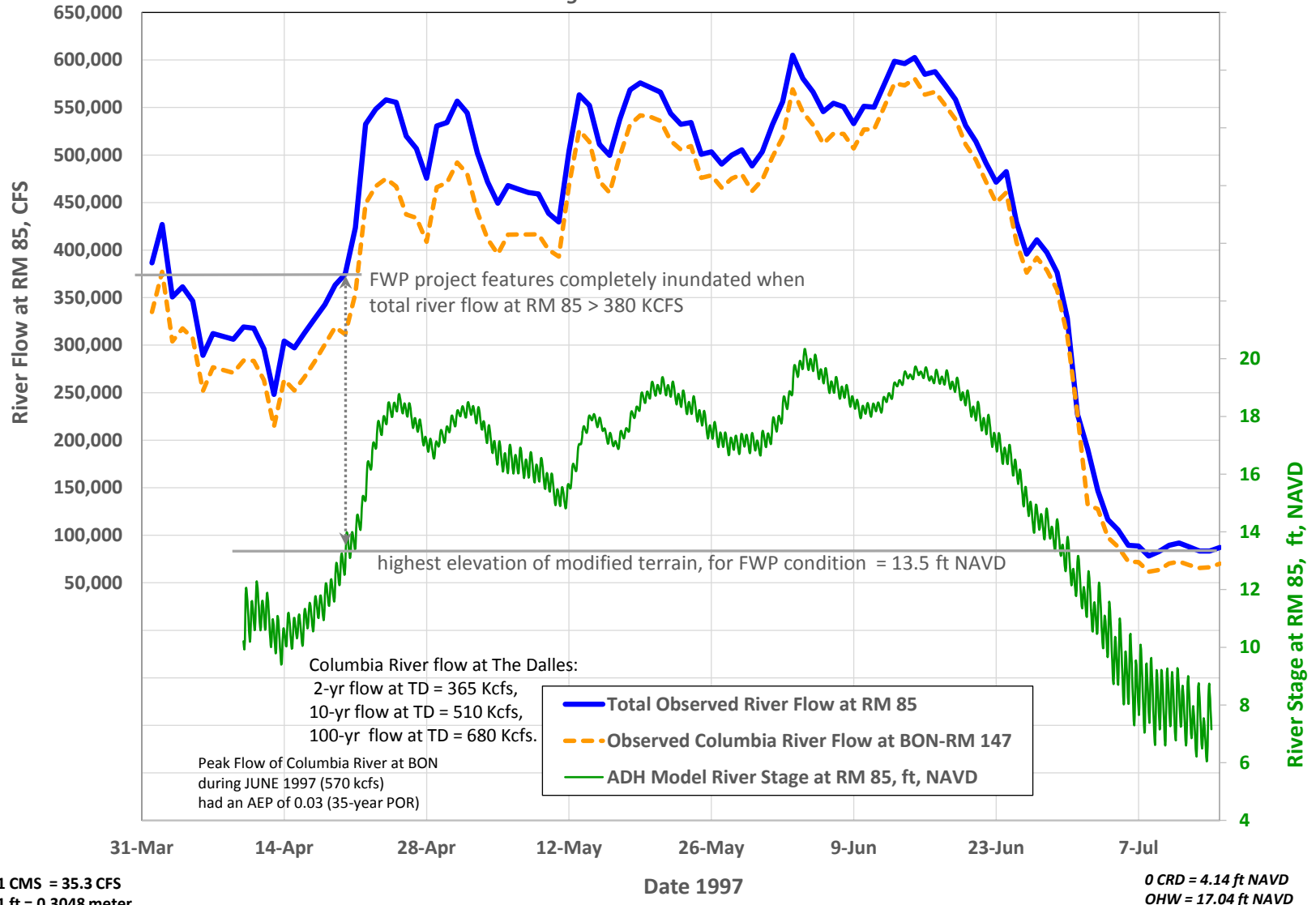
Flow within Mainstem Columbia River vs. Woodland Island Embayment



River FLOW and STAGE Affecting Woodland Islands During APR-JUL 1997

River Flow Components Affecting Woodland Islands (RM 85)
during 1 APR to 14 JUL 1997

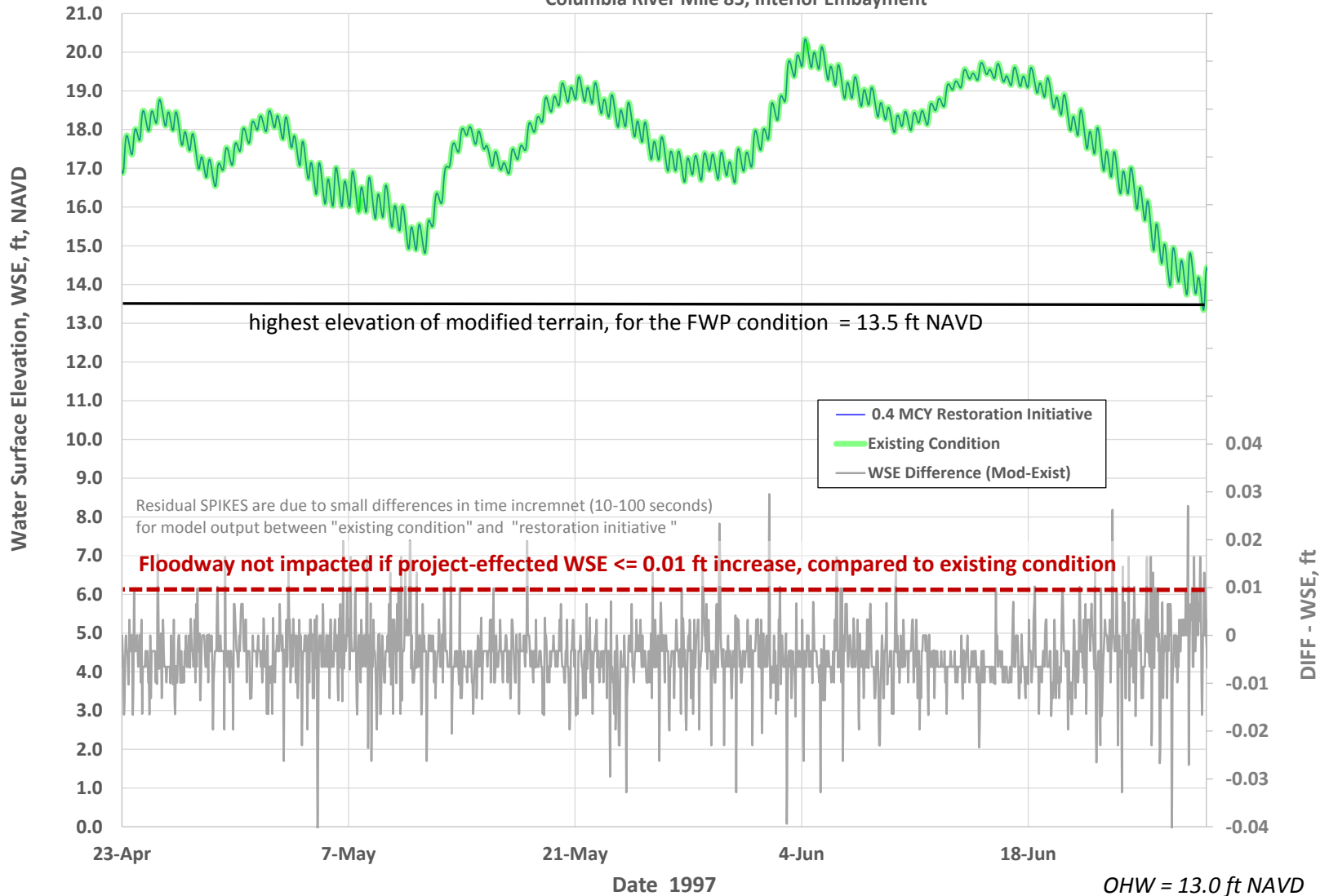
35-year Event

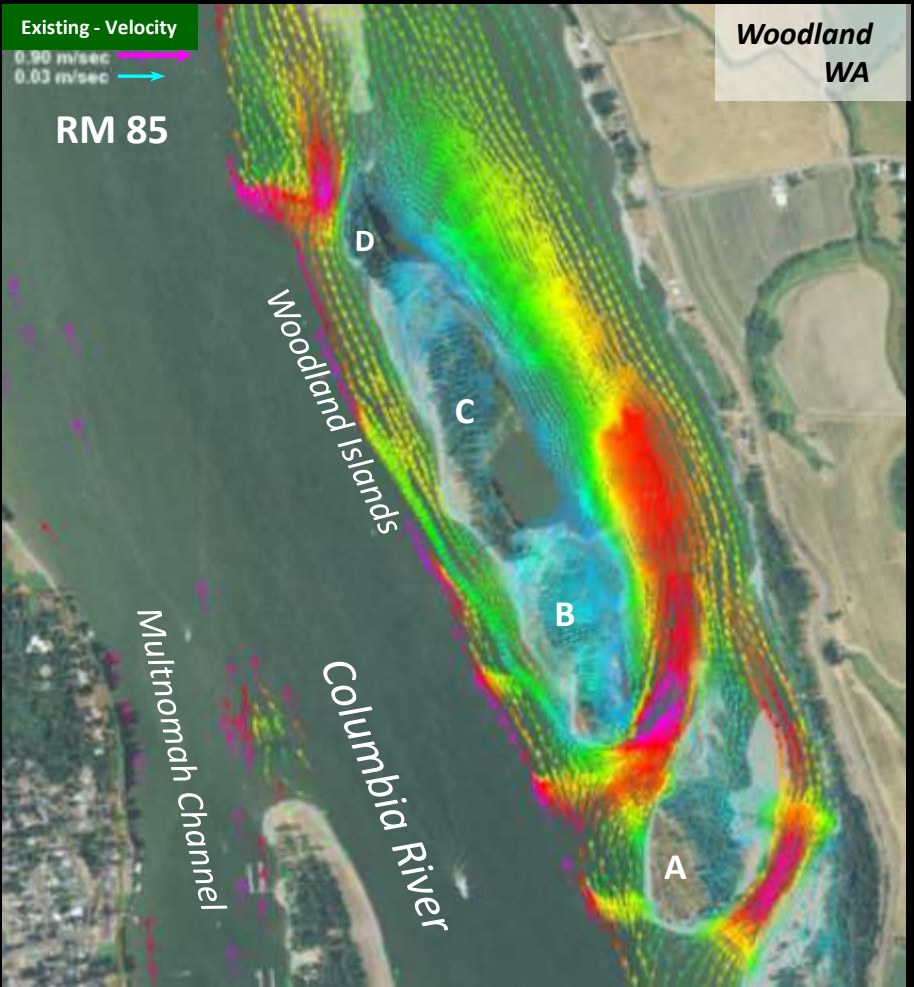


1 CMS = 35.3 CFS
1 ft = 0.3048 meter

Verification that Woodland Island Project Does NOT Affect Increase in River Stage

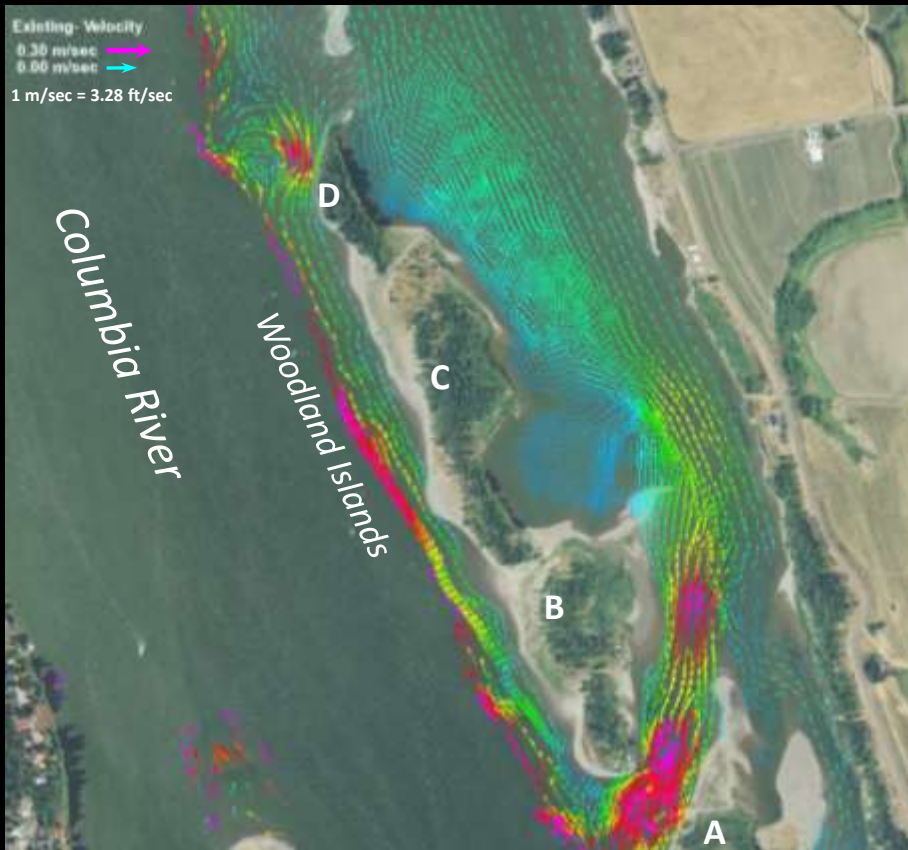
APR-JUL 1997 ---- AdH Model Estimate for WSE at Woodlands Islands, WA
Columbia River Mile 85, Interior Embayment



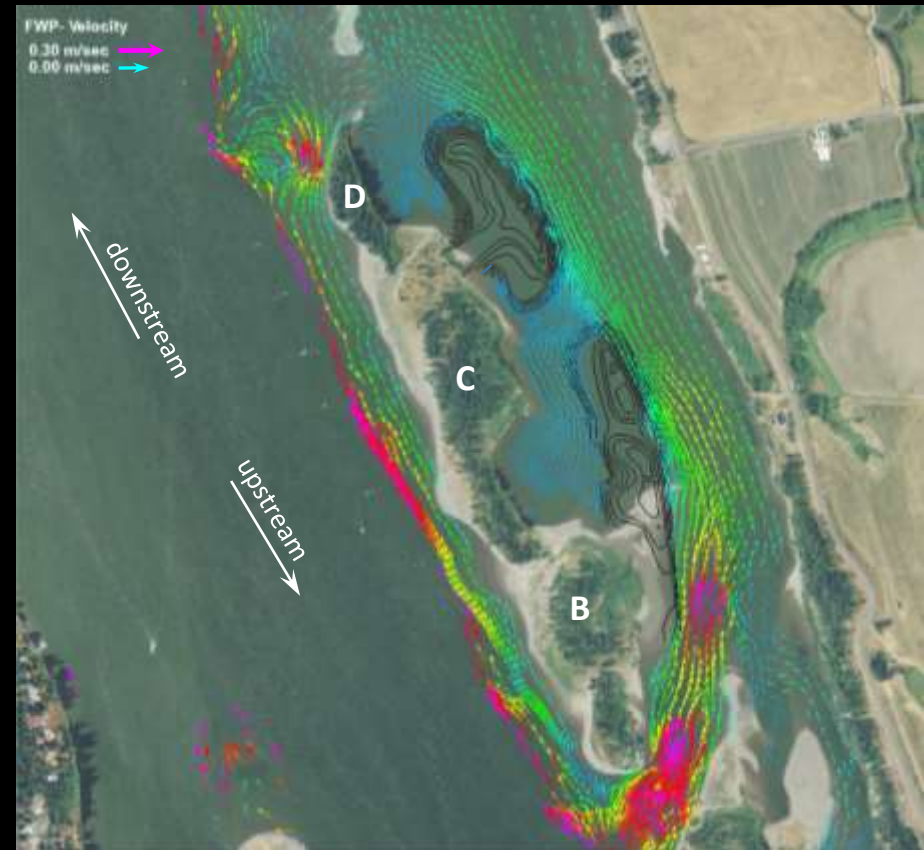


LEFT. Existing Condition Currents – HIGH River Flow Event, with Columbia River flow at RM 85 reaching 610 kcfs (17.3 kcms). Current speed within the mainstem Columbia River > 0.90 m/sec. Both figures are a “snapshot” of river current vectors simulated by AdH model for 1200 on 15 JUN 1997 (model TS=1812 hrs).

PEAK of 1997 Flood Event (610 Kcfs) “35-year event”

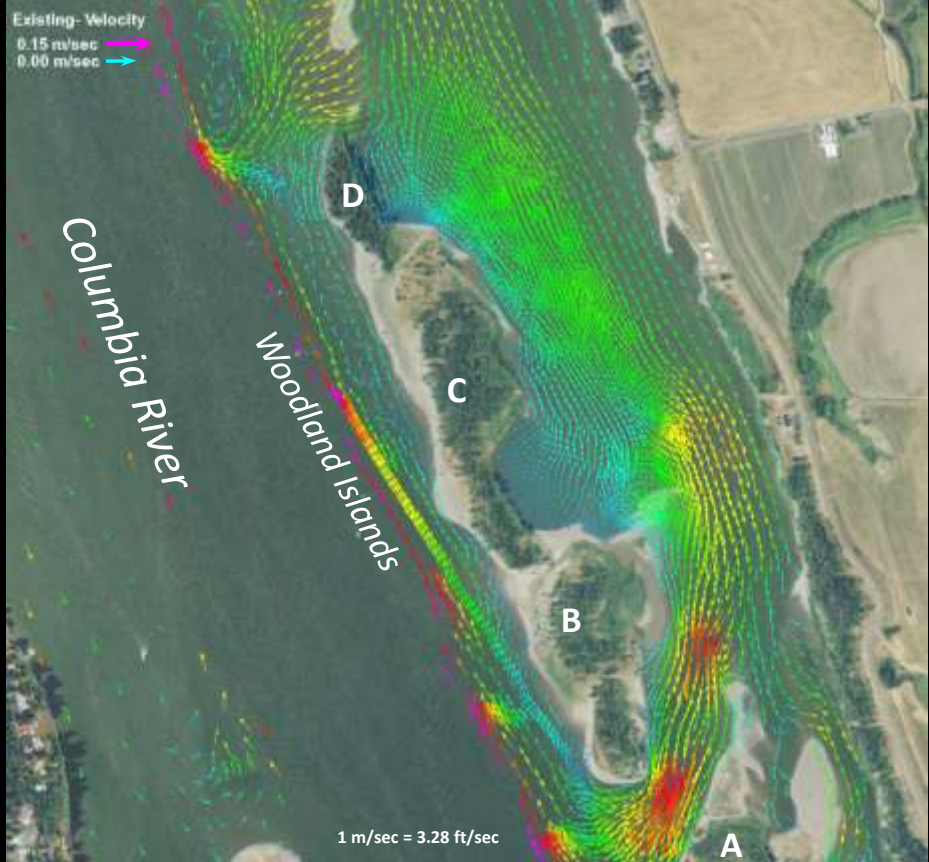


LEFT. Existing Condition Currents – Ebb Tide during LOW riverine flow. Columbia River flow at RM 85 was about 100 Kcfs (2.8 kcms). Current speed within the mainstem Columbia River > 0.30 m/sec. River stage was at 6.7 ft and falling to 6.0 ft NAVD.

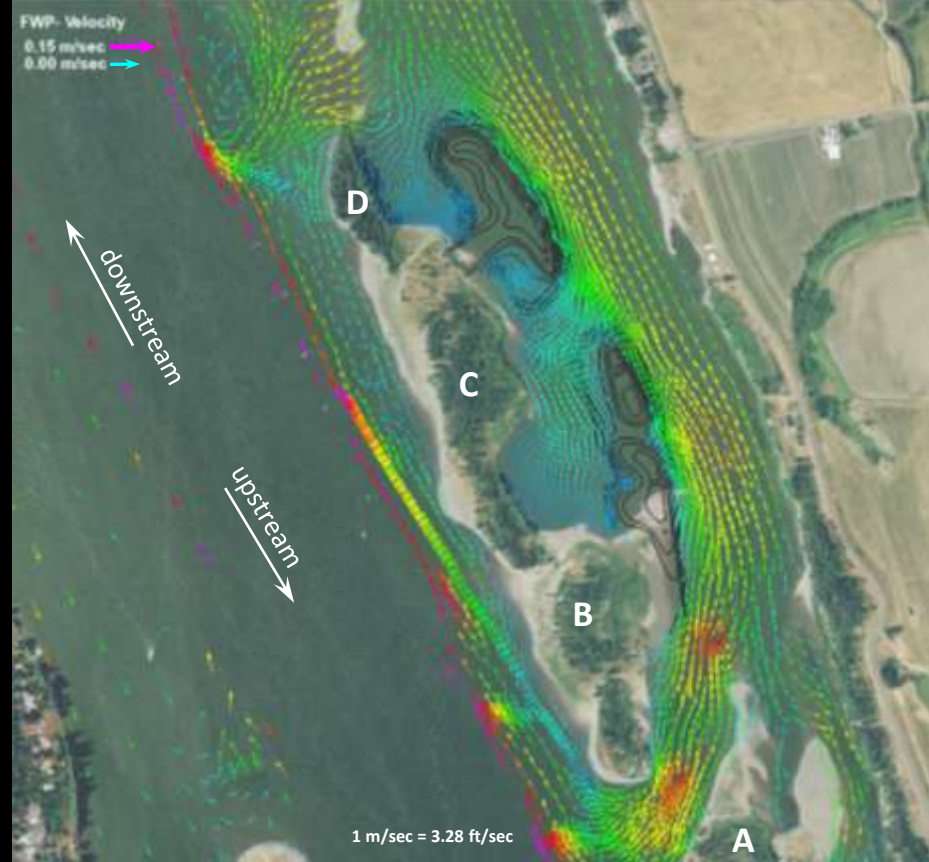


RIGHT. FWP River Currents – Ebb Tide during LOW riverine flow. Both figure H3a and H3b are “snapshots” of river current vectors simulated by AdH model for 1400 on 13 JUL 1997 (model TS=2486 hrs).

EBB TIDE during Typical Summer Low Flow (100 Kcfs)

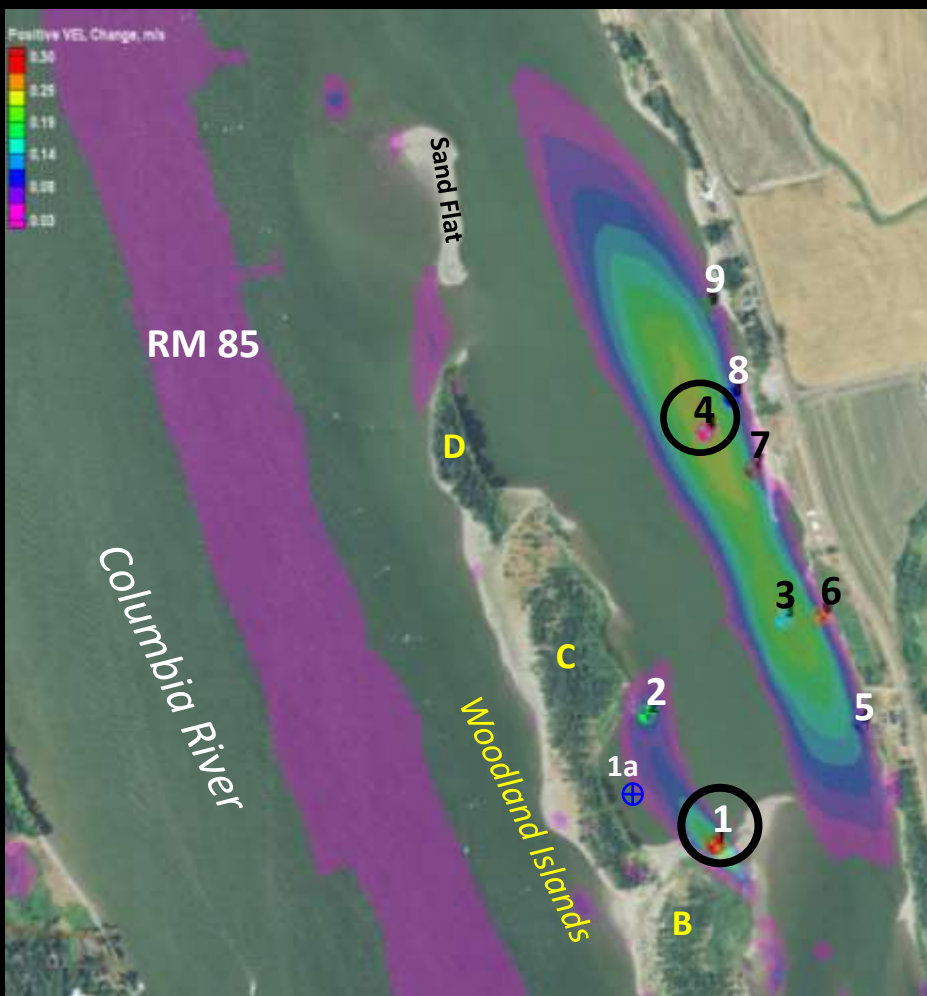


LEFT. Existing Condition Currents – Flood Tide during LOW riverine flow. Columbia River flow at RM 85 was about 100 Kcfs (2.8 kcms). Current speed within the mainstem Columbia River > 0.15 m/sec. River stage was at 8.1 ft and rising to 8.7 ft NAVD.

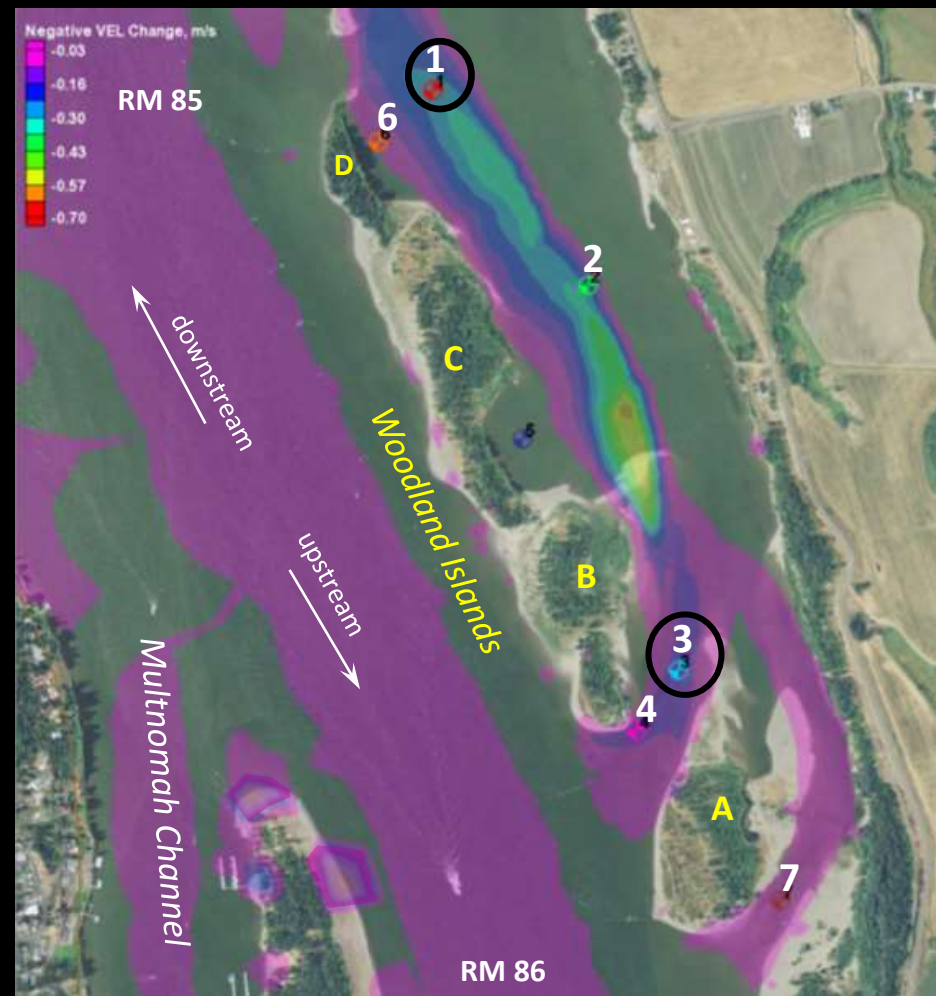


RIGHT. FWP River Currents – Flood Tide during LOW riverine flow. Both figure H3a and H3b are “snapshots” of river current vectors simulated by AdH model for 2000 on 12 JUL 1997 (model TS=2468 hrs).

FLOOD TIDE during Typical Summer Low Flow (100 Kcfs)



LEFT. Areas affected by an INCREASE in river current magnitude due to project implementation, as compared to existing condition. 1 m/s = 3.28 ft/s. This graphic shows the maximum increase in current between existing condition and FWP.

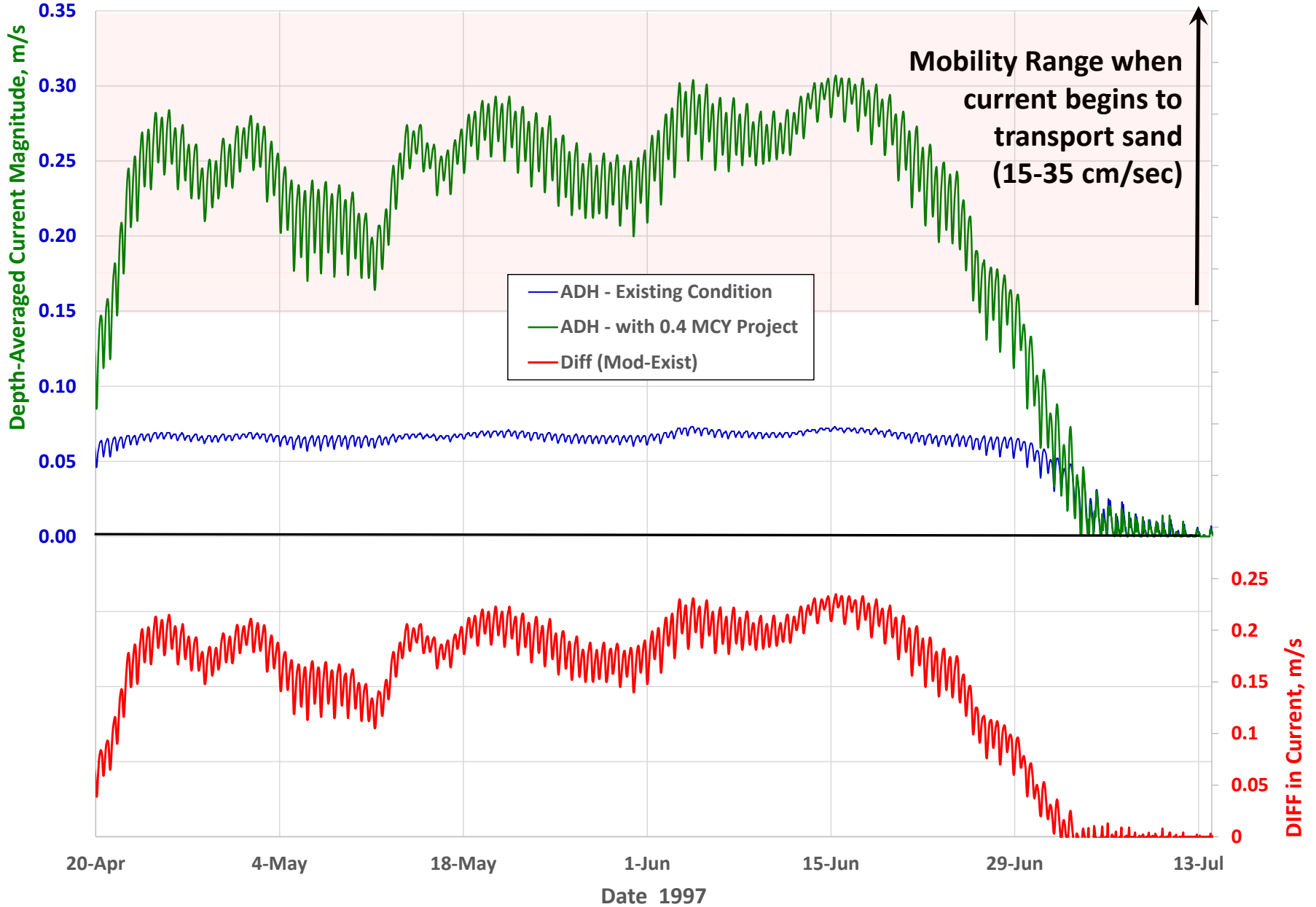


RIGHT. Areas affected by REDUCTION in river current magnitude due to project implementation, as compared to present condition. This graphic shows the maximum decrease in current between existing condition and FWP.

AREAS OF MAXIMUM VELOCITY CHANGE APR-JUL 1997

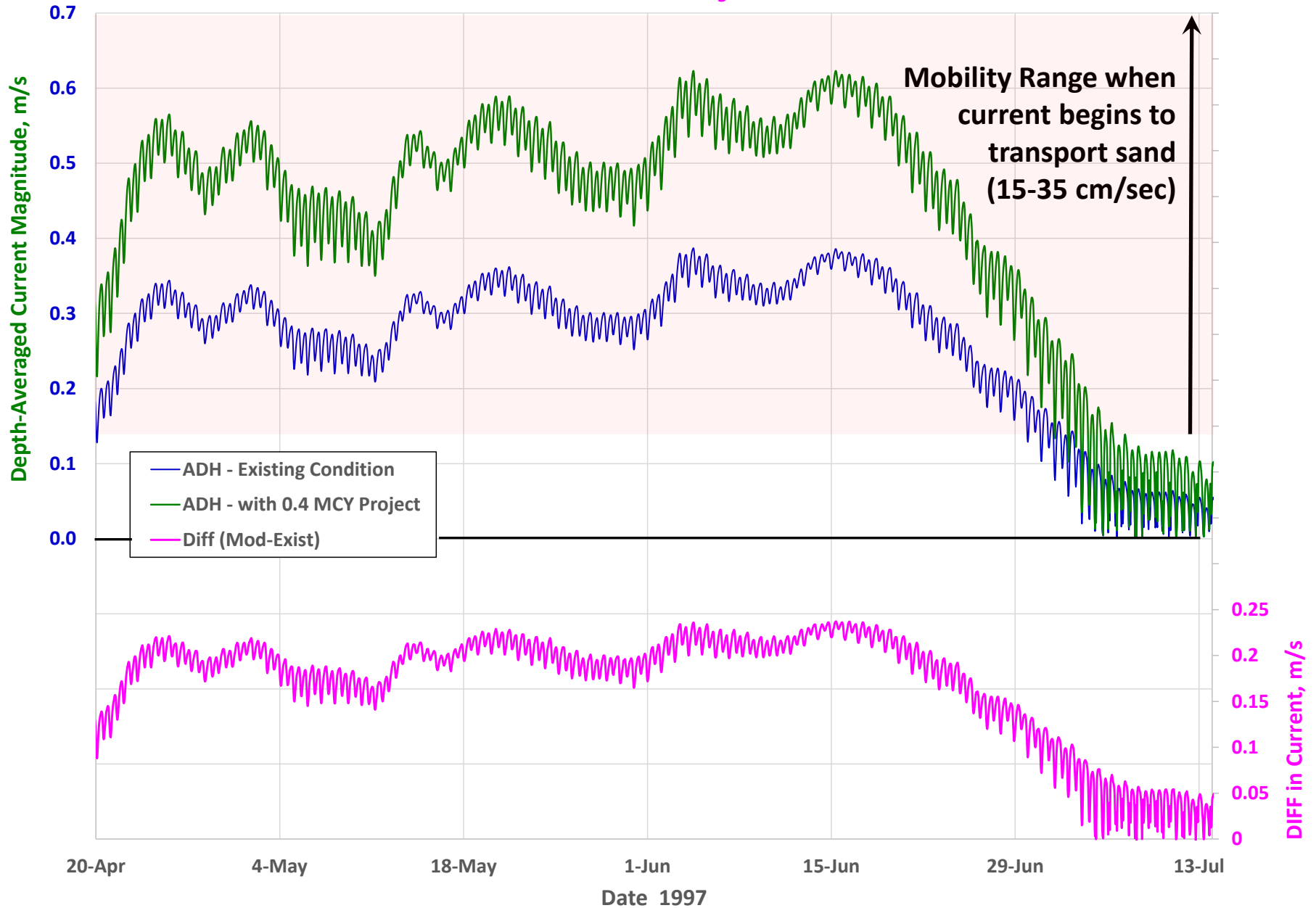
APR-JUL 1997 ---- AdH Model Estimate of Project-Affected Change in River Current at Woodlands Islands, WA

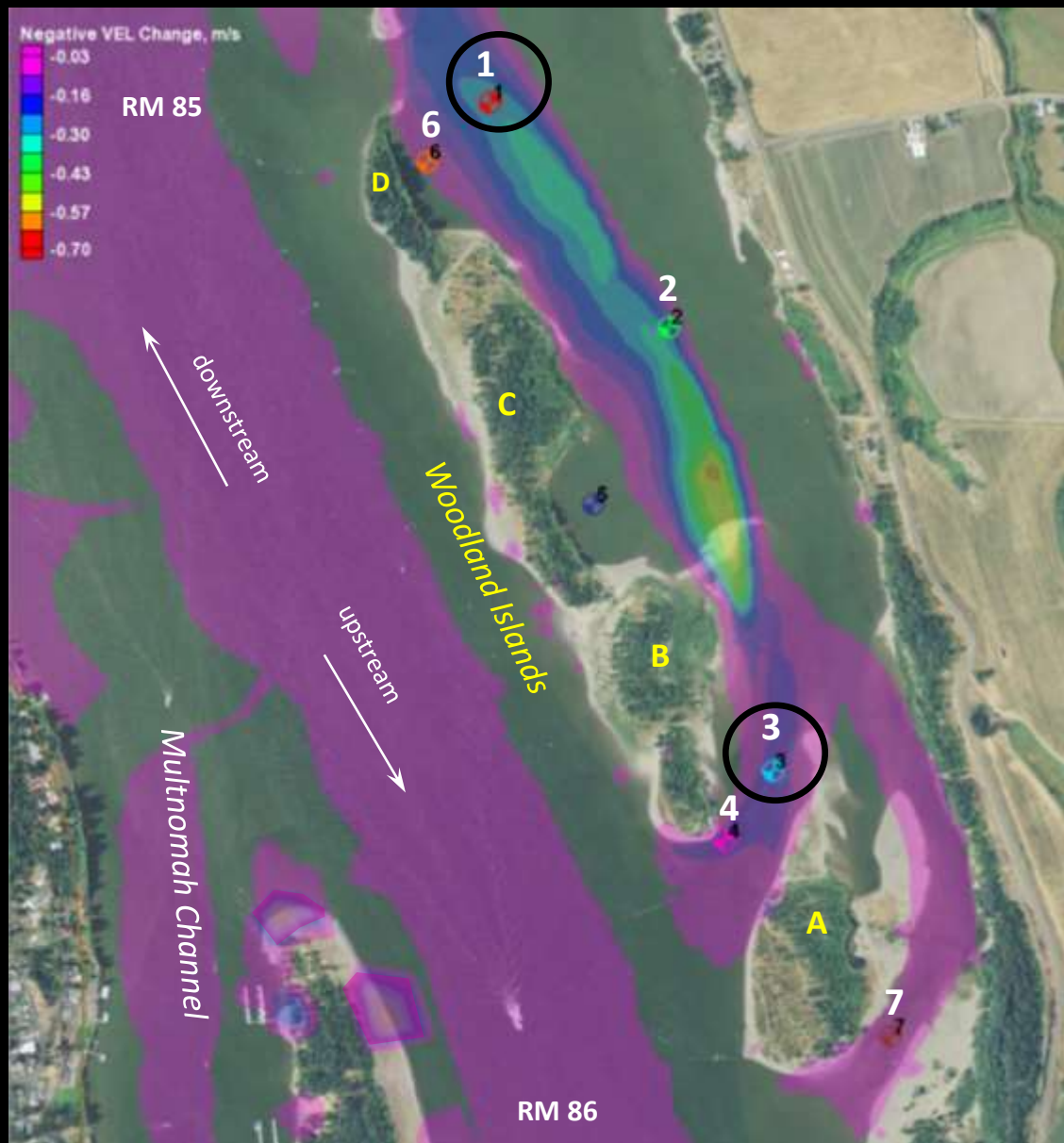
Point #1 - POSITIVE change location



APR-JUL 1997 ---- AdH Model Estimate of Project-Affected Change in River Current at Woodlands Islands, WA

Point #4 - POSITIVE change location

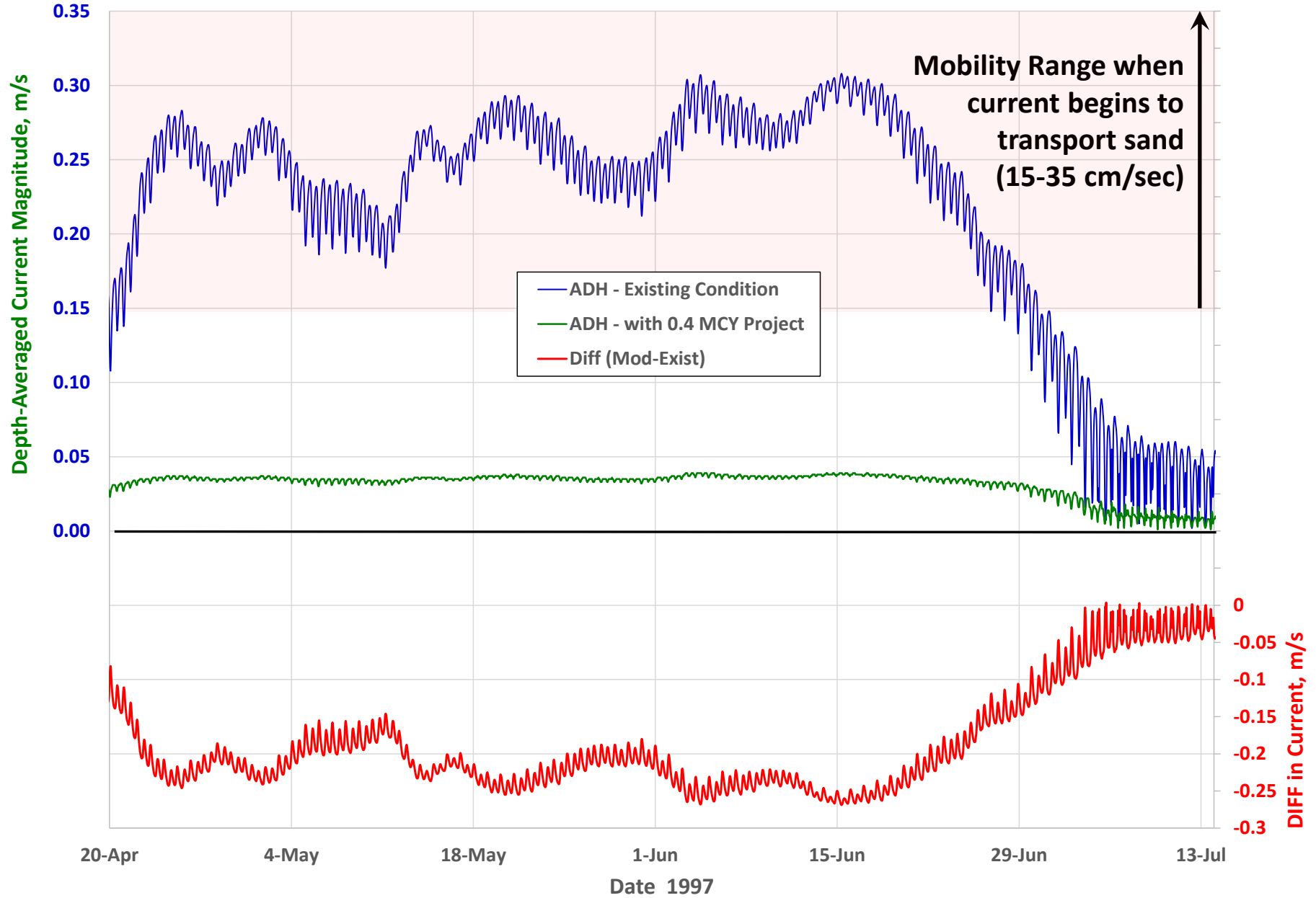




Areas affected by REDUCTION in river current magnitude due to project implementation, as compared to present condition. This graphic shows the maximum decrease in current between existing condition and FWP.

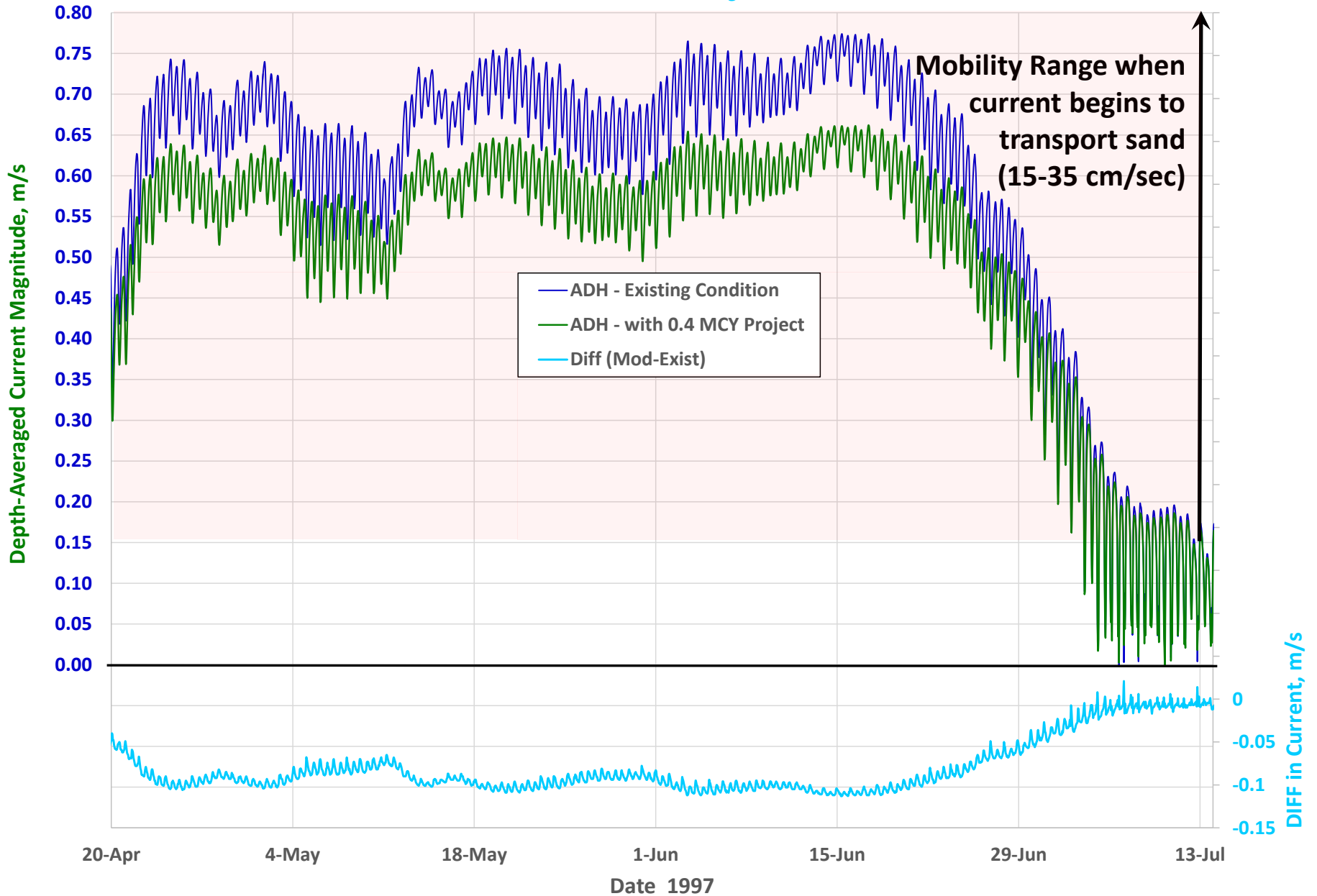
APR-JUL 1997 ---- AdH Model Estimate of Project-Affected Change in River Current at Woodlands Islands, WA

Point #1 - NEGATIVE change location



APR-JUL 1997 ---- AdH Model Estimate of Project-Affected Change in River Current at Woodlands Islands, WA

Point #3 - NEGATIVE change location



IMPLEMENTATION



Targeted placement of 400,00 CY of sand dredged from the St. Helens Bar using the hydraulic dredge Oregon.

pumping capacity 30,000-40,000 gallons/min = 20,000-60,000 cy sand/day

temporary berm (will become new shoreline)

discharge of dredged material

return water to river

existing shoreline (from past placement)





Low pressure discharge of dredged material-water mixture at shore interface: Traditional shoreline placement – best for making low relief features (sand bars) with high enough elevation that shore equipment can grade

HABITAT RESTORATION USING DREDGED MATERIAL PLACEMENT

**WITHIN THE LOWER COLUMBIA RIVER
AT WOODLAND ISLANDS, WA**

Conclusions

- Proposed Action is Based on Previous Experiences - RIDM
- Optimized Plan Restores Salmonid and Avian Habitats
- Moderate Scale Project Occurs within a Diverse LCR Reach
- Project is Resilient to Potential Climate Change Effects
- Project Not Expected to Negatively Affect Adjacent Properties
- Project Expected to Provide Added Ecological Function
- Project Beneficially Uses 400,00 cy of Dredged Sand

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