

GOING OPERATIONAL: LESSONS LEARNED FROM NORTH HEAD NEARSHORE PLACEMENT PILOT STUDY AT THE MOUTH OF COLUMBIA RIVER, WA

A COLLABORATIVE EFFORT TO SUSTAIN THE SEDIMENT BUDGET AT THE MOUTH OF COLUMBIA RIVER, WA

Julia Keiter, Kate Groth, Jarod Norton, Rod Moritz, Rachel Stolt, Austin Hudson, James M. McMillan, Chris Motti, Terry Geroux, Alyssa Moore, Michael Booton, Hydrosurvey Crew, and Crew of the *Essayons*

USACE Portland District

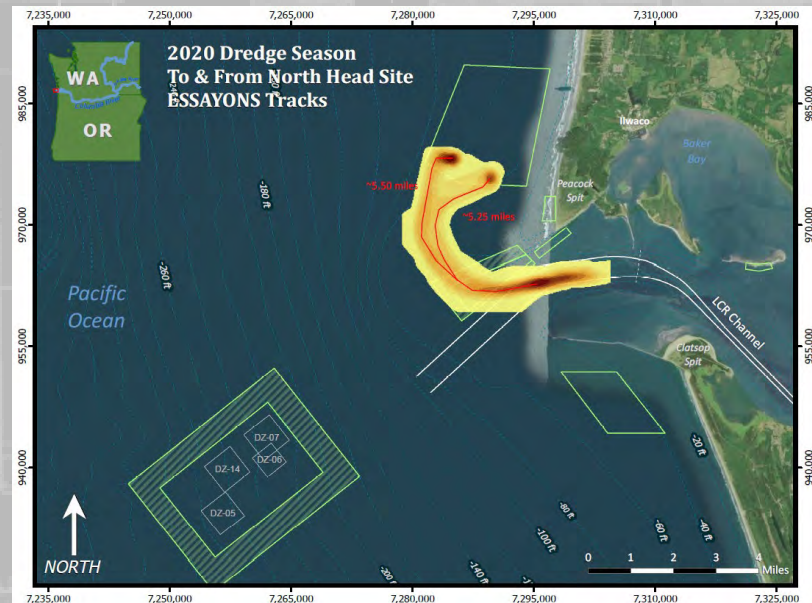
Andrew Stevens
USGS – Santa Cruz

Curtis Roegner
NOAA Fisheries, Point Adams Research Station

WEDA-Pacific Chapter
27-29 Oct 21 Meeting



US Army Corps
of Engineers®



7,235,000 7,250,000 7,265,000 7,280,000 7,295,000 7,310,000 7,325,000



North Head Site

2.3 miles x 2.8 miles

- Phase I-III Pilot Studies (2018-20)
- latest monitoring results
- First Operational Site Use Plan Sep-Oct 2021

North Head Site
 formally known as
 North Head Study Area
 Pilot Study, 2018 - Present

WA

Ilwaco

Peacock Spit

North Jetty Site
 Active, 1999 - Present

Benson Beach Site
 Inactive, 2011

East Sand Island
 Pilot Study, 2018 - Present

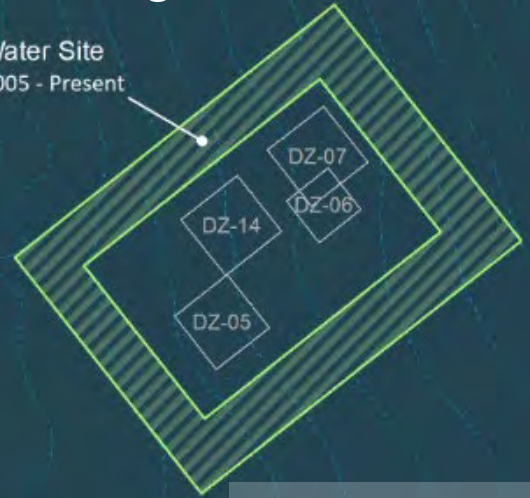
OR

Pacific Ocean

3 Million CY/yr of Sand Dredged from the 5-mile long MCR Federal Navigation Channel

Shallow Water Site
 Active, 2005 - Present

Deep Water Site
 Active, 2005 - Present



South Jetty Site
 Active, 2012 - Present

MCR Entrance Channel

LCR Channel

Clatsop Spit



Objective is to Maximize Placement of Dredged Material within Nearshore Zone (<60 ft) FEED THE BEAST

7,235,000 7,250,000 7,265,000 7,280,000 7,295,000 7,310,000 7,325,000

Presentation Overview

Thin-Layer Placement* at North Head Site – The Pilot Study

- *Phase I (2018) – 50 Kcy placed, all dispersed within 12 months*
- *Phase II (2019) – 100 Kcy placed, all dispersed within 12 months*
- *Phase III (2020) – 300 Kcy placed, 60-70% dispersed within 9 months*

Dispersion of Dredged Sand Placed at North Head Site

- *Phase III Monitoring Results*
- ***----- where did “it” all go? -----***

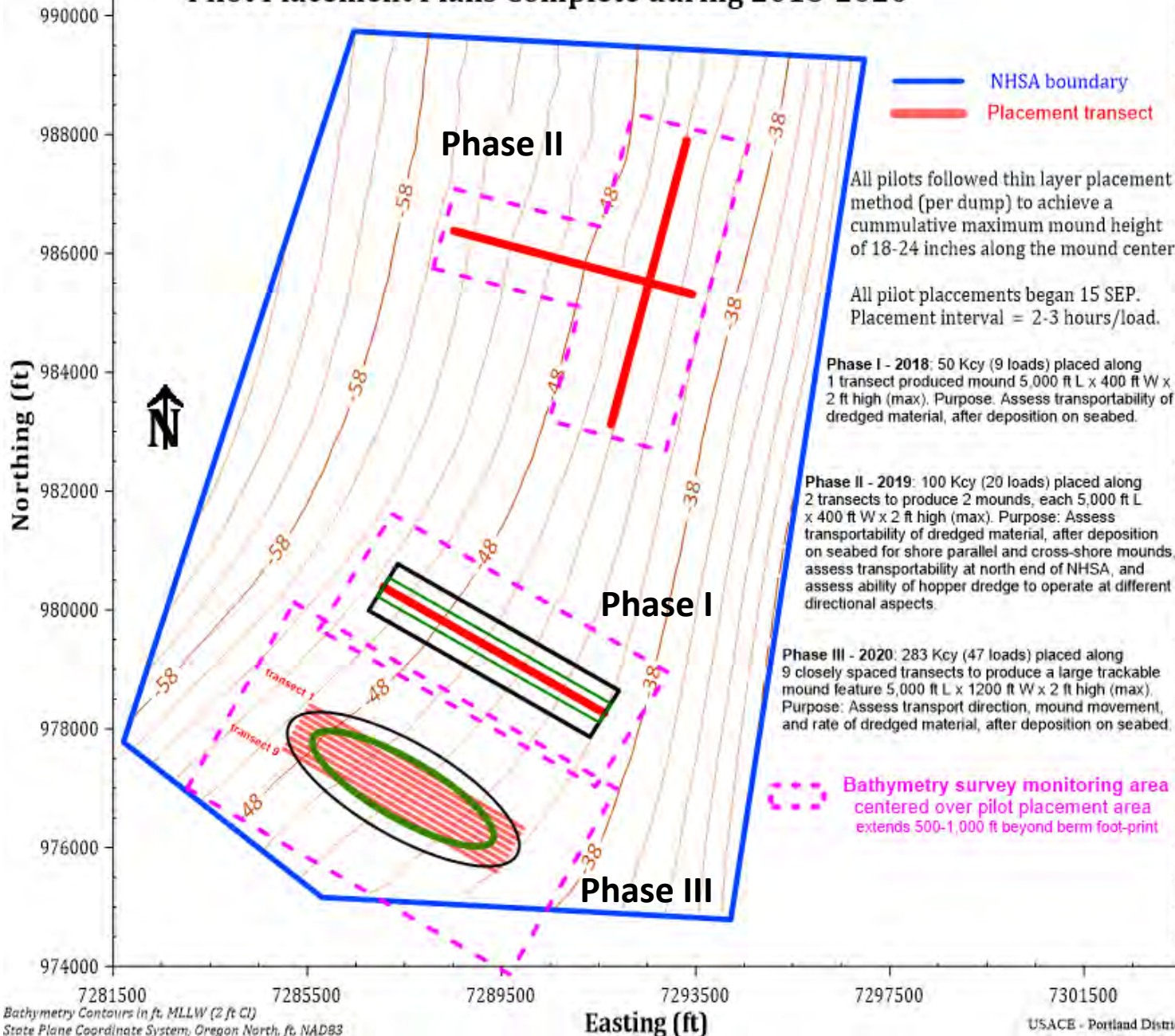
Operational Use of North Head Site

- *Informed Considerations Enable...*
- ***First Operational Use in 2021 (400 Kcy)***

* Thin Layer Placement = 2 inches deposition on seabed per load (to avoid impacts to benthos)

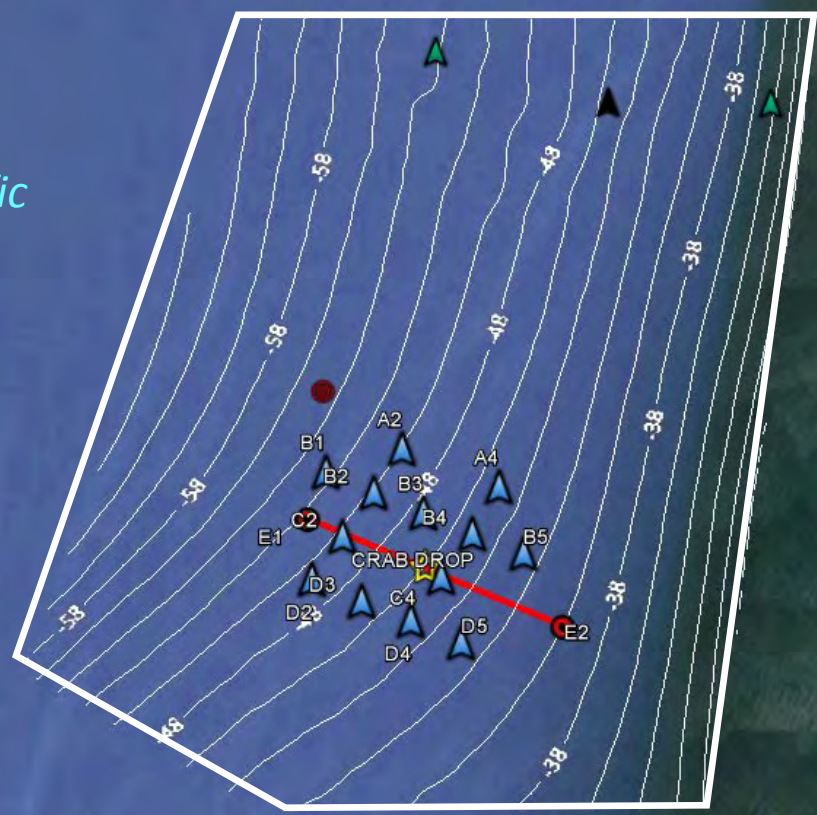
MCR North Head Study Area (NHTA)

Pilot Placement Plans Complete during 2018-2020



NORTH HEAD SITE STUDY AREA Phase I

Pacific



Peacock Spit

Ocean

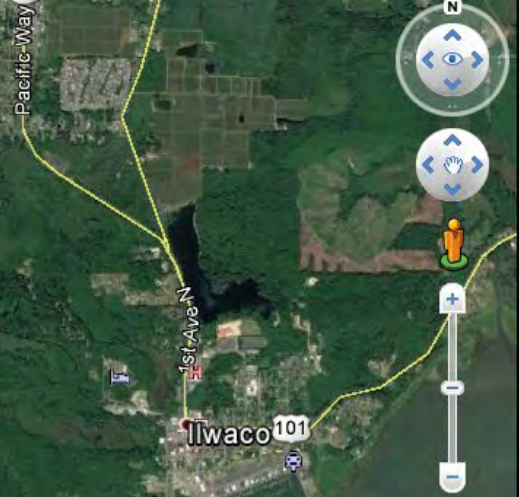
Mouth of Columbia River

North Head

Benson Beach

Rumy Island

Sand Island



North Head Site (NHS) PHASE I Concept for Nearshore Placement

--- Presented to Stakeholders and Agencies in MAY 2018---

- A One-Time Experiment to measure dispersion
- Low-relief Accumulation on Seabed using thin-layer placement
- No effect on Waves: 2 ft. of mounding of dredged material in 35-50 ft. water depth will not affect wave action.

51 Kcy of MCR dredged sand was placed by hopper dredge Essayons along a 5,000 ft-long transect, using thin-layer placement method, and produced a 2 ft high mound (21 SEP18)

77% of material was dispersed 60 days after placement. By spring 2019, mound GONE

NORTH HEAD SITE STUDY AREA Phase II



Pacific

North Head

Ilwaco

Benson Beach

Peacock Spit

Ocean

Mouth of Columbia River



North Head Site – PHASE II (2019 Placement)

100,000 CY placed along TWO Transects (each 5,000 ft long)

East-West transect (cross-shore) = 50,000 CY

North-South transect (alongshore) = 50,000 CY

Findings Addressed in Phase II

Hopper dredge can operationally place sediment alongshore & cross-shore at NHS

Placing sediment along (parallel to) shore is not operationally preferred

Sediment is dispersed vigorously at NHS regardless of “mound” orientation

Transport direction could NOT be defined in Phase I or II (like smoke, not a turtle).

The Northern End of NHS appears to exhibit similar sediment transport rate as the Southern End of NHS. All placed sediment dispersed within 12 months

More Results needed to establish sediment transport direction (Phase III)

MCR North Head Study Area (NNSA) - 2020 Phase III Plan

(Bathymetry from September 5, 2017 Survey)

North Head Site (NHS)
Phase III Drop Zone is
nominally 1,000-ft x 5,000-ft

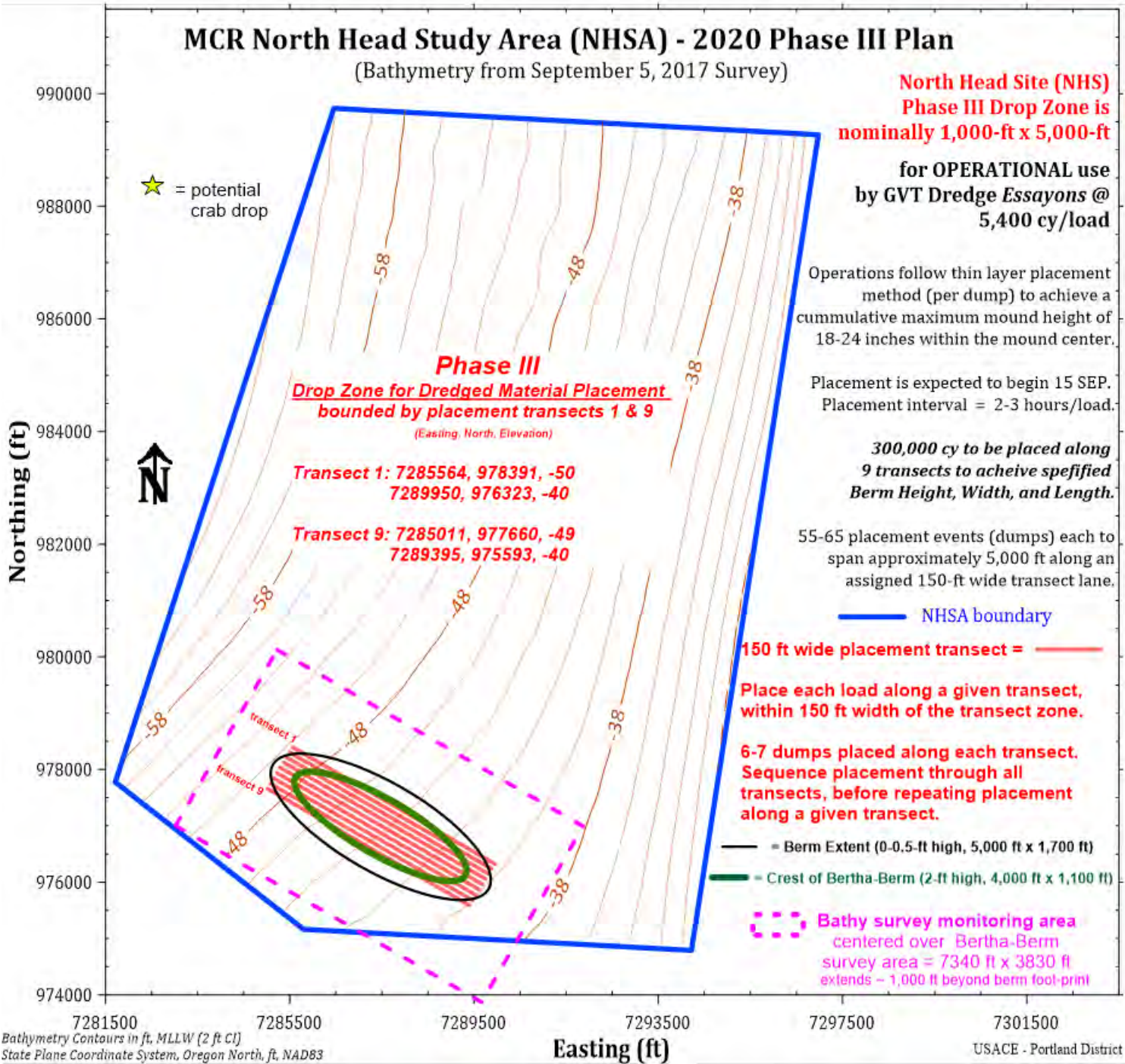
for OPERATIONAL use
by GVT Dredge Essayons @
5,400 cy/load

Operations follow thin layer placement
 method (per dump) to achieve a
 cumulative maximum mound height of
 18-24 inches within the mound center.

Placement is expected to begin 15 SEP.
 Placement interval = 2-3 hours/load.

300,000 cy to be placed along
9 transects to achieve specified
Berm Height, Width, and Length.

55-65 placement events (dumps) each to
 span approximately 5,000 ft along an
 assigned 150-ft wide transect lane.



Bathymetry Contours in ft, MLLW (2 ft CI)
 State Plane Coordinate System, Oregon North, ft, NAD83

MCR North Head Site (NHS) - Execution of Phase III

PRE-Placement Survey Date = 9 SEP20 (phase III Baseline)



— =150 ft wide placement transect
Each load placed along a given transect, within 150 ft width of the transect zone. 6-7 dumps placed along each transect. Placement sequenced through all transects, before repeating placement along a given transect.

Bathymetry survey monitoring area
survey area = 7340 ft x 3830 ft
extends ~ 1,000 ft beyond berm foot-print

transect 1
transect 5
transect 9

Northing, ft

980000
979000
978000
977000
976000
975000
974000

7284000 7285000 7286000 7287000 7288000 7289000 7290000 7291000

Easting, ft

7286000

7288000

7290000

MCR NORTH HEAD SITE - Path of Hopper Dredge During Placement

Dredge: ESSAYONS

Date: 15-22 SEPTEMBER 2020

Loads: 1052 - 1099 (47 loads placed in NHS-Phase-III)

282,747 cy placed
5,500 cy per load

Displacement

- Low (8794)



- High (16502)

+ Starting Points

Transect Lines

NHS Phase III Survey Area

978000

978000

976000

976000



Average time to place each load = 15 minutes

0 295 590 1,180 Feet



Horizontal Coordinate System: NAD83 Oregon North U.S. Survey Feet

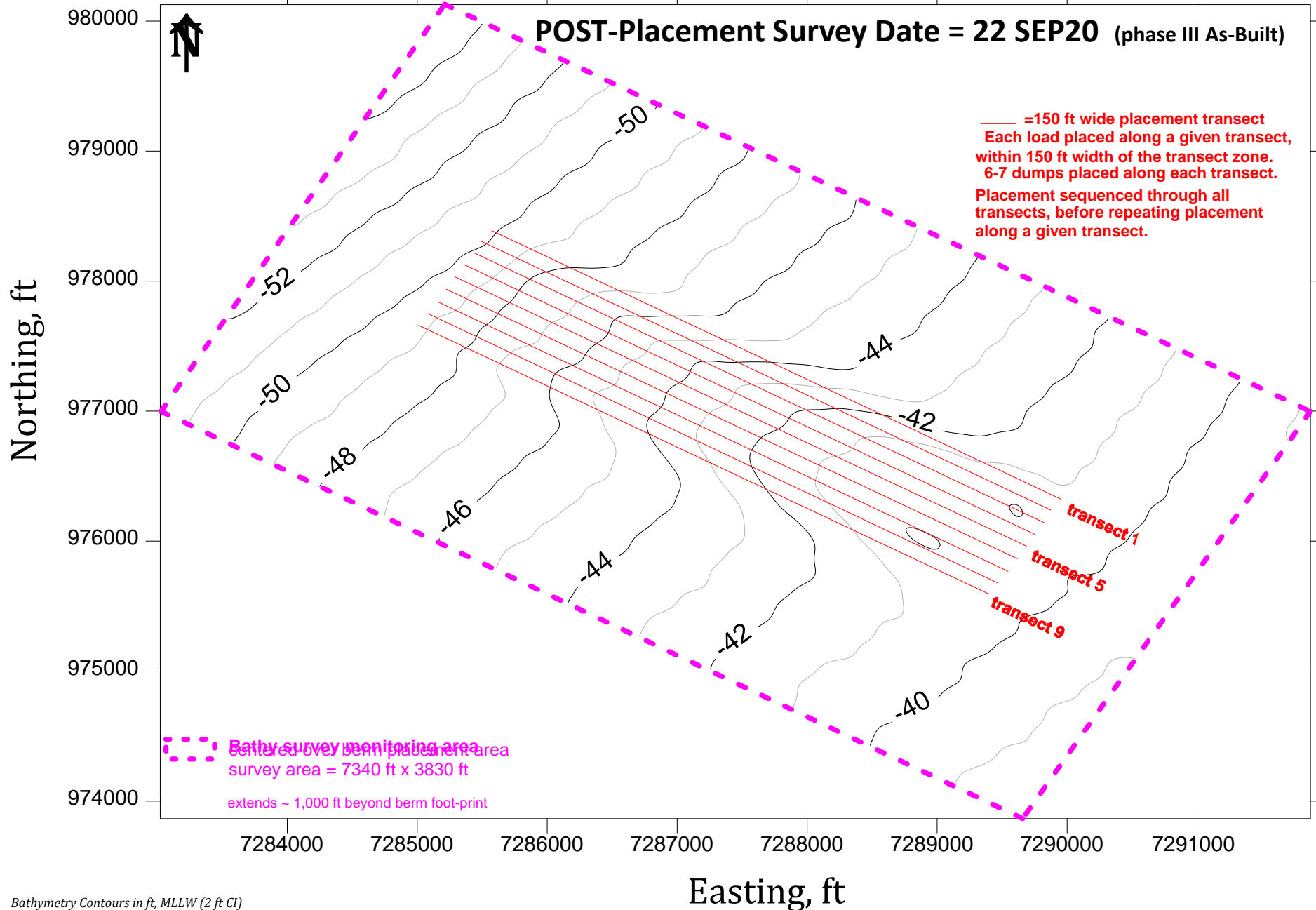
7286000

7288000

7290000

MCR North Head Site (NHS) - Execution of Phase III

282,747 cy (47 loads) placed by hopper dredge Essayons within NHS-III area during 15-22 SEP 2020



MCR North Head Site (NHS) - Execution of Phase III

282,747 cy (47 loads) placed by hopper dredge Essayons within NHS-III area during 15-22 SEP 2020

Post-Placement Survey Date = 22 SEP20

0 days after placement

Color-filled contours indicate Difference between 22 SEP and 9 SEP surveys indicating the remaining deposition of dredged material (sand) that was initially placed on seabed during 15-22 SEP.

BERTHA

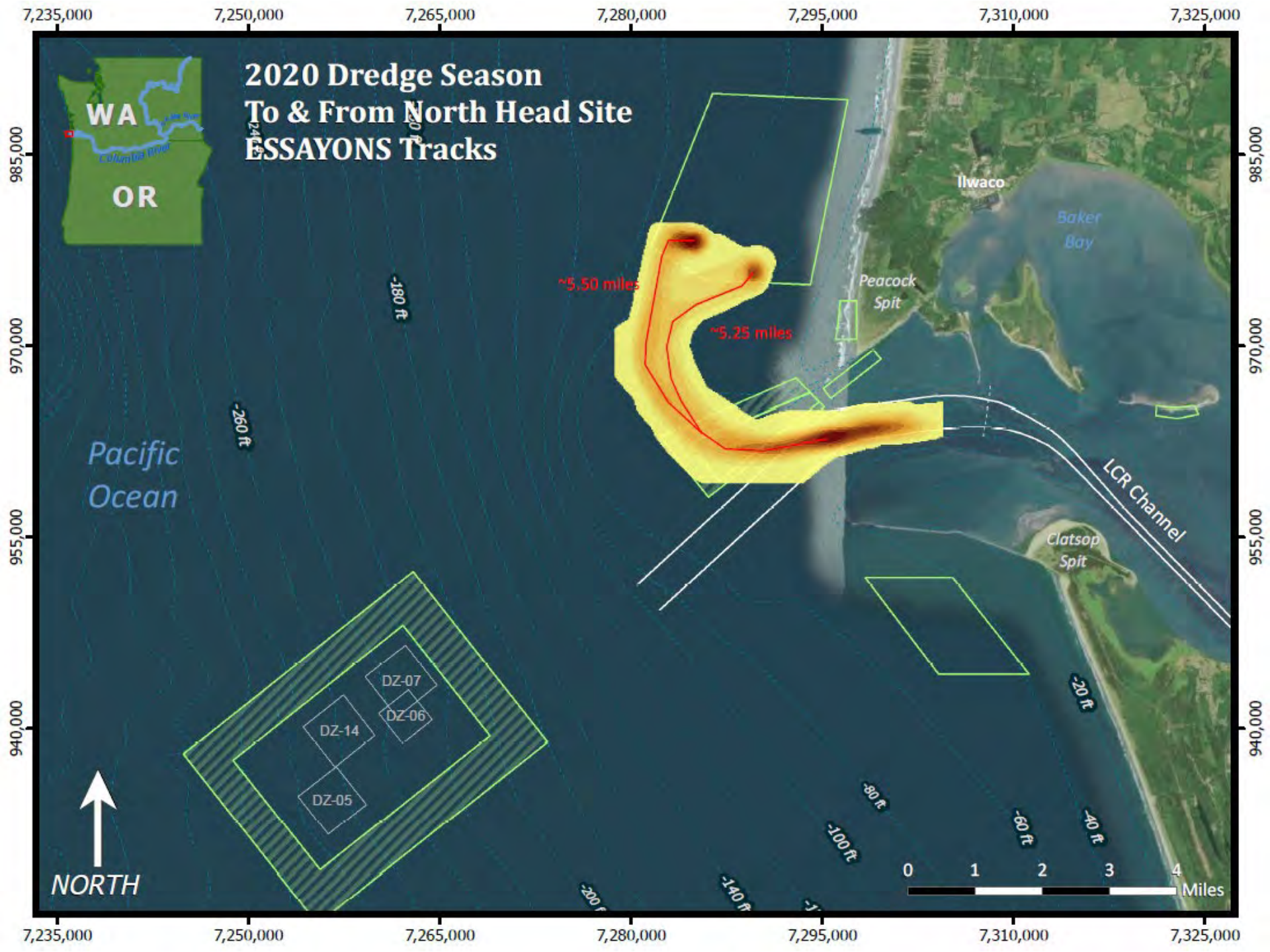
Approximately 278 Kcy of sand remains within the deposition feature initial footprint. Very little material has been dispersed off initially-formed mound feature.

Bertha survey monitoring area
bertha survey monitoring area
survey area = 7340 ft x 3830 ft
extends ~ 1,000 ft beyond berm foot-print



Northing, ft

Easting, ft



MCR North Head Site (NHS) - Execution of Phase III

282,747 cy (47 loads) placed by hopper dredge Essayons within NHS-III area during 15-22 SEP 2020

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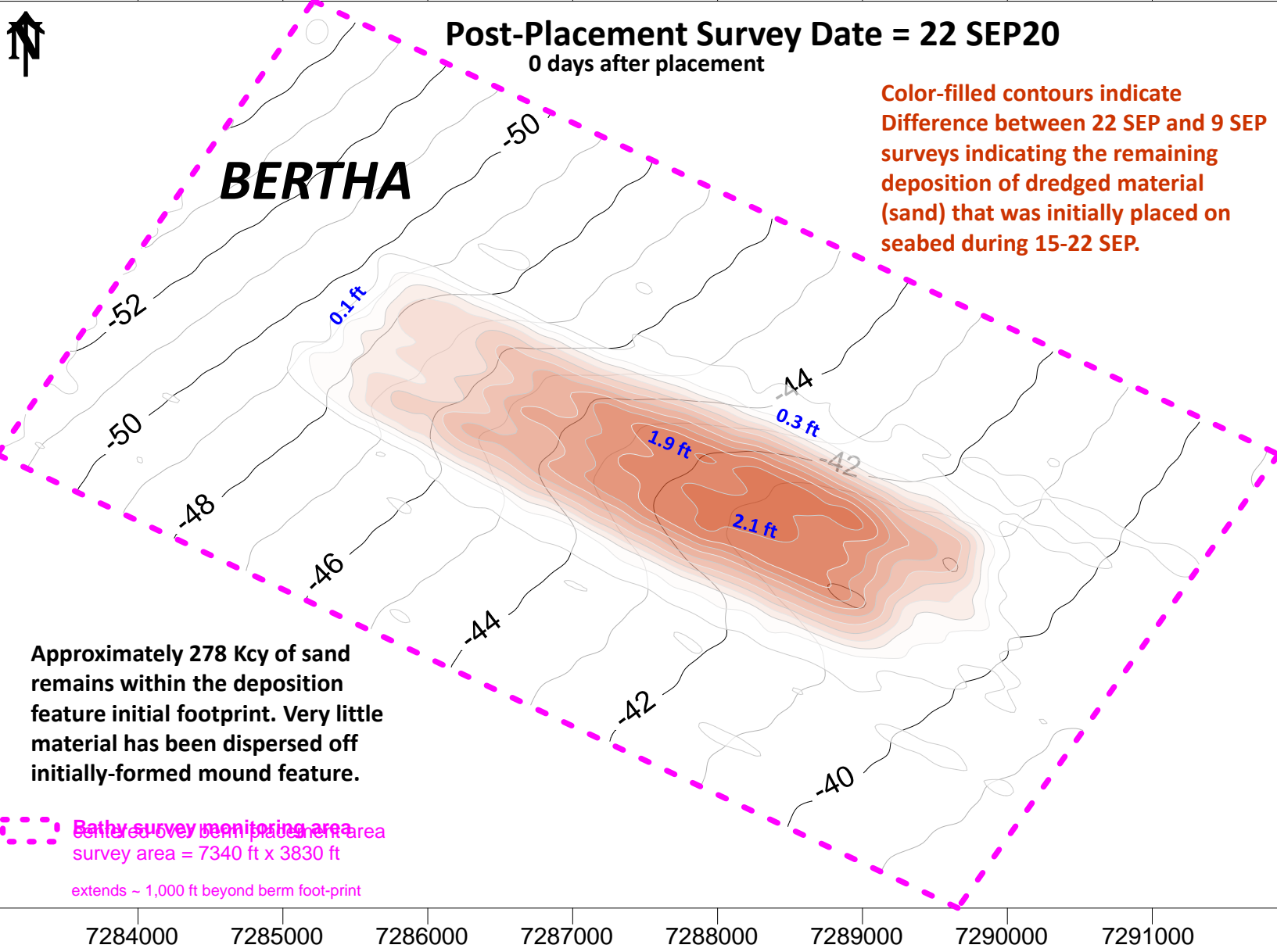
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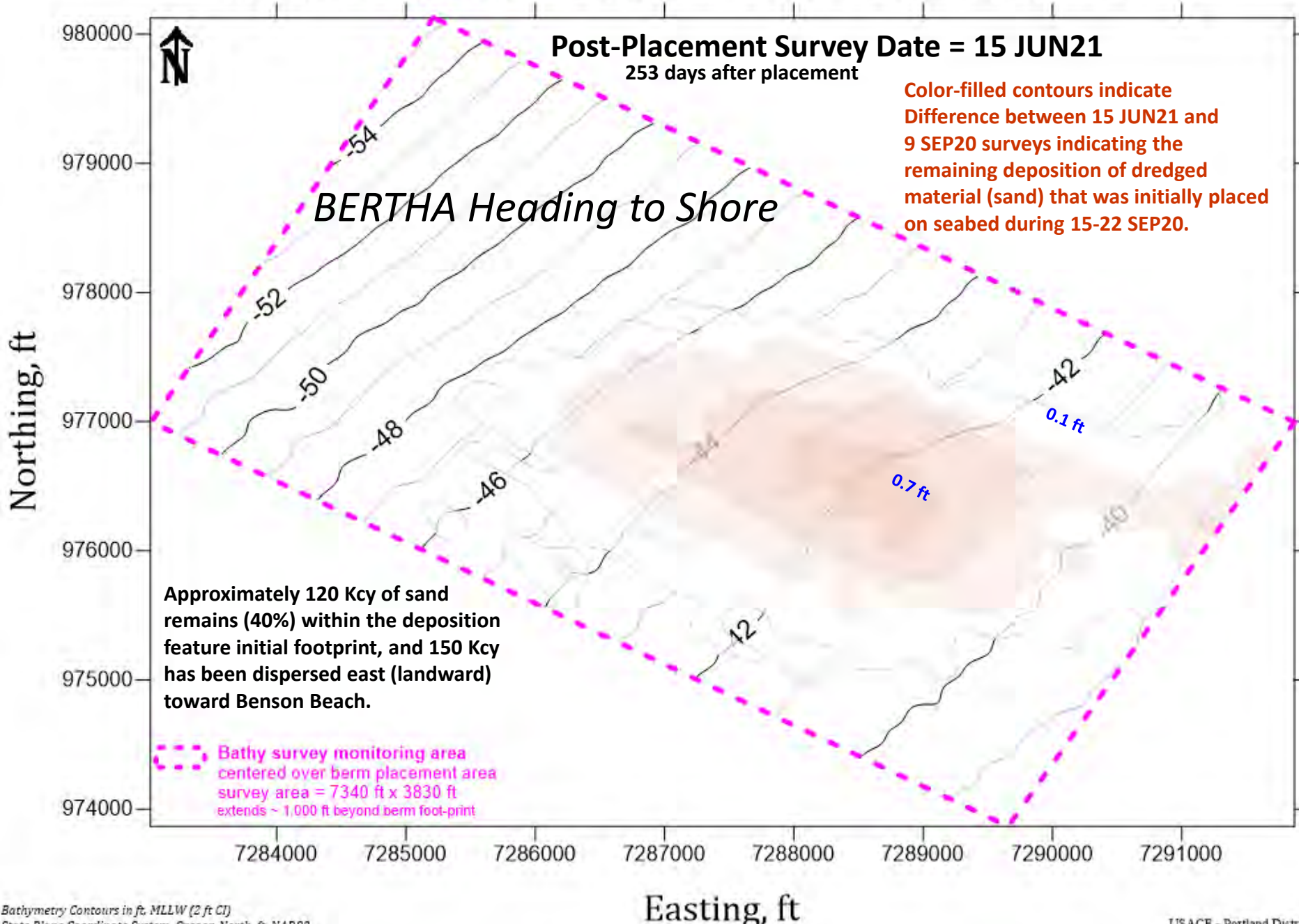
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Bathymetry Contours in ft, MLLW (2 ft CI)
State Plane Coordinate System, Oregon North, ft, NAD83

MCR North Head Site (NHS) - Execution of Phase III

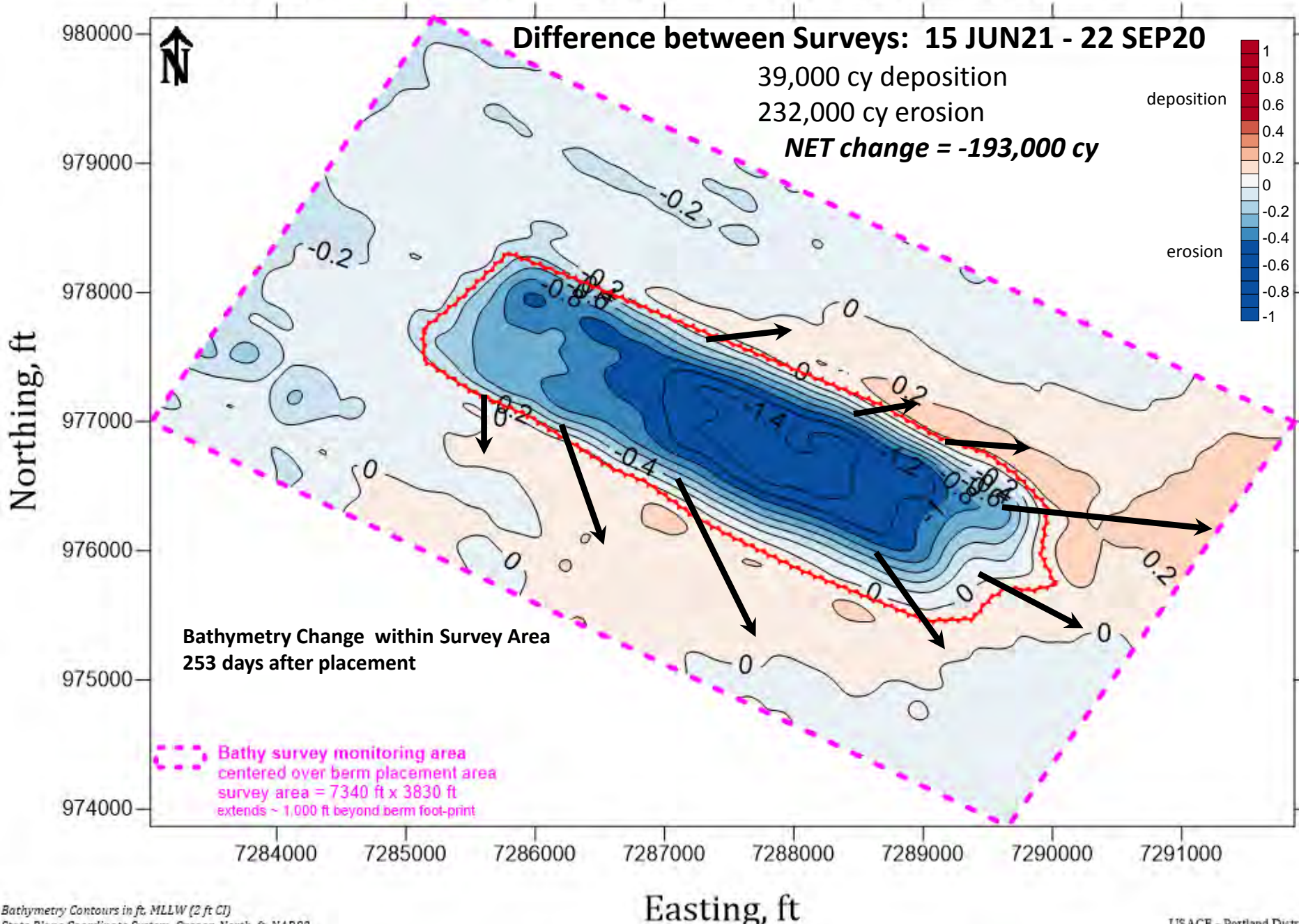
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MCR North Head Site (NHS) - Execution of Phase III

282,747 cy (47 loads) placed by hopper dredge Essayons within NHS-III area during 15-22 SEP 2020

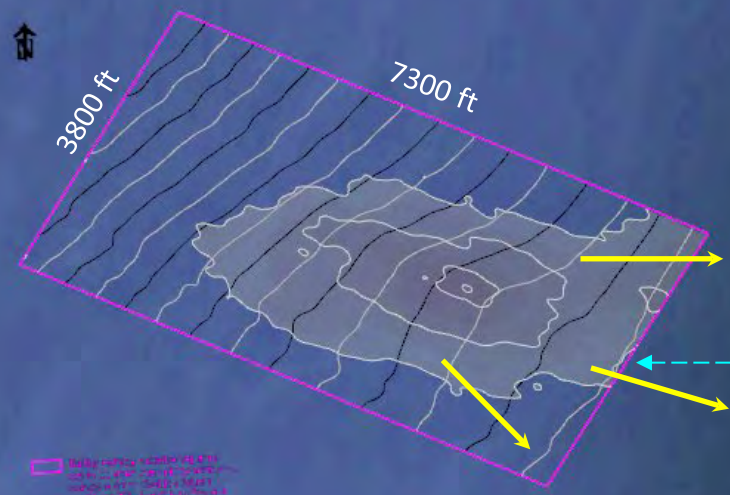


Bathymetry Contours in ft. MLLW (2 ft CI)
State Plane Coordinate System, Oregon North, ft. NAD83

MCR North Head Site (NHS) - Execution of Phase III

PM: Julia.r.keiter@usace.army.mil

10 MAR 21: 142 Kcy sand remains within initial mound footprint (50%)



1.6 miles

North Head

Benson Beach

North Jetty

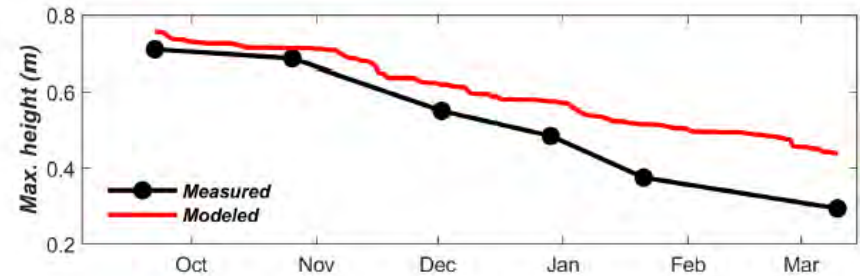
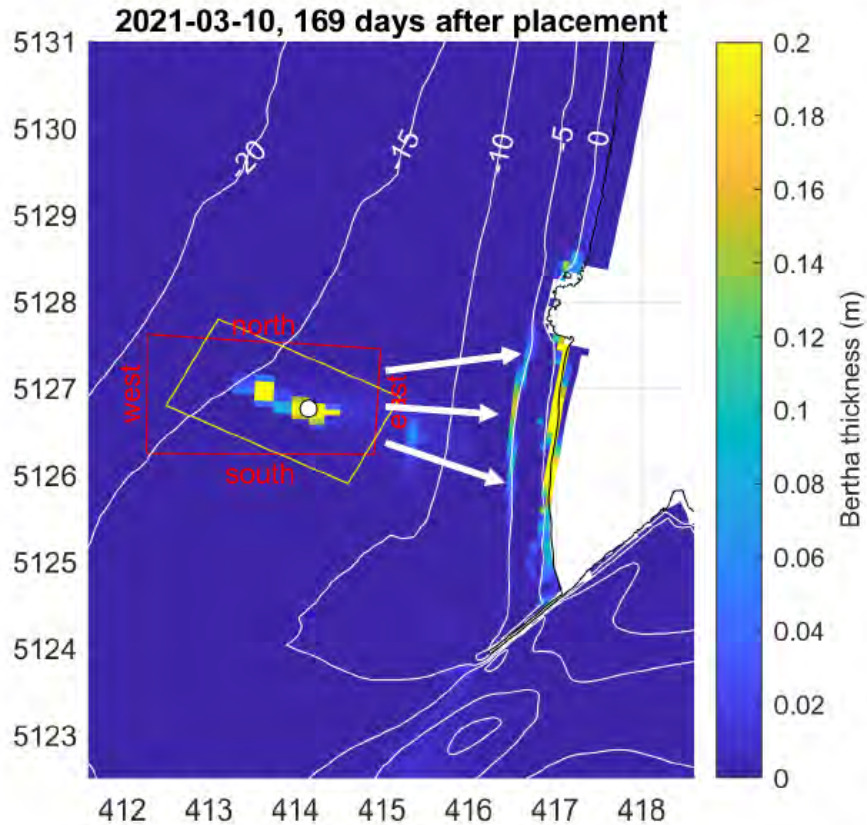
Based on monitoring results 22 SEP 20 to 10 MAR 21, 130 Kcy of Sand eroded from Phase III mound was being transported EAST toward shore (Benson Beach)

15 JUN 21: 120 Kcy sand remain within initial mound footprint (40%)

ShoutOut: The crew for the dredge Essayons performed an admirable job to build the mound at NHS-III, and the crew for survey vessel Elton did an excellent job for the surveying.

USGS Application of Delft 3D Hydrodynamic & Sediment Transport Model Simulate the Fate of Dredged Material Placed at NHS-Phase III (Bertha)

Sediment dispersed out of survey area (yellow box) deposited on Benson Beach



- *Transport model with default parameters does a commendable job reproducing volume flux and maximum height of deposit*

PHSE III Pilot Study - North Head Site (NHS) Placement & Monitoring

NHS-Phase III Pilot Placement and Monitoring Plan approved by stakeholders 22 July 2020

Pre-placement (baseline) survey = 9 SEP 2020

283,000 cy of sand was placed 15-22 SEP 2020, “exactly” according to Monitoring Plan
47 loads by the hopper dredge Essayons (sand was dredged from MCR federal navigation channel).

As-built survey (first post-placement) = 22 SEP 2020

2.0 - 2.5 ft high Mound was created on seabed: 4,900 ft long and 1,200 ft wide.
278,000 cy contained within mound (97% of placement volume).

Successive surveys obtained: 28 Sep, 15 Oct, 26 Oct, 2 Dec, 29 DEC, 20 Jan21, 10 Mar21, 15 JUN21

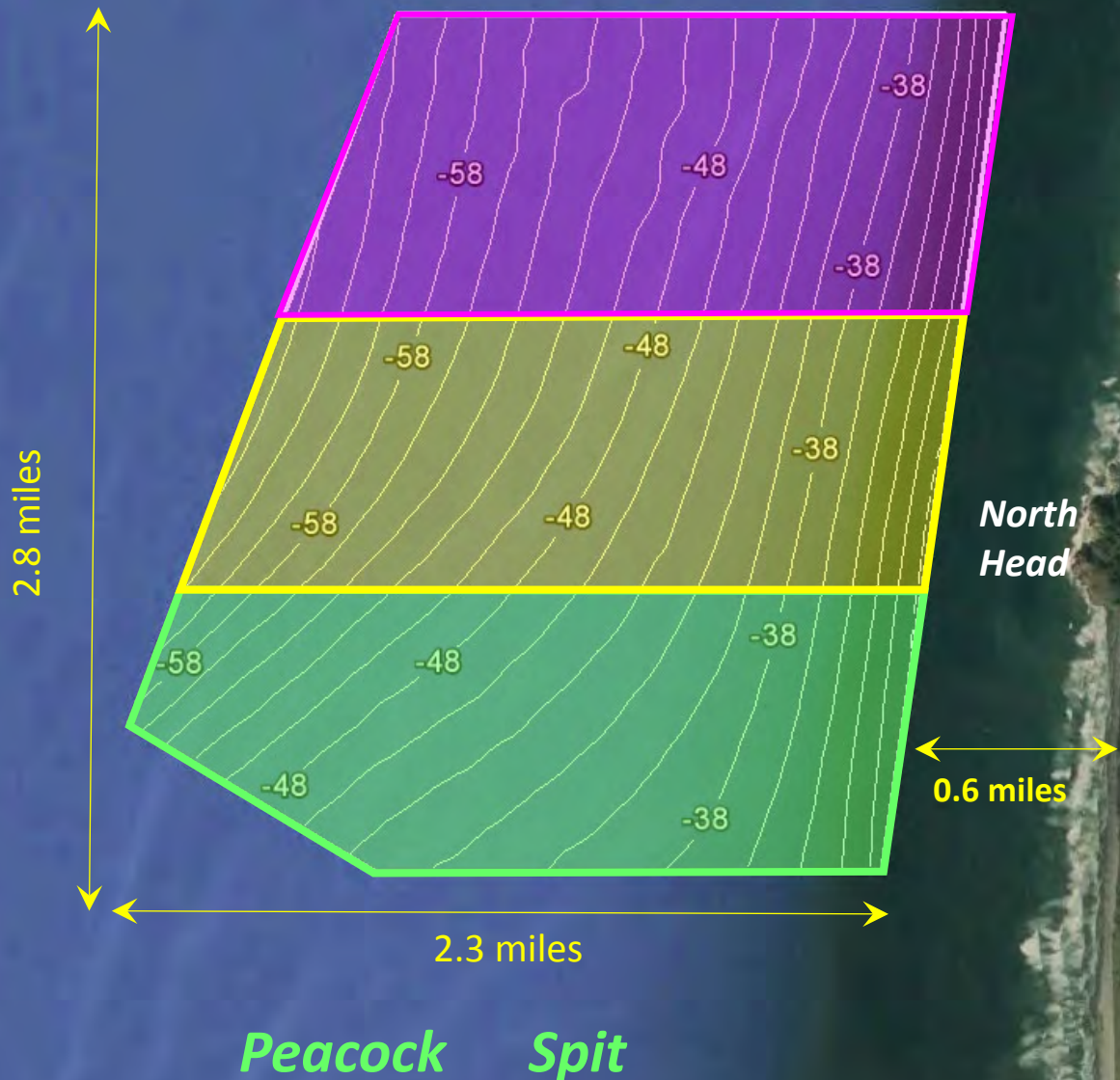
No significant movement of mound (placed sand) during 22 Sep -26 Oct.

Significant transport of sand from initial mound footprint during 26 Oct 20 – 10 Mar 21:
130 Kcy eroded from initial mound footprint, material transported shoreward of mound.
Mound height reduced from 2.4 ft (22 SEP20) to 0.7 ft (15 JUN21).

Sand eroded from mound was moving toward Benson Beach, as of 15 June 2021.

Proposed Operational Plan For North Head Site (NHS)

Use sub-areas of NHS on a rotational basis (annual use) at 400 - 500 KCY/yr
--> with close stakeholder coordination <--



Proposed Placement Rate
= 400,000 to 500,000 cy/yr

Use the NHS in similar manner as SJS –

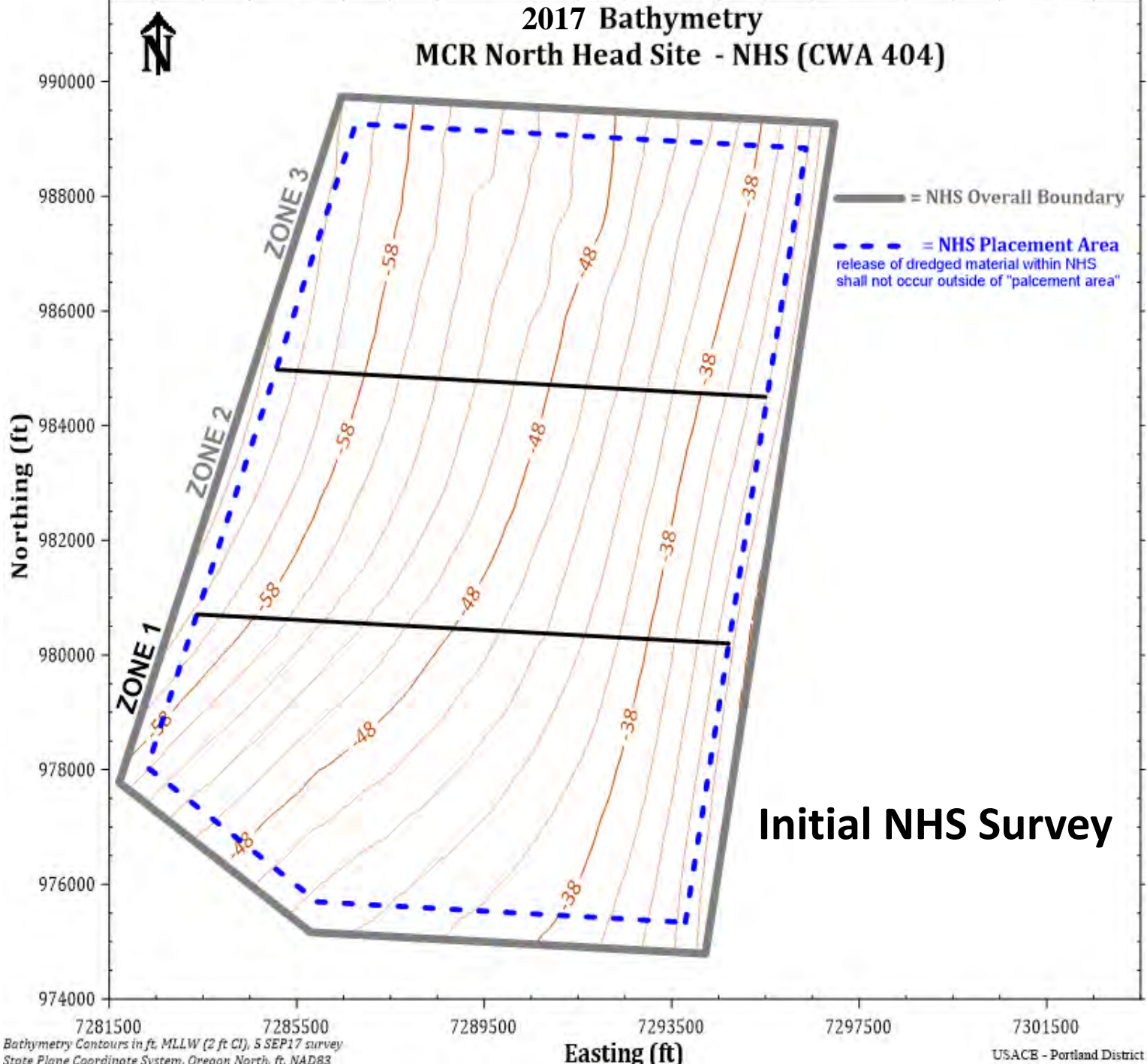
Place MCR dredged sand using thin-layer placement method. Each hopper load is dispersed over a ~5,000 ft distance to minimize benthos impact. Placements are distributed within annual drop zone to avoid mounding material greater than 2 ft WRT baseline condition.

-----TO CONFIRM-----
Baseline Condition for NHS would be based on Spring-Summer 2021 survey.

Placement Begins: 15 SEP

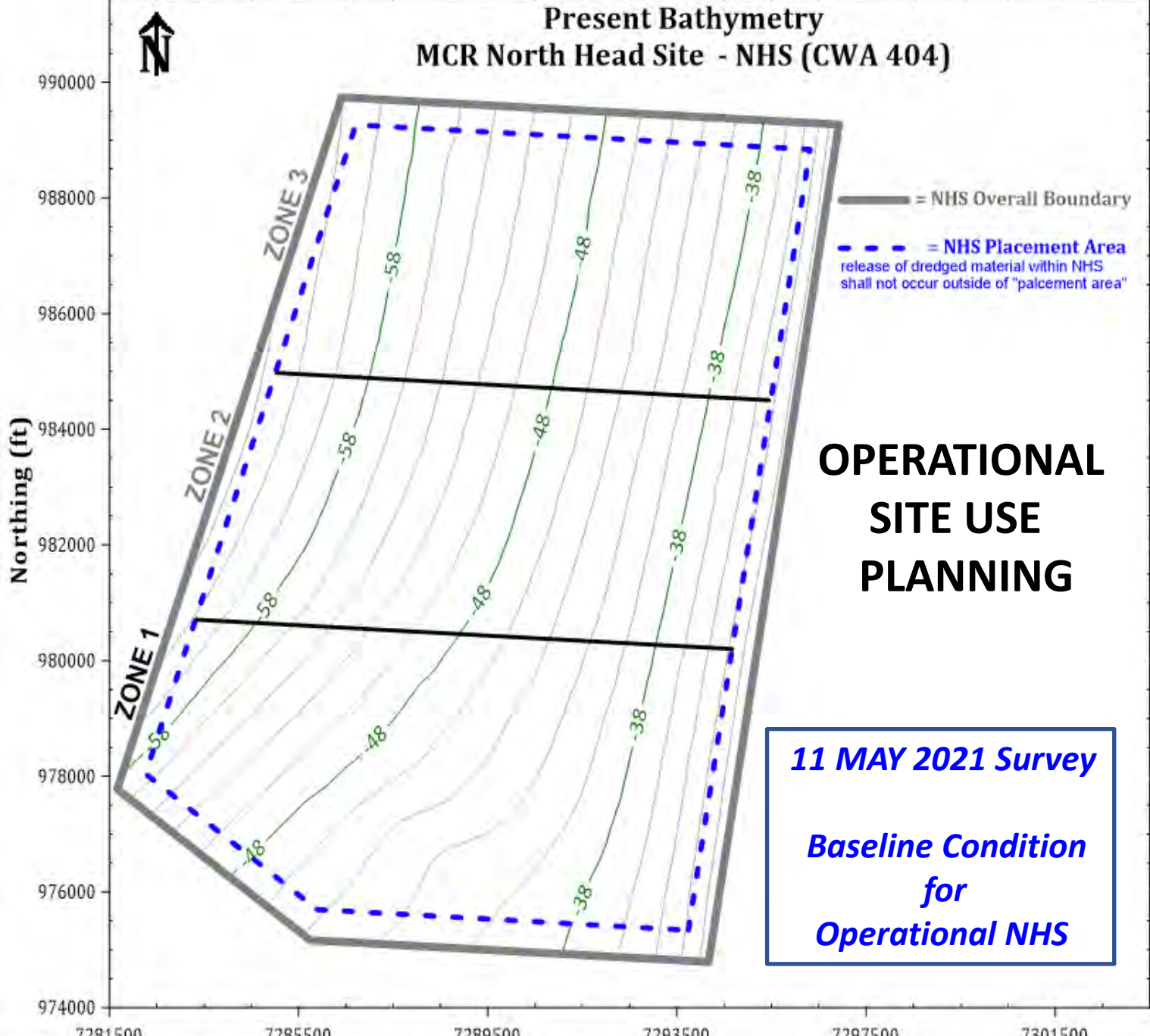
Benson Beach

2017 Bathymetry MCR North Head Site - NHS (CWA 404)



Bathymetry Contours in ft, MLLW (2 ft CI), 5 SEP17 survey
State Plane Coordinate System, Oregon North, ft, NAD83

Present Bathymetry MCR North Head Site - NHS (CWA 404)



— = NHS Overall Boundary
- - - = NHS Placement Area
release of dredged material within NHS shall not occur outside of "placement area"

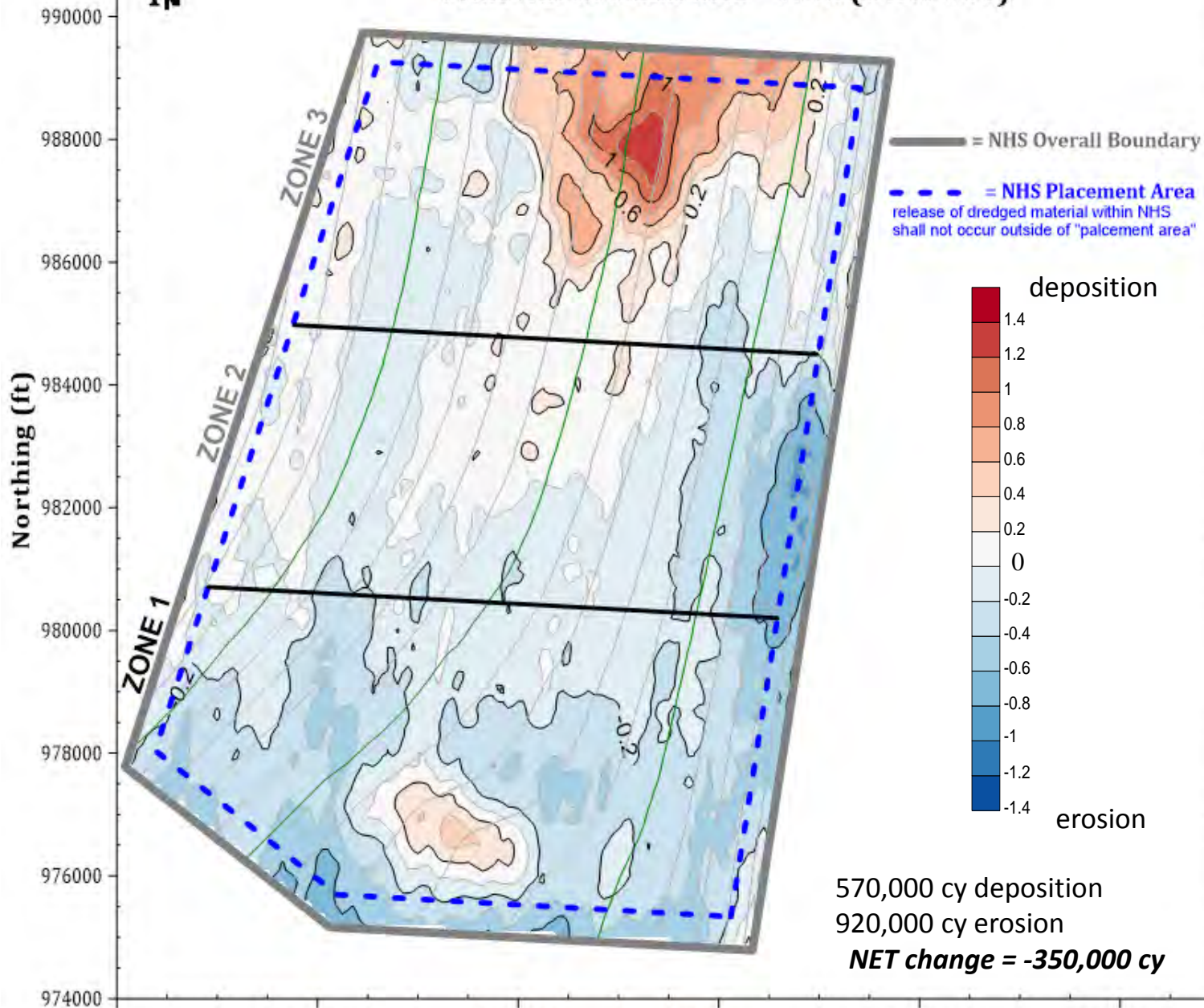
**OPERATIONAL
SITE USE
PLANNING**

11 MAY 2021 Survey
*Baseline Condition
for
Operational NHS*

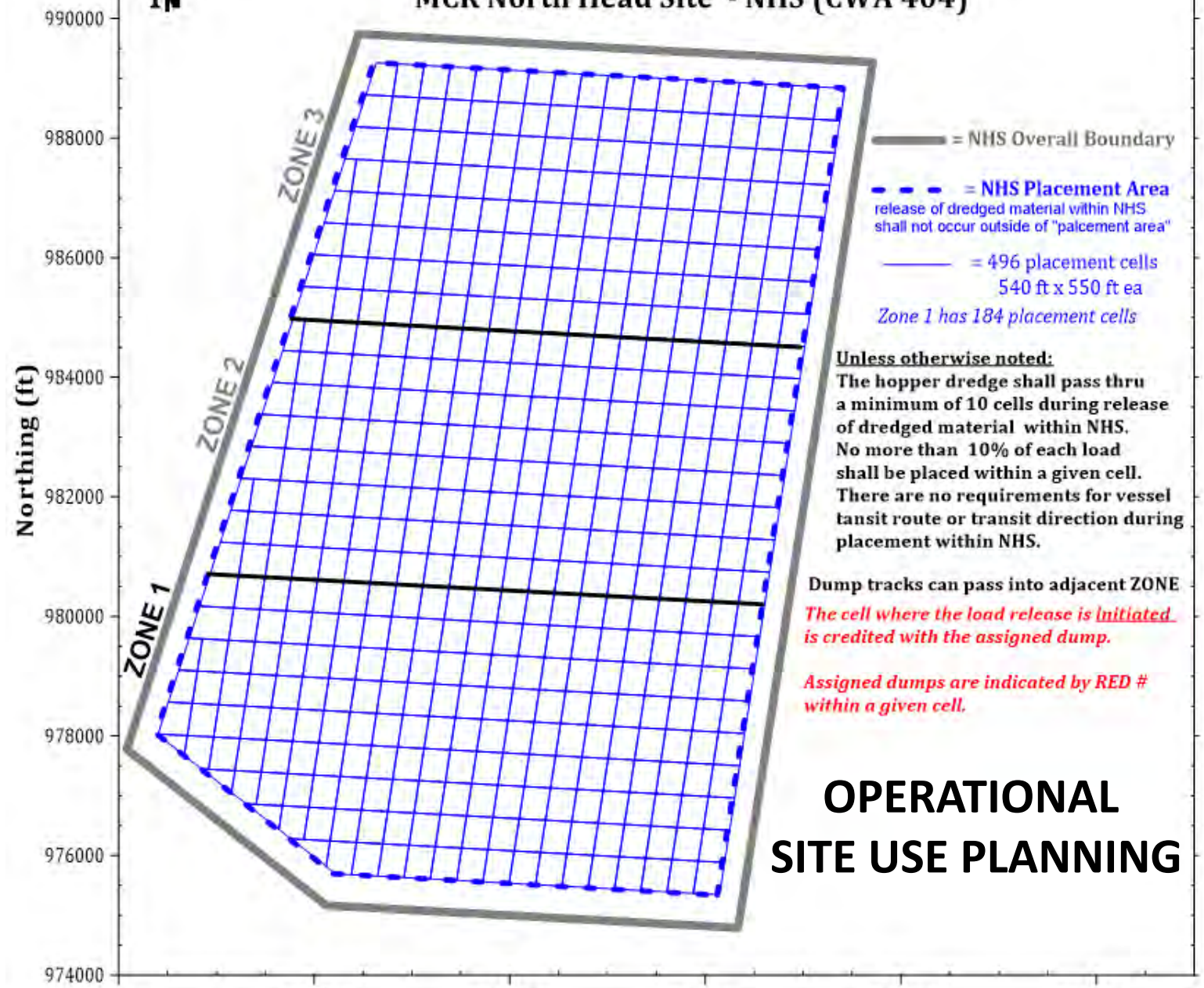
Bathymetry Contours in ft. MLLW (2 ft CI), 11 MAY21 survey
State Plane Coordinate System, Oregon North, ft, NAD83

Bathymetry Change 2017 to 2021

MCR North Head Site - NHS (CWA 404)



Placement Cells MCR North Head Site - NHS (CWA 404)



- = NHS Overall Boundary
- - - = NHS Placement Area
release of dredged material within NHS shall not occur outside of "placement area"
- = 496 placement cells
540 ft x 550 ft ea
Zone 1 has 184 placement cells

Unless otherwise noted:
 The hopper dredge shall pass thru a minimum of 10 cells during release of dredged material within NHS. No more than 10% of each load shall be placed within a given cell. There are no requirements for vessel transit route or transit direction during placement within NHS.

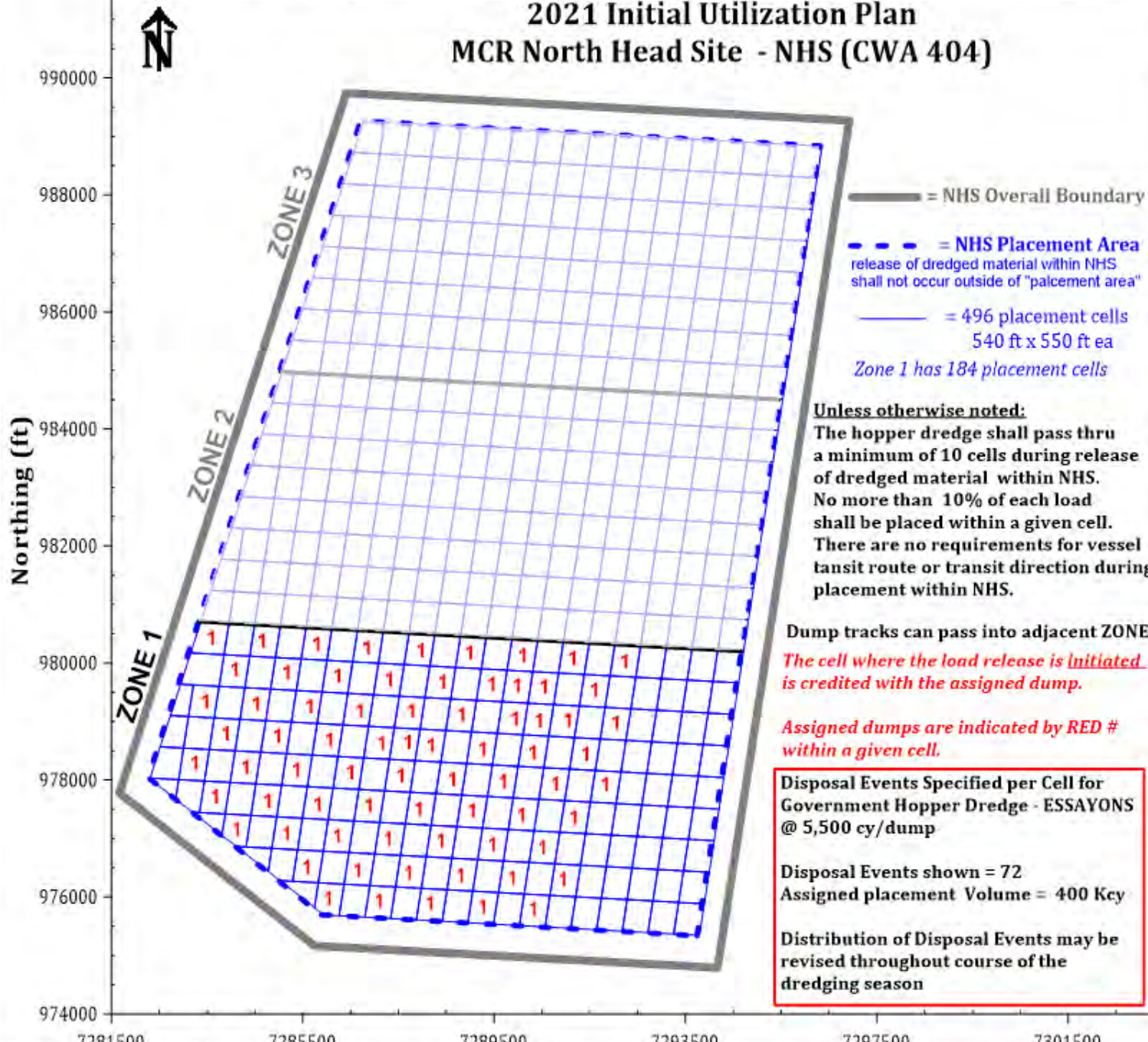
Dump tracks can pass into adjacent ZONE
The cell where the load release is initiated is credited with the assigned dump.

Assigned dumps are indicated by RED # within a given cell.

OPERATIONAL SITE USE PLANNING

Bathymetry Contours in ft. MLLW (2 ft CI), 11 MAY21 survey
 State Plane Coordinate System, Oregon North, ft. NAD83

2021 Initial Utilization Plan MCR North Head Site - NHS (CWA 404)



MCR NORTH HEAD SITE

Dredge: ESSAYONS

Date: SEPTEMBER 16-30, OCTOBER 1-10, 2021

Loads:

FY21: 1035-1044, 1051-1054, 1058-1081, 1091-1092, 1094

FY22: 2-8, 10, 14-17, 31-45

67 Loads Placed during 16 SEP to 10 OCT

Avg Load = 5,100 cy

Total Placed = 348 Kcy (86% of objective, 400 Kcy)

- ✦ Starting Points
- Open Cells
- Closed Cells



0 1,000 2,000 4,000 Feet



Horizontal Coordinate System: NAD83 Oregon North U.S. Survey Feet

