USACE Portland District MCR Navigation Program

Science-Policy Workshop

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USACE Portland District

May 3, 2016

Ilwaco, WA

US Army Corps of Engineers

BUILDING STRONG®

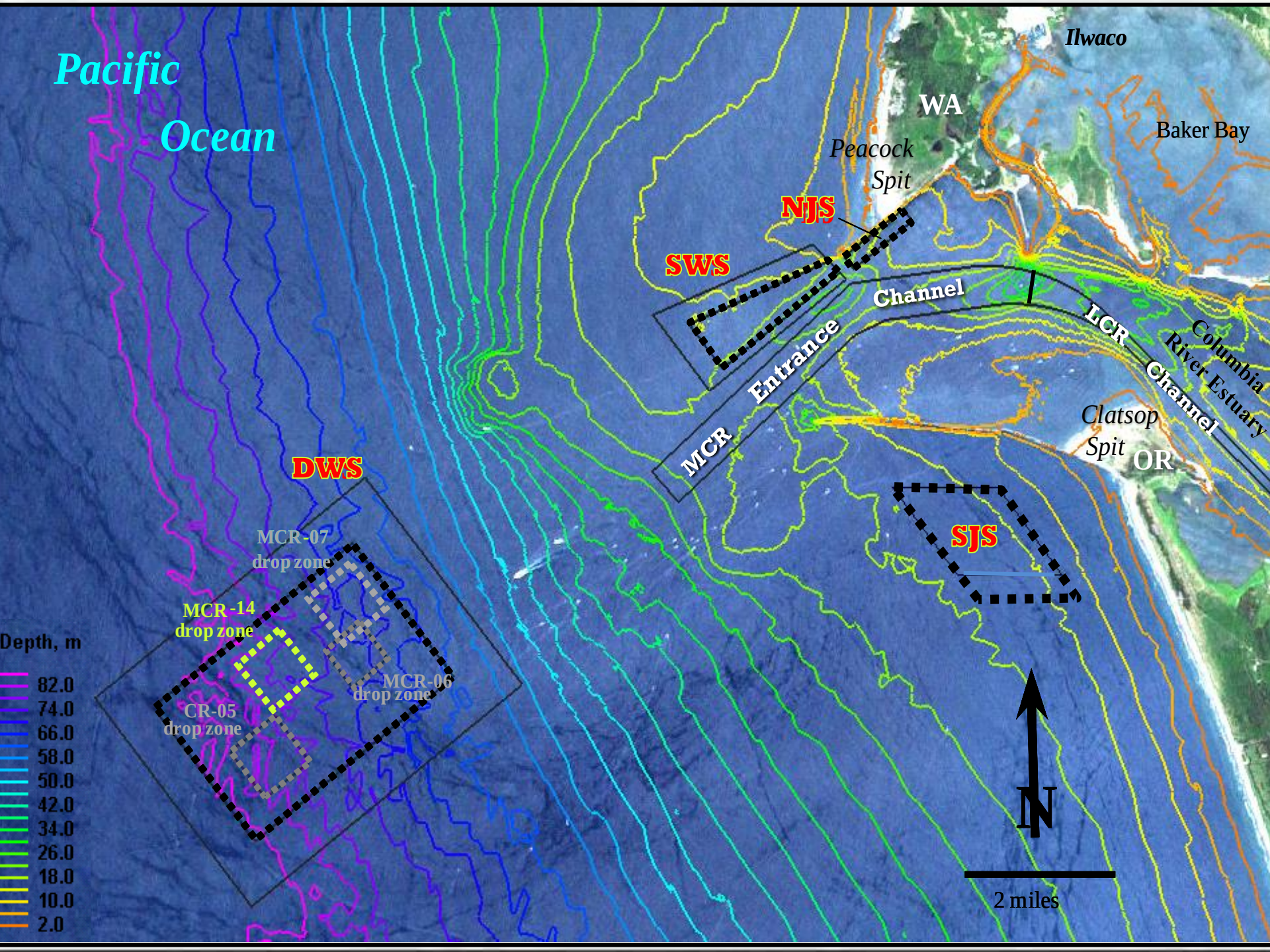
Mouth of the Columbia River– Gateway to the Columba-Snake River System

Columbia River at the Mouth, WA & OR

- Entrance channel 55/48 feet deep, 2640 feet wide, and 6 miles long
- Average annual dredging 3.5 MCY, June-Sept work window
- Support Columbia-Snake River Navigation System
  - 46 million tons of cargo annually, worth $24B
  - Largest wheat and barley export gateway in the Nation
  - Second largest soy export gateway in the World
  - Over $930M in commercial investments-to-date because of the deepening
  - Supports 40,000 local jobs
- Large group of stakeholders, with varying concerns
- Focus on the beneficial use of dredged material and Engineering with Nature to prevent ‘wasting’ clean sediment resources.
- Disposal Mission, responsible use of the placement sites to maximize capacity

Mouth of the Columbia River RSM Stakeholders

1) National Oceanic and Atmospheric Administration (NOAA)
2) Environmental Protection Agency (EPA)
3) Oregon Governor's Office
4) Washington Governor's Office
5) WA Department of Ecology (WDOE)
6) Columbia River Crab Fishers Association (CRCFA)
7) Washington Department of Natural Resources (WDNR)
8) Oregon Dept. of Land Conservation and Development (ODLCD)
9) Oregon Sea Grant
10) Portland State University
11) Oregon State University
12) Oregon Health Sciences University
13) National Policy Consensus Center
14) Oregon Department of Environmental Quality (ODEQ)
15) Port of Astoria
16) Port of Ilwaco
17) Port of Chinook
18) Pacific County, WA
19) Clatsop County, OR
20) Oregon Department of State Lands (ODSL)
21) US Fish and Wildlife Service (USFWS)
22) Oregon Department of Fish and Wildlife (ODFW)
23) Washington Department of Fish & Wildlife (WDFW)
24) Lower Columbia Solutions Group (LCSG)
25) Institute for Natural Resources
26) Center for Public Service

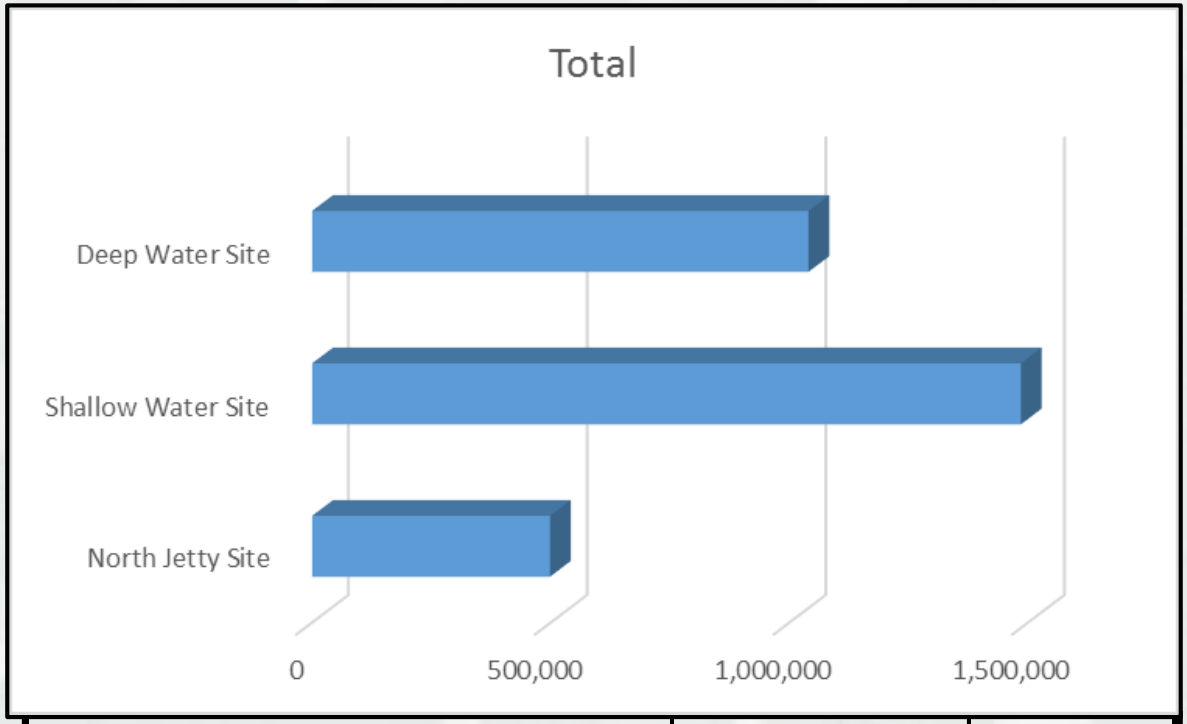

Pacific
Ocean
Ilwaco
WA
Baker Bay
Peacock
Spit
NJS
SWS
Channel
Entrance
MCR
LCR
Channel
Columbia
River Estuary
Clatsop
Spit
OR
DWS
SJS
MCR-07
drop zone
MCR-14
drop zone
MCR-06
drop zone
CR-05
drop zone
Depth, m
82.0
74.0
66.0
58.0
50.0
42.0
34.0
26.0
18.0
10.0
2.0
N
2 miles

5-Year MCR Dredging Totals

2011
3,023,408
2012
2,674,941
2013
3,264,772
2014
3,558,121
2015
3,429,963

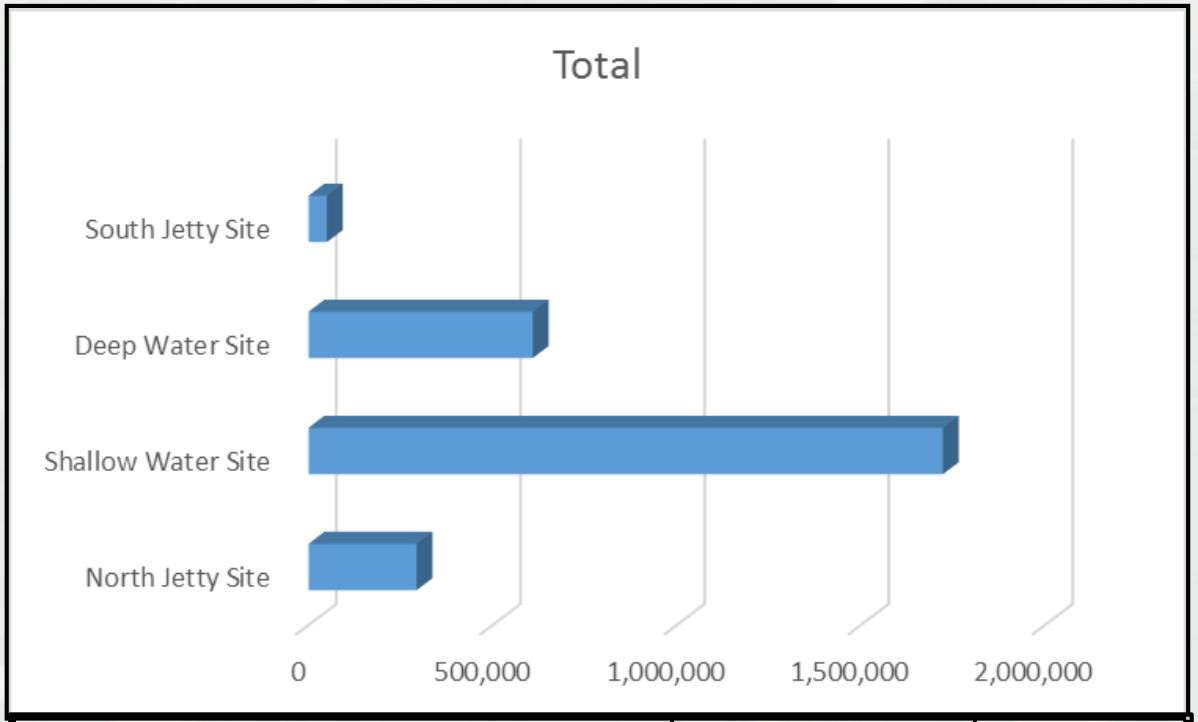
► We have had dredging seasons over 5mcy

2011 Dredging Summary



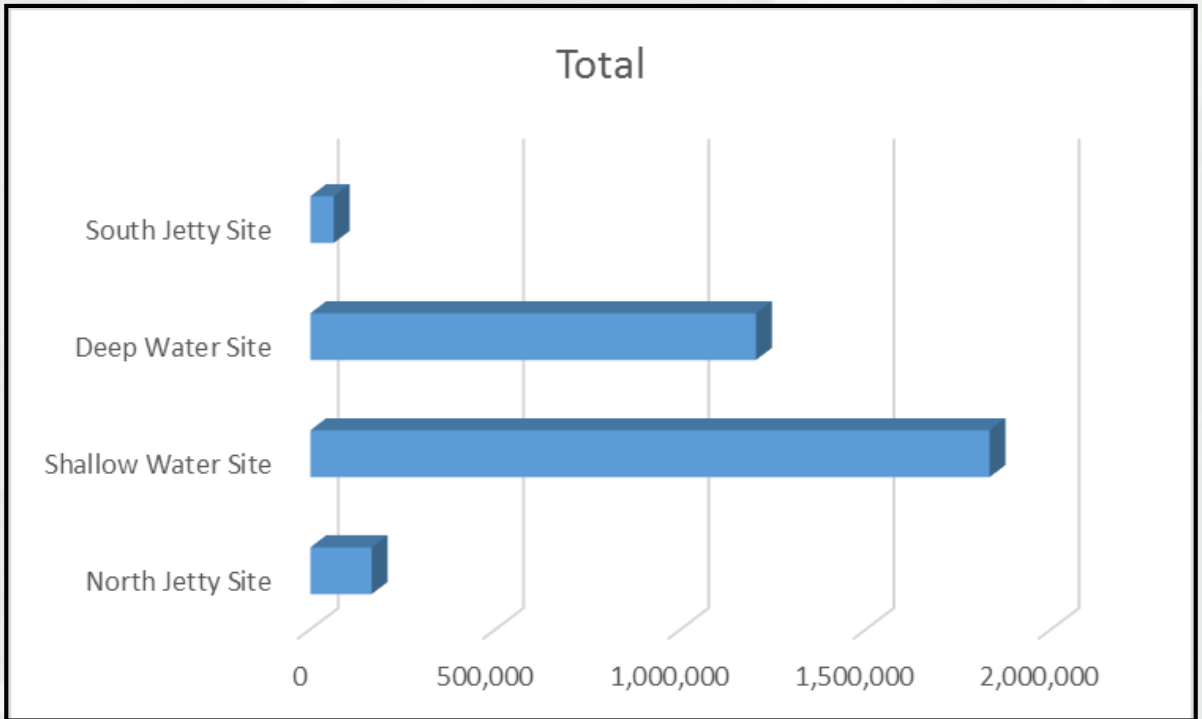
2011 Dispsoal Site Distribution	Total	% of Total
North Jetty Site	498,417	16%
Shallow Water Site	1,485,062	49%
Deep Water Site	1,039,929	34%
Total	3,023,408	

2012 Dredging Summary



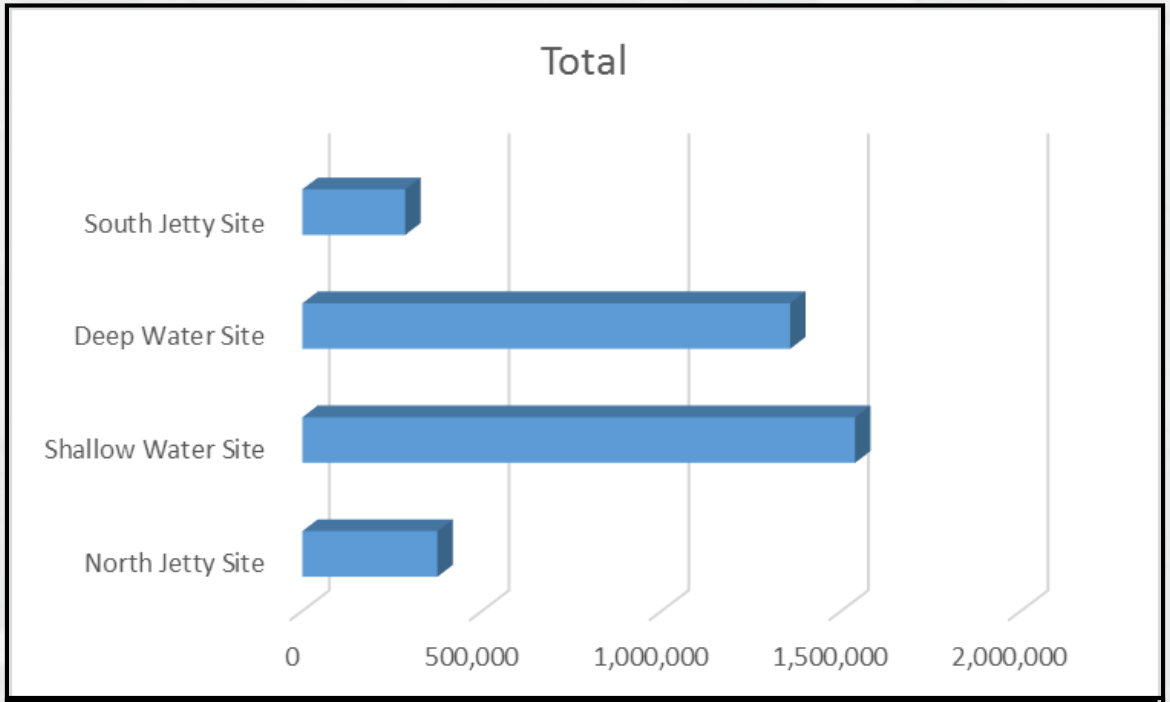
2012 Dispsoal Site Distribution	Total	% of Total
North Jetty Site	293,542	11%
Shallow Water Site	1,722,918	64%
Deep Water Site	608,829	23%
South Jetty Site	49,652	2%
Total	2,674,941	

2013 Dredging Summary



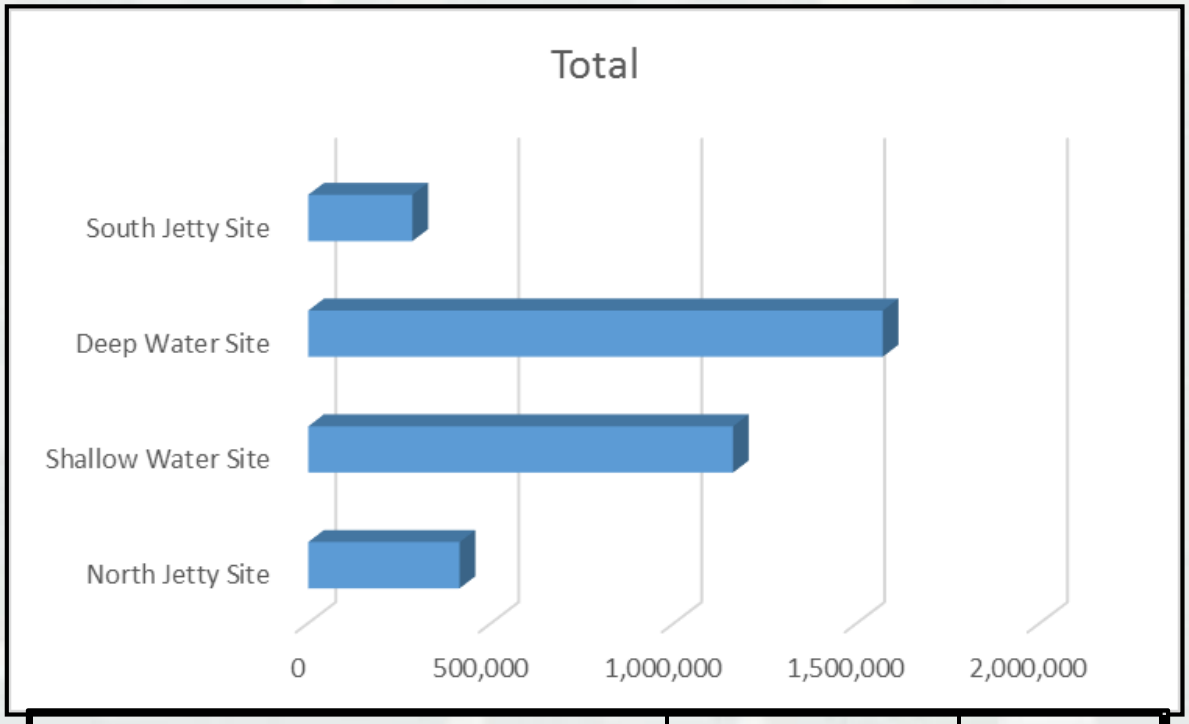
2013 Dispsoal Site Distribution	Total	% of Total
North Jetty Site	165,381	5%
Shallow Water Site	1,833,535	56%
Deep Water Site	1,202,954	37%
South Jetty Site	62,902	2%
Total	3,264,772	

2014 Dredging Summary



2014 Dispsoal Site Distribution	Total	% of Total
North Jetty Site	375,778	11%
Shallow Water Site	1,538,254	43%
Deep Water Site	1,357,535	38%
South Jetty Site	286,554	8%
Total	3,558,121	

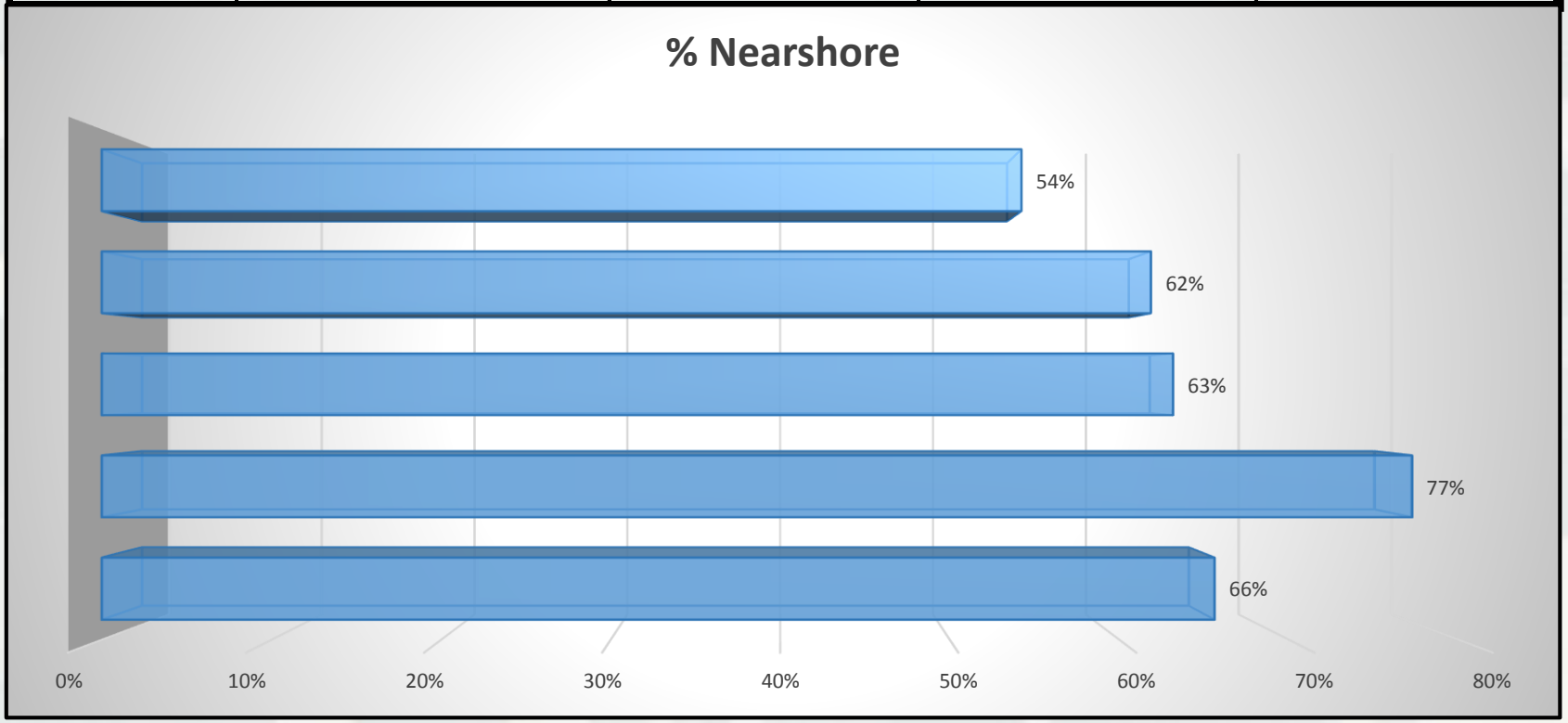
2015 Dredging Summary



2015 Dispsoal Site Distribution	Total	% of Total
North Jetty Site	413,851	12%
Shallow Water Site	1,161,206	34%
Deep Water Site	1,570,331	46%
South Jetty Site	284,575	8%
Total	3,429,963	

5-Year Disposal Site Distribution

Year	Dredging Total	Nearshore	DWS	% Nearshore
2011	3,023,408	1,983,479	1,039,929	66%
2012	2,674,941	2,066,112	608,829	77%
2013	3,264,772	2,061,818	1,202,954	63%
2014	3,558,121	2,200,586	1,357,535	62%
2015	3,429,963	1,859,632	1,570,331	54%



Monitoring Program

Benthic Surveys

- Use of the NOAA benthic video sled to enable quantification of macrofaunal abundances and distributions.
- Conduct benthic surveys at control and dredge material deposition sites spanning the operations period.
- Analysis includes extracting organism abundance data from digital video logs and testing for significance in a BACI statistical design.

Crab Mortality and Motility

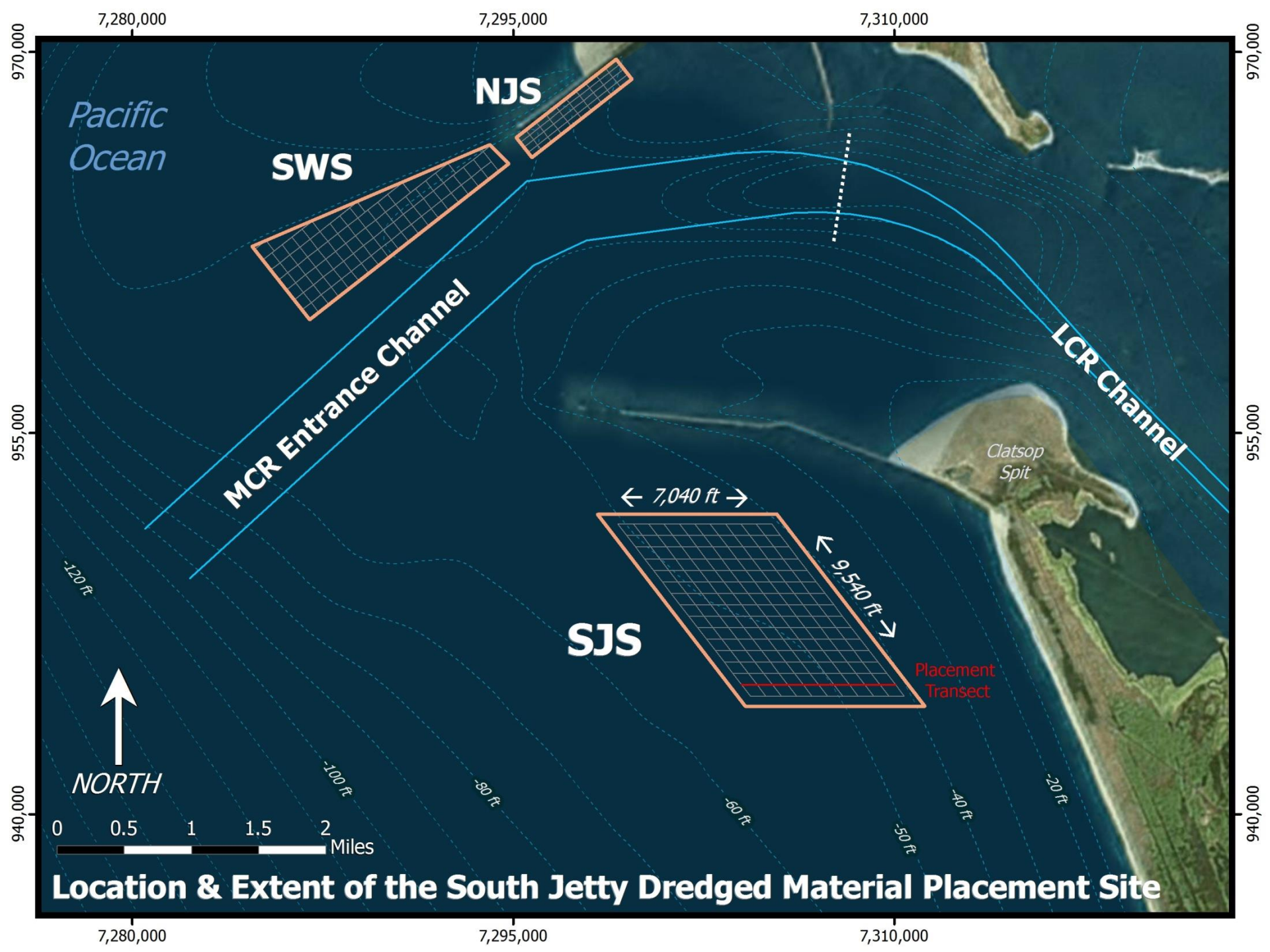
- Deploy acoustic receiver moorings at control and impact sites.
- Catch, tag, release and monitor crab movements during and after dredge material deposition events.
- Analysis of crab positions.
- Campod Deployment

Models, Tools, Databases, etc

- Sediment Profile Imaging Photography (SPI)
- Multi-beam survey data
- Acoustic telemetry to evaluate survival of Dungeness crabs
- Benthic video sled to assess the presence of benthic species
- Benthic Algorithm Development
- Environmental Buoy
- ADCP

Benefits

- Keep sediment in the littoral cell
- Slowing the erosion of Clatsop Spit
- Maintain Jetty Foundation/Root
- Reduced costs to the dredging program
- Increased habitat opportunities
- Distribute material between a network of sites
- Reducing the likelihood of mounding in the nearshore sites



Location & Extent of the South Jetty Dredged Material Placement Site

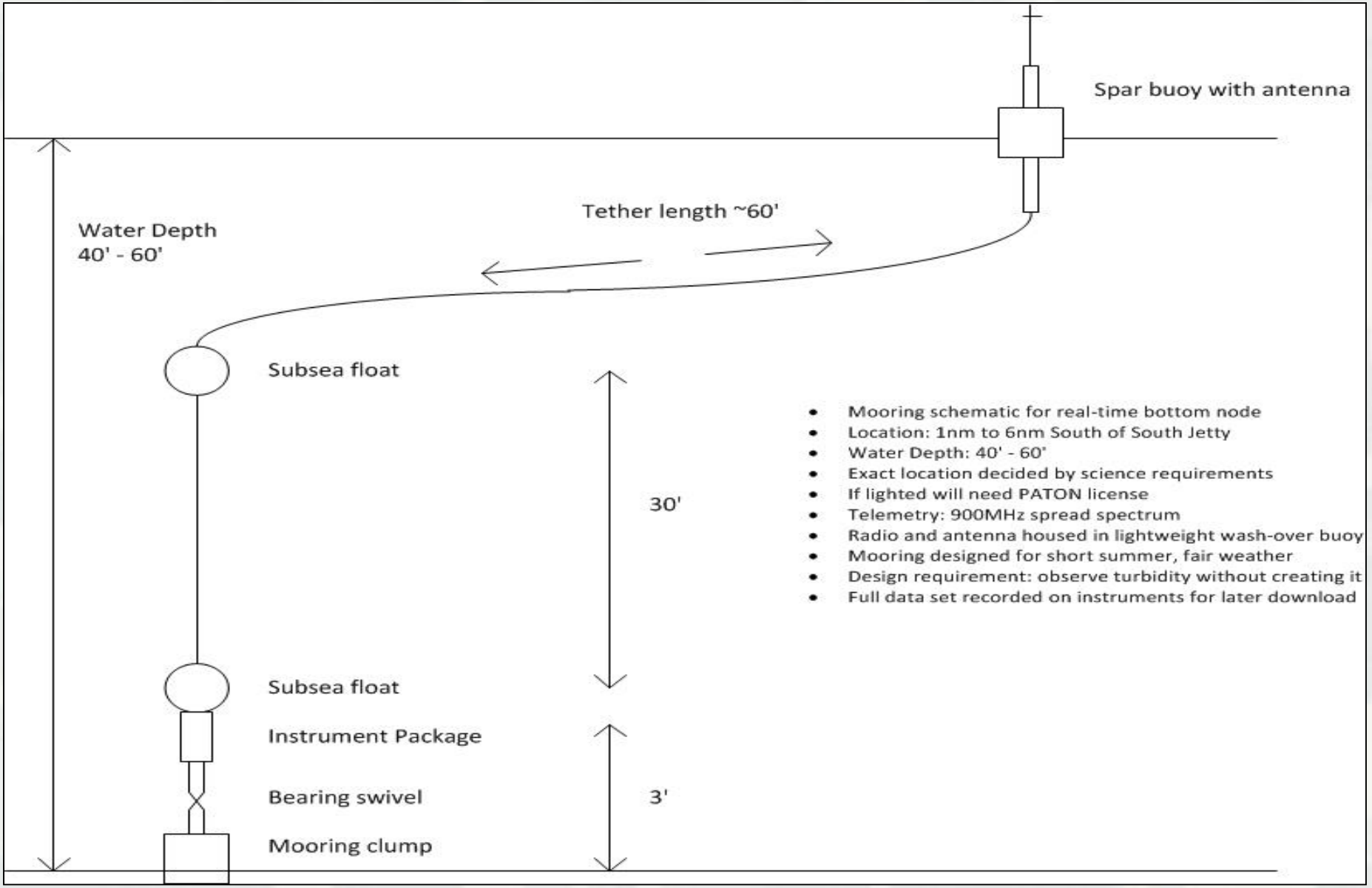
Environmental Buoy

- Prevalent phytoplankton blooms in previous years wasted resources
- Deployed by the Center for Coastal Margin Observation and Prediction (CMOP) Science and Technology University Research Network (SATURN)
- Provides real-time conditions in the SJS to allow monitoring during optimal conditions

Reporting Properties:

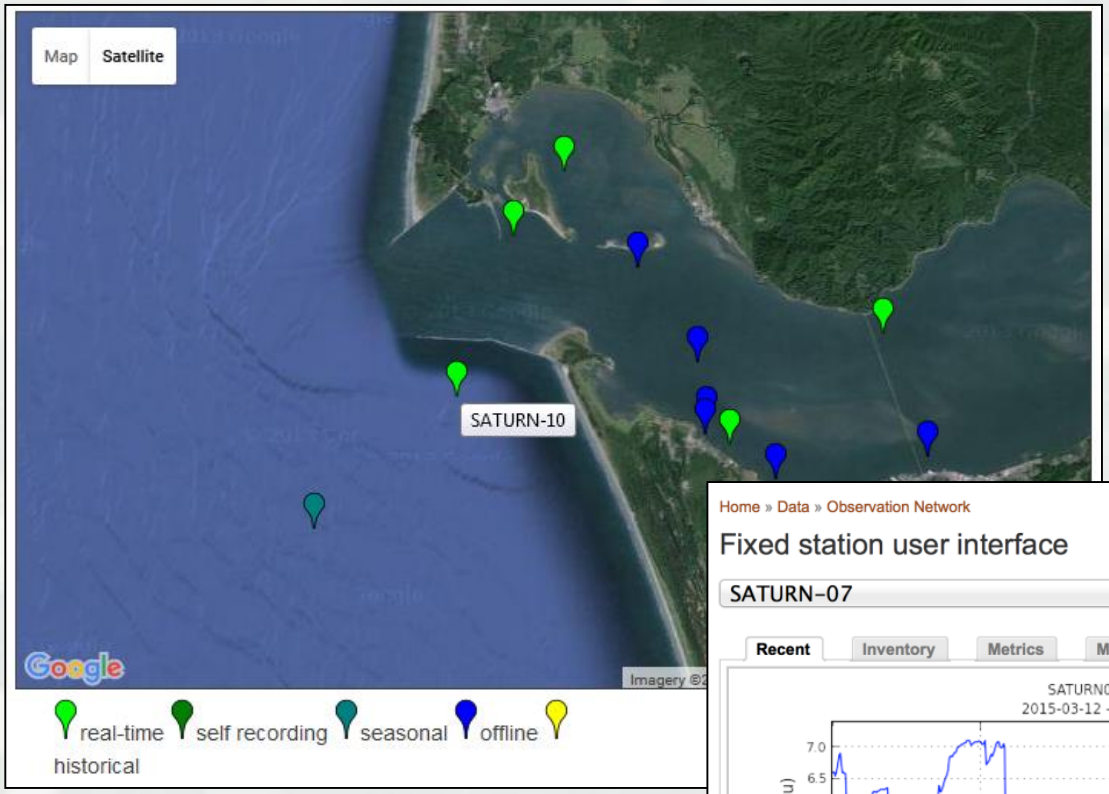
- Salinity
- Temperature
- Dissolved oxygen
- Conductivity
- Turbidity
- Chlorophyll Fluorescence
- Wind information
- National Buoy Data Center (NBDC)

Environmental Buoy



- Mooring schematic for real-time bottom node
- Location: 1nm to 6nm South of South Jetty
- Water Depth: 40' - 60'
- Exact location decided by science requirements
- If lighted will need PATON license
- Telemetry: 900MHz spread spectrum
- Radio and antenna housed in lightweight wash-over buoy
- Mooring designed for short summer, fair weather
- Design requirement: observe turbidity without creating it
- Full data set recorded on instruments for later download

SATURN Observation Network



Home » Data » Observation Network

Fixed station user interface

SATURN-07

Observation network | Network status | Write us | Link

Recent | Inventory | Metrics | Map

SATURN07 (1.0 m) best
2015-03-12 - 2015-03-14 (PST)

Salinity (psu)

time

2 Days | 7 Days | 15 Days | Zoom | Stack Plot | Data explorer

Latest observations

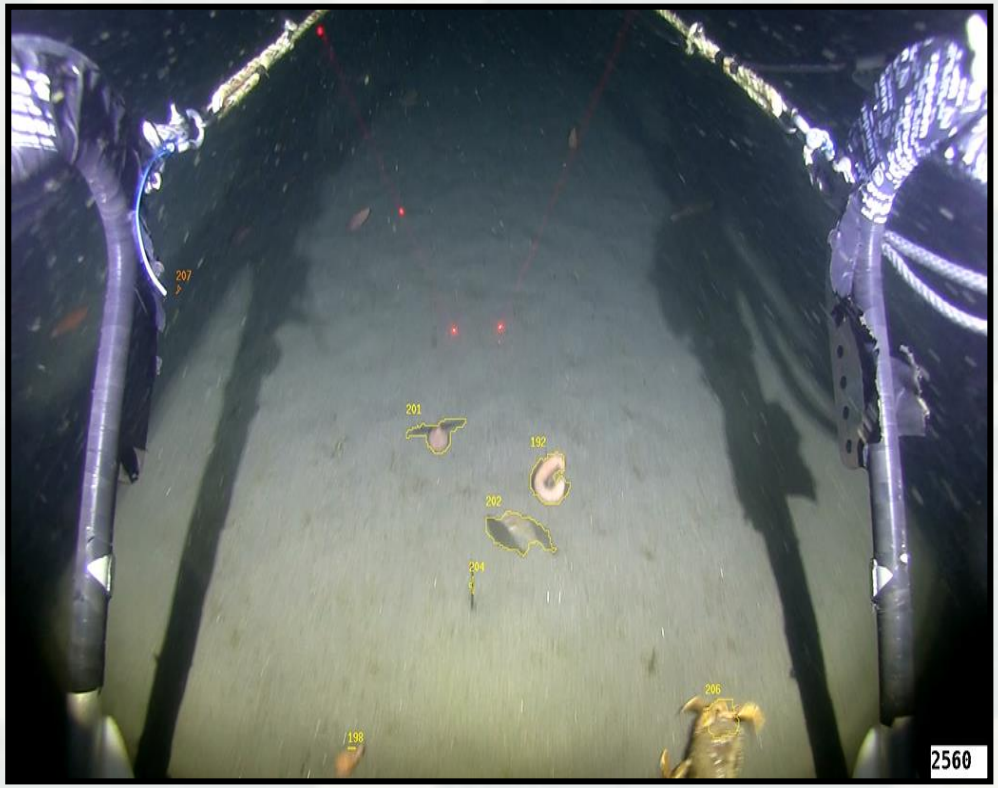
Salinity [psu]			
✓ 5.2	03 13	1 m	
Temperature [C]	15:56		
9.8	03 13	1 m	
Dissolved oxygen [ml/l]	15:56		
7.8	03 13	1 m	
Turbidity [ntu]	15:50		
3.2	03 13	1 m	
Phycoerythrin [rfu]	16:00		
10548.1	03 13	1 m	
CDOM [ppb]	16:00		
16.1	03 13	1 m	
Chlorophyll [µg/l]	16:00		
1.5	03 13	1 m	
Oxygen saturation [%]	16:00		

Time on PST MM DD h:m

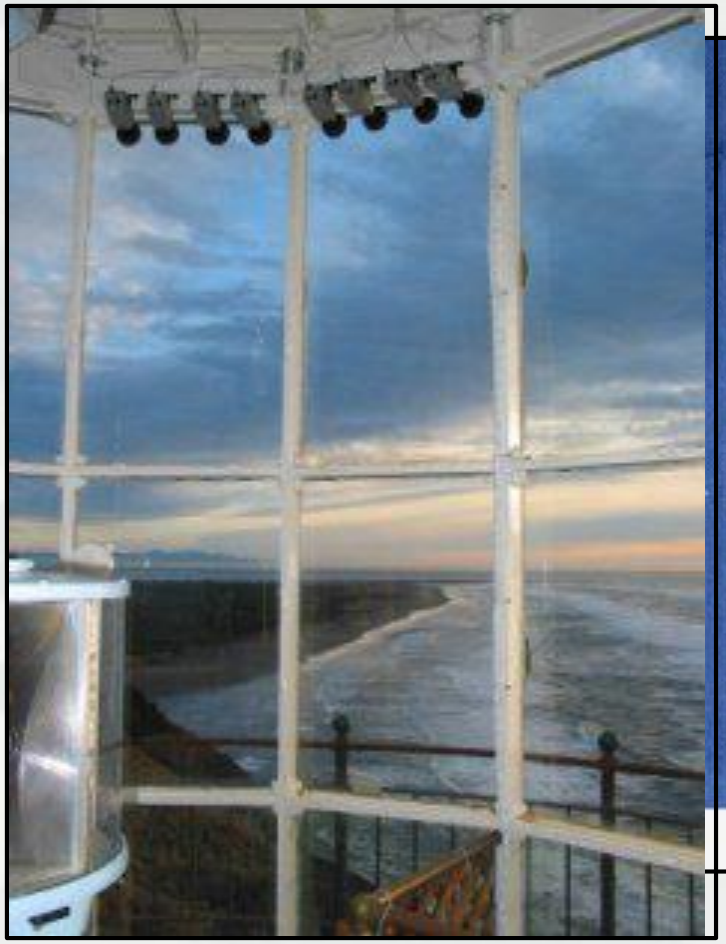
Not working | >48h | <48h | <24h

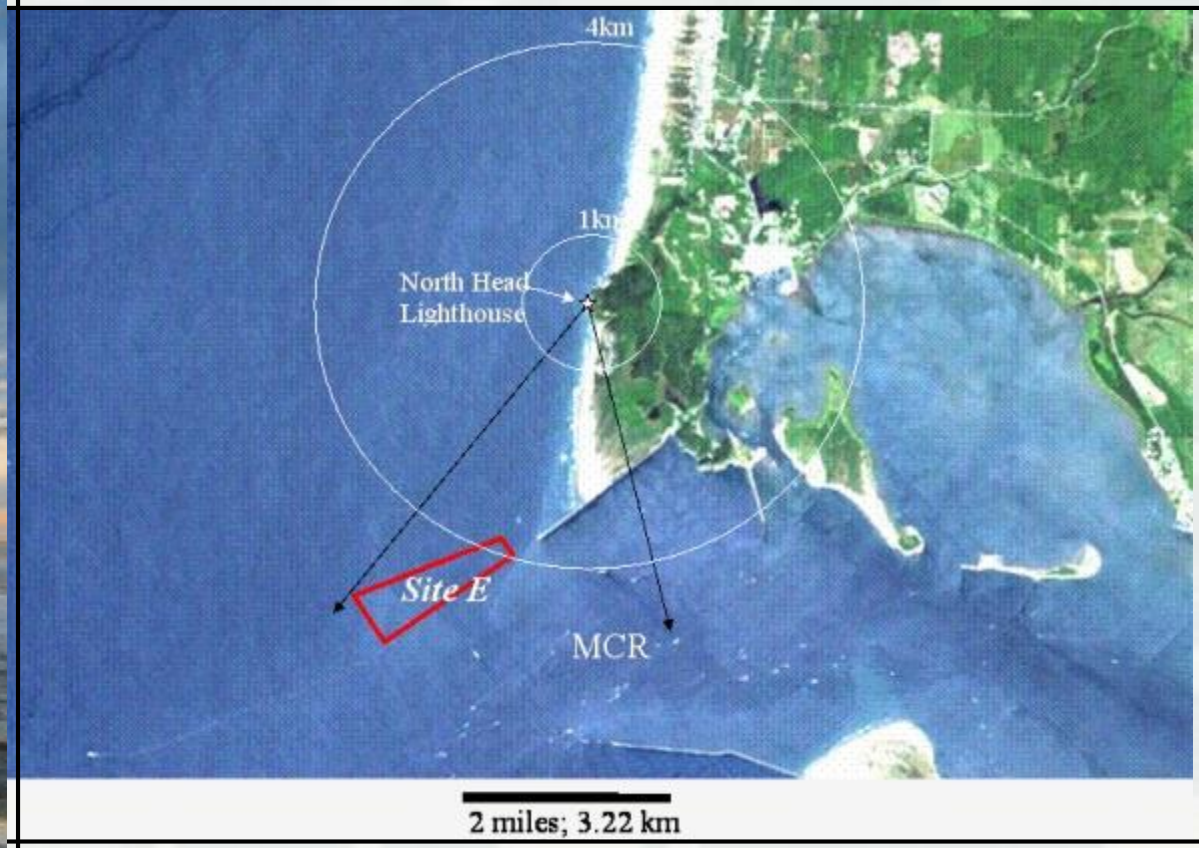
Automated Event Detection and Classification (AVEDac) Software

- Developed by MBARI, Caltech, and USC for analysis of ROV video.
- Software is capable of tracking objects of interest through video frames.
- Continued development of the software to review video and classify species.
- Quality Control by graduate student.
- Once developed it should reduce labor requirement.

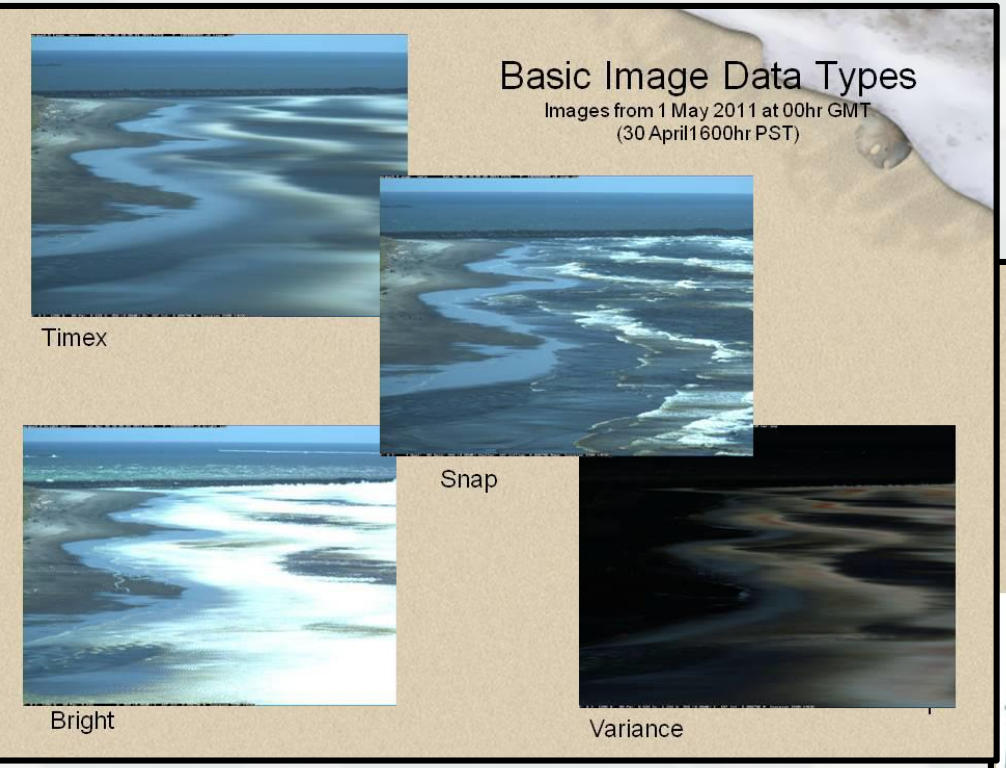


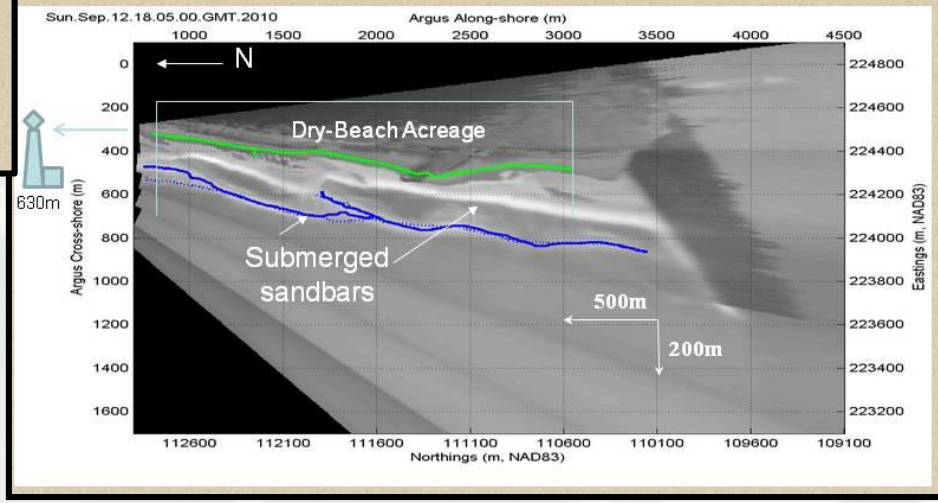
North Head Argus





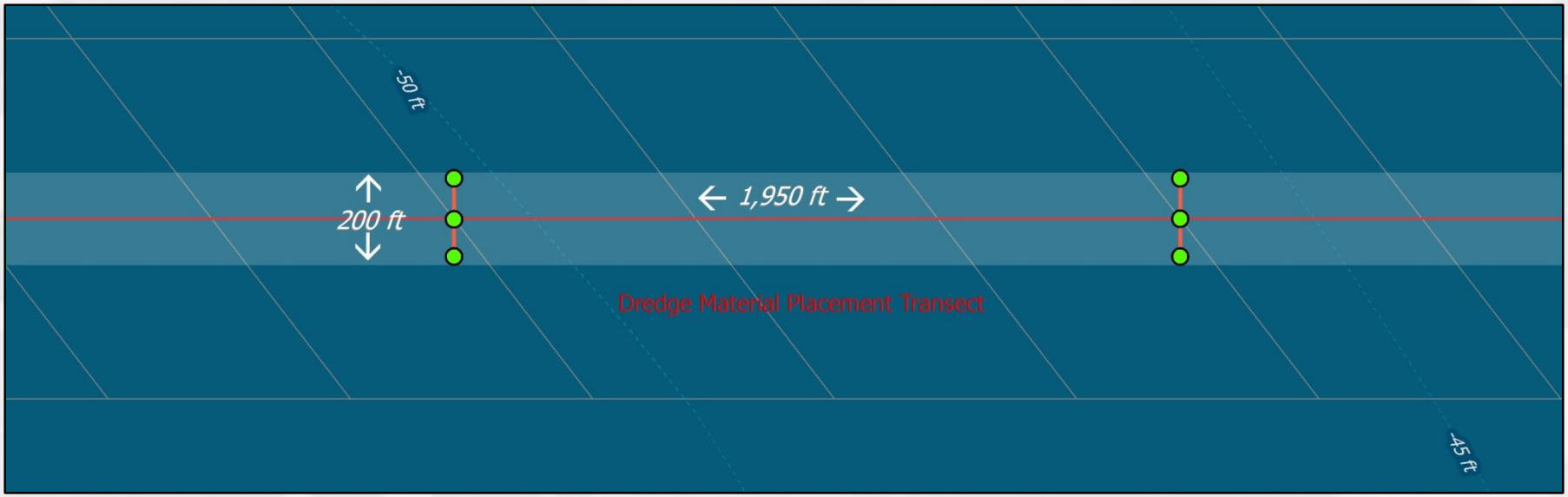
North Head Argus

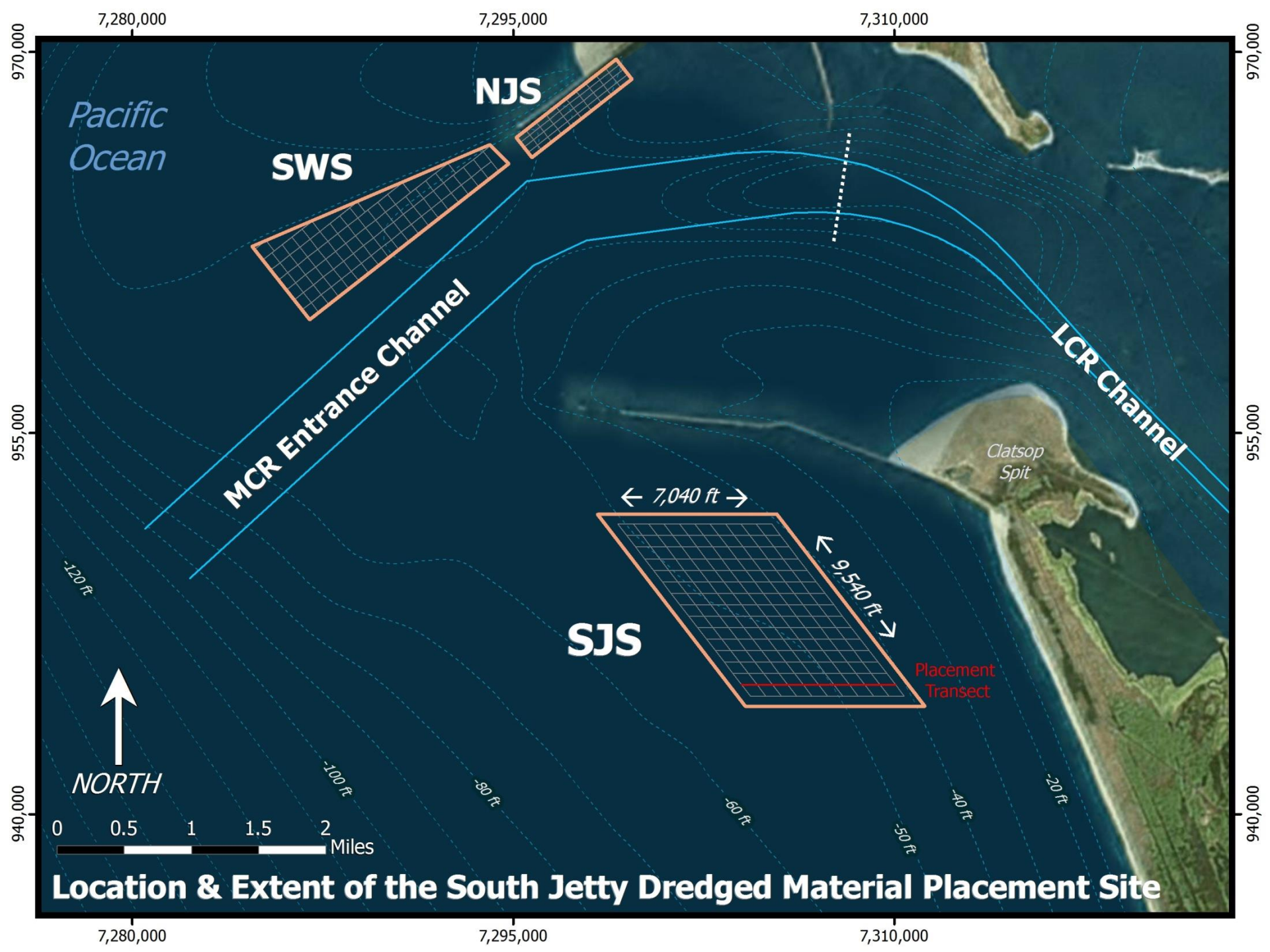




Deposition Monitoring Instruments (Campods)

- Measure material deposition following placement by dredge ESSAYONS (target 5cm)
- Monitoring crab response to placement (mortality at 10cm burial)
- Capture baseline conditions in the SJS

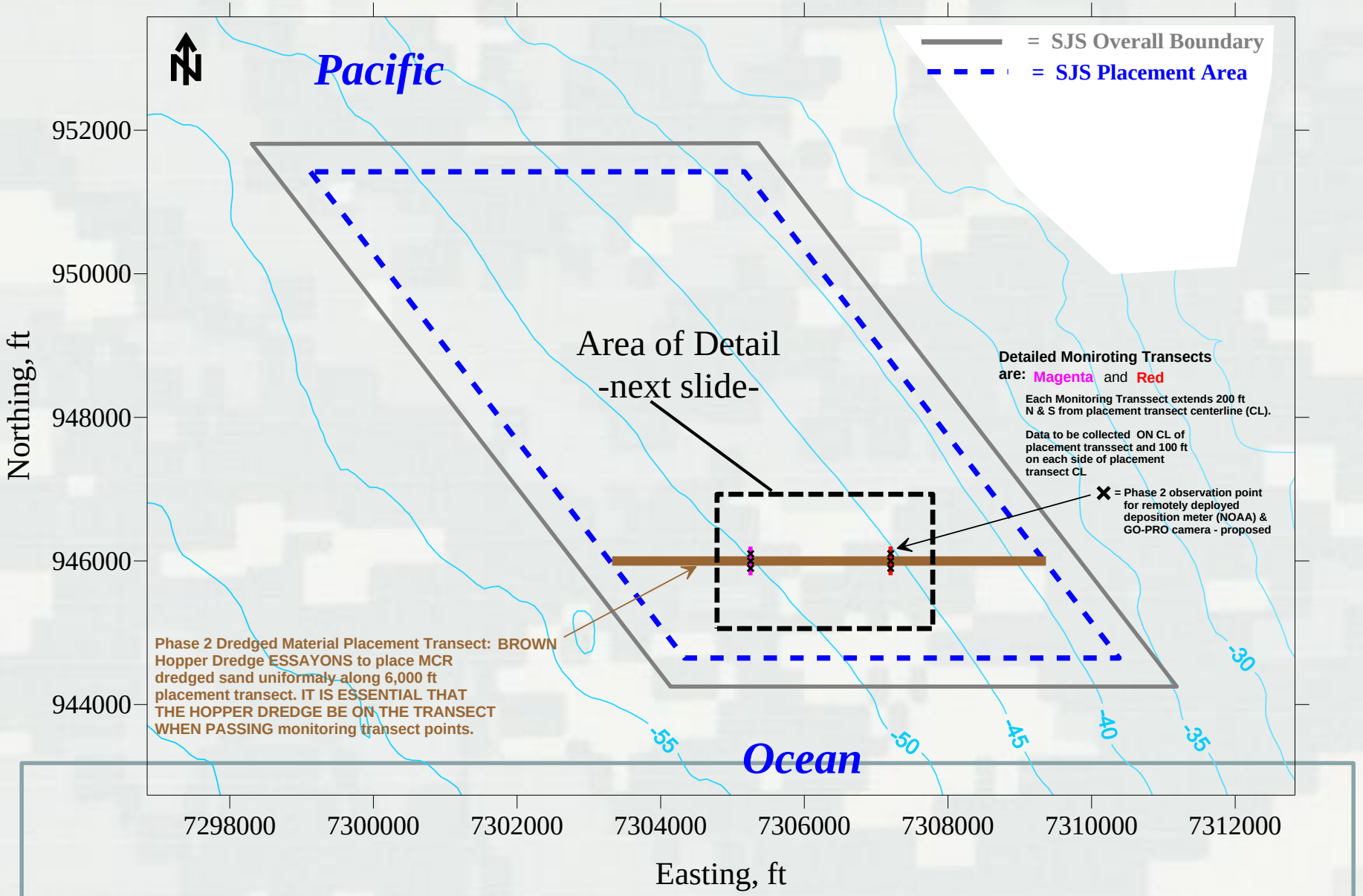




Location & Extent of the South Jetty Dredged Material Placement Site

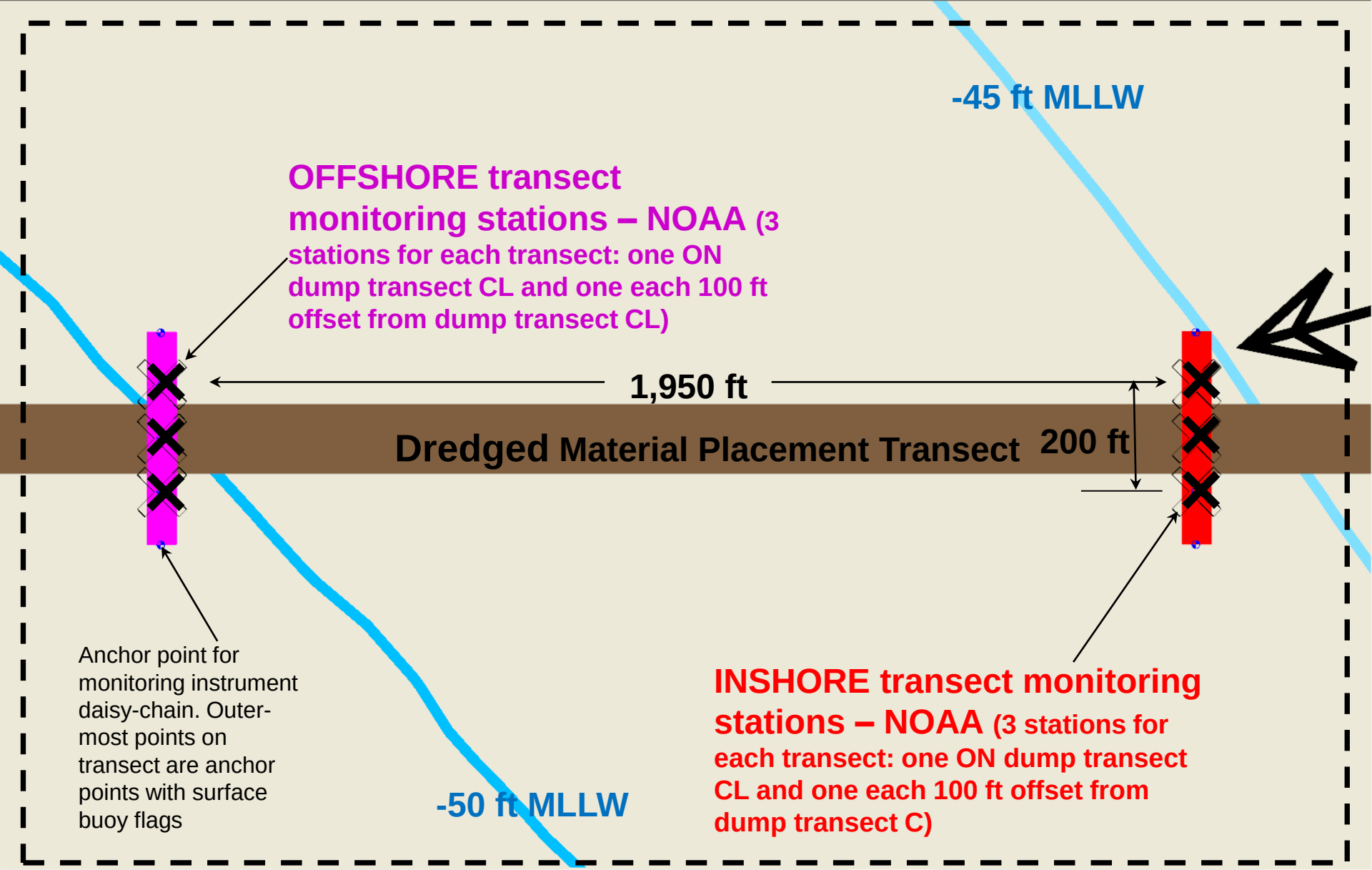
MCR South Jetty Site - SJS (CWA 404)

Layout For Phased Implementation of Initial Site Utilzation & Monitoring Plan

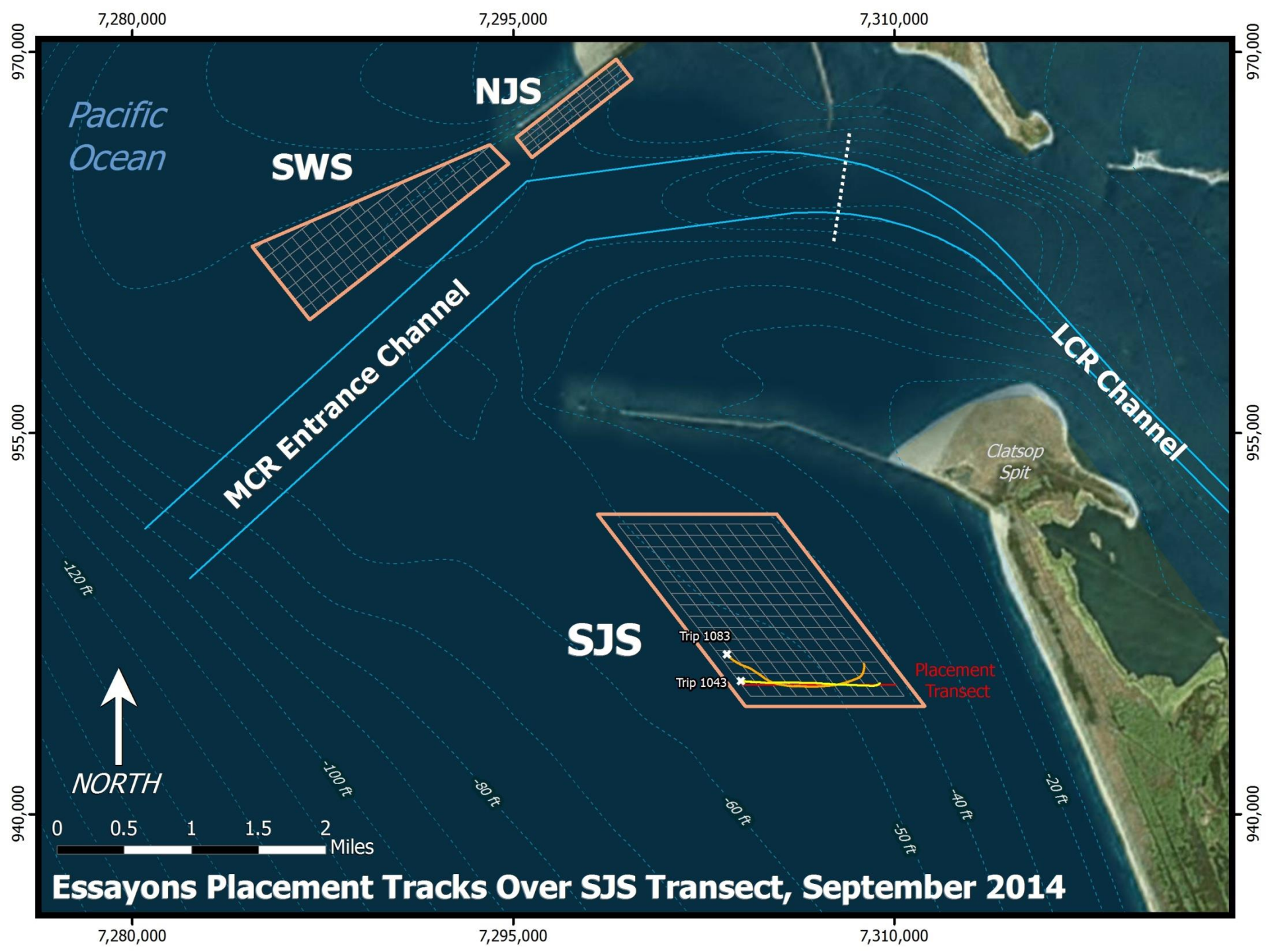


coordinates are SPCS Oregon, north, ft NAD83
elevations are in ft, below MLLW, data = Aug 2012, contour interval = 5 ft

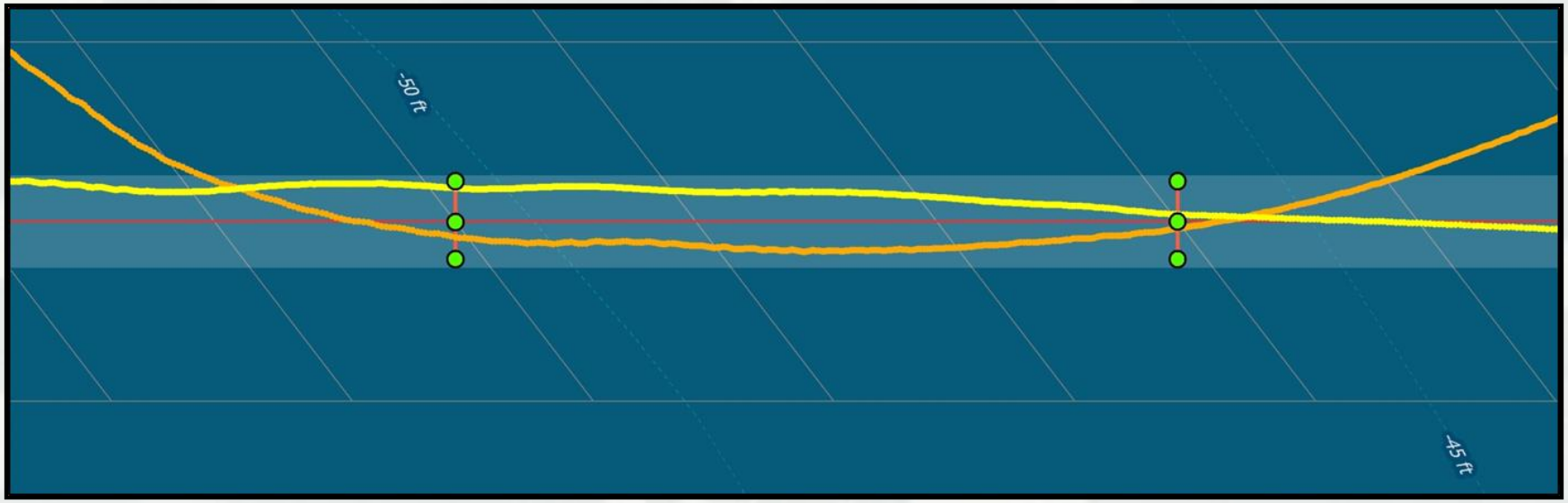
US Army Corps of Engineers
Portland Distirct

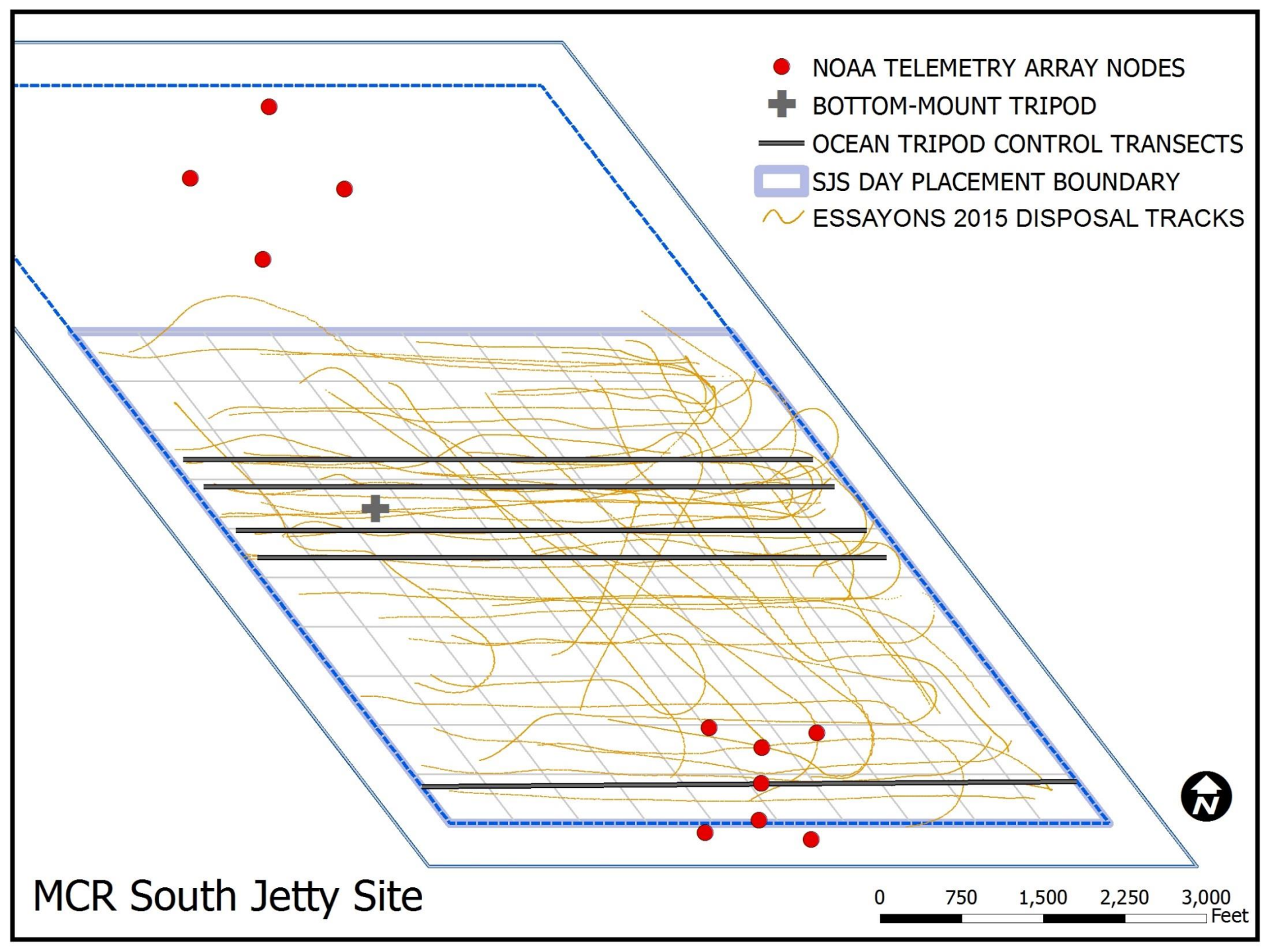


Close-up View of SJS Phase II - Monitoring Transect Details

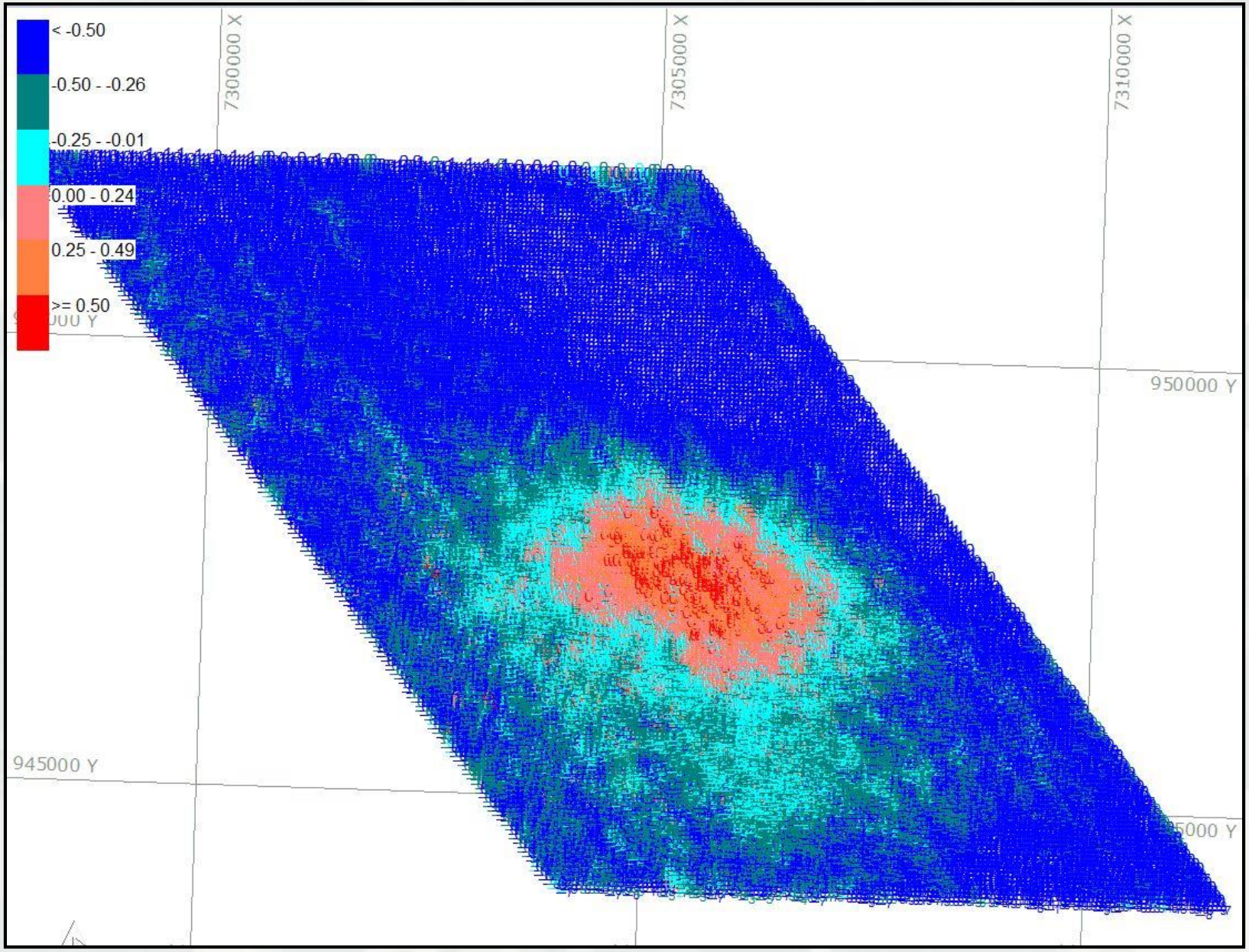

7,280,000
7,295,000
7,310,000
970,000
955,000
940,000
Pacific Ocean
NJS
SWS
MCR Entrance Channel
LCR Channel
Clatsop Spit
SJS
Trip 1083
Trip 1043
Placement Transect
-120 ft
-100 ft
-80 ft
-60 ft
-50 ft
-40 ft
-20 ft
NORTH
0 0.5 1 1.5 2 Miles
Essayons Placement Tracks Over SJS Transect, September 2014

September 2014 Placement Runs




NOAA TELEMETRY ARRAY NODES
BOTTOM-MOUNT TRIPOD
OCEAN TRIPOD CONTROL TRANSECTS
SJS DAY PLACEMENT BOUNDARY
ESSAYONS 2015 DISPOSAL TRACKS
MCR South Jetty Site
0
750
1,500
2,250
3,000
Feet

Difference Plot 2016 v Baseline



Status of Environmental Permits

Initial permits – 2012

- Biological Opinion
- CZMA Compliance
- Water Quality Certificate
  - Oregon expires 2022
  - Washington expires 2018

Actions needed

- All permits for placement at a North Head Site

Conclusions/Limitations

- Critical need for on-going stakeholder engagement
- Measurements of benthic response to dredged material placement
- Passive acoustic detections
- On-going operational placement of 300kcy annually
- AVEDac software needs work to be fully operational
- Continue developing innovative monitoring techniques
- Monitoring the migration of material from the nearshore site to the beach
- Use information from monitoring to expand network of nearshore sites, reduce costs of future monitoring