PORTFOLIO-SCALE INFRASTRUCTURE ANALYSIS

COASTAL NAVIGATION PORTFOLIO MANAGEMENT

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COASTAL INLETS RESEARCH PROGRAM

FY24 IN PROGRESS REVIEW

U.S. ARMY

US Army Corps of Engineers®

ERDC

CIRP

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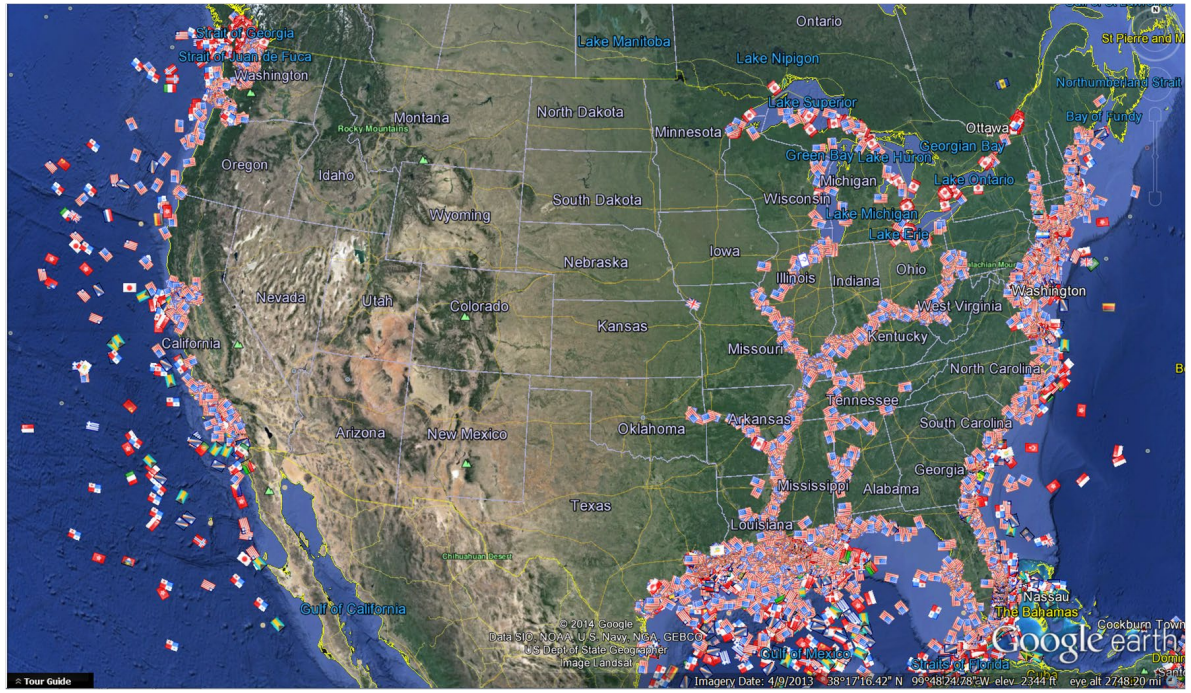
PROBLEM STATEMENT

- USACE currently quantifies supply of service (dredging volume) without quantifying demand (encroaching sediment volume) when managing navigation channels. Legacy KPIs (tonnage, cargo value) send funds to projects based on size. Demand-side indicators are necessary for effective management.



- SoN's:
  - 2017-N-52 Further Development of CPT and AIS software products
  - 2016-N-14 Long-term modeling of coastal structure functionality
  - 2015-N-15 - Integration of national and local monitoring datasets to support navigation and operations projects
  - 2015-N-34 - Incorporating methods to evaluate length of navigation channel required for safe and efficient travel of two-way traffic in ship simulations
  - 2015-N-38 - AIS investigation of Dredge Behavior
  - 2015-N-40 - Reducing the need for dredging

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CAPABILITY AND STRATEGIC IMPACT

CNPM: Advance ***objective***, ***quantitative***, and ***systems-based*** approaches to management of the Corps' large coastal navigation portfolio of projects.

Legacy metrics tell managers that large volumes of cargo are carried on waterways of varying depth by vessels of varying draft.

Advanced KPIs tell waterway managers ***where*** and ***how much*** sediment ***impedes*** navigating vessels.

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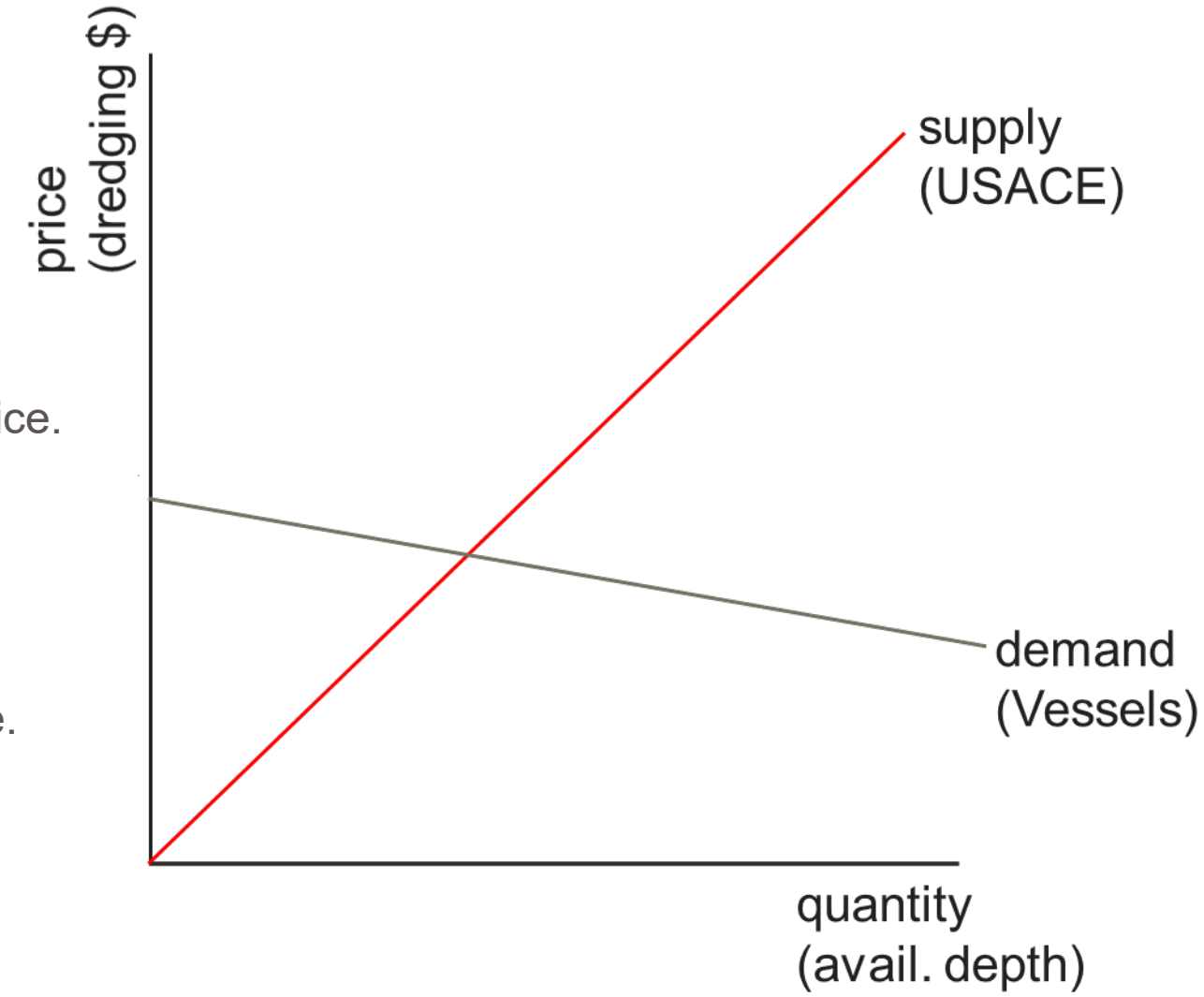
The Vision

- User-demand-driven channel maintenance/deepening decisions.
- For a given supply of service (vessel clearance we want to provide).
- Vessel Encroachment Parameter (VEP).
  - How well are we meeting that level of service.
  - **Where do we need to dredge.**
- Volume to Dredge (V2D).
  - **How much do we need to dredge.**
  - So that we would meet that level of service.
- DQM Dredge Volumes.
  - **How much did we actually dredge.**



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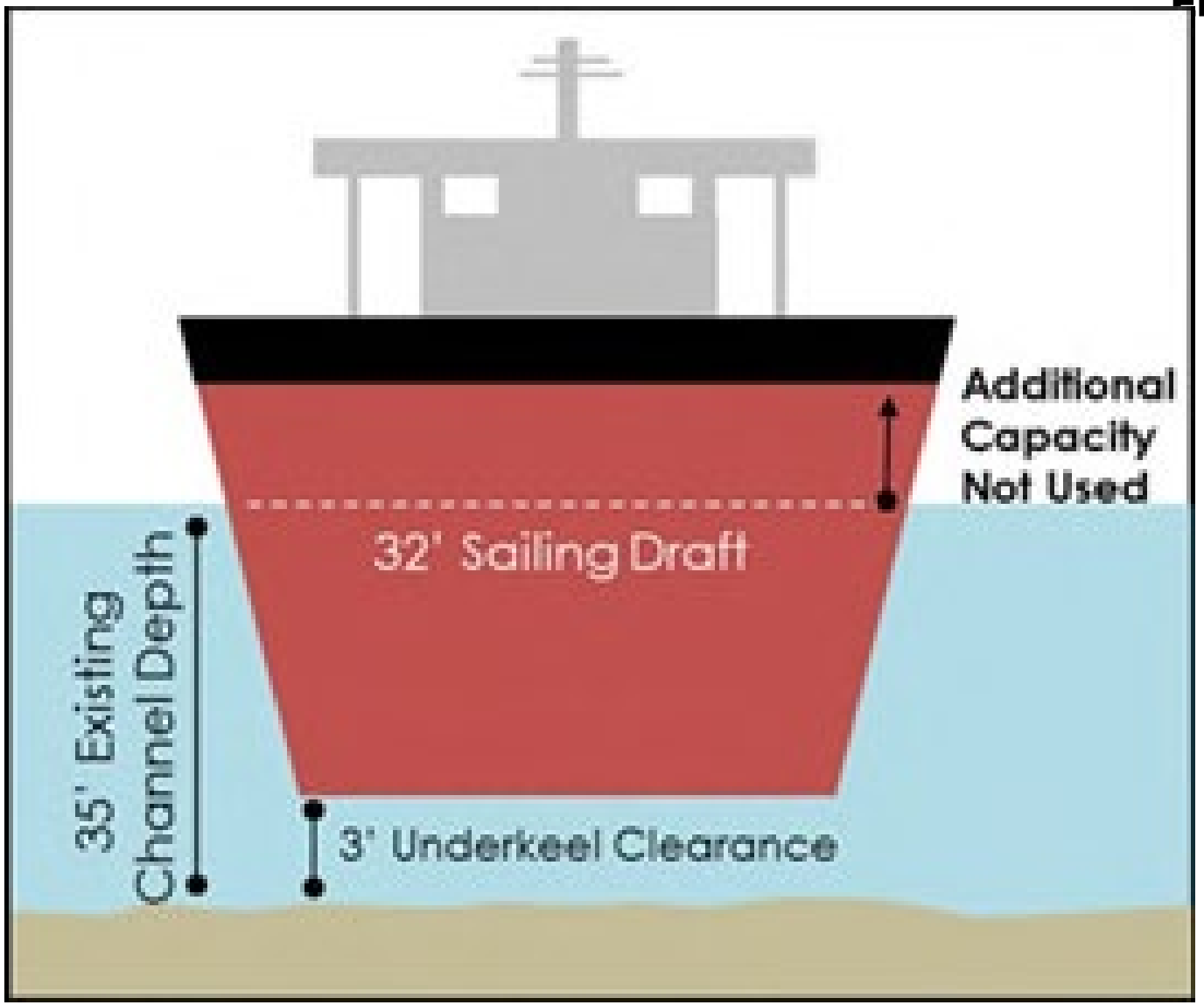
DATA FOR UNDERKEEL CLEARANCE METRICS

- Marine Cadastre AIS:
  - LAT/LNG.
  - Time.
  - Ship ID.
  - Backup for vessel horiz. dimensions.
  - Backup for vessel type.
- Vessel draft – ~~Foreign Vessel Entrances & Clearances (IWR 2018).~~
  - Now pull directly from Customs.
  - 3-year lag to 1 week!
  - Still missing “the gap”.
  - AIS data recency is now limitation (3 mo. lag).
- Bathymetry - eHydro survey data.
- WL data - NOAA tide stations.
- Dredge Quality Management (DQM)
  - Dredge position, production rate, volume.
  - RMS for pipeline total volumes.



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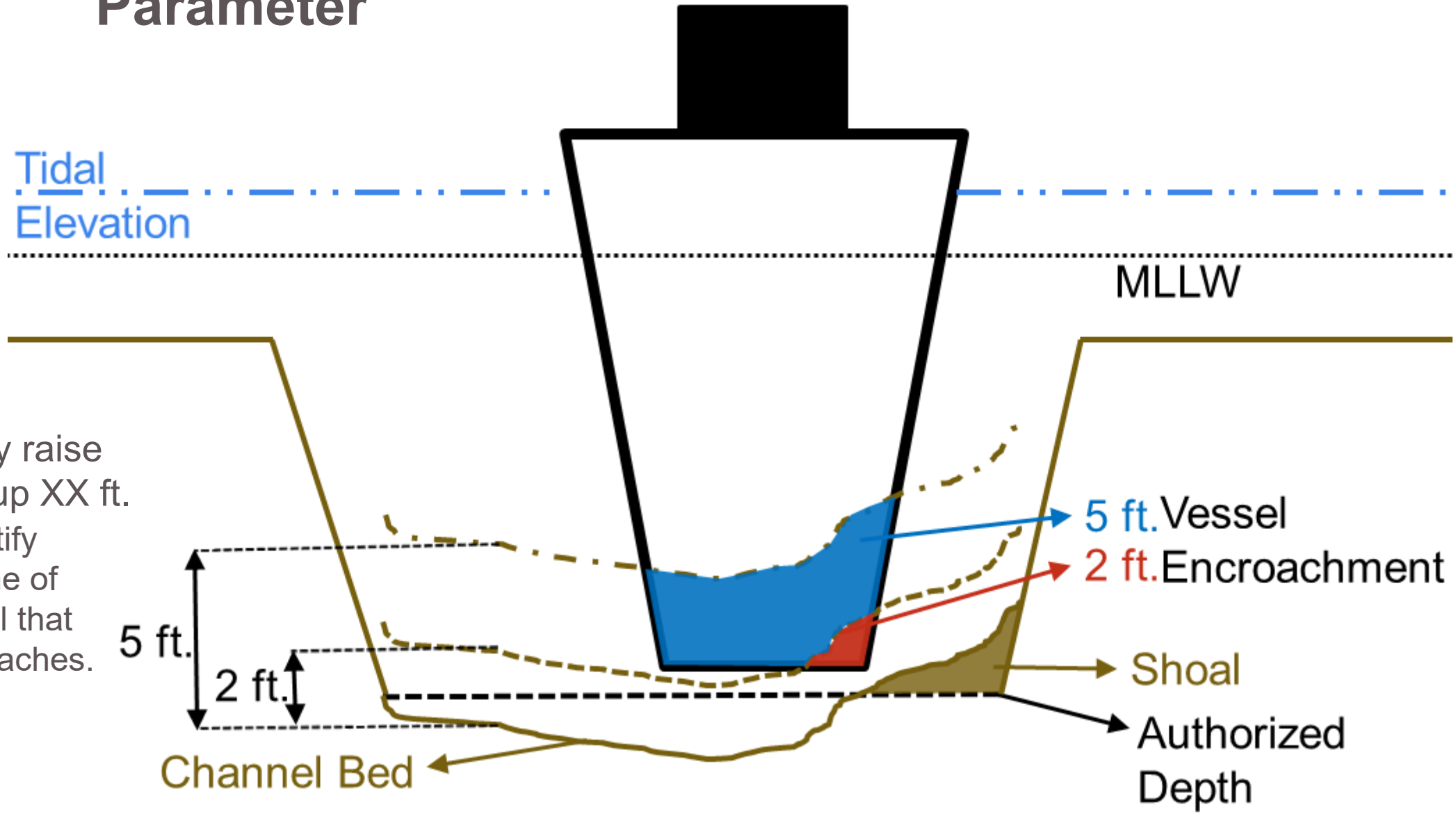
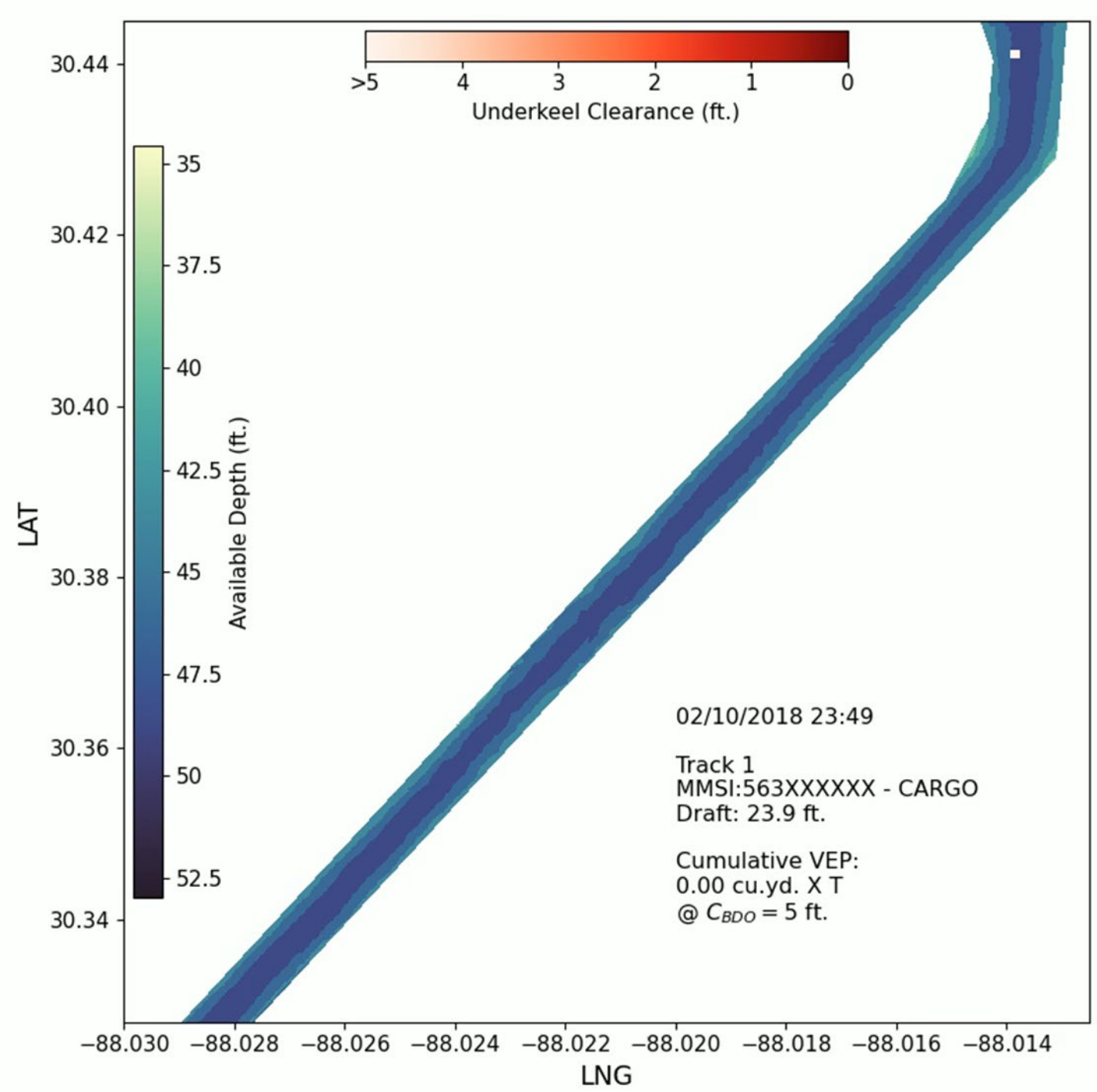
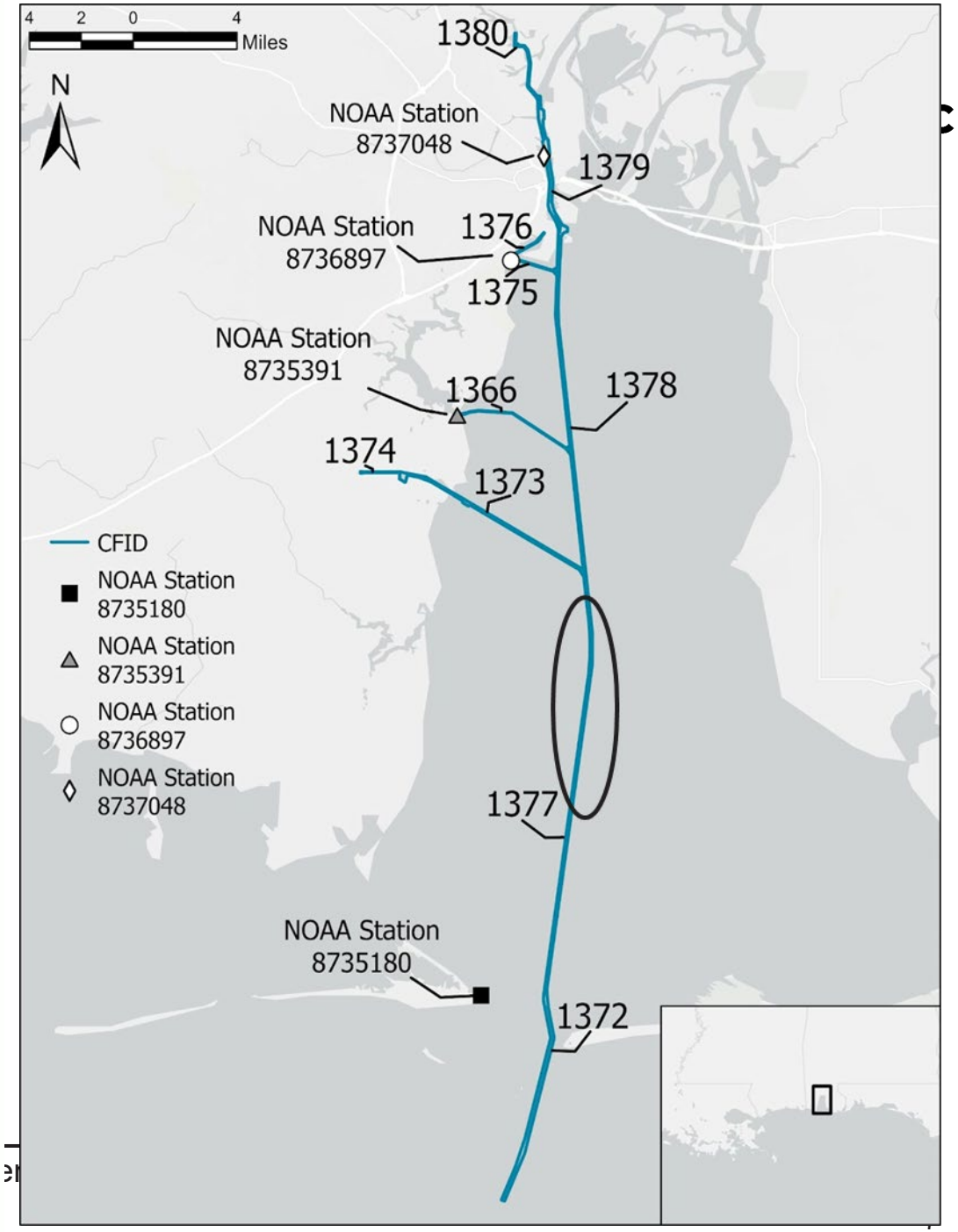
Vessel Encroachment Parameter

- Artificially raise the bed up XX ft.
  - Quantify volume of vessel that encroaches.

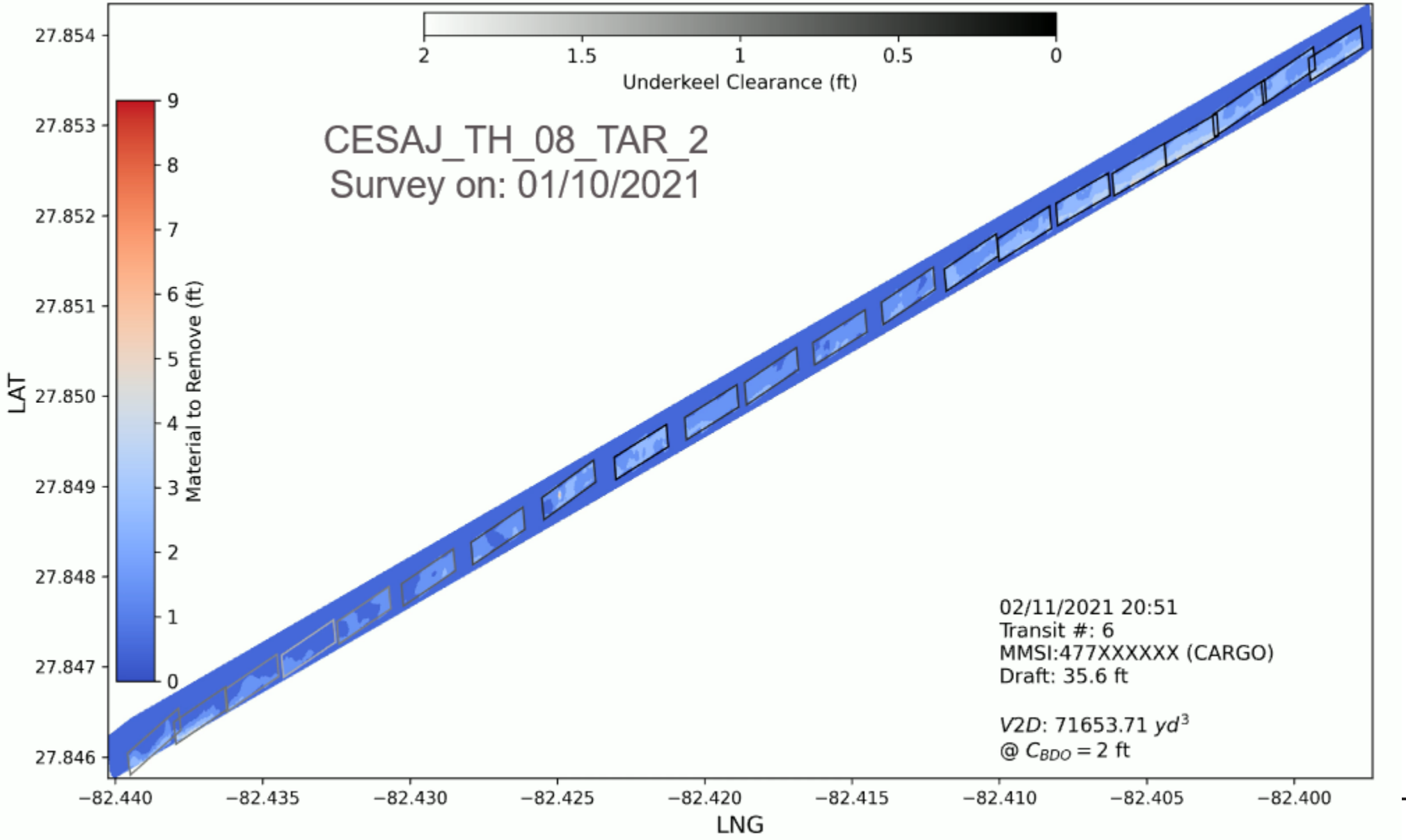



>5
4
3
2
1
0
Underkeel Clearance (ft.)
35
37.5
40
42.5
45
47.5
50
52.5
Available Depth (ft.)
30.44
30.42
30.40
30.38
30.36
30.34
LAT
−88.030
−88.028
−88.026
−88.024
−88.022
−88.020
−88.018
−88.016
−88.014
LNG
02/10/2018 23:49
Track 1
MMSI:563XXXXXX - CARGO
Draft: 23.9 ft.
Cumulative VEP:
0.00 cu.yd. X T
@ C_{BDO} = 5 ft.


4
2
0
4
Miles
N
1380
NOAA Station
8737048
1379
NOAA Station
8736897
1376
1375
NOAA Station
8735391
1366
1378
1374
1373
CFID
NOAA Station
8735180
NOAA Station
8735391
NOAA Station
8736897
NOAA Station
8737048
1377
NOAA Station
8735180
1372

- Tampa, FL
- Manatee, FL
- St. Petersburg, FL

Volume to Dredge (V2D)



Dredge Volumes from DQM

- DQM on hoppers and cutterheads under contract with USACE.
  - Save small business set-asides.
- Where, when, what for dredges.
  - Can compute instantaneous production rates.
  - From that volume at every DQM report.
- Densities are a mess.
  - Trying to integrate production rate to get volumes = crazy.
- Use production rate as a scaling factor to estimate what % of load/daily volume was dredged in that location.
- Load volume for hoppers is easy.
- Daily volume 96% blank for pipelines…
  - Use RMS to get total volumes.

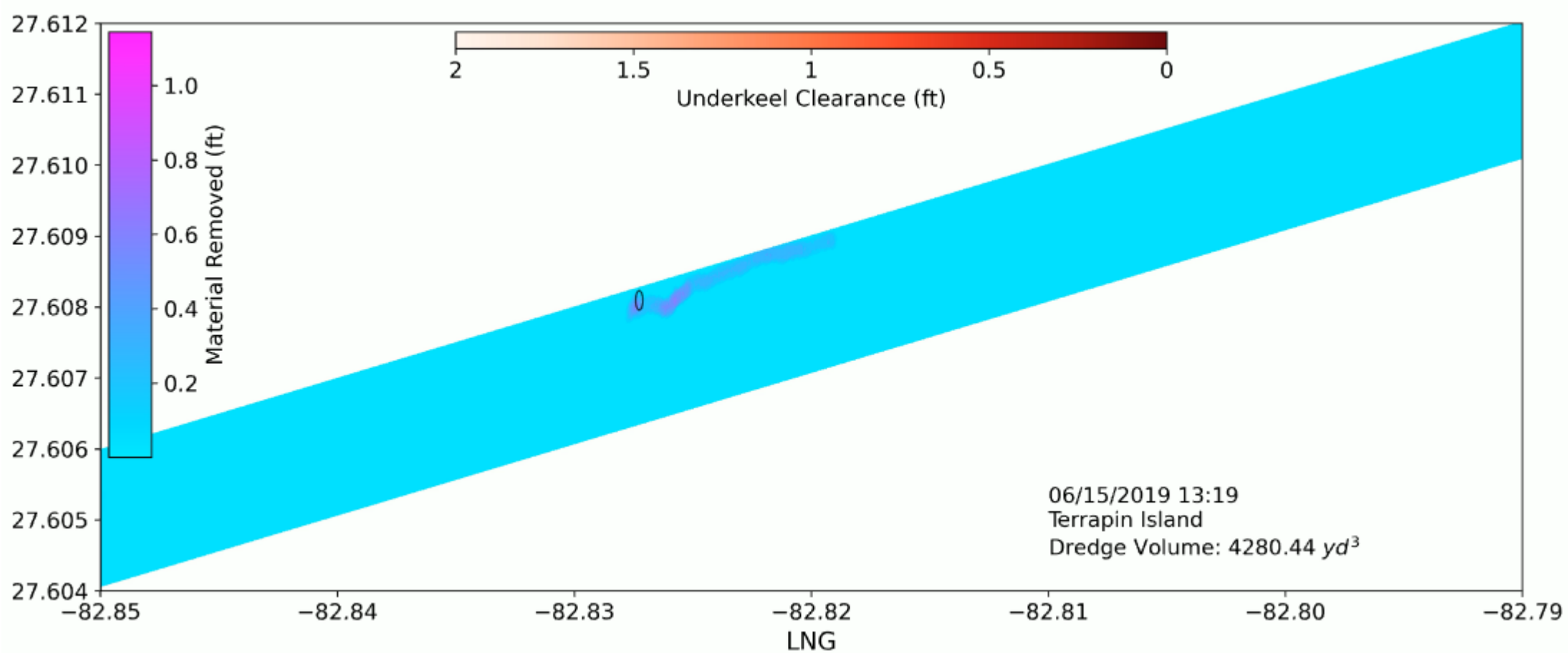
Production Rate:

- $PR = \frac{\rho_s - \rho_w}{\rho_i - \rho_w} VA$
- PR = production rate (cfs).
- ρ_s = slurry density (g/cm^3).
- ρ_w = water density (g/cm^3).
- ρ_i = material in situ density (g/cm^3).
- V = suction pipe velocity (ft/s).
- A = suction pipe area (ft^2).

$$InstVol_{NEW} = LoadVol \times \frac{InstVol_{PR}}{LoadVol_{PR}}$$

Dredge Volumes from DQM

CESAJ_TH_01_TEN_2
between Longitude 82.85W and 82.79W



SUMMARY

FY23 Milestones:

- Coastal Sediments Apr ‘23 Presentation + Paper.
- 11th Int. Conf. on Marine Bioinvasions May ‘23.
- National Dredge Meeting May ‘23 Poster.
- MVD Nav R&D Brief: Vessel Clearance – April 7, 2023.
- SAD Brief: Vessel Clearance – March ’23.
- CIRP TD - 8/22/2023.
- Storyboard 7/5/2023.

FY24 Major Accomplishments/Milestones:

- Migrated to NavPortal AIS & Survey Elastic Database.
- E&C Draft data directly from customs + automated.
  - FSK Bridge Collapse.
- JP Published 01/2024.
- TR w/ ITL editor.
- DQM database access + analysis.
- 2nd JP first draft by EoFY.
- Power of ERDC Podcast next week.
- National Dredge Meeting June ‘24 Poster.
- SAD Brief: Vessel Clearance – May ’24.
- Ports Abstract.

Planned Outyear Products/Advances

- Full integration with Nav Portal viewer
- Integration with dredge optimization model
- Reduced latency through near-real time implementation