Beneficial Reuse Updates (and What is Next?) Segment

Steve Carroll
Ducks Unlimited

Linda Tong
State Coastal Conservancy

Julie Beagle
USACE

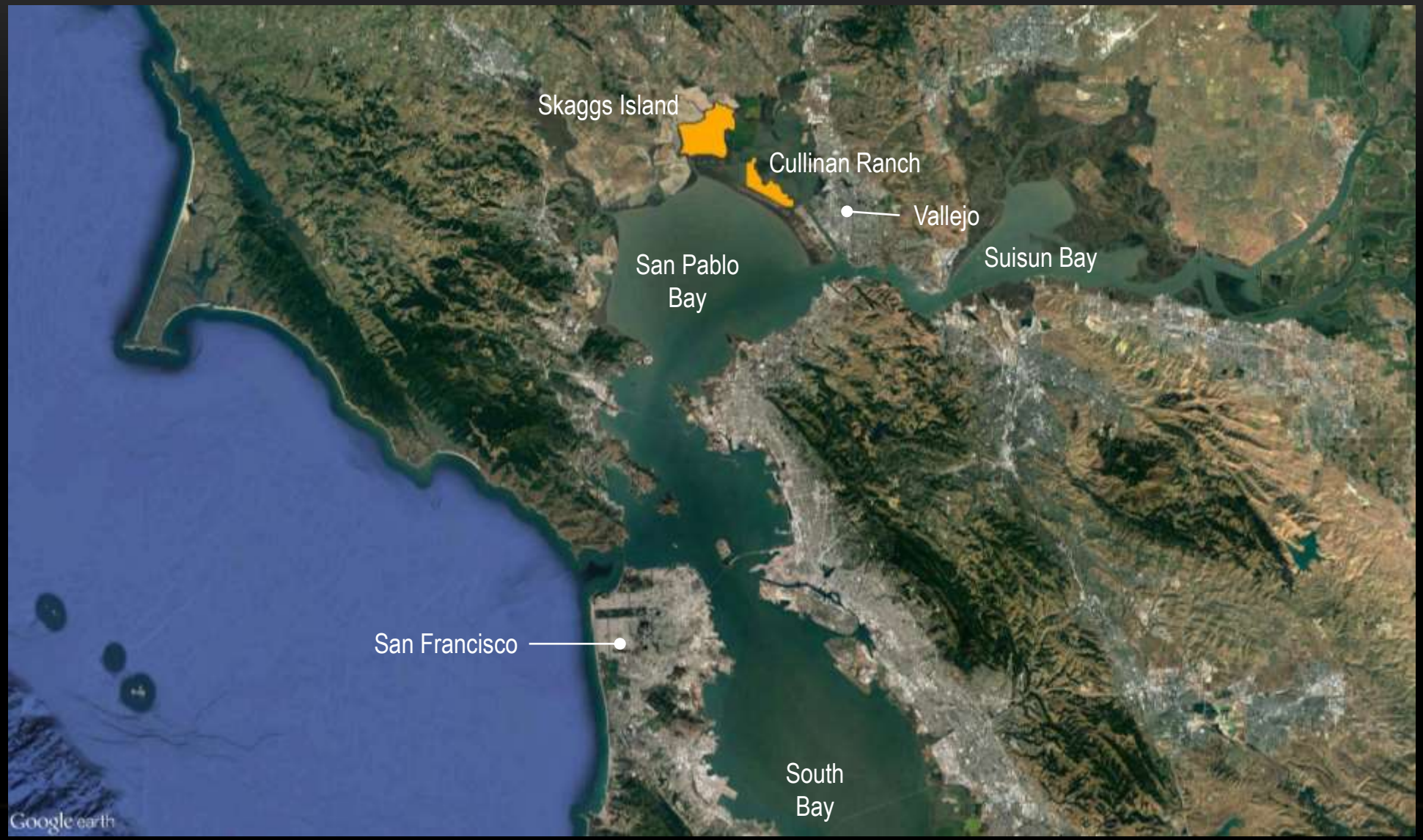
Jim Levine
Montezuma Wetlands

Scott Bodensteiner
Haley & Aldrich

MODERATOR

Ducks Unlimited conserves, manages, and restores wetlands and associated habitats for North America's waterfowl. These habitats also benefit other wildlife and people.

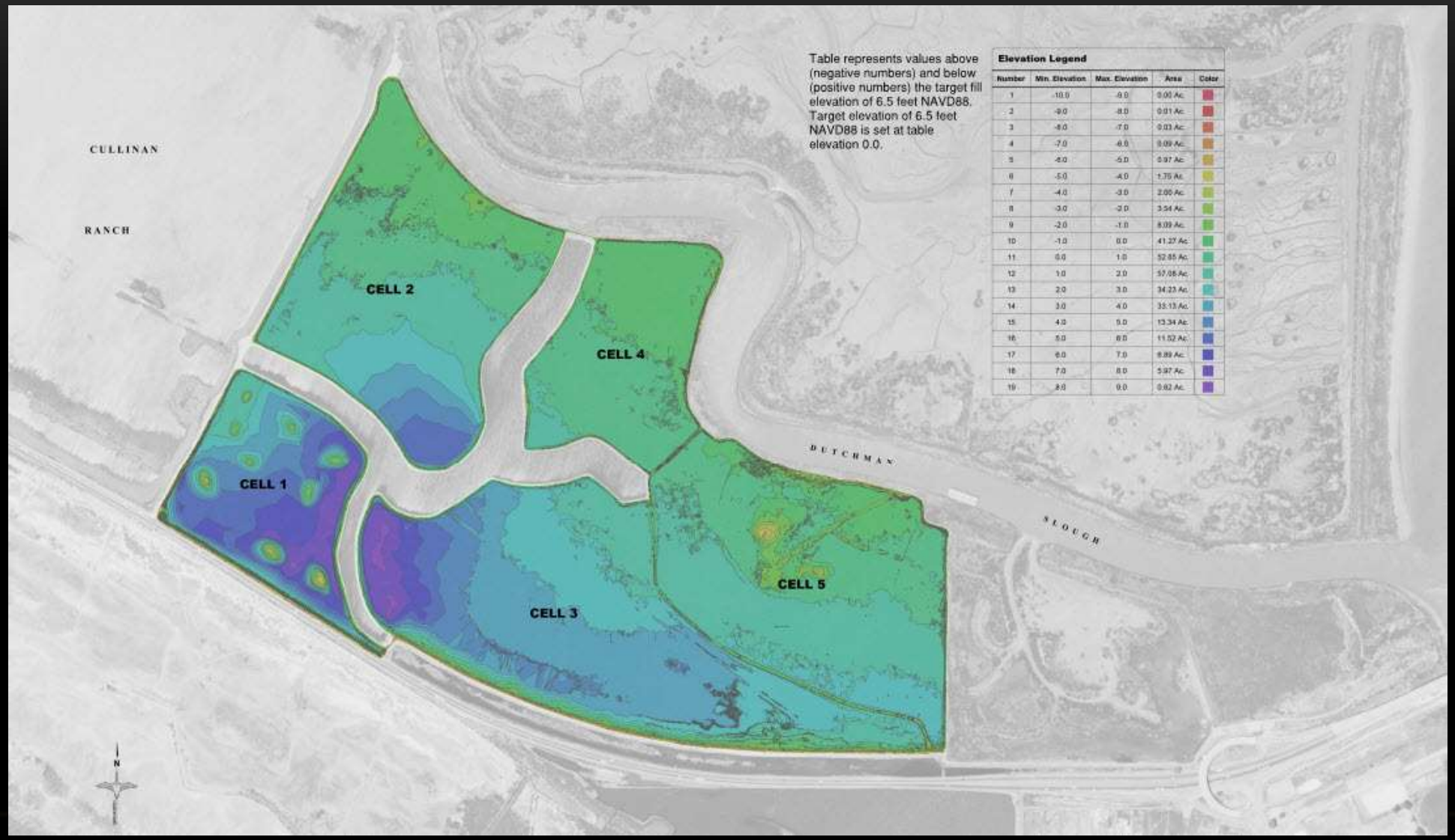
Cullinan Ranch & Skaggs Island are in north San Pablo Bay



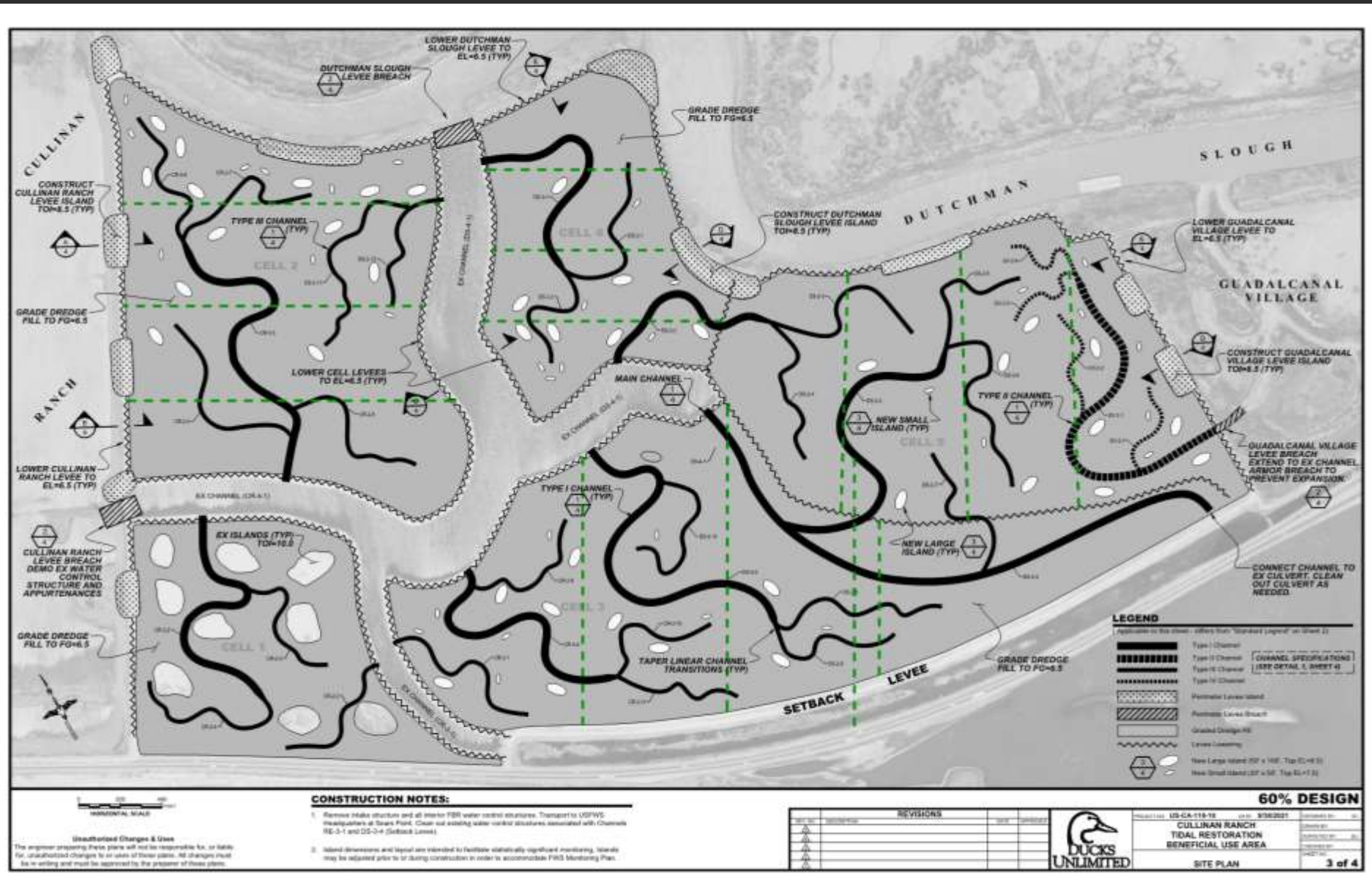
Cullinan BU site will import 4 MCY and raise ground elevations by ~6.5 feet

Manson offloaded 918,000 cubic yards of material during the winter of 2022

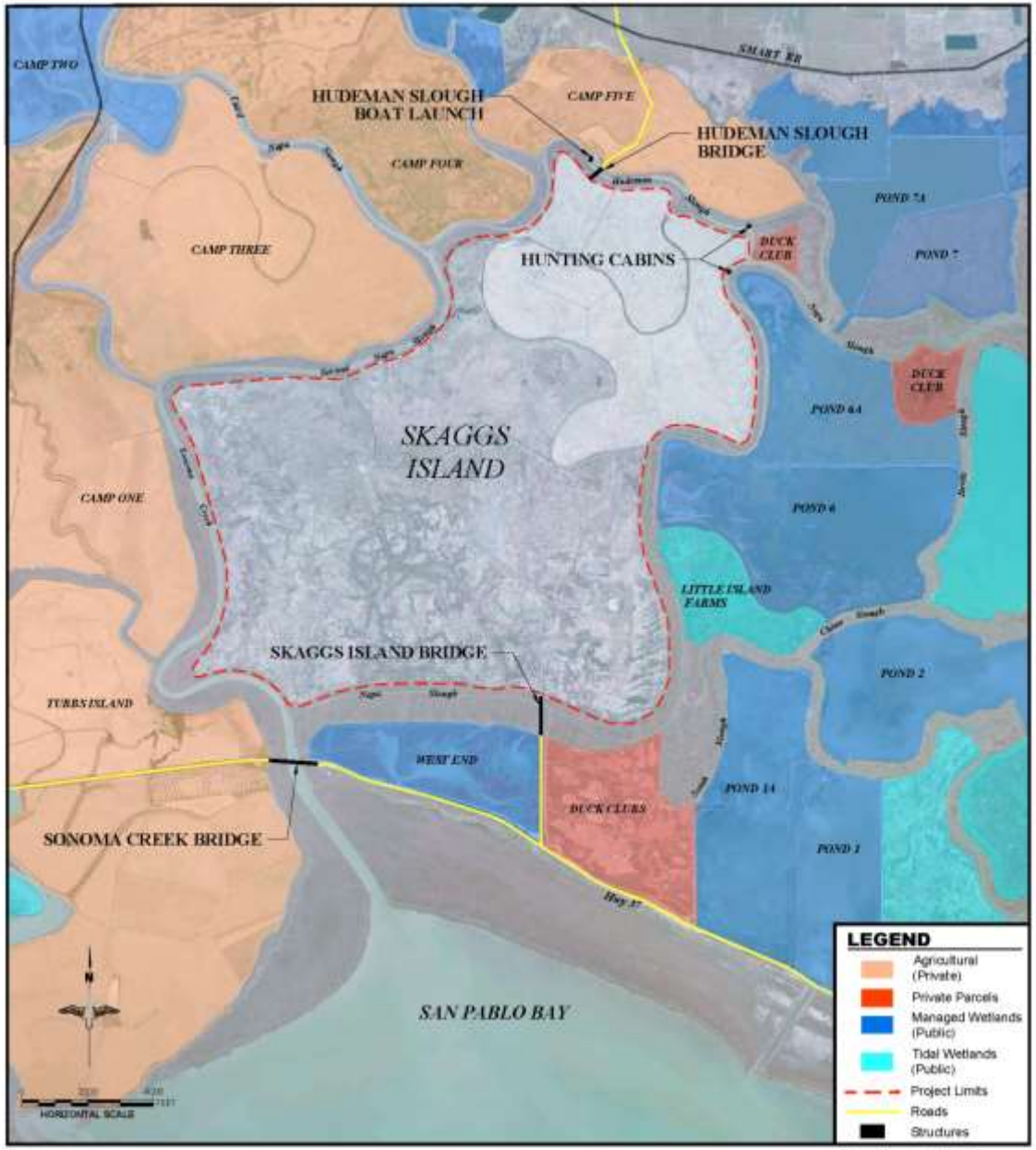
1.08 million cubic yards are still needed



Restoration will be completed by lowering berms and excavating channels



Planning and design on Skaggs Island is in progress



Cullinan Ranch and Skaggs Island Contacts

Refuge Manager
Melissa Amato
U.S. Fish & Wildlife Service
San Pablo Bay NWR
7715 Lakeville Highway
Petaluma, CA 94954
melisa_Amato@fws.gov
(707) 769-4200

Dredge Import Operations
Steve Carroll, P.E.
Ducks Unlimited, Inc.
1175 Nimitz Ave., Suite 110
Vallejo, CA 94592
scarroll@ducks.org
(916) 717-3094

Hamilton/Bel Marin Keys Wetland Restoration Project

Bay Planning Coalition Dredging and Beneficial Reuse Workshop
October 31, 2023

Linda Tong, Project Manager

Coastal Conservancy
STATE of CALIFORNIA

Hamilton/Bel Marin Keys Wetland Restoration Project

Bel Marin Keys Unit V

- Planning phase

North Antenna Field

- FUDS clean up required

Hamilton Wetlands

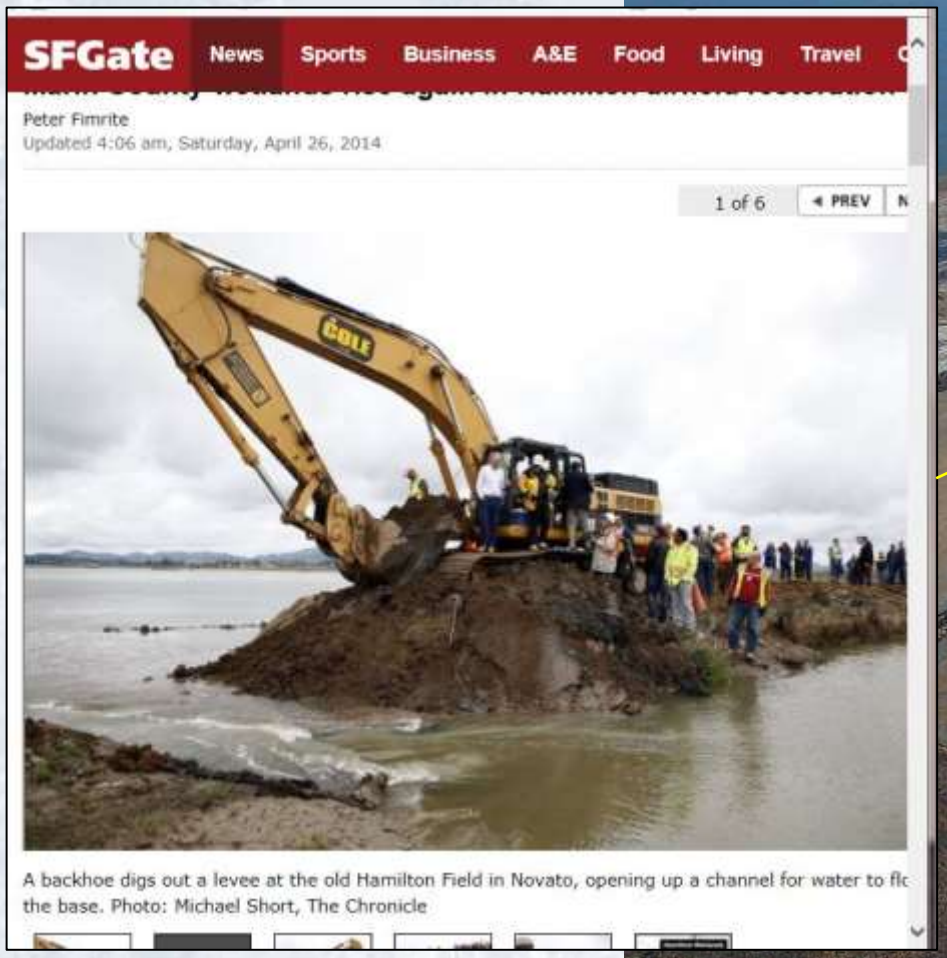
- Restored

SOURCE: ESA, 2023

DRAFT

Bel Marin Keys Wetland Restoration Project - Phase 2 . 2200350.00

Hamilton Wetlands Restored



Bel Marin Keys Phase 1 Completed

Levee

- 11,800-ft long
- 1,400,000 cubic yards
- On-site borrow source

Drone footage of Bel Marin Keys Unit V new setback levee - Haley & Aldrich, July 2022

Bel Marin Keys Restoration Phase 2

Status and Next Steps

- BMK Phase 2 scoping
- Design Agreement with USACE
- Interim management

View of Hamilton Wetlands and Bel Marin Keys Unit V from Reservoir Hill

Tentative Schedule for BMK Phase 2

- 2023-2024: Update scope, evaluate preliminary design
- 2024-2026: Initiate final design and obtain permits
- 2027 and on: Place dredged sediment
- TBD: Breach bayfront levee

Hamilton Wetlands Restoration

BMK Phase 2 Considerations

- Understand updated opportunities and constraints
- Explore restoration scenarios with reduced cost and sediment
- Learn from Hamilton Wetlands and other restoration sites

Tour group along the Bay Trail by Hamilton Wetlands

Thank you

Coastal Conservancy

STATE of CALIFORNIA

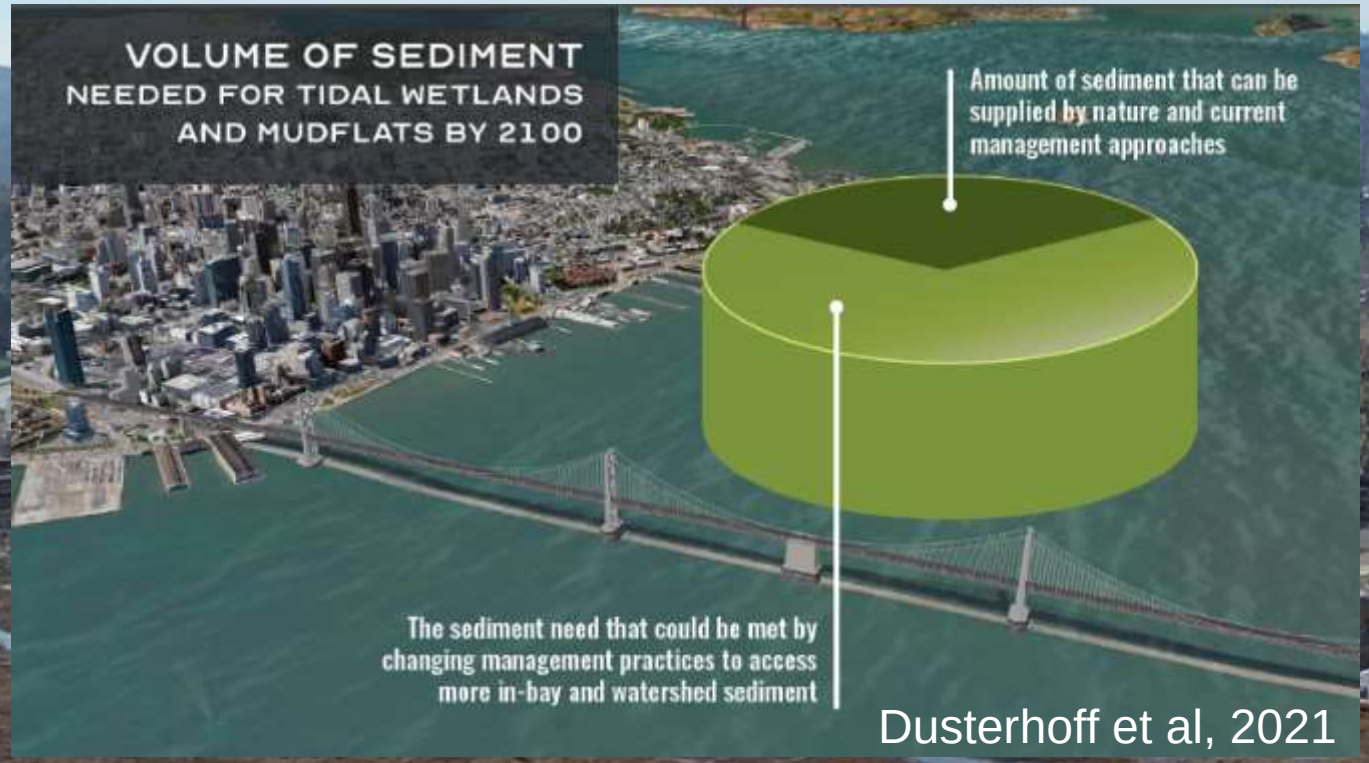
Strategic shallow-water placement using dredged sediment in San Francisco Bay - Update

October 31, 2023

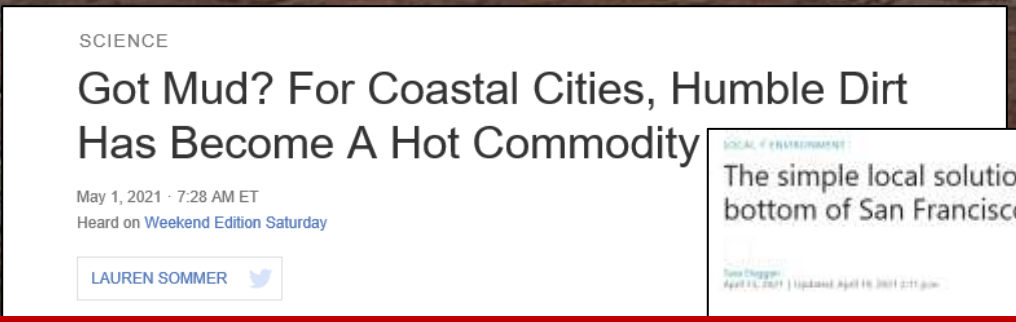
Julie Beagle
Environmental Planning Section Chief
U.S. Army Corps of Engineers San Francisco District

Problems

- Limited **sediment supply** regionally + **sea-level rise**
  - Marsh drowning and erosion
  - **Habitat loss** for endangered and threatened species
  - Increased **flood risk** for low-lying communities



Dusterhoff et al, 2021

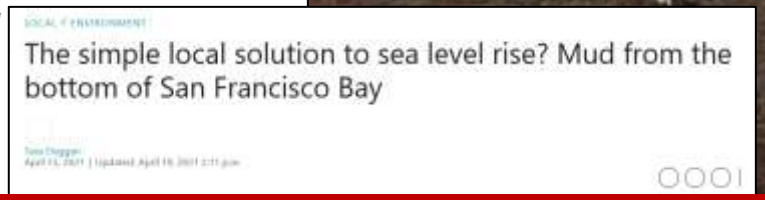

SCIENCE

Got Mud? For Coastal Cities, Humble Dirt Has Become A Hot Commodity

May 1, 2021 · 7:28 AM ET

Heard on Weekend Edition Saturday

LAUREN SOMMER


The simple local solution to sea level rise? Mud from the bottom of San Francisco Bay

US Army Corps of Engineers: San Francisco District

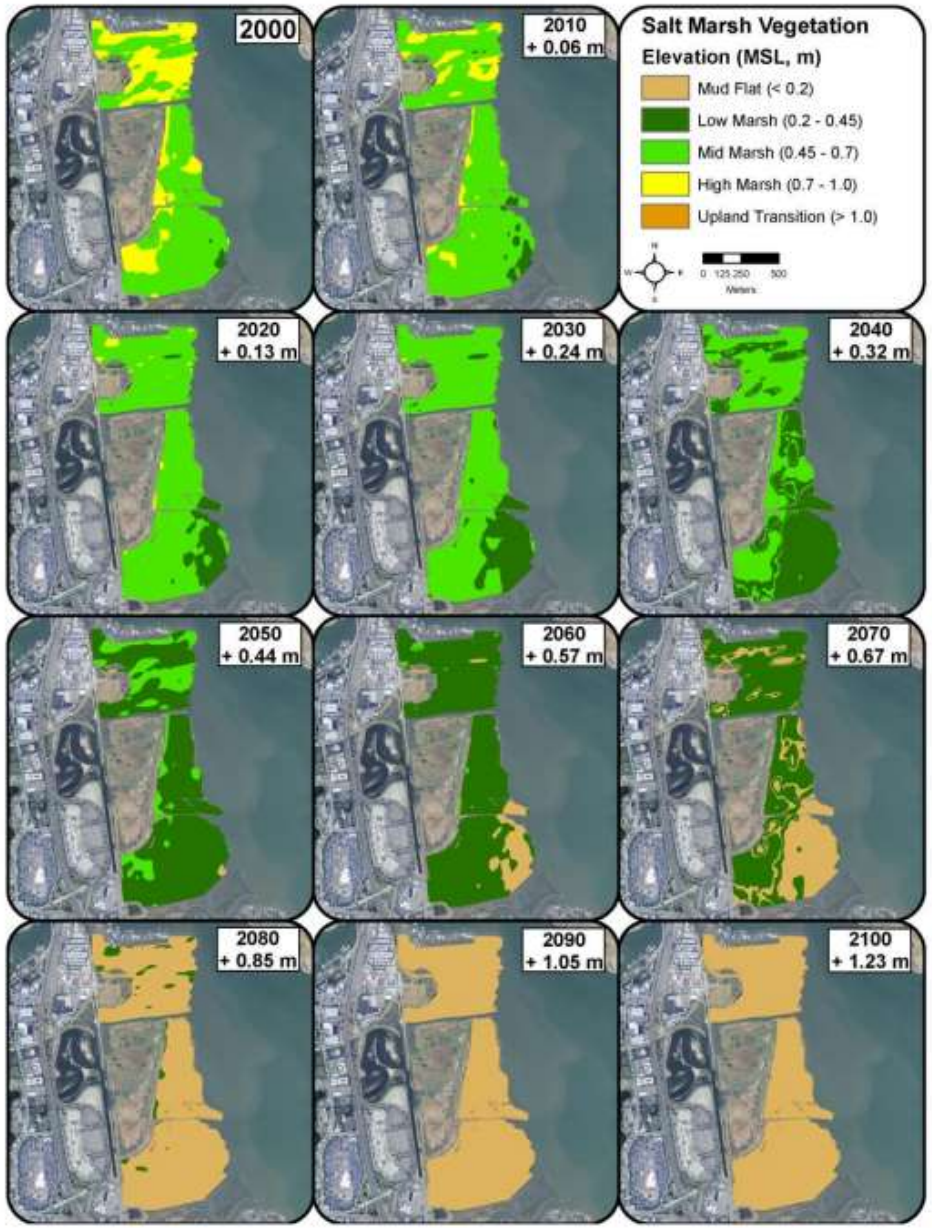


Figure G-9. Corte Madera WARMER results in terms of vegetation category: mudflat, low, mid, or high marsh, or upland transition.

Karen Thorne, USGS

Problems

- Limited **sediment supply** regionally + **sea-level rise**
  - Marsh drowning and erosion
  - **Habitat loss** for endangered and threatened species
  - Increased **flood risk** for low-lying communities

US Army Corps of Engineers: San Francisco District

(SFEI and Baye 2020)

Habitat availability of Ridgways rails over time

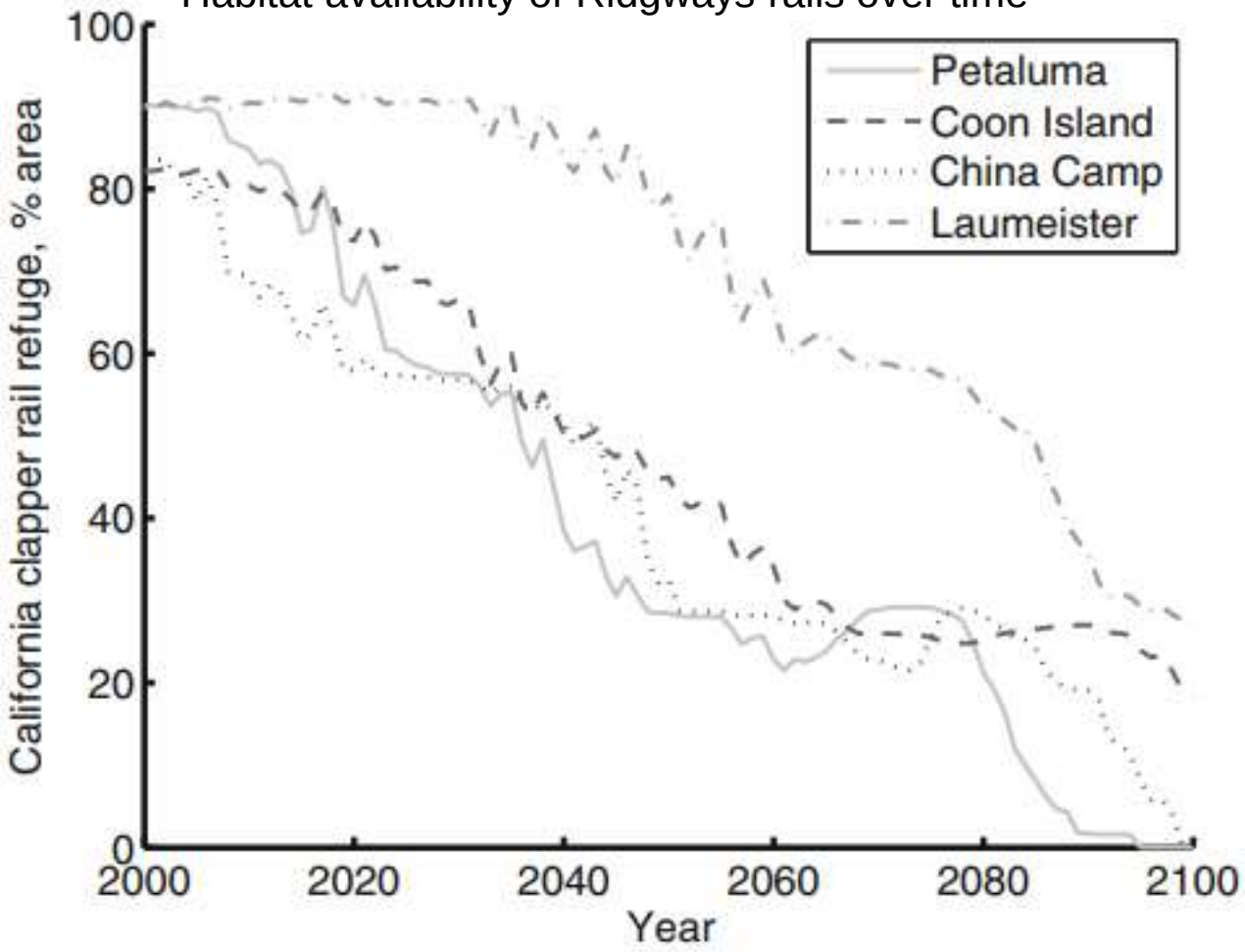


Fig. 9 *R. longirostris obsoletus* habitat availability at MHHW. Projected marsh area (%) where elevation plus maximum vegetation height exceeds MHHW by at least 20 cm

Swanson et al. 2013

Problems

- Limited **sediment supply** regionally + **sea-level rise**
  - Marsh drowning and erosion
  - **Habitat loss** for endangered and threatened species
  - Increased **flood risk** for low-lying communities

Opportunities/Solutions

- **Leverage dredged material** from navigation channels
  - Beneficial Use: Direct Placement
  - **Novel EWN Methods (e.g., Strategic Placement**)

US Army Corps of Engineers: San Francisco District

CECG 25 January 2023

Beneficial Use of Dredged Material Command Philosophy Notice

Teammates,

Today I am formally issuing a Beneficial Use of Dredged Material Command Philosophy Notice which outlines my vision for expanding the U.S. Army Corps of Engineers beneficial use of dredged material (BUDM) program. This philosophy notice aligns with two of my four key priorities for the organization, Partnerships and Innovate.

USACE historically uses 30-40% of the sediments derived from the Navigation mission for beneficial purposes. I have established a goal for USACE to advance the practice of BUDM to 70% by the year 2030 ("70/30 Goal").

Achieving our vision will require purposeful documentation and an innovative pursuit both internally and externally with our partners and stakeholders. You will need to leverage available solutions, strategies, and tools to the maximum extent practicable while developing and applying new approaches and technologies to address the associated engineering challenges.

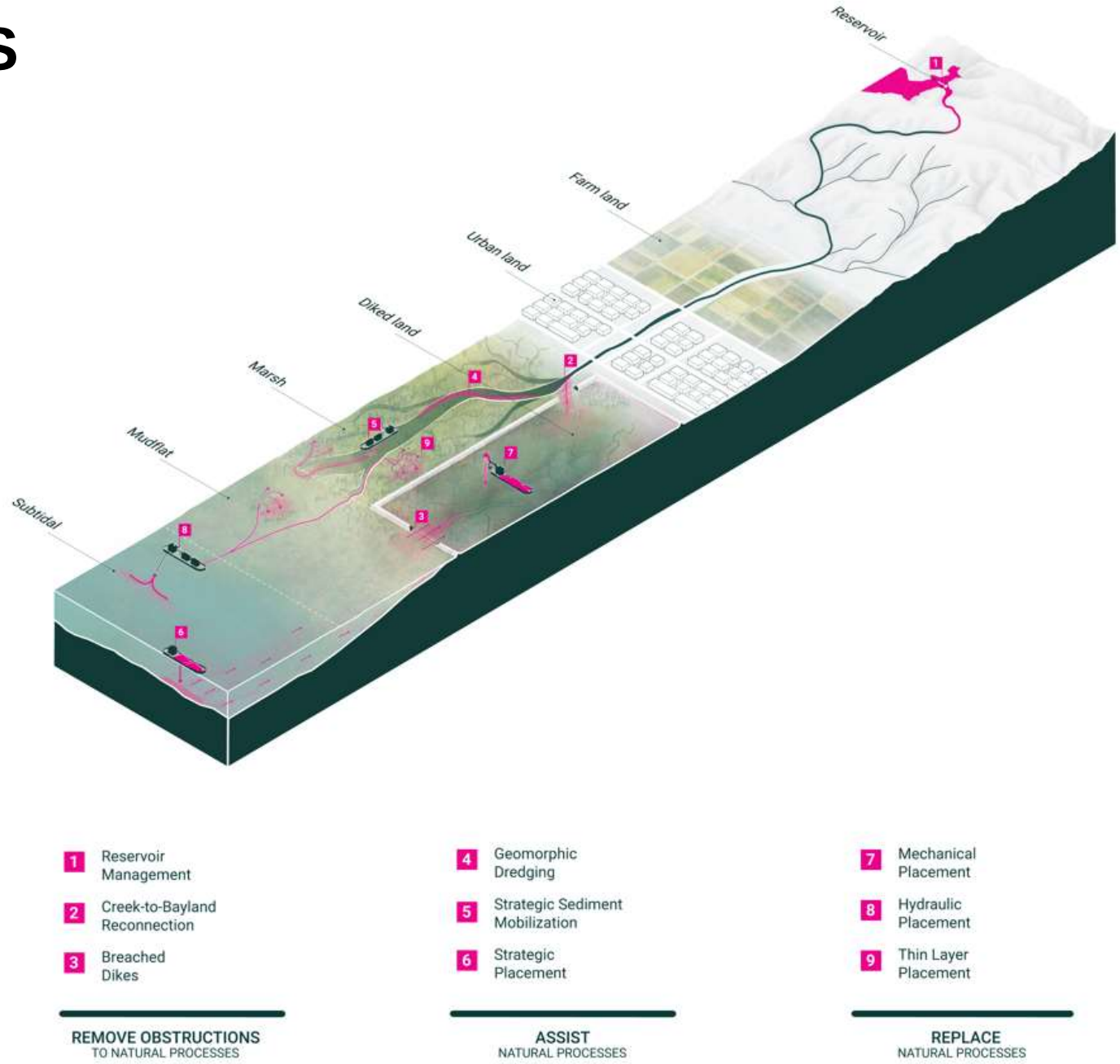
USACE NAVIGATION – CHALLENGES & OPPORTUNITIES

Challenges

- Equipment challenges
  - Hard to get material to other sites (long distance pipelines)
  - Small enough scows to get close to shore for shallow water placement
- Timing of receiving sites coming online
- Federal standard remains, but environmental benefits can be counted, accounting for all the costs
- Quantifying the benefits of strategic placement

BENEFICIAL USE STRATEGIES

- **Remove obstructions**
  - Reservoir management
  - Reconnect Creeks to Baylands
  - Mechanical breaches
- **Assist natural processes**
  - Strategic shallow water placement
  - Geomorphic Dredging
- **Replace natural processes**
  - Mechanical placement
  - Hydraulic placement



REGIONAL ANALYSIS OF POTENTIAL BENEFICIAL USE LOCATIONS

For each analysis unit…

Marshes

Diked baylands (potential future marshes)

…calculating metrics to aid in prioritization:

Wildlife support

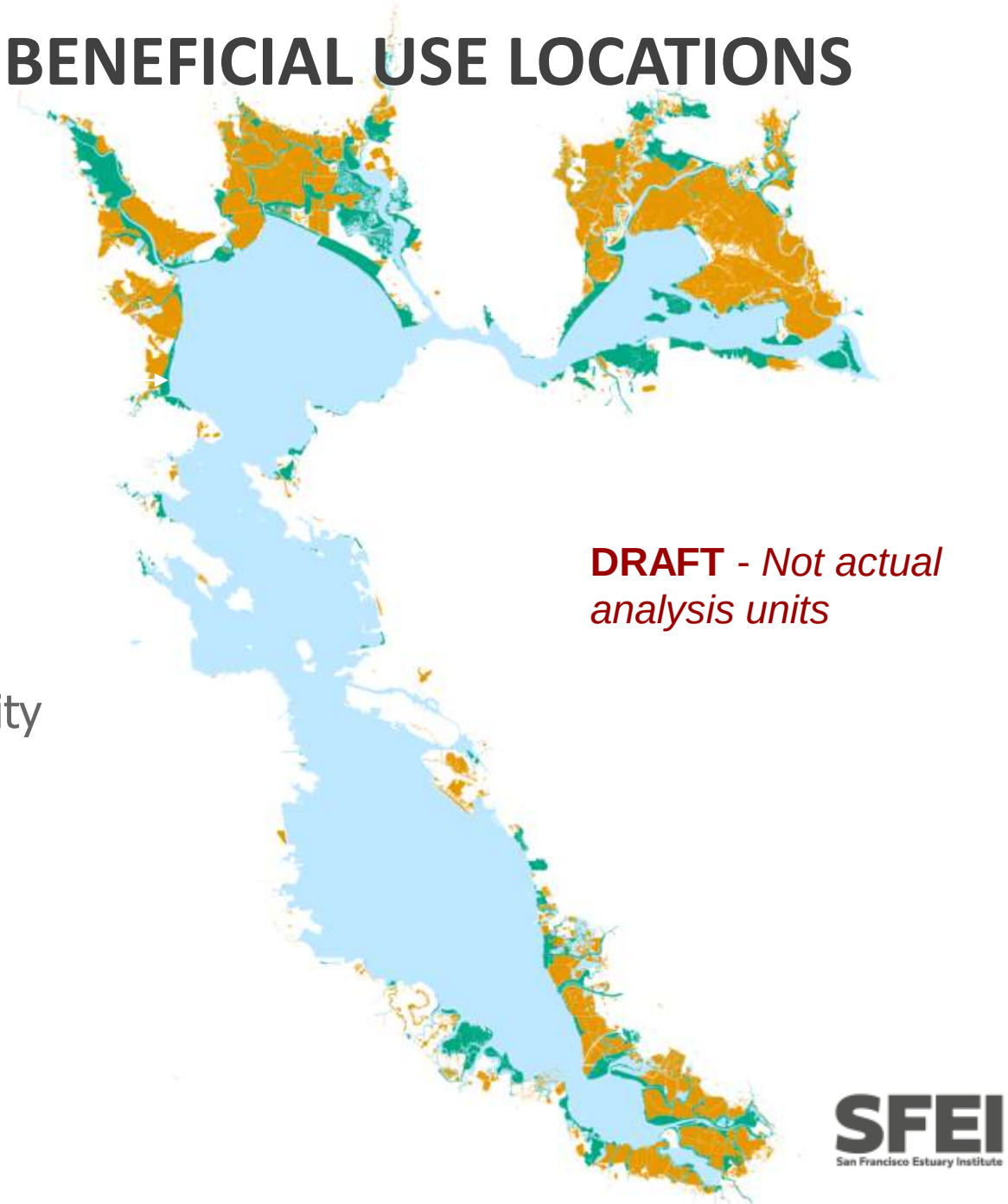
- E.g. patch contribution to habitat connectivity

Flood attenuation

- E.g. wave attenuation benefits of existing marshes and mudflats

Placement feasibility

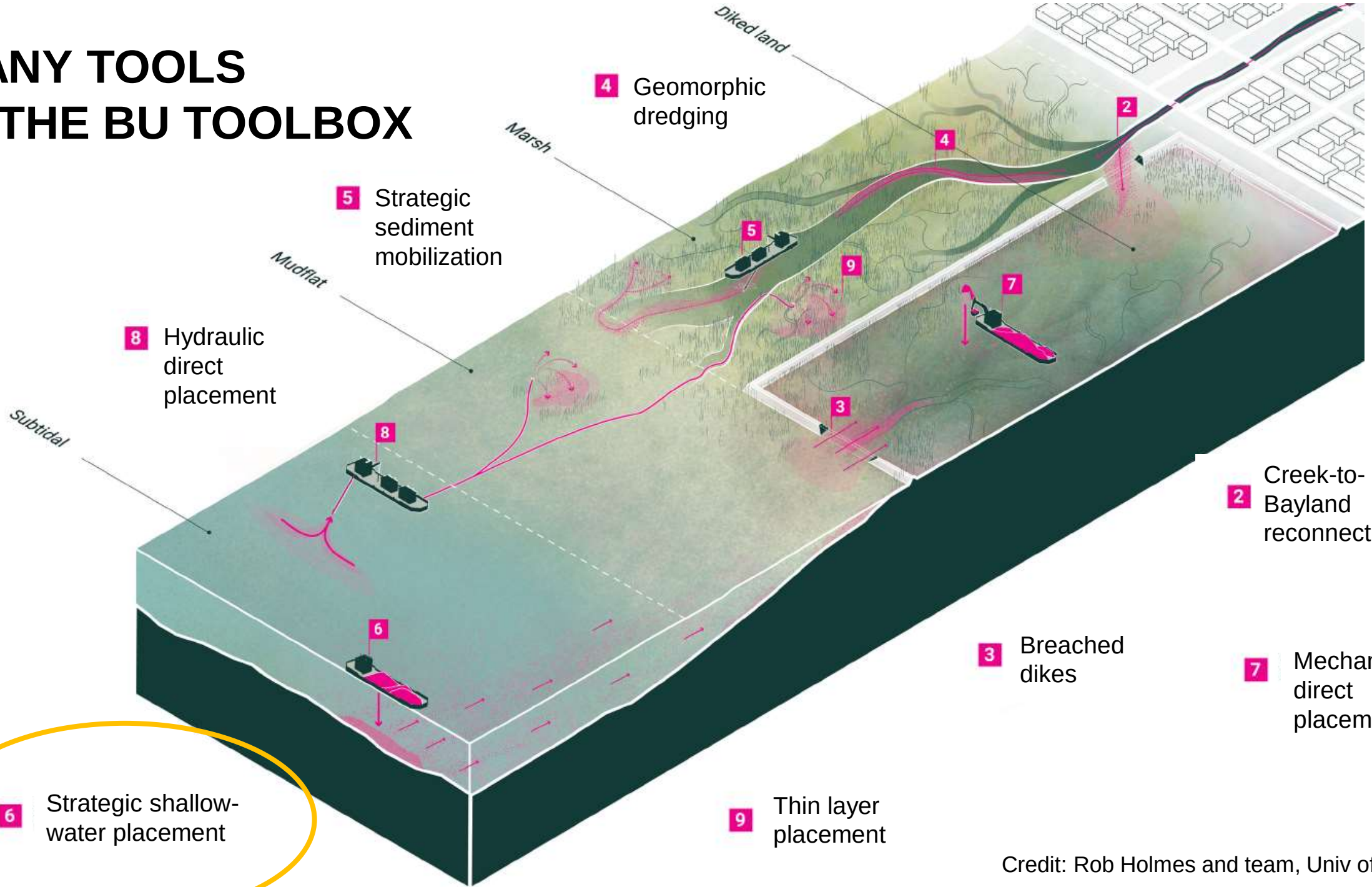
- E.g. proximity to dredging location



DRAFT - *Not actual analysis units*

SFEI
San Francisco Estuary Institute

MANY TOOLS IN THE BU TOOLBOX



4 Geomorphic dredging

5 Strategic sediment mobilization

8 Hydraulic direct placement

2 Creek-to-Bayland reconnection

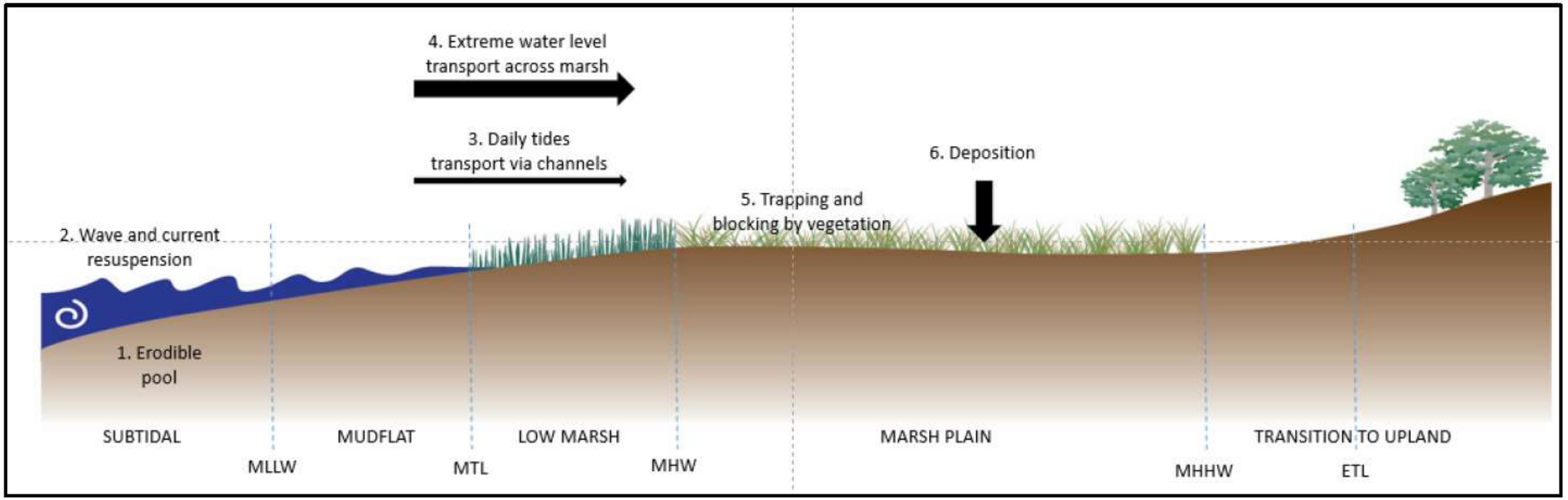
3 Breached dikes

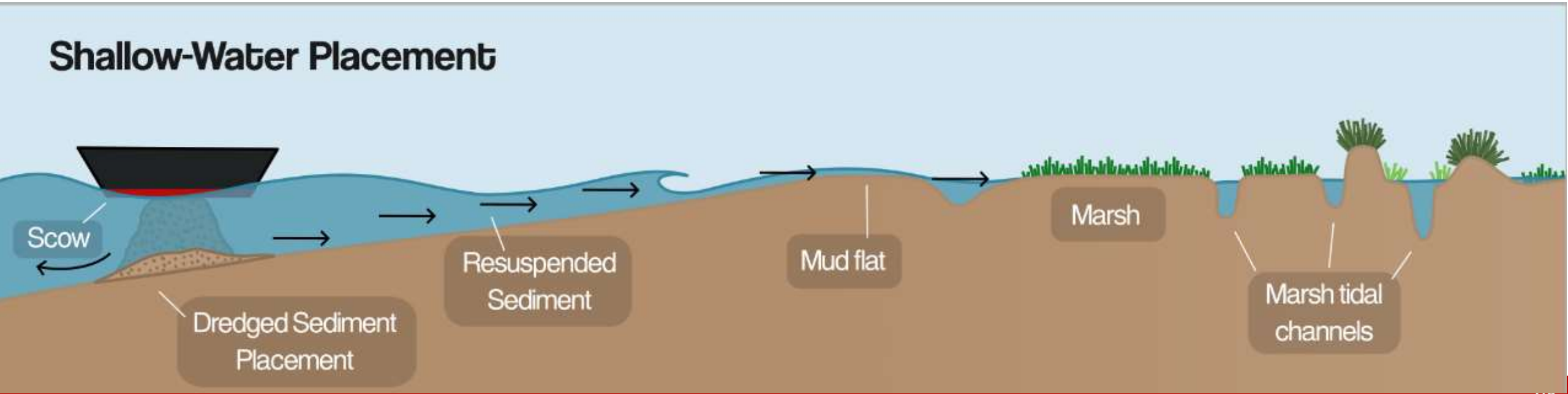
7 Mechanical direct placement

6 Strategic shallow-water placement

9 Thin layer placement

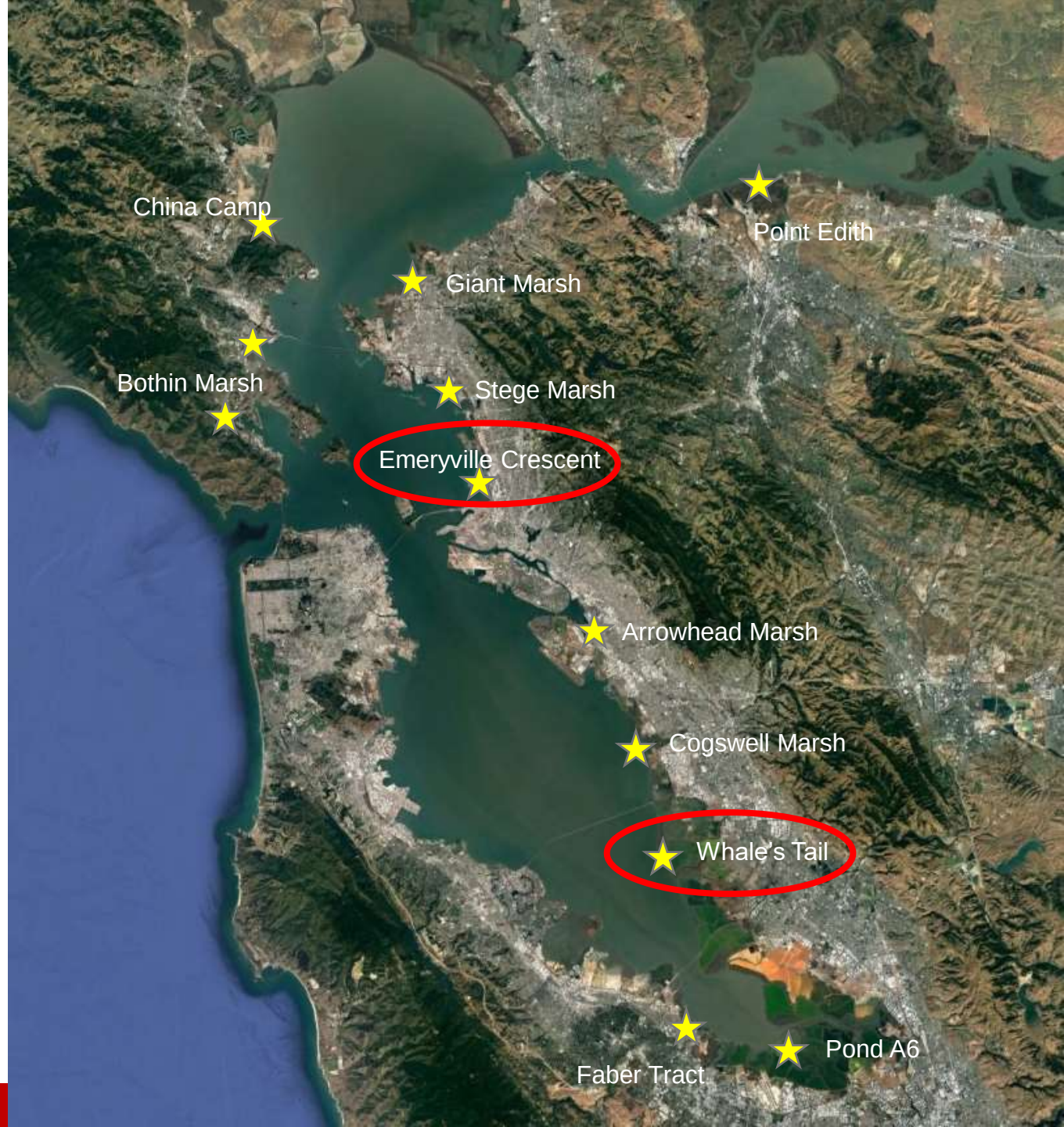
Credit: Rob Holmes and team, Univ of Auburn


4. Extreme water level transport across marsh
3. Daily tides transport via channels
6. Deposition
5. Trapping and blocking by vegetation
2. Wave and current resuspension
1. Erodible pool
SUBTIDAL
MUDFLAT
LOW MARSH
MARSH PLAIN
TRANSITION TO UPLAND
MLLW
MTL
MHW
MHHW
ETL


Shallow-Water Placement
Scow
Dredged Sediment Placement
Resuspended Sediment
Mud flat
Marsh
Marsh tidal channels

SCREENING OF SITES

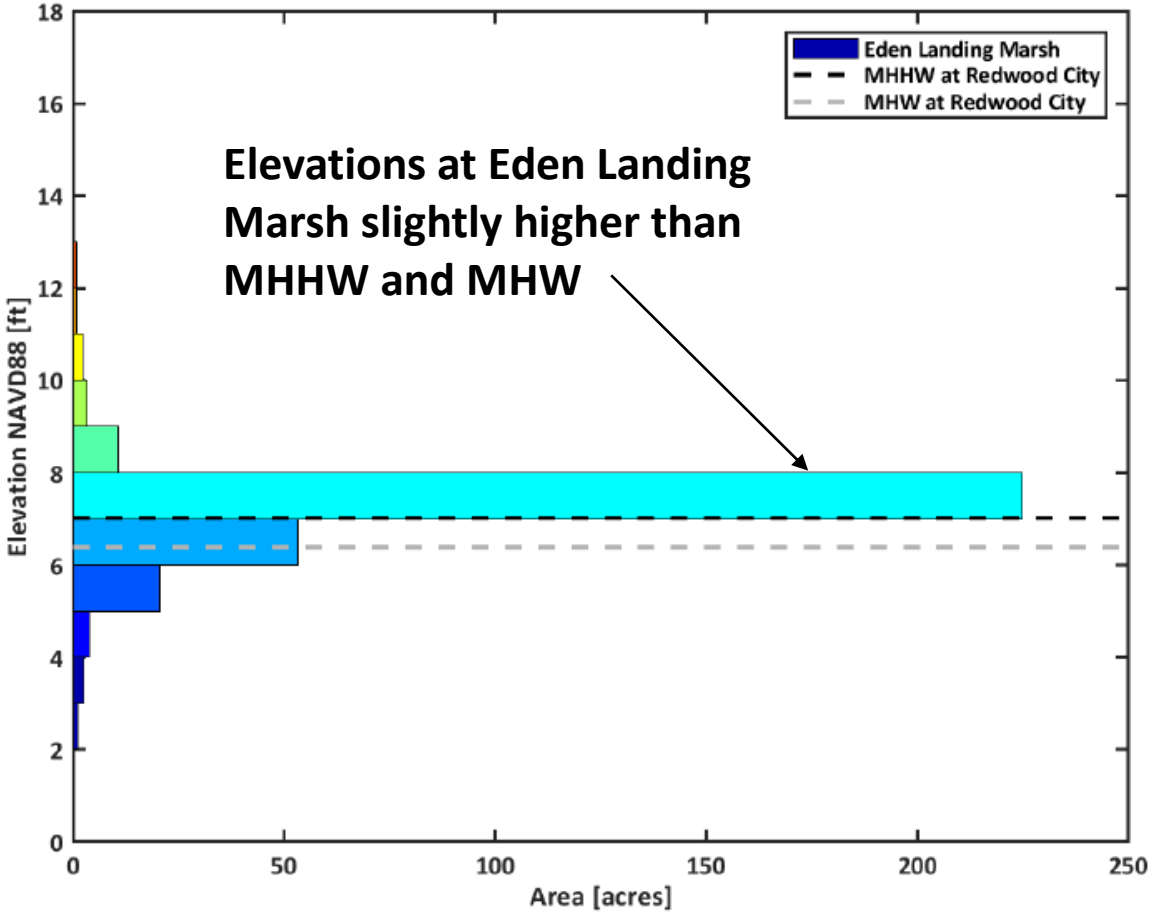
- **Site selection criteria**
  - Eroding or drowning marsh, lack of natural sediment supply
  - Sufficient wind-wave action to resuspend sediment placed
  - Open to tidal exchange
  - Wind-wave shore-normal approach
  - Proximity to a Federal Channel
  - Water deep enough to get scow close to shore
  - Lower populations of critical species
  - Avoiding large eelgrass beds/nearshore reef projects
  - Flood protection for EJ/disadvantaged communities

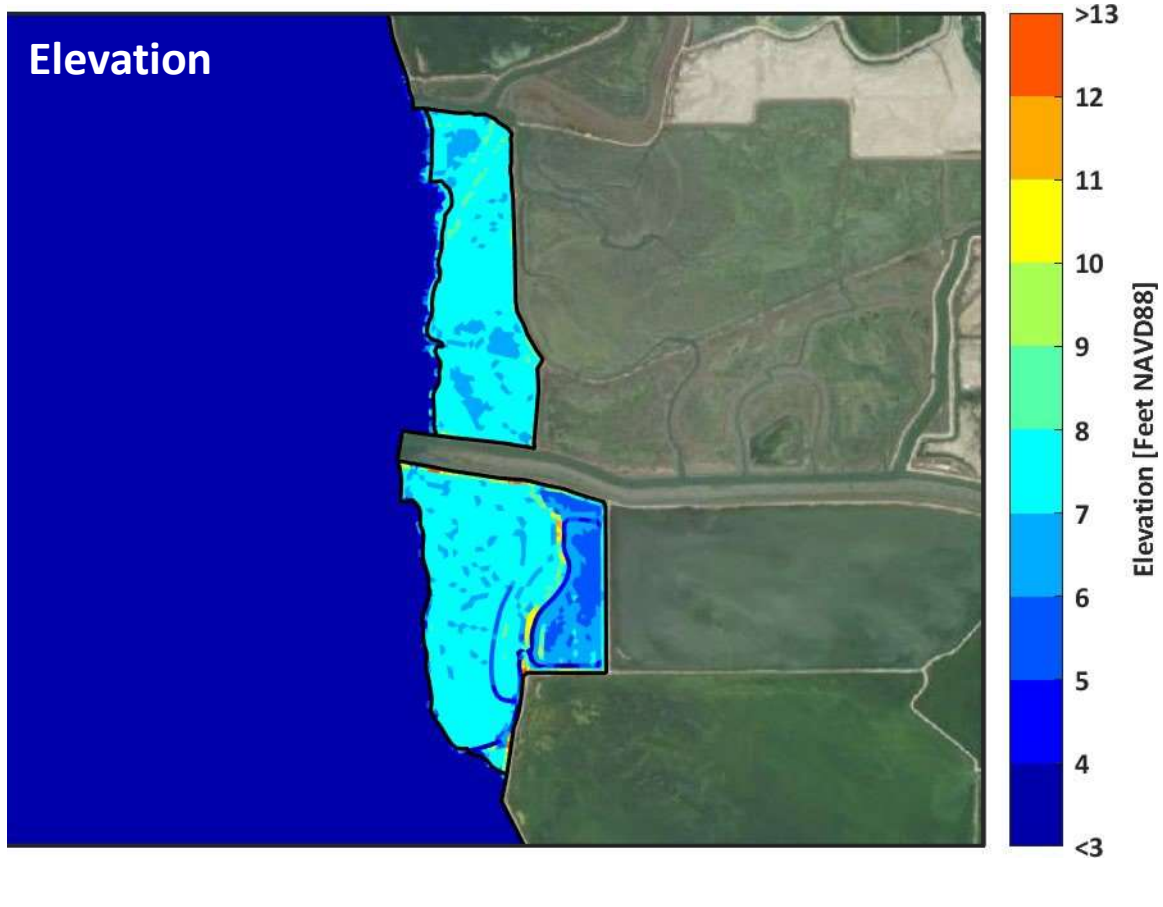


MODELING

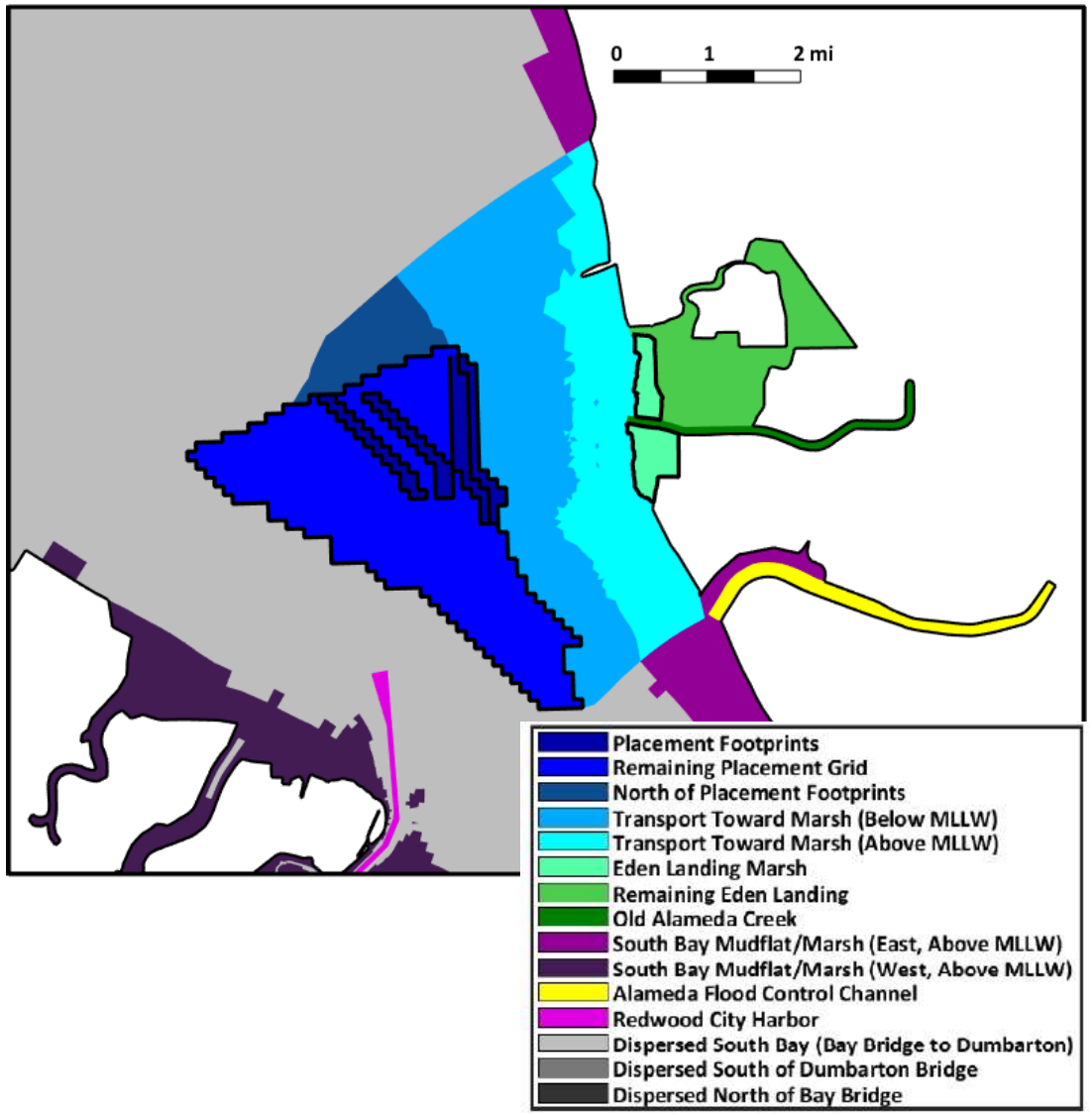
- Modeling using UnTRIM Bay-Delta model and sediment transport model to simulate existing conditions and placement alternatives
- **First Round – Site Selection**
  - Determine whether Emeryville or Eden Landing is most suitable for this pilot study
  - Evaluate different placement strategies
    - Testing 100,000 yd^3 total
    - Placement locations
- **Second Round –sensitivity analysis**
  - Different volumes
  - Seasonal differences
  - Size of placement footprint
  - Sediment sources

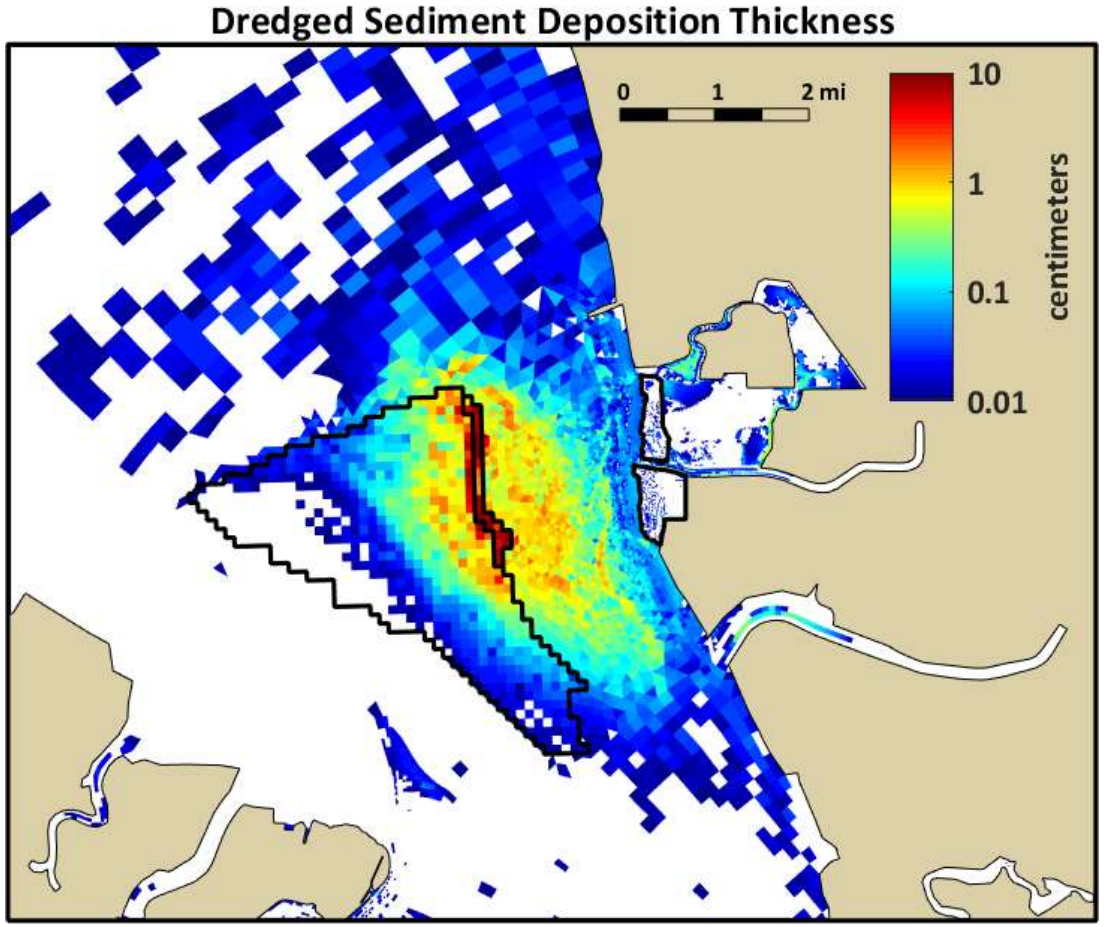
EDEN LANDING: MARSH ELEVATIONS

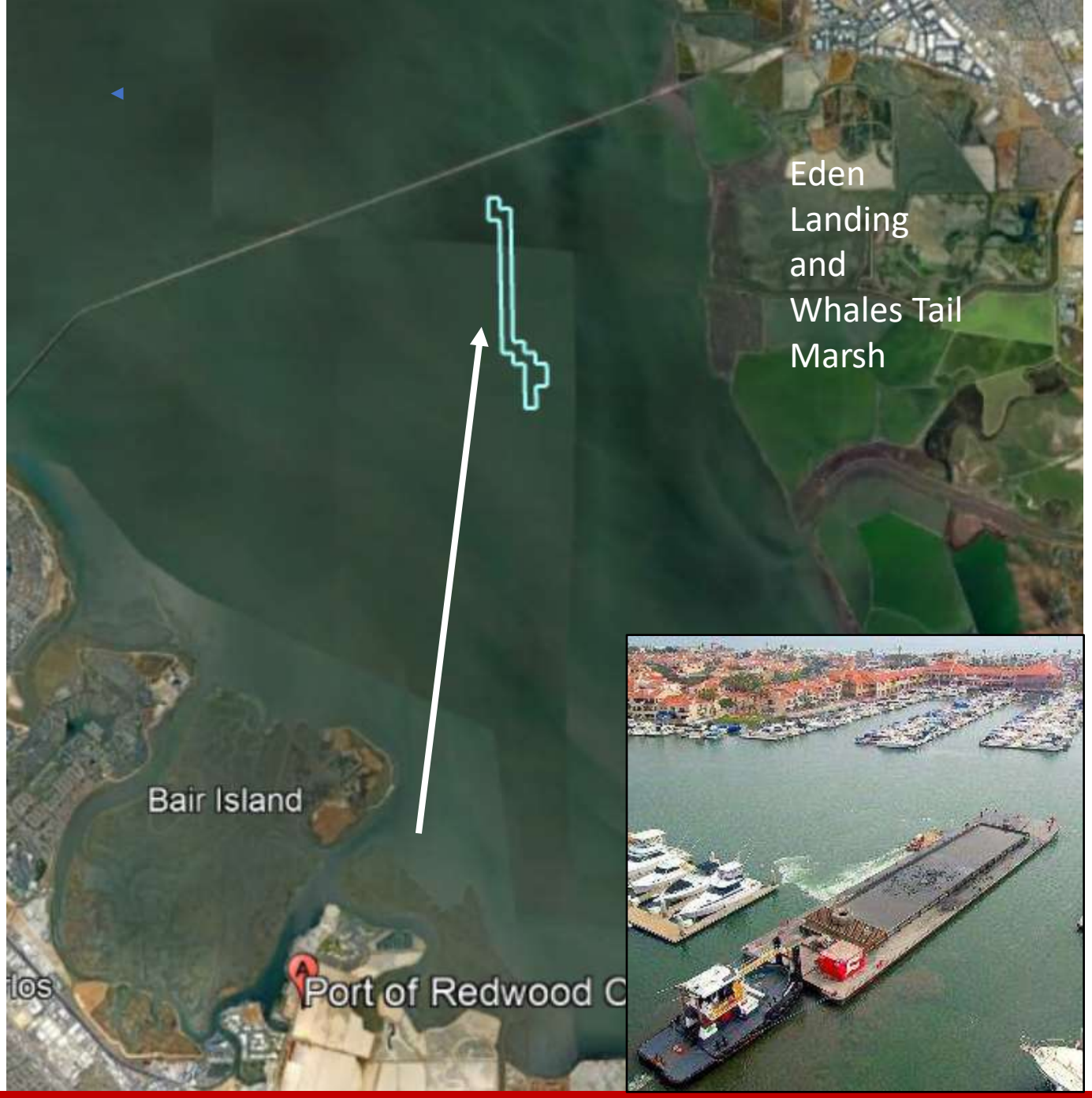




EDEN LANDING MODELING RESULTS
SCENARIO: 100K YD^3 PLACEMENT







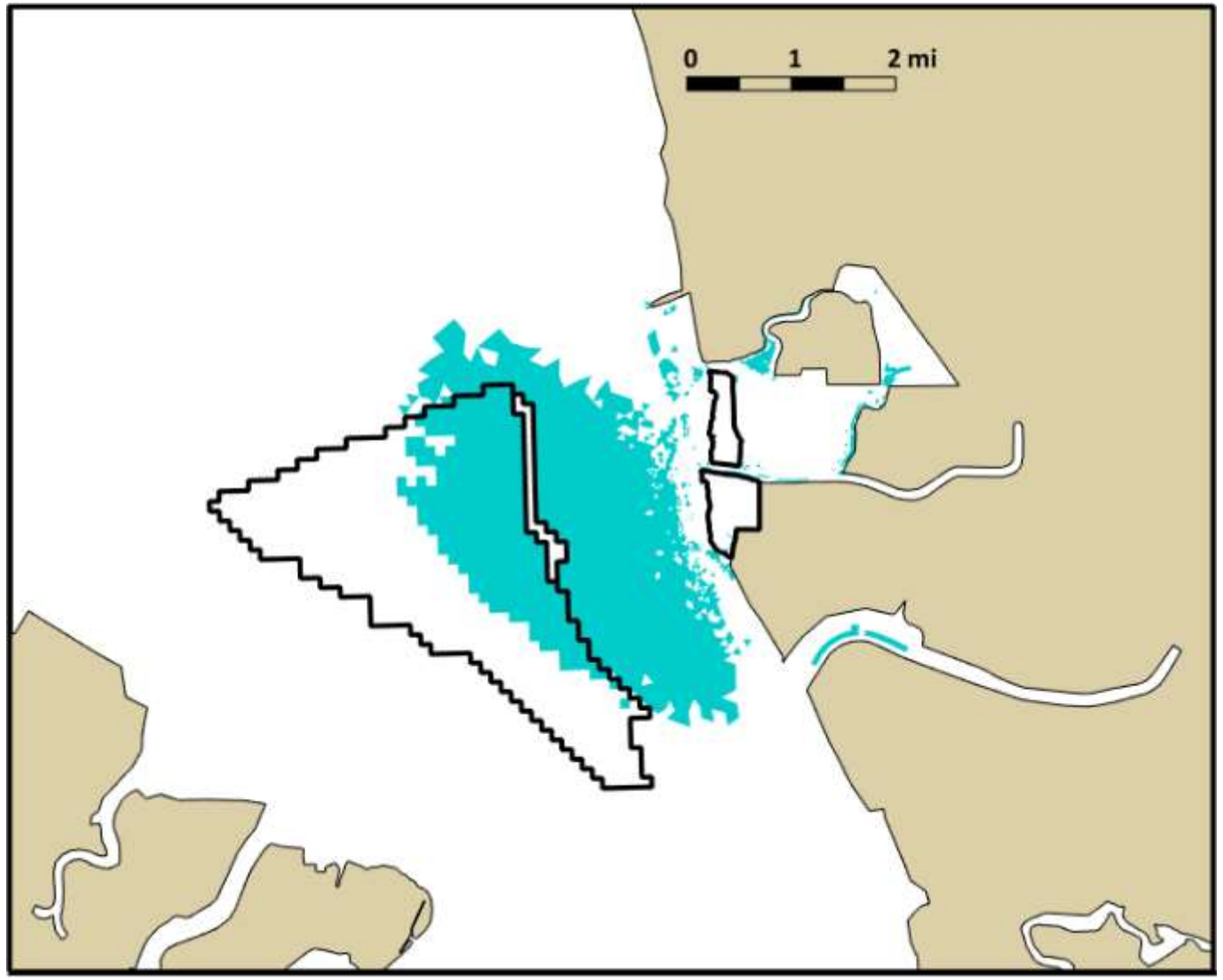
RECOMMENDED PLAN

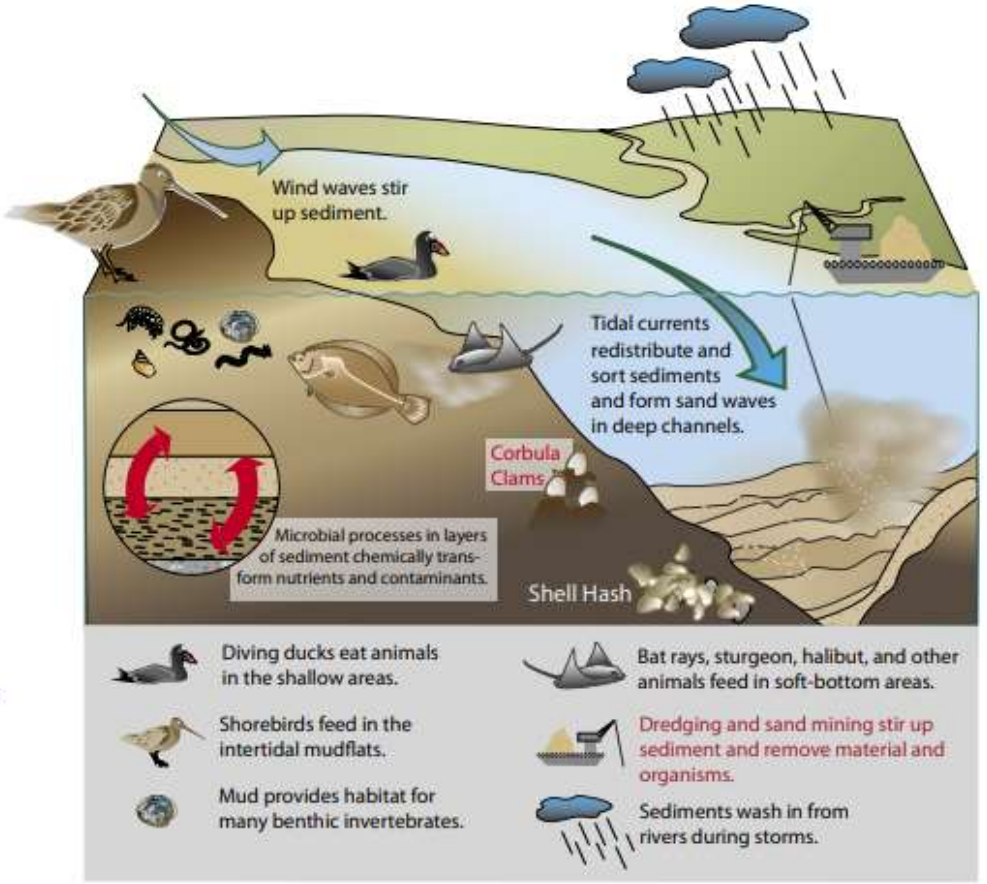
- Placement Site: Eden Landing (shallow)
- Volume: 100,000 yd^3
- Material from Redwood City Harbor Federal Dredging
- ~112 scow trips from RWC dredging diverted to 1.5 miles offshore of Eden Landing
- Placement site is 138 acres, absolute depth is 9-12 ft MLLW
- Nov-Dec 2023

US Army Corps of Engineers: San Francisco District

https://curtinmaritime.com/fleet/arrow-pt-loadlined-split-hulled-dump-scow/

POTENTIAL ENVIRONMENTAL IMPACTS



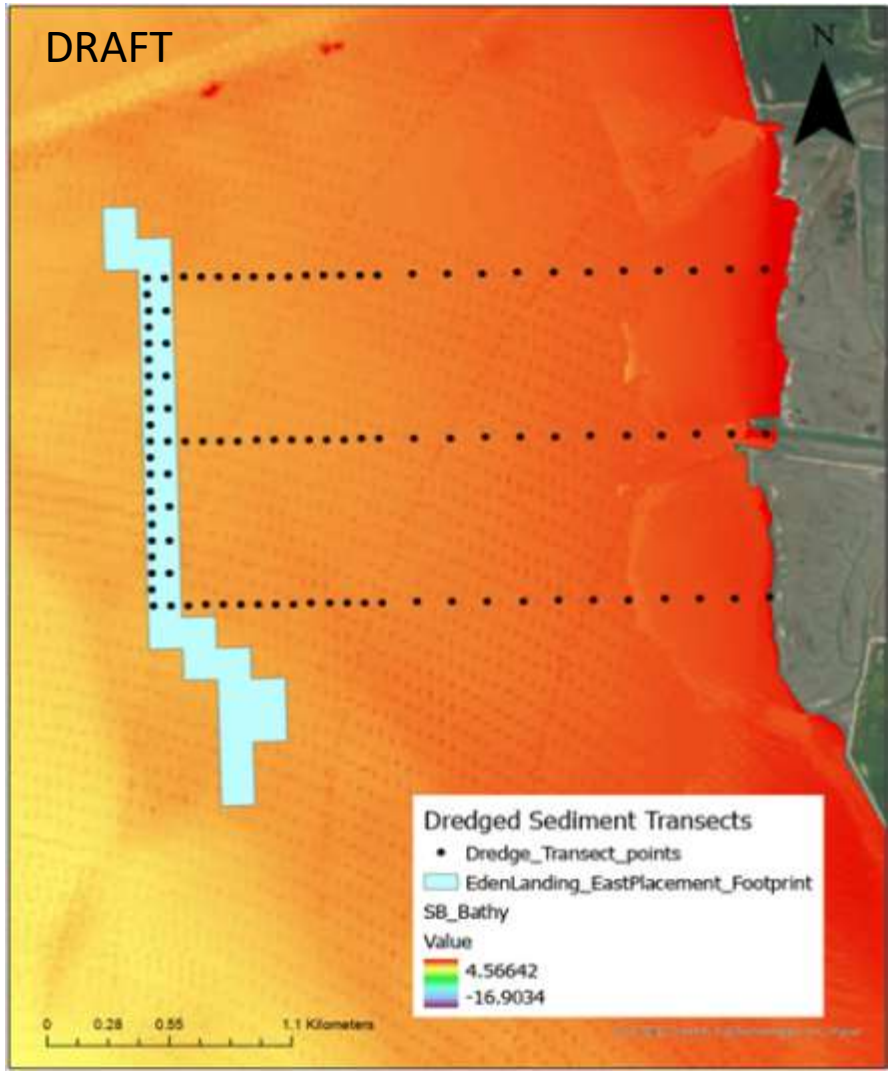


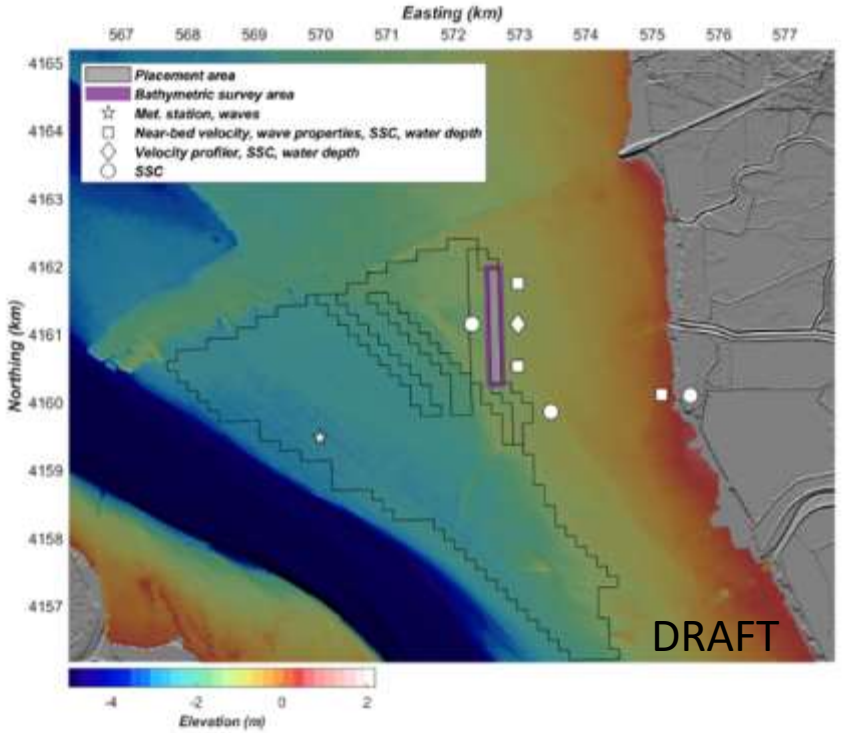
Subtidal goals, 2010

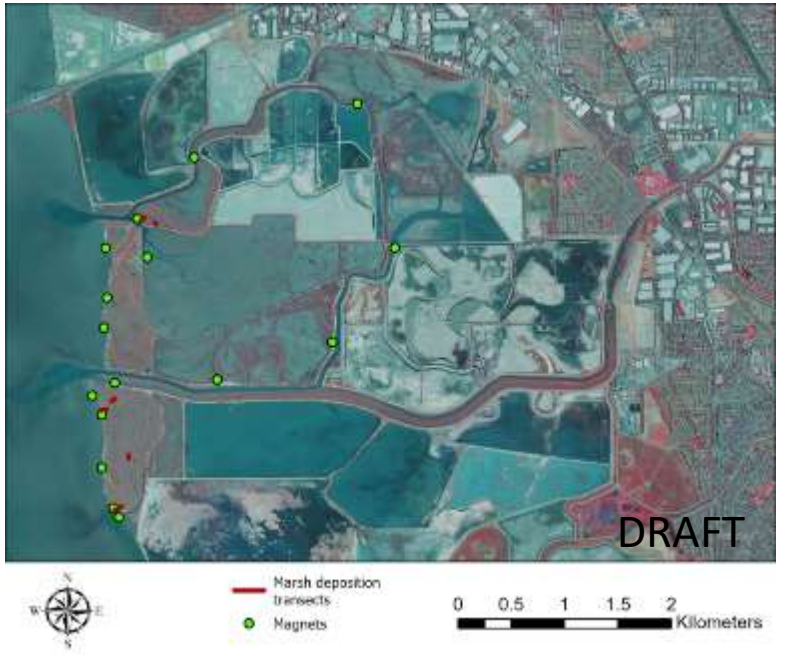
MONITORING PLAN

- **Pre-project**
  - Eelgrass surveys
  - Suspended sediment, wave conditions
  - Sediment transport rates
  - Benthic communities
  - Background marsh/mudflat gain or loss

- **Post-project**
  - Benthic recovery
  - Eelgrass survey
  - Sediment transport rates
  - Marsh/mudflat deposition
  - **Magnetic Particle Tracking Study**







Karen Thorne, USGS

SCHEDULE UPDATE AND CHALLENGES

- **Environmental Compliance**
  - NEPA, CEQA, CWA, FWCA, MSA, ESA, NHPA, CAA, CZMA
  - Permit extensions until 31 December 2023

- **Contracting**
  - Solicitation/bids Sept – Oct 2023
  - Contract awarded 27 Oct and NTP 1 Nov 2023
    - » HME Construction, Vancouver WA
  - **Implementation November – December 2023**
  - Monitoring began October 2023, ending December 2024
  - Technical report produced post-placement and data analysis

SCHEDULE UPDATE AND CHALLENGES

- **Challenges**
  - Matching with O&M dredging contract
    - » Cost estimating, communication, balancing priorities
  - Re-solicitation was needed
  - Permitting coordination with resource agencies
    - » Limited to Dec 31st for placement
  - Timing of monitoring with uncertainty of dredging

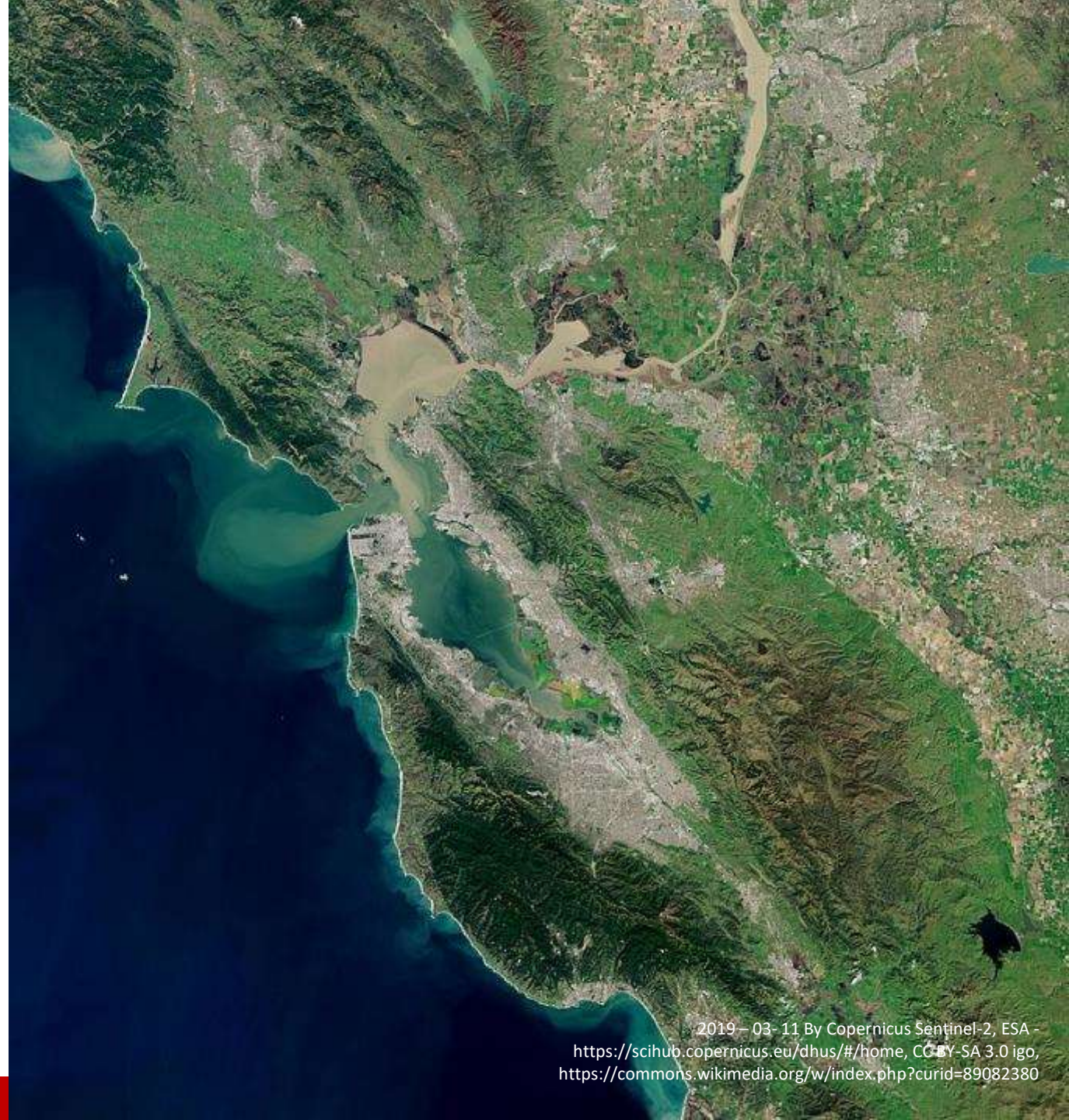
DEFINING SUCCESS

- What will make this effort successful?
  - Implementation of **novel placement method**
  - Placement **without significant impact** to ecological function of shallows
  - Material not going to disposal site; **keeping dredged material in the system**
  - **Delivery to mudflats**, and eventually marshes, and restoration ponds
  - Community and Tribal **engagement**
  - Development of **monitoring methods** for shallow water placement projects
  - Completion of a **successful contract** with available existing equipment
  - Attracting **new members** of the dredging industry to the region
  - **Testing a tool** useful in maximizing BU for Regional Dredged Material Management Plan and beyond

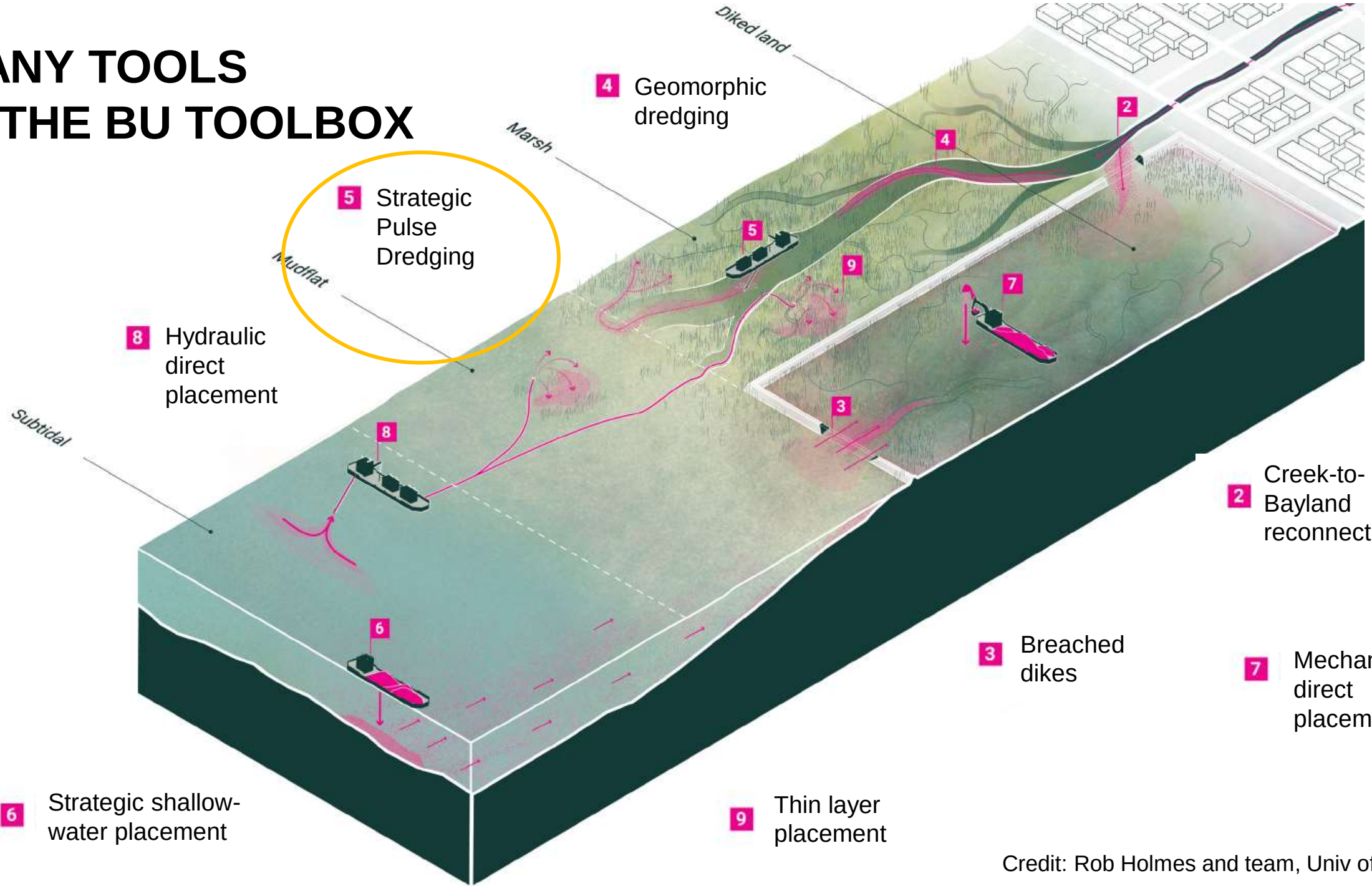
US Army Corps of Engineers: San Francisco District

WHAT'S NEXT?

- **More pilot efforts for thin lifts for existing marshes**
  - Other suitable sites are being modeled through the RDMMP + SLR
  - How to fund other pilot efforts!
    - Water column seeding, ways to get sediment closer to existing marsh
    - **Strategic Sediment Pulse Dredging**



MANY TOOLS IN THE BU TOOLBOX



4 Geomorphic dredging

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9 Thin layer placement

Credit: Rob Holmes and team, Univ of Auburn

STRATEGIC PULSE DREDGING

Big Idea

- Small tidal flood control channels
- Remobilize sediment at bed
- Timed for before storm events
- Uses watershed discharge, and ebb tides to distribute sediment into SF Bay naturally

Environmental Benefits

- Sediment stays in system, limits on handling material
- Lower carbon footprint, cost effective (?)
- Achieve flood risk reduction in tidal channels, and pulse sediment at storms (as occurs naturally)

Environmental Concerns (potential)

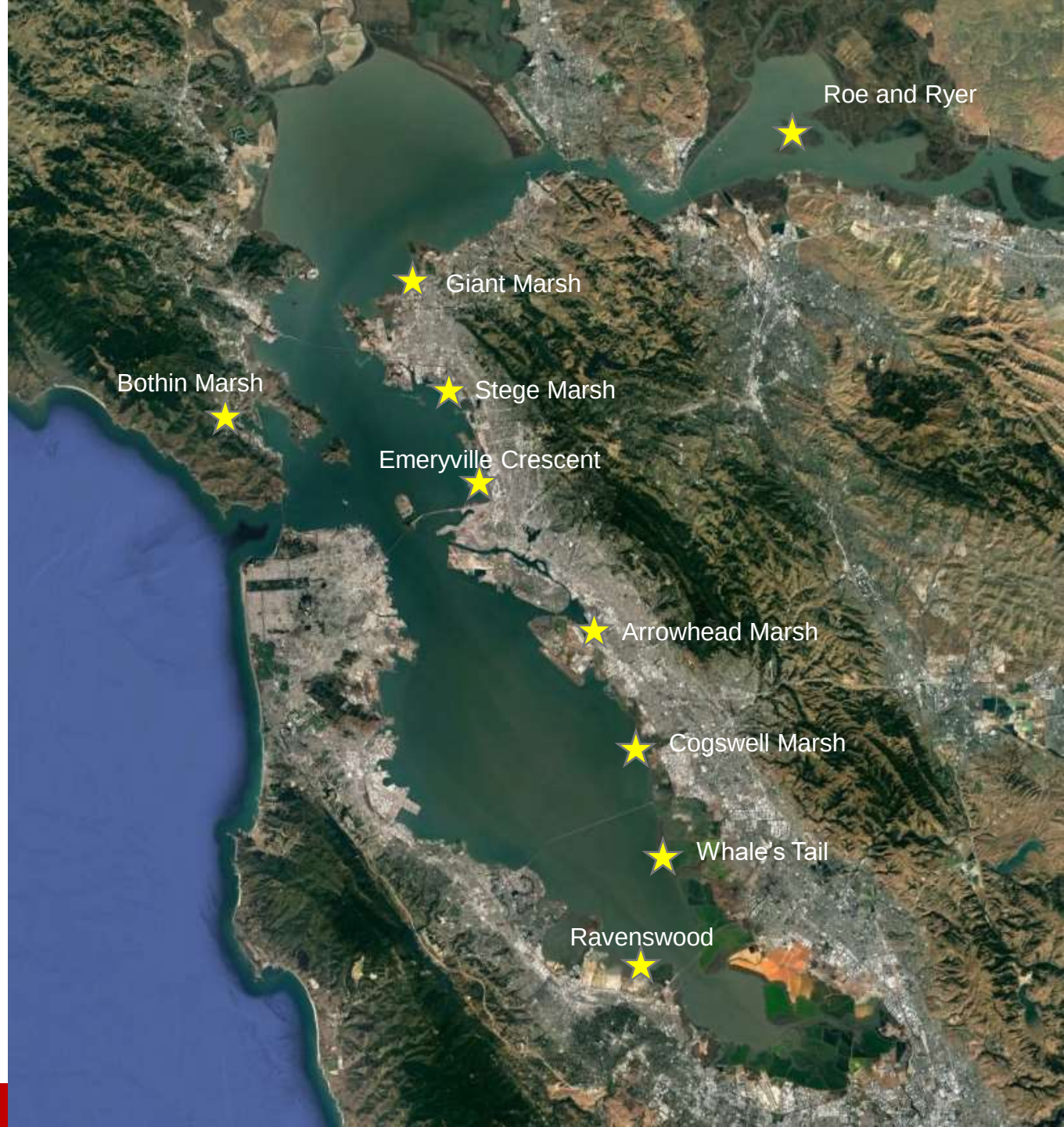
- Increased turbidity, impacts to benthic communities

Source: Van oord Marine Ingenuity
https://www.vanoord.com/en/equipment/water-injection-dredger/

WHAT'S NEXT?

- **More pilot efforts for thin lifts for existing marshes**
  - Other suitable sites are being modeled through the RDMMP + SLR
  - How to fund other pilot efforts!
    - Water column seeding, ways to get sediment closer to existing marsh
    - **Strategic Sediment Pulse Dredging**
  - **"Marsh Maintenance Plan"**

- **Other strategies needed for Polder restoration**



PROJECT TEAM

USACE
- Peter Mull - Project Manager
- Arye Janoff – Lead Planner
- John Dingler- Planning Mentor
- Julie Beagle- Environmental Planner
- Eric Joliffe- Environmental Planner
- Stephanie Bergman – Cultural Resources
- Tiffany Cheng- Coastal Engineer
- Fanny Chan- Civil Engineer
- Kelly Boyd – Real Estate

Non-Federal Sponsor (CA Coastal Conservancy)
- Evyan Sloane (SCC)-Sponsor Program Manager
- Brenda Goeden (BCDC)-Sponsor Technical Support

- **Contractor (Modeling)**
  - Anchor QEA (Michael MacWilliams, Aaron Bever)

- **SF Bay Regional Water Quality Control Board (CEQA Lead)**
  - Xavier Fernandez
  - Kevin Lunde
  - Jazzy Graham-Davis
  - Christina Toms

Contact:

Julie.R.Beagle@usace.army.mil

THANK YOU

Contact: Julie.R.Beagle@usace.army.mil

SCC 1122 PROPOSAL

U.S. ARMY

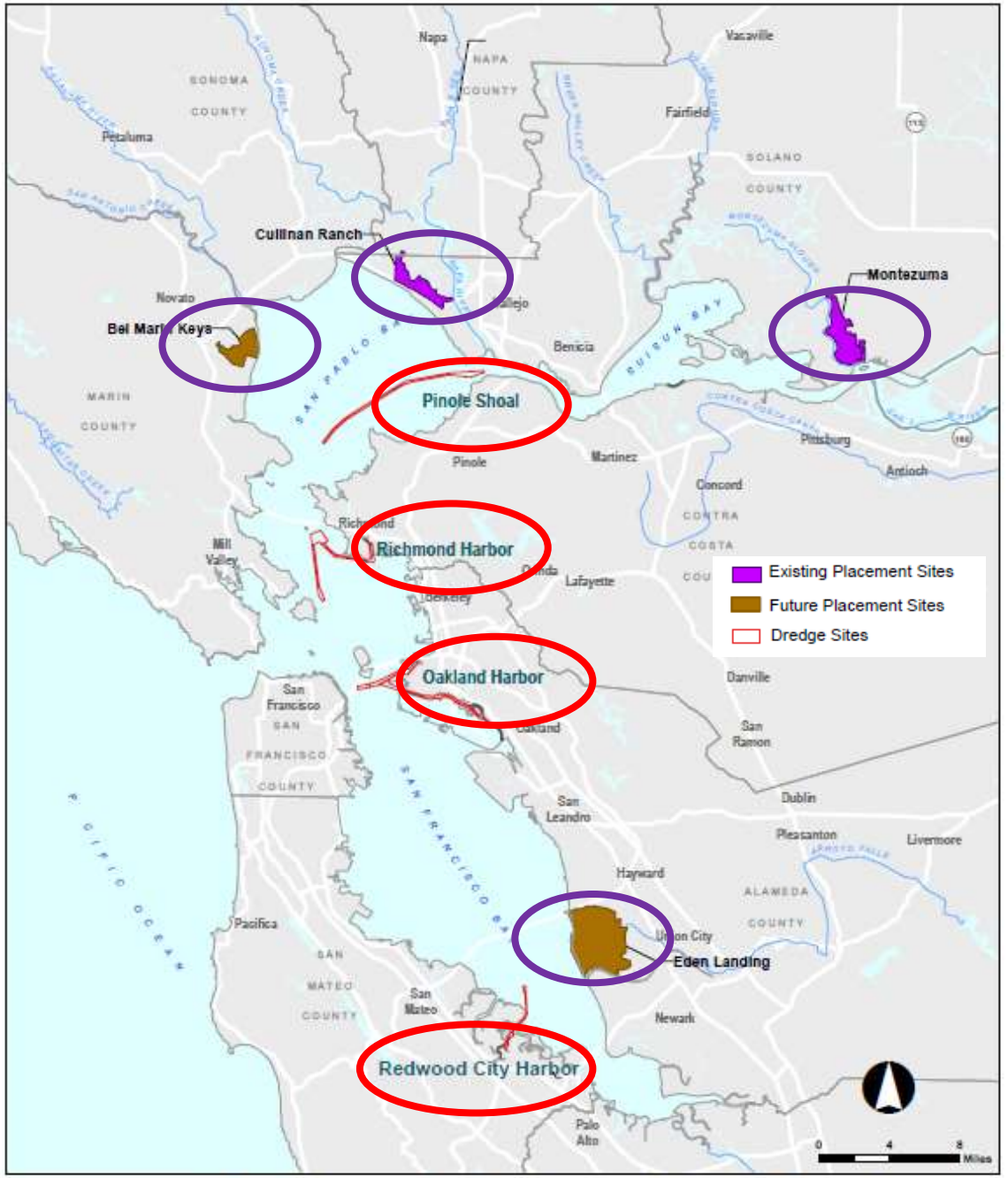
Federal Navigation Projects (SOURCE):

- Oakland Harbor
- Richmond Harbor (Inner; Outer = Hopper)
- Pinole Shoal (Hopper)
- Redwood City

Beneficial Use Site:

- Cullinan Ranch
- Montezuma
- Bel Marin Keys Unit V
- Eden Landing

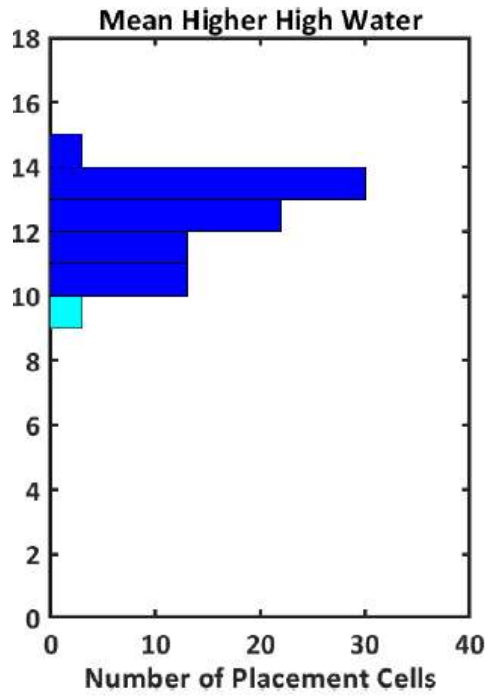
	Est. Federal 1122 Costs	Est. Volume	Notes
Strategic Placement	$3.25M	TBD	Finalizing Design
Cullinan Ranch Direct Placement	$6.5M	2 MCY	Available now
Montezuma Direct Placement	$24.9M	4.5 MCY	Available now
Bel Marin Keys	$29.4M	9.1 MCY	Available ~FY24+
Eden Landing	TBD	7.2 MCY	Available ~FY26+
Total over 10 years	**$64.05M**	22.8 MCY	

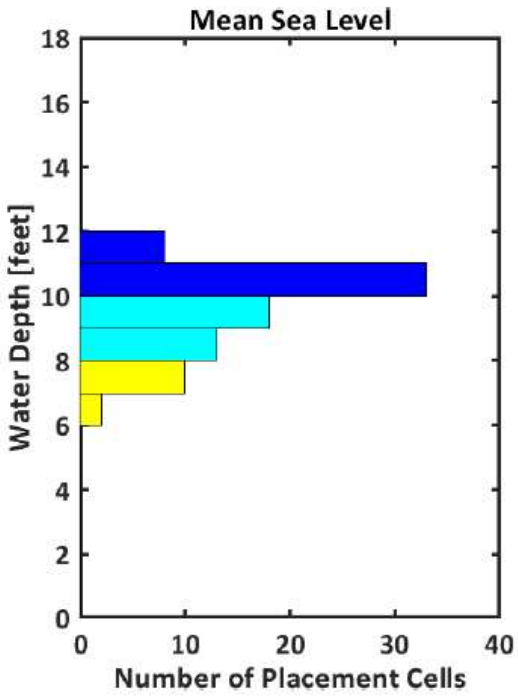


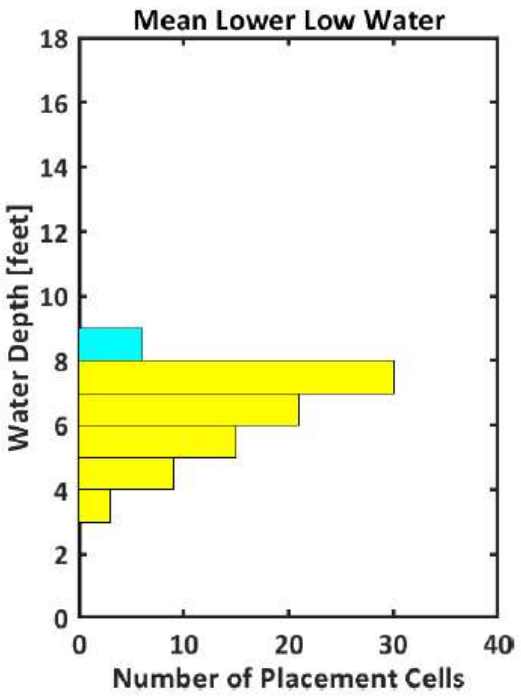
SAN FRANCISCO BAY WIIN PILOT PROJECT

Beneficial Use of Dredged Material in San Francisco Bay

PLACEMENT STRATEGIES (EMERYVILLE EXAMPLE)

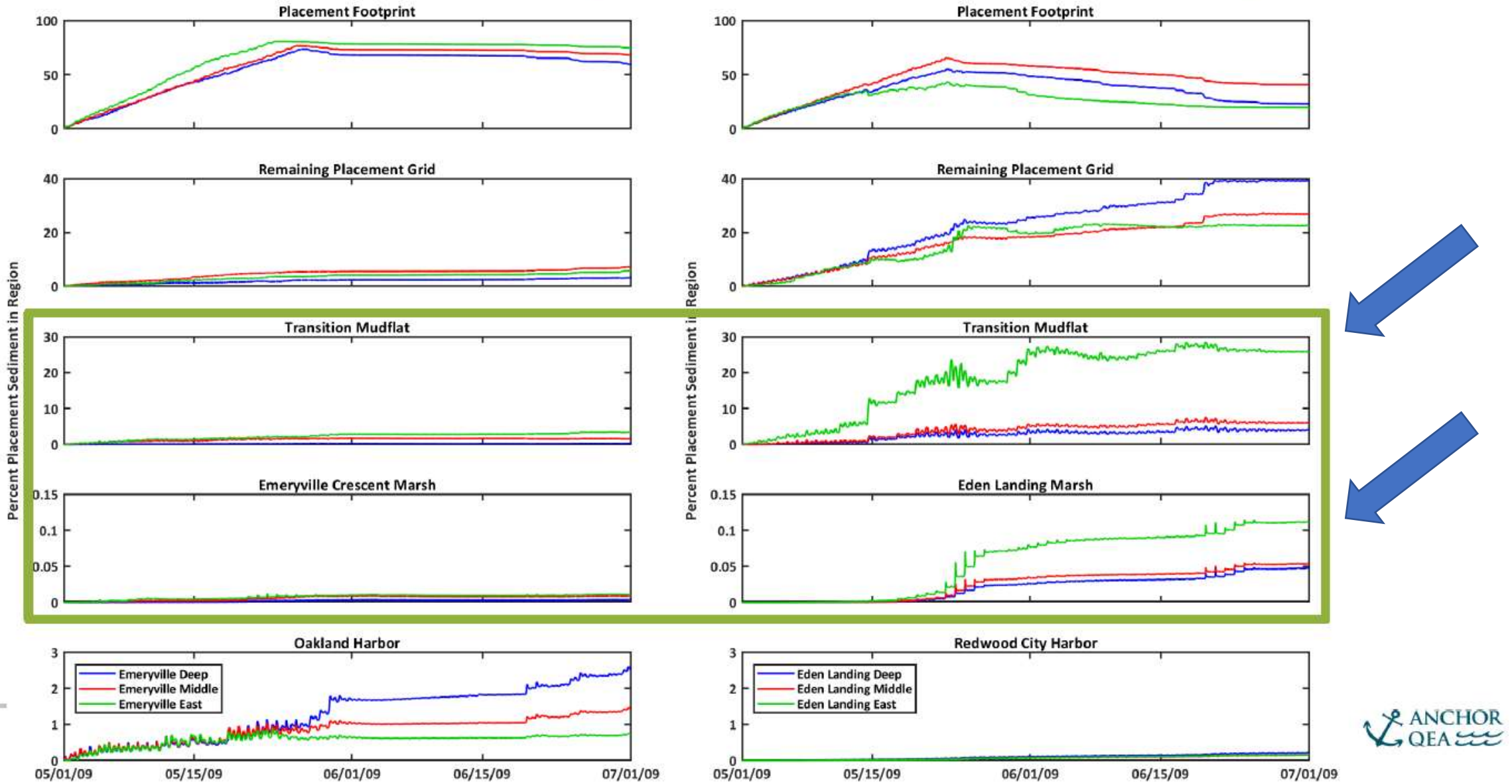






ANCHOR QEA

SCENARIO RESULTS: EMERYVILLE AND EDEN LANDING



SCENARIO RESULTS: EMERYVILLE AND EDEN LANDING

- Percentage of dredged material in various regions at end of simulation

Scenario	Placement Footprint	Remaining Placement Grid	Transition Mudflat	Marsh	Remaining Eden Landing	Ancillary Mudflat (Above MLLW)	Oakland Harbor/ Redwood City Harbor	Dispersed (Below MLLW)
Emeryville Deep	60%	3%	<1%	<1%	NA	<1%	3%	35%
Emeryville Middle	68%	7%	1%	<1%	NA	<1%	1%	22%
Emeryville Shallow/ East	75%	6%	3%	<1%	NA	<1%	<1%	16%
Eden Landing Deep	23%	39%	4%	<1%	<1%	5%	<1%	34%
Eden Landing Middle	41%	27%	6%	<1%	<1%	4%	<1%	26%
Eden Landing Shallow/East	20%	22%	26%	<1%	1%	5%	<1%	32%

Dispersed is any dredged material not in the other noted regions

ANCHOR QEA

Montezuma Wetlands Project

A Private Initiative to Solve Two Regional Problems

How to Safely Use Dredge Sediment

to Maximize Wetland Values in the Bay Area

How can we incentive private investment in doing this?

2023 Update

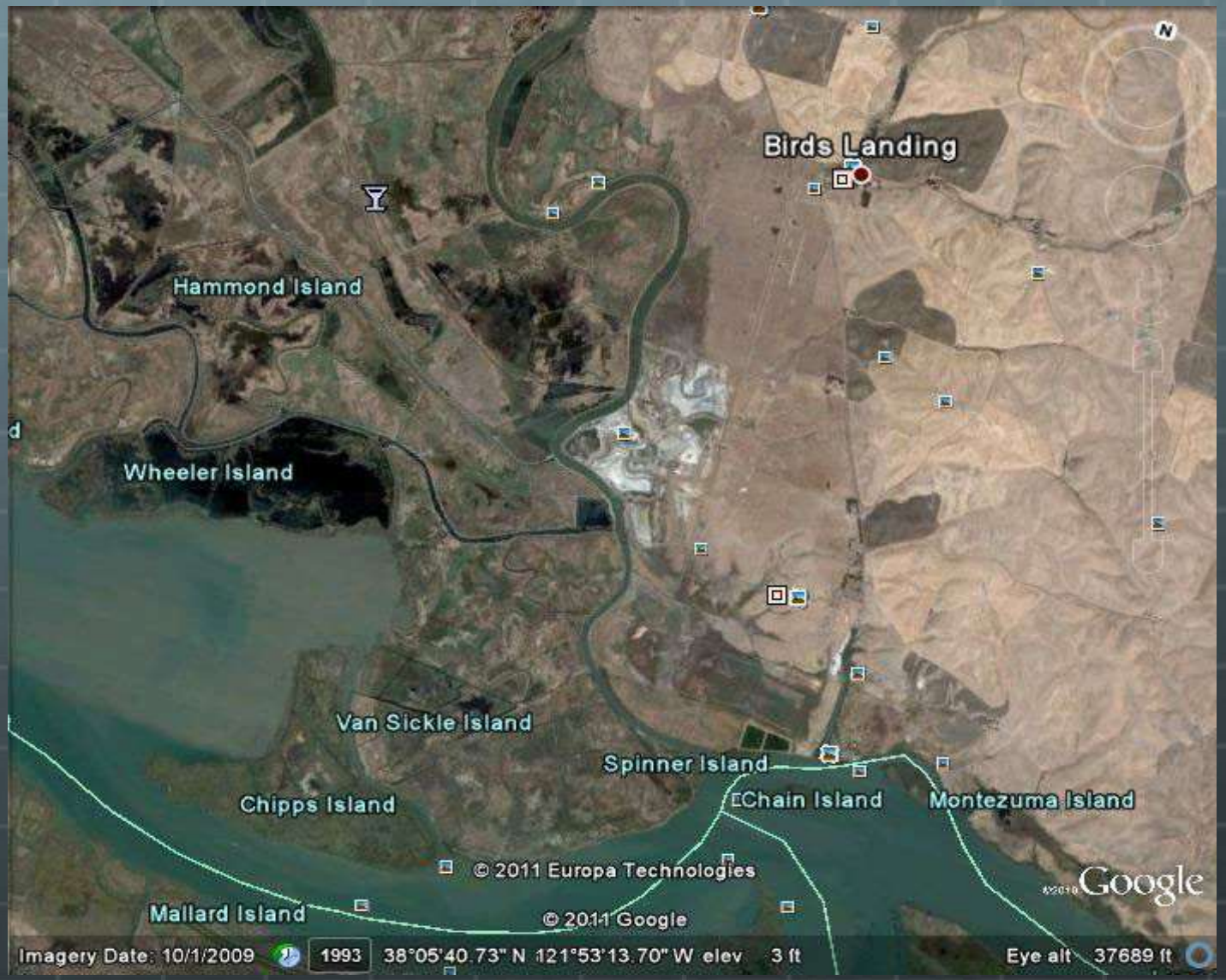
Montezuma Wetlands Project

- First wave of multi-user beneficial reuse sites (2001) in SF Bay Area, with 25 mcy of capacity
- Restores 1,600 acres of historical tidal marsh in null zone of SF Bay Estuary, and rebuilds the Port of Collinsville.
- Since 2003, has successfully received over 10 mcy of sediment, operating 24/7 in season, filling Phase I and now Phase II of the site
- Phase I restored to tides Oct 2020!

Provides union jobs and revenues to Solano County

Site Location

Overview of Site Operations



Sediment Offloading System

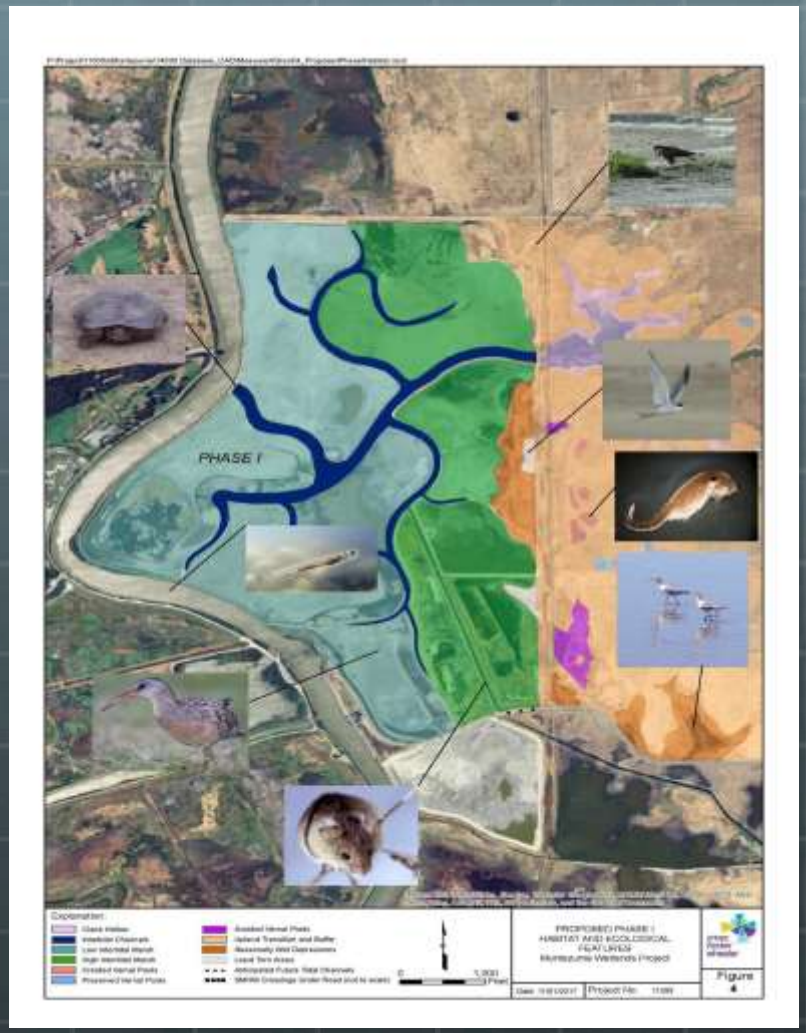
Montezuma Wetlands Project 2023 Update

- Thanks to Army Corps and state agencies, 2022 and 2023 were good for beneficial reuse, 2022 material went to Cullinan, 2023 material to Montezuma setting new site operational records
- Working on adding upland construction soils to our incoming source materials
- Post-Breach monitoring results continue to show extraordinary recovery of tidal wetlands – vegetation, birds, SMHM, fish

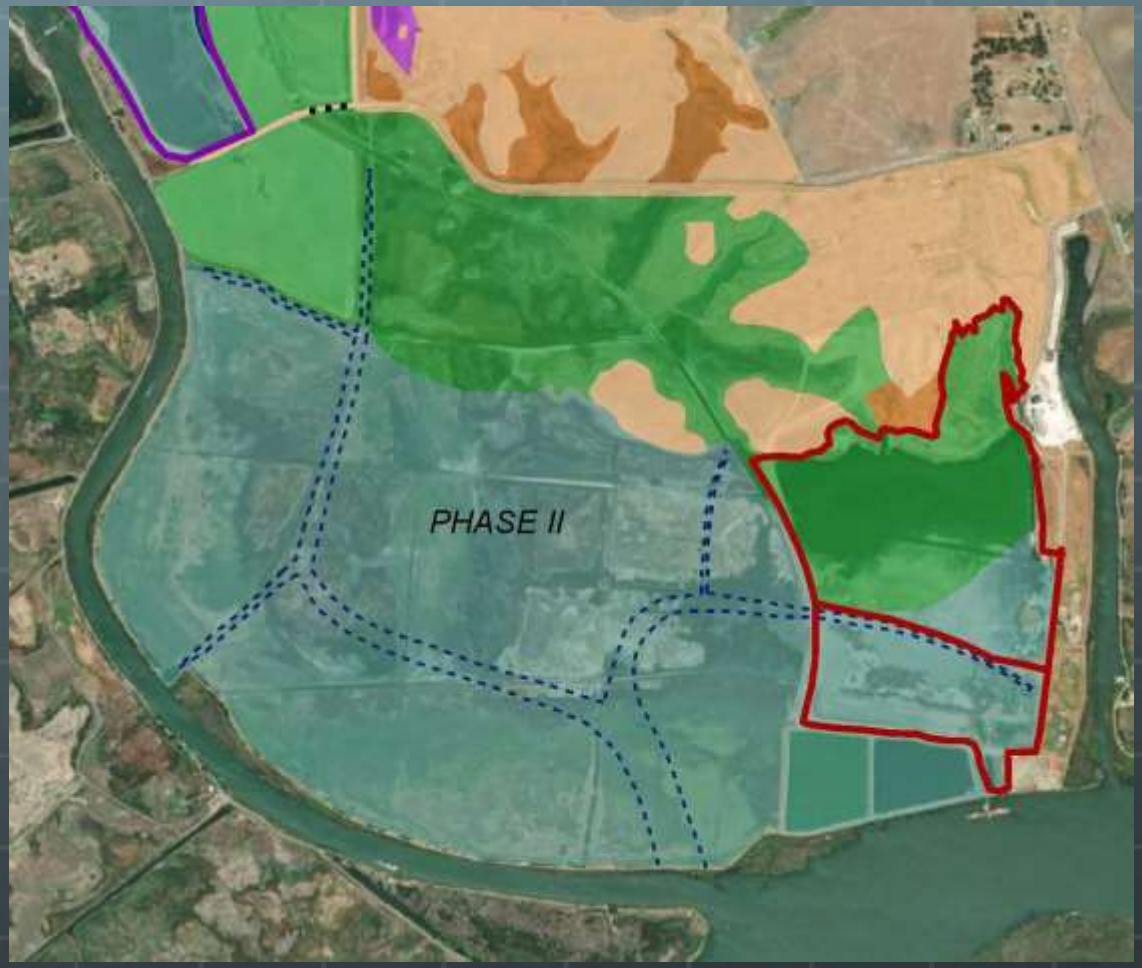
Our extraordinary operations team offloaded 24 Barges over 72 hours (dredging and tug personnel included)

469	Port of Oakland	158	10/21/23	October	07:15	08:10
470	Port of Oakland	159	10/21/23	October	10:40	12:10
471	MARAD	42	10/21/23	October	12:55	13:25
472	Chevron	62	10/21/23	October	14:05	14:35
473	Port of Oakland	160	10/21/23	October	18:10	19:15
474	MARAD	43	10/21/23	October	19:50	20:15
475	Chevron	63	10/21/23	October	21:15	21:55
476	MARAD	44	10/22/23	October	03:30	04:05
477	Port of Oakland	161	10/22/23	October	06:10	07:05
478	MARAD	45	10/22/23	October	10:30	11:00
479	Port of Oakland	162	10/22/23	October	11:35	12:45
480	MARAD	46	10/22/23	October	17:10	17:40
481	Chevron	64	10/22/23	October	18:05	18:45
482	MARAD	47	10/22/23	October	23:50	00:25
483	Port of Oakland	163	10/23/23	October	00:55	01:55
484	Chevron	65	10/23/23	October	02:30	03:20
485	Port of Oakland	164	10/23/23	October	09:40	10:35
486	Chevron	66	10/23/23	October	11:40	12:35
487	MARAD	48	10/23/23	October	13:15	13:40
488	Chevron	67	10/23/23	October	20:45	21:30
489	Port of Oakland	165	10/23/23	October	22:30	23:40
490	MARAD	49	10/24/23	October	00:20	00:45
491	Port of Oakland	166	10/24/23	October	01:25	02:25
492	Chevron	68	10/24/23	October	06:20	07:05
493	MARAD	50	10/24/23	October	07:50	08:15
494	Port of Oakland	167	10/24/23	October	10:40	11:40

PHASE I RESTORATION PLANNING STARTED WITH FIRST SEDIM RECEIVED



Montezuma Wetlands Phase II recently approved by agencies



Explanation:

- Phase I Breached Area
- Cell 14 Boundary
- Clark Hollow
- Intertidal Channels
- Low Intertidal Marsh
- High Intertidal Marsh
- Created Vernal Pools
- Preserved Vernal Pools
- Avoided Vernal Pools
- Upland Transition and Buffer
- Seasonally Wet Depressions
- Least Tern Areas
- Anticipated Future Tidal Channels
- SMHM Crossings Under Road (not to scale)

Phase I Breach 0800 October 27, 2020

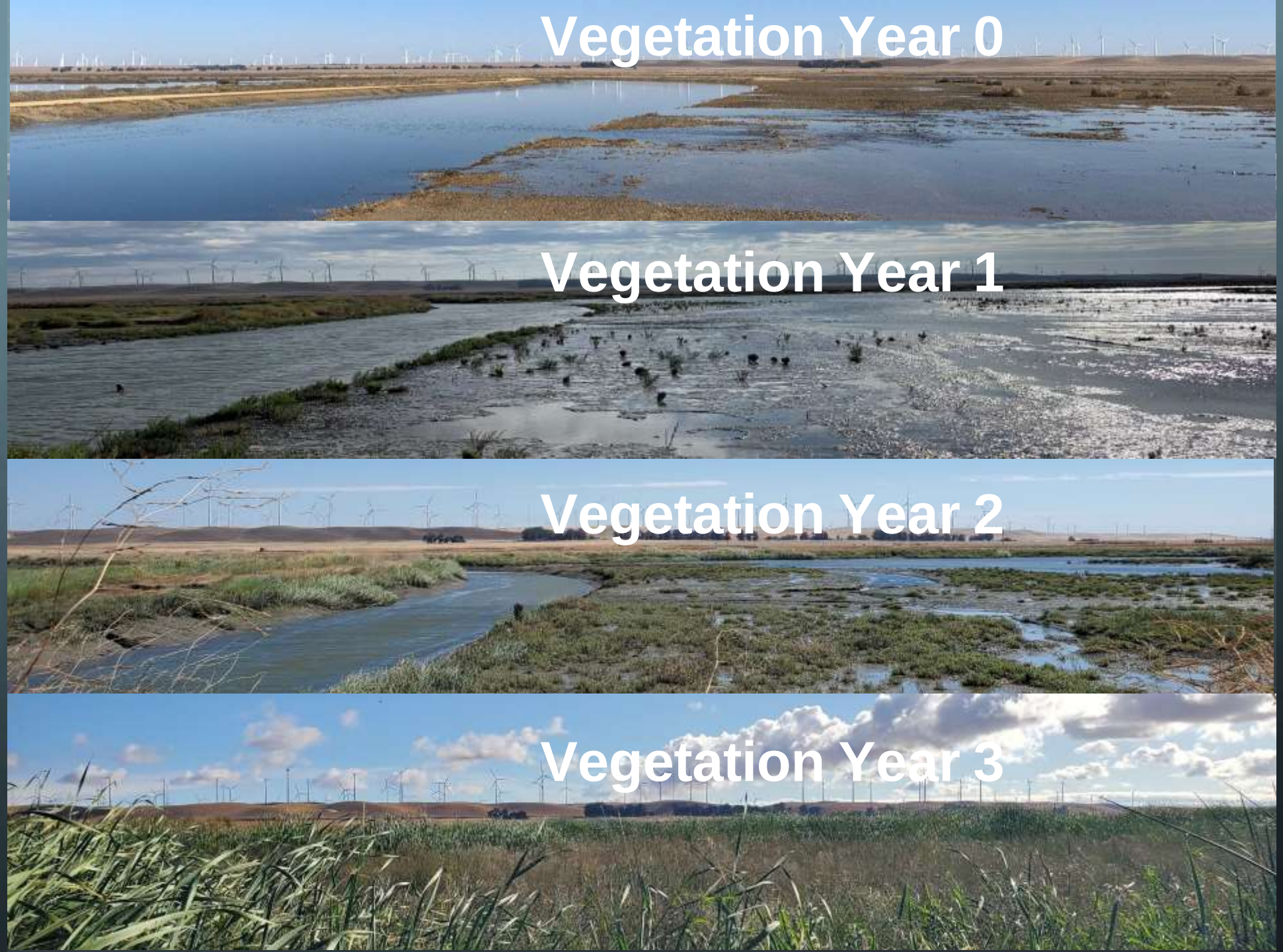
Key Findings

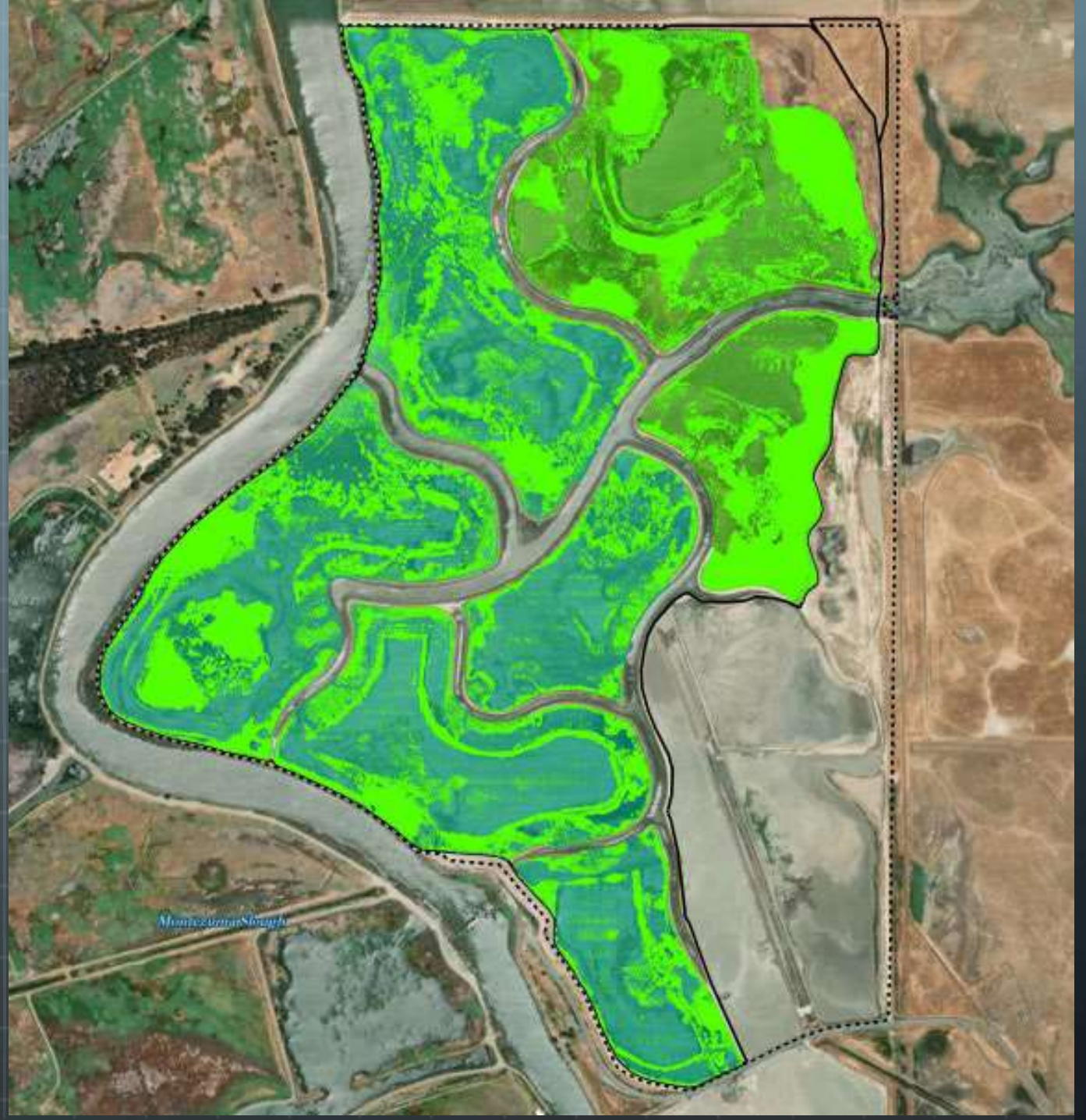
Tidal channels developing as expected; no incision into Foundation sediment

All water quality criteria and WDRs met since tidal breach

Vegetation developing as expected

Successful tidal restoration and habitat development has promoted the return of fish and special-status species to the site

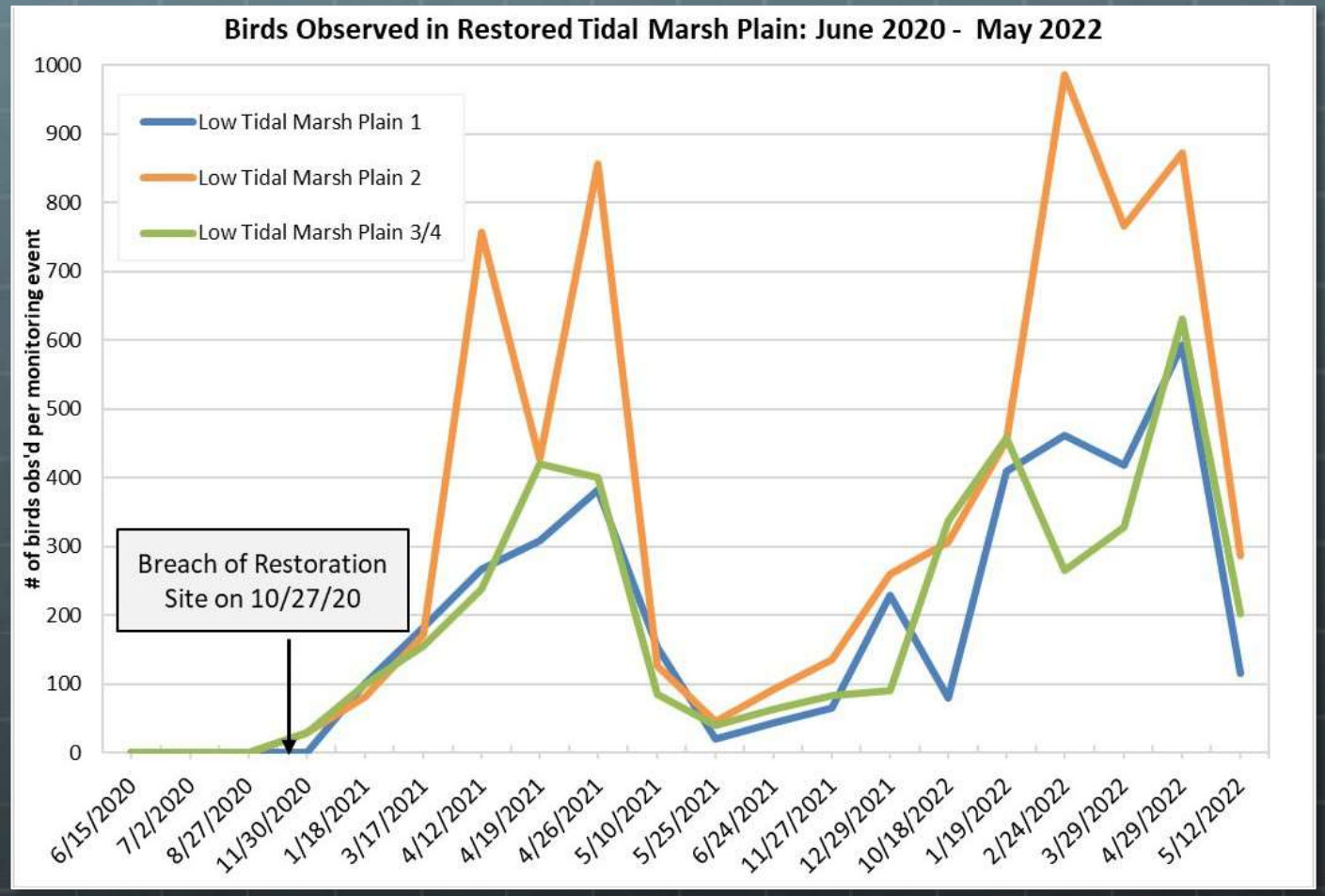

Vegetation Year 0
Vegetation Year 1
Vegetation Year 2
Vegetation Year 3


Legend
Vegetation
Phase I Boundary
Breached Area
Habitat Areas
Low Marsh: 39% Cover
High Marsh: 50% Cover

Tidal Channel Formation (Cell 10)

Shorebird Early Monitoring Results

Increases in abundance of shorebirds were observed within one month of breach (late October 2020 – shown with arrow), as compared to pre-breach conditions.



What does the future hold?

- Critical role in recovery of endangered fish and other species (Montezuma now demonstrated as delivering very significant ecological benefits due to our work and its location in the Estuary)
- 15 million yards and 20 more years operating life
- Possible use of Montezuma offloading system on other Bay projects

How to incentivize additional private investment into wetlands, sediment reuse and shoreline resilience?

- Non-philanthropic private investment requires financial return on investments
  - Project revenues from mitigation banking or sediment disposal
  - Protection of other land and facilities that have economic value or acceleration of related permits
  - Tax credits

How to incentivize additional private investment into wetlands and shoreline resilience?

- Tax credits
  - Recent USACE policy places an economic value on created wetlands
  - These economic values can be accelerated and achieved through private investment but no current mechanism exists to convert a portion of those values into returns for the investor.
  - Possible new tax credits are a way to do this

Incredible Project Team

- Peter Hornick, Zebra Fund
- Doug Lipton, PhD. Chief Scientific Officer
- Roger Leventhal, PE and Jim Levine PE, Chief Engineers
- Cassie Pinnell, Chief Biologist and Dep. General Mgr Montezuma Wetlands, LLC
- Sharon Hall, Chief Financial Officer
- TRT led by Jeremy Lowe of SFEI
- Past staff Rachel Bonnefil and Stu Siegel
- Solano County and state agency staff and leadership, Port of Oakland, Bill Bagley, Bay Area dredging contractors (Dutra, Manson, Lind, Great Lakes), Ferrari Bros (Ferma), and renowned author and visionary Marc Reisner

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