2010-11 ENVVEST Sediment Monitoring Studies

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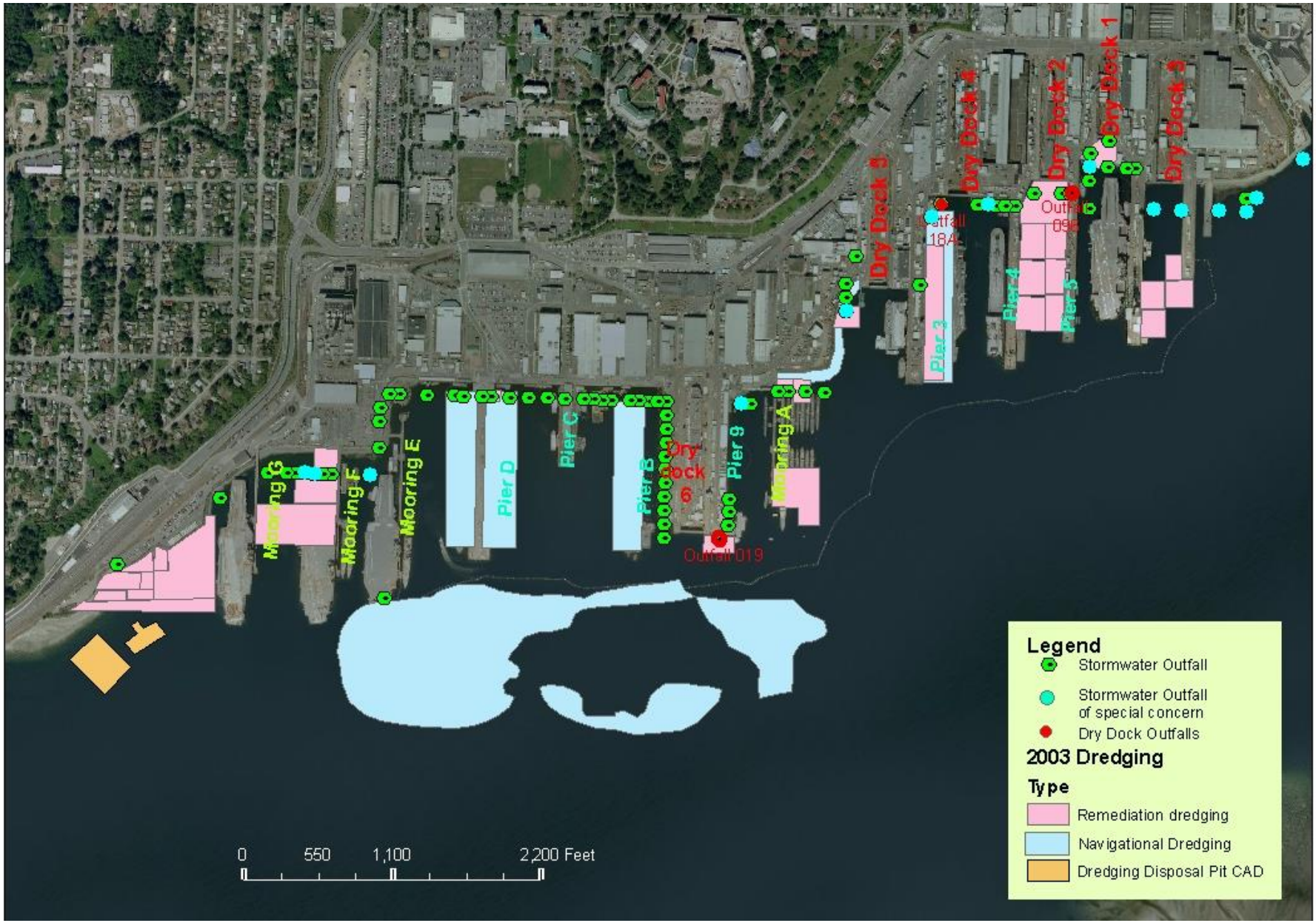
  - Biota
  - Stormwater
  - Sediment
- Sediment Monitoring Technical Approach
  - OUBM Sediment Monitoring
  - Sediment Quality Verification
  - Support for R&D Studies
- Schedule


Dry Dock 3
Dry Dock 4
Dry Dock 2
Dry Dock 1
Dry Dock 5
Outfall 18A
Outfall 09B
Pier 3
Pier 4
Pier 5
Mooring G
Mooring F
Mooring E
Pier D
Pier C
Pier B
Dry Dock 6
Pier 9
Mooring A
Outfall 019
0
550
1,100
2,200 Feet
Legend
Stormwater Outfall
Stormwater Outfall of special concern
Dry Dock Outfalls
2003 Dredging
Type
Remediation dredging
Navigational Dredging
Dredging Disposal Pit CAD

Ambient Monitoring

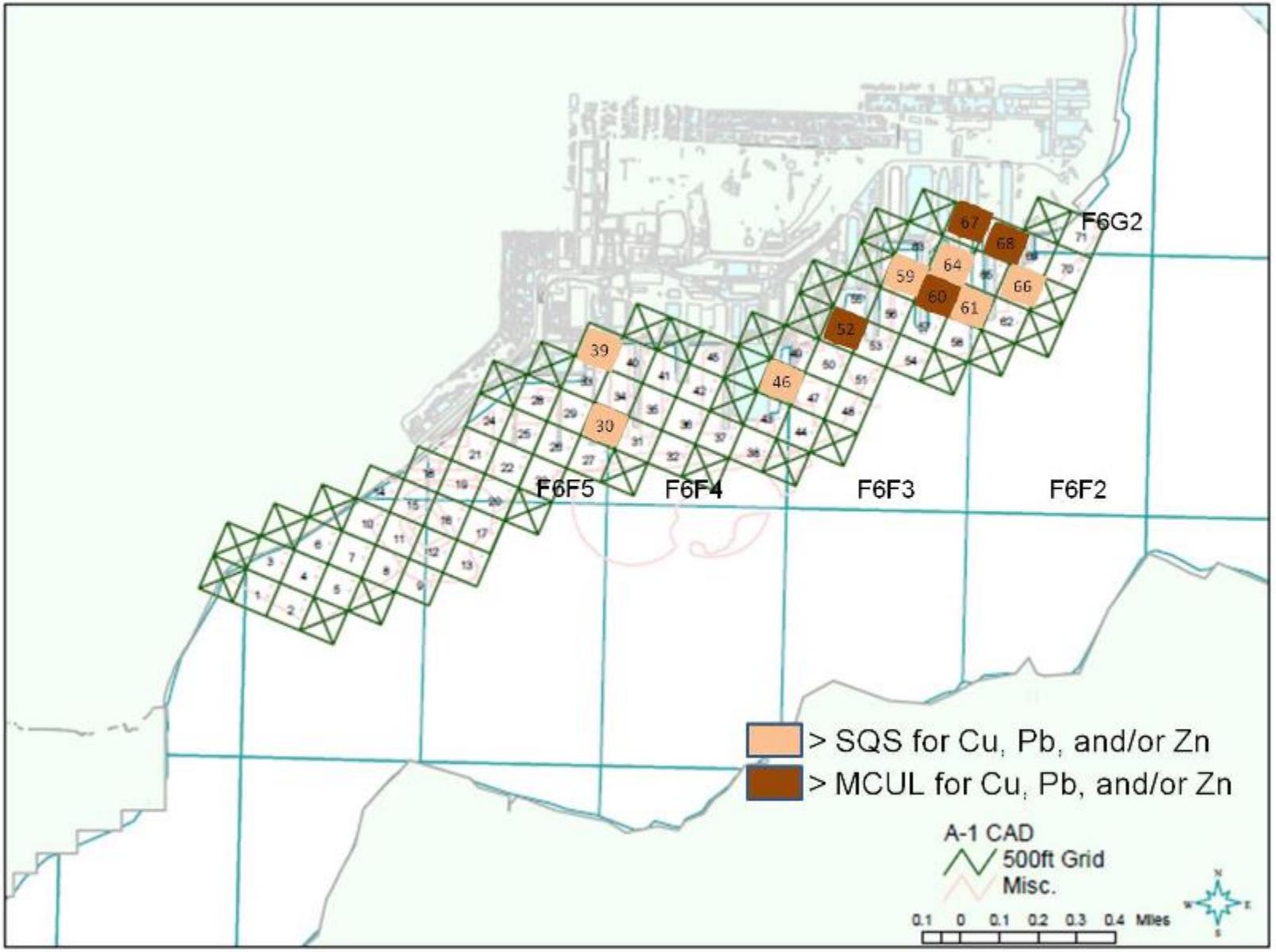
- **Seasonal Sampling of Water and Effluents**
  - Chemistry – Metals (Ag, Al, As, Cd, Cr, Cu, Hg, Pb, Zn), Nutrients, TOC/DOC, TSS, Oceanographic Salinity
  - Toxicity Testing of Effluents & Ambient Water
- **Biota – Mussel Watch (Semi-Annual)**
  - Metals, PAHs, PCBs, $\delta^{13}C$, $\delta^{15}N$, Lipids
- **Fecal Coliform**
  - Monthly for ambient marine; Storm Events for Stormwater
- **Stormwater Monitoring - 3 Events/OF (Storm Events >0.25" in 24hr)**
  - Representative Stations within CIA and NBK (6 stations)
  - Auto samplers programmed for rain, conductivity, tide height
    - Event Mean Concentrations – Metals, Nutrients, TOC/DOC, TSS
    - Grab Samples – TPH, FC
- **Sediment Monitoring**
  - Coordination with 2010 OUBM sediment monitoring (metals and PAHs)
  - Sediment Quality Verification (fill data gaps)
  - Support for R&D Studies

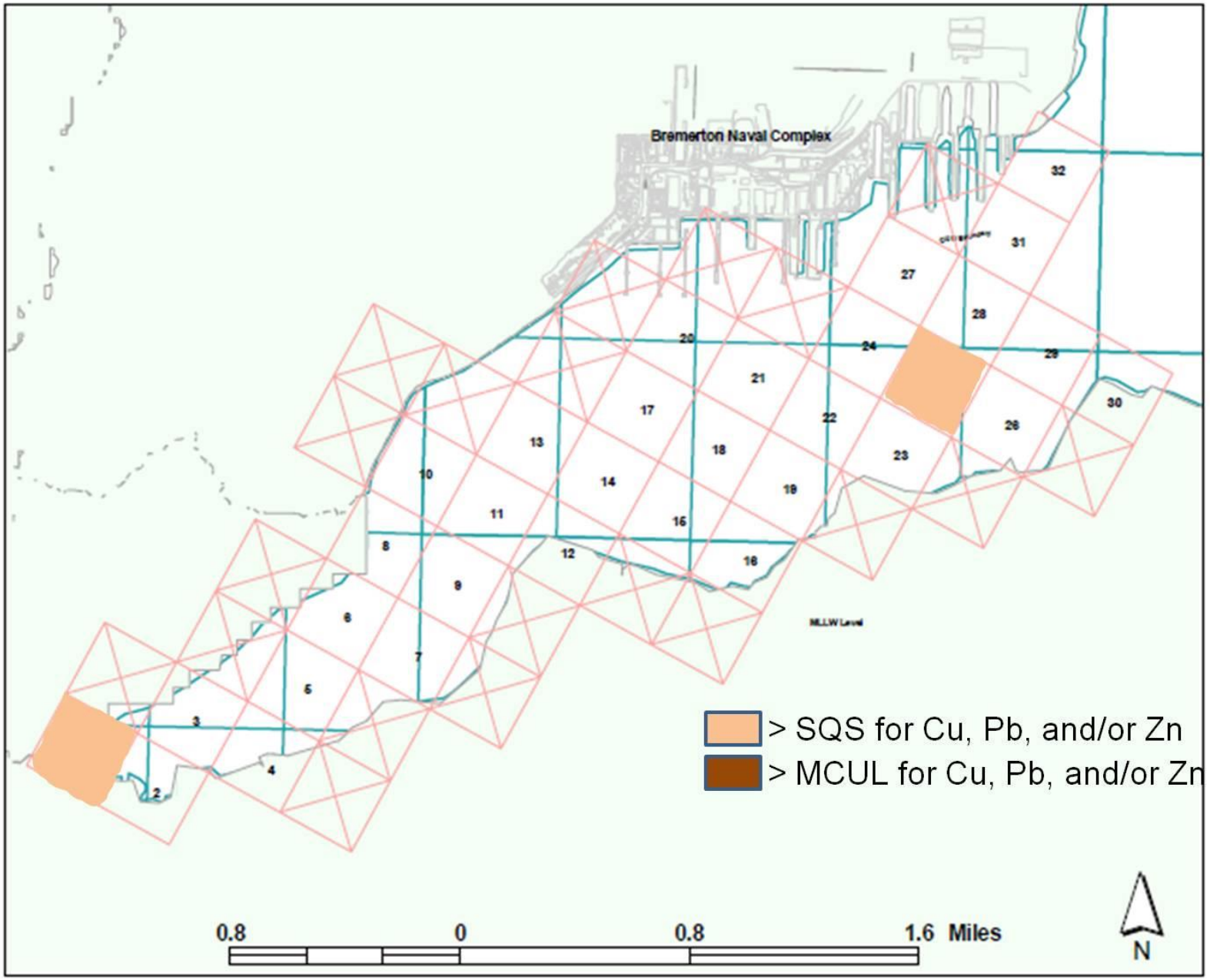
Sediment Sampling Objectives

- Establish baseline for continuous process improvement
- Characterize silt and sediment in the vicinity of outfalls and dry docks (eg operational areas not included in OUB sediment monitoring)
- Provide data to assess sediment impact zones for NPDES discharges
- Provide data to assess anti-degradation requirements for water quality certifications needed for pier and dry dock infrastructure improvements
- Provide data to support R&D studies of sediment treatability and bioavailability

Technical Approach

- Coordination with OUBM Sediment Monitoring
  - Splits with URS samples
  - Screening and Confirmation Analysis
    - Metals and PAHs (71 samples 500ft gird, 32 samples 1500ft grid)
- Sediment Quality Verification - Characterize Surface and Deep Sediment Conditions at High Priority Locations
  - All Samples
    - Screening Metals (XRF); PAHs, PCBs (ImmunoAssay)
    - Hg Analysis
  - Confirmation for Subset of Samples
    - Metals (ICMP/MS); PAHs, PCBs (GC/MS)
  - Evaluate Bioavailability
    - Pore Water Concentrations
    - Toxicity Assessment
- Support R&D Projects on treatability and bioavailability


F6G2
F6F5
F6F4
F6F3
F6F2
67
68
64
59
60
61
66
52
39
46
30
> SQS for Cu, Pb, and/or Zn
> MCUL for Cu, Pb, and/or Zn
A-1 CAD
500ft Grid
Misc.
0.1 0 0.1 0.2 0.3 0.4 Miles


Bremerton Naval Complex
1
2
3
4
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9
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13
14
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16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
> SQS for Cu, Pb, and/or Zn
> MCUL for Cu, Pb, and/or Zn
0.8
0
0.8
1.6 Miles
N

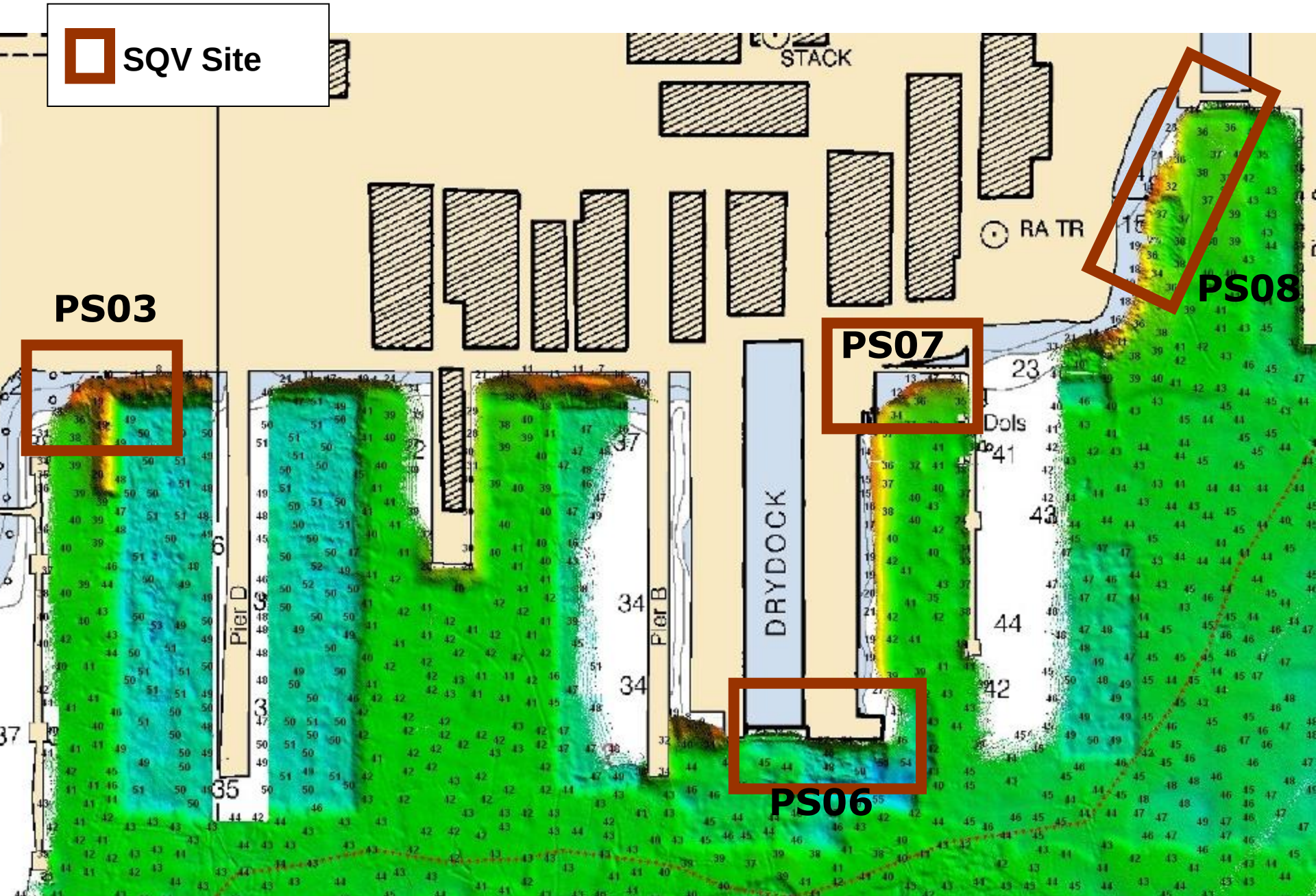
Ambient Monitoring Stations

Mussel Watch Stations 2010

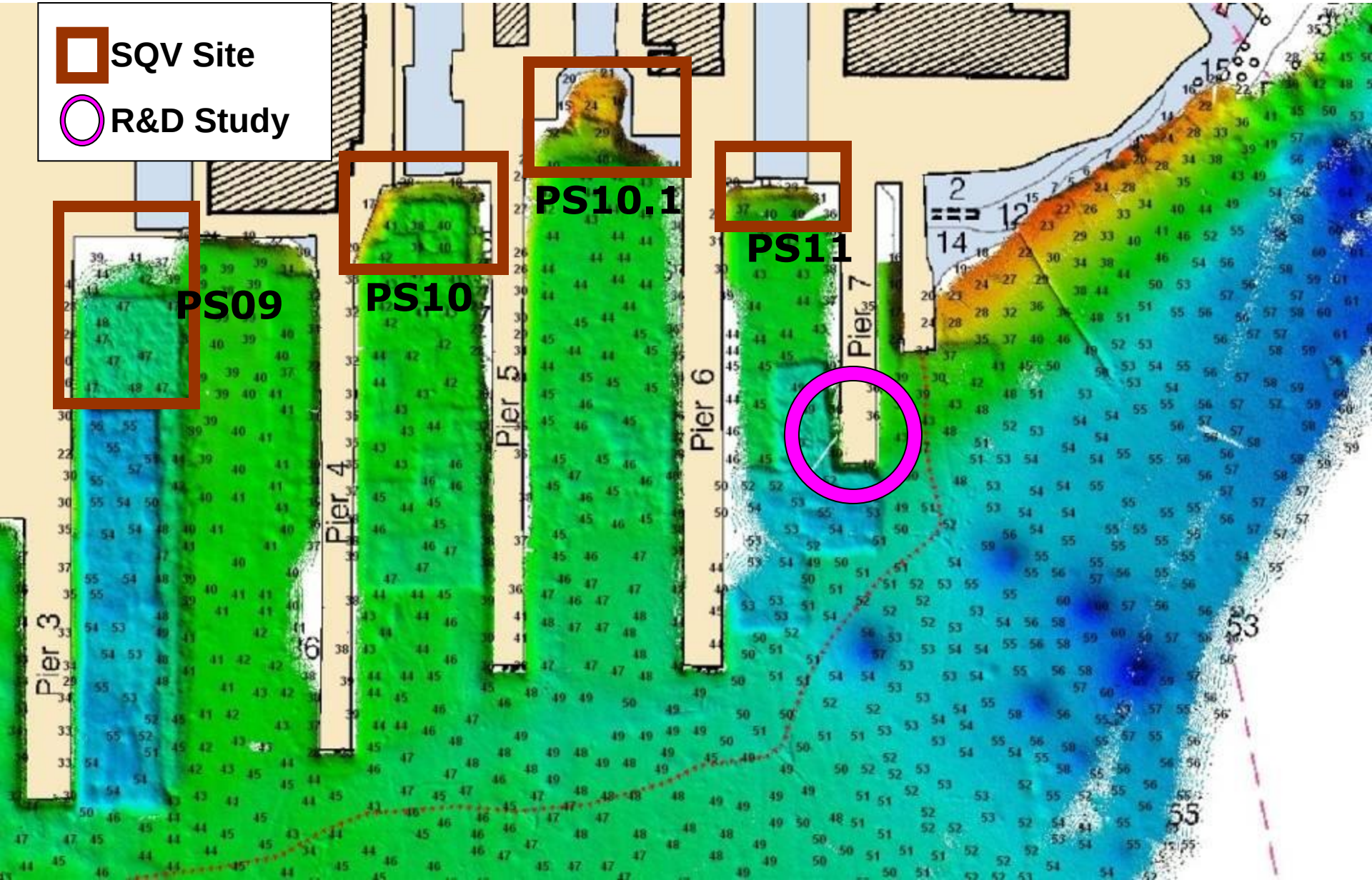
Sediment Area	Rank	Justification
PS09 OF18 DD4	Highest	OUBM validation for 2007 exceedences No Data for outside OUBM grids Dredge Wall/shoreline stabilization Elevated Monitoring Data – Water (Cu); Mussel (PCBs)
PS08 DD5, RMTS	Highest	No Data for outside OUBM grids Dredge Wall/shoreline stabilization Elevated Monitoring Data – Mussels (Cu, Zn, Pb)
PS03 Mooring E –Pier D	High	Ecology/EPA concern area No Data for outside OUBM grids Elevated Monitoring Data – Mussel (Hg, Pb); Water (Hg)
PS06 OF18 DD6	High	Ecology/EPA concern area No Data for outside OUBM grids Dredging Pier Improvement
PS07 Finger Pier	High	No Data for outside OUBM grids Elevated Monitoring Data – Water (Zn)
PS10 DD2	High	Ecology/EPA concern area OUBM validation for 2007 exceedences
PS10.1 DD1	High	Ecology/EPA concern area OUBM validation for 2007 exceedences Elevated Monitoring Data – Water (Cu)
PS11 DD3	High	Ecology/EPA concern area Post Construction Hits OUBM validation for 2007 exceedences Elevated Monitoring Data – Mussels (metals)
PS12 Pier 8	Medium	Ecology/EPA concern area Waiting for Post Demolition Data
PS04 Pier D to C	Low	On target to meet PCB cleanup goal Waiting for Pier B construction to finish
PS05 Pier C to B	Low	Waiting for Pier B construction to finish
PS01 PS02 Mooring E to F	Lowest	Stormwater monitoring continues

SQV Site Priority Ranking

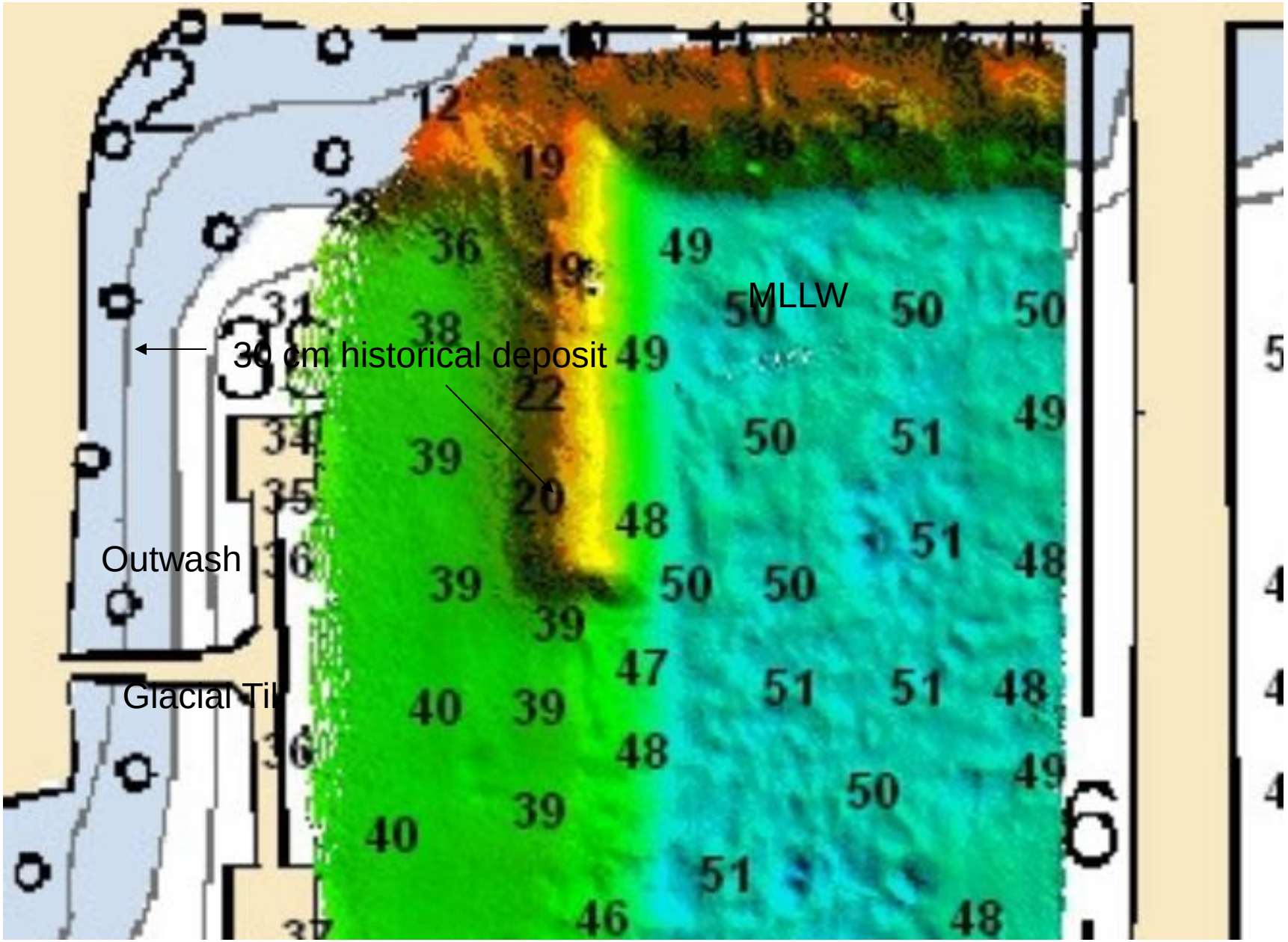
Priority Sediment Areas (NBK/CIA)



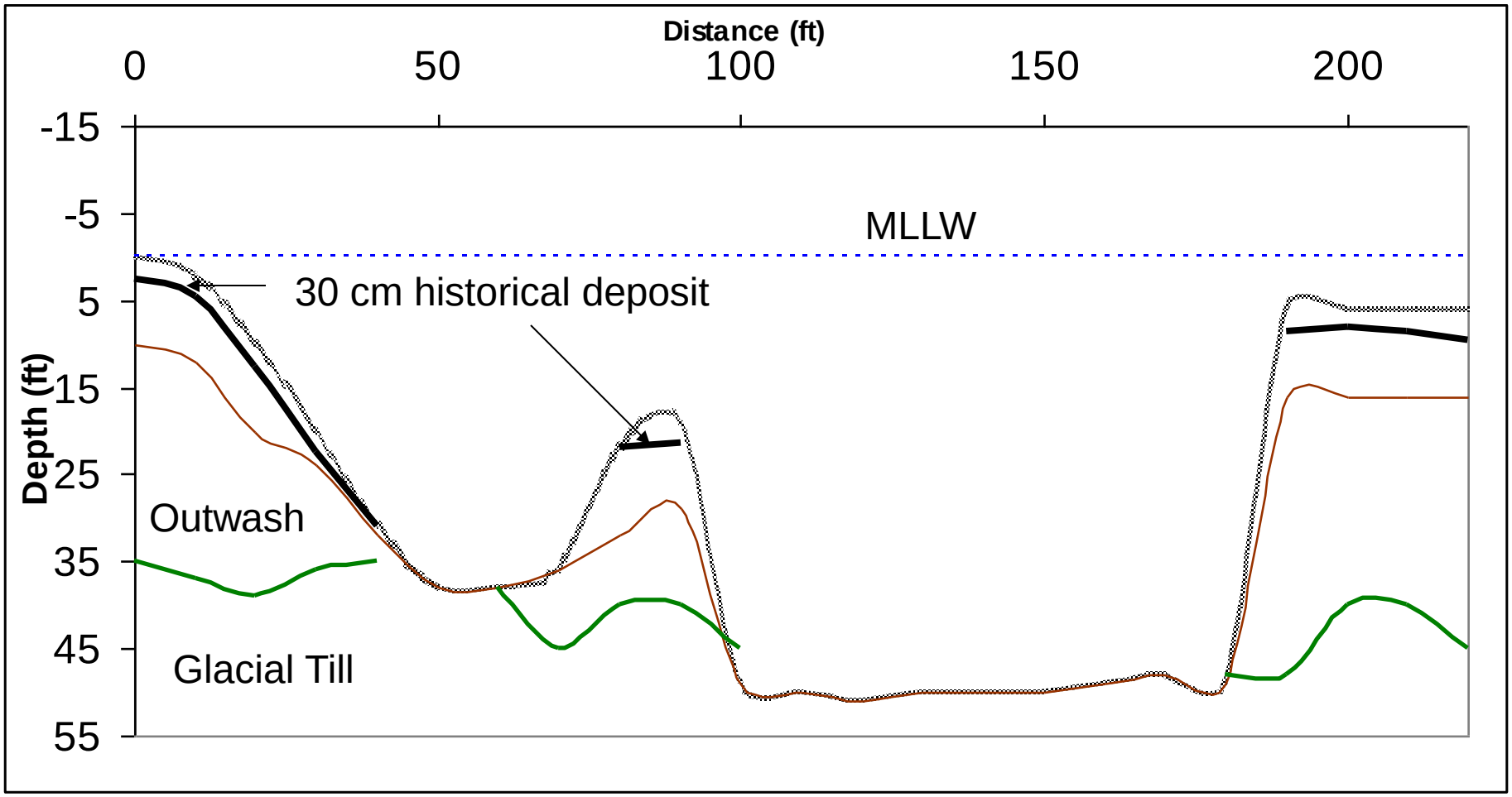
Priority Sediment Areas (CIA)



Conceptual Model of Bottom Environment



Conceptual Model of Bottom Environment

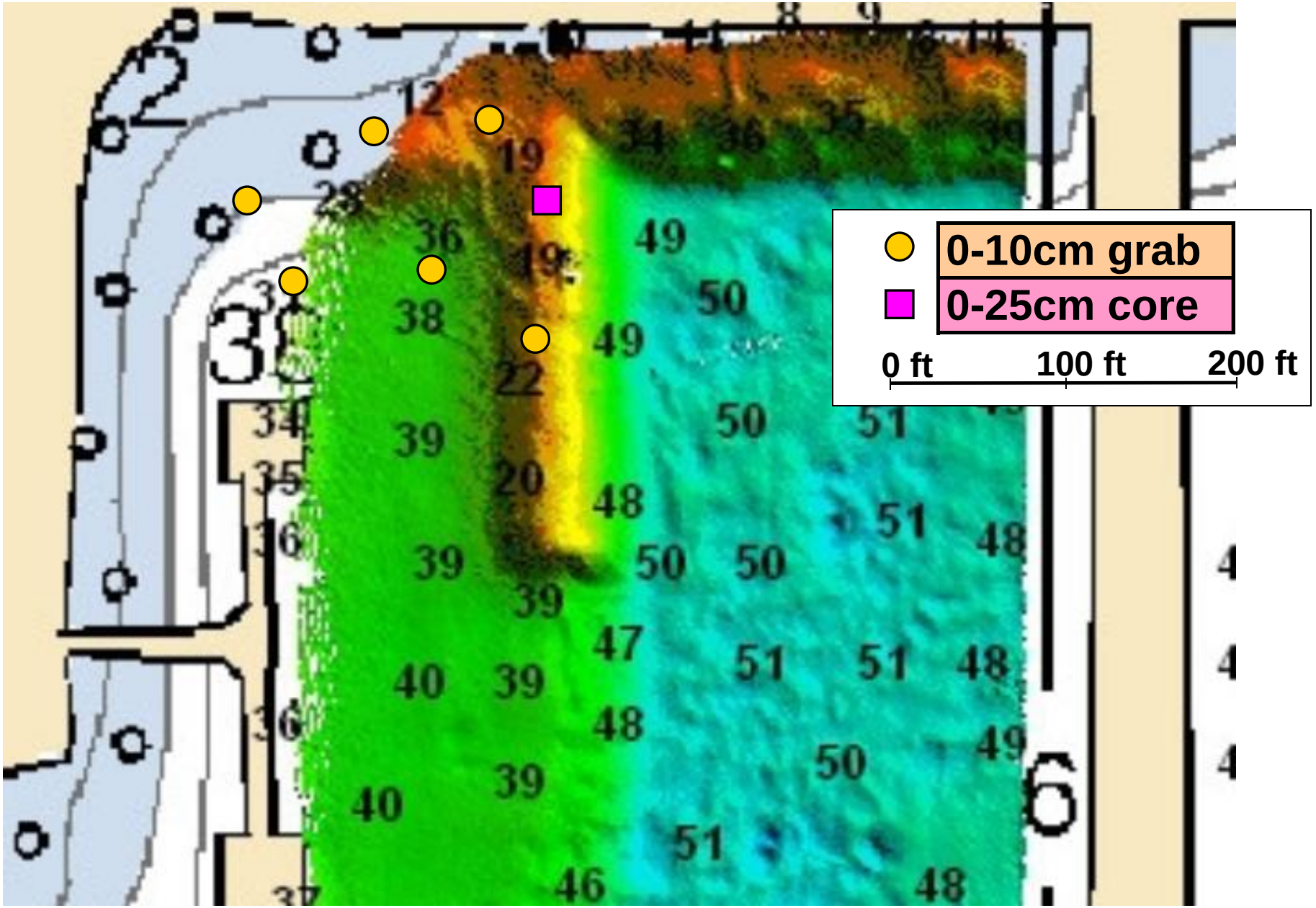


Sampling Summary

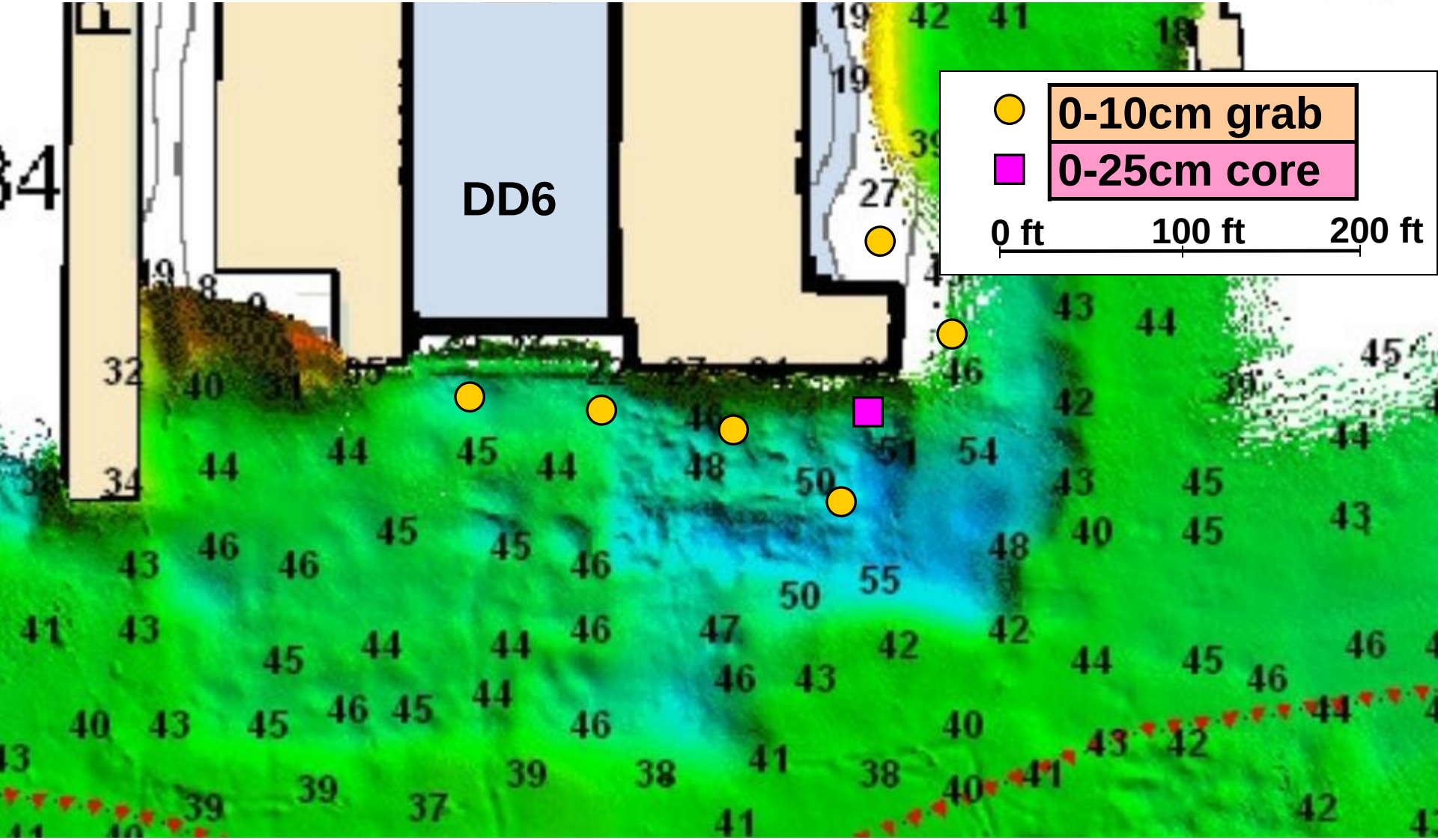
	Number of Samples							
Stations	**PS03**	**PS06**	**PS07**	**PS08**	**PS09**	**PS10**	**PS10.1**	**PS11**
0-10cm grab	6	6	6	6	6	6	6	6
0-25cm core	1	1	1	1	1	1	1	1
0-25cm squeeze core				1	1			
0-5cm Tox Eval				1	1			

	Analysis							
	XRF*	iaPAH*	iaPCB*	HgDMA	Pore Water	GrainSize	TOC	AVS/SEM
0-10cm grab	X	X	X	X		X	X	
0-25cm core	X	X	X	X			X	X
0-25cm squeeze core	X	X	X	X	X		X	X
0-5cm Tox Eval	X	X	X	X	X	X	X	X
	* Includes confirmation analysis of 20% of the samples by ICPMS and GC/MS							
0-25cm core	Core sectioned at intervals of 0-2.5, 2.5-5, 5-10, 10-15, 15-20							
0-25cm squeeze core	PW extracted at intervals of 0-2.5, 2.5-5, 5-7.5, 7.5-10, 10-15, 15-20							
0-5cm Tox Eval	Media	Endpoint						
	Sediment	polychaete (*Neanthes arenaceodentata*) survival and growth,						
	Sediment	amphipod (*Leptocheirus plumulosus*) survival						
	Sediment	amphipod (*Leptocheirus plumulosus)* survival						
	Overlying Water	bivalve (*Mytilus galloprovincialis*) embryo-larval development						

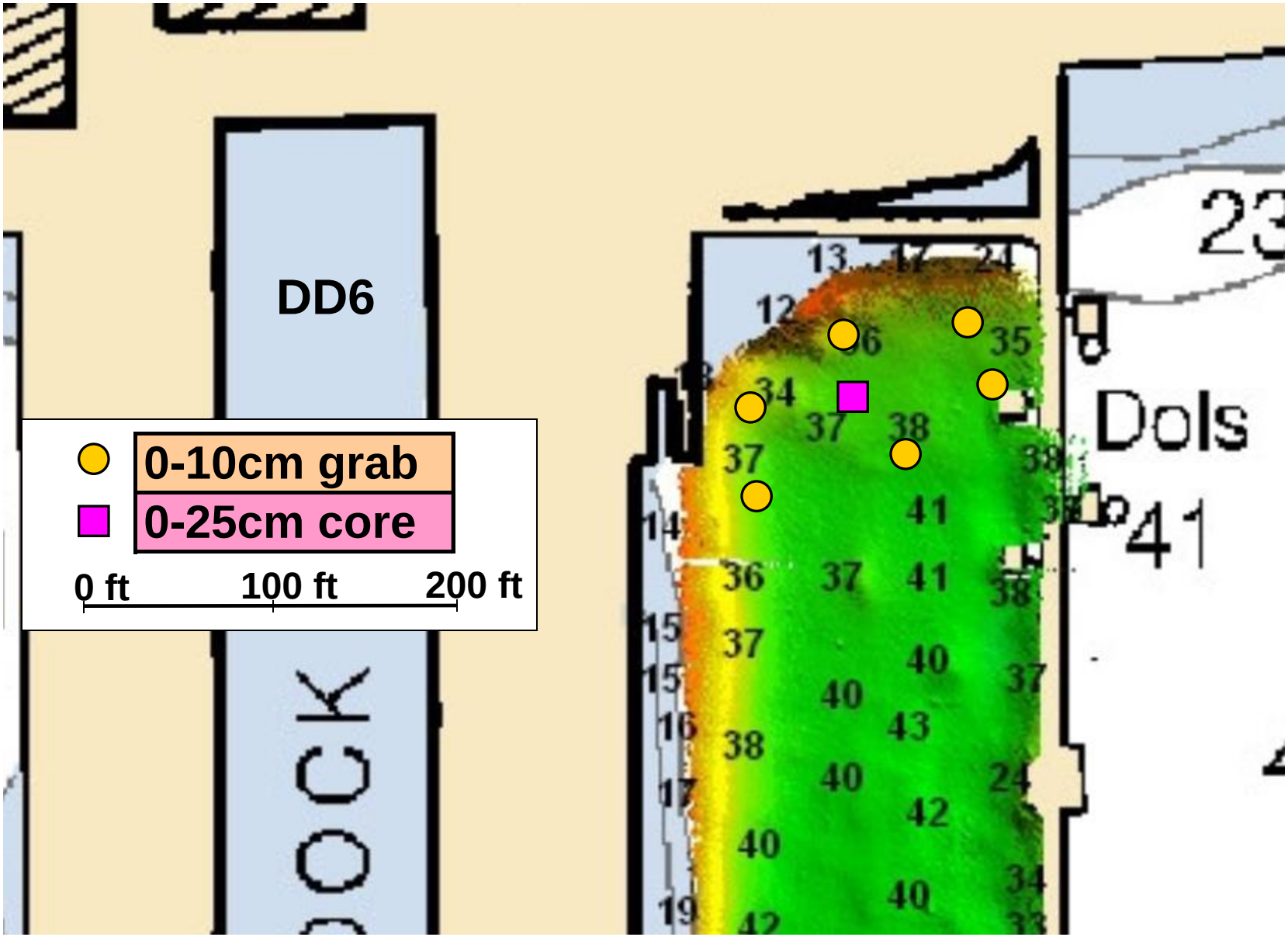
Target Sampling Locations SQVPS03



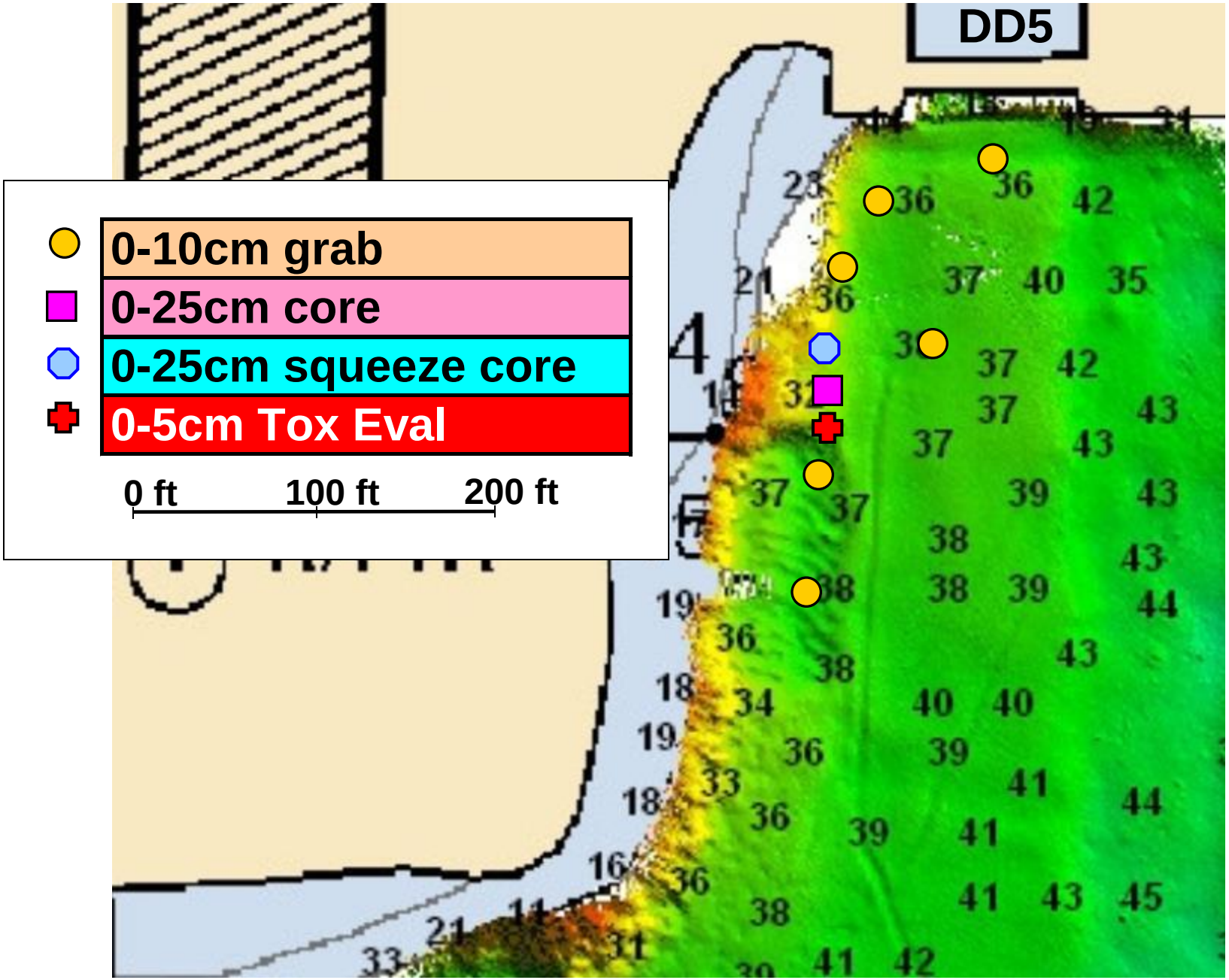
Target Sampling Locations SQVPS06



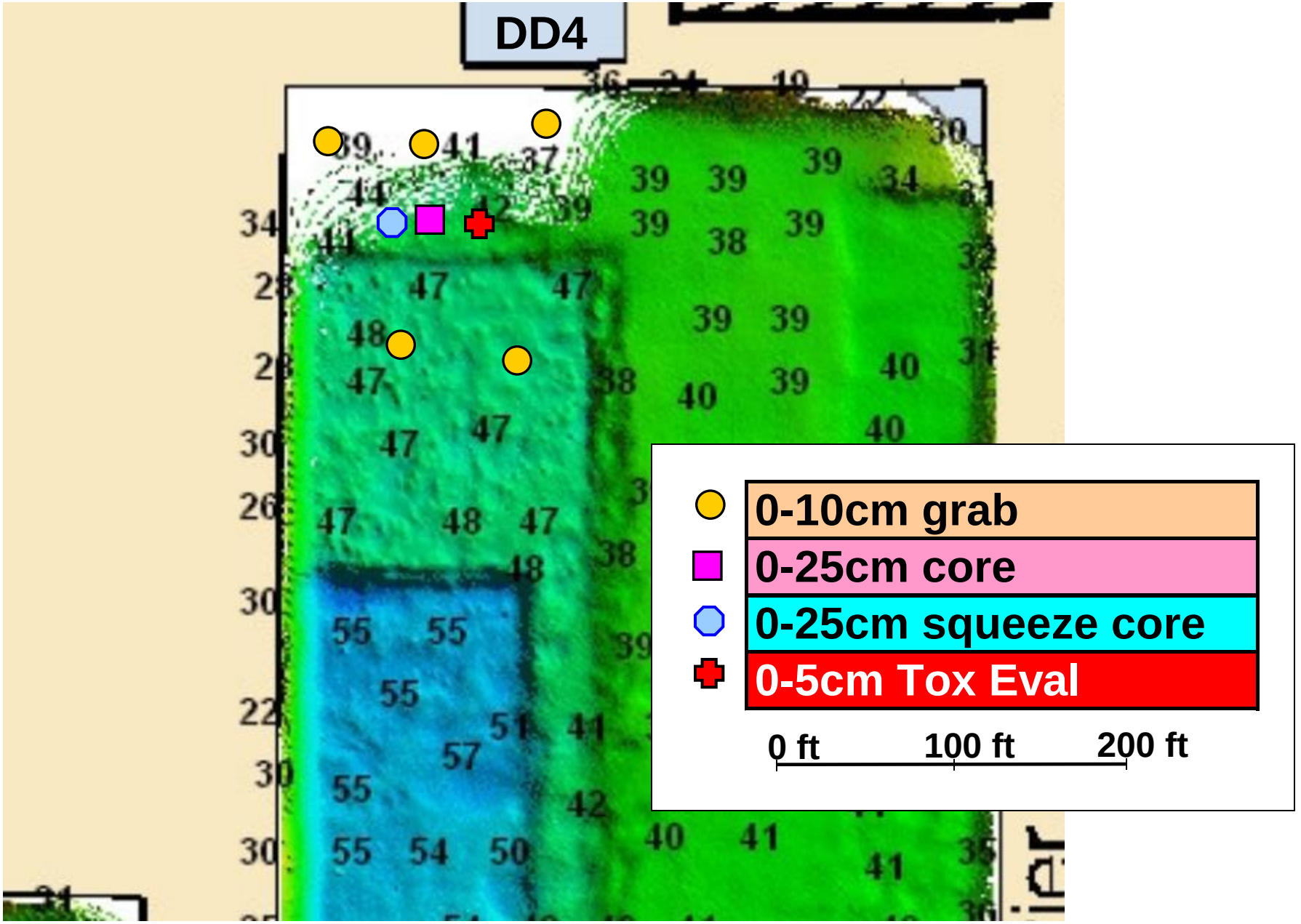
Target Sampling Locations SQVPS07



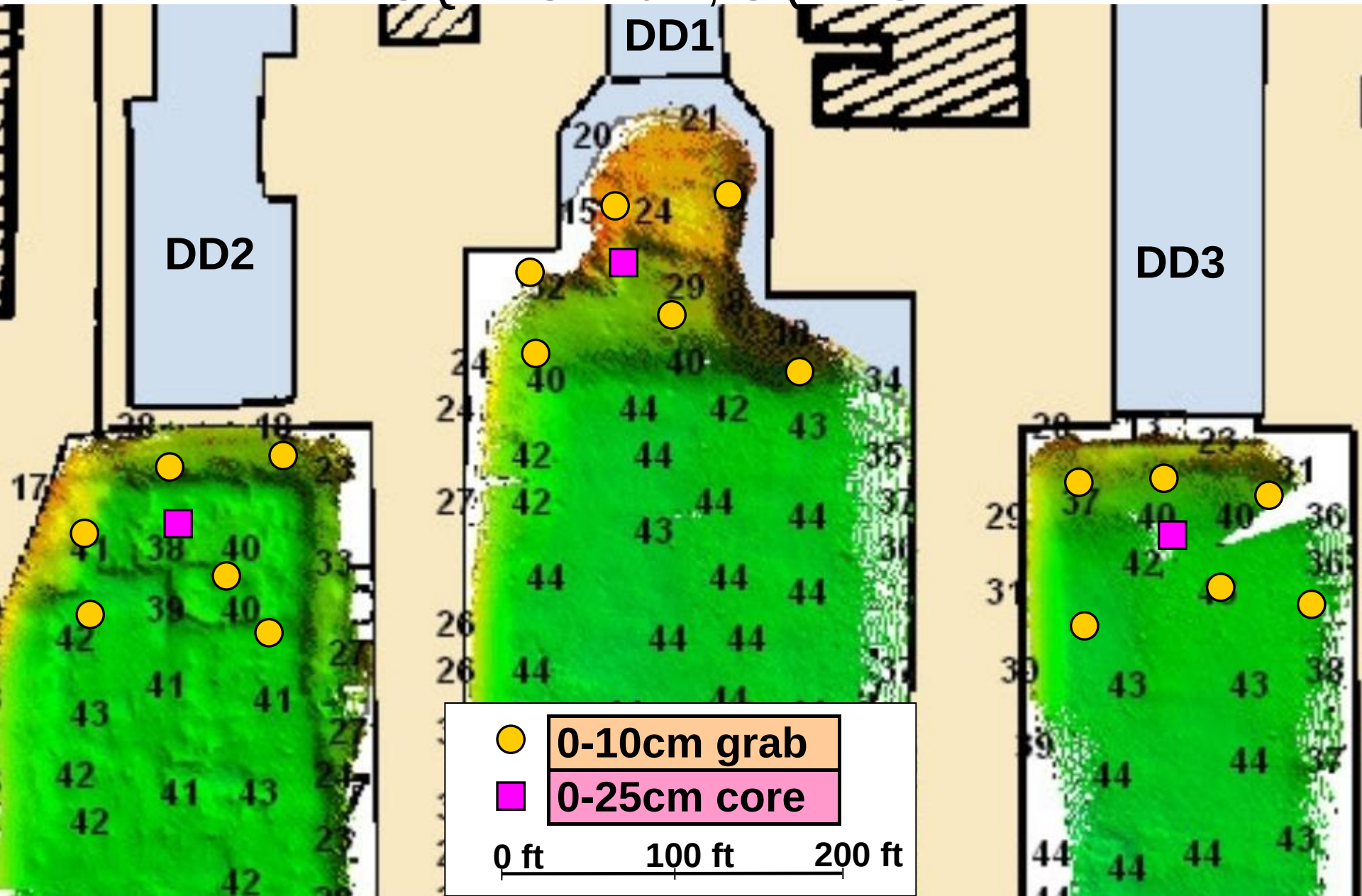
Target Sampling Locations SQVPS08



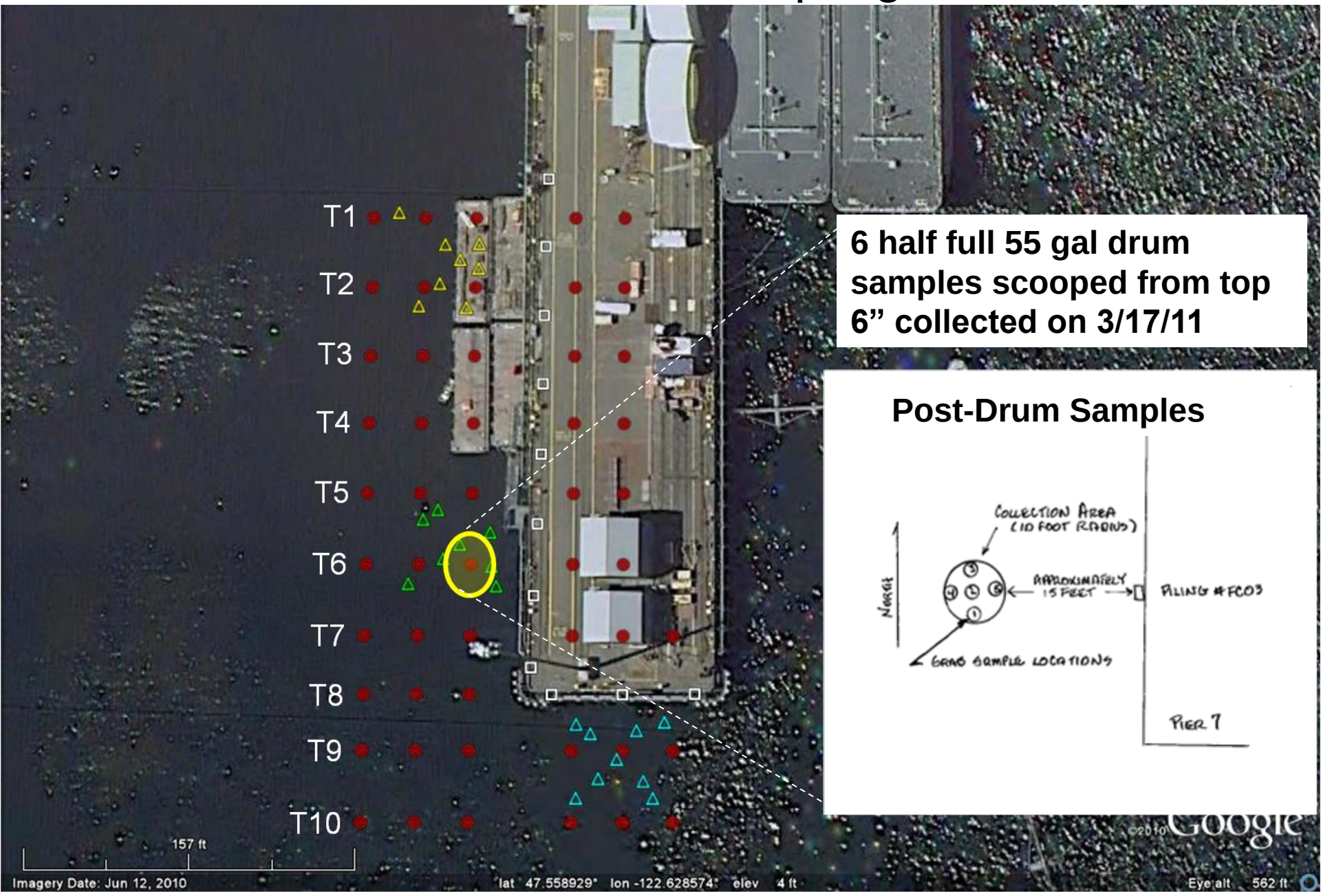
Target Sampling Locations SQVPS09



Target Sampling Locations SQVPS10, SQVPSV10.1, SQVPS11



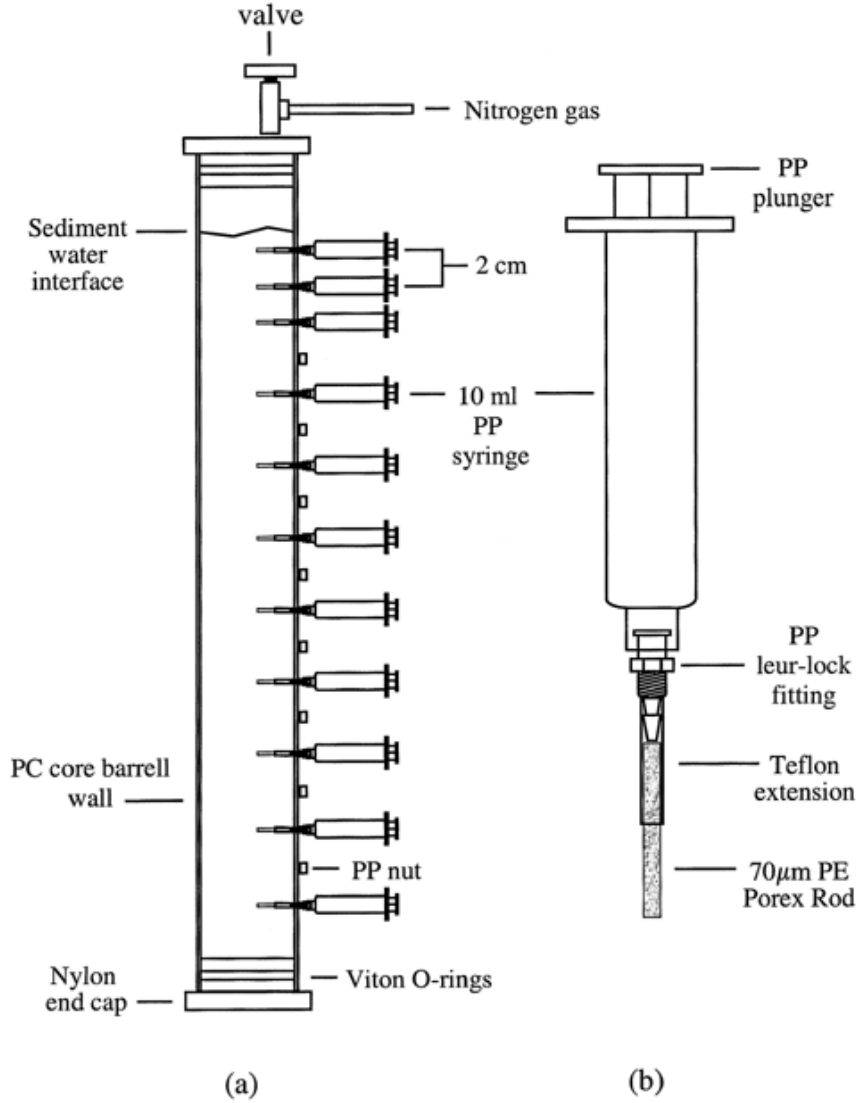
Pier 7 R&D Sampling



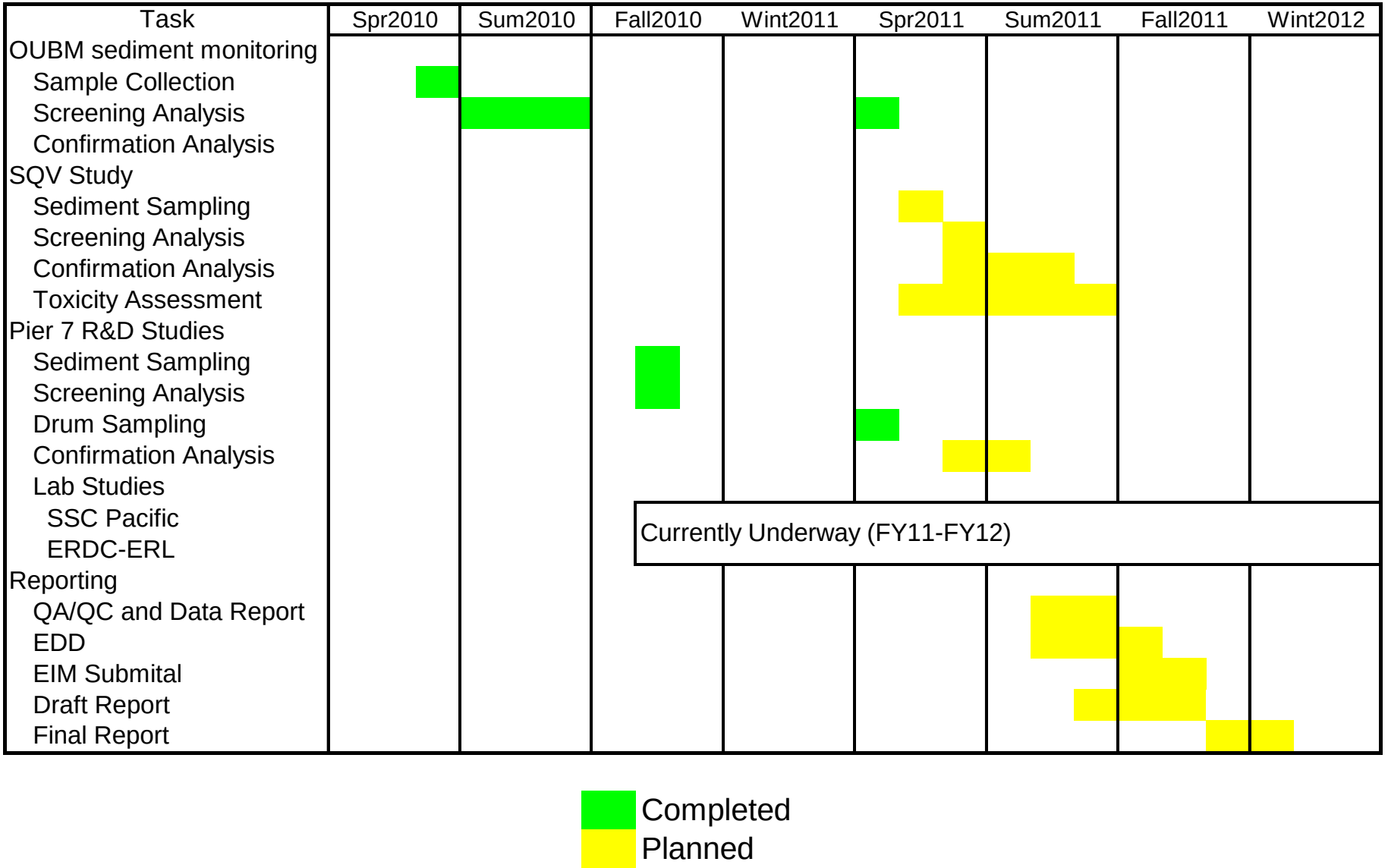
6 half full 55 gal drum samples scooped from top 6" collected on 3/17/11

Post-Drum Samples

Sediment Core and Porewater Sampling Areas



Schedule


Task
Spr2010
Sum2010
Fall2010
Wint2011
Spr2011
Sum2011
Fall2011
Wint2012
OUBM sediment monitoring
Sample Collection
Screening Analysis
Confirmation Analysis
SQV Study
Sediment Sampling
Screening Analysis
Confirmation Analysis
Toxicity Assessment
Pier 7 R&D Studies
Sediment Sampling
Screening Analysis
Drum Sampling
Confirmation Analysis
Lab Studies
SSC Pacific
ERDC-ERL
Currently Underway (FY11-FY12)
Reporting
QA/QC and Data Report
EDD
EIM Submital
Draft Report
Final Report
Completed
Planned