

PCB Margin Unit Prioritization Final Report

Alicia Gilbreath, Don Yee, Lester McKee, and Jay Davis, SFEI

June 2015

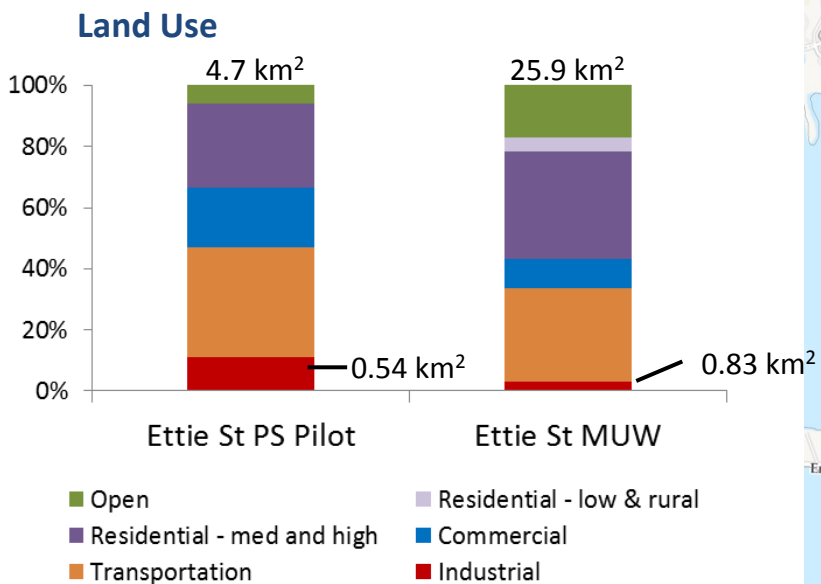
SFEI Contribution #812

The following slides summarize information that was assembled to inform the RMP PCB Workgroup's strategy for developing conceptual site models for priority margin units. The Workgroup decided to develop conceptual models for margin units downstream of four of the five pilot watersheds that were identified in the first term of the Municipal Regional Stormwater Permit and for one additional unit (San Leandro Bay). The margin unit downstream of the Leo Avenue pilot watershed was not included because the pilot watershed is too distant and too small a contributor of PCB loading to that unit. The Workgroup decided to develop conceptual models first for Emeryville Crescent and second for San Leandro Bay. The order after that has not yet been decided. West Santa Fe Channel and Parr Channel, which each were pilot watersheds, were combined into one PMU: Richmond Harbor.

The following information was assembled for each unit:

- 1) The boundaries of the watersheds draining into each PMU.
- 2) Land use information, locations of documented source areas and cleanup sites, estimated tributary loads to the PMU, and estimated load reductions based on existing plans for management actions.
- 3) Available information on PCB concentrations in soils and sediment in the watershed.
- 4) Historical and recent aerial photos showing land use and PMU bathymetry.
- 5) A rough estimate of the area in the PMU that would be inundated by a storm with a one-year return frequency over a 24 hour period. The PCB inventory for the inundation area was estimated using the closest available surface sediment data. Load to inventory ratios were then calculated both for the pilot watershed and the other watersheds draining into each PMU.

Land Use



Management Actions

- 1) Ettie St Pump Station Media Filters
- 2) Ettie St Pump Station – addl wet well cleanout
- 3) West Oakland Industrial Area Bioretention

ESTIMATED PCB from Margin Unit Watershed
590 – 760 g/yr

Ettie St PS Pilot Watershed: 330 g/yr

Ettie St PS excluding pilot area: 50 – 120 g/yr

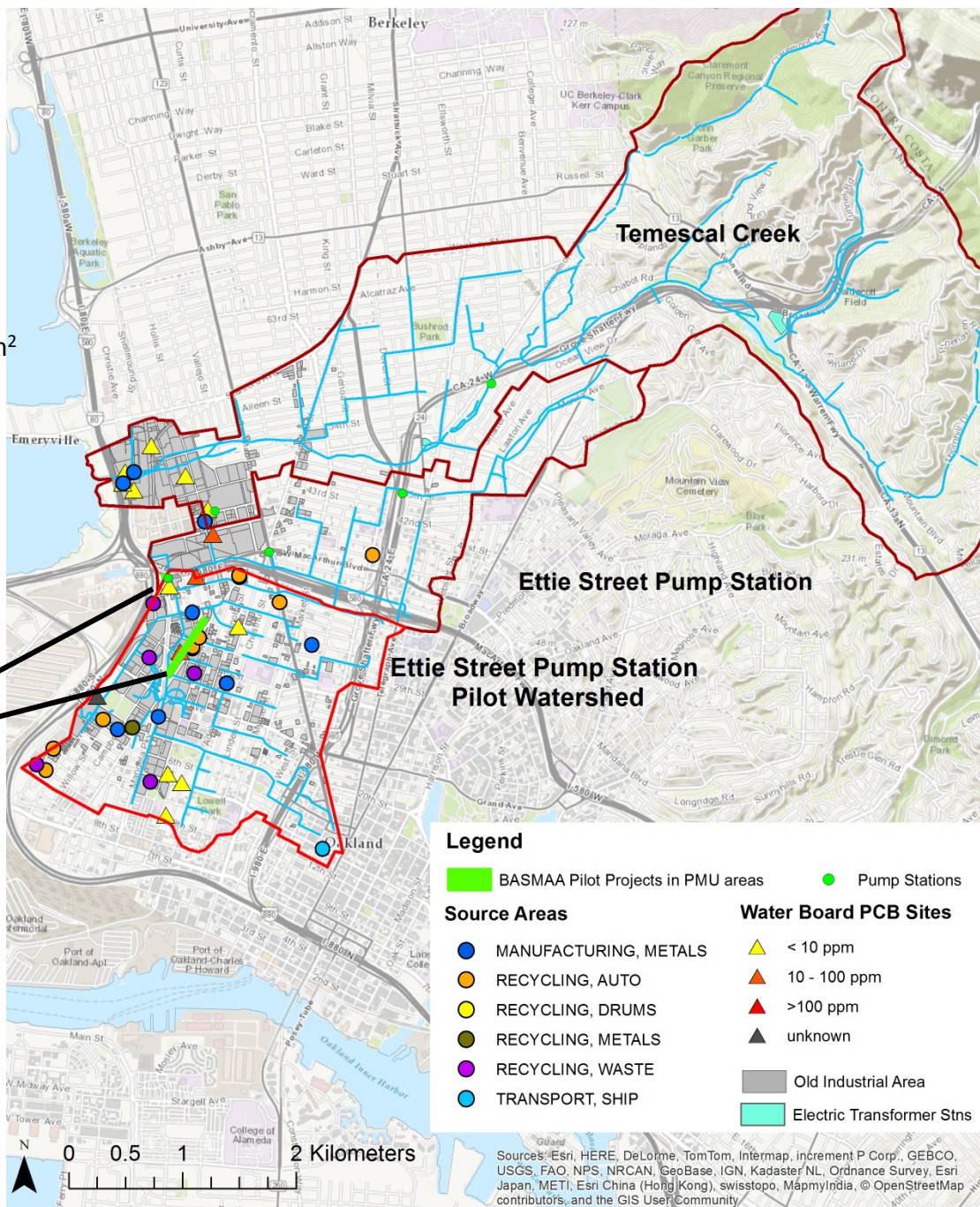
Temescal Ck: 210 – 310 g/yr

% of Load from Pilot Watershed: 49%

ESTIMATED Reduction from Currently Quantified Management Actions

0.312 g/yr

ESTIMATED % Load Reduction to Margin
<1 %



Emeryville Crescent: Soil and Sediment Data

Sediment/Soil Sampling

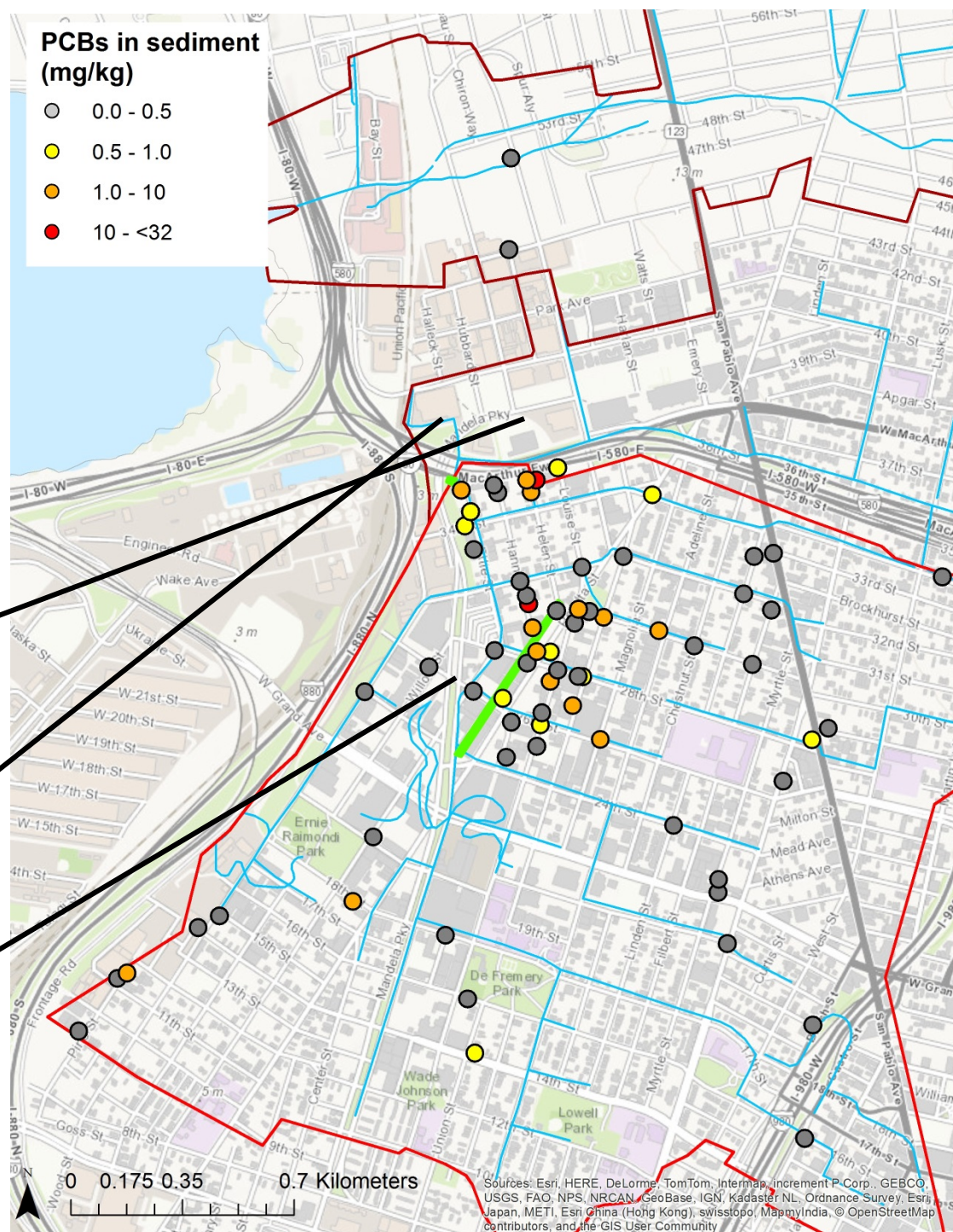
	Avg (mg/kg)	Max (mg/kg)	N
Ettie St	1.8	31.3	97
Temescal	0.12	0.21	2

Maximum Sediment Concentration

Sampled by Kleinfelder in 2005
= 31 mg/kg

Management Actions

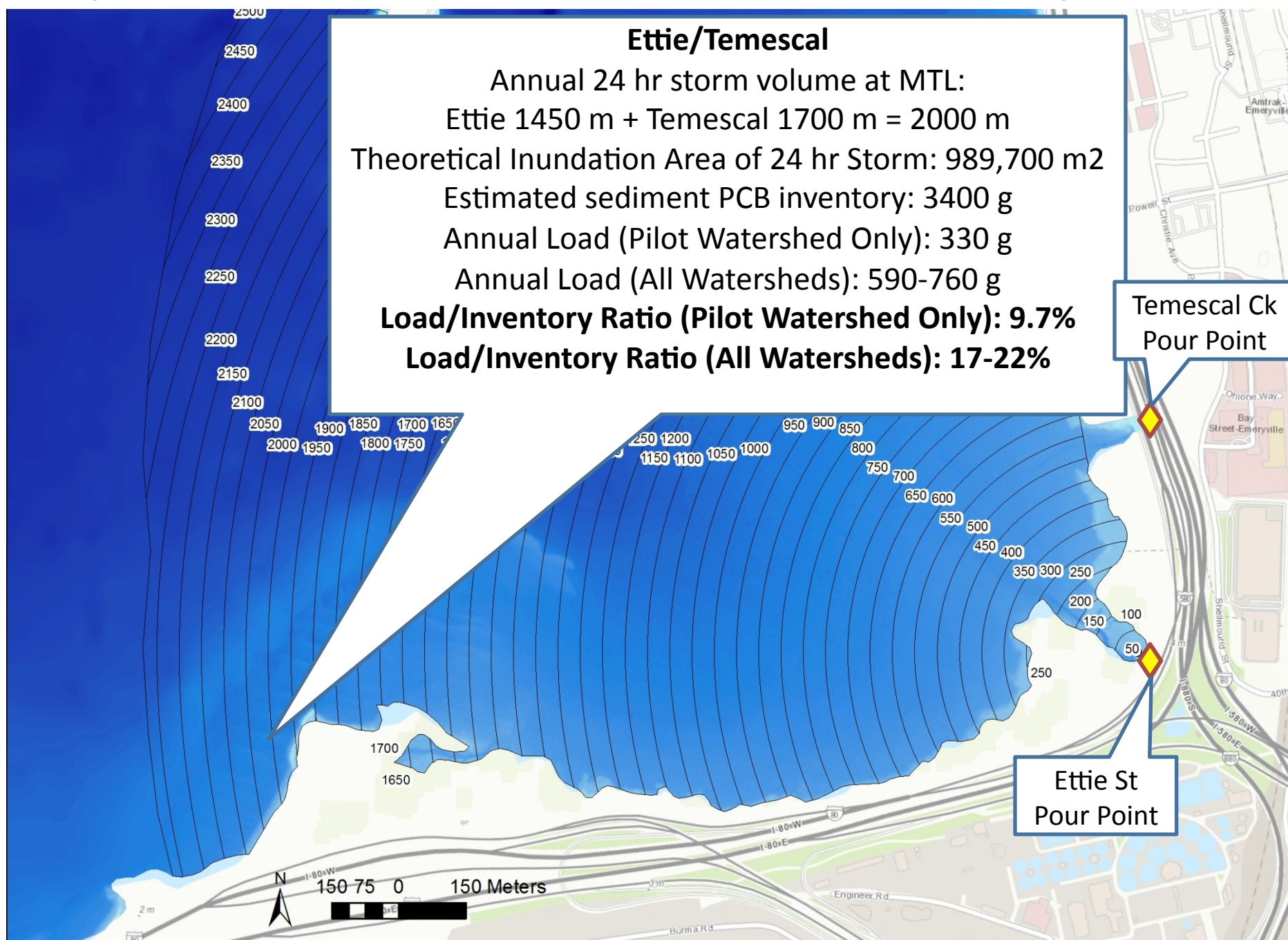
- 1) Ettie St Pump Station Media Filters
- 2) Ettie St Pump Station – addl wet well cleanout
- 3) West Oakland Industrial Area Bioretention



Emeryville Crescent: Historical and Recent Aerial Photos



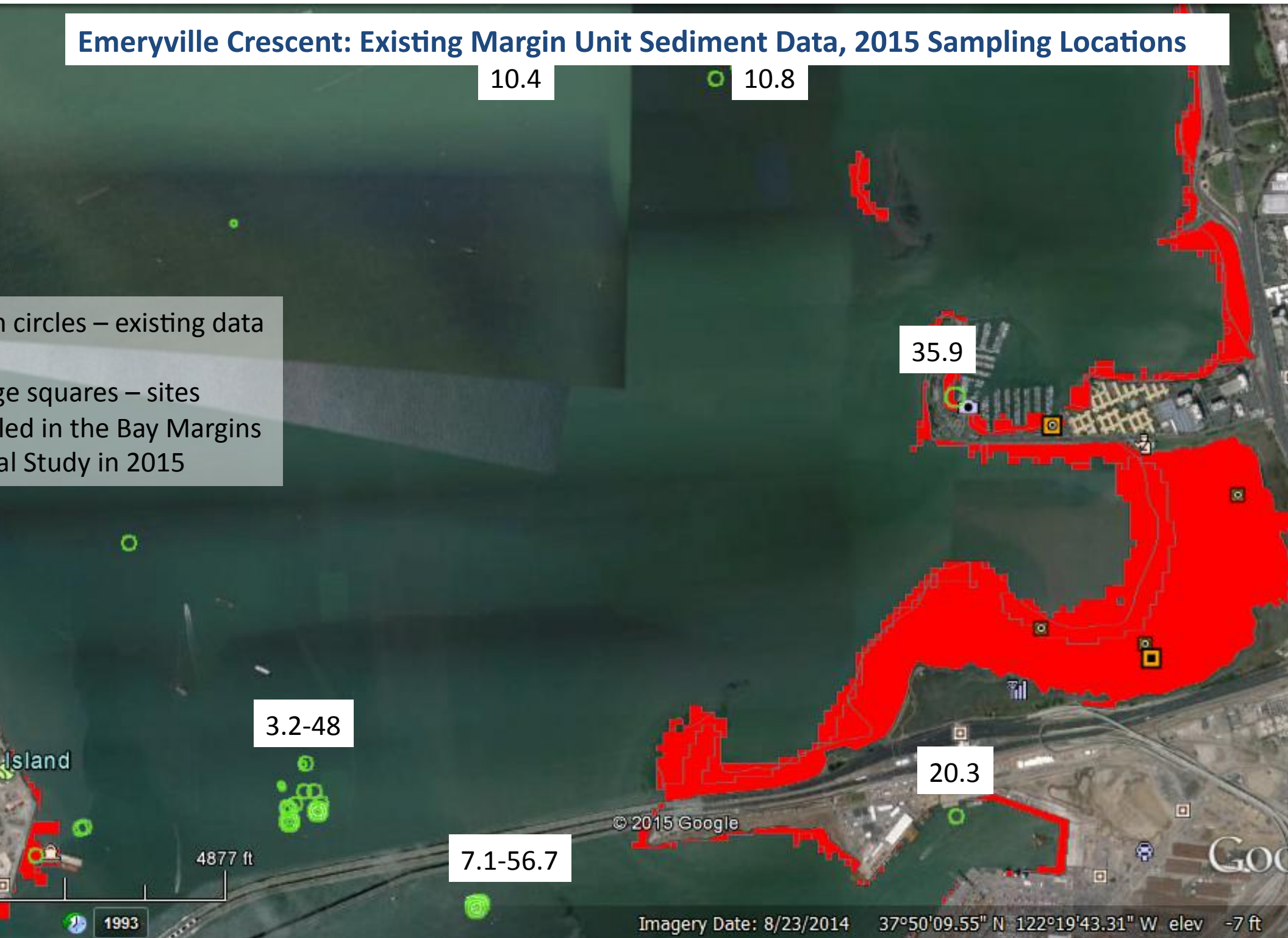
Emeryville Crescent: 24 hr Storm Inundation Area and Load/Inventory Ratios



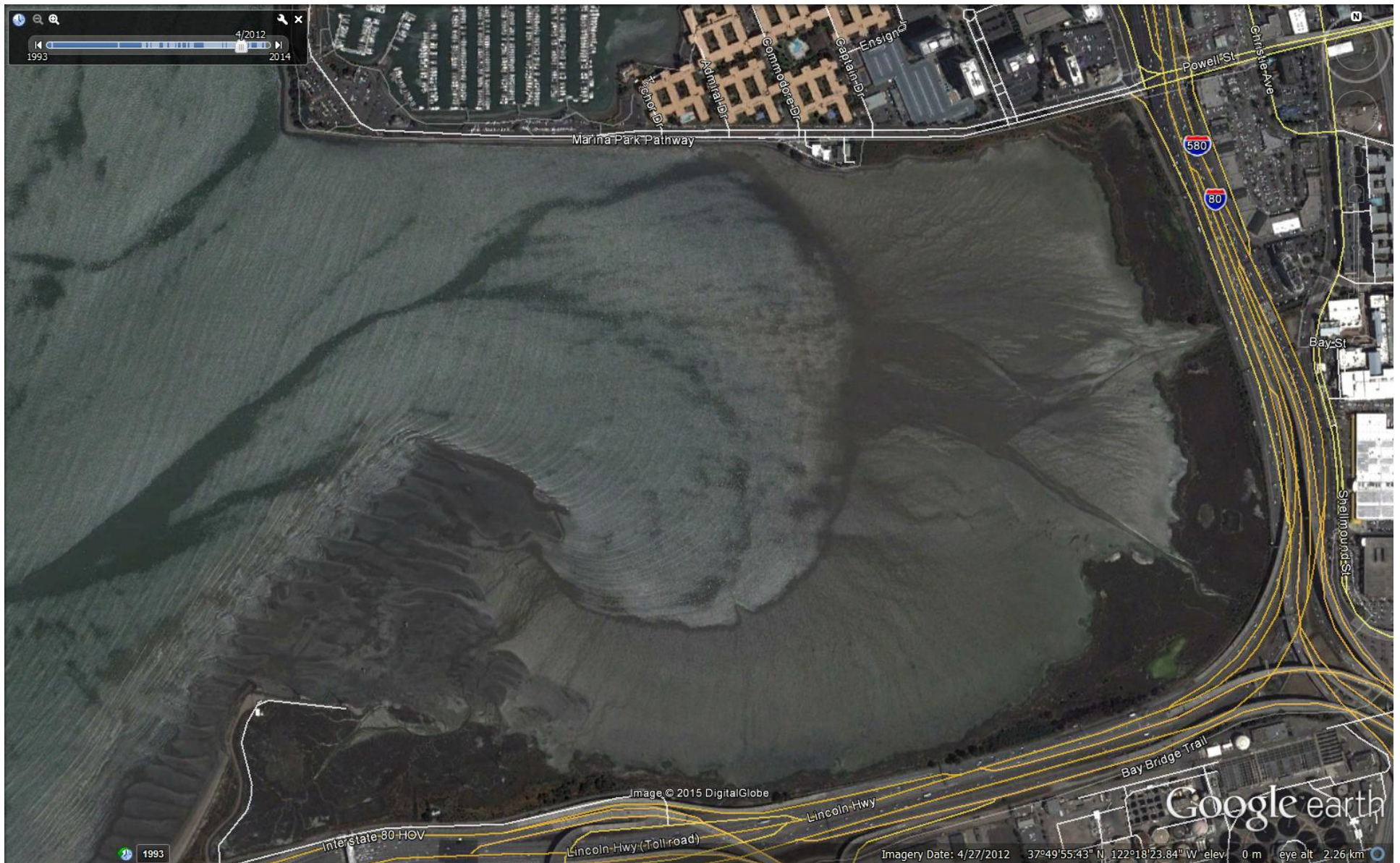
Emeryville Crescent: Existing Margin Unit Sediment Data, 2015 Sampling Locations

Green circles – existing data

Yellow squares – sites sampled in the Bay Margins Study in 2015



Emeryville Crescent: Bathymetry



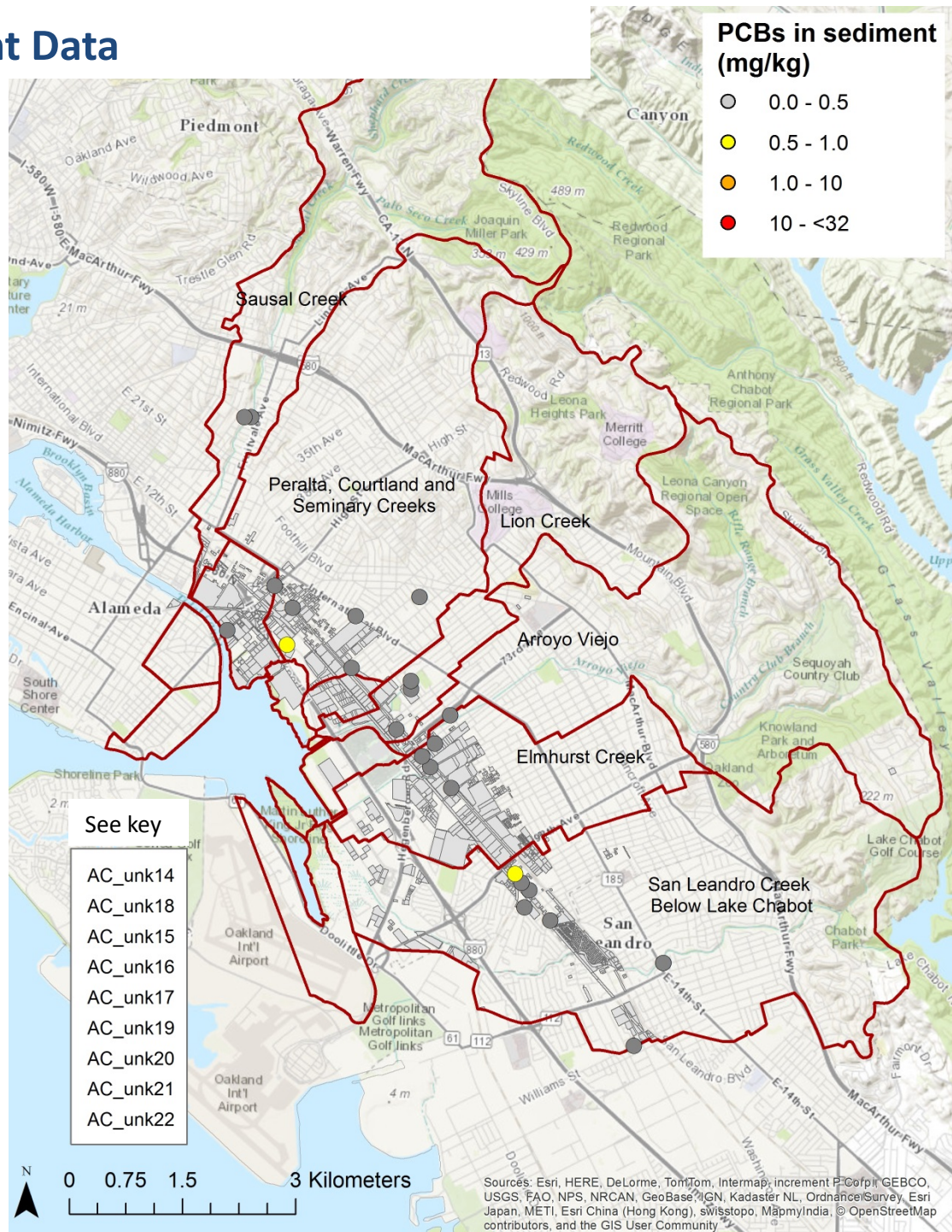
San Leandro Bay: Soil and Sediment Data

Sediment/Soil Sampling

	Avg (mg/kg)	Max (mg/kg)	N
AC_unk15	0	0	2
Elmhurst Creek_A	0.11	0.36	6
Lion Creek	0.05	0.08	3
Peralta and Courtland and Seminary Creeks	0.12	0.61	6
San Leandro Creek Below Lake Chabot	0.18	0.54	8
Sausal Creek	0.04	0.04	2

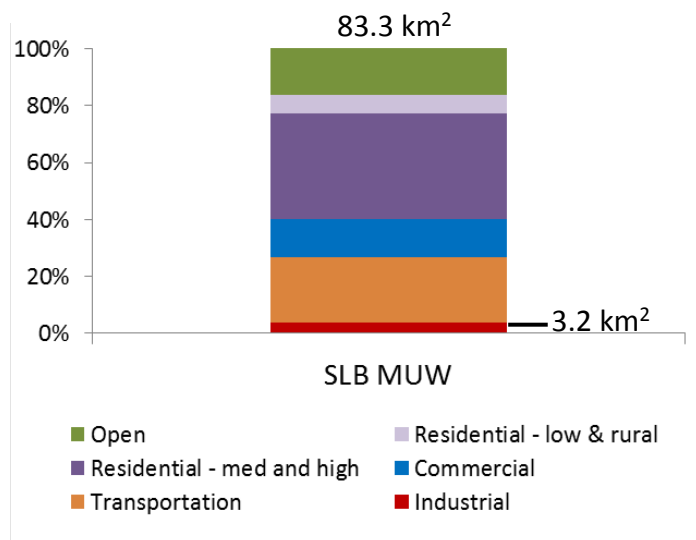
Maximum Sediment Concentration

Sampled by SFEI in 2010 = 0.61 mg/kg



San Leandro Bay: Land Use, Source Areas, Cleanup Sites, Loads, and Load Reductions

Land Use



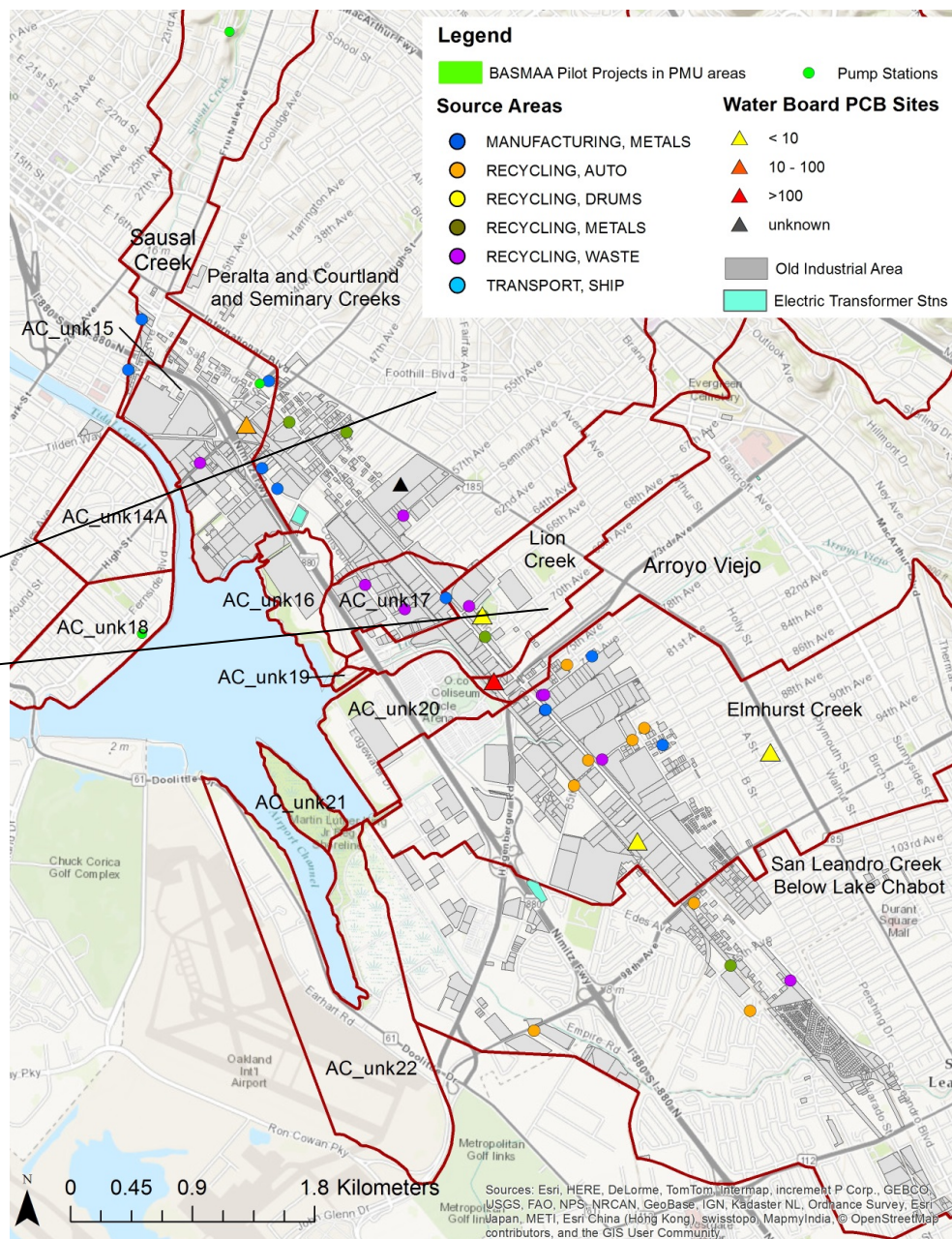
PCB Clean-Ups in San Leandro Bay

- 1) General Electric Oakland (DTSC)
- 2) Union Pacific Rail Road Oakland (EPA)

ESTIMATED PCB from Margin Unit Watershed
1,800 – 2,200 g/yr

ESTIMATED Reduction from Clean-Ups distributed
over 10 years
5 g/yr (WB clean up on Damon Ch)
others?

ESTIMATED % Load Reduction to Margin
< 1 %



San Leandro Bay: Watershed Names



San Leandro Bay: Historical and Recent Aerial Photos

1993

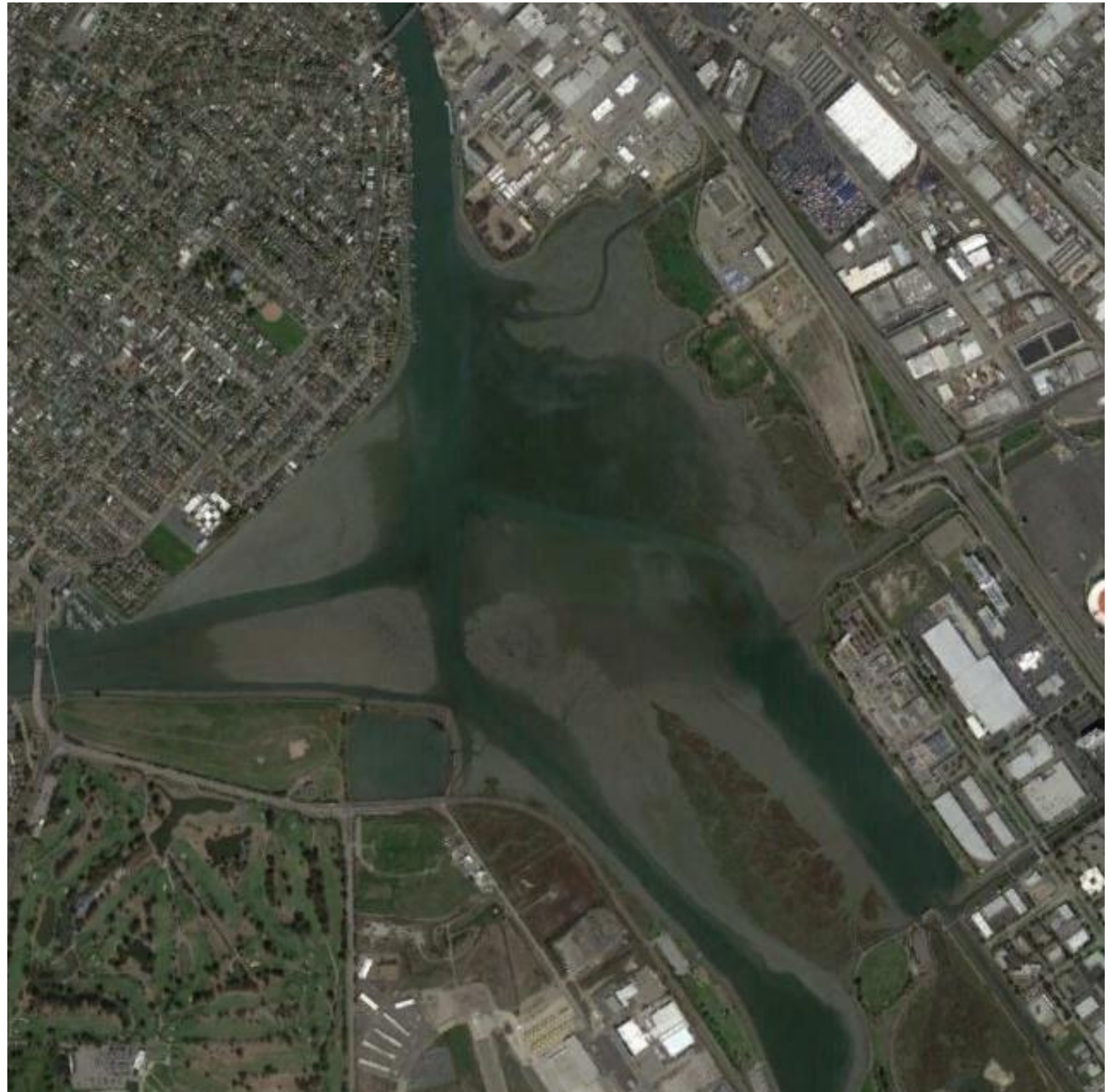


2013



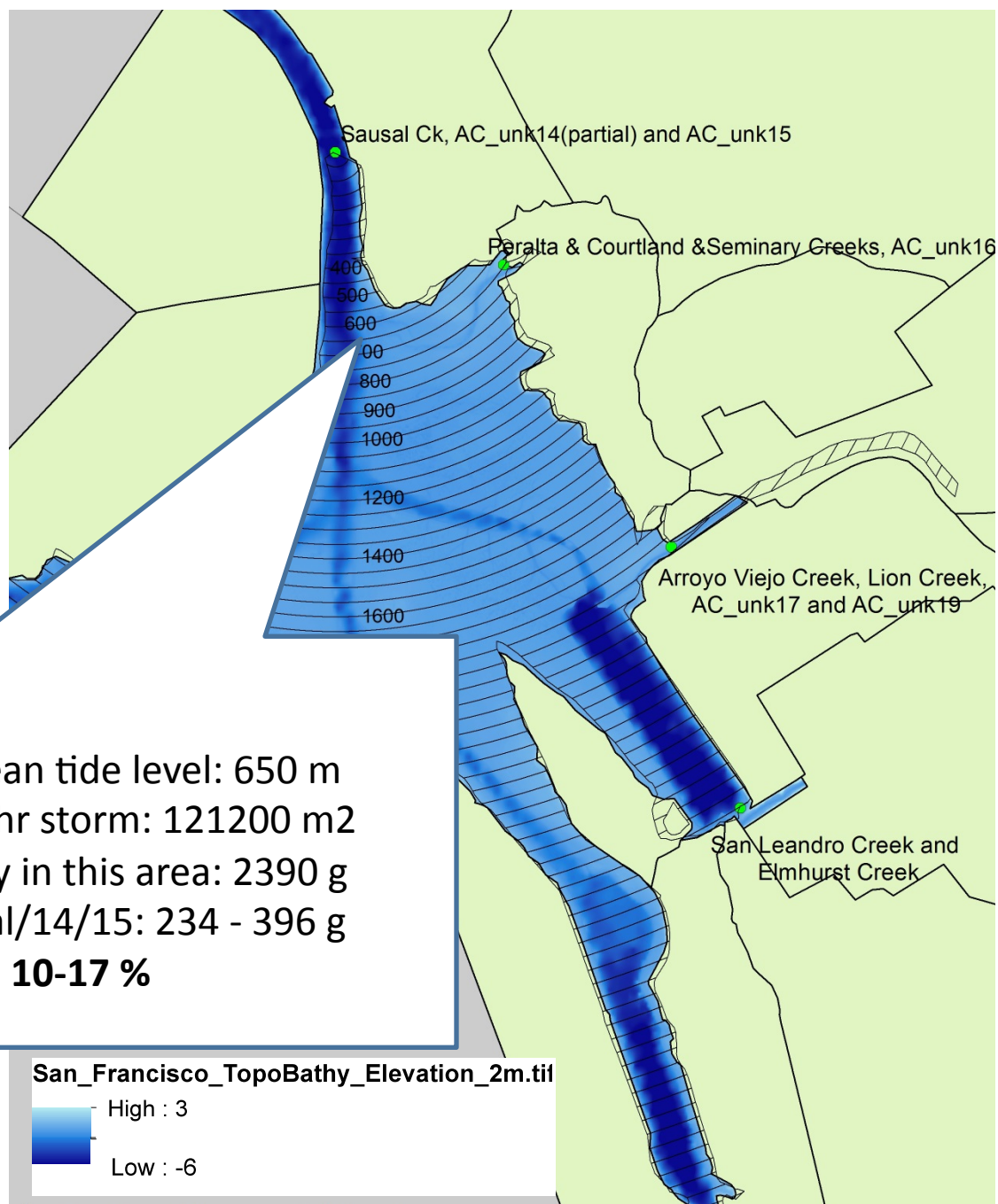
San Leandro Bay: Bathymetry

Low Tide
March 2014



San Leandro Bay: 24 hr Storm Inundation Area and Load/Inventory Ratio

Drainage	Estimated Annual PCB Load (g)
Sausal/14/15	230 - 400
Peralta/Courtland/Seminary/16	270 - 390
Arroyo Viejo/Lion/17/19	400 - 440
San Leandro Ck/Elmhurst Ck	800 - 980
San Leandro Bay - Entire margin unit watershed	1800 - 2200



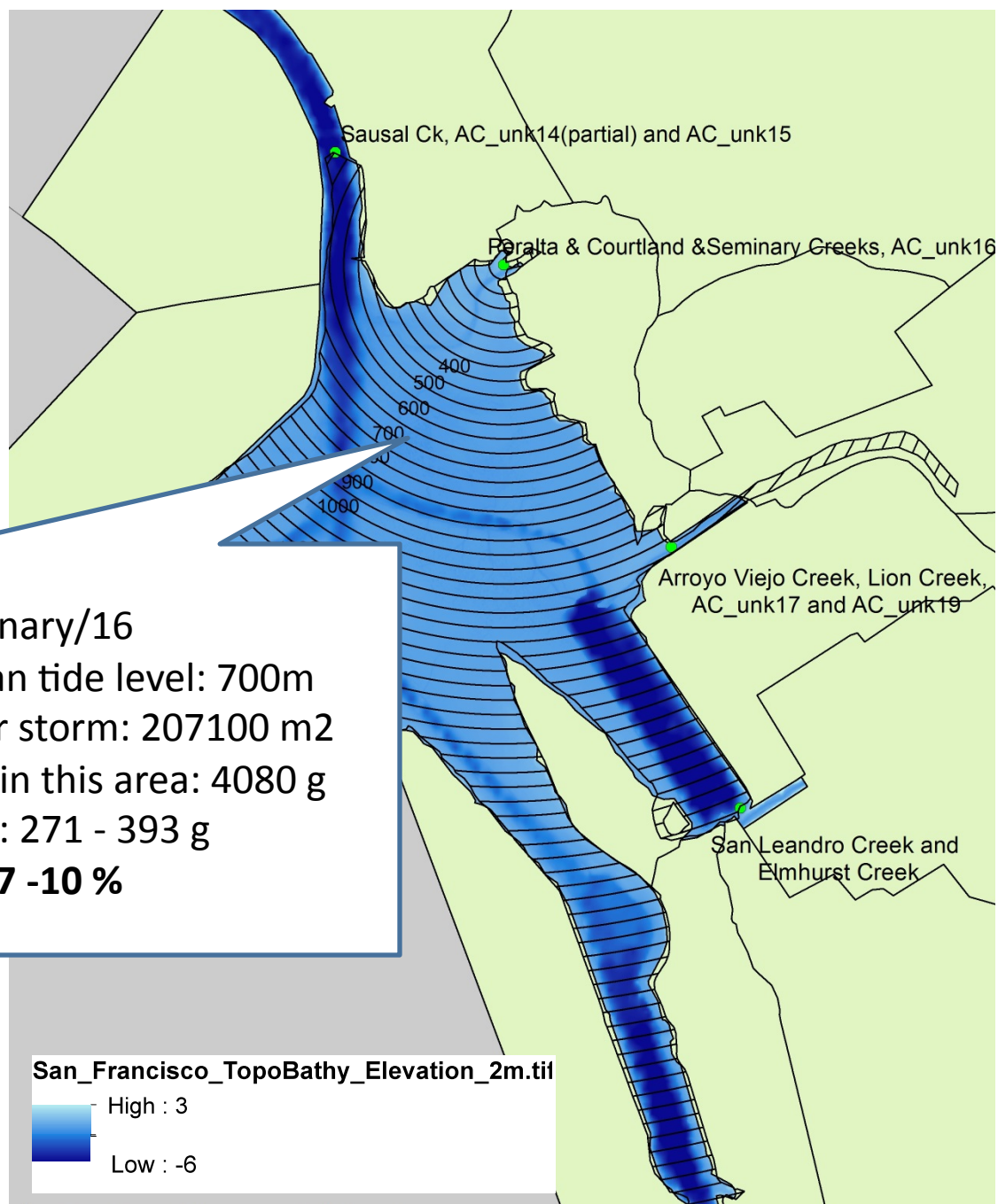
Sausal/14/15

Annual 24 hr storm volume at mean tide level: 650 m
 Theoretical inundation area of 24 hr storm: 121200 m²
 Estimated sediment PCB inventory in this area: 2390 g
 Estimated annual load from Sausal/14/15: 234 - 396 g

Load/Inventory Ratio: 10-17 %

San Leandro Bay: 24 hr Storm Inundation Area and Load/Inventory Ratio

Drainage	Estimated Annual PCB Load (g)
Sausal/14/15	230 - 400
Peralta/Courtland/Seminary/16	270 - 390
Arroyo Viejo/Lion/17/19	400 - 440
San Leandro Ck/Elmhurst Ck	800 - 980
San Leandro Bay - Entire margin unit watershed	1800 - 2200

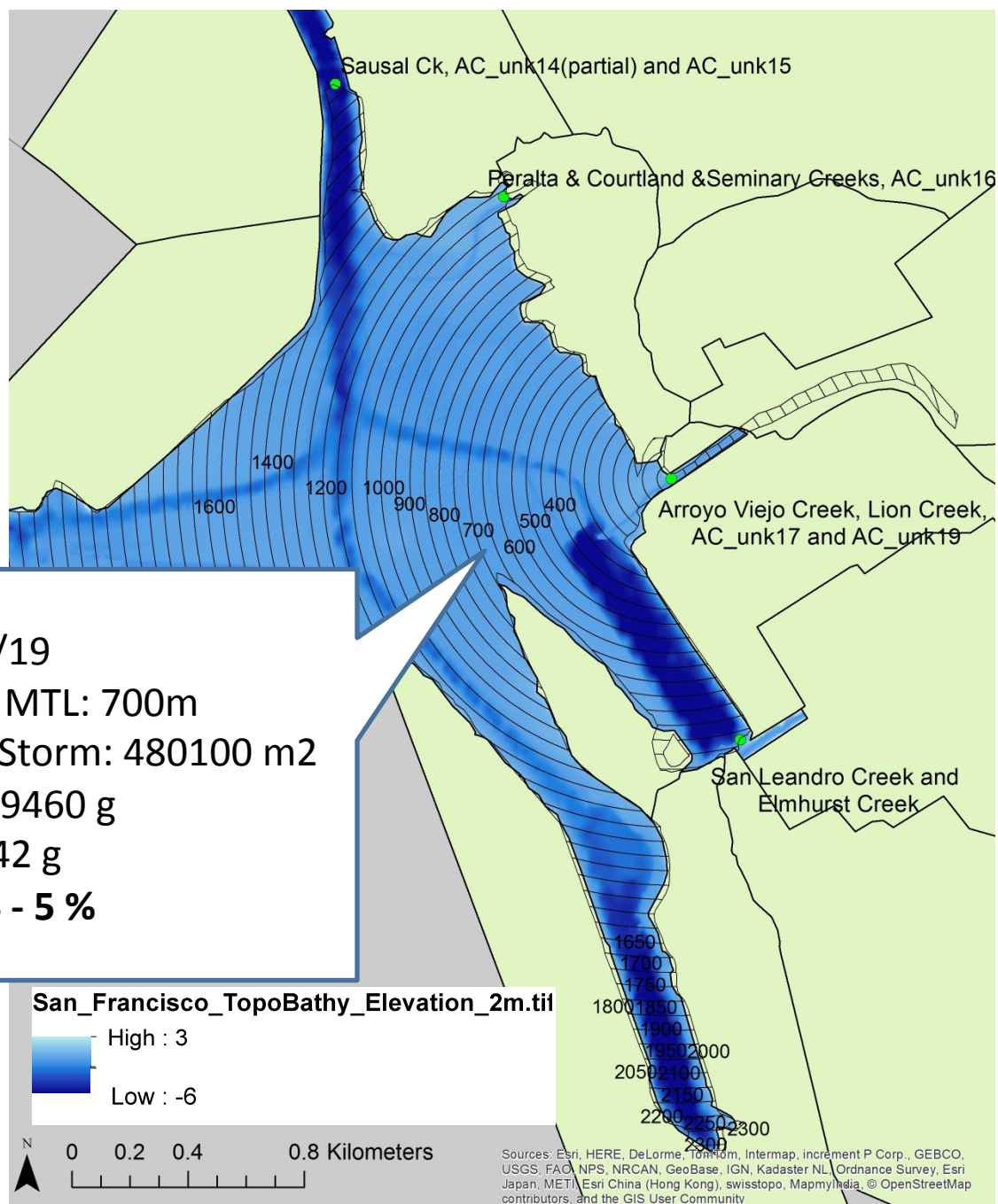


Peralta/Courtland/Seminary/16

Annual 24 hr storm volume at mean tide level: 700m
 Theoretical inundation area of 24 hr storm: 207100 m²
 Estimated sediment PCB inventory in this area: 4080 g
 Estimated annual load from : 271 - 393 g
Load/Inventory Ratio: 7 -10 %

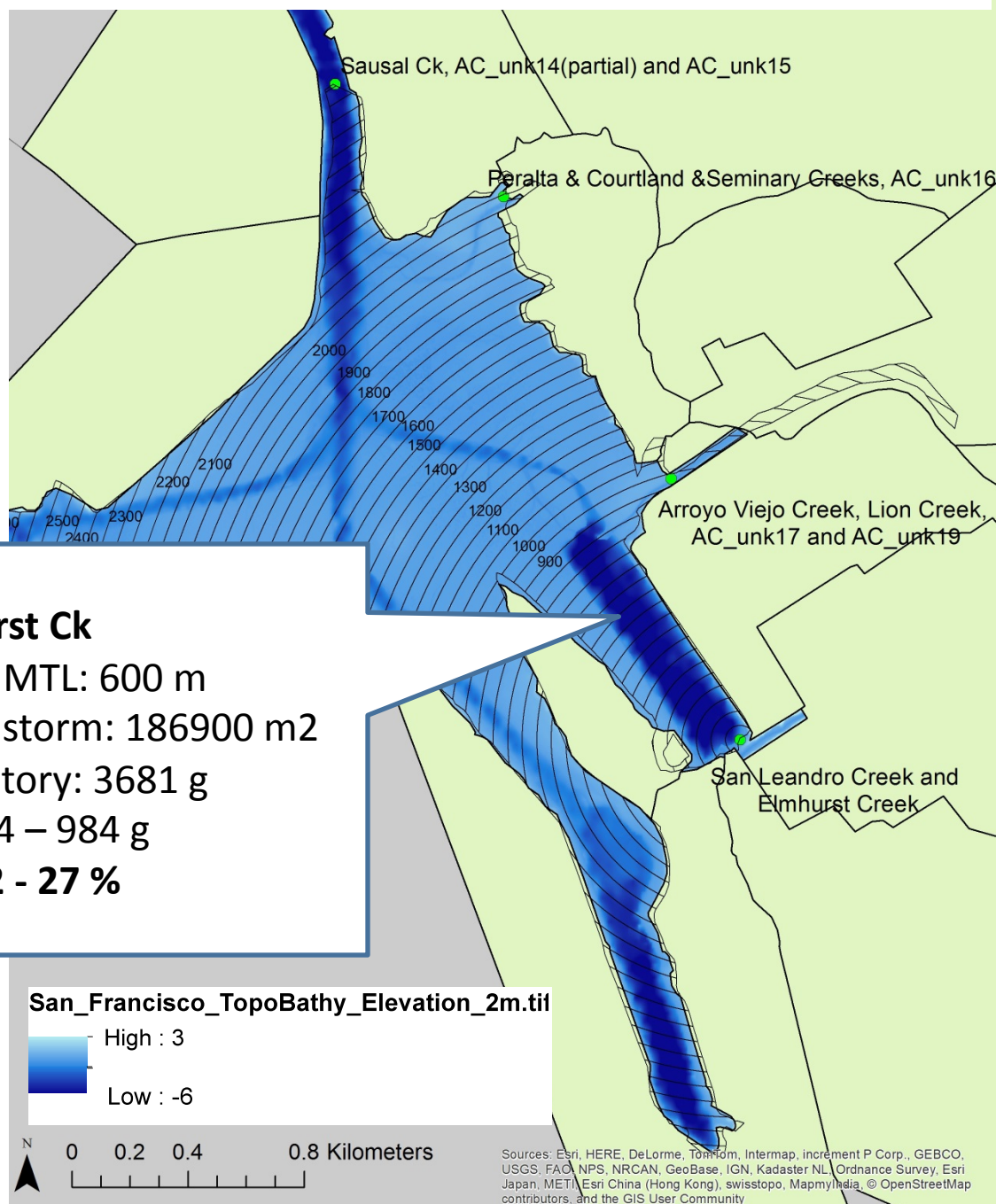
San Leandro Bay: 24 hr Storm Inundation Area and Load/Inventory Ratio

Drainage	Estimated Annual PCB Load (g)
Sausal/14/15	230 - 400
Peralta/Courtland/Seminary/16	270 - 390
Arroyo Viejo/Lion/17/19	400 - 440
San Leandro Ck/Elmhurst Ck	800 - 980
San Leandro Bay - Entire margin unit watershed	1800 - 2200



San Leandro Bay: 24 hr Storm Inundation Area and Load/Inventory Ratio

Drainage	Estimated Annual PCB Load (g)
Sausal/14/15	230 - 400
Peralta/Courtland/Seminary/16	270 - 390
Arroyo Viejo/Lion/17/19	400 - 440
San Leandro Ck/Elmhurst Ck	800 - 980
San Leandro Bay - Entire margin unit watershed	1800 - 2200



San Leandro Ck/Elmhurst Ck

Annual 24 hr storm volume at MTL: 600 m

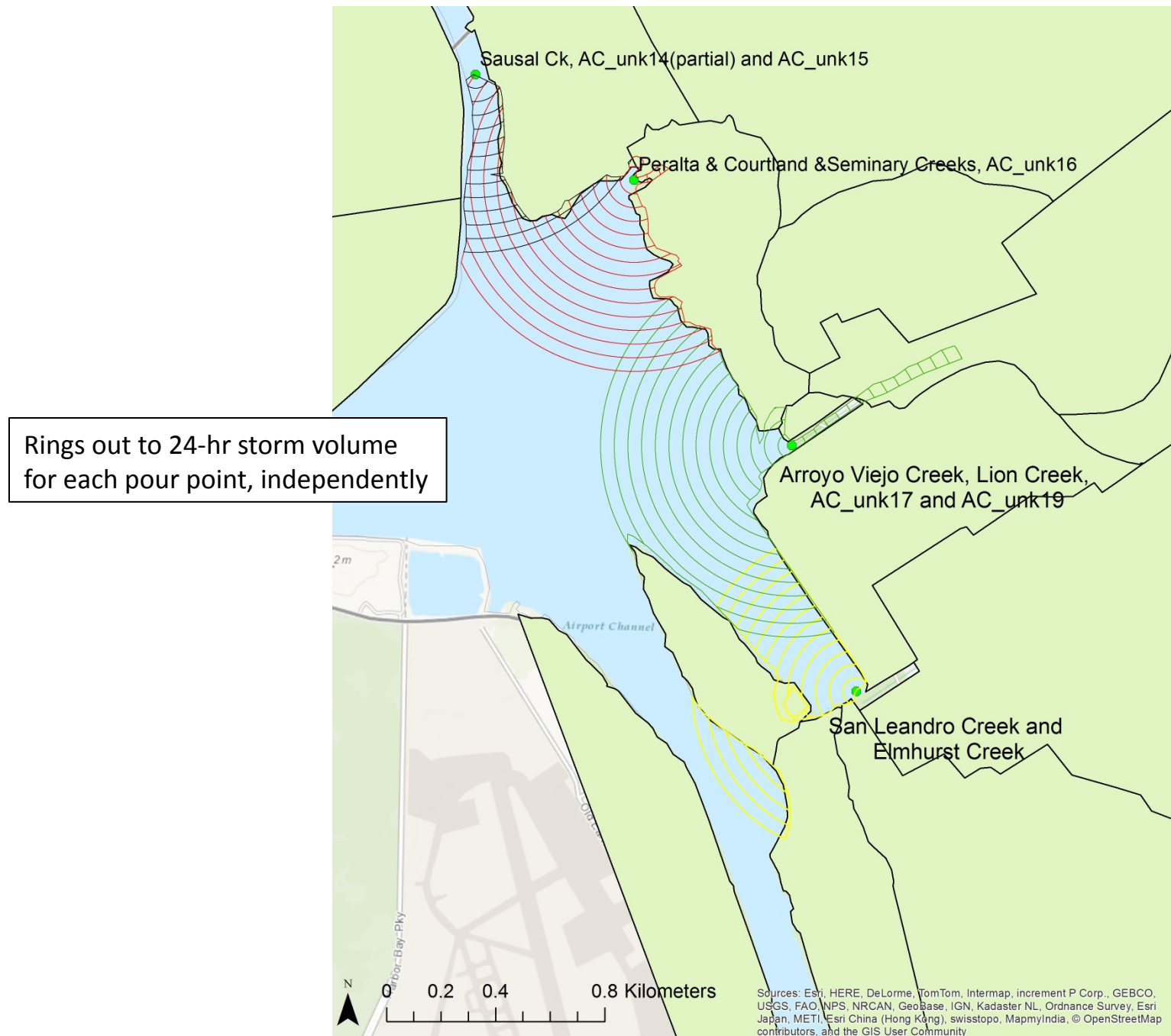
Theoretical inundation Area of 24 hr storm: 186900 m²

Estimated sediment PCB inventory: 3681 g

Estimated annual load : 804 – 984 g

Load/Inventory Ratio: 22 - 27 %

San Leandro Bay: 24 hr Storm Inundation Areas for Each Tributary



San Leandro Bay: 24 hr Storm Inundation Area for All Watersheds Combined

Drainage	Estimated Annual PCB Load (g)
Sausal/14/15	230 - 400
Peralta/Courtland/Seminary/16	270 - 390
Arroyo Viejo/Lion/17/19	400 - 440
San Leandro Ck/Elmhurst Ck	800 - 980
San Leandro Bay - Entire margin unit watershed	1800 - 2200

Sum of All Watersheds

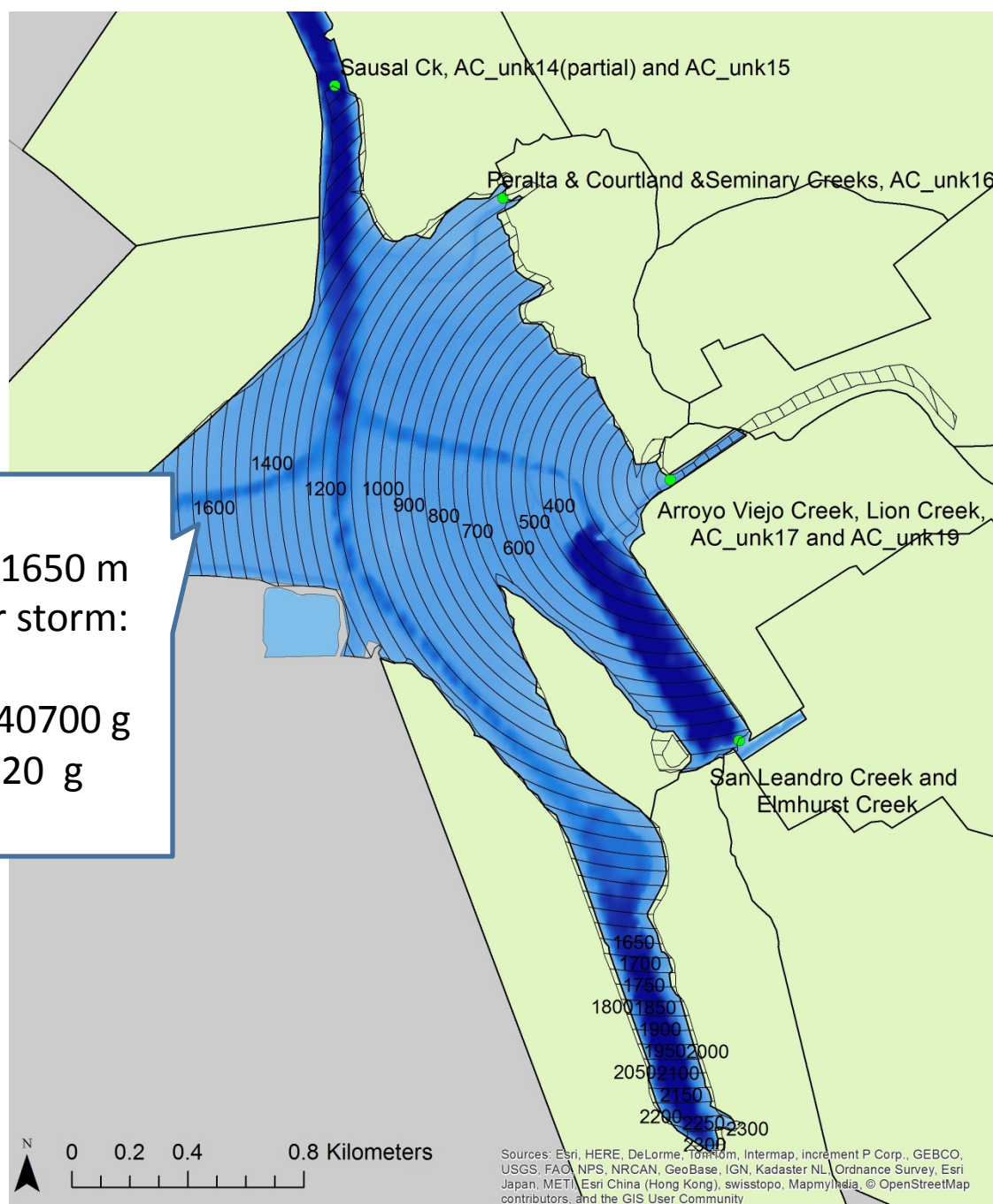
Annual 24 hr storm volume at MTL: 1650 m

Theoretical inundation Area of 24 hr storm:
2066500 m²

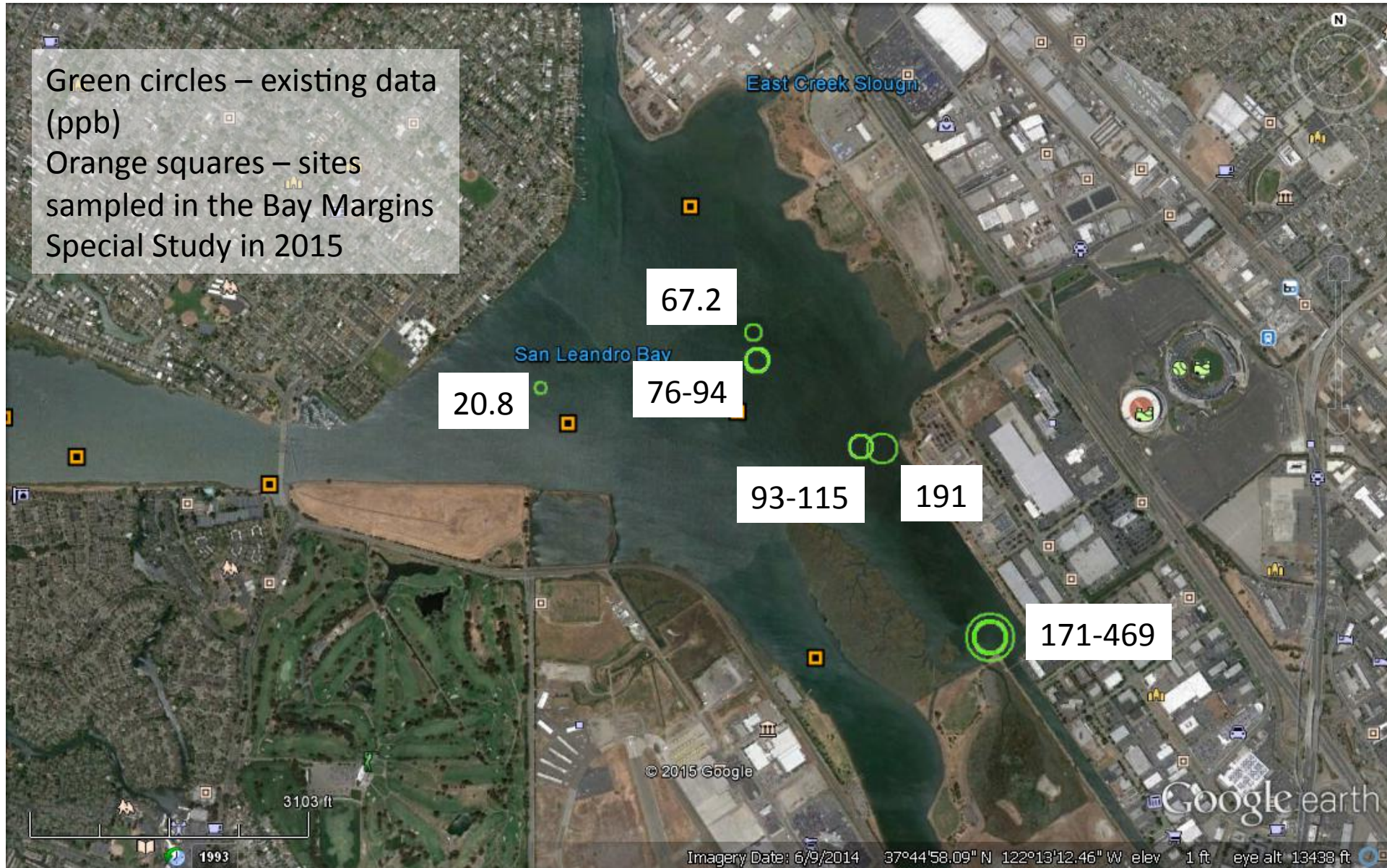
Estimated sediment PCB inventory: 40700 g

Estimated annual load: 1780 – 2220 g

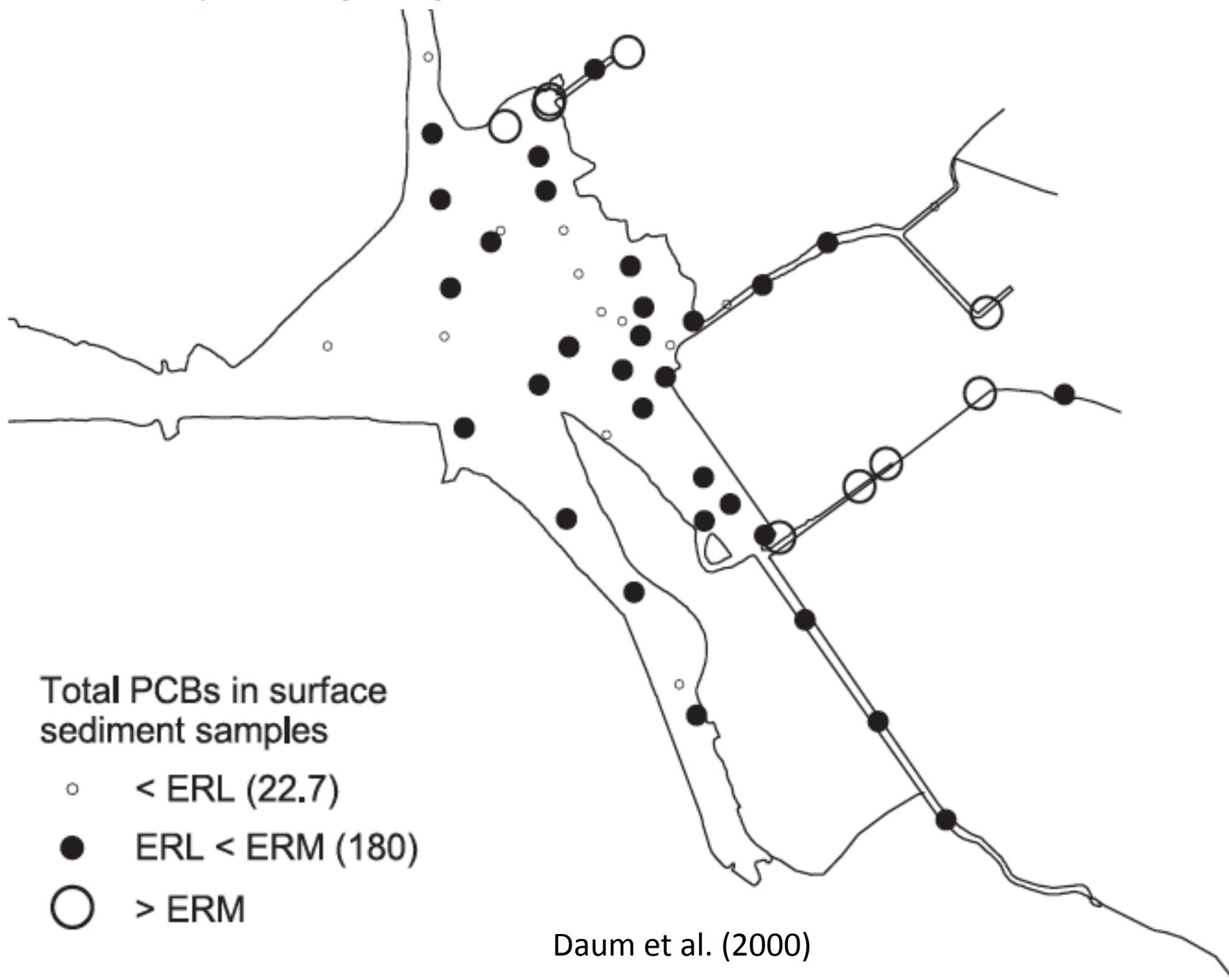
Load/Inventory Ratio: 4-5%



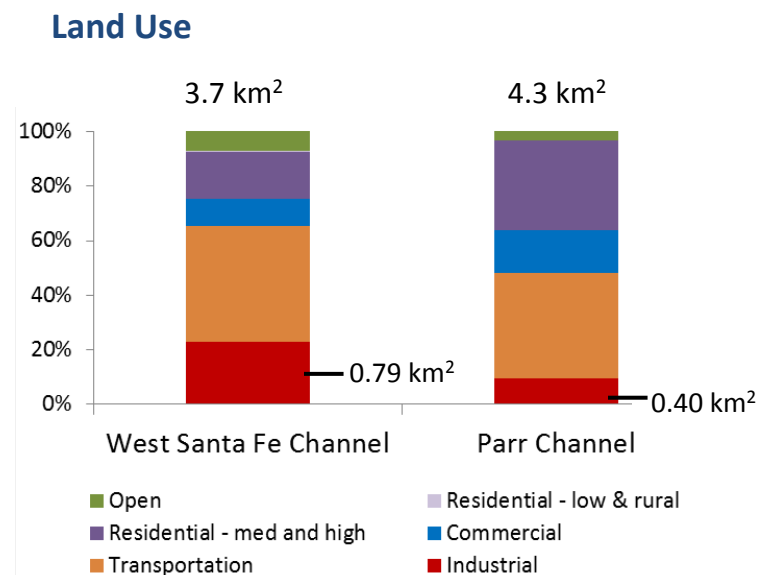
San Leandro Bay: Existing Margin Unit Sediment Data, 2015 Sampling Locations



San Leandro Bay: Existing Margin Unit Sediment Data



Richmond Harbor: Land Use, Source Areas, Cleanup Sites, Loads, and Load Reductions



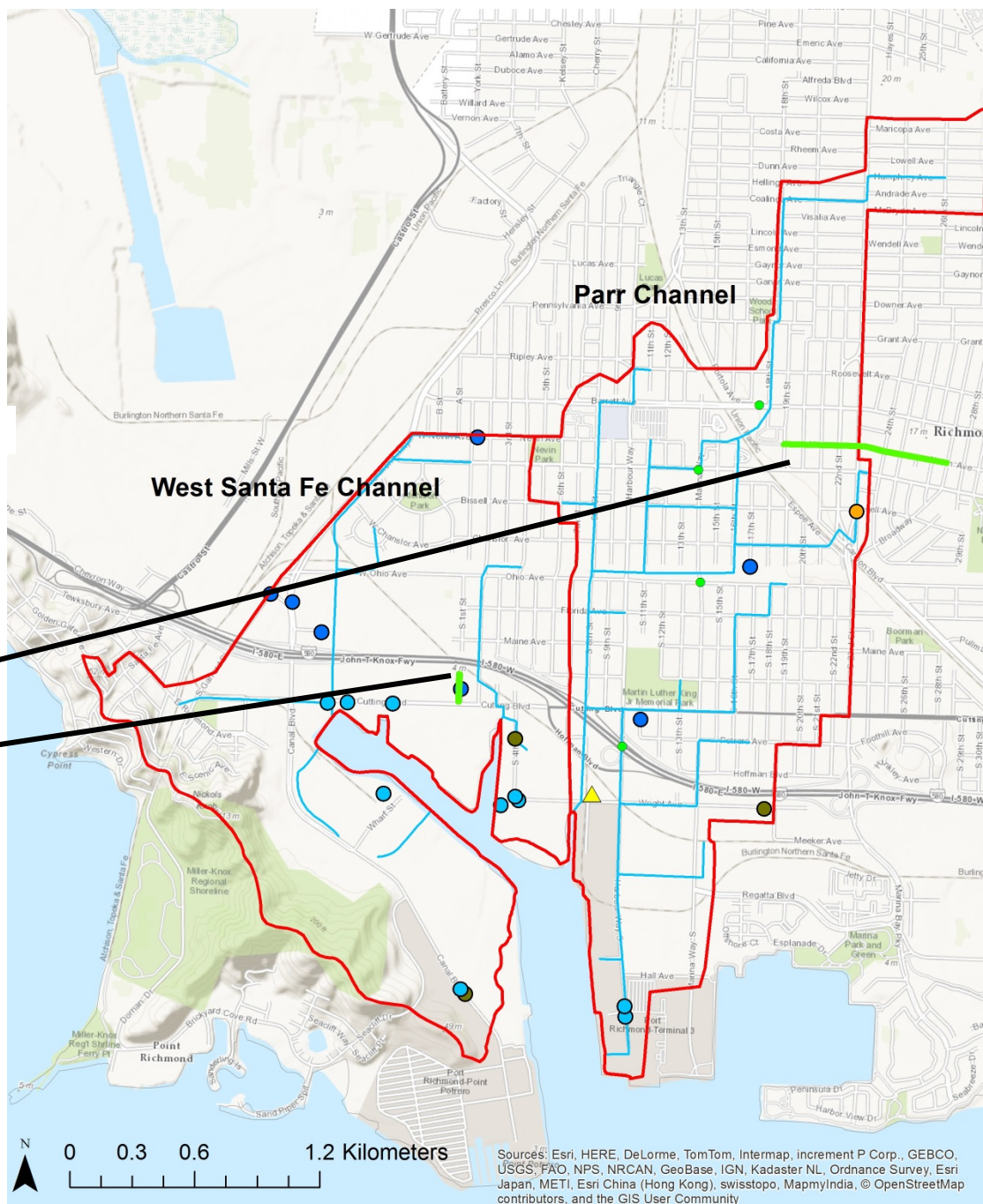
Management Actions

- 1) Nevin Ave. Bioretention
- 2) Bioretention outside PG&E substation

ESTIMATED PCB from Margin Unit Watershed
550 - 620 g/yr (West Santa Fe Ch)
330 - 430 g/yr (Parr)
% of Load from Pilot Watersheds: 100%

ESTIMATED Reduction from Currently Quantified Management Actions
0.271 g/yr (West Santa Fe Ch)
0.036 g/yr (Parr)

ESTIMATED % Load Reduction to Margin
<1 %



Richmond Harbor: Soil and Sediment Data

Sediment/Soil Sampling

	Avg (mg/kg)	Max (mg/kg)	N
Parr Channel	0.81	2.3	19
West Santa Fe Channel	0.73	2.8	34

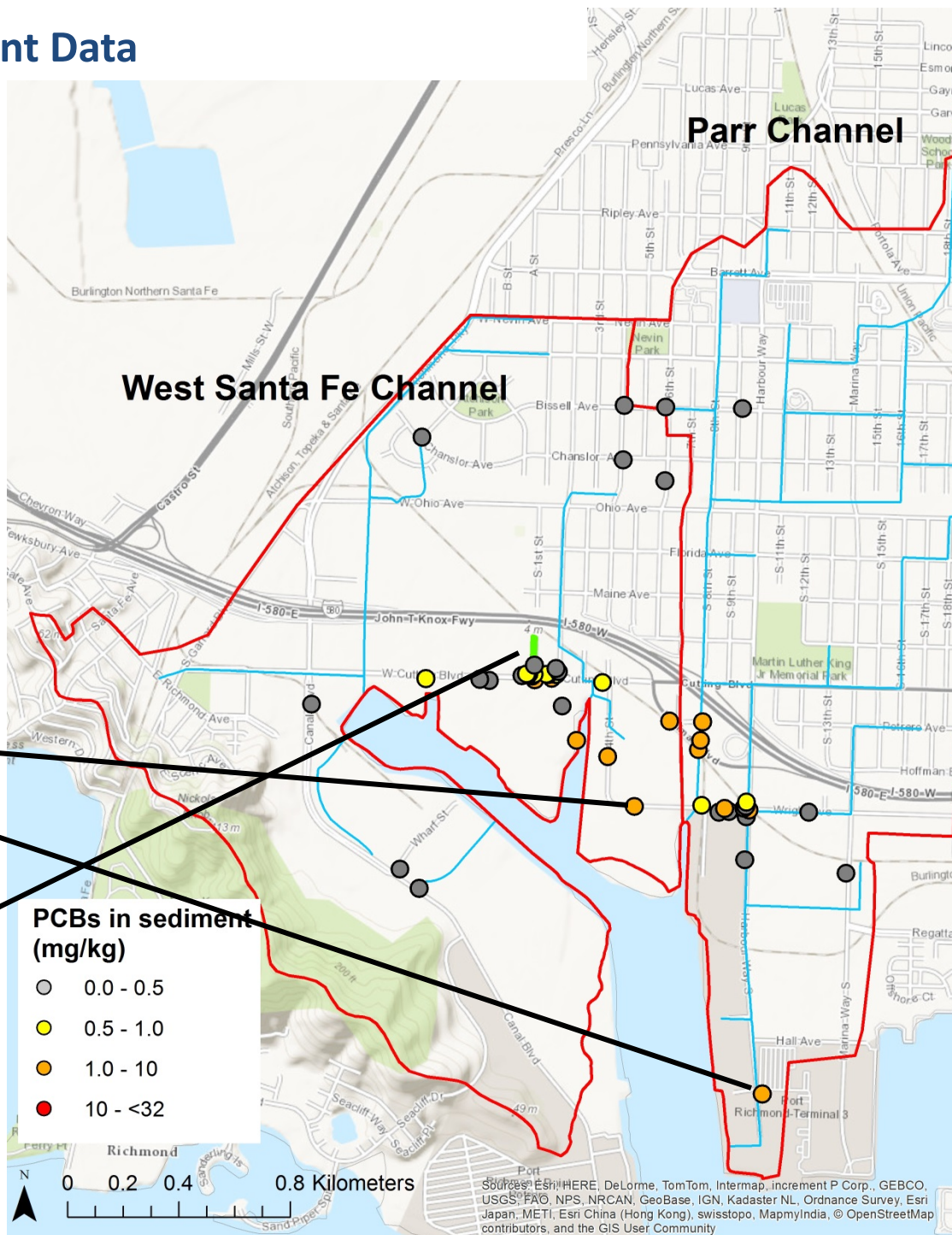
Maximum Sediment Concentration

Sampled by EOA (2007) = 2.8 mg/kg

Sampled by SFEI (2010) = 2.3 mg/kg

Management Actions

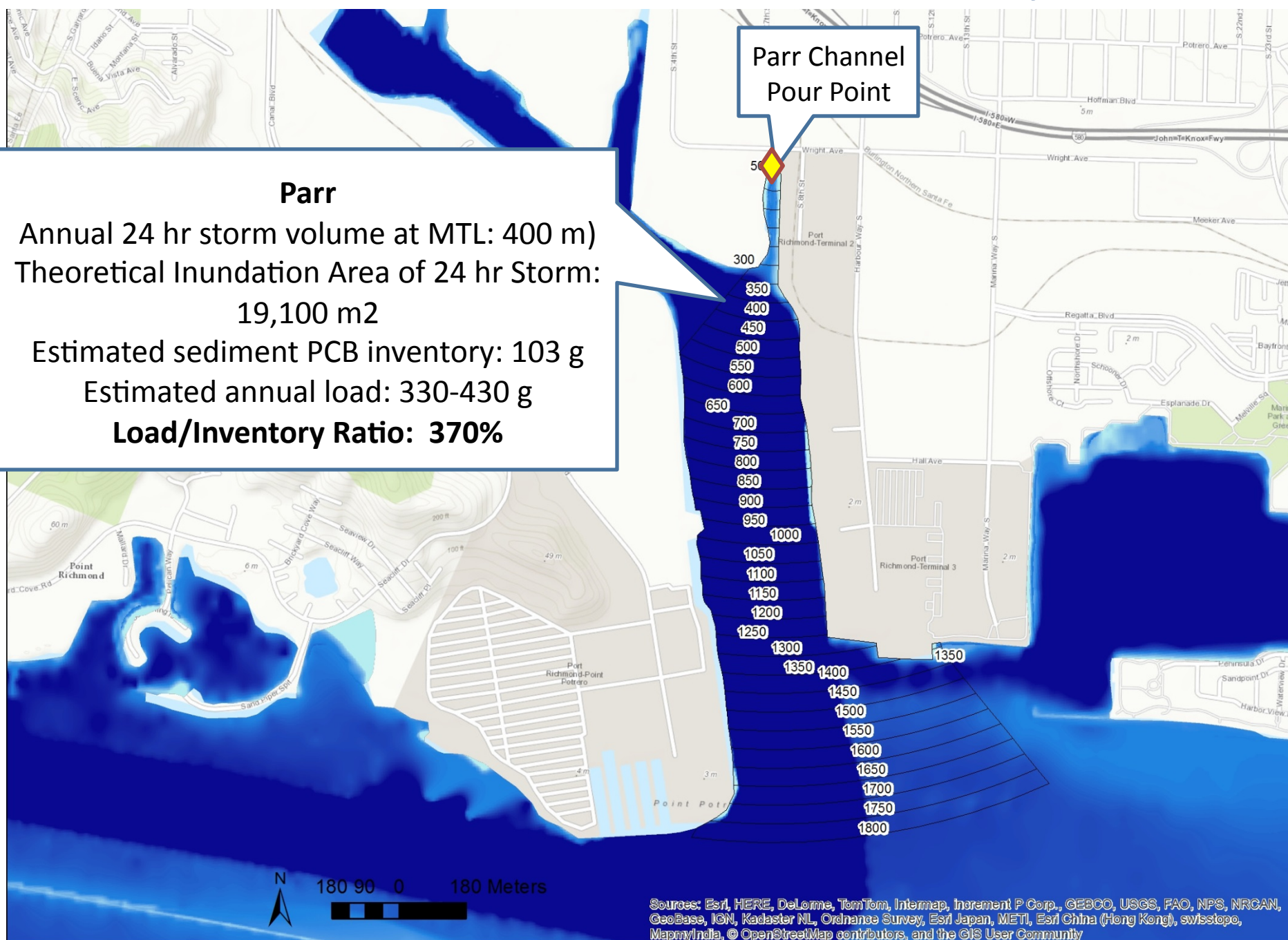
- 1) Bioretention outside PG&E substation



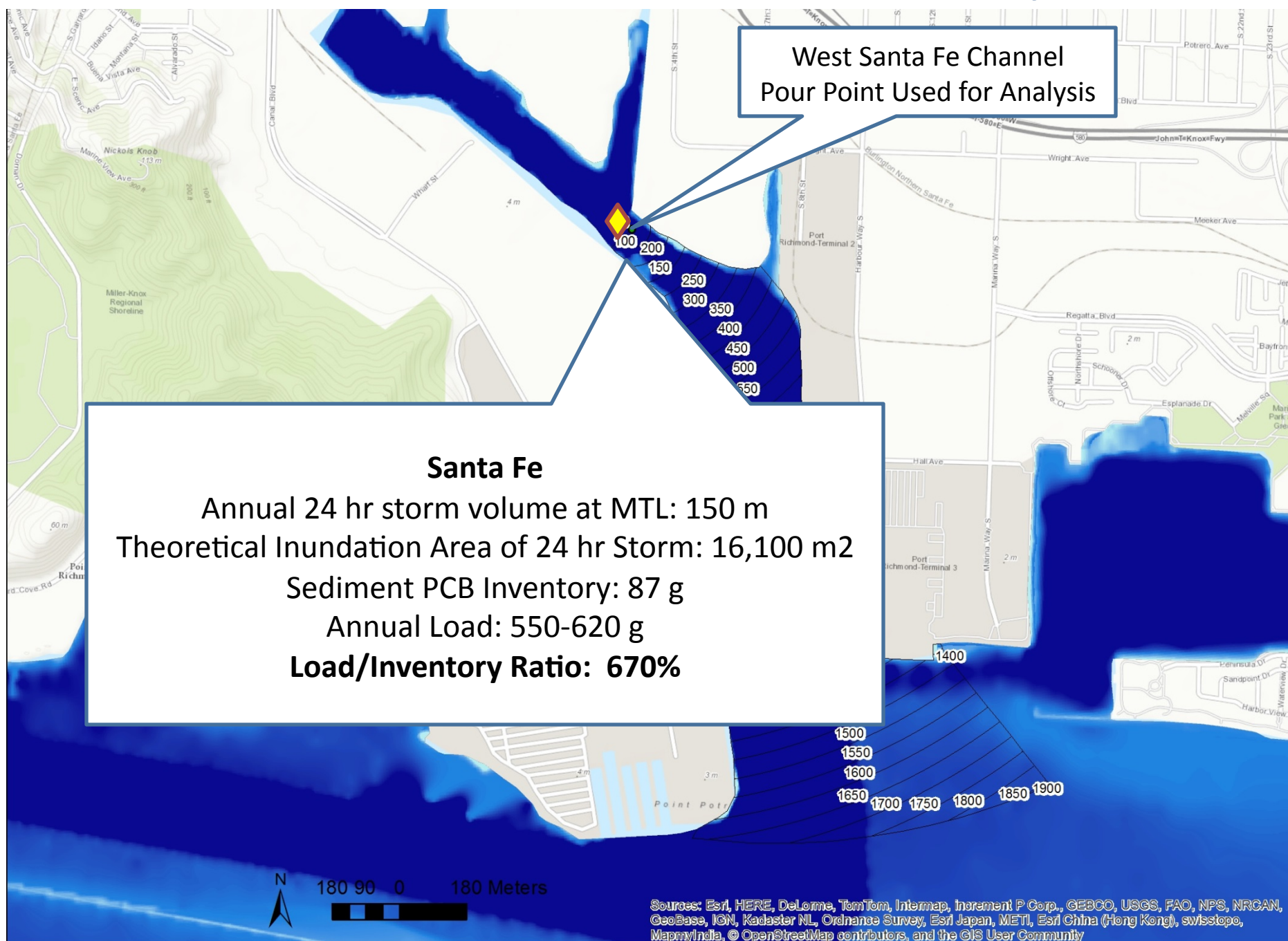
Richmond Harbor: Historical and Recent Aerial Photos



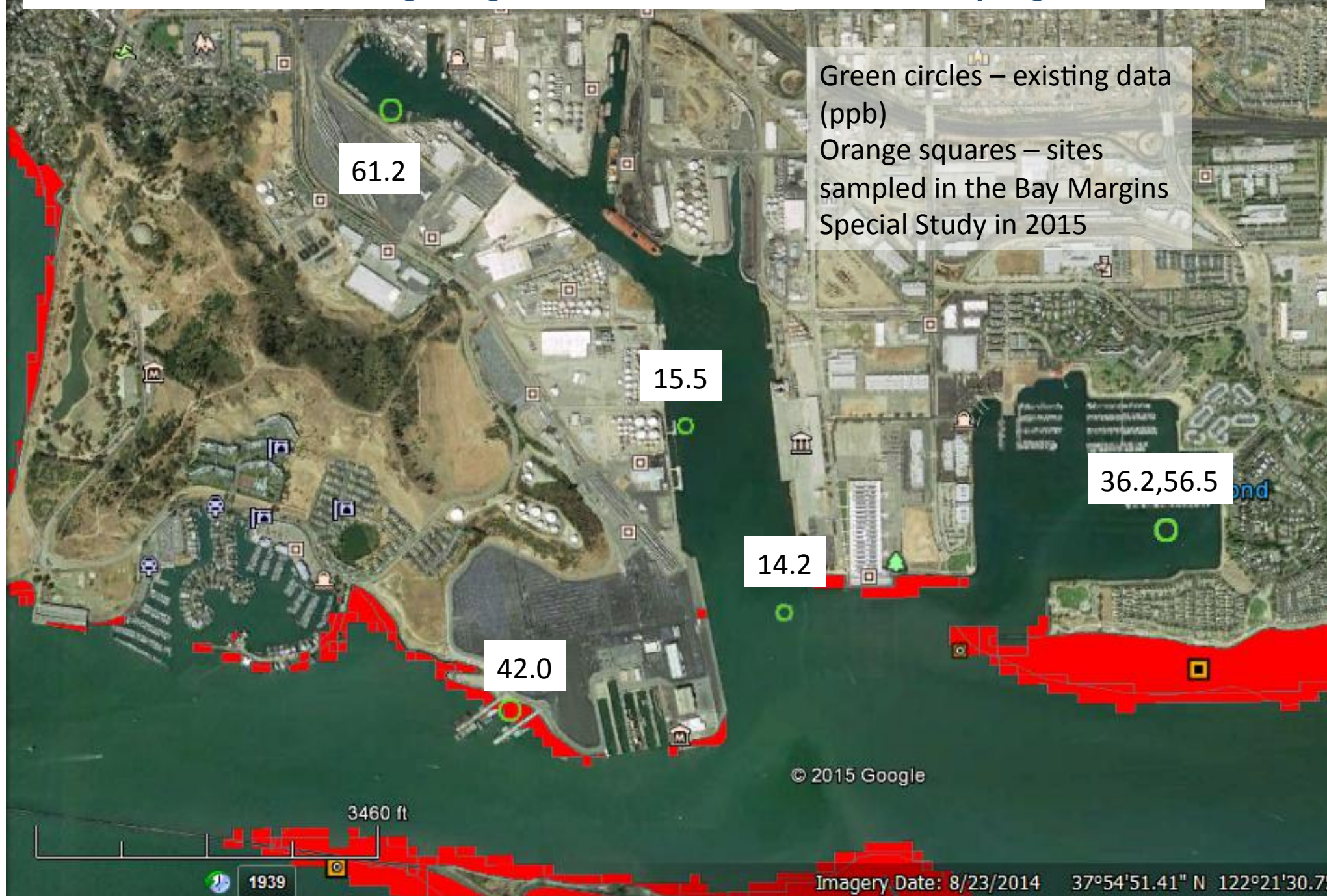
Richmond Harbor: 24 hr Storm Inundation Area and Load/Inventory Ratio



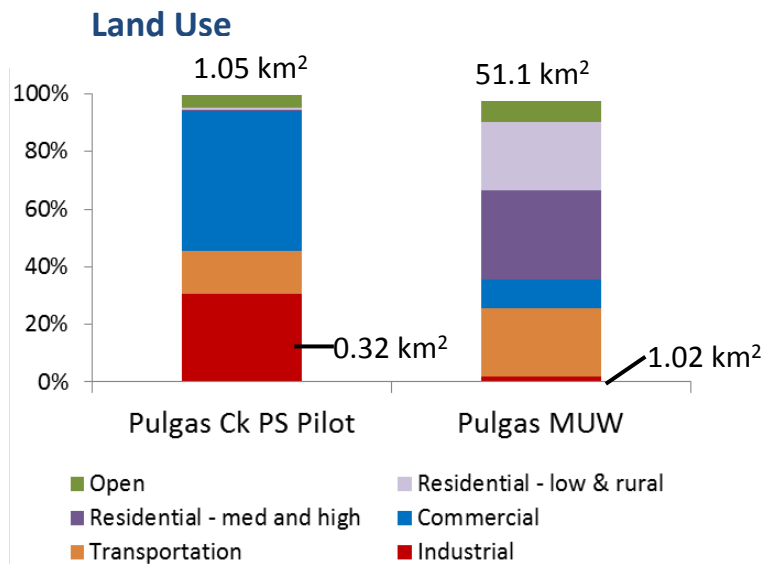
Richmond Harbor: 24 hr Storm Inundation Area and Load/Inventory Ratio



Richmond Harbor: Existing Margin Unit Sediment Data, 2015 Sampling Locations



Steinberger Slough: Land Use, Source Areas, Cleanup Sites, Loads, and Load Reductions



Management Actions

1) Bransten Rd Bioretention

ESTIMATED PCB from Margin Unit Watershed
400 - 540 g/yr

Pulgas Ck PS Pilot Watershed: 49 g/yr

Pulgas Ck excluding pilot area: 80 - 120 g/yr

Cordilleras Ck: 35 - 40 g/yr

SMC_unk15: 80 - 140 g/yr

Redwood & Arroyo Ojo de Agua Cks: 150 - 190 g/yr

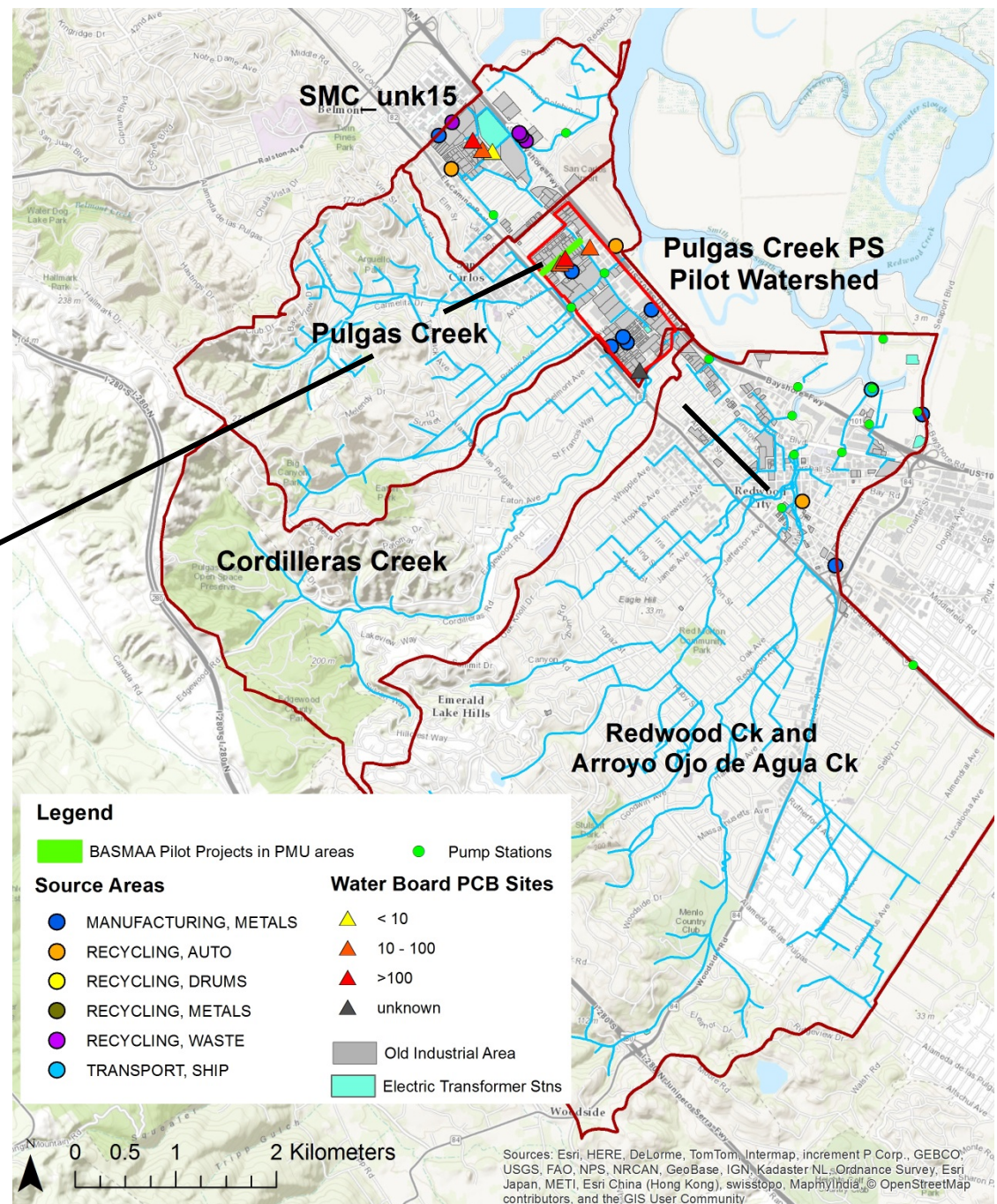
% of Load to PMU from Pilot Watershed: 10%

ESTIMATED Reduction from Currently Quantified Management Actions

0.133 g/yr

ESTIMATED % Load Reduction to Margin

<1 %



Steinberger Slough: Soil and Sediment Data

Sediment/Soil Sampling

	Avg (mg/kg)	Max (mg/kg)	N
Pulgas Ck Pump Station (only)	0.93	11.5	45
Whole watershed draining to MUW	1.2	20.3	54

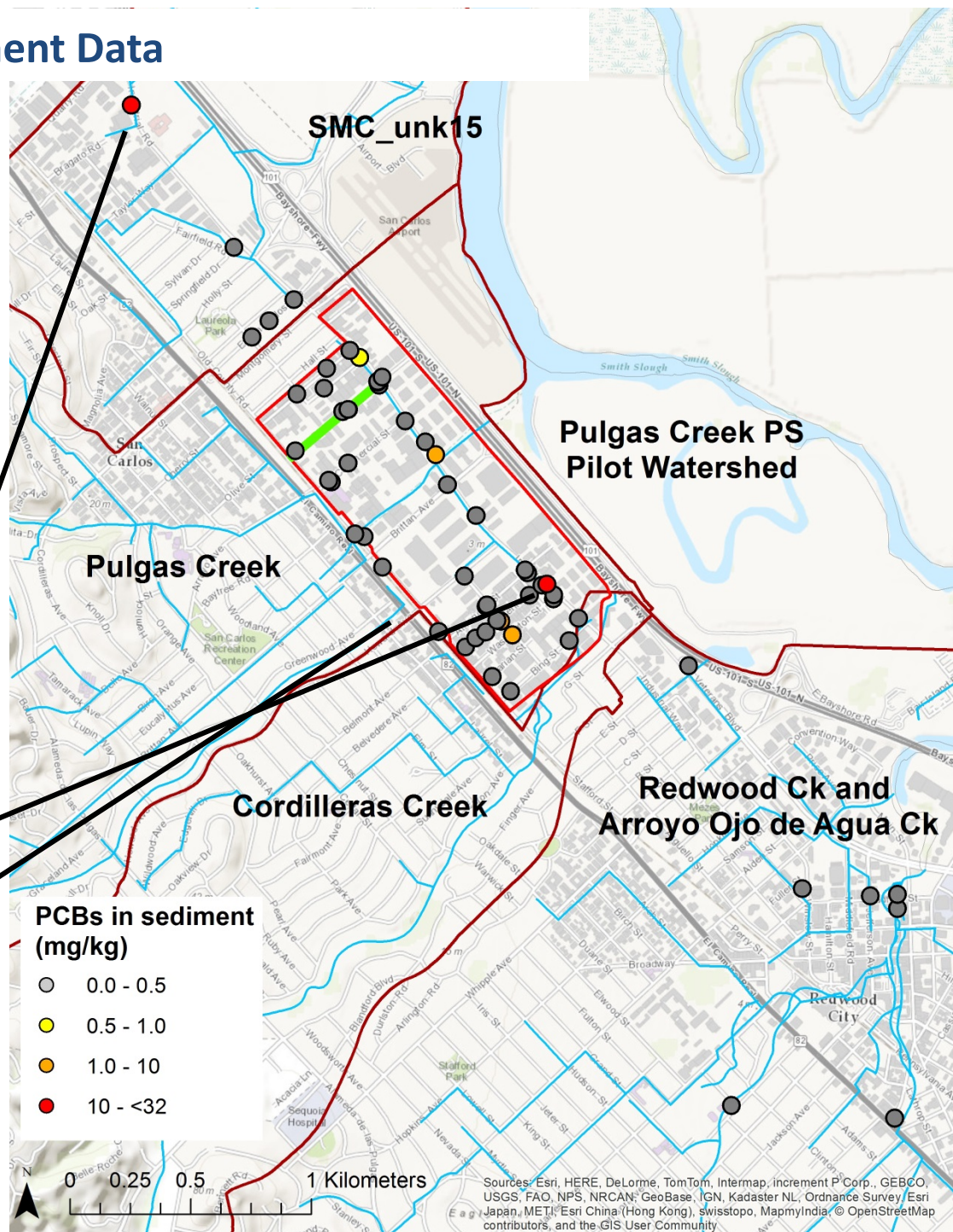
Maximum Sediment Concentration

Sampled by Kleinfelder in 2005 = 20.3 mg/kg

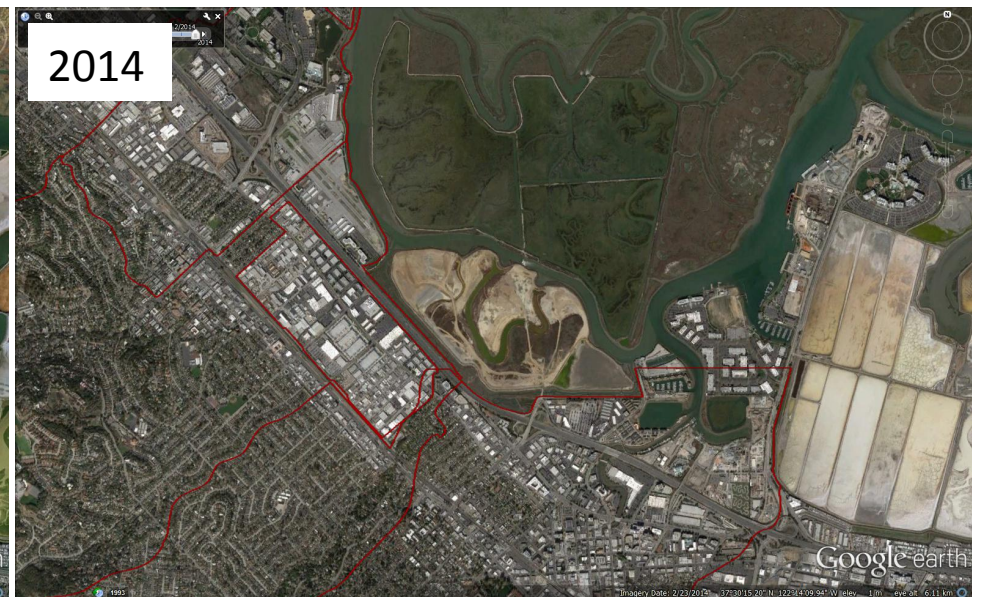
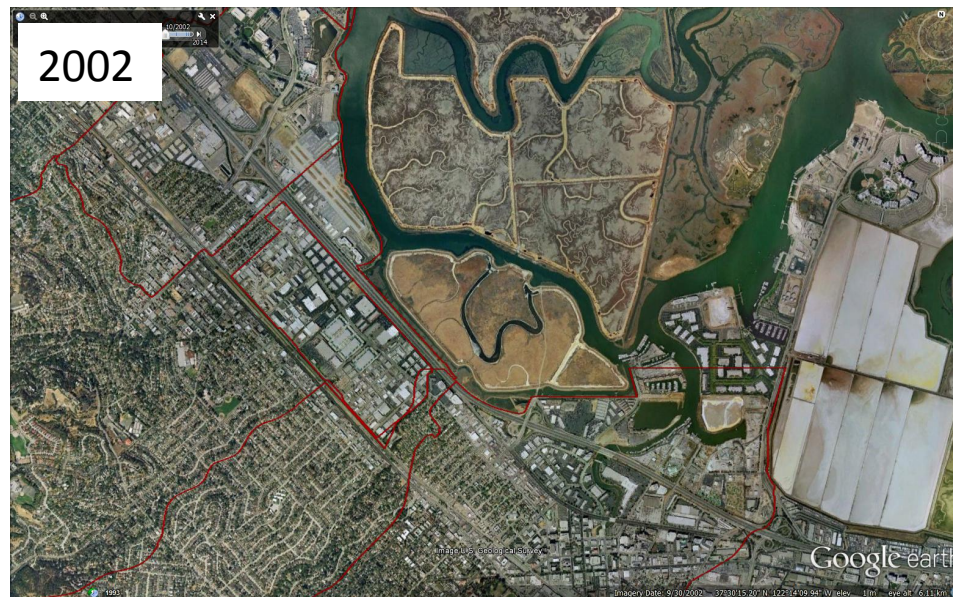
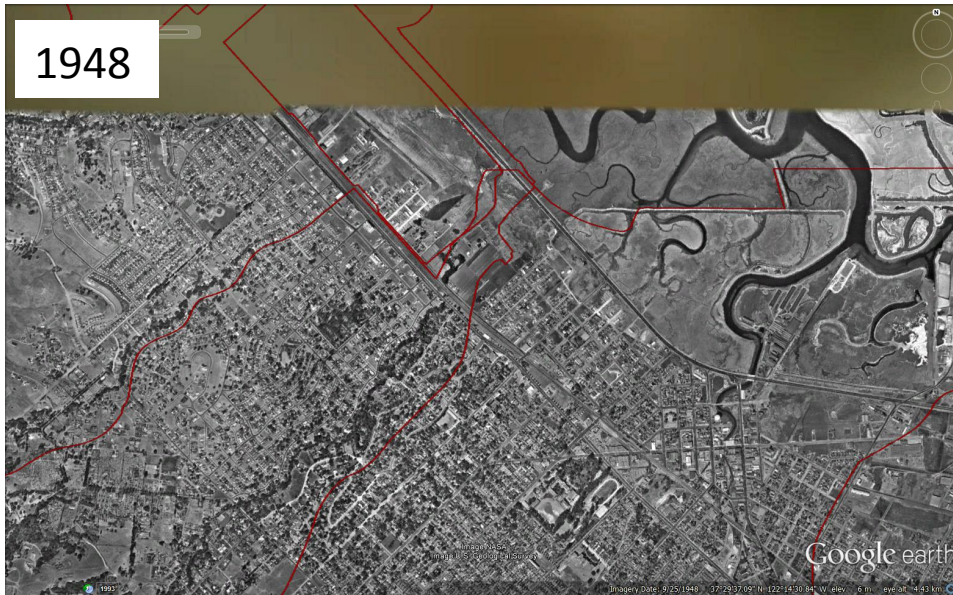
Sampled by Kleinfelder in 2005 = 11.5 mg/kg

Management Actions

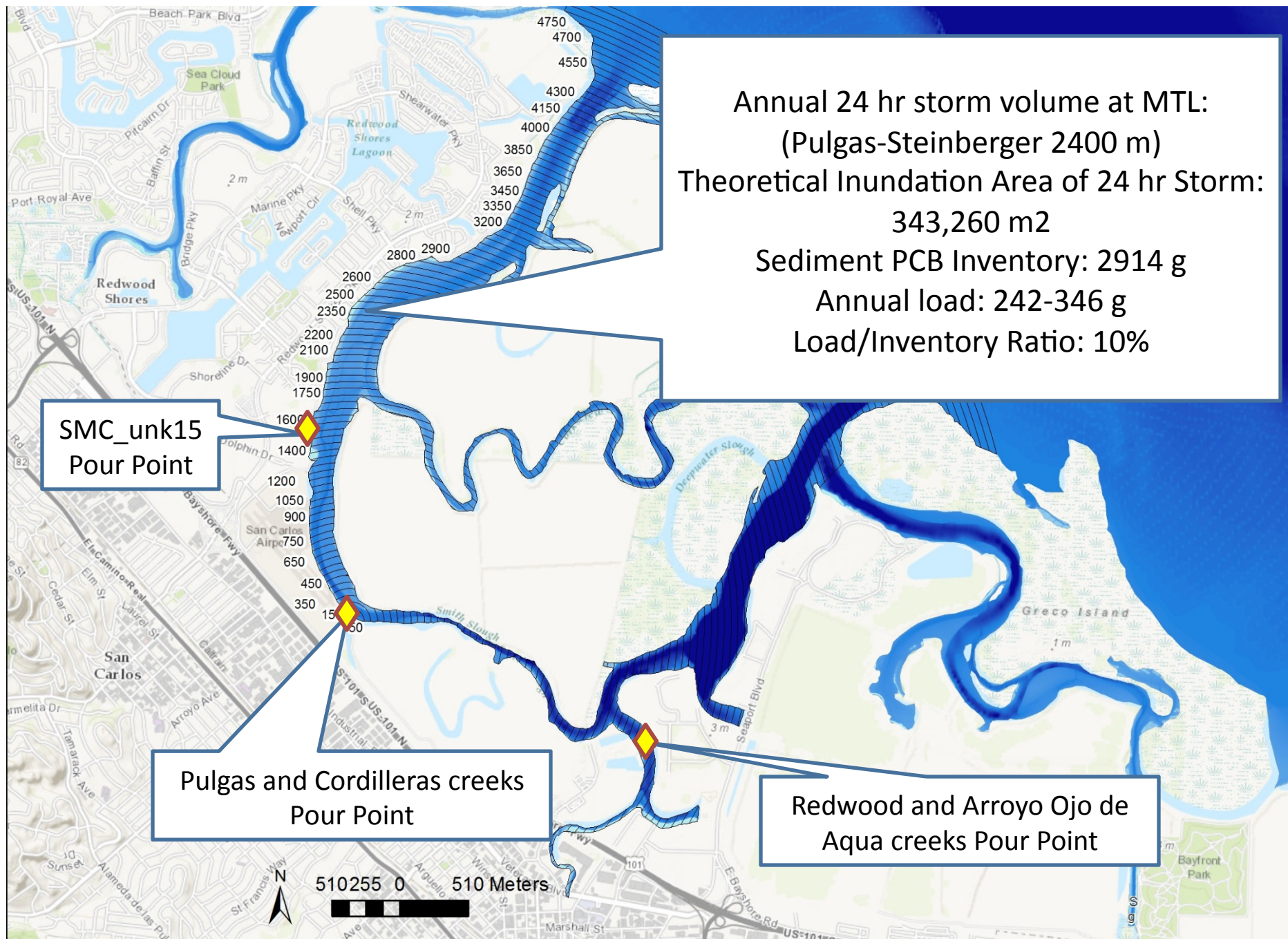
- 1) Bransten Rd Bioretention



Steinberger Slough: Historical and Recent Aerial Photos



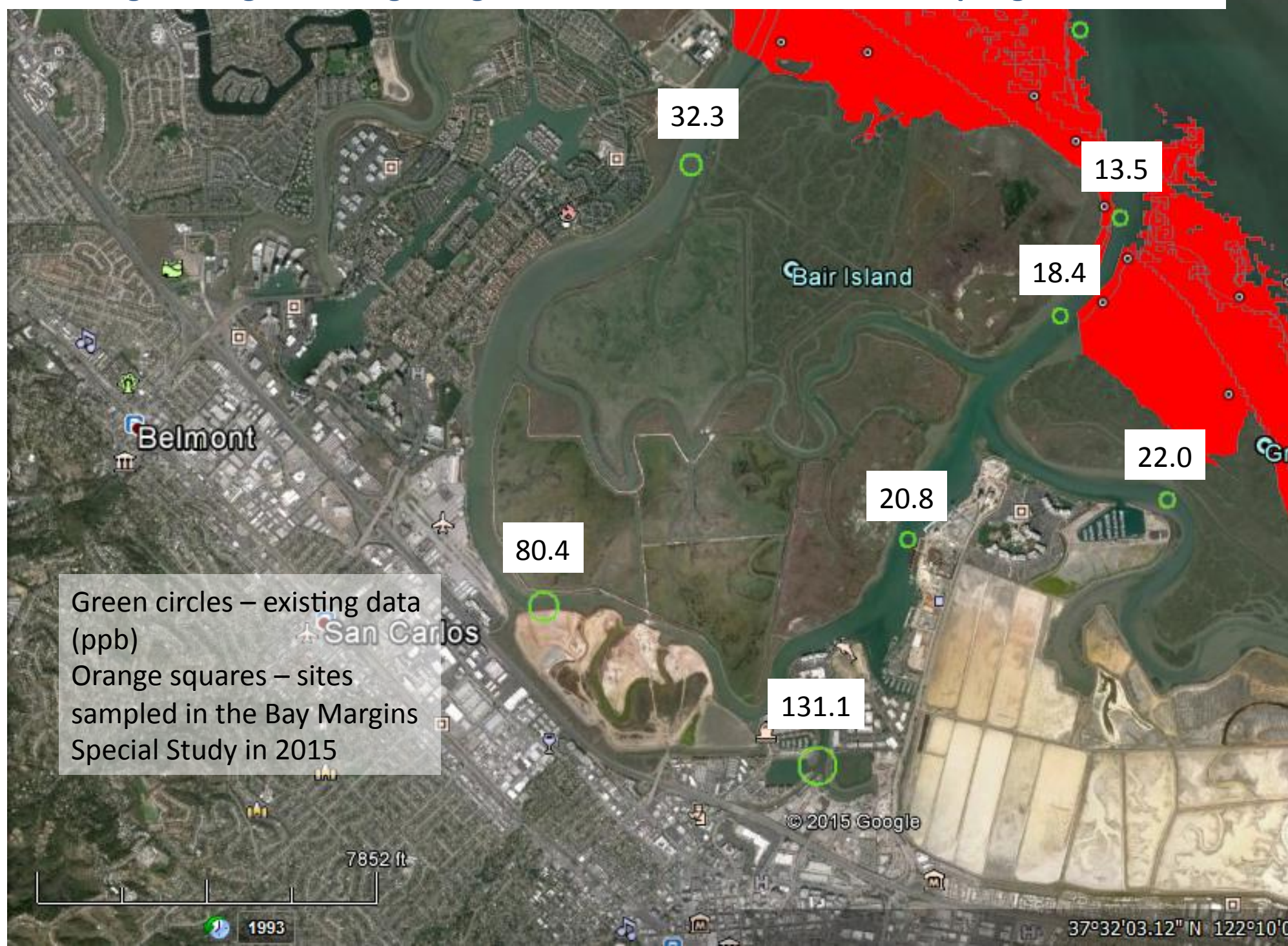
Steinberger Slough: 24 hr Storm Inundation Area and Load/Inventory Ratio



Steinberger Slough: Bathymetry



Steinberger Slough: Existing Margin Unit Sediment Data, 2015 Sampling Locations



Steinberger Slough: Bathymetry

