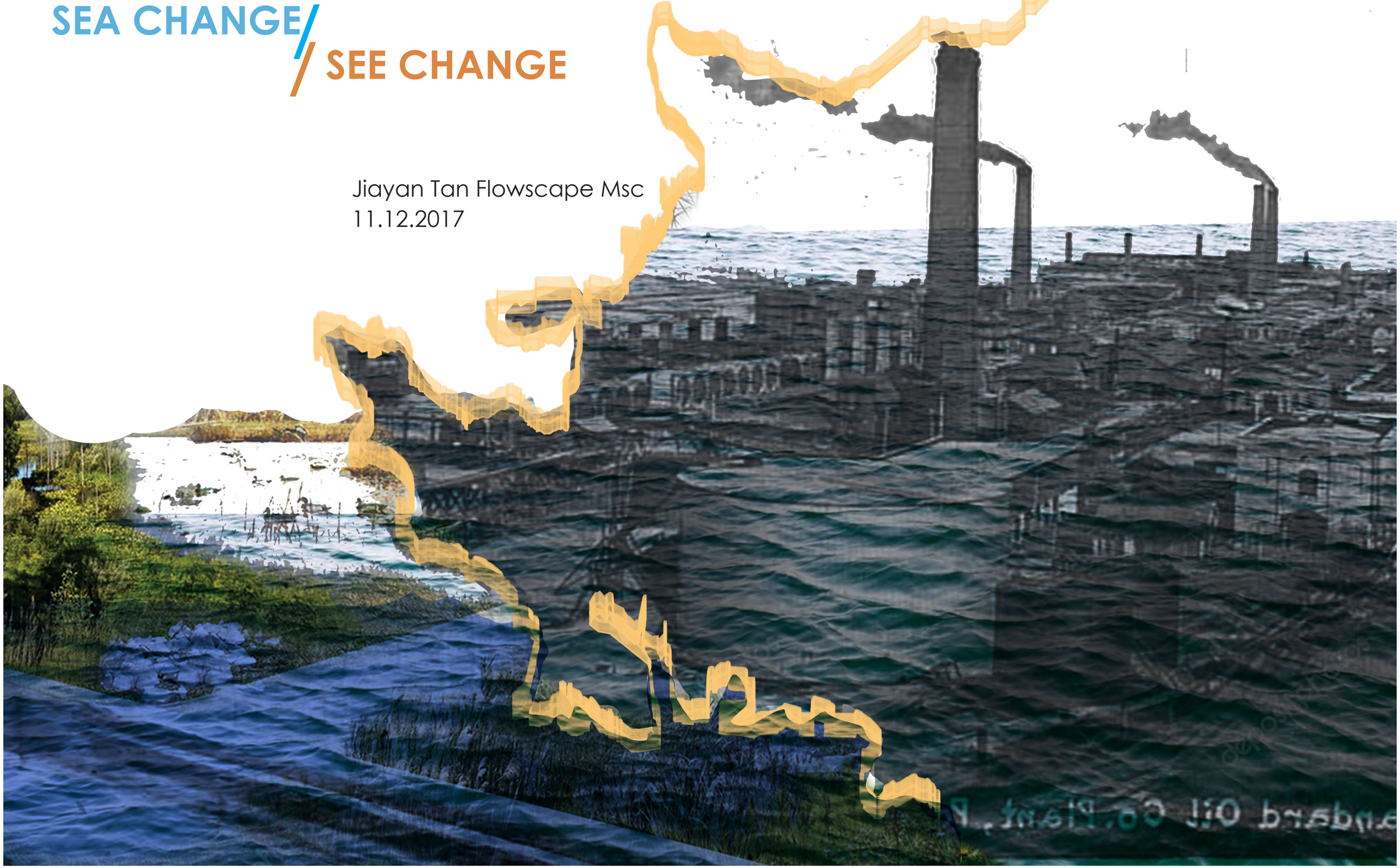
SEA CHANGE / SEE CHANGE

Jiayan Tan Flowscape Msc
11.12.2017



Fasination

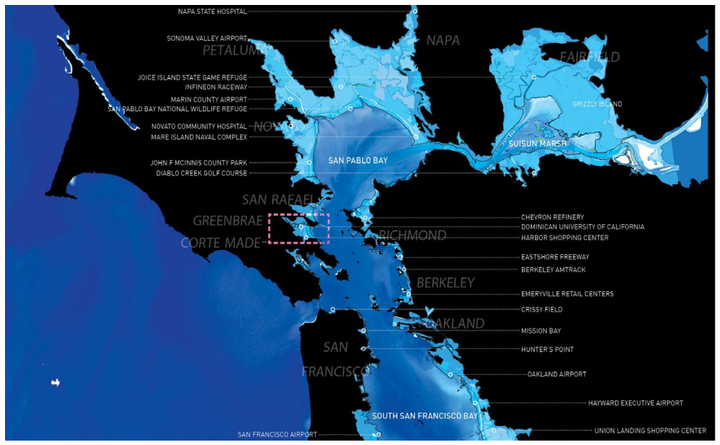
elements

river

industry

Fasination

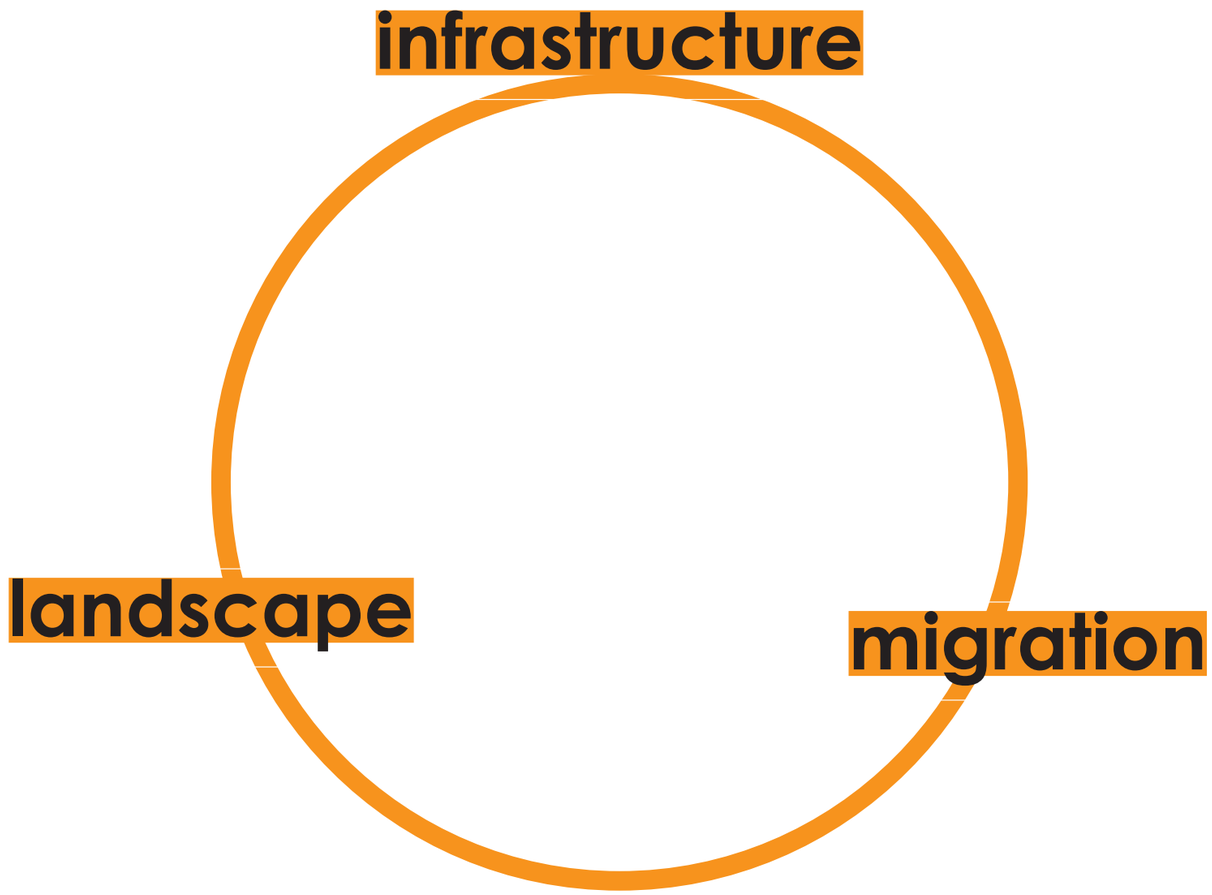
global warming and sea level rises



lake mosaic patter

urban shrinkage

Fasination



In the era of Anthropocene, we are facing accerlerating migration more than ever, which infrustructure should me choose, and how we articulate on guiding the landscape process?

Methodology

patterned movement

landscape migration

Driven Force

Critical moment

Landscape migratio n as Ecological and social phenomenon

adaptive management

interaction

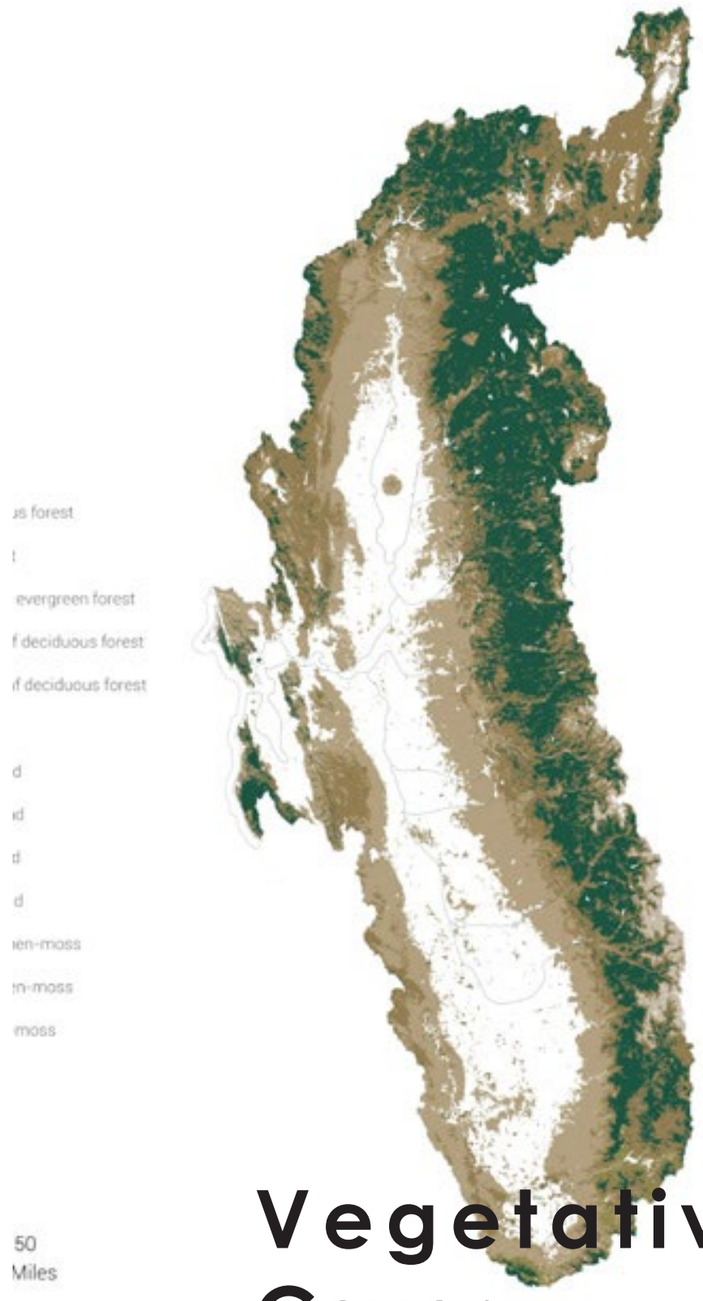
quality

infrastrcture as specify a ssemblis e are choosen an d articulated

Bay-Delta Scale

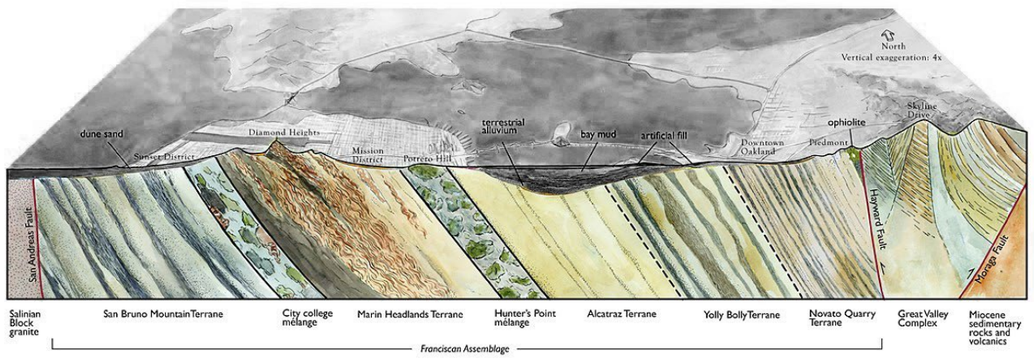
Agriculture

Urban Areas



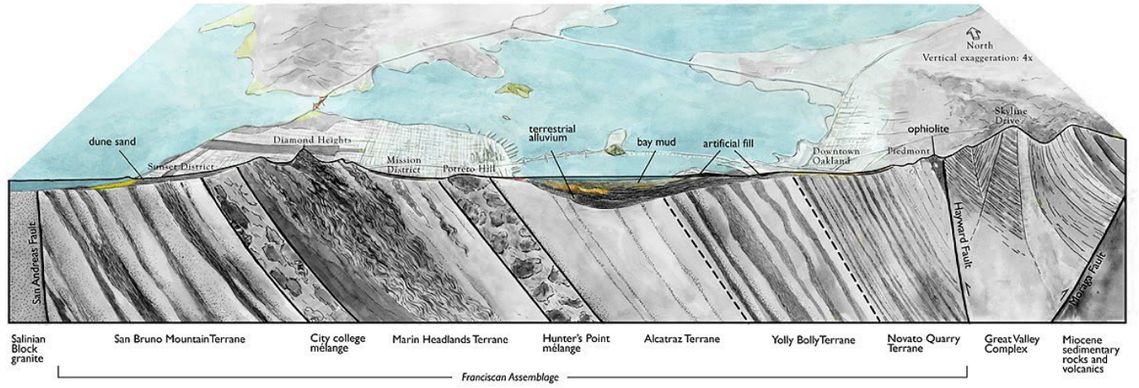
Vegetative Cover

Driven Forces in Bay scale



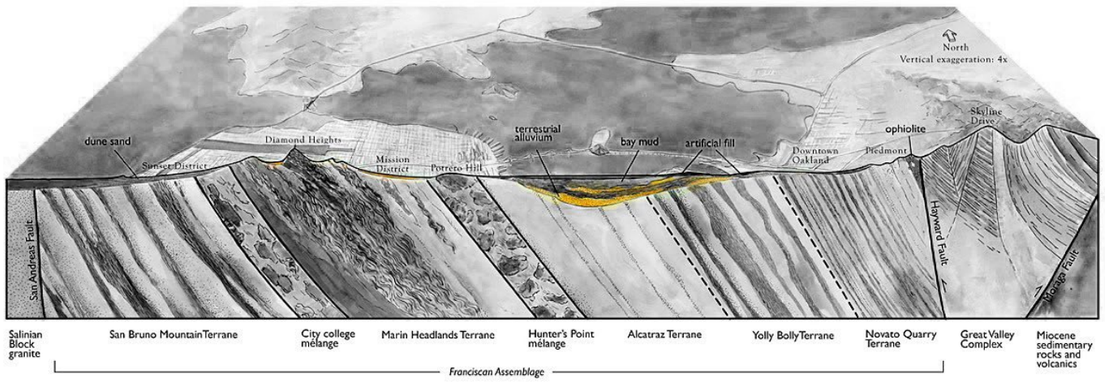
Geologic Cross-section of the San Francisco Bay Area

Crustal Movement



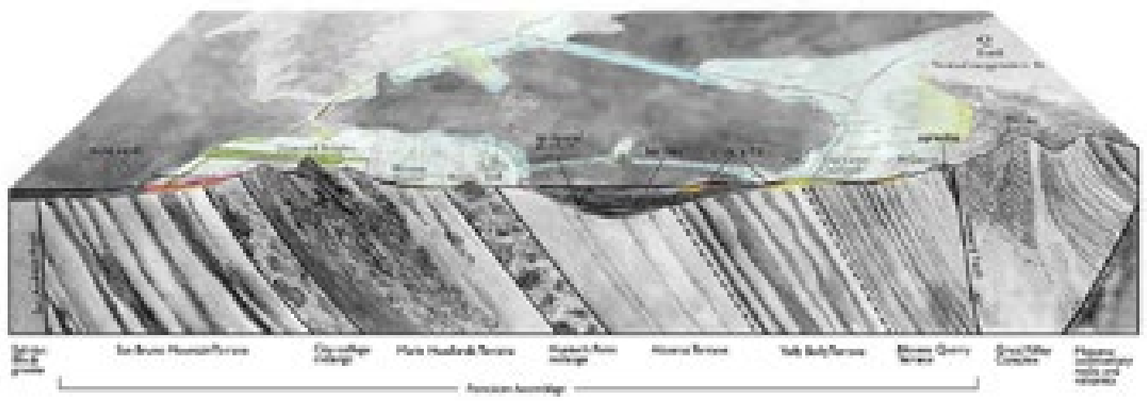
Geologic Cross-section of the San Francisco Bay Area

Sea dynamic



Geologic Cross-section of the San Francisco Bay Area

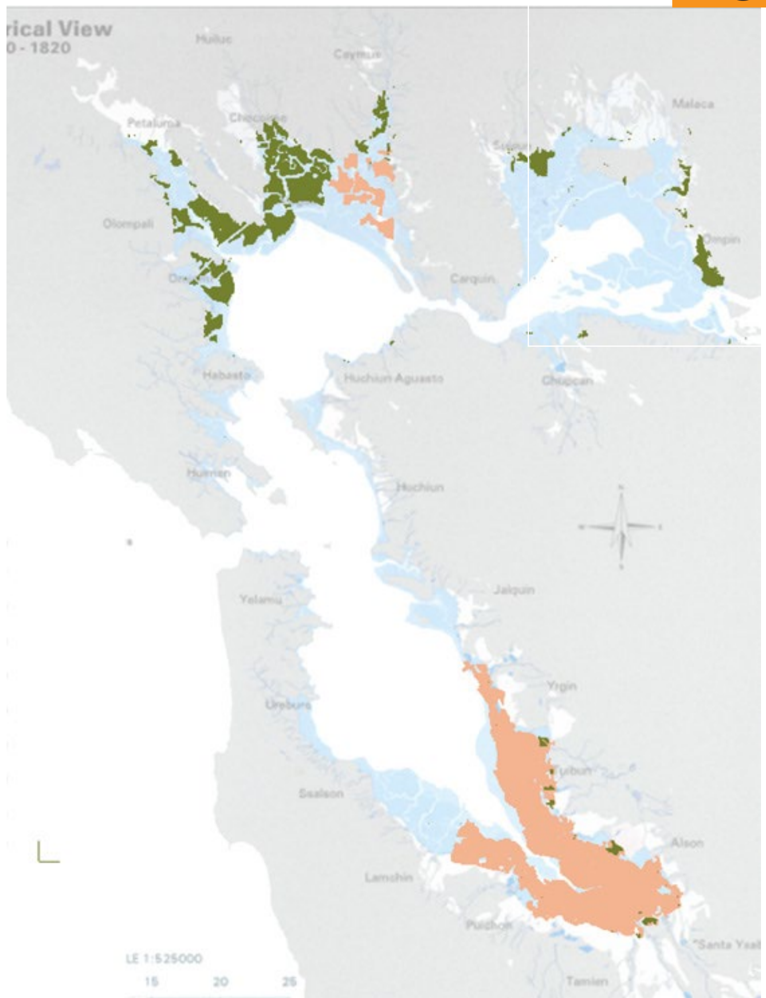
Terrestrial Alluvium

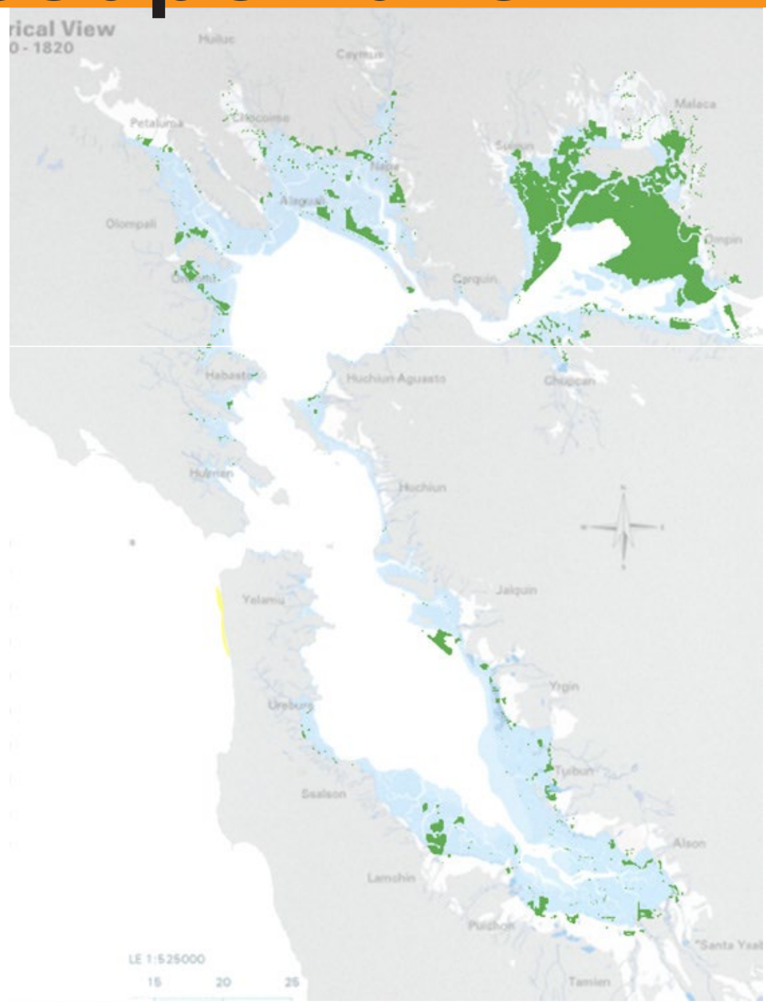


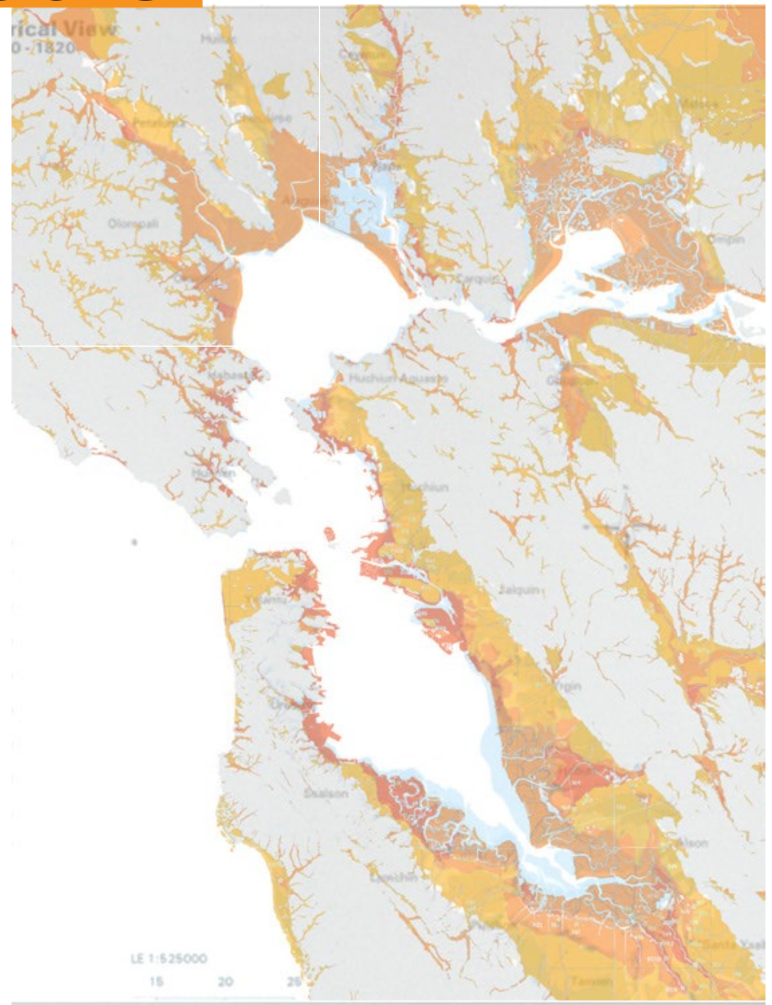
Geologic Cross-section of the San Francisco Bay Area

Anthropocenic activities

Landscape Pattern in Bay scale

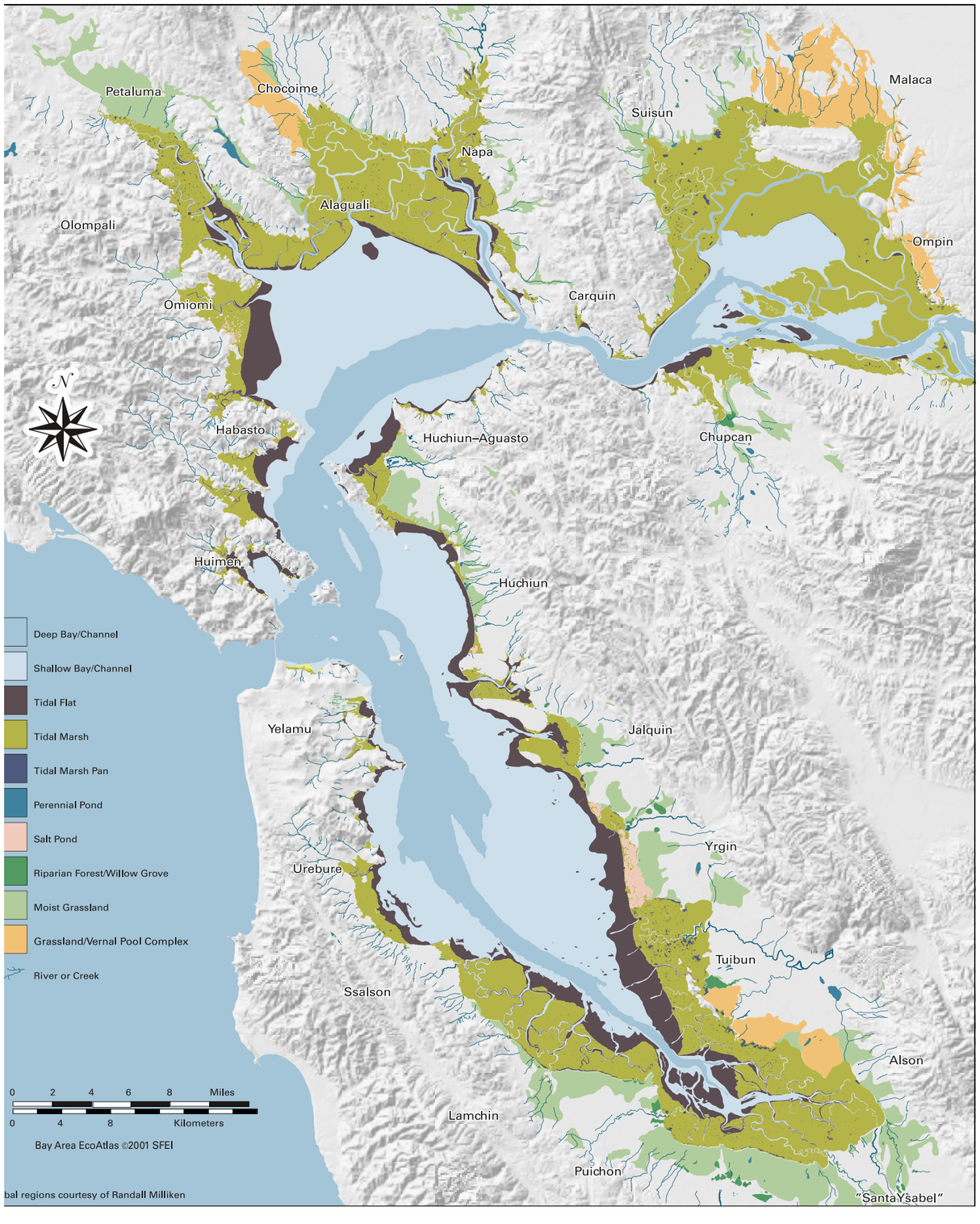




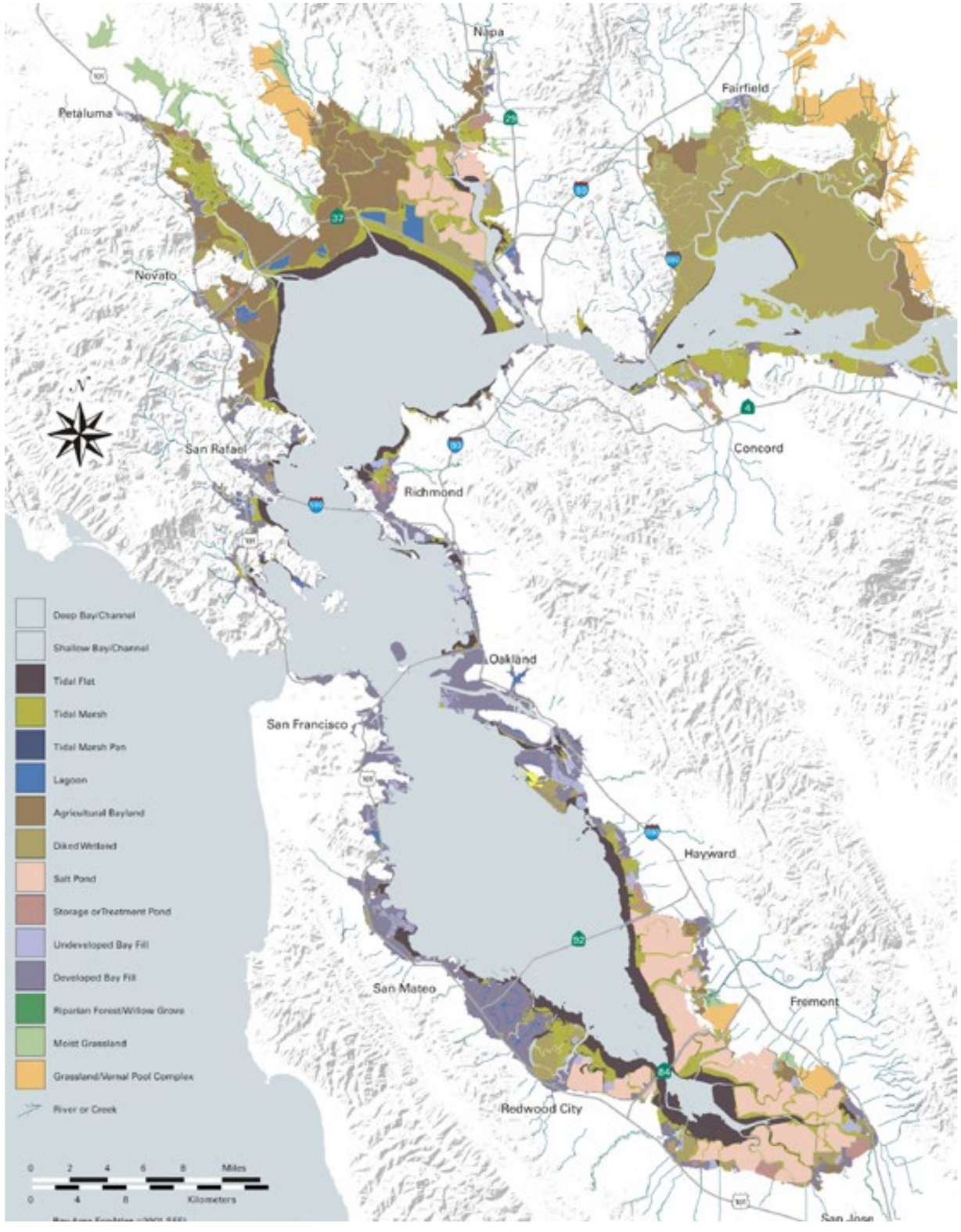


Landscape Patterned movement

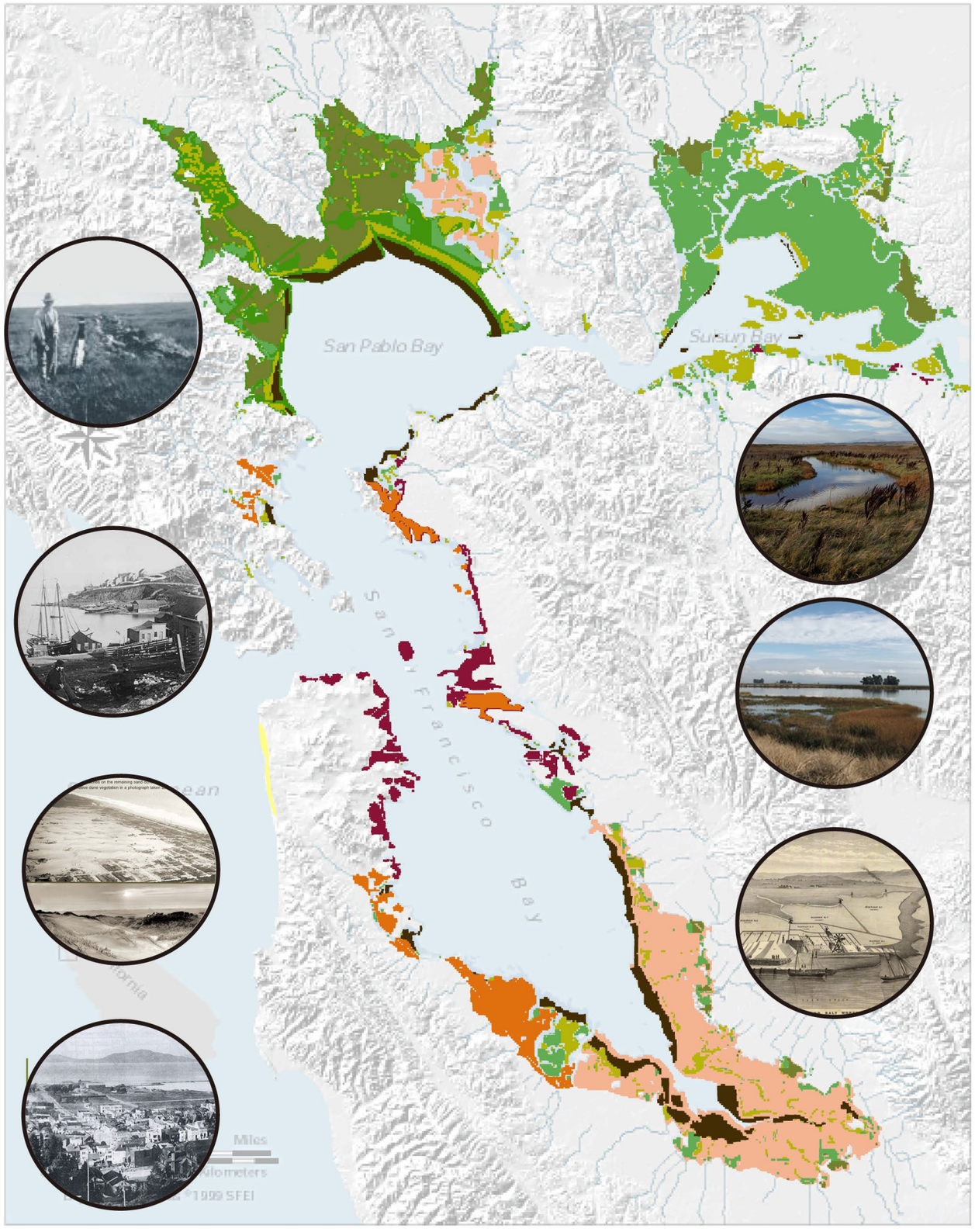
natural resources



anthropocene activities



Problem Statement



wHAT KIND OF INFRASTRUCTURE ?

1.Fortify

(Keep Water Out)

2Adapt

(Live with Water)

3 Retreat

(move to higher ground)

wHAT KIND OF INFRASTRUCTURE ?

1.ecological

- Increased habitat
- Wave attenuation
- Pollutant filtration

2.Waterfront Space

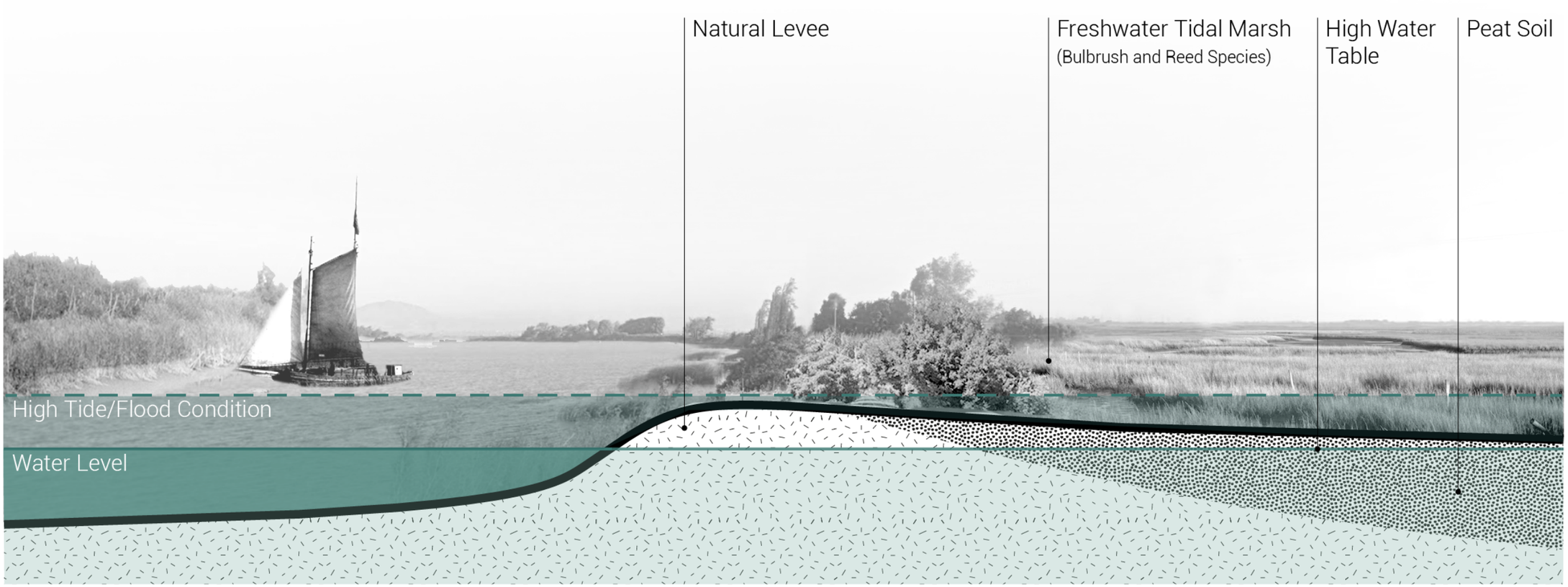
- Floodable parks
- Cultural amenities

3.new opportunities

- Aquaculture
- Maritime industry

Historical leevee study

wHAT KIND OF INFRASTRUCTURE ?



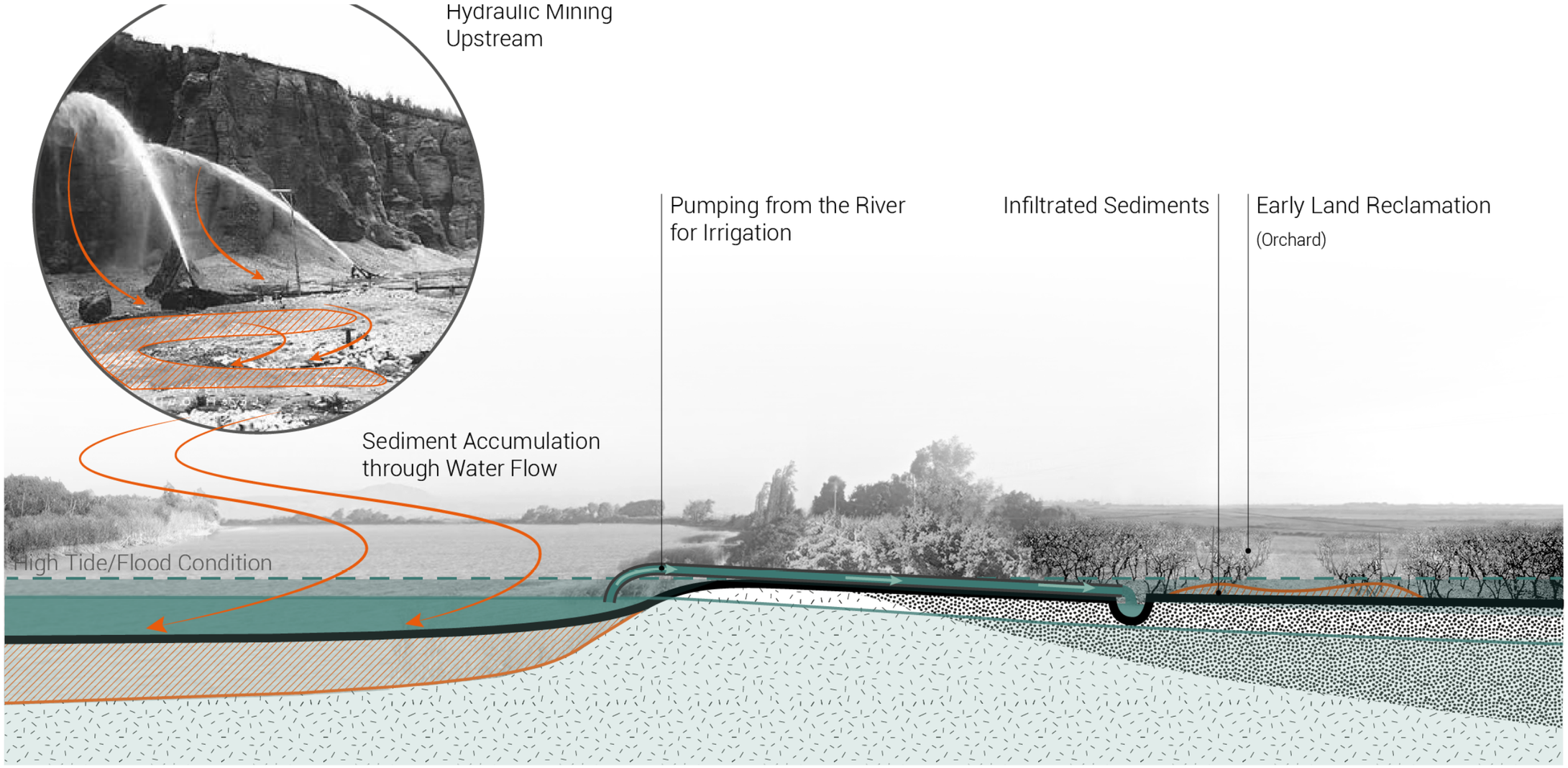
NATURAL LEVEE

Formed by sediments deposited during floods and stablized by vegetation

FRESHWATER TIDAL MARSH

The historical landscape of the central delta was tidal islands vegetated with freshwater emergent wetland of tule and willow

wHAT KIND OF INFRASTRUCTURE ?



Not to Scale

GREAT SEDIMENT PULSE -1852

Hydraulic mining debris, particularly in the Sacramento River, dramatically elevated the river bed and reduced tidal influence to 2 inches

Overwashed Sediments

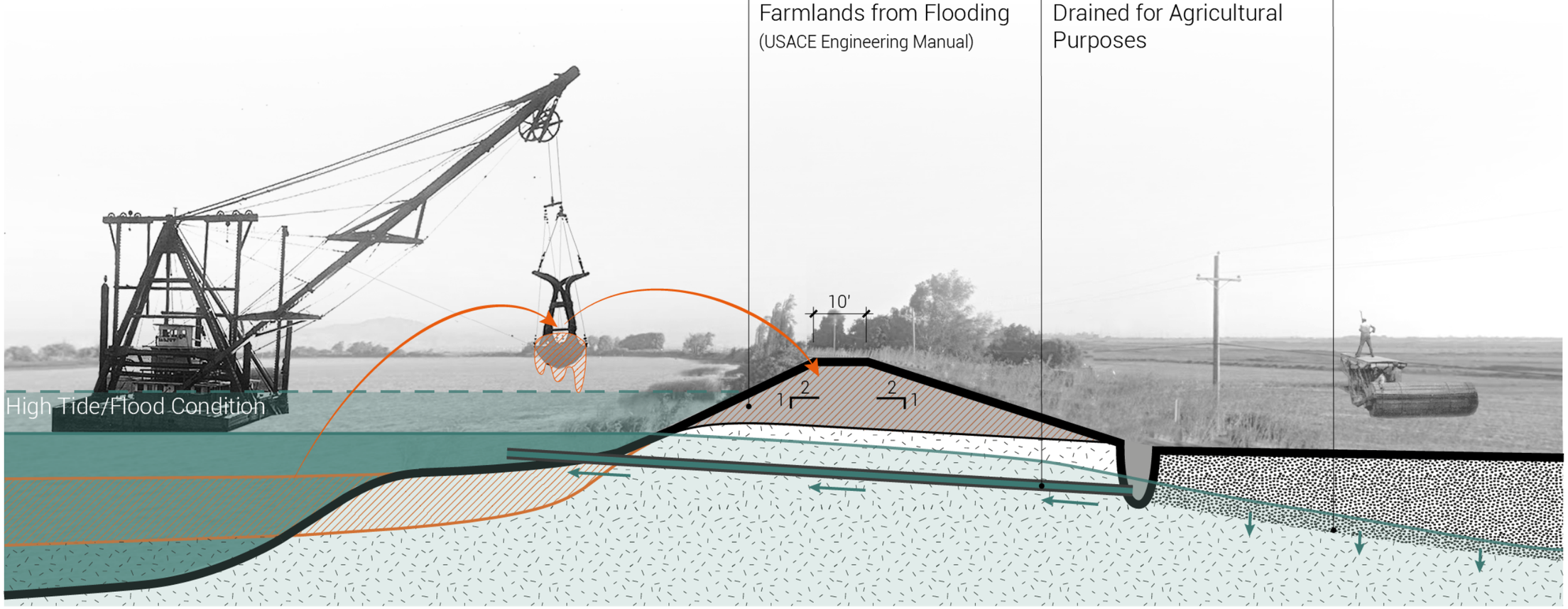
Some of the hydro sediments overwashed into the tracts by flooding, damaging the fertility of the soil

wHAT KIND OF INFRASTRUCTURE ?

Artificial Levees Prevent Farmlands from Flooding
(USACE Engineering Manual)

Highly Saturated Soil was Drained for Agricultural Purposes

Water Table Dropped



CLAMSHELL DREDGING -1880s

Clamshell dredge invented to deepen shipping channels

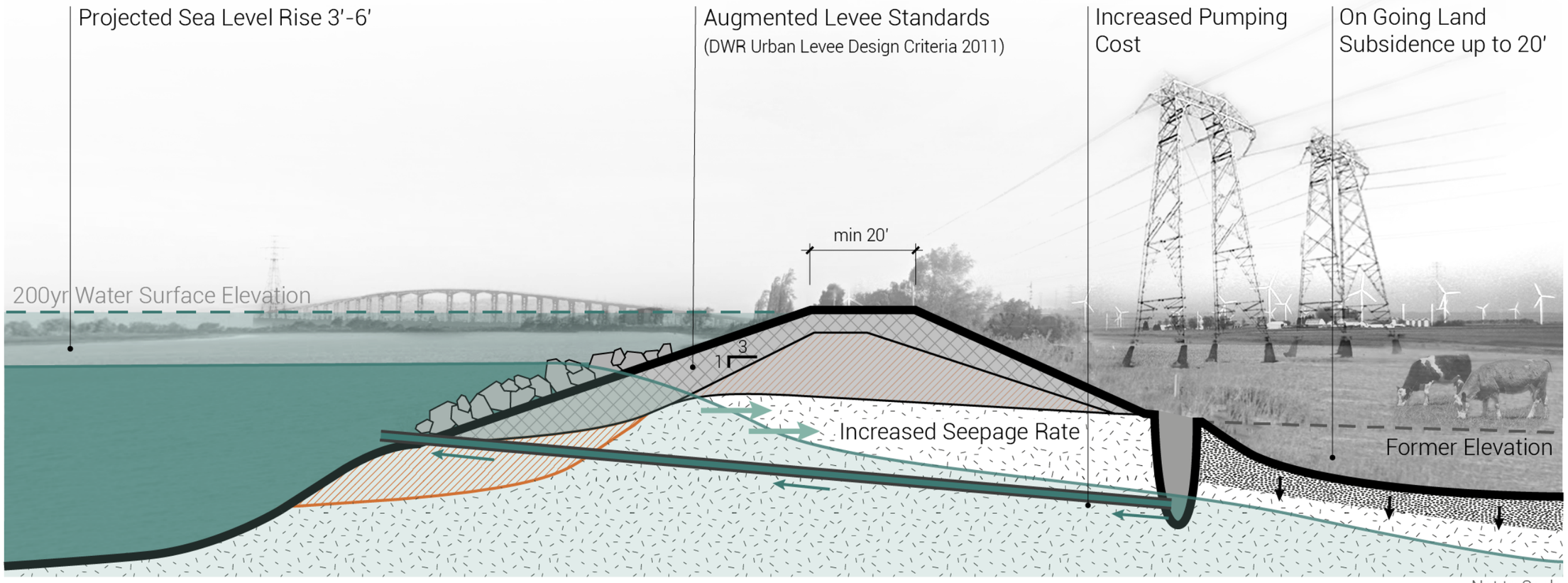
LEVEE CONSTRUCTION

Development of levee system to prevent tidal inundation of land in central delta

LAND RECLAMATION

Reclamation started in the 1850s, and was encouraged in the 1860s-70s. By the 1930s, the delta was almost reclaimed.

wHAT KIND OF INFRASTRUCTURE ?



Not to Scale

SEDIMENT SHORTFALL

Dams, river bank protection, and flood management contribute to the deficit of sediment supply to the Bay-Delta Esturary

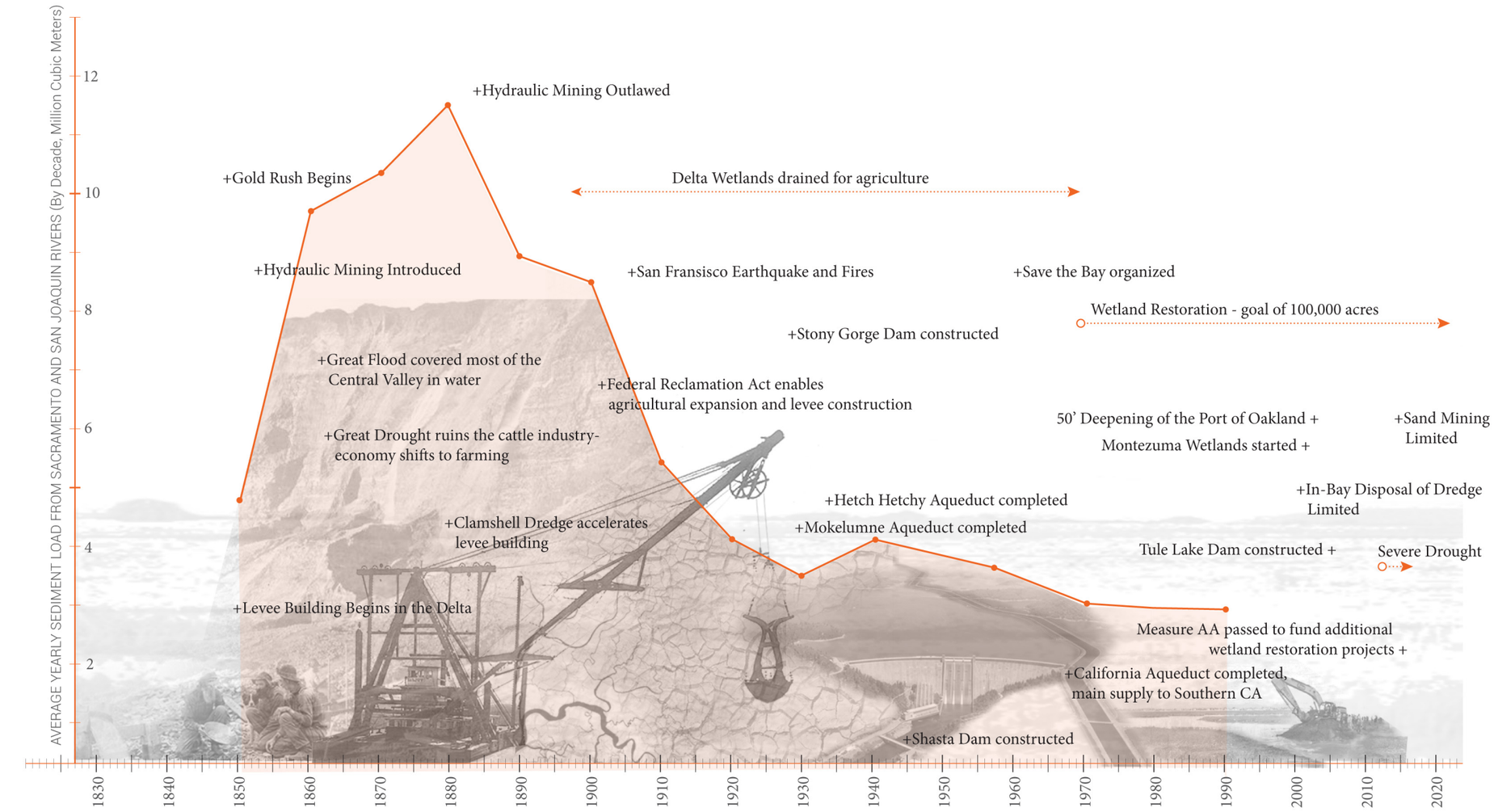
LEVEE AUGMENTATION

Rising flood levels, frequent failure of old levees, and sea level rise demands the reinforcement of levees to protect farmland and infrastructure

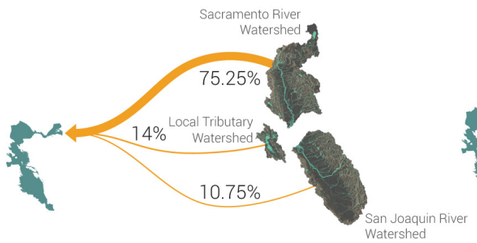
ELEVATION DIFFENCE BETWEEN LAND AND WATER

Surface elevation of the land significantly lower than the water level

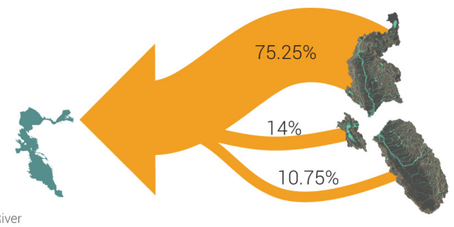
Critical moment in Sediment resources



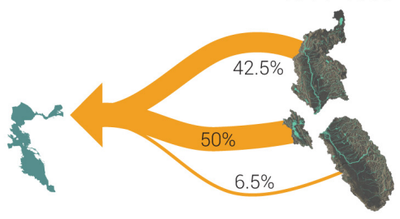
1.5 Mm³ ANNUAL SEDIMENT LOAD



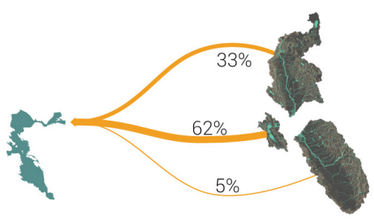
13.5 Mm³ ANNUAL SEDIMENT LOAD
1849-1914



6.6 Mm³ ANNUAL SEDIMENT LOAD
1914-1966

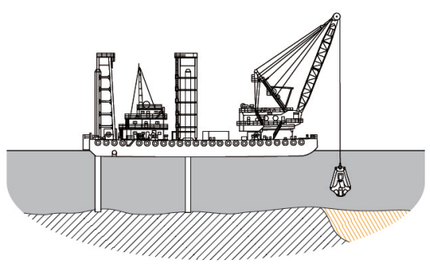


2.7 Mm³ ANNUAL SEDIMENT LOAD

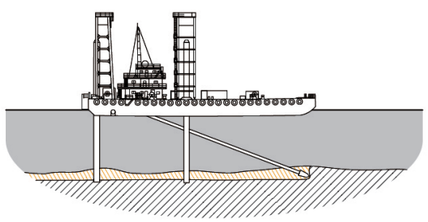


Driven Force

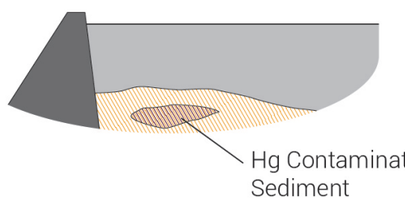
Sediment Sinks



Clam Shell Dredge
$10.46/CY

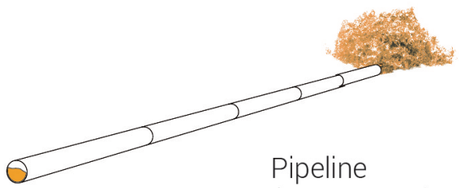


Hydraulic Dredge
$8/CY

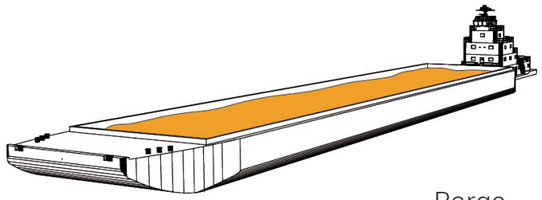


Removal of Sediment Behind Dams
$10.50/CY

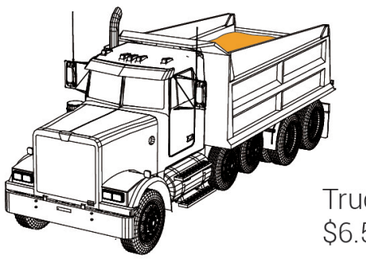
Conveyance



Pipeline
$0.05/CY/mi

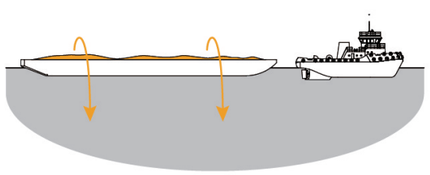


Barge
$1.14/CY/mi

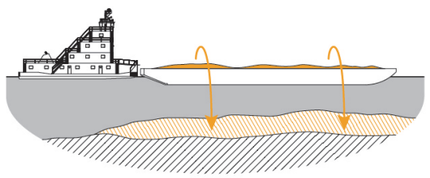


Truck
$6.50/CY/mi

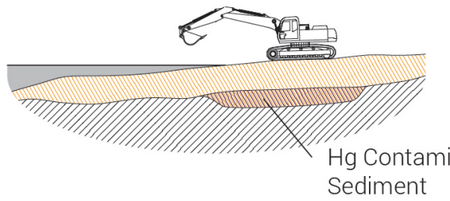
Sediment Sources



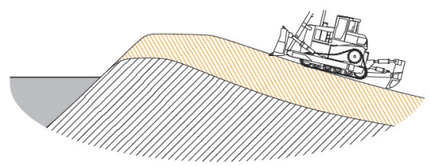
Deep Ocean (8,200-9,840') $23-25/CY
Open Ocean (36-47) $11/CY



Near Shore (29-46') $11/CY
In-Bay (12-372') $9-11/CY

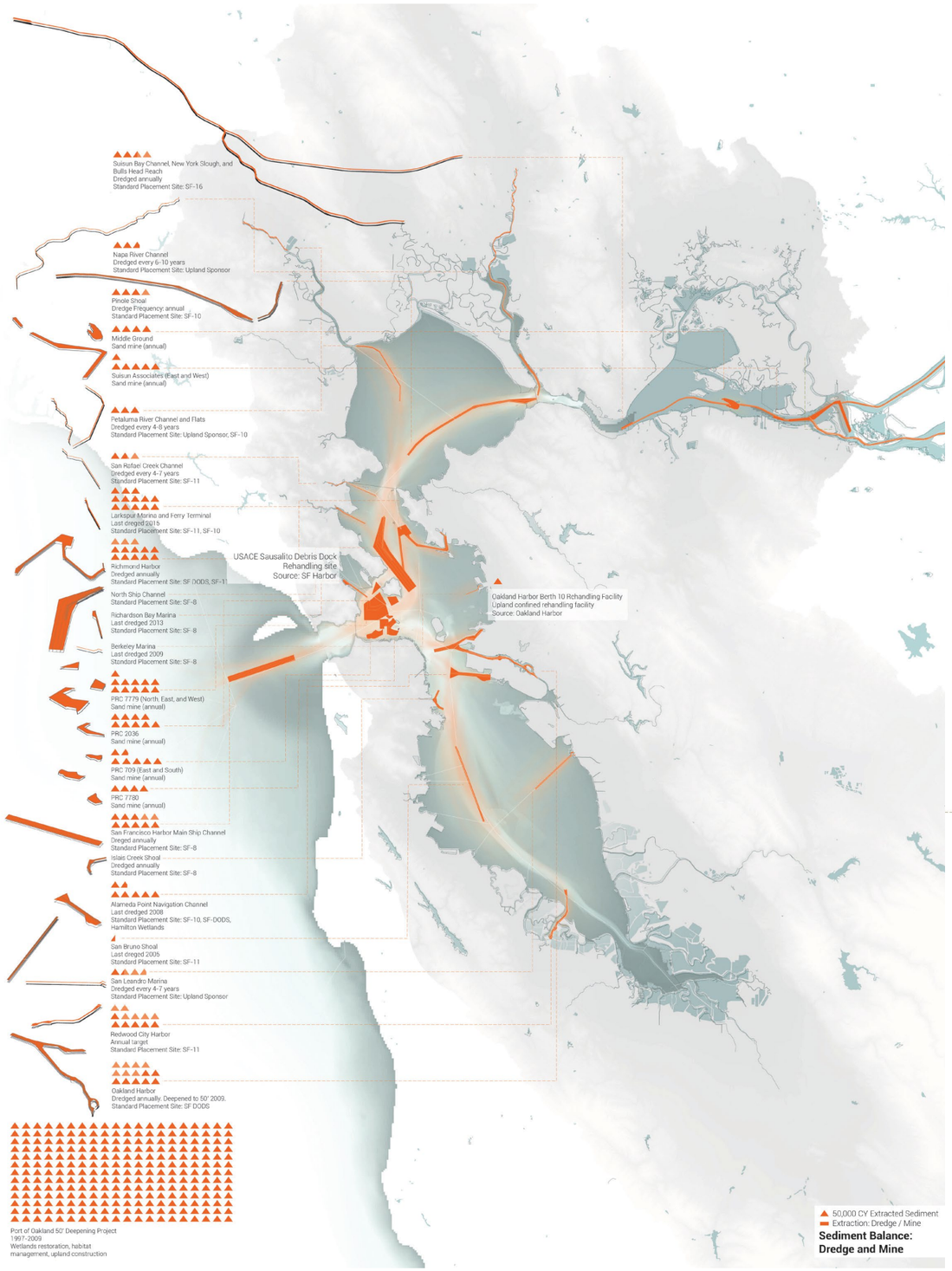


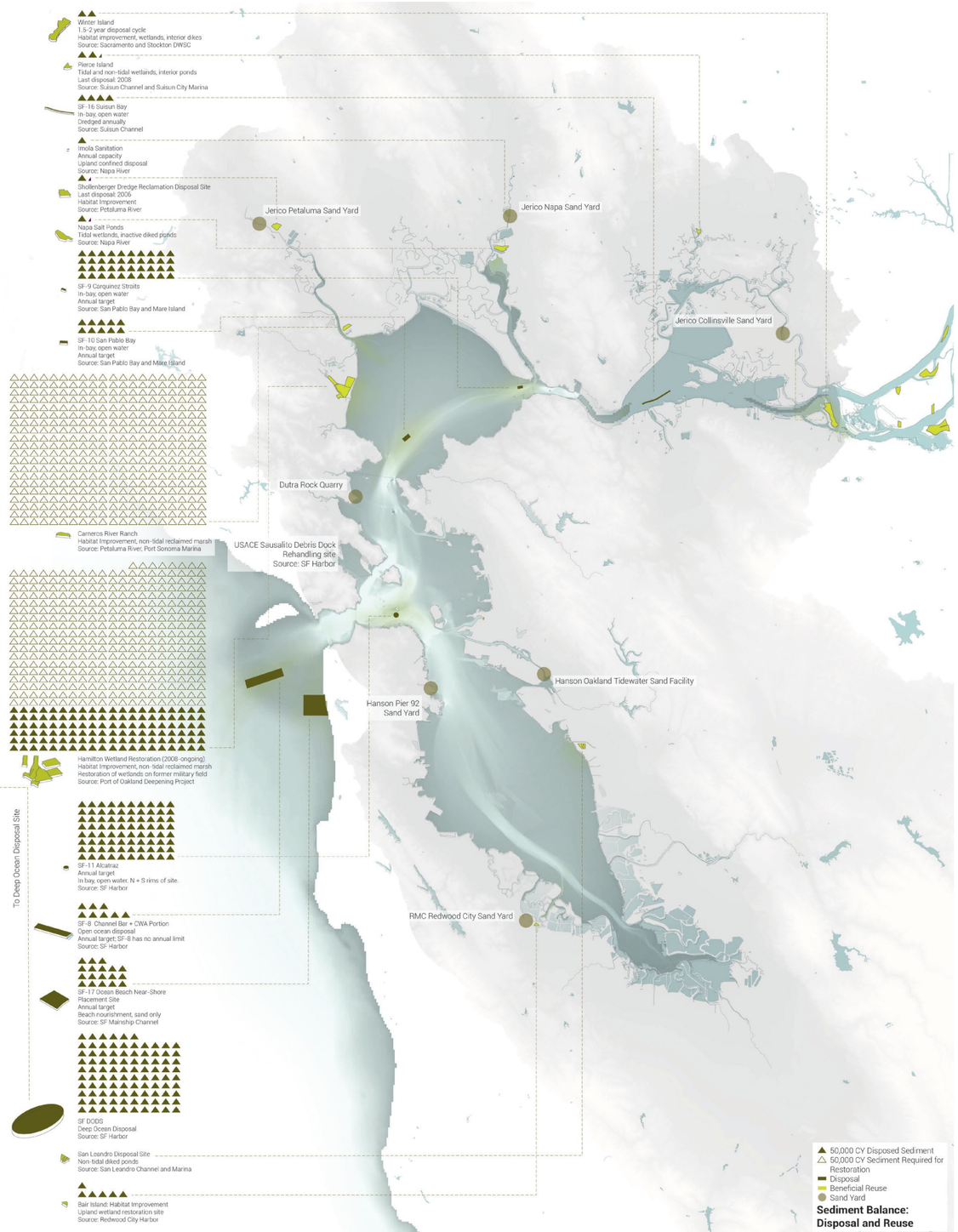
Wetland Restoration $25-30/CY
Contaminated Sediment Disposal $31-55/CY



Levee Maintenance $24/CY

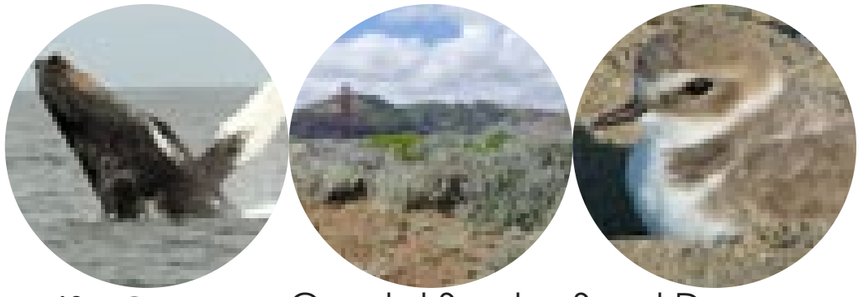
Sedimentation dynamic in bay area





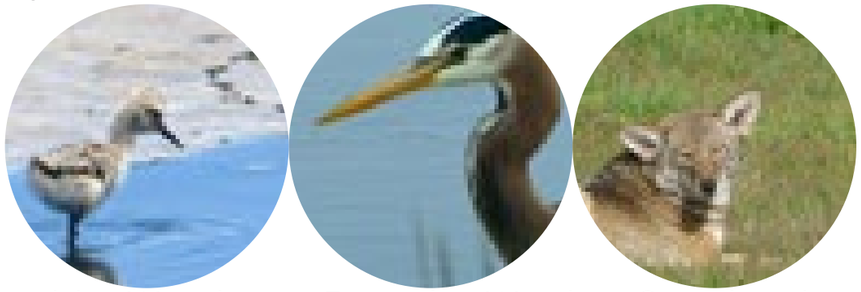
Dredging activities impact on Natural habitat

people environment flora and fauna

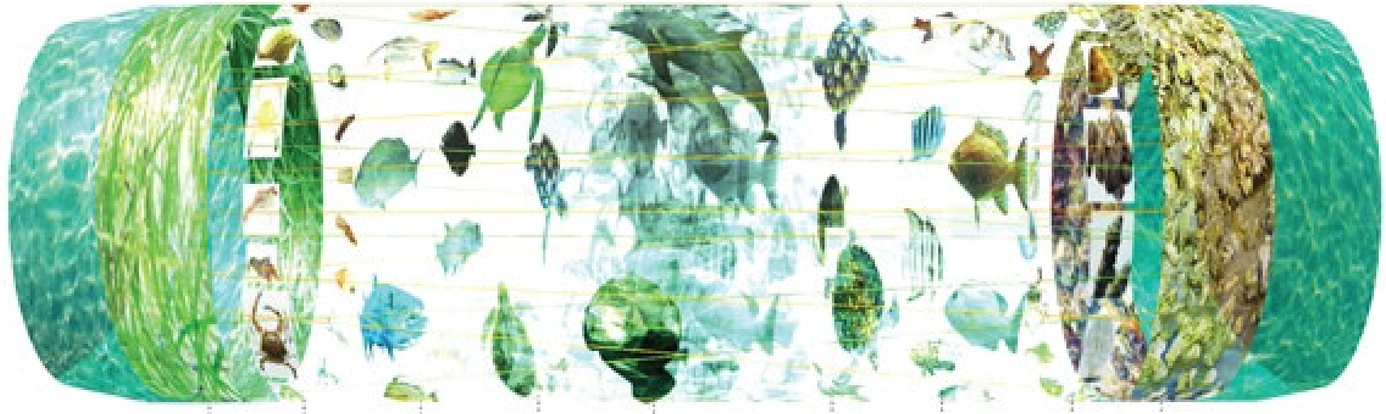


Pacific Ocean Coastal Scrub Sand Dunes

San Francisco Bay Oak Woodlands Riparian

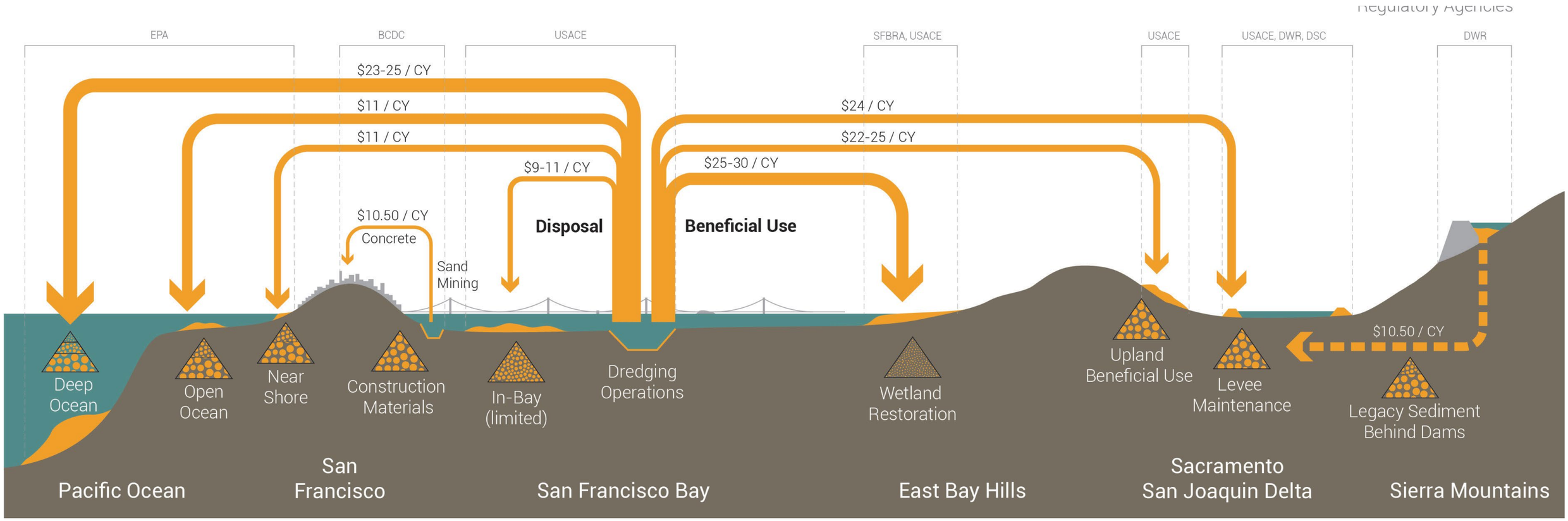


Salt Water Wetlands Fresh Water Wetlands Grasslands



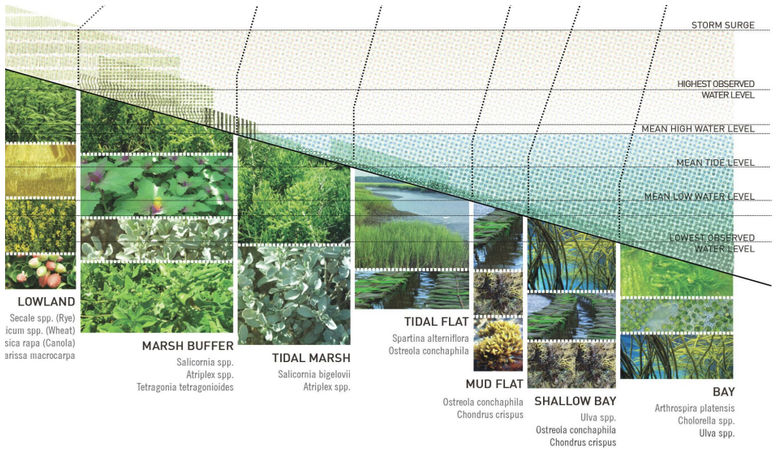
Tampa Bay Food Web

Beneficial use of Dredging Materials

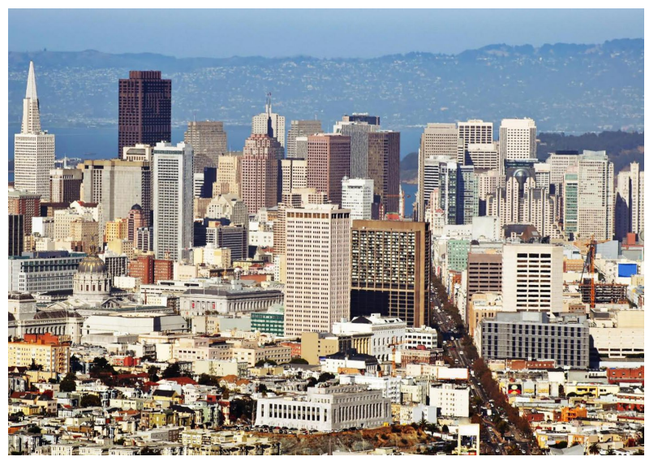


A intergreted leeve system

Water defence
Water resilience

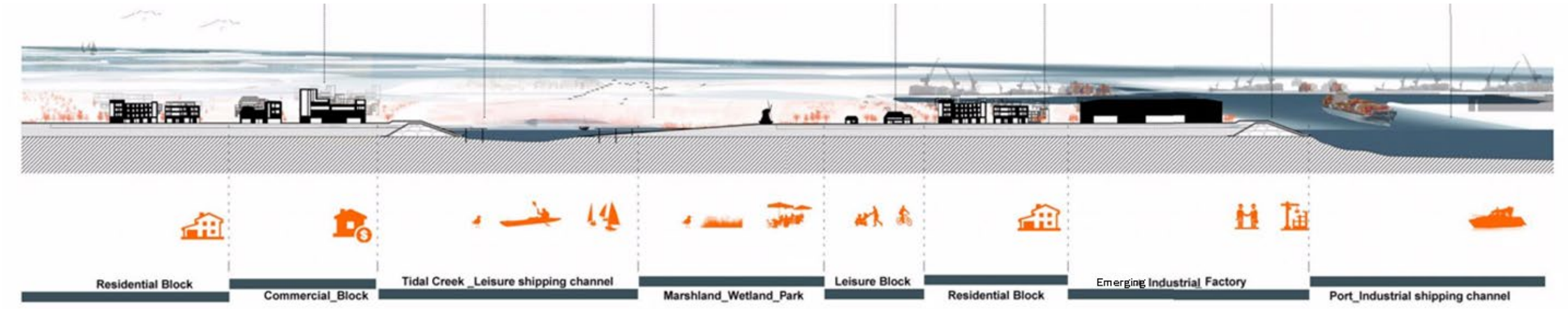


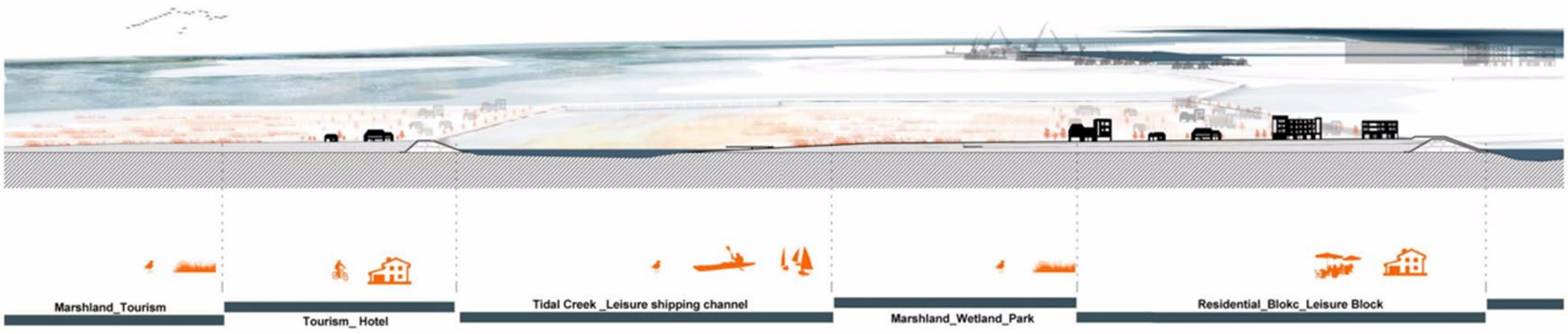
habitate Restoration



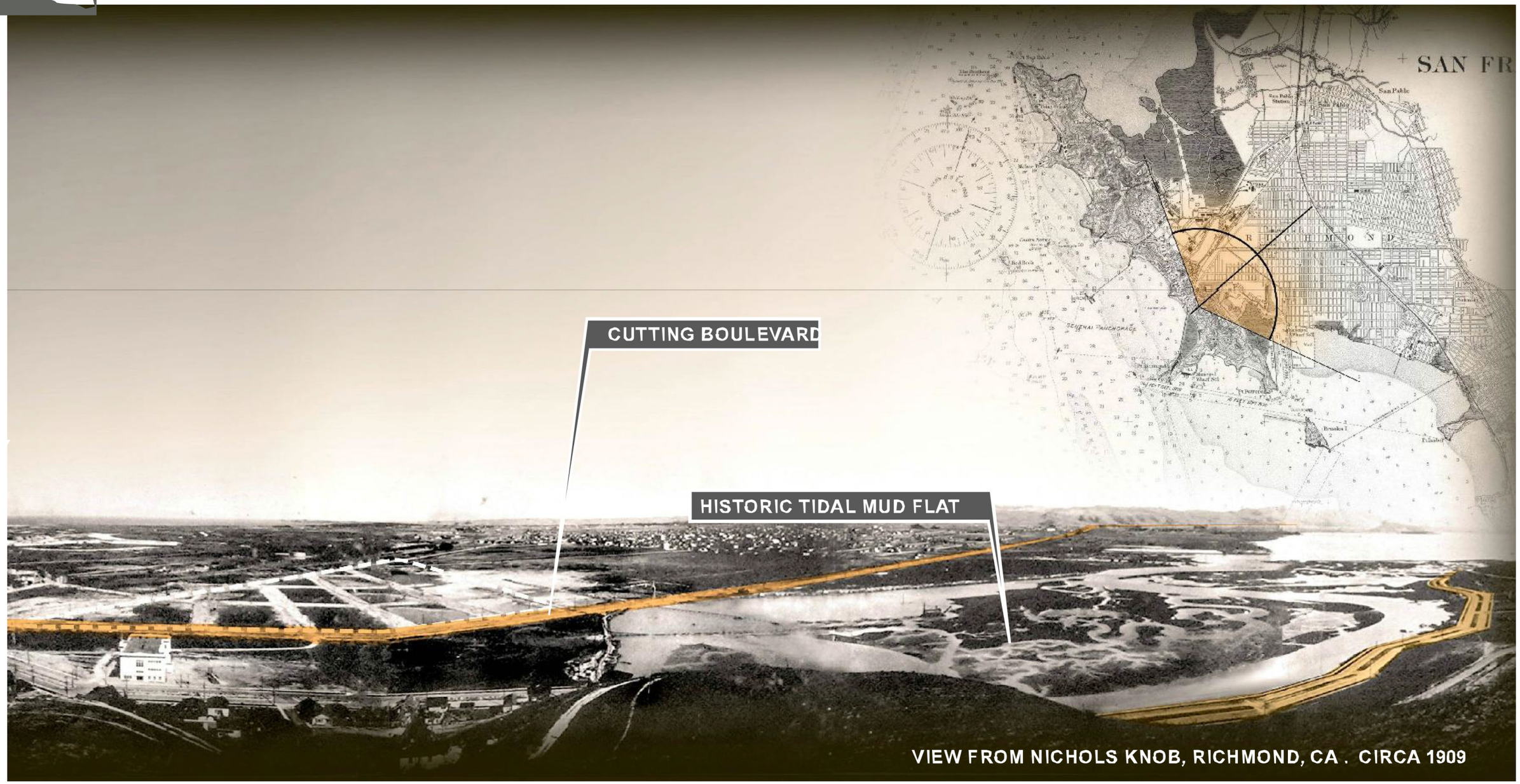
urbanization

Conceptual intergreted leeve landscape





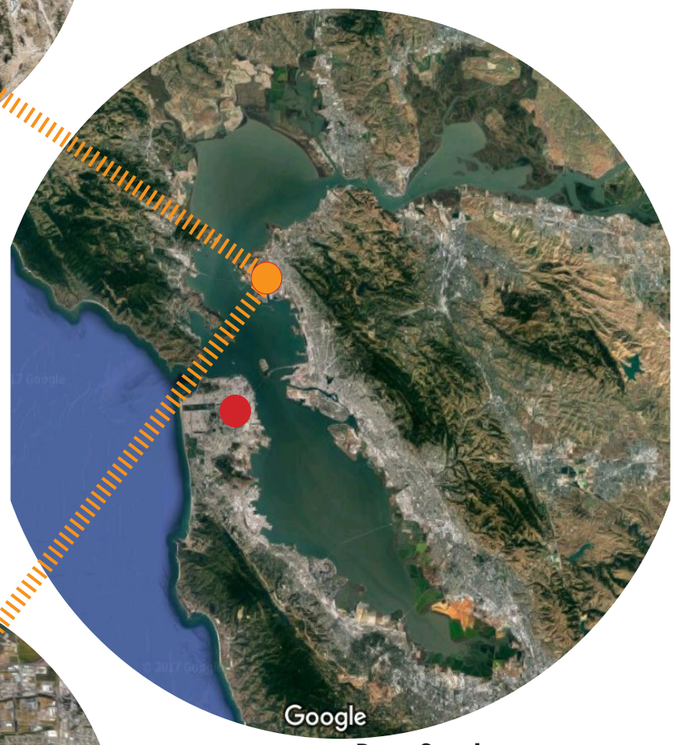
Richmond, CA



VIEW FROM NICHOLS KNOB, RICHMOND, CA . CIRCA 1909

Richmond, CA

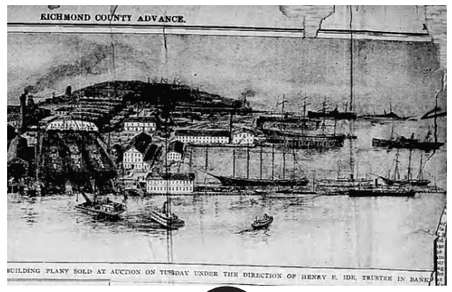
San Francisco Bay-Delta



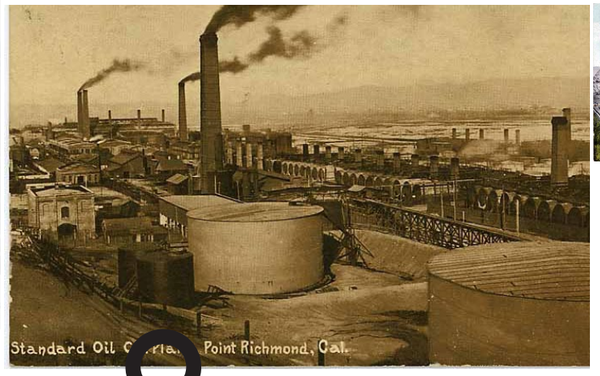
Bay Scale

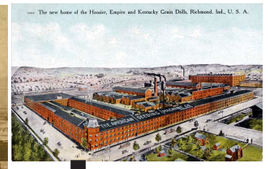
Richmond

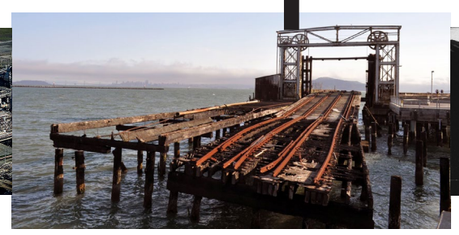
Richmond, CA

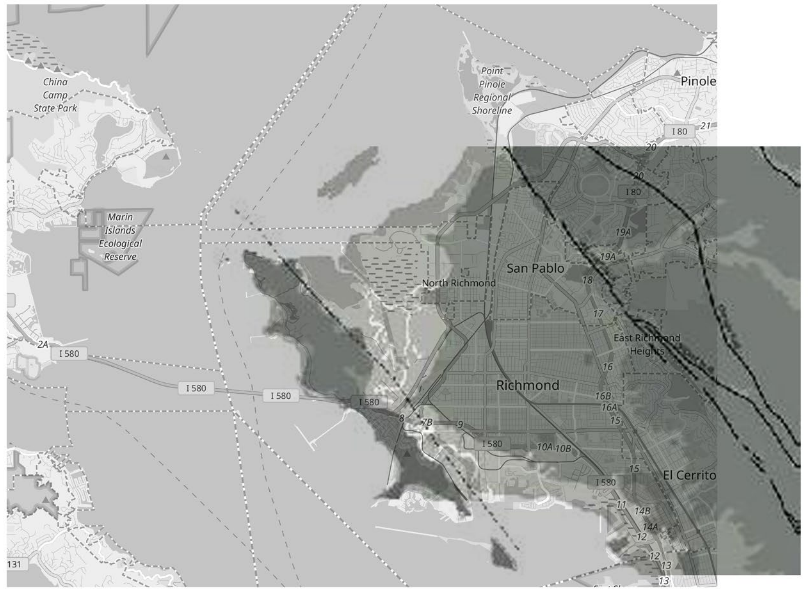


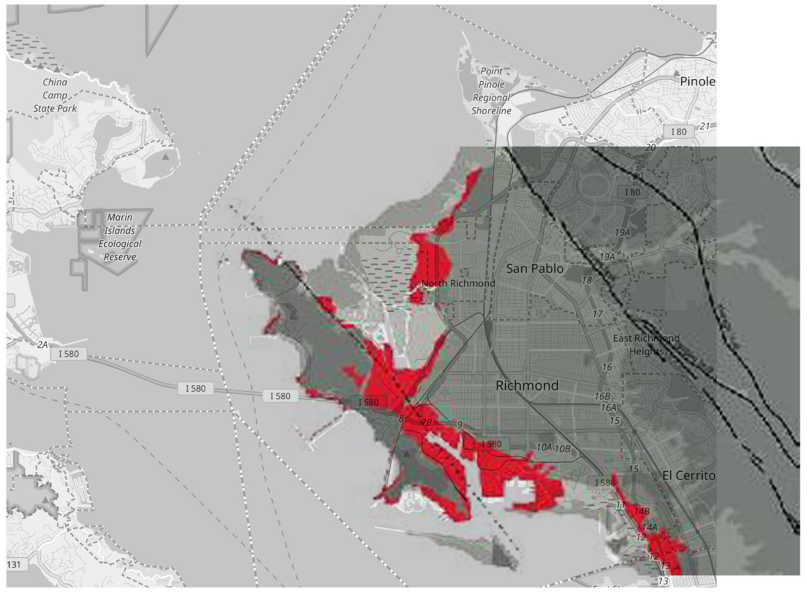

Up the Slopes not Far from the Old Mi... District Climbs the Potrero Housing Project for War Workers
...000 new residents live in such low-cost units ... erected, they rise on hills, reclaimed swamps, and dust bowls, fringing virtually every B... of City Hall stands above buildings of the ... background). In upper right is Nob Hill where bonanza millions built lavish home...

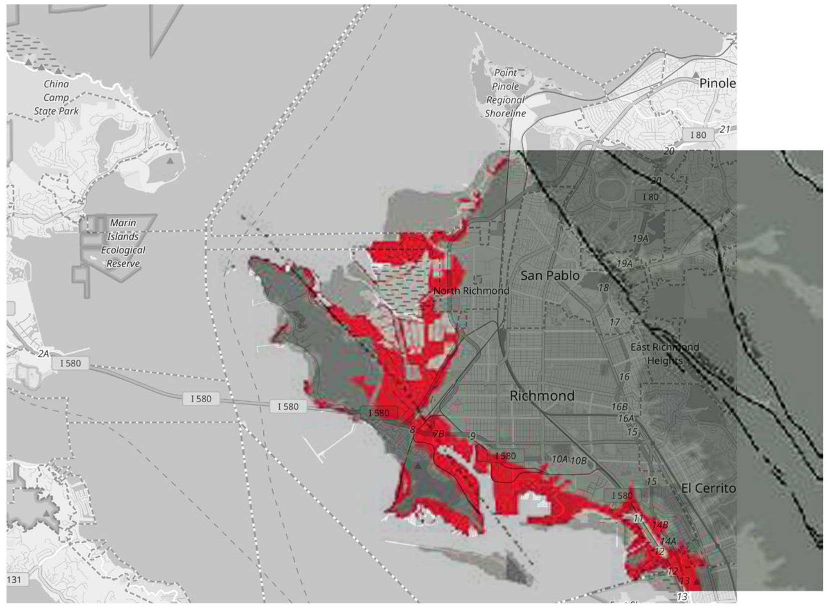


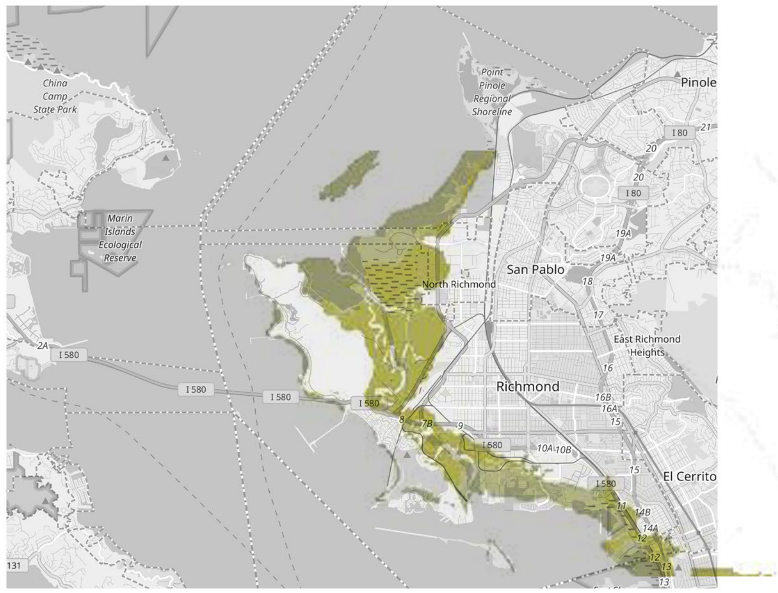

The new home of the Hoosier, Empire and Kentucky Grain Dells, Richmond, Ind., U. S. A.




China Camp State Park
Point Pinole Regional Shoreline
Pinole
Marin Islands Ecological Reserve
San Pablo
North Richmond
Richmond
El Cerrito
I 580


China Camp State Park
Point Pinole Regional Shoreline
Pinole
Marin Islands Ecological Reserve
San Pablo
North Richmond
Richmond
El Cerrito
I 580


China Camp State Park
Point Pinole Regional Shoreline
Pinole
Marin Islands Ecological Reserve
San Pablo
North Richmond
Richmond
El Cerrito
I 580


China Camp State Park
Point Pinole Regional Shoreline
Pinole
Marin Islands Ecological Reserve
San Pablo
North Richmond
East Richmond Heights
Richmond
El Cerrito
I 580


China Camp State Park
Point Pinole Regional Shoreline
Pinole
Marin Islands Ecological Reserve
San Pablo
North Richmond
East Richmond Heights
Richmond
El Cerrito
I 580

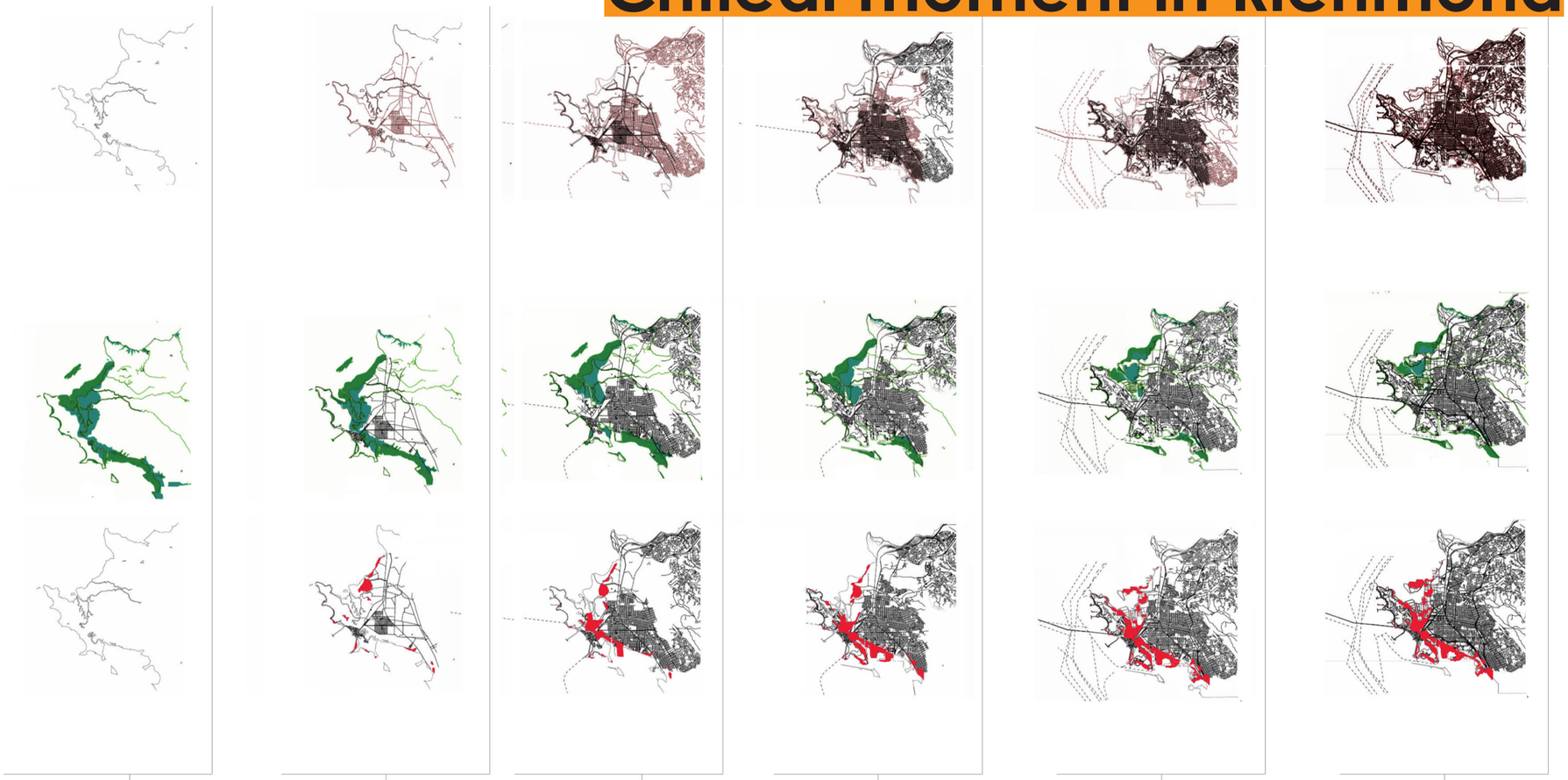

China Camp State Park
Point Pinole Regional Shoreline
Pinole
Marin Islands Ecological Reserve
San Pablo
North Richmond
East Richmond Heights
Richmond
El Cerrito
I 580

Critical moment in Richmond

Urban Expension

Marsh Lost

Land Fill



city population

6,385 acre Marshland

Tideland filling as part of the harbor dredging in the 1920s

In 1901,the Standard Oil Company built its refinery

1899 the railroad established its western terminus in Point Richmond.

The earliest inhabitants were the Ohlone Indians, who settled here an estimated 5,000 years ago.

2,150

7500
1910

23600
1926

Kaiser Richmond Shipyards started running in January 1941.Vacant industrial land in the South Shoreline harbor area, requiring extensive additional tideland filling

101,500

the shipyards closed in 1945.

93,700
1947

Harbour Redevelopment

42% Marshland lost

The Harbor Gate Redevelopment Project cleared war housing in 1955.

'70s Hoffman Freeway

71900 78000
1987

The new freeway passes across Richmond's South Shoreline and connects Interstate 80 with the Richmond-San Rafael Bridge.

93,000
1995

'95 Richmond Parkway

109800
2016

Richmond's economy is currently from its former heavy industrial character toward more high technology ("high tech") and light industrial companies with new business parks accommodating light industrial and "office/flex" land uses.

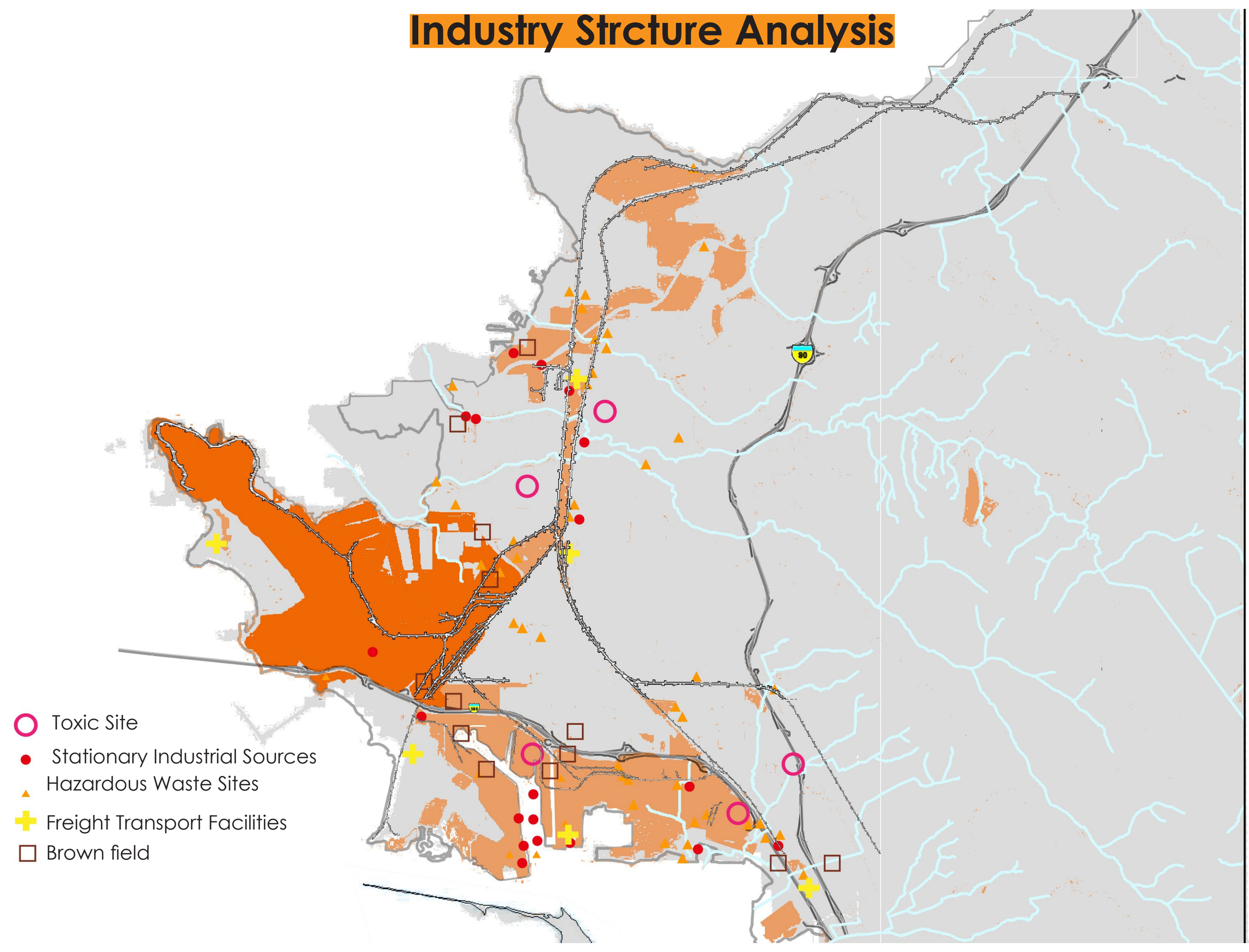
60% Marshland lost

Ecological Value

Ohlone Period | 1850 | 1905 | 1926 | 1947 | 1989 | 2014

Spainish Era | Early industry | War time booming | Post-war Redevelopment | New industry

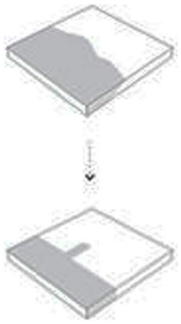
Industry Strcture Analysis



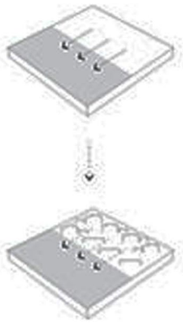
Shoreline water ploblematic analysis

costal problems

edge hardening

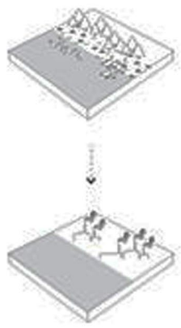


reduced success

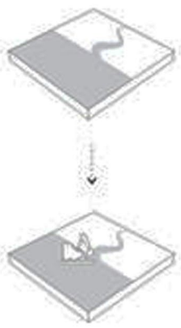


soil contamination

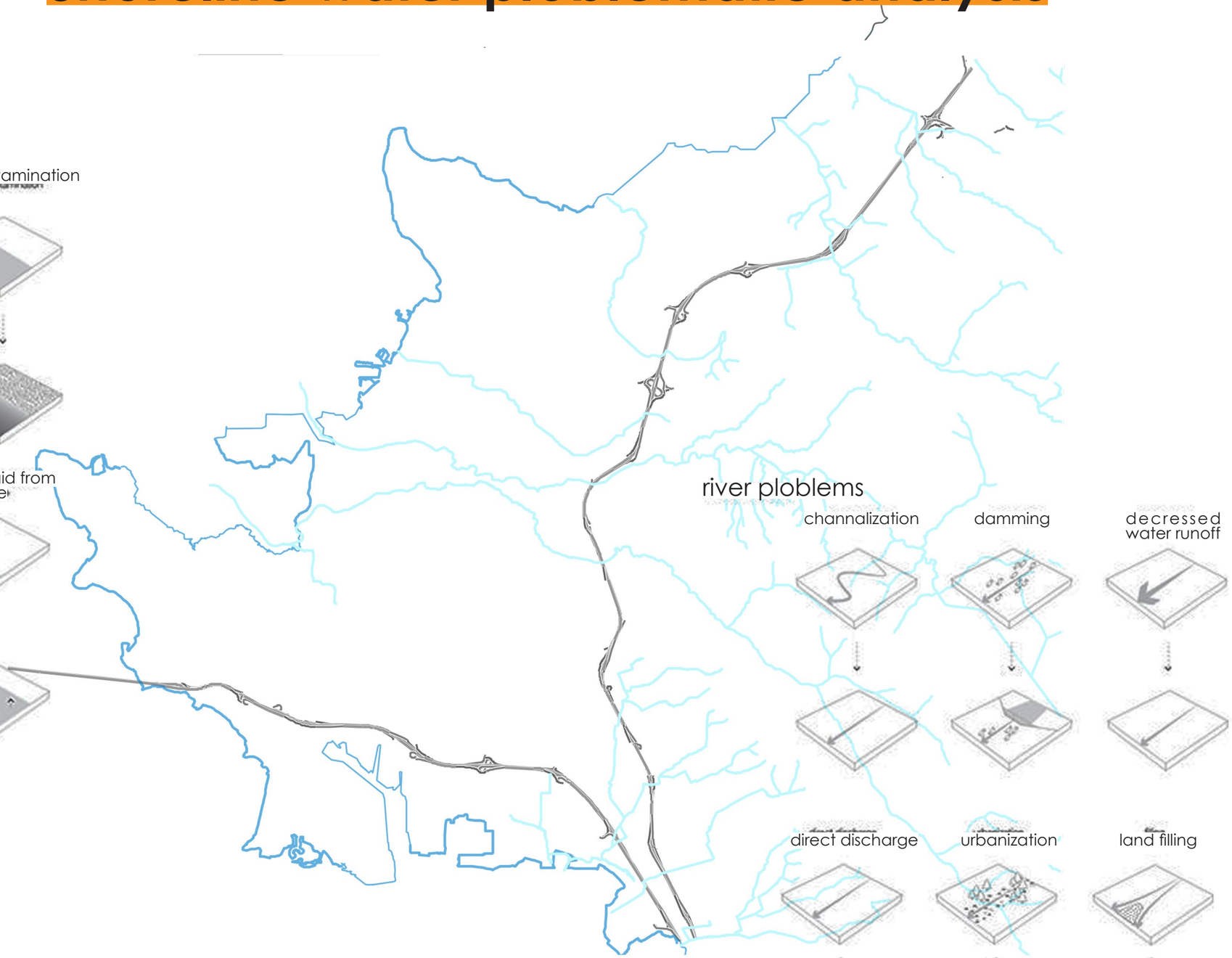
ripaian zone decontamination



aquatic habitat reduction



shoreline rigid from sea level rise



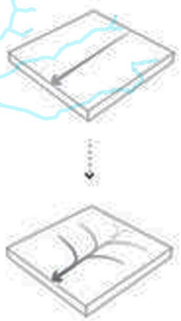
river ploblems

channalization

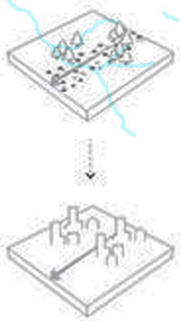
damming

decressed water runoff

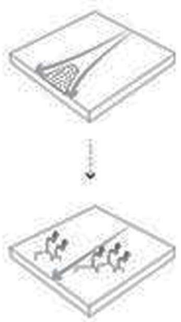
direct discharge



urbanization

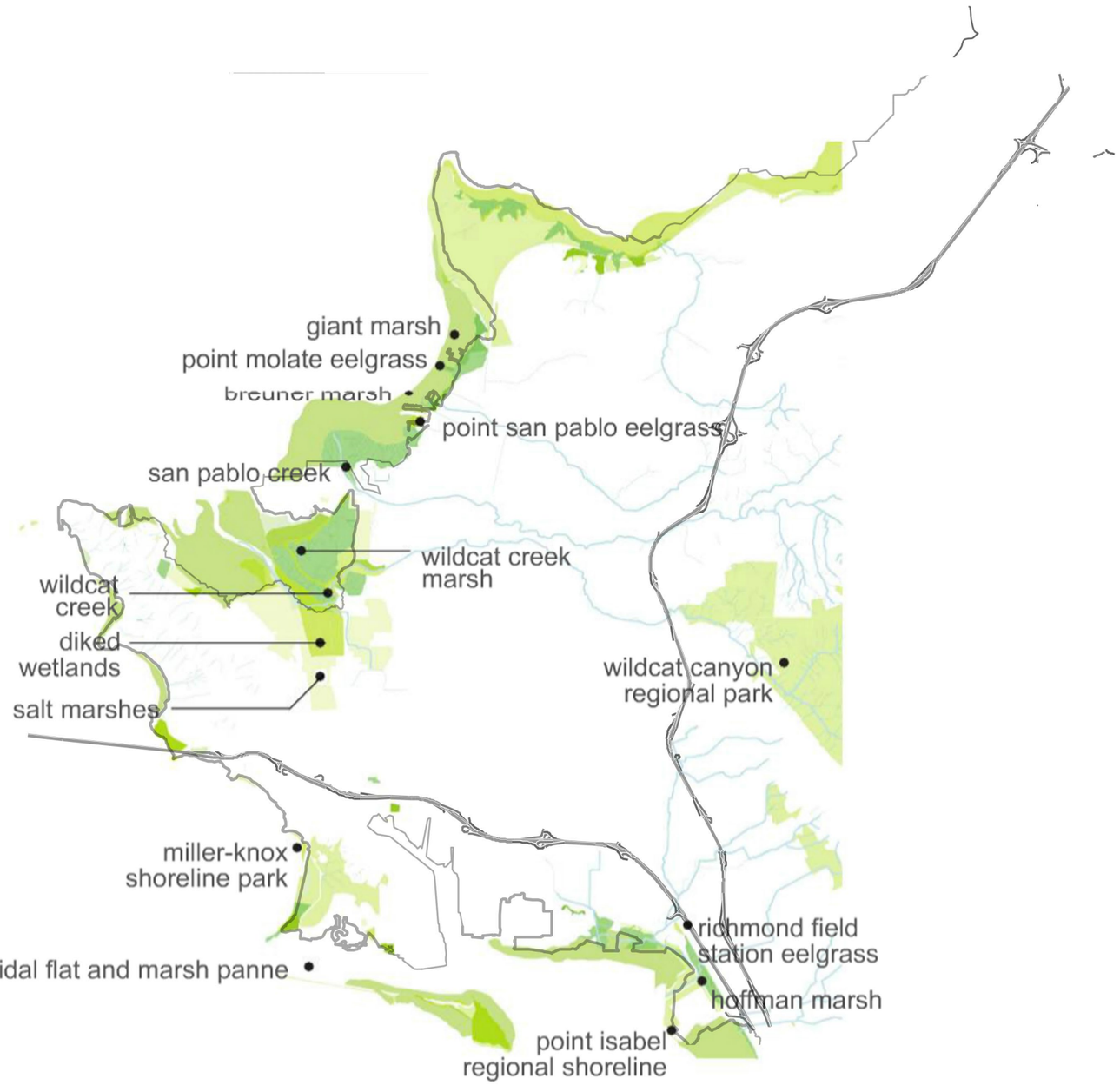


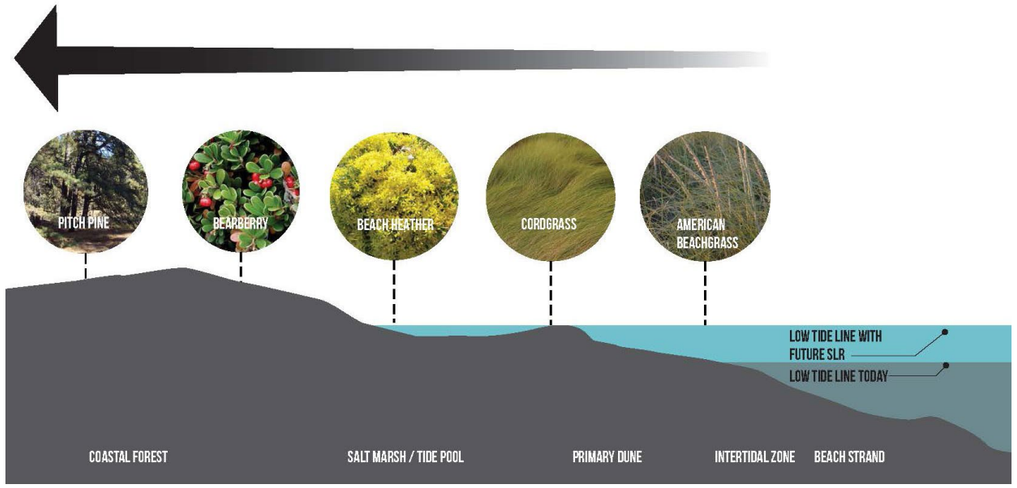
land filling

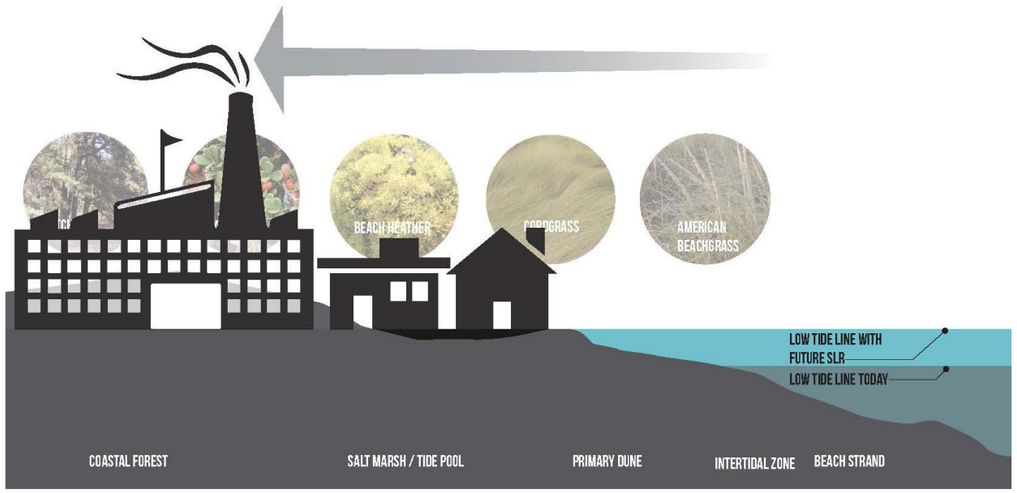


Industial structure impact on natural enviroment

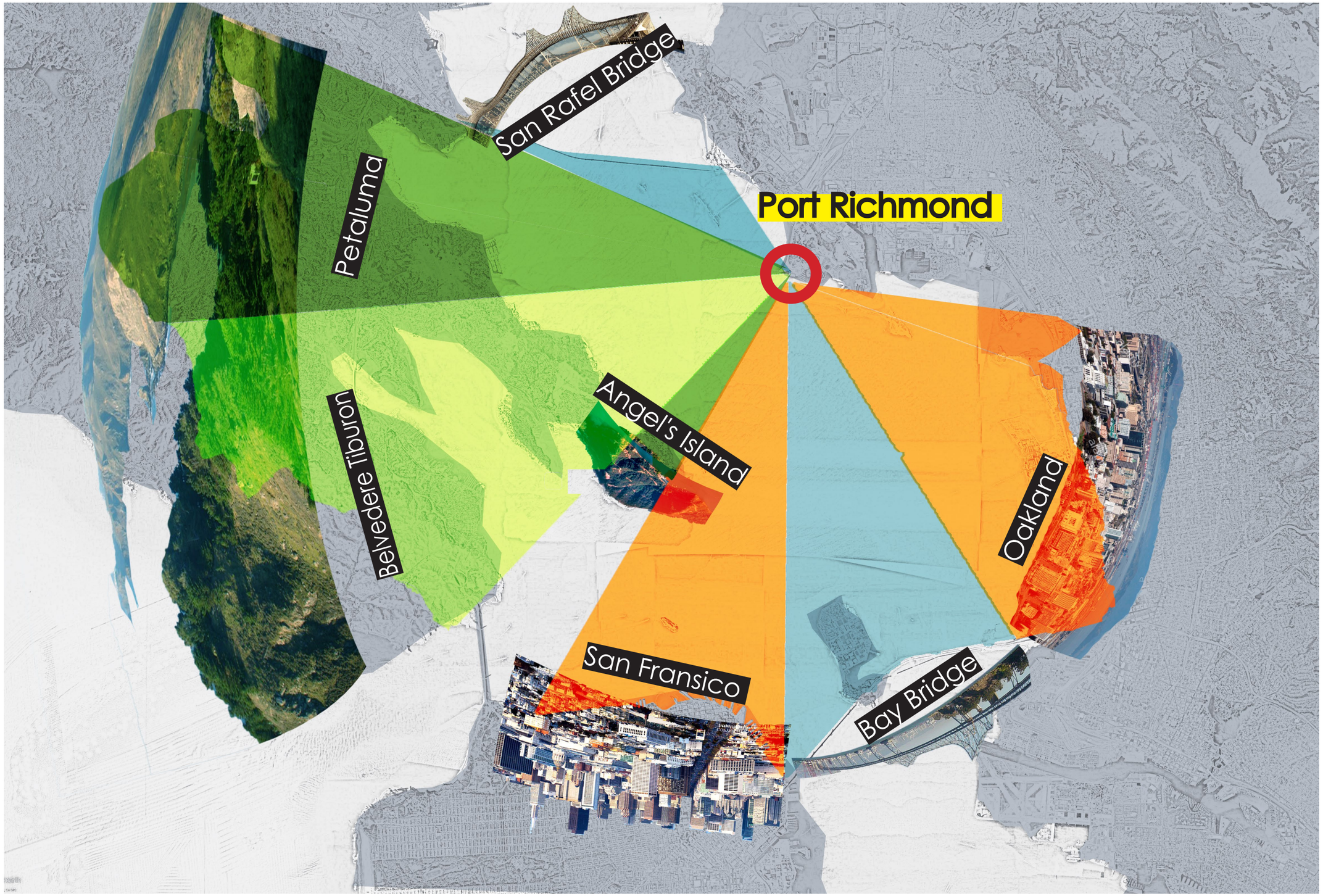
Some of the ways that urban development impacts natural systems are by impeding plant migration, altering the hydrologic cycle, and exacerbating coastal erosion due to man-made infrastructures.





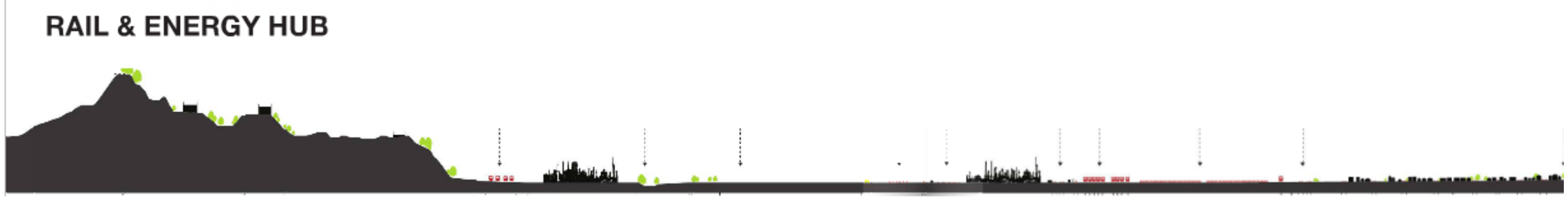


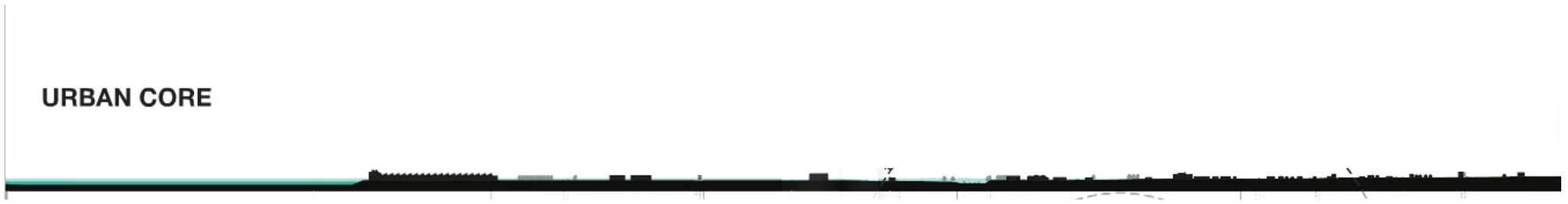
View analysis in costal Richmond



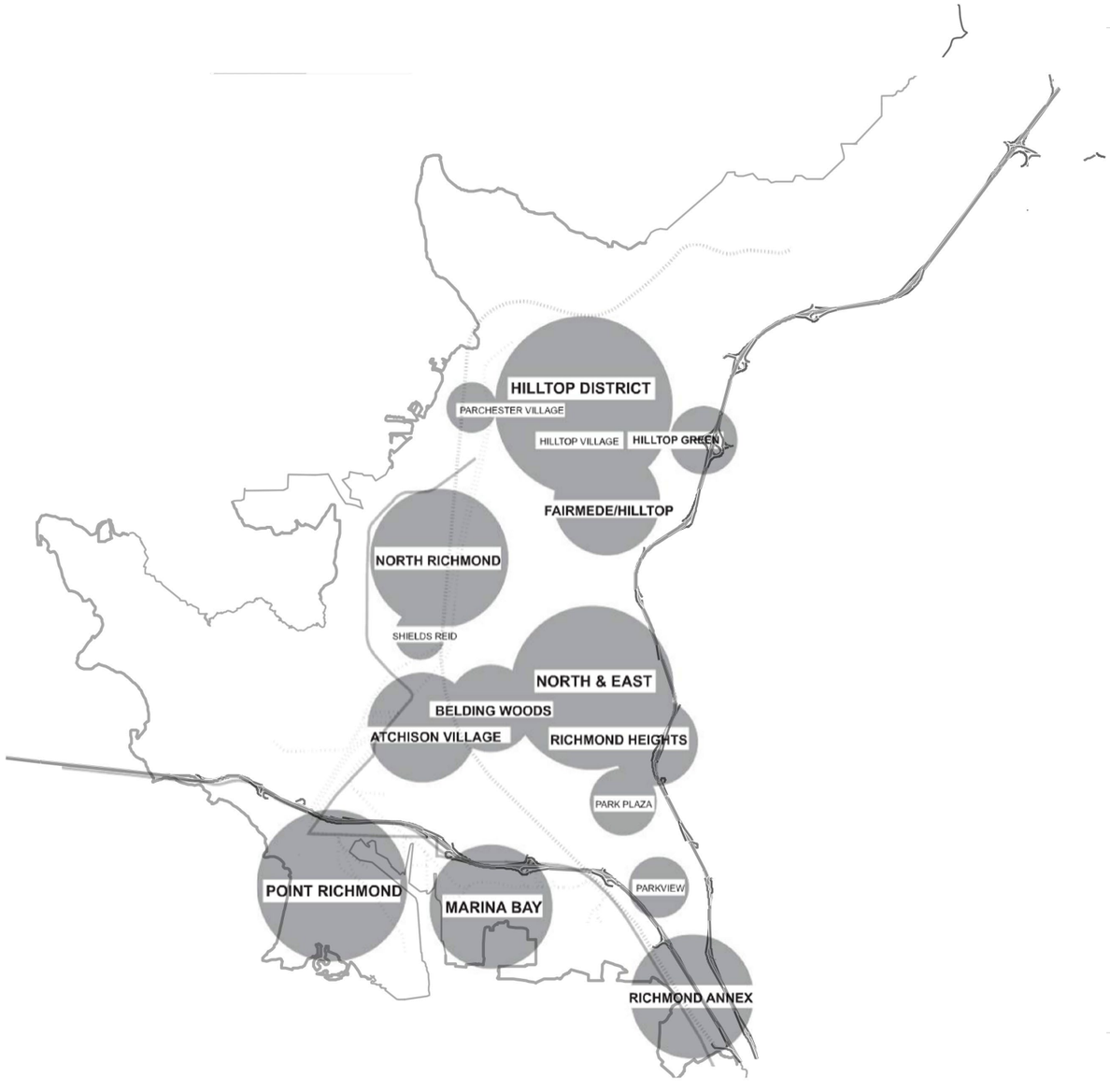
Spatial impact of Industial belt

Shoreline - city intersection analysis





Industial structure impact on comminities

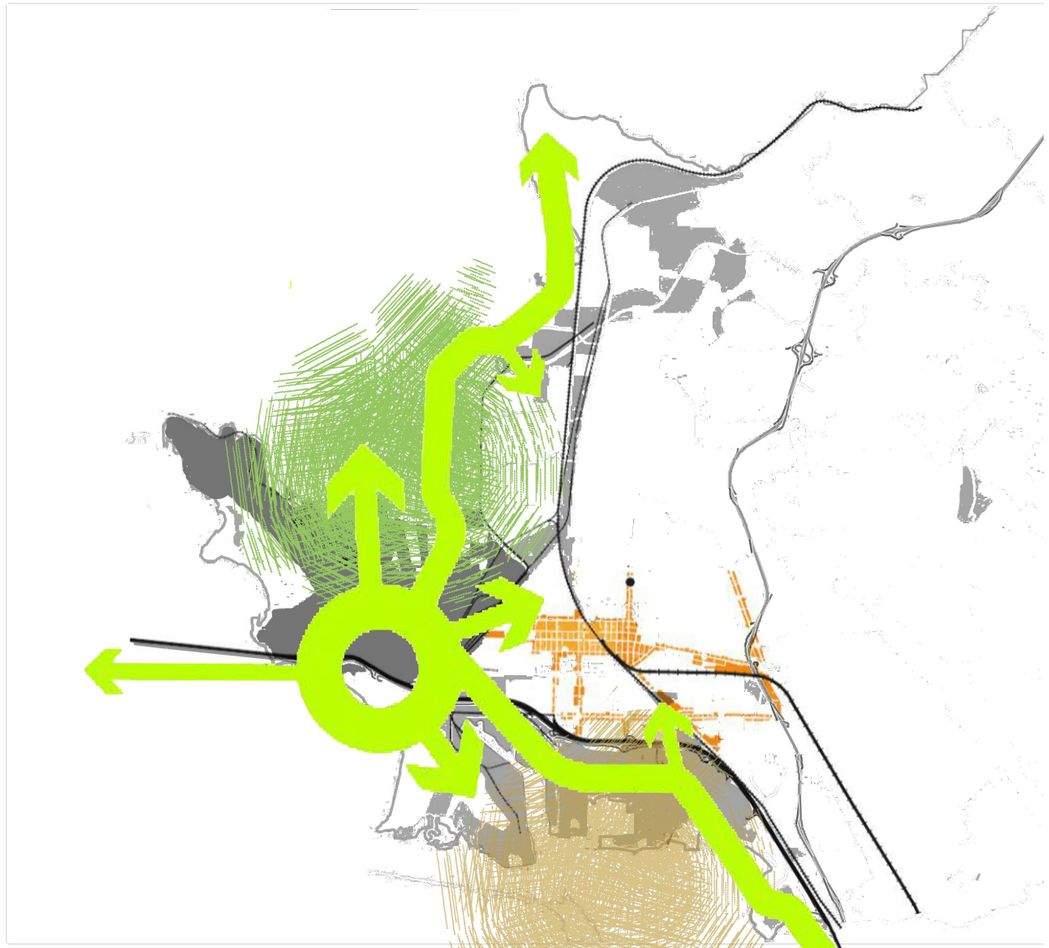


problematic

Problem statement

By mapong Richmond and cross mapping data from ecological, historical , industrial structural and demograpgical aspect.
We can see that the city of Richmond is facing the following 5 problems:

- ecological value lose
- threat of sea level rises
- spatial and ethical segregation
- connection to the bay and to other city
- Industial remains and polution remediation



Test site Richmond shioyard

accessing city

industrial migration

waterfront dynamic

1930
Kaisher shipyard is still tidal marshland

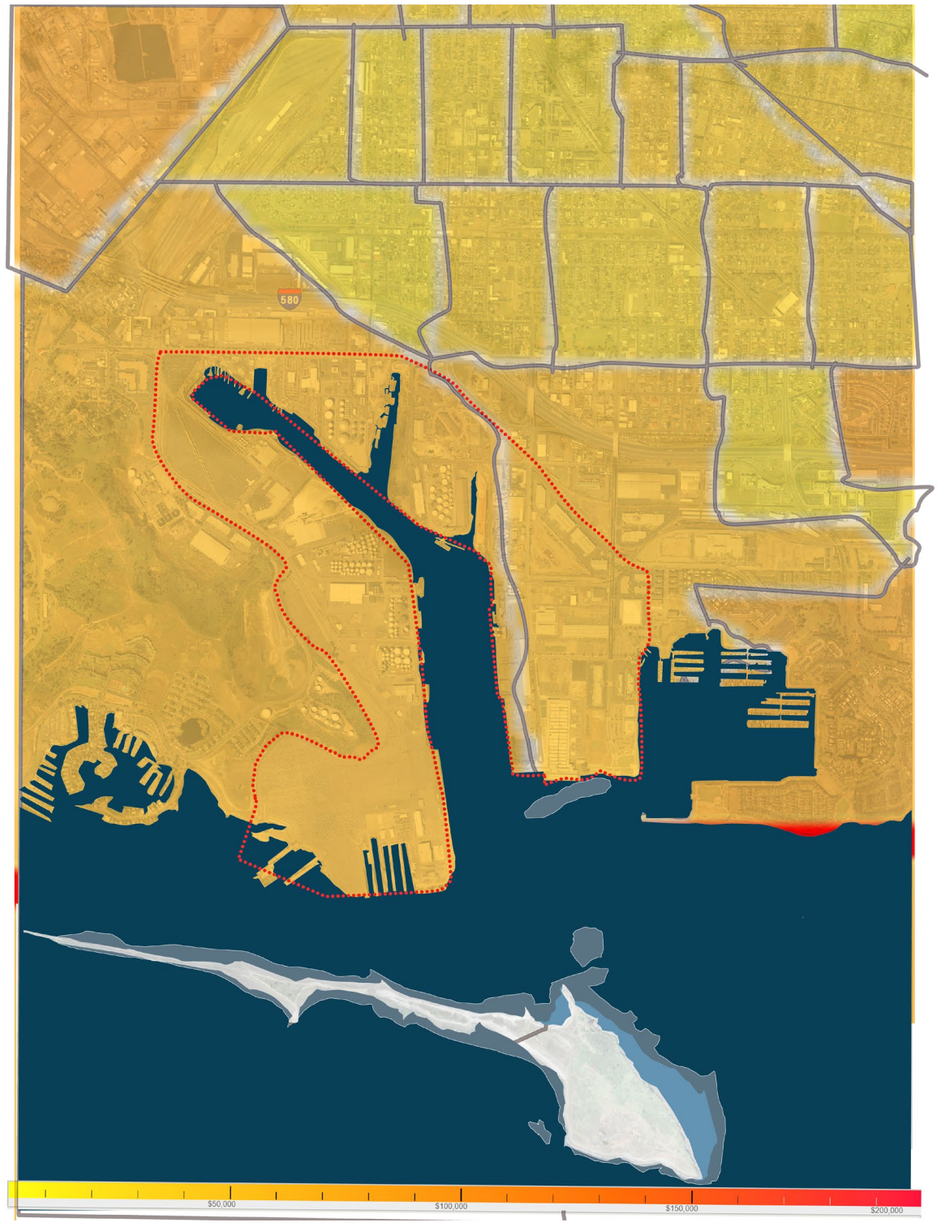
1943 first construction

1944 complication and retire from military service

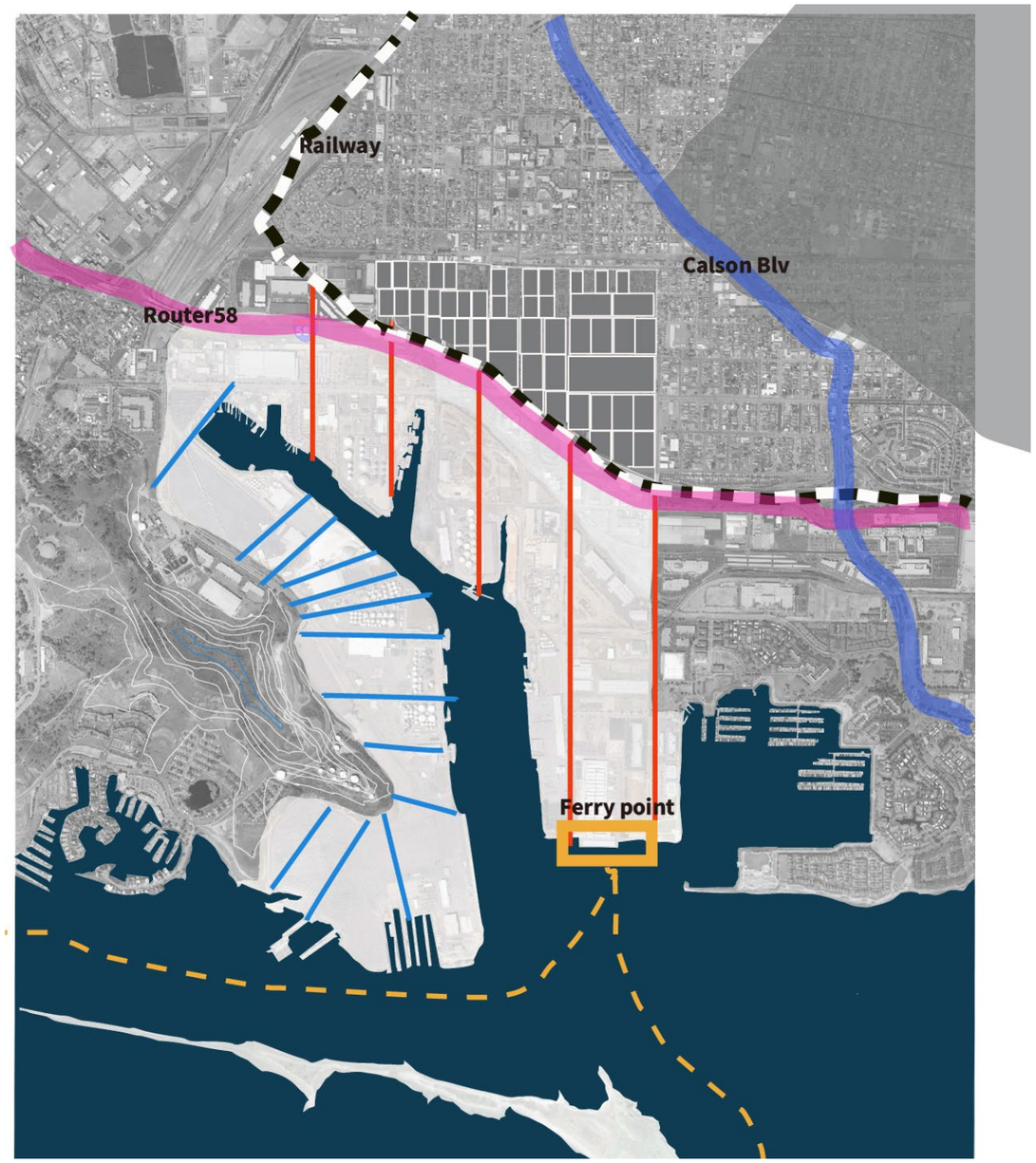
Richmond nowadays is being used by Fort Plant and Oil Refinaory company

current land use

Income map



Infrustructure and urban grid

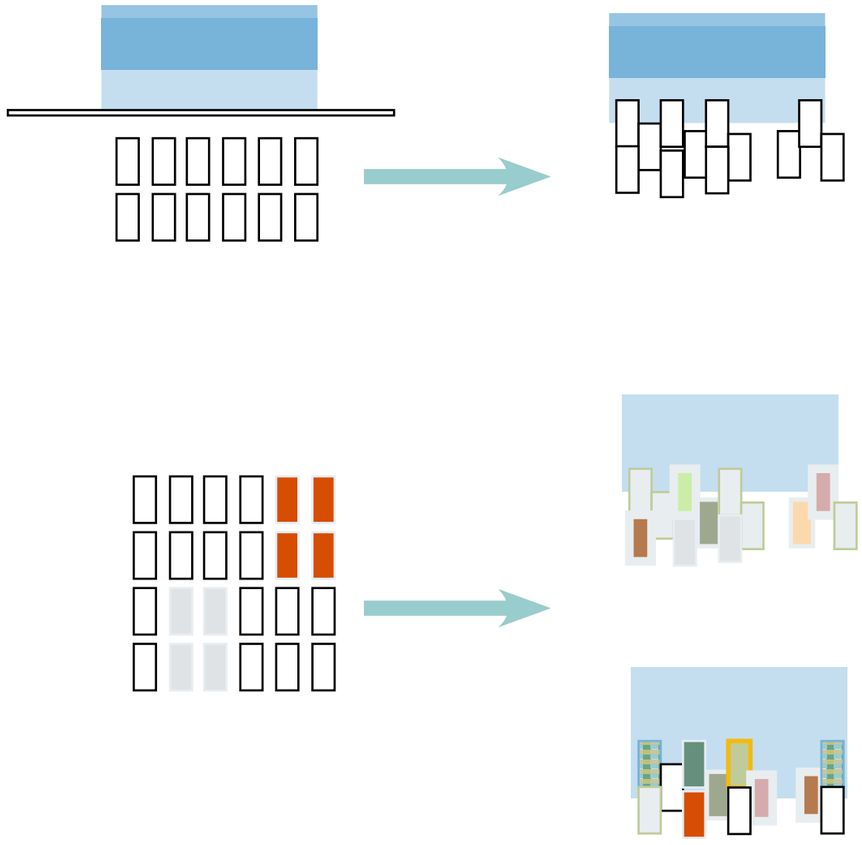


Natural resources and historic heritage

Tideal and bythy

Design Strategy

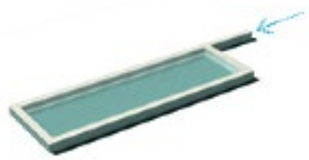
Ploblem conclusion map



Leeve Functions

Moderate

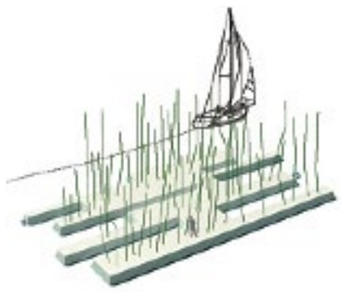
Communicate



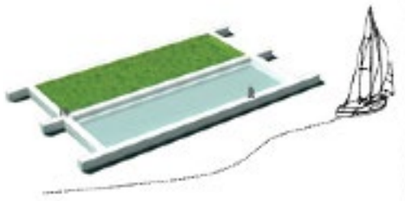
Collect

Remediate

Flexible

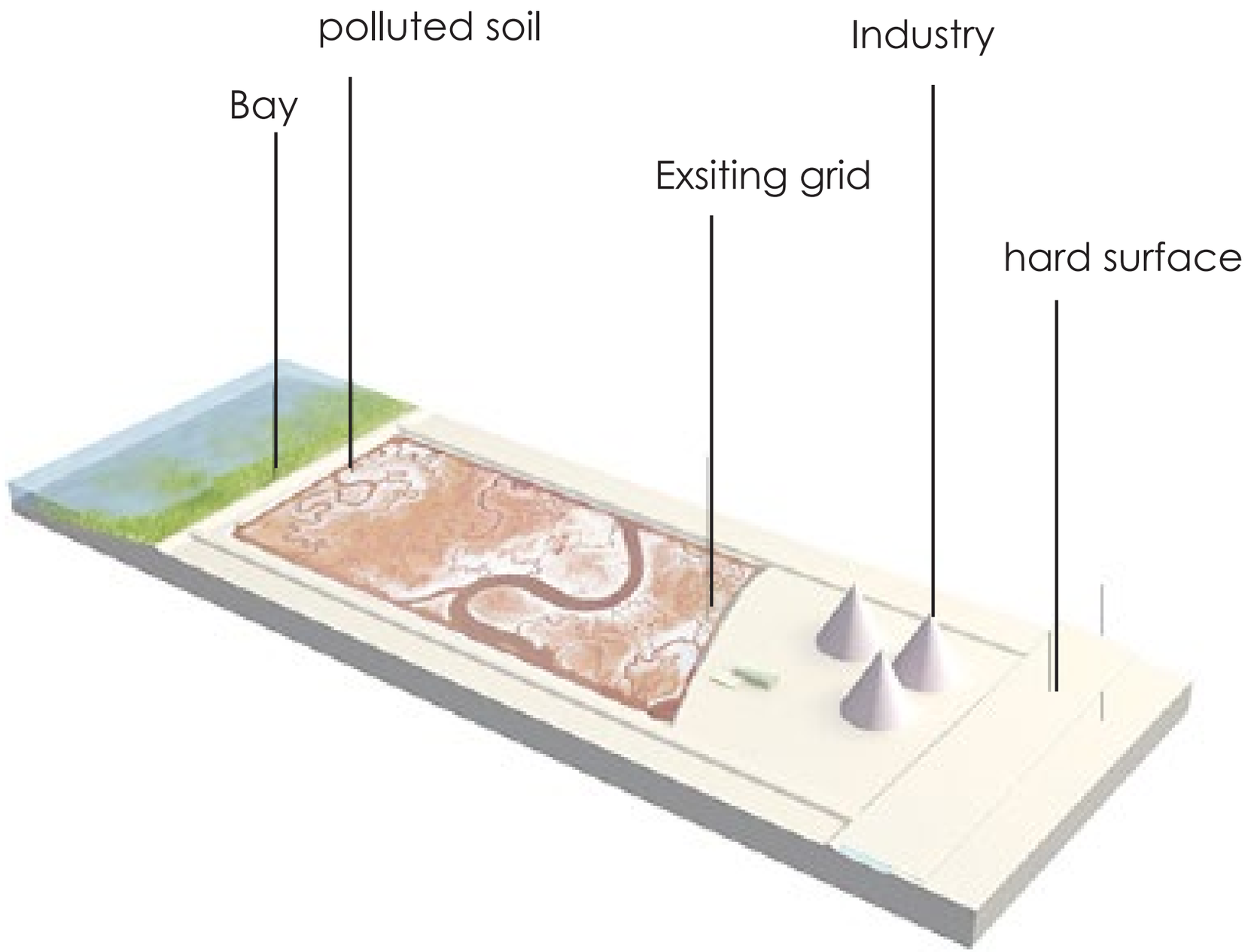


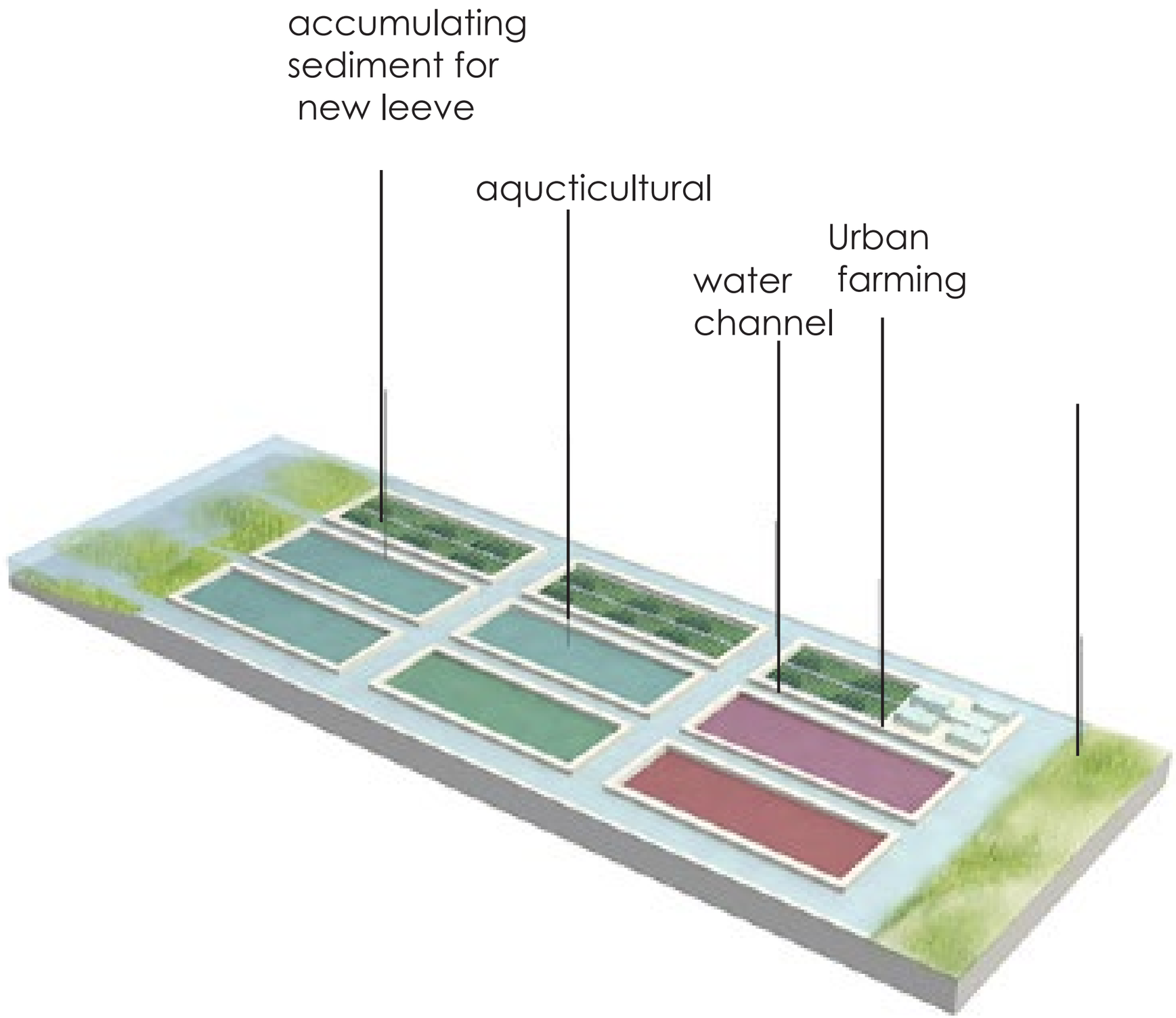
Digest



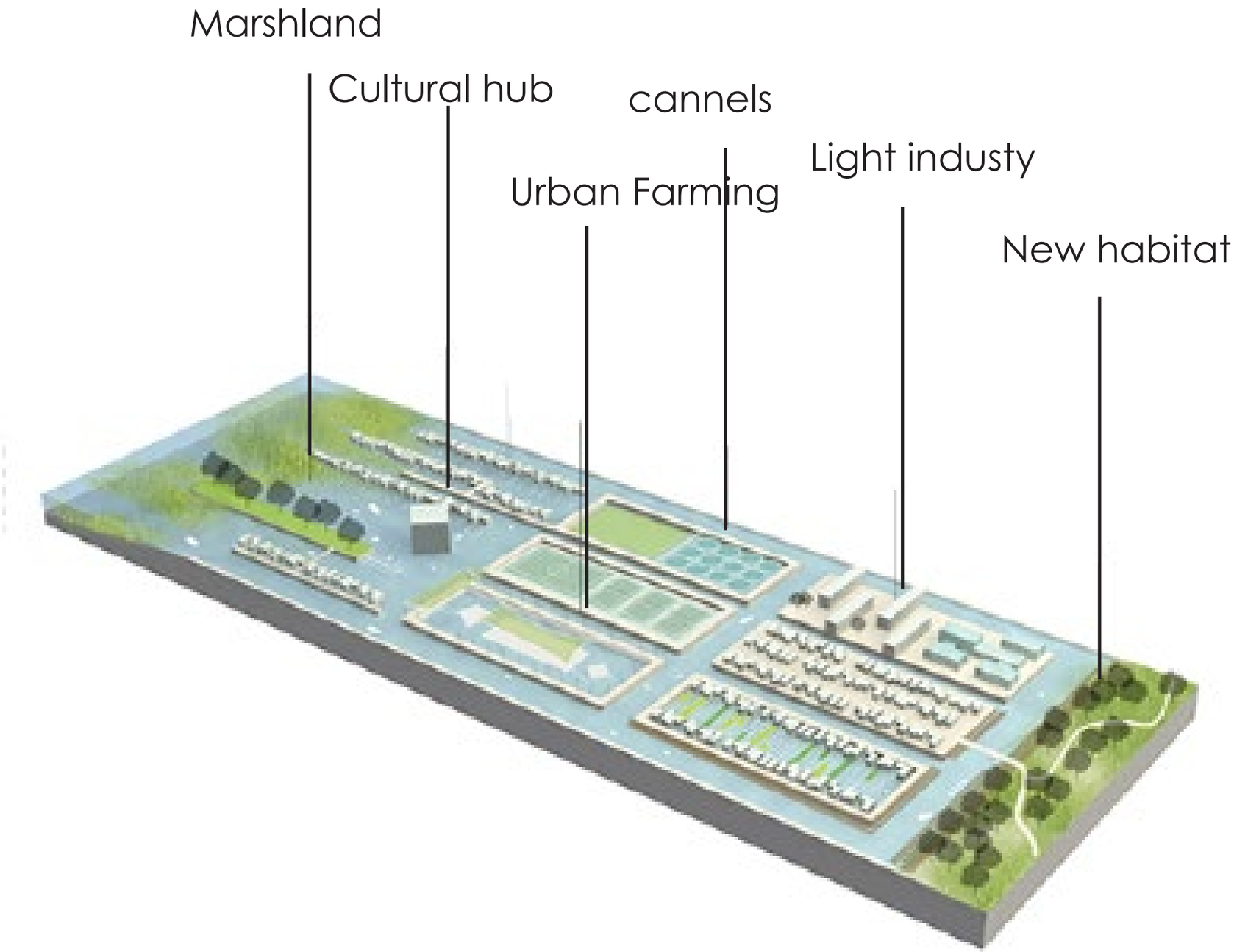
Production

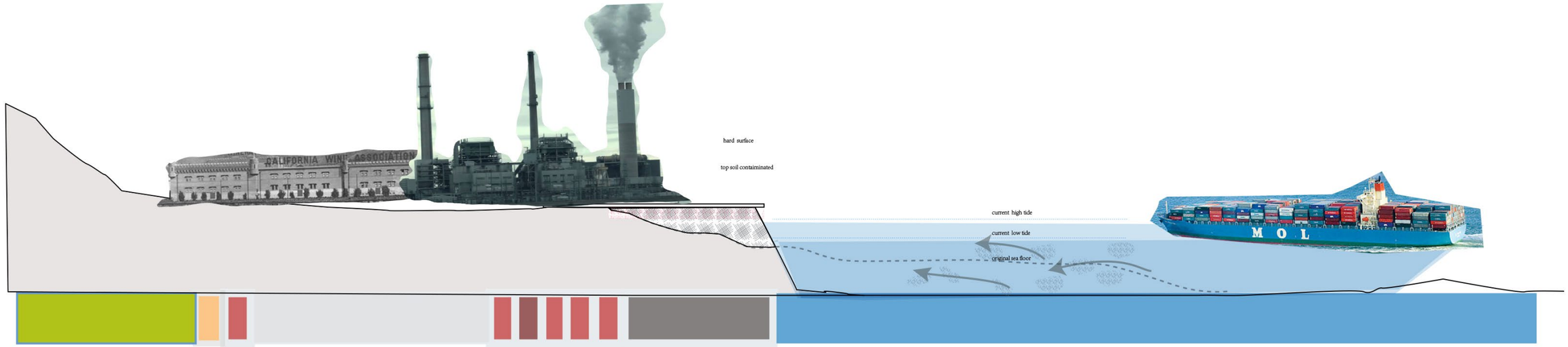
Leeve prototype



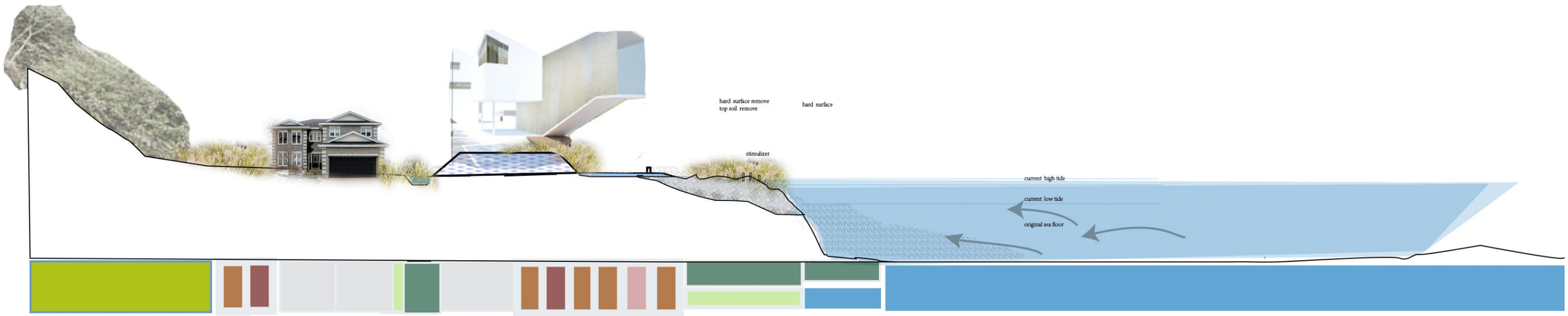

accumulating
sediment for
new leeve
aquciticultural
water
channel
Urban
farming

Leeve prototype

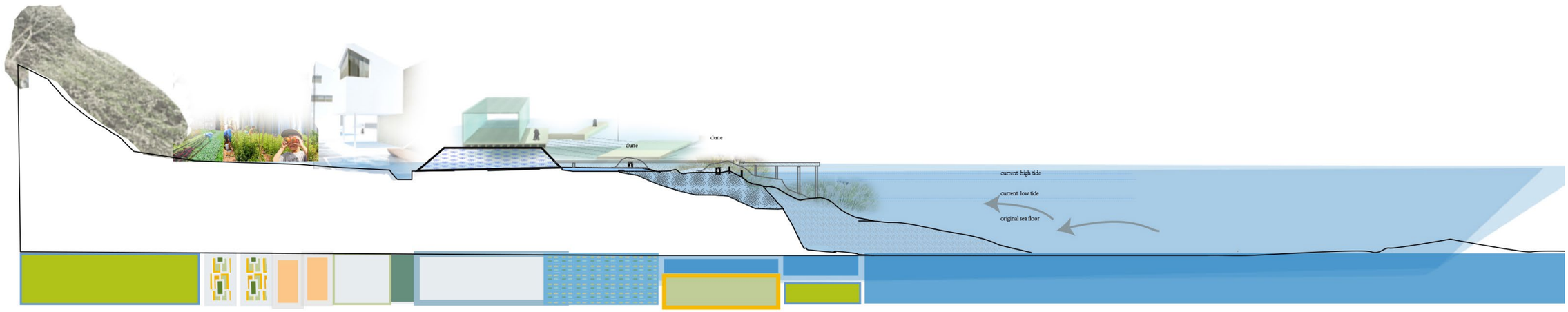


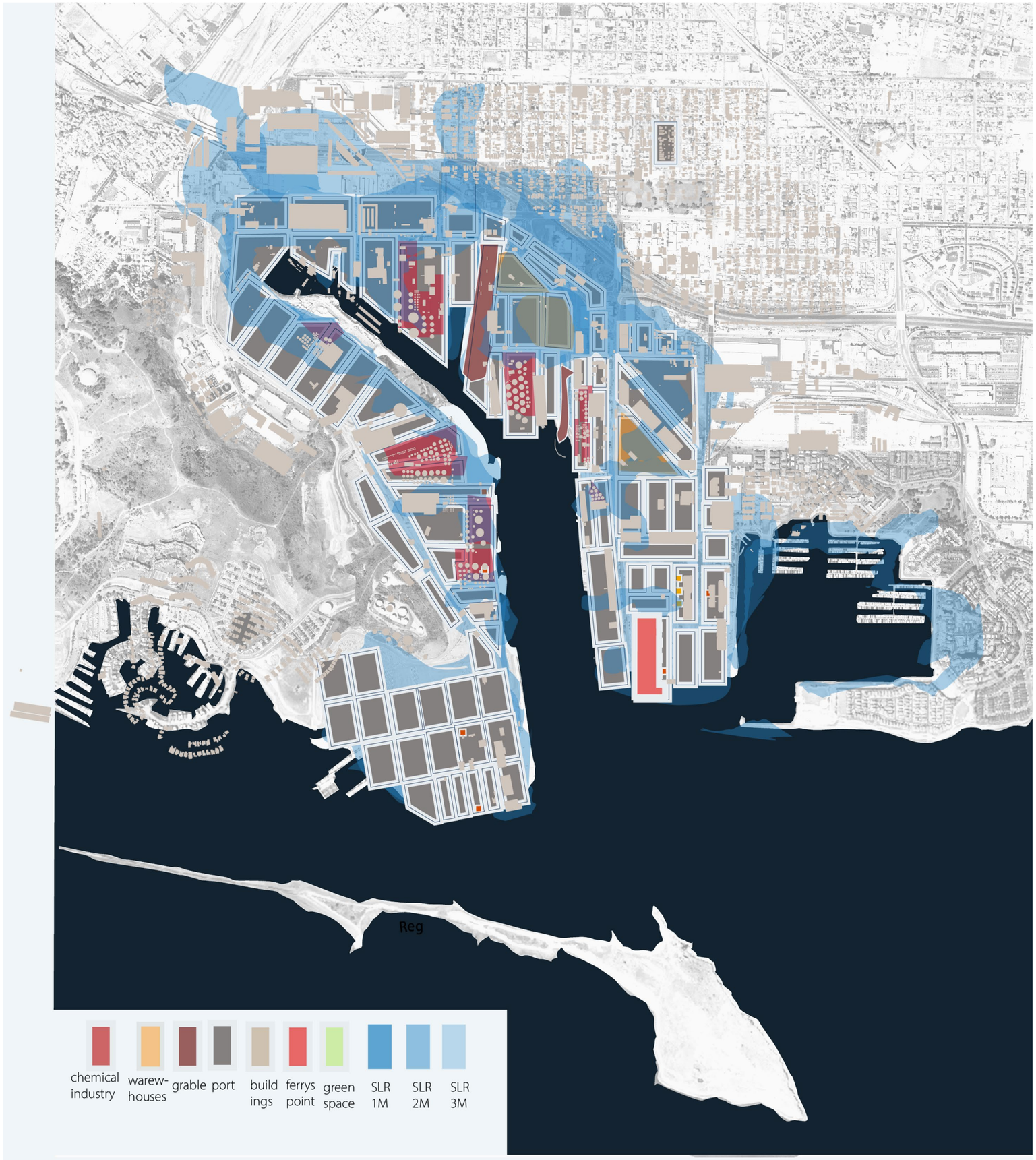

CALIFORNIA WINE ASSOCIATION
hard surface
top soil contaiminated
current high tide
current low tide
original sea floor
M O L

p2


hard surface remove
top soil remove
hard surface
stimulizer
current high tide
current low tide
original sea floor

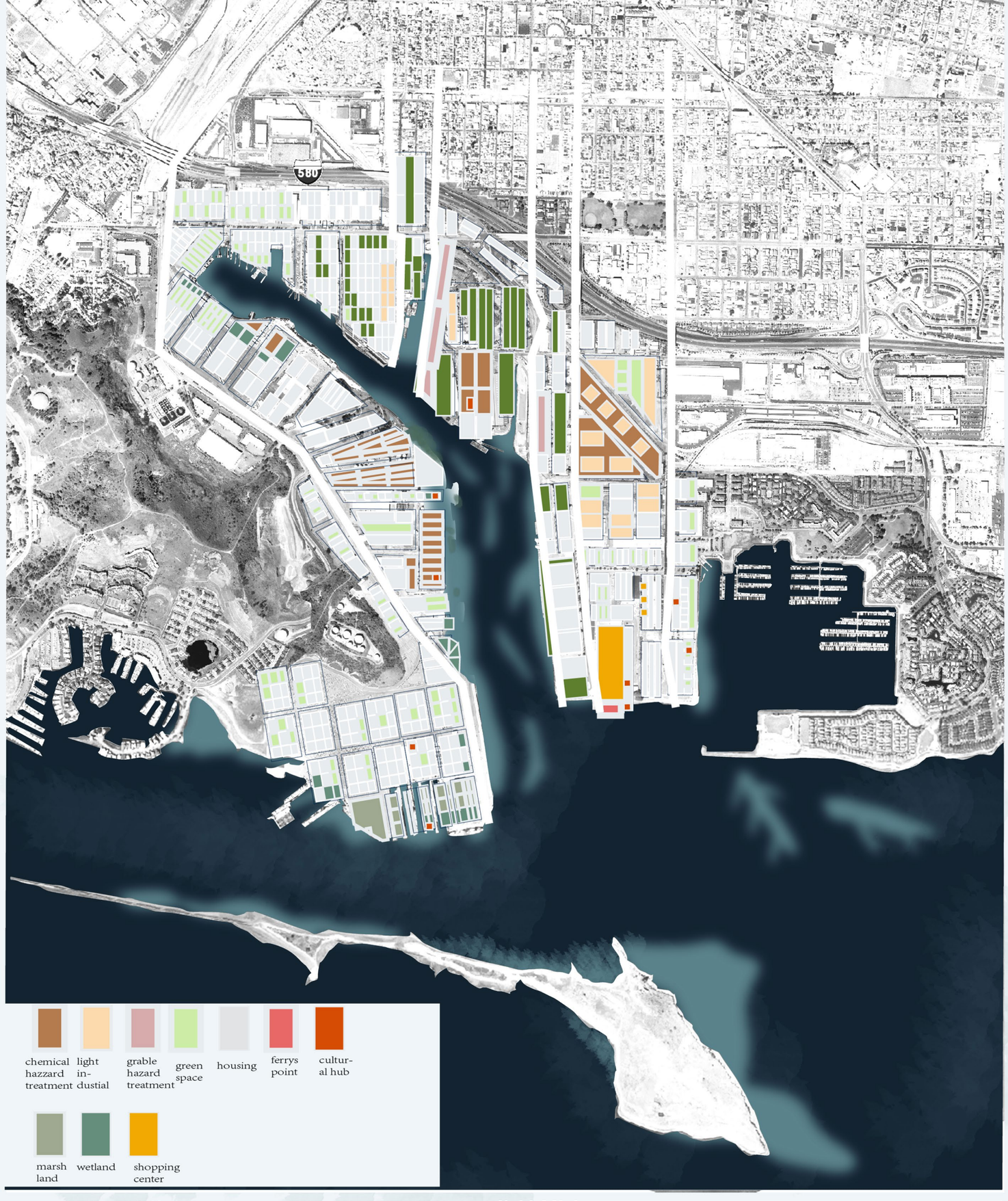
p3


dune
dune
current high tide
current low tide
original sea floor


chemical industry
warew- houses
grable
port
build ings
ferrys point
green space
SLR 1M
SLR 2M
SLR 3M
Reg

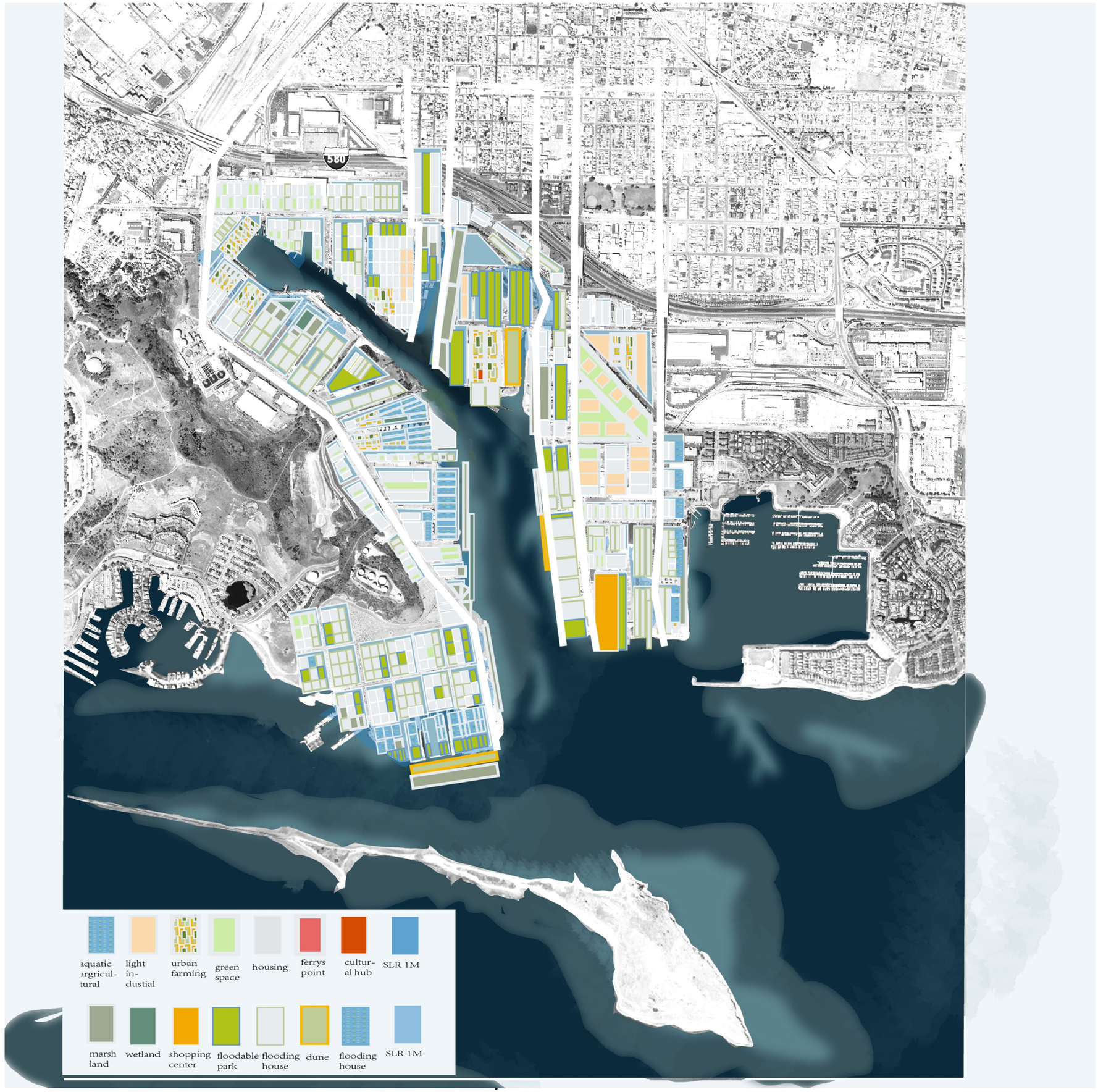
p1

hase1

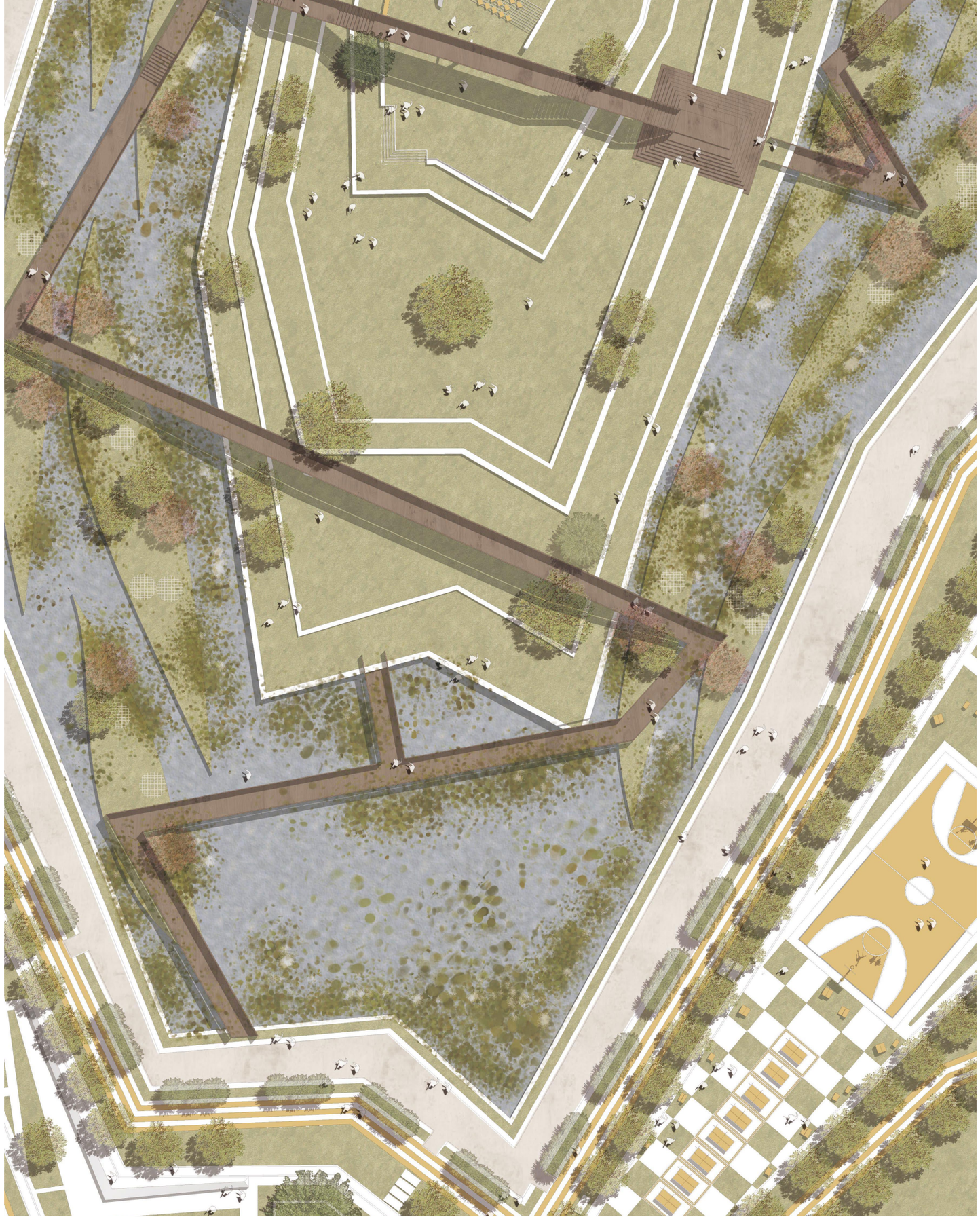

580
chemical hazzard treatment
light in- dustial
grable hazard treatment
green space
housing
ferrys point
cultur- al hub
marsh land
wetland
shopping center

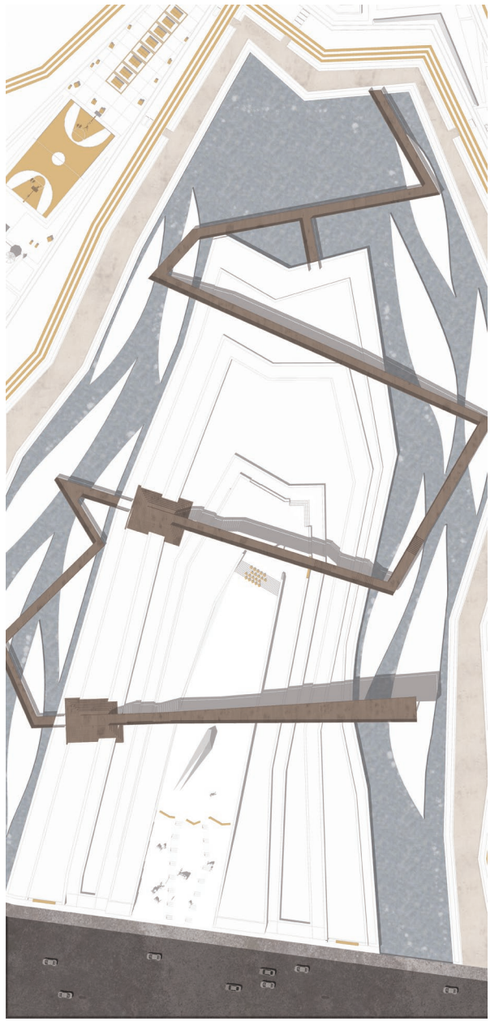
phase1


580
SLR 1M
light in-dustial
urban farming
green space
housing
ferrys point
cultur-al hub
marsh land
wetland
shopping center
floodable park
flooding house
dune

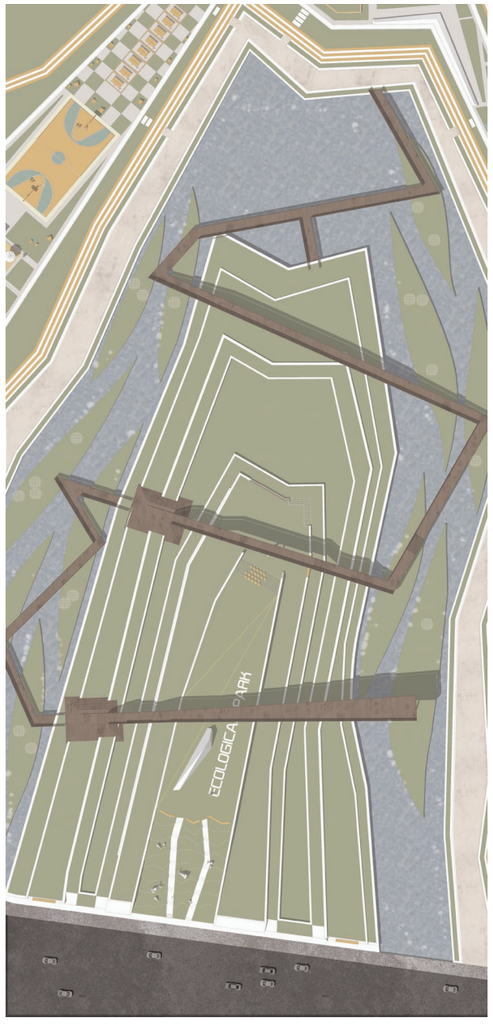

580
aquatic
argricul-
tural
light
in-
dustial
urban
farming
green
space
housing
ferrys
point
cultur-
al hub
SLR 1M
marsh
land
wetland
shopping
center
floodable
park
flooding
house
dune
flooding
house
SLR 1M

Amphibious Urbanization

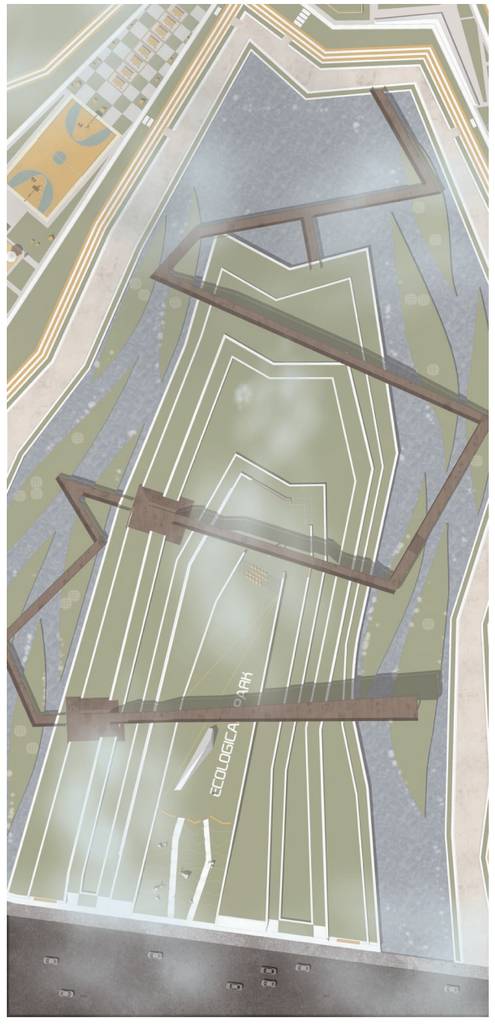


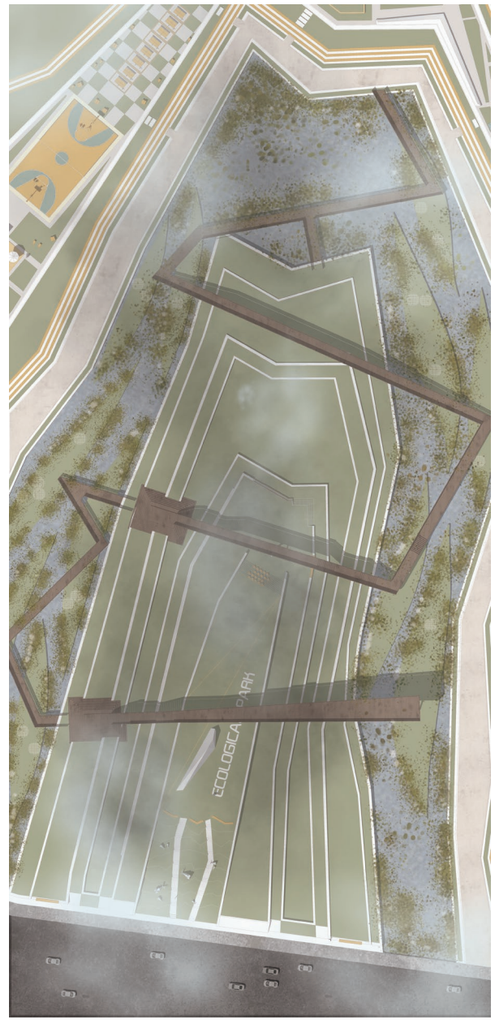


1. geotube and dredge material as base construction



tidal and wave gradually bring in materials

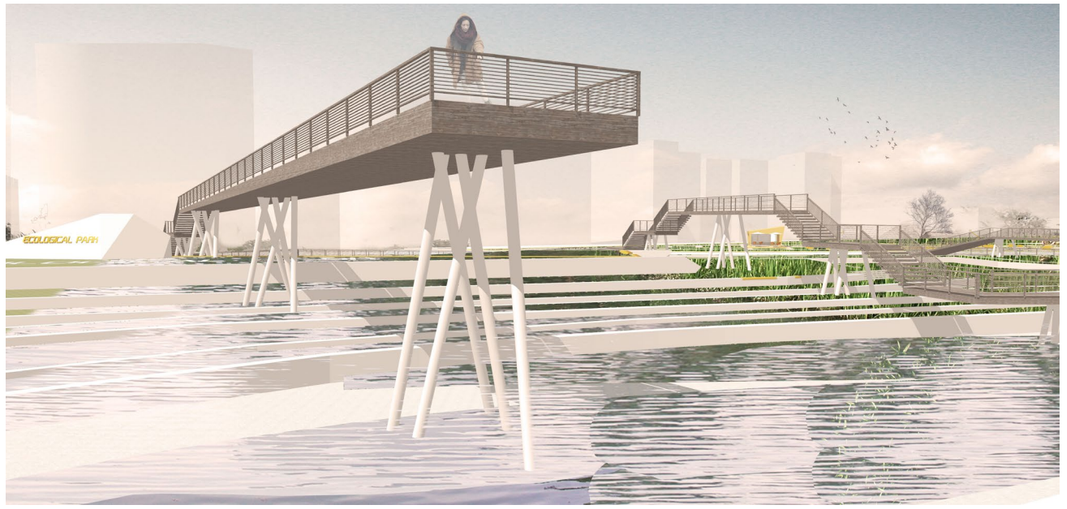




Marsh land start forming and natural success began

Phasing prspective

1. geotube and dredge material as base construction

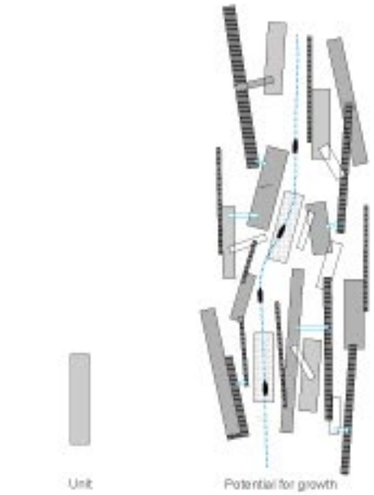


phase 2 high tide brings in sedimente and starts to accumulate

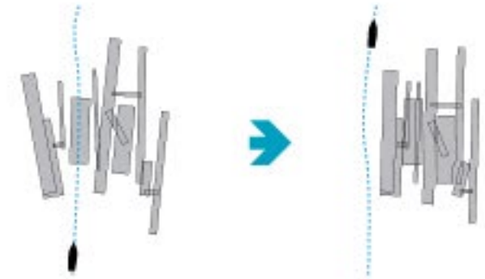
phase 3 frontier plants starts to grow on tidal flat land

phase 4 habitats starts to establish. local fraun and flora settle in.

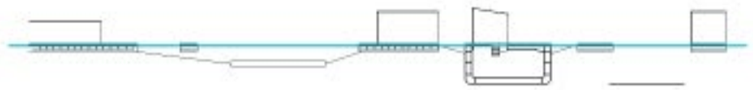

PIER
TK999



Growth



Movement



Buoyancy