Delta intervention in Embarcadero

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4463234


I DON'T BELIEVE IN
GLOBAL WARMING

My focuses

1. The sea-level rise in 2100
(1.5m)

2. The renovation of coastal cities
(CBD)

Content

Part 1

Urban design
Embarcadero

History

1850 1920 2000

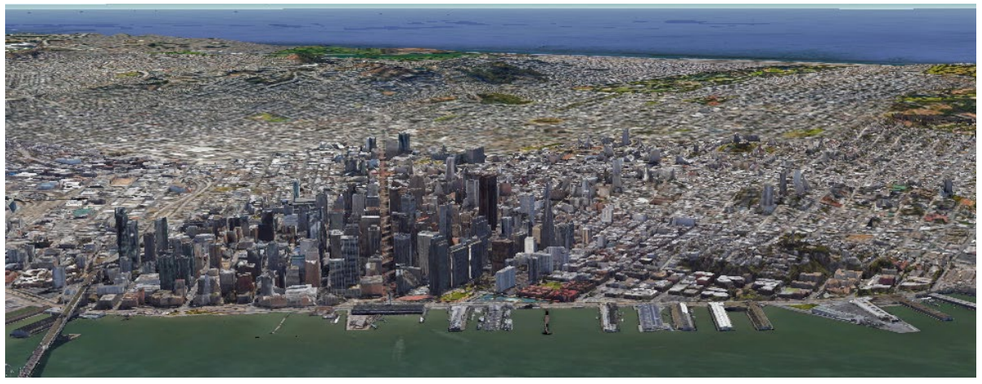
1850 1920 2000

1850-1920
Gold rush: new settlement, small port

1920-1940
Development: cargo port

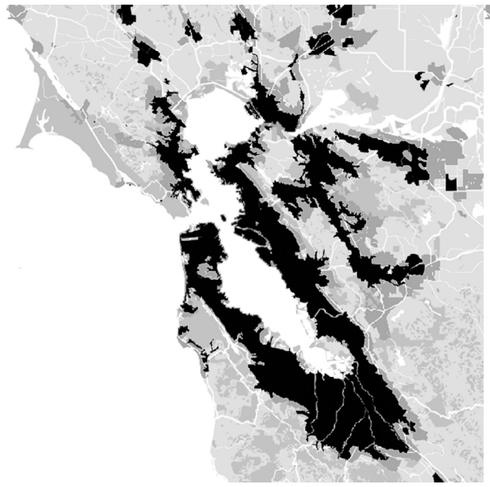
1940-1950
World war II: military port

1950-1980
After war: abondoned port

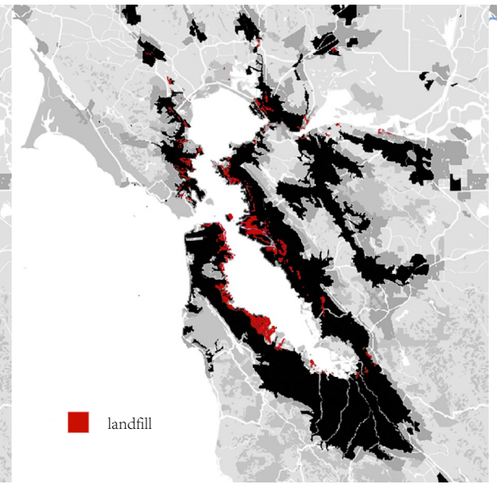


1980-now
CBD: redevelopment, tourism & recreation port

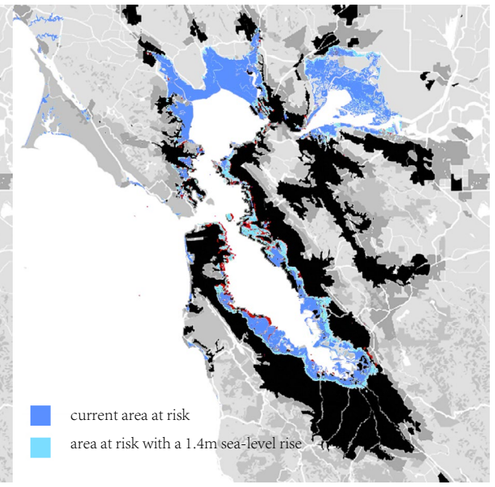
Inundation 2100



Occupation

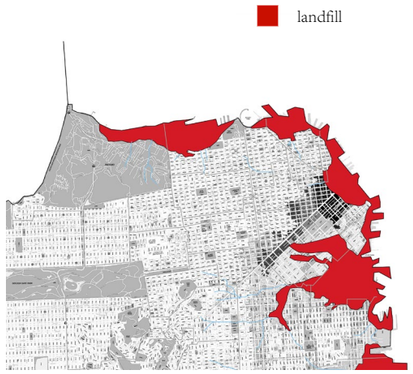


Landfill

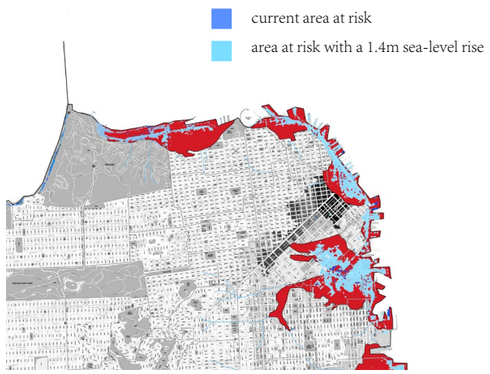


Inundation 2100

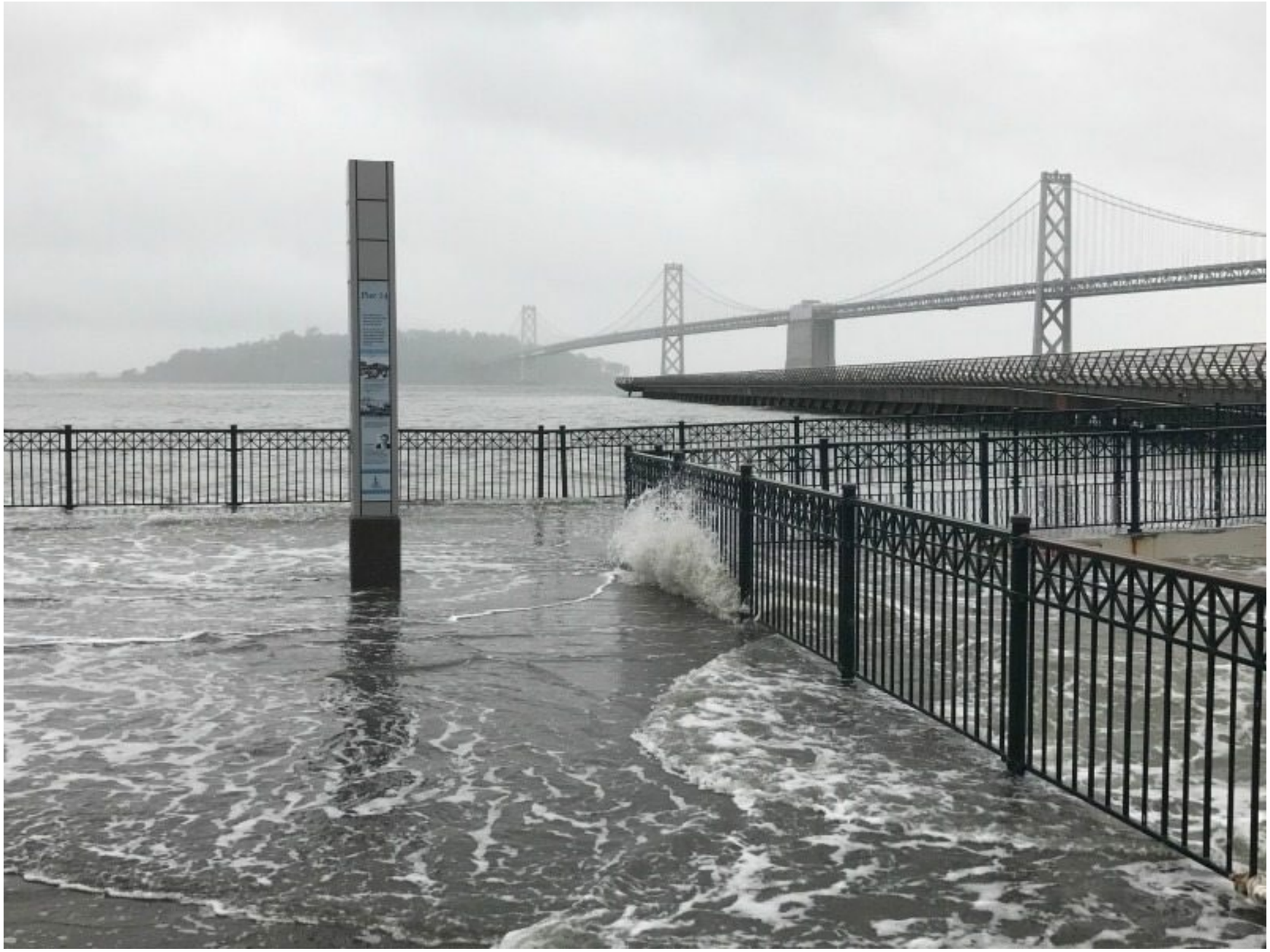
Occupation



Landfill

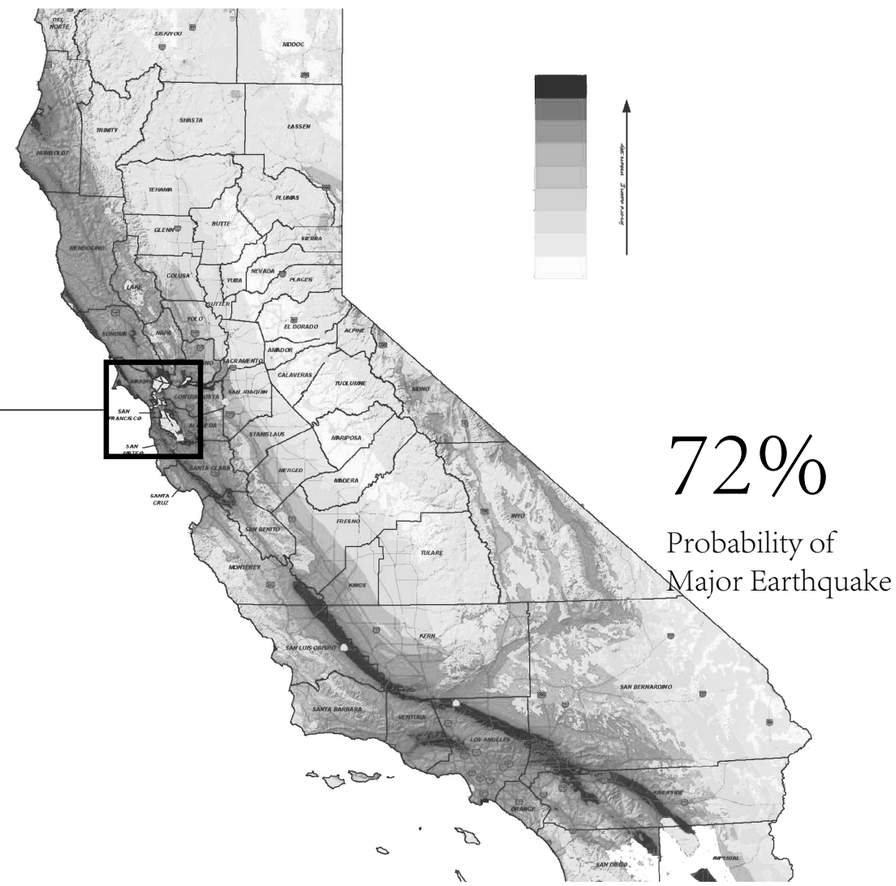


Inundation 2100



December 2016, Embarcadero

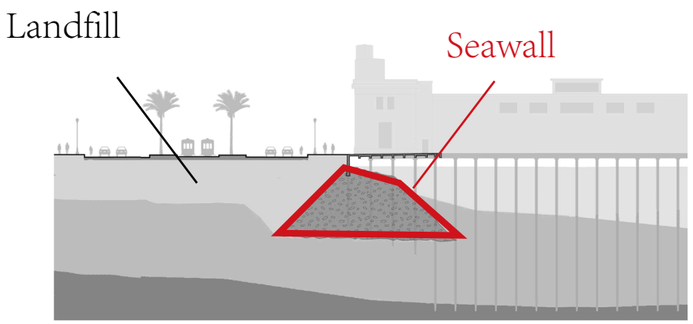
Major Earthquake by 2044



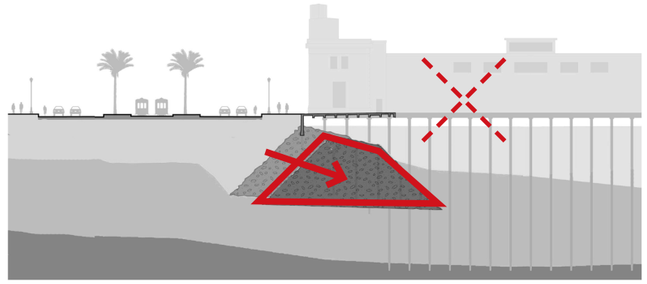
San andreas fault

1906 Embarcadero

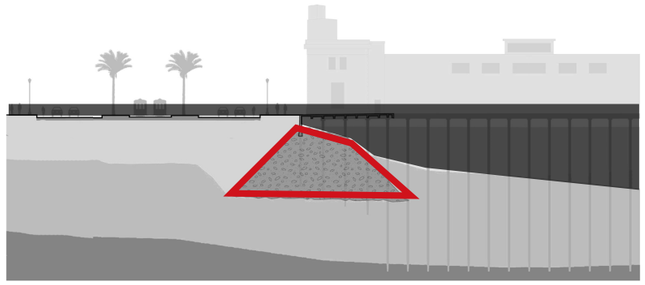
Existed situation: Landfill + seawall
1910-now



Situations in disasters

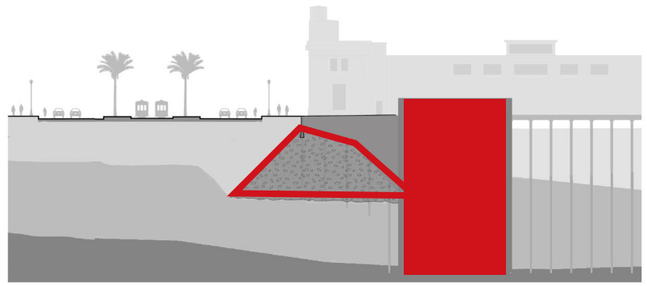


Earthquake 2044



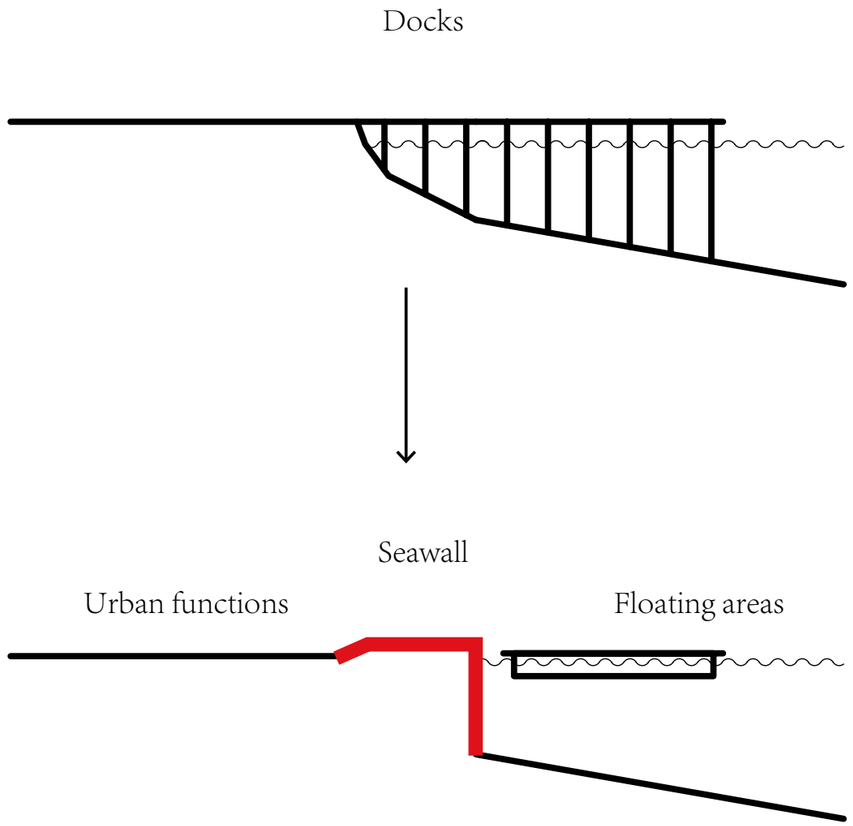
Inundation 2100

Solution

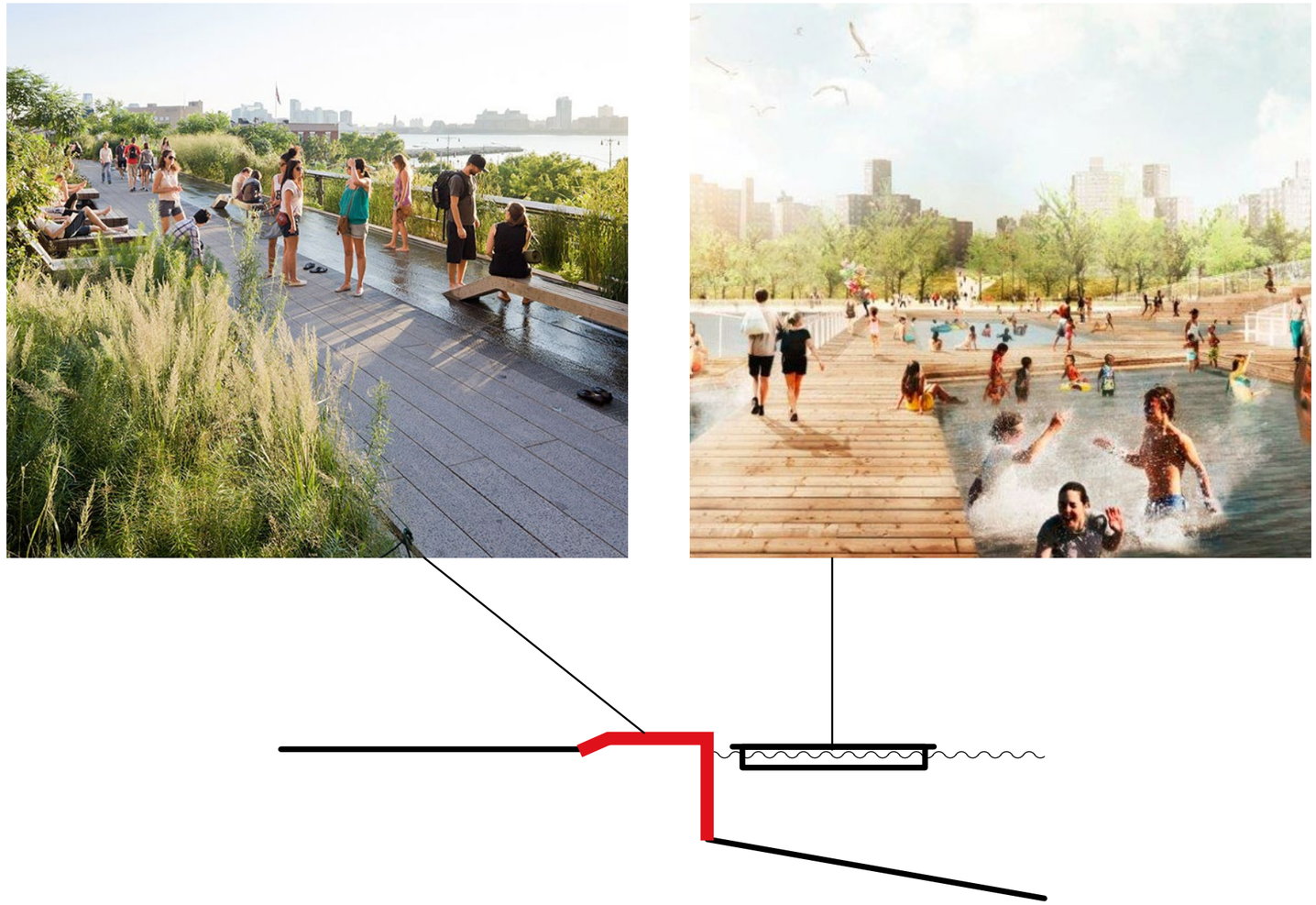


Combined with new seawall

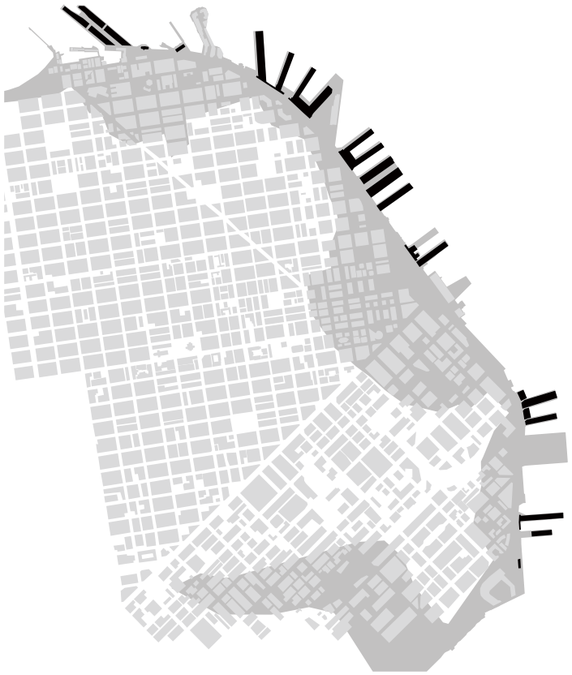
Conceptual diagram



Potentials

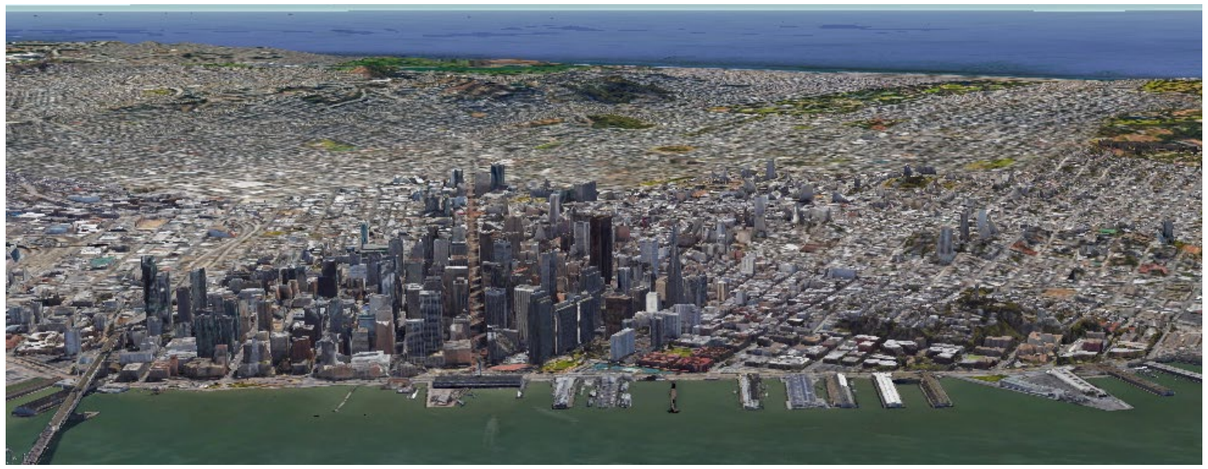


Situation 1: old piers



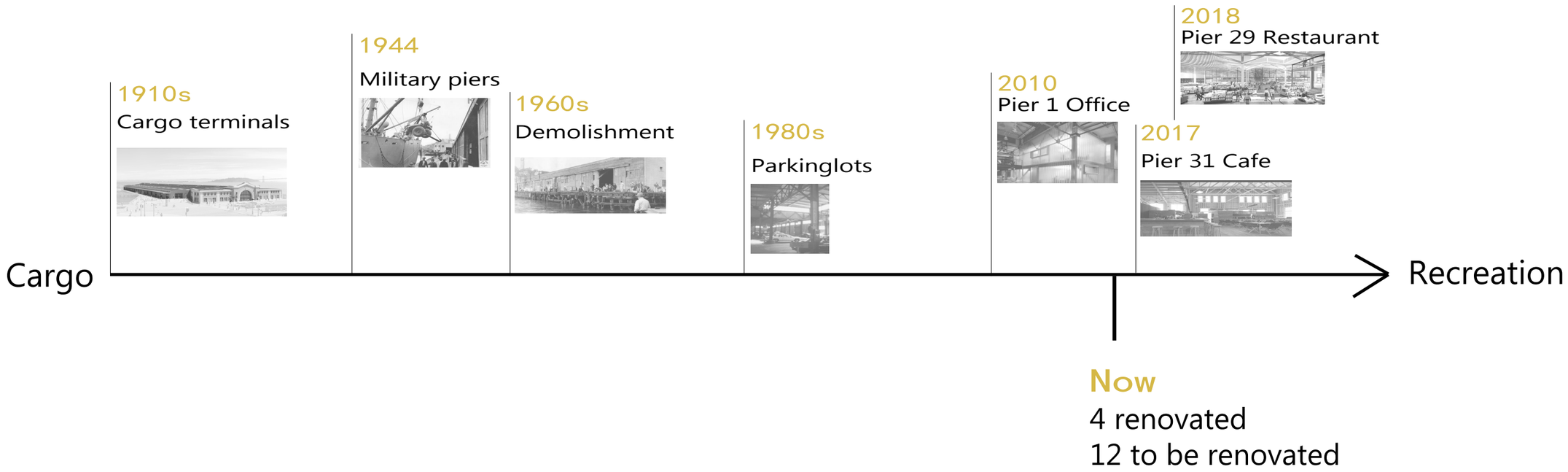
Old piers

1930s

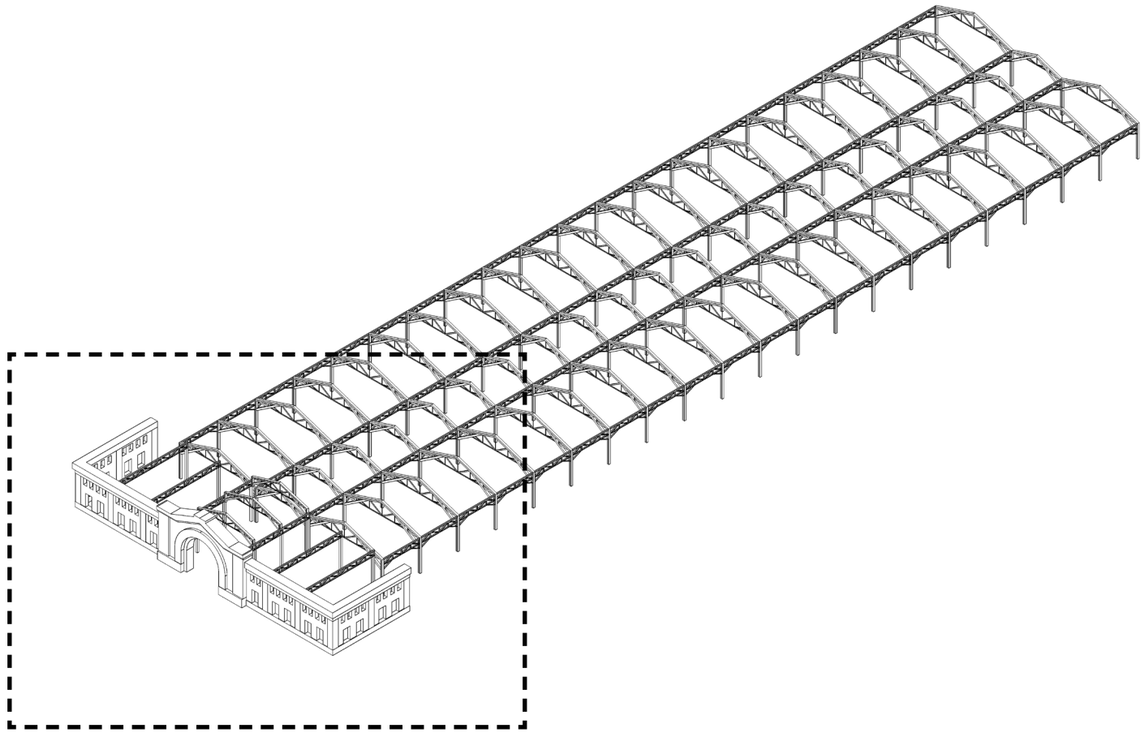


2010s

Feature 1: Important urban structure



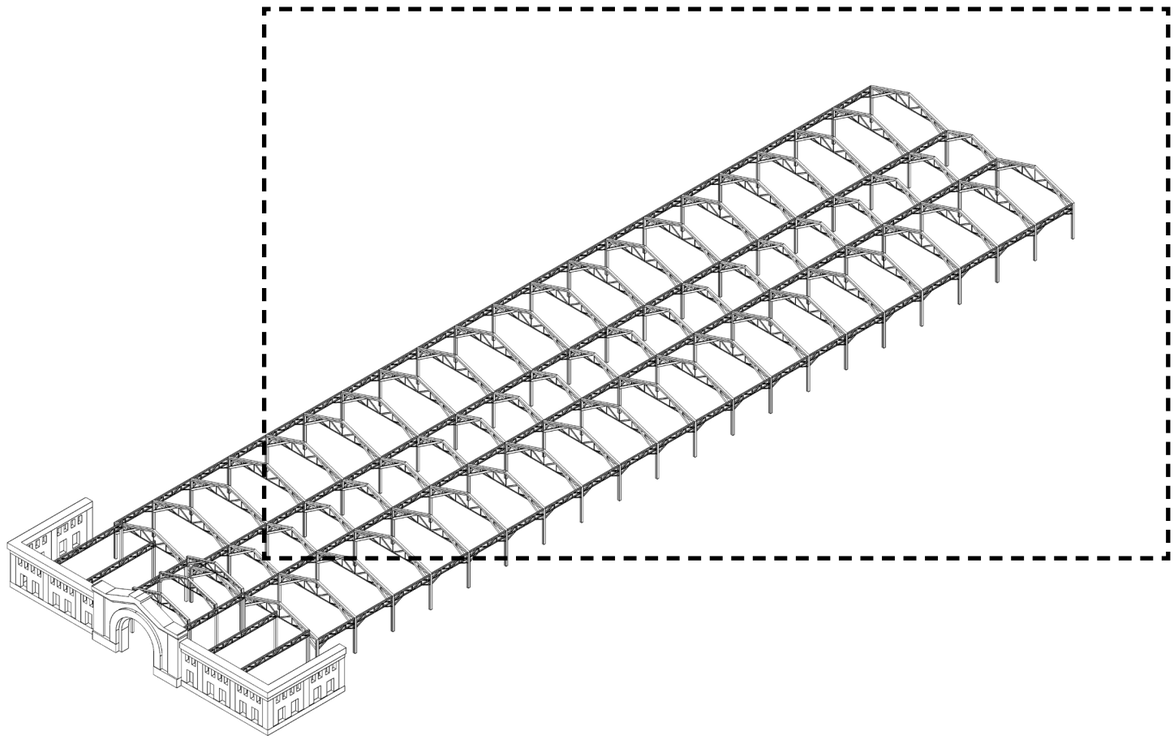
Feature 2: Great historic value

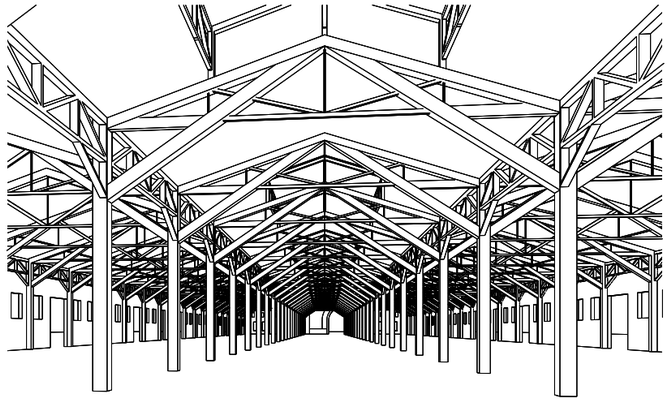


1930s

Present

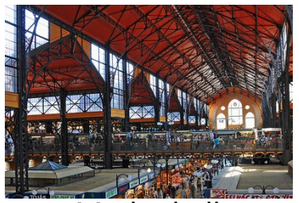
Feature 3: Iconic facades





Pier

Museum



Markethall

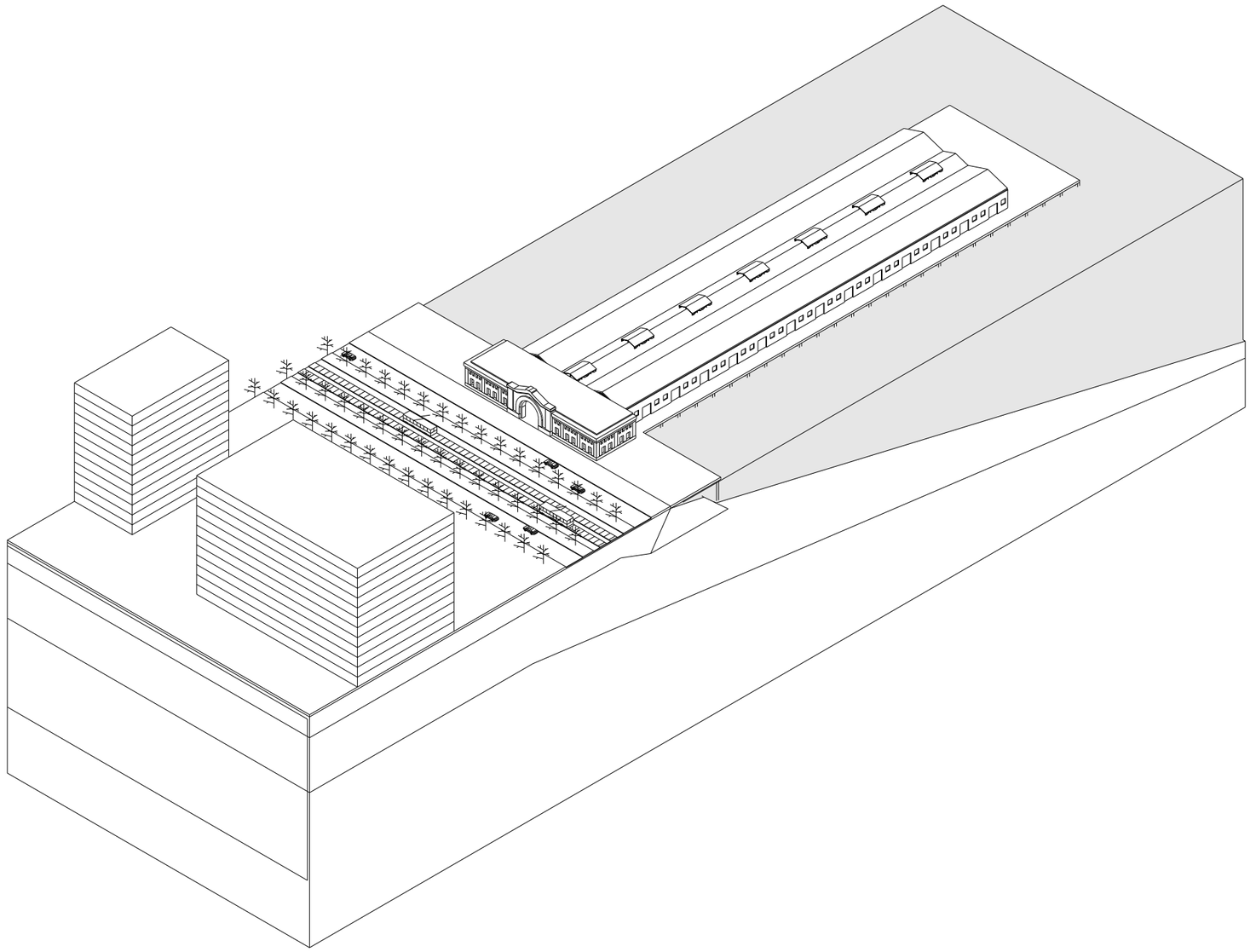
Shopping mall

Office

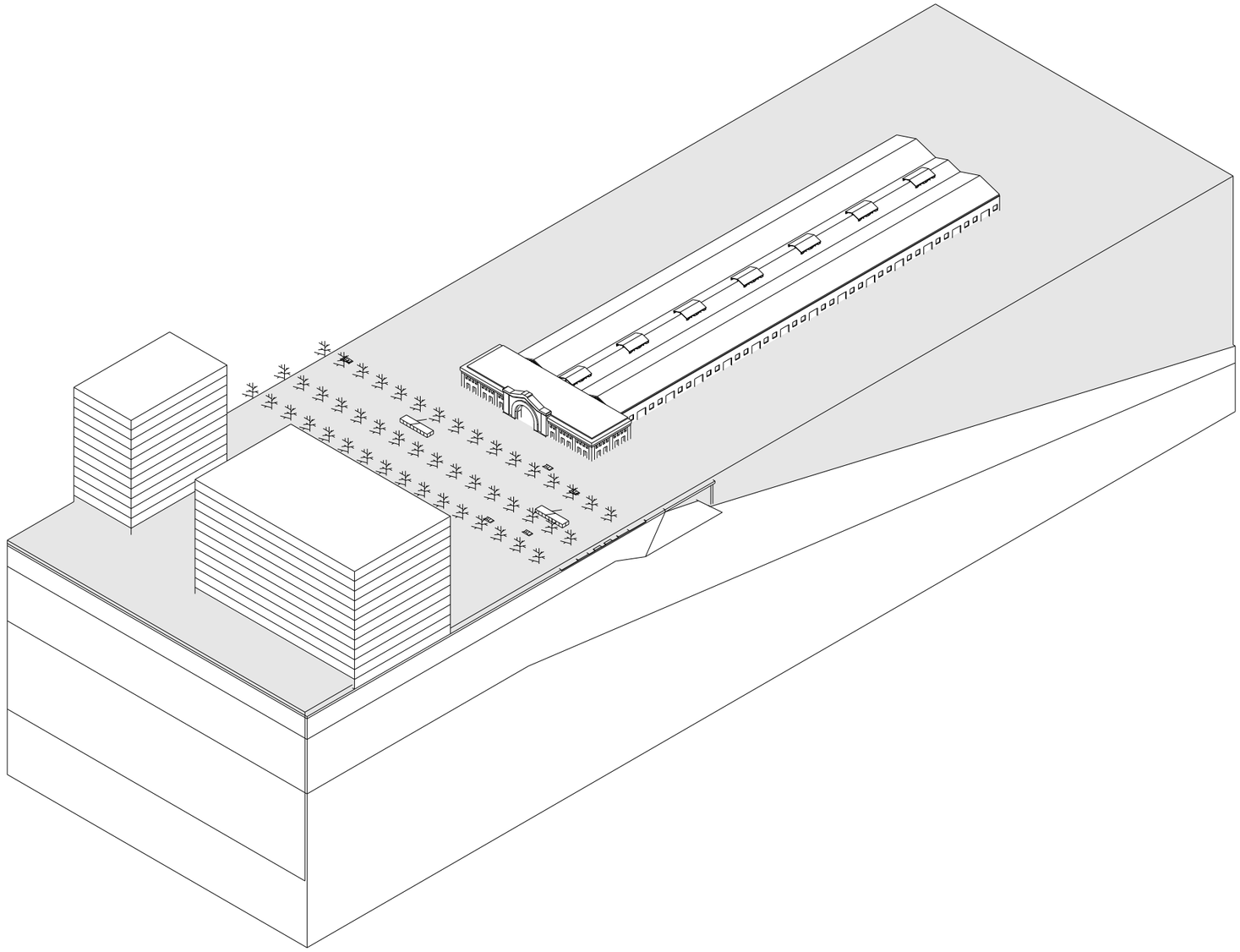
Sports

Feature 4: Large-span structures are good for public programs

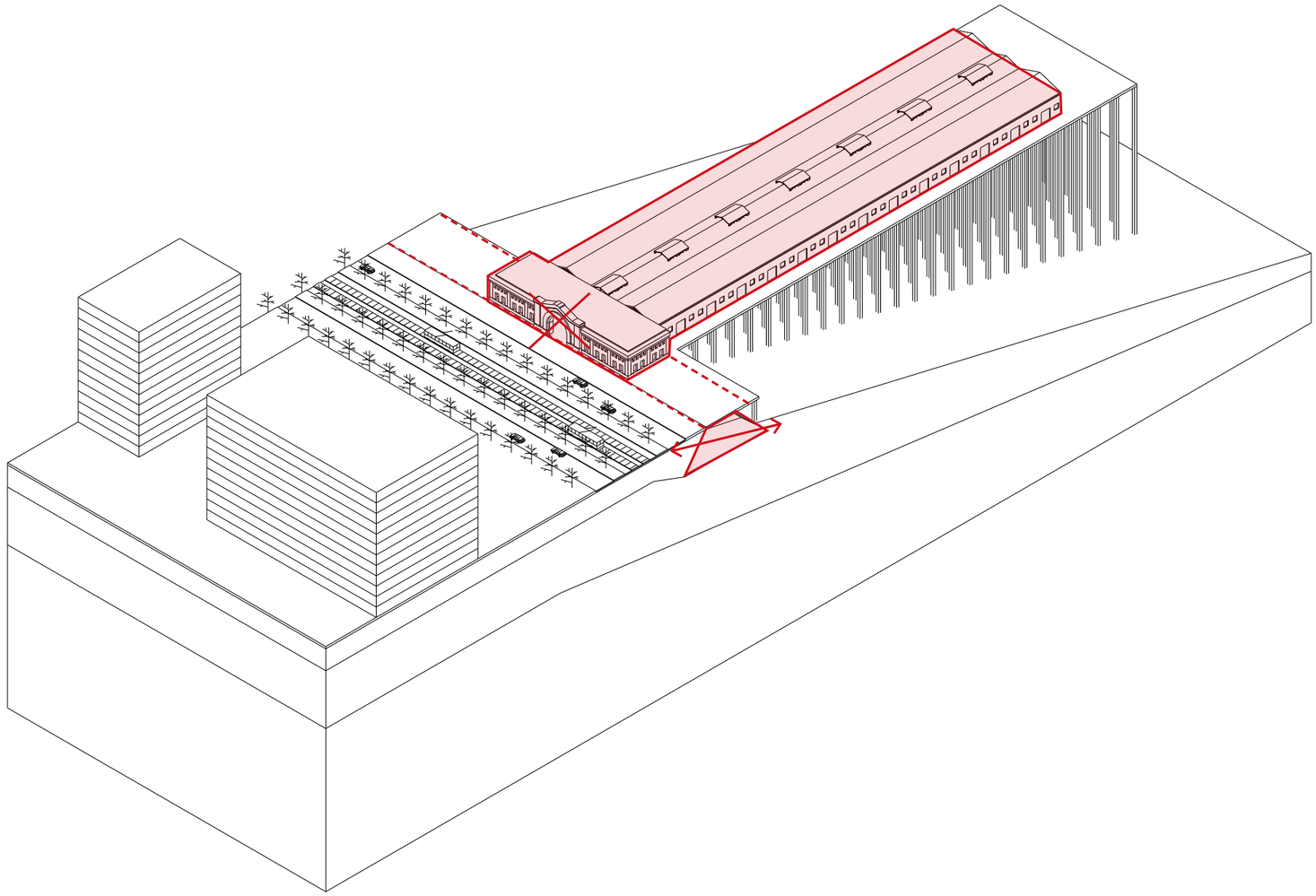
Future plannings of the old piers



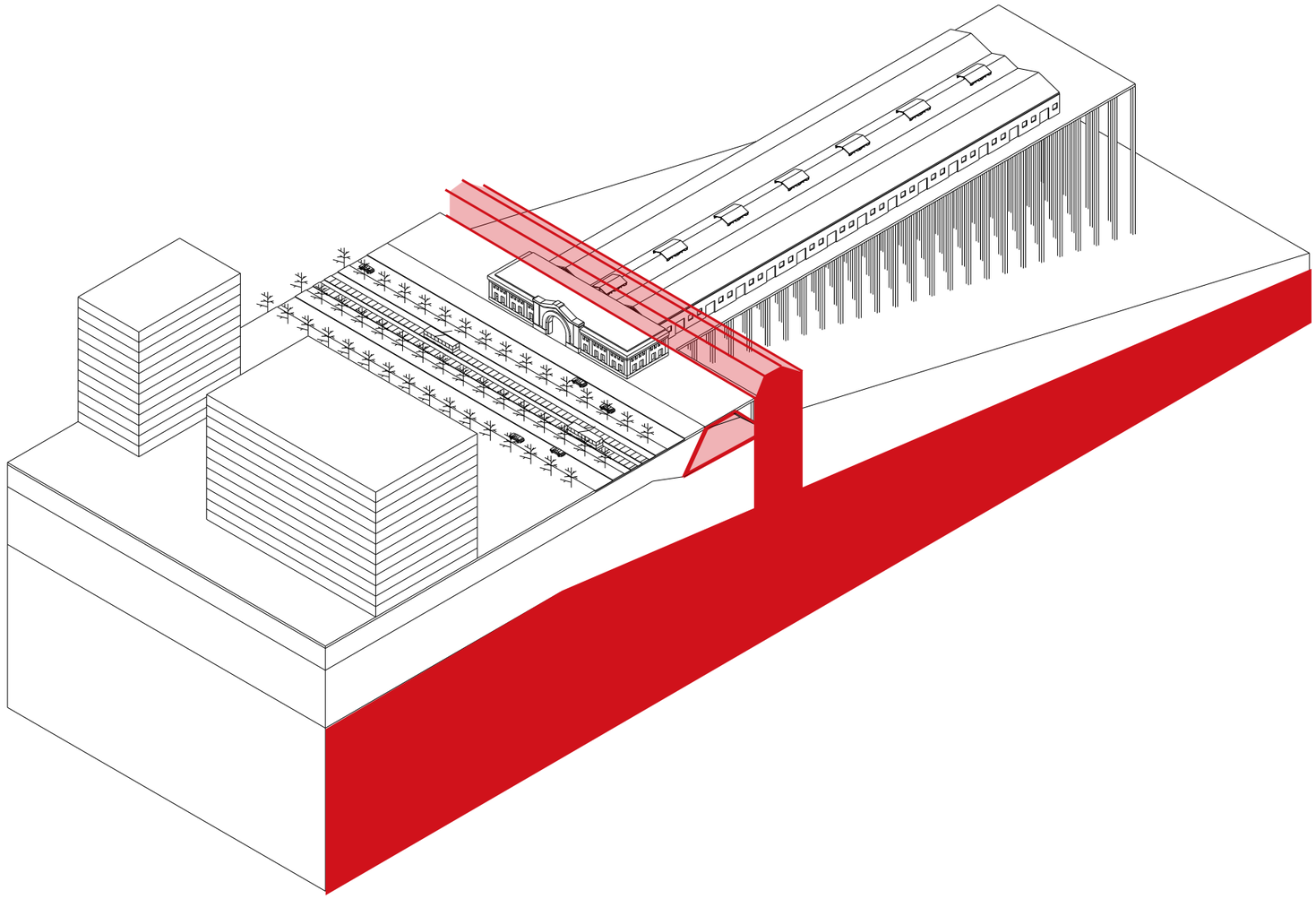
Existed situation



Inundation

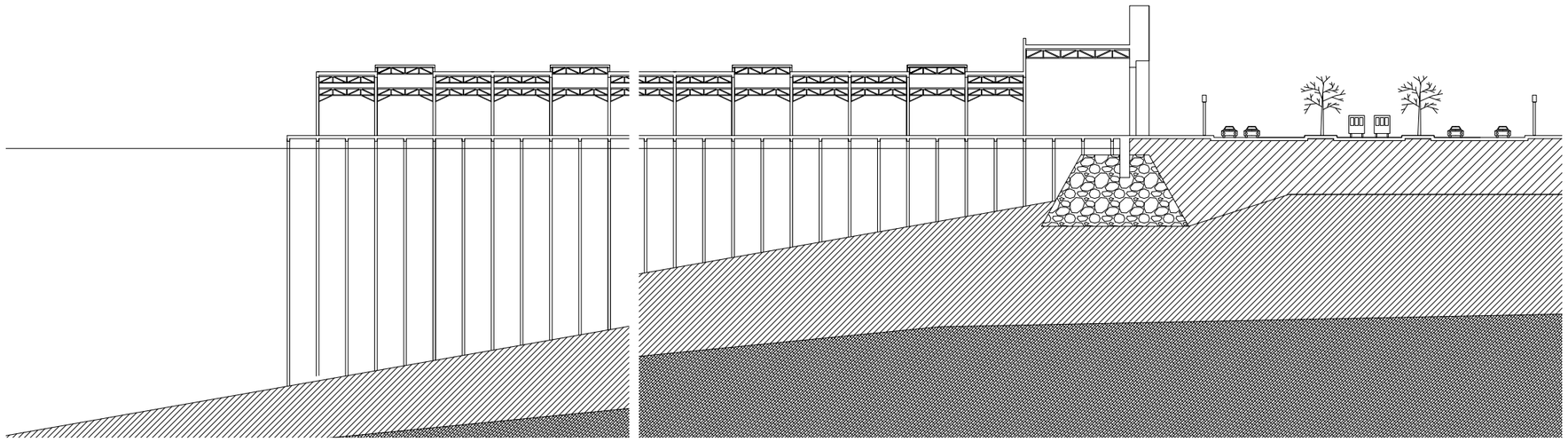


Earthquake

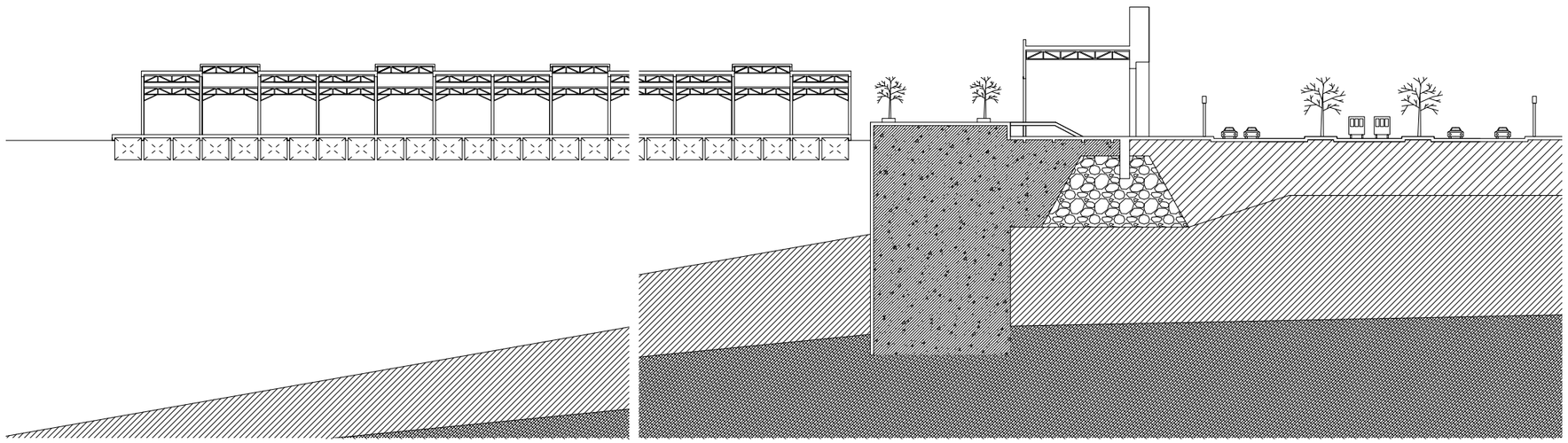


New seawall

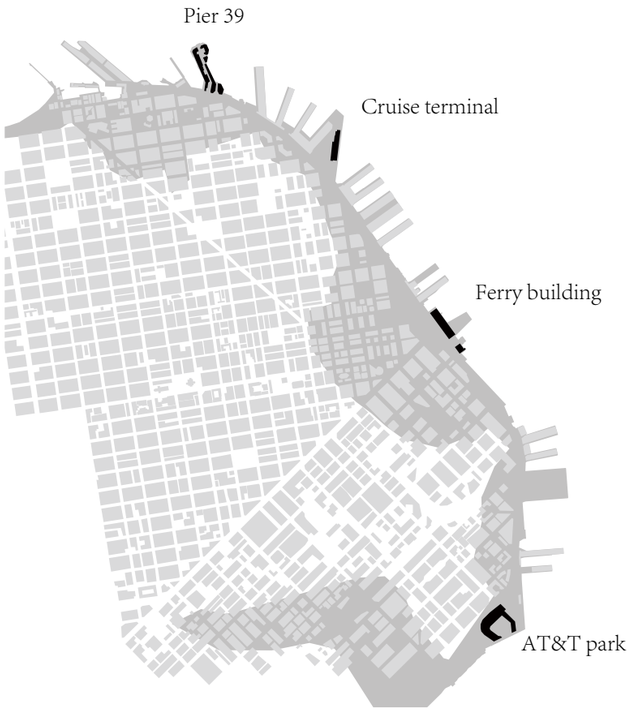
Present

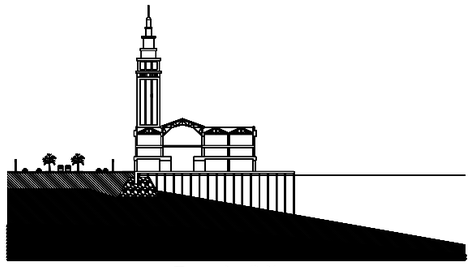


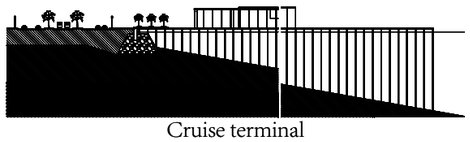
Future

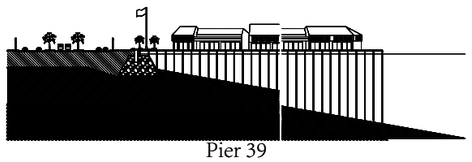


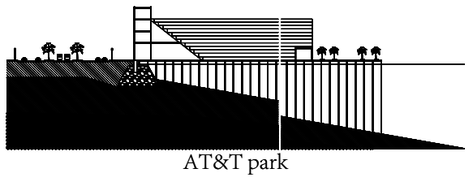
Situation 2: particular sites



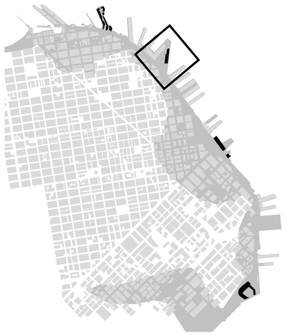

Ferry building


Cruise terminal


Pier 39


AT&T park

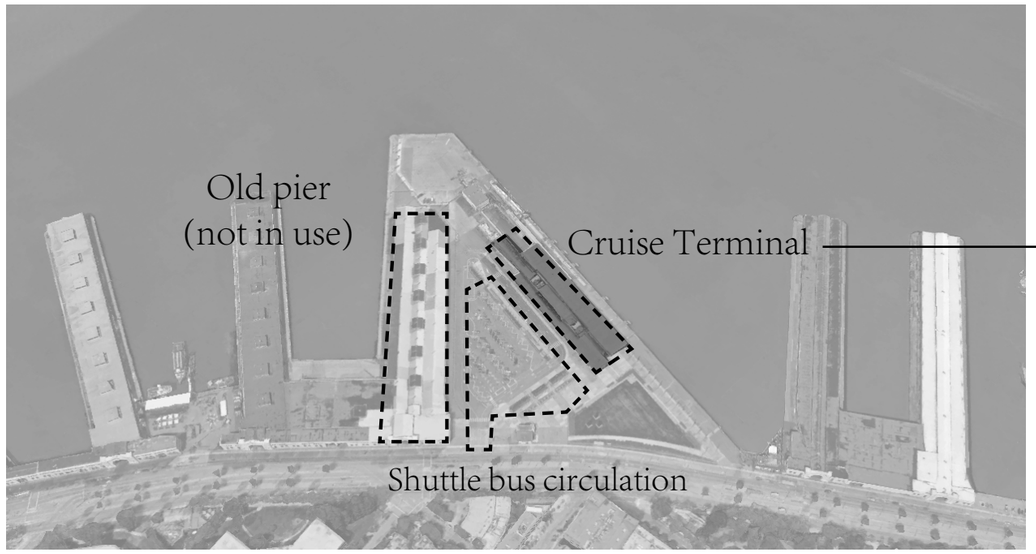
Cruise terminal



2013
The starting point of San Francisco's cruise industry

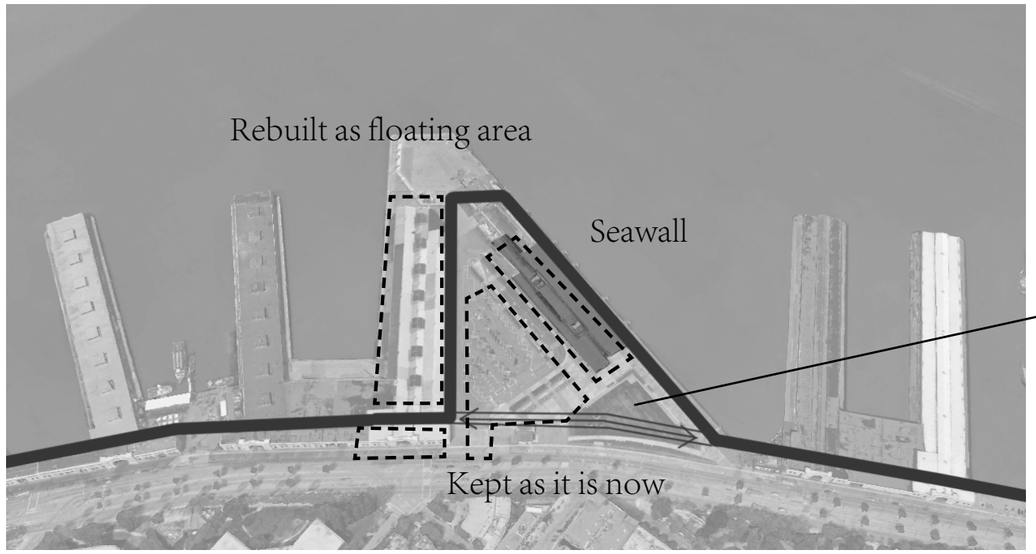
One of the only two places that deep enough for a cruise ship
The only place for shuttle buses

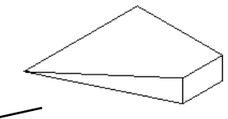
Present



Cost $92 million

Future



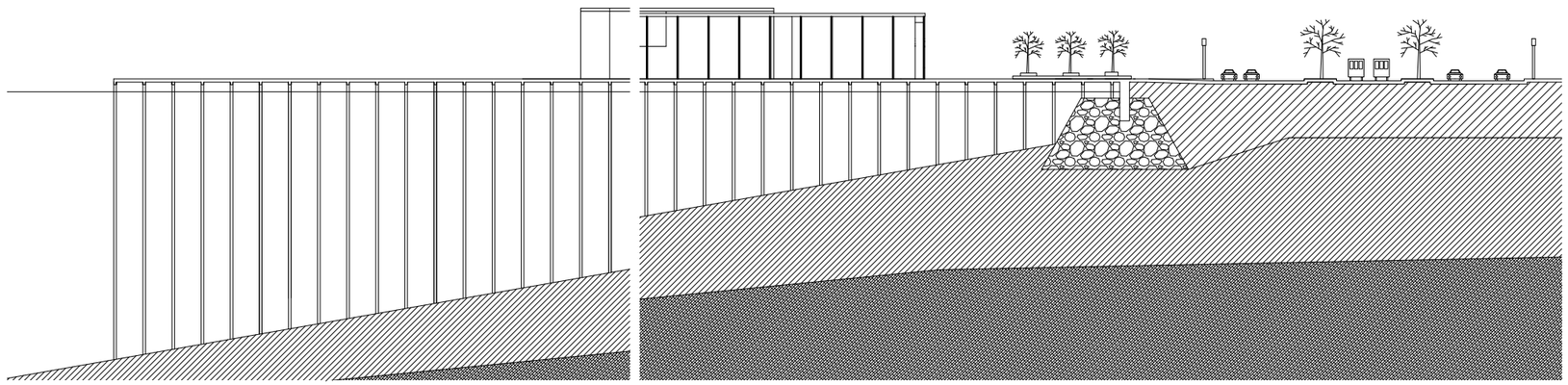


Landfill
+
Hydraulic fill

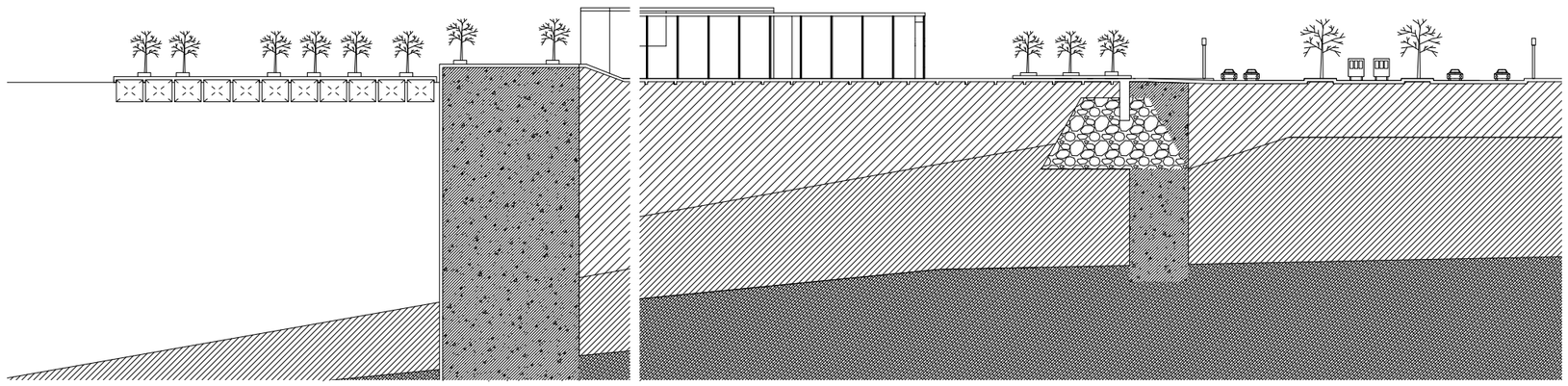
330, 000m^3

$18 million

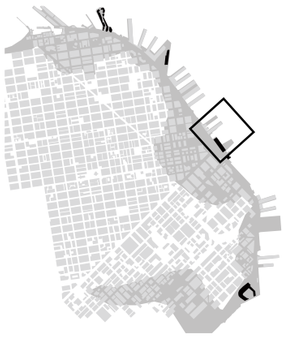
Present



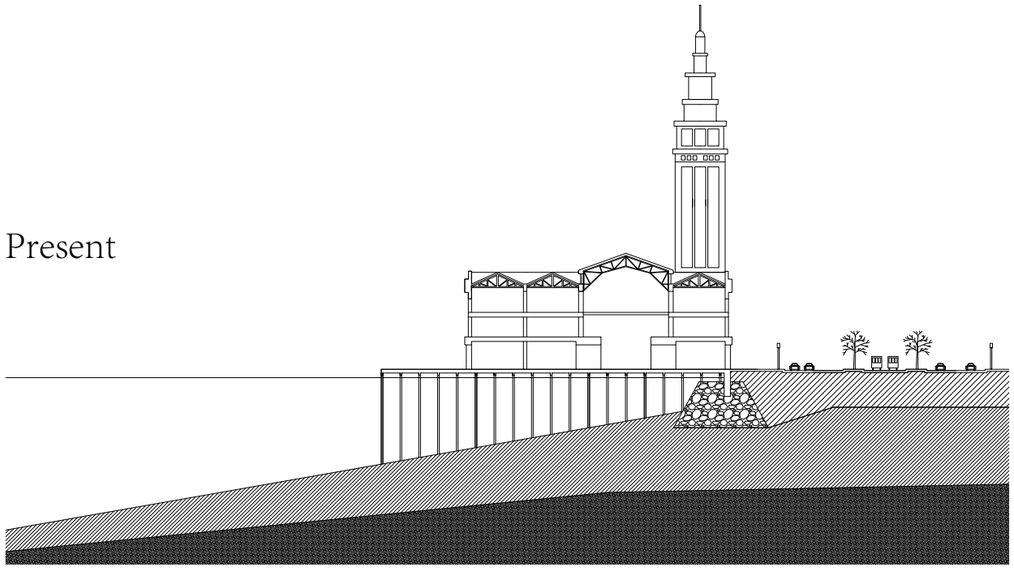
Future



Ferry building

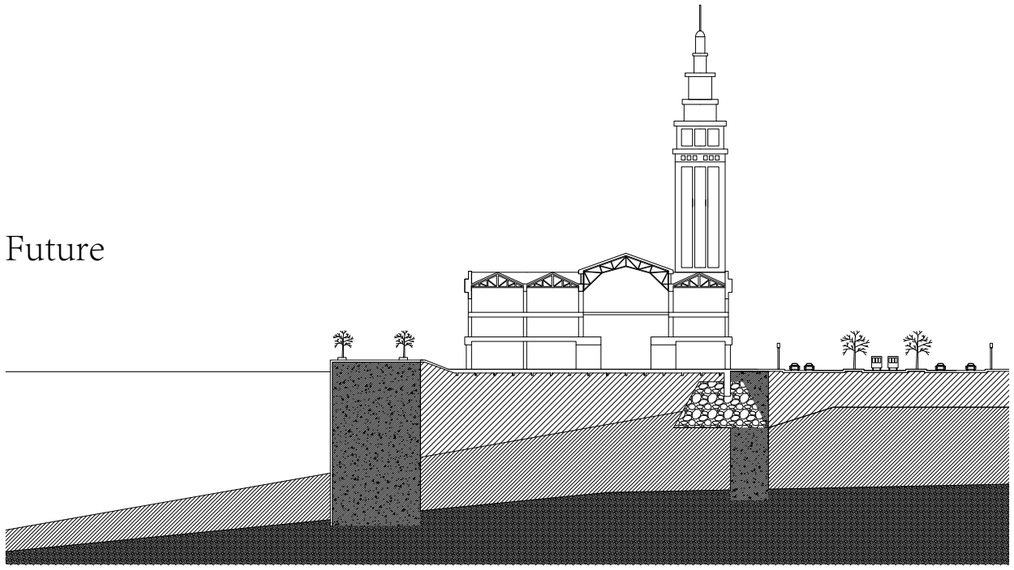


Present

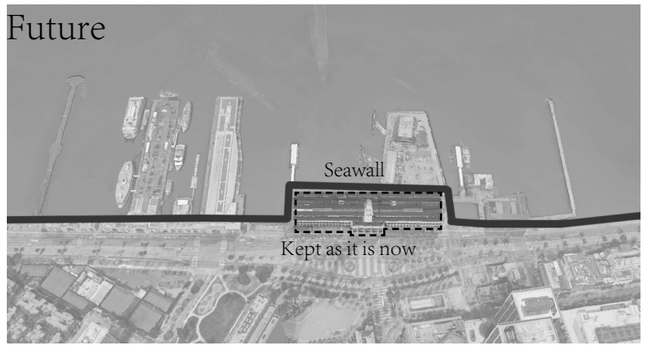


Present

Future

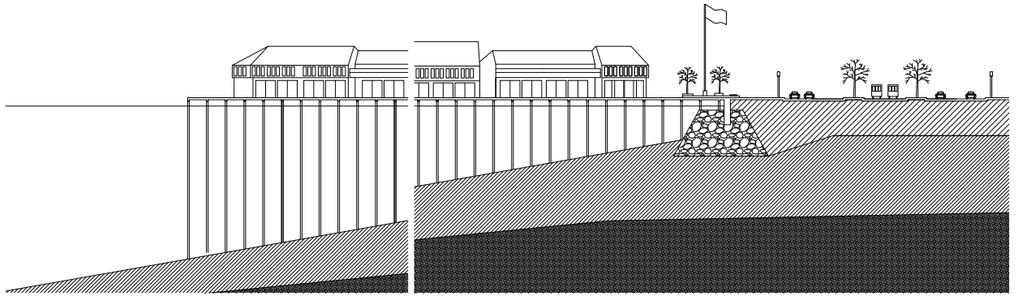


Future



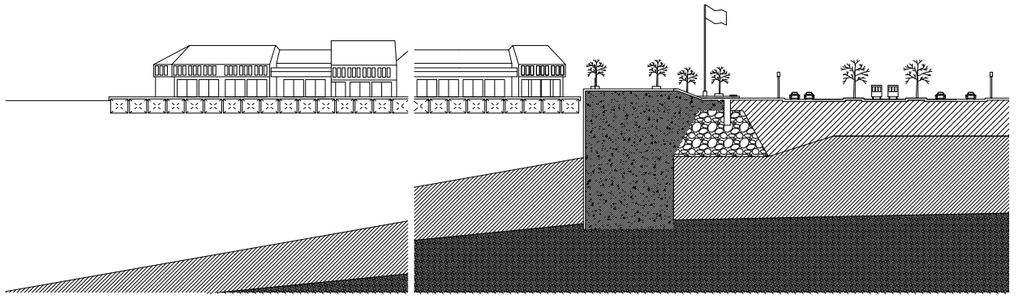
Pier
39

Present

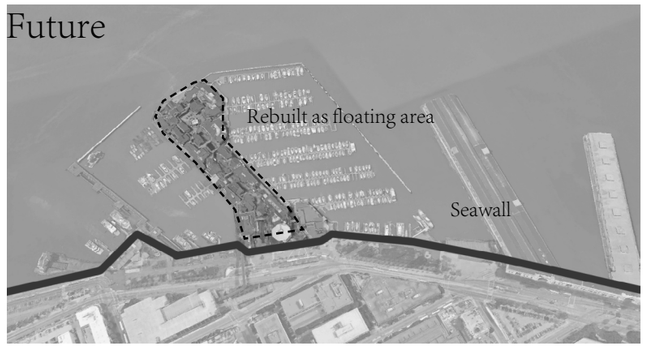


Present

Future

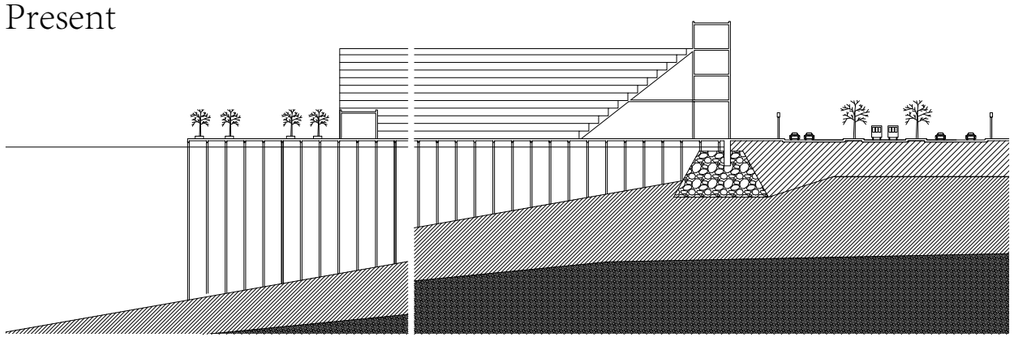


Future

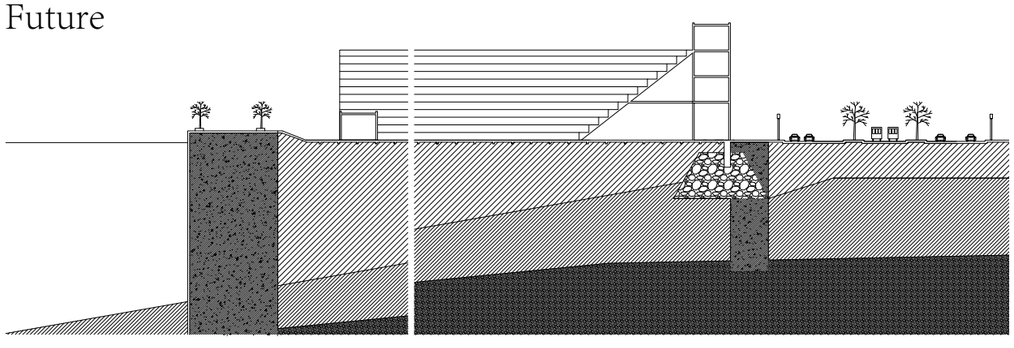


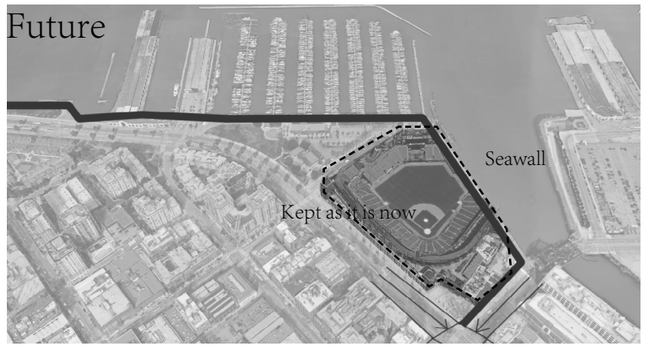
AT&T
park

Present



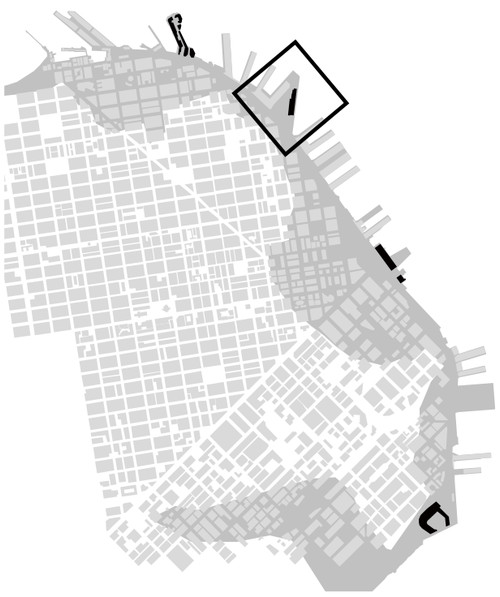
Future



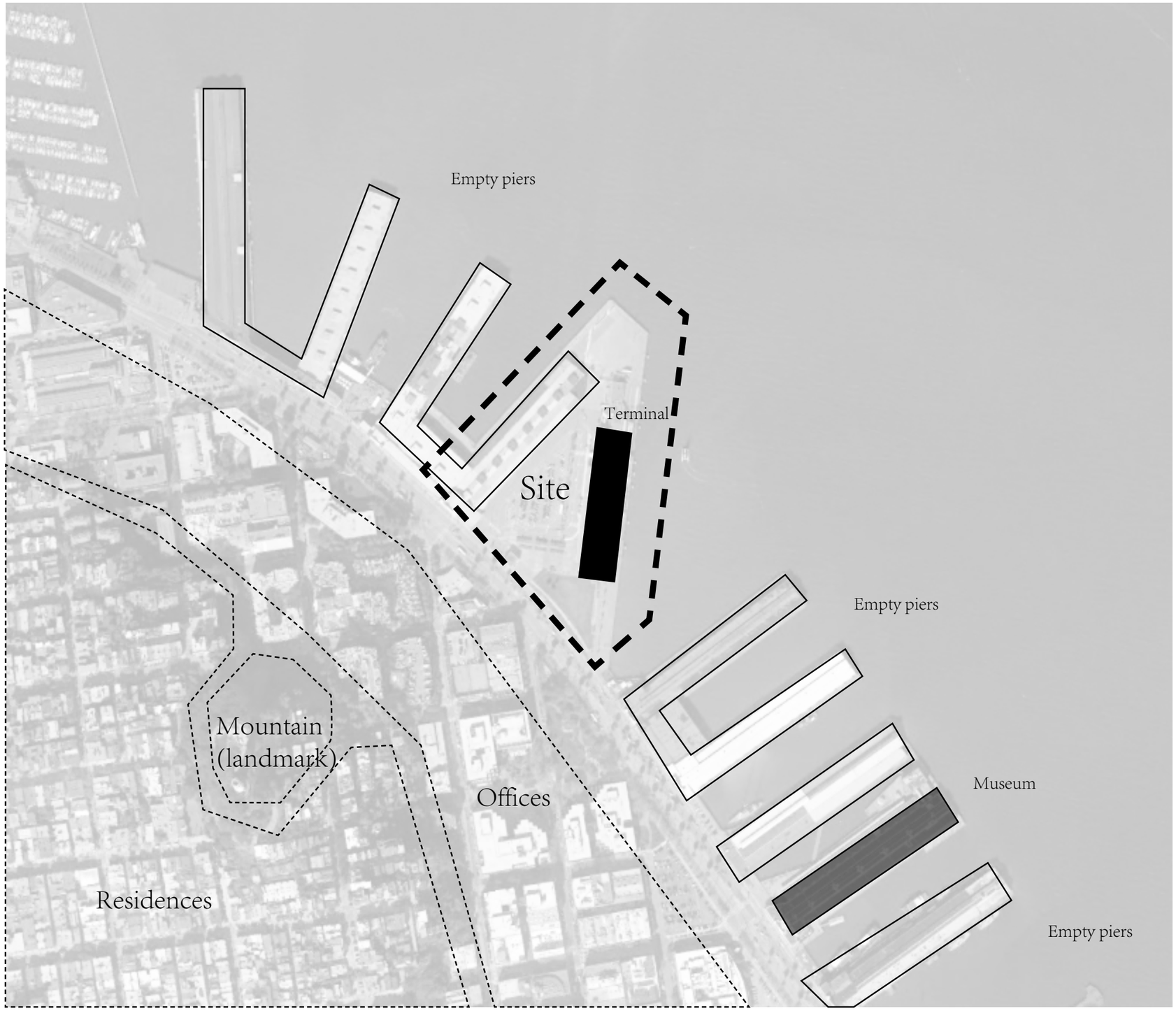


Part 2

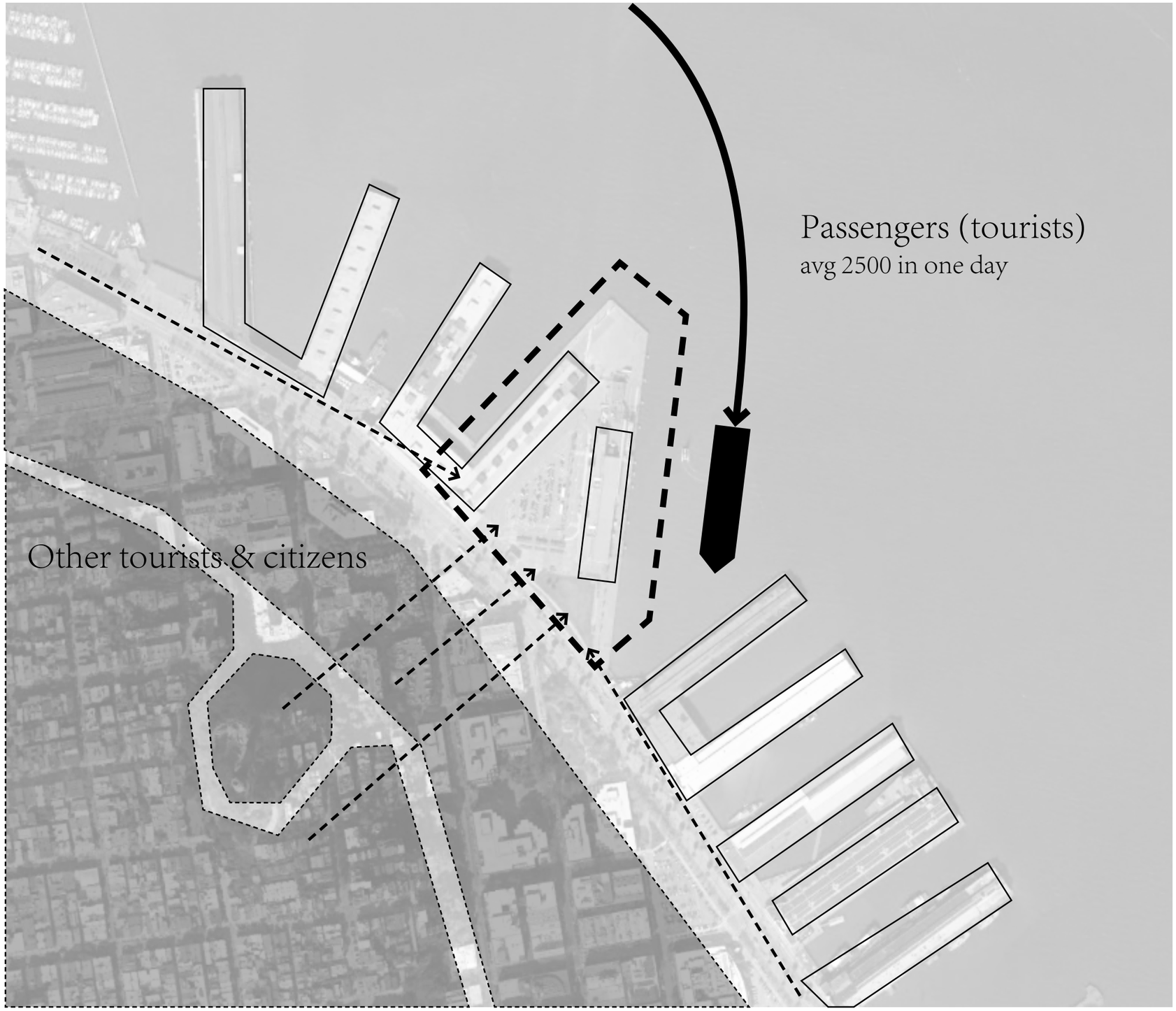
Architectural design
Terminal site



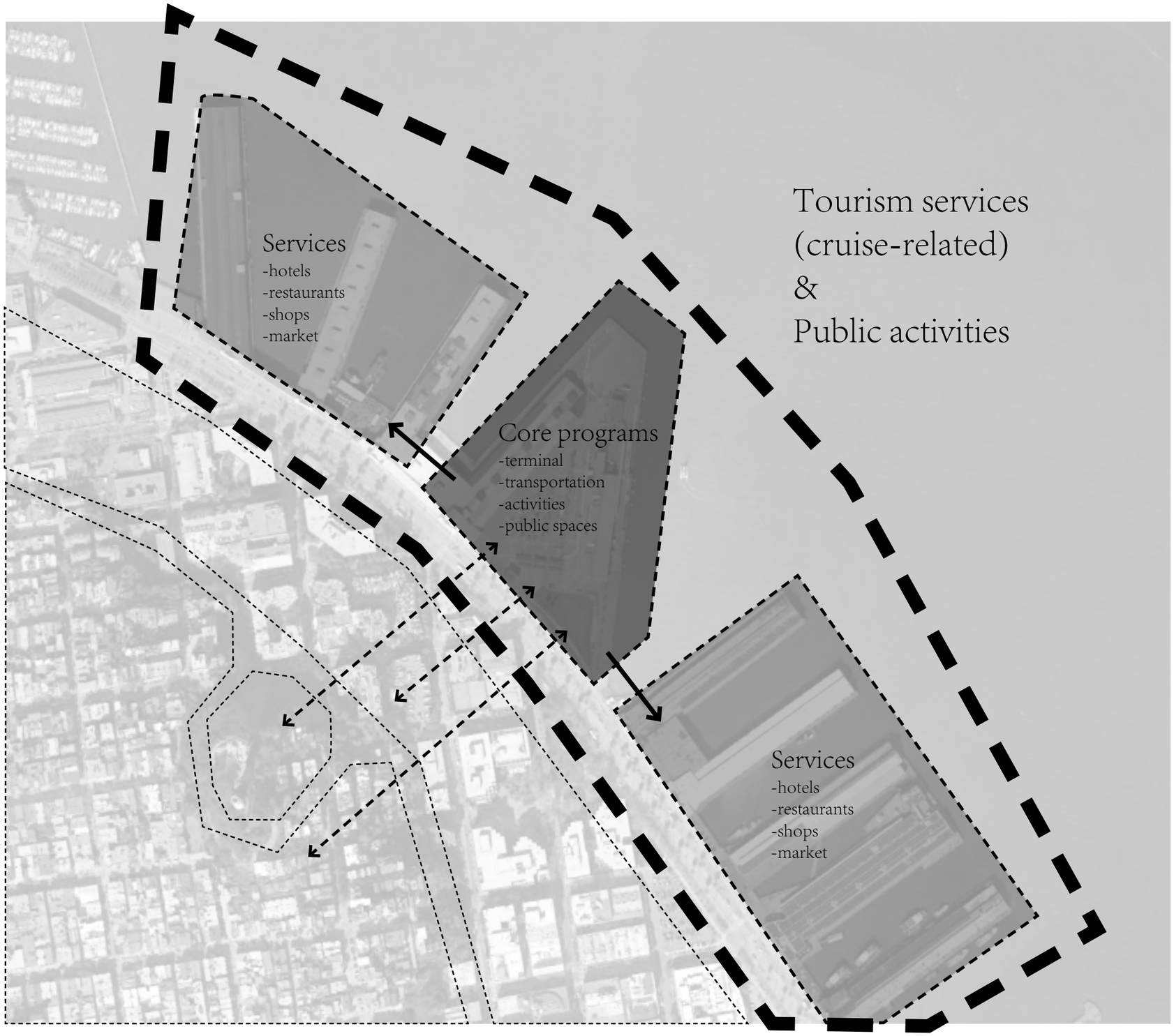
Site analysis



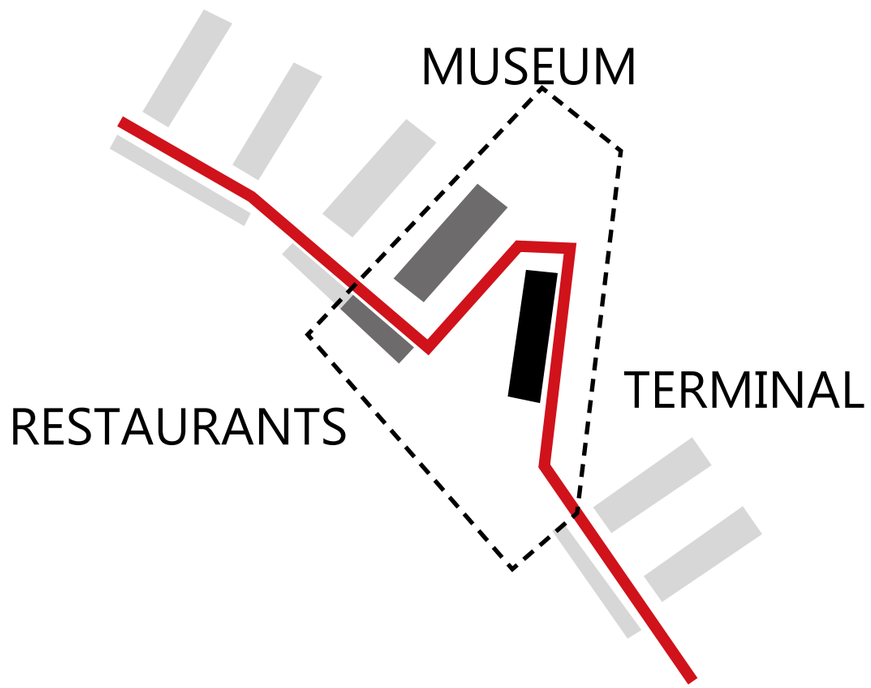
Users


Passengers (tourists)
avg 2500 in one day
Other tourists & citizens

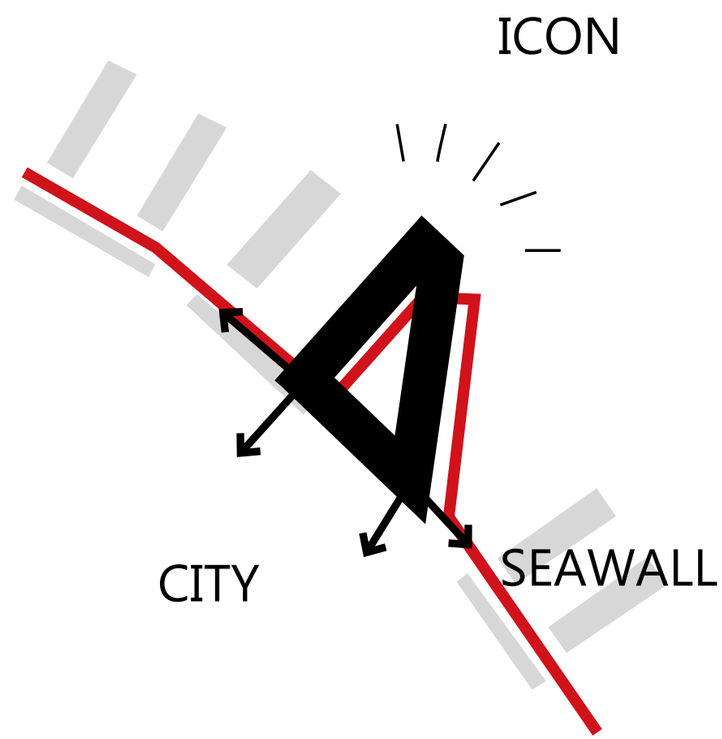
Future plannings



Concept: a public loop



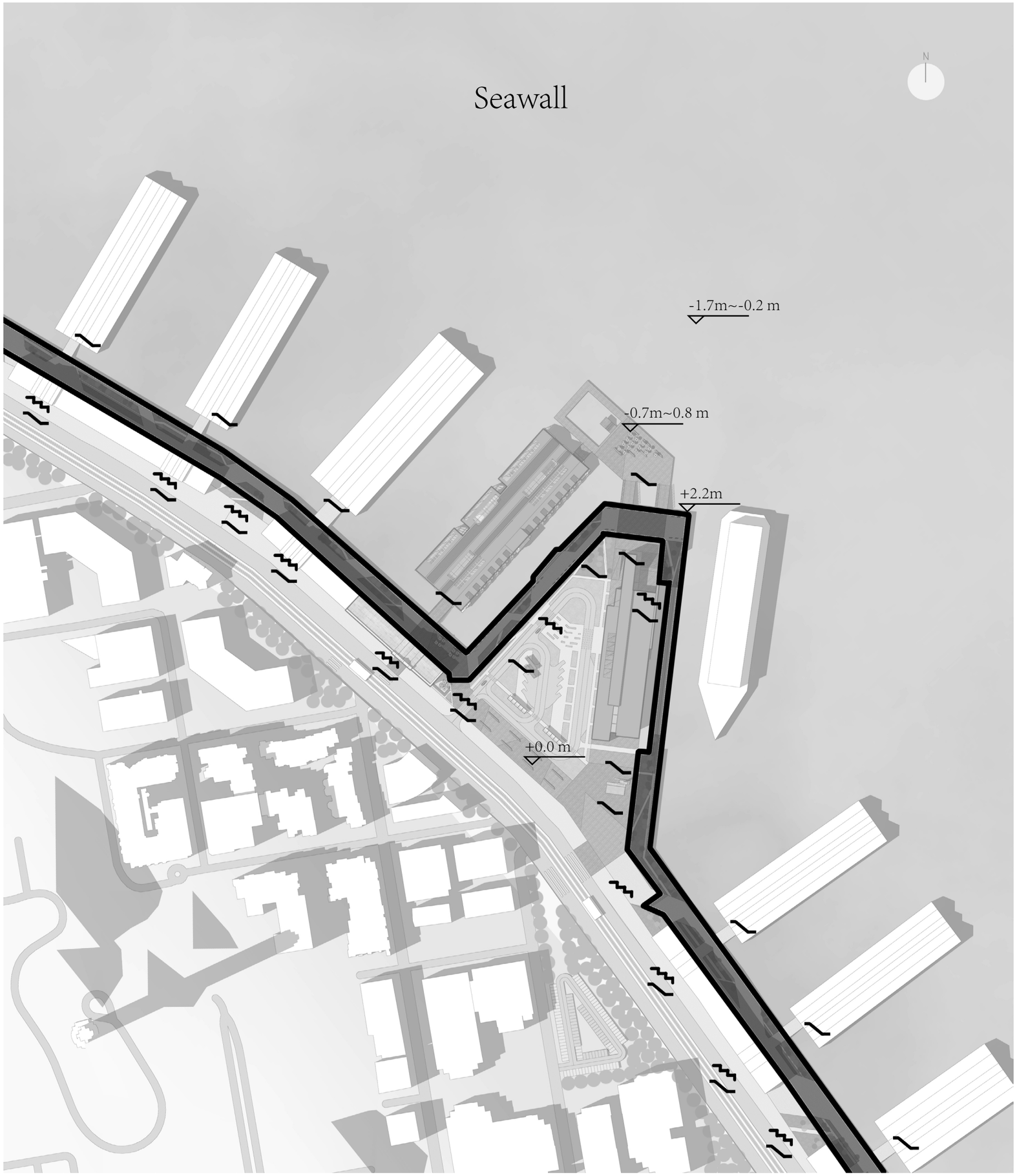
Architectture



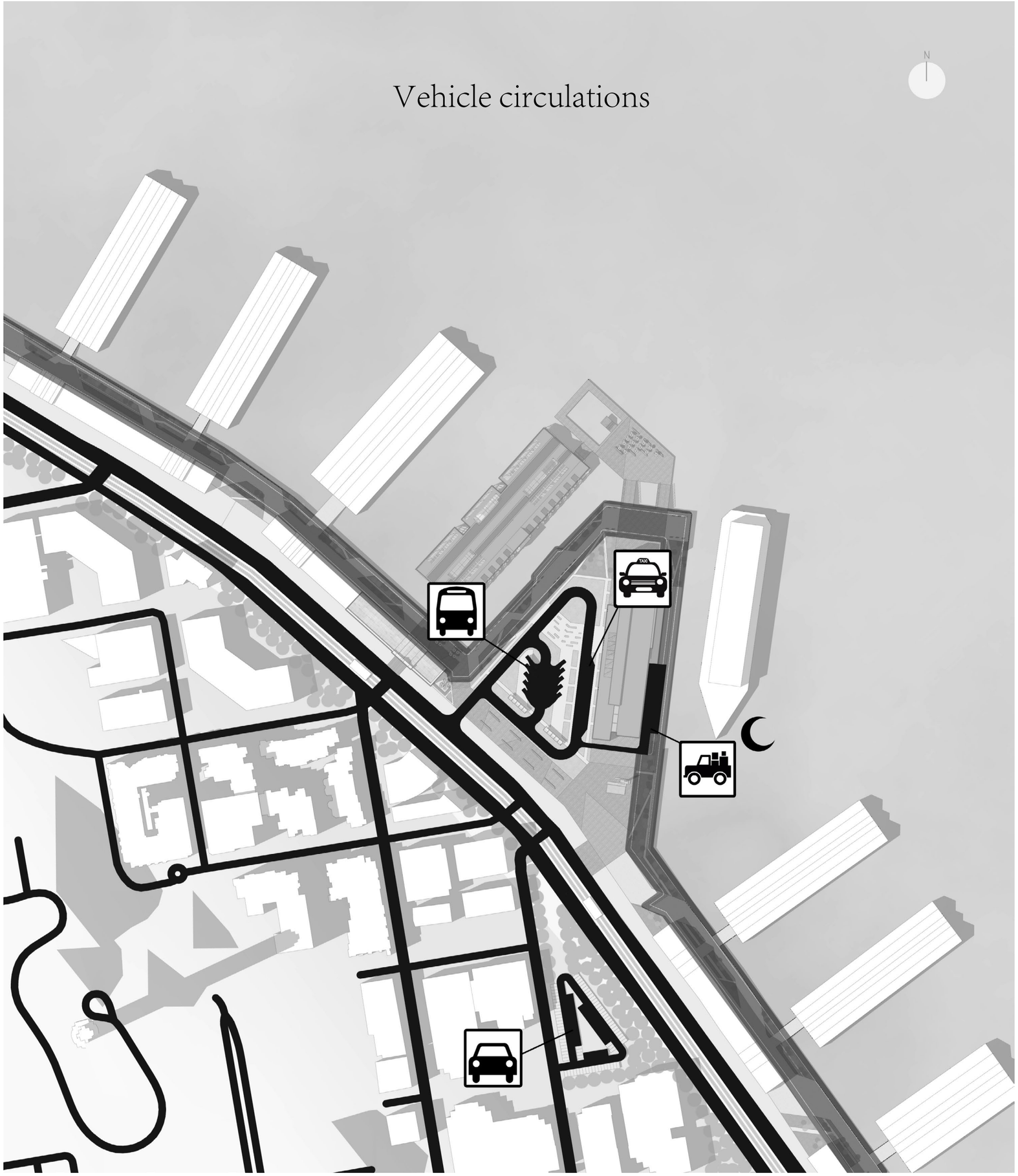
Landscape


N
Museum
Terminal
Restaurants

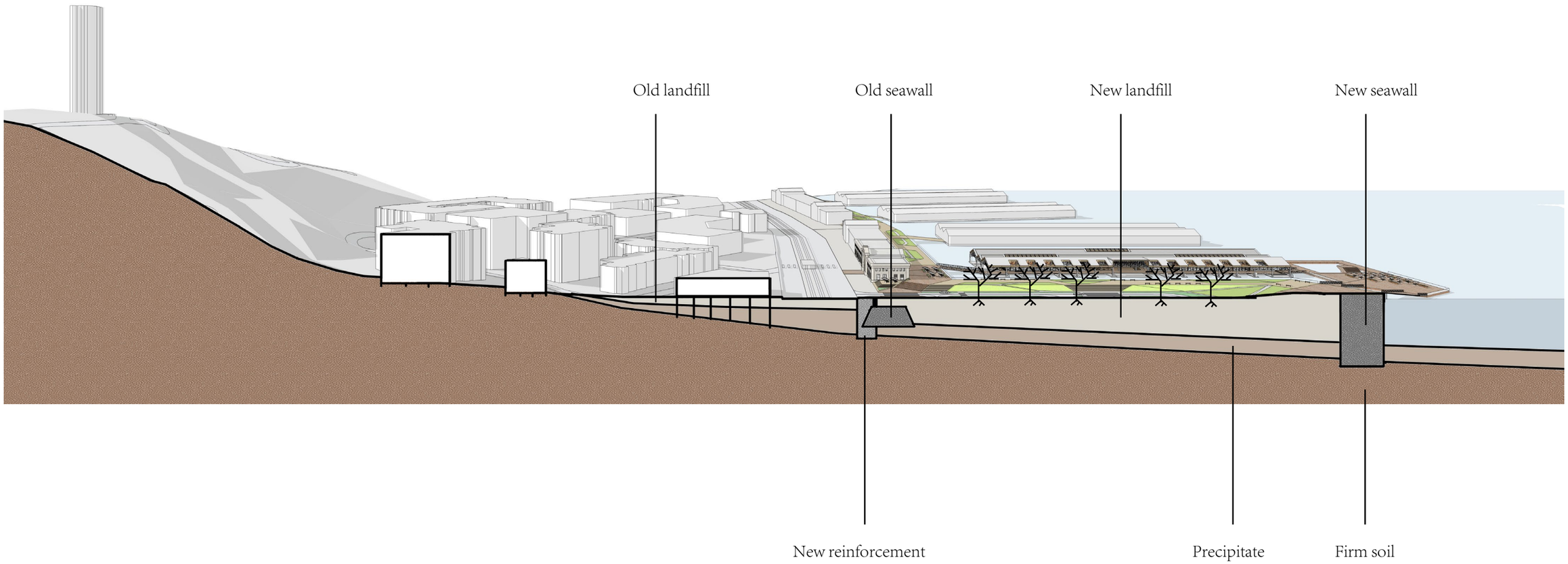
Seawall

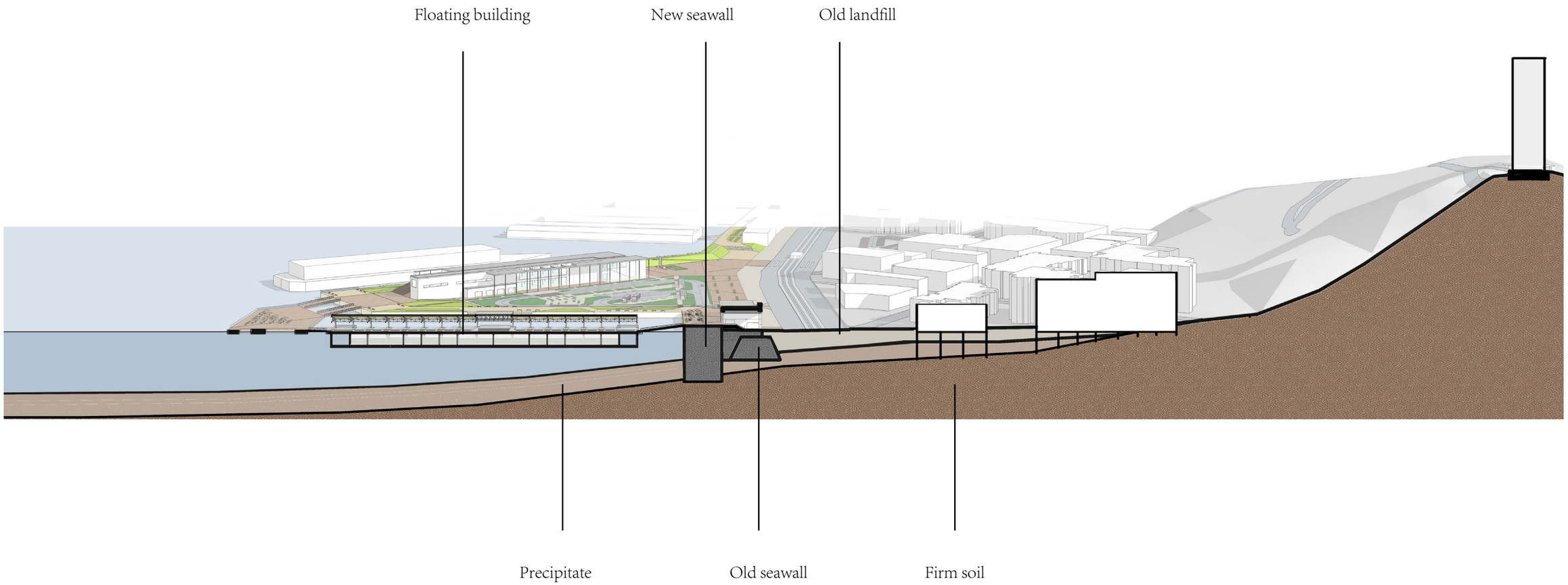


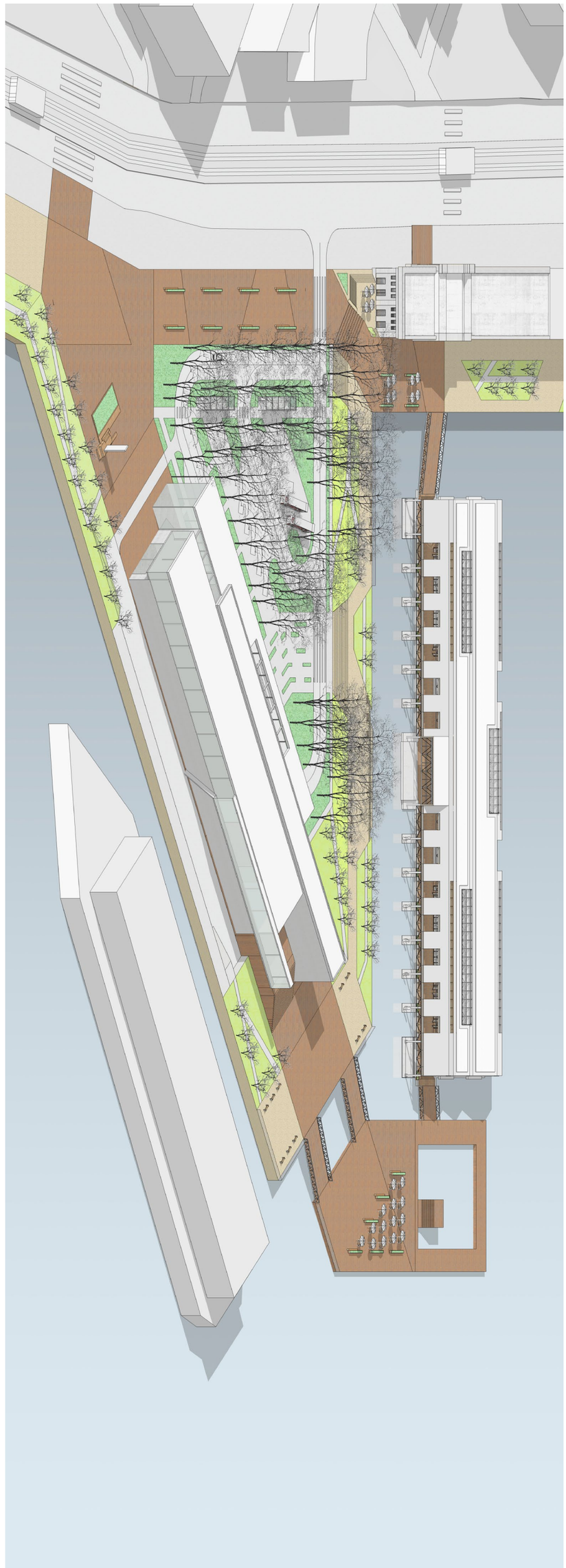
Vehicle circulations

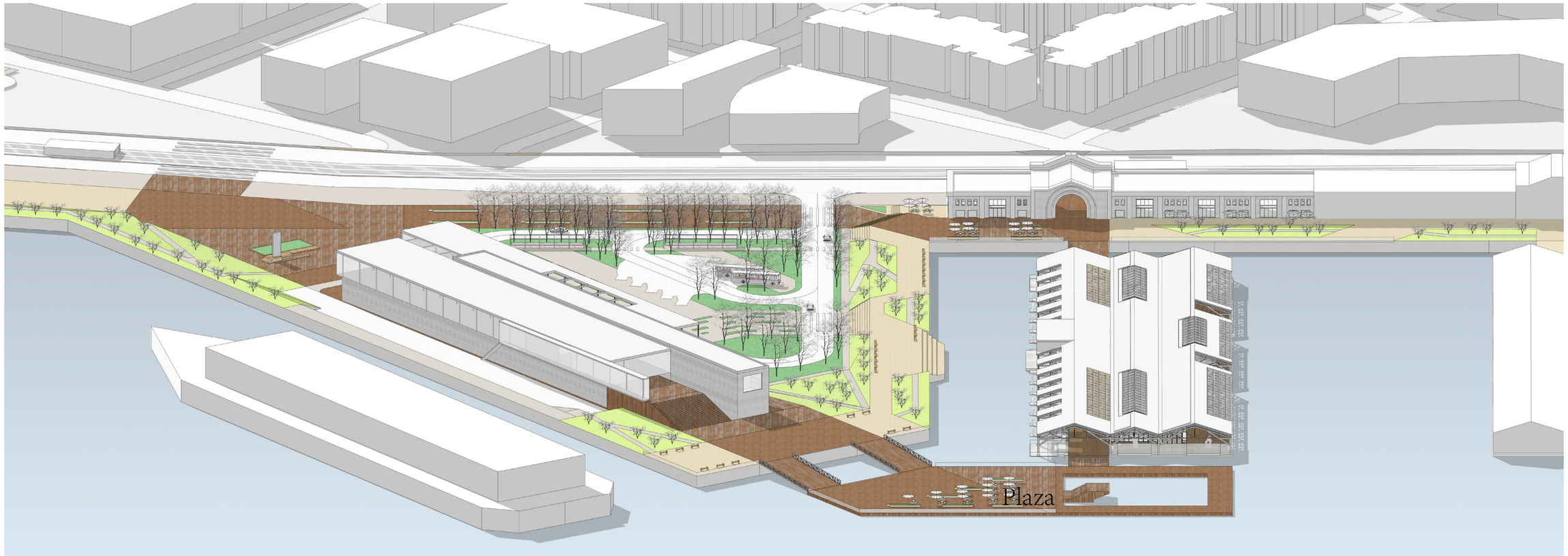


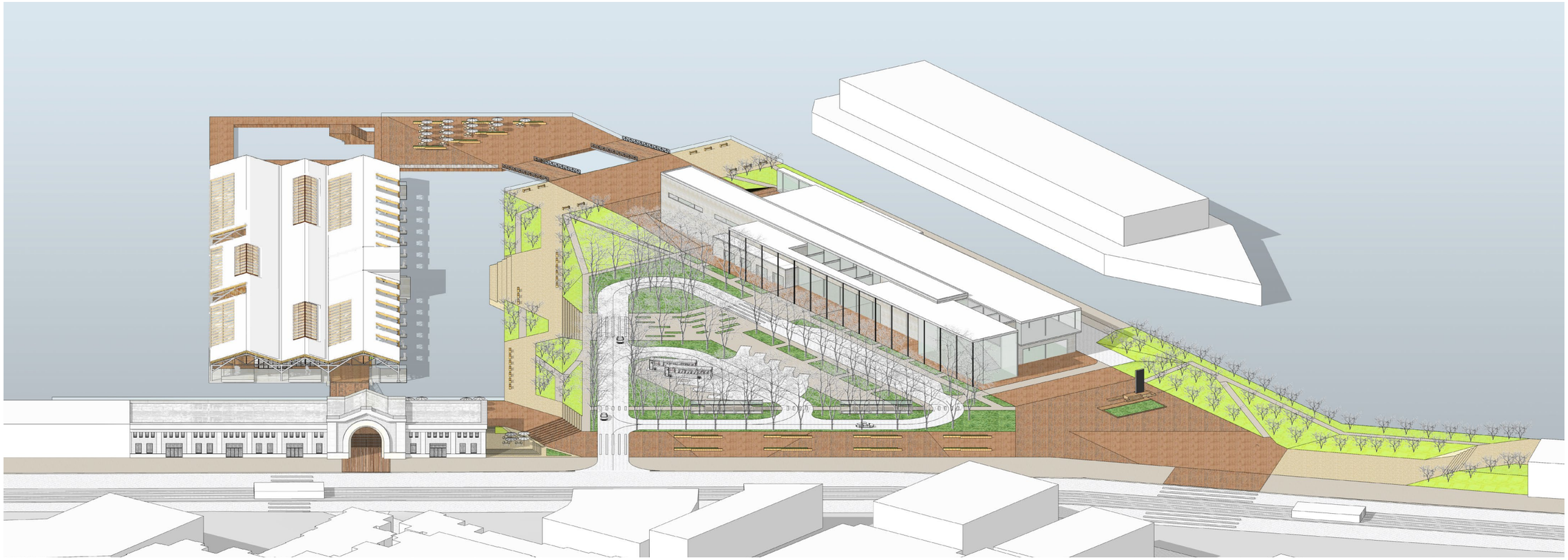
Pedestrian ciculations


Old landfill
Old seawall
New landfill
New seawall
New reinforcement
Precipitate
Firm soil

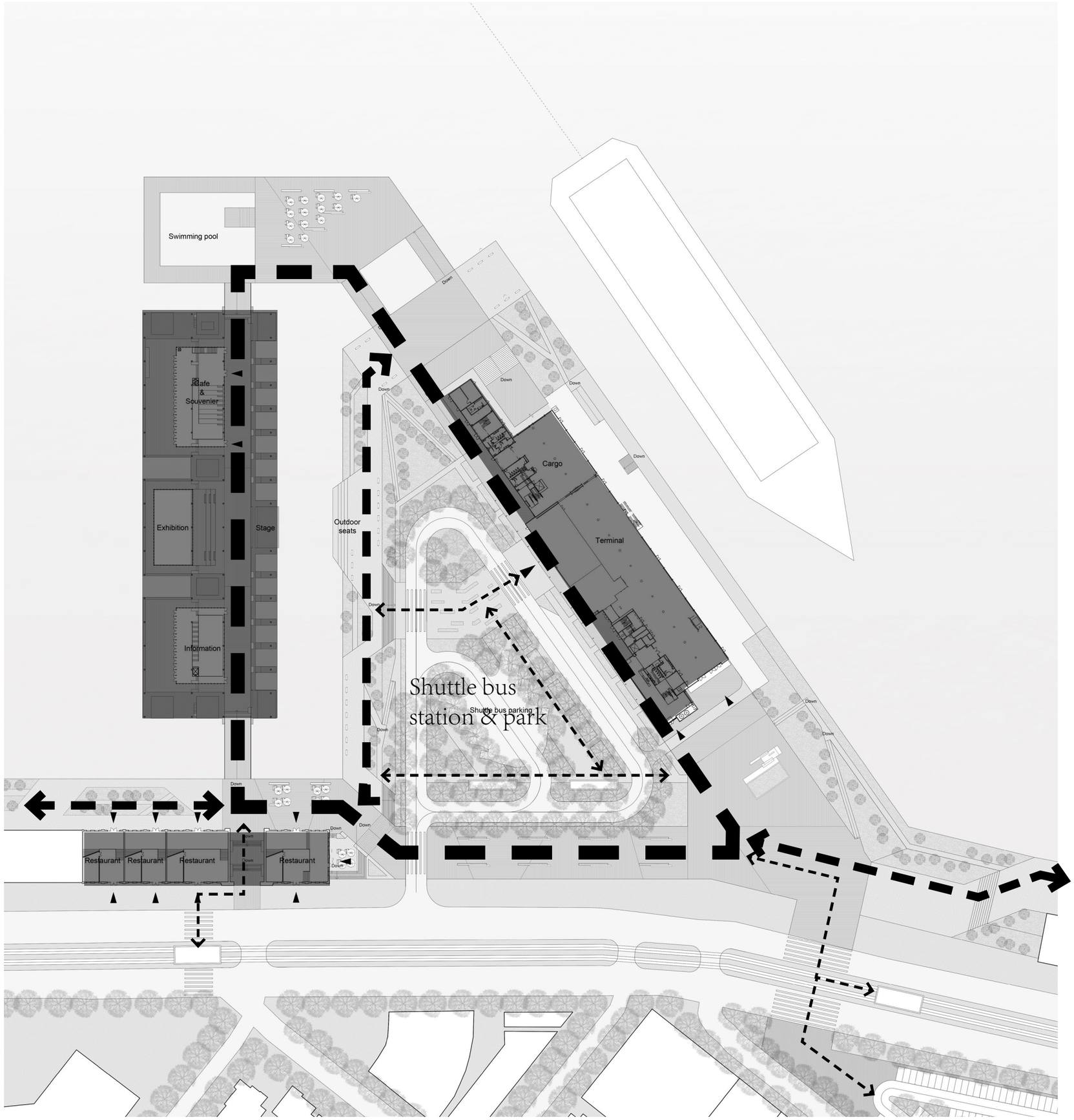

Floating building
New seawall
Old landfill
Precipitate
Old seawall
Firm soil

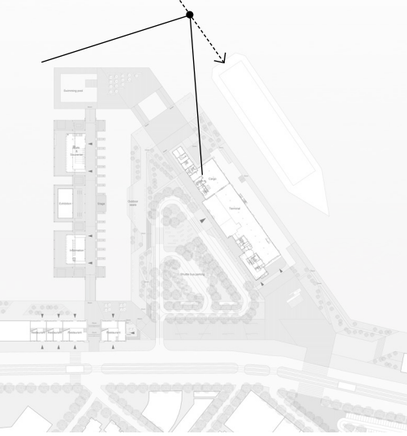


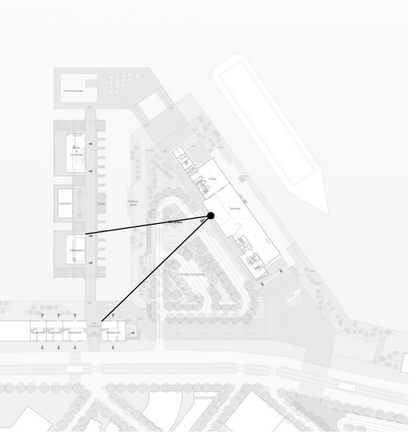

Plaza

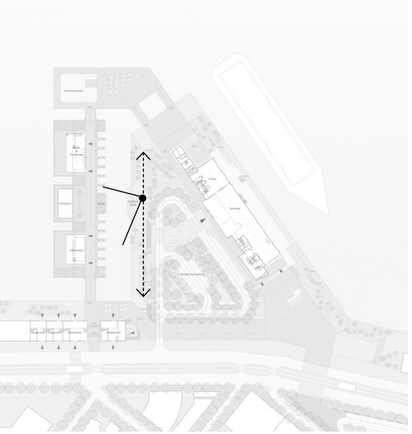


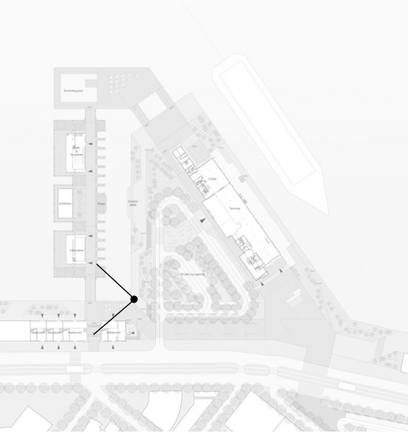

Swimming pool
Cafe
&
Souvenier
Exhibition
Stage
Information
Outdoor
seats
Cargo
Terminal
Shuttle bus parking
Restaurant
Restaurant
Restaurant
Restaurant
Down


Swimming pool
Cafe
&
Souvenier
Exhibition
Stage
Information
Outdoor
seats
Cargo
Terminal
Shuttle bus
station & park
Shuttle bus parking
Restaurant
Restaurant
Restaurant
Restaurant
Down



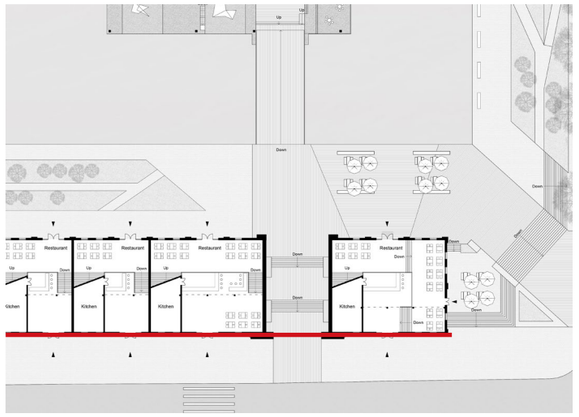


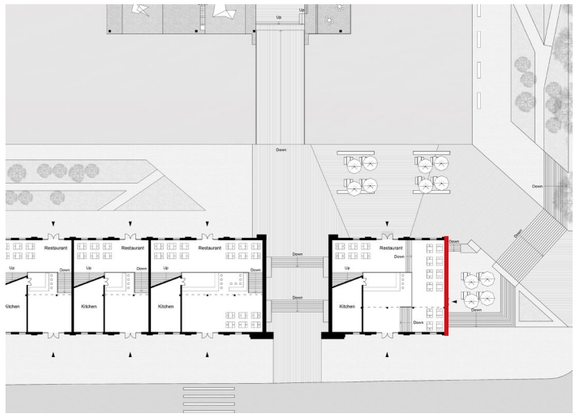


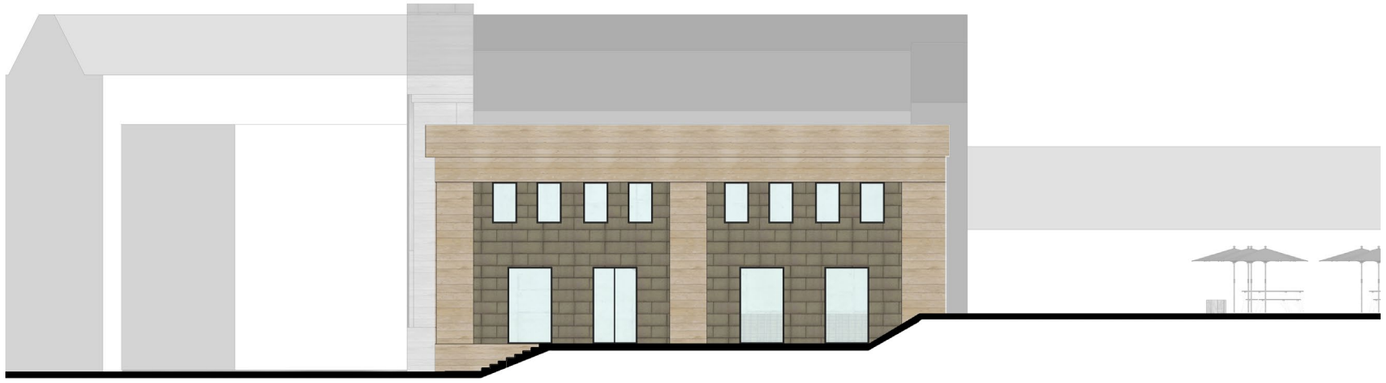


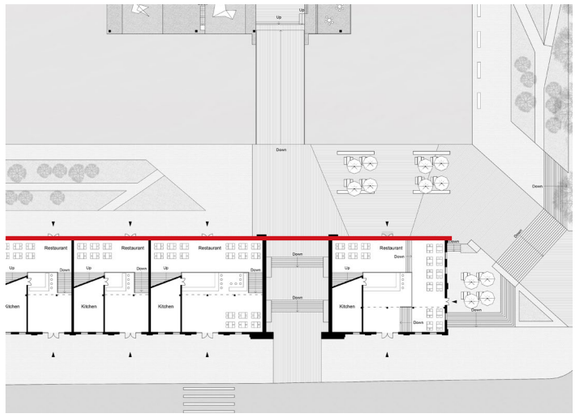

Public
Up
Up
Up
Down
Down
Down
Down
Down
Down
Down
Down
Down
Restaurant
Restaurant
Restaurant
Restaurant
Up
Down
Up
Down
Up
Down
Up
Kitchen
Kitchen
Kitchen
Kitchen


Restaurant
Down
Restaurant
Down
Restaurant
Down
Restaurant
Down

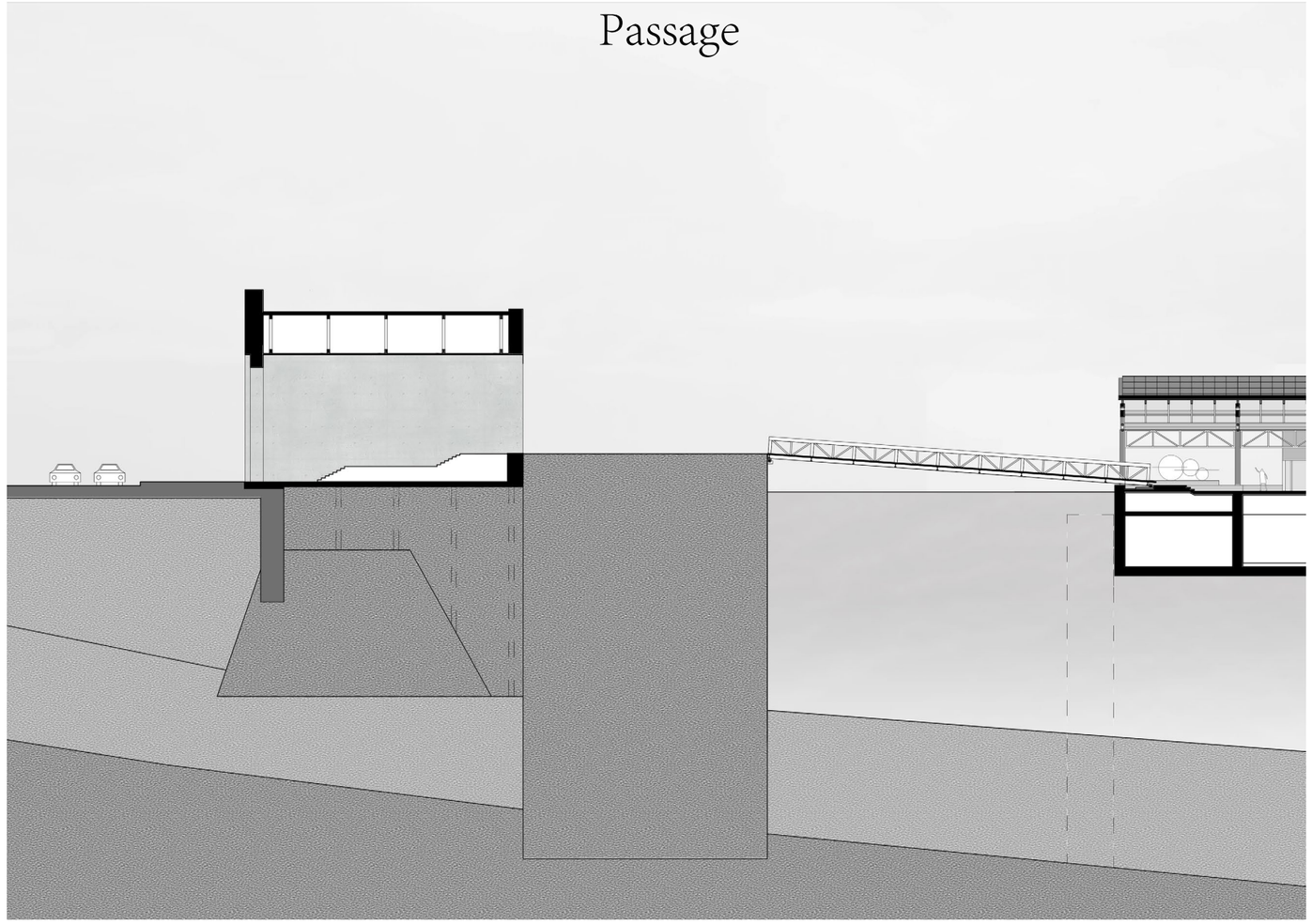

Up
Down
Restaurant
Kitchen


Up
Down
Restaurant
Kitchen



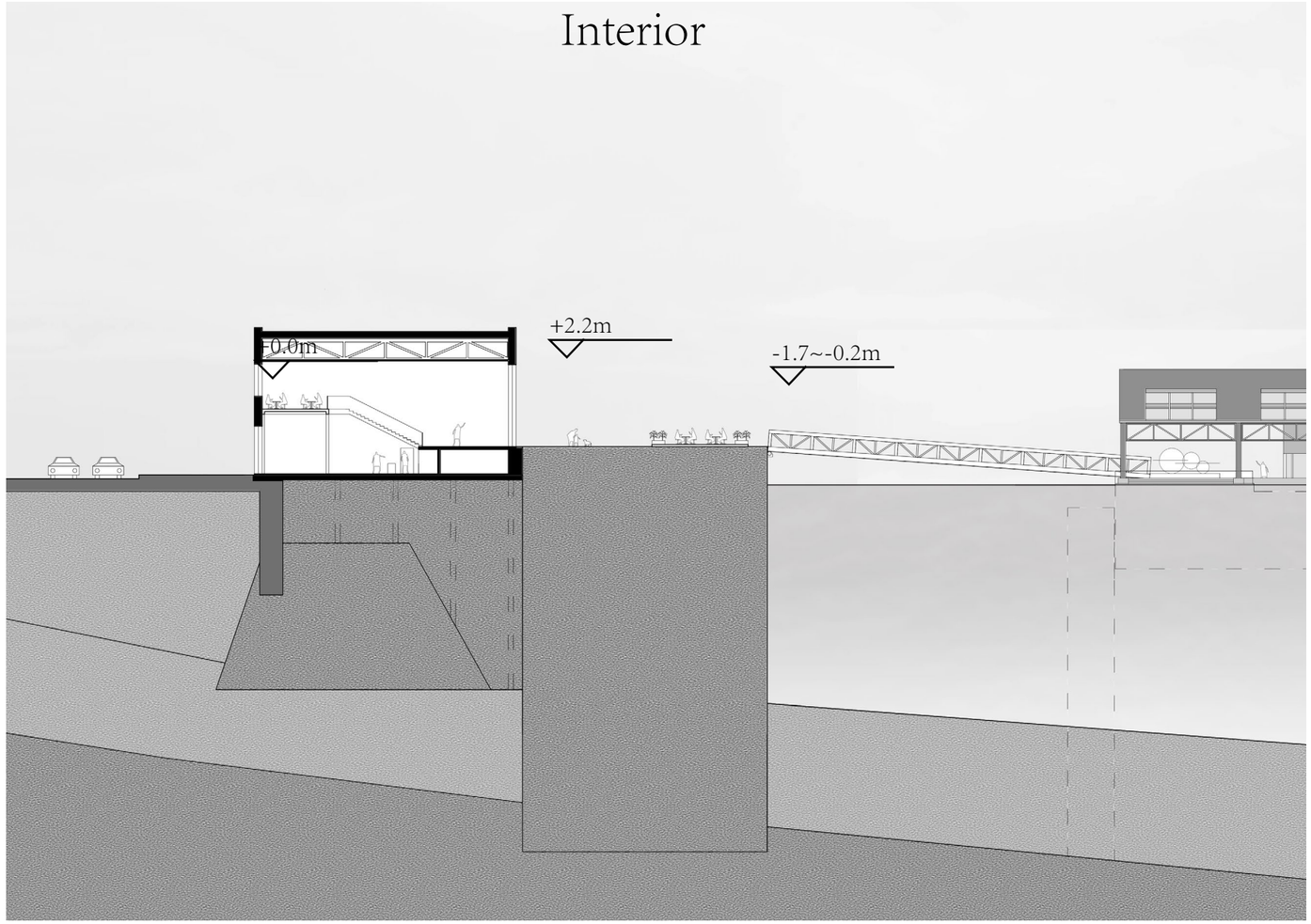

Up
Down
Restaurant
Kitchen

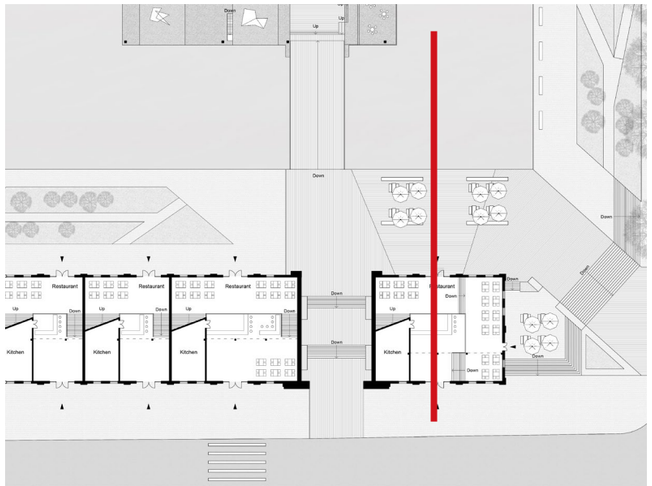
Passage

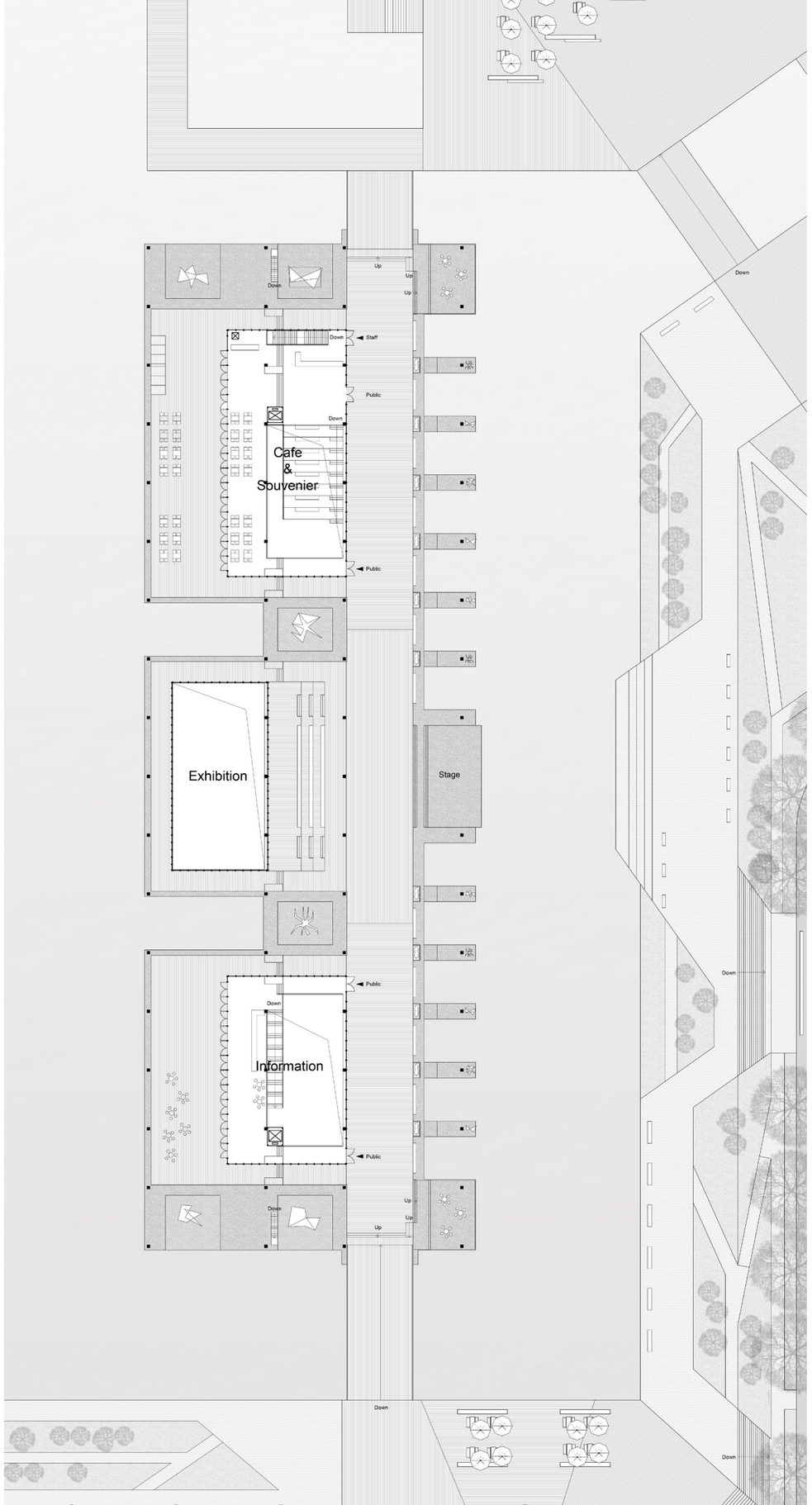



Down
Up
Up
Down
Restaurant
Restaurant
Restaurant
Restaurant
Up
Down
Up
Down
Up
Down
Up
Down
Kitchen
Kitchen
Kitchen
Kitchen
Down
Down
Down
Down
Down
Down

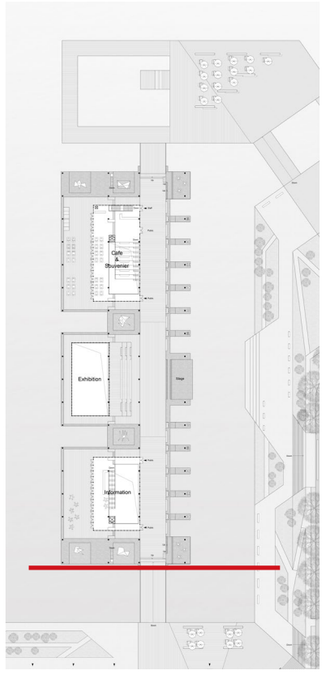
Interior

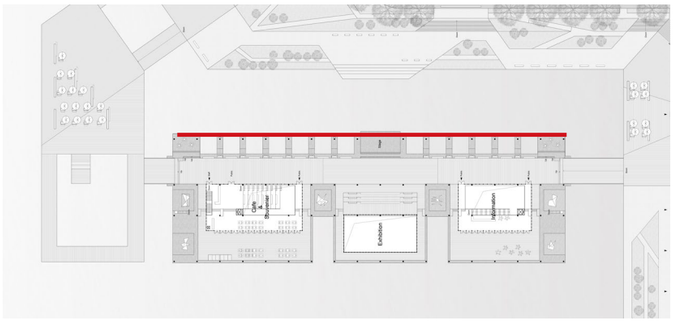

±0.0m
+2.2m
-1.7~-0.2m

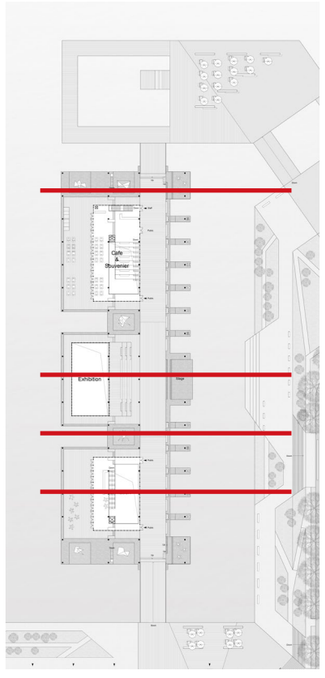

Restaurant
Restaurant
Restaurant
Restaurant
Kitchen
Kitchen
Kitchen
Kitchen
Up
Down

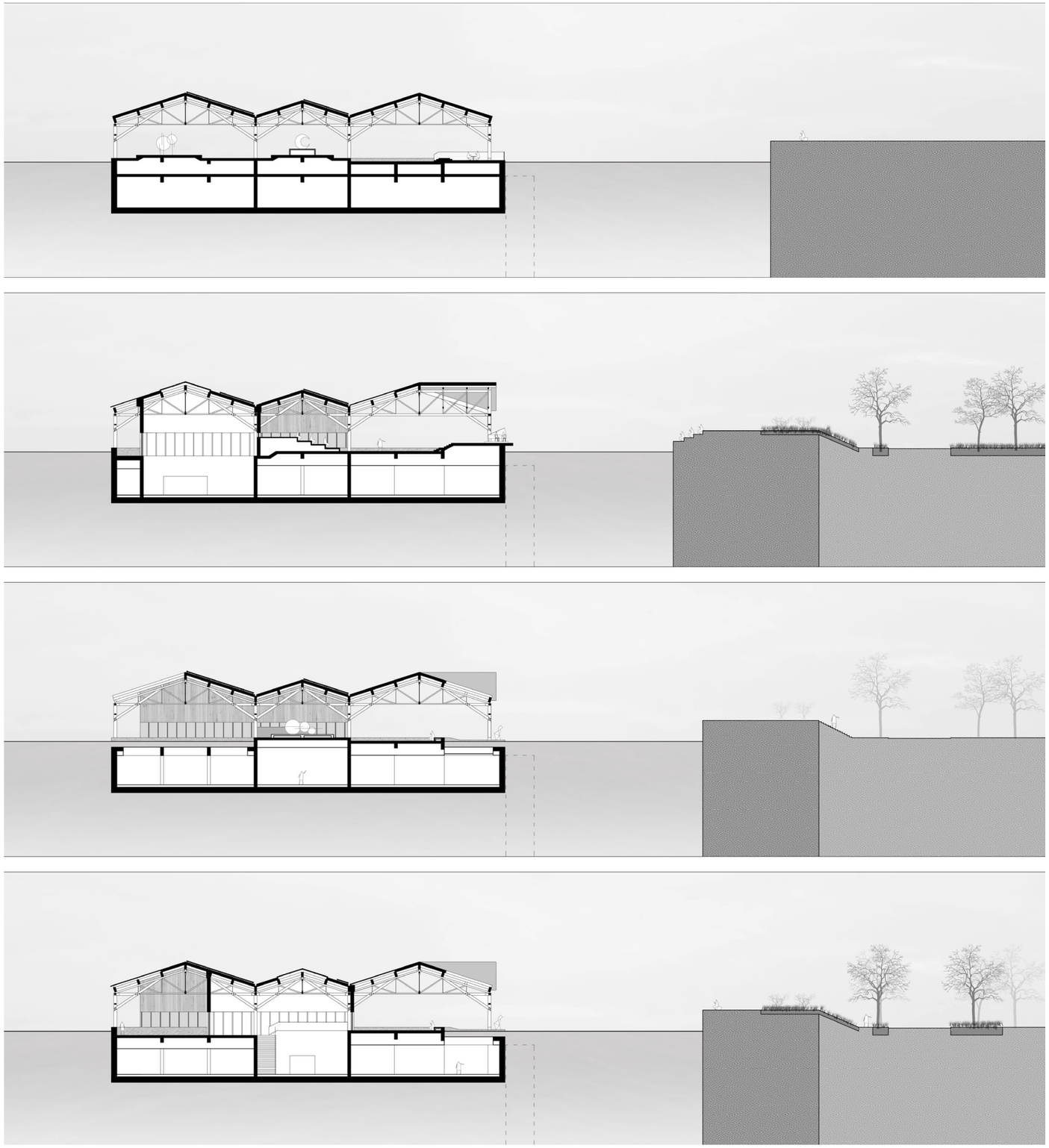

Cafe
&
Souvenier
Exhibition
Stage
Information
Staff
Public
Up
Down

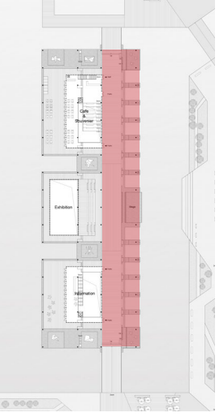

Compartment 1
(Pump water in and out)
Food Storage
Pipe system
Kitchen
Storage
Gray water collection & Waste Water purification (iba)
Toilet
Toilet
Storage
Exit hall
Projection
Room 1
Exhibition 2
Room 2
Exhibition 1
Room 3
Administration
Storage
Entry hall
Luggage
Compartment 2
(Pump water in and out)

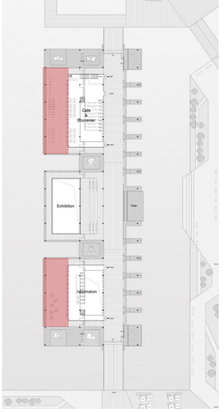

Cafe
&
Brunnen
Exhibition
Shop
Information


Cafe
Restaurant
Exhibition
Exhibition

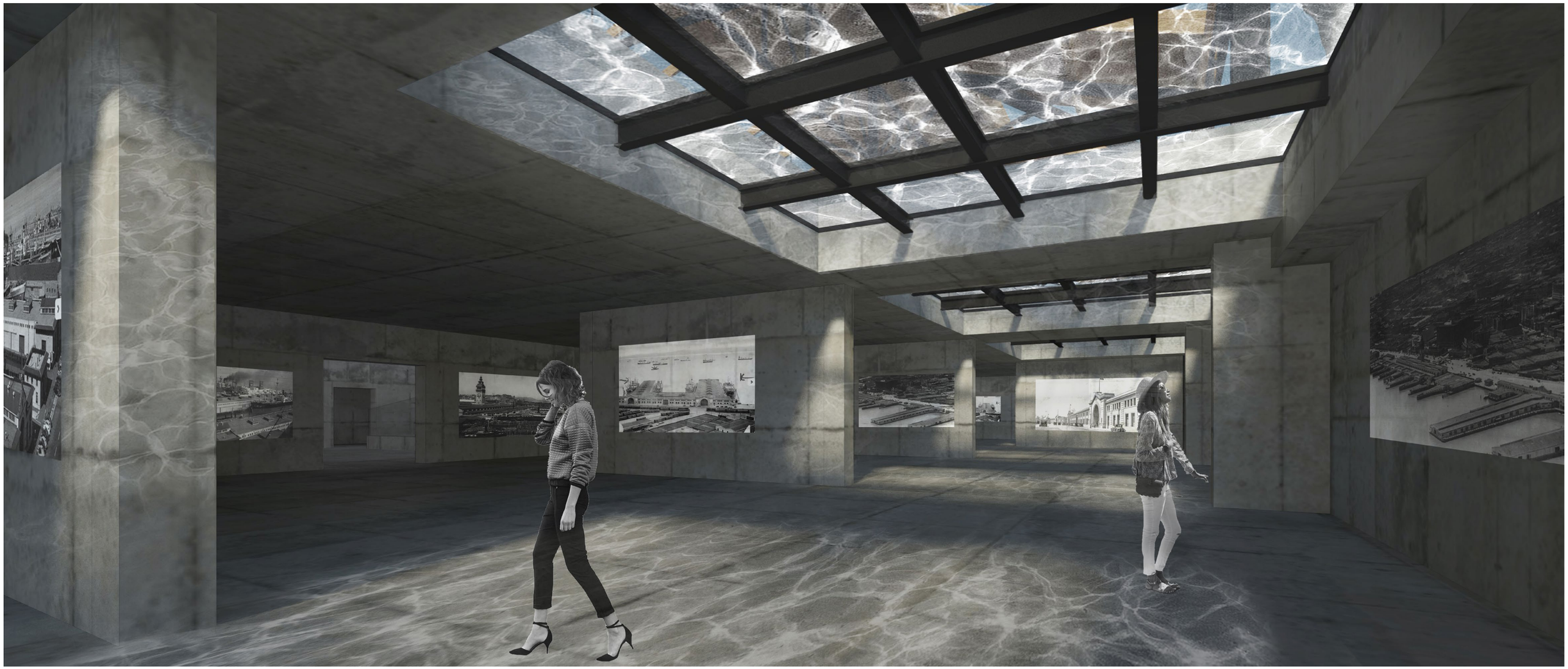

Cafe
&
Obstbrenner
Exhibition
Shop




Exhibition
Information


Exhibition
Exhibition

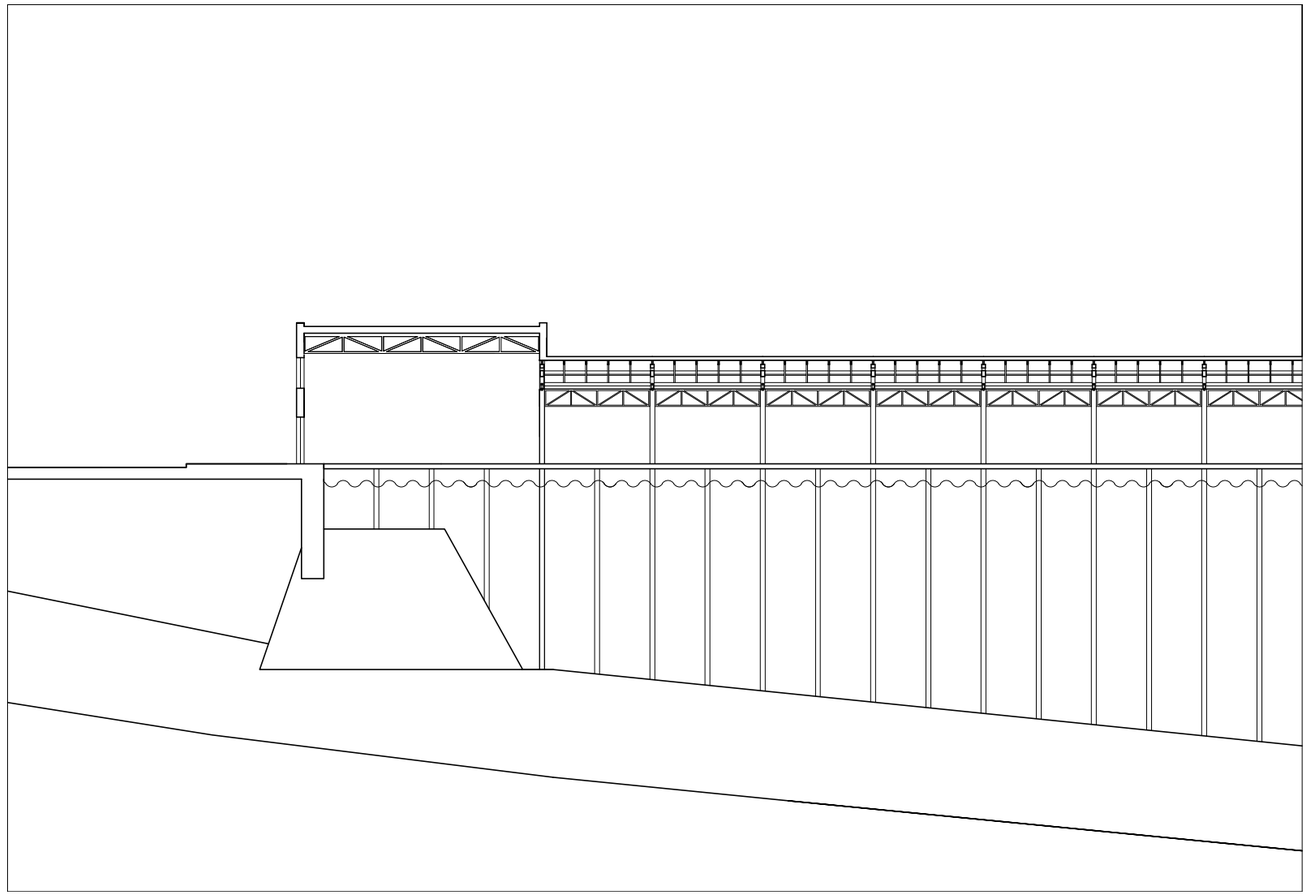

Exhibition
Exhibition



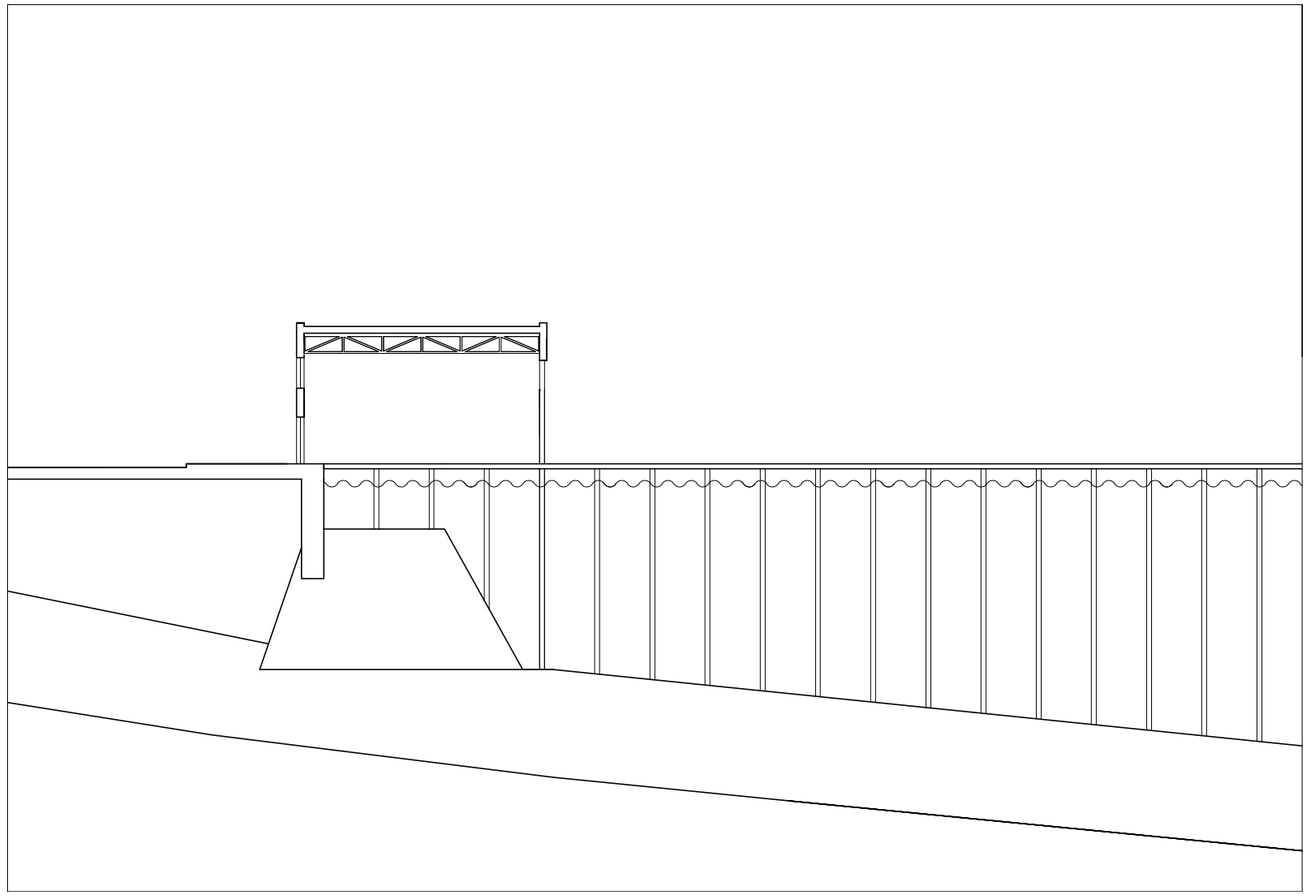
Part 3

Building technology

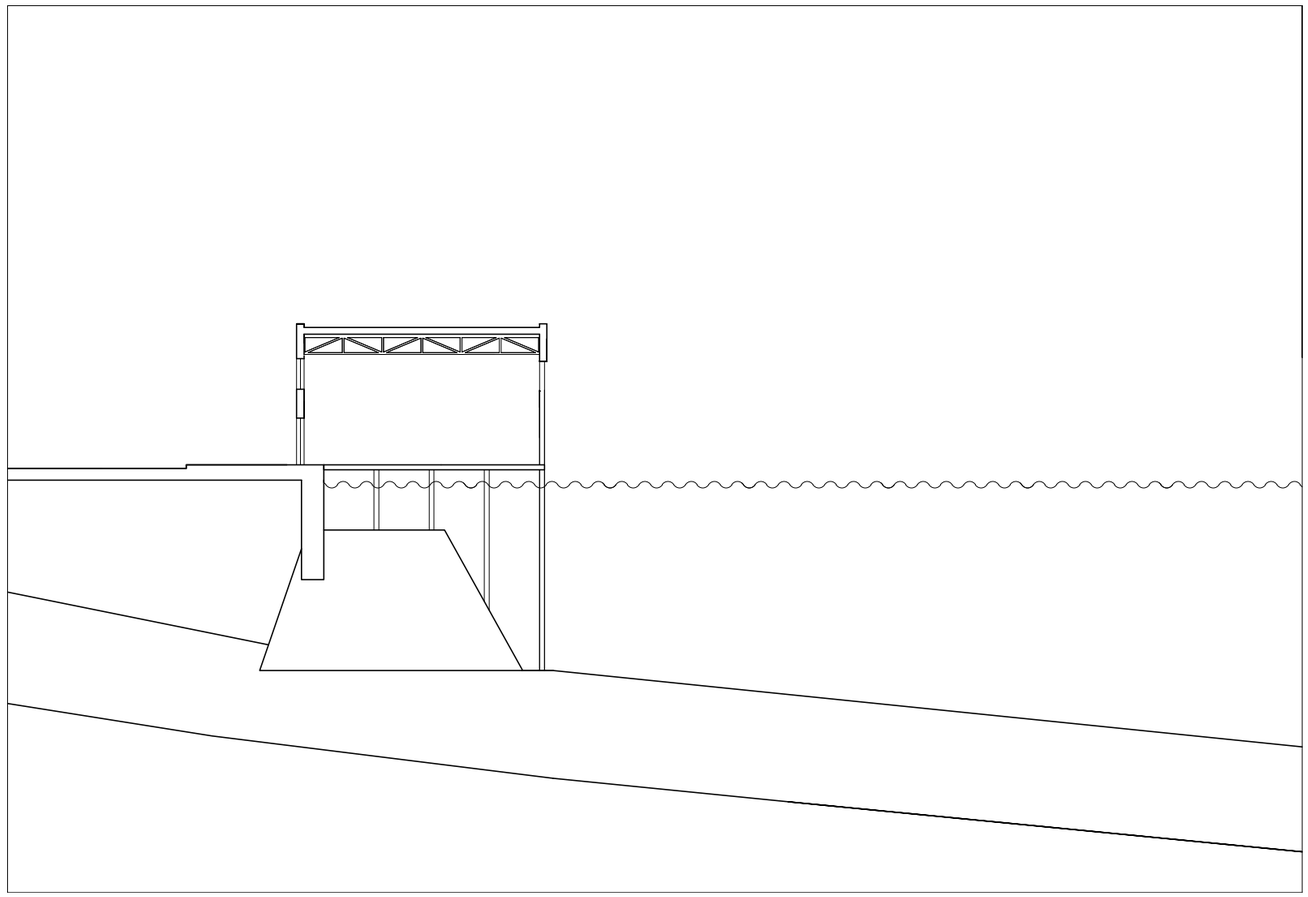
The construction process of seawall



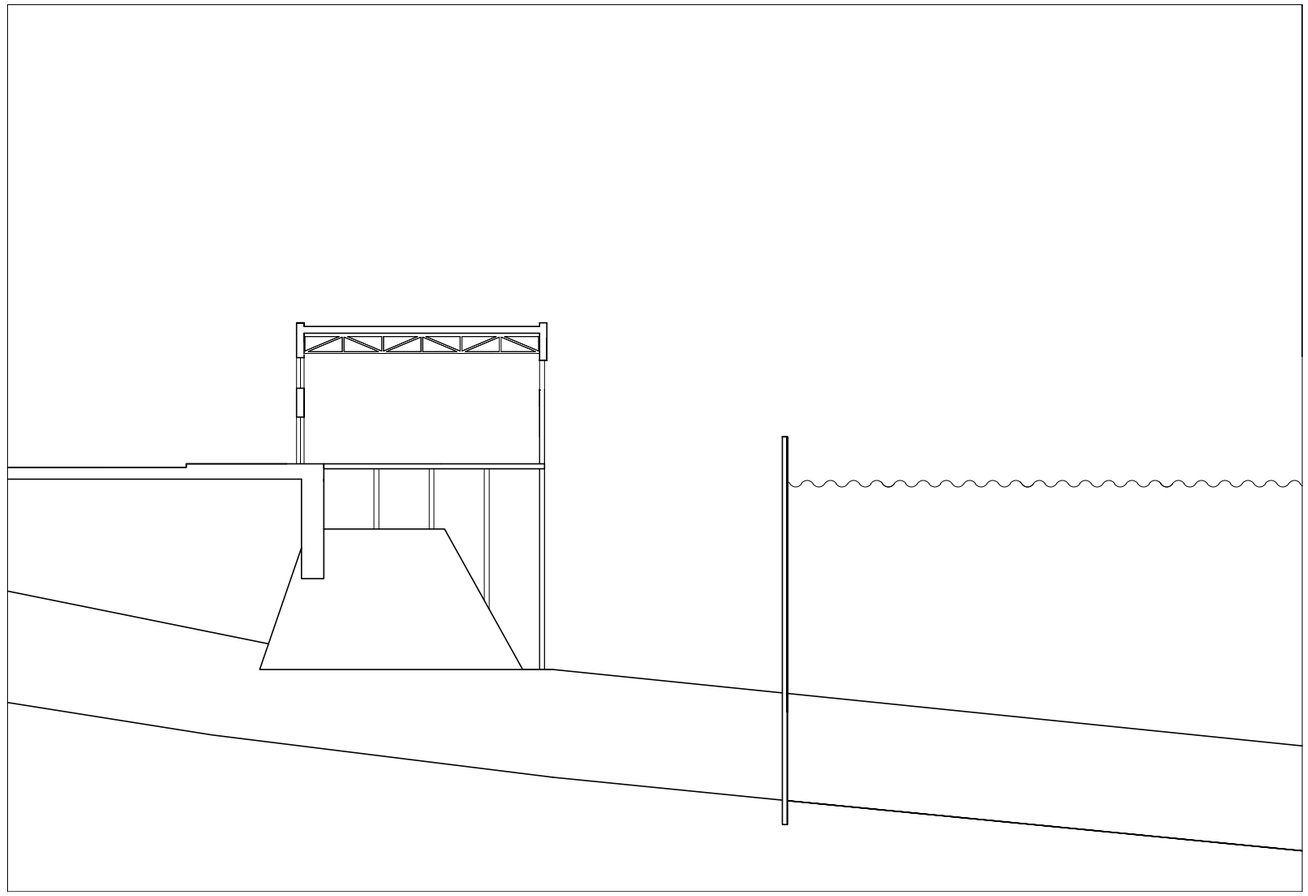
Existing situation.



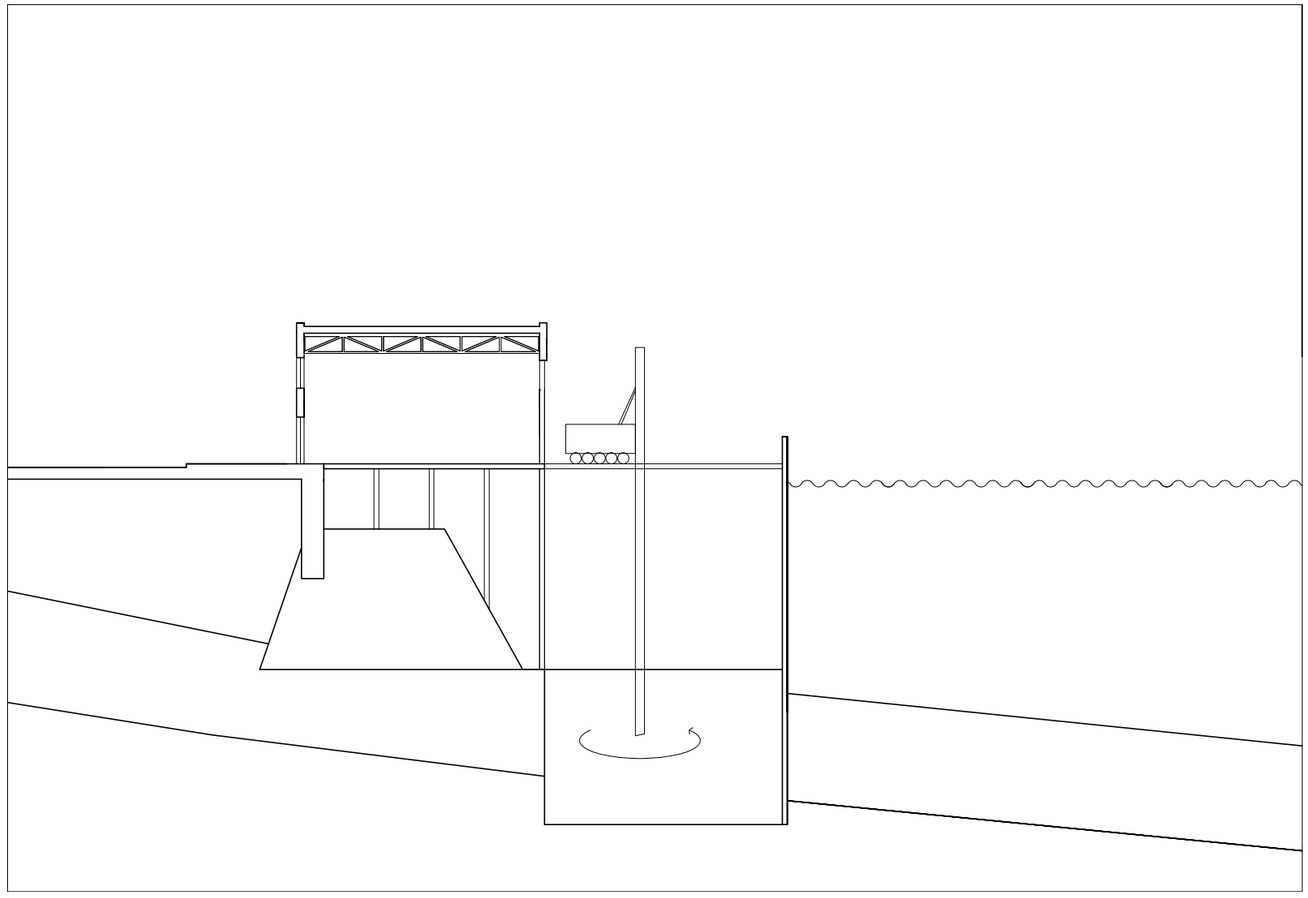
Dismantle the structure for future uses.



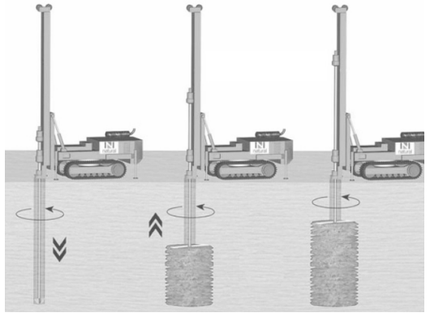
Demolish the deck and pillings.

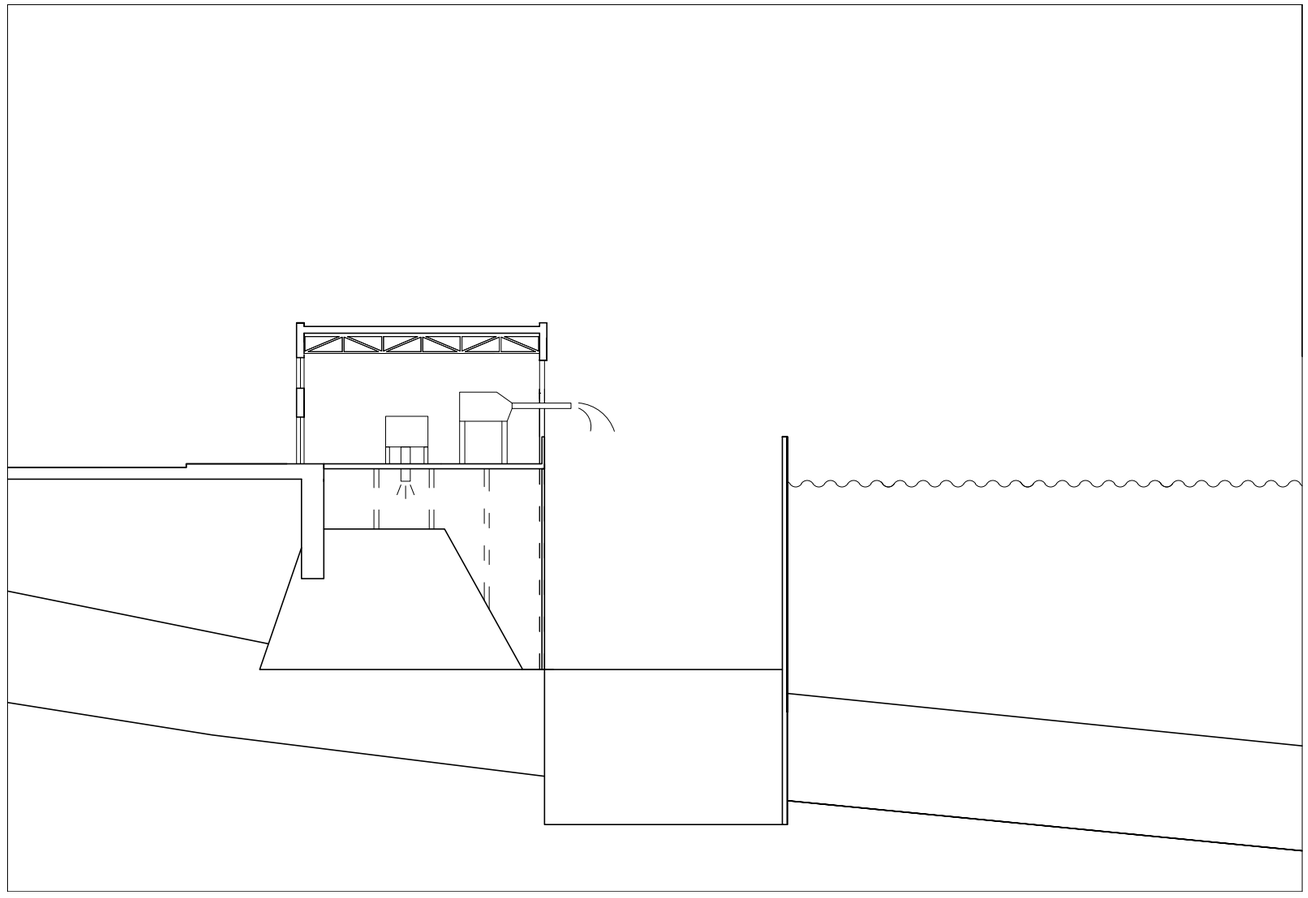


Build sheet pile wall; dewater.

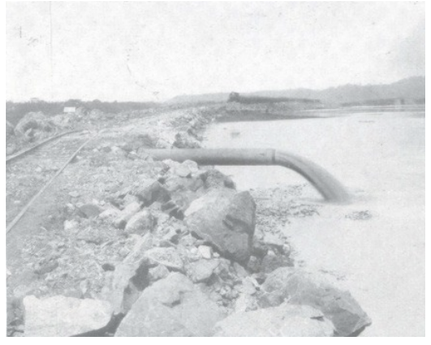


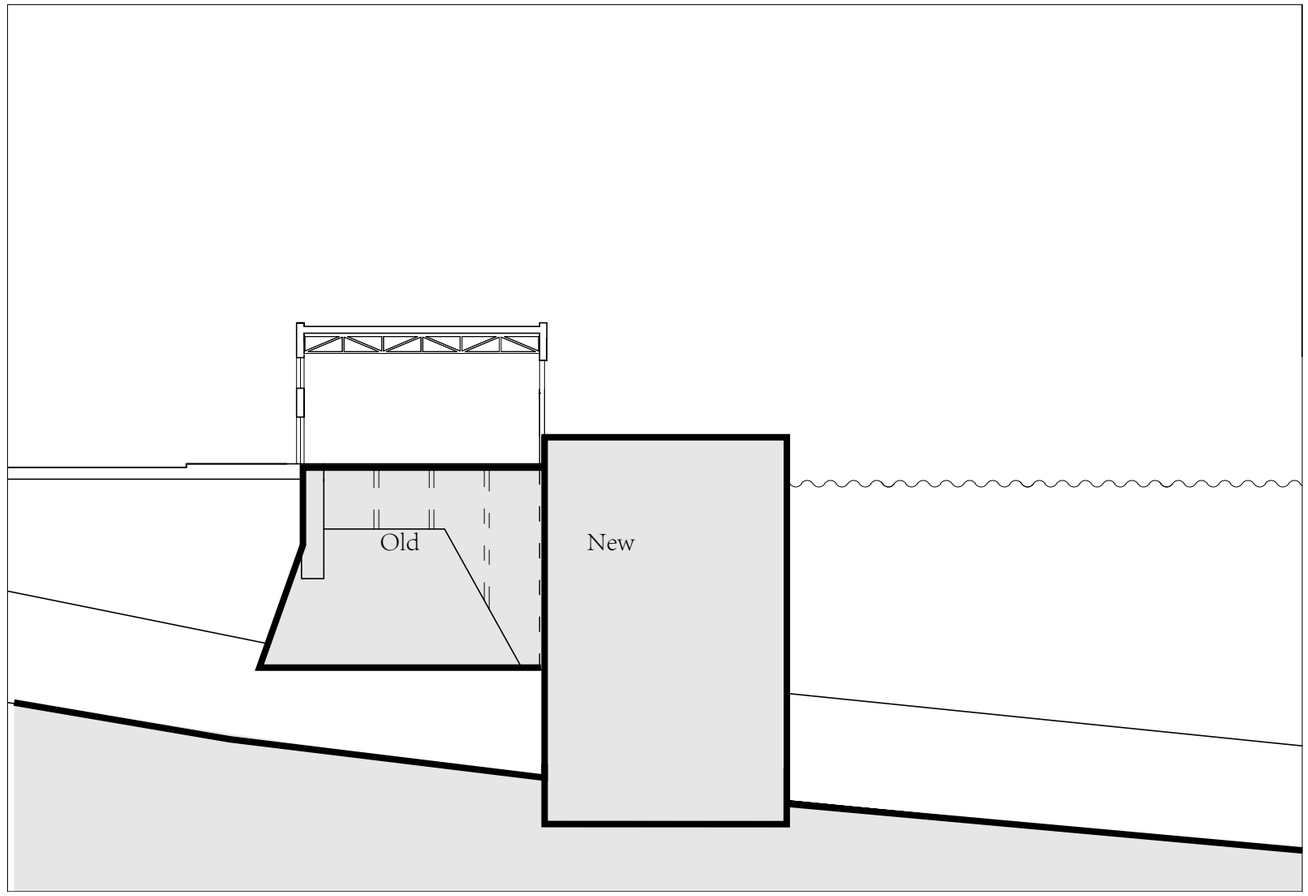
Blend precipitation with concrete (DSM).



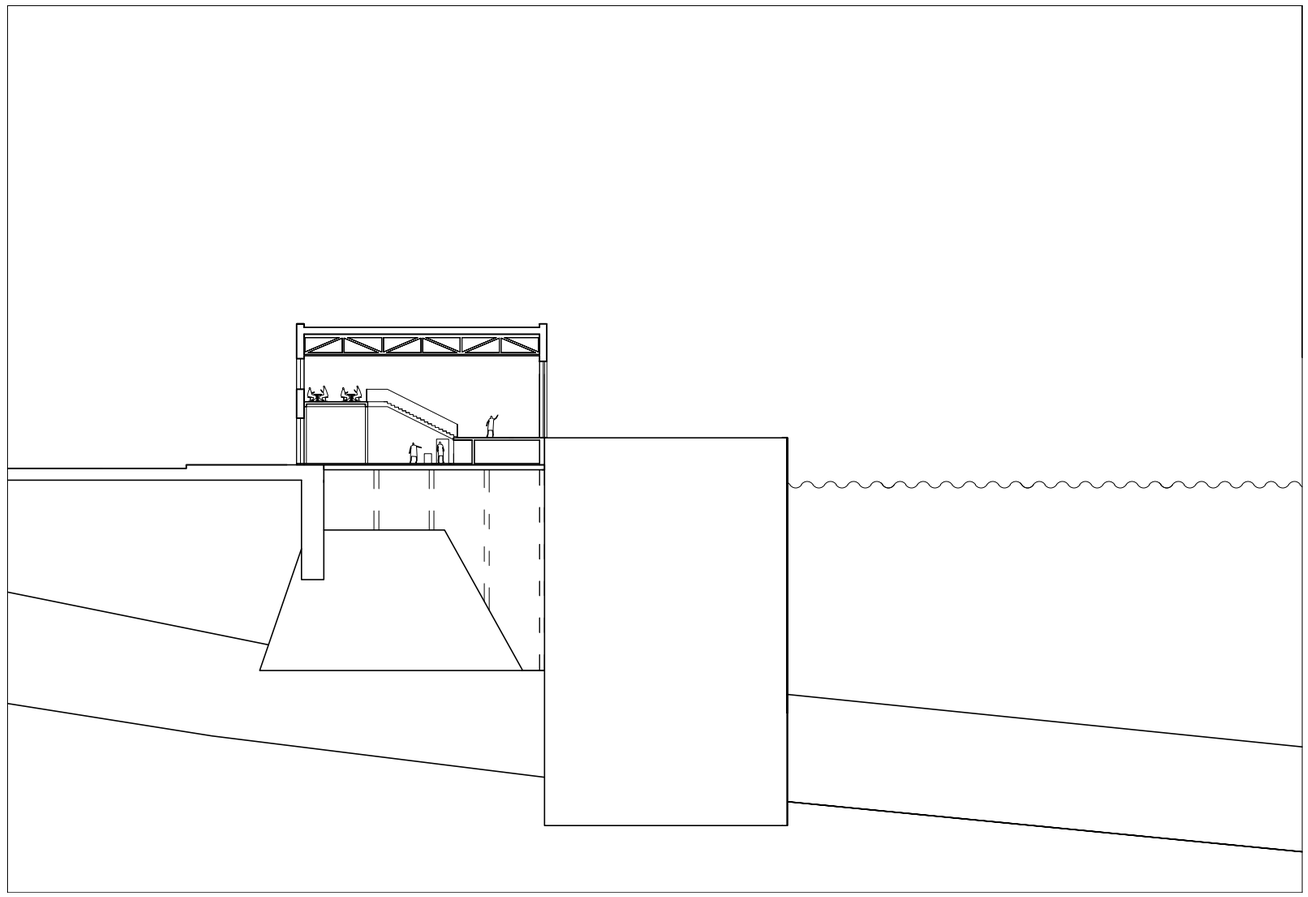


Cast cellular concrete; hydraulic fill (strong concrete).

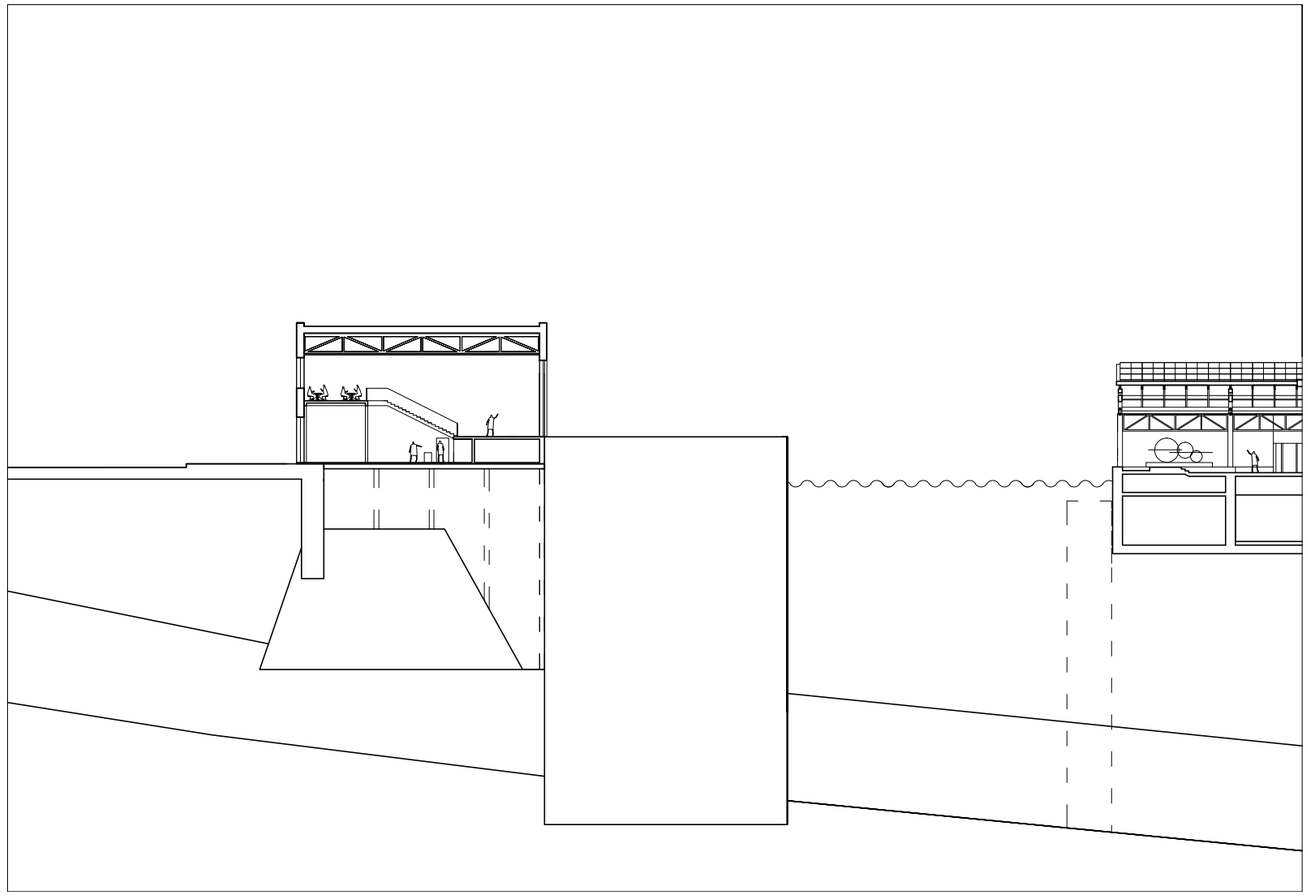




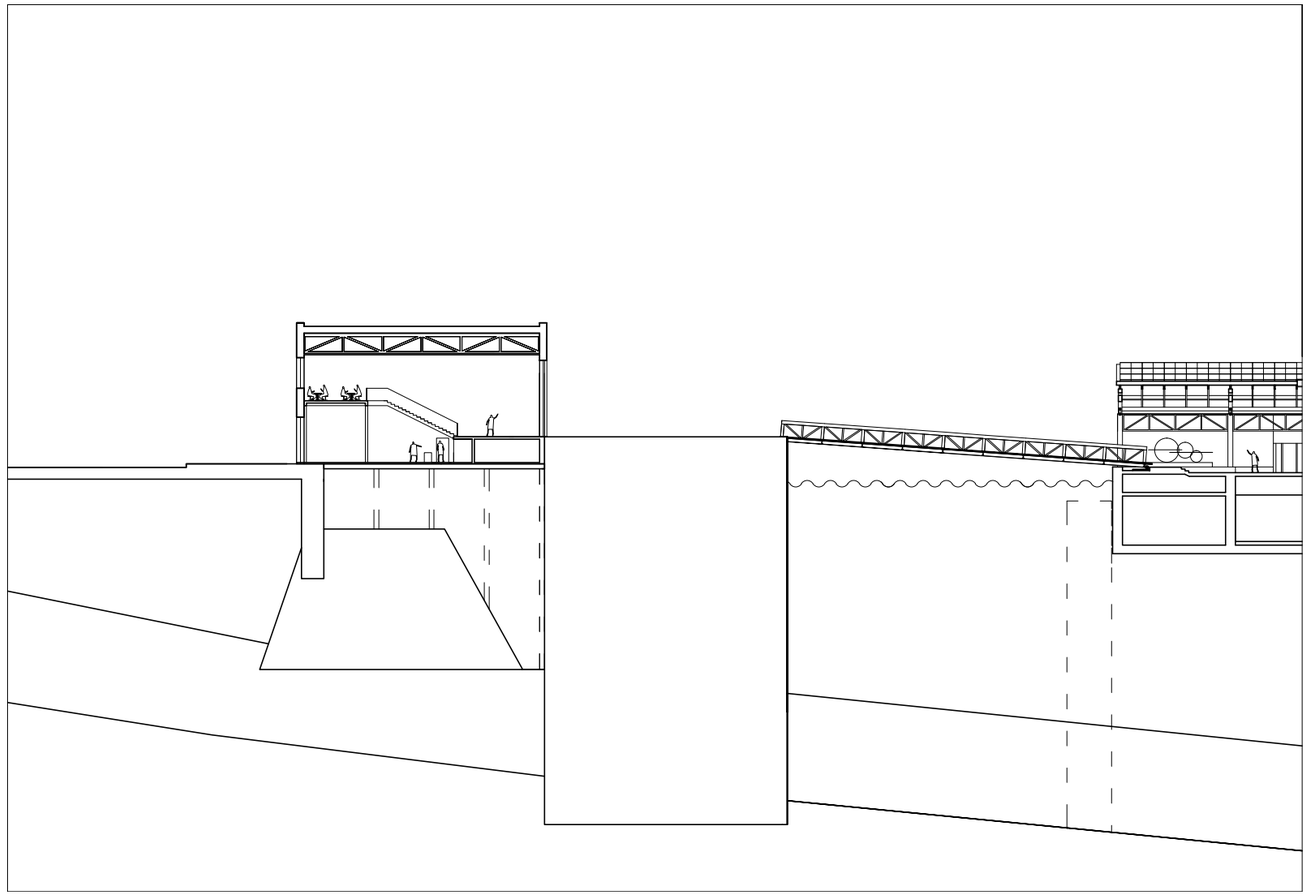
A combined new seawall.



Renovate the front part of the old pier.

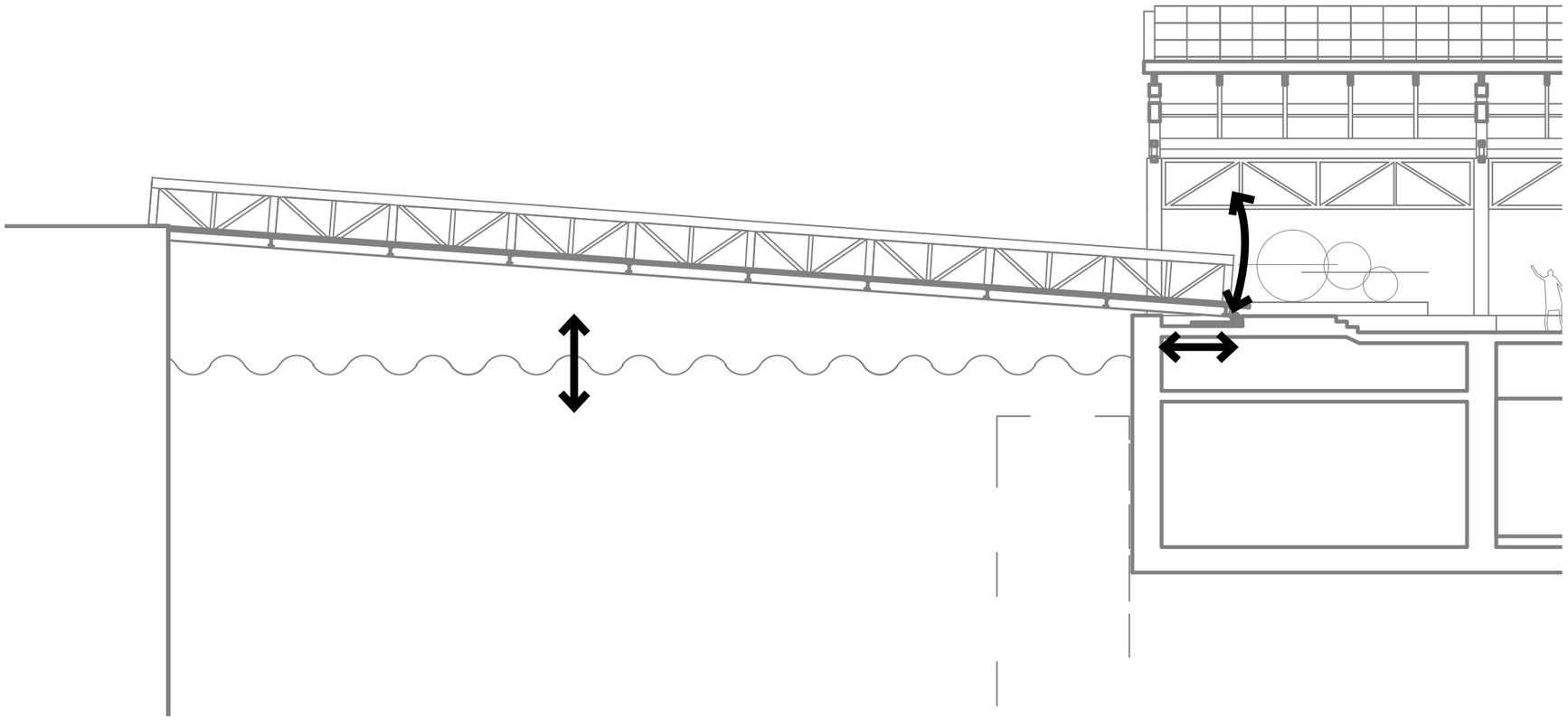


Assemble the dismantled structure on a new floating foundation (concrete box) somewhere else; drag it to the site.



Build the connection.

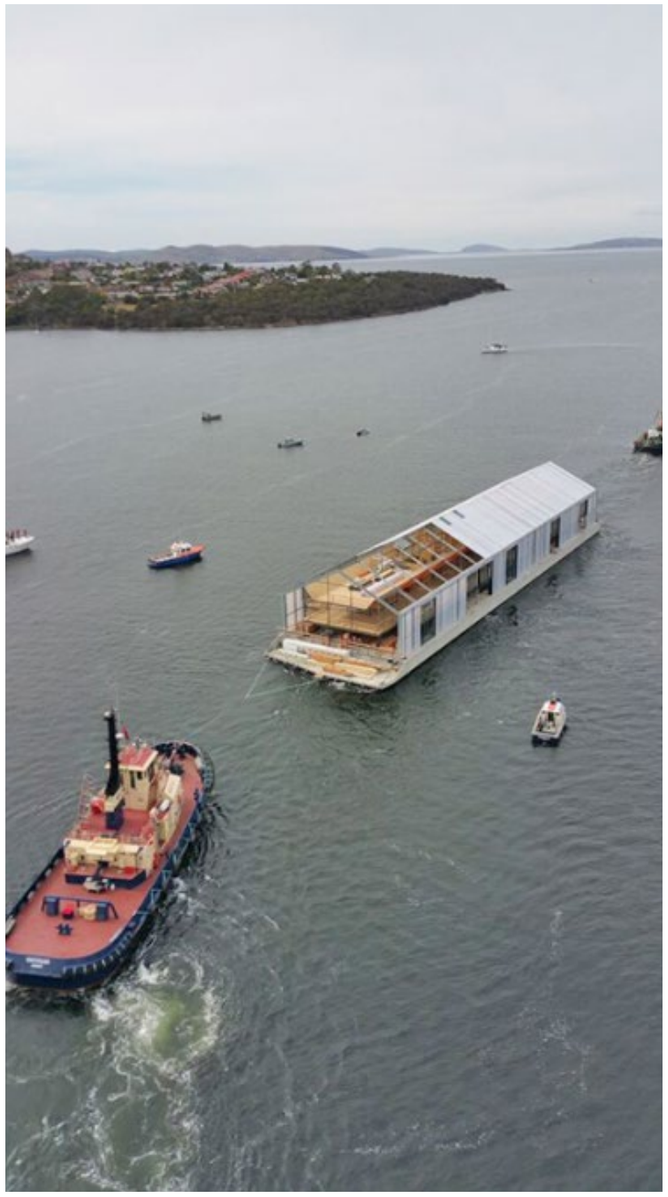
Connection



The floating building

Case: Brooke street pier

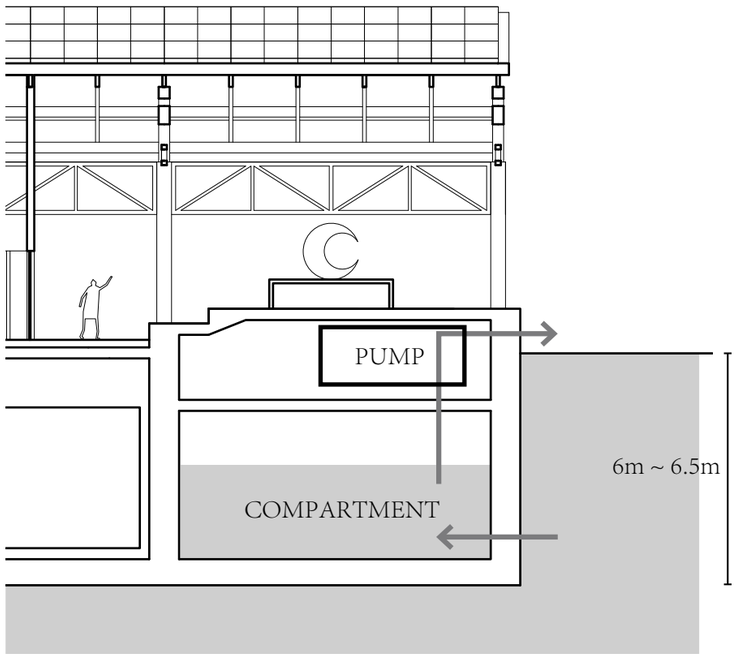

Backing Rod
Polyurethane Sealant
Waterstop
Concrete Slab

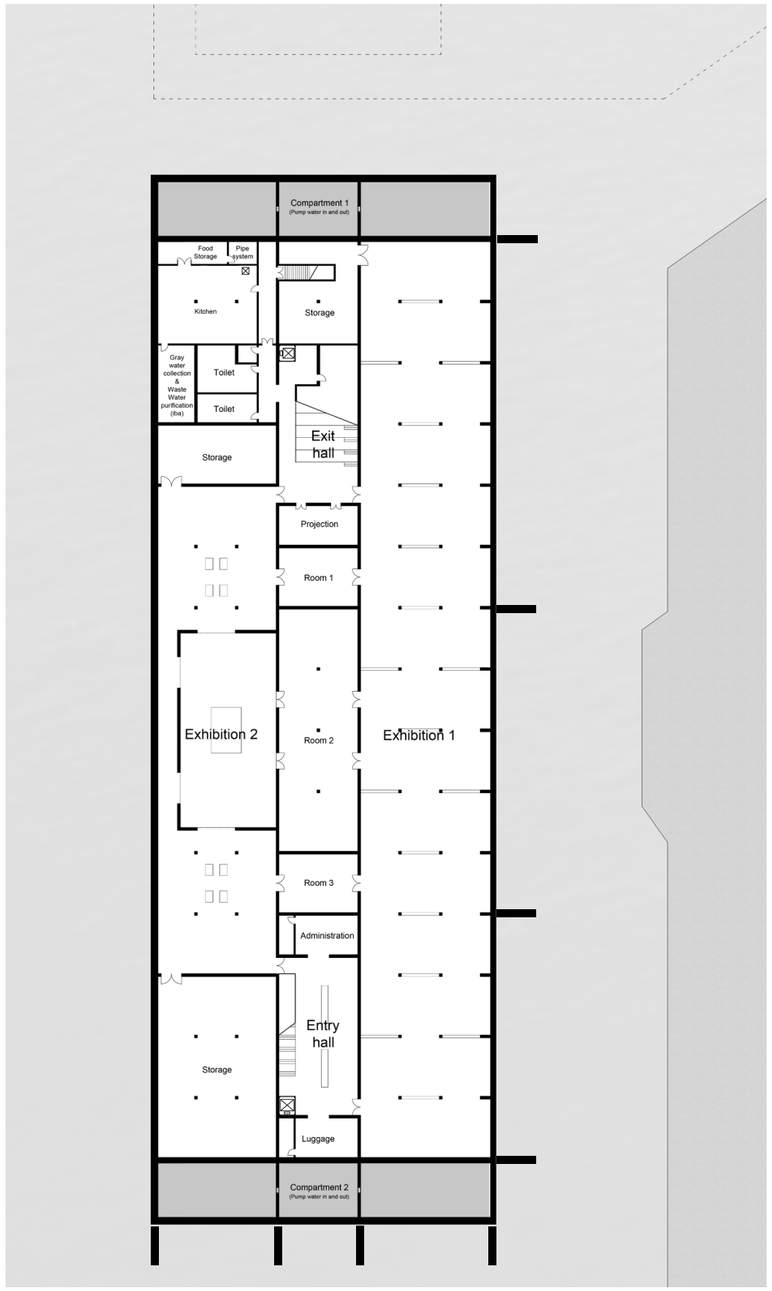


San francisco's shipyards
(assemble place)

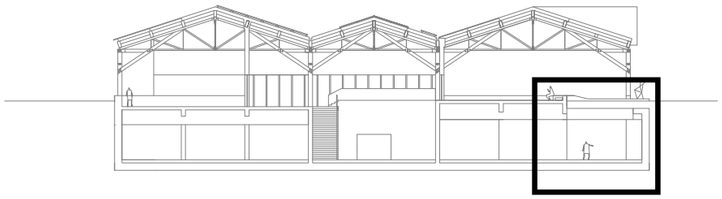
Floating caculation

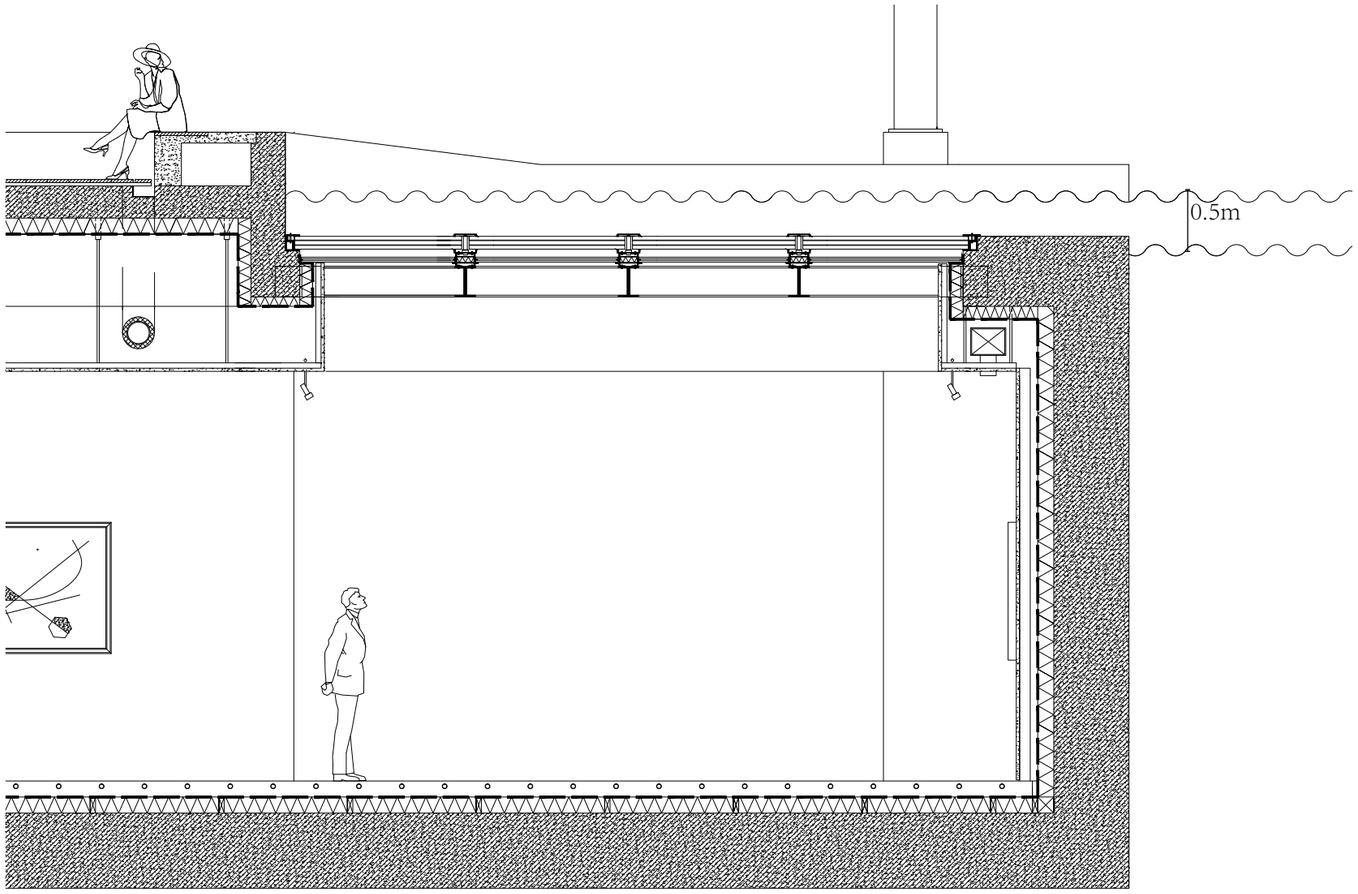
		WEIGHT	SINKING
BUILDING MATERIALS	Total	42000t	6m
	Concrete box	80%	
	Metal structure	6%	
	Wood roof & wall	8%	
	Other elements	6%	
	300 people	0.006%	
COMPARTMENTS	Water	3500t	0.5m
TOTAL	42000t ~ 45500t		6m ~ 6.5m

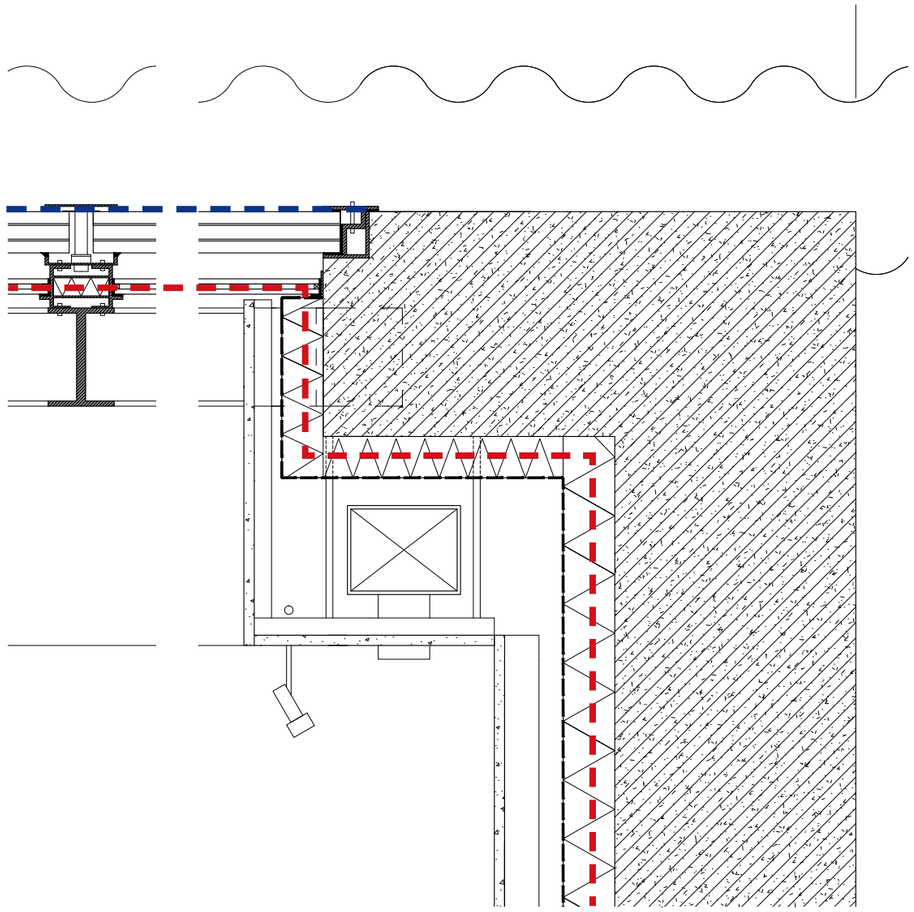




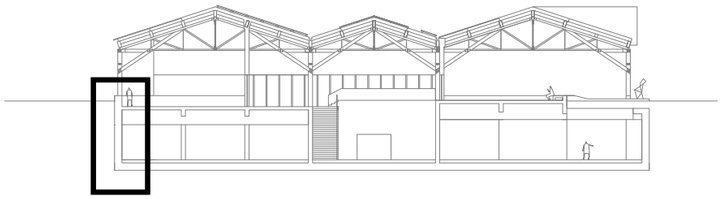
Details

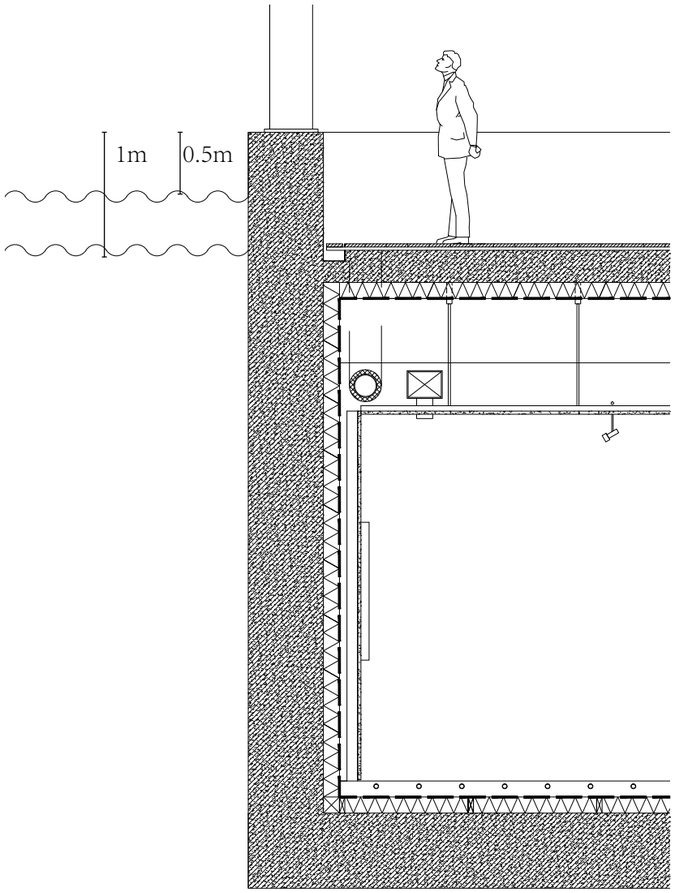


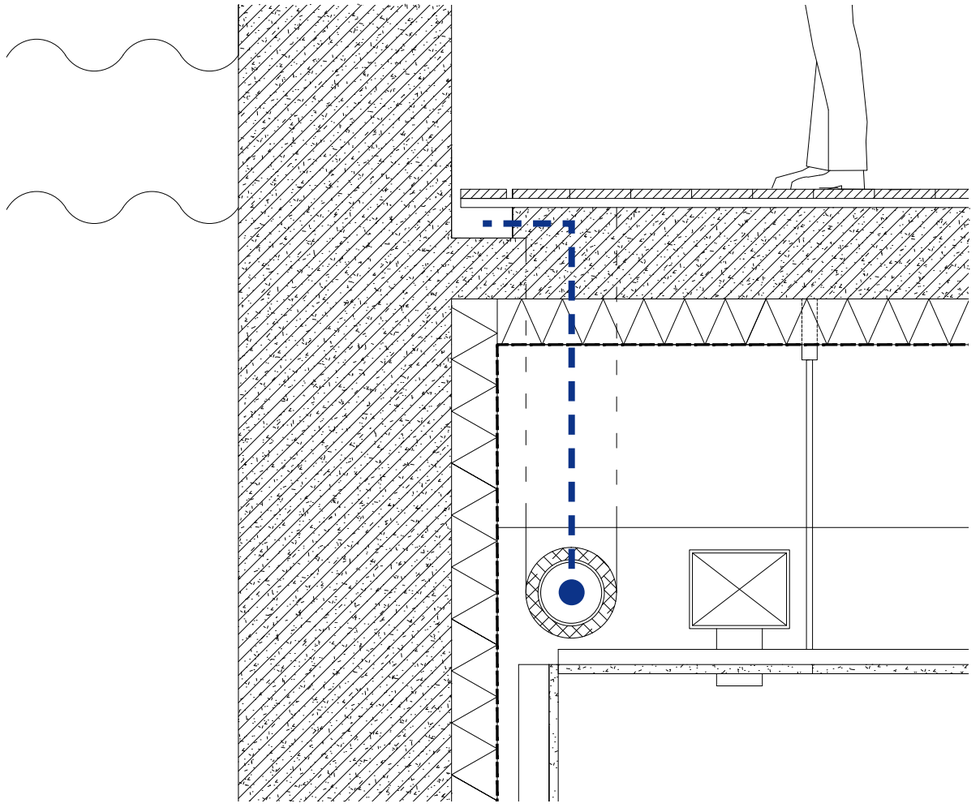


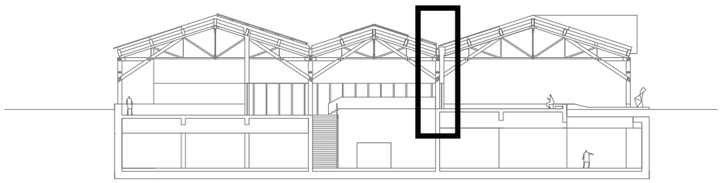


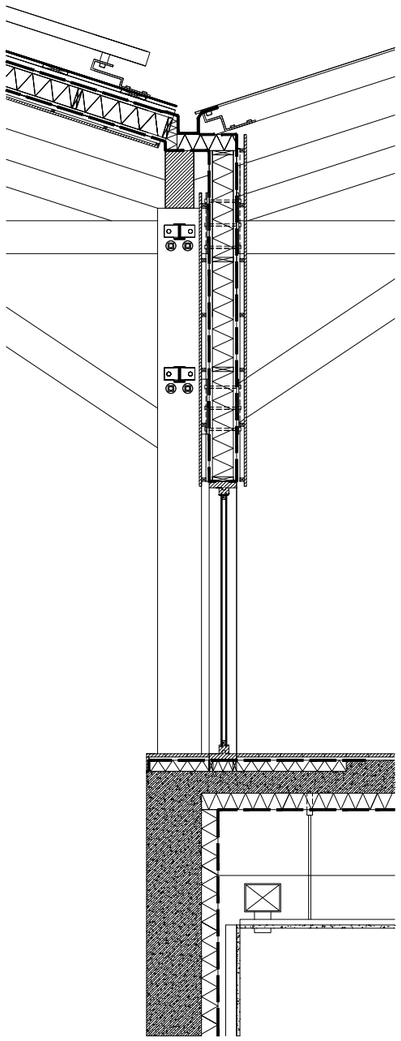
Details

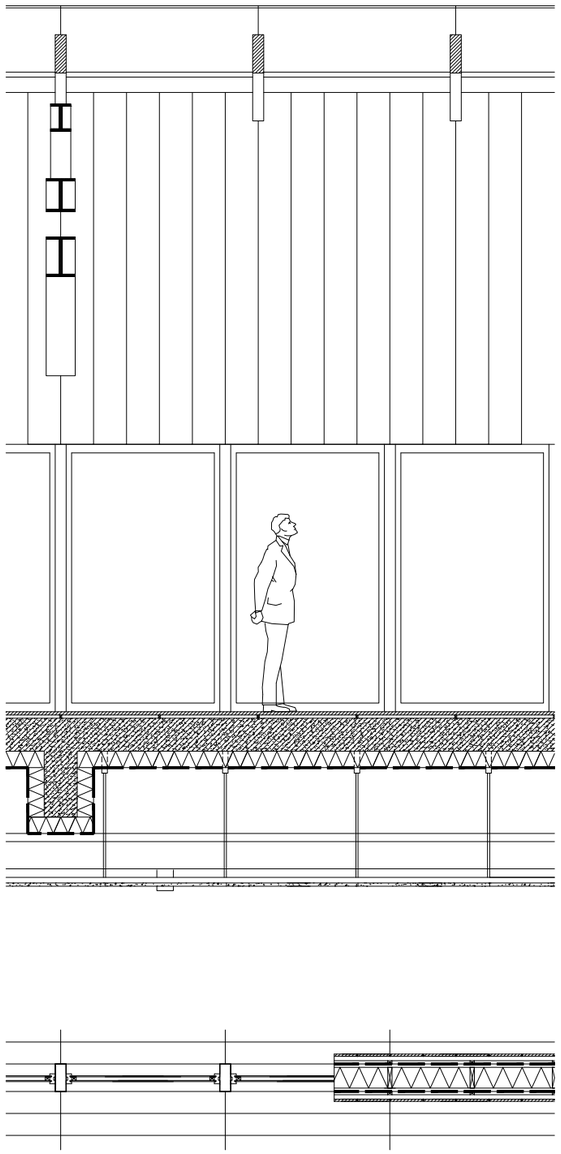


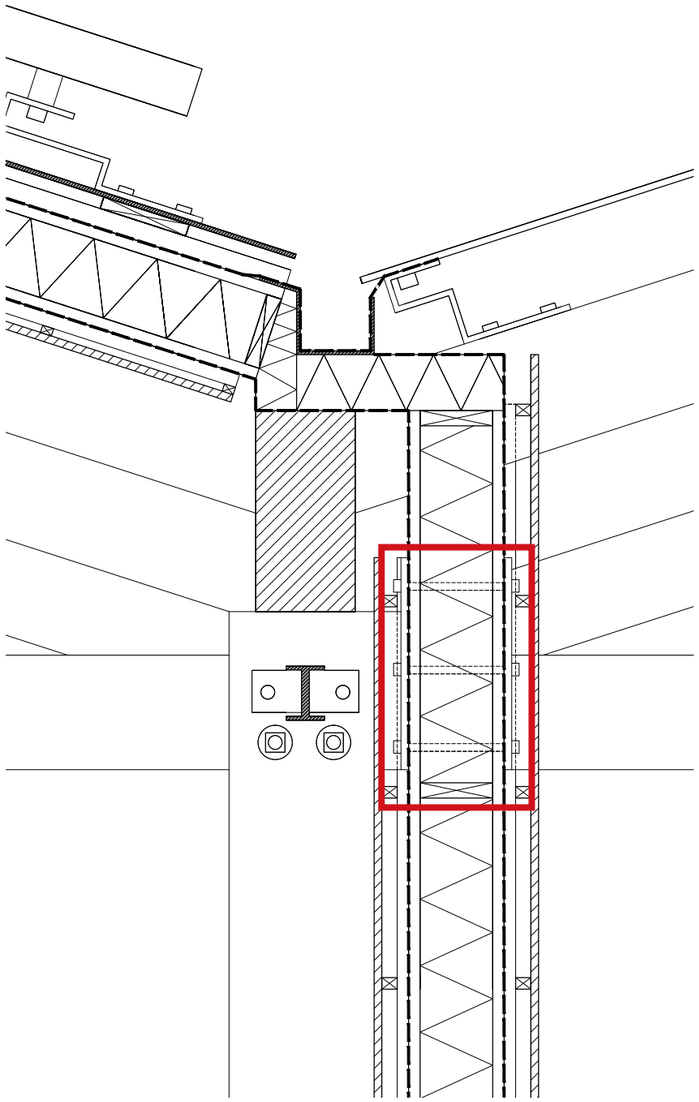




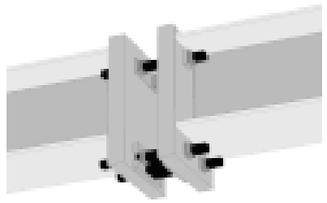






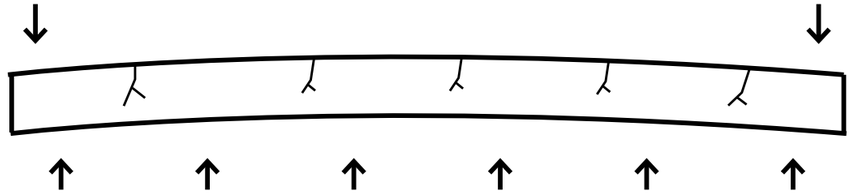


Isokorb (a component dealing with thermal bridge)

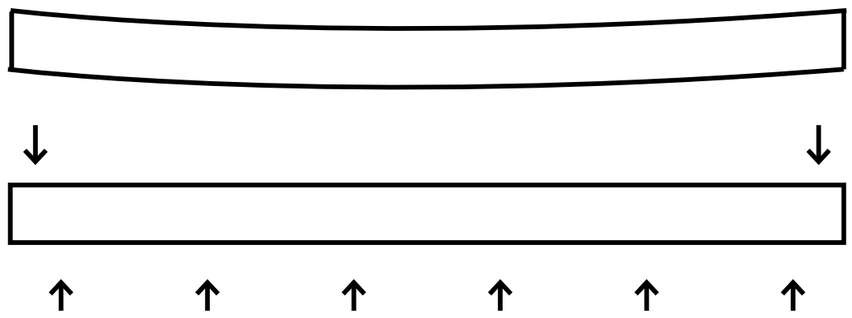


Concrete foundation

Reinforced concrete

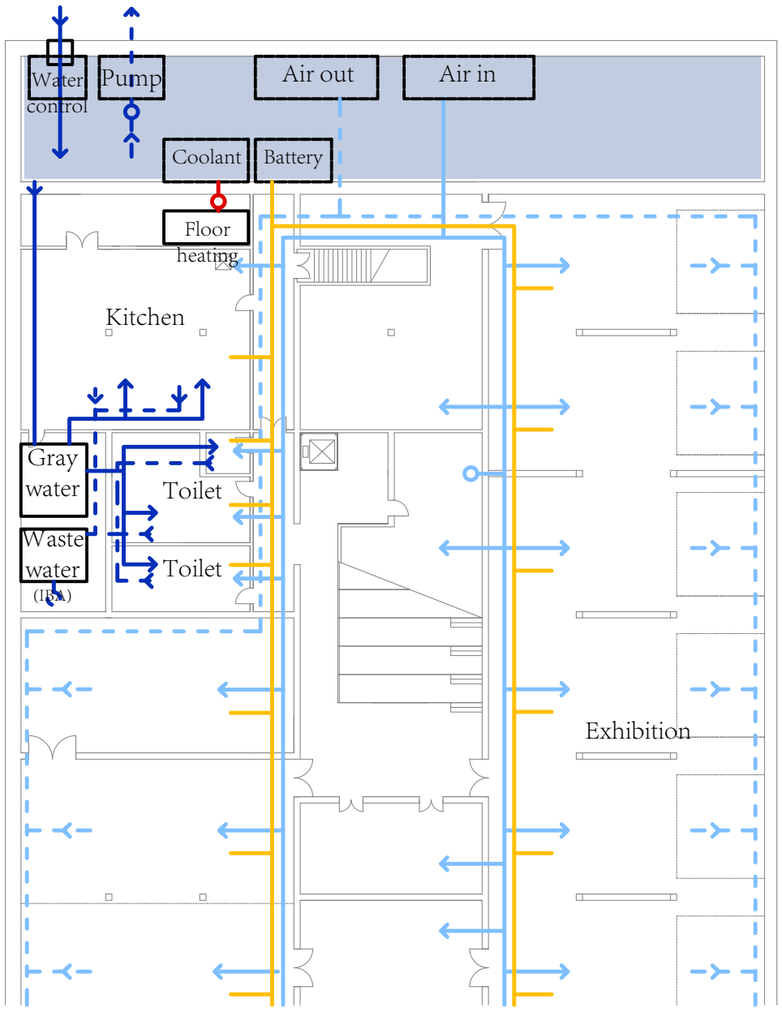


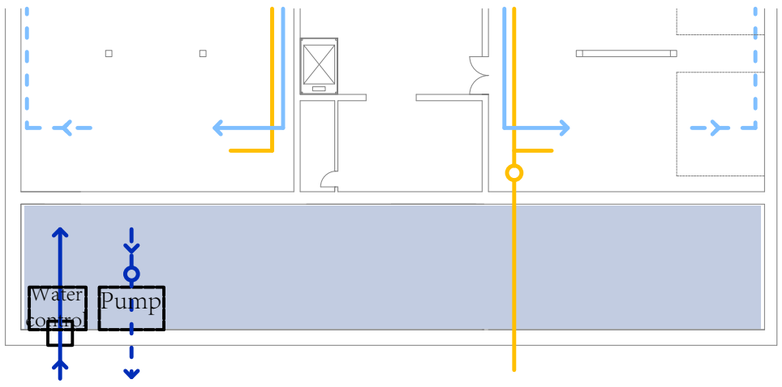
Prestressed concrete

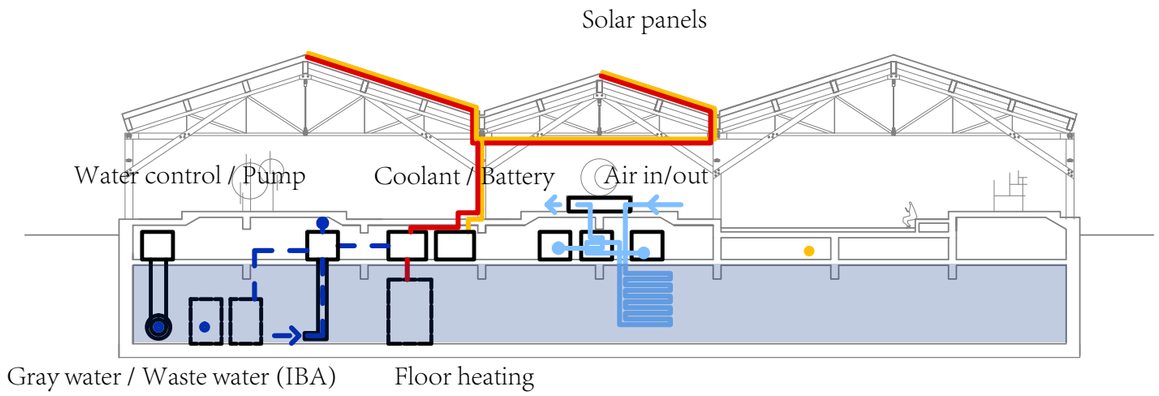


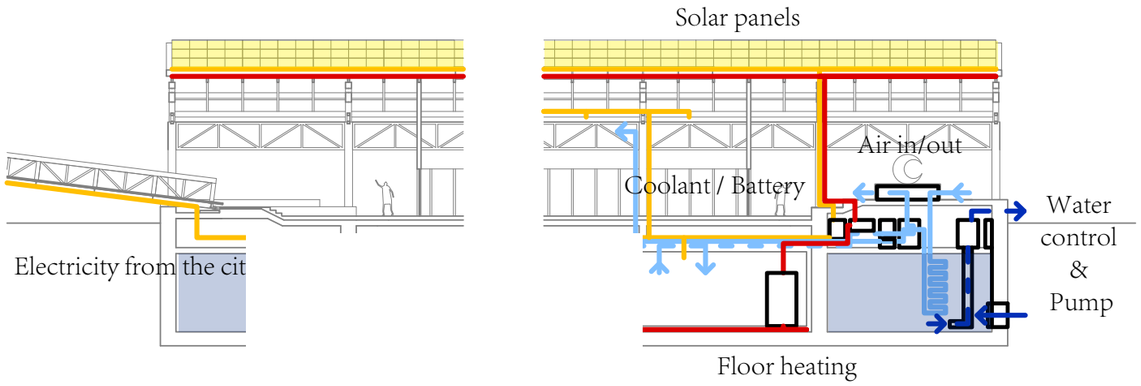
Prestressed concrete

Facilities









Air in
Air out
Electricity
Water in
Water out
Coolant / Floor pipes (heating)

Ventilation

Mechanical Ventilation

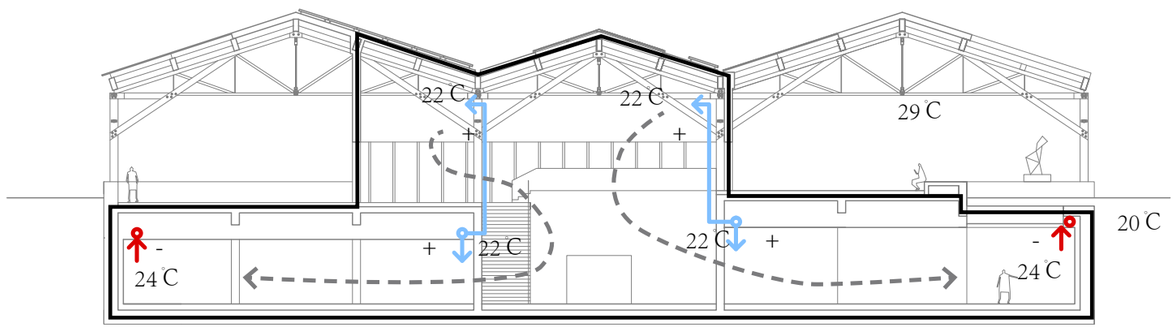
↑ air out ↓ air in

Heating & Cooling system

heating pipes

Air flows

Direction + High pressure - Low pressure



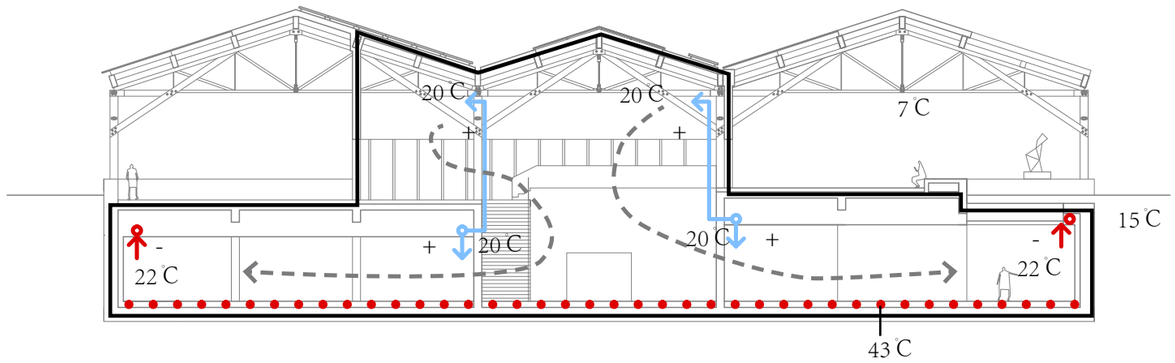
Summer

Heating & cooling:

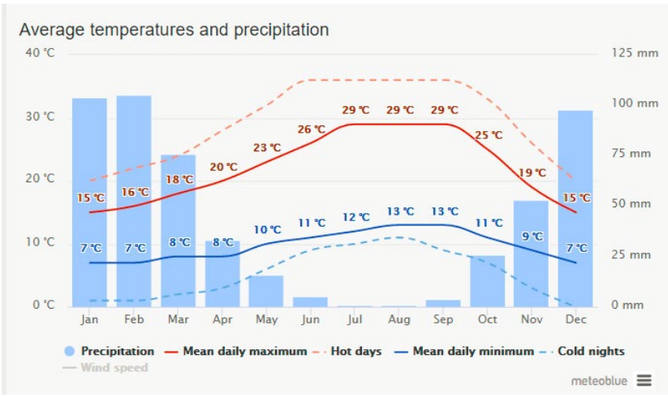
In winter, the hot coolant produced by the solar panels will be used by floor pipe system to warm the interiors. Cooling is not needed in the building.

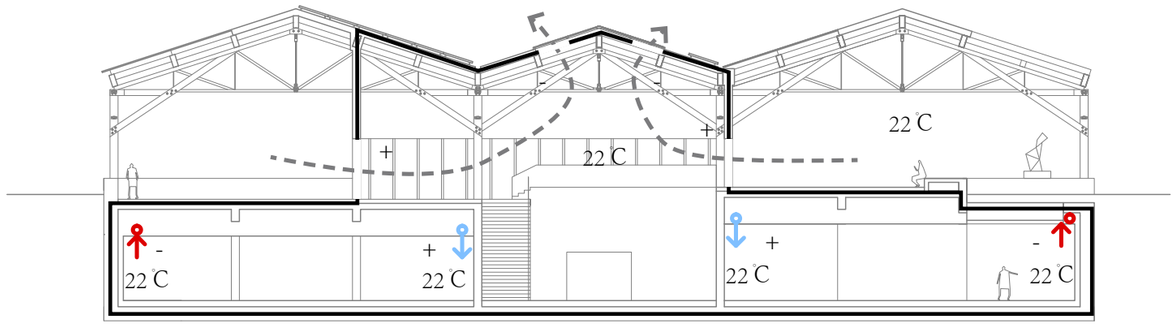
Ventilation:

The sea water could be used to exchange the heat with the fresh air in both summer and winter. In winter, the cold fresh air will also exchange the heat with the warm exhausted air after the exchange with sea water.



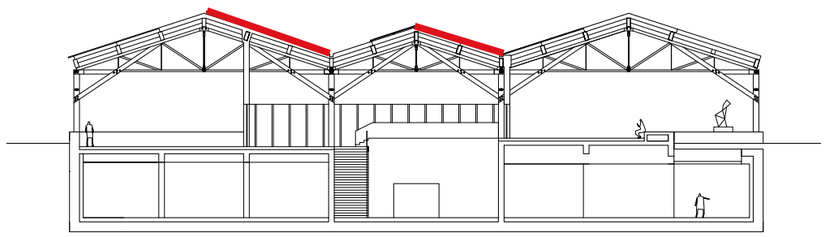
Winter

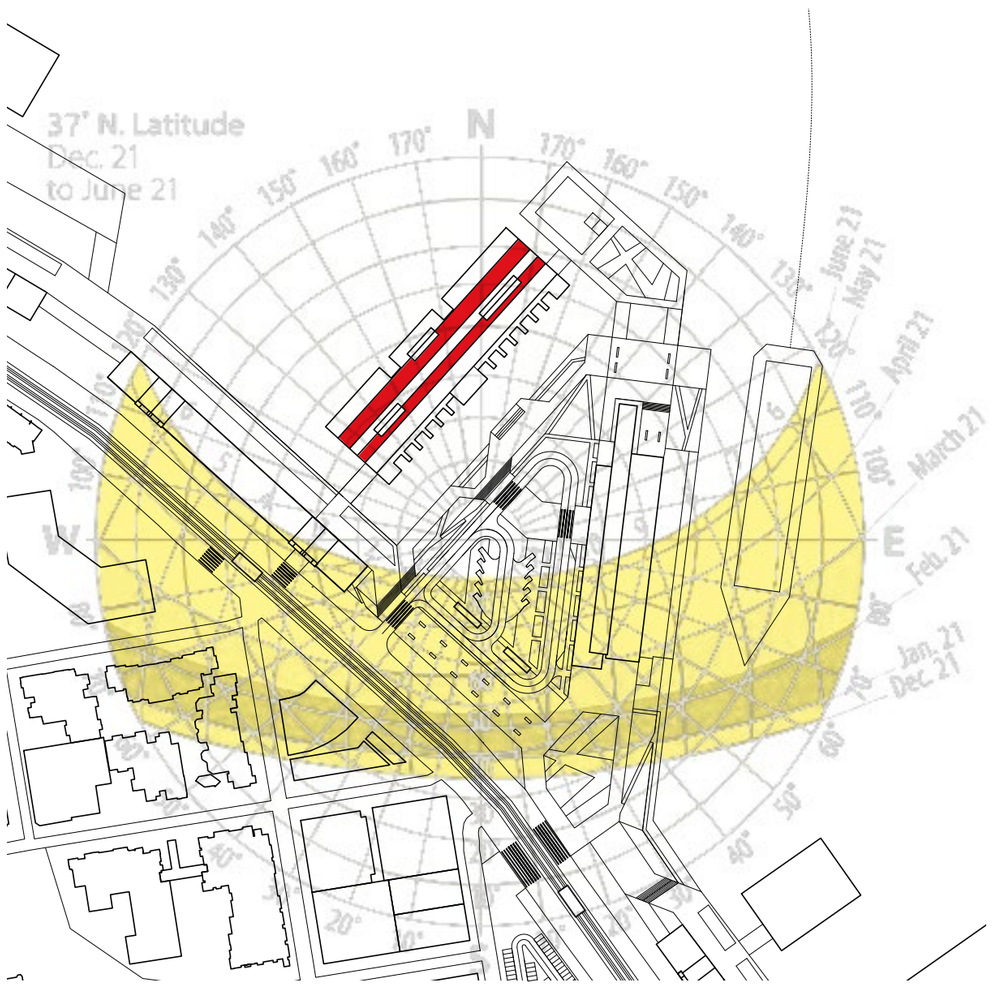




Spring / Autumn

Solar energy





$ 70,860 per year

RESULTS

789,082 kWh per Year *

System output may range from 758,229 to 802,496kWh per year near this location

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	3.10	39,493	3,546
February	4.11	47,040	4,224
March	4.94	63,060	5,663
April	6.19	75,326	6,764
May	6.80	85,544	7,682
June	7.09	85,734	7,699
July	7.59	93,930	8,435
August	6.90	85,263	7,657
September	6.40	75,908	6,817
October	4.90	60,554	5,438
November	3.34	40,925	3,675
December	2.82	36,305	3,260
Annual	5.35	789,082	$ 70,860

Location and Station Identification	
Requested Location	san francisco
Weather Data Source	(TMY2) SAN FRANCISCO, CA 11 mi
Latitude	37.62° N
Longitude	122.38° W

PV System Specifications *(Commercial)*	
DC System Size	507.6 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	20°
Array Azimuth	180°
System Losses	14%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

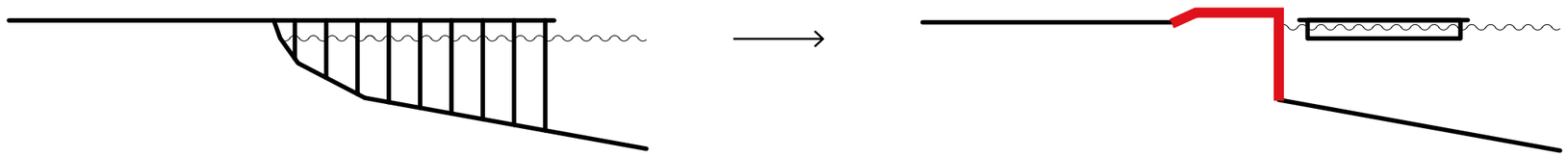
Economics	
Average Cost of Electricity Purchased from Utility	0.09 $/kWh

Performance Metrics	
Capacity Factor	17.7%

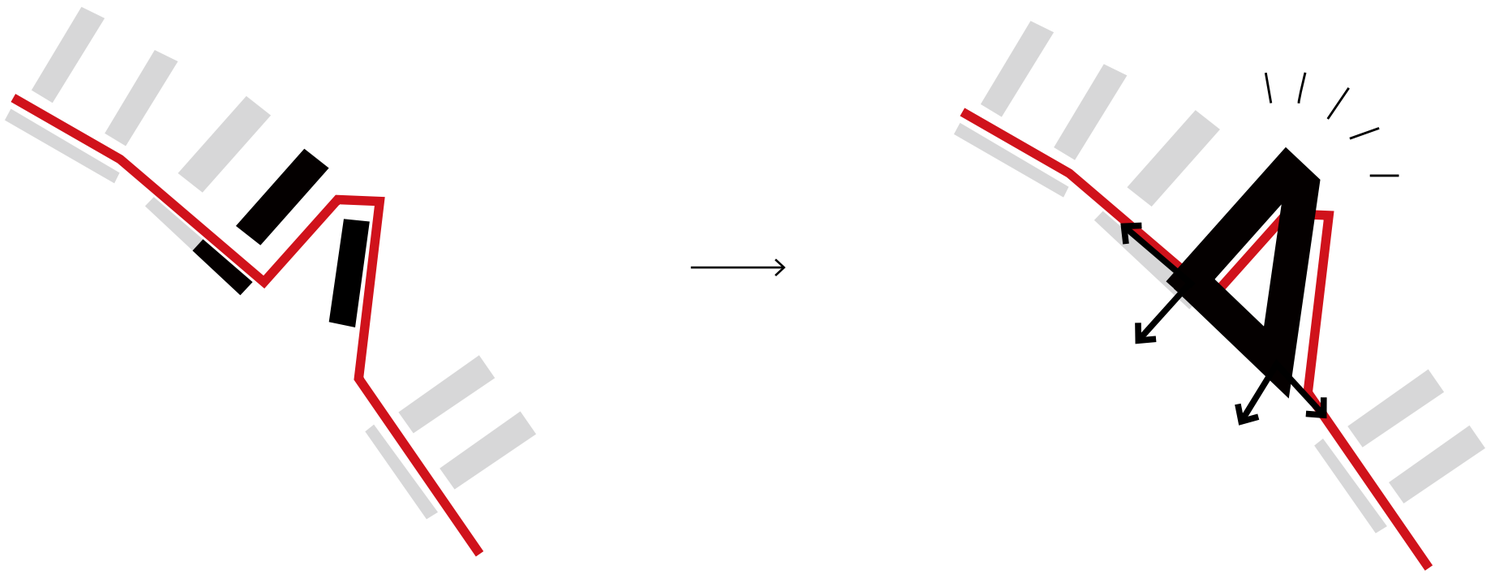
source: http://pvwatts.nrel.gov/pvwatts.php

Conclusion

Urban design



Architectural design



New York 2400

Mega Cities Under Water
Documentary 2014

A sustainable solusion for all coastal cities

Koen Olthuis
Architect, The hague