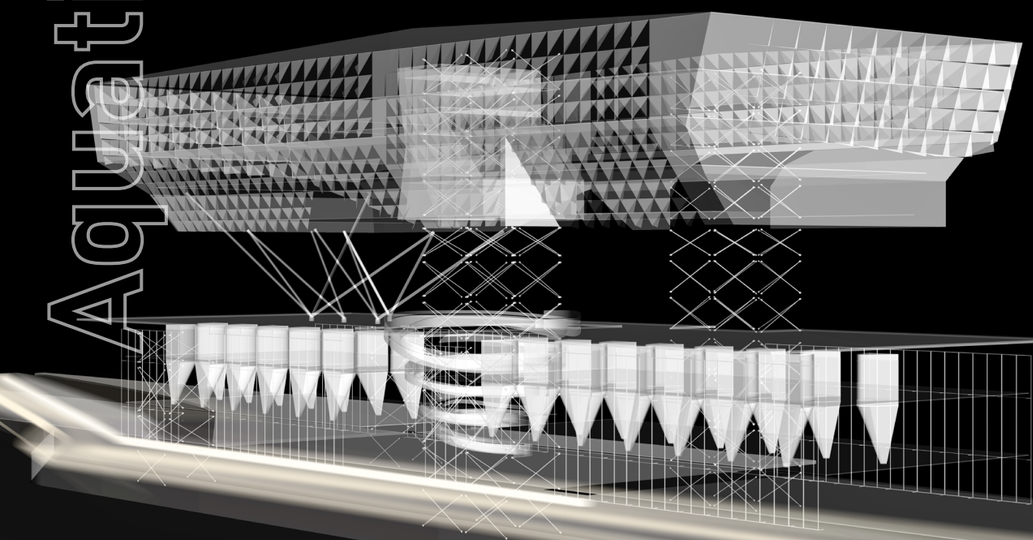
Aquatic Center



The project seeks to establish a new connection between the traditional wastewater purification infrastructure and public space, to allow a scheme that will not only eliminate the regional water pollution issue but allow a direct interaction between the people and water resources they live by.

DATA Water Purification Zone
40°43'42"NB, 73°59'39"WLa

The Water Purification Zone

—P5

2nd July *2020*

Complex Studio
- Midtown NE Manhattan

Xian Chen

Henri van Bennekom
Sjap Holst
Hielkje Zijlstra
Zhang Yang

INTRODUCTION

RESEARCH

SITE ARGUMENT

DESIGN

IMPLEMENTATION

CONCLUSION


MANHATTAN MIDTOWN
THE VALLEY OF GIANTS
Midtown NE
10 km2
61 str
42 str
23 str


WATER POLLUTION

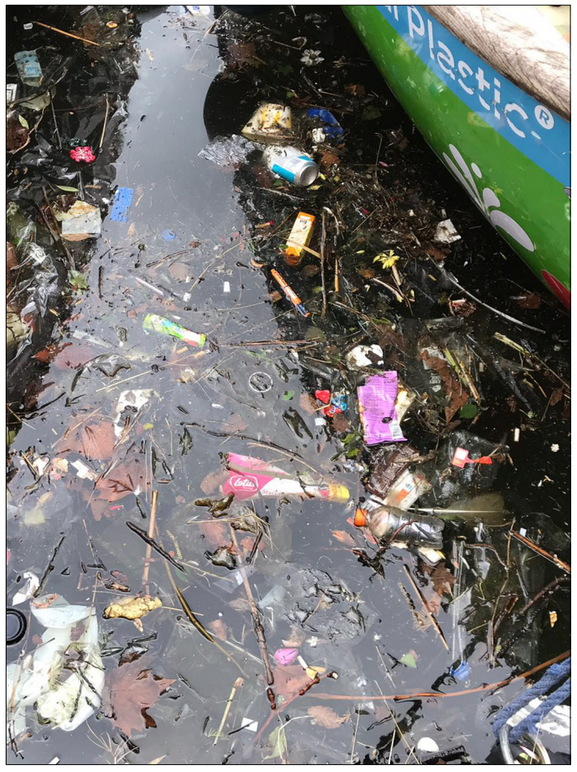
GLOBAL AND LOCAL EMERGENCY



CN- Wuxi



AFR-Sahara



NL-Amsterdam



US-MANHATTAN

MAJOR CAUSES OF WATER POLLUTION



Domestic Sewage



Industrial Wastewater



Global Warming



Acid rain



Agricultural waste


Water Pollution in Manhattan


1770
INDUSTRIALIZATION
1970
From Manna Hatta to Manhattan



Source: Wainwright, O. (2019). Super-tall, Super-skinny, Super-expensive: the 'Pencil Towers' of New York's Super-rich.

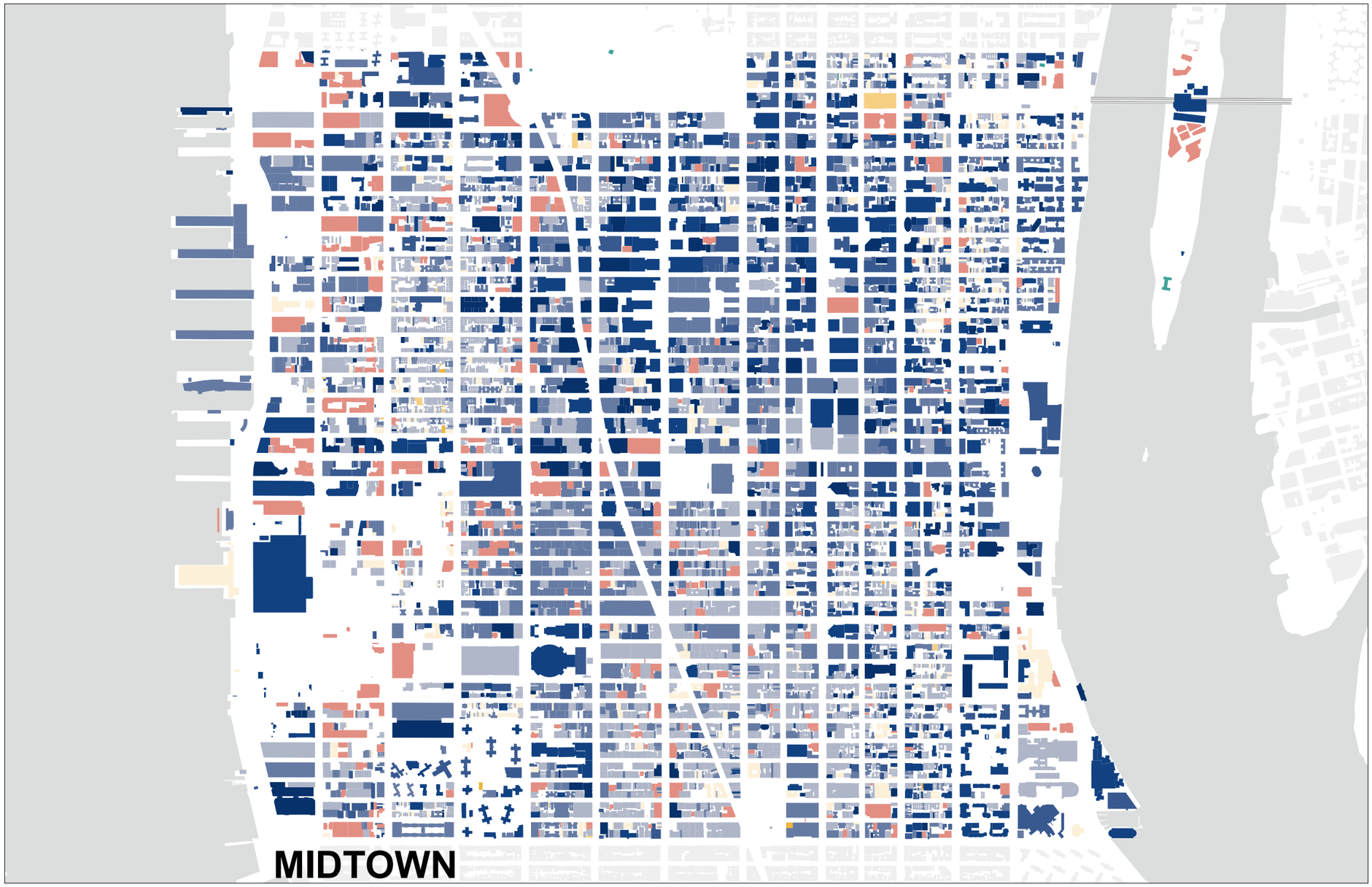


Source：Drew Angerer/Getty Images. (2019). Congestion pricing in NYC, explained. NY CURBED

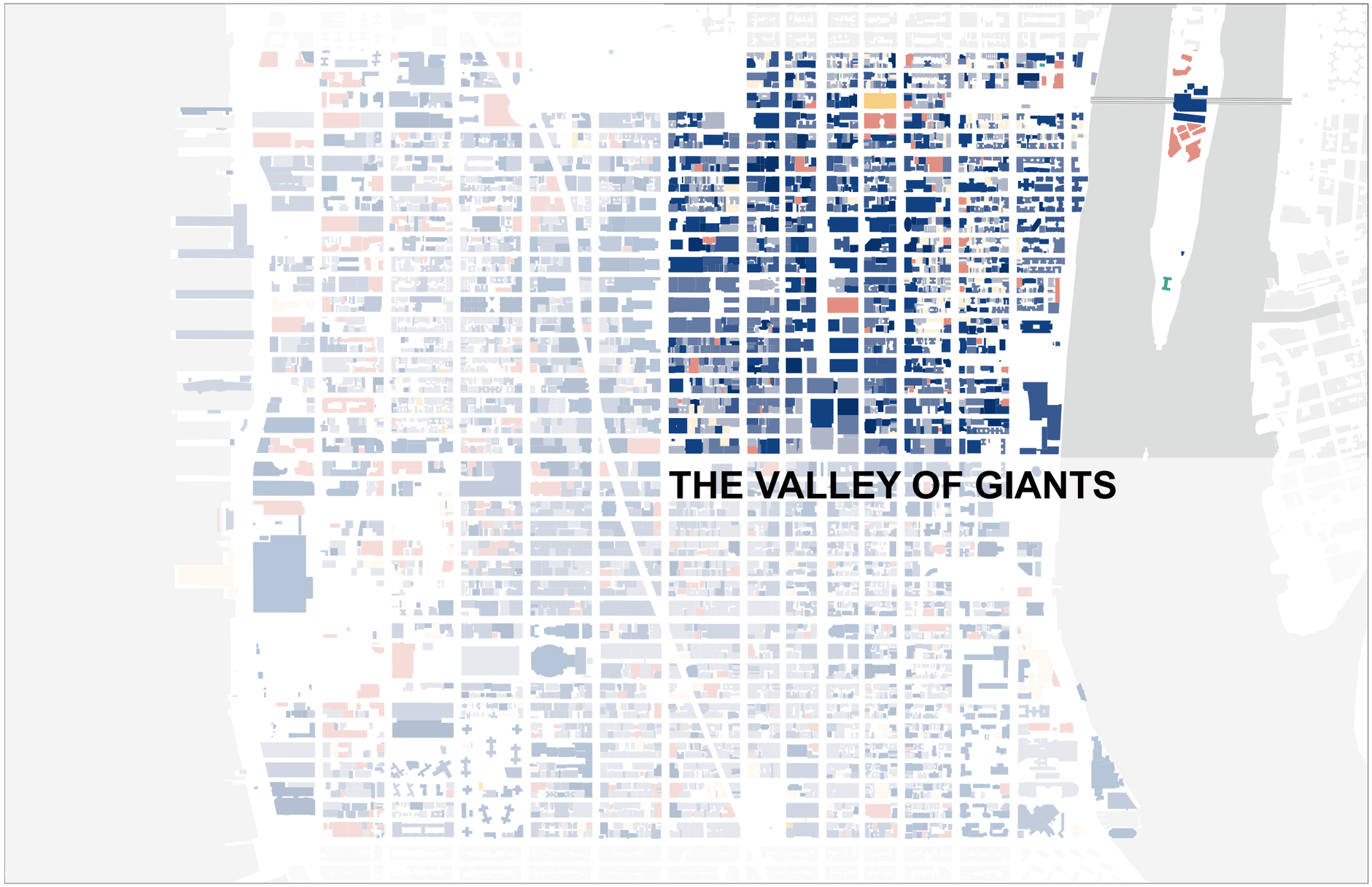


Source: Luke Juday Images. (2016). How is New York City growing if it's constantly losing people?

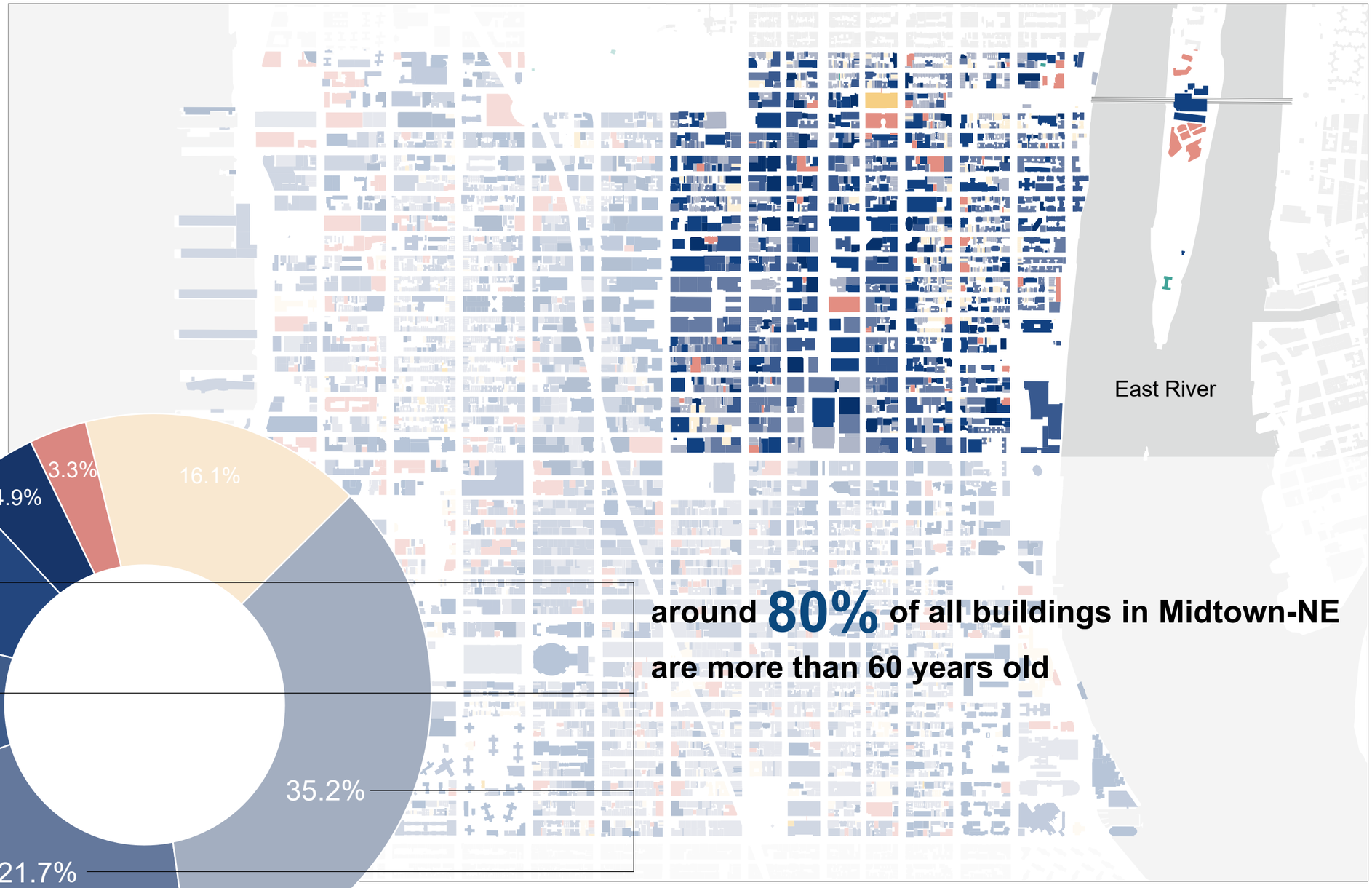
DENSITY



DENSITY



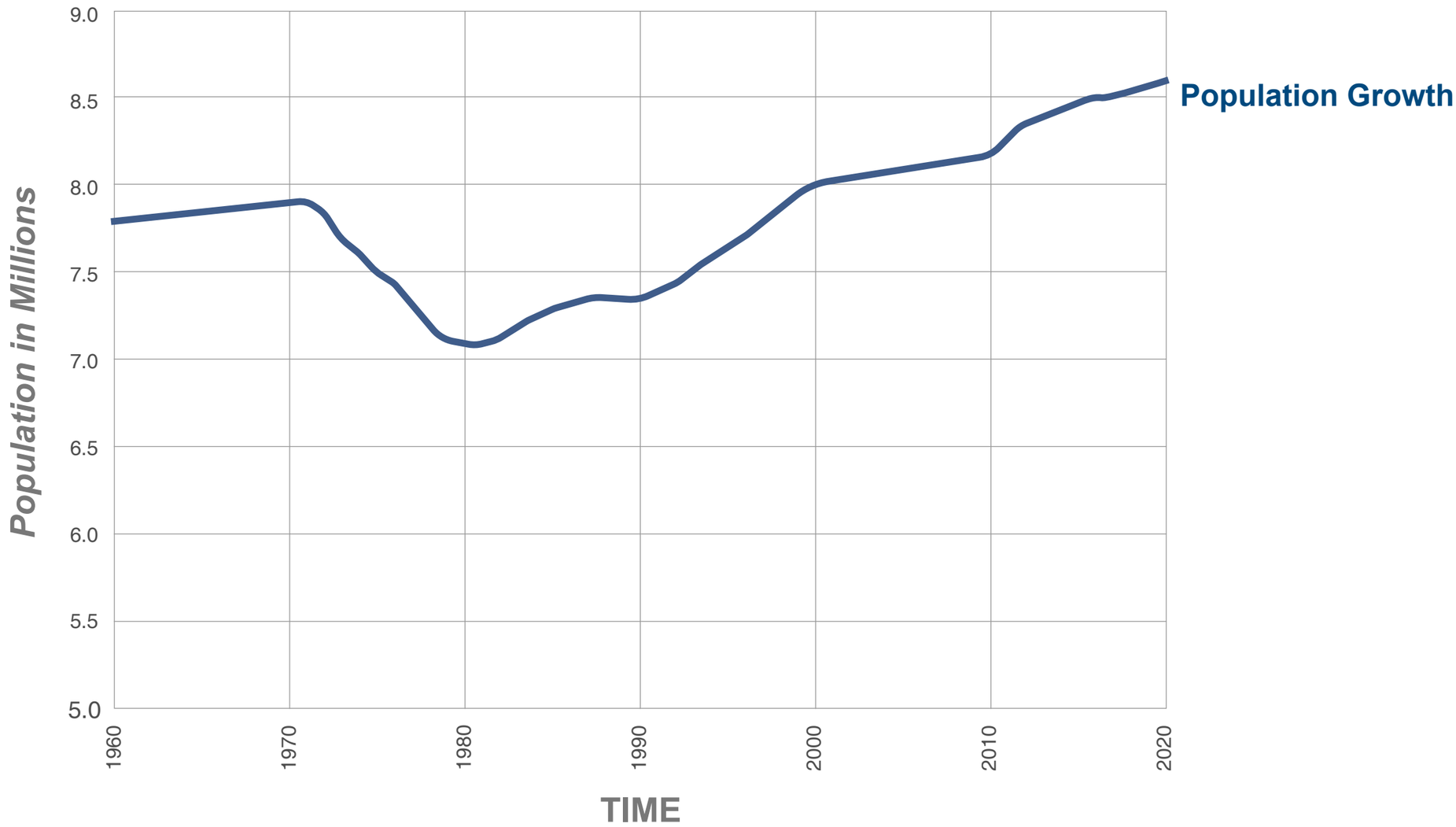
OLD BUILDING = OLD SEWER SYSTEM



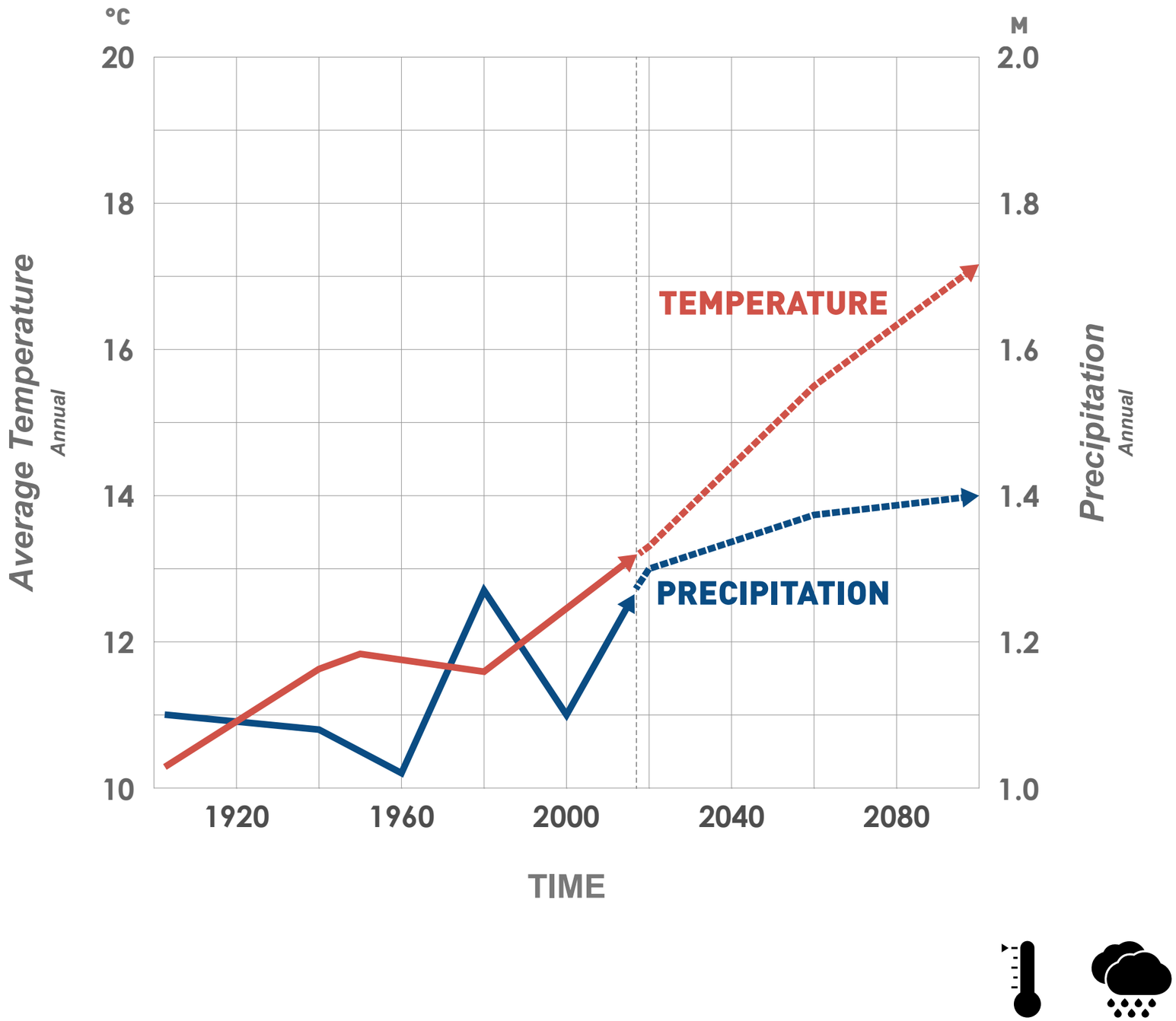
around 80% of all buildings in Midtown-NE are more than 60 years old

collection of buildings per period of Midtown-NE

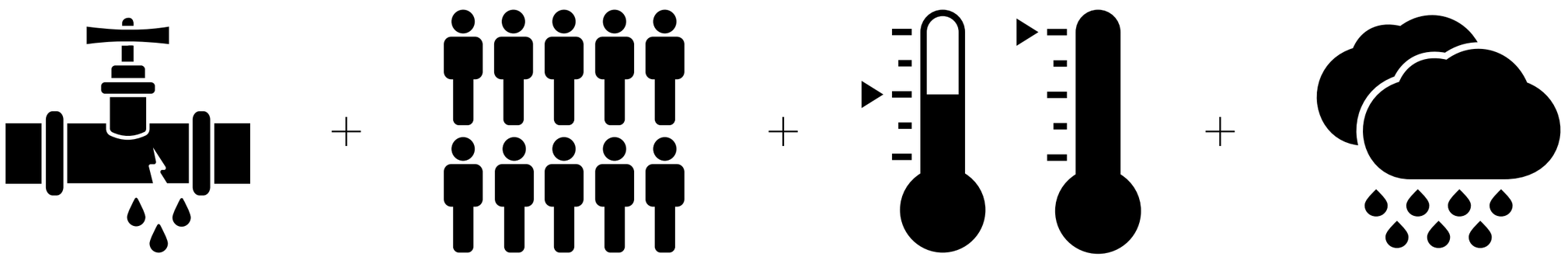
EXPECTED POPULATION INCREASE = HIGHER DEMAND FOR WATER



THE INCREASING TEMPERATURE & MORE FREQUENT PRECIPITATION

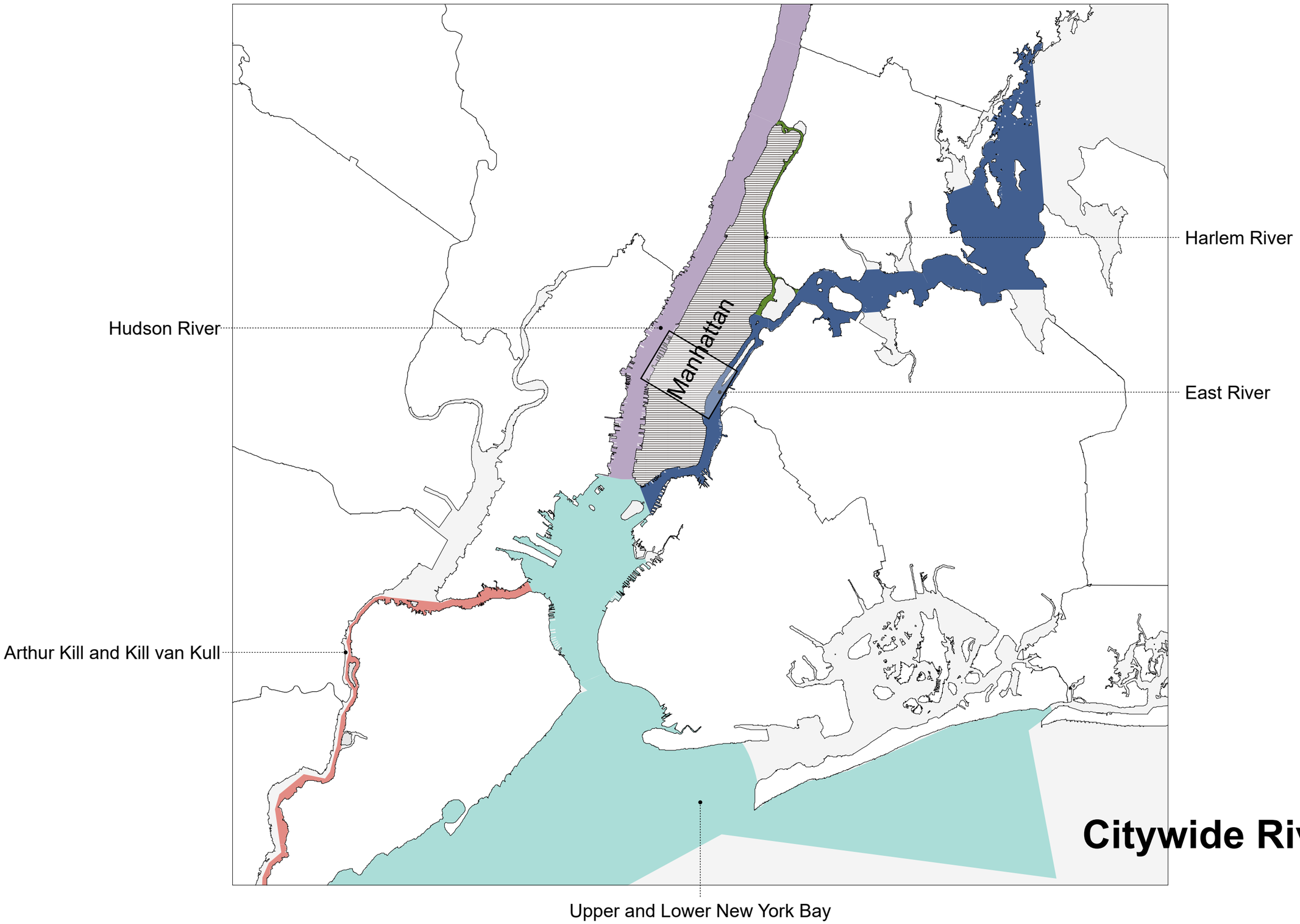


THE POTENTIAL FACTORS (MANHATTAN-NE)



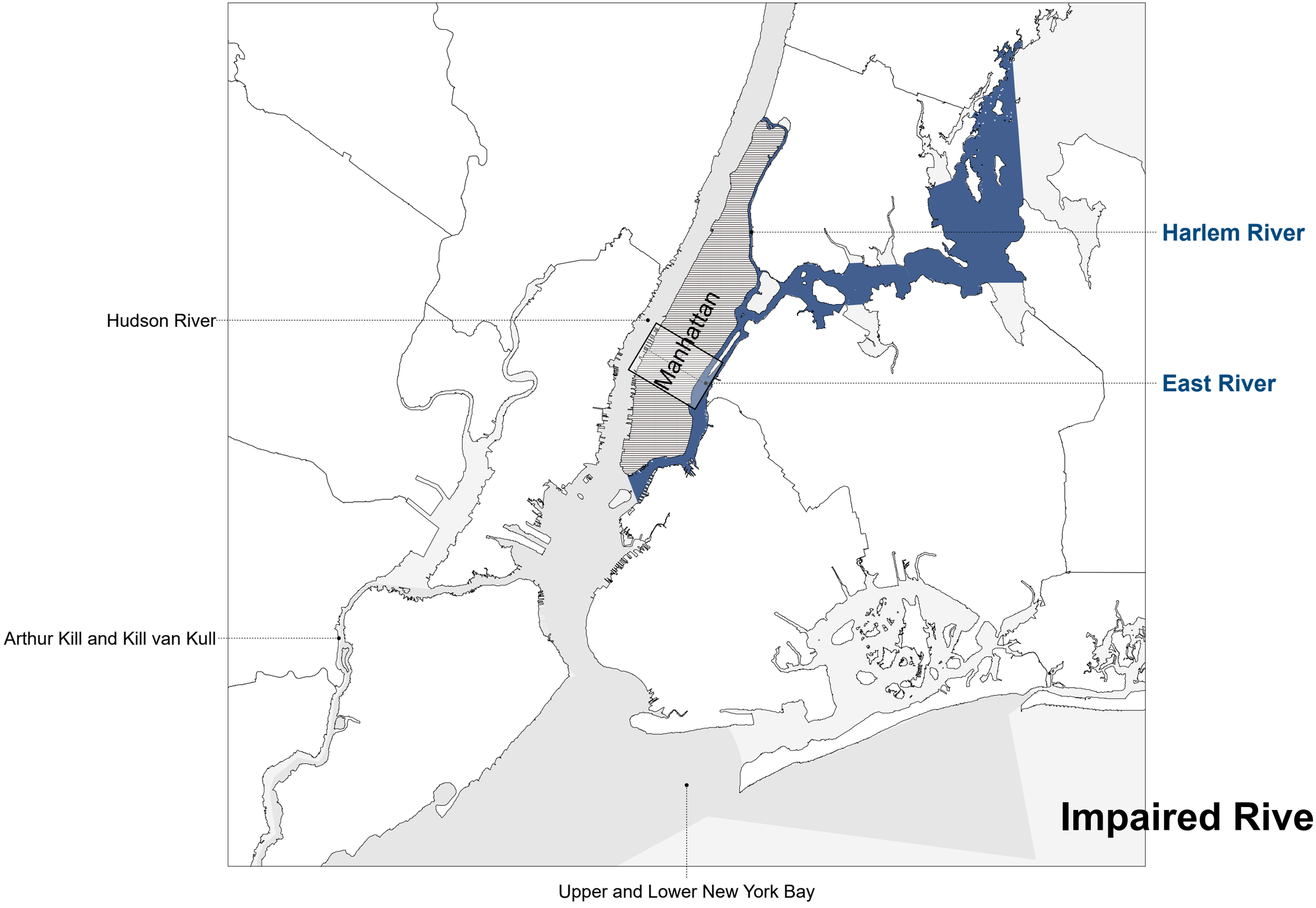
Aging sewer system | Growth population | Temperature rise | Increase precipitation





Citywide Rivers

East River & Harlem River are listed as impaired for the pollutants.



NYC ready to dump millions of gallons of toxic chlorine into the city's sewer system

06/01/2017 / By Bridgette Wilcox



New York's Sewer Overflows Could be Contributing to Climate Change

AUTHOR Avery Miles DATE January 28, 2019



Cancer-Linked Contaminants Found In NYC Drinking Water: Study

A nonprofit says possibly cancerous contagions have been found in city water but state officials dispute their conclusions.

By Kathleen Culliton, Patch Staff (https://patch.com/users/kathleen-culliton)
Oct 23, 2019 12:00 am ET | Updated Oct 24, 2019 10:23 am ET



07.13.16 :: CATEGORIES: BOAT BLOG AND WATER QUALITY. News & Events

Exploring polluted NYC waterways: 'You have to decide, I'm going to do what I can'



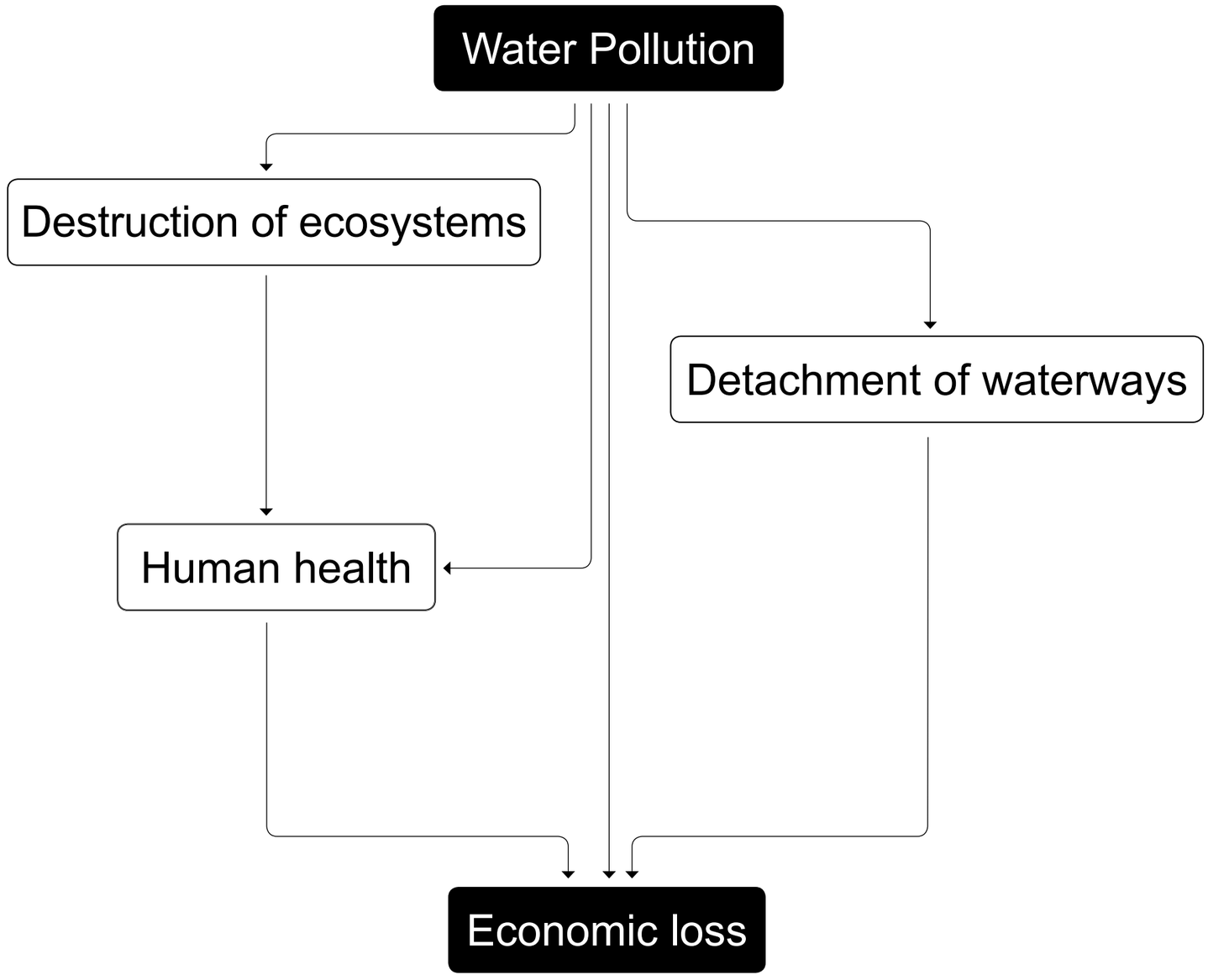
Enhancing the culture of waterfront detachment, causing the closure of the beaches



Enhancing the culture of waterfront detachment, causing the closure of the beaches

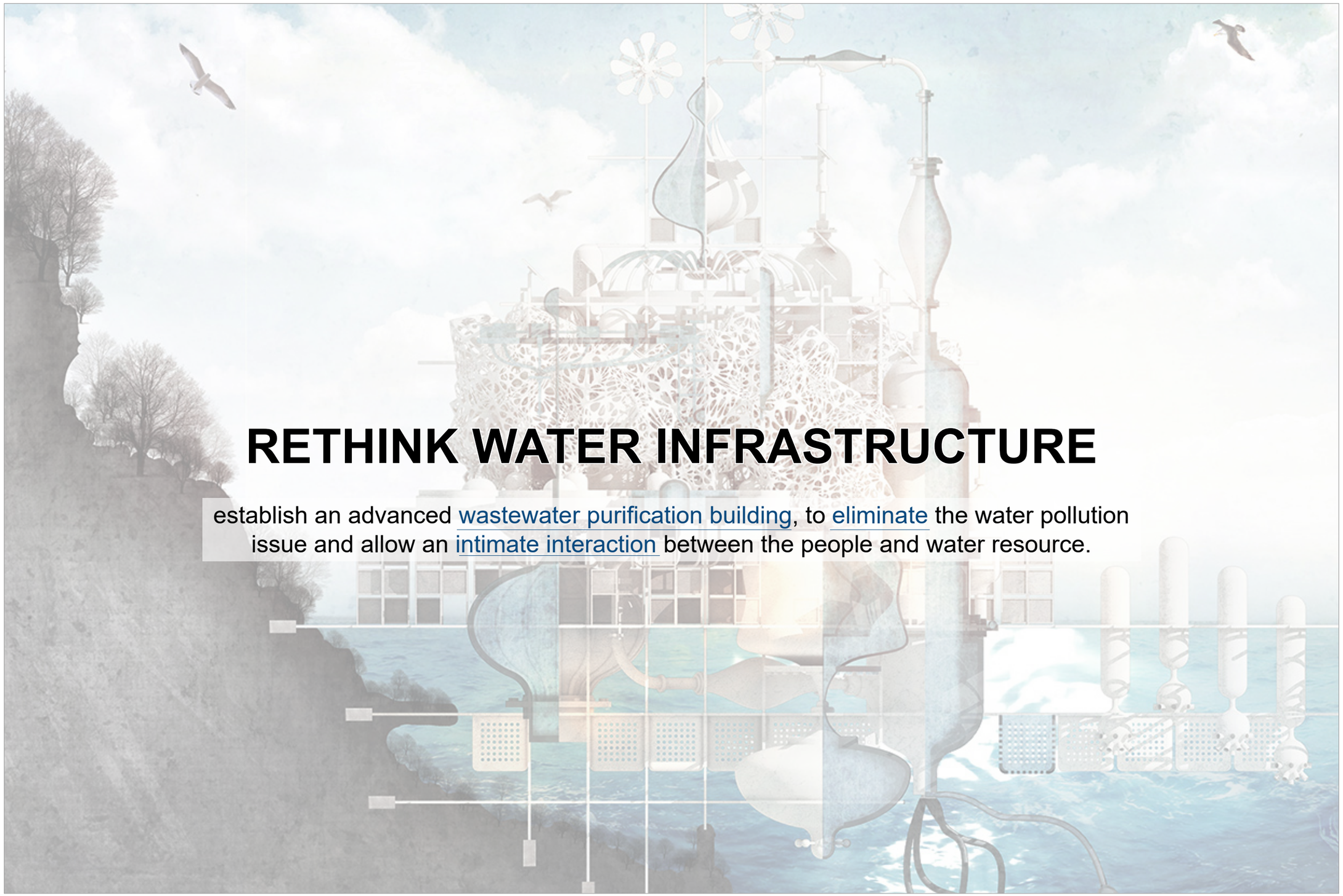


EFFECTS OF WATER POLLUTION (LOCAL)



RESEARCH QUESTION

*How can (infrastructural) architecture address **the water pollution** through a socio-ecological way, to evoke a **more livable and healthier community** for Midtown-NE's future development?*



RETHINK WATER INFRASTRUCTURE

establish an advanced wastewater purification building, to eliminate the water pollution issue and allow an intimate interaction between the people and water resource.

Source: 2014 Evolo Competition:Tower of Refuge



Source: Lizzie Crook . (2019). BIG opens Copenhill power plant topped with rooftop ski slope in Copenhagen. Dezeen


New Trends
waste-to-energy

IN ORDER TO PROVIDE IN THIS TREND

THE ZONE OF WATER PURIFICATION

AQUATIC CENTER

GOALS



Intervention Strategy

Project goal

(MANHATTAN) WATER INFRASTRUCTURE 2050



INTRODUCTION

RESEARCH

SITE ARGUMENT

DESIGN

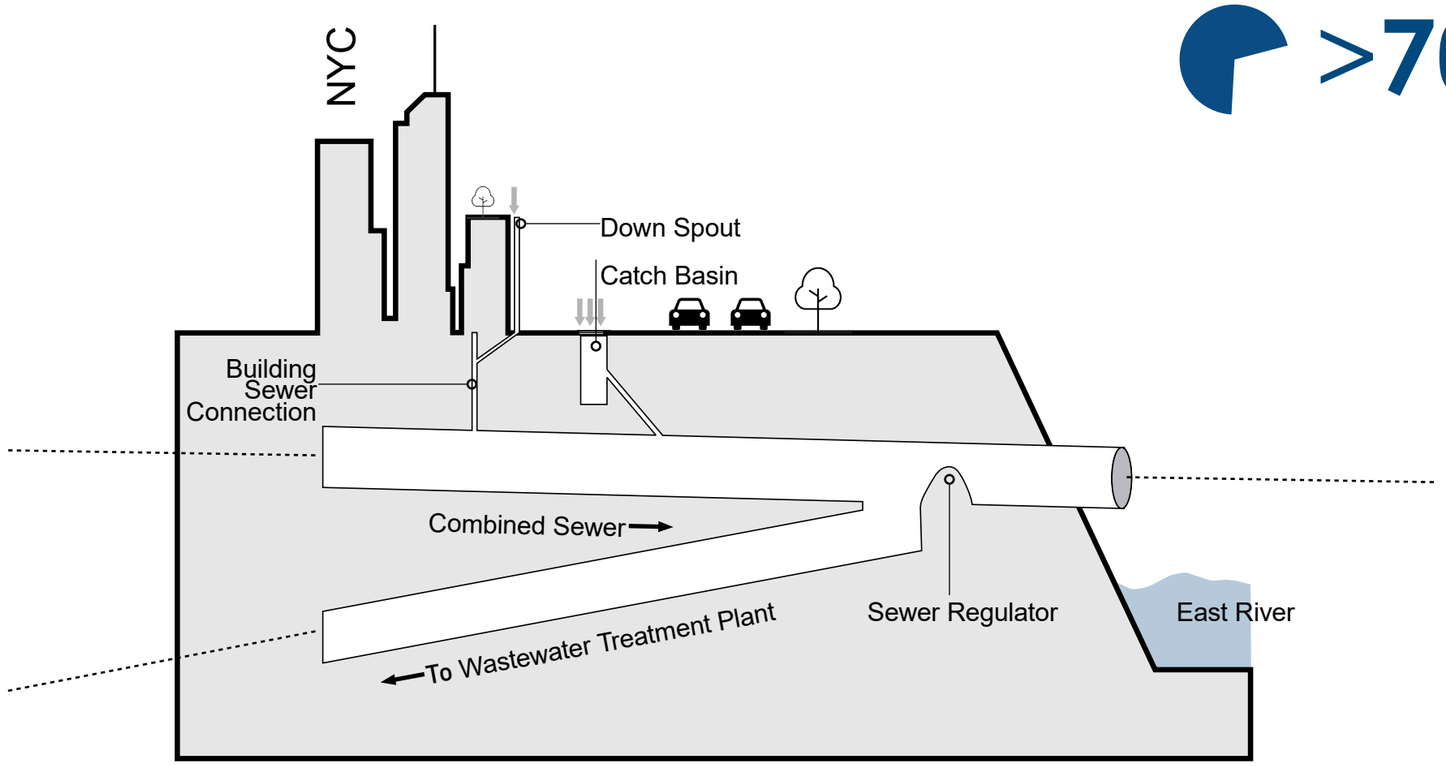
IMPLEMENTATION

CONCLUSION

The most relevant factor affecting water pollution is the underground sewer system

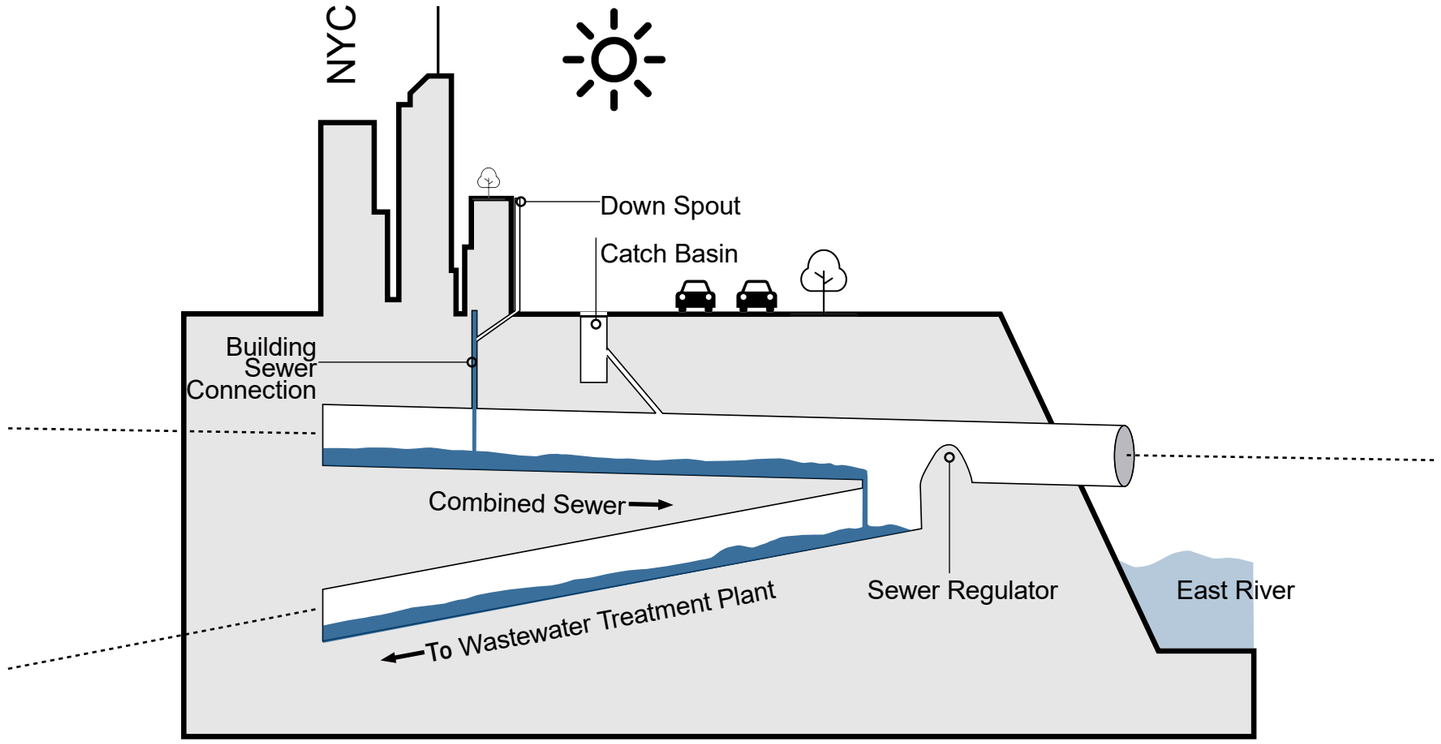


COMBINED SEWER SYSTEM



1. combined sewer system

COMBINED SEWER SYSTEM

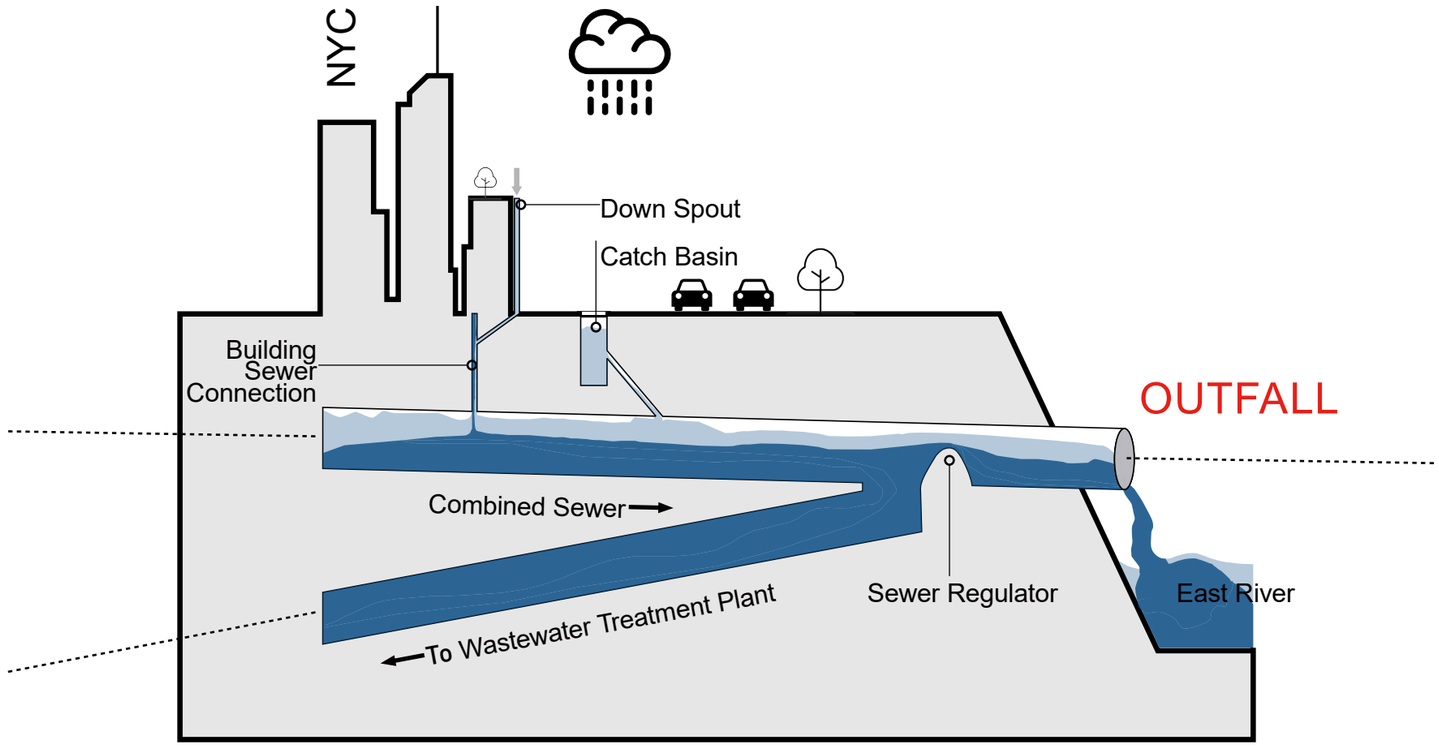


2. Dry weather

storm sewers

sanitary swewrs

COMBINED SEWER SYSTEM



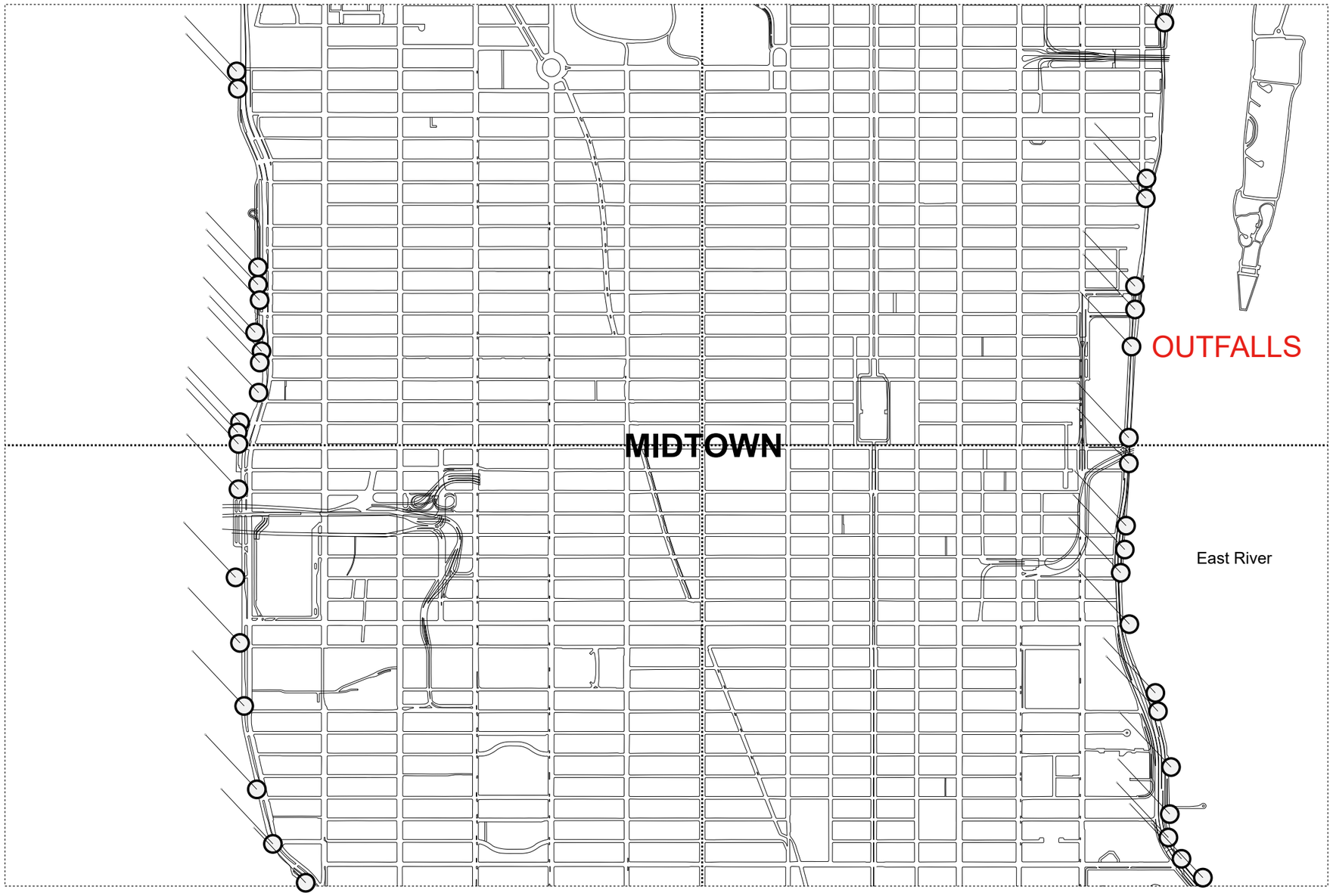
3. Wet weather

storm sewers

sanitary swewrs

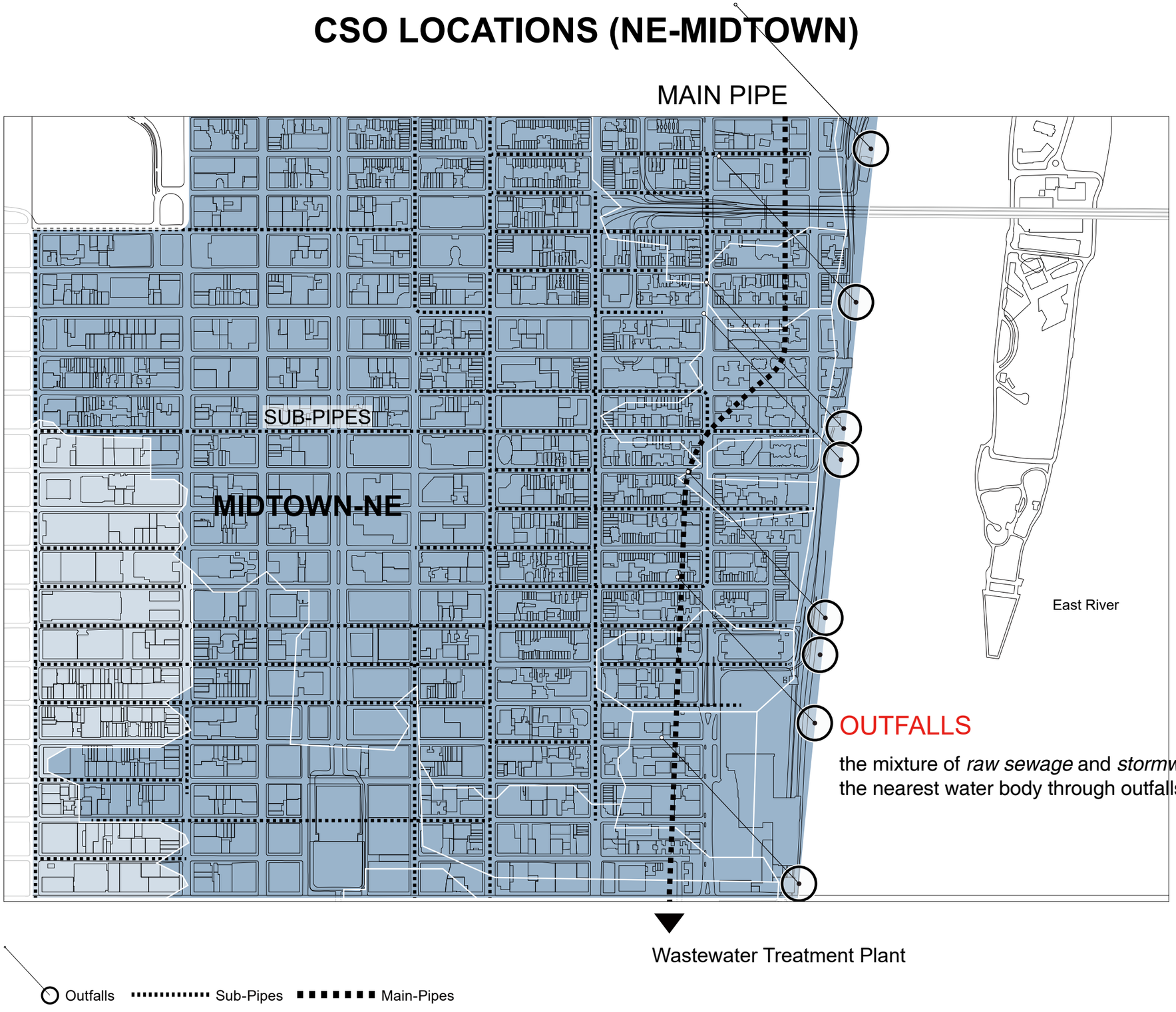
Combined Sewer Overflows **(CSO)** Event

CSO LOCATIONS (MIDTOWN)



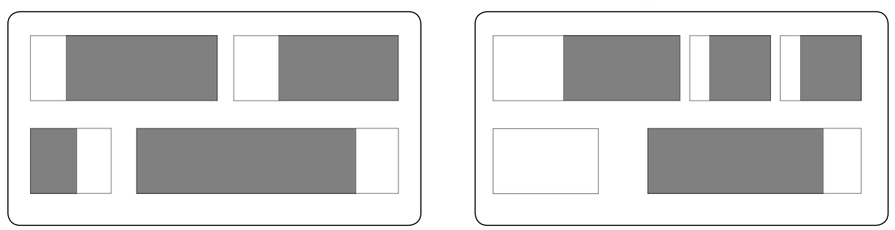
Outfalls

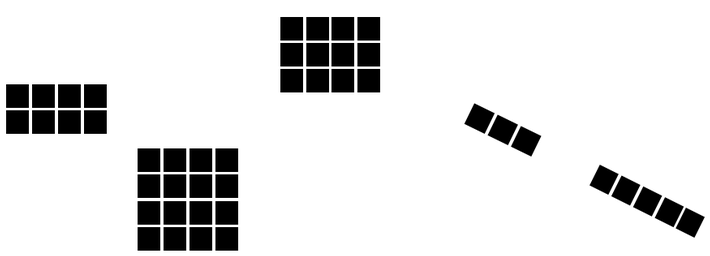
CSO LOCATIONS (NE-MIDTOWN)



THE SEWAGE COLLECTION NETWORK

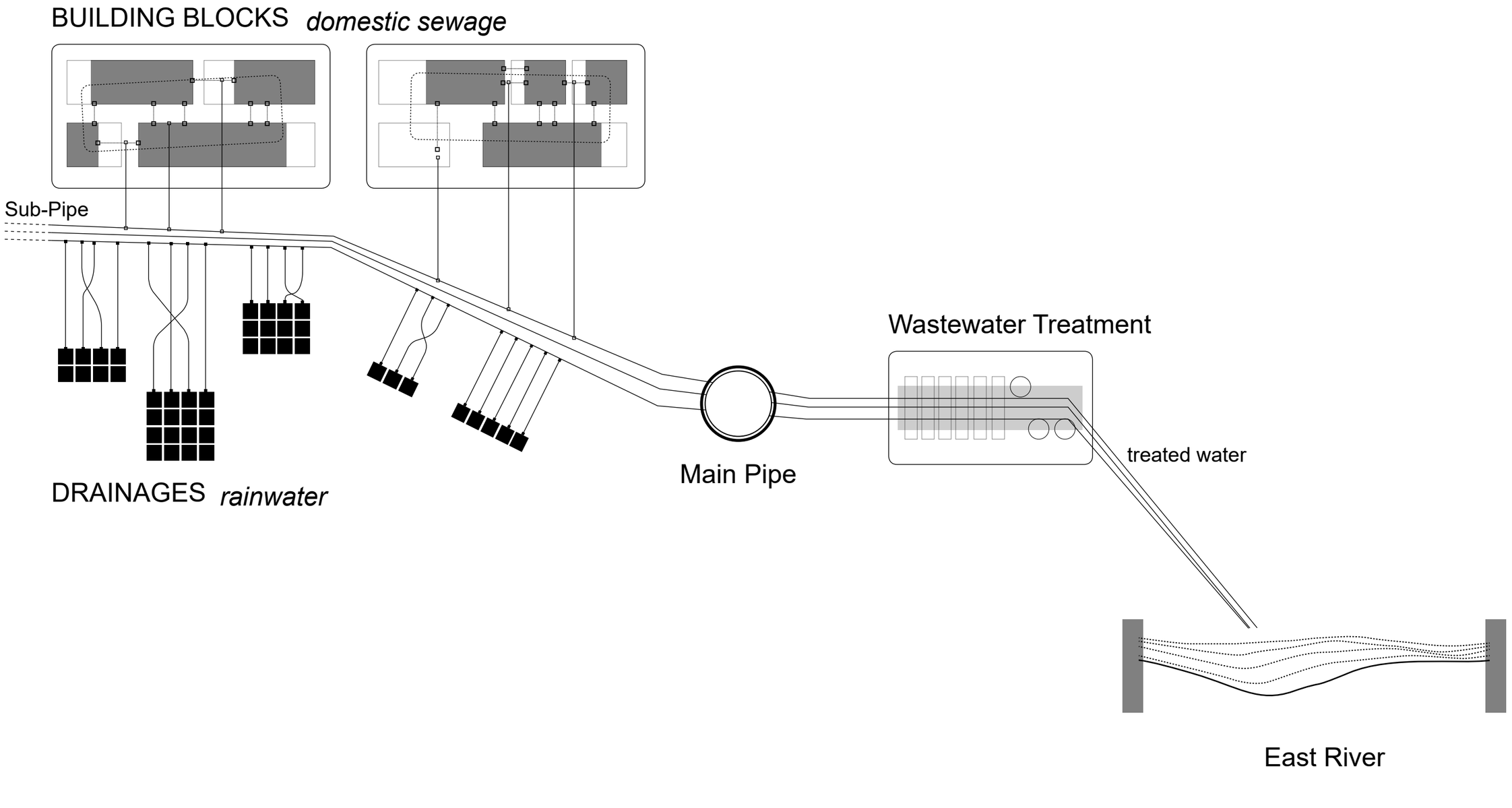
BUILDING BLOCKS *domestic sewage*



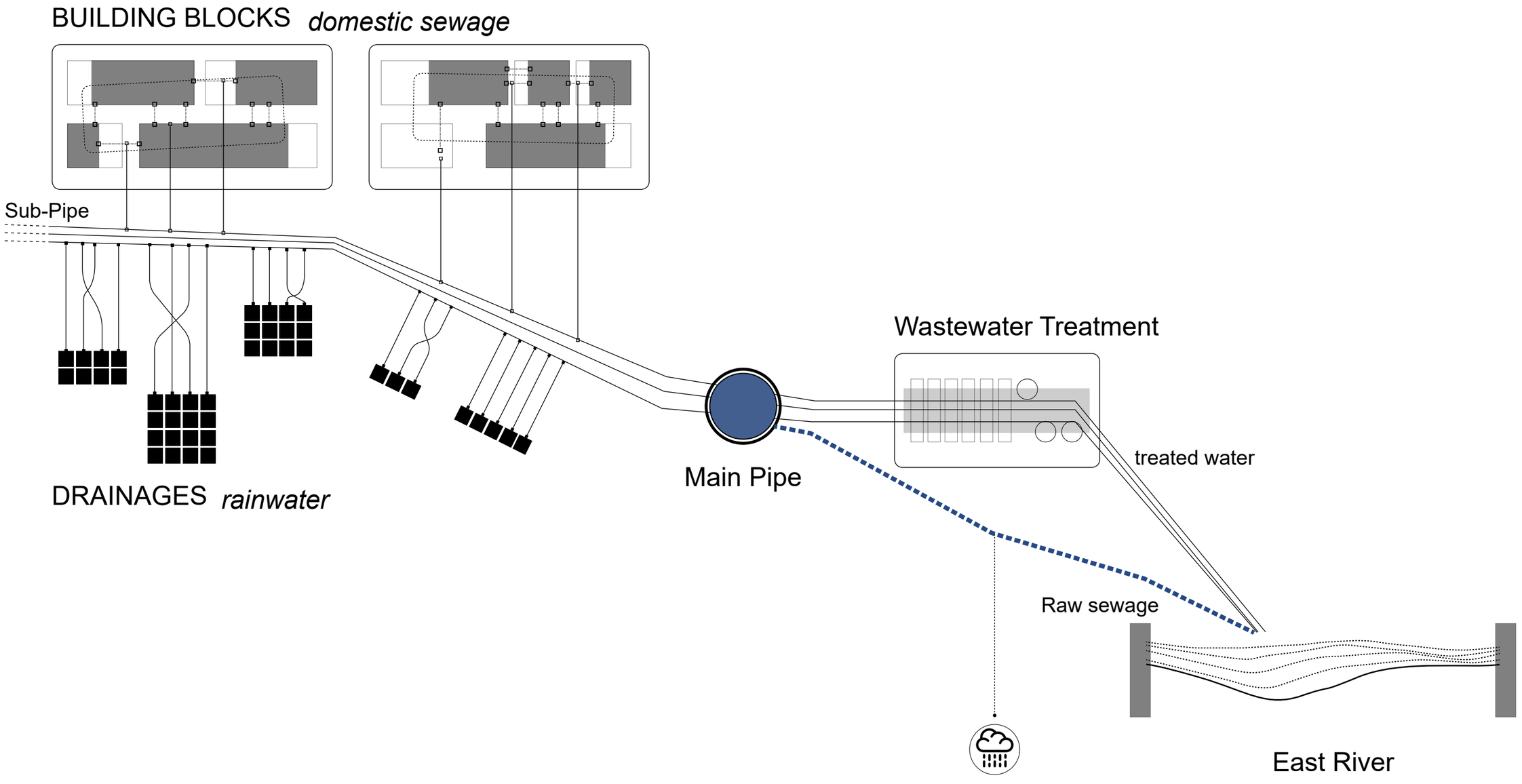


DRAINAGES *rainwater*

THE SEWAGE COLLECTION NETWORK



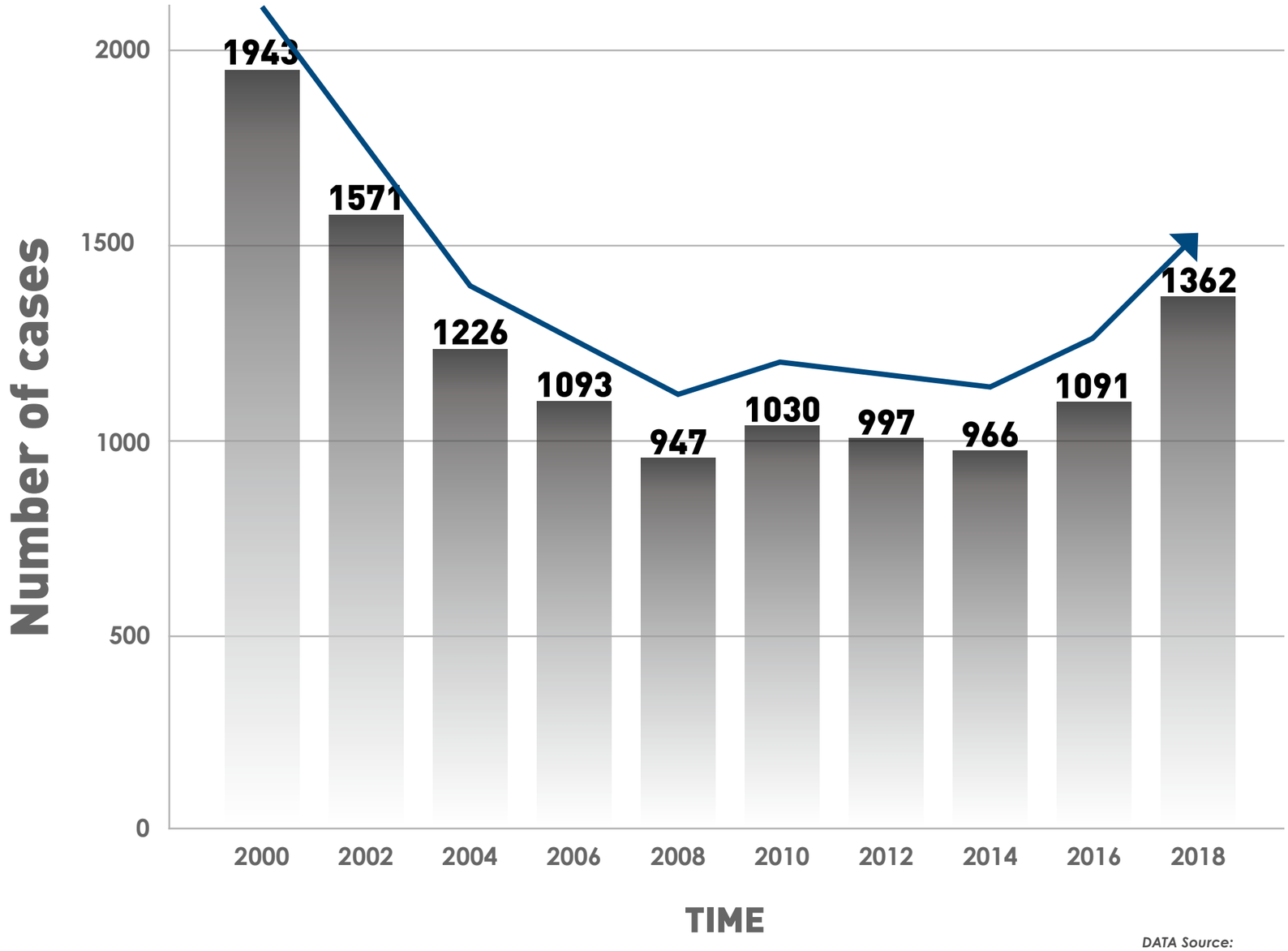
THE SEWAGE COLLECTION NETWORK



On average CSO events occur about **once per week** and the average weekly polluted discharge is about **19000 m³** Citywide.

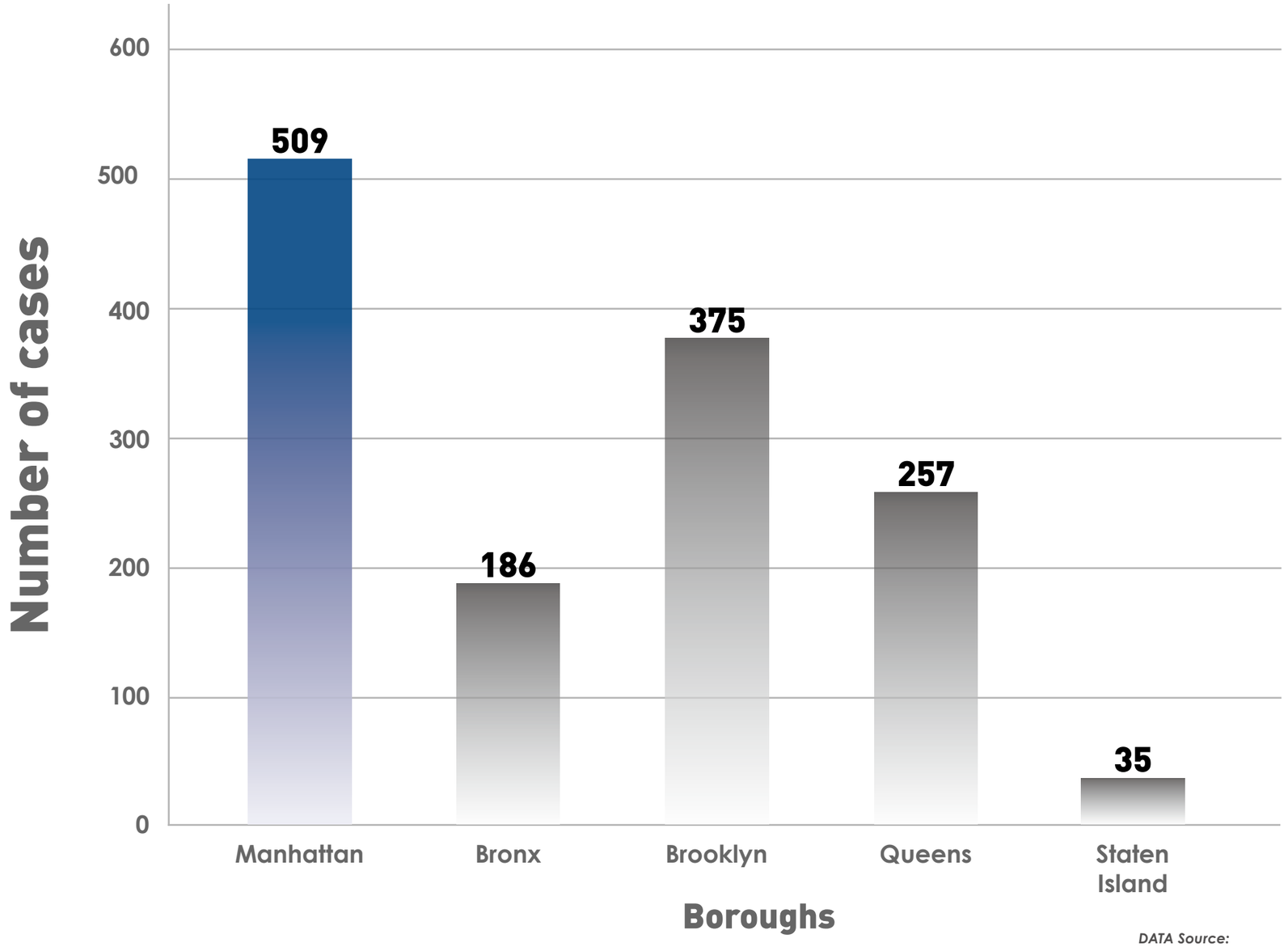


HUMAN HEALTH: pathogens introduced into waterways from sewer overflows and contaminated runoff make thundreds of New Yorkers sick per year.



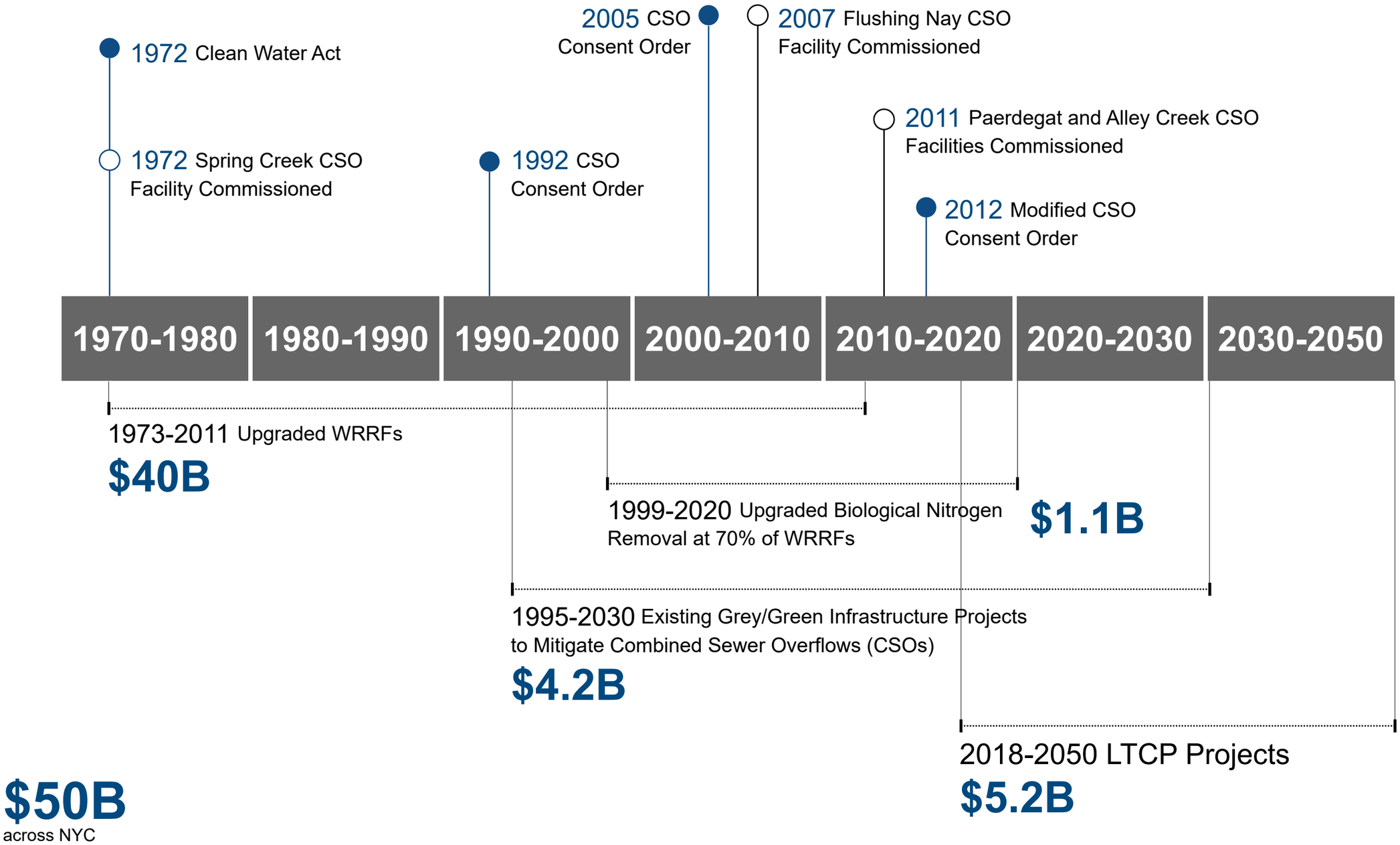
DATA Source:
Waterborn Disease Risk Assessment Program 2018 Annual Report (DEP)

HUMAN HEALTH: Manhattan has the highest waterborne disease risk among all five boroughs.



DATA Source:
Waterborn Disease Risk Assessment Program 2018 Annual Report (DEP)

Historical and Planned investments in WASTEWATER INFRASTRUCTURES

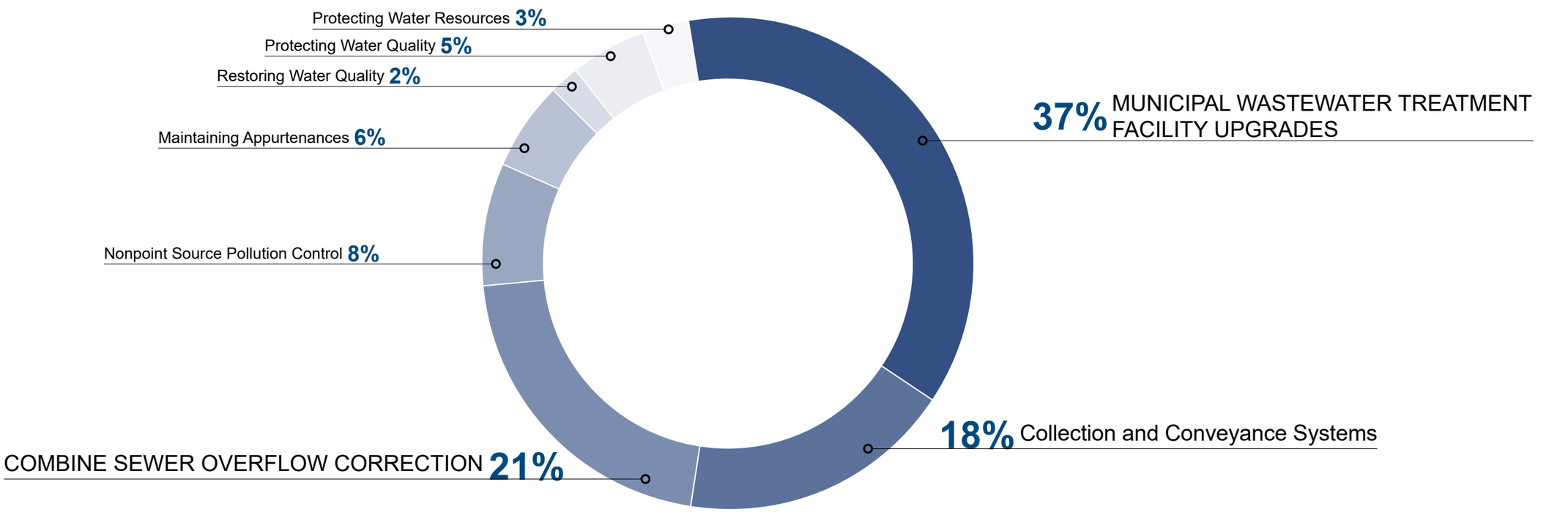


$50B
across NYC

WRRF: wastewater resource recovery facility

Source: New York City Environmental Protection

20-Year (future) Estimate of Wastewater Infrastructure Financial Needs



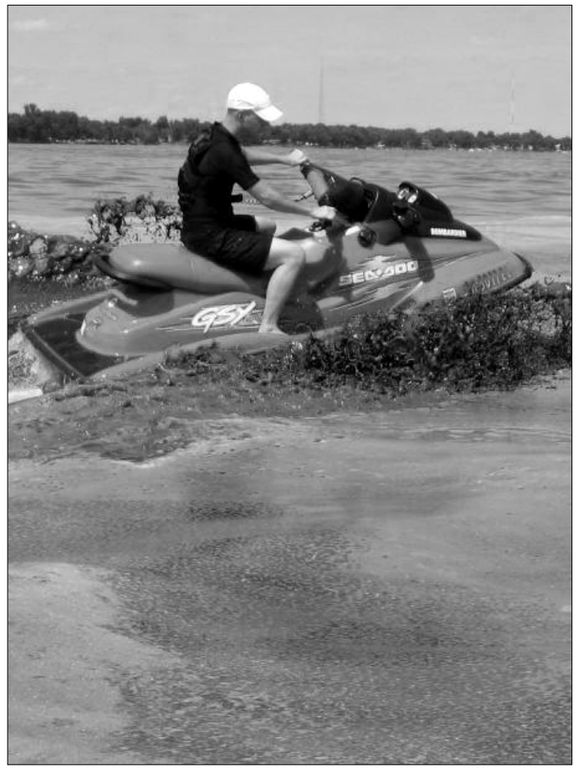
across NYC

Source: Wastewater Infrastructure Needs of New York State

ECONOMIC LOSSES: nutrient pollution has diverse and far-reaching effects on many sectors that depend on clean water.



Drinking water cost



Tourism loss



Fishing loss



Property value loss

MIDTOWN-NE NEEDS AN ADVANCED WATER BUILDING

Newtown Creek Wastewater Treatment Plant

INTRODUCTION

RESEARCH

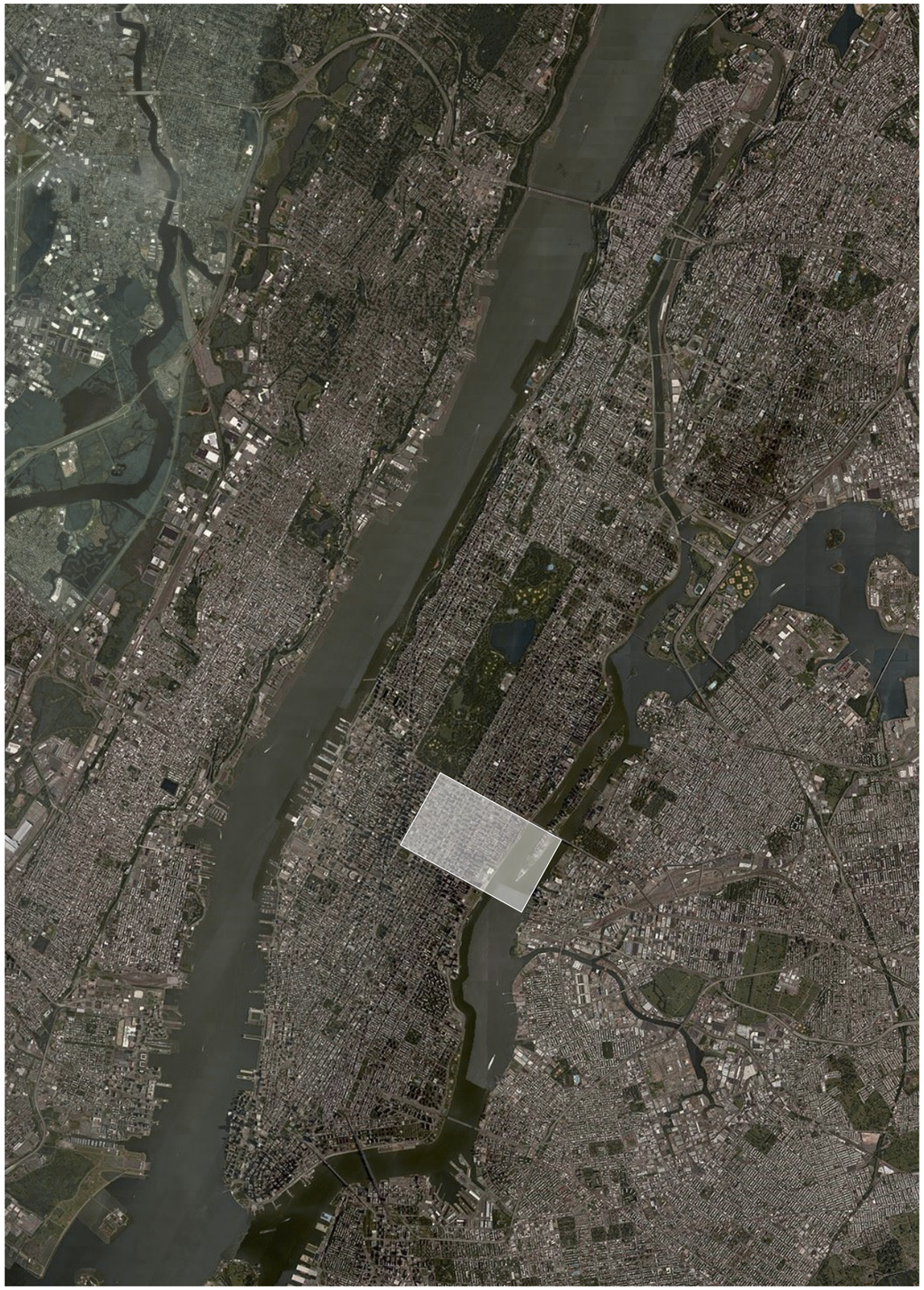
SITE ARGUMENT

DESIGN

IMPLEMENTATION

CONCLUSION

MANHATTAN-THE ARTIFICIAL ISLAND



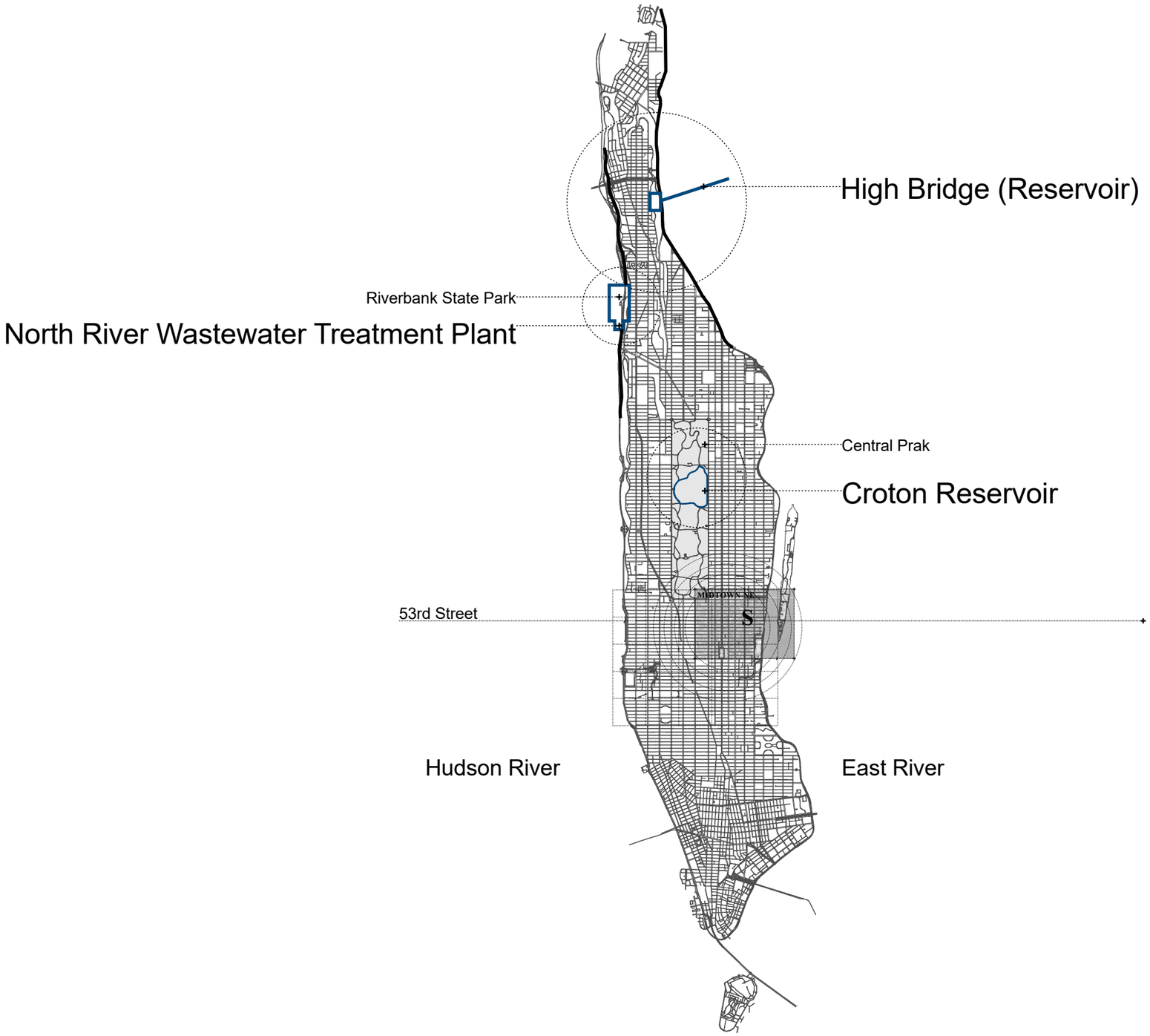
TWO IDENTITES



TWO IDENTITES

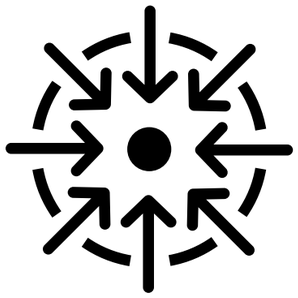


RECONNECTING PUBLIC, WATERWAYS AND INFRASTRUCTURES

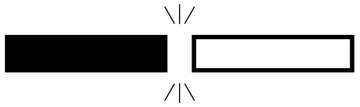


The Proposed site should reconnect public, waterways and some existing water infrastructures.

SITE REQUIREMENTS



Potential Accessibility



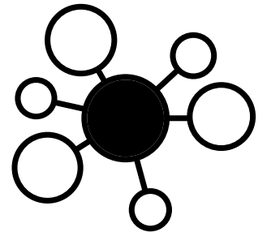
Intermediation



Water Boundary



Public Appeal

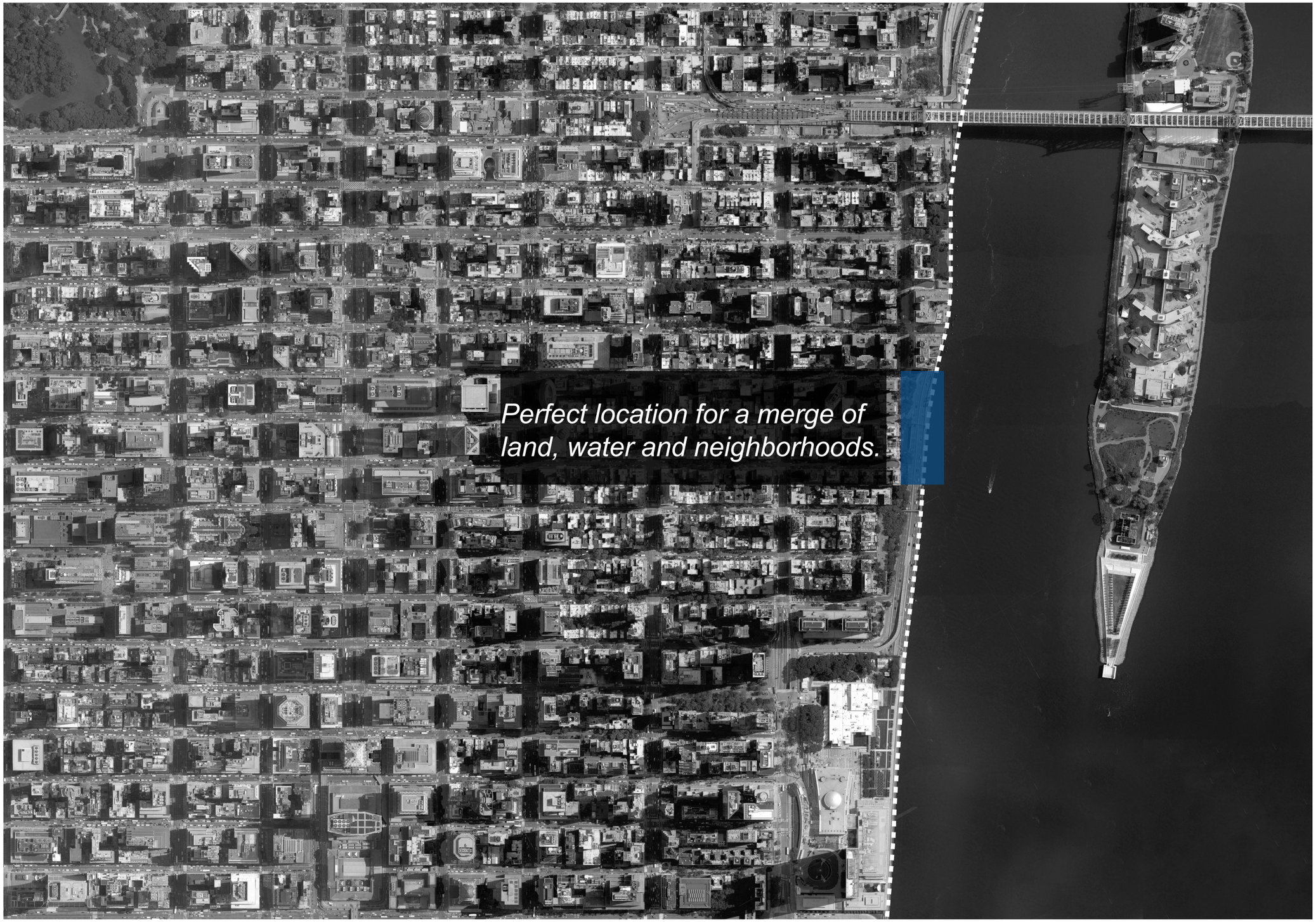


Support Neighborhoods

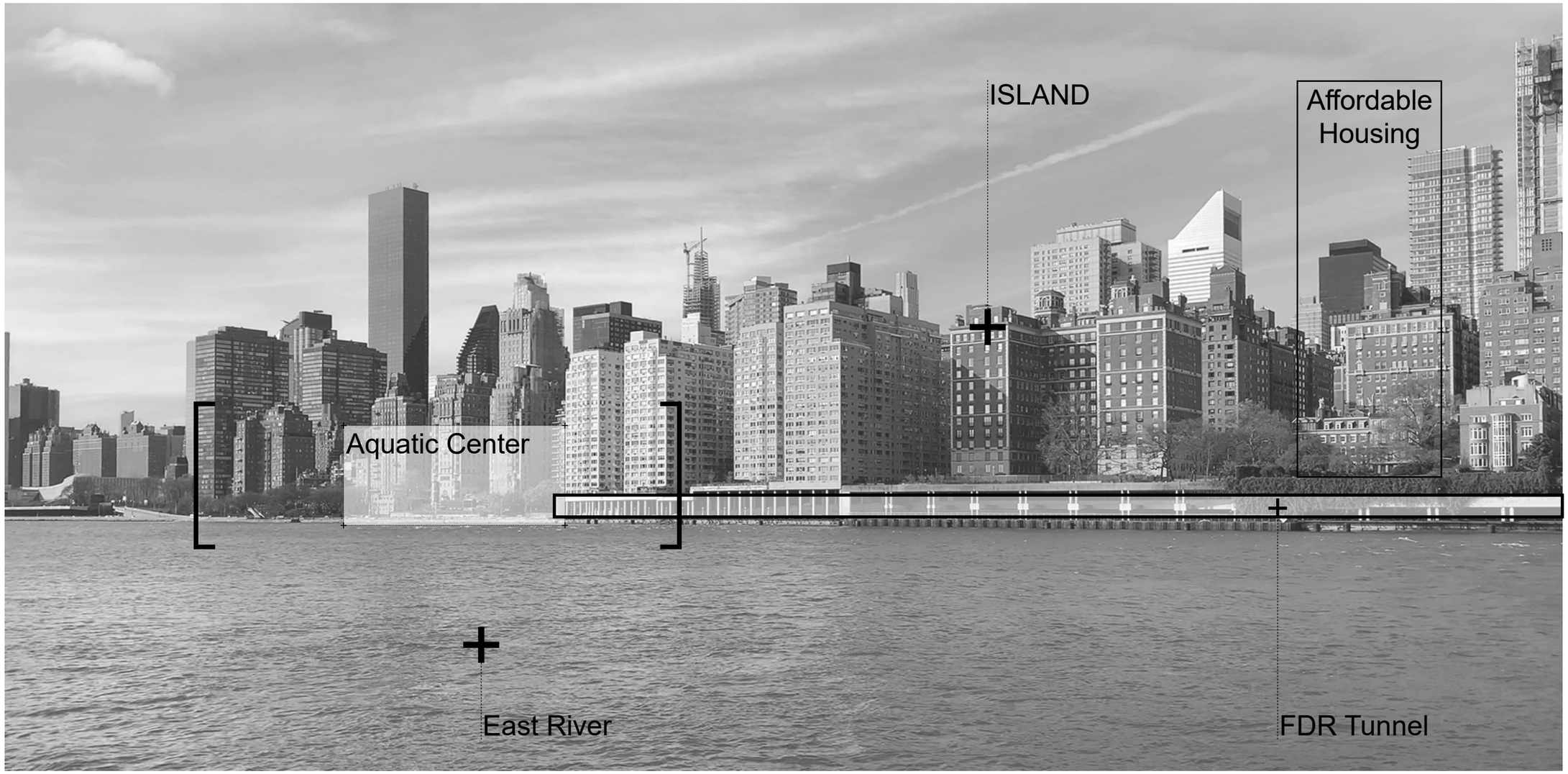
POTENTIALS



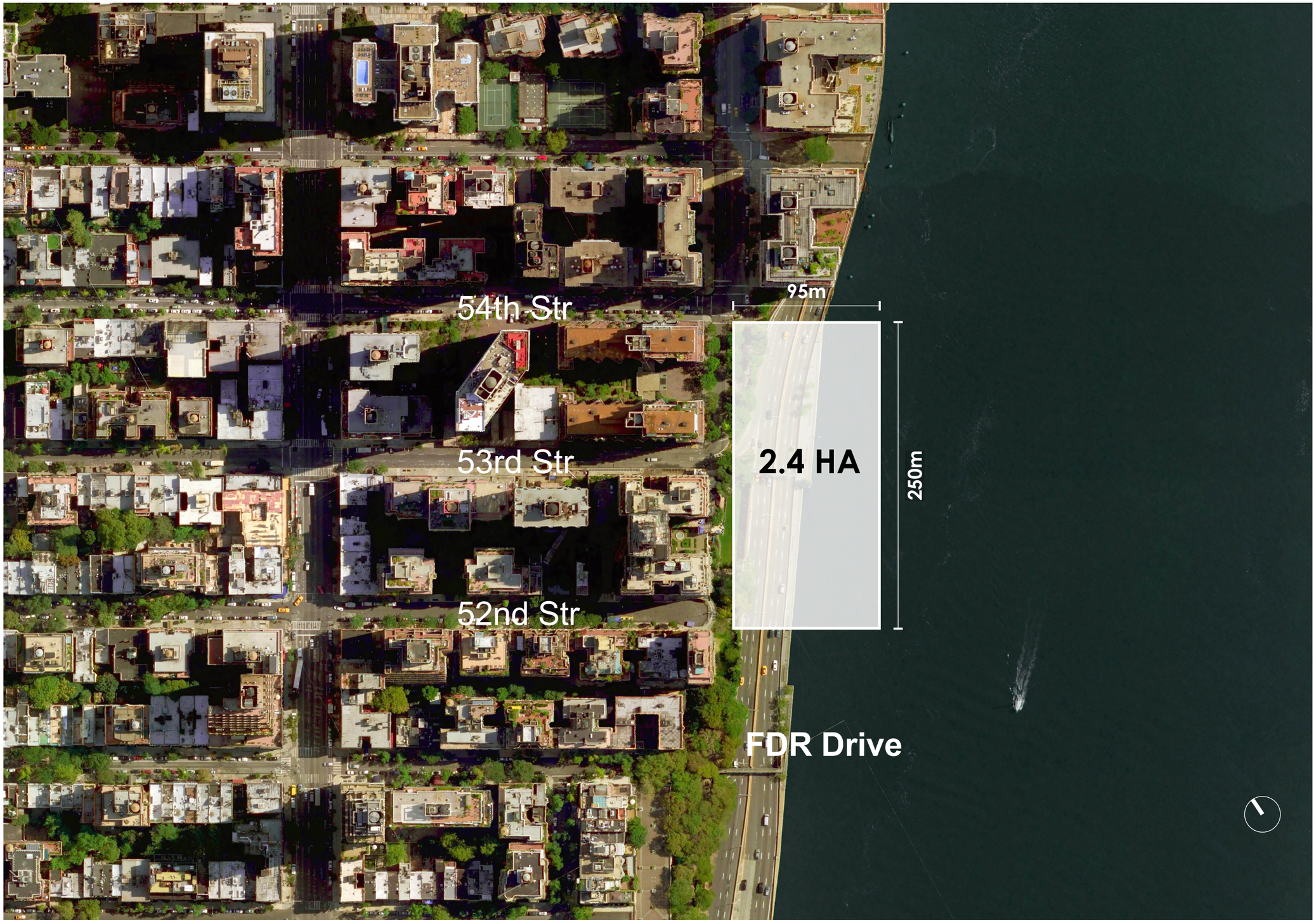
THE OPTION


Perfect location for a merge of land, water and neighborhoods.

THE OPTION


ISLAND
Affordable Housing
Aquatic Center
East River
FDR Tunnel

LOCATION



COLLECTING OUTFLOWS

Water Boundary



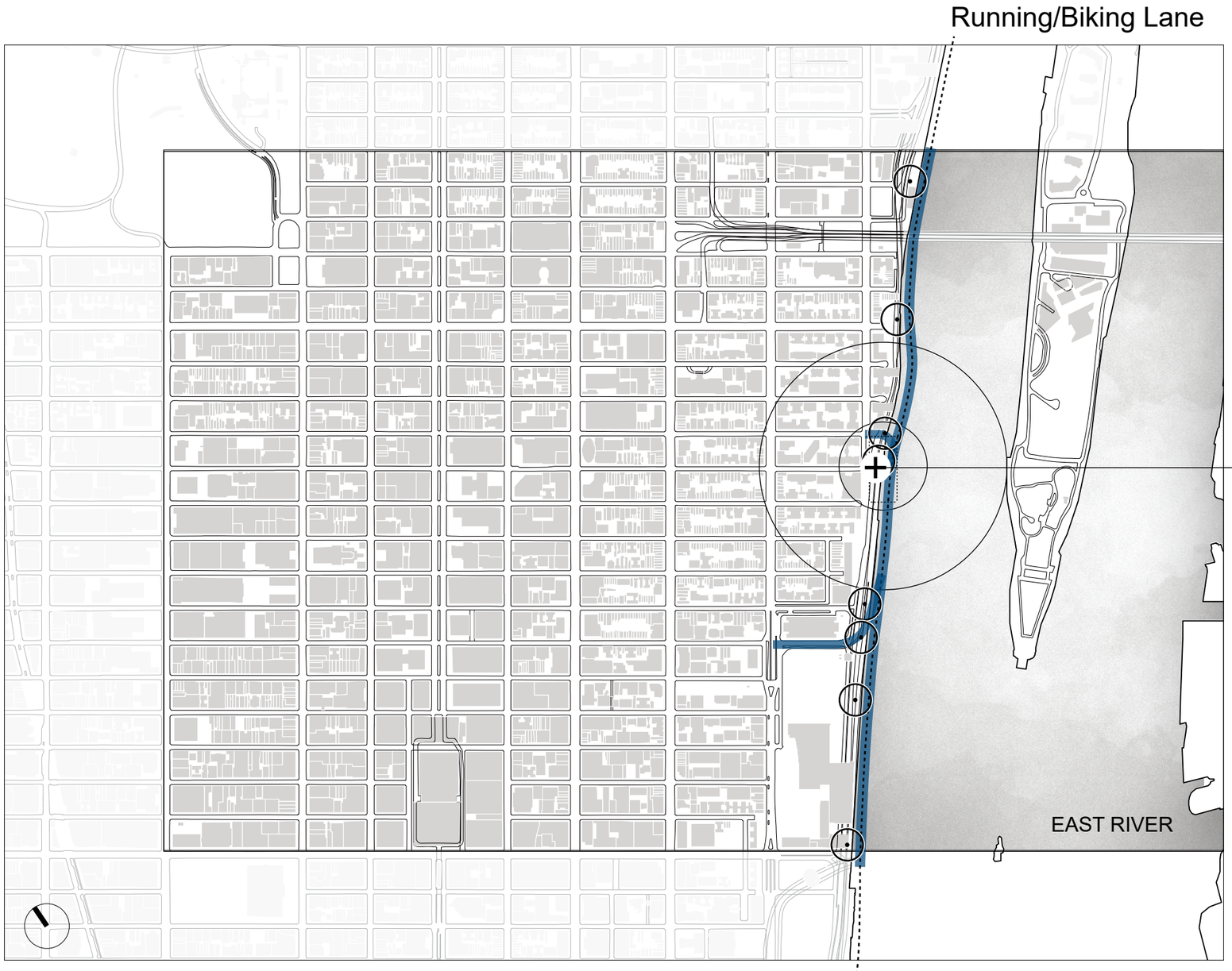
An efficient location to collect sewages by connecting the outfalls.

Sewage Outfalls

WATERFRONT GREENWAY

Public Sense

Intermediation

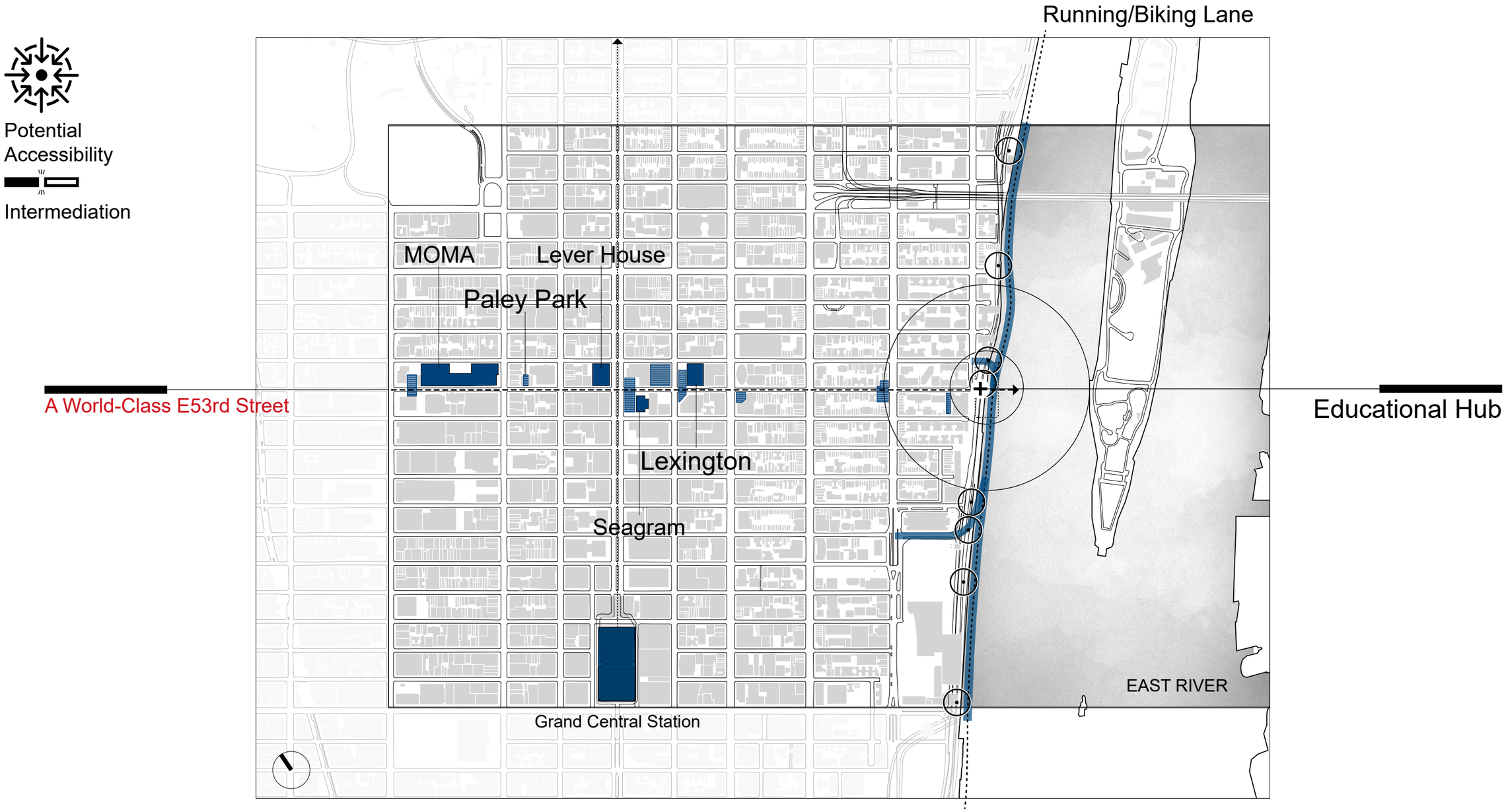


Educational Hub
environmental education

It’s located on one of the greenway nodes, which are proposed by the government to spread environmental education.

Greenway

GROUP VISION



Connecting the Valley of Giants' neighborhoods to the East River along the 53rd street, which is an enlarged pedestrain.

NEIGHBORHOODS

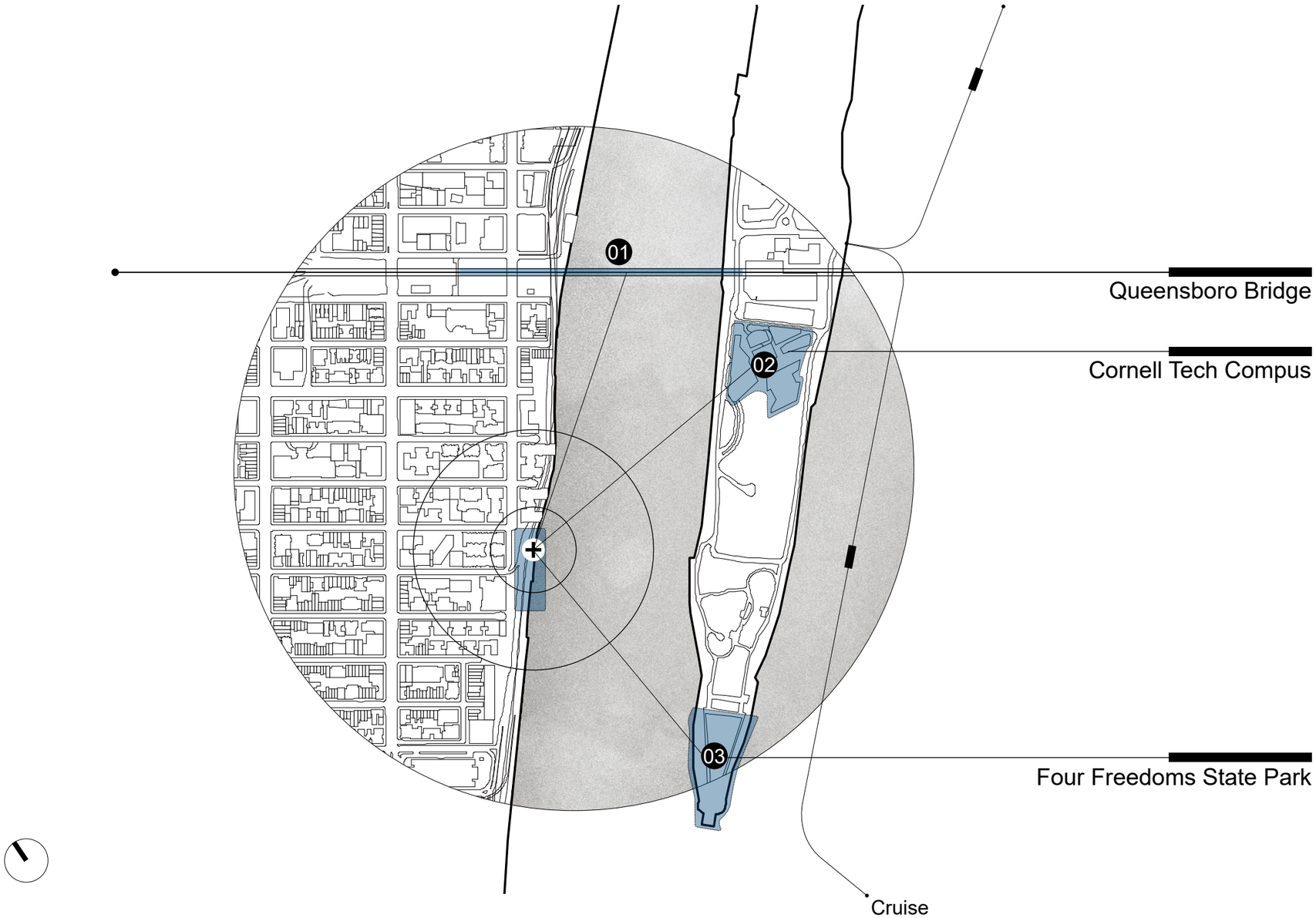


Providing the neighborhoods with public space and recycled water.

Residentials

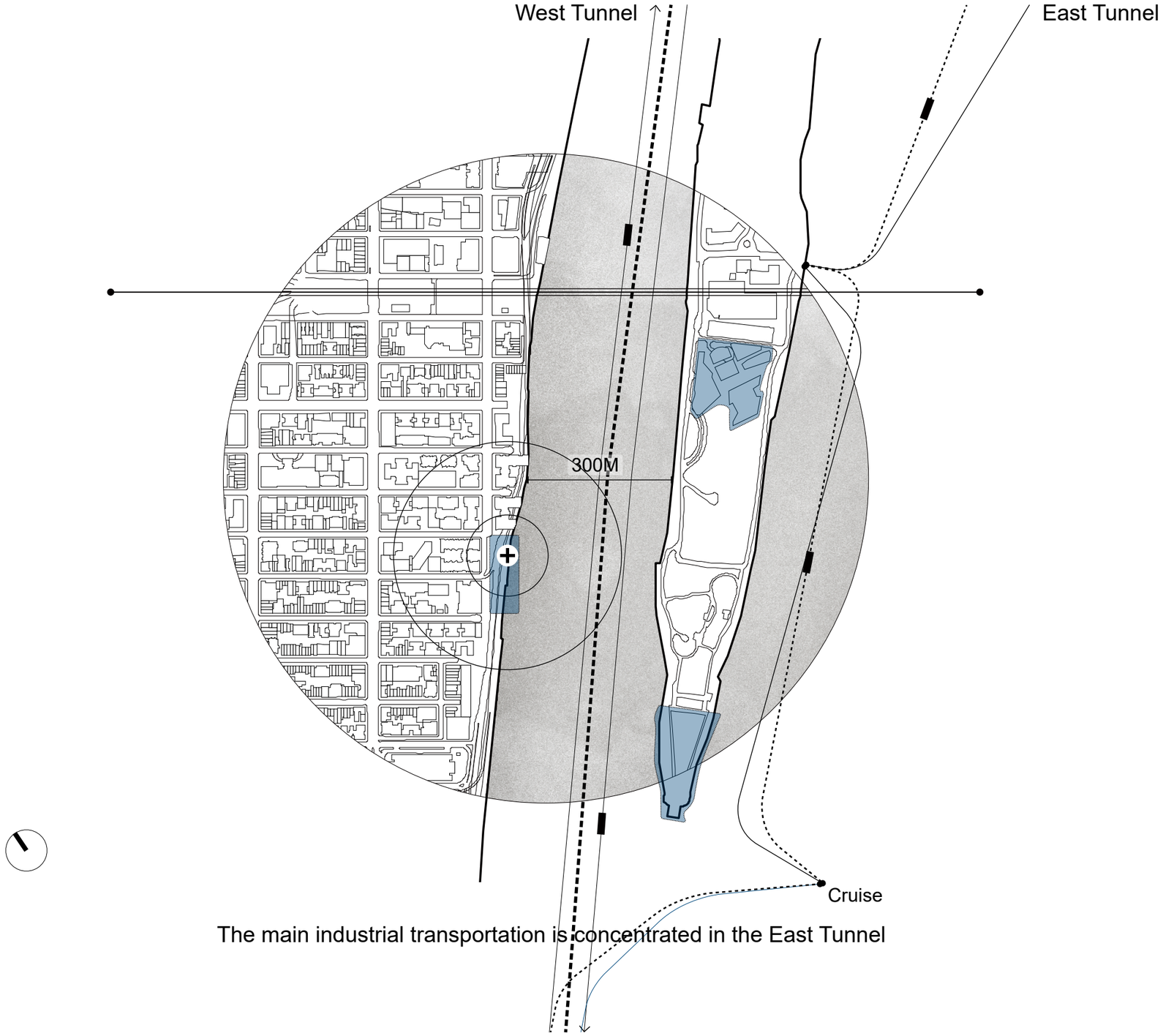
Commercials

SIGHT CONNECTION



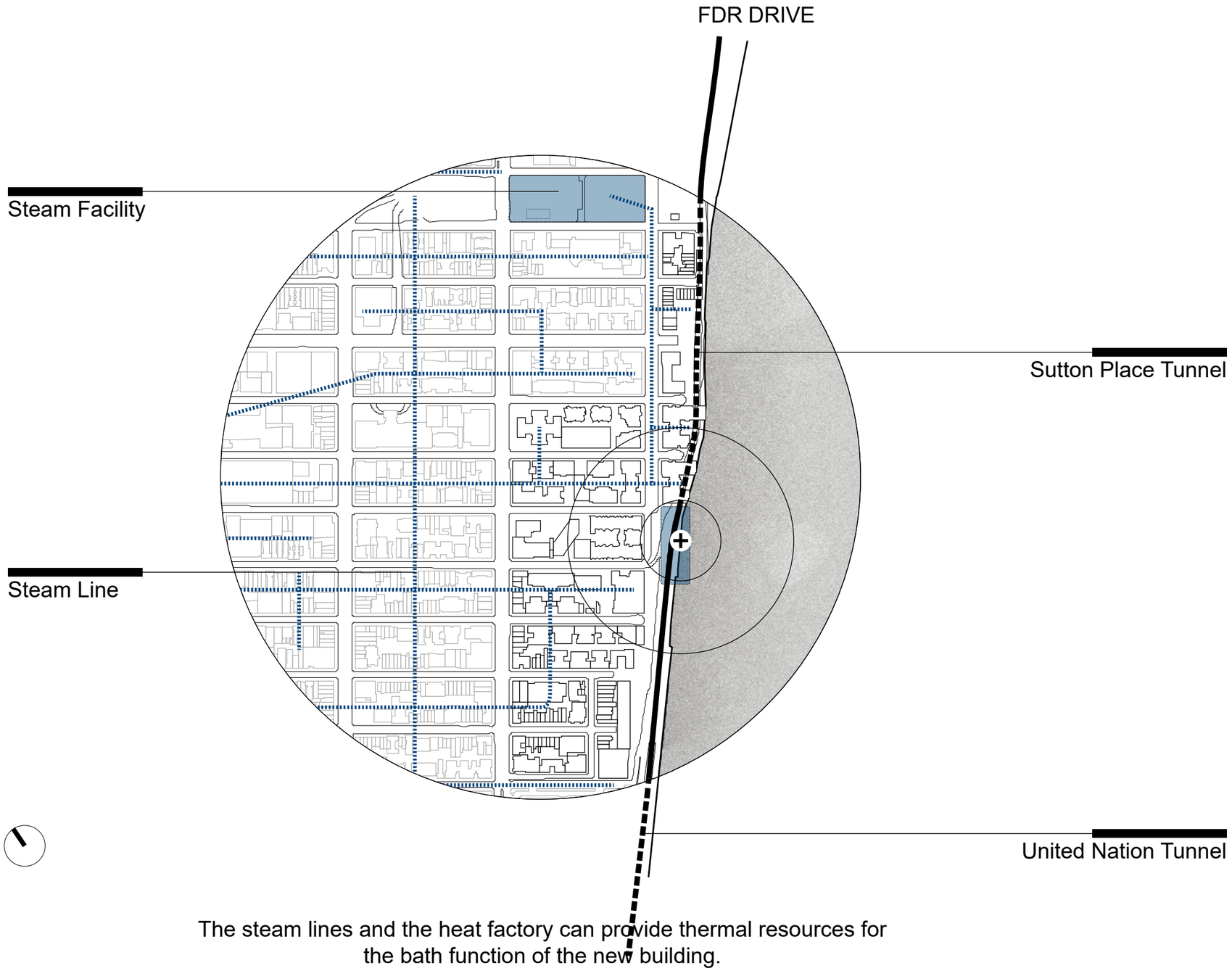
An observation point: it will draw the attention of passersby because of the unobstructed view.

Curise Route



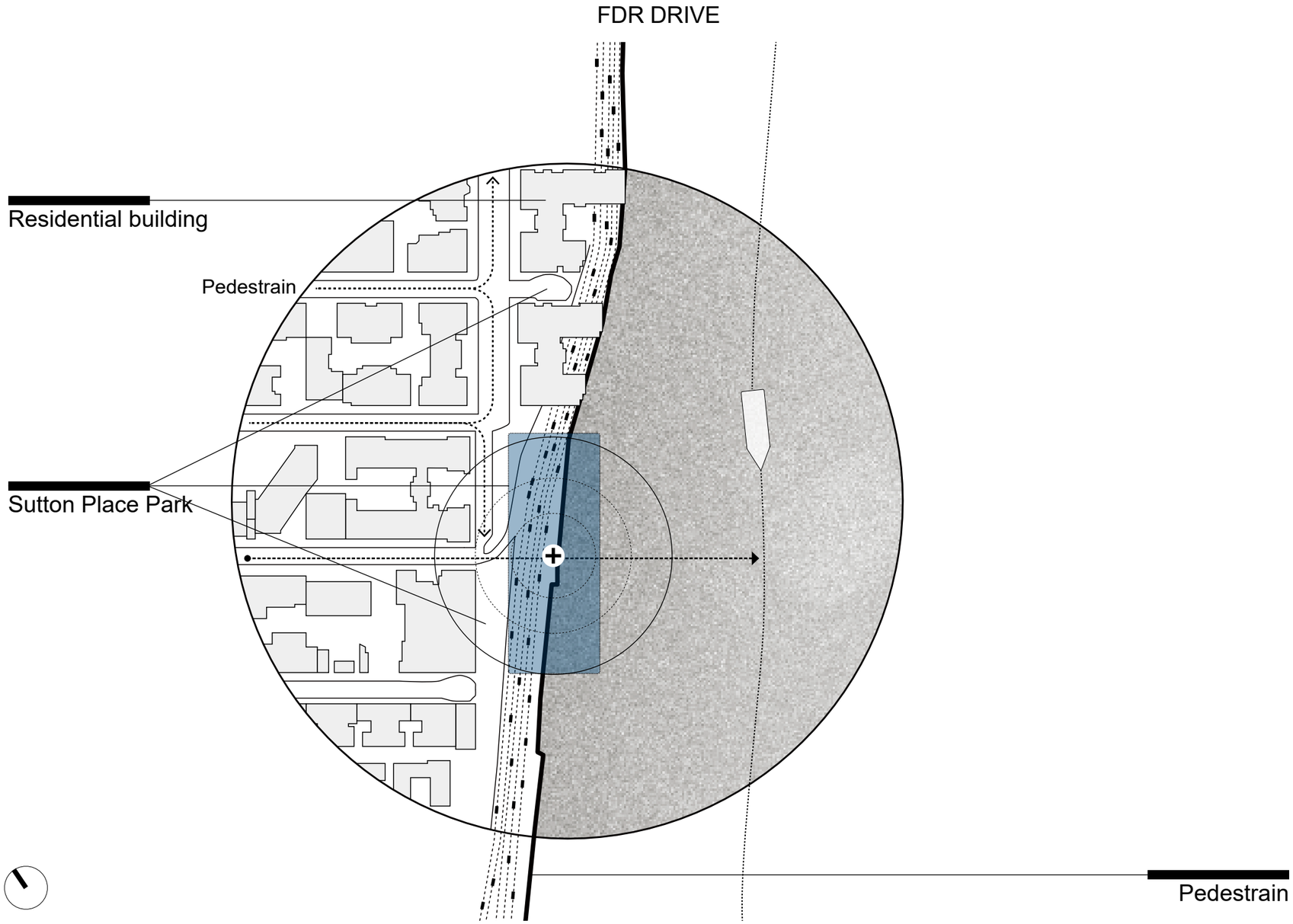
The main industrial transportation is concentrated in the East Tunnel

TECHNICAL ANALYSIS



The steam lines and the heat factory can provide thermal resources for the bath function of the new building.

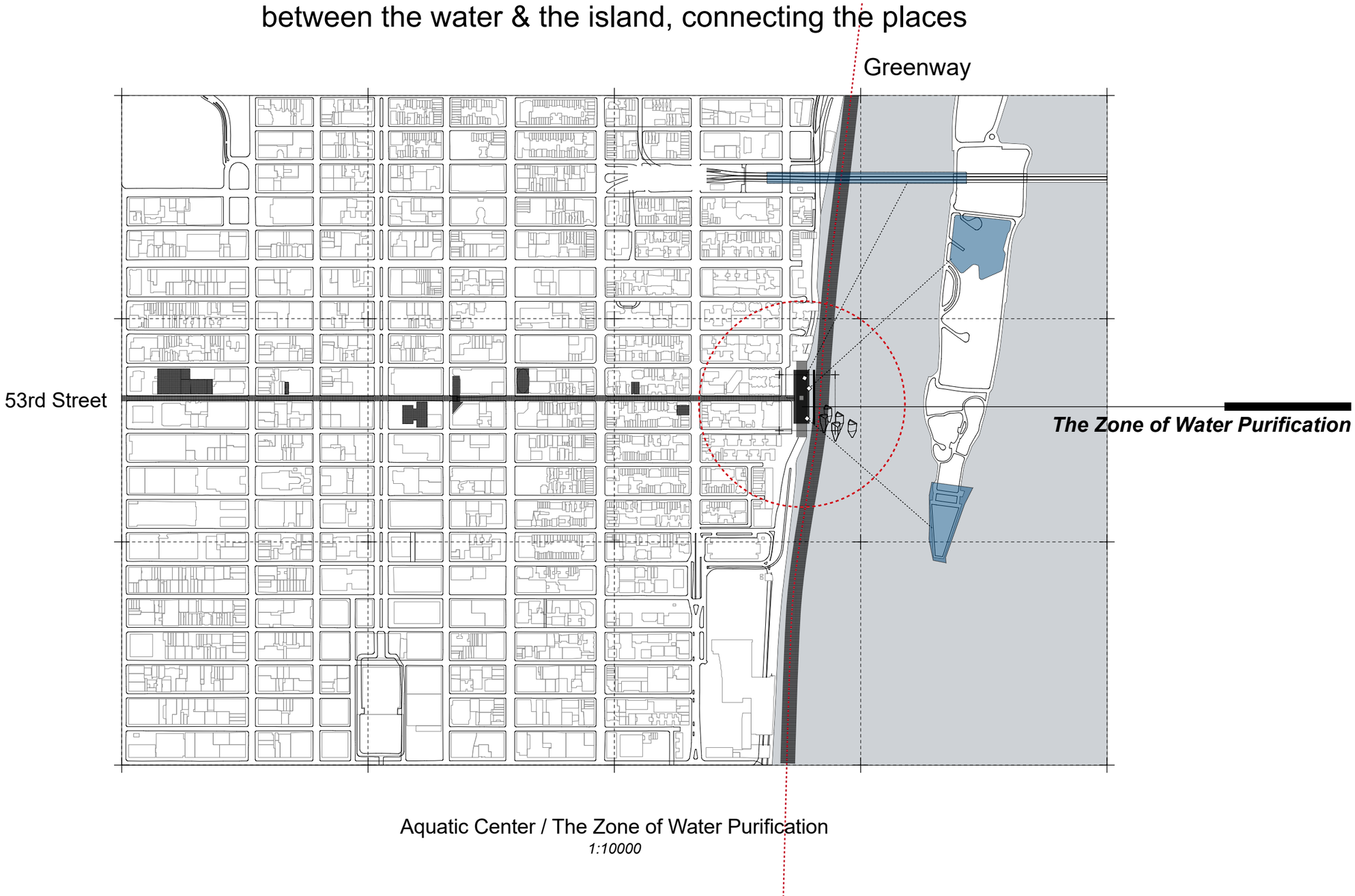
PHYSICAL BARRIER



The continuous expressway creates a physical barrier between the area and the East River and brings the noise to the surrounding environment.

SITE CONCLUSION

between the water & the island, connecting the places



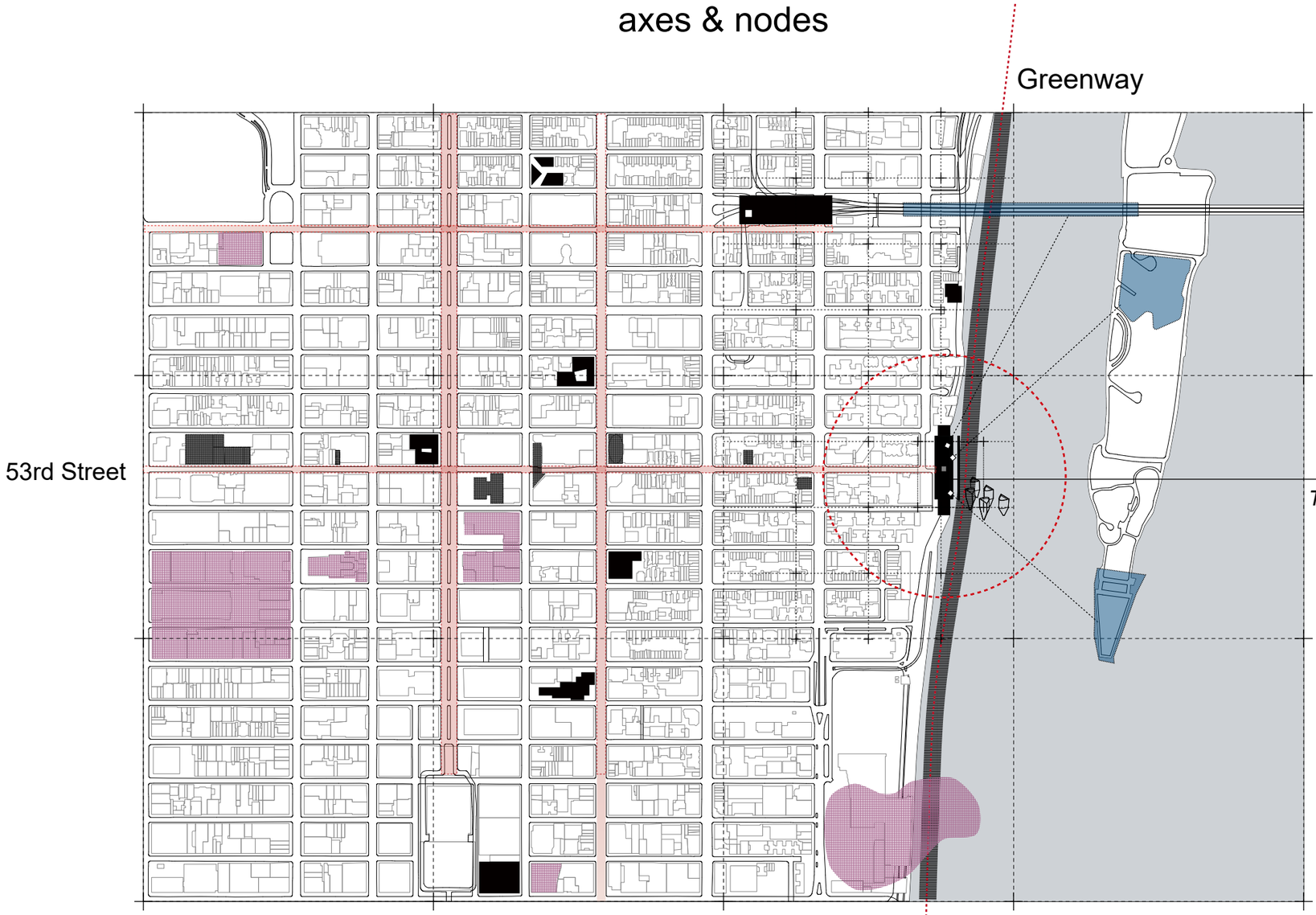
Aquatic Center / The Zone of Water Purification

1:10000

Projects

SITE CONCLUSION

axes & nodes



Individual Interventions

1:10000

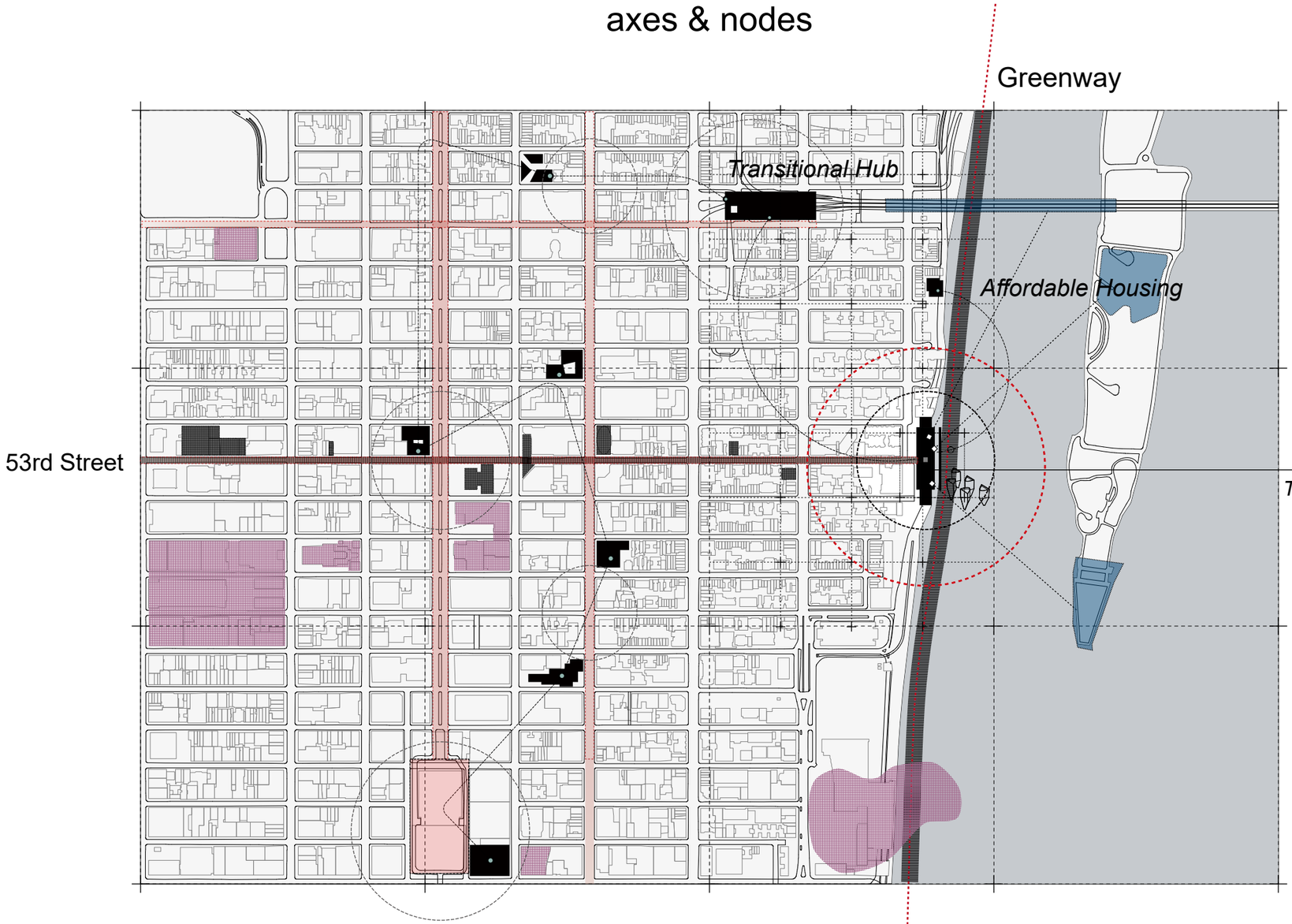
Axes

Projects

Landmarks

SITE CONCLUSION

axes & nodes



Individual Interventions

1:10000

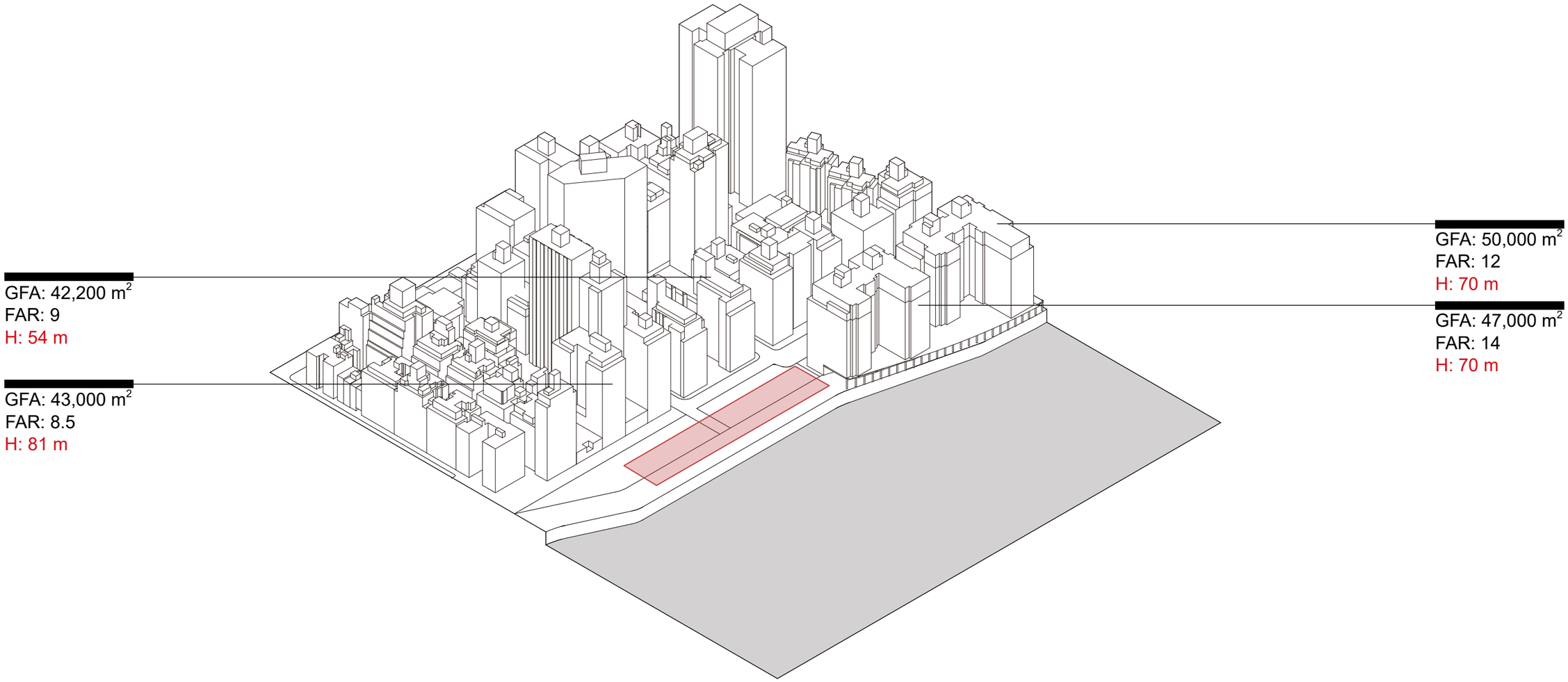
Axes

Projects

Landmarks

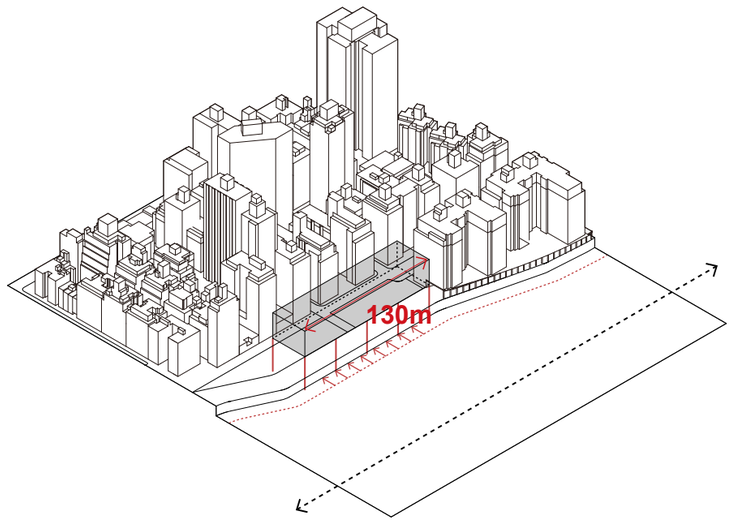
Many including Kevin’s affordable housing residents will benefit from the recreation purposes, and it benefits from Jerry’s Transitional Hub, which provides parking area and bicycles to people wanting to access the project.

BUILDING ORIENTATION



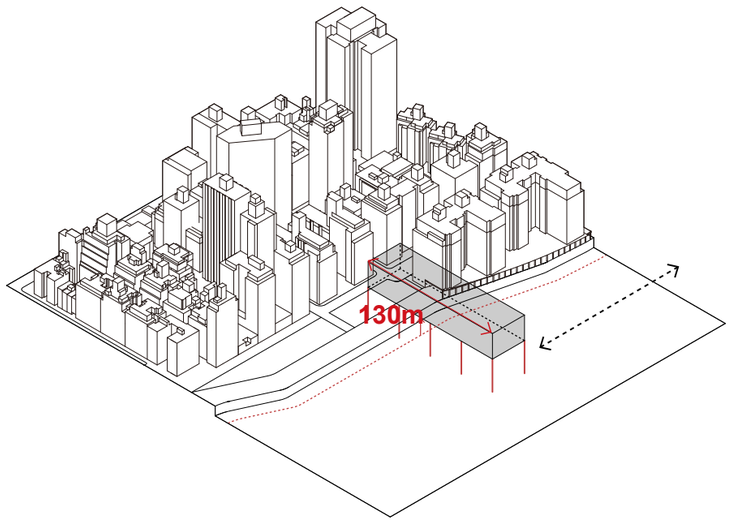
Datas of nearby buildings

BUILDING ORIENTATION



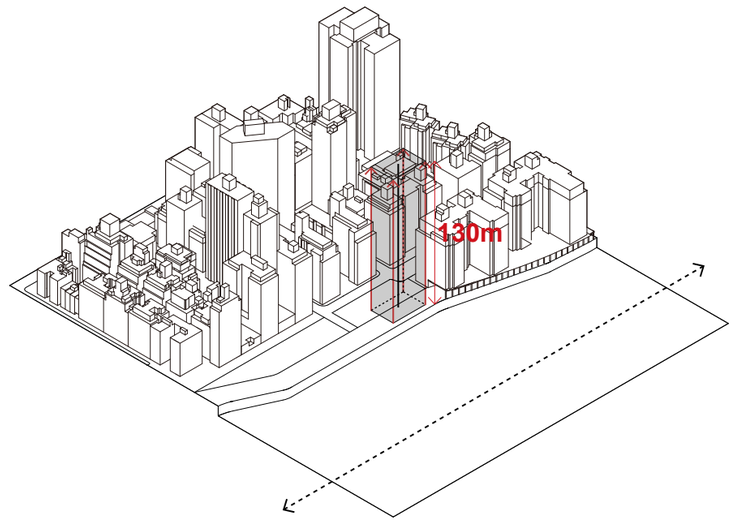
Option1

- *Structural fesibility*
- *More production of purification*
- *Avoding the confliction of the cruise route*



Option2

- *Increasing flooding risks*
- *Influencing the cruise route*



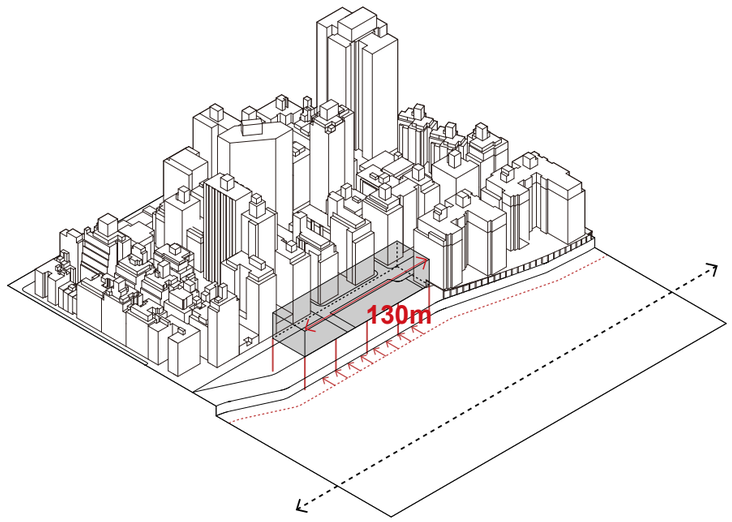
Option3

- *The structural confliction with FDR Drive*
- *Less production of purification*

Structure

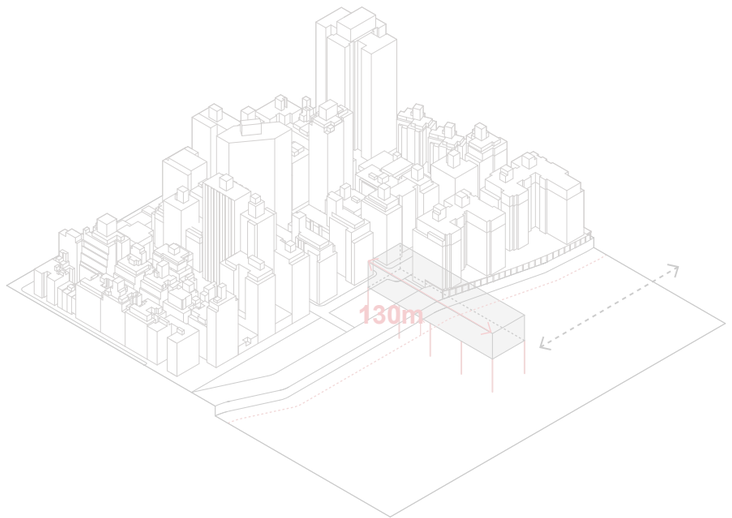
Cruise Routes

BUILDING ORIENTATION



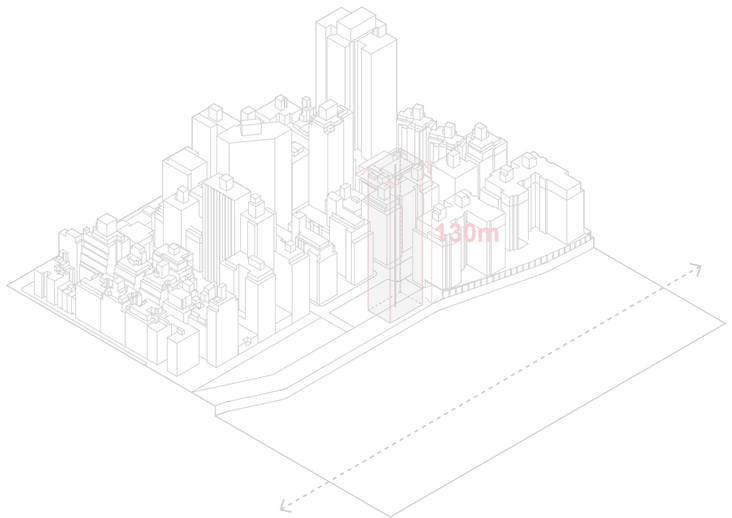
Option1

- *Structural fesibility*
- *More production of purification*
- *Avoding the confliction of the cruise route*



Option2

- *Increasing flooding risks*
- *Influencing the cruise route*



Option3

- *The structural confliction with FDR Drive*
- *Less production of purification*

Structure

Cruise Routes

INTRODUCTION

RESEARCH

SITE ARGUMENT

DESIGN

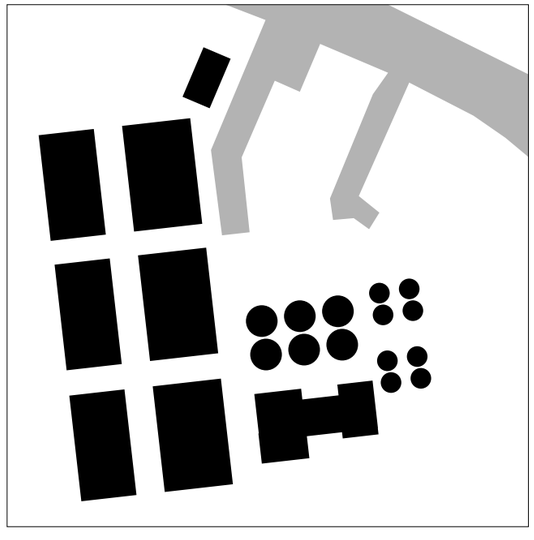
IMPLEMENTATION

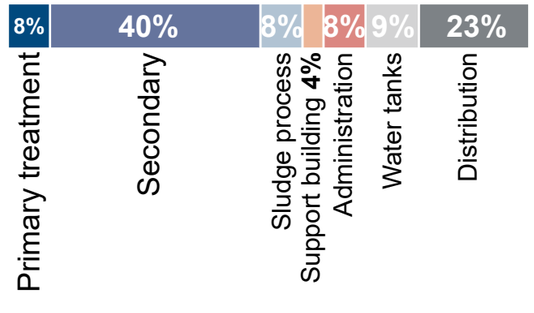
CONCLUSION

WASTEWATER PURIFICATION PLANT (CONVENTION)

Newtown Creek 1967

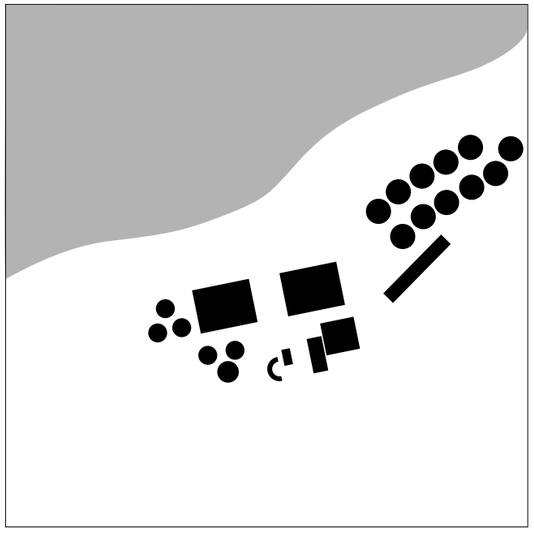


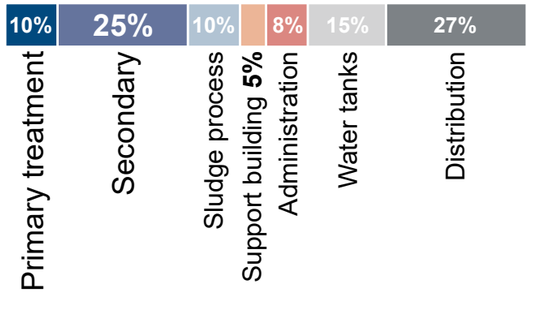




West Point 1964

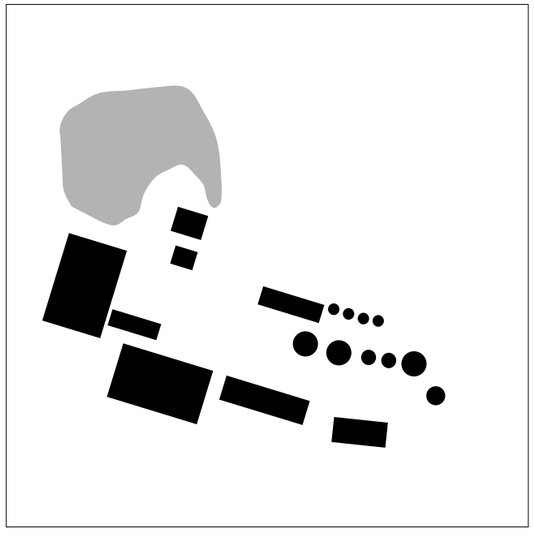


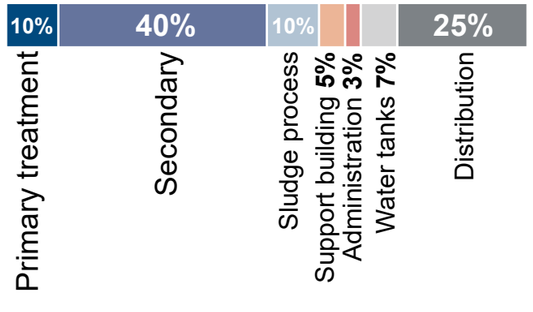




Obere Lutter 1967



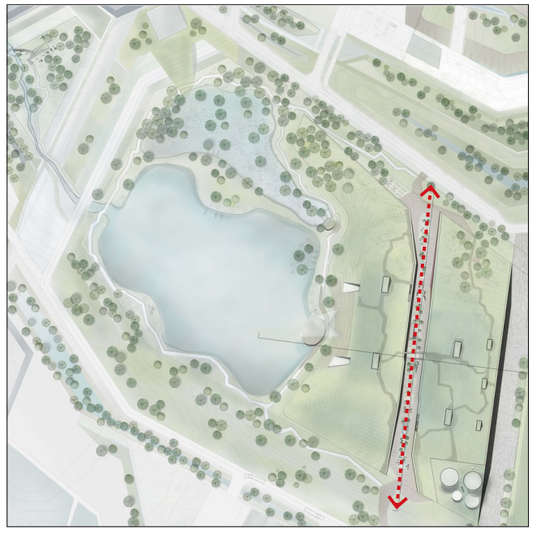


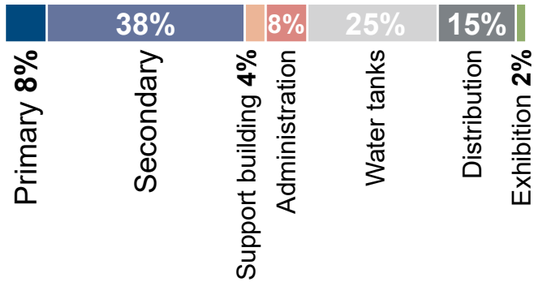


WASTEWATER PURIFICATION PLANT (MODERN)

Solrødgård 2017

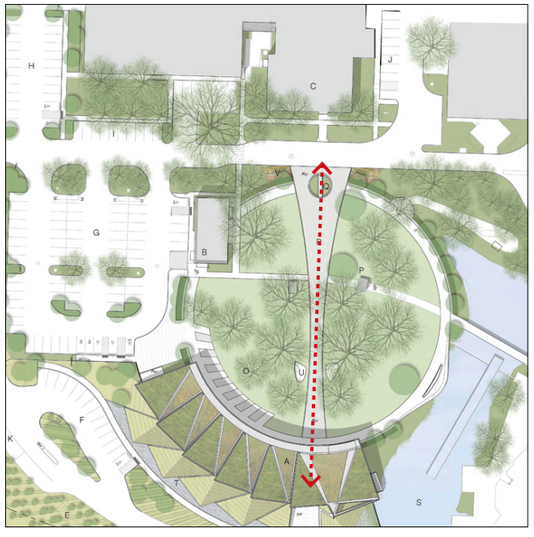


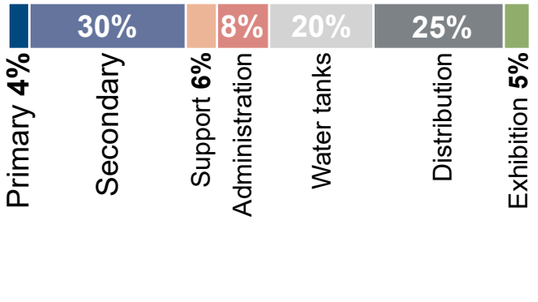




Columbia Boulevard 2012



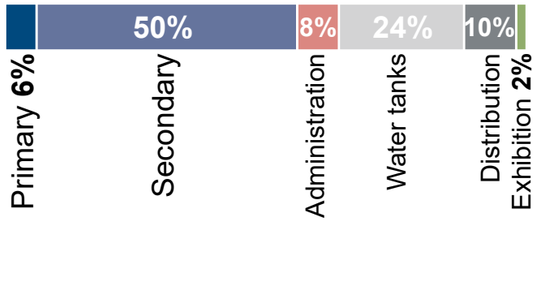




Muttenz 2017



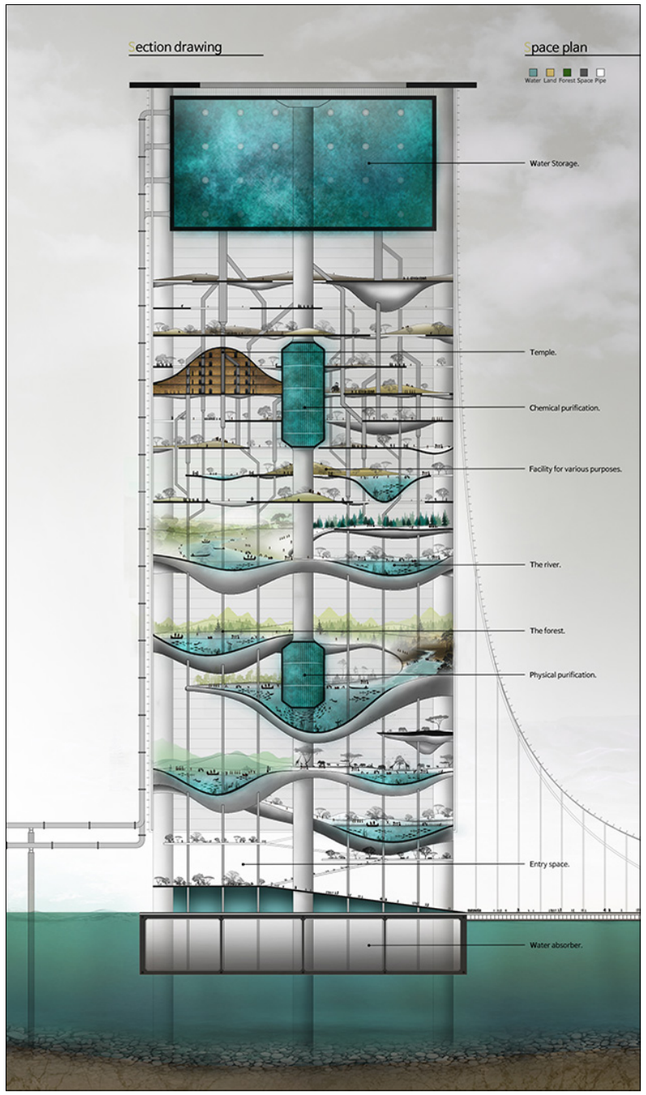




WASTEWATER PURIFICATION PLANT (FUTURE)

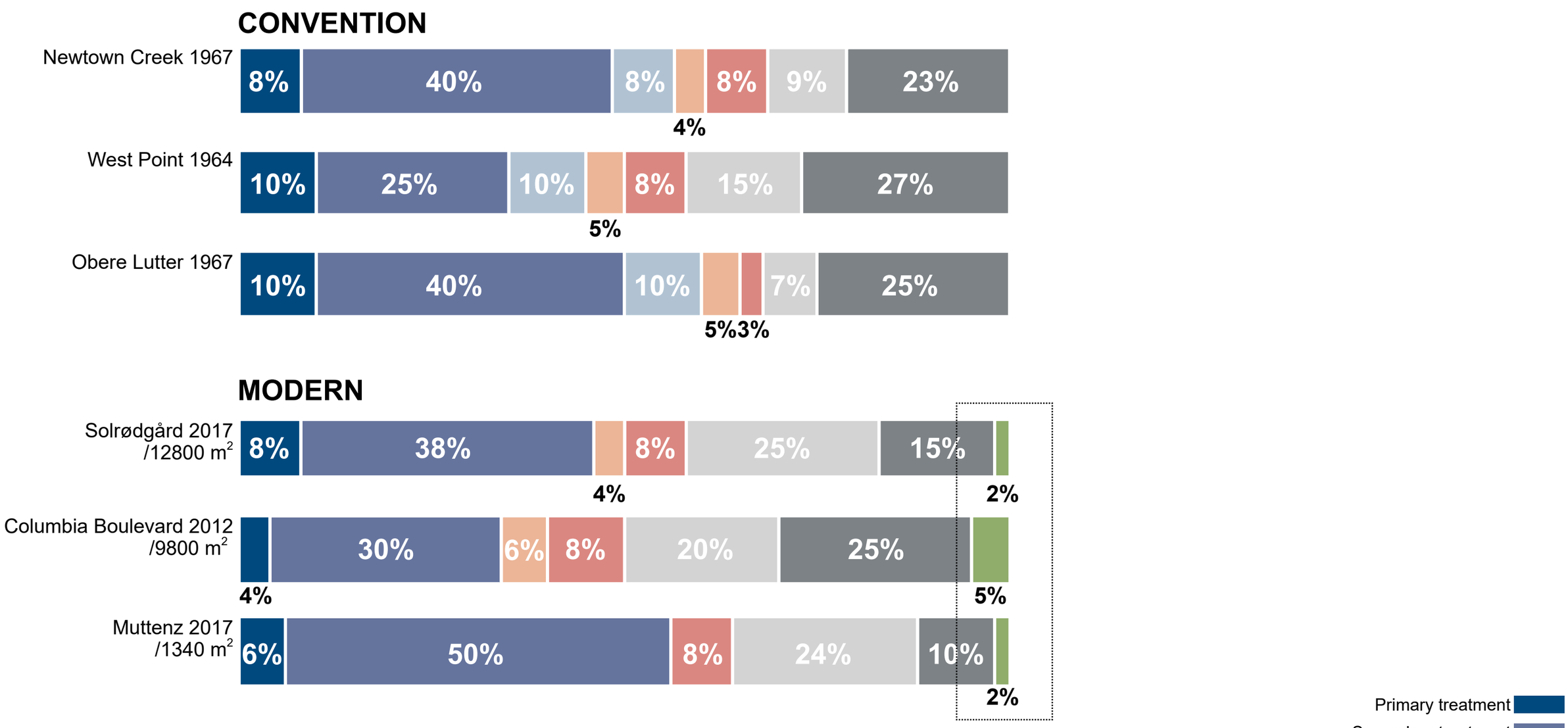
Water purification skyscraper (INDIA)





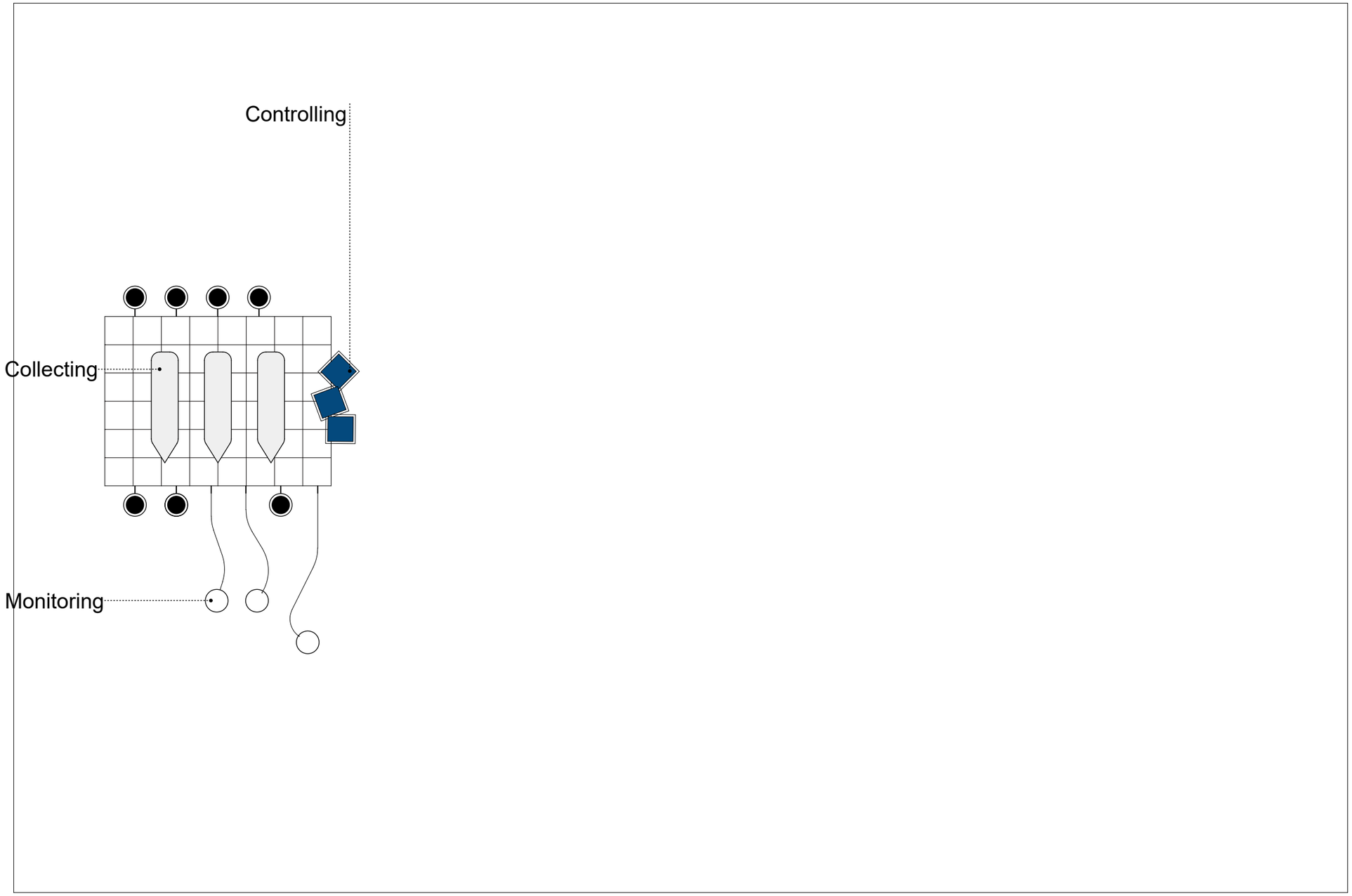
Source: EVOLO CPMPETITION. 2018

CONCLUSION - PROGRAM BARS

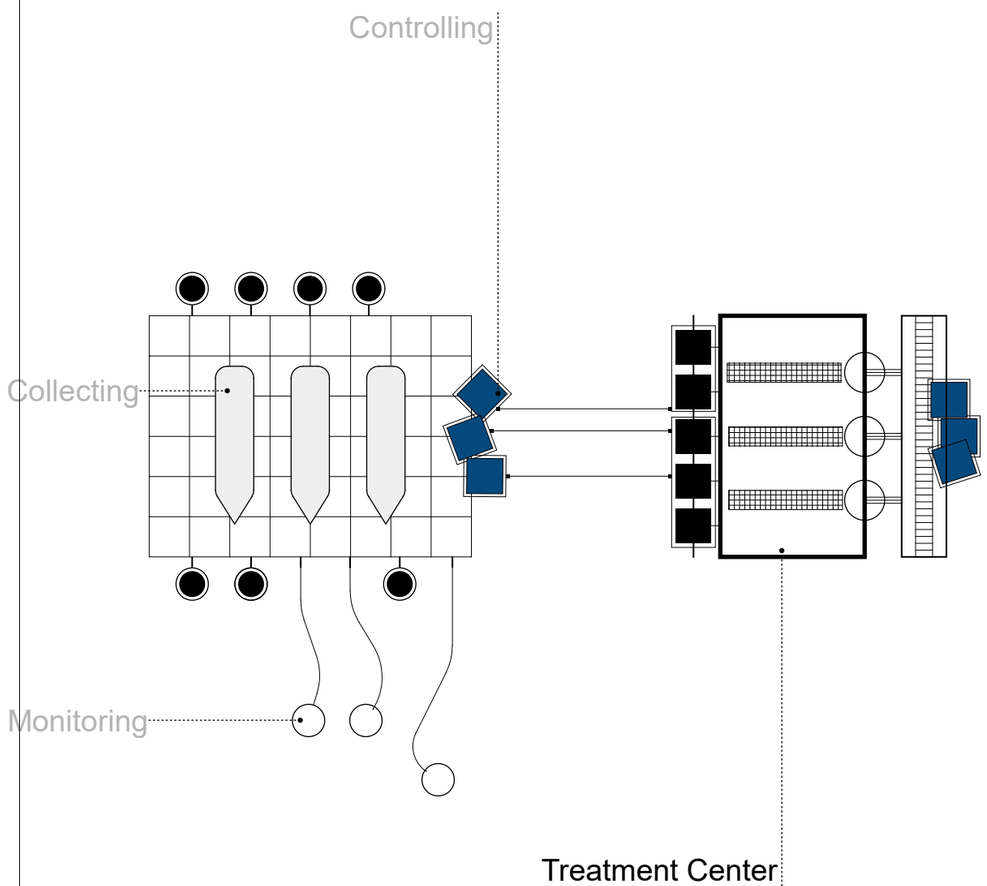



PROGRAM 1
PURIFICATION INFRASTRUCTURE

WORKFLOW

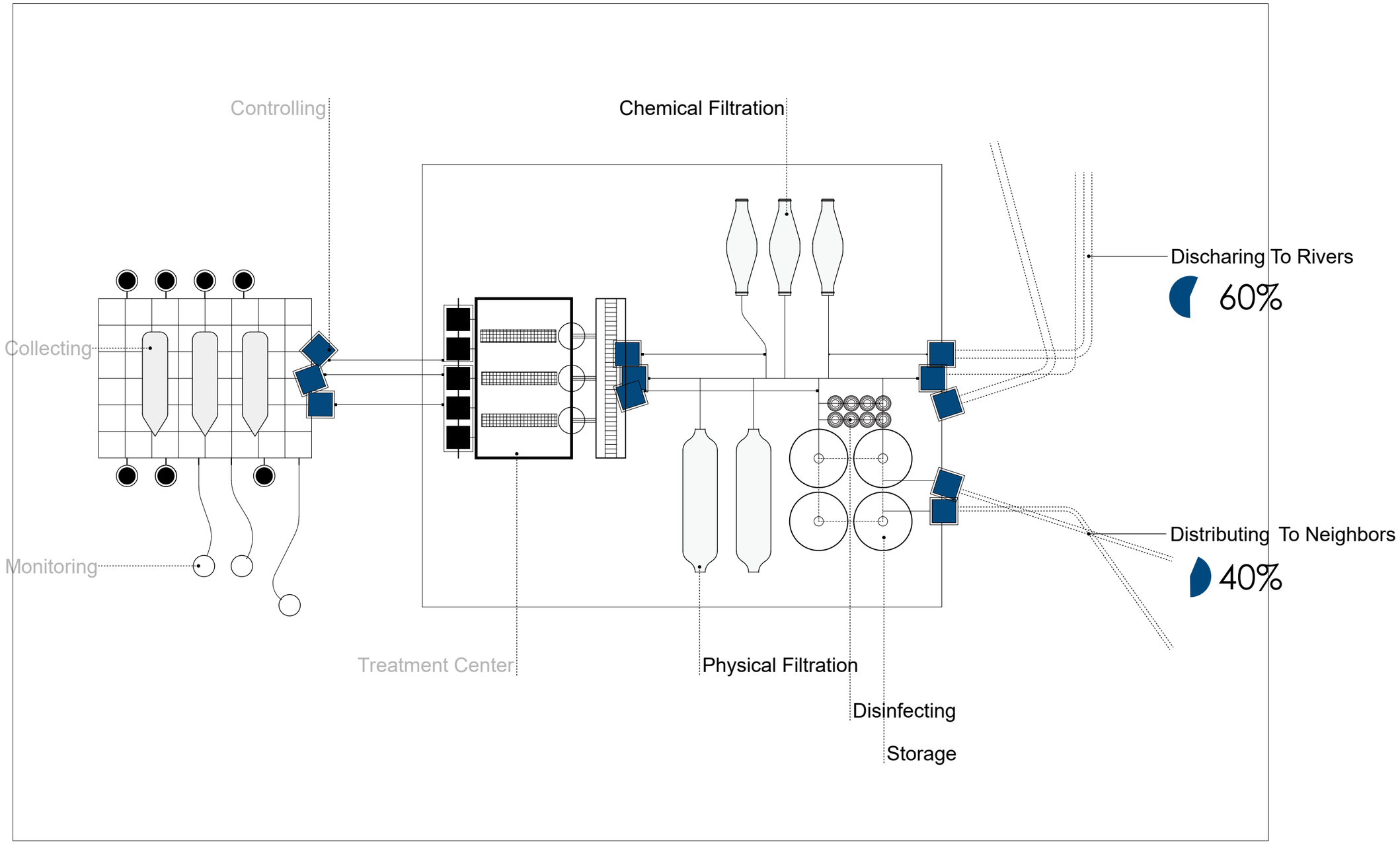

Controlling
Collecting
Monitoring
Wastewater Treatment Infrastructure

WORKFLOW



Wastewater Treatment Infrastructure

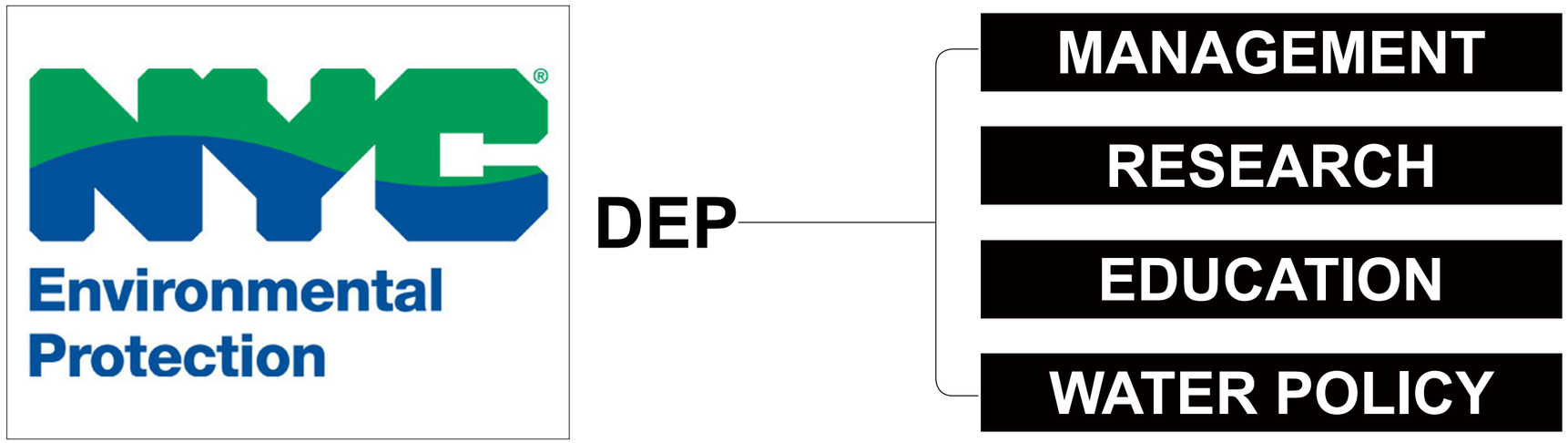
WORKFLOW



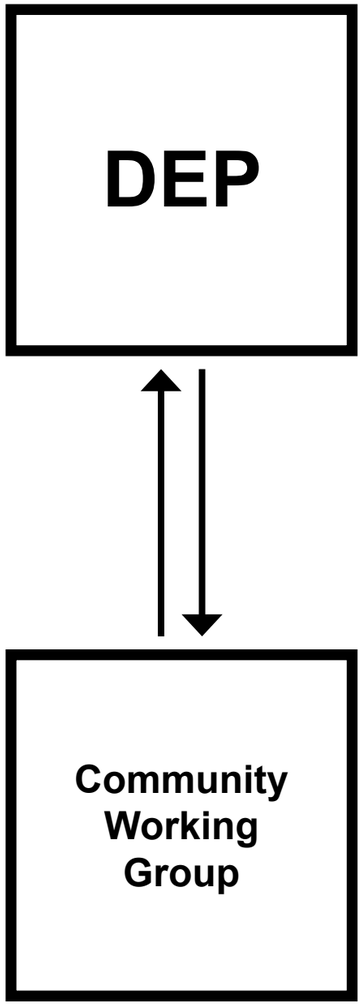
Wastewater Treatment Infrastructure


PROGRAM 2
SOFT INFRASTRUCTURE

SOFT INFRASTRUCTURE



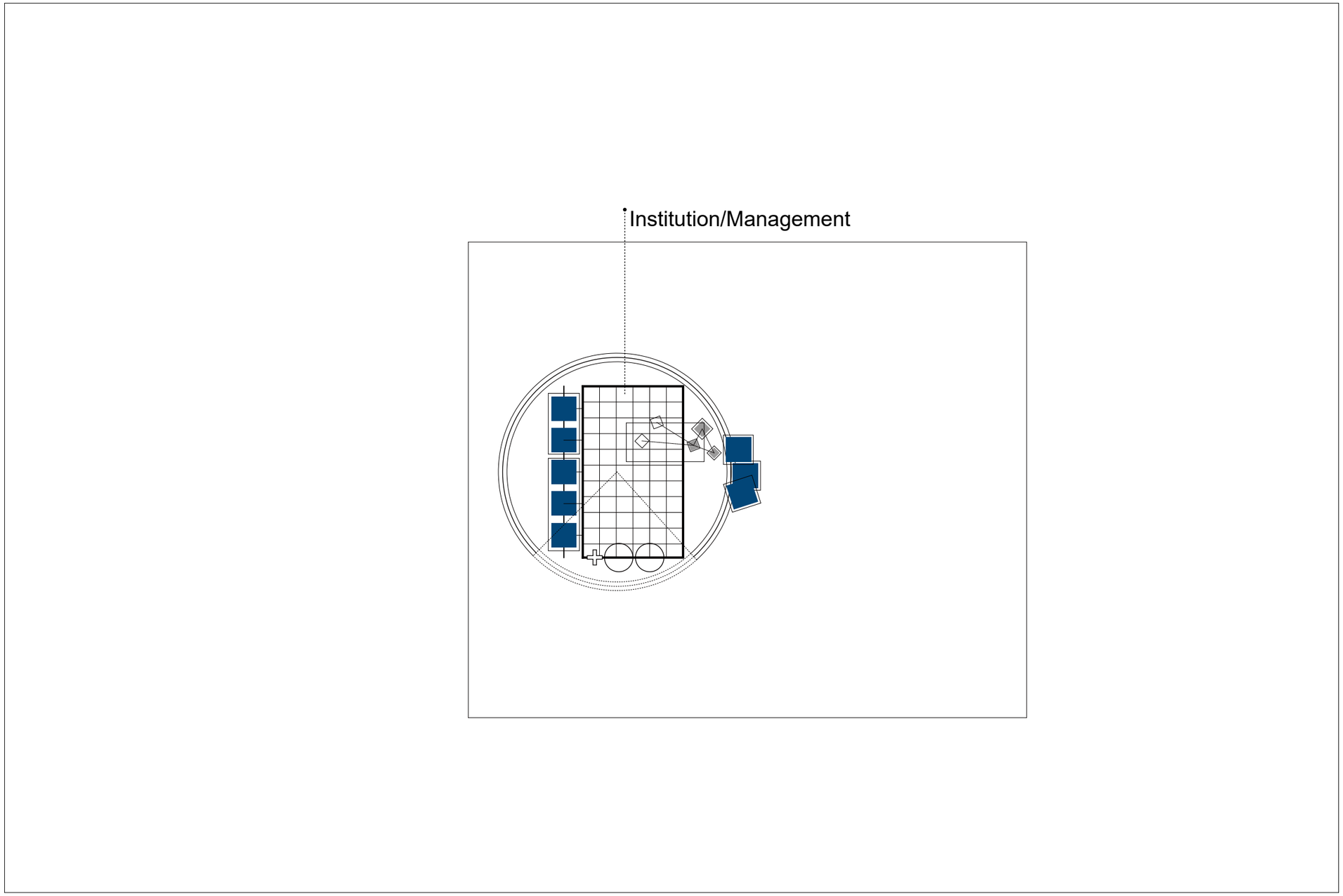
COMMUNITY OUTREACH



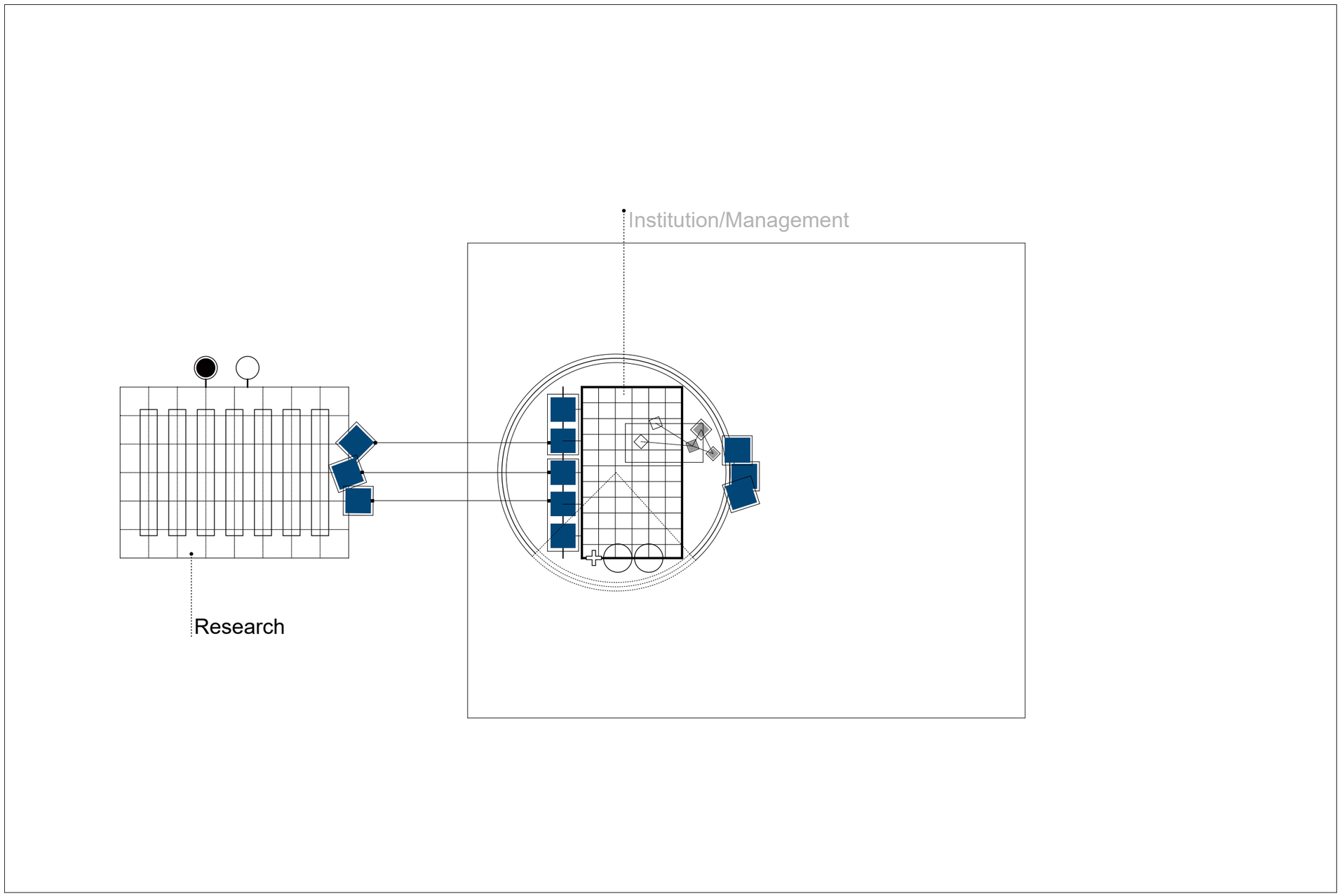




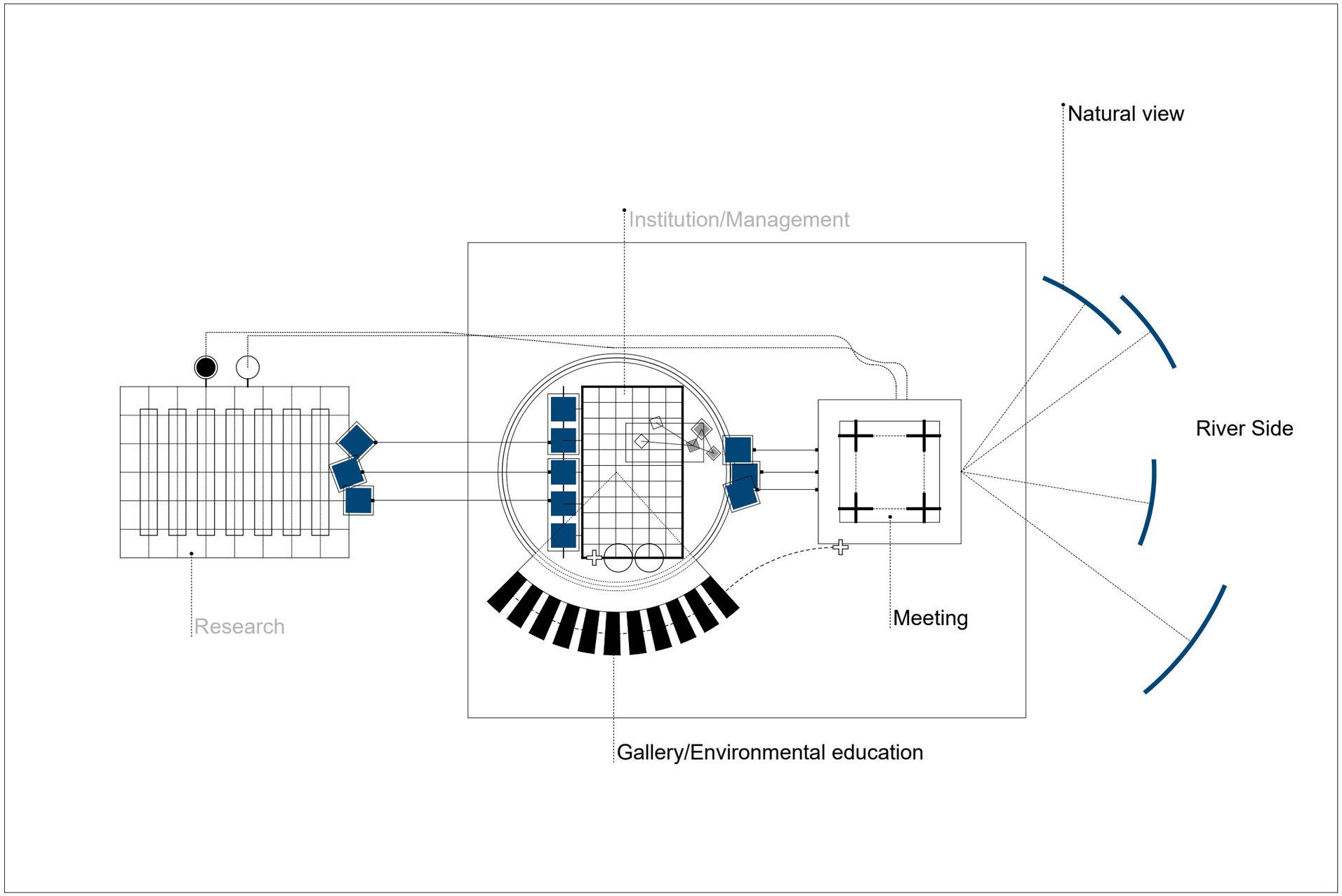
WORKFLOW



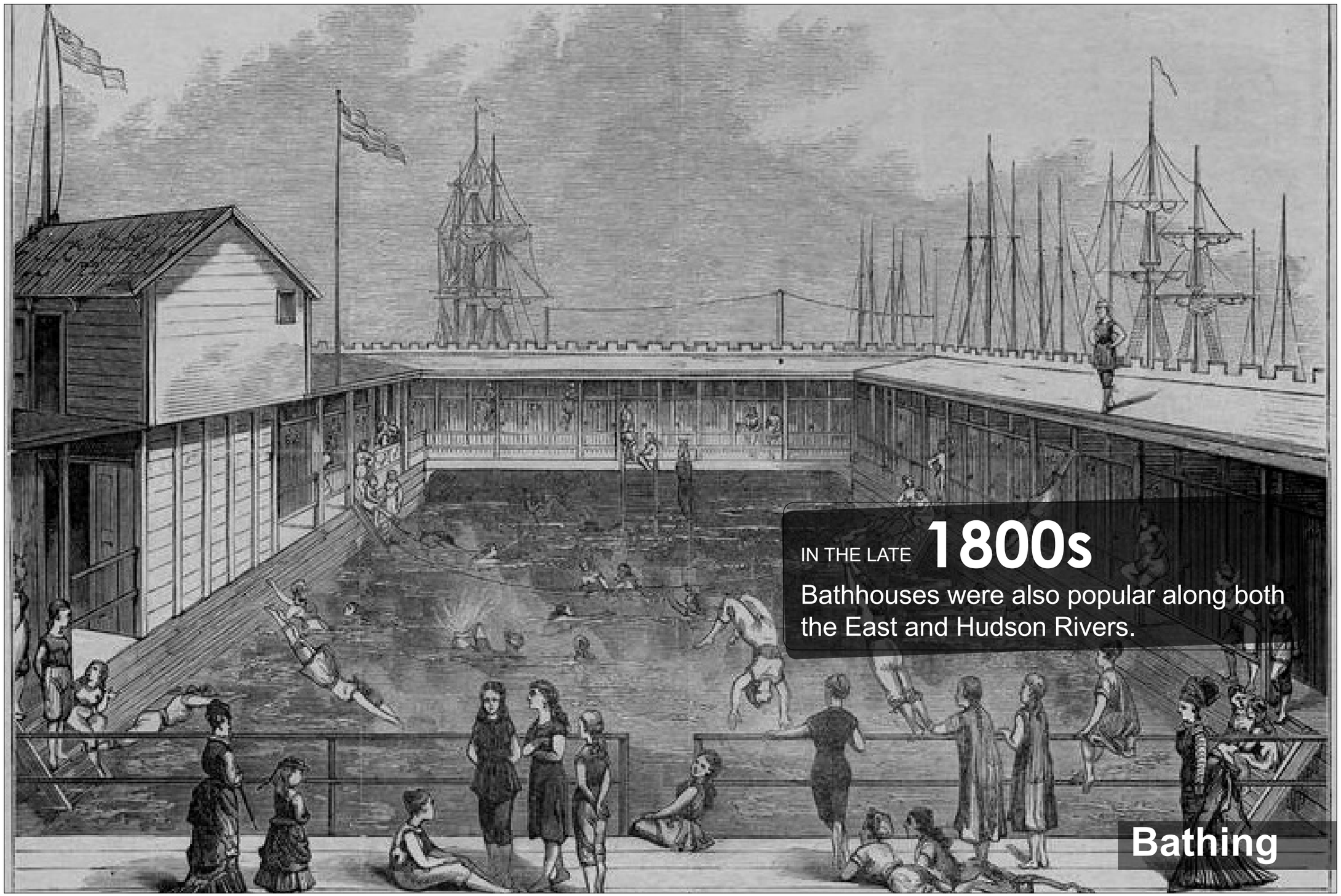
WORKFLOW

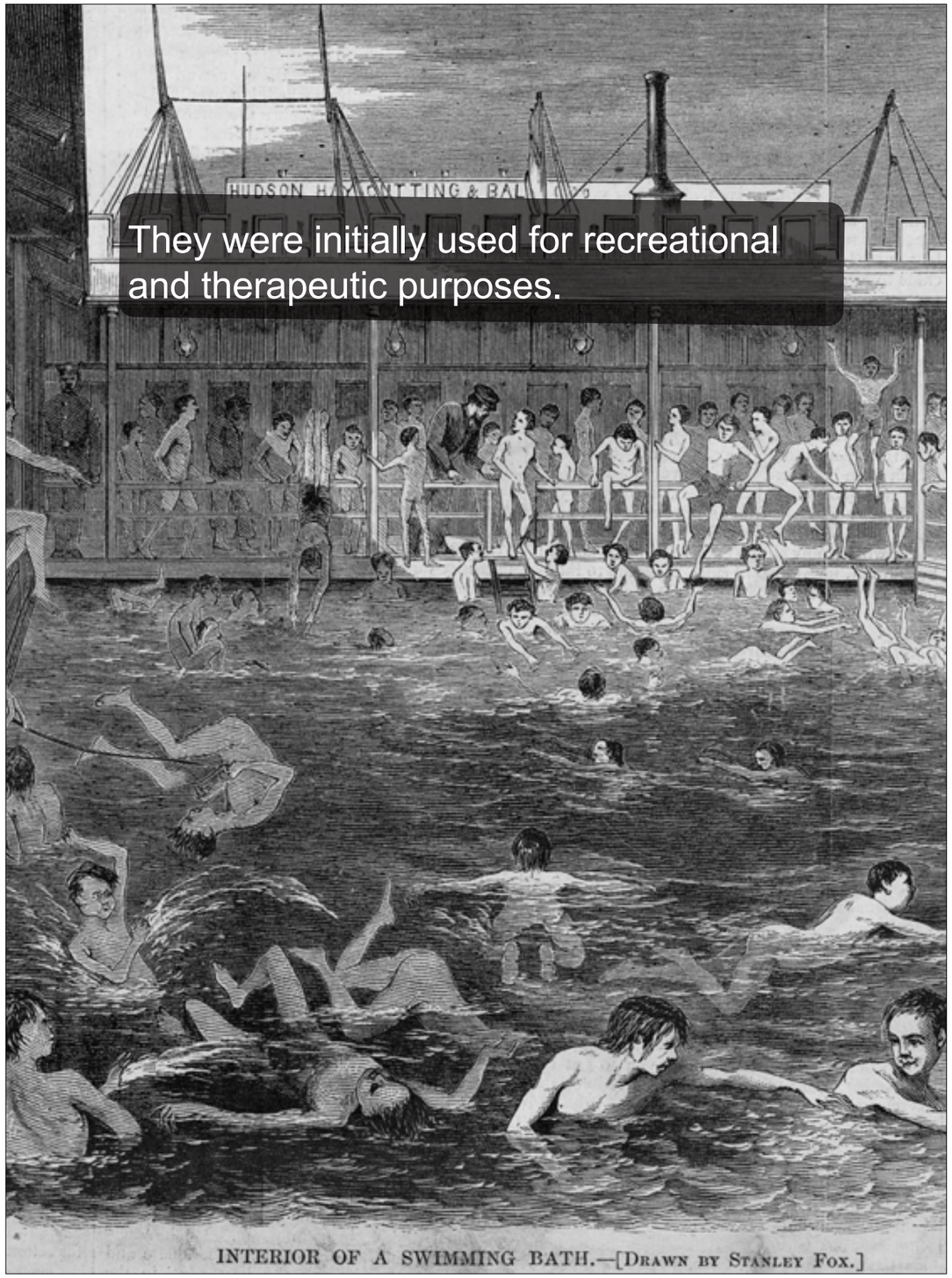


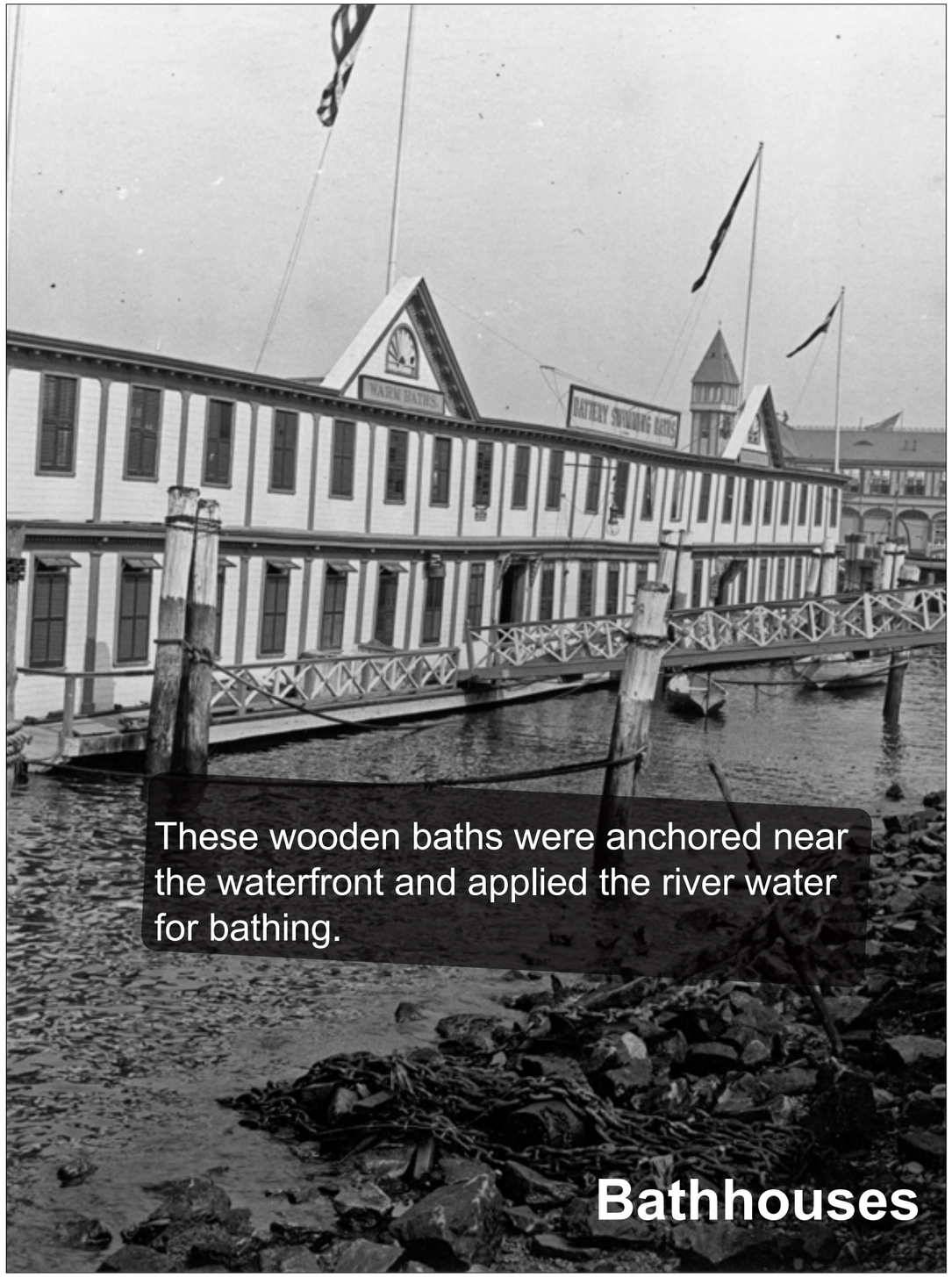
WORKFLOW

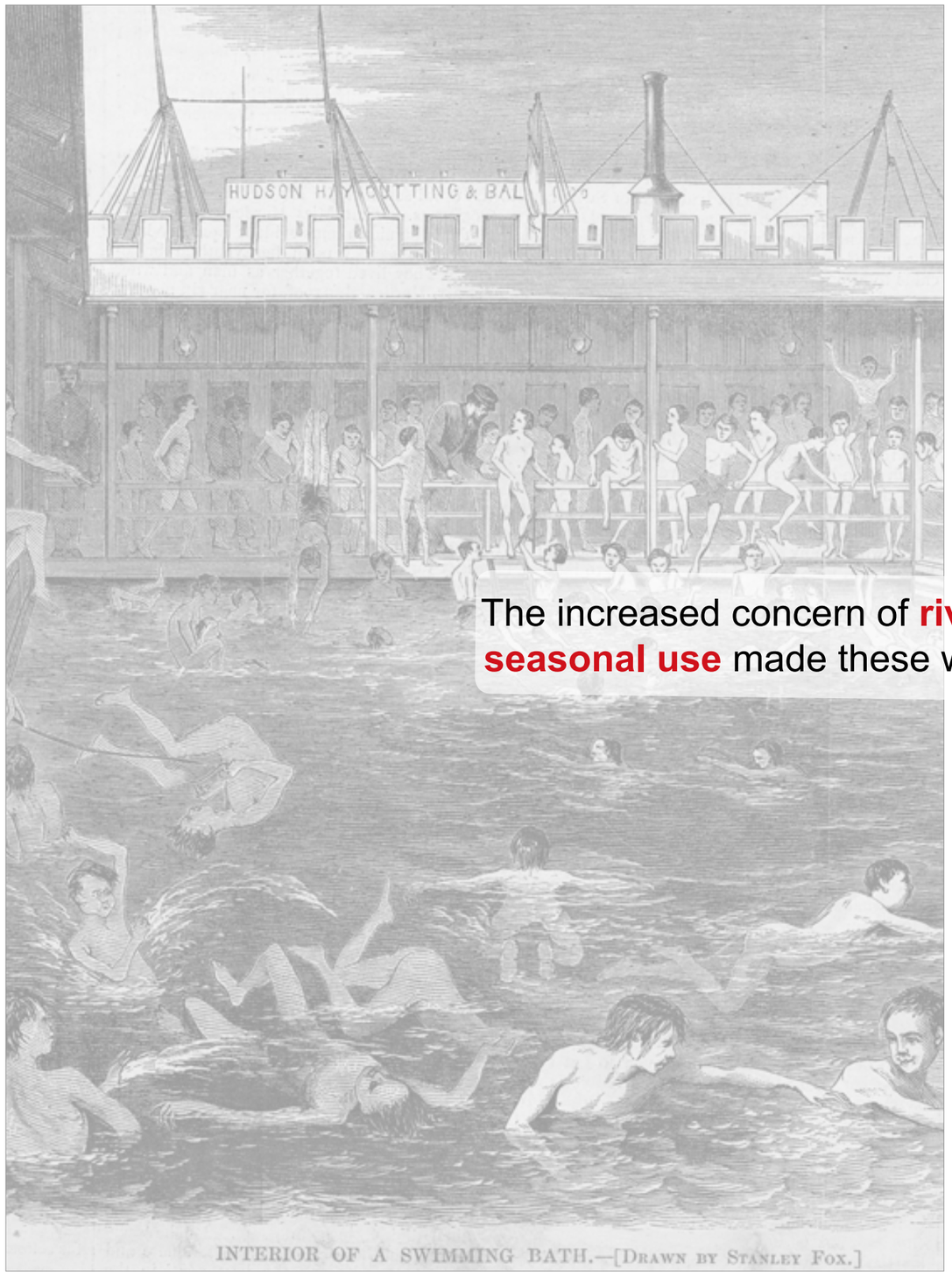

Natural view
Institution/Management
River Side
Research
Meeting
Gallery/Environmental education


PROGRAM 3
IDEOLOGY MATERIALIZED
DEP


IN THE LATE 1800s
Bathhouses were also popular along both the East and Hudson Rivers.
Bathing

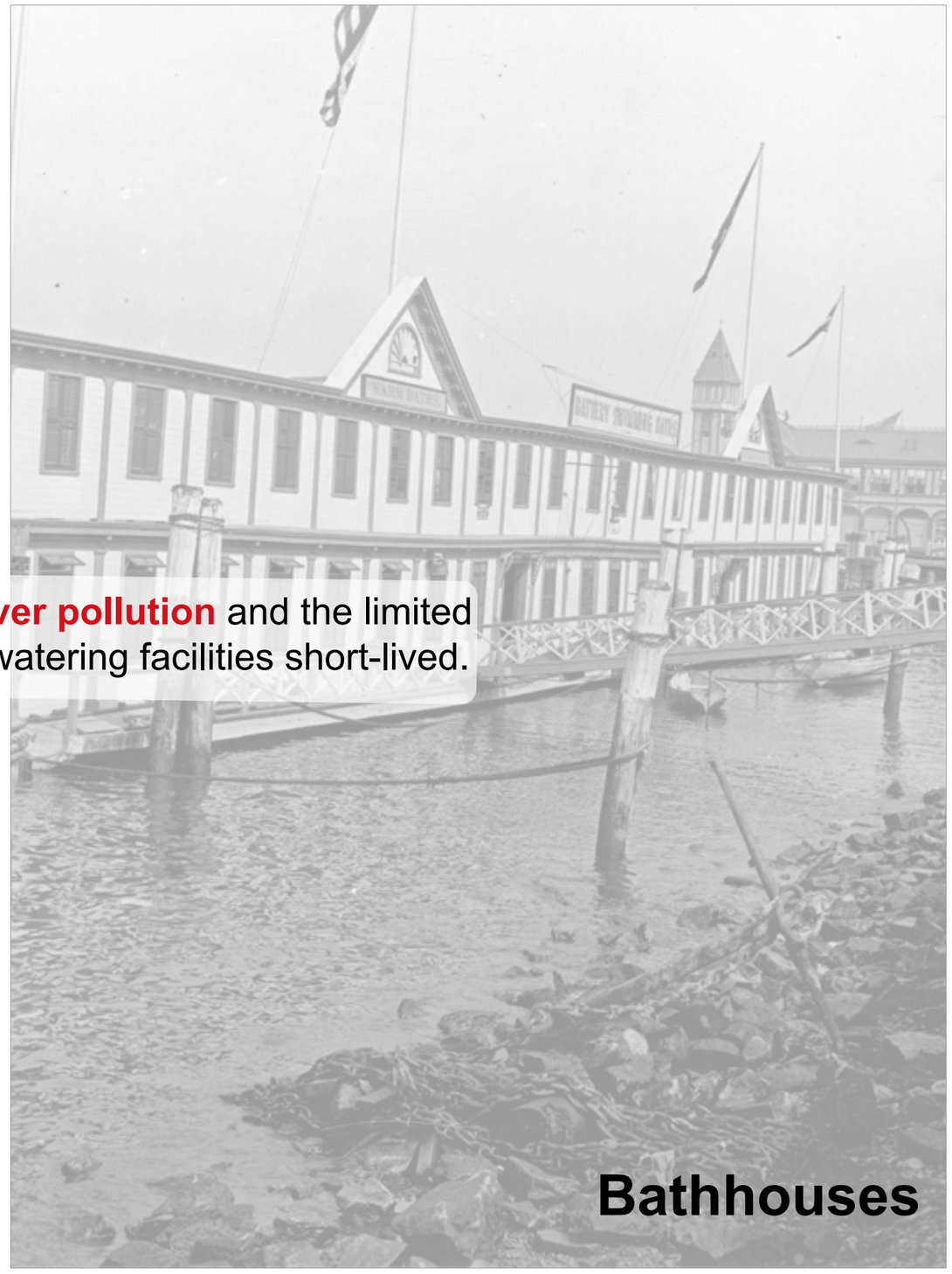

They were initially used for recreational and therapeutic purposes.
INTERIOR OF A SWIMMING BATH.—[Drawn by Stanley Fox.]


These wooden baths were anchored near the waterfront and applied the river water for bathing.
Bathhouses



INTERIOR OF A SWIMMING BATH.—[Drawn by Stanley Fox.]

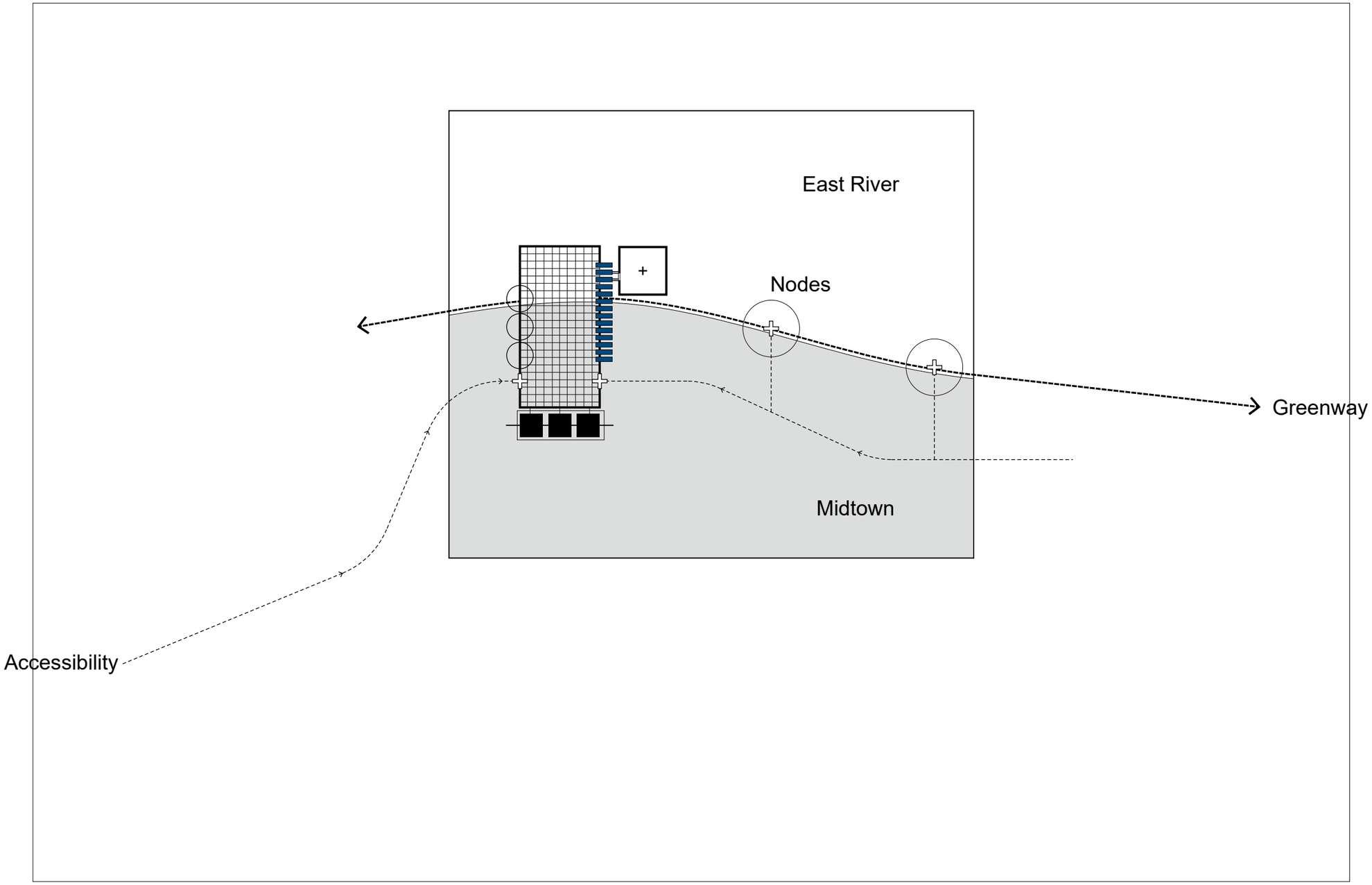
The increased concern of **river pollution** and the limited **seasonal use** made these watering facilities short-lived.



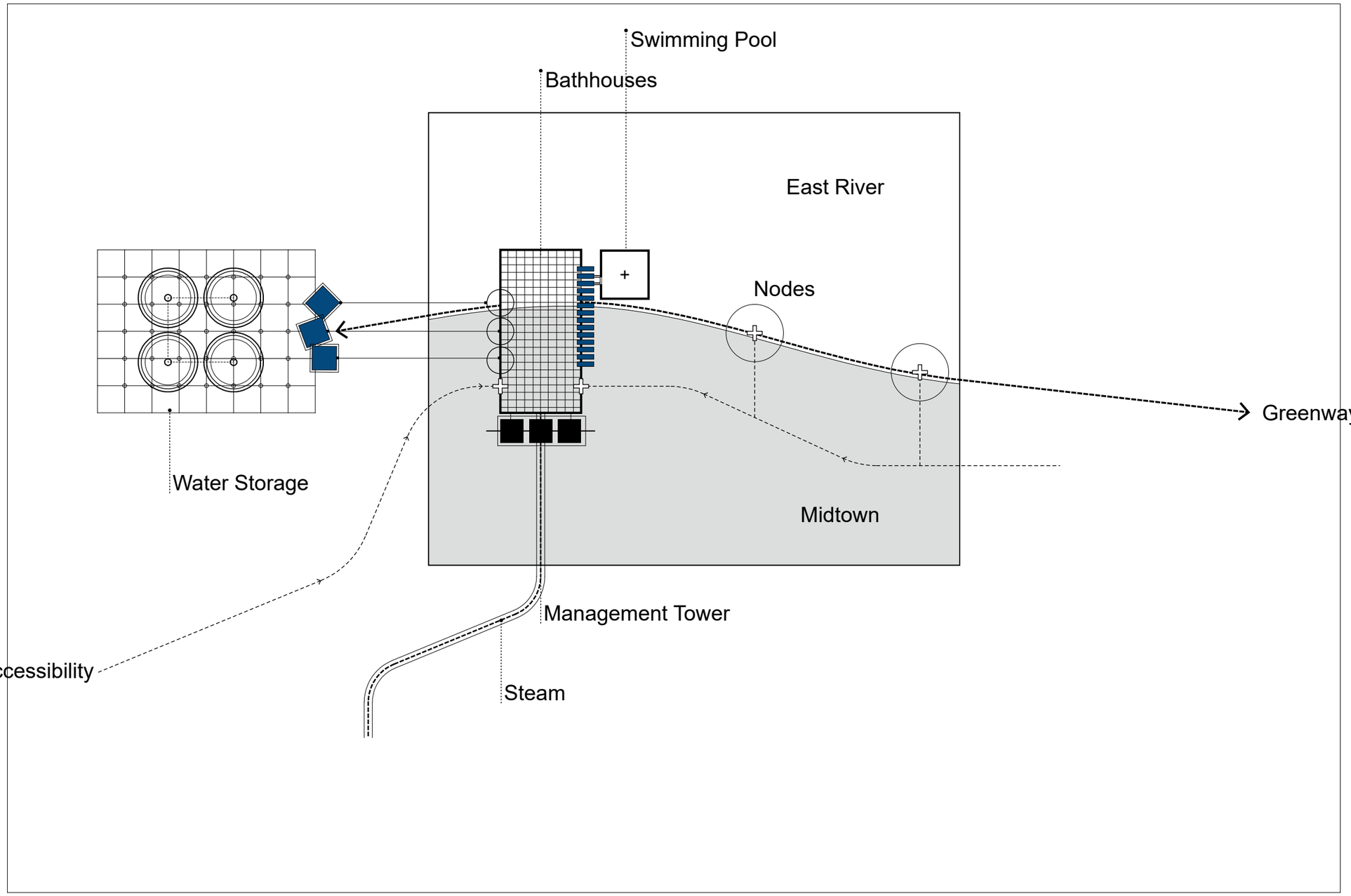
Bathhouses


Forgotten water memory: New York used to live with water,
contained in reservoirs and bathhouses meant to
evoke ***Might, Sophistication and Security.***
Attachment

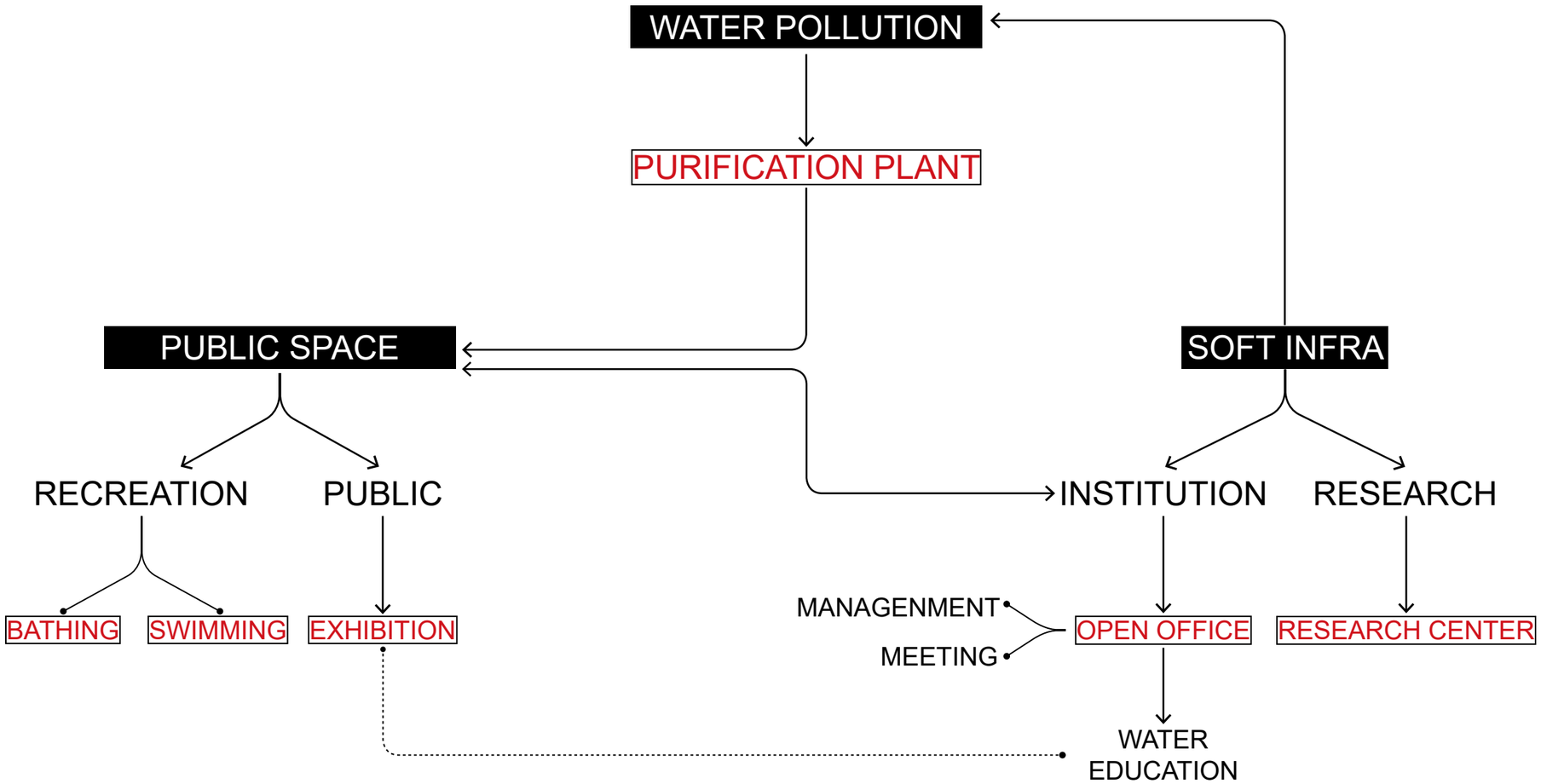
WORKFLOW


East River
Nodes
Greenway
Midtown
Accessibility
Public Appeal

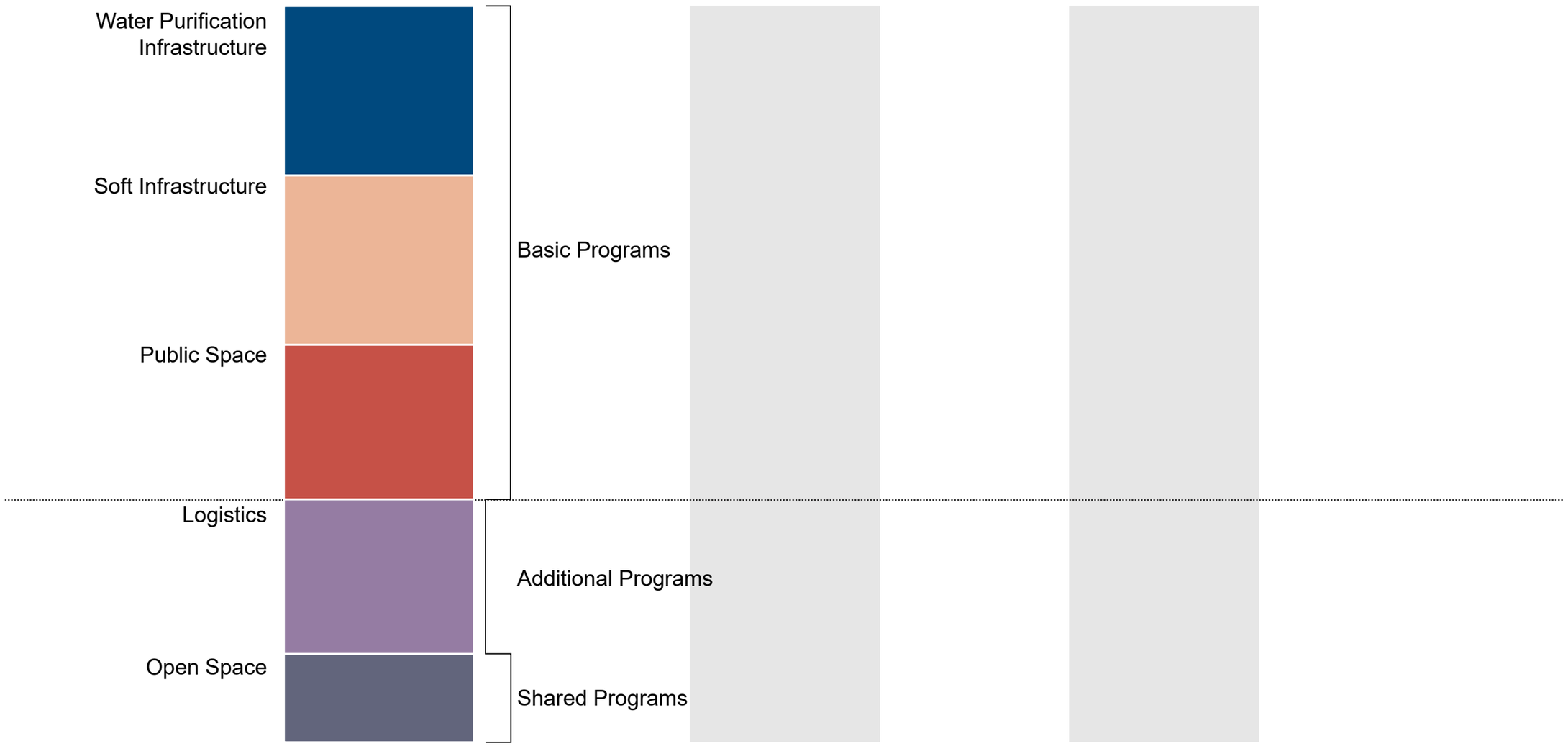
WORKFLOW


Swimming Pool
Bathhouses
East River
Nodes
Greenway
Water Storage
Midtown
Management Tower
Accessibility
Steam
Public Appeal

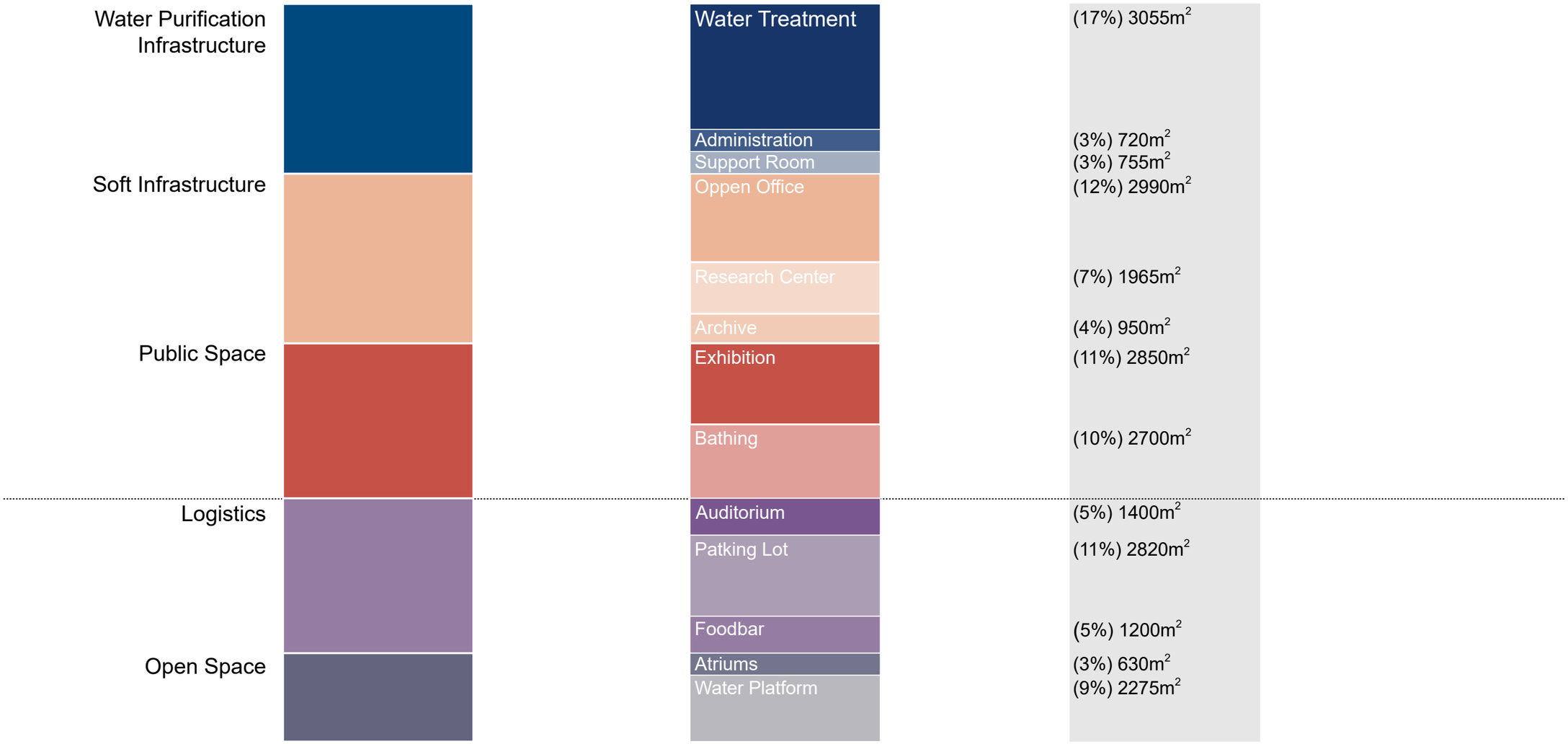
PROPOSED PROGRAMS



BASIC ELEMENTS OF A CONTEMPORARY WATER INFRASTRUCTURE



BASIC ELEMENTS OF A CONTEMPORARY WATER INFRASTRUCTURE



BASIC ELEMENTS OF A CONTEMPORARY WATER INFRASTRUCTURE

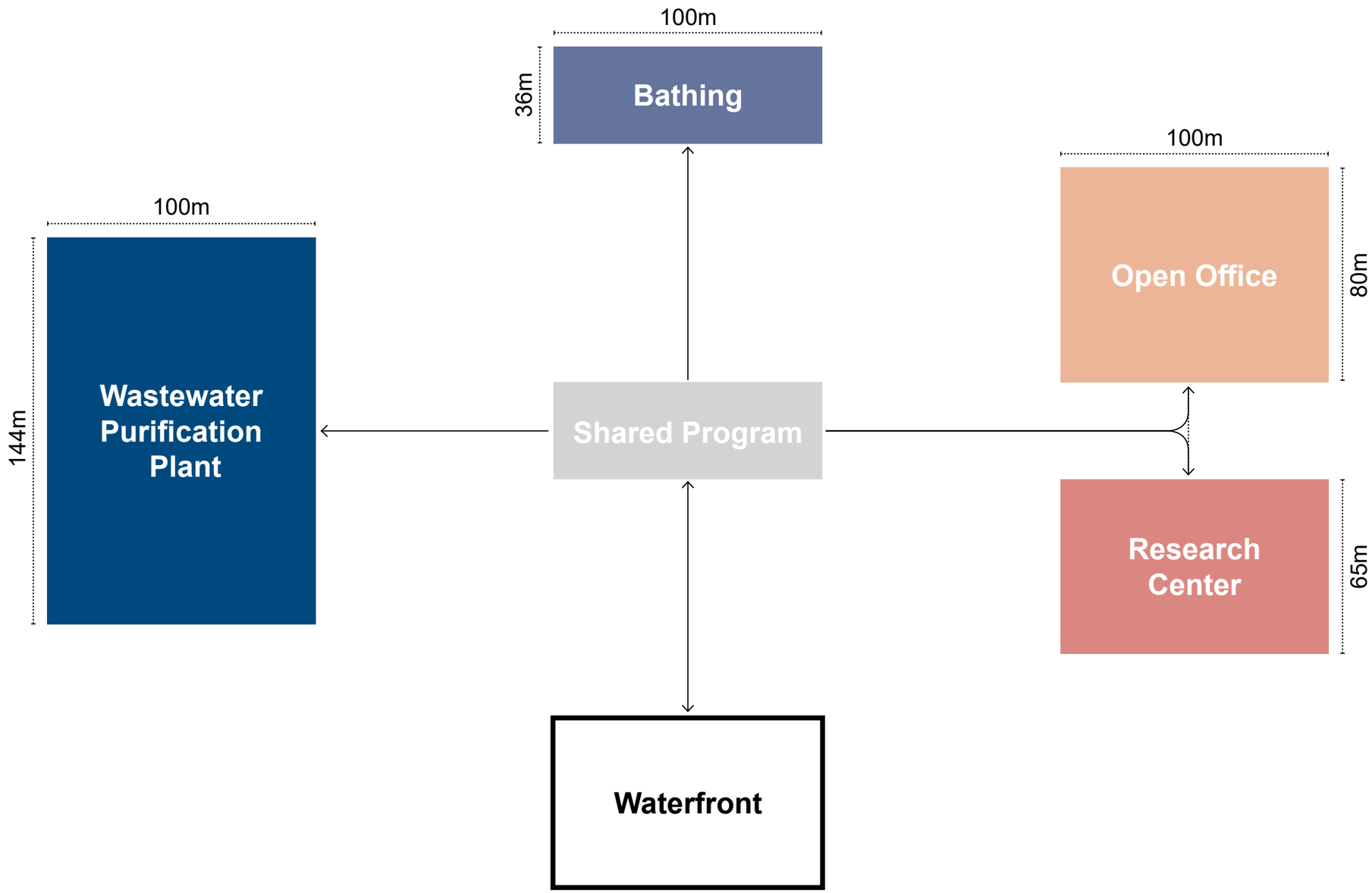


GFA =25570m^2

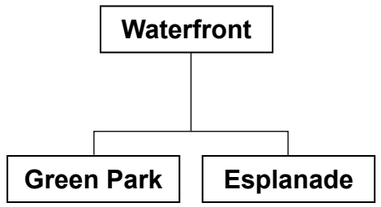
LOT AREA =3455m^2

FAR =7.4

PROGRAMMATIC SCHEME

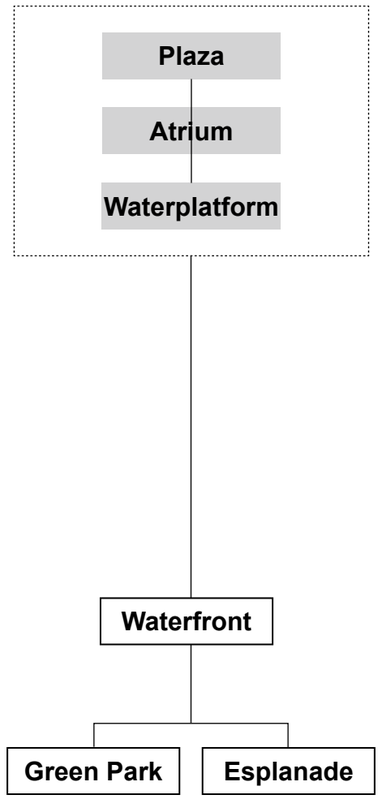


PROGRAMMATIC SCHEME



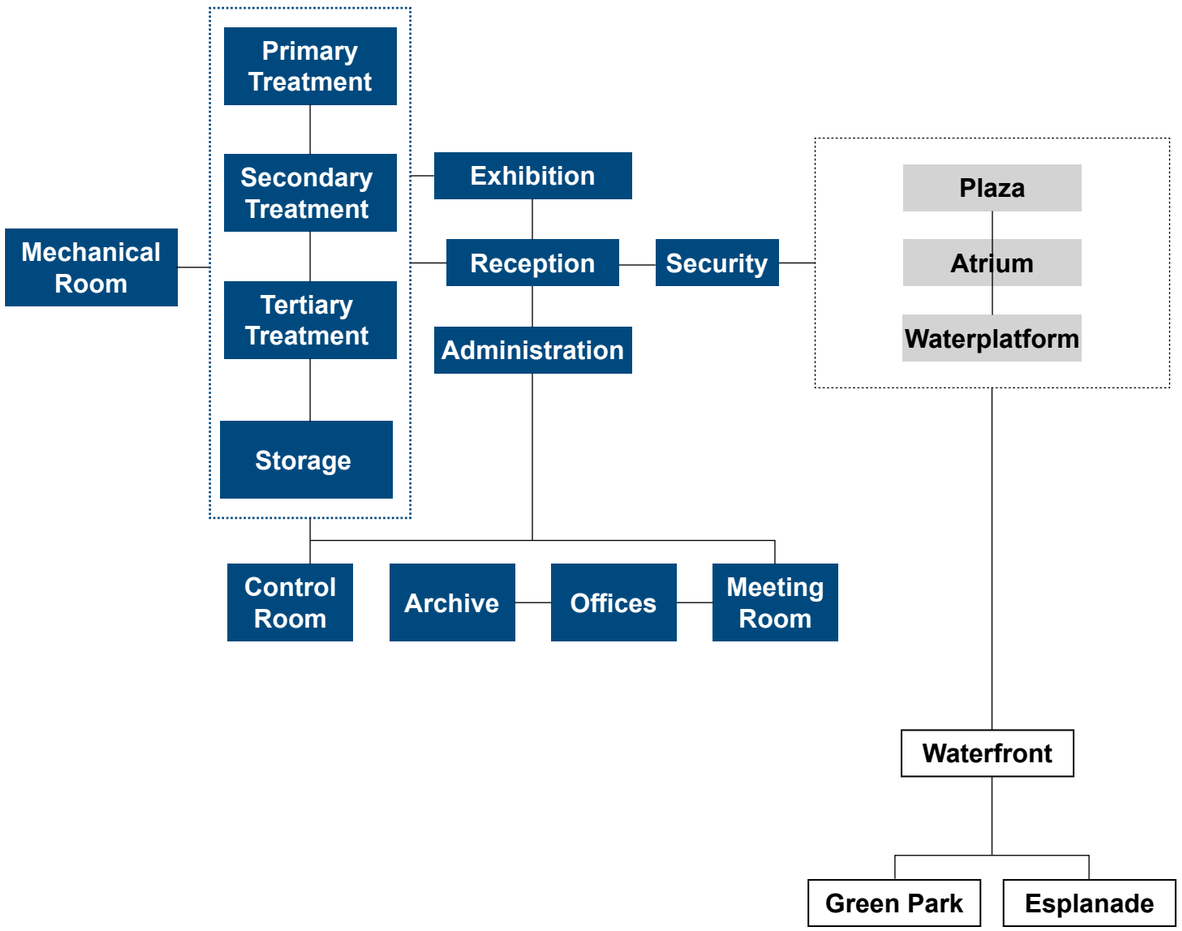
Public Plaza

PROGRAMMATIC SCHEME



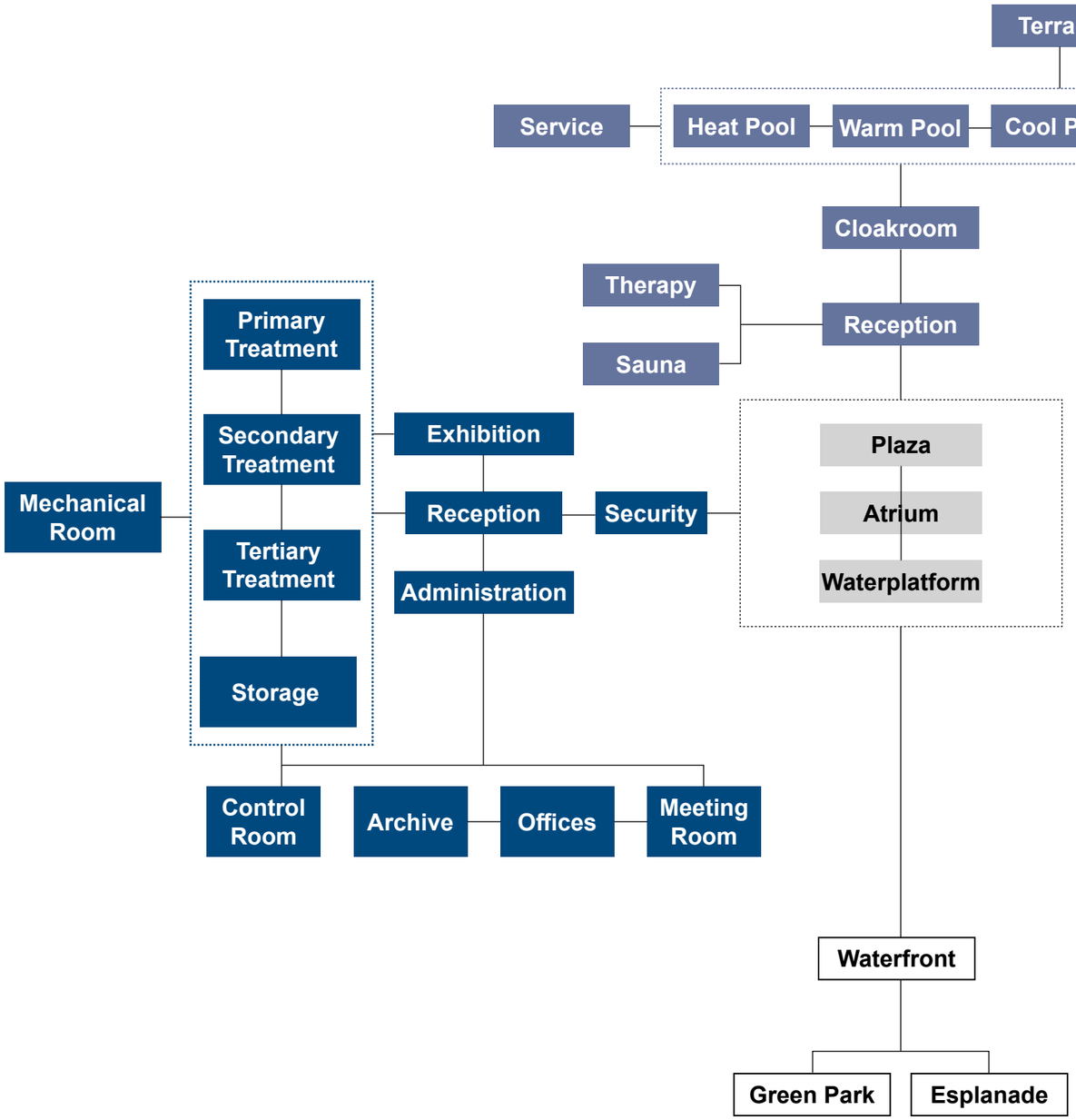
Shared Program

PROGRAMMATIC SCHEME



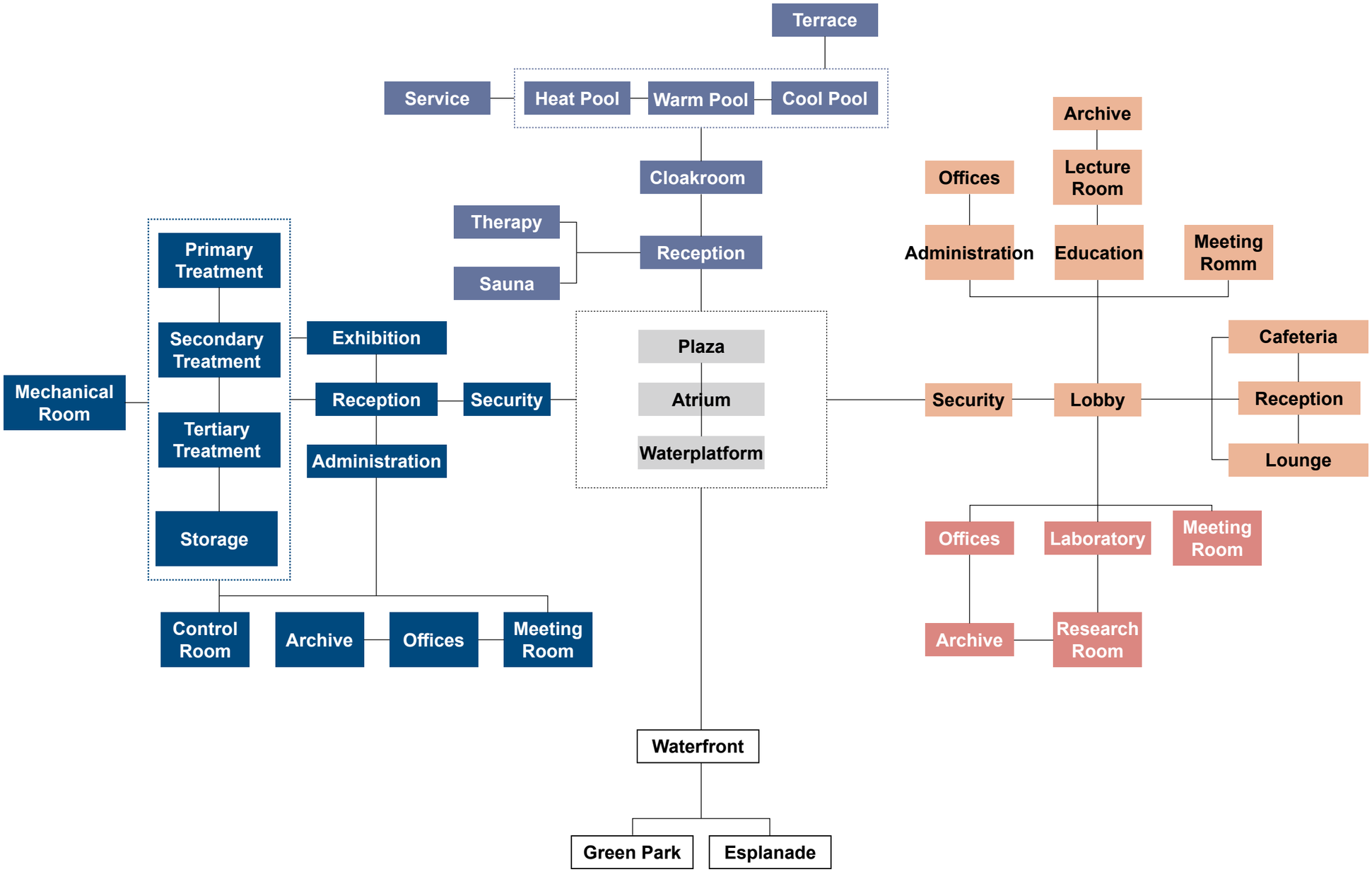
Wastewater Pruification Plant

PROGRAMMATIC SCHEME



Bathing

PROGRAMMATIC SCHEME



Soft Infrastructure

INTRODUCTION

RESEARCH

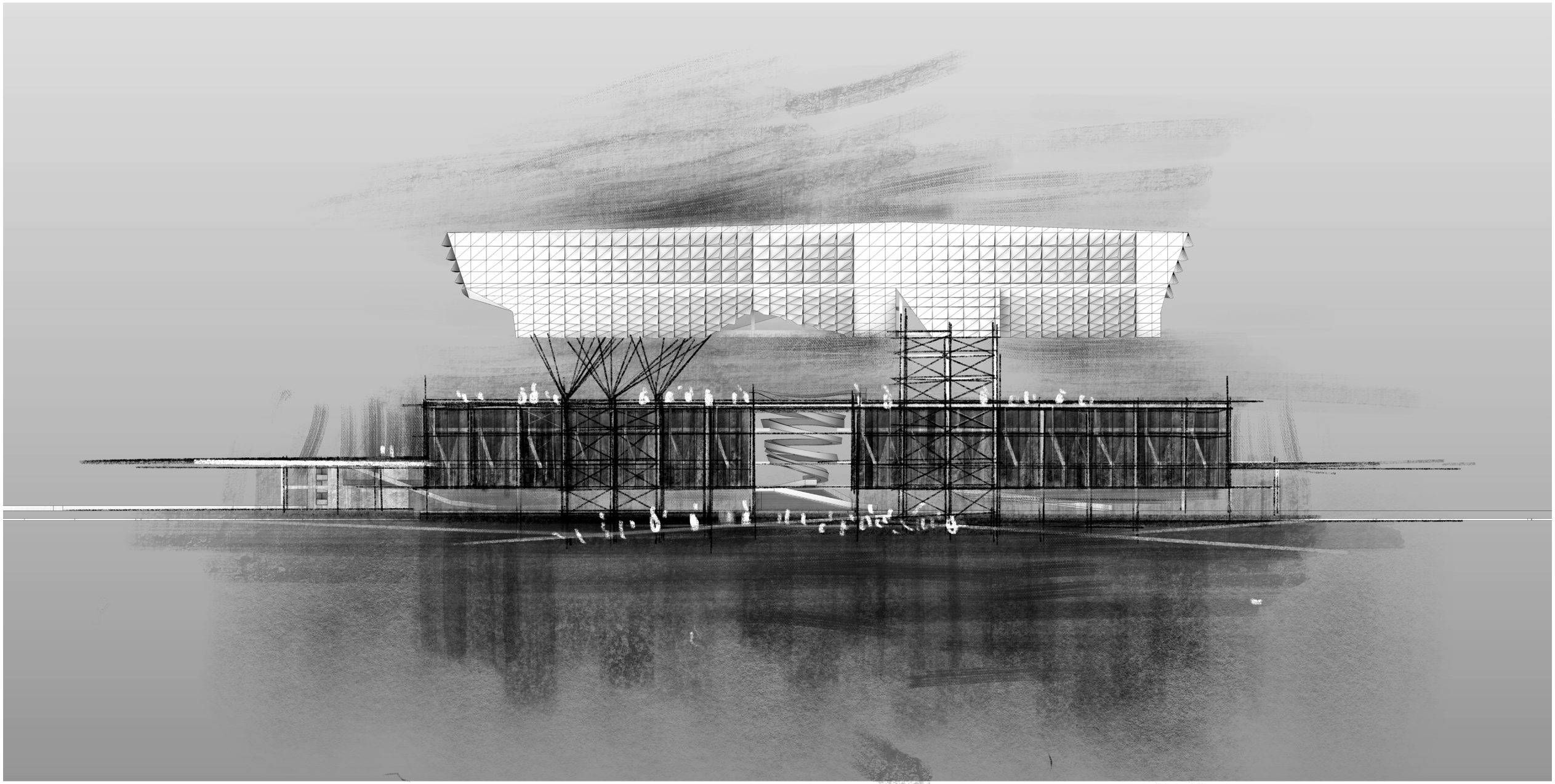
SITE ARGUMENT

DESIGN

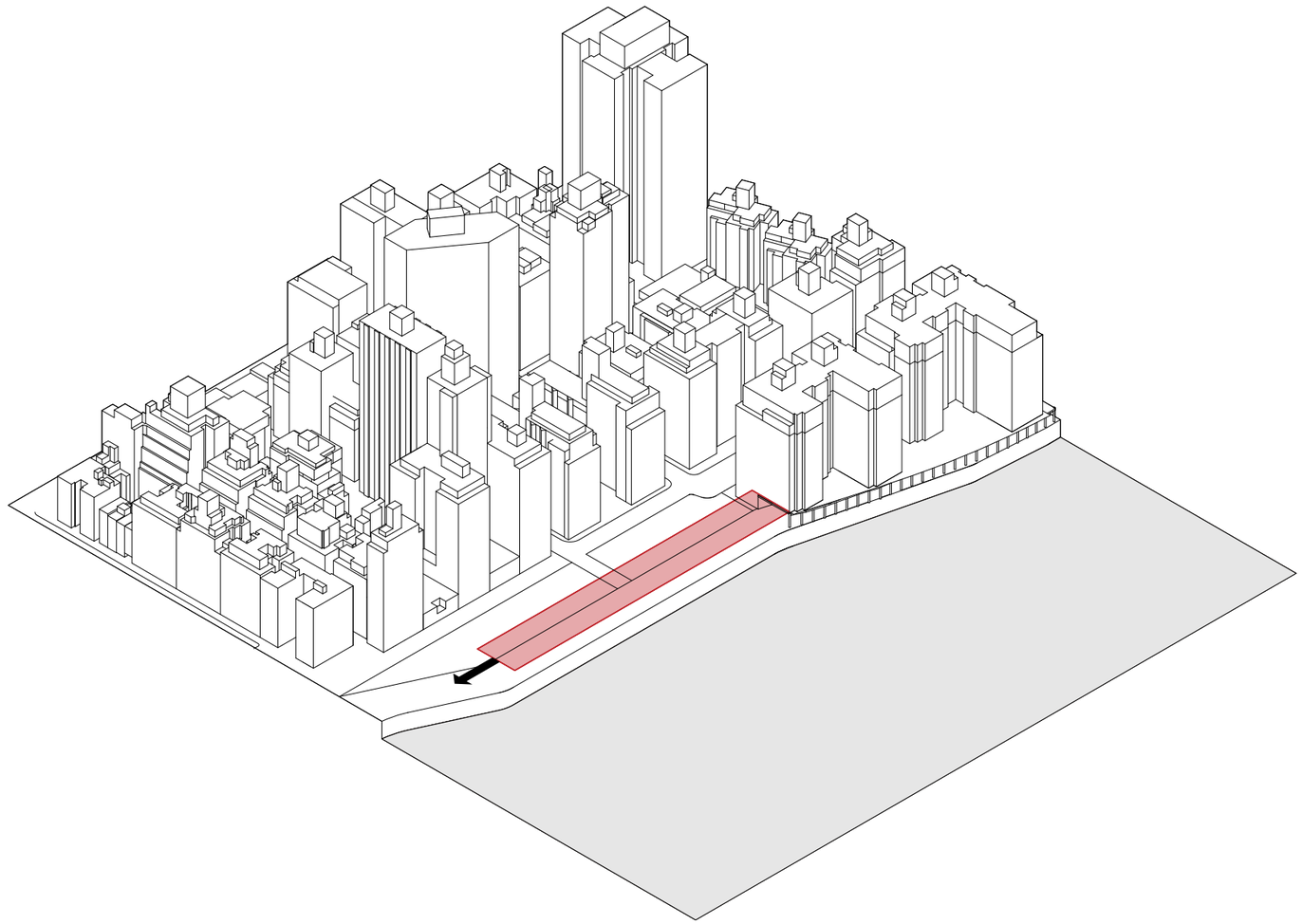
IMPLEMENTATION

CONCLUSION

CONCEPTUAL SKETCH



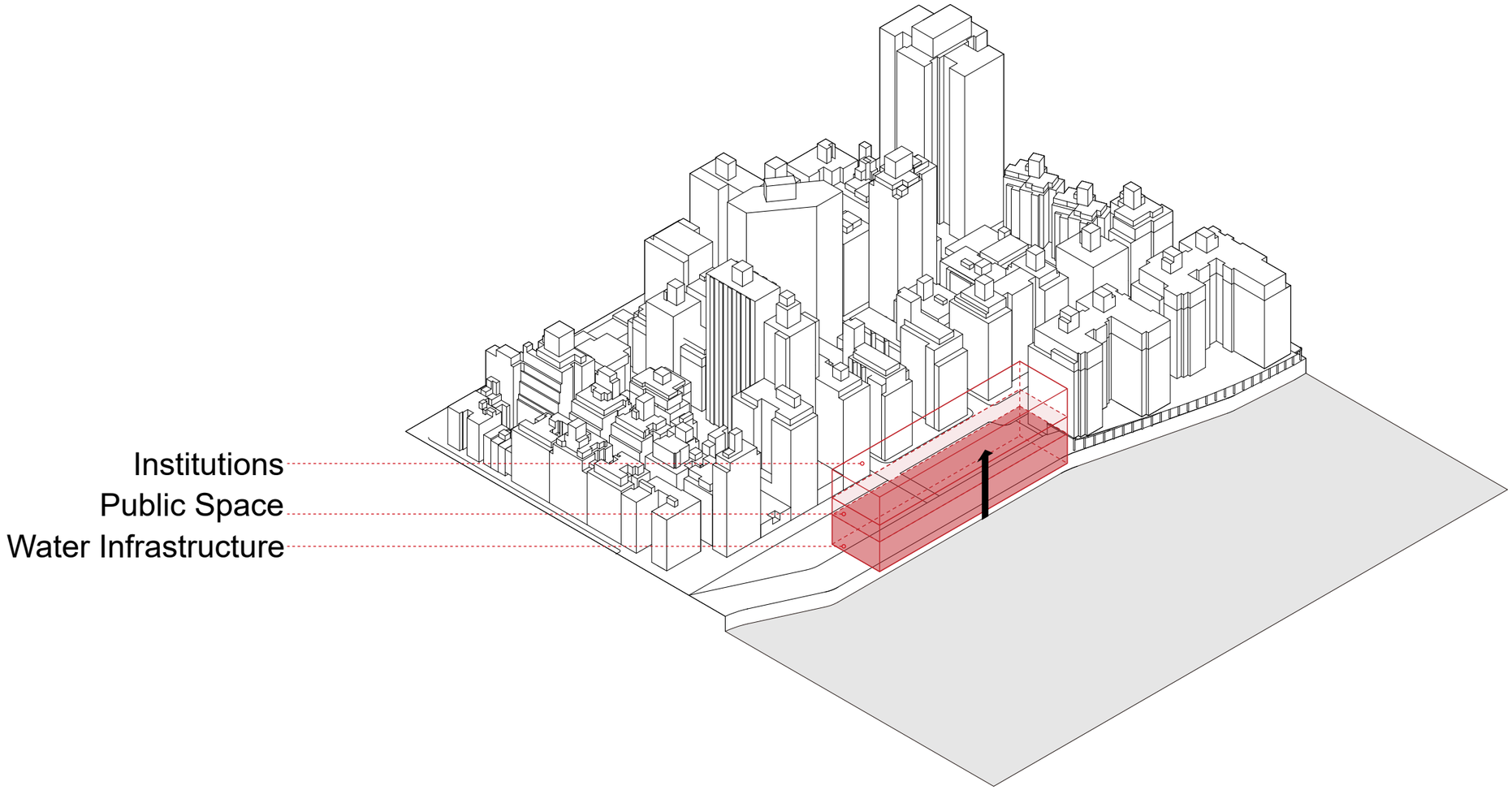
BUILDING MASS



Expanding the platform

expanding the existing platform alongside the FDR Drive to avoid the confliction of the expressway and reduce the noise pollution.

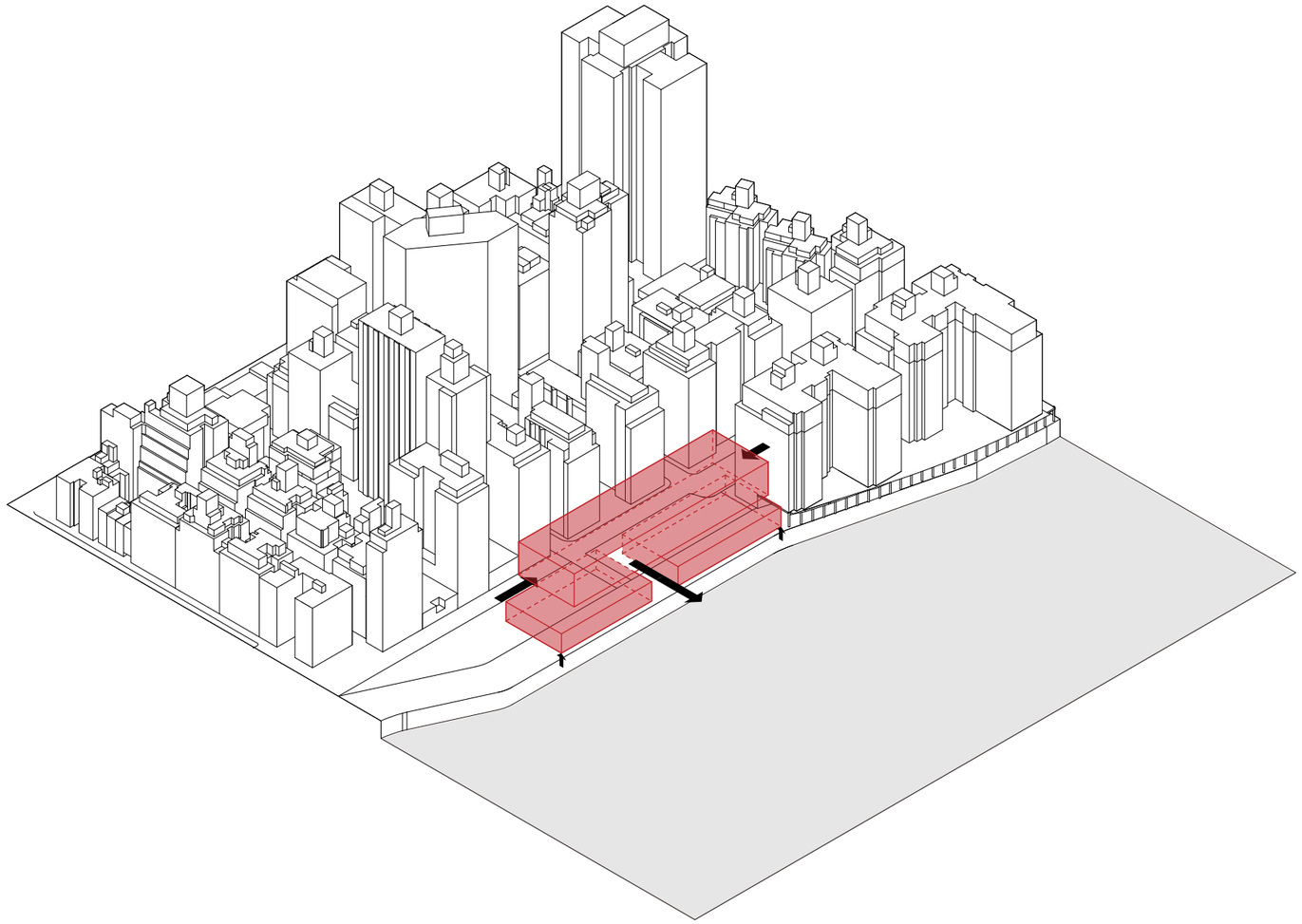
BUILDING MASS



Orranging the programs

based on the built solid platform, the water infrastructure, public functions, and private institutions are vertically orranged

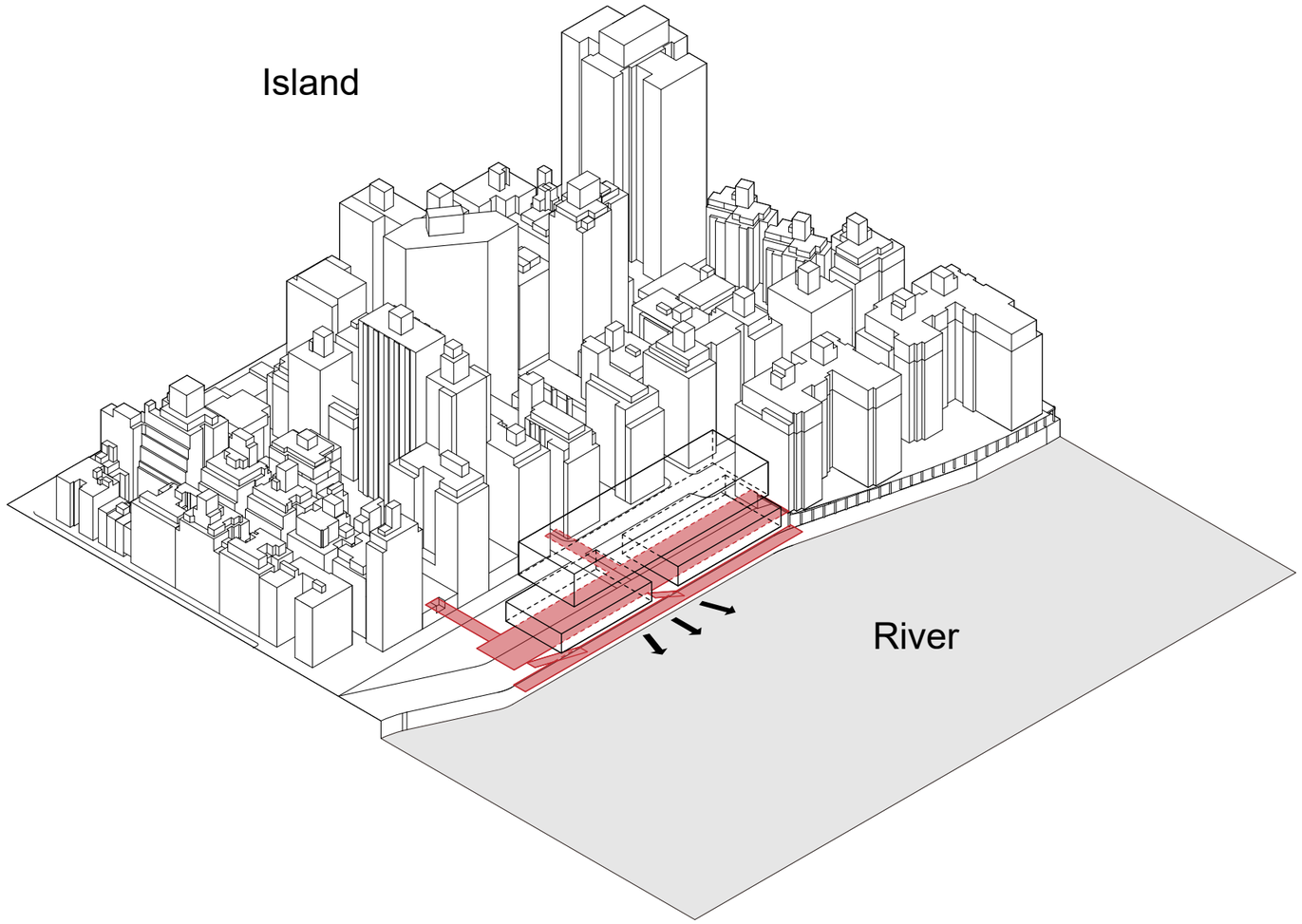
BUILDING MASS



Enabling Sight Through

the rising and recessing treatments enable the sight to go through in west-east direction with less obstruction.

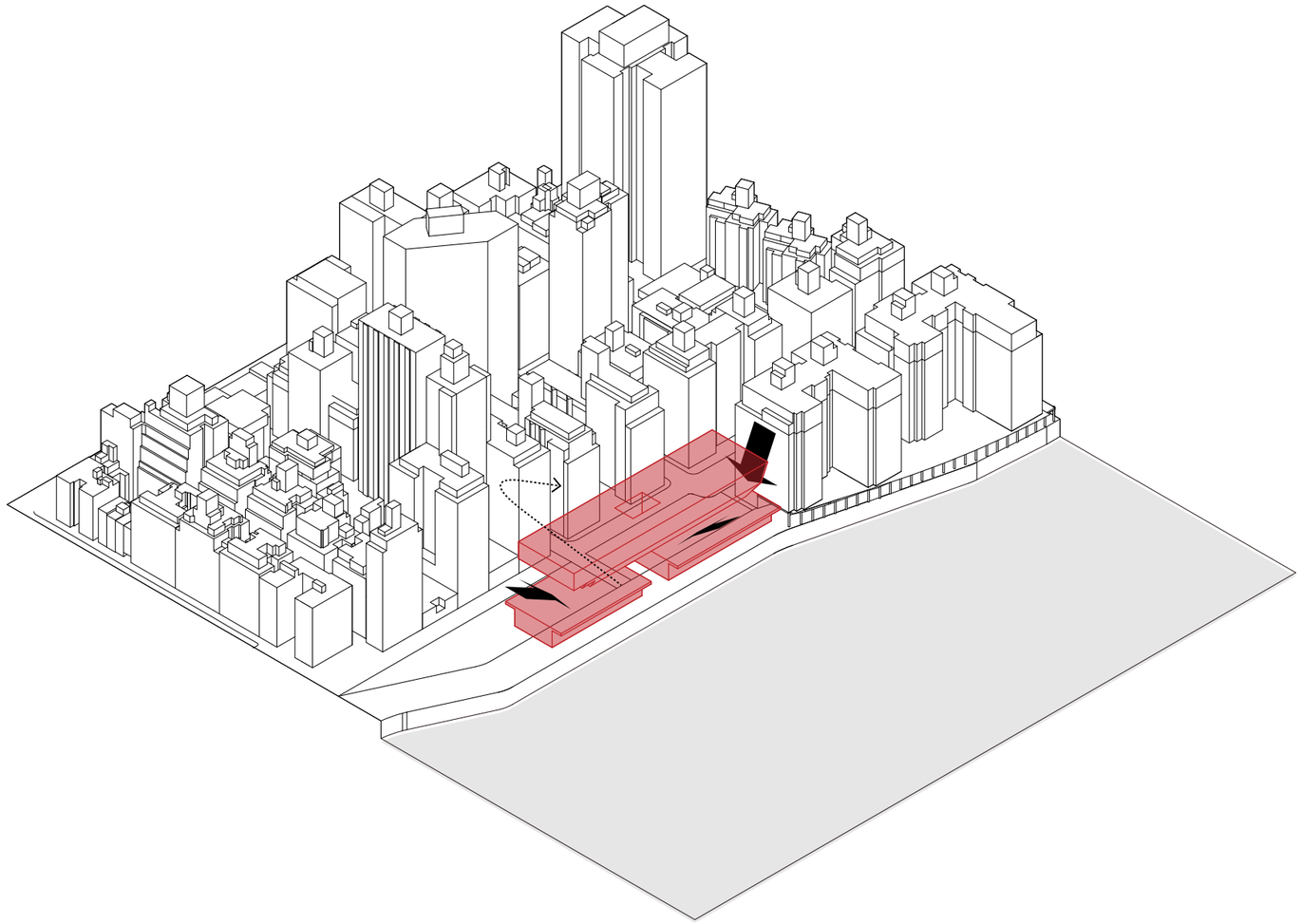
BUILDING MASS



Urban implementation (Horizontal Connection)

the island and the River is relinked by the new water platform which closely brings people back to the water.

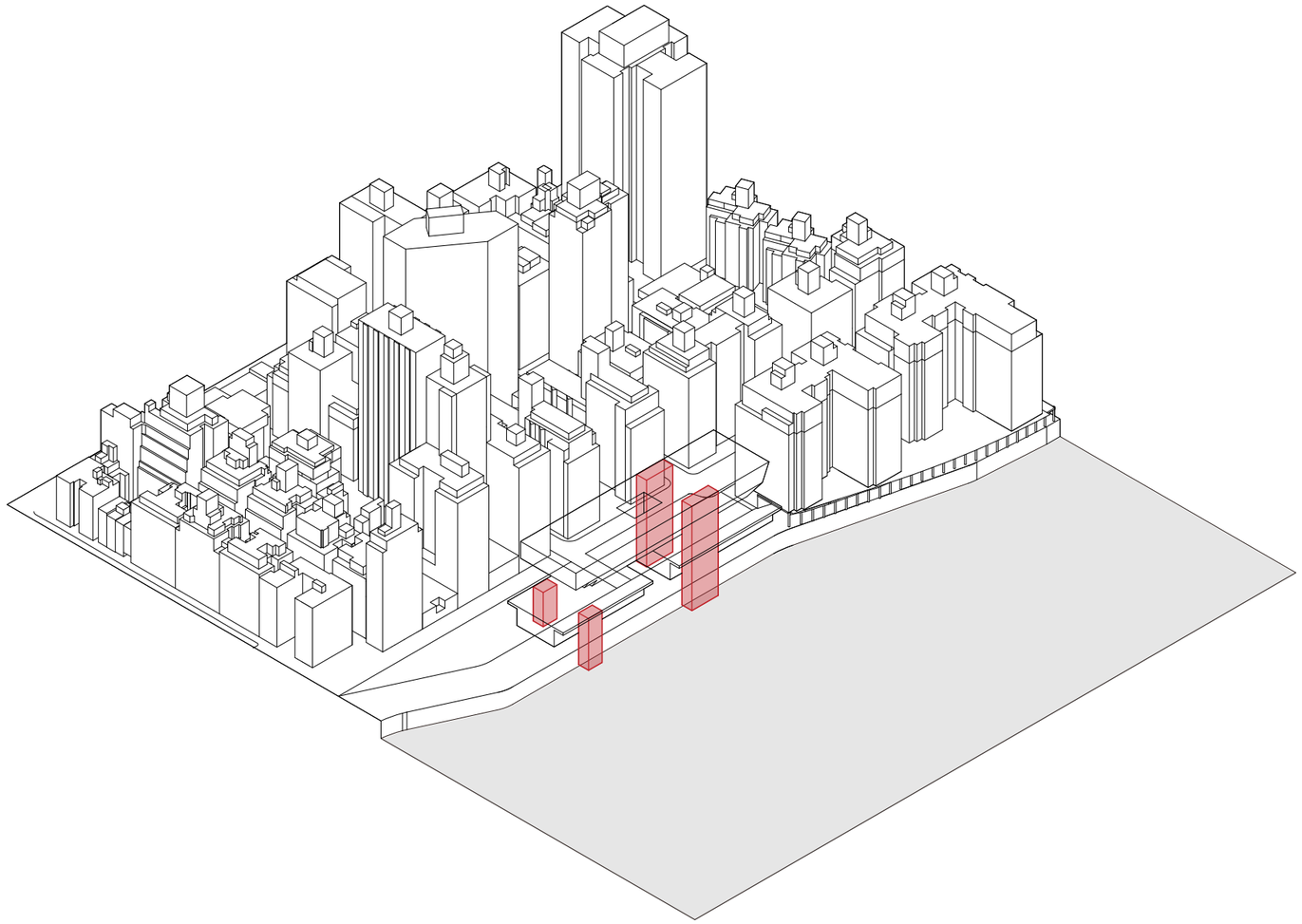
BUILDING MASS



Climatic responses

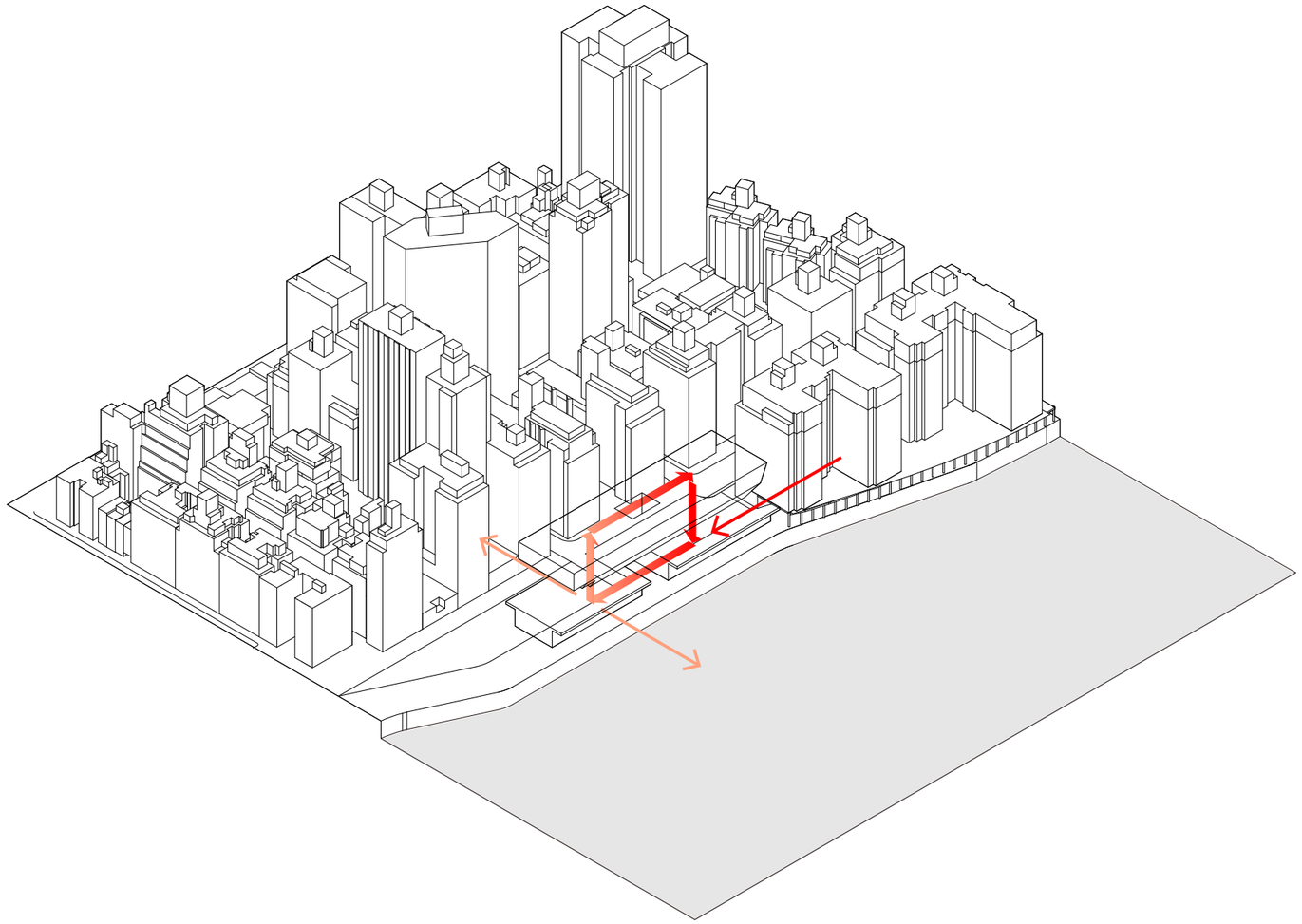
the sloping volume introduces the natural daylight and allows ventilation.

BUILDING MASS

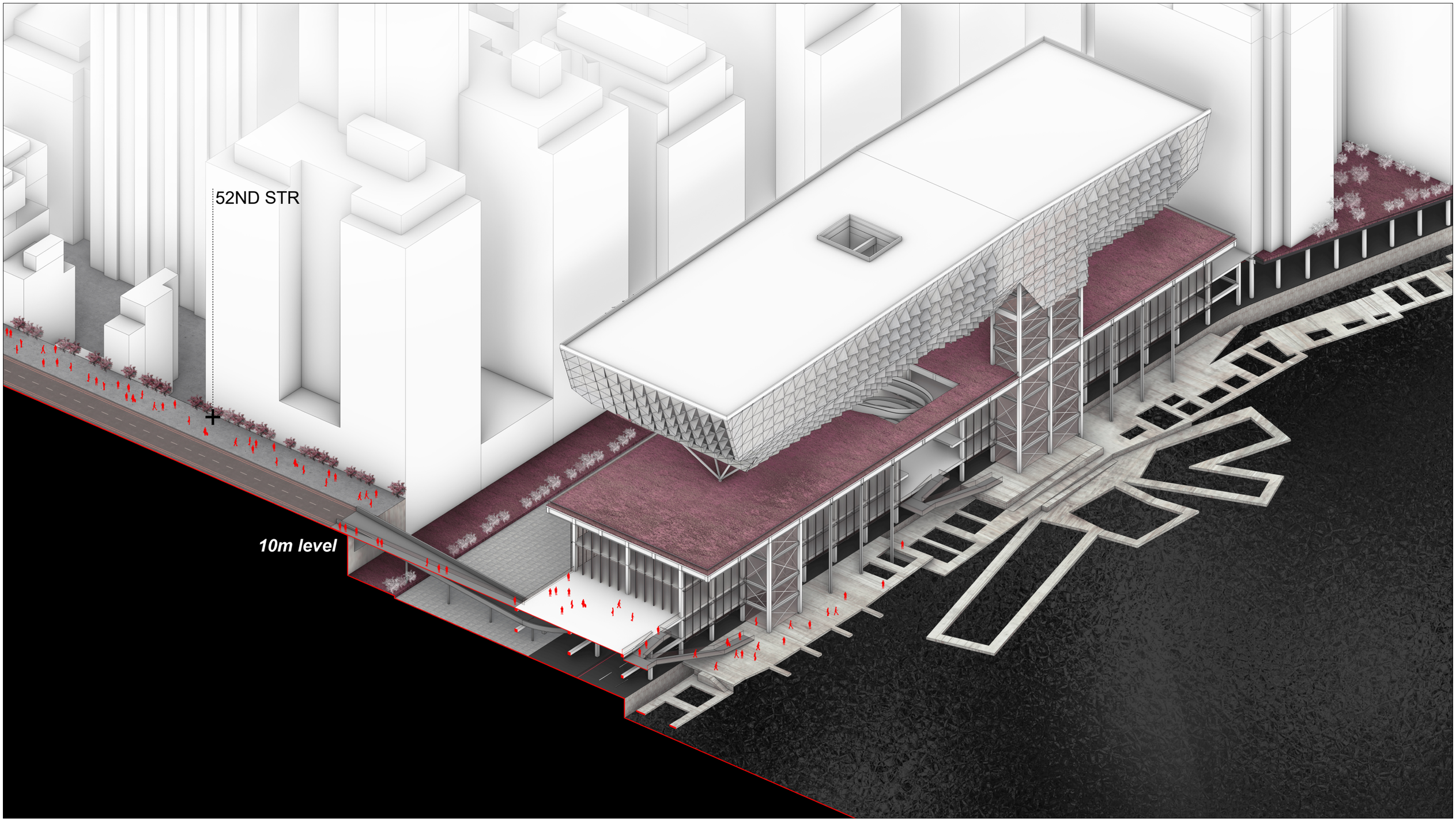


Circulation (Vertical Connection)

BUILDING MASS

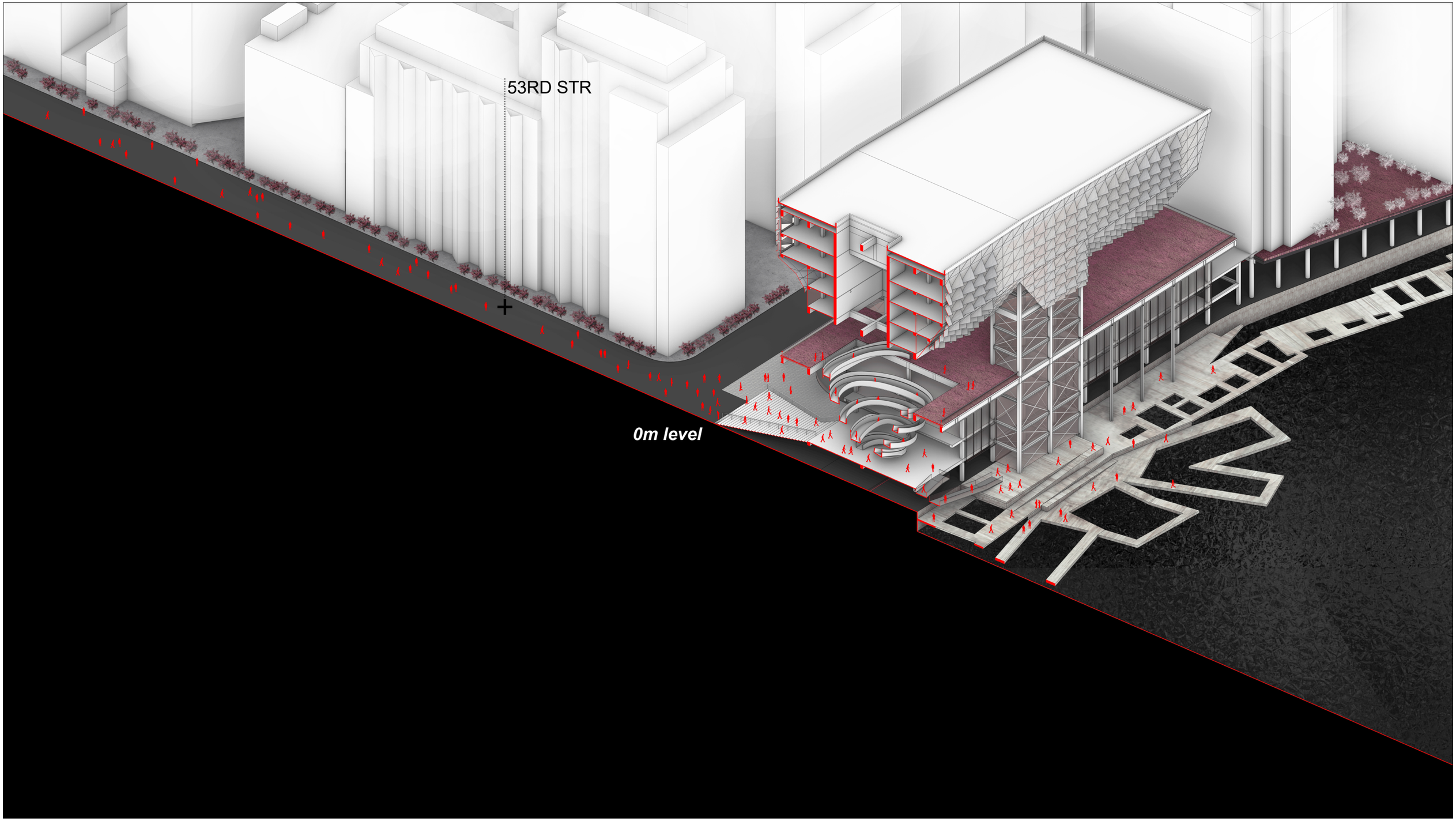


Water loop



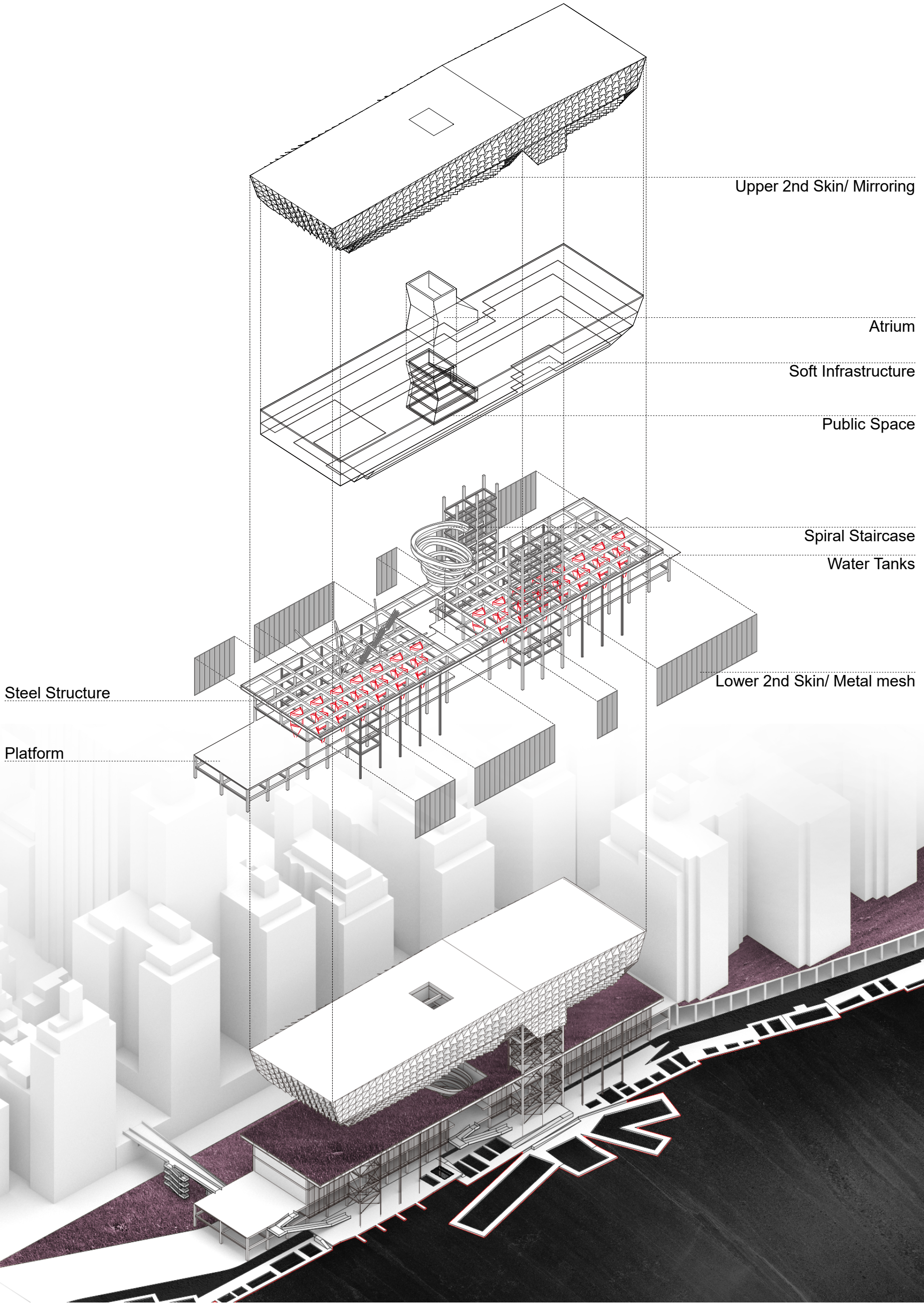
CONNECTING ISLAND & RIVER

The building links the island and the East River by the 52nd street on 10m level



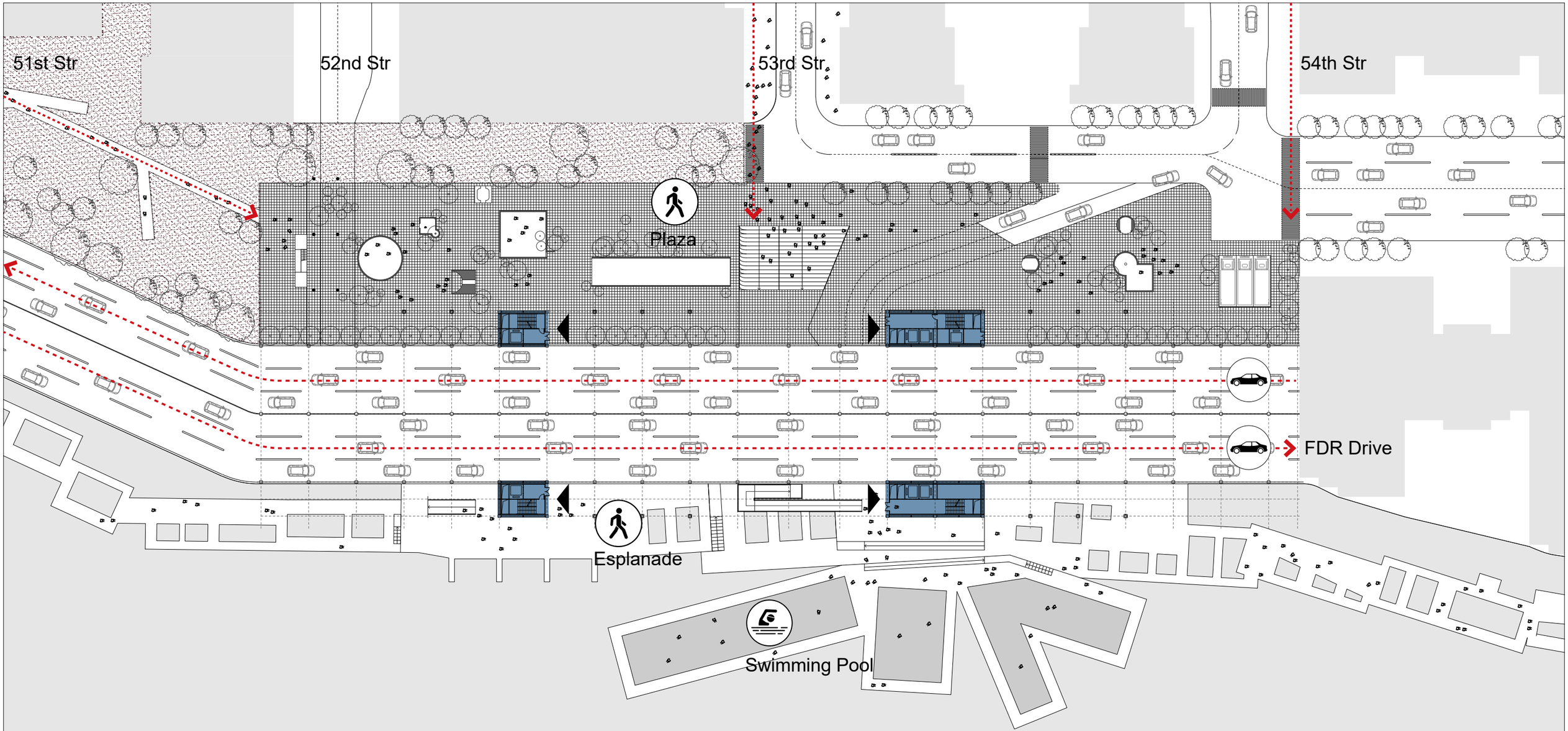
CONNECTING ISLAND & RIVER

The building links the island and the East River by the 53rd street on ground level



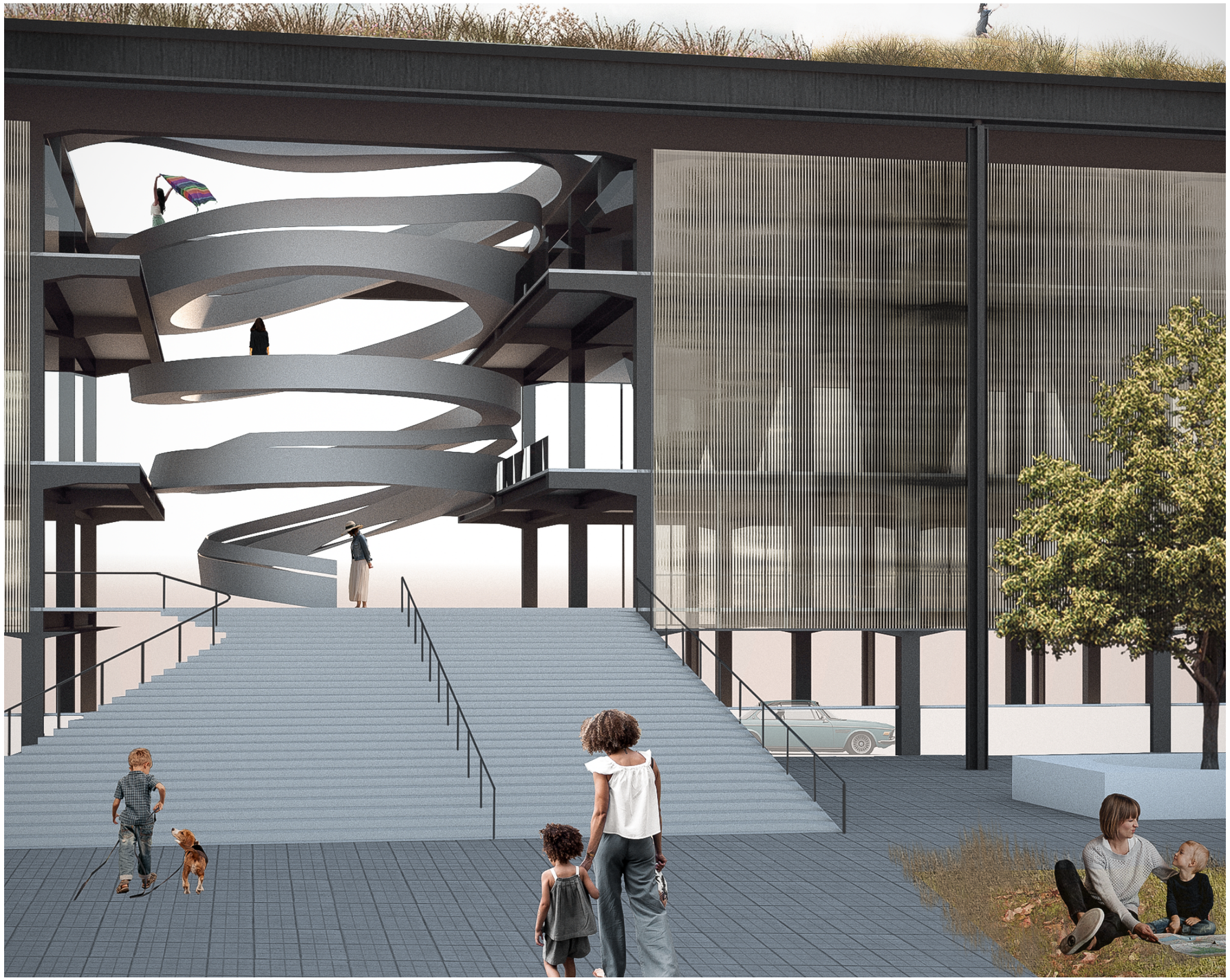
AXONOMETRIC DIAGRAM

The building consists of two parts: the lower volume for the water infrastructure and the upper volume for the public functions and soft infrastructure.



Cruise route

URBAN IMPLEMENTATION



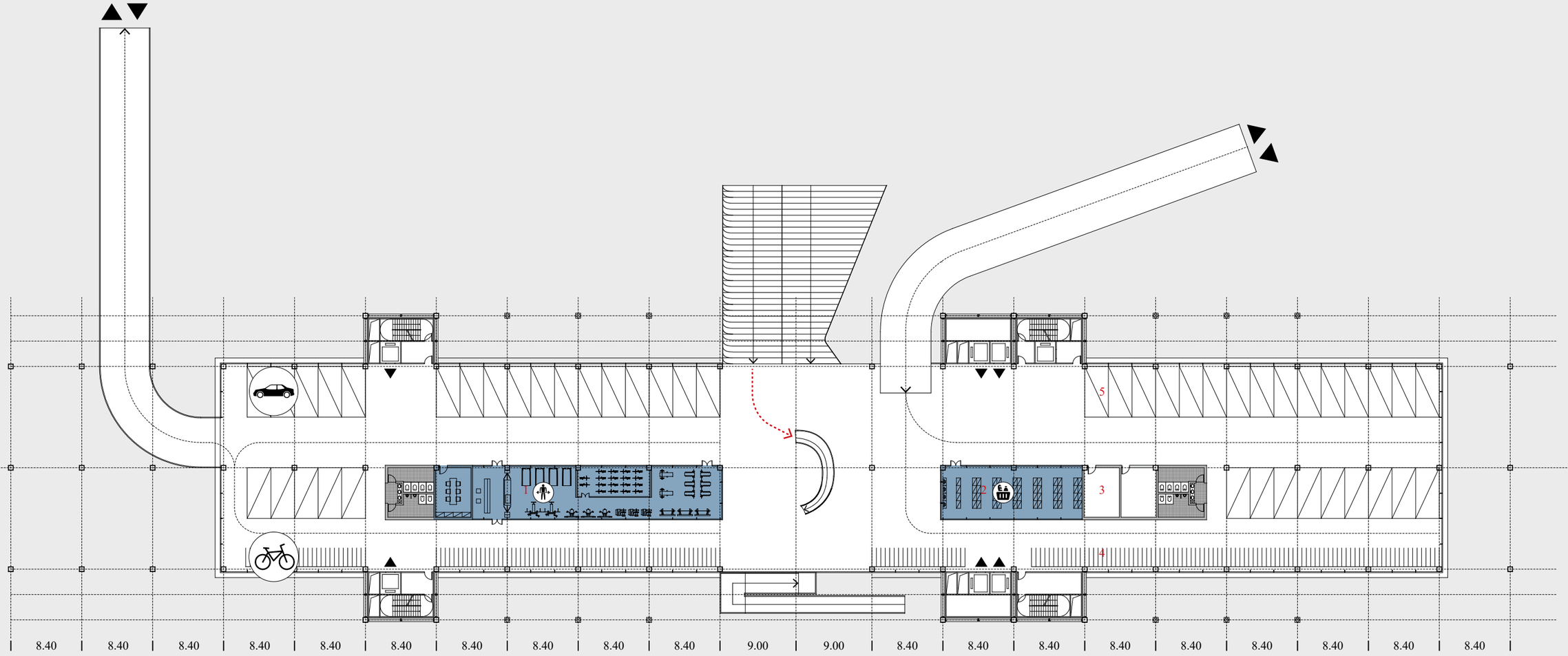
ATRIUM



STREET VIEW



SWIMMING POOL

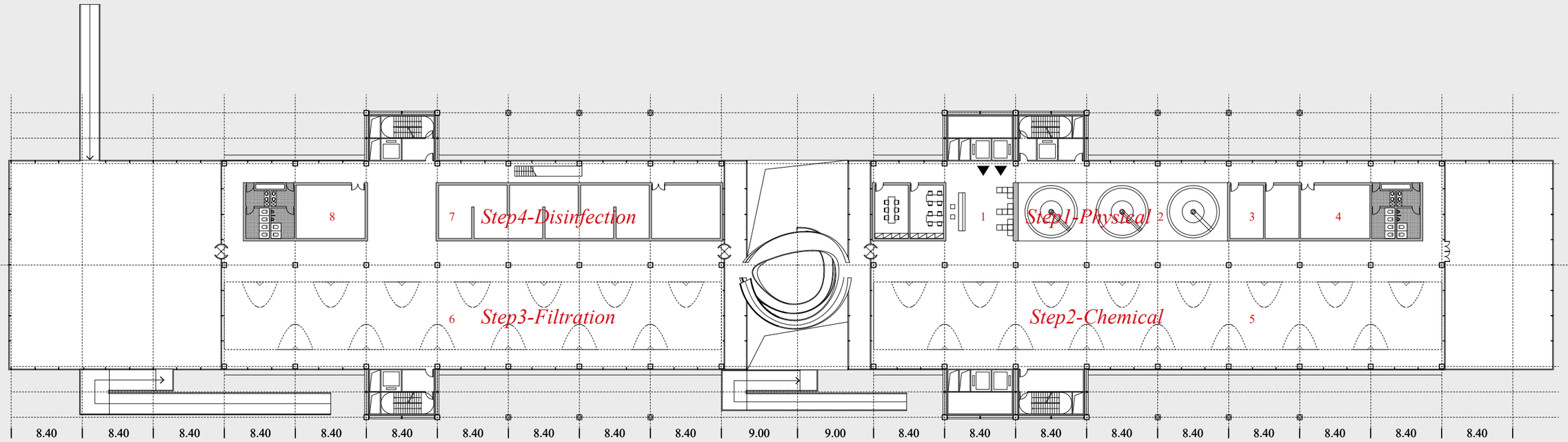


Parking Floor Plan 5.5 m Level

0 5 10

1. Gym
2. Grocery
3. Storage
4. Bike Parking
5. Car Parking

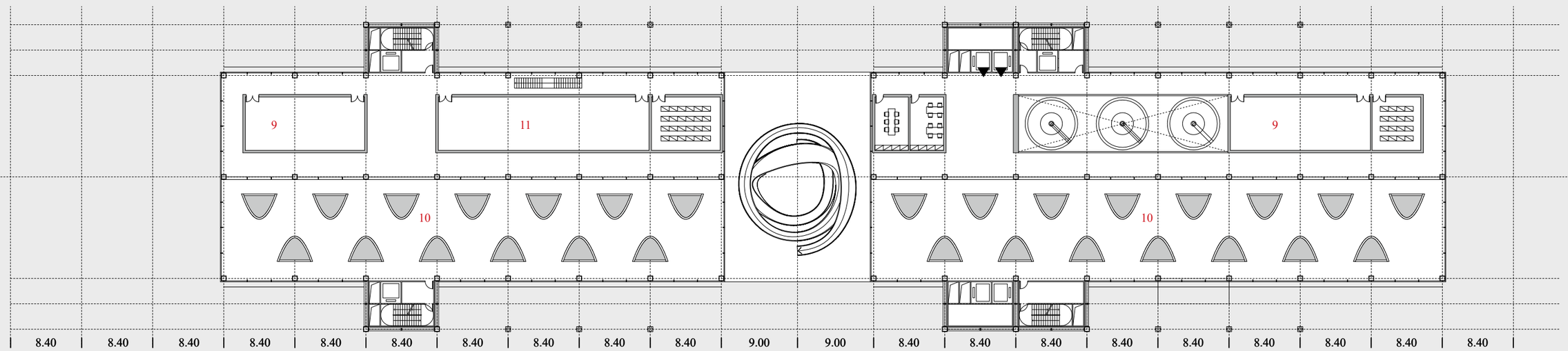
▲ Access



Wastewater Plant 10m Level

0 5 10

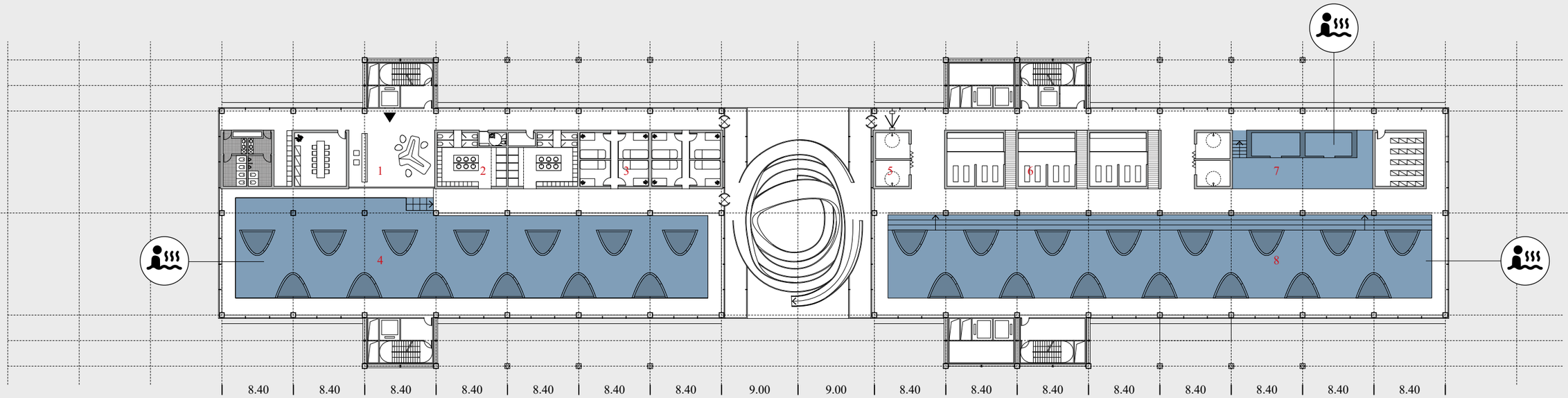
1. Lobby
2. Physical Treatment
3. Sand & Oil Storage
4. Sand & Oil Treatment
5. Chemical Treatment
6. Filtration
7. Disinfection
8. Ultra violet Treatment



Wastewater Plant 13m Level

0 5 10

9. Electrical Room
10. Walking Path
11. Finished Water Pumps

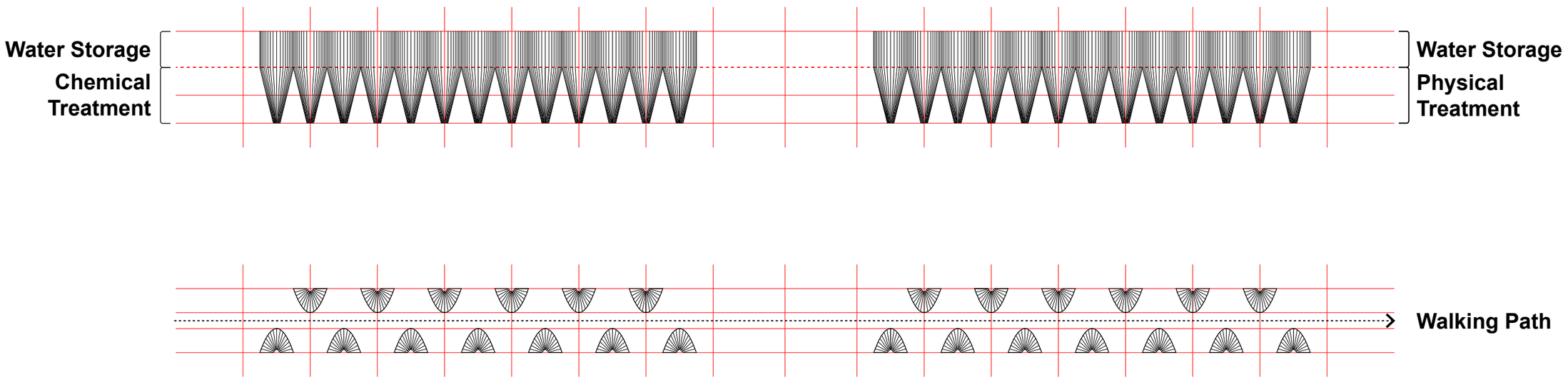


Thermal Bath 16.00m Level

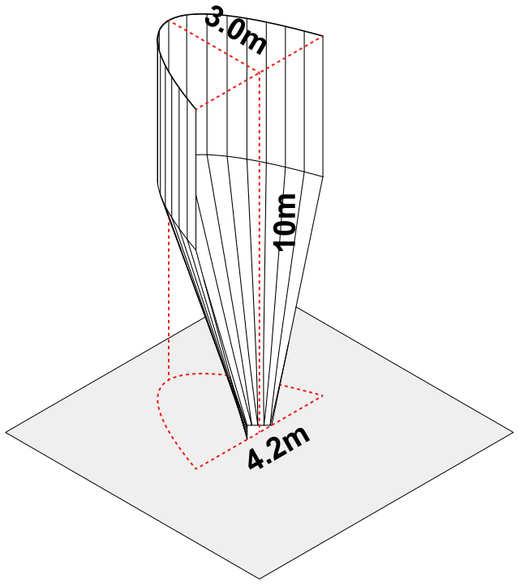
0 5 10

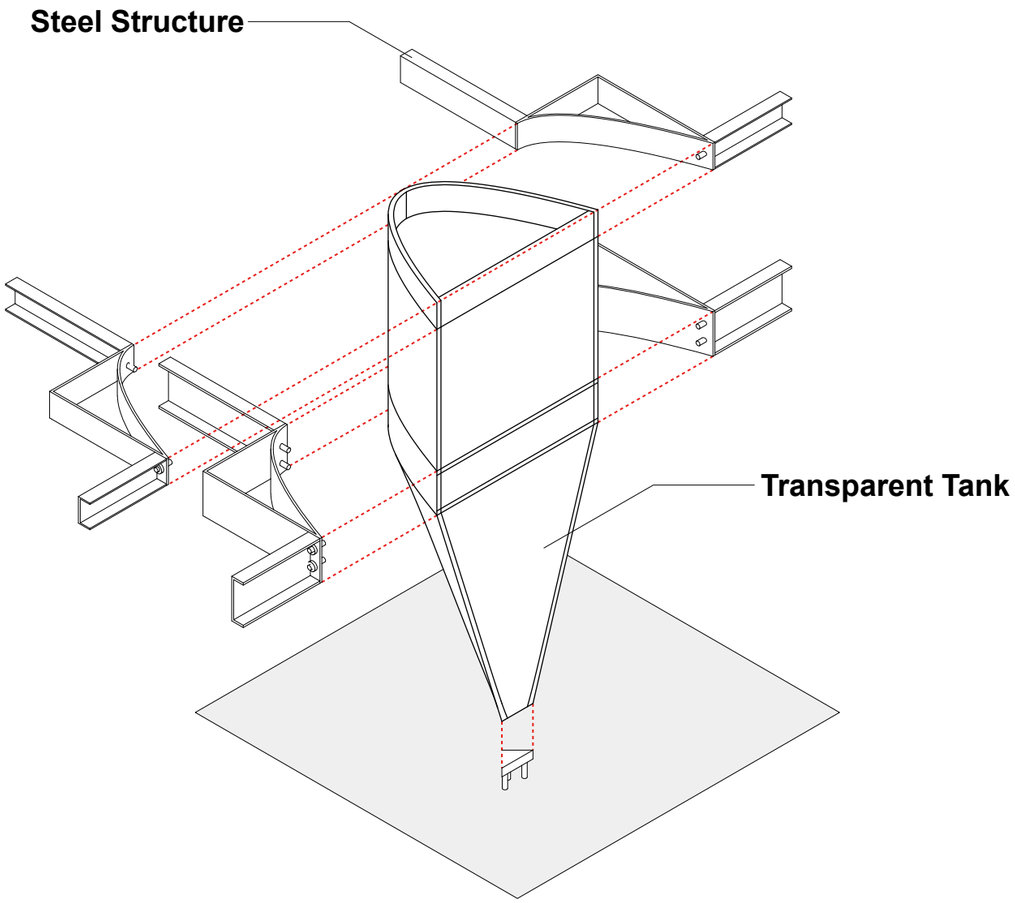
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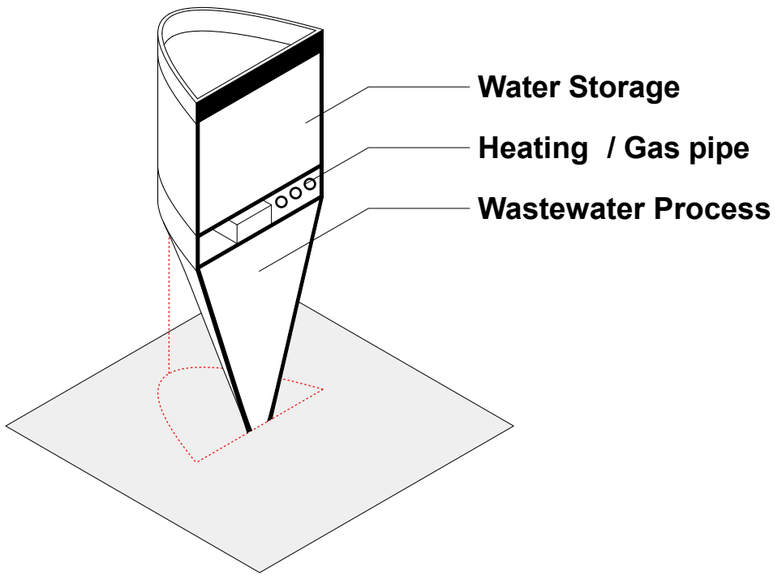
1. Lobby
2. Cloakroom
3. Massage
4. Cool Pool
5. Showers
6. Rest Room
7. Warm Pool
8. Hot Pool


Water Storage
Chemical Treatment
Water Storage
Physical Treatment
Walking Path
Walking Path
Bathing Pool
Walking Path

WATER TANKS


3.0m
10m
4.2m


Steel Structure
Transparent Tank


Water Storage
Heating / Gas pipe
Wastewater Process

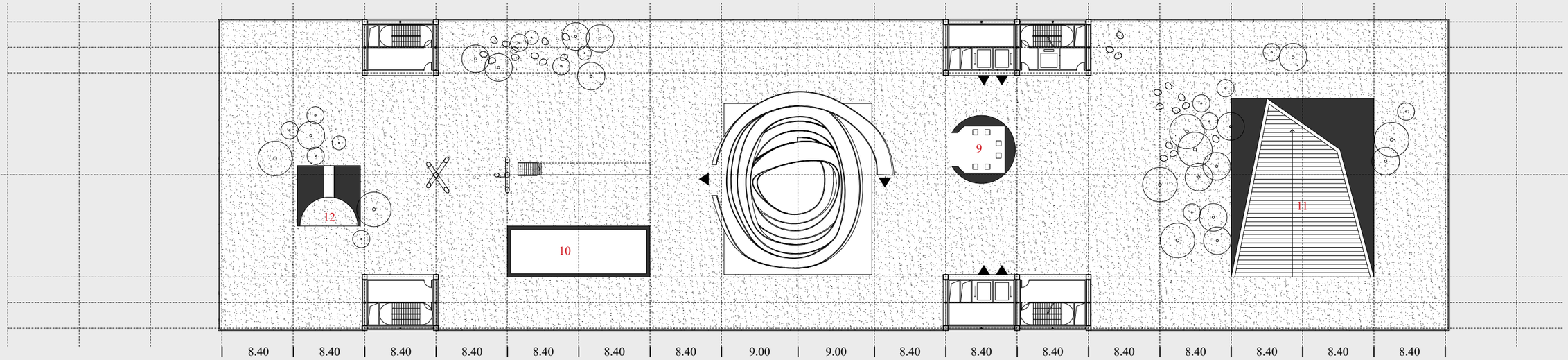
WATER TANKS



WATER TANKS



BATHING



Water Platform 22.0m Level

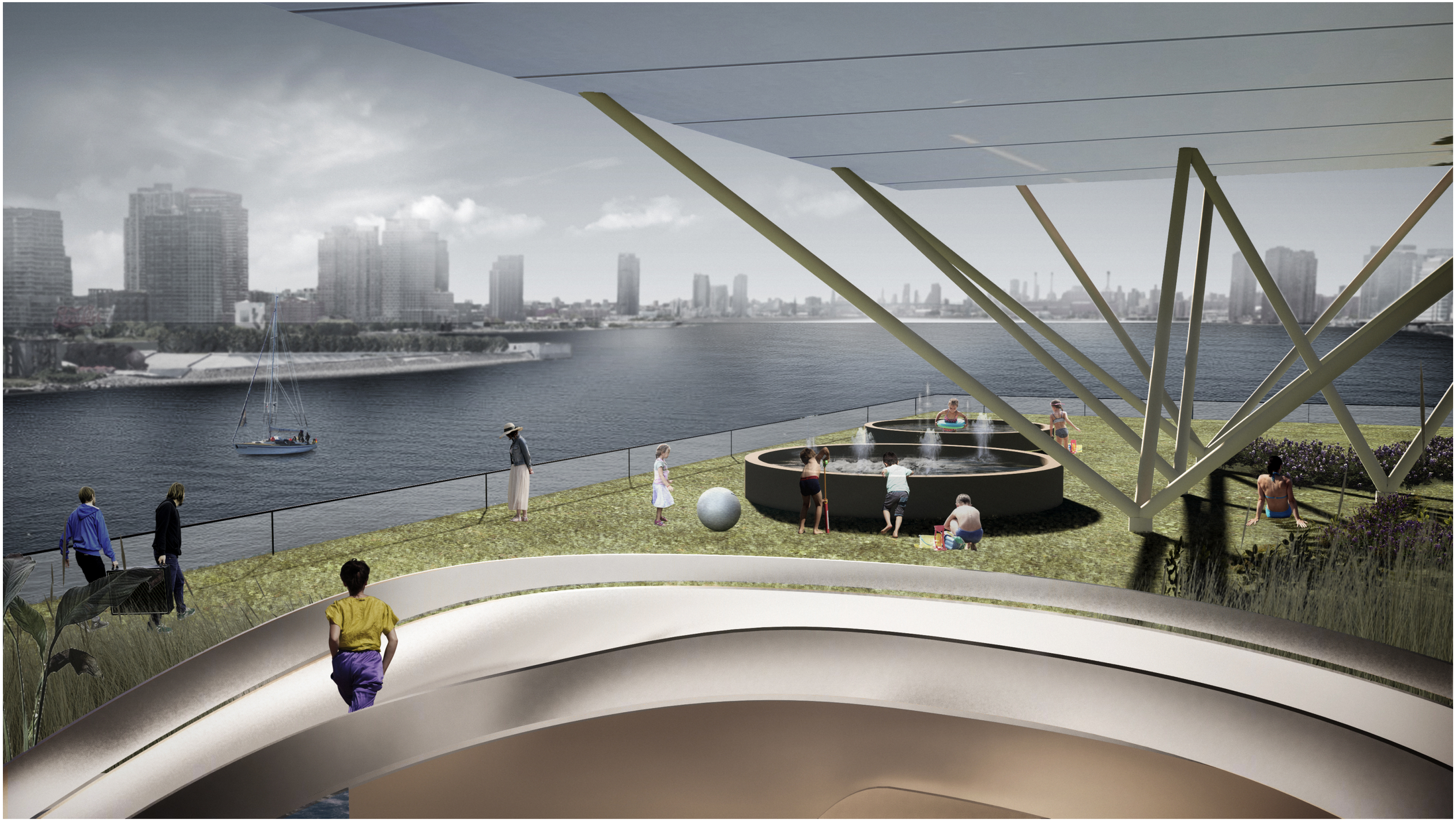
0 5 10

▲ Access

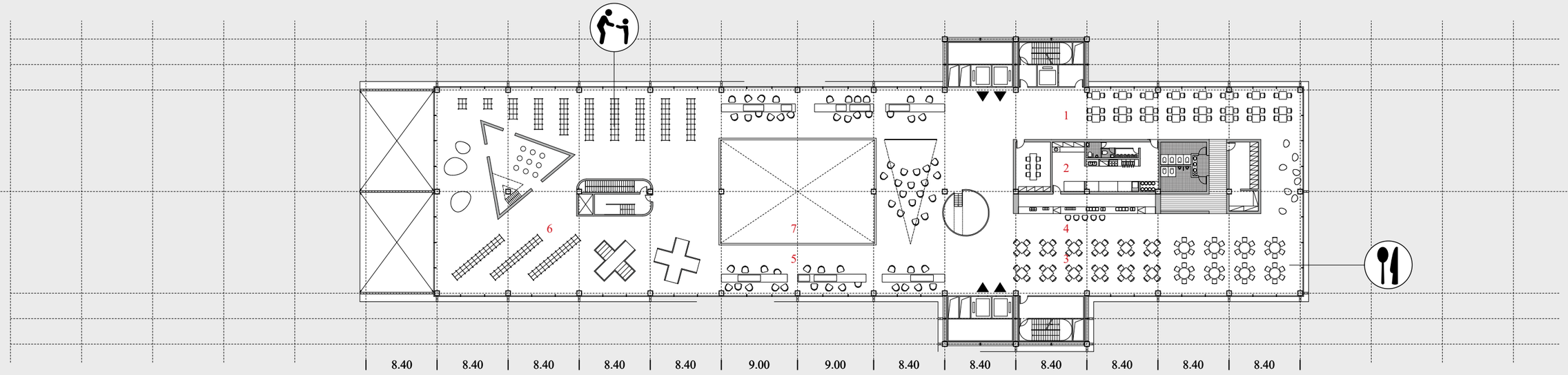
9. Reception
10. Fountain
11. Viewing Place
12. Waterfall



WATER PLATFORM



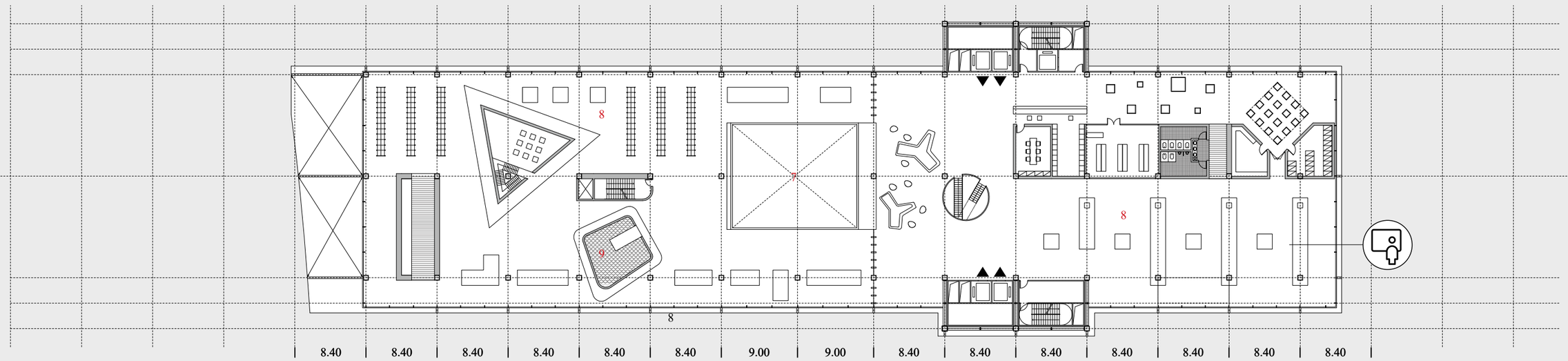
WATER PLATFORM



Foodbar&Workshop 35m Level

0 5 10

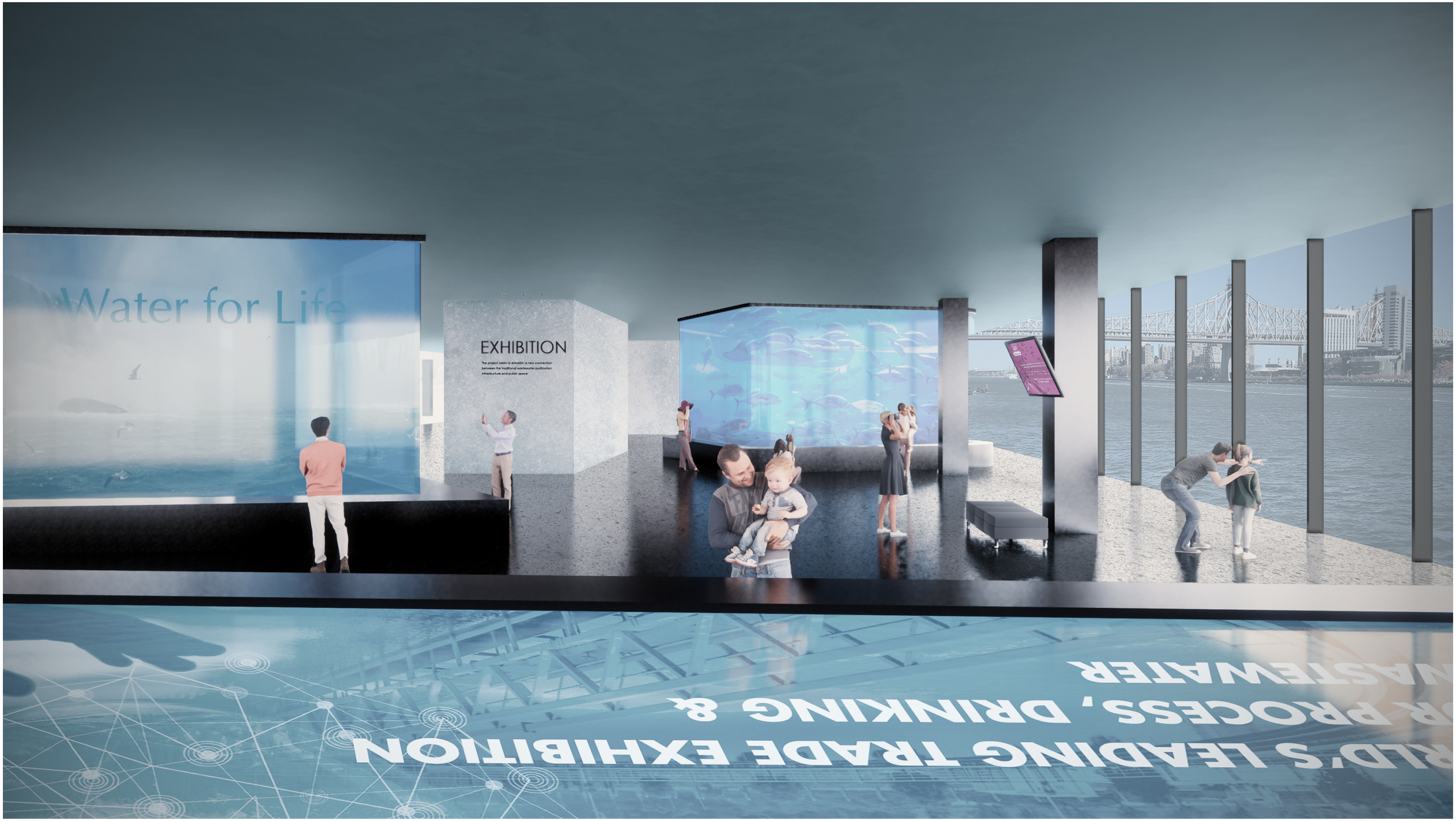
1. Lobby
2. Kitchen
3. Seatings
4. Bar
5. Coffee
6. Workshop (Parents-Child)
7. Atrium



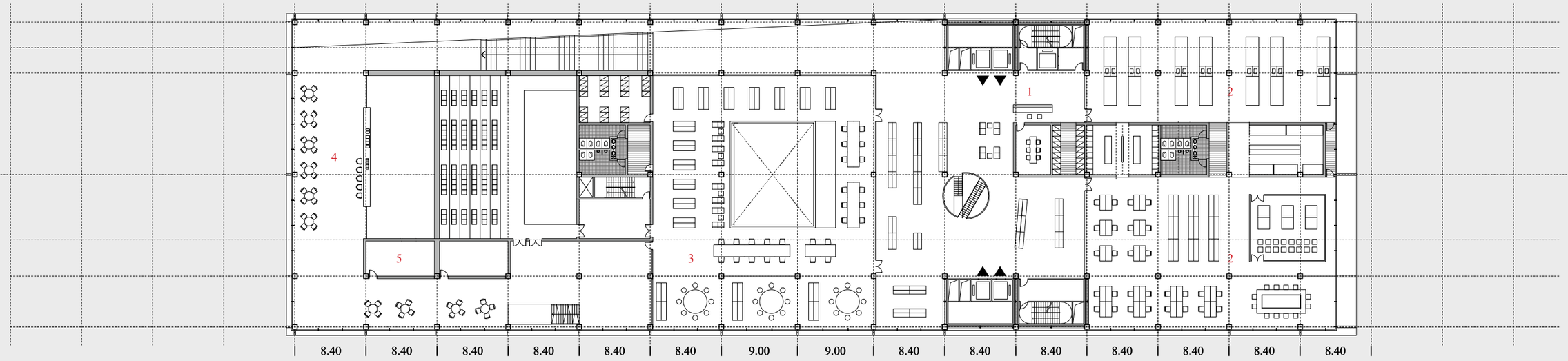
Exhibition 39.2m Level

0 5 10

7. Atrium
8. Open Gallery
9. Interactive Rooms


Water for Life
EXHIBITION
The project seeks to establish a new connection
between the traditional wastewater purification
infrastructure and public space
WORLD'S LEADING TRADE EXHIBITION
WATER PROCESS, DRINKING &
WASTEWATER

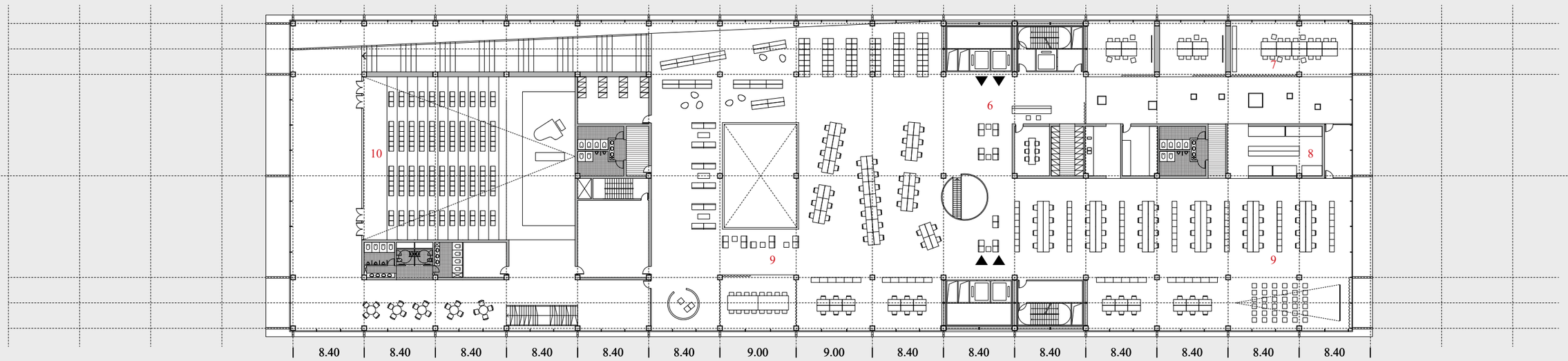
EXHIBITION



Research Center 43.4m Level

0 5 10

1. Lobby
2. Labs
3. Archive
4. Bar
5. Storage



1

Office 47.6m Level

0 5 10

6. Office Lobby
7. Meeting Rooms
8. Printing
9. Open Office
10. Auditorium



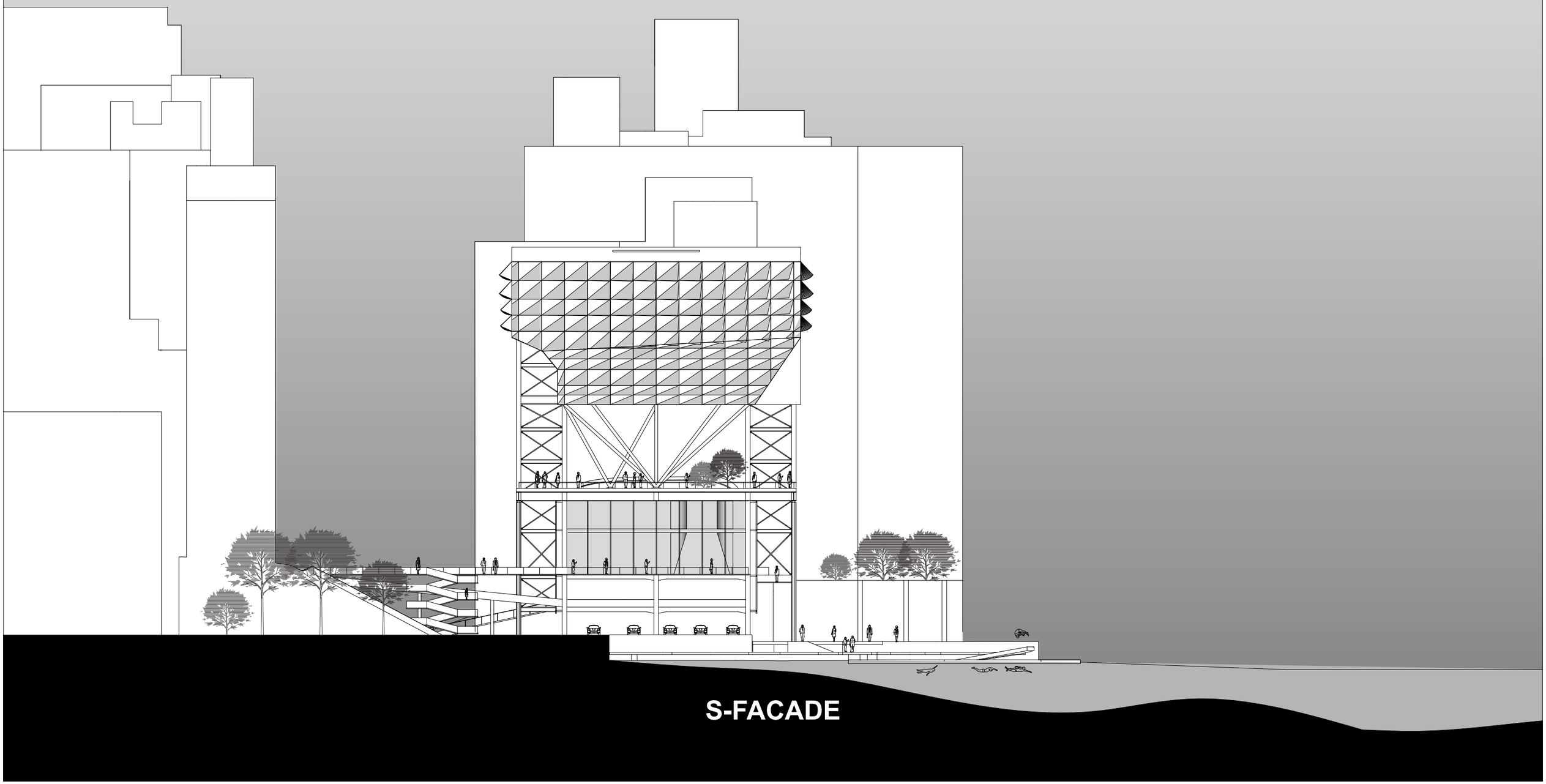
AUDITORIUM



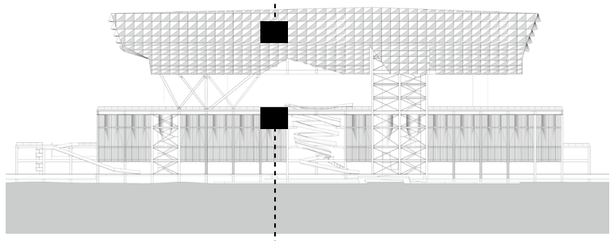
OPEN OFFICE

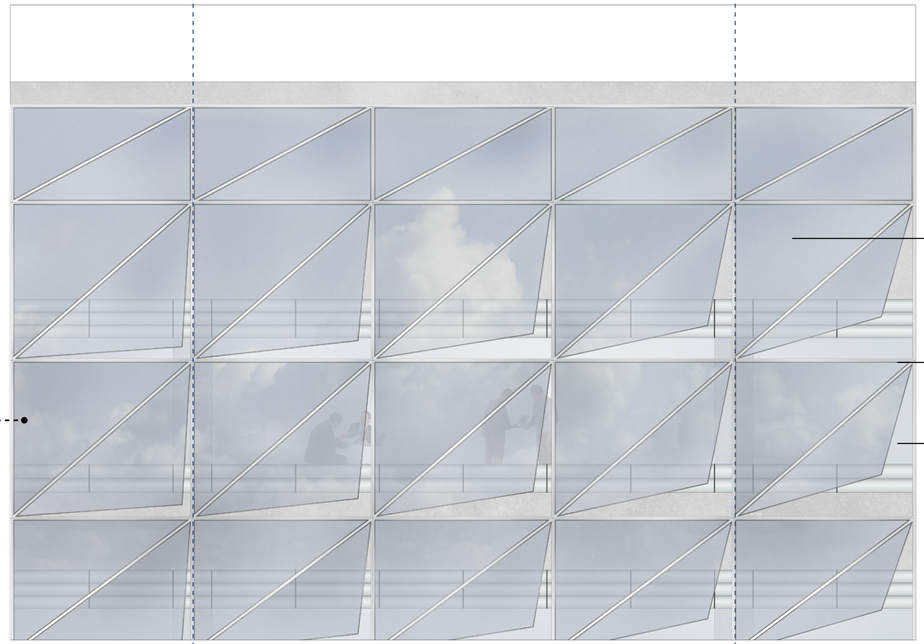
E-FACADE

from River to Island



S-FACADE





Mirror Material (Outer)

Aluminium Frame

Laminated Glazing (Inner)

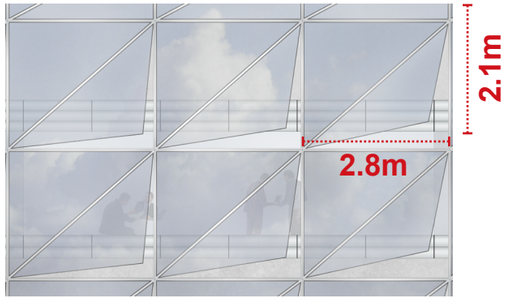


Steel Beam

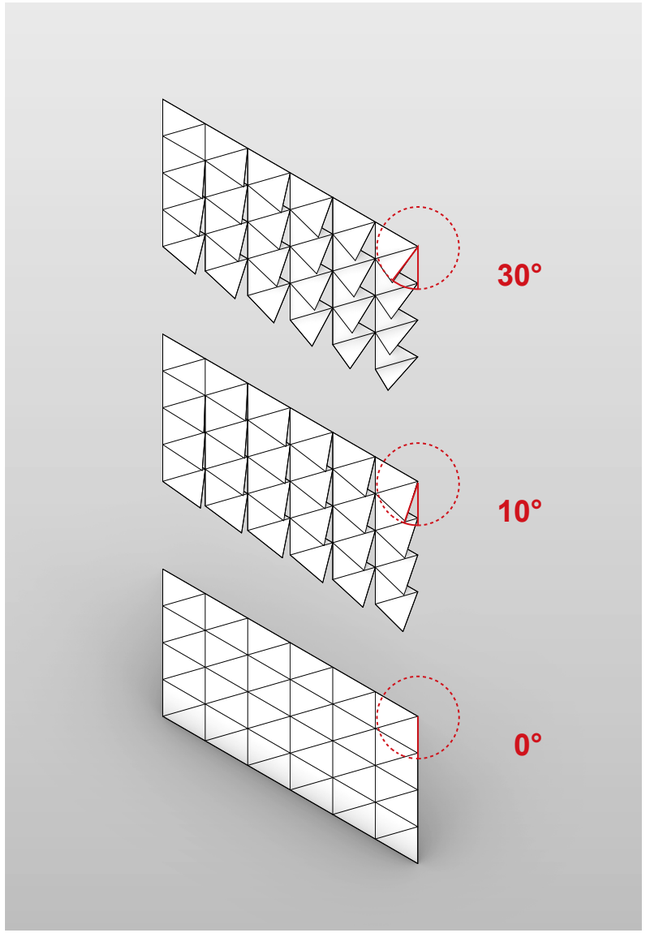
Steel Column

Metal Mesh

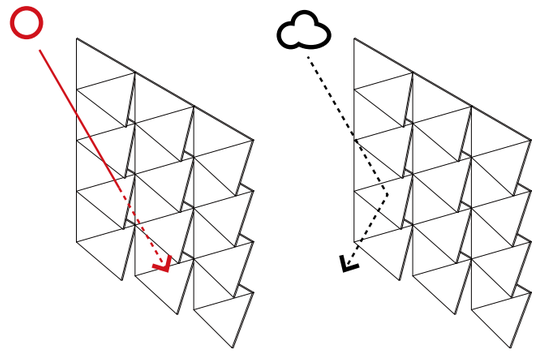
FACADE MATERIAL



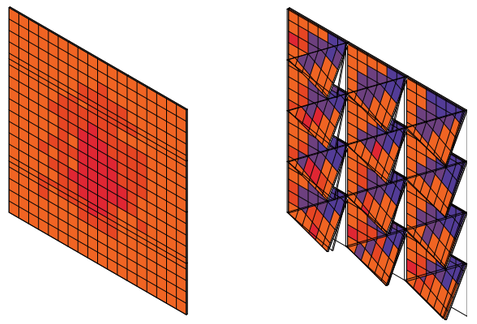
Single Panel



Interative facade



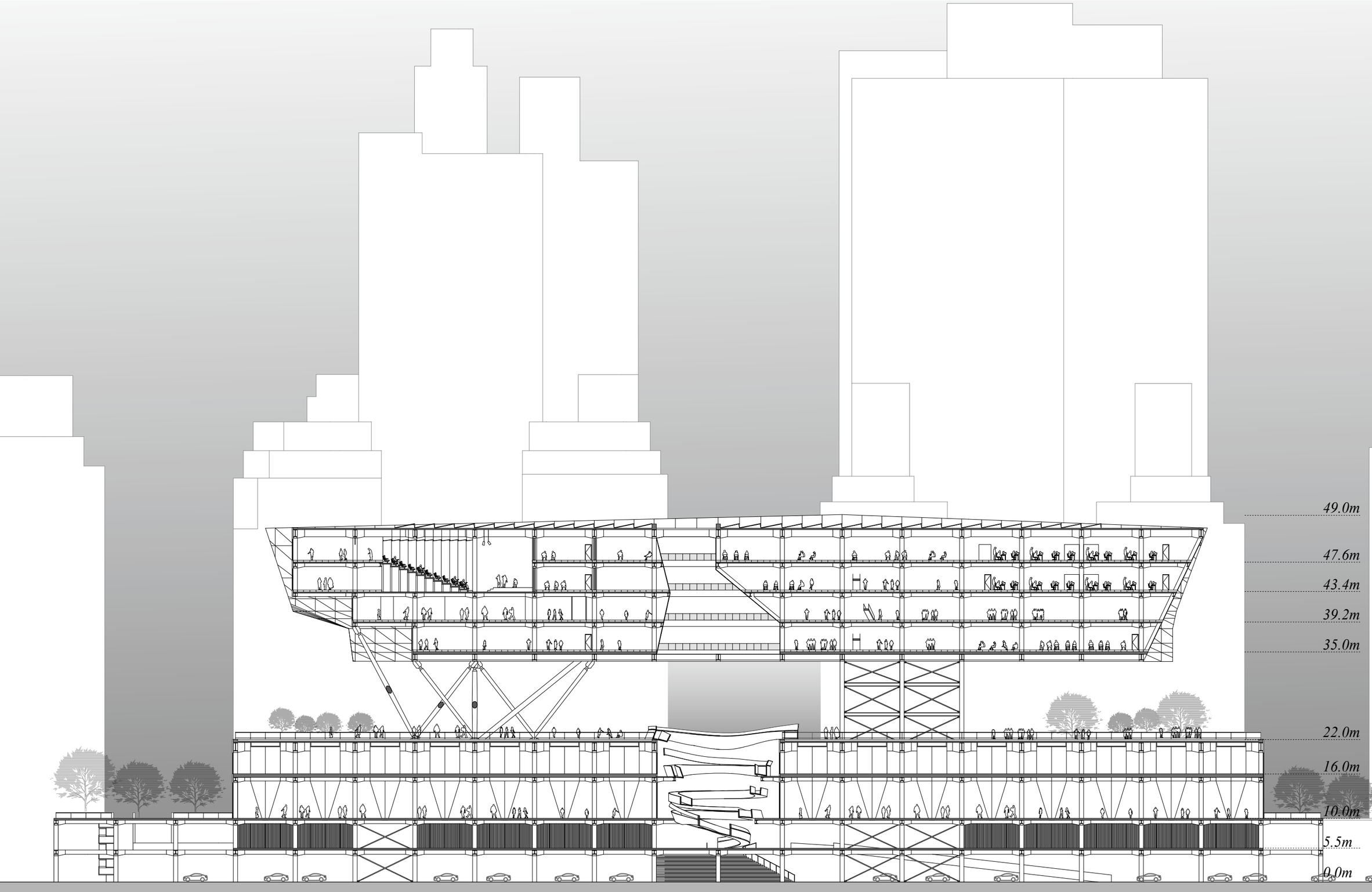
sun **rain**

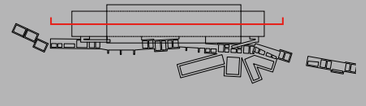


traditional surface

Solar radiation
-23%

CLITICAL FACADE





SECTION

AUDITORIUM
ARCHIVE
OPEN OFFICE
RESEARCH CENTER
EXHIBITION
FOODBAR
WATER PLATFORM
THERMAL BATH
WATER PLANT
PARKING
FDR DRIVE

Institutions
Public Space
Infrastructure

SECTION

49.0m

47.6m

43.4m

39.2m

35.0m

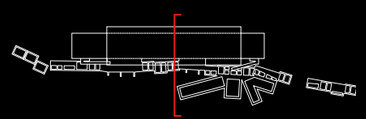
22.0m

16.0m

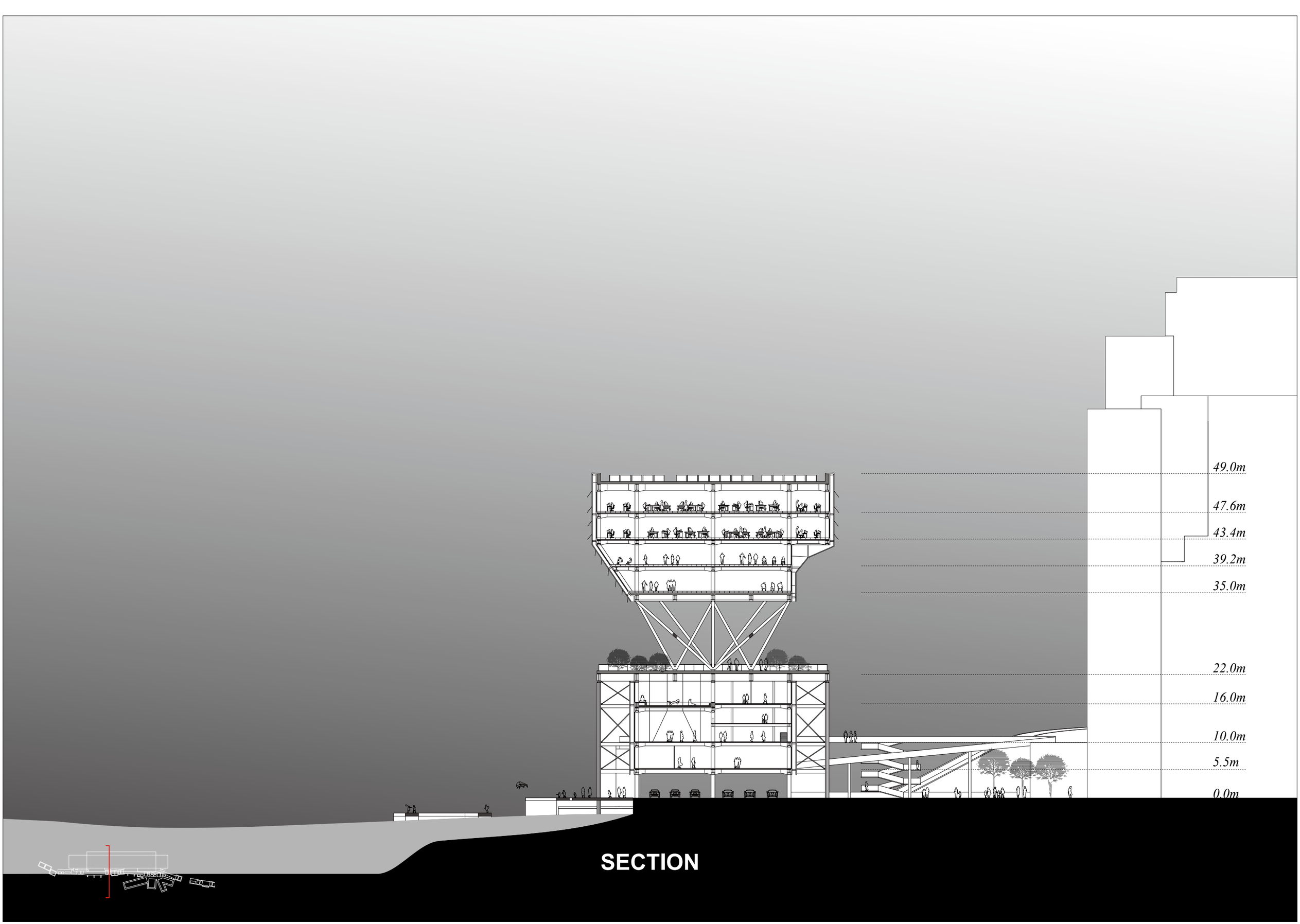
10.0m

5.5m

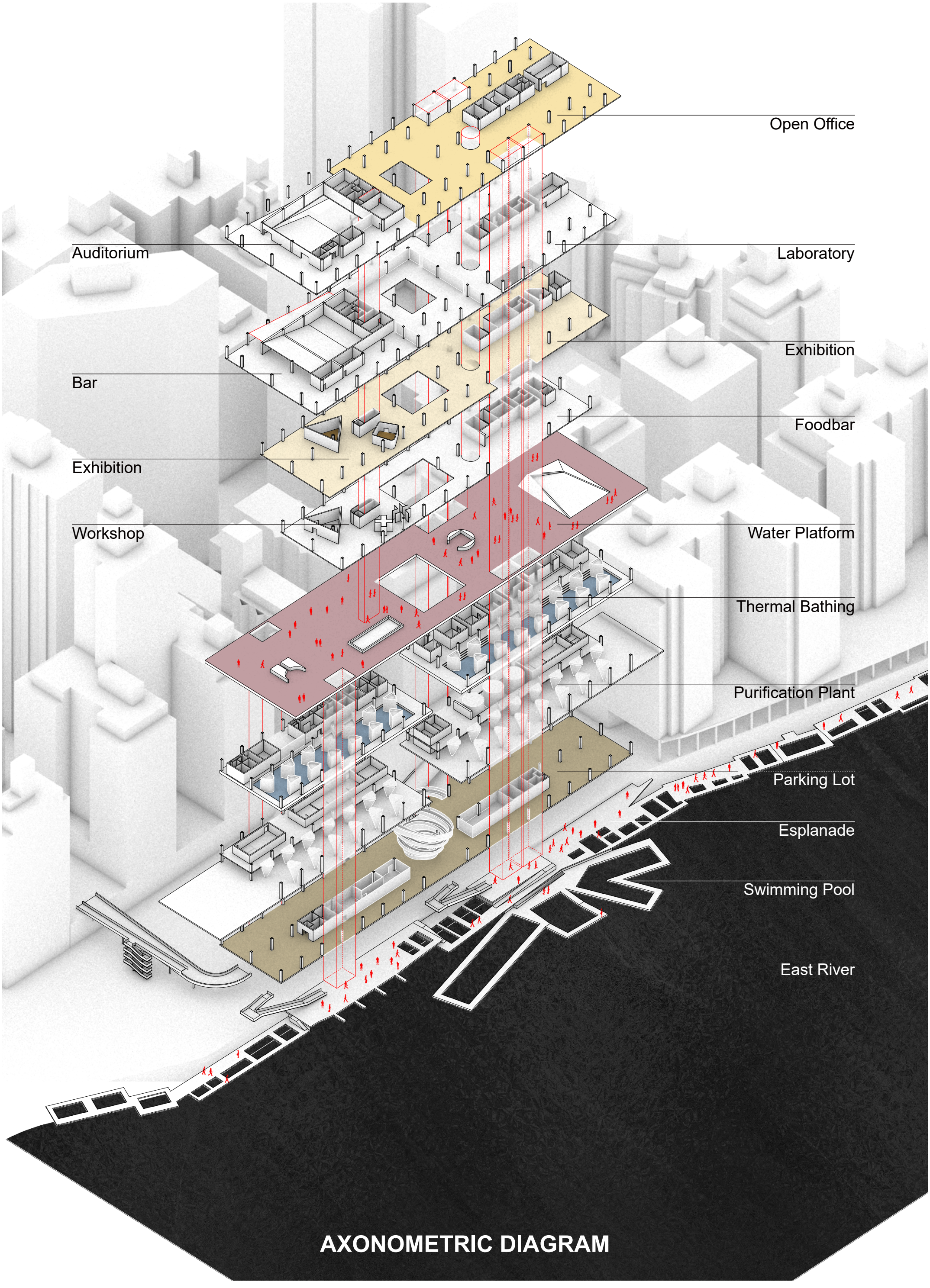
0.0m



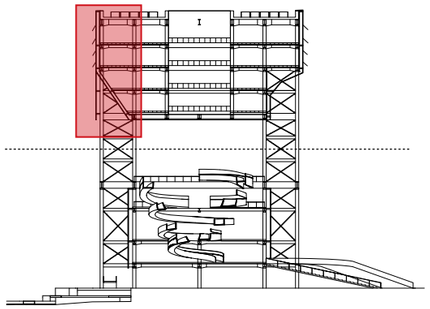
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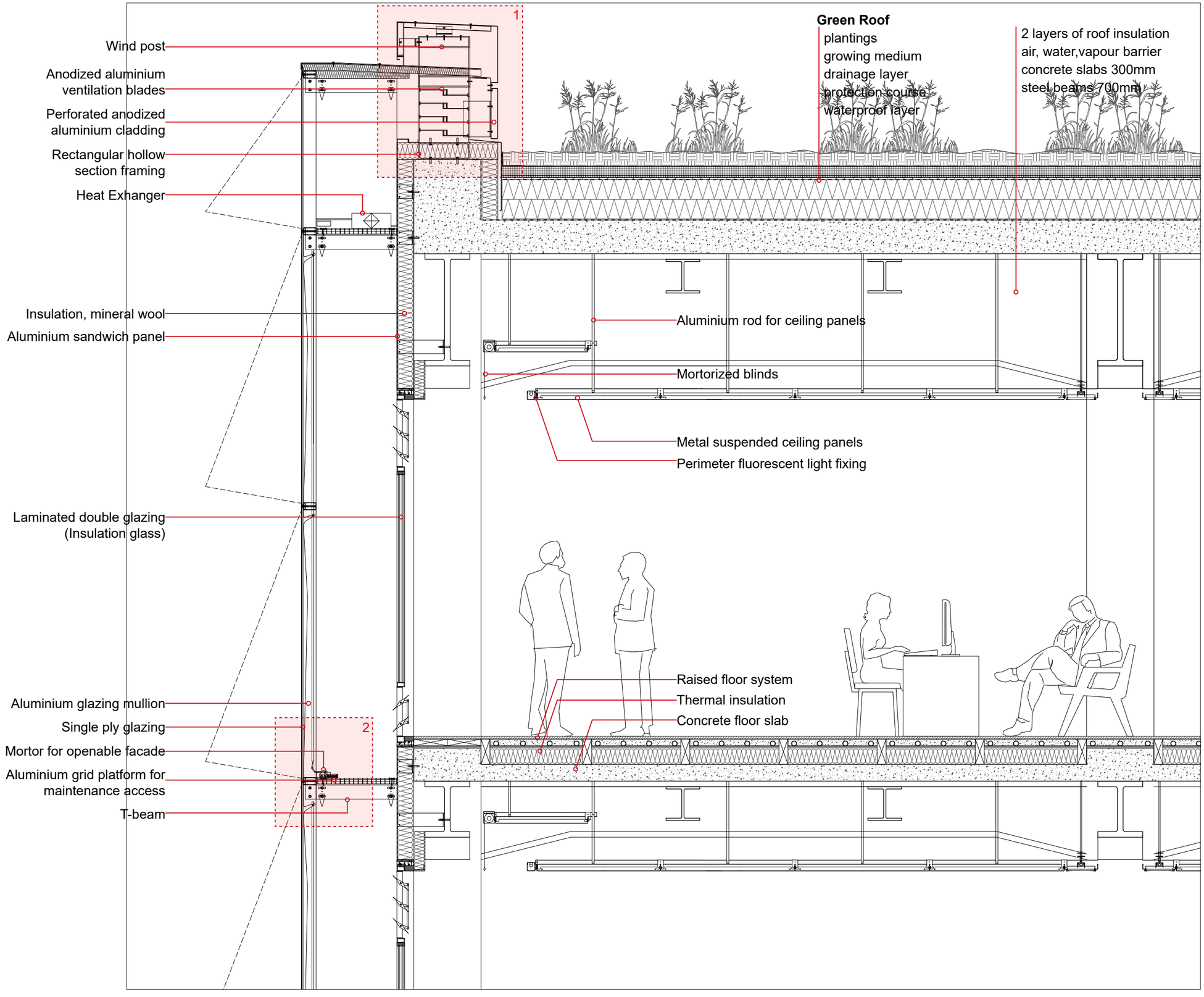


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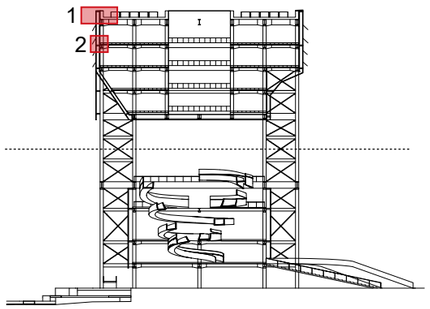


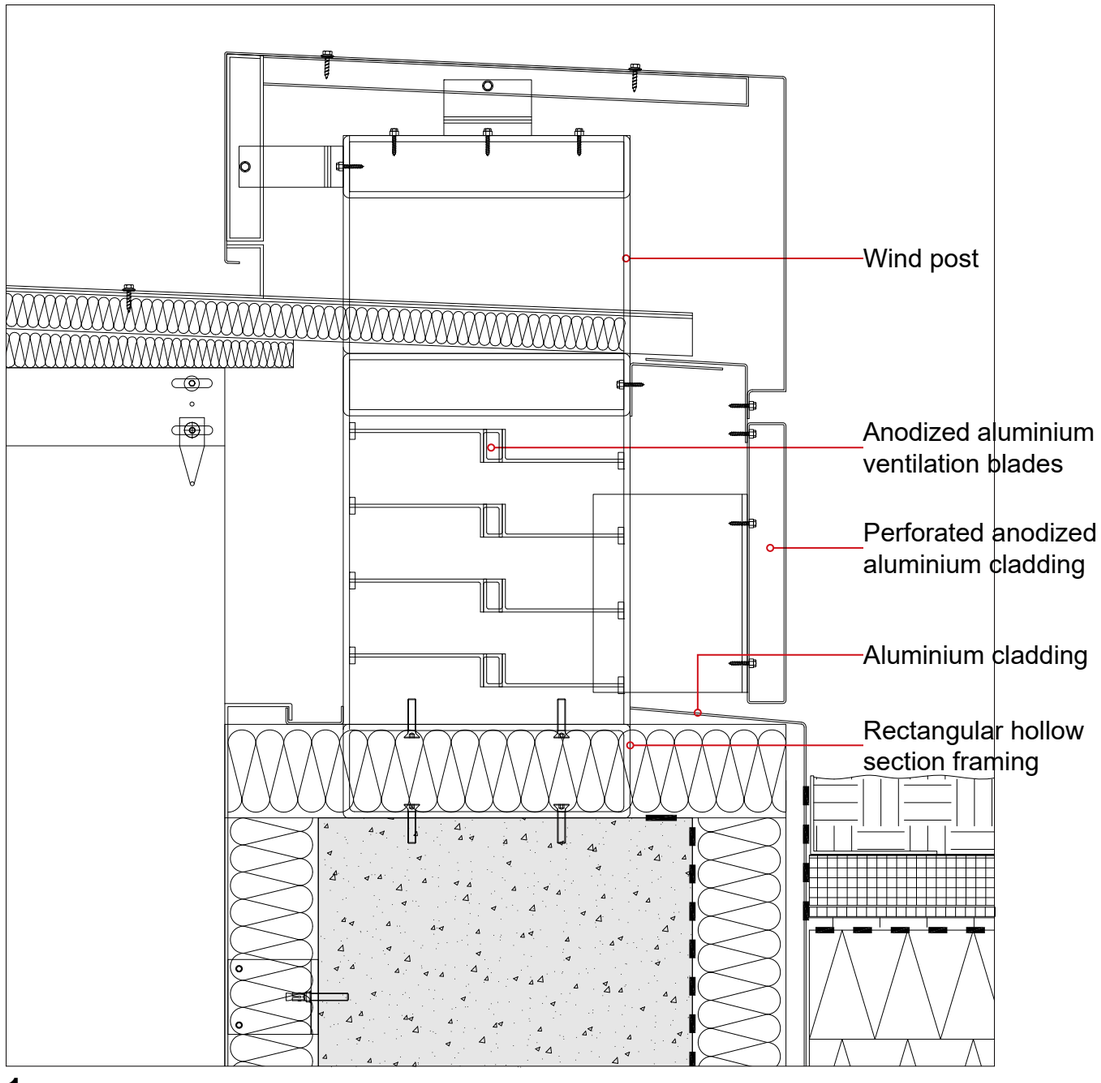
AXONOMETRIC DIAGRAM



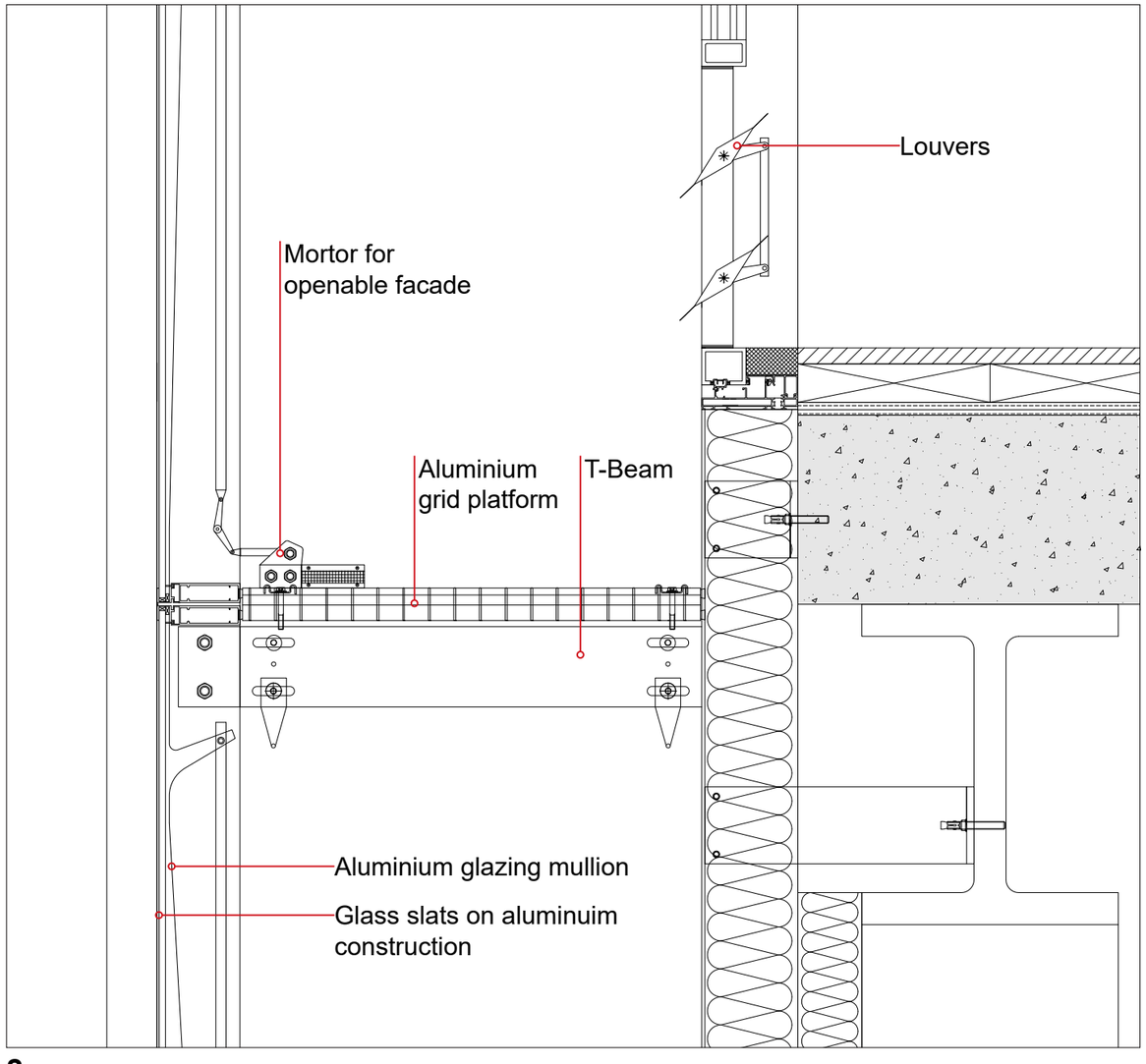

1
2
Wind post
Anodized aluminium ventilation blades
Perforated anodized aluminium cladding
Rectangular hollow section framing
Heat Exhanger
Insulation, mineral wool
Aluminium sandwich panel
Laminated double glazing (Insulation glass)
Aluminium glazing mullion
Single ply glazing
Mortor for openable facade
Aluminium grid platform for maintenance access
T-beam
Green Roof
plantings
growing medium
drainage layer
protection course
waterproof layer
2 layers of roof insulation
air, water,vapour barrier
concrete slabs 300mm
steel beams 700mm
Aluminium rod for ceiling panels
Mortorized blinds
Metal suspended ceiling panels
Perimeter fluorescent light fixing
Raised floor system
Thermal insulation
Concrete floor slab

DETAIL 1:20


1
2

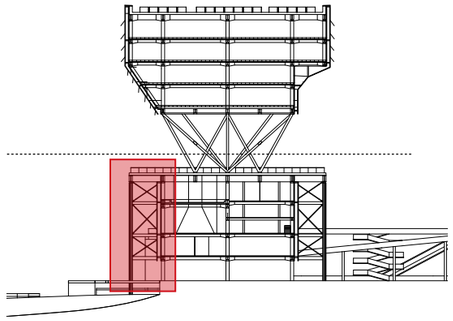

Wind post
Anodized aluminium ventilation blades
Perforated anodized aluminium cladding
Aluminium cladding
Rectangular hollow section framing

1


Louvers
Mortor for openable facade
Aluminium grid platform
T-Beam
Aluminium glazing mullion
Glass slats on aluminuim construction

2

DETAIL 1:5

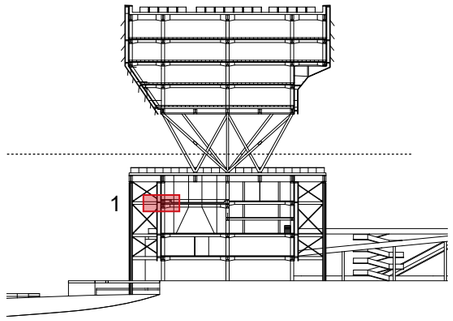


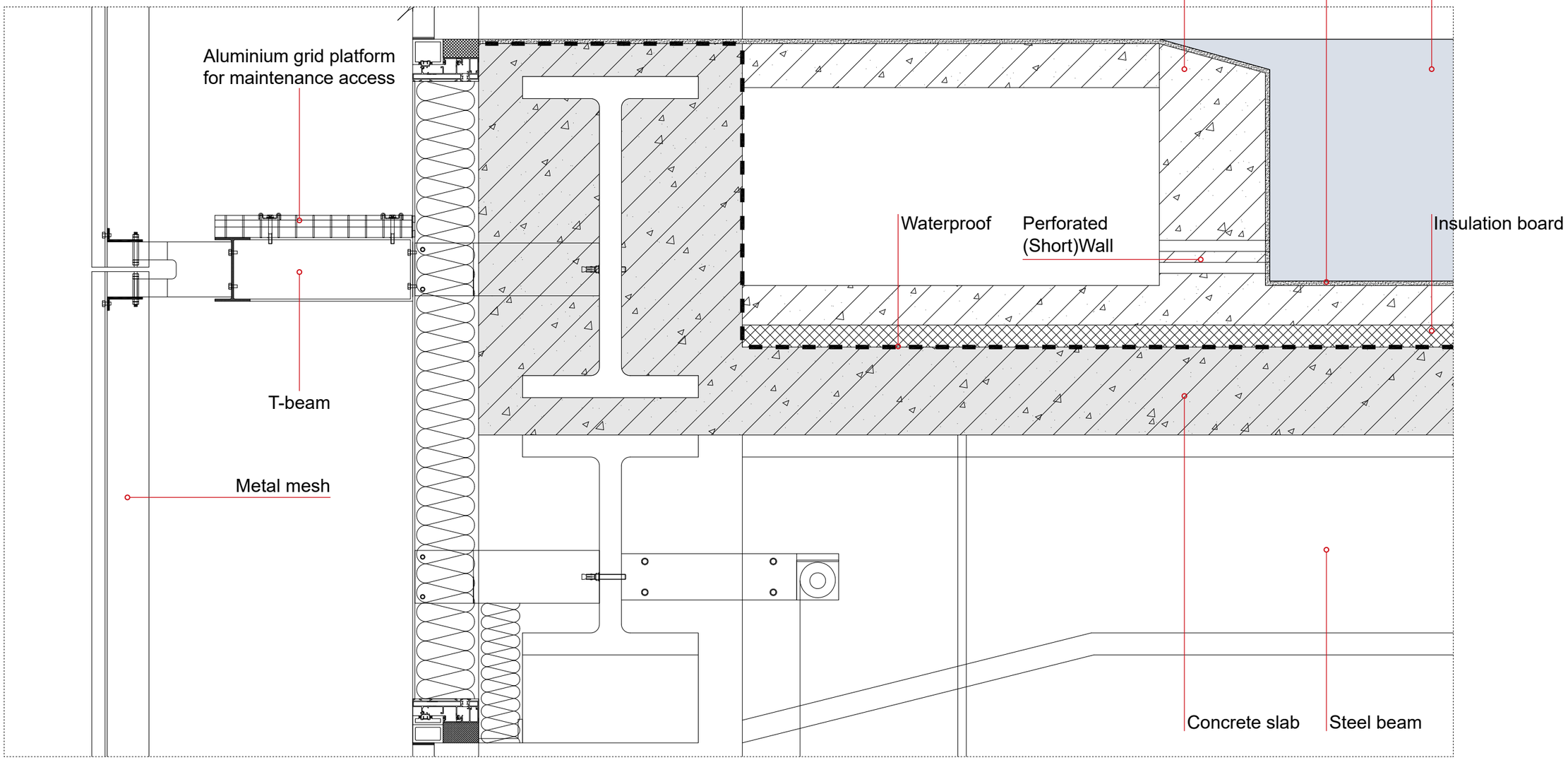
Glazing
Aluminium glazing mullion
T-beam
Steel Column
Metal mesh
Aluminium grid platform
for maintenance access
T-beam

GREEN ROOF
Plantings
Growing medium
Drainage layer
Protection course
Waterproof layer

POOL SYSTEM
Water
Finished mortar
Reinforced concrete
Insulation board
Waterproof
Concrete slab
Steel beam

DETAIL 1:20

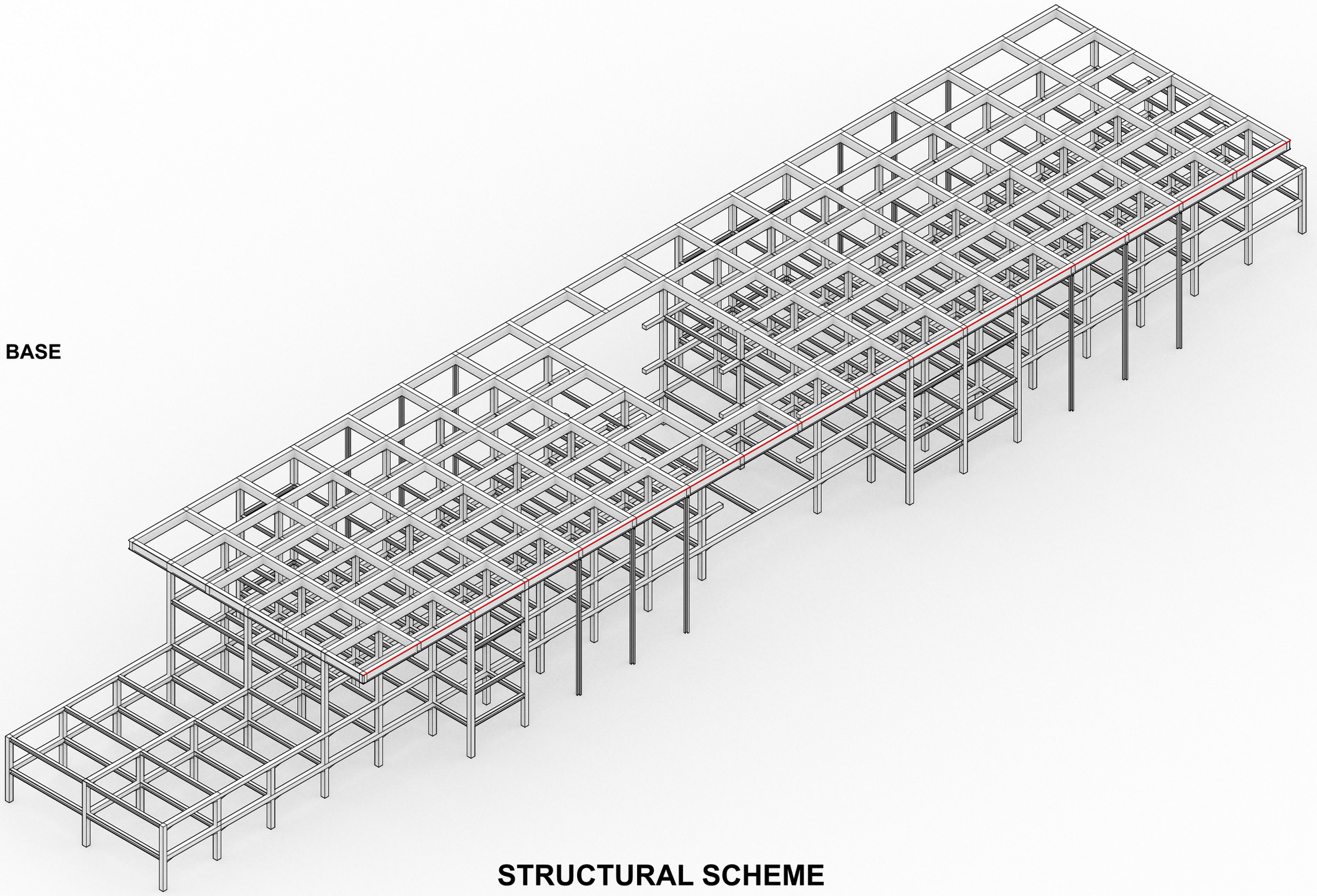

1


Reinforced concrete
Finished mortar
Water
Aluminium grid platform for maintenance access
Waterproof
Perforated (Short)Wall
Insulation board
T-beam
Metal mesh
Concrete slab
Steel beam

1

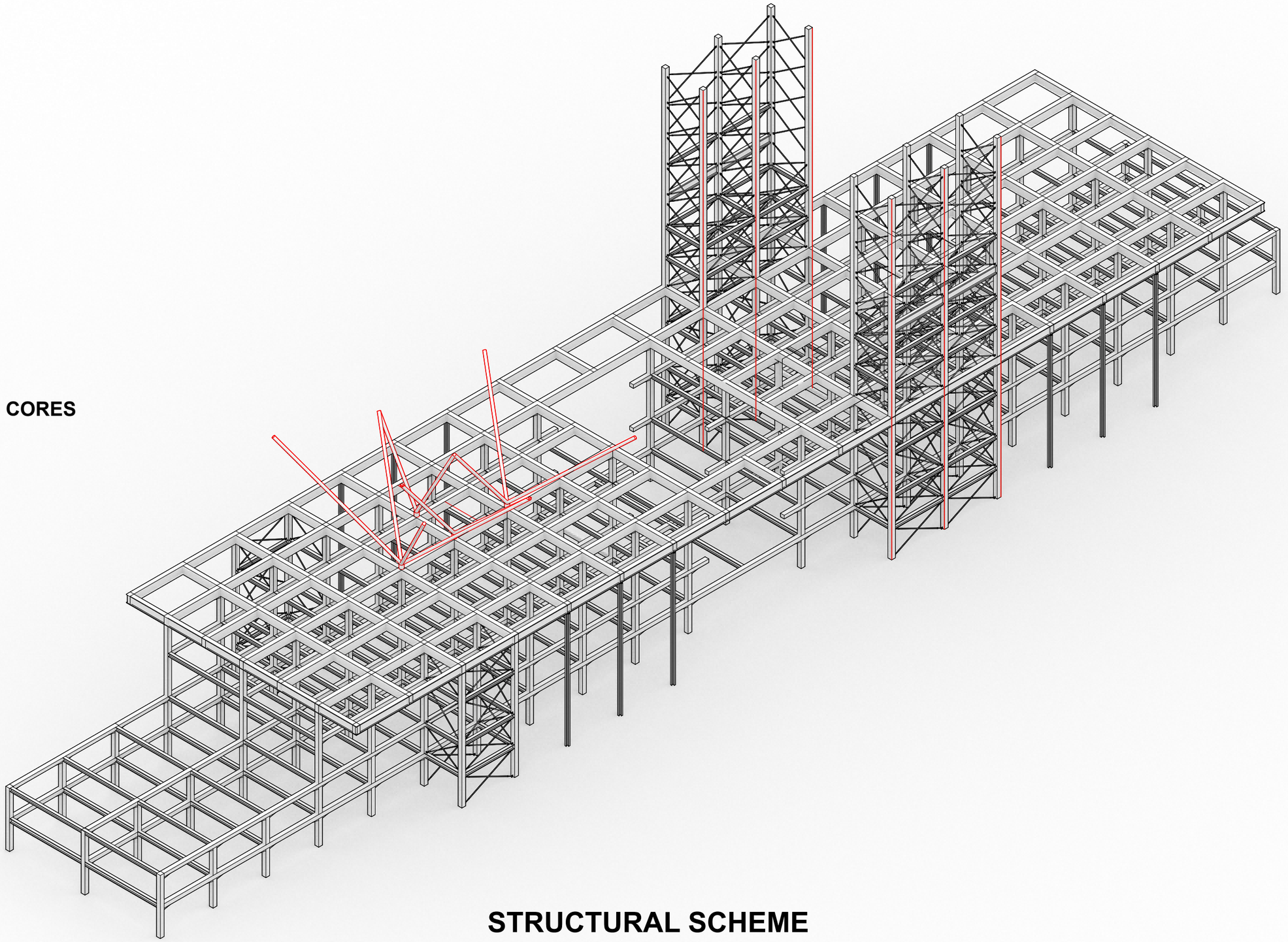
DETAIL 1:5

BASE



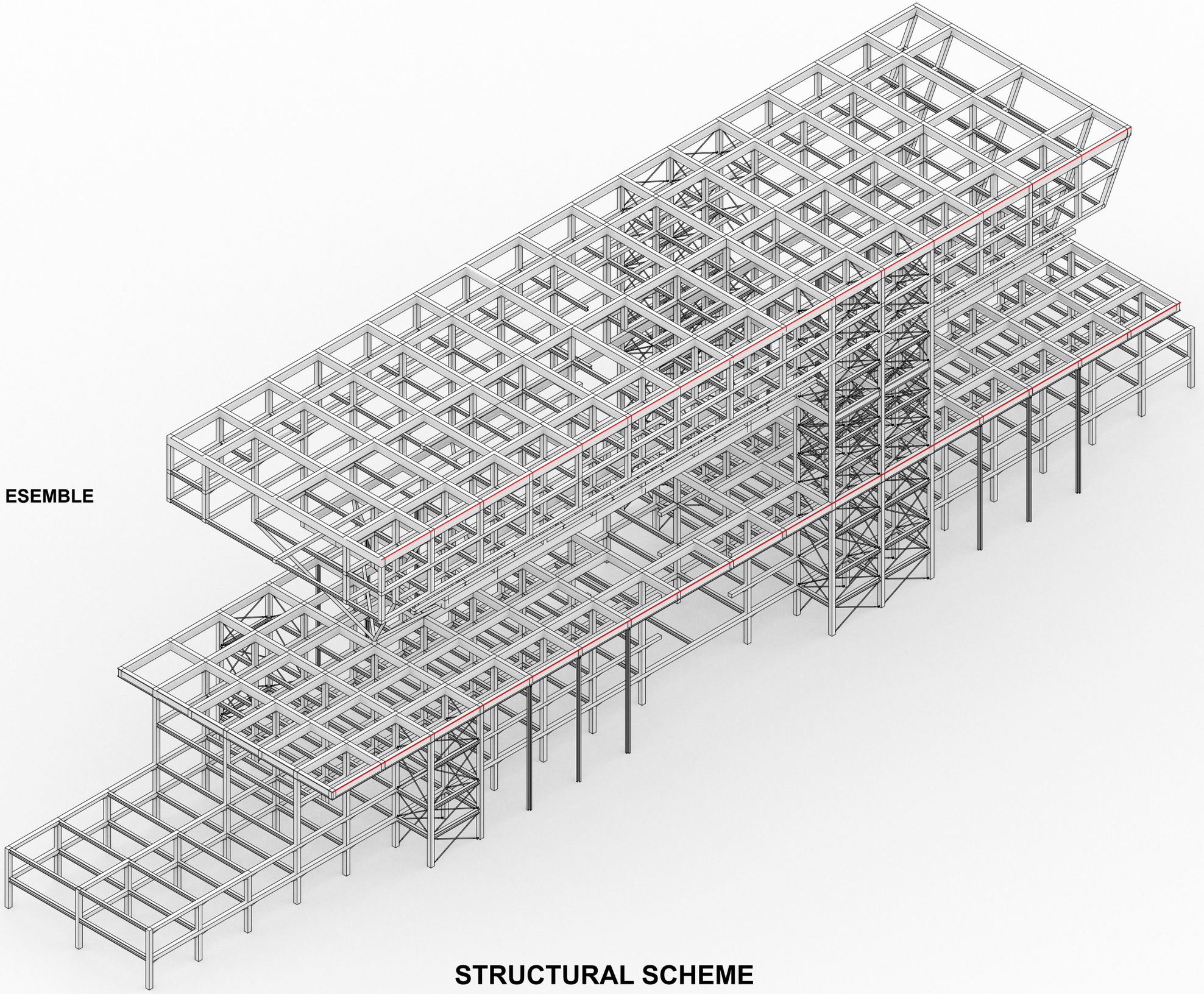
STRUCTURAL SCHEME

CORES

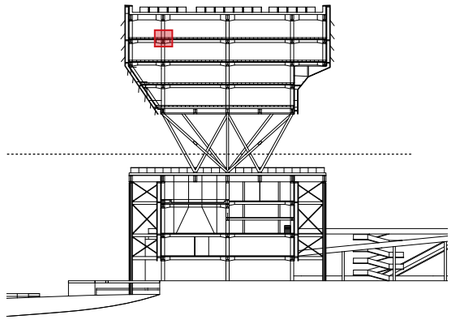


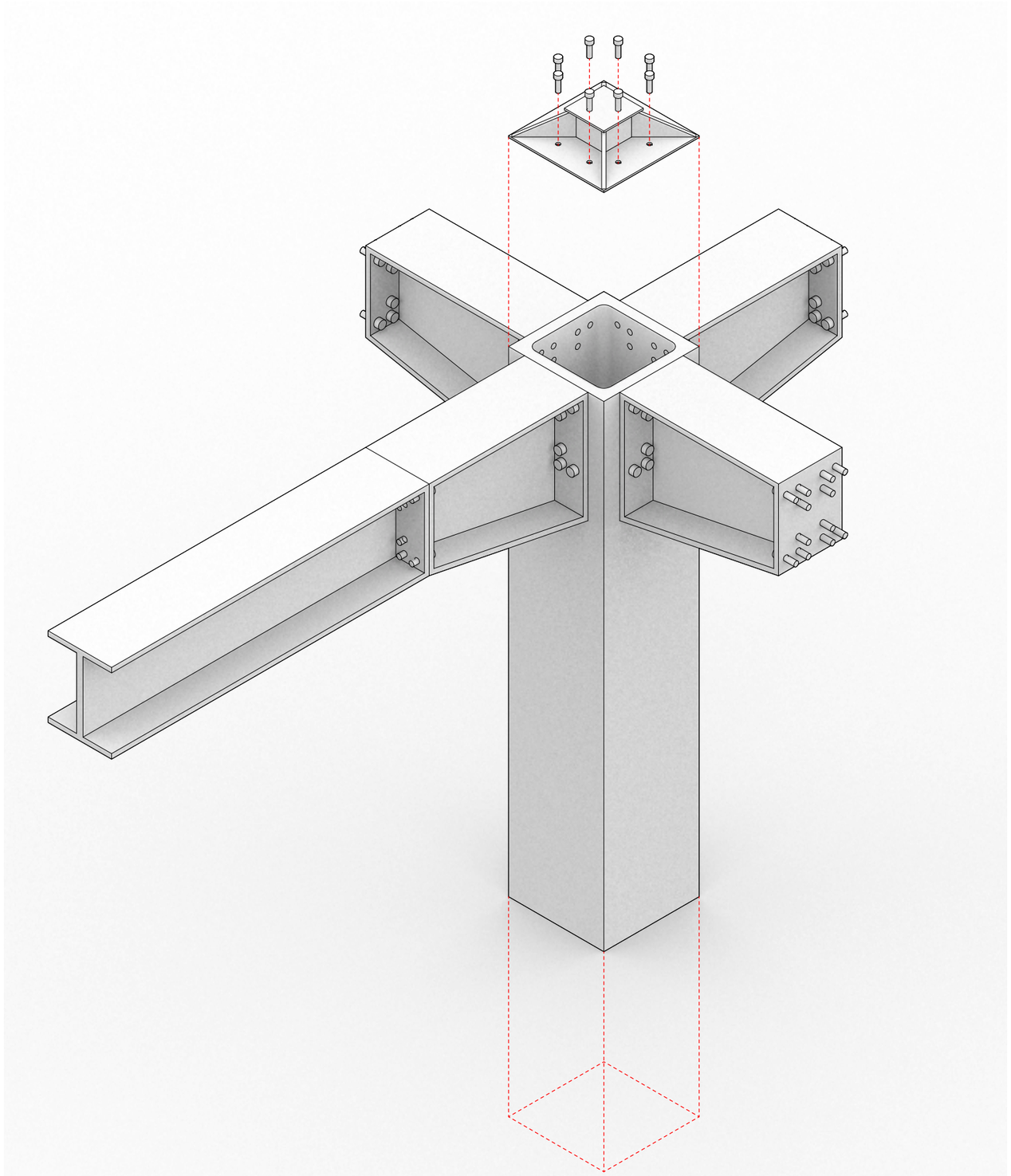
STRUCTURAL SCHEME

ESEMBLE



STRUCTURAL SCHEME





VIERENDEEL TRUSSE

Sum 60°

Win 30°

The 2nd Skin reduces heat gain and allows for passive cooling

Atrium facilitates ventilation and maximizes daylight, as well as provides shaded communal areas

Solar Panels

help reduce energy demand and provide hot water

Rainwater Collectors

Sunlight 50%

Feedback Loop

Support Neighborhoods

Natural Ventilation

Natural Ventilation

Evaporation

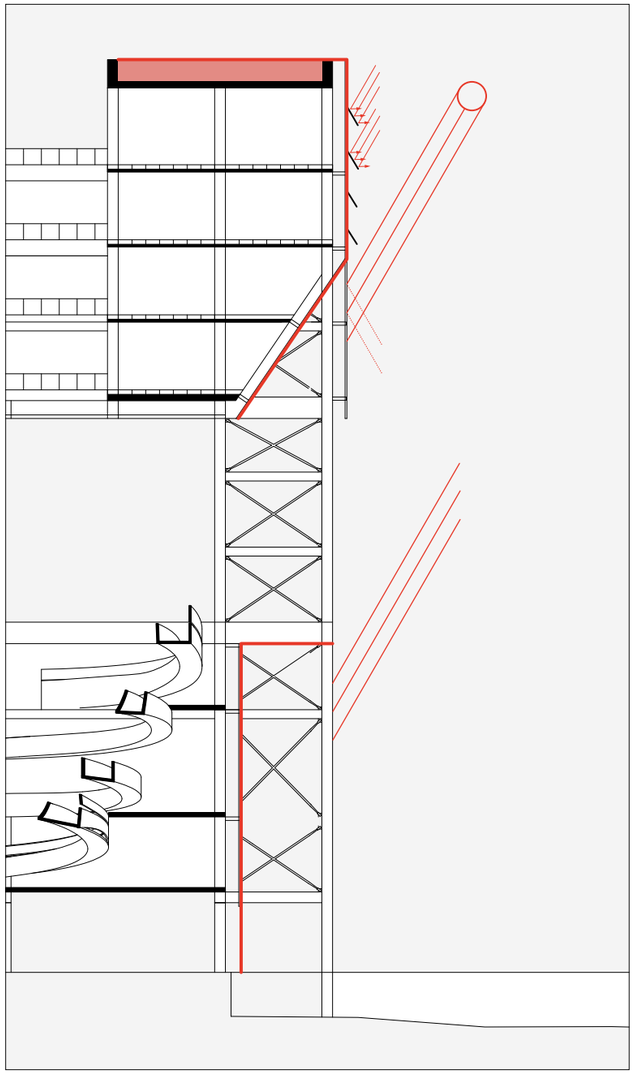
Irrigation

Support Neighborhoods

Discharging Clean Water

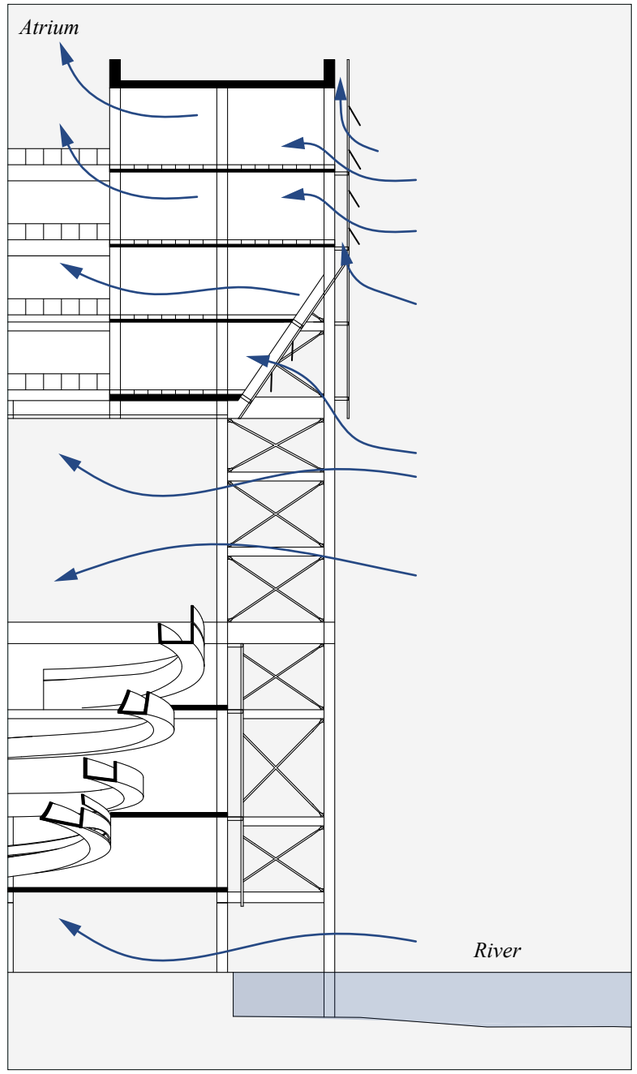
Collecting Dirty Water

CLIMATE STRATEGY



HEAT

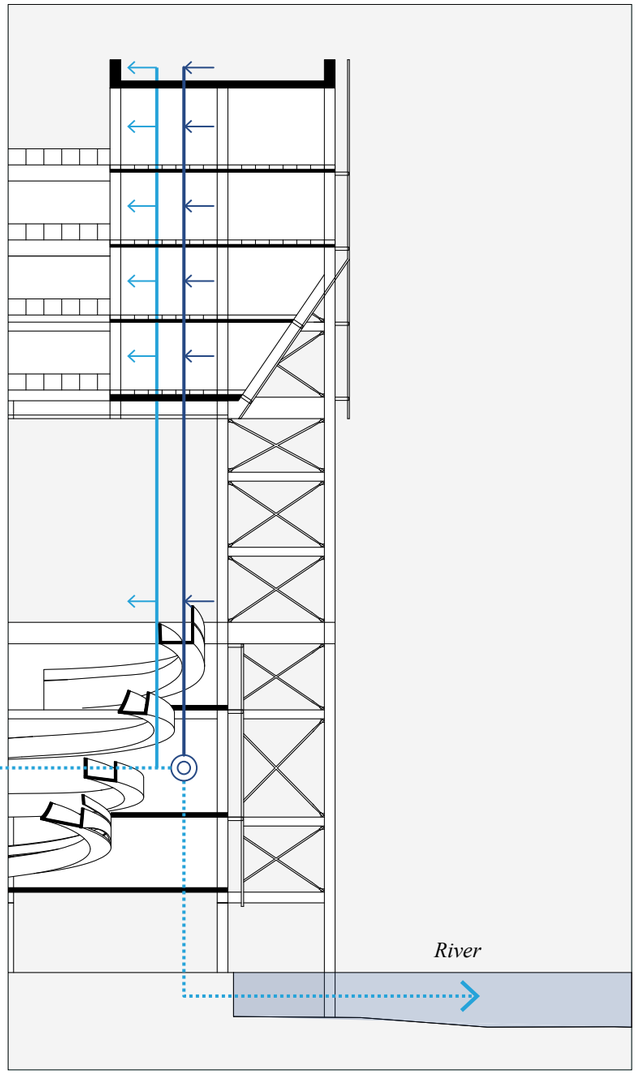
- The facade is sloped or recessed to minimize solar gain
- The 2nd Skin reduces heat gain and allows for passive cooling
- The top roof functions as a thermal buffer



AIR

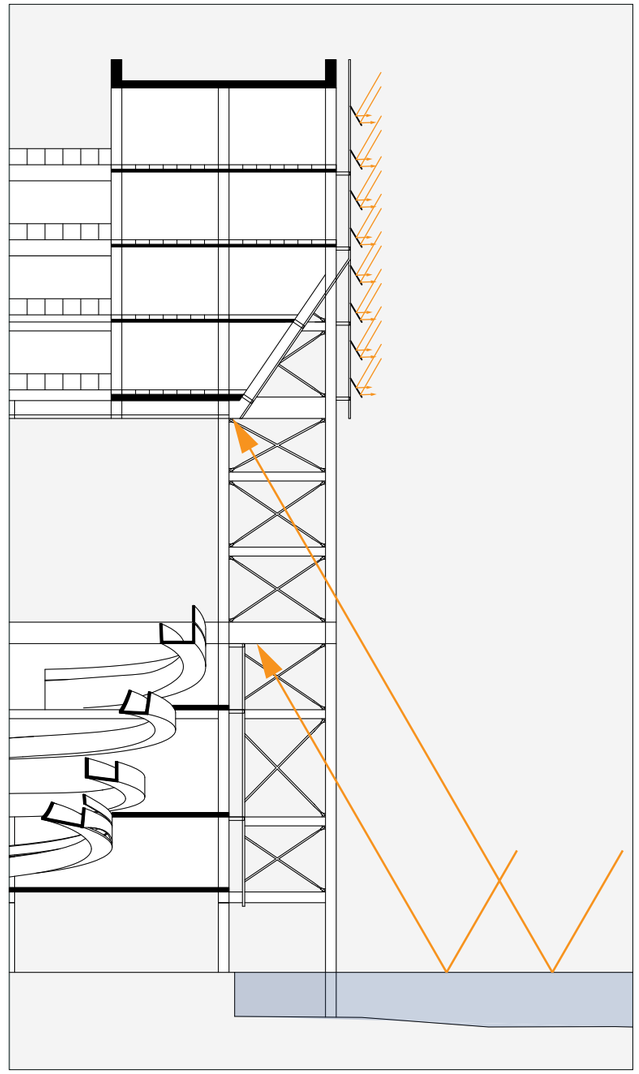
- The open spaces below and in-between allow natural ventilation
- The atrium creates a pressure difference to facilate air circulation

FRAGMENT PRINCIPLES



WATER

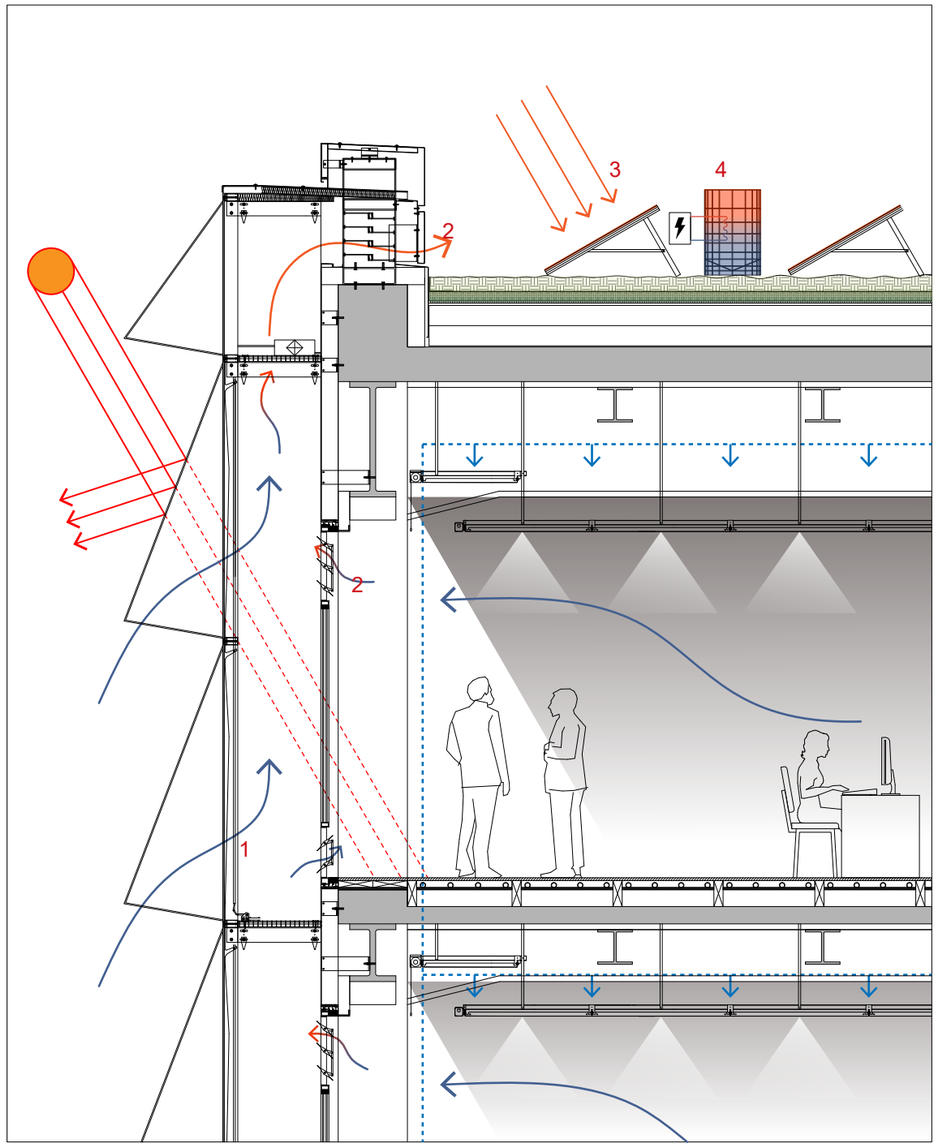
- Rainwater and sewage is collected and delivered to the wastewater plant before reusing and discharging



LIGHT

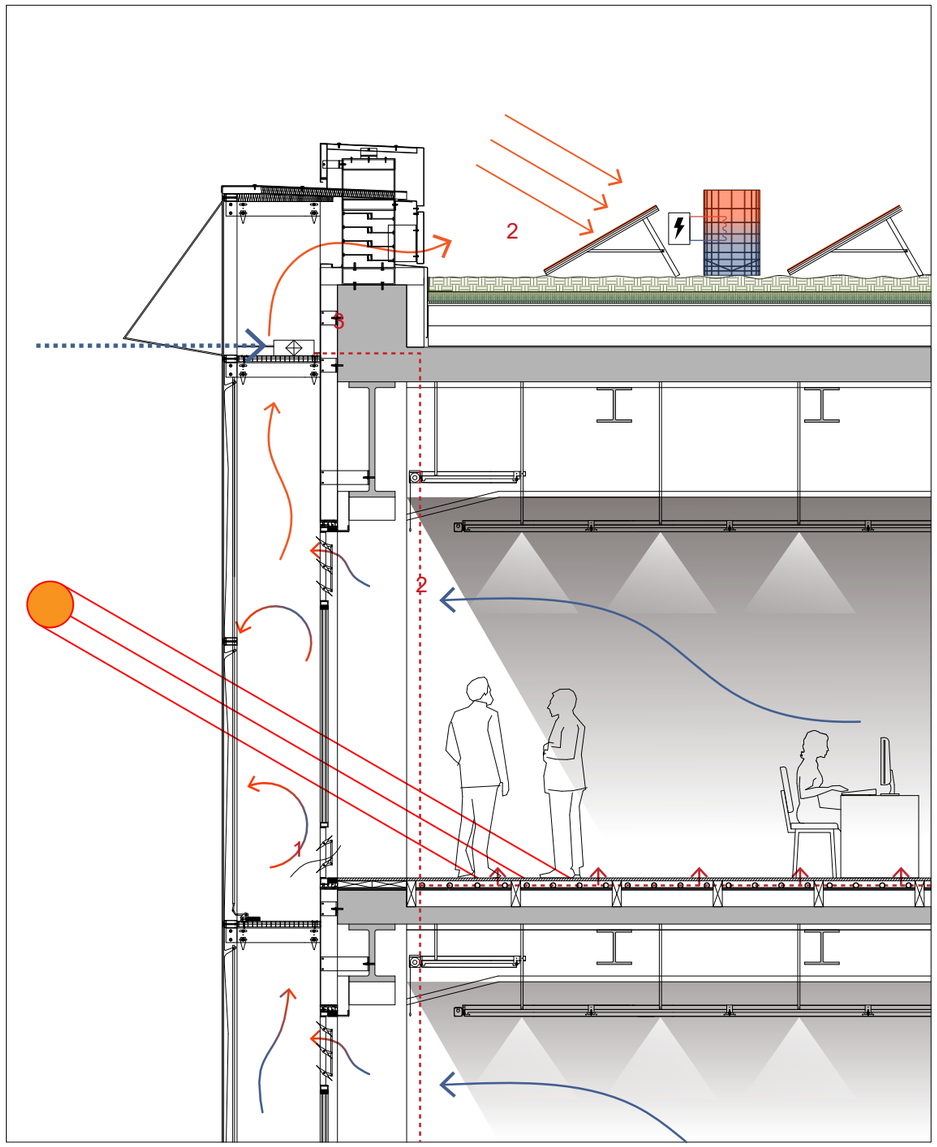
- The river reflects sunlight to brighten up the grey area
- The wave pattern of the reflected light provides a marine atmosphere

FRAGMENT PRINCIPLES



SUMMER DAY

1. Opened double facade skin, facade ventilation cools down building
2. Air exaust
3. Solar panels
4. Water basin for hot water supply



WINTER DAY

1. Closed double facade skin, facade ventilation greenhouse-effect warms up building
2. Air exaust
3. Heat-exchange units pre-heatventilation air

INTRODUCTION

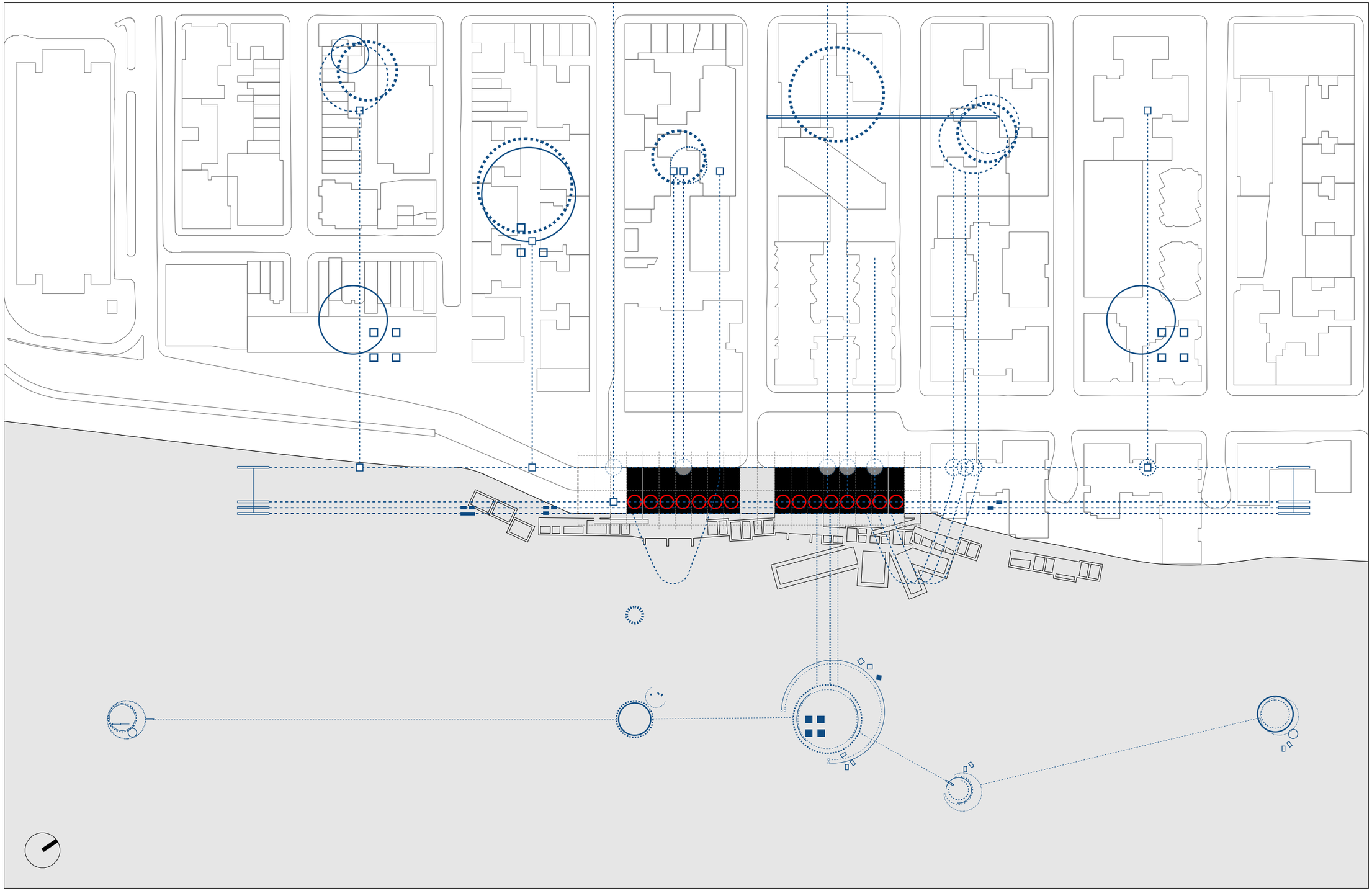
RESEARCH

SITE ARGUMENT

DESIGN

IMPLEMENTATION

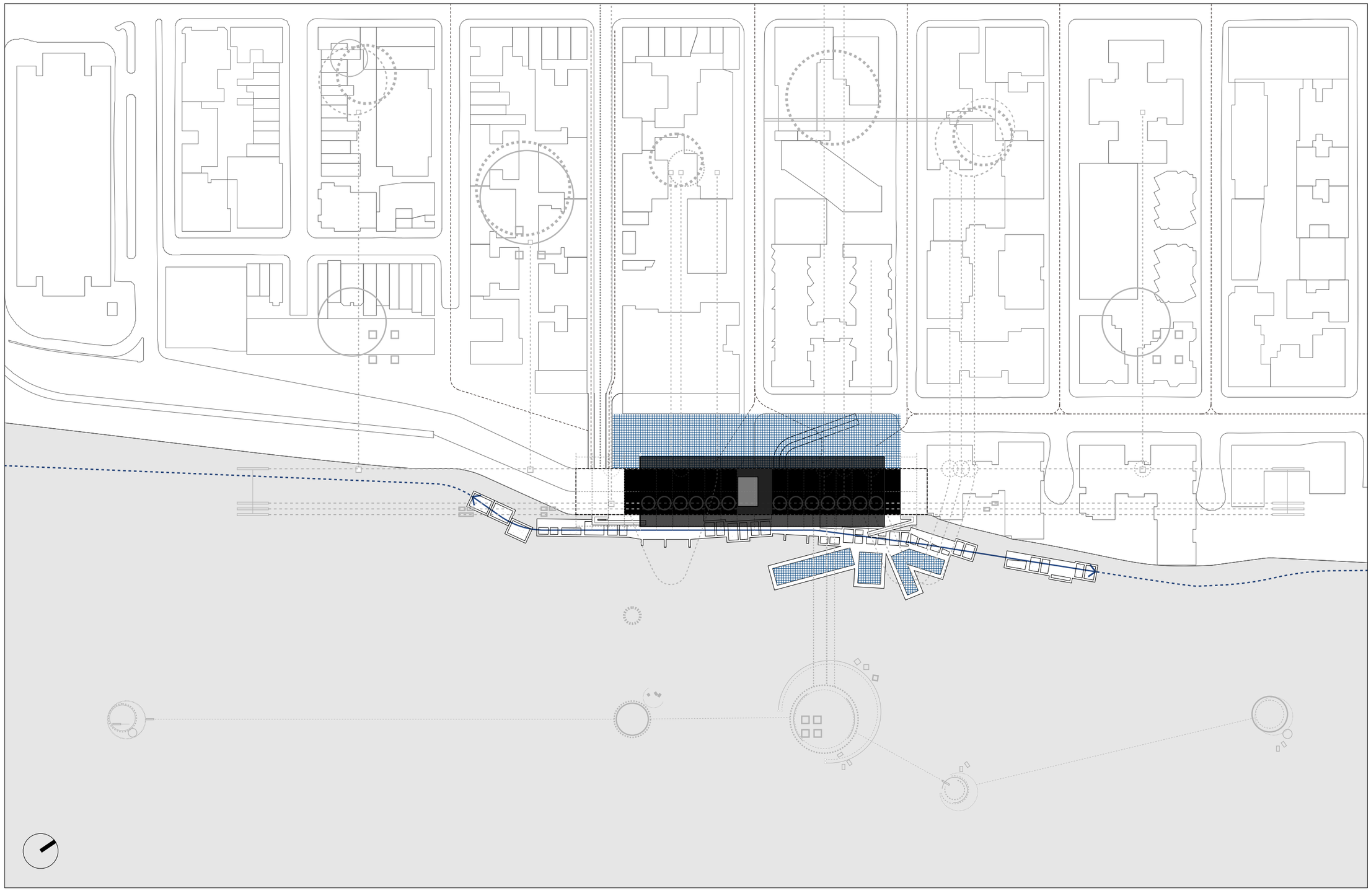
CONCLUSION



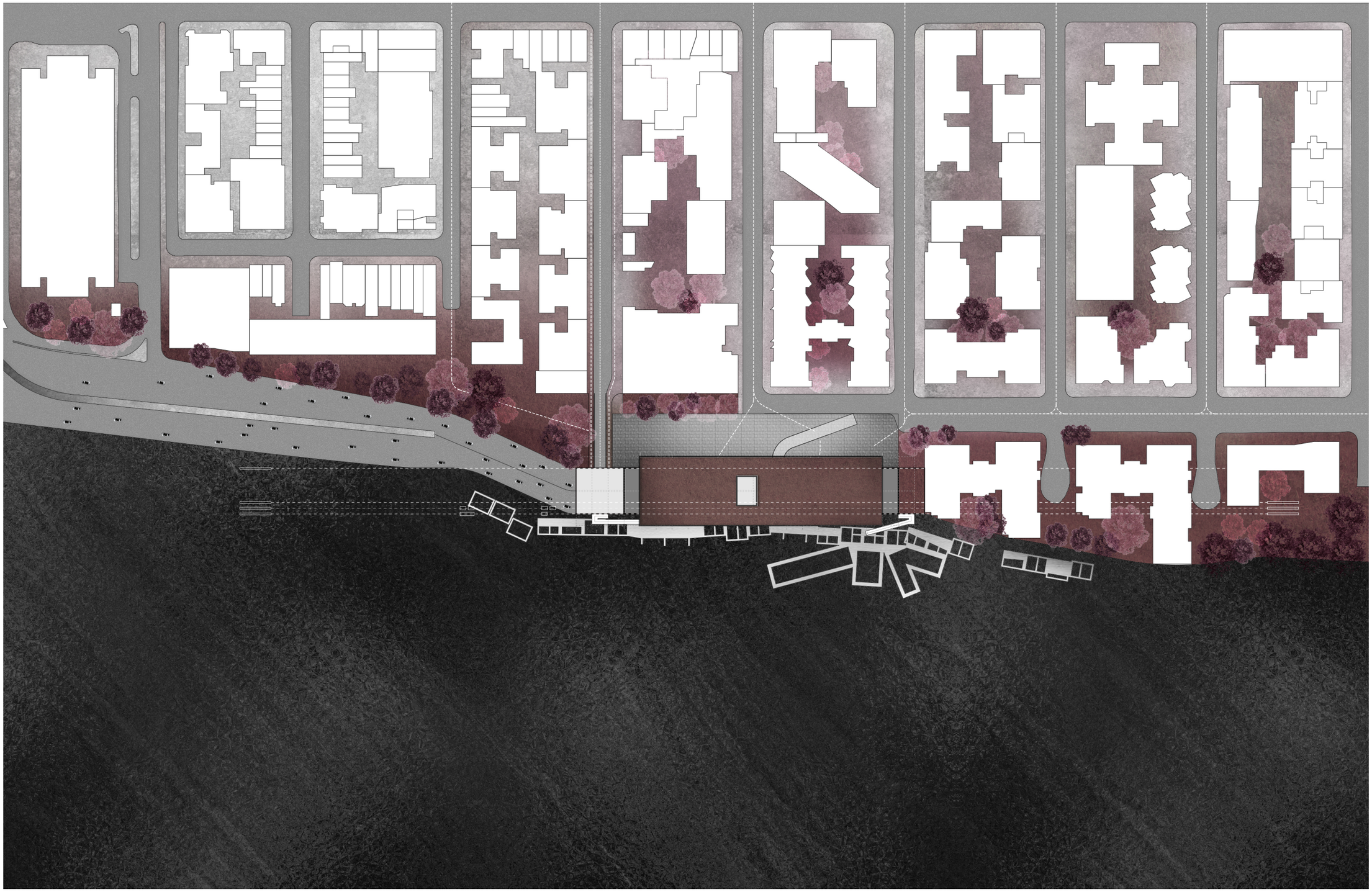
CLEANING WATER



INCREASING ACCESSIBILITY



CONNECTING PEOPLE, RIVER, INFRASTRUCTURE



SITE PLAN



THANKS