

# Water Group

Under the Supervision of: Professor Jana VanderGoot  
ARCH 700: Urban Design Studio VII  
The University of Maryland- College Park  
Fall 2015

PALS- Partnership for Action Learning in Sustainability  
An initiative of the National Center for Smart Growth  
Gerrit Knapp, NCSG Executive Director  
Uri Avin, PALS Director



# Design for Detention & Retention Ponds

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# Detention v. Retention

**Detention Pond** : Area where excess stormwater is held temporarily, and then slowly drains into the receiving channel. It is a slowly released into channel at a controlled rate.

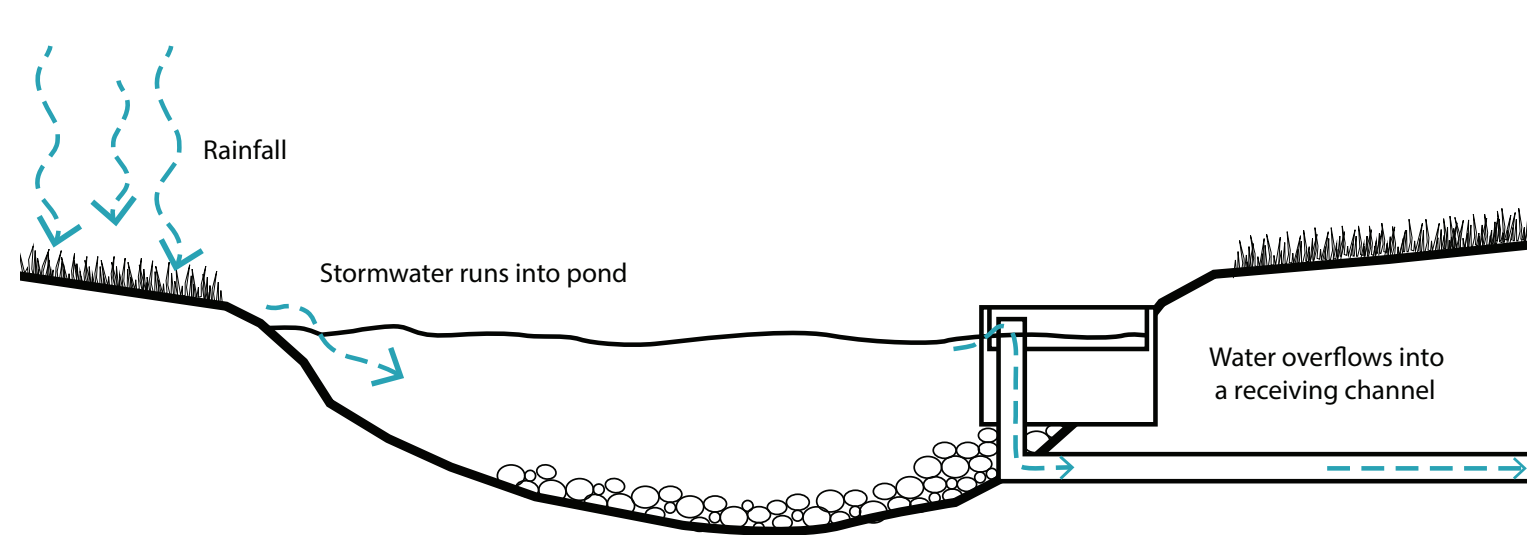
- WHY USE IT? It is an effective flood control. It reduces peak runoff during storms, decreasing floor damage.

**Retention Pond**: Storage of stormwater on a permanent basis.

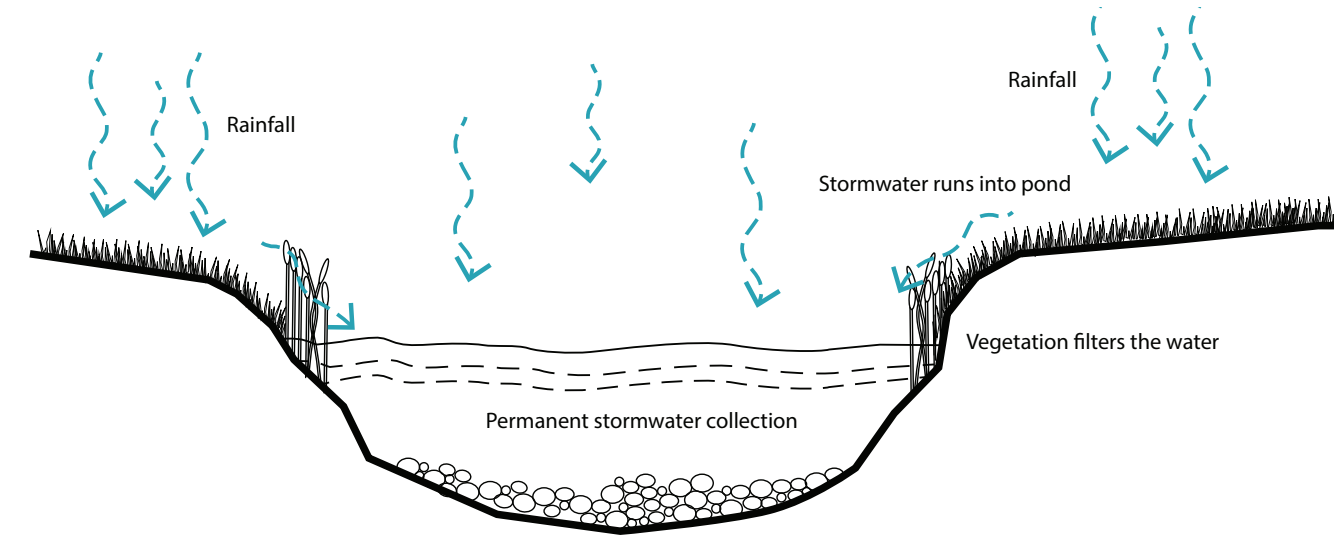
- WHY USE IT? Improves water quality, filtering/removing environmental contaminants, and reducing sediments.

**Why use detention ponds than retention ponds?**

- Detention Ponds are used for flood controls, whereas retention ponds are used to storing and cleaning the water.



Detention Pond illustrating how the water flows during a storm.



Retention Pond

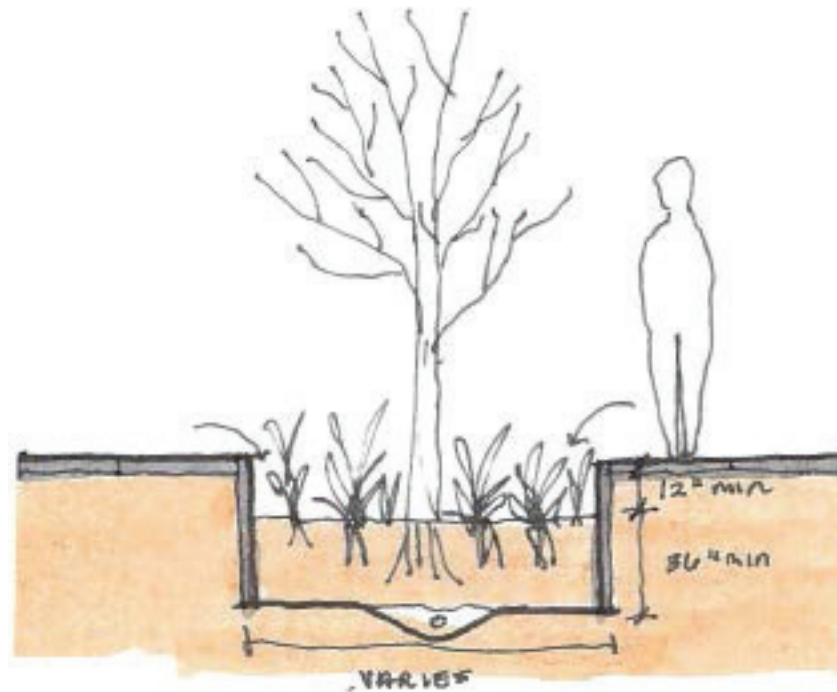
# Curbside Raingarden

## WHAT:

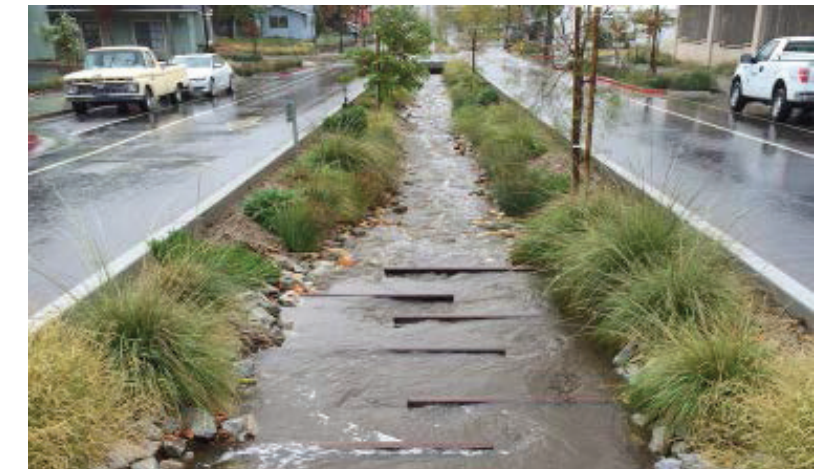
Curbside raingardens is a raingarden adaptived for an urban context. They often extend from the curb or intersection, serving to both capture storm water, while also slowing traffic and making these areas safer for pedestrians.

## WHY:

Not only does this serve all the positives of a rain garden, it also helps bring in moment of “nature” into urban public spaces.



Adaptive reuse of railroad tracks as curbside rain garden: 21st Street Paso Robbles, CA  
<http://www.svrdesign.com/21st-street-paso-robles-ca/>



Adaptive reuse of railroad tracks as curbside rain garden: 21st Street Paso Robbles, CA  
<http://www.svrdesign.com/21st-street-paso-robles-ca/> (top and bottom right images)





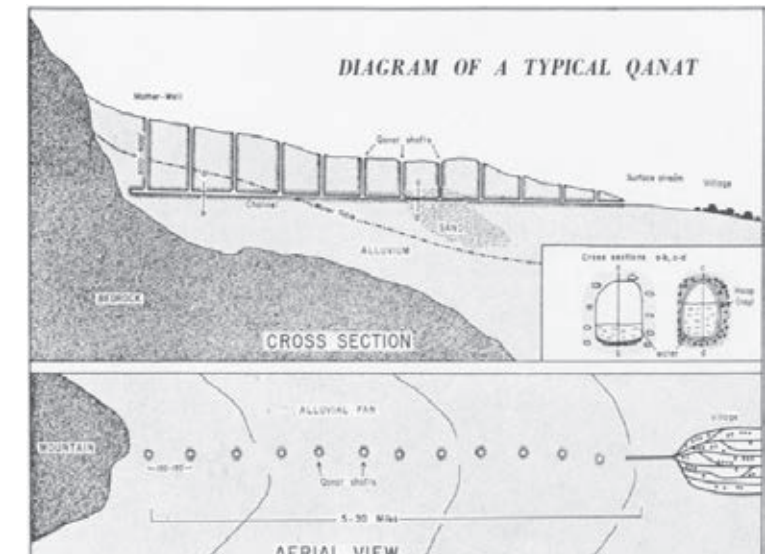
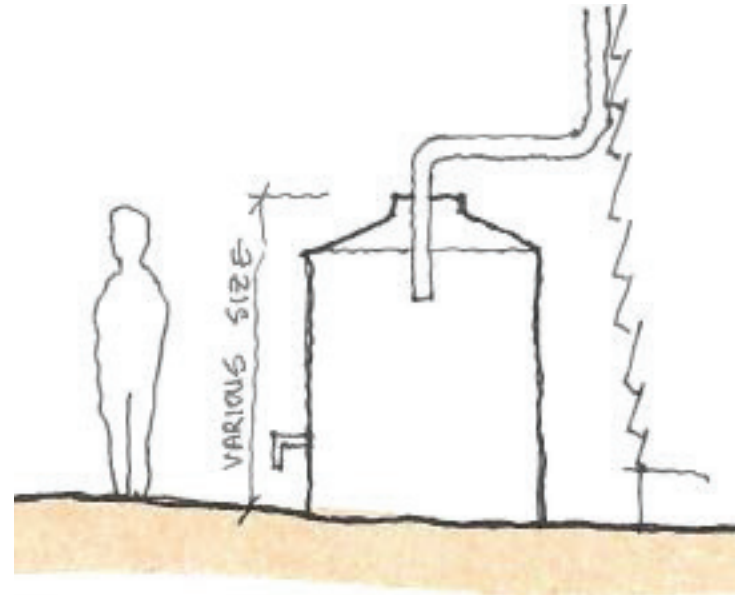
# Cistern

## WHAT:

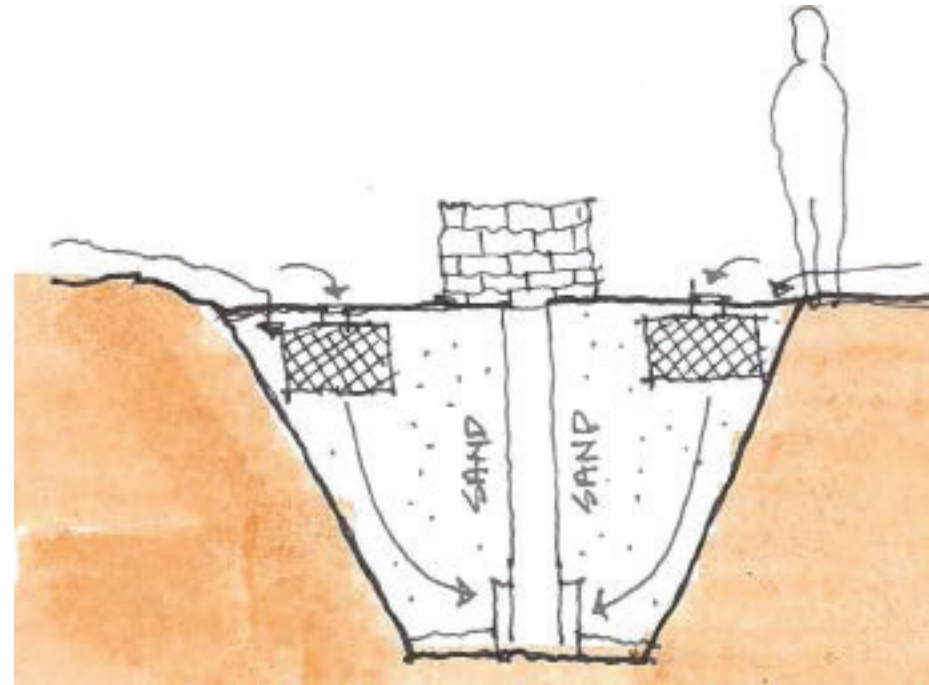
A cistern is a waterproof receptacle for holding liquids usually built to catch and store rainwater. In addition to storage of rainwater, it can act as storage of well water, air conditioning condensate, cooling tower make-up, fire protection reserves and manufacturing process water systems.

## WHY:

Water collected in cisterns can be used for domestic use and consumption. Using rainwater to perform functions such as flushing toilets, watering gardens, cleaning laundry, and washing cars can reduce use of traditional supply system.



Underground channel/Qanat: Iran  
<http://www.waterhistory.org/histories/qanats/>



Underground precedent:  
Venice Cistern by Robert Ampie  
<http://www.eyevuetheworld.org/>



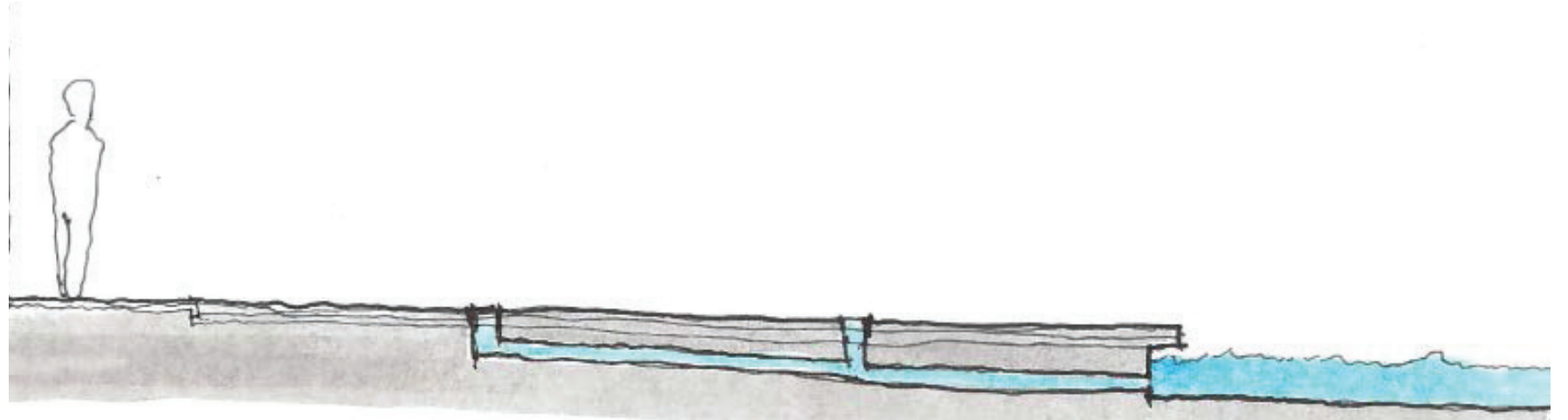
# Waterplein

## WHAT:

Waterplein is a public square that has multiple scales of directing and storing runoff. Usually squares feature a system of connected concrete basins of different depths which can be used for leisure \activities during dry weather.

## WHY:

Waterplein is a versatile system that can serve the community both leisurely and environmentally. During heavy rainfall, the basins can be filled to relieve the sewage system.



Urban Park:  
Waterplein in Rotterdam  
[http://www.c40.org/case\\_studies/ben-themplein-water-square-an-innovative-way-to-prevent-urban-flooding-in-rotterdam](http://www.c40.org/case_studies/ben-themplein-water-square-an-innovative-way-to-prevent-urban-flooding-in-rotterdam)



Urban Park:  
Bellamyplein in Rotterdam  
<http://www.urban2020.nl/duurzame-project-en/>





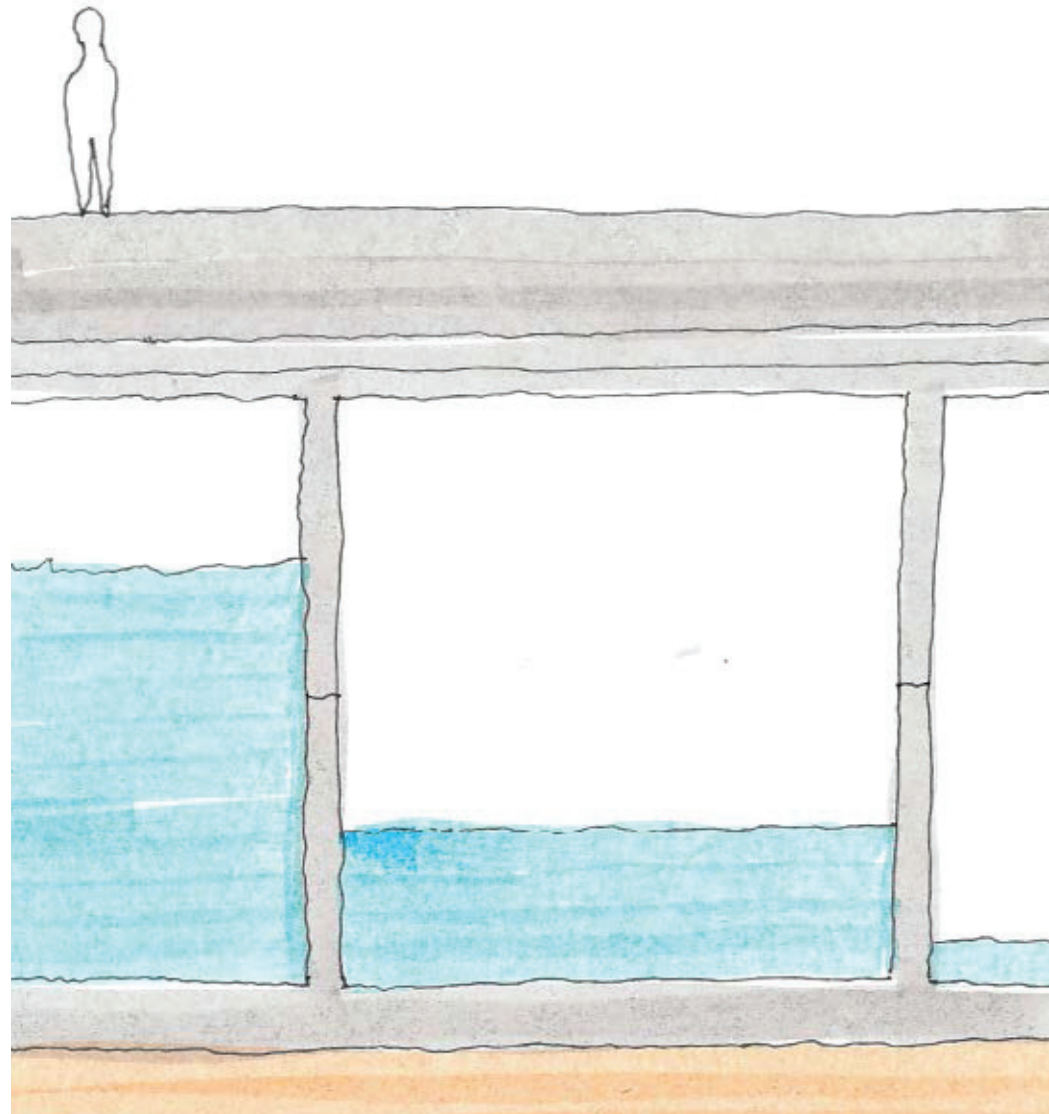
# Reservoir

## WHAT:

Reservoirs are an enlarged storage pond. Reservoirs can be created through controlling streams, in river valleys, or by excavating flat ground and construction retaining walls and levees.

## WHY:

Reservoirs can help certain areas maintain large water supply when needed. It also can help generate hydroelectric power. Though it has positive benefits, it has far more negative social and environmental impacts.



Above/below ground precedent:  
Indian step well  
<https://s-media-cache-ak0.pinimg.com/736x/5d/f0/f3/5df0f3436b50b7654e92e4eb23e75b22.jpg>



Underground precedent: NW D.C.  
McMillan Reservoir  
<https://www.google.com/maps/>



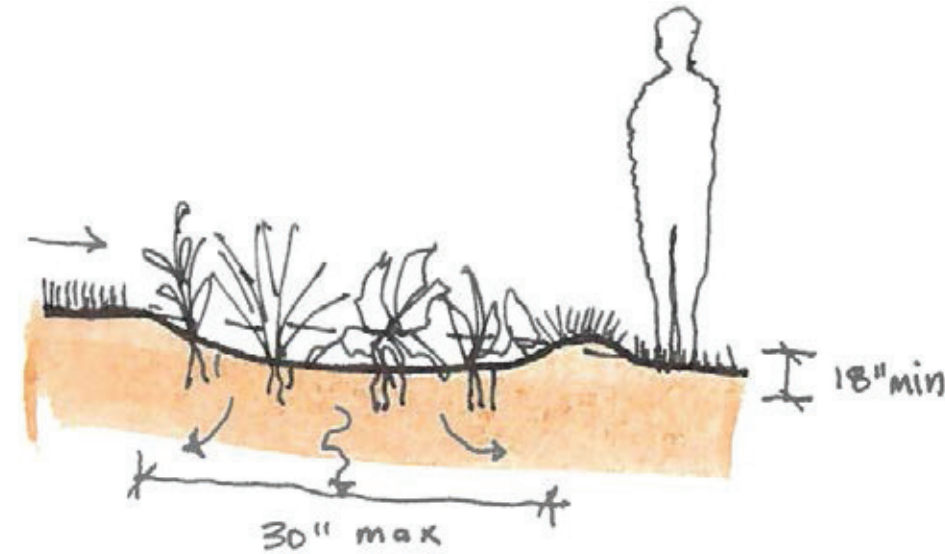
# Raingarden/Bioretention

## WHAT:

Rain garden is an on-site treatment of stormwater runoff. Surface runoff is directed into shallow, landscaped depressions that are designed to incorporate many of the pollutant removal mechanisms that operate in forested ecosystems.

## WHY:

This simple, low maintenance, affordable method can reduce runoff and eliminates expansion of sewage system. It also filters the runoff before entering into the sewage system. The first extensive use of rain gardens in Somerset, a residential subdivision which has a 300–400 sq ft rain garden on each house's property. Instead of a system of curbs, sidewalks, and gutters, which would have cost nearly \$400,000, the planted drainage swales cost \$100,000 to install.



Residential precedent:  
Residential rain garden by Geeky Swedes  
<http://www.myballard.com/2010/04/30/city-rolls-out-rainwise-program/>



Urban precedent:  
Urban rain garden by Town of Amherst  
[http://amherstgreenways.org/storm\\_water.html](http://amherstgreenways.org/storm_water.html)





# Combined Sewer Overflows & Seperate Sewer Systems

## WHAT:

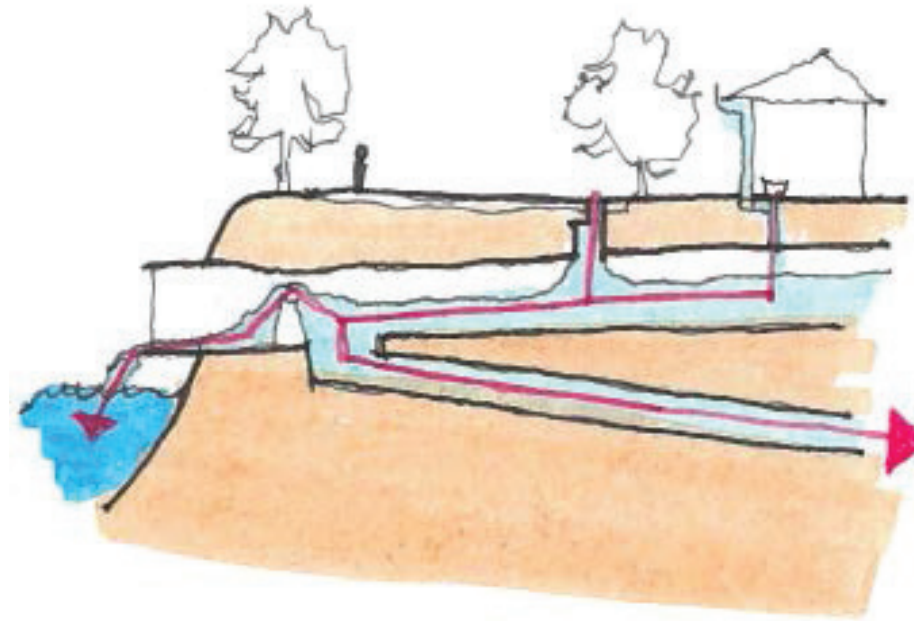
Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. Systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies.

Separate sewer system consists of two different sewer pipes running one on top of the other. Though it may have less apparent environmental hazards than CSO, there is still potential to discharge polluted waters from runoff of buildings.

## WHY:

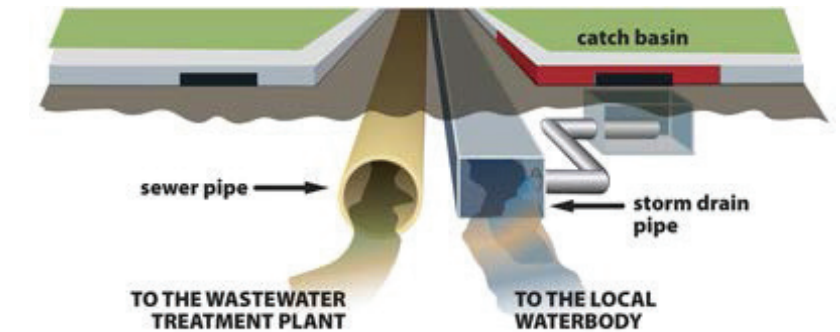
Both systems causes pollution of the streams & rivers that are the source of city's water supply.

Combined Sewer Overflows (CSO)



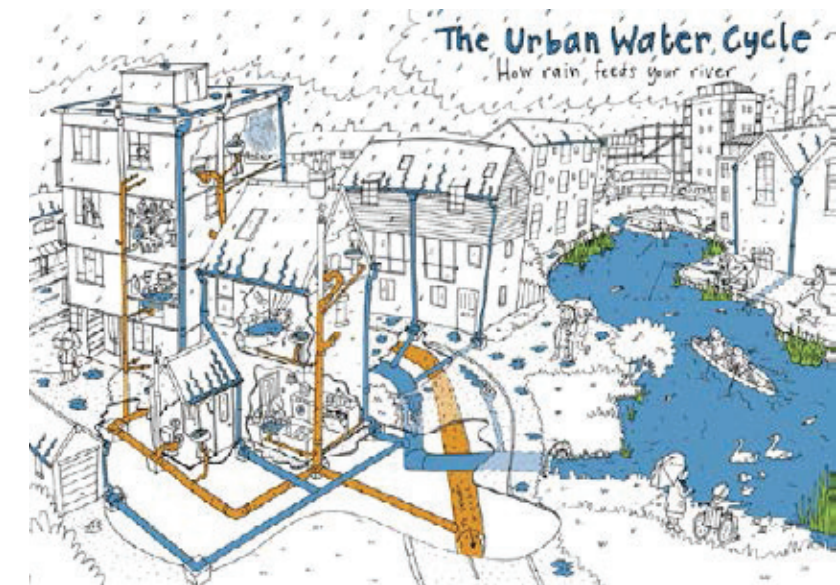
CSO New York City:  
<http://energyindepth.org/>

Seperate Sewer Systems



Seperate sewer system:

<https://www.gocolumbiamo.com/PublicWorks/StormWater/images/undergrnd-sys-tems.jpg>



Seperate sewer system:

<http://www.thames21.org.uk>





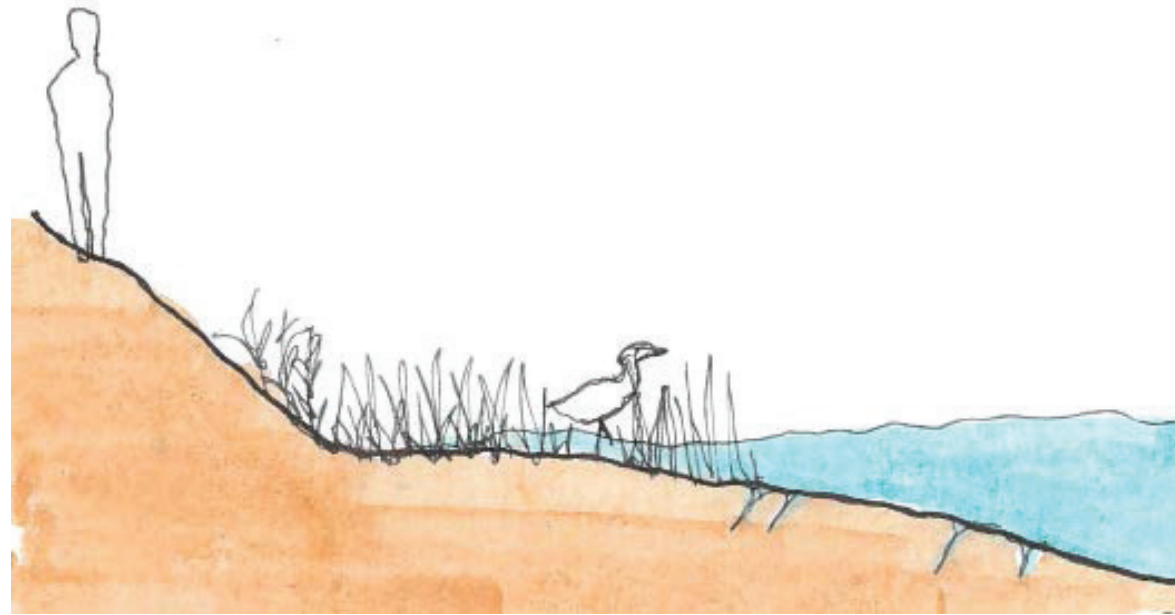
# Wetland

## WHAT:

Wetlands feed downstream waters, trap floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetlands include swamps, marshes and bogs. Some wetlands have no apparent connection to surface water like rivers, lakes or the ocean, but have critical groundwater connections.

## WHY:

Wetlands can help filter the surface runoff with their ecosystem. Wetlands protect and improve water quality, providing fish and wildlife habitats, stormwater retention, and maintaining surface water flow during dry periods.



Wetland Park: Guizhou Province, China  
Liupanshui Minghu Wetland Park  
<http://inhabitat.com>



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Liupanshui Minghu Wetland Park  
<http://inhabitat.com>





# Qunli Stormwater Wetland Park

Haerbin, Heilongjiang, China | **Turenscape**

This case study looks at the use of detention/retention ponds at a larger scale but still in an urban context. This wetland park is situated in the middle of a new city, surrounded on 4 sides by roads and dense development. The central core of the existing wetlands is untouched and left alone for the natural process of cleaning water. The outer ring of the park consists of multiple ponds-and-mounds collecting stormwater and urban waste water to be cleansed before it is released into the core wetland.

This project demonstrates how a typical large scale wetland can fit inside an urban city; collecting and cleansing stormwater and urban waste water.



Site Plan of Qunli Stormwater Park in a dense urban setting.  
Image: Turenscape.

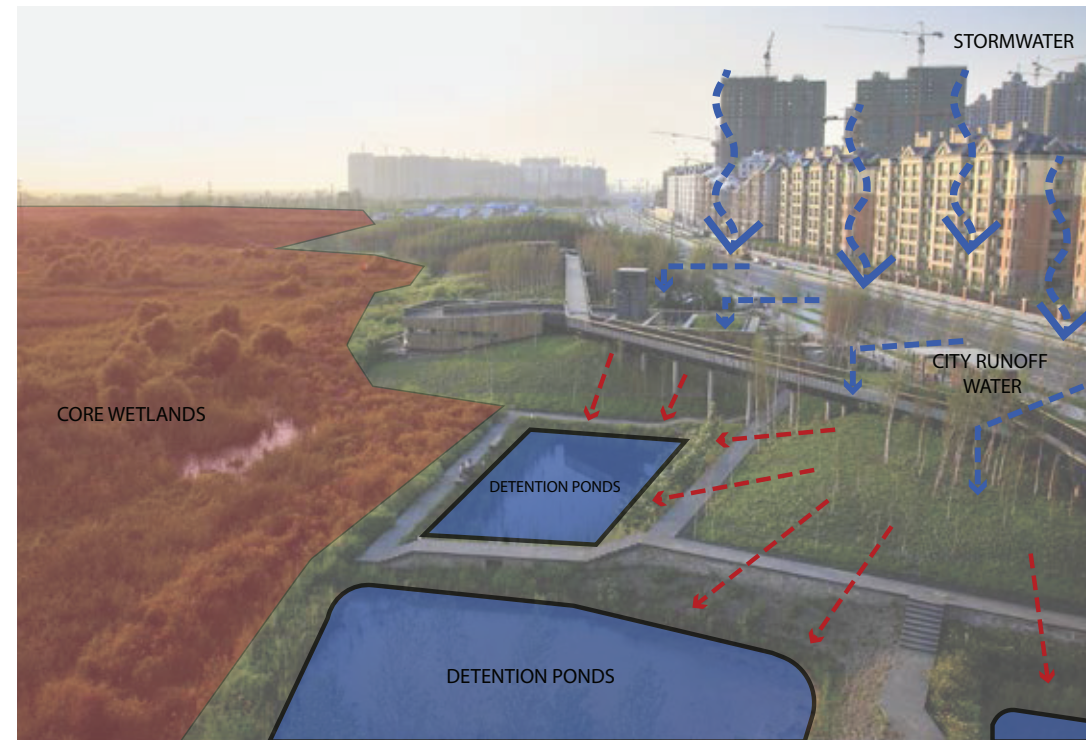


Diagram showing the water flow into the park.  
Image: asla.org; Diagram Drawn: Olivia

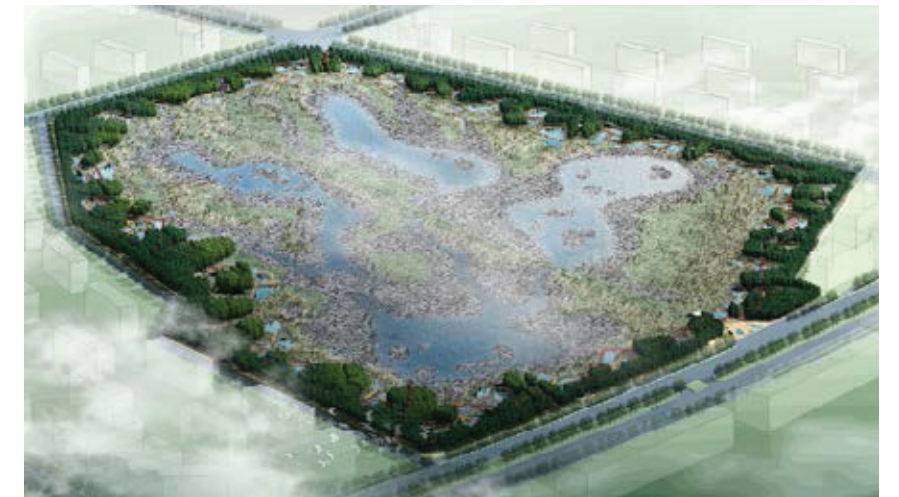


Image from Turenscape.com





# Bill & Melinda Gates Foundation Campus

Seattle, Washington | **NBBJ Architects & Gustafson Guthrie Nichol**

This case study looks at an urban setting of implementing detention and retention ponds on a former contaminated parking lot. Adding trees, raingardens and porous pavers directs the stormwater into the onsite detention and retention ponds. The detention ponds channels into an underground cistern, which then pumps water back into the building for usage. The retention ponds help filter and clean the collected water with the help of surrounding vegetation, aeration, and the sun.



The site shows the campus in an urban context.  
Image from Google Earth.



Diagram illustrates how stormwater flows around the building.  
Image from NBBJ Architects; Diagram by Olivia

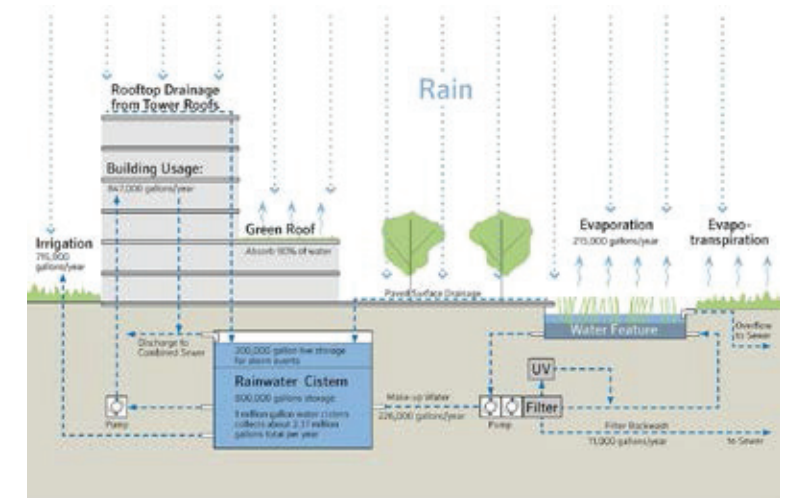


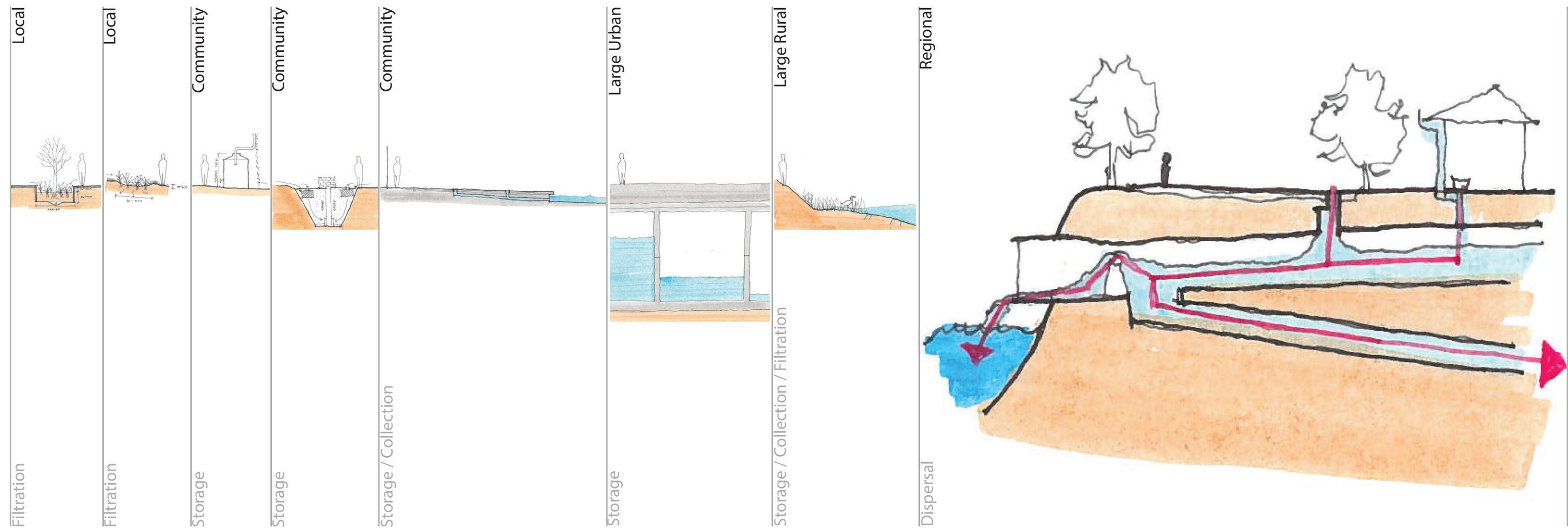
Image from asla.org

Designs for Detention & Retention Ponds

Ellicott City, MD



# Scale



Scale and Use relationship of water features

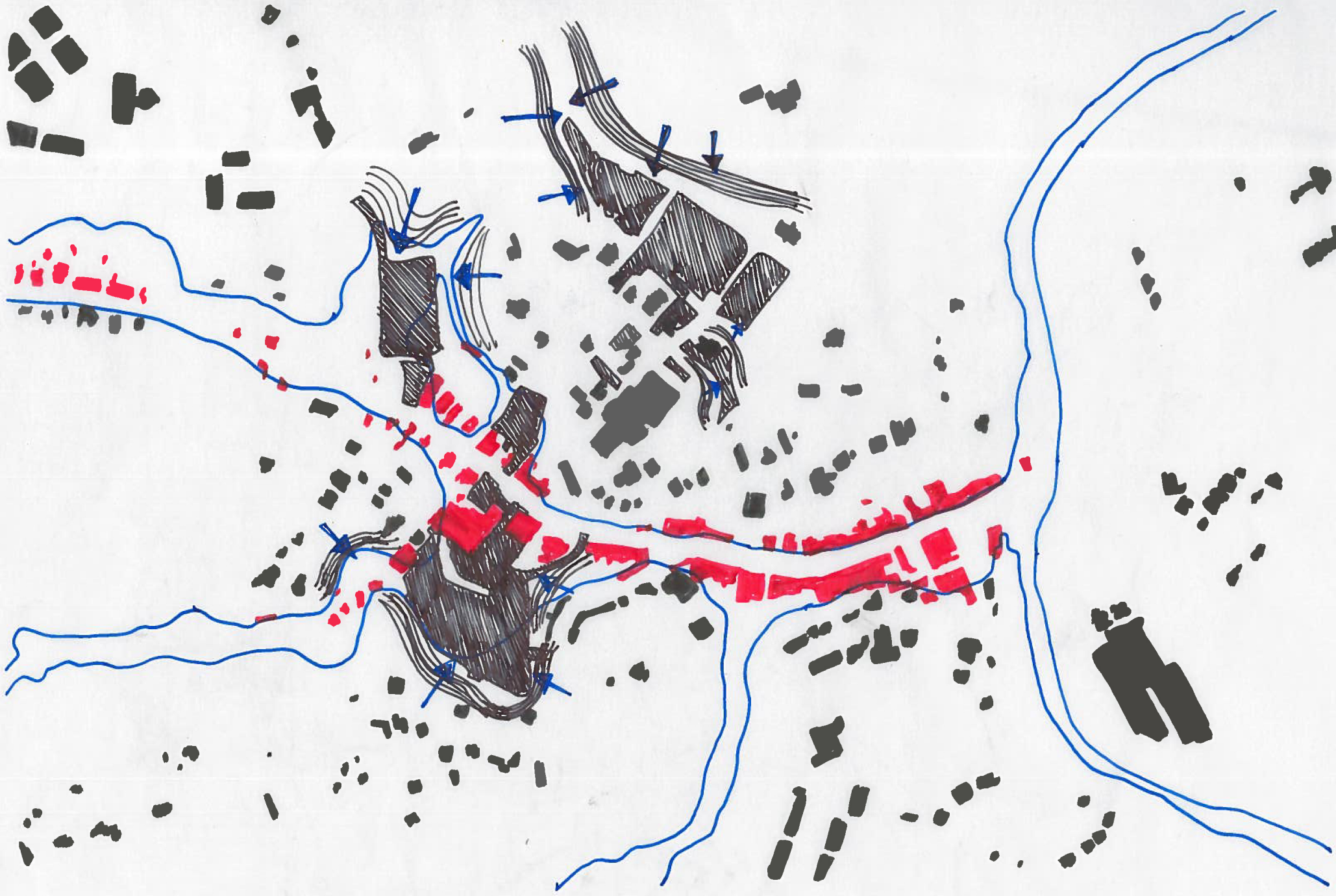
Drawn by: Min Soo Kang

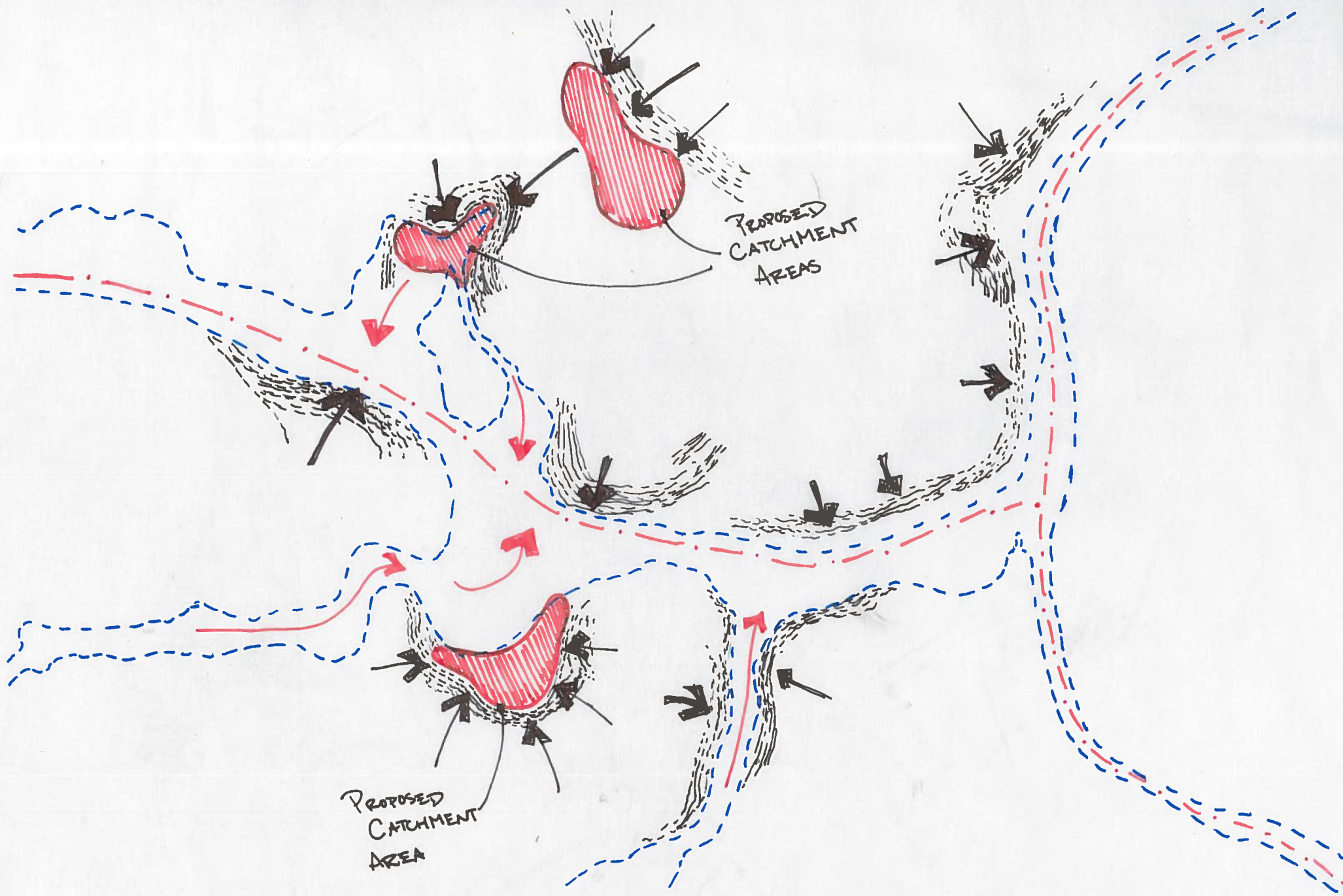
# Summary

Detention and Retention is invaluable because it:

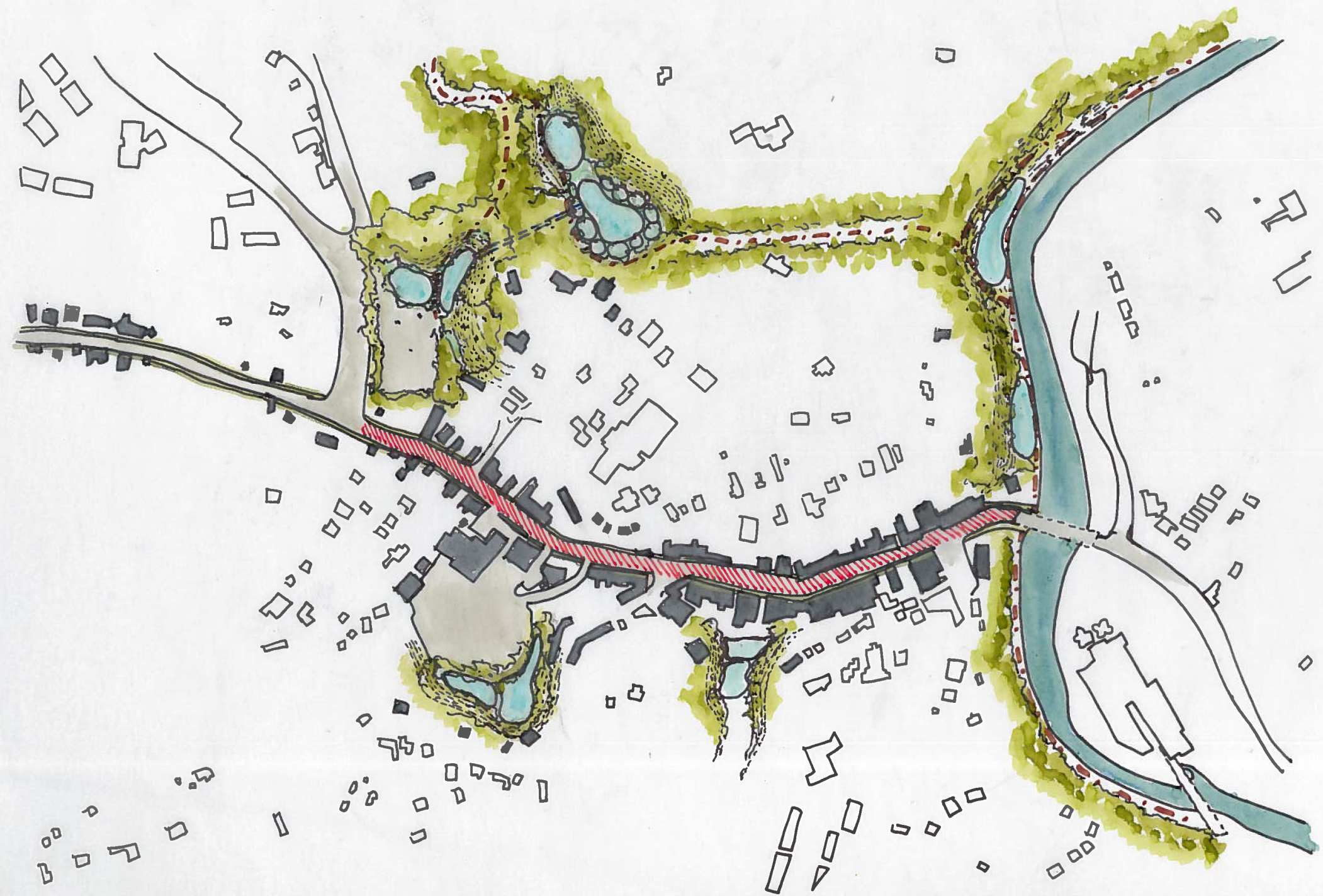
- reduces runoff during storms
- improves water quality through filtration
- can contain and store large amounts of water
- can be used as a public amenity
- safely controls potential growth
- facilitates access and use to water







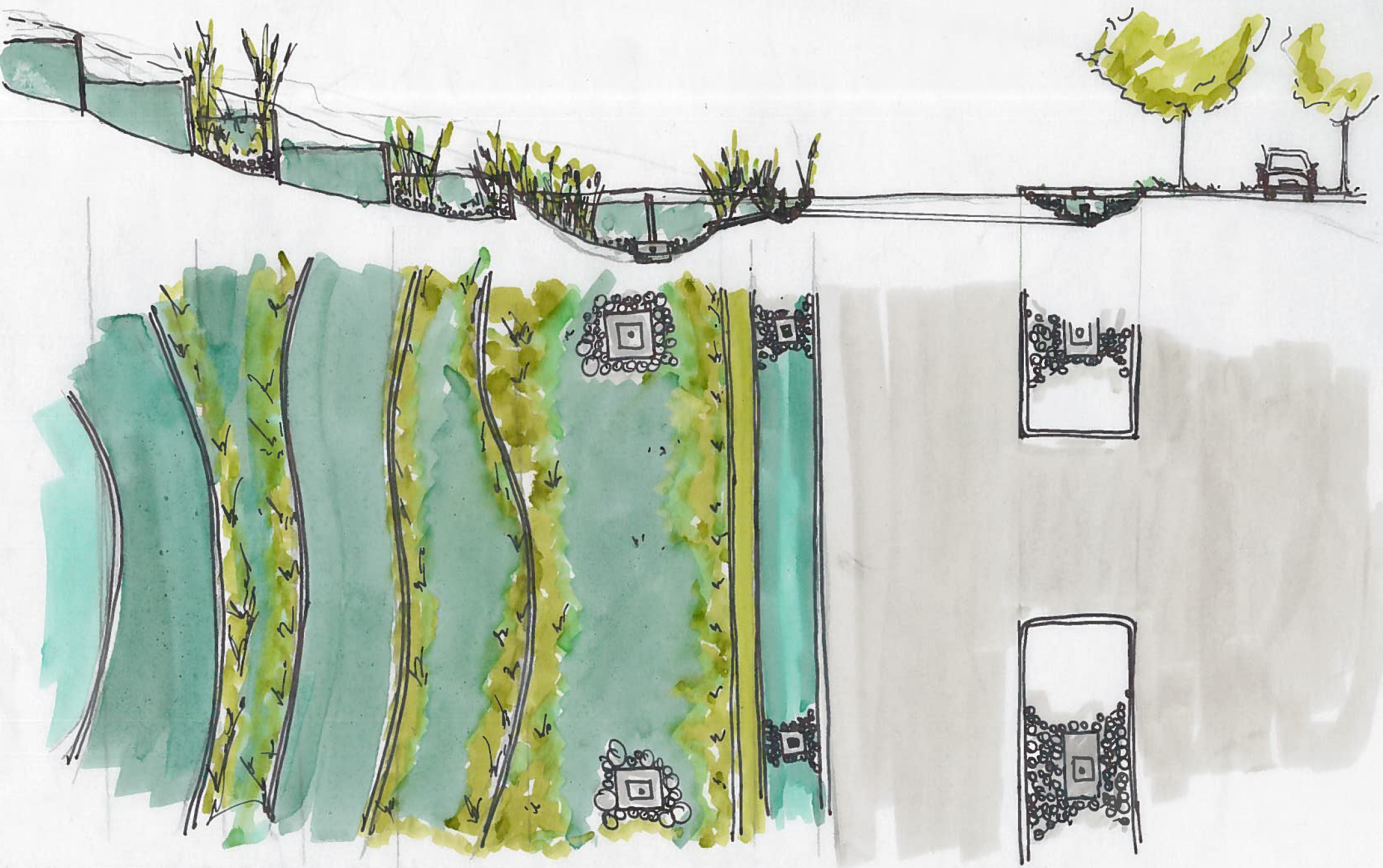




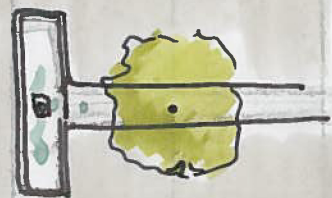
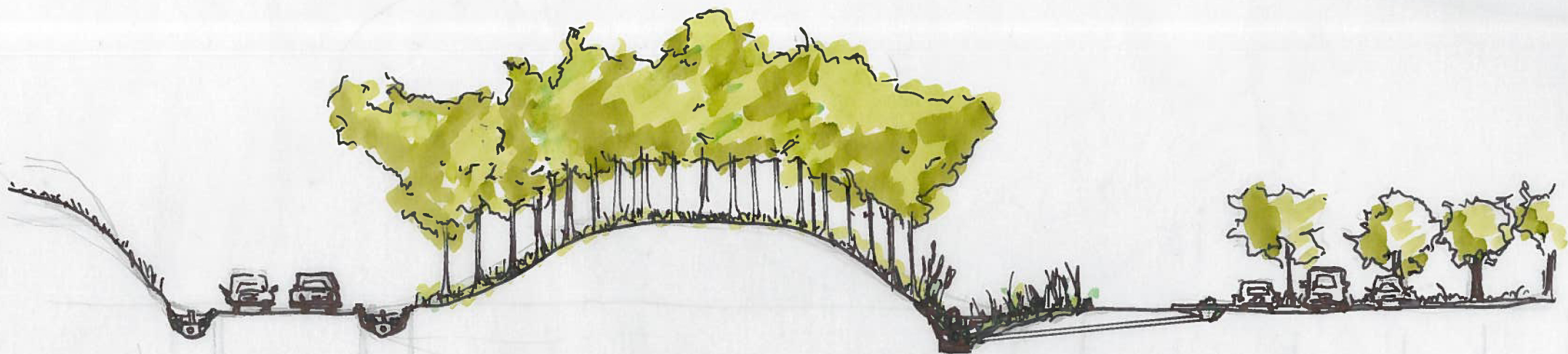






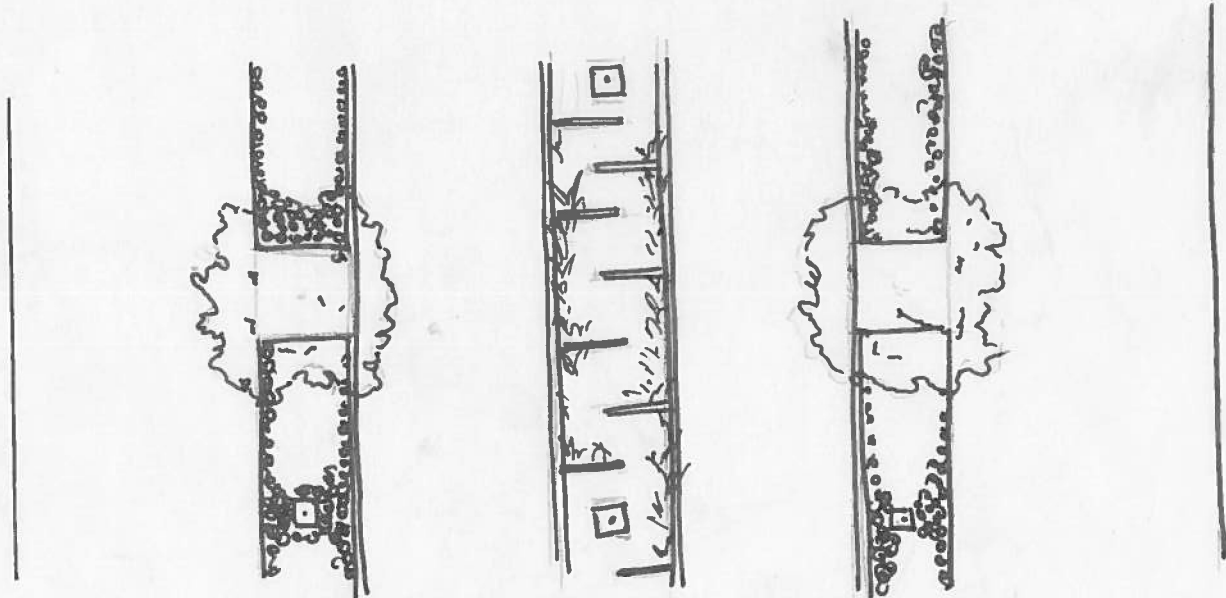
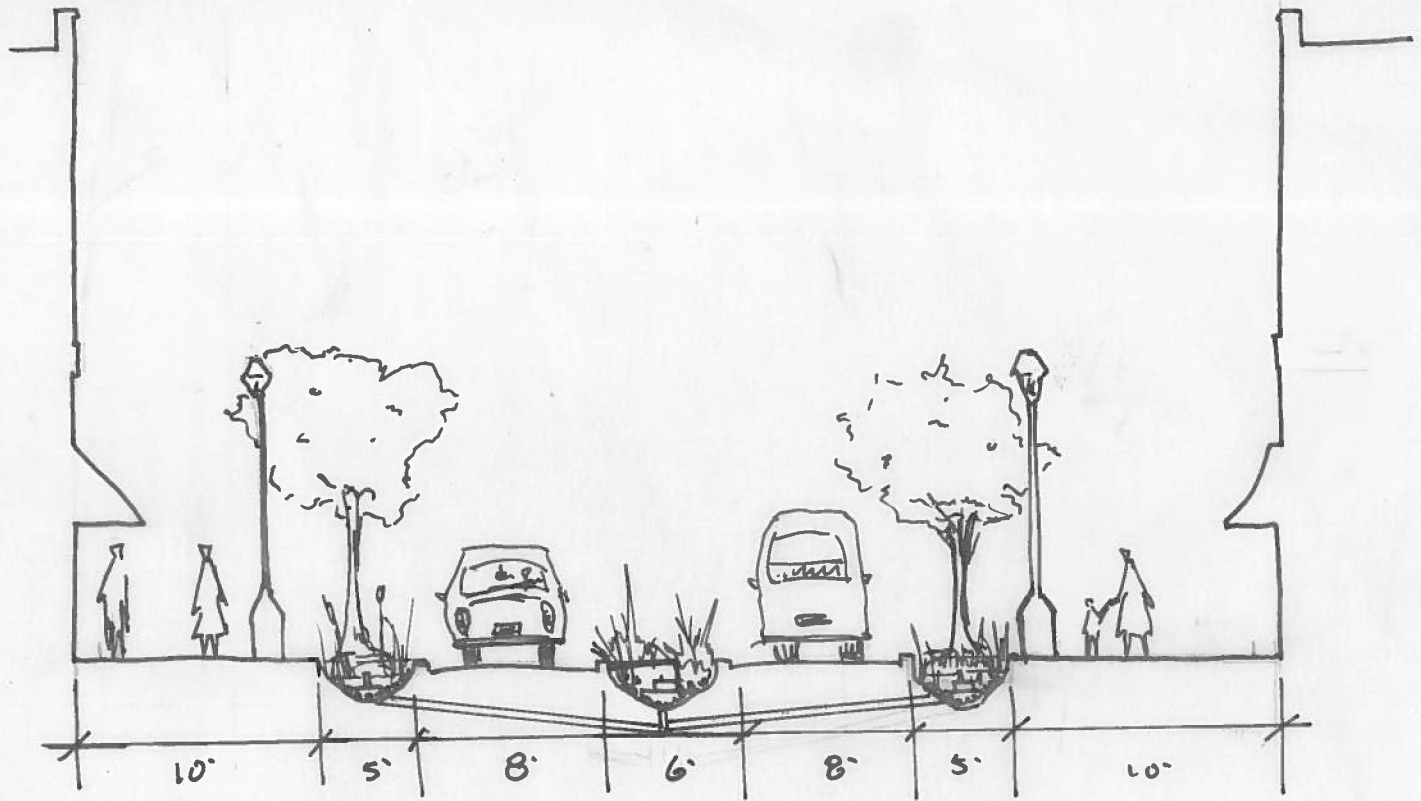










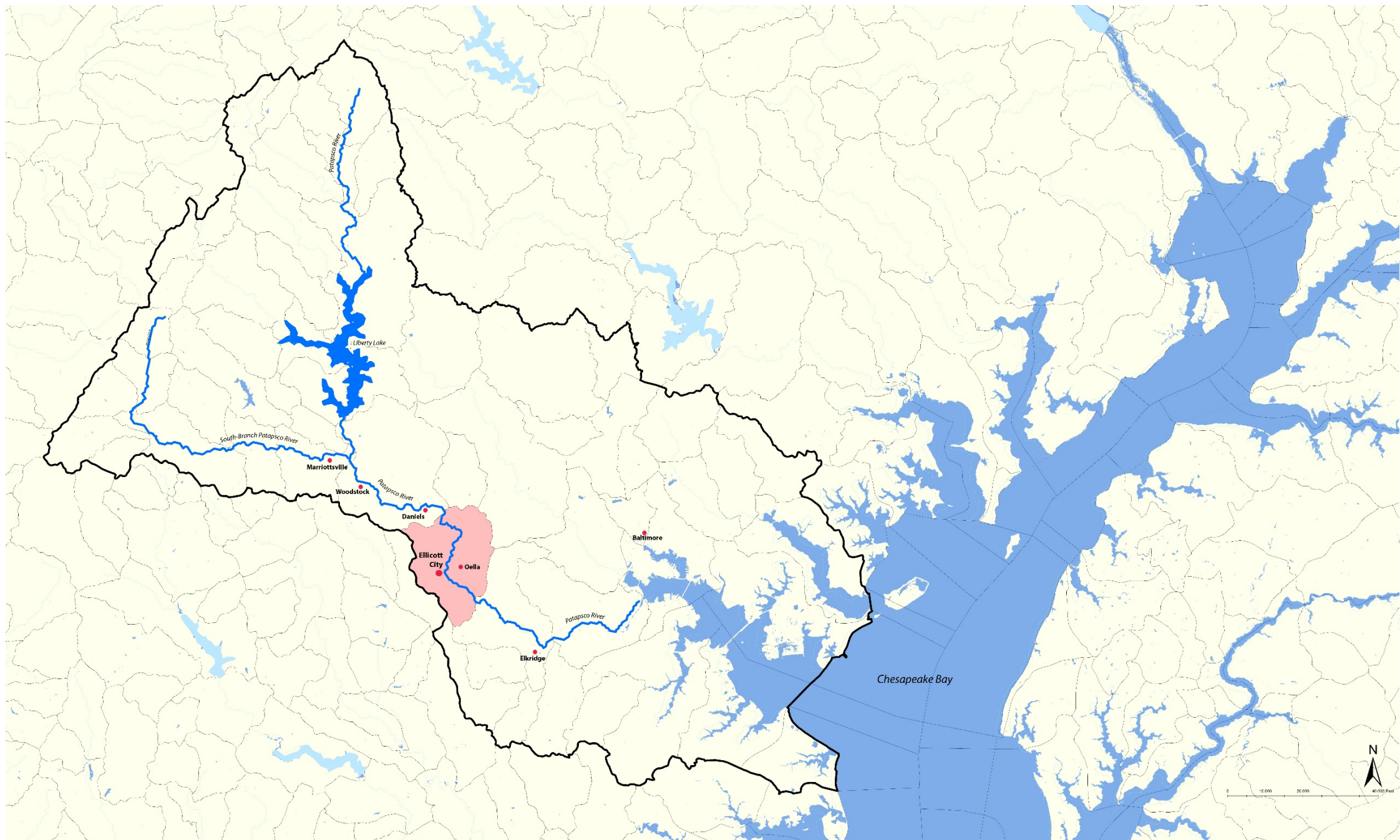


# PUBLIC WATER

TACTICS FOR MANGING WATER IN PUBLIC PLACES

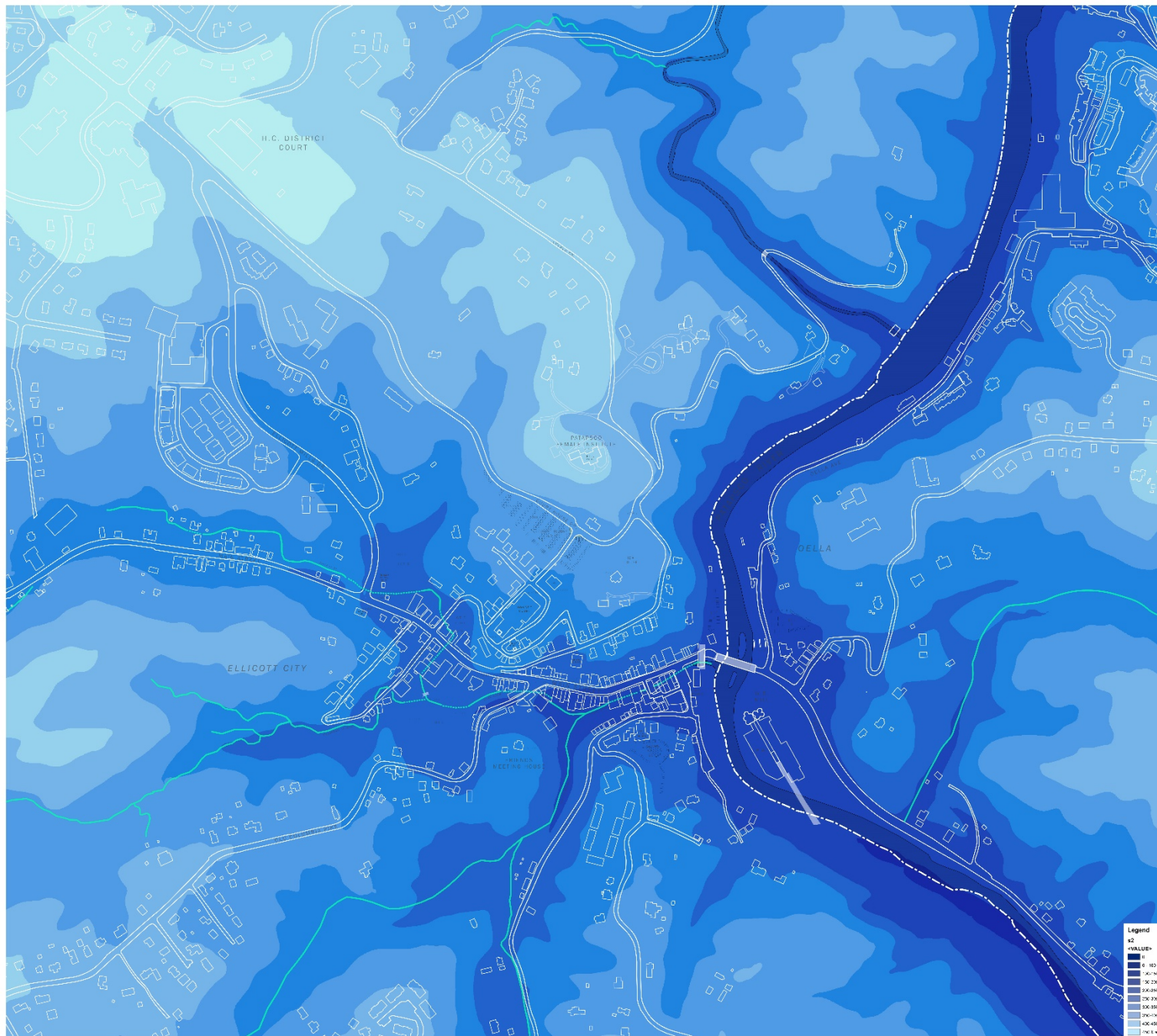
KARA JOHNSTON, NICOLE AKPEDEYE, PRANJALI RAI, MAGGIE JOYCE, SAM ENGLEHART



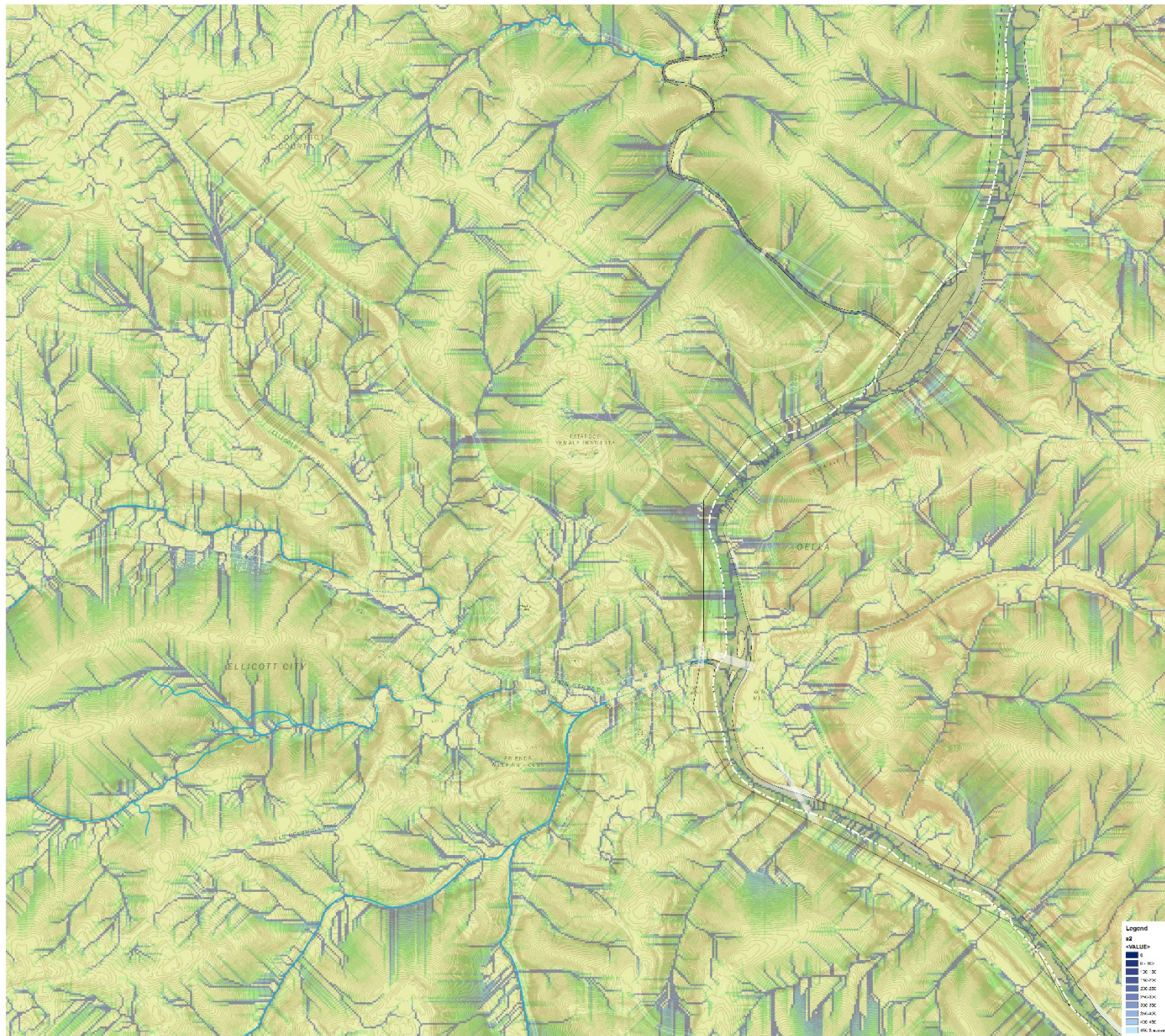


Regional Map



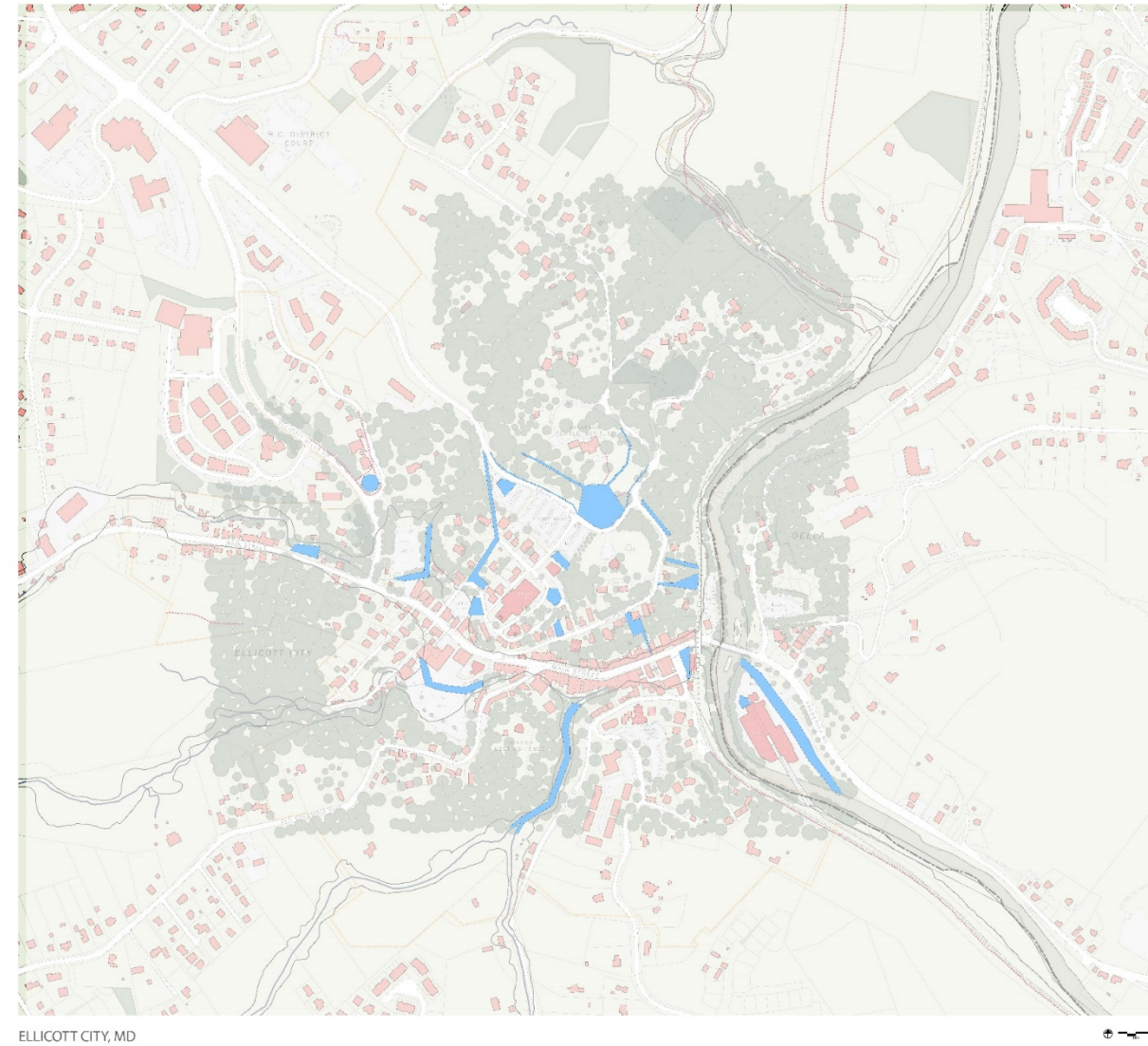
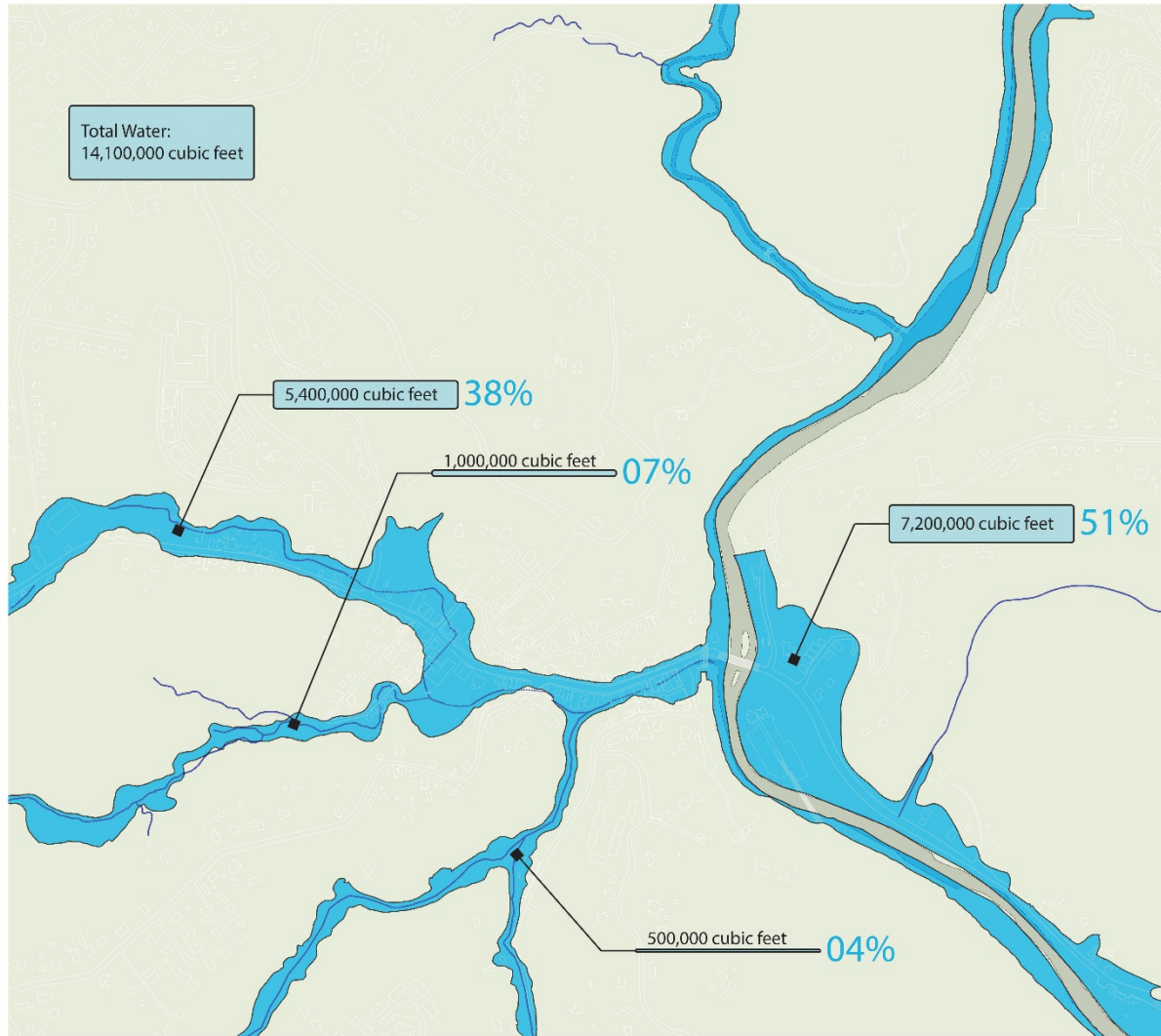






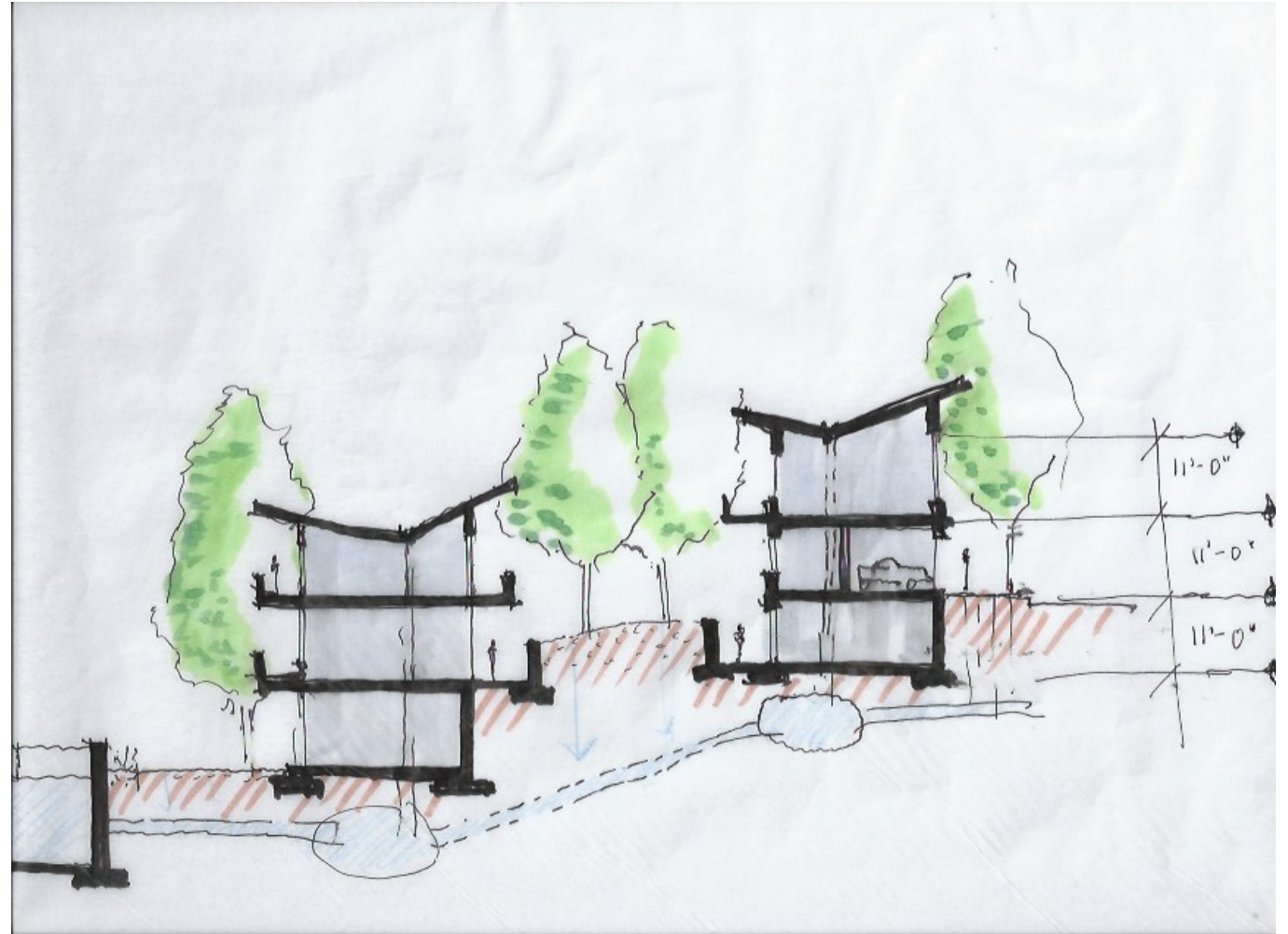
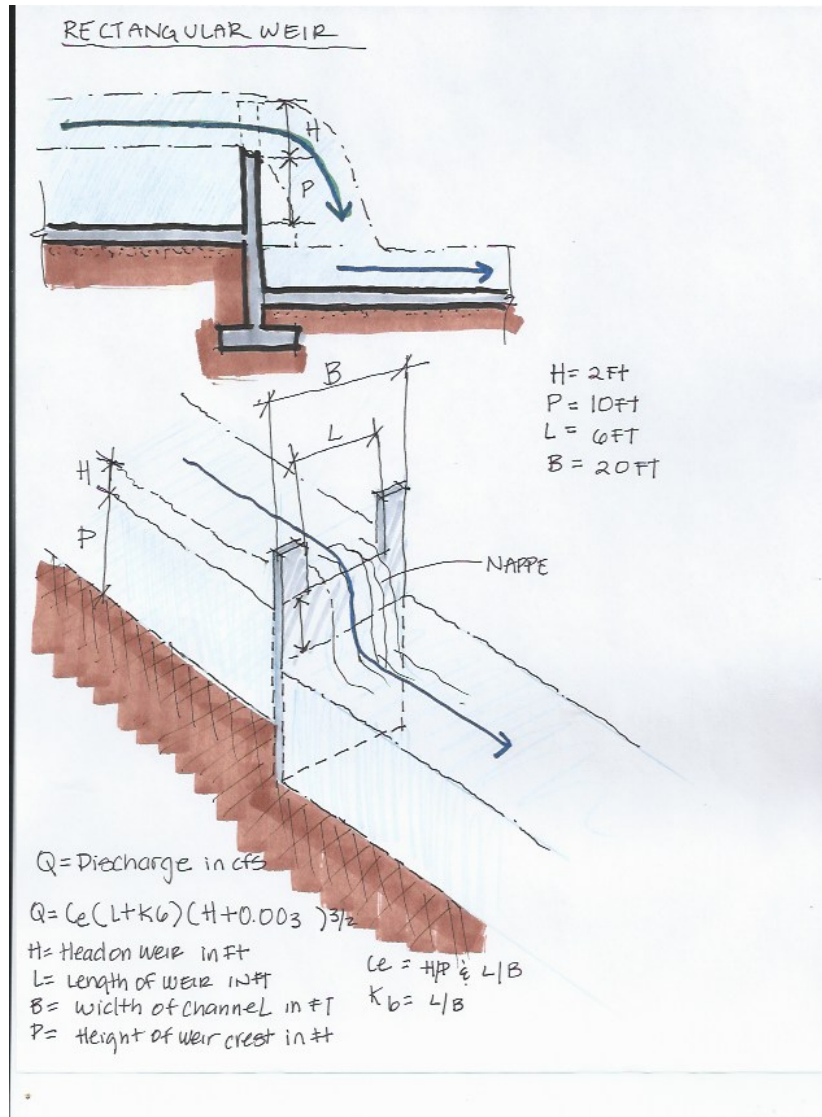
Ellicott City Map showing storm water runoff flow





Tactics deployed in specific areas in Ellicott City

## CHANNELLING/ WEIR



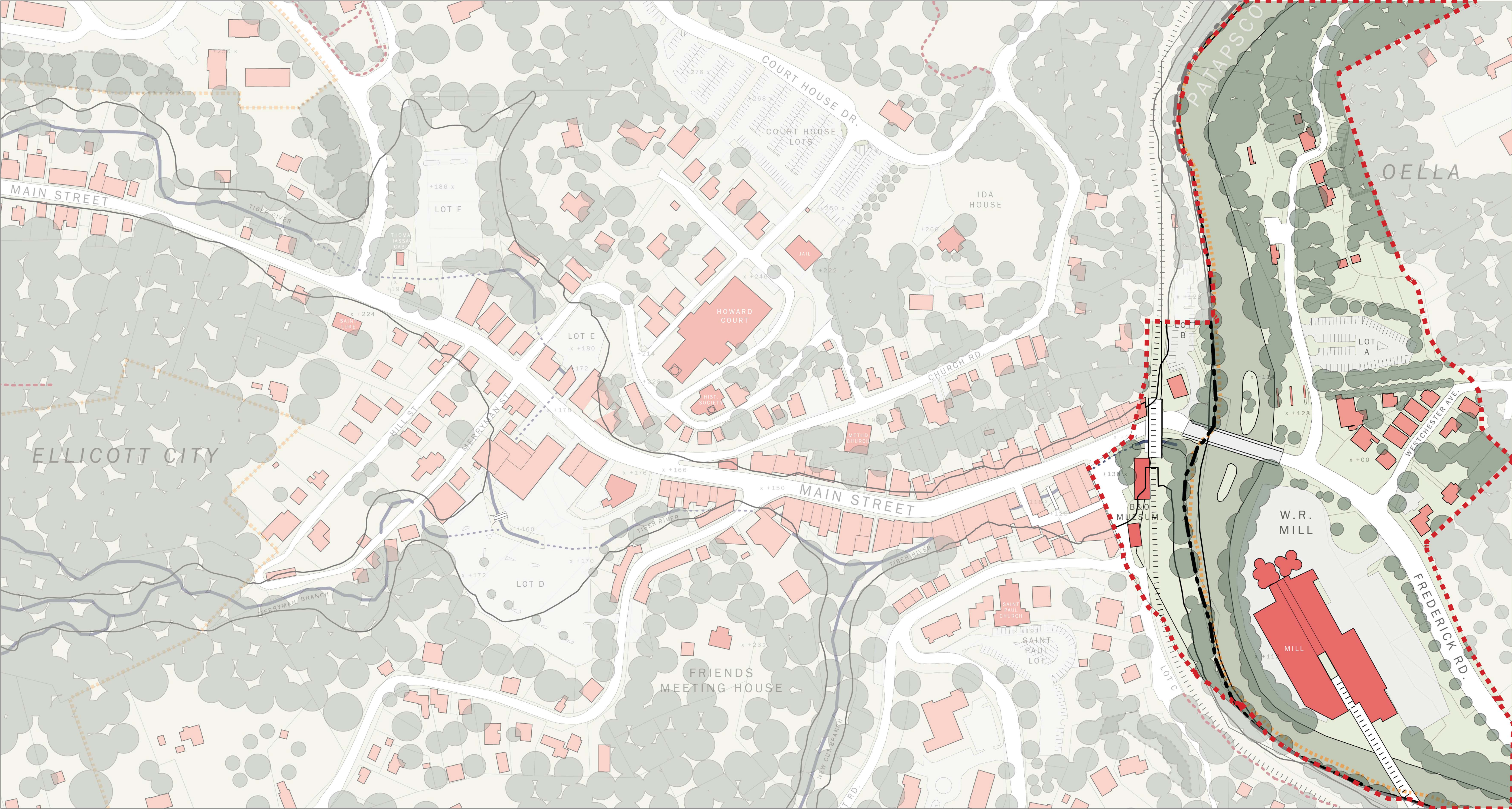
CHANNELLING/ WEIR





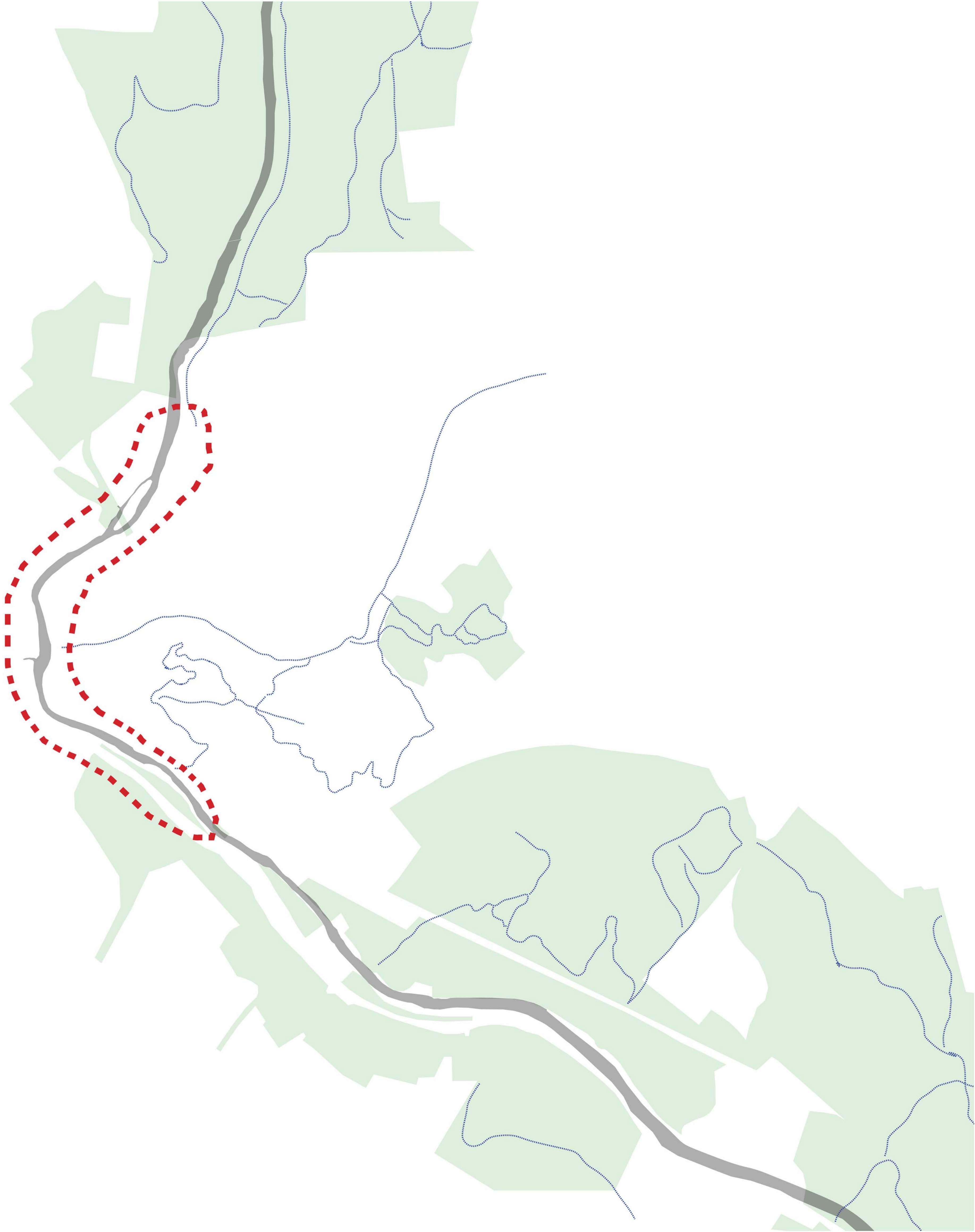
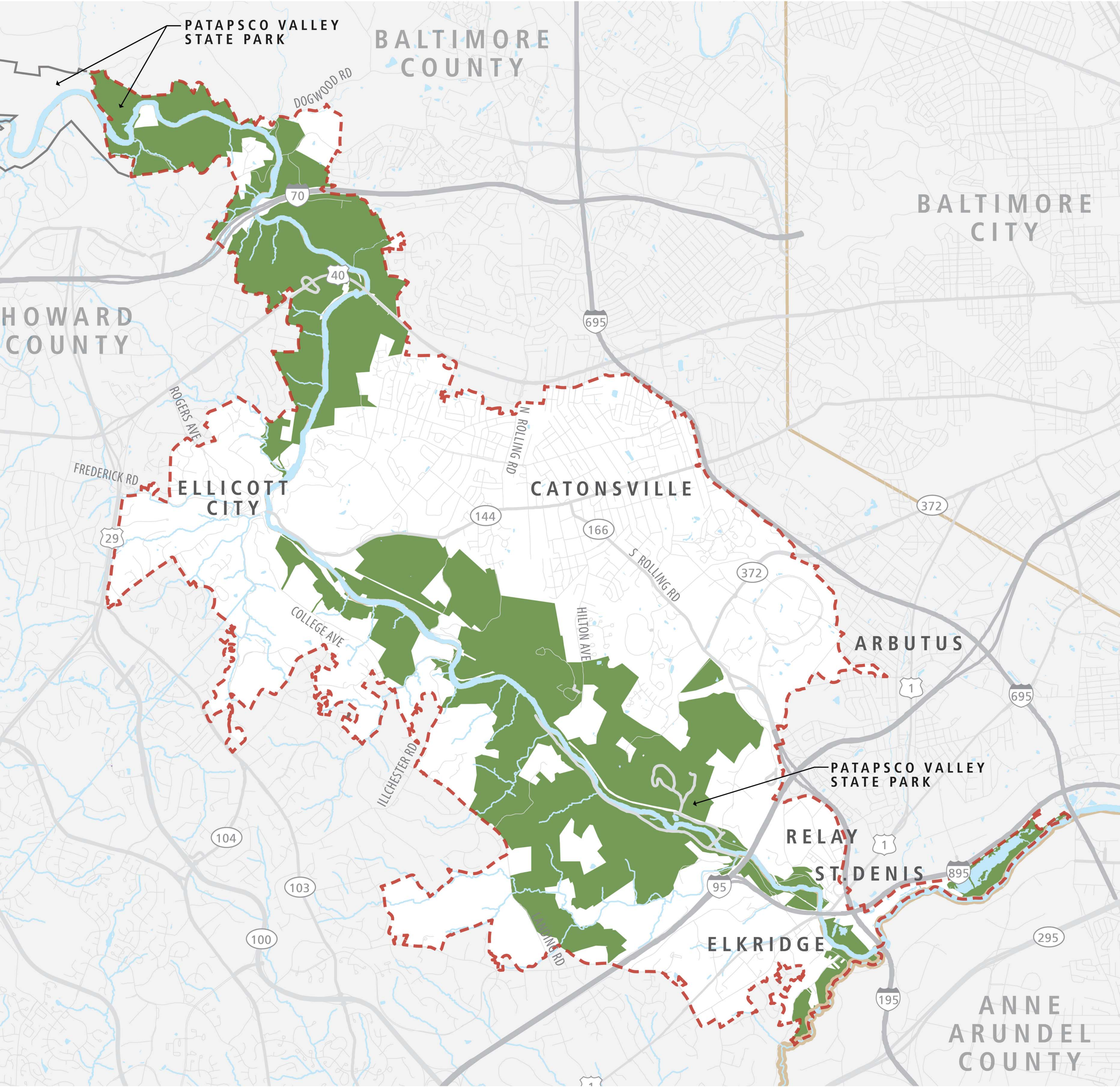
THE MILL & RIVER DISTRICT| ELLICOTT CITY, MARYLAND  
DIANE BICKEL | MINSOO KANG | SEAN KONIG | PRANJALI RAI





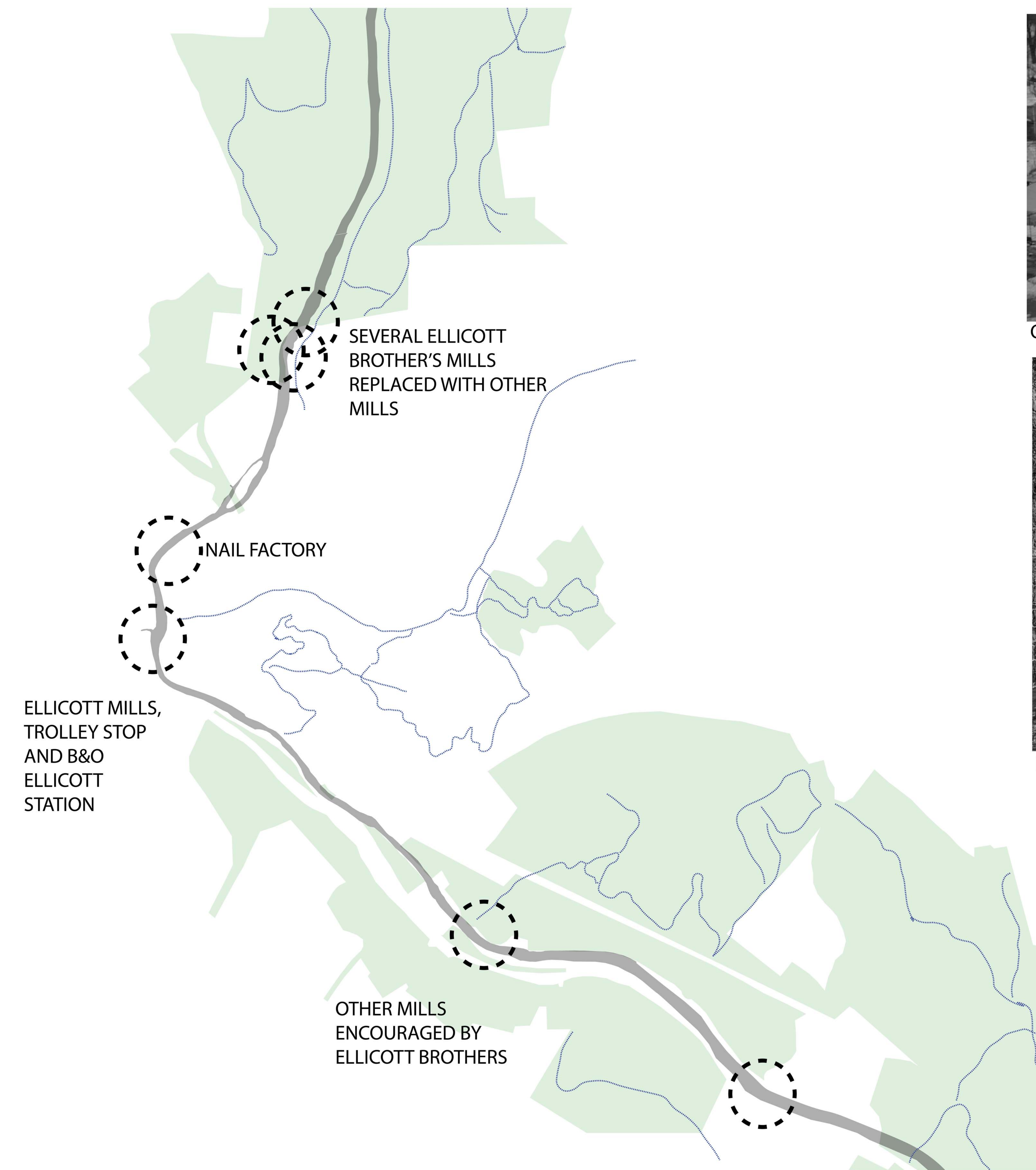
EXISTING PLAN OF ELLICOTT CITY - 'MILL & RIVER DISTRICT'



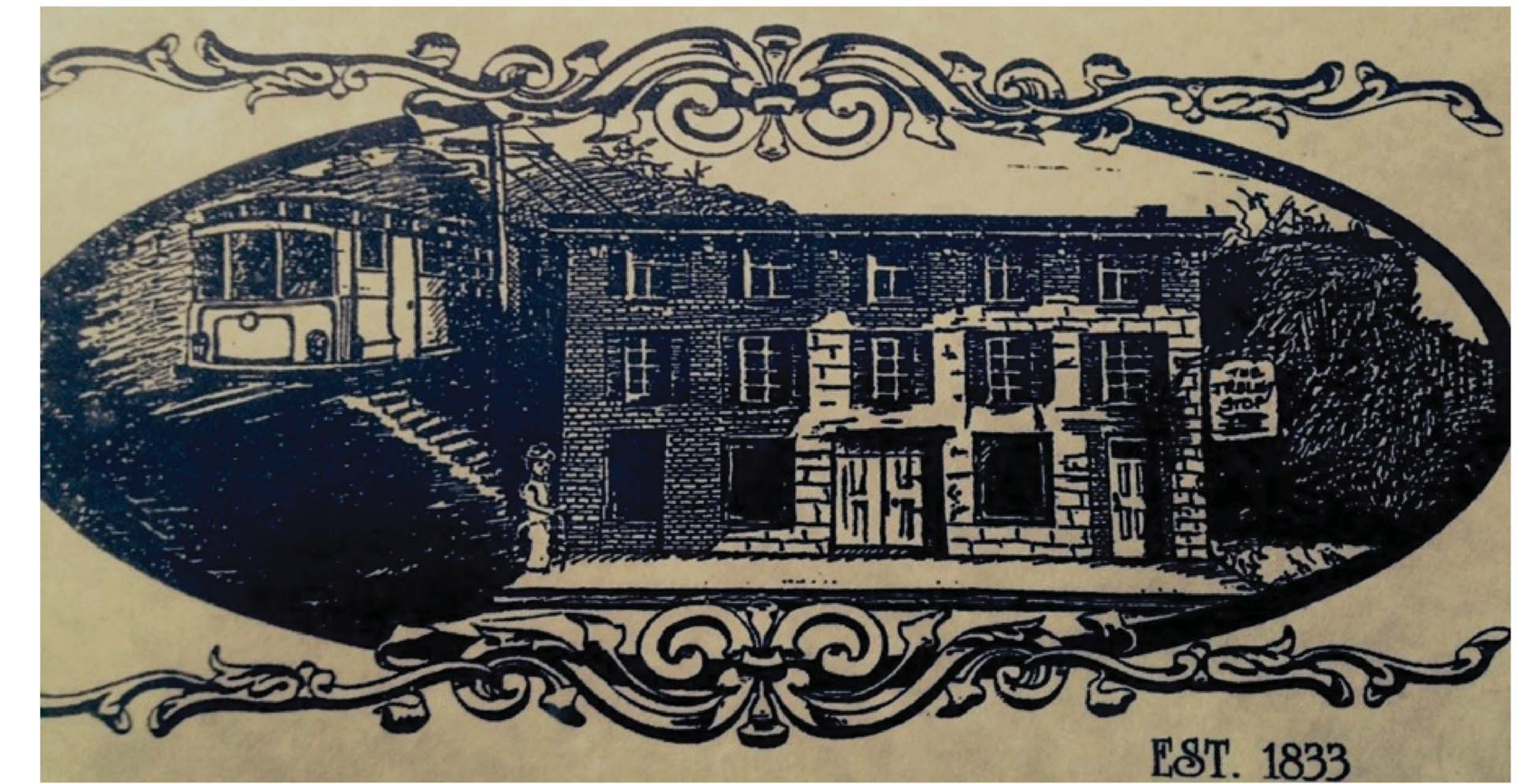


TRAIL CONNECTIONS





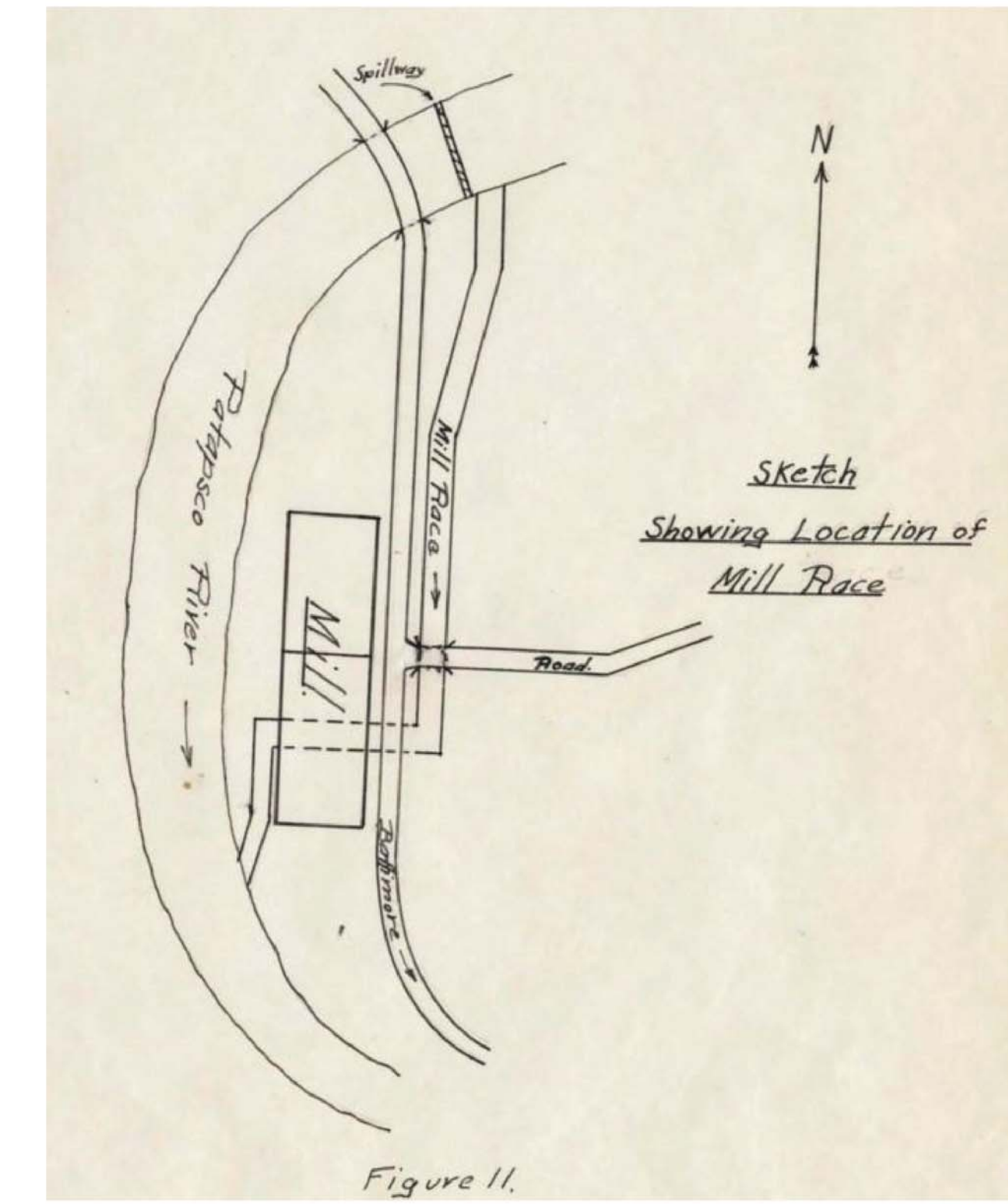
OLD TROLLEY BRIDGE



THE TROLLEY STOP



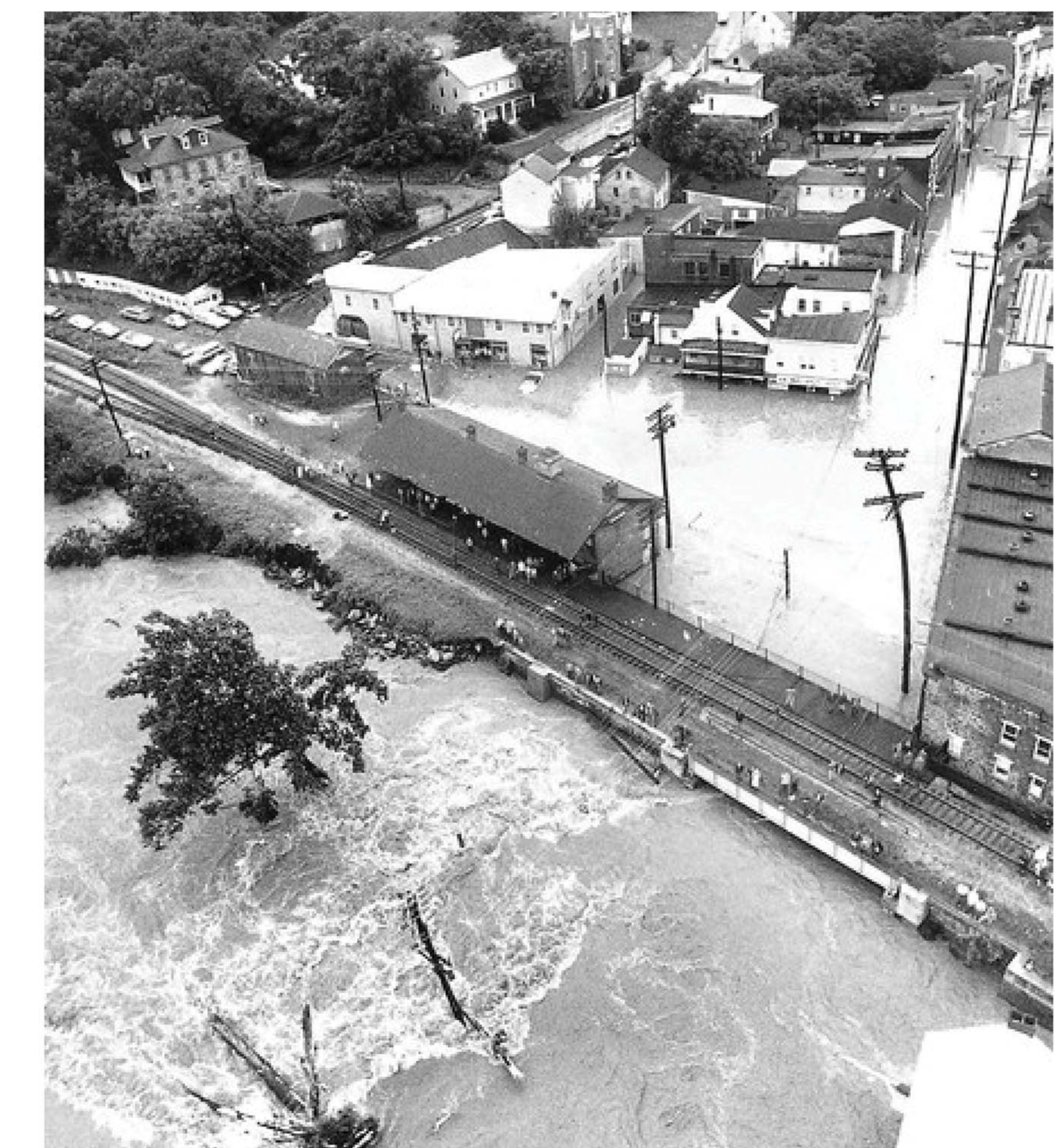
ELLICOTT CITY STATION PLAZA



OLD MILL RACEWAY (NOT EXISTING TODAY)



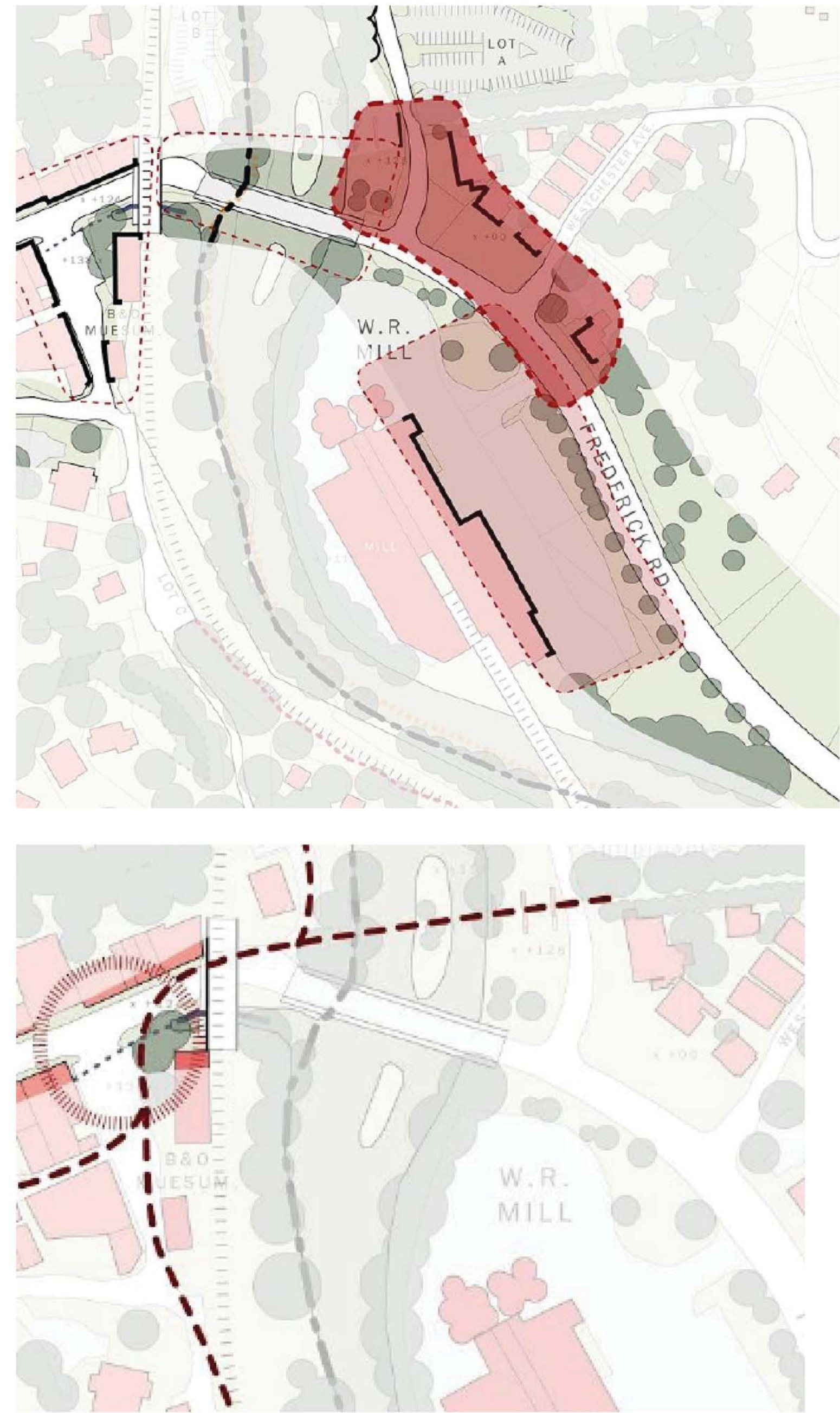
THE NEW AND OLD MILL BUILDINGS



FLOODING AFTER STORM AGNES (1972)



PUBLIC PLACES



B & O PLAZA

22,811sqft

TROLLEY PLAZA

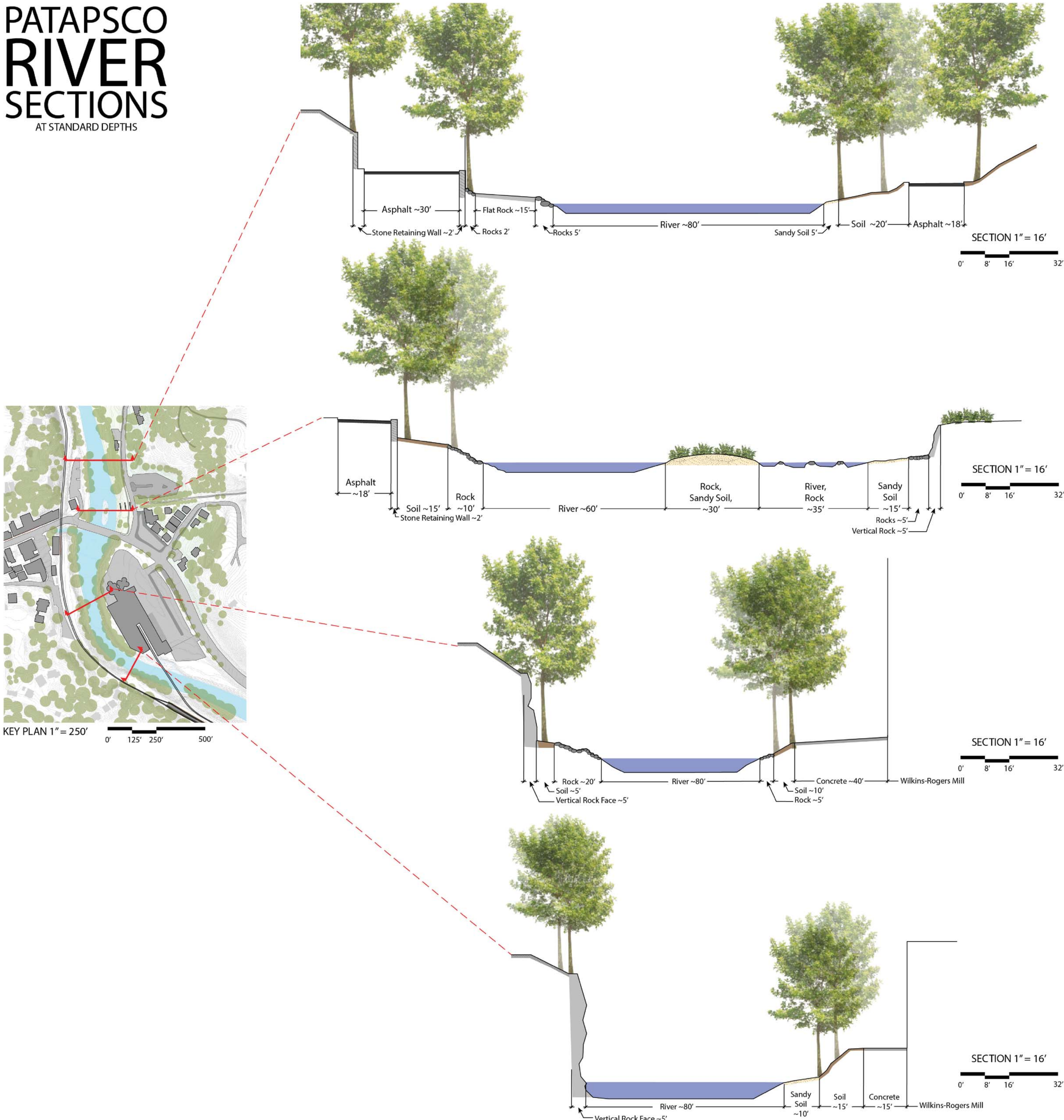
13,040sqft

TERRAIN

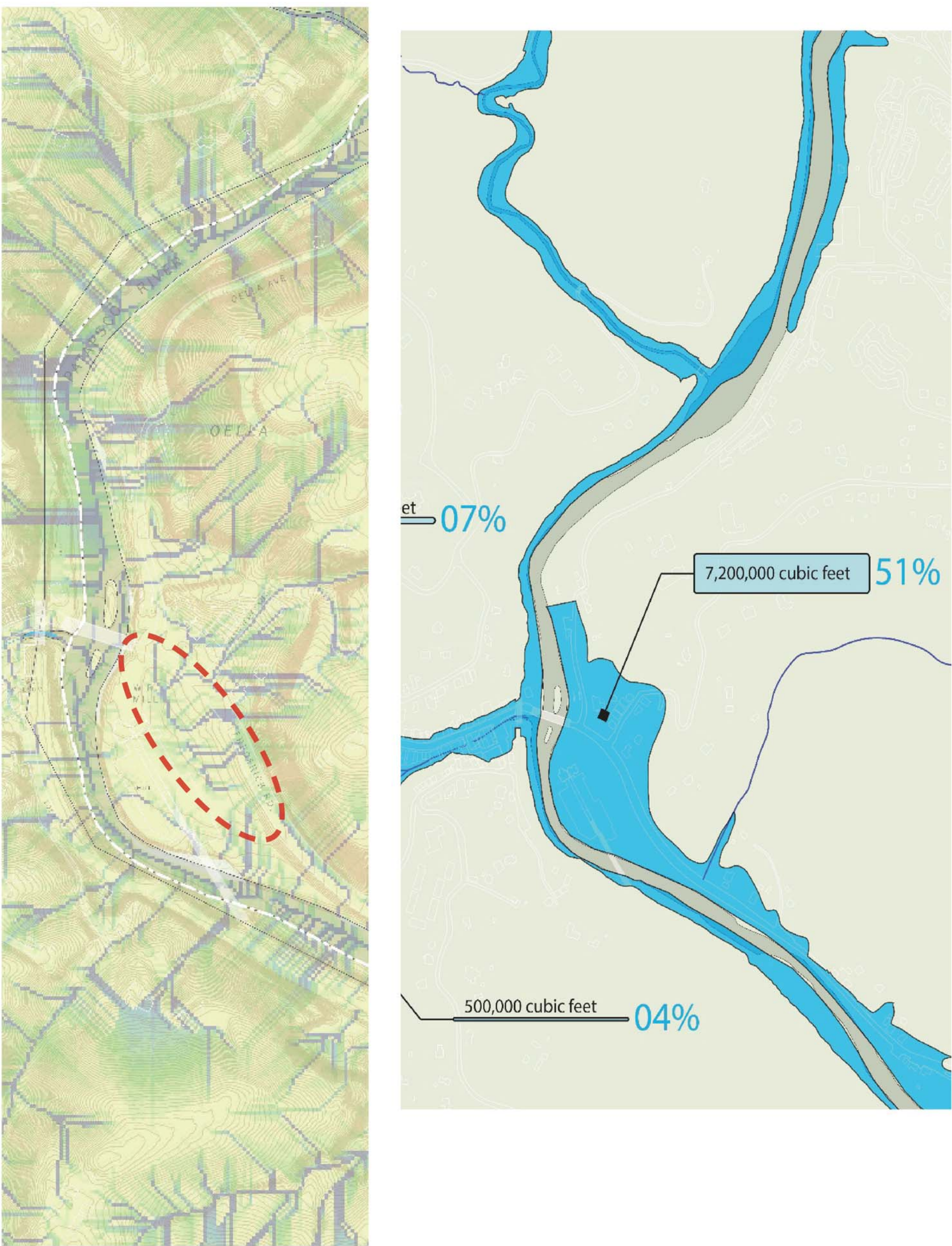
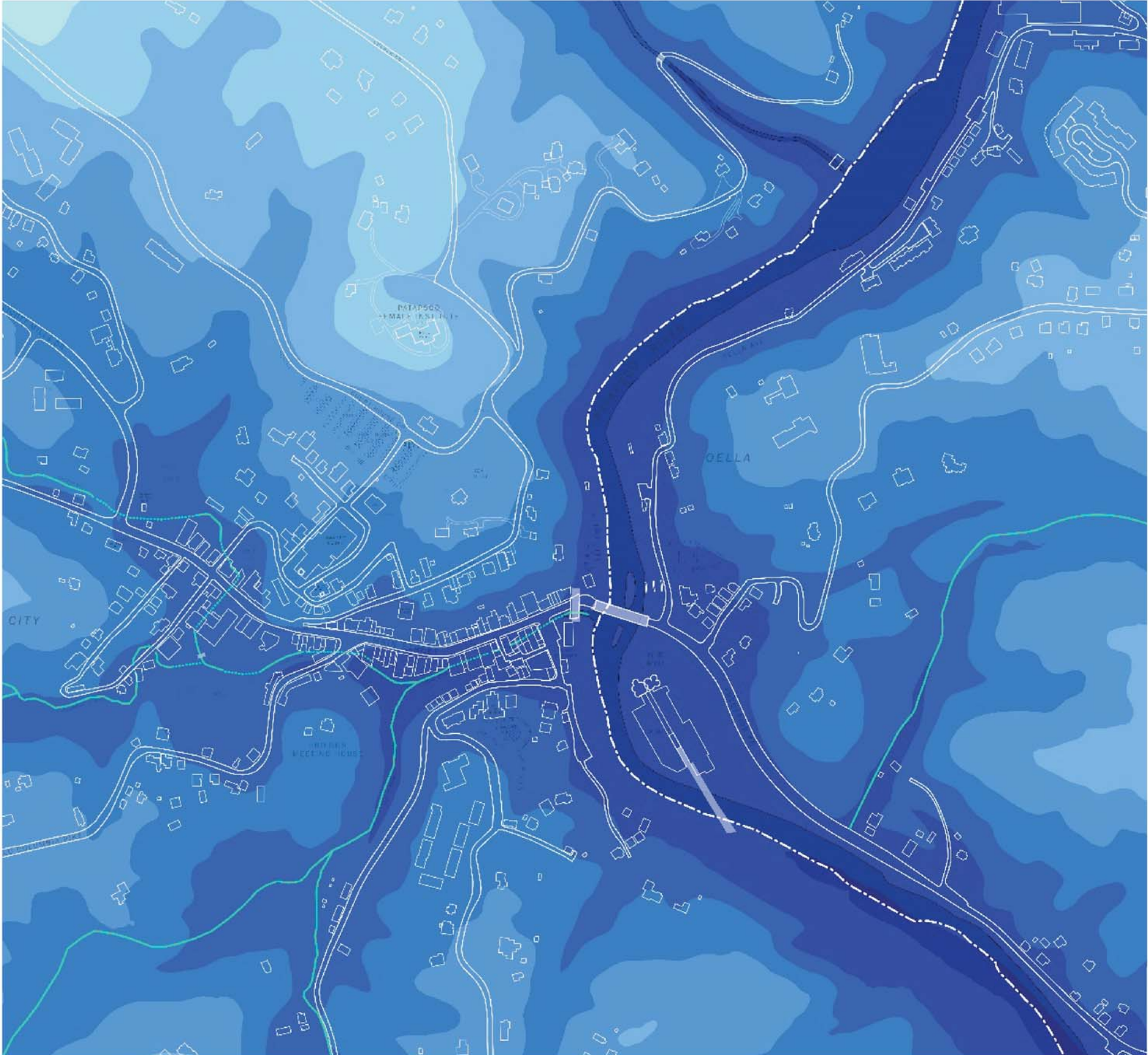


PATAPSCO RIVER SECTIONS

AT STANDARD DEPTHS



HYDROLOGY



OPPORTUNITIES

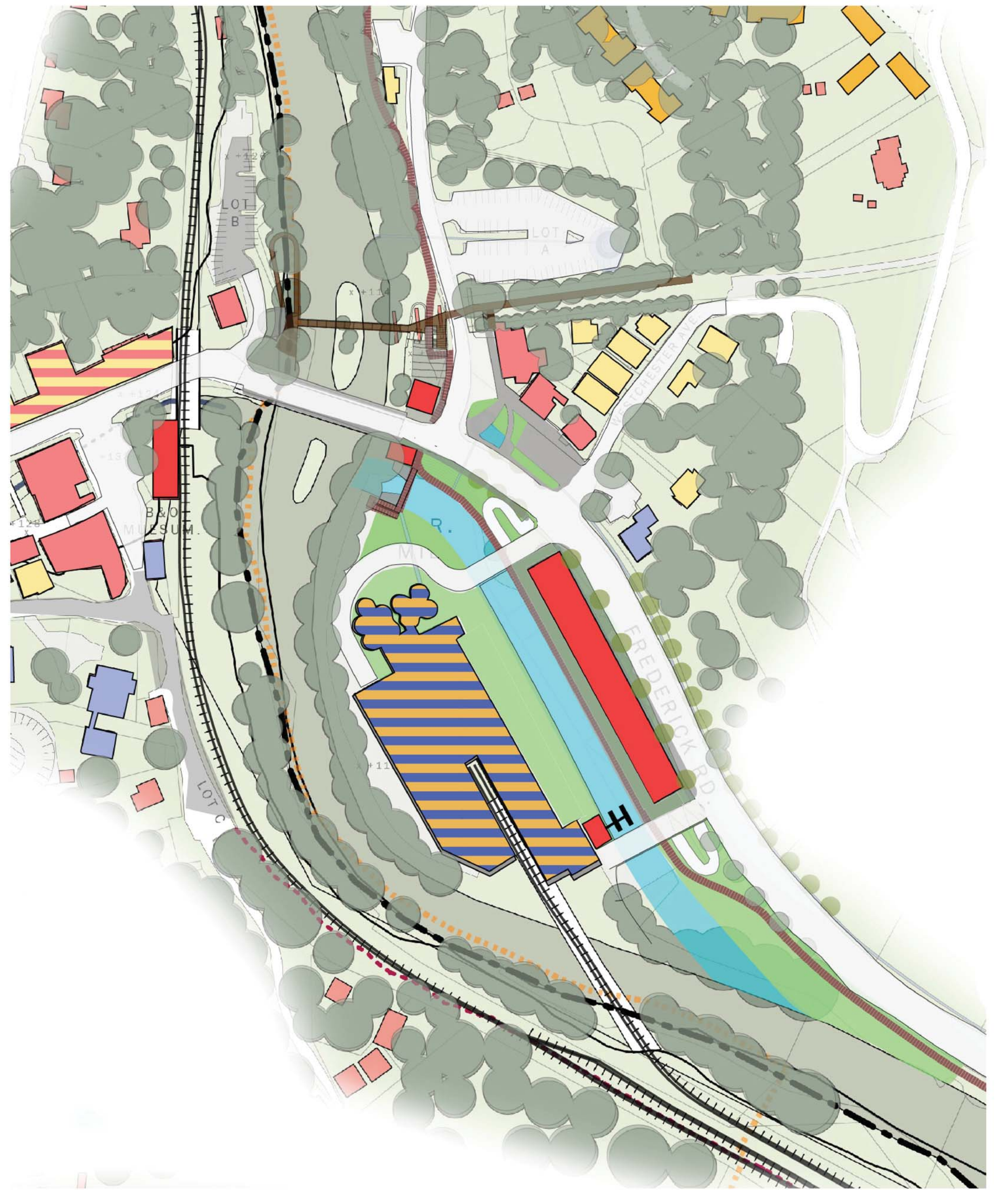
- FLAT TOPOGRAPHY IN MILL AREA FOR DEVELOPMENT
- PUBLIC SPACE DEVELOPMENT

CONSTRAINTS

- CONNECTIVITY ACROSS PATAPSCO RIVER
- MAJOR FLOODING IN MILL DISTRICT

THEME RESEARCH



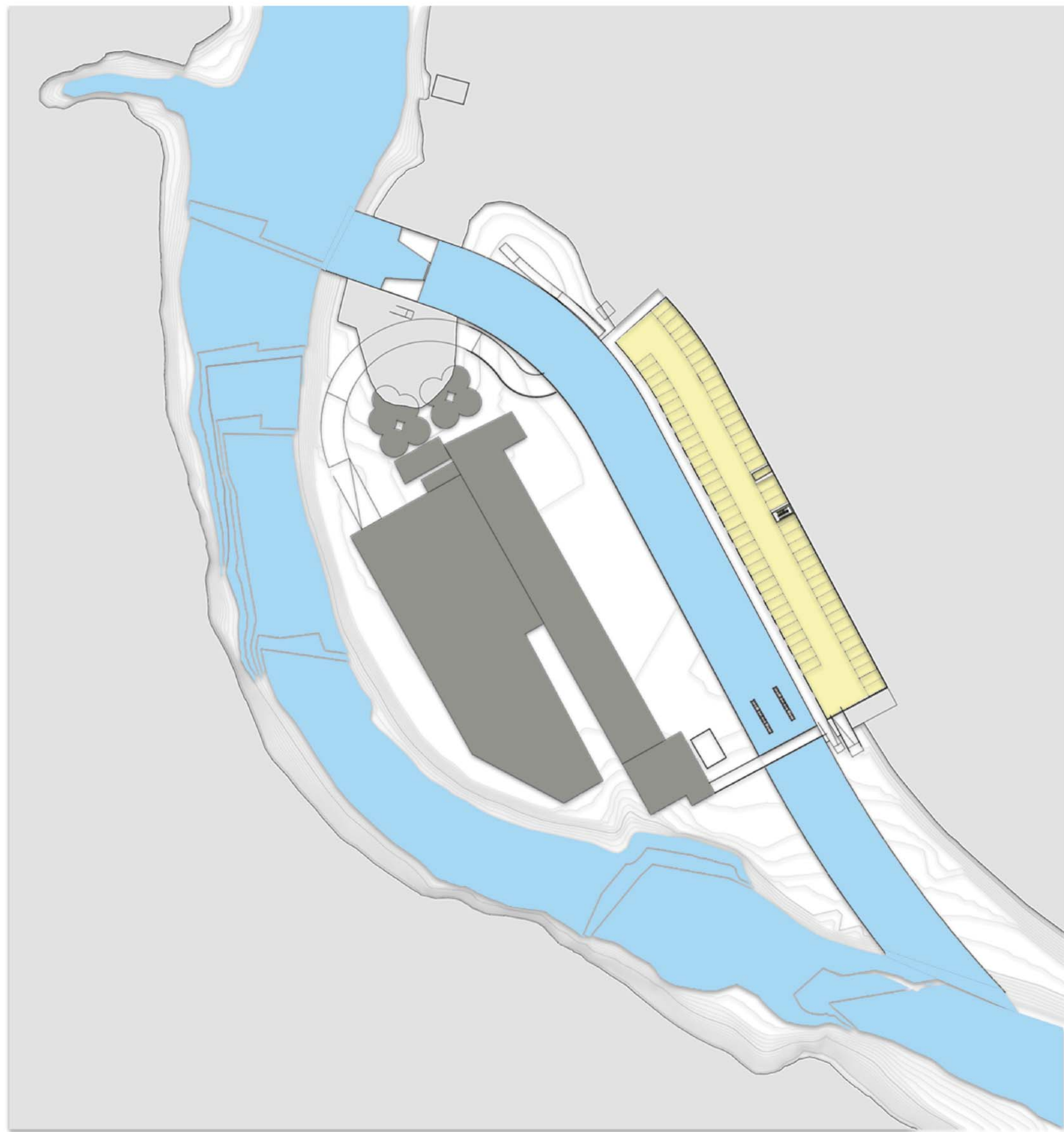


MASTER PLAN (EXISTING AND PROPOSED)

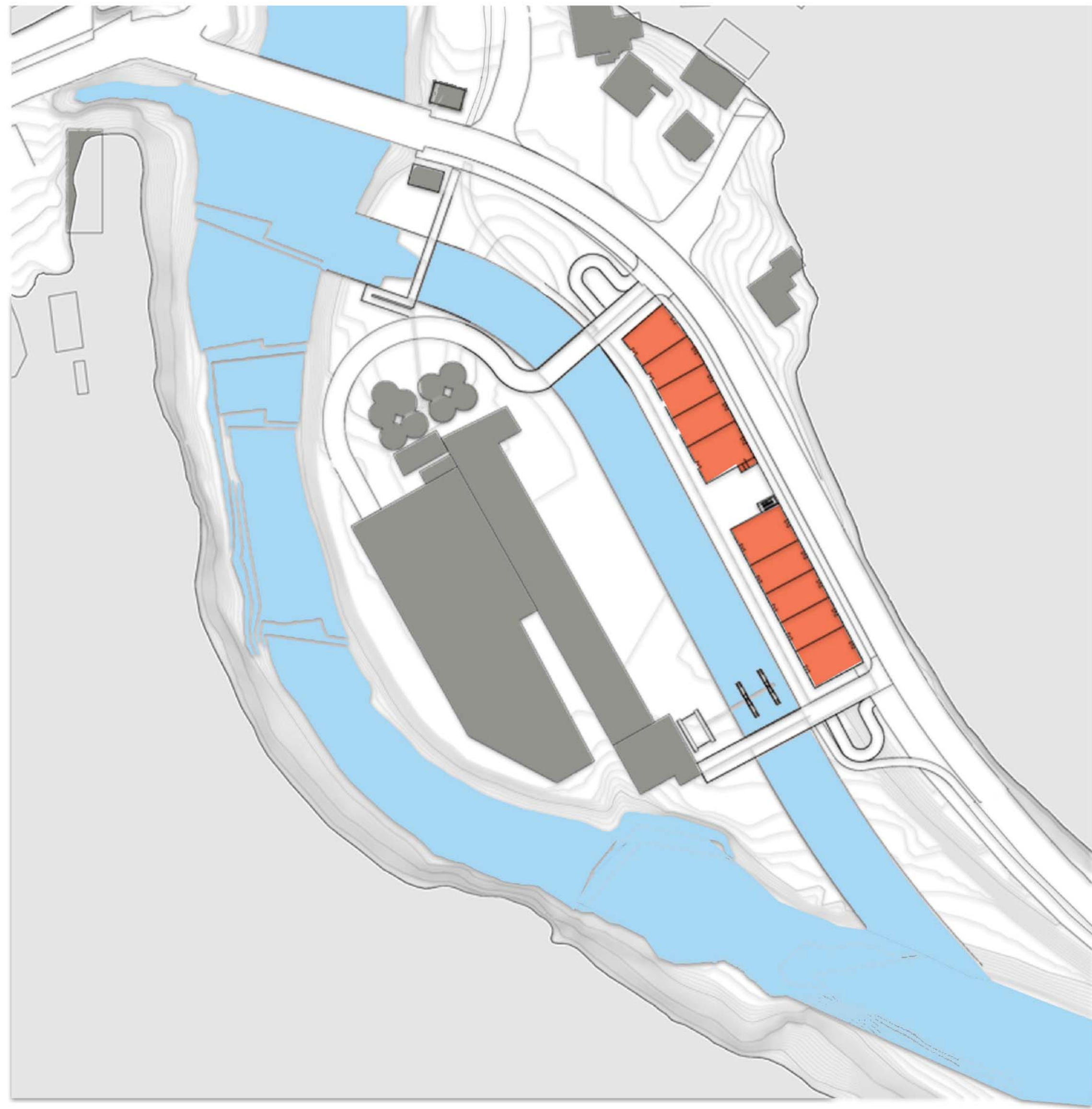




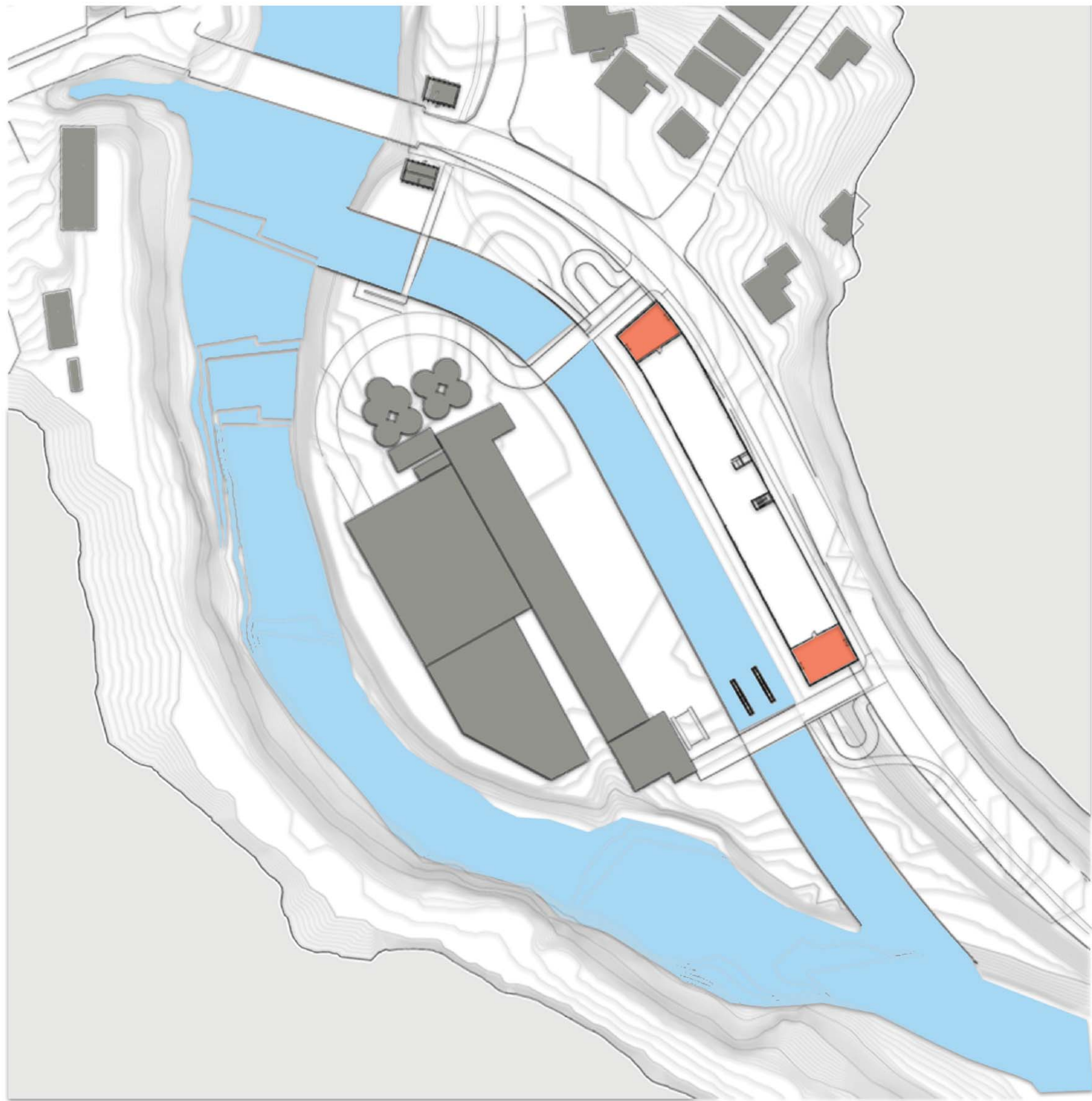




BASEMENT PARKING LEVEL (120 FT) - PARKING FOR 76 CARS)



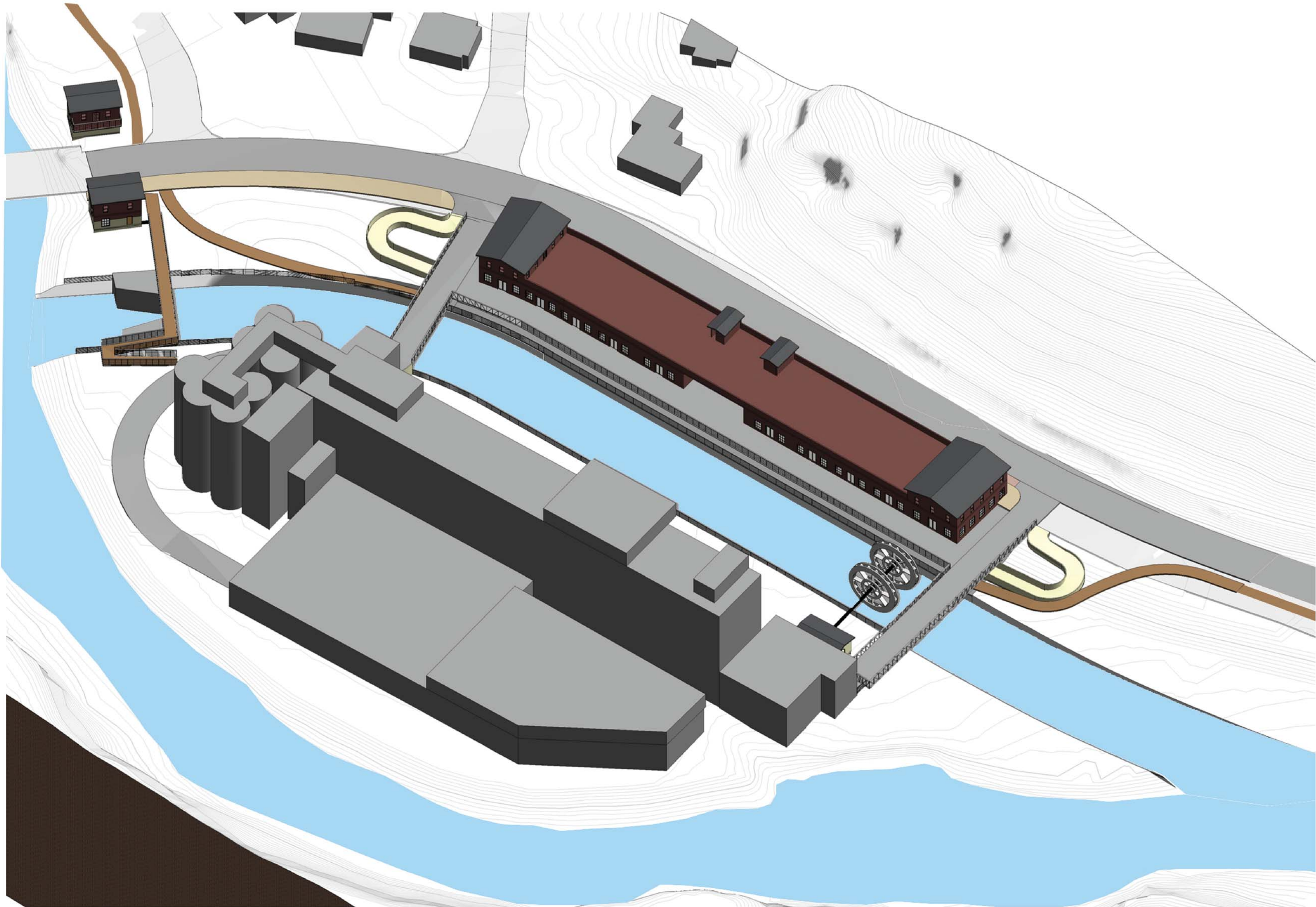
GROUND LEVEL (132 FT) - 16, 400 SQ FT OF RETAIL SPACE



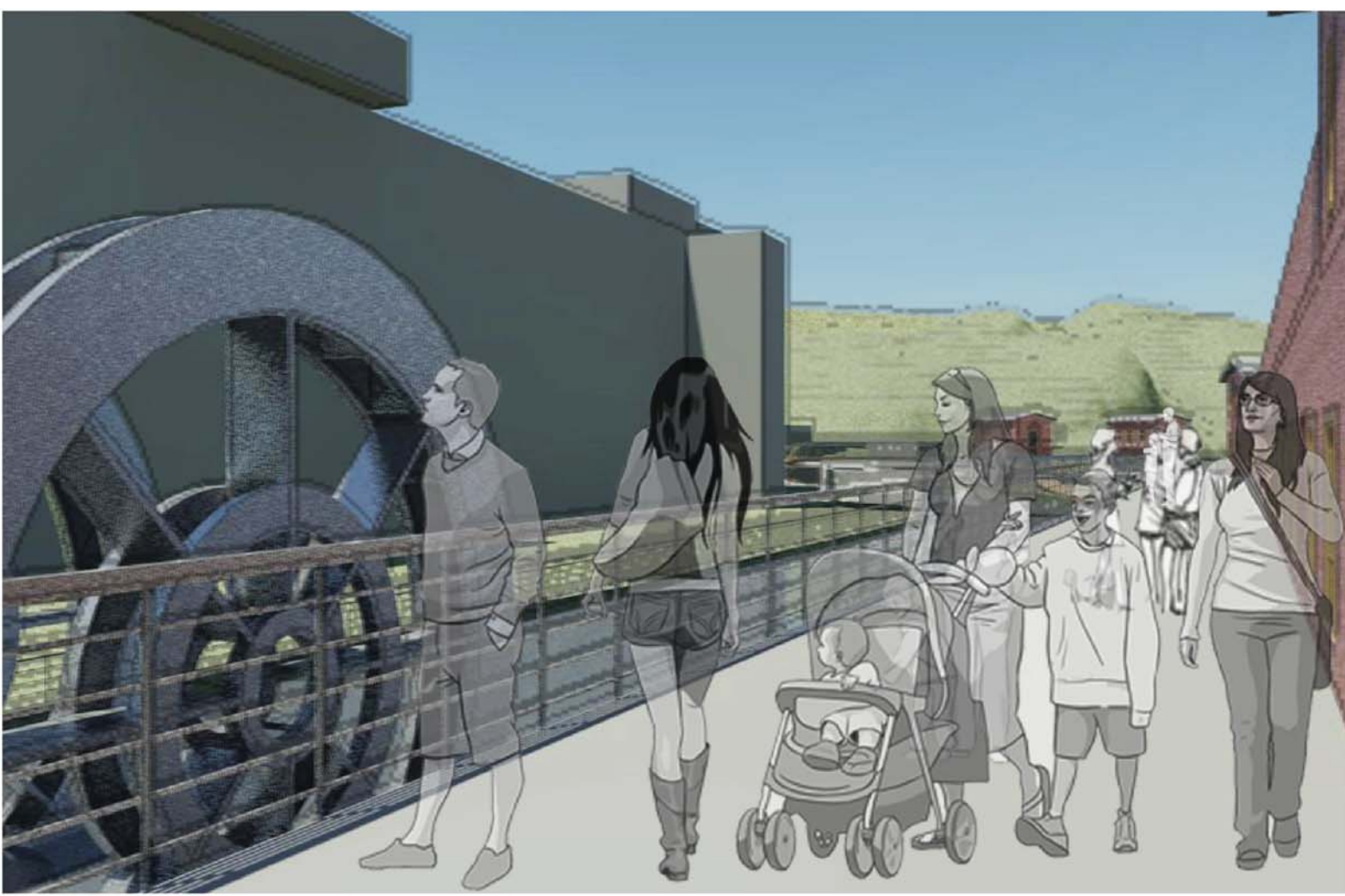
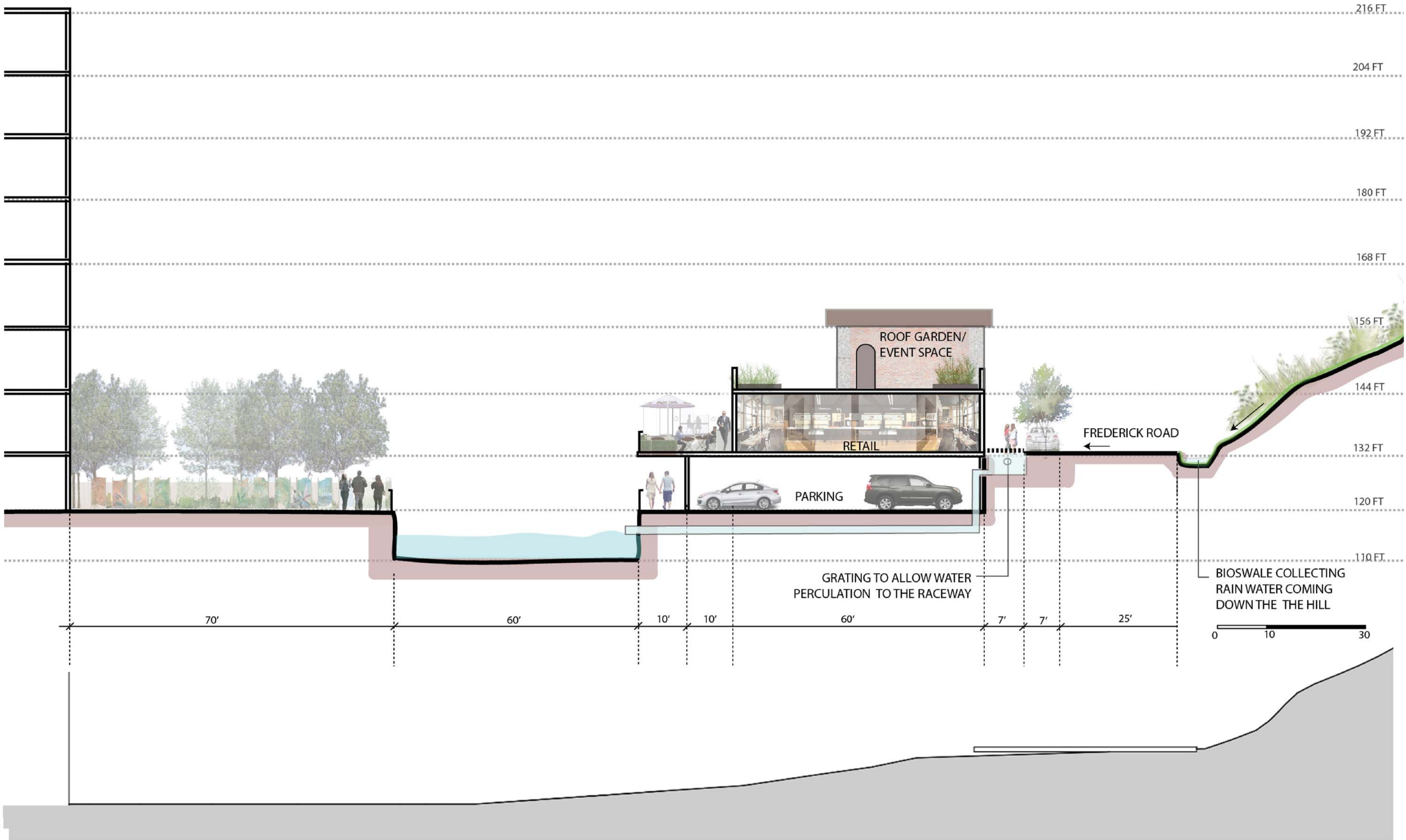
ROOF LEVEL (144 FT)- 3,560 SQ FT OF RETAIL SPACE)



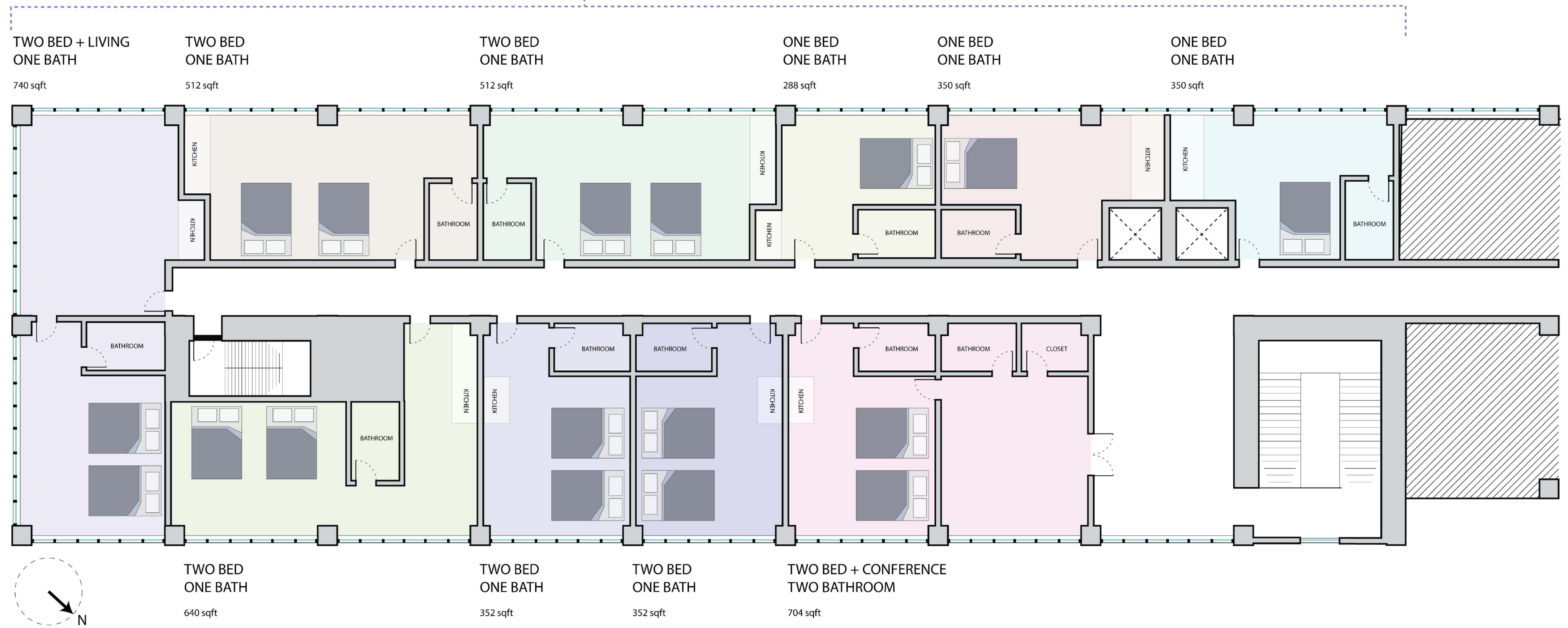
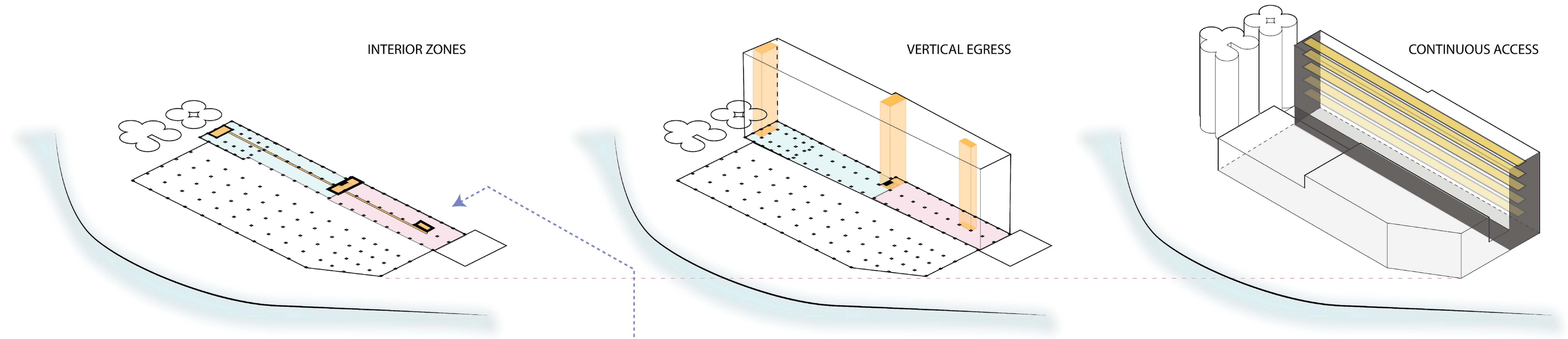
EXISTING WILKINS AND ROGERS MILL PARKING SITE



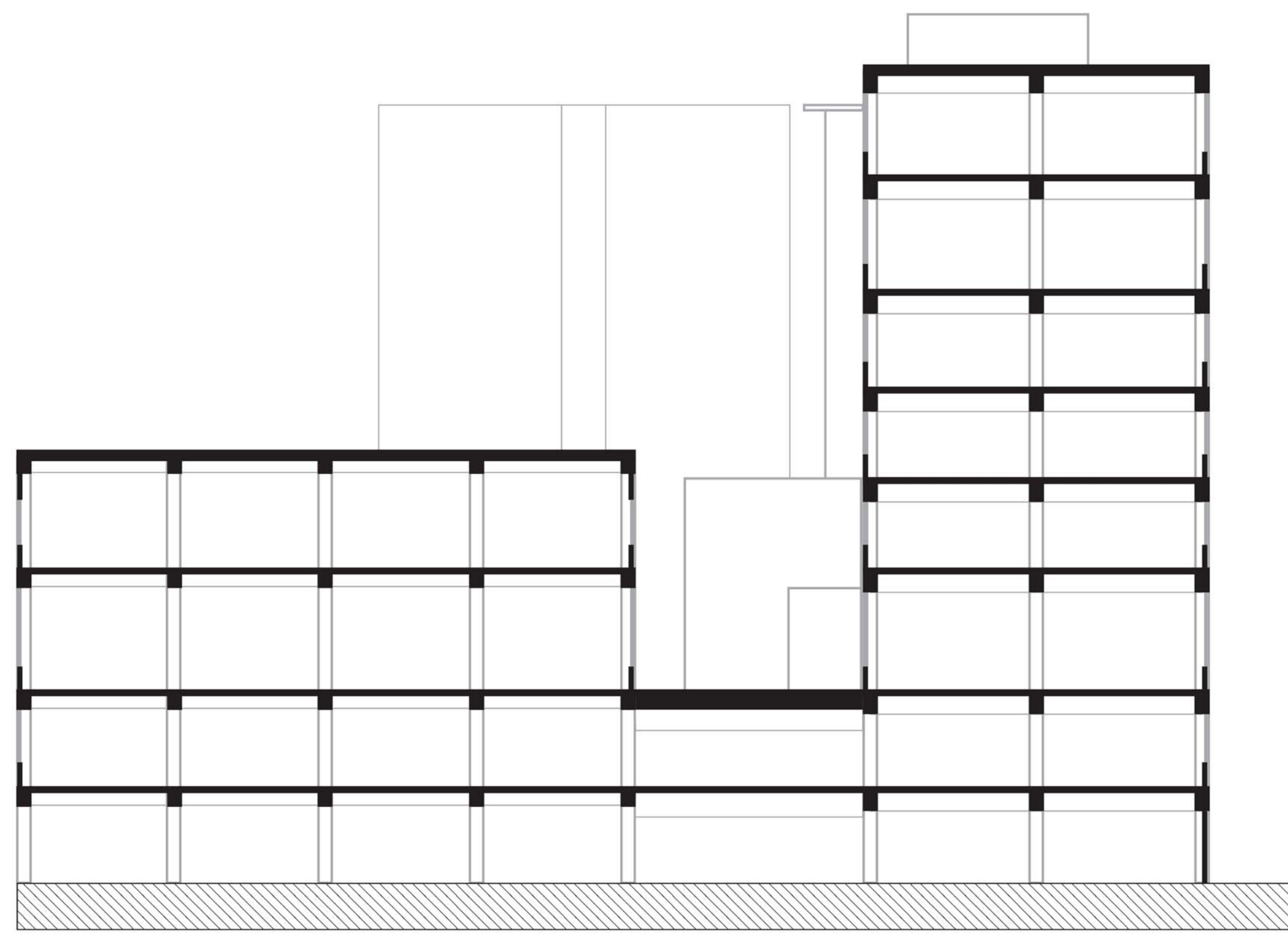
THE RACEWAY SCHEME



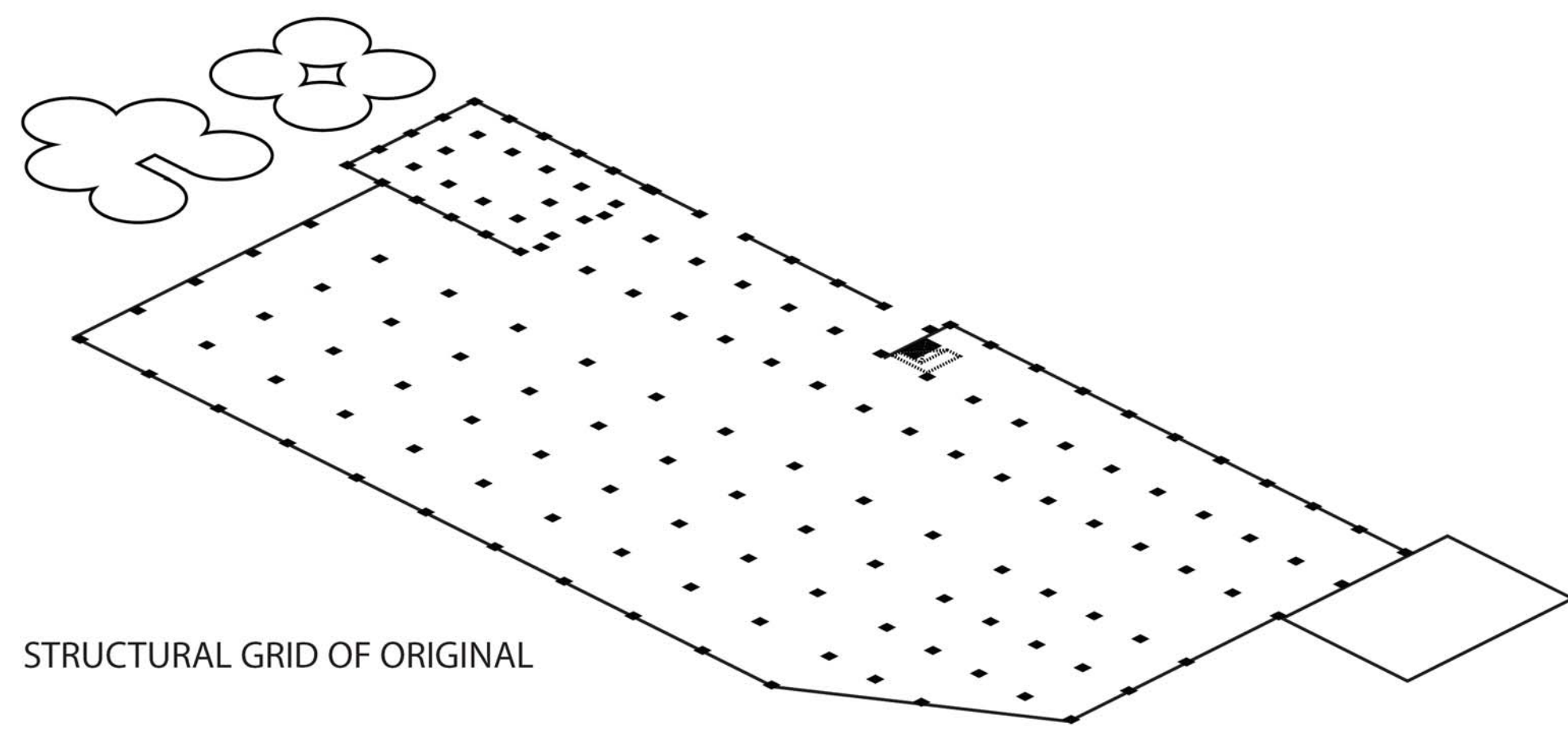




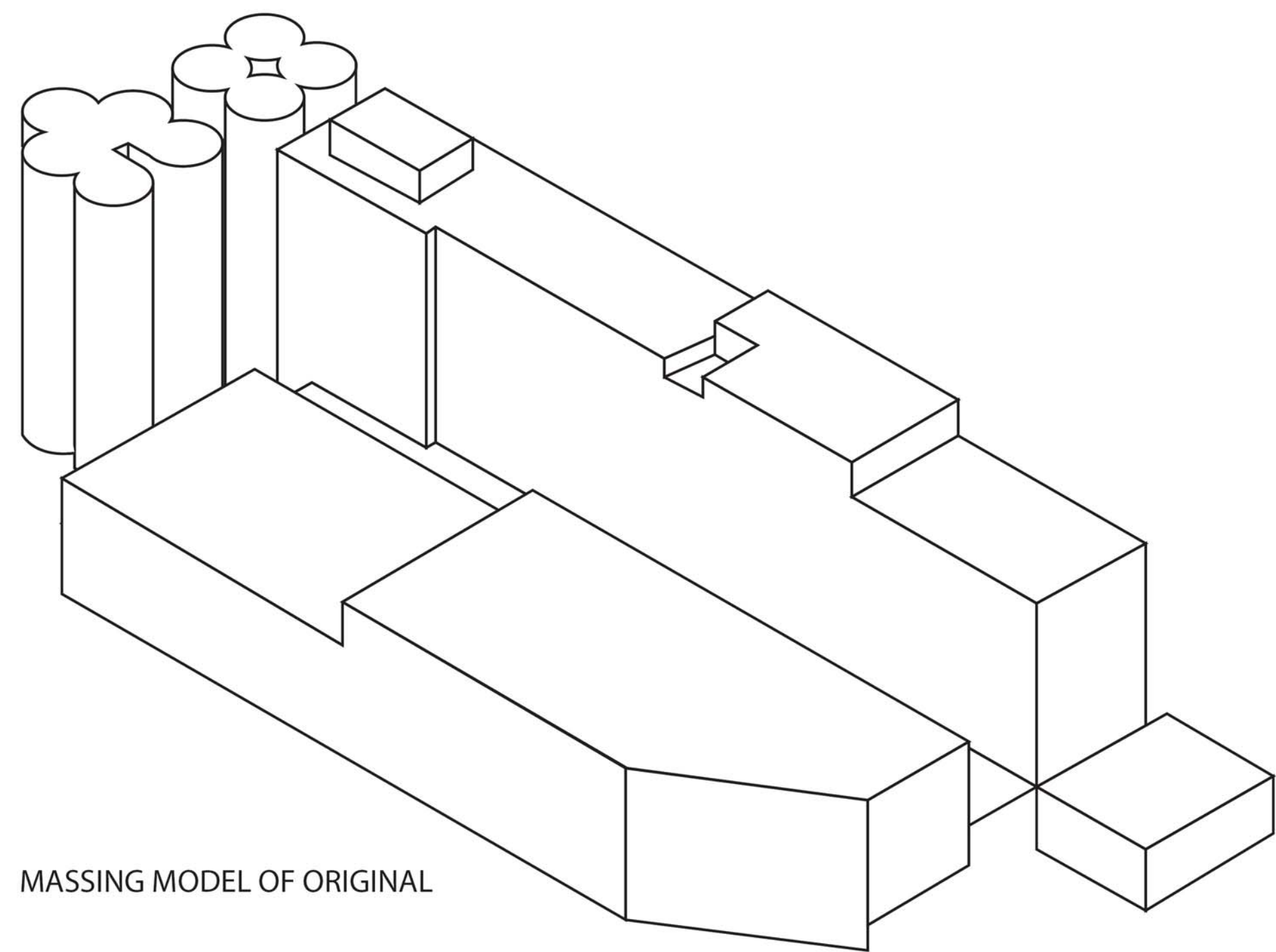




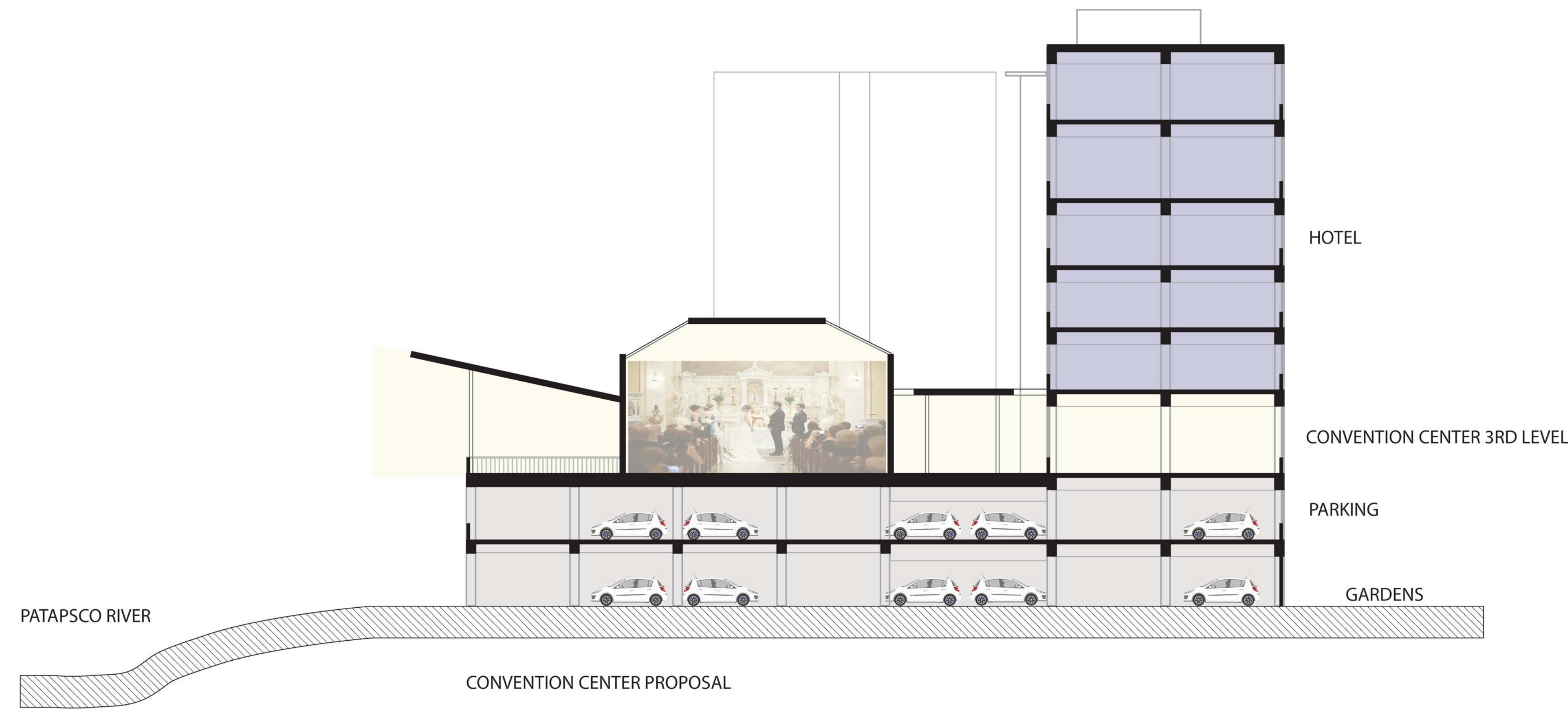
FLOUR MILL ORIGINAL STRUCTURE



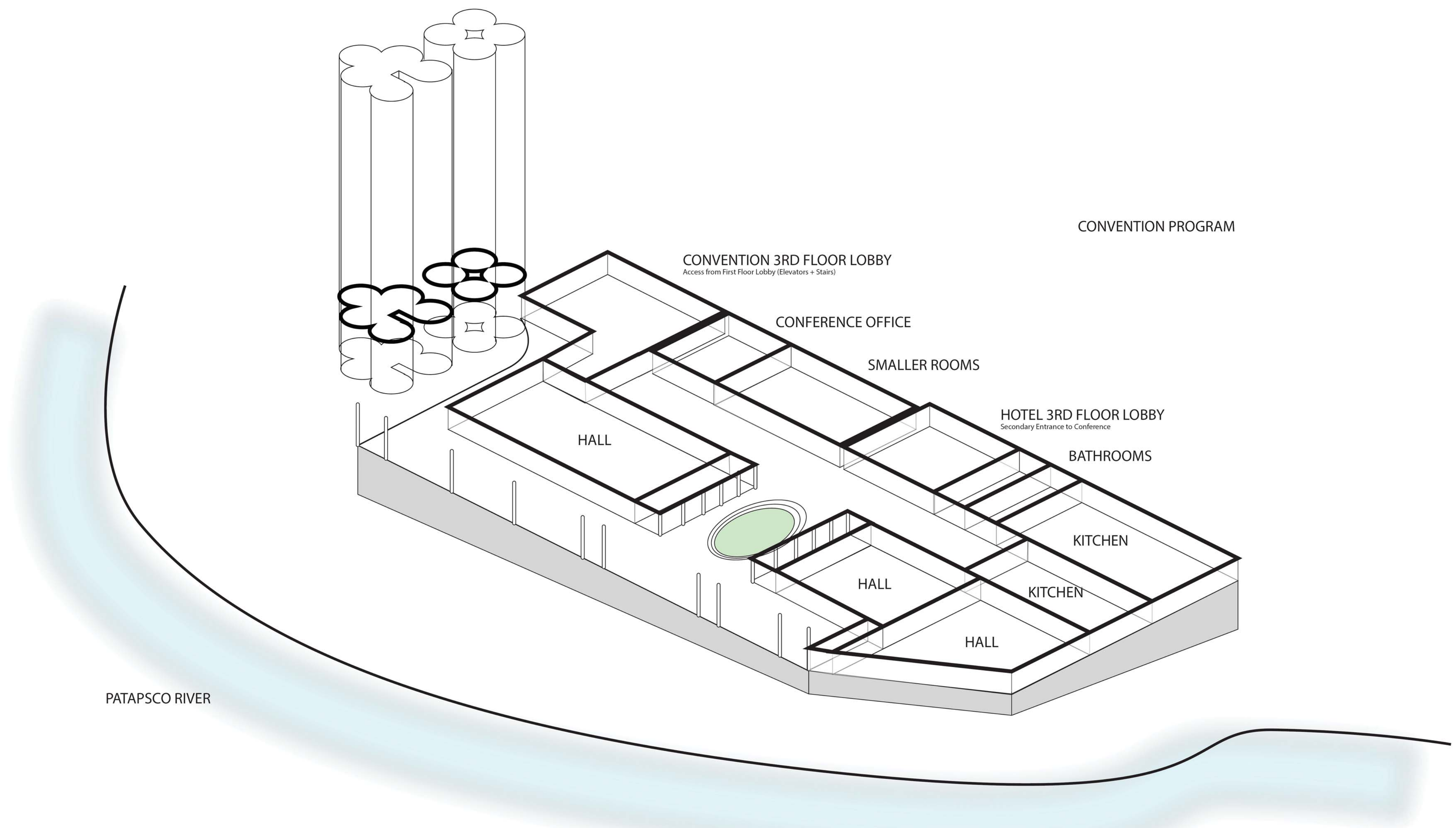
STRUCTURAL GRID OF ORIGINAL



MASSING MODEL OF ORIGINAL



CONVENTION CENTER PROPOSAL



PATAPSCO RIVER



