REACTIVATING WASTELAND

transforming the industrial soil and water cycle

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ABSTRACT

Since its inception, industry has always been a vital asset of modern life. But due to changes in technology and consumer needs in addition to fluctuations in city growth and decline, the role of industry in specific locations adjusts accordingly. When a specific industrial center becomes outdated or is no longer necessary, it withdraws, ceasing operations. This often leaves the former sites of production abandoned, creating a decline in the surrounding economy and a mental and visual subtraction within the adjacent community. Furthermore, the contaminants released into the soil, air, and water while the industry was operational present a vast number of problems for the future of the site, limiting the possibilities of potential development. Depending on the pollutants, the costs of renewal often outweigh the benefits, leaving the site underused and decrepit.

By introducing a system that eliminates the contaminants within the site, the problem established by the abandoned industry becomes only partly solved. Ideally, there would be a way to reduce the need for brownfield redevelopment from the initial planning of the area by seeking to lessen contaminants released during production. The total solution, however, lies within reactivating the community and reestablishing function in addition to remediating the site. One method of implementing this strategy is a biofuel factory and aquatic center. Within these programmatic components, overlapping the processes of bioremediation with the outcome of natural pools, crops for fuel growth, and contamination removal seeks to reinforce a cyclical nature of production, and perhaps one that could be implemented on a number of brownfield sites.

THESIS QUESTION

How can architecture reinterpret the negative stigma of a contaminated and neglected site into one that is accessible and useful to the public? Furthermore, how can the introduction of an industrial building and remediative ground strategy not only eradicate the contaminants from a previous industrial site, but also ensure that future contamination on site is eliminated?

As an integral part of modern society, industry offers a number of advantages that would otherwise be nonexistent. And, with constantly updating technology and public needs, current industry adapts as best as it can. But, when conditions change too much, the particular industrial node retreats, creating a void from a once productive epicenter.

Using the frequent example of abandoned industry, the opportunity for development presents many challenges and possibilities. They are left contaminated, completely devoid of function, and offer a multitude of problems for buyers/developers. Often times, they remain in their abandoned state for a number of years because a regenerative standard has not been successfully developed. Though useful to the community when operational, industrial production centers often release various contaminants into the soil, air, and water. In addition, if the site ceases operations, it becomes useless to the community, but still has the lingering negative effects from the time in which it was open; thereby, creating a looming paradox of the industrial atmosphere being damned if it is open and damned if it not.

Perhaps the most significant challenge when dealing with an abandoned industrial site is to reintroduce and reclaim the area. Improving upon the current production methods is necessary in order to establish a system that can be implemented within the various situations of brownfield recuperation. Furthermore, by keeping the previous site function in mind, it seems imperative to eliminate some of the negative aspects of industrial production. By relieving the undesirable stigmas of old means of production, perhaps industry can become something that is welcomed and encouraged by its surrounding community.

Although traditional methods include temporary surface cleanup and then another ecologically harmful system is reintroduced, basically allowing the process to repeat itself, there is the possibility to create an area that becomes more significant and productive. The answer lies within an alternative that implements strategies of production through which the system becomes self-sustaining ecologically until the site is remediated (and beyond). Working with contamination, reintroducing industry, and strategically planning how the two can operate in unison could be a solution that could help eliminate some of the many abandoned industrial sites throughout the nation.

CURRENT INDUSTRIAL METHODOLOGIES

Industry, however, has the staggering potential to activate a community. By providing services such as fabrication, citizens acquire the manufactured products, increasing the local economy. But, more importantly is the opportunity for employment. Especially in areas where long distance commuting is common, nearby employment opportunities can benefit the community tremendously.

A heavy reliance on industry by the community is something that has dated back to the onset of the Industrial Revolution. And even the proximity between housing and industry has been a topic of much debate. Traditionally, close proximity was considered ideal, reducing the commute time between work and home, but this idea shifted drastically with the widespread popularity of the automobile. Instead of living in the city, near a plethora of employment opportunities, the ideal became to live outside the city in a grassy suburban environment. As a result of urban sprawl in addition to shifts in technology, industrial sites became vacant. With this absence, a visual reminder remains within the framework of its context, sending a message of failure.

But a scheme developed by Garnier, the *Cite Industrielle*, was an ideal realism that sought to reverse traditional standards by expanding upon the ideas set in forth by utopian schemes previously existing in France. By clustering program into separate interrelated zones, Garnier placed as much emphasis on industry as he did housing, medical care, etc. An early example of such a scheme was Ledoux' *Salines at Chaux*. This example surpassed Garnier's by creating a central focus of industry and libraries in the new city with housing spanning off radially. Though both of these projects were based on a socialist type of government, it was clear that industry was becoming an overwhelmingly significant thought in the minds of architects.[1]

Furthermore, these visionaries were seeking the form and format that the emerging industrial city might take. Garnier in particular created a proposition that most accurately reflects and early modern ambition of a model that incorporates the productive amidst the residential.[2] Though these ideas are considered utopian, a fraction of them remains truthful. The location of industry to other aspects of the city was not a unique idea, because it in fact existed when these designs were being created. However, a somewhat more realistic and organic method was implemented to how industrial zones were arranged. In essence, the ideal sought to integrate industry from the inception of new cities. But, in reality, industry was introduced more sporadically into the framework of functioning cities.

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[1] General information about Garnier and Ledoux taken from Wiebenson, Dora. "Utopian Aspects of Tony Garnier's Cité Industrielle." *Journal of the Society of Architectural Historians* 19 (1960): 16-24.

[2] Reference to Garnier's comparison between production and residential taken from pg 100 of White. "Bracket [on farming]." *The Productive Surface*, Edited by Mason White and Maya Przybylski, 99-104. Actar, 2010.

Due to the significance of industry since its origin, the effect it has within the community is extremely powerful. When industrial factories cease their operations, a huge void is left within the framework of the community. Many jobs are lost, and often the buildings become abandoned. More importantly, the catalyst of production and activation within the adjacent community is halted sometimes indefinitely.

It is easy to visualize the decline of an abandoned building over a period of time. To see the shell of a once productive object gather rust, weaken, and crumble can be a powerful reminder of what once existed. What is often not observed, however, is the level of contamination that is released from industrial/post industrial sites. Toxins such as arsenic, copper, lead, mercury, aluminum, and thallium to name a few slowly accumulate in the soil over years while the building is in operation.[3] They remain for the most part, but just as they were introduced into the soil, so they spread through the air, water, plants, or whatever else happens to intrude upon them. An increasing problem is the contamination running into groundwater systems, which are then transferred into ecological systems affecting numerous flora and fauna. It is the contamination of the sites that often has a deeper impact ecologically than the declining buildings.

The EPA defines a brownfield as "a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."[4] For brownfield land to be considered contaminated land, it requires there to be a significant risk of harm occurring to the site user, or a negative impact on the site development or the environment if no mitigation measures are put in place. It is common to analyze

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[3] EPA. *Brownfields and Urban Agriculture: Interim Guidelines for Safe Gardening Practices*. Summer 2011.
[4] EPA. *Brownfields and Urban Agriculture: Interim Guidelines for Safe Gardening Practices*. Summer 2011.

such risks using a pollution linkage model. This requires identification of all potential sources of contaminants or pollution agents on the site. These are compared to the likely receptors on site or introduced to the site under redevelopment. These typically include site users, property, ecosystems, surface water, and groundwater. It is then possible to identify and assess all potential pathways in the new development that could link sources to receptors. This should include any pollution linkages to off-site receptors through dispersion by migration of contaminants in surface water, groundwater, ground gases, or windborne dust. If any significant pollution linkages are identified, then remediation measures can be planned to remove the pollution source, block the pathway, or remove the receptor.

Estimating that there are over 450,000 brownfield sites in the United States, improved strategies for brownfield redevelopment could potentially help reactivate a majority of these areas. Unlike "greenfield" development, which encroaches on agricultural or greenbelt land, so-called brownfield redevelopment reuses previously developed land that is often derelict, underutilized, or neglected. This can improve the aesthetic, social, environmental, and economic value of the land, so it is consistent with the broad principles of sustainable development and the ambition of achieving intergenerational equity. However, brownfield land that was previously used for industrial activity is commonly contaminated, necessitating remediation to render the land suitable for the new use.[5]

Brownfield revitalization increasingly is also seen as an opportunity to alleviate sprawl, traffic congestion, and to relieve that gaps within metropolitan areas. At the same time, some communities

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[5] General information and definiteion of brownfield taken from "Brownfield Redevelopment" chapter of Cohen, Nevin, and Paul Robbins. *Green Business: an A-toZ Guide*. Los Angeles: Sage Publications, 2011.

are viewing brownfield reuse as a means to obtain much needed job development and training for dislocated workers and minority populations.[6]

COMMON SOLUTION

There are several situations within production industries where site remediation may be desired: along pipelines, at refineries or chemical plants, at former service stations, or at abandoned industrial sites.[7] These manufacturing areas are located in various geographical and environmental conditions around the world, from internal to domestic, centralized urban to rural sites, and in industrial to developing countries. In terms of environment, remediation solutions are sought while concentrating on a policy of pollution prevention, product stewardship, and resource conservation. It is perhaps most logical to search for solutions that, while aiming to cleanup and fix a site, are cost effective, environmentally sound, and aesthetically pleasing.[8]

Traditional ways of dealing with the clean-up of industrial sites have been to dig up existing contamination and haul it to a hazardous waste dump or entomb it in place with an asphalt or concrete cap.[9] Now we recognize that we can go beyond traditional methods of site cleanup with the use of introduced plants to remediate contamination in place and simultaneously restore and renew

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[6] Information summarized from the preface of Bartsch, Charles, and Elizabeth Collaton. *Brownfields: Cleaning and Reusing Contaminated Properties*. London: Praeger, 1997.
[7] Misrach, Richard, and Kate Orff. *Petrochemical America*. Aperture, 2012.
[8] Suggestions for cleanup of manufactured sites through remediation, restoration and renewal of habitat from pg 31-40 of Kirkwood, Niall. *Manufactured Sites: Rethinking the Post-Industrial World*. New York: Spon Press, 2001.
[9] Conway, Richard. "Ground Water and Soil Contamination Remediation: Toward Compatible Science, Policy, and Public Perception." Paper presented at Report on a Colloquium Sponsored by the Water Science and Technology Board. National Academy Press, 1991.

habitat. The use of vegetation opens up opportunities for architects, engineers, and biologists to work together to create new environments in former industrial settings.

Though traditional methods can be effective for cleaning sites, scientists and engineers are often criticized for their narrow focus and failure to take in the big picture when developing remediation technologies. As more field studies and cleanup actions are attempted, it is imperative that scientists and engineers look to examples of other works and successes. But, by resolving the temporary issues of fixing a site, there are still many question left to be answered. With increases in technology and awareness of new strategies, the opportunities to explore beyond surface remediation have become possible. In that, creating a central database, from which several successful remediation strategies can be drawn by multiple sources will be essential to the goal of fixing abandoned industrial sites along a network of sites.[10]

Though there is a significant challenge in remediating a site, the benefits often outweigh the risks. The benefits clearly refer to a reactivation of an unused area with potential. However, the monetary costs of doing so can be extensive, which is why many sites are left in their post-industrial condition. Sometimes it become much more expensive to remediate a site in relation to how much it would benefit the owners. There are several different strategies for remediation including local containment, site capping, excavation, and in situ. Each varies in cost, effectiveness, and time requirements, but all seek to provide efficient results for contamination problems.

In today's skeptical regulatory and social environment, a carefully planned strategy for research, development and testing is required to build technical and public confidence in any new

[10] Idea of peripheral vision taken from pg 180-194 of Conway, Richard. "Ground Water and Soil Contamination Remediation: Toward Compatible Science, Policy, and Public Perception." Paper presented at Report on a Colloquium Sponsored by the Water Science and Technology Board. National Academy Press, 1991.

remediation technology. Within this notion, key elements include peripheral vision, the ability to observe concurrent research and observations; laboratory testing, both through the soil and water to properly analyze; pilot testing; and the scientific method.

Ecological remediation should not necessarily be the only process to renew an abandoned site. There are numerous possibilities for going beyond remediation, including those that seek to reactivate the site and reengage the community. A renewed interest in urban agriculture, renewable energy technologies, and positive energy developments invites a re-reading of early modern planning with regard to the productive urban surface.[11] The city proposed by Garnier was conceived and strategically programmed to absorb the productive characteristics of industry for its own benefit: for the production of energy, food, and a strong economy. On a similar note, White explains:

> Productive surfaces articulate a new public realm, and with that a new public; a public not characterized by its degree of urban, suburban, or rural, but by its ability to participate in the cultivation of its consumables… Is a constructed terrain that has the ability to, simply put, yield something. In other words, it has a tangible, positive byproduct – energy, biotic, or abiotic components, for example, premised on an intimate understanding of context, climate, and natural processes.[12]

This idea refers to these surfaces as being structured in order to successfully provide through all cycles. Therefore, they must be planned with the idea of continuity and progression, from start to finish, and back over again. It is in this idea that the surface yields, making it not only responsive to its environment, but indeed operational because of it. It becomes architecture of created surfaces

[11] White. "Bracket [on farming]." *The Productive Surface*, Edited by Mason White and Maya Przybylski, 99-104. Actar, 2010.
[12] Quote taken from pg 104 of White. "Bracket [on farming]." *The Productive Surface*, Edited by Mason White and Maya Przybylski, 99-104. Actar, 2010.

servicing variously scaled constructed environments: the roof, site, and even the macrocosmic version of its ecological context.

Acknowledging and capitalizing the innate potential of the site for a cyclical production involves a process that is responsive, yet usable and functional. And, within these extensive realms of possibility, “the role of the architect and landscape architect here is ripe for opportunity.” [13] By using productive surfaces, the premises behind architecture and landscape can serve a similar function. With a heavy collaboration between the two, they both can become fruitful and in unison work towards the same goals: remediation and production.

VEHICLE

Seeking to remediate a former industrial and contaminated site, the possibility from which to choose is quite astounding. Due to the extensive availability of production and former production areas along the Mississippi River, a number of brownfield areas remain unused and derelict, even when narrowing the focus to the greater New Orleans area. And, with a majority of these sites located near a relatively high population, the option to reclaim these areas becomes even more relevant.

One site in particular, located just outside of New Orleans, is the former Kaiser Aluminum plant. A generation ago, it was a state of the art plant. And, at its peak producing over 275,000 tons

[13] Quote taken from pg 104 of White. "Bracket [on farming]." *The Productive Surface*, Edited by Mason White and Maya Przybylski, 99-104. Actar, 2010.

or aluminum annually, it was the largest smelter in the world.[14] Today, however, the plant remains a rusted skeleton. As it was once a major activator in the community, providing thousands of jobs, the random assortment of businesses on site now employ only a fraction of that. Although a majority of the site remains in minor operation, hosting a slew of recently established low scale minor businesses, there are still significant reminders of its prosperous past.

Located in the site is a mound housing a large landfill that was used when the plant was operational. Surrounding the mound is a canal that transfers groundwater runoff into a large retention pond. The canals bring in water from the adjacent factories and industrial zones to the pond, which is then pumped into the Mississippi River. The site itself is sizeable, at nearly 2.5 million square feet, but the area that would develop with detail would be significantly smaller.

As an integral part to the design, the cyclical nature will be reinforced in a number of ways. Perhaps the most elementary description can be summarized from growth to production to waste to treatment, and back to growth, etc. Although harvesting for consumption seems inappropriate for the contaminated site, the possibility for growth in terms of regeneration is an aspect that will be crucial to the overall concept. Within that, growth for production will also be introduced. And, the waste required for production will be filtered into a system to reduce its outward effects on the environment.

With the current landfill on site, in addition to the toxicity of the soil, little can be developed without drastic action. Keeping in mind the cyclical nature of the productive surface, growing crops such as soybean, corn, canola, and switchgrass on a contaminated site can be used for the

[14] Binczewski, George. "The Energy Crisis and the Aluminum Industry: Can We Learn from History?." JOM Online.

production of biofuel.[15, 16] And, biofuel production through algae farming is even more successful. Yielding anywhere from 1,200 to 10,000 gallons per acre, algae farming is a much more eco-friendly solution. Crops such as soybean, canola, and sunflower offer anywhere from 48 to 130 gallons per acre, significantly less productive than algae, but they provide the opportunity to eliminate contamination from the soil. Thinking about the functional reactivation of the site, the concept of growth for production seems like a viable option for such conditions.

Biofuel is a type of fuel whose energy is derived from biological carbon fixation. It can be made from the carbohydrates produced in sugar or starch crops such as corn. Typical concern about biofuel lies on the issues that deforestation might be a possible result, and therefore, justify the idea as unreasonable. However, if unused vacant land is available, and if the assumption that biofuel crops would be able to grow, perhaps crops could be grown on brownfield sites, serving a dual purpose of eliminating contamination while also providing sources for biofuel. Studies have been done to test the plausibility of brownfield crop generation, and the results have been successful.[17] After a conversation with the Regional Planning Commission and the St Bernard Parish Government, the suggestion for a biofuel factory was brought forward and thought to be plausible.

As a catalyst for biofuel production, the cyclical nature of site function also comes into light. As once a major factory for aluminum, the enforced restrictions of development and the conditions therein have changed significantly since the inception of the Kaiser plant. Not only have the laws

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[15] Information regarding specific details such as plants on brownfield bioremediation taken from EPA. *Brownfields and Urban Agriculture: Interim Guidelines for Safe Gardening Practices*. Summer 2011.
[16] Successful examples of crop growth on brownfields have been documented. One study has been thoroughly documented by the University of Michigan according to Ethanol Producer Magazine.
[17] Information comes from pg 186-199 of Conway, Richard. "Ground Water and Soil Contamination Remediation: Toward Compatible Science, Policy, and Public Perception." Paper presented at Report on a Colloquium Sponsored by the Water Science and Technology Board. National Academy Press, 1991.

governing pollutants and byproduct output been regulated, but the allowed conditions during the reign of the plant have been considered seriously outdated. As a reminder of what the site once was, the new biofuel factory serves as an example of how to properly operate a smaller scale production facility within the ecological and sustainable regulations encouraged today.

In conclusion, since its inception, industry has always been a vital asset of modern life. But due to changes in technology and consumer needs in addition to fluctuations in city growth and decline, the role of industry in specific atmospheres adjusts accordingly. When a specific industrial center becomes outdated or is no longer necessary, it withdraws, ceasing operations. This often leaves the former sites of production abandoned, creating a decline in the surrounding economy and a mental and visual subtraction within the adjacent community. Furthermore, the contaminants released into the soil, air, and water while the industry was operational present a vast number of problems for the future of the site, limiting the possibilities of potential developers. Depending on the pollutants, the costs of renewal often outweigh the benefits, leaving the site underused and decrepit.

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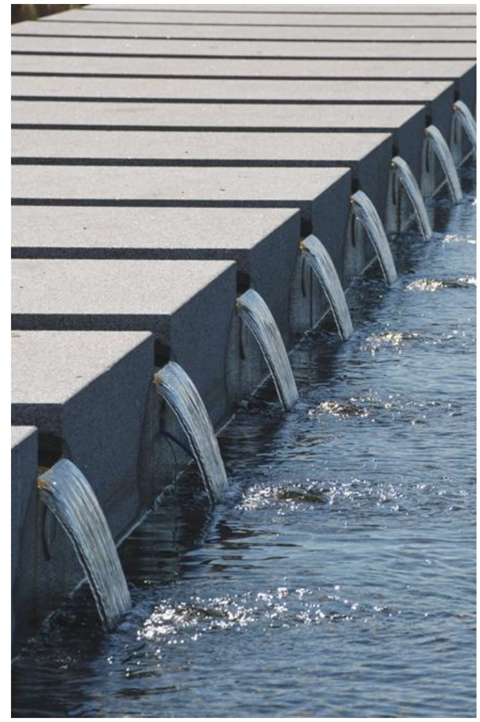
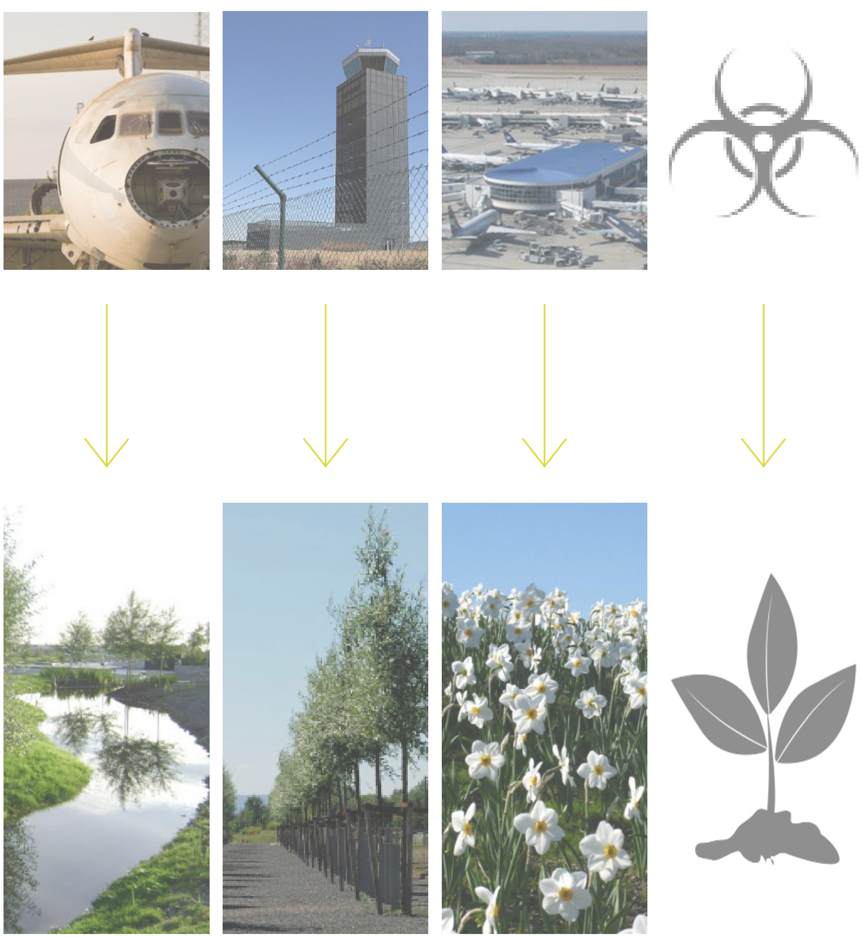
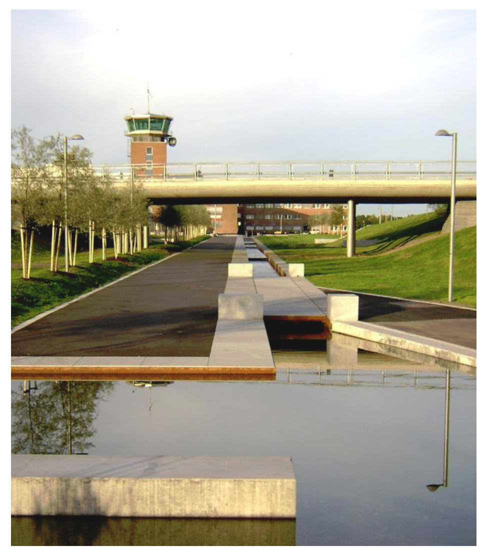
NANSEN PARK

BJORBEKK AND LINDHEIM
OSLO, NORWAY





TRANSFORMING A CONTAMINATED AREA INTO AN AREA OF NATURAL RICHNESS



AN OLD CULTIVATED LANDSCAPE WITH MUCH VARIATION AND BEAUTY WAS LEVELLED INTO OSLO'S INTERNATIONAL AIRPORT IN THE MID 20TH CENTURY. SOME FORTY YEAR AFTER, THE AIRPORT MOVED OUT AND LEFT BEHIND A DEPRESSING WASTELAND. RECENTLY, A NEW ENVIRONMENT HAS BEEN CREATED, WITH VISUAL REFERENCES TO THE OLD NATURAL FORMS OF ITS LANDSCAPE HISTORY, AND IN A VISUAL DIALOGUE WITH THE MORE RECENT MACHINE-LIKE LINEARITY OF THE AIRPORT RUNWAYS.

GRADUALLY SHIFTING ECOLOGY/ECONOMY

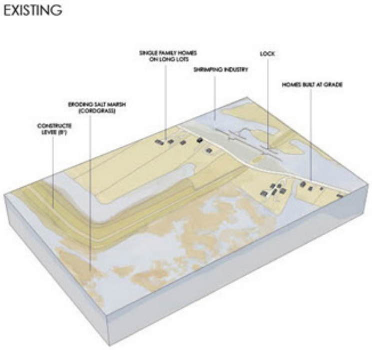
PARADOXCITY STUDIO NEW ORLEANS
LOUISIANA WETLANDS

SECTION A

SECTION B

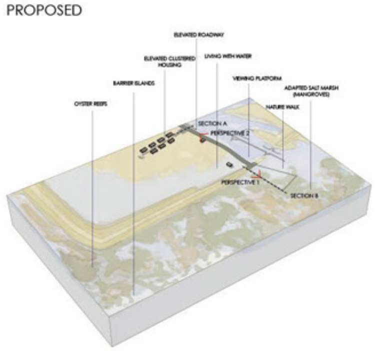
COASTAL EDGE

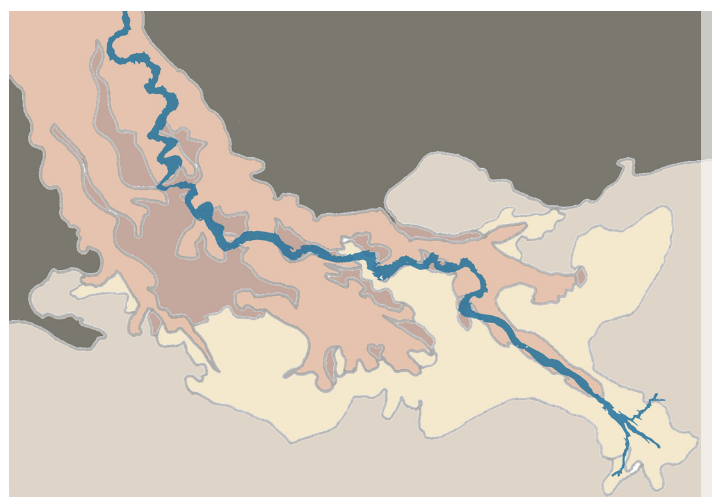
EXISTING



COASTAL EDGE

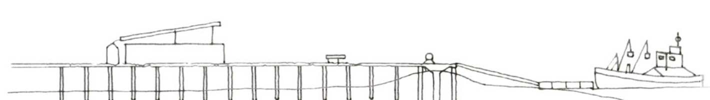
PROPOSED





CONSTRAINED RESOURCES OF MISSISSIPPI RIVER AND ITS FORMER NATURAL SEDIMENT DEPOSIT BOUNDARIES

THE ATCHAFALAYA BASIN IN LOUISIANA CAN BE A DIFFICULT AREA TO IMPLEMENT SUCCESSFUL ARCHITECTURE DUE TO ITS ELEVATION. NATURALLY AN AREA THAT FORMERLY HAD TO ADAPT TO THE CHANGING PATH OF THE MISSISSIPPI, THE INTRODUCTION OF THE LEVEES BLOCKED OFF NATURAL RESOURCES FROM COLLECTING. THIS PROPOSAL SEEKS TO ACCOMMODATE THE NATURAL PATH OF THE RIVER BY REIMAGINING ITS COURSE AS A NATURAL ENTITY.

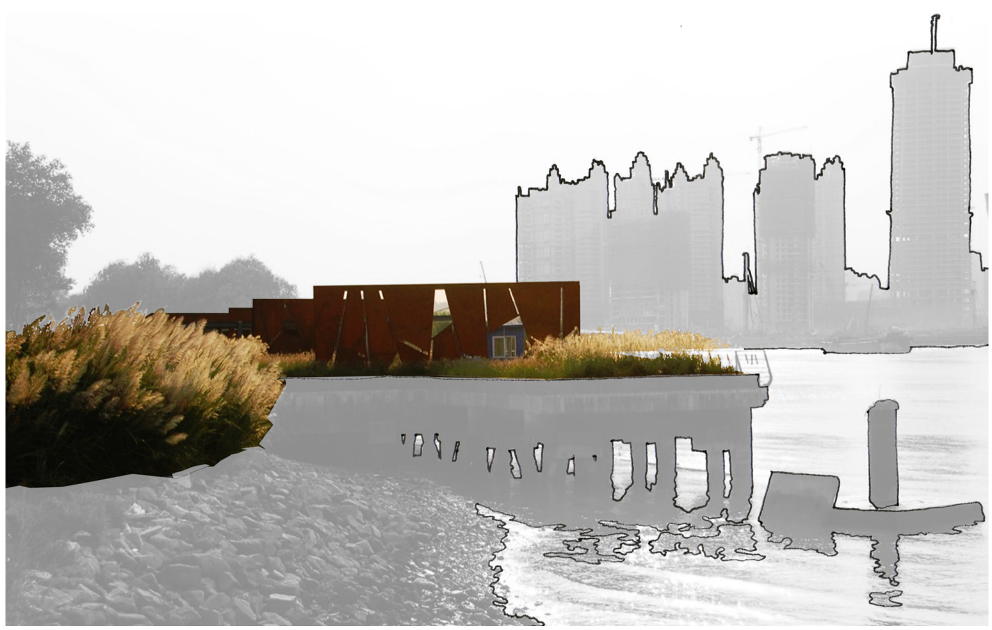


RAISED PROGRAM ALLOWS FOR HEIGHT OF MISSISSIPPI BASIN TO FLUCTUATE NATURALLY

SHANGHAI HOUTAN PARK

TURENSCAPE
SHANGHAI, CHINA

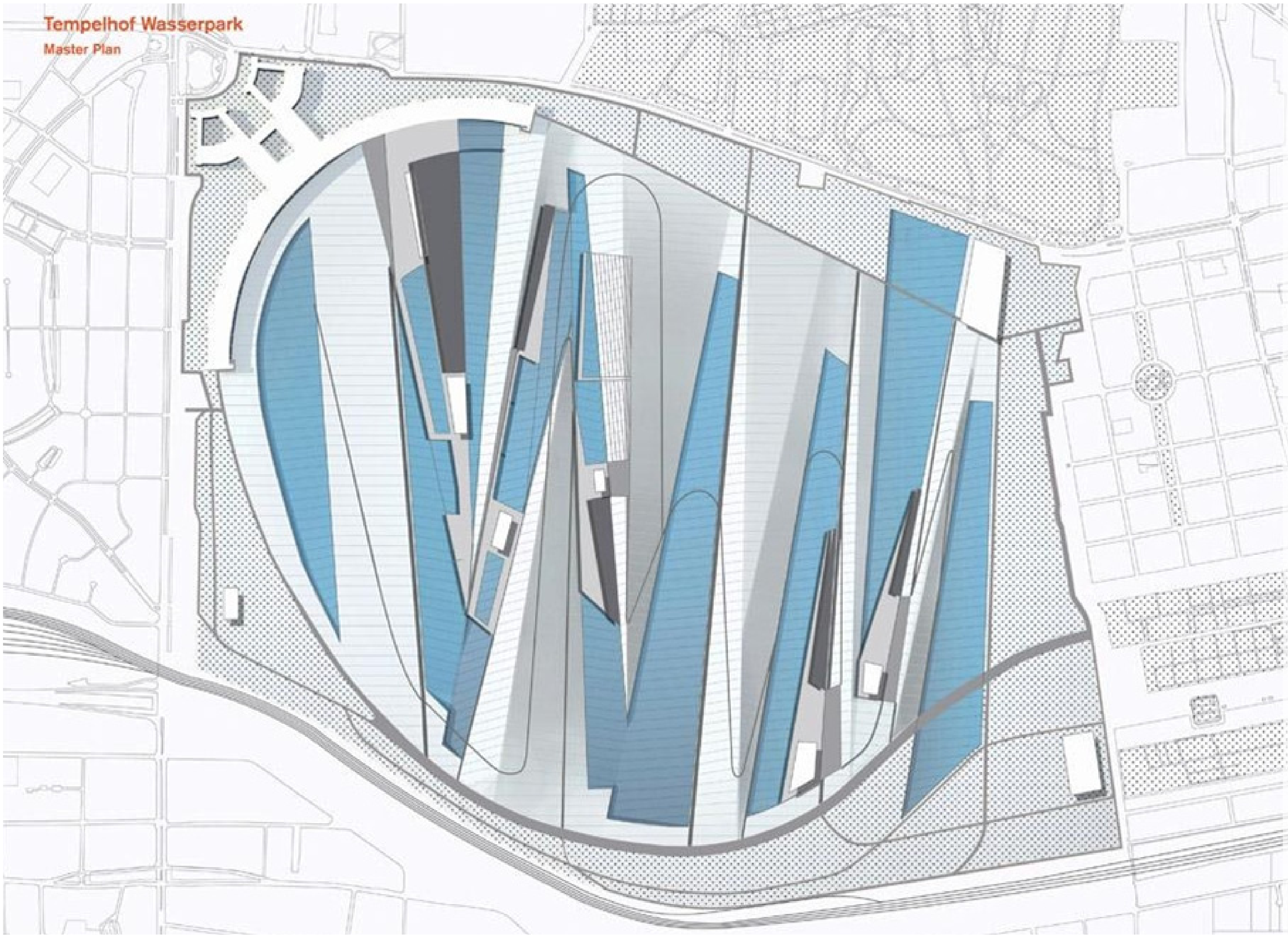
THIS PARK IN SHANGHAI TOOK AN AREA THAT WAS UNDERUTILIZED AND A FORMER BROWN-FIELD ON THE RIVERFRONT AND REINVENTED IT AS A CONSTRUCTED WETLAND AND ECOLOGICAL FLOOD CONTROL POINT. BY RECLAIMING INDUSTRIAL STRUCTURES AND MATERIAL AND INTRODUCING URBAN AGRICULTURE, THE ZONE BECOMES AN EXAMPLE OF SUCCESSFUL RESTORATIVE DESIGN AIMED TO TREAT POLLUTED RIVER WATER AND RECOVER THE DEGRADED WATERFRONT THROUGH ARCHITECTURE AND LANDSCAPE.

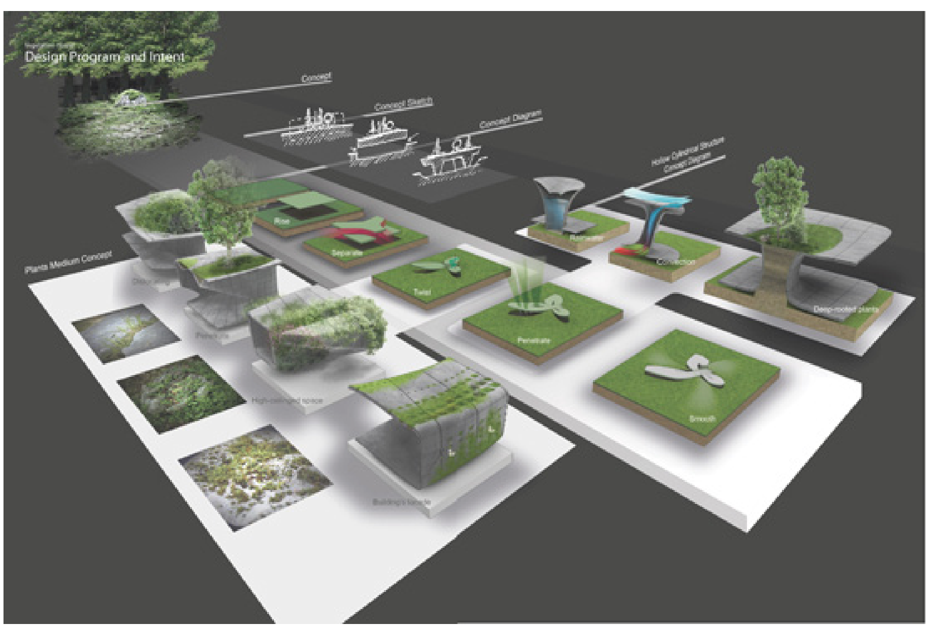


TEMPELHOF WASSERPARK

JOHANNA BARTMAIER - STUDENT PROJECT
BERLIN, GERMANY

4.3 million sf

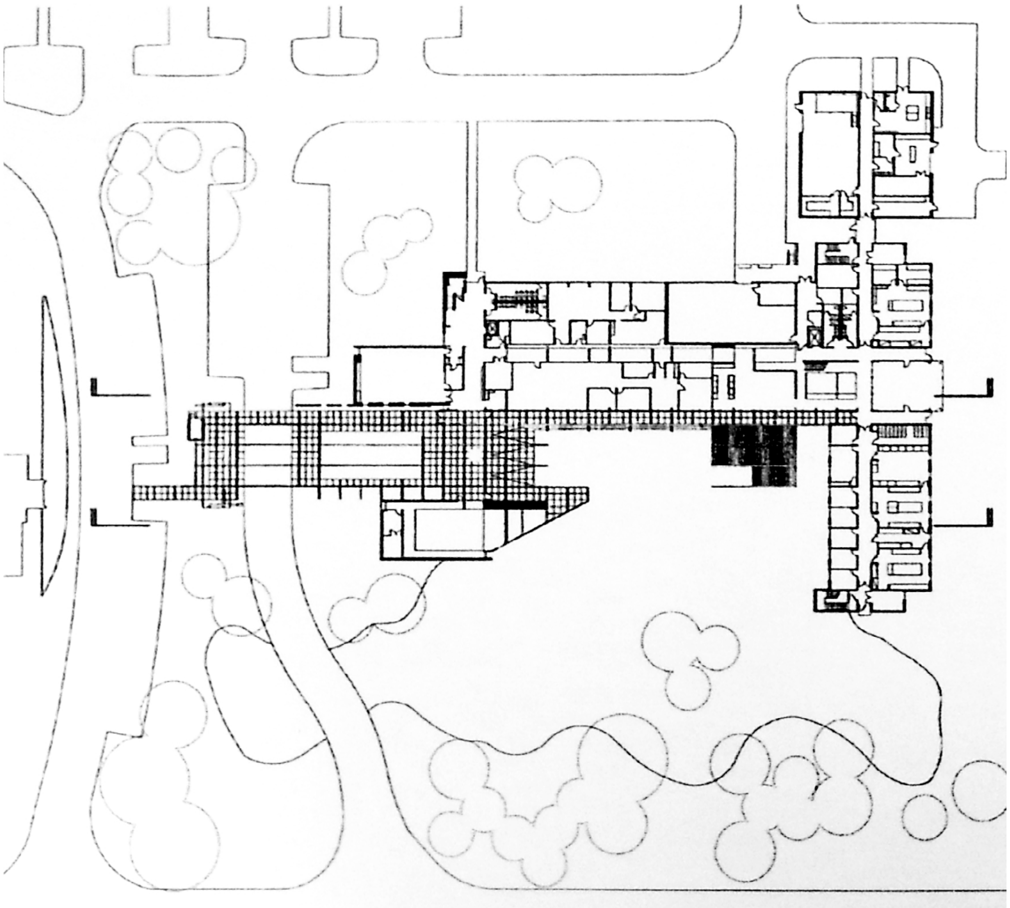




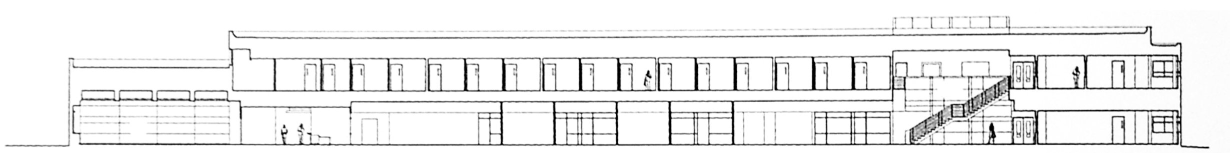
ESTUARINE HABITATS RESEARCH CENTER

ESKEW+DUMEZ+RIPPLE
KEY WEST, FLORIDA

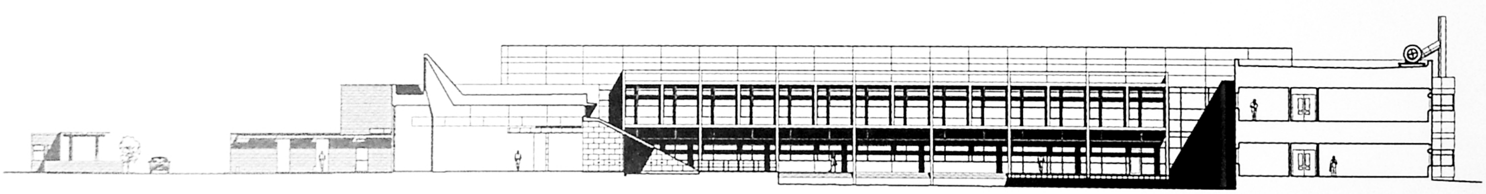
30,000 sf



First Floor Plan



Building Section

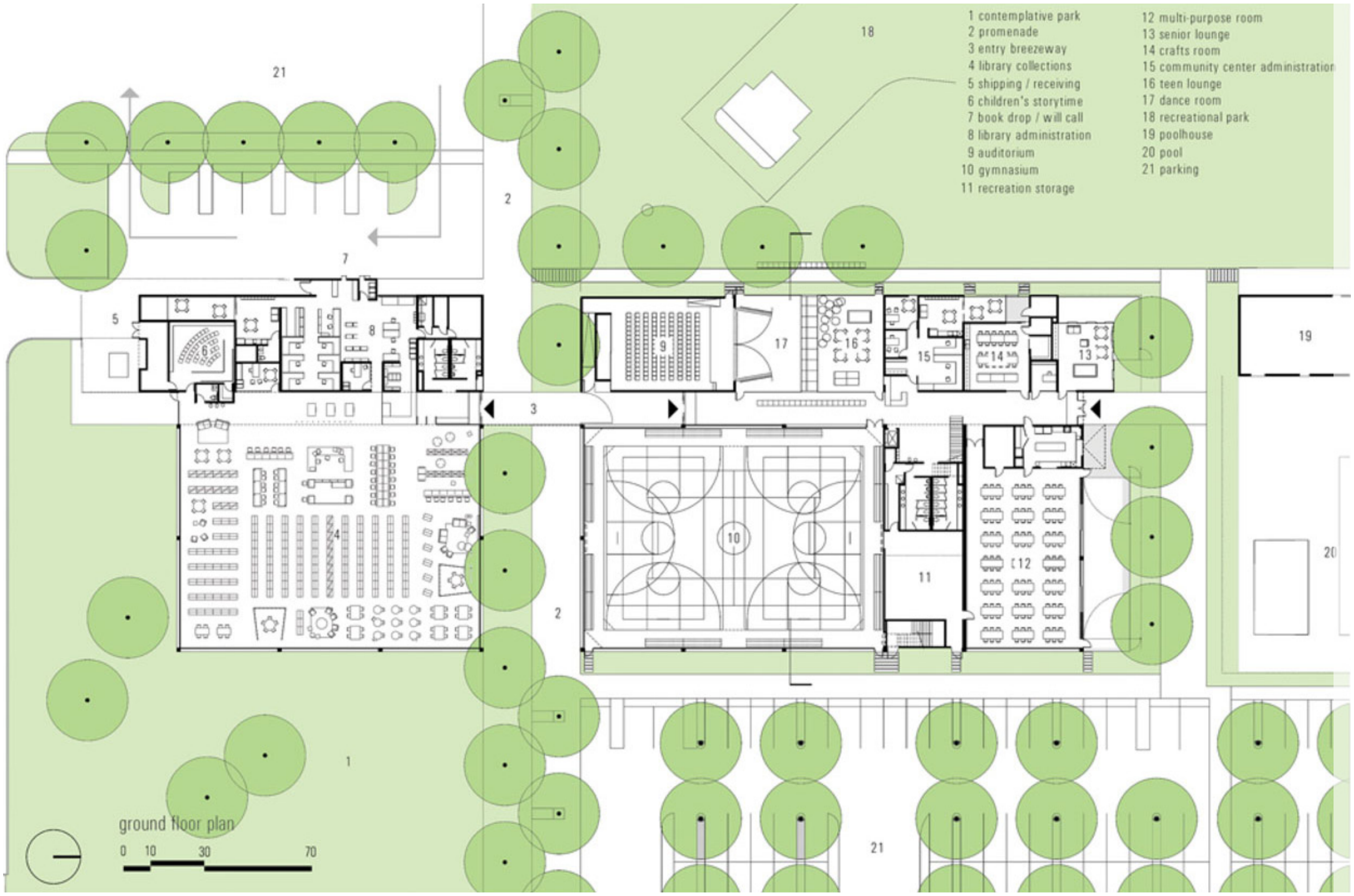


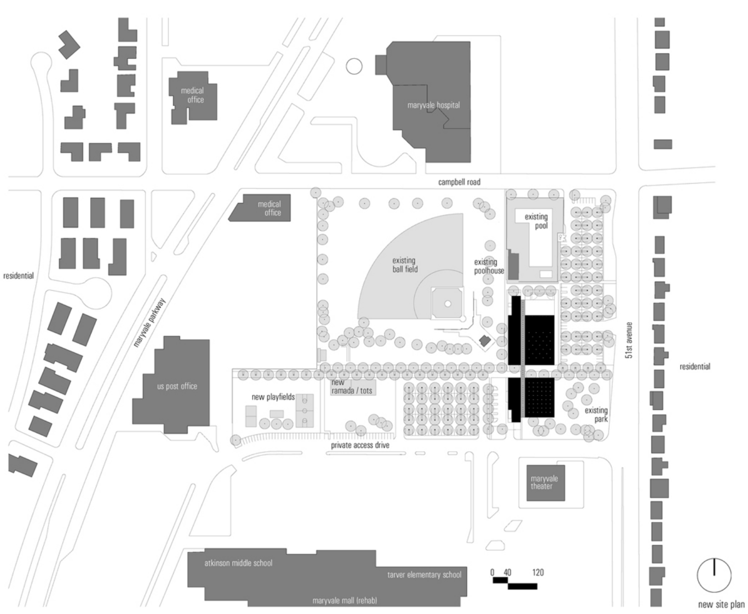
South Elevation

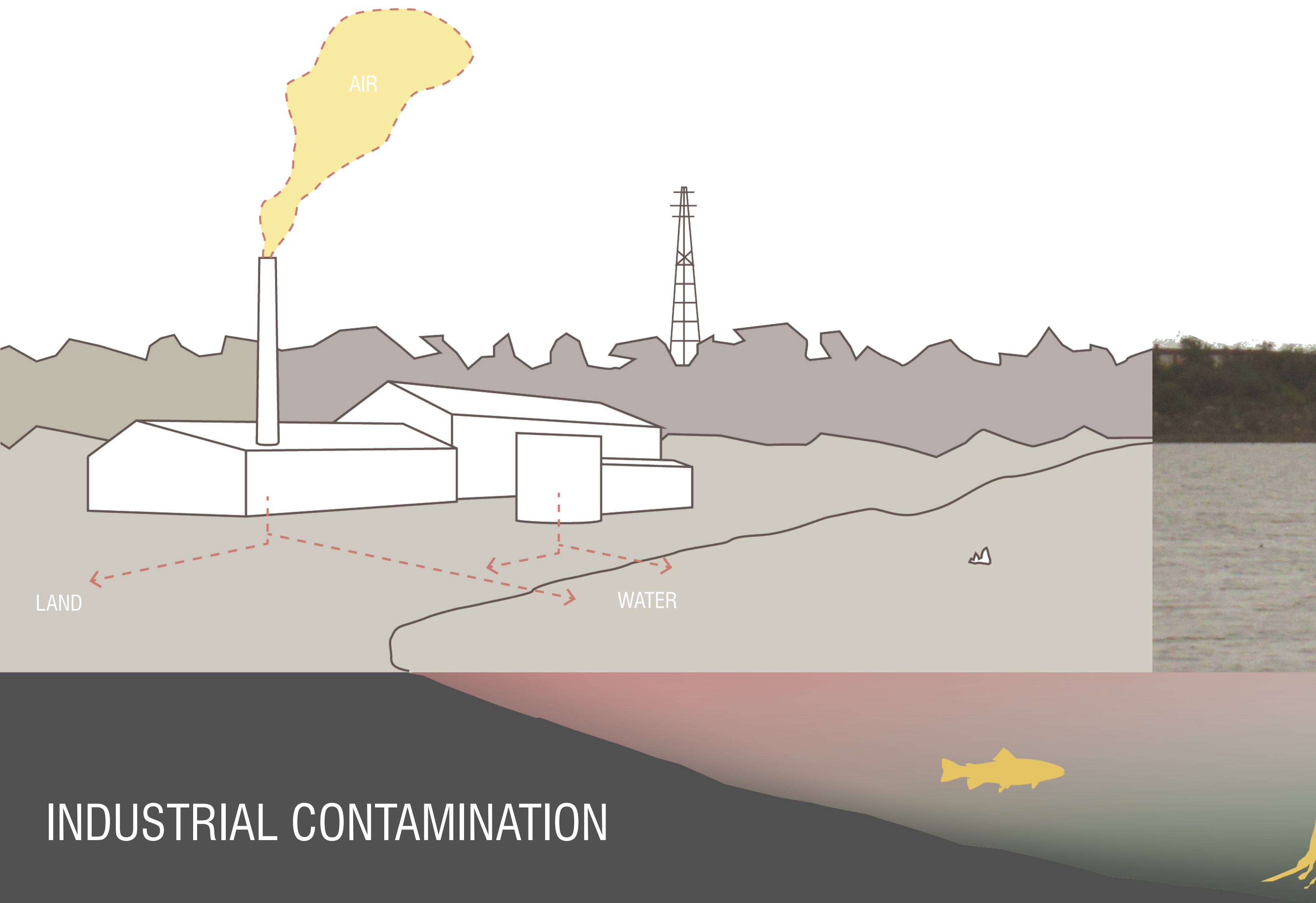
PALO VERDE LIBRARY AND MARYVALE COMMUNITY CENTER

GOULD EVANS AND WENDELL BURNETTE ARCHITECTS
PHOENIX, ARIZONA

43,000 sf



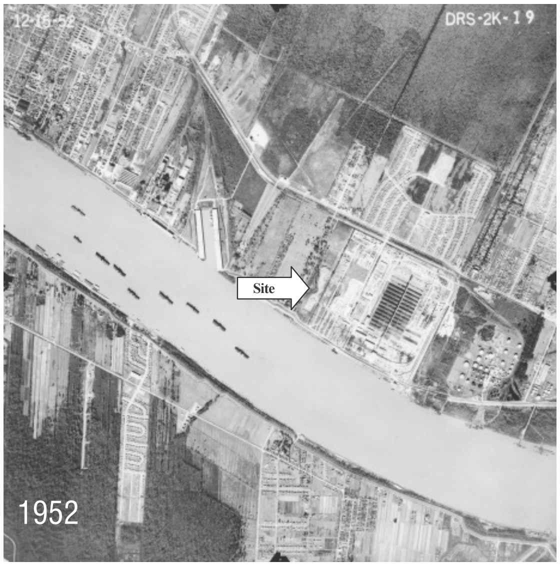


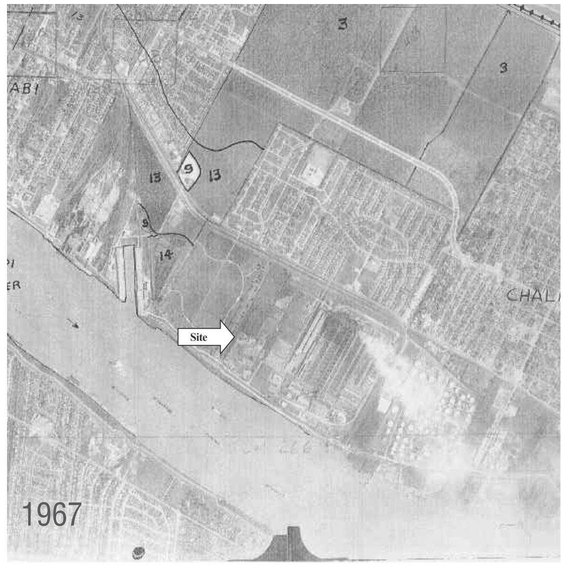


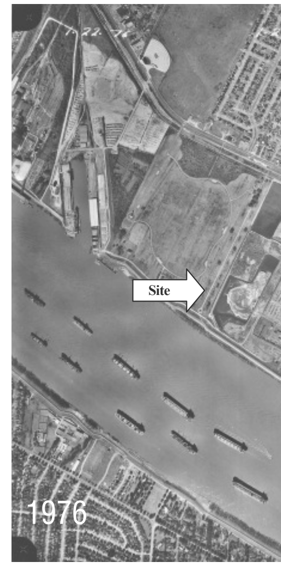
INDUSTRIAL CONTAMINATION

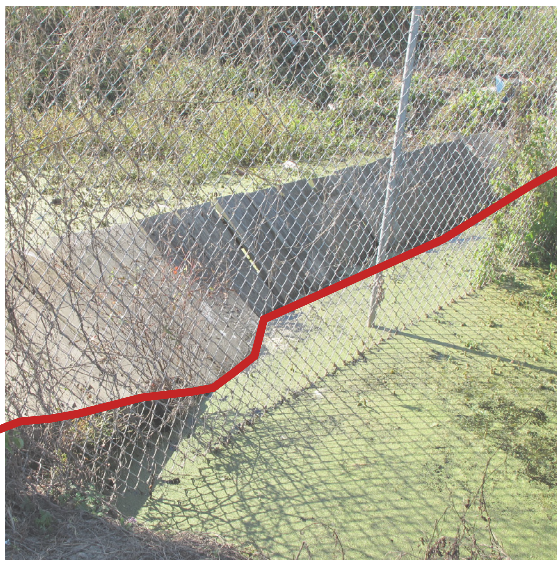
MAJOR AXES
INDUSTRIAL SITES ALONG MISSISSIPPI

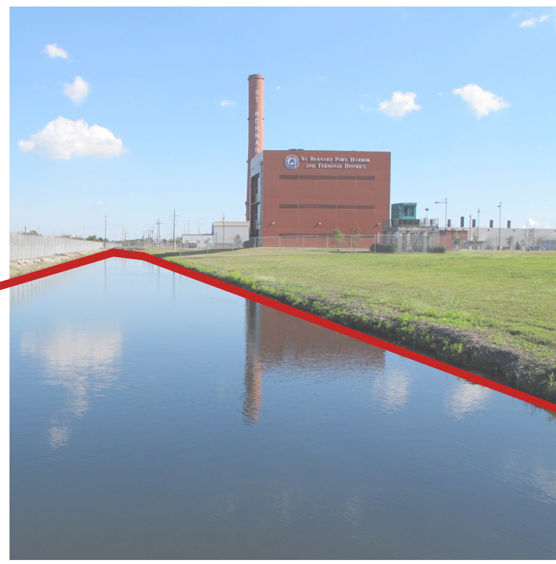
SITE MORPHOLOGY



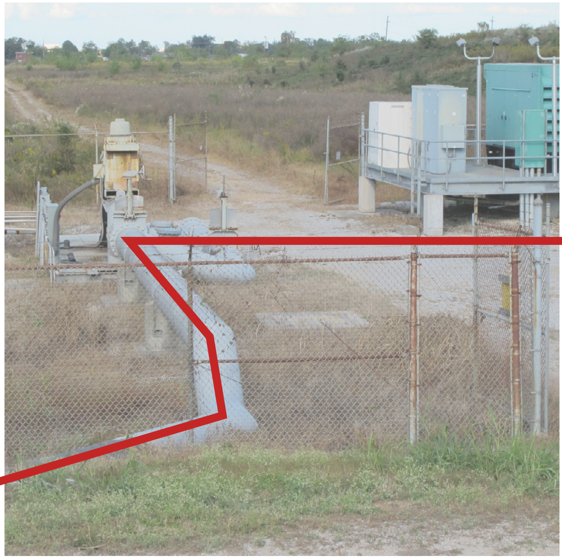








CURRENT LAND AREAS

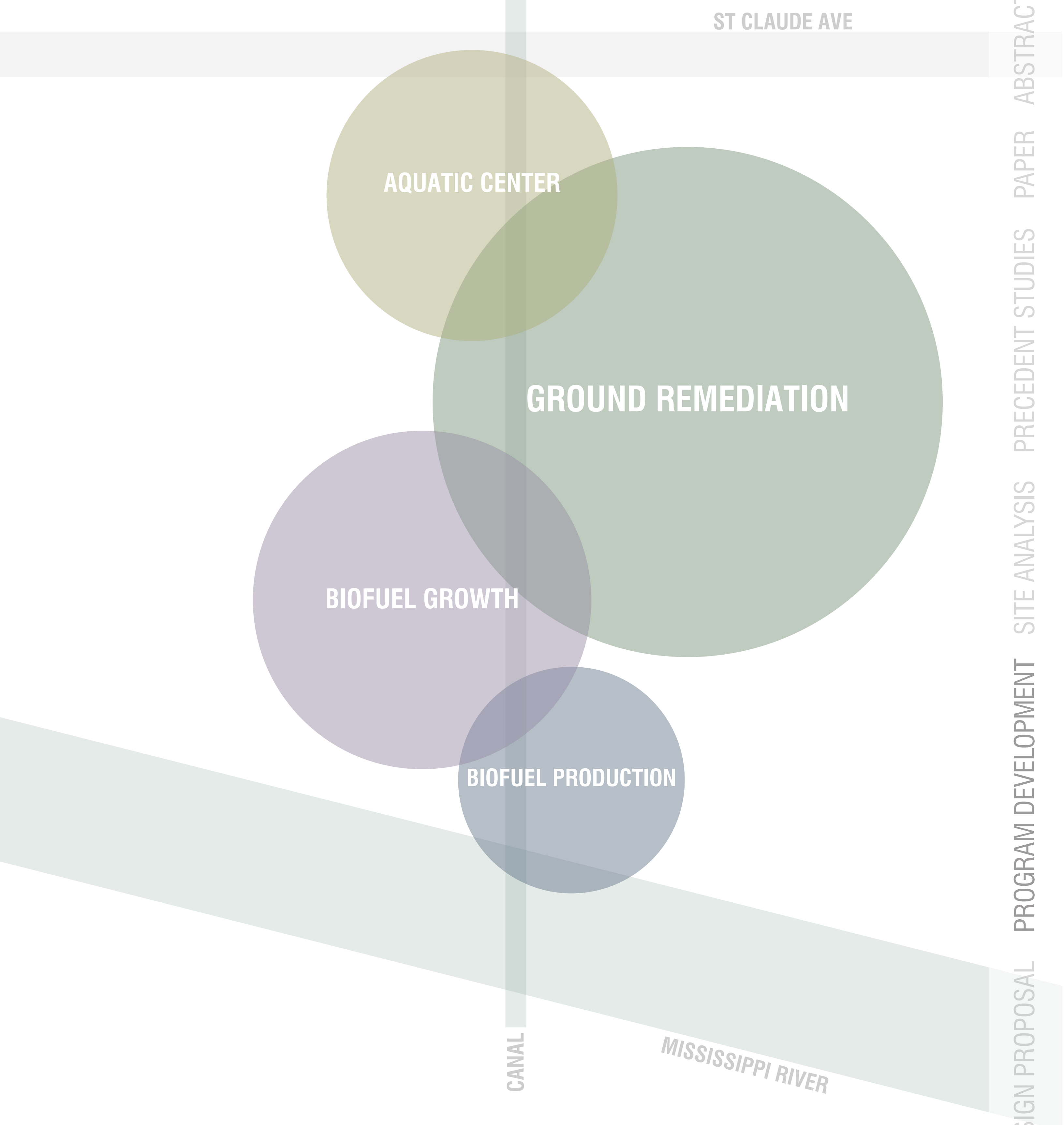


CURRENT WATER AREAS

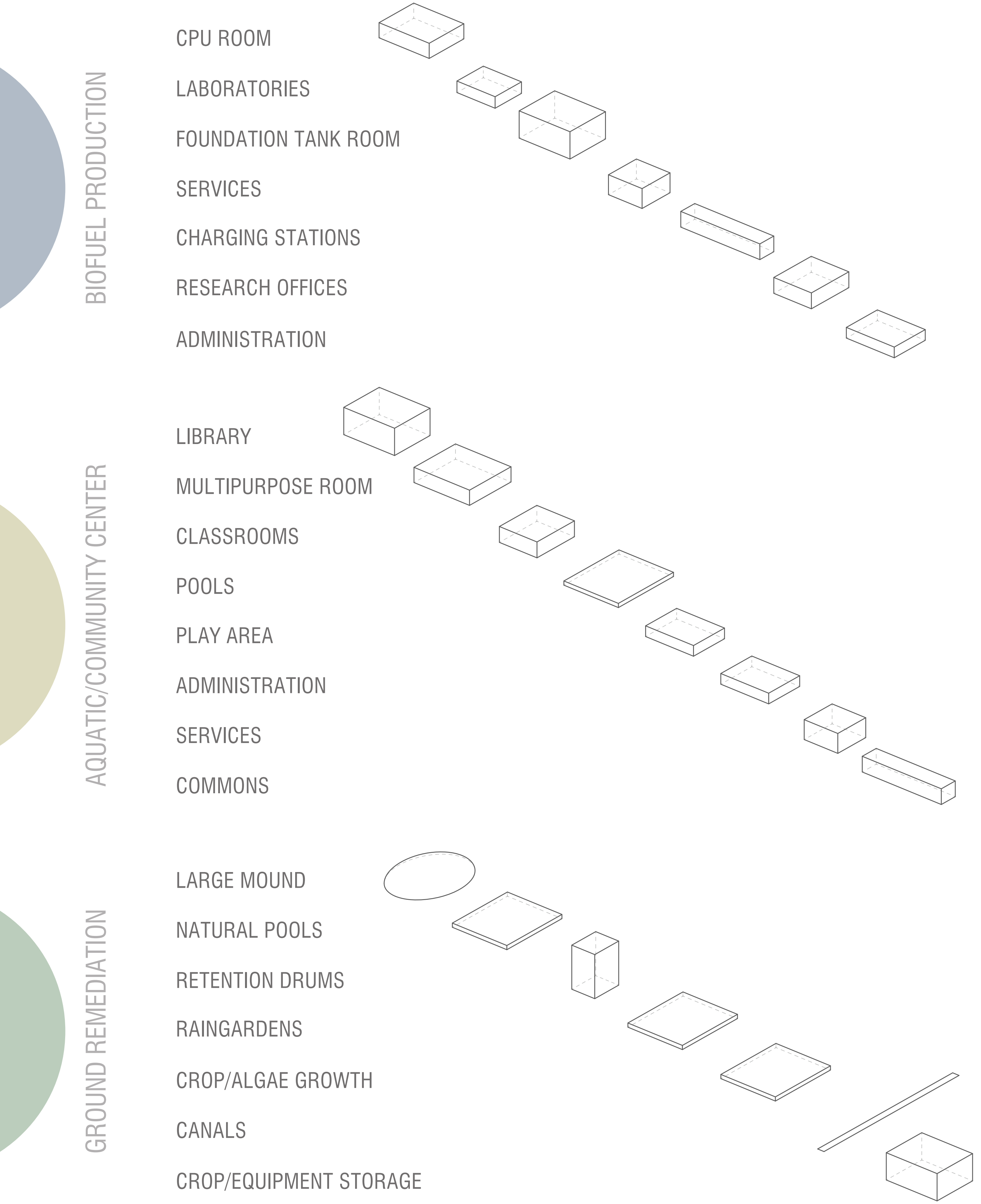
CURRENT SITE PLAN


neighborhood
canal
st bernard port and
harbor transit
industrial refineries

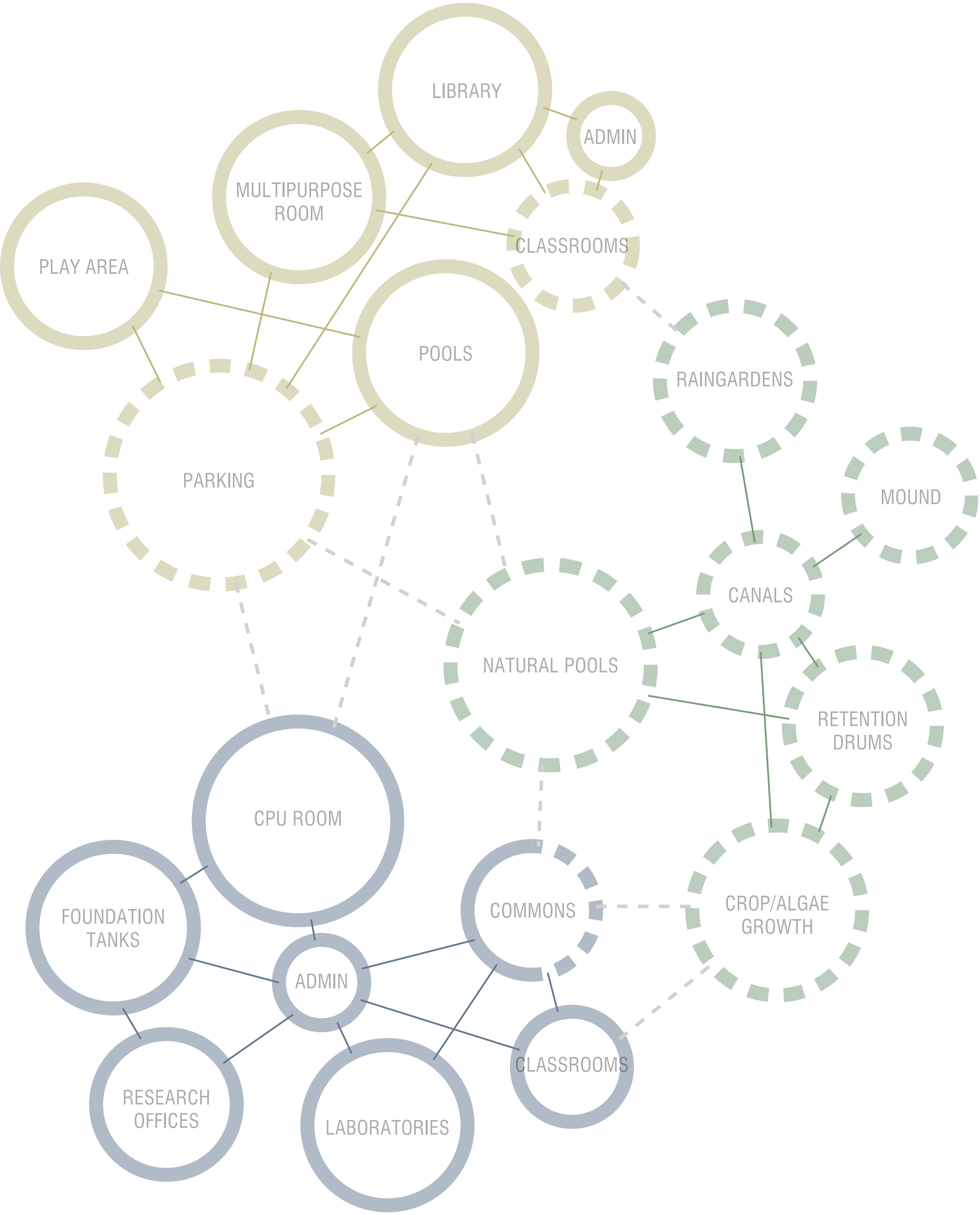
BIOFUEL PRODUCTION		AQUATIC/COMMUNITY CENTER		GROUND REMEDIATION	
CPU ROOM	6,500 sf	LIBRARY COLLECTIONS	3,000 sf	MAX DEVELOPMENT	2.5 million sf
FOUNDATION TANKS	7,500 sf	MULTIPURPOSE ROOM	2,000 sf	EXISTING CANAL	9,500 linear ft
CHARGING STATION	850 sf	CLASSROOMS (2)	1,000 sf	EXISTING POND	461,000 sf
DISCHARGING STATION	850 sf	COMMONS	1,500 sf	LARGE MOUND	590,000 sf
LABORATORIES (3)	3,000 sf	LAP POOLS	1,400 sf	PATHWAYS	collective/individual, safe areas
RESEARCH OFFICES	1,200 sf	LEISURE POOLS	4,000 sf	MICROBES	soil and water
ADMINISTRATION	1,500 sf	KIDS AREA	3,000 sf	ALGAE GROWTH	marine nannochloropsis, etc
CONFERENCE ROOM	500 sf	ADMINISTRATION	2,000 sf	CROP GROWTH	soybean, corn, canola, switchgrass
COMMONS	500 sf	STORAGE	2,000 sf	CROP STORAGE	4,000 sf
STORAGE	1,500 sf	SHIPPING/RECEIVING	1,200 sf	EQUIPMENT STORAGE	1,400 sf
RESTROOMS/LOCKERS	1,200 sf	RESTROOMS/LOCKERS	2,000 sf	WATER CONTAINMENT	
				NATURAL POOLS	
				RETENTION DRUMS	
				RAINGARDENS	
				CANALS	
				PONDS	
				PARKING	35,000 sf
TOTAL net area	25,100 sf	TOTAL net area	23,100 sf		
TOTAL gross area	32,630 sf	TOTAL gross area	30,030 sf		



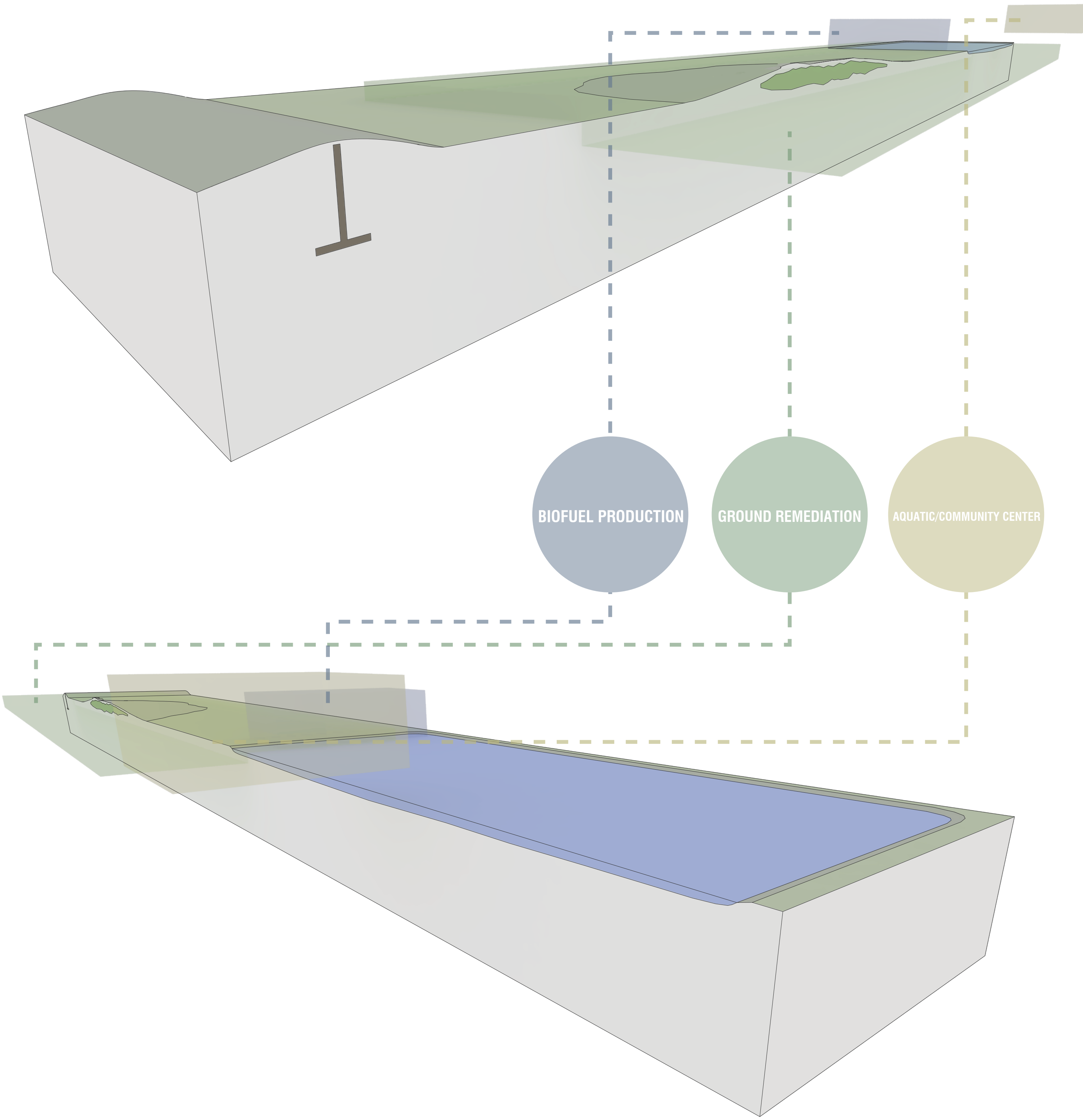
EXTERIOR CONNECTION OF STREET TO RIVER



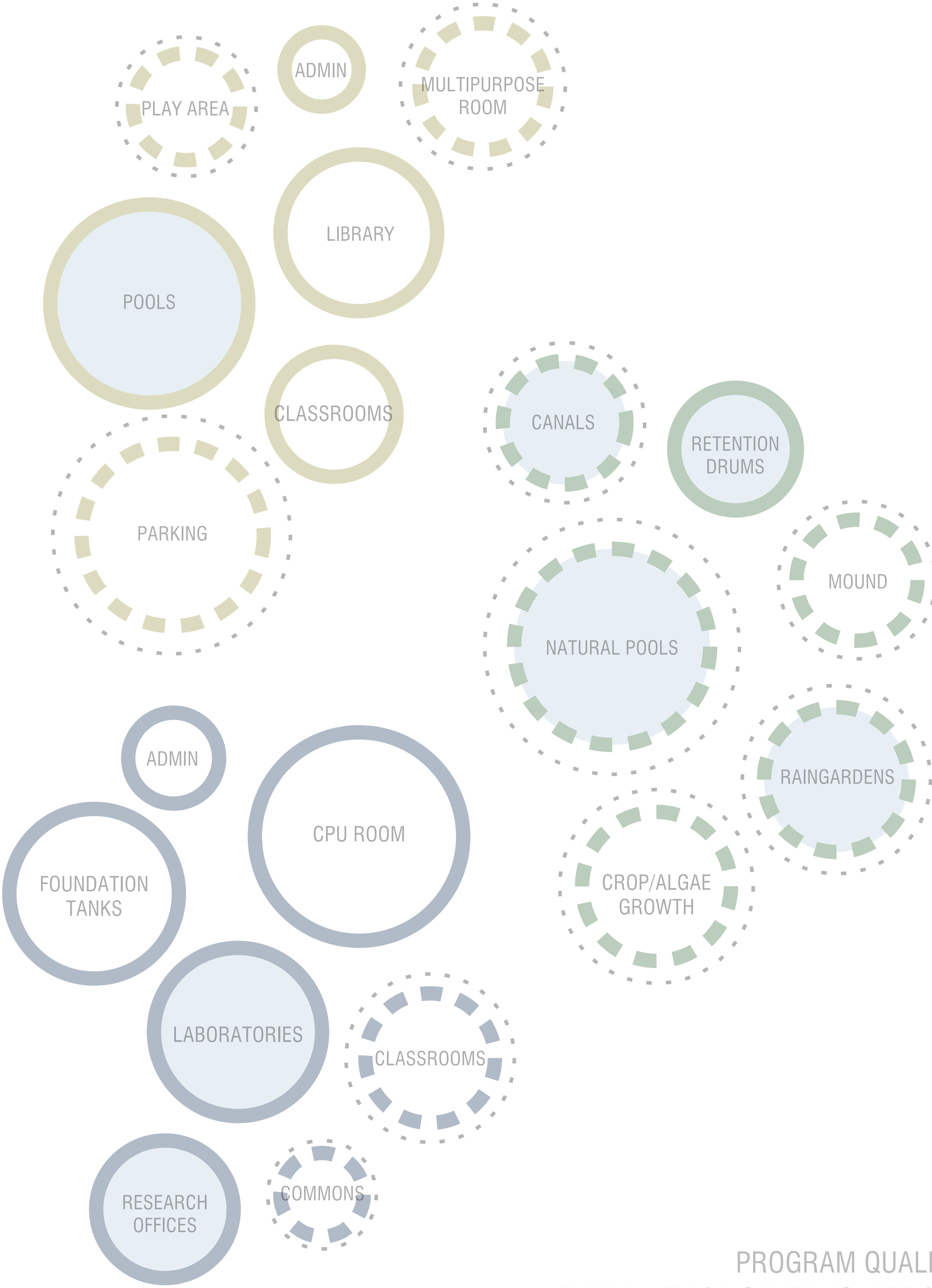
PRIMARY / SECONDARY SPACE PROPORTIONS



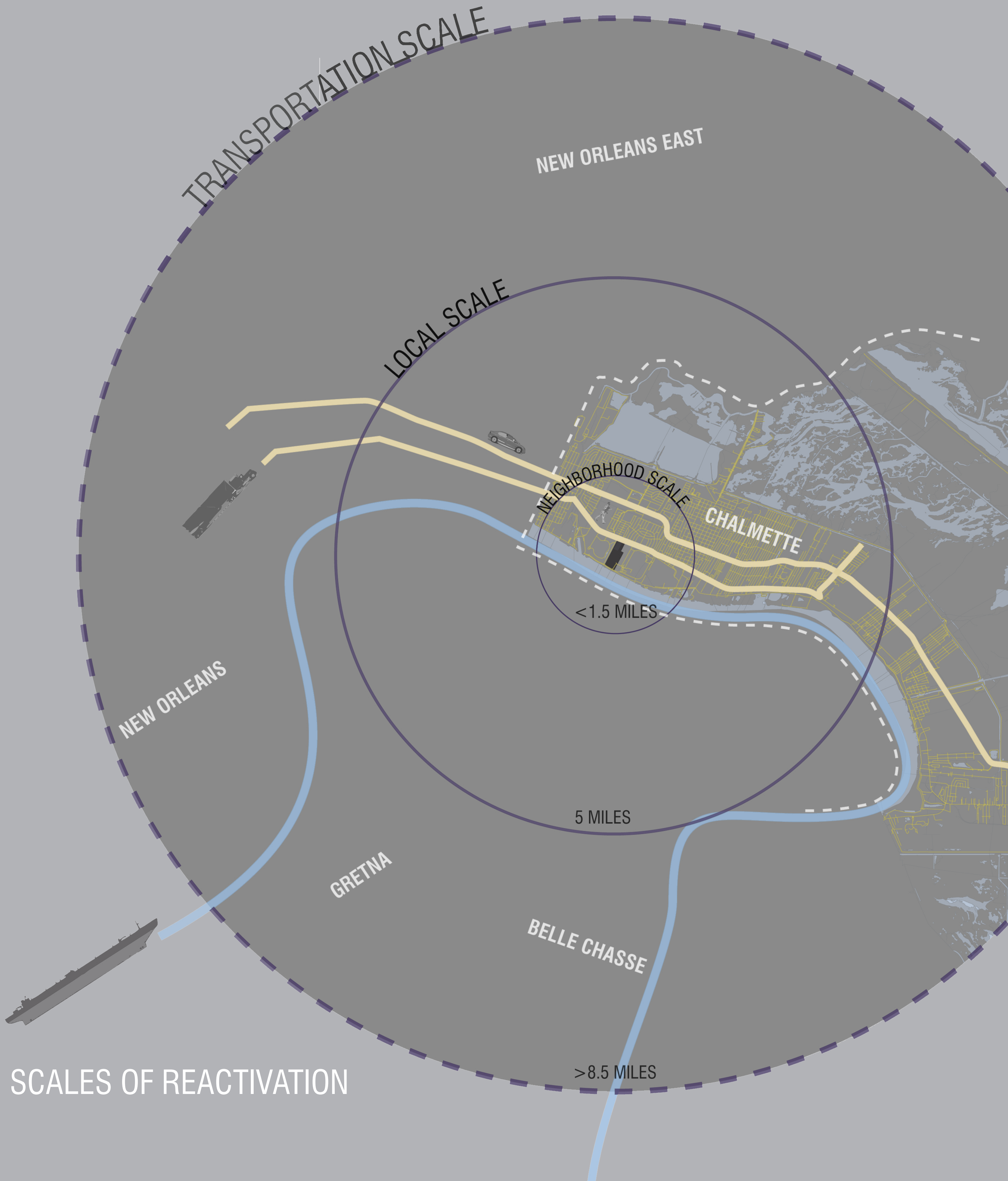
PROGRAM ORGANIZATION
INTERIOR / EXTERIOR SPATIAL CONNECTIONS



EXTERIOR SPATIAL ARRANGEMENT IN SITE

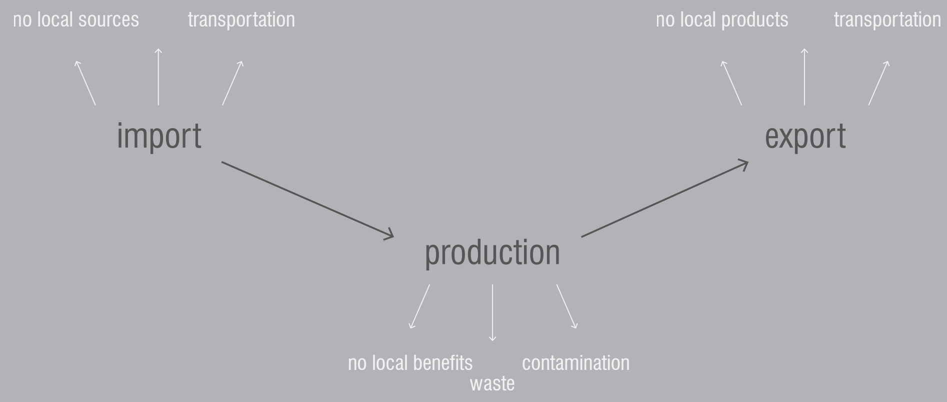


PROGRAM QUALITIES
FLEXIBILITY / RIGIDITY VS WET / DRY

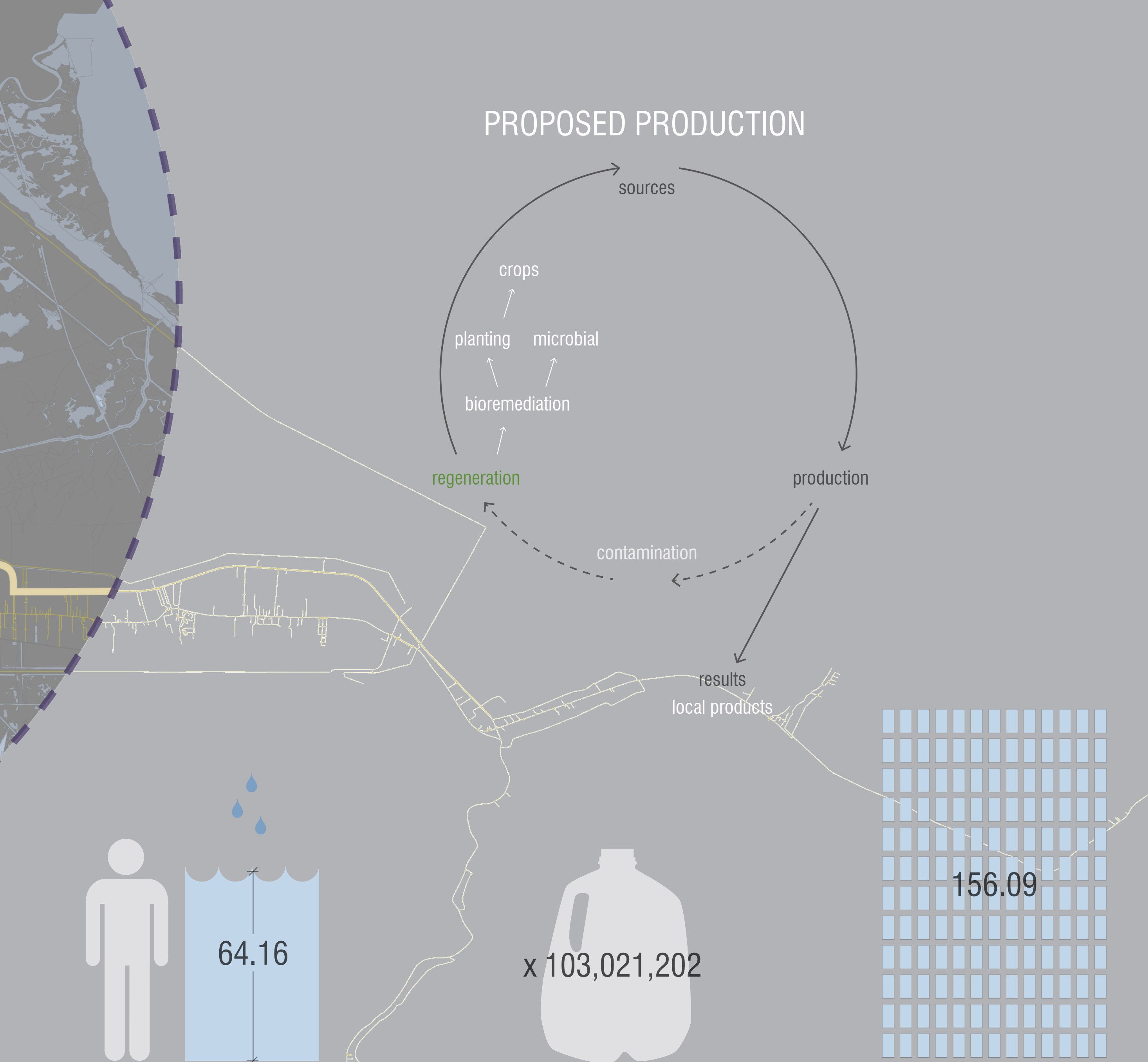


SCALES OF REACTIVATION

TYPICAL PRODUCTION



PROPOSED PRODUCTION



there are 64.16 INCHES of rainfall per year on site

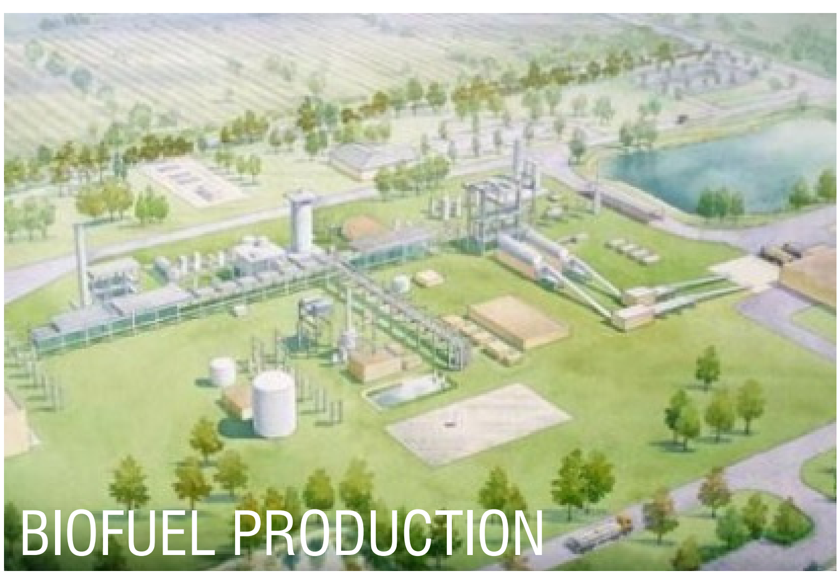
which translates to 103,021,202 GALLONS

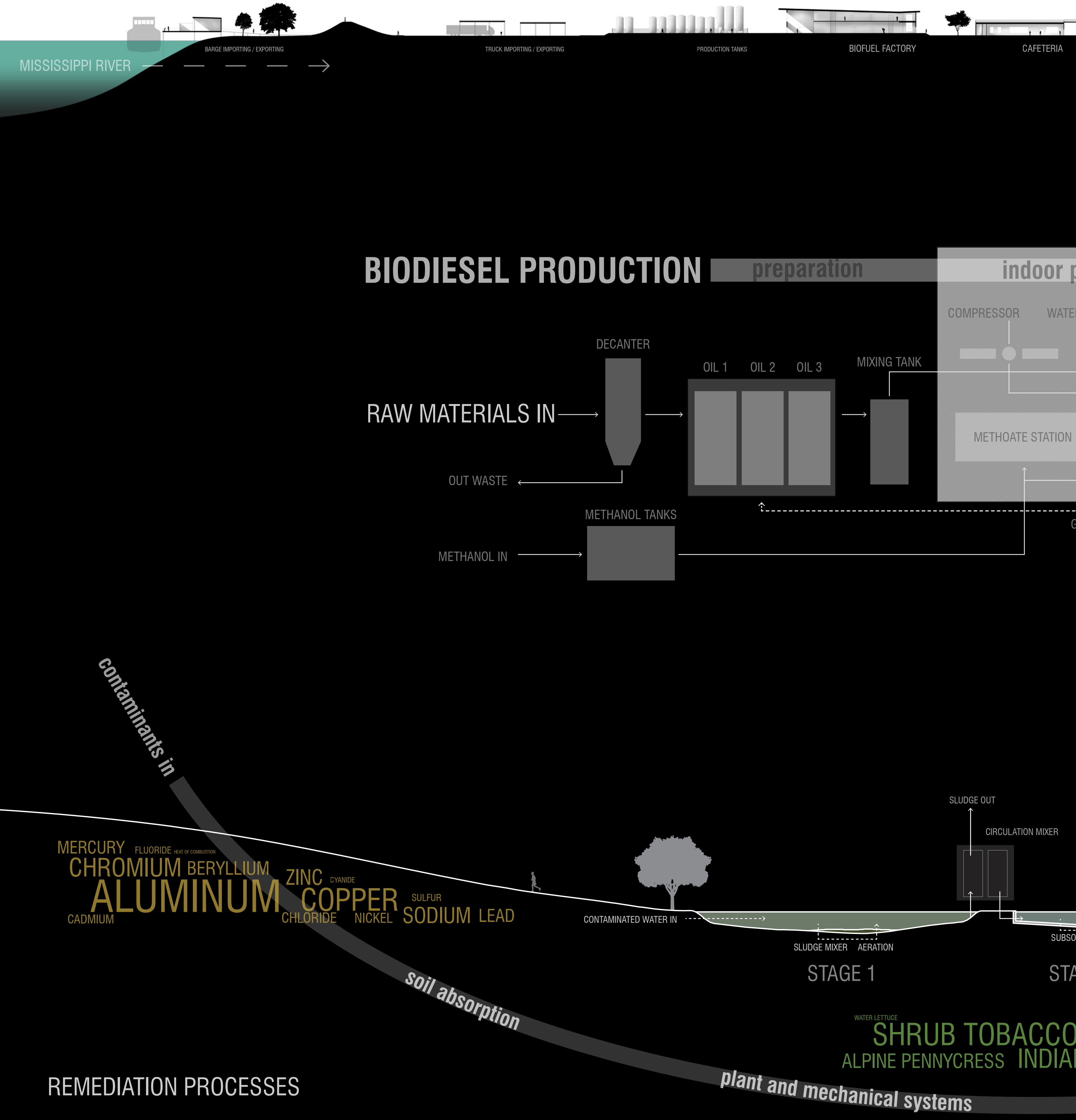
or enough to fill 156.09 olympic swimming POOLS

MAGNITUDE OF RAINWATER

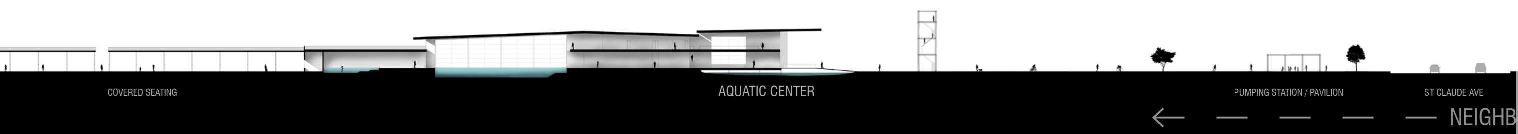

AQUATIC CENTER

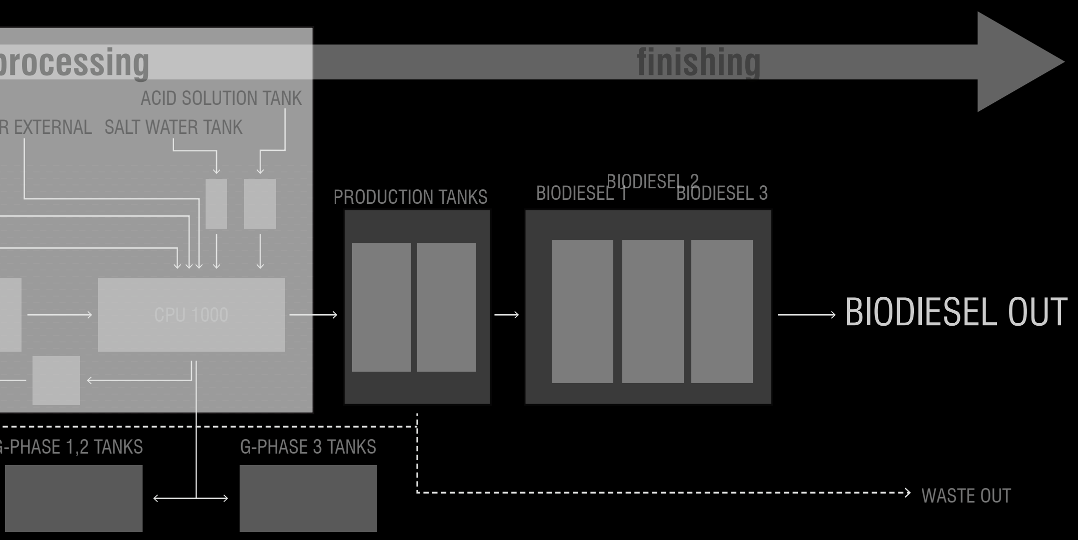
GROUND REMEDIATION

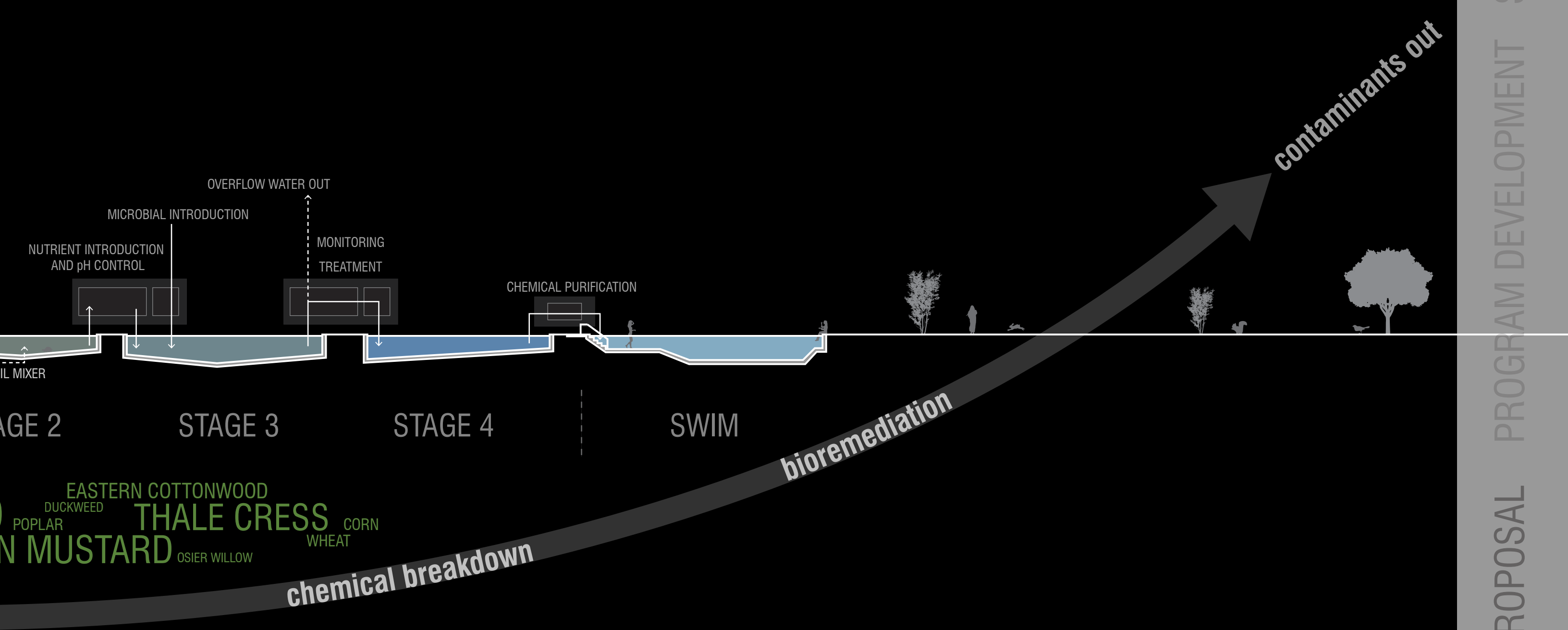

BIOFUEL PRODUCTION

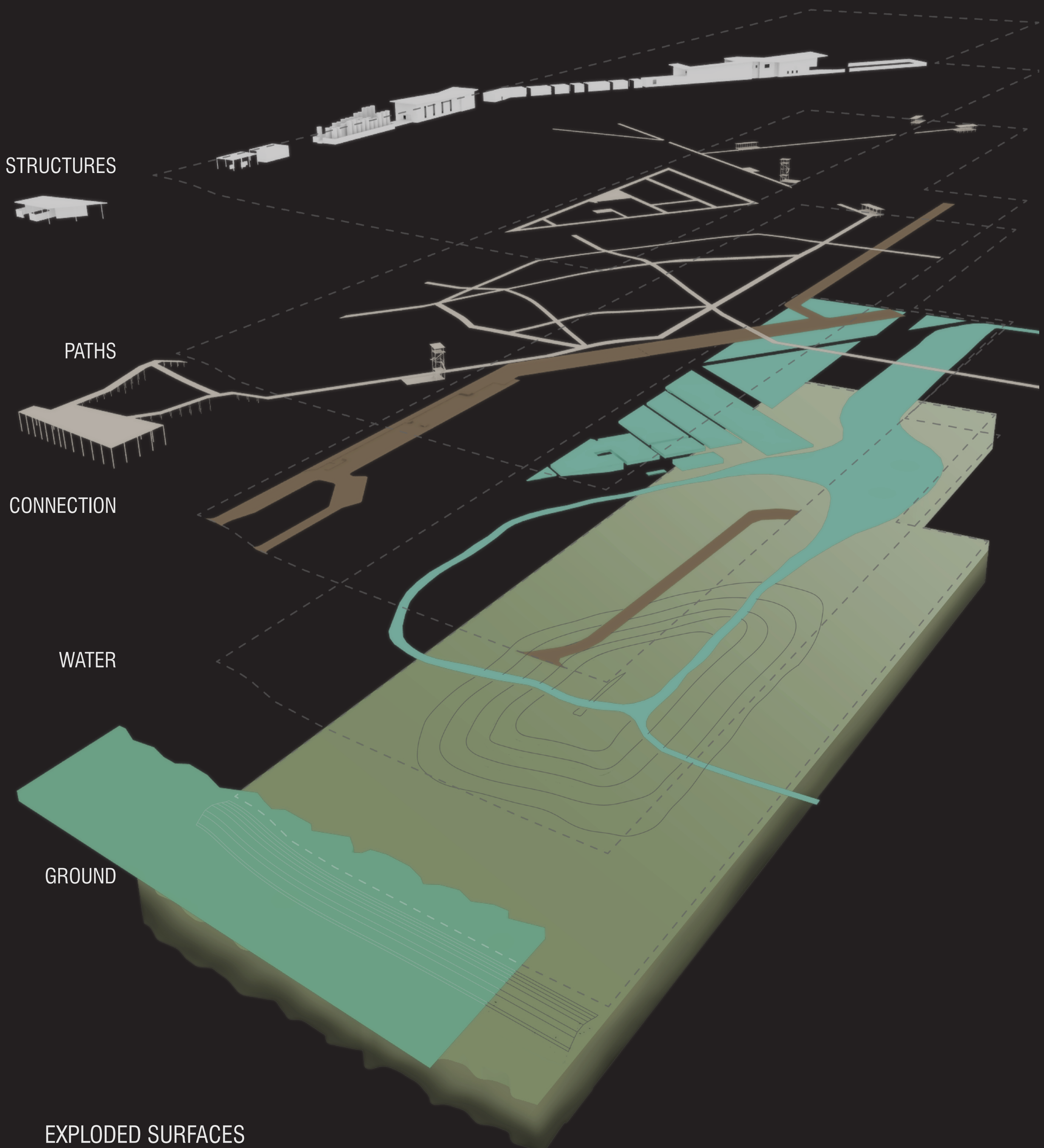


MISSISSIPPI RIVER
BARGE IMPORTING / EXPORTING
TRUCK IMPORTING / EXPORTING
PRODUCTION TANKS
BIOFUEL FACTORY
CAFETERIA
BIODIESEL PRODUCTION
preparation
indoor
COMPRESSOR
DECANTER
OIL 1
OIL 2
OIL 3
MIXING TANK
RAW MATERIALS IN
METHOATE STATION
OUT WASTE
METHANOL TANKS
METHANOL IN
contaminants in
MERCURY
FLUORIDE
HEAT OF COMBUSTION
CHROMIUM
BERYLLIUM
ZINC
CYANIDE
ALUMINUM
COPPER
SULFUR
CADMIUM
CHLORIDE
NICKEL
SODIUM
LEAD
SLUDGE OUT
CIRCULATION MIXER
CONTAMINATED WATER IN
SLUDGE MIXER
AERATION
STAGE 1
soil absorption
WATER LETTUCE
SHRUB TOBACCO
ALPINE PENNYCRESS
plant and mechanical systems
REMEDIATION PROCESSES

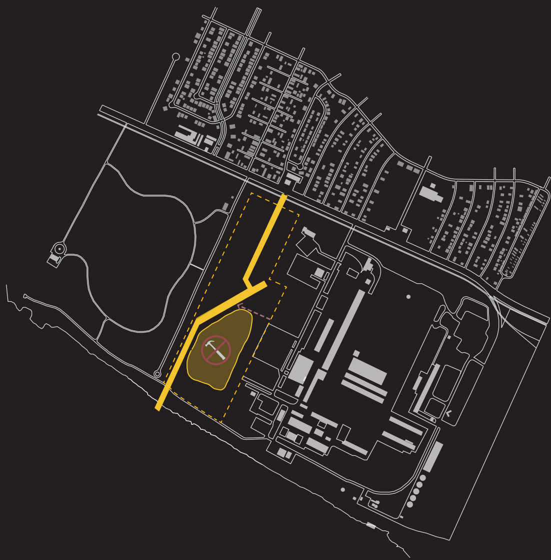

COVERED SEATING
AQUATIC CENTER
PUMPING STATION / PAVILION
ST CLAUDE AVE
NEIGHBORHOOD


processing
finishing
ACID SOLUTION TANK
R EXTERNAL
SALT WATER TANK
PRODUCTION TANKS
BIODIESEL 1
BIODIESEL 2
BIODIESEL 3
CPU 1000
BIODIESEL OUT
G-PHASE 1,2 TANKS
G-PHASE 3 TANKS
WASTE OUT


contaminants out
OVERFLOW WATER OUT
MICROBIAL INTRODUCTION
NUTRIENT INTRODUCTION
AND pH CONTROL
MONITORING
TREATMENT
CHEMICAL PURIFICATION
IL MIXER
AGE 2
STAGE 3
STAGE 4
SWIM
bioremediation
EASTERN COTTONWOOD
DUCKWEED
POPLAR
THALE CRESS
CORN
WHEAT
N MUSTARD
OSIER WILLOW
chemical breakdown

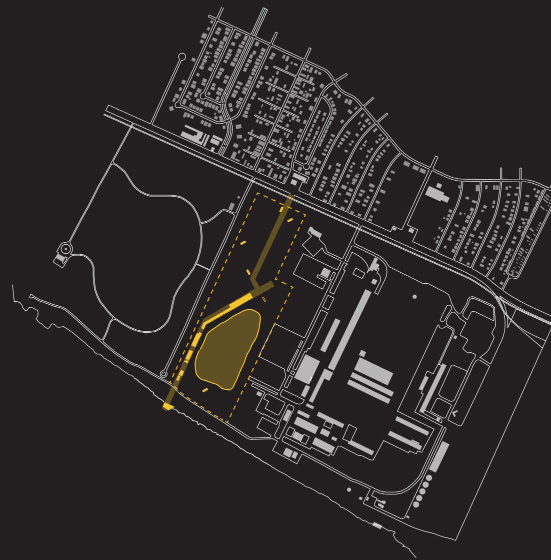


EXPLODED SURFACES



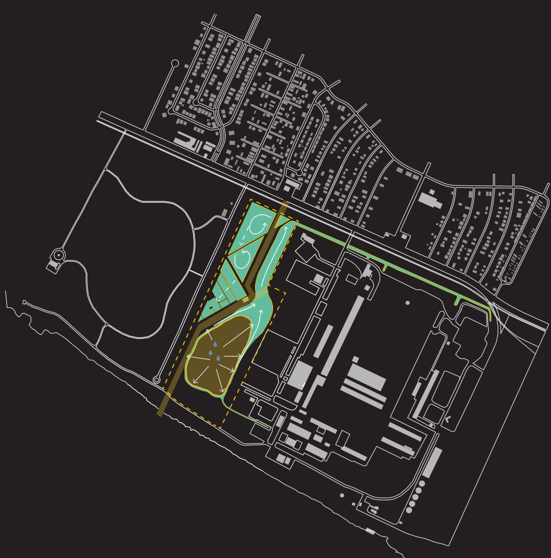
CONNECT NEIGHBORHOOD TO RIVER

ADJUST FOR EXISTING CONDITIONS
DIRECT AROUND LANDFILL / OVER LEVEE



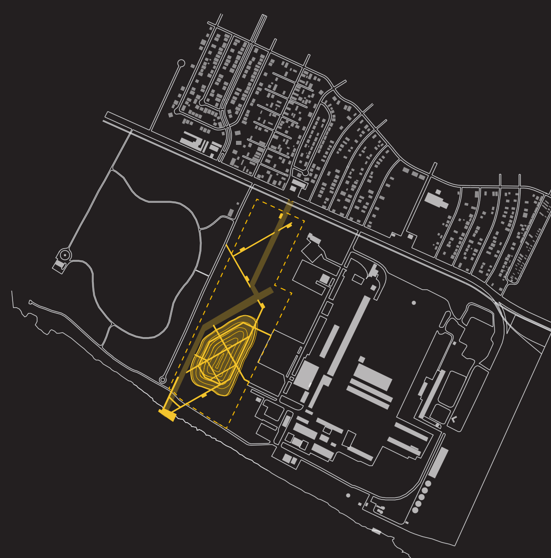
PLACE STRUCTURES

FOLLOW CONNECTION PATH
EMPHASIZE ADJACENCY TO LANDFILL



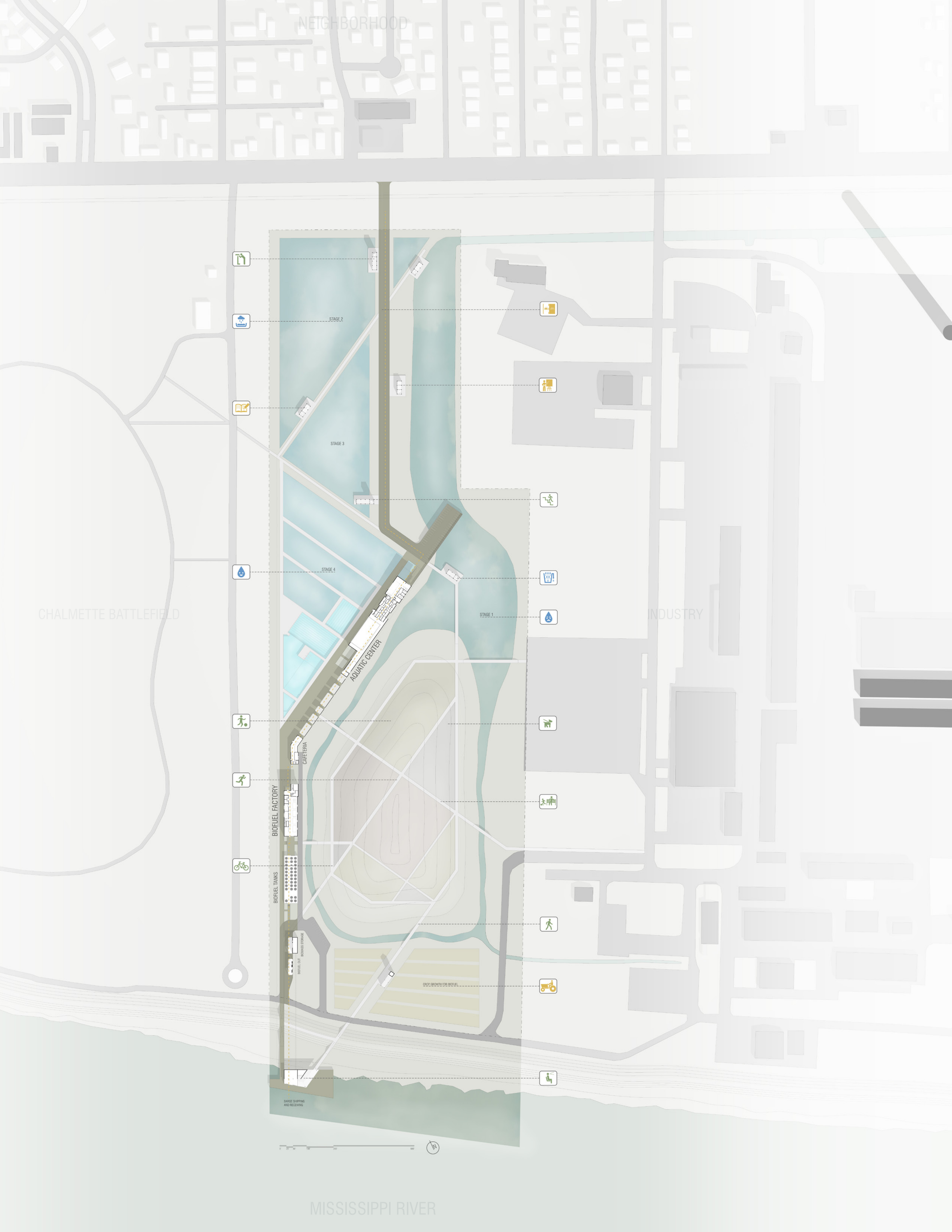
DIRECT WATER FLOW

FOLLOW NATURAL TOPOGRAPHY
CYCLE THROUGH REMEDIATION

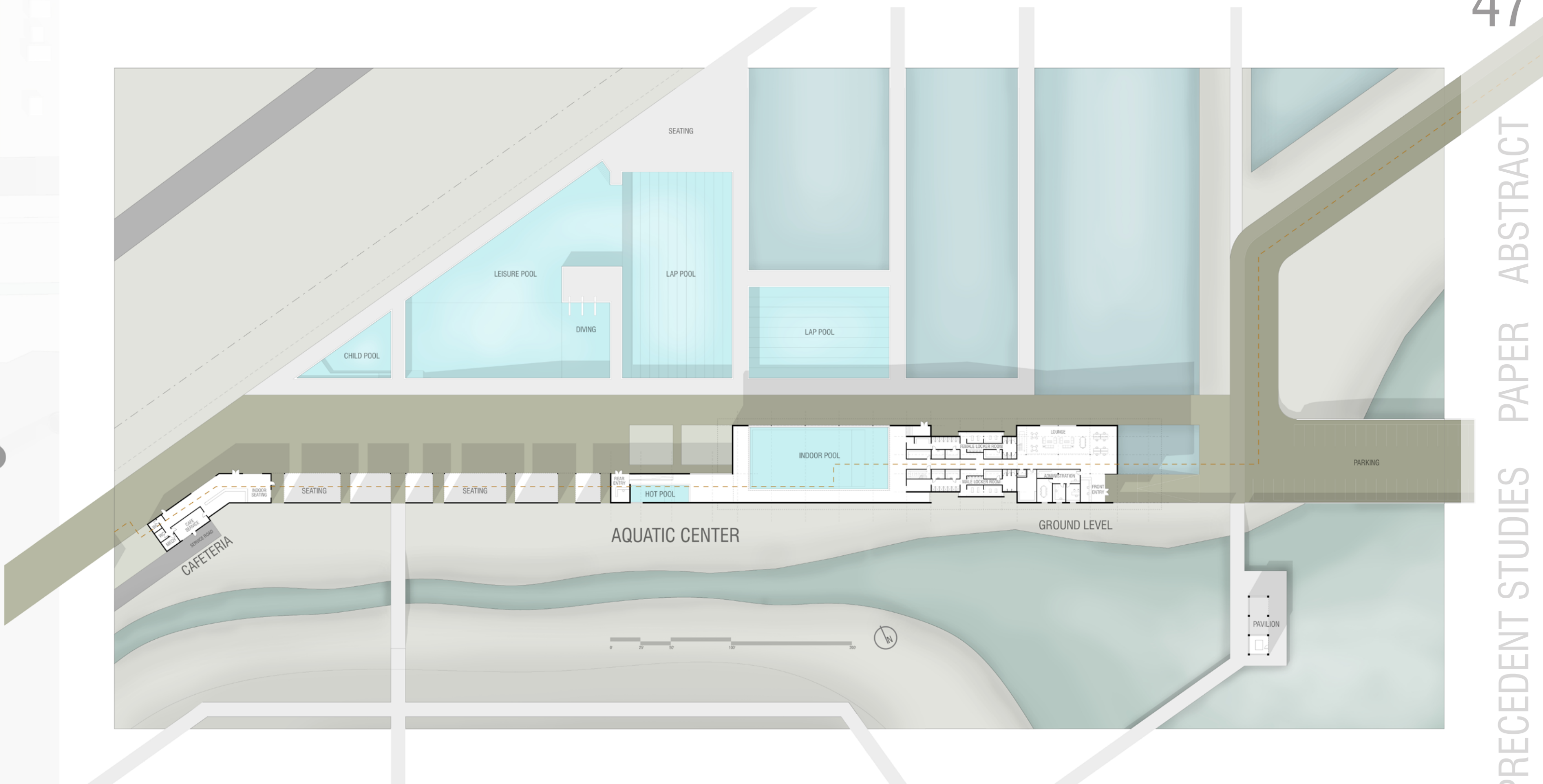


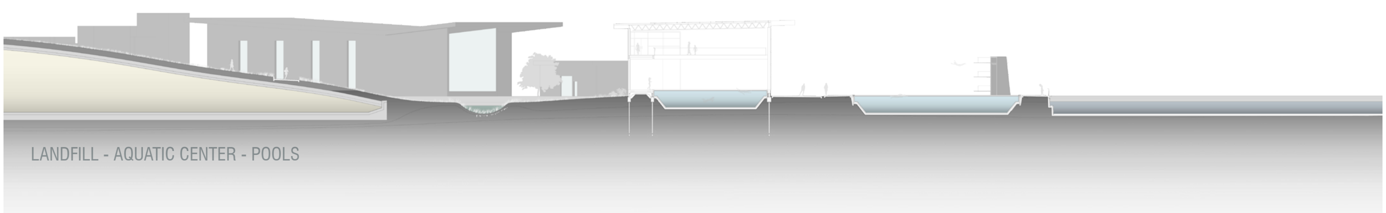
ORGANIZE REMAINDER OF SITE

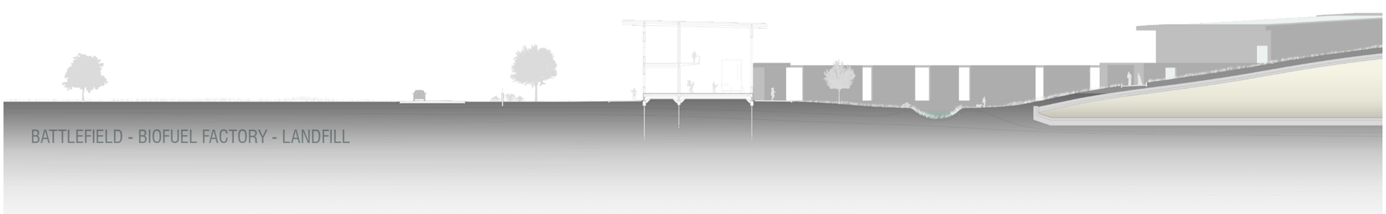
CONNECT PATHS THROUGH UNBUILT AREAS
CONNECT TO CONTEXT

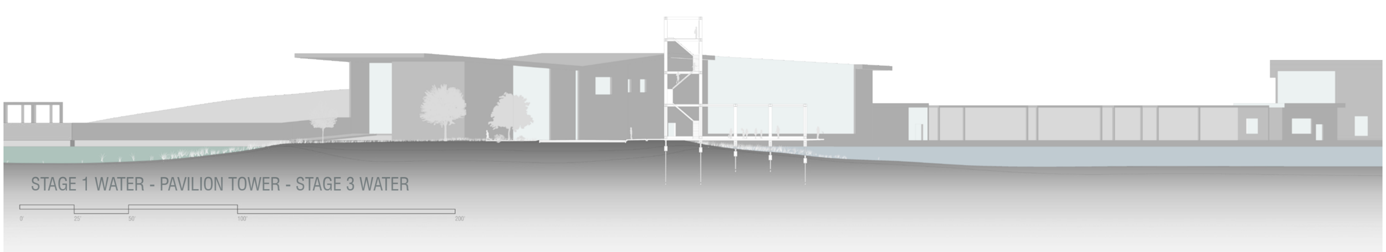


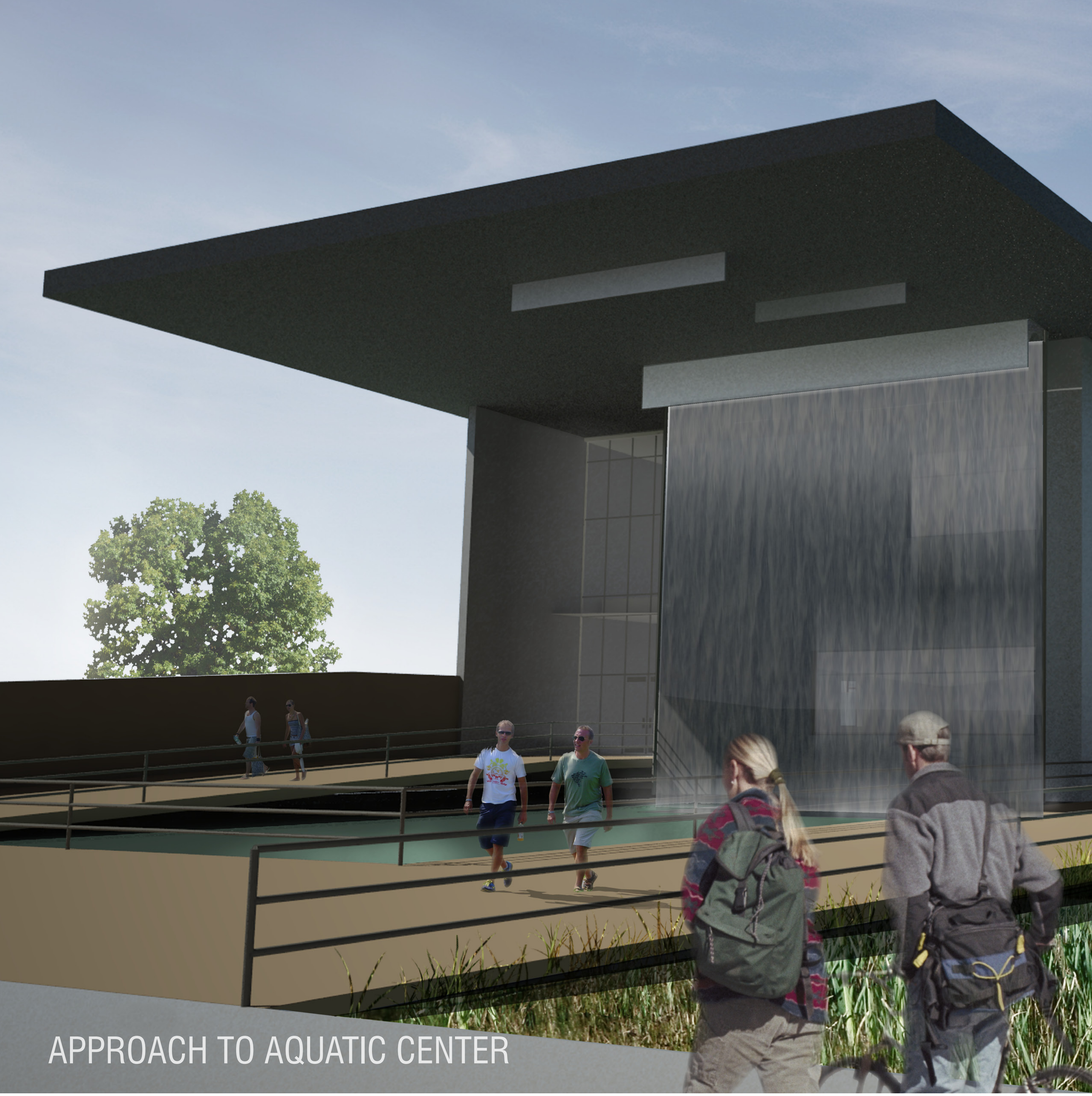
NEIGHBORHOOD
STAGE 2
STAGE 3
STAGE 4
STAGE 1
CHALMETTE BATTLEFIELD
INDUSTRY
AQUATIC CENTER
CAFETERIA
BIOFUEL FACTORY
BIOFUEL TANKS
BIOMASS STORAGE
BIOFUEL OUT
CROP GROWTH FOR BIOFUEL
BARGE SHIPPING
AND RECEIVING
0' 25' 50' 100' 200' 500'
N
MISSISSIPPI RIVER


SEATING
LEISURE POOL
LAP POOL
DIVING
CHILD POOL
LAP POOL
INDOOR POOL
HOT POOL
SEATING
SEATING
AQUATIC CENTER
GROUND LEVEL
CAFETERIA
PARKING
PAVILION

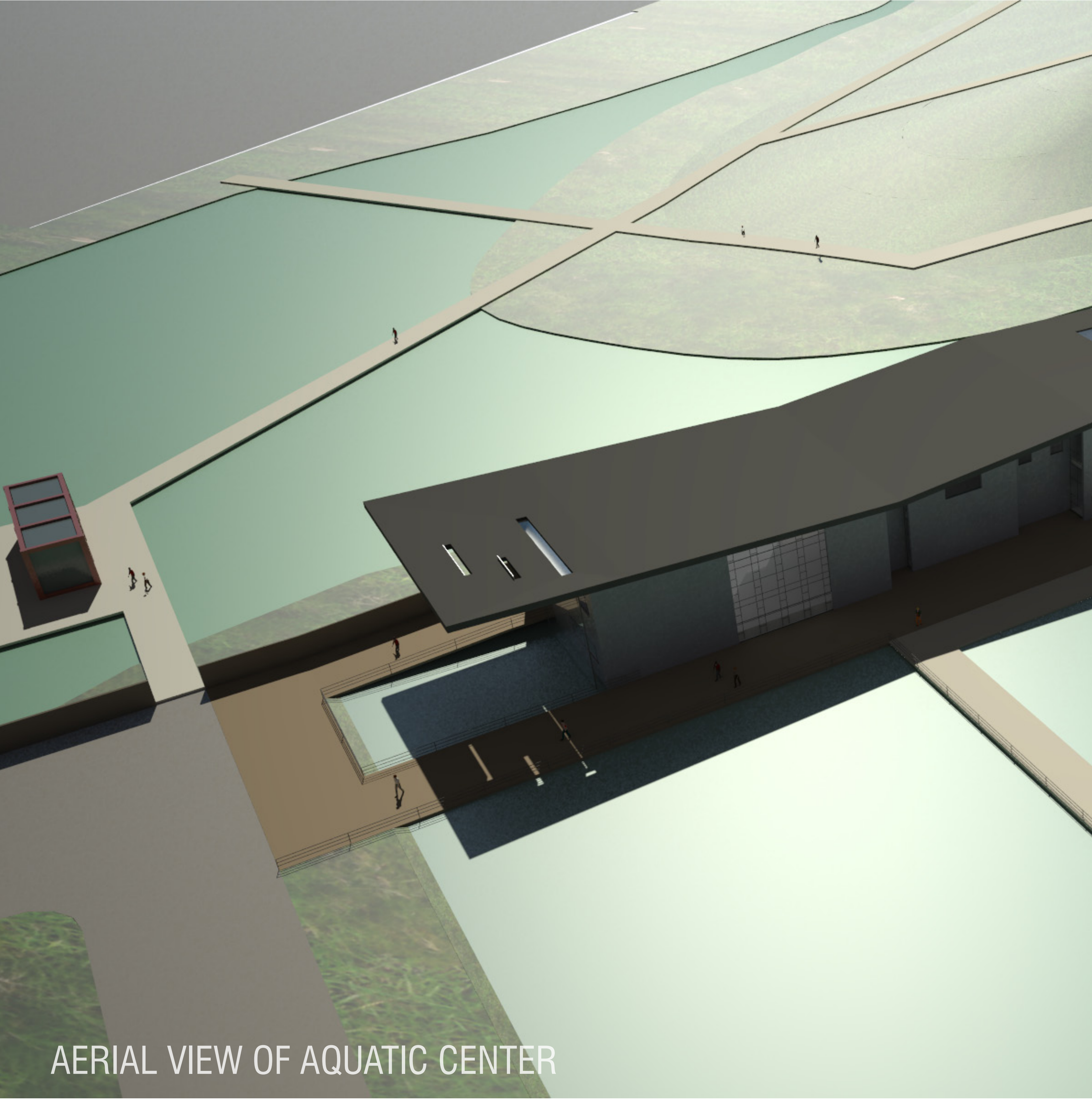

LANDFILL - AQUATIC CENTER - POOLS


BATTLEFIELD - BIOFUEL FACTORY - LANDFILL

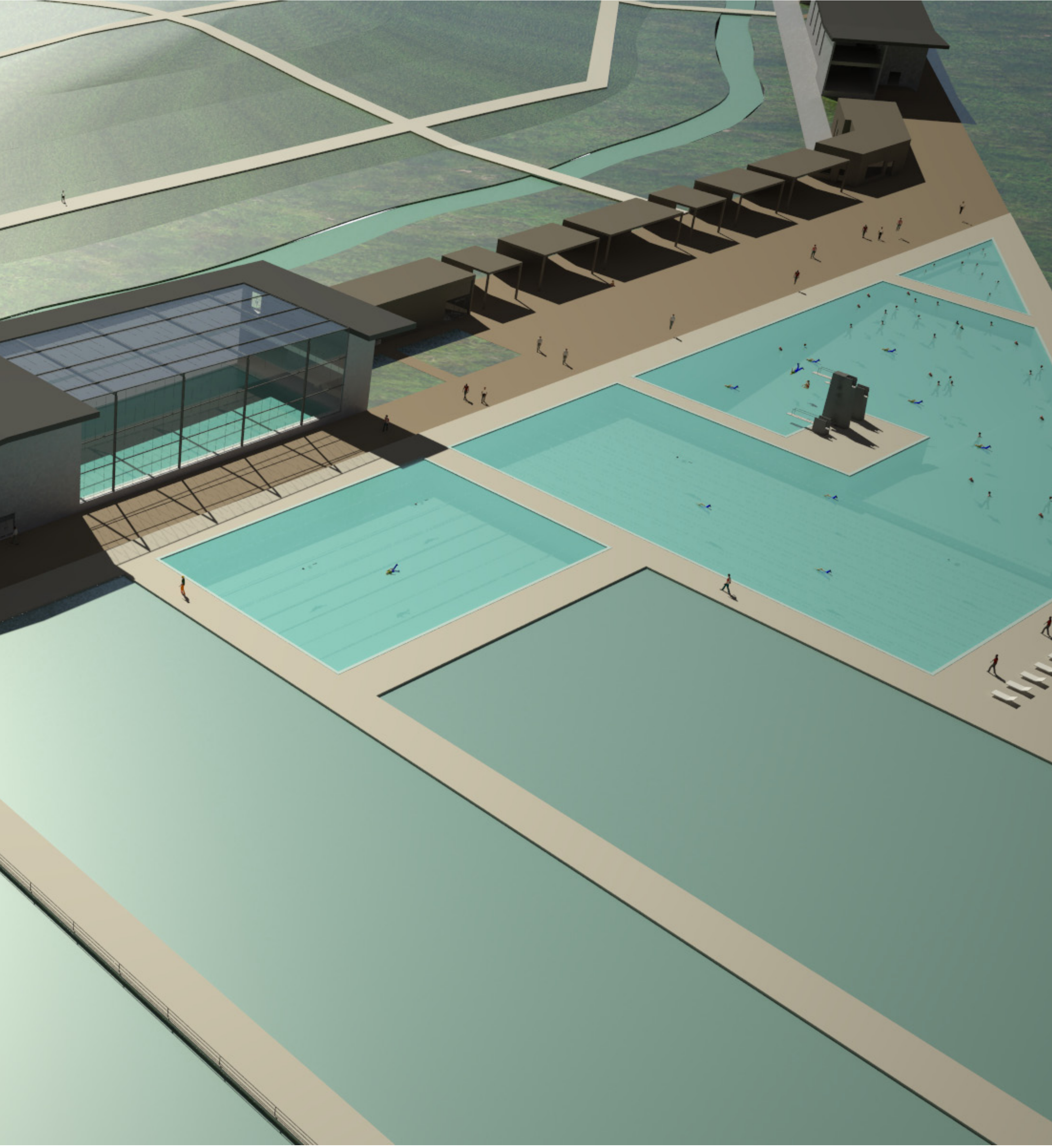

STAGE 1 WATER - PAVILION TOWER - STAGE 3 WATER

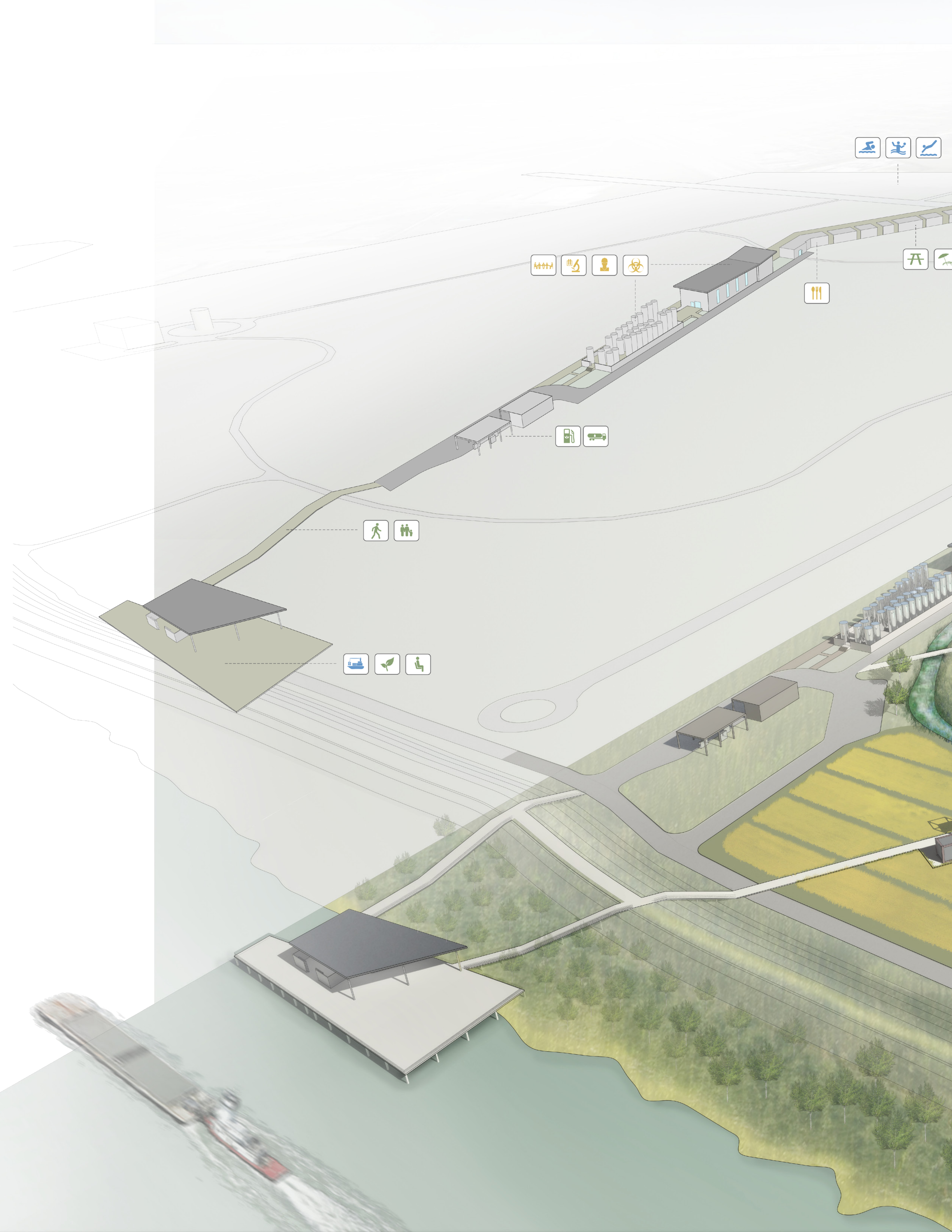

APPROACH TO AQUATIC CENTER

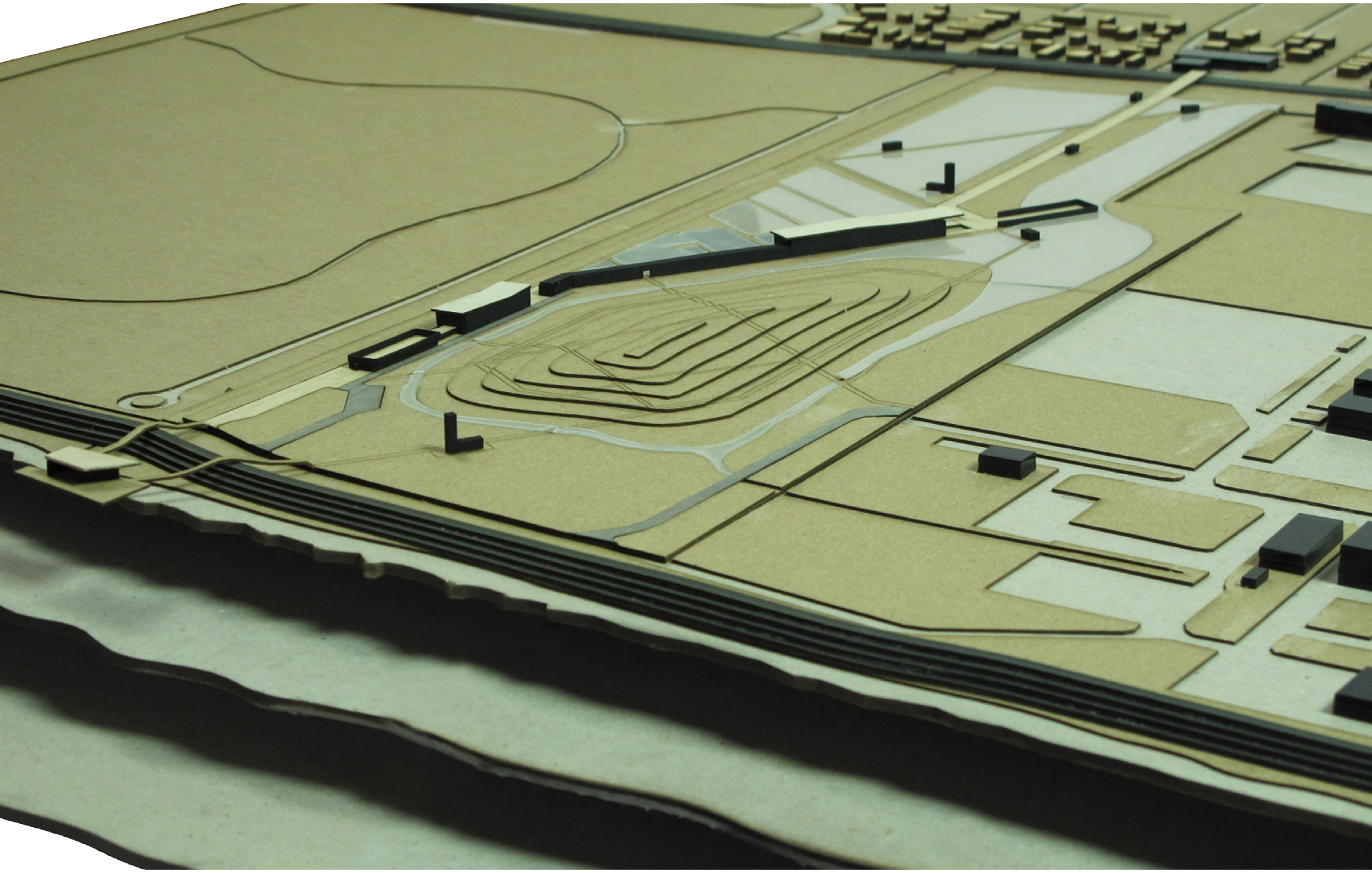

MAIN INTERIOR POOL



AERIAL VIEW OF AQUATIC CENTER







MODEL PHOTOGRAPHS