DAY-LIGHTING ISLAIS CREEK

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SHINING A LIGHT IN THE DARK: DAY-LIGHTING ISLAIS CREEK

A STUDY OF POTENTIAL BENEFITS OF DAY-LIGHTING AN URBAN CREEK IN SAN FRANCISCO

CHRISTOPHER HASLE NORGAARD - MAY 15, 2013 - SENIOR THESIS

I would like to thank my Family for dealing with me and helping me out my whole life, the University of California at Davis Faculty, professor Michael Rios, Professor Claire Napawan, and all of my friends I have met over the years.

Because we are what we have lost

ACKNOWLEDGEMENTS

ACCEPTED AND APPROVED BY:

Professor Stephen Wheeler, Instructor

Professor Michael Rios, Committee Member

Professor Claire Napawan, Committee Member

The development of urban settings has allowed human beings unprecedented control over the environment. By diverting waterways that had previously occupied developed areas into underground culverts and pipes, important habitat and hydrological functions have been lost. Vegetated settings that are unpaved allow for water infiltration and can help reduce flooding events while paved urban locations greatly diminish the environments' ability to handle water run-off because of a distinct lack of penetration. Water, in an impervious setting, is then routed elsewhere in an unnatural way via underground piping, culverts, or through other similarly constructed means. Directing creeks through sewers to treatment plants can be tremendously costly because of the demand it places on treatment facilities (Creek Day-lighting: 1). By diverting waterways through separate systems, and in a more natural way, the demand on these facilities is lessened and water can be utilized to develop a myriad of beneficial functions. Day-lighting, or bringing currently piped water systems to the surface, can repair the natural hydrological cycle,increase effective capacity in pipes, slow peak flow rates, remediate run-off and sewage, provide habitat, create recreation-facilities, and offer a site for ongoing awareness and education (Creek Day-lighting: 1).In order to successfully reintroduce a creek several factors must be taken into account; by examining local geology, climate, and hydrology, while also taking into account the urban framework which must by worked within, successful implementation of a waterway may be safely and effectively achieved. After the outline has been laid, economic, social, and infrastructural growth can occur. Islais Creek, located in southeastern San Francisco. and currently buried in underground pipes, is currently of interest to environmental and utility groups because of its location amongst the highly urbanized setting of southeastern San Francisco, the frequency it floods, its burden on the local sewage and storm water management facilities, and because of the presence of critical animal species and habitat (Water Management: 5). So, by examining the local, historical, and natural factors that dictate stream flow through such a developed site, a framework for the restoration of Islais Creek Can be realized that revitalizes the waterway to the best ability of both the natural and human developed site(s), while also serving as a spring board for the rejuvenation of the urban area on a whole.

ABSTRACT

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0.3 Smith, Jana (jores59). ***Furnace Brook Culvert***. Website. 15 March 2013. Flickr.com

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05 Norgaard, Christopher. **Islais Tryptic**. 2013. (Originally, before alterations by Christopher Noraard: ***Aleman_Islais-Creek-1911***. Website. 20 May 2013 foundsf.org & Google Earth.)

KNOW

1.0 Desertshore. ***front_cover.*** 2013. 20 May 2013 <desertshore.com>

1.1 ***San Francisco Peninsula***. Website. 15 May 2013 Google Earth.

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1.12 **Cattle in butchertown jan 11 1921 AAB-6727**. Web site. <foundsf.com>

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1.20 SPUR. ***The Changing Shoreline 1850, 1929, 2006.*** "Imagining Islais Creek". The Piero N. Petri Fellowship in Urban Design. <http://spur.org>

1.21 Bayview Butchertown 1926. 2010. Ver Planck Historic Preservation Consulting. Website. <verplanckconsulting.com>

WHY?

2.0 Gulf of Maine Research Institute. ***rivertyp.*** 2012. <gma.org>

2.1 Gulf of Maine Research Institute. ***headh20.*** 2012. <gma.org>

2.2 Gulf of Maine Research Institute. ***h20shed.*** 2012. <gma.org>

2.3 ***04_08_01***. SUNY Department of Environmental Engineering. 20 May 2013<fgmorph.com>

2.12 ***sonoma-baylands-350w.*** prbo. 2011. 20 May 2013. (data.prbo.org>

2.13 Claire Napawan. ***1949 shoreline.*** Productive Landscapes 2013. <Smartsite.ucdavis.edu>

2.14 Claire Napawan. ***1959 shoreline.*** Productive Landscapes 2013. <Smartsite.ucdavis.edu>

2.15 Claire Napawan. ***1967 shoreline.*** Productive Landscapes 2013. <Smartsite.ucdavis.edu>

2.16 Corey Holmes. ***2326/2210561546_f35fab5fa5_z.*** 2008. 20 May 2013. <flickr.com>

LEARN

3.0 ***construction8.*** 2012. University of Virginia. 20 May 2013 <ehs.virginia.edu/>

3.4 ***Green Infrastructure.*** 2013. Philadelphia Water Department. 3 May 2013. <phillywatersheds.org>

3.5 GreenInfra-Tools_v5-web. 2013. Philadelphia Water Department. 3 May 2013. <phillywatersheds.org>

3.6 SFEI. The Pulse of the Estuary: Linking Watesheds to the Bay. Oakland, California. 2010

3.8 Jala Pfaff. ***Culvert***. 2013. Art and Molecules. 2 May 2013. < http://jalapfaff.blogspot.com/>

MIMIC

4.0 ***AN_OPEN_SPACE_VISION_FOR_SAN_FRANCISCO_map.*** Openspacesf. <Openspacesf.org>

4.1 superkilen-copenhagen_red_square_topotek1_collabcubed. 2012. Teraforma. <Teraforma.org>

4.2 ***OBSFPix6. 2013***. Oakland Museum of California. <museumca.org>

4.3 ***628x471***. 2001.sfgate. <sfgate.com>

ILLUSTRATIONS

4.4 Corey Holmes. ***2326/2210561546_f35fab5fa5_z.*** 2008. 20 May 2013. <flickr.com>

4.6 ***butchertown***. Website Greg Gaar Collection, San Fran cisco, CA. FoundSF.org

SPECIFICS

5.0 A. Jesse Jiryu Davis. ***gowanus090720_560***. 2009. New York Magazine. New York, NY

5.1 dlandstudio. ***Gowanus Canal Sponge Park***. <Sponge park.org>

5.2 dlandstudio. ***Gowanus Canal Sponge Park***. <Sponge park.org>

5.3 dlandstudio. ***Gowanus Canal Sponge Park***. <Sponge park.org>

5.4 dlandstudio. ***Gowanus Canal Sponge Park***. <Sponge park.org>

5.5 dlandstudio. ***Gowanus Canal Sponge Park***. <Sponge park.org>

5.6 dlandstudio. ***Gowanus Canal Sponge Park***. <Sponge park.org>

5.7 dlandstudio. ***Gowanus Canal Sponge Park***. <Sponge park.org>

5.8 scape/ Landscape Architecture PLLC. ***Oyster-tecture***. 2004. <scapestudio.com>

5.9 scape/ Landscape Architecture PLLC. ***Oyster-tecture***. 2004. <scapestudio.com>

5.10 scape/ Landscape Architecture PLLC. ***Oyster-tecture***. 2004. <scapestudio.com>

5.11 scape/ Landscape Architecture PLLC. ***Oyster-tecture***. 2004. <scapestudio.com>

5.12 scape/ Landscape Architecture PLLC. ***Oyster-tecture***. 2004. <scapestudio.com>

ILLUSTRATIONS

PART 1: KNOW

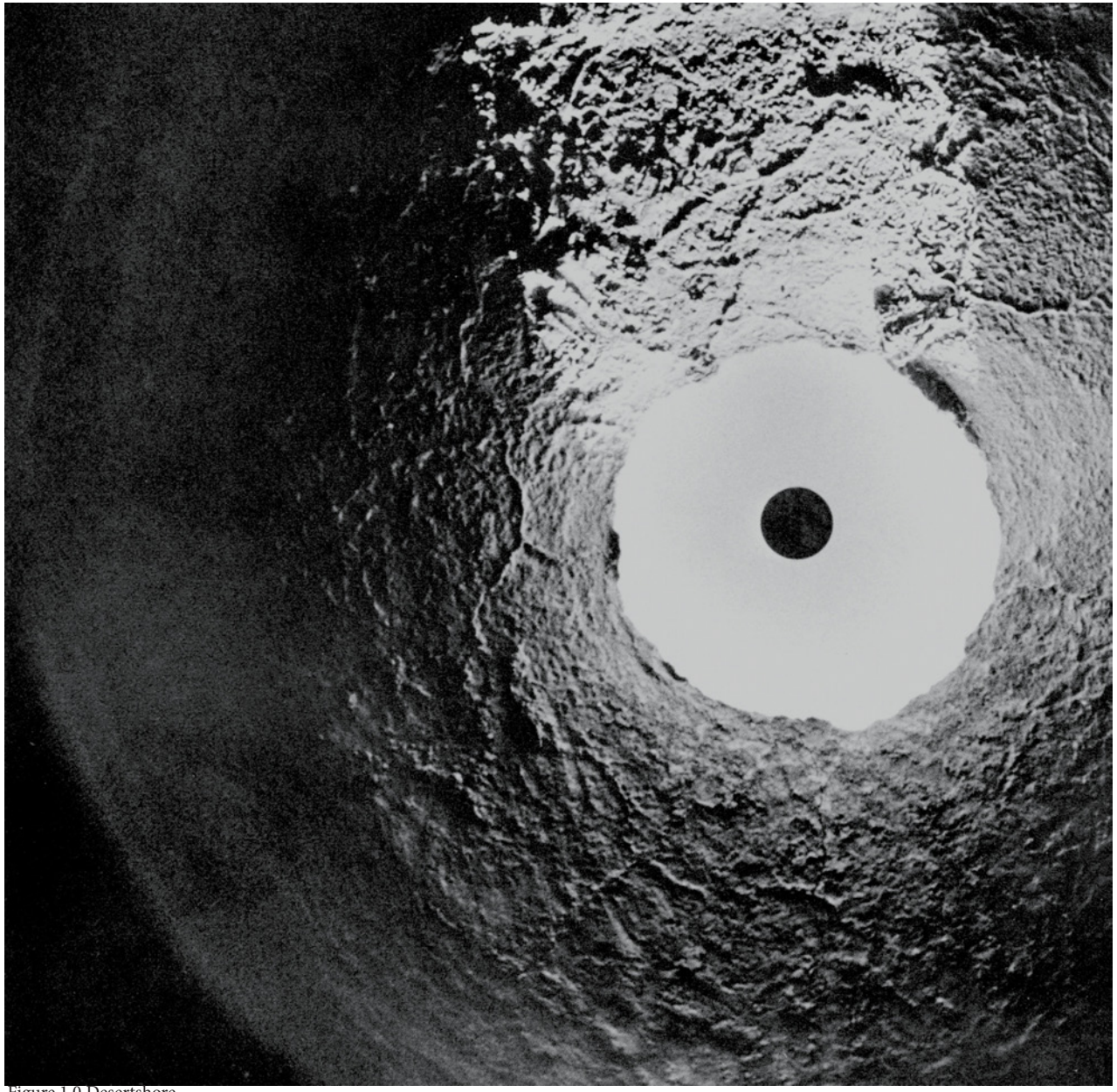


Figure 1.0 Desertshore

ACCORDING TO THE LID BASIN ANALYSIS TECHNICAL MEMORANDUM BY THE SAN FRANCISCO UTILITY COMMISSION, ISLAIS CREEK, HISTORICALLY THE LARGEST BODY OF WATER AND DISCHARGER IN THE CITY, IS ONE OF THE PENINSULA'S FOUR BAYSIDE BASINS ALONG WITH YOSEMITE BASIN, SUNNYVALE BASIN, AND CHANNEL BASIN. IT'S UPPER PORTIONS STILL FLOW IN A LARGELY NATURAL WATERWAY ABOVE GROUND THROUGH GLEN PARK CANYON AMIDST STEEP HILLS WHILE ITS LOWER PORTIONS ARE DIRECTED INTO A 5-DIAMETER STORM DRAIN BEFORE ENTERING A COMBINED SEWER PIPE (LID BASIN ANALYSIS TECHNICAL MEMORANDUM: ISLAIS CREEK DRAINAGE BASIN APRIL 2009. 3). THIS IS LARGELY BECAUSE MUCH OF THE CREEK'S UPPER WATERSHED RUN THROUGH STEEP TERRAIN. WHILE IT'S LOWER PORTIONS ARE PREDOMINANTLY FLAT AND ARE PRONE TO FLOODING. FROM HERE MUCH OF THE CREEK RUNS THROUGH A COLLECTIVE SEWER WHICH WAS DESIGNED IN THE 1850'S AND IS NOW OPERATED TO PROVIDE A 5-YEAR LEVEL OF SERVICE UNDER WET WEATHER CONDITIONS (I.E. RAIN EVENTS WITH RETURN PERIODS SHORTER THAN 5 YEARS) (LID BASIN ANALYSIS TECHNICAL MEMORANDUM: ISLAIS CREEK DRAINAGE BASIN APRIL 2009. 3)

Figure 1.1: San Francisco Map with the Islais watershed Illuminated

ITS LOWER PORTION CONSISTED OF EXTENSIVE WETLANDS, SLOUGHS, AND BEACH SANDS, WHICH AT ONE TIME SUPPORTED A VAST RIPARIAN HABITAT, CONSTITUTING THE FLOODPLAIN OF THE REGION, AND WHERE NUMEROUS PLANTS AND ANIMALS RESIDE(RAMIREZ-HERRERA, SOWERS, RICHARD, GROSSINGER: 14), ISLAIS CREEK TRAVERSES ROUGHLY 11 SQ. MILES OF AREA ON ITS ROUTE TO THE SAN FRANCISCO BAY FROM THE EASTERN SLOPES OF THE SAN BRUNO MOUNTAINS. ALONG THIS PATH, IT MEANDERS UNDERNEATH SOME OF THE MOST HIGHLY URBANIZED AREAS IN THE NATION,

The landscape of the eastern section of the peninsula, where Islais Creek is located, is vastly different than what it once was. While now the region is predominantly urban, the historical landscape was much more rich in ecological diversity, which needs to be reintroduced and maintained in order to preserve the plants and animals that reside in the area, as well as dealing with the effects of the highly urbanized development(s) surrounding the site. The San Francisco Bay serves as the terminus for the creek. Consisting of coastal shrub and grasslands at its inception point at Glen Park Canyon, the creek slowly empties into the Islais Valley, where, upon meeting the San Francisco Bay, it becomes part of the regions wetland system, and provided valuable refuge for animals while also serving as the regions floodplain. Throughout the creek's 11 sq. mile voyage, riparian habitat littlers its slopes.

Grassland: Treeless habitat that once covered the Peninsula

Riparian: Creekside habitat; numerous flora & fauna

Wetland: Biologically productive habitat; dependent on flooding

Bay: Breeding grounds for numerous species

Coastal Scrub: Thrives on fog; dominated by shrubs

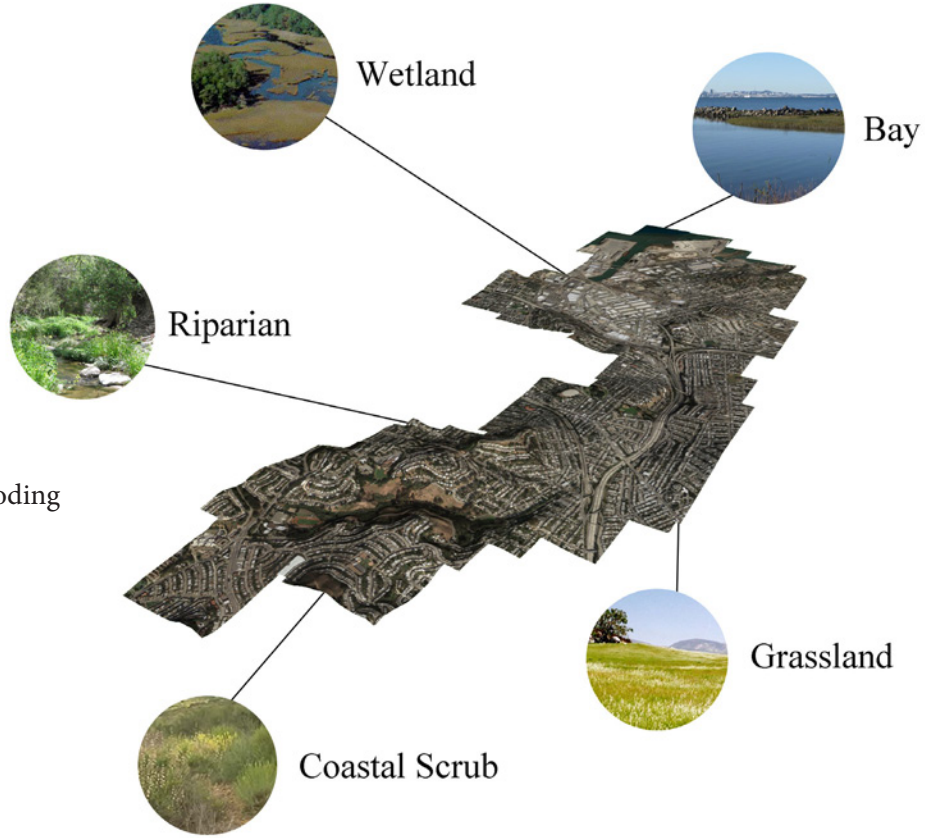


Figure 1.2 Islais Creeks' habitats

Presently, several important native species are found within the Islais Basin, including the Pacific Chorus Frog, the Islay Cherry (Prunus Ilicifloria), and the endangered Mission Butterfly, which are all in dire need of protection. Restoring the creek to at least a fraction of its original state would greatly help these constituents. Without some sort of change, these plants and animals will surely disappear completely from the peninsula region, and the planet.

Figure 1.3: Pacific Chorus Frog

Figure 1.4: Mission Blue Butterfly

Figure 1.5 : Islay Cherry

MUWEKMA OHLONE INDIANS

Before Europeans arrived in what is now known as the San Francisco Bay Area, the Muwekema Ohlone tribe had settles the region. The Muwekema were a tribal society that lived through out the Bay area, as well as in the San Joaquin Delta (Muwekma Ohlone Tribe of the San Francisco Bay Area 15) On the Peninsula, though, Islais Creek provided them with clams, mussels, shrimp, and plants, which grew in and around the fluvial basin (Imagining Islais Creek 14). Their reliance on the creek for subsistence was in stark contrast to future populations that resided in the area, who viewed the creek as more of a depository for discarded material. Further, shell mounds found around the creek were misinterpreted as being dumping grounds for the tribe. But is actuality, these were burial sites (The Muwekma Ohlone Tribe of the San Francisco Bay Area 13). The Ohlone utilized the Islay Cherry as part of their diet. The Islay Cherry is a plant that grows in the Riparian areas surrounding the creek. The Islay Cherry is becoming more and more difficult to locate along the banks now due to increased urbanization.

Figure 1.6: Muwekma Ohlone


Figure 1.7: Muwekma Ohlone

European arrival in the 18th century would severely effect Islais Creeks history. Alterations to the landscape due to industry and urbanization were the biggest culprits. One particular location, the Bayview region of the peninsula, where the creek empties into the bay, was altered due to due to slaughterhouses that heavily populated the area. Like many cities around the world, slaughterhouses have 3 things in common: Easy access to railroads, located on the edge of town, and near flowing water (Robichaud and Steiner 16). Often referred to as "Shit Creek", due to the dumping of excrement and offal into its waters, The contamination from the surrounding area led to the creek being channeled into an underground culvert in order to control the pollution problem that was occurring (LID Basin Analysis Technical Memorandum: Islais Creek Drainage Basin April 2009. 2). the creek was buried due to health concerns in the early 20th Century. San Francisco's Butchertown is somewhat unique because it was located on a tidal sink (Robichaud and Steiner 16).

Figure 1.8: Historic Islais Creek's output to the Bay and Wetlands

Figure 1.9: Islais Creek region after the establishment of Butchertown, 1926


Figure 1.10: Islais Channel, 2004

Figure 1.11

Figure 1.12: Butchertown, 1921

Figure 1.13: Butchertown, 1921

Figure 1.14: Northend, Butchertown

HISTORICAL ROUTE

AS MENTIONED BEFORE, THE HISTORICAL ROUTE OF THE CREEK FLOWED FROM THE EASTERN SLOPES OF THE SAN BRUNO MOUNTAINS, LARGELY IN THE CENTER OF THE PENINSULA, EAST TOWARDS THE SAN FRANCISCO BAY. AS THE TOPOGRAPHY FLATTENED OUT THE WATER SPREAD OUT AND SLOWED DOWN, CREATING MARSHLANDS, WETLANDS, AND SLOUGHS ALONG THE WAY. WITH ITS ORIGINS IN THE PENINSULA'S MOUNTAINS AND HILLS RISING UP AROUND 530 FT, THE CREEK BEGINS FAST MOVING.

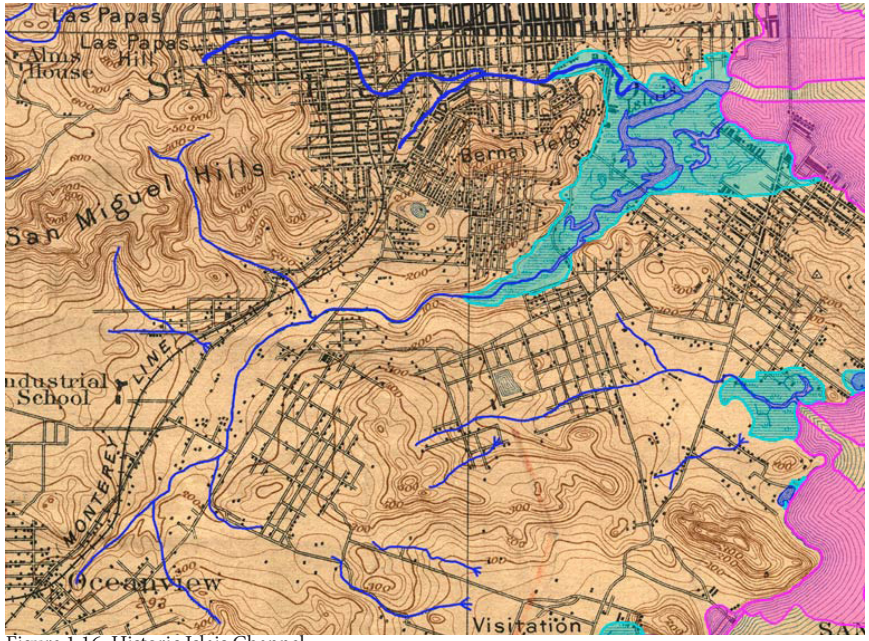


Figure 1.16: Historic Islais Channel

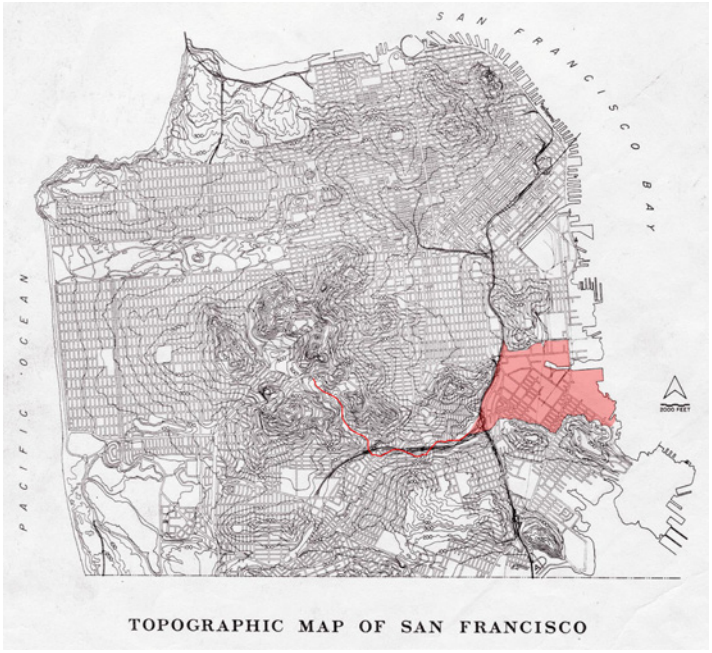


Figure 1.17: Topography of the Bay Area with Islais Creek Illuminated

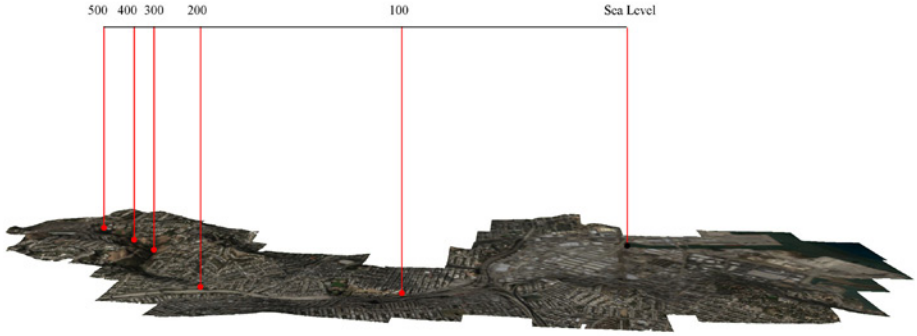


Figure 1.17: Topography of the Bay Area with Islais Creek Illuminated

THE CURRENT CONDITIONS OF THE SITE ARE VASTLY DIFFERENT FROM THE PRE-SETTLEMENT DAYS OF THE LATE 18TH CENTURY. A HIGHLY URBANIZED CITY NOW SITS OVER THE MARSHES, WETLANDS, AND COASTAL LANDSCAPES. THIS POSES A UNIQUE PROBLEM WHEN TRYING TO RE-ESTABLISH A CREEK. FREEWAYS, PRIVATE PROPERTIES, PUBLIC PROPERTIES, STREETS, AND OTHER DEVELOPED ENTITIES SIT IN THE WAY OF DAY-LIGHTING THE CREEK.

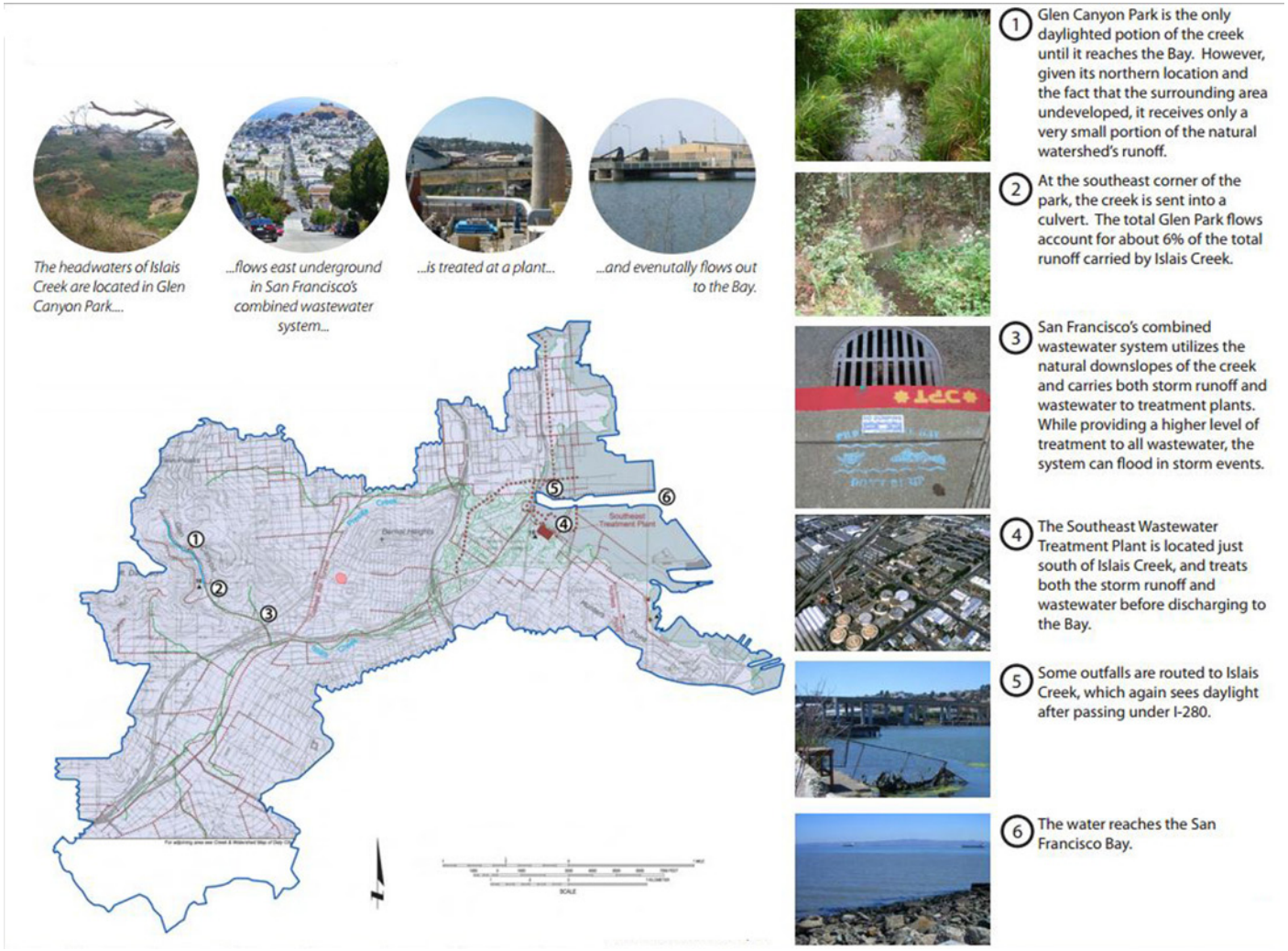


Figure 1.18: Islais Creek current conditions

Islais Creek is one of many watersheds and basins on the peninsula. Included in the list are: Sunnydale, Yosemite, Islais, Channel, Northshore, Richmond, Sunset, and Golden Gate. The shoreline of the eastern portion of the city has been dramatically changed over the years. Bay fill has been deposited over the last 100 years, creating more shoreline. This has caused flood concerns due to rising sea levels.

Figure 1.19: The shoreline from 1860 to 2006


San Francisco Shoreline, pre-1850 (6)


San Francisco Shoreline, 1929 (7)


San Francisco Shoreline, 2006 (8)

Figure 1.20: The shoreline- 1850, 1929, 2006

Figure 1.21: Butchertown, 1926

PART 2: WHY?

WHAT IS A STREAM?

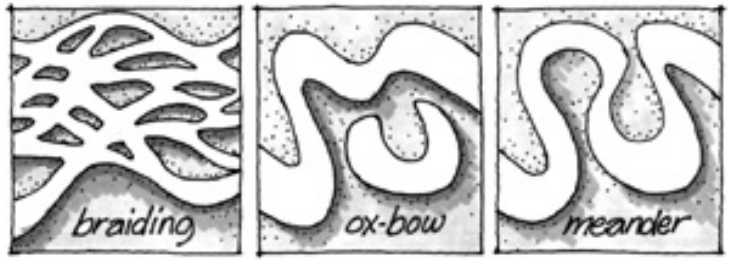


Figure 2.0: Different forms a creek can take over time. Dependent on composition of the surface the creek flows over.

Figure 2.1: Stream flow from its inception point to its exodus point.

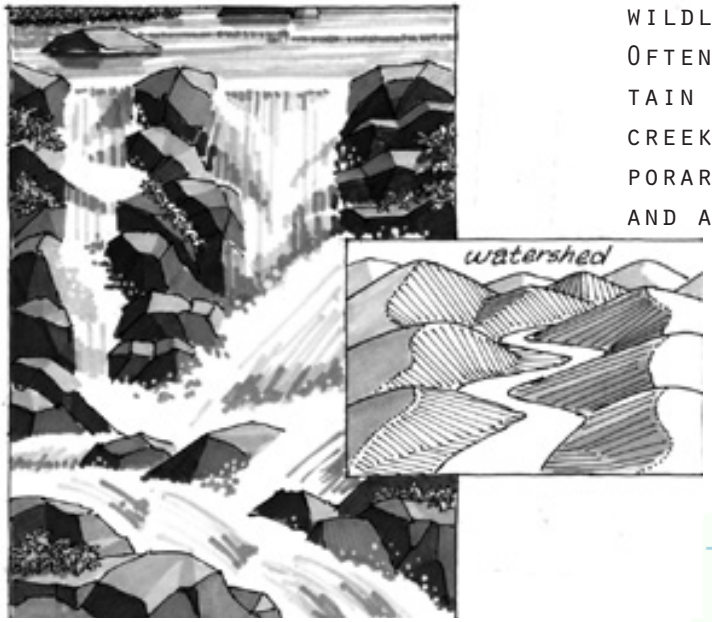


Figure 2.2: The stream bed and watershed of a creek

A creek, or stream, is a mass of water that has a current and is confined to banks and a bed. Creeks are smaller, in both size and mass, than rivers. Creeks have a ranking system and meander which effect the surrounding environment and the flow of water throughout the landscape. Streams play a vital role in surface hydrology, serving as conduits for wildlife, and recharging ground water. Often times creeks run dry during certain months or for periods of time. These creeks are considered ephemeral, or temporary. Islais Creek is largely ephemeral and a 4th order stream

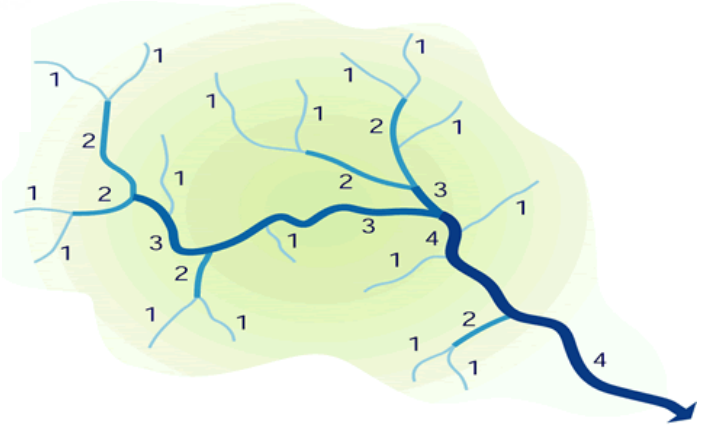


Figure 2.3: Order of streams with the higher numbers representing exodus points and lower numbers representing inception

Daylighting creeks involve a distinct understanding of local geological activities. Infiltration, or the descending of water through the soil, is an important aspect of geological activity, and is dependent on predominantly the density of vegetation on the soil surface and the characteristics of the soil (Leopold, Water, Rivers, and Creeks, 10). The size of holes, or spaces, in between soil composed of grains dictates how infiltration rates occur. For example, variations in soil type, such as sandy soils tend to have higher infiltration rates than fine-grained soils, whereas clay loams have lower rates becuase there are large spaces between grains (Leopold, Water, Rivers, and Creeks, 10). Other modes of infiltration, such as capillarity and whether a soil is hydrophobic, effect water infiltration. Capillarity, or the tendency of a liquid to cling the surface of a solid material, has a profound effect on the permeation of water through the soil, and can be removed by drying (Leopold, Water, RIvers, and Creeks, 14). So, the composition of the surface region of a landscape can have a great effect on water retention.

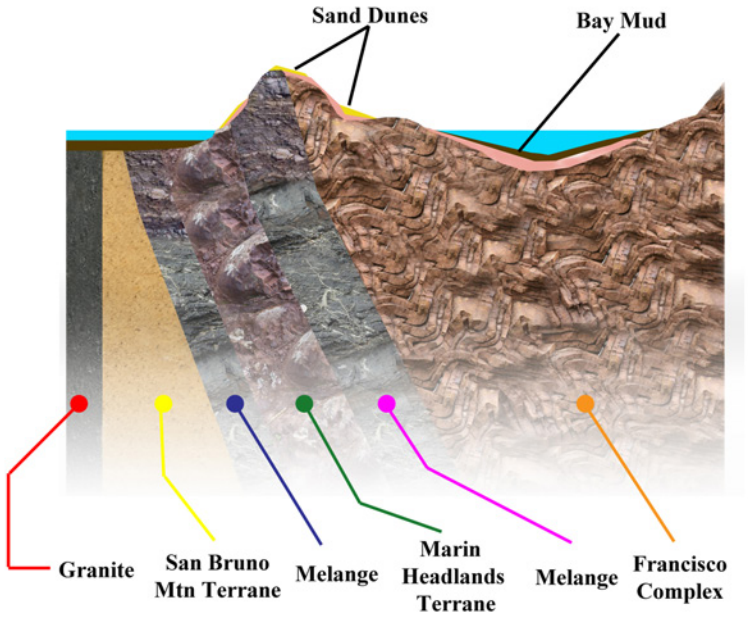


Figure 2.4: Geological formation of the San Francisco Peninsula, from east to west.

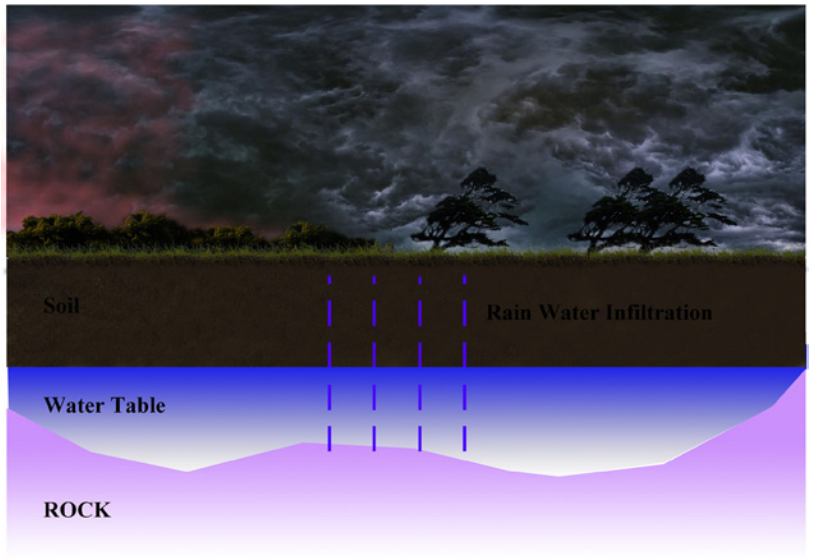


Figure 2.5: Graphic showing infiltration of water during a storm

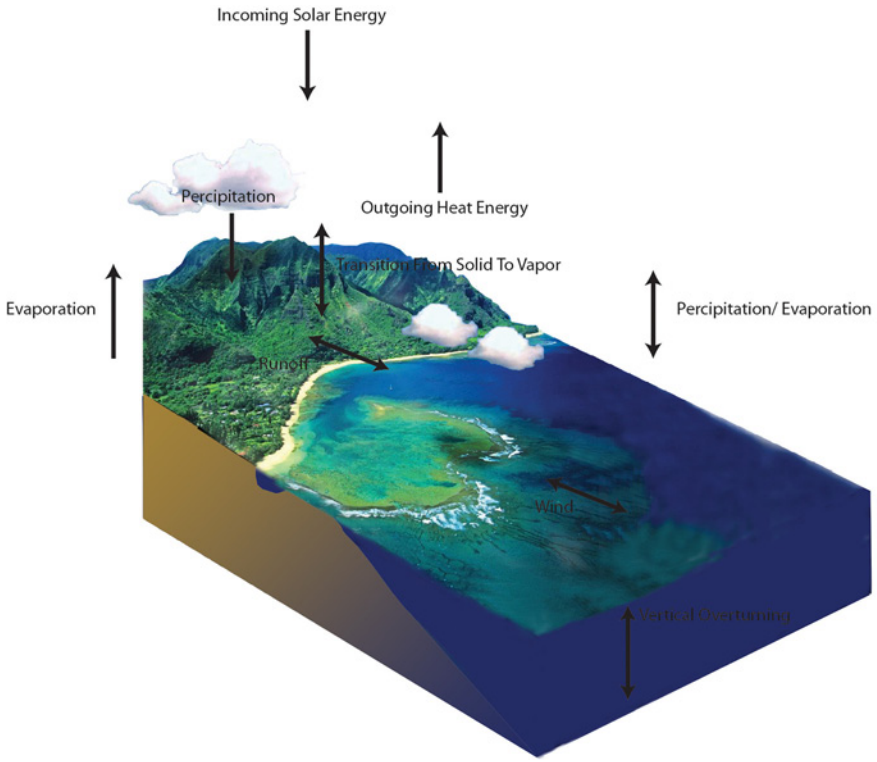
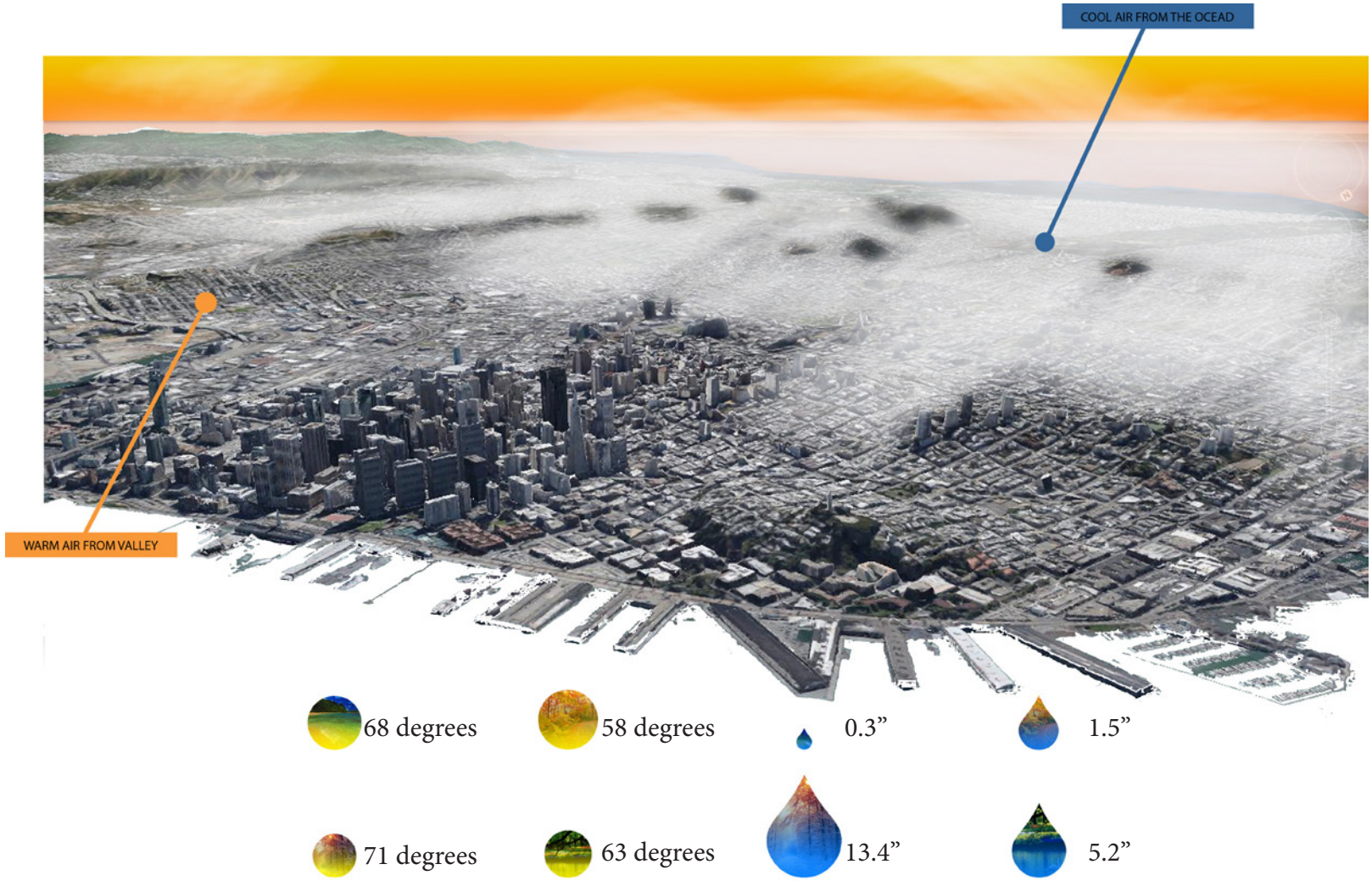


Figure 2.6: A Climate System

A region's climate has a great effect on hydrology and the presence of water. A Region's precipitation totals, in particular, are important to the development of streams and creeks. These rainfall totals dictate when these waterways, and by how much volume, they will occur. Using the United States as an example, states in the east receive from 1,000mm to 1,270mm annually while in the west annual precipitation totals are sharply lower (Keipold, Water, Rivers, and Creeks, 7). While annual precipitation totals have a great effect on whether a creek is dry or wet, the season of greatest precipitation plays a vital role in the presence of waterways and flooding. San Francisco, the location of Islais Creek, for instance, has a Mediterranean climate, which, like Spain, Italy, and Greece, has a rainy season which occurs in the winter and a dry season which transpired much of the rest of the year. In contrast, a considerable amount of the Southwest United States receives an abundance of rain in the summer, and mostly from thunderstorms (Leopold, Water, Rivers, and Creeks, 7). These instances of heavy rainfall play a vital role in flooding occurrences, precisely because most flooding oc-


COOL AIR FROM THE OCEAD
WARM AIR FROM VALLEY
68 degrees
58 degrees
0.3”
1.5”
71 degrees
63 degrees
13.4”
5.2”

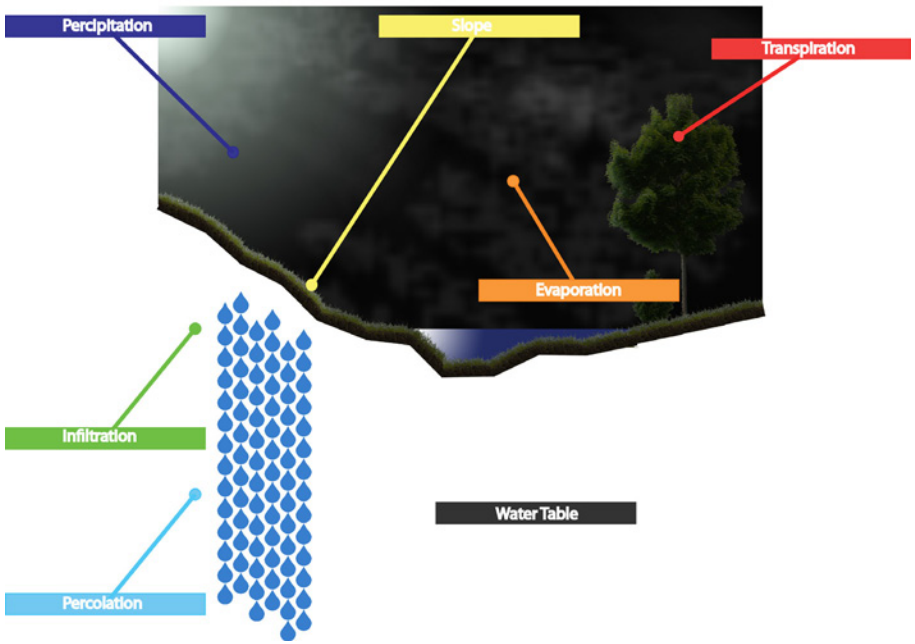


Figure 2.8: Hydrology

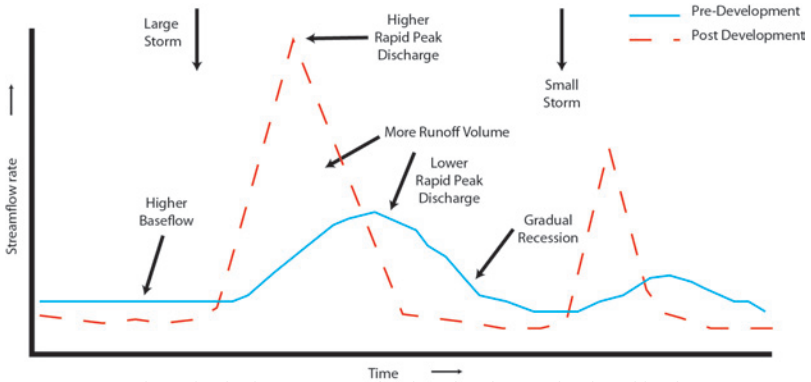


Figure 2.8: Graphing the discharge rates in developed and none-developed landscapes

Stream hydrology, which expands on the previous subject, soil structure and geology, takes a holistic view of creek development, and is important in understanding how water may traverse and coalesce on a particular site. Stream hydrology is often referred to as open channel flow because of the way flow distorts channels (The Hydrology of Streams, 1) This is in sharp contrast to the flow groundwater undergoes, which largely doesn't affect the grains and particles it interacts with. The primary factors that control stream velocity are gravity and friction. Friction, or the tendency for water to be held in place, is affected by two situations; first, frictional drag between one layer of water and another, and secondly, the frictional drag between water and the sides and bed of the channel (The Hydrology of Streams, 1). Gravity, on the other hand, is heavily effected by slope steepness. Elevation gradient, or variation in slope steepness, can increase or decrease water velocity based on the gradients steepness (The Hydrology of Streams, 1). The interaction between these two forces heavily affects either one or the other. This interaction creates the boundary layer, which is where the forces induced by gravity are stunted by the forces brought by friction (The Hydrology of Streams, 1). These actions cause erosion.

The hydrology of Urban settings is in sharp contrast to that of the natural landscape. The presence of impervious surfaces throughout cities and towns doesn't allow water the opportunity to infiltrate the surface, where it would join the water table, or other naturally occurring groundwater facilities. This leads to flooding, contaminations, and erosion. By implementing pervious pavements, naturally occurring surfaces, Impervious urban surfaces also limit evapotranspiration, which is the action of water leaving its physical form and re-entering the atmosphere. These conditions lead to sewage treatment facilities to become overworked. They also increase the impact of pollution on oceans and bays, where the water ultimately ends up. So, by reintroducing urban creeks and retrofitting buildings and streets with more pervious surfaces, the impact, and potential cost, of surface flooding can be mitigated.

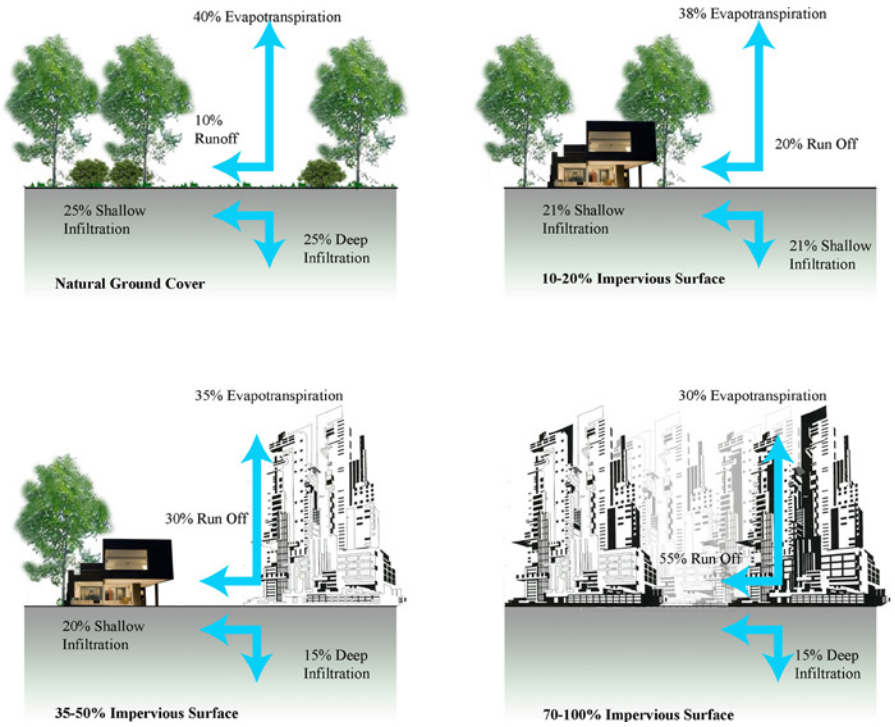


Figure 2.10: Different landscapes and their ability to manage water

WETLAND ECOLOGY

Wetlands serve as immense areas of biological diversify. Their ability to clean and filter water of chemicals and debris makes them extremely viable tools in the Landscape Architecture field. With areas varying in depth and size, meandering and wading water flows deliver nutrients in and around wetlands allowing for immense habitats full of diversity.

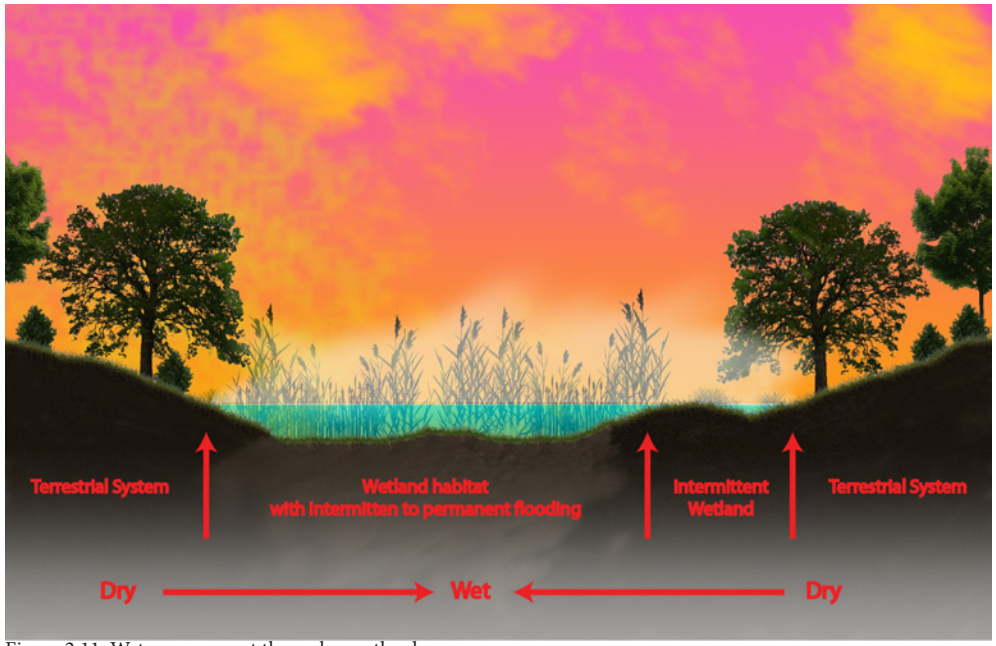


Figure 2.11: Water movement through a wetland


Figure 2.12: Bay area tidal marshes

Figure 2.13: San Francisco's Eastern shoreline; 1949

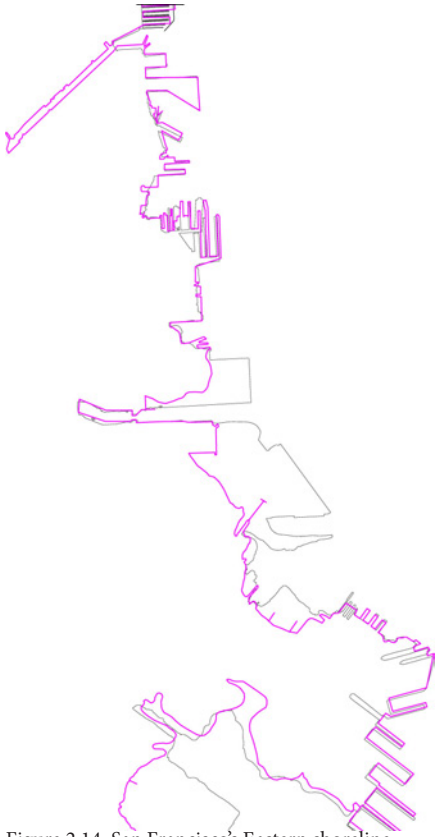


Figure 2.14: San Francisco's Eastern shoreline; 1957

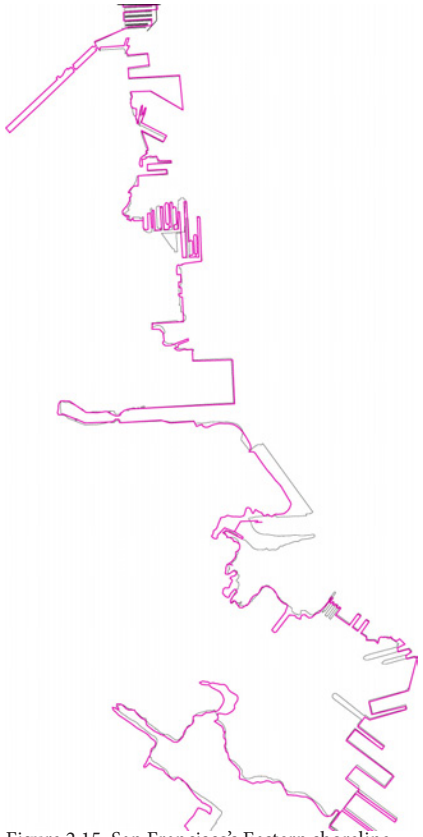


Figure 2.15: San Francisco's Eastern shoreline; 1967

San Francisco's eastern coastline is extremely susceptible to flooding and rising sea level. This is due to the fact that bay fill has been deposited throughout the shoreline, resulting in unnatural coasts that have been heavily developed with residential and commercial developments. There is little that can be done without major overhauls that would prove costly. Creating infrastructure that can deal with flooding, such as wetlands and restored creeks would go a long way to dealing with the problem. Even developments with pervious surfaces would help.

Figure 2.16 Stampede

Figure 2.16: Culvert

PART 3: LEARN

Figure 3.0: Meadow Creek Day-Lighting project

Day-lighting, or the removing of streams from buried conditions, is a contemporary movement advocated by environmental planners and scientists that restores life and health to streams, reduces flooding (especially in urban locations), saves money, and creates valuable public open spaces (Virginia Resource Center: 3). Historically, burying streams in pipes and culverts underground was mirrored by social factors at the time. Most notably, in the 1800's, "as rapid expansion took place, concern about pollution in public drinking water led to placing thousands if not millions of miles of creeks and rivers"(Virginia Resource Center: 5) underground into pipes. The creeks and waterways of industrial areas became dumping grounds and were sub-servant to the land-uses at the time. They also became the reciprocal of what they were in early history; what had previously been used as a resource was now becoming a problem. Sometime later, when the automobile was developed and growing in popularity, the culverting of surface water channels necessitated filling in extensive valleys with tons of dirt, a leveling process that was done in advance of urban expansion to accommodate vehicular traffic (Virginia Resource Center: 5). The pipes that sophisticated sewage systems run through are largely outdated in many places across the country, and while replacing them is an option, developing methods of day-lighting and Low Impact Development are currently en vogue due to the astronomical costs of replacing underground infrastructure(s) and the benefits related to restored creeks. Another function of day-lighting a creek is that plant and animal communities can become reestablished. These restored ecosystems serve as an escape for both humans and wildlife in an urban environment.

PHYTOREMEDIATION

Phytoremediation, or the removal of contaminants from the soil through the usage of plants, can be an extremely beneficial, and cheap(er), way of healing contaminated site. By choosing appropriate plants for contaminants on-site, healing of the soil to healthy levels can occur. In contrast, according to The Field Guide to Phytoremediation, a 2,500sq. ft. parcel of land can cost as much as $50,000-$100,000 to excavate and fill, while simply using plants, such as the lead-loving Indian Mustard, can cost 10% of that (A Field Guide to Phytoremediation). It should be noted that in some cases the plants need to be removed because they become hazardous. But the potential benefits for cleaner waters and soils is definitely too great to overlook. Day-lighting a creek would create the opportunity for purification to occur.

While phytoremediation typically utilizes plant life, certain other creatures, such as Oysters, Fungi, and Bacteria, serve as cleansers of water and soil.

Figure 3.1: What is Phytoremediation? This is.

Figure 3.2: The excavation and fill of a 2,500sq ft site would cost up to $100,000 to do with conventional construction methods, while choosing appropriate plants can cost about 10% of that cost.

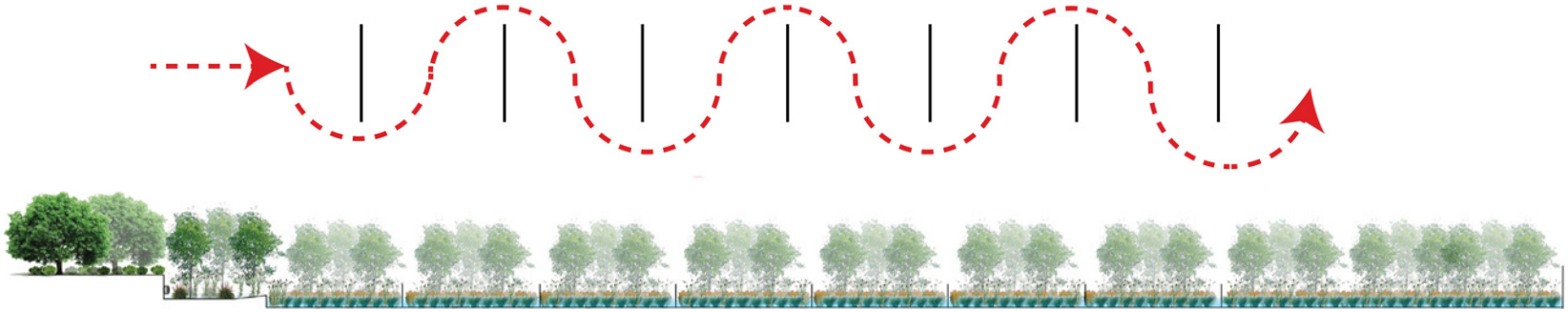


Figure 3.3: Graphicical section/plan of one method of phytoremediation that involved water meandering through various elevation levels and plant variations in order to cleanse and remediate the water.

Figure 3.4:

Figure 3.5:

Low impact developments are a series of strategies which seek to manage excess water flow by reusing it, allowing it to infiltrate the ground, or using vegetation in order to achieve natural processes. In terms of creeks, and the day-lighting of them, low impact developments mimic what the natural landscape, and to some extent, what creeks and streams do; utlilize natural processes to lower the strain on man mad sewer and wastewater systems.

BEST MANAGEMENT PRACTICES

Best management practices are solutions to water management amongst developments. By allowing water a way to get to areas it can infiltrate into teh ground, the strain on infrastructure moving and delivering water to facilities is lessened. This would result in lower costs for everybody

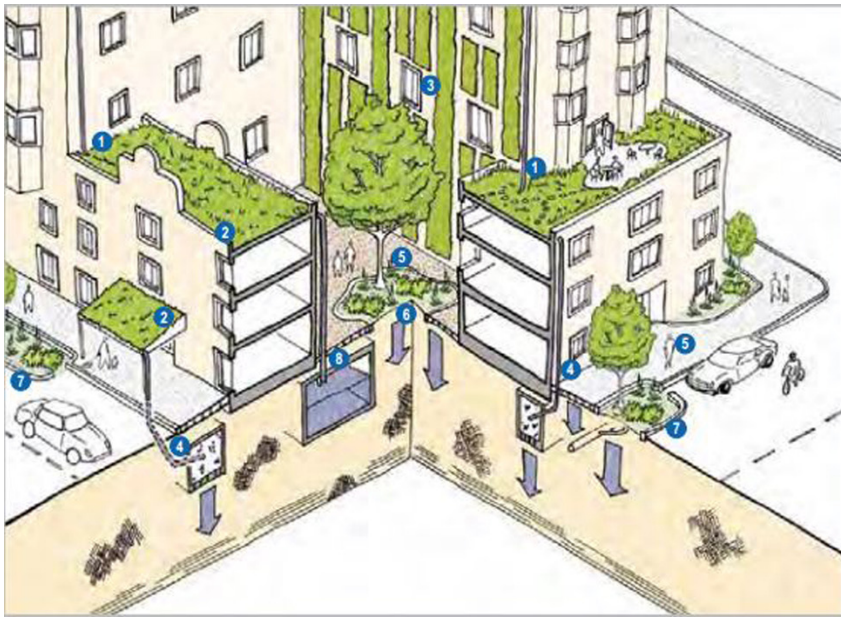


Figure 3.6:

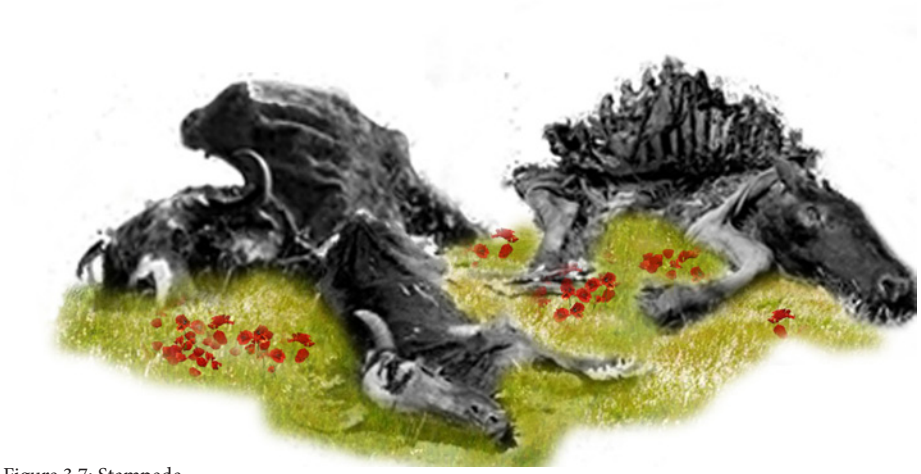


Figure 3.7: Stampede

Figure 3.8: Culvert

PART 4: SPECIFICS

OPEN SPACE

The need to preserve and create open space in San Francisco is paramount to the health of its citizens. While huge swaths of land, like that of Golden Gate Park, are well known and can accomodate huge music festivals, smaller parks, like that of Cayuga Park, in the Cayuga Terrace neighborhood, for example, were simply made in order to curb illegal activities and invite the neighborhood into its space. Open Space SF, an organization comprised of neighborhood groups and political entities, is devoted to creating more open space on under utilized spaces in San Francisco, while also connecting these spaces to a larger regional framework. Superkilen, a park in Copenhagen, is a great example of a park space which combines numerous activities and functions. It serves as an example of how a park in an urban setting should be designed. Open space is integral to our well being as humans. Its especially important in highly dense locations. So, a day-lighting project must be able to create more open space for the public.

Figure 4.0: OpenspaceSF

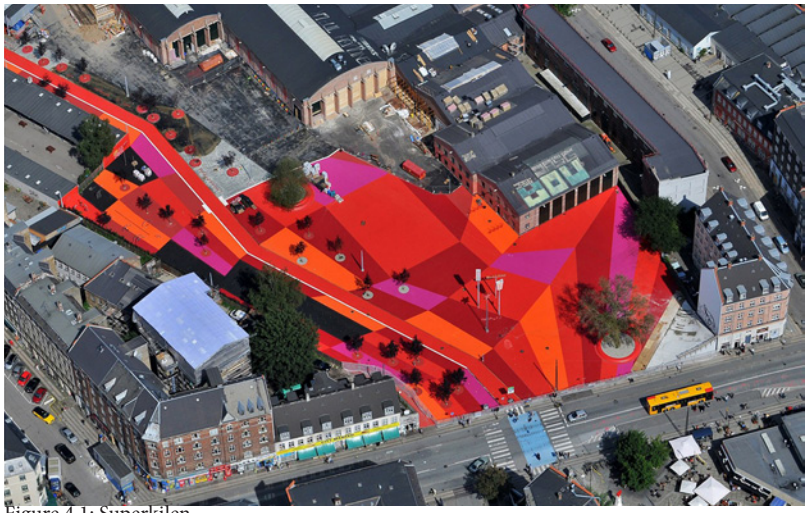


Figure 4.1: Superkilen

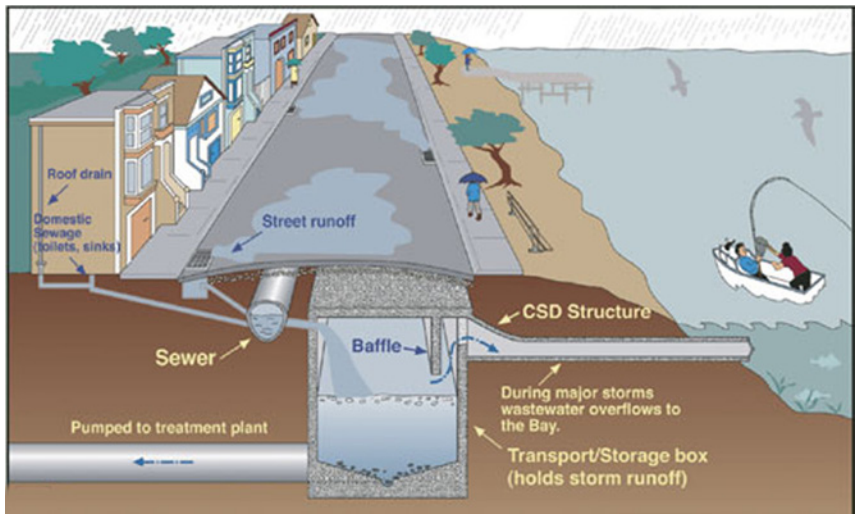


Figure 4.2: Typical San Francisco Sewer system

Figure 4.3: San Francisco sewer transport system

San Francisco's sewage system is the only combined sewage wastewater system on California's coast (San Francisco Public Utilities Commission). This means that water run off from roofs, sidewalks, roads, etc go to the same place as sewage does.

This results in facilities around the peninsula, and especially the Southeastern power plant, where Islais Creek lies, being over, and unnecessarily, worked. Overflow during storms routinely litter the streets of the Southeastern neighborhoods. Transport tunnels hold some of the overflow in order to alleviate this

CULVERTS

A Culvert is a closed conduit used to convey water from one area to another, usually from one side of a road to the other side (EPA, 2003). Most cities around the world have extensive culvert systems in order to manage and move water. In most cases watersheds are culverted in the locations that creeks and streams once were, which makes day-lighting an easier task. But if development has been created above where a stream or creek once was, it can make it nearly impossible to recreate those water bodies. Culverts are divided into two functional types: Stream crossings and runoff management (EPA, 2003). In other words, culverts are installed where roadways are as to not create an inaccessible situation, and they allow for water to continue downstream. They also allow runoff from roads, streets, and sidewalks, to be moved to a separate location to be further managed. In the case of San Franciscos' Islais Creek, much of the creek is buried in culverts and only sees the light of day at its inception point, and at its exodus point.

Figure 4.4: Skull Culvert

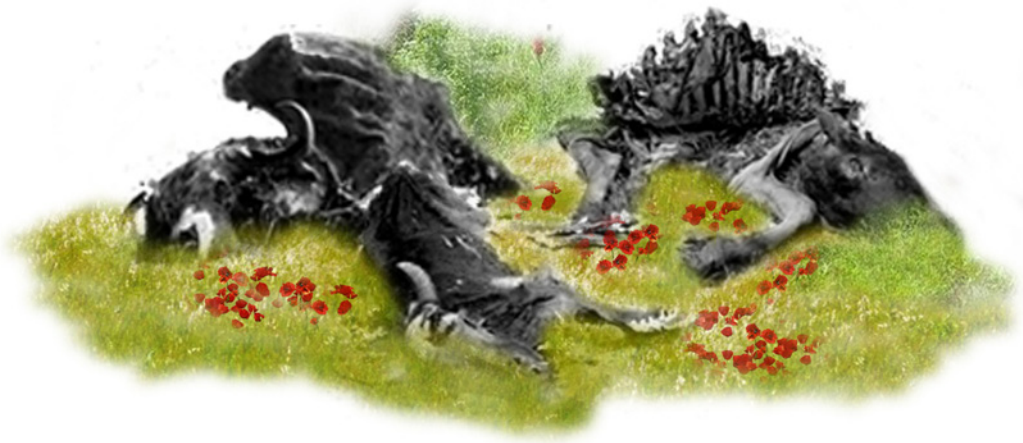


Figure 4.6: Butchertown

PART 5: MIMIC

Figure 5.0: Gowanus Canal

Gowanus Canal, a historical waterway in Brooklyn, New York, recently underwent an overhaul in order to clean its waters, which were some of the most polluted in the country. Built in 1881 in order to facilitate trade traffic, the canal has slowly degraded over time (Gowanus Canal an Bay Ecosytem Restoration Project). Refineries, chemical plants, and other such industrial facilities line the canal, exposing it to their by products. Local sewer out falls also spill into the waterway (Gowanus Canal an Bay Ecosystem Restoration Project). The goal for the project was to clean the canal and create parkland, while preserving the visual splendor of the canal, and its historic values.

Figure 5.1: Gowanus Canal

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GOWANUS CANAL
SPONGE PARK™

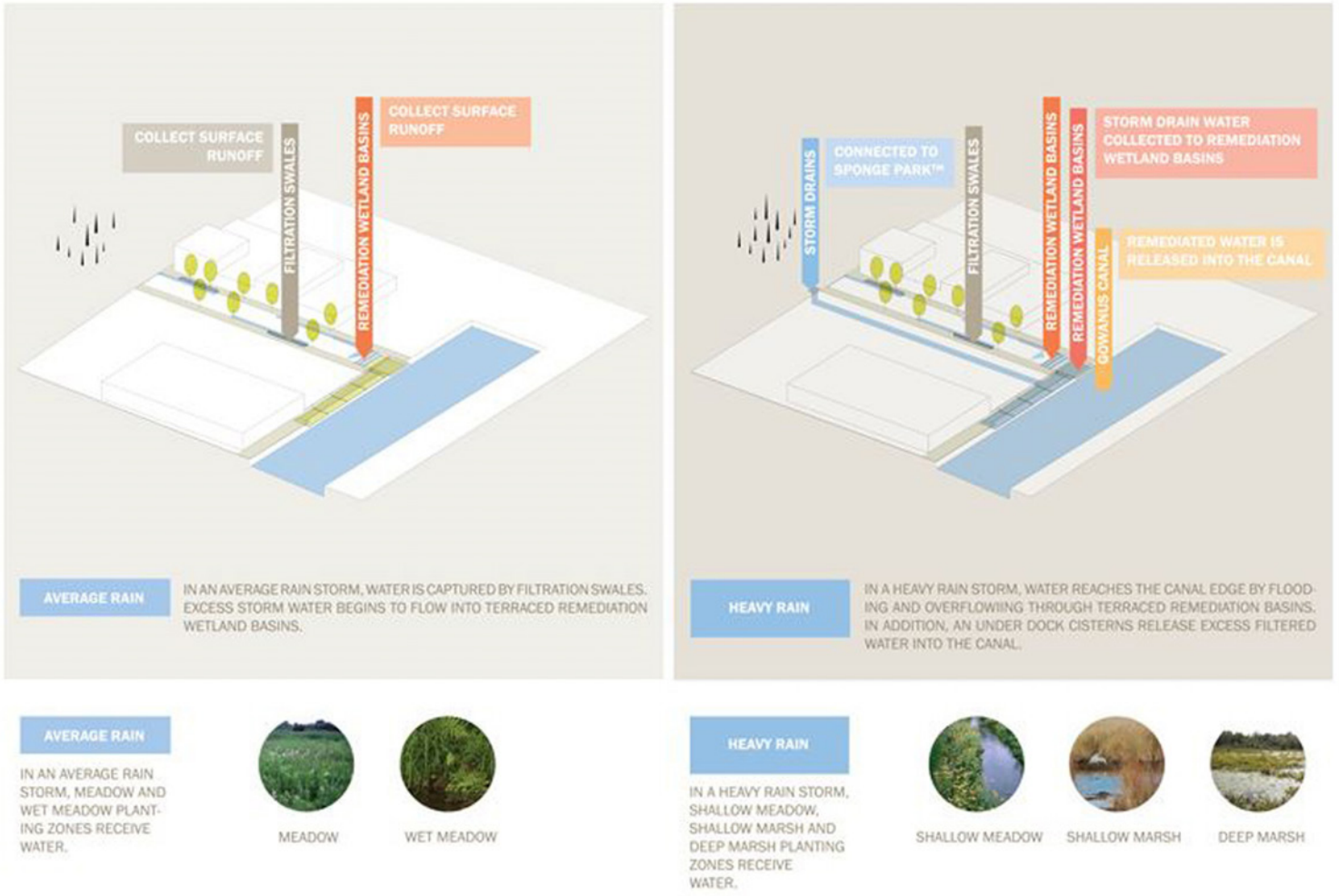

Figure 5.2: Gowanus Canal

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GOWANUS CANAL
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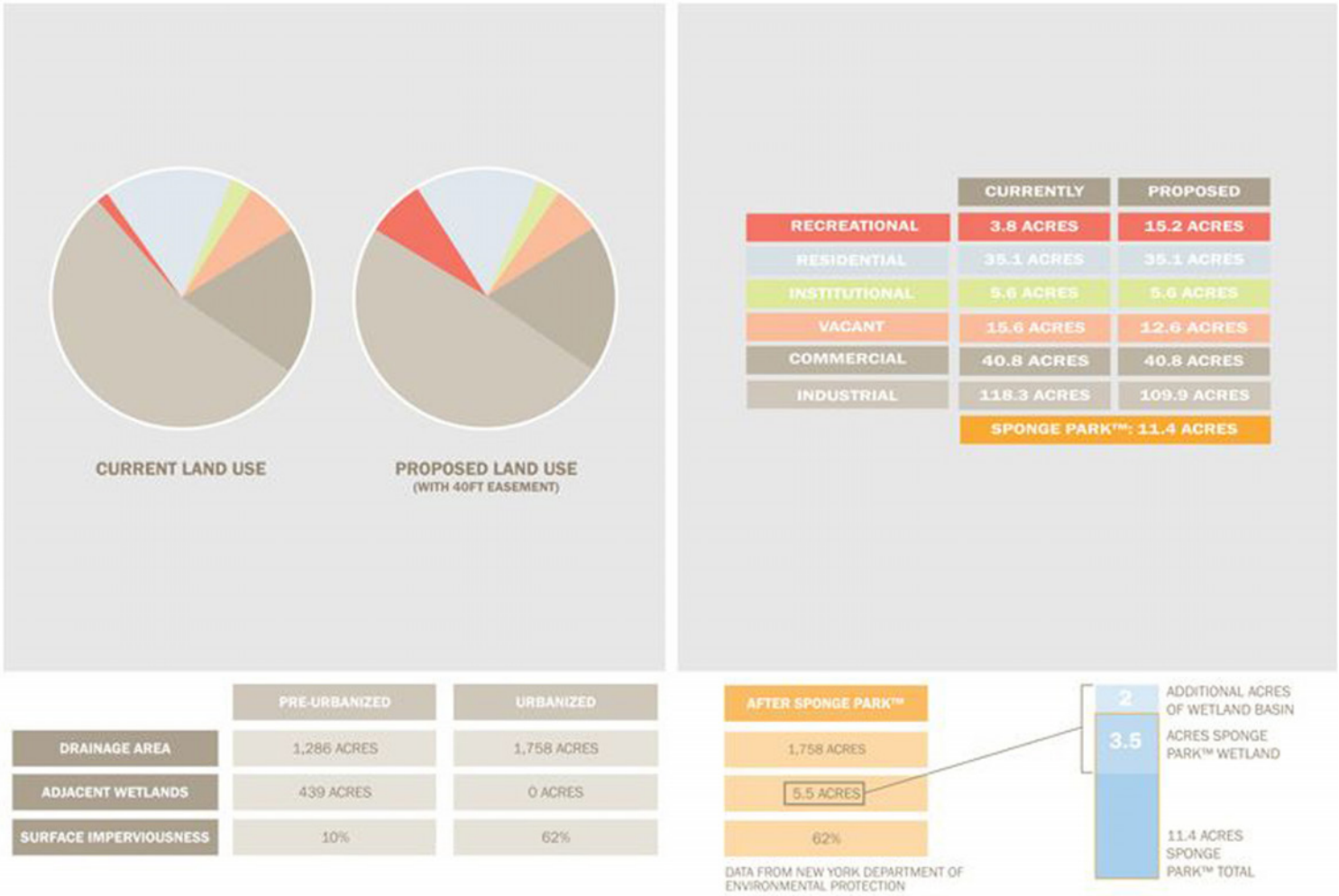

Figure 5.3: Gowanus Canal

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GOWANUS CANAL
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GOWANUS CANAL SPONGE PARK™

WILDLIFE

WATER QUALITY IMPROVEMENTS FROM THE SPONGE PARK™ WILL HELP THE PROLIFERATION WILDLIFE IN THE GOWANUS. EACH SPECIES LISTED HERE PLAYS AN IMPORTANT ROLE IN THE OVERALL HEALTH OF THE ECOSYSTEM OF THE CANAL AND ADJACENT AREA WHILE INCREASING BIODIVERSITY.

AVIAN SPECIES

FIDDLER CRABS ARE A DELICACY FOR SHOREBIRDS AND OTHER AVIAN SPECIES SUCH AS THE HERON AND THE EGRET. ALL OF THESE AVIAN SPECIES LISTED ARE ATTRACTIVE TO BIRDWATCHERS.

LAND SPECIES

A HEALTHY ECOSYSTEM REQUIRES A WIDE RANGE OF PLANTS, BIRDS, ANIMALS AND FAUNA. MICE, RABBITS AND OTHER ANIMALS HELP TO MAINTAIN THE BALANCE WITH THE PLANTS WHILE PROVIDING A SOURCE OF FOOD FOR MANY SPECIES SUCH AS A RAPTOR, PEREGRINE FALCON, HAWK AND OSPREYS.

SHORE DWELLING SPECIES

FIDDLER CRABS DINE ON ALGAE, BACTERIA, FUNGUS AND DETRITUS (DEAD AND DECAYING PLANT AND ANIMAL MATTER) AND THUS HELP TO CLEAN THE CANAL. FIDDLER CRABS PREFER TO LIVE IN SOFT SAND OR MUD ALONG THE EDGES OF SALT MARSHES. THEIR HABITATS CONSIST OF BURROWS IN THE MUD THAT AERATE MARSH GRASSES AND UNDERWATER AQUATIC PLANTS. AS STATED PREVIOUSLY, INCREASES IN OXYGEN CONCENTRATION WITHIN THE CANAL ARE NECESSARY IN ORDER TO SUSTAIN LIFE, BOTH PLANT AND ANIMAL.

WATER SPECIES

CSO'S ARE BELIEVED TO BE THE MOST COMMON CAUSE OF EXCESS ALGAE. OYSTERS FEED ON THIS ALGAE WHICH RESULTS IN AN IMPROVEMENT IN WATER CLARITY. A HEALTHY ADULT OYSTER HAS THE ABILITY TO FILTER UP TO 50 GALLONS OF WATER A DAY INCLUDING SUSPENDED SEDIMENT, WHICH ALONG WITH ALGAE CONTRIBUTE TO THE OPAQUENESS OF THE CANAL.

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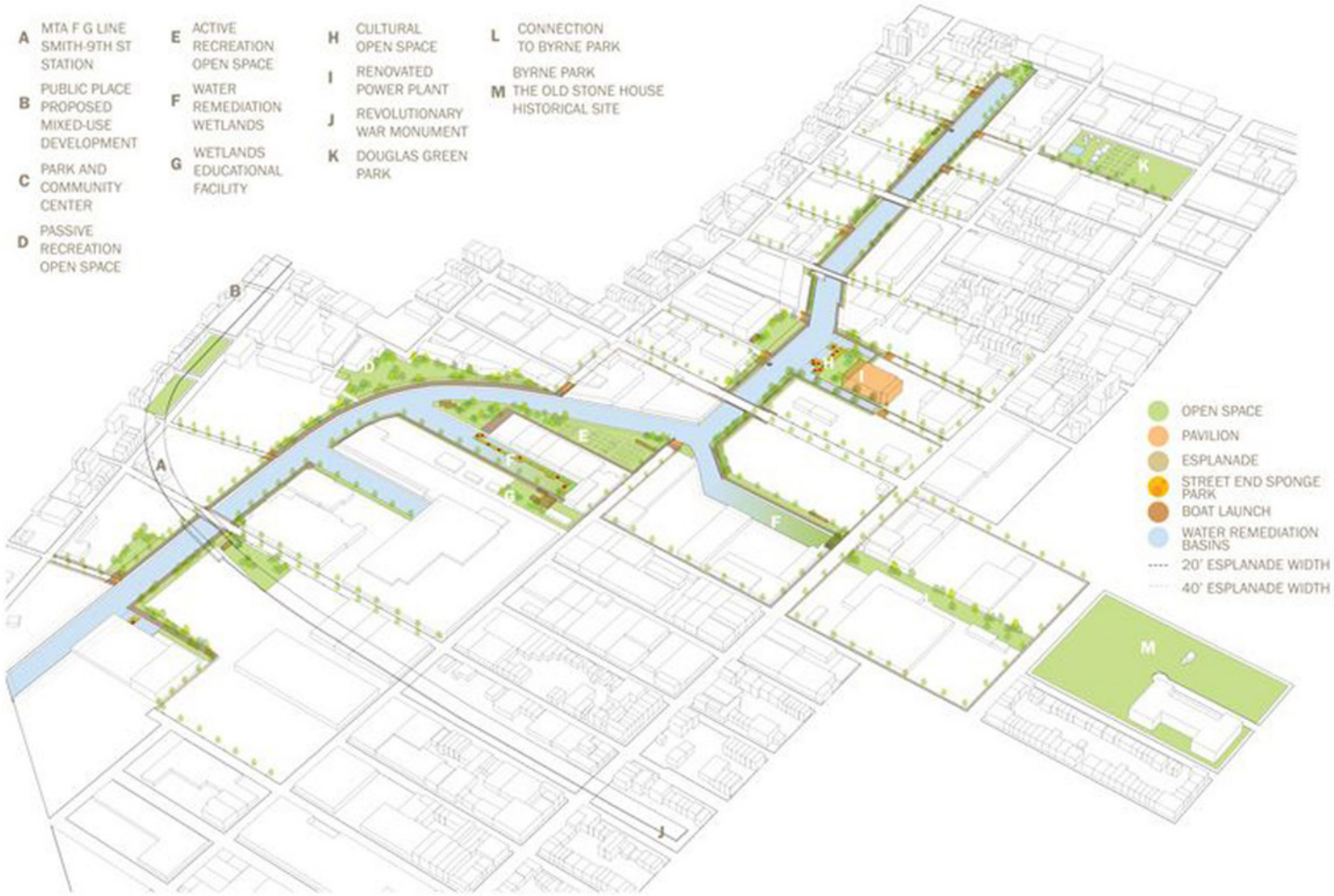
GOWANUS CANAL
SPONGE PARK™



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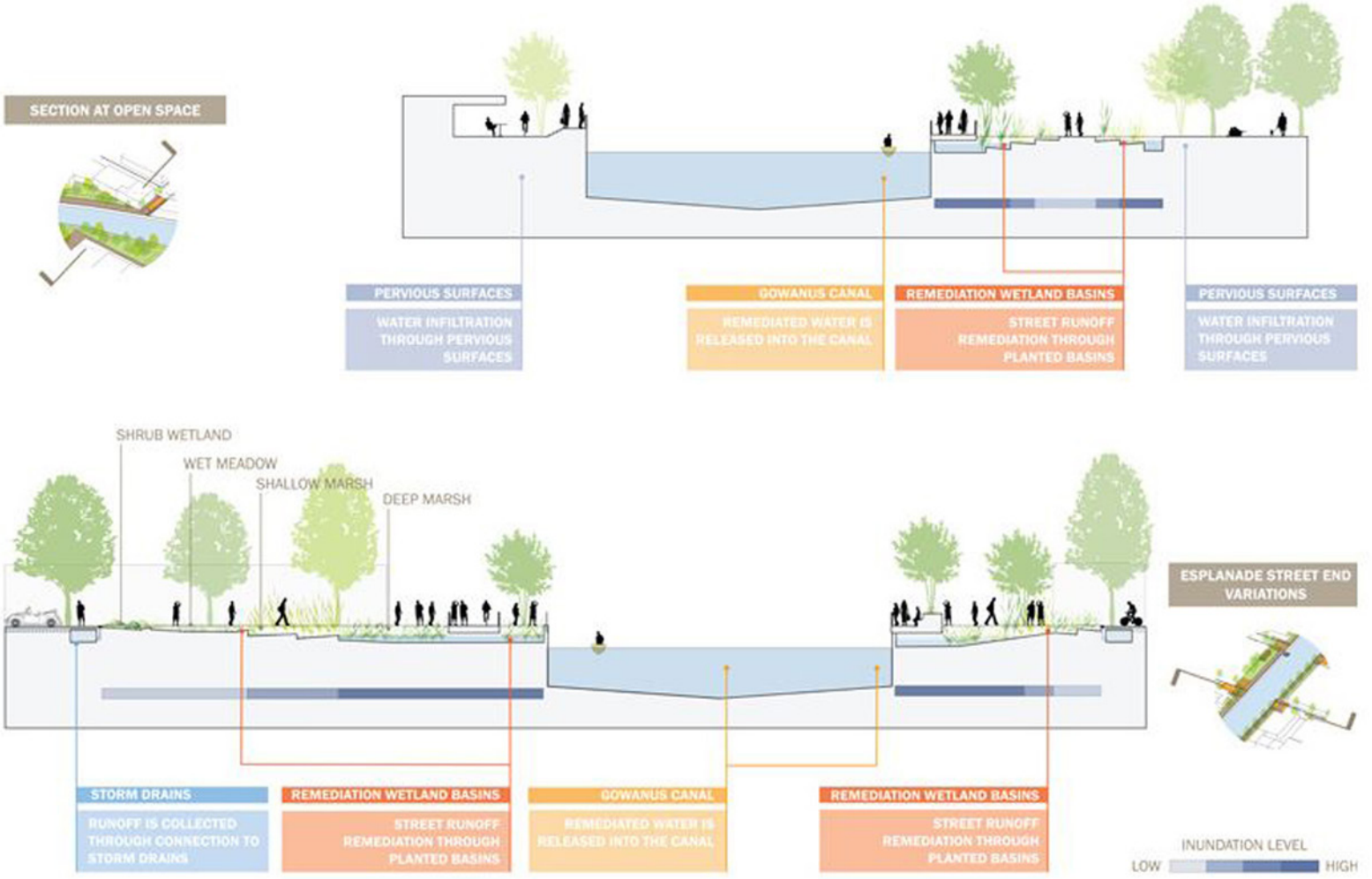

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GOWANUS CANAL
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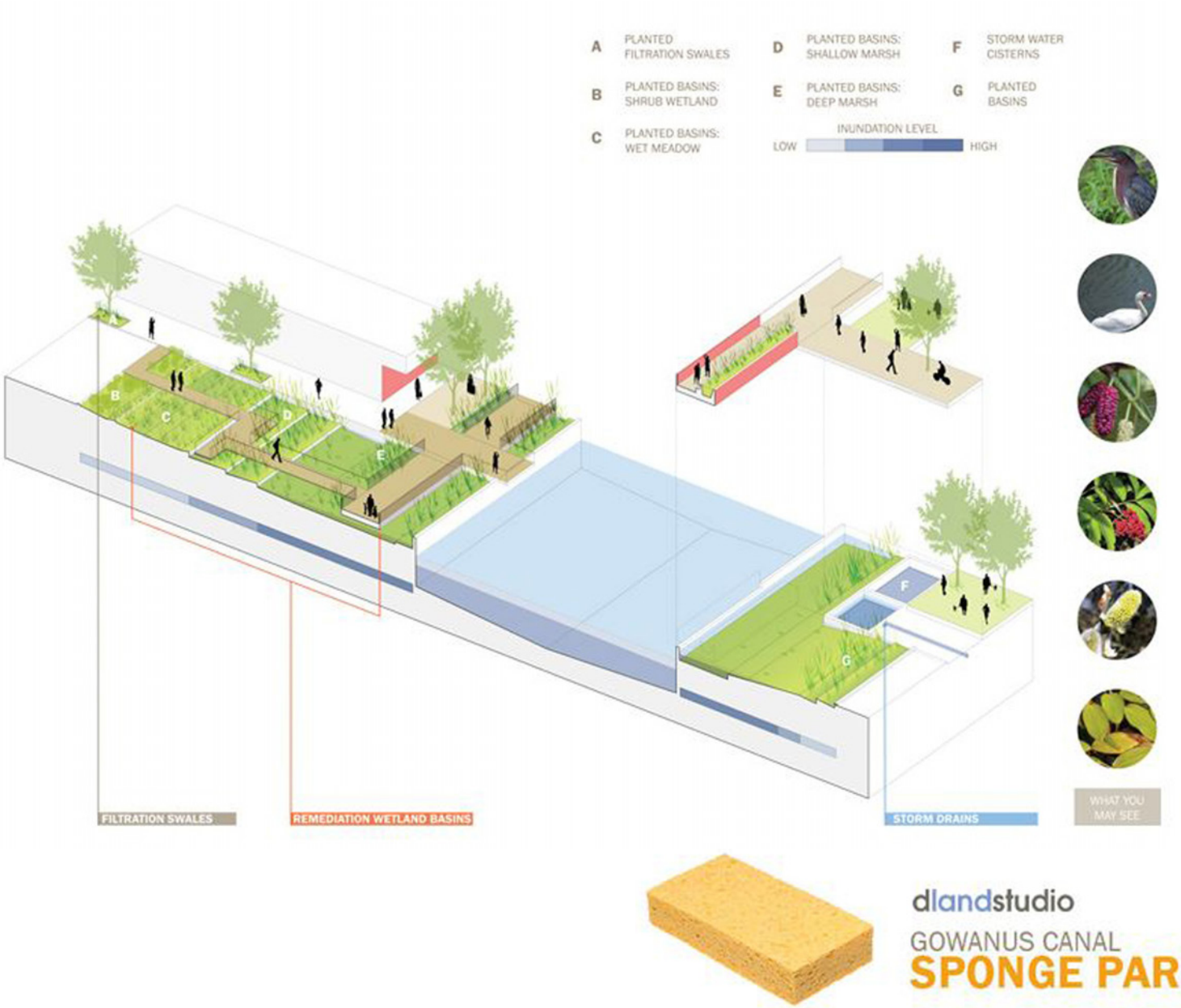
A PLANTED FILTRATION SWALES
B PLANTED BASINS: SHRUB WETLAND
C PLANTED BASINS: WET MEADOW
D PLANTED BASINS: SHALLOW MARSH
E PLANTED BASINS: DEEP MARSH
F STORM WATER CISTERNS
G PLANTED BASINS
INUNDATION LEVEL
LOW
HIGH
FILTRATION SWALES
REMEDIATION WETLAND BASINS
STORM DRAINS
WHAT YOU MAY SEE
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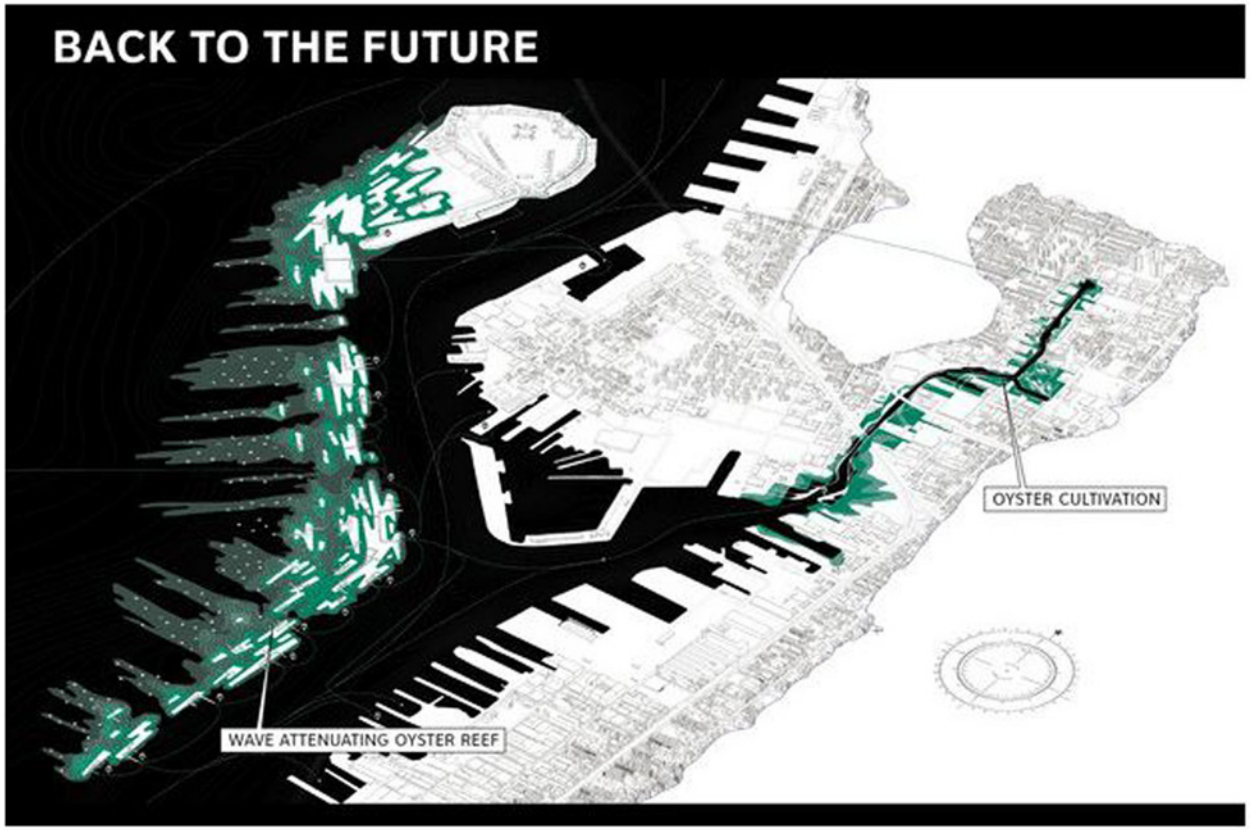
GOWANUS CANAL
SPONGE PARK™



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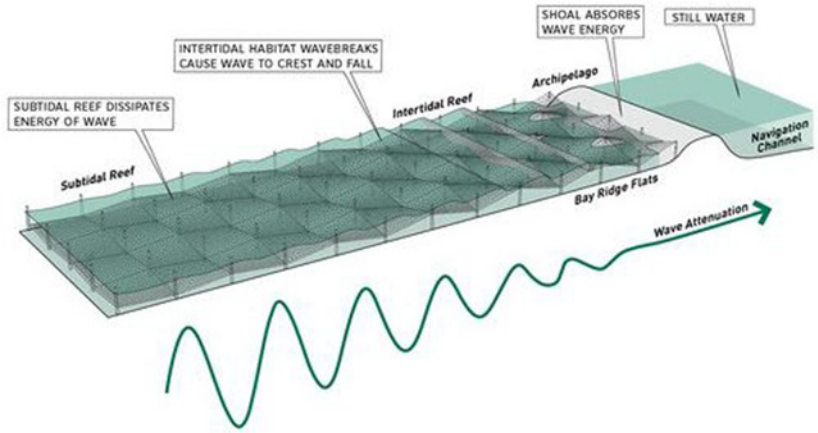
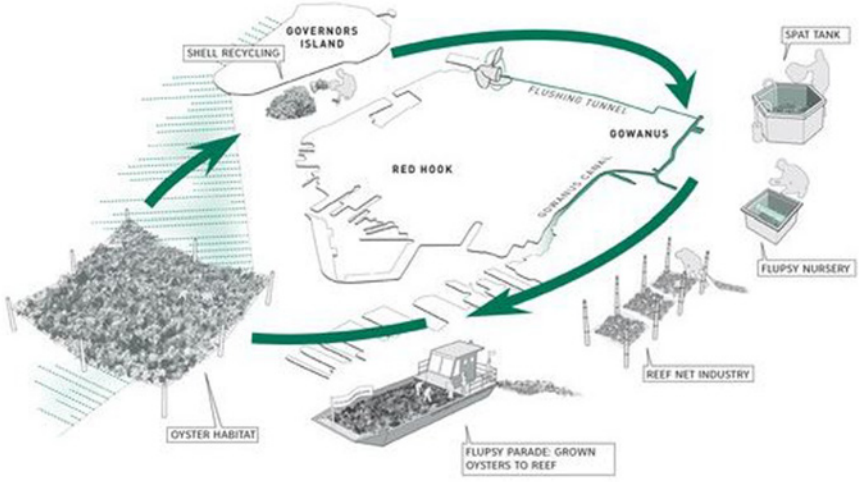
ARCHITECTURE PLLC

BAY RIDGE FLATS
WAVE ATTENUATION REEF



LIFE CYCLE



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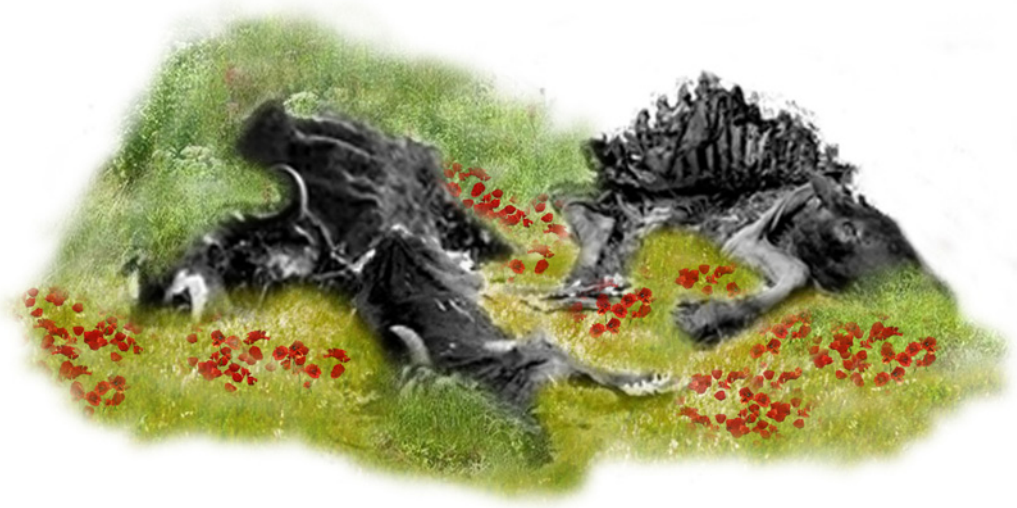
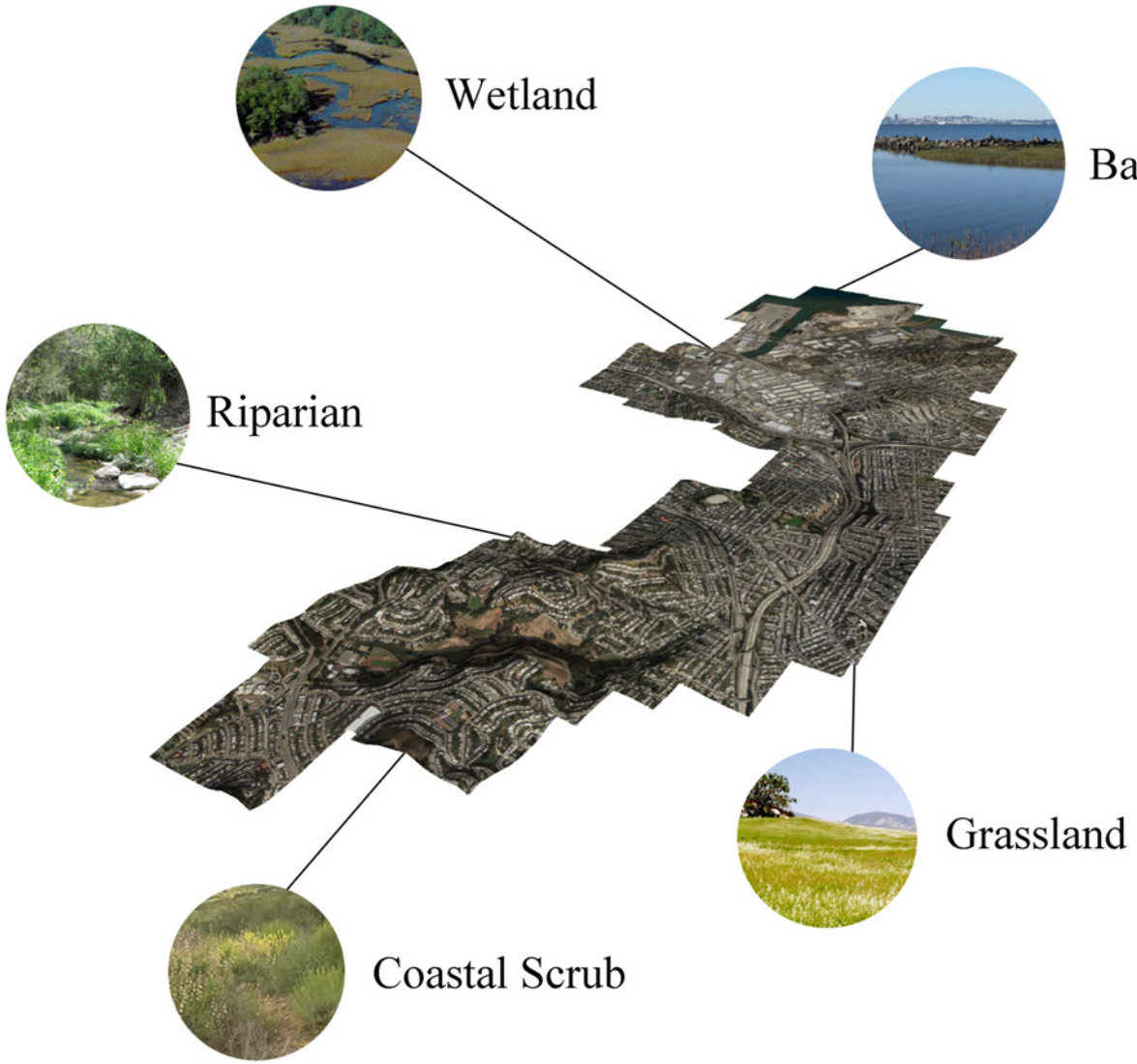
DAY-LIGHTING ISLAIS CREEK

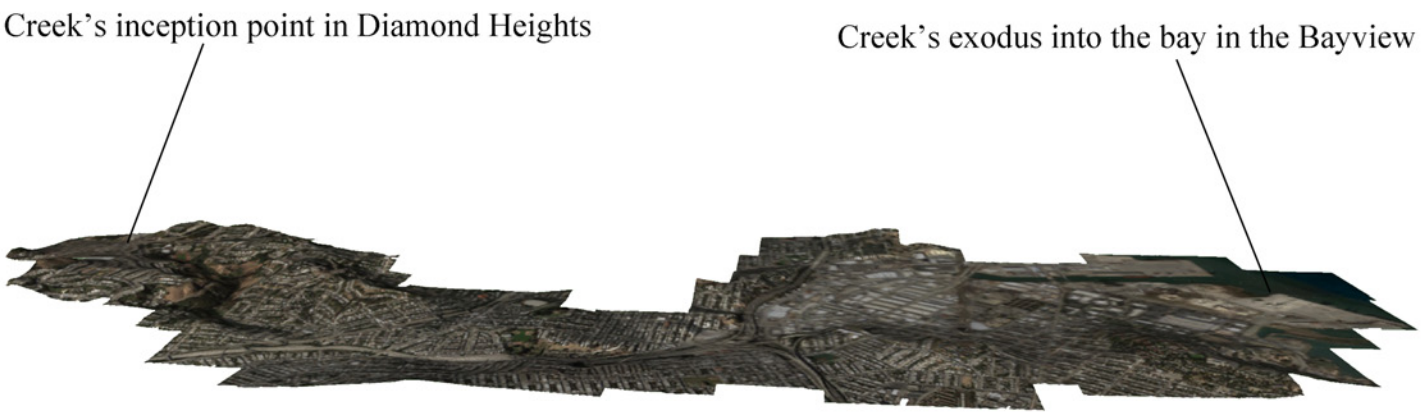


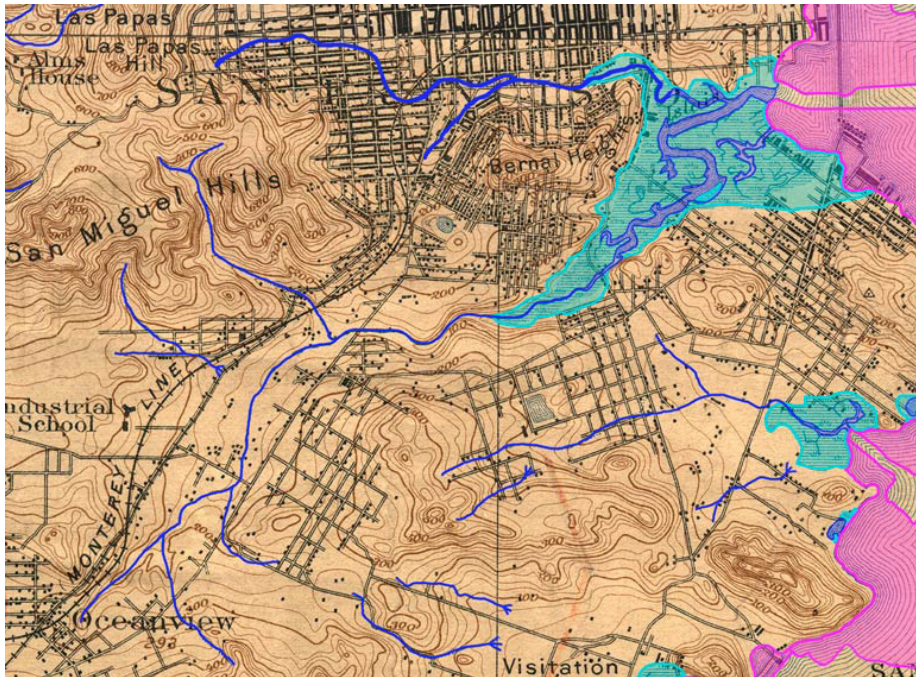
PART 6: ANALYSIS

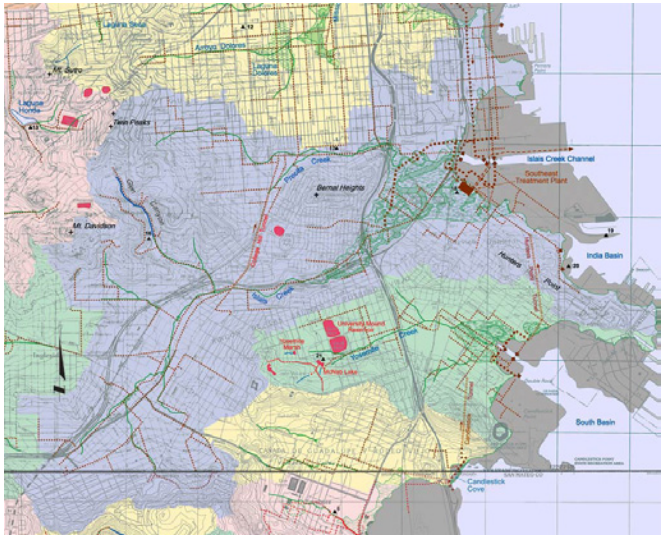
Islais Creek lies the Southestern corner of San Francisco. It is the largest watershed on the peninsula and traverses some of the most populated areas of the city.

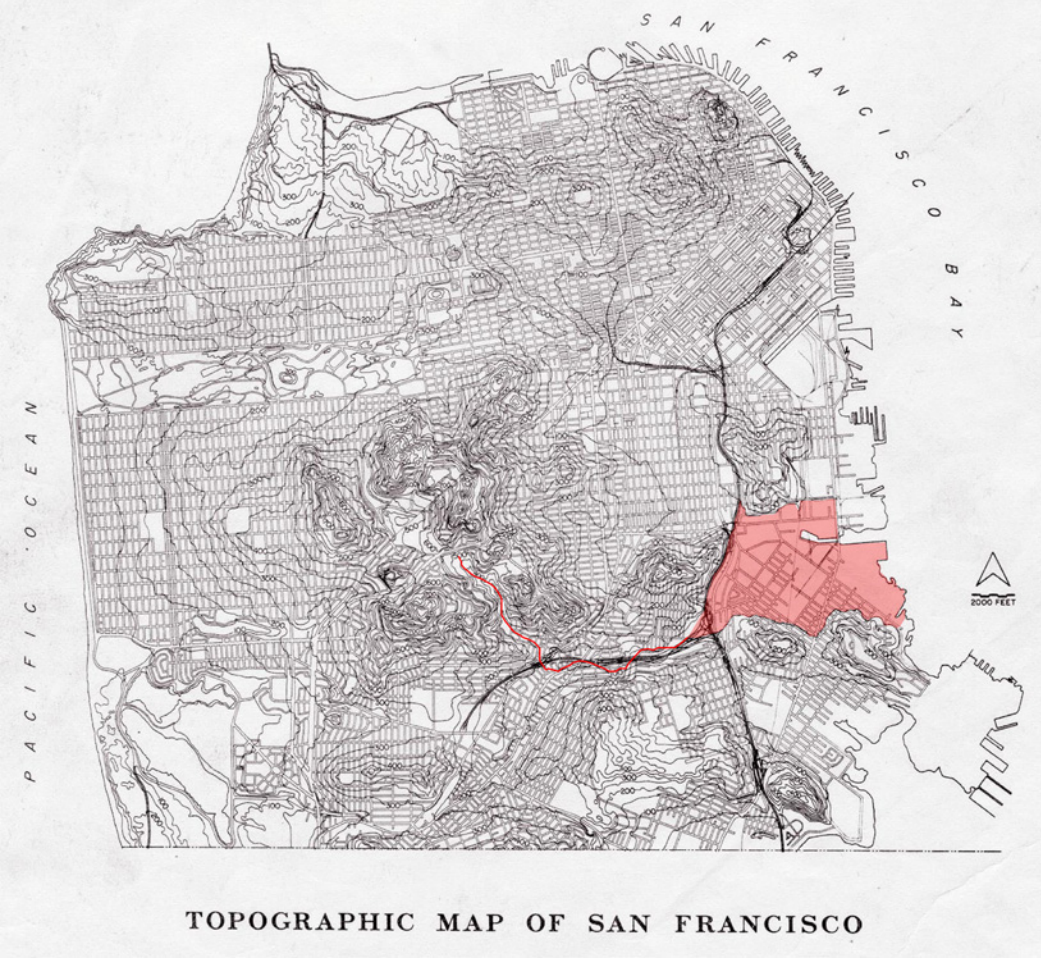
A closer look at the Islais Watershed.


Wetland
Bay
Riparian
Grassland
Coastal Scrub


Creek's inception point in Diamond Heights
Creek's exodus into the bay in the Bayview


Las Papas
Las Papas
Alms House
Hill
San Miguel Hills
Bernal Heights
Industrial School
MONTEREY
LINE
Oceanview
Visitation


Islais Creek Channel
Southeast Treatment Plant
Bernal Heights
India Basin
South Basin
Candlestick Cove

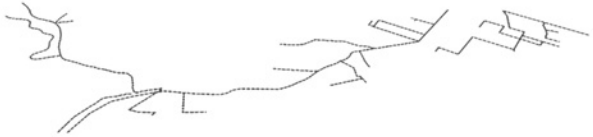


TOPOGRAPHIC MAP OF SAN FRANCISCO

Freeway

Islais Creek

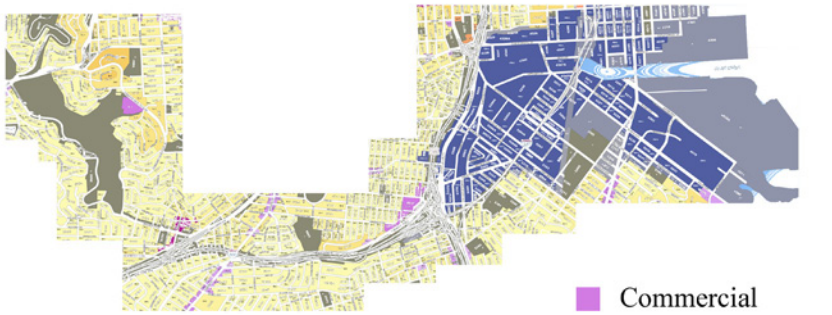
Open Space

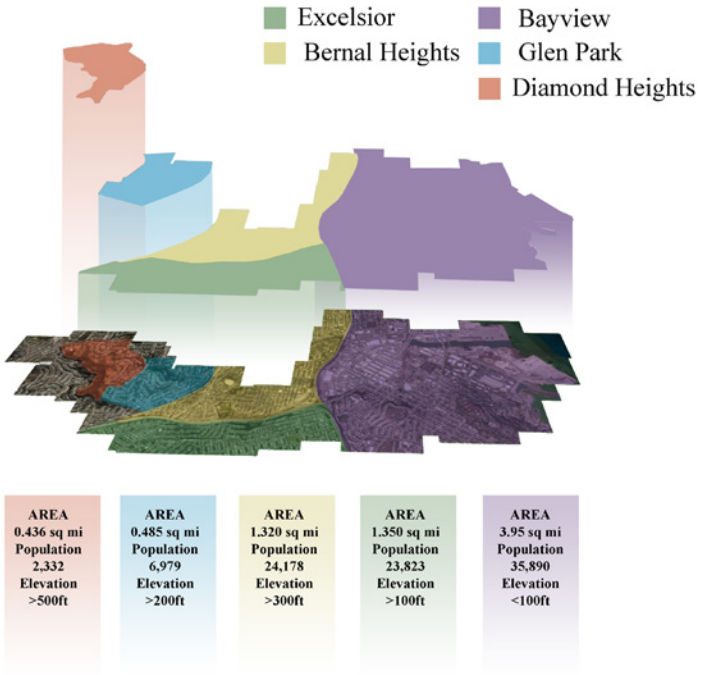


Storm/Sewage Piping route

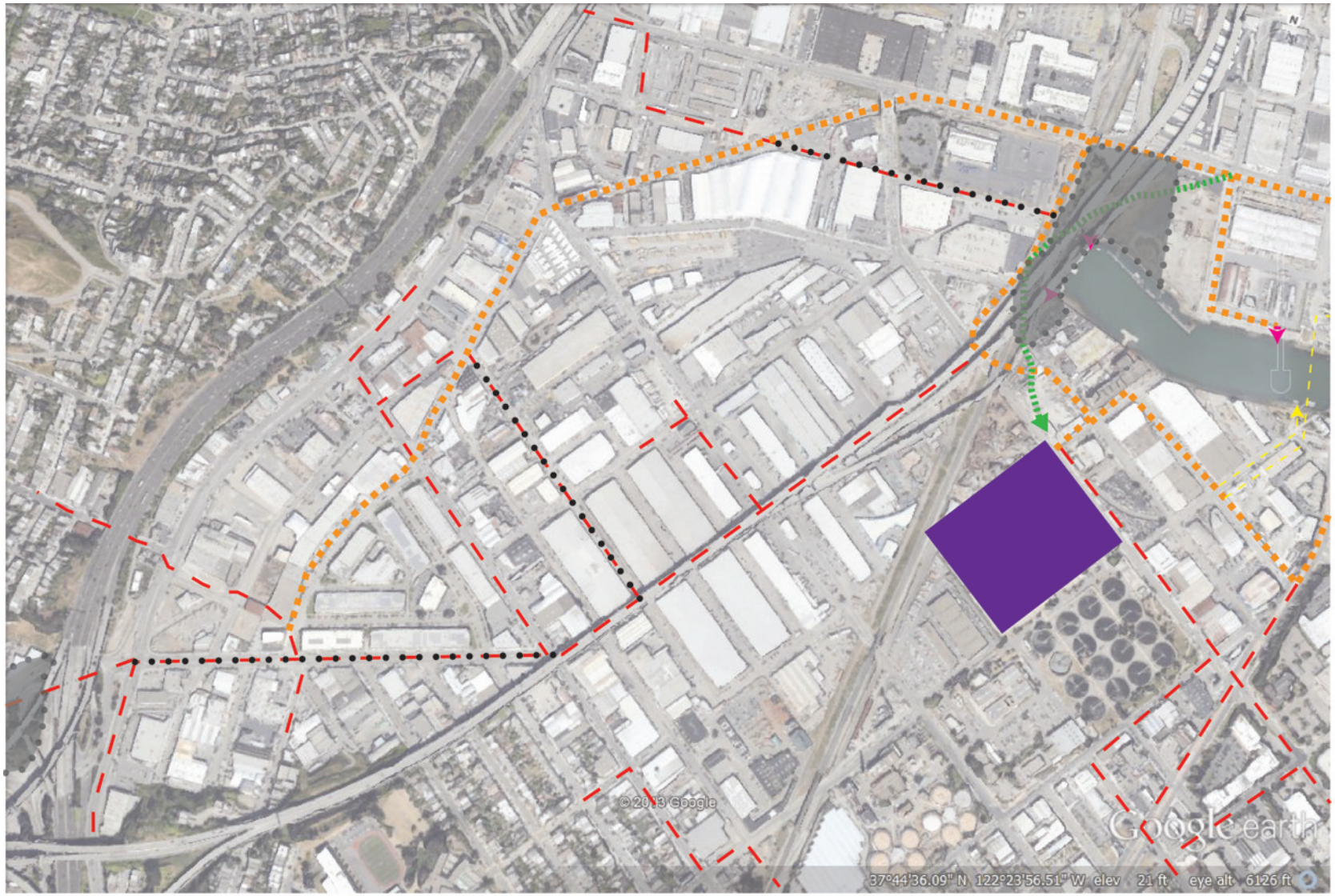
Roads

Excess Storm Tunnel/Storage

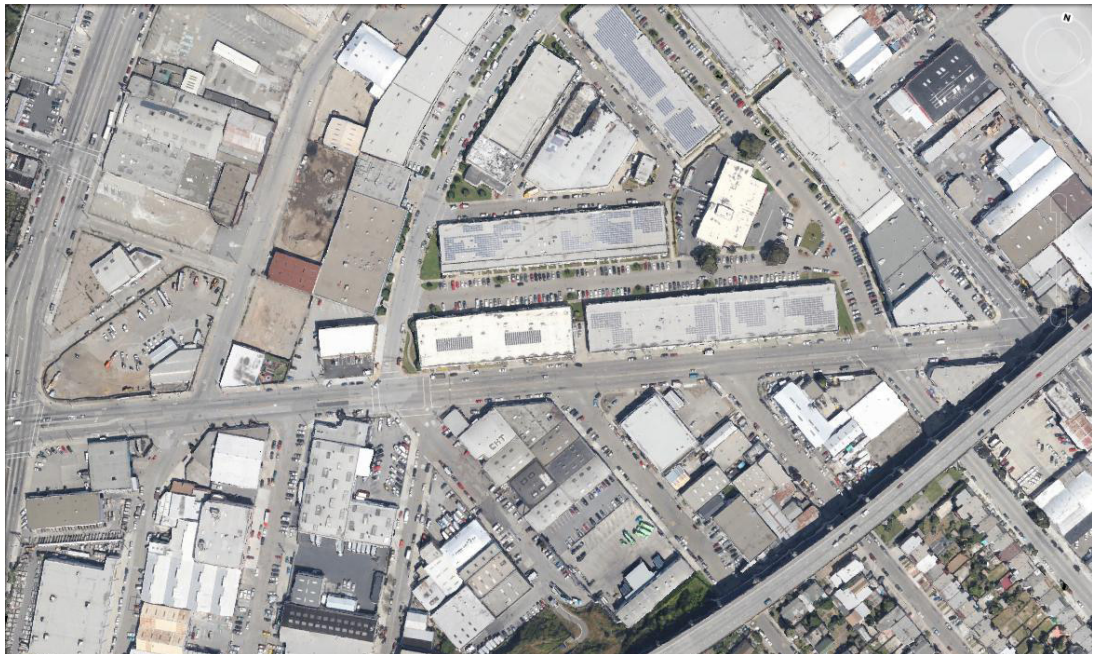

Commercial
Industrial
Public Land
Private/Residential

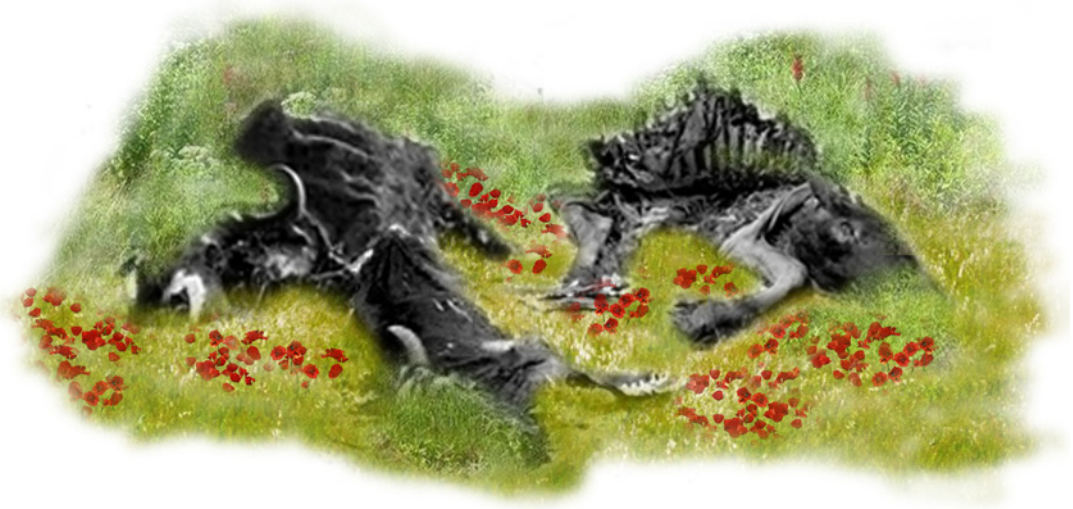

Excelsior
Bernal Heights
Bayview
Glen Park
Diamond Heights
AREA
0.436 sq mi
Population
2,332
Elevation
>500ft
AREA
0.485 sq mi
Population
6,979
Elevation
>200ft
AREA
1.320 sq mi
Population
24,178
Elevation
>300ft
AREA
1.350 sq mi
Population
23,823
Elevation
>100ft
AREA
3.95 sq mi
Population
35,890
Elevation
<100ft


BayFill
Current daylit areas
Islais Creek Flood Basin


©2013 Google
Google earth
37°44'36.09" N 122°23'56.51" W elev 21 ft eye alt 6126 ft

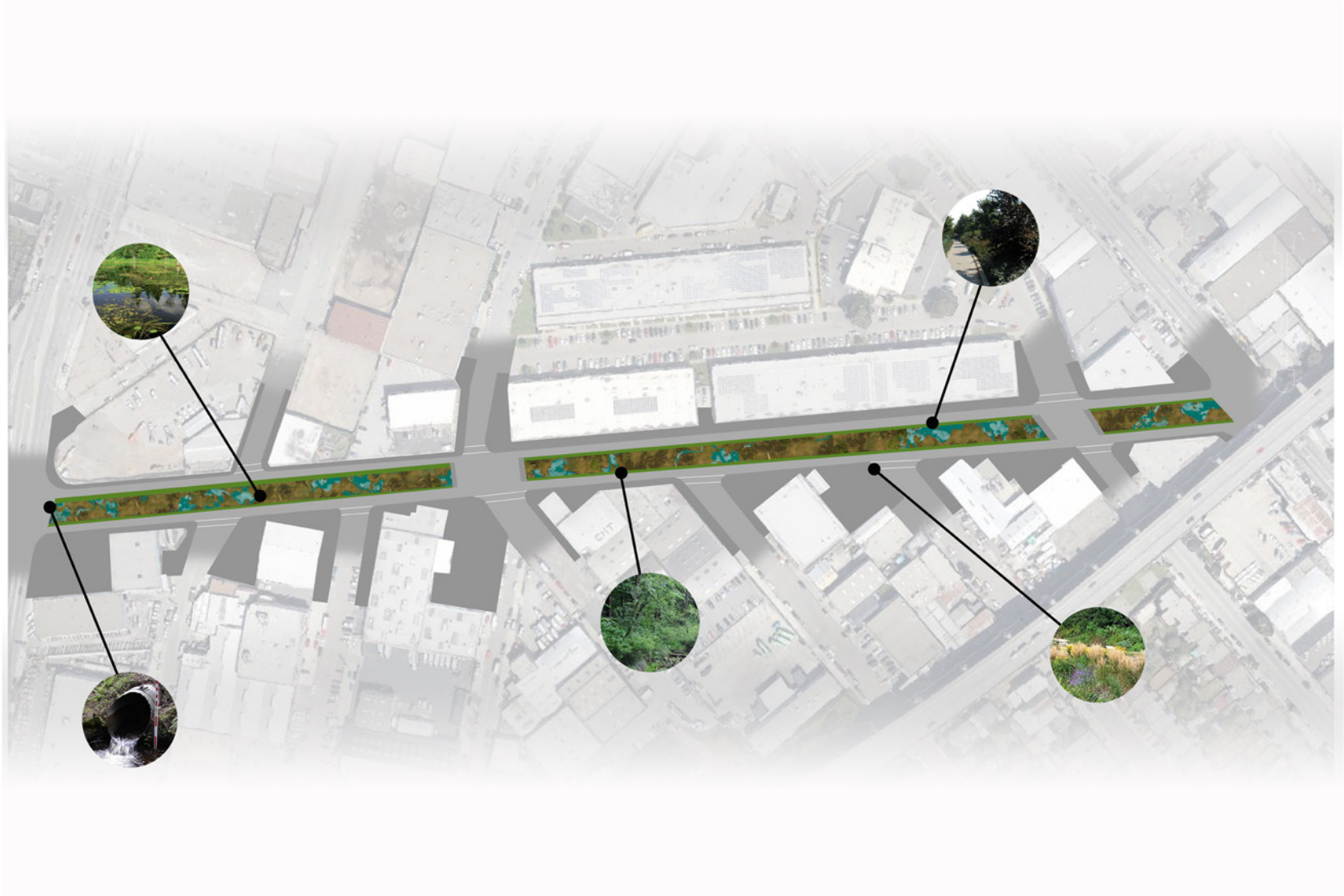
DAY-LIGHTING ISLAIS CREEK

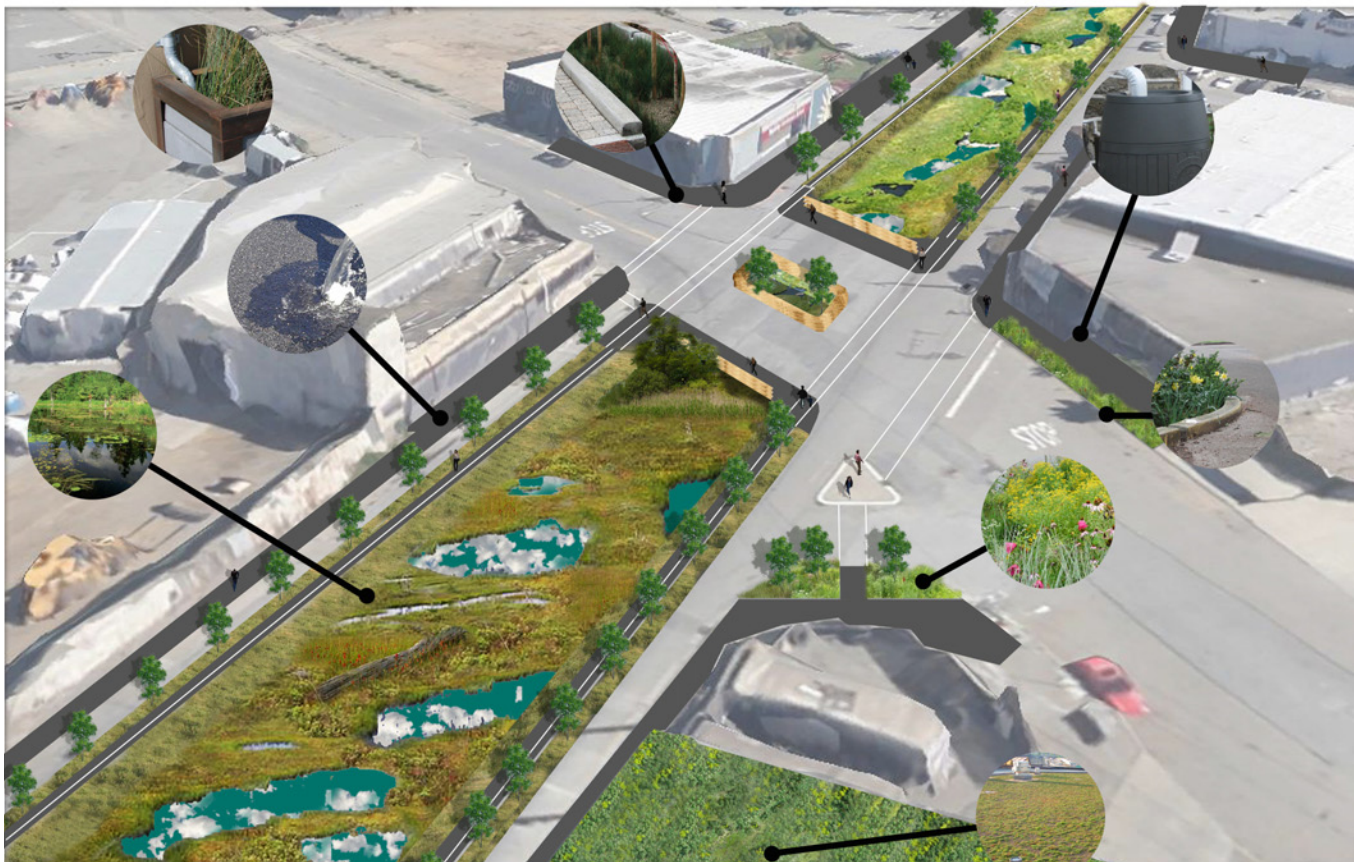


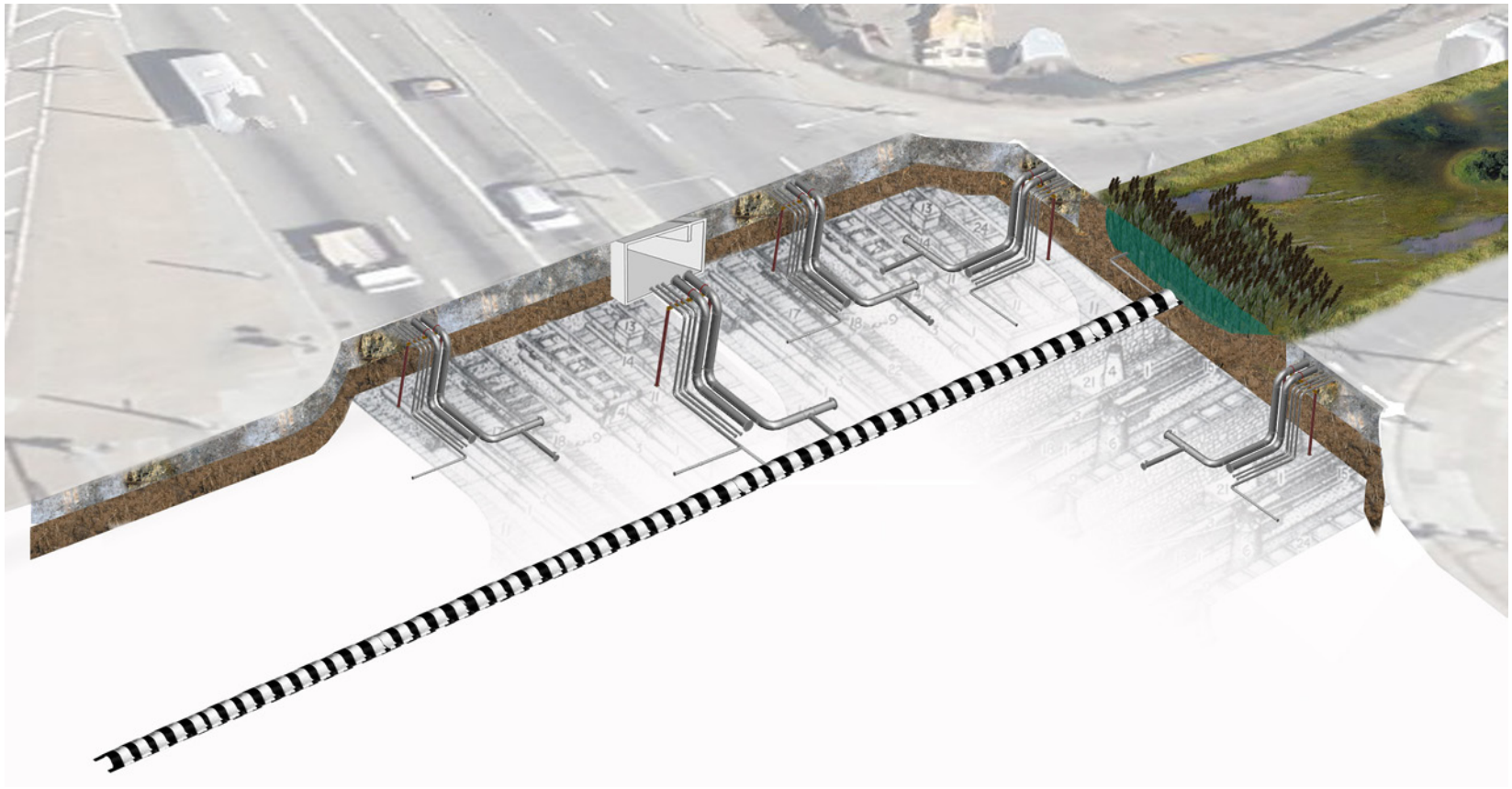


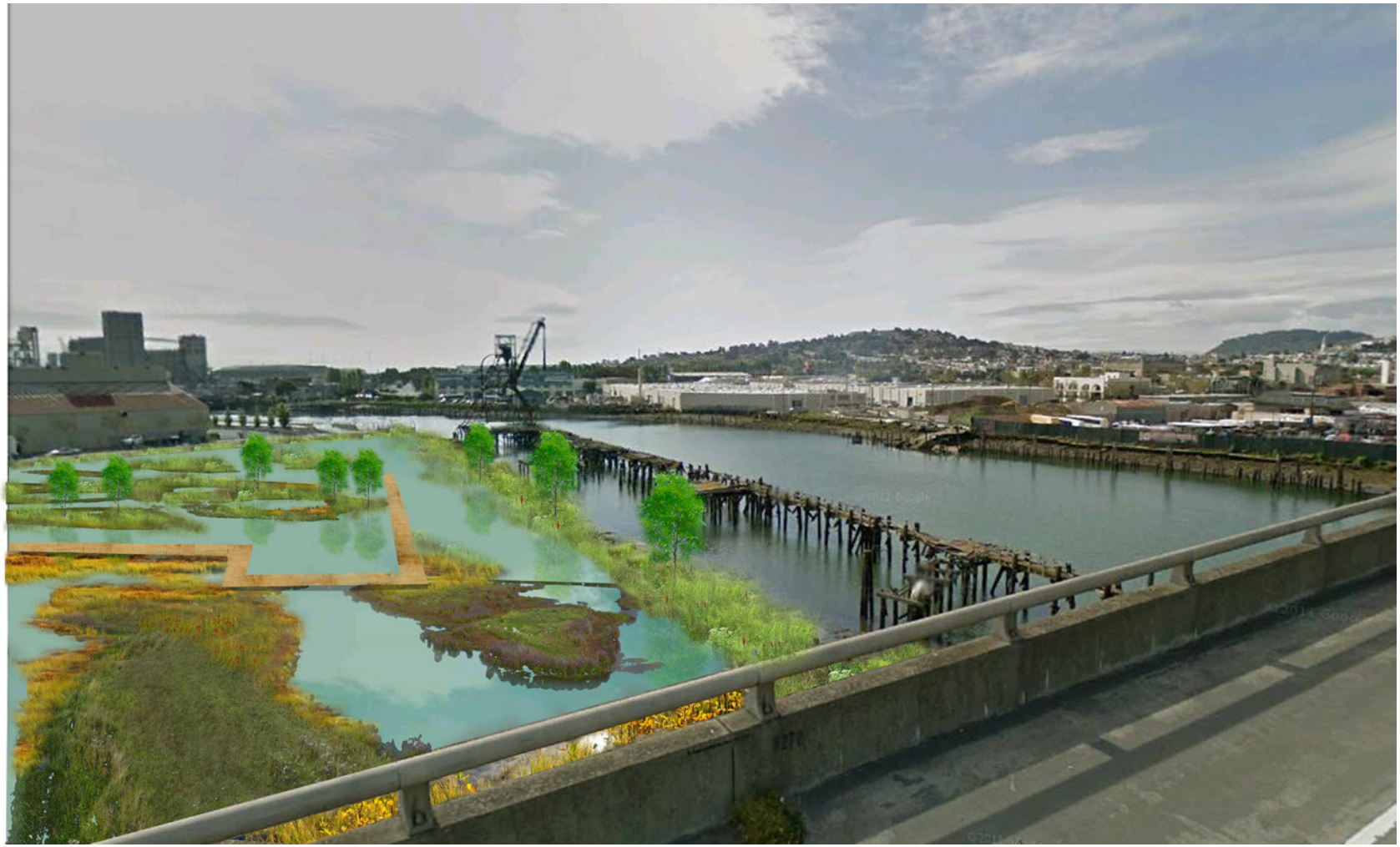
PART 7: IMPLEMENTATION

DAY-LIGHTING ISLAIS CREEK



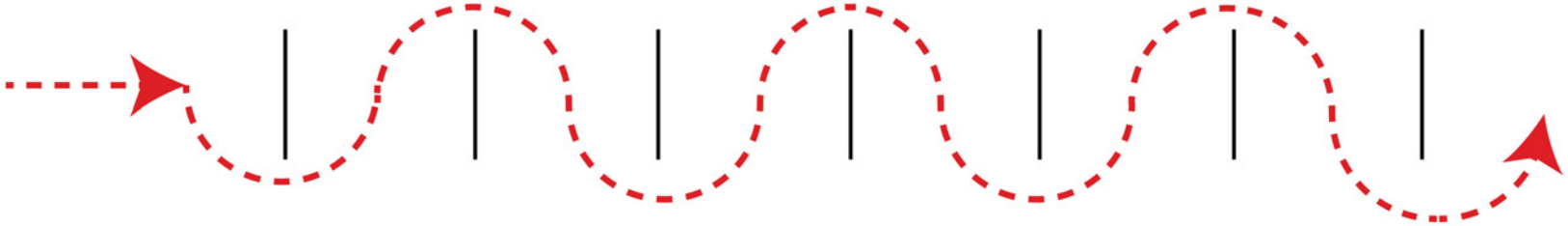


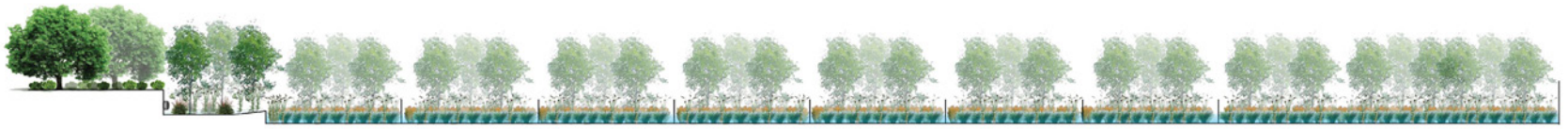




DAY-LIGHTING ISLAIS CREEK

Phytoremediation =  + 

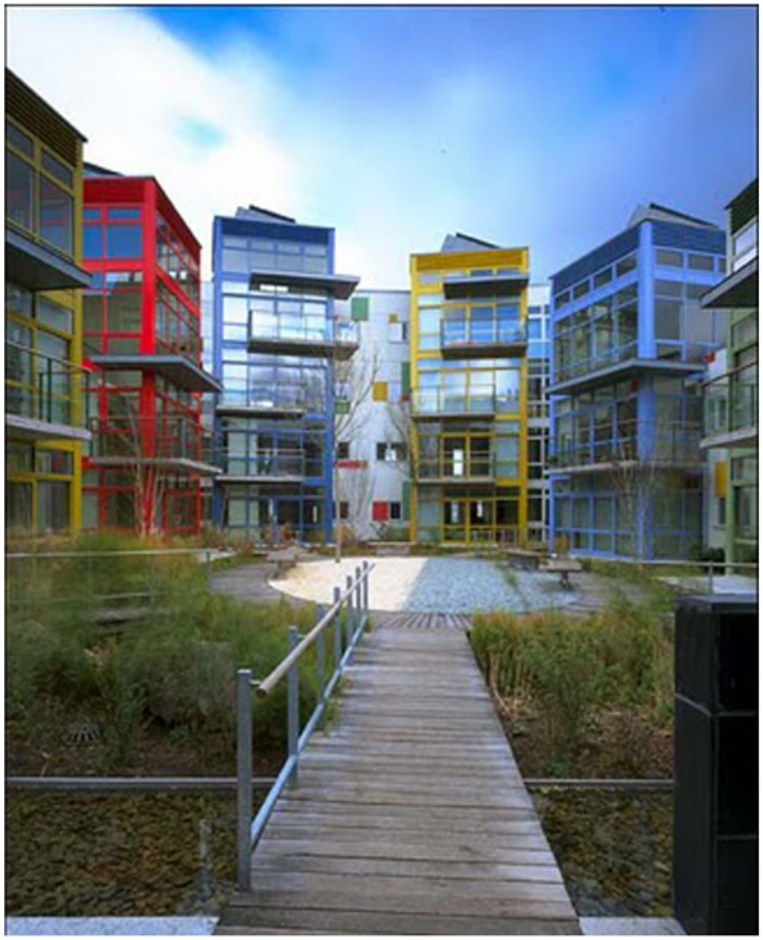




PART 7: FUTURE

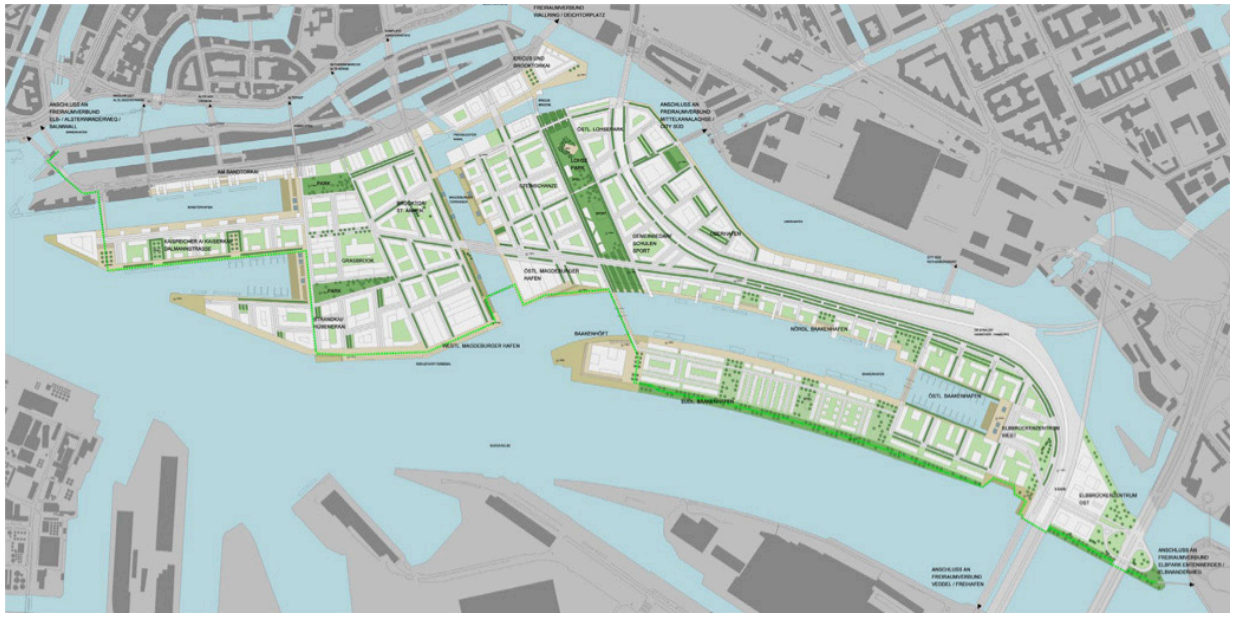
MALMO STAD ECO CITY

Augustenburg Eco District in Malmo, Sweden. A redevelopment project that created residential neighborhoods while also creating water management possibilities. The Bayviews Future may look something like this



DAY-LIGHTING ISLAIS CREEK

Hafen City in Hamburg Germany. A redevelopment of the cities port area. The canals that line the streets may be a possibility for the Bay view neighborhood given that the sea level is going to rise and swallow its streets in the near future.



1 San Francisco Public Utilities Commission. Creek Daylighting. San Francisco Public Utilities Commission. < http://www.sfwater.org/index.aspx>
2 San Francisco Public Utilities Commission. LID Basin Analysis Technical Memorandum: Islais Creek Drainage Basin April 2009. April 2009. San Francisco Public Utilities Commission. < http://www.sfwater.org/index.aspx>
3 Leopold, Luna. Water, Rivers, and Creeks. Sausalito, Ca: Unviersity Science Books. 1997. Print
4 Virginia Water Resources Center. Urban Stream Daylighting. 2007. Virginia Polytechnical Institute and State University. Virginia Tech
5 Stockton College. The Hydrology of Streams. Stockton College. <Stockton.edu>
6 Leopold, Luna, and Thomas Maddock Jr.The Flood Control Controvesy. New York, NY: The Ronald Press Comapany. 1954. Print
7 Open Space San Francisco. The City of San Francisco, The Walter Gerbode Foundation, and the W & E Haas Fund. Website. 11 March 2013.
8 San Francisco Public Utilities Commission. http://www.sfwater.org/index.aspx. The San Francisco Public Utilities Commis sion. Website. 11 March 2013.
9 Buchholz, Tracy and Tamim Younos. "Urban Stream Daylighting Case Study Evaluations". Virginia Water Resources Re search Center Special Report SR35-2007l. July 2007. <http:// http://vwrrc.vt.edu/>
10 Jencks, Rosey and Rebecca Leonardson."Daylighting Islais Creek: A feasibility Study". Landscape Architecture 227: River Restoration, UC Berkeley. November 29, 2004
11 SPUR. "Imagining Islais Creek". The Piero N. Petri Fellowship in Urban Design. <http://spur.org>
12 Hoobyar "Daylighting and Restoring Streams in Rural Community Centers: Case Studies". National Park Service: River, Trails, and Conservation Assistance Program.Seattle, Washington. 2002.
13 Islaiscreek.org. The Muwekema Ohlone Tribe of the San Francisco Bay Area. Islaiscreek.org. Website. 15 May 2013.
14 Ramirez-Herrera, M. Teresa, Sowers, Janet M., and Grossinger, Robin M. "Creeks & Watershed Map of San Francisco". Oakland Museum of California. San Francisco Water Power Sewer. 2011
15 Muwekma Ohlone Tribe of the San Francisco Bay Area. The Muwekma Ohone Tribe. <Muwekma.org>
16 Robichaub, Andrew, Steiner, Erik. "Trail of Blood: The Movement of San Francisco's Butchertown and the Spatial Transfor mation of Meat Production 1849-1901". Stanford Unviersity History and Department. April 2010
17 Kuhl, Kaja. "From Brownfields to Greenfields: A Guide to Phytoremediation". Columbia University. 2010

BILBIOGRAPHY

18 EPA. “Chapter 3: Culverts”. < http://water.epa.gov/polwaste/nps/urban/upload/2003_07_24_NPS_unpavedroads_ch3.pdf>
19 US ARMY CORPS OF ENGINEERS. “Gowanus Canal and Bay Ecosystem Restoration Project: Final Sediment Sampling Report”. New York District.