

# *Alive!*

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Senior Capstone Project



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A dynamic process of renewal at Pier 70.

A project by:  
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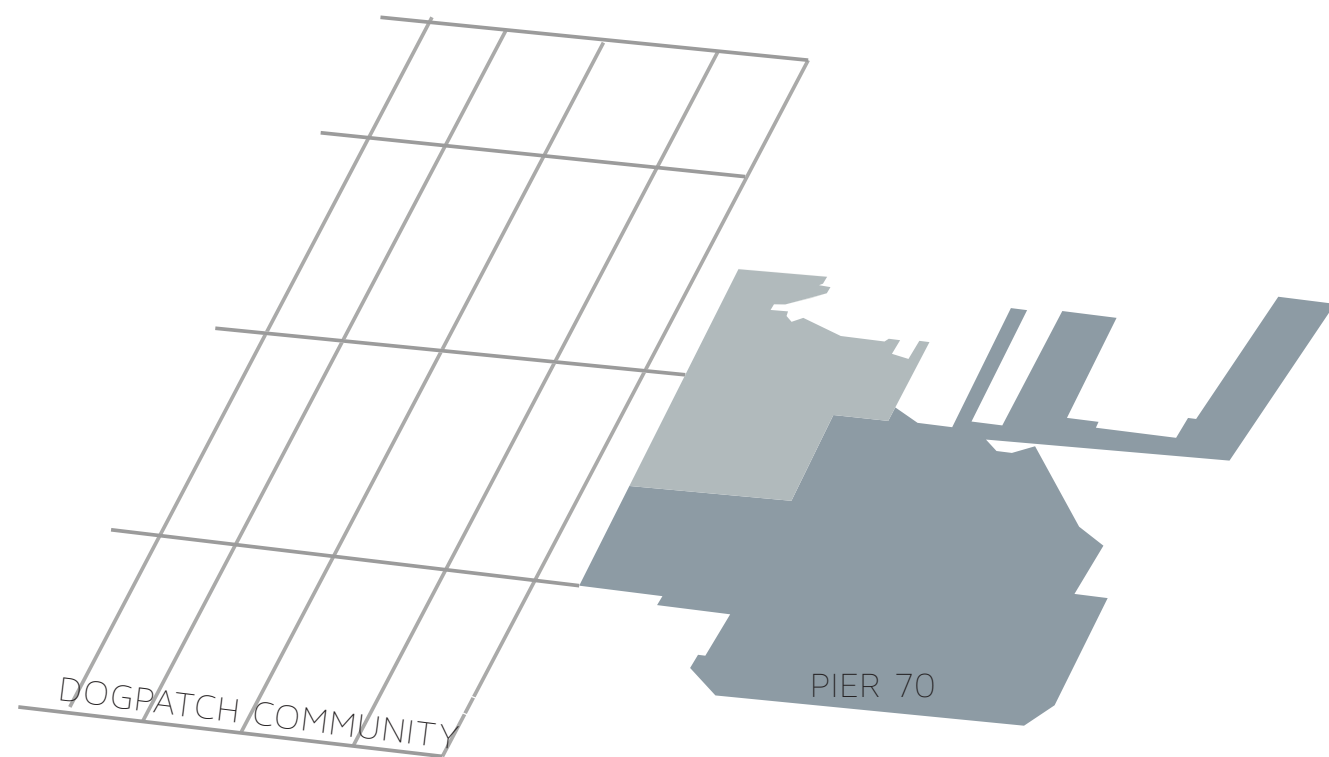
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# *Introduction*

Project Statement  
City of San Francisco  
Pier 70  
Central Waterfront





## PROJECT STATEMENT

Alive is a project proposal for the most northern portion of Pier 70 in San Francisco at the historical slip number four. The project strives to reinvigorate a toxic brownfield with remediation systems, transforming the location into a productive landscape beneficial to surrounding neighborhoods. The project strives to revitalize adjacent communities as well as natural ecosystems.



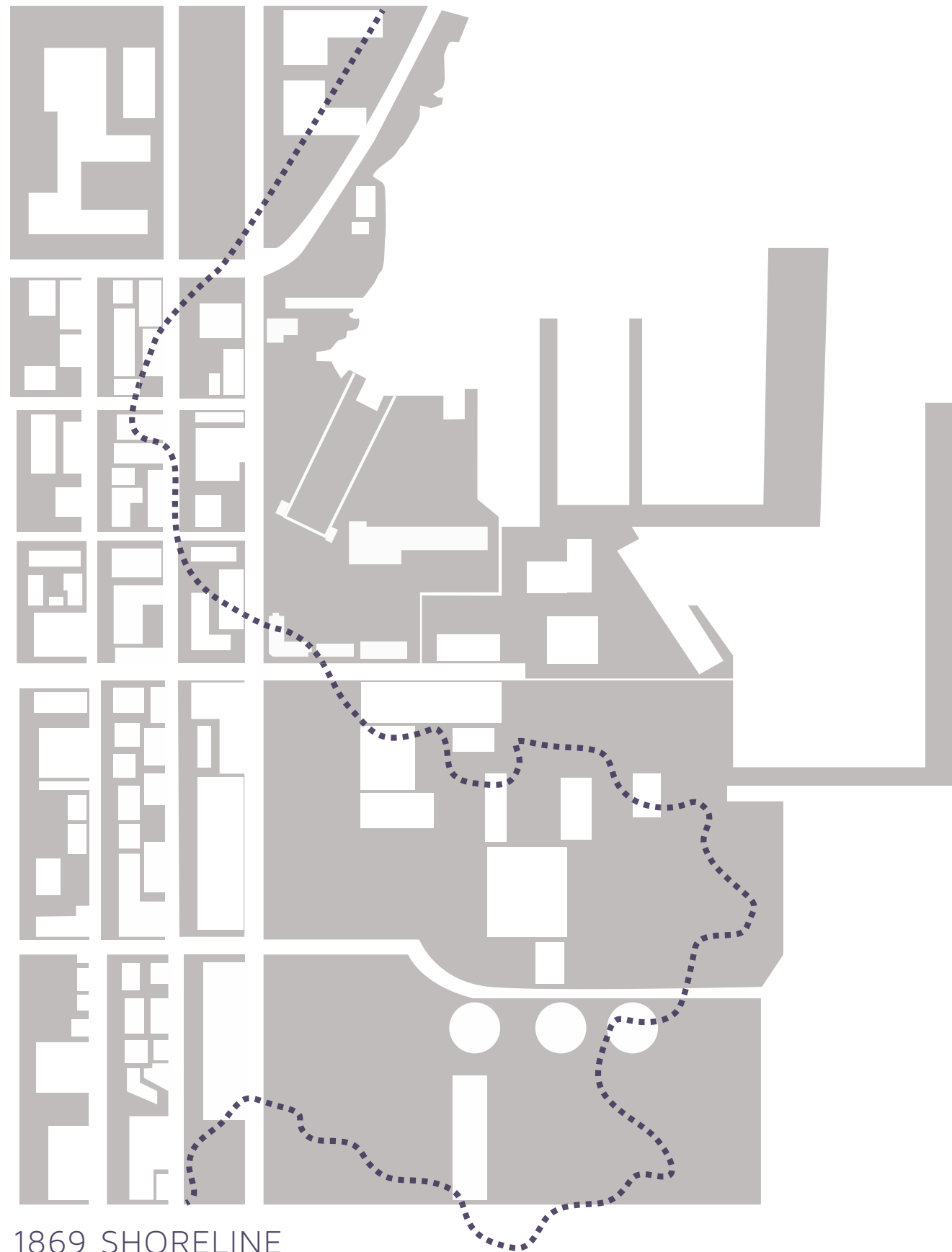
## CITY OF SAN FRANCISCO

At the entrance to one of the world's best natural harbors, San Francisco, California has a long time history of maritime development and trade. Along the peninsula's eastern shore lie many industrial piers that collectively made up the most important heavy industry centers for over 100 years.

A city with 835,000 people, San Francisco lies in the lowest third percentile of available parkland per person in comparison to the largest U.S. cities, landing itself just above Detroit and Los Angeles. Pier 70 is part of a city developed waterfront program to restore the Bay shoreline and provide for more parkland and community open space.







1869 SHORELINE

## *ORIGINAL SHORELINE*

Pier 70 in San Francisco sits along the eastern edge of the city at Portero Point, a small cape just south of the now-filled Mission Bay. The natural contour of the bay shore was changed drastically by filling the swampy Mission Bay with blasted rock from the existing serpentine hills. By 1869, the government granted submerged lands under Mission Bay to the Southern Pacific, Atchison, Topeka, and Santa Fe railroad companies.

By 1929, Mission Bay disappeared completely creating new lands suitable for the intense industrial development in steelworks and ship-building. Today three rivers that fed into Mission Bay, Hayes Creek, Mission Creek, and Dolores Creek, run underground beneath the Civic Center and Mission District.

Mission Bay contained an abundance of mussels, limpets, and smelt that fed migratory birds along with herons, egrets, osprey, and hawks.

"Great stretches of craggy bluffs have disappeared. Vast masses of rock have been blasted away from the hillsides and thrown upon the marshes"

- San Francisco Examiner (August 1889)



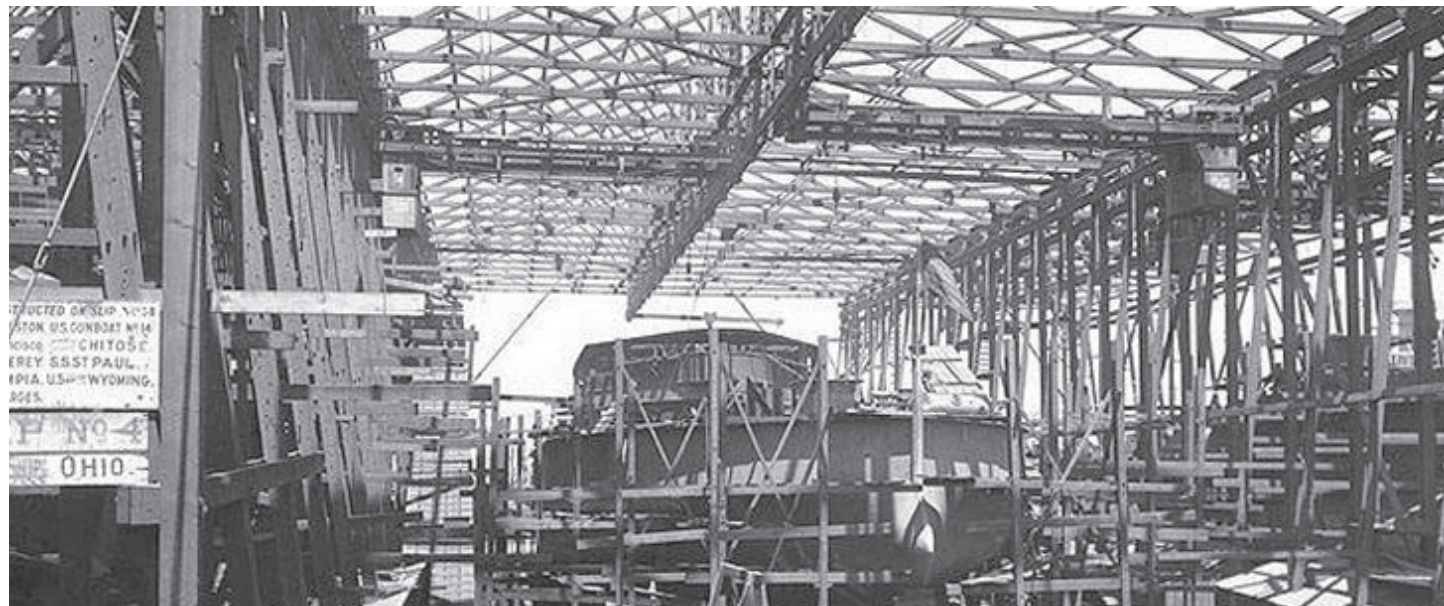
## PIER 70

The area attracted early industrial operations because of its cheap land, deep-water access, and isolation from the more populated sections of the city. As a small cape of land that was enlarged and flattened over the decades, the pier was home to at least half a dozen major manufacturing and utility companies that played significant roles in the western and national economies.

Today slips 1-4 on the northern portion of the pier remain closed. BAE Systems San Francisco Ship Repair continues the ship building business on about fifteen acres of land just adjacent to slips 1-4 that is leased from the City of San Francisco. Over 175 union Ship workers are employed at BAE Systems on an average day.

At sixty-five acres in size, the pier remains one of the best-preserved turn of the century industrial sites west of the Mississippi. Aside from the BAE Systems, most of the buildings have been unoccupied since the decline of the shipbuilding area.





## *HISTORICAL CONDITIONS*

Ships were built in and around Portero Point and nearby Mission Bay as far back as the Gold Rush. Large-scale ship building began in the 1880's by George Kneass and his sons. Pacific Rolling Mill operated at Portero Point from 1866 until 1900. As the first significant iron and steel mill in the west, Pacific Rolling Mill produced machinery and specialized steel parts for mining, construction, and San Francisco's cable cars.

Layout of the shipyard was carefully designed to make the flow of work from workshops to shipways as efficient as possible. During the world wars, the pier produced 72 vessels and repaired over 2500 navy and commercial craft. However, after the war, shipbuilding went into decline.

The yard continued to build large barges into the 70's. Later large steel tubes were crafted to transport BART trains under the Bay, making 57 sections each 325 feet long and weighing 800 tons.

On November 1, 1982 the City of San Francisco became owner of the Portero yard property.









## *SITE LOCATION*

Slip 4 is a portion of Pier 70 located in the most Northern section of the site. Covering about 15 acres, the site sits adjacent to the operating BAE Systems Repair.

Over the last 30 years, Pier 70 has attracted an artist community concentrated in the nearby structure known as the Noonan Building. This former Navy Office Building provides studio space for 30 artists. Some of the port land is also leased to construction storage, metal recycling operations, and a car impound facility.





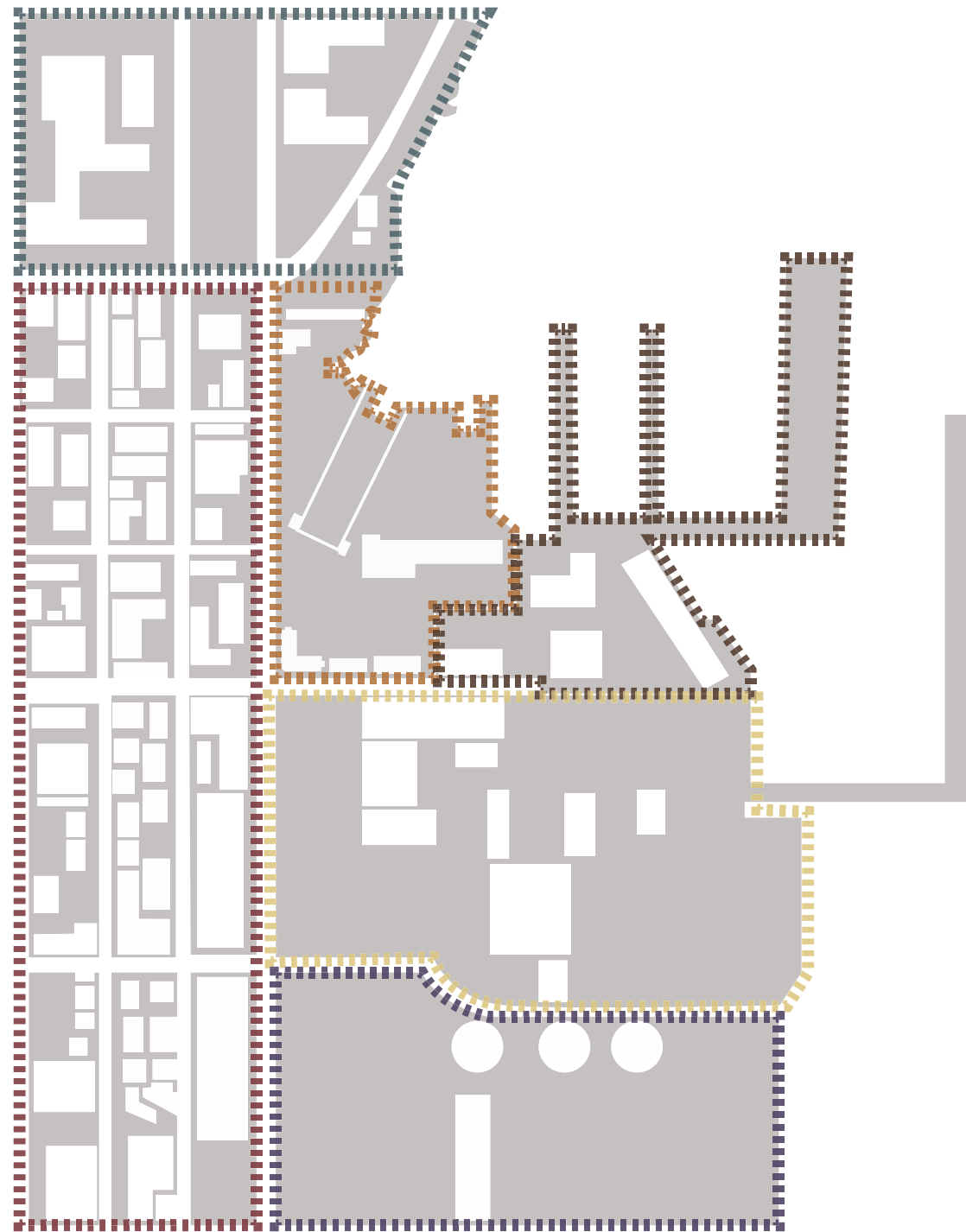


## *EXISTING CONDITIONS*

Pier 70 currently sits fenced off and inaccessible to the surrounding communities. Now owned by the City of San Francisco, part of the pier remains functional for ship repair, while the remainder of the site awaits project approval for redevelopments to remediate pollutants and restore purpose to this historical location.

Existing structures and cranes have been condemned for public safety. Historical structures including Bethlehem Administration (Building 101), the Power House (Building 102), the Union Iron Works Administrative Office (Building 104), and Union Works Machine Shop (Building 113/114) along 20th Street are closed for public safety due to water damage and seismic vulnerability. Historic preservation offers the opportunity to restore the structures preserving the historic neighborhood character of the Central Waterfront.





- ..... DOGPATCH NEIGHBORHOOD
- ..... BAYFRONT
- ..... SLIP 4 [PROJECT LOCATION]
- ..... PIER 70 REDEVELOPMENT
- ..... BAE SHIP REPAIR
- ..... PG&E PROPERTY

## ADJACENT LAND USE

Surrounded by adjacent neighborhoods and commercial uses, Pier 70 sits at a culmination of historical industries and modern architectures. Just inland and west of Pier 70 belongs the neighborhood known as “Dogpatch;” a charming microhood that encompasses antique Victorian cottages and micro-manufacturing work spaces. Revamped studio spaces have attracted a budding enclave of artisans, craftsmen, chefs, designers and engineers. Dogpatch is quickly growing in popularity for young entrepreneurs, providing the perfect foundation for a successful redevelopment at Pier 70.

Just north of Slip 4 Cove lies a dive bar known as “The Ramp,” that embodies the craftsmen bayshore atmosphere of the surrounding neighborhoods. The Ramp shall remain in tact and adjoined to the redesigned Pier 70 through bike paths, and pedestrians walks, ensuring convenient accessibility to this eclectic and symbolic location.









## CENTRAL WATERFRONT

Restoration plans have been developed for the entire Pier 70 with various developers restoring portions of the site. The Central Bayshore Waterfront has located potential areas for infill transit-oriented development, public open space, and other community benefits. Pier 70 is part of the city's plan for bayshore development in conjunction with Mission Bay to the north and Hunters Point to the South.

Potential facility uses for Pier 70 include general office and corporate campus, retail service, education, museum space, entertainment, cultural, restaurant, and housing.

The Blue Greenway is a City effort to expand and improve public access and open space along the San Francisco Bay from China Basin Channel south to the San Francisco county line. This effort evolved out of earlier attempts to link the bay shoreline including the San Francisco Bay Trail and the Bay Water Trail which strive to increase connection and access.

Several sites along the bay shore have been identified as linkage points of connection along the Bluegreenway including open spaces for Pier 70. The Bluegreenway creates the opportunity to bring visitors into the space as a part of a community experience, as well as makes the site more accessible.

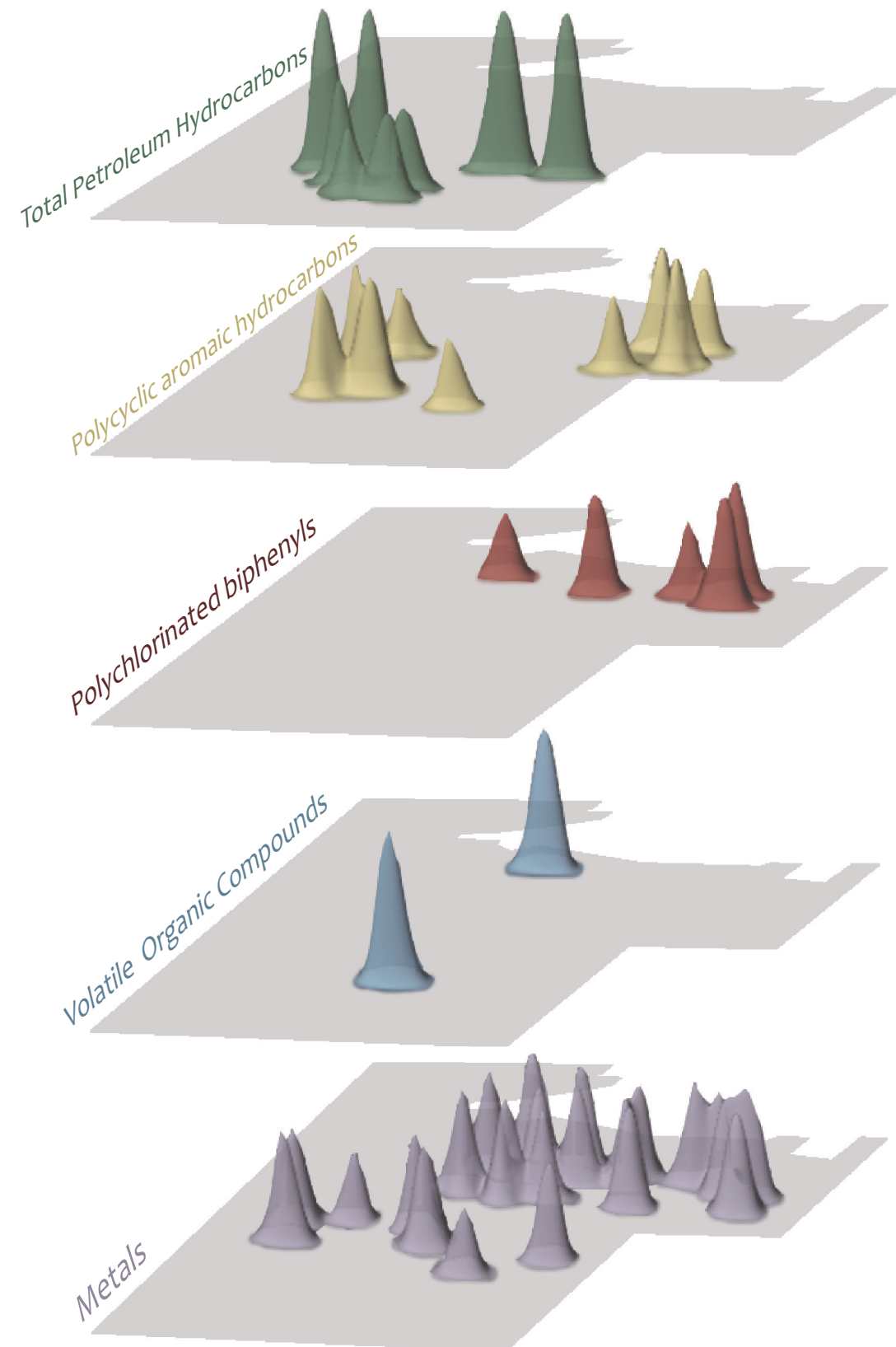




*Issues*

- Contaminated Site
- Sea Level Rise
- Shoreline Access
- Community Open Space





## CONTAMINATED SITE

There are over 5 million acres of abandoned industrial property in the United States within urban areas alone. Brownfields contain industrial contaminants within the soil, water, and air, that degrade the health of surrounding communities, in turn putting citizens at greater risk for respiratory disease, cancer, and heart disease.

The amount of pollutant toxicity on site is measured by an exposure scale of intended use including commercial, residential, and recreational use. Investigations have been conducted on site between 1989 and 2011 to determine screening levels of contamination in soil and groundwater.

Levels of contaminants of potential concern that are naturally occurring or associated with historical land use are present at concentrations that exceed Environmental Screening Levels. Filled with bay soil, the site contains naturally-occurring asbestos (NOA) and metals, as well as total petroleum hydrocarbons (TPH), semivolatile organic compounds (VOC's), polycyclic aromatic hydrocarbons (PAHs), anthropogenic metals, and polychlorinated biphenyls (PCBs) at levels that exceed screening.

Soil gas and groundwater contamination is minimal and are associated with the existing soil fill material. Cleanup Levels for contaminants were identified along with several potential remediation tactics.





2025 sea level rise



2075 sea level rise

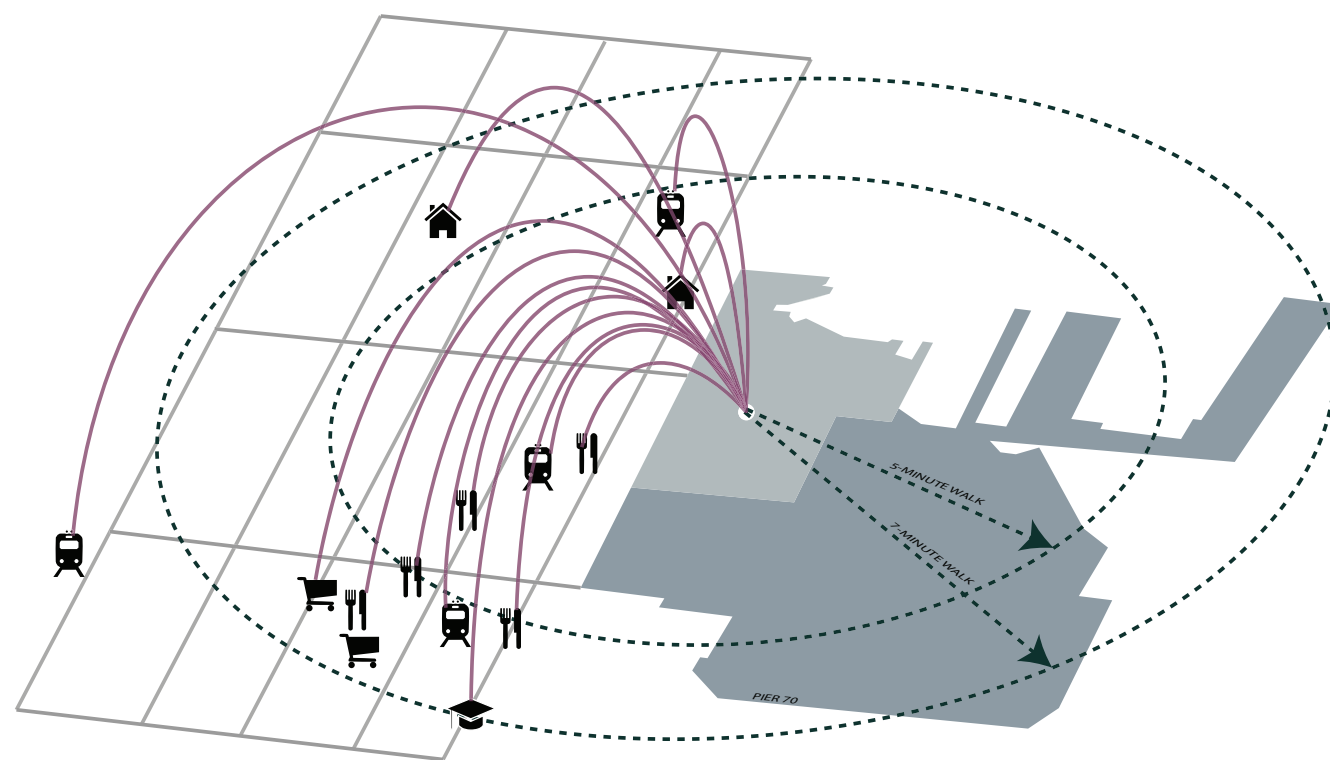


2100 sea level rise

## SEA LEVEL RISE

Sea levels are currently rising at 1/8th inch per year. Experts believe that much of this rise is due to thermal expansion, which will allow storm surges to inundate coastal areas more frequently. The number of people living near the coasts is expected to double by 2025, showcasing a need for water catchment and absorption systems.



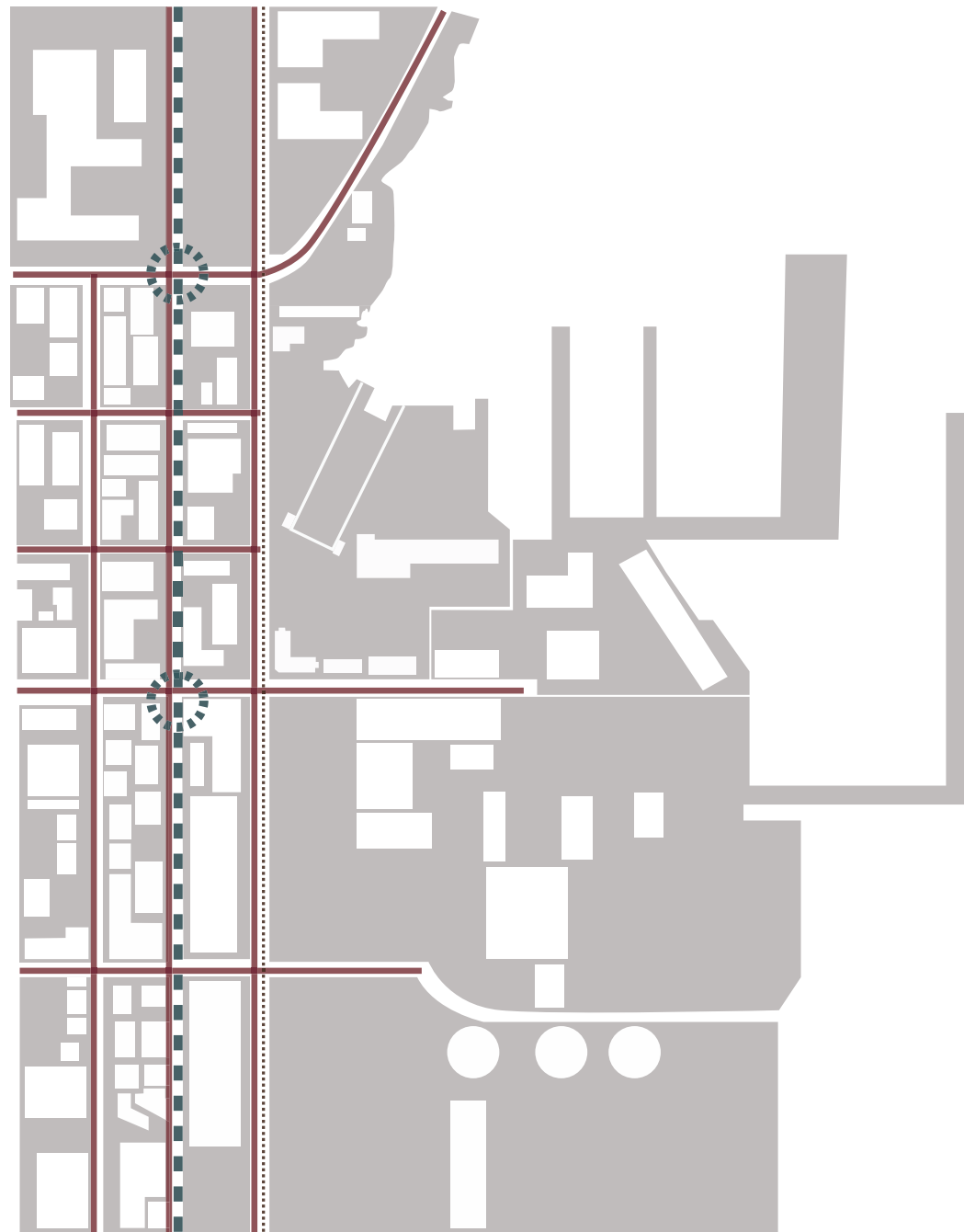


## SHORELINE ACCESS

Pier 70 sits right on the Bay Shoreline, but restricts water access due to a fenced perimeter and unsafe areas for water access. However, the site has a great potential for water activity due to its accessibility by foot, bicycle, and car. Nearby vehicular access provides opportunity for equipment dropoff in close proximity to a launching site.

The site has prime waterfront access to the San Francisco Bay, presenting ample opportunities for shore front development and recreational access. Water access will allow adjacent communities opportunities for launching kayaks, paddle boards, and human powered recreation.





- ..... BICYCLE CIRCULATION
- VEHICULAR CIRCULATION
- - - - - PUBLIC TRANSPORTATION
- ⊙ MUNI STATION

## ADJACENT CIRCULATION

Pier 70 is within walking distance from adjacent communities as well as Muni lightrail and bus stops along third street making the site easily accessible by public transportation.

Current bicycle transportation runs adjacent to the site along Illinois Street, making vehicle contact frequent and dangerous. A proposed Blue-greenway along the Bay shoreline will designate safe bike passage through the site in conjunction with the rest of the Bayshore pathway.

New public transportation routes will drop riders off directly at Pier 70, providing more access to the site, and in turn decreasing vehicular use.





## COMMUNITY OPEN SPACE

Dogpatch and Portero Point, the surrounding communities of Pier 70 offer little park and recreational community open space.

As an increasing technological center, the importance of outdoor environments is also increasing. Allowing adequate outdoor space for learning, relaxing, and recreation is a major component in developing a healthy and unified community.

Due to the proposed areas of commercial and housing developments at Pier 70, it will be more crucial to retain open space along the shore. The Bay Shore offers ample opportunity for community access and open space, providing a place to throw a frisbee, a lawn to nap on, a park to walk your dog in, a pathway to stroll along, a bike path to ride on, and a wetland to explore.





# Design Proposal

Site Design Strategy

[Phase 1] 2016-2022

[Phase 2] 2022-2028

[Phase 3] 2028-2034

[Phase 4] 2034-2040

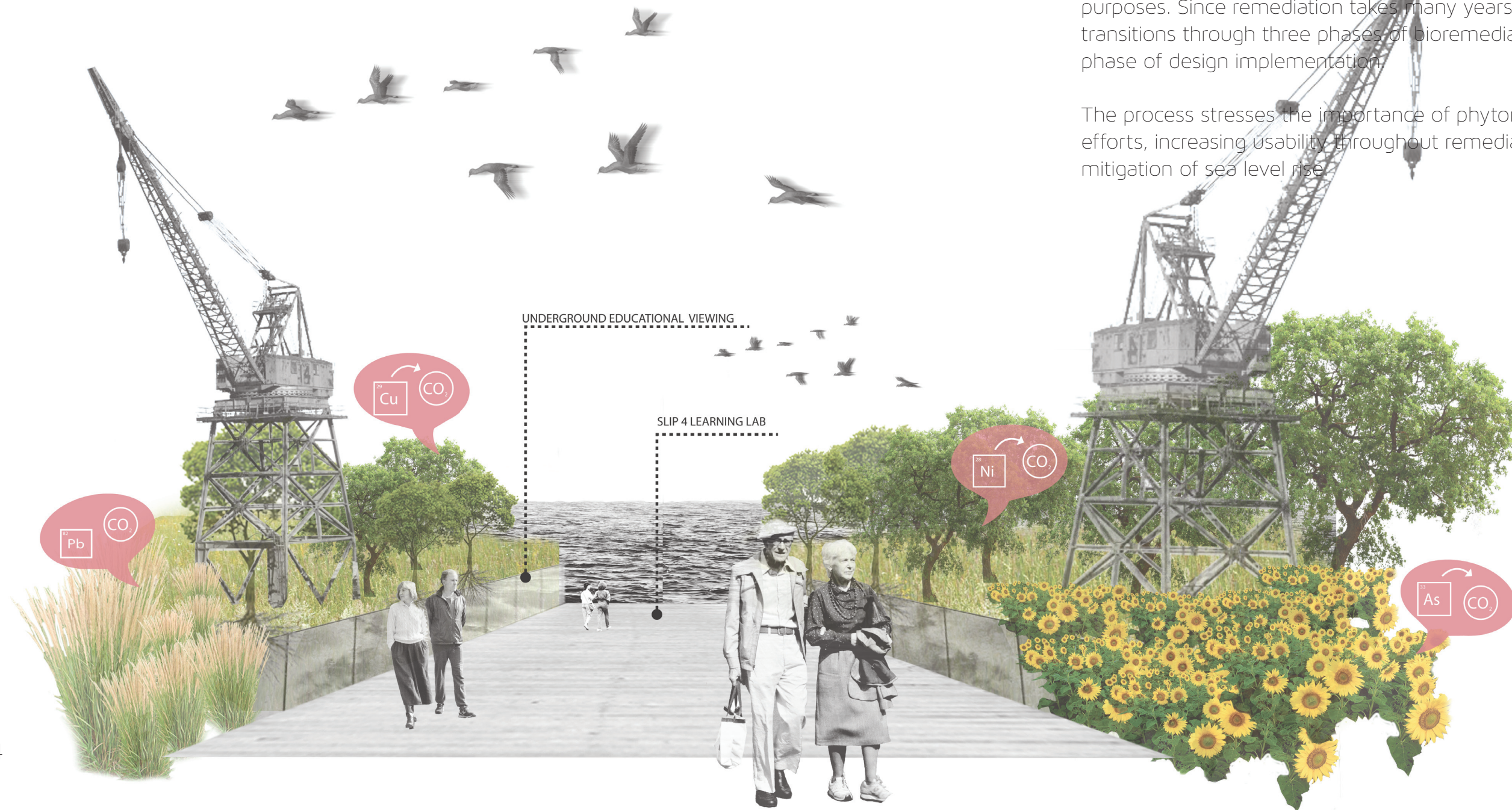


## SITE DESIGN STRATEGY

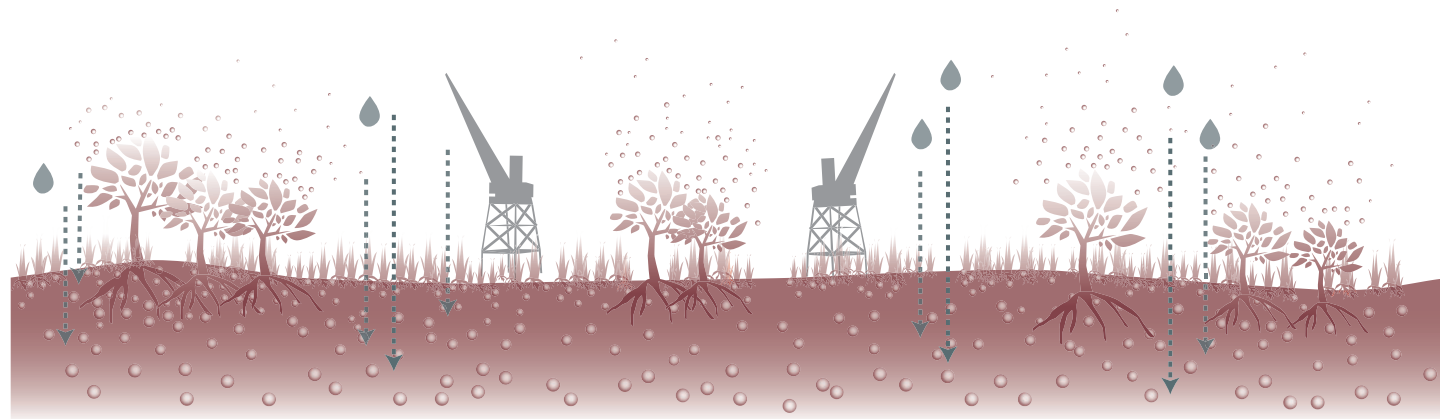
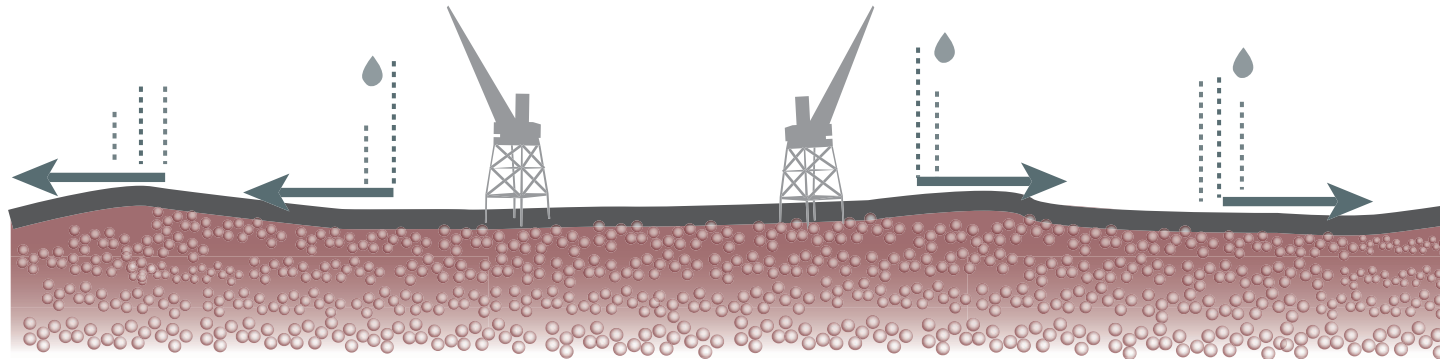
Alive! is a transformative project embracing temporal fluctuations from contaminated brownfield to remanufactured park system. Incorporating various phases of remediation, the design endorses revitalization of adjacent communities as well as natural ecosystems.

Due to the toxic pollutants occurring on site, the area must go through remediation before it can be opened for recreational purposes. Since remediation takes many years, the site transitions through three phases of bioremediation and finally a phase of design implementation.

The process stresses the importance of phytoremediation efforts, increasing usability throughout remediation, and mitigation of sea level rise.







## *TOXIC REMEDIATION*

The current design proposal caps the entire site, creating an impervious surface trapping contaminants beneath the ground. This solution prohibits water percolation, toxin breakdown, and increases runoff.

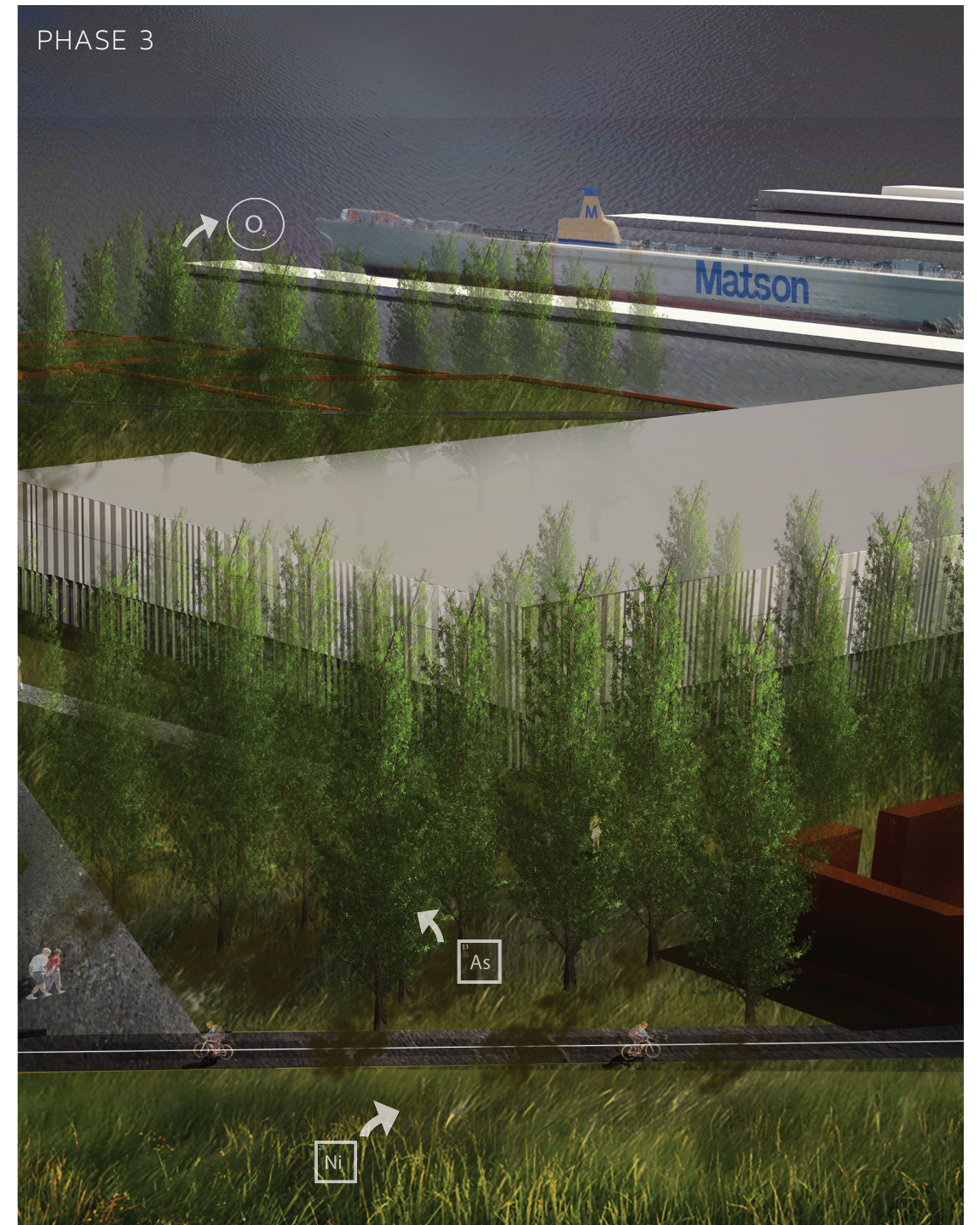
As an alternative to capping the site with a thick impervious layer, Alive is a proposal that embraces methods of phytoremediation to degrade hazardous contaminants within the soil through plant root systems. This approach allows for an integration of land and atmosphere.

Plants are selected for their ability to extract or degrade contaminants, adaption to local climates, root structure, compatibility with soil, growth rate, high biomass, water requirements, and maintenance schedule.

A benefit of phytoremediation includes the breakdown of toxic substances, reducing the lifespan of contaminants, in turn restoring the land to a usable state. Additionally the process encourages water percolation, reduces the health risk of adjacent communities, and increases opportunity for greenspace.

Surrounding communities benefit from the redevelopment process with a cleaner community, educational awareness, and restored natural environments.

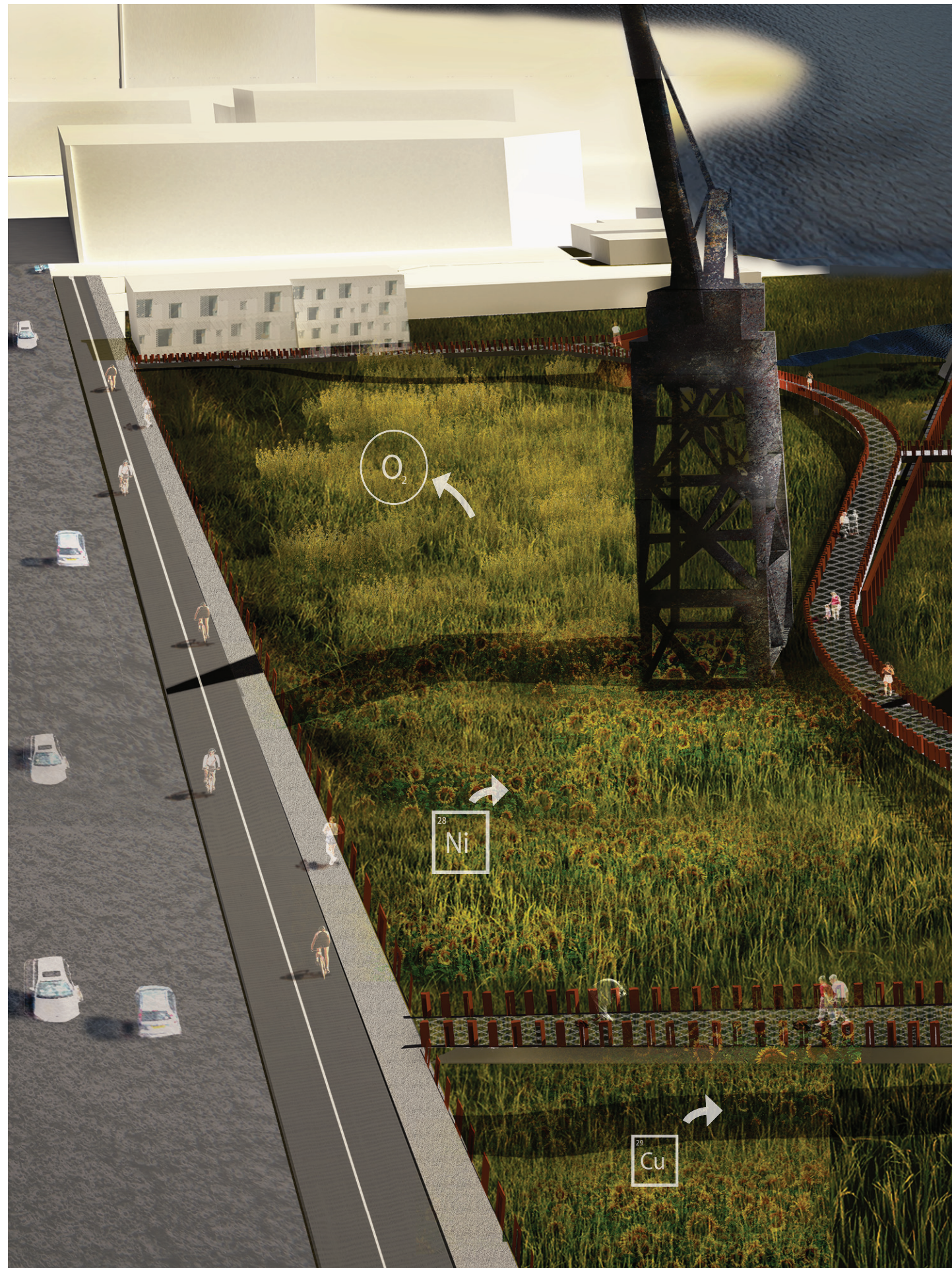




## PHASING

Pier 70 incorporates various phases of visitor usability in correlation with vegetation stages. Phasing through three phases of phytoremediation, the landscape morphs from vegetated grassland to canopy forestland, and eventually returns to a native ecosystem.





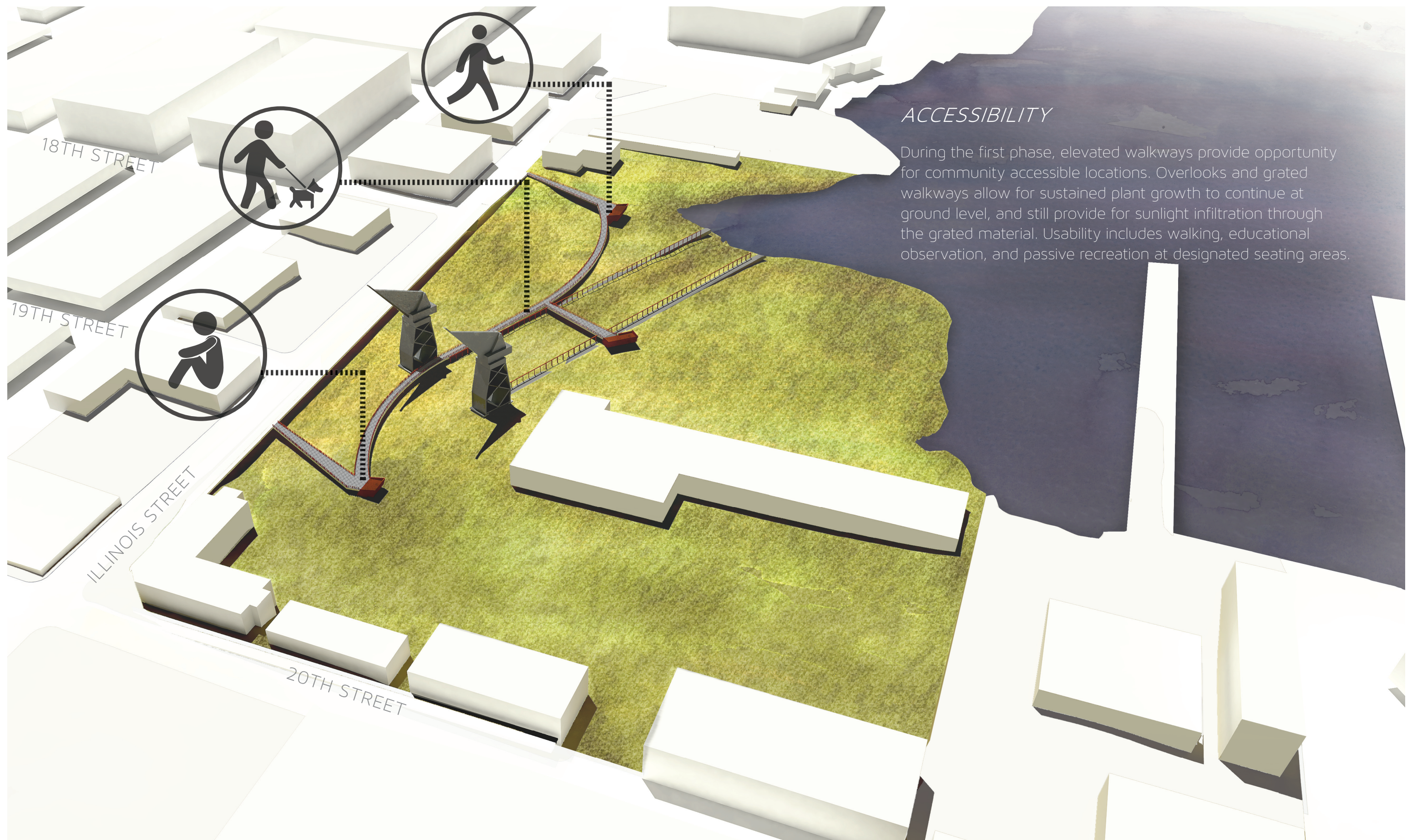
## [PHASE 1] 2016-2022

The first phase of the design process initiates phytoremediation. Soils must be cultivated with microorganisms and nutrients to establish a rich growing medium for plant material. Grasses and perennials are planted throughout the site, working to remove semivolatile organic compounds and total petroleum hydrocarbons.

Community outreach educational programs are developed in conjunction with adjacent neighborhoods, providing an educational opportunity to learn about the phytoremediation process and participate in its success. Through appropriate safety measures and training sessions, community members can partake in the planting and harvesting cycles of the plant material. Not only does this fulfill maintenance needs, but additionally instills pride within the community who are nurturing the landscape.

Perennials and grasses need to be planted and harvested annually. Harvested material will be sent to a disposal location where remaining contaminants within plant material are separated out from biomass and recycled for clean energy generation.

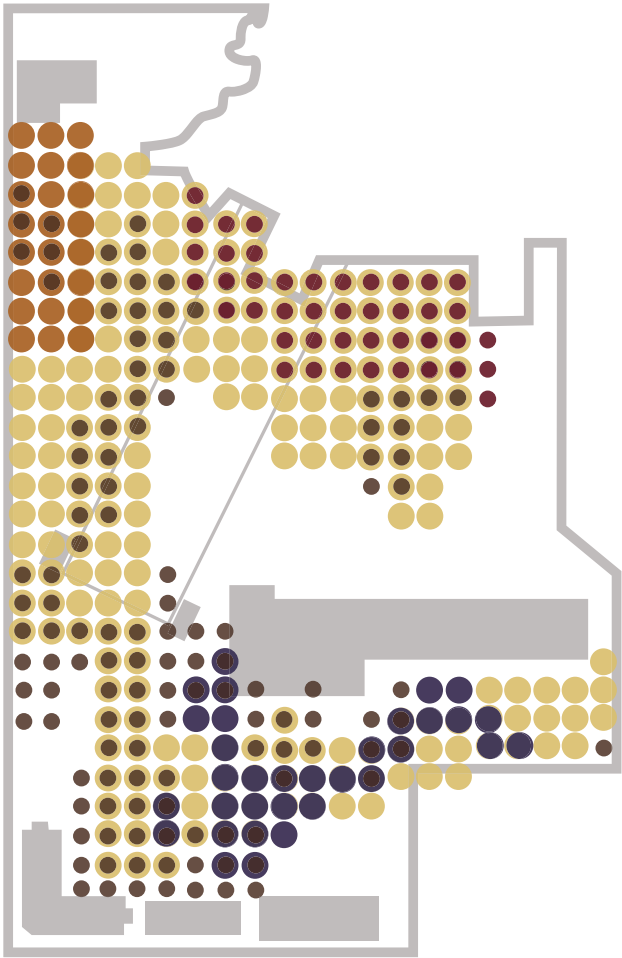




## ACCESSIBILITY

During the first phase, elevated walkways provide opportunity for community accessible locations. Overlooks and grated walkways allow for sustained plant growth to continue at ground level, and still provide for sunlight infiltration through the grated material. Usability includes walking, educational observation, and passive recreation at designated seating areas.





VEGETATION

Various grasses and perennials ensured to grow in San Francisco climate are located on site according to their correlated pollutant their plant structure is capable of degrading. Agrostis Pallens and other grasses gradually breakdown PCBs, Helianthus Annus degrades TPHs, Brassica juncea extracts VOCs, and Carex and Festuca species remediate metals.



AGROSTIS PALLENS



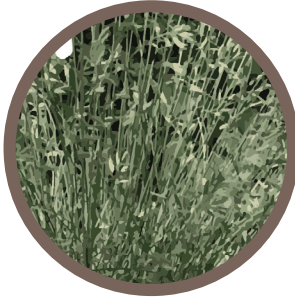
HELIANTHUS ANNUS



BRASSICA JUNCEA



FESTUCA SPECIES



CAREX SPECIES

WINTER

SPRING

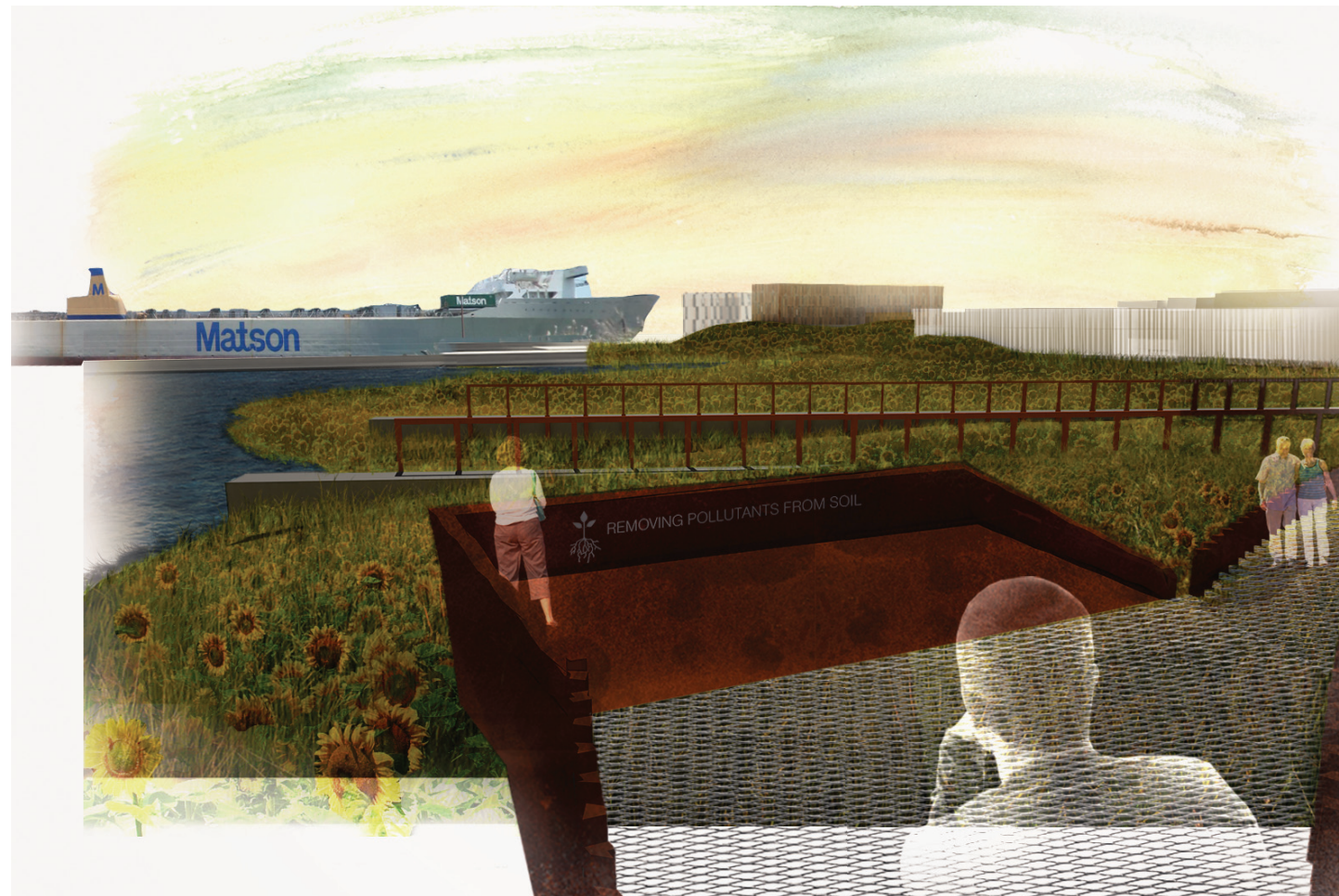
SUMMER

FALL

SEMIVOLATILE ORGANIC COMPOUND (VOC)

TOTAL PETROLEUM HYDROCARBON (TPH)

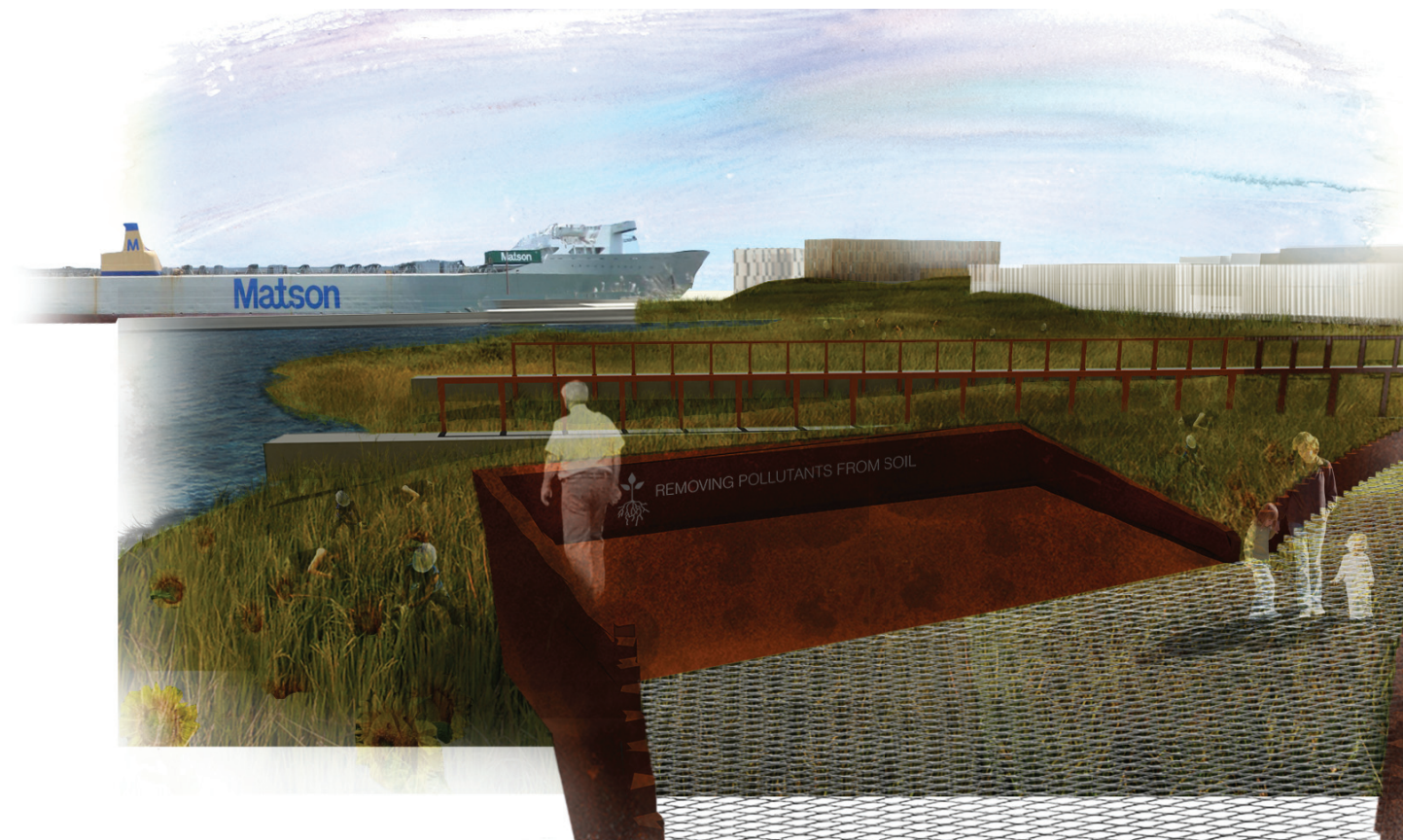




## *FLUCTUATING CYCLES*

As part of the constantly changing landscape, the first phase witnesses swells of vegetation states, depending on seasonal growth and harvest seasons. The bottom pictured to the left showcases what the landscape might look like from an overlook point as community members partake in harvest and replanting cycles.

Community involvement is key for successful continuation of phytoremediation. Without continuous maintenance and oversight, vegetation will die off and prevent healthy root systems from continuing the breakdown of pollutants.







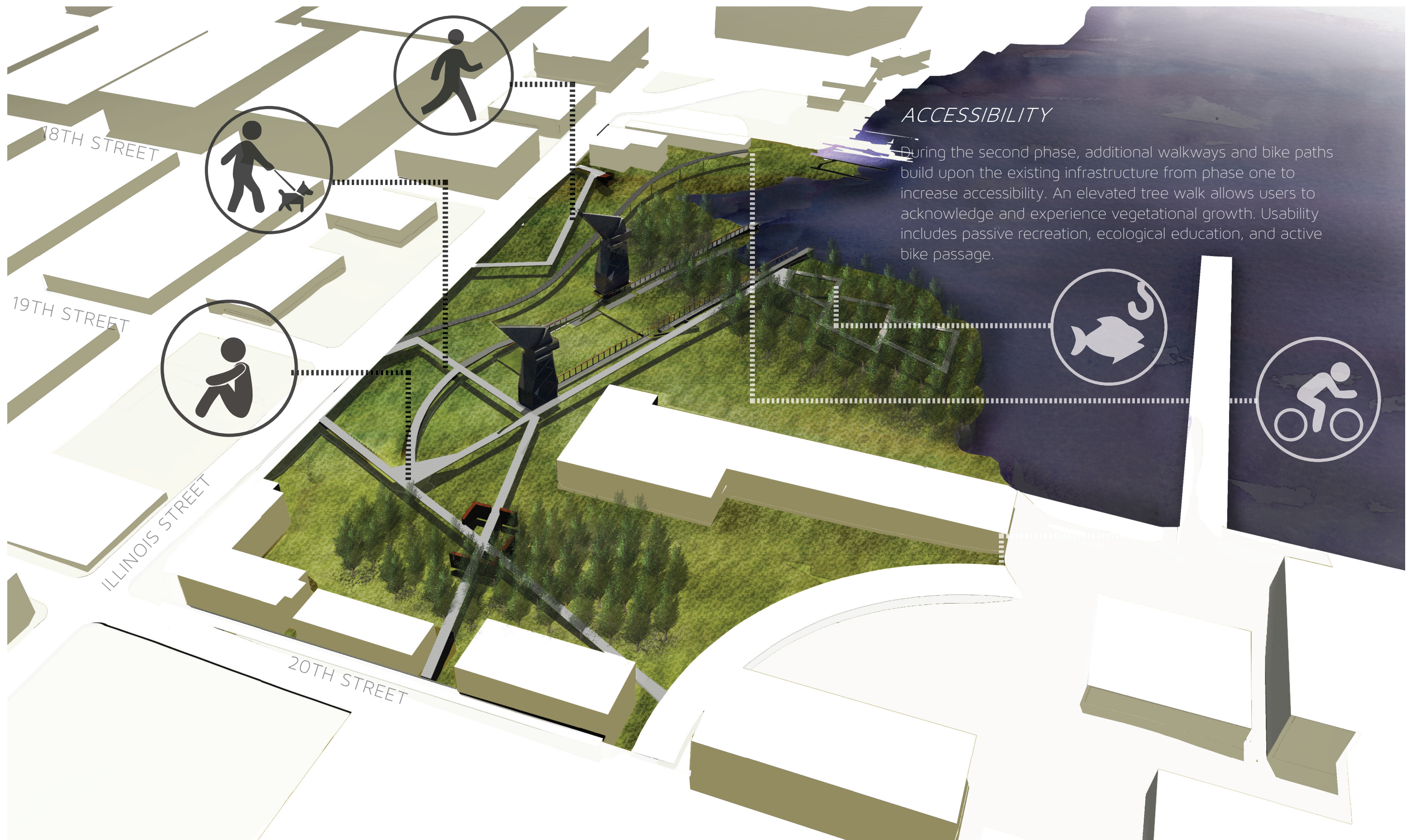
## [PHASE 2] 2022-2028

The second phase of the design process continues phytoremediation into a canopy vegetation state. Tree species develop and create a ceiling over parts of the location. Two main types of trees work in conjunction with all existing perennials and grasses from phase one to remove total petroleum hydrocarbons and metals.

Tree species additionally serve as soil stabilization methods and uptake a greater amount of carbon dioxide, releasing more oxygen into the atmosphere. Trees help to mitigate the heart warming effect in urban areas, providing shade and ecosystem services we take for granted.

Since trees grow at a much slower rate than small grasses and perennials, taking much longer to reach full maturity, the trees do not need to be harvested and replanted each season. The trees remain through the second and third phase, gradually flourishing and growing.



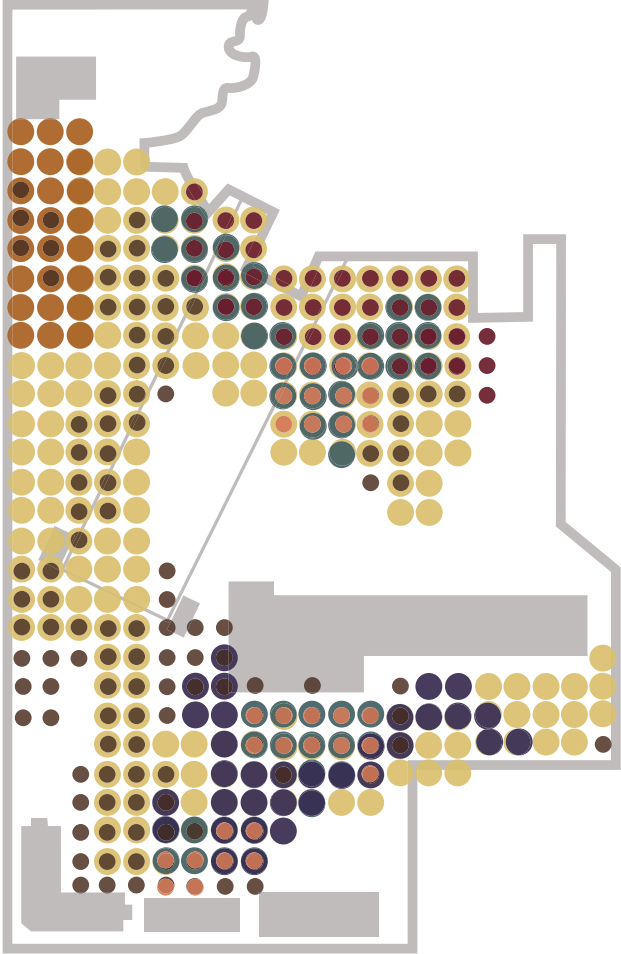


## ACCESSIBILITY

During the second phase, additional walkways and bike paths build upon the existing infrastructure from phase one to increase accessibility. An elevated tree walk allows users to acknowledge and experience vegetational growth. Usability includes passive recreation, ecological education, and active bike passage.







AGROSTIS PALLENS



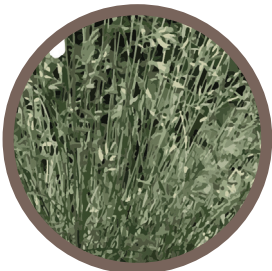
HELIANTHUS ANNUS



BRASSICA JUNCEA



FESTUCA SPECIES



CAREX SPECIES



POPLUS TRICHOCARPA



SALIX LASIOLEPIS

VEGETATION

Additionally tree species aide in the extraction of pollutants, helping the existing grasses and perennials functioning in phase one. Agrostis Pallens and other grasses gradually breakdown PCBs, Helianthus Annus degrades TPHs, Brassica juncea extracts VOCs, and Carex and Festuca species remediate metals. Populus trichocarpa assists in the removal of metals and Salix lasiolepis works to breakdown PCBs.

WINTER

SPRING

SUMMER

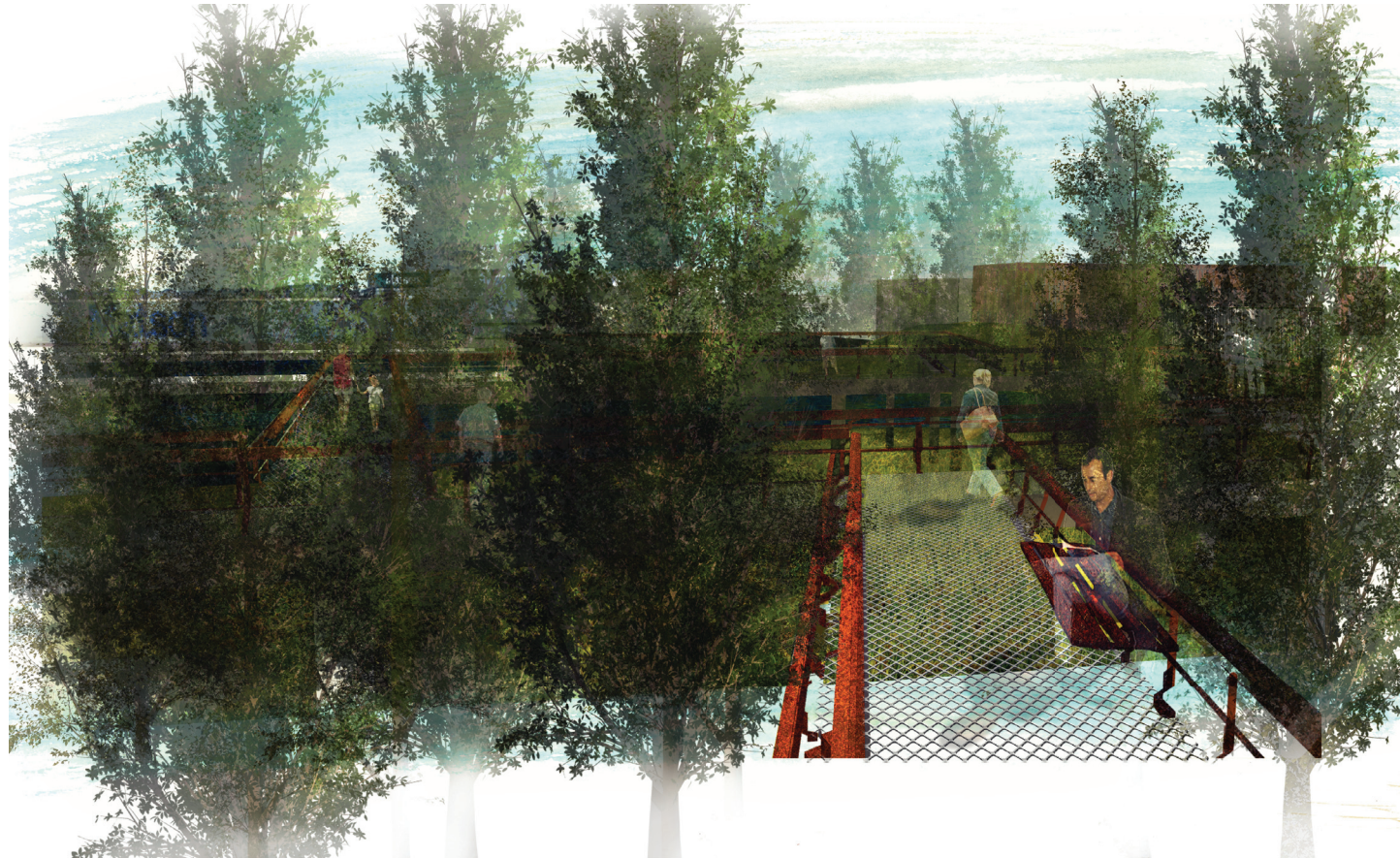
FALL



TOTAL PETROLEUM HYDROCARBON (TPH)

METALS: NICKEL & ARSENIC





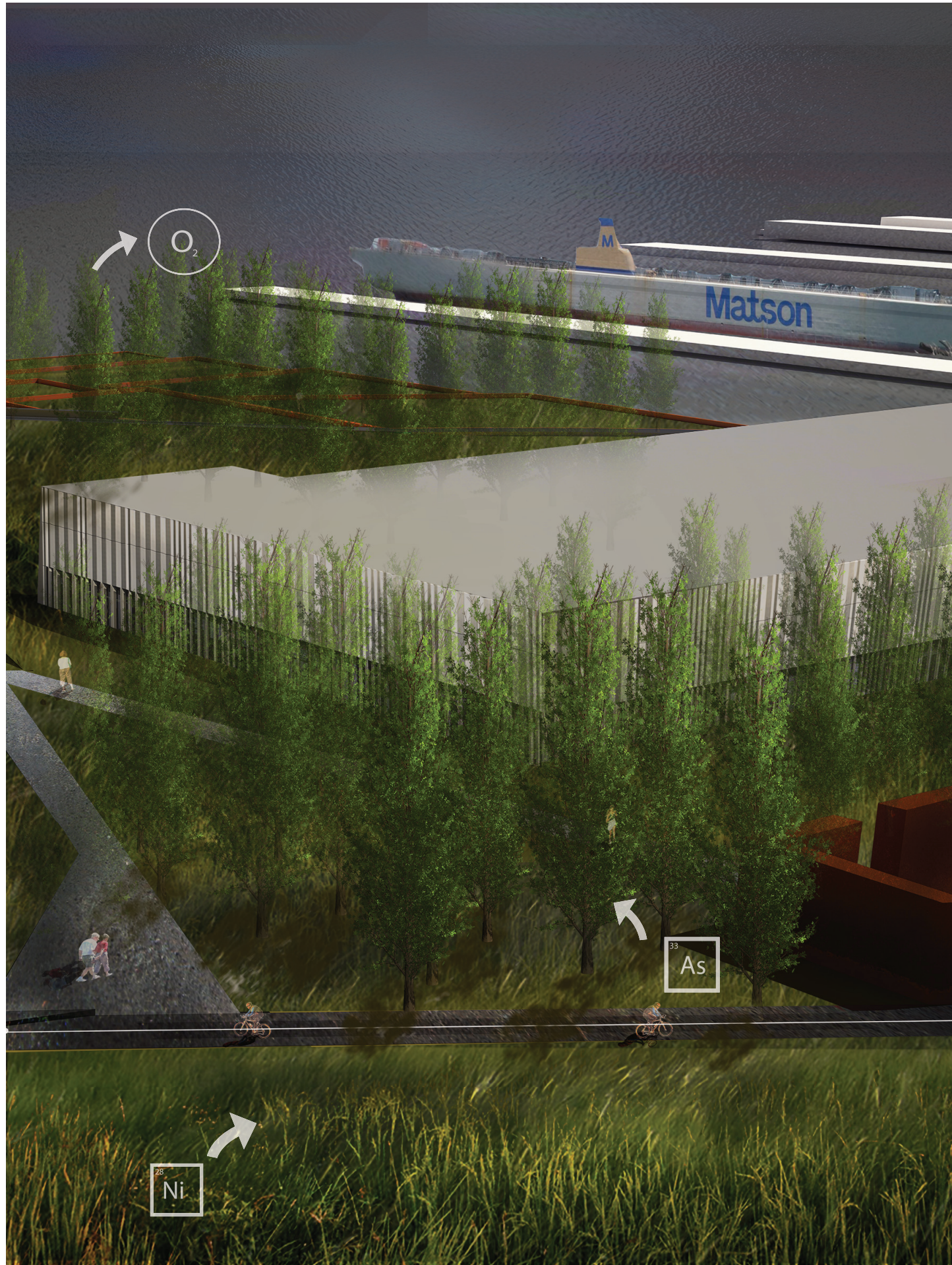
## *FLUCTUATING SEASONS*

As part of the morphing landscape, the second phase embodies seasonal changes with a large visible tree population that shed their leaves in fall to remain dormant for winter. The landscape is completely different throughout the various seasons. The top left pictures what spring and summer experience would like across the canopy walk, while the bottom images recreates what a winter stroll through the same location might look like.

The site allows for usability across the seasons, providing for a new experience everytime a visitor returns.







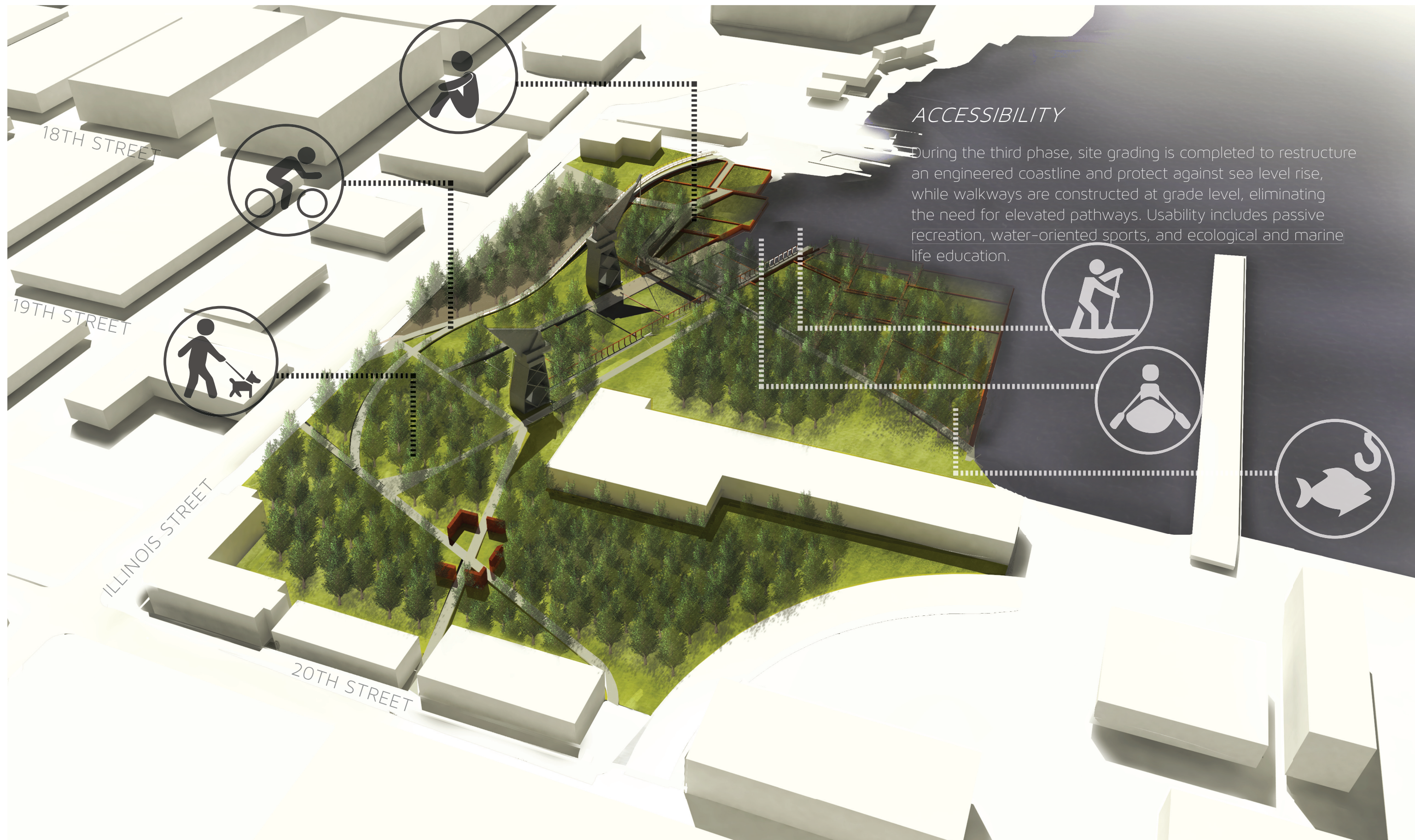
## [PHASE 3] 2028-2034

The third phase of the design process continues phytoremediation into a greater area of canopy cover. The willow and Poplar species from phase two continue to evolve and grow across new portions of the site, concentrating their extraction potential into as small of a space as possible.

Tree species continue to uptake greater amounts of difficult contaminants such as hard metals and PCBs, than smaller grasses and perennials are capable of. Although the tree species are not native to San Francisco, they are not invasive and will thrive in that environment.

As tree species continue to develop, soil becomes more rich with nutrients and less contaminated with pollutants, establishing a nourishing environment for future ecosystems.

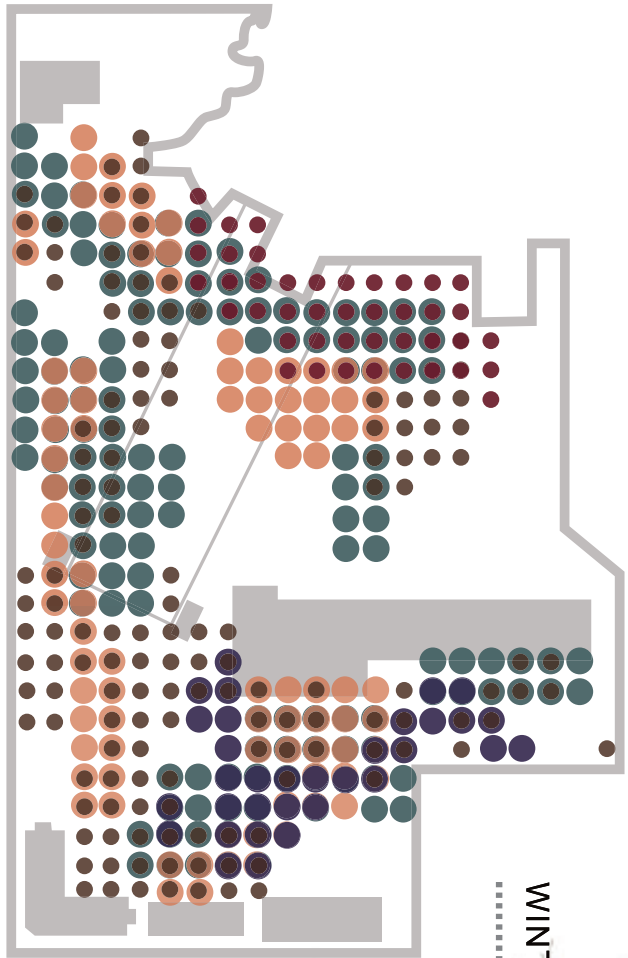




## ACCESSIBILITY

During the third phase, site grading is completed to restructure an engineered coastline and protect against sea level rise, while walkways are constructed at grade level, eliminating the need for elevated pathways. Usability includes passive recreation, water-oriented sports, and ecological and marine life education.

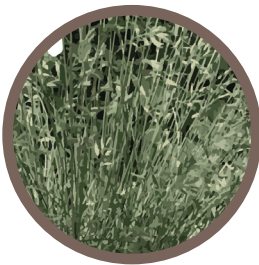




AGROSTIS PALLENS



FESTUCA SPECIES



CAREX SPECIES



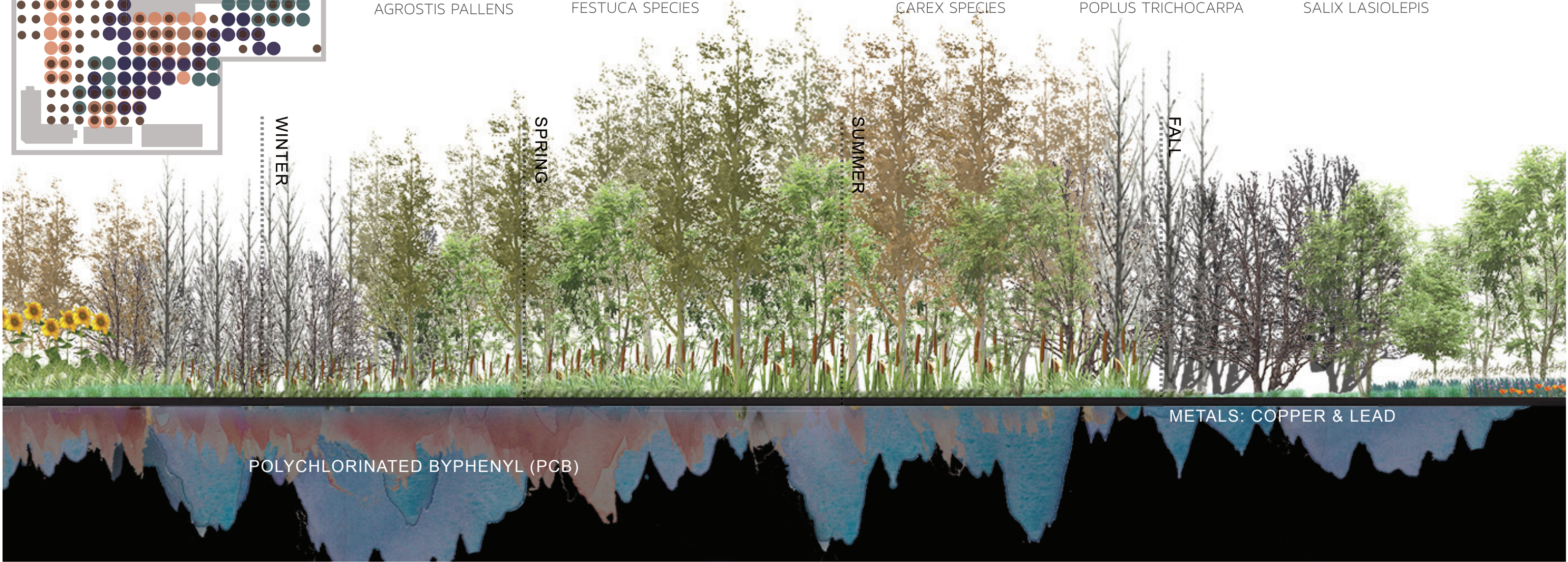
POPLUS TRICHOCARPA



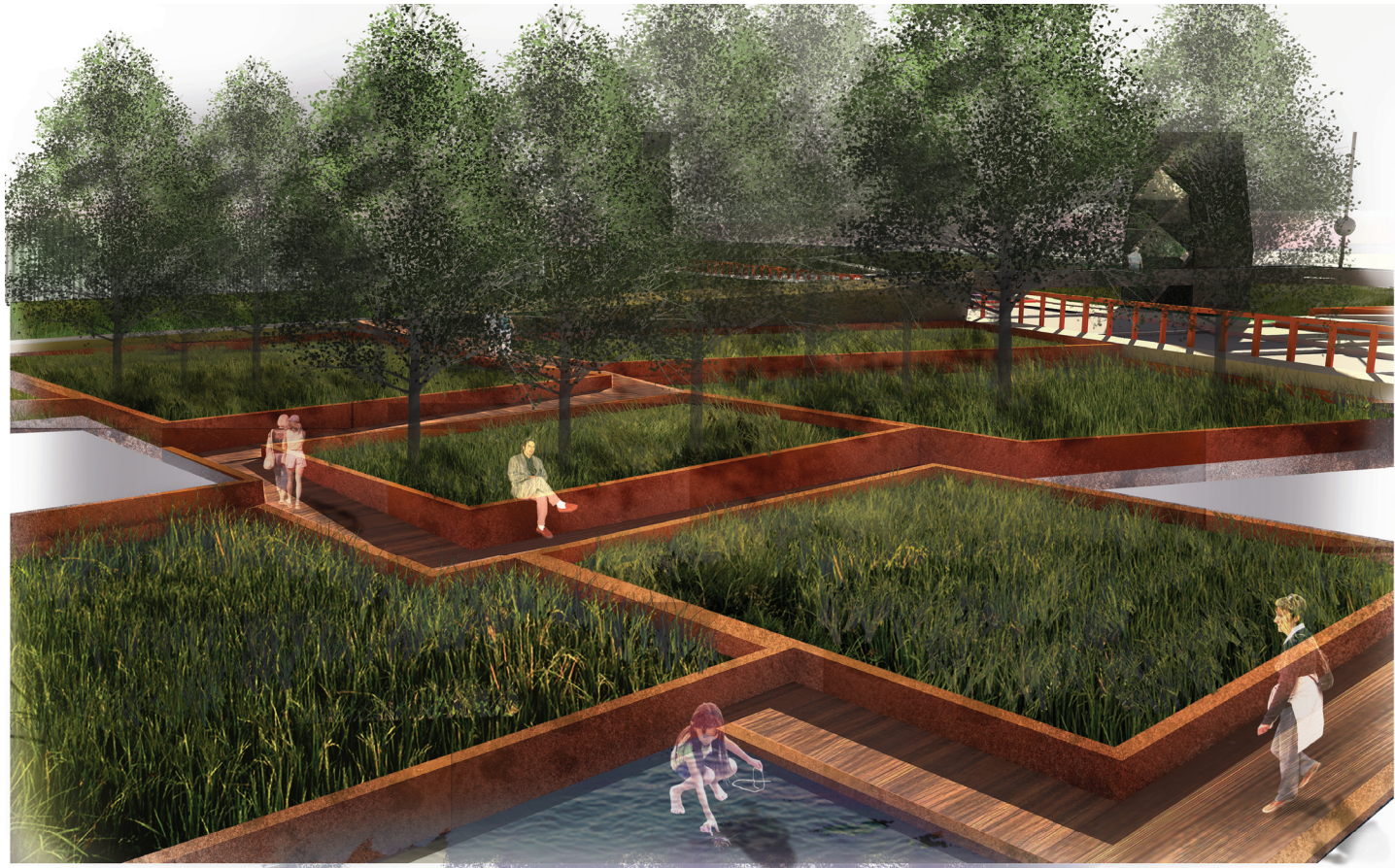
SALIX LASIOLEPIS

VEGETATION

Existing tree and grass vegetation from phase two continues to remediate pollutants. Annuals such as sunflower and mustard are no longer required to remove their correlated toxin. Agrostis Pallens and other grasses gradually breakdown PCBs, Carex and Festuca species remediate metals, Populus trichocarpa assists in the removal of metals, and Salix lasiolepis works to breakdown PCBs.







## *FLUCTUATING TIDES*

As part of the morphing landscape, the third phase embodies tidal fluctuations along an engineered coastline. Three feet high terraces fill with water throughout the day as tides rise and fall six feet twice a day. The terrace flats function as marshland type tide pools for ecological habitat and learning opportunity. Accessible at water level, the terraces allow for visitors including children to play in and showcase opportunity for ecological restoration at the shore level. The marsh vegetation simultaneously removes toxins from its associated locations.

Functioning as a water purifying method and water catchment systems, the terraces provide ample opportunity for new experiences and embrace the idea of a living landscape constantly in flux.







## [PHASE 4] 2034-2040

The fourth phase of the design process represents the culmination of phytoremediation and the transition into a restored ecosystem simultaneously functioning as a community park. Fully accessible and usable for the community, a once brownfield is now an ecologically enhanced redevelopment.

Amenity spaces function for multiple and changing uses, providing for adequate space and user opportunity. Buildings remain flexible for use in accordance to surrounding development. Amphitheater seating and plaza areas can transform from food truck or farmers market day event to night concert. Water access rises and falls with the tide, allowing for consistent use of the site.

- |                          |                               |
|--------------------------|-------------------------------|
| 1. entry plaza           | 12. descending terrace walk   |
| 2. flexible amphitheater | 13. bicycle blue greenway     |
| 3. building entrance     | 14. food truck parking        |
| 4. terraced slipway      | 15. food truck plaza          |
| 5. flexible building     | 16. street parking            |
| 6. experiential room     | 17. tidal experiential zone   |
| 7. studio courtyard      | 18. floating water access     |
| 8. outdoor patio         | 19. drop off zone             |
| 9. historical walk       | 20. equipment rental location |
| 10. terraced shoreline   | 21. connection to the ramp    |
| 11. bridge crossover     |                               |





## ACCESSIBILITY

During the fourth phase of implemented design, water access is located at multiple locations encouraging the parks relationship with water activities. Usability includes passive recreation, water-oriented sports, ecological and marine education, and cultural community events.



VEGETATION

Phytoremediation plants non native to San Francisco are removed from the site and replaced with native grasses and trees that represent what a restored ecosystem may appear as. The potential to return this polluted, abandoned landscape to a thriving native ecosystem symbolizes its application at a greater scale.



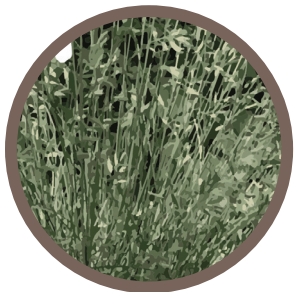
AGROSTIS PALLENS



NARELLIA PULCHRA



FESTUCA SPECIES



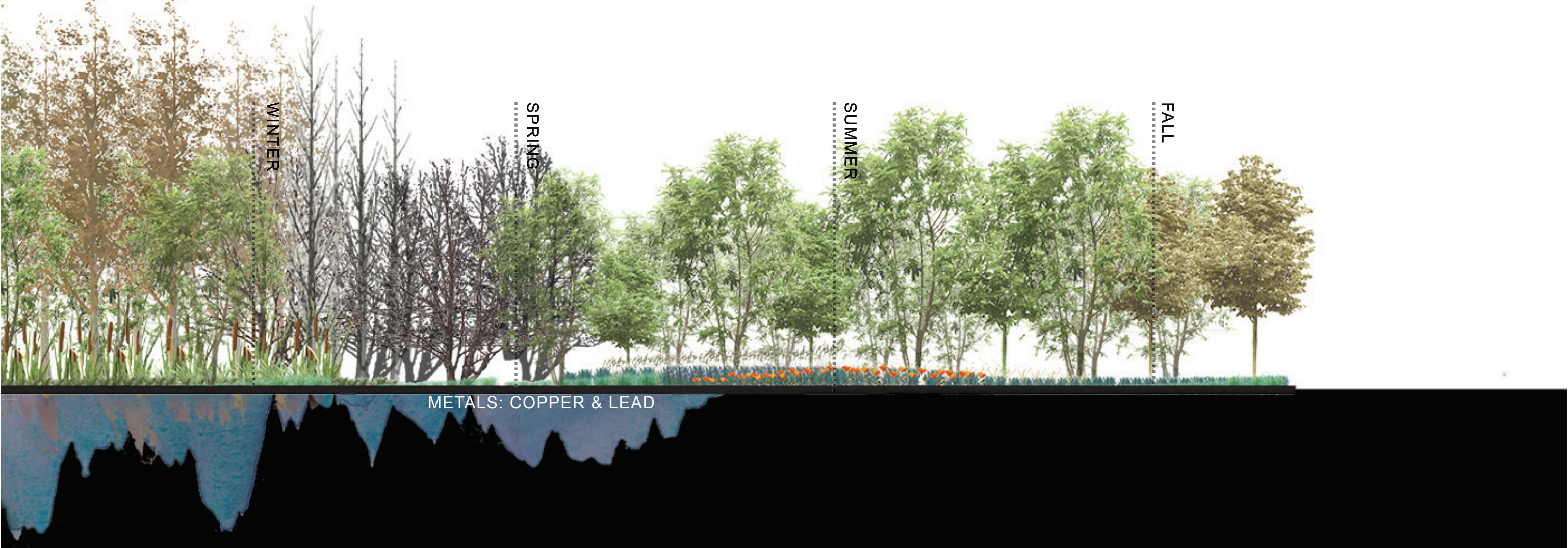
CAREX SPECIES



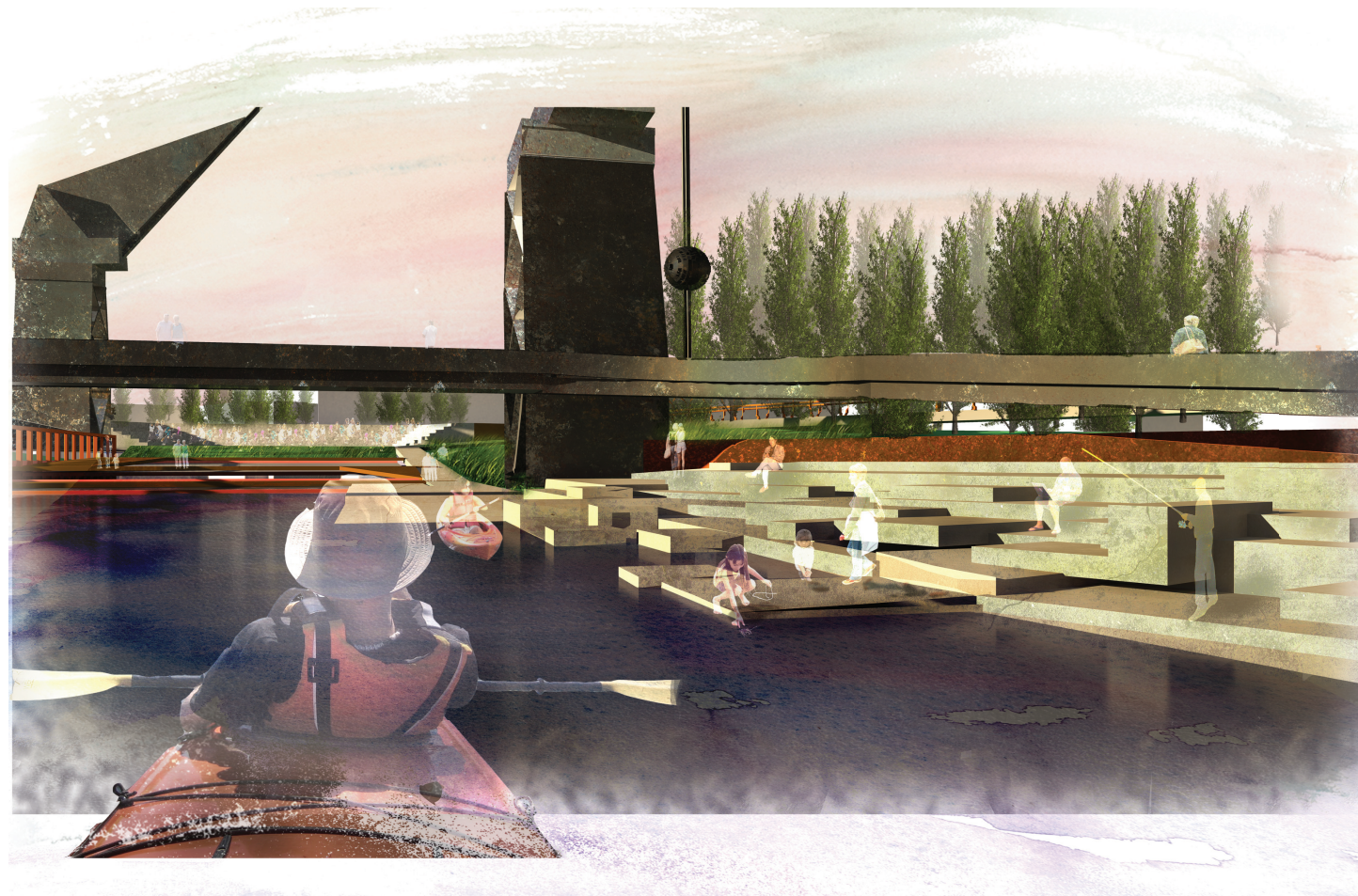
DISTICHLIS SPICATA



SALIX LASIOLEPIS

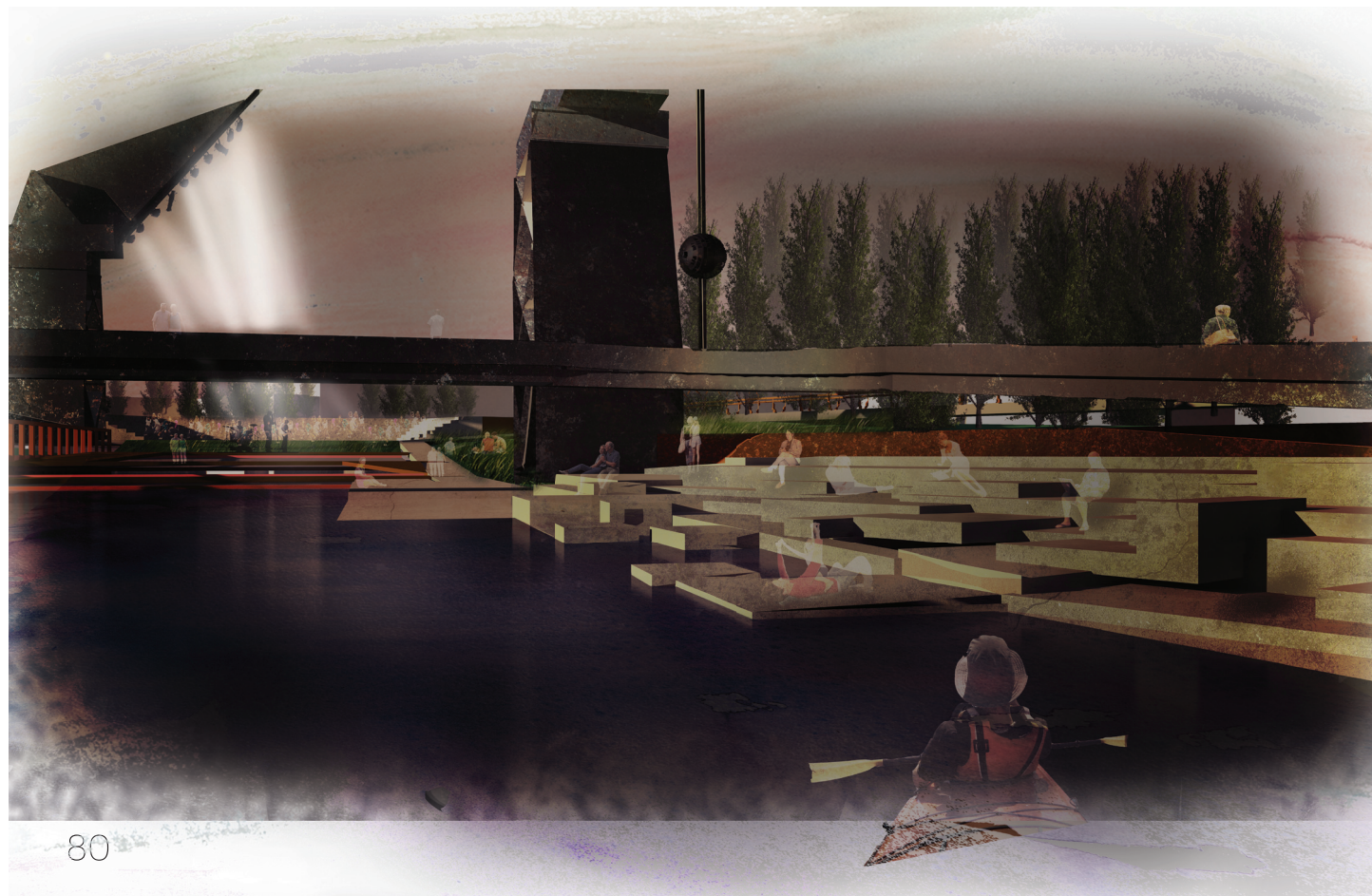






## *FLUCTUATING TIMES*

The fourth and final phase represents an intersection of community and ecological restoration, enhancing both user experiences and natural environments on site. An engineered coastline protects the redeveloped site from sea level rise, allowing for the rise and fall of sea levels within terraces and a structured central slipway. Multiple types of water access are granted for visitors, showcased in the images to the left. A kayak launching dock as well as staged launching and landing area represent the opportunity to include water usability within the park system.



At this final phase, the location is usable at multiple times throughout the day, serving as a buzzing park during the day and a functional performance space by night. The existing cranes on site move throughout each phase, landing here in the final phase to serve as a structural bridge support and overhead lighting for nighttime events. Repurposing site elements and materials along with the overall location creates a sustainable parkway system and symbolizes redevelopment potential.





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