# ENGAGING THE POST- INDUSTRIAL FRONTIER:
## REVEALING THE INHERENT NATURE OF THE MANUFACTURED LANDSCAPE THROUGH THE PROCESSES OF ITS RECLAMATION

by

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# ABSTRACT

This thesis investigates the nature of horror and fascination experienced when confronted with manufactured landscapes. The inherent qualities found at these radically manipulated and altered places are often comparable to those found in the "natural" landscapes - places that we are drawn to and seek to preserve. This proposal aims to challenge our negative perception of manufactured landscapes and offers a new approach for how we may engage with, and better understand these hauntingly beautiful and often restricted places. This study focuses on large scale abandoned mining operations found throughout the American West. The proposal will reuse current and decommissioned infrastructure to support environmental clean-up efforts and promote new programmatic uses to renew public awareness of these manufactured sites, provide interactive experiences, and grow a new economic basis for these current wastescapes.

## ACKNOWLEDGEMENTS

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# CHAPTER 1: INTRODUCTION

## A RE-EMERGING FRONTIER

> The stubborn American environment is there with its impervious summons to accept its conditions; the inherited ways of doing things are also there; and yet, in spite of environment, and in spite of custom, each frontier did indeed furnish a new field of opportunity, a gate of escape from the bondage of the past; and freshness, and confidence, and scorn of older society, impatience of its restraints and its ideas, and indifference to its lessons.[1]

Fredrick Jackson Turner concluded his thesis on *The Significance of the Frontier in the American West* stating that this once open frontier has since closed. This monolithic view of the West has been challenged, most notably perhaps, by Alan Berger who instead argues the western frontier to be far more fragmented and dynamic than Turner claims. It is within this fragmentation that a new landscape has emerged. A landscape radically altered and reformed by the processes of settlement, extraction and industrialization. This man-made geological event has produced a vast industrialized wild - re-opening the frontier as a manufactured one. Berger specifically identifies active mining sites throughout the Interior West to be the largest “soon-to-be-reclaimed region in America.”[2] The Bureau of Land Management estimates 500,000 abandoned mines already exist within the United States.[3] Of these, the United States Environmental Protection Agency (EPA) has designated 174 Abandoned Mine Lands as Superfund sites. The goal of Superfund aims to protect human and environmental health, ensure responsible parties pay for clean-up costs, involve community engagement within the clean-up process, and the return of contaminated sites to productive use.[4] Within this existing framework there are latent possibilities inherent within these manufactured landscapes and their existing infrastructure that may broaden the EPA’s goal beyond mere remediation. By tapping into the manufactured landscape’s embedded potential we can reveal a new field of opportunity and imagine a new narrative for the post-industrial life of these places. These possibilities are dependent on our value of such landscapes and whether or not we can find methods to treat them as we would a more traditionally perceived “natural” landscape.

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1 Fredrick Jackson Turner, *The Frontier in American History* (New York: Dover, 1920), 38.

2 Alan Berger, *Reclaiming the American West* (New York, NY: Princeton Architectural Press, 2002), 31.

3 “Extent of the Problem.” *The Bureau of Land Management*. Accessed March 28, 2018. https://www.abandonedmines.gov/extent_of_the_problem.

4 “What Is Superfund?” *EPA* online. Last modified November 9, 2017. https://www.epa.gov/superfund/what-superfund.

## DEFINING "NATURE"

> What matters is not what ecology is, but how it functions, how it is perceived and used – and perhaps why we seem compelled to assert assumptions of "naturalness" at all.[5]

A proper definition of "nature" is critical for our interpretation of the manufactured landscape. This definition has long been debated by two conflicting views; the environmentalists and the industrialists. The more widely accepted environmentalist view interprets "nature" as fully separate from the impact of human alteration. This notion elevates the concept of "nature" beyond our reach rejecting the possibility for humanity to maintain a relational connection with natural processes. This in turn, marks human altered lands as "unnatural" - removing manufactured landscapes from thoughtful discourse and meaningful interaction with their surrounding "natural" environment. This thesis however embraces the industrialist definition which rightfully challenges the environmentalist perspective and views humanity simply as a natural occurrence within the ecological morphology of nature. This concept invites humanity into a relationship with nature granting the potential for us to engage with the natural environment in a more profound and dynamic way than we have traditionally in the past.

## FROM COHABITATION TO DOMINANCE

Our relationship with the natural environment has shifted over time. Friedrich Engels defines the shift as, "the transforming reaction of man on nature."[6] This idea is based from an assumption that humanity has transcended nature, and therefore has taken an omnipotent roll - reshaping the form and characteristics of nature in order to benefit our own agenda. The further enriched by the manipulation of nature as commodity, the further departed humanity becomes from the natural world. This relationship is socially and culturally constructed and does not apply in all situations. First Nations and Native Americans still believe that,

> All things are animate, imbued with spirit, and in constant motion. In this realm of energy and spirit, interrelationships between all entities are of paramount importance, and space is a more important referent than time.[7] (Leroy Little Bear)

5 Lorne Leslie Neil Evernden, *The Social Creation of Nature* (Baltimore: Johns Hopkins University Press, 1995), 15.

6 Friedrich Engels, *Dialectics of Nature* (London: Wellred, 2012), 34.

7 John Ralston Saul, *The Comeback: How Aboriginals Are Reclaiming Power And Influence* (Toronto, Ontario: Penguin Canada Books, 2014).

By rethinking our dominance over nature as the extreme of our reliance on nature, we can more tactfully study the relationship that we share with our surrounding natural environment.

### *HUMAN LANDSCAPES AS “NATURAL” LANDSCAPES*

> Treating the relationship between the organic and the mechanical as a dualistic system, the ethical framework of the bionic worldview must reject as its basis the concepts of an autonomous individual and a morally neutral technological world, but must instead be founded on the symbiotic interactions that exist between technology and organic life…the problem that we now face is not protecting the organic from mechanical interference but recognizing that technology has become part of our environment, that “artificiality” is part of the “natural” condition of the world.[8]

We impact nature and, in turn, nature impacts us. Within this systemic reciprocity the natural environment and ourselves are continually interacting with, modifying, and affected by, landscape. In *The Social Creation of Nature*, Niel Evernden suggests that our role may extend beyond a mere participant in the status quo of natural processes. He instead proposes for humanity to function as “an agent of ecological renewal.”[9] Like a purging fire that devours the forest - our seemingly destructive impact on nature may be part of a greater process that reinvigorates and redefines the landscape. With this agency we must no longer view the manufactured landscape as a liability but rather an opportunity - one that demands our continued involvement for its development. Our activities within the natural environment should no longer be interpreted as artificial but rather as part of the natural process.

## HISTORICAL RELATIONSHIP WITH NATURE

Naturally formed landscapes once shared the same conflict that our current manufactured landscapes now face. Lack of understanding and engagement left the beautiful and dangerous alpine landscapes of the Eastern Alps absent from human interaction and recreation. It was not until the late 1880s that alpinists were able to replace “the monsters and demons of the medieval Alps with new, more positive imagery.”[10] Through a series

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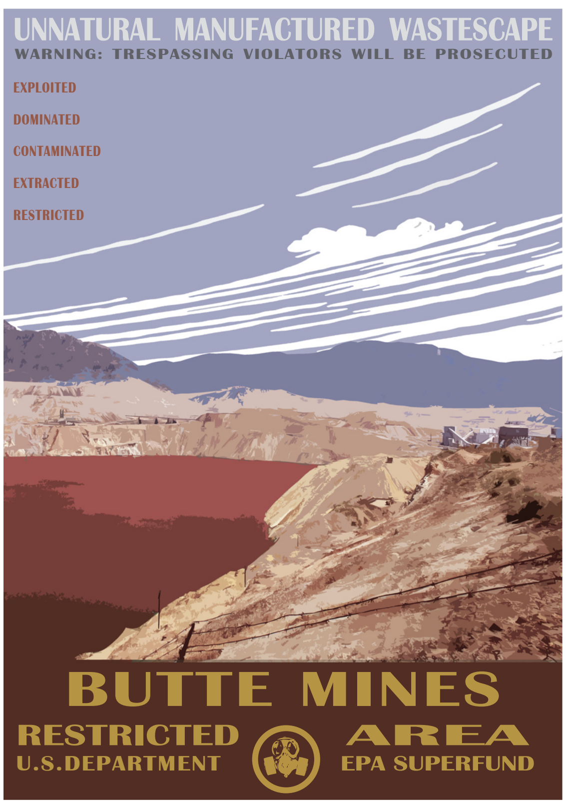
8 David F. Channell, *The Vital Machine* (New York: Oxford University Press, 1991), 151.

9 Lorne Leslie Neil Evernden, *The Social Creation of Nature* (Baltimore: Johns Hopkins University Press, 1995), 13.

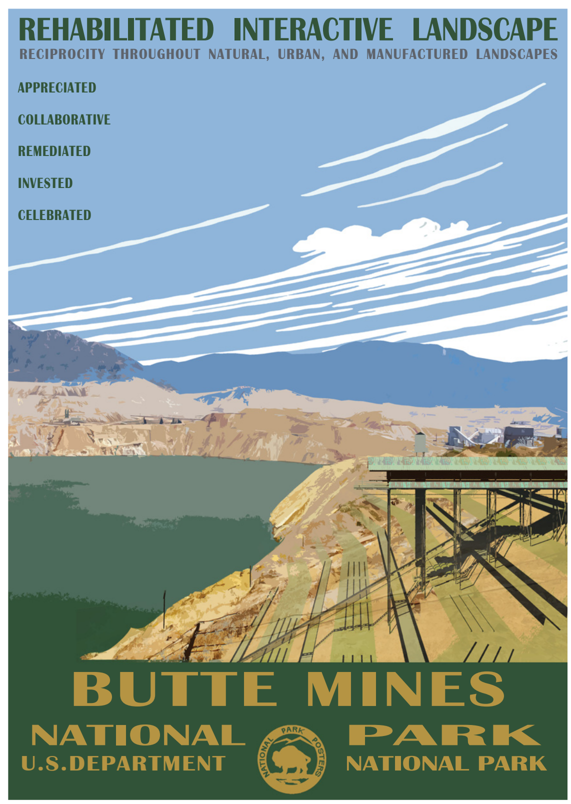
10 Ben M. Andersin, “The Construction of an Alpine Landscape: Building, Representing and Affecting the Eastern Alps, c. 1885-1914”, *Journal of Culture and Geography* 29, no. 2 (2012): 155-183.

of urban art installations, graphic and physical representations, and the construction of extensive networks of paths, huts, and viewpoints - the natural landscape of the eastern Alps were finally made socially, culturally, and physically available to human inhabitation.

This systematic push for engagement with the natural landscape parallels our current need to reconnect with our manufactured wastescapes. Just as the Alpinists of Europe fought to dispel the non-existent and socially created “monsters” of the natural landscape, we too can follow their method to eliminate the stigma surrounding these spaces. Today the natural landscapes that we once feared have now become the places we wish to visit - the most extreme of these landscapes being promoted and preserves as National Parks.




Butte Montana’s Berkeley Pit.




Butte Montana’s Berkeley Pit Mine reimagined as a reclaimed and publicly accessible park.

Representation Inspired by the U.S. National Parks Works Progress Administration Posters.

### *THE BIASES OF THE "NATURE" PARK*

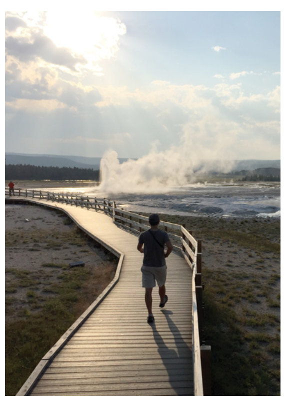
The National Parks promote a seemingly immersive experience for one to dwell amongst presumably "untouched" land to learn the ecology, heritage, and history of these places. These are wonderful places, yet they fall short of accurately portraying the current state of our true relationship with the vast majority of the environment. Great effort is taken to maintain and restore these "natural" places through the monitoring and limitation of our interaction with these sites as well as the removal of our impacts within them.

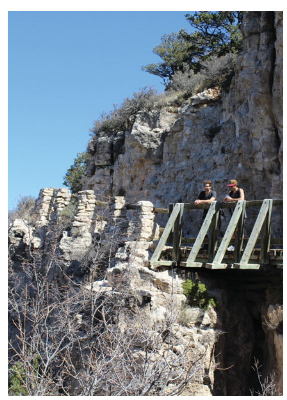
> The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations.[11]

James Corner's position on landscape as, "an ongoing medium of exchange" suggests these desires to "preserve unimpaired" these places may not be acknowledging the true essence of landscape as an ever-evolving medium.

Despite the National Park Service's desire to leave the land unimpaired, our mere presence within these sites still leaves them altered. Though sensitive and limited in their footprint, simple interventions construct a manufactured layer within these otherwise natural landscapes. These modifications provide vital access for the public to experience these previously hazardous and fragile places - allowing us to better understand, engage with, and tame these previously wild landscapes.


Desert View Watchtower
Photo by Mike Koopsen


Boardwalks


Bridges


Terraced Pathways
Photo by Adriana Bermudez

Man-made alterations to Provide Public Access in the U.S. National Parks.

11 The National Parks Service Mission Statement: https://www.nps.gov/aboutus/index.htm

## LANDSCAPE RE-IMAGINED

> [Manufactured landscapes are] places that are almost never visited - places where the earth has been gouged out, or piled high with manufactured waste - places where human activity has significantly reshaped the surface of our world.[12]

The manufactured landscape embodies a similar conflicted relationship to the one we once shared with the natural environment. With the taming of the natural frontier there are no untouched 'wilds' left.[13] It is amongst the ruins of the post-industrial frontier that the next chapter of exploration presents itself. Here we can witness the wondrous impacts that we have had on the land as well as natures' power to adapt and transform due to our actions. Within this "medium of exchange"[14] we can test new methods to draw attention to the connectivity we share with nature in order to reimagine our position in this relationship. These places maintain a collective memory of our industrial past but also hold the potential to redefine the nature of this relationship for the future.

> [...] industrial ruins produce new kinds of space that are imbued with powerful meaning... Yet because their meaning and purpose are delineated and require imaginative, sensual, and conjectural interpretation... encounters with industrial ruins are liberating experiences.[15]

Here "both site and materiality of landscape provide an experimental laboratory, a cultural testing ground to be directly engaged and experienced."[16] Experimentation has begun but a deeper investigation can only help bring about a more culturally significant reason for recovering these landscapes. As James Corner laments,

> Clearly, an ecology of human creativity – as exemplified in adaptive, cosmographic, and artistic practices – has yet to be developed in resistance to an increasingly uncritical, scientistic ecology that refers to an increasingly abstract 'environment'.[17]

There is an opportunity for our response to the manufactured landscape to unify both these scientistic processes of ecological reclamation with the imaginative possibilities that this re-emerging frontier has to offer.

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12 Lori Pauli, "Seeing the Big Picture" in *Manufactured Landscapes* (New Haven and London: Yale University Press, 2009), 10.

13 William M. Denevan, *The Pristine Myth: The Landscape of the Americas in 1492* (Malden, MA: Blackwell, 1992).

14 James Corner, and Alison Hirsch, "Recovering Landscape as a Critical Cultural Practice." In *The Landscape Imagination. The Collected Essays of James Corner, 1990-2010* (New York: Princeton Architectural Press, 2014), 111-129.

15 Tim Edensor, *Industrial Ruins: Space, Aesthetics, and Materiality* (Oxford: Berg, 2005).

16 Corner, *The Landscape Imagination,* 124.

17 Ibid., 122.

## POST - INDUSTRIAL PARKS

A number of notable architects and landscape architects have explored the potential of post-industrial and manufactured landscapes. Gasworks park by Richard Haag was "one of the first post-industrial landscapes to be transformed into public place."[18] Haag maintained the character and industrial heritage of this site by saving its iconic infrastructure - though they remain fenced-off within a "forbidden zone"[19] due to safety concerns.

Haag's work inspired similar adaptive parks such as Landschafts Park in Duisburg Nord, Germany. Here Latz + Partner converted a massive industrial wasteland into a public amenity where the industrial ruins can actually be explored, touched, and even climbed. Additionally within the same post-industrial landscape of the Germany's Rurhe region, OMA created a master plan for how to redevelop and transform the industrial complex for the abandoned Zollverein Industrial Complex, in Essen, inviting Sanaa, and Foster+Partners to add educational facilities, museums, restaurants and event venues. Landscape Architects Latz + Partner were also involved in this project and designed the park spaces and pathway networks. These additions to the existing fabric of the industrial ruin provide educational components that are used along with the park to broadening public understanding of this place and its historical role and influence on the land.

James Corner Field operations is currently working on the reclamation of the Freshkills Landfill In New York. This massive project has been designed to reclaim the site over the next 30 years and will open to the public in phases.[20]

Each of these projects only bring the public into these sites after the reclamation process is complete. By building upon the progress made in this field of post-industrial park design, we can seek to expand our understanding of these manufactured landscapes during the reclamation process by analyzing the systems that formed these places and finding similar inhabitable conditions that they share with more traditionally "natural" landscapes.

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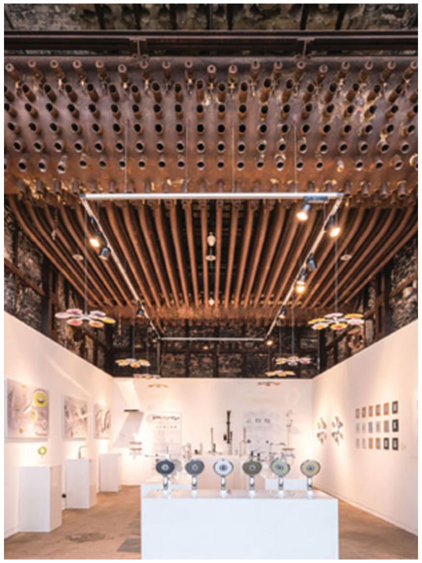
18 Thaïsa Way, *The Landscape Architecture of Richard Haag: From Modern Space to Urban Ecological Design* (Seattle: University of Washington Press, 2015), 147.

19 Miranda Ray. "Gas Works Park." *Atlas Obscura* (blog), November 16, 2016. https://www.atlasobscura.com/places/gas-works-park.

20 "Freshkills Park." Field Operations - Project_details. Accessed March 25, 2018. http://www.fieldoperations.net/project-details/project/freshkills-park.html.

Industrial Backdrop at Gasworks Park
Photograph Courtesy of Rich Haag Assoc.

Climbing  the Ruins at Landschafts Park
Photograph by Kletterarena



Red Dot Museum at Zollerien
Photograph by Sebastian Kautz

Phased Reclamation at Freshkills Park
Image by Freshkills Park/City of New York

## NATURAL ESSENCE OF THE MANUFACTURED LANDSCAPE

Though the root cause of the “natural” and manufactured landscape differ, their resulting formations are not so dissimilar. Both find their origin in extreme and often-hazardous geological events. The scars left behind define some of the most unique places on the planet - alien landscape of great horror and beauty that peek our curiosity and draw us toward them. This duality spans across both the natural and the manufactured landscape yet while the formations found within the natural landscape have been made habitable and encourage public engagement, similar conditions found in the manufactured landscape remain off limits.

Traditionally landscapes are known to be scarred by natural processes of; wind, water, volcanic, and seismic activity. These forces produce some of the most striking, diverse, and uniquely formed landscapes and ecosystems on the planet. The most iconic of these sites are often the most volatile and dangerous, yet do to a carefully designed network of paths, boardwalks, refuges, and overlooks, these places are now promoted and visited by roughly 282 million people every year as the United States National Parks.[21]

Humanity’s impact on the land come from; settlement, economics, extraction, and industry. The scars we leave behind manifest themselves in quarries, mines, dams, canals, landfills, cities, suburbs, shopping malls, etc. These scars are not often regarded with the same esteem as those found in the National Parks. This disregard for these places proliferates our dominion and exploitation at these manufactured sites, resulting in a growing number of hazardous wastescapes. Do to short-sighted greed and disillusion with our actions, many of these places are closed to the public - unintentionally broadening their disconnect from natural and social engagement.

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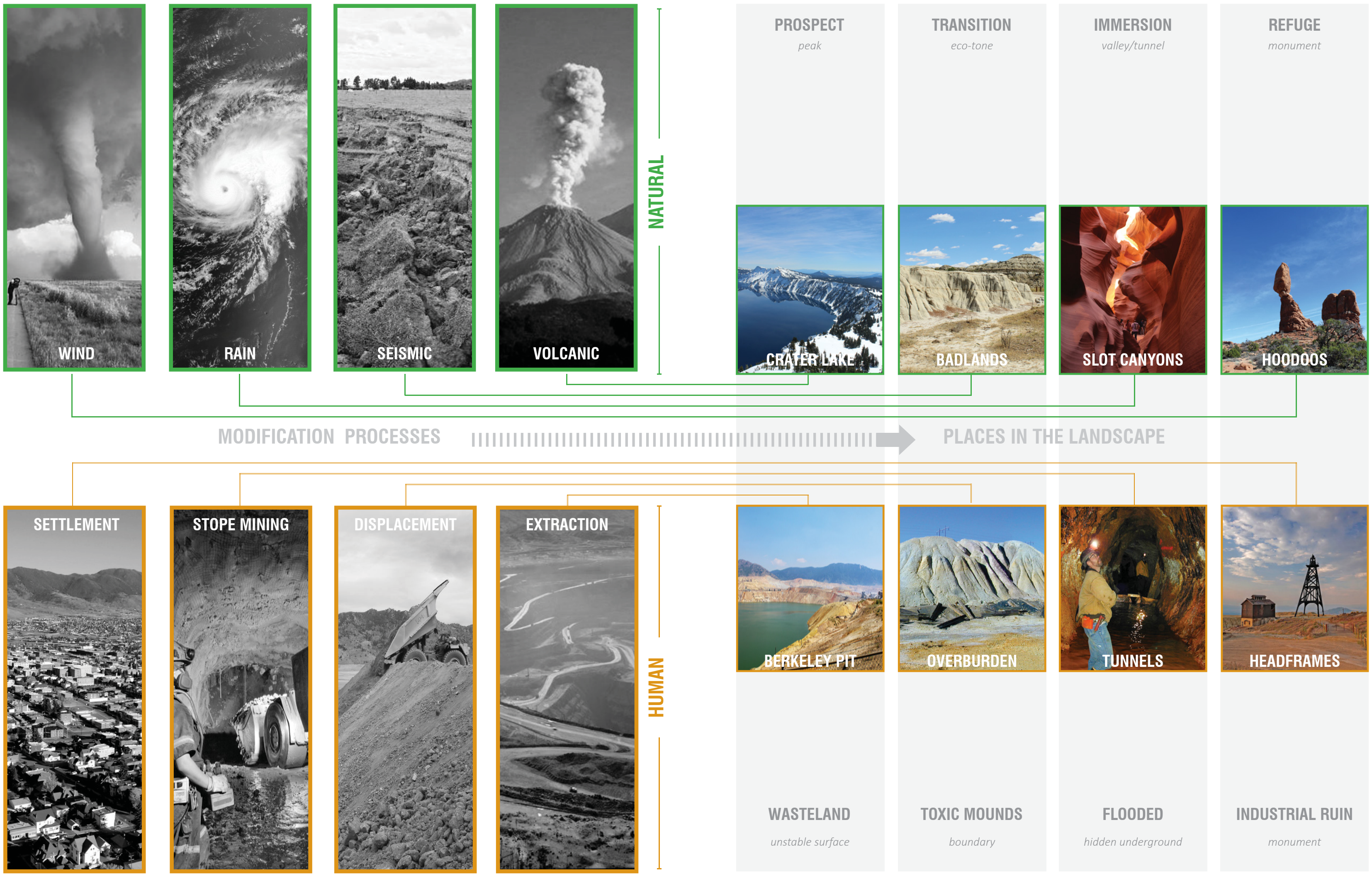
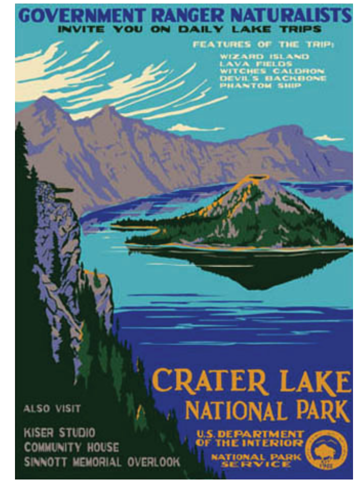
21 Jennifer Errick. “Park Service Releases Most-Visited National Park Data for 2012.” *National Parks Conservation Association*. Last modified April 3, 2013. https://www.npca.org/articles/202-park-service-releases-most-visited-national-park-data-for-2012.

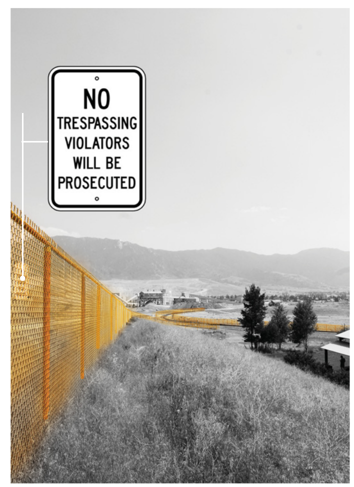



Natural and Human processes that scar and form the landscape. Wind: Brandon Goforth; Rain: Jeff Schmaltz; Seismic: GNS Science; Volcanic: Jessica Ball; Settlement: Matt Hoffman; Stope Mining: Teresa Andrepoint; Displacement: Walter Hinick; Extraction: Library of Congress



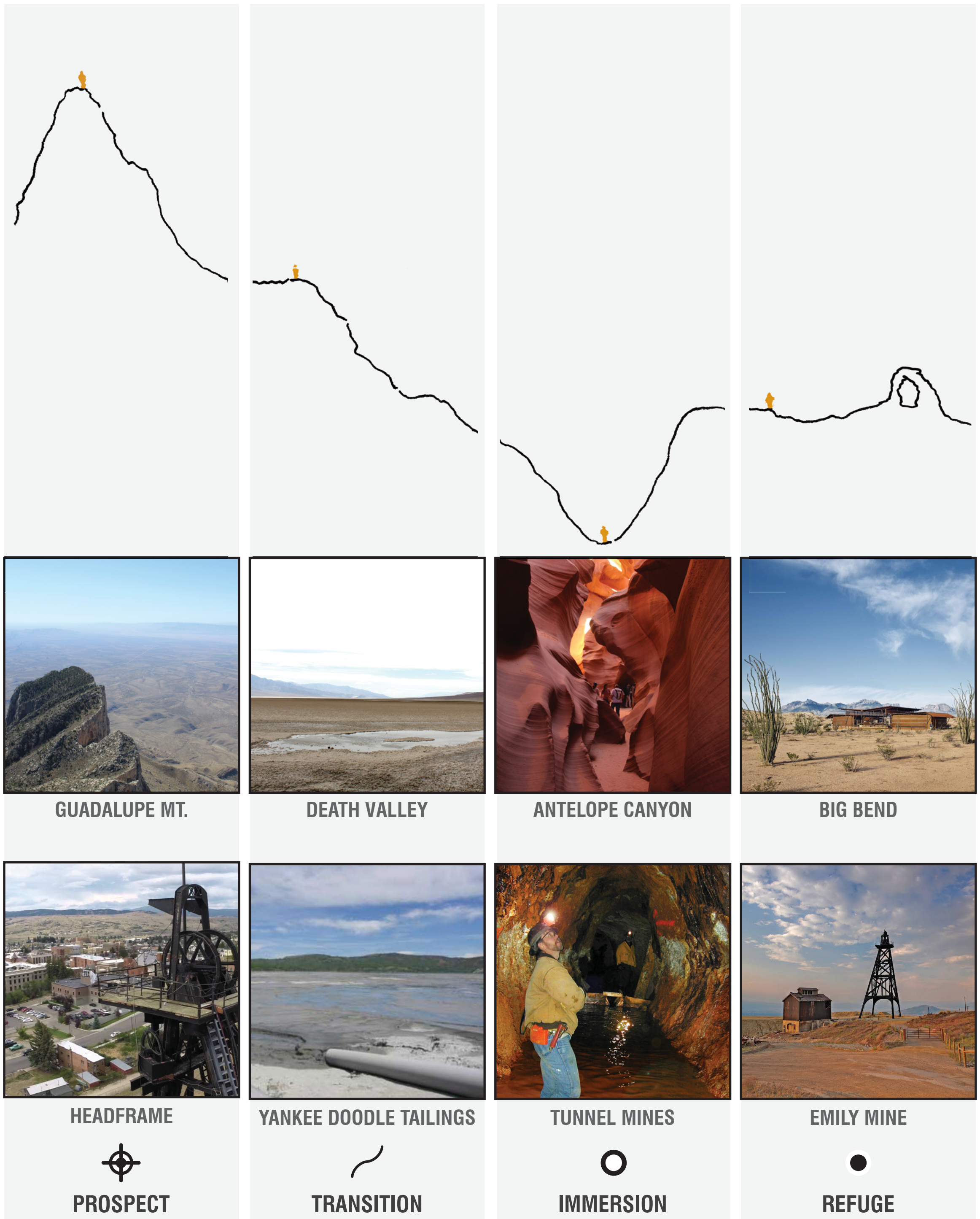




Promotional Tourism Posters for the United States National Parks - Images from: Works Progress Administration.




Posted Signs and Barriers around Mining Sites in Butte, Montana. Photographs by Mike Albans, and Google Maps API.

***EXPERIENTIAL CONDITIONS***




Experiential Conditions in the “Natural” and Manufactured Landscape.

### *PROSPECT*

Prospect sites often take place at points of high elevation, providing expansive vistas. These sites create visual links with their greater context.

Prospect from the Top of Guadelupe Mountain

Prospect at the Top of the Original Mine
Photograph by VintageSlots

### *TRANSITION*

Transitions within the landscape mark the edge between various geological or ecological zones. These linear swaths of land are often in constant motion - shifting as erosive and sedimentary activities morph the landscape.

Transition at the Yankee Doodle Tailings
Pitwatch.com - Photograph by Justin Ringsak

Transition at the Salt Flats of Death Valley

***IMMERSION*** ○

Immersive spaces allow for one to be fully absorbed into the topographical, contextual, and ecological properties of a space. These places provide opportunities for engagement with, and alteration of the landscape.

Immersion in Antelope Canyon

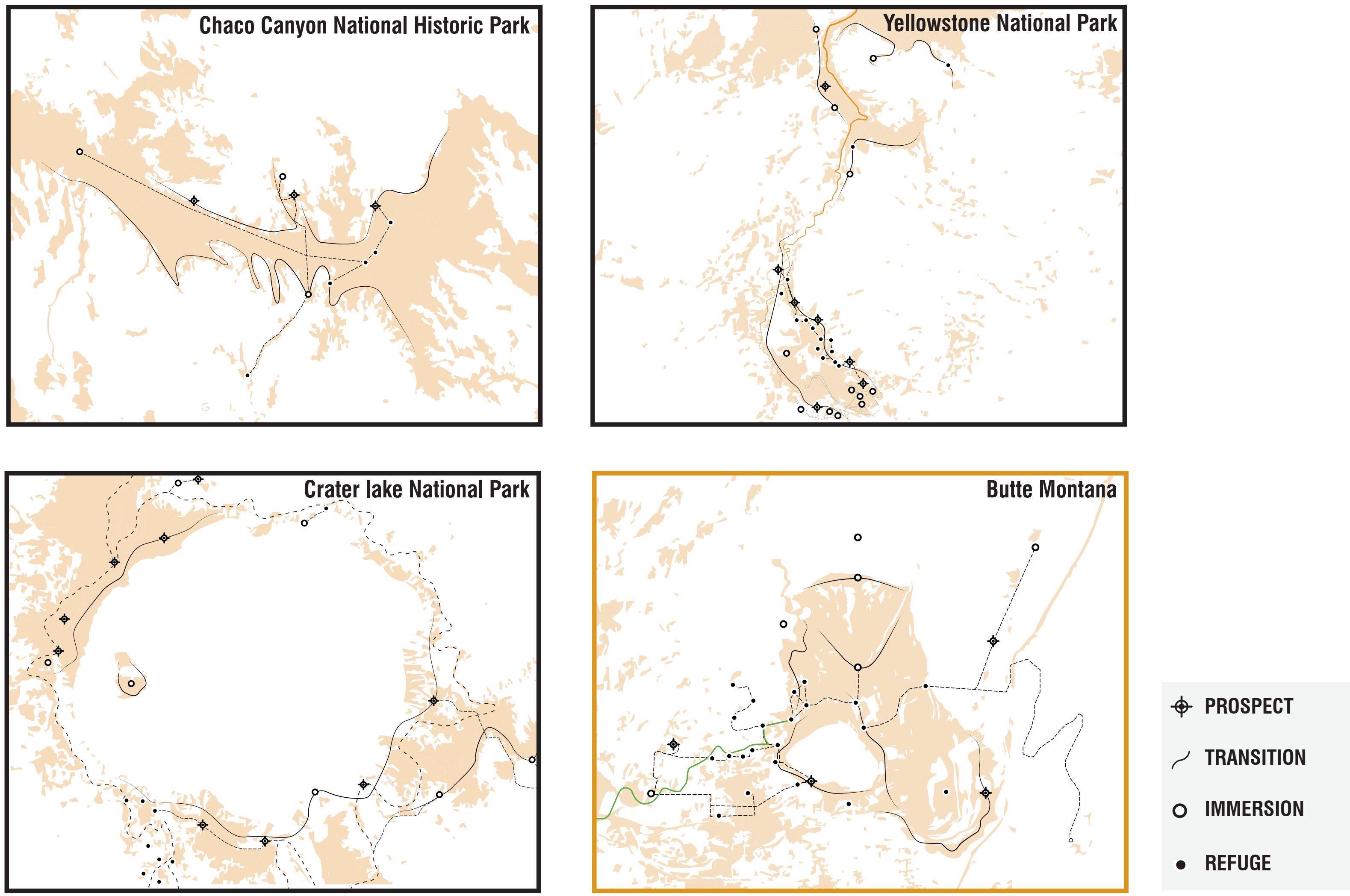
Immersive Tunnel Mines Below Butte, Montana
Photograph by Todd Trigsted

***REFUGE*** ●

Places of refuge offer shelter and an opportunity for communal gathering and/or rest and reflection. These sites may be landforms or constructed elements.

Refuge and Exhibit in the Desert of Big Bend
Lake|Flato Architects - Photograph by Casey Dunn

Informal Refuge at the Ruins of the Emily Mine
Photograph by Sunny Thronborrow




Experiential Conditions and their existing trail networks mapped throughout the National Parks and compared to the manufactured landscape of Butte, Montana.

## CRITICAL POSITION

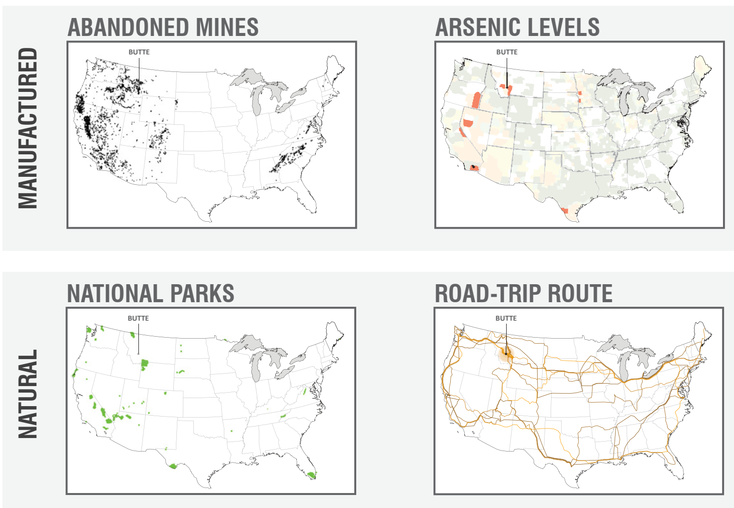
Manufactured landscapes, even though altered from their traditionally considered "natural" state, are still part of our natural environment and therefore change its geological, ecological, and even hydrological systems. The scars inflicted, no matter how contaminated or volatile, can and should be treated just as any other hazardous condition found in the natural landscape. We must not view these spaces as liabilities but rather as opportunities to create new ways of engagement and usage over time. By analyzing how natural and human processes both modify and construct landscape, and by comparing the qualities of their resulting formations, we can find similar experiential conditions amongst them. By understanding the connections between the environmental and natural systems, we can better understand our role historically in the alteration of nature, and as well where within these systems we can intervene to influence the greatest change. The thresholds and edges between these systems of geology, hydrology, urbanization, industry, and extraction hold the greatest opportunity for exploration in a repositioning of our cultural and architectural relationship with the manufactured landscape.

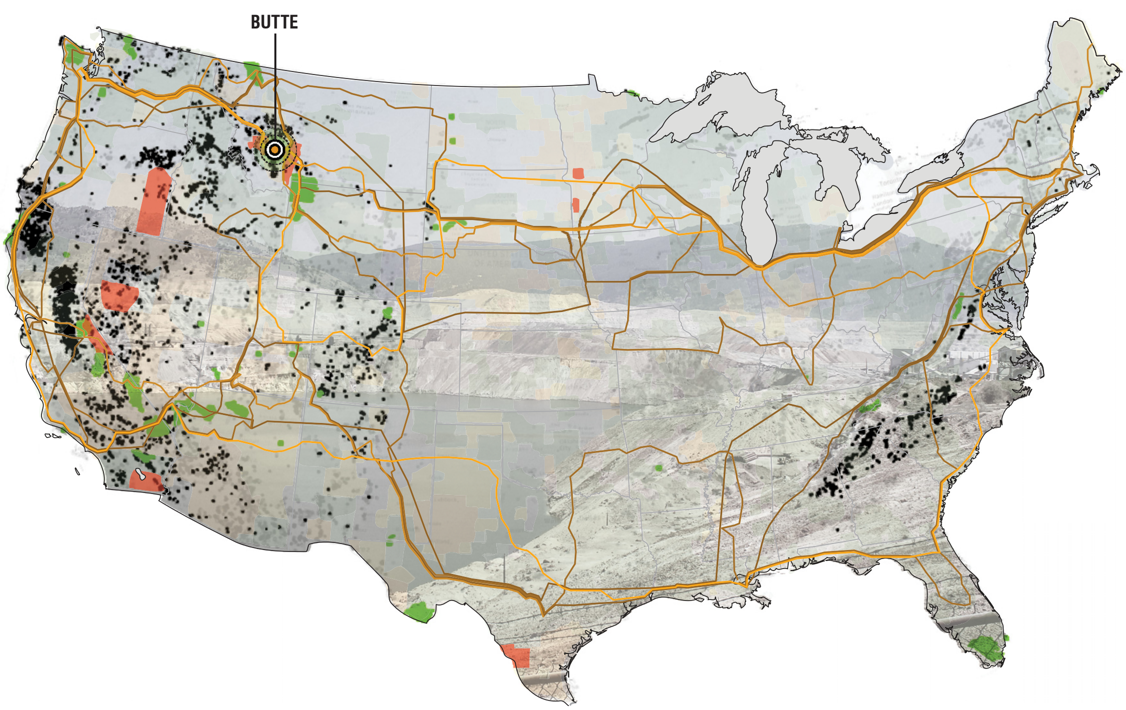
## THESIS QUESTION

In engaging in the reclamation process of our neglected and manufactured waste-scapes, can architecture not only inform how we connect to these landscapes, but also transform our relationship to these spaces, and how they interact with the rest of the natural environment?

# CHAPTER 2: SITE ANALYSIS

The mining town of Butte Montana will form the test site for this thesis. It was chosen through the mapping of mining operations, focusing specifically on large scale abandoned surface mines in the United States, and overlaying the current National Parks and most common road-trip routes. Butte is located directly between Yellowstone and Glacier National Park with a high volume of through-traffic from adventure seeking road-trippers making it ideally positioned to be added to the National Park tourist route.



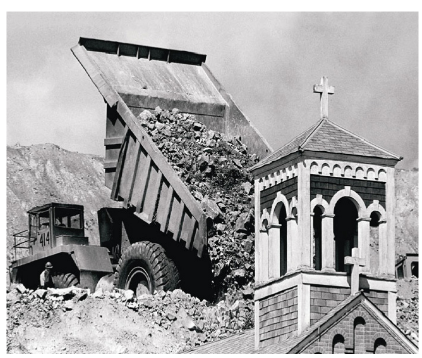

Manufactured and "Natural" Landscapes of the United States. Information from USGC, Geotimes, and Sky Truth.

## BRIEF HISTORY OF BUTTE, MONTANA

Butte Montana was once considered the richest hill on Earth. As the mining operations grew, and the techniques changed, so did the mines' impact on the urban and natural landscapes. Tunnel mining evolved into open pit mining which relentlessly swallowed portions of the town while burying others. Overburden (excess soils and waste) was mounded around the pit and was used to infill a natural ravine to the North in order to dam up the Yankee Doodle Tailings Pond. These alterations to the landscape drastically changed the ecology, hydrology, and geology of the site as well as the lives of the city's citizens. As the mine closed, it's effect on the ecological and social landscape changed. The economy stagnated, and Butte grew quieter as the population slowly waned. As the pit lay dormant the remaining citizens awareness of the mine has begun to fade.

The Berkeley Pit has since been deemed an ecological disaster site and is the largest super-fund site in the United States. Though many attempts to restore this landscape have been made, there is currently no unanimously approved or economically sustainable plan to fully clean it up. The Environmental Protection Agency (EPA) has taken steps to filter the water and prevent the pit from rising to the critical elevation (5410') but this action is not a solution but rather a mitigation of the problem.[22]

Mt. Con Mine and Centerville
Photograph by David T. Hanson



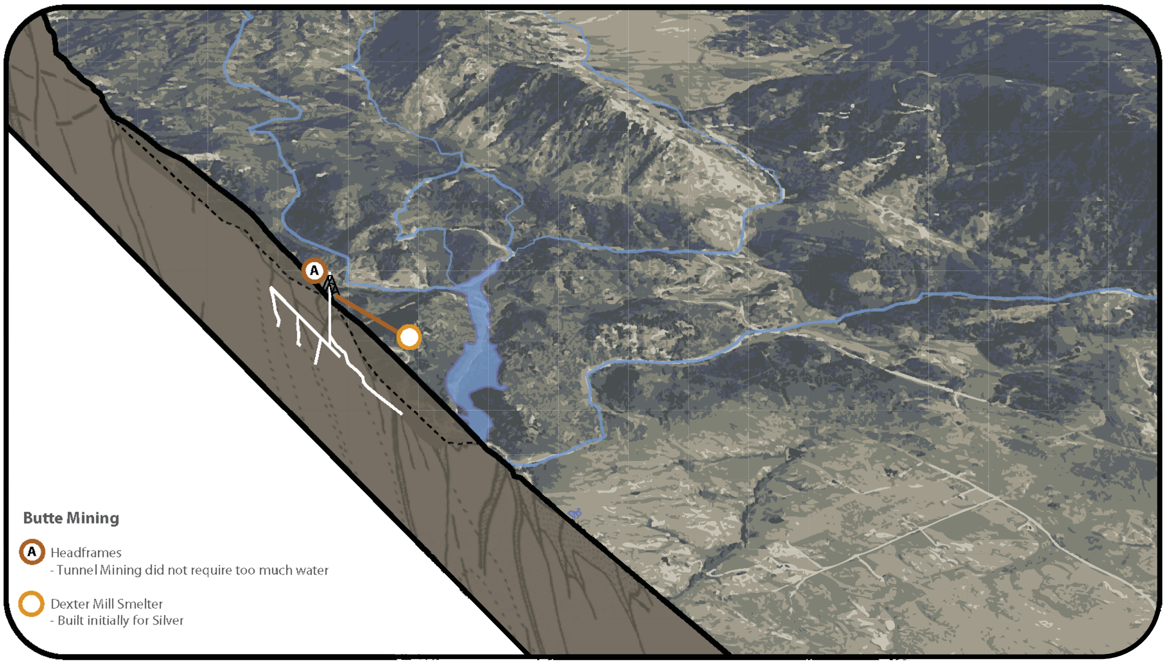
Holy Saviour Church Buried
Photograph from Pitwatch.com

Dead Goose in the Berkeley Pit
Photograph from Montana Standard

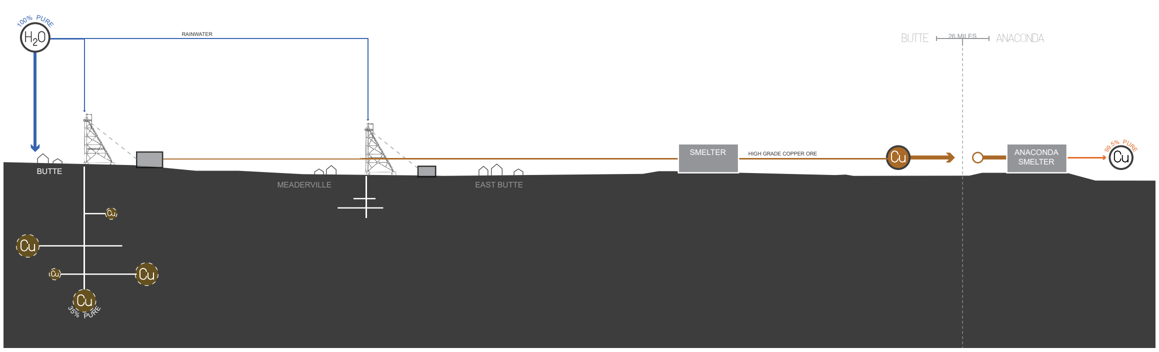
22 Pat Kearney, *Butte's Berkeley Pit* (Montana: Skyhigh Communications, 2014), 227-228.

# MANUFACTURING THE BUTTE LANDSCAPE

1856 - 1879

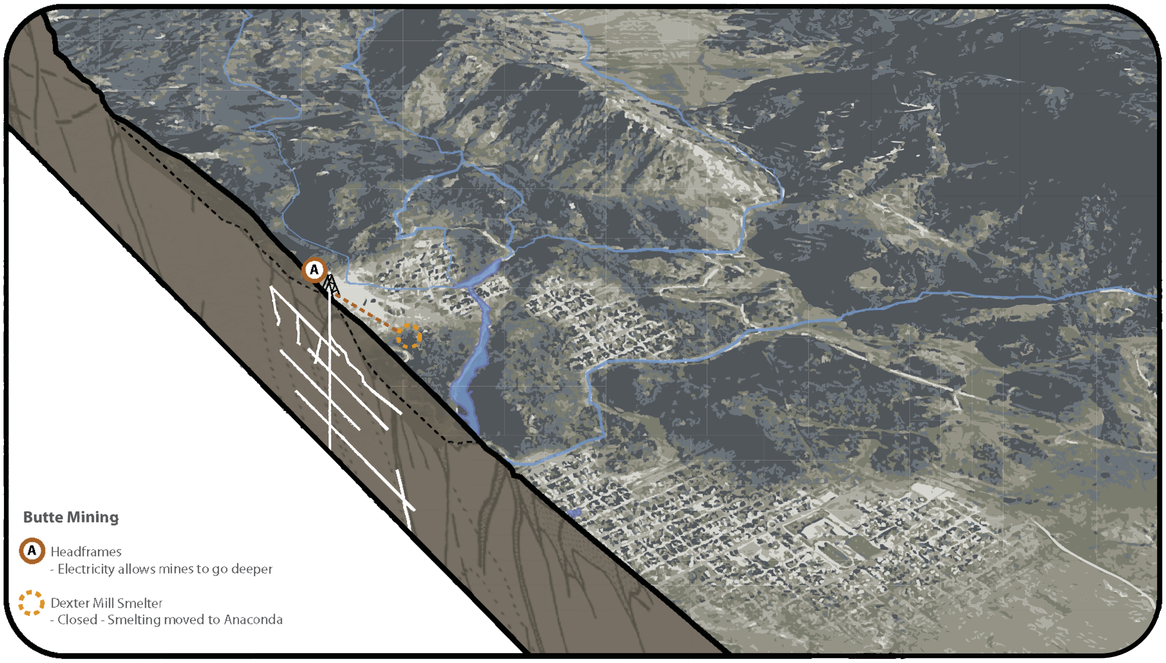



| | |
|---|---|
| 1856 | Prospectors discover holes dug by Native Americans |
| 1864 | Gold discovered in Summit Valley |
| 1866 | Population: 50 |
| 1875 | Silver discovered at Travona Mine |
| 1876 | Marcus Daly purchases mining properties in Walkerville. Introduces waterpumps to mine below the water table. Changes mining in Butte. |
| Alexander Graham Bell invents the telephone. | |
| Thomas Edison invents the incandescent lightbulb. | |
| 1879 | Dexter Mill (smelter) built to process silver. |



# MANUFACTURING THE BUTTE LANDSCAPE

1880 - 1917




1880 → Alice Mine installs electric lighting in the mine. Revolutionizes mining and allows for hoist systems to follow copper veins deeper.

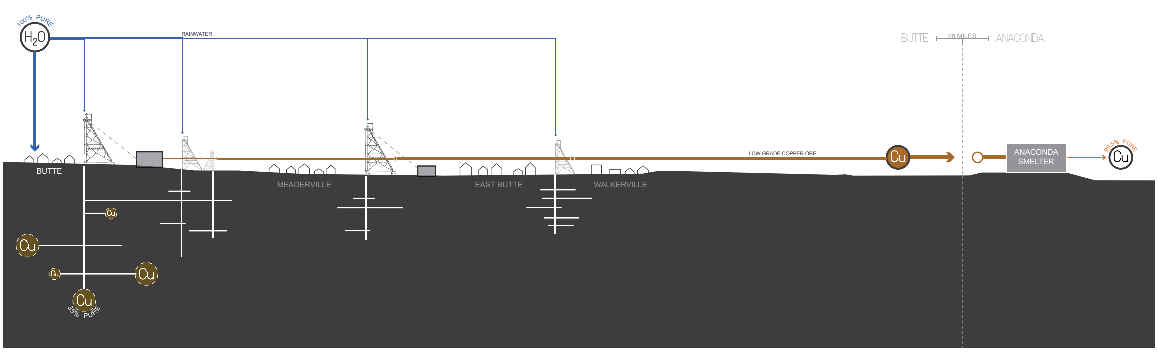
1884 → Warm Springs Creek Smelter begins operation in Anaconda, 26 miles Northwest of Butte. Ore shipped here for processing

1910 → Amalgamated Copper Company reorganized as the Anaconda Copper Mining Company and gains total control of mining operations on the Butte Hill.

1914: WWI begins - high demand for copper.

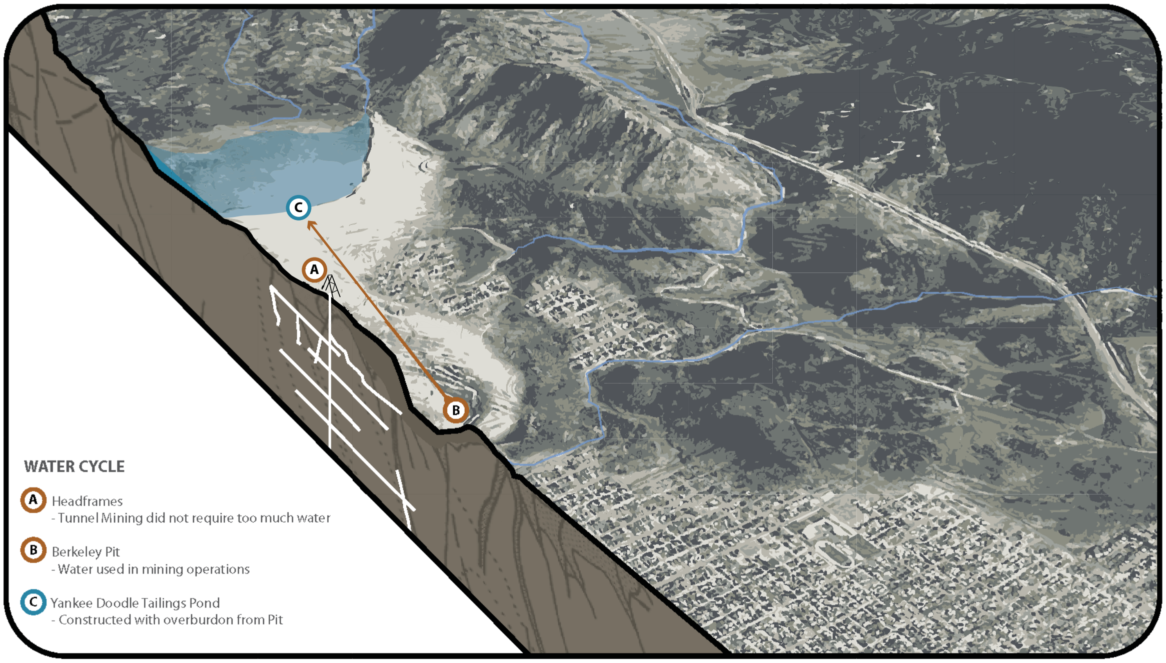
1916 → 292 million tons of copper are mined setting a record.

1917 → Mining abroad in Chile begins to drain the economic wealth of the Butte Mines

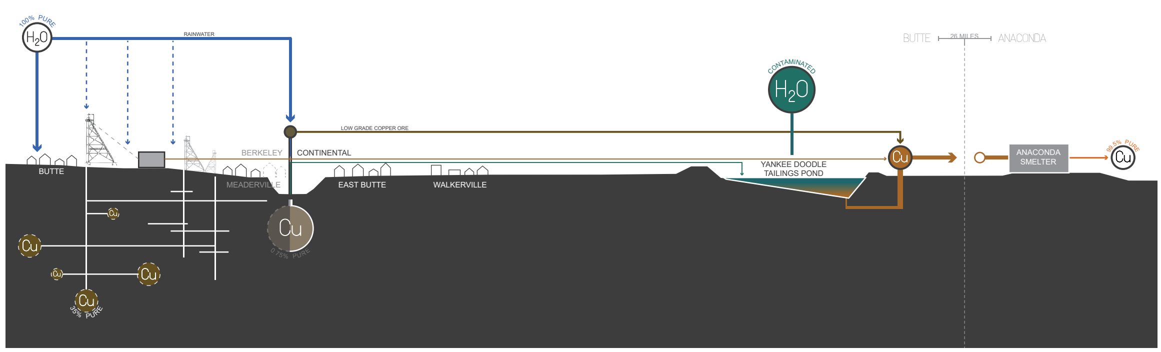


# MANUFACTURING THE BUTTE LANDSCAPE

1918 - 1959

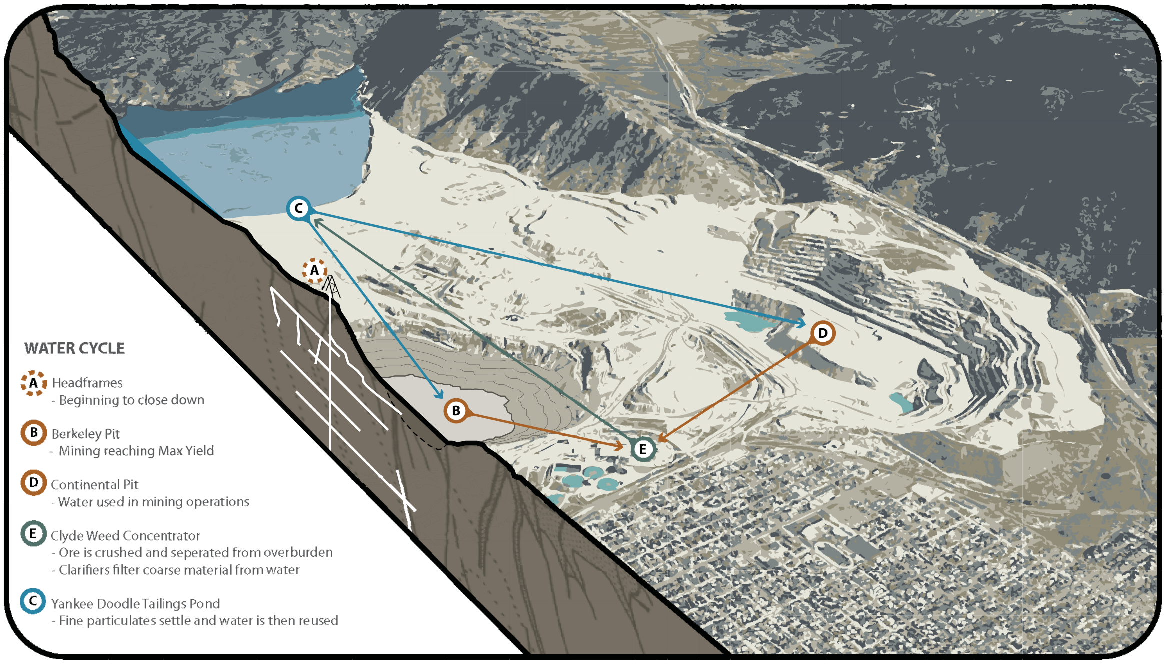



| | |
|---|---|
| 1947 | The Greater Butte Project announces plans to mine low-grade copper ore. |
| 1948 | The Kelley Mine begins new method of Block Cave Mining. Extremely dangerous. |
| 1949 | The Anaconda Company secretly begins developing plans for an open pit mine. |
| 1950 | Population: 48,422 |
| 1955 | Digging begins at the Berkeley Pit (0.75% pure copper ore)<br>Mining for: Copper, Zinc, Manganese, Lead, Silver, Gold. |
| 1959 | Anselmo and Emma zinc mines close after major strike - never to re-open.<br>Berkeley Pit grows closer to Walkerville, Meaderville, and East Butte. |



## MANUFACTURING THE BUTTE LANDSCAPE

1960 - 1973




1963 —— Clyde Weed Concentrator (15 building complex) built in Butte, just South of the Berkeley Pit. Separates waste rock and grinds ore into concentrate before shipping to Anaconda for smelting

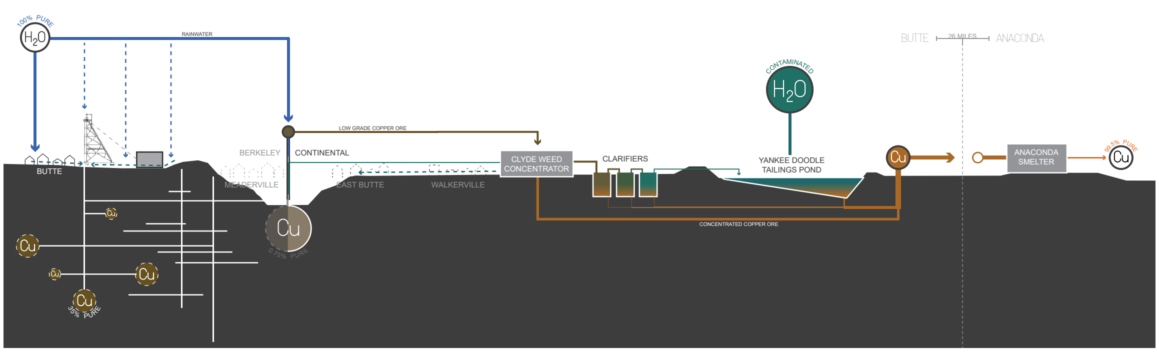
1965: Vietnam War - high demand for copper.

1967: Global market oversaturation with copper.

1968: U.S. begins importing copper.

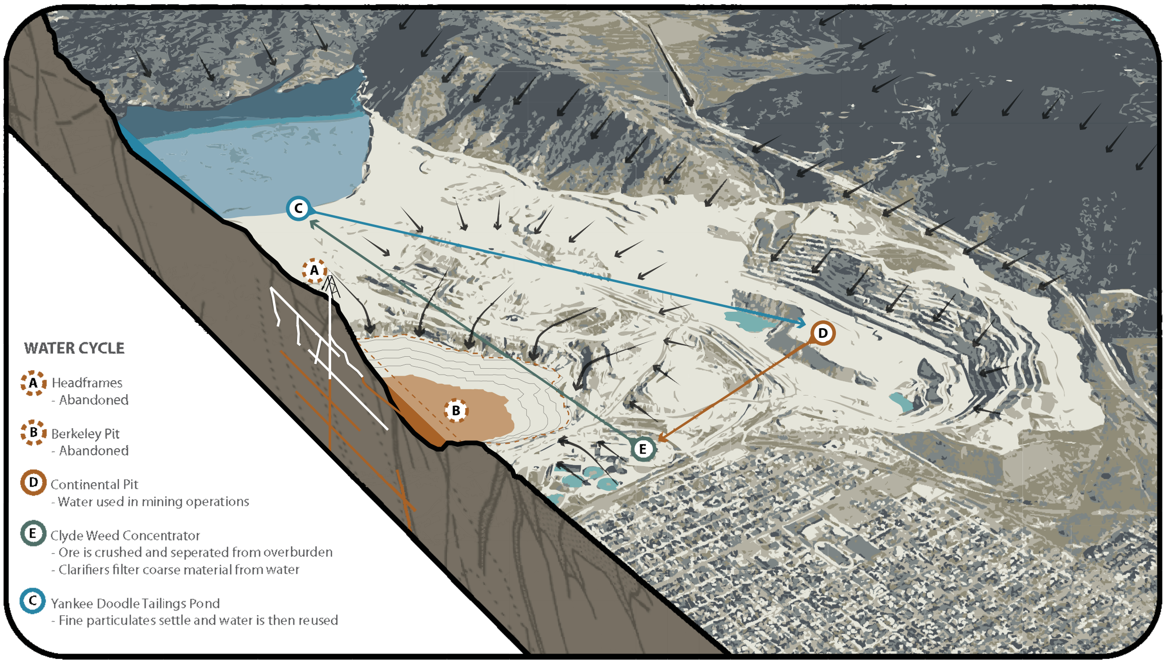
1964 —— Meaderville completely abandoned. Begins collapsing into underground mines

1973 —— The Anaconda Company begins buying up properties in McQueen.
Columbia Gardens burns down.
Continental Pit begins digging at this site.
Holy Savior Church buried under overburden from Berkeley Pit.



# MANUFACTURING THE BUTTE LANDSCAPE

1974 - 1998




April 23, 1982 → Atlantic Richfield shuts down operations at the Berkeley Pit and turns off the water pumps at the Kelley Mine. The Pit slowly begin to fill with acidic water.

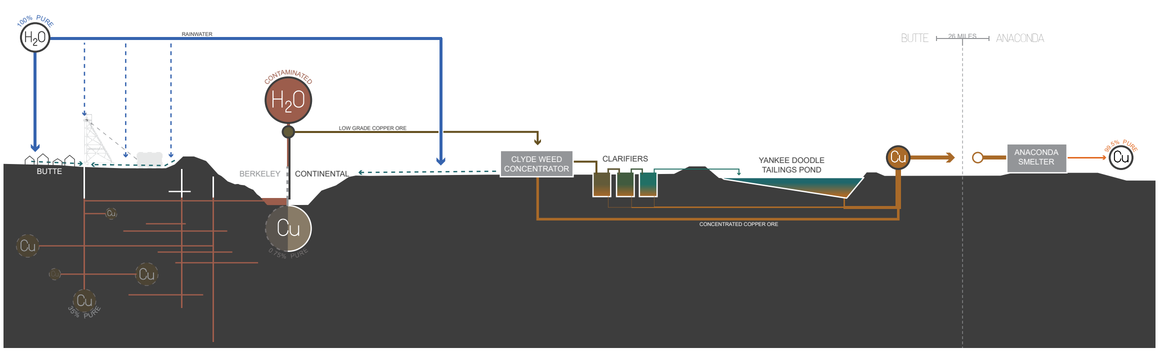
1984 → U.S. government designates the Berkeley Pit as a Superfund site.

1990 → EPA begins studies for cleanup

1994 → Record of Decision announced for the Berkeley Pit cleanup

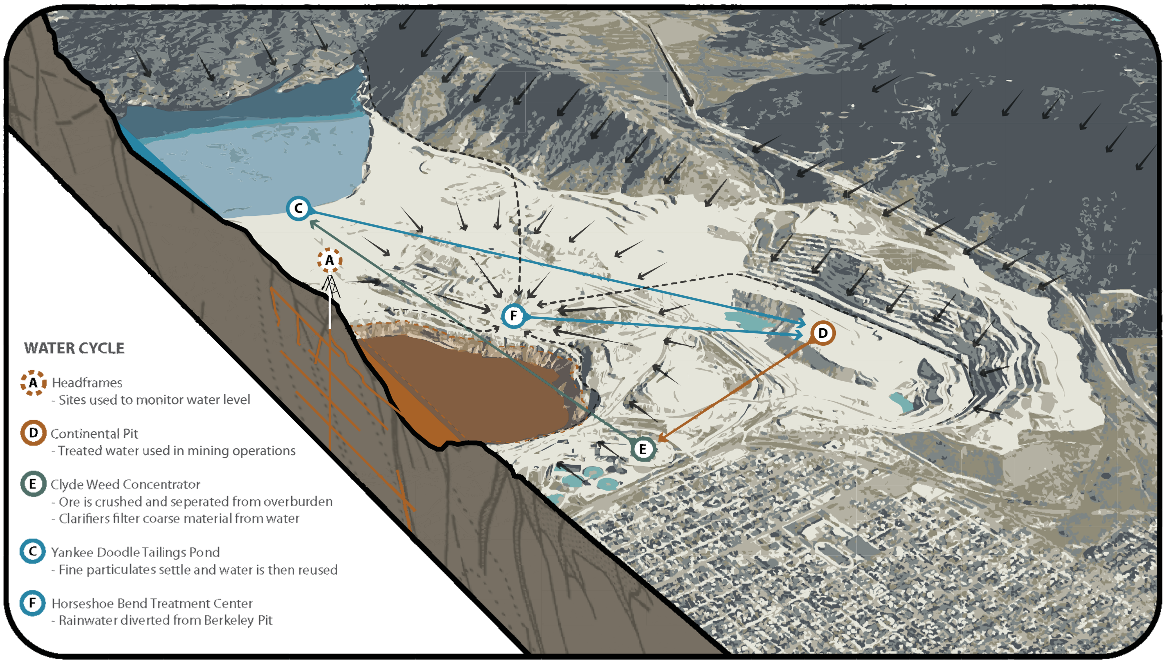
1996 → Pumping systems at Horseshoe Bend divert nearly 50% of water flow from entering the Pit.

1998 → Landslide at the Berkeley Pit rim.



# MANUFACTURING THE BUTTE LANDSCAPE

1999 - 2016

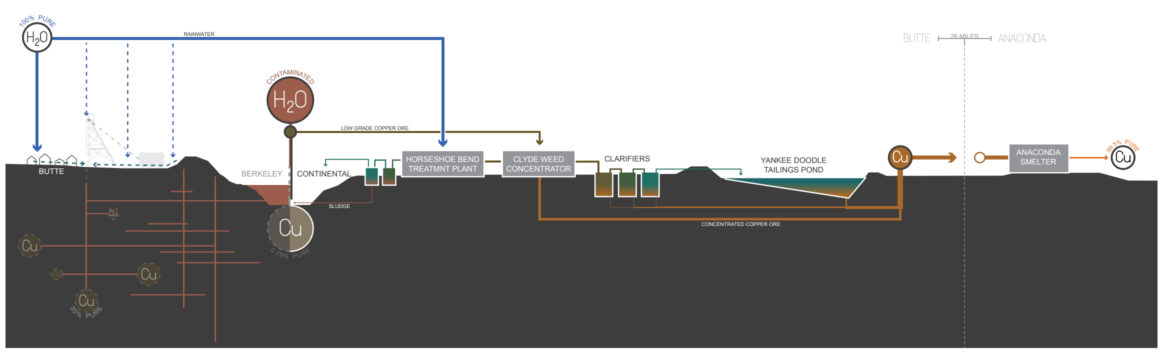



2008 — Horseshoe Bend Treatment Plant passes performance standard testing but still fails to lower the pH levels of the highly acidic water.

2012 — Minor landslide damages the Montana Resources pontoon boat used for water quality sampling in the Pit

2013 — A massive 550 foot wide collapse of the southeast wall raises the water level 0.6 feet. Equal to a months average rise. The slough damages pumps which were being used to mine the water for copper ore. Sampling of water is suspended due to safety concerns.

2016 — 3,000 - 4,000 migrating geese land in the Berkeley Pit and die due to toxicity of the water.



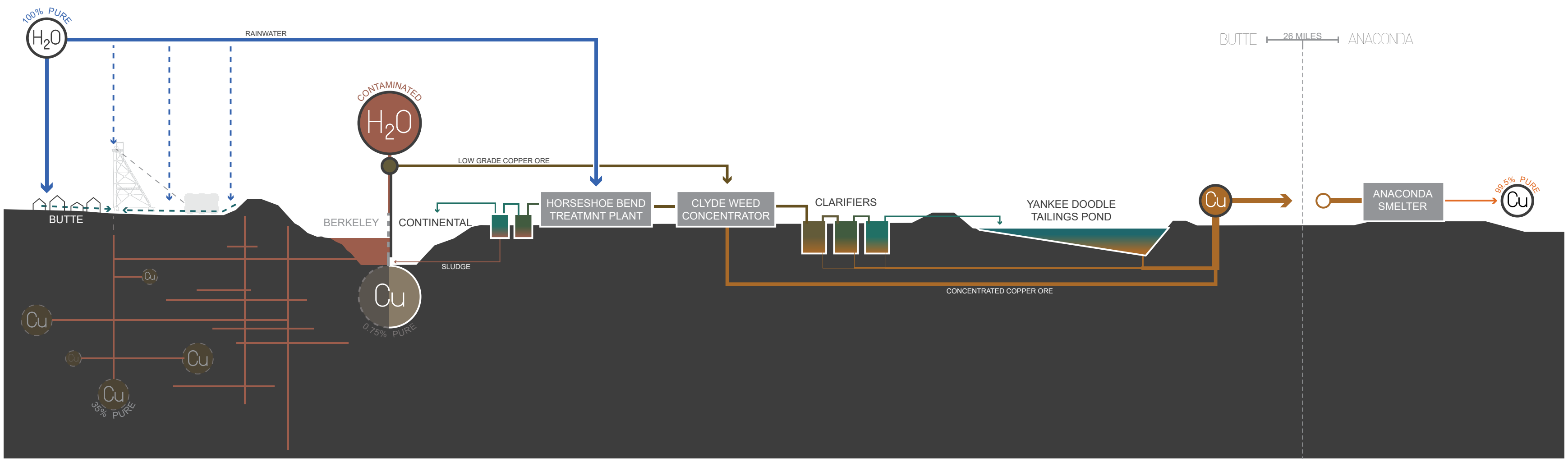



Diagram of Current and Dormant Industrial Systems and Infrastructural Networks in Butte, Montana.

View of the Berkeley Pit from the Berkeley Pit Viewing Stand.

## HORRORS IN THE BUTTE LANDSCAPE

Today the Berkeley Pit is a toxic wastescape. Overburden from its excavation is mounded around its perimeter defining the boundary that separates the mine from the city and obscuring its visibility. Its surface is steep and Unstable– occasionally producing a toxic dust due to its bare and dry condition. The pit itself has become a contaminated lake which below the surface has connected with, and flooded, the vast network of tunnels that exist below the city with a toxic water that rises closer each day toward a critical level that threatens to poison Butte and its much larger ecological context.

Steps have been made within the minescape to try and mitigate these ecological issues but these efforts do very little to engage the public. A water treatment plant has been built on the far side of the pit, but this facility only diverts and treats surface water entering the pit. Though future plans to expand this facility include pumping and treating the water from the pit itself, experts are not confident that dewatering the pit from this point will affect the water within the tunnels.[23] This means that a dewatering and treatment facility will be built at one of the headframes sites within the urban fabric of Butte and will have to operate in perpetuity.

Mounds of Overburden

Water in the Berkeley Pit
Photo from Pitwatch.com

Horseshoe Bend Treatment
Photograph by Mike Albans

23 Ted Duaime, (Hydrogeologist on the Butte Hill) E-mail to author, October 16, 2017.

# GEOLOGY [OVERBURDEN]

CONTAMINATED VISUAL + PHYSICAL BOUNDARY

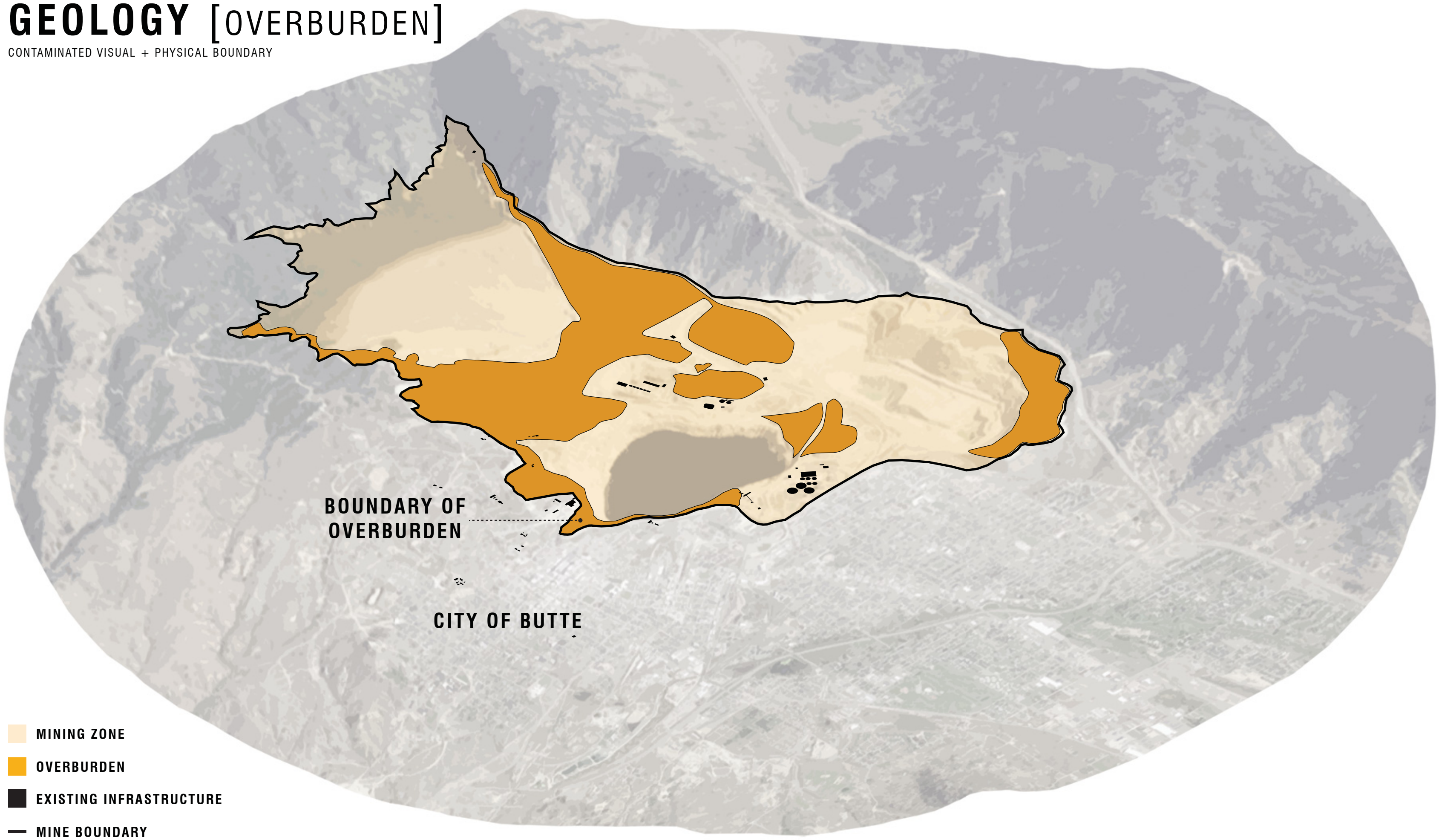
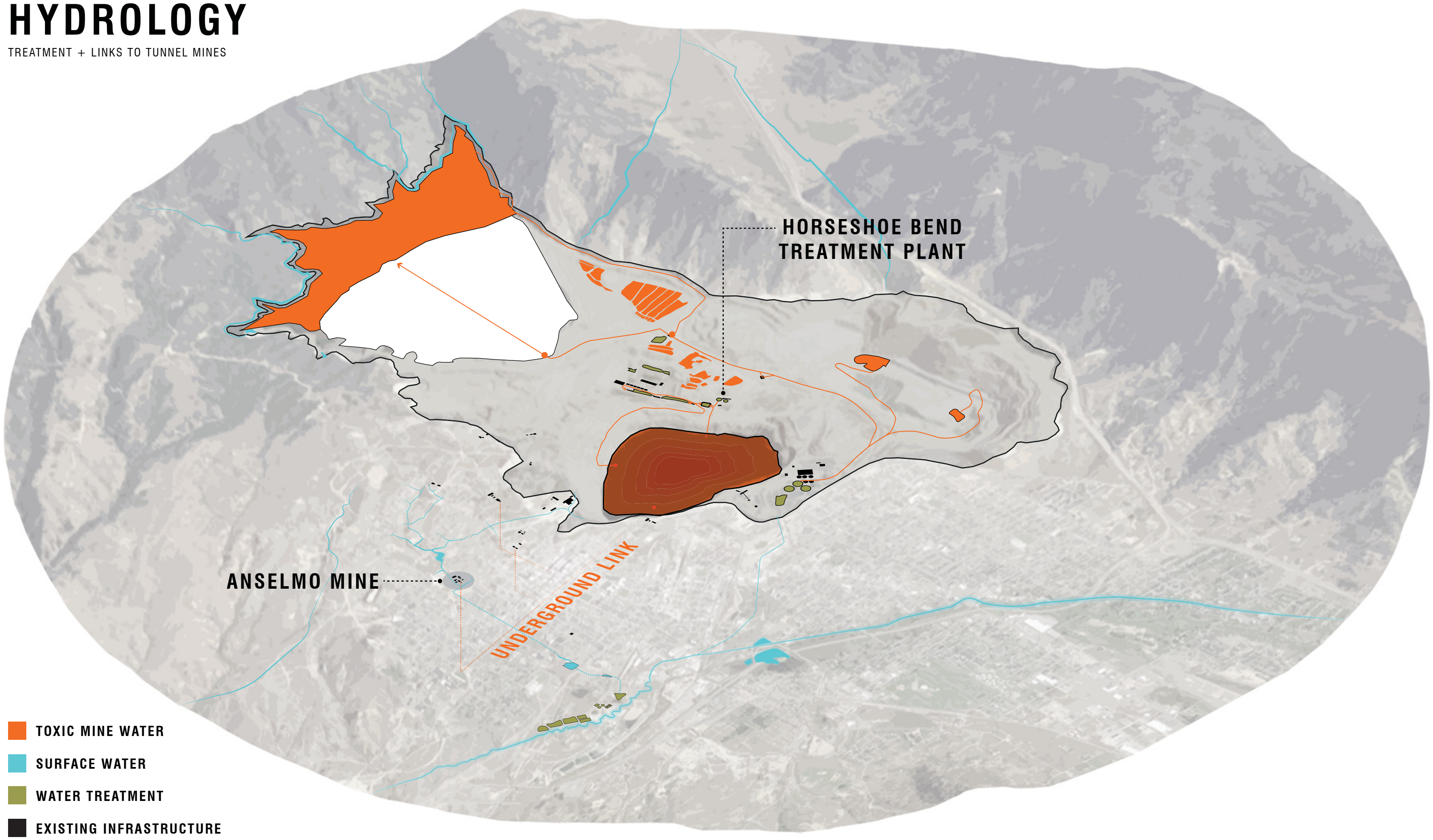



Diagram Showing Where the Topography has been Modified by Mounds of Overburden (Contaminated Waste Soils).

# HYDROLOGY

TREATMENT + LINKS TO TUNNEL MINES




TOXIC MINE WATER

SURFACE WATER

WATER TREATMENT

EXISTING INFRASTRUCTURE

MINE BOUNDARY

Diagram Describing the Current Hydrological Systems within the Mine and Throughout the City of Butte, Montana.

## BEAUTY IN THE BUTTE LANDSCAPE

The contaminated horrors in Butte bring with them a curious beauty. It is a vast landscape of earthen mounds reminiscent of the badlands and dotted with iconic industrial ruins – like steampunk versions of the hoodoos at Bryce Canyon.

Earth Mounds in Badlands National Park

Overburden in Butte, Montana
Photograph by Todd Trigsted

Hoodoo in Bryce Canyon National Park

Headframe in Butte Montana
Photograph by Todd Trigsted

It’s a place with sweeping views that echo the spectacular vistas of Crater Lake - and like the springs of Yellowstone, it is filled with acidic waters that change color with fluctuations in its composition.  These unique conditions may have marked the close of the mining age in Butte, but they have also spurred a new industry for this city; tourism.

Crater Lake National Park

Berkeley Pit in Butte, Montana

Springs in Yellowstone National Park

Heap Leach Ponds in Butte, Montana
Photograph by Todd Trigsted

## TOXIC TOURISM

> What we're seeing in Butte is a surge in interest in outdoor recreation.[24]

The unique landscape found in Butte has led to a rise in tourism throughout the city. Visitors either come to view the minescape at the Berkeley Pit Viewing Stand (24,000 visitors annually)[25] and/or the headframes along an urban trail. These systems currently present themselves in isolation due to their visual disconnect, hazardous conditions, and the miles of chain linked fence built-up between them. While development is stalled within the Berkeley Pit, the development along the urban sector, where a series of abandoned infrastructure dot the landscape, has steadily been growing ambivalent to this estranged relationship. Various industrial ruin sites have become cultural gathering places for the city. However, these skeletal structures serve merely as a backdrop for new programmatic uses - perpetuating a limited and isolated perception of this dormant infrastructure which maintain a direct link to the Berkeley Pit minescape.

Anselmo Mine and BA+P Hill Trail
Photograph from Google Maps API


Berkeley Pit Viewing Stand

Berkeley Pit Viewing Stand
Photograph by Todd Trigsted

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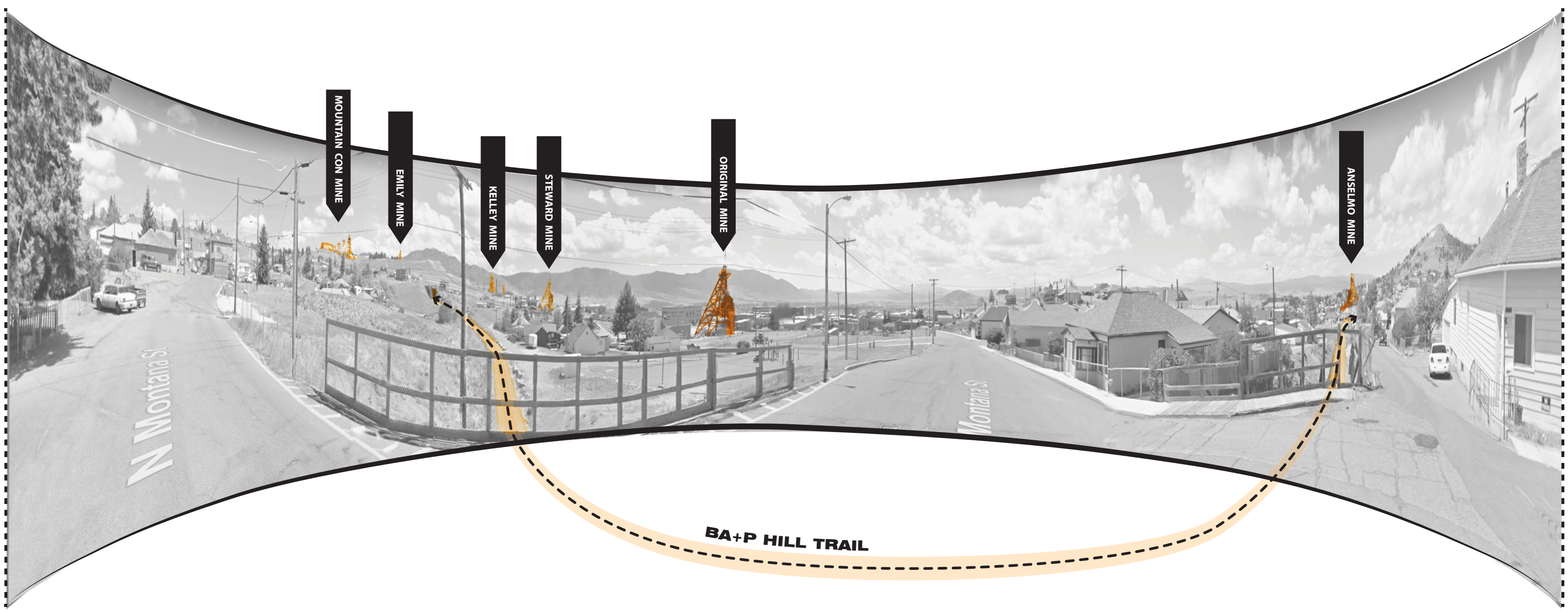
24 Matt Hoffman. "Tourism Rebounds in Montana, Butte." *Montana Standard*. September 17, 2014. http://mtstandard.com/helena/news/local/tourism-rebounds-in-montana-butte/article_de6cf713-2061-5f31-977c-75ed6e860419.html.

25 Ibid.



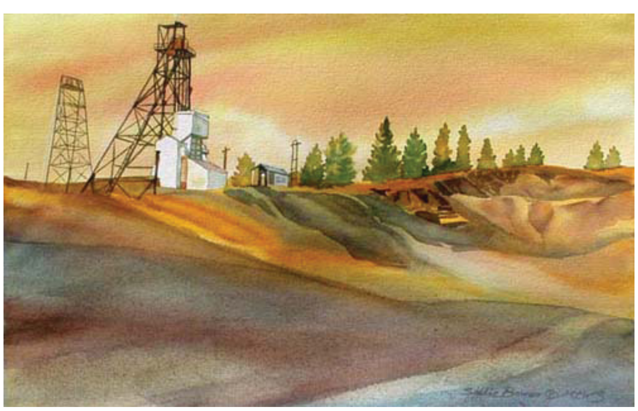

Headframes along the “BA+P Hill” Urban Trail System.
Photograph adapted from Google Maps API.

## ARTISTIC INSPIRATION

Artists have also begun capturing the true nature of this landscape, as well as provide new imaginative representations of it. These works range from the gritty depiction of some 4,000 geese that perished in the toxic waters of the Berkeley Pit in 2016, to the more utopian depiction of vibrant rolling hills expanding outward from the existing headframes. These works have inspired a deeper cultural connection with the manufactured landscape of Butte, and work toward the promotion of this landscape, both as it exists today and as a place to be reimagined.


"Untitled" by Nolan Salix


"Submerged" by David Burke


"Rich Dirt" by Sallie Bowen


"Mines #43" by Edward Burtynsky

## ANATOMY OF EXISTING INFRASTRUCTURE

> No city in Montana, or possibly anywhere in the Western U.S., offers so many iconic landmarks as Butte and its signature headframes.[26]

The most defining pieces of mining infrastructure in Butte are the 14 remaining headframes. Headframes (along with their hoist-houses) are usually all that is visible of a much larger and complex network of underground mining tunnels. These towering steel structures are the elevators; transporting miners, mules, and equipment deep into earth and hoisting ore back out. Looming over dangerous vertical shafts that reach as deep as one mile below grade; these skeletal structures were know by the miners as the “gallows frame” due to their symbolism toward the dangers of underground mining as well resemblance to hanging gallows.[27] These great sentinels, scattered across the landscape, evoke a sense of ingenuity, pride, and fear as they stand resolute in their charge to guard the gates of the vast and rich underworld within the “richest hill on Earth”.

Today these monuments serve as a memory to Butte’s booming and rugged mining past. The city of Butte was built from these rigs, and yet now these giants lie dormant - slowly weathering away as they watch - a mere spectator, while the city of Butte staggers on without them. As icons of the industrialized past, they now serve a nostalgic role as destination markers along a new 4.1 mile urban trail, the BA+P Hill Trail, built along the abandoned railway that once carried the ore from these headframes to the smelter in Anaconda. Since the decline of the copper market, the remaining headframes scattered across the landscape still attract people to them; not for work, but rather for tourism. They have become one of the main attractions for the city even prompting The National Park Service to provide $192,000 in grant funding to maintain and illuminate them in an effort to preserve this rich heritage for the growth in the tourism market.[28]

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26 “Butte in 75, No. 75: Steel Sentinels: Headframes Loom Large as Reminders, Attractions.” *Montana Standard*. July 06, 2014. http://mtstandard.com/news/local/butte-in-no-steel-sentinels-headframes-loom-large-as-reminders/article_551da00e-049f-11e4-b0fa-001a4bcf887a.html.

27 Roberta Forsell Stauffer, “Gallows or Gallus?” *The Montana Standard.* March 29, 2006. http://mtstandard.com/news/local/gallows-or-gallus/article_642b76c0-8483-59da-ac84-0095101e5329.html

28 “Butte in 75, No. 75: Steel Sentinels: Headframes Loom Large as Reminders, Attractions.” *Montana Standard*. July 06, 2014.

The original design for these structures was not determined by pre-considered aesthetic ideas, but rather the result of pragmatic needs for extraction. Changes in the design of these structures followed technological, economic, and social shifts producing an organically developed architecture. Edward Burtynsky sees such infrastructural design as the result of "the most efficient machine that does the task, and with that premise the structure unfolds."[29] Each mine instituted similar practices yet based on the scale of the mining efforts, depth of mine, quantity of extraction, and possible partnership with other vertical mining shafts, each mines infrastructure is unique.[30] These similarities and differences are most prevalent with the headframes. The headframe is a fairly standard universal component used at each tunnel mine to support the hoist which allowed miners and materials to move up and down the mine-shaft. Little more than a stripped down scaffold, these structures were parasitically built upon to support a myriad of additional mining functions. Each mine customized their headframe to meet the needs of their unique circumstances. The result is a purely functional organic framework to which architecture is generated from out of necessity of the systematic needs of mining.

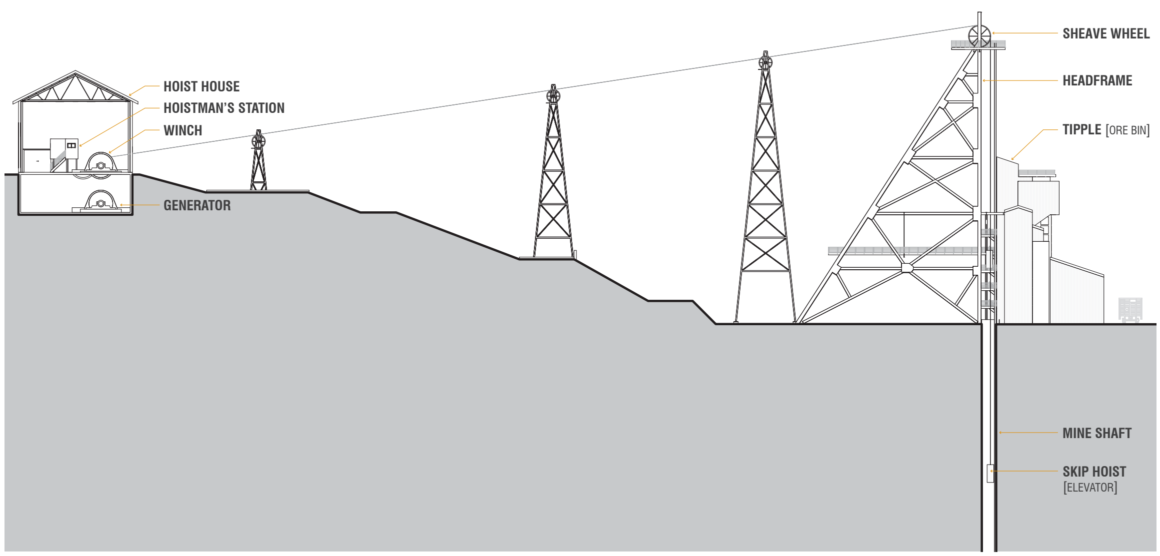
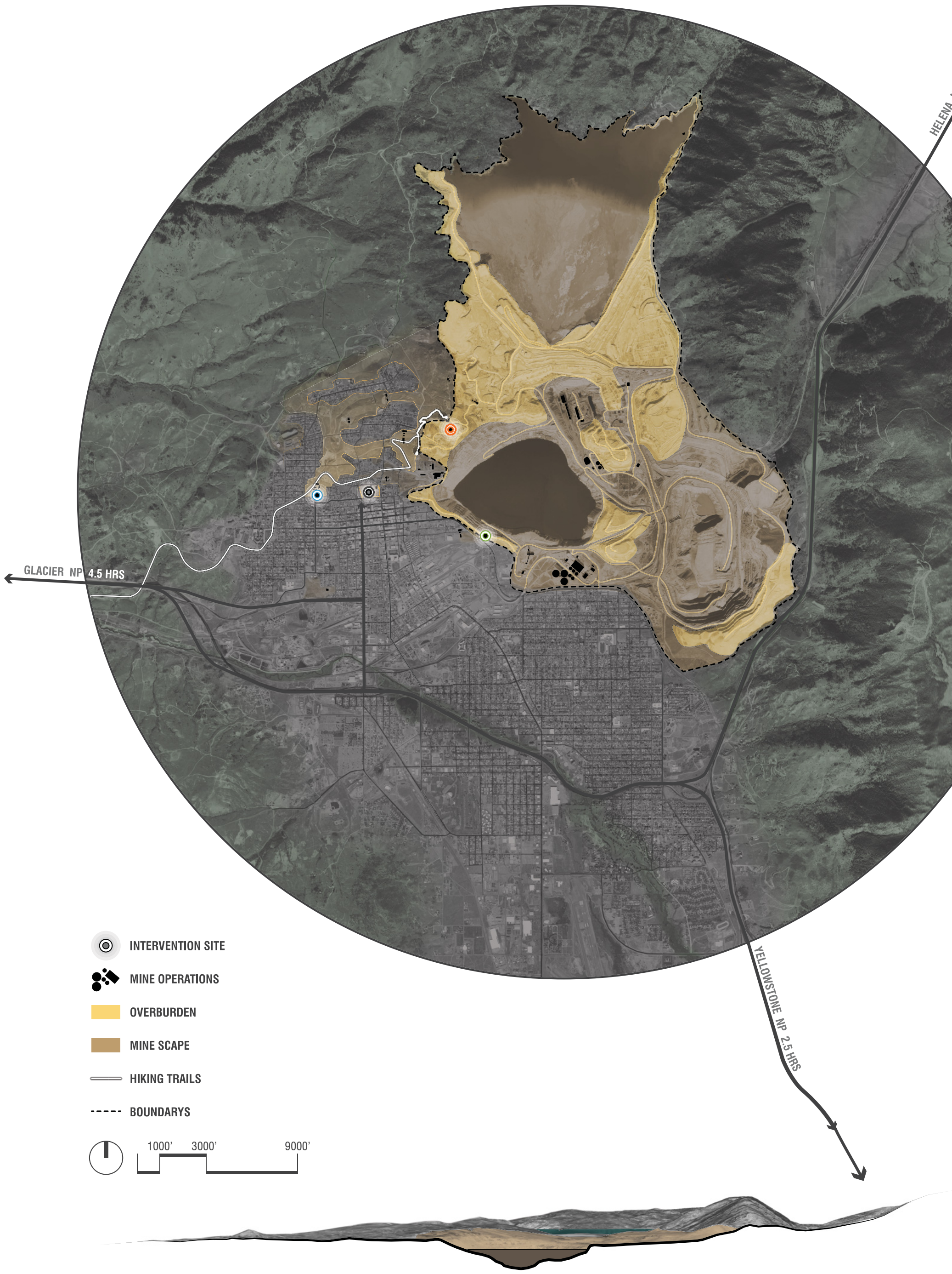



Diagram of the Typical Components of a Headframe Mine in Butte, Montana.

29 Edward Burtynsky and Lori Pauli, *Manufactured landscapes: The Photographs of Edward Burtynsky* (Ottawa: National Gallery of Canada in association with Yale University Press, 2006), 53.

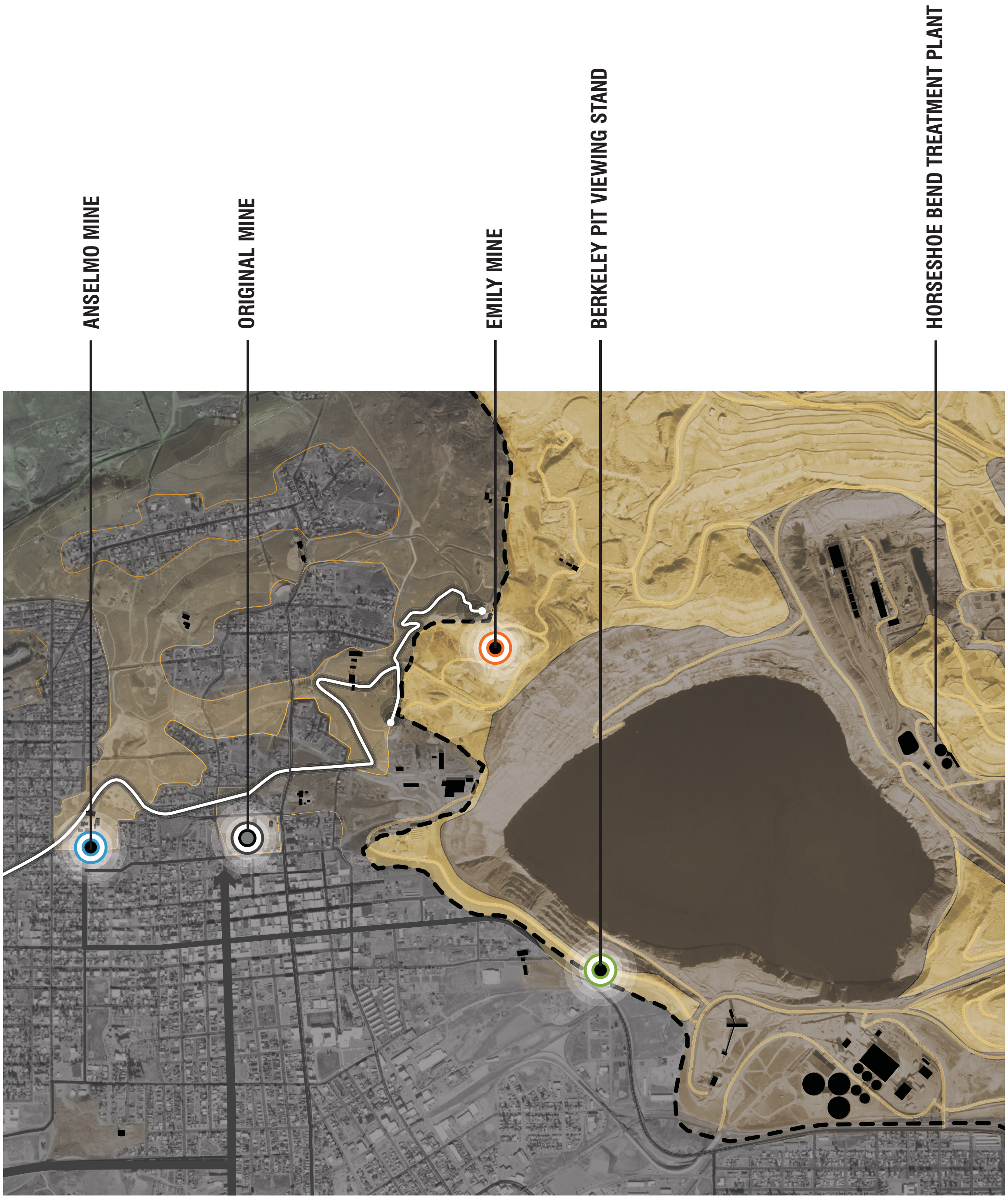
30 Pat Kearney, *Butte's Berkeley Pit* (Montana: Skyhigh Communications, 2014), 10.

Anatomy of the Butte Landscape




Site Conditions in Butte.
Photograph Adapted from Bing.com.

## Significant Sites in the Landscape




Significant Infrastructural Sites in Butte, Montana.

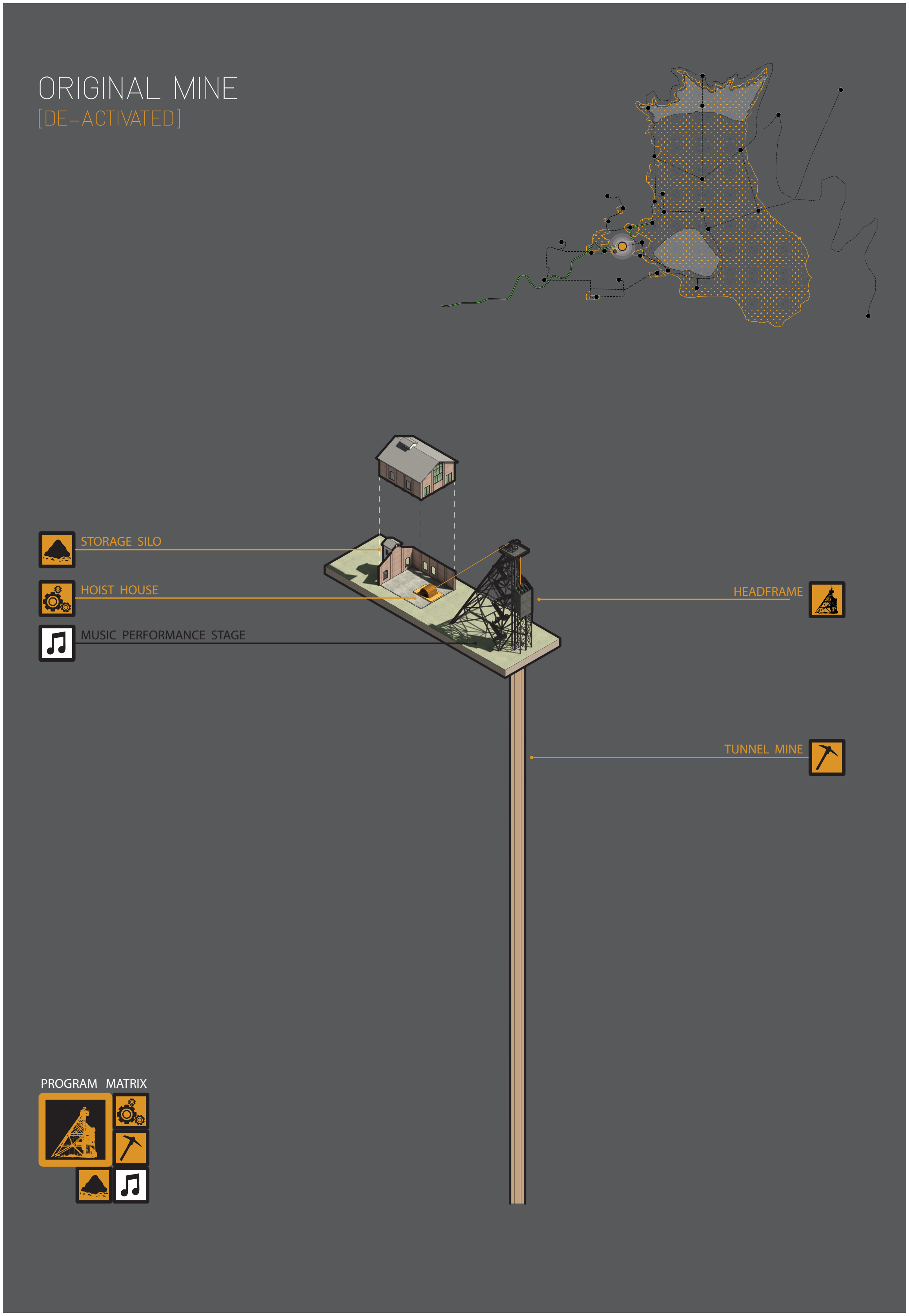
### *ORIGINAL MINE*

The first of it’s kind back in 1878, the Original Mine Yard is one of the few headframe sites which has found a new purpose since it’s closure in 1976. However, these new functions do little to engage with the infrastructure itself. The city has been reclaiming the site over the past decade and there are larger aspirations for this mine yard to become a “world class concert facility” that can draw in larger crowds and support a wider range of events. With it’s history as the “Original Mine” in Butte, the city’s ambitions for its revival and its ideal location along the main street in Butte, this site will serve as the main starting point for my thesis investigation.

> It could be a good thing for Butte... I could definitely see us attracting bigger artists to that area.... This is all part of the vision... [a] world-class concert facility.[31]

Music Festival at the Original Mine, from the Lively Times: Photograph by Derek Pruitt.

31 Justin Post. “Original Mine Yard Slated for Major Upgrades.” *Montana Standard*. July 04, 2011. http://mtstandard.com/news/local/original-mine-yard-slated-for-major-upgrades/article_539625d6-a646-11e0-8786-001cc4c03286.html.




Existing Conditions at the Original Mine.

### *ANSELMO MINE*

Located in the heart of the urban fabric of Butte, the Anselmo Mine has one of the most iconic headframes in the city. This mine operated from 1887 until 1959 with a depth of 4,301' and initially mined zinc before it began following copper veins.[32] The site still contains a portion of the original BA+P railway which was the main transport for ore to the Anaconda Smelter 26 miles away. Most of this railway has since been converted into walking trails which wind throughout the city and pass directly adjacent to, but do not interact with, this site. Today this headframe provides little amenity to the city beyond the occasional wedding reception in the hoist house or paid tours of it's derelict structure.

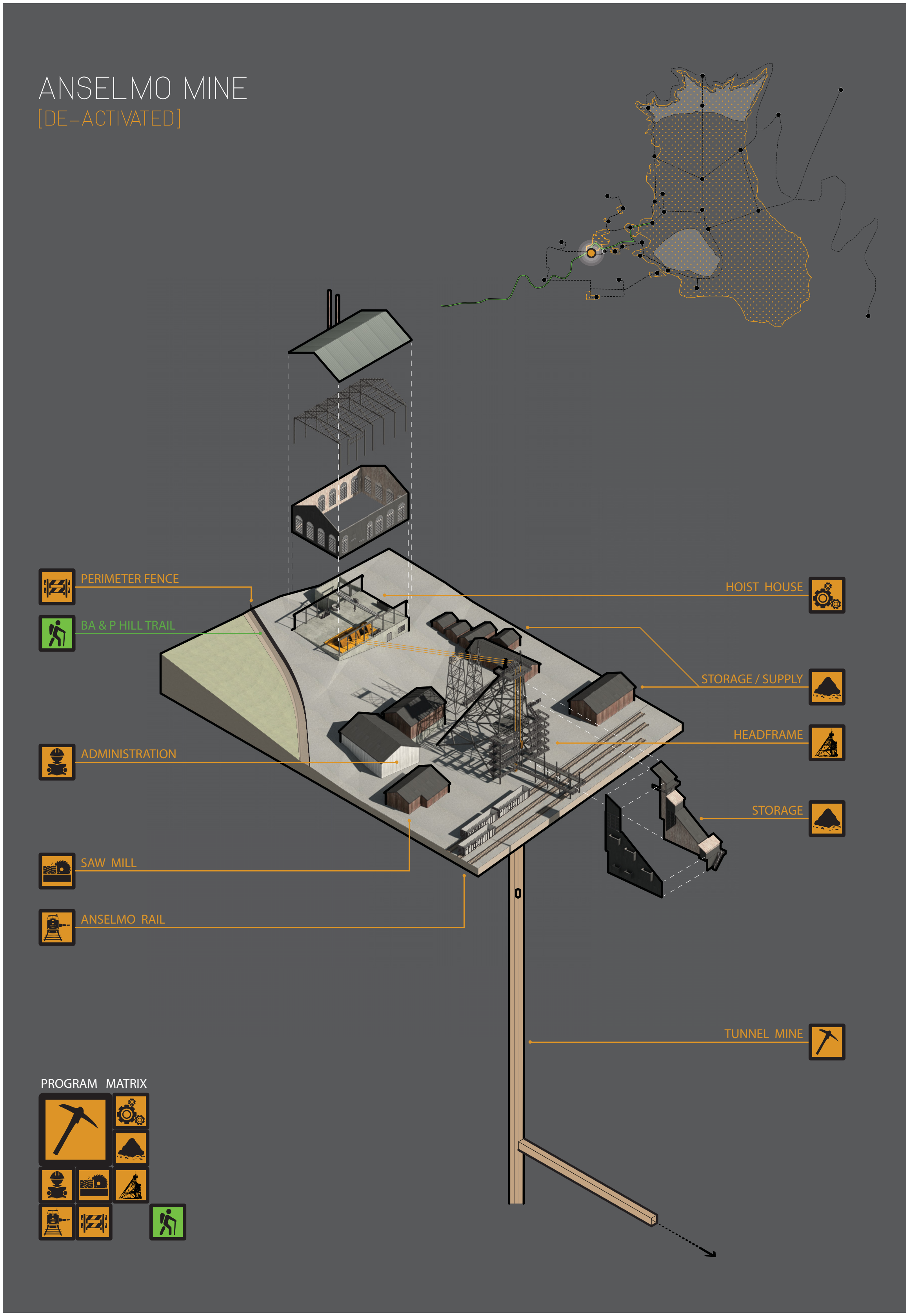
In a conversation with the Director of Restoration on the Butte Hill, it is apparent that the Anselmo Mine shaft my not be impacted by dewatering efforts taking place at the Horseshoe Bend Treatment Plant. This will require additional pumping and treating of flooded tunnel water to take place on site at the Anselmo Mine.

> Based on the water-level observations and their responses to unplanned events, i.e. landslides and earthquakes, we believe dewatering from the pit will affect water levels throughout the entire system. The most vulnerable location in my mind is the Anselmo Mine due to its remote location compared to the rest of the mines.[33]

Anselmo Mine, Photograph Adapted from Google Maps API.

32 "Anselmo Mine Tours Scheduled." *Montana Standard*. August 20, 2004. http://mtstandard.com/entertainment/anselmo-mine-tours-scheduled/article_280f1eaf-309d-54c1-8d3c-77c3cc1b22ef.html.

33 Ted Duaime, (Hydrogeologist on the Butte Hill) E-mail to author, October 16, 2017.

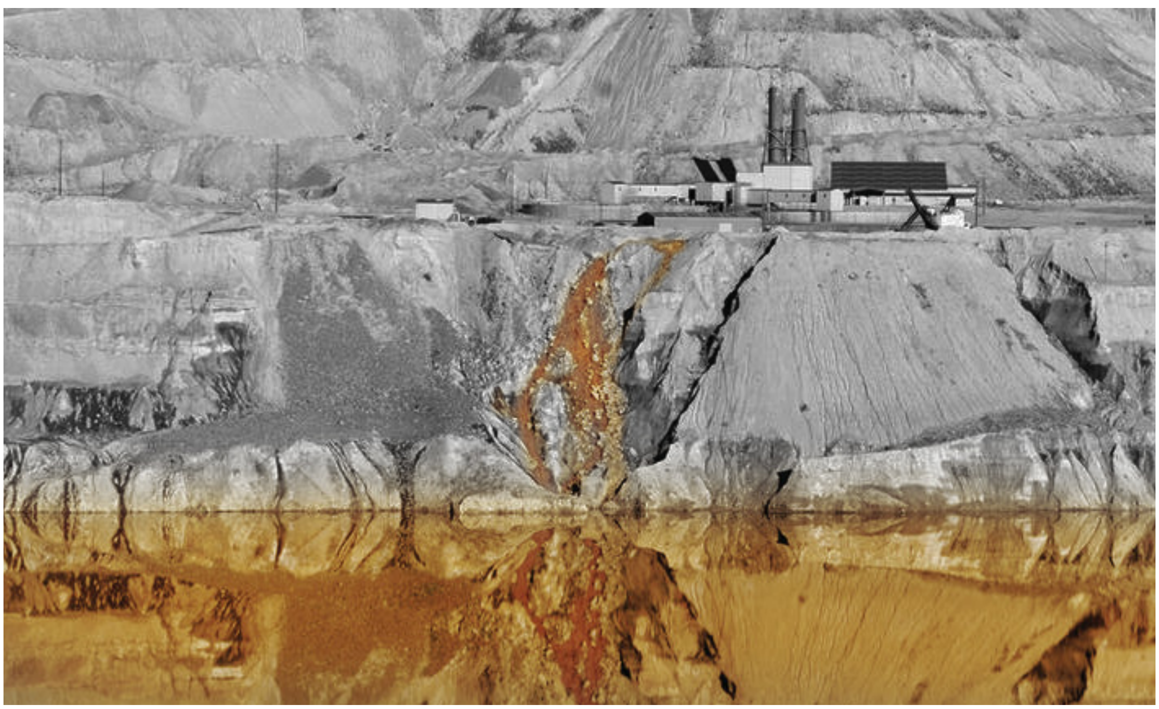



Existing Conditions at the Anselmo Mine.

### *THE HORSESHOE BEND TREATMENT PLANT*

Built into 2002 to comply with the EPA Record of Decision, this facility captures run-off before it enters the pit and treats it for continued mining efforts at the Continental Pit.[34] The plant costs Atlantic Ritchfield $3 million dollars annually to operate and is slated for an upgrade in 2021 to add two more clarifiers and begin pumping from the pit in perpetuity.[35] Lime infusion is used to increase pH levels and remove metals in the form of sludge which is dumped back into the pit at a rate of 491,000 gallons per day according to pitwatch.com. Located on the northeastern bank of the Berkeley Pit, this facility is divorced from any public oversight or interaction which has led to mounting concerns about it's performance.

> It's never been run at a level and for a period of time that suggests it's going to work.... If you ask community of Butte, America, to trust the EPA when (Horseshoe Bend has) been tested at one tenth of one percent, you've got to be kidding.[36]

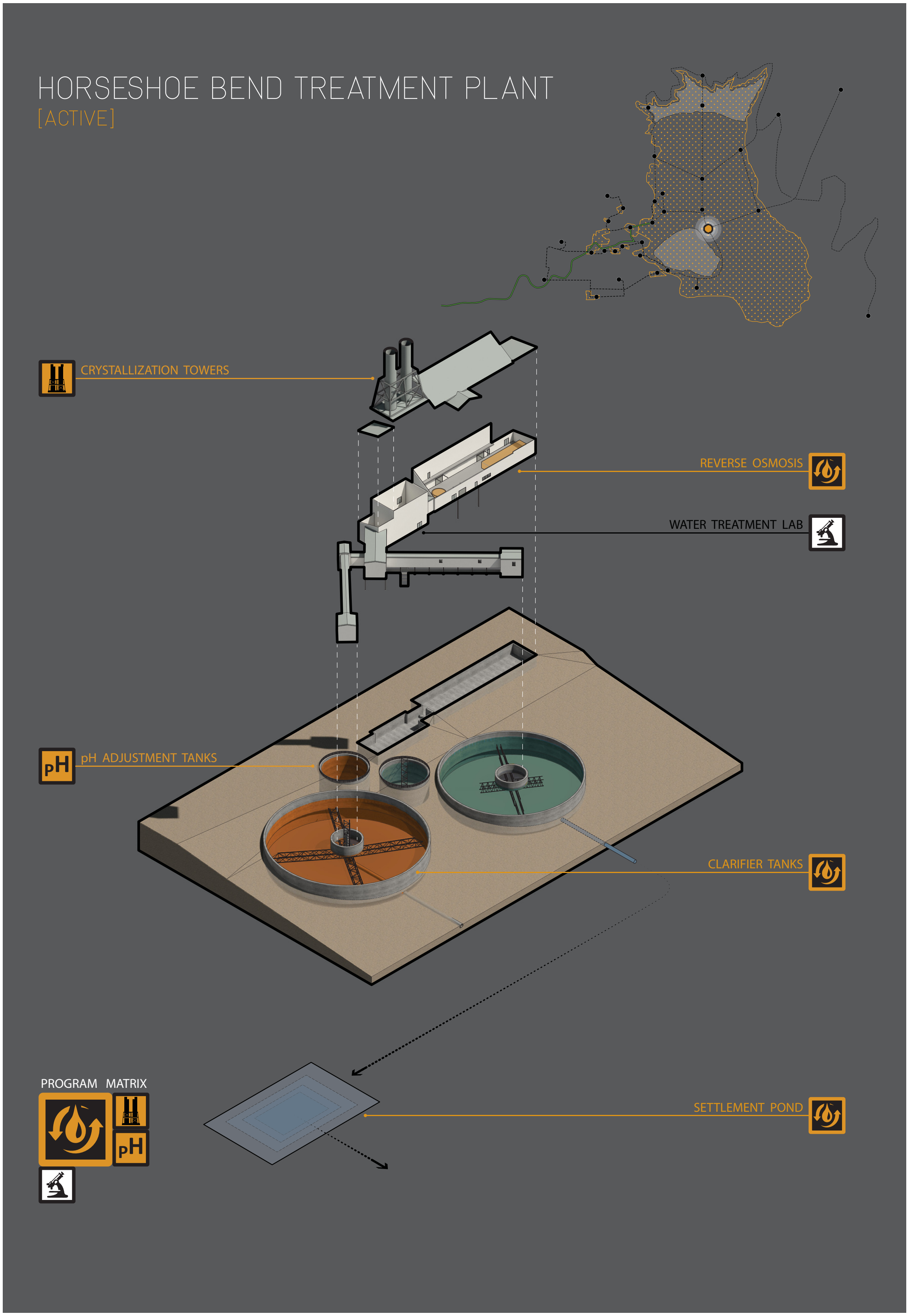


Horseshoe Bend Treatment Plant, Photograph by Mike Albans.

34 "What is the Horseshoe Bend Water Treatment Plant?" *PitWatch*. April 23, 2017. http://www.pitwatch.org/what-is-the-horseshoe-bend-water-treatment-plant/.

35 Christensen Kelley. "Pit water rising: Some worry treatment plans not good enough." *Montana Standard*. November 10, 2014. http://mtstandard.com/news/local/pit-water-rising-some-worry-treatment-plans-not-good-enough/article_fc4fb860-167d-5e87-9bd8-9290df7716cf.html.

36 Ibid.



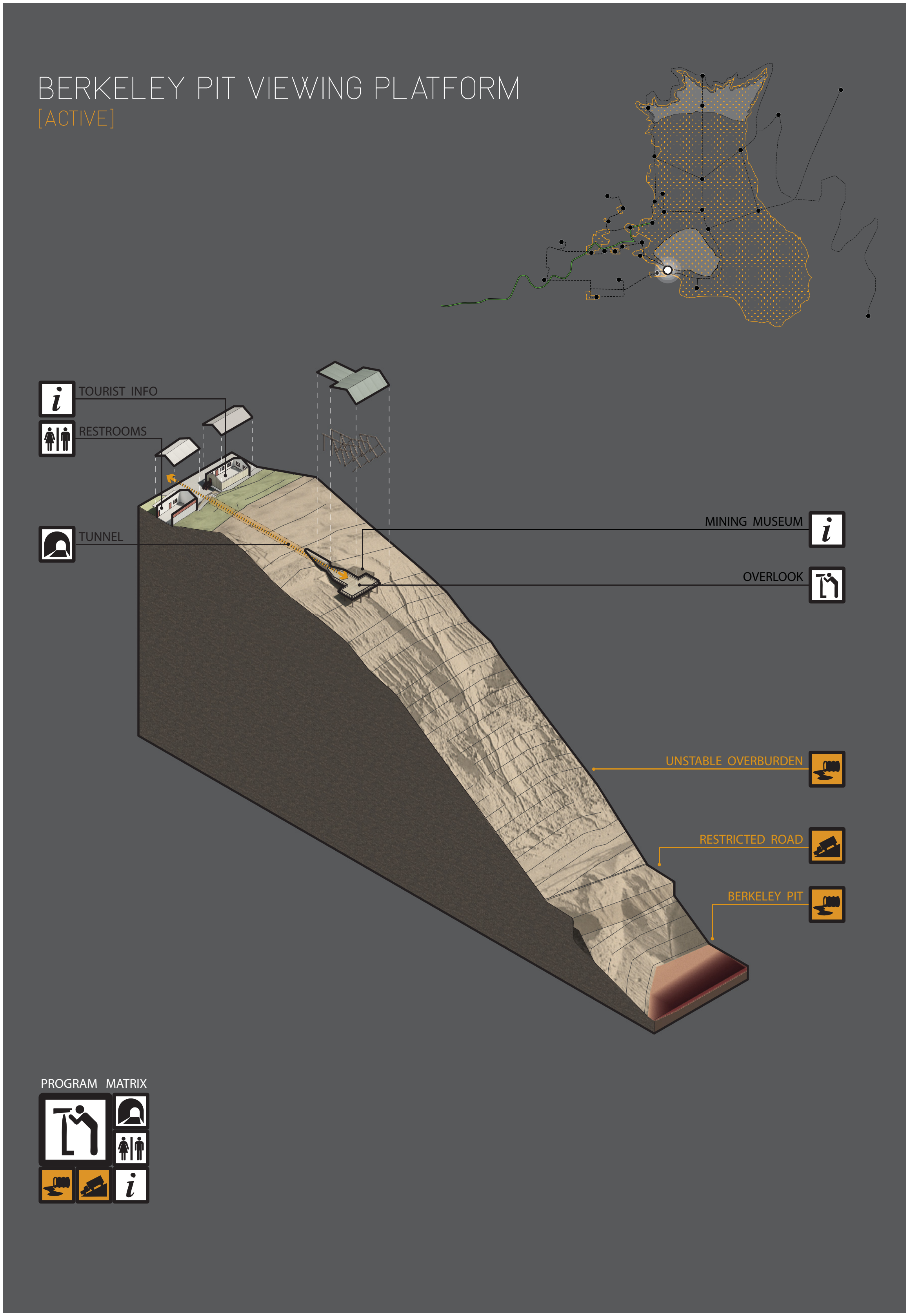

Existing Conditions at the Horseshoe Bend Treatment Plant.

### *THE BERKELEY PIT VIEWING STAND*

The Berkeley Pit Viewing Stand is the main tourist attraction for the vast and restricted minescape. Designed mainly for tourism, it contains public restrooms, a small gift shop, and a picnic pavilion. A two dollar admission allows for passage inside a narrow tunnel which takes visitors through the perimeter mound of overburden and onto a small covered platform with sweeping views of the Berkeley Pit. Loud speakers and informational plaques provide historical context on the formation of the pit as well as the current contamination issues that exist. From this overlook you can still see mining taking place in the nearby Continental Pit and hear the periodic air cannon which is used to deter any birds from landing in the pit's toxic water.

Berkeley Pit Viewing Stand, Photograph Adapted from Google Maps API.


Berkeley Pit Viewing Stand, Photograph by Todd Trigsted.




Existing Conditions at the Berkeley Pit Viewing Stand.

## ANATOMY OF COPPER

Copper built the city of Butte.  The fervent desire for this metal led to the formation of the landscape we see today.  The ways in which nature and humans engage with this material produce varying effects on the aging process of copper.  The oils left behind by human touch causes the copper to tarnish and staves off patina.  The touch of natural weathering causes the copper to oxidize and patina in a greenish-blue hue.  The use of such an impressionable material in the design will not only celebrate the most influential material in the formation of the Butte landscape, but will also highlight the differences in how humans and the nature affect this material as well as impact the landscape.

### *HUMAN EFFECT*

Tarnish may be Removed by Rubbing - Restoring the Copper to it's Initial State.

### *NATURE EFFECT*

Ageing Process of Copper in Natural Weather Conditions.

## ANATOMY OF WATER

> "More water is used to produce a ton of copper, on the average, than to produce a ton of any other major metal."[37]

The process in which copper ore is mined, concentrated, smelted, and purified has reciprocal affects with other elements, minerals, and materials – most notably water. Water is used throughout the process, around 100,000 gallons of water is used to obtain one ton of copper[38], and this water becomes increasingly polluted with ammonia nitrate mixed with diesel during blasting[39], tall oils during crushing and concentration,[40] and sulfuric acids during leaching[41]. These affects are anticipated during the mining process, but what is often overlooked is the additional effects caused by the altered landscape on unprocessed rainwater. Rain and groundwater sweep across mine-scapes just as they would any other place. However, within abandoned mining sites this water flows across heaps of overburden waste piles and mineral rich open pit surfaces, collecting contaminates and impurities, as it settles in pools or continues downstream. This water either coagulates with an over-saturation of acidic metals within open pits or releases these minerals along the banks of streams and flood plains. Water is the biggest problem when it comes to Butte. The Berkeley pit is nearly full with high toxic and acidic water.

Imaginative Water Treatment Center.

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37 Orville D. Mussey. *Water Requirements of the Copper Industry.* (Washington: U.S.G.P.O., 1961), 181.

38 Ibid., 181.

39 Pat Kearney. *Butte's Berkeley Pit*. (Montana: Skyhigh Communications, 2014), 40.

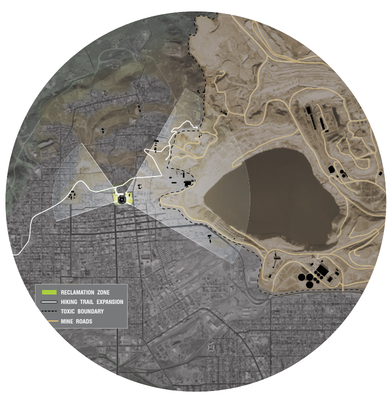
40 Orville D. Mussey. *Water Requirements of the Copper Industry.* (Washington: U.S.G.P.O., 1961), 181-184.

41 Ibid., 185.

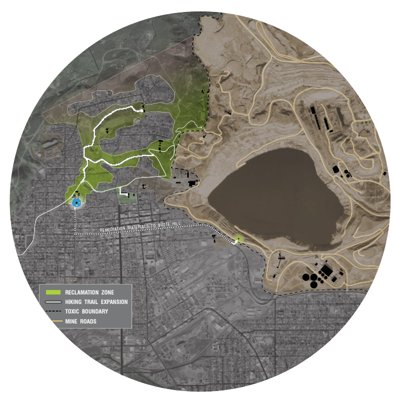
# CHAPTER 3: DESIGN FOR THE NEW FRONTIER

## STRATEGY

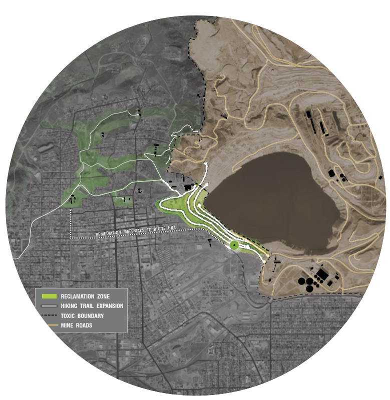
The method for design is a nested scalar strategy located at existing infrastructural points to effect larger ecological systems of hydrology, toxicity, and soil stability in a phased approach that enables the public to engage with these manufactured sites in a new ways over time.  By partnering with current adaptive reuse efforts, expanding upon natural restoration zones, strengthening environmental treatment processes, and introducing new educational, research, public interaction – the fragmentation of urban, manufactured, and natural landscapes can be united as they are slowly pieced back together.  Programmatic uses for specific sites are based off of their latent infrastructural potential and seek to reveal the inherent nature of the landscape through experiential conditions of; prospect to reveal a visual connection to the manufactured landscape, immersion to reveal and address hydrological issues, transition to cross the threshold into the mine, and refuge to provide communal gathering space and reflection within the post-industrial frontier.



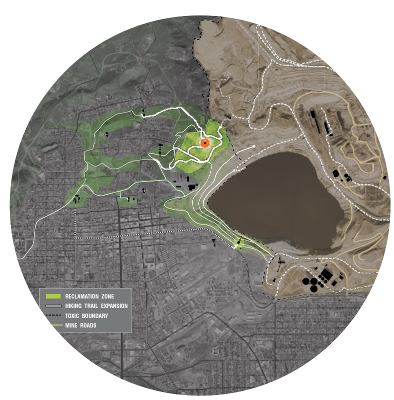
Visual Connections.



Hydrology.



Soil Stabilization.



Inhabitation.

## PHASE 1: PROSPECT

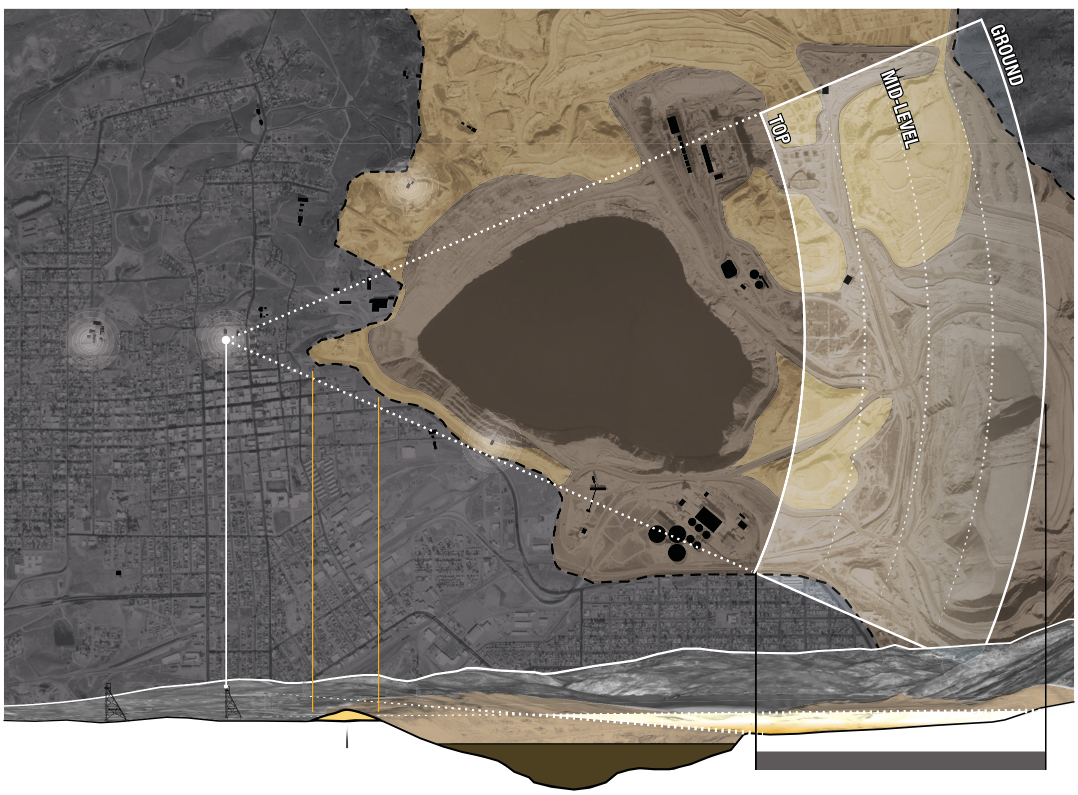
*Reveal the disconnect between the urban/natural and manufactured landscape by using existing infrastructure to elevate the viewer at the Original Mine cultural center.*

The Original Mine Yard is situated just North of the downtown core of Butte Montana and sits at the culmination of the main entry street into the city, Montana Street. Due to it's current use as an impromptu music festival and the city's desires to expand upon these existing programs, the Original Mine will serve as the catalyst for the reclamation of Butte's dormant infrastructure and manufactured landscapes.


Viewpoint from the Original Mine.

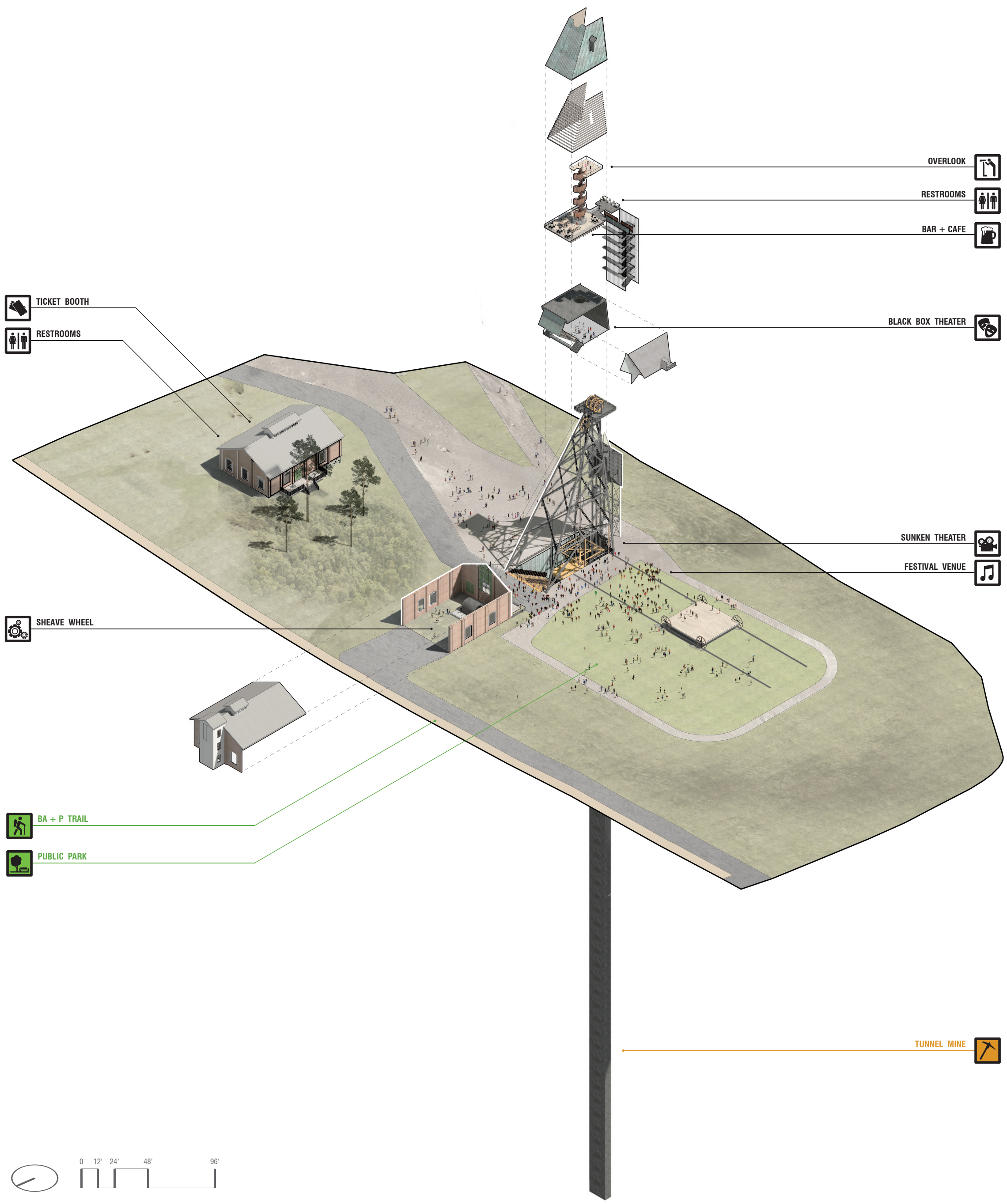
### *ORIGINAL MINE*

The current use of the Original Mine only makes use of the ground plane. By simply climbing the headframe, one can gain a whole new perspective of the city and its relationship to the Berkeley Pit. This headframe can be reimagined as a device that both supports these various performance spaces but also acts as an overlook establishing a visual connection between the urban center of the city and its adjacent manufactured landscape.




Headframes provide an expanded field of view that bridges visually over the boundary that exists between the city and the minescape.

# ORIGINAL MINE
## [PROSPECT]



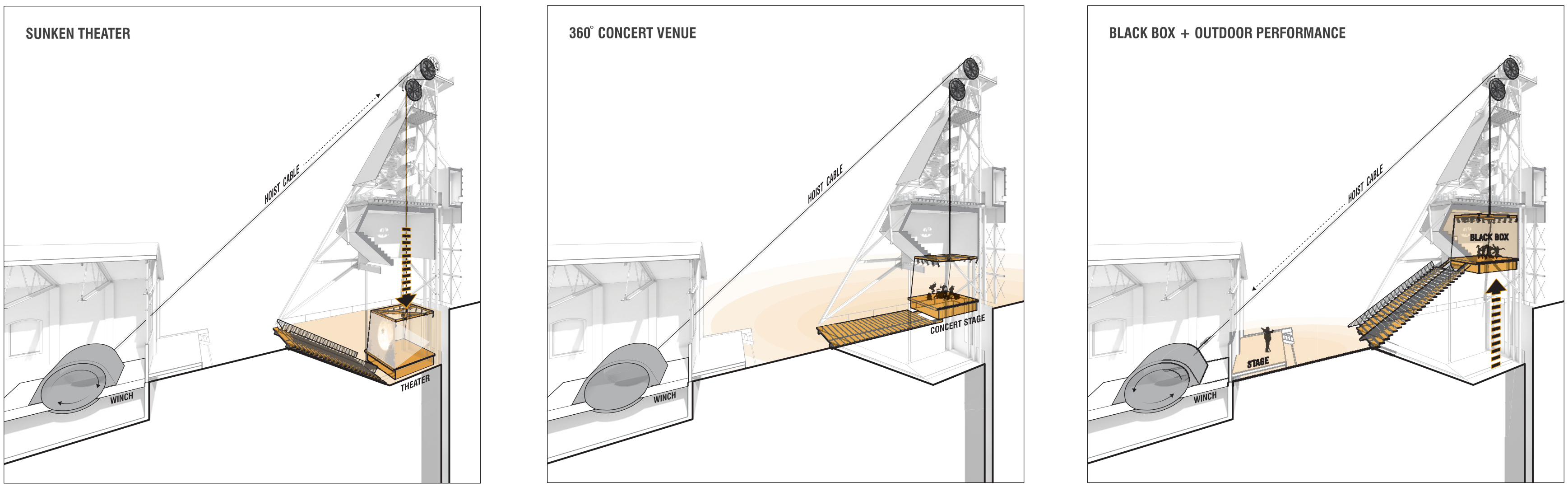

Programmatic Design Proposal for the Original Mine.

***PROSPECT NARRATIVE***

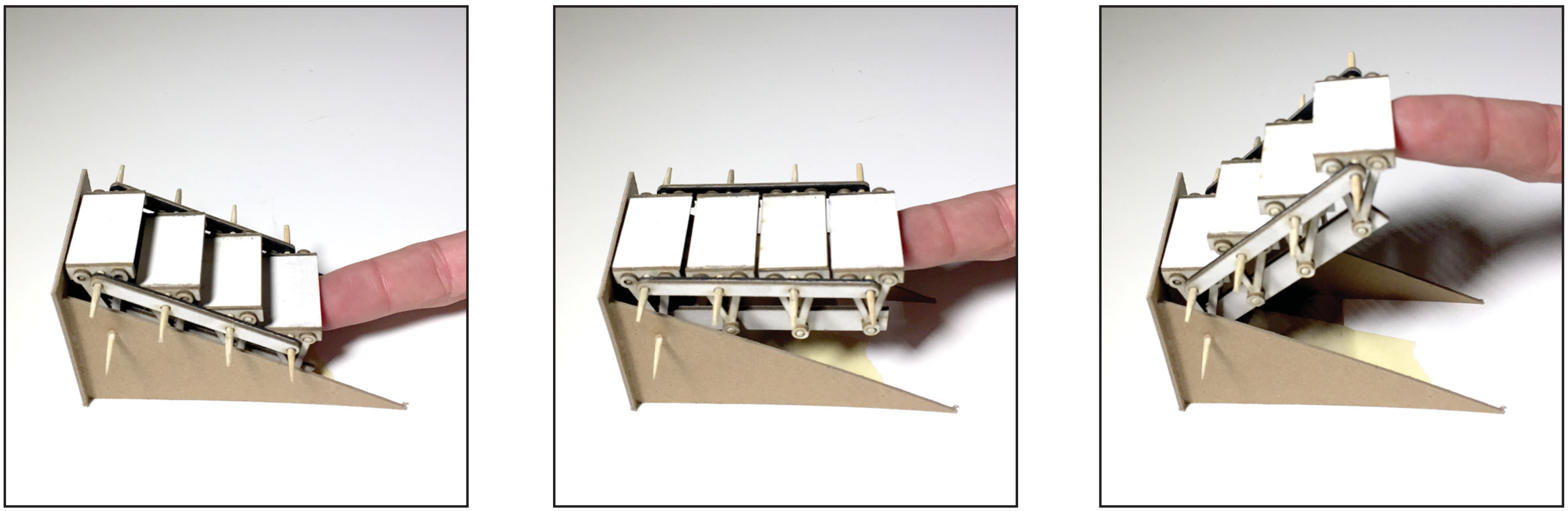
Visitors arriving at the Original Mine from the BA+P hill trail first pass through the existing hoist house where tickets are sold for the various events at this festival center. Once through the hoist house, visitors are free to roam the mine yard and engage with the new programmatic functions that nest inside the headframe. These new spaces are linked directly to the framework and mechanical functions of the headframe itself so that as the winch of the hoist house retracts and releases its cable, the configuration of the music venue will transform vertically into a variety of performance spaces: a sunken theater for movies, a 360 concert venue for music festivals, an outdoor performance stage and elevated black box theater. The configuration of these spaces will change day-to-day depending on the performance needs, but an additional overlook café and observation deck will be open at all times.

These spaces provide a new and deeper prospective view of the Butte landscape and aim to reveal not only the stark divide that exists between the urban and manufactured landscape, but also a rethinking of these industrial ruins as devices of transformative potential, setting the stage for Phase 2: Immersion.

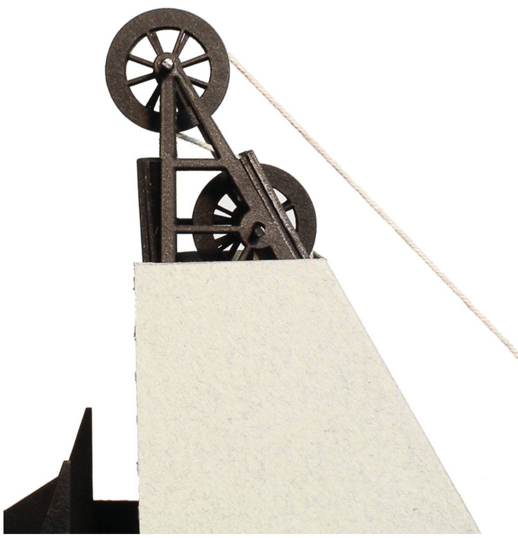
View of the Original Mine from Montana Street.



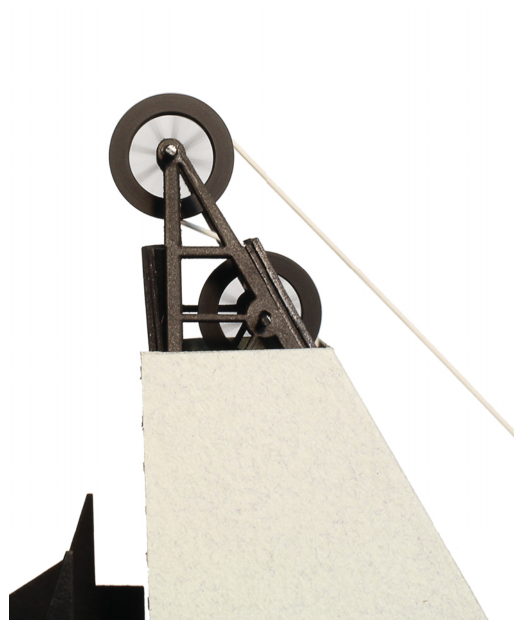

Vertical Transformation of the Performance Configuration within Original Mine Headframe.



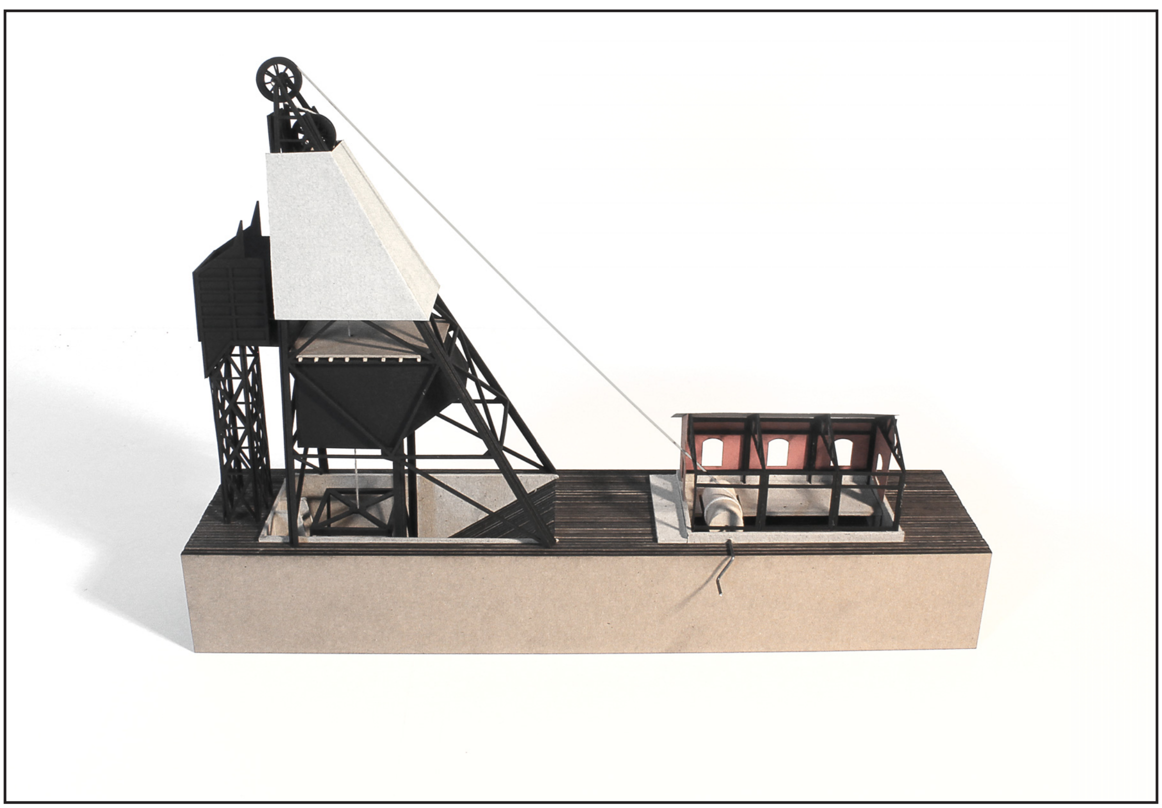
Study Model of Vertical Transformation at the Original Mine Headframe.



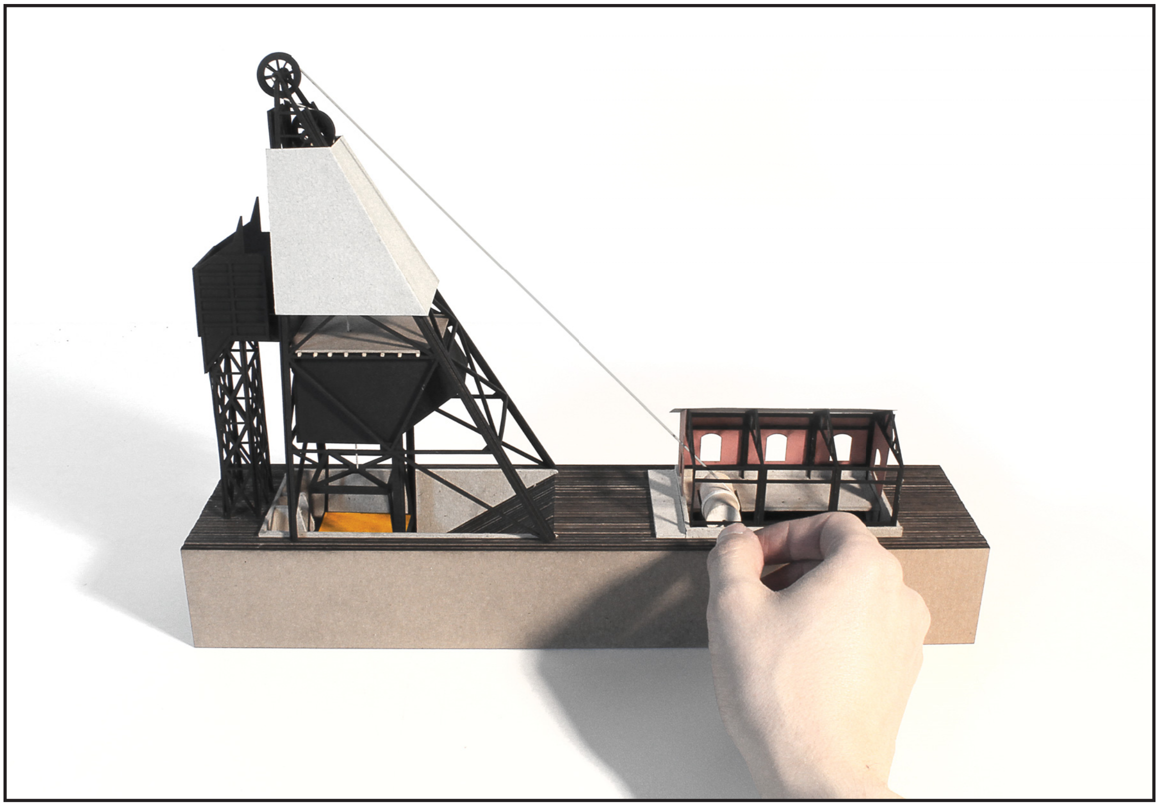
Sheave Wheel.

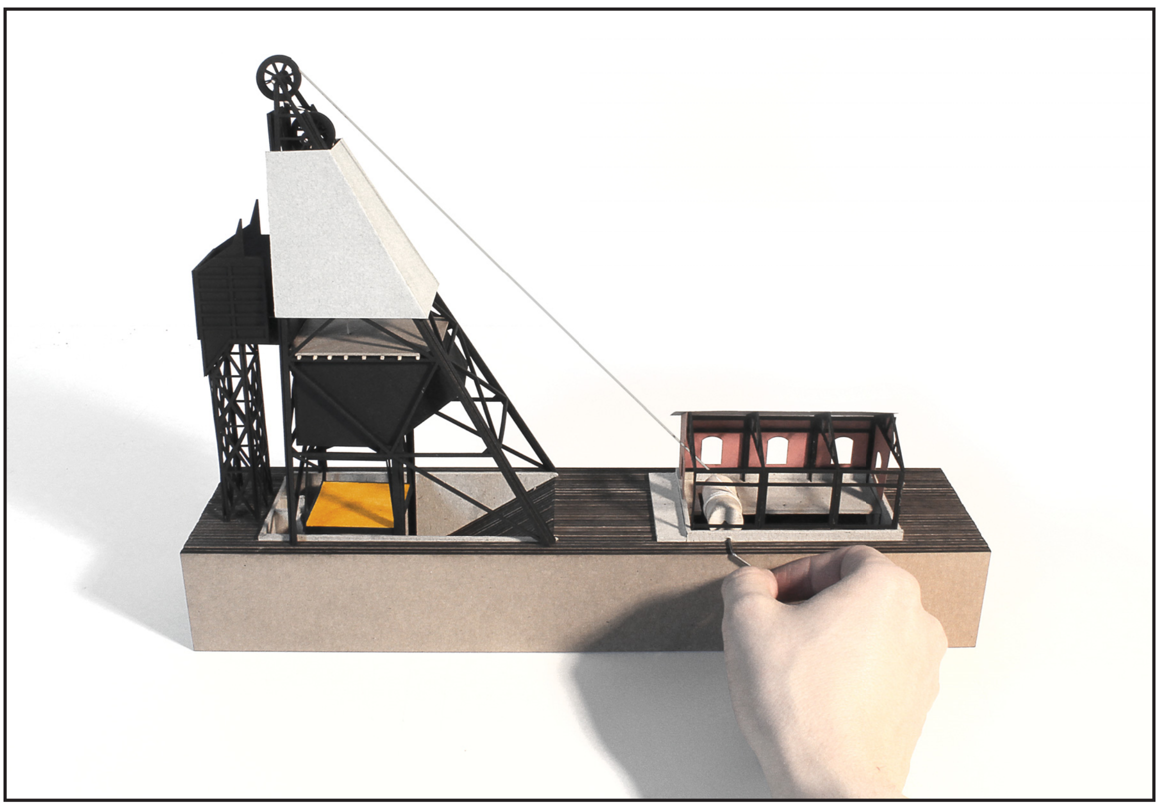


Sheave Wheel in Motion.

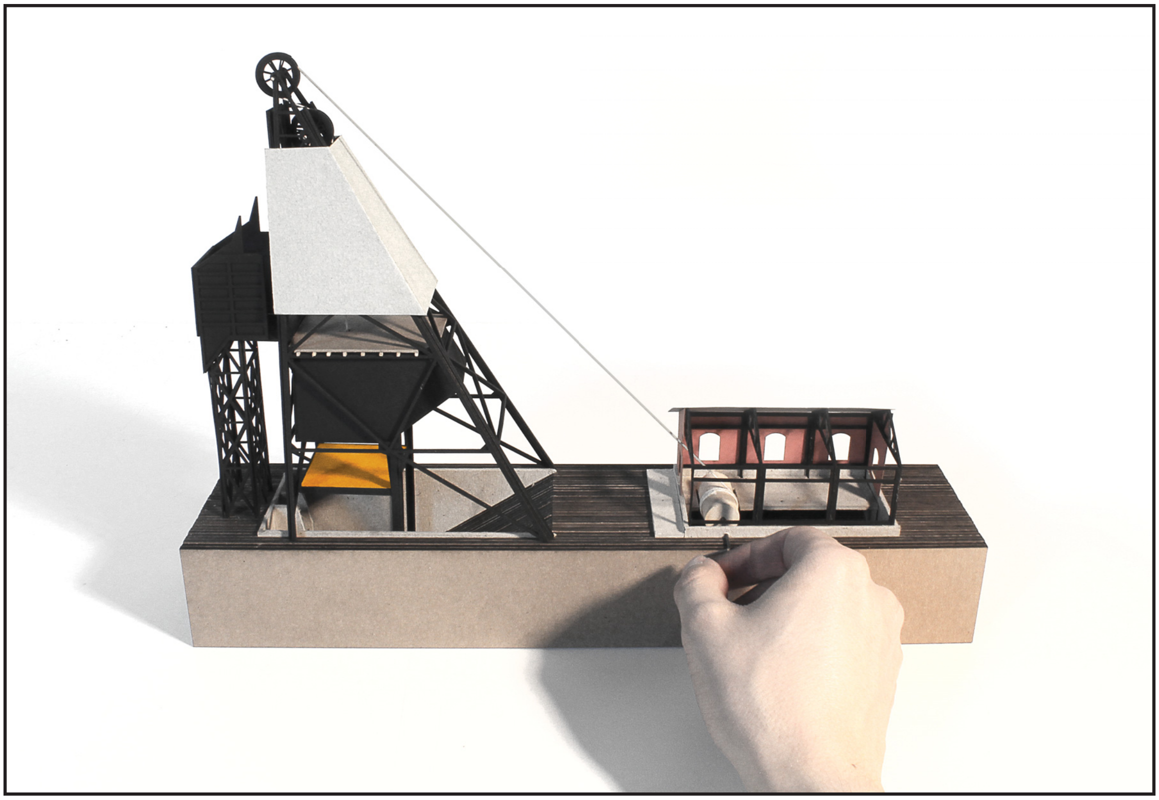


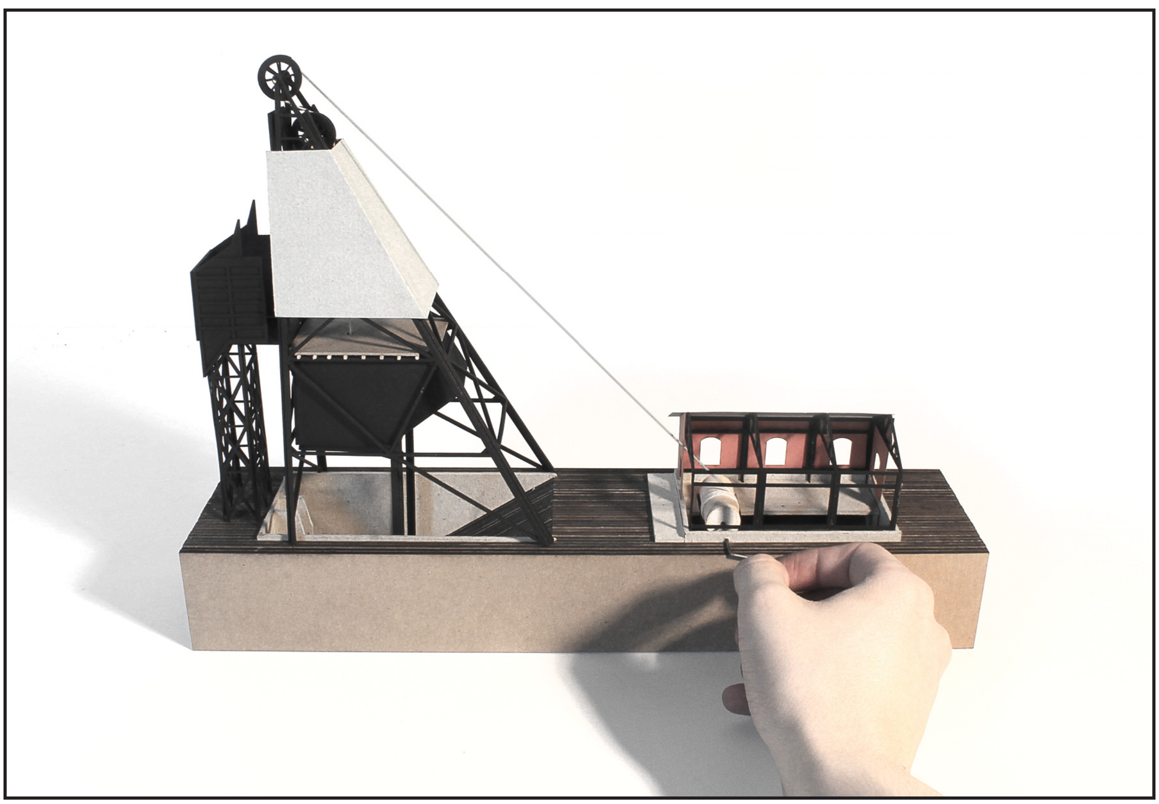
Model Showing the Vertical Transformation at the Original Mine Headframe.





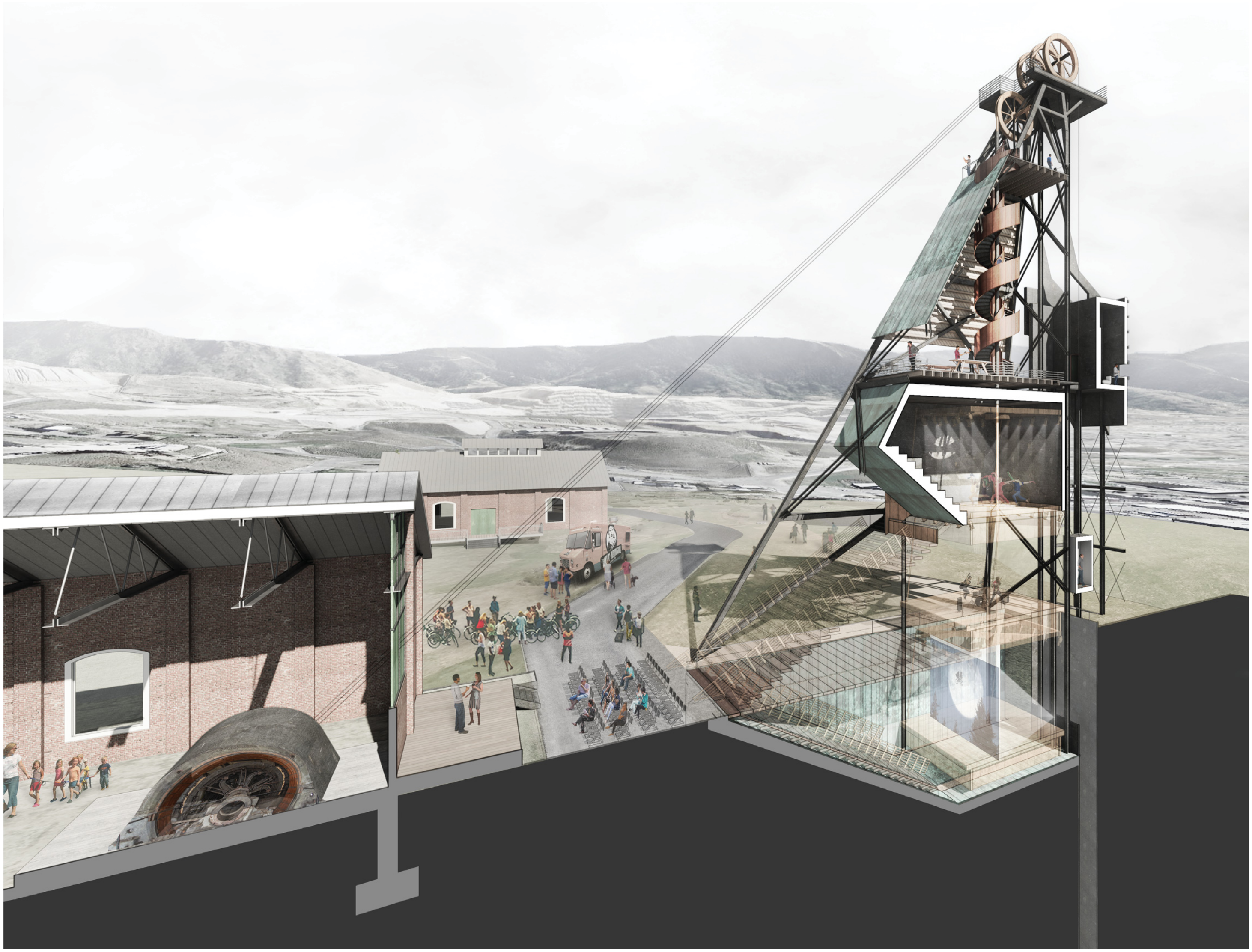
Model Showing the Vertical Transformation at the Original Mine Headframe.



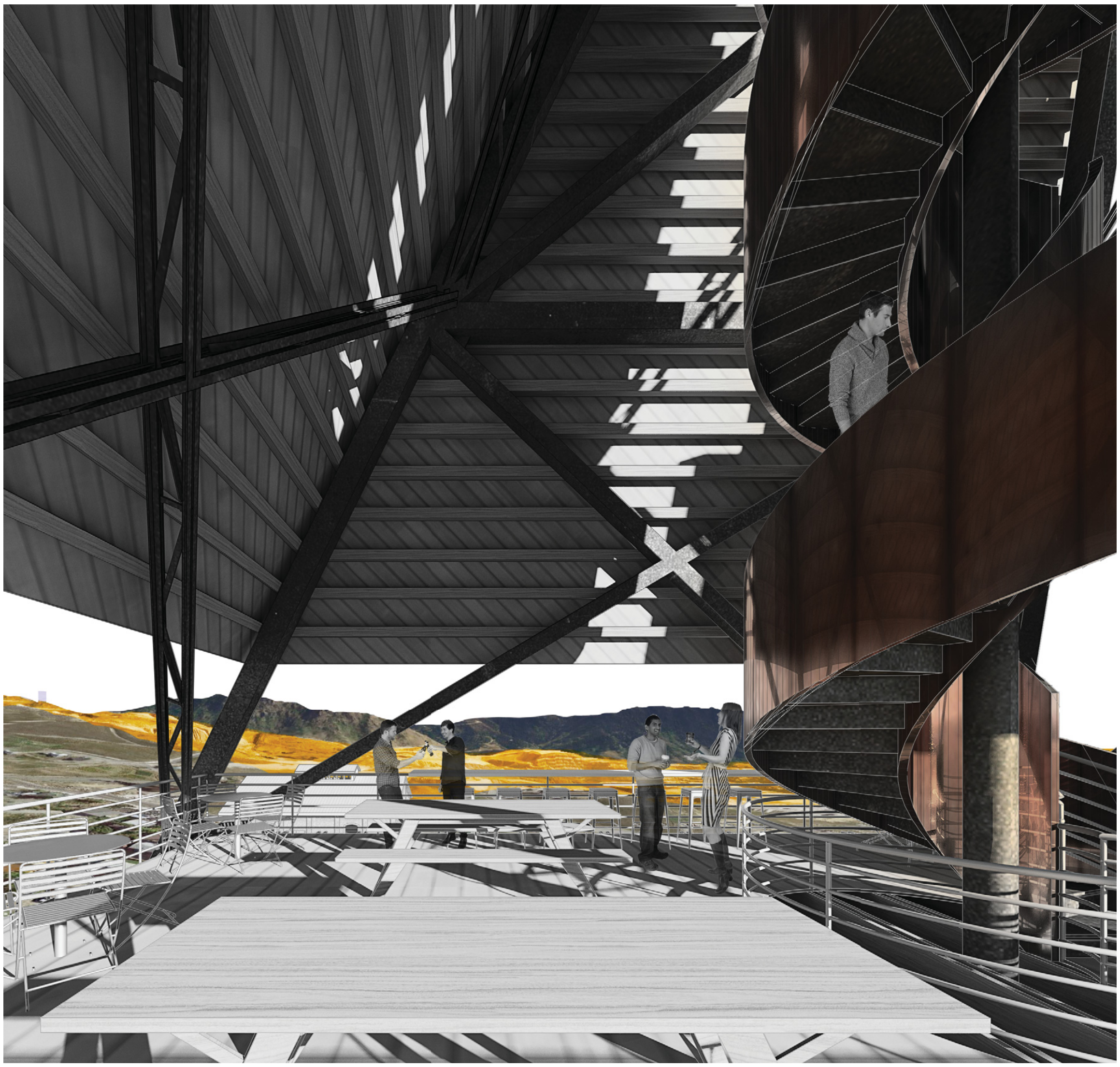


Model Showing the Vertical Transformation at the Original Mine Headframe.

Model of the Original Mine Headframe and Hoist House.



Section Perspective at the Original Mine Music Venue and Urban Overlook Tower.



Overlook Cafe with View of the Berkeley Pit at the Original Mine.

## PHASE 2: IMMERSION

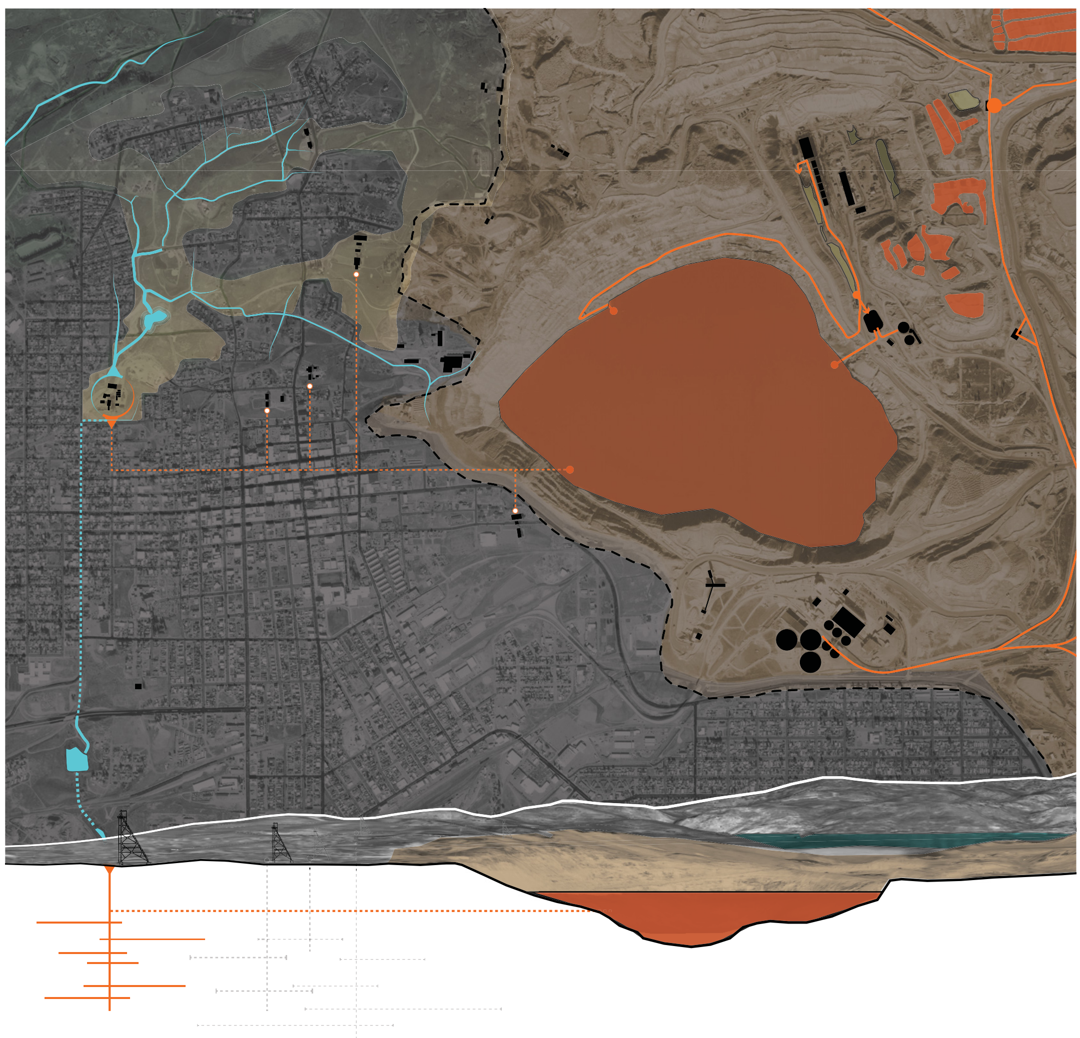
*Reveal hydrological links between the urban and manufactured landscape by coupling public park space with a water treatment facility.*

The Anselmo mine is the furthest site from the Berkeley Pit and resides over the largest mine yard in Butte. The landscape to the North remains vacant, residual space from old mining railroads, that now serves as the main watershed for uptown Butte, channelling surface water toward the mine. Activating this site as a public park can over-time transform this vacant watershed into a remediated greenway that can host new walking paths and expand the existing urban trail system North toward the edge of the Berkeley Pit.


Expanded Trail Networks from the Anselmo Mine.

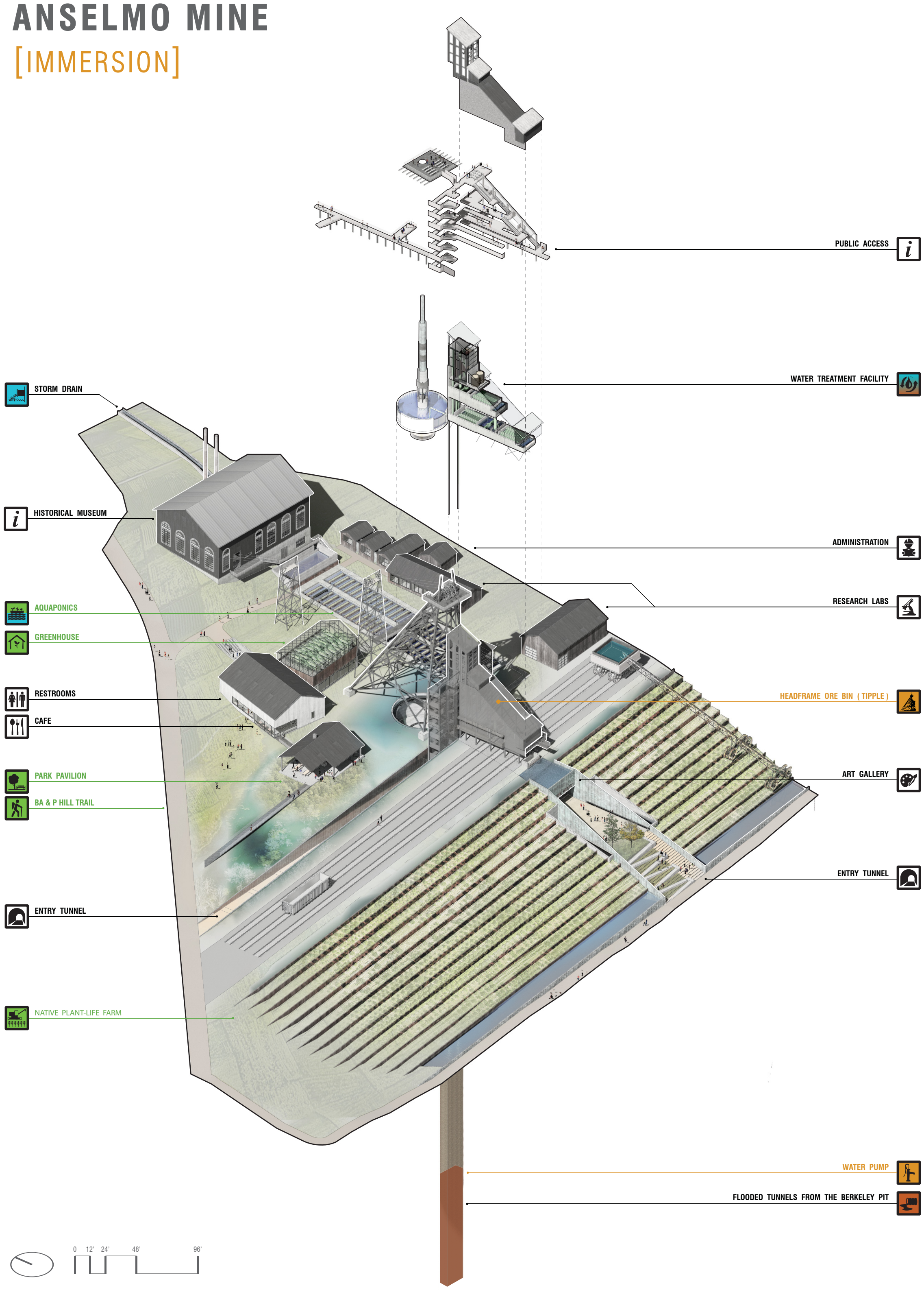
***ANSELMO MINE:*** *IMMERSIVE WATER TREATMENT PLANT AND URBAN WETLAND*

The Anselmo mine is one of a few monitoring points where the water levels of the Berkeley Pit are tracked, and it is projected to be the first point of compliance to reach the critical water level. Here this hydrological link it strongest yet not known do it invisibility below the surface. Once this milestone is hit, the water within its tunnels will have to be pumped and treated in perpetuity requiring a water treatment facility to be built on -site amongst the industrial ruins of the mine.



Underground Tunnels Connecting the Headframes with the Water from the Berkeley Pit. Water from the Pit may be Pumped from these Remote Locations within the City.

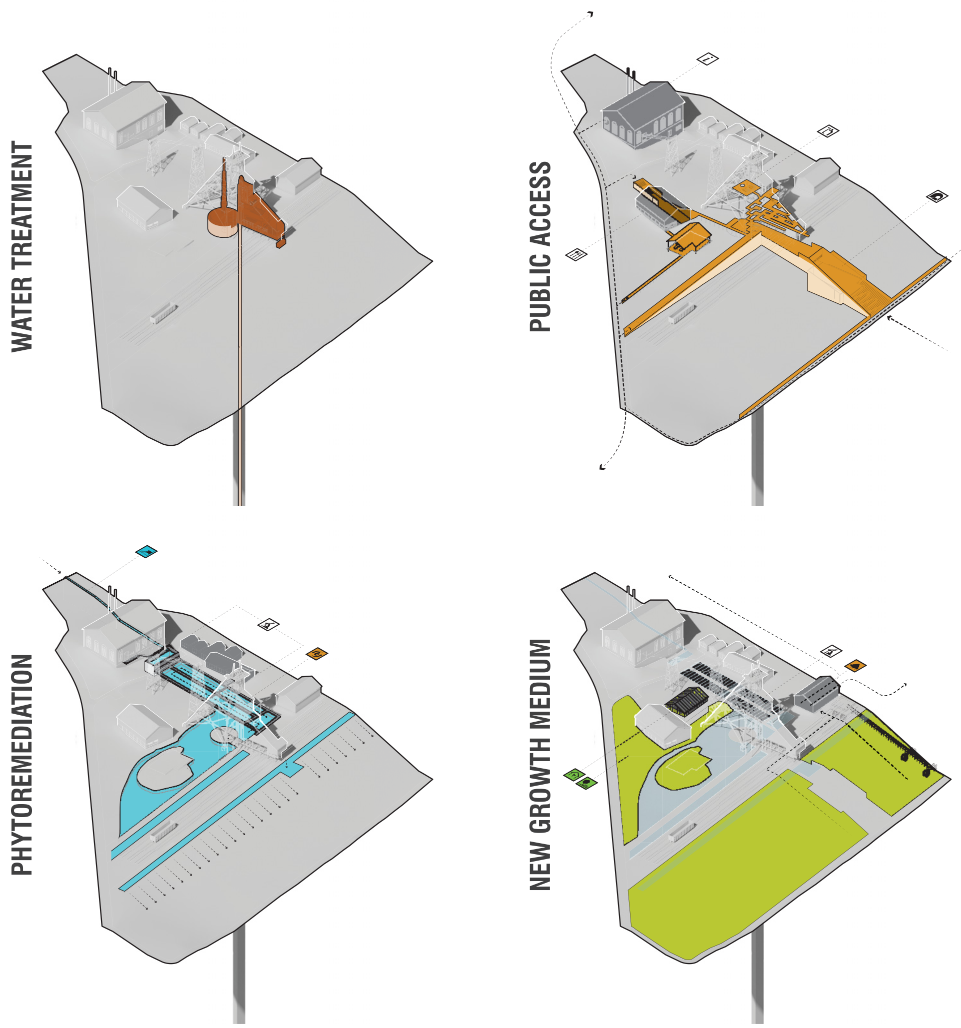
# ANSELMO MINE
## [IMMERSION]



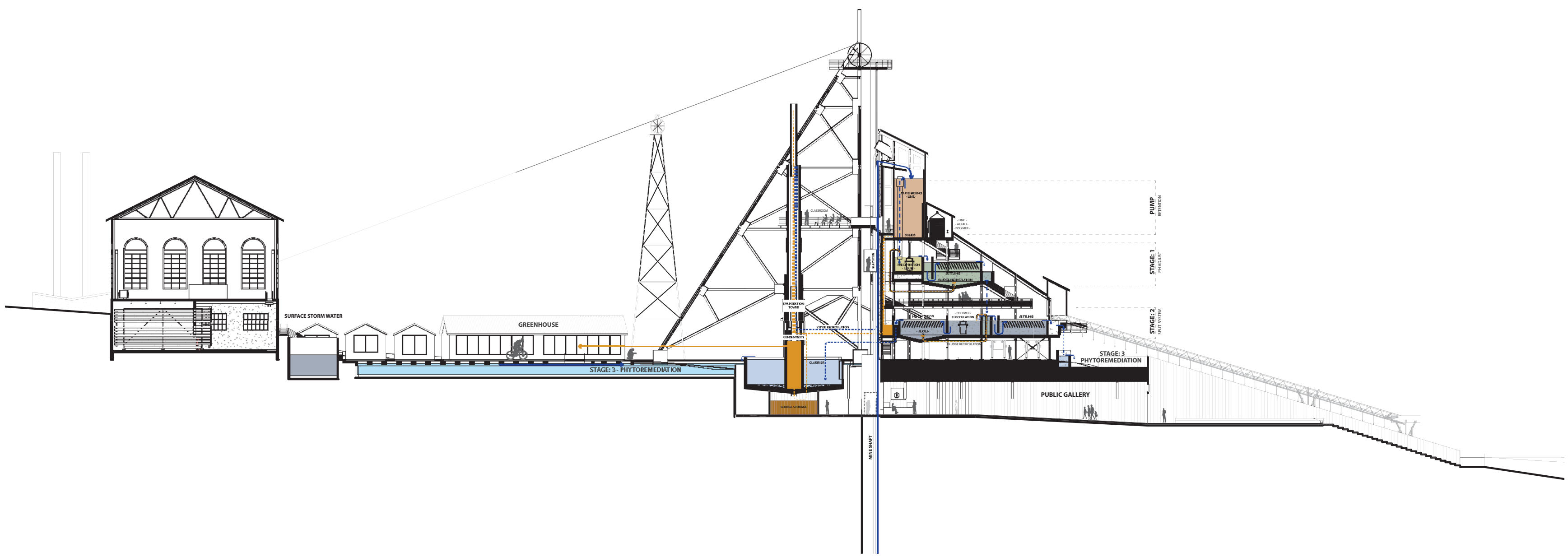

Programmatic Design Proposal for the Anselmo Mine.

### *WATER TREATMENT SYSTEMS*

The Anselmo Mine headframe was built with a large ore processing building called the "tipple". This structure saddles the headframe and used to process, sort, and store, the copper ore being pulled from the tunnels. By re-engineering this robust ore processor as a water processor, the Anselmo can once more begin mining its tunnels, only this time for toxic water. This adaptation of the Anselmo Mine's Infrastructure will not only reveal the hydrological connections that exist but will also celebrate the water treatment process and will include public access throughout the facility. The plant-life grown on-site from the newly cleaned waters will provide an urban garden and wetland for the local community.




Systems Diagrams for the Anselmo Mine.




Section at the Anselmo Mine Water Treatment Center, Main Public Gallery, and Phytoremediation Wetlands.

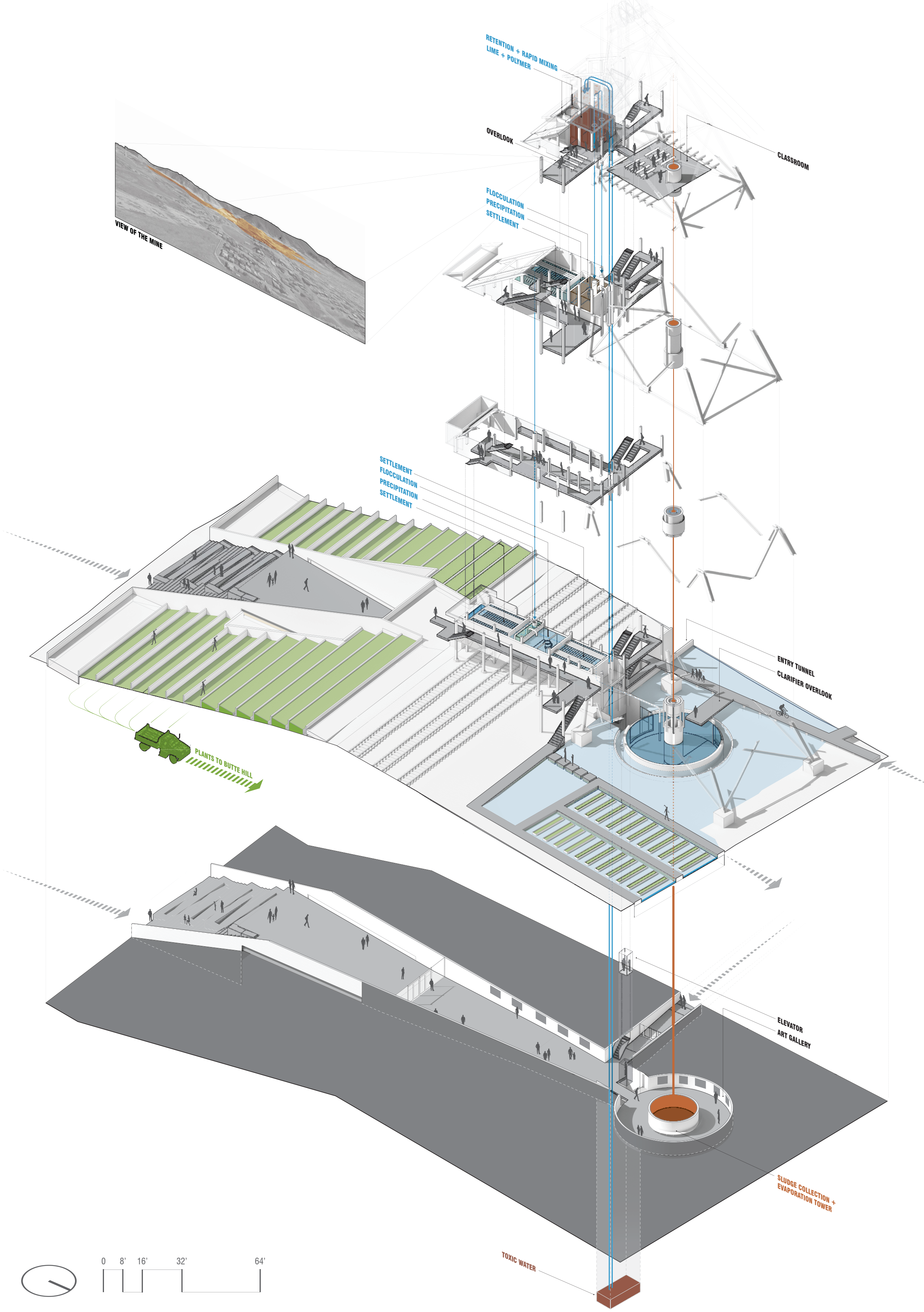
***IMMERSION NARRATIVE***

In order to fully immerse the visitor in this subterranean water-world, entry points around the periphery of the site pull the visitor below the surface through slots and tunnels that cut into the ground - echoing the mine's tunnels and the flows that the water takes to collect here. At the site's central point, the main shaft, visitors have the opportunity to hop on an elevator and tour the vertical water treatment facility. Both water and visitors will rise up out of the Earth and arrive at the first stage pH treatment level at the top of the mine's tipple. Here, much like at the original mine, visitors get a view of the Berkeley Pit mine, only this time with the toxic water pulled from it displayed in juxtaposition. From this point both water and visitor will begin slowly filtering down the treatment facility. As the water sheds its toxicity so will this view of the Berkeley Pit mine diminish. Once at grade, the water will enter a final clarifier before being released into a series of phytoremediation wetlands where a nursery of native flora will continue to purify and adjust the pH levels of the water making it safe for public engagement.

The additional buildings on site activate this new parkland with picnic pavilions, café spaces, administrative offices, greenhouses (for year-round growing), and water research labs. The plant-life grown on-site will provide an urban garden and wetland for the local community. As the facility continues to pump and treat this water, these wetlands will continue to spread North through the veins of the residual space left behind by Butte's Industrial past and expanding the urban trail network toward the edge of the Berkeley Pit Mine.

Surplus growth medium and remediated soils will be shipped via truck to the Berkeley Pit Viewing Stand for Phase 3: reclamation efforts on the pit slopes.

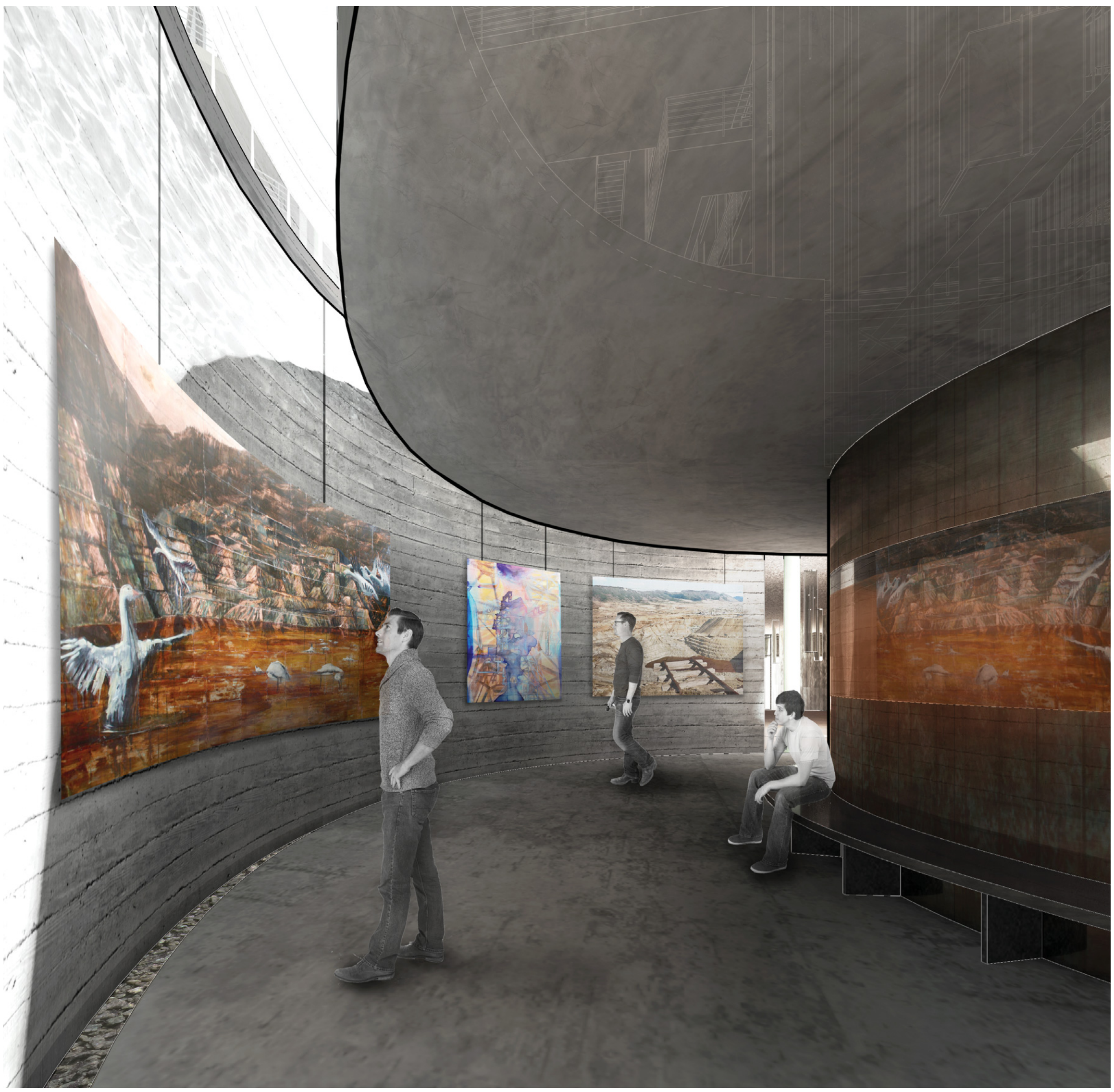
## WATER TREATMENT CENTER




Circulation Diagram of the Anselmo Mine Water Treatment Center.

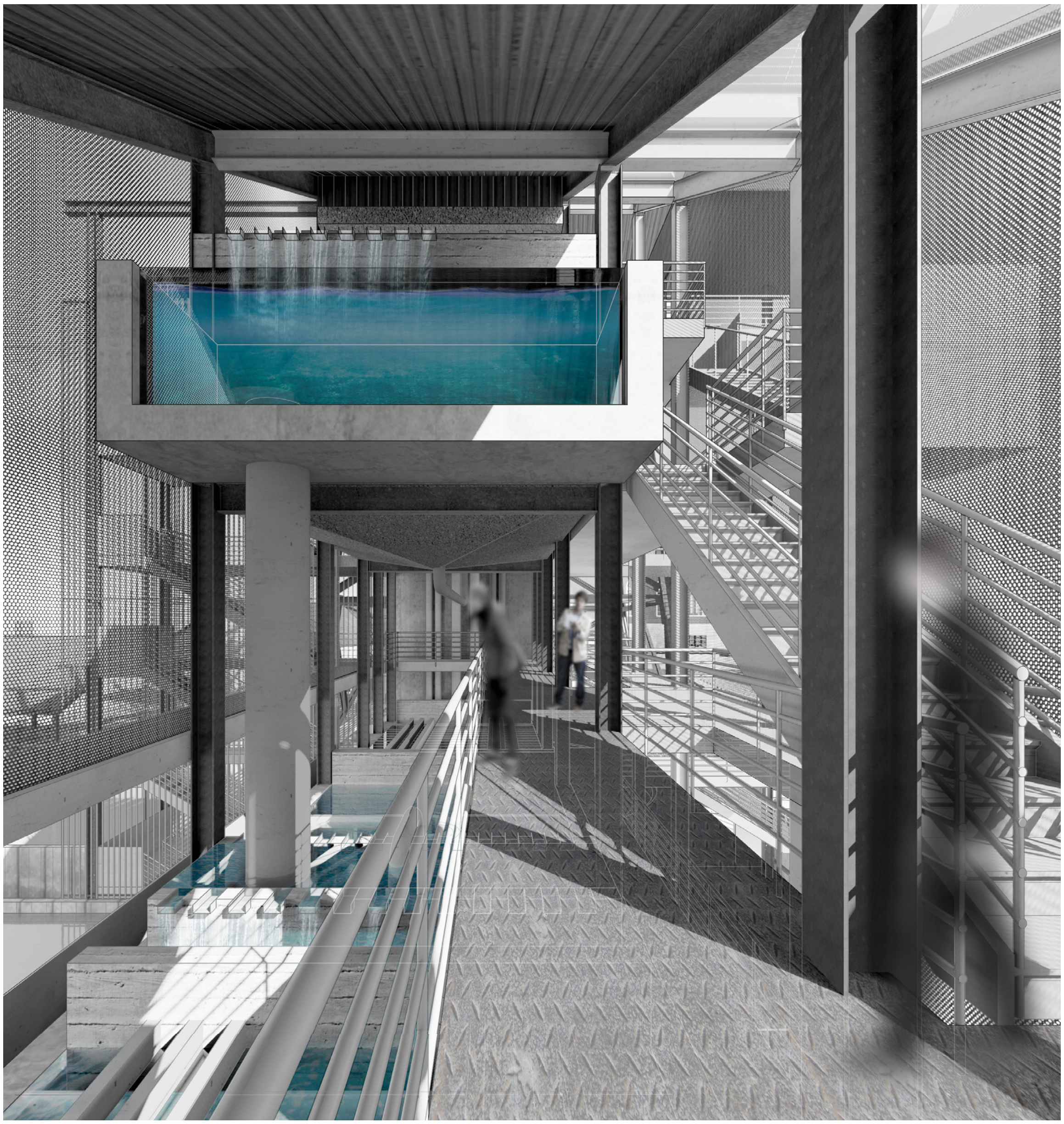
Perspective View at the East Entry Tunnel from the BA+P Hill Urban Hiking Trail.

Perspective View of the Treatment Center Entry Gallery.



Perspective View of the Treatment Center Art Gallery Below the Final Stage Clarifier.
“Untitled” by Nolan Salix,
“Submerged” by David Burke,
“Mines #43” by Edward Burtynsky


View at the 1st Stage Lime Infusion + Alkaline Tank with View of the Bekeley Pit Beyond.

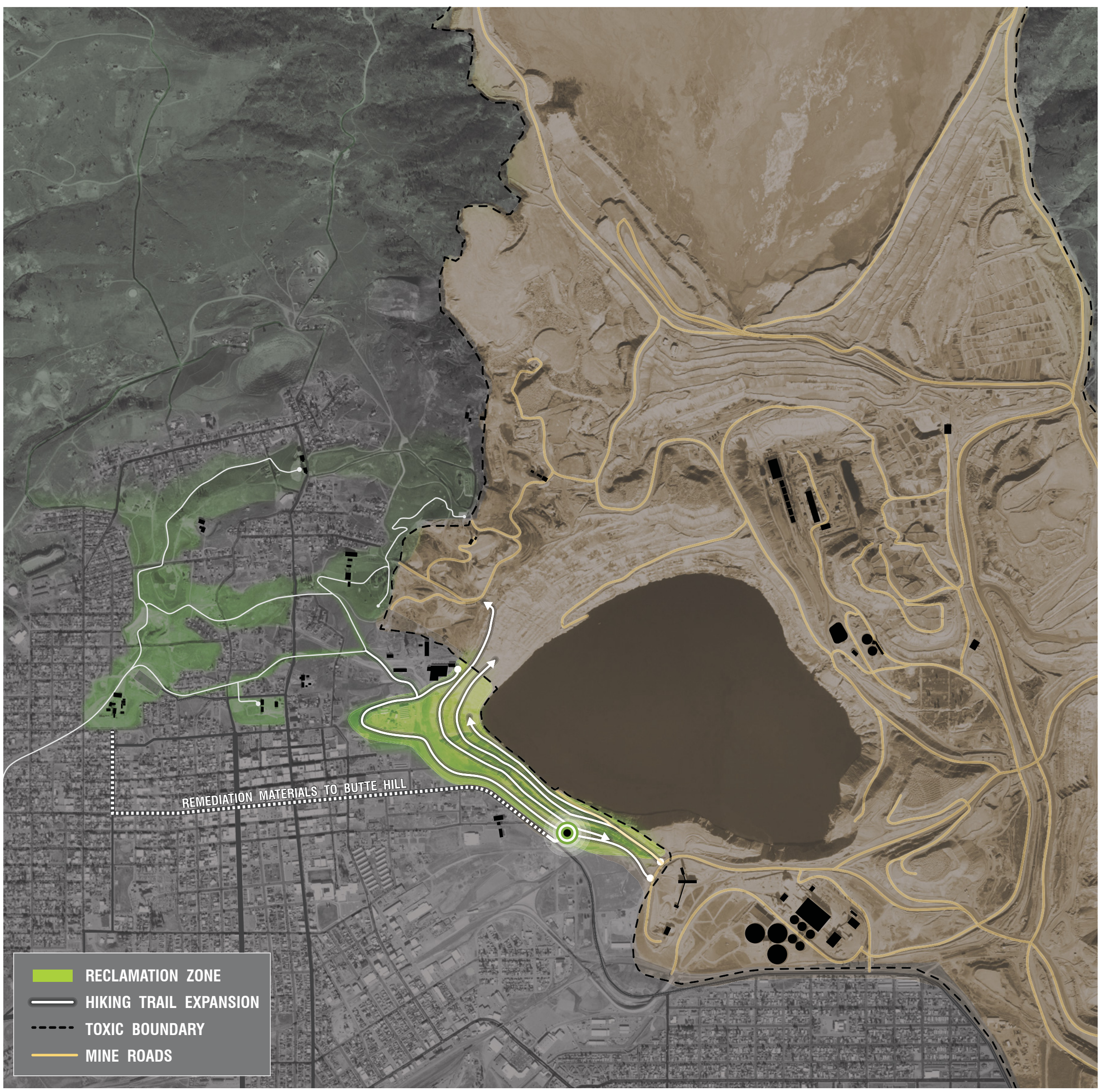


Perspective View Overlooking the 2nd and 3rd Stage Settlement, Flocculation, and Precipitation.

Perspective View of Constructed Wetlands and Picnic Pavilion.

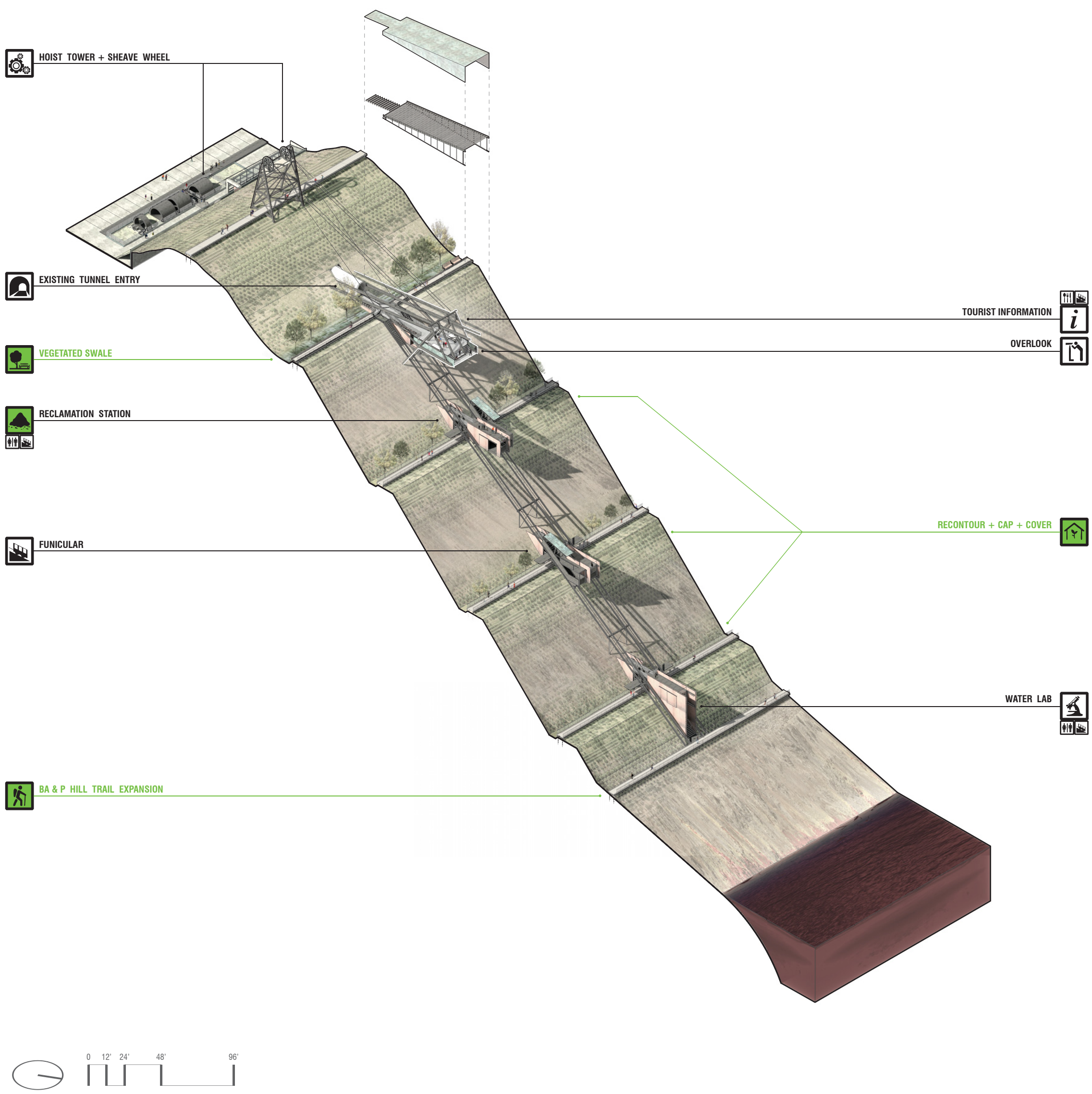
## PHASE 3: TRANSITION

With the Anselmo Mine Treatment Center generating remediated soils and matured native plant-life, the previously prohibited slopes of the Berkeley Pit can begin the process of recontouring, capping and vegetation to expand our sphere of engagement onto the surface of the mine beginning at the existing Berkeley Pit Viewing Stand. These reclamation efforts will reveal the Berkeley Pit minescape by expanding the reach of the existing viewing stand with a network of boardwalks and overlooks that work to stabilize the mines surface.



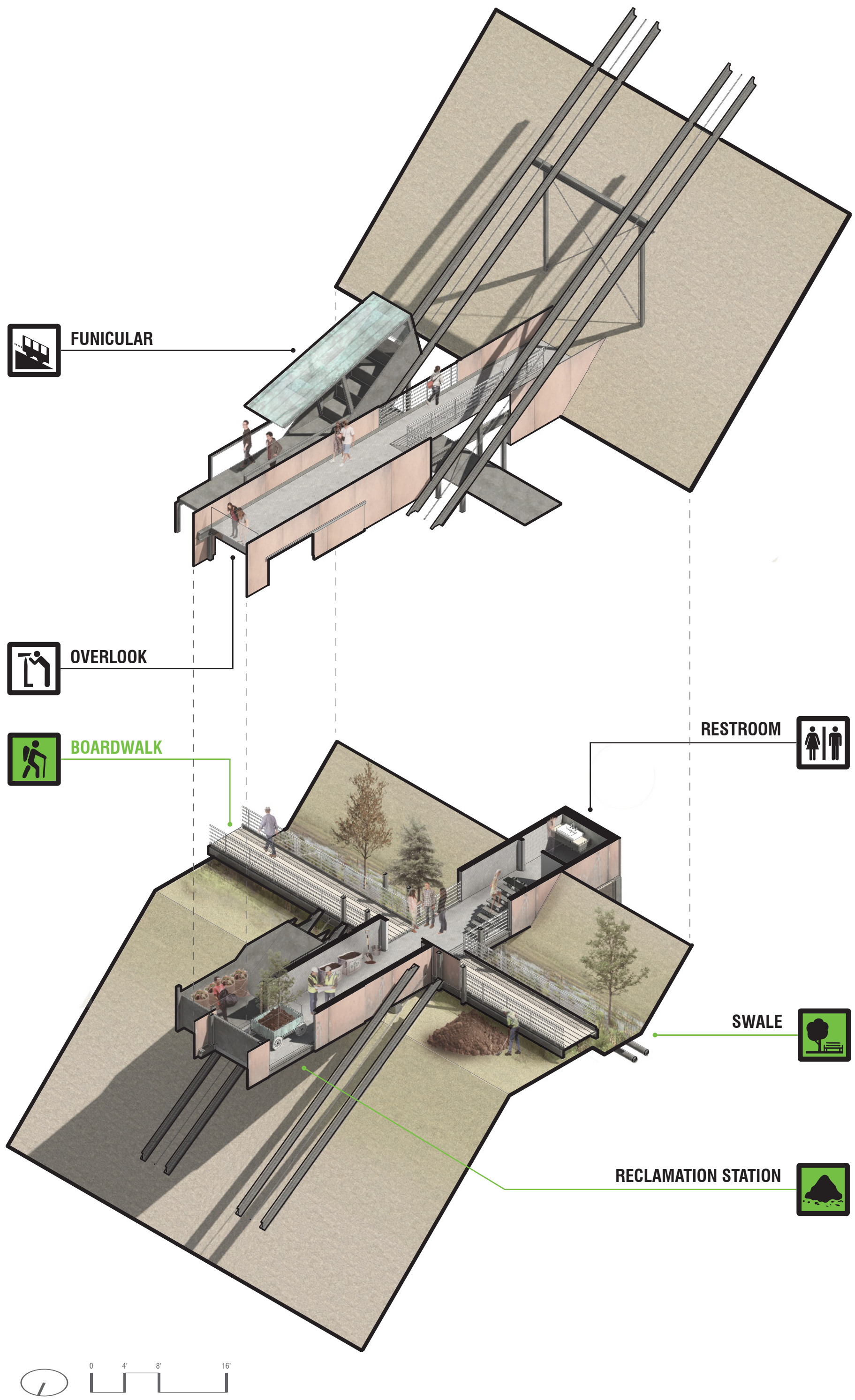

Slope Stabilization and Boardwalk Pathways Along the Edge of the Berkeley Pit.

# BERKELEY PIT RECLAMATION CENTER
## [TRANSITION]




Programmatic Design Proposal for the Berkeley Pit Viewing Stand.

# RECLAMATION STATION

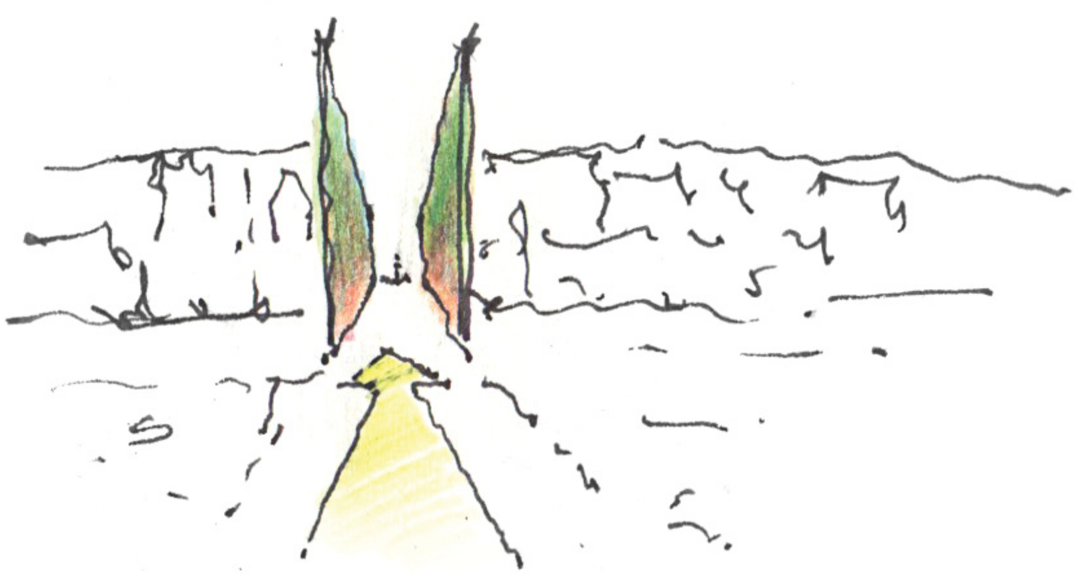



Typical Design for the Berkeley Pit Reclamation Stations.

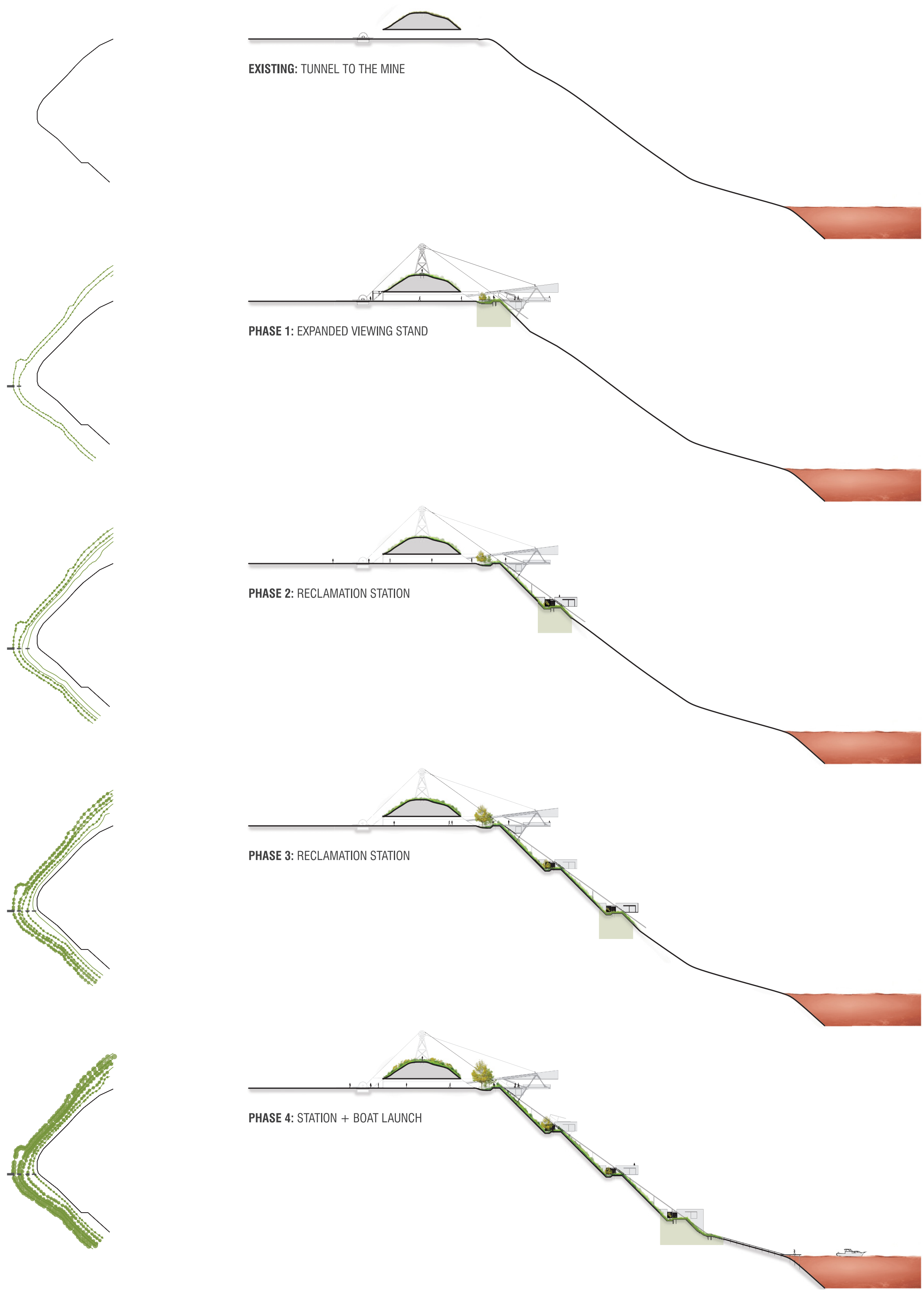
***TRANSITION NARRATIVE***

The viewing stand sits isolated on the edge of Berkeley Pit and lays claim to the only existing tunnel that cuts through the boundary of overburden. This existing connection will be vital for the first stages of reclamation on the mines surface. Here is where the remediated soils and matured native plant-life from the Anselmo will shipped to and placed into temporary greenhouses before being transported through the tunnel and out onto an expanded viewing stand that will now supports two funiculars that travel the vertical axis of the mine.

These funiculars will transport both plant-life and visitors down to a series of station points along terraced swales constructed on the slope and will serve as the initial staging point to recontour the slope. A geo-grid stabilization layer will support new top soils and will be staked down and held in place by a boardwalk system that will form the horizontal circulatory system for both visitors, workers, and vital nutrients to flow across the mine. Constructed swales work to slow the flow of surface run-off - preventing it from entering the pit and using it to grow thicker threads of vegetation. As these threads thicken and spread across the rim of the pit they will eventually lead to Phase 4: refuge within the manufactured landscape at the Emily Mine.



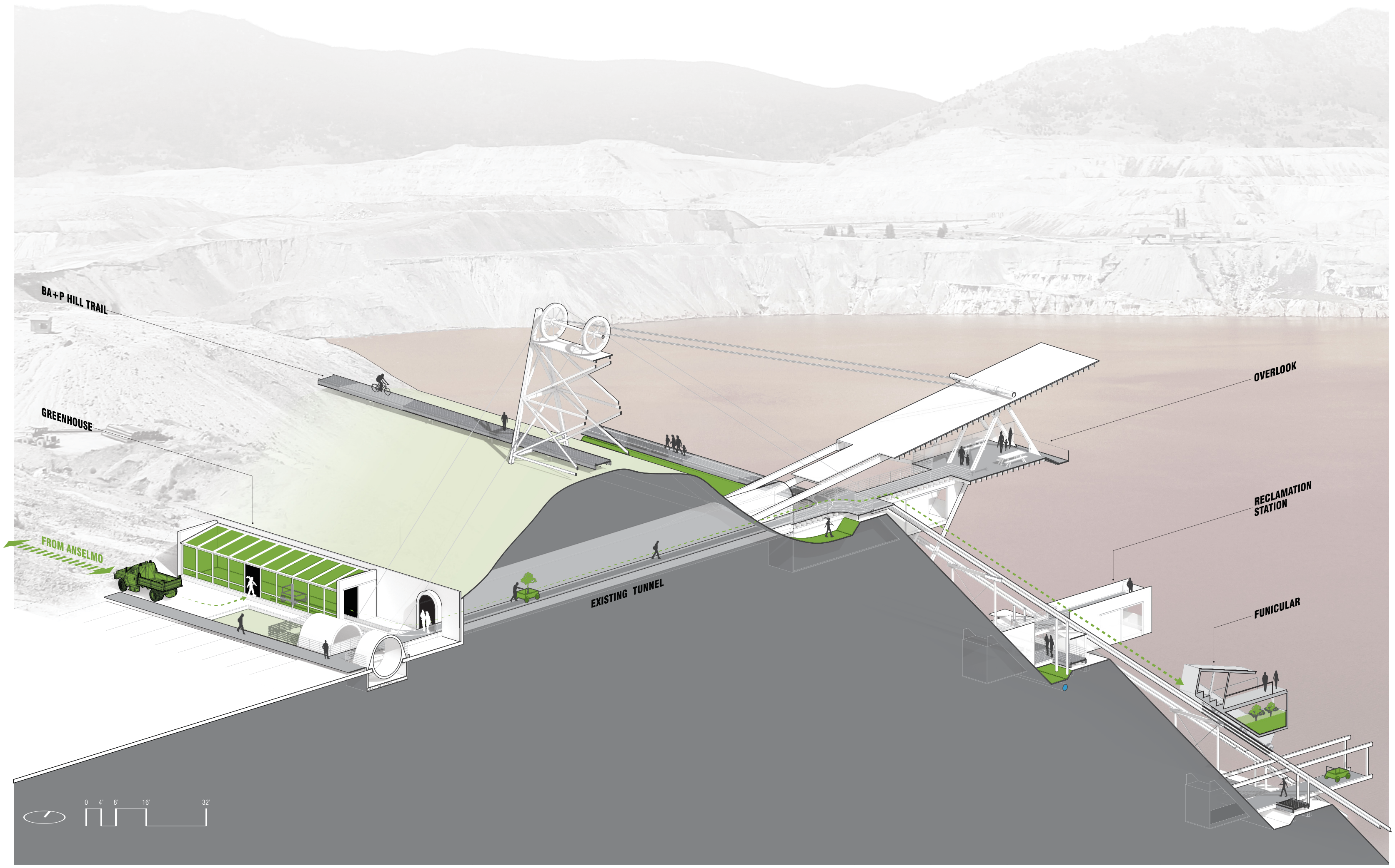
Early Concept Sketch for the Berkeley Pit Viewing Stand.




Phased Strategy to Recontour, Cap, Cover and make Publicly Accessible the Slopes of the Berkeley Pit.

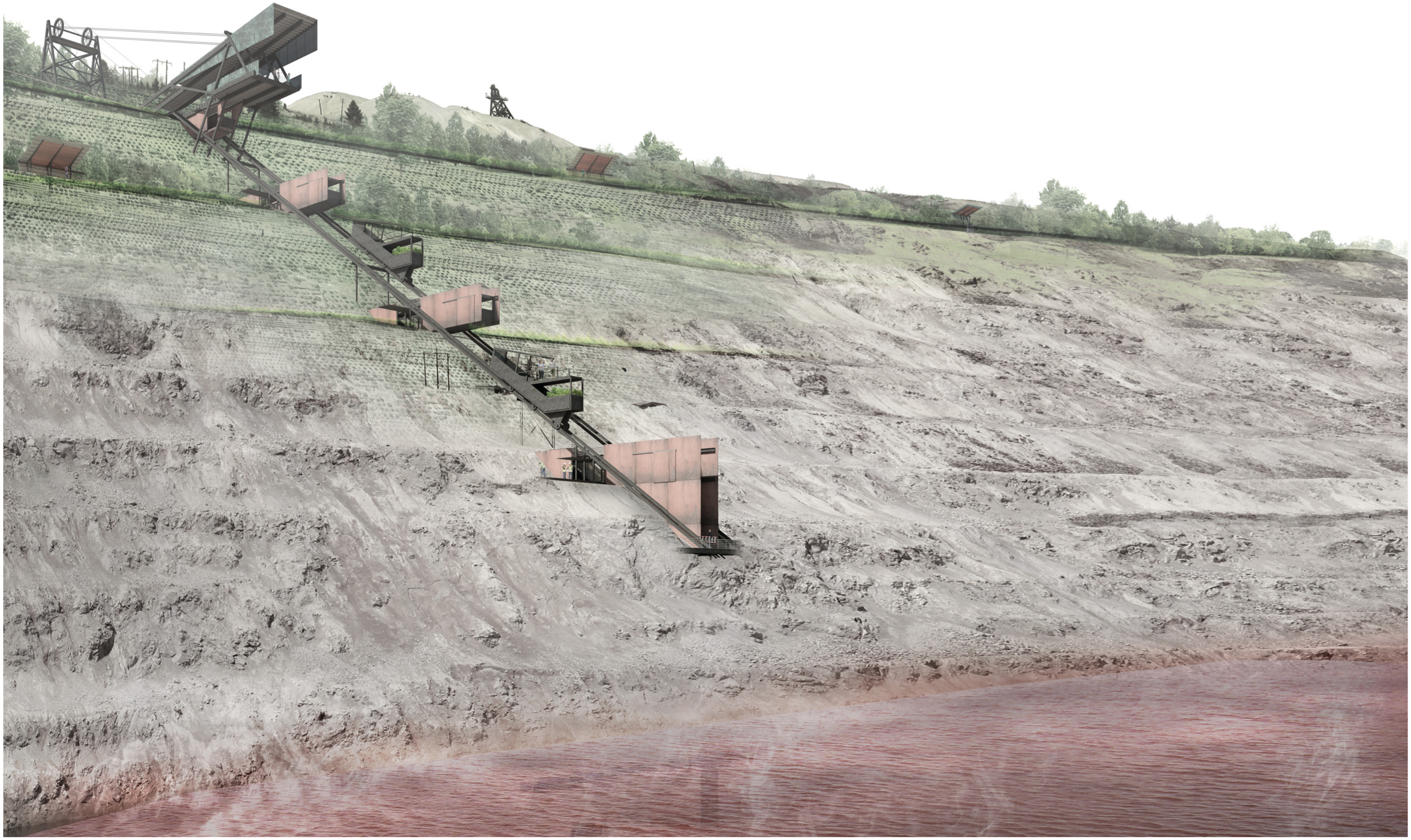
ERODED TERRACES | RECONTOUR + GEO-GRID | CAP + COVER | OPEN TO PUBLIC | REMEDIATED SLOPE

Phased Strategy to Recontour, Cap, cover, and make Publicly Accessible the Slopes of the Berkeley Pit.

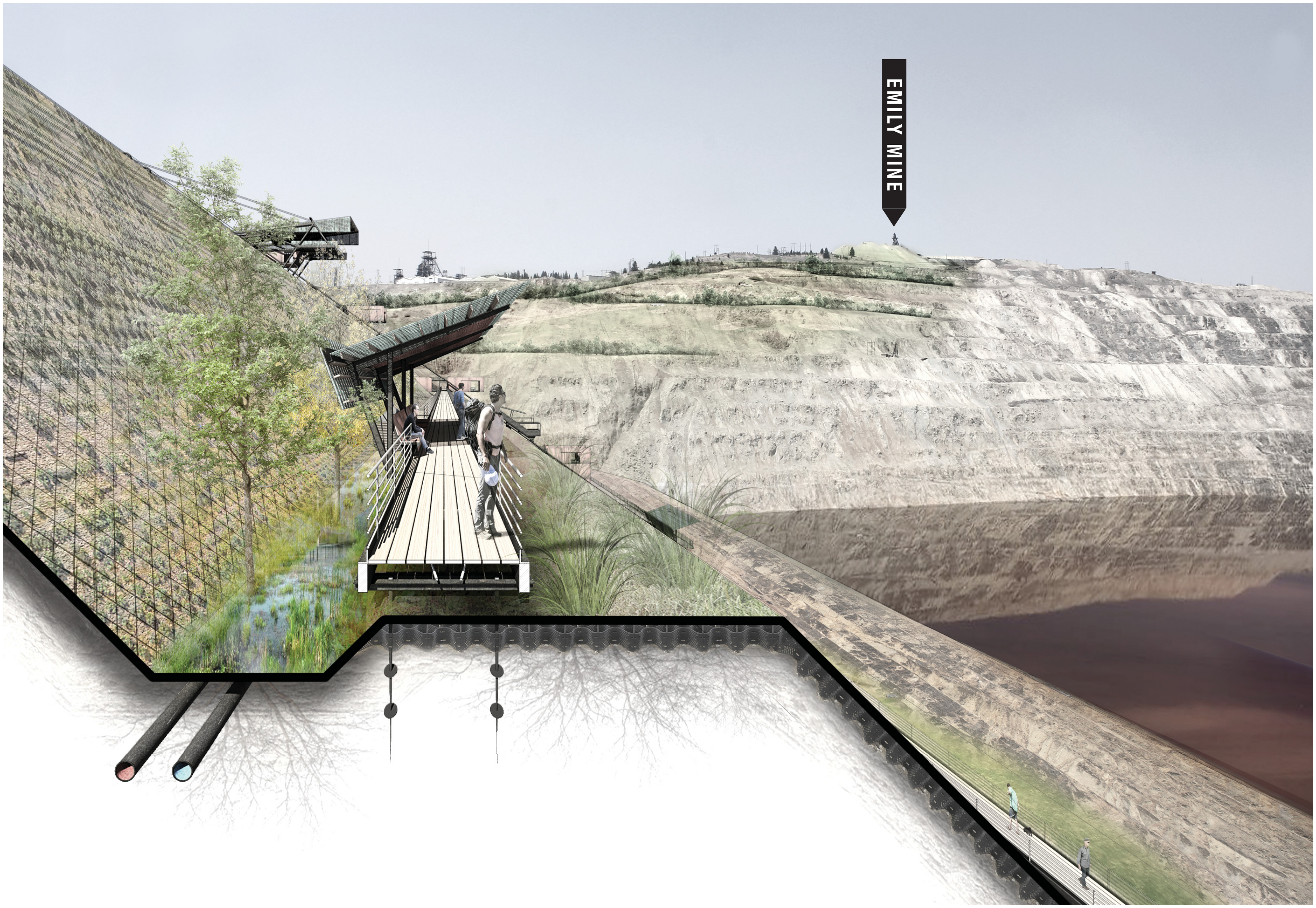



Section Perspective Diagram Showing the Flows of Visitors and Workers Through the Berkeley Pit Viewing Stand and Reclamation Center.

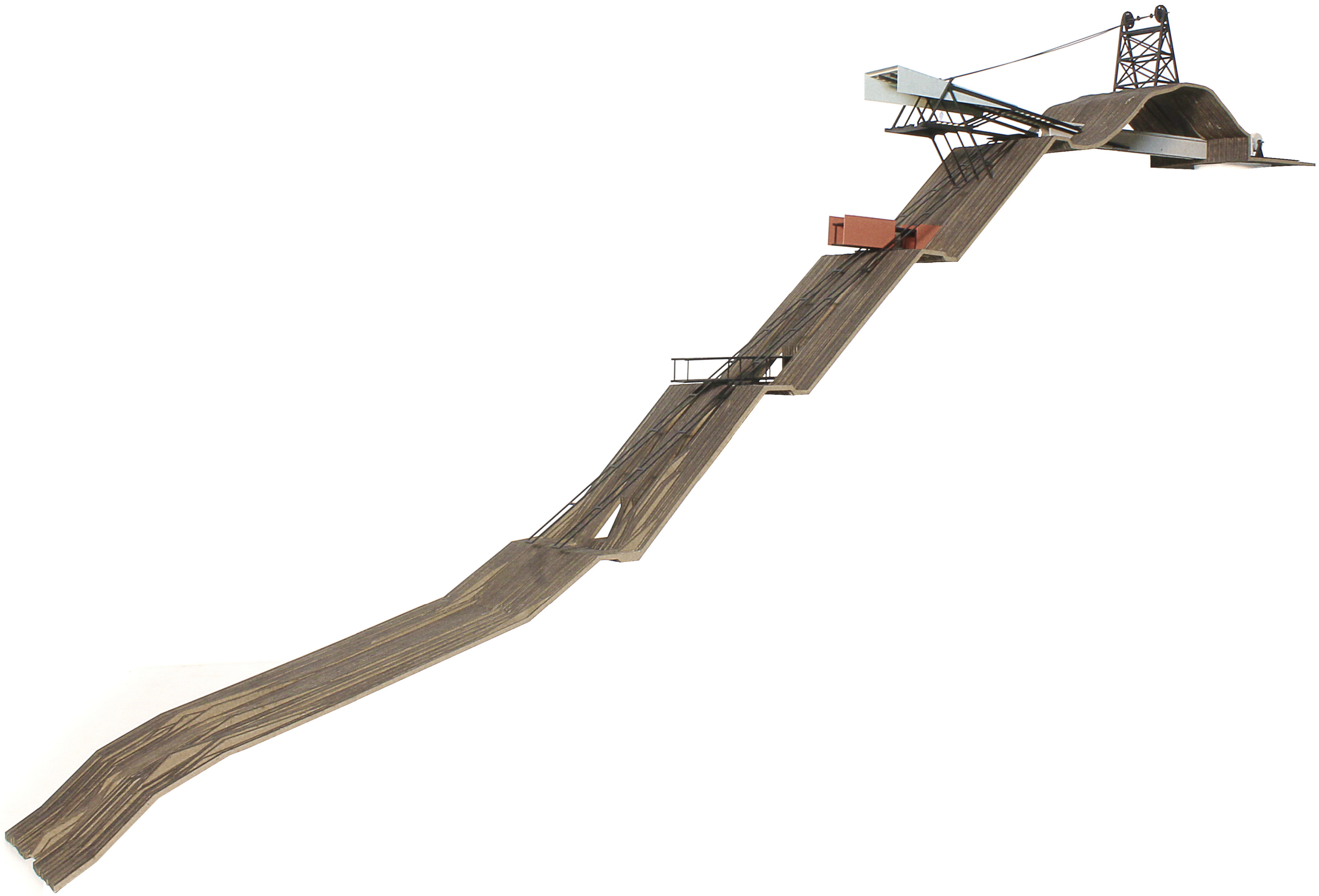
Perspective View from the Berkeley Pit Viewing Stand Overlook.



Perspective View of Berkeley Pit Viewing Stand and Reclamation Center from the Berkeley Pit.

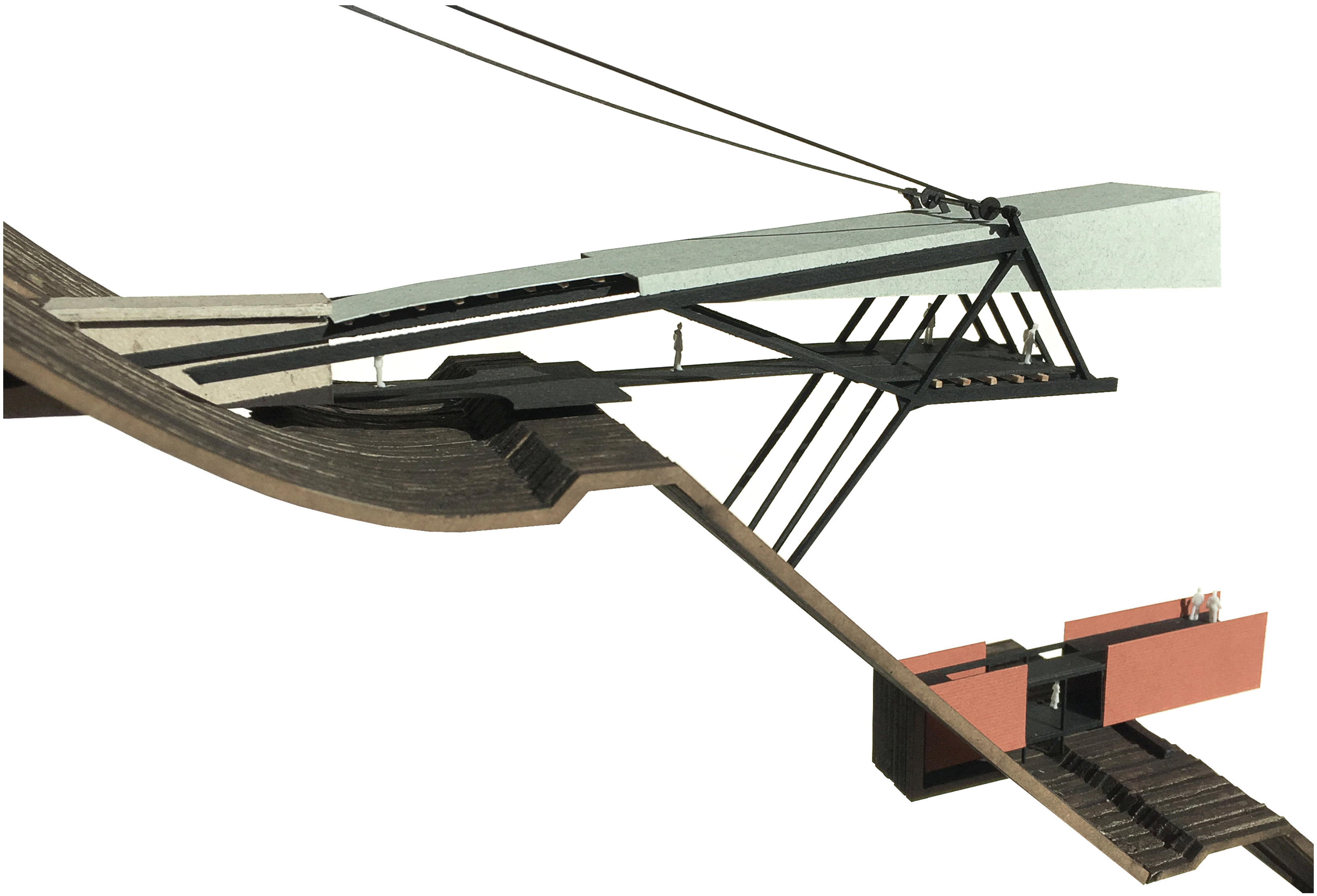



Section Perspective Through the Slope Stabilization Swale and  Boardwalk.



Model of the Berkeley Pit Viewing Stand and Reclamation Center.

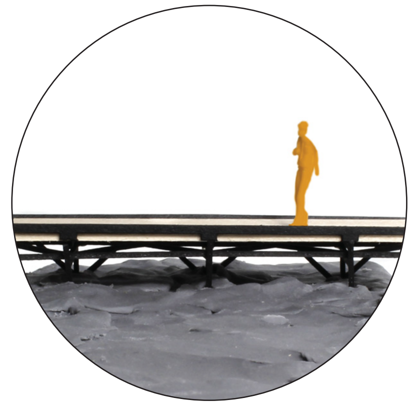
Model of the Berkeley Pit Viewing Stand and Reclamation Center.



Model of the Berkeley Pit Viewing Stand and Reclamation Center.

Model of the Berkeley Pit Viewing Stand and Reclamation Center.

## BOARDWALKS ON FLAT TERRAIN



In Safe Topographic and Non - Contaminated Terrain, Boardwalks may not Require Handrails.

## BOARDWALKS ON MOUNDED TERRAIN

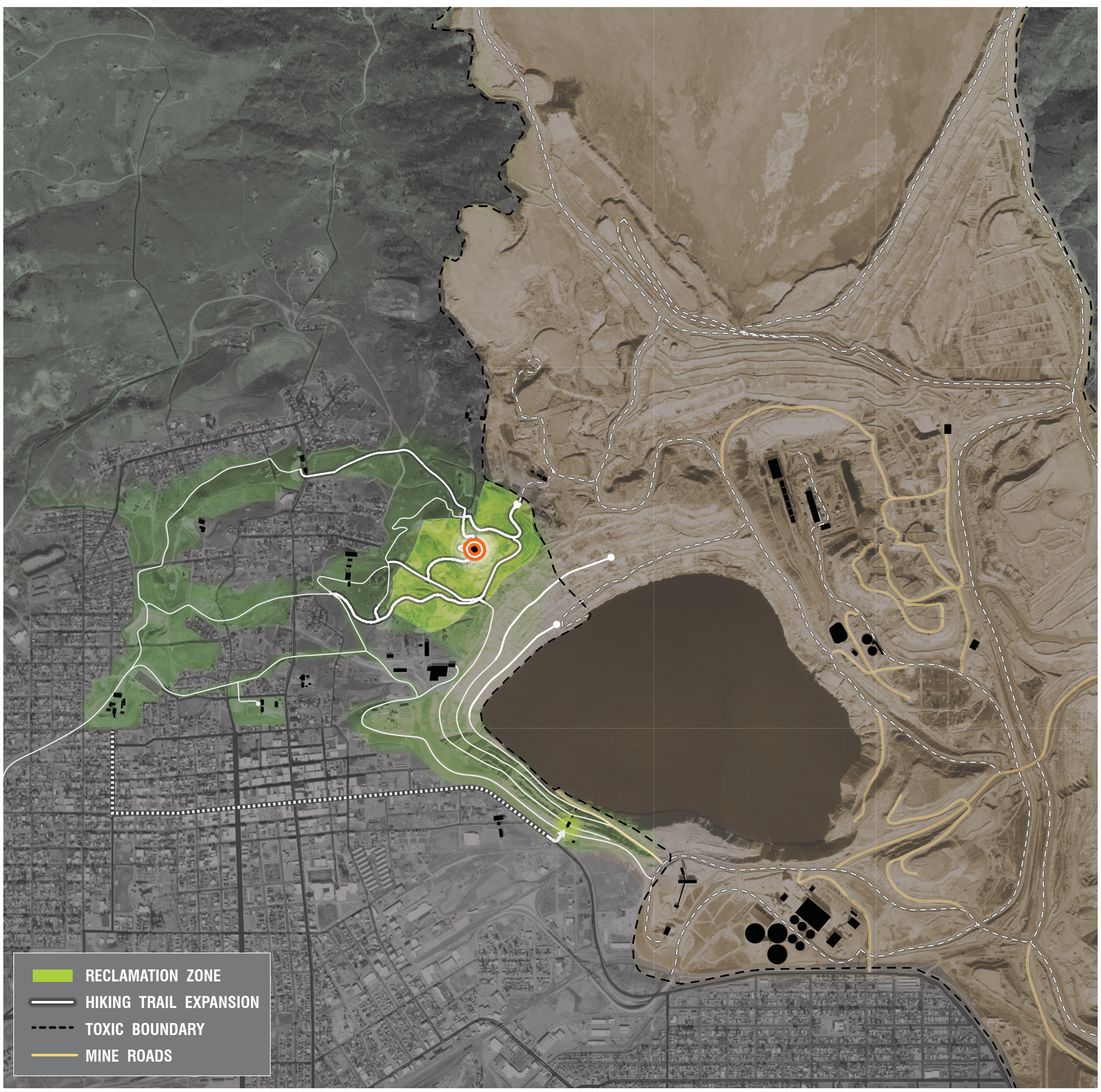
Mounded landscapes Require Guardrails.  Seating for Overlooks.  Trenches for Immersive Pass-Throughs.

## BOARDWALKS ON STEEP TERRAIN

Canopies Protect from Potential Erosion or Rockfall, Provide Sun Protection at Key Vista Points.

## PHASE 4: REFUGE

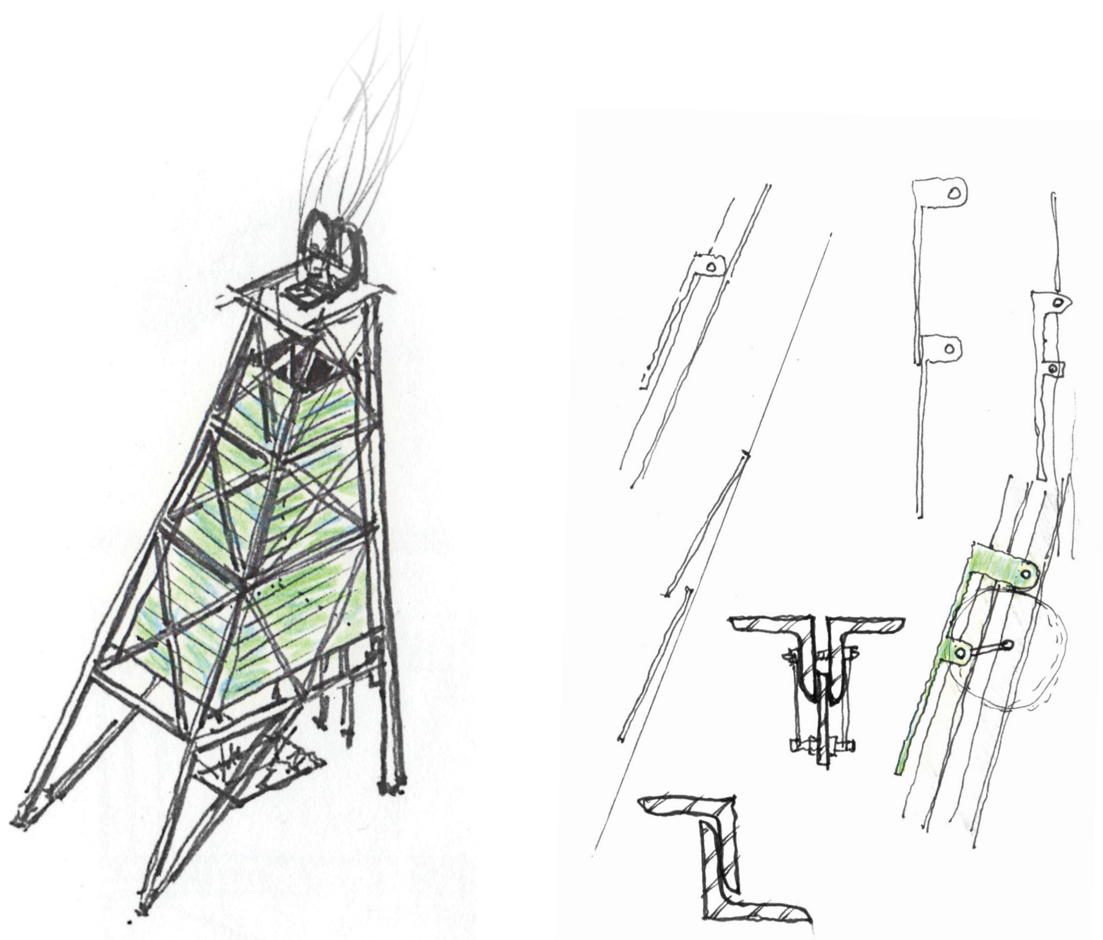
The Emily Mine sits high on top the northern slopes of the Berkeley Pit. This prominent location makes this headframe the most visible throughout both the minescape and the city of Butte. It also sits at the crossroads of the new trail network from the Viewing Stand and the expanded urban trail system from the Anselmo Mine. This point will become the main gathering place and refuge for visitors within this manufactured landscape.



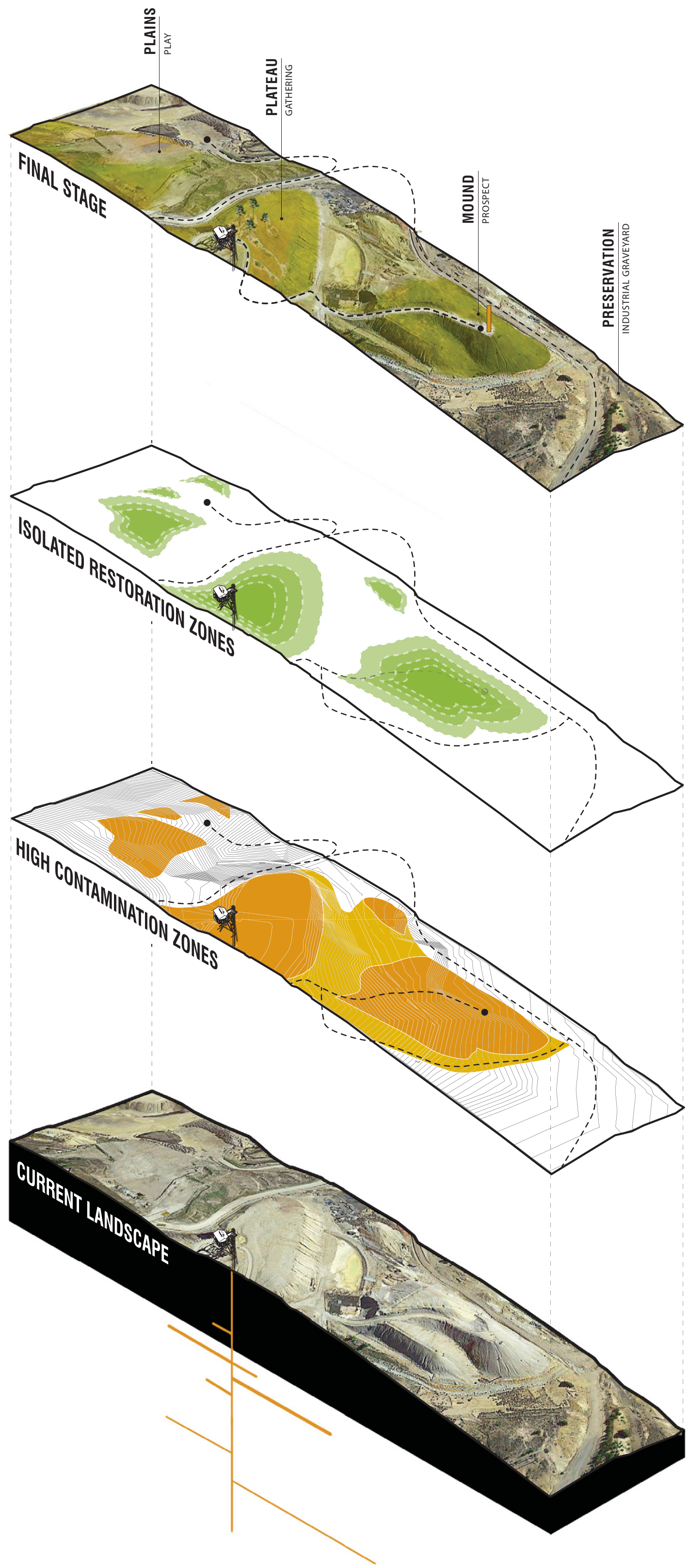

Expanded Trail Networks and Destination Point at the Emily Mine.

***EMILY MINE:*** *REFUGE AND CAMPGROUND*

Adaptations to the Emily Mine headframe will support an operable flue for communal bonfires for a new campground within the mine. These modification will illuminate the headframe at night as a beacon on the hill - drawing visitors out into this newly reclaimed landscape. Recapped mounds of overburden will become lush fields for play and new places of inhabitation can be built to provide more permanent refuge for visitors to inhabit the manufactured frontier.

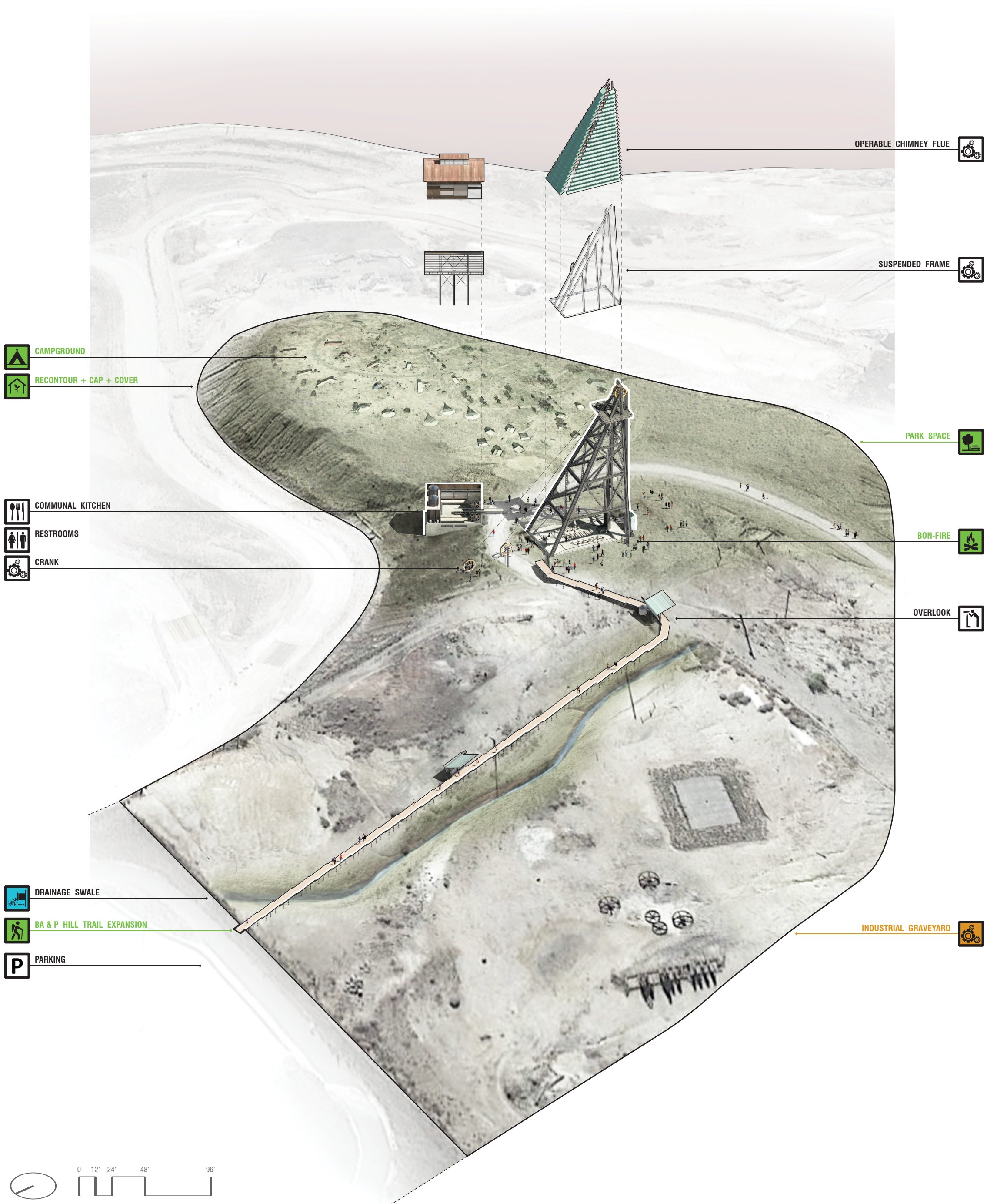


Concept Sketches for the Emily Mine Refuge and Operable Fin Detailing.



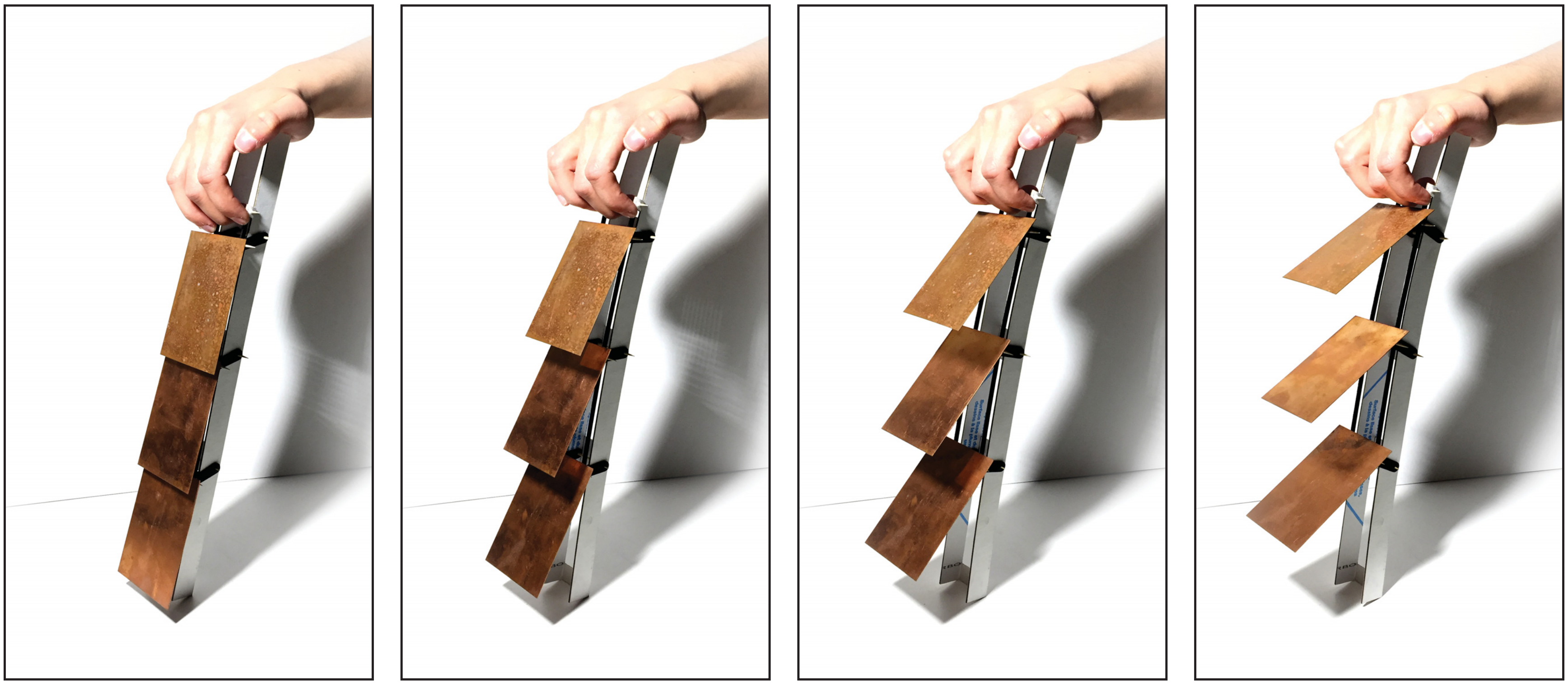

Strategic Site Reclamation at the Emily Mine.

# EMILY MINE
## [REFUGE]




Programmatic Design Proposal for the Emily Mine.

Section Perspective at the Emily Mine Refuge and Communal Gathering Space.

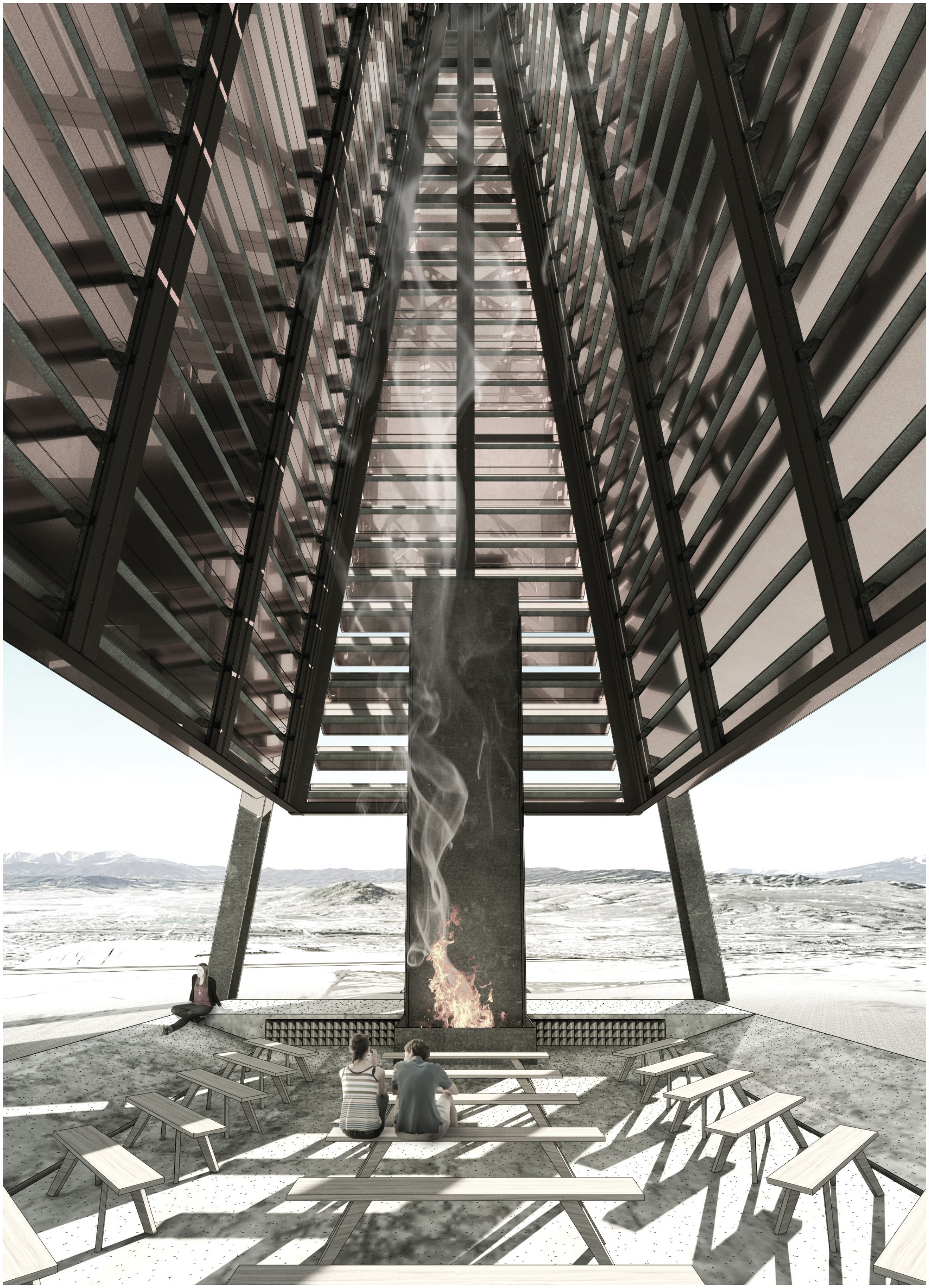


Study Model of Operable Fins at the Emily Mine Headframe.

Model of the Emily Mine Refuge.

Model of the Emily Mine Refuge.

Model of the Emily Mine Refuge at Night.



Perspective View within the Emily Mine Refuge.

Perspective View Within the Emily Mine’s Communal Kitchen.

Perspective View of the Emily Mine Campground at Night.

# CHAPTER 4: CONCLUSION

Mining has played a critical role in the exploration, settlement, and industrialization of the frontier of the American West. While these processes have slowly enabled us to tame the natural wilds of this landscape, they have inadvertently led to the reformation of this frontier as a manufactured 'wild'. Over time, as the supply of precious metals inevitably wane, these once rich and prosperous mine-lands eventually find themselves abandoned and forgotten - leaving behind vast regions of strangely beautiful and horrifyingly toxic wastescapes. These scars on the land and their industrial ruins maintain a collective memory of our past dominance, reliance, and alteration of these landscapes. These post-industrial landscapes make up the "largest soon-to-be reclaimed region in America"[42] and embody a rich cultural heritage and spirit of exploration, determination, and ingenuity.

The minescape of Butte Montana may be one of the most extensive manufactured landscapes in the American West, but it is only one of nearly 500,000 abandoned mines that are spread across the United States.[43] By rethinking our response to the Butte landscape, through the adaptation of its dormant infrastructure, we can not only work towards the restoration of local environmental systems, but we can also propose new prototypical and imaginative possibilities for how we may better understand, inhabit, and explore the greater post-industrial frontier of the American West. This strategy demands a reclamation process that does more than just contain the environmental hazards of these sites, but rather requires the public play a critical role in these processes. This integration will allow for us to better understand our impact on the land, the connections we share, and the processes necessary to restore them. By revealing the inherent nature and potential of the manufactured landscape we can set the table for a cultural shift in how we deal with these often neglected spaces in a more environmentally sensitive and culturally relevant way.

The proposal laid out in this thesis, though completed under the advisement of local scientists and professionals, is predominantly theoretical and architectural in nature. These

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42 Alan Berger, *Reclaiming the American West* (New York, NY: Princeton Architectural Press, 2002), 31.

43 "Extent of the Problem." *The Bureau of Land Management*. Accessed March 28, 2018. https://www.abandonedmines.gov/extent_of_the_problem.

ideas are meant to construct a framework for how such reclamation efforts may include the public as a critical component in the site remediation and reclamation process. For a practical application of these ideas to succeed, a far more robust team of hydrogeologists, botanists, geotechnical engineers, landscape architects, etc. will have to be assembled in order to fully analyze the unique conditions of the site, establish a comprehensive and feasible design response, and work with local and federal (EPA) officials to implement such interventions.

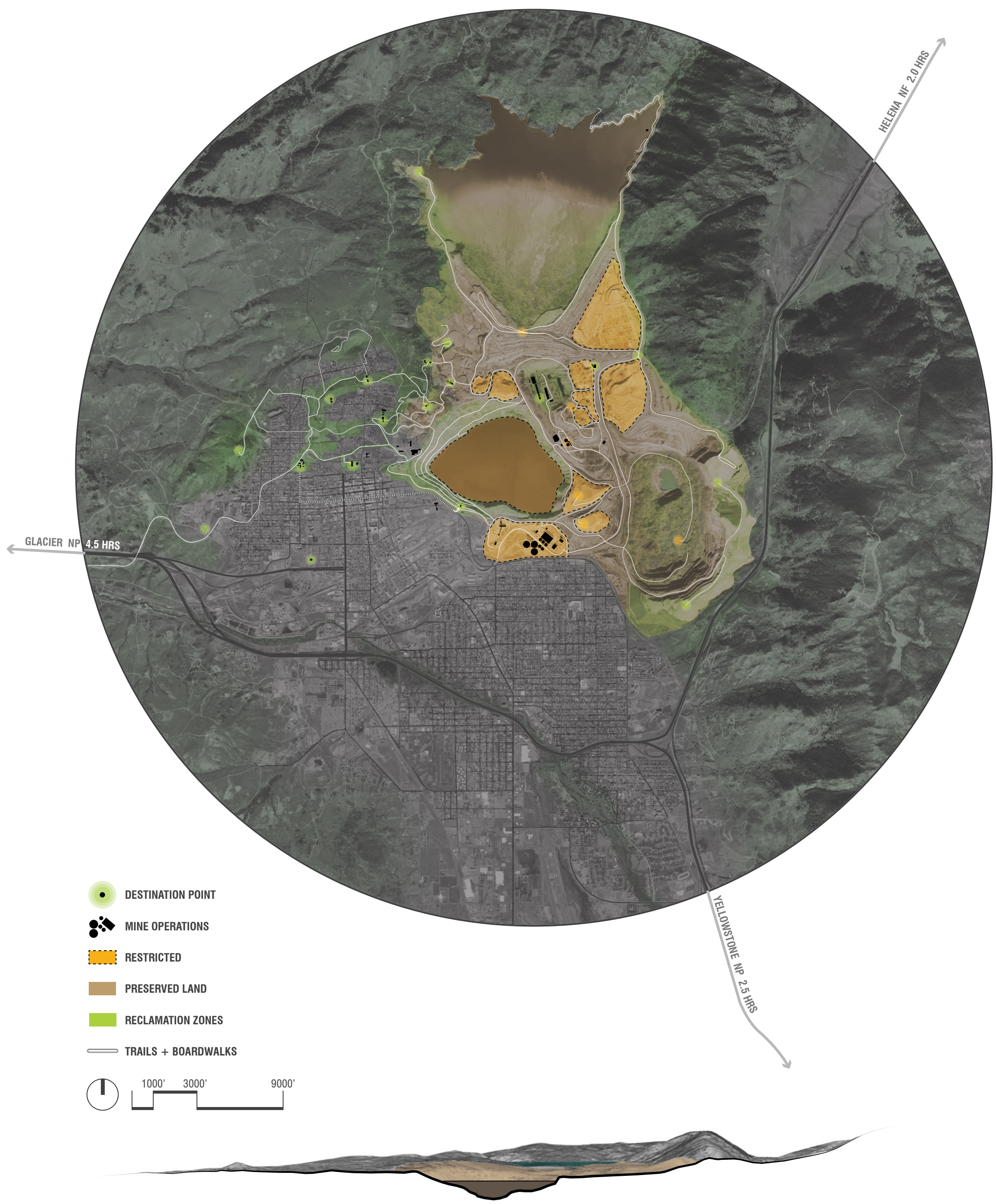
This design proposal aims to provide space for the public to engage in the reclamation processes of the manufactured landscapes of the Butte mines. These adaptations to existing infrastructure provide a potential process and strategy for how the local community of Butte, as well as outside visitors, may cross the boundaries that surround these landscapes in the hopes of revealing not only the wonder and fascination that exists in these historically restricted and strange places, but to also integrate the public with current and future restoration efforts. By coupling environmental restoration with public amenities and parkspace, our approach toward site remediation may evolve to a more financially and culturally sustainable solution that treats the reclamation process as a commodity and not a liability.

The Environmental Protection Agency has already begun significant work on the Butte Hill, specifically the topsoiling of the dry and bare flat lands at the Yankee Doodle Tailings Pond. Public involvement with these efforts may push this transformation beyond just a containment solution. New developments can provide benefits for ecology, hydrology and humans with new fields for recreation, and forested areas for wildlife and camping activities. As the Continental Pit eventually closes, instead of allowing its slopes to crumble and fill with toxic water like the Berkeley Pit, it can be stabilized through the use of boardwalk systems and geo-grid layers that vegetate the pit and make it safe for public access. These interventions are necessary to mend the fragmented relationship between the manufactured landscape and its surrounding natural and urban context. These efforts are meant to rehabilitate ecological, hydrological, and geological systems while preserving the spirit of the place. The post-industrial character of the manufactured landscape is what maintains its meaningful historical and culturally significance. The ways in which we influence these landscapes should not be intended to revert them back to their original and natural state, but rather to seek to make safe and accessible these places - all while carefully preserving their industrial character within a new park typology.

Re-establishing this landscape as a publicly accessible parkland will not only grant a new field of opportunity for the citizens of Butte Montana, but may also attract more tourism to the city - potentially supplanting Butte's economic dependency on mining and extraction, while maintaining the city's industrial heritage and legacy as a forerunner in the manufactured frontier of the American West.

We must continue to engage in the reclamation processes of our neglected and manufactured wastescapes - not only inform how we connect to these landscapes, but to reposition ourselves culturally as stewards of the land. By maintaining such a relationship we have the opportunity to serve a critical role in the re-establishment of the manufactured landscape as part of nature, open to exploration, and ready for re-imagination as a re-emerging and post-industrial frontier.

Anatomy of the Butte Landscape 25 years in the future




Speculative Impact of a Post-Industrial Park in Butte, Montana.

# APPENDIX: CASE STUDIES

## GASWORKS PARK

Landscape Architect: Richard Haag

“Gas Works Park evolved as one of the first post-industrial landscapes to be transformed into public place.”[44] Prior to its conversion Gasworks Park was where the city would burn it’s garbage. Eventually it became the industrial center for coal gasification for the city. By 1956 the plant was closed and remained abandoned until 1962 when it was purchased by the city and site remediation began.[45] Richard Haag was hired to masterplan and design this site into a new park. Haag maintained the charm and history of the site by saving the iconic infrastructure and addressing contamination with the introduction of “oil degrading enzymes into the surrounding area to stimulate the breakdown of toxic contaminants in the soil”[46] Portions of the existing infrastructure have been converted into playground and covered picnic spaces while other remain closed off due to safety concerns, now dubbed “the forbidden zone”.[47] Buildings and foundations that could not be saved were demolished and the rubble was piled together and covered in new top solid to form the great mound where park visitors can view the Pugit Sound and the city skyline beyond. The park opened in 1975 inspiring similar adaptive parkscapes such as Duisburg Nord, Germany.

> I haunted the buildings and let the spirit of the place enjoin me. I began seeing what I liked, then I liked what I saw—new eyes for old. Permanent oil slicks became plain without croppings of concrete, industrial middens were drumlins, the towers were ferro-forests and the brooding presence became the most sacred of symbols. I accepted these gifts, and decided to absolve the community’s vindictive feel towards the gas plant.[48]

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44 Thaïsa Way, *The Landscape Architecture of Richard Haag: From Modern Space to Urban Ecological Design* (Seattle: University of Washington Press, 2015), 147.

45 Miranda Ray, “Gas Works Park.” *Atlas Obscura* (blog), November 16, 2016. https://www.atlasobscura.com/places/gas-works-park.

46 Ibid.

47 Ibid.

48 Thaïsa Way, *The Landscape Architecture of Richard Haag: From Modern Space to Urban Ecological Design* (Seattle: University of Washington Press, 2015), 150.

Before Transformation
Photograph by Richard Haag (1969)

Aerial View
Photograph by Richard Haag Assoc. (1975)

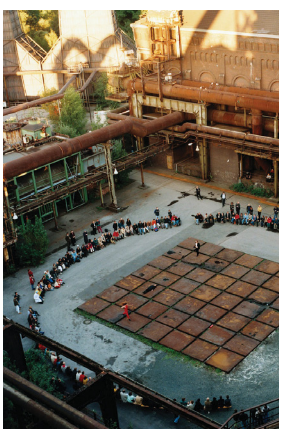
After Transformation
Photograph by Richard Haag Assoc.

## LANDSCHAFTSPARK DUISBURG-NORD

Architect: Latz + Partner

This massive industrial wasteland was converted into a network of independent parkscapes which find their programmatic and architectural basis in the existing forms of the industrial ruins. Blast Furnace Park consists of an open courtyard within the old furnace. Sinter Park, a once heavily contaminated site, is now a lush landscape with smaller intimate spaces for "retreat and contemplation".[49] Waterpark utilizes the existing water channel as a new wastewater and restoration facility. "Man uses this artefact as a symbol for nature, but remains in charge of the process. The system is at one and the same time entirely natural and entirely artificial."[50] Railway Park repurposes the abandoned train tracks once used for industrial use as pedestrian pathways and running trails which link various portions of the full park together and provide viewpoints at bridges. Adventure Playground sites are scattered throughout the park and utilize existing surfaces for a number of climbing, skating, and water activities. The Ore Bunker Gallery takes the vast collection of concrete rooms and uses them as gallery spaces for artwork as well as microclimate spaces for gardens.

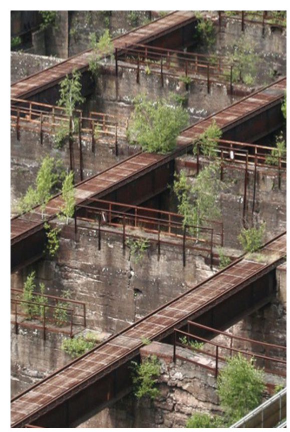
> The idea was to integrate, shape, develop and interlink the existing patterns that were formed by its previous industrial use, and to find a new interpretation with a new syntax. The existing fragments were to be interlaced into a new "landscape.[51]



Blast Furnace
Photograph by Latz+Partner

Adventure Playground
Photograph by Latz+Partner

Waterpark
Photograph by Latz+Partner



Ore Bunker Gallery
Photograph by Latz+Partner

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49 "Duisburg Nord - Waterpark". *Latz + Partner*. Accessed March 23, 2018. https://www.latzundpartner.de/en/projekte/postindustrielle-landschaften/duisburg-nord-wasserpark/.

50 Ibid.

51 Ibid.

## ZOLLVEREIN INDUSTRIAL COMPLEX

Architect: OMA, Foster + Partners, SANAA

From 1847 to 1993 Essen Germany was home to the Zeche Zollverein, Europes largest coal mining and industrial complex. This iconic industrial landscape is most known for its Bau-haus inspired buildings designed by architect Fritz Schupp. As the complex closed in 1993, a push was made to reimagine this massive industrial park into a new historical and multi-functional recreational hub. OMA and Henri Bava devised a new master plan in 2002 and other notable architects, Sir Norman Foster and SANAA, joined together to redevelop the site an construct new museums, restaurants, venues, and recreational space. Zollverein has since been designated as a World Heritage Site. The exemplary adaptive reuse works for the Red-Dot Deign Museum by Foster + Partners, and the historical Ruhr Museum by OMA demonstrate "the potential of sensible preservation and the importance of ever-lasting architecture."[52] While the sensitive adaptation of the historical and iconic industrial architecture has been a huge success, the newly constructed School of Management and Design has received mixed praise as it seems to stand apart from the rest of the complex as an overly flashy design that seems foreign and at odds with the pragmatic and timeless structure of the rest of Zollverein.

> The masterplan consists of a band around the historic site. New roads and the extension of an existing highway through a tunnel servicing the site allow for an easier access. The rail tracks inside the site are maintained as public space, and connect the main buildings. The sky bridges for transporting coal are opened for visitors, who can also visit a former mine 1,000 m deep.[53]

Walking Paths
Photograph by Gili Merin

Reflecting Pond
Photograph by Gili Merin

Ferris Wheel
Photograph by Gili Merin

52 Gili Merin, "A Photographic Journey Through Zollverein: Post-Industrial Landscape Turned Machine-Age Playground" *Archdaily*. Last modified August 6, 2014.

53 "Zollverein Masterplan." *OMA*. Accessed March 27, 2018. http://oma.eu/projects/zollverein-masterplan.

## FRESHKILLS PARK

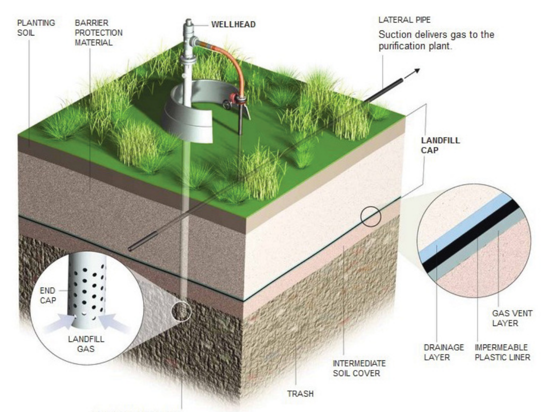
Architect: James Corner Field Operations

From 1947 to 2001, the Fresh Kills Landfill became the single largest man-made structure as this once sea-level wetlands grew into a undulating hillscape of 30,000 tons of garbage.[54] Since its closure in 2001, James Corner Field Operations has been developing a 30 year master plan to reclaim the site as a natural wildlife habitat, and recreation park. This strategy divides the 2,200 acres landfill into five sections that each support new public activities; playing fields, sculpture gardens, hiking trails, waterfront access, restaurants, etc. As portions of the site are reclaimed and made safe, the publics access of this landscape will continue to expand over time.

> Perhaps instead of designing a wonderful master plan, that's unlikely to be built in all of its perfection, maybe we should design a process, process around which this very large and complex landscape can begin to grow over time.[55]

This process includes the harvesting of the landscapes own new top-soil, through the farming of high organic crops that are periodically mowed into the ground. This strategy should produce a 6 to 9 inch layer of top-soil within five years, sidestepping the need to import such materials.[56]

Park Rendering
Rendering by Freshkills Park / City of New York




Freshkills Systems Diagram
Diagram by Kate Ascher and Frank O'Connell

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54 "Landfill Reclaimation: Fresh Kills Park Develops as a Natural Coastal Buffer and Parkland for Staten Island." *ArchDaily*. March 03, 2013. https://www.archdaily.com/339133/landfill-reclamation-fresh-kills-park-develops-as-a-natural-coastal-buffer-and-parkland-for-staten-island.

55 James Corner, "Beyond the High Line: Transforming Fresh Kills, Staten Island." *Friends of the High Line*, (Lecture, New York City, September 23, 2013).

56 Ibid.

## WELDON SPRINGS NUCLEAR WASTE HILL

EPA Superfund Site

From 1941-1945 the U.S. Army performed tests and manufactured explosives and weapons in Weldon Springs, Missouri.[57] From 1956-1966 a 205 acre portion of land was controlled by the U.S. Atomic Energy Commission (AEC) which constructed a Uranium Feed Materials Plant.[58] The site was eventually abandoned in 1969. Minor contamination clean-up efforts were made to address the toxicity of the plant but it was not until 1987 when the EPA designated it a Superfund Site. Instead of shipping off contaminated materials to an off-site containment facility, the EPA Record of Decision called for the 214 tons of uranium and 129 tons of thorium to be entomb within an on-site 41 acre disposal cell.[59] This $400 million clean-up project took 12 years to complete and is designed to protect this radioactive material for the next 1,000 years.[60] The disposal cells strange mountainous design provides a vista and destination point for curious tourists and also includes a small museum dedicated to the toxic history and containment efforts that were made. It is an extraordinary looking structure but it unfortunately does not provide enough to make a visit worth while. As one visitor described their visit:

> It's not a very well advertised attraction, even compared to the rail-trail down the road. There's a metal building with some museum stuff and a conference room (named for ex-town Howell), a several mile-long trail snaking around the area, and the staircase. A couple of benches and plaques sit up top explaining the situation. The view is pretty great, one of the highest points in the county.[61]

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57 U.S. Department of Energy, "Fact Sheet - Weldon Spring, Missouri, Site: History" last modified April 12, 2017. https://www.lm.doe.gov/Weldon_Fact_Sheets.pdf.

58 Ibid.

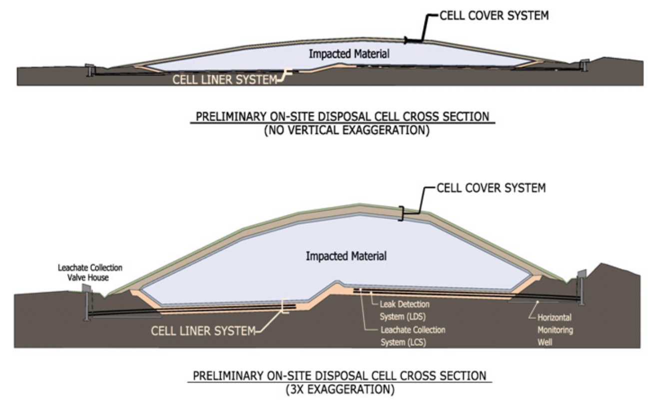
59 Ibid.

60 "Contamination: How Weldon Springs Went from Model to Mess." *TorHoerman Law* (blog), Oct 14, 2012 (4:24pm), https://www.torhoermanlaw.com/contamination-of-the-clean-one/.

61 Michael Byrne, "Hiking Up a Big Pile of Nuclear Waste in Weldon Springs, Missouri." *Motherboard* (blog), October 04, 2012. https://motherboard.vice.com/en_us/article/d7777x/hiking-up-a-big-pile-of-nuclear-waste-in-weldon-springs-missouri.

Weldon Springs Containment Mound
Photograph from Google Maps API.

Weldon Springs Containment Mound
Photograph by Jeff Joiner




Containment Section Diagram
Diagram by The Department of Energy, Portsmouth

## ALLMANNAJUVET ZINC MINES

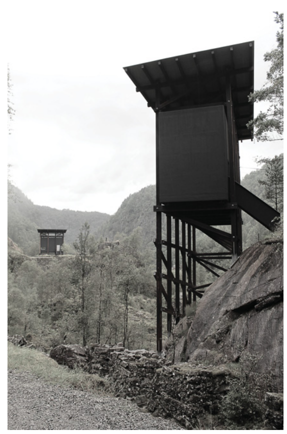
Architect: Peter Zumthor

Part of the larger nation-wide tourist route in Norway, the Allmannajuvet Zinc Mine development designed by Peter Zumthor provides a scenic rest-stop and destination point within an abandoned mountainous minescape. New buildings find their inspiration from the pragmatic and rugged mining structures of the past. These spaces lift the visitor out over the landscape for sweeping views and provide washrooms, a cafe, and a historic artifact mining museum. These structures are connected by new hiking trails and stairways that allow visitors to explore the architecture but also beyond the buildings and out into the vast landscape. The modesty and simplicity of the architecture strikes a poetic balance with the surrounding landscape and constructs a series of refuge vignettes across the mine.

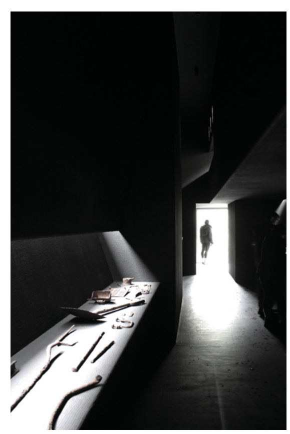
> Each place has a history, we know that. It's a memorial for the people who worked here in very poor conditions... The architecture should speak a little bit about labour - simple things.[62]

Cantilevered Restrooms

Elevated Cafe



Overlook and Pathways



History and Cultural Museum

62 Vmproduksjon. "Peter Zumthor Allmannajuvet UHD 221116". YouTube Video, November 22, 2016. https://www.youtube.com/watch?v=dSfkim0mohA.

## ROMAN QUARRY OPERA

Architect: AllesWirdGut Architektur

This rock quarry in Austria has been repurposed as “one of the most beautiful and impressive open air arenas in Europe”.[63] Roughly 220,000 visitors each year journey along the elevated ramp down into the stone walled opera venue. The site was being used as a concert venue prior to the construction of the new walkways and tickets booths which aim to elevate the theatrical experience of the site. The architecture steel construction of the architecture stand in contrast with the rocky landscape providing contrast and expressing more clearly the divide between the past industrialized landscape and the newly public infrastructure.

> The basic idea of the design is to extend the ambiance of the magnificent rock-face scenery to all parts of the theatrical arena so as to make it a more palpable and visual enveloping experience.[64]

Quarry Overlook
From Archdaily: Photograph by Hertha Hurnaus

Elevated Boardwalks
From Archdaily: Photograph by Hertha Hurnaus

63 “AllesWirdGut Architektur, Redesign of the Roman Quarry Disposed Opera Festivals.” *Divisare* online. May 05, 2011, https://divisare.com/projects/165621-alleswirdgut-architektur-hertha-hurnaus-redesign-of-the-roman-quarry-disposed-opera-festivals.

64 Ibid.

## WILLAMETTE WATER TREATMENT PLANT

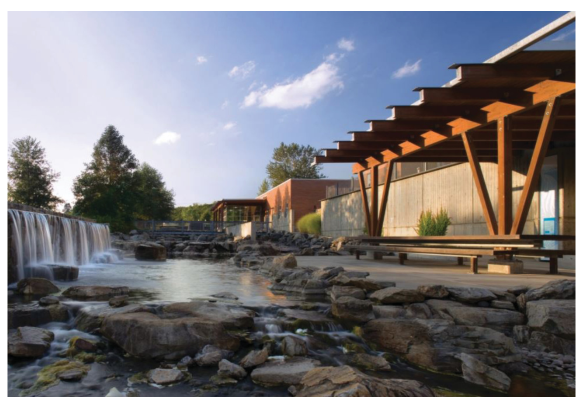
Architect: The Miller Hull Partnership

The Willamette water treatment plant does not hide it's infrastructure but rather makes its function available for education and recreation. An 800 foot long concrete garden wall creates a natural park space inviting the public to engage with the water treatment settling ponds while separating visitors from the more hazardous treatment systems. Windows into the garden wall still allow viewers to see these more machined processes taking place. Covered pavilions provide outdoor picnic areas and multi-purpose spaces are used as classrooms spaces to educate the public on the treatment process for their drinking water. This project is a novel example of interactive public infrastructure.

> Public works was once a source of pride in a community, design with prestige to proclaim the dignity of public needs. But in the last half century such projects have lost much of their pride of place. Stripped of all design expression other than explicit functionality, they are often tucked away in forgotten corners of towns, or hidden behind fences that disguise their important public purpose... In their design for the Willamette River Drinking Water Treatment Plant in Wilsonville, Oregon, MWH Global teamed up with Miller/Hull and landscape architect Bob Maruse to create a project that attempts to put the "public" back into public works.[65]

> It celebrates the link between the town and the river, and the quality of its details and site design are a source of community pride. Furthermore, according to MWH, perceptions of the water quality in the town have risen now that the public can now see where its water comes from.[66]

Public Parkland and Settling Ponds
Photograph by The Miller Hull Partnership



Covered Picnic Area
Photograph by The Miller Hull Partnership

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65 Chris Sensenig, "Willamette River Water Treatment Plant - Wilsonville, Oregon [EDRA / Places Awards, 2004 -- Design]" (Places Journal 16(3), escholarship.org, 2004), 6-9.

66 Ibid.

## WORLD BIRDING CENTER

Architect: Lake|Flato Architects

This eco-tourism headquarters responds to its unique and fragile climatic and ecological conditions by maintaining and expanding micro-climates damaged by farming practices which previously limited the natural flooding of the Lower Rio Grande Valley. With a reduction of conditions spaces by the construction and the utilization of exterior spaces for circulation, the architecture minimizes its impact on the landscape. Simple design forms and the use of vernacular construction methods lower operational costs for the facility and root the project more deeply into it's place. Boardwalks for bird watchers are built with helical piers which reduce disruption of the natural landscape.

> It caters carefully to the type of occupant, a place for quiet observation, a nice, delicate intervention on its site… This project follows all the big moves: reduce, reuse, recycle.[67]


Constructed Wetlands
Photograph by Lake|Flato


Elevated Boardwalks
Photograph by Lake|Flato


Exterior Circulation
Photograph by Lake|Flato

67 "American Institute of Architects Announces 2006 Top Ten Green Projects." *GreenBiz*. April 19, 2006. https://www.greenbiz.com/news/2006/04/18/american-institute-architects-announces-2006-top-ten-green-projects.

## CRAWICK MULTIVERSE

Landscape Artist: Charles Jencks

This land-art project transformed an open cast pit coal mine into an outdoor parkland and festival space. Pathways swirl around the unique topography taking advantage of the otherworldly landscape left behind by past mining efforts. This 55 acres landscape design is inspired by the cosmos and utilizes hundreds of boulders found on site to create astrological alignments and other cosmic inspired landscapes. Amphitheaters are sited within existing bowls in the landscape for festivals

> There are several motives at work. One is to deal with... a “hideous scar in the landscape.” Another is to help revive the local economy, hit hard by the demise of the mining industry and by the fact that the region is, in tourism terms, a backwater: the Crawick Multiverse could be a much-needed draw. And beyond the noblesse oblige, there is also surely an awareness that such philanthropy is a riposte to a Scottish government keen to reform the country’s concentrated landholding structure.[68]

> Destroyed sites are an opportunity to renew them and to turn them into something positive.[69]

Walking Trails
Photograph by McAteer Photography

Amphitheater
Photograph by McAteer Photography

68 Neville Hawcock, “The Crawick Multiverse: Sandpit Becomes Land Art” *Financial Times* online, June 26, 2015. https://www.ft.com/content/9eeb3b26-1a63-11e5-a130-2e7db721f996.

69 “Charles Jencks - Crawick Multiverse”, June 09, 2015. YouTube Video, https://www.youtube.com/watch?v=tbUIhWTjAxc.

## YELLOWSTONE NATIONAL PARK

Yellowstone National Park is an active supervolcano steeped in active geysers and pools bubbling with highly acidic and toxic chemicals. The hazardous conditions found in this landscape has led to sum 22 deaths since the park was established. Many of these deaths are due to visitors leaving designated paths and falling into boiling hot sulfuric acid pools. “Because (Yellowstone) is wild and it hasn’t been overly altered by people to make things a whole lot safer, it’s got dangers,” says Deputy Chief Ranger Lorant Veress.[70] Yet it is the peril and wonder offered by these volcanic scars that draw us to them. Through the construction of a sensitive and malleable network of pathways and boardwalks, this hazardous and unpredictable landscape has been made available for human inhabitation.

> We’re here to protect Yellowstone’s wonderfully dynamic geothermal process. So rather than build a permanent boardwalk around a spring, we’ll continually move the boardwalk to keep everyone safe so the spring can move where it wishes…. to embrace the concept that they are continually moving, unique forces of nature that -- unlike most other geologic forces that shape the Earth -- we can witness changing with every visit. (Henry Heasler – Yellowstone Chief Geologist)[71]

Just as the networks of Yellowstone are designed to allow nature to continue its shifting processes, we can design similar networks within manufactured landscapes that allow for us to continually reclaim and re-adapt the landscape.

Elevated Boardwalks

Wildlife + Bridges

Warning Signs

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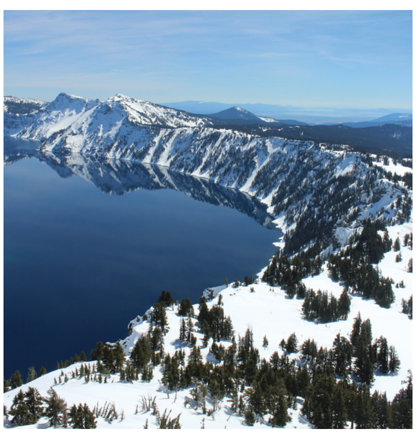
70 Doug Criss, “Man dissolves in acidic water after he falls into a Yellowstone hot spring” *CNN* online. Last updated November 18, 2016. https://www.cnn.com/2016/11/17/us/yellowstone-man-dissolved-trnd/index.html.

71 Kurt Repanshek, “The Boardwalks of Yellowstone National Park” *National Parks Traveler*. last udpated May 22, 2011. https://www.nationalparkstraveler.org/2011/05/boardwalks-yellowstone-national-park8162.

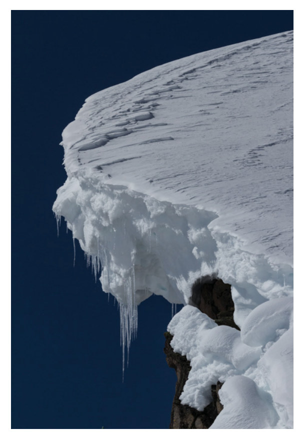
## CRATER LAKE NATIONAL PARK

Crater Lake National Park is another landscape with a violent history. The lake was formed some 7,700 years ago when Mount Mazama erupted - releasing its entire reserve from its magma chamber. The eruption blew out pyroclastic materials within a 12 miles radius and ash covered roughly one million square miles. “The landscape after the eruption was a scene of devastation.”[72] The hollowed out volcano collapsed into itself a few days after the explosion resulting in the crater we see today. It took and estimated 250 years for the crater to fill with water and since then the landscape has been recovered, now containing one of the clearest bodies of water in the world.[73] Though the landscape now is far safer than it was 7,000 years ago, there are still dangers that some visitors must face. To protect visitors from rockfalls and steep cliffs, a loop road and paths have been constructed which lead the people along a safe network of hiking trails and look-out points. However these paths are lost during the winter when Crater Lake gets covered in roughly 500 inches of snow making this landscape prone to avalanches and other hazards formations like snow cornices (cantilevering snow deposits that hikers can fall through) and tree wells (funnel-like depressions formed around trees that can trap hikers who fall into).[74]



View From the Watchman Overlook

Watchman Overlook
Photograph by Jubileejourney



Snow Cornice
Photograph by Mike Jensen

72 “Geologic History.” *Oregon Explorer*. Accessed March 23, 2018. http://oe.oregonexplorer.info/craterlake/geology.html.

73 “History & Culture.” *National Parks Service*. Last updated July 1, 2015. https://www.nps.gov/crla/learn/historyculture/index.htm.

74 “Winter Safety.” *National Parks Service*. Last updated March 12, 2018. https://www.nps.gov/crla/planyourvisit/winter-safety.htm.

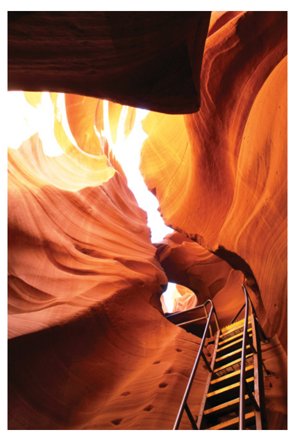
## ANTELOPE CANYON TRIBAL PARK

Antelope Canyon is not a National Park due to it's location within protected Navajo lands. It is however, visited and explored by roughly 160,000 people every year who come to see the uniquely carved slot canyons.[75] The flash flooding that forms this beautiful place is also the main danger for visitors. In 1997 eleven tourists lost their lives when a storm miles away caused the canyon to flash flood.[76] Since then new safety protocols have been put in place which monitor the conditions up stream and require guides for each group entering the canyons.[77] Steel stairs and ladders have been built in the canyons to help visitors traverse the undulating groundplane of the canyon.

The landscape that a visitor sees is not quite as purely natural as you might expect. Great efforts are made to clean out debris from periodic flooding. This debris would otherwise litter the floor surface of the canyon making it difficult to walk through and less pristine to photograph.


Slot Canyon Entry


Slot Canyon Floor


Staircase


Flash Flooding
Photograph by J.D. Rose

75 "Antelope Canyon." *Grand Canyon Guru*. Accessed March 23, 2018. https://grandcanyonguru.com/national-parks-near-grand-canyon/antelope-canyon.

76 Ibid.

77 Ibid.

## BADLANDS NATIONAL PARK

The landscape of the Badlands formed through a combination of deposition and erosion.[78] The deposition of sedimentary materials caused by various ecological conditions began during the late Cretaceous Period and continued up until around 34 million years ago.[79] Around 500,000 years ago, rivers that once brought the sediment to the badlands deviated causing a new geological era of erosion to begin.[80] Today the landscape is constantly changing as new formations are carved out by wind and rain. The National Park Services estimates that these formations will completely erode within the next 500,000 years. These conditions make the badlands an extremely rugged yet delicate landscape to visit. Vehicular roads have been built along relatively flat surfaces to avoid them washing away. These roads connect visitors to a number of hiking experiences depending on the delicacy of the landscape. Hiking paths directly on terra firma are the most common at flat plains and along the ever shifting edges of the eroding landscape. These trails cause moderate damage to native plants and are not the most ideal of ecological protection. A push for elevated boardwalks as been made to protects the soil conditions and plants from being trampled while maintaining an immersive experience of the landscape. Other locations require ladders to traverse the landscape since earthen stairs would certainly wash away.

> All park resources, including soils, would benefit from adding outdoor classrooms, or pavilions, and visitor contact stations. Visitors could be educated about the nature of the park's soils and learn ways to avoid or minimize the impacts from foot traffic. This would result in a minor to moderate long-term beneficial effect on park soils.[81]


Roadways


Hiking Trails


Ladders and Boardwalks

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78 "Geologic Formations." *National Parks Service*. Accessed March 23, 2018. https://www.nps.gov/badl/learn/nature/geologicformations.htm.

79 Ibid.

80 Ibid.

81 *Badlands National Park, North Unit, South Dakota: Draft General Management Plan, Environmental Impact Statement.* (Washington, D.C.: National Park Service, U.S. Dept. of the Interior, 2005), 142.

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