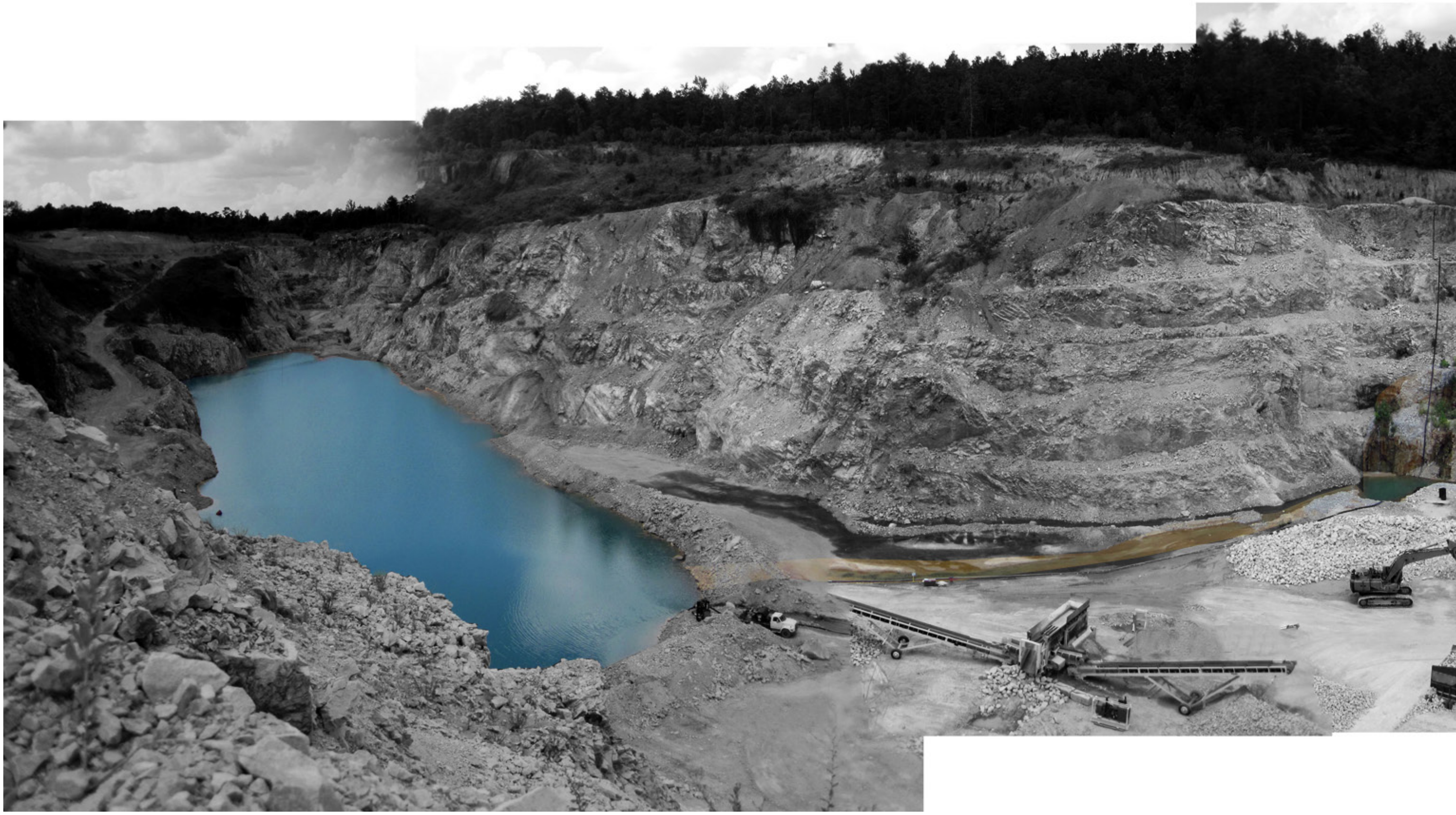
How can democratic process be integrated into the reclamation of an open-pit aggregate mine in order to positively influence finite resource management and the social and cultural perceptions thereof?



BEYOND THE PIT [OF DEMOCRACY]:
Mine Reclamation, Emergence, and Finite Resources

Daniel Ballard, Master of Landscape Architecture, Thesis
Auburn University, 2011

DEDICATION

This book is dedicated first and foremost to Amy; my wife and my best friend. Without your love, your patience, and your encouragement I would not have been able to complete this journey.

To Miles, Avery, and William - Thank you for filling my life with joy. You are as much a part of this book as I am!

ACKNOWLEGMENTS

Charlene LeBleu (Thesis Mentor) - Your mentoring, guidance, and support over the last three years has been invaluable. Without you I would never have discovered the breadth, beauty, and bounty of such a wonderful profession. Thank You!!!

Matt Dunn - Thank you for being a great friend and confidant. I owe my sanity to your support and encouragement.

I am deeply grateful for the help and guidance of my thesis committee: THANK YOU Mark Dougherty, Ph.D, Eve Brantley, Ph.D, John Curry, and Rodney Barnett, Ph.D.

I am especially grateful for the support and encouragement from the City of Auburn in this endeavor.

All findings and opinions herein are those of the author and do not reflect those of the City of Auburn or any of its employees.

TABLE OF FIGURES

TABLE OF CONTENTS

PREFACE

For more than 30 years now my family has vacationed together in Gulf Shores, Alabama, a rapidly growing coastal city along the Gulf of Mexico. Each year my older brother, in what might be misinterpreted by many to be an overly emotional, irrational, and "tree hugger"-like tone, comments on his growing disgust for what he observes to be an endless devastation of the once-pristine ecosystem that we knew in our youth. Contrary to what one might expect, he is not trained as a biologist, environmental scientist, or other profession educated to recognize urban-induced ecological impacts, for no expertise is required to understand the obvious impacts of large scale landscape alteration (in this case, coastal sprawl).

I cannot say that I completely disagree with him and, likewise, am often equally disturbed at what I see. However, as arguably true as his observations may be, I believe my principal concern is likely different than the immediate Emersonian *Nature* of his own. His disgust, as I understand it, is for what he perceives to be large scale environmental destruction at the expense of under-regulated, private and public economic development in the form of wide roads, high rise condos, luxury resorts, and outlet malls (infrastructure). Disturbing as it may be, I am not as concerned about the immediate environmental degradation as I am of the cultural and social conditions by which the current <u>pattern</u> and <u>method</u> of development (coastal sprawl) operate. Consider this; the Gulf Shores that we once knew, with the vast, relatively undeveloped beaches, uninterrupted rolling dunes, large contiguous tracts of coastal woodlands, and endless brackish, backwater sloughs to explore, was largely afforded by a combination of remoteness and low population density. It was, by no means, a result of careful planning and thoughtful development implemented by earlier leaders; rather, it was simply afforded by a mostly rural, sparse population.

As new highways spawned off Interstates 85 and 65 in the 1960's to 1990's the beaches of Alabama became more accessible and thereby became a more desirable vacation destination for tourists. This perpetuated rapid speculative land development practices and relatively uncontrolled growth that occurred in an environmentally uinformed pattern, resulting in vast changes in the landscape that are the visual qualifiers of my brothers concern. So, when I now take my children, how will the "new" landscape conditions of Gulf Shores inform the way they view human habitation and the ecosystems that support it? Will the Gulf Shores my siblings and I experienced be confined to the lands preserved in the Gulf State Park and other "preserves" while development of conventional method and pattern consume the rest?

According to Garret Hardin's "Tragedy of the Commons" (1968), even preservation in and of itself is an unsustainable method of subsistence (think oil exploration in the Alaska National Wildlife Refuge or massive transmission lines in the Chattahoochee National Forest). So what will the next generation do?

Perhaps a more critical question is whether or not they will see the two (human habitation and nature) as incompatible, as my brother is beginning to, and develop a belief that there must be the destruction, or marginalization, of one to support the other (the "we're over here, it's over there" conservationist outlook on nature), or will they lack the opportunity altogether to experience a fully functional coastal ecosystem and thereby never develop the same appreciation that my brother is so fortunate to have?

Either of these paths seems very likely to lead them (my children) to believe that the homogenous patterns of contemporary development are their only option and would result in a severe limitation of their ability to ever imagine any other way of living. In essence, they would become complacent and content with the patterns as they are and they would only consider dissent out of necessity. Randall Hester may have said it best when he wrote "city and suburban design divides us from others in our communities, destroys natural habitats, and fails to provide a joyful context for our lives" (Hester, 2006). Though it may be cliche to say, I do not want this for my children and I believe our conventional methods and approach to address development and infrastructure fail to provide a solid, sustainable foundation for the next generation to build upon. Herein lay the personal foundation for the following research.

Mining, though in a more acute, concentrated, and (often) obvious way, creates the same large-scale landscape destruction and environmental impact as the coastal sprawl that has occurred in Gulf Shores, and numerous other coastal cities (UN Habitat Report - State of the Worlds Cities, 2009). The closure and subsequent reclamation of mines offer unique opportunities to experiment and "speculate" about human habitation, for mined sites are not "indebted to, historical filters, aesthetic traditions, or strict contextuality". We are thereby free to explore their design as a potential "incubator for design research on any altered landscape" (Berger, 2008). Through the research herein, which investigates how the integration of democratic process with that of mine reclamation projects can positively influence social and cultural attitudes toward finite resource management, I hope that it may influence others, if at a minimum, to reimagine how we inhabit an ever changing, ever diminishing finite world (of course, in hopes that more emphasis will be placed upon informed and sustainable development). For those who may not be so impacted or influenced, I close this foreward with the recommendation that you seek to at least apply the last four principals outlined in Wendell Berry"s essay "Solving for Pattern" when addressing concerns of development and finite resource management: 1) accept given limits and use so far as possible what is at hand, 2) accept, and understand, the limitation of your discipline, 3) employ a qualitative solution that improves the balances, symmetries, or harmonies within a pattern, and 4) generate a solution that solves more than one problem and does not generate new problems.

ABSTRACT

Through the integration of democratic process with that of the reclamation of the Martin-Marietta Aggregate Quarry (MMQ), my design research proposes that it is possible to positively change contemporary understanding of the potential, performance, and value of landscape as a finite resource. As the democratic process of participatory design is becoming near-standard practice for projects of broad public interests, I argue that the method fails to achieve the optimization of ecological, cultural, and economic value of both public and private landscapes. Rather, I suggest that these potentials are more likely found through the democratic freedom of endless transformation. By furthering the gesture of participatory design through the wholehearted gift of transformative freedom, the interest of the many may become the interest of the collective, thereby generating an endless succession of positive feedback and resulting in the emergence of a new landscape; one that is truly formed by the people, for the people. My design project demonstrates how accountability for such a multitude of potential interests can be maintained through a collaborative stakeholder approval process. Design visualizations are utilized to demonstrate the multiplicity and diversity of potential found within degraded landscapes and, to a larger extent, to allow the reader to "reimagine" a post-mined use that redefines productivity and value. It is through the feedback process of an ongoing democratic engagement of the site that ecological, social, cultural, and economic accountability are maintained. Furthermore, it is implied that stakeholder approval process ensures that the agenda and /or use of or by one group may not hinder the capacity of another to enjoy the same, thereby enabling the endless evolution of the MMQ landscape to reveal its true performance potential. Participants, or stakeholders, in the development of the MMQ landscape will then come to the realization that their collective potential to work together toward a common goal has transcended their previous expectations and beliefs (with independent agendas) about the value of the landscape and the resources that permit its existence.   What is generated is a new understanding and expectation for how landscapes are developed, how finite resources are managed, and how altered landscapes are valued. This research argues that these changes of perception would allow for greater capacity in our societies ability to cohabit an earth with increasingly diminishing opportunities (and resources) to do so.

THESIS INTRODUCTION

In his essay "The Tragedy of the Commons", Garret Hardin provides an apocalyptic prophecy for the human inhabitation of our planet Earth. What he broadly refers to as "the commons" are basically two categories of resources; renewable resources and finite resources. However, Hardin does not distinguish between the two in his essay. Rather, he understands that regardless of the rate of replenishment (fast for renewable and slow for finite, i.e. tree and rock respectively), each is bounded in limitations with regards to the number of persons and/or purpose it can reasonably support in any given place or time. Such an understanding allowed Hardin to set aside the arbitrary differentiation between the two and develop a theory that foretells the end of civilization through the physical or capacitative depletion of any and all resources necessary for the continued existence of man. He argued that technological innovations (often now associated with sustainability through extensibility) are merely prolonging the inevitable and that there will never be a "technical solution" that deters us from our fate and futility that lay within our reliance in finite resource management. Although the only solution provided by Hardin himself was for the entire human population to "relinquish the freedom to breed", he provides little guidance for how he foresees such an evolution of behavioral, if not instinctive, pattern that doesn't involve force or necessity to realize an outcome that won't "bring ruin to all". Additionally, Hardin failed to address other ways by which changes in social and cultural attitudes toward finite resource management could reveal outcomes in which we ARE able to change "human values and ideas" to overcome our habits and patterns that accelerate our path to self destruction.

Regardless of ones disposition with regards to the authenticity or trueness of Hardin's argument, it is more important ,and less arguable, to understand the guiding principle by which his theory operates; that some concerns, dilemmas, and/or problems "have no technical solution". This is contrary to the contemporary model of land development, that relies upon a highly technocratic finite resource management sector, in which trillions of dollars are spent each year on technological innovations that increase precision, efficiency, and technique (yet largely ignore inherent finite limits of built-in capacity). Mining operations are arguably at the forefront of this race, utilizing everything from ground penetrating radar to modern excavators that can displace 12,000 cubic meters of material every hour. So how do we begin to explore non-technical solutions to an obviously unsustainable resource management complex that is so synonymous with technological prowess? Better yet, how do we do so in such a way that it positively impacts our social and cultural perspectives toward finite resource management so that we may elude Hardin's suggestion for the voluntary (or involuntary) castration of our global society? Technology merely addresses "technique", so how do we begin to address patterns and perceptions that perpetuate our overreliance and overconfidence of its ability to sustain finite-resource limited habits and development?

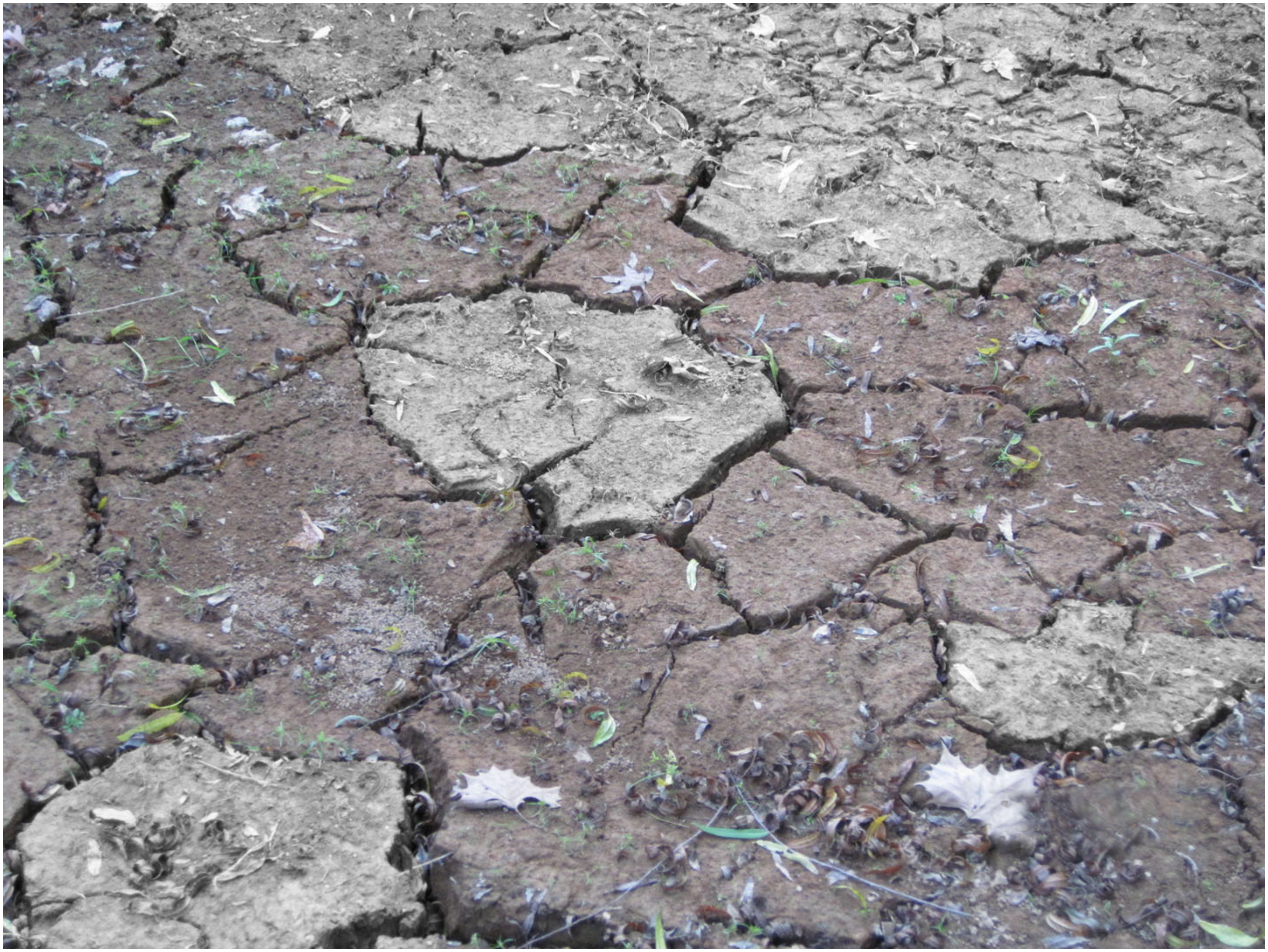
Herein lay the need for the research that follows and forms the backbone of the thesis question: *How can democratic process be integrated with the reclamation of an open-pit aggregate mine in order to positively change contemporary social and cultural understandings of finite resource management*? What follows is the author's research, exploration, and investigation into non-technical solutions for re-imagining the uses, opportunity, and value of mined landscapes (seen as testable surrogates for all forms of altered landscapes) .

WHAT IS EMERGENCE?
[A THEORETICAL FRAMEWORK]

Emergence can be loosely defined as the process of becoming. It is not an evolutionary process with finite resolution or product, yet this should not be confused as meaning it is unproductive or has not substance. Rather it is the "conditions, processes, and behaviors that change as a result of their continual encounter with other states and processes"; or more simply put it is the process of infinite production (Barnett, 2009). All forms or products thereof are temporary and change through time as they encounter other, different objects or processes that act upon each other. Emergence operates as a complex, open system and is often referred to as a "bottom-up", indeterminate, and/or "form-finding" process.

In landscape architecture, emergence produces forms, events, processes, programs, and functions that are indeterminate of the author's design. This, the "bottom up"/"form-finding" process, typically involves a designer employing the strategic placement of initial conditions that allow for a loosely controlled set of outcomes. The working force here being that the outcome is unbeknownst to the designer. It would, at first glance, appear that such a form of design is irrational and unaccountable to the basic idea that we design for a specific purpose or intent. However, the qualitative use of emergence in landscape architecture presumes the same ethical (safety, operability, etc.) and moral (sensitive to concerns and principles of others) responsibility by the designer as it would through any other method or approach. It is through the variability of components and the dynamic interplay between them that determine the designers degree of control. With increasing variability comes increasing outcomes. Therefore, whatever initial conditions are established should be balanced with an understanding that the diversity of outcomes may be evaluated upon their capacity to serve the sites potential or productivity for all stakeholders (whomever or whatever they may be).

Herein lay the theoretical framework guiding the authors research. Although contemporary mining is extremely precise with regards to measuring extractable materials outcomes, the shape of the mined land and spoils areas (the new landscape) operate under the process of emergence. For example, there is no precise plan that predetermines the shape, orientation, or aspect of the an open-pit quarry or of the final shape, height, and width of the tailings piles and combination of seeded and volunteer vegetation that has established. The resultant landscape is a product of extractable efficiency, with the mining operator trying to minimize the effort necessary to remove the desired material (whatever that may be). The reclamation process often follows this same level of effort, with mine operators working to meet the minimum federal and state regulatory requirements. Working under this assumption, the design proposal herein harnesses the productive qualities of emergence, demonstrating how the use of initial conditions, established in the mining process and through a rich understand of the site context, can produce endless opportunities that are both form-finding and value-finding alternatives to more determinate mine reclamation.



The Pattern of Soil Cracking in the Image Above is an Emergent Condition Determined by Initial Conditions

WHAT IS RECLAMATION?

For the purpose of researching the methods by which democratic process may be integrated into reclamation of the Martin-Marietta Materials, Inc. Auburn, Alabama Quarry, a working definition of reclamation was necessary to understand the elemental and fundamental operating criteria by which they may be combined to produce a functional or integral whole. What proceeds is both a definition and description of the act of reclamation. [The following draws heavily upon the works of Alan Berger and the Project for Reclamation Excellence (PREX)].

Landscape reclamation is largely a by-product of human reactions toward alteration, loss, and/or irreversible defacement of the natural environment (Berger, 2002). Though anthropogenic endeavors often inform its intent and are widely associated with the popular use of the term, it is unequivocally important to understand that we are certainly not the first to perform the act. At its very roots, vegetative succession through voluntary seeding and colonization of lands denuded by natural processes (erosion, tornado, hurricane, etc.) is a form of ecological reclamation; one that has occurred since the emergence of vascular flora over 400 million years ago (Hawken, 2007). Thereby, in the narrowest of understanding, our very existence is not necessary for either the initial alteration or the subsequent reclamation of the natural environment. However, just as this limited definition of reclamation requires no human intervention, intent, or purpose, it also limits the diversity of outcomes and potential utility to enhance our understanding and position as a part of or apart from the very nature that affords its occurrence. Likewise, any assignment of superiority to non-human reclamation runs the risk of questioning the legitimacy of human/non-human cohabitation (i.e. generating the idea that nature is perfect and is thereby the best agent to perform the act of reclamation). As such, this form of natural, autonomous emergent reclamation would not alone satisfactorily fulfill the intent of this research, for utilization of democratic process is (to my knowledge) restricted to humans. Therefore, a broader, anthropocentric understanding of the term is also necessary.

Reclamation is an act which is given purpose by the culture that informs its intent, which, according to Alan Berger, is currently driven by our contemporary "reaction against human alteration of natural environments" (Berger, 2002). The act of reclamation assumes no likeness, though it is often used interchangeably with the processes involved in restoration, remediation, conservation, and preservation (Arbogast, 2008; Barnett, 2008; Brown and Berger, 2008). As such, it is imperative to understand why and how it is different. Unlike restoration, reclamation gives no hierarchical importance to what was, whether it be in the history of the preexisting landform, context, or use. Rather, "it makes very little attempt to return the landscape to its former condition". However, this should not be confused as omitting of the relevance or potential informative qualities of the past conditions, whatever they may have been.

Contrary to a restorative foundation in reclamation, by freeing the landscape from its historical form and function, reclamation is thereby dually freed of the potential shortfalls that an overly prescriptive and pre-determined restoration regimen might otherwise restrict the outcomes, possibilities, and "futures" of the site (Berger, 2002). It is also necessary to understand that, often, the extractive methods and impacts of mining prevent restoration as a reasonably obtainable objective. Though the void may be filled and preexisting surface contours reformed, it is idle-minded to believe that we can recreate or "restore" the dynamics that took millions of years to create (Cherry, 2008).

Similar to its common likeness to restoration, reclamation, though often informed by the processes of remediation, is insuperably linked due to its immediate association with large-scale environmental degradation (whether it be physical, chemical, or biological). However, it is equally important to understand that it is not defined or limited to the forms and functions to serve only that purpose.

Finally, reclamation should not be synonymously associated with the acts of preservation or conservation. For the want of preservation, it must first be assumed that some part of what currently exists is of substantial value and thereby warrants the need to be "set aside" or protected (for which open pit mines sites may offer). For the want of conservation, it must be assumed that that same quality exist, but rather than set aside we should actively pursue a perpetual cohabitation and/or use thereof. Once again, as with its potential utilization of the opportunities presented in restoration and remediation, reclamation may also take from the qualities inherent of conservation and preservation to address the "bigger picture"; to what potential and to what value can mine reclamation offer?

By understanding the qualities and modus operandi of these sub-fields of reclamation, we are able to gain but a bare minimum of the potential offerings altered landscapes present. Therefore, this research seeks to incorporate the these qualities into the reclamation program, yet also seeks to expand upon their individual capacities, so that the collective capacity of their whole is greater than the sum of their independent parts. Invariably, the adopted intent of reclamation as applied to the following research is to present new opportunities in reclaimed sites and to influence others to "see and plan landscape systems in new ways" (Berger, 2008).

WHAT IS A DEMOCRATIC PROCESS?

Democracy, as defined in the Oxford English Dictionary, is:

1) A government by the people; that form of government in which the sovereign power resides in the people as a whole, and is exercised either directly by them (as in the small republics of antiquity) or by officers elected by them. In mod. use often more vaguely denoting a social state in which all have equal rights, without hereditary or arbitrary differences of rank or privilege.

2) A state or community in which the government is vested in the people as a whole.

This contemporary definition appears to have has changed little from its etymological origins, which is derived from the aggregation of the Greek terms *demos* and *kratos*; meaning rule of the common people (online etymological dictionary, 2011). If we then combine this definition with that of process, or "the fact of going on or being carried on, as an action or series of actions", then we are able to decipher how the theory of democracy may be applied to address any number societal issues. In short, democratic process then translates to the perpetual actions or series of actions applied by a group of people seeking to achieve a common objective. Though this presumes that there is an overarching, "common" objective the need for the use of the democratic process also operates under the assumption of difference, in that there will undoubtedly be mixed interest and understandings of the particularities of how that objective is to be pursued. Therefore, there must be, at least in general terms, a common objective grounded in an understanding that conflict is inevitable and can be harnessed as productive discourse rather than disruptive ignorance.

This is obviously an oversimplified definition, as democracy has many forms and the processes guiding its application are equally, if not more, variable. However, it establishes the principal intent by which numerous contemporary design fields have explored as a means to enhance the intrinsic and extrinsic qualities of the public (and sometimes private) realm (source). Herein then, presents the another question to be answered by the following research; can the democratic process be integrated into the act of mine reclamation and, if so, what is the common objective? It must first be presumed that there are more than one interest and that these interests may vary widely and may conflict on a number of levels. What is of interest is how widely varying interest groups, or stakeholders, could come together to re-imagine the reclamation process as an ongoing, collaborative process in which open discourse and feedback results in the emergence of greater value and potential of altered landscapes.

Photo Taken of Recent Aerial Reconnaissance Mapping of the Martin-Marietta Quarry

SITE INTRODUCTION

The Martin Marietta Materials, Inc. (Hereafter MMM) Auburn, Alabama Quarry (hereafter the quarry) is an open-pit, hard rock surface mine. It is located approximately 4.5 miles south of Auburn, Alabama, a medium sized, rapidly growing city in Lee County, Alabama (City of Auburn Community Profile, 2011). MMM operates the quarry under a mineral lease from three landowners, collectively forming an approximate 482+/- acre property (hereafter the property). The property is approximately 9,200 linear feet across its east-west axis and approximately 3,700 linear feet across its longest north-south axis. The primary ingress and egress from the property is through an entrance at the south-central boundary, which forms the terminus of Wrights Mill Road, a small county road off the larger Sandhill Road (County Road 10). The property is surrounded by mostly mixed hardwood and coniferous forest, with the exception of two agricultural fields abutting the southern most boundary east and west extents. Chewacla Creek, a large fifth to sixth order perennial stream forms the northern property boundary and flows in a general east to west direction. Chewacla Creek also forms the boundary between the quarry and Chewacla State Park, a 696 acre "nature" park designed and built by the Civilian Conservation Corp between 1935 and 1939.

The material quarried at this site is known as Chewacla Marble, a "fined-grained, dolomitic marble, locally rich in phlogopite (a reddish-brown Mica). As a limestone formation, Chewacla Marble is a sedimentary rock formed mostly of calcium carbonate minerals. Similar to other limestone formations, Chewacla Marble is susceptible to dissolution when it comes into contact with acidic solutions, forming conditions in which Karst topography may form. Karst topography, or the formation of surface depressions (sinkholes) caused by the dissolution of sub-surface materials, is often associated with areas abundant in limestone. The area surrounding the quarry is no exception to this rule. Located in the piedmont physiographic region, many of the soils are slightly acidic and therefore many of the surface and groundwaters are also acidic, resulting in the dissolution of the Chewacla Marble and subsequently resulting in sinkhole formations. Local environmental groups have expressed concerns over the mining activities potential expedition of these formations in the proximity of Chewacla Creek, arguing that considerable loss of base flows occur, resulting in loss of suitable habitat for critically impaired freshwater mussel species. In an effort to minimize loss of habitat MMM, the City of Auburn, and several surrounding property owners entered a Safe Harbor Agreement in 2003, requiring independent conservation measures to maintain a 2 million gallon per day average baseflow in Chewacla Creek. One of the conservation measures required of MMM is to repair subsidence features that occur in Chewacla Creek and/or within 10' from its banks (Chewacla Creek Safe Harbor Agreement, 2003).

Figure 1 - Aerial Photo of Auburn, Alabama

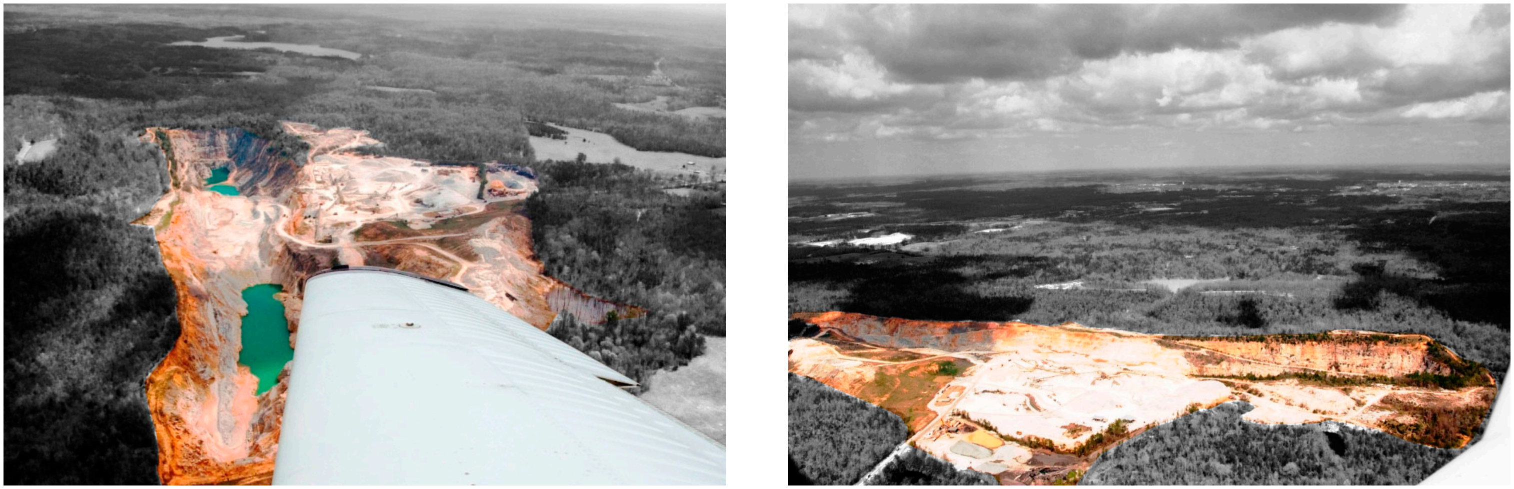


Figure 2 - Aerial photo of quarry looking West and North, respectively

SITE PHYSICAL CONTEXT

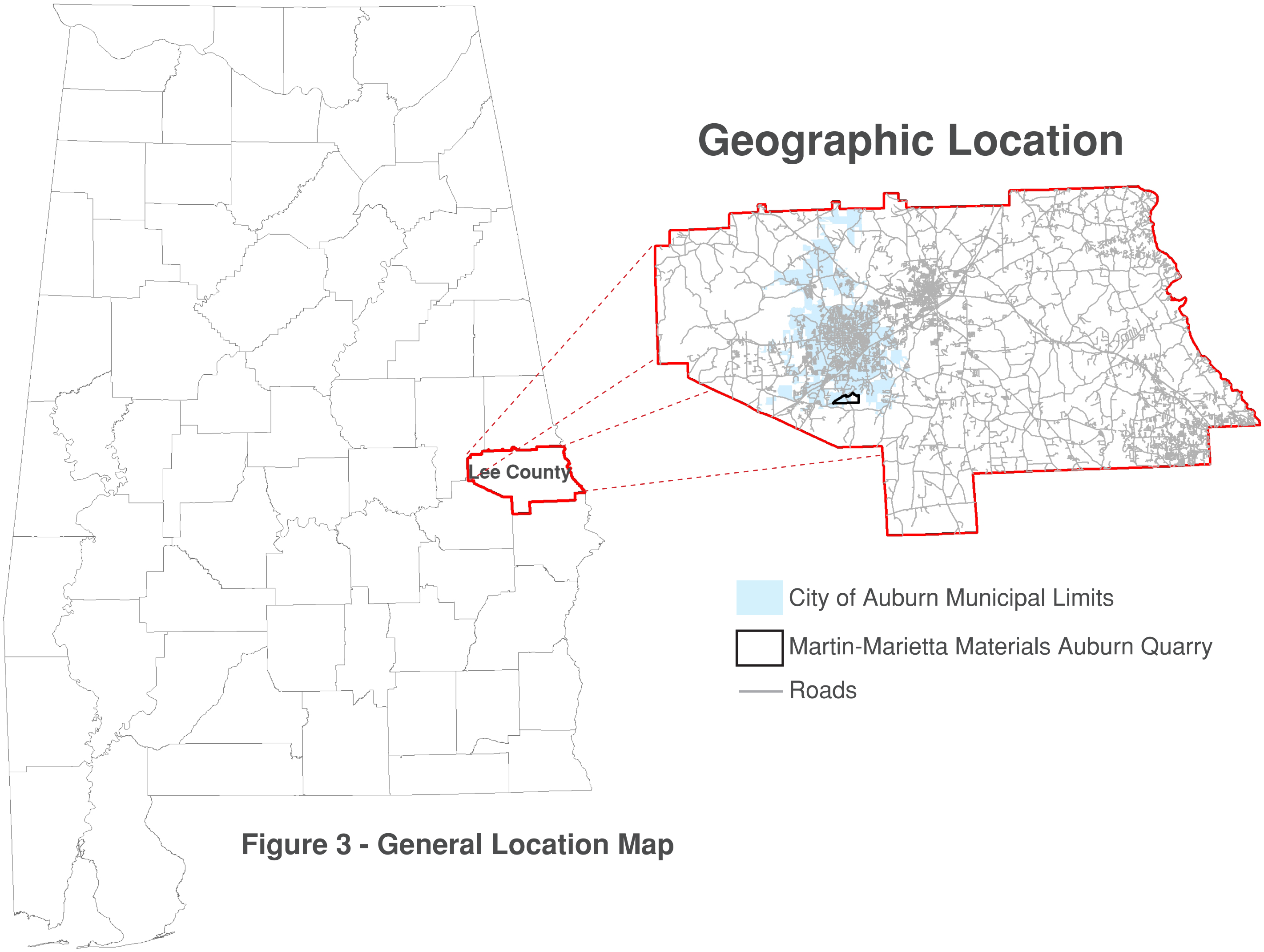


Figure 3 - General Location Map

Major Transportation

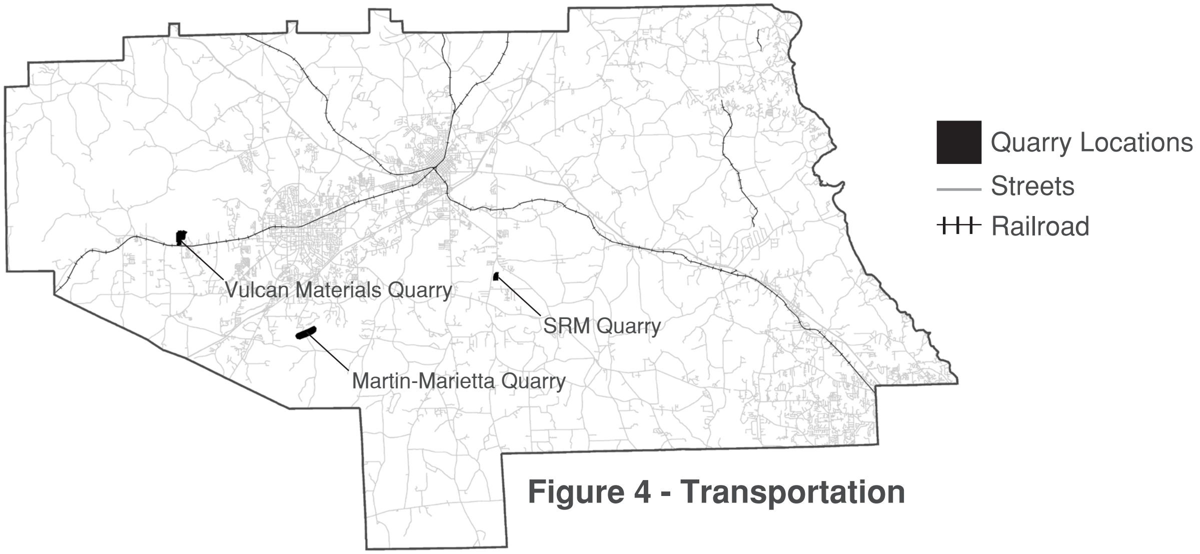


Figure 4 - Transportation

Development Density

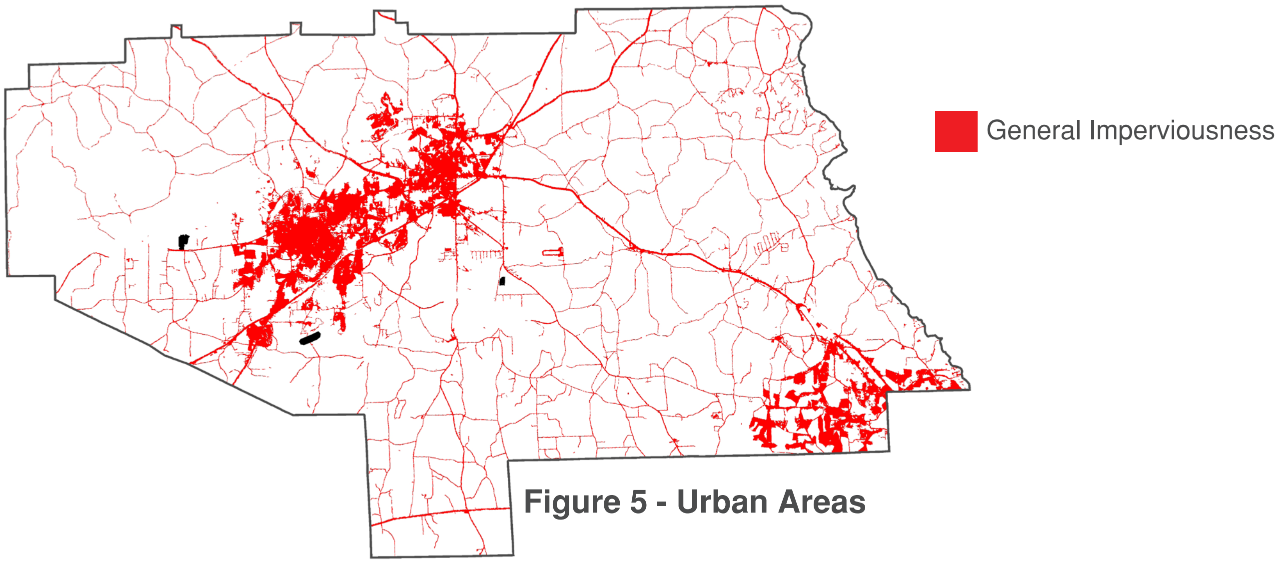


Figure 5 - Urban Areas

Surface Reservoirs

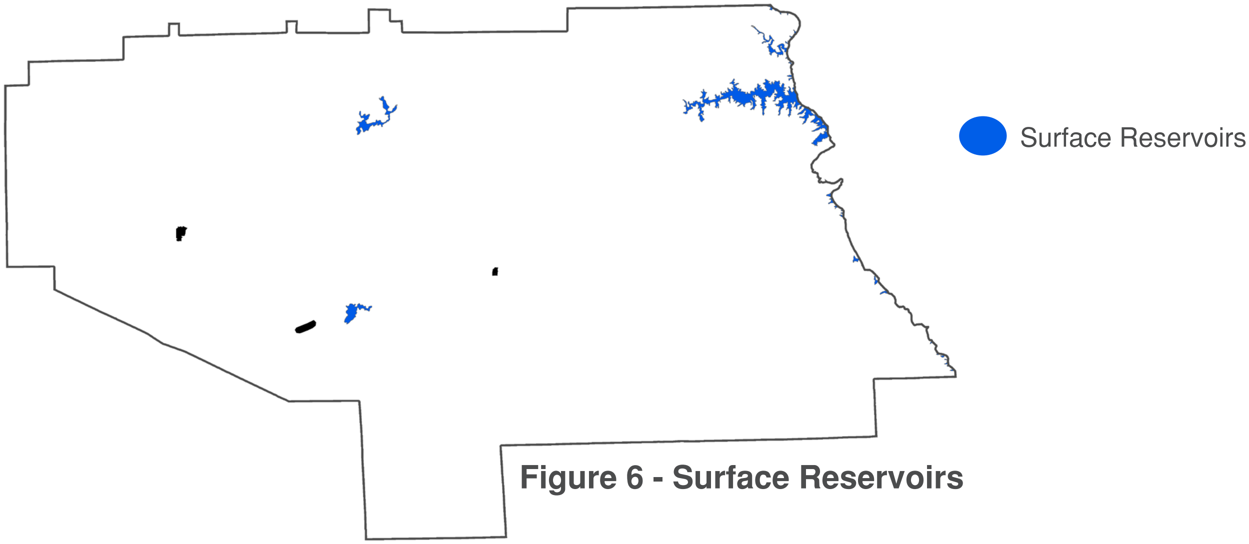


Figure 6 - Surface Reservoirs

Hydrology

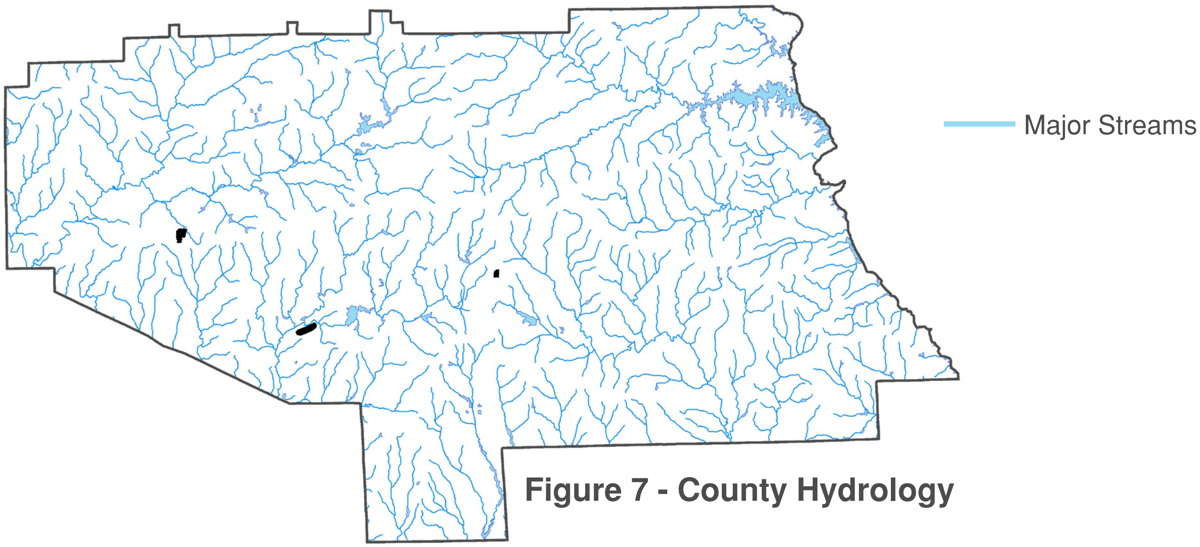


Figure 7 - County Hydrology

Major River Basins

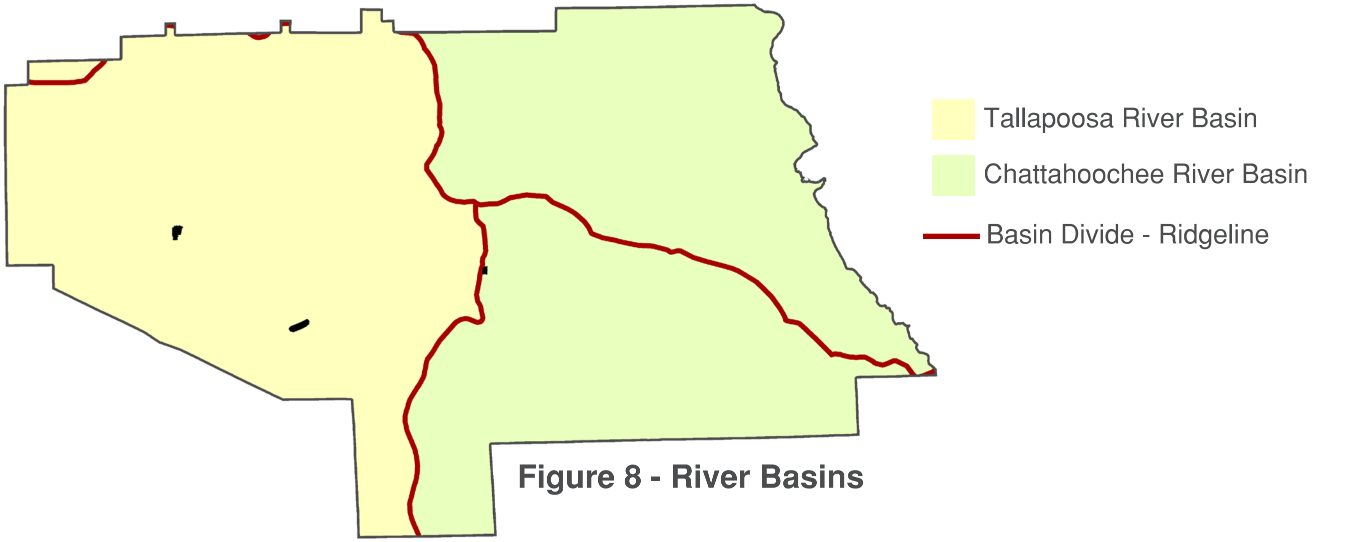


Figure 8 - River Basins

Wetlands

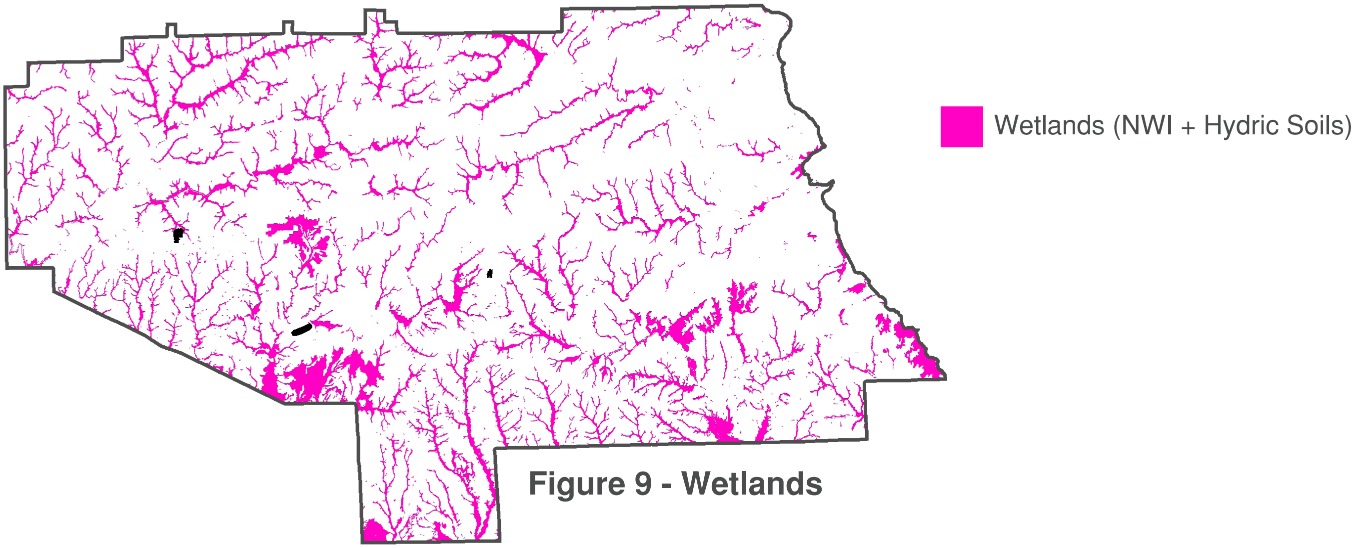


Figure 9 - Wetlands

Forest Cover

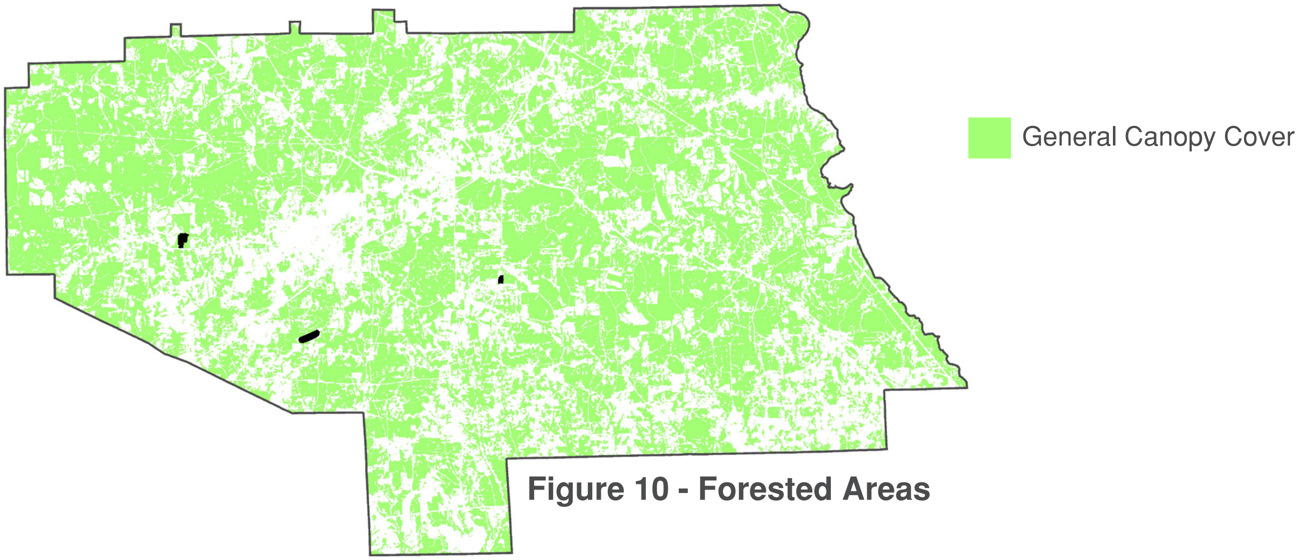


Figure 10 - Forested Areas

Agricultural Lands

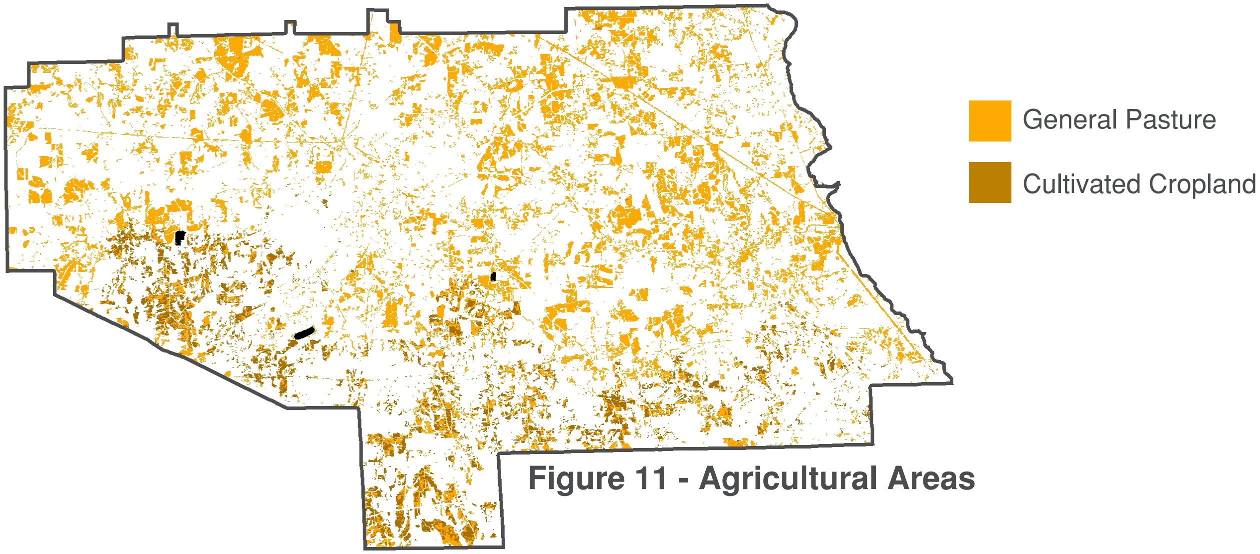


Figure 11 - Agricultural Areas

Digital Elevation Model

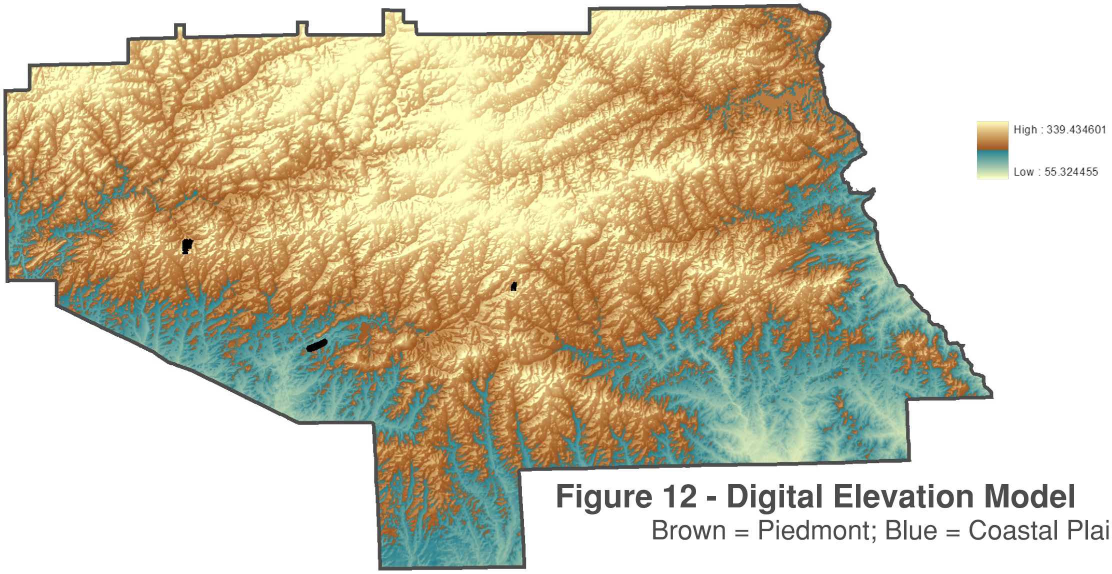


Figure 12 - Digital Elevation Model
Brown = Piedmont; Blue = Coastal Plain

Publicly Held Lands

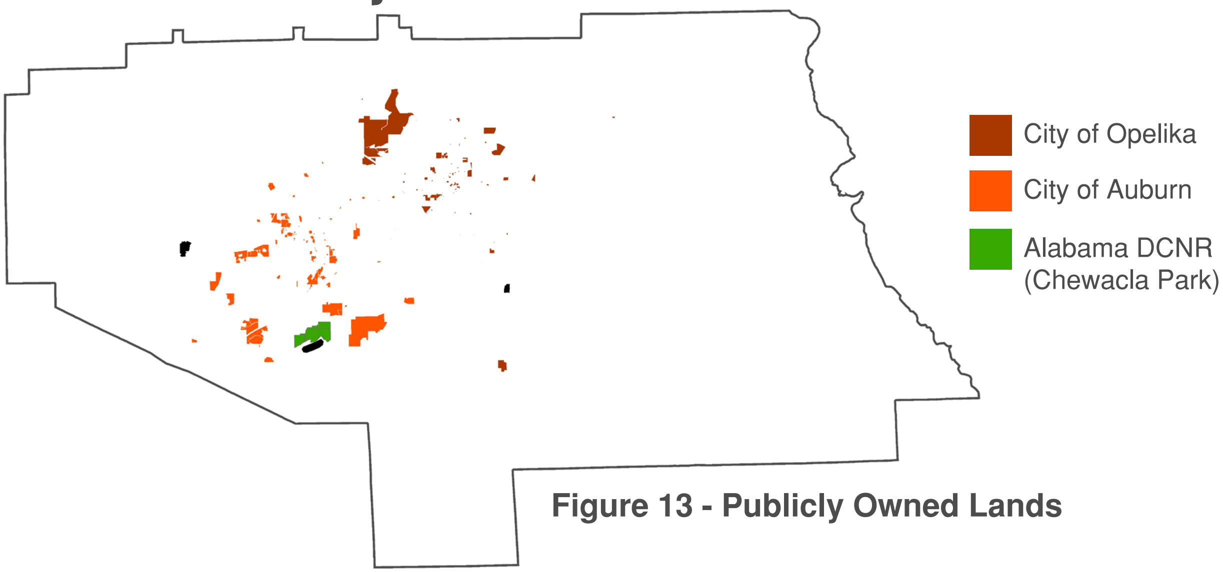


Figure 13 - Publicly Owned Lands

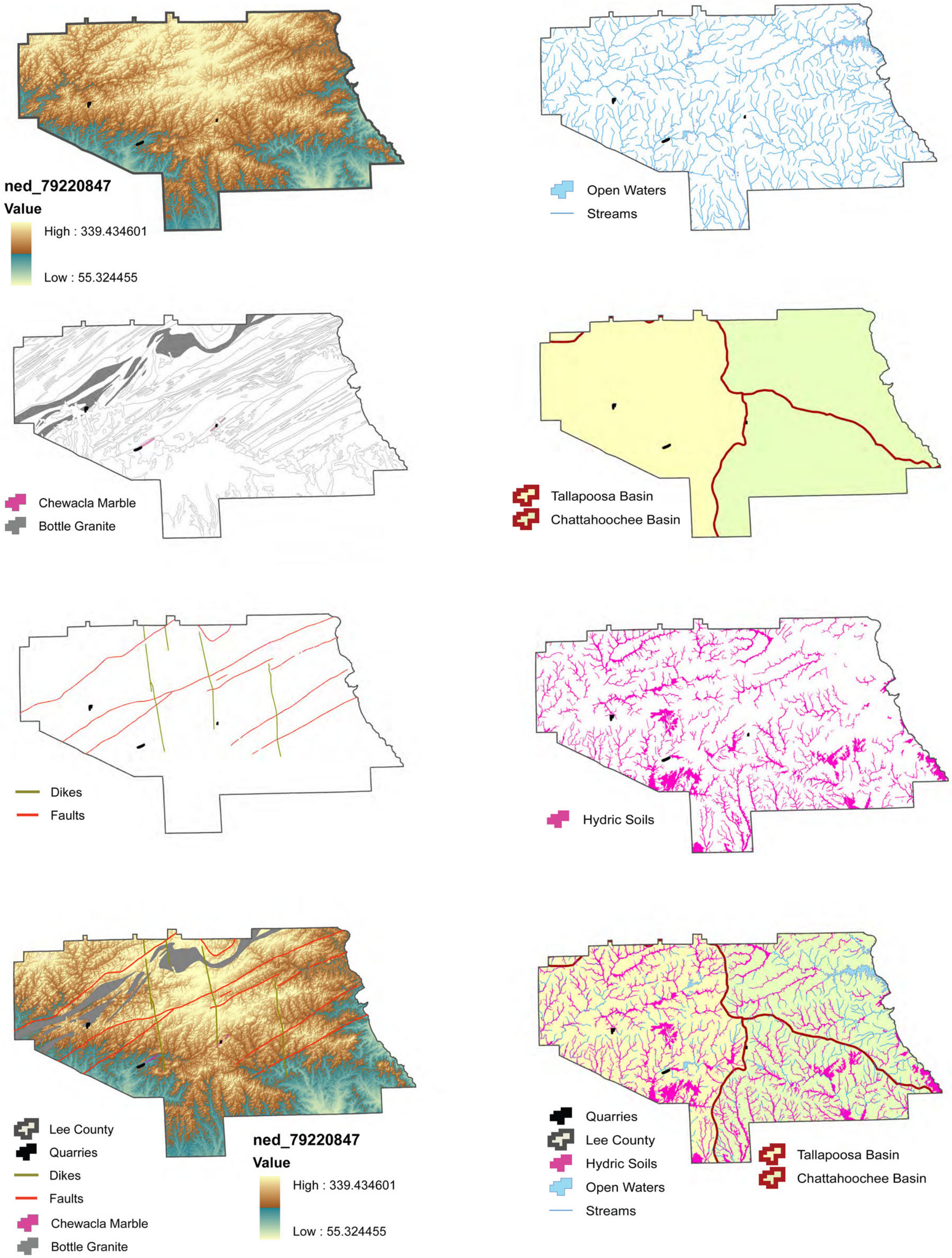


Figure 14 - Composite Overlay 1

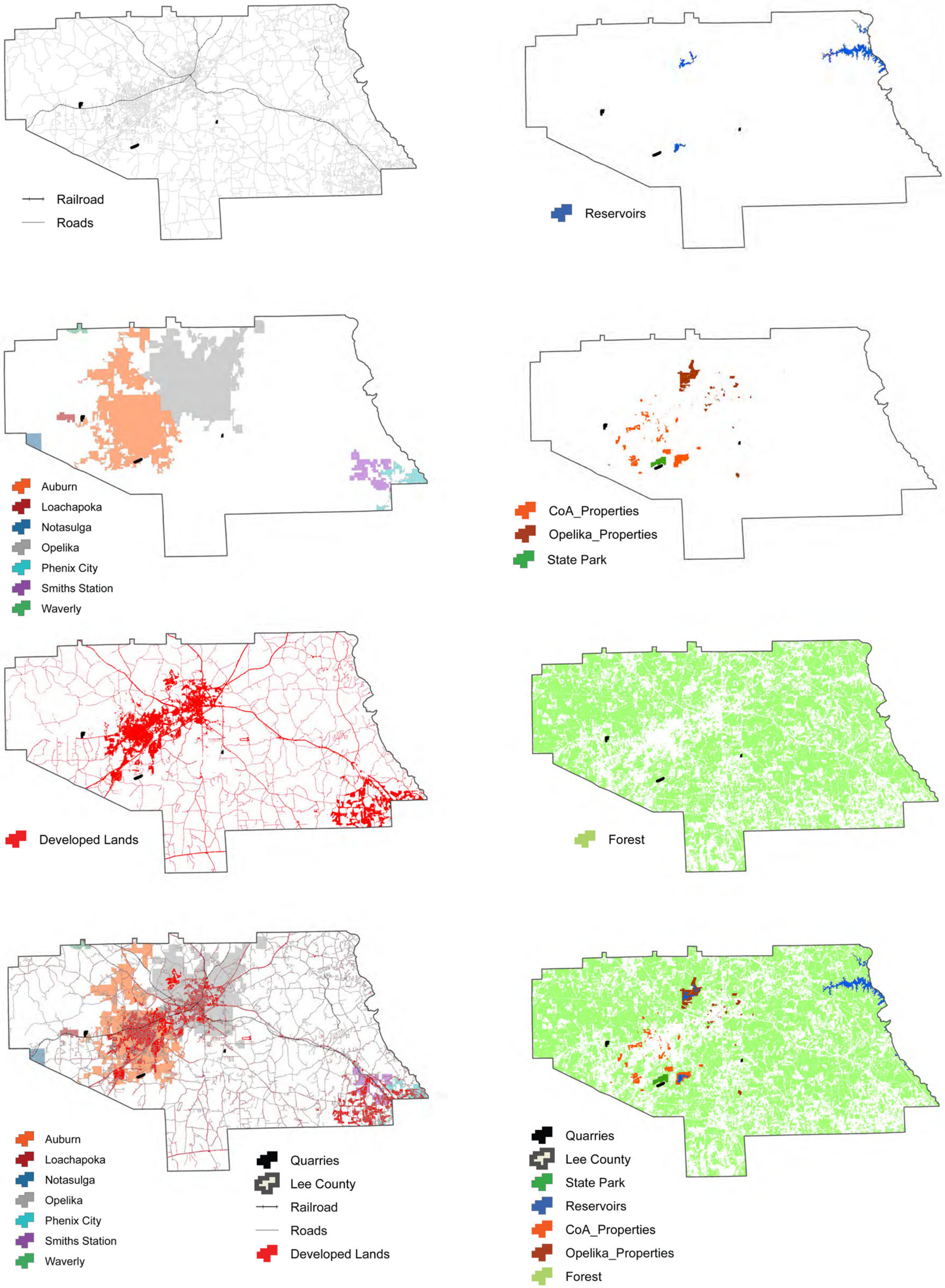


Figure 15 - Composite Overlay 2

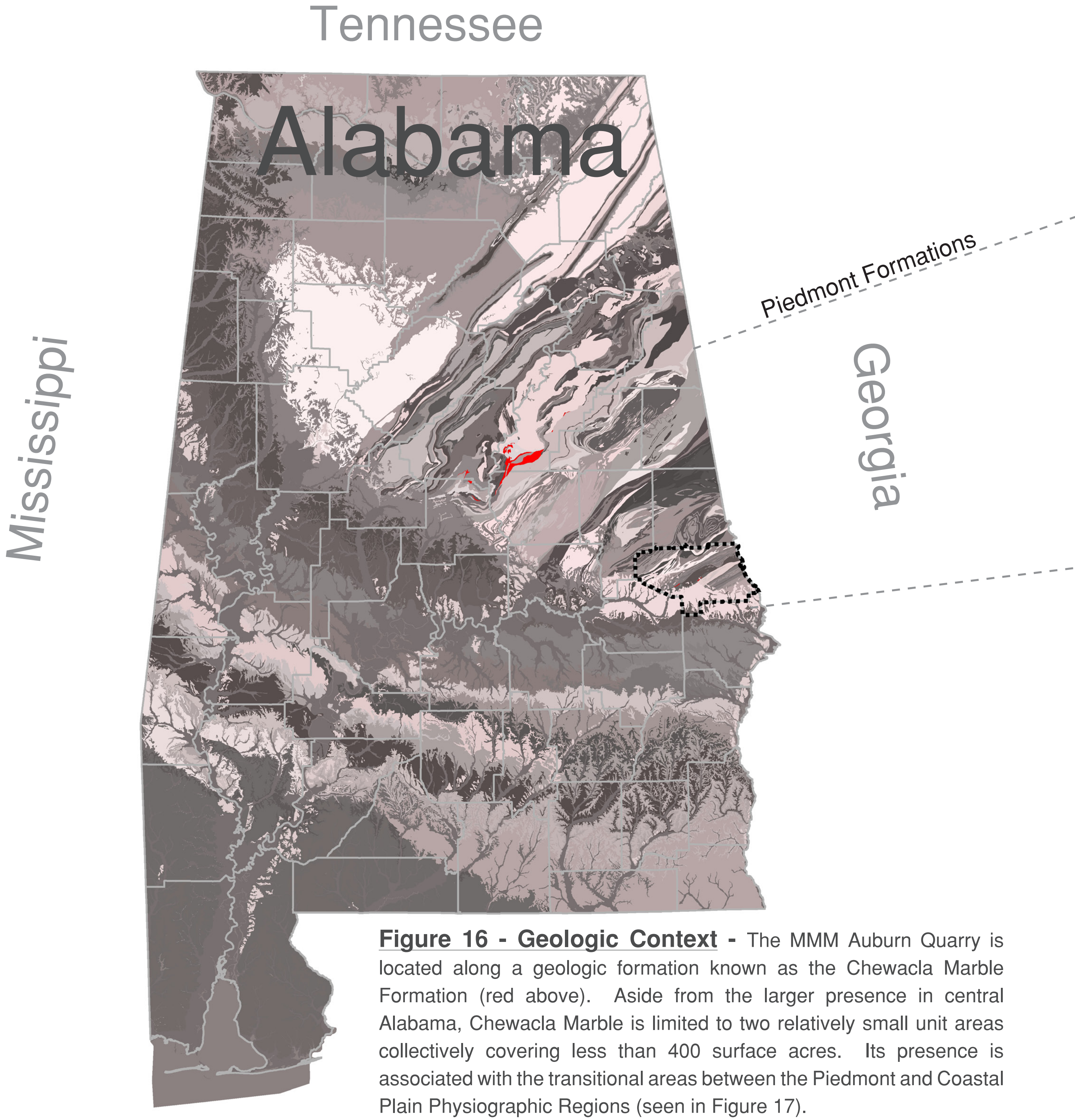
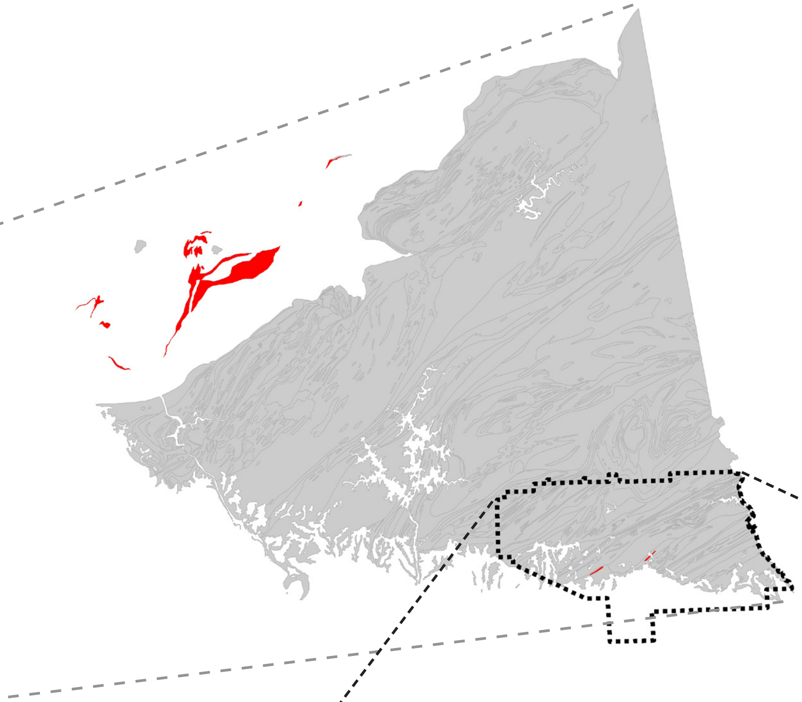
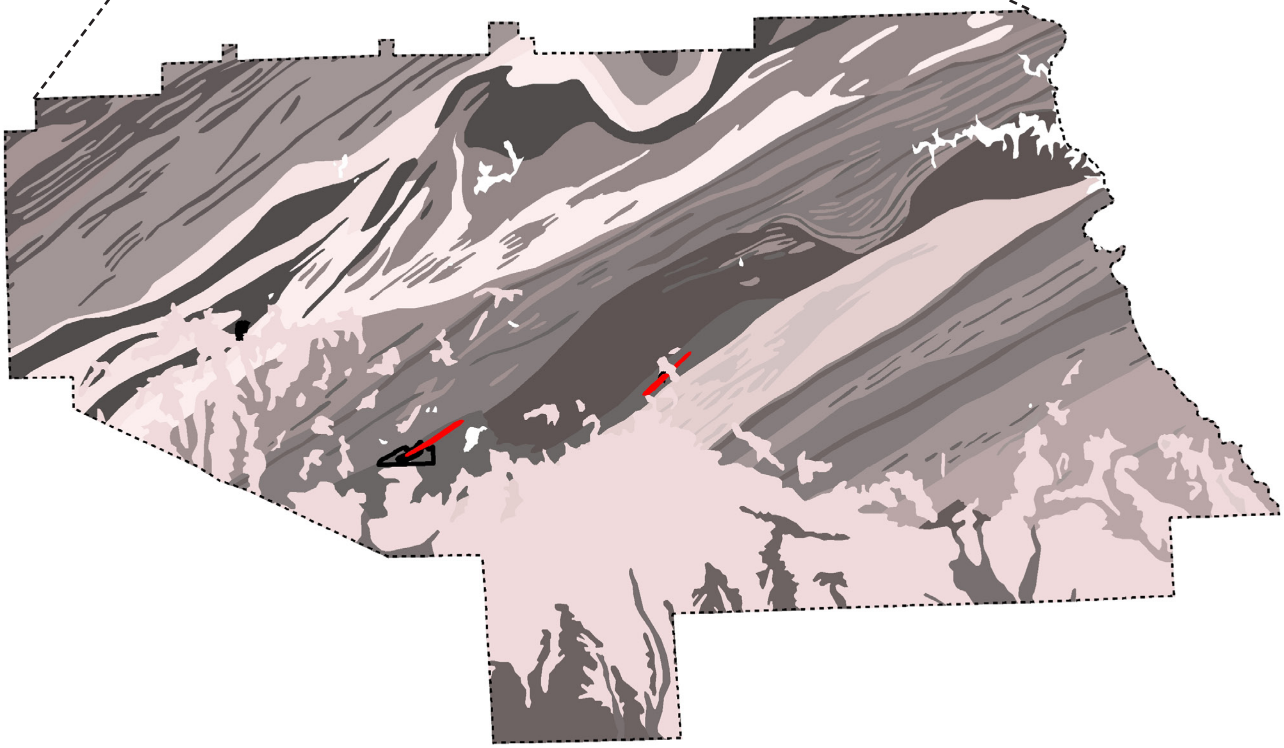
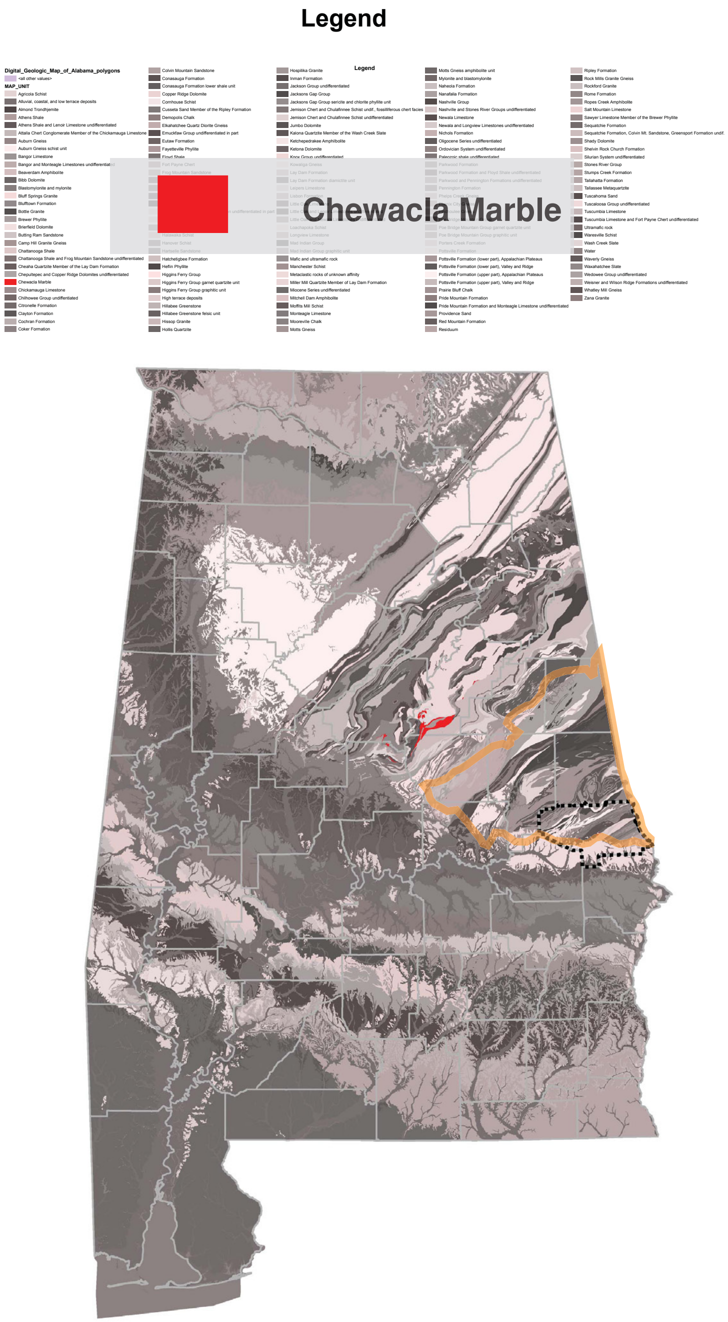


Figure 16 - Geologic Context - The MMM Auburn Quarry is located along a geologic formation known as the Chewacla Marble Formation (red above). Aside from the larger presence in central Alabama, Chewacla Marble is limited to two relatively small unit areas collectively covering less than 400 surface acres. Its presence is associated with the transitional areas between the Piedmont and Coastal Plain Physiographic Regions (seen in Figure 17).



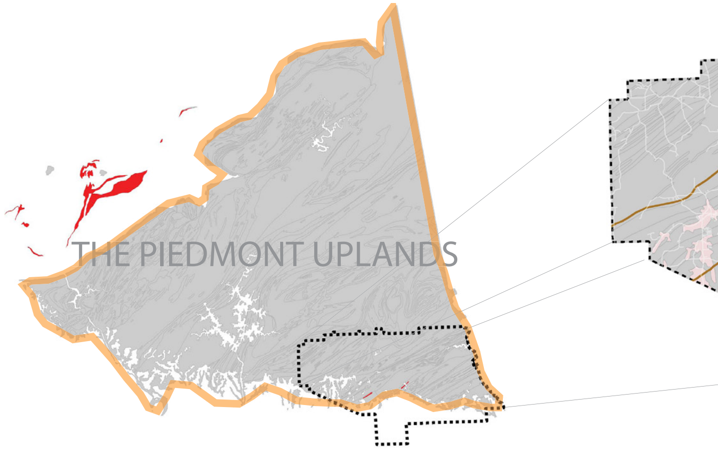

Chewacla Marble





PRECAMBRIAM AND PALEOZOIC ERA FORMATIONS

Chewacla Marble formations are found near the transitional areas between the Piedmont and Coastal Plains physiographic regions. The "fall line" represents the geographic divide that seperates these two regions, often presenting vast changes in elevation over short distances.



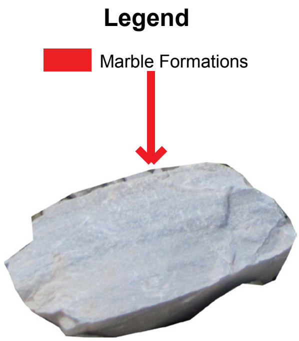
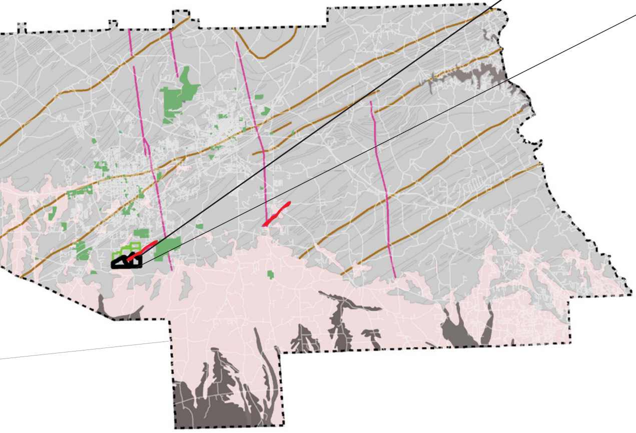


Figure 17 - Graphic Explanation of Karst Topography at The Quarry - Chewacla Marble is a dolomitic, sedimentary rock formation composed of metamorphosed limestone. It is a mineral rich in calcium carbonate, that dissolves readily in the presence of low pH water. It has been mined in Auburn since the 1850's, with over 35 million short tones mined since 1958. Areas near Chewacla Marble formations are prone to subsidence formation.

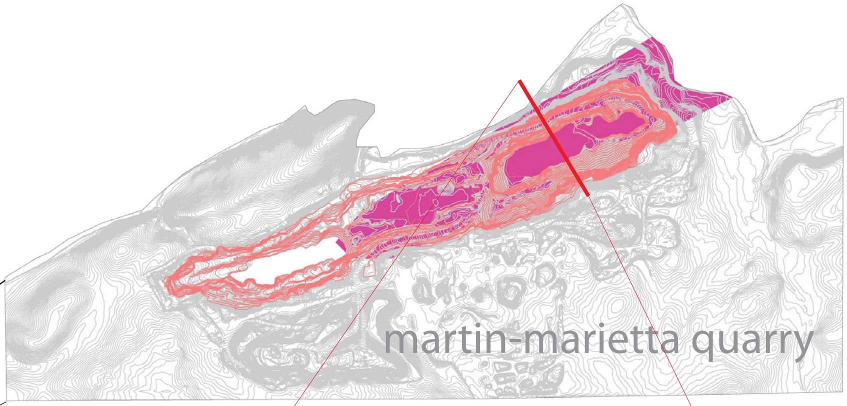
SOUTHERN OUTER PIEDMONT

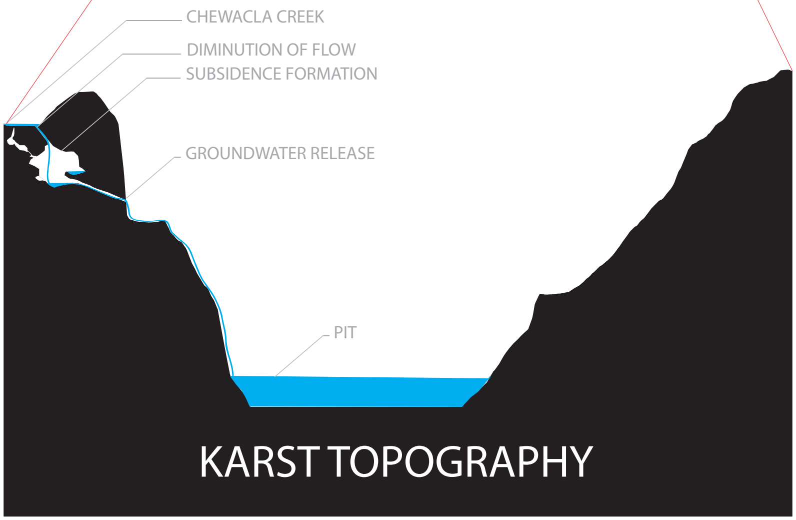


PHYSIOGRAPHIC TRANSITIONS

INNER COASTAL PLAIN

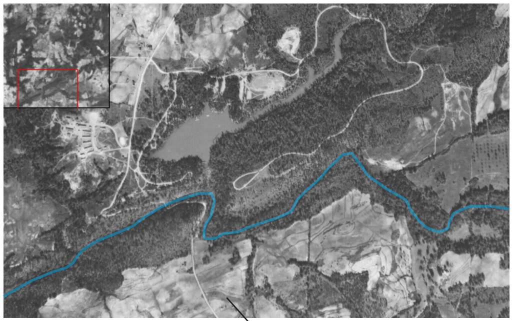
SURFACE TOPOGRAPHY





Karst topography is defined as the formation of surface landscape features through the dissolution of subsurface minerals. In the presence of carbonate bedrock formations, such as that of Chewacla Marble, subsidence (sinkhole) formation is common. Sinkholes can greatly affect both surface topography and hydrology and may impact groundwater quality and quantity. In addition, diminution of flow in nearby waterbodies may occur.

SITE HISTORY



Quarry property as a farm in 1938

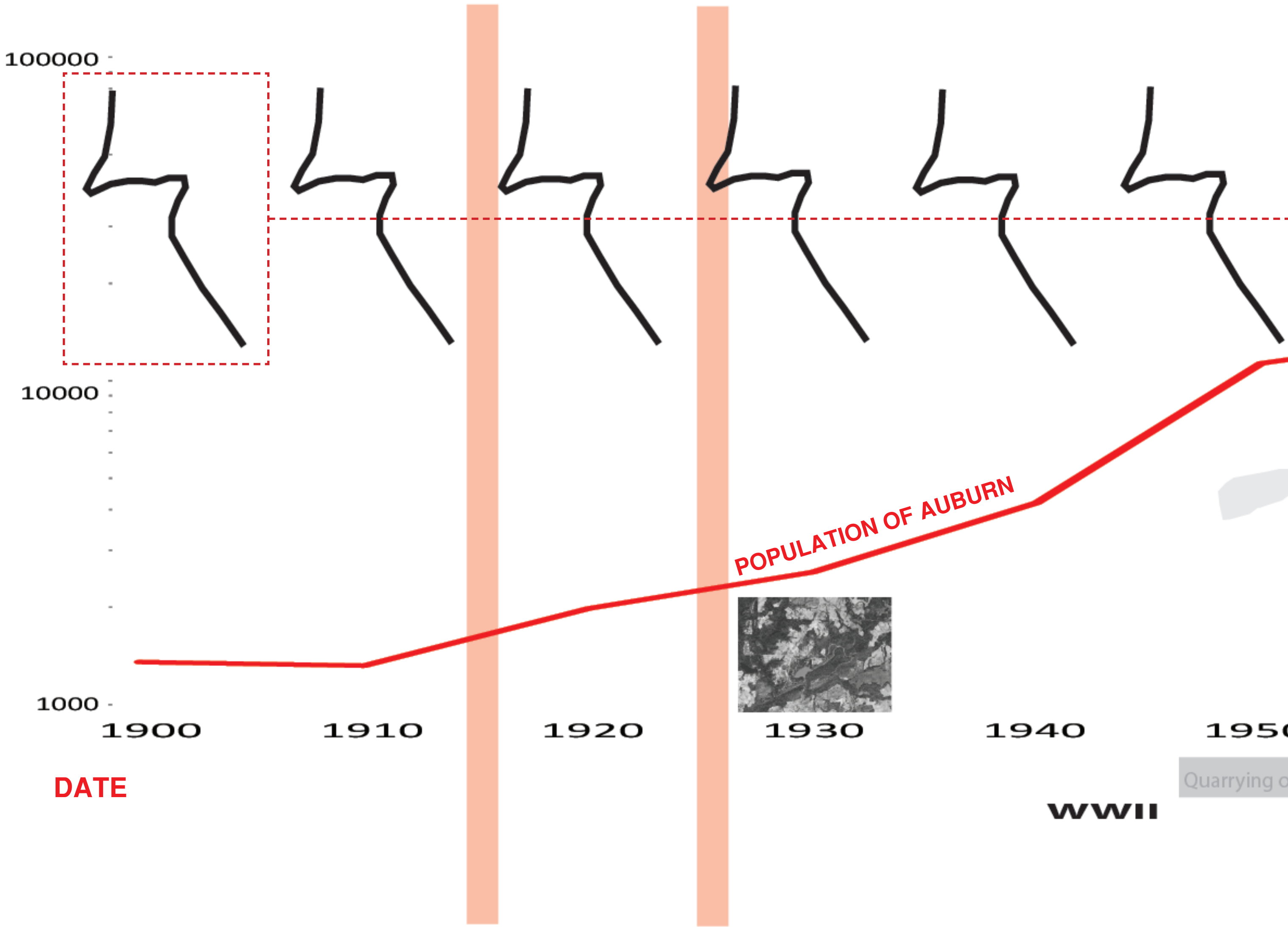
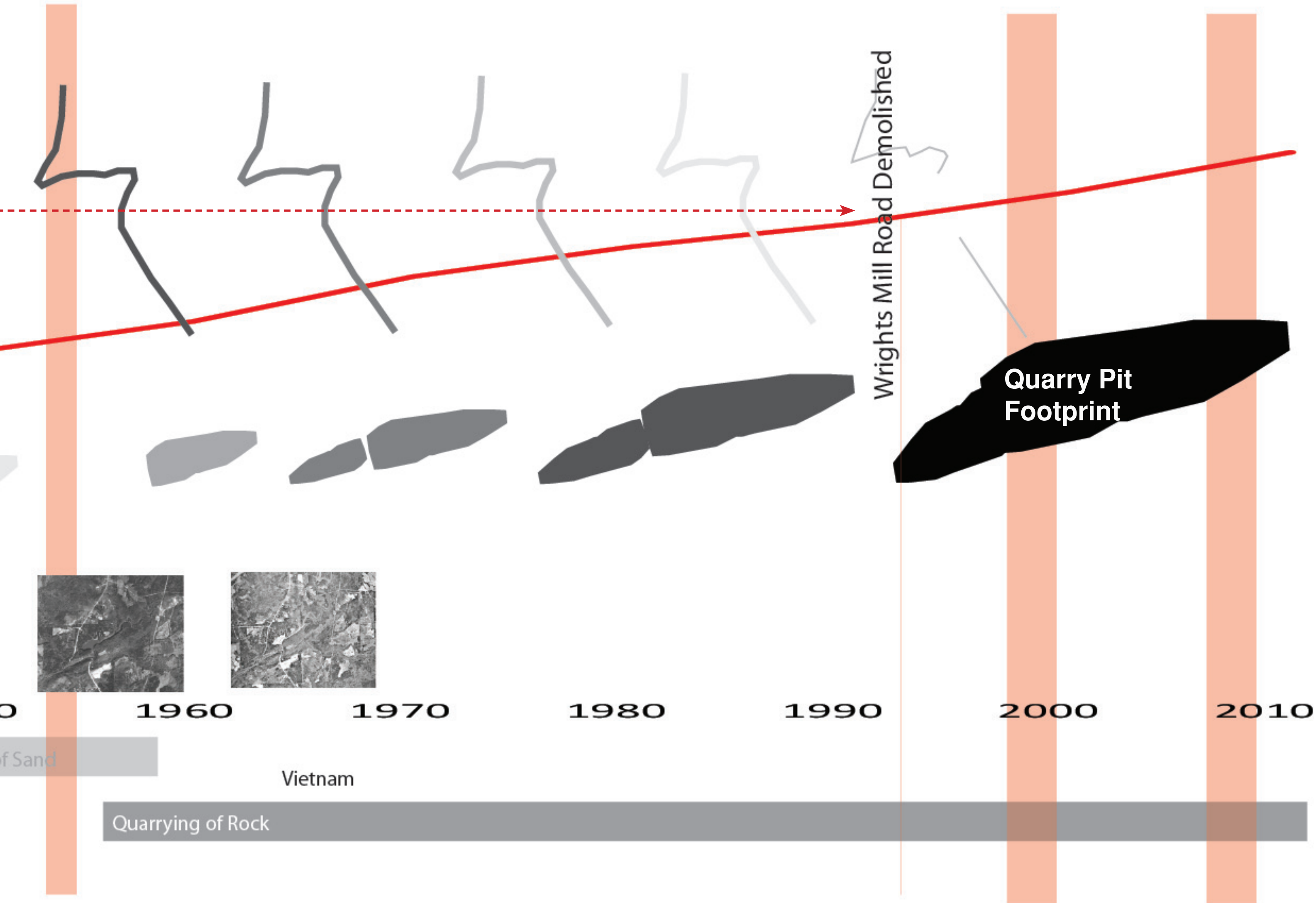


Figure 18 - Historic Section

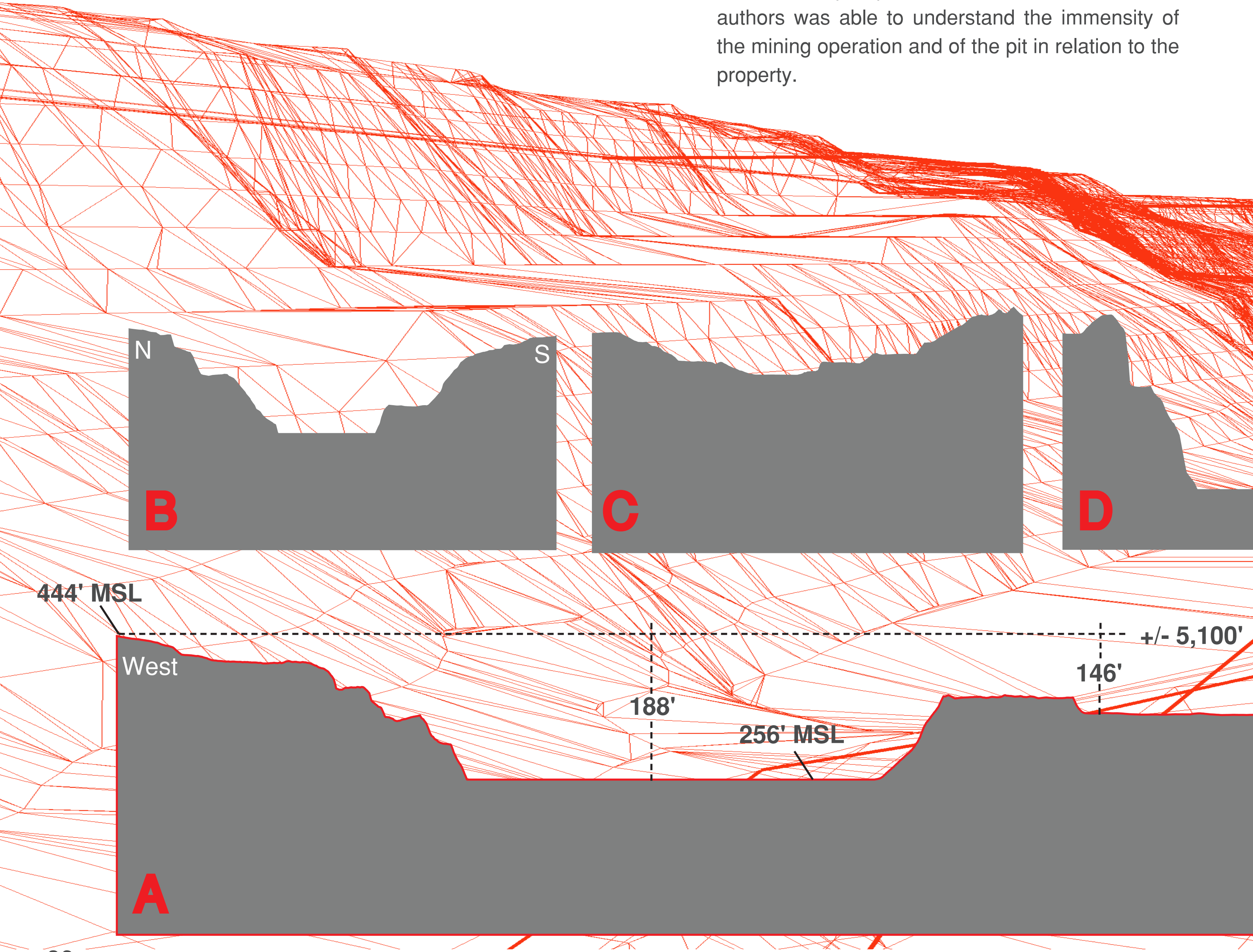
What is now known as the Martin-Marietta Materials, Inc. Auburn Quarry was quarried prior to the founding of the larger Martin-Marietta Cooperation in 1961. It began in the late 1950's as a sand pit quarry by the Auburn Stone Company. However, once plans began for the construction of Interstate 85 its strategic location made it an ideal contributor for aggregate materials. The quarry was leased by the Southern Stone Company from 1970-1976, Dravo Industries from 1976-1994, and Martin-Marietta Materials from 1994-present. As growth in the surrounding area has increased, so has the demand for aggregates, resulting in the subsequent growth of the quarry operation (depicted below).



SITE DIMENSIONING

Figure 19 - Physical Dimensional Analysis of The Quarry Pit

ArcGIS and ArcScene were used to generate digital elevation models, which were then used to analyze pit dimensions. From these the authors was able to understand the immensity of the mining operation and of the pit in relation to the property.



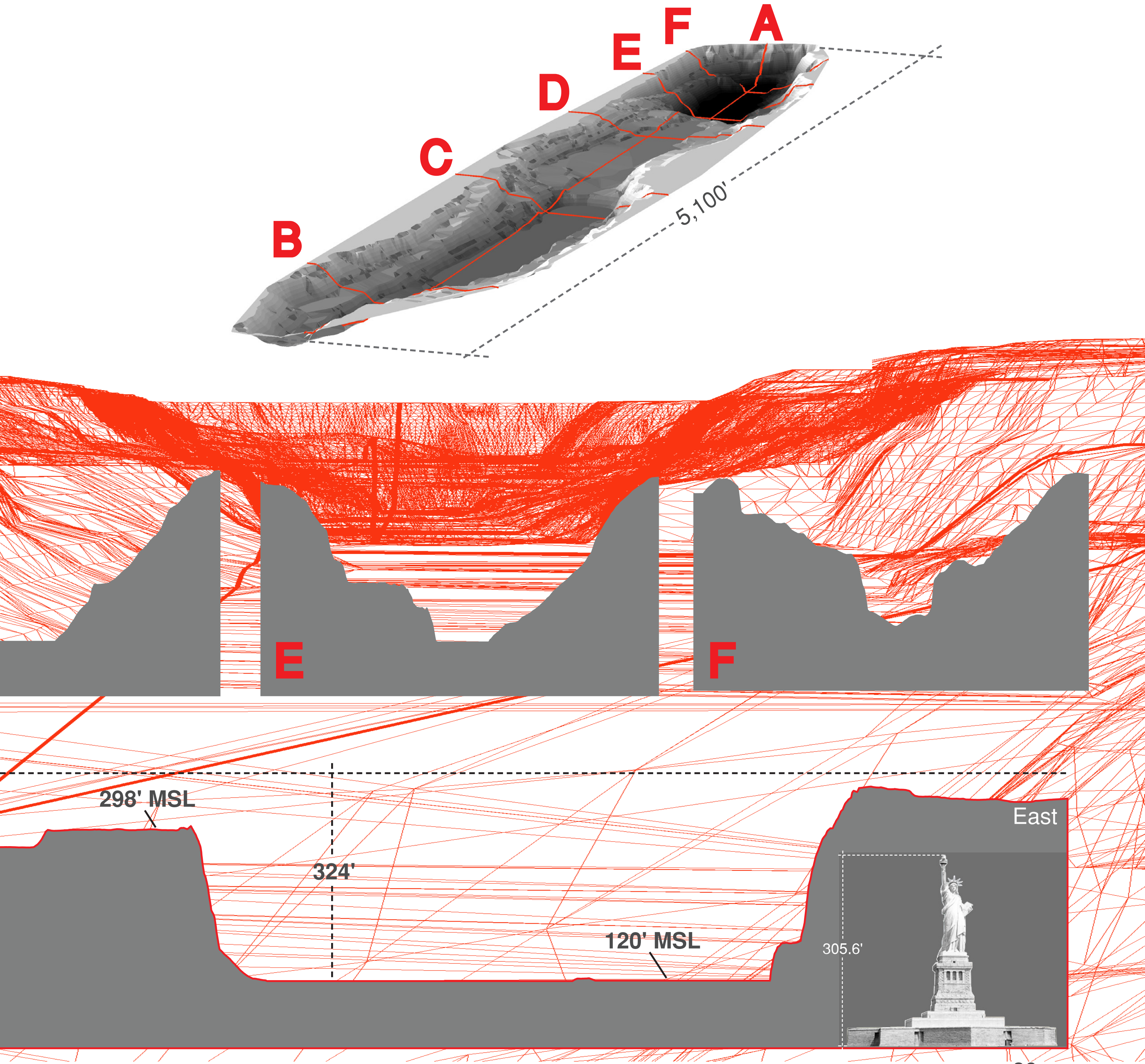

A
F
E
D
C
B
5,100'
E
F
298' MSL
324'
120' MSL
East
305.6'

Figure 20 - Axonometric Overlay of Site "Signatures"

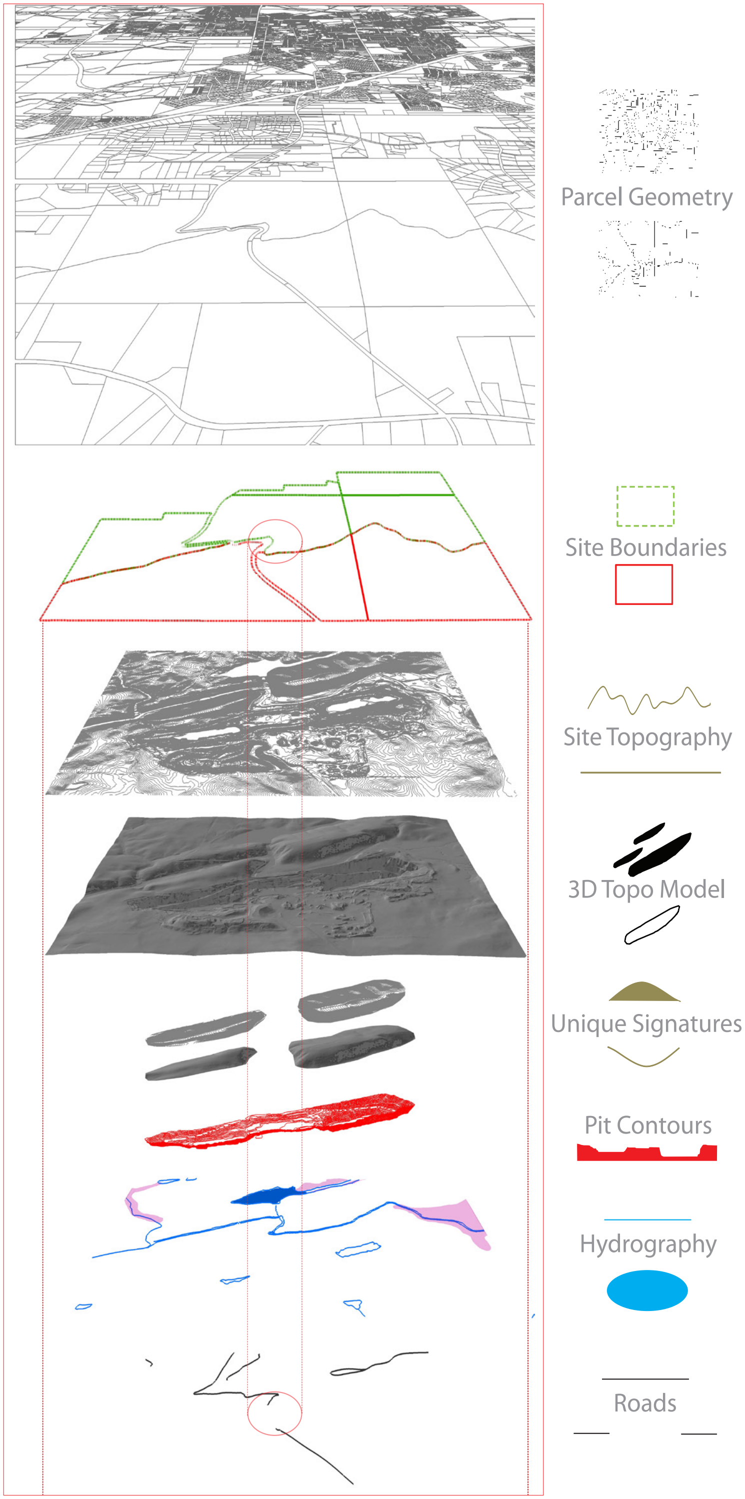
The axonometic overlay on this page depicts the various physical and cartographic signatures that were identified early in the mapping process. Parcel boundaries to the north and south of the quarry reflect the different landuse patterns that exists between the urban and rural areas of Lee County. The parcels to the immediate north form Chewacla Park, the Alabama Department of Conservation and Natural Resources 696-acre State operated park (seen in green).

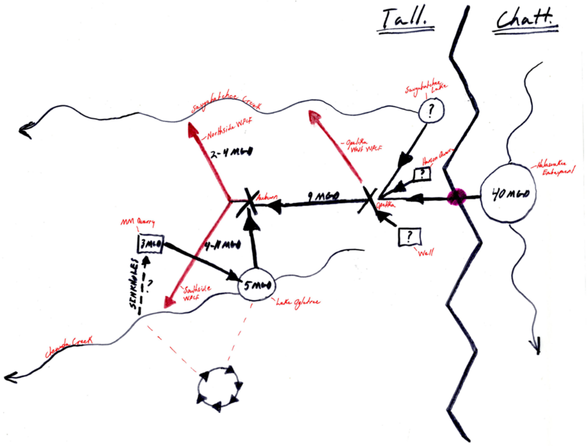
Further down the drawing are the site contours and digital elevation model. From these you can easily see the final foothills of the piedmont region as they approach the relatively flat coastal plain. The presence of the quarry pit further reinforces the physical presence of this divide.

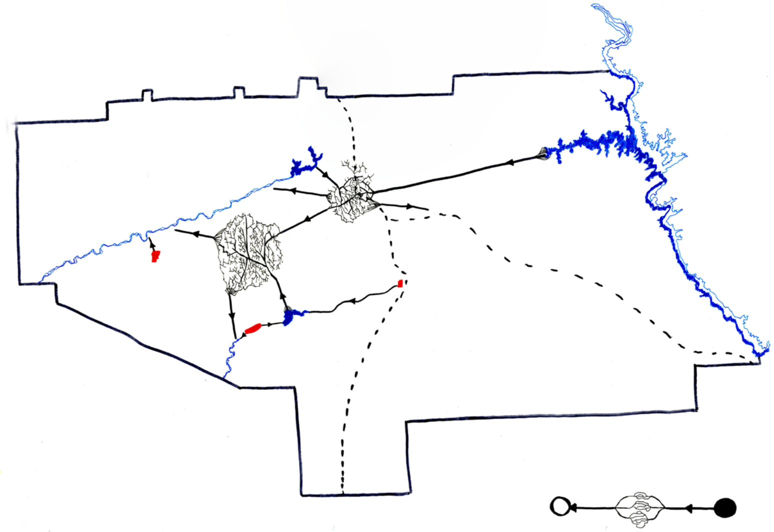
Figure 21 - Hydrologic Mapping (opposite page)

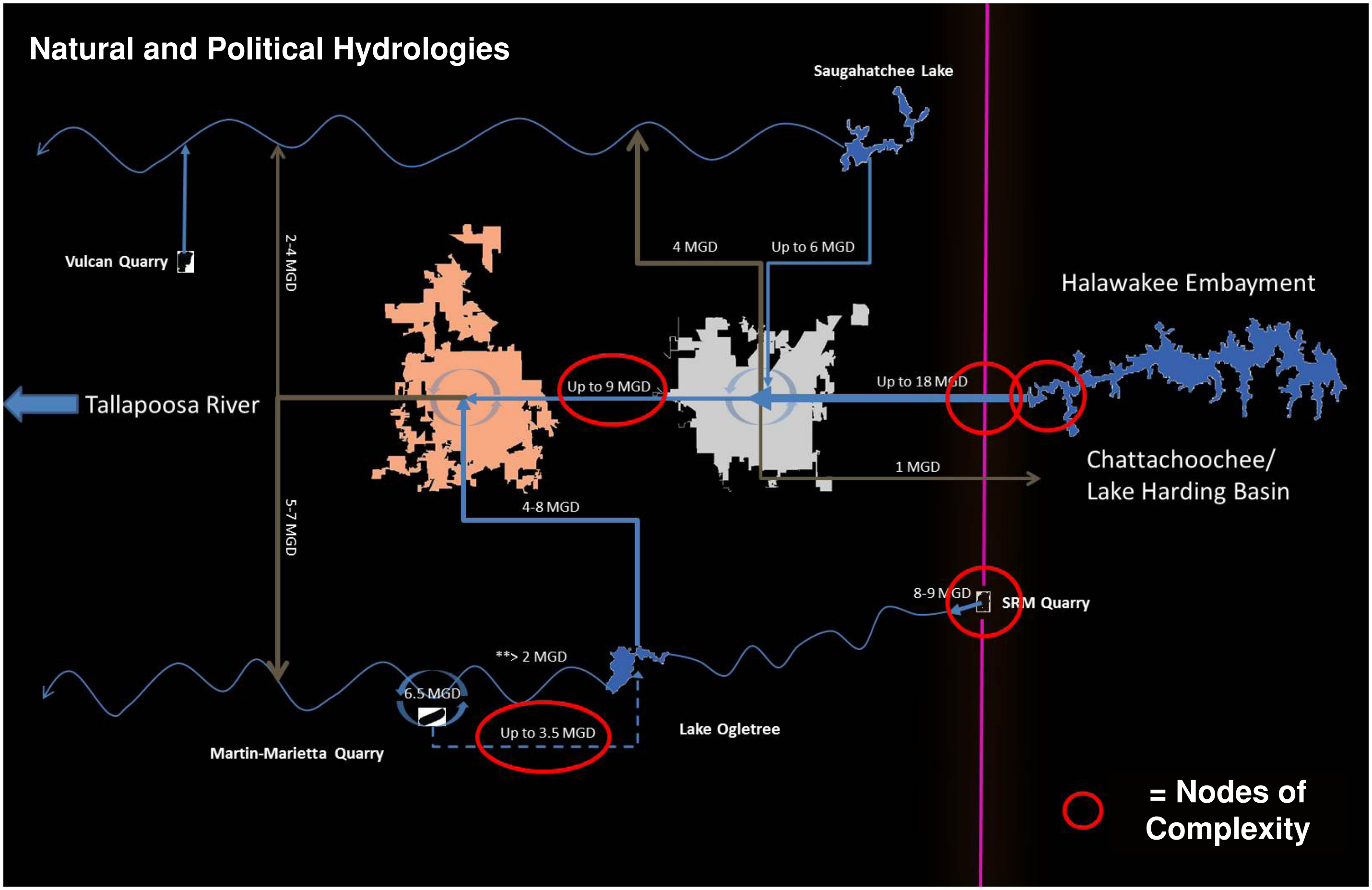
This mapping exercise allowed the author to better understand both the natural and political hydrology that exists in relation to the areas surface water supply network.

The City of Auburn obtains the majority of its drinking water from Lake Ogletree, a 300-acre surface water reservoir located on Chewacla Creek and approximately 0.5 miles east-northeast of the quarry. In addition to natural base flow from Chewacla Creek, Lake Ogletree also receives pit effluent water from the SRM quarry in Opelika, which discharges to Chewacla Creek upstream of the reservoir. The City of Auburn may also request up to 3.5 million gallons per day from the MMQ for supplemental flow to Lake Ogletree during drought periods. However, under normal operating periods, the MMQ discharges their pit effluent to Chewacla Creek, upstream of the confluence with Moores Mill Creek. Numerous grass roots organizations have voiced concerns with regards to the mining/pumping in the presence of Chewacla Creek, arguing that the presence of sinkhole formation coincides with direct loss of flow in Chewacla Creek.




Tall.
Chatt.
2-4 MGD
9 MGD
40 MGD
5 MGD
3 MGD
4-8 MGD




Natural and Political Hydrologies
Saugahatchee Lake
Vulcan Quarry
2-4 MGD
4 MGD
Up to 6 MGD
Halawakee Embayment
Tallapoosa River
Up to 9 MGD
Up to 18 MGD
Chattachoochee/
Lake Harding Basin
1 MGD
4-8 MGD
5-7 MGD
8-9 MGD
SRM Quarry
**> 2 MGD
6.5 MGD
Up to 3.5 MGD
Lake Ogletree
Martin-Marietta Quarry
= Nodes of
Complexity

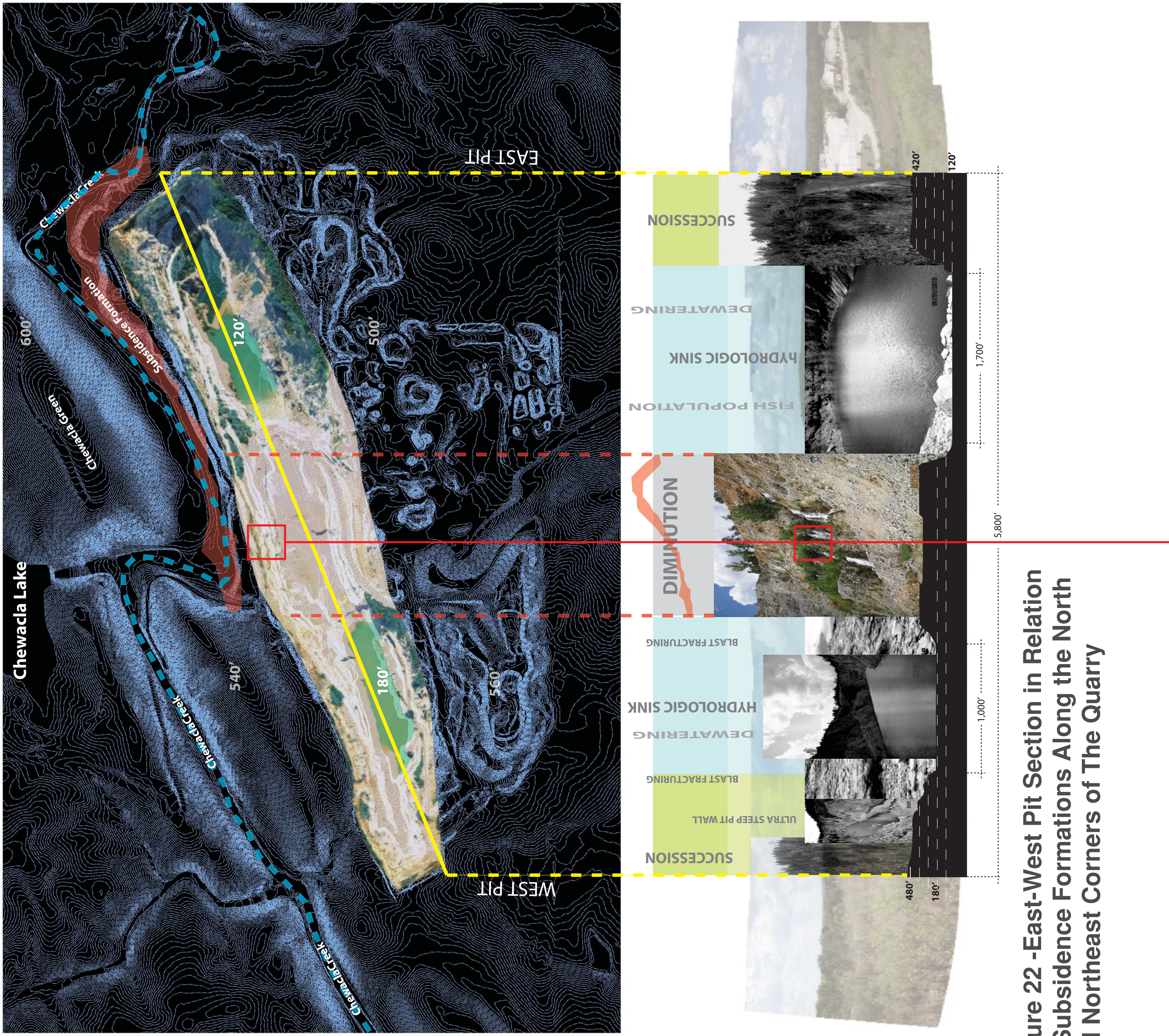
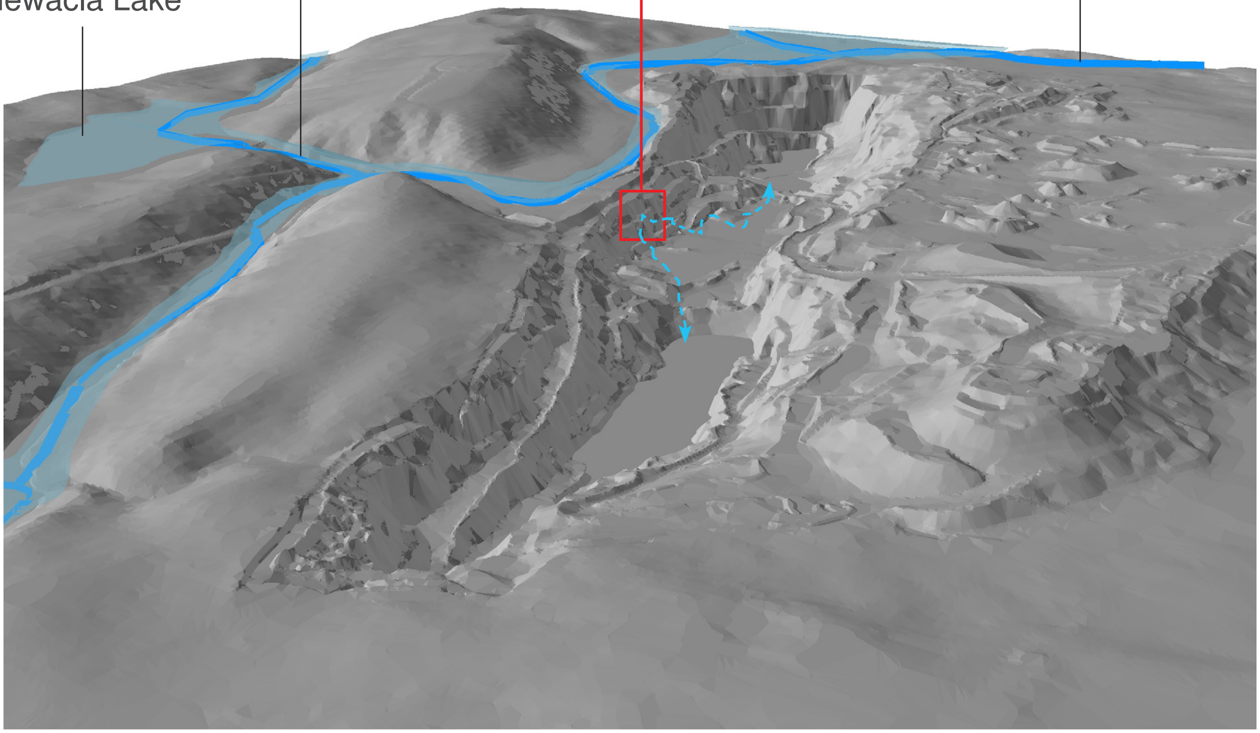
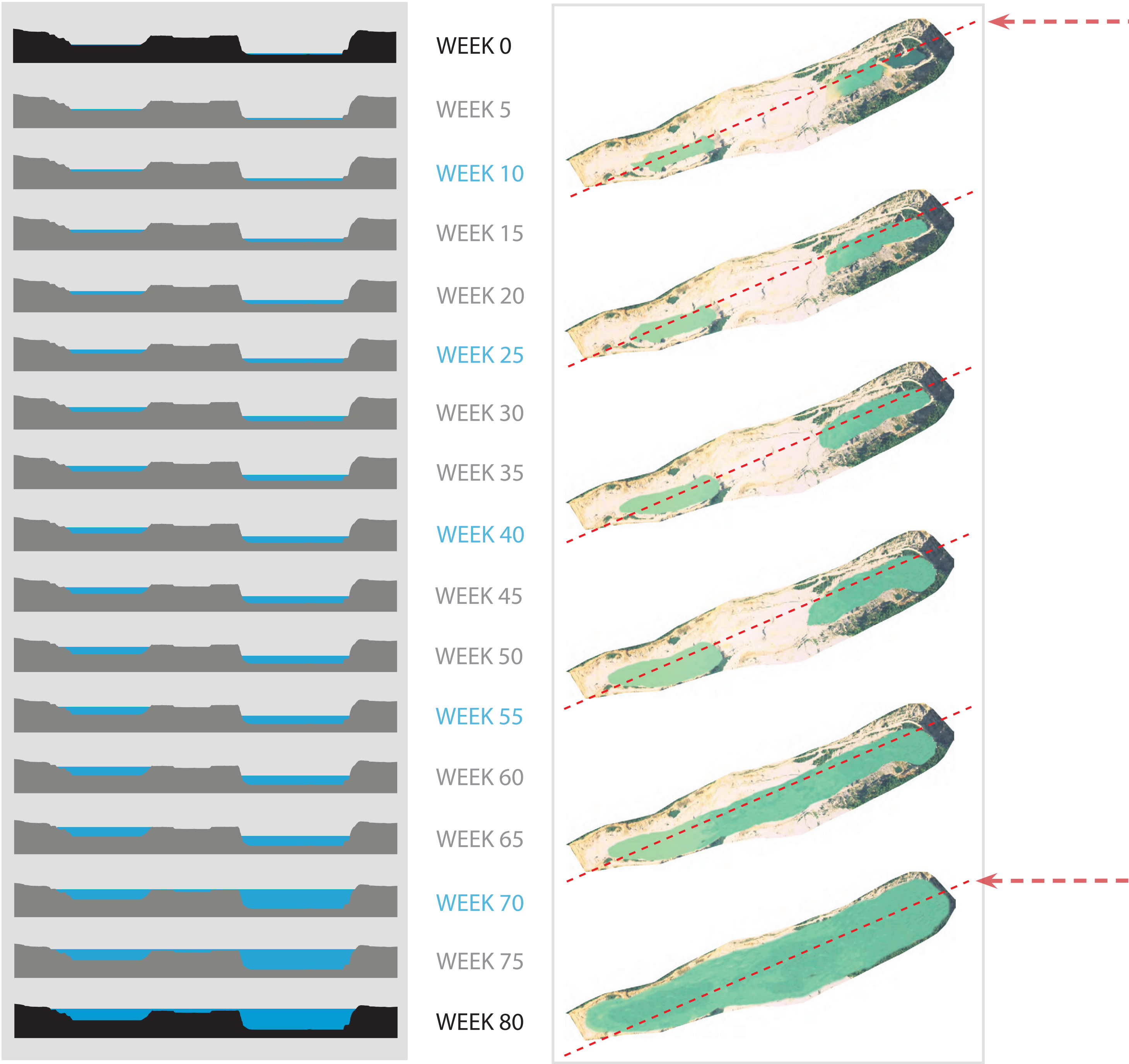


Figure 22 -East-West Pit Section in Relation to Subsidence Formations Along the North and Northeast Corners of The Quarry

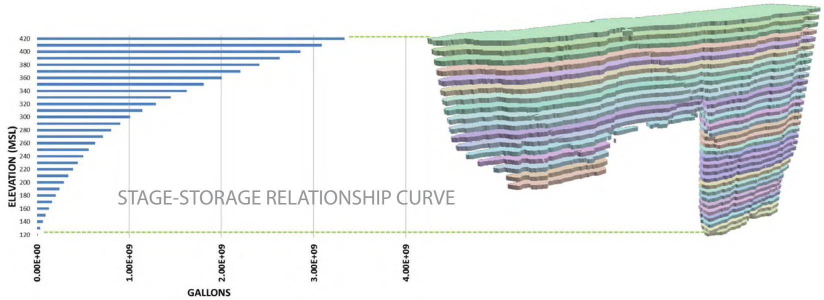
Figure 23 -North High Wall Showing Concentrated Groundwater Discharge Into Pit

Figure 24 -Digital Elevation Model Used to Explain Connection Between Subsidence and Pit Water Inflow




WEEK 0
WEEK 5
WEEK 10
WEEK 15
WEEK 20
WEEK 25
WEEK 30
WEEK 35
WEEK 40
WEEK 45
WEEK 50
WEEK 55
WEEK 60
WEEK 65
WEEK 70
WEEK 75
WEEK 80

- 6.5 MILLION GALLONS PER DAY ENTERS THE QUARRY
- THE QUARRY HAS A CAPACITY TO HOLD 3.7 BILLION GALLONS OF WATER
- AT A RATE 6.5 MILLION GALLONS PER DAY, IT WOULD TAKE 569 DAYS TO FILL
- SUBSIDENCE FEATURES ARE COMMON AROUND THE QUARRY
- SUBSIDENCE FEATURES FORM AS A RESULT OF DISSOLVING CARBONATE MATERIAL
- DIMINUTION OF FLOW OCCURS WHEN SUBSIDENCE FEATURES FORM NEAR CHEWACLA CREEK
- AQUATIC FAUNA ARE IMPACTED BY FLOW AUGMENTATION (DURING PUMPING) AND DIMINUTION



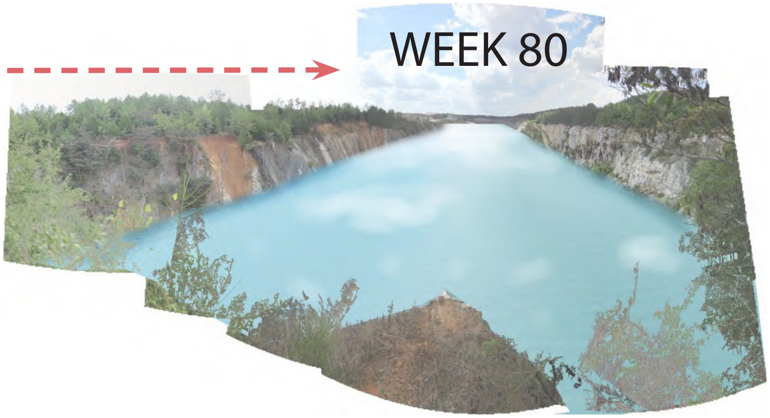


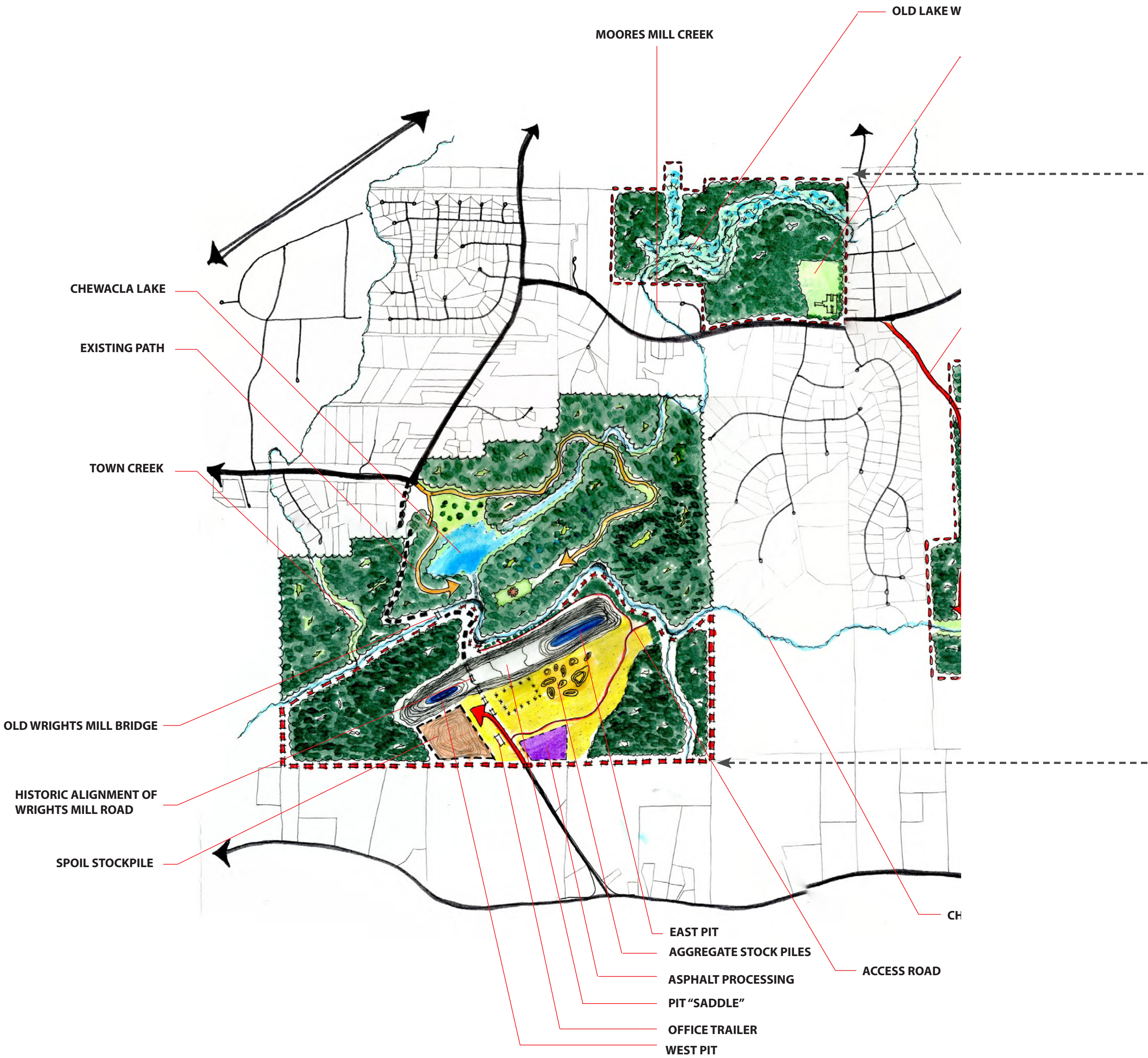
Figure 25 - Stage-Storage Relationship to Hydrogeologic Response to Post-Mine Scenario

Using pit dimension analysis to develop a stage-storage relationship curve, this figure represents visual & phsical changes that may occurr as the pit fills with water during a post-mine scenario. At an approximate rate of 6.5 million gallons per day (determined from average discharge rate from the pits to Chewacla Creek), the quarry would fill with water in approximately 570 days, or 80 weeks. The level at which the quarry will fill is determined by the surrounding groundwater elevatation (Shannon, 2010, Personal Communication).

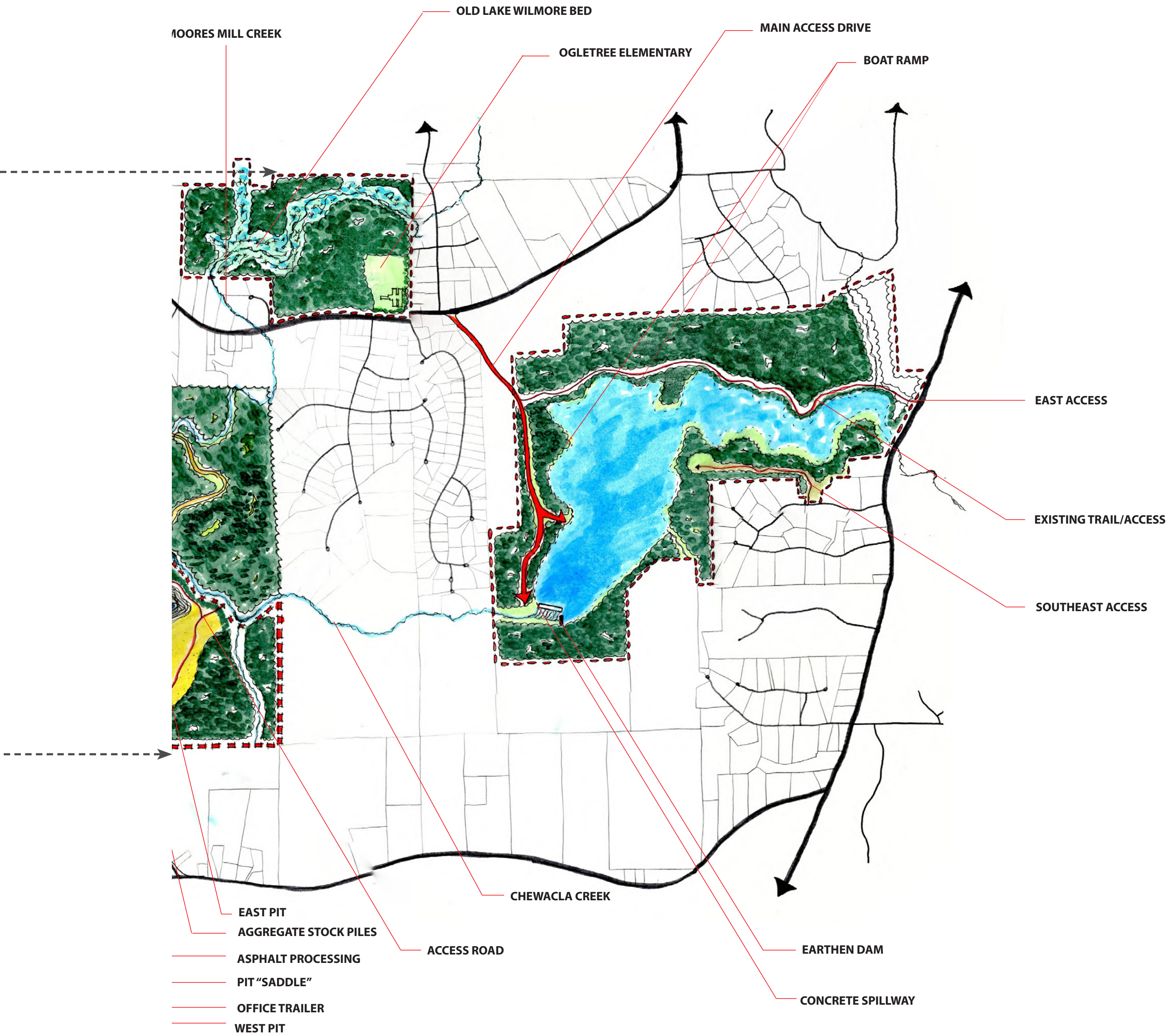
Without data on surrounding groundwater elevation, the author has made the assumption that this will occur at or near an elevation assocated with the concentrated groundwater discharge identified earlier in Figures 22-24 (somewhere around 418' MSL).

The filling of the quarry with water presents an opportunity for both positive and negative outcomes. When filled with water, the cavernous views that were once offered as a stunning visual expression of our contemporary societies insatiable appetite for infrasture will no longer be present. However, the potential for numerous civic and recreational functions arise in the form a oblong, linear lake. Further reinforcing this assumption, the City of Auburn has already expressed interest in the use of the quarry as an additional surface water supply reservoir (CoA Water Supply Master Plan, 2009).

Figure 26 - Mapping of The Physical Relationship and Proximity of the MMQ to Lake Ogletree and the old Lake Wilmore Properties.



The MMQ is located near three large, publicly owned properties; Lake Ogletree (the CoA's current surface water reservoir), the old Lake Wilmore properties (the CoA's historic surface water reservoir), and Chewacla State Park. These properties and their proximity to the MMQ present connective opportunities for numerous potential uses.




Chewacla Creek
Wrights Mill Rd.
Wrights Mill Rd.
Hiktoric Bridge
False Spring
West Pit
Expansion
Rural Entry
Pit Spoil
Dewatering

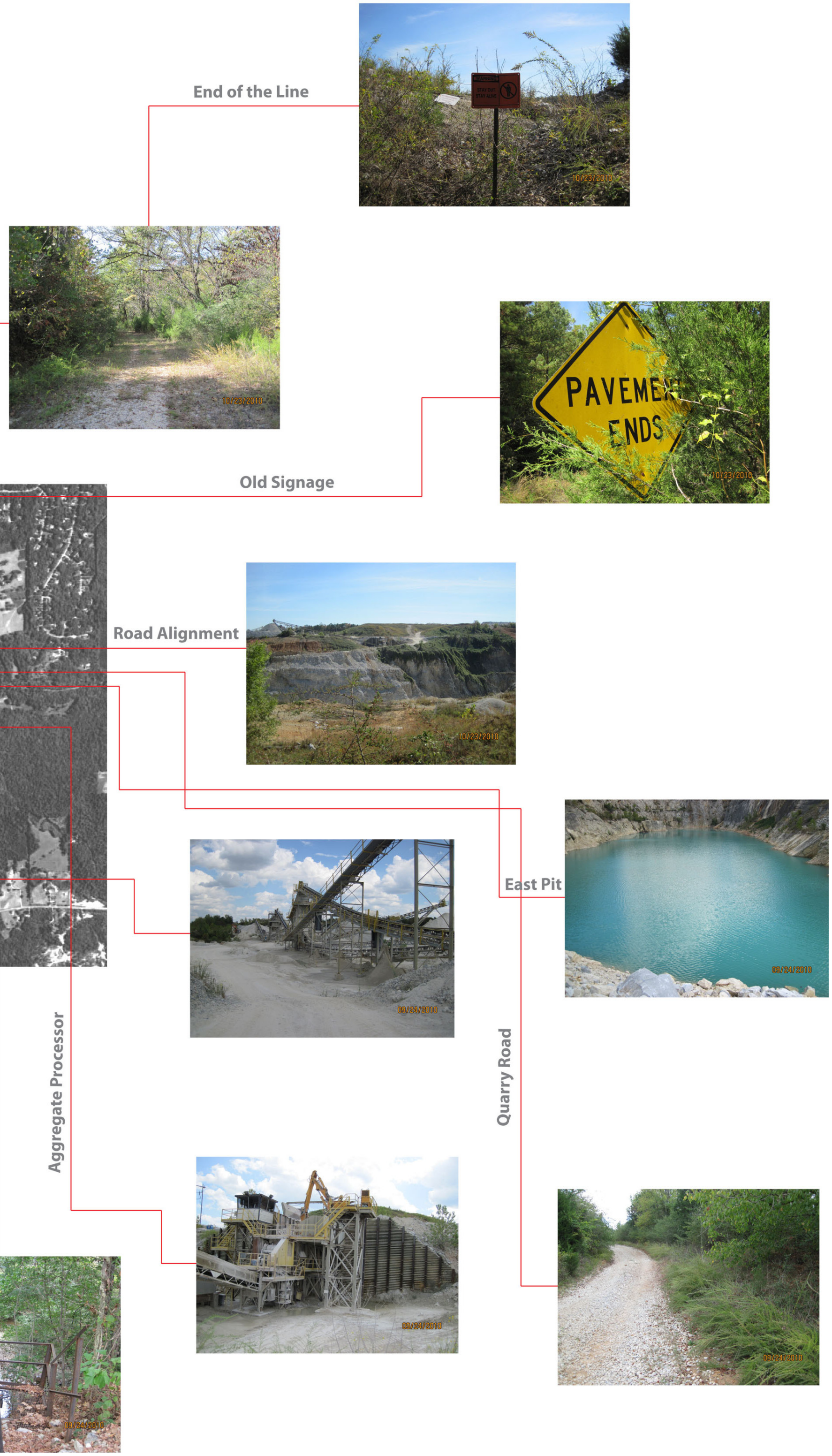


Figure 27 - Field Survey and Ground Truthing

This figure represents the authors field survey of existing site conditions. This survey was performed over several site visits that occurred between September and October of 2010. Martin Marietta Materials provided an onsite tour of the operational facilities and allowed for photographs to be taken of the quarry facilities and operations. Additional investigations were performed on surrounding properties that are adjacent to the quarry, with particular emphasis along the vacated portions of Old Wrights Mill Road.

The abandoned road bed remains visible, yet overgrown and provides a relatively easy walk from the entrance of Chewacla Park to the northern highwall of the quarry pit. "No Trespassing" and "Pavement Ends" signs are present to demarcate the quarry property and warn of the roads end. Half way between the entrance to Chewacla Park and the quarry along Old Wrights Mill Road is a historic stone-mortar bridge. Though passible by foot, the wood decking is severely deteriorated and the footings of the bridge piers show evidence of scour and movement.

These site visits and surveys provided a critical understanding of the site qualities and potentials, including understanding of adjacent landuses and landcover.

DESIGN THEORY

Projects within the subfield of open-pit mine reclamation arguably present the most diverse and rich opportunities for the advancement of the study, theory, and practice of landscape architecture. This argument is solidified by the very presence of the mining operation, for their very existence presumes that the value (whether it be monetary, social, cultural, environmental, etc.) of the pre-mined landscape is outweighed by the minerals that lay beneath. Hence, what occurs is not just landscape transformation, but landscape removal. The actively mined area is reduced to, as the name suggest, an open-pit. What remains may best be described as nothingness and leftovers that reveal themselves as cavernous holes into the earth and rolling hills of soil strippings and mine tailings. Herein presents the overarching question for the reclamation of these sites; to what potential value does a landscape that has already been so reduced, so degraded, and so devalued for all other purposes offer? The answer lay perhaps in the very "nothingness" that exist; unbounded opportunity. Mined sites offer a "landscape that is not bound by, nor indebted to, historical filters, aesthetic traditions, or strict contexuality" (Berger, 2008). Therefore, the designer is freed of the prescriptive nature of preconceived expectations (internal and external) for what the landscape should be, in terms of both form and function. They may then serve as "incubators for design research" that push the envelope of how we perceive the landscape and to what value it may sustain.

So how do we as landscape architects begin to explore the potential value that mined landscapes offer? Furthermore, how do we maximize that value in a way that changes not only our perception of the landscape, but in a way that positively influences our ability to inhabit a world of limited, finite resources (of which mines present a concentrated outward expression of)? Case study analysis provides evidence of endless uses, functions, and potential of mines sites (nature preserves, water supply reservoirs, hiking, biking, and equestrian use, gardens of many form, research facilities, scuba diving, boating, industrial development, etc.), but each presumes a relatively static design process in which engagement with the value-finding process of landscape transformation is terminated prematurely; i.e. the design process is linear and lacks continuity (Berger et. al. 2008). Conventional design approaches, and to a certain degree participatory design as well, are a value-determinate process, in many ways similar to the mining feasibility analysis that resulted in the original devaluation of the mined landscape that currently exist. This research project attempts to address the limitations of these value-determining processes through the incorporation of the value-finding qualities of a perpetual democratic process.

The author, through extensive mapping, exploration, design visualizations, planning, and process drawings has determined that an ongoing democratic process of design can be applied to the mine reclamation process in order to achieve outcomes of greater value of the post-mined landscape and the potential for positive changes in our understanding of finite resource management.

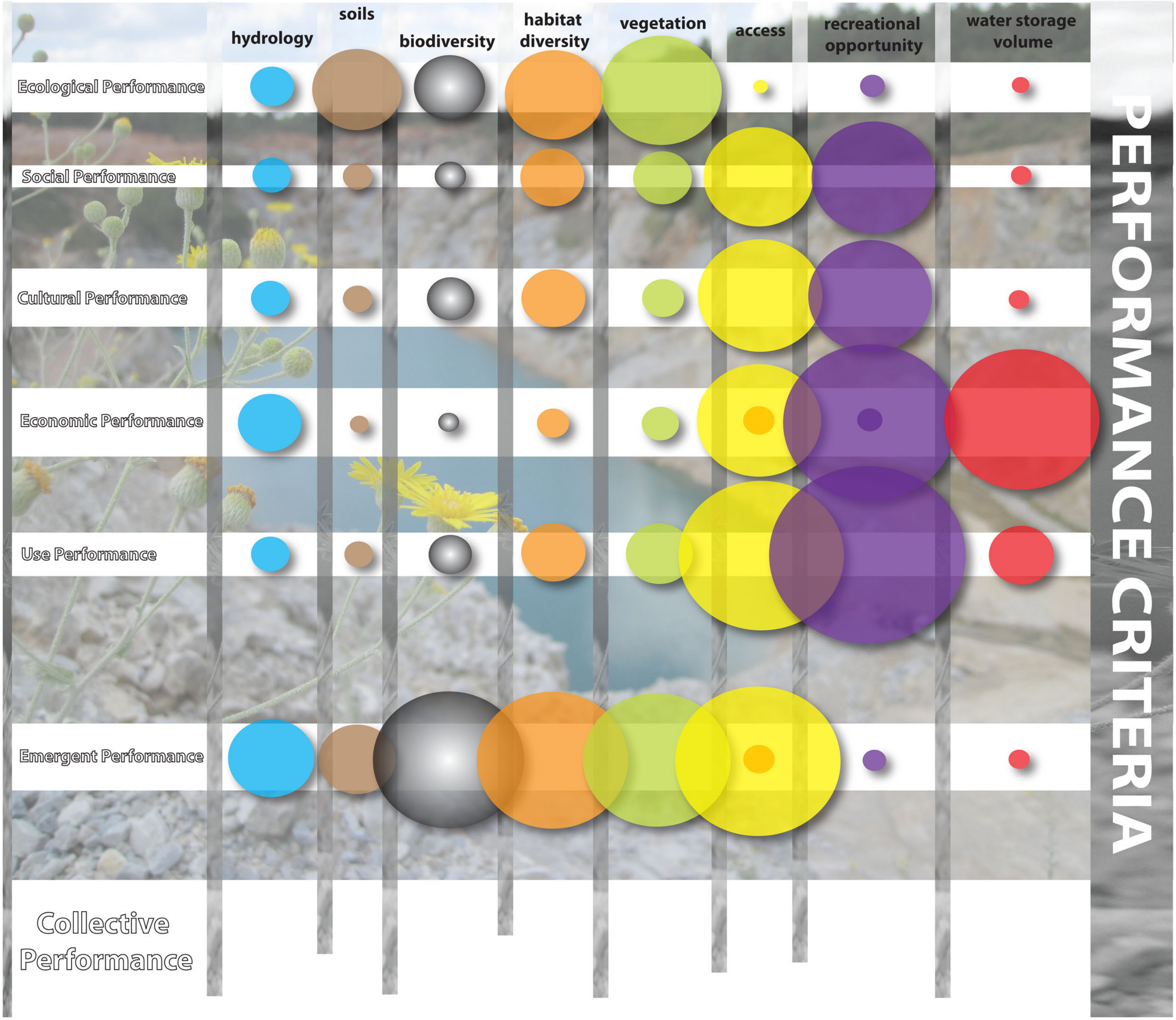


Figure 28 - An Initial Attempt to Begin to Evaluate the Sites Potential to Perform for Various Agendas and/or Programs

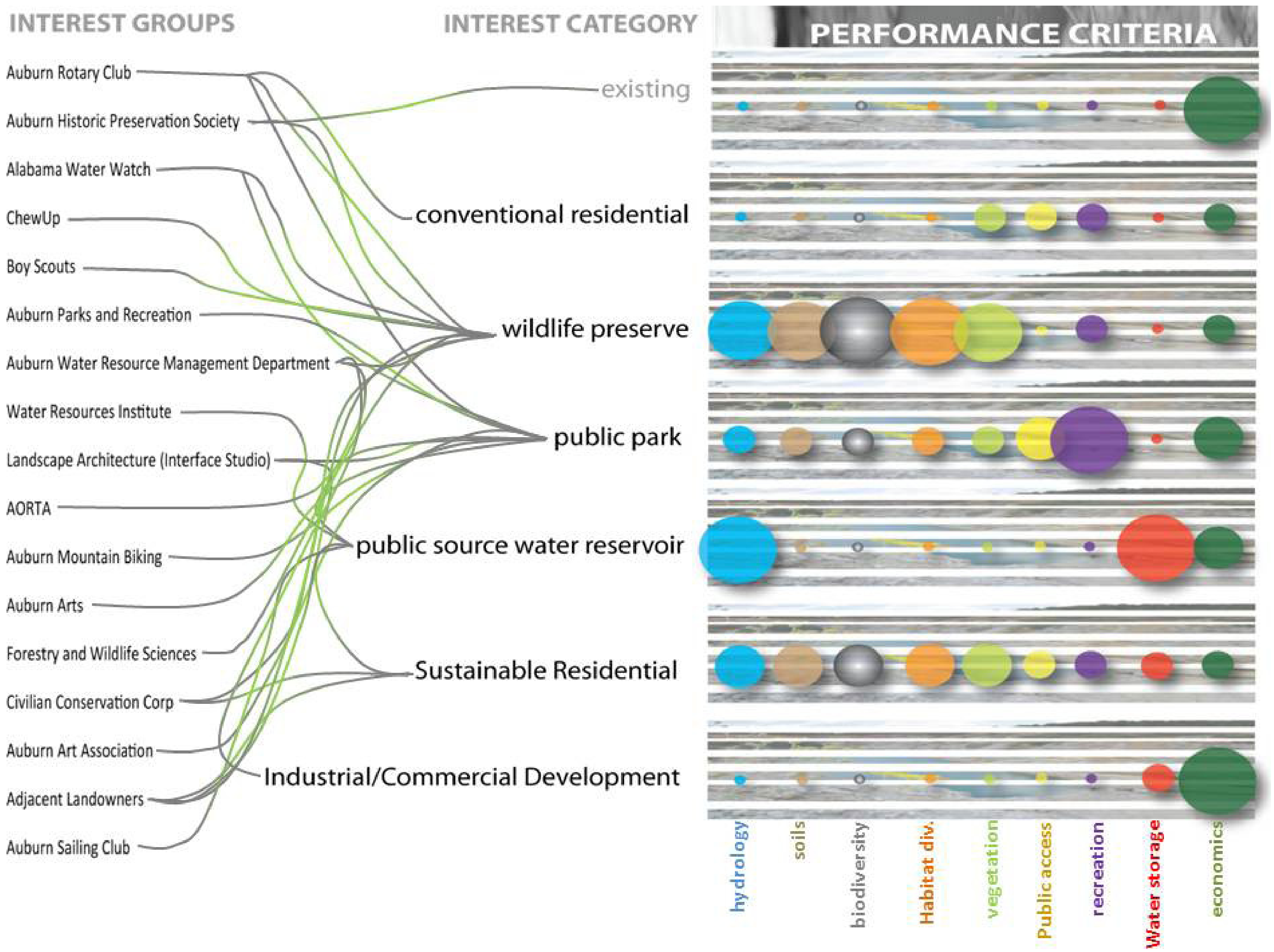


Figure 29 - Analysis of Potential Intersecting Agendas

This figure represents the authors attempt to begin to identify specific, local user groups, or stakeholders, who could potentially benefit from reclamation of the quarry as a public ammenity. It is also an attempt to analyze the various interests and agendas of each group in order to determine how they might differ in terms of ranking performance parameters. This allowed the author to begin to understand the numerous ways in which various groups might have fundamental conflicts and/or similarities.

By integrating a perpetual democratic process with that of mine reclamation, we would be able to continually evaluate the post-mined landscape value, as the site would be transformed to reflect the continuous changes of social, cultural, economic, and environmental drivers. Though indeterminate in both form and function, the freedom of transformation would be regulated and accountable through representative governence of a regulatory body. Through an ongoing stakeholder process, all of the potential uses and qualities of the site would remain viable options for the future.

This research argues that democratic process can be integrated into mine reclamation in order to positively influence contemporary social and cultural perceptions of finite resource management. A participatory approach was determined to be the most suitable method of integration, due to its capacity to empower user groups and its ability to harness design visualizations in "helping all parties to understand the three dimensional complexities created by mining" (Carlson et. al., 2011). When actively involved in the design process, individuals and groups may develop a broader understanding of the quarry's potential and value as a reclaimed landscape and as afforded through finite resources. As active participants in the reclamation process, they would inherently become attuned to the physical limitations of the site, but would be encouraged to build upon the capacity thereof.

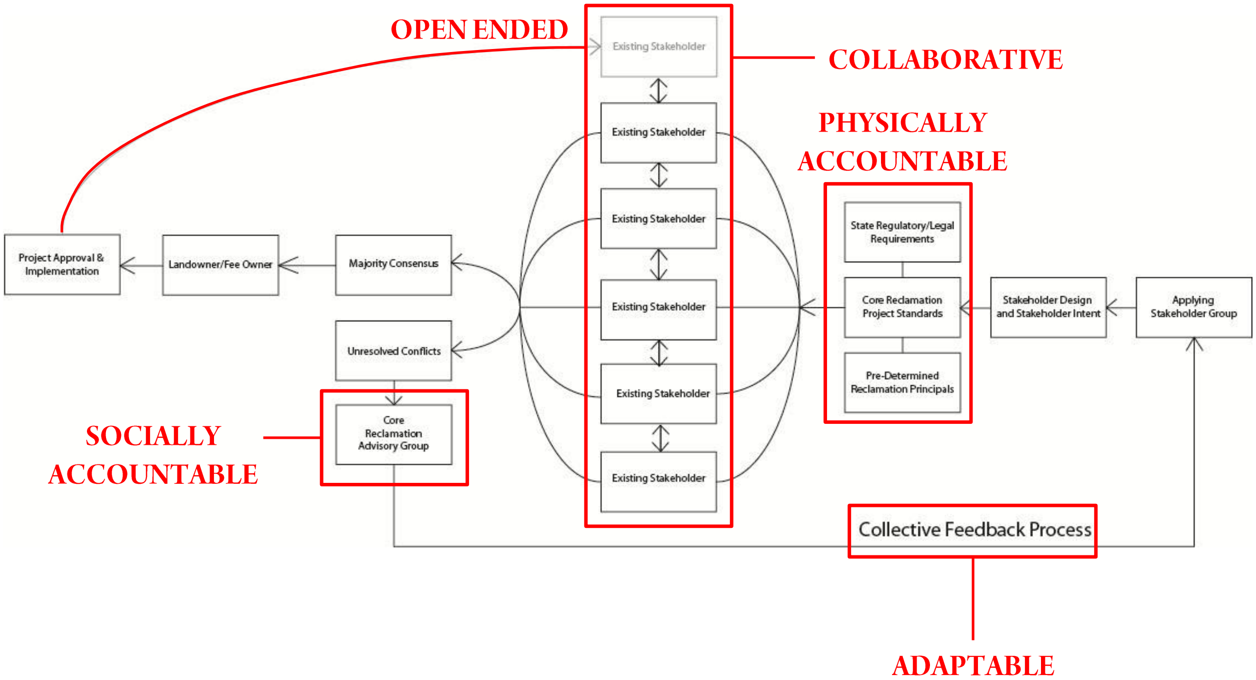


Figure 30 - Ongoing Democratic Involvement

This flow chart demonstrates how an ongoing democratic process could be used as a screening tool for project proposals, ensuring accountability across a wide range of criteria. The continual feedback provided by a democratic approval process also allows for adaptability through consensus and concession that would be necessary with each new stakeholder.

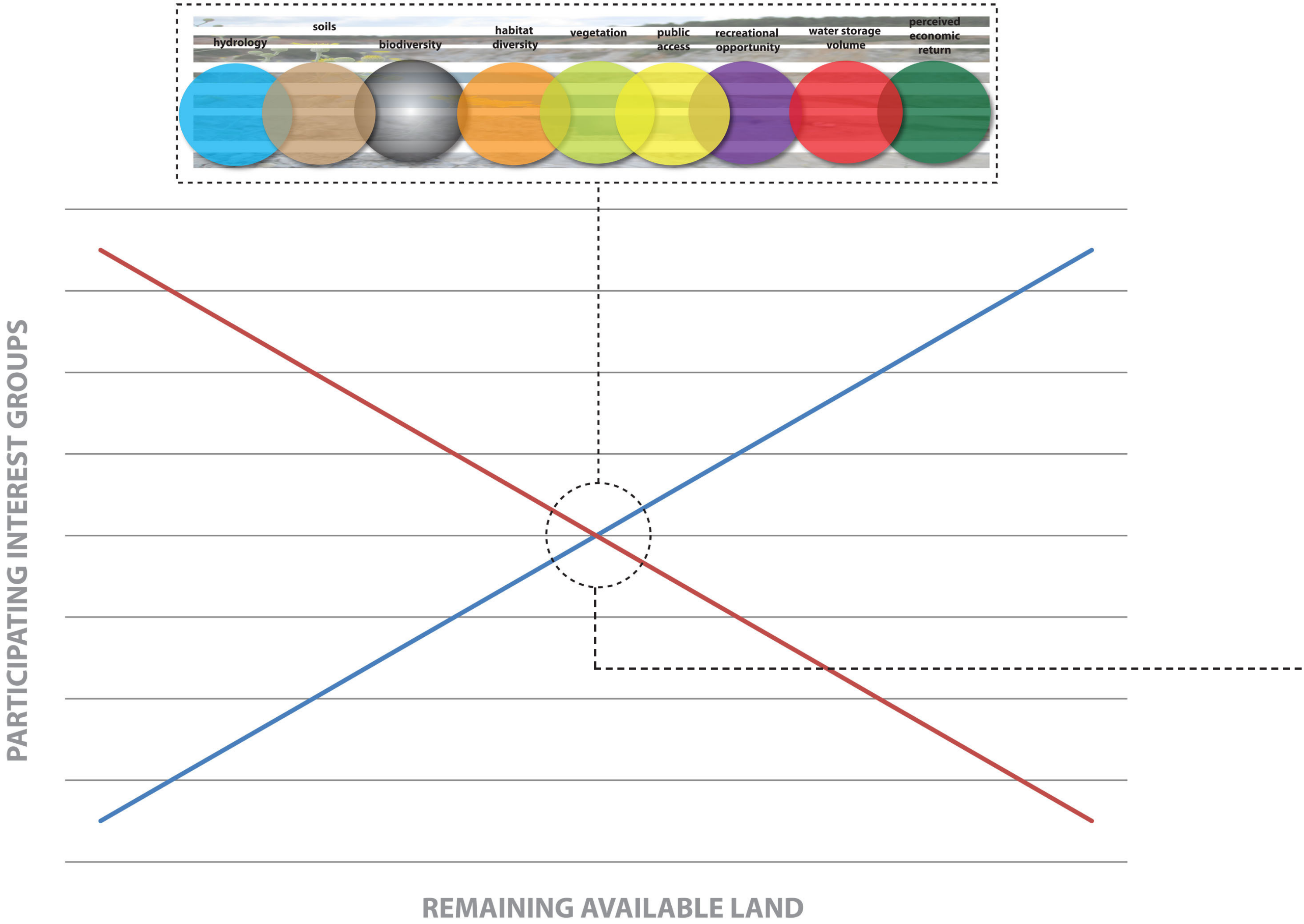


Figure 31 - Graphic Representation of Participatory Design Limits

This figure is a graphical representation of the limits inherent with most forms of limited participatory design processes. Many designers have incorporated participatory processes in an attempt to inform site design moves, gauge potential interest, and to empower the likely user groups. However, the typical model of participatory design assumes a relatively static form and does not account for potential uses or value for groups that may not have been included in the initial design process for one reason or another.

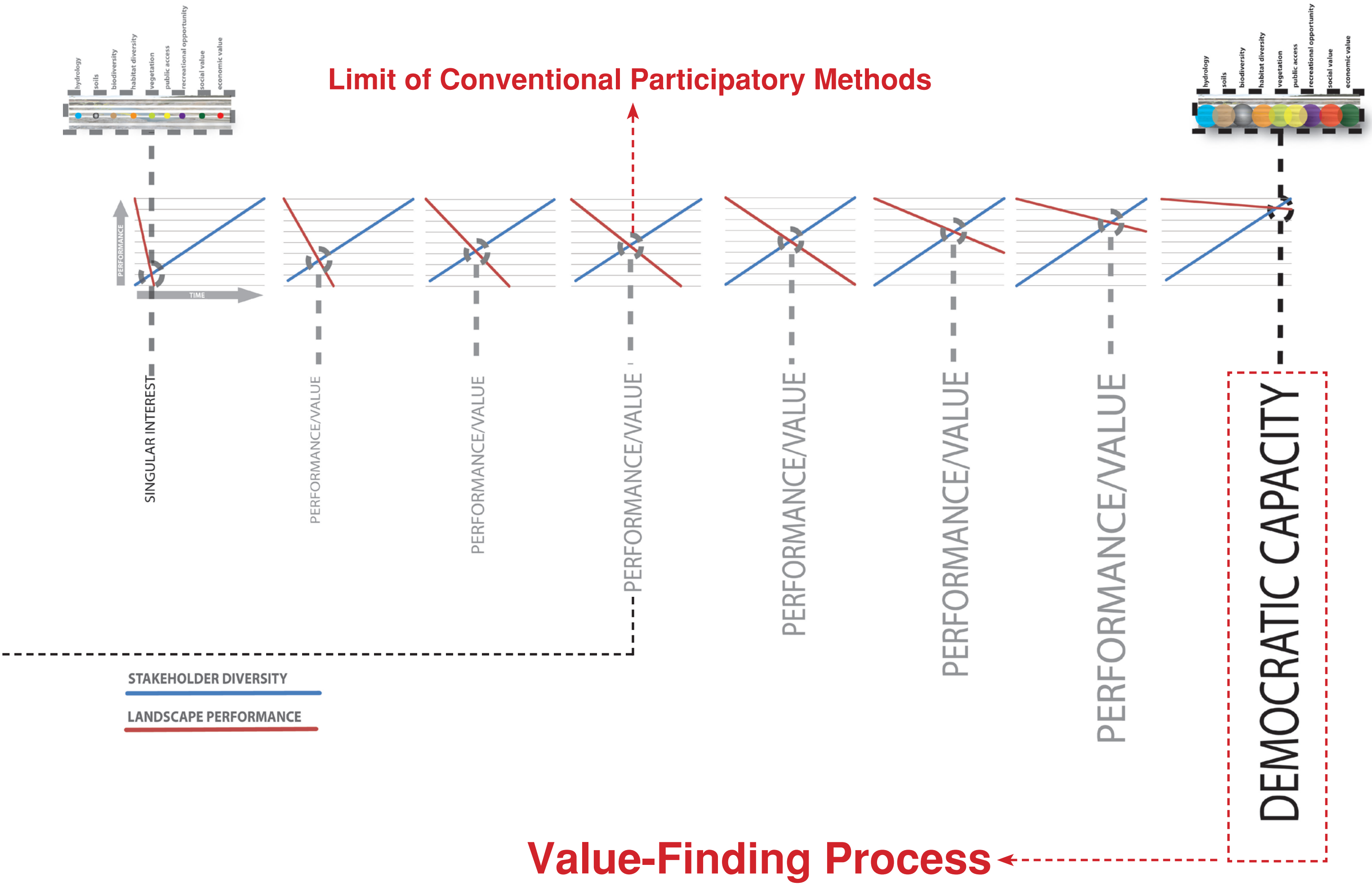


Figure 32 - Graphical Exploration of the Capacity of an Ongoing, Democratic Design Process

In an attempt to push beyond the limits of diversity and empowerment offered through traditional participatory design methods, this figure explores how increasing stakeholder diversity may serve as a "value-finding" method to increase landscape performance and value. This would provide a less determinate approach to designing of altered, devalued, or degraged landscapes.

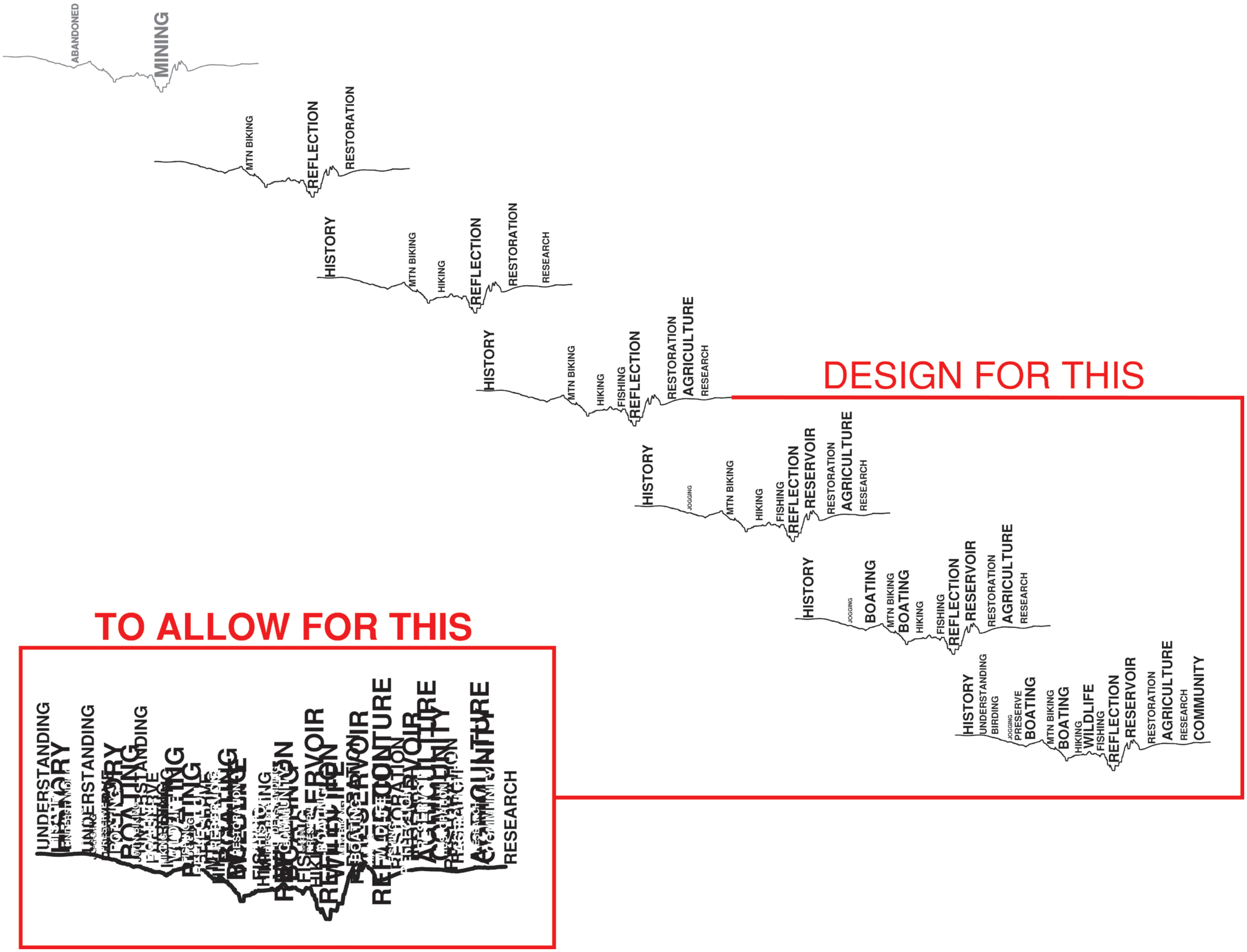


Figure 33 - Initial Design Proposal to Catalyze Future Opportunity

As it is impossible to design for unforseen opportunities that may arise through an ongoing democratic design process, the author proposed to design for a handful of opportunities that could serve as catalysts for increasing stakeholder interest and diversification.

DESIGN TEST & VISUALIZATIONS

Figure 34 - Historic Restoration and Preservation of Wrights Mill Road and Bridge

The author discovered that an opportunity exists in the historic restoration and preservation of the vacated portion of Wrights Mill Road and bridge crossing at Chewacla Creek. Much of the old road bed remains passible, yet overgrown and could offer opportunity for paths connecting to Chewacla State Park.

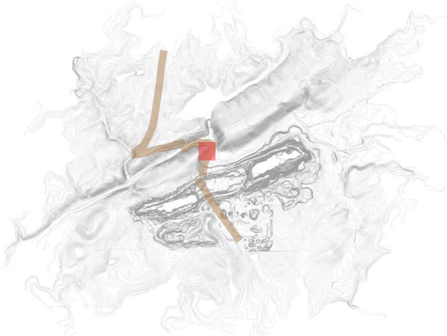
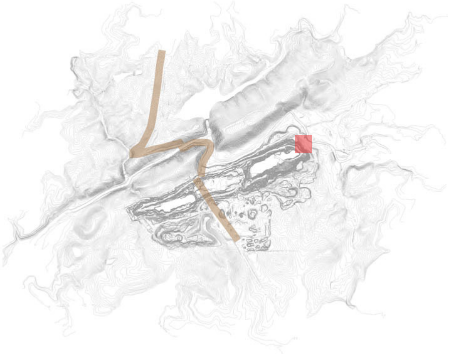
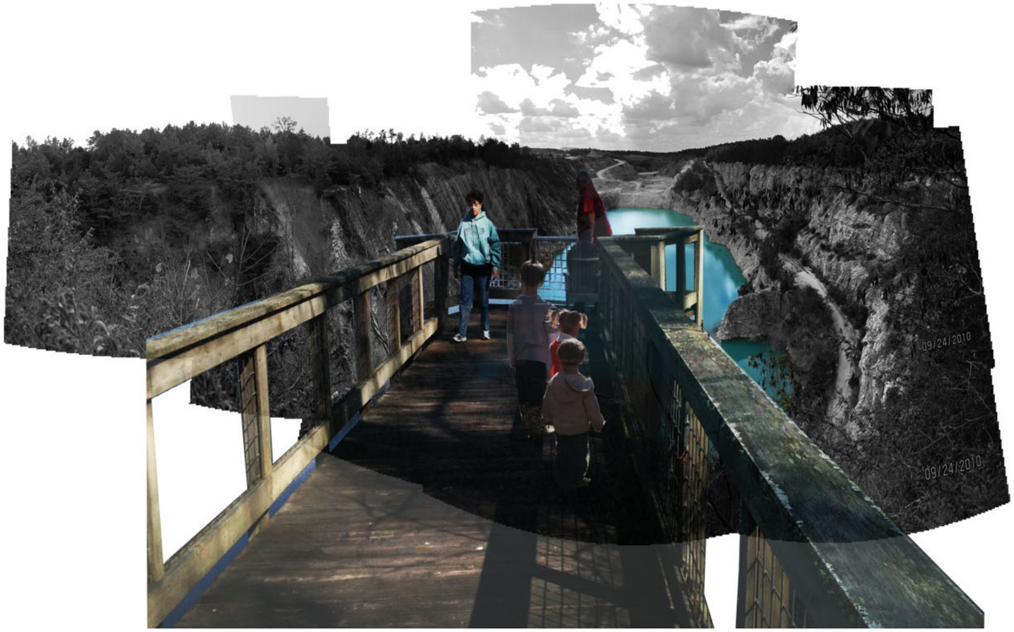


Figure 35 - Historic Restoration and Preservation of Wrights Mill Road and Bridge

This is a second perspective of the vacated Wrights Mill Bridge, showing both opportunity as a connection between the MMQ and Chewacla State Park and as access to Chewacla Creek for recreational use. The bridge pylons and footings are of a concrete and local stone-morter construction and show evidence of movement from years of scour and undermining.





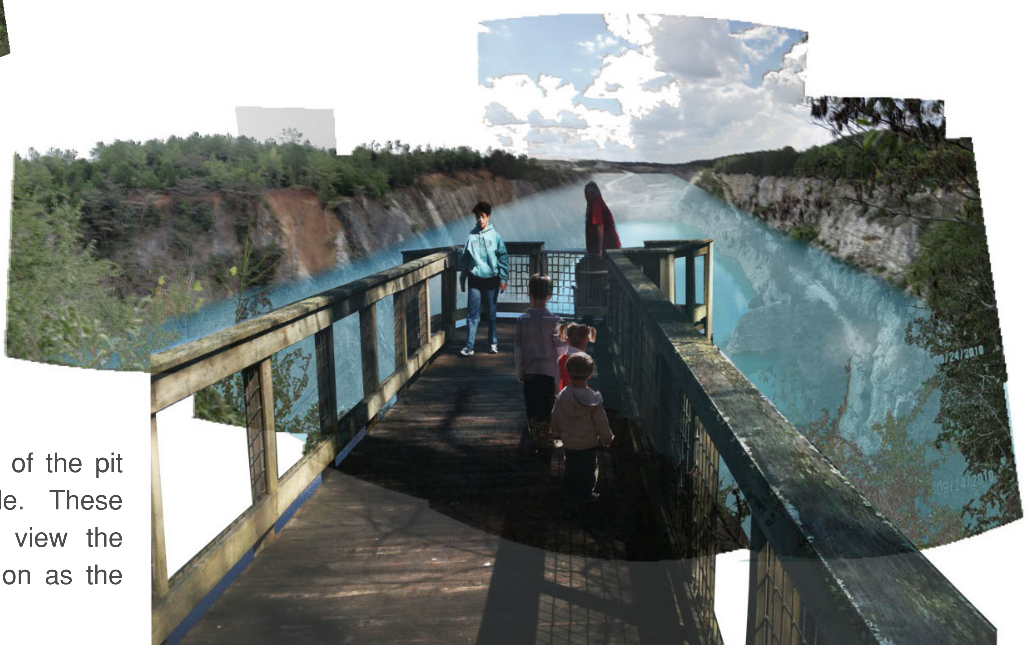
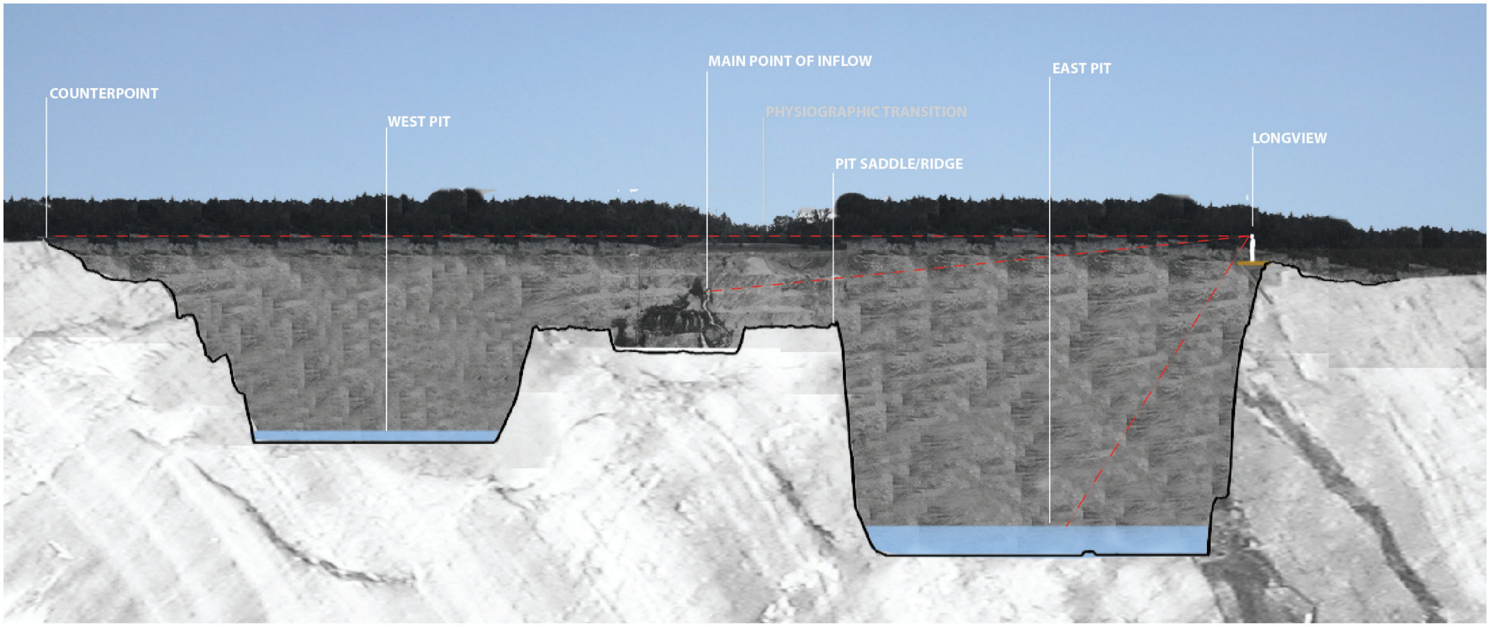
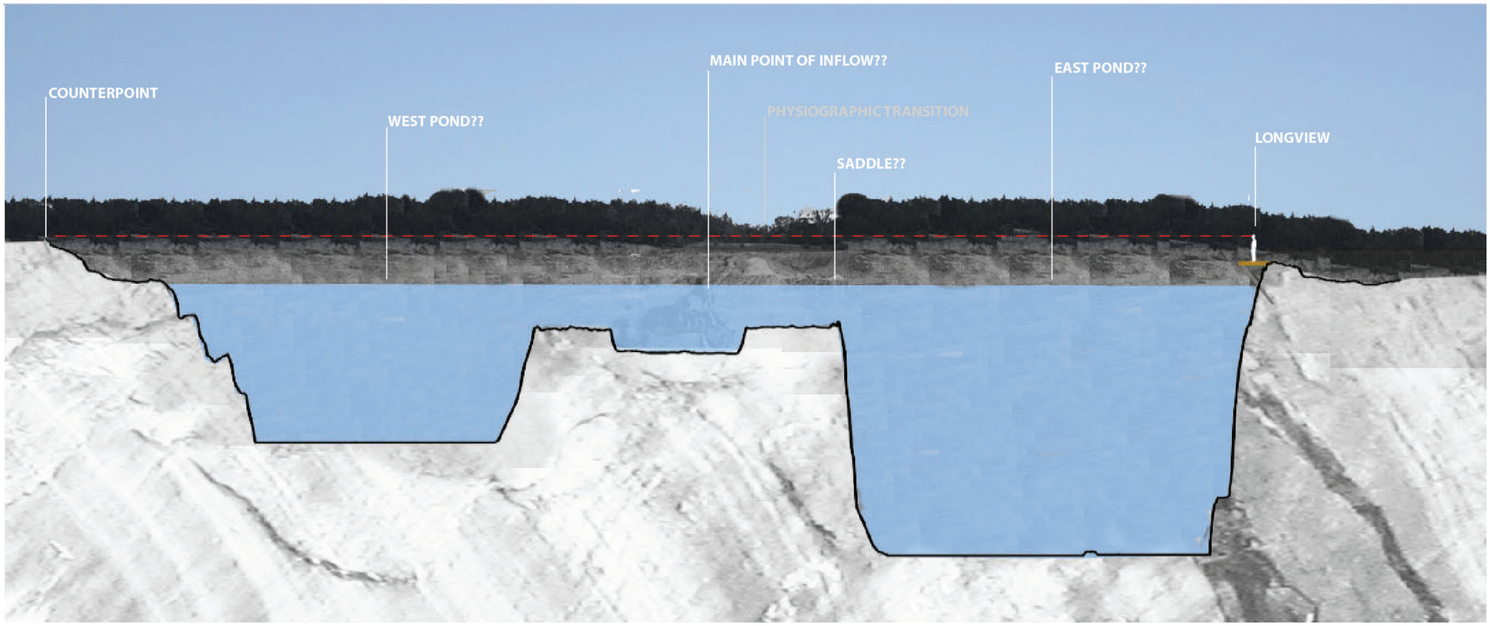


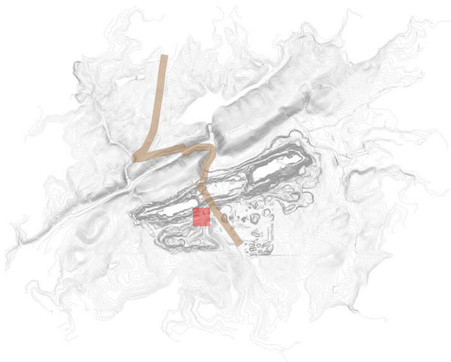
Figure 36 - Pit Overlook

Along the longitudinal axis of the pit exist a view that spans over 1 mile. These renderings show opportunities to view the quarry at various stages reclamation as the quarry fills with water.



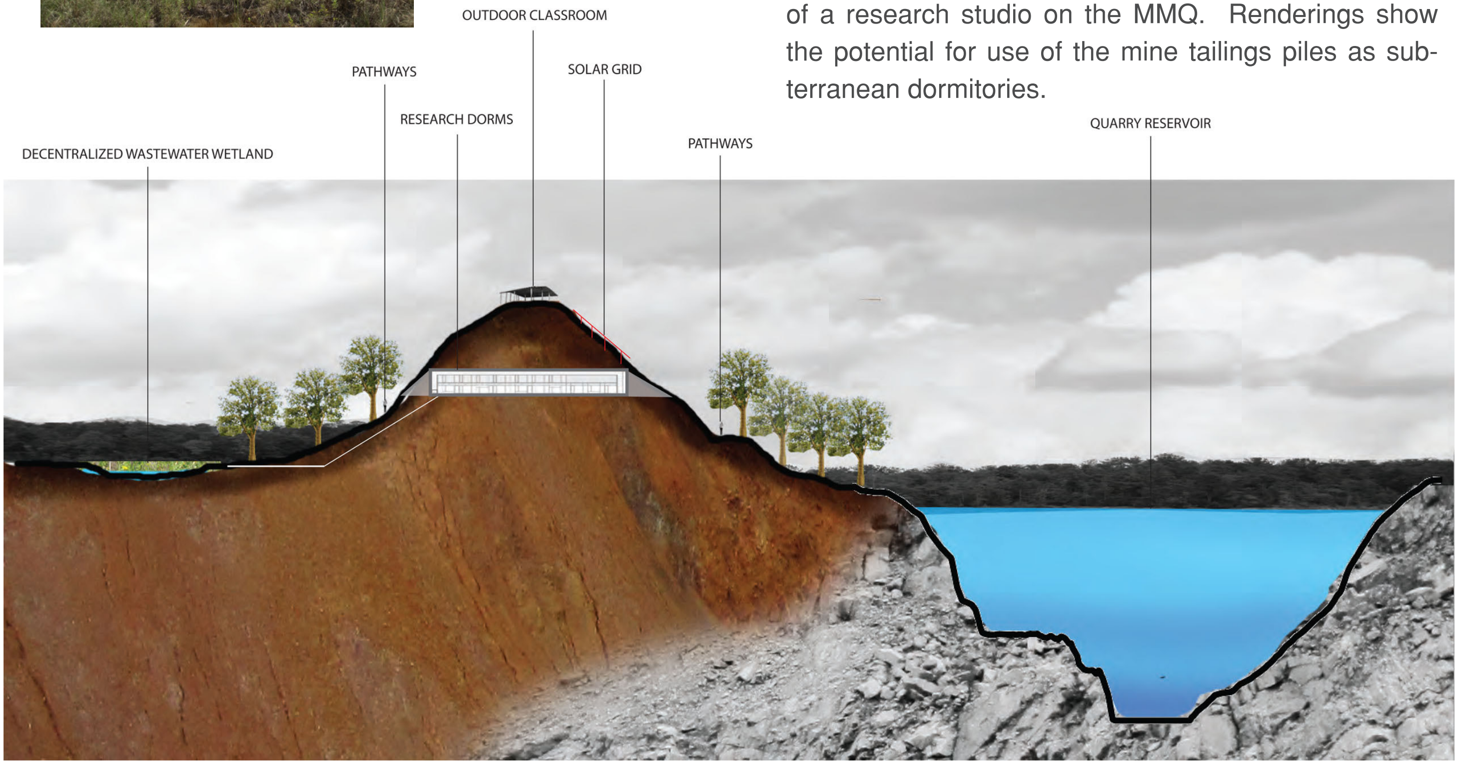
Figures 37 & 38 - Longitudinal Sections - The section above shows the view from the eastern-most edge of the pit. Early in the reclamation of the MMQ, this viewpoint would offer visual access to the highwalls of the pit and a potential to view how groundwater enters. The section below shows how this view would change after the pit filled with water and equalized with the surrounding groundwater table. Many of the visual opportunities noted above would be lost.

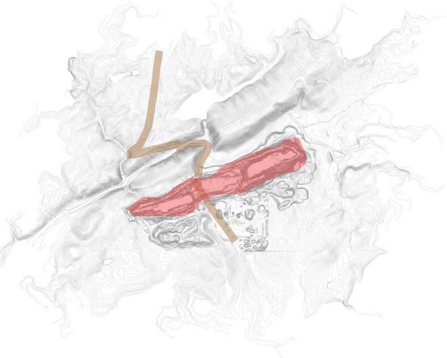


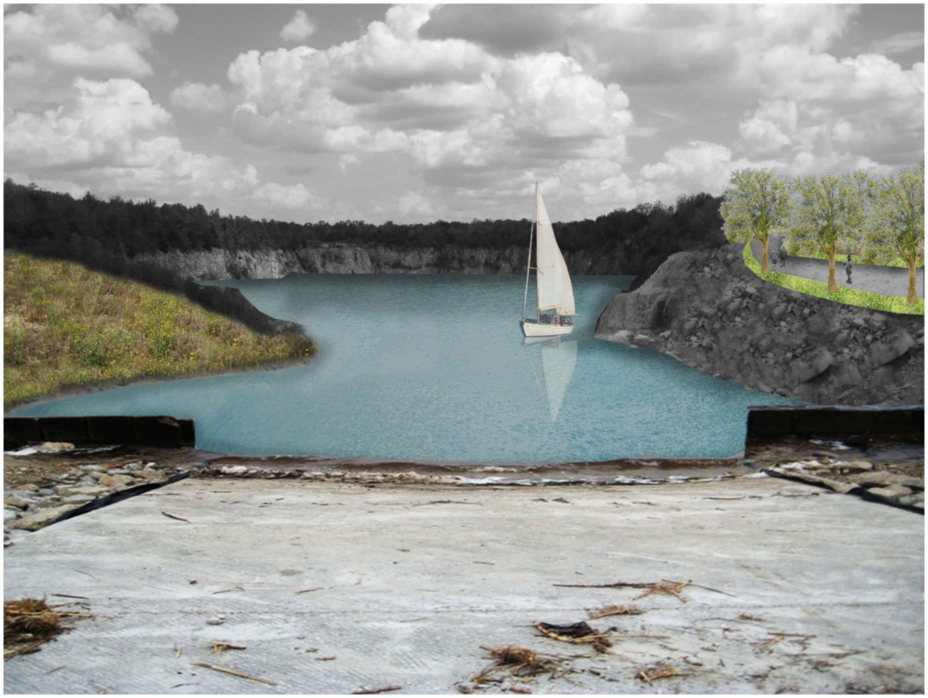


Figures 39 & 40 - Research Studio

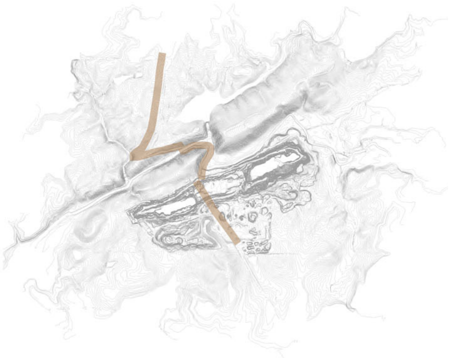
These figures show potential for the installation of a research studio on the MMQ. Renderings show the potential for use of the mine tailings piles as sub-terranean dormitories.

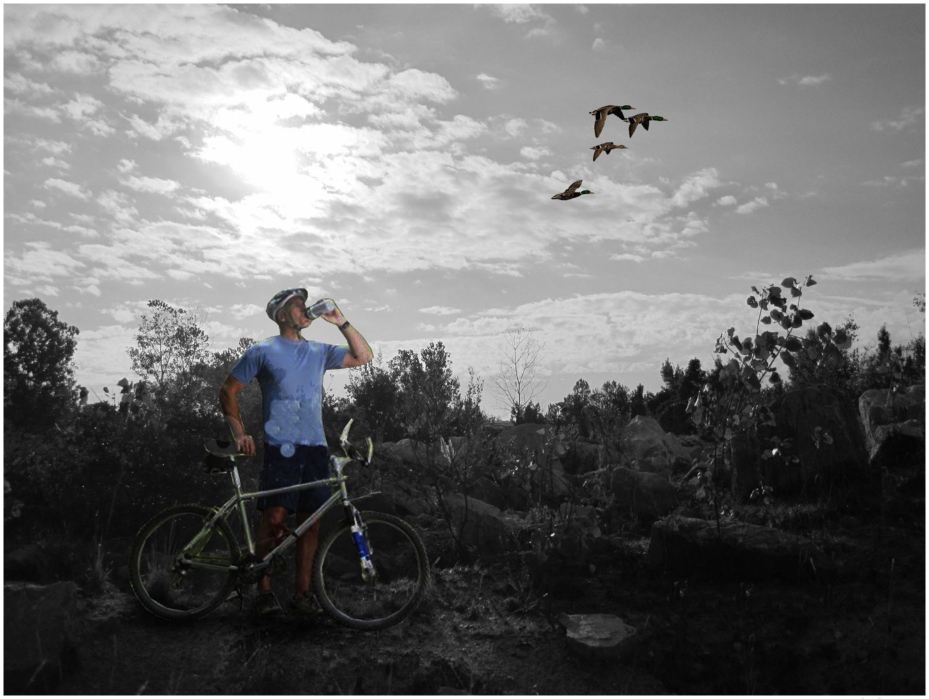






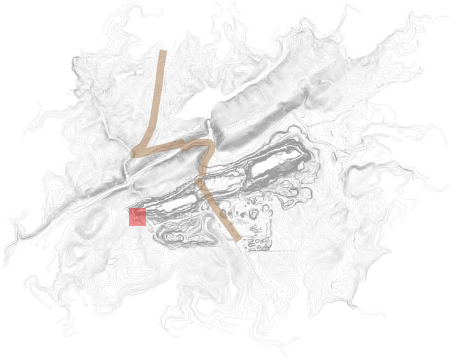
Figures 41 & 42 - Boating/Sailing - Once filled with water, the quarry pit will offer opportunity for numerous recreational activies, including boating and sailing. These renderings help to visualize this potential.





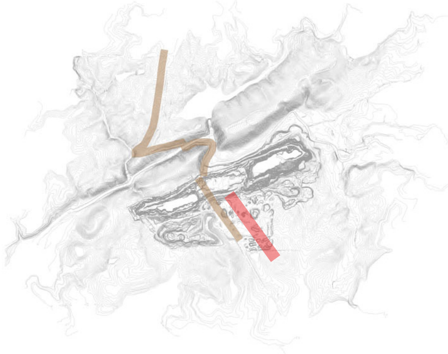
Figures 43 & 44 - Haul Road and Mine Tailing Pile Reuse

The MMQ property has a vast topographic variability, with both large and small hill formations located throughout the property. Additional, numerous haul roads traverse the property and provide access to much of the site. These site renderings show potential for haul road and mine tailing pile reuse for the purposes of mountain biking.



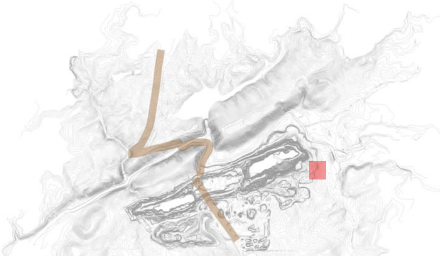
Figures 45 & 46 - Surface Water Reservoir and Mountain Biking

Based upon the author's assumption that the quarry will become a lake after mining has ceased, this is a visualization showing the potential for its use as both a surface water reservoir and recreational hiking/biking amenity.



Figures 47 - Stream Restoration Opportunity - Mapping and ground truthing (site survey) revealed the presence of a partially buried and partially excavated stream. This visualization represents opportunity for academic and/or civic engagement in a stream restoration project.


09/22/2010




09/22/2010

Figures 48 & 49 - Civic Group Installation (Trail Enhancement)

The MMQ has numerous access roads throughout the property, of which offer opportunity for improvement or enhancement as trail systems by civic groups (i.e. Boy Scouts of America). These visualizations are two scenarios in which the author imagined improvement for both human and non-human uses through the use of onsite materials and volunteer vegetation. Common wildlife observed on both the MMQ property and Chewacla State Park include white-tailed deer, American bobcat, wild turkey, beaver, numerous predatory bird species, and other native wildlife.

AN INTEGRATIVE METHOD

The preceeding design illustrations provided the author with an immense understanding of the potential diversity of uses that could occur at the MMQ in a post-mined scenario. However, these visualizations generally consisted of single-use or single-agenda outcomes. Such limitation was ignorant of the potential opportunities that arise from the interaction of multiple user groups (or stakeholders), whether it be physical or social. Thereby, the author began to explore how multiple stakeholders would benefit from these interactions and how these interactions might influence social and cultural dynamics.

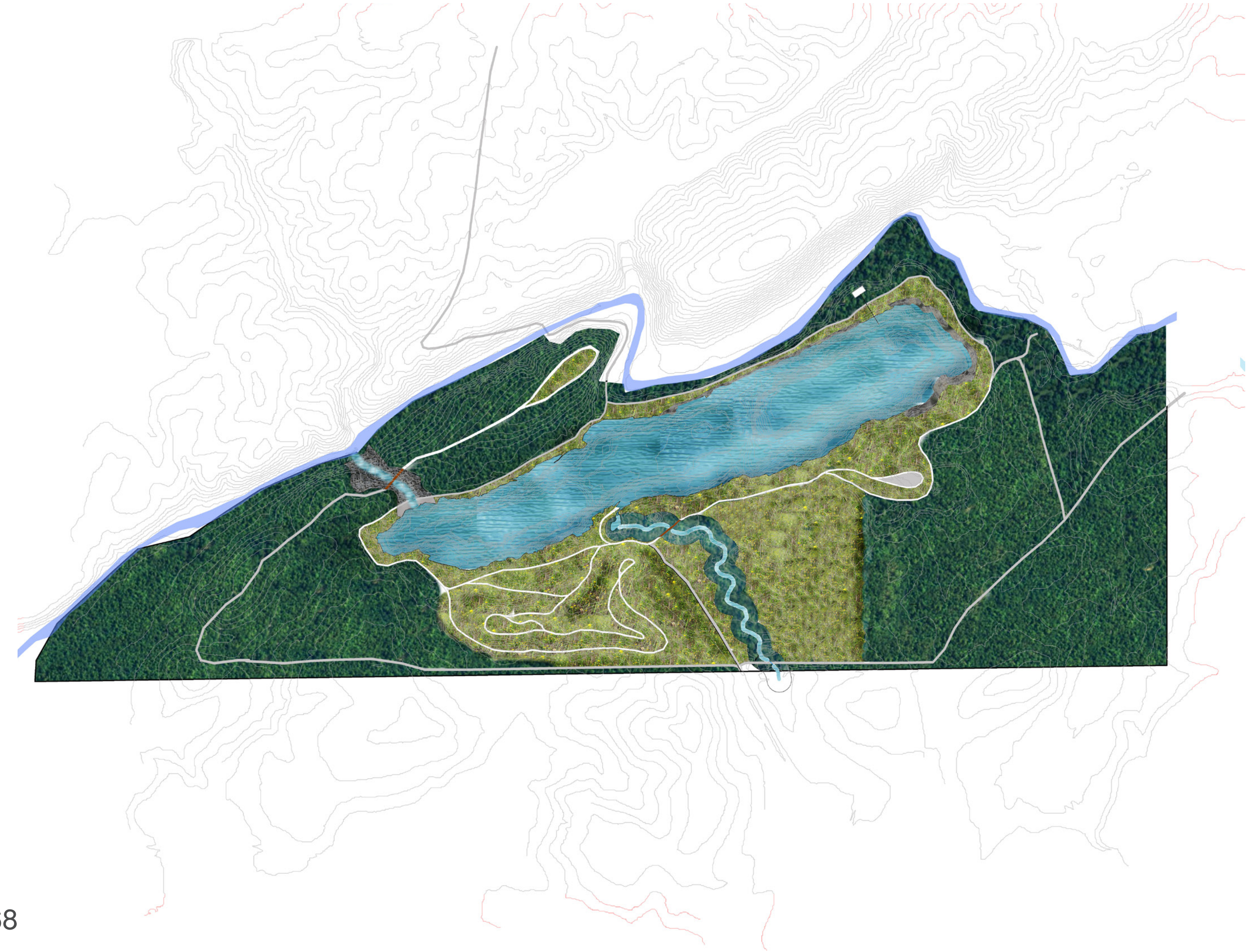
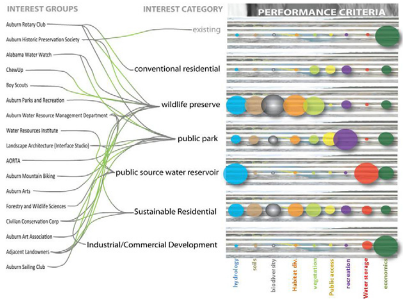
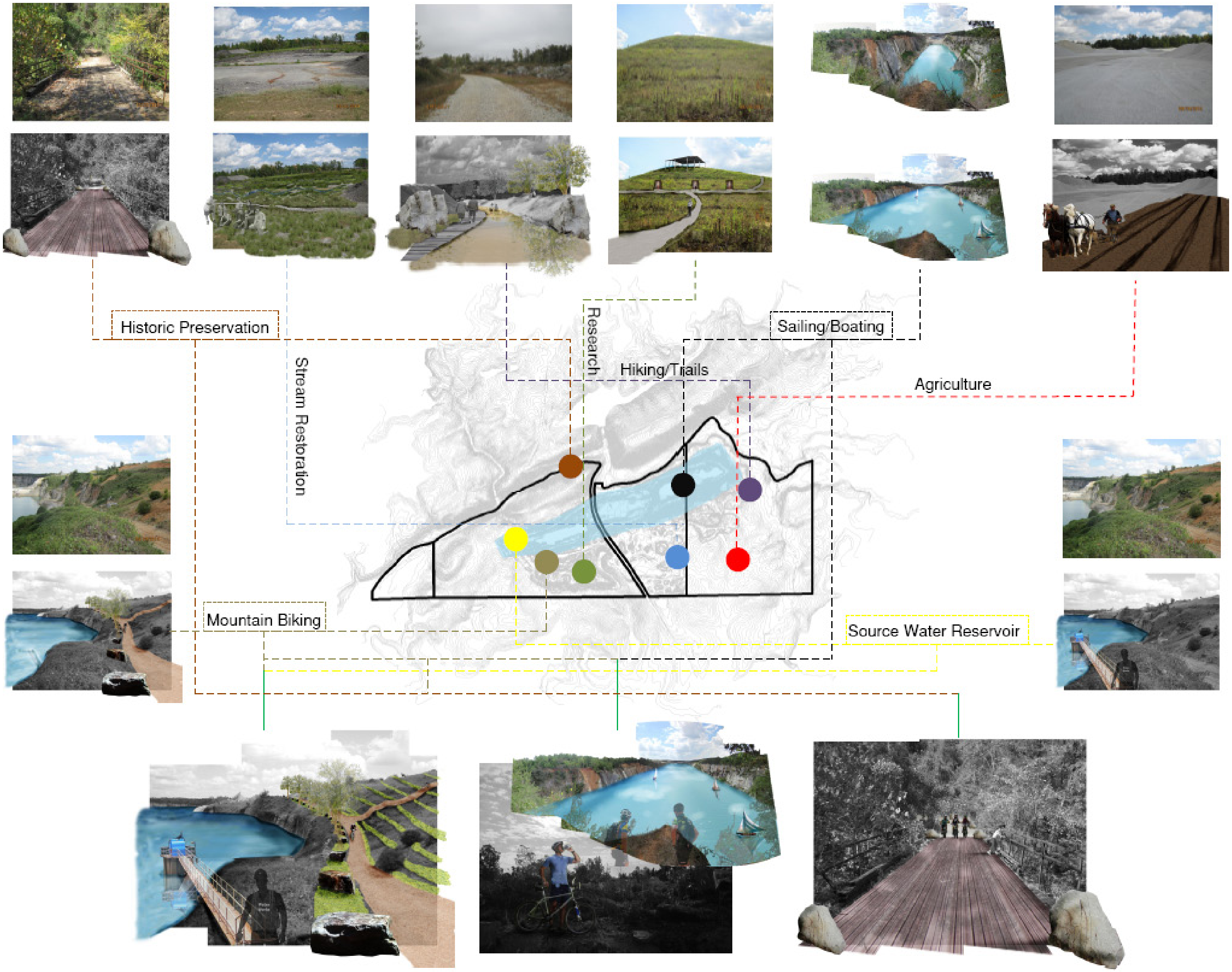


Figure 50 - Combining of Opportunities

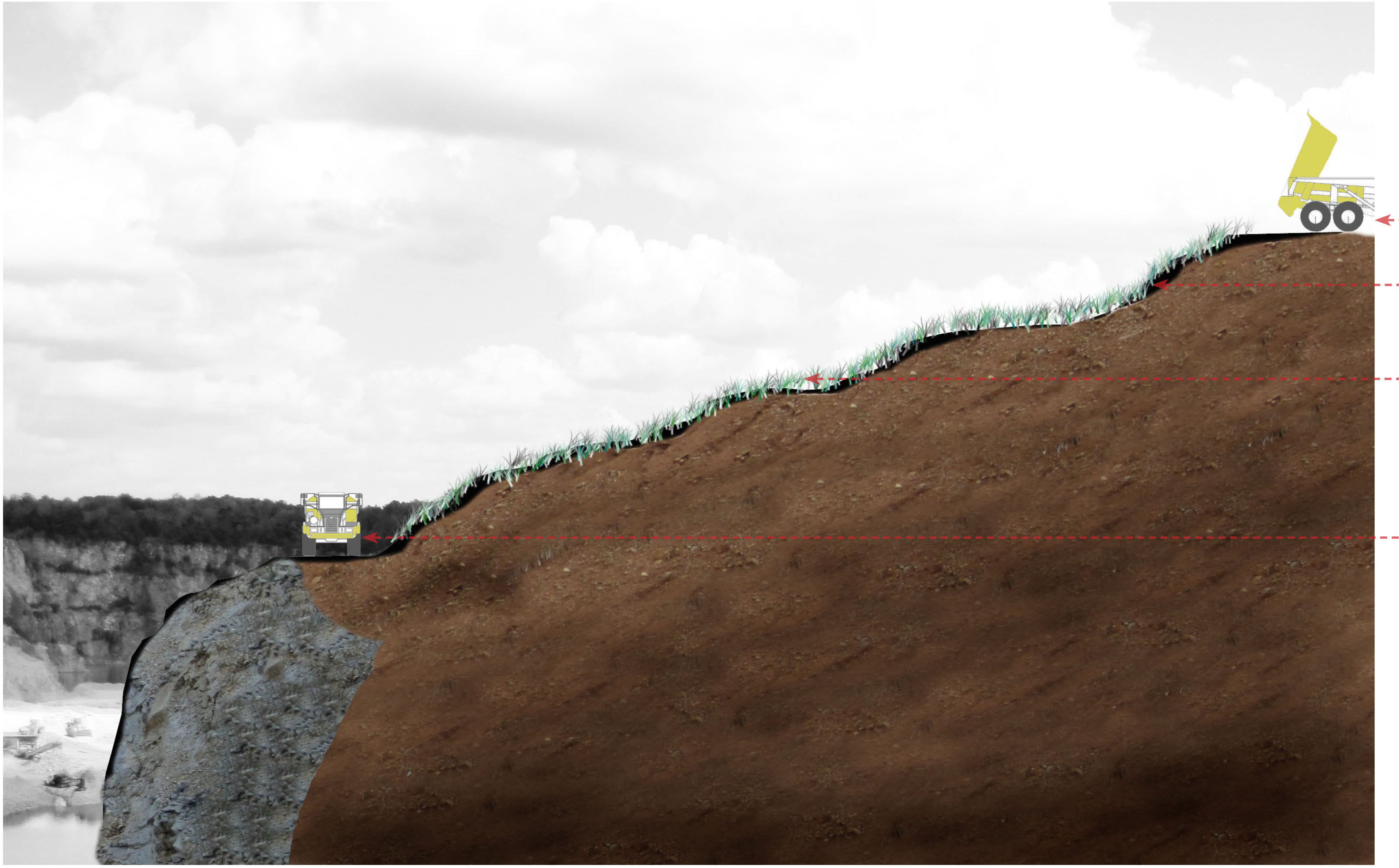
This graphic illustrates early design visualizations in which the author began to research the potential interactions, positive and negative, that might arise if multiple user groups or stakeholders were to utilize the property for independent agenda's and/or purpose. This allowed the author to begin to think about the possibilities that would arise out of these interactions (physical and social).





IN-DEPTH DESIGN EXPLORATIONS

HAUL ROAD REPURPOSING



Figures 51 & 52 - Section of Haul Road Repurposing Through Principal Mine Tailing Hill

The existing haul road infrastructure that traverses the MMQ is abundant in opportunity to both perform in and of itself and to provide ingress and egress to other areas of the site that may serve other purpose or opportunity. The illustration below shows how the existing haul roads that currently provide access for dump trucks to dispose of top soil and tailings could be repurposed so as to provide a diversity of experiences and views of the once-mined landscape and of the adjacent topographic changes that occur at the foothils of the piedmont.

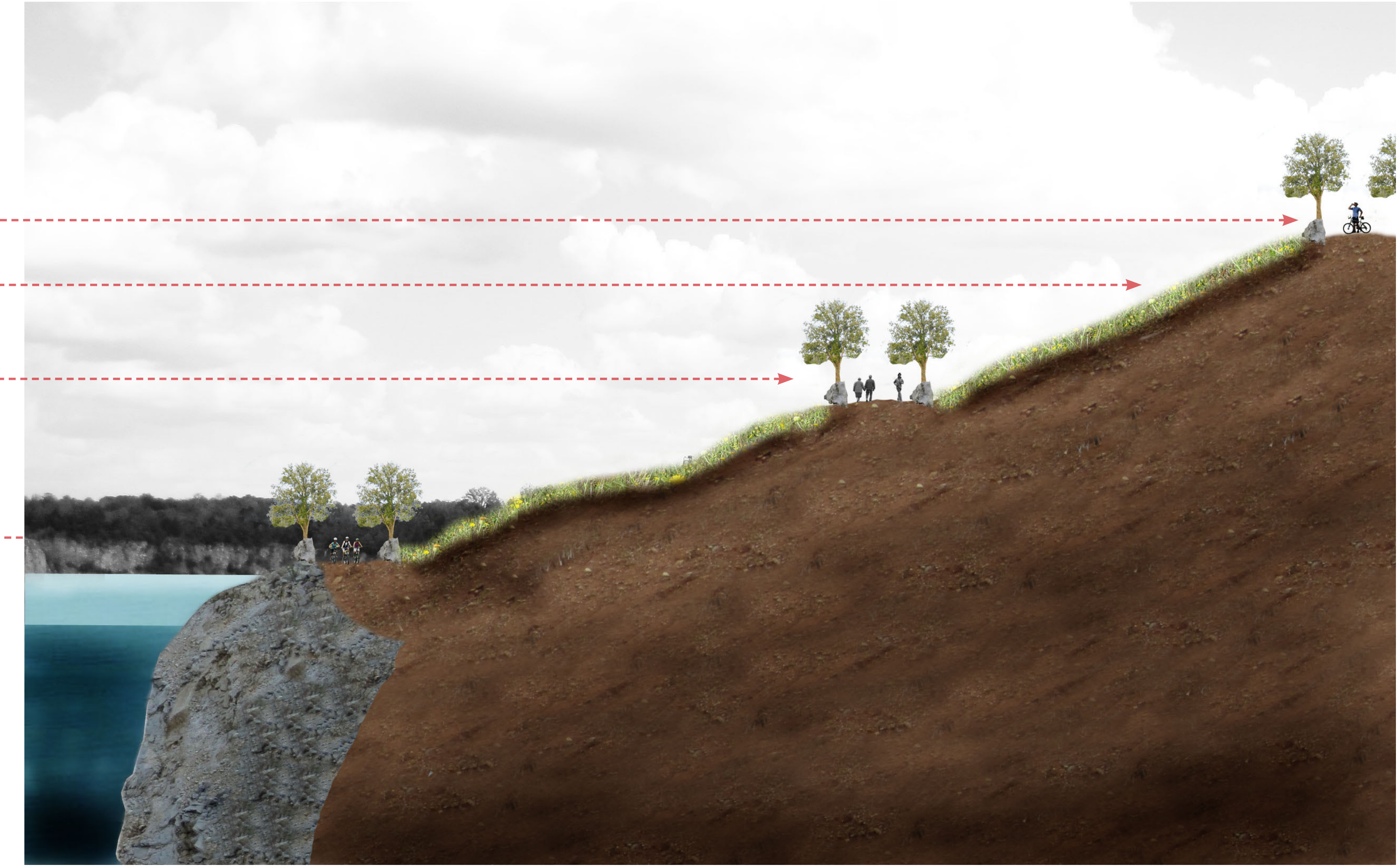
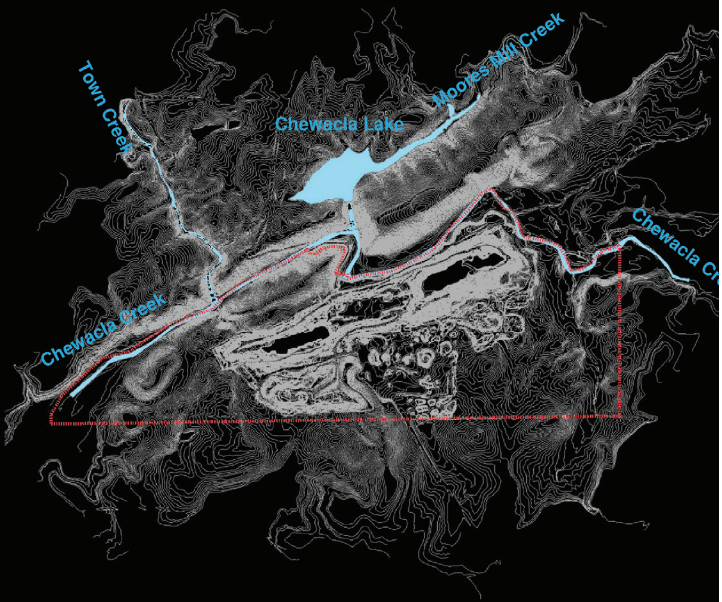


Figure 53 - Mapping of Existing Haul Road System and Design Proposed Design Detailing

There are numerous haul roads that traverse the majority of the MMQ property. The width of these roads varies and is determined by their principal use. Wider roads (up to 30') are typically located along the main ingress and egress from the pit and are associated with large (30-ton and larger) dump trucks. In addition, access roads of various widths circumvent the entire pit. Small roads and foot paths are located in the remaining wooded areas to the eastern and western extents of the MMQ property.

The Alabama Surface Mining Act of 1969 only requires that surface mines be reclaimed, at a minimum, in such a way so as to control the potential for environmental degradation upon the closure of the mining operation and requires that public access be restricted for purposes of liability and risk management. Operating under the assumption that the mining operators (Martin Marietta Materials, Inc. in this case) would likely attempt to minimize their reclamation cost prior to terminating their mineral lease, these figures show how relatively simple steps could be taken to repurpose the existing haul and access road infrastructure for post-mined use.

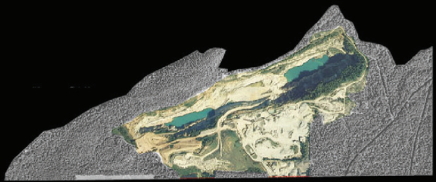
The repurposing of these haul roads for post-mining use could serve as catalyst for other opportunities, providing access to areas of the site that would otherwise be inaccessible. The following standards would also minimize concern over hazards by providing a clearly definable path.



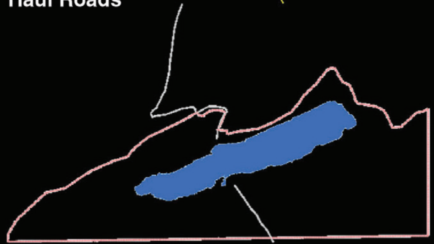

Haul Road


Mine Tailings (stabilized)

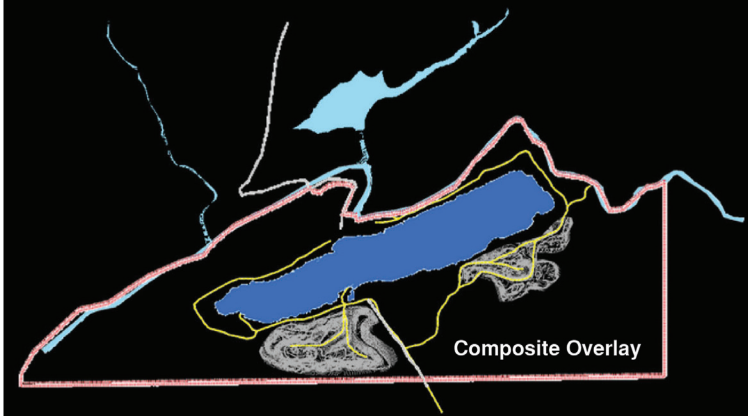

Haul Roads and Mine Tailings/Top Soil

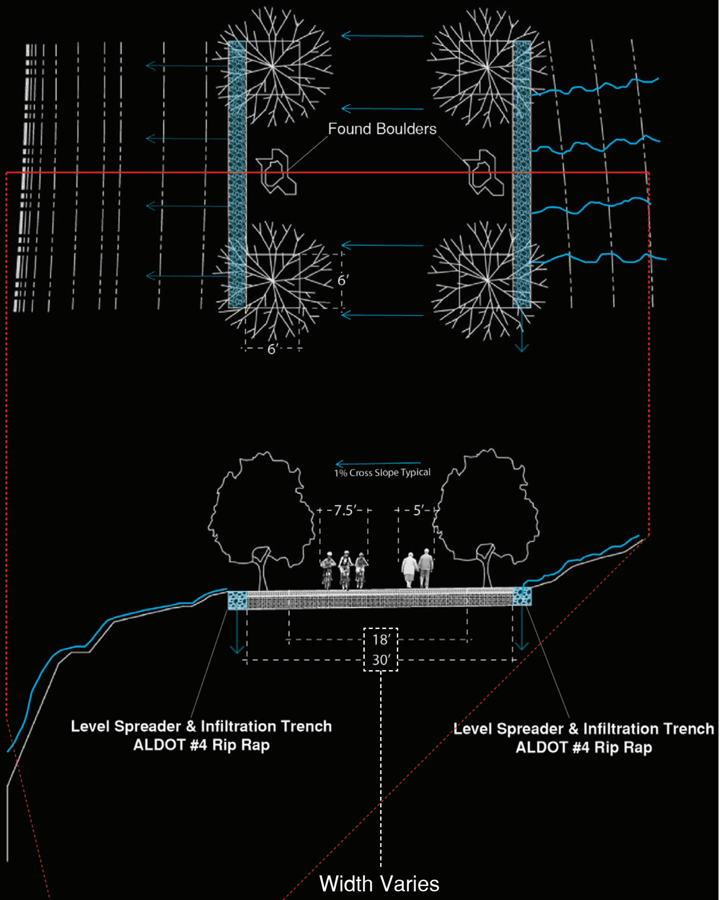

Existing Mining Limits

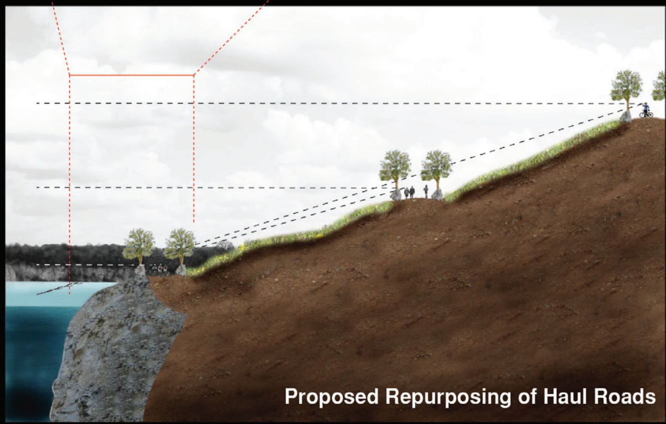

Haul Roads


Pit Lake and Historic Road


Mine Tailings/Top Soil


Composite Overlay




Proposed Repurposing of Haul Roads

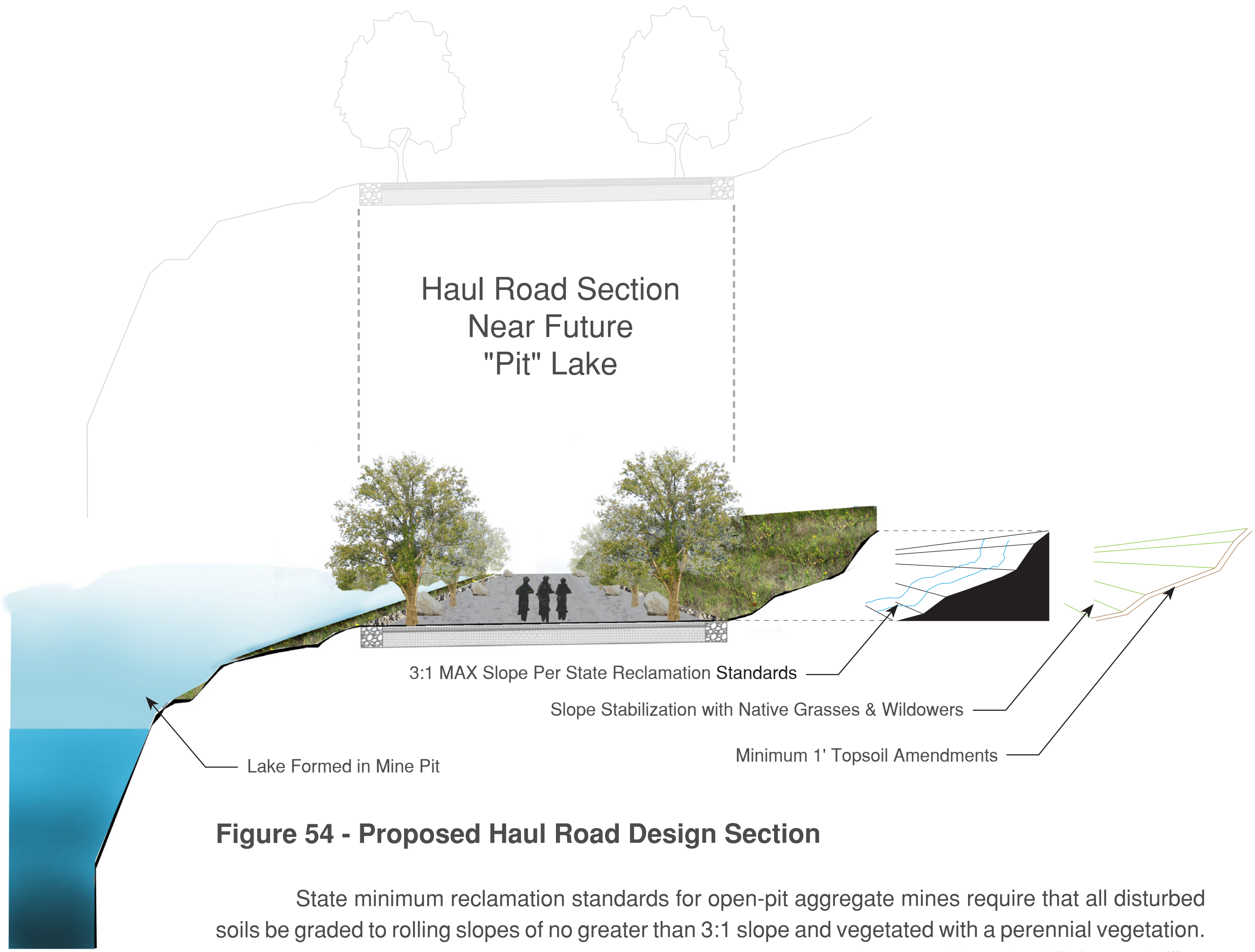


Figure 54 - Proposed Haul Road Design Section

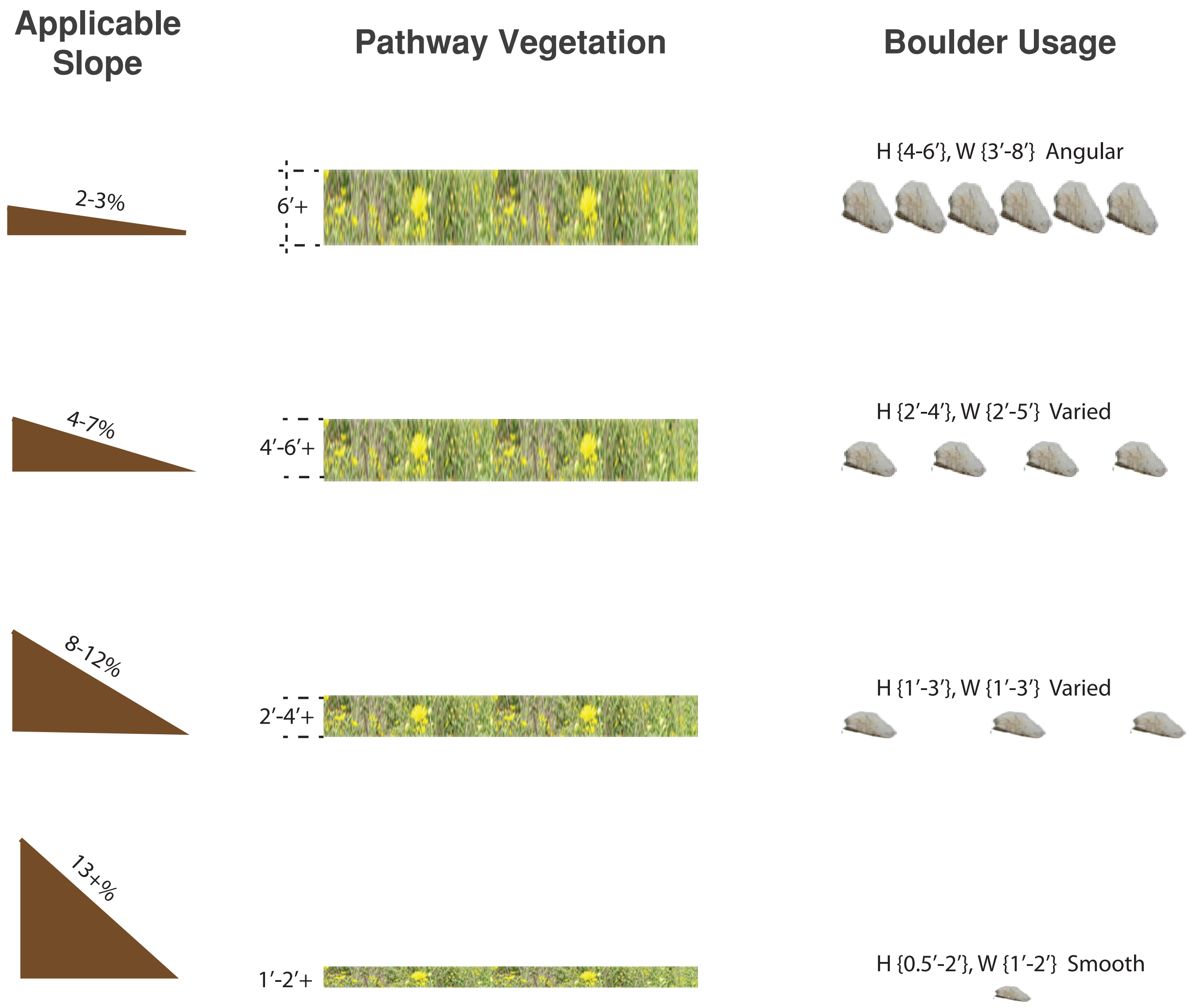
State minimum reclamation standards for open-pit aggregate mines require that all disturbed soils be graded to rolling slopes of no greater than 3:1 slope and vegetated with a perennial vegetation. This figure illustrates one way in which haul road design can be integrated into the hillslopes (tailing piles) to avoid damage from concentrated stormwater runoff, while at the same time working within the minimum standards established by the State.

Figure 55 - Haul Road Repurposing Perspective at Woodline

The existing haul road infrastructure provides access to a wide variety of views and opportunities within the quarry property. This design visualization illustrates how the repurposed haul road might appear as it transitions from a mostly wooded section of the property to an area that was once part of the actively mined site. The linear use of rock, tree rows, and roadside vegetation provides for continuity throughout the highly variable site conditions.

Figure 56 - Proposed Design Standards for Haul Road Repurposing

These figures represent criteria established by the author that could be utilized as standard design details for the repurposing of haul roads based on the pre-existing width and existing use of each road type. These standards would establish a connective framework for future projects and would serve to visually bind the site as a collective whole, regardless of the number of projects or uses that arise over time from a continual democratic process of transformation.

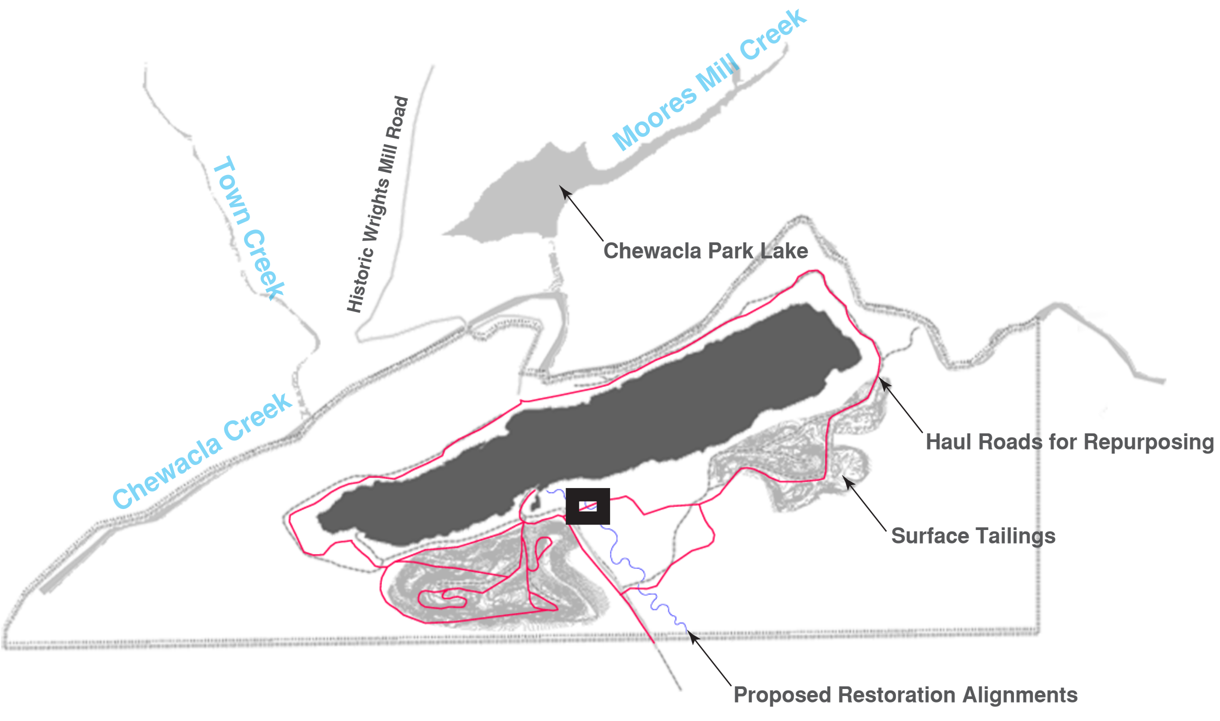


Applicable Slope
Pathway Vegetation
Boulder Usage
2-3%
6′+
H {4-6′}, W {3′-8′} Angular
4-7%
4′-6′+
H {2′-4′}, W {2′-5′} Varied
8-12%
2′-4′+
H {1′-3′}, W {1′-3′} Varied
13+%
1′-2′+
H {0.5′-2′}, W {1′-2′} Smooth

IN-DEPTH DESIGN EXPLORATIONS
STREAM RESTORATION

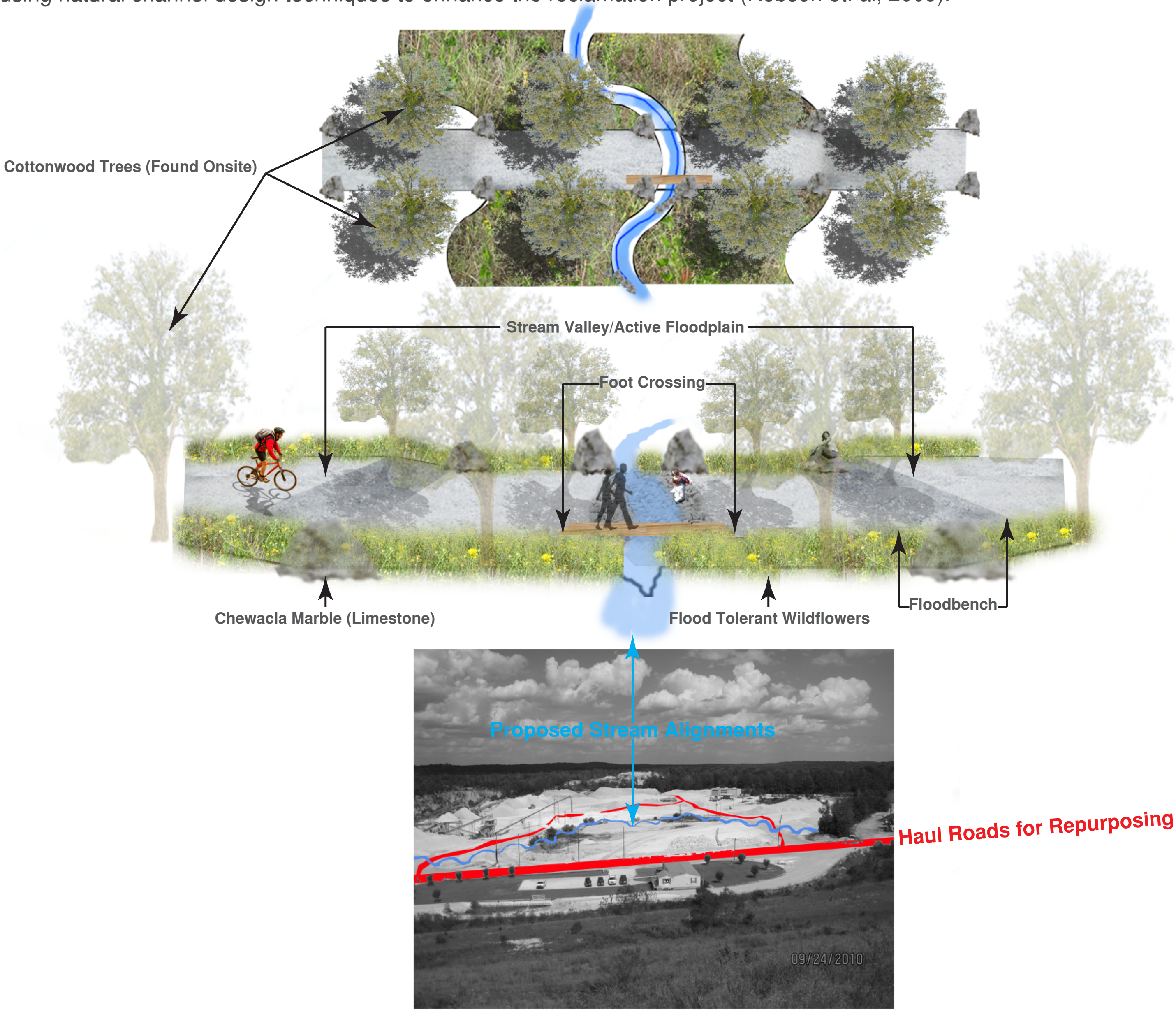
Pre-Mine (1938) Aerial Photography
Showing Historic Stream Location

Current (2008) Aerial Photography
Showing Partial Excavation and Piping



Figures 57 & 58 - Proposed Stream Restoration at Intersection of Haul Road Trail System

A partially buried and partially excavated stream is located along the central axis of the MMQ property. Historic aerial photography provided evidence of the original alignments. This presents an opportunity for stream restoration using natural channel design techniques to enhance the reclamation project (Robson et. al, 2009).



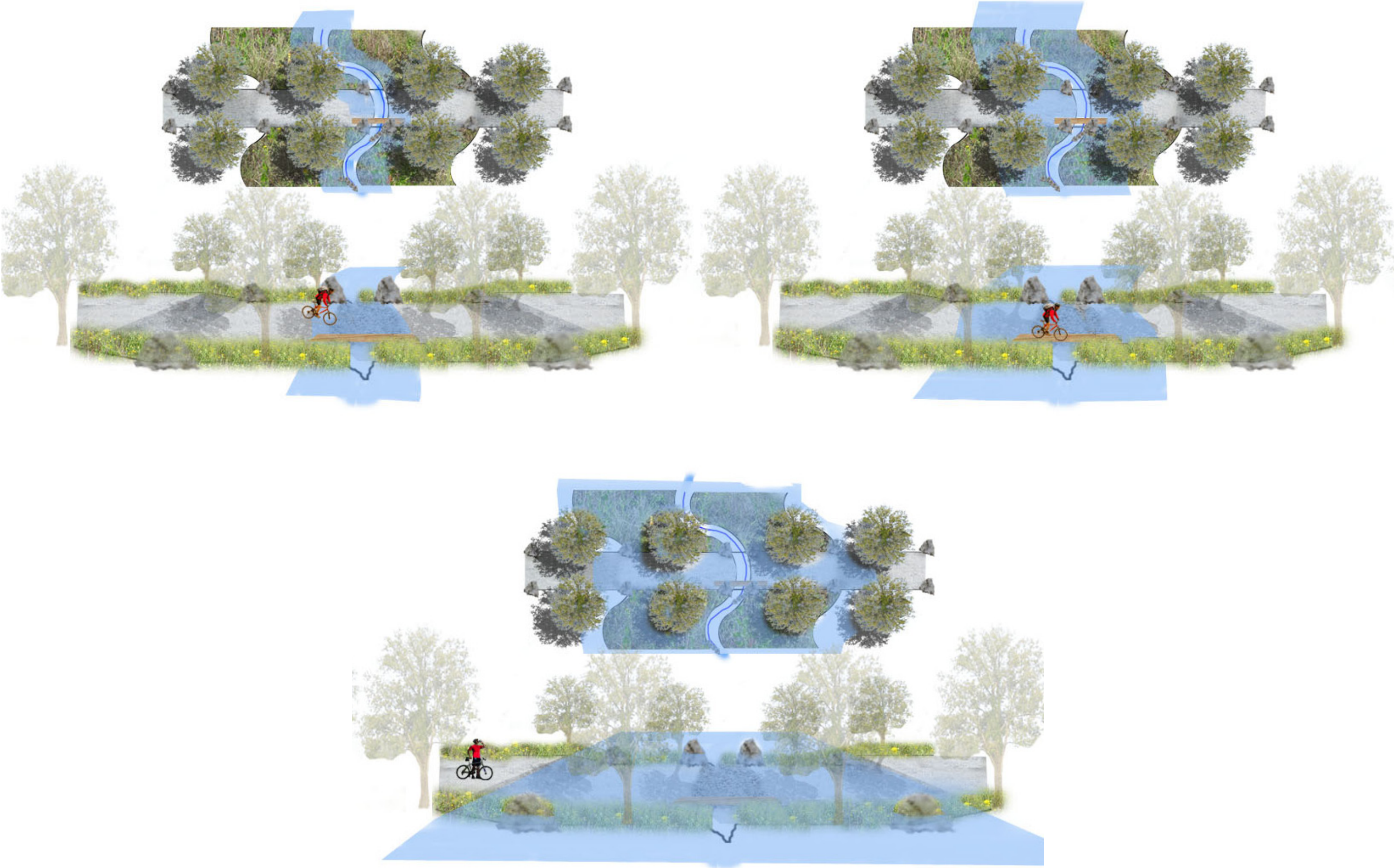
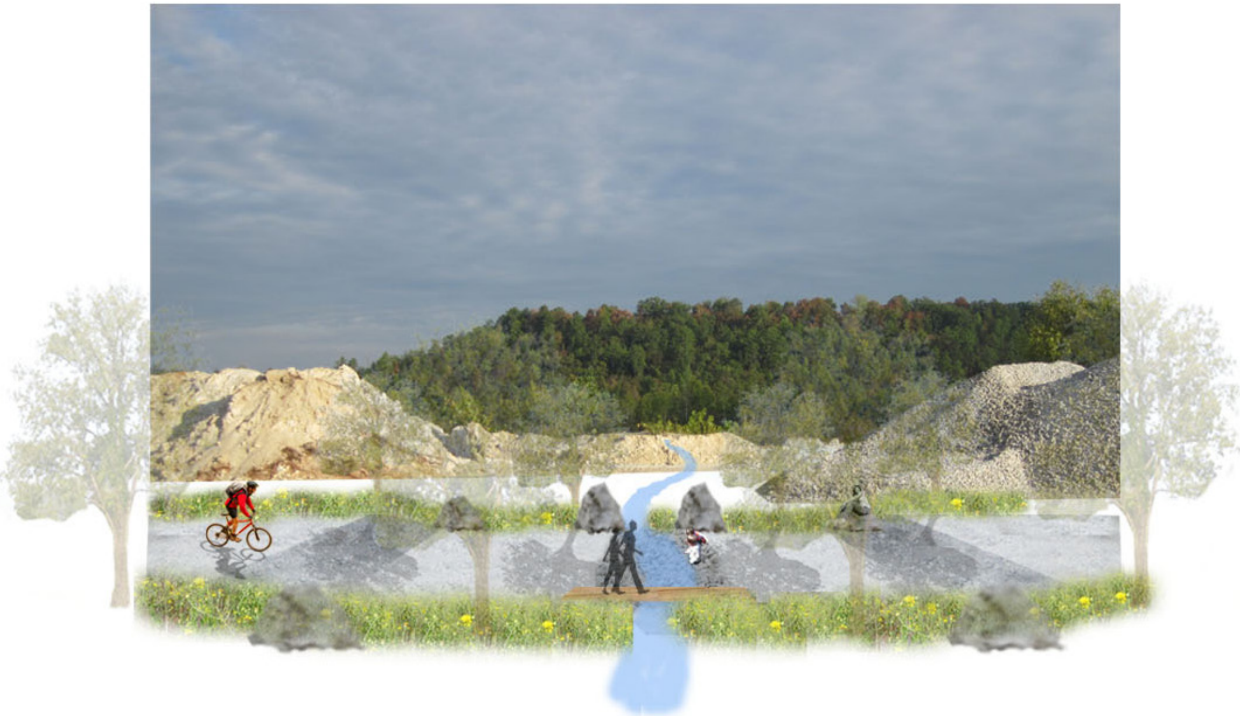
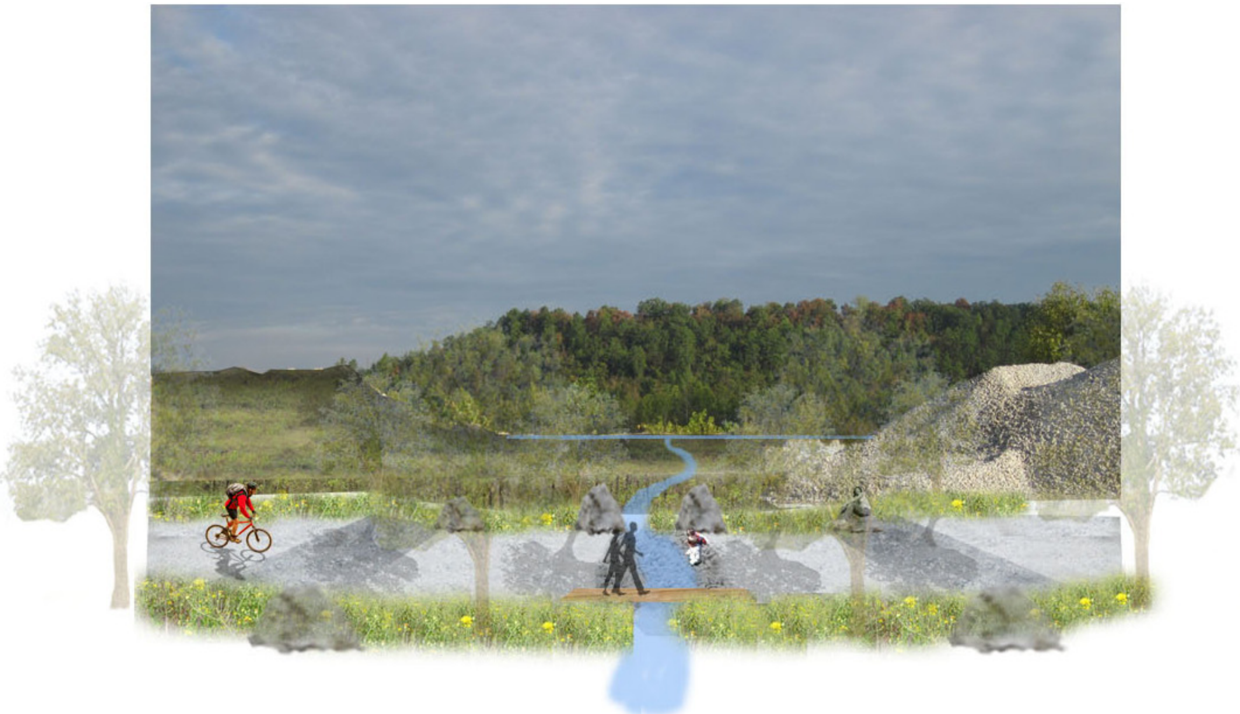


Figure 59 & 60 - Fluvial Geomorphological Enhancement of Mine Reclamation Process

These illustrations demonstrate how a regular flood regime, as created through Priority 1 stream restoration, would provide for opportunities in harnessing the benefits of floodplain productivity to enhance the restoration and remediation of onsite soils and to provide a diversity of vegetation and habitats. This could provide a low-cost, non-exhaustive enhancement of the mine reclamation, while providing for enhanced experiences along the repurposed haul roads. The design visualizations on the opposite page show how the site might change through time, from early completion to early stabilization.



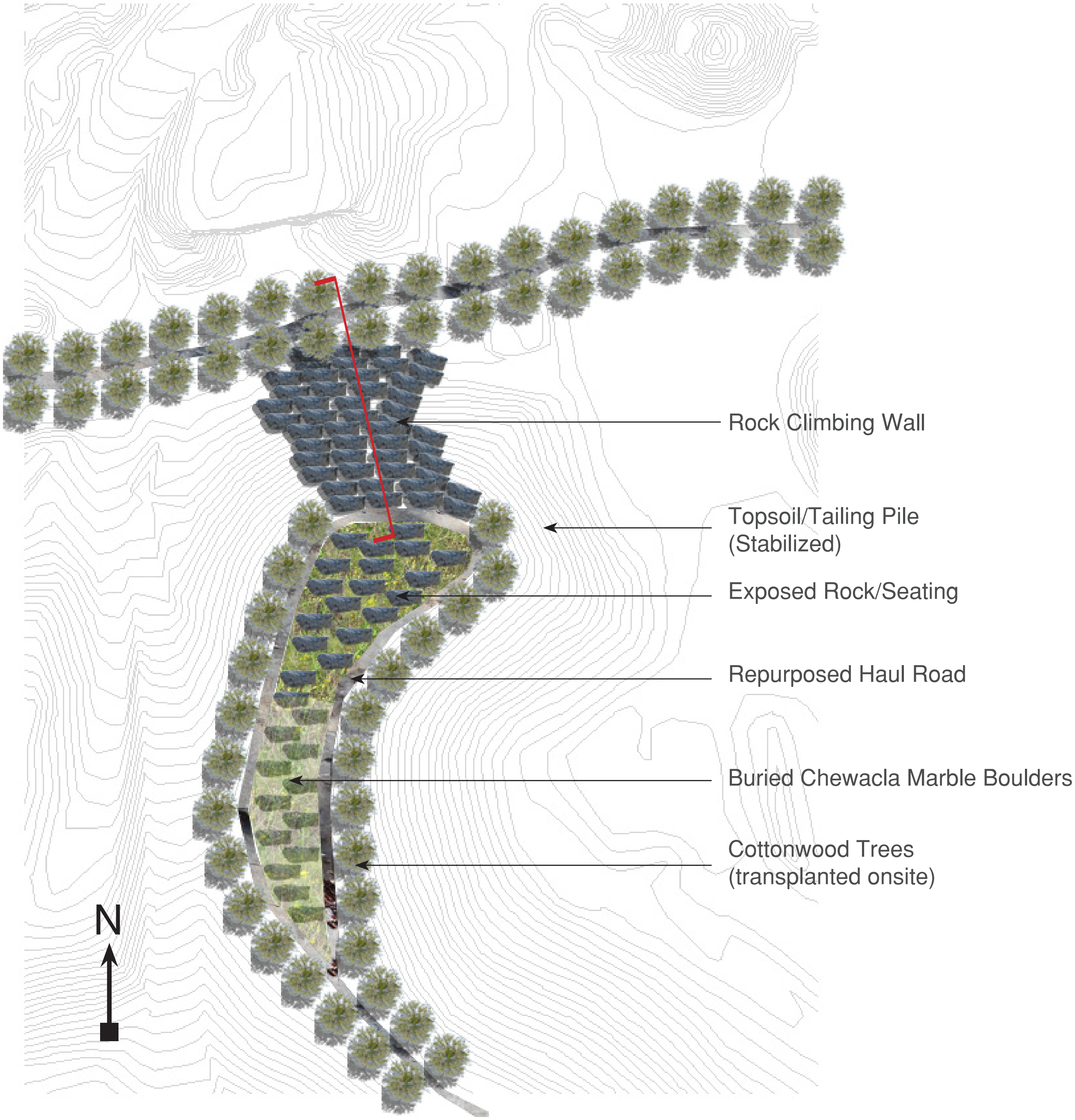


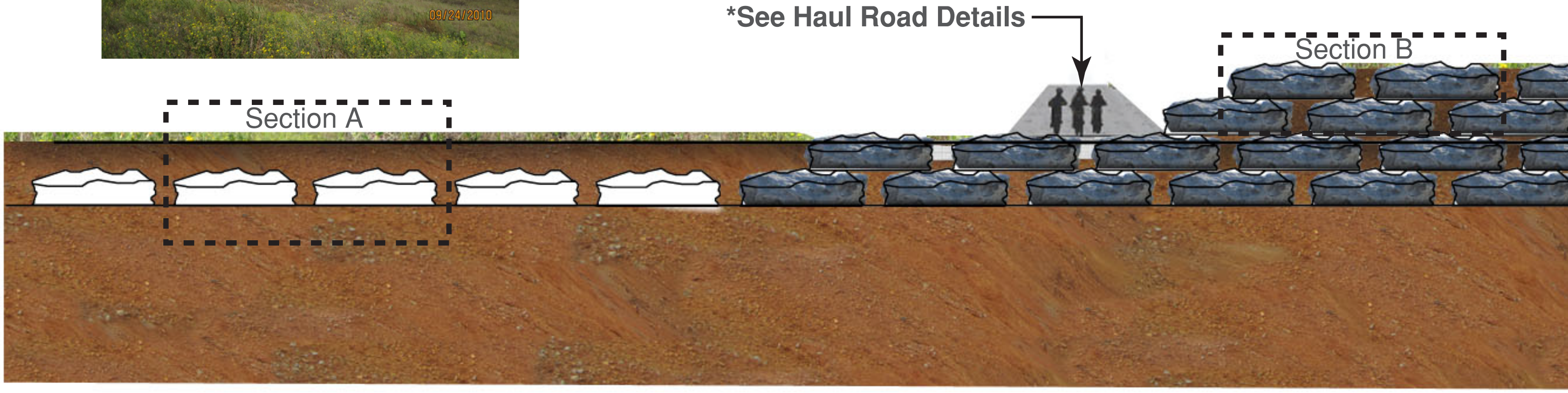
INTEGRATION OF KARST TOPOGRAPHY

HABITAT DIVERSITY & TRAIL ENHANCEMENT

Figure 61 - Proposed Design Feature Integrating the Dissolution of Chewacla Marble with Haul Road Repurposing

In order to demonstrate the potential for place-based design within the aforementioned opportunities, these illustrations present the authors understanding of how the Karst processes could be harnessed as initial conditions for the strategic development of vernal pool formation, habitat diversity, and aesthetic appeal.


Rock Climbing Wall
Topsoil/Tailing Pile
(Stabilized)
Exposed Rock/Seating
Repurposed Haul Road
Buried Chewacla Marble Boulders
Cottonwood Trees
(transplanted onsite)
N



Inspiration Drawn from Dissolution

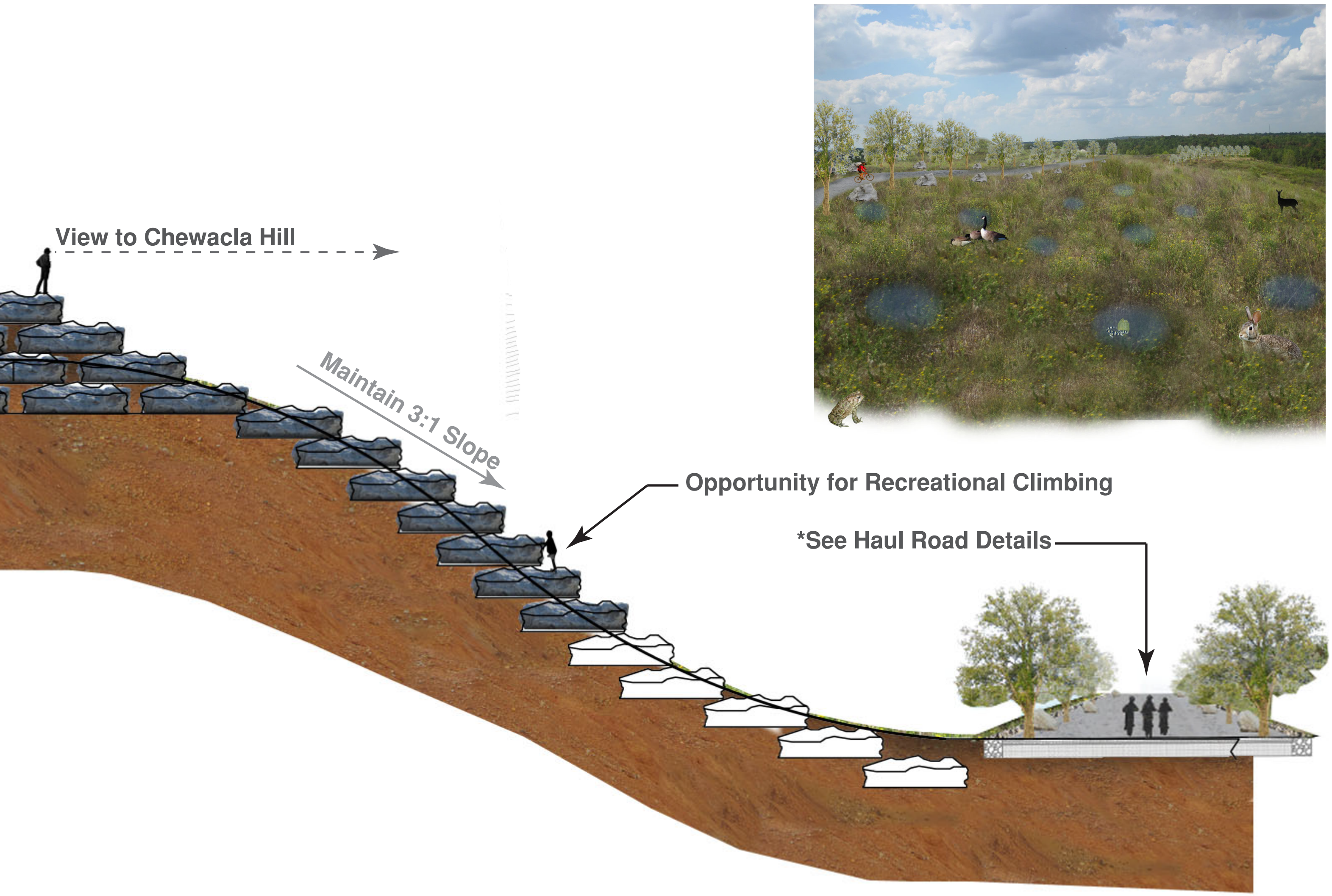
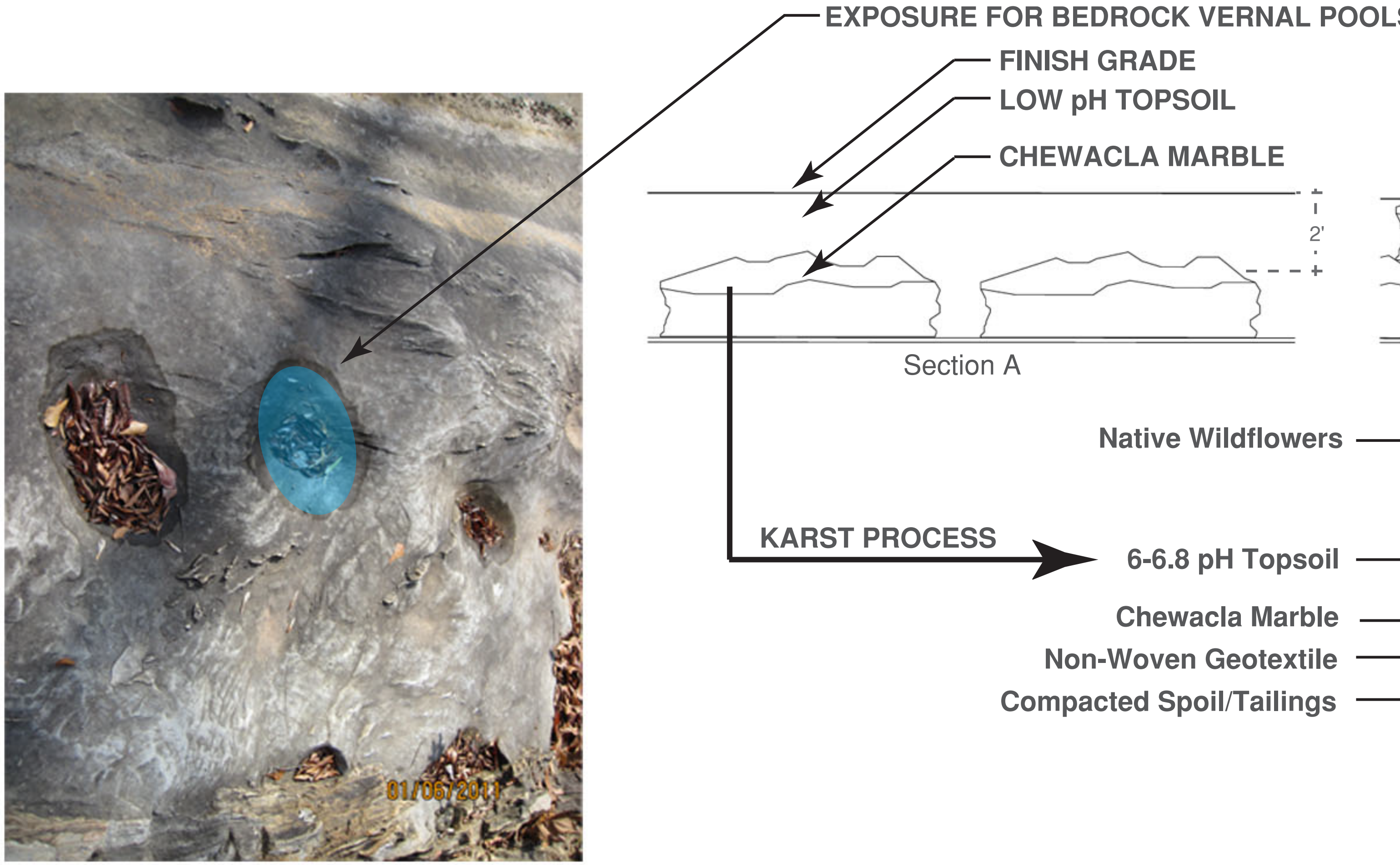


Figure 62 - Section Showing Visual and Recreational Opportunties That Would be Available with the Proposed Design Scenario

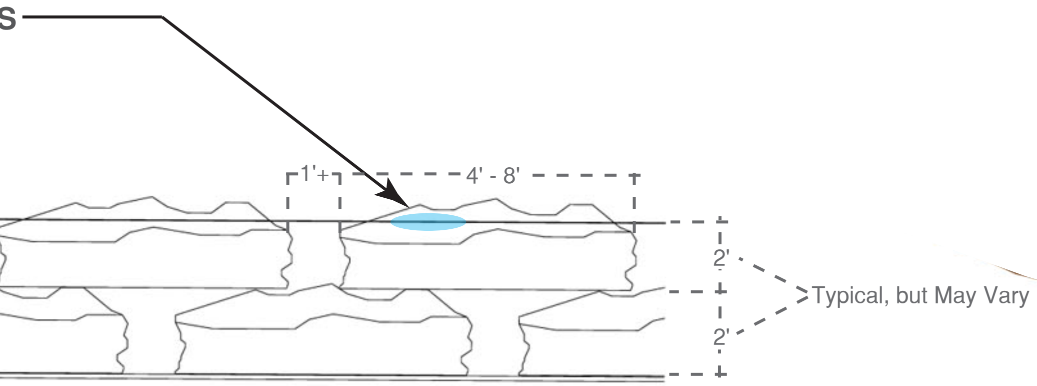
This section illustrates the multiple opportunities that arise through the integration of Karst Topography with haul road repurposing along a mine tailing transect. Through the strategic burying of large boulders of Chewacla Marble, opportunity could arise in the formation of vernal pools. The relatively small pockets of dissolution would generate depressions within the soil and, over time, provide for seasonal inundation. The formation of vernal pools would contribute to increased habitat diversity, wildlife diversity, and a unique, "place-based" site experience.



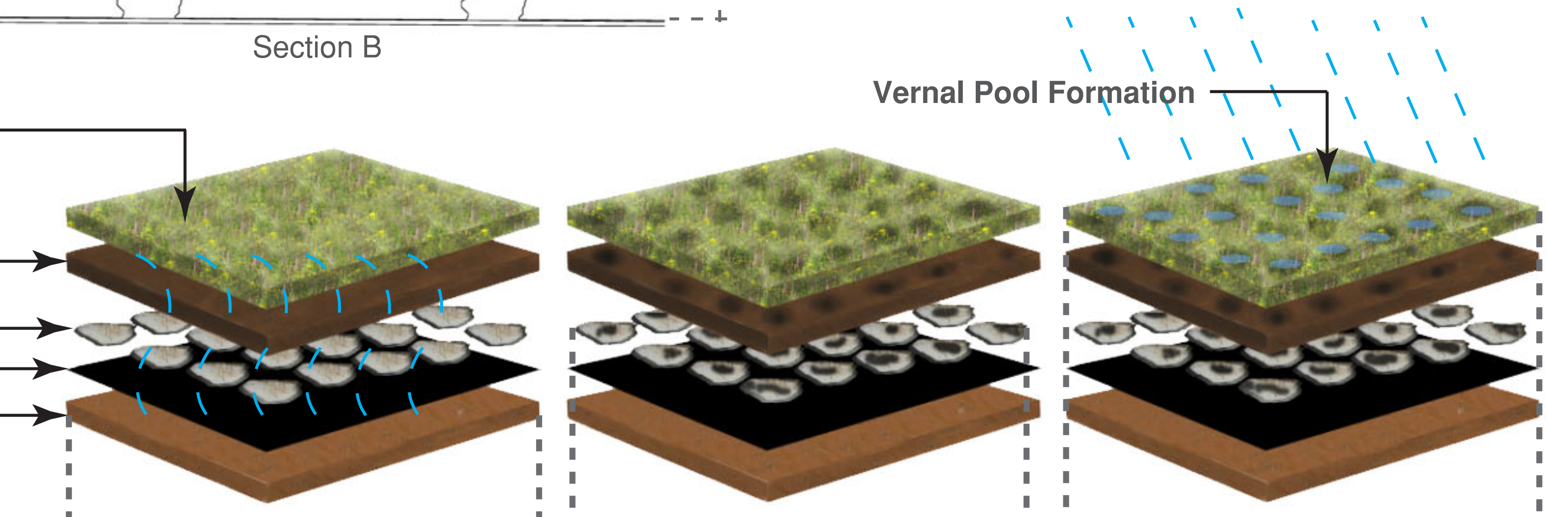
Onsite Photo - **Dissolution of Rock Forming Depression**

Figure 63 - Design Detail of the Potential for Vernal Pool Formation as an Emergent Quality of Karst

The illustration above demonstrates how the dissolution of Chewacla Marble can be harnessed for the production of vernal pool formation. Utlizing low pH soil strippings from the active mine process, the buring of waste rock found onsite could be used to catalyze this process.



Section B



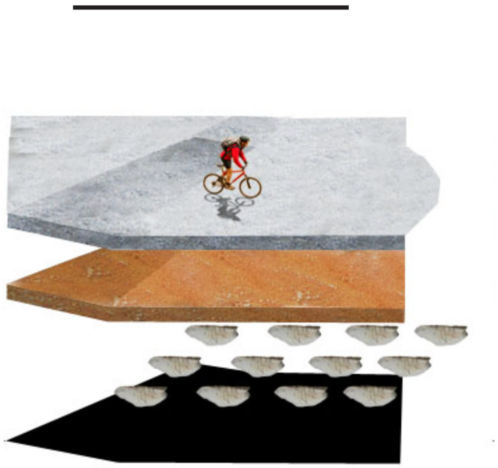
INITIAL CONDITIONS
Strategic Layering
Use of "Leftovers"
Site Specific Modeling

EARLY DISSOLUTION
Dissolution of Marble
Surface Depressions Form
Creates Interesting Topography

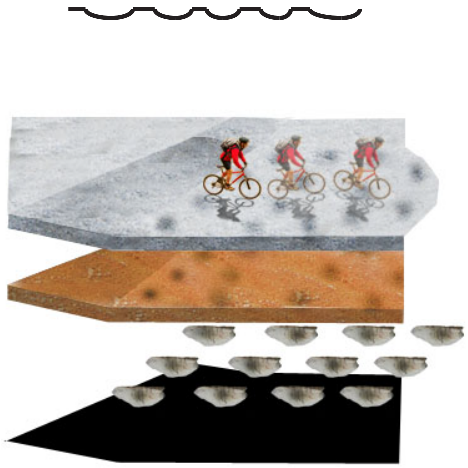
KARST TOPOGRAPHY
Deppressions Fill Seasonally
Vernal Pools Form
Wildlife Habitat

INTEGRATION OF KARST TOPOGRAPHY

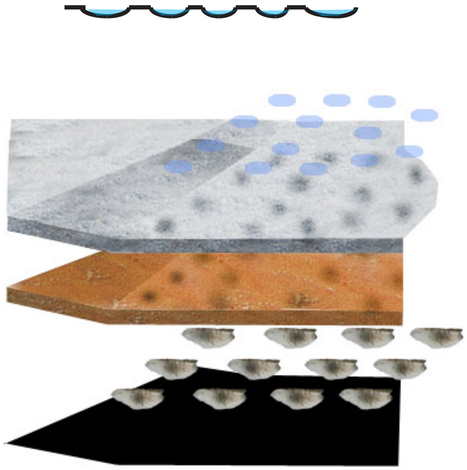
MOUNTAIN BIKING EXPERIENCE



Initial Installation



Dissolution



Formation of Karst Topography

Figure 64 - Additional Use of Dissolution for Mountain Bike Terrain

These axonometric sections show an additional potential use for the integration of Karst processes into the design.

CONCLUSIONS

The emergence of both modern participatory design and mine reclamation began during our latest environmental renaissance period of the 1960's and 1970's (Berger; Watson; Carlson). However, the two have evolved along very different, if not divergent, paths of becoming; with participatory design growing in a transcendental pattern through social and cultural engagement and mine reclamation harnessing scientific and technological innovation through the environmental engineering and geotechnical professions. There are recent, strong case study evidence now though, that suggest the two have now begun to converge and are exposing new opportunities and expanded potentials for altered landscapes (Berger; Carlson; Cherry). However, three decades of divergent growth is strongly evident in the obstacles that have arisen out of these projects; with designers/authors often having to overcome centuries of embedded mine-cultures, strong differentiation of expectations, and negative stereotyping that arises from a propensity, and/or the appearance thereof, for groups or individuals to "align" with one side over the other (typically most evident between environmental justice organizations and mining companies and workers). Although these projects have shown promise in overcoming these obstacles through the use of persistent engagement, provocative 3-D visualizations, and the formation of strategic partnerships, they do not address or acknowledge site performance capacities and/or value-finding processes as may be afforded through a continuous, democratic engagement of an altered landscape. The work has contributed to the beginning of such research.

The author has addressed this shortfall (identified as an inherent limitation of contemporary participatory design methods - See Figure 31-32) by demonstrating how the integration of an ongoing democratic process may be applied to mine reclamation projects, and other altered or degraded landscapes, as a value-finding method of participatory engagement with the landscape and finite resource management (i.e. landscape). The extensive research, mapping, design visualization, and the integration of place-based site qualities with a design proposal for the reclamation of the Martin Marietta Materials, Inc. Auburn, Alabama Quarry provides evidence that there are an endless array of potential post-mine uses and that the realization of the sites capacity to support them may ONLY be found through an ongoing democratic, stakeholder process. The involvement in such a process would in turn allow each individual stakeholder and/or stakeholder group an opportunity to reimagine how we view finite resource management, the landscapes they create, and the ways in which we value them. These new understandings of value could then translate to positive changes in lifestyle habits, thereby positively influencing the dynamics of the finite resource management complex that support the established way of life.

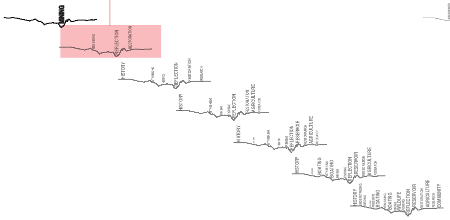
The opportunities that designers will have to address these obstacles is projected to grow exponentially in the following century, yet it by no means reduces the urgency and necessity to do so as soon as possible. As unsustainable a practice as mining may be, it is only expected to "rapidly increase over the next quarter millenium" (Berger) and the demand for mined materials is greater today than it has ever been (Cherry). Thereby, actively mined sites will grow more numerous and so to will the opportunties and the need for reclamation that resolves the inherent risk and problems associated with minimum federal, state, and local regulatory requirements. Similarly, our urban areas will continue to expand outwardly toward mined sites that once operated under the protection of remoteness and marginalization. Therefore, society, and to a larger extent designers, will have to decide how to address and interact with these sites as it becomes more and more apparent that we can no longer hide them. So a critical question remains; are we going to continue our historical habits of restricting access to them once mining operations have exceeded their life capacity and continue to perform reclamation in the singular contexts of "nature", environmental "restoration", or economic development, or will we be able to reimagine the altered landscape as also rich in social and cultural opportunity for humans to expand their abilities to sustainably (as much as that may be possible) cohabit our world of finite resources?

SELF CRITIQUE/REFLECTION

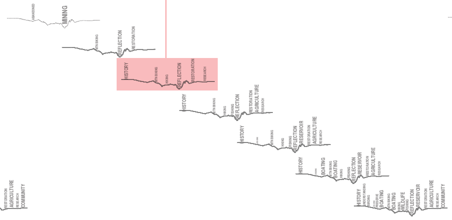
The research, mapping, design, and written prose of this thesis evolved over a period of nine months (or two semesters). The author acknowledges that this is far too little time to develop an in-depth understanding of all of the dynamics involved in mine reclamation, finite resource management, and participatory design practices. A greater level of research and understanding of each of these fields of research would have allowed greater focus to be placed upon specific, more realistic potentials for the use of the site (i.e. greater detail in the final proposal for haul road repurposement and fluvial geomorphic enhancement of mine reclamation). Additionally, it would have served as a strong foundation to support the author's claim of "endless opportunity" for diversity of uses if interviews had been conducted with some of the potential stakeholders and/or interest groups. Such an understanding would have allowed the author to develop a more realistic framework from which to develop specific design scenarios that would allow each group to "imagine" their activity or purpose on the site. Case study research of the application of transdisciplinary action research (TDAR) to the Laurentian Vision Partnership's address of the mined landscapes of the Mesabi Iron Range provided strong evidence of the benefits of such engagement.

Emergence, as a guiding theoretical framework, required that the author consider programmatic and physical design moves in which the final outcomes are indeterminate of the authors will. A more determinate design method might have allowed the author to develop a greater level of detail for a specific, chosen form and function of the site. This would have also allowed for further explorations of feasibility and practicability for any chosen scenario. Furthermore, the indeterminacy of the emergent, democratic proposal could result in a misunderstanding that the author is unable to make an informed decision with regards to what the site "should" be or how it "should" perform and to what purpose.

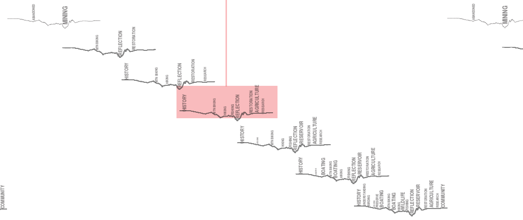
Post-Mining Year 1

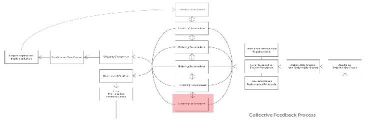


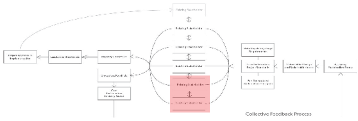
Post-Mining Year 2

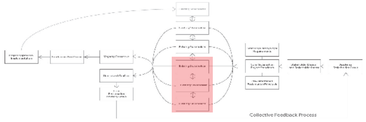


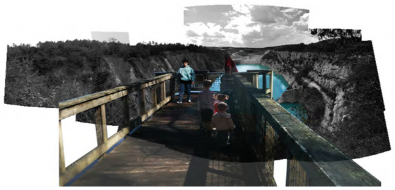
Post-Mining Year 5



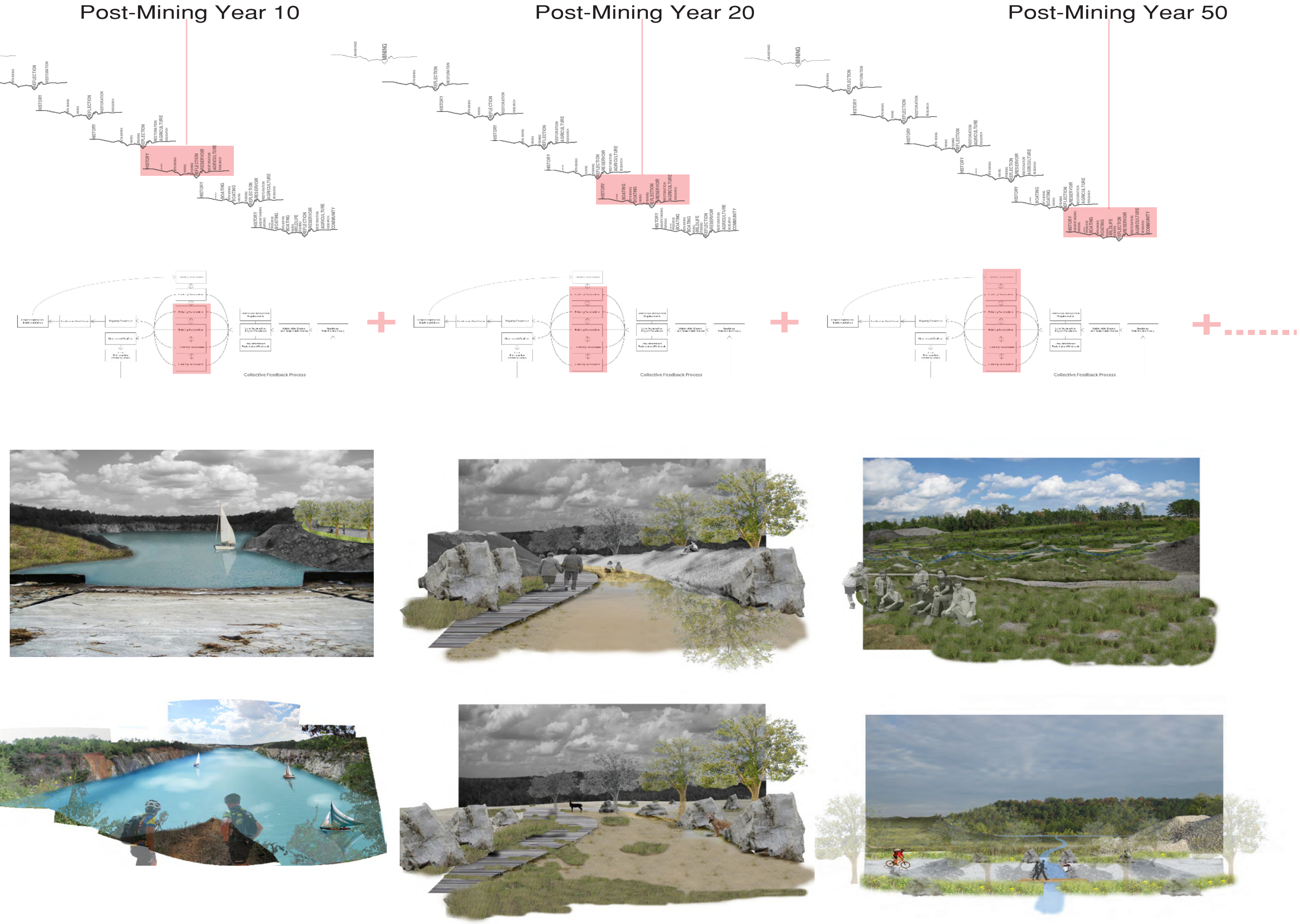








"A Continuous Democratic Proc
Metho



ess Allows for a Value-Finding Versus Value-Assigning
od of ReclaimingMined Sites"

Figure 65 - Timeline Demonstrating the Diversity of Uses Evolves out of a Continuous Democratic Process

This illustration is the authors vision of how democratic process may be integrated into the reclamation of the MMQ in order to bring about a greater diversity of potential through time.

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