Deep Down:

A New Form Responds to an Old

Tim Boyle

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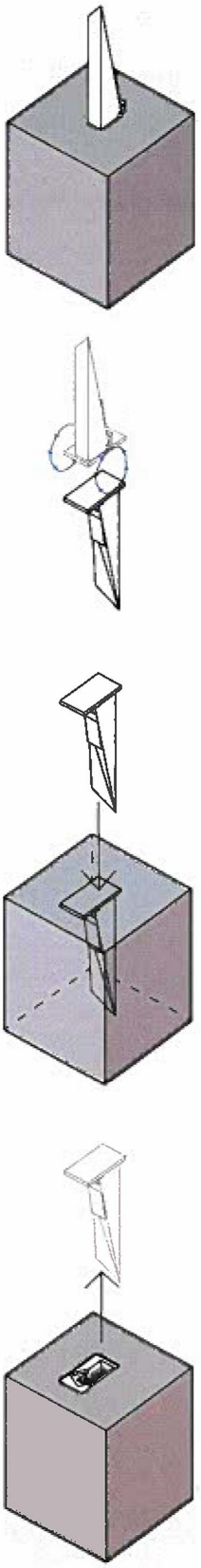
Statement

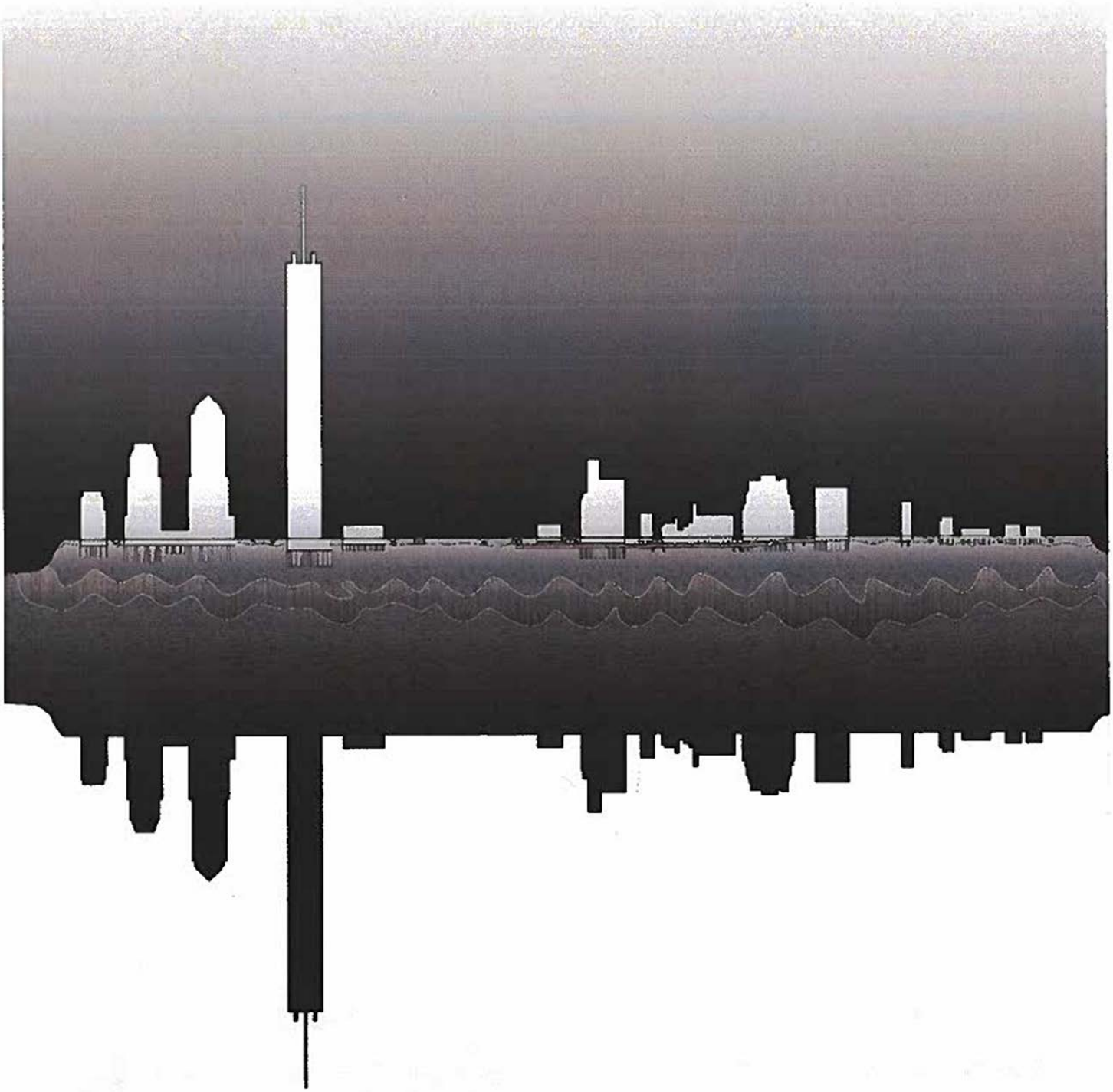
As taller buildings grow denser and denser in the city hubs around the world, issues of blight, claustrophobia, and actual need fill the conversation, a very human response is then required to be investigated, what results is an inverted approach, a construct reaching into the ground through which new and exceptional experiences can stem from.



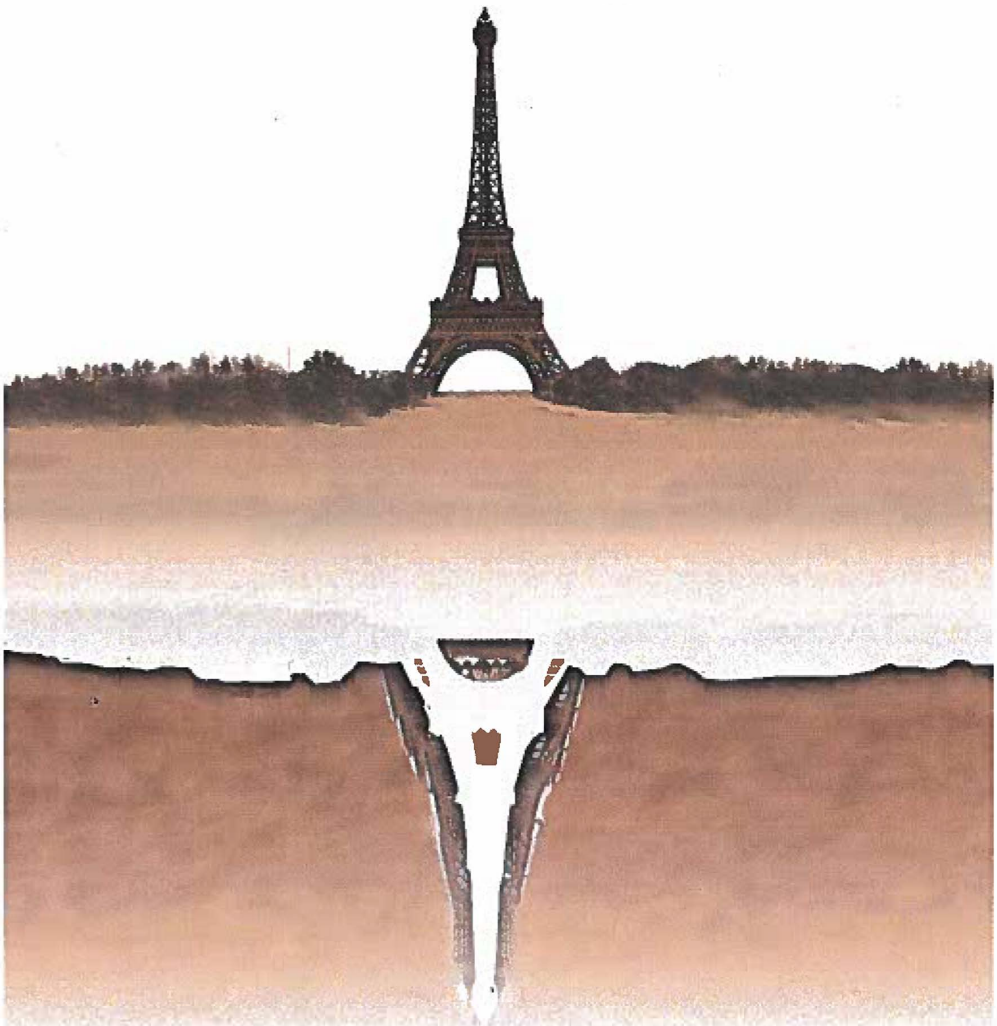
Abstract

To a young child in a metropolitan area, the skyscraper is often the first experience they'll have of architecture that is truly a spectacle. The notion of these impossibly tall towers reaching to the heavens is simply infectious to their innocent and curious minds. As the days go, the towers get taller and the child older. Soon an intersection hits between the aging child and the increasingly tall buildings. The spectacle wears away and the negative implications of these building become apparent. The street level is suffocated, the spectacle turns to intimidation, the apexes of these buildings never to be seen by a typical spectator on the ground and often not even by the people with actual access. The superficiality of these "super-talls" gives rise to cynicism and critique. Would a completely antithetical intervention in response to "super-talls" solve all the problems its catalyst creates? More importantly what does the antithesis of a skyscraper formally look like, what new spaces are created and how are they experienced?

The most logical response to completely inverting a skyscraper's form is to first orient it downward. Skyscrapers climb stories into the air, so the opposite must delve levels into the ground. Super-talls rely heavily on stacked, linear, and cascading masses, a critical inversion would then instead focus on a void left by an imprint of these forms. Skyscrapers suffocate the public realm, the response partii then offers techniques to open the public realm instead. What eventually becomes revealed is a theoretical response to the typology of Skyscrapers in the form of a completely antithetical project, and from there, exceptional experiences , new organizational logics, and alternative approaches to street level engagements can be realized.



Delving Into It...



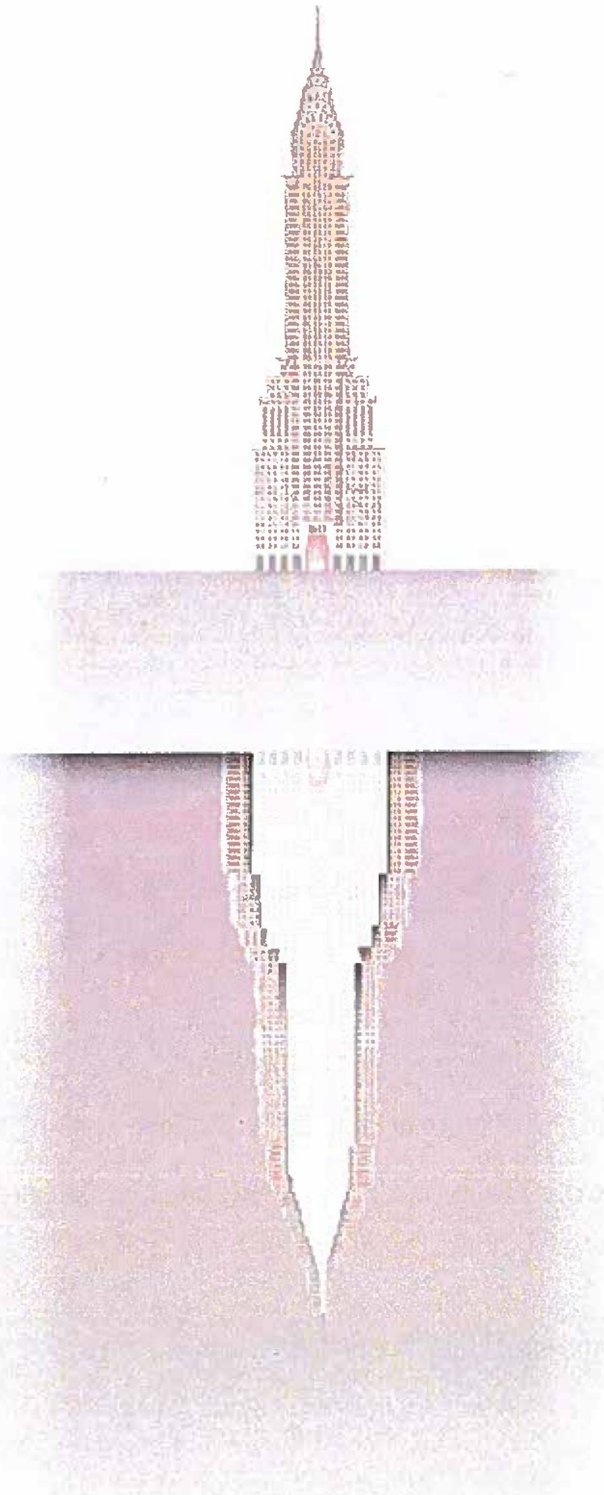
To properly critique a "super-tall" an overall understanding is required. Super-Tall refers to any habitable structure topping out at least at 1000 feet. Most cities only have a couple of super-tall structures at the most, but the densest cities find themselves cramming together super-talls in some impenetrable labyrinth. The catalyst? The favorably viewed FAR benefits of verticality and perspective. FAR or "floor to area ratio" refers to how much habitable square footage a building has in regards to the site footprint. The logic is most certainly sound- maximizing space for growing populations, however the reality is unfortunately fare more superficial. The super-talls service the city's agenda first and the community's second. What that translates to is an increased focus on economic gain over social infrastructure.

The square footage favored in the FAR's of super-talls isn't to benefit an increased distribution of housing or office space, but to maximize leasable and sellable square footage marketed specifically to affluent demographics. What results is large units in these towers that allow for very few total apartments in regards to total FAR available. To add fuel to the fire, many of these apartments are not consistently lived in. Instead these super-tall's are reduced to even further to their economic core. The apartments are seen more as stocks than actual dwellings:

"The wealthy want 'a safe harbor for their money,' adds Liebman. 'The appreciation in New York City real estate has been quite extraordinary. Over the last five years, the Manhattan luxury new development market has appreciated 57 percent. So people feel pretty good about putting their cash here.'"[1]

As truths like these are unveiled, the positives of these tall skyscrapers wear away. It gives importance as to why the critique must be so drastic, by inverting everything a supertall is, the subversive issues are better realized when critiqued overtly and fantastically. A void space in

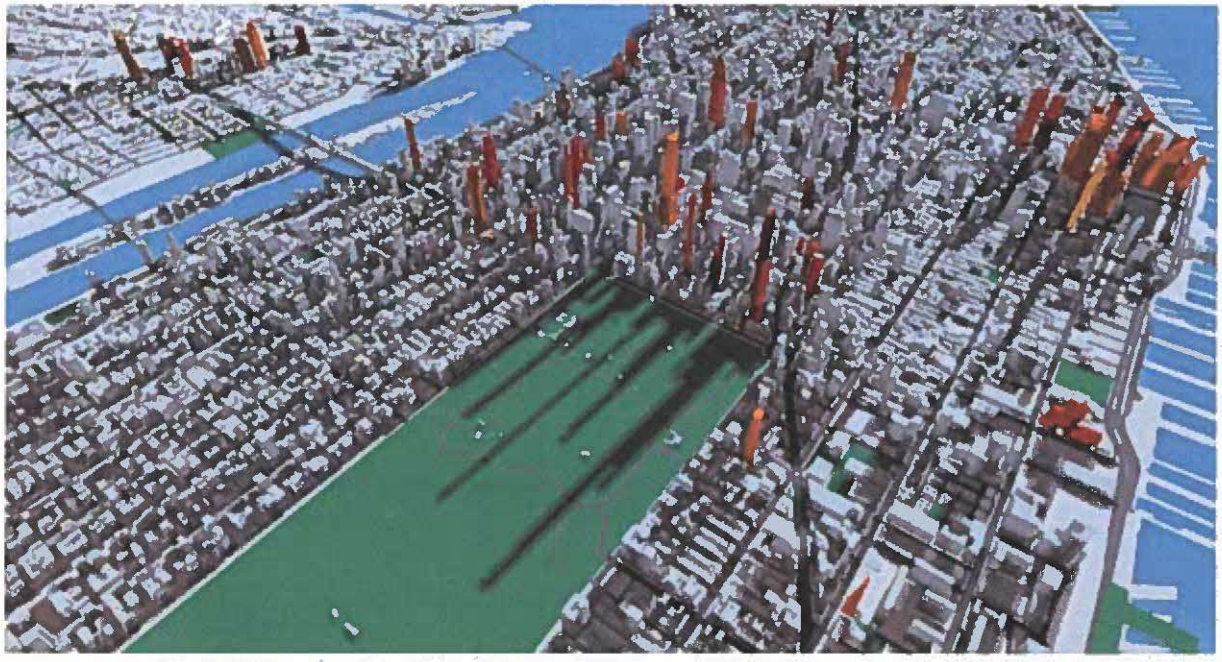
[1] Denvir, Daniel, City Lab "The Big...Money Behind Tall Buildings.



the ground may not be able to compete with the views, but often the views hardly matter. If these spaces are seen as stocks then it's the *idea* and *value* of the views that matter, the views have little true experiential implications if no one is ever going to be frequently utilizing them.

The issues at work stay not only up high but also impact the cityscape at the street level. The more scrapers the built, the larger the density of built fabric that suddenly occupies the air around you. In addition to it starting to mimic a density ironically as impenetrable as the earth itself they also contribute significantly to shadows cast upon the street and surrounding parks:

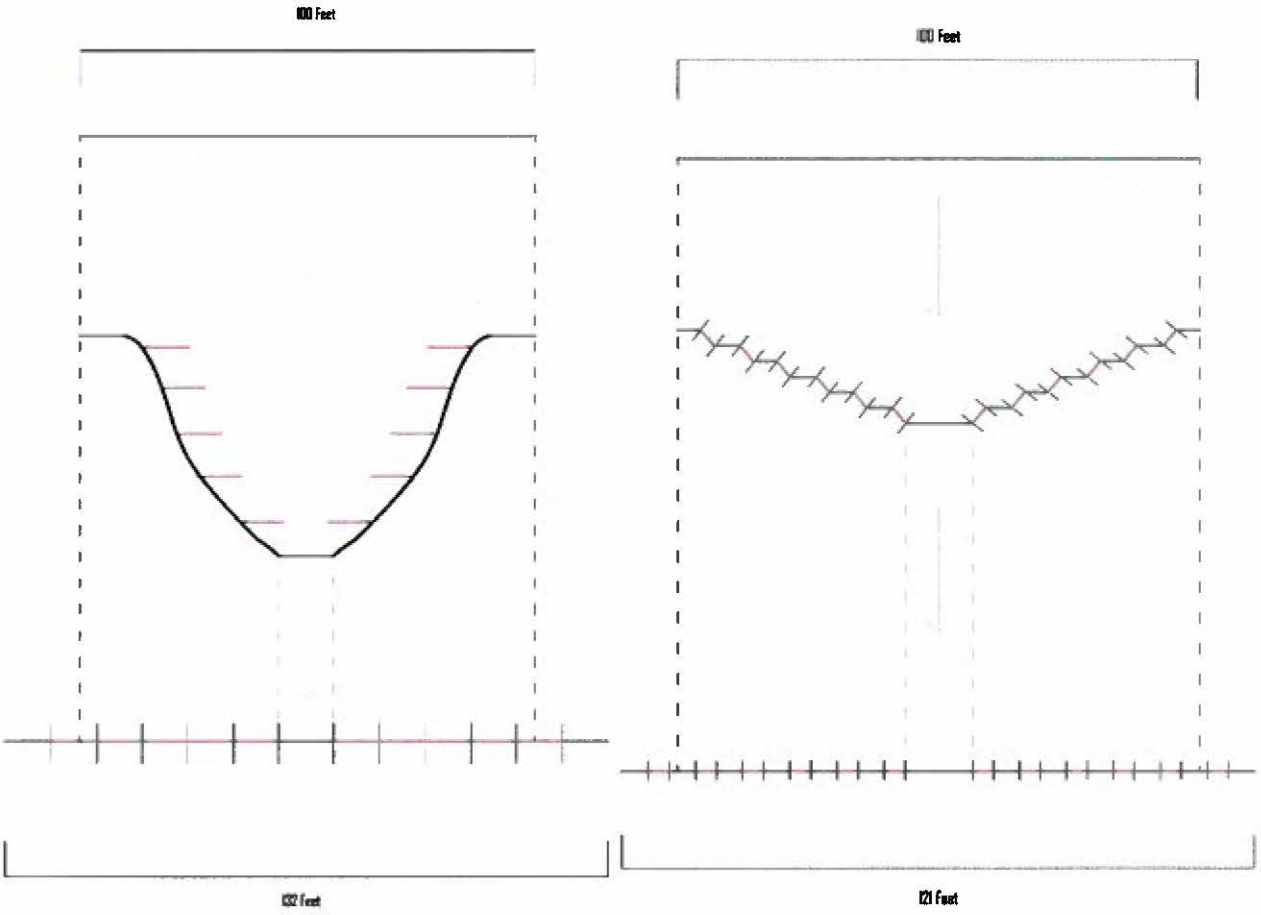
"The shadow studies produced by MAS in 2013 demonstrated that existing zoning and environmental review regulations do not sufficiently protect Central Park from the impact of nearby supertalls."[2]



(Courtesy of the Accidental Skyline Report)

[2] Accidental Skyline Report 2017

The overall vehicle for the proposal, a void space activating the ground, responds admirably to the concerns presented by these mammoths. First by eliminating any vertical intervention upward from the datum of the ground plane, shadows cast on the surrounding areas are eliminated by default. Furthermore, rather than suffocate other public realms, the proposal can inherently create public space on its own site as well as open vistas if other parks act adjacent. Building into a void in the ground provides a rare opportunity of providing public outdoor space at a FAR greater than the site footprint without imposing on the space around it. Angled and tiered spaces flatten out to greater



values that their footprint in both two dimensions and three dimensions giving the illusion of larger usable space in the same amount of space at the ground level.

Clearly, ground excavation is no stranger to architectural design, yet recently as survival standards have changed substantially, it has most definitely fallen out of vogue. While such a

massive and deep activation of void space has never been undertaken before, there are still smaller instances of ground-based architecture to take cues from.

Shelter, in addition to food and water, it is a key aspect to daily survival in the life of a human being. In today's world our shelters range from these aforementioned skyscrapers breaching the heavens with complicated structural systems to modest houses built to mimic styles of the past. The variety of approaches that our cultural ecosystem implements is a luxury afforded by time established security, and precedent attempts throughout history. In the early dawn of humanity, such luxuries did not exist, and quick solutions had to be made. The earliest known shelters of are of course caves, which then lends credence to the notion of a "caveman". Small excavations in the earth, usually preexisting, allowed our early predecessors to hide and congregate in a protected environment.

As we evolved, so too did our sheltering methods but rather than abandon the notion of caves, we elaborated on them. Mesa Verde in Colorado, is a prime example of such elaboration. A community in itself, this development consisted of dozens of small houses carved out into the side of a mountain. Over time an entire network of domiciles was established and the notion of single rock dwelling turned into an entire self-sustaining town. The mountain provided both overhead shelter and the structural material needed for the individual dwellings. Today it still stands as a testament to the ingenuity and resiliency of such building methods almost a thousand years later, a complex extension of the primitive "cave dwelling". This is not a standalone example either, on the complete opposite end of the world, over a millennia earlier, developments were being made in what is now modern day Turkey.

The Turkish landscape is varied and almost alien to an outsider, specifically the rock formations known as "Fairy-Chimneys". Located mainly to the east in a region known as

Cappadocia, these "chimneys" were formed from years of natural erosion until only the strongest most vertical portion of the inner core remained. While the geological phenomenon is fascinating in itself, it is the utilization of such that is most important. The locals, consistently faced and caught in the middle of open conflict, carved out dwellings into these rocks much like what was done in Mesa Verde. The intent was two-fold, these spaces provided a resilient shelter that could outlast the wars, and the utilization of the natural fabric allowed these communities to be camouflaged. Taken even further, this same region houses entirely subterranean towns, built underground, designed to harbor a populace and its economy for extended periods of time, leaving no trace of its existence along the surface.

Still these examples harken back many, many years ago, however there are even more recent examples of this "cave dwelling" approach. In the midst of westward expansion in the mid19th century, "sod houses" became the norm across the American Midwest. Designed to be simple, effective, and easily insulated, these grass huts, an extension of the "cave dwelling" instinctively built into our subconscious, were built into the side hills and provided the pioneers with effective houses with the limited resources around. Their materiality of the earth sod also lend themselves to certain ephemerality, allowing them to be built, torn down, and rebuilt across different areas almost in direct opposition to the prior examples.

The intent of referencing this history is to be simply put saying, the nuance of utilizing the ground fabric and building downward has been lost in society today. In driving the fantasies of the imagination by building upward, the thought of doing the opposite and the benefits it brings has become a point of derision and an almost taboo topic. The sod houses stand as the last time, that we, as a culture maintained a qualitative fascination with the ground. They weren't just a physical representation of previous ground based efforts, they captured the imaginations of citizens in western culture. At the time right before the rise of heavy industry in the mid 19th century, the

western mind yearned for an idyllic pastoral setting, an environment where interventions and nature exist symbiotically. Thomas Cole exhibits this yearning for the pastoral phase in his painting series *Course of an Empire*. It shows the development of a land over the ages, starting off as chaotic wilderness eventually becoming tamed and destroyed by the development of man. The second painting, called the *Arcadian or Pastoral State* (shown below) visually captures the harmony of man and nature that 19th century thinkers so desperately sought out. The sod houses were the most realistic example of such and it wasn't until the industrial revolution shortly arrived that fascination went from pastoral harmony, to massive constructed sprawl.

Yet still, the examples mentioned, all bring with them certain practical, formal, and qualitative aspects highly sought after in the green design oriented architectural approaches today. Architecture is built upon precedent and yet in this era we have begun to abandon to most original precedent in our history, building downward and retaking the ground fabric for a new form of revitalized architecture. With the recent attention towards green architecture, the fascination of pastoral harmony between built and natural form can be brought back into the forefront of our culture.

Architecture approaches into the fabric of the earth do not have to take upon themselves the negative and primitive characteristics we so often associate with them. In fact the idea of subterranean dwelling has existed fantastically in fiction and myth since the beginning of recorded history. The Greek notion of the underworld is one most clarified, ancient examples of a subterranean realm. In Greek mythology, the underworld was not seen as good or evil but rather more "matter of fact". Of course, there were characteristically positive and negative portions of it, but the overall concept of it was rather neutral. It was seen as a location of supplementary existence after the primary portion of a soul's existence had passed, the primary portion of course being life. There was certain intriguing rigorous organization to the underworld. All arriving souls approached through a

centralized location on the river Styx guarded by the three headed dog Cerberus. The underworld itself was divided amongst individual parts for certain souls as well.

Inside the Tartarus pits lay an area of imprisonment and punishment for the Titan Kronos father of Zeus as well as other famous mythic characters such as Sisyphus and Tantalus. On the flip side, Elysium, or "The Elysian Fields" existed as utopian area for the afterlife. Here resided the individuals and heroes who landed the most favor of the gods, not necessarily the most moral, but the most heroic. Still most souls went to the primary portion of Hades, and this area was seen more gestation location for lived out souls.

The notion of this underground afterlife brought with it physical traditions, extensive tombs complete with traps and shrines housed many lived out lives providing them with a final resting place that reflected the area their souls were heading to and would eternally inhabit. The underworld to Greeks was not seen as an alternate dimension but literally a location that could be traveled to if delved deep enough into, much like Mount Olympus was simply a tall mountain. Because of this notion, there were some interesting implications. Stories arose of Greek heroes traveling to and from the underworld on individual quests. Deals had to be struck and risks were made, but it was accepted in the Greek's minds that a living soul could journey to the underworld and return back to the land of the living. The point of all this is that Ancient Greek Religion is a very ground based theology, and brings with certain notions of such that are lost on the modern era. Robin Dripps, in her essay "Ground Work" effectively summarizes the Greek tradition:

> "The souls of the did not depart the foreign world, they continued to exist underground in close proximity to the living, from whom they required regular attention. This gave to the soil a meaning of considerable personal import, suggesting an unexpected vitality. The advice to bury the dead near the front entrance of the house to facilitate

consultation with one's ancestors when leaving or returning reveals much about this vitality and the grounding anticipated from generational continuity. This was not land to be easily abandoned. In fact, a man could not quit his dwelling place without taking with him his soil, or in other words, his ancestors"[3]

Here we see the mythical understandings of Greek culture translated into literal tradition. The formal organization of the theoretical underworld finds itself translated into the burial rituals of a Greek property. In this translation the significance of the earth is further substantiated

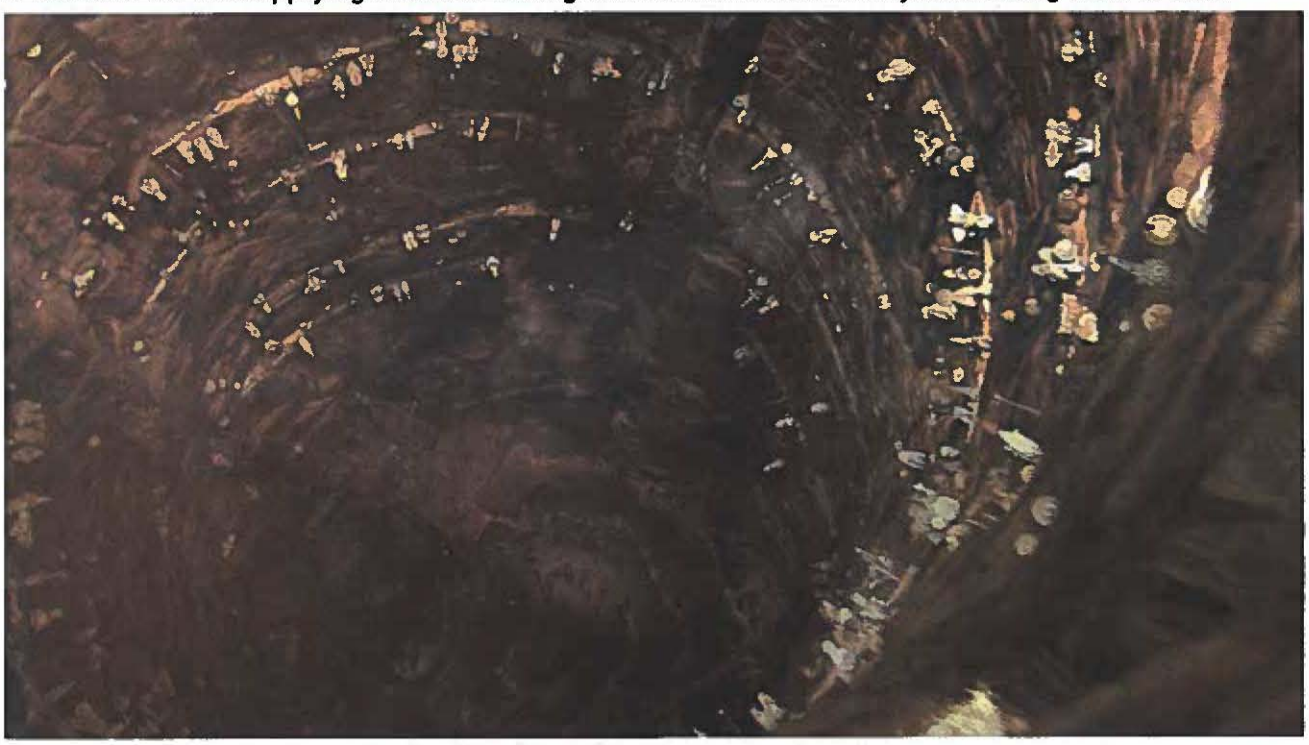
Positive qualitative tendencies are brought forth in modern fiction as well. These concepts too are meant to capture the imagination and elaborate on the provocative nature of subterranean approaches. Star Wars for example is the most well-known, providing an entire planet based around sink-hole cities. Utapau, as the planet is called, consists entirely of towns and communities built vertically along the edges and confines of massive sinkholes. This design approach isn't meant to bring with it negative implications and vibes but instead intends to augment the notion and aesthetic of a fantastical and high tech and oddly cultural society existing at the organizational peak of the fictionalized Galactic Republic. The fantasies of the underground, old and new, capture their audience through its greatest aspect, the form, the form is something

[3] Dripps, Robin "Ground Work"

so differently approached than typical shelter, that the nature of it alone allows public perception to be more interested in its culturally unorthodox image.

Star Wars Episode III, Revenge of the Sith

The formal qualities of the subterranean approach are myriad. There are forms implicated through materiality, forms implicated through practical access to the surface and for light, and forms resulting from schematic approaches. The three main formal strategies historically implemented result from these approaches. First is the idea of a "cavernous network". Taking the notion of caves and applying a schematic organization to them, literally connecting them to each



other through a system of nodes and connections almost like a human nervous system. Derinkuyu, one of the underground towns mentioned in Cappadocia most adamantly adheres to this philosophy. The town exists over 6 levels deep and contains open rooms connected by narrow tunnels, each room has a different function further informed by their size shape.

The next strategy employed results from materiality. Still in the same region, the "fairy chimneys" of Cappadocia make every house unique. Every detail is different from dwelling to dwelling, from the size of each rock "chimney" to the space of each individual room, all the way to the fact that each window is of a different scale. Ironically, the form of each chimney house is consistent in that every house is inconsistent from each other, the approach in carving out individual shelters by hand results in a level of induvial nuance impossible to create. This same level of nuance can be seen in the examples of Mesa Verde as well, while a more standardized approach was attempted through a more orthogonal shape, each form still falls in line to the fickleness and nuance of the rock excavation.

The final strategy is most resonant to modern architecture. The Indian Stepwells accomplish many standard architectural requisites such as organized form with rigorous deliberation, sufficient light access and presence to the ground fabric. These wells in their most recognizable form are inverted ziggurats, creating a tiered pyramid into the earth rather than above it. From there each tier allows access into spaces carved into the adjacent earth. Each tier becomes smaller and smaller until reaching a centralized pit in the bottom. At their simplest these wells are "holes in ground" almost like the sinkhole towns of Utapau, but the organization allows for so much more. The simple yet uniform system of form creates a truly monumental prescience from the ground and achieves all the tenants of architecture that makes designers typically shy away from excavate architecture, namely concealment. The monumentality not only augments the form but the qualitative experience of the architecture, another primary tenant.

All of these forms benefit from a hierarchy best visualized in section. The ground is not a single plane, but series of planes stacked upon each other. It is this stacking that offers such a rich layering within the soil. A form reacting to this level of layering and components, regardless of the

selected strategy is bound to contain an unprecedented level of nuance that is so desired in modern architecture. Dripps mentions this in further detail:

> "The interweaving of different thickening and thinning layers that gives the ground such sectional complexity provides far more effective a structure for expanding the three dimensional connective potential among places than the now common stack of undifferentiated floor plates with point connection by the elevator and fire stair...
>
> ... Multiple ground planes increase the opportunity for more parts of the architectural project to be grounded in the particularity of the larger world."[4]

Here we can see how in creating new form and responding to the established form of the ground, qualitative experiences can be creating. The form and the experience of the subterranean act codependently on each other rather than independently.

The qualitative experience is what makes each form of architecture so memorable. Without the qualitative experience, instances of architecture become matter of fact, simple existences, nothing expressive. The subterranean offers a plethora of qualitative conditions not existing and sometimes not even possible on surface level structures. The underground and the spaces associate with it, basements, bunkers, caves, and crevices all bring with them certain notion and awareness of dark, the unknown. While typically seen as a negative, this notion of dark can be formalized and used to create truly proactive qualitative instances. A dark room in the earth, no light access, is a space of pure abyss, however by adding a single light source, artificial or natural, to this space of pure black, a potent dichotomy is create. The focus on light and dark becomes intense as the only two presences is

[4] Drips, Robin, "Groundwork"

in the space is the light and the absence thereof. This is materialized in a cellar analogy from *The Poetics of Space*

> "As for the cellar, we shall no doubt find uses for it, it will be rationalized and its conveniences enumerated. But it is first and foremost the *dark entity* of the house, the one that partakes of subterranean forces. When we dream there, we are in harmony with the irrationality of the depths" [5]

Through these two pure presences, manipulations can be made, thresholds can be created, and areas highlighted, all through these two ethereal conditions. This is not possible without the purity and density that subterranean darkness creates. The mentioned sense of irrationality is also delved into by Dripps where she says:

> "Irrationality, however must not be understood as negative, but instead as the source of other intuitions about the relationship to the world that compliment and amplify those that come from the more transparent processes of reasoning"[6]

Here she makes a point, that the irrational is not something to be avoided, but instead is something exceptional, a fantastical experience to be sought out due to its unorthodoxy.

Still, light is not the only qualitative aspect of the subterranean. Going back to history of humans and the ground dwellings they inhabited, a notion of refuge is incredibly prevalent. No place feels safer and more protected than a space within the ground. It is difficult for hostile forces to reach an experience when there are feet and feet of earth separating the two. This can be applied to a modern context albeit not as literally. A construct in the ground can be utilized to make its inhabitants feel safe and cozy. With the ground comes the idea of a hearth, another

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[5] Bacheluard, Gaston *Poetics of Space*, p18
[6] Dripps, Robin, "Groundwork"

philosophical entity in ancient Greek culture. The hearth was at the center of a dwelling, and was firmly rooted in the ground, creating a connection between the life of a home and the earth.[7] A truly comfortable environment insulated from the stress and rustle of surface activities is possible. The ground need not be seen as a grave or a prison, but as an escape, a protected safe space purely internalized in form and function. Positive spaces could be further augmented by antithetical cramped spaces leading into them. While seemingly counterintuitive, the intent is true, the cramped claustrophobic spaces promote action, circulation, a lack of desire to remain, and in connecting to a positive open space a pungent duality is created, amplifying the positive quality of the open space and the negative quality of the transition space. This qualitative structure of narrow vs open can directly relate to the formal organization of nodes and connections, the open spaces become the nodes with tight spaces being the connections. The ground fabric offers and amplifies so many phenomenological qualities excluding practical implications, it's almost baffling it hasn't been explored as extensively as other types of historical architecture.

Water retention is another green building technique easily utilized in a subterranean strategy. All rain water winds up on the ground eventually and by placing a design directly underneath the destination of such, pathfinding and integration becomes simple as the water never needs to be rerouted upwards or over, gravity provides most of the heavy lifting.

The dirt not only provides a destination and absorption function of water, but provides thermal insulation levels impossible in any other instance. The sun may bake the air in the summer and the winters may freeze over the ground plane, but underneath things stay more

[7] Ibid

consistent. Achieving the notion of thermal delight becomes more facile and affordable with the ground as an insulator.

Finally perhaps the most provocative modern advantage of building downwards is because what exists below already. Subway systems, sewer lines, power networks all run beneath the ground. A structure down needs not bring these systems upward, but can exist as a lateral destination, a single power house where all these systems can directly connect to. Imagine an inverted structure of multiple levels providing a centralization for power lines, water networks, and subterranean transit options. A structure down need not be purely explorative in its reasoning, practical implications exist in parallel.

With all things considered it is a wonder why we have abandoned our sheltered routes of humans. But perhaps that is the reason, seeing ourselves as more sophisticated than our earliest iterations we wish to abandon the things associated with our primitive predecessors. But evolution is process of refinement, not of reinvention. For this reason we need to revisit our earliest strategies, refine them, and integrative them into our modern lexicon and vision. The qualitative, formal, and practical reasons clearly exist. However there is still even more it can improve and solve, cities have been suffocating today with an increased focus on skyscrapers. City density is killing green space and polluting skylines. Ironically this exaggerated focus on the building up has brought about a notion of claustrophobia, the same notion that prevents many great minds from exploring into the earth fabric. With city green planning being such a large focus, inverted architecture solves many of those problems, the buildings go down, and the ground level becomes open, perhaps even a park. Building down puts tighter spaces in an already tight condition of the earth, and does not force a dense narrative on the surface, the surface exists

naturally as an open space, it is important we respect that lest the entire earth be overpopulated with dense structure creating an artificial, secondary earth layer, ignorant of becoming what it sought to avoid.

General Precedents

Frontier Sod Houses

Early 1800's

North America

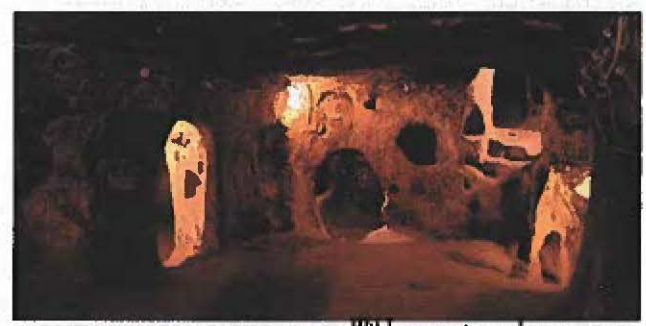
During the pioneering era of the early American 1800's, thousands of migrant Americans moved west for cheap land and new start. What they found were barren prairies with little resources to start the homesteads they imagined. Instead they used a heavy intuition to work the land regardless. These sod houses became a cornerstone to the homesteads. Simple yet effective they exemplify some early merits of utilizing the ground fabric. Built into the hills, they required little new material. The grass helped keep the entire structure fresh and together. The integration into the ground kept the interiors nice and cool during summers and the ease at which they could be built made them quick for starting up a fresh homestead or moving to a new on.

Cappadocia Rock Houses and Derinkuyu

1st Millenia BC

Anatola, Turkey

The Cappadocia region is perhaps one of the most extensively realized developments of underground living in human history. The almost alien terrain of the region gave rise to many simple rock houses literally carved into the surface of the piercing ground conditions. Resiliency was the name of the game of these structures and they remained almost unspoiled since their construction almost 3000 years ago. The most profound development from this region is the underground city of Derinkuyu. Originally built to house approximately 20000 inhabitants, the city has a history a provided ample refuge from hostile outside forces from the Macedonians, to the Roman Empire alway the way to the Early Ottomans.



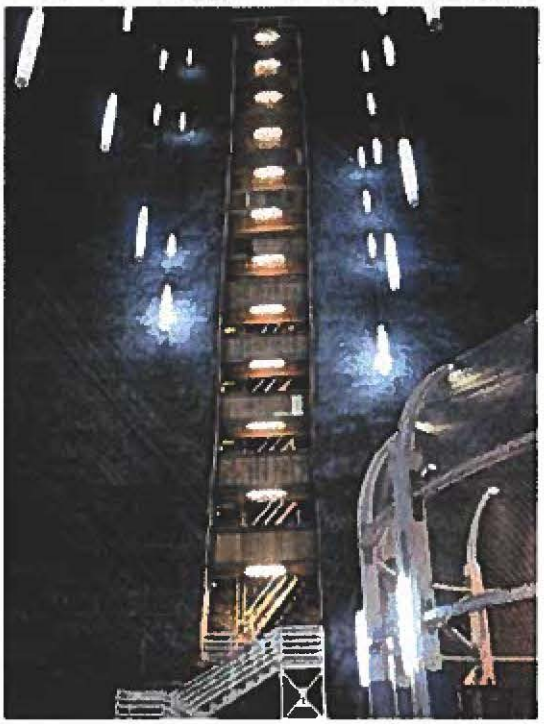
Wildernesstravel.com

Salina Turda Salt Mines

1992

Turda, Romania

The Salina Turda salt mines provide some of the most phenemenological experiences of being underground. It also exemplifies some the practical underground fabric .This project is a re-purposed salt which now sees some of the heaviest tourist volumes in the entire country. This showcases an inherent curiosity to inhabit spaces intrinsically different than ones people are typically accustomed to. The spaces themselves showcase a beautiful contrast between pitch black and blinding white with its use of a radiant LED lighting system. At the surface level of the project, independent structures arise highlighting individual spaces while leaving the form of the surrounding mine to maintain the experience



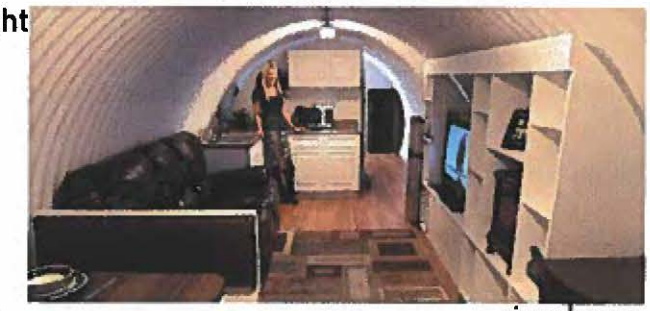
salinaturda.eu

American Fallout Shelters

1950's-Present

North America

Whereas many underground developments highlight the positive qualities of living underground, American fallout shelters attempt to negate those elements. Capturing the imaginations of Americans for the past 50 years, these shelters house not only RetroFuturistic ideals and Americana, but also attempt to provide the same amenities and phenomenological qualities of an interior space above ground. From casually furnished interiors, to fake windows and yards, these spaces act in direct contrast to their true nature providing an almost uncanny and morbid recreation of the above ground spaces. Of course, the number one function of these spaces is for protection from unseen horrors, but the bright and sunny tones of the interiors create an interesting dichotomy between their inherent true purpose and create an almost unsettling internal experience.



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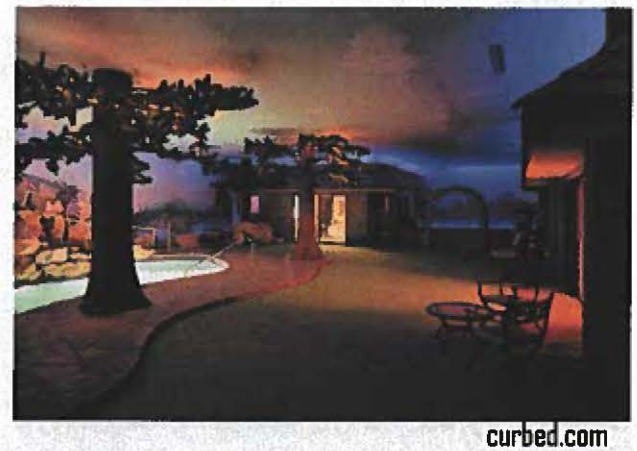


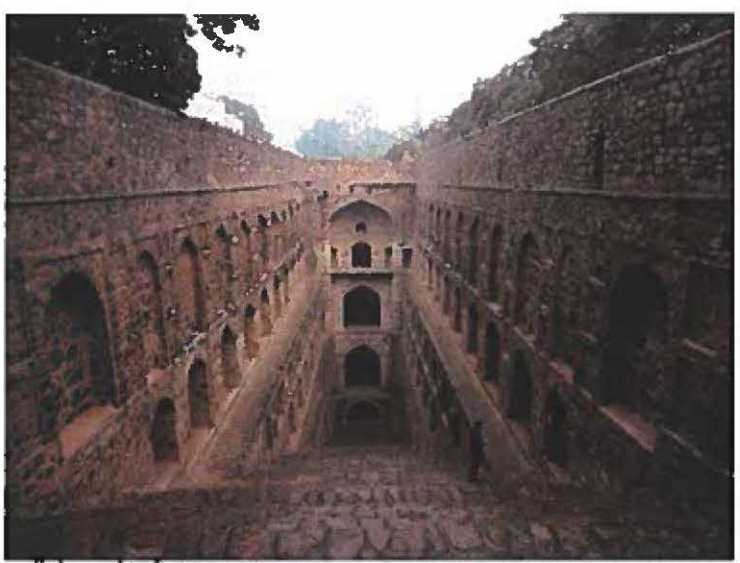
curbed.com

Indian Stepwells

200-400AD

India

While not having much in common with the thesis functionally, the form of the Indian Stepwells is especially provocative. Built almost entirely into the earth, these structures showcase exterior architectural design into the ground fabric while also providing ample access to light. Furthermore, small spacial interiors are cut into the sides of the structures leaving even more architectural potential. The use of these spaces as wells allows for an interesting functional and sustainable integration into my thesis design as well.



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Greek Underworld

The Greek Underworld is interesting delve into the underground experience. There is an interesting narrative the Greeks hold towards the underworld. Firmly believed in, the underworld was located under the crust of the earth and stood in direct contrast to Olympus. The Greeks believed that every dying soul journeyed to the underworld. It was not seen necessarily as a place of punishment, but place of a stagnation, a place where souls simply went to after fulfilling their primary phase in life. The underworld itself was broken into many different portions, there was the River Styx, a place where all new souls entered from, ferried by the boatman Charon, then there was the Tartarus pits, a location of punishment for particular souls who offended the gods, the most notable inhabitant being Cronos, the father of Zeus and leader of the Titans. Finally there was the Elysian Fields, a portion of the underworld most easily associated with the modern perception of "heaven". Here rested the souls who maintain a close affiliation with the gods, hero's and demigods typically retired here and was seen as a portion of the underworld with little worry for the intense labors bestowed on other souls.

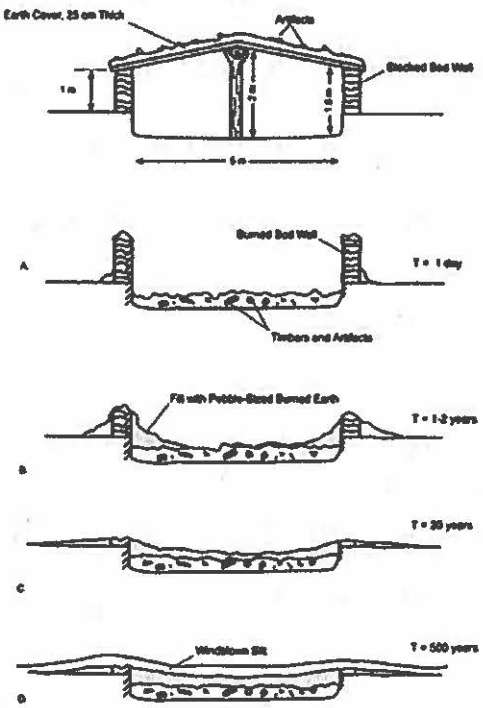
"Elysium"-Artist Unknown

"Charon"-Luca Giordono

Case Studies

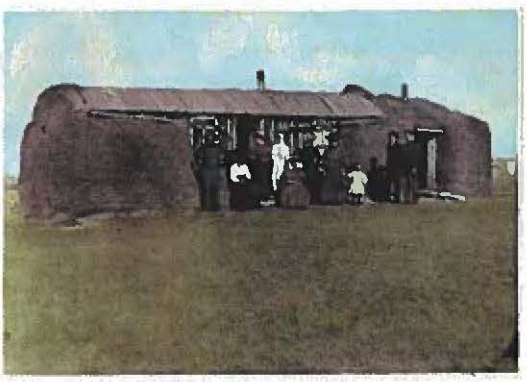
Case Study #1 American Sod Houses

The sod houses were an inexpensive solution to dwellings the mid 19th century migrant Americans. On the move, in search of the new land the government was providing, these men and women traveled with little and once they arrived they needed to start up quick. To make matters worse, the land they arrived to was barren of many rudimentary construction resources we have to today. Tree's were scarce and the land was open with little topological variations. The entire situation stood in an interestingly stark contrast of Jay Appleton's habitational concept. It was up to men and women to intuitively use the land to make their own refuge.

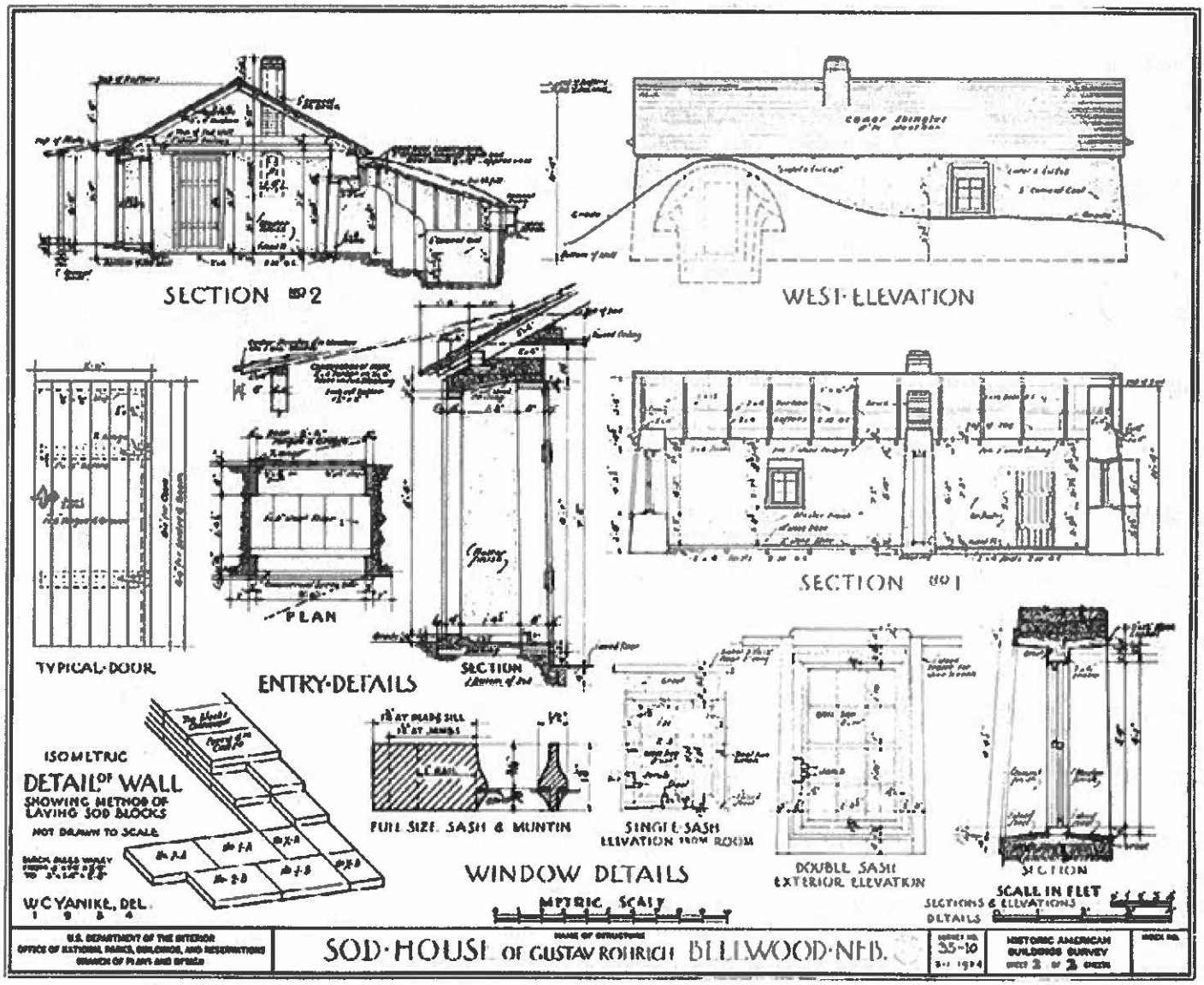


State Historical Society of North Dakota

The basis in these houses was in the name: the sod. When the opportunity arose these dwellings would be built into the side a of a small hill, otherwise on four sides the walls were built of stacked up sod. Sod itself is a hardened dirt extracted from the ground that acts a bit like a clay. The proximity to the ground helped with insulation and temperature management but the walls themselves could be up to a couple feet thick. The floors themselves were typically dirt and the structure had maybe one door and window. Still the materiality of these constructs required constant maintenance and replacement with



the abundant locally sourced materials. What results is a uniquely interesting, and what I call a "dynamic" building, almost living with the land-an ever changing structure constantly swapping out failing parts with new ones from the ground fabric. This nature also allowed these dwellings to be easily upgraded, for example perhaps after a decade or so, a railroad was built nearby and provided easier access to off-site materials, the malleability of the previous materials allows to for quick retrofitting, easily enabling the replacement of roofs, windows, and even the walls you could say these dwellings fit into the realm of the vernacular. Such a statement seems almost alien to say as earthen engineering and single room dwellings are not at all common. However one could argue that in their given context, they are the vernacular. At the time of their construction, the sod houses were the typical dwellings for all early western farmers. More resilient structures like cabins and multi-roomed farms were the outliers. It wasn't just what they were made out of, but how they looked. Ubiquitous was the one room sod house with foot thick walls, crude windows and a grass roof. Now the westward farmers weren't architects but there's something to say from imitation here. The consistency in style is testament to the trial and error these people went through, not that they were being derivative. In an age of survival, these individuals didn't have the luxury to stubbornly figure it out themselves making their own unique attempt at survival. Instead they had to observe around them to see what worked and didn't work from their peers and quickly integrate that into their own design. The sod house was a very happenstance study into trial and error and how to use everything and anything you could around you to create the best possible outcome.


SECTION #2
WEST ELEVATION
SECTION #1
PLAN
SECTION
TYPICAL DOOR
ENTRY DETAILS
ISOMETRIC
DETAIL OF WALL
SHOWING METHOD OF LAYING SOD BLOCKS
NOT DRAWN TO SCALE
W C YANIKE, DEL.
FULL SIZE SASH & MUNTIN
SINGLE SASH
ELEVATION FROM ROOM
DOUBLE SASH
EXTERIOR ELEVATION
SECTION
WINDOW DETAILS
METRIC SCALE
SCALE IN FEET
SECTIONS & ELEVATIONS
DETAILS
U.S. DEPARTMENT OF THE INTERIOR
SOD HOUSE OF GUSTAV ROHRICH BELLWOOD NEB.
HISTORIC AMERICAN BUILDINGS SURVEY

Case Study #2 Indian Step-Well

Indian step wells offer a glimpse into the formal beauty and rigorous order and complexity that can arise from building downwards. At their core, these developments almost act as inverted structures. Whereas the most basic structure is protruding walls and a roof, these wells are four subterranean walls and a central floor. This inverted architectural approach creates some interesting conditions. Because on the ground level there is little built form, the massive excavation provides a not so subtle realization upon approach. Once arriving, these massive undertakings provide the witnesses with a sense of astoundment and sudden dislocation due to the monumental construct emerging in front of and beneath them. The step wells show that building down can potentially have the same effect on the viewer that the monumentality of more well-known architectural undertakings have. Whereas the form is the most impressive component of these pieces of history, there is a reason they are built down rather than up.

Functionally they are wells as their name states. Their location in the ground allows them to act as a reservoirs for after days of rain as well as collecting the water that seeps in through the earth. Still even today, these wells

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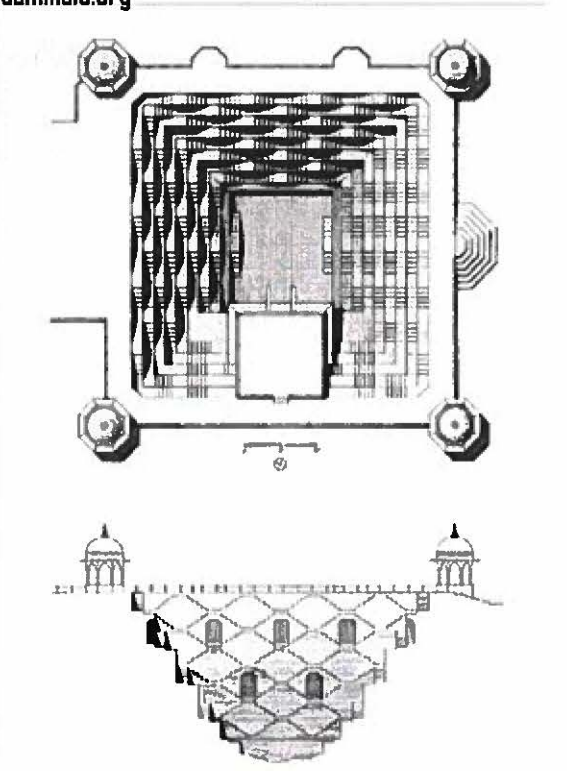

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may hold the solution to India's evolving water crisis. Water retention is a popular design strategy in sustainable architecture, collecting water for reintegration is a popular goal to retake some of the water that our society is so quickly using up. Modern methods have proven complex and expensive and these step wells show that maybe the best approach is in our past and not our future, Structures, rather than systems going into the earth provide a potent solution to water collection and further balance the age old architectural adage of form vs function.

Continuing on the outlook of form and function, the titular steps of the step wells are particularly potent. Creating a form that essentially results in an inverted Ziggurat of Mesopotamia, these steps act as a method of circulation downward towards the center. This tiered, step

system allows the subject move down and access the water regardless of its level height on any particular day. The abundance and order of the steps further pushes the narrative that this is a structure for the public, inclusive of all castes and genders, there is no exclusivity, and these were meant to be utilized by the masses. While mainly an outdoor experience, the stepped, leveled form provides many possibilities for interior excavations and functions influenced by this design. Each level down narrows in further on itself meaning more ground space between the extents of the site and boundary wall established by the form. The gradient of increasing ground density opens up numerous possibilities to carve out. What could result is a stepped structure retaining all the form and function of the public step wells with a now private division under the fabric of the earth with differing program contingent on the space provided. This strategy could create

an effective dichotomy and added complexity to the project-private in the dark interior

maybe less organized interior, public in the sunny ordered exterior

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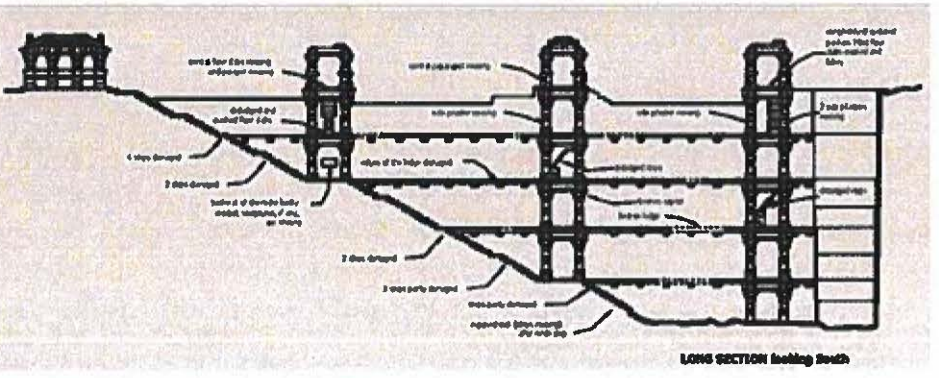
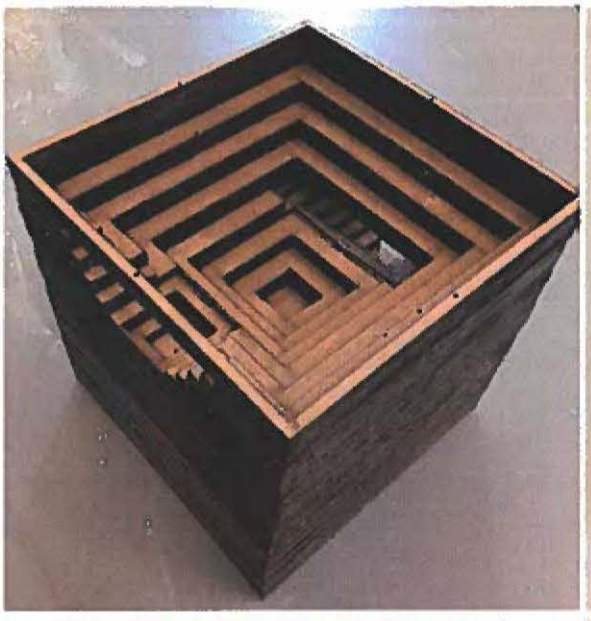
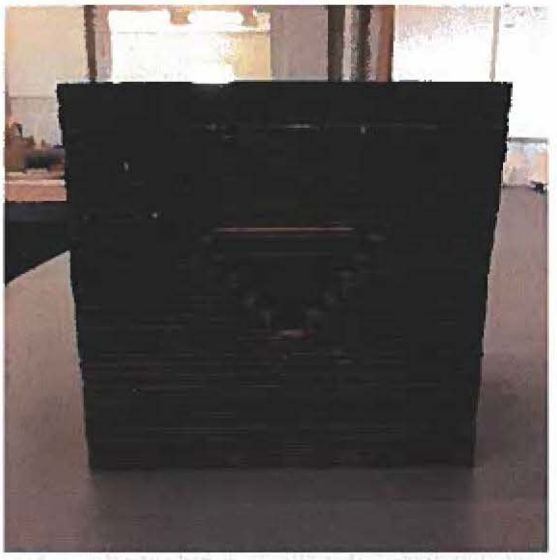


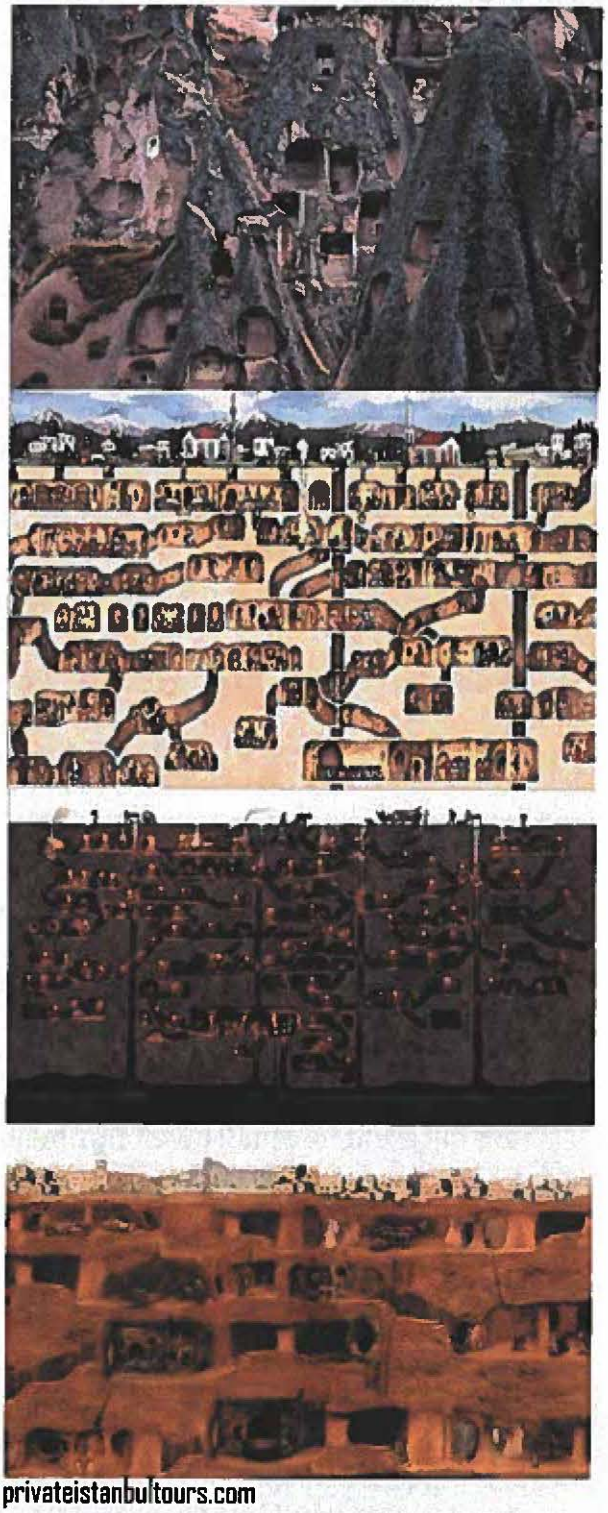




Case Study #3 Cappadocia and Derinkuyu

Ancient history is rife with the tales of struggles between factions throughout the world and the civilians caught in the middle of it only trying to seek refuge. Turkish history is not different. Between the early Greek conquests, to the Roman annexation, even to the Ottoman Arab and Byzantine struggles, Turkey is no stranger to armed conflict. For civilian life refuge and resiliency was a fundamental requirement in the Turkish region. Today, the region of Turkey known as Cappadocia stands as a testament to that resiliency.

The Cappadocian country side is littered with "fairy chimneys" large vertical rocks that have lasted thousands of years. Into many of them are built dwellings, typically around cultural and monastic centers. There is something poetic about the way the rocks are formed and how they were used. The rocks themselves are a result of millenniums of weather erosion until the hardest and the most resilient core of the form is the only part left. In a way so too were the inhabitants of these dwellings, living under many conflicted circumstances, only the toughest and most rigid remained sheltering themselves in their similarly stoic dwellings.



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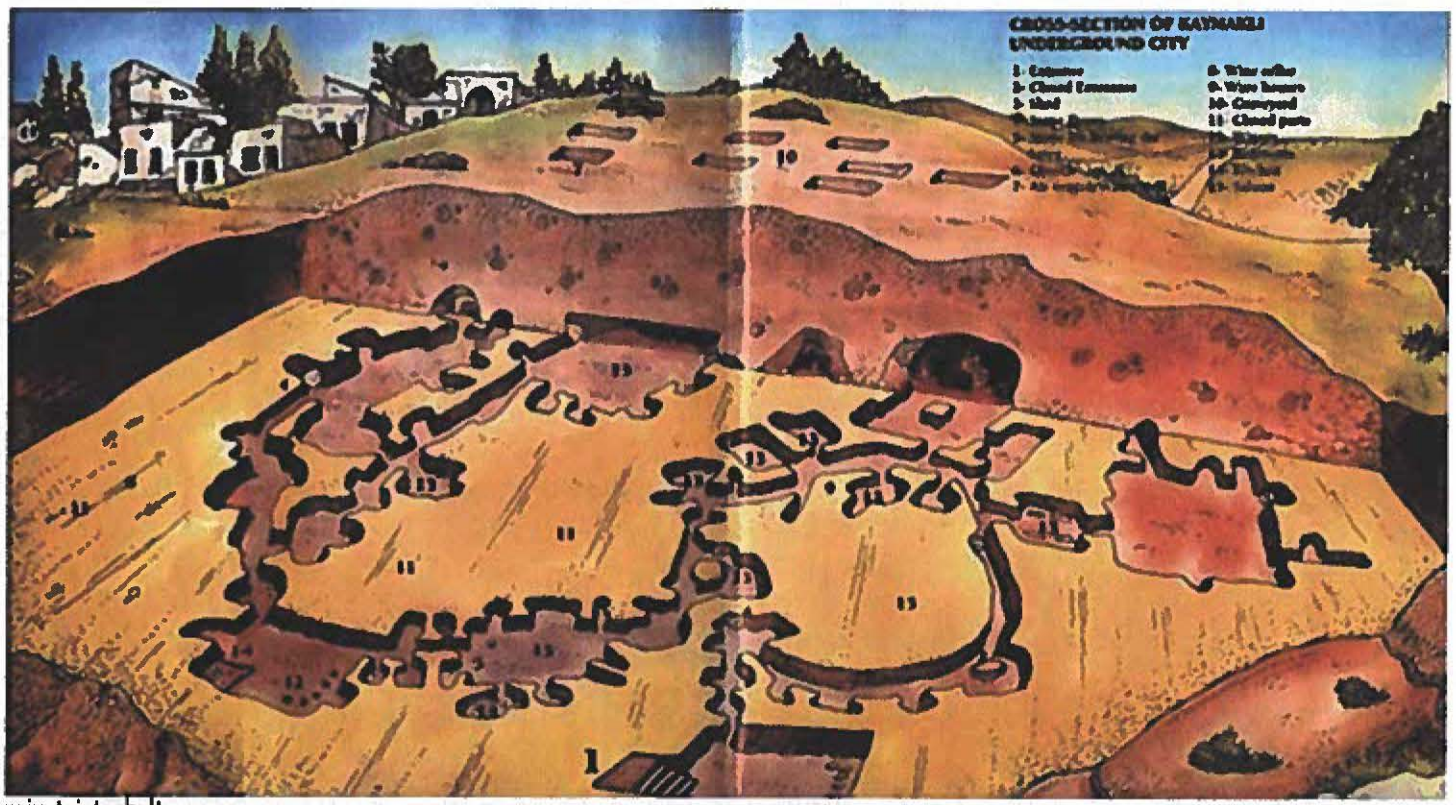
This approach to dwelling design was taken even further with places in the region like Derinkuyu and Kaymakli. Rather than individual houses, these were entire cities built into the ground fabric. The depths and extents to which these cities exist is still unknown fully and is a testament to their effectiveness as subversive towns weathering the storm of armed conflict. These locations were not just a series of connected subterranean houses but an entire urban network, functions ranging from livestock pens, to public gathering spaces to ventilation shafts and tombs. These cities aimed to be self sustaining further accomplished such by being attached other underground towns. Still despite their self sustaining nature, they were not meant to be inhabited at all times, Instead they acted as a spot of extended, easily defensible refuge when the surface became under attack. Traps could be laid out and choke points were easy to maintain. The ephemeral nature of the habitation of these cities is almost certainly due to the toll that underground living can have on a psyche, between claustrophobia, lack of light, and stale air, conditions below for an extended time could potentially deteriorate.

There is definitely something to be said for the form of these cities. There is unmatched almost headache inducing variation of hierarchy to these excavations. While functionally different, (and almost unprecedented for underground structures) the forms are different to. Small dwellings maintain their claustrophobic scale but there are also open cavernous spaces retaining smaller structures within them creating an interesting system best related to an idea of layers. Still on top of all of that there are light wells, water wells, vertical and horizontal circulation shafts.

The rock formations themselves also add to this wide range of hierarchy, the tools at hand during the time of construction meant the entire inside was hand crafted with

haphazard curvilinear forms. Surely the uniqueness of every individual crevice further clutters the already extensive hierarchy established within the functions and overall spacial changes.



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Program Narrative

It is difficult for the project to act to be analogue of its skyscraper cousins on a 1 to 1 practical base. Because of this, a vague, systematic, and experiential approach is the best angle for a programmatic narrative since and inverted skyscraper is gonna find tough competition trying to best every specific thing a super-tall accomplishes. It is meant as a response, a commentary on super-talls, not an attempt to one up them.

Green-space is a must as the project aims to show that green design is much more beneficial when air space can be opened up once in an inverted context. Piggybacking off the public service mentality of greenspace is the implementation of a public "draw space". Being such new and unapproached form, this project should contain ways to be experienced for people outside the clientele of the building's typically inhabited spaces. A retail shopping complex would be the easiest to implement, but theaters or recreation spaces may be a more provocative in response the subterranean conditions. A transit hub will also further a public agenda while also providing an appropriate response to integrating intersecting networks that already exist beneath the surface. It is important to keep these possibilities open and also towards the top of the excavation to take advantage of familiarity by being closer to the surface level.

Residential should best be left out because despite the truly unique qualities of the underground, the stigma of subterranean habitation is too controversial for the larger scale intents of this exploration.. The project seeks to be a celebration of everything great about exists beneath. Attention should be brought onto the gradient of light conditions that can be experienced instantaneously by simply traveling down. Contrasts between light and dark should be heightened. The thick poche of the ground can begin to be felt. The monumentality of an excavation will draw the eye. The absurd will be noticed.

Programmatic Precedents

-When undertaking a design of an entirely new form- a form built around a submerged void, it is neigh impossible to find a perfect programmatic precedent. Instead it is better to look public servicing skyscrapers and take away what they succeed with and what they struggle to execute on.

Precedent 1-Penn Plaza and MSG

It is divided up into three major parts, an office tower, a transit hub, and an entertainment district. While the exact type of entertainment here-a sports complex, is different from my perceived attempt, the notion of a rather large-scale public draw remains. One of the most important reasons this project has been selected is because its failed implementation gives even more justification to my parti. The MSG Penn Plaza complex has been derided for years for its aesthetics and destruction of major historical landmarks. These programs can still work in harmony with the benefit of exceptional formal features, no longer a visual blight, instead a destination, a marque location in the city.

MADISON SQUARE GARDEN CENTER • *architect* CHARLES LUCKMAN ASSOCIATES; *general contractor* TURNER CONSTRUCTION CO. & DAN E. WEBB CORP.; *consulting engineers* SYSKA & HENNESSY, INC.; *plumbing contractor* WACHTEL PLUMBING CO., INC.; *plumbing subcontractor* GLAUBER, INC.; *fixture manufacturer* KOHLER CO.

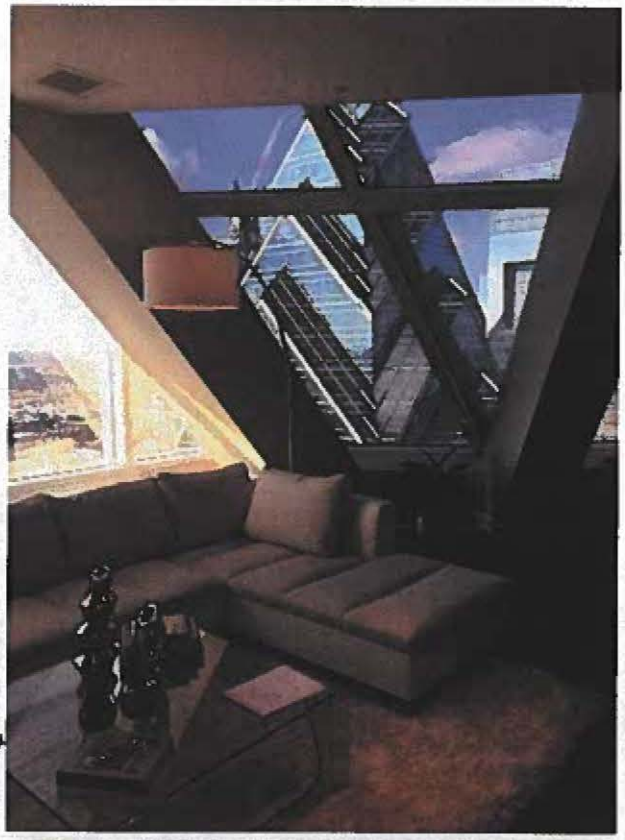
TWO PENNSYLVANIA PLAZA • *architect* CHARLES LUCKMAN ASSOCIATES; *general contractor* TISHMAN REALTY & CONSTRUCTION CO., INC.; *consulting engineers* JAROS, BAUM & BOLLES; *plumbing contractor* WACHTEL PLUMBING CO., INC.; *plumbing subcontractor* GLAUBER, INC.; *fixture manufacturer* KOHLER CO.

Madison Square Garden Center

—a new international landmark

Precedent 2-Liberty Place

Liberty Place in Philadelphia is another triple program complex in an urban setting. This one combines residential, retail, and offices in what was the tallest building in Philadelphia for over twenty years. While not directly integrated into the design, the building also offers nearby access to the subterranean transit system. In terms of organization the residential exists on the highest floors, the retail mall on the ground, and the offices exist within the middle. The retail mall sizeable and services not only the tower occupants, but acts as a main draw for the entirety of center city, especially the food court. In an inverted organization this approach could offer a provocative twist on the organization, a sixty story structure with the priciest units at the nadir, offering a new almost ironic outlook on the high-class spaces



Precedent 3-Cira Center South

Cira Centre South comprises the heaviest portfolio of programs amongst the three. This project, also a high rise, contains retail, residential, restaurants, a hotel, and most importantly an elevated connected greenspace. Provocatively this project advertises itself as a "vertical neighborhood". Given the historical precedents for my thesis being primary residential, there is something tangible about keeping this "vertical neighborhood" idea into my parti, albeit vertically downwards instead of upwards. Still the most provocative piece of this project is the green space connecting the two towers of this plaza. Rather than being a park around the base, this green space is designed into the architecture itself, elevated above the surface level, doubling almost as a gantry circulation space. So few large scale projects build green park space into their program that this approach will offer a good precedent to analyze how large a greenspace space should be in relation to the other programmatic application of the design.

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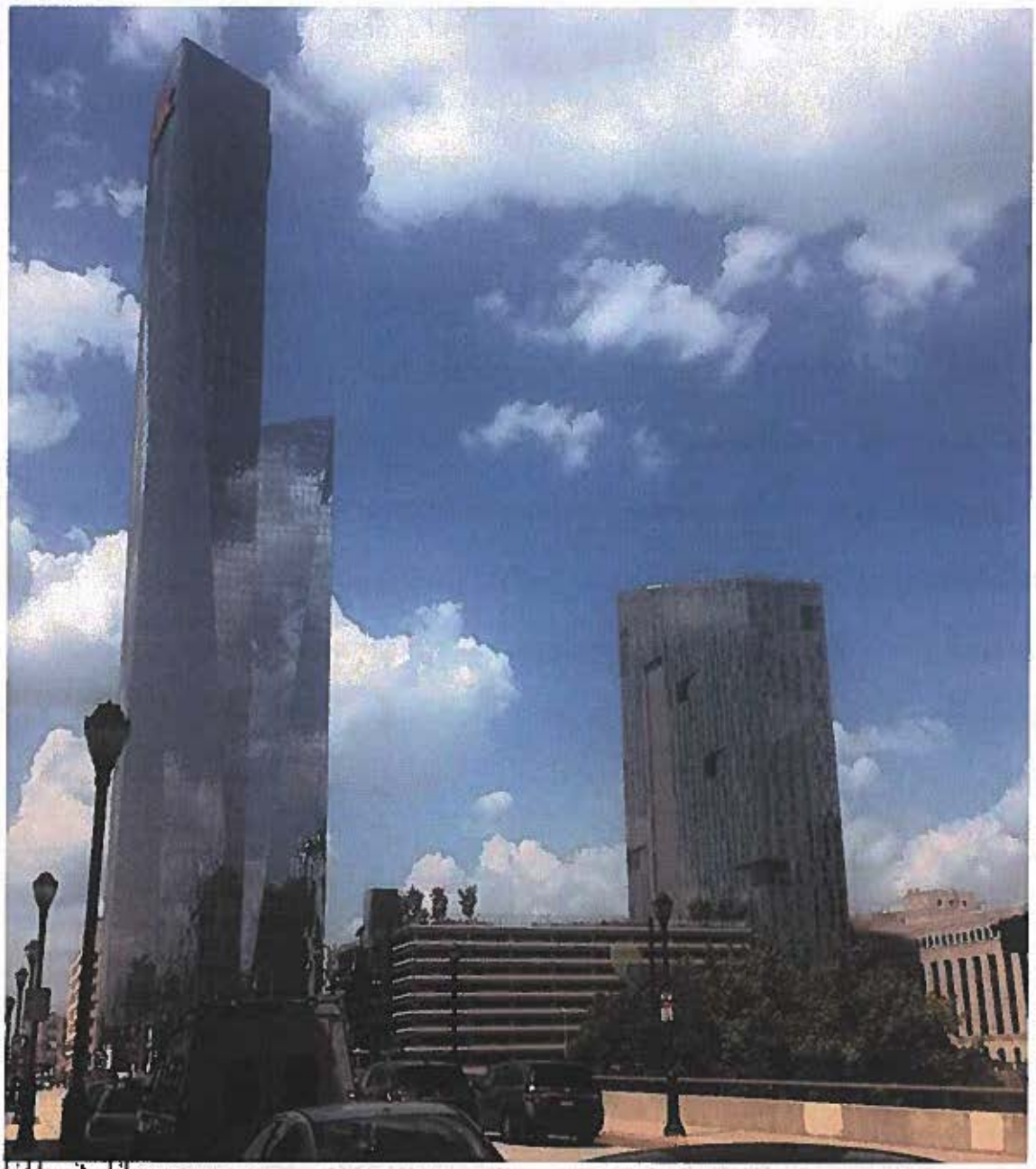

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Site Narrative

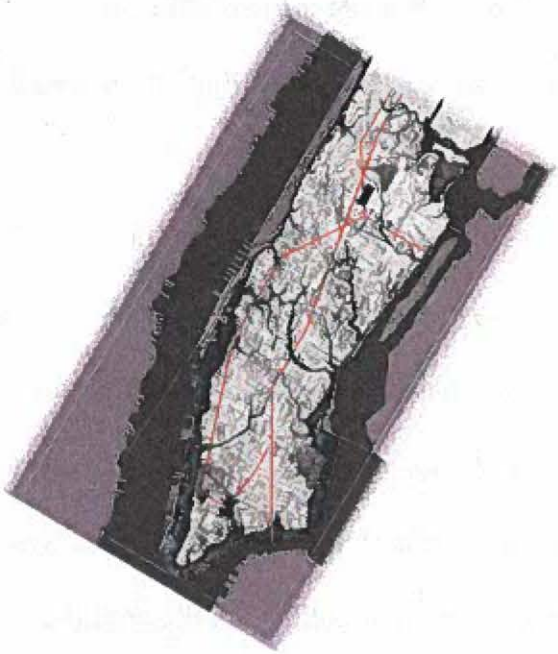
Site selection for the project requires a much more unorthodox approach. Whereas a typical design parti requires thorough analysis of the context condition, a project involving a true activation of the ground plane takes into account a different kind of context entirely. The constraints of the program, the required exposure of such, and formal approach to antithetic contemporaries make the island of Manhattan a prime location. Further compounding the potency of Manhattan is it being the epicenter of super-tall construction. Formals responses work best in close proximity,

Manhattan sits upon hundreds and hundreds of feet of bedrock, making a deep urban excavation of the space indeed possible. However, bedrock is not the only thing under the surface of the island. Water mains, subways, power lines, sewer lines, tunnels and caverns all line the ground fabric of New York City. Moreover, the soil conditions can change easily and there are existing natural water conditions from the pre-industrial era of the city that remain underground to this day. Egbert Ludovicus Viele composed a map in the mid-19th century that delineated these preexisting ground conditions. To this day the map remains a potent example of what existed before, and still manages to inform modern architects and engineers of what to expect within site ground conditions when starting a new project.

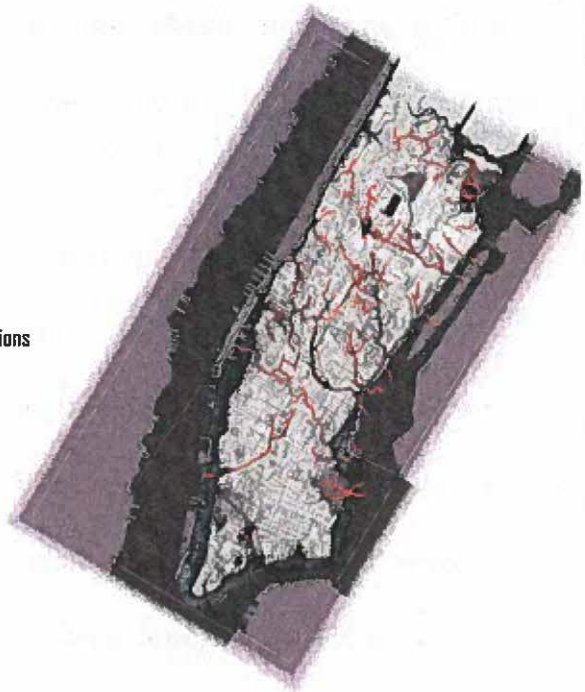
The site selection must be contingent on all these factors as well as by super tall development. Simply selecting a site based on preferable surface level context conditions misses a majority of the point when the bulk of the project stands to exist beneath it. Therefore, within the boundaries of the site of the island, this excavation seeks to be located at a crux of the all the underground systems. Integration of the of the natural underground water passages and subterranean transit lines lend themselves to a more vivid and realized project.

Viele-Based Diagramatic Analysis

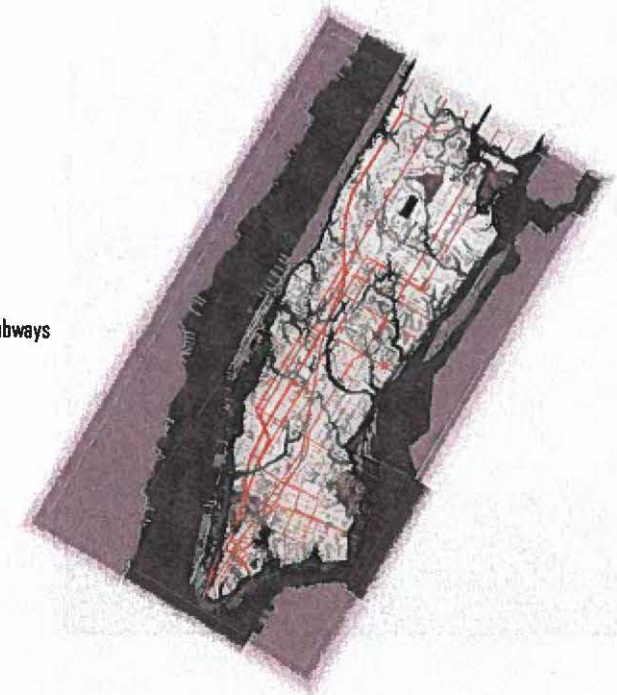
Water Tunnels



Prexisting Conditions



Subways

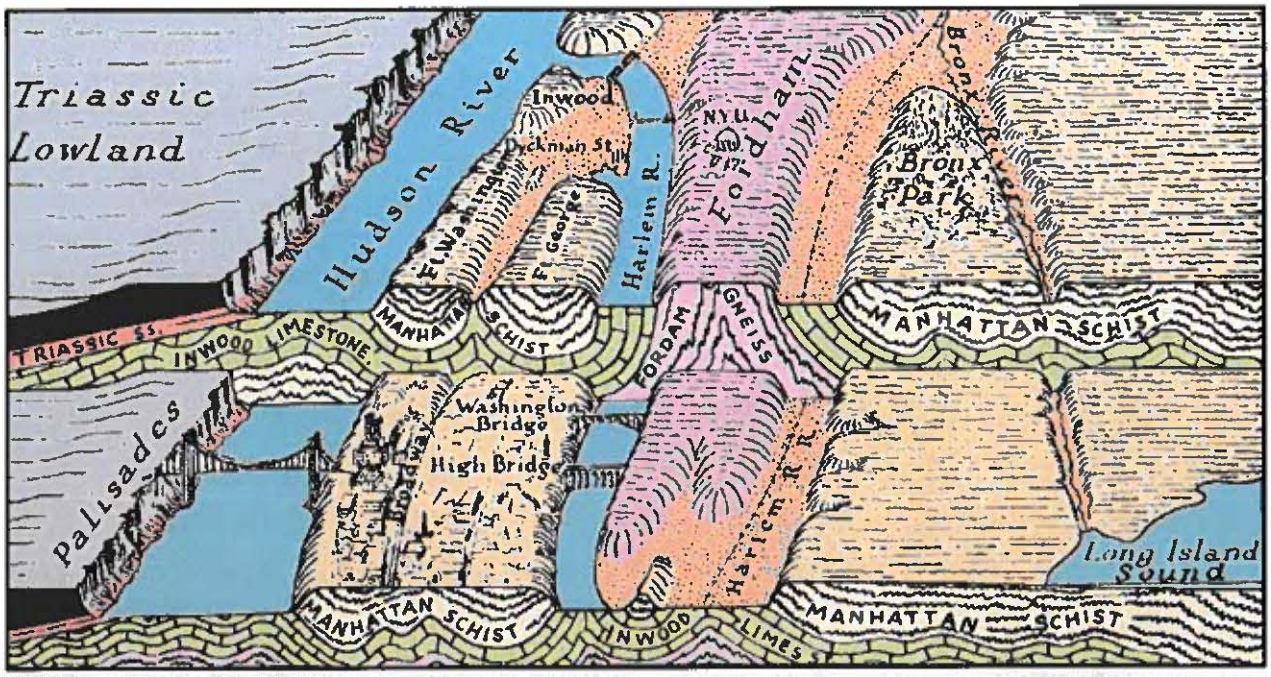


Composite

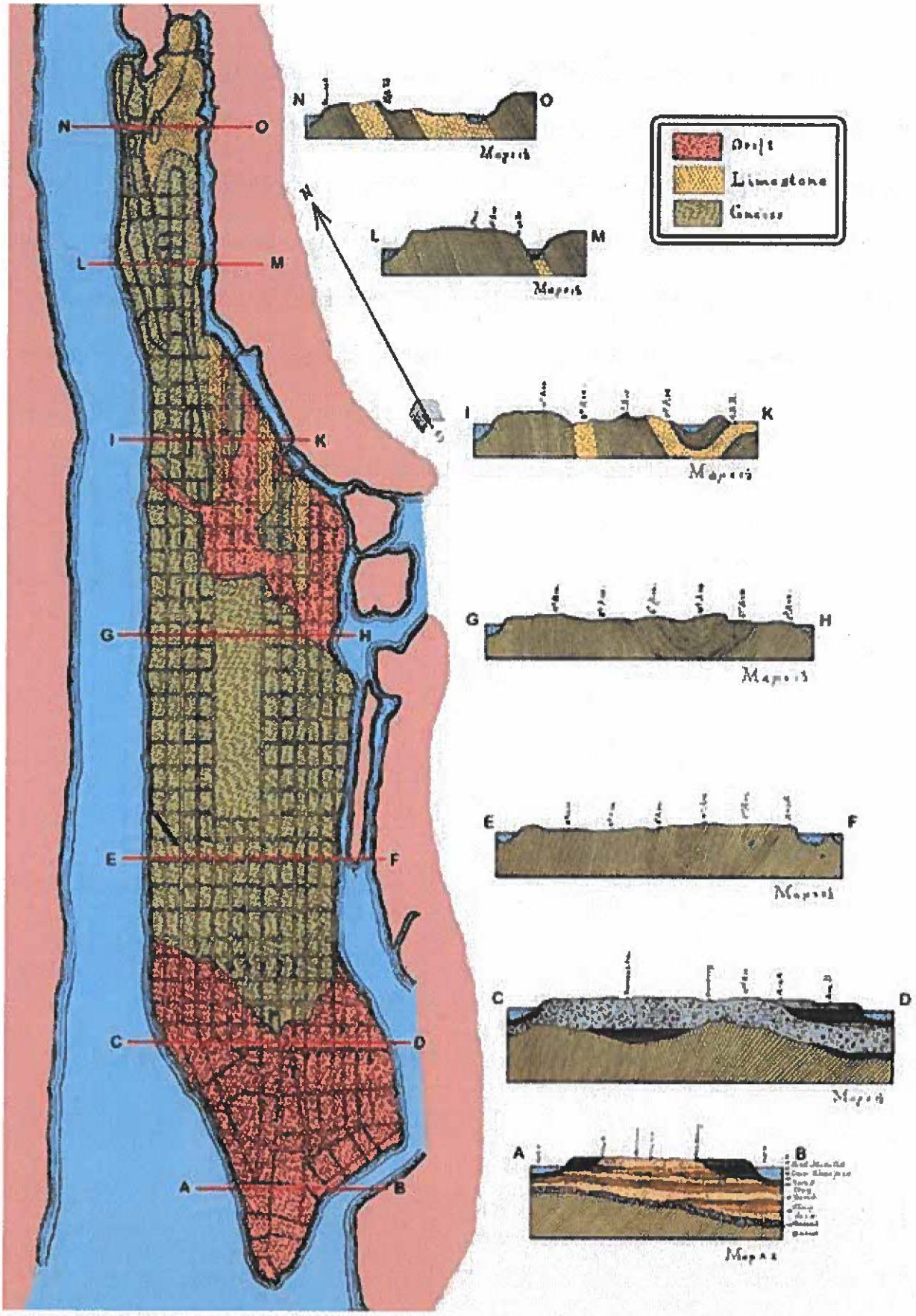
Underground Context of Manhattan

At this point it becomes necessary to bring up what exactly comprises the subterranean context of Manhattan. The aforementioned Viele Maps in addition to the more contemporary records help paint a relatively clear picture as to what comprises the underground.

A majority of the financial district's tip is packed-on land from the colonies. Through that formation and the original bedrock many streams and currents run through the ground originating from both the Hudson and east rivers. The main rock formation amongst Manhattan is known as "Manhattan Schist". About one thousand feet below that weaves "Fordham Gneiss". Limestone shifts against the opposite bank of the Hudson river. The depth of the individual conditions changes depending on location, but the conditions themselves remain in their respective layering throughout regardless.



NYC Regional Geology #238248

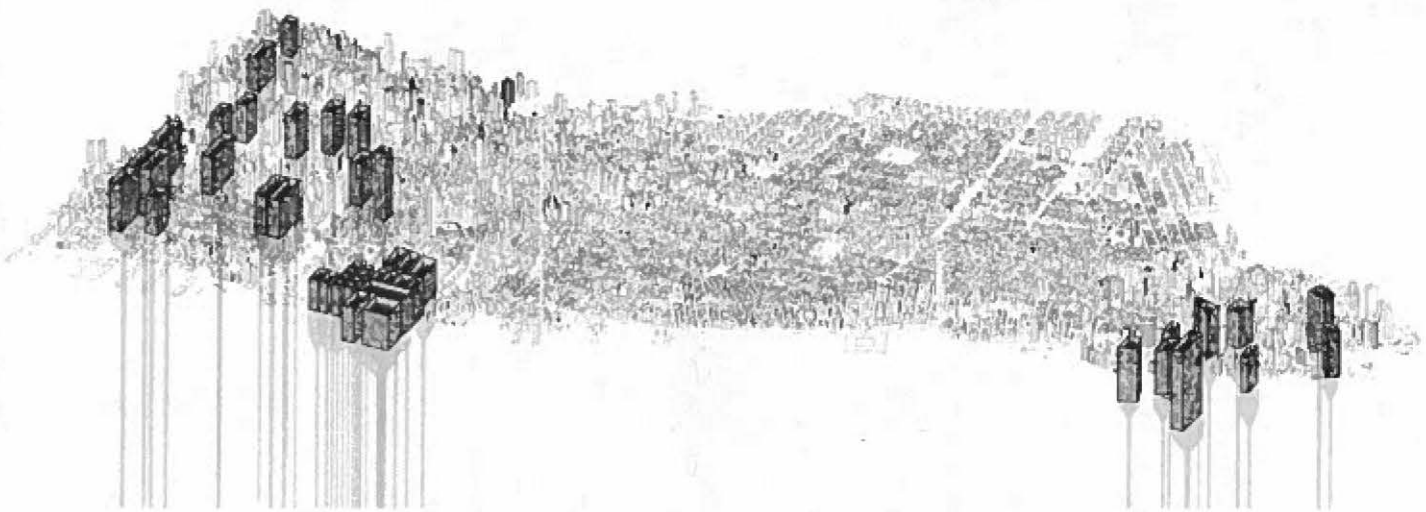


JF Kemp Geological Survey

In addition to the natural conditions, man made conditions exist as well. The subways typically range from about 60-150 feet into the earth. Around either side of the subways exist the gas, water, sewage, and electrical lines. These lines run directly under the street when no subway is present. Below this runs the main water tunnels which feeds the water mains. These tunnel exist much deeper at around 600 feet, and are much wider in diameter than the systems running directly under the streets. The contextual buildings themselves have foundation systems that range from twenty to thirty feet deep, depending on the scale of the building, piles may be needed as well which tunnel usually no further than 100 feet down.

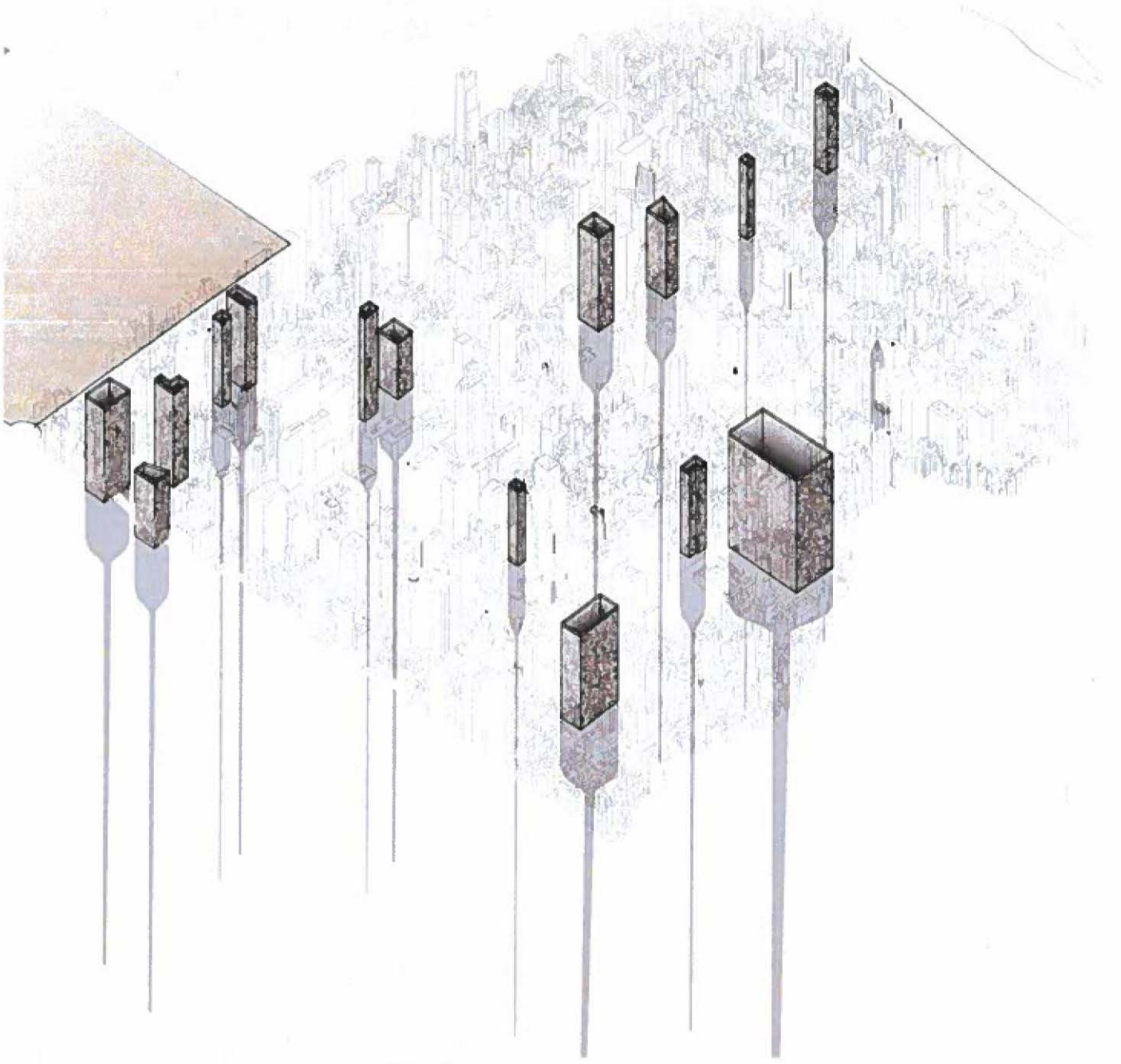
Process and Proposal

The first move of a design response started by a straightforward analysis of the built form of the city scape. If the moves and partii's were to be in response to skyscrapers implications, looking at the target of critique was a good starting point. Three distinct neighborhoods in Manhattan comprised a dense majority of the super-talls- Hudson Yards, the Financial District, and Midtown Manhattan. By extracting the blocks which the towers are located ,and then replacing the blocks with excavations of depth relative to the original heights of such towers, a good sense of relative scale on the systemative level can be viewed.

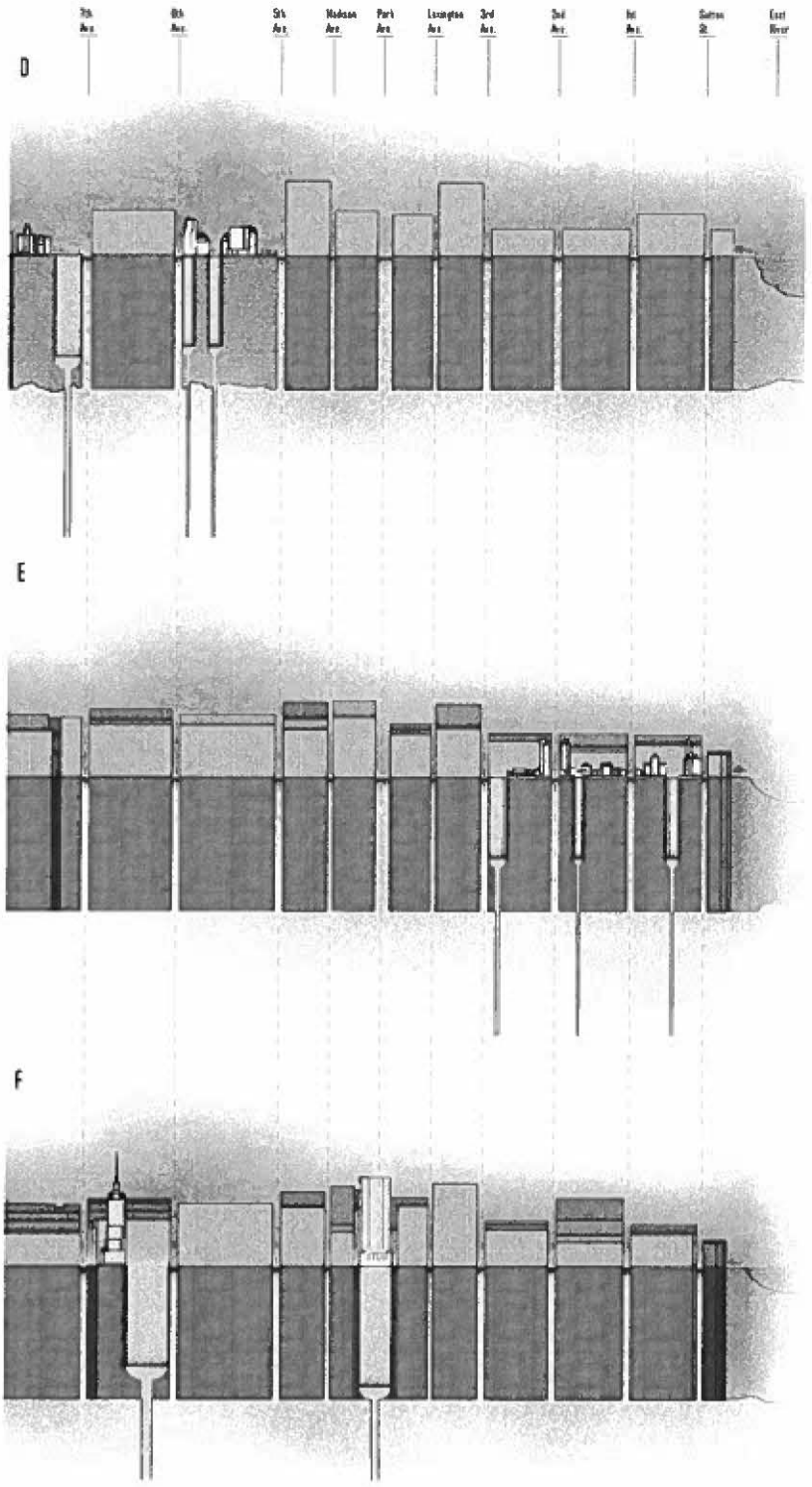


After delineating the three distinct locations, localized conditions helped determine the specific neighborhood for enhanced analysis. The Hudson Yard's constructs are all incredibly recent and a result of recent zoning changes, an entirely new neighborhood in itself placing it an bubble, meanwhile the financial district is dominated by large scale offices. Instead midtown is varied, and contains an even spread of super-scraper locations. The border of central park provides further opportunity to expand upon the public realm. Now zoomed in on a specific neighborhood, a similar process was repeated

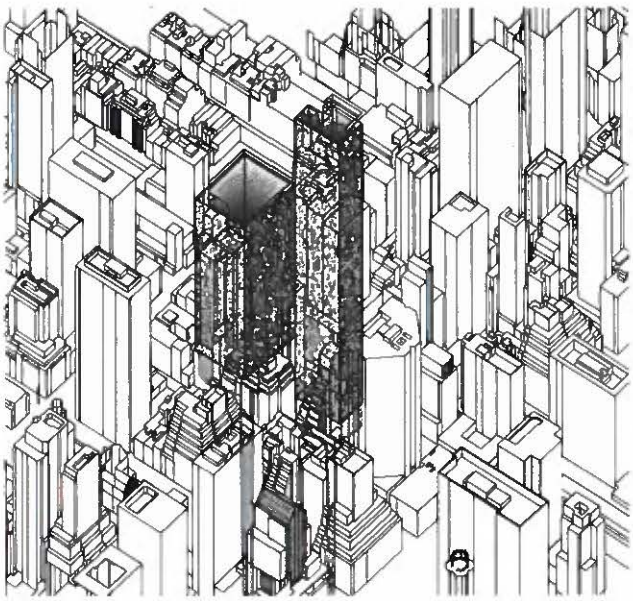
as last time, instead this time focusing on individual building footprints rather than entire blocks.

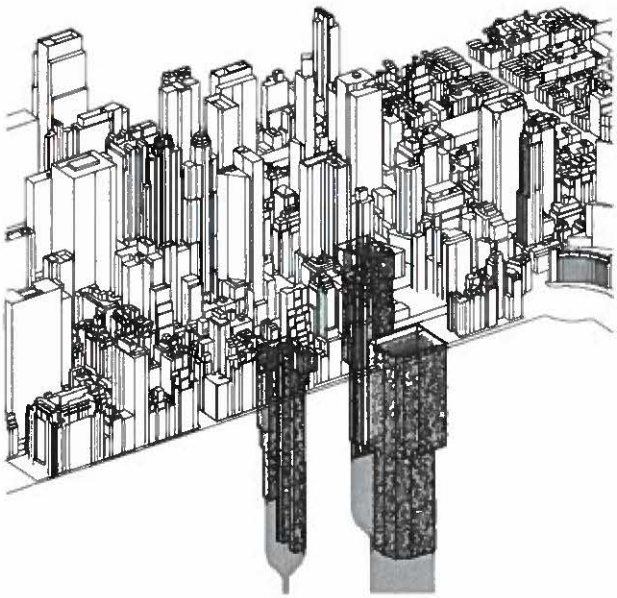


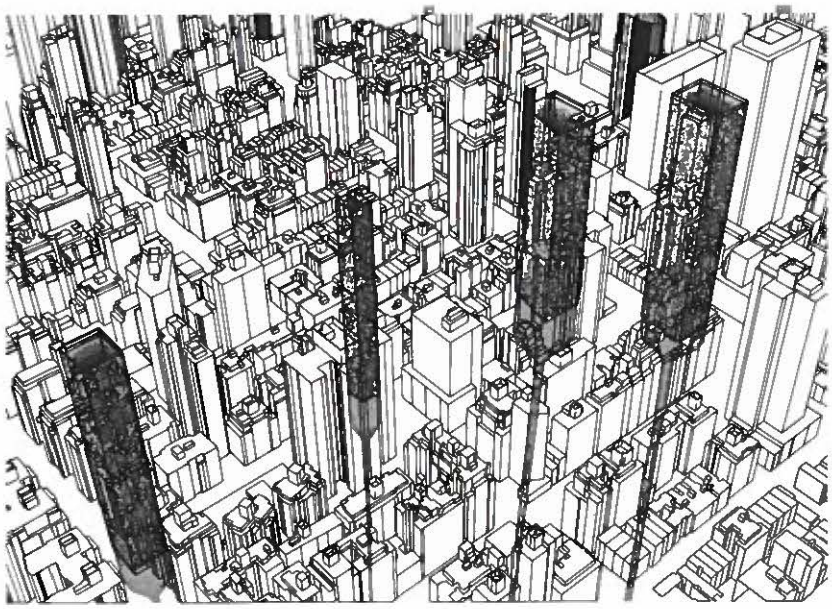
In order to determine the individual sites for further design within the system, further analysis was undertaken on the neighborhood of midtown Manhattan. A diagrammatic model was created and then analyzed through section in order to better visualize the relationships and scale between the excavated scraper form.



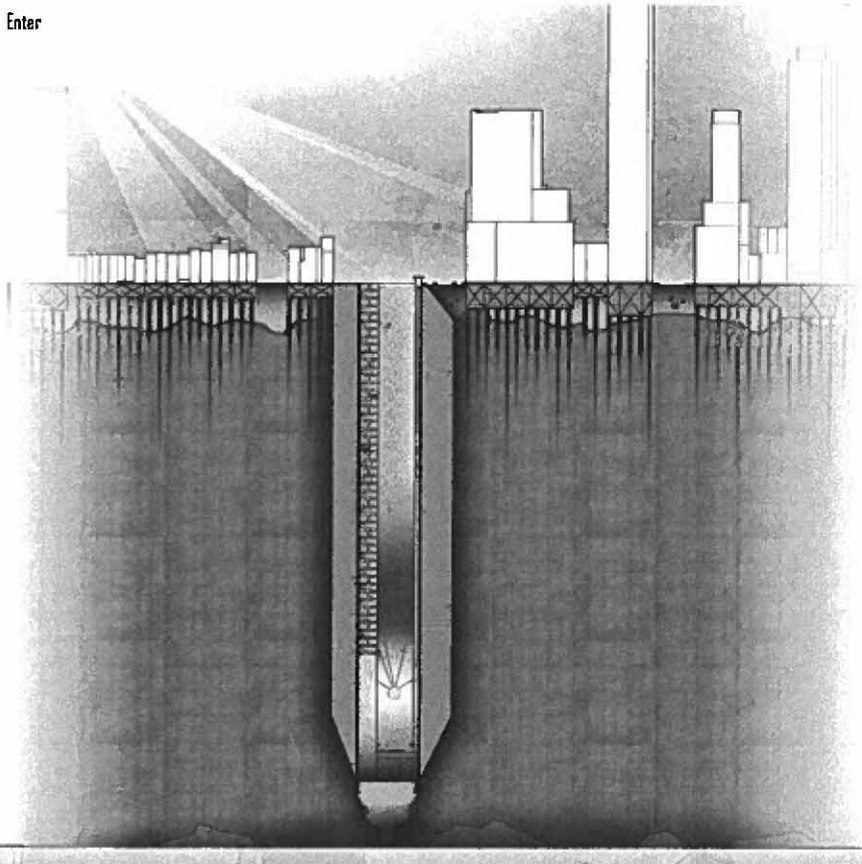
Eventually three sites were determined, one a control site, an excavation designed solely on its own merits of deep void space, The only site condition lending to it- a corner lot, enhancing the street presence and views of its strong monumentality. The next site, standing adjacent to the boundary of Central Park provides a location to respond to narratives regarding the public realm. Finally the last of the three sites is a row of blocks along a subway route and a soon to be finished water tunnel- "Water Tunnel No. 3". This site lends the best sense towards a systematic relationship between excavations.

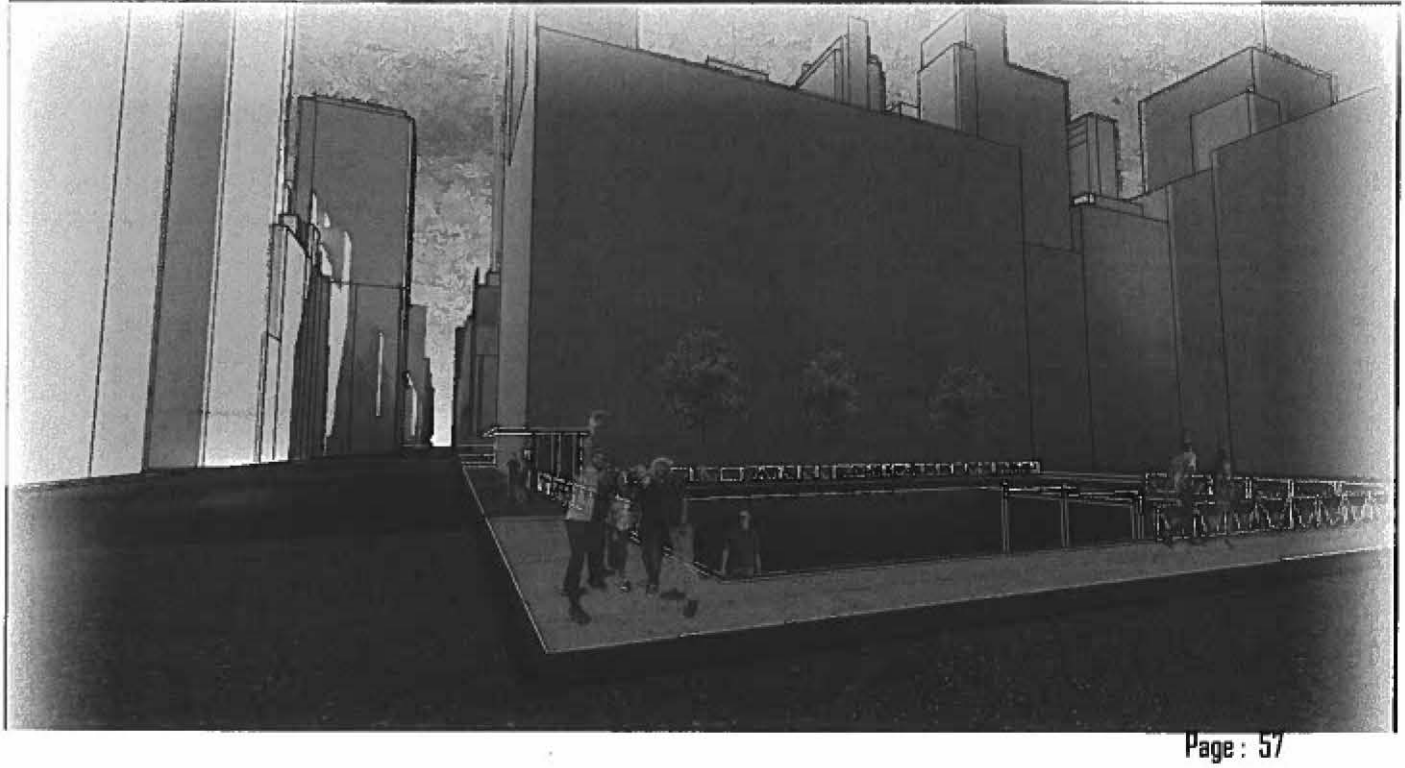




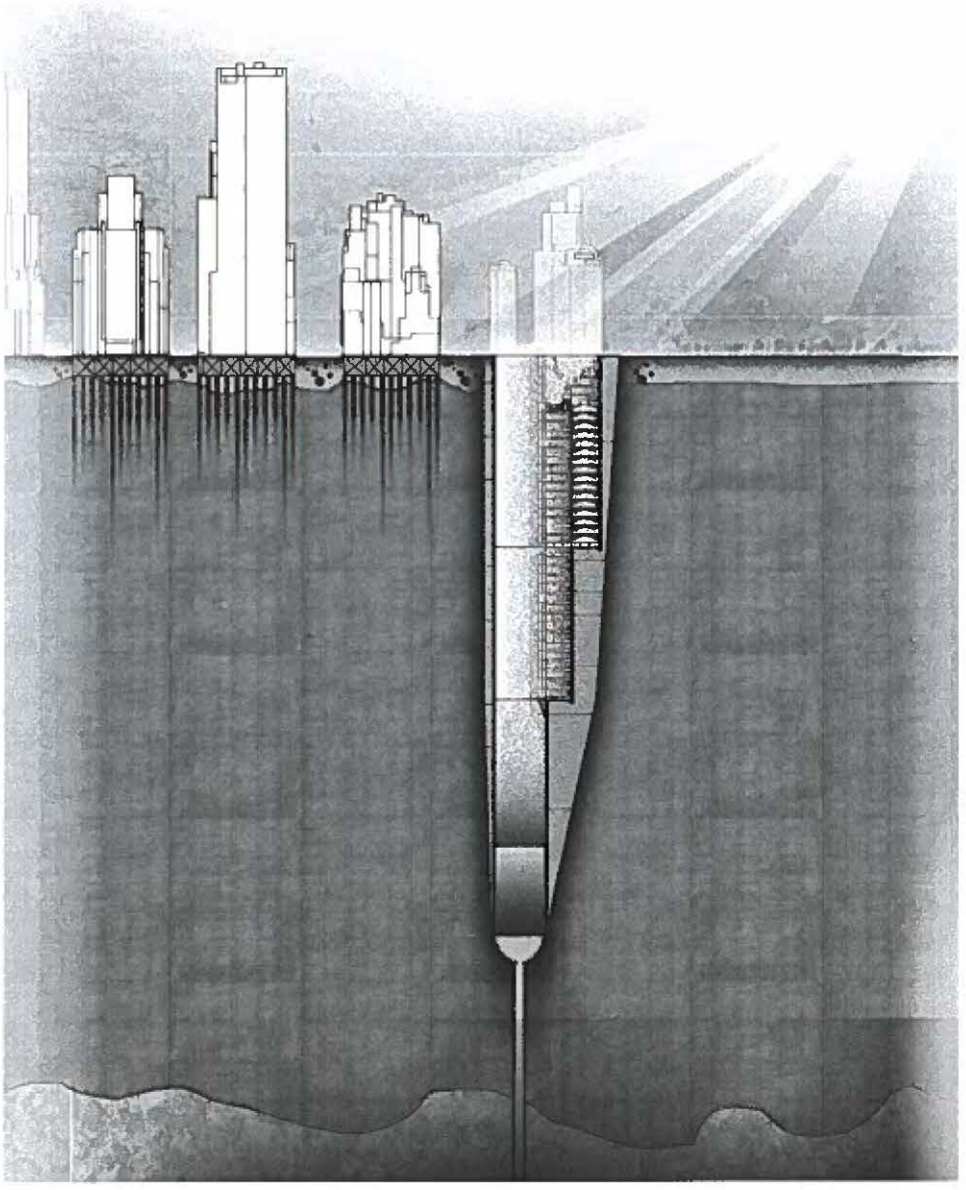


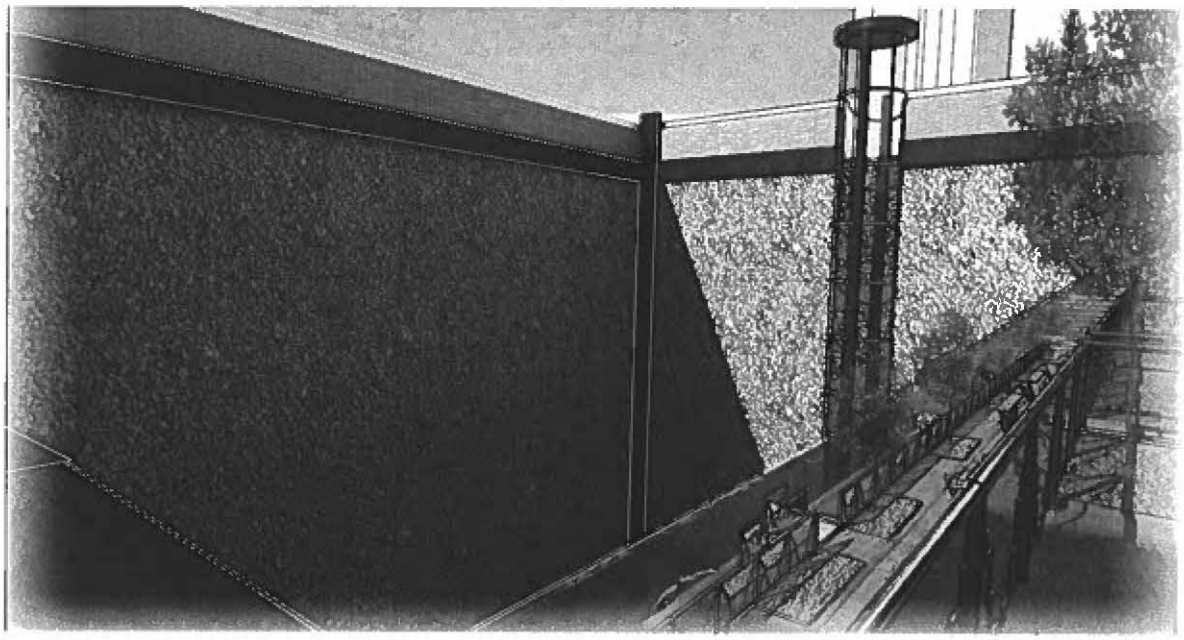
After having selected the sites, development of individual designs could then be commenced. For the control site, the focus became street presence and contrast of light and dark at the deepest depths.



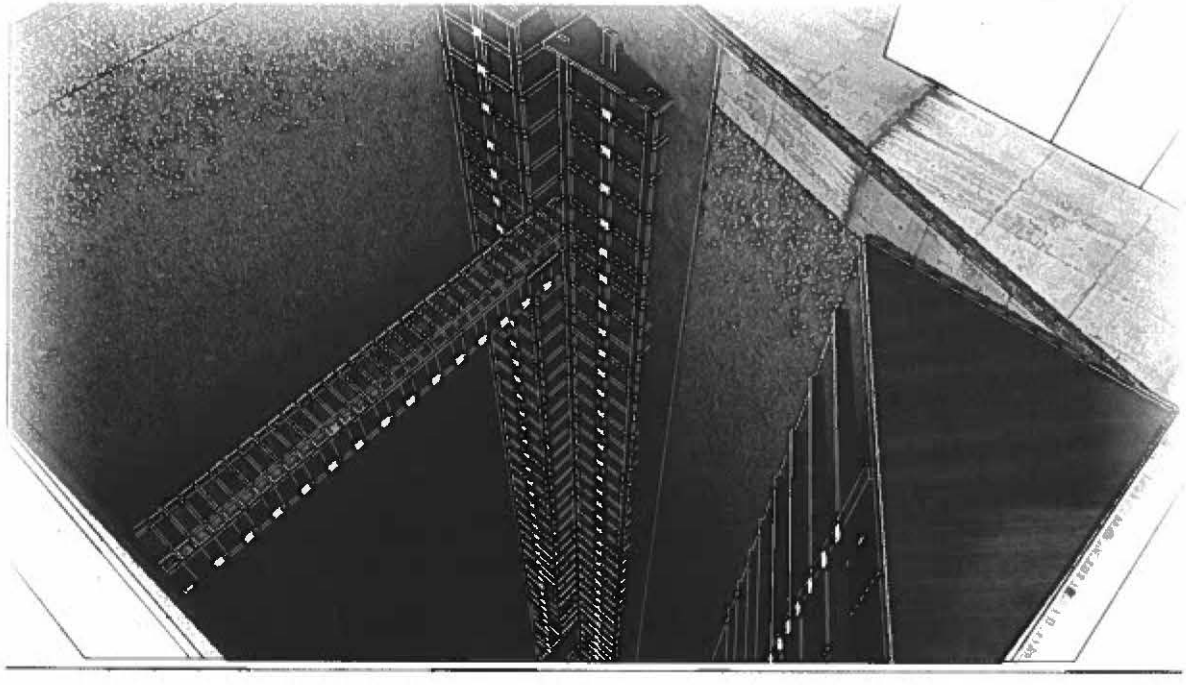


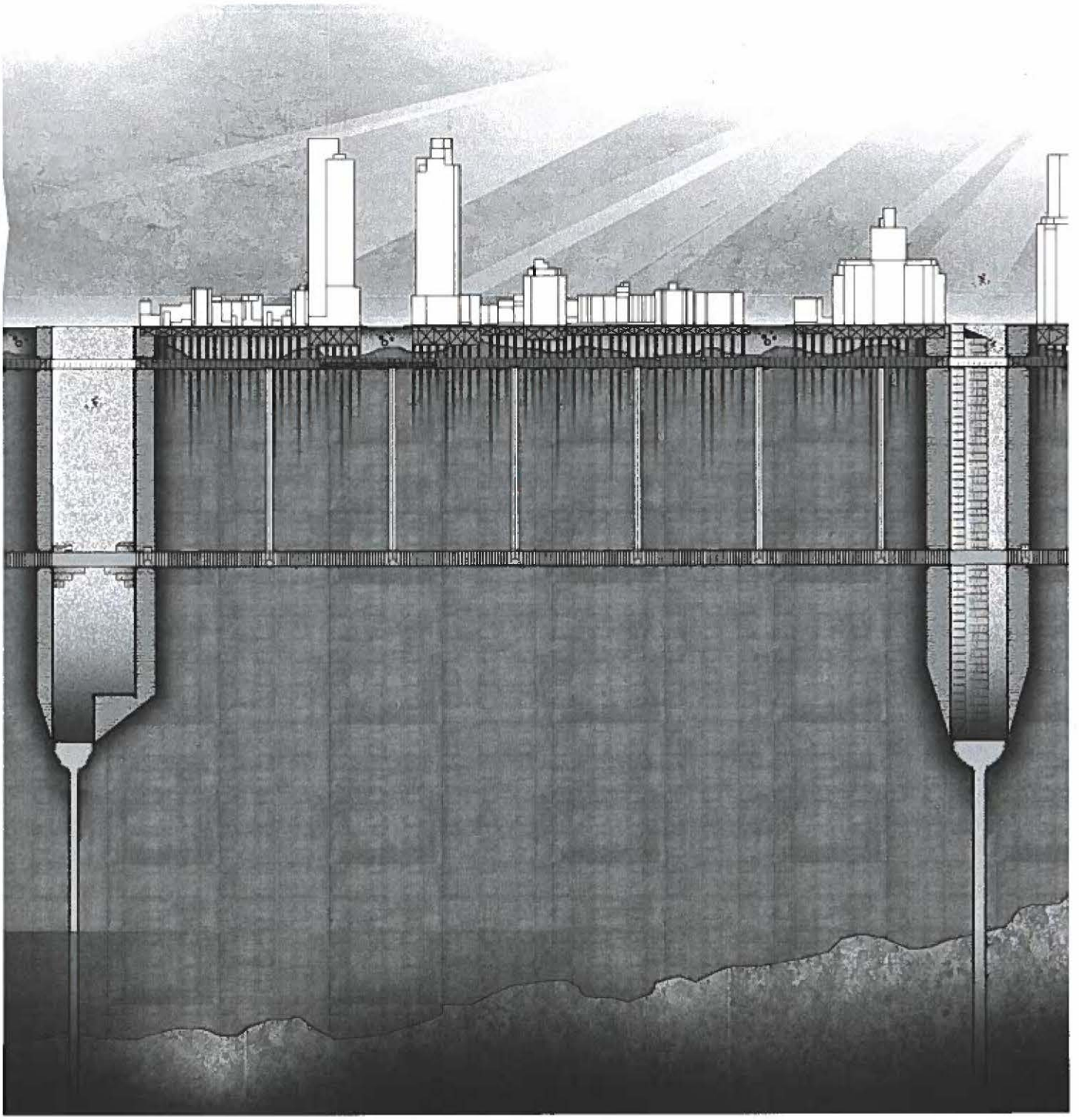
The site adjacent to Central Park became the focus of a development emphasizes park space expansion. Exploiting the use of the sound dampening of sunken spaces, the dip in this design created a distinct realm of its own, the addition of a public swimming space attempts to heighten the exceptionalness of the space. The water-filled nadir of the excavation seeks to play off the integrated water feature, as well as reference historical uses of similar negative forms such as cisterns and step-wells.





The last site used sought to take advantage of the intersecting subway line, water tunnel and proximity of two sites. One site has construction to base of the void, whilst the other only contains mass around the water tunnel. While all spaces within the proposal are meant to be vague and implicative, these two partii's are meant to heavily imply subway station access, presence, and illuminations, as well as a water pumping station respectively.

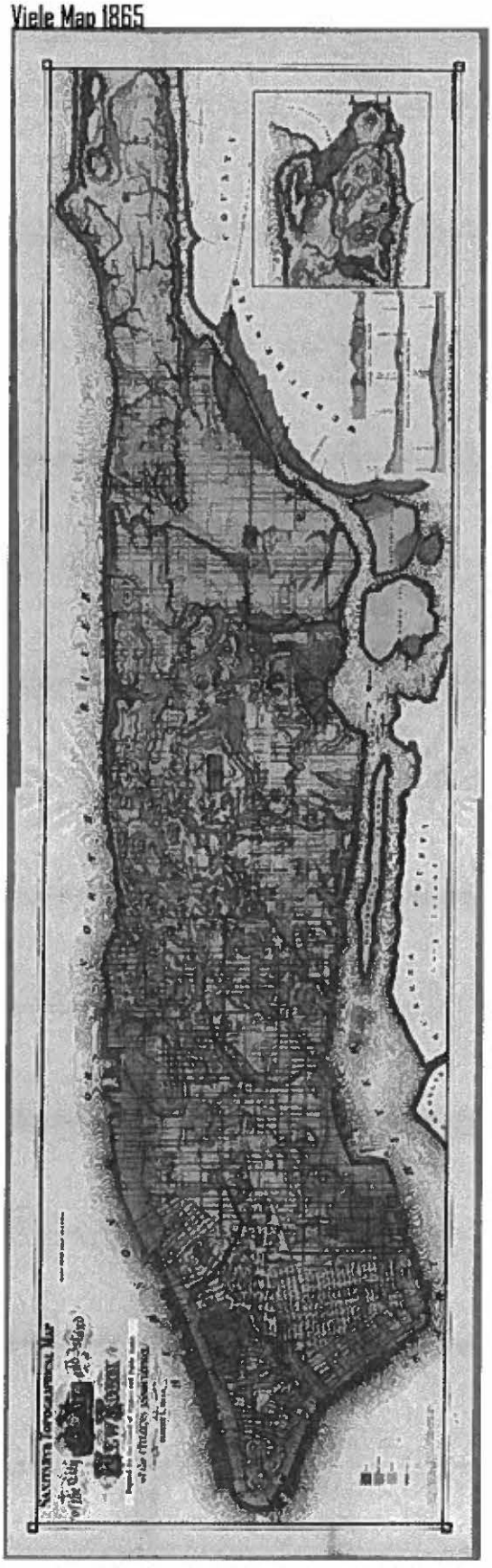




Further Reference Images

Courtesy of NYC DDC

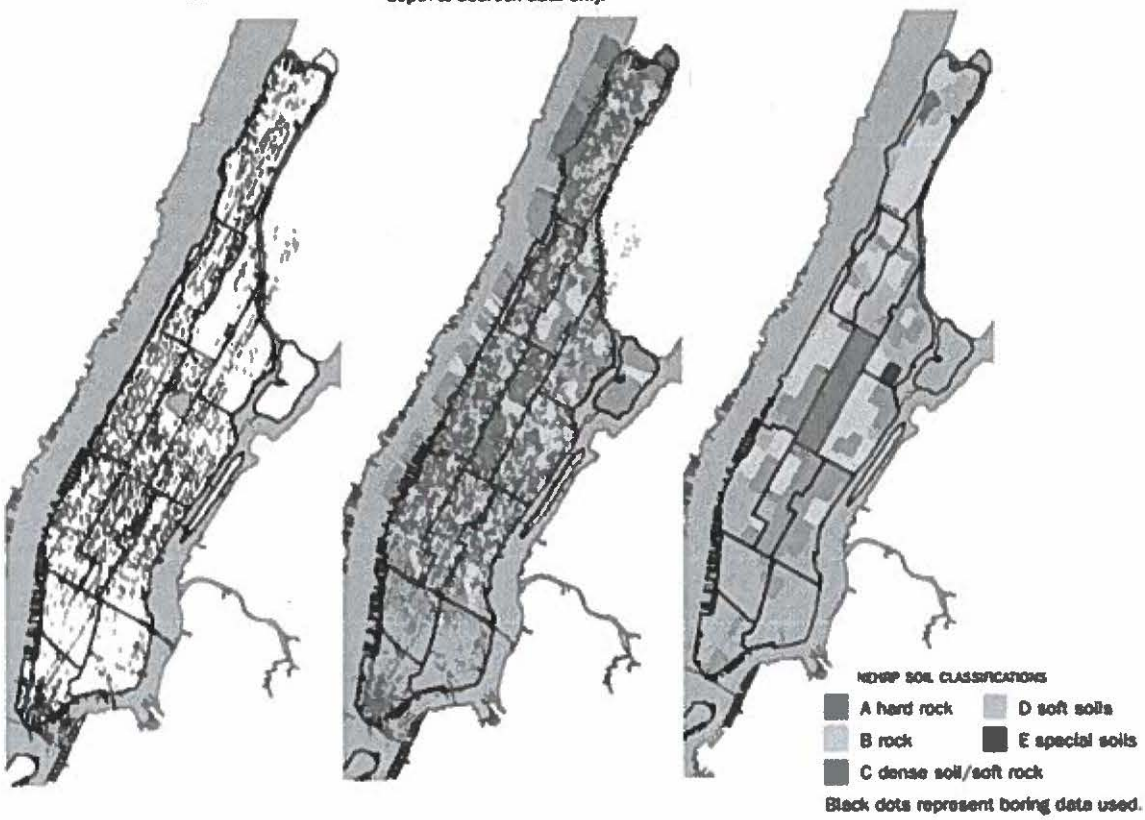
Viele Map 1865

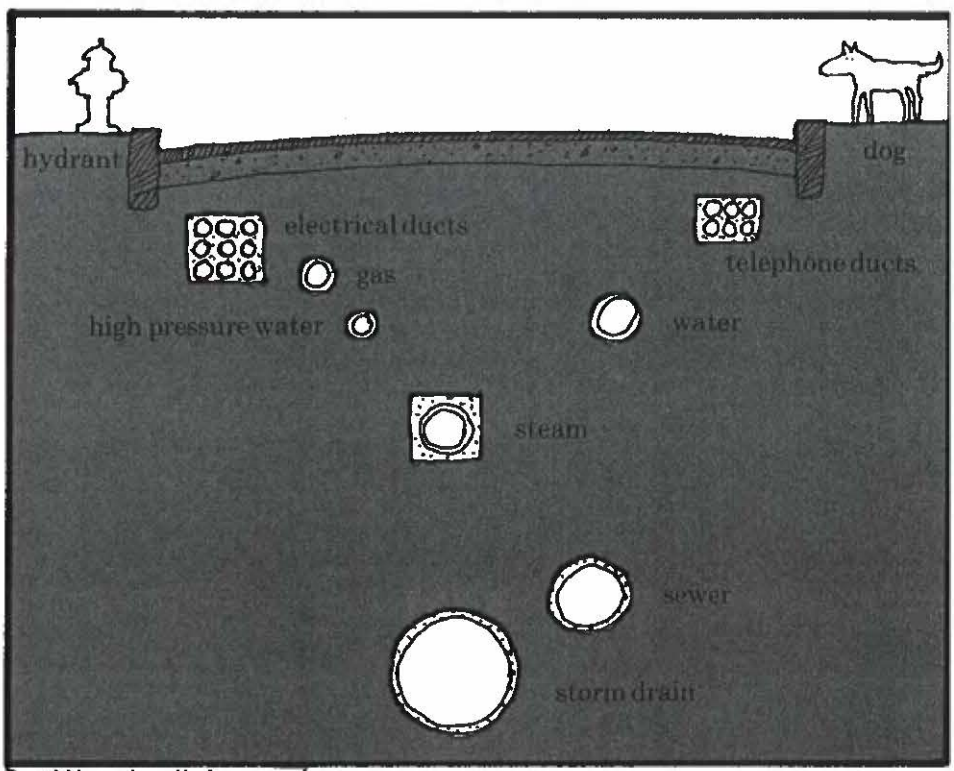


Boring data map for Manhattan which was used to create the next "Thiessen Polygon" map.

"Thiessen Polygon" map of site classes in Manhattan derived from depth-to-bedrock data only.

Census-tract-based map of site classes in lower Manhattan using all boring data and additional geological information.





David Macaulay- Underground

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Molotch, Harvey. "The City as a Growth Machine: Toward a Political Economy of Place." American Journal of Sociology, vol. 82, no. 2, 1 Sept. 1976, pp. 309–332., doi:9-10-18.

"A city and, more generally, any locality, is conceived as the areal expression of the interests of some landbased elite. Such an elite is seen to profit through the increasing intensification of the land use of the area in which its members hold a common interest. An elite competes with other land-based elites in an effort to have growthinducing resources invested within its own area as opposed to that of another. Governmental authority, at the local and nonlocal levels, is utilized to assist in achieving this growth at the expense of competing localities. Conditions of community life are largely a consequence of the social, econimic, and political forces embodied in this growth machine."

Wener, Richard, and Hannah Carmalt. "Environmental Psychology and Sustainability in HighRise Structures." Technology in Society, vol. 28, no. 1-2, 2006, pp. 157–167., doi:10.1016/j.techsoc.2005.10.016.

"The focus of this paper is on sustainability in the context of the built environment with primary emphasis on consumption of physical resources, wherein a sustainable building is one that improves occupant health and performance, minimizes energy and material consumption, and stimulates a healthy ecosystem."

Bachelard, Gaston, et al. The Poetics of Space. Beacon Press, 1964.

"Verticality is ensured by the polarity of cellar and attic, the marks of which are so deep that, in a way, they open up two very different perspectives for a phenomenology of the imagination. Indeed, it is possible, almost without commentary, to oppose the rationality of the roof to the irrationality of the cellar"

Dripps, Robin. "Groundwork." Fluxworks, fluxwurx.com/jstudio/wpcontent/uploads/2011/01/dripps_groundwork.pdf

"Grounds operate with great nuance. They resist hierarchy. There are no axes, centers, or other obviously explicit means of providing orientation, Single, uncomplicated meanings are rare. Instead, there are open networks, partial fields, radical repetition, and suggestive fragments that overlap, weave together, and constantly transform. Within this textural density edges, seams, junctures, and other gaps reveal moments of fertile discontinuity where new relationships might grow."

Brebbia, C. A., et al. Underground Spaces: Design, Engineering and Environmental Aspects.
WIT, 2008.

"Interest in underground development, especially in urban areas, is constantly increasing internationally. As noted, the main driving force behind the process is the continuously growing urban areas, coupled with the
demand for high quality environmental conditions. Unless one or both these factors cease to exist, the exploitation of the urban subsurface will undoubtedly be in the centre of attention"

Burton-Page, John, and Georges Michell. Indian Islamic Architecture: Forms and Typologies, Sites and Monuments. Brill, 2008.
"[The] vāv, is of high artistic and architectural merit as well as functional; it is more elaborate than its northern counterpart and consists of two parts: a vertical circular or octagonal shaft, from which water may be drawn up as a from an ordinary well, and a series of galleries connected by flights of steps, with pillared landings on the lower galleries supporting the galleries above; passages from each landing run to the shaft where there are frequently chambers which form a cool retreat in the hot season."

Macaulay, David. Underground. Paw Prints, 2008

Denvir, Daniel, and CityLab. "The Big, Enormous, Truly Massive Amounts of Money Behind Tall Buildings." CityLab, 12 June 2015, www.citylab.com/equity/2015/06/the-big-money-behind-tall-buildings/395690/.

Goldstein, Elizabeth. Accidental Skyline Report. Municipal Art Society of New York, pp. 1–54, Accidental Skyline Report.

"Underground Thermal Energy Storage." Underground Thermal Energy Storage UTES | Geo Exchange Systems | ThermalBanks Save Carbon Emissions | Thermal Energy Storage Using Interseasonal Heat Stores, 2007, www.icax.co.uk/Underground_Thermal_Energy_Storage.html.