ABSTRACT

Title of Thesis:	"WORKSHOP OF THE WORLD": UNITING COMMUNITY AND CREATING OPPORTUNITY THROUGH ADAPTIVE REUSE
	John Vogtman
	Master of Architecture, 2017
Thesis directed by:	Professor, Garth Rockcastle, School of Architecture, Planning, and Preservation

An abundance of abandoned structures exist in post-industrial cities throughout the United States. Many of these structures have significant historical and cultural ties which contribute to the identity of the city. This thesis seeks to examine how these remnants can be adaptively reused or revalued to strengthen and regenerate communities while retaining elements of the character and history of the site and building. Using the city of Philadelphia and the Delaware Riverfront as a case study, it identifies a range of possibilities and focuses on the PECO Delaware Generating Station as a final design proposal.

“WORKSHOP OF THE WORLD”: UNITING COMMUNITY AND CREATING OPPORTUNITY THROUGH ADAPTIVE REUSE

by

John Vogtman

Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Master of Architecture
2017

Advisory Committee:
Professor Garth Rockcastle, Chair
Professor Michele Lamprakos, Committee Member
Professor Brian Kelly, Committee Member

FORWARD

One of my earliest memories, and possibly something that forever sparked my interest in architecture was going on bike rides with my father through a nearby community that was being constructed. Looking back, there was nothing special about this community. It was a typical suburb with a mix of rowhomes and single family houses, however; seeing something come from nothing was inspiring. Also, if we went on weekends or after the workers had left for the day, we were able to sneak in and explore some of the partially built houses. These were great experiences for me because our surroundings were constantly changing and I was learning and exploring at the same time.

When the community was complete we found new places to bike and mixed it up with some hiking along a nearby stream. A common thread in our explorations was experiencing the unknown. I'm sure he knew where we were going most of the time but for it seemed like we were always going somewhere new or extending the trip just a little bit further.

When I left home for college and moved to Philadelphia, I realized there were even more places to explore and more things to see in the city. There were unique neighborhoods, all different kinds of buildings ranging scale and style, new construction, a massive park system to escape the density of the city, and most of all the energy of the human spirit. I could walk the same path a hundred times and still notice something new or experience something different.

While exploring Philadelphia I was struck by the opportunity for growth and the grit left over from a history of industry. For me it created a connection and sense of pride in

place. The countless abandoned or underutilized industrial buildings were inspiring and sparked my interest for exploration. I found myself imagining what was inside, what the building was originally used for, and how it could be reused for something new.

At the pinnacle of completing my education at the University of Maryland it seems only right that my final project return to the city that solidified my interest in architecture. It is my goal to create an architecture that blurs the lines between the public and private realms, embracing the importance Philadelphia's history of making though the promotion of private industry while allowing the public to experience, explore, and learn.

ACKNOWLEDGEMENTS

Professor Garth Rockcastle

Without your guidance this thesis would not have been possible. Thank you for all the insightful ideas and always pushing me to be creative.

Colleagues and Classmates

Your constant encouragement and friendly competition pushed me to a level I would not have achieved otherwise. Looking back on my experience at Maryland it was though you that I truly learned the most.

CONTENTS

FORWARD ii

ACKNOWLEDGEMENTS iv

LIST OF FIGURES ix

BACKGROUND 1

THEORY 8

Designing for Change 8

Lifecycle – Beginning and Ending 9

Weathering 11

Aquatecture 13

Preservation 14

Conclusion 15

PROCESS AND METHODOLOGY 16

Building Driven Research 17

Public Schools 17

Industrial Buildings 22

Prisons 25

Building New 26

Neighborhood Driven Research 28

Low Income Neighborhoods 28

Transitional Neighborhoods 29

Developing Neighborhoods 30

Innovation Zones 33

New Neighborhoods 33

Infrastructure 34

Reading Viaduct 34

Market Frankford Line 36

Interstate 95 37

PECO Generating Station 38

Narrowing the Selection 39

Spring Garden 42
PECO Delaware Generating Station 43
Washington Avenue 43
Site Selection 44
HISTORY 45
A Selective History of Philadelphia 45
Fishtown 50
Philadelphia Electric Company Generating Station Site 51
Conclusions 52
SITE ANALYSIS 53
Larger Context of the Delaware Riverfront 53
Masterplan Review 55
Site Description 57
Delaware River 59
Context 60
Transportation 62
Climate 63
Topography 64
Access to Healthy Food 65
Existing Building Description 66
PRECEDENT RESEARCH 74
Seaholm Power Plant, Austin Texas 74
Homan Square Power House 75
Station L Power Plant 76
Pennsylvania Railroad Powerhouse 76
Tate Modern Museum 77
Centrale Montemartini 78
Gas Works Park 79
The Exploratorium 80
PROGRAM INVESTIGATIONS 83
Live / Work Community 83

Museum 84
Hotel 85
Apartments / Condominiums 85
Event Space 86
School and Community Center 86
Green Space and Riverfront Remediation 87
Power Generation 87
Urban Design and Master Planning 88
Conclusions 88

DESIGN 90
Site Strategies: Process Investigations 90
Extending the Grid 90
Densification 90
Softening the Edge / Bio-Remediation 90
Building as a Link 91
Expansion / Addition 91
Saw-tooth Pier Typology 91
Schematic Design: Programmatic Explorations 93
Scheme 1: Live Work Community 93
Scheme 2: Residential / Hotel and Event Space 95
Scheme 3: Industrial / Science Museum 96
Scheme Selection 98
Program Selection 99
Urban Design Solutions 100
Building Design Solutions 104
Process 104
Design Solution 112
Ground Floor 113
Piano Nobile 114
Innovation Space 117
Corporate Space 119
Internal Flexibility 121
Vertical Flexibility 122
Facade as a Response to Site Conditions 124

CONCLUSIONS..... 133

BIBLIOGRAPHY..... 136

LIST OF FIGURES

Figure 1: Abandoned Properties in Philadelphia (source: author) 2
Figure 2: Adaptive Reuse vs. Ancient Construction (source: author) 7
Figure 3: Intentional Weathering at Brion-Vega Cemetery on Chapel Wall (source: author) 12
Figure 4: BOK (source: author) 19
Figure 5: Charles Carrol High School Northeast Façade (source: author) 20
Figure 6: Abigail Vare Public School (source: author) 21
Figure 7: The Walter George Smith Public School (source: author) 22
Figure 8: Rear of Warehouse Building (source: author) 23
Figure 9: Alleyway between Industrial Buildings (source: author) 23
Figure 10: Crane Arts Building (source: author) 24
Figure 11: New Liberty Distillery (source: author) 25
Figure 12: Holmesburg Prison (source: author) 26
Figure 13: Abandoned Properties (source: author) 27
Figure 14: Developing Neighborhoods. (source: Google Earth, author's overlay) 30
Figure 15: Pier 9 Façade (source: author) 32
Figure 16: Pier 9 (source: author) 32
Figure 17: Reading Viaduct Potential Site (source: author) 36
Figure 18: Underside of the El (source: author) 37
Figure 19: Underside of I95 in Frankford (source: author) 38
Figure 20: Underside of I95 in Port Richmond (source: author) 38
Figure 21: PECO Power Station (source: author) 39
Figure 22: Waterfront Site Selections (source: Google Earth, author's overlay) 41
Figure 23: Spring Garden Site (source: Google Earth, author's overlay) 42
Figure 24: PECO Generating Station (source: Google Earth, author's overlay) 43
Figure 25: Seam in the Grid between Riverwards and Penn's Original Intention (source: Google Earth, author's overlay) 46
Figure 26: Delaware Riverfront (source: Google Earth, author's overlay) 54
Figure 27: Figure Ground: Fishtown Neighborhood (source: author) 59

Figure 28: Neighborhood Site Analysis (source: author) 61
Figure 29: Existing Buildings (source: Google Earth, author's overlay) 62
Figure 30: Walkscore. Graphic developed by Author based on walkscore.com information (source: author) 63
Figure 31: Average Temperature Data for Philadelphia (source: author) 64
Figure 32: Site Boundary and Topography (source: author) 65
Figure 33: Exposed Rebar on North Side of Switch House (source: author) 67
Figure 34: Building Components (source: Google Earth, author's overlay) 68
Figure 35: Coal Tower (source: author) 70
Figure 36: Neoclassical Wrapper (source: author) 71
Figure 37: Interior Spaces (source: author) 72
Figure 38: Occupational Status Segregation (source: author) 72
Figure 39: Building Processes (source: author) 73
Figure 40: Site Typologies. Diagrams by Author (source: author) 92
Figure 41: Live Work Community (source: author) 94
Figure 42: Residential and Hotel (source: author) 96
Figure 43: Industrial and Science Museum (source: author) 97
Figure 44: Program Concept (source: author) 99
Figure 45: Program Breakdown (source: author) 100
Figure 46: Building as Link (source: author) 101
Figure 47: Water Fingers (source: author) 102
Figure 48: Storm Water Management (source: author) 102
Figure 49: Commercial Street (source: author) 103
Figure 50: Proposed Site Plan (source: author) 104
Figure 51: Process Insert Models (source: author) 105
Figure 52: Building Model with Inserts (source: author) 106
Figure 53: Building within a Building (source: author) 106
Figure 54: Interior Morphologies (source: author) 107
Figure 55: Block Divisions (source: author) 107
Figure 56: Internal Streets and Alleys (source: author) 108
Figure 57: Internal Sub-Divisions of Boiler House(source: author) 108

Figure 58: Internal Sub-Divisions of Boiler House within Model (source: author) 109
Figure 59: Structural Canopy (source: author) 110
Figure 60: Beach Street Approach (source: author) 110
Figure 61: View from Penn Treaty Park (source: author) 111
Figure 62: Ferry Approach (source: author) 111
Figure 63: Turbine Hall (source: author) 111
Figure 64: Maker Space Perspective (source: author) 112
Figure 65: Aerial (source: author) 112
Figure 66: Ground Floor Plan (source: author) 113
Figure 67: Graffiti Gallery (source: author) 114
Figure 68: Piano Nobile Floor Plan (source: author) 115
Figure 69: Turbine Hall (source: author) 116
Figure 70: Maker Space (source: author) 117
Figure 71: Innovation Space Floor Plan (source: author) 118
Figure 72: Innovation Space (source: author) 119
Figure 73: Corporate Space Floor Plan (source: author) 120
Figure 74: Programmatic Section (source: author) 120
Figure 75: Mondrian Explorations (source: author) 121
Figure 76: Flexible Floor Plans and Furniture Layouts (source: author) 122
Figure 77: Structural Bay Configuration (source: author) 123
Figure 78: Boiler House Exploded Axon (source: author) 124
Figure 79: Existing Facade Analysis (source: author) 125
Figure 80: Facade Response to Context (source: author) 126
Figure 81: Facade Studies (source: author) 127
Figure 82: North Façade (source: author) 128
Figure 83: South Façade (source: author) 128
Figure 84: East Façade (source: author) 129
Figure 85: West Façade (source: author) 129
Figure 86: Beach Street Perspective (source: author) 130
Figure 87: Ferry Approach (source: author) 131
Figure 88: Aerial (source: author) 132

Figure 89: Site Expansion (source: author) 133
Figure 90: Vertical Expansion (source: author)..... 134
Figure 91: Sustainability Opportunities (source: author)..... 135

BACKGROUND

Cities and communities are in a constant state of flux. Populations rise and fall, technology advances, political and economic policies change, and the needs of people and the communities in which they live evolve. However, architecture is generally slow to change and buildings are not always able to keep up with these fluctuations. As a result, they often times fall into a state of disrepair, leaving behind ruins of once valuable community and economic resources.

This is especially true for post-industrial cities struggling to reinvent themselves following suburbanization and the decline of manufacturing in the United States. Many factories and warehouses, once essential to production in cities are now decaying and empty. The same can be said about many power plants and utility buildings. As technology advances, economies change, and the needs of consumers evolve, these types of buildings often become irrelevant, resulting in the abandonment of valuable structures. Philadelphia, for example, has between forty and fifty thousand abandoned properties throughout the city, which include both abandoned lots and buildings (Figure 1).[1] These kinds of vacancies have significant economic and social implications to both the neighborhoods in which they reside and the city as a whole.

According to a study conducted by Econsult Corporation, the Penn Institute for Urban Design, and May 8 Consulting, vacant properties have resulted in a loss of 3.6 billion dollars in household wealth across the city.[2] The blight caused by these vacancies

---

[1] Econsult Corporation, Penn Institute for Urban Research, May 8 Consulting, *Vacant Land Management in Philadelphia: The Costs of the Current System and the Benefits of Reform* (2010), ii.
[2] Ibid., 2.

decreases the value of nearby properties "reducing value by 6.5 percent citywide and up to 20 percent in some neighborhoods.[3]" The city spends an estimated 20 million dollars per year cleaning and maintaining these vacant lots.[4] Additionally, nearly 17,000 of these parcels are tax delinquent, contributing to 2 million dollars of uncollected taxes each year.[5]

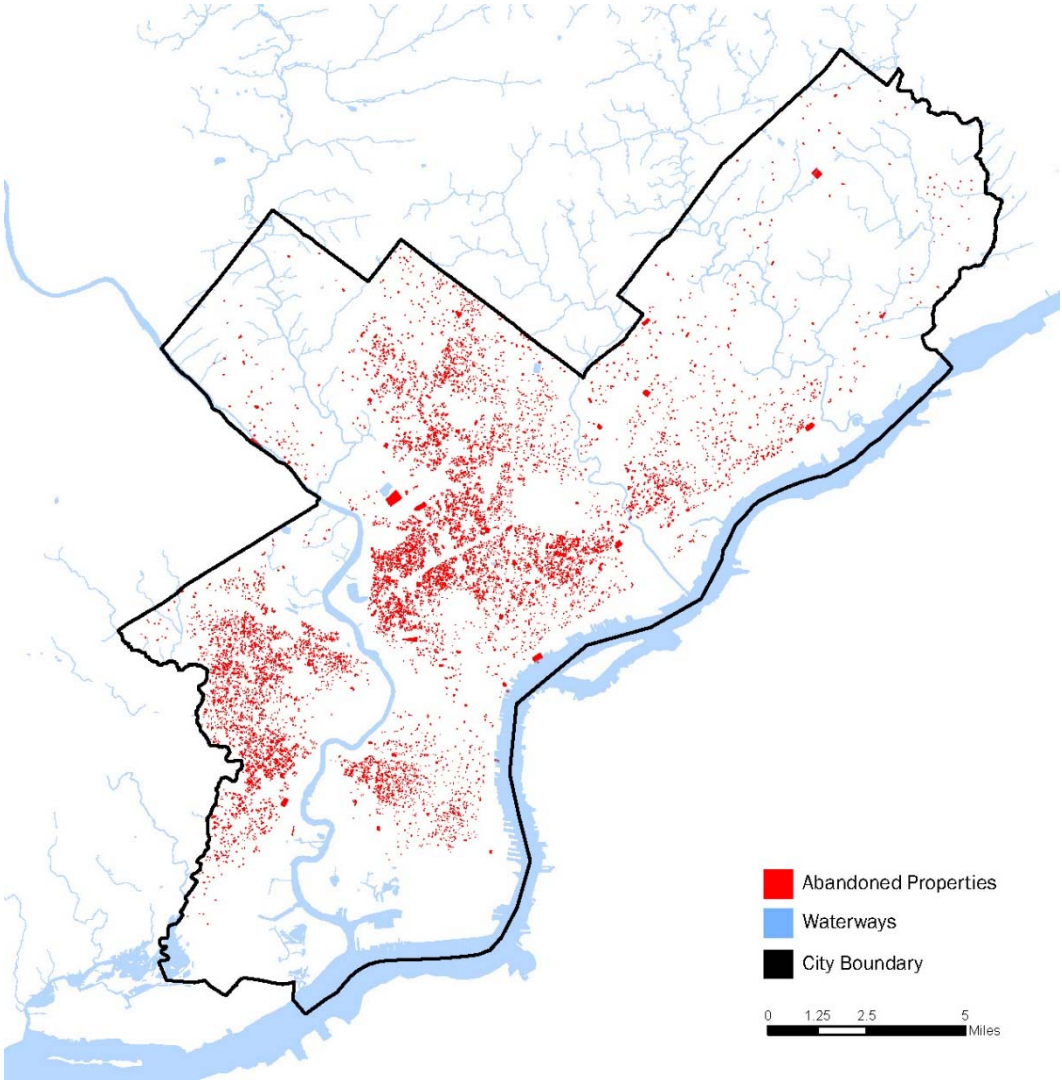

Figure 1: Abandoned Properties in Philadelphia (source: author)

[3] Econsult Corporation, Penn Institute for Urban Research, May 8 Consulting, *Vacant Land Management in Philadelphia*, 2.
[4] Ibid.
[5] Ibid.

This study estimates that by revising policies related to how the city handles vacant properties, it could generate 180 million dollars of construction growth supporting 800 jobs, creating 30 million dollars in earnings, and 1.9 million dollars in taxes.[6] Policy changes could also generate increases in the property tax base resulting in additional income for the city and school districts.[7] Additionally, more wage earners would increase wage tax income for the city.[8]

Beyond this there are significant social implications for abandoned and vacant properties. One major concern is safety. According to an article by William Spelman, "blocks with unsecured buildings had 3.2 times as many drug calls to police, 1.8 times as many theft calls, and twice the number of violent calls," compared to blocks with no vacant buildings.[9] This goes along with George Kelling and James Wilsons' broken window theory, if a window is broken or a building is in disrepair, people assume no one cares about the property and proceed to vandalize and progressively commit more severe crimes.[10]

Arson, accidental fires, and health concerns are also considerable issues surrounding these vacant properties. According to the US Fire Administration, there are 12,000 fires in abandoned structures each year resulting in 73 million dollars in property damages.[11]

---

[6] Econsult Corporation, Penn Institute for Urban Research, May 8 Consulting, *Vacant Land Management in Philadelphia)*, 23.
[7] Ibid.
[8] Ibid., iii.
[9] William Spelman, "Abandoned Buildings: Magnets for Crime?" *Journal of Criminal Justice* 21.5 (1993), 481.
[10] Adam MeKee, *Encyclopedia Britannica,* "Broken window theory," (2013).
[11] National Vacant Properties Campaign, *Vacant Properties: The True Costs to Communities* (2005), 1.

In addition, trash, illegal dumping, rodent infestations, and toxic waste on industrial sites all contribute to the health and safety of nearby residents.[12]

Although less measurable in terms of statistics, abandoned structures also lead to a poorer quality of life for residents. According to "More than Just an Eyesore: Local insights and solutions on vacant land and urban health," abandoned lots and buildings can result in social fragmentation and feelings of isolation resulting in a weakening of community.[13] It can also affect mental health, creating anxiety and stigmas.[14]

Now that the case has been made for reducing the number of abandoned buildings, the question of the feasibility of adaptive reuse arises. There are a number of reasons why adaptive reuse is valuable. The book, "*Creative Reuse of Buildings*," by Derek Latham, outlines a rationale for adaptive reuse. Latham suggests that there are five major motives that drive an appeal for older buildings: archeological, aesthetic, economic, functional, and psychological.[15]

All of these motives relate to the value of older buildings. The archeological appeal is more historical and values the preservation of architectural history for future generations.[16] Aesthetic appreciation corresponds to visual and cultural value, suggesting that reuse combines aesthetics of the past with modern trends and continues a cultural lineage by adding to the context of what already exists.[17] The economic standpoint proposes that there is significant monetary value in adaptive reuse. Some of these

---

[12] National Vacant Properties Campaign, *Vacant Properties*, 1.
[13] Eugenia Garvin, "More than Just an Eyesore: Local Insights and Solutions on Vacant Land and Urban Health," *Journal of Urban Health: Bulletin of the New York Academy of Medicine"* (2013), 413.
[14] Ibid.
[15] Derek Latham. *Creative Re-Use of Buildings* (Shaftesbury, Dorset: Donhead, 2000), 3.
[16] Ibid., 4.
[17] Ibid., 5.

economic benefits include the promotion of tourism and leisure activities, quicker turnaround and cheaper costs, availability of valuable resources already in place, and job creation because reuse is a labor intensive process.[18] Functional value corresponds to finding new uses for old structures, proposing that older buildings are sometimes better equipped to suit particular needs.[19] Finally, the physiological component relates to the human desire to hold onto the past and preserve what we are comfortable with and understand.[20] There is a certain nostalgia and comfort that comes with older buildings.

Although Latham takes a more liberal approach to the freedom with which architects have to intervene in existing buildings, there are a range of philosophies that include more conservative ideas regarding preservation. This thesis aligns more with Latham's philosophy, focusing on retaining elements of the building or site that contribute to spirit and sense of place without sacrificing usability and functionality. In *Creative Re-use of Buildings*, Latham defines "Creative Re-use" as a process that "harnesses the energy and quality of the original building, whether of special architectural or historic interest or simply a work-a-day redundant building, and combines this with the new energy and activity that the new use brings."[21] This process seeks to find a balance between the existing building and the new use by taking character, condition, and user needs into consideration.

User needs, the user being defined as the community and or city in which the project is located, is a priority for this thesis. It seeks to capitalize on the link between existing buildings, especially those of significant size and cultural interest, and personal identity

---

[18] Derek Latham. *Creative Re-Use of Buildings*, 7.
[19] Ibid., 9.
[20] Ibid., 12.
[21] Ibid., xi.

to strengthen community. This relates to the history of the building, its appearance, as well as its function. When buildings are abandoned it impacts peoples view and confidence in the community. Thus, this thesis will seek to determine how adaptive reuse can help strengthen communities by reviving a sense of pride and identity through architecture.

Another pertinent concept is the idea of community development through construction. Buildings under construction create an interest (good or bad) within communities. People want to know what's being built, how it will impact them, and what that means to the future of the neighborhood. An interesting historical example of this is the Duomo in Florence. The Duomo was built by various architects and craftsmen over the span of more than a hundred years. Various artisans, craftsmen, and architects contributed to the construction knowing that in all likelihood they would never be able to use the building or get to see its completion. It was understood that this type of undertaking was for the benefit of future generations and it became a communal interest that served as a way to connect people from all walks of life throughout the city.[22]

This is not practical for modern day construction, however, adaptive reuse could incite a similar feeling of connection amongst the community. Instead of building new, it allows for a common thread or element of continuity to persist within the community (see Figure 2). Thus moments of construction become episodic but the overall life of the building is understood span multiple generations. Each generation plays a role in its development and therefore has a sense of ownership. The building becomes something like folklore

---

[22] Marvin Trachtenberg, *Building-in-Time: From Giotto to Alberti and Modern Oblivion* (New Haven, Connecticut: Yale University Press, 2010), 145.

that is passed down from generation to generation, retaining elements of the original story, yet picking up new anecdotes or perhaps changing greatly along the way.

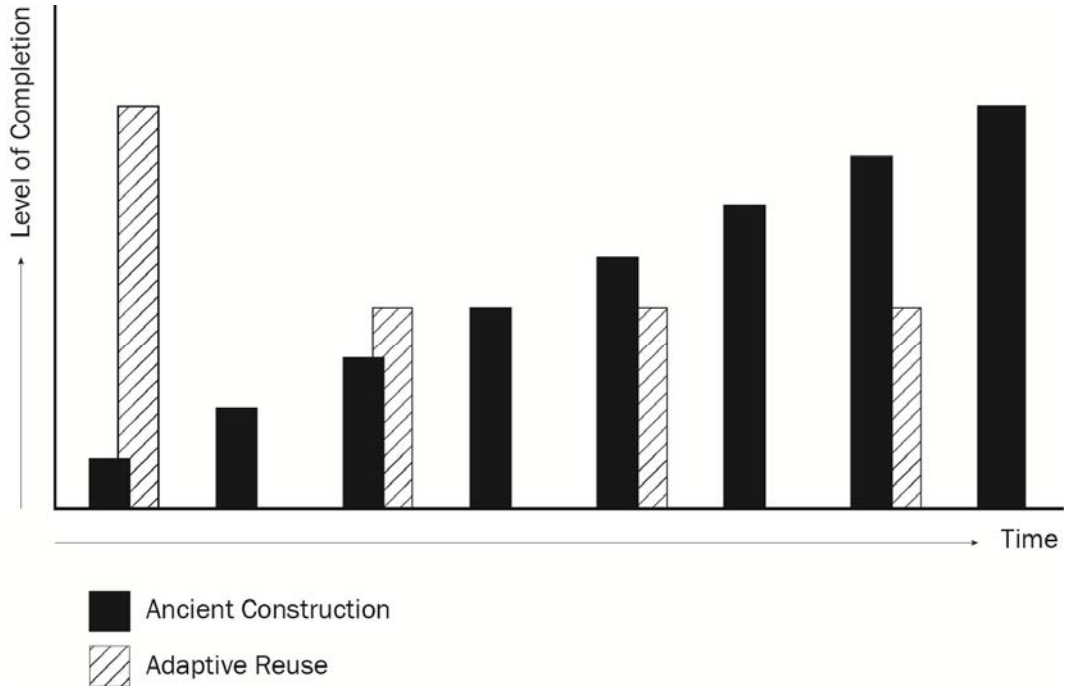

Figure 2: Adaptive Reuse vs. Ancient Construction (source: author)

This thesis attempts to interpret the history and stories of the past in order to create a layer of growth representative of the current generation. This is accomplished by analyzing the abandoned PECO Generation Station in Philadelphia and the surrounding neighborhood of Fishtown to develop a program and architectural intervention that begins to build community and create opportunity. It is very process based and approaches design as if it were a journey of discovery, searching for inspiration from the city, context, and people. The following pages describe a process of searching for opportunities within the existing fabric of Philadelphia, investigating site conditions, and developing a program based on observations and evaluation of city and neighborhood needs.

THEORY

There have been numerous theorists who have discussed the concept of adaptation and change over time. However, this has been largely overshadowed by a sense of "architectural natalism,"[23] a design philosophy that that portrays the creative process as the birth or growth of an idea from the creative mind. In the book *Buildings Must Die,* Stephen Cairns suggests that this type of mindset generally ignores time. Similar to the notion that a parent never wants to outlive their children, Architects like to think that their buildings will live forever, or at least longer than themselves.

This type of thinking promotes "starchitects," who design masterpieces that cannot be changed because to do so would do a disservice to the original design intent. Any additions or subtractions would only be for the worse. This thesis, and specifically this section on theory, offers a counter viewpoint. It suggests that architects should be designing for change, adaptability, and flexibility and accept the fact that buildings, programs, and needs evolve over time.

Designing for Change

In order to design buildings that last, one must consider the notion of time. This means understanding that a building will most likely someday end up being used differently than it was initially intended. As much as architects plan and attempt to solve their client's needs, these needs will inevitably change and lead to unforeseeable situations.

---

[23] Stephen Kains and Jane M Jacobs, *Buildings Must Die: A Perverse View of Architecture* (Cambridge, Massachusetts: MIT Press, 2014), 11-29.

Frank Duffy of DEGW suggests that "there isn't such thing as a building." But rather "a building properly conceived is several layers of longevity of built components."[24] This means that different components of a building will inevitably age at different rates and will therefore need to be replaced at different times. This relates not only to the physical wear and tear of the building, but also to aesthetic and technological changes. In *How Buildings Learn: What happens after they're built*, Stewart Brand takes this concept and expands the theory to include the following six layers: site, structure, skin, services, space plan, and stuff.[25]

According to Brand, each of these components has different rates of change and therefore requires replacement at different times throughout the life of the building. Other than site, structure is the most permanent building component. It is designed to last 30-300 years and is very expensive to change or replace. However, the skin generally needs to be replaced or updated every 20 years and the services every 7-15 years. "Many buildings are demolished early if their outdated systems are too deeply embedded to replace easily." By creating flexible spaces and separating or disentangling the building components, it becomes easier to maintain, update, or replace layers as they become functionally or aesthetically unappealing.[26]

Lifecycle – Beginning and Ending

Buildings are often thought of as having life. They are described through metaphors related to the human body and compared to living organisms. "Building structures are

---

[24] Francis Duffy, "Measuring building performance", *Facilities* (1990), 17-20
[25] Steward Brand, *How Buildings Learn: What Happens After They're Built* (New York: Penguin Books, 1995), 15.
[26] Ibid.

referred to as “sinews” and “bones”; walls are like biological “membranes” or “skins” that may even breath; windows and doors are understood as sensory apertures that “see,” “smell,” and “hear…” Some even imbue buildings with a sense of “spirit” or “memory”. Yet architects rarely consider another fact of life; all lifeforms die. Thus, in order to design for life we must also design for death, knowing that there is no escape from decay, deterioration, and potentially destruction.

This overarching theme of death, and how it can be used as a design tool, is thoroughly discussed by Stephen Cairns and Jane Jacobs in *Buildings Must Die*. In changing the way buildings are idealized, architects may begin to open their mind to other possibilities.

An important part of designing adaptable, long lasting buildings is to consider the entire lifespan of the structure. This means accepting the fact that buildings, in all likelihood, will one day be demolished or significantly changed. Stephen Cairns and Jane Jacobs take the notion of time a step further with the bold statement and title of their book, *Buildings Must Die*. If this is true, then architects must design and plan for death.

In *Wasting Away*, Kevin Lynch suggests the idea of “Planned Obsolescence,” meaning buildings should be “planned to decline gracefully.” Ideally this means designing so that the structural lifespan matches the use lifespan; however, this very difficult to predict. One way of achieving this is designing a building with two systems of parts: one that is more permanent and one that is easily replaced. Another interesting idea discussed by Lynch is that in addition to developing construction documents, architects should develop plans for how the building could be remodeled to serve different programs and what it would look like if it were abandoned. This asks the question, could we design buildings that once abandoned, could be transferred to the public realm when they have outlived

their commercial use? Many cities such as Detroit and Philadelphia have given abandoned lots to communities to develop gardens and other public functions. Could the same idea apply to buildings?

Finally, Lynch suggests that architects should also design demolition plans. Designing for deconstruction could provide interesting possibilities in terms of how materials are reused and create fascinating building forms based on simplistic construction and deconstruction methodologies. The concept of demolition and reuse also raises the question of what should be preserved to maintain the history and sense of place. Could architecture be designed with temporal elements designed to be replaced and permanent components designed to retain unique characteristics of place?[27]

Weathering

Again, going back to the theme of death, Mostafavi states that "No building stands forever, eventually every one falls under the influence of the elements, and this end is known from the beginning." Natural elements such as wind, rain, sun, etc. inevitably act upon building surfaces to break down material leading to ruination unless prevented by maintenance or replacement. However, this is not necessarily negative, and could be used to influence design and material choices. *On Weathering: The Life of Buildings in Time* suggests that the completion of construction is not the completion of the building. Instead, the deterioration and weathering of a buildings' finishings are part of its

[27] Kevin Lynch, *Wasting Away* (San Francisco: Sierra Club Books, 1990), 174.

manifestation and continuous evolution. “Finishing ends construction, weathering constructs finishes.”[28]

Carlos Scarpa is a master of designing for weathering. In Brion-Vega Cemetery he purposely breaks the cornice along the roof of the chapel to allow water to run down the blank wall. Mostafavi suggests that the staining created by rainwater reveals nature’s temporality and shows “the life of the building in time.” This is especially relevant given that the weathering is occurring at a cemetery.

Figure 3: Intentional Weathering at Brion-Vega Cemetery on Chapel Wall (source: author)

[28] Mohsen Mostafavi and David Leatherbarrow, *On Weathering: The Life of Buildings in Time* (Cambridge, Mass.: MIT Press, 1993), 5.

Thus, architecture could be designed to age and change with time, developing a sense of maturity. In *How Buildings Learn*, Brand connects this idea to Levi's jeans. A good pair of jeans "show age honestly and elegantly." They fade and shrink to develop a perfect fit and texture. And although they eventually wear out, their design is timeless, being worn from generation to generation.[29]

Aquatecture

According to *Aquatecture* by Robert Barker and Richard Coutts, the most successful waterfronts tend to be mixed use neighborhoods, providing more than just picturesque museums and conference centers. While landmark buildings can increase footfall and attract locals and tourists alike, they are not enough on their own to create a successful waterfront. They also discuss the importance of public space. In Hamburg Germany, the HafenCity waterfront contains 37% public space. Barker and Coutts write, "It is important to find the right balance between the character of the public and private spaces, the land use and frontage, the activity on the water, the destination/landmark and the transport/movement."

They also discuss the "Anatomy of a successful riverfront." This includes wildlife, public amenities along the river edge, distant views, key buildings, activities, and lots of public access. The most successful waterfront must include a physical engagement and a sensory engagement. However, it is most important to create public space. Foot traffic activates waterfronts and without public space this is difficult to attain.[30]

---

[29] Stewart Brand, *How Buildings Learn*, 11.
[30] Robert Barker and Richard Coutts, *Aquatecture: Buildings and Cities Designed to Live and Work with Water* (London: RIBA Publishing, 2016), 113.

"Aquatecture" also discuss best practices for docks, wharfs, and shipyards. Since shipping has generally moved to larger distant areas, many ports and docks have become redundant. While the reuse of this infrastructure can be useful, the height of these docks can also create challenges for recreational use. Because they were designed for larger ships, they are often too high to serve recreational purposes. Similar to riverfronts, some key components that help create successful docks include anchor buildings, activities, floating amenity spaces, and shared public space. Again, the most important component appears to be increasing activity through public space and year round activities.

Preservation

There are many conflicting views on architectural preservation. Some take a liberal stance suggesting that preservation should be more about continuity of use. They may argue that there is no point in preserving something if it cannot be adapted and used for modern purposes. Others have very strict views believing that buildings should be preserved exactly as they were built. According to Robert Maguire, this philosophy stems from the fear of losing architecturally significant buildings to widespread demolition.[31] Both views have merit and should be determined case by case depending on the context and historical significance of the building. This thesis will not attempt to solve this debate and will focus on the concept of preserving a sense of place and character. Whether creating a new building or adapting existing structures, this project will seek to enhance elements which contribute to the history of Philadelphia as a manufacturing powerhouse and port city.

---

[31] Robert Maguire, "Conservation and Diverging Philosophies," *Journal of Architectural Conservation* (1997), 7–18.

Conclusion

Moving forward into site selection and design, this theory was used as a foundation on which decisions were made as to what to kept, what to change, and what to remove. While it is important to maintain elements that pertain to the context and history of the building, this thesis puts the greatest emphasis on functionality and using existing components to the advantage of program. An in-depth analysis and understanding of the building was used to direct design decisions for the new uses and interventions.

PROCESS AND METHODOLOGY

One of the major challenges throughout the process of developing this thesis was selecting a site/building, program, and determining whether the project should be adaptive reuse or new construction. Because the nature of developing adaptable architecture hinges on its ability to change in order to suit various needs, the site and program are highly dependent upon each other, yet neither is essential to the conception of the idea. This flexibility allows the project to be approached from various directions.

A building driven approach places highest importance on the investigation of existing building stock to determine site and would require a program that suits the needs of the community in which it is located. Ideally the site would be located in an area of flux, somewhere that has experienced change in the past or is expected to experience change in the future.

A site, or neighborhood driven approach places highest importance on the needs of the community and then searches for a building within that particular area. Ideally the building should be abandoned and have some kind of historical, communal, or architectural significance.

A third approach involves searching for abandoned or underutilized infrastructure that could be adaptively reused to help strengthen community. Infrastructure that was once essential to Philadelphia as an industrial city could be creatively reimagined to serve the needs of a changing city.

In an effort to explore all options and develop interest in a particular site or program, this thesis began by approaching the problem from all three angles. The following research

involved combing the city of Philadelphia for inspiration though a combination of online investigations and site visits to develop a sense of place for each potential site and building. The research is by no means exhaustive and admittedly presents some bias based on previous experiences from living in the city.

Building Driven Research

The first approach is rooted in the idea of placing the needs of the building first. It begins by asking the question: What existing building stock or infrastructure can be adaptively reused? And then follows up by determining what kind of program is needed to serve the community in which the building is located. Through a process of online research and site visits, the following possibilities were identified.

Public Schools

Philadelphia, like many other urban cities across the country, is in the midst of an education crisis. Declining populations have resulted in decreased tax income for the city and fewer students to attend the existing schools. These financial and attendance issues, coupled with the growing popularity of charter schools, has made it difficult for the Philadelphia Department of Education to maintain the existing public school system and its buildings. According to "New Life for Old Schools: Philadelphia Reuse Studio," developed by the University of Pennsylvanian School of Design, this has resulted in the closing of 32 schools as of 2013.[32]

[32] "New Life for Old Schools: Philadelphia Reuse Studio," *University of Pennsylvania School of Design* (2013), 9.

According to this study, 33% of Philadelphians live within a half mile radius of a closed or closing school and 75% of these areas lost population from 1990 to 2010.[33] Schools play a major role in community stability and when a neighborhood institution disappears and the building, a symbol of its presence, sits vacant, it can have a very negative impact at both the social and economic level.

Some communities and developers are already taking advantage of these empty buildings. Edward W. Bok Technical High School (BOK) in South Philadelphia is currently being repurposed as a commercial property designed to serve a "thriving and growing community of innovators, businesses, entrepreneurs, and creatives" (Figure 4).[34] The project is designed to use the existing infrastructure of classrooms, woodshops, kitchens, and labs to provide an affordable place for local residents to work, make, and learn.[35] According to buildingbok.com, 80% of the tenants are local residents of South Philadelphia.[36] This project exemplifies the "loose fit long life" philosophy because of the wide range of spaces and additional room to grow. Currently 26,000 square feet of the total 340,000 square feet are occupied, leaving room for expansion, adaptability, and growth.[37] The mission statement of the project corresponds directly to the topics being investigated in this thesis.

> "This is a multi-phased project intended to evolve over time and therefore we are interested in how both the temporal and the permanent contribute to the building's evolution. We seek to apply a nimble and thoughtful multi-disciplinary

---

[33] "New Life for Old Schools," *University of Pennsylvania School of Design*, 9.
[34] "About," *BOK*, http://www.buildingbok.com/about/ (accessed March 25, 2017).
[35] Ibid.
[36] Ibid.
[37] Ibid.

development approach to drive the building's revitalization through a careful balance that considers commercial viability, impactful community engagement, and long-term outcomes."[38]

Figure 4: BOK (source: author)

Using BOK as a precedent, each of these 32 closed schools were investigated through a series of online research and narrowed down to eight potential sites. The selection was based on identifying schools which had not yet been reused or demolished, were located along the eastern side of the city (within recovering postindustrial areas), and had interesting urban characteristics (density, access to public transportation, and character). All eight schools were visited, however, three of particular interest are described in further detail as follows.

Charles Carroll High School (**Error! Reference source not found.**) is located in the Port Richmond neighborhood on the edge of a densely populated working class neighborhood.

[38] "About," *BOK*.

The building was originally constructed in 1922 and has since been added on to. An elevated portion of Interstate 95 is located half a block southeast of the school and there are numerous bus stops within walking distance. There are very few green spaces in the immediate vicinity, however, there are future plans to develop a park system along the nearby Delaware riverfront.

Figure 5: Charles Carrol High School Northeast Façade (source: author)

This school presents an interesting opportunity to investigate how adaptive reuse can be used to mitigate the differences between the two buildings. The nearby waterfront also provides an opportunity to connect the site to a future green space. I95 is challenging because it divides the city from the waterfront, but also presents an opportunity to explore ways of improving connectivity. Some additional challenges include: very little open space for expansion, minimal access to major public transportation, and the site' distance from center city.

The Abigail Vare Public School (Figure 6) is located in southeast Philadelphia directly across from Dickinson Square Park and was originally constructed in 1902. This is an

interesting site due to its close proximity to public green space and the dense urban fabric of South Philadelphia.

Similar to Charles Carrol High School, there is very little room for expansion. The school has access to numerous nearby bus stops but is not within walking distance of the subway. An elevated portion of I95 and the Delaware riverfront is located directly east of the site. This portion of the waterfront includes big box retail and abandoned piers. Although the waterfront may prove to be a future asset, at this time it does very little to improve the value of the site.

Figure 6: Abigail Vare Public School (source: author)

The Walter George Smith Public School (Figure 7) is also located in south Philadelphia and was built in 1924. This school is situated in a very dense urban setting just west of Broad Street. While the site has very little access to green space, there is a large lot behind the school that could be used for expansion and/or development of park space. Additionally, there are numerous nearby bus stations and a subway stop within walking distance.

Figure 7: The Walter George Smith Public School (source: author)

Industrial Buildings

Philadelphia has a rich history in terms of industry. The abundance of water resources, port facilities, access to transportation, and strong labor market made Philadelphia a hub for production particularly in the 19th and first half of the 20th century. "From ships to clothing, Philadelphia provided products that helped the United States win two World Wars and became the muscle behind the brains and the money (Washington and New York).[39]" Many of these buildings are located along the Delaware riverfront or along abandoned train routes within adjacent communities.

A potential building that fits this description is a seemingly abandoned warehouse on the corner of Spring Garden and Delaware Avenue (Figure 8). It is located in a prime location and could be used to develop a gateway to the waterfront for people accessing the site from the Spring Garden subway station. There is also an iconic mural on the side of the building that could be maintained as part of an adaptive reuse strategy to repurpose

[39] "Master Plan for the Central Delaware: Transforming Philadelphia's Waterfront," *Delaware Riverfront Corporation (*October, 2011), 253.

the building. Another appealing aspect of this site is an alleyway located between two industrial buildings that has potential to create a very unique public space (Figure 9).

Figure 8: Rear of Warehouse Building (source: author)

Figure 9: Alleyway between Industrial Buildings (source: author)

Another example of an industrial building that has already been adaptively reused is the Crane Arts Building and New Liberty Distillery (Figure 10, Figure 11). The Crane Arts Building is located in Kensington, Philadelphia at the corner of North American Street

and Master Street. It was originally designed as a plumbing warehouse for the Crane Company in 1905 by the architect Walter Ballinger.[40] The site also included a three-story stable for deliveries and horse storage.[41] A large concrete first floor addition was later added for refrigerated storage when the building was converted into a seafood processing plant.[42]

The building has since been converted into an artist community with studios, performance venues, and event space. The "Icebox," previously used to store frozen seafood, has been adaptively reused to host a variety of events including performances, exhibits, and corporate parties and meetings.[43] For this project, specific care was taken to preserve the historic character of the building's interior and exterior components.[44]

Figure 10: Crane Arts Building (source: author)

[40] "Mission and History," *Crane* Arts, http://www.cranearts.com/mission/ (accessed March 25, 2017).
[41] Ibid.
[42] Ibid.
[43] Ibid.
[44] Ibid.

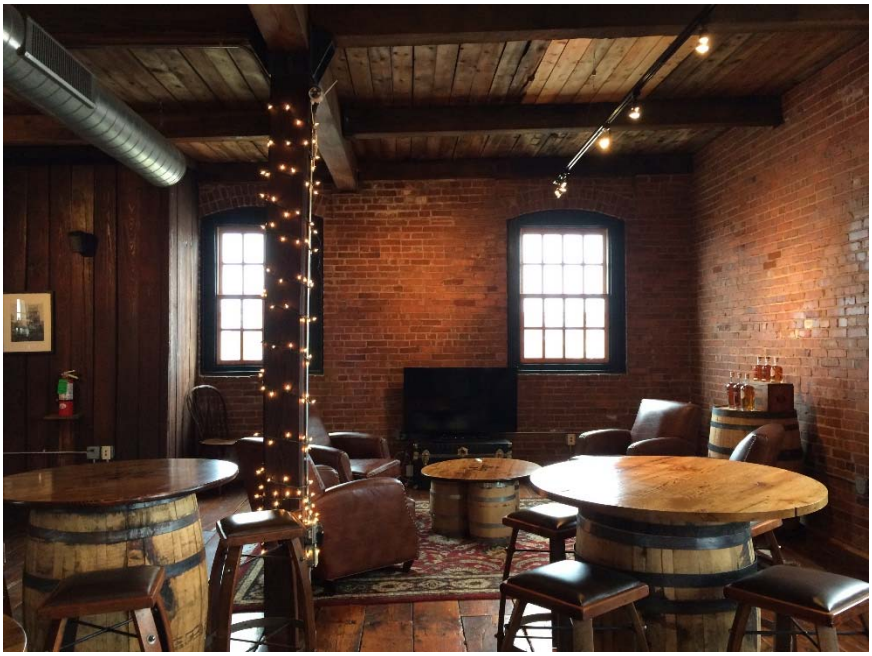

Figure 11: New Liberty Distillery (source: author)

Additionally, the stables have been converted into a whisky distillery. Structurally and programmatically, the building is perfectly suited for distilling the whisky on the bottom floor, storing the casks on the second floor, and serving the whisky in a bar and tasting room on the third floor. As the building was originally designed to withstand the load of horses, it can easily support the casks of aging whiskey.

Prisons

Philadelphia is home to multiple abandoned prisons. The most well-known is Eastern State Penitentiary which has been partially renovated and turned into a tourist attraction. In addition,, there is Holmesburg Prison (Figure 12) located in northeast Philadelphia on Torresdale Ave. This prison is, for the most part, decommissioned and abandoned, however; it is sometimes used for overflow.

Figure 12: Holmesburg Prison (source: author)

This site was ultimately eliminated due to a lack of strong urban context, difficulty in obtaining plans and making site and building visits, and a general disconnect from the heart of the city. Although there are bus lines nearby there is no immediate access to the subway or trolley system.

Building New

Another possibility is that this thesis becomes focused on developing a new type of architectural language that is more suitable for adaptation and growth or change over time. This would most likely be implemented on empty lots or new developments. An interesting aspect about this type of design, is that although there may be limited demand at the time of construction, as neighborhoods grow and demand increases, the architecture could be designed to expand or change to suit future needs.

As discussed in the Background section, Philadelphia is filled with abandoned properties. A report developed for the for the Redevelopment Authority of the City of Philadelphia and the Philadelphia Association of Community Development Corporations estimates

that there are at least 40,000 abandoned properties, 30% of which are owned by the city (**Error! Reference source not found.**).[45] Many of these are empty lots would be perfect sites for investigating adaptable architecture. Smaller row house lots also offer the opportunity to investigate mobile and/or plug and play type buildings that could be customized and even moved from site to site to suit community needs.

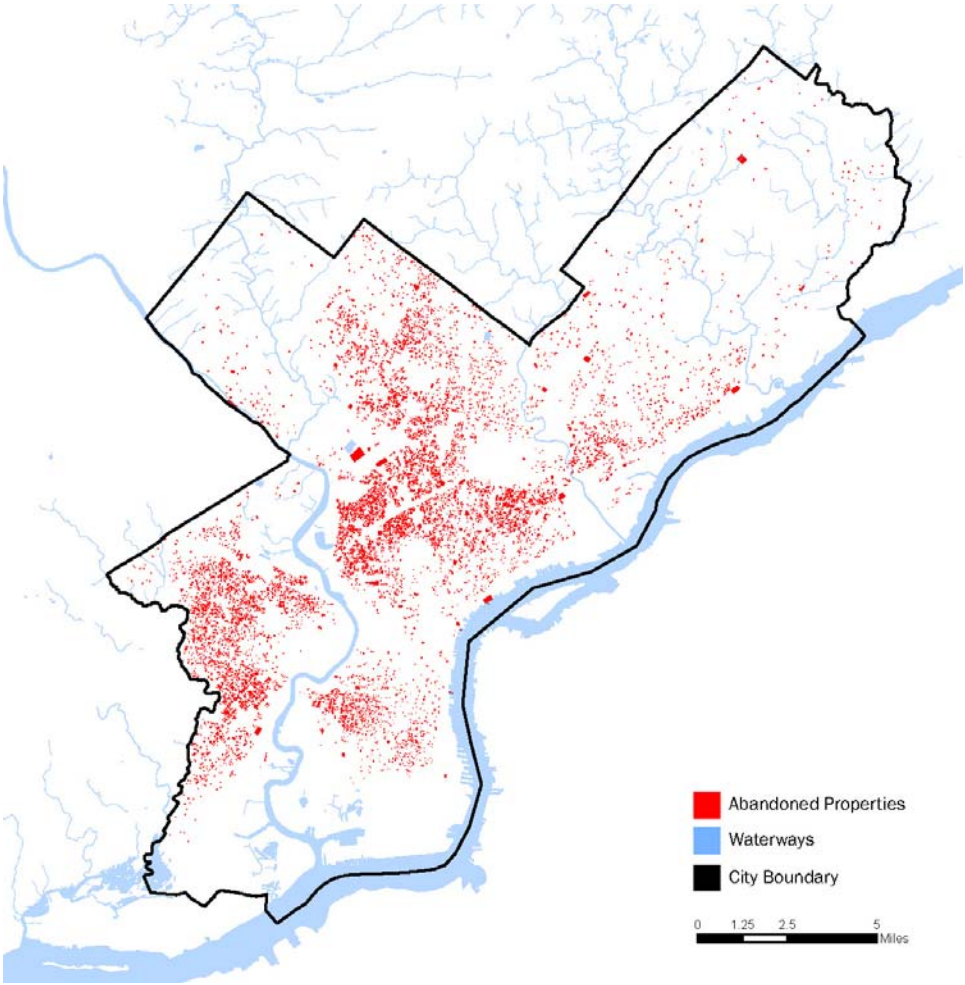

Figure 13: Abandoned Properties (source: author)

The Delaware Riverfront would also be a great location for this type of construction, considering that the planning department has proposed limiting construction to low or

[45] Econsult Corporation, Penn Institute for Urban Research, May 8 Consulting, *Vacant Land Management in Philadelphia*," i.

mid-rise buildings in the hope of spreading out development along the entire waterfront. There are a series of underutilized parking lots and abandoned lots, which could potentially accommodate mixed use development with the intention of increasing density or height over time.

These conditions are prevalent in numerous areas throughout the city and it is therefore difficult to narrow down the selection to one specific lot. Selecting a site of this nature would rely heavily upon the desired program and the criteria discussed in the following Neighborhood Driven Research section.

Neighborhood Driven Research

Another method of investigating site involves searching for neighborhoods and areas of the city that could potentially be conducive to adaptable architecture. The major consideration was the likelihood that the community would change over time and/or that the community had an existing stock of buildings that could potentially be adaptively reused. The following types of neighborhoods were found to pose qualities that could lead to adaptability.

Low Income Neighborhoods

Many lower income neighborhoods in Philadelphia are in desperate need for redevelopment. Adaptability is one piece of a complex puzzle that could be used to strengthen and begin to provide essential resources to residents. The benefit of creating a language of adaptability in this case is that the program could change and develop with the community as it grows. It also has the potential of creating buildings that allow community members to become more engaged with the design, creating a sense of

ownership and connection to a place. An example of one such site is the Sharswood Blumberg Neighborhood in North Philadelphia.

This neighborhood is sandwiched between the quickly developing Brewerytown to the west and Temple University to the east. Its southern border is formed by Girard College and the Fairmount neighborhood. A thorough masterplan of the area was developed in 2015 which lays out improvements directed towards the people, the neighborhood, and housing.[46] Some of the goals that align with the objectives of this thesis include; empowering residents through workforce development and small business assistance, improving health and wellness programming, and establishing achievement goals that include social services, adult education, and workforce training.[47]

This area was ultimately not chosen due to a relatively low urban density and a potentially unsafe environment. Working within this neighborhood would require a more complete masterplan for residential infill and commercial redevelopment which is beyond the scope of this thesis.

Transitional Neighborhoods

Gentrification is a major issue in Philadelphia and other developing postindustrial cities. As higher income individuals move back into the city, rising costs due to increased demand often push existing members of the community out. This is particularly the case for neighborhoods such as Northern Liberties and Fishtown, which have gone through dramatic gentrification over the past 10 years. Two nearby neighborhoods that are currently facing similar pressure include Kensington and Port Richmond.

---

[46] "Sharswood/Blumberg Choice Neighborhoods Transformation Plan," *Philadelphia Housing Authority* (2015), 3.
[47] Ibid.

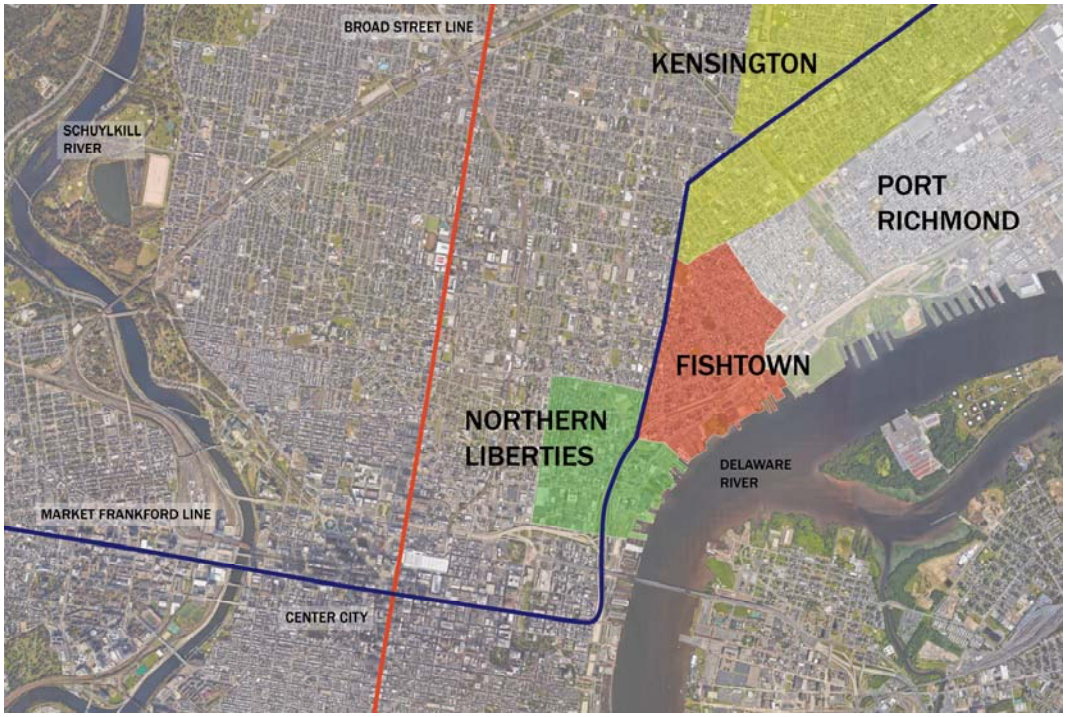

Figure 14: Developing Neighborhoods. (source: Google Earth, author's overlay)

Adaptability could play an important role in the way these communities grow and change based on new demographics. These areas include neighborhoods that were once dependent on industry, and thus have a number of abandoned factories and industrial buildings that could potentially be suitable for adaptive reuse. There are also numerous abandoned schools that were analyzed as part of the building driven research which could be used to build stronger ties between new and existing residents. Selecting a site within these neighborhoods would likely direct the thesis towards searching for ways to encourage development while reducing the negative effects of gentrification.

Developing Neighborhoods

Areas of the city that are currently under development or have plans for significant infrastructural improvements could also be interesting sites to investigate adaptable architecture. As these neighborhoods grow and change, the buildings should adapt with

them, which could be applied in terms of adaptive reuse or new construction. Two areas that fit this description include the Delaware Riverfront and the Callowhill Neighborhood.

There is currently a master plan designed to transform the Delaware Riverfront from its industrial past to a future of mixed use residential, low density industry and commercial, and a series of parks and public spaces.[48] There is a rich history of industrial buildings suitable for adaptive reuse including the decommissioned power stations, abandoned piers, and vacant warehouses. Three buildings of particular interest in this area include the PECO Delaware Power Station, Pier 9, and a group of abandoned warehouses and industrial buildings on the corner of Spring Garden and Delaware Avenue. The warehouses along Delaware Avenue and Spring Garden were previously discussed in the Building Driven Research portion of this paper and the PECO Generating Station will be discussed in more detail in the following Infrastructure section.

Pier 9 is located near the Benjamin Franklin Bridge next to the newly renovated Race Street Pier. It is directly across from the Fringe Arts building and could provide an interesting location for public art space and artist living. The masterplan for developing the Delaware Riverfront considers this building an "artifact" meaning that the character of this building should be maintained to some level.[49] This would be a possible adaptive reuse site.

[48] "Master Plan for the Central Delaware: Transforming Philadelphia's Waterfront," 3.
[49] Ibid., 81.

Figure 15: Pier 9 Façade (source: author)

Figure 16: Pier 9 (source: author)

Innovation Zones

In 2007, Pennsylvania initiated the Keystone Innovation Zone (KIZ) Tax Credit Program. This program was designed to "provide tax credits to for-profit companies less than 8 years old operating within specific targeted industries within the boundaries of a Keystone Innovation Zone.[50]" Philadelphia adopted this program for select areas of the city in various fields including: life sciences, information technology, advanced manufacturing, nanotech, energy, communications/IT, and homeland security[51].

Using these innovation zones to develop a program could be an interesting way to link commercial and community development by bringing high tech jobs and job training to neighborhoods in need. These zones are very wide spread and could provide an additional layer of analysis for previously discussed overlapping buildings and neighborhoods.

New Neighborhoods

There is currently a proposal in to construct a completely new neighborhood at 30th Street Station in Philadelphia. The plan calls for a revitalization of the 30th Street train station in conjunction with a long range masterplan that envisions a new neighborhood on top of the existing CSX and Amtrak rail lines and maintenance yards.[52] According to the District Plan developed by SOM, the projects primary planning goals include:

---

[50] "Keyston Innovation Zone (KIZ) Tax Credit Program." *Pennsylvania Department of Community and Economic Development,* http://dced.pa.gov/programs/keystone-innovation-zone-tax-credit-program/ (accessed February 18, 2017), 2.
[51] Ibid.
[52] "Philadelphia 30th Street Station District Plan: Growing Philadelphia's Future at 30th Street Station," *Amtrak, Brandywine Realty Trust, Drexel University, The Pennsylvania Department of Transportation, and the Southeastern Pennsylvania Transportation Authority,* https://static1.squarespace.com/static/539b050fe4b077b40b221f4f/t/57694caaff7c5085d0a3de31/1466518722881/District+Plan+Final+Report_June2016_8.5x11_web.pdf. June 2016, 6.

1. Building community with opportunities to live, work, and play[53]
2. Improving connectivity by developing 30th Street station into a multimodal transportation hub[54]
3. Creating identity though active, attractive, and safe places with memorable character[55]

These objectives align with the community development goals of this thesis and provide an interesting lens in which to address adaptation. Instead of adaptively reusing an existing building, it would propose developing a new building that could adapt to suit the changing needs of the growing 30th Street Station District.

Infrastructure

The final method of investigation involved searching for abandoned or underutilized infrastructure. Some of this infrastructure, such as the elevated portion of the Market Frankford subway line and the underside of Interstate I95, are operational but contribute to blight and discontinuities within the city. Other infrastructure, such as the Reading Viaduct and the PECO Generating Station, are abandoned. In either case, utilization and improvement or redevelopment of these resources could be used to spark growth and improve connectivity within communities. This research may be slightly beyond the scope of this thesis; however, it could provide a context by which to examine adaptability.

Reading Viaduct

The Reading Viaduct is a rail line that was constructed in 1889 as a way of connecting the Reading Railroad to a new train depot and passenger station at the corner of 12th and

[53] "Philadelphia 30th Street Station District Plan: Growing Philadelphia's Future at 30th Street Station," *Amtrak, Brandywine Realty Trust*, 6.
[54] Ibid., 6.
[55] Ibid., 6.

Market Street. The rail line is currently abandoned but remains generally intact and connects Center City to the Philadelphia Art Museum by a series of bridges and tunnels. The Friends of the Rail Park have organized a campaign to revitalize the rail line into an elevated park and pedestrian travel route similar to the highline in New York City. In addition to the redevelopment of the line itself, there are multiple locations along the route that would serve as potential sites for adaptive reuse or new construction.

One building of particular interest is located at the intersection of Spring Garden Street and North Percy Street directly adjacent to the Reading Viaduct. At this location the rail line is straddled by an old station and an abandoned industrial building. With the development of the Viaduct in mind, this could be an interesting adaptive reuse project that serves as a community node along a future pedestrian transportation route. The building is relatively long and narrow and could serve well as an apartment building with two levels of retail along Percy Street and the elevated rail line. Additionally, this site is located in the Callowhill Neighborhood which has been previously identified as a "Developing Neighborhood."

Figure 17: Reading Viaduct Potential Site (source: author)

Market Frankford Line

The elevated portion of the Market Frankford subway line (El) that runs through Northeast Philadelphia presents a unique opportunity to revitalize a functioning transportation line. The public transit line runs directly above Front Street and Kensington Avenue passing through some of the most troubled communities in the city.

According to the Malvern Institute, some of the most notorious drug corners, including Kensington and Allegheny and Kensington and Summerset, are located directly under the El.[56] This is a very complex issue and improvements to the El are not expected to prevent crime or cure the heroin epidemic. However, developing the underside of the El and adaptively reusing some of the adjacent buildings could offer opportunities to improve safety and strengthen communities in the hope of reducing illegal activity.

[56] "The Loved One's Guide to Heroin and Other Drugs in Kennsington, Philadelphia," *Malvern Institute,* March 25, 2016, http://www.malverninstitute.com/the-loved-ones-guide-to-heroin-other-drugs-in-kensington-philadelphia/ (accessed May 18, 2017).

Figure 18: Underside of the El (source: author)

Interstate 95

Another piece of infrastructure that was analyzed for adaptive reuse is the underside of Interstate 95. It cuts through the eastern edge of City, beginning in south Philadelphia and working its way all the way up to the northeast, separating the waterfront from the rest of the city. Most of the highway is elevated, however, portions directly east of Center City are sunken below grade with a few pedestrian bridges and parks crossing above to improve connectivity between the waterfront and the city.

While burying the highway and allowing passage above is one way to improve connectivity, it does not solve the problem for the majority of the highway that is elevated. This presents an opportunity to reimagine what happens below and how it can be developed into more of a connector than a separator. Through development of this underutilized space, there is an opportunity to provide additional public space, unique development, and most importantly a safe and inviting connection to the waterfront.

Figure 19: Underside of I95 in Frankford (source: author)

Figure 20: Underside of I95 in Port Richmond (source: author)

PECO Generating Station

In addition to transportation, there are also opportunities to develop new uses for abandoned utility buildings. For example, the Philadelphia Electric Company Power Station is an abandoned power plant that sits beside Penn Treaty Park and is sandwiched

between Interstate 95 and the Delaware River. Although I95 and Delaware Avenue create a barrier between the site and the adjacent Fishtown neighborhood, there are underpasses which could be improved to create more connectivity. The site has good access to public transportation along Girard Avenue and Penn Treaty Park that already attracts a number of residents to the area.

The site has a rich history that includes ship building as well as coal powered energy production that was essential to fueling industrial development in Philadelphia. The building's neoclassical style of architecture also creates a unique contrast to the rusted industrial smoke stacks. This structure is an iconic building well known to the residents of Philadelphia and highly visible from I95 to anyone traveling though the city.

Figure 21: PECO Power Station (source: author)

Narrowing the Selection

After an exhaustive research process of combing the city in search of buildings and neighborhoods suitable for investigating the concept of adaptability, it was determined that the Delaware Riverfront was an ideal location for this thesis. The area offers overlap

between all three methods of investigation, including searching for new and existing building opportunities, finding neighborhoods in development or transition, and reusing abandoned or underutilized infrastructure.

Additionally, Philadelphia's industrial dependence on the waterfront for shipping and power production provides a rich historical background for developing program, establishing resiliency, and using adaptable architecture as a way to encourage economic flexibility. There is also an extensive masterplan developed by The Delaware River Waterfront Corporation that provides an opportunity for evaluation and critique.

The Delaware Riverfront is vast. It includes six linear miles of waterfront, 1,100 acres of property[57] and includes numerous opportunities for investigating adaptable architecture. While this thesis may include some urban design, developing a plan for the entire waterfront is beyond the scope of investigation. It was therefore necessary to narrow the selection to three potential sites; Spring Garden, PECO Delaware Generating Station, and Washington Avenue.

[57] "Master Plan for the Central Delaware: Transforming Philadelphia's Waterfront," 11.

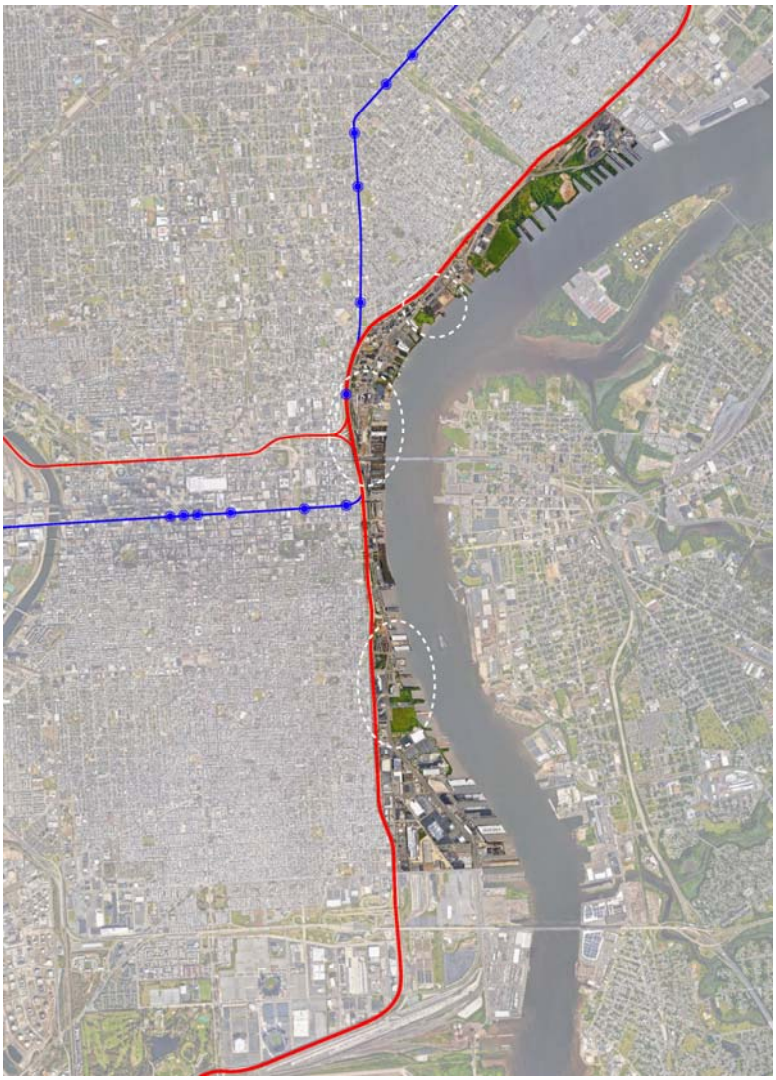

Figure 22: Waterfront Site Selections (source: Google Earth, author's overlay)

These sites were selected and evaluated based on the following criteria:

1. Access to public transportation
2. Connectivity to the waterfront
3. Connectivity to city
4. Historical relevance to Philadelphia's industrial past
5. Historical relevance to the Delaware Riverfront as a port
6. Suitability for adaptability through adaptive reuse or new construction

Spring Garden

The first potential site is located at the intersection of Spring Garden and Delaware Avenue. This is a major access point by both vehicles and pedestrians, and is in many ways a gateway to the waterfront. The site has great access to public transportation by way of the Spring Garden subway stop and is directly connected to the waterfront. Spring Garden provides a relatively strong connection to the city, however, the I95 underpass needs to be improved to provide safe and encouraging connectivity. The piers and warehouses also suggest a strong connection to the historical significance of Philadelphia as a port city.

Figure 23: Spring Garden Site (source: Google Earth, author's overlay)

This site is particularly well suited for new construction. There are numerous empty lots along Delaware Avenue between Vine Street and Noble Street and a number of piers that are either abandoned or currently used as parking lots. The site also includes buildings suitable for adaptive reuse including Municipal Pier 5 and a number of warehouses.

PECO Delaware Generating Station

This site was selected primarily because it provides an opportunity to adaptively reuse an iconic, historically rich piece of architecture with the potential of building community. The site is also large enough that it allows for expansion which would require negotiating the relationship between new and old.

As previously discussed, it also has good access to public transportation along Girard Avenue and is located directly on the waterfront. The site also has a very strong history as a Navy Shipyard and coal burning power plant that is directly tied to both Philadelphia's industrial past and the Delaware Riverfront as a port.

Figure 24: PECO Generating Station (source: Google Earth, author's overlay)

Washington Avenue

The area including Pier 38 and 40 between South Street and Tasker Avenue presents an opportunity for a more ecological and landscape based approach to developing the waterfront. There are a significant number of abandoned and overgrown piers along with

lots that could be developed into a park system focused on healing the Delaware River. There are a number of streets that pass under I95 to connect this area of the waterfront to South Philadelphia but, there are no nearby subway stations. In terms of public transportation this site would have to rely on bus service or potentially propose a trolley line along Delaware Avenue.

Exploring adaptive reuse strategies for the piers corresponds directly to Philadelphia's past history as a port city and the development of a park system ties back to William Penn's original plan to develop Philadelphia into a green community that coexists with the rivers, plants, animals, and abundant resources. Although currently occupied, Pier 38 and 40 are underutilized and could be adaptively reused to act as a community anchor to attract more of the nearby South Philadelphia neighborhood to the area. The Exploratorium, located at Pier 15 in San Francisco, exhibits an uncanny resemblance to Pier 38 and 40 and is a unique precedent for a pier typology adaptive reuse project. See the precedent research section of this paper for a more detailed description of the project.

Site Selection

While all three of these sites provide opportunities to investigate adaptable architecture, the PECO Delaware Generating Station was selected as final site for this thesis. It is located directly on the waterfront with site boundaries that provide room for expansion but also limit the thesis to a more defined location. The site has relatively good access to transportation and as previously discussed, has a strong historical background. The adjacent Penn Treaty Park and office building across the street also provide an intriguing context by which to respond to. The following History and Site Analysis section will discuss the PECO Generating Station in more detail.

HISTORY

In order to select program and make informed design decisions it is important to understand the history of the site. This section begins broadly by looking at a selective history of Philadelphia and becomes more specific in terms of the neighborhood and building itself.

A Selective History of Philadelphia

Philadelphia was founded by William Penn on October 27, 1682. Penn was a Quaker and envisioned a city where people of different religions could live together free from persecution. The city was designed on a grid system similar to the rural towns of England. Homes were to be separated and surrounded by gardens with plenty of open space at relatively low densities.[58]

The city was designed to expand north and west towards the Schuylkill River with the same grid system. The plan called for major north-south and east-west streets, now known as Broad Street and Market Street, to intersect at a central square surrounded by public buildings. This central square is now home to City Hall. Penn also designated four squares in the four quadrants of the city for public parks and green space.

As the city began to grow, people tended to settle along the Delaware River instead of buying lots to the West. They wanted to be located close to the trades and businesses associated with the "bustling seaport and market town."[59] Land was subdivided and smaller streets were constructed within the larger lots. Penn's vision of a rural English

[58] Ron Avery, *A Concise History of Philadelphia* (Philadelphia: Otis Books, 1999), 20.
[59] Ibid.

town quickly faded as commerce and density increased along the waterfront.[60] Development along the waterfront was also not always in line with the idealized grid. Fishtown and the many of the other "Riverwards" neighborhoods developed perpendicular to the riverfront which created a seam where the two grids collide. See Figure 25 for present day diagram analyzing the intersection of these two grids.

Figure 25: Seam in the Grid between Riverwards and Penn's Original Intention (source: Google Earth, author's overlay)

Philadelphia was attractive for both its religious tolerance and its natural resources. Wheat and flour became one of the region's major exports and the streams and rivers were excellent sources of fish and birds. The Delaware River was especially famous for its shad, herring and sturgeon, which would migrate upstream every spring to spawn.[61] In fact, Fishtown, originally a part of Kensington, got its name from the high concentration of shad fisheries and canneries located along the Delaware River.

---

[60] Ron Avery, *A Concise History of Philadelphia*, 25.
[61] Ibid., 26.

By the 1760's Philadelphia had grown to over 25,000 people. Wharves and warehouses were prevalent along the waterfront and approximately 700 ships arrived annually, so shipbuilding became an important and popular trade. With this growth two major classes emerged: the merchant elite and the skilled artisans. Skilled artisans included silversmiths, furniture makers, printers, iron masters, stone masters, and people like Benjamin Franklin who symbolized the new "self-made American."[62] Philadelphia was a city of makers.

Philadelphia played a key role in the Revolutionary War. As tensions rose with Britain, the colonies gathered in Philadelphia for the first Continental Congress. Both the Declaration of Independence and the United States Constitution were signed in Philadelphia and the city served as the temporary capital from 1790 to 1800.

The years between 1800 and 1850 were an interesting time period for Philadelphia. It lost its status as the State and National Capital, its ranking as the number one port city was exceeded by Baltimore and New York, and it was no longer the largest city in America. It was a period characterized by crime and ethnic and class friction, however; it was also a period of transition and growth characterized by many scientific, architectural, and medical achievements.[63]

During this time, Philadelphia evolved from a predominantly shipping focused economy to an industrial based economy. It became a center for manufacturing and emerged as one of the Nation's leading industrial cities. The city became host to numerous shops and

---

[62] Ron Avery, *A Concise History of Philadelphia,* 27-30.
[63] Ibid.

factories and was especially well known for its textile industry.[64] The city was nicknamed "Workshop of the World," which is where the name of this thesis originated from.

The Franklin Institute of the State of Pennsylvania for the Promotion of Mechanic Arts was founded in 1824 as a way of encouraging innovation and promoting industrialization. Today the building serves as a science museum, however; "in the 19th century it was a dynamic organization that educated artisans and mechanics in practical science, mathematics, and drafting. It was a "think tank," testing and developing inventions and technological advancements."[65]

A major contributing factor to the industrial boom of Philadelphia was the discovery of hard anthracite coal in northeastern Pennsylvania. Coal was transported down the Delaware River and along a progressively developing canal, river, and rail system to power plants and industrial buildings in and around Philadelphia. A newly developed method of burning this coal to generate steam power played a huge role in fueling the industrial revolution.[66]

Philadelphia also played a major role in producing supplies for the Civil War. The shipyards produced vessels, the Frankford Arsenal produced ammunitions, and the textile mills produced blankets and uniforms. The city was also an important medical center and provided care to injured soldiers who arrived by train.[67]

Following the Civil War, Philadelphia continued to distinguish itself as the Nation's leading industrial center. Unlike other industrial cities such as Pittsburgh and Detroit,

---

[64] Ron Avery, *A Concise History of Philadelphia,* 51.
[65] Ibid., 55.
[66] Ibid., 54.
[67] Ibid., 58.

Philadelphia was not dependent on one type of industry. It was extremely diverse with over 7,000 manufactures creating a number of products including; toys, cigars, beer, candy, leather, drugs, rope, paint, hats, printings, baseballs, and dental supplies along with some of the more well-known textiles, ships, and locomotives. A key component to diversity was the small to medium sized manufactures.[68]

In the late 1800's and early 1900's the city became known for its political corruption. Despite this corruption, and perhaps largely because of it, the city built numerous public buildings, grand boulevards, and an expansive park system. Philadelphia was again a leading manufacturer for supplies during World War I and World War II. It faired relatively well during the depression given its diversity of manufacturing. The unemployment rate was 12% for whites and 20% for African American and foreign born workers. That national average reached 25% with some cities such as Akron Ohio reaching 50-60%. [69]

Following World War II the city continued to grow reaching a population of just over 2 million in 1950 with a flourishing modern industry. However, it was hit hard by white flight, suburbanization, and the decline of industry. By the end of the 20th century, the population had decreased from 2 million to 1.5 million and thousands of people lost jobs as key industries such as the Navy Yard, Pennsylvania Railroad, and other factories shut down or significantly decreased levels of production.[70]

In recent years the city has seen a slight increase in population and there are signs of revitalization. The past industrial economy has moved towards a service and information

---

[68] Ron Avery, *A Concise History of Philadelphia,* 62.
[69] Ibid., 66-71.
[70] Ibid., 75.

based economy which includes computer based businesses, finance, telecommunications, insurance, and printing and publishing. Higher education, health institutions, and tourism have developed into the backbone of the city's economy.[71]

Fishtown

The Fishtown neighborhood has historically been a part of Kennsignton, however, due to a high number of shad fisheries it became known as Fishtown. In addition to shad fishing the neighborhood was known for its maritime related trades including ship building, rope factories, and smoke houses.

Fishtown was also one of the first areas of the city to industrialize. It was home to a number of large scale industrial buildings including lumber yards, dying and textile facilities, and factories as well as smaller mom and pop workshops and stores. While industrialization brought a number of jobs and development to the area, it also produced significant pollution creating ecological damage to the Delaware River causing the shad fisheries to shut down.

Deindustrialization resulted in a loss of jobs however, due to the variety of small scale manufacturing, the area fared better than many other places in Philadelphia. Despite the loss of jobs the area still maintained a hard working blue collar feel. The construction of 95, which began in 1959, was also a detrimental to the neighborhood, further severing it from the waterfront.

---

[71] "Philadelphia: Economy," *City-Data.com,* http://www.city-data.com/us-cities/The-Northeast/Philadelphia-Economy.html (accessed May 6, 2017).

Currently the neighborhood is experiencing a revival fueled by artists and young professionals. While this has been good for development it is creating issues related to gentrification and the potential erosion of community.

Philadelphia Electric Company Generating Station Site

As previously discussed, the Delaware Riverfront played an important role in the initial settlement of Philadelphia. In fact, in 1683 an agreement between William Penn and the Native Americans known as the Penn Treaty was signed just south of the Delaware Station in the park now named Penn Treaty Park.

Prior to becoming a Power Station, the site was occupied by the United States Navy shipyard called the Nefie and Levi Shipyard. The shipyard was home to some of the world's largest ships and specialized in marine engineering. Some of the first submarines were built here. The shipyard closed in 1907 and the site was acquired by the Philadelphia Electric Company in 1913.

The site was ideal for a power plant given its location along the Delaware River which provided not only a convenient way to receive coal deliveries, but also the river water could be used in the water systems of the Power Plant. Construction began in September of 1917 and following a two year pause during World War I, the building was completed in October of 1920.[72] Between 1920 and 1924 the Power Plant gradually added generators as energy needs increased. The sixth and final generator was installed in 1924.[73]

---

[72] Stephanie Haller and Jill Betters, "Nomination of Historic Building, Structure, Site, or Object Philadelphia Register of Historic Places: Philadelphia Electric Company Delaware Generating Station," *Philadelphia Historical Commission,* March 03, 2017, 6.
[73] Ibid., 9-10.

As electricity demands continued to increase an addition was added to the eastern side of the plant in 1953.[74] At the height of production, the plant could produce 455,000 kilowatts of power per hour.[75] In 1970 the coal plant was converted to oil and in 2000, PECO merged with Exelon and the plant ended operation shortly thereafter in 2004.[76] The expansion was demolished in 2008 due to asbestos and the need for additional parking for a nearby office building.[77]

Conclusions

Understanding the history of the city, the waterfront, and the neighborhood played an important role in determining program and formulating design. The function of this building is derived from Philadelphia's industrial past and the idea of making, the importance of generating power, movement and transportation along the Delaware River, and the importance of creating diverse communities to strengthen both economic and social resiliency. The ecological role of the river and an attempt to revitalize natural systems also plays a major role in the development of this thesis.

---

[74] Stephanie Haller and Jill Betters, "Nomination of Historic Building, Structure, Site, or Object Philadelphia Register of Historic Places: Philadelphia Electric Company Delaware Generating Station," *Philadelphia Historical Commission*, 10.
[75] Ibid.
[76] Ibid.
[77] Ibid.

SITE ANALYSIS

Similar to the history section, site analysis begins at the larger scale of the Delaware Riverfront and gets more specific in terms of the neighborhood and surrounding context. Understanding of the Fishtown neighborhood and existing building were essential to design.

Larger Context of the Delaware Riverfront

Philadelphia is largely defined by two major rivers: the Delaware River and the Schuylkill River. The Delaware forms the eastern border of the city and the Schuylkill generally runs along the western side of the city. Broadly speaking, the city can be thought of as having six major zones: North, South, West, Northeast, Northwest, and Center City. These zones are split into a number of different neighborhoods, each having their own unique character.

Before jumping into site specifics, this section will begin more broadly by analyzing a portion of the Delaware Riverfront which is located on the eastern edge of Philadelphia between East Allegheny Avenue and East Oregon Avenue (Figure 26). There are three major subway stops within close proximity of the waterfront and there are multiple bus lines along Delaware Avenue, the main stretch of road running alongside the river. Delaware Avenue is a challenge because in many ways it is more of a highway than a street, with three lanes of traffic in either direction.

Interstate 95 also runs roughly parallel to the Delaware River creating a barrier between the city and the waterfront. The highway is generally elevated along the northern and southern ends of the waterfront and drops below grade east of center city where a number

of pedestrian bridges and parks pass over top. In general the waterfront is backed up by healthy neighborhood fabric. However, when this fabric reaches I95 it breaks up, becomes disjointed, and does not carry through to the other side of the highway. While the highway makes accessing the waterfront by car or truck very easy, it creates a design challenge of better connecting and integrating the city and the waterfront.

Figure 26: Delaware Riverfront (source: Google Earth, author's overlay)

The northern portion of the riverfront is characterized by abandoned industrial buildings, overgrown lots and piers, and the abandoned PECO Delaware Power Station. The central portion consists of patches of development which includes the Sugarhouse Casino, concert venues, a range of piers with various uses, and a variety of residential buildings ranging from traditional row houses to high rise condominiums and apartments. The lower portion of the site is home to numerous big box shopping facilities, restaurants, and industrial piers.

Masterplan Review

The Delaware River Waterfront Corporation (DRWC) commissioned the development of a masterplan for the Central Delaware in an effort to breathe new life and development into Philadelphia's waterfront. The main goal of this plan was to "transform Philadelphia's central Delaware River waterfront into an authentic extension of the thriving city and vibrant neighborhoods immediately to its west."[78] The area in consideration for the masterplan includes the waterfront area between Allegheny Avenue to the north, Oregon Avenue to the south, Interstate 95 to the west, and the Delaware River to the east. It includes six linear miles of waterfront and 1,100 acres of property.

The following design principles and goals are taken directly from the Master Plan for the Central Delaware.

1. Create a network of civic and public spaces that are distinctive public amenities as well as catalysts for private development
2. Promote the development of new, low- to mid-rise, dense and walkable neighborhoods

[78] "Master Plan for the Central Delaware: Transforming Philadelphia's Waterfront," 71.

3. Accommodate diverse land uses along the waterfront
4. Incorporate best practices in sustainability
5. Participate with city and state entities to create a pedestrian friendly and balanced transportation plan that supports the walkability of the waterfront and its strong connection to the city and the region
6. Create strong inclusionary opportunities for economic development for minority-owned, women-owned, and disadvantaged businesses
7. Create a plan that can be implemented in discrete increments over time
8. Create a truly Philadelphia waterfront

For the most part this plan address the major issues related to the waterfront. It proposes a trolley line along Delaware Avenue for improved public transportation, it includes large park spaces and improved walking and biking trails, it aims to better connect nearby neighborhoods to the waterfront. However, there are a few contentious points that are worth revisiting.

First, the plan calls for walkable neighborhoods and diverse land uses along the waterfront. However, all the office space and light industrial buildings are located to the far north of the site rather than being dispersed throughout the plan. In an effort to create truly diverse neighborhoods these other types of uses could be sprinkled throughout the site. Additionally, if the city wants to create a "truly Philadelphia waterfront" there may be more opportunities to develop uses which are more in line with its original purpose of producing and shipping goods.

Secondly, the plan calls for predominantly low- to mid-rise buildings as an effort to pull existing neighborhood fabric into the area and to spread out development more evenly along the waterfront. An opposing view could be that the land between I95 and the waterfront is not significantly large enough to establish these kinds of neighborhoods. It

is a unique, narrow strip and while walkability is important, high rise buildings with better views and higher densities may be better suited for the area.

Finally, diving a little further into the plan, it calls for a mixed use residential complex on the existing Festival Pier site. While there may be better uses for the site than a concert venue, this area serves as a gateway to the waterfront and it seems like this could be a good opportunity to develop a more public building complex or green space.

An interesting portion of the masterplan is the vision for the PECO Energy Station. While programming is very vague, the building is described as an event space capable of hosting indoor and outdoor concerts. While this building should be open to the public in some way, it presents an interesting case study as a way to investigate adaptation. The following site description narrows in on the PECO Generating Station and its surrounding context.

Site Description

The PECO Generating Station is located in the Fishtown neighborhood of Philadelphia between Interstate I95 and the Delaware River. Fishtown is on the eastern side of City and, among other neighborhoods in River Wards area, is considered to be the birthplace of the industrial revolution in Philadelphia. It got its name from the shad fisheries that once populated this portion of the river and from the working class people that lived in the neighborhood.

The area is currently facing issues related to gentrification and a lack of green space. As development reaches its saturation point, older buildings are being threatened by

demolition, for the prospect of denser newer construction.[79] According to data derived from the United States Census Bureau, Fishtown has a population of 16,734 with a population density of 10,808 people per square mile. The median age is 34 and the neighborhood race breakdown consists of the following: Caucasians (79.48%), African American (8.19%) Asian (3%), American Indian (.06%), Mixed Race (3.59%), and Other (5.56%).[80] AreaVibe gave the neighborhood an F for Cost of Living, Crime, and Education and a D+ for Employment. It is unclear what these ratings are based on but it suggests there is certainly a need for affordable housing, improved safety, and better opportunities for education.

[79] Bradley Maule, "Defining Historic "Fishtown," *Hidden City Philadelphia,* May 17, 2016, http://hiddencityphila.org/2016/05/defining-historic-fishtown/ (accessed May 20, 2017).
[80] "Fishtown, Philadelphia, PA Demographics," *Areavibes.* http://www.areavibes.com/philadelphia-pa/fishtown/demographics/ (accessed May 9, 2017).

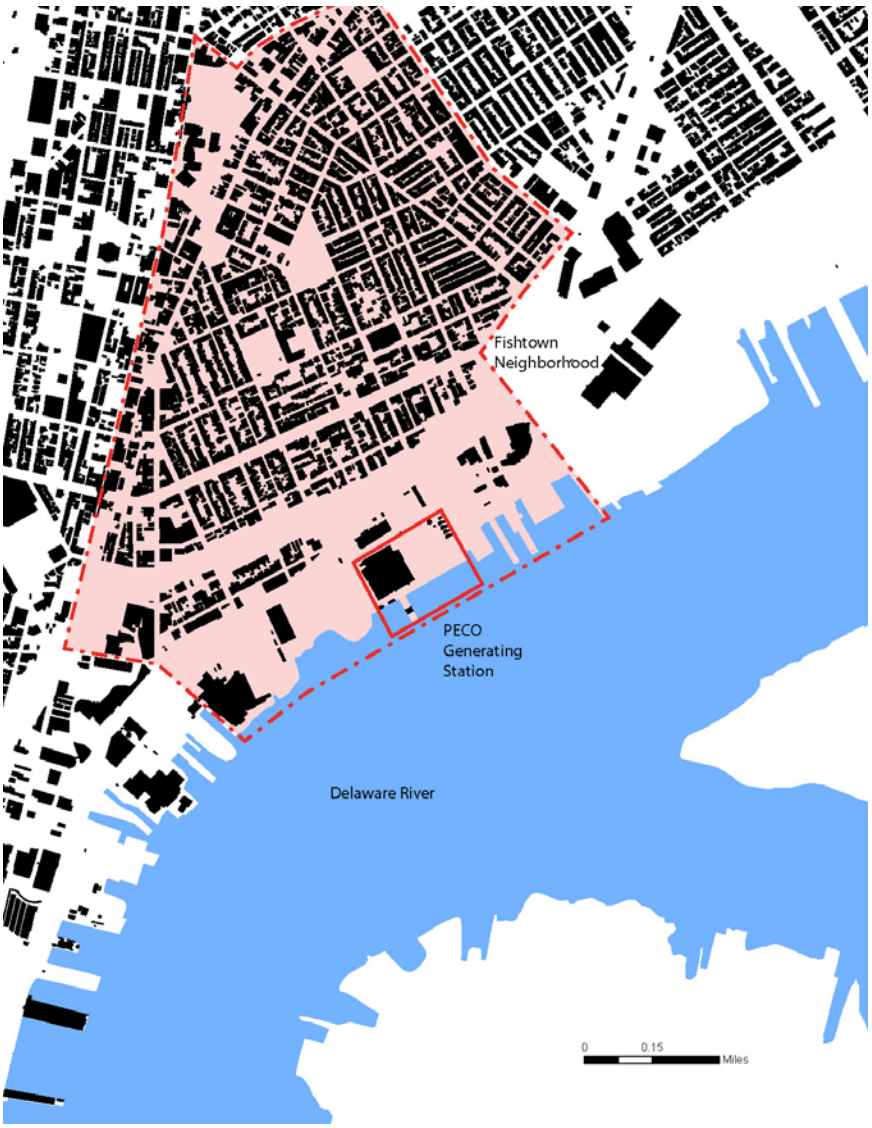

Figure 27: Figure Ground: Fishtown Neighborhood (source: author)

Delaware River

A potentially important component to this thesis is addressing the Delaware River. The river was important to the history of the site as a ship yard and a power plant, and it will be equally important as the riverfront begins to reinvent itself. The following information will be essential for developing a stance towards the interaction of the building and the water.

The Delaware River is 330 miles long with a drainage area of 13,549 square miles.[81] It begins in New York and flows through Pennsylvania, New Jersey, and Delaware into the Delaware Bay and Atlantic Ocean. The river is essential for the regions trade, drinking water, and wildlife. The Delaware River Port complex is the largest freshwater port in the world and 42 million gallons of crude oil is transported along the river every day. It also provides drinking water to approximately 15 million people. In addition to drinking water, the river is used for thermonuclear cooling, agriculture, and recreational purposes. The portion of the river that passes by Philadelphia is tidal and fluctuates between six and seven feet throughout the day.

Context

Northeast of the site is characterized by industrial storage yards and abandoned lots and piers. According to the masterplan, this area is slated to be redeveloped into an office and light industrial zone. Penn Treaty Park and the Surgarhouse Casino are located to the southwest of the site. The park is active and is a positive component of the site, however; the Surgarhouse presents a number of challenges. Although it could potentially bring people to the waterfront, it is debatable whether these visitors will actually engage in any activities outside of the casino. Casinos are by nature designed to encourage visitors to stay, gamble, and spend their money on the premises – not to leave and explore the surrounding city. Since the footprint of the facility is rather large, it also acts as a barrier between future development at the PECO Station and some of the more popular areas further south near Spring Garden.

---

[81] "Delaware River Basin Facts," *Bureau of State Parks Outdoor Programming Services Division,* June 2010, http://dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20031252.pdf (accessed May 10, 2017), 1.

The Fishtown Neighborhood is located north of the site and is home to a vibrant community. Girard Avenue and Frankford Avenue serve as the major commercial streets with numerous bars, restaurants, and local shops. There are also a number of community buildings including churches, public schools, and a police station. The neighborhood consist primarily of two to three story row houses with a few multistory apartment buildings, most of which appear to be adaptive reuse projects of factory or warehouse buildings.

Figure 28: Neighborhood Site Analysis (source: author)

The site is located along the Delaware River front and is bordered by Beach Street to the North, the Delaware River to the South, Penn Treaty Park to the West, and an industrial storage lot to the East. The entire site is approximately 16 acres with 6 acres below sea level, 5 acres taken up by the main building, 4 acres dedicated to surface parking, and a 1 acre for storage of a back-up generator, turbines, and oil storage tanks.[82] The site also consists of the coal tower, ash bunker, and screen house which are located behind the main building along the waterfront (see Figure 29).

[82] Stephanie Haller and Jill Betters, "Nomination of Historic Building, Structure, Site, or Object Philadelphia Register of Historic Places: Philadelphia Electric Company Delaware Generating Station," *Philadelphia Historical Commission*.

Figure 29: Existing Buildings (source: Google Earth, author's overlay)

Transportation

The site is easily accessible by car from I95 or Delaware Avenue, which runs along the edge of the riverfront. In terms of public transportation, there is a trolley stop, which is currently under construction, 0.3 miles north of the site and a Subway stop 0.6 miles west of the site along Girard Avenue. There are also nearby bus stops on Delaware Avenue and Beach Street with an opportunity to develop a water taxi stop along the river. According to Walkscore.com, the site is very walkable (75), with good public transit (69), and is very bikeable (85).[83] The Fishtown neighborhood has an overall walkscore of 93 and is ranked the 10th most walkable neighborhood in Philadelphia.

[83] "1325 Beach Street," *Walk Score*, https://www.walkscore.com/score/1325-n-beach-st-philadelphia-pa-19125 (accessed May 5, 2017).

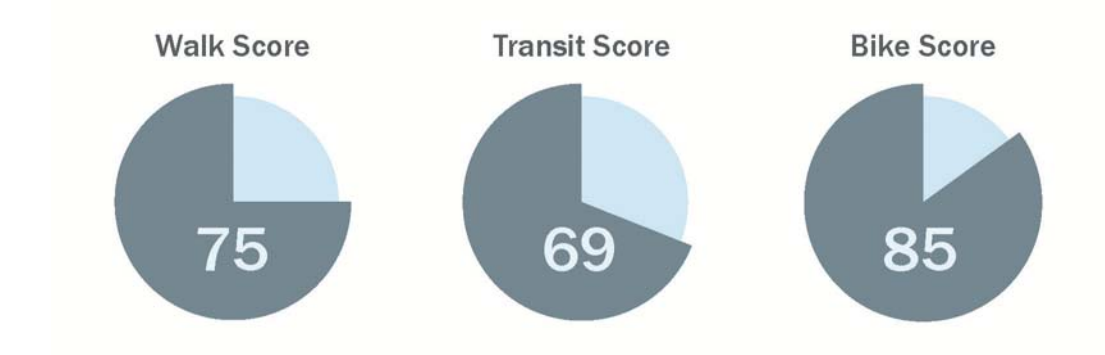

Figure 30: Walkscore. Graphic developed by Author based on walkscore.com information (source: author)

Climate

Philadelphia is typically hot and humid in the summers with relatively cold winters. Average winter temperatures range from 26 to 40 degrees Fahrenheit in January and 69 to 87 degrees Fahrenheit in July. For monthly averages refer to Figure 31. The average annual rainfall is 41.45 inches and the average annual snowfall is 23 inches.[84]

Wind direction varies throughout the year but generally blows from the northwest in the winter between November and March, from the southwest in the summer from April to August, and from the northeast in the fall in September and October. At the Philadelphia Airport, the average wind speed varies between 9 and 13 mph with an average yearly wind speed of 10 mph.[85]

---

[84] "Climate Philadelphia – Pennsylvania," *U.S. Climate Data,* http://www.usclimatedata.com/climate/philadelphia/pennsylvania/united-states/uspa1276 (accessed May 5, 2017).
[85] "Wind and Weather Statistics: Philadelphia International Airport," *Windfinder,* https://www.windfinder.com/windstatistics/philadelphia_airport (accessed May 5, 2017).

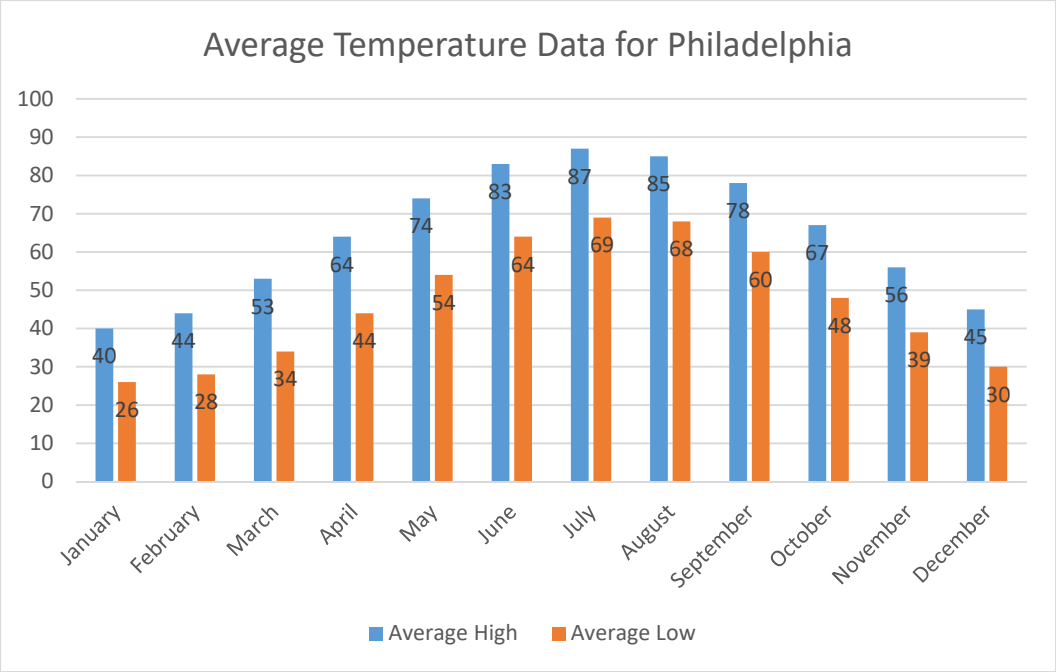

Figure 31: Average Temperature Data for Philadelphia (source: author)

Topography

The site is generally very flat with a six foot drop in elevation from Beach Street to the water. There is an approximately 6 foot drop from the edge of the site to the water.

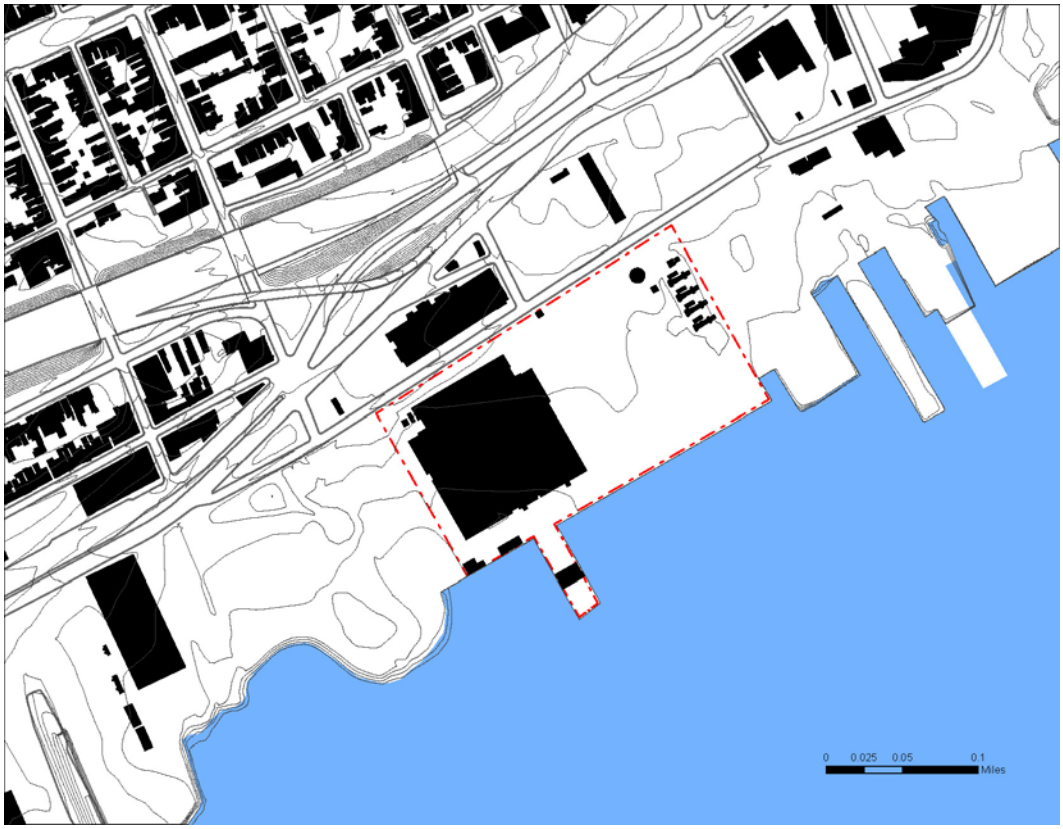

Figure 32: Site Boundary and Topography (source: author)

Access to Healthy Food

In terms of access to food, the site appears to be well situated in terms of both restaurants and grocery stores. There are a variety of restaurants and local markets along Girard Avenue and Frankford Avenue which are all within walking distance of the site. There is also a relatively close by large scale grocery store approximately 0.75 miles west of the site. Anything not within walking distance can be reached by public transportation, including many of the other big box retail and grocery stores which are a thirty minute bus ride south on Delaware Avenue.

Existing Building Description

The following description of the existing building conditions is derived primarily from the Nomination for Historic Buildings completed by Stephanie Haller and facilitated by Jill Betters and a series of observations from site visits.

The Delaware Power Station is an industrial building constructed in a monumental Neo-Classical style. The primary structural systems consist of reinforced concrete and concrete with steel frame. In fact, it was the first major power station to be constructed of reinforced concrete.[86] The foundation is made of steel caissons with reinforced concrete which are important given the massive building loads and saturated soil conditions along the Delaware River. The primary structure is roughly square with a footprint of approximately 130,000 square feet. It is 367 feet long, 373 feet wide, and 91 feet tall with a total square footage of 223,000. The building footprints for the coal tower, ash bunker, and screen house account for an additional 8,400 square feet.

According to the Nomination for Historic Buildings, the station is "in relatively sufficient structural condition, with minimal degradation to the reinforced concrete façade. Façade degradation is limited to the exposure of rebar" (see Figure 33). There are also a number of broken windows, graffiti, and locations of water infiltration. In some cases there is a cracking of the façade which could be a result of weathering or differential settlement.[87]

---

[86] Melissa Romero, "PECO Delaware Station Receives National and Local Historic Designation, *Curbed Philadelphia* (August 23, 2016) http://philly.curbed.com/2016/8/23/12603642/peco-delaware-station-historic-designation (accessed May 10, 2017).
[87] Stephanie Haller and Jill Betters, "Nomination of Historic Building, Structure, Site, or Object Philadelphia Register of Historic Places: Philadelphia Electric Company Delaware Generating Station," *Philadelphia Historical Commission*, 2.

Figure 33: Exposed Rebar on North Side of Switch House (source: author)

The main building is split into five primary spaces: the switch house, turbine hall, two boiler houses, and storage (see Figure 34). Turbine hall spans the entire length of the building and is approximately 116 feet wide by 373 feet long. There are a total of six bays designed to house the original turbines with a ground level and a first floor that consists primarily of catwalks. The space is characterized by large four story bay windows at both ends with a number of skylights which provide natural light. There is also a moveable crane that runs along the upper story.

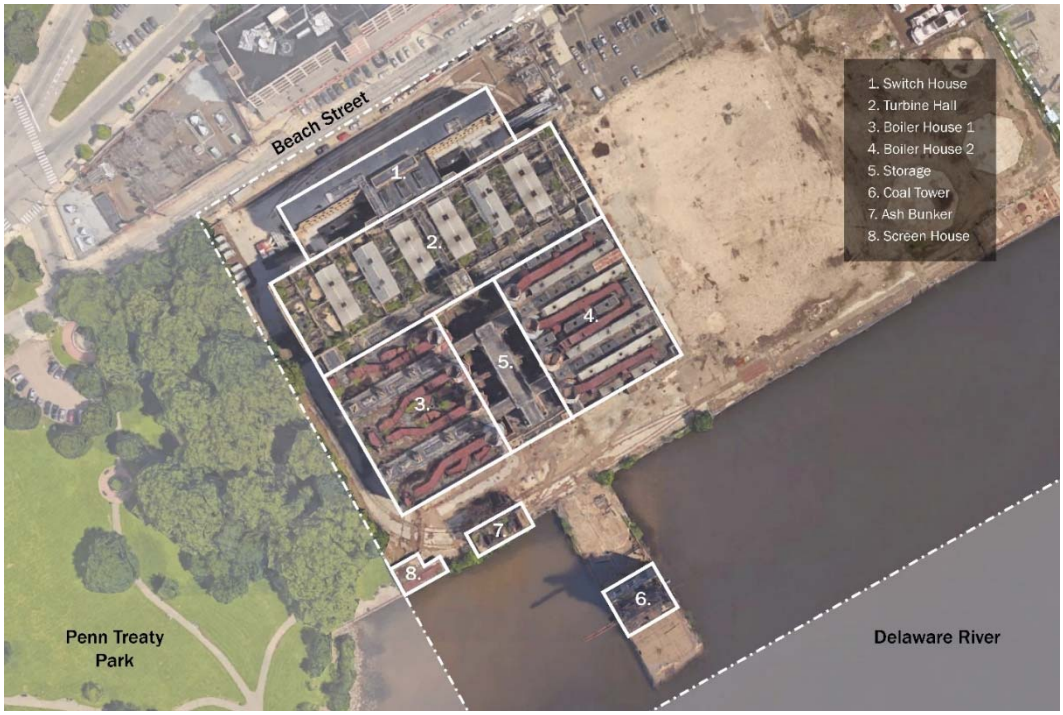

Figure 34: Building Components (source: Google Earth, author's overlay)

The boiler houses are each approximately 136 feet by 174 feet and are slightly more complex in terms of floors and spaces. They consist of six different floors connected by a series of stairs and catwalks with portions of the ceiling that undulate up and down. These spaces also have movable cranes and are characterized by the same four story windows located in the turbine hall.

In terms of the façade, the first story consists of eight ashlar courses that wrap the entirety of the building. Windows extending from the 2nd to 5th story are repeated on each side of the building and are the main source of light for the boilers rooms and switch house. Portions of the façade are recessed or extruded to distinguish points of entry. The building is also characterized by eight copper smoke stacks that rise above the tan classical facade.

The switch house, which is attached to turbine hall, is equal in height to the rest of the building and serves as the north façade. The bar shaped structure includes five above ground levels and one basement level, with the majority of the spaces being approximately 30 feet deep. It was originally responsible for checking for short circuits and channeling the electricity to the substation.

There are several other structures which were important to the process of producing coal generated power and contribute to the character of the site. These include the coal tower, ash bunker, and screen house. There are also turbines and fuel oil storage tanks located on the northeastern edge of the site.

Perhaps the most distinctive building is the Coal Tower, with a blocky six story base topped by a streel truss apparatus designed for receiving coal deliveries (see Figure 35). "The coal tower is located at the rear most point of the site, on a centrally located pier in the Delaware River." The primary function of this structure was to "hoist, store, and feed coal to the bunkers." Originally, the tower was connected to the main building by a conveyor belt that carried coal to the bunkers.

Figure 35: Coal Tower (source: author)

The ash bunker and screen house are also located at the rear of the site and were used to remove ash from the coal that was delivered by train and filter river water that was used as part of the plants cooling process. These structures are three and one story, respectively.

The gas turbines and oil storage tanks are located on the northeastern side of the site and are associated with the buildings transformation from coal to oil power generation. According to the Nomination form these are non-contributing structures, however, they

helped extend the life of the power plant and could be viewed as adaptations that contributed to the life and story of the building.

While a detailed understanding of coal power production is not necessary for this thesis, developing a basic understanding of these structures and their contribution to the power generating process could be useful in developing program and making design decisions.

Aside from the more quantitative observations, there are many qualitative conditions that contribute to the character of the building. Graffiti covered walls and the occasional glimpse of an urban explorer climbing the ruins of the coal tower suggest that although the building may be closed, there is a cultural interest and excitement that lives on. The building speaks to the past but is also an expression of the present. Decay and informal interventions contribute to create a sense of mystique and charm.

Diagrammatically the building can be broken down into a neoclassical wrapper that hides and industrial core (Figure 36).

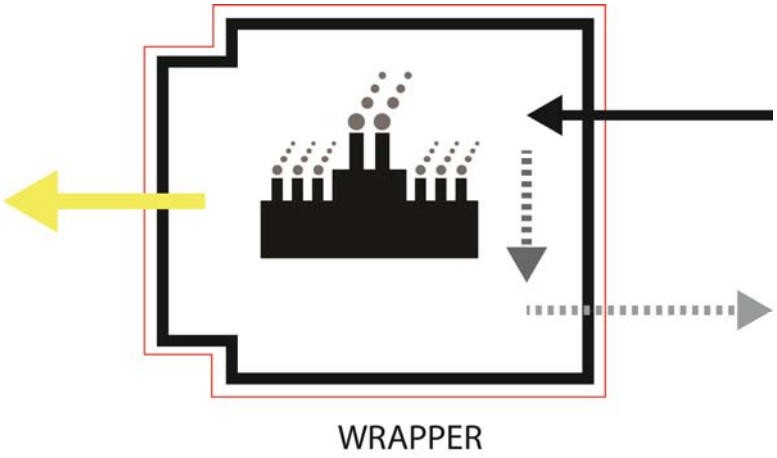

Figure 36: Neoclassical Wrapper (source: author)

It can then be further broken down into five distinct interior spaces (Figure 37)

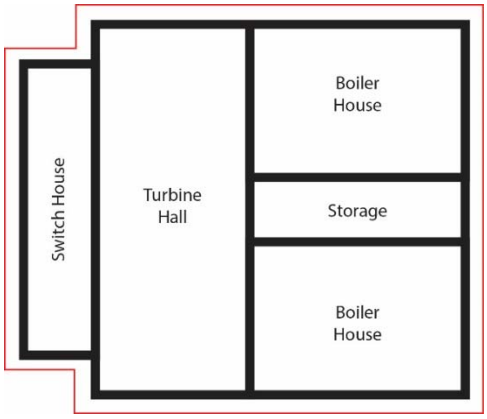

Figure 37: Interior Spaces (source: author)

These spaces are segregated into zones with very little porosity or connection within the building. This separation ties almost directly to occupational status leaving the manual laborers segregated in the back of the building to work with the coal, the skilled mechanical workers in Turbine Hall, and the Engineers and Managers in the Switch House (Figure 38)

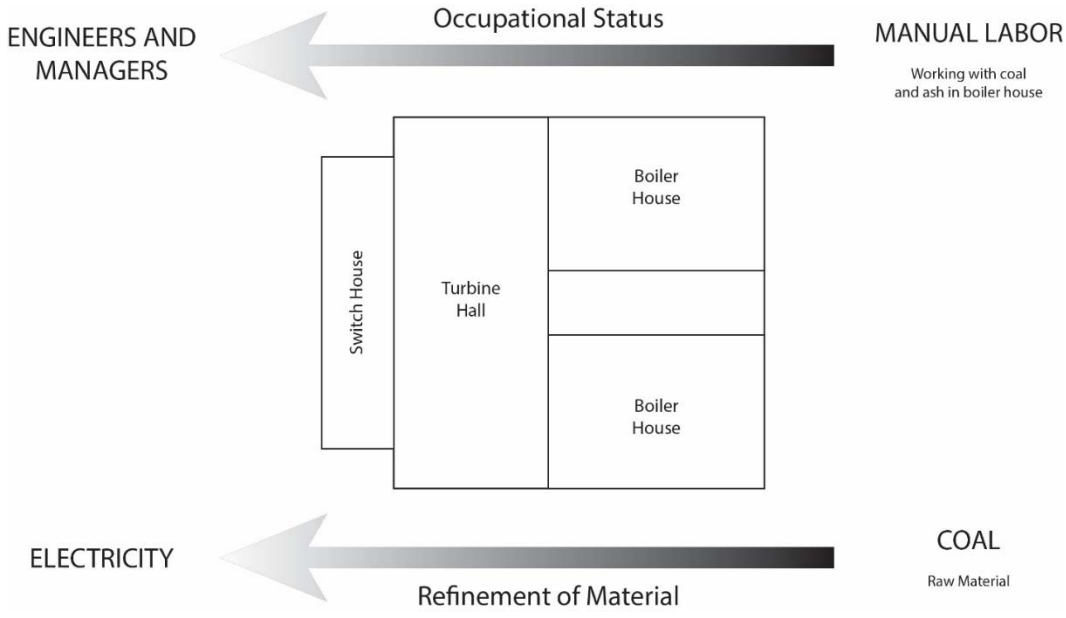

Figure 38: Occupational Status Segregation (source: author)

Finally, looking at the building from a more technical stand point, the process of bringing the coal in from the barges to the creating electricity is shown in the following diagram.

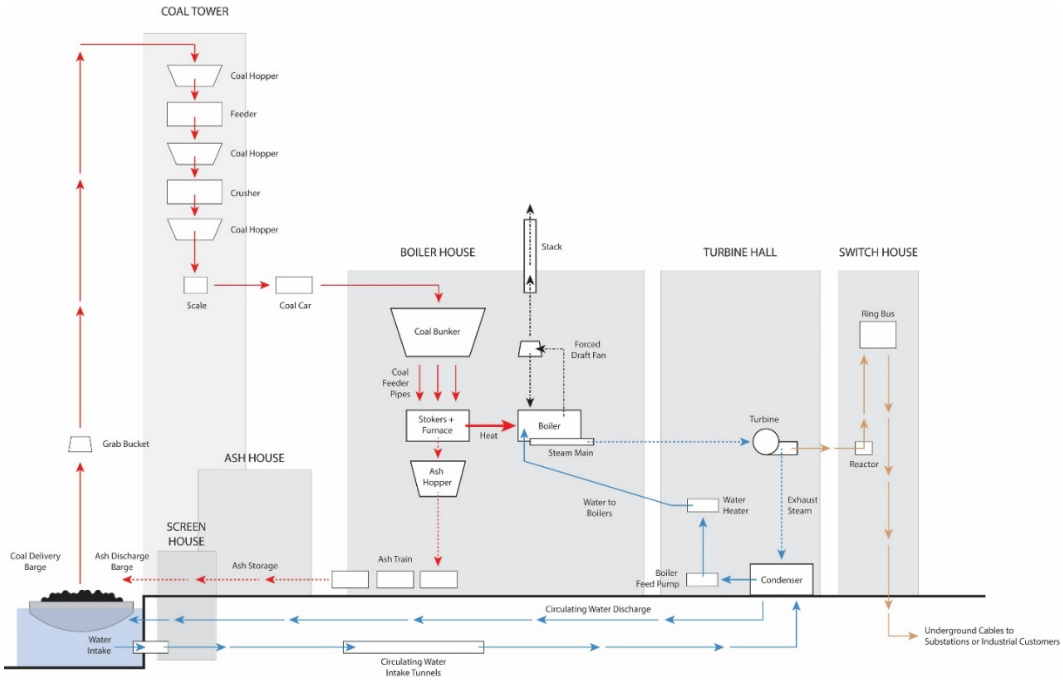

Figure 39: Building Processes (source: author)

These observations became important to the design goals which include creating a dynamic process flow for circulation amongst programs that are no longer segregated within the building.

PRECEDENT RESEARCH

The following precedents focus on the adaptive reuse of power plants and water front development. Programs vary greatly from building to building, including condominiums, museums, event spaces (concert venues), hotels, high schools, community centers, offices, and more. Despite these differences there are many common themes.

Most of the power plants utilize the large multi-story turbine rooms for public spaces, circulation, or some kind of event space. The buildings are also often part of a larger plot of land that architects and developers have used to create a larger scale complex or community that typically includes some kind of mixed use development. The power plant generally becomes an iconic, more public focused building within the larger context of a development or community. These types of buildings are also typically didactic in nature. They either include some sort of museum piece that relates back to the past history of the building as a power plant, highlight architectural features of the original building, or exhibit new sustainable technology. In all cases the history of the building and the process of producing power is used to inform design decisions.

Seaholm Power Plant, Austin Texas

Seaholm Power Plant is located along the Colorado River in Austin Texas. The plant was originally built in 1958 and stopped producing power in 1989. It was officially closed in 1996 and was dormant until 2004 when the city of Austin began investigating opportunities for redevelopment. Construction began in 2013 and the site is still in the process of being developed.

The proposed complex consists of three buildings totaling 130,000 sq. ft. and sits on a 7.8 acre site. The main Turbine Generator Building is 110,000 sq. ft. and features a third floor 8,000 sq. ft. hall with clear story windows and a 65 ft. ceiling. The adaptive reuse plan calls for this space to be converted into an event space designed for hosting concerts. The bottom two floors will be converted into office space, retail shops, and restaurants.

The remainder of the site will be developed to include a boutique hotel and condominium building, an office building, and a public plaza that links the three together. In terms of parking, the plan includes an elevated garage beneath the hotel and a below ground garage for the office building. The design of these two new buildings will feature art deco style architecture similar to the power plant.[88]

Homan Square Power House

The Homan Square Power House is located on the West Side of Chicago and was constructed in 1905. The original four building complex was 30,000 square feet and included a three story tall turbine room. It is now a National Historic Landmark.

The power plant was adaptively reused in 2007 to accommodate a charter high school and community center for low to moderate income residents. The Charles H. Shaw Technology and Learning Center now focuses on teaching students about green energy and technology, which seems very appropriate given its past history as a coal burning power plant. The building is LEED Platinum certified and uses the buildings green infrastructure (geothermal well, natural lighting, and heat recovery ventilation) to educate students and community members.

---

[88] Slavin, Mathew and Tatyana Brown, "Repurposing Legacy Power Plants: Lessons for the Future," *American Clean Skies Foundation* (August 2011), 18.

The redevelopment retains much of the original equipment for educational and aesthetic qualities including the coal conveyor belt and hopers, generators, crane, rail system, and chilling machine. In terms of program, the school uses the turbine room for larger gathering spaces including a cafeteria, gymnasium, assembly room, and community space and converted the boiler room into classrooms. Most of the original materials including terra cotta floor tiles and glazed brick walls were retained.

Station L Power Plant

The Station L Power Plant was constructed in 1908 in Portland, Oregon on an 18.5 acre site along the Willamette River. The wood fired steam plant was converted into the Oregon Museum of Science and Industry in 1990. The building is 219,000 square feet and now includes a "305-seat, five-story OMNIMAX Dome Theater and a 200-seat planetarium."[89] It also includes exhibit halls, science labs, motion simulator, shop, science store, and café. This project is particularly interesting because it showcases advanced technology with historic machines and architecture.

Pennsylvania Railroad Powerhouse

The Pennsylvania Railroad Powerhouse is located in Queens, New York and was built in 1906. It is characterized by four 275 foot chimneys and was originally designed to supply steam to create electricity for the Long Island and Pennsylvania railroads.

In 2008 the power plant was converted into a condominium complex consisting of "447 units and 180,000 square feet of galleries, restaurants, and offices." This is an interesting project because of the program as well as some of the design decisions. Due to structural

[89] Slavin, Mathew and Tatyana Brown, "Repurposing Legacy Power Plants: Lessons for the Future," 12.

issues the architect had to remove the iconic chimneys. However, in order to maintain their character, they were replaced by "shorter, round glass towers for living areas."

Like many of the other projects, this complex includes additional buildings and new construction in addition to the adaptive reuse. Developers purchased a nearby chemical plant and constructed additional housing, retail, courtyard space, and parking garages. In terms of amenity spaces, the architects attempted to use the qualities of the power plant to create a unique living experience that included a "two story lounge and catwalk viewing perch, extensive water features, a courtyard garden, spa, fitness center, media center, children's playroom, and rooftop deck with private cabanas and public zones."[90]

Tate Modern Museum

The Tate Modern Museum in London is perhaps one of the most famous power plant adaptive reuse projects. The original building was designed in 1940 and is located directly across from St. Paul's Cathedral on the Thames River.

The architects Herzog and de Meuron chose to maintain the industrial character of the building by applying minimal changes to the exterior façade and using cast iron and unfinished wood in the interior. The most visible alteration is a glass addition that appears as a "light beam set atop its roof, a horizontal contrast to the towering chimney. In this situation the new is clearly differentiated from the old brickwork of the original façade.

[90] Slavin, Mathew and Tatyana Brown, "Repurposing Legacy Power Plants: Lessons for the Future," 16.

The tall grand space of the turbine hall is used for public gathering and was envisioned as an indoor public plaza. Gallery spaces line the Turbine Gallery and range in size to house various forms of artwork.[91]

Centrale Montemartini

Centrale Montemartini is a museum located in southern Rome just outside the Aurelian walls near the Tiber River in Ostiense. The museum is unique in that it juxtaposes classical sculptures with machinery associated with the buildings original use as a thermoelectric plant. This pairing highlights the artistry and detail of these contrasting elements. "Visiting the museum provides, as the curators so eloquently put it, an "Olympian calm," a state of mind that is woefully missing at the more well-known sites in the Eternal City." This location of Rome is similar to the Philadelphia Riverfront in that it is incrementally evolving from its industrial past to a cultural, educational, and commercial future. [92]

The building uniquely serves its new function as a museum; "…the spacious ceilings and natural light from the high glass window panes creates a dream-like atmosphere that guides you back through time to the turn of the century and into Rome's classical past." The combination of preserved turbines, diesel engines, and steam boilers and marble statues of gods forces visitors to contemplate change and time.[93]

---

[91] Jones Rennie, "AD Classics: The Tate Modern / Herzog & Meuron," *Archdaily,* September 17, 2013. http://www.archdaily.com/429700/ad-classics-the-tate-modern-herzog-and-de-meuron. (accessed September 17, 2017).
[92] Ellen Ryan, "Rome's Centrale Montemartini Museum – Gods among the Machines," *Untapped Cities, June 03, 2013.* http://untappedcities.com/2013/06/03/romes-centrale-montemartini-museum-gods-among-the-machines/ (accessed September 15, 2017).
[93] Lauren Mouat, "Centrale Montemartini Museum: Machines, Gods and Ghosts at Rome's Centrale Montemartini Museum," *Romeing,* March 10, 2017. http://www.romeing.it/centrale-montemartini-museum/ (accessed September 16, 2017).

Gas Works Park

Gas Works Park, designed by Richard Hagg in 1971, is located on a twenty acre abandoned power generation site in Seattle. The park consists of "an assemblage of industrial ruins adapted to recreational use and exposed to the sky, the wind, and the city beyond."[94] Ecology and the sites connection to water is very important to this project. It is located on Lake Union with connections to the Puget Sound and Lake Washington. The high water table results in soggy saturated soil conditions throughout the park.

The site has a history of disturbances including noise, smells, and smoke and turning a power station into a park turned out to be more complex than originally thought. It has taken longer for the site to heal than originally thought and there are still signs of pollution including chemical seepage and minimal plant growth.

Perhaps most interesting about this project is Haggs method of design. "Hagg interpreted the industrial remnants – the turbines and compressors, the scrubbers and generators, the sheds, the towers, and the sixty-foot-high mound of contaminated soil (known as Kite Hill) – as elements in an "unself-conscious assemblage…" This method of design involved sculpting and "selectively editing" that which already existed to heighten the sense of place. The process becomes more about interpretation and manipulation of the existing rather than imposing something new.

Meyer also makes an interesting point that the power of this site lies in the sublime. Sublime, "usually associated with large landscapes in the wild" such as mountains, canyons, waterfalls, and massive storms, create the feeling of both terror and pleasure.

---

[94] William S Saunders, Patrick M Condon, Gary R Hilderbrand, and Elizabeth K Meyer, *Richard Haag: Bloedel Reserve and Gas Works Park*, *Landscape Views, 1*. (New York: Princeton Architectural Press, 1998).

They invoke a feeling of awe and a connection to the eternal. She suggests that projects such as Gas Works, that juxtapose human technology and natural elements, create the sense of sublime through a lack of bounds and sense of timelessness. The hybrid nature and history of contamination and disturbance also contribute to creating a feeling of awe.

The PECO Generating Station exhibits similarities to Gas Works Park in that it invokes a feeling of the sublime. The massive neoclassical walls juxtaposed to the rusted smoke stacks with the Delaware River and Center City as a backdrop, create an assemblage of eras. The building incites a feeling a public grandeur yet also stands as testament to human technological advancement. These layers and the questions that the site initiates invokes feelings of the eternal yet recognizes their brevity in time. Once a monument to the power of technology, industrialization, and power – the building now stands as a ruin reminding us of the temporality of all things.

The Exploratorium

The Exploratorium, located at Pier 15 in San Francisco, exhibits an uncanny resemblance to Pier 38 and 40 in Philadelphia and is a unique precedent for a pier typology adaptive reuse project. The pier was converted into a science museum focused on education and exploration of art, science, and perception. The project was completed by EHDD architects in April, 2013 and consists of 62.8% renovated space and 37.2 new space. In terms of programming, the building includes educational facilities such as classrooms, laboratories, and training rooms, restaurants and cafes, a theater, and retail facilities. The building is 301,099 square feet cost approximately 220 million.[95]

---

[95] "Exploratorium at Pier 15," *The American Institute of Architects.* http://www.aiatopten.org/node/472 *(*accessed March 20, 2017).

The museum is connected to the city through numerous forms of public transportation and is located near hotels and dense residential neighborhoods eliminating the need for dedicated parking. The project also includes an outdoor public plaza and pedestrian walkway that wraps the entire building, providing additional public access to San Francisco Bay.

The building utilizes numerous design strategies for obtaining a Net Zero Energy goal. The historic pier provides optimal daylighting, thermal massing, and solar orientation. Additionally, the bay water is used for cooling the building through a radiant cooling system and the roof provides a large enough area for PV panels to power all electrical equipment in the building. The building is sensitive to site ecology and interacts with the tides, bird nesting seasons, and marine habitat preservation.

Prior to the renovation, the stretch of waterfront between Pier 15 and 17 in San Francisco was dormant and had fallen into disrepair. Through the development of an interactive museum space and additional public spaces, EHDD Architects were able to revive this stretch of the Embarcadero creating a vibrant waterfront experience. Delaware Avenue is not yet the thriving public promenade that the Embarcadero is, however, a public building similar to the Exploratorium could be a catalyst in turning the Delaware Riverfront into a thriving mixed use destination within the city.

The Exploratorium is a model for the long life, loose fit philosophy. Pier 15 was a significant increase in space from their previous location and by acquiring Pier 17 they are capable of expanding by 33% as future needs develop. The outdoor spaces also provide increased flexibility for exhibits and public programs. Finally the exhibits are designed for maximum flexibility by using materials that are easily deconstructed,

reassembled, and reconfigured. The building was created with the idea that it will continue to change and develop with time.

PROGRAM INVESTIGATIONS

As previously discussed, there are a number of power plant adaptive reuse projects that offer inspiration for developing program. This includes a wide range of options from residential complexes and live/work spaces to museums and event halls. These types of buildings are also usually located along the waterfront and include large portions of land that allow for additional programming and development. In most cases the power plant becomes a central piece to a larger urban plan or complex.

While it is useful to analyze precedents, this thesis is meant to be site and neighborhood specific. This means that the program will primarily be developed from analyzing the historical layers of the site, the current needs of the city and community, and the building's potential to strengthen and encourage future development. The following sections identify program that could potentially be utilized to transform this historic building into a cornerstone for community growth and development. The final programming selection is further discussed at the end of the Schematic Design chapter which tests various programs on the site.

Live / Work Community

The riverfront has a history of producing, making, and shipping. Whether that is power, water, goods, or services, they all tie back to industry and jobs. With this history in mind, there is an opportunity to develop the PECO Power Station into a live/work space for artists, makers, and thinkers to come together.

A relevant precedent for this type of program is the HOPE Center for Advanced Technology[96] in Detroit. This project aims to "regenerate the local economy and tackle high levels of youth unemployment" by training students from inner city schools in computer-integrated manufacturing skills. The center not only educates but also creates jobs and supplies parts to the automotive industry to pay for its running costs.

Prior to renovation, the existing building consisted of an 180,000 square foot manufacturing floor with an adjacent 40,000 square foot three story office building. The new design reverses the idea of "functional space for machines to operate, supplemented by humans," to a people central design focused on learning and training.[97] The factory floor has now been converted into a series of neighborhoods each having fifteen workstations and a series of three story "power towers" that contain services and act as wayfinding devices. The previous office space has been converted into teaching and conference rooms with an electronic library.

The basic program is split up into the following functions: meeting rooms, conference rooms, power stations with workspaces, manufacturing space, classrooms, locker rooms, a visitor center, storage rooms, and a service pantry.

Museum

As previously discussed, many power stations have already been adaptively reused for museums of all types. The large open spaces once used to house machinery are well suited for public gathering, circulation, and galleries. The turbine hall in the PECO Energy Stations provides a large open space that is ideal for some type of museum space.

---

[96] Ken Powell, *Architecture Reborn: Converting Old Buildings for New Uses*, (New York: Rizzoli, 1999), 77.
[97] Ibid.

This could tie back to the industrial past of Philadelphia, explaining the process of creating and delivering coal power and/or displaying the evolution of the port. Even if the program is not dedicated solely to a museum, it could include a historical piece that allows people to follow the path that coal took in the delivery / production process. In this case the coal tower could serve as a welcome center / museum piece that includes an observation deck for scenic views of downtown Philadelphia and the Delaware River. It could also be taken in another direction and made into a modern art museum similar to the Tate Modern in London. In either case, the building would act as an iconic landmark attracting both tourists and locals to the waterfront.

Hotel

With hospitality, leisure, and tourism on the rise, there is a growing need for hotels in Philadelphia. Currently, there are only two hotels within a mile radius of the nearby Sugarhouse Casino. This site offers an opportunity to convert the existing Power Station into a boutique hotel directed towards those visiting the casino. The empty lot to the north of the site could also be used to build a new hotel, leaving the power plant available for other events and programs.

Apartments / Condominiums

Although the current masterplan does not call for residential development this far north along the riverfront, there exists an opportunity to develop the site into apartments or condominiums. Again, this could be part of the adaptive reuse of the power station or it could be a new building in the empty lot.

Event Space

Turbine hall offers a unique opportunity to develop this building into a venue to host a variety of different events. The space could be rented out for weddings, parties, and corporate meetings or it could host concerts, art exhibits, and performances. The site also offers opportunities for outside events. The building could open up towards Penn Treaty Park to engage with the public space or the north side of the site could be converted into an outdoor venue. Although there are a number of things to do along the waterfront, it lacks a "there." Converting this historic landmark building into a public or civic venue could create a focal point and act as a catalyst for development in the area.

School and Community Center

The building could be developed into a vocational training center that includes a school for children alongside job training programs for adults. If coupled with a live/work program for professionals both parties could benefit. People going to school or attending adult programs could learn from the professionals, who would take part in teaching while the professionals could benefit from getting help from students or receiving some kind of reduced rent.

For security purposes, this type of programming would require school related functions to be separated or closed off from adult education and the community center. Fortunately the Power Station is already portioned and could easily be separated into areas for students and adults while maintaining shared spaces for collaboration.

With a building this large, reuse and programming could be thought of as a one stop shop for community needs. This could include the previously discussed educational

programming along with other community needs such as a library, health clinic, gym, and/or grocery store.

Green Space and Riverfront Remediation

Regardless of the selected program it is essential for the site to include green space and some kind of riverfront remediation. In order to improve the conditions of the river for plant and animal life as well as developing ways to naturally mitigate storm water, flooding, and potential sea level rise, it is essential that each building do its part to restore natural habitats. Perhaps the building could also have some built in water treatment center or fish habitat that could begin to educate the public on the importance of the Delaware River. In any case this experience should offer a learning opportunity for all those who visit.

Power Generation

Since the building was once a power plant that helped fuel the city, it would be interesting to investigate ways it could, in its new life, power itself and a portion of the city around it. This would go a step beyond memorializing the fact that the building used to produce coal power, and actually celebrate its past through renewal of use and function.

By estimating the amount of pollution and environmental harm created by the power plant, the adaptation could be designed to offset those negative effects through creating a net positive building. The building could stand as a monument to sustainable power production while helping to clean the environment it once polluted.

Urban Design and Master Planning

Due to the size of the building, the available site, and the range of possible programs identified above, this project is capable of addressing a number of different programs. The project could focus on a larger urban scale, developing a masterplan that includes a range of programming from public space, residential, and retail to office and manufacturing space. The Seaholm Power Plant, which includes a range of buildings with different functions designed to create a more holistic community, offers a basis by which to develop basic programming.

Conclusions

Based on the size of the building, the neighborhood and waterfront context, and the availability of land by which to expand, there is a wide range of programs that would work for the adaptive reuse of the power station. In the spirit of the thesis, which involves a journey of exploration for opportunities, the program selection cannot be made without investigating various design agendas for the site. This coupled with the historical and community context will help inform the final selection of program for this project.

With that in mind, there are a few emerging themes which should manifest themselves in the final programming. This includes the following priorities:

1. Childhood learning and continuing adult education
2. Public gathering and community development
3. Making or Producing of goods
4. Historical connection power generation
5. Connection to the Delaware Riverfront and Fishtown neighborhood
6. Net positive energy production goals

There are a number of programs that by themselves do not serve the purposes of this thesis. They include a museum, hotel, and condominium / apartment complex. On the other hand, there are a number of programs that fit the above priorities but are not substantial enough to warrant development. They include event space, park and riverfront remediation, waterfront interaction, and power generation. Thus the following design investigations will seek ways to combine these programs as dictated by a site based agenda.

DESIGN

Initial design began with investigating a series of site based schemes that privileged certain philosophies. These schemes were then used to help inform inquiries into building form and program as discussed in the Schematic Design section. Listed below are six initial site strategies that were evaluated as part of this process with an accompaniment of diagrams.

Site Strategies: Process Investigations

Extending the Grid

The first strategy, which corresponds to the masterplans initiative to create a neighborhood typology along the riverfront, focuses on taking the existing street grid in Fishtown and pulling it through the site. This sets the stage for potentially developing a neighborhood or urban plan for additional development.

Densification

This is a spinoff from extending the grid through to the waterfront and involves using the street pattern to populate and densify the area with mixed use and residential properties. In this type of scheme Beach Street could be developed into a commercial street and the PECO Power Station could serve as an anchor for the new community.

Softening the Edge / Bio-Remediation

This strategy focuses primarily on bio-remediation and restoring the health of the waterfront. Instead of developing the site, it converts the empty lot as well as some of the industrial storage yards and abandoned piers to the northeast of the site into wetlands.

The wetlands would help serve as a buffer zone for flooding, a natural habitat for plants and animals, a pollution mitigation system for storm water runoff, and a public park.

Building as a Link

This idea considers the building as a link that ties the two sides of the site together. Turbine Hall, which is an open space that cuts through the entire length of the building, could be converted into an internal street that invites the public into the building and connects Penn Treaty Park with the other side of the site.

Expansion / Addition

Depending on the program and the site agenda it may become necessary to expand or add onto the PECO Power Station. There are two major opportunities for this type of expansion. The first is into the empty lot next to the PECO Plant and the second is a northward expansion into the office building on the other side of Beach Street. This building is currently occupied but connecting these two structures by a series of bridges would create an interesting dynamic and could serve to enliven Beach Street making the densification strategy more plausible. Finally, it is also possible that the building could expand south into the water by adding a pier or floating device.

Saw-tooth Pier Typology

The final site typology that was investigated was the idea continuing a saw-tooth pier pattern down from the industrial storage lots to the north. This would not only create a dynamic waterfront with additional buildings and piers, it would also relate back to the sites history as a shipyard which could have an interesting effect on design as well as programming.

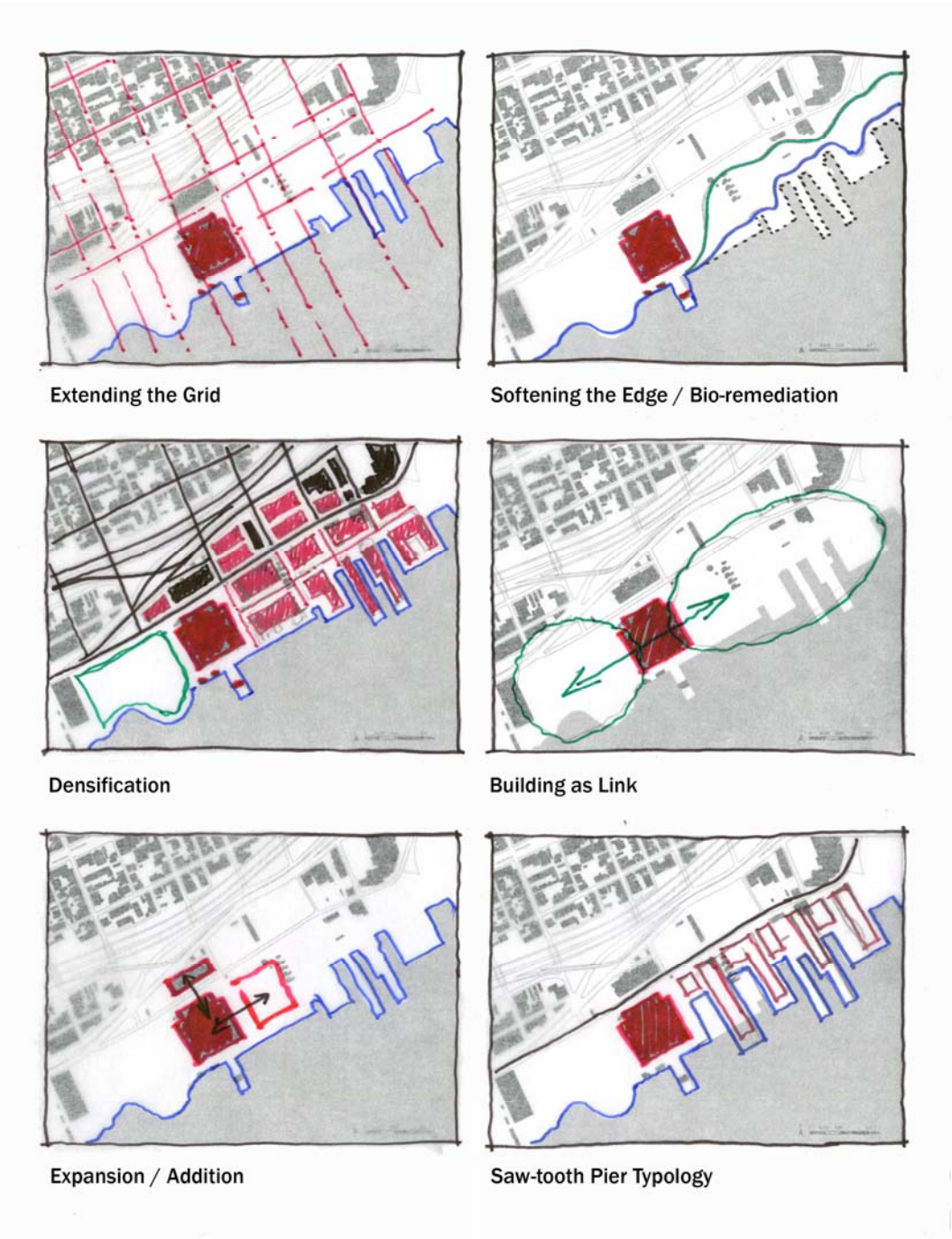

Figure 40: Site Typologies. Diagrams by Author (source: author)

Schematic Design: Programmatic Explorations

Based on the previously identified site strategies a series of several schematic design exercises were developed as a way of investigating program. In each the three schemes the major site consideration was the waterfront resulting in different building layouts, interventions, and programs.

The first scheme makes very few changes to the waterfront resulting in a program that was influenced by existing building conditions. The second scheme takes precedent from the sites history as a shipyard and the final approach seeks to return the waterfront to a more natural state. Moving forward, elements from each scheme will likely be combined and used for the final design.

Scheme 1: Live Work Community

This scheme leaves the riverfront primarily intact and evaluates the existing building configuration as a way of developing program. The power station is already split into a series of four distinct pieces that lend themselves to being repurposed to serve new program. The two boiler rooms could be converted into a maker / small scale manufacturing space and a technology focused / think tank area. Depending on the design, these spaces could be more interlaced to further encourage interdisciplinary collaboration.

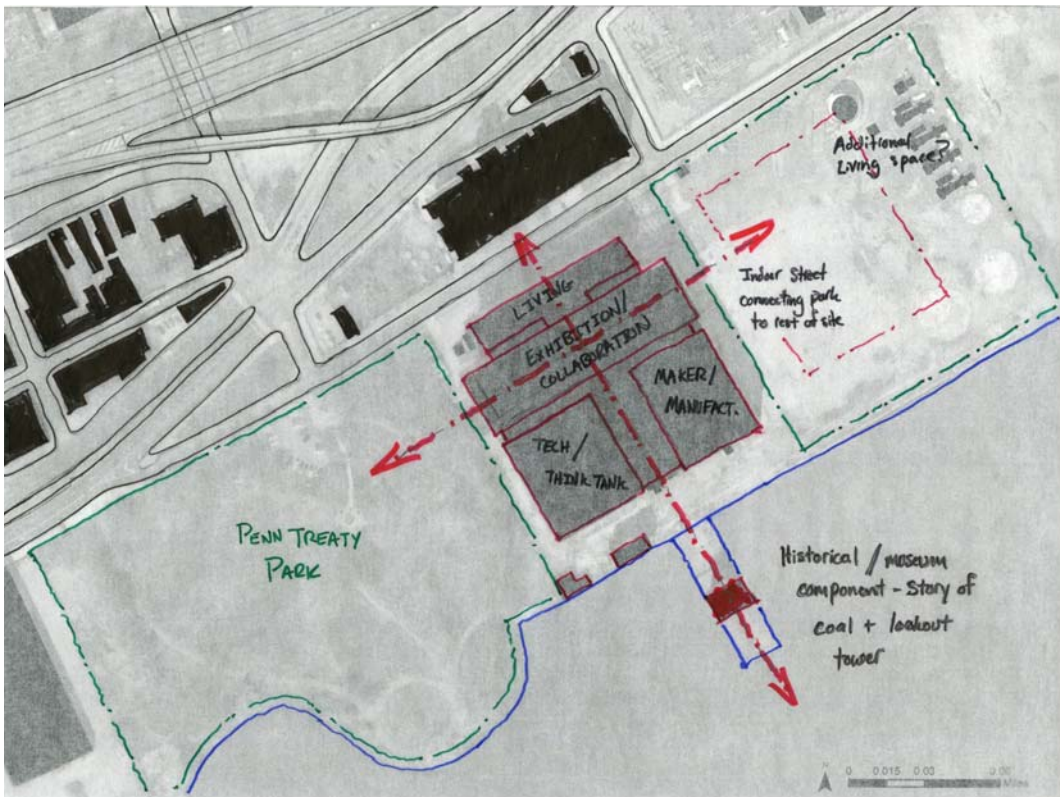

Figure 41: Live Work Community (source: author)

Turbine hall is perfectly situated to act as an exhibition and collaboration space that allows manufactures and tech people to share ideas, interact with the public, and even sell goods on an indoor street that links Penn Treaty Park to the north side of the site. The switch house is ideally situated to act as classrooms, offices, and conference rooms. In an attempt to create a truly live work environment, the site north of the building could be developed into a mix of apartments and condos designed to primarily serve those working in the building. The building will also be designed with a historical component that links these new functions together. The coal tower, which will serve as a visitor center, museum component, and observation deck will be linked to the main building along a historic circulation route. The route could begin at the tower and work its way into the building, between the new innovation spaces, and into turbine hall.

The program of this building will primarily take precedent from the HOPE Center for Advanced Technologies and be a place where students from inner city schools can come as part of a work study program to learn life skills related to technology, designing, and making. This would be designed to not only benefit the students but also the tenants of the building through rent incentives and reduced labor costs.

Creating a live work community focused on technology and making for the PECO Power Station blends the importance of developing community and economic resilience with the historical context of the site. Idea and product creation ties back to the sites original purpose of building ships and generating power. In a sense the building is serving the same purpose, it is merely generating a new type of power, human power.

Scheme 2: Residential / Hotel and Event Space

This scheme responds to the Riverfront by creating a series of piers reminiscent of the previous conditions when the site was a shipyard. The pier typology is continued into the PECO Generating Station, essentially splitting the building in half up to Turbine Hall. The two Boiler Rooms could be repurposed to serve as event spaces for concerts, weddings, and corporate gatherings with large windows that look out onto the Delaware River and inlet. This scheme also uses the idea of converting Turbine Hall into an interior street that links the old power station to a new residential complex or hotel.

The new building will have a main circulation spine with residential piers that break off like fingers reaching into the Delaware River. This setup provides natural light and air to each of the units as well as views to the Delaware River. Finally, the switch house and corresponding frontage along the new building could be mixed use with restaurants and

retail on the bottom floor to help create a more dynamic and lively atmosphere along Beach Street.

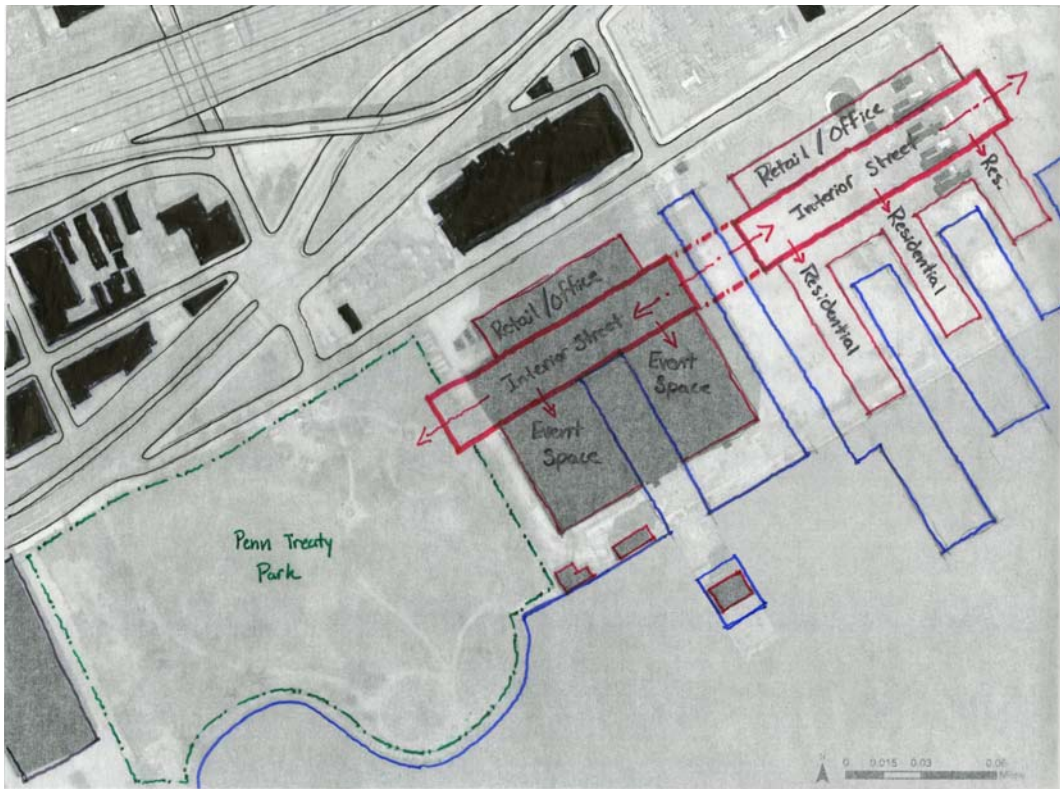

Figure 42: Residential and Hotel (source: author)

Scheme 3: Industrial / Science Museum

This scheme addresses the waterfront by softening the edge, removing the existing piers further north along the riverfront, and creating a more natural wetland. Because it places the highest value on ecology and environmental factors, these conditions lend themselves more to a museum type of program.

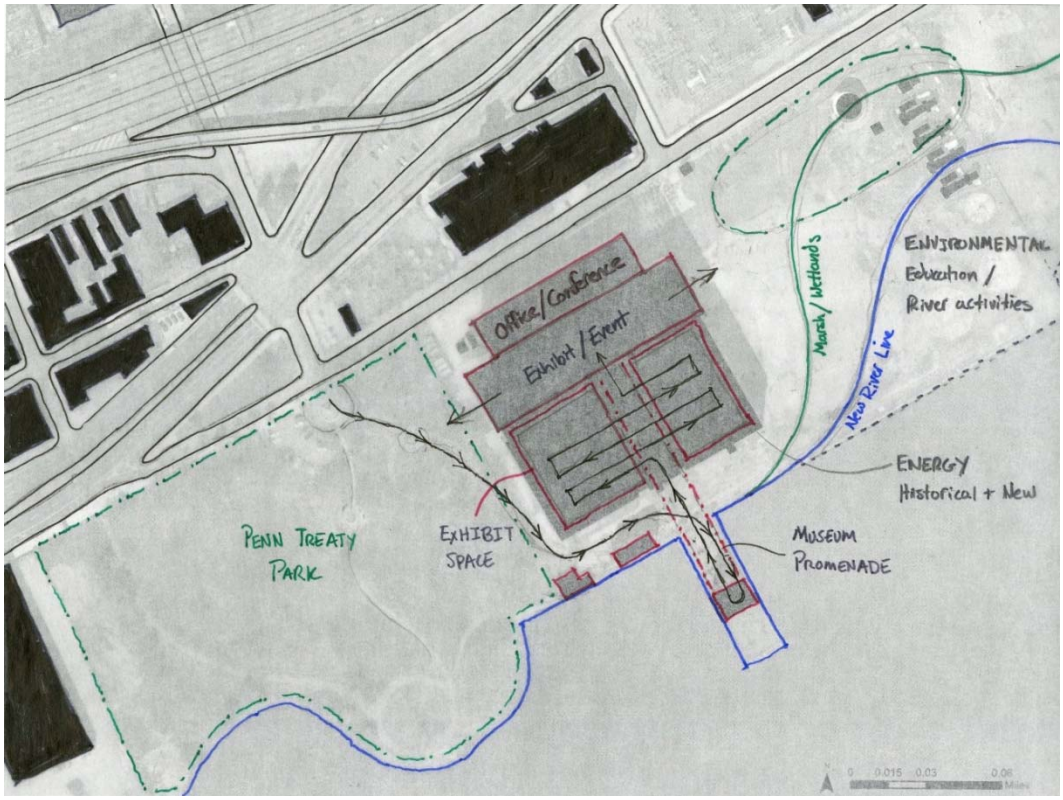

Figure 43: Industrial and Science Museum (source: author)

Visitors to the museum could arrive by boat, or walk to the rear of the site by way of Penn Treaty Park. The ash bunker and screen house could be repurposed to serve museum functions such as ticketing and the coal tower could start the journey through the museum. Visitors could take an elevator to the top floor, take in views of the city and river, and then proceed into the main building by way of a newly constructed "conveyor" that links the coal tower to the power plant.

They could then cross back and forth between the boiler rooms through exhibits dedicated to industrialization and coal generated power. The museum could also juxtapose new ways of producing power with older techniques to show how we have progressed. It would be interesting to make this a functioning museum that produced its

own power. The building could itself be a learning apparatus that teaches visitors about clean energy solutions through its functionality.

Finally, visitors would end in Turbine Hall which could house additional exhibits, cafes, and be rented out for private events. Offices, conference rooms, and classrooms could be located in the switch room.

Continuing along the museum / educational route, there is also an opportunity to develop some sort of Delaware River environmental center. This could educate the public on the importance maintaining the health of the river and would be a good counterpoint to the idea of energy production and industrialization. It would be a holistic experience that seeks to find a balance between the necessities of production and environmental protection.

Scheme Selection

Based on the scope of this thesis it was determined that a combination of elements from each of the three schemes would be best suited for this project. The maker space ties directly into the history of blue collar workers in Fishtown while the idea of an interior street is well suited for creating a communal public space for the neighborhood. The expansion of the building will be left to future designers and the creation of additional and more defined piers will be combined with the idea of creating a more natural waterfront environment upstream. Additional details can be found in the Urban Design section of this document.

Program Selection

One of the biggest challenges of this project was developing a program to fill out the entire building. In order to fill the nearly 750,000 sq ft while still providing a connection to the community, a unique program that couples larger corporations with smaller entrepreneurs, makers, and people from the community was developed.

Figure 44: Program Concept (source: author)

The big idea is that corporations would sponsor the innovators and makers to offset the cost for these smaller start-ups. In turn, they would help fuel the creativity of the corporations. There would also be an educational component that would help the community with job training and apprenticeships along with after school programs. All of these programs would be centered around turbine hall creating a dynamic space for everyone to interact.

Breaking this down into more specific functions, the following figure identifies how these spaces could potentially function.

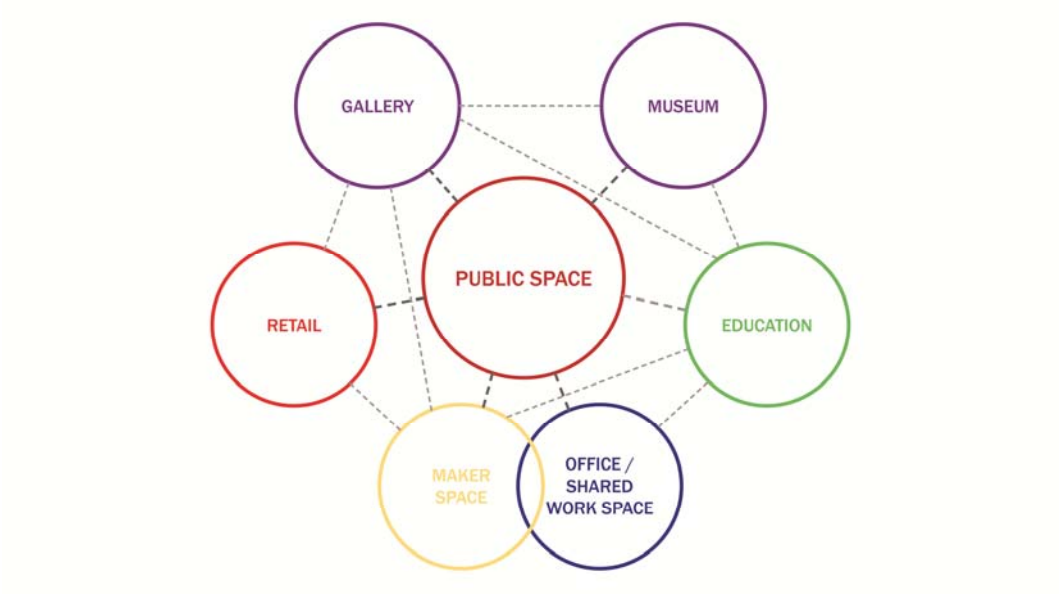

Figure 45: Program Breakdown (source: author)

Urban Design Solutions

The first major urban design move was using the building as link between two parks. To the south, historic Penn Treaty Park will remain generally unchanged, with minor modifications to monument locations so that they are on axis with the entry to Turbine Hall. To the north the newly developed park would be focused on phytoremediation with the intent of healing the land once occupied by the powerplant expansion. Turbine Hall would then serve as an internal public street between these two parks (Figure 46).

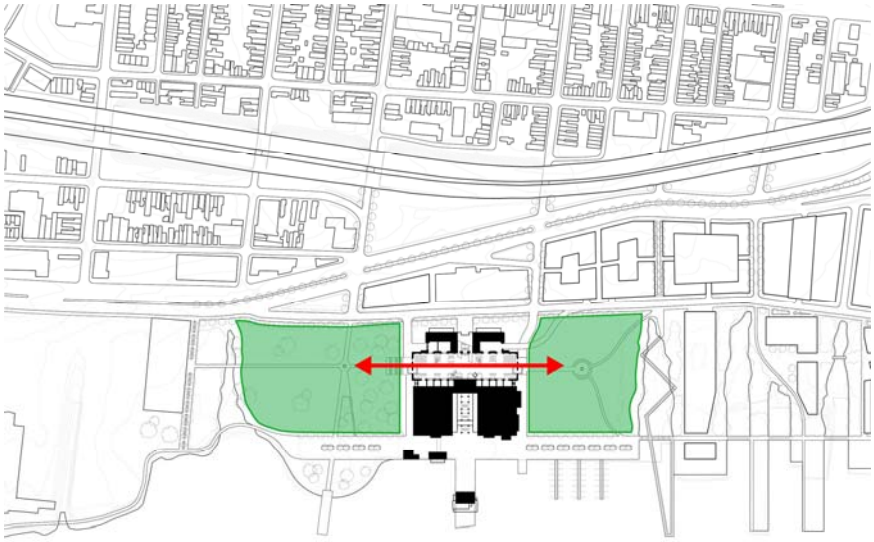

Figure 46: Building as Link (source: author)

The next urban design move is carving inlets into the shore to create a stronger connection to the waterfront as well as increasing the amount of waterfront property available. This would also serve to create a more dynamic push and pull relationship between the urban fabric of Fishtown and the Delaware Waterfront (Figure 47). Additionally, these inlets would incorporate storm water management strategies to more naturally treat runoff. Storm water elements would then be pulled into Fishtown to further tie the neighborhood to the waterfront (Figure 48).

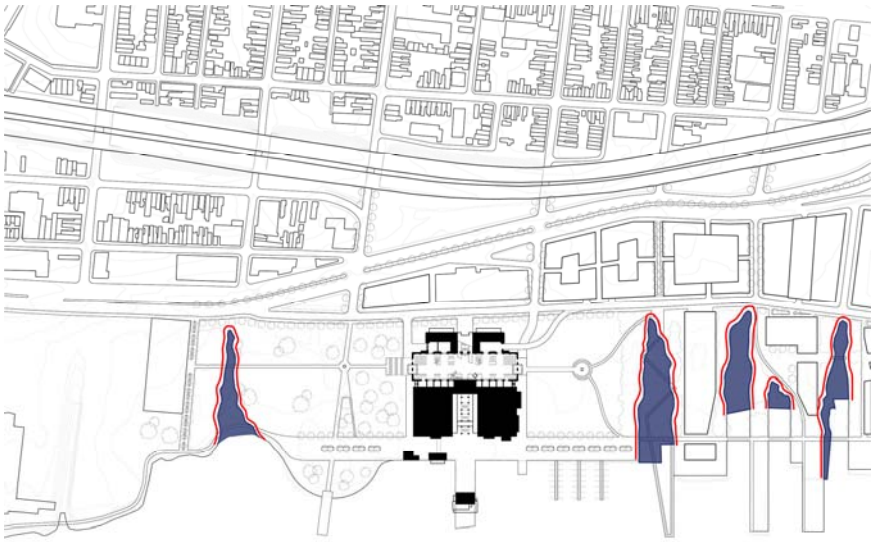

Figure 47: Water Fingers (source: author)

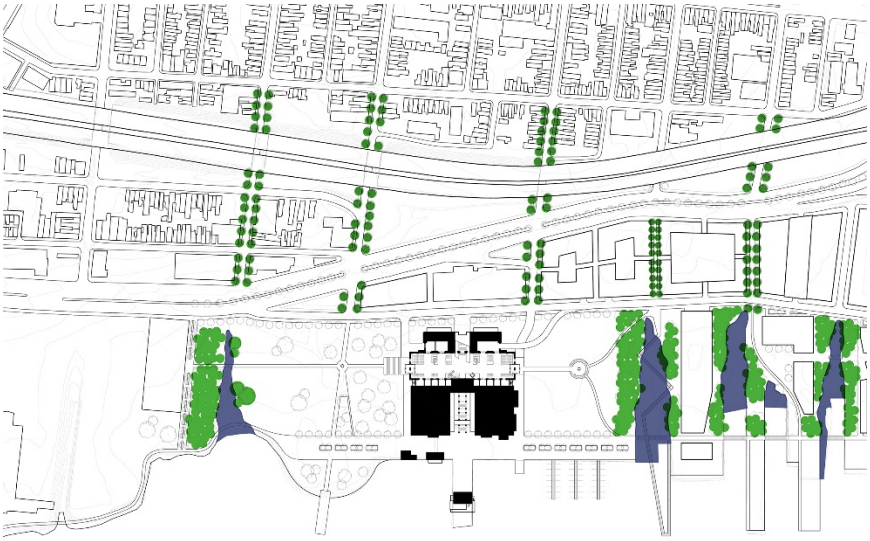

Figure 48: Storm Water Management (source: author)

The building is also designed to be a catalyst for future development upriver paving the way for housing and other industrial and commercial properties. To encourage this kind of development, Beach Street could be established as a commercial street with retail and dining facilities on the ground floor. The proposed adaptation to the PECO station would

involve turning the ground floor of the switch house into flexible sized retail facilities (Figure 49).

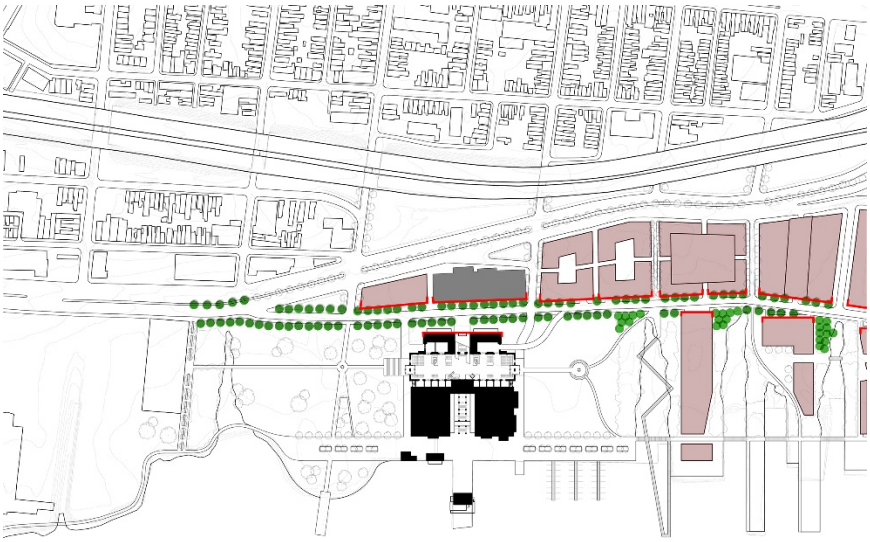

Figure 49: Commercial Street (source: author)

The resulting site plan (Figure 50) includes the key components listed above along with a vegetated buffer zone along the highway for natural storm water management, a water front promenade, a boat dock for water taxi access in Penn Treaty Park, a bike and walking trail that continues north along the waterfront, and a series of future buildings that push and pull alongside the water fingers creating opportunity for additional unique and inspiring structures along the waterfront.

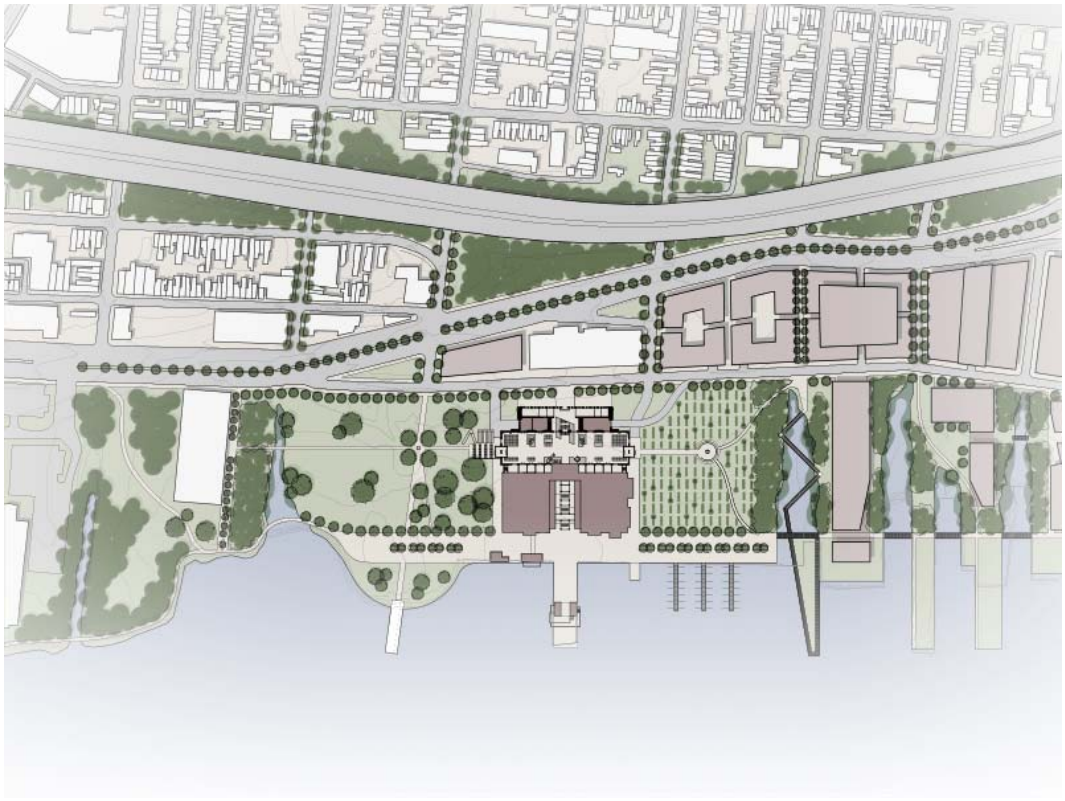

Figure 50: Proposed Site Plan (source: author)

Building Design Solutions

One of the key strategies in this process was using the color red to distinguish between the new and the existing. Existing components are typically rendered in black while the new components are rendered in red. This method helped to highlight and keep track of what was manipulated and added within the design.

Process

Initial design schemes were primarily investigated with the mindset of inserting a building within a building. The boilers were originally constructed with a gap between the exterior walls that extended around the entire perimeter. Within the gasket of space there were interwoven circulation elements and catwalks to access the boilers and machinery. This same idea was applied to inserting a new glazed volume within the

building that would be distinct from the exterior walls yet follow the same structural methodology as the original use. Within the volumes, various floors were added and columns were removed to create new spaces. This is demonstrated in the following physical models.

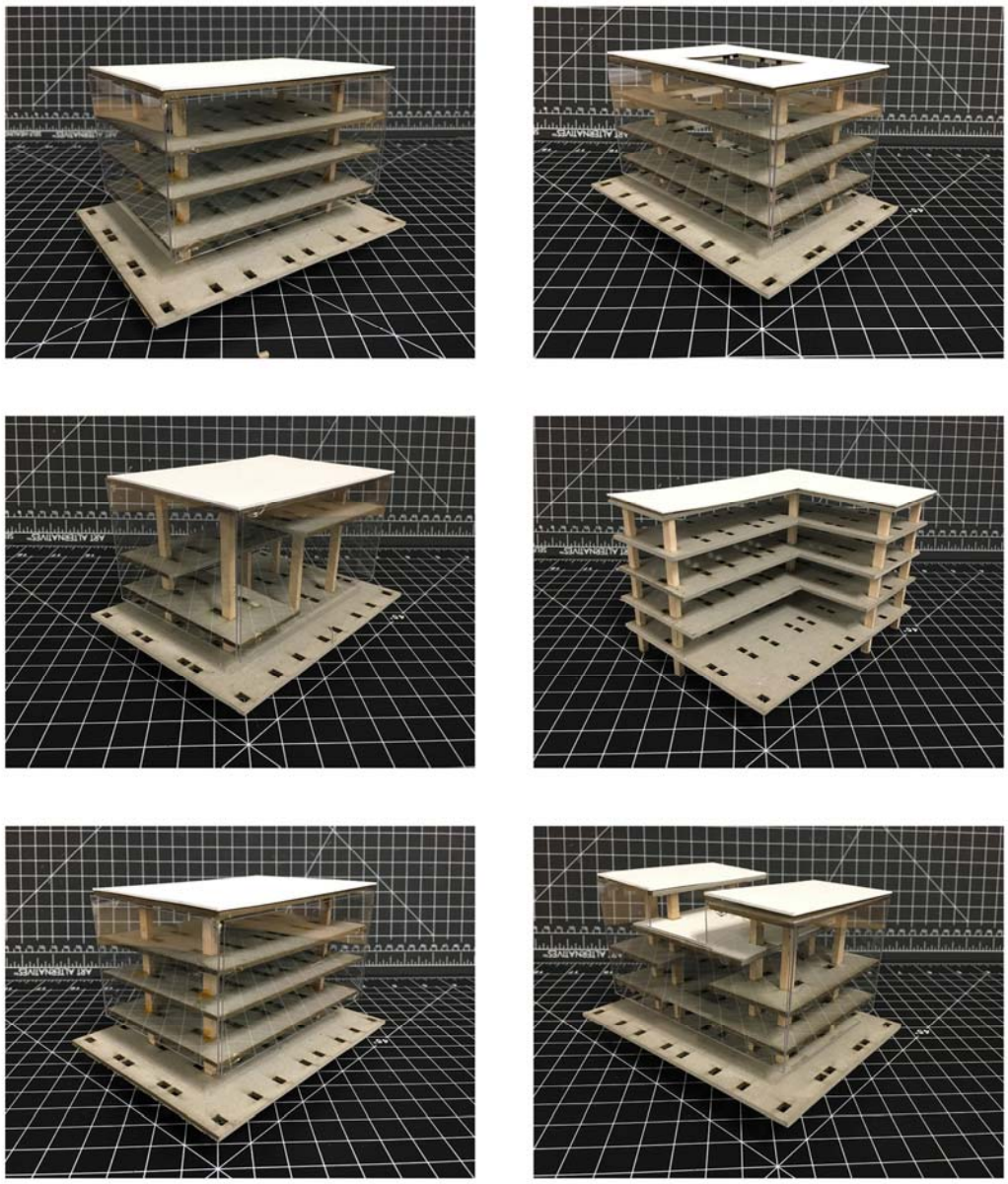

Figure 51: Process Insert Models (source: author)

These models were designed to be inserted within a model of the existing building (Figure 52).

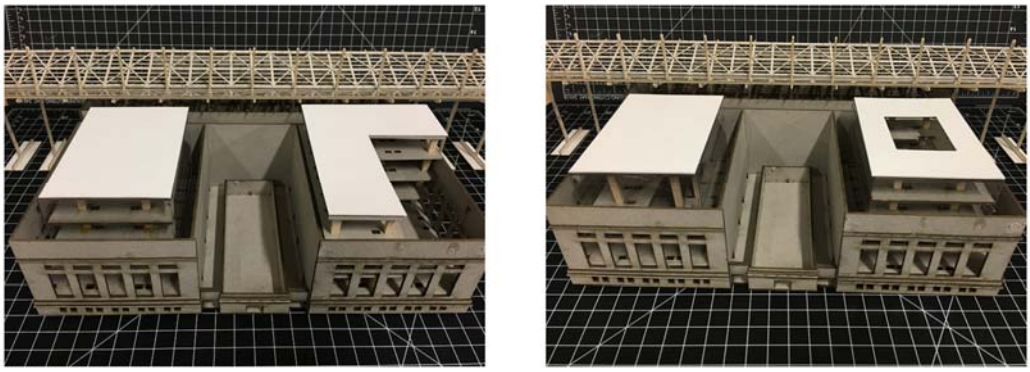

Figure 52: Building Model with Inserts (source: author)

This paved the way to further investigating the idea of a building within a building, however, the subsequent iteration involved looking at ways the internal building could break free and puncture through the existing facade (Figure 53). This led to a set of diagrams examining ways the building could morph outside the confines of the exterior walls and be subdivided yet connected within the existing building.

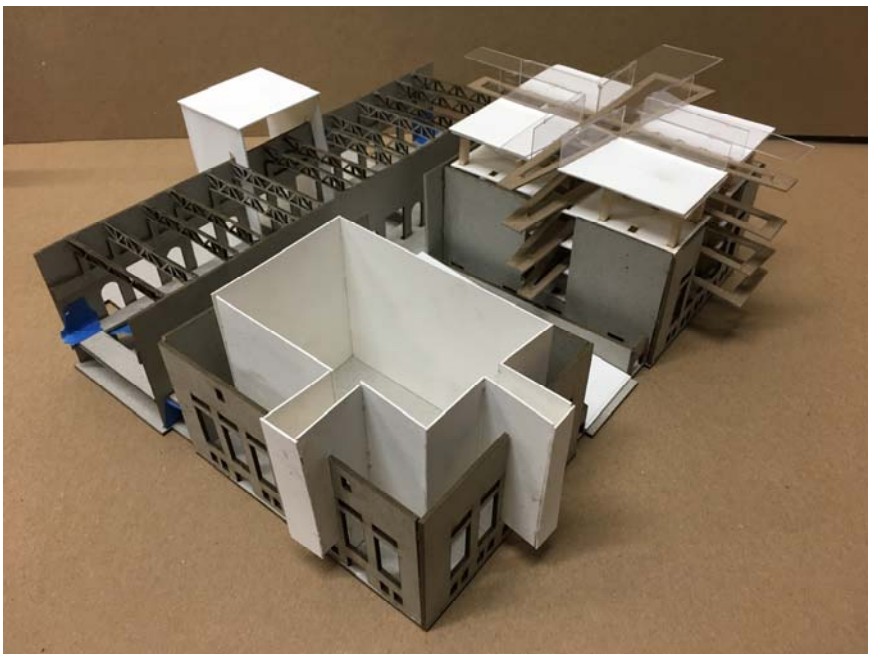

Figure 53: Building within a Building (source: author)

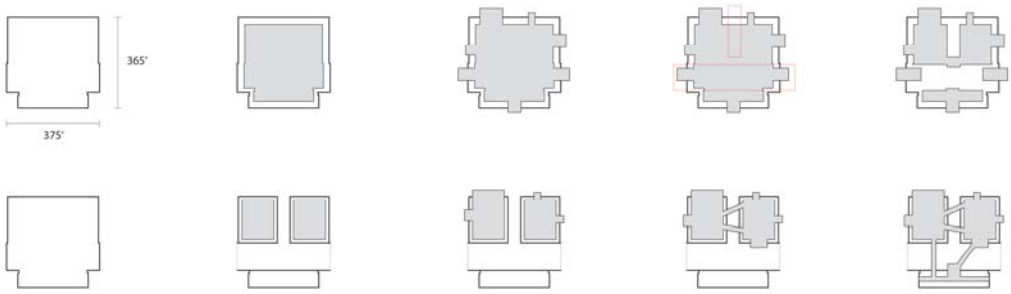

Figure 54: Interior Morphologies (source: author)

Due to the fact that the Power Plant was so large, roughly the size of an entire city block, the next steps in the design process began by taking cues from original city grid developed by William Penn. Blocks throughout the city were analyzed in terms of how they were subdivided over time to develop a method for internally breaking down the sheer size of the original structure and determining circulation paths. The following diagrams (Figure 55) indicate how alleyways and secondary streets were added the urban grid over time.

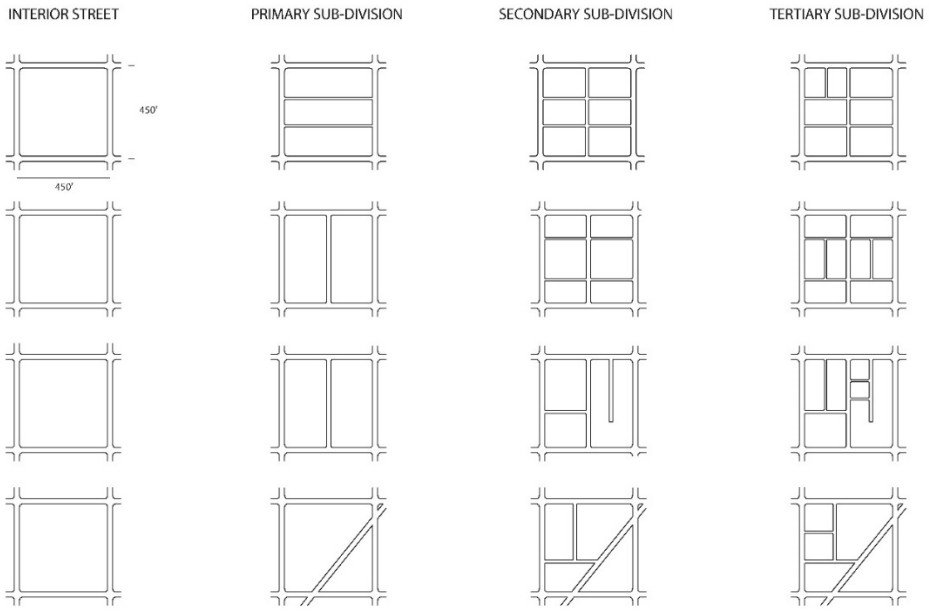

Figure 55: Block Divisions (source: author)

A set of diagrams was developed which examined splitting up the boiler houses with a series of internal streets and alleyways (Figure 56) which were further investigated through physical modeling (Figure 57 and Figure 58). Breaking up the Boiler Houses with various sub-divisions of circulation paths successfully reduced the scale of the larger spaces, created dynamic connections between zones, and provided a sense of vertical porosity and connectivity.

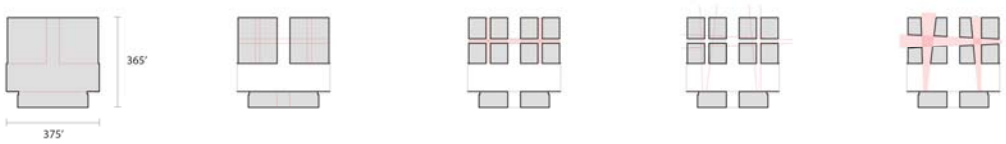

Figure 56: Internal Streets and Alleys (source: author)

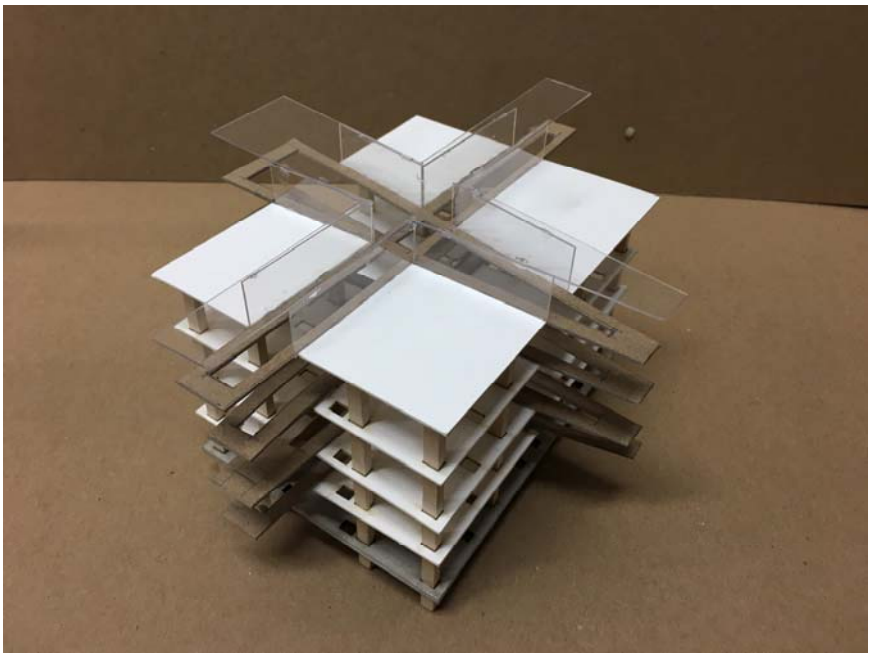

Figure 57: Internal Sub-Divisions of Boiler House(source: author)

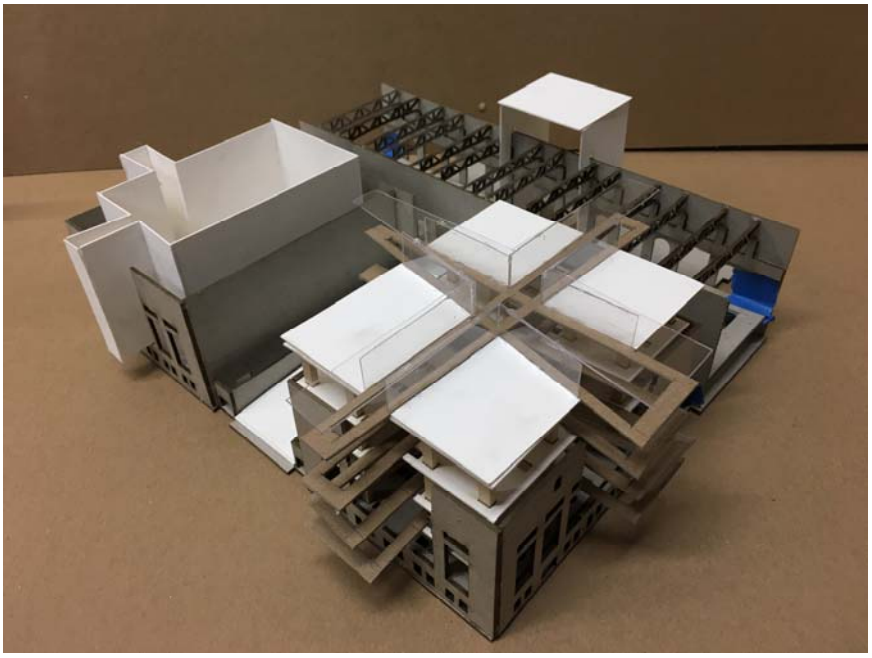

Figure 58: Internal Sub-Divisions of Boiler House within Model (source: author)

Ultimately a combination of these two methods were developed so that the internal program could project out of the confines of the façade while providing additional means of circulation though the Boiler Houses. This will be discusses in greater detail later in this chapter.

Another investigation that did not make its way through to the final design was a structural canopy that spanned the length of Turbine Hall. This was conceived as a way to call out the main entry ways on the sides of the building while providing a new roof in order to expose the trusses hidden above the ceiling of the Turbine Hall (Figure 59). While the final design removes parts of the ceiling in Turbine Hall to make way for pedestrian bridges, the canopy was not included because the scale of the structure and its shear contrast to the existing building were too extreme.

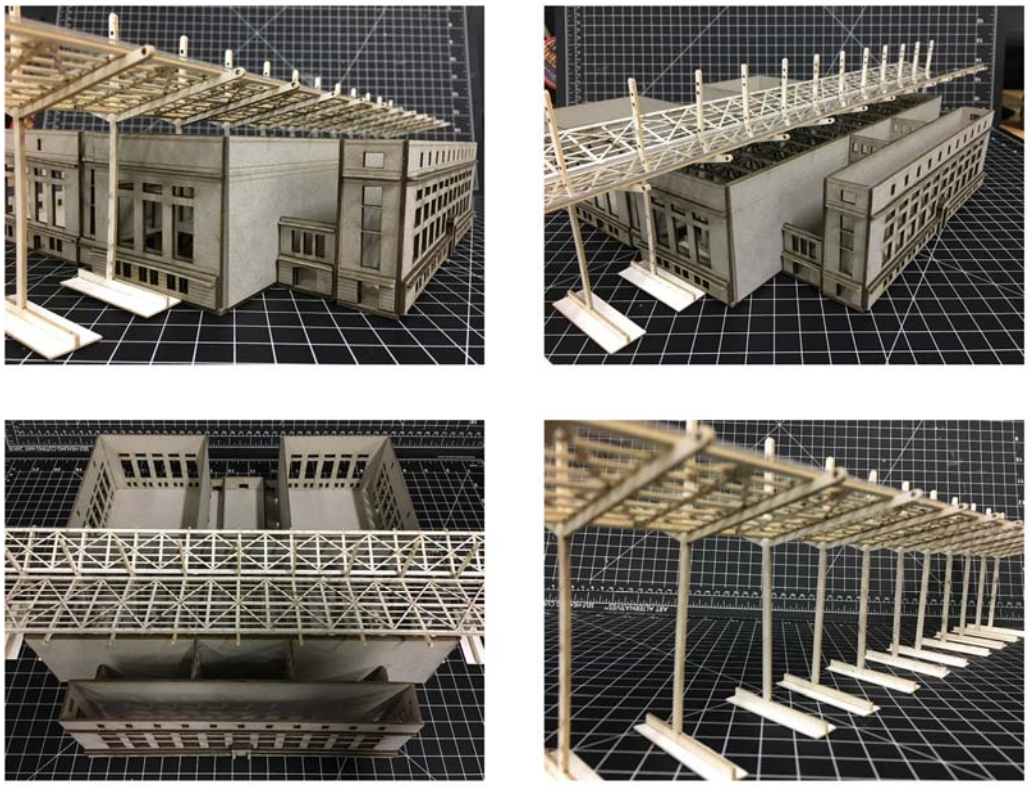

Figure 59: Structural Canopy (source: author)

These methods were then applied to the digital model in which a series of interventions were applied to the building using red to highlight the distinction between new and old.

Figure 60: Beach Street Approach (source: author)

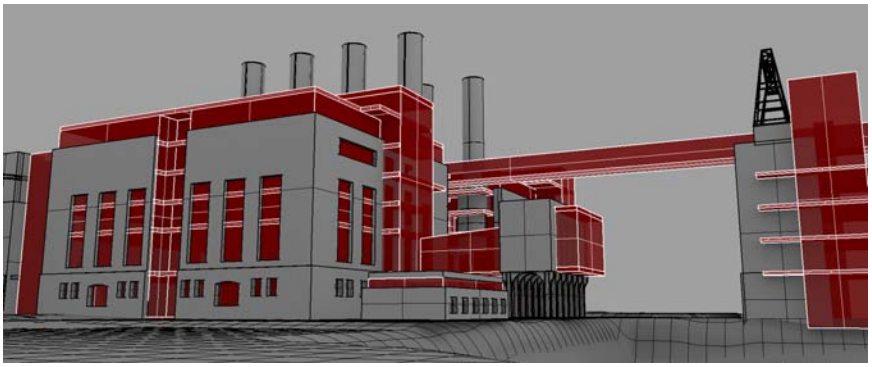

Figure 61: View from Penn Treaty Park (source: author)

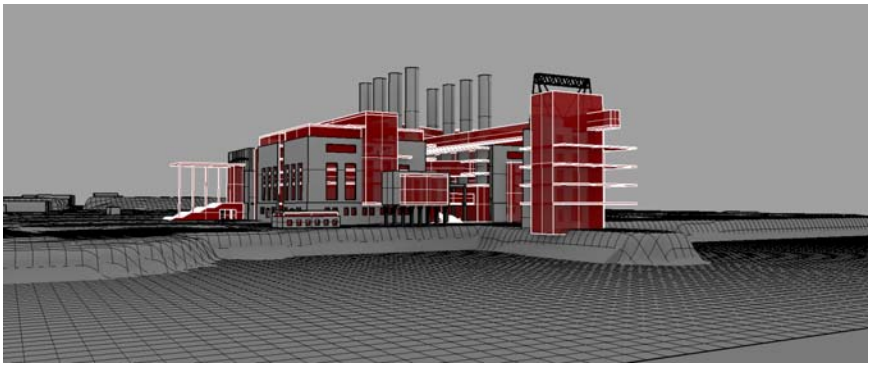

Figure 62: Ferry Approach (source: author)

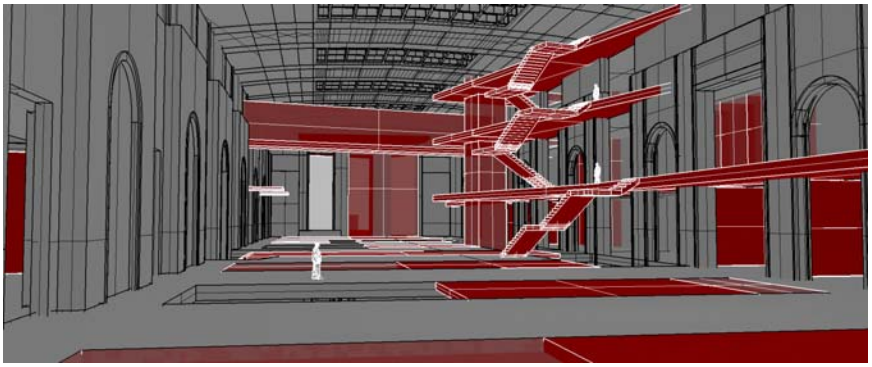

Figure 63: Turbine Hall (source: author)

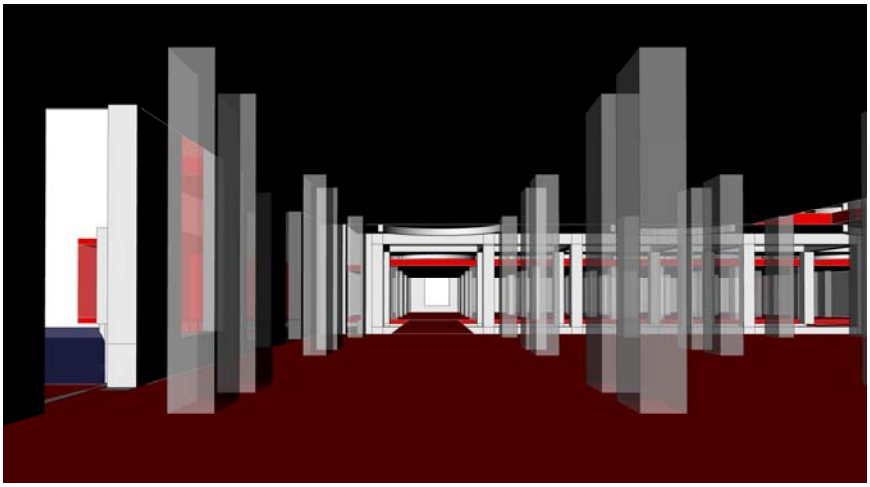

Figure 64: Maker Space Perspective (source: author)

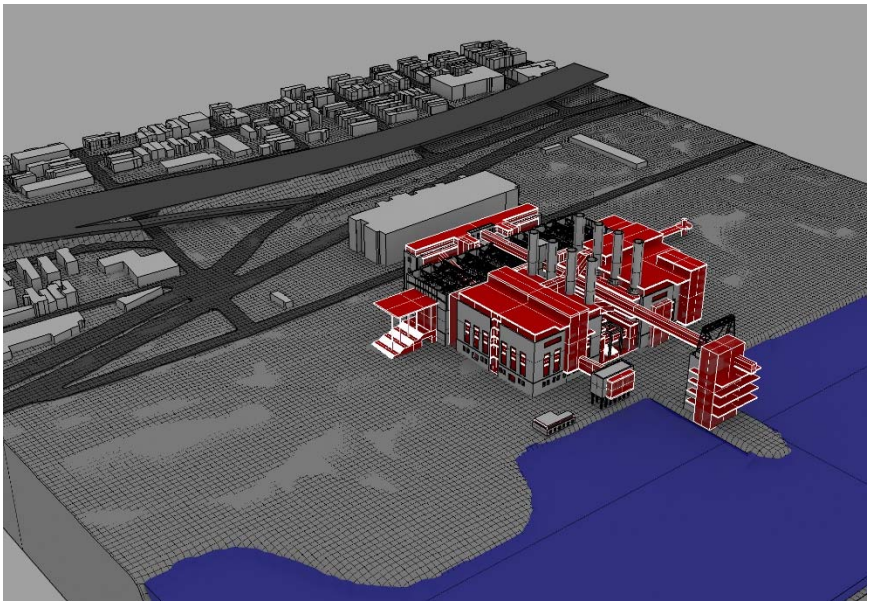

Figure 65: Aerial (source: author)

Design Solution

The final building design utilizes a program consisting of various uses including maker space, incubator space, corporate offices, classrooms, and gallery space spread out amongst the various levels and components of the building. This will be described floor by floor through the following diagrams.

Ground Floor

The primary components of the ground floor include graffiti gallery beneath Turbine Hall, a main entrance along Beach Street, parking in the rear of the building, and a number of service entries. Graffiti gallery uses the existing underbelly of Turbine Hall to create a raw art space for local artists to display work in an evolving and changing environment (Figure 66). The Beach Street entrance leads visitors to a grand staircase which ascends to Turbine Hall or grants them the opportunity to circulate into Graffiti Gallery. There are also a number of stairs and elevators in the gallery that lead upwards to work and education spaces.

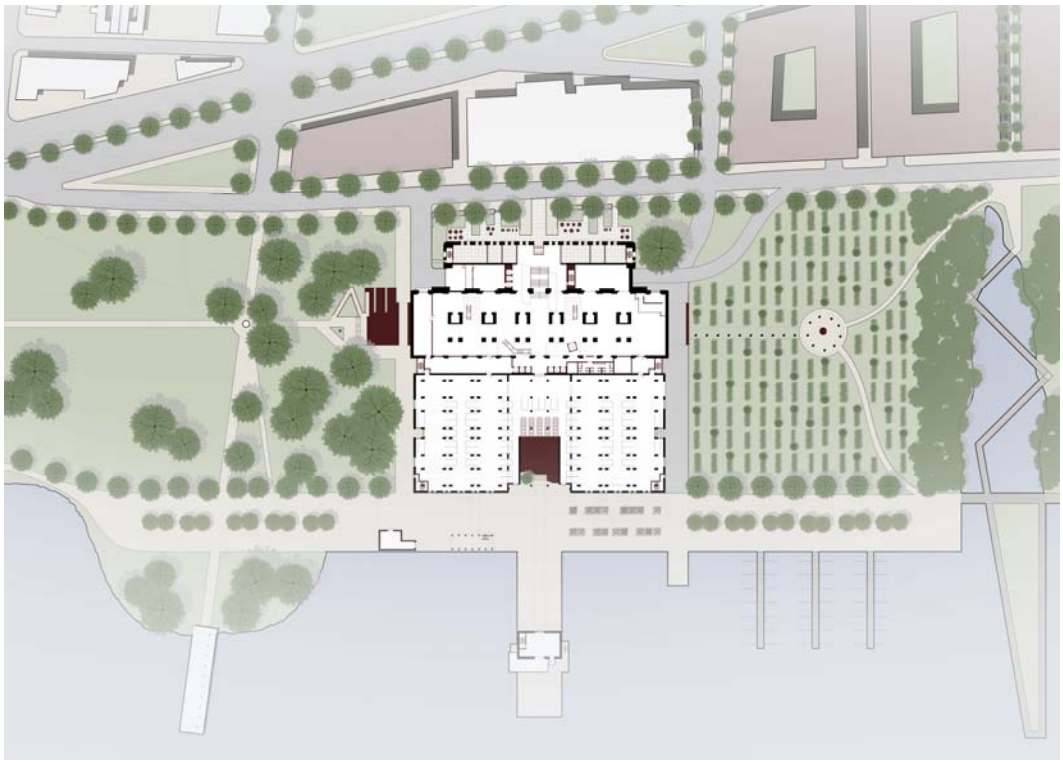

Figure 66: Ground Floor Plan (source: author)

Figure 67: Graffiti Gallery (source: author)

Piano Nobile

The highlight of the Piano Nobile is Turbine Hall. Turbine Hall (Figure 69) is designed to be an internal public street where locals from Fishtown as well as visitors from other parts of the city can interact with makers and creators who work in the Boiler Houses. This space could also be used to host exhibits, conferences, concerts, and all kinds of events. The idea of the internal street is exemplified through storefronts associated with the maker space where specialized stores could sell products as well as garage doors that open to service areas where food trucks could pull up into the building to serve food at lunch time. The large open space is designed to be flexible to serve all kinds of changing needs. The space is also highlighted by shifted floor plates and a protruding staircase that rises to the floors above as a juxtaposition of the new and old.

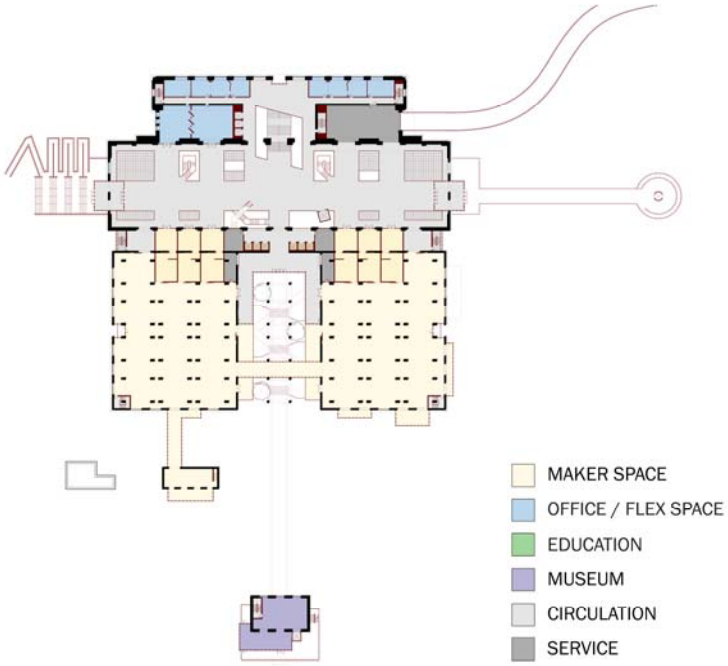

Figure 68: Piano Nobile Floor Plan (source: author)

Additionally, this floor includes flexible office space in the Switch House and maker space in the Boiler Houses. The maker space includes adjustable work zones around the perimeter to provide access the natural light while the center is composed of more defined spaces that include 3D printing and CNC routing on the left side and metal working on the right. There is also an elevated walkway that connects the two Boiler Houses to increase connectivity within the building. In terms of access there is a grand staircase that connects Turbine Hall to Penn Treaty Park and an elevated walkway that leads to an outdoor observation deck above the Phytoremediation Park. There is also a back entry that leads people from the water up an elongated set of stairs though the existing structure that was once used for storage.

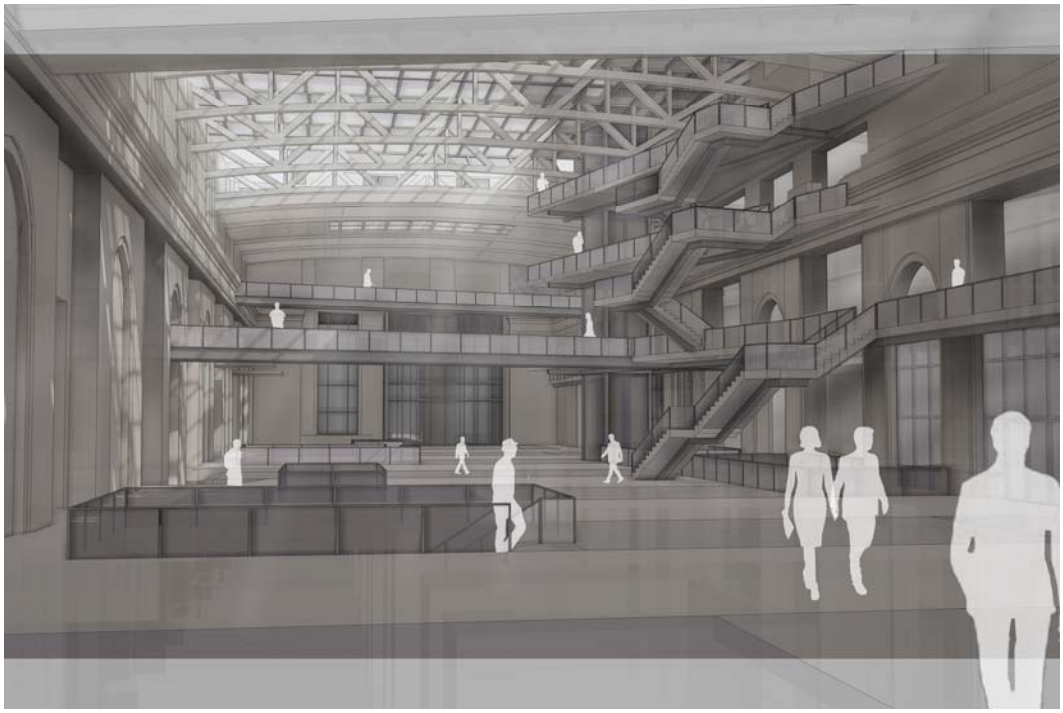

Figure 69: Turbine Hall (source: author)

Throughout the building, as exhibited in the maker space (Figure 70) lighting and mechanical systems are used to highlight areas of circulation. This also creates a didactic indusial feel that fits well with the program yet in a way juxtaposes that buildings original design which included a neoclassical façade to hide the mechanical components of the power plant within. Throughout the building many of the columns are also wrapped in translucent dry erase boards so that workers and visitors can write notes, haven meetings, or work through design processes in impromptu locations. This also allows for a level of layering which places a new material and constantly changing notes in front of the existing concrete piers. However, due to the transparency they are not hidden, but remain artifacts beneath evolving and changing ideas.

Figure 70: Maker Space (source: author)

Innovation Space

The Innovation Space is located on the second and third level of the building consists primarily of flexible office space shown in blue in Figure 71. The Switch House is composed of flexible educational rooms which are linked to the innovation spaces be an elevated catwalk across Turbine Hall. Similar to the grand staircase on the ground floor, the catwalk passes through an existing archway of Turbine Hall which constantly allows people within the building move amongst the new and old simultaneously experiencing both elements. Through plan the angled floor plate is highlight with an iconic elevator and staircase.

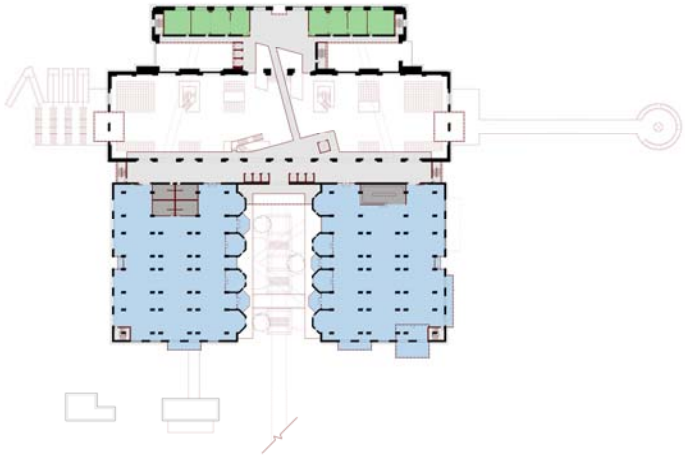

Figure 71: Innovation Space Floor Plan (source: author)

The innovation space is designed to be as flexible as possible by including movable furniture that can be arranged based on tenants needs. Startups frequently grow and shrink so this type of adaptability would allow tenants to quickly adjust and expand to changing needs. The floor plates can also be removed to allow for vertical flexibility amongst the floors. This is demonstrated by the spiral staircase in Figure 72which can be inserted within any of the removable floor plates to adapt to changes in use or circulation within the building. This method of vertical flexibility is discussed in greater detail later in the paper.

Figure 72: Innovation Space (source: author)

Corporate Space

The corporate space occupies the upper two stories (4th and 5th floor) of the building and are designed similarly to the Innovation Spaces with the idea of flexibility and adaptability in mind. It also includes roof access for access to the exterior as well as views to center city. The Switch House portion of this floor is again designed to house an educational component to better integrate the community into entrepreneurial and apprenticeship positions.

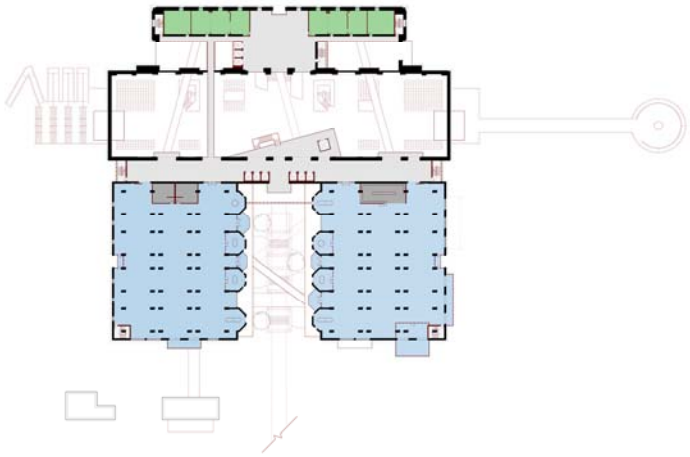

Figure 73: Corporate Space Floor Plan (source: author)

To better understand the way program is dispersed throughout the building the following section demonstrates how different users, defined by different colors, are dispersed throughout the building. While different floors feature particular uses the building is designed to encourage an integration and mixing of uses. This is especially highlighted in turbine hall where a mixture of all the different users come together to interact. This section also highlights a few key components of the design such as a grand staircase leading to turbine hall, roof access from both the Switch House and Turbine Hall, and bridge linking the Coal Tower to Turbine Hall.

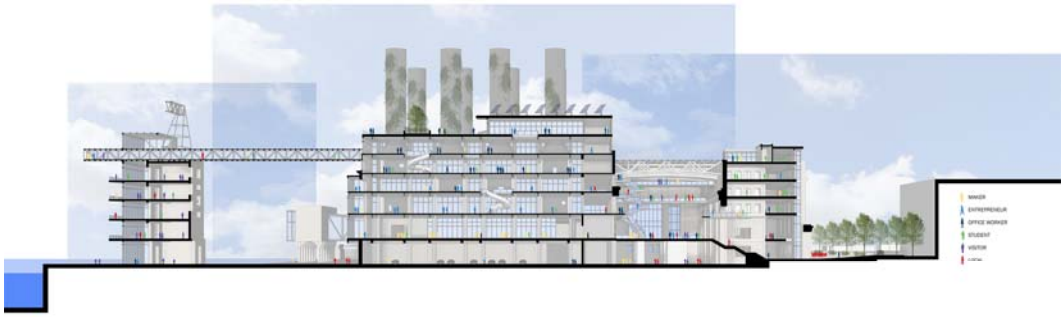

Figure 74: Programmatic Section (source: author)

Internal Flexibility

Within the maker space, innovation space, and corporate space a series of investigations based on Mondrian's Broadway Boogie Woogie were conducted as a way of investigating movement, nodes, and flexibility (Figure 75). The following plans and colors are abstracted but represent different modes of circulation, nodes of activity, programs, and furniture.

Figure 75: Mondrian Explorations (source: author)

Based on this series of explorations a set of more concrete plans were developed for potential setups within each of the major spaces in the building. Based on the column grid the floor plates are generally set up into zones of use and circulation. There are also banks of furniture (desks, work benches, toolsets, table, walls, televisions, etc…) that can be dispersed to suit the needs of individual clients. These could also be rented in a "build your own office" fashion rather than based on floor area or defined spaces.

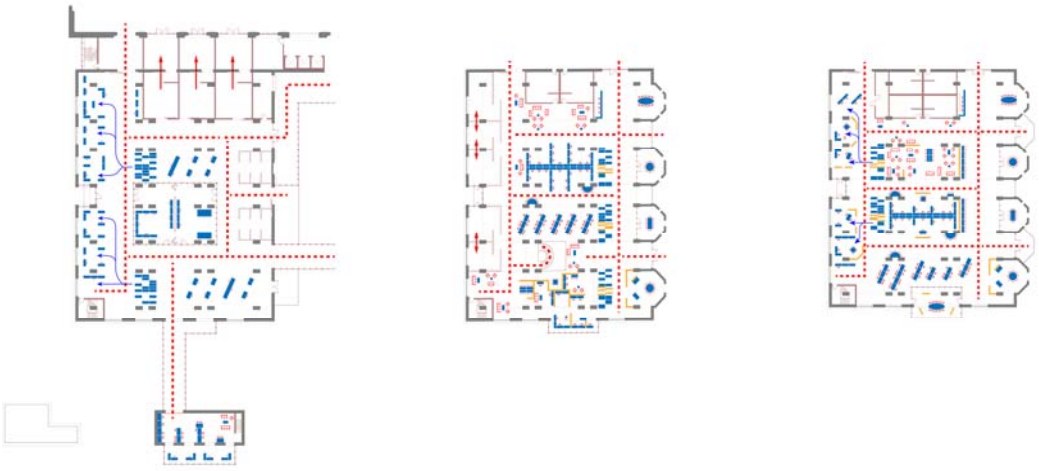

Figure 76: Flexible Floor Plans and Furniture Layouts (source: author)

Vertical Flexibility

In addition to the horizontal flexibility of the floor plan, this building also incorporates a vertical flexibility made possible through a adaptable structural system. Steel columns are bolted to the existing piers and are infilled with pre-cast concrete panels. These panels are removable making it possible to insert vertical circulation or create double height spaces as the needs and functions of the building change. For example, if the innovation space was thriving but the corporate space was less successful, the innovation space could expand upwards. This concept is demonstrated in the following structural diagrams.

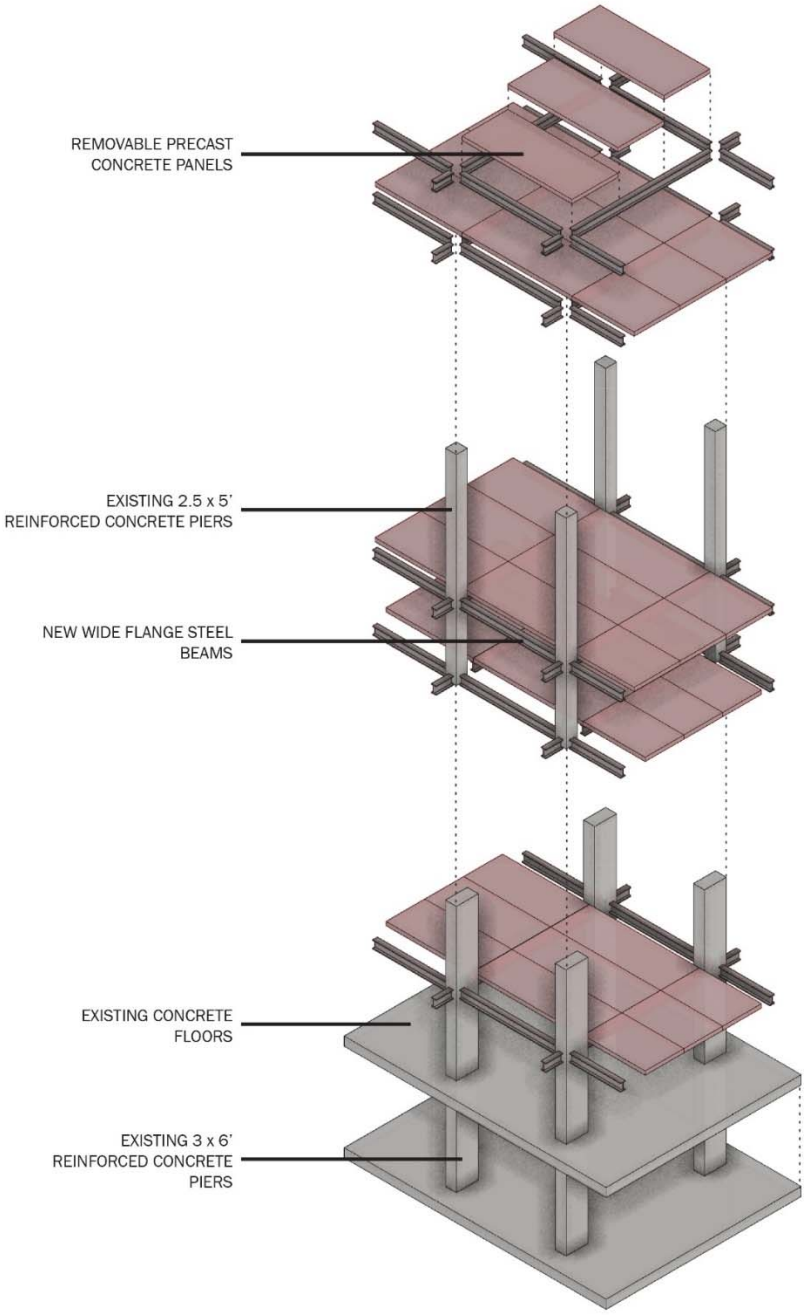

Figure 77: Structural Bay Configuration (source: author)

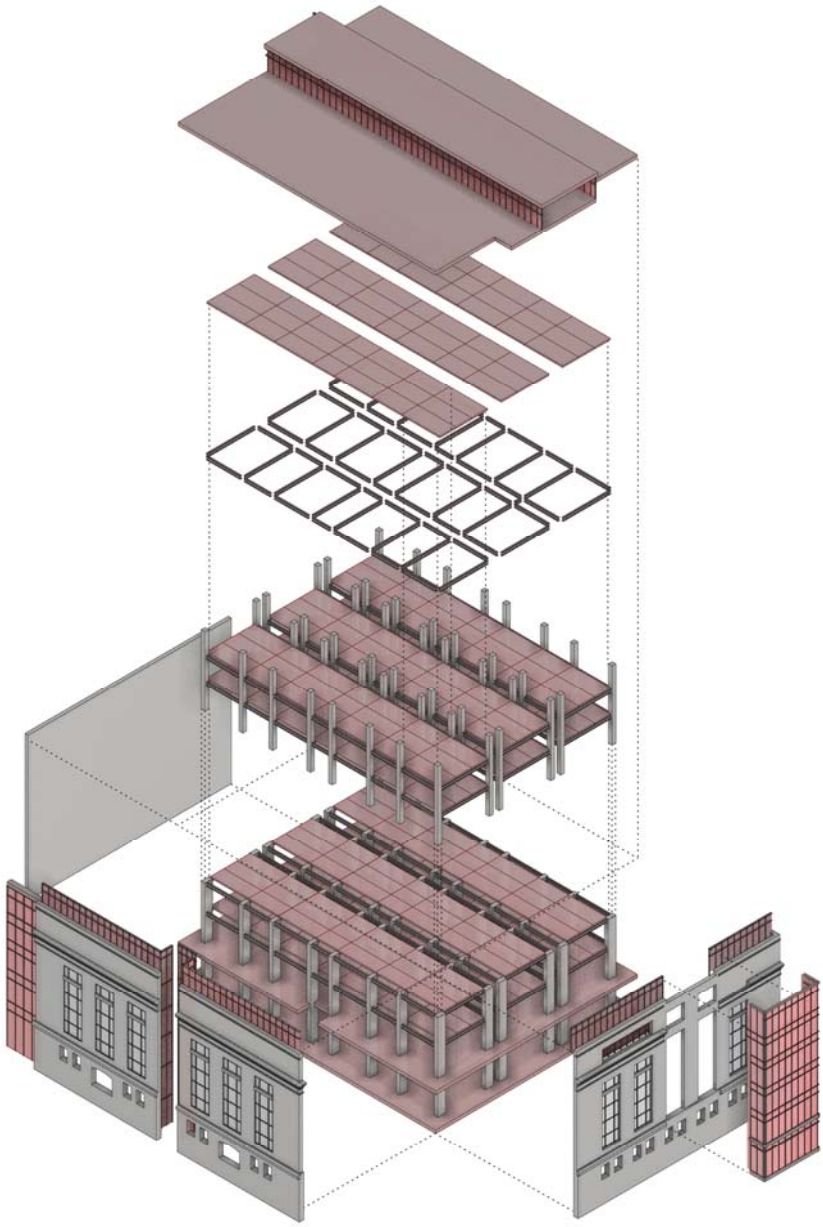

Figure 78: Boiler House Exploded Axon (source: author)

Facade as a Response to Site Conditions

The exterior of the building is characterized by the juxtaposition of a modern glazed curtain wall against the neoclassical reinforced concrete façade. The specific placement and configuration was largely a result of analyzing the existing facades and responding to

the context on each side of the building. This analysis is demonstrated in the following two diagrams.

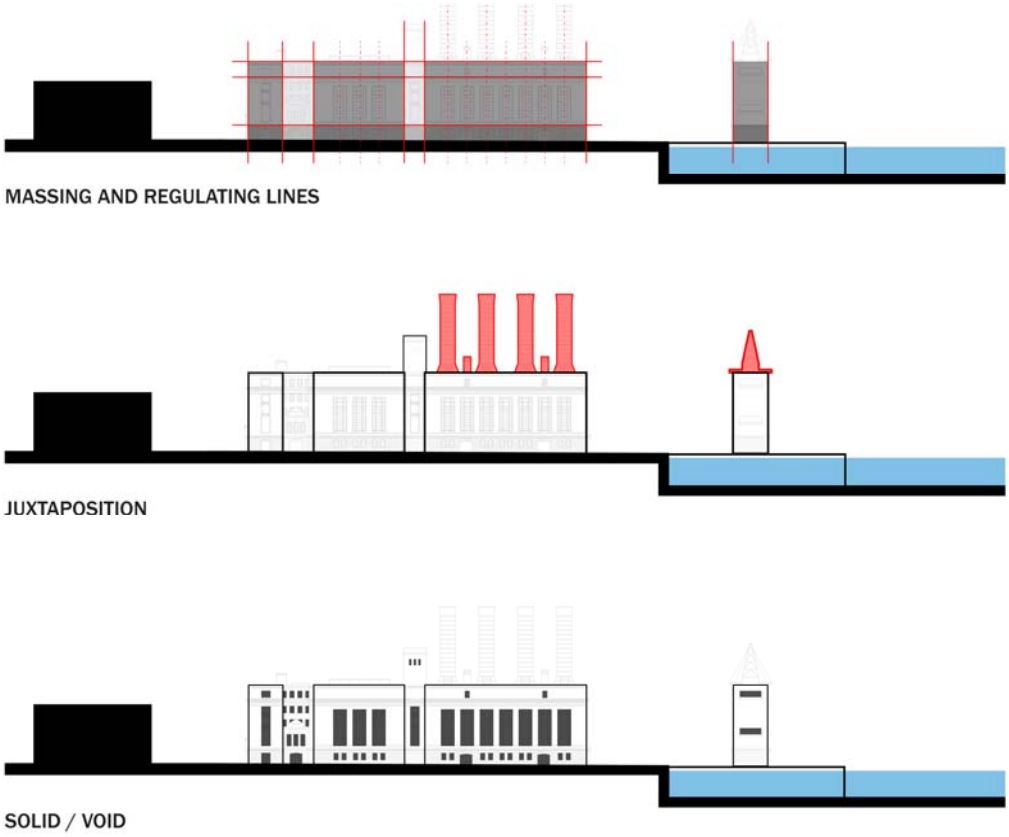

Figure 79: Existing Facade Analysis (source: author)

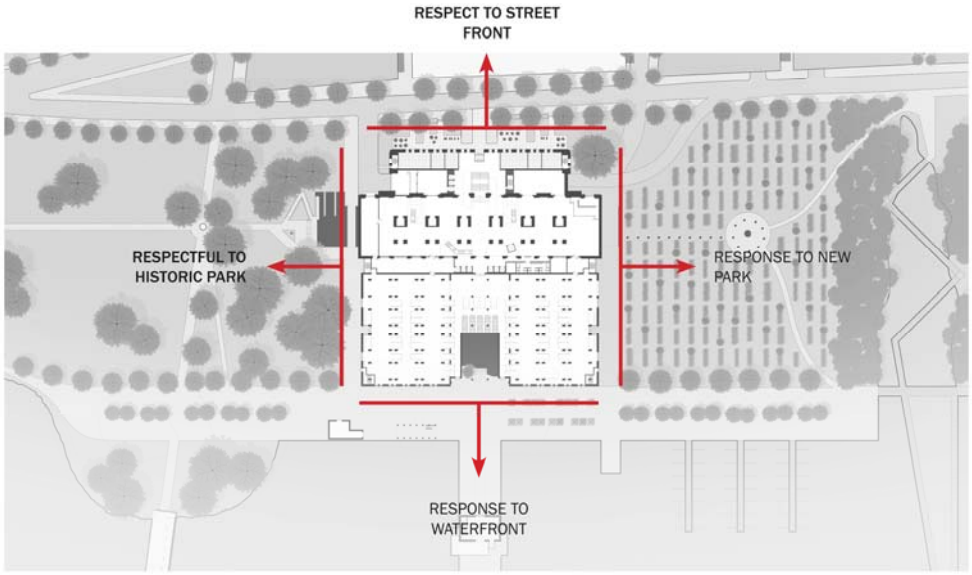

Figure 80: Facade Response to Context (source: author)

Facades facing Beach Street and Penn Treaty Park were generally preserved to maintain respect to the historic park and primary façade of the building. However, the waterfront and Phytoremediation Park facades were more aggressive in how the new interacted with the old. The idea behind taking a more liberal approach to conservation on these sides is a response to opening and connecting the building to new opportunities. The river façade provides views to the Delaware and opens up onto a new promenade along the waterfront. Phytoremediation Park provides new life to the landscape and promises of future development thus the building responds by opening up and reaching out to this bright new future.

A number of façade studies were investigate in this process ranging from more aggressive contrasting forms bulging and breaking free from the confines of the wrapper to a more subtle push and pull that corresponded to the geometry and regulating lines of the existing building. In all cases the goal was to create zones of porosity, allowing the public glimpses into the interworking's of the building, and using glazing to break down

the massing into smaller, more digestible pieces. This process is highlighted in the following diagrams.

Figure 81: Facade Studies (source: author)

This manifested itself through the digital model, using red as an indicator of new, as a series of pushed and pulled volumes in and out of the original façade. It is also important to note that many of the glazed sections that separate massing and building components contain vertical circulation, displaying movement and activity on the façade of the building. The following figures us red as a diagrammatic tool to highlight the interventions made to each façade which are coupled with the final rendering to show how this would translate to the actual building.

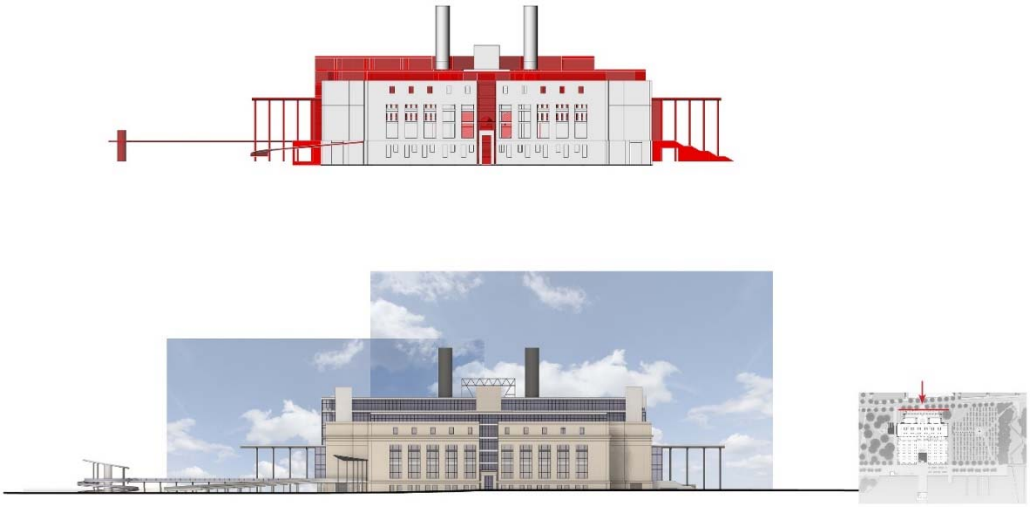

Figure 82: North Façade (source: author)

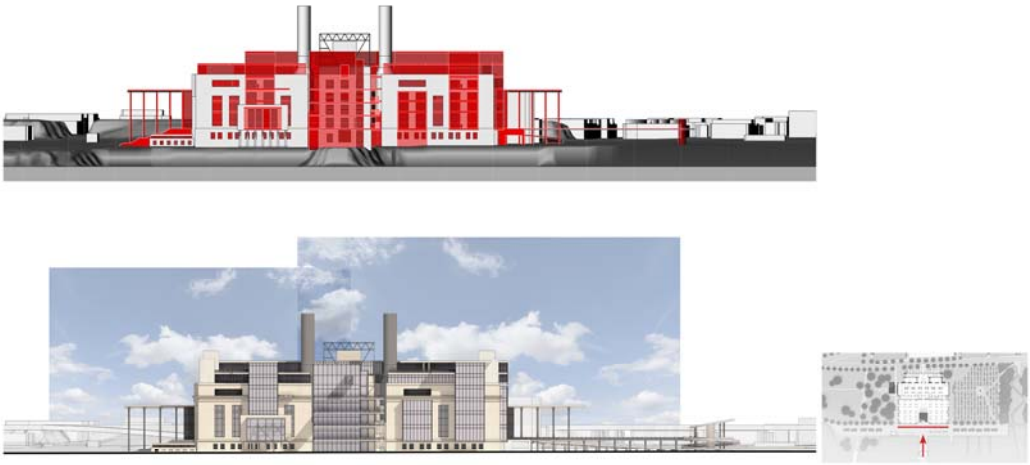

Figure 83: South Façade (source: author)

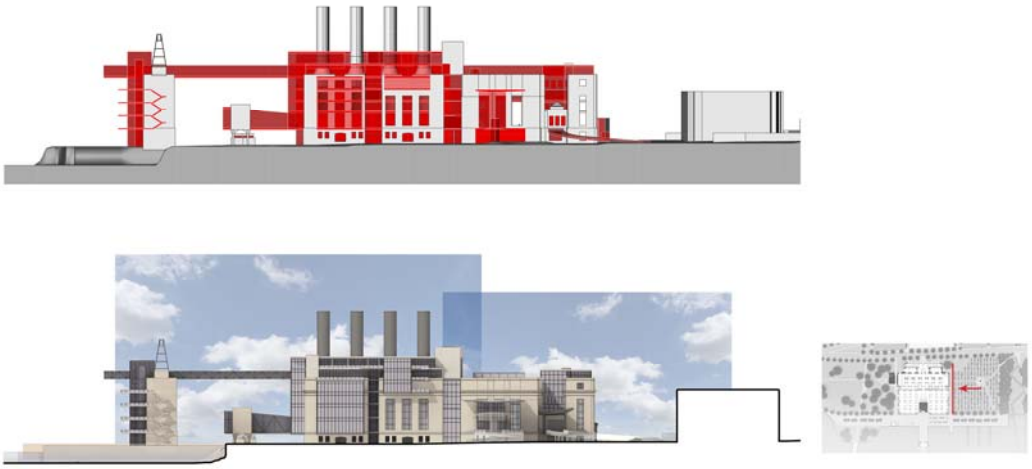

Figure 84: East Façade (source: author)

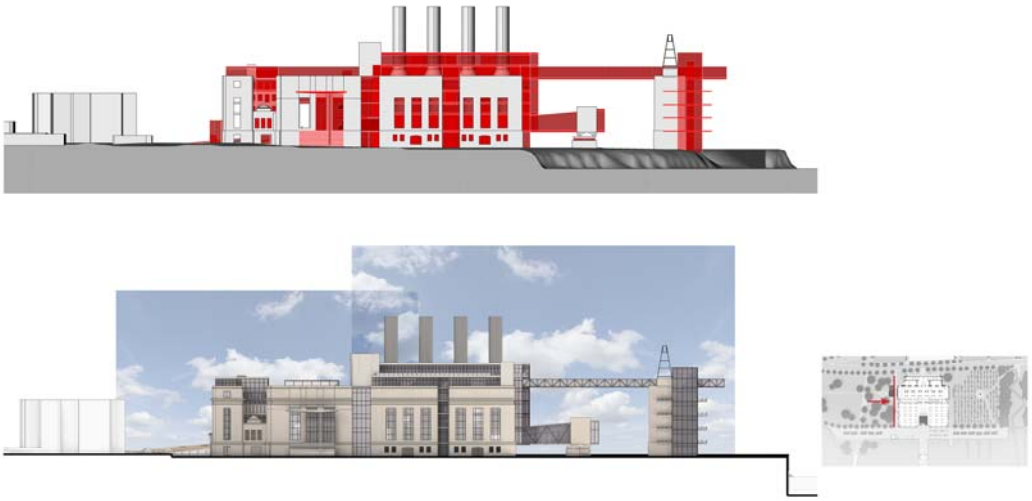

Figure 85: West Façade (source: author)

The resulting building is displayed in the following perspectives. The Beach Street perspective includes a ramp for deliveries directly into Turbine Hall without the use of a service elevator. One additional floor is visible on the Switch House and the beginnings of a more complete street are demonstrated through the use of street trees and pedestrians.

Figure 86: Beach Street Perspective (source: author)

One of the key components highlighted in the Ferry Approach perspective (Figure 87) is the glass and steel curtain wall system that is grafted onto the Coal Tower. Similar to Penn Treaty Park, which contains a tree grafted from the original tree that the Penn Treaty was signed beneath, the new structure attaches itself to the old growing into something of the same descent but entirely of itself. They park and the building are tied together through a green wall that covers the original exterior of the Coal Tower.

Figure 87: Ferry Approach (source: author)

Finally, the aerial shows the building in its context. The two park system is clearly visible on either side of the building, the piers and water fingers undulate in and out of the site, vegetation reaches into Fishtown to tie the city into the waterfront, and a new innovation district of mid-rise buildings moves its way up the river.

Figure 88: Aerial (source: author)

CONCLUSIONS

The opportunities presented in this thesis are by no means exhaustive and provide room for additional expansion. In many ways adaptive reuse and this thesis can be thought of in terms of the “exquisite corpse.” Renovations and adaptations are meant to continue into the future as a way of redefining the building as the needs of city and neighborhood evolve. It presents a framework that is not complete, allowing for future adaptations and changes.

One potential future development would be expansion into Phytoremediation Park. Once the vegetation has done its part to heal the land, it would be ripe for development. This would also give the area time to develop and more thoroughly define what is needed programmatically (Figure 89).

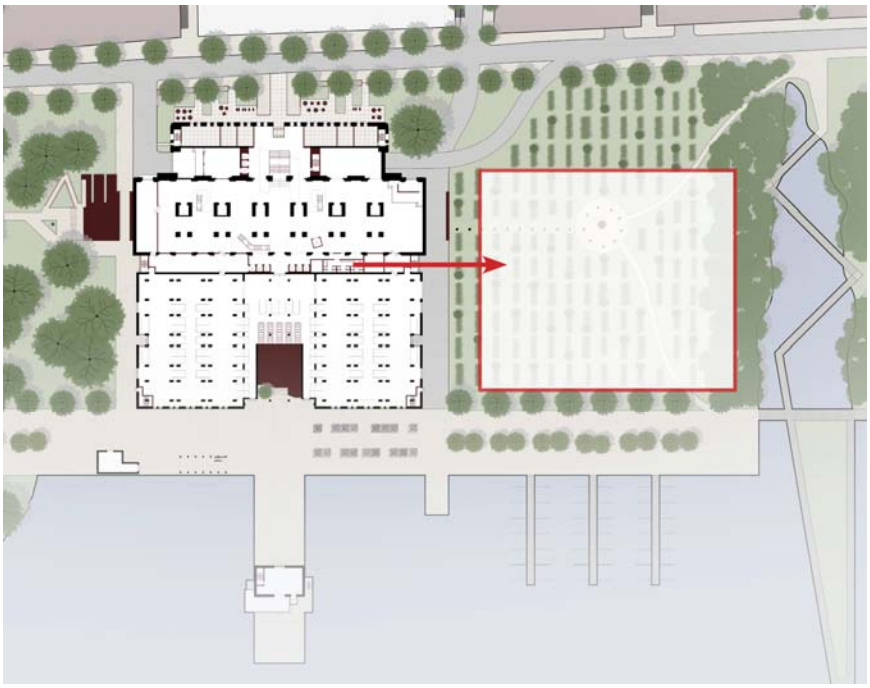

Figure 89: Site Expansion (source: author)

As discussed previously the removable floor panels provide opportunities for internal spaces to expand up or down, however, the robust structural piers in the boiler house also provide additional strength to expand the building higher. Perhaps this is an opportunity for a few additional floors of residential to create a truly mixed use building (Figure 90). The smoke stacks also provide an opportunity for creative reuse. They could be repurposed as studios or observation decks as show in Figure 90.

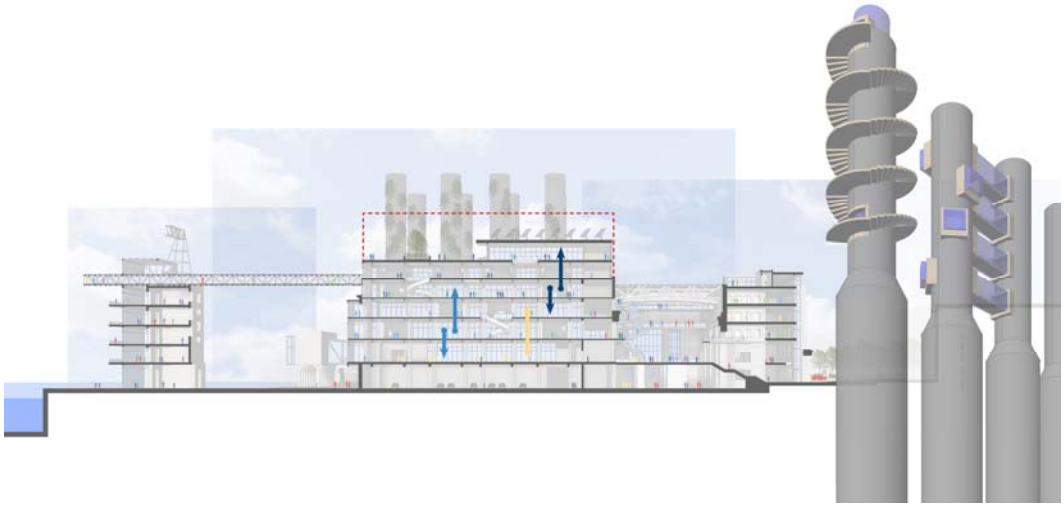

Figure 90: Vertical Expansion (source: author)

There are also a number of sustainable design strategies that could be implemented in the initial design or incorporated at a later date. This includes a rain water collection system that utilizes underground water storage tanks left over from the buildings original use as a power plant. Collected rain water could be used as part of a gray water system for the building or slowly released back into the river to reduce storm surges. It could also be used to water Phytoremediation Park. These systems are highlighted in Figure 91.

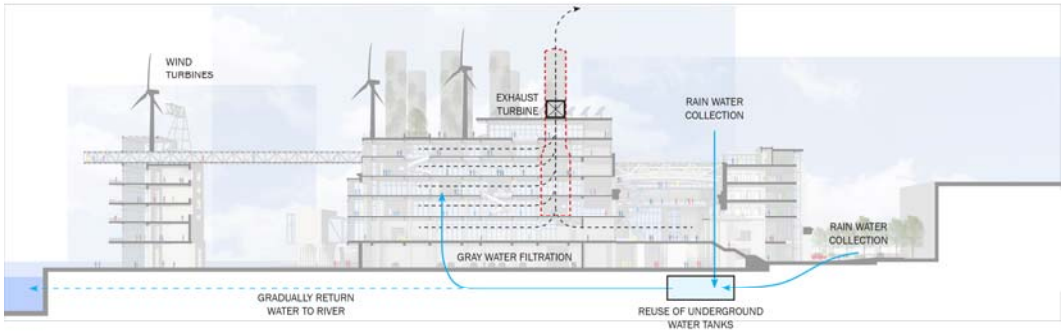

Figure 91: Sustainability Opportunities (source: author)

This thesis has been an investigation into the potential of what abandoned buildings can be transformed into using the community and surrounding context as a driver for program. In the case of the PECO Generation Station, it was determined that a dynamic mixed use working space, focused on making and the creation of ideas was most appropriate for the Fishtown neighborhood of Philadelphia. The program is uniquely designed to create partnerships between the community, makers, innovators, and corporations. It uses simple materials such as steel and glazing to contrast with the existing reinforced concrete to create a unique and juxtaposed addition that is suited for the new use. The design also creates a number of public spaces, both interior and exterior, which tie into to community.

While each adaptive reuse project is unique, this thesis proposes a unique program that could be applied to countless other buildings and cities. The method of analysis and design is also applicable to the field of adaptive reuse.

BIBLIOGRAPHY

"1325 Beach Street." *Walk Score*. https://www.walkscore.com/score/1325-n-beach-st philadelphia-pa-19125 (accessed May 5, 2017).

"About." *BOK*. http://www.buildingbok.com/about/ (accessed March 25, 2017).

Avery, Ron. *A Concise History of Philadelphia*. Philadelphia: Otis Books, 1999.

Barker, Robert, and Richard Coutts. *Aquatecture: Buildings and Cities Designed to Live and Work with Water*. London: RIBA Publishing, 2016.

Brand, Stewart. *How Buildings Learn: What Happens After They're Built*. New York: Penguin Books, 1995.

Cairns, Stephen, and Jane M Jacobs. *Buildings Must Die: A Perverse View of Architecture*. Cambridge, Massachusetts: MIT Press, 2014.

"Climate Philadelphia – Pennsylvania." *U.S. Climate Data.* http://www.usclimatedata.com/climate/philadelphia/pennsylvania/united states/uspa1276 (accessed May 5, 2017).

"Delaware River Basin Facts." *Bureau of State Parks Outdoor Programming Services Division,* June 2010. http://dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20031252.pdf (accessed May 10, 2017)

Duffy, Francis. "Measuring building performance." *Facilities*, 8.5, 1990.

Duffy, Francis, and DEGW London Limited. *Design for Change: The Architecture of DEGW*. Basel: Birkhäuser, 1998.

Econsult Corporation, Penn Institute for Urban Research, May 8 Consulting. *Vacant Land Management in Philadelphia: The Costs of the Current System and the Benefits of Reform,* 2010.

Exploratorium at Pier 15." *The American Institute of Architects.* http://www.aiatopten.org/node/472 *(*accessed March 20, 2017).

"Fast Facts." *Seaholm Power, LLC*. http://www.seaholm.info/fastfacts.html (accessed April 29, 2009).

"Fishtown, Philadelphia, PA Demographics." *Areavibes.* http://www.areavibes.com/philadelphia-pa/fishtown/demographics/ (accessed May 9, 2017).

Garvin, Eugenia et al. “More Than Just An Eyesore: Local Insights And Solutions on Vacant Land And Urban Health.” *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 90.3, 2013.

Haller, Stephanie and Jill Betters. “Nomination of Historic Building, Structure, Site, or Object Philadelphia Register of Historic Places: Philadelphia Electric Company Delaware Generating Station.” *Philadelphia Historical Commission.* March 03, 2017.

Latham, Derek. *Creative Re-Use of Buildings*. Shaftesbury, Dorset: Donhead, 2000.

Lynch, Kevin. *Wasting Away*. Edited by Michael Southworth. San Francisco: Sierra Club Books, 1990.

Kains, Stephen and Jane M Jacobs. *Buildings Must Die: A Perverse View of Architecture*. Cambridge, Massachusetts: MIT Press, 2014.

“Keyston Innovation Zone (KIZ) Tax Credit Program.” *Pennsylvania Department of Community and Economic Development.* http://dced.pa.gov/programs/keystone innovation-zone-tax-credit-program/ (accessed February 18, 2017).

Maguire, Robert. “Conservation and Diverging Philosophies.” *Journal of Architectural Conservation* 3 no. 1, 1997.

“Master Plan for the Central Delaware: Transforming Philadelphia’s Waterfront.” *Delaware Riverfront Corporation,* October, 2011.

Maule, Bradley. “Defining Historic “Fishtown,” *Hidden City Philadelphia,* May 17, 2016. http://hiddencityphila.org/2016/05/defining-historic-fishtown/ (accessed May 20, 2017).

MeKee, Adam. *Encyclopedia Britannica*, s.v. “Broken window theory.” Encyclopedia Britannica, https://www.britannica.com/topic/broken-windows-theory, June 13, 2013.

“Mission and History.” *Crane* Arts. http://www.cranearts.com/mission/ (accessed March 25, 2017).

Mostafavi, Mohsen, and David Leatherbarrow. *On Weathering: The Life of Buildings in Time*. Cambridge, Mass.: MIT Press, 1993.

Mouat, Lauren. “Centrale Montemartini Museum: Machines, Gods and Ghosts at Rome’s Centrale Montemartini Museum.” *Romeing,* March 10, 2017. http://www.romeing.it/centrale-montemartini-museum/ (accessed September 16, 2017).

National Vacant Properties Campaign. *Vacant Properties: The True Costs to Communities*, 2005.

"New Life for Old Schools: Philadelphia Reuse Studio." *University of Pennsylvania School of Design*, 2013.

"Philadelphia 30th Street Station District Plan: Growing Philadelphia's Future at 30th Street Station." *Amtrak, Brandywine Realty Trust, Drexel University, The Pennsylvania Department of Transportation, and the Southeastern Pennsylvania Transportation Authority,* June, 2016. https://static1.squarespace.com/static/539b050fe4b077b40b221f4f/t/57694caaff7c5085d0a3de31/1466518722881/District+Plan+Final+Report_June2016_8.5x11_web.pdf (accessed May 10, 2017).

"Philadelphia: Economy." *City-Data.com*, http://www.city-data.com/us-cities/The Northeast/Philadelphia-Economy.html (accessed May 6, 2017).

Powell, Ken. *Architecture Reborn: Converting Old Buildings for New Uses*. New York: Rizzoli, 1999.

Romero, Melissa. "PECO Delaware Station Receives National and Local Historic Designation. *Curbed Philadelphia*, August 23, 2016. http://philly.curbed.com/2016/8/23/12603642/peco-delaware-station-historic designation (accessed May 10, 2017).

Rennie, Jones. "AD Classics: The Tate Modern / Herzog & Meuron." *Archdaily*, September 17, 2013. http://www.archdaily.com/429700/ad-classics-the-tate modern-herzog-and-demeuron (accessed September 17, 2017).

Ryan, Ellen. "Rome's Centrale Montemartini Museum – Gods among the Machines," *Untapped Cities, June 03, 2013.* http://untappedcities.com/2013/06/03/romes centrale-montemartini-museum-gods-among-the-machines/ (accessed September 15, 2017).

Saunders, William S, Patrick M Condon, Gary R Hilderbrand, and Elizabeth K Meyer. *Richard Haag: Bloedel Reserve and Gas Works Park. Landscape Views, 1*. New York: Princeton Architectural Press, 1998.

"Sharswood/Blumberg Choice Neighborhoods Transformation Plan." *Philadelphia Housing Authority*, 2015.

Slavin, Mathew, Tatyana Brown. "Repurposing Legacy Power Plants: Lessons for the Future." American Clean Skies Foundation, August 2011.

Spelman, William. “Abandoned Buildings: Magnets for Crime?” *Journal of Criminal Justice* 21.5, 1993.

“The Loved One’s Guide to Heroin and Other Drugs in Kennsington, Philadelphia.” *Malvern Institute,* March 25, 2016. http://www.malverninstitute.com/the-loved ones-guide-to-heroin-other-drugs-in-kensington-philadelphia/ (accessed May 18, 2017).

Trachtenberg, Marvin. *Building-in-Time: From Giotto to Alberti and Modern Oblivion.* New Haven, Connecticut: Yale University Press, 2010.

Wang, Shaoqiang. *Transformer: Reuse, Renewal, and Renovation in Contemporary Architecture*. Berkeley, CA: Ginko Press, 2010.

“Wind and Weather Statistics: Philadelphia International Airport.” *Windfinder.* https://www.windfinder.com/windstatistics/philadelphia_airport (accessed May 5, 2017).