Moving Cities:
Reclaiming the Fragmented Region of the Oil Sands

by

Beth MacLeod

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The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "Moving Cities: Reclaiming the Fragmented Region of the Oil Sands" by Beth MacLeod in partial fulfilment of the requirements for the degree of Master of Architecture.

Dated: March 19, 2013

Supervisor: _____

Reader: _____

Reader: _____

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ABSTRACT

As the Oil Sands in Northern Alberta continue to develop and new companies take up leases, they continue to fragment the region's communities and landscape. Rather than continuing the trend of subdividing the lands and the population, through isolated workers camps, this thesis proposes a moving city that can follow industry, remediate its path and reconnect the community through its processes.

Large scale canopies will cover past mining and tailings sites. The canopies will create micro-climates and harvest energy through solar updraft. The elevated temperatures under the canopies will provide improved climatic conditions for human inhabitation and a bioremediation industry.

This cyclical city will embed opportunities for strengthening relationships through interaction during relocation processes. Stronger ties to the people, and new clean industries that the population can find pride in, will vastly improve the reputation of the region.

The moving city will allow the community to follow in the voids left behind by the Oil Sands' processes in order to improve industrial, environmental and social conditions in the region.

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CHAPTER 1: INTRODUCTION

The temporary nature of single industry 'boom' cities causes the populace to be in a constant state of unease as the perception of these cities is that there is an inevitable impending 'bust' looming in the future. This constant concern results in a reluctance of workers to establish themselves within society and become active community members. Endless negative connotations are associated with these communities as a result of the resentment the population feels for the city. Eventually, the city becomes associated with the loneliness of "...a collection of strangers rather than a community of kinsmen, friends and neighbors," (Knapp 1998, 100). Eventually, the exhaustion of the local resource and a failure to establish a sense of community cause the boom town to disintegrate into a ghost town.

Traditionally the transition from boom town to ghost town leaves far too much development and infrastructure for the remaining citizens to maintain/use, while the industrial site is minimally reclaimed. However, if the initial industry could adapt its processes and infrastructure in order to allow another industry to follow it, the community would be at ease, as the depletion of the resource would only be a queue that something new is on the horizon. The city would occupy a site long enough to exhaust the current available resource for economic gain, then, as the thriving industry starts to fail, a new parasitic industry would commence. The 'bust' phase of the current industry, based on the exhaustion of the local resource, abandonment of infrastructure and an economic decline, could in fact be reconfigured to become

appropriate to a subsequent industry. This new industry has strong potential in remediation and agriculture due to the types of residual sites, remaining infrastructure and accessibility to water and heat.

The design will develop a prototype for a temporary city that would be built, disassembled and reassembled according to the life cycle of its location based resource. A temporary approach to city building and a well developed social community allows the city to become nomadic. The cyclical nature of these mobile communities becomes an essential contributing factor to the recovery of their post-industrial sites. Through man-made structures and landscapes that would assist in the reclamation, the site can first be used for its resources, but then reclaimed into a self sustaining ecosystem by the time of the collapse of the physical city. The design combines energy harvesting arcologies with mobile, cyclical architecture and the natural cycle of a single industry community. Arcologies, as originally conceived of by Paolo Soleri, are holistic, integrated, yet somewhat isolated structures that house thousands of residences, and corresponding commercial, industrial and agricultural facilities. The resulting nomadic community will establish mutualistic relationships with environmental sites as it first exhausts the resource, reclaims the site to a functioning ecosystem, then relocates to being this process anew.

CHAPTER 2: EXISTING CONTEXT

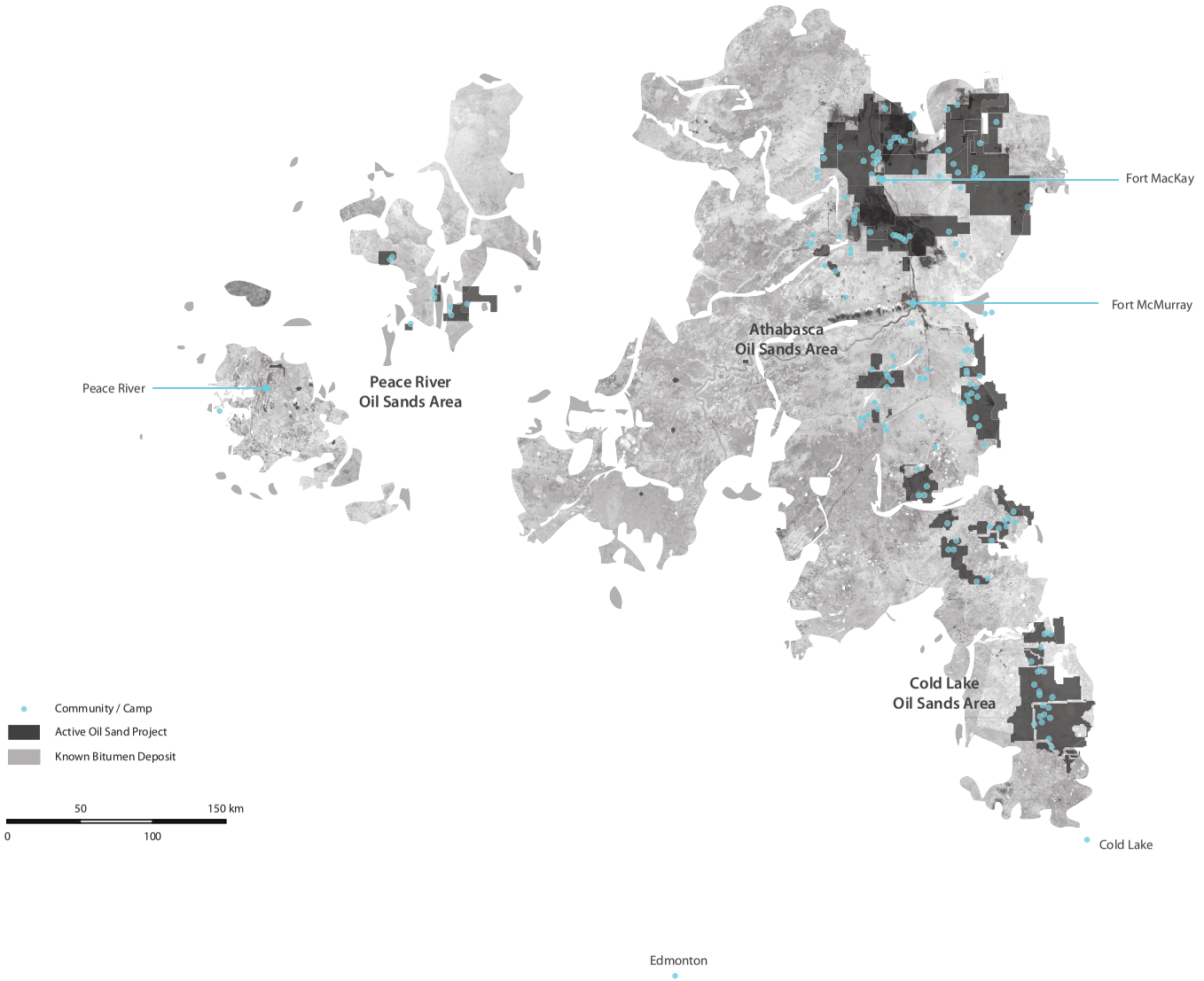
Communities

The conditions of the region's communities are consistent with most single industry boom towns. They can be considered in terms of the environmental, economic, developmental and psychological conditions. The majority of the population can not be accounted for as they only exist outside of census' as a 'shadow population' (Municipal Census 2012). Many of the commuters will not complete a census for two different cities, and generally chose to identify with another city that they feel represents 'home'. This choice impacts all other aspects of these types of cities, as the inaccurate population counts result in a lack of funding, therefore a lack of facilities and programs appropriate to the number and type of users actually present in the city at any given time. This perpetuates the reputation of the region as commuters will not relocate their families to a city of this nature.

Obsolete Boomtown

The oil sands in Northern Alberta have been a major driver of the Canadian economy, and the primary industry of the Regional Municipality of Wood Buffalo for the past 46 years. Fort McMurray, the region's major city center, has quickly transformed into a boomtown as a result of the tar sands found in the area.

As the area has developed, the city which once housed the majority of the Oil Sands' workers, is now becoming more and more obsolete. The Oil Sands companies



Map of Fragmented Oil Sands Sites and Communities. (Google 2013)

have begun to house their workers in camps within their own private leases, keeping a great deal of the regional population isolated from the larger community in scattered workers camps. This fragmentation and division of the local population is making it impossible for the city to provide the necessary infrastructure to support the incredible explosion in population. When considering the problems associated with this 'Town of Companies', who will not come together to provide the population with basic infrastructural necessities, it is hard not to be momentarily envious of the clear singular design visions possible within model company towns.

The region is instead driven by economy and haste, as most of the city's infrastructure was designed for a population of 30,000 while the city currently booms at more than 100,000.

Housing specifically has responded with ready-made options. In the city of Fort McMurray and the workers camps in the region, housing is largely addressed through the use of trailers. This type of housing is selected in response to the unpredictable, ephemeral and mobile qualities of the regional industry. Unfortunately, these trailers are not specifically designed for a region that is subject to a change in temperature from -50˚C to 30˚C. Most of the modules brought into the city are from providers that are designing for more mild climates. This means that not only does the local industry provide one of the largest contributions to greenhouse gas emissions in the country, but the housing in the area, isn't doing it any favours through a lack of acknowledgment of the local climate.

Image of trailer and addition on casters (Hirmer 2012)

Image of mobile trailer with additional insulation and concrete addition (Hirmer 2012)

Image of trailer with additional insulation added to survive the winter (Hirmer 2012)

Workers' Camps

Image of typical workers' camp, Horn River, 2013 (Alta-Fab Structures Ltd. 2013)

Existing workers' camp facilities heighten the sociological and psychological impacts of the isolation felt by community members that must leave their families for weeks, sometimes months at a time. The isolation felt within the transient commuter population is compounded by their remote locations. As many workers live and work at the same remote location, the negative perception of the community is scrutinized from a very limited perspective. Unfortunately, this lack of division between work and life outside that realm, results in increased boredom, isolation and reduced freedom, which causes friction. Thus, architecture has the potential to shift this perception through the opportunities to create places of social interaction and foster a feeling of belonging in order to encourage a sense of community.

The conditions of the workers camps, are the minimum that the industry can get away with providing. Housing its workers in minimally maintained units, that are surveyed by security guards who reinforce that this service is a "privilege". Workers lives are constantly under the surveillance of their employer, even their phone calls and internet usage is monitored. These living conditions are more similar to a prison than to a community.

Precedent

Blacksand Executive Lodge, Horizon North Logistics Inc., Workers Camp, Fort McMurray Area, CA

This project exemplifies the current state of workers camps in Northern Alberta. This facility is considered to be 'state of the art' and luxurious compared to many. The program of this type of facility provides solely for the workers' basic needs and entertainment. Generally, these facilities include individual rooms for workers, these include small kitchenettes, independent bathrooms, a small workspace and a bedroom. The larger facility has a cafeteria, lobby, dining room, fitness room, lounge, meeting room and games room.

These facilities are generally constructed using trailers as modular structures that are blast resistant, providing protection from explosions, fire and toxic release hazards. These structures are made specifically for refineries, petrochemical and chemical operations, and extraction plants. Generally these modules are referred to as 'ATCO Trailers' as they are largely supplied by ATCO Structures & Logistics.

Image of typical workers' camp corridor and indoor conditions, near Fort McMurray, Alberta, 2010, photograph by Dru Oja Jay (The Tyee 2013)

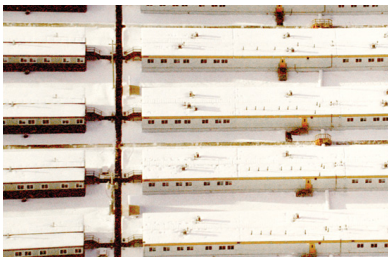


Image of ATCO trailer configuration for workers' camp (Hirmer 2012)

Image of typical ATCO trailer (ATCO Ltd. 2012)

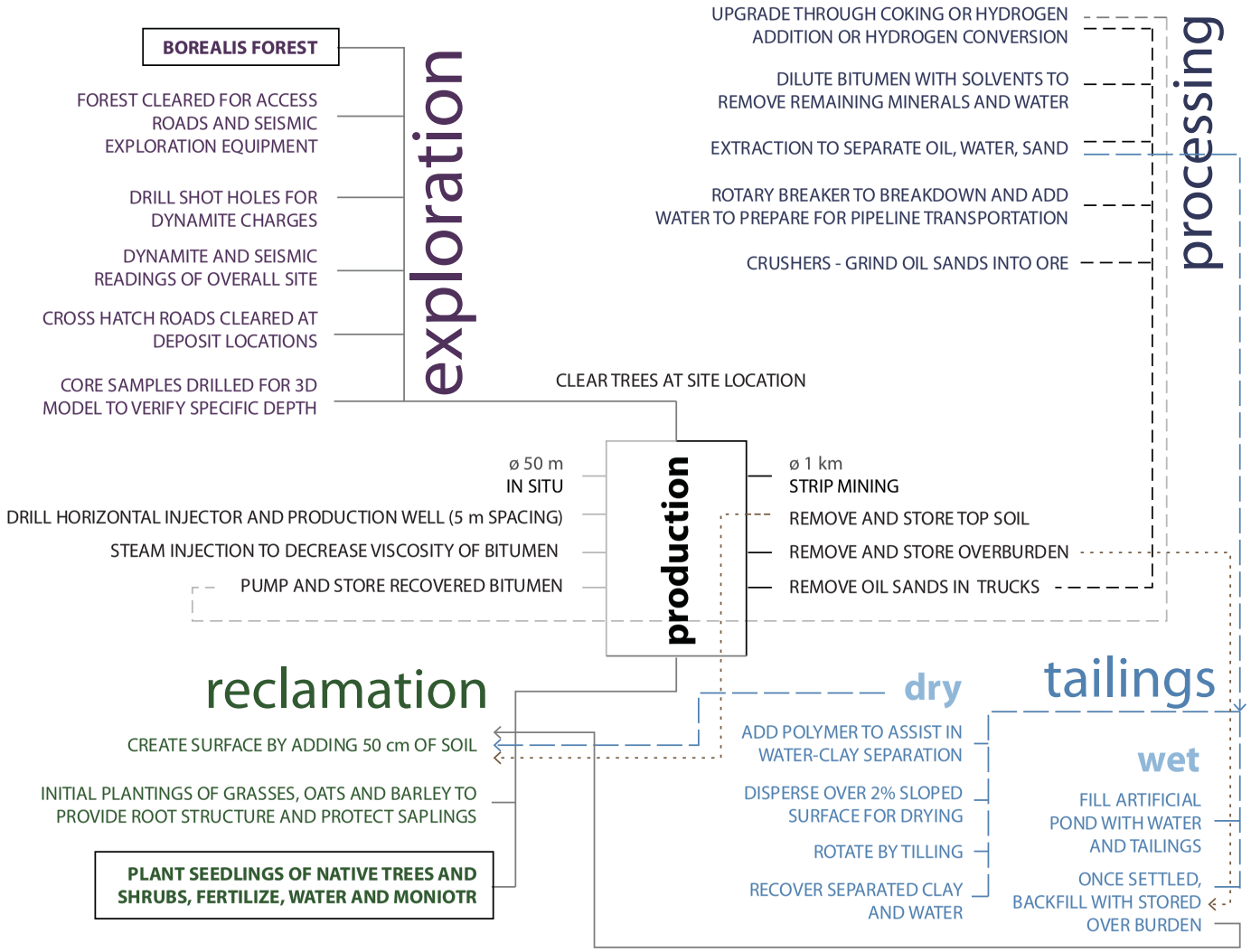
Open Camps

Fort MacKay is located between the two largest areas of current oil sand mining activity in the region. This Aboriginal community along with Fort Chipewyan, Fort McMurray, Anzac and Conklin, has taken the opportunity to create partnerships with new businesses. By partnering with new lodging providers and catering services, these

communities are able to provide their populations with new revenue streams, jobs and opportunities. These partnerships also form the only ‘open’ camps. Most camps are ‘closed’ workers’ camps, provided and occupied by individual Oil Sand Companies, resulting in private occupancy, and a very limited perspective for workers/residents. ‘Open’ camps run by the local population in partnership with an external provider, are the only lodgings that are open to anyone, similar to a hotel, they are also the only camp typology that allows a mixing of the local population and the workers population, allowing a clearer division between work and life.

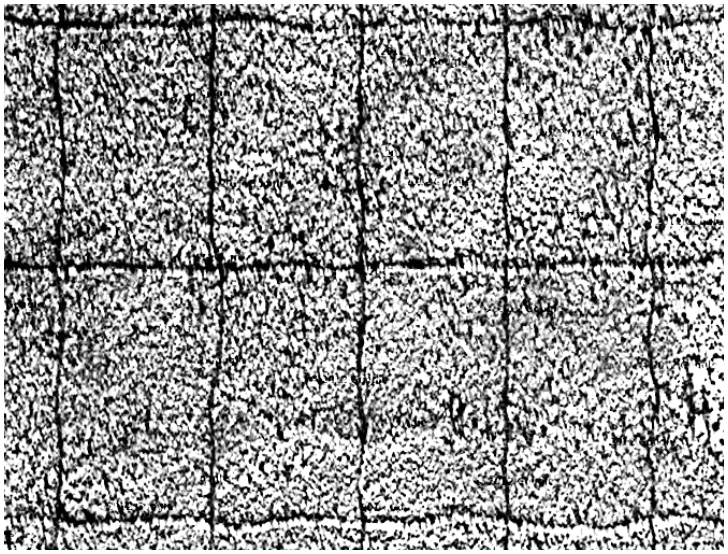
Industry: The Oil Sands

Tar sands are a mixture of sand, water and a heavy crude oil called bitumen. Bitumen can be recovered through surface mining, using shovels and dump trucks in open pits up to 80 meters deep. Tar sands are then crushed and mixed with water until they are of a consistency to be transported by pipeline. Liquified bitumen is then piped to upgraders for refining. Once the bitumen has been recovered from the site, the site needs to be remediated, and the tailings produced during the extraction process need to be dried and stabilized. Generally the processes involved can be broken down into five categories, exploration, production, processing, tailings and reclamation, see *Oil Sands Site Procedures Overview*.



Oil Sands Site Procedures Overview (data from Suncor Energy Inc. 2013, Canadian Centre for Energy Information 2013, and The Pembina Institute 2013)

Exploration



Inverted Aerial View of Seismic Grid Access Roads, near Fort McMurray, AB (Google 2012a)

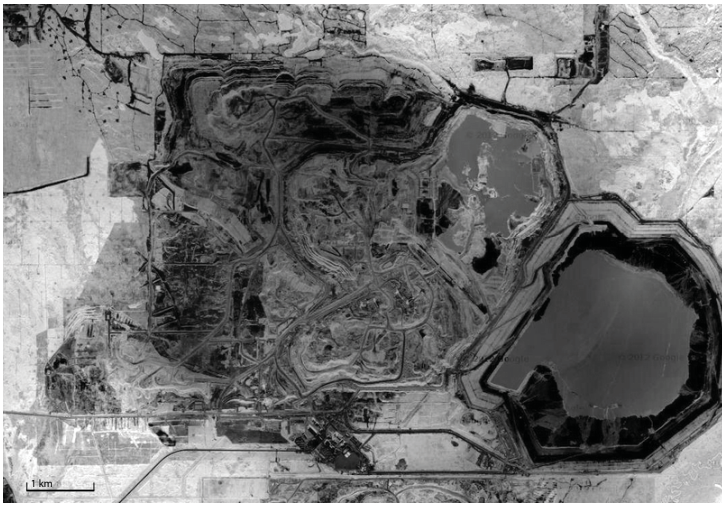
Before oil sands are recovered from the soil, oil companies conduct seismic explorations throughout their leases to determine which deposits will be prioritized. In order to do this, access routes are cleared throughout the entire lease, along a single axis from a main spine. Next, shot holes are drilled and dynamite charges are recorded at all intervals for seismic readings to create a general map of deposit locations. While this amount of information is sufficient for surface mining, in situ requires exact depths to inform well drilling. Where in situ extraction is necessary, geologists revisit deposit locations and take core samples at intersections along a tight cross hatch pattern of cleared access roads. Their findings are then used to assemble a 3D model of the existing deposits, and determine well depths and locations.

Production

Surface Mining

The traditional method for retrieving bitumen from the oil sands is surface mining. This method of production uses trucks and shovels to remove the oil sands. The trucks then transport the oil sands to a preparation plant where they are crushed and mixed with water. They are then moved to an extraction plant where the bitumen, water and sand are separated. The bitumen is then transported to a processing plant, while the water and sand are transported for tailings treatment.

Photograph of Oil Sand Surface Mine, near Fort McMurray, AB, photograph by Garth Lenz (Lenz 2013b)



Aerial View of Surface Mine and Tailings Pond, near Fort McMurray, AB (Google 2012b)

Tailings

Tailings management refers to the methods used by oil sands companies in order to deal with the mixture of clay, sand, water and residual bitumen produced during the extraction process.

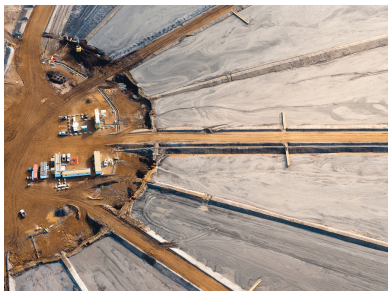
Tailings Ponds

Its traditional, tailings pond, management involves a waiting period of almost 40 years as Thin Fine Tailings consolidate to become Mature Fine Tailings in order to settle at the base of artificially constructed lakes. Two major obstacles of tailings ponds are the amount of water use, and the recovery of land, as the tailings maintain qualities of quick sand until the water is mechanically removed from the remaining clay particles.

Photograph of Tailings Pond, near Fort McMurray, AB, photograph by Garth Lenz (Lenz 2013c)

Dry Tailings

Using methods of land farming, the tailings are dispersed over a large surface area, dried and rotated, allowing them to recover structural qualities lost during the removal of bitumen from the oil sands. A polymer is added to the tailings to assist the separation of water and clay. By using a 2% sloped surface the water will naturally drain from the clay. The clay and the water recovered in the process can both be reused in other industry processes. This new form of tailings reduction reduces the overall footprint of the mine substantially as a large percentage of the site is currently used for traditional tailings ponds. This process will allow a huge reduction in the time, taking only 7 years, it takes to recover the water, the clay and the original footprint of the mine pit.



Photograph of Dry Tailings, near Fort McMurray, AB, photograph by Garth Lenz (Lenz 2013a)

Reclamation

To date there has only been one mine that has completed the cycle from mine, to tailings pond, to reclaimed land. The low volume of reclaimed land is likely the result of a lack of incentive. Although Oil Sands developers agree to reclaim their lands once they have completed their projects, there is no incentive to do this with any haste. Reclaiming their lands restores a natural ecosystem to the site which could improve their reputation, however, it also renders them useless to the company. The transition from an active mine site to reclaimed lands means that huge areas of leased lands no longer have the potential to host tailings, top soil, overburden, or workers camps.

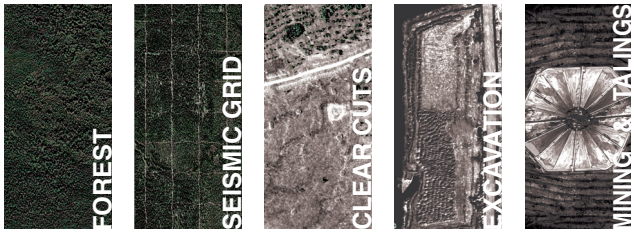
Fully reclaimed lands can be submitted to be certified and are then ready to be returned to the crown, however, this would also mean that the company would lose access to these lands, and could potentially have civilians on those lands, which could become a hazard for the active adjacent site.

CHAPTER 3: DESIGN

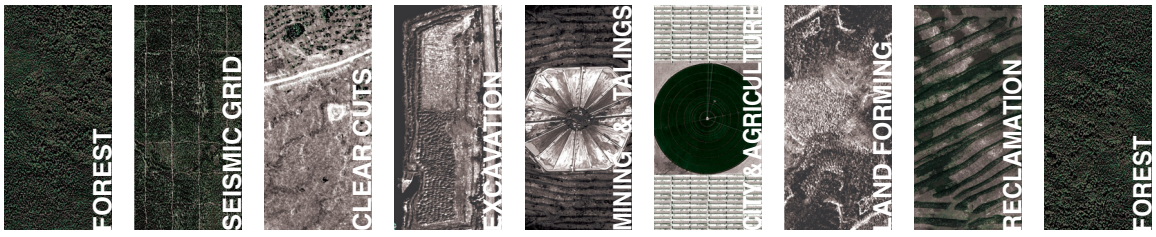
Site Cycles

Current mining practices take the initial lease land from its native Borealis Forest state, through seismic exploration, massive clear cuts, top soil removal and excavation to open pit mining and tailings conditions. This thesis begins at the city and agriculture stage of the site cycle.

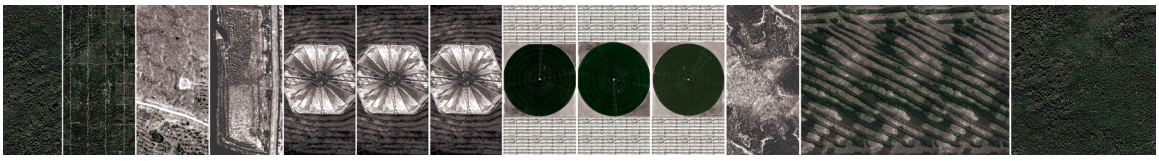
The intention is to reconnect the people and industry through a connection to the land and to each other. The subsequent phases that the site would undergo include city and agriculture, land forming to restore natural land conditions, reclamation with sapling plantings and finally forest regrowth.



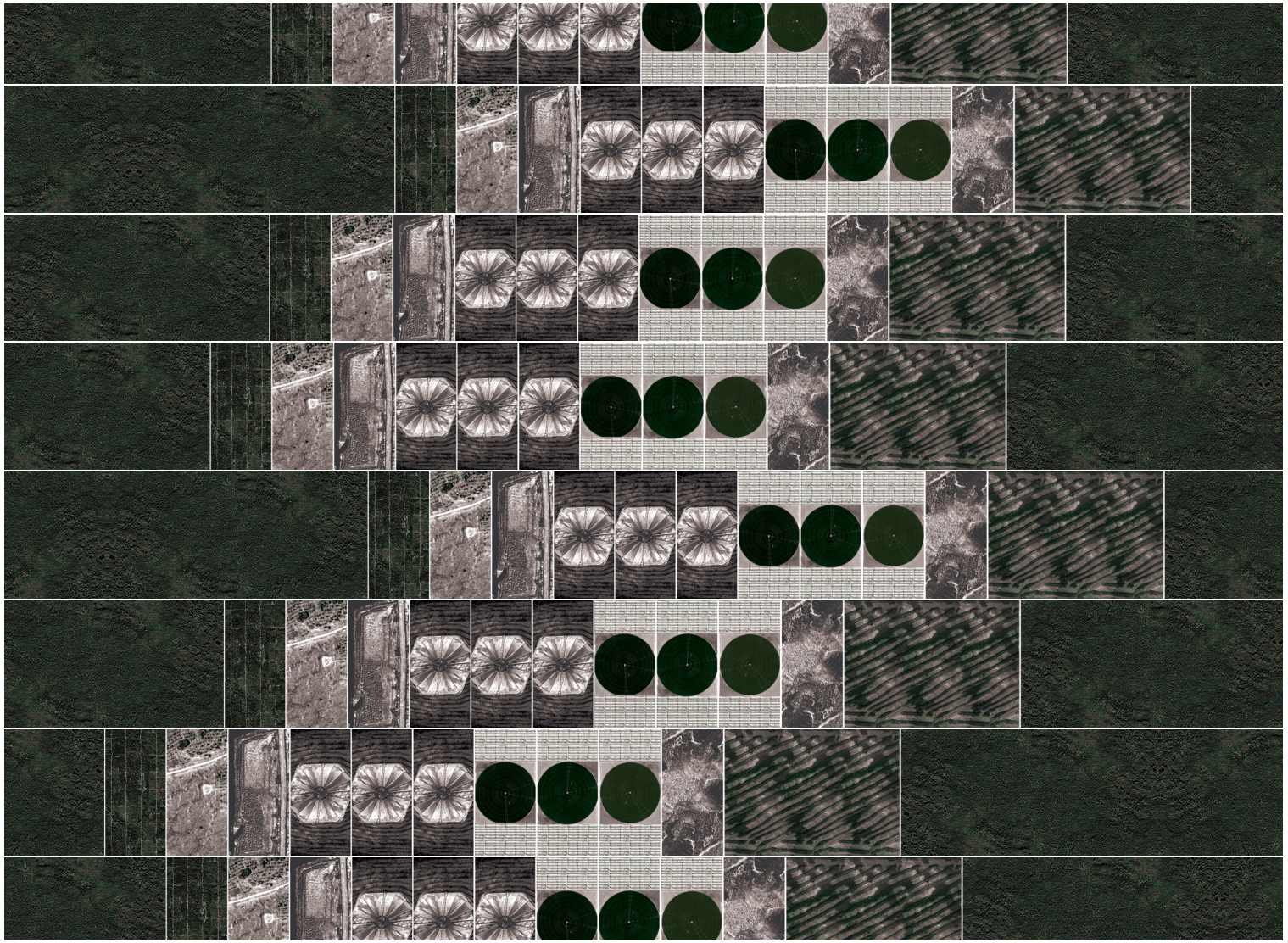
Site cycle based on current practices.



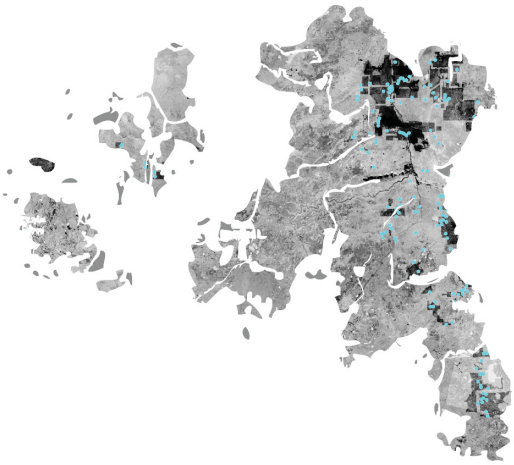
Envisioned site cycle.



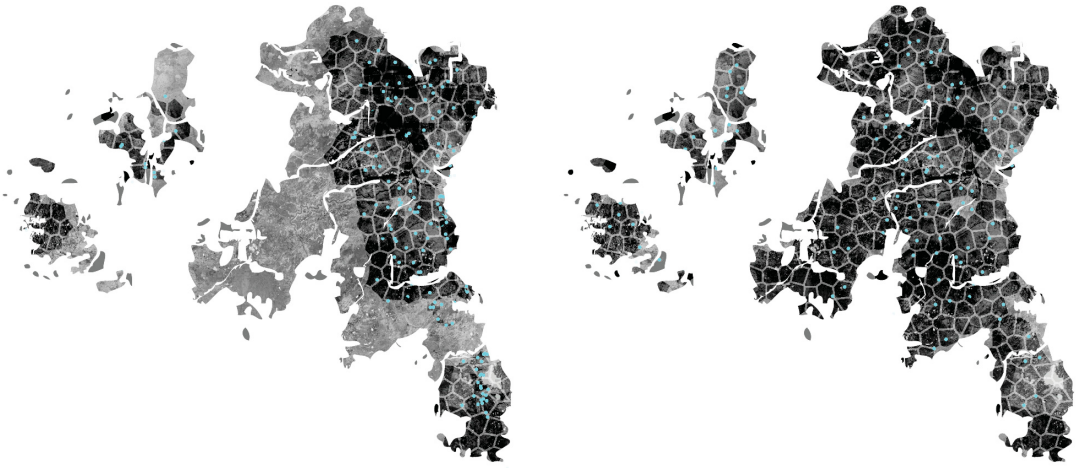
Site Cycle with timeline applied to the sequence of activities, allowing processes that require longer to occur in multiples. Each sequence represents approximately 5 years of activity.



Envisioned aerial of region with new site cycle applied to linear lease lands.



Existing land scarring through active mine sites and scattered workers' camp locations.



Projected fragmentation through land scarring and scattered workers' camp locations, if development continues with exiting trends.

Envisioned project development possible with moving cities, reducing land scarring present in the region at any given time, and reconnecting mines and reclamation through cities.

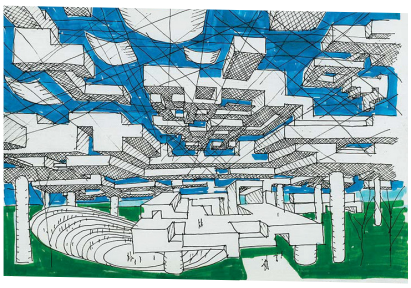
[Re]Building Rituals

Oil Sands development is pushing the sites further and further from the Fort McMurray area, rendering the city obsolete. A proposal for any other fixed city will also inevitably become obsolete, therefore mobile cities become the most appropriate modern adaptation to human settlement patterns, based on resource dependency, and the movement patterns of workers camps in this area.

The cyclical nature of nomadic societies builds a strong sense of identity, through the ritual inherent to a mobile lifestyle. In these kinds of societies, community is not tied to a singular place, but exists within the relationships between people, culture, and a way of life.

The mobility of the city allows for constant [re]building and experimentation within their society. A key industry within this cyclical city will be [re]building, as a ritual of recreating the community in new locations, meaning that there will be endless opportunities for [re]configuration and the incorporation of what can be learned in hindsight with each evolution of the community.

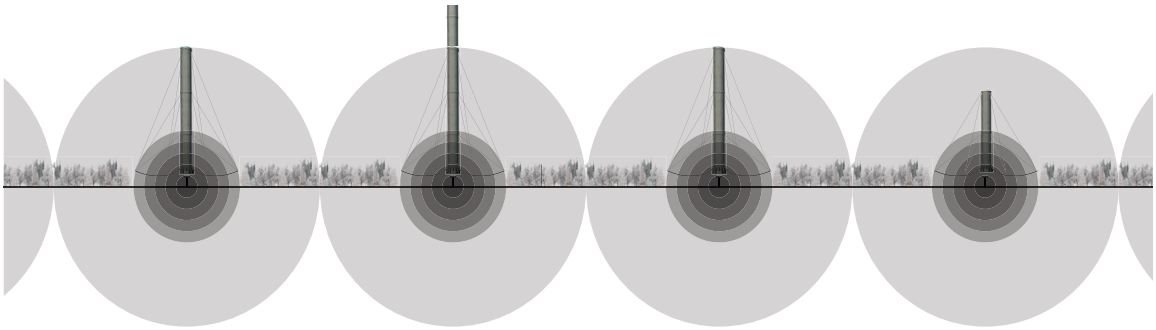
These ideas stem from those presented in Yona Friedman's utopian non-plan theories. La Ville Spatiale exemplifies these theories through a proposal for a futuristic city in which the city is constructed solely of skeletal super structures and the inhabitants are provided with components (similar to walls, roofs and floors) with which they have the freedom to build their own spaces, ideal for whichever activities they desire. The 'planned chaos' at the hand of the inhabitant is slightly



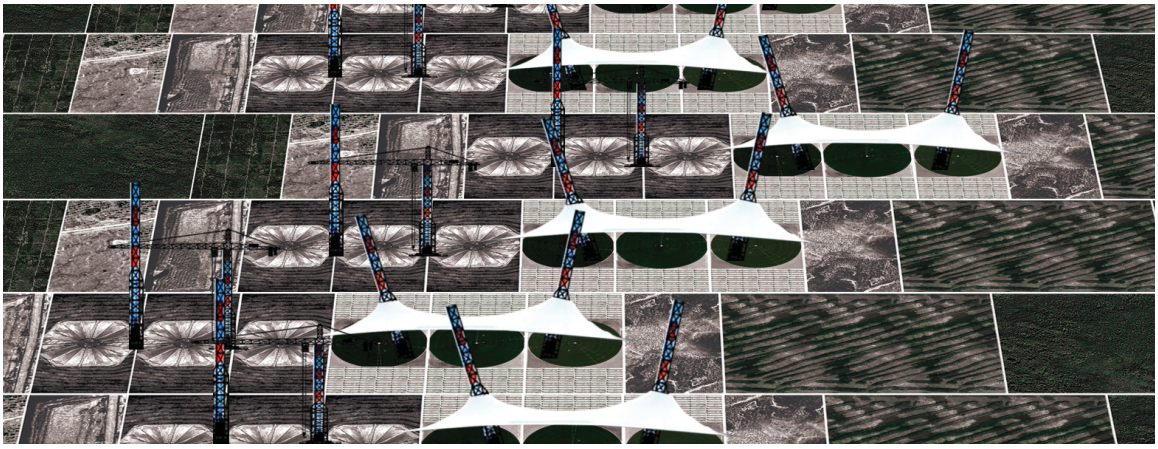
La Ville Spatiale, 1959, sketch by Yona Fridman (Frac Centre 2013)

idealized, however, possible. The less realistic aspect of this project is the idea that the inhabitants would constantly reconfigure and reorganize without prompting. This notion is addressed within the mobile city as the city must inevitably collapse and reconfigure throughout the cycles, therefore prompting the inhabitants to optimize their spaces with each new city establishment.

Endless community [re]development allows the community members to form strong bonds to each other, and the territory. This mobility and the [re]use of cyclical processes is also inherent to the current processes of the oil sands. Using the infrastructure and cleared sites left behind by this industry, a new type of city will be developed that can follow a moving industry.



Initial concept image of demountable canopies across multiple sites.



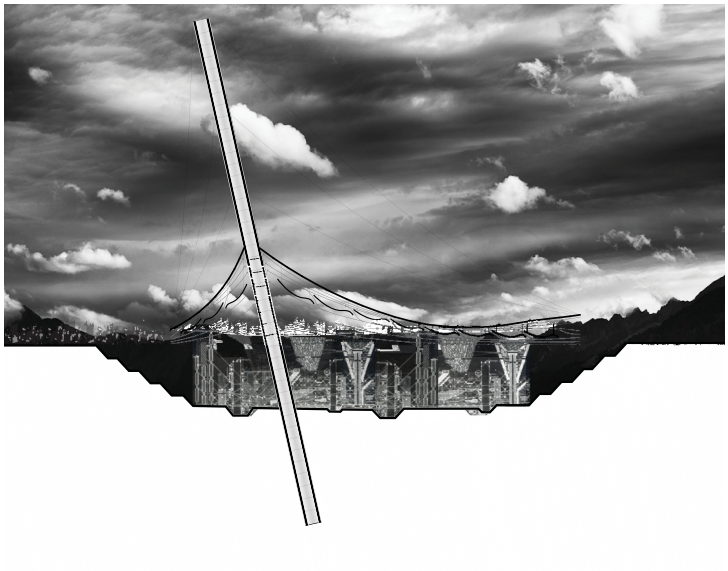
Snapshot of developed canopy design and structural masts being built and moving across multiple lease lands.

Conceptual scene of the moving city, captured from a current mine site looking back at the city following behind. The canopy allows the city to enjoy spring-like weather, while winter looms outside.

Privatizing Utopia

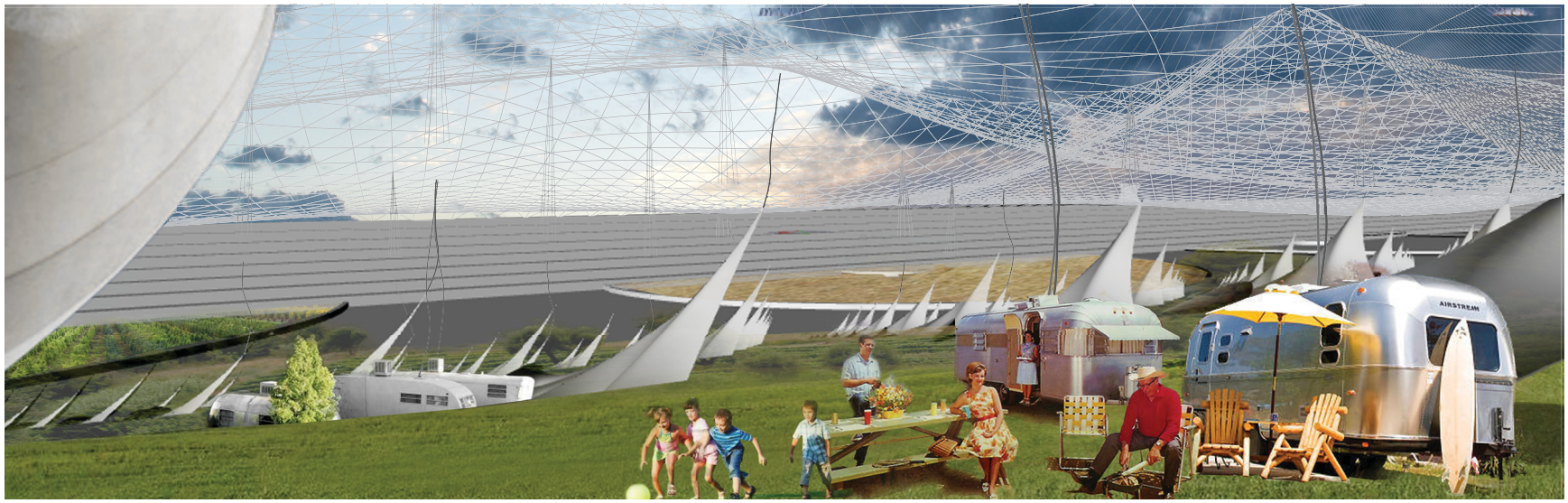
The idea of privatizing utopia is not a new idea by any means. We see this in most company town developments, however, the ownership of the entire development by the employer somewhat taints the value of it for the workers. This ‘overlord’-like presence of the employer through ownership and surveillance removes all sense of freedom and any chance of division between work and life.

In this design balance is achieved through equal presence of company owned infrastructure, and privately owned units. While the site and canopy would be privately owned by a single Oil Sand Developer in order to ensure clear ownership and guaranteed investment and upkeep, the city would be plugged into by individually owned housing and mobile modules. The trailers from nearby towns could be relocated to ensure the inhabitants have full control over their own domain.



Conceptual image of plug-in city, to represent the individually owned units, combined with private canopy infrastructure.

Conceptual image of canopies owned by individual Oil Sands Developers.



Conceptual image of private residences hooked up to the infrastructure provided by the developer owned canopy.

Industry

By extending the lifespan of the known oil sands deposits their value will be increased and the necessary extraction technologies will have more time to be developed. By the time the technologies are applied, they will have the potential to be more efficient and effective.

The addition of a bioremediation research industry in the area will allow the oil extraction to be prolonged by supporting the region's workforce and economy. The phases of the current industry could be reconfigured to focus equally on mining and remediation simultaneously.

In order for the region to sustain a remediation industry, the growing season will need to be almost year round. The city design proposes large scale canopies with the potential to shift the temperature up to 35˚C.

Energy Harvesting

The design proposes the hybridization of natural and man made systems to allow for energy harvesting as a new temporary industry to sustain the mobile population and industries. The system takes advantage of post-industrial and natural conditions. The various canopies used to harvest energy will take advantage of wind, sun, geothermal and water already available on site.

Solar Updraft Towers

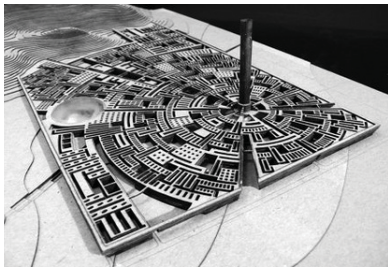
Solar updraft towers make use of two existing features on any site, sun and wind. These towers require a cleared area to host an artificial canopy. Using the greenhouse effect air is heated, then through stack ef-

fect air moves from the periphery of the canopy, to the central tower. As the air moves up to escape, its speed increases and rotates a turbine, collecting energy.

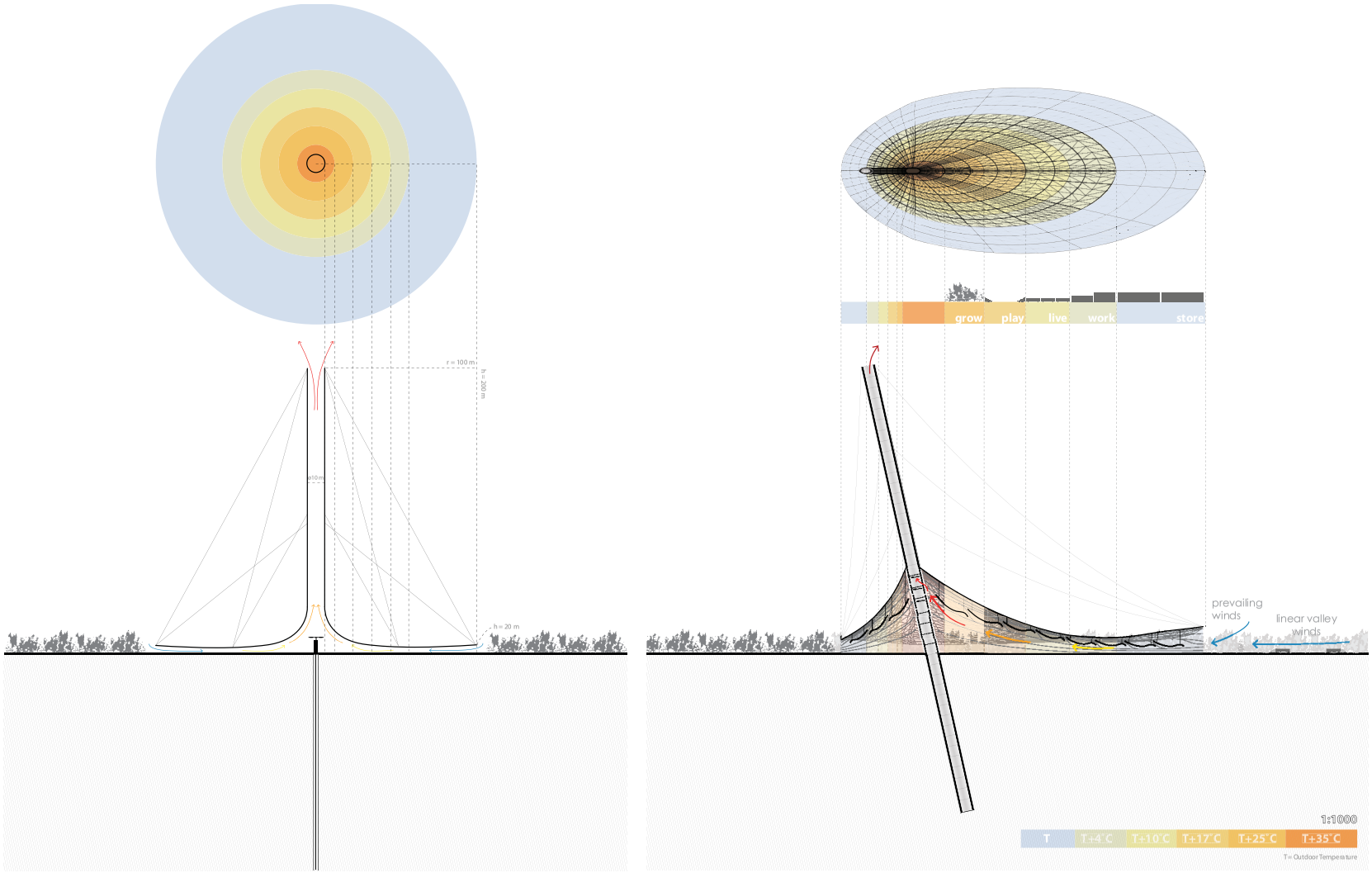
Jörg Schlaich's Solar Updraft Tower model and its prototype in Manzanares, Spain are mainly focused on solar collection to effect air speed, however, it has recently been proven that the thermal and wind effects of solar updraft towers are additive (Afonso and Oliveira 2000, 76-78). Adjusting the shape of the canopy in order to align with prevailing winds, and incoming roads would increase incoming wind speeds, and therefore, increase energy gains.

Schlaich's Solar Updraft Tower prototype in Manzanares, Spain (Meteorological Reactors 2013)

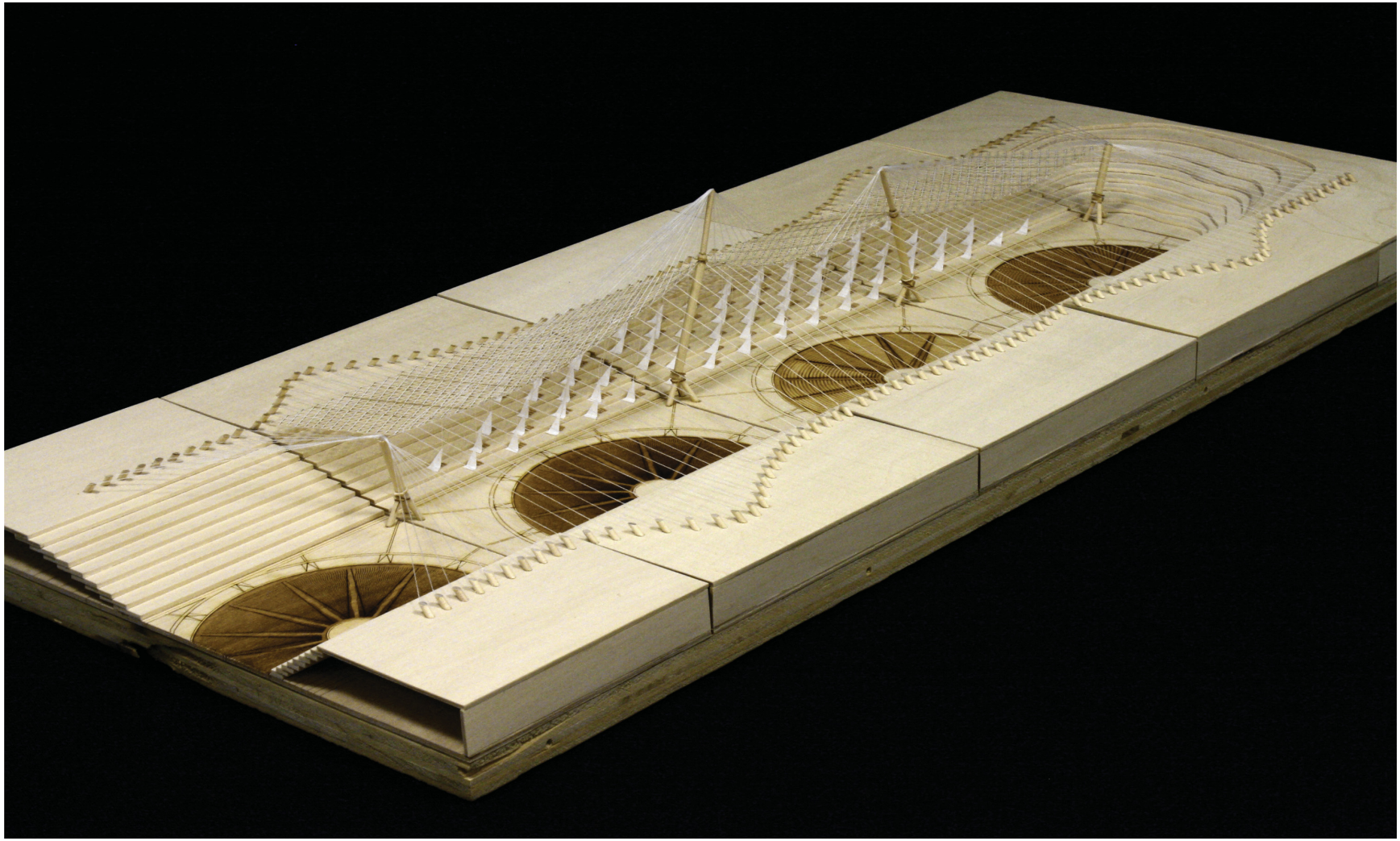
Observations of tree densities along river valleys, revealed that wind speeds increase along natural corridors. Artificial 'city valleys' created along linear roadways, are generally seen as city design flaws, but could be intentionally designed in order to amplify the natural site features. By strategically organizing the city below and designing the canopy peaks and crescents to amplify air movement, the energy gains can be further enhanced. These strategies are employed in 'Stack City', the theoretical city design by Behrang Behin.



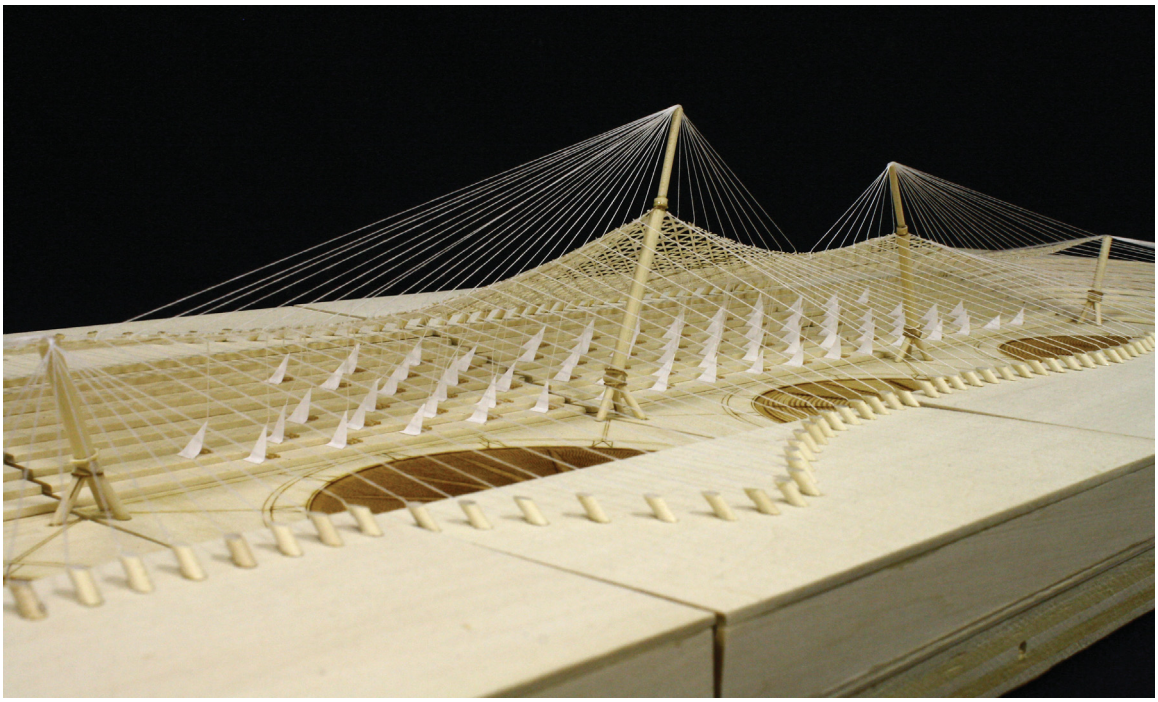
Stack City Conceptual Model, photograph by Behrang Behin (Behrang Behin 2008)



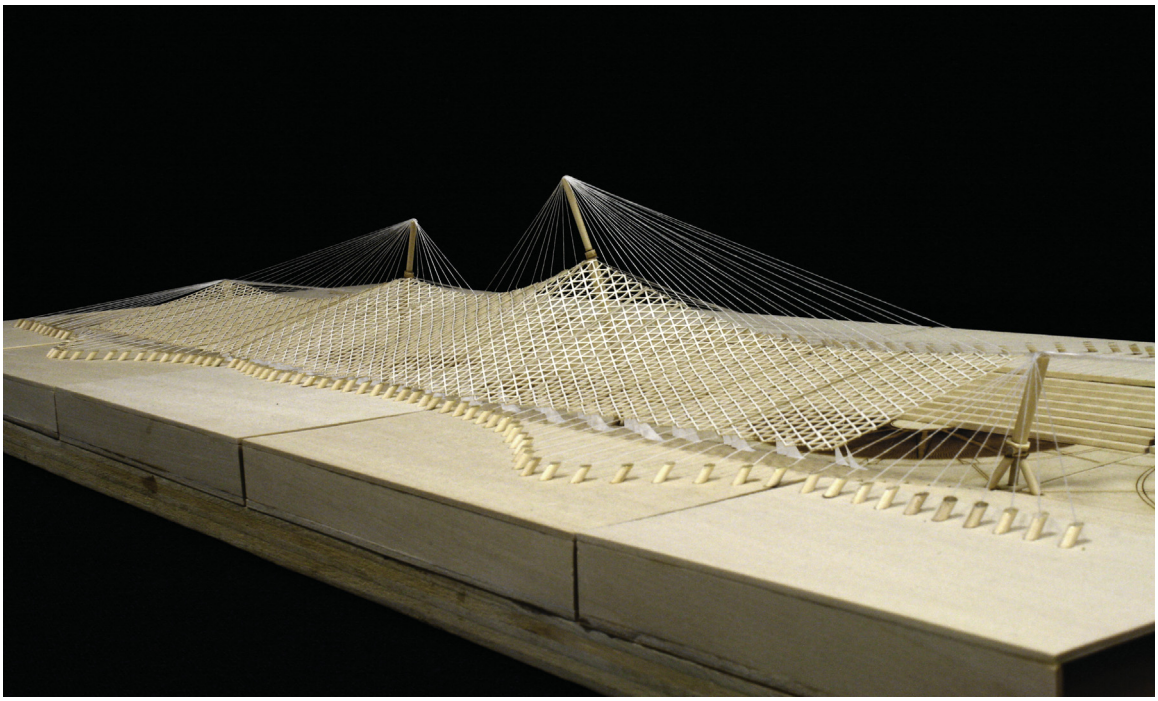
Schlaich's precedent (left) with envisioned Solar Updraft Tower redesign (right) to incorporate additive wind power, city layout and growing conditions.



Model at 1:5000 showing the modified canopy to open to both easterly and westerly winds, which are predominant in the area.



Model at 1:5000 showing the tie downs to resist wind uplift beneath the canopy. These tie downs are created through small wind shelter canopies that also become opportunities for infrastructure at water collection locations.



Model at 1:5000 showing the hexagonal and triangulated component breakdown of the canopy, supported above the suspension cable net structure.

Remediation

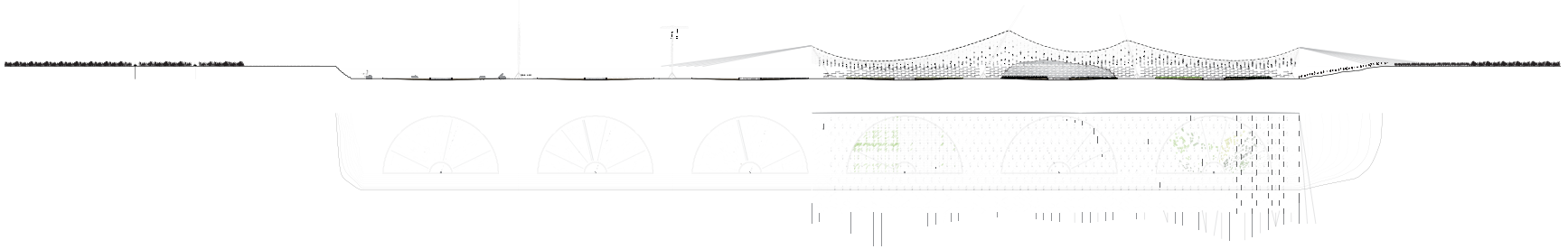
By law, the oil sands developers must return the land in a state determined to be equal to the original state of the land prior to beginning development. This will require an incredible amount of remediation, and will therefore become the next major industry for the region.

Tailings and Bioremediation

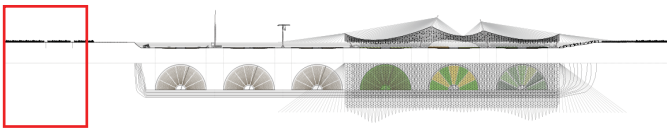
After land farming processes are used to dry and rotate tailings, they will undergo three sequential stages of bioremediation under the city's canopy. Each stage will use a type of bioremediation to restore tailings and adjacent sites to their natural productive states. These stages will correspond to their locations beneath the canopy and the resulting climatic conditions. .

Mycoremediation will occur at the first stage using oyster fungi to breakdown bitumen content and act as a biostabilizer (Thomas 1998). Rhizoremediation and phytoremediation will occur at the second stage using alfalfa (or legumes) alternated with corn, beans and squash to restore soil nitrogen levels to ensure productive soils (Kathi and Khan 2011). The last phase of plantings will be a tree nursery, that can be used for forest regrowth in adjacent sites. Jack Pine is recommended as it is a native species that also has proven remediation capabilities (McCutcheon and Schnoor 2003).

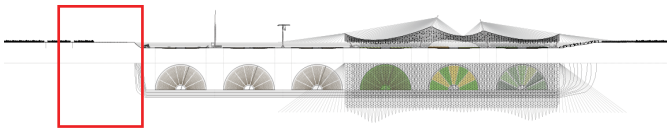
All plantings listed are recommendations, and should be considered as first steps, the concept is that these sites be used for research, and have therefore been designed to support multiple species simultaneously to allow for improvements and experimentation within the system.



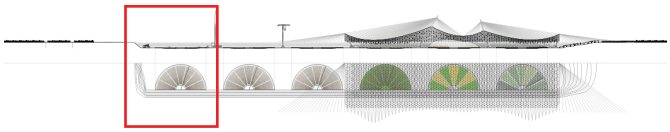
Section showing the processes of the moving city. The sequence moves from forest, to seismic exploration, to mining and tailings drainage with structural mast construction, to full canopy coverage, with mycoremediation, rhizoremediation and tree nursery, all hosted under the microclimate of the canopy. Finally, land forming restores the natural contours of the land, saplings grown in the nursery are planted and full forest regrowth recovers the original condition of the site.

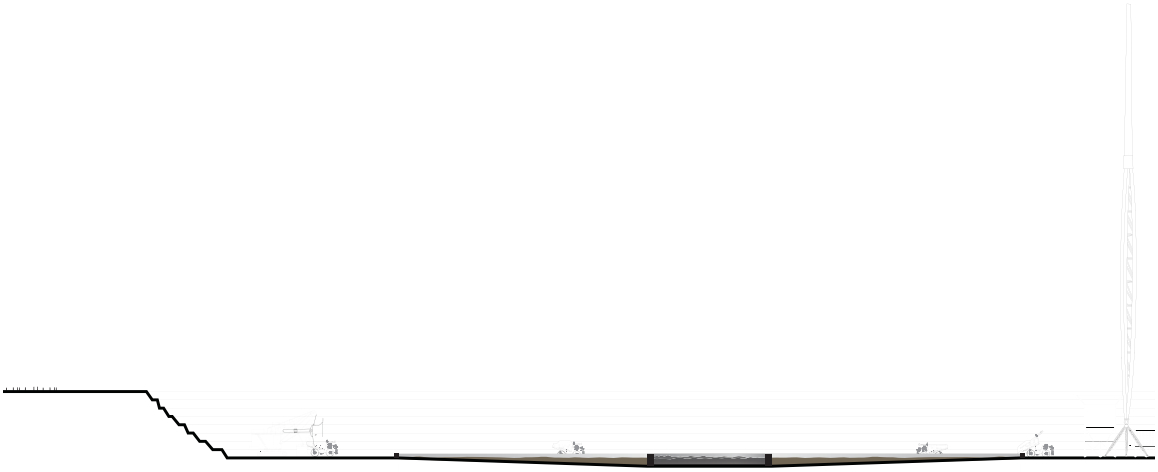


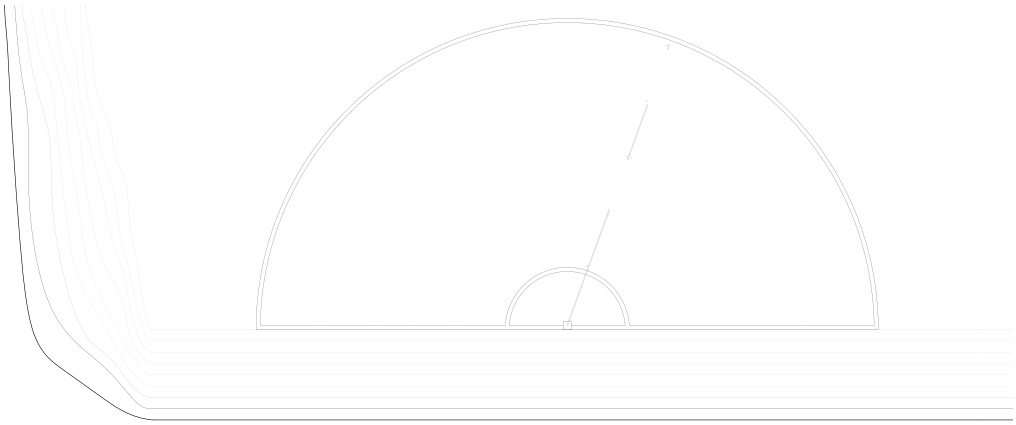
Detail of process section, including forest and seismic exploration.



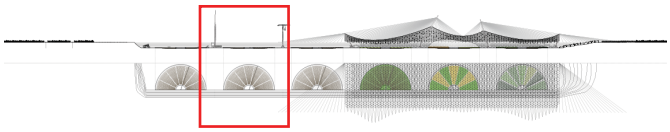
Detail of process section, including seismic exploration, clear cuts and excavation.

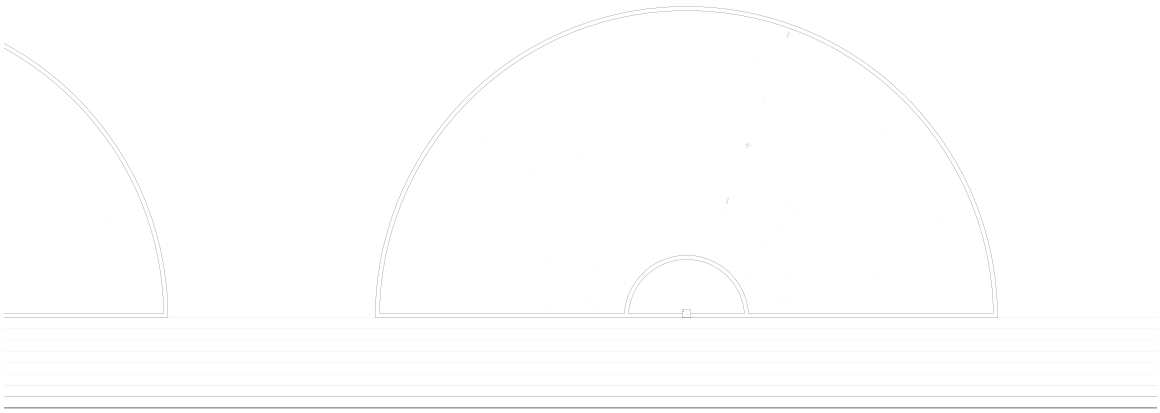




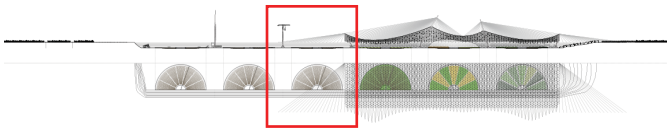


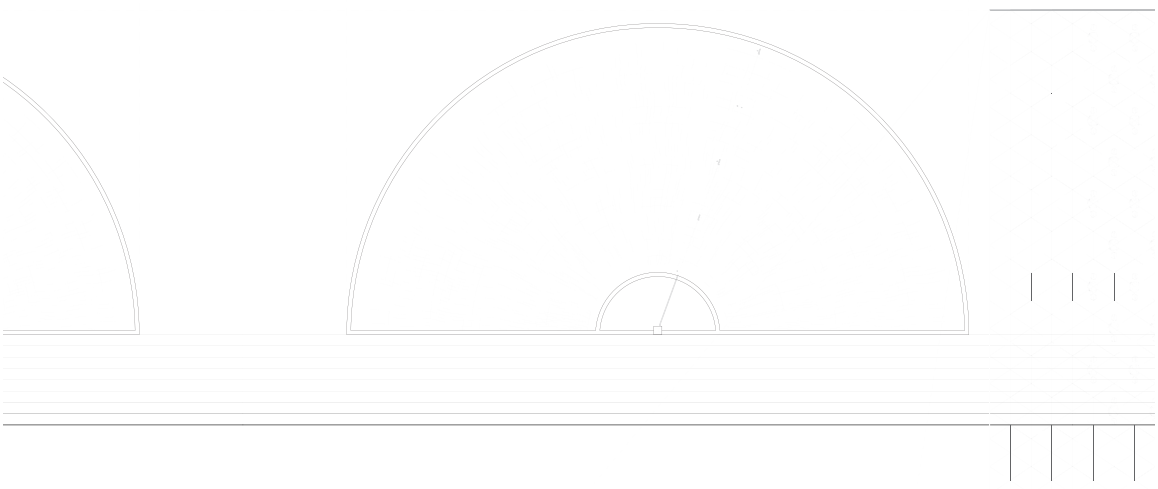
Detail of process section, including excavation, mining, tailings drainage and mast construction.



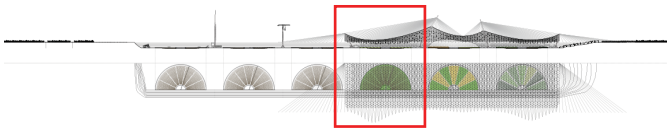


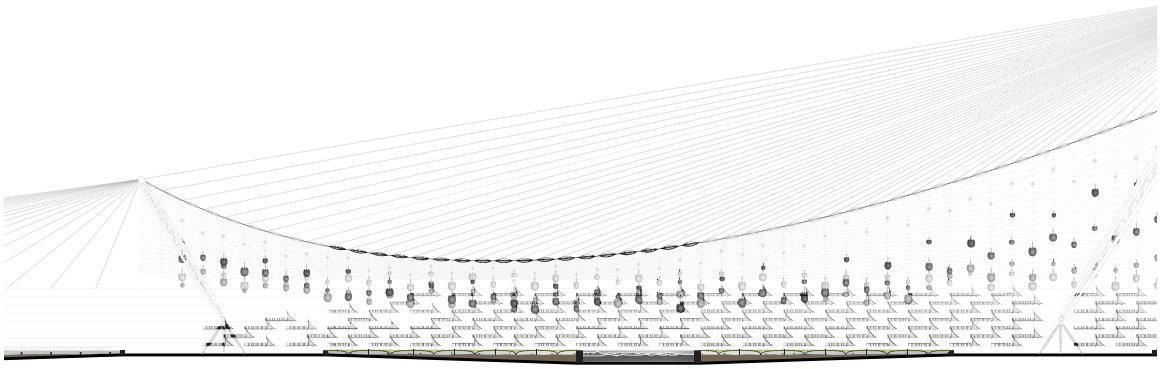
Detail of process section, including mining, tailings drainage and mast construction.

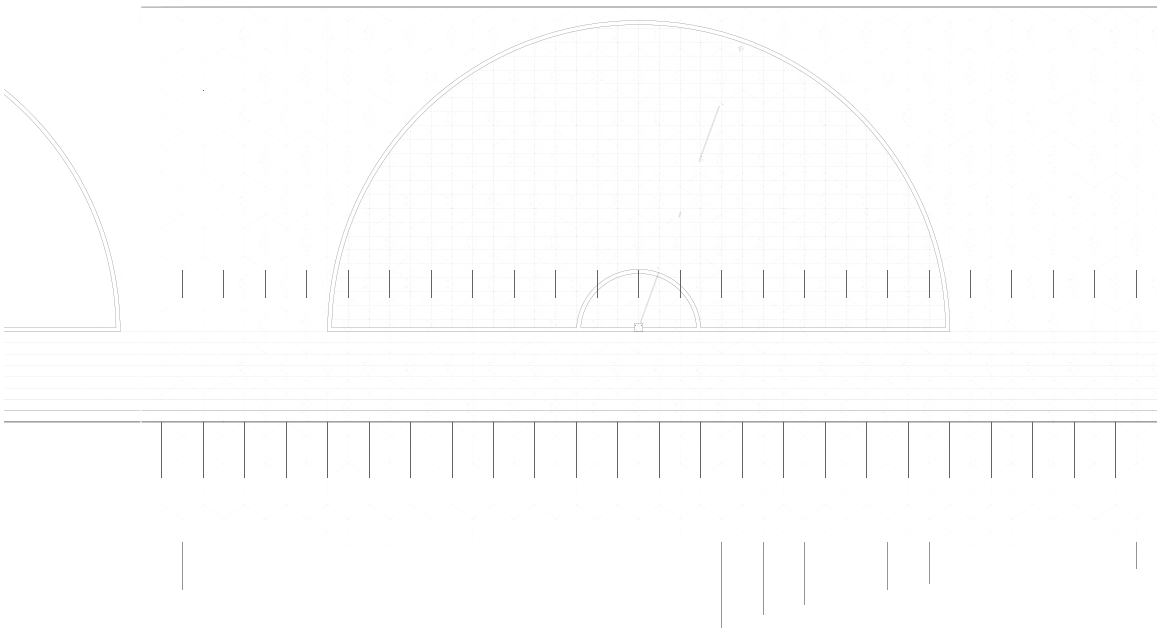




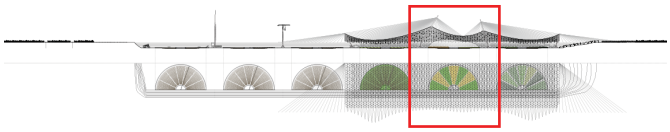
Detail of process section, including mining, tailings drainage, mast construction and canopy coverage.

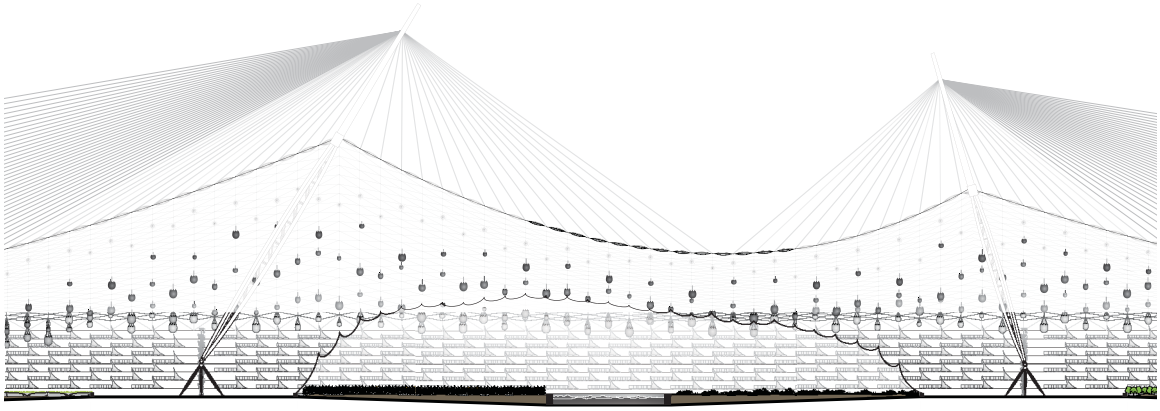


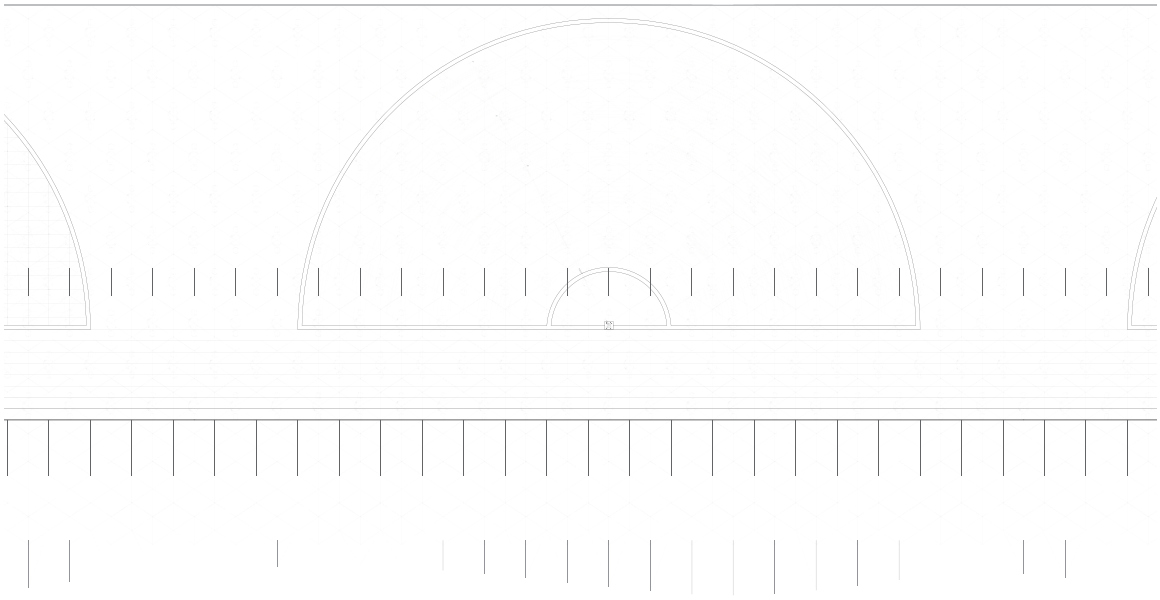




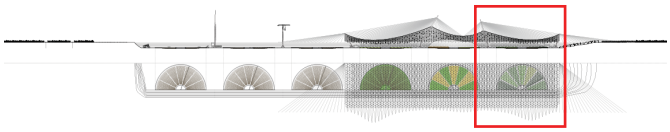
Detail of process section, including tailings mycoremediation using fungi and canopy coverage.

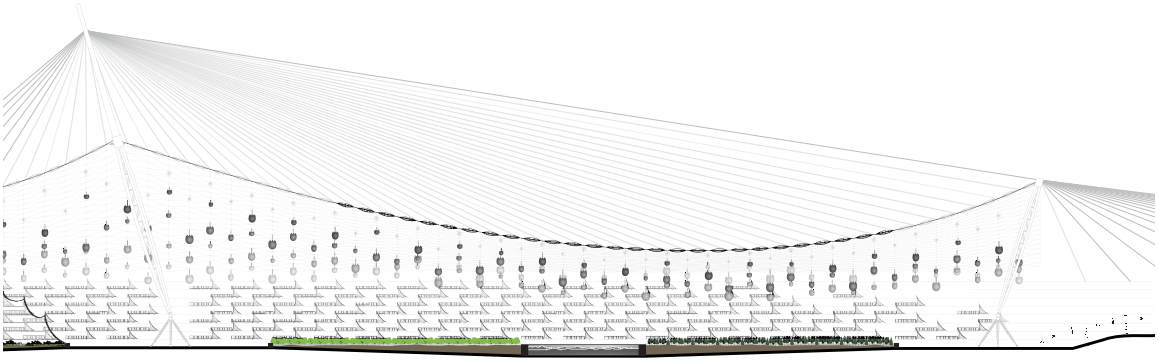


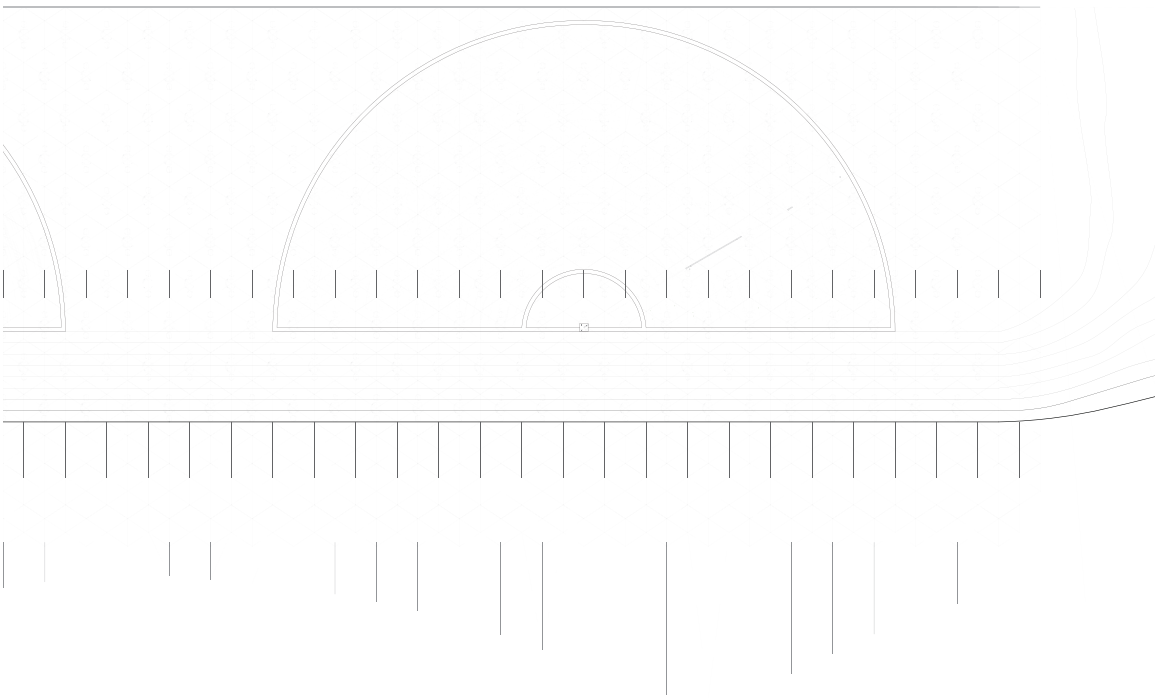




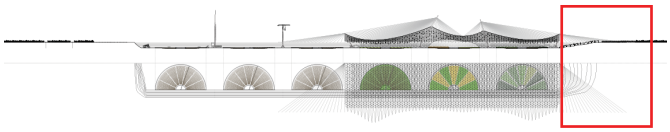
Detail of process section, including tailings rhizoremediation and phytoremediation through nitrogen restoration crops and canopy coverage.

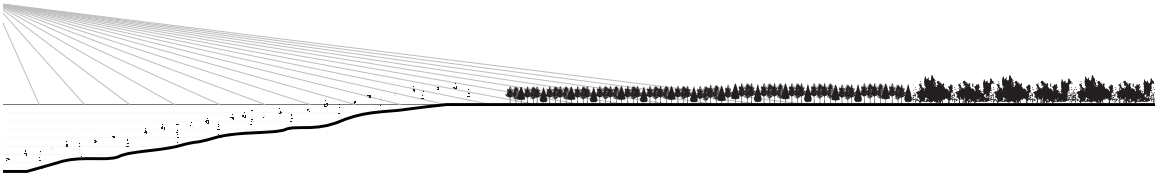


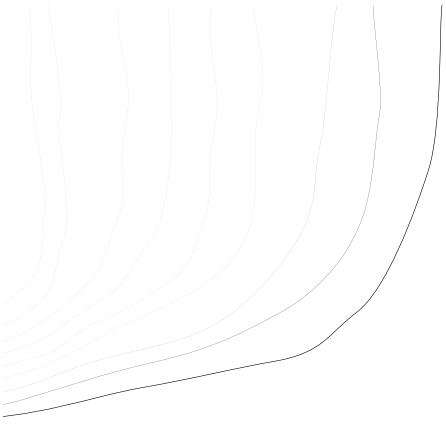




Detail of process section, including tree nursery and canopy coverage.







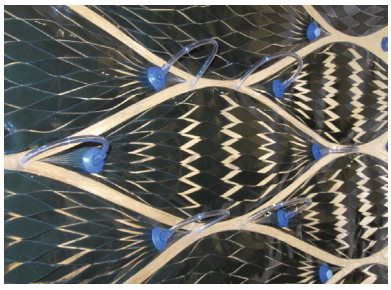
Detail of process section, including land forming, sapling plantings and forest regrowth.

Technology

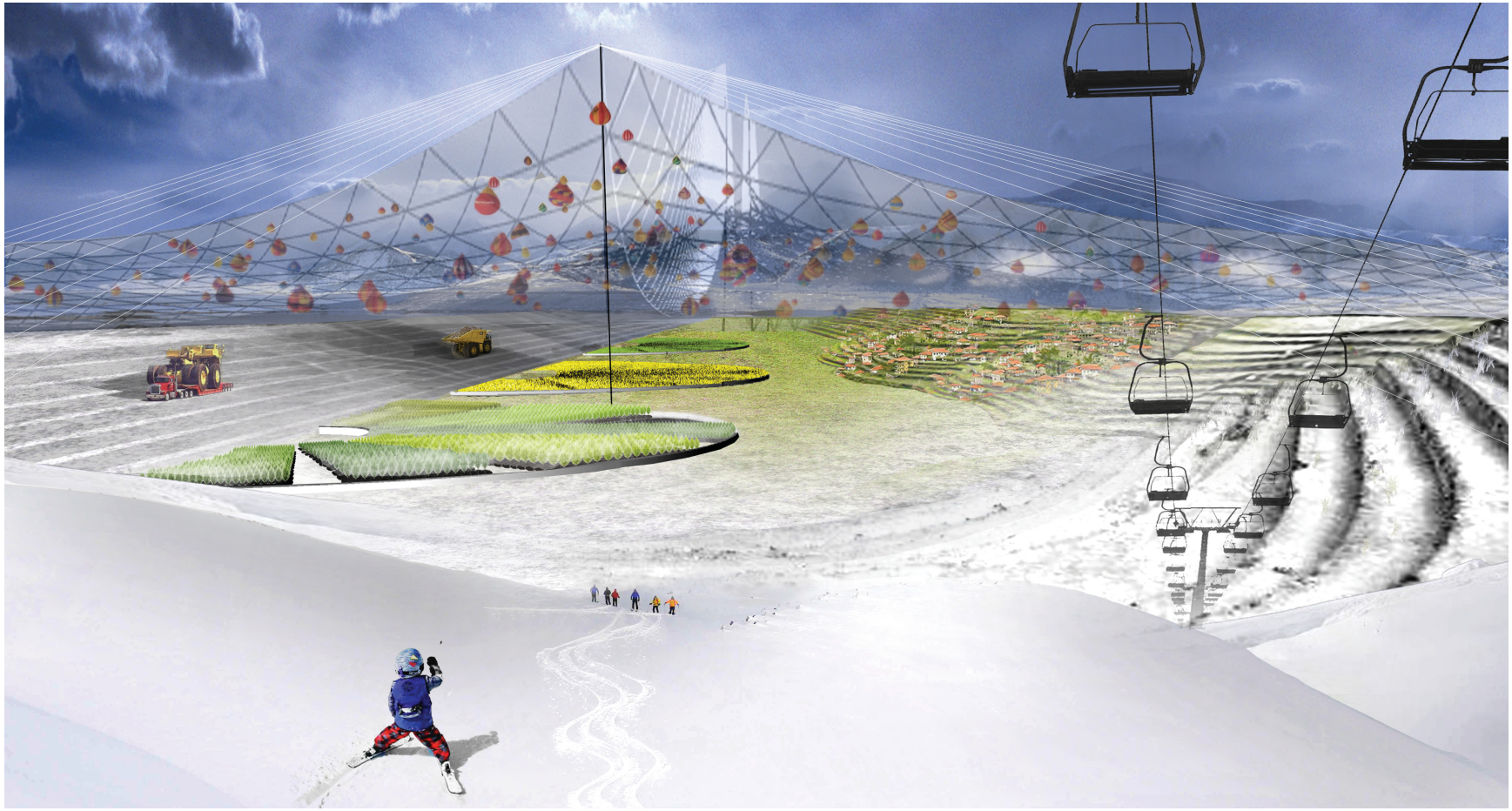
Seasonal Dynamics

The cladding of the canopy will need to address the temperature variance between winter and summer, and the intensification of the peak temperatures, in order to stabilize the intense heat gain during the summer. The solar updraft tower will allow the increase of outdoor temperatures by up to 35˚C (Schlaich and Schiel 2001, 2), which will keep winter temperatures from going below -5˚C rather than -40˚C. However, during the summer, the canopy will allow the potential to raise the temperature to up to 65˚C at the center most point.

Pneumatic insulation will allow a dynamic system that can respond to the seasonal temperatures. Thinner insulation throughout the summer will allow the city below the canopy to remain liveable. This system woulc be modeled after the experimental envelope design developed by Rick Sole at the University of Toronto which also allows a system of variable transparency on top of air pocket thickness. The breakdown of the canopy skin into components will allow crucial locations to be replaced with responsive components. Where necessary, bi-metal components (sheets of two laminated metals, with different expansion rates, that curl up when heated) could be inserted in order to allow the canopy to open increase ventilation when temperatures are too hot.



Rick Sole, Pneumatic Envelope, 2010 (RAD 2013)



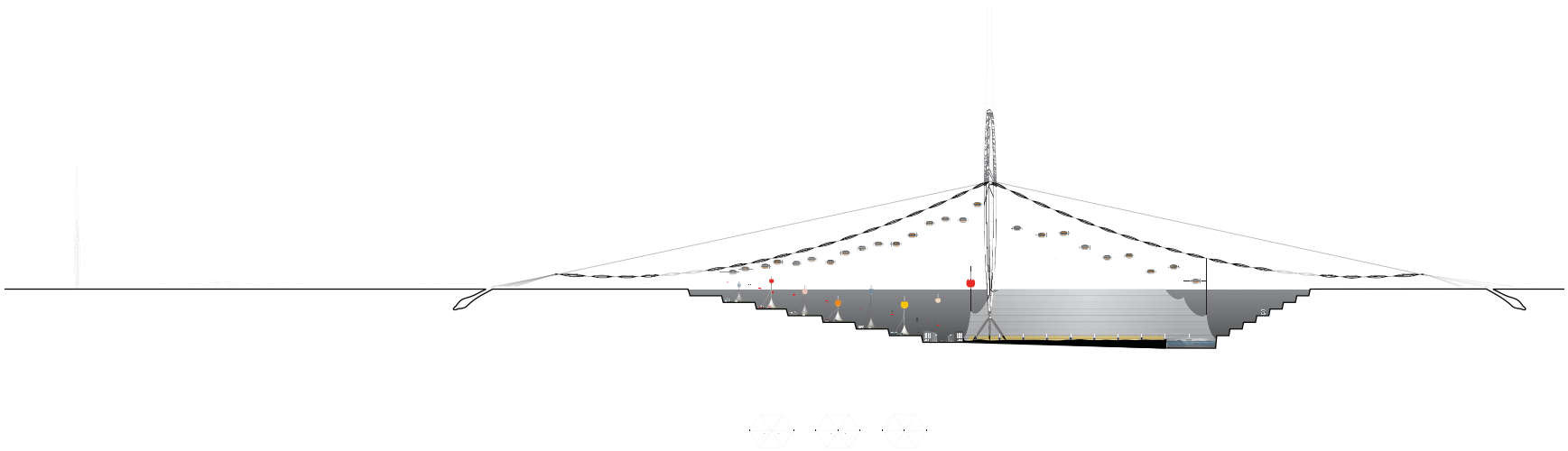
Conceptual image showing season duality. Winter conditions exist exterior to the microclimate induced spring conditions under the canopy.

Modularity

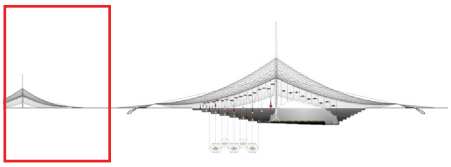
The housing trend in the region is based on mobility. In terms of initial building, and eventual removal, it seems the entire city is predetermined as an ephemeral city, ready to pick up and move at anytime. The city is designed to be broken down into modules appropriate to the scale of small groups of trailers in the residential sectors.

The mobility of the project is realized through its breakdown into components/modules. The module sizes are constrained by road widths and turning radii. This along with footings rather than deep foundations are the reality of mobile living.

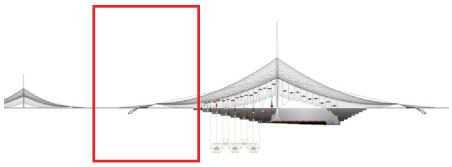
The final critical components are the infrastructure nodes that act as weights to prevent wind uplift of the overall canopy. Hung water collectors and rotary wind generators will provide essential infrastructure for groups of 4 to 8 trailers, a size small enough to encourage interaction between neighbours, while not overwhelming the inhabitants. The adaptors hang down ready to be plugged in to people's existing RVs, trailers and mobile homes. The concept is that people bring their own comforts of home, or quite literally their homes, rather than living in a unit provided by, and surveyed by their employer.

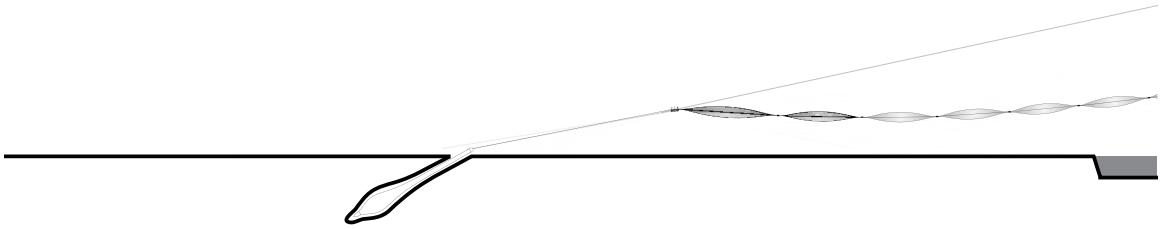


Section through canopy displaying the modular infrastructural components to supply water and electricity to privately owned units below.

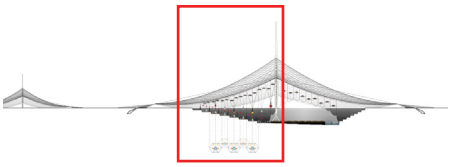


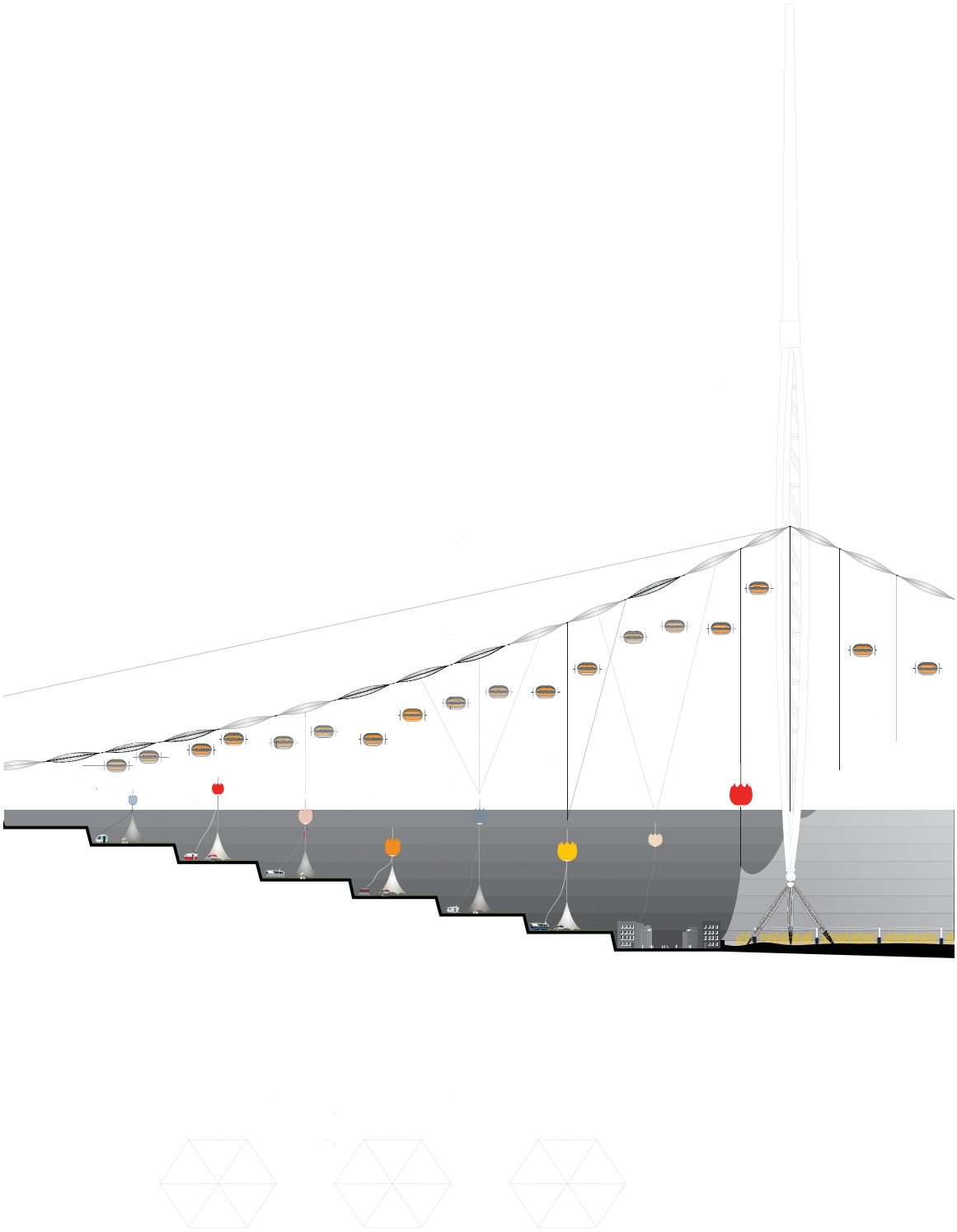
Detail of section through canopy showing adjacent project in background.



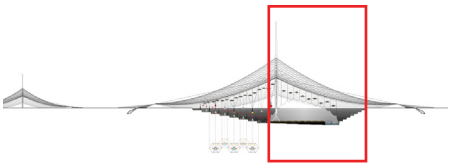


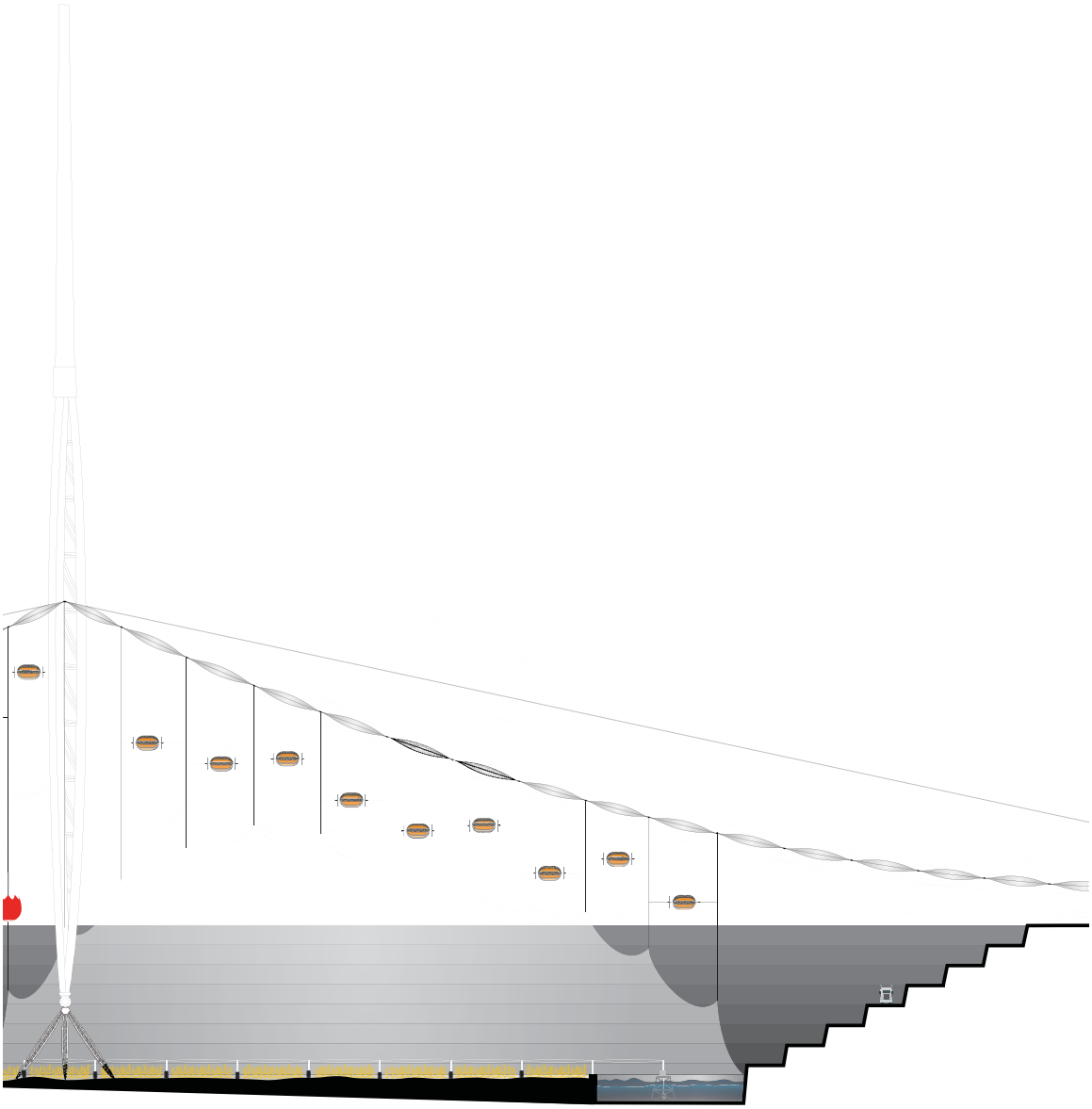
Detail of section through canopy showing ground anchors.



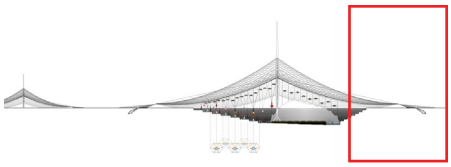


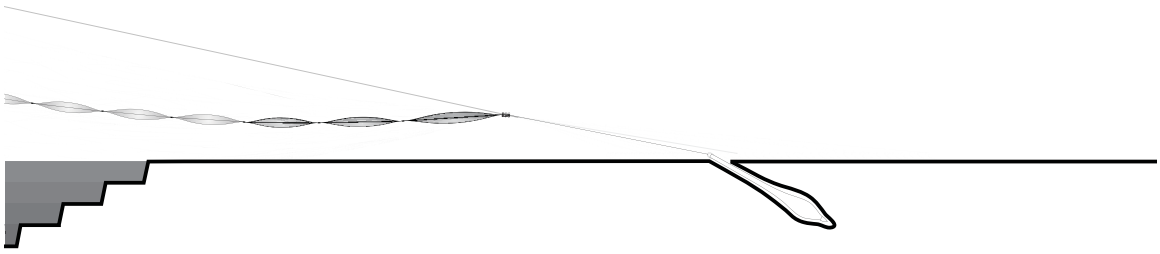
Detail of section through canopy showing modular infrastructure components and units below.



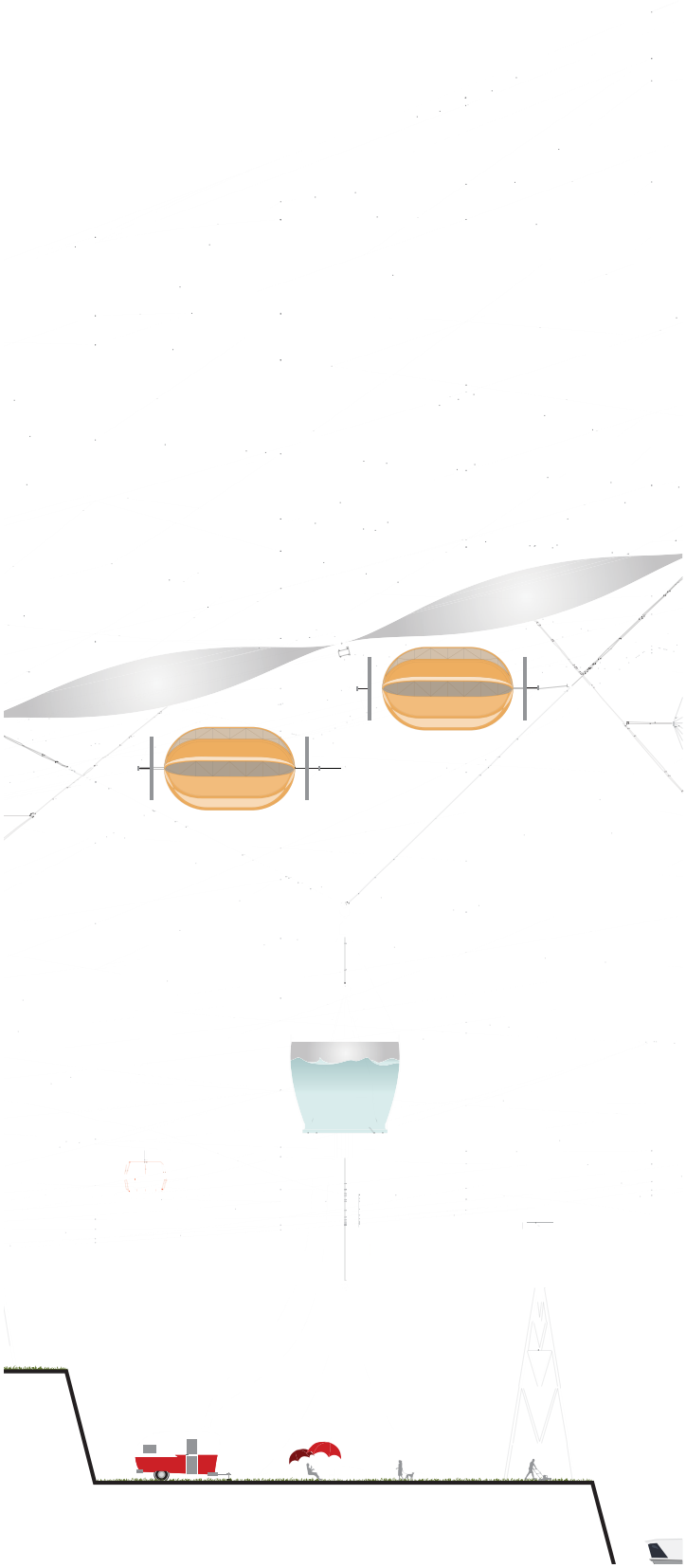


Detail of section through canopy showing greenhouse canopy and circular irrigation system.





Detail of section through canopy showing ground anchors.



Detail of section through canopy showing infrastructure component.

CHAPTER 4: CONCLUSION

The mobile city explores a potential shift to a new type of nomadic city lifestyle. The topic of mobility as addressed by most theoretical city projects presents an ideal of total freedom with all the comforts of home. Freedom of movement suggests possible infinite industry, as the city can migrate from one resource to the next. What is usually overlooked is the actual restrictions of that movement based on its needs for industry while it moves, and infrastructure that is independent of predetermined layouts.

Nomadic cultures are restricted by territorial understanding of climate and food and water sources. While fantastical proposals like Archigram's Walking City must allude to predefined infrastructure layouts. Archigram envisioned structures that would plug into utilities and information networks worldwide that would allow a lifestyle where we would not be tied to a certain location. The only difficulty with this type of system would be that future sites would need to be predetermined in order to layout the network initially, and this reliance on these networks would actually restrict the intended freedom of this project. This thesis proposal addresses these concerns through its reliance on natural resources like sun and wind, that exist everywhere.

The key to the design execution was that ultimately there had to be no city design. Instead of super-imposing a culture and a predetermined way of life, the focus became the necessary precursors to allow a city to grow. This thesis determines infrastructure for privately owned

units, and an industry that workers can be prideful of, to be critical to the population's willingness to identify with the city as home. The city and the population's willingness to identify with it are mainly related to their attachment to the people, the place, or the industry. Since the design assumes a nomadic culture, this attachment can not be directly to a place, so instead the thesis focuses on industry. Shifting the industry from destructive to restorative, would also shift the reputation of the city as culture and pride could grow through the act of cultivating the land and restoring life to the scarred lands.

Further to this, a balance is struck allowing people to own their own private residence within which they can escape the ties of their employer, making it possible to build a home, even within a mobile unit. Within this context, the population is far more likely to invite loved ones to come and stay, and to possibly become a part of this stable yet dynamic society.

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