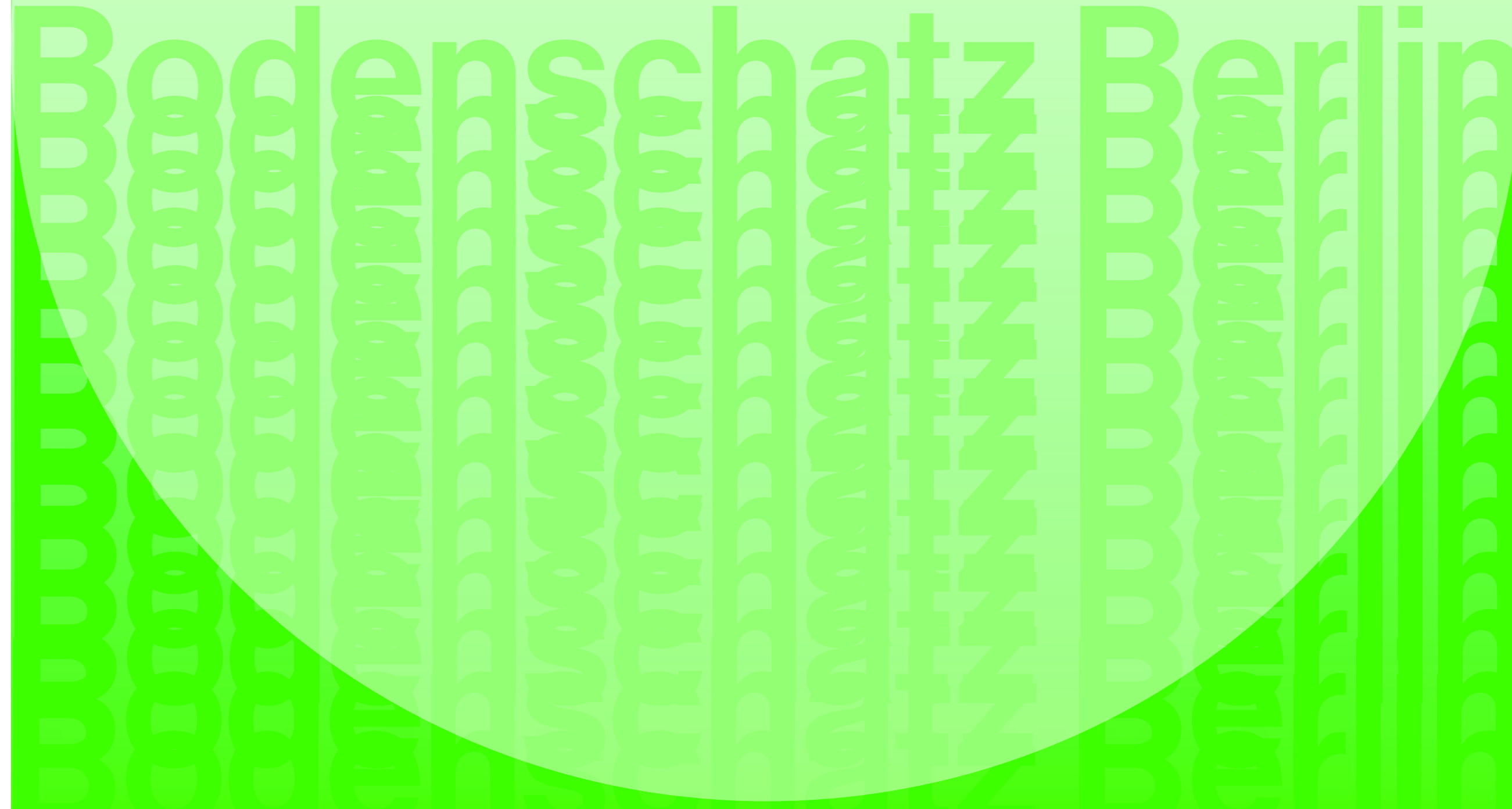


# Bodenschatz Berlin

Preparing the Ground with Design Science Fiction

Fynn N Mengel



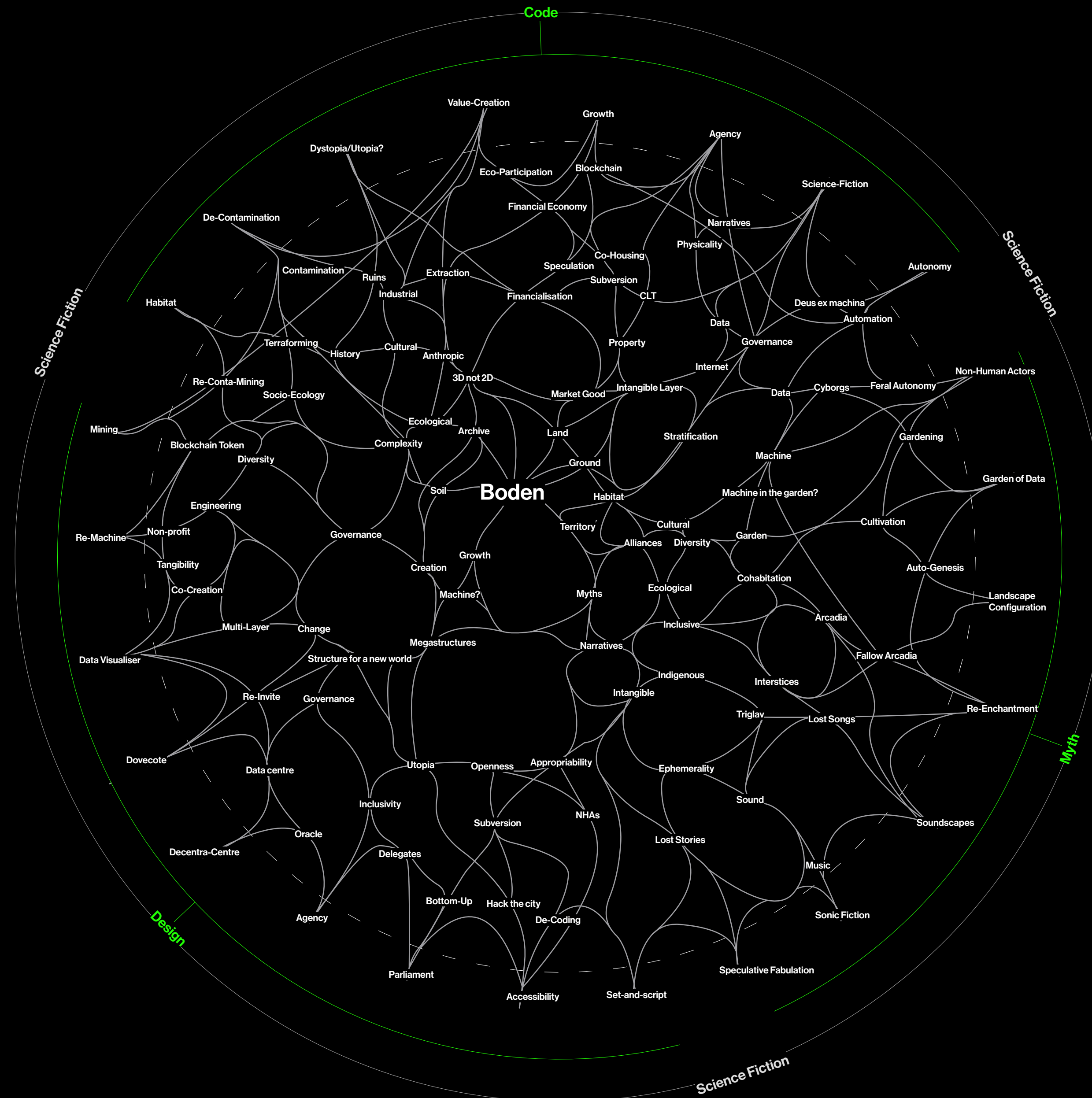
# Index

<b>REFLECTION</b>	<b>03</b>
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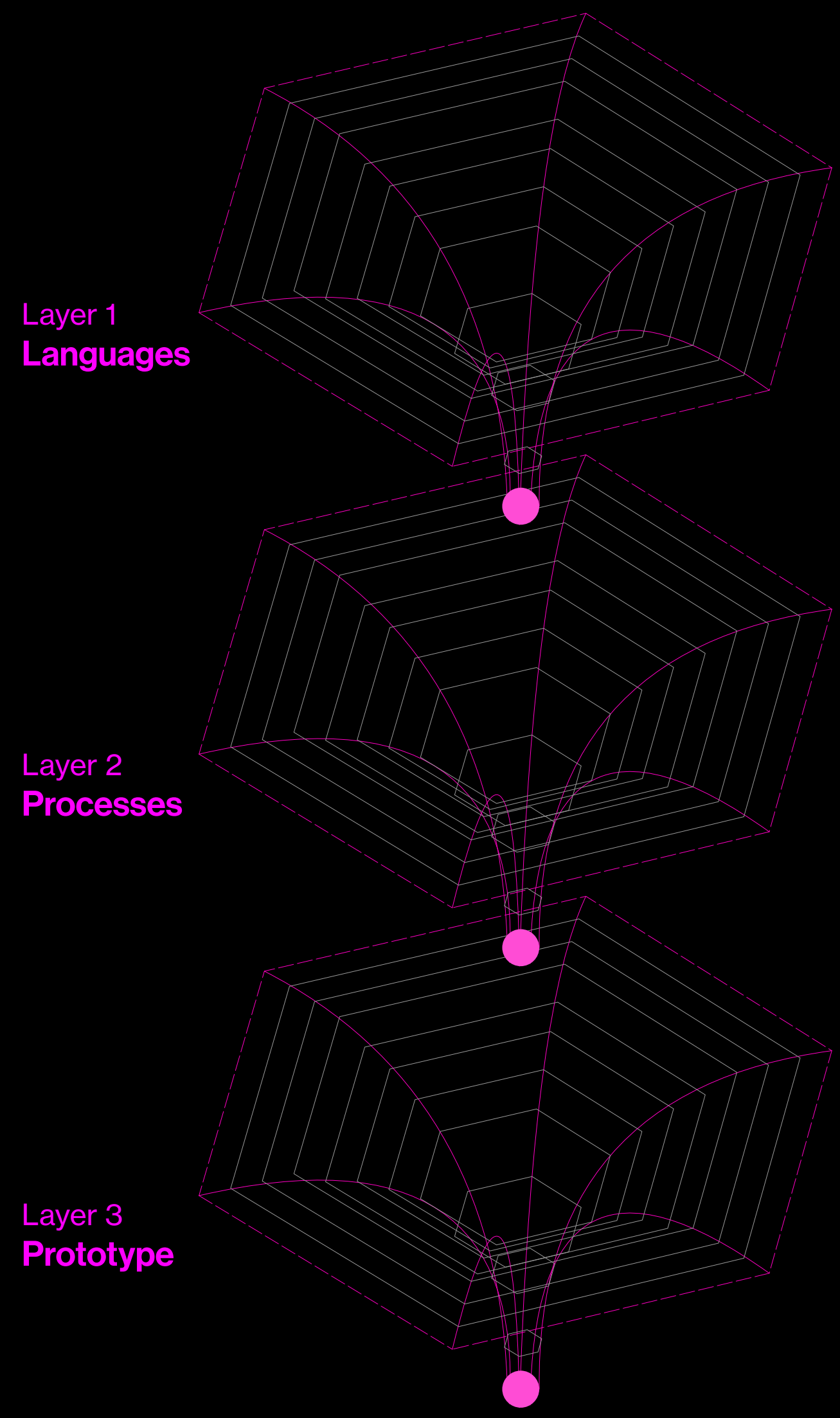


# REFLECTION

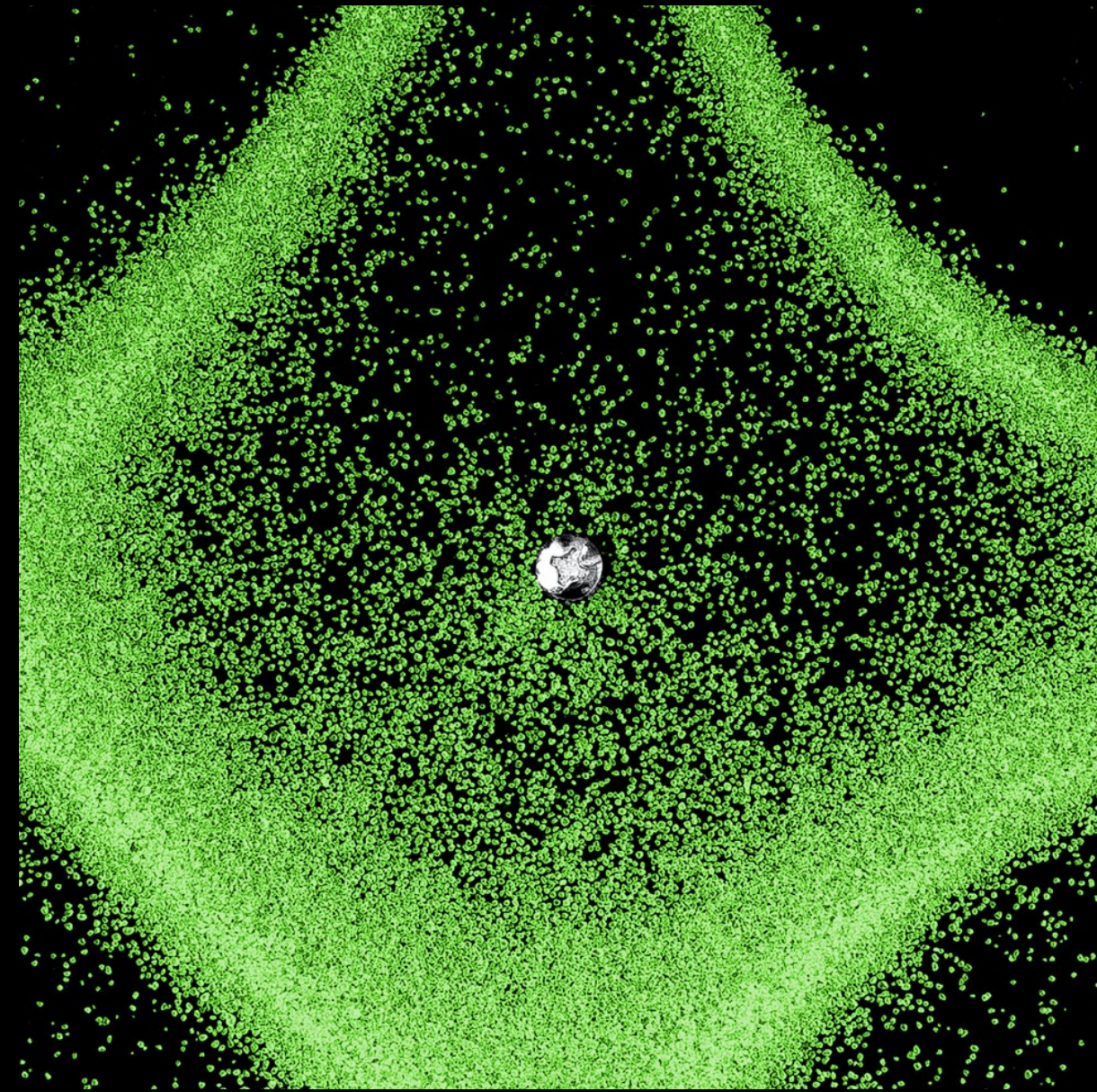












Samples

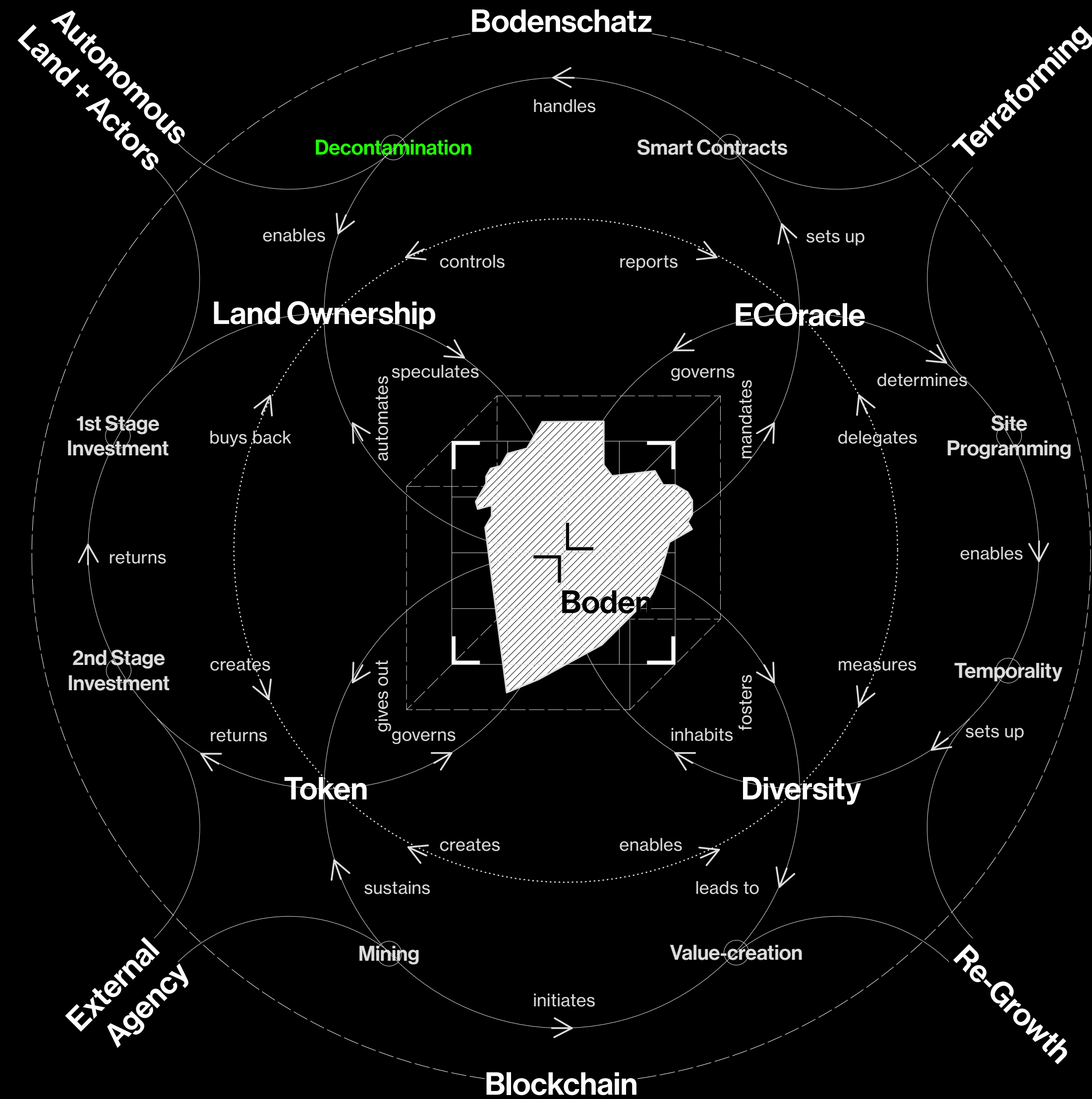


Stories



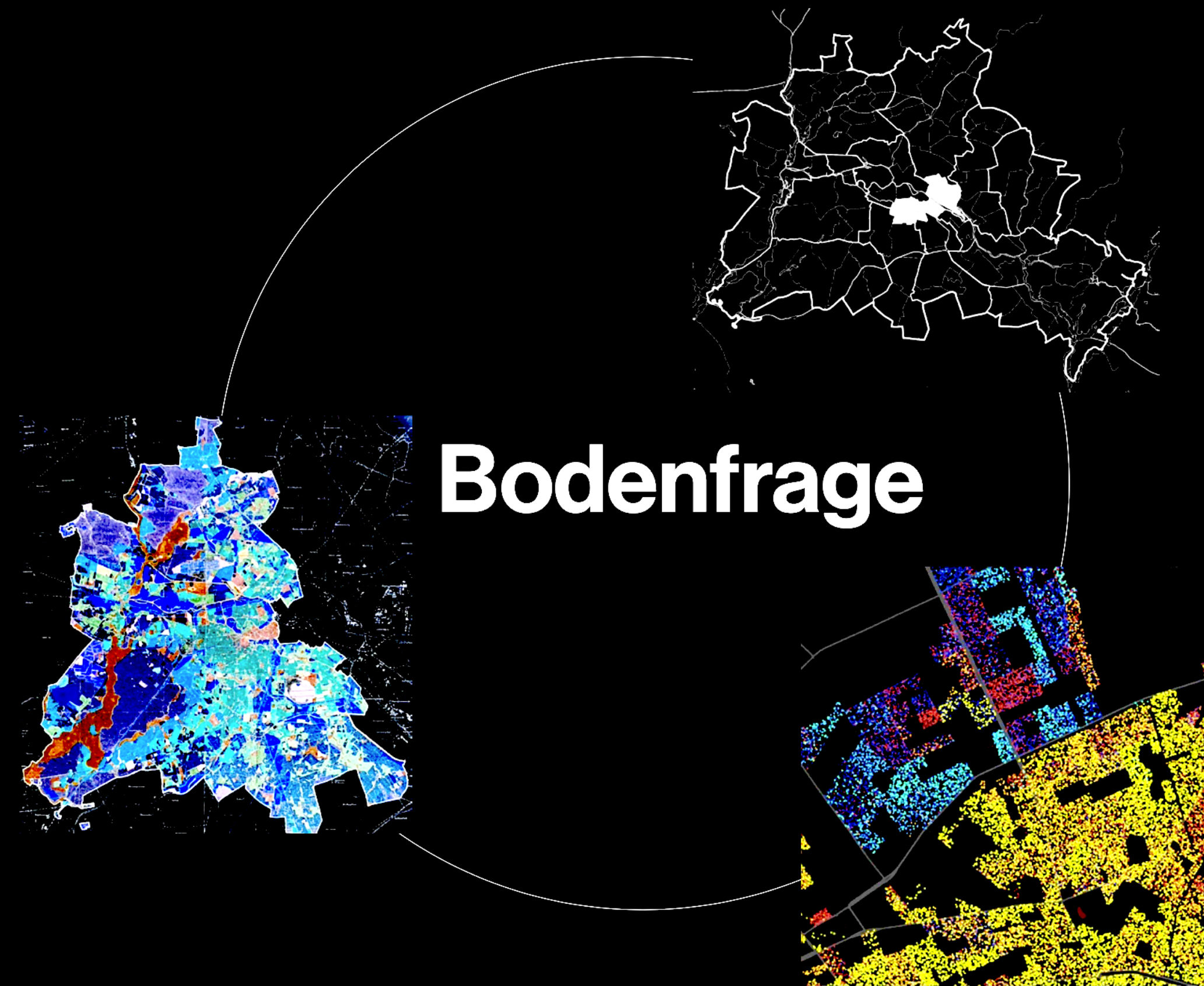
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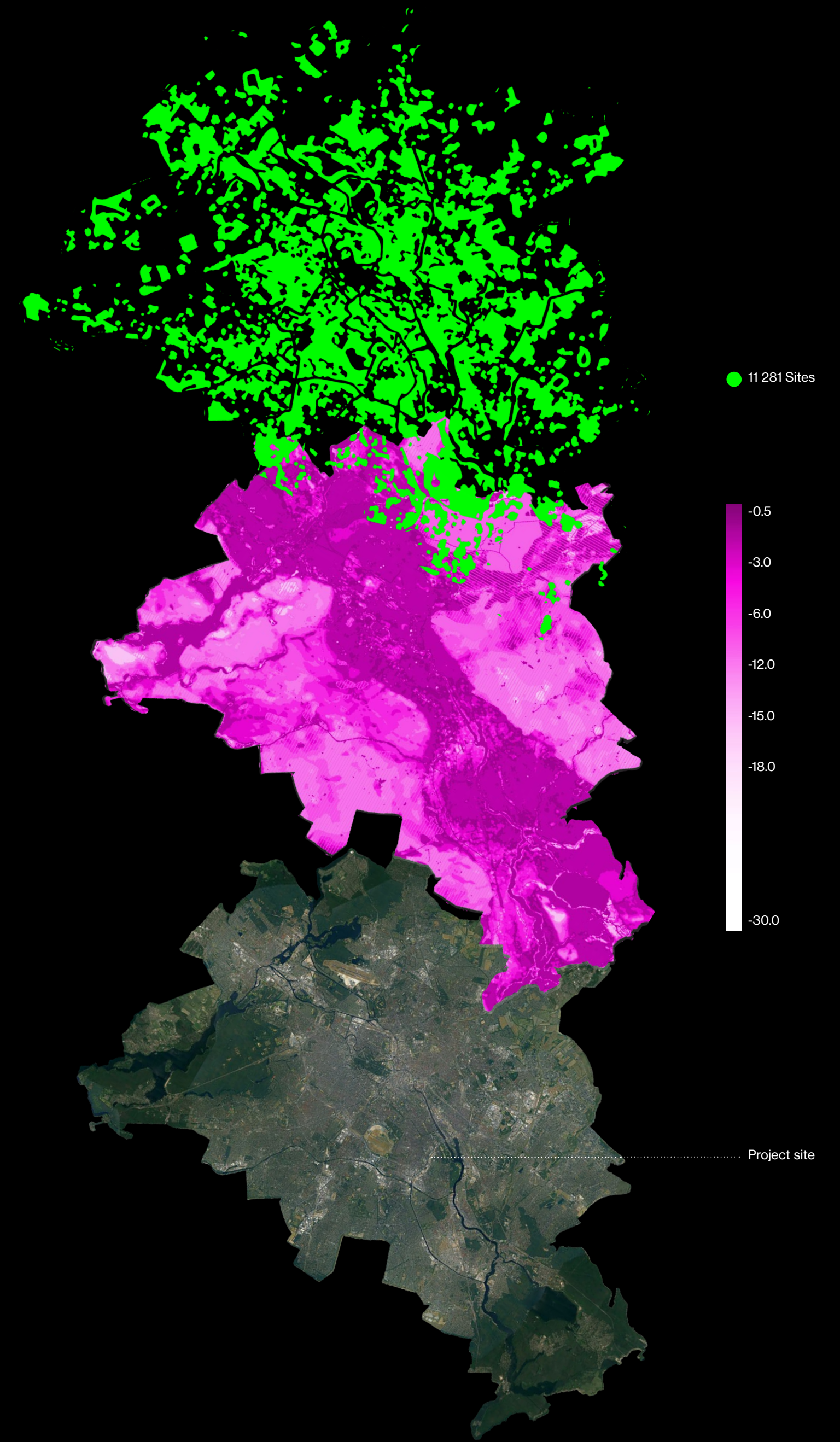


# PROBLEMATISATION

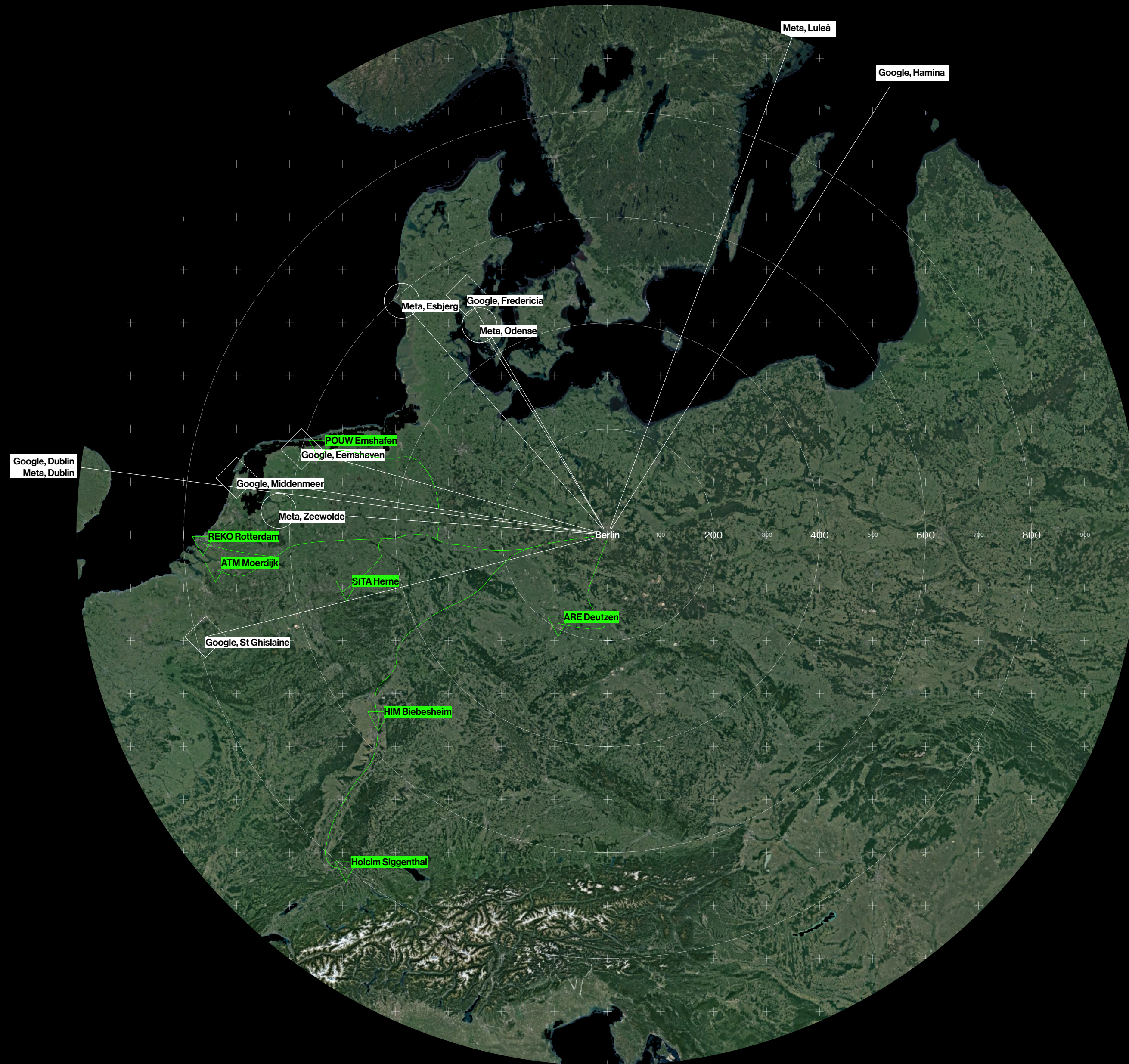








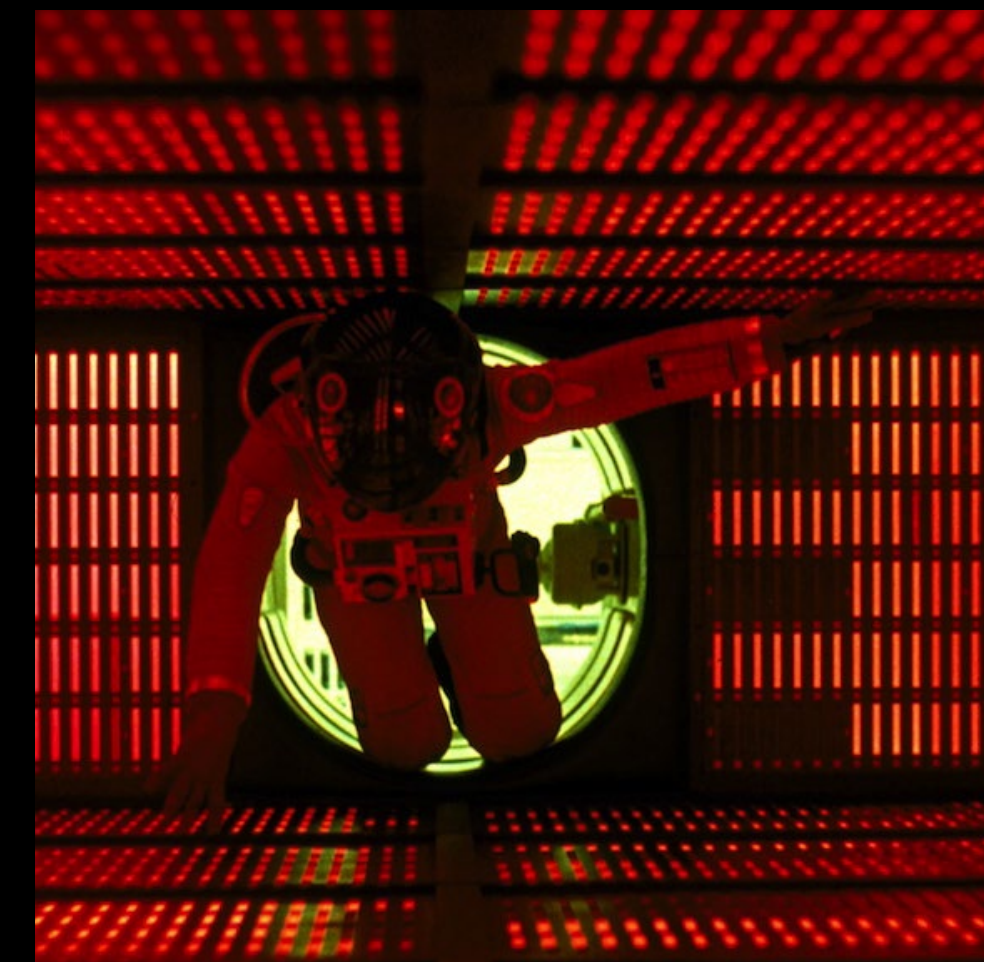
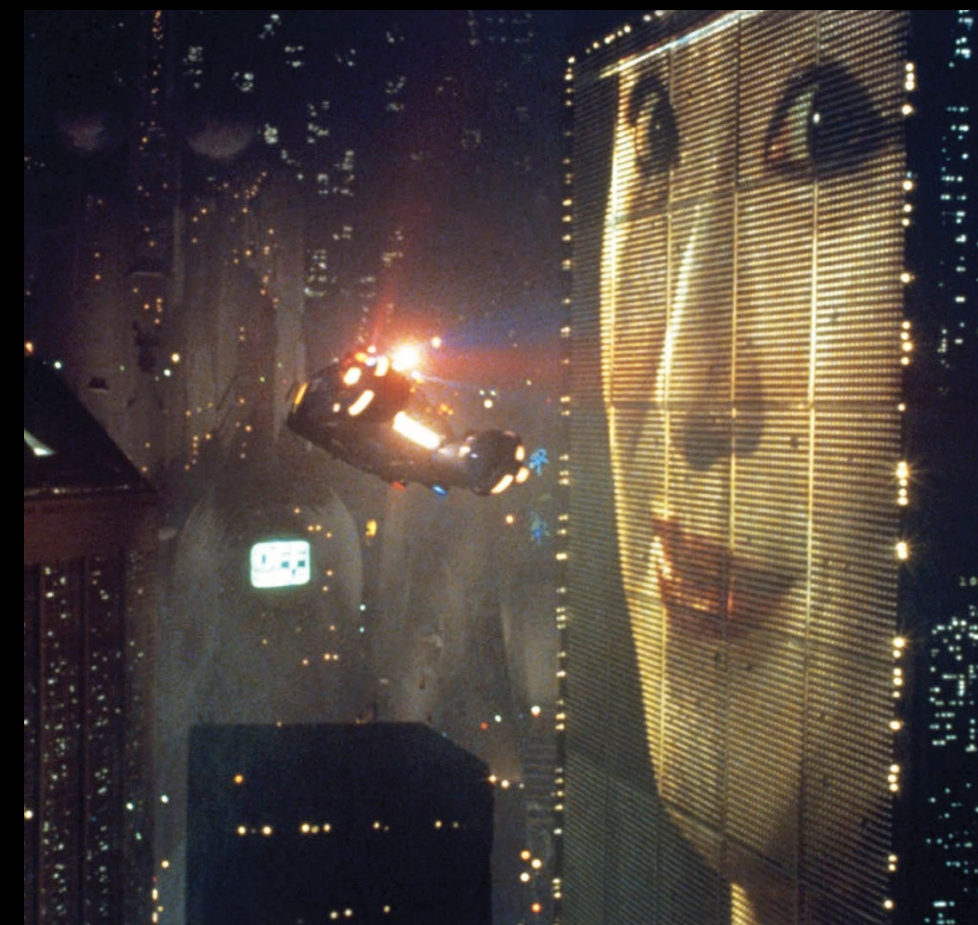
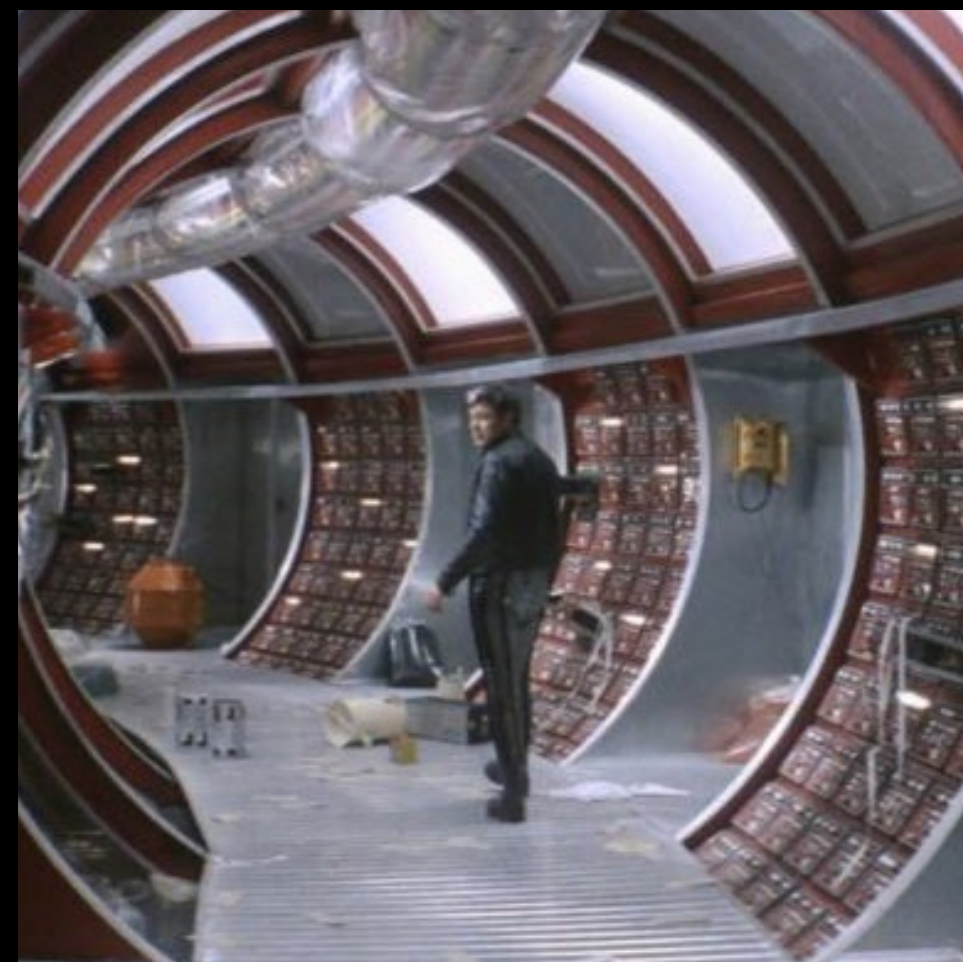




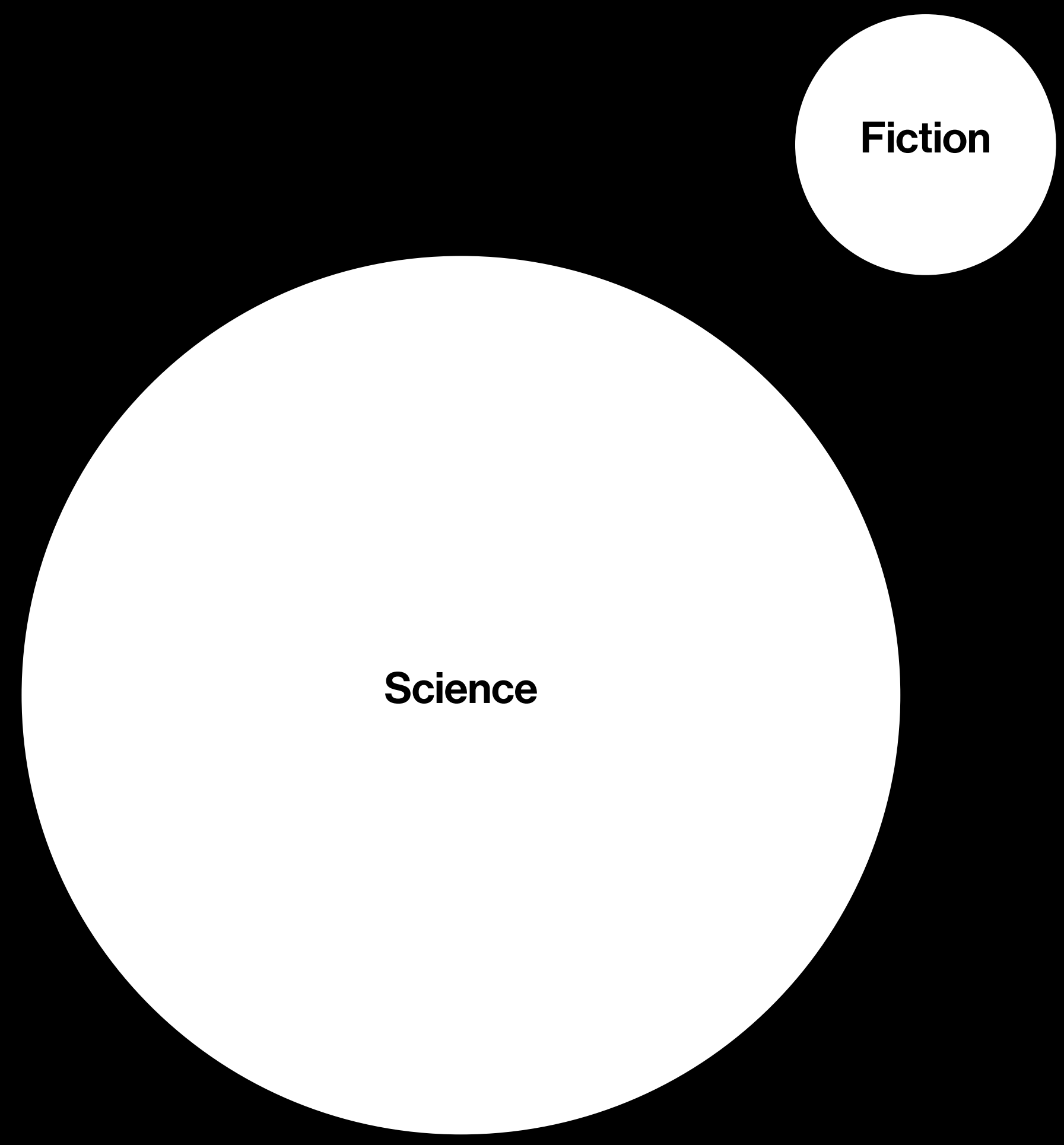


**How can architecture become a synergetic prototype of mitigating urban urgencies by *mining* space? To what extent can former ex-situ processes like soil remediation and data handling be reimaged as a symbiotic urban typology?**

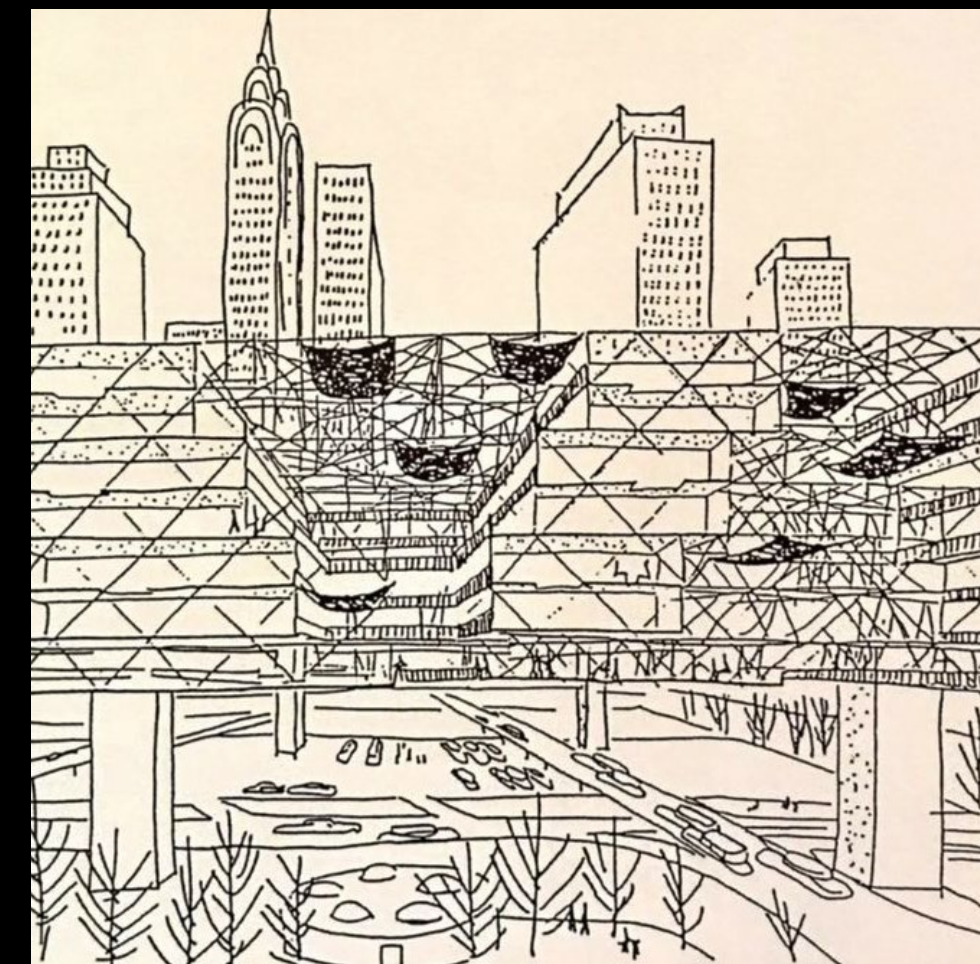
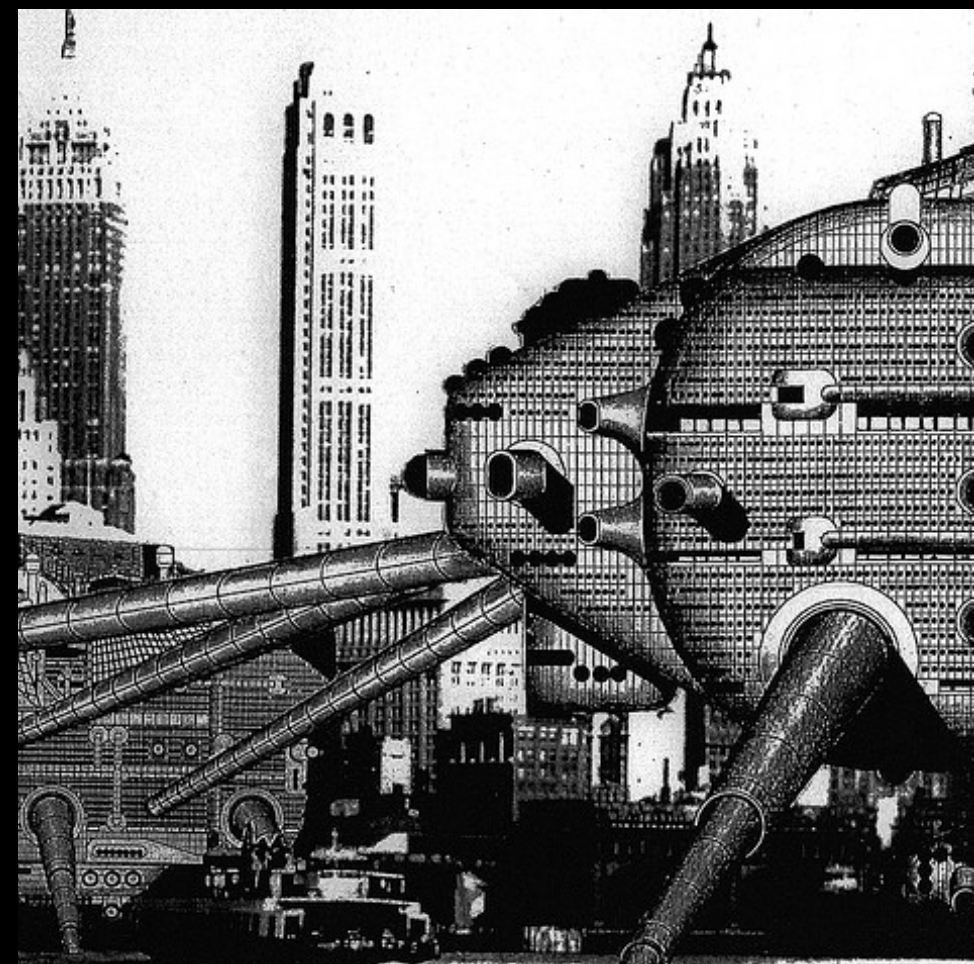
# SCIENCE FICTION



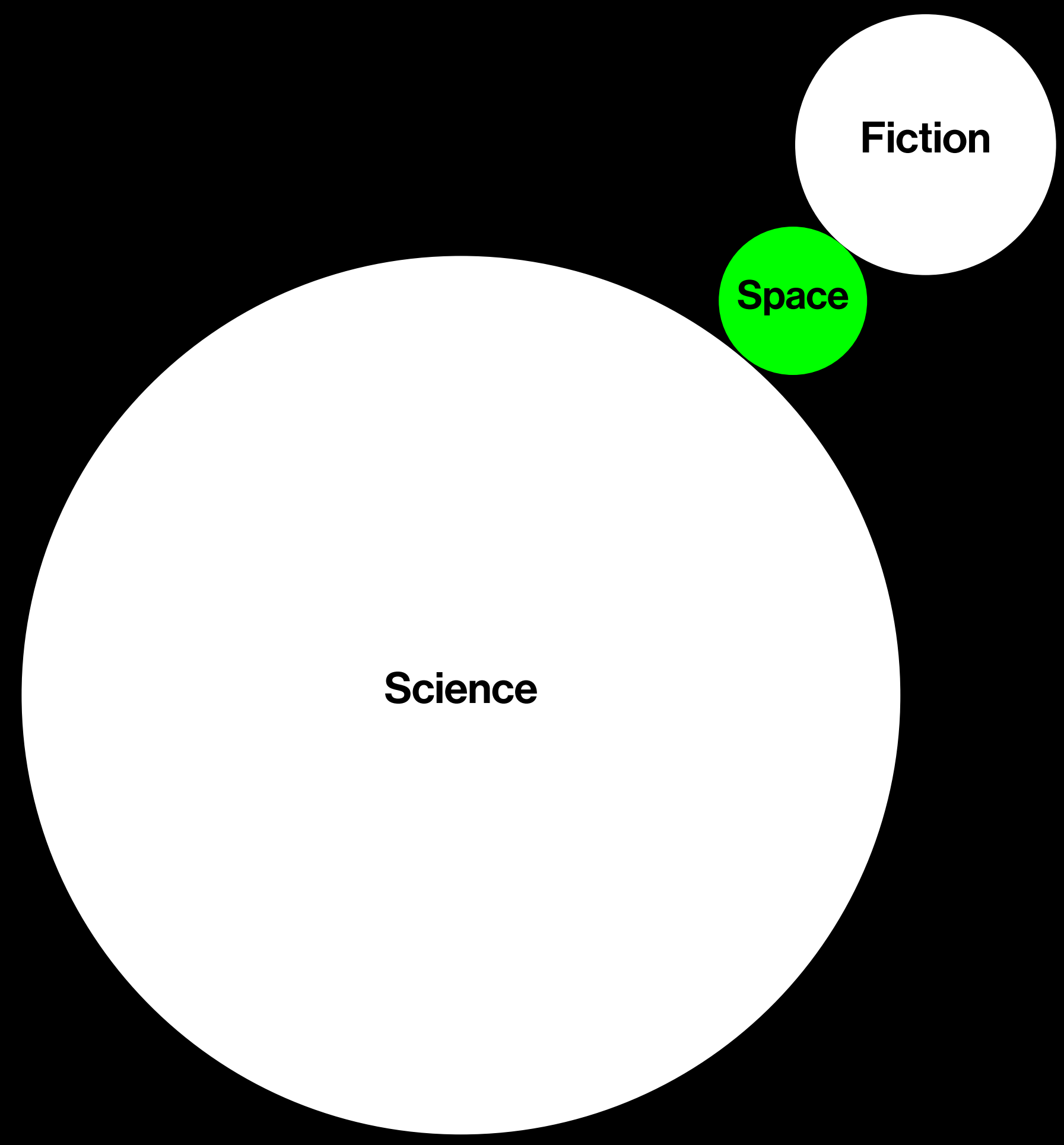
**Strictly and precisely speaking, utopia is not a  
genre but a socio-economic sub-genre of  
Science Fiction. (Darko Suvin, 1972)**









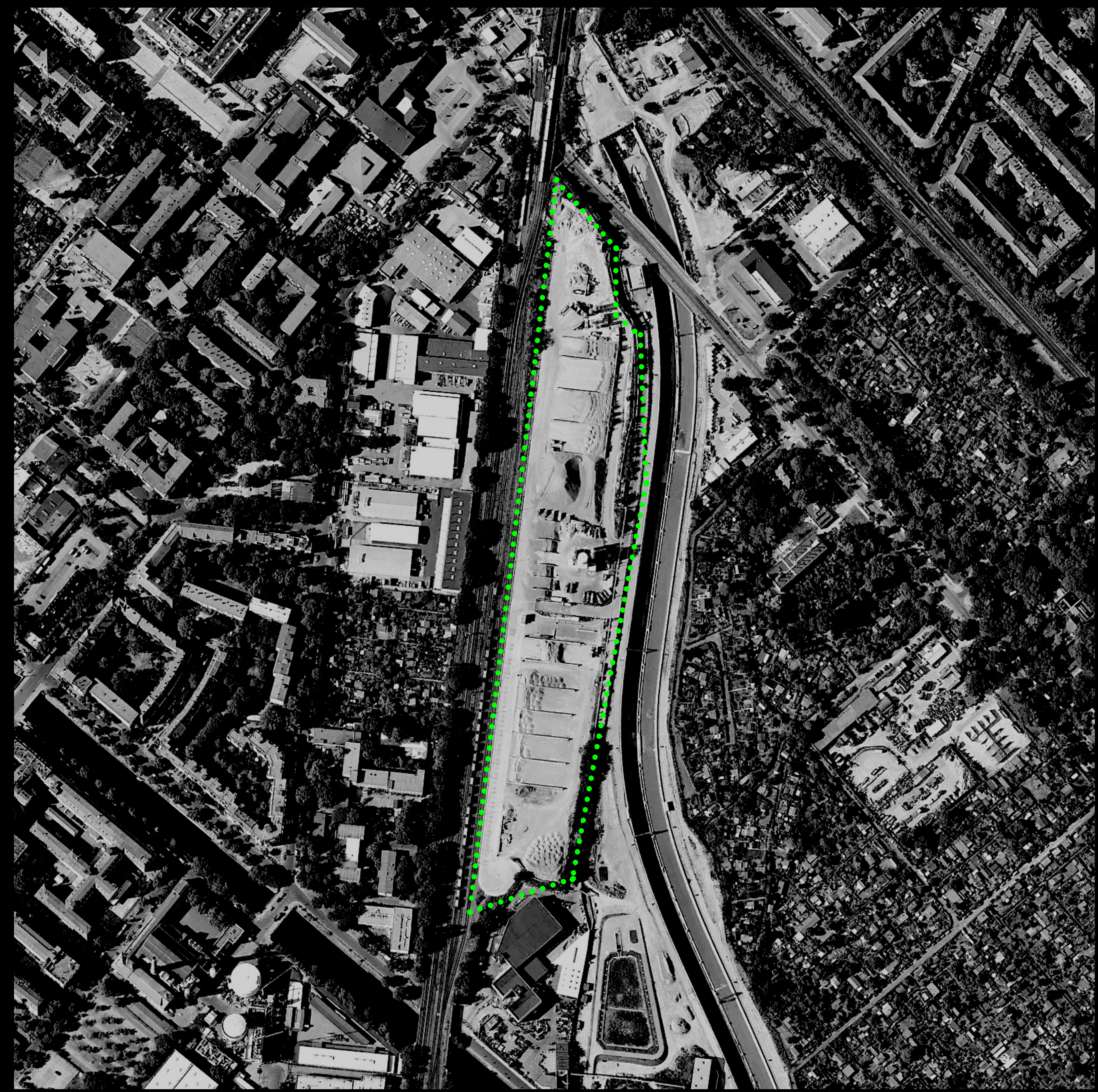


# OPERATION





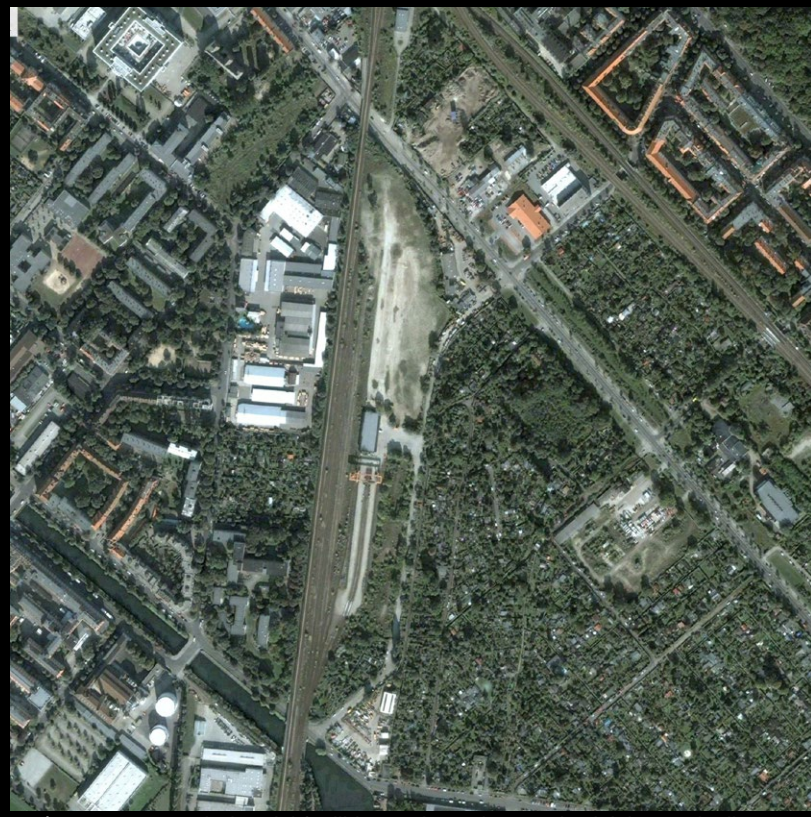








Winter 1981 Due to the proximity of the border wall, the station in West Berlin was almost unused during the separation of Berlin. It experienced a revival in the 1990s before being demolished to make space for the sand deposit.



09/2005 Industrial facilities and warehouses in vicinity gradually start to close down.



06/2012 HeidelbergCement's plant is fully operational, including material storage. Last site-internal railway tracks are removed.



12/1953 Post-war destructions, early Wirtschaftswunder. Siemens' mobility section settles on Mergenthalerring. The wall will soon be erected close to it, right north of the site.



10/2009 Demolition of station building and facilities begins.



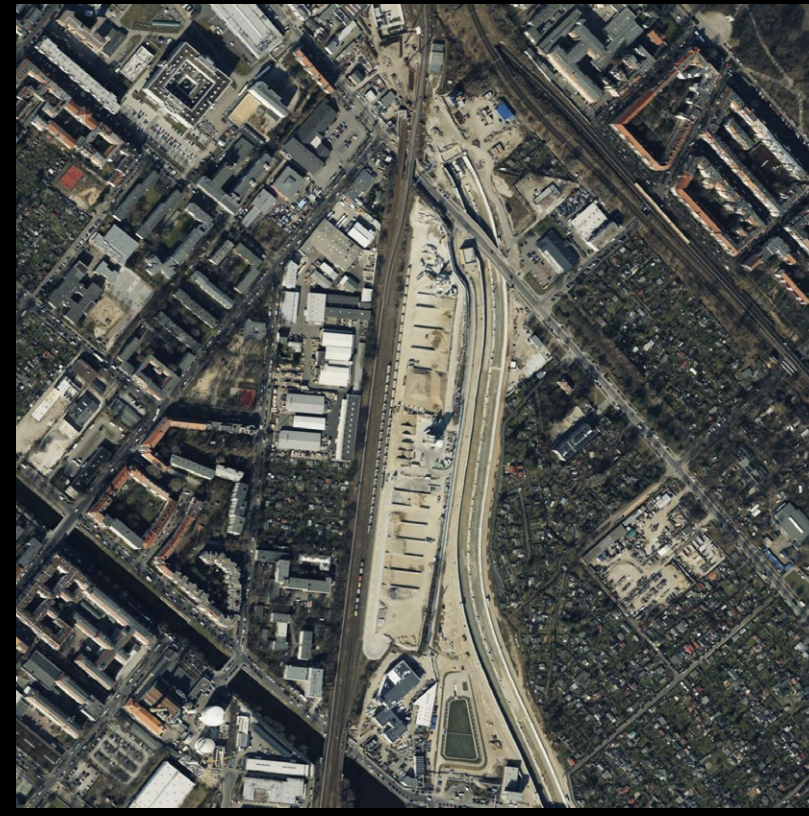
06/2016 Material deposit extends almost over the whole site. Autobahn A100 constructions reach the site. New accessway.



07/1993 After the reunification, the station is used and extended.



09/2010 Demolition is finished, HeidelbergCement sets up a cement plant on the plinth of the former freight station building.

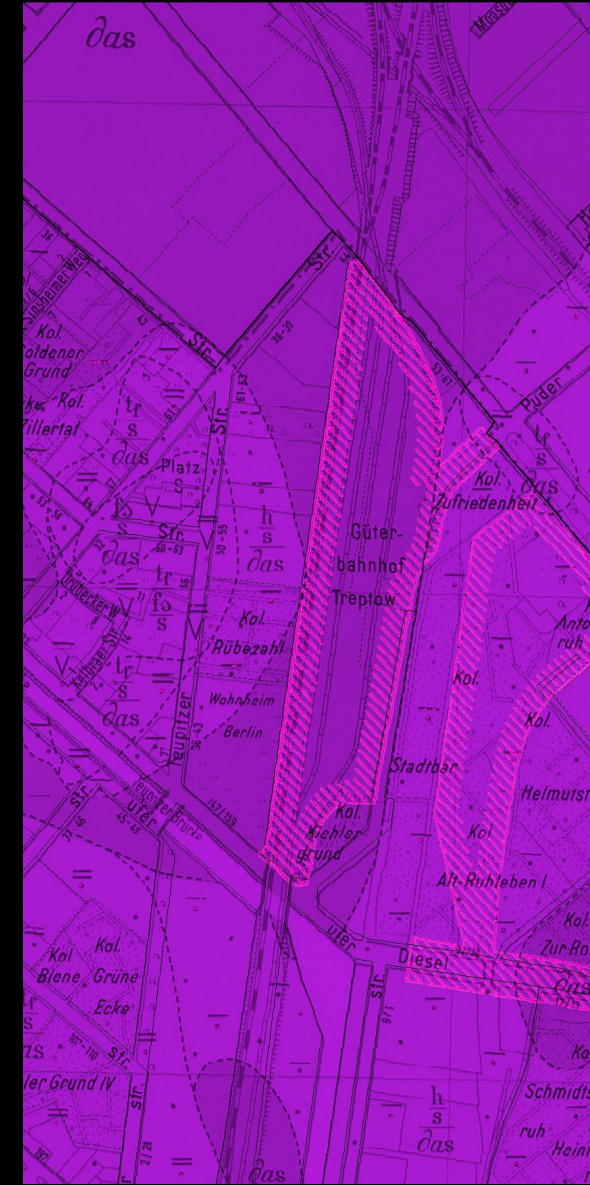


11/2022 A100/BA16 is almost finished. Site perimeter is fully used by sand and cement firms. Pumps handle the high ground water levels for tunnel construction. Temporary railway bridge is in use.





# Grundwasser



# Landfilling



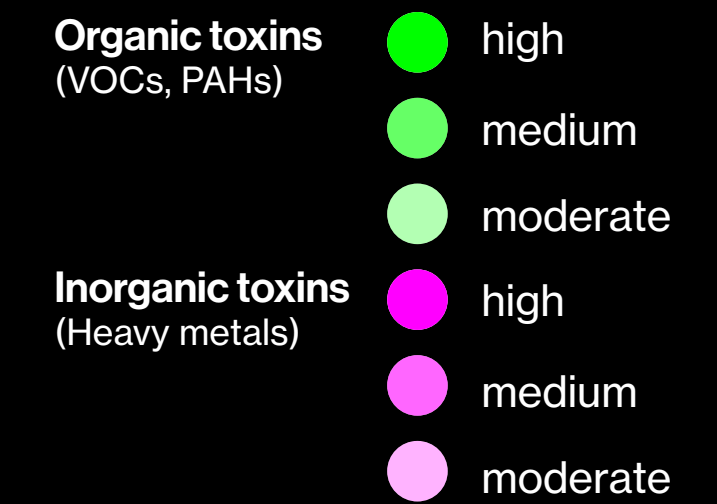
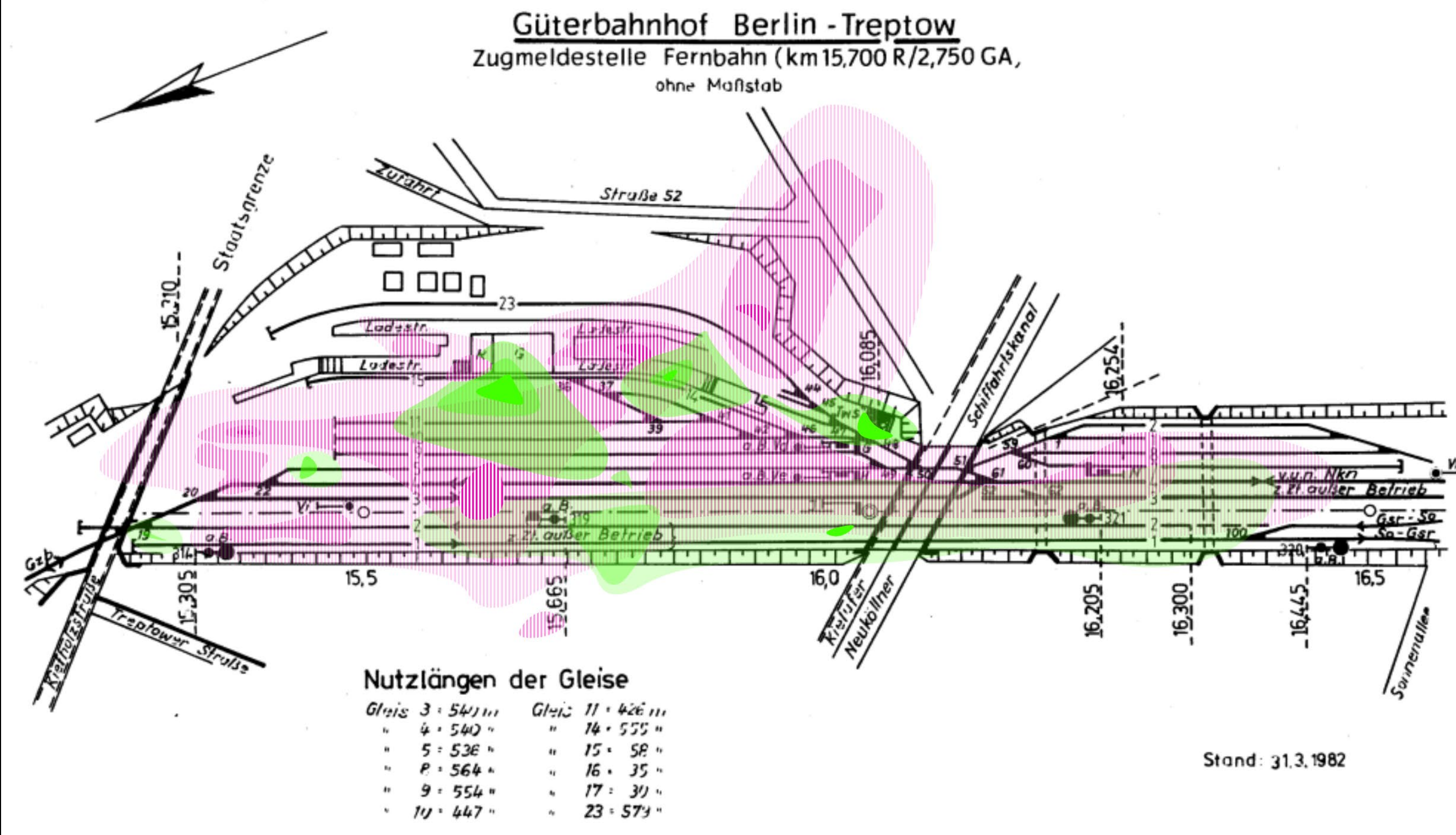
# Kleingärten



# Access











Gesetz zum Schutz vor schädlichen Bodenveränderungen und zur Sanierung von Altlasten

(Bundes-Bodenschutzgesetz - BBodSchG)

**§ 1 Zweck und Grundsätze des Gesetzes**

**Zweck dieses Gesetzes ist es, nachhaltig die Funktionen des Bodens zu sichern oder wiederherzustellen. Hierzu sind schädliche Bodenveränderungen abzuwehren, der Boden und Altlasten sowie hierdurch verursachte Gewässerverunreinigungen zu sanieren und Vorsorge gegen nachteilige Einwirkungen auf den Boden zu treffen. Bei Einwirkungen auf den Boden sollen Beeinträchtigungen seiner natürlichen Funktionen sowie seiner Funktion als Archiv der Natur- und Kulturgeschichte so weit wie möglich vermieden werden.**

Act on the Protection against Harmful Soil Changes and on the Remediation of Contaminated Sites (Federal Soil Protection Act - BBodSchG)

**§ 1 Purpose and Principles of the Act**

The purpose of this Act is to sustainably safeguard or restore the functions of the soil. To this end, harmful soil changes must be prevented, the soil and contaminated sites as well as water pollution caused by them must be remediated and precautions must be taken against adverse effects on the soil. In the case of impacts on the soil, impairments of its natural functions and its function as an archive of natural and cultural history are to be avoided as far as possible.









Substrate	n	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	Bap	ΣPCB
Brick	12	10-25	0.5-2	20-50	10-70	<0.3	10-30	40-110	20-60	< 0.8	0.1-0.4
Mortar/concrete	8	<20	<0.2	10-50	a	<0.1	10-20	10-40	a	< 0.1	< 0.1
Asphalt (tar)	29	10-20	1-1.5	10-80	a	a	a	80-100	a	30-150	< 0.1
Blast furnace slag	5	<10	<0.6	10-50	<30	<0.1	<10	10-40	10-140	< 0.1	< 0.1
Steelworks slag	11	<30	<0.7	90-4.5%	20-180	<0.2	20-250	10-170	130-410	< 0.3	< 0.1
Lead slag	a	1,000-7,000	5-20	1,000-4,000	1,000-4,000	<0.1	100-1,500	2-5%	7-13 %	a	a
Copper slag	a	300-1,000	5-20	200-2,000	7,000-12,000	<0.1	1,000-2,000	2,000-4,000	5-10 %	a	a
Bottom ash (coal-fired)	12	2-25	0.1-1.7	10-60	90-110	<0.1	30-80	10-180	10-230	< 0.8	< 0.1
Fly ash (garbage incinerator)	9	10-230	270-380	160-3,600	630-1,300	7.5-9	100-1,300	5,500-8,300	1.5-2.7 %	a	a
Bottom ash (garbage incinerator)	11	2-90	2-77	40-1,300	510-3,400	<2.0	40-280	410-3,200	840-4,800	a	a
Coal gangue	71	3-70	0.2-1.2	10-50	50-80	<0.3	20-90	20-180	130-330	< 0.5	a

Bap = benzo(a)pyrene  
a>Data not available  
Metal extraction method: aqua regia

Contaminant concentrations (mg/kg-1, %) of different technogenic mono-substrates present a.o. in railway embankments of different locations in Berlin, Germany (Data from Hiller & Meuser, 1998)



### Cadmium

Group: Heavy Metals  
Origin: Smelters, fossil and industrial emissions, waste incineration  
Remediation strategies:  
+ Thermal Desorption  
+ Phytoremediation  
+ Soil Washing  
+ Solidification / Stabilisation



### VOCs

Group: Organic Contaminants  
Origin: Industrial emissions, agricultural trade and logistics  
Remediation strategies:  
+ Soil Vapour Extraction  
+ Bioremediation (bacterial)  
+ Air Sparging  
+ Solidification / Stabilisation

### Arsenic

Group: Heavy Metals  
Origin: Industrial emissions, agricultural trade and logistics  
Remediation strategies:  
+ Thermal Desorption  
+ Phytoremediation  
+ Soil Washing  
+ Chemical Reduction/Oxidation

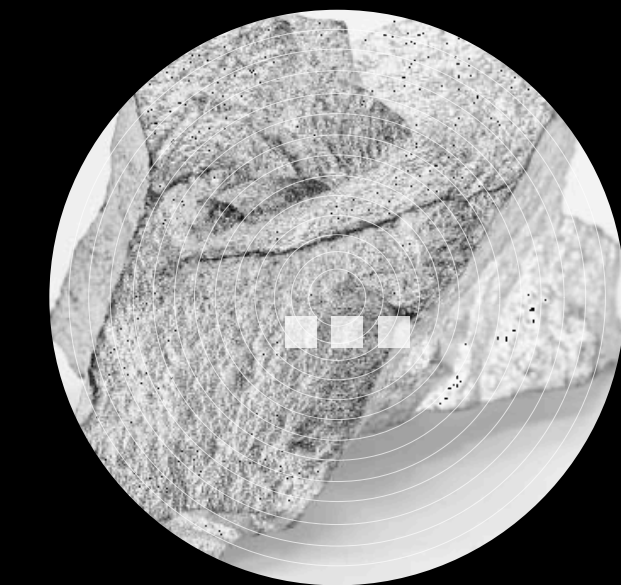
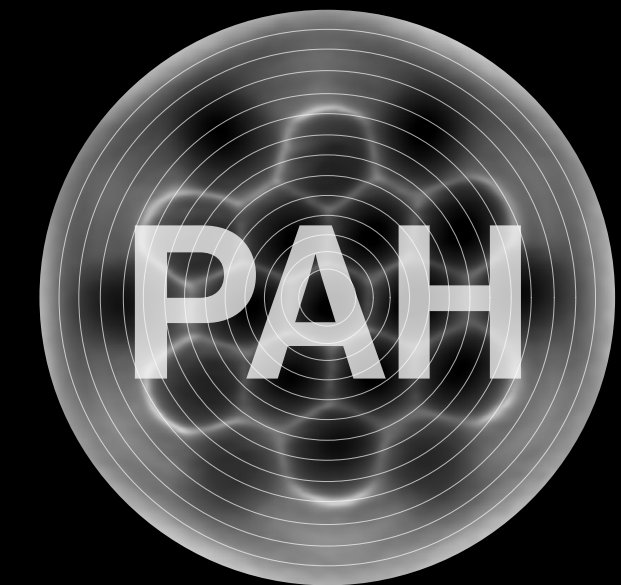


### Lead

Group: Heavy Metals  
Origin: Fossil fuel combustion (pre-1980s), fuel spills, industrial logistics  
Remediation strategies:  
+ Thermal Desorption  
+ Phytoremediation  
+ Soil Washing (+Solvents)  
+ Chemical Reduction/Oxidation

### PAHs

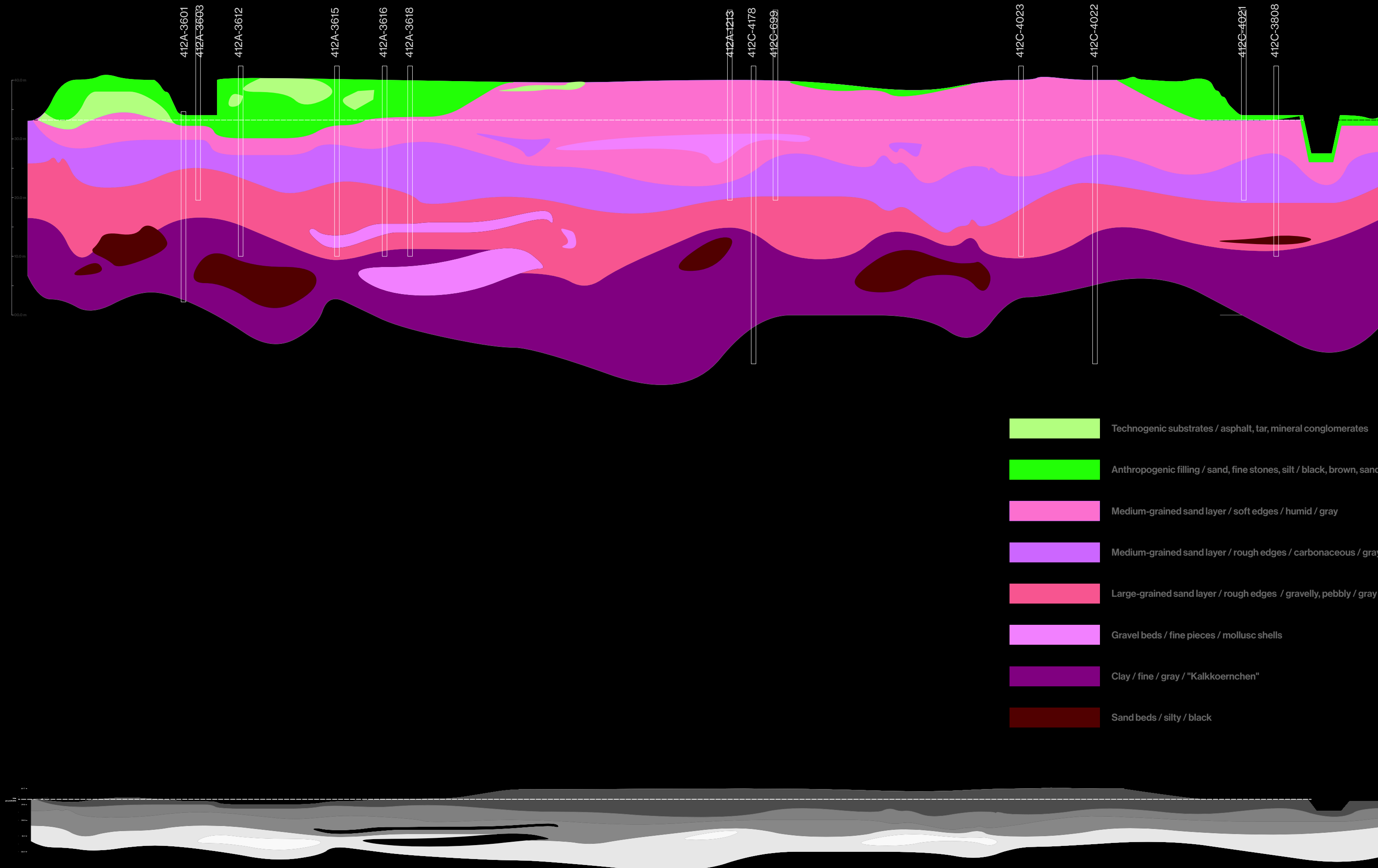
Group: Hydrocarbon Contaminants  
Origin: Railway tracks (tar treatment), fuel combustion  
Remediation strategies:  
+ Thermal Desorption  
+ Phytoremediation (sunflowers)  
+ Bioremediation  
+ Soil Washing  
+ Chemical Oxidation



### Other Heavy Metals (smaller quantities)

Group: Heavy Metals  
Origin: Industrial emissions  
Remediation strategies:  
+ Thermal Desorption  
+ Phytoremediation  
+ Soil Washing  
+ Chemical Reduction/Oxidation

Material collages by author based on sample images by Wikimedia Commons, Adobe Stock and Encyclopedia Britannica



Height is quadrupled in top figure.  
See monochromatic section for correct proportions.

Section represents a layer estimation based on drill sample data by Senatsverwaltung für Umwelt, Verkehr und Klimaschutz / Senate Berlin (1993-2010).  
Bohrpunktatlas accessed in April 2023 via <https://fbinter.stadt-berlin.de>





Fine silty topsoil  
Southeast



Medium-grained sand, high carbon content  
South



Pebbly fine-grained sand  
East



Technogenic substrate (asphalt)  
East



Techno-technogenic substrate  
Northeast



Fine clay with high carbon content  
North



Anthropogenic residues becoming substrate  
South



Anthropogenic residues becoming substrate  
West



0.00

-764.30



**Technogenic landfilling**  
Excavation up to -6.5m  
see i.e. 412A-3612

**Railway embankment**  
Excavation up to -2.5m  
see i.e. 412A-3617

**Railway embankment**  
Excavation up to -2.5m  
see i.e. 412A-3617

**Fuel spills etc.**  
Excavation up to -2.5m  
see i.e. 412A-1213

**Spills & Landfilling**  
Excavation up to -2.5m  
see i.e. 412C-699

**Fuel spills etc.**  
Excavation up to -2.5m

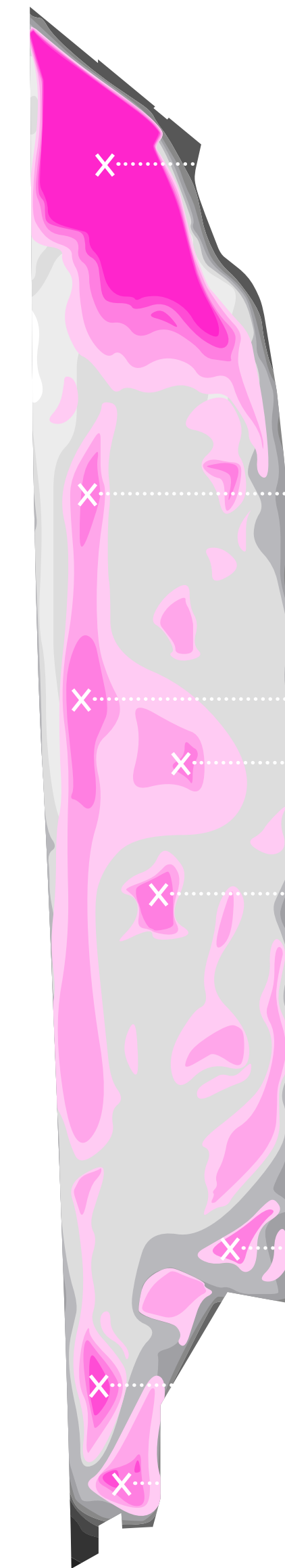
**Technogenic landfilling**  
Excavation up to -5.5m  
see i.e. 412C-4021

**Technogenic landfilling**  
Excavation up to -4.0m  
see i.e. 412A-4022

99'266.75 m<sup>3</sup>  
158'826.80 t

0.00

-764.30



**Technogenic landfilling**  
Excavation up to -6.5m  
see i.e. 412A-3612

**Railway embankment**  
Excavation up to -2.5m  
see i.e. 412A-3617

**Railway embankment**  
Excavation up to -2.5m  
see i.e. 412A-3617

**Fuel spills etc.**  
Excavation up to -2.5m  
see i.e. 412A-1213

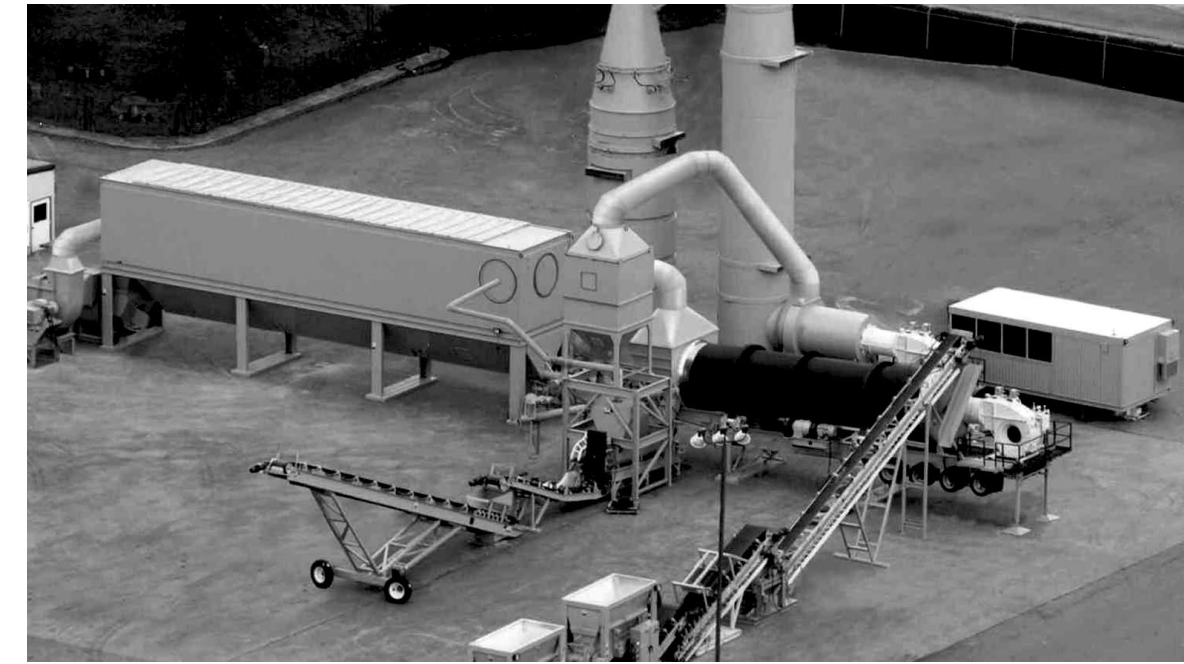
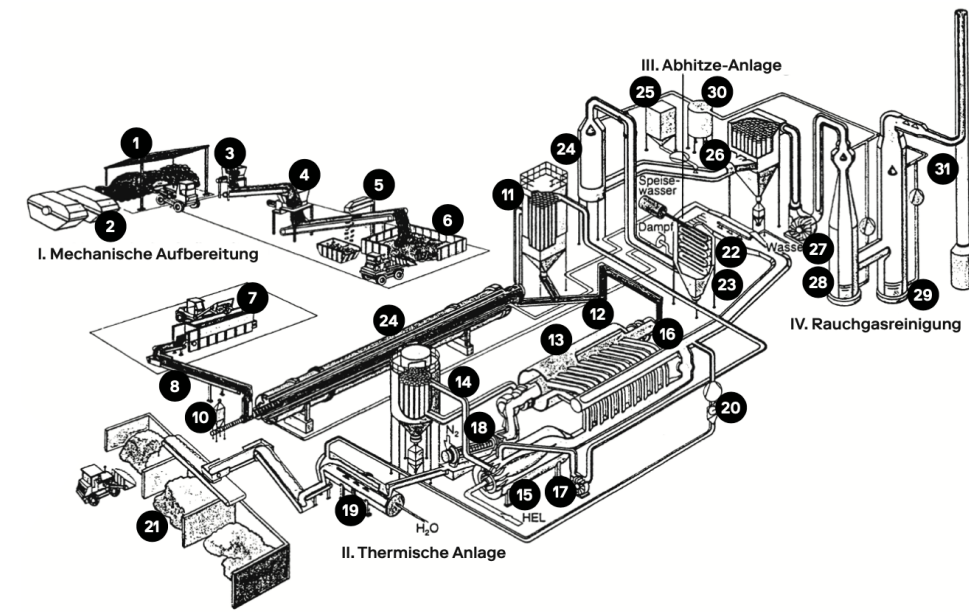
**Spills & Landfilling**  
Excavation up to -2.5m  
see i.e. 412C-699

**Fuel spills etc.**  
Excavation up to -2.5m

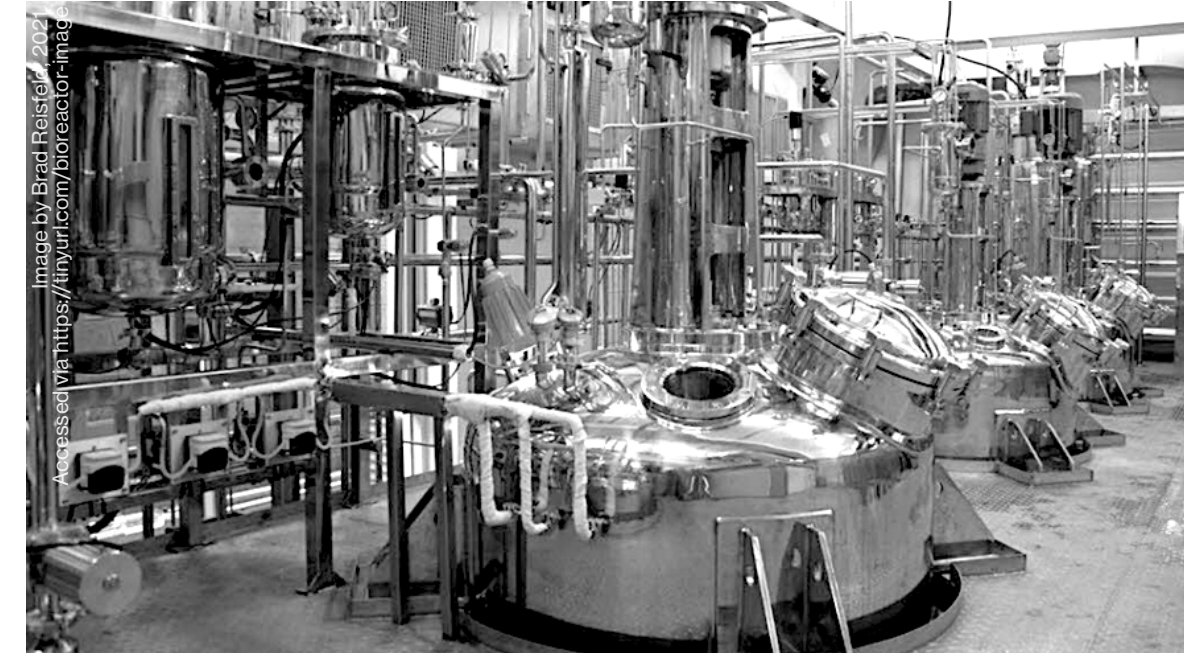
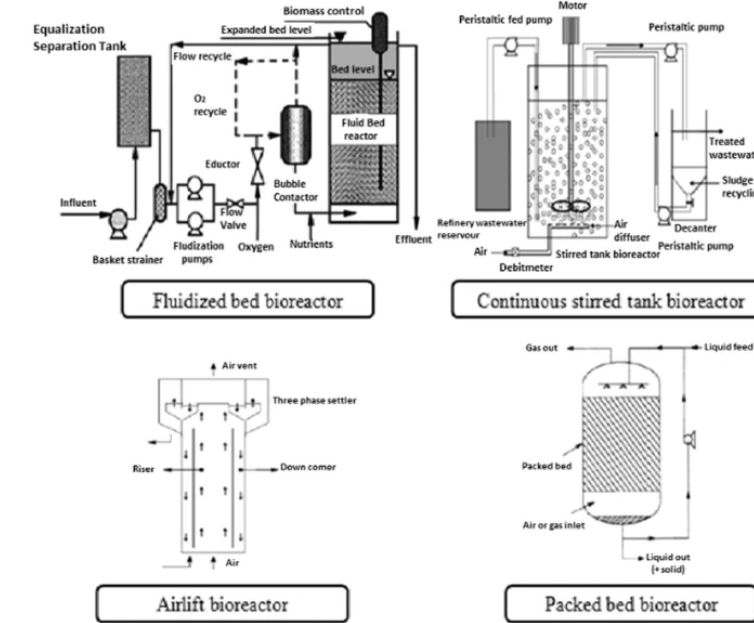
**Technogenic landfilling**  
Excavation up to -5.5m  
see i.e. 412C-4021

**Technogenic landfilling**  
Excavation up to -4.0m  
see i.e. 412A-4022

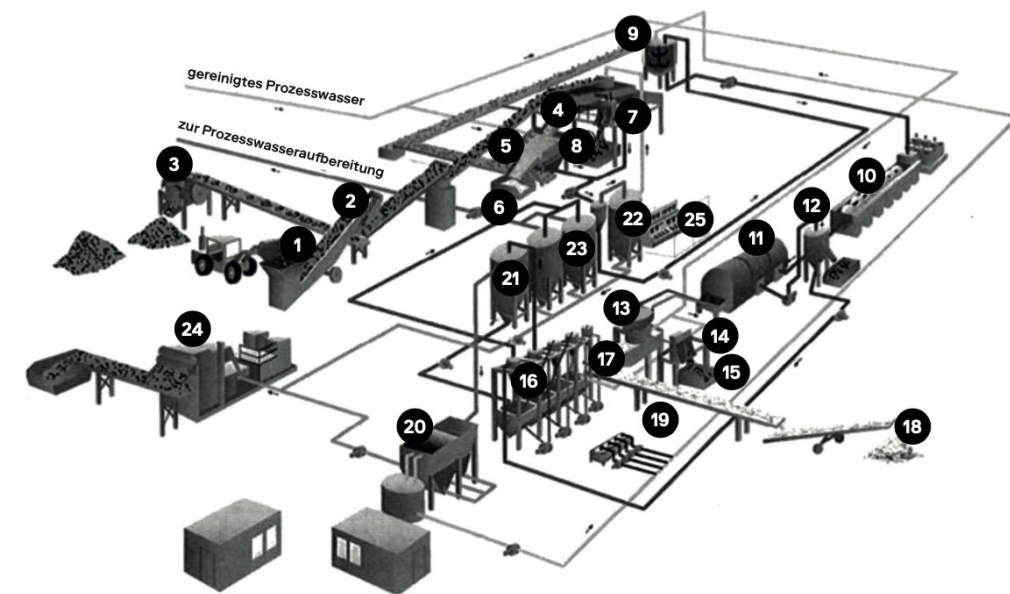




**Thermal Desorption**  
Capacity  
2 tph

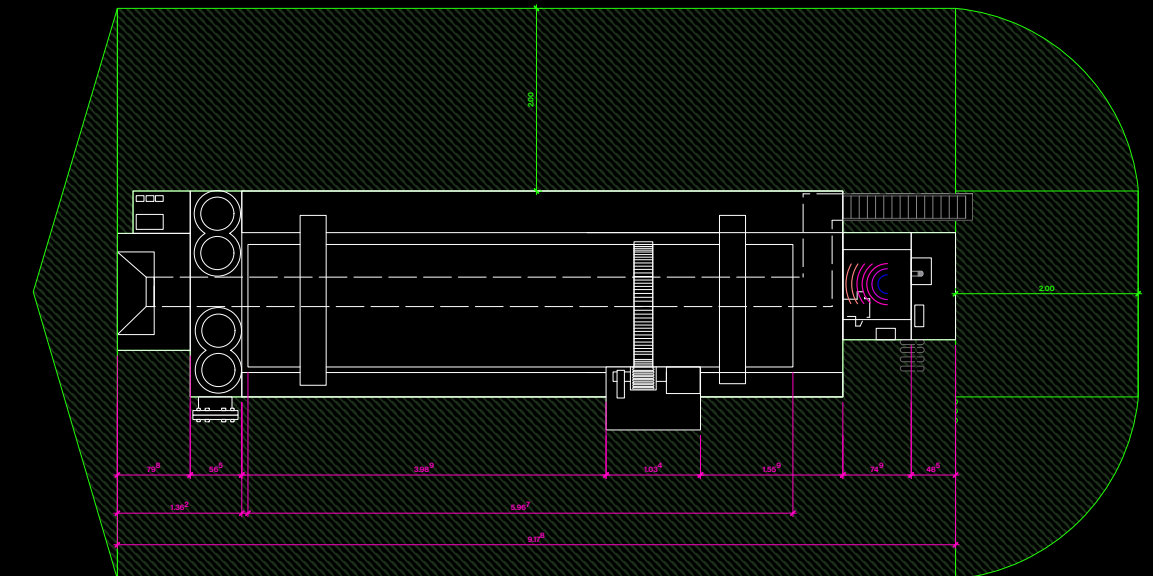
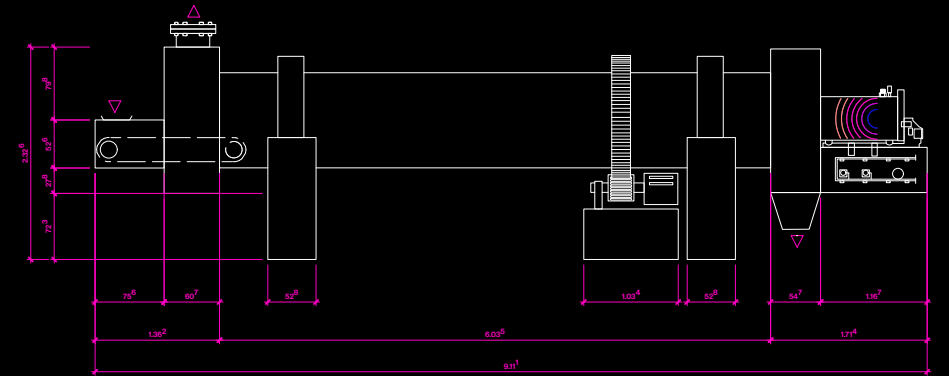
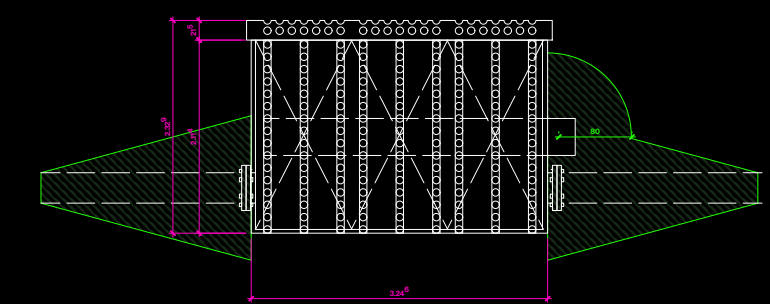
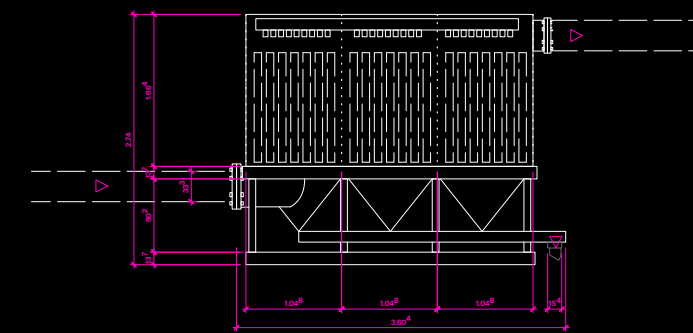
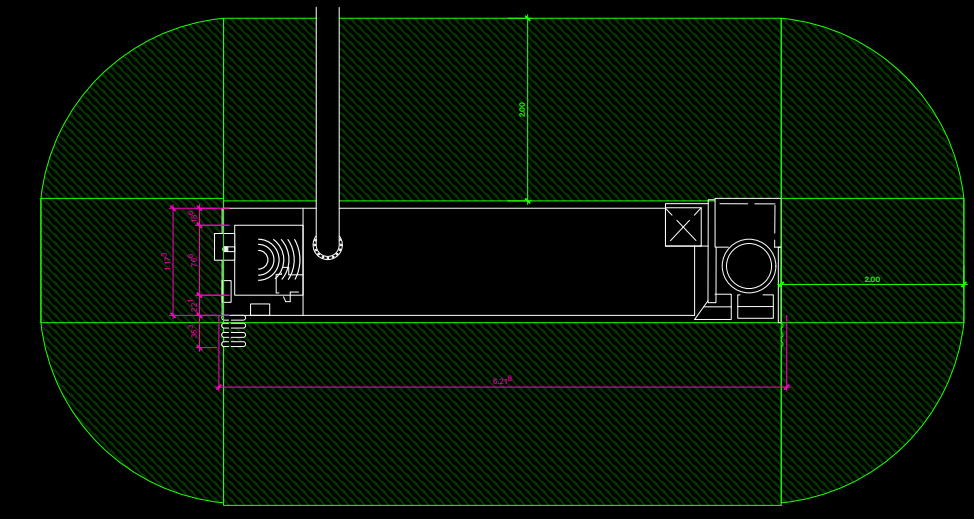
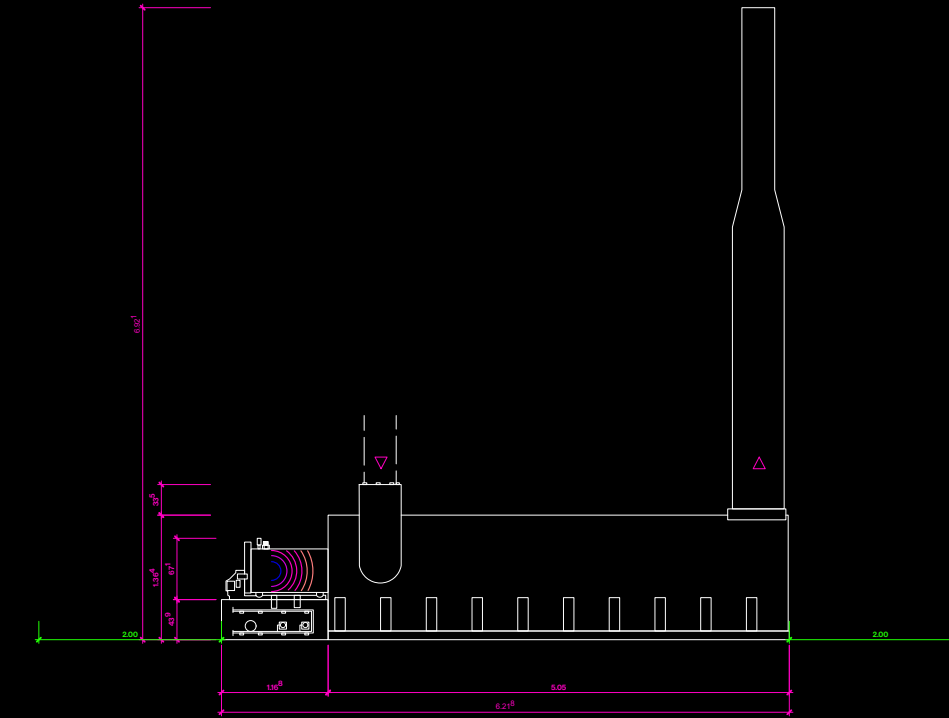
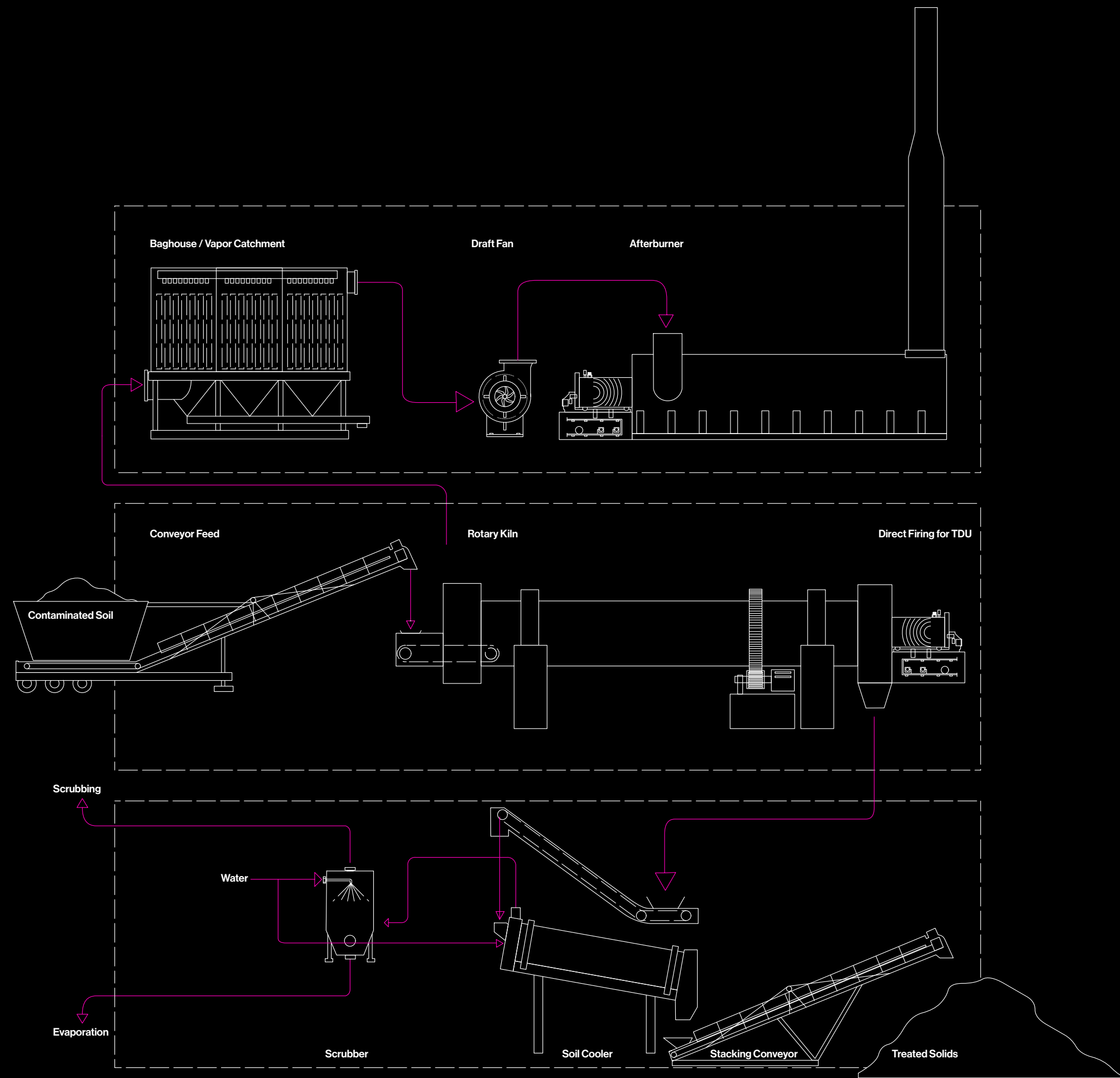


**Bioremediation**  
Capacity  
0.2 tph



**Soil Washing**  
Capacity  
10 tph

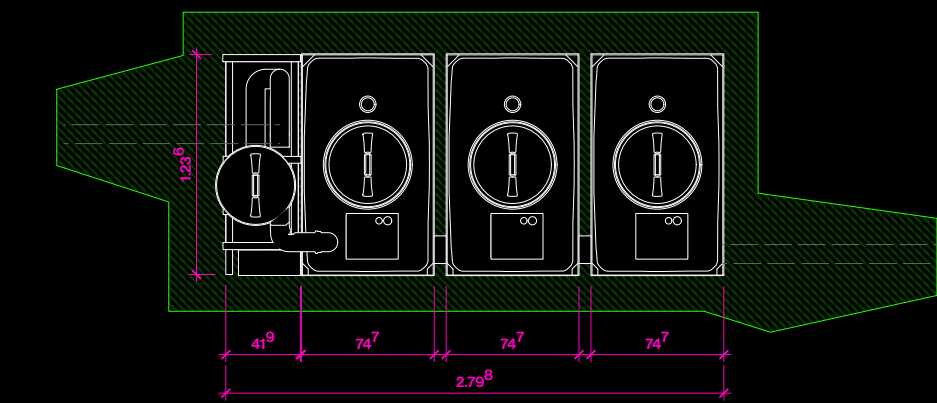
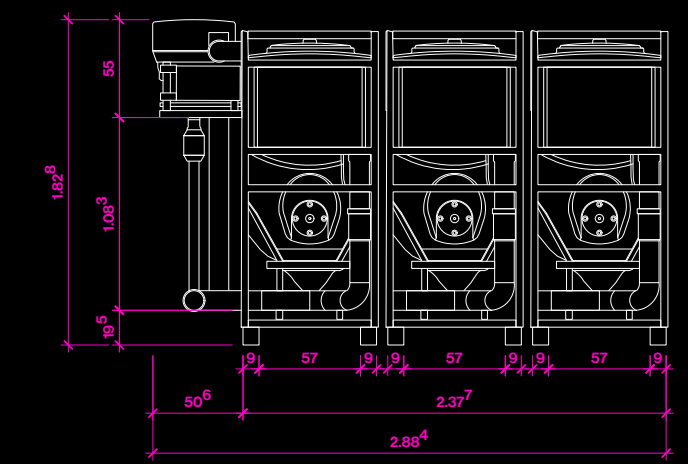
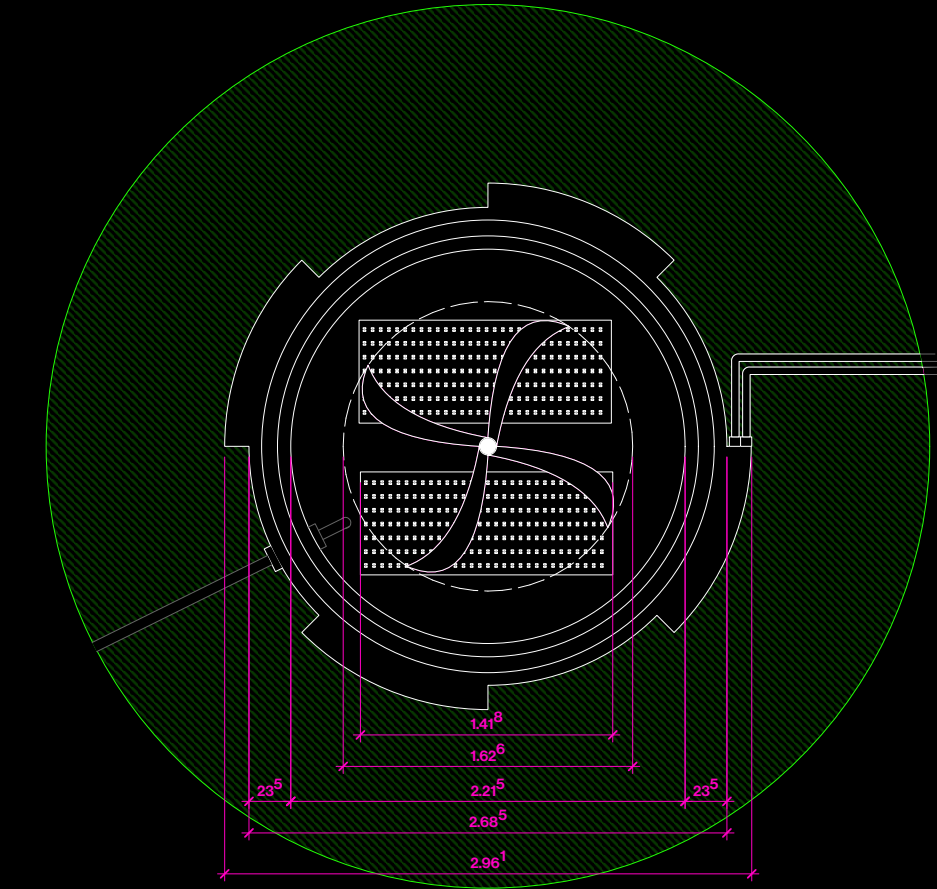
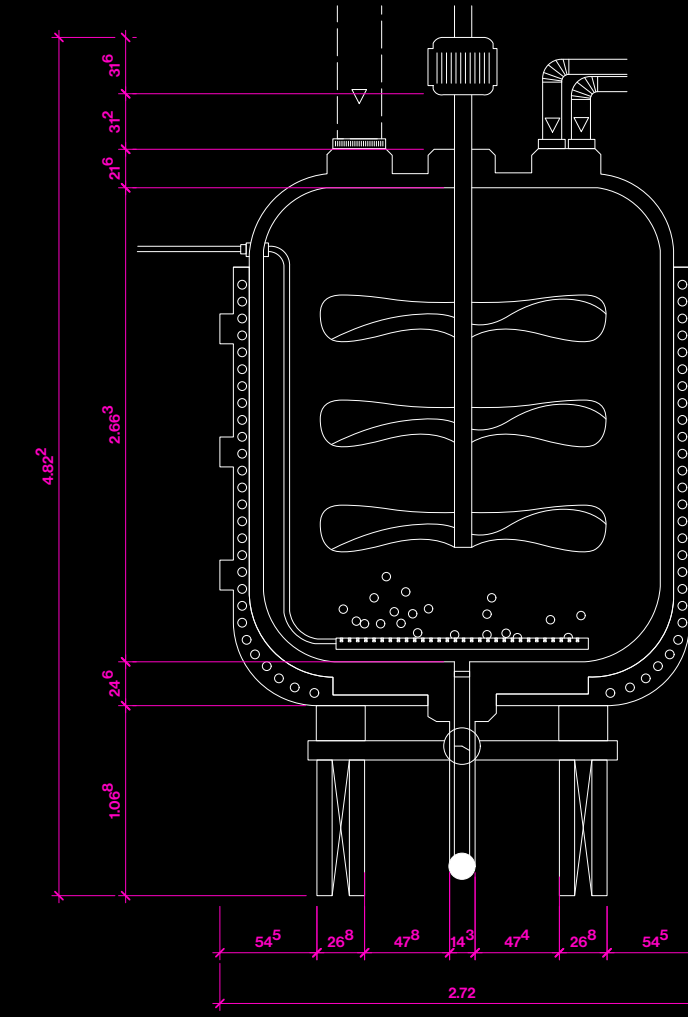
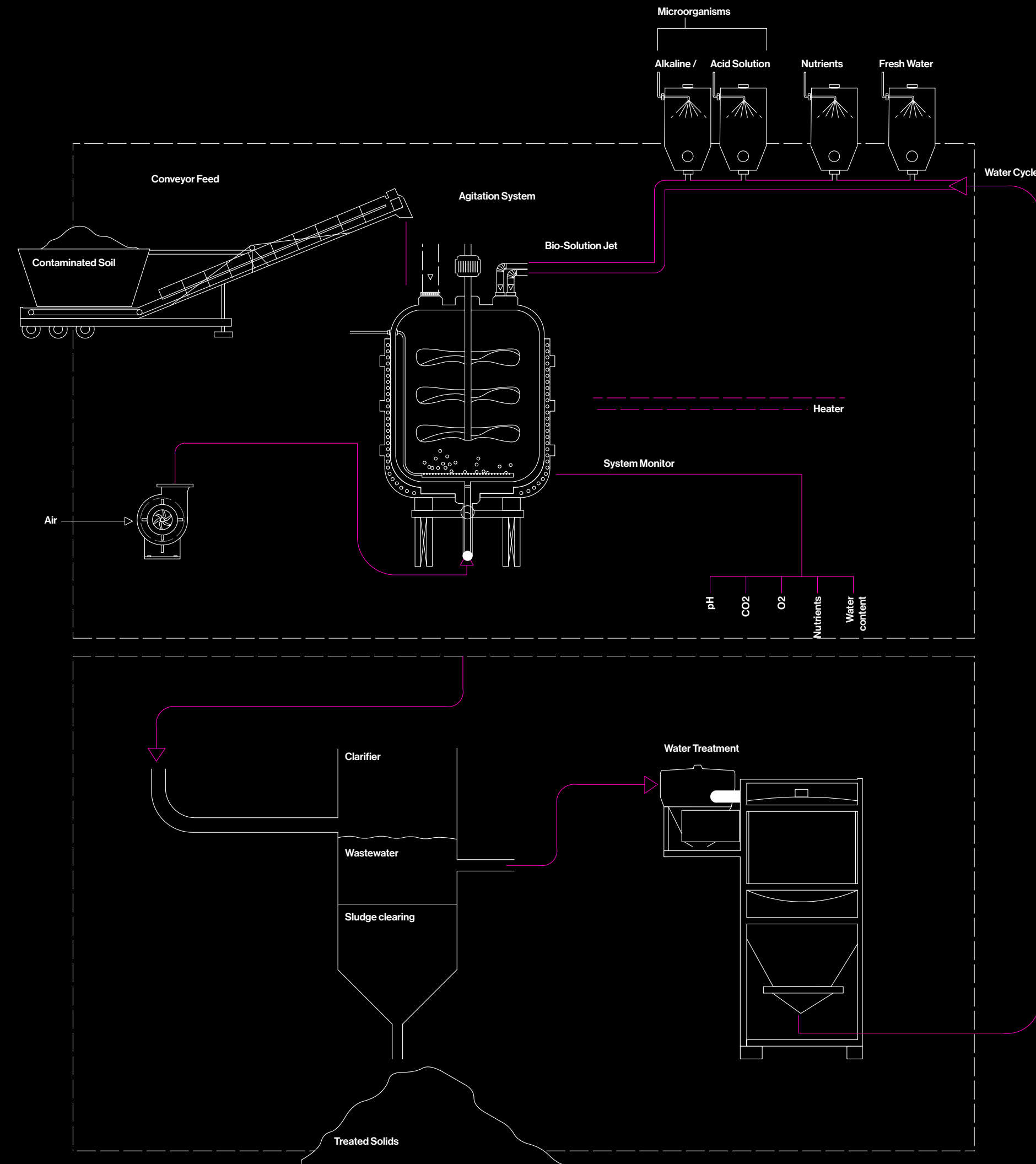




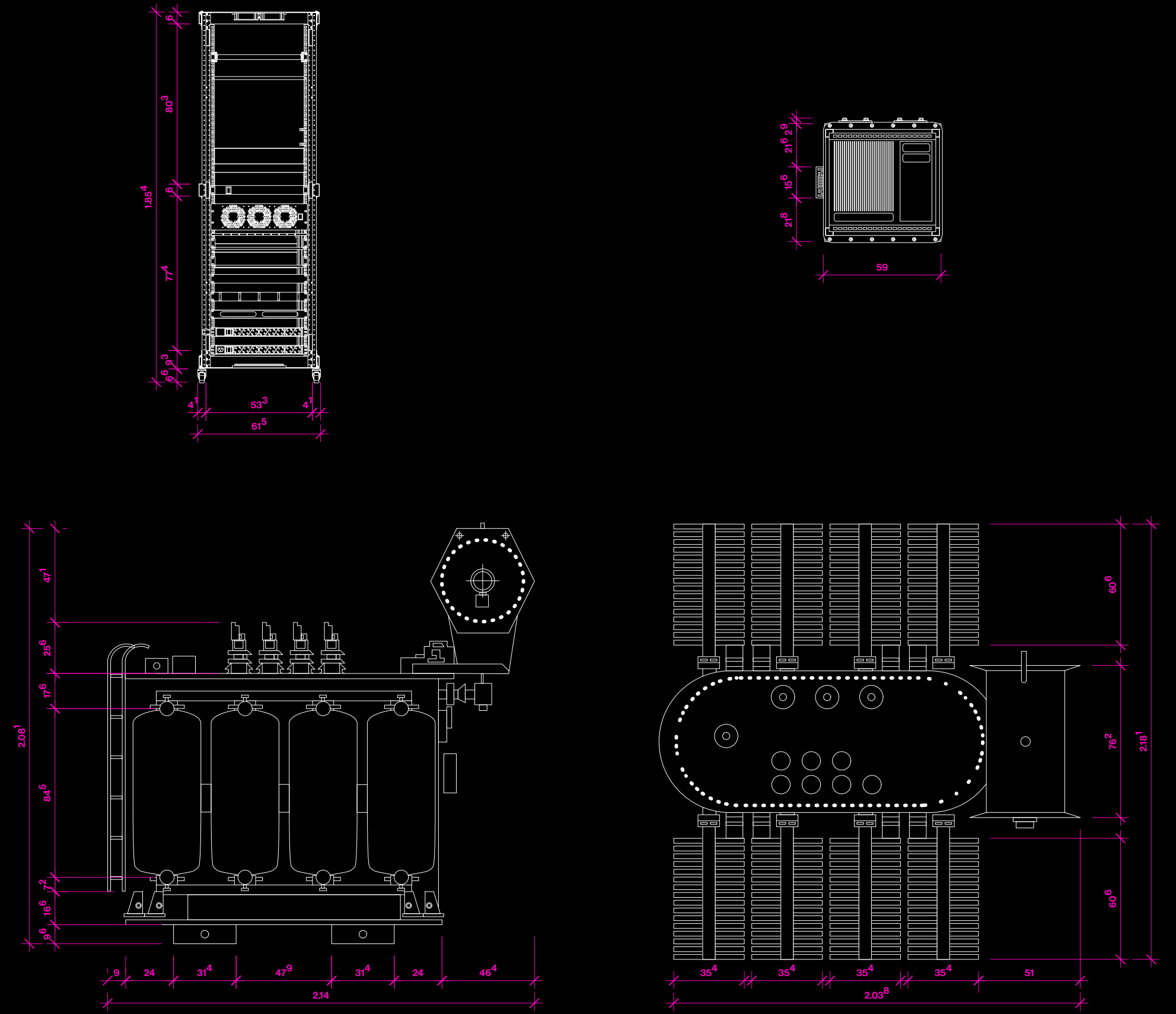
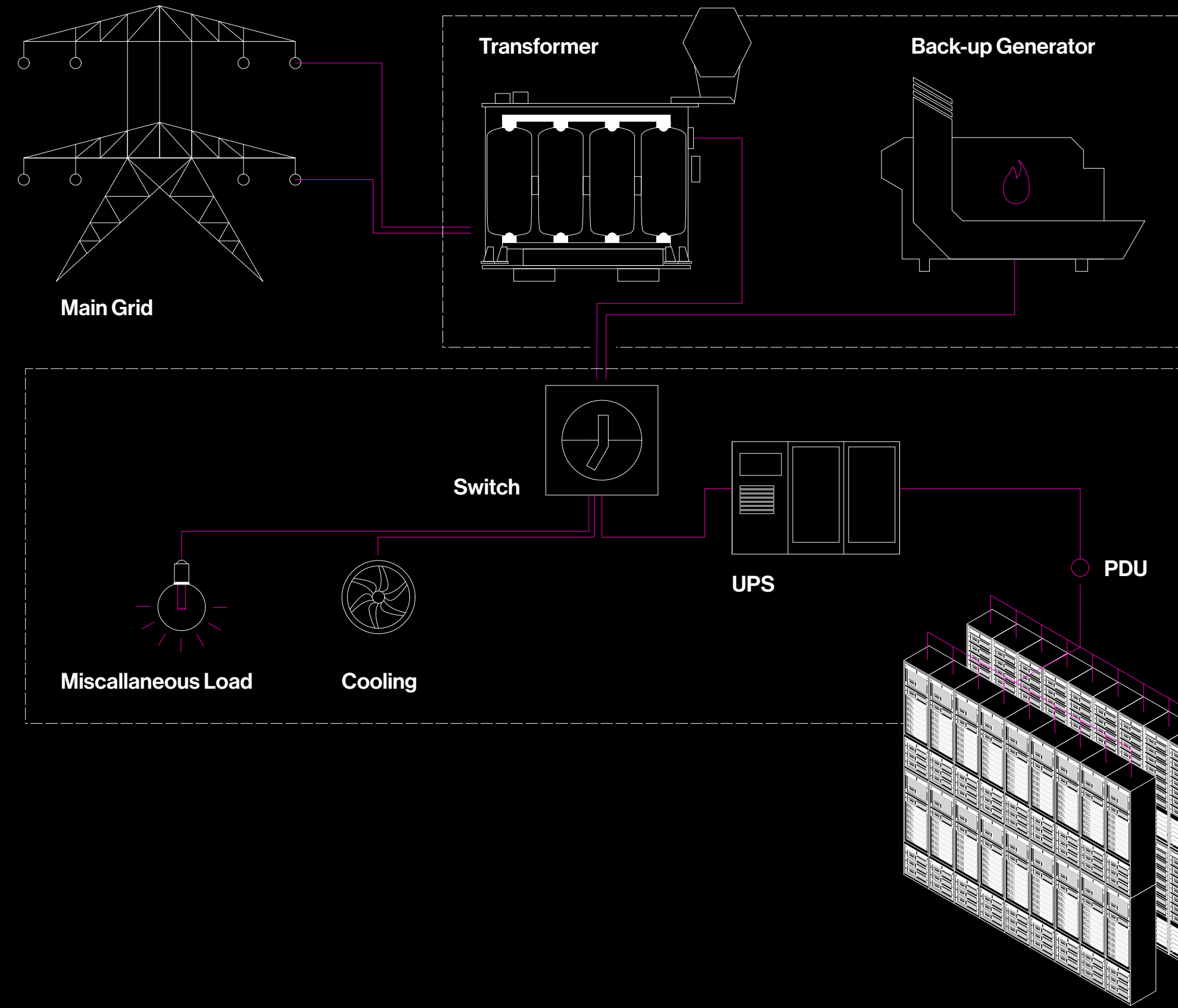








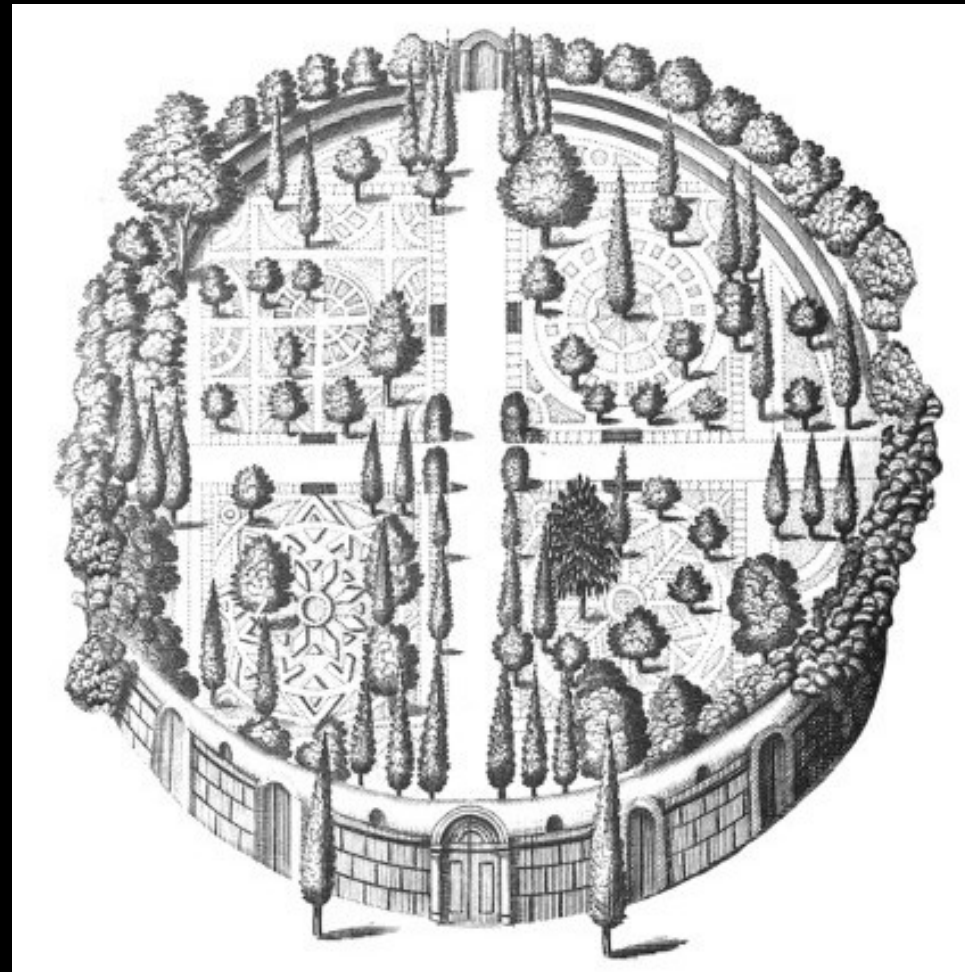






# DESIGN





**Hortus Conclusus Padova**  
Contemporary representation of the paradise-resembling garden typology from 1632



**Sondermülldeponie Kölliken**  
Photo of the explosion-proof vehicle used in the site's decontamination efforts, 2007-2015



**Post-nuclear landscape in Fukushima**  
Photo of containing efforts in the large-scale reactor catastrophe, March 2011

# Enclosure

Decontamination Concept



# Filters

## Interaction Concept



**6 Standing Panes**  
Gerhard Richter, 2002/2011  
Multi-layered filtering

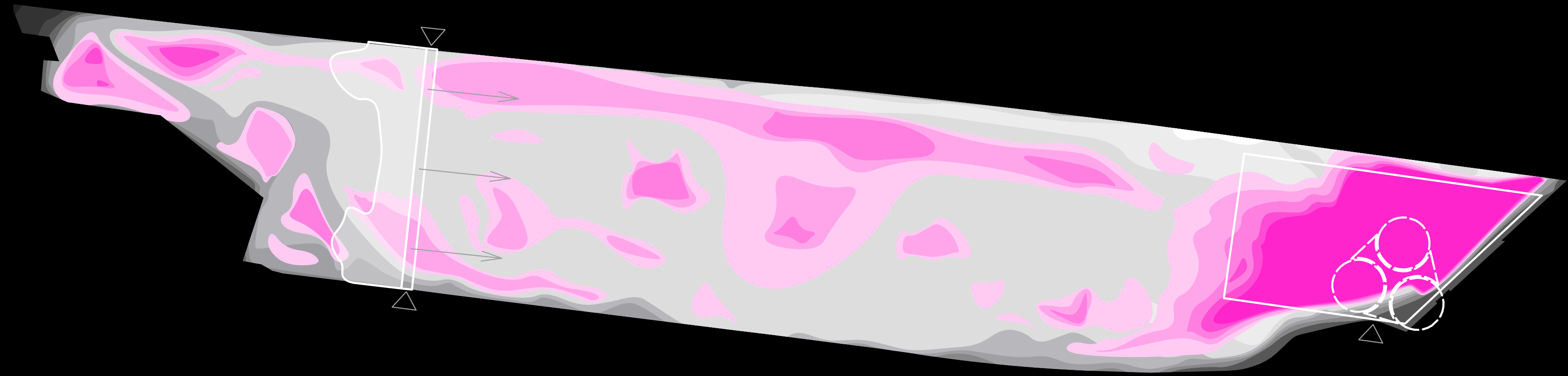


**Monumento Continuo (a Positano)**  
Superstudio, 1969-70  
Monumental filtering



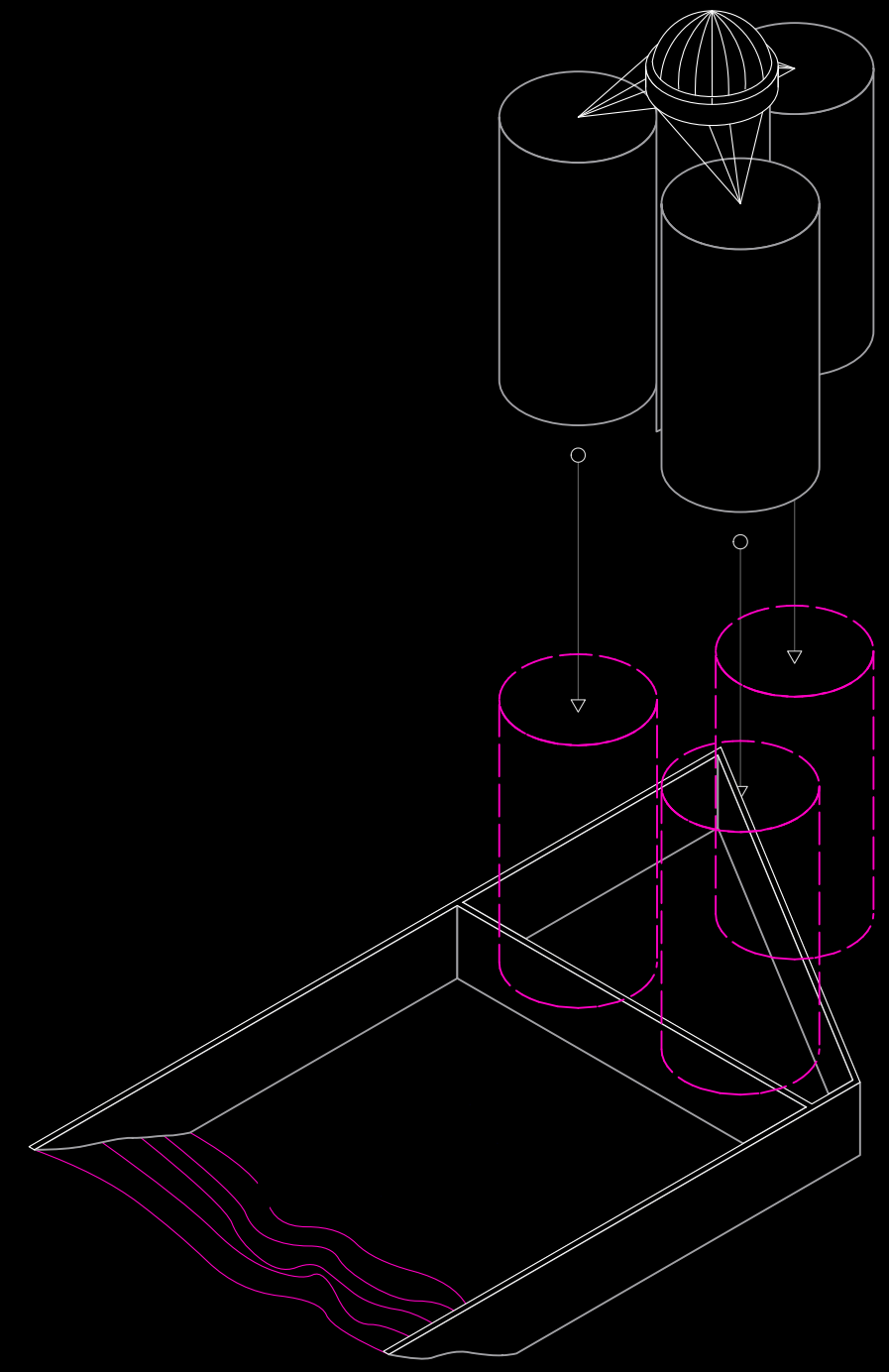
**Former Sondermülldeponie Kölliken**  
Swiss media interviews as part of the open day after the finalisation of decontamination efforts, 2016



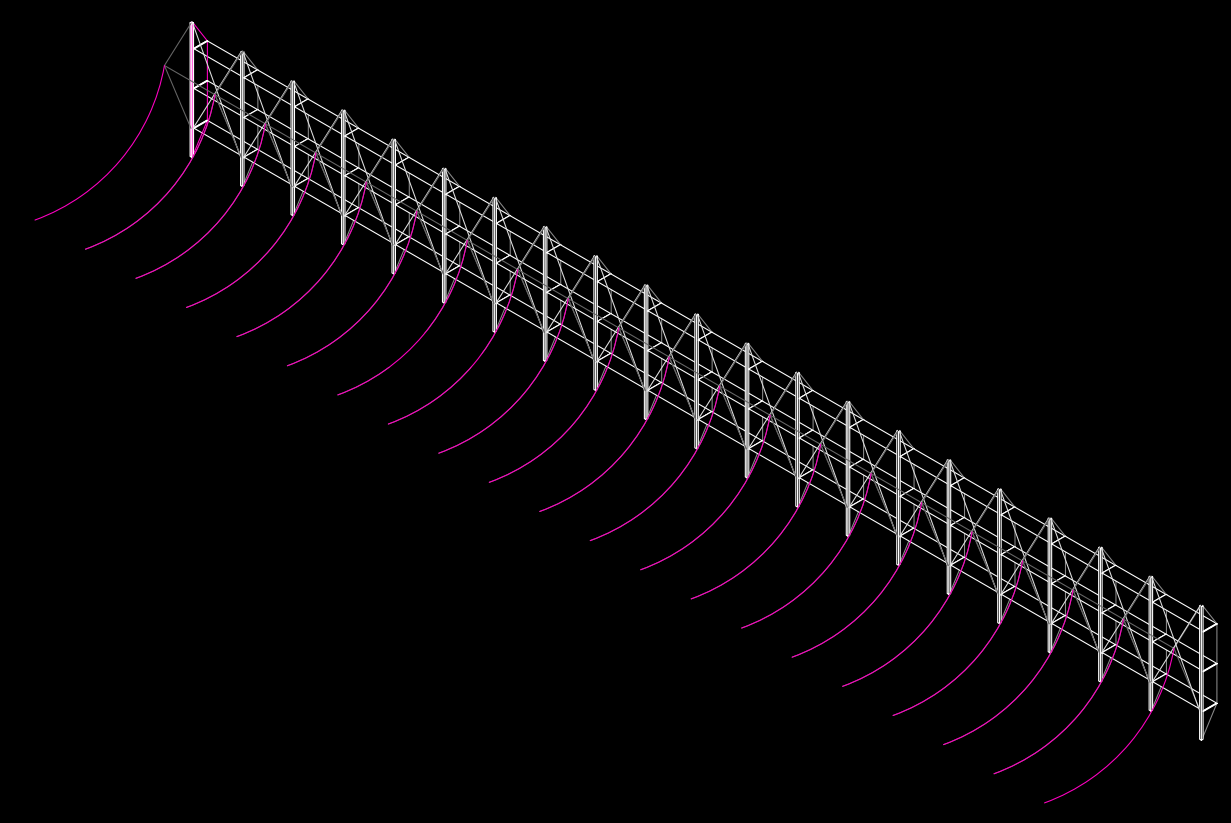


# Process Spatialisation

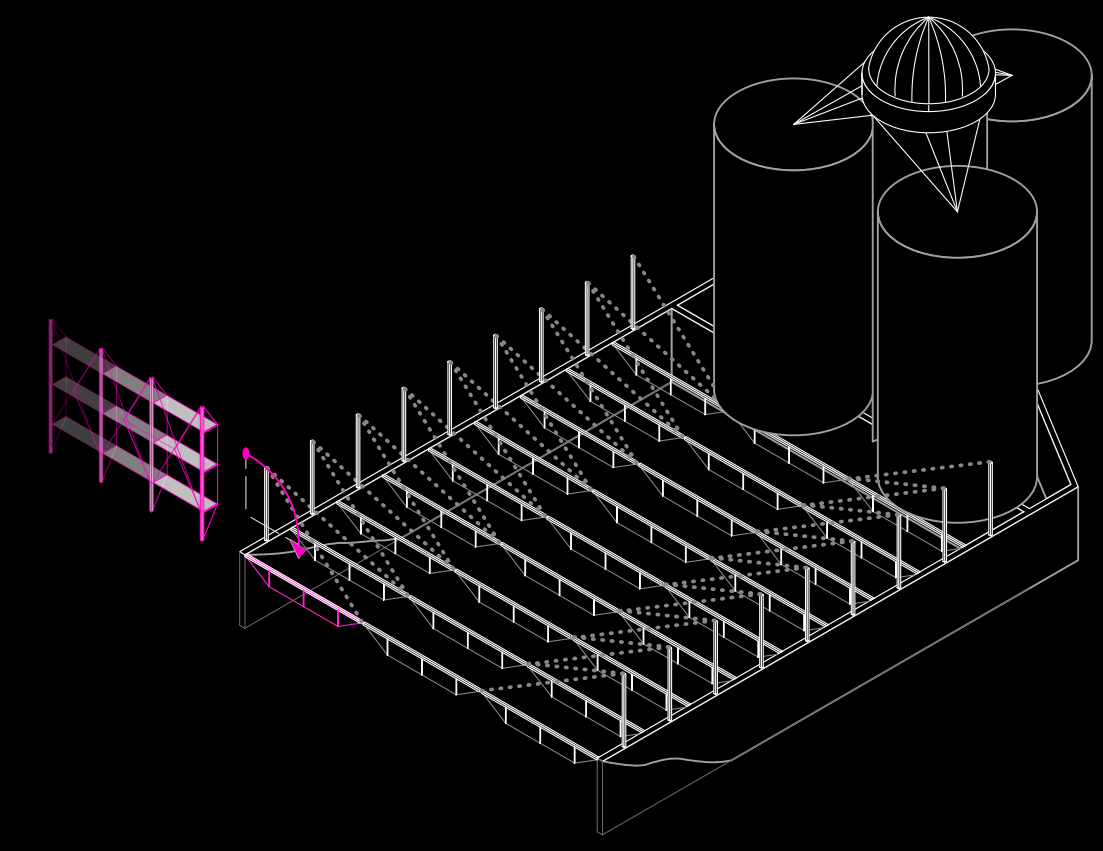




Act I



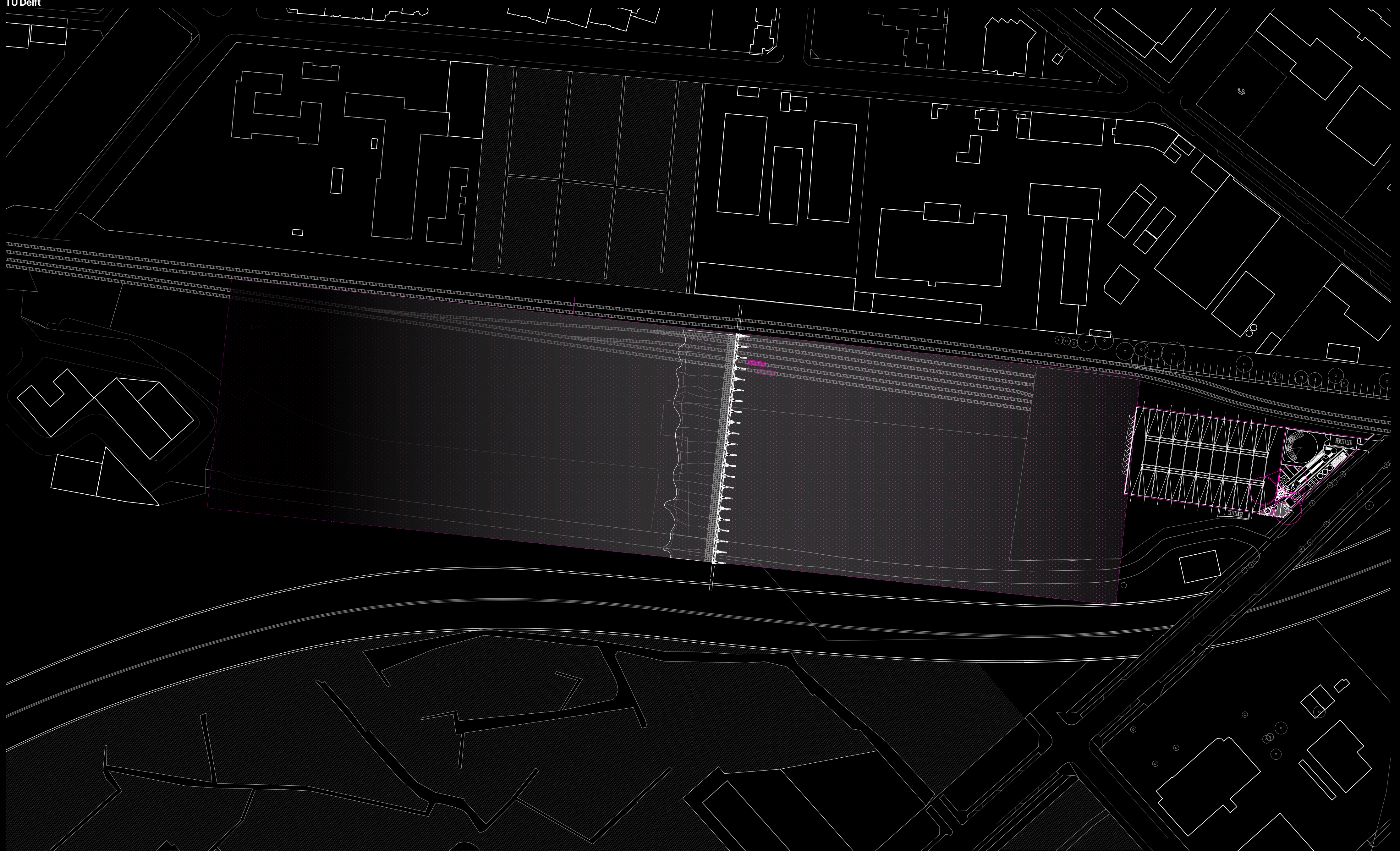
Act II



Act III

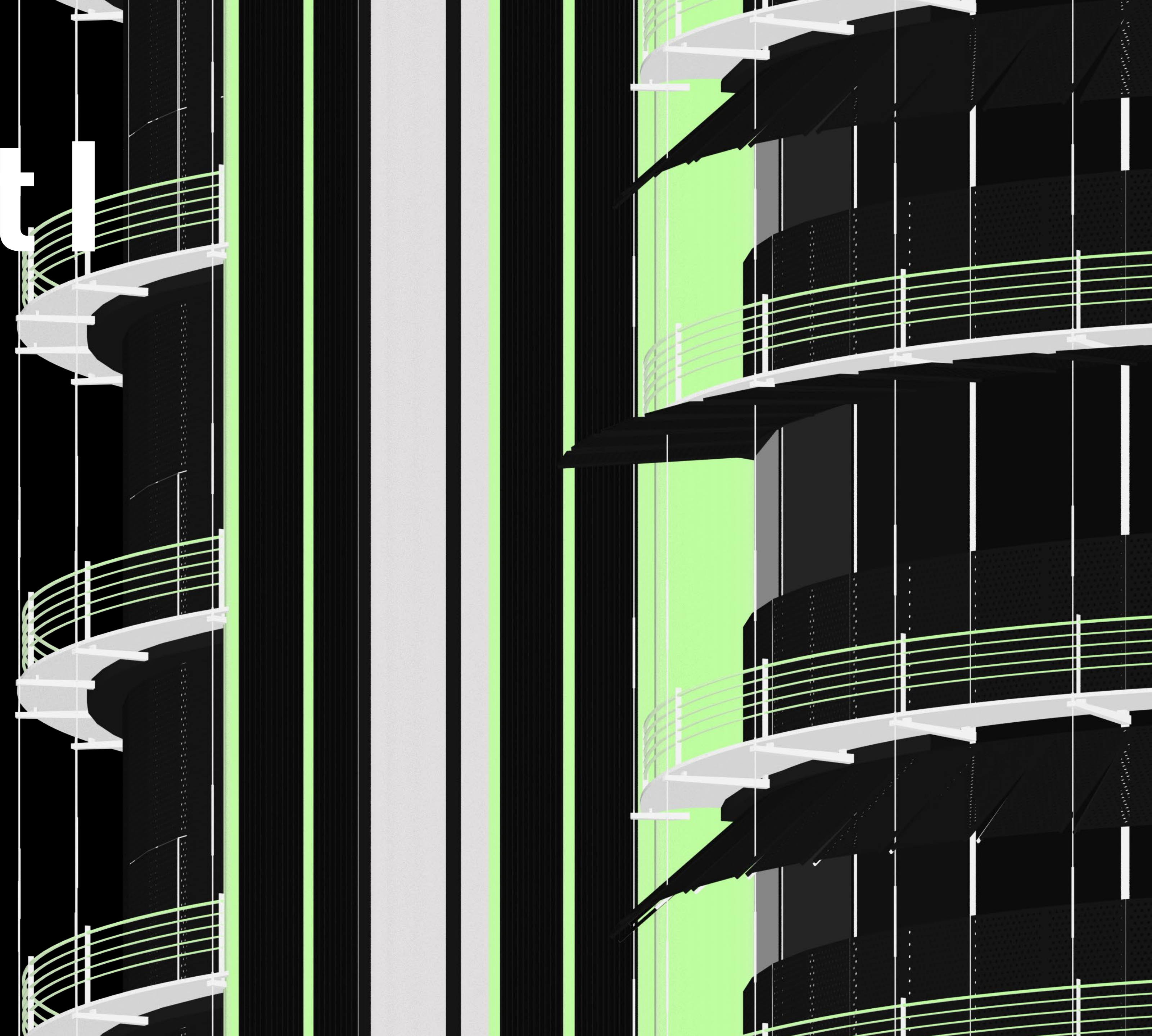
Three Acts



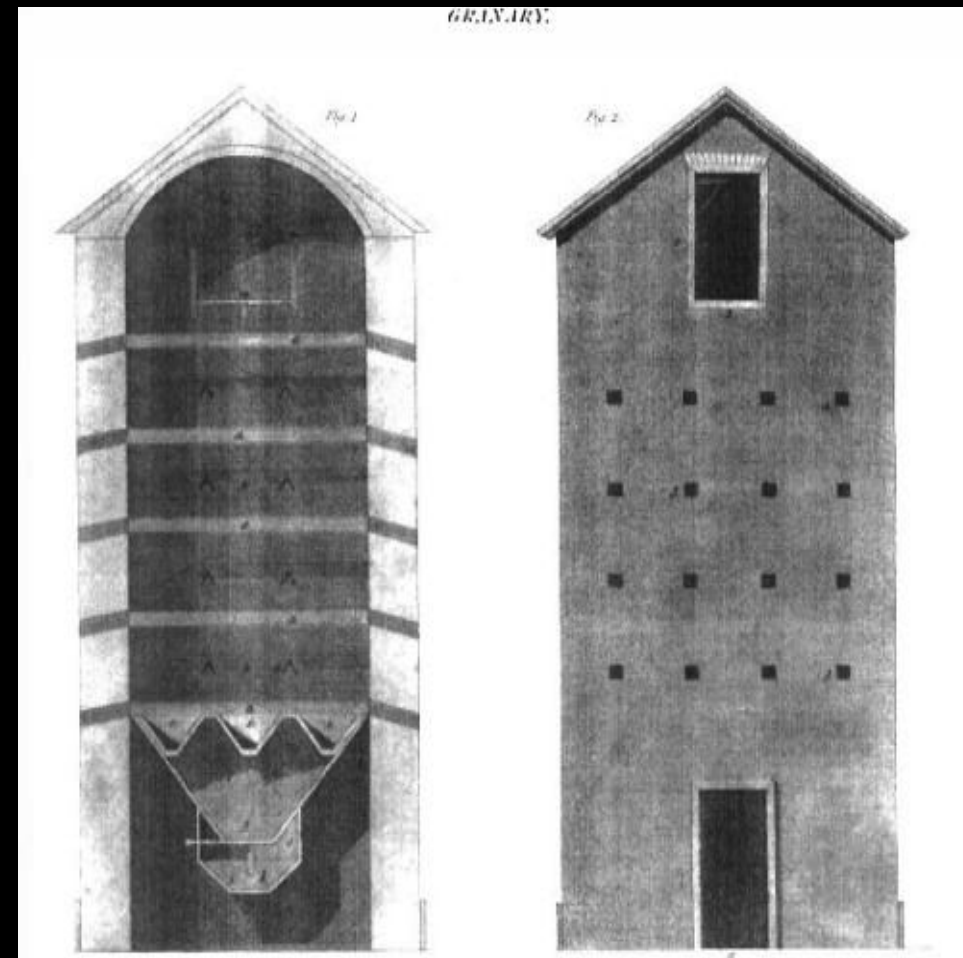




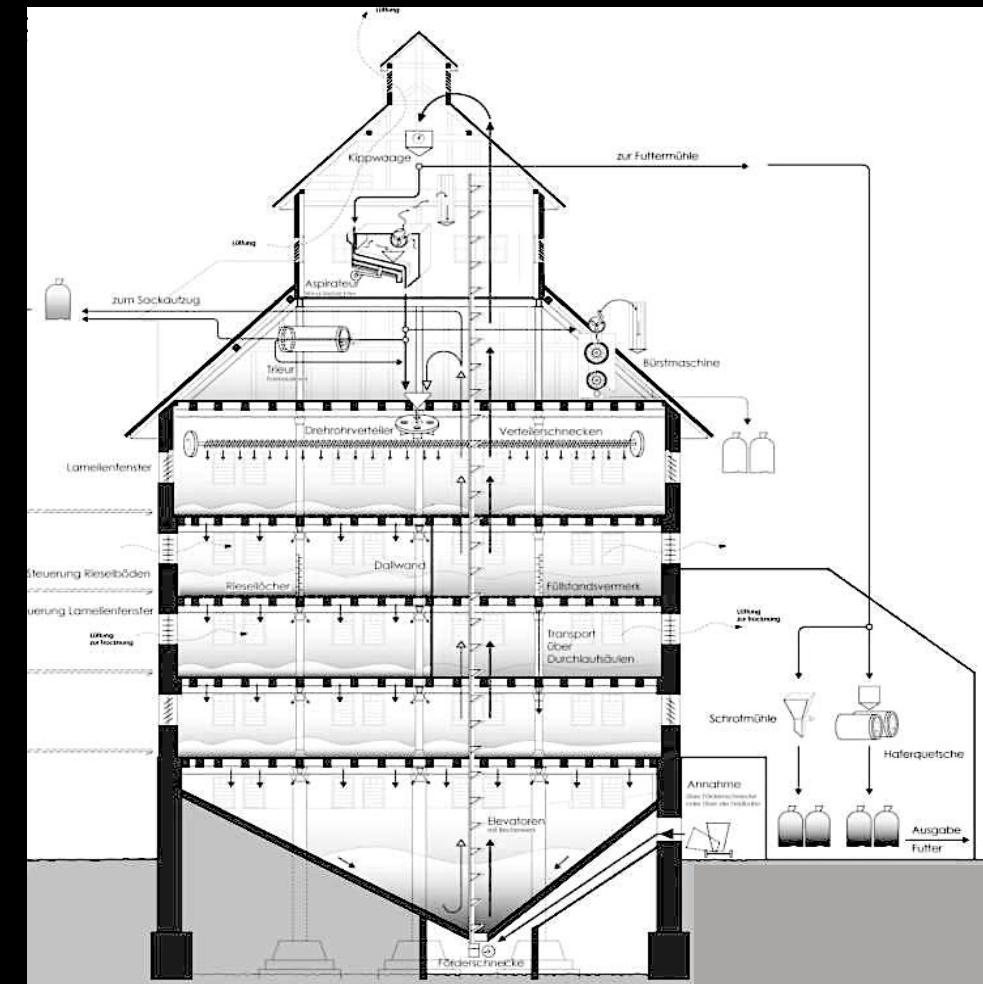
# DESIGN Act I



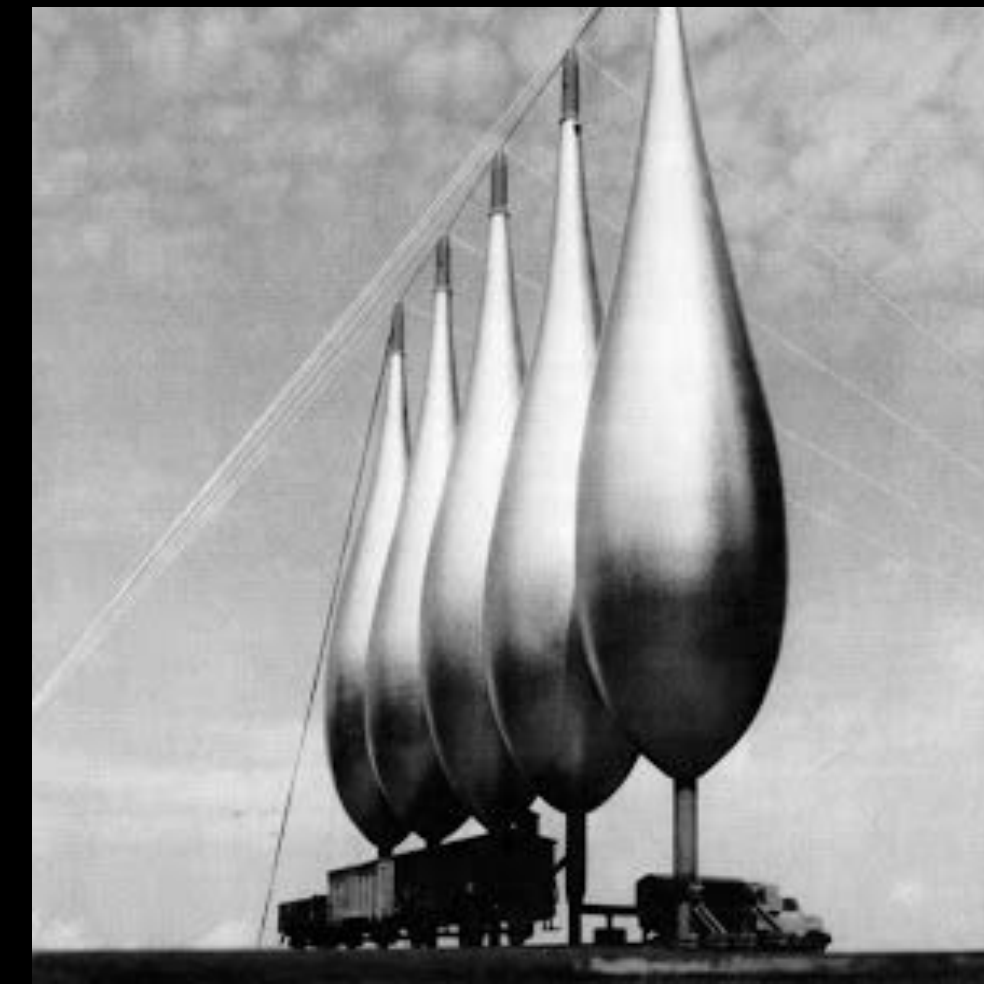




**Granaries**  
Rees, 1810  
An overlooked machine typology



**Granary Berlin-Hobrechtsfelde**  
James Hobrecht, 1889-1906  
The local version



**Silos for grain (or cement)**  
Frei Otto, 1959  
A visionary adaptation

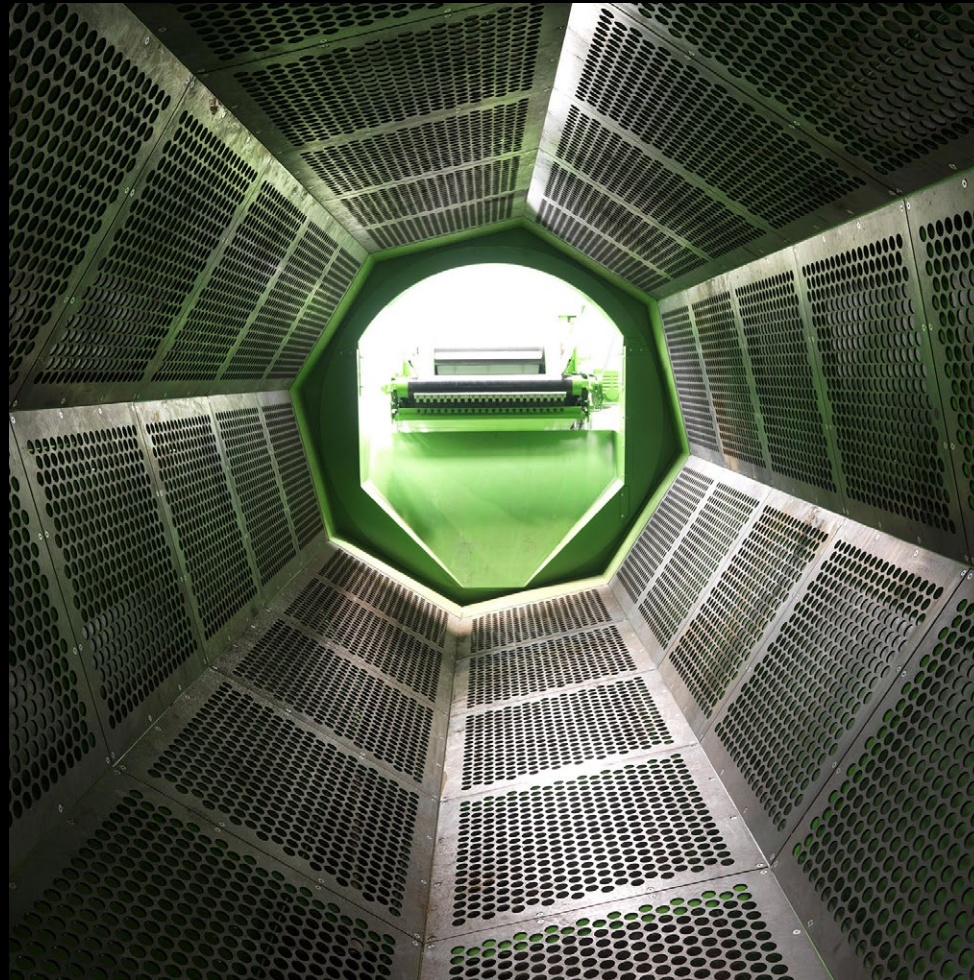
# Verticality

Volume Concept



# Screens

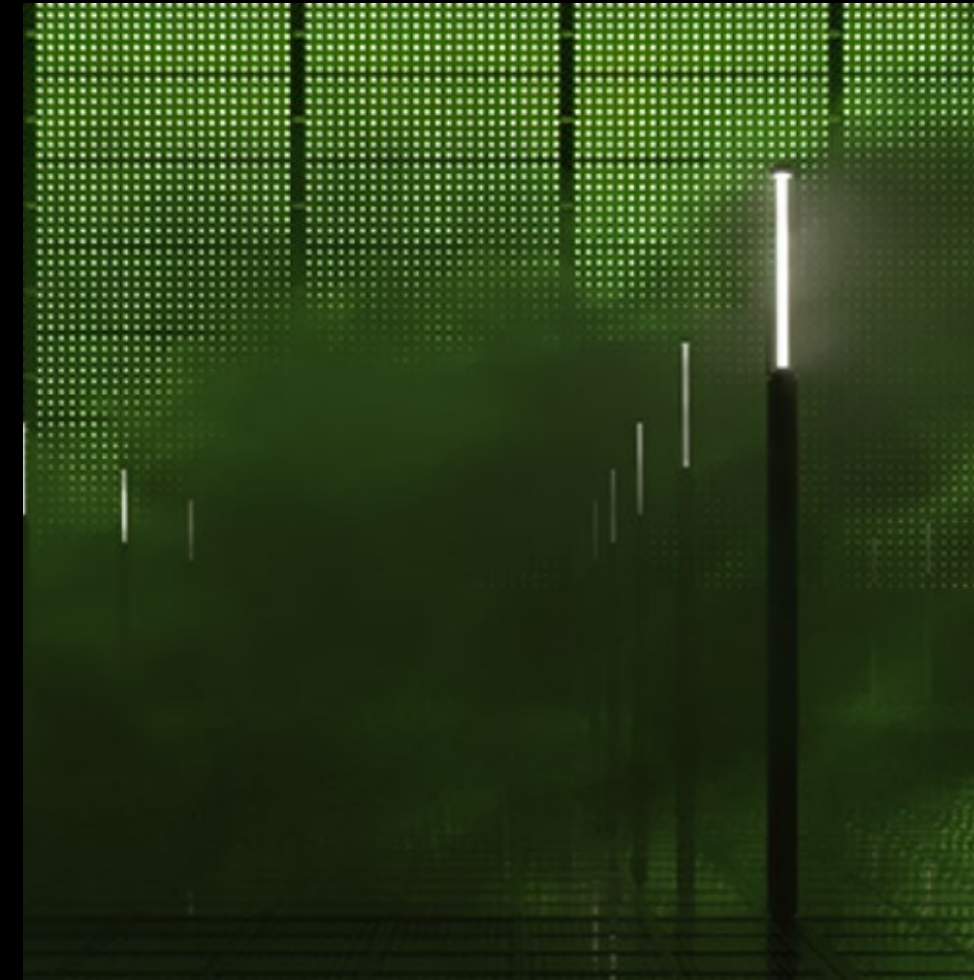
## Facade Concept



**Trommel screen**  
Mining and decontaminating  
An overlooked machine typology

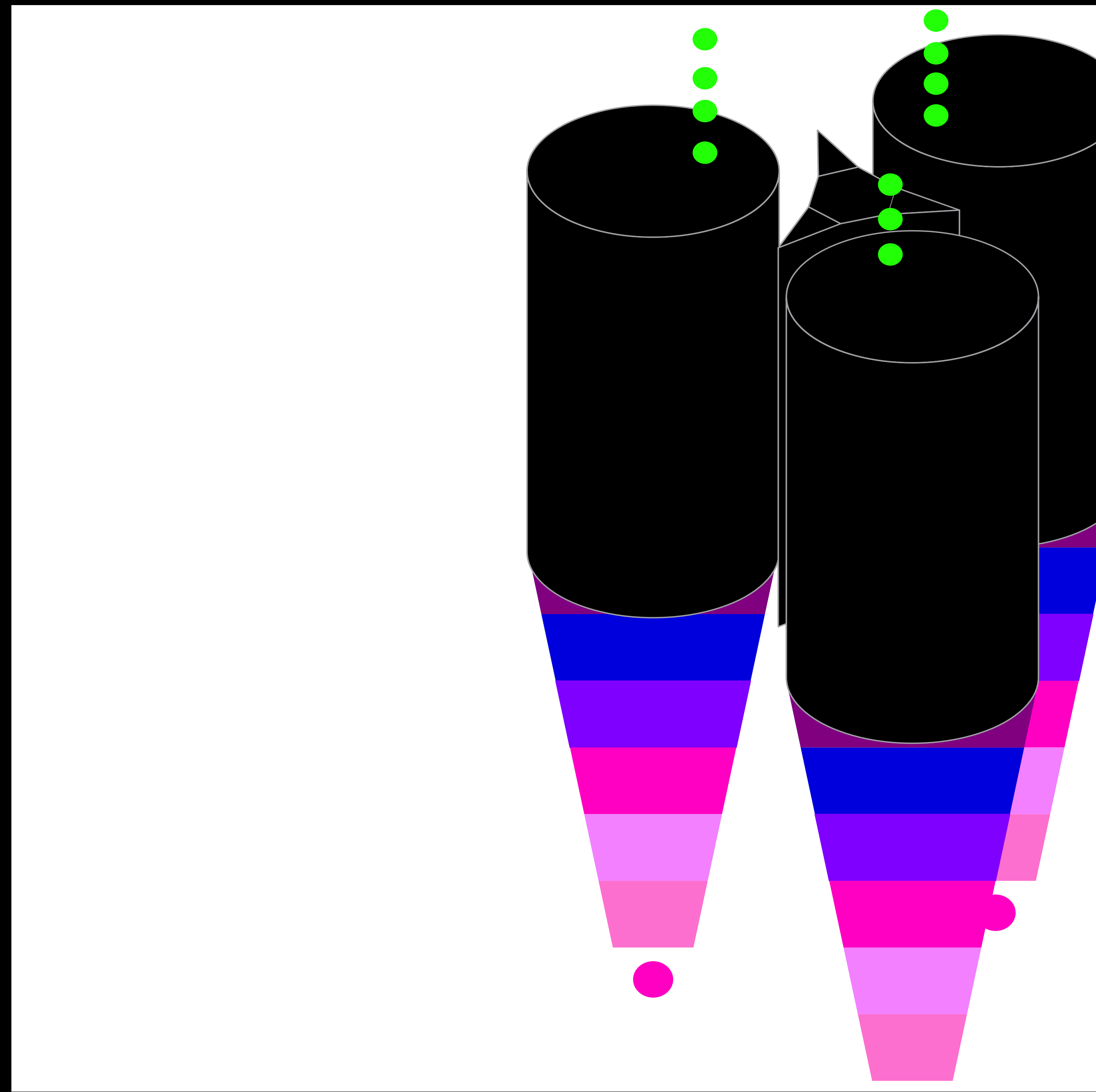


**Girl with Leica**  
Alexander Rodchenko, 1934



**LCD Screen Installation (unbuilt)**  
Studio David Klemmer / Artefactorylab, 2020





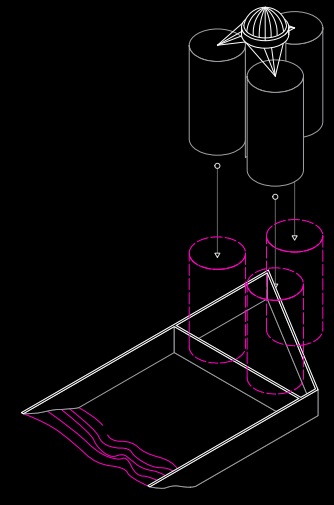




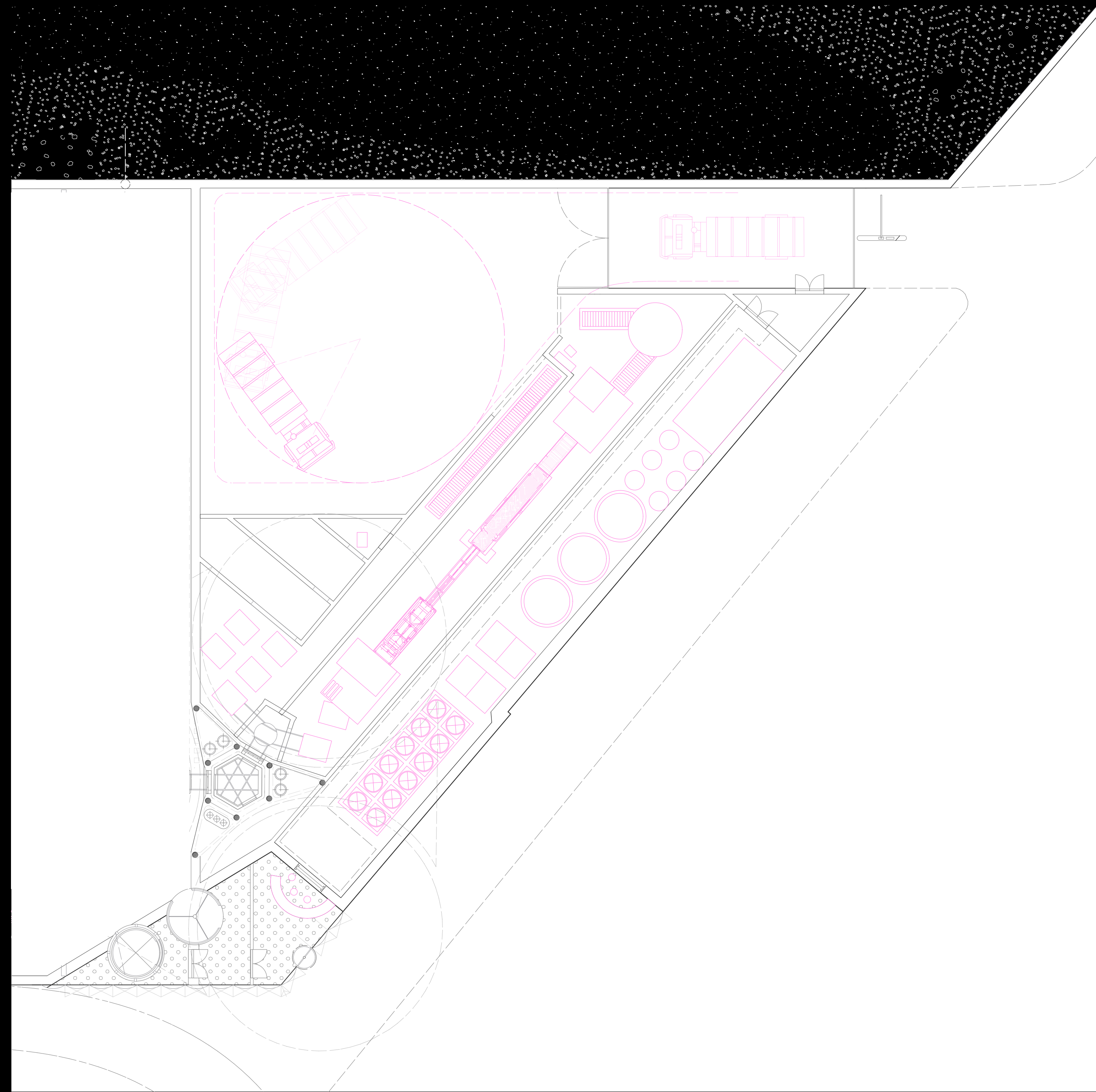
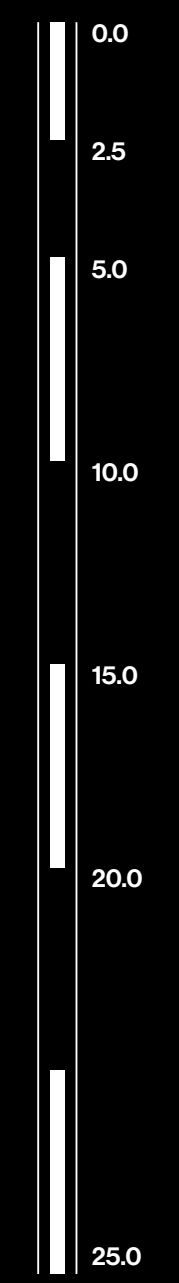


0.00

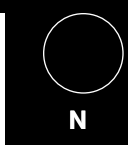
-49.20



Act I  
Groundfloor Granary  
1.200





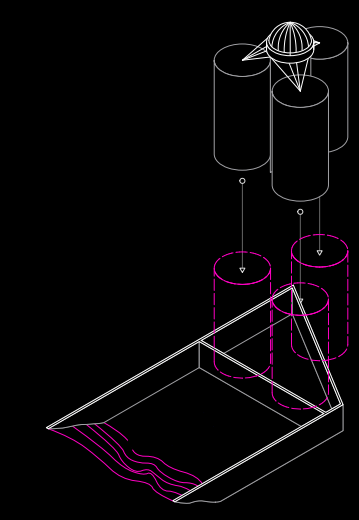
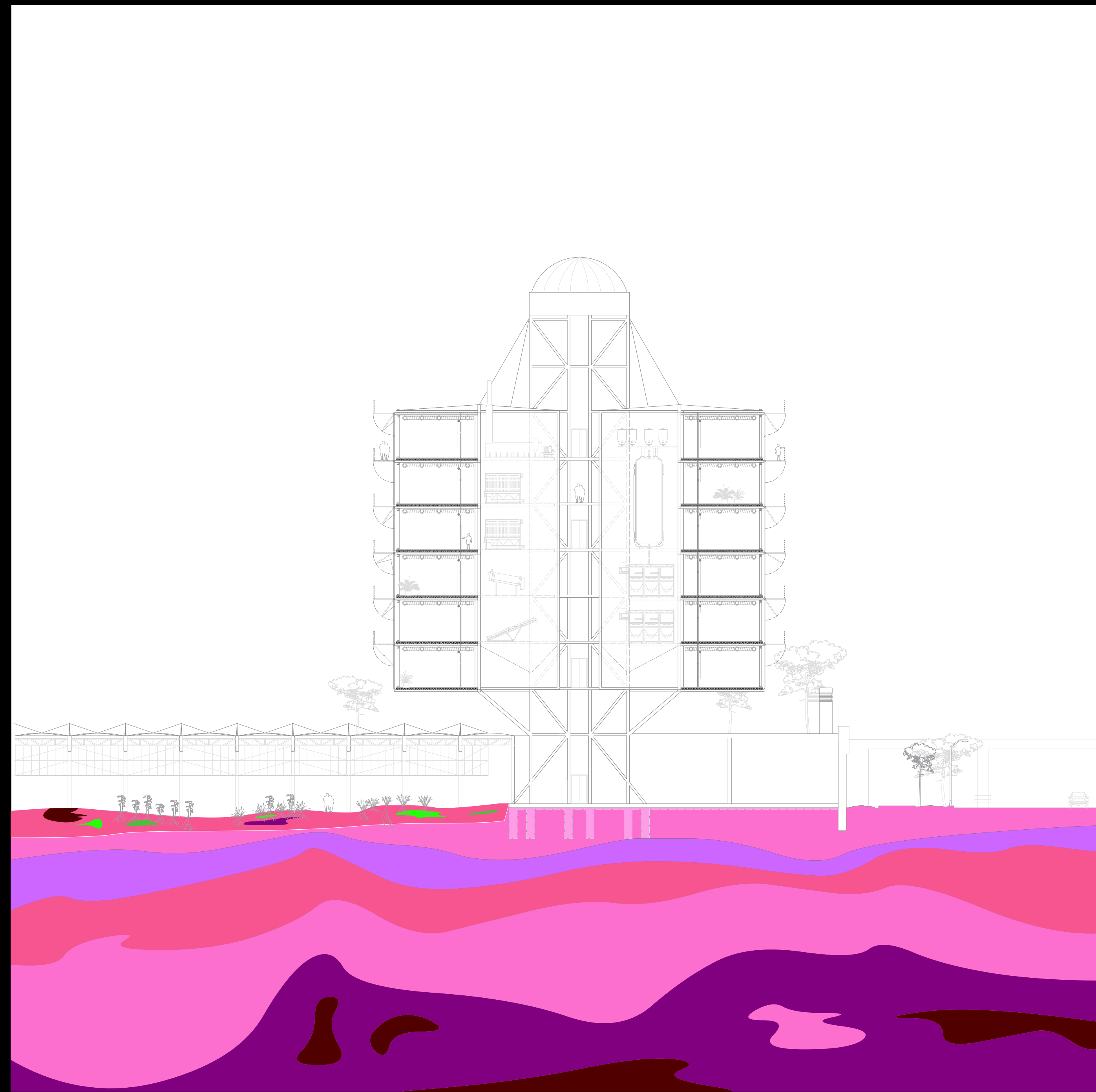


42.10

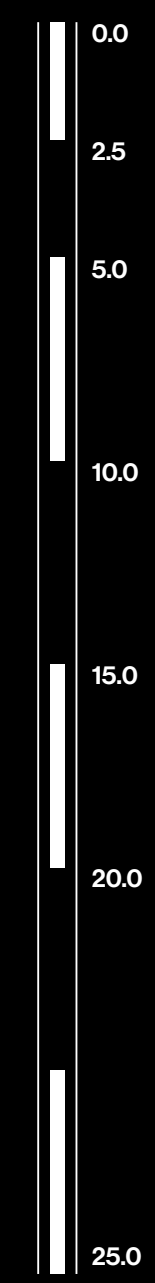
5.90

0.00

-15.10

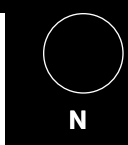


Act I  
Section Granary  
1:200



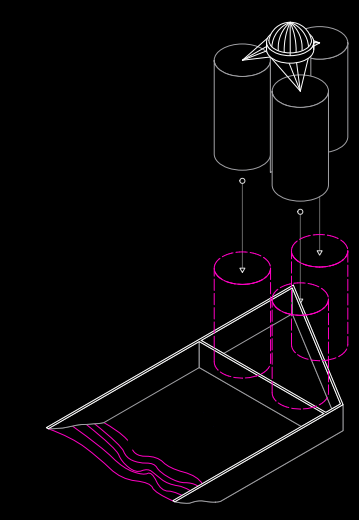
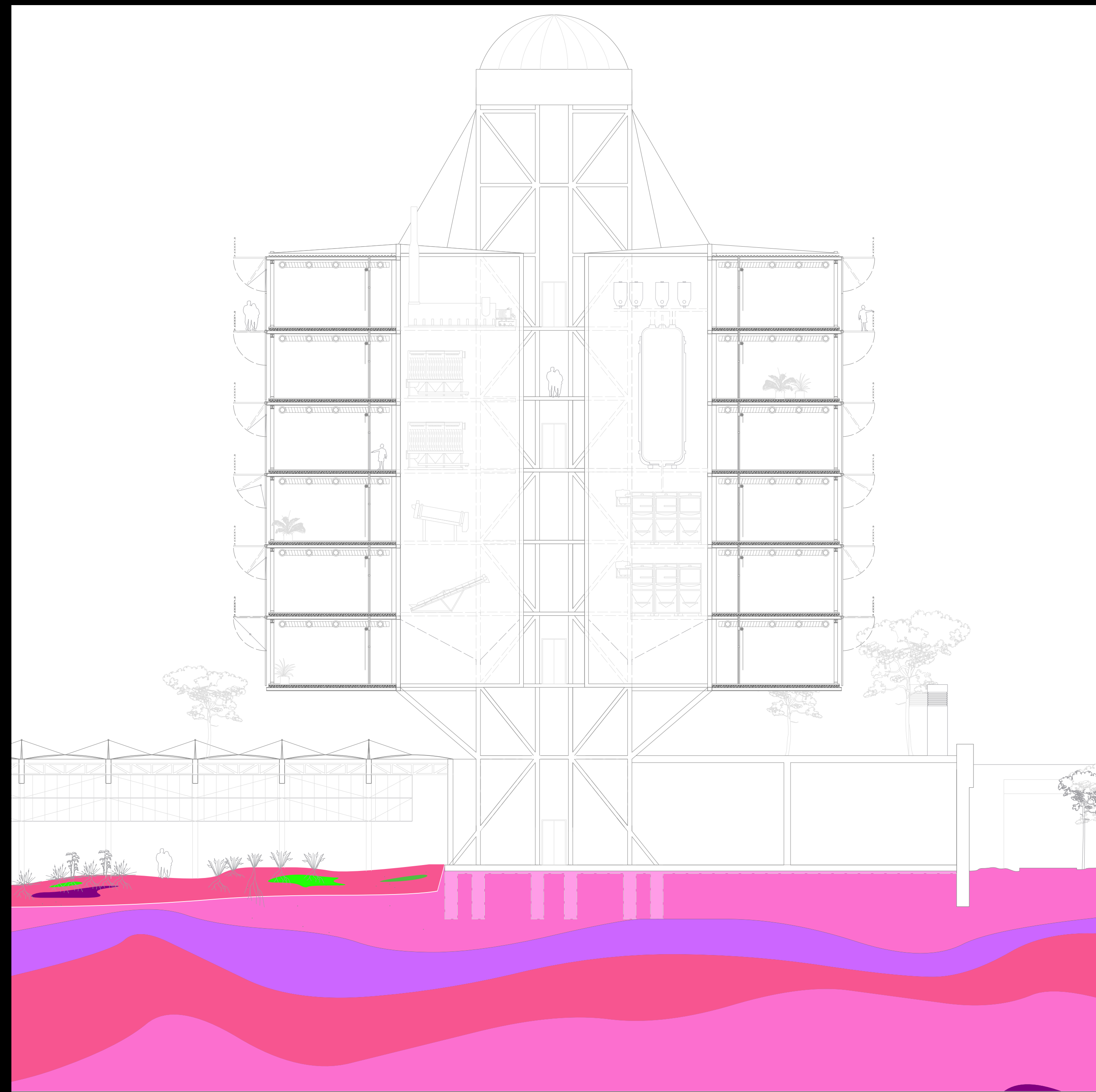


42.10

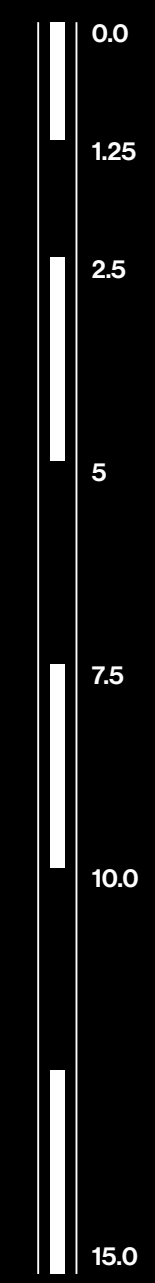


5.90

0.00

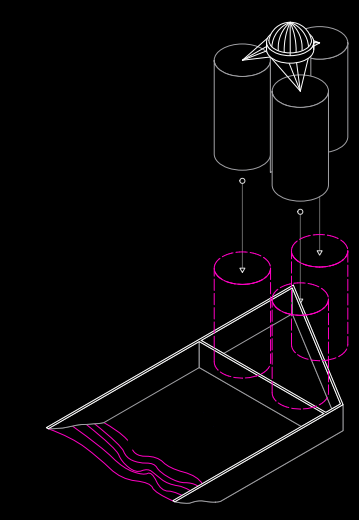
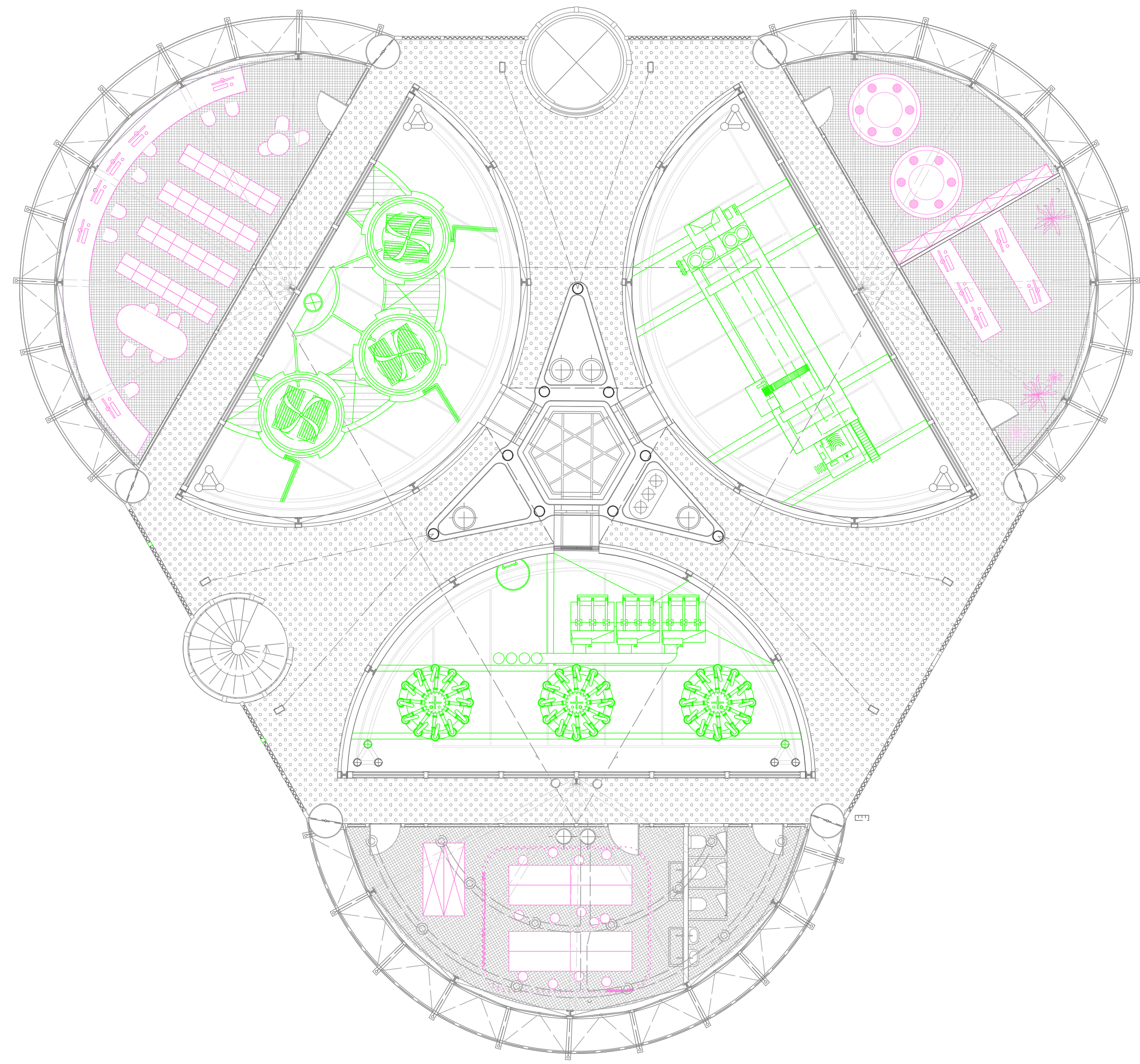


Act I  
Section Granary  
1:100

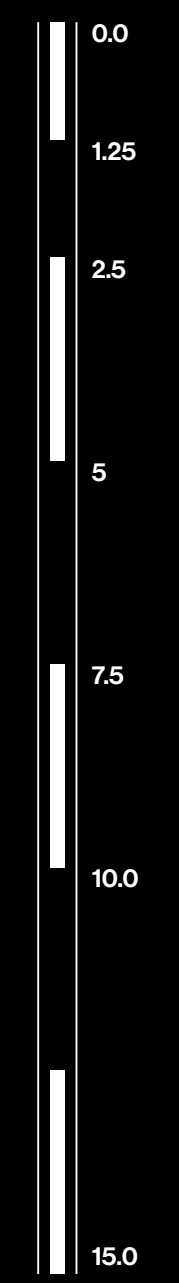




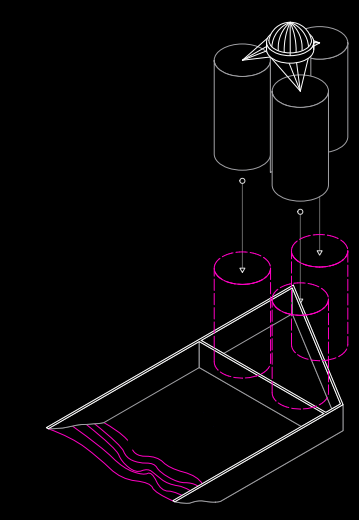
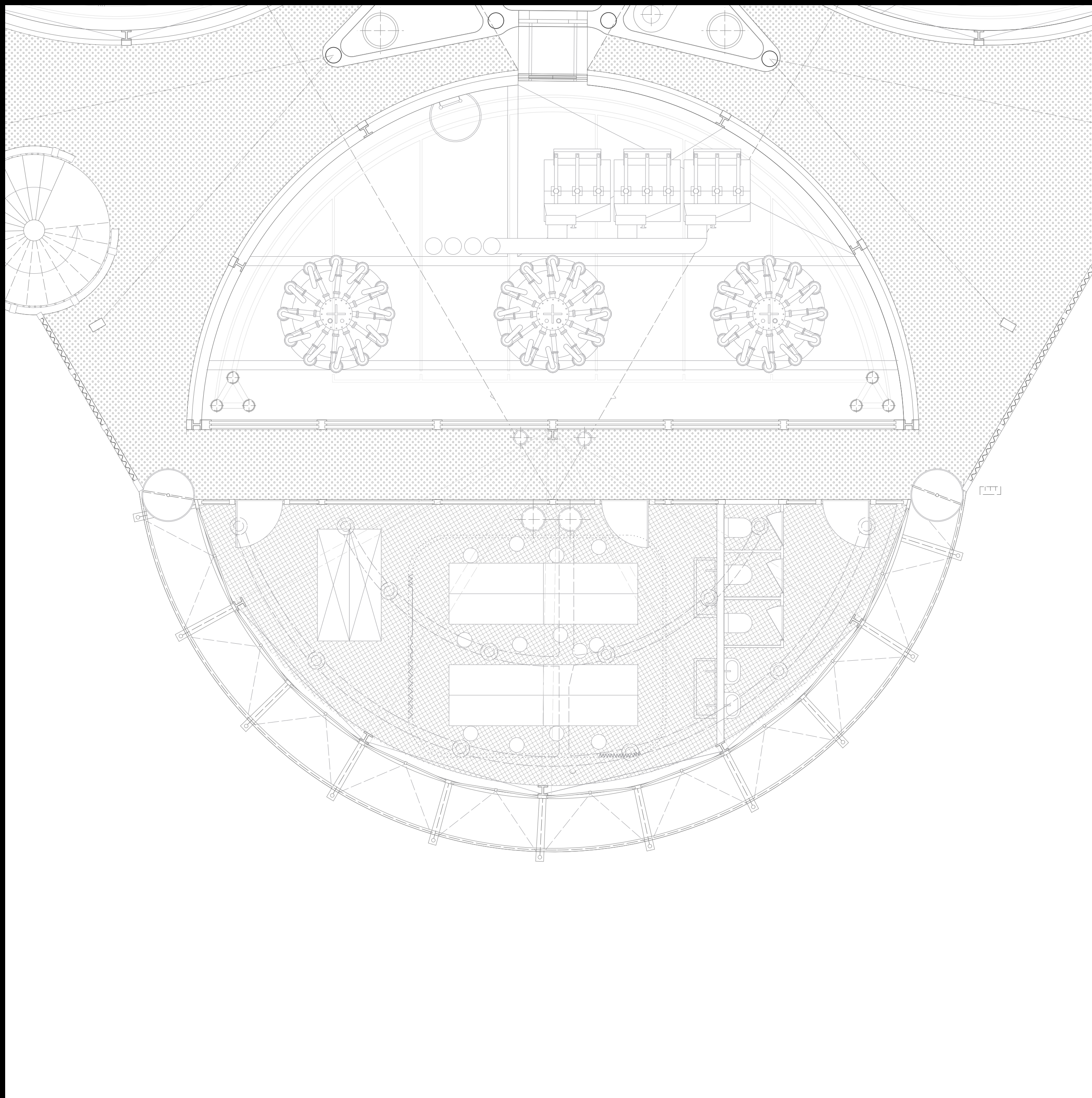
1.50  
0.00  
-7.50  
-15.00  
-16.00  
-32.50



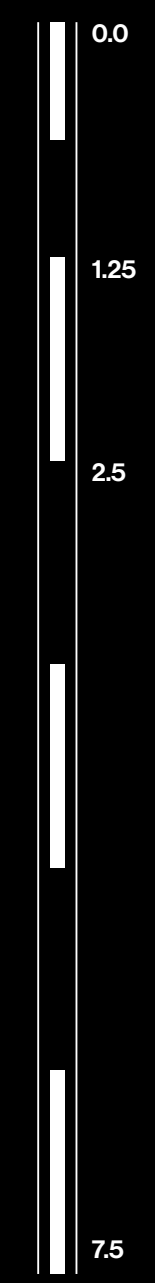
Act I  
Regular Floorplan Granary  
1:100



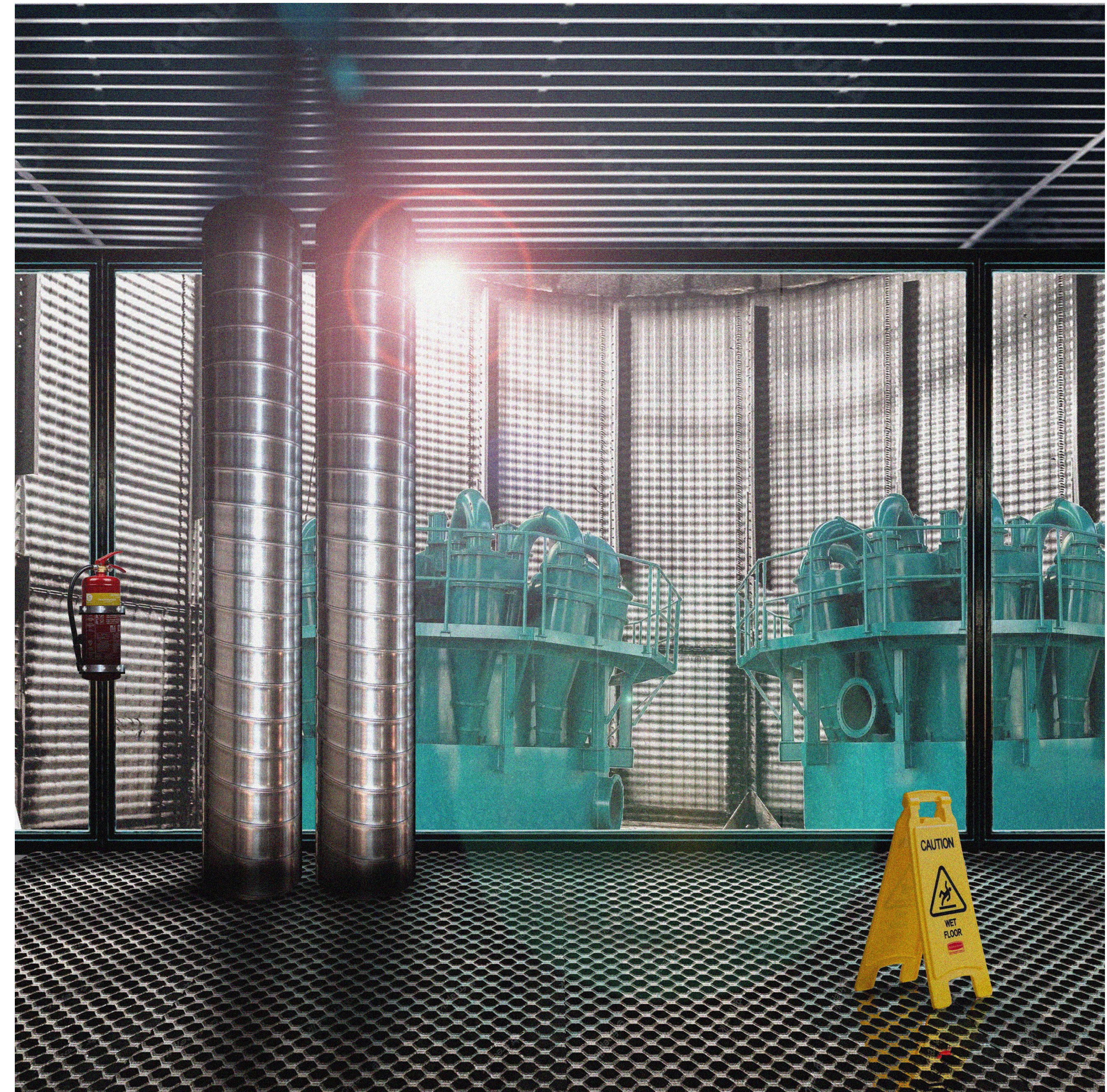




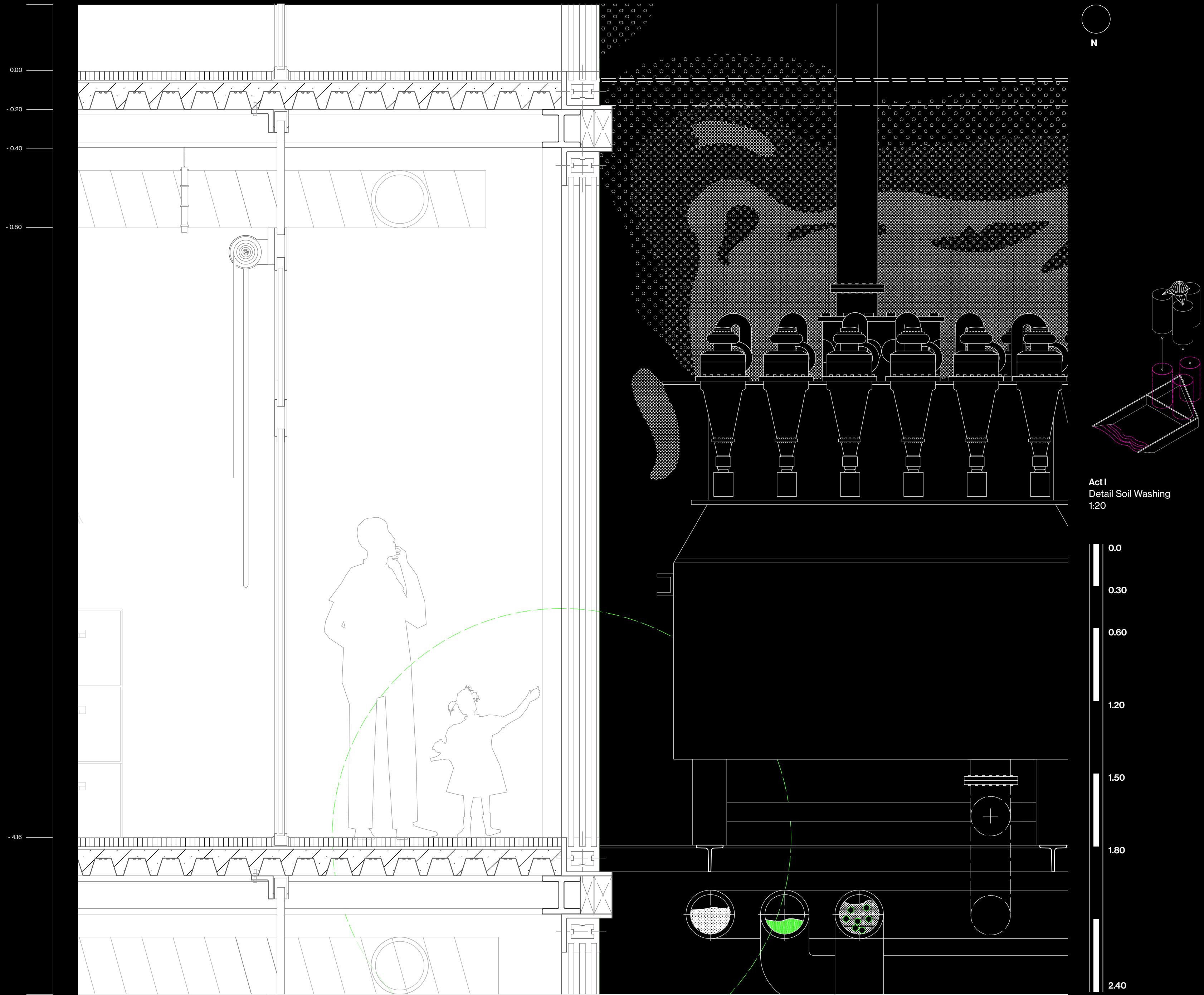
Act I  
Regular Floorplan Granary  
1.50



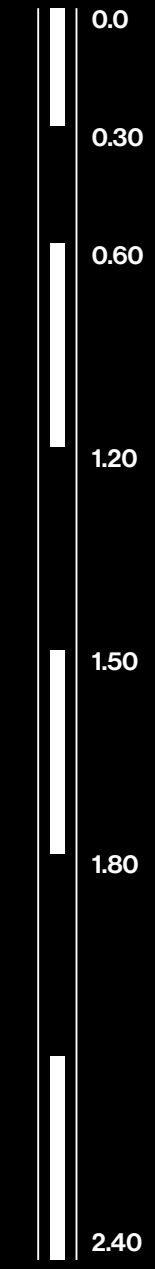






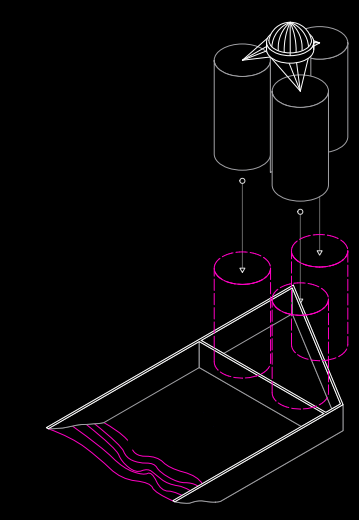
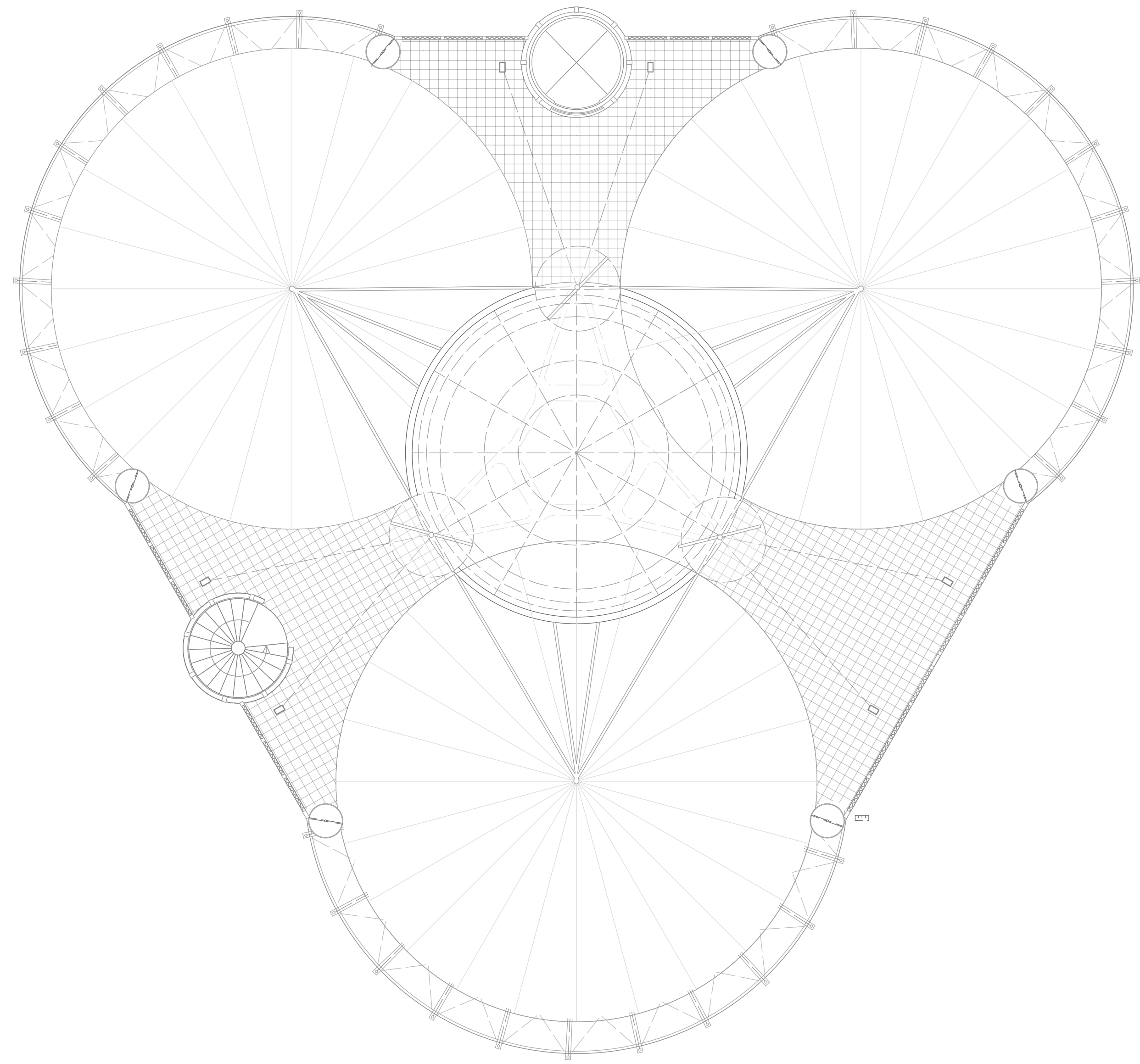


Act I  
Detail Soil Washing  
1:20

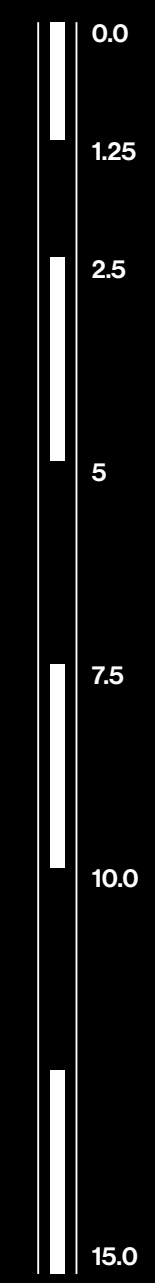




1.50  
0.00  
-7.50  
-15.00  
-16.00  
-32.50



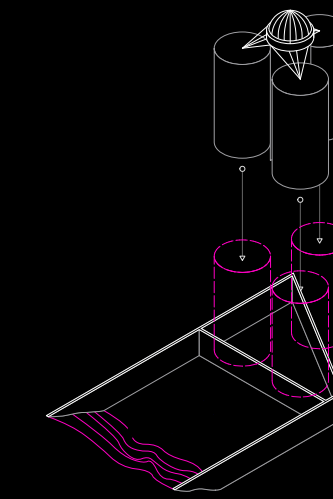
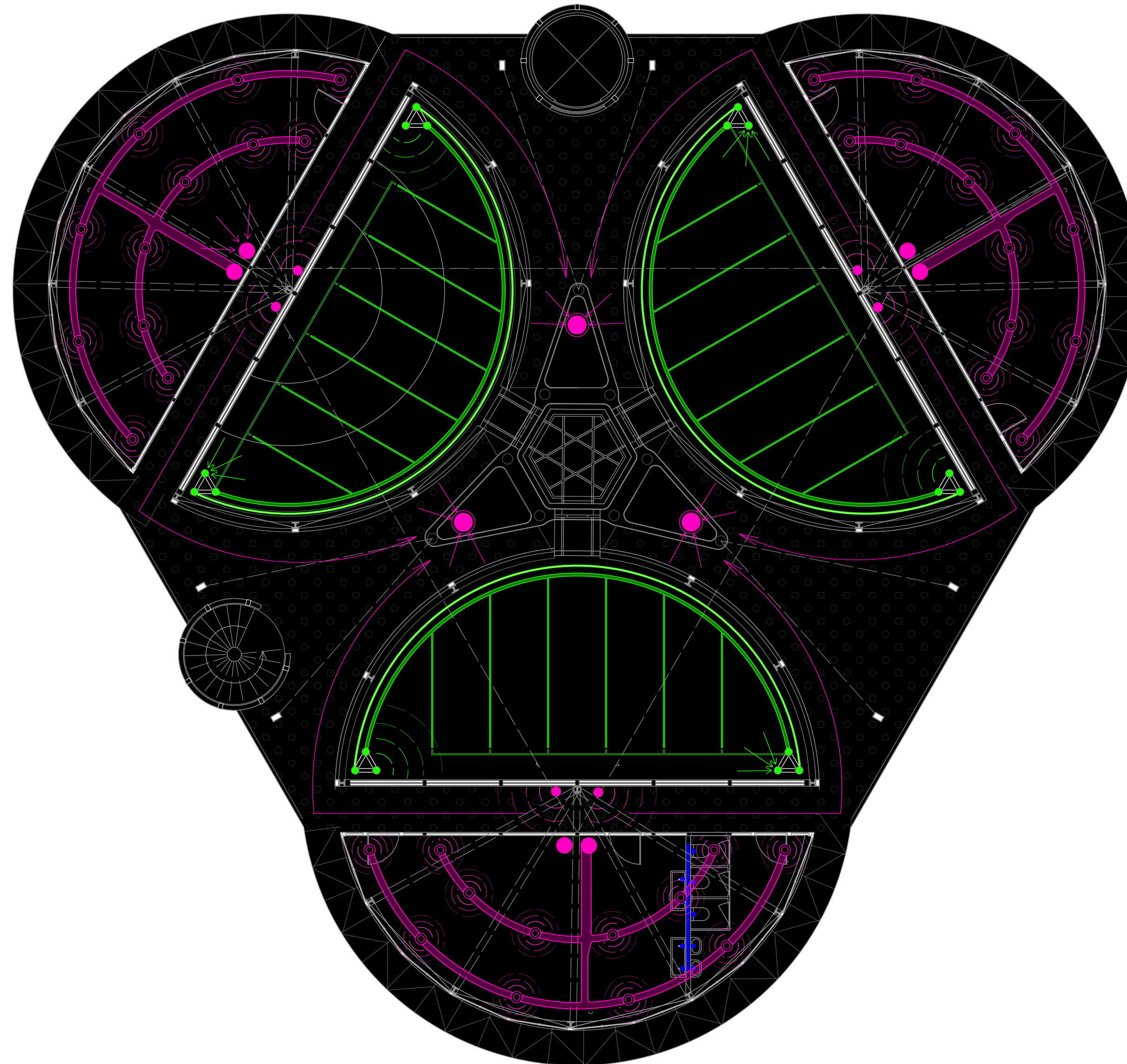
Act I  
Regular Floorplan Granary  
1:100



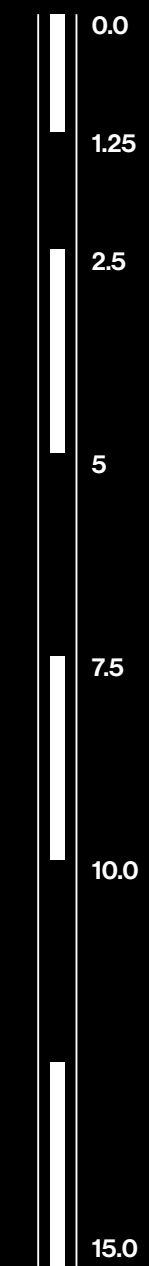




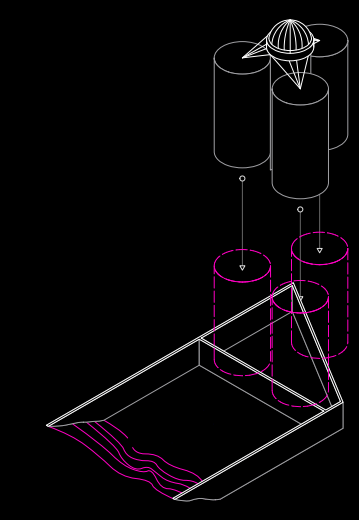
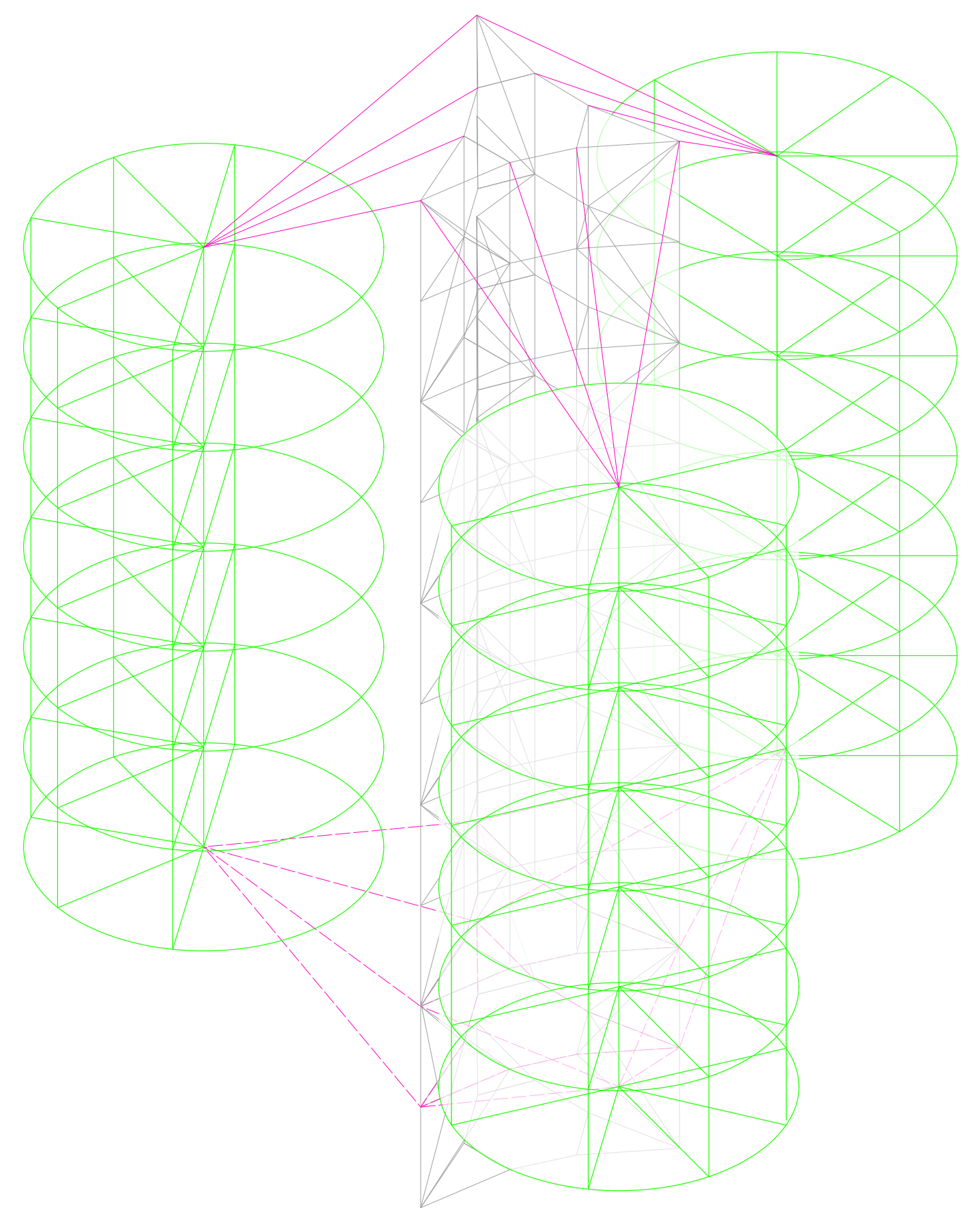
1.50  
0.00  
-7.50  
-15.00  
-16.00  
-32.50



Act I  
Regular Floorplan Granary  
1:100

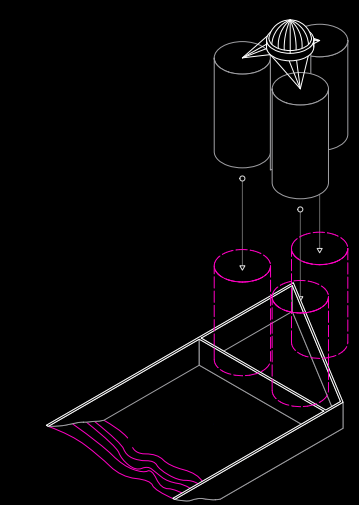
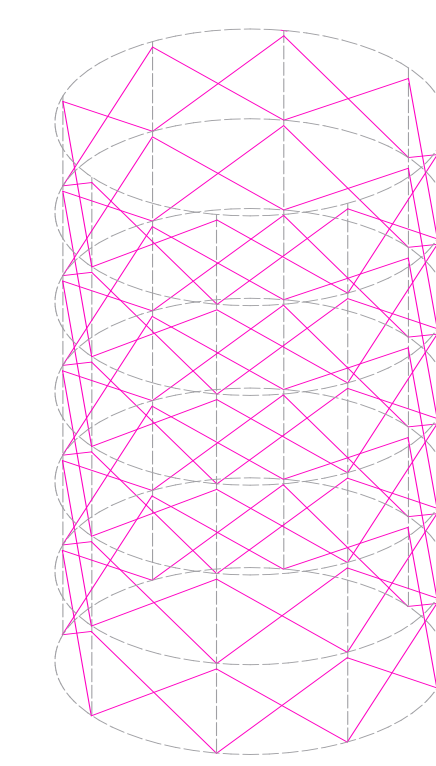
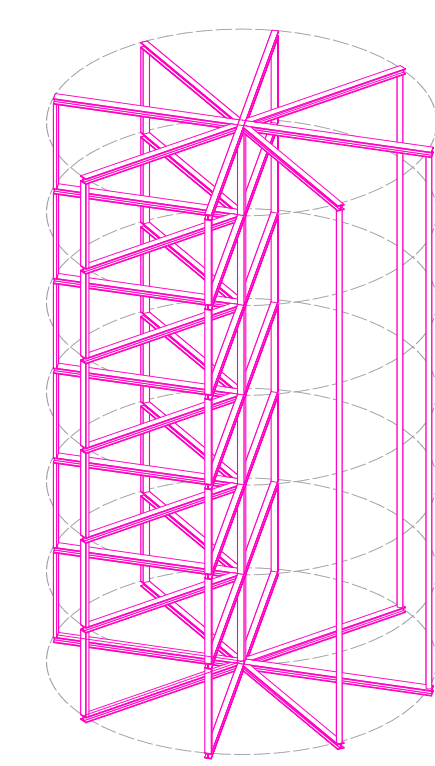
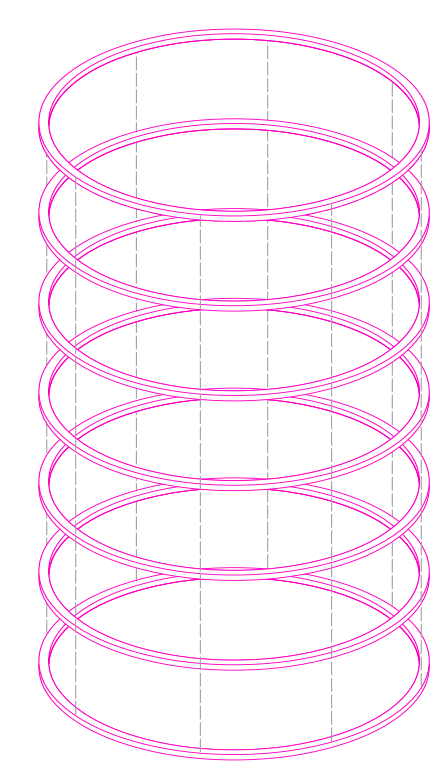
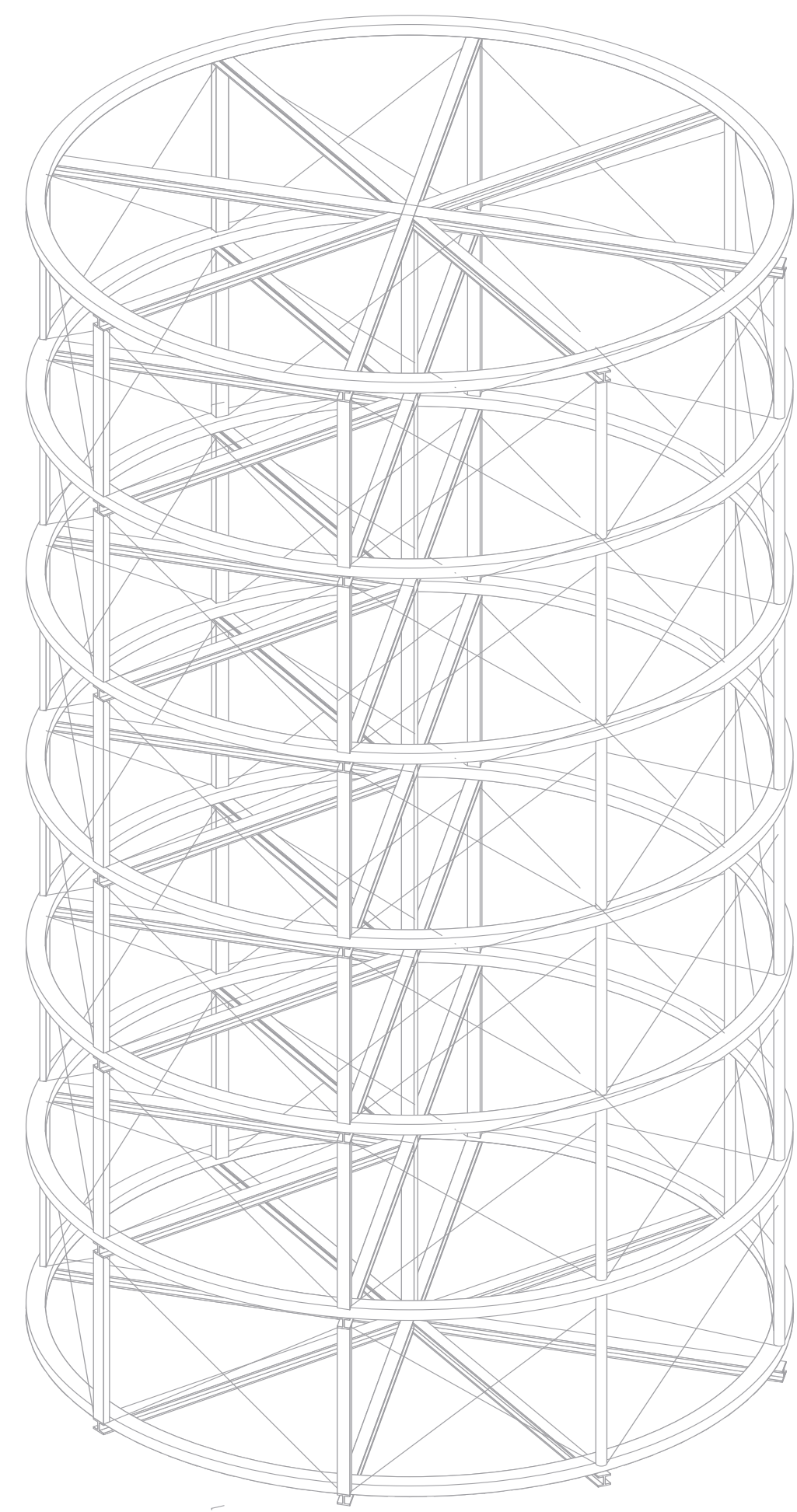






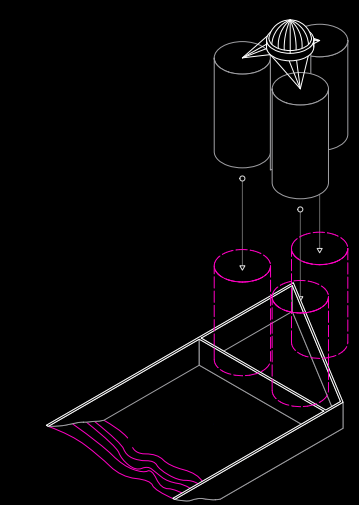
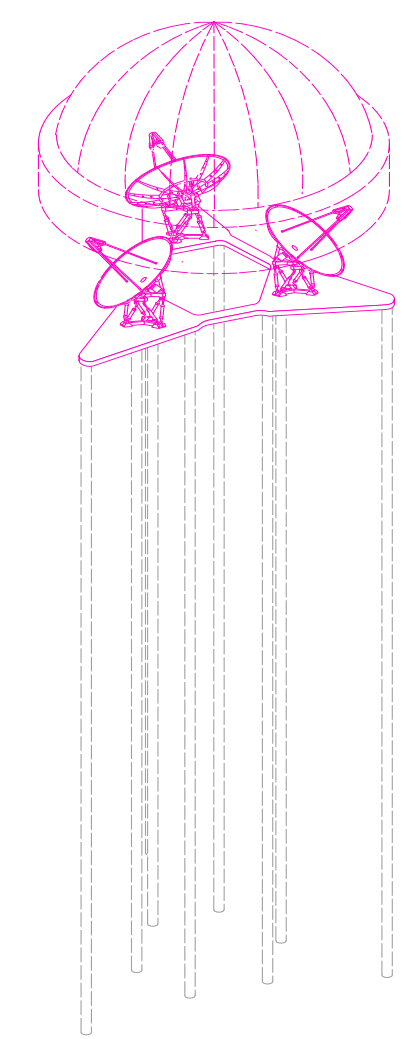
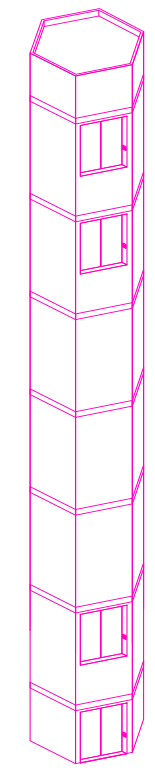
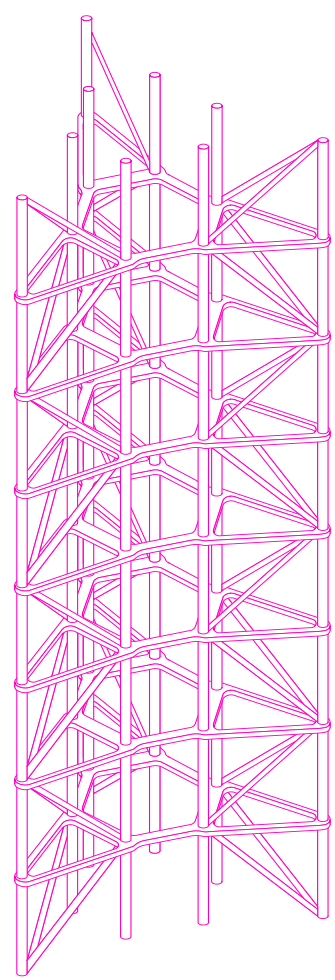
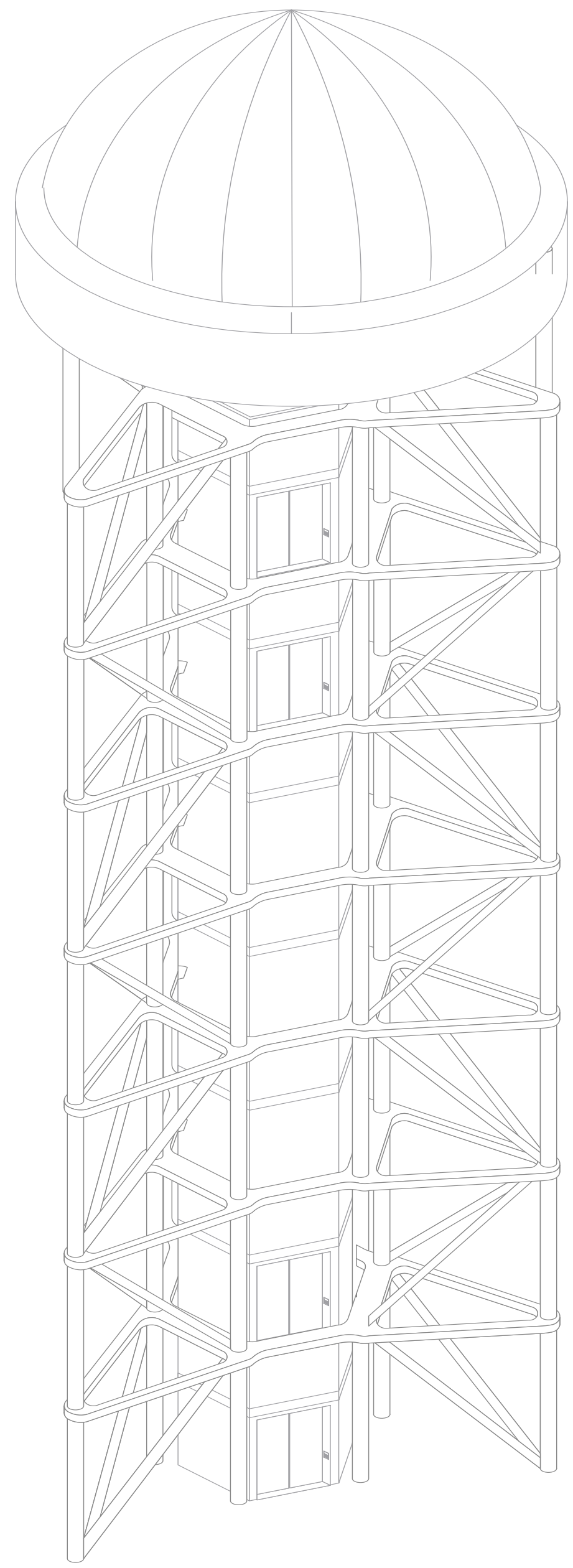
Act I  
Structural Isometric  
1.200





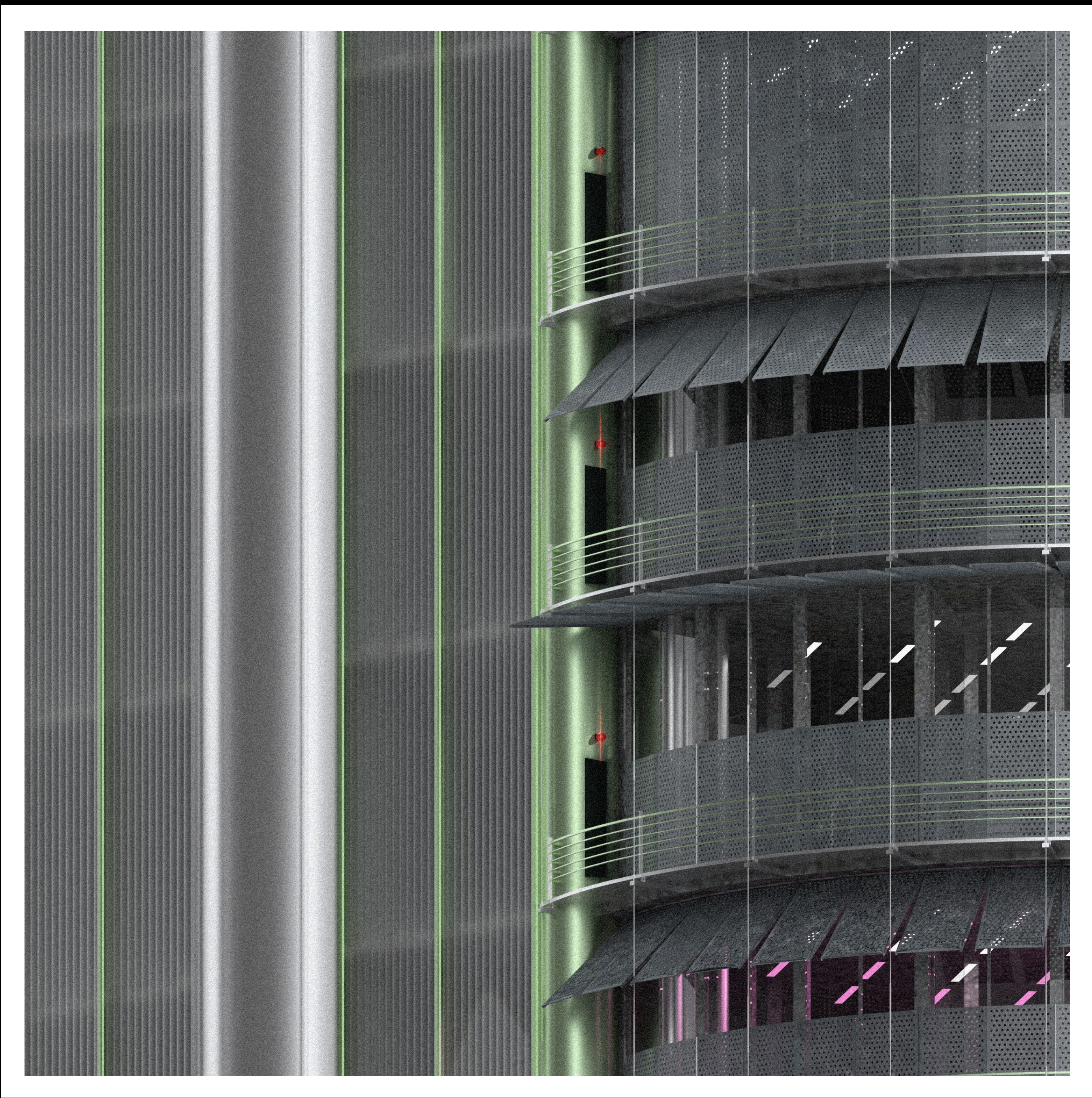
Act I  
Structural Isometric  
1:100



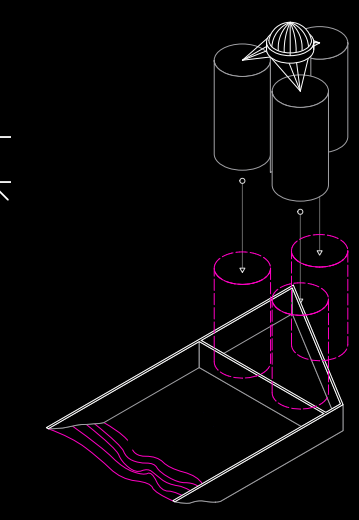
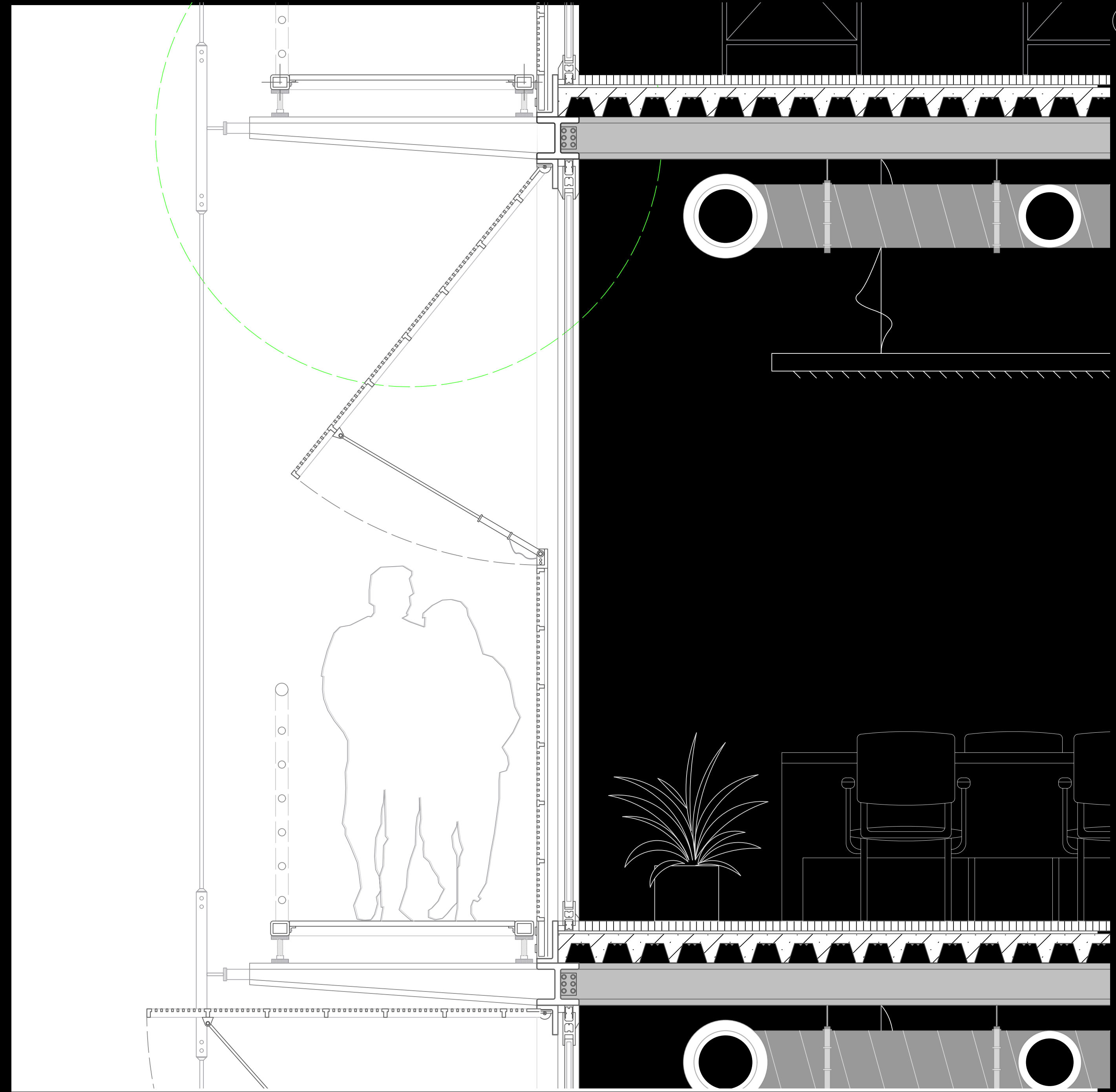


Act I  
Structural Isometric  
1:100





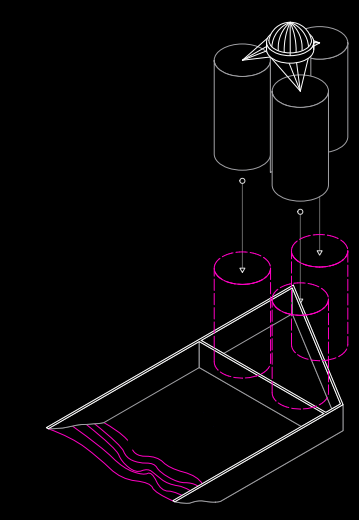
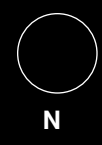
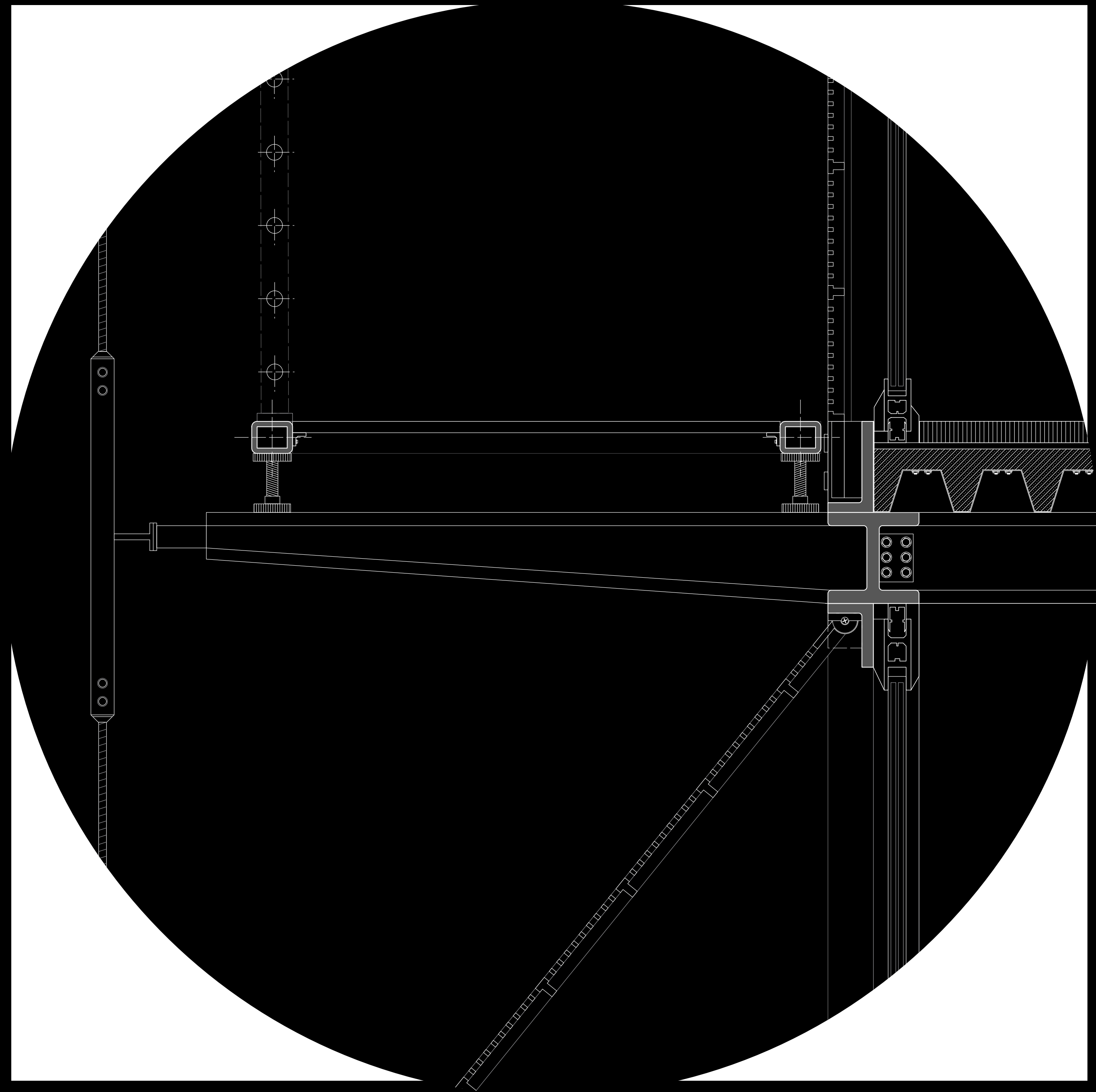




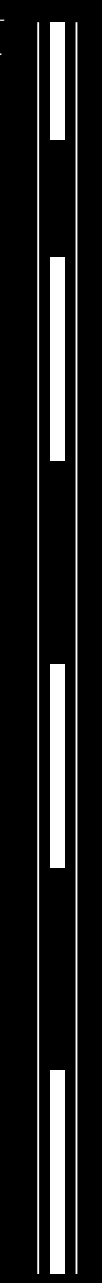
Act I  
Detail Facade  
1:20







Act I  
Detail Balcony  
1.5

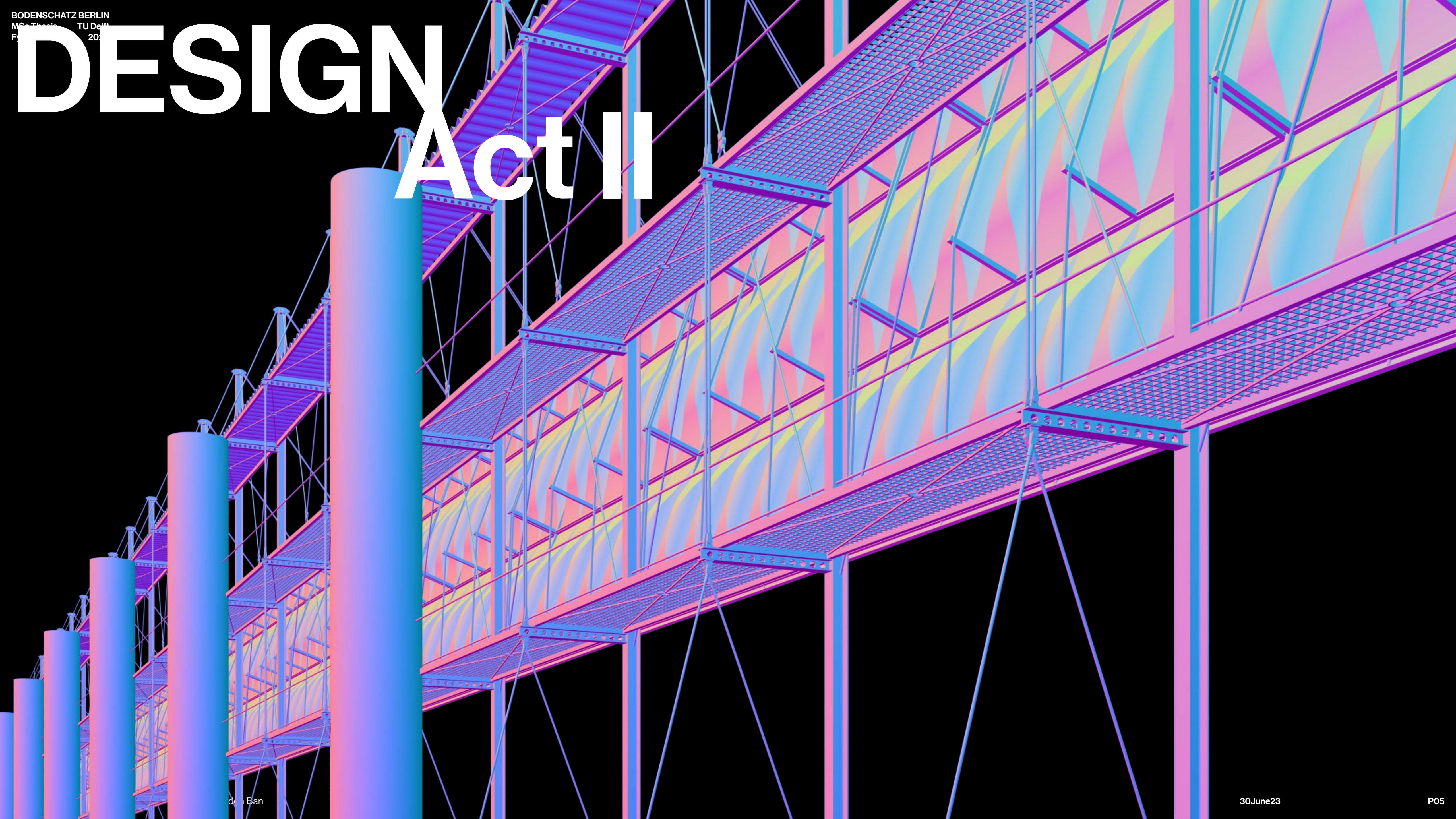








# DESIGN Act II





# Dynamism

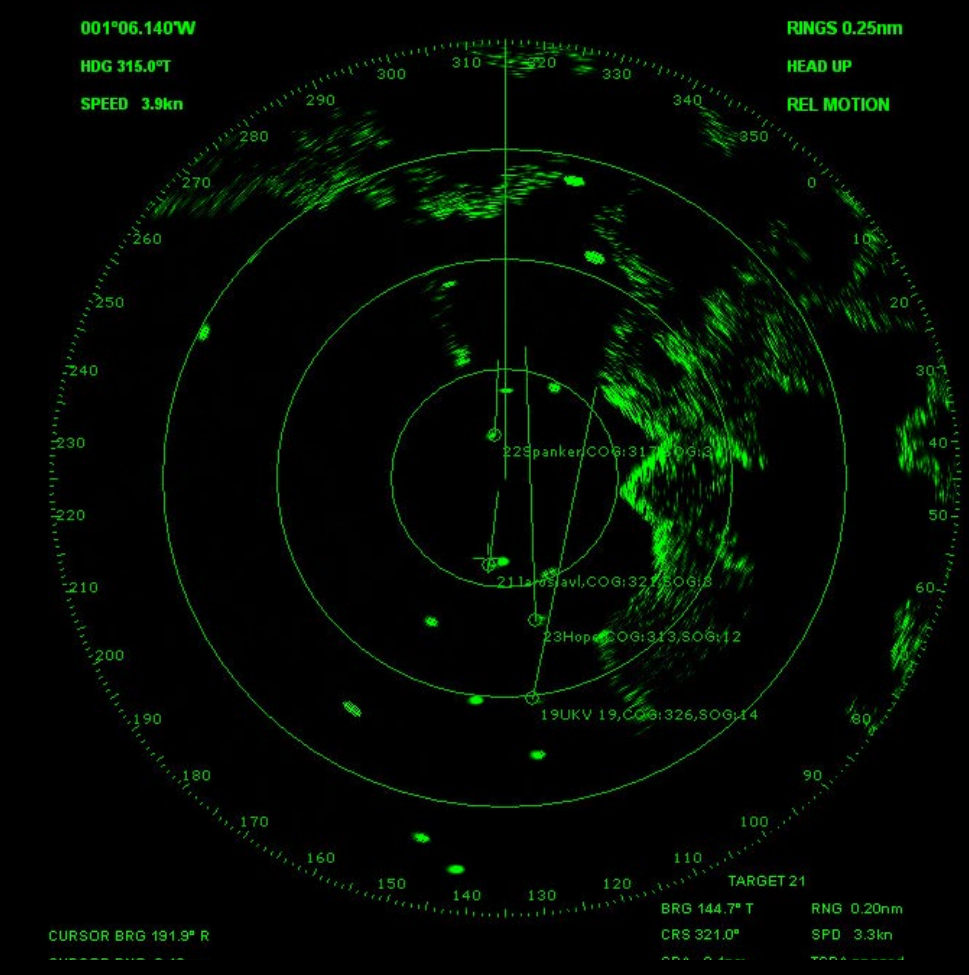
Process Concept



**Dress with train**  
Wedding of Prince Harry and Meghan Markle

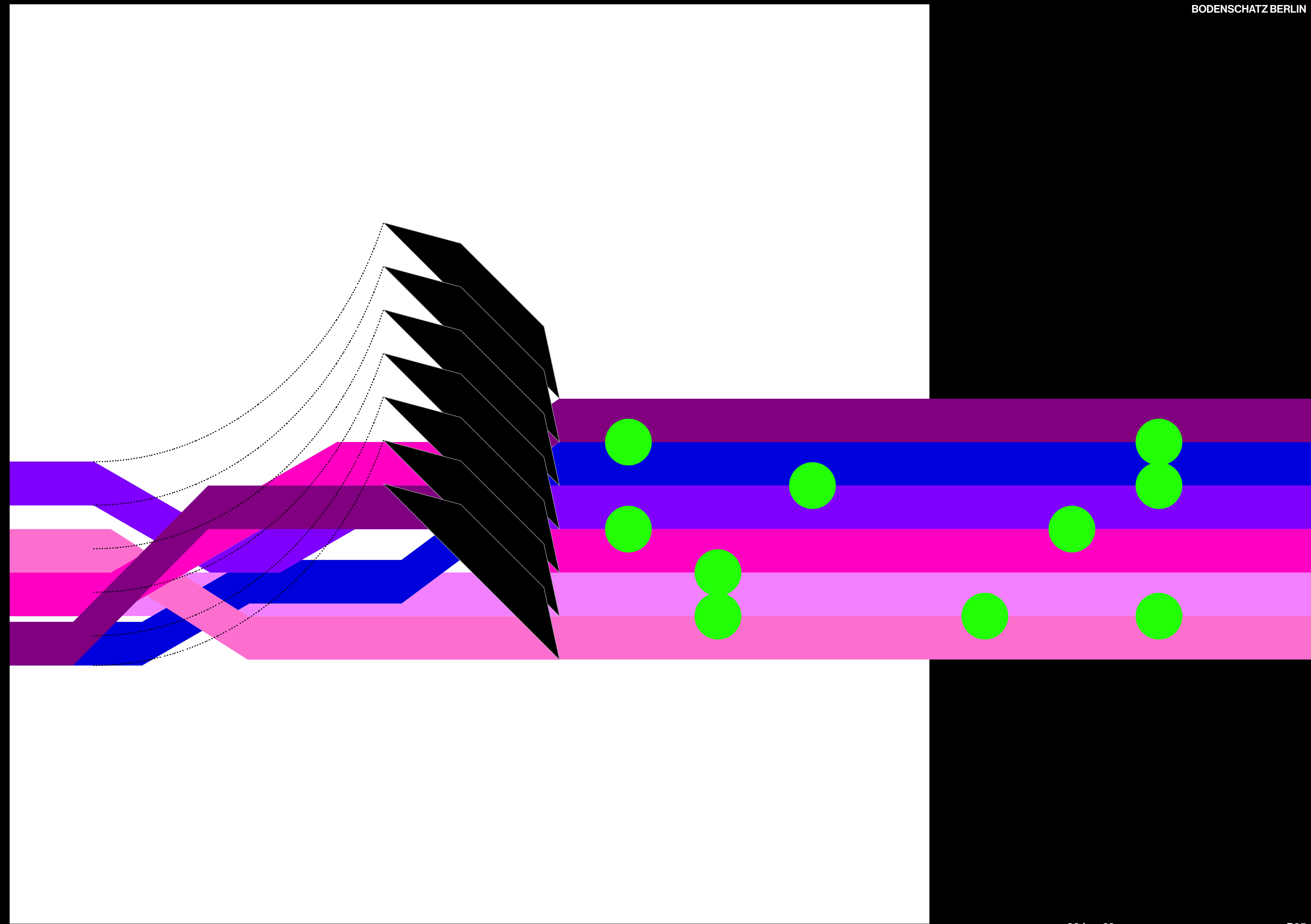


**Tractor drag**  
Giants Software: Farming Simulator 2018



**Radar Scanner**  
Echolotic scanning on a container ship

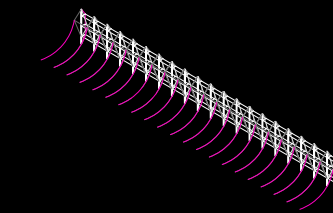
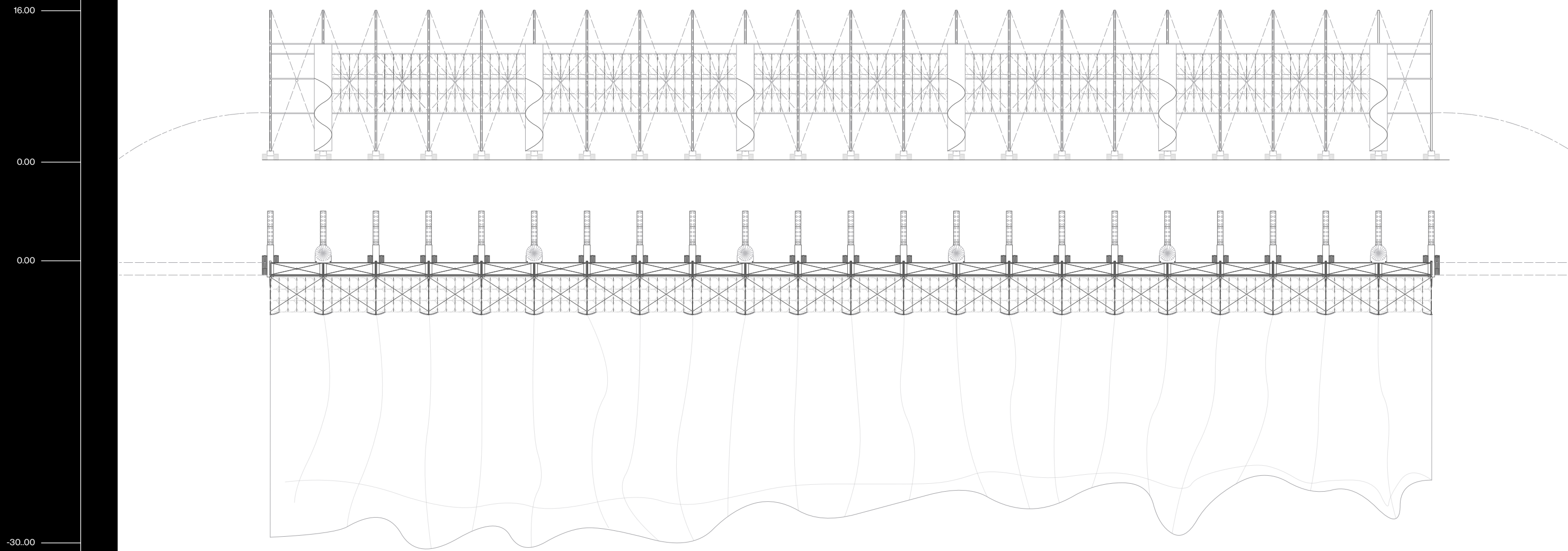




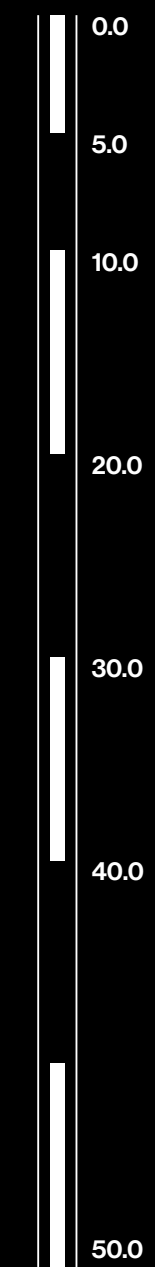








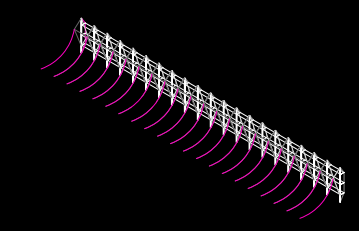
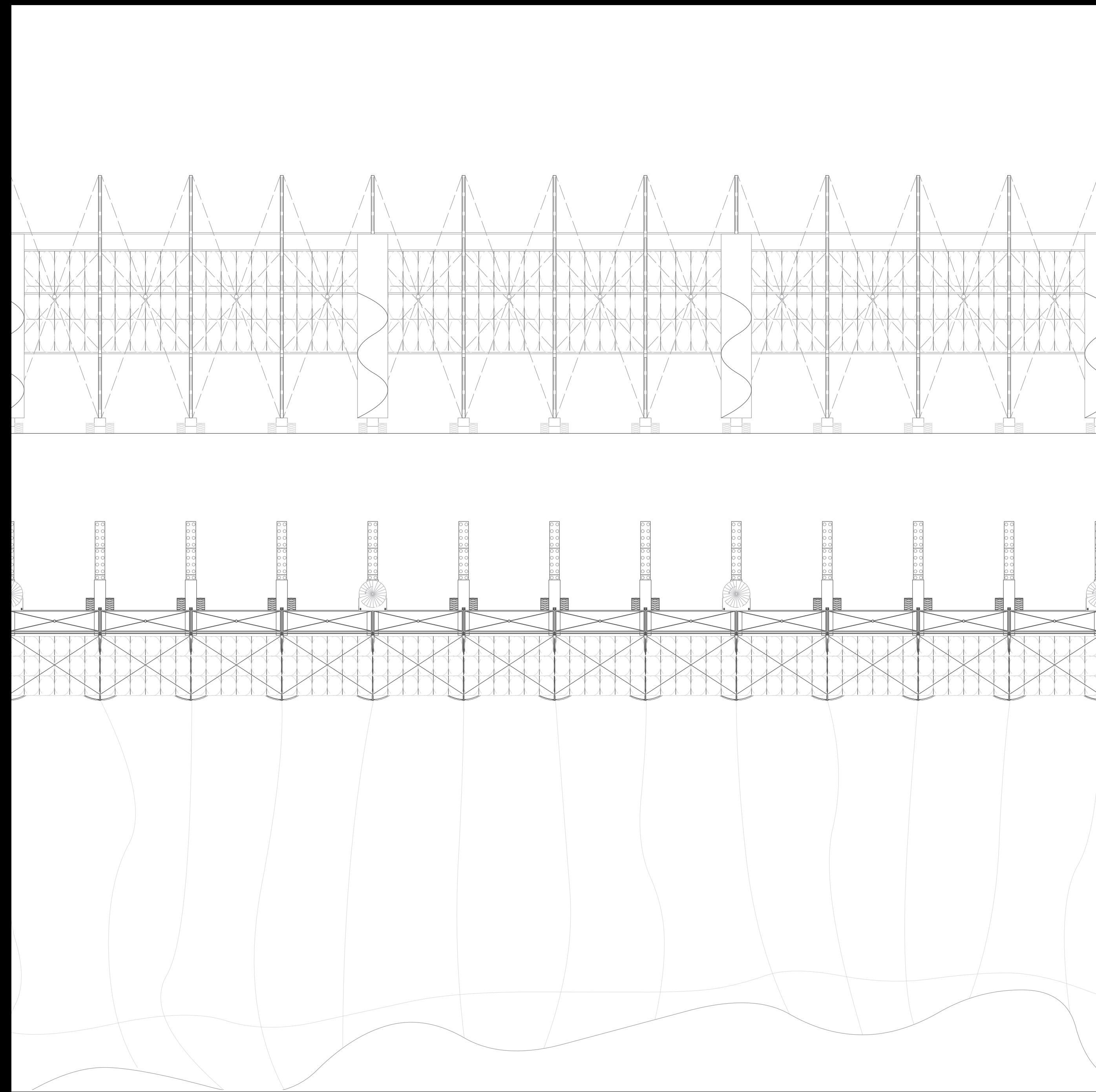
Act II  
Elevation + Floorplan Scanner  
1.500



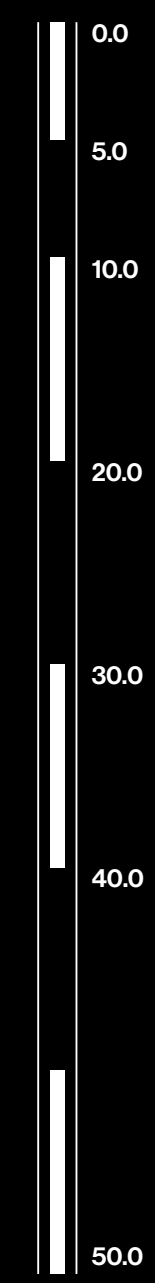




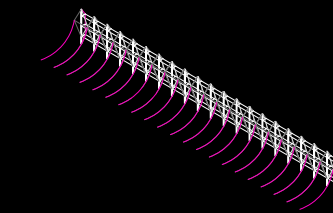
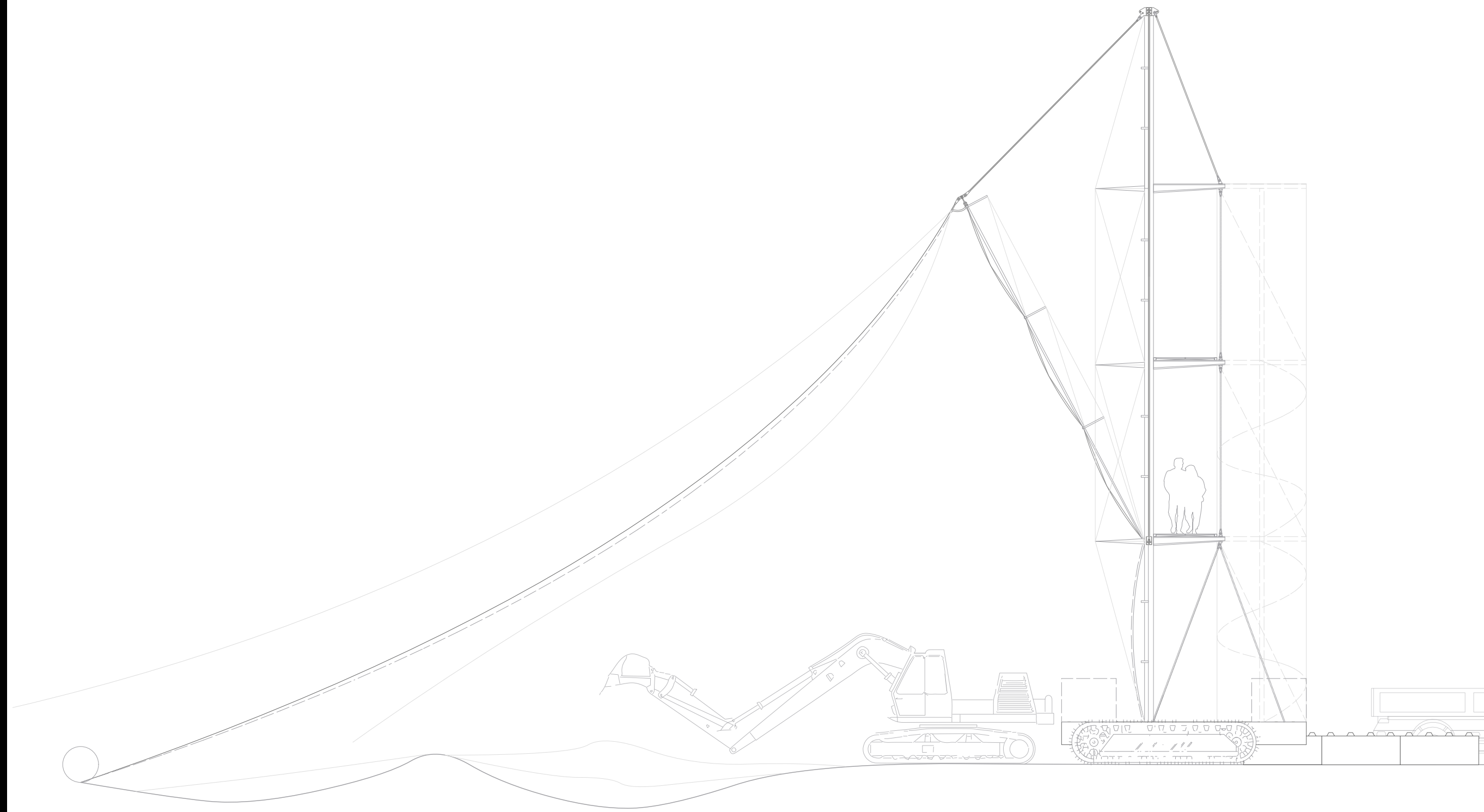
16.00  
0.00  
0.00  
-30.00



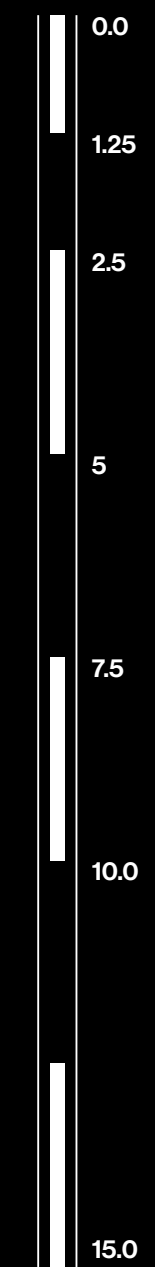
Act II  
Elevation + Floorplan Scanner  
1:500



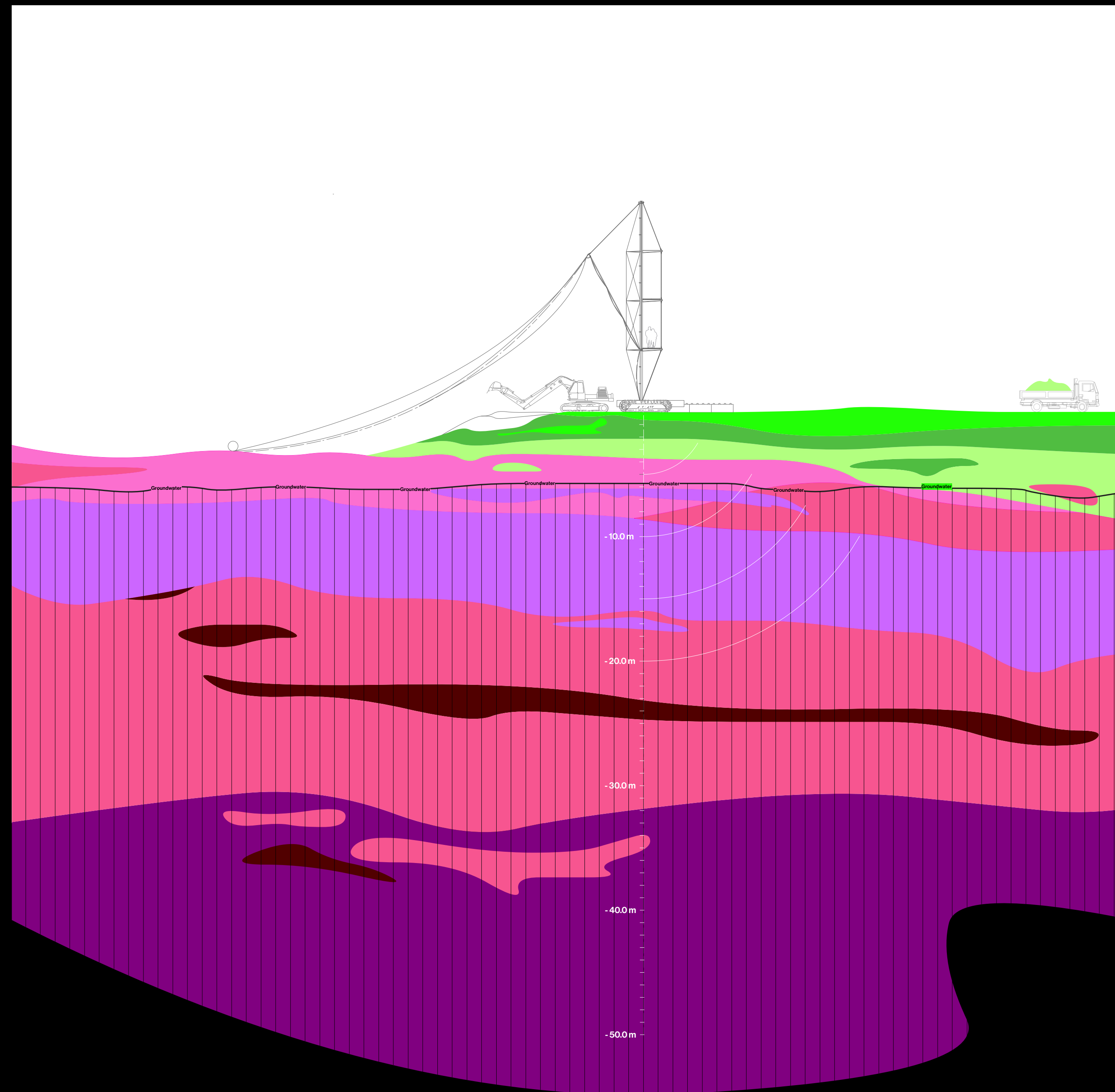




Act II  
Section and Floorplan  
1.50



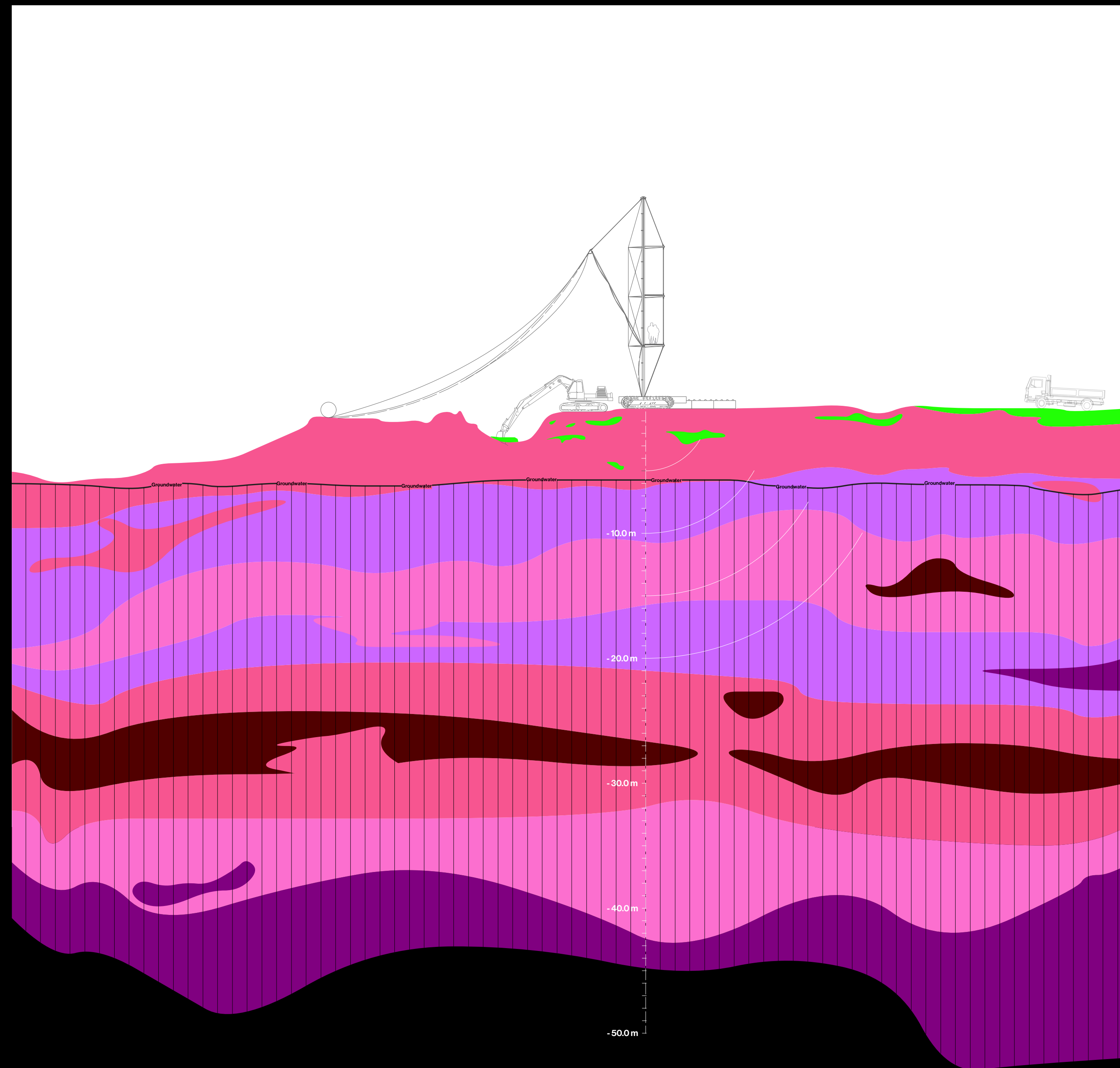




- 40.34 m / 412A-3613
- Silty landfilling / black / dry
- Clay (dense) / landfilling / brown / very low humidity / calcium
- Fine sand, limestone pieces / landfilling / anthracite
- Medium grain sand / loose / gray, brown / lime-free
- Medium grain sand / rough loose / gray / lime-free
- Medium grain sand with gravel beds / grainy / gray
- Coarse sand / gravelly-rocky / carbonaceous / gray





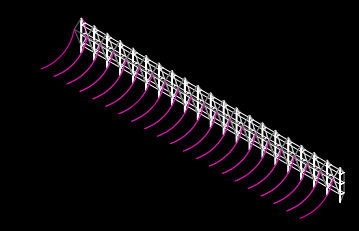
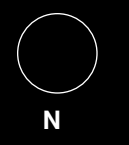
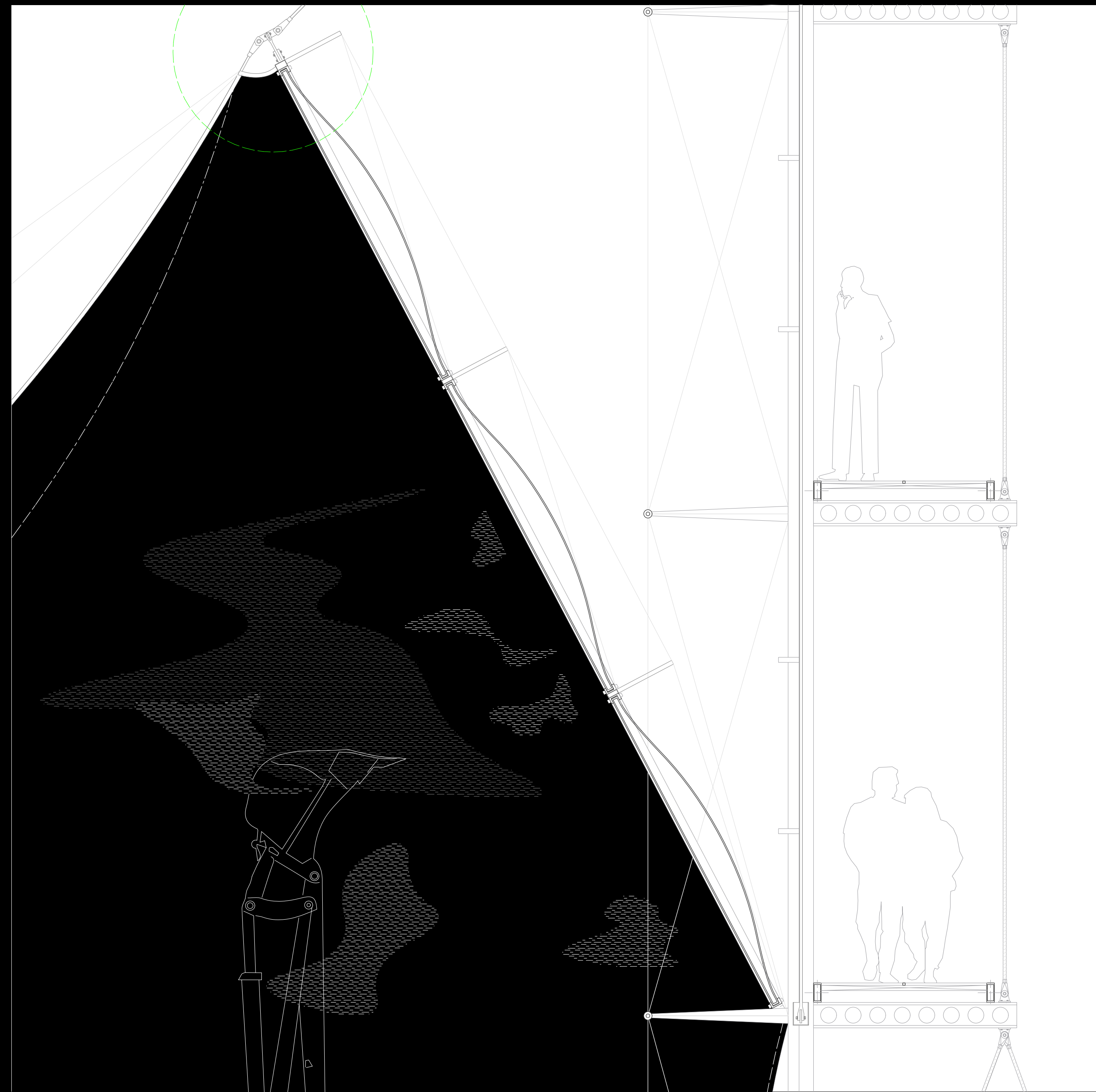


- 40.00 m / 412A-1213  
Sand (clayey) / landfilling / technogenic substrates / multicolor
- Medium grain sand / black / low humidity
- Medium grain sand / round / gray
- Medium grain sand / gravelly / gray / carbonaceous
- Medium grain sand / round / gray
- Fine gravel / rough, medium grains / gray
- Medium grain sand / black / high humidity
- Fine sand, limestone pieces / anthracite
- Coarse sand / gravelly-rocky / carbonaceous / gray

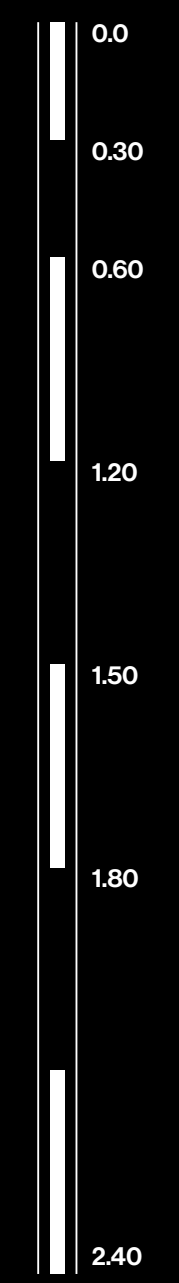




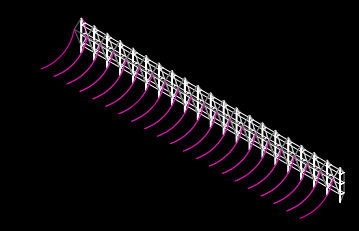
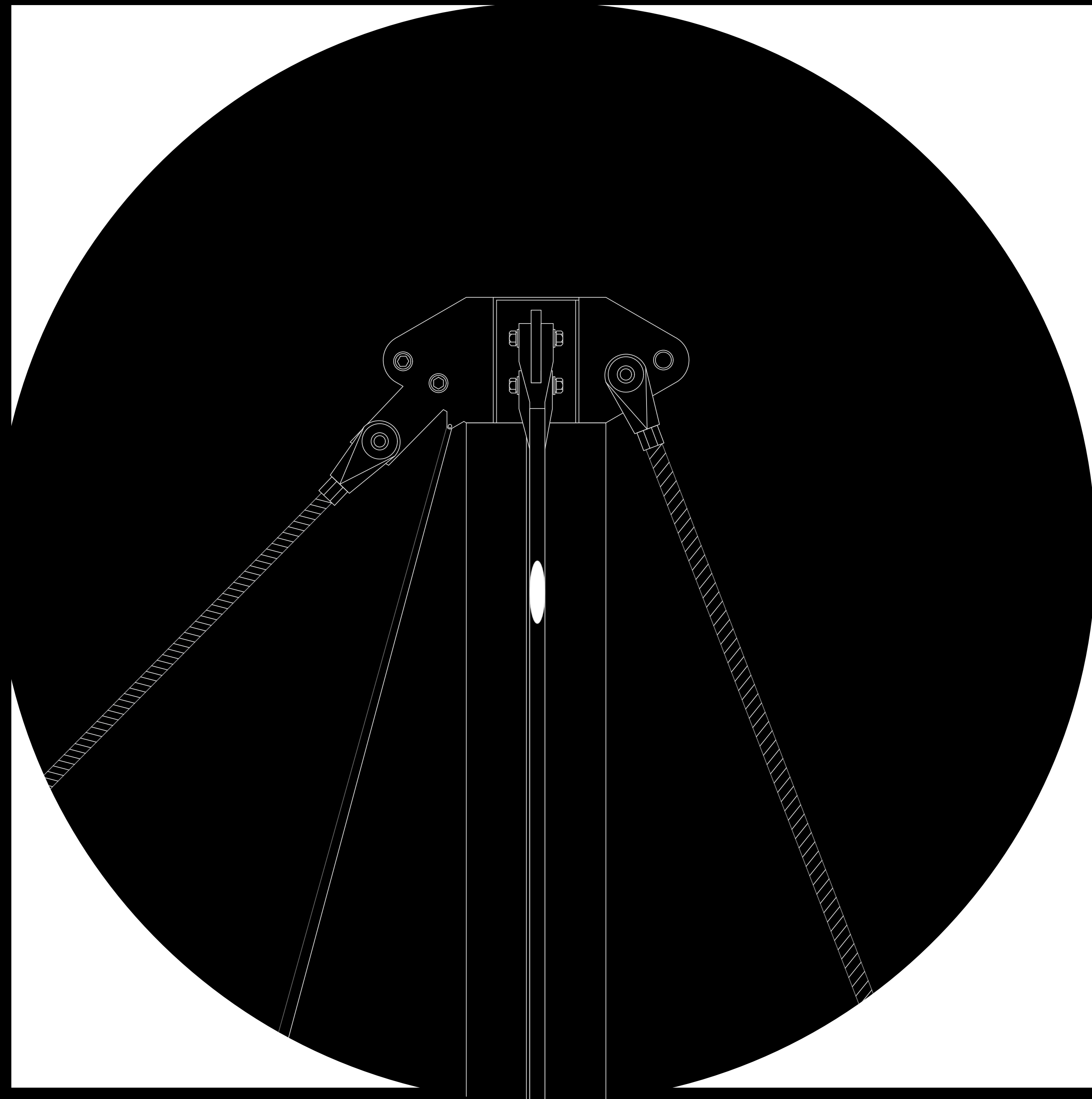
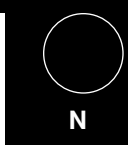




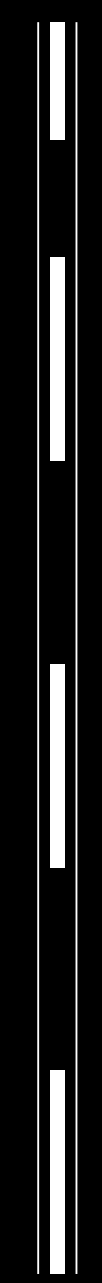
Act II  
Detail Scanner  
1:20



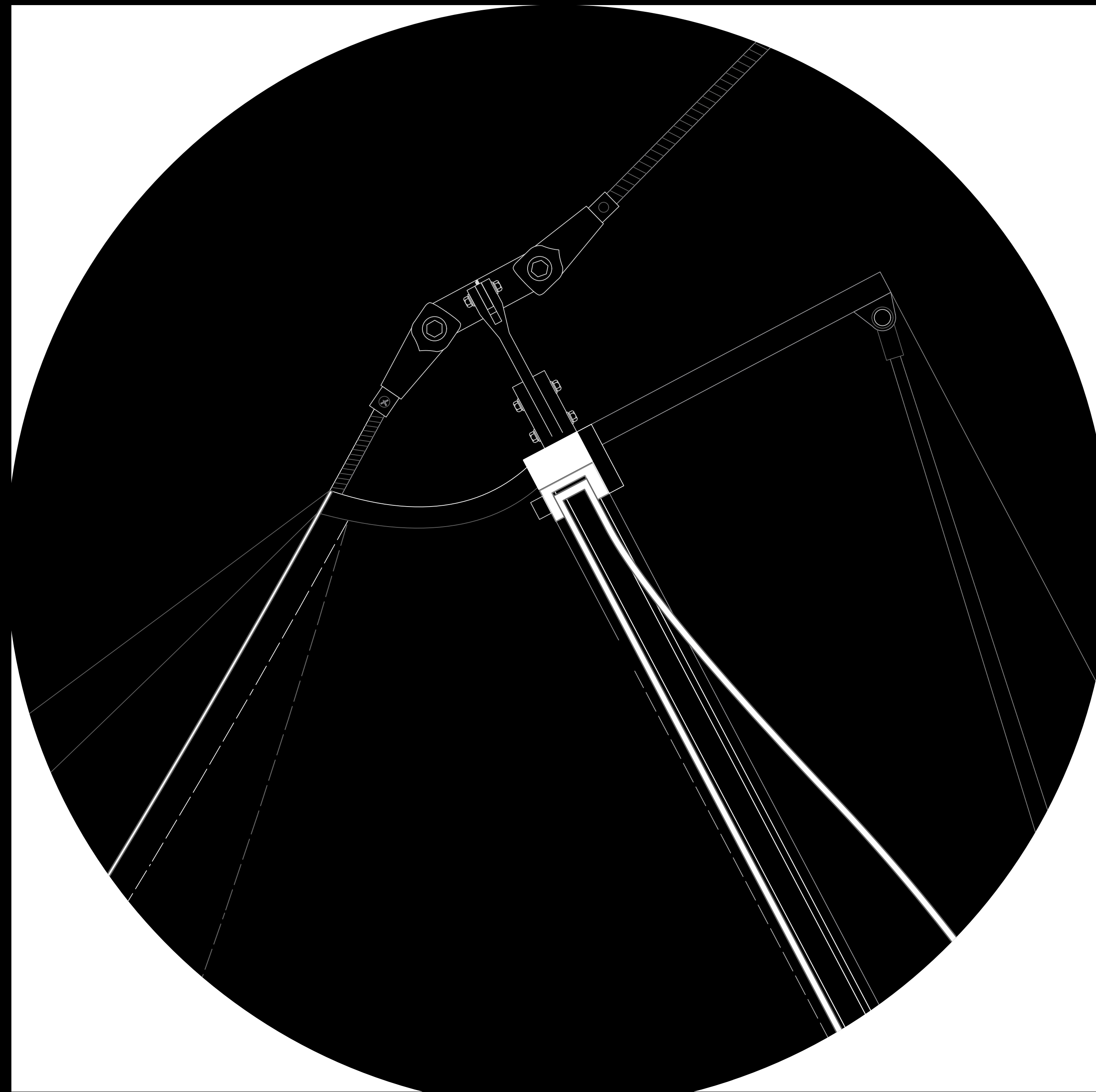
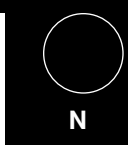




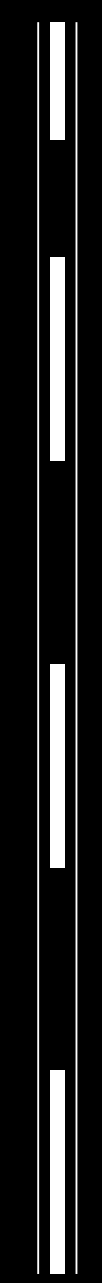
Act I  
Detail Suspension Head  
1.5







Act I  
Detail Visor-Tent Connection  
1.5



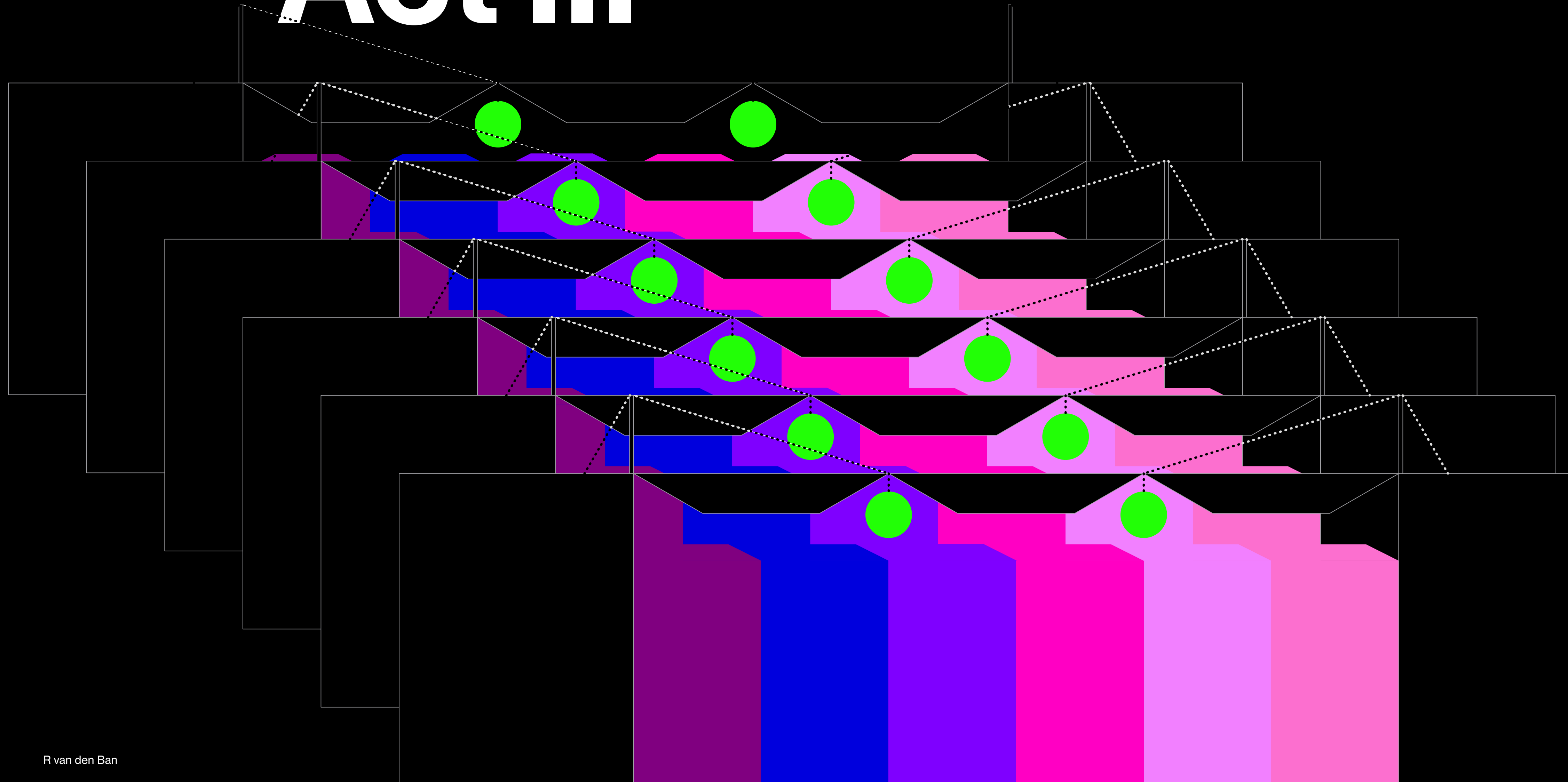






# DESIGN

## Act III







**Contained environments: Ecotron in Belgium**  
Hasselt University, Maasmechelen  
noAarchitecten, 2016



**Still from the (actually) toxic garden in Stalker**  
Andrei Tarkovsky, 1979



**Post-coal age in Gräfenheinichen**  
Campsite Ferropolis under dredger ruins





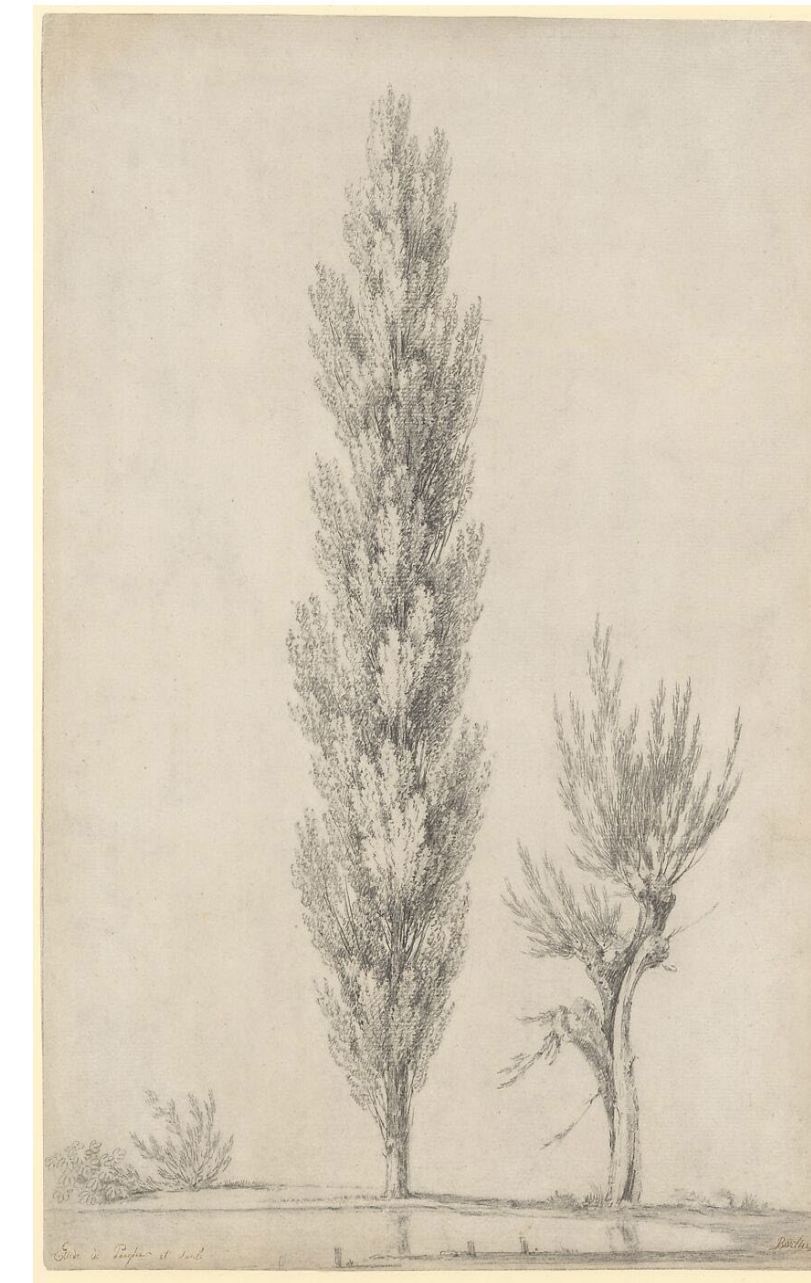




**Helianthus annuus**  
Common sunflower



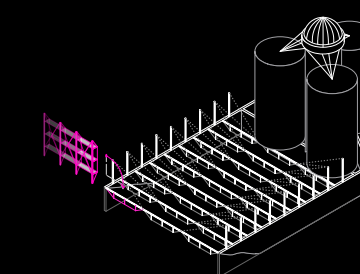
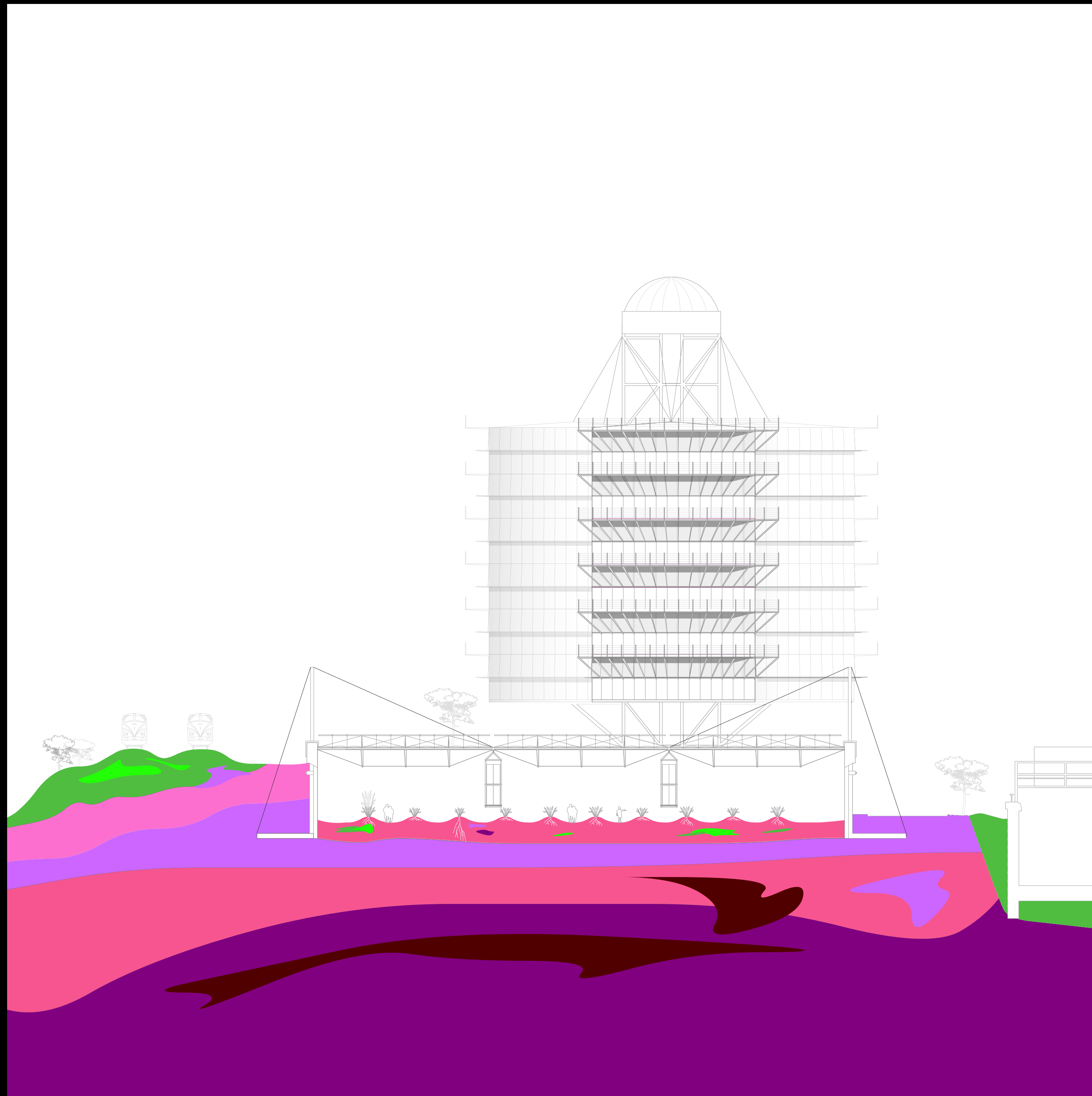
**Brassica juncea L.**  
Indian mustard



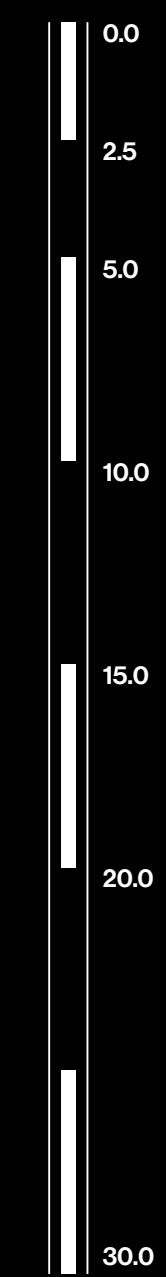
**Populus**  
Poplar tree

**Salix**  
Willow tree





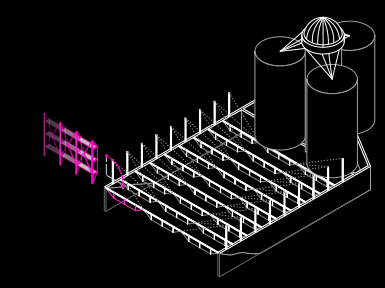
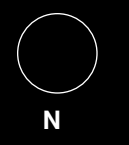
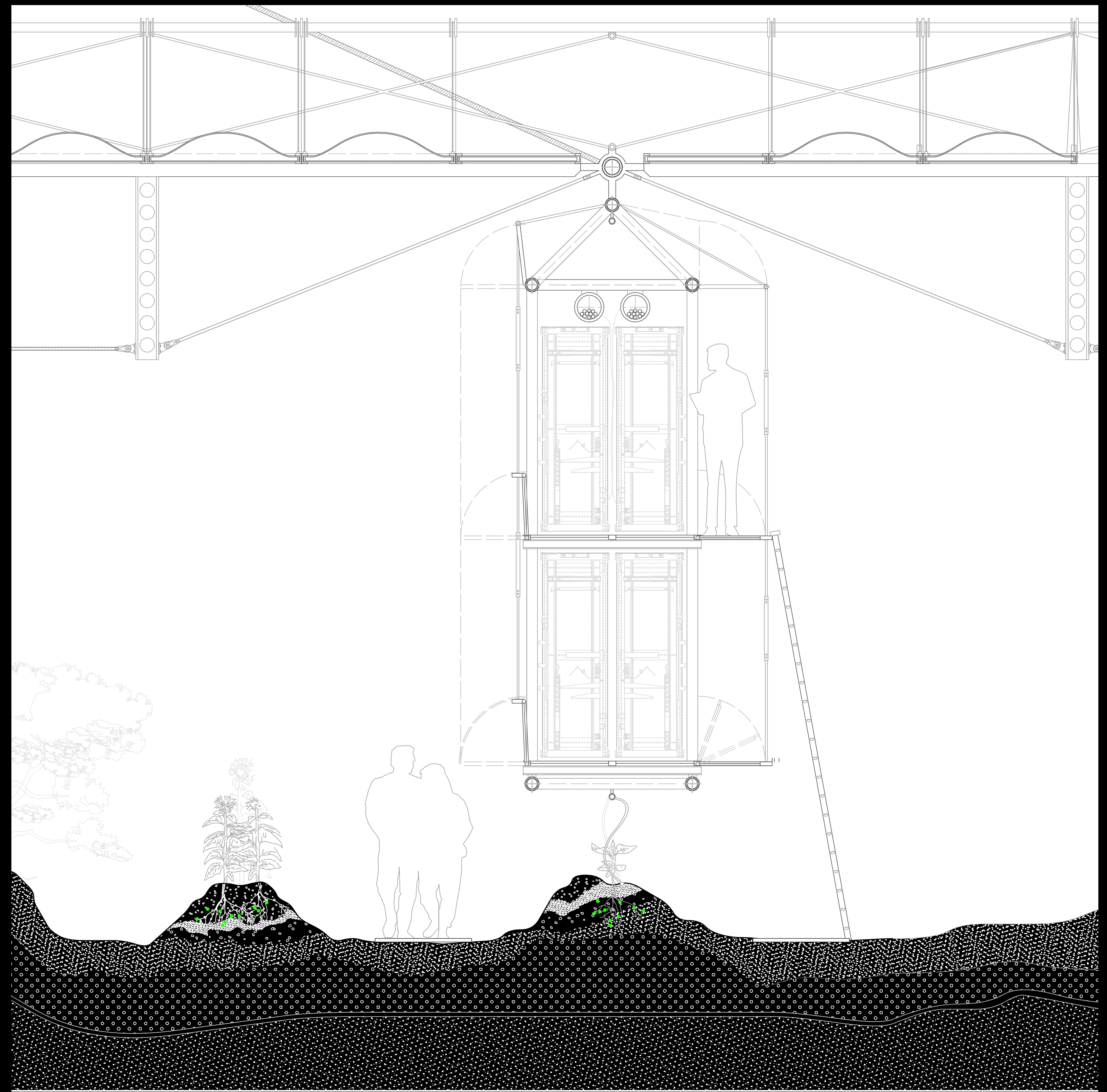
Act III  
Section Greenhouse  
1:200



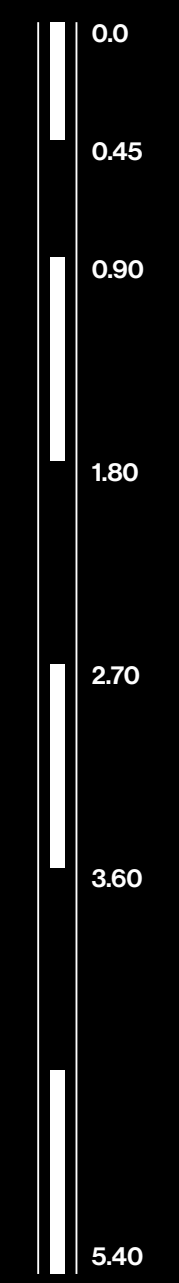




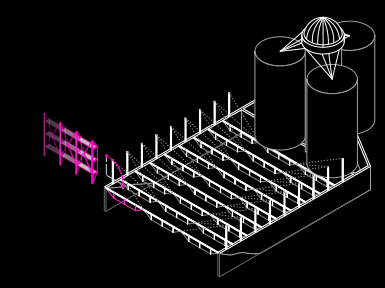
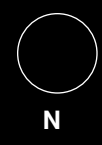
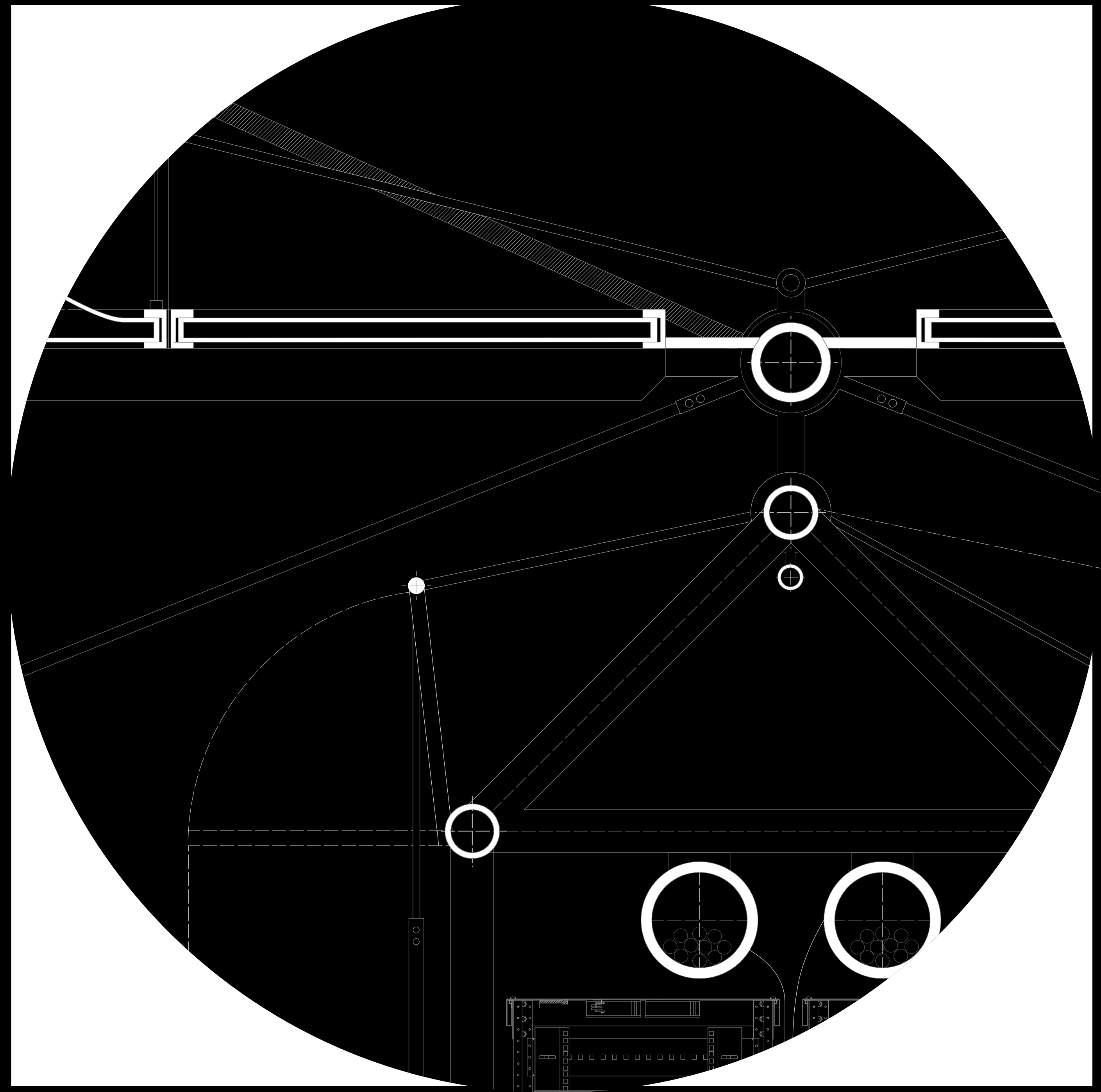




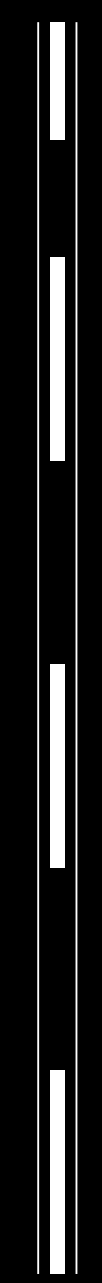
Act III  
Detail Servers  
1:20



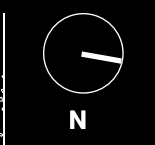




Act III  
Detail Servers  
1:5

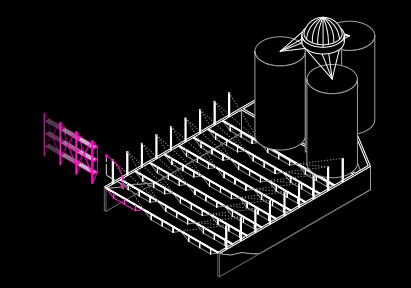
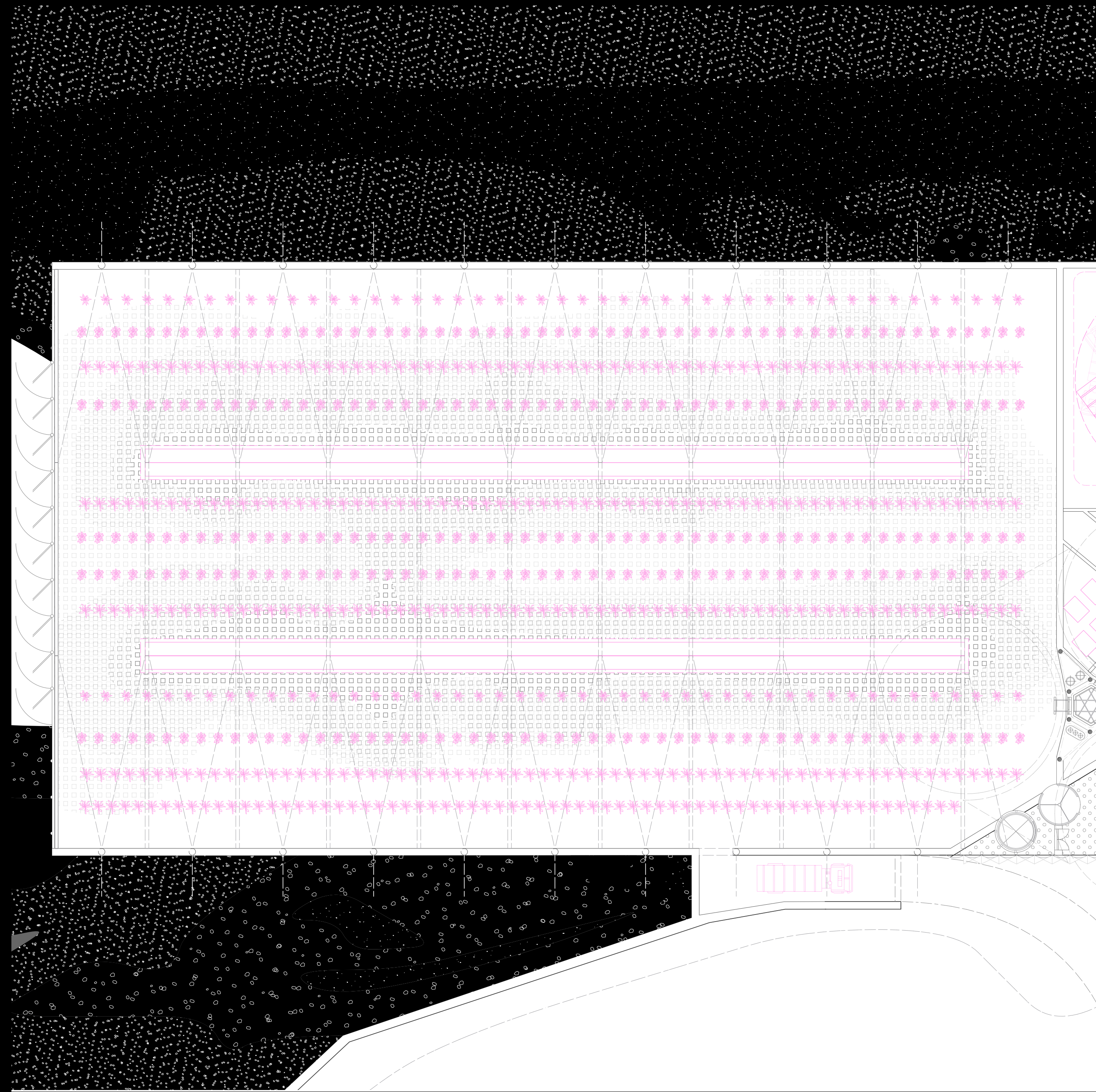




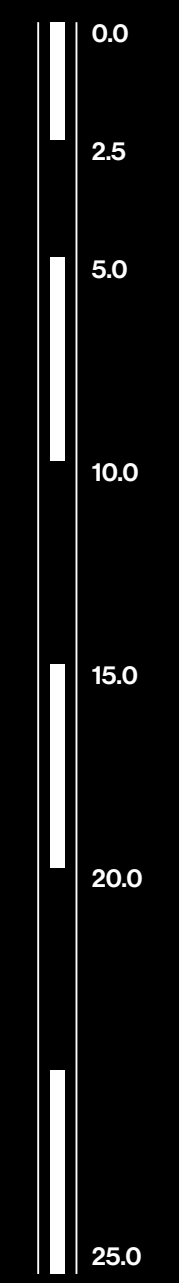


0.00

-49.20



Act III  
Groundfloor Greenhouse  
1.200

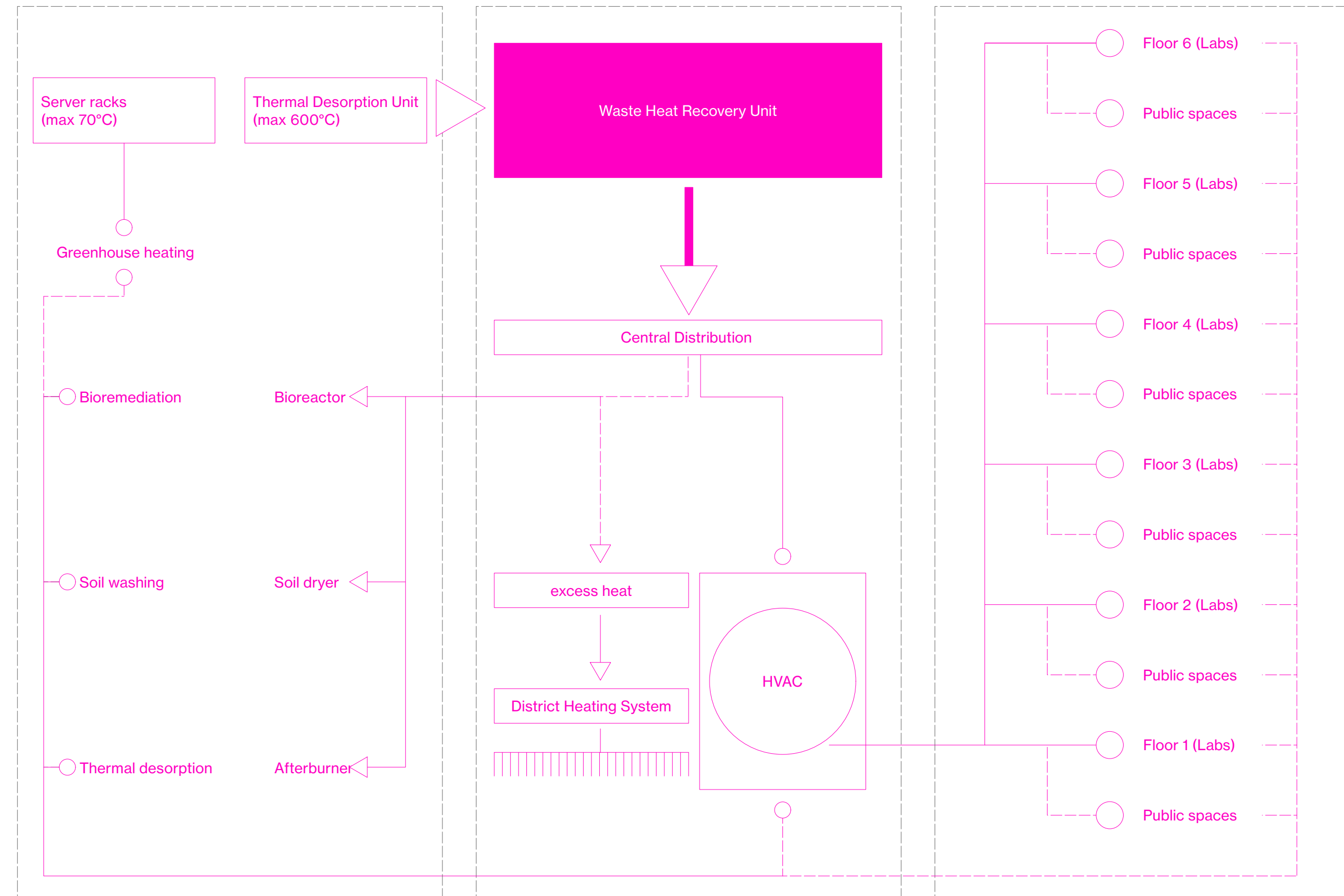




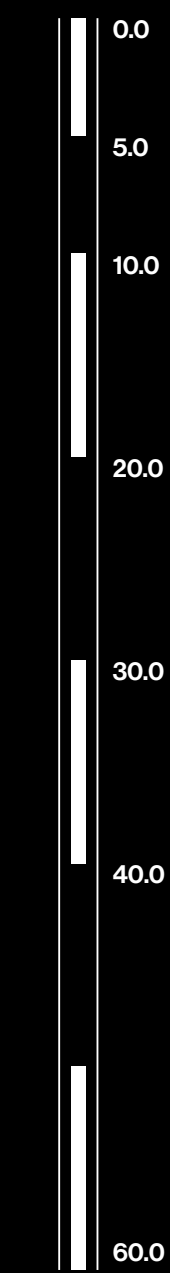
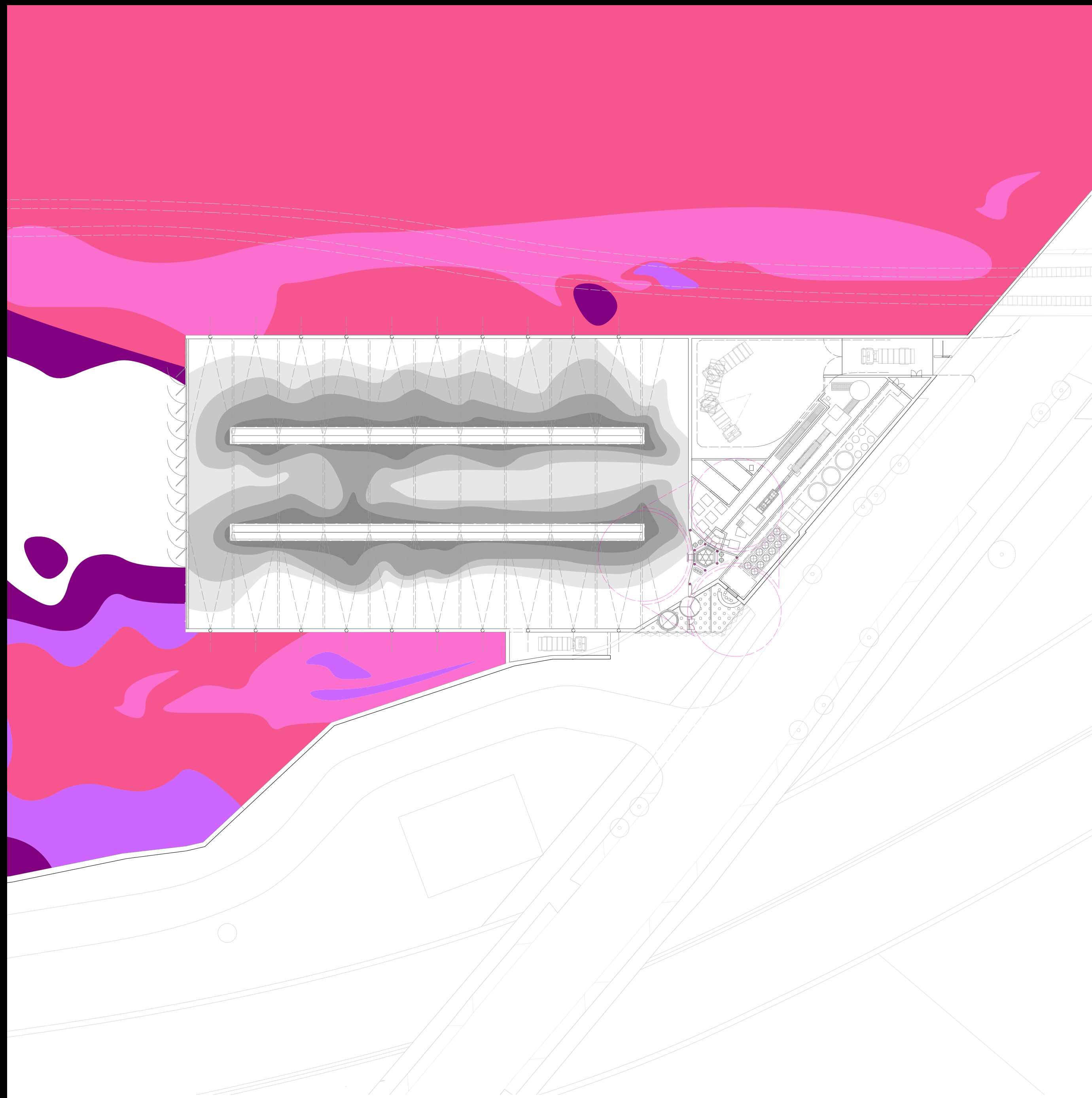
# DESIGN

# Final Act: Futur Zwei







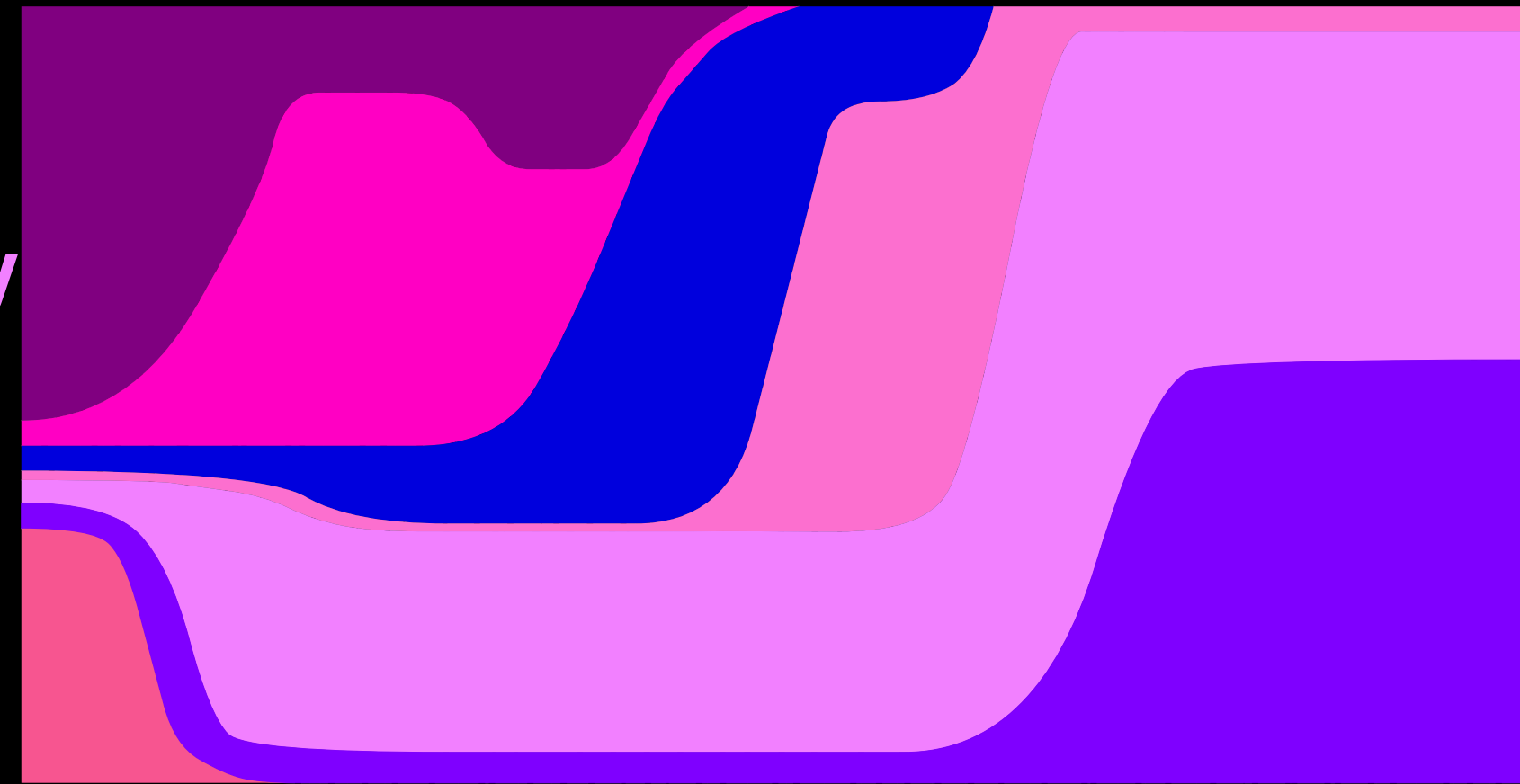








Excavation on site  
Granary construction  
Radar movement  
Greenhouse set-up  
Decontamination granary  
Data centre operation  
Site scanning

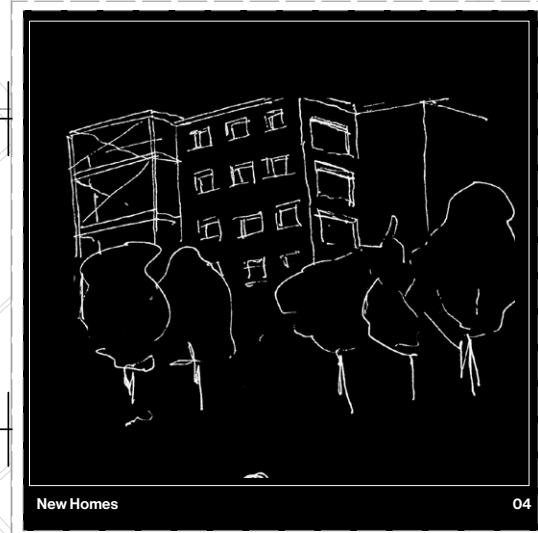
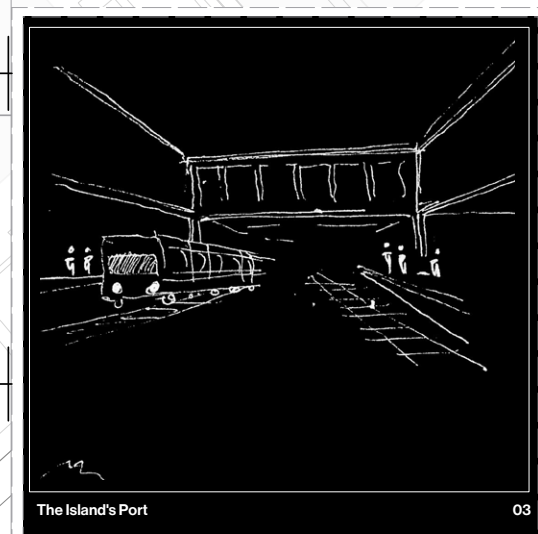
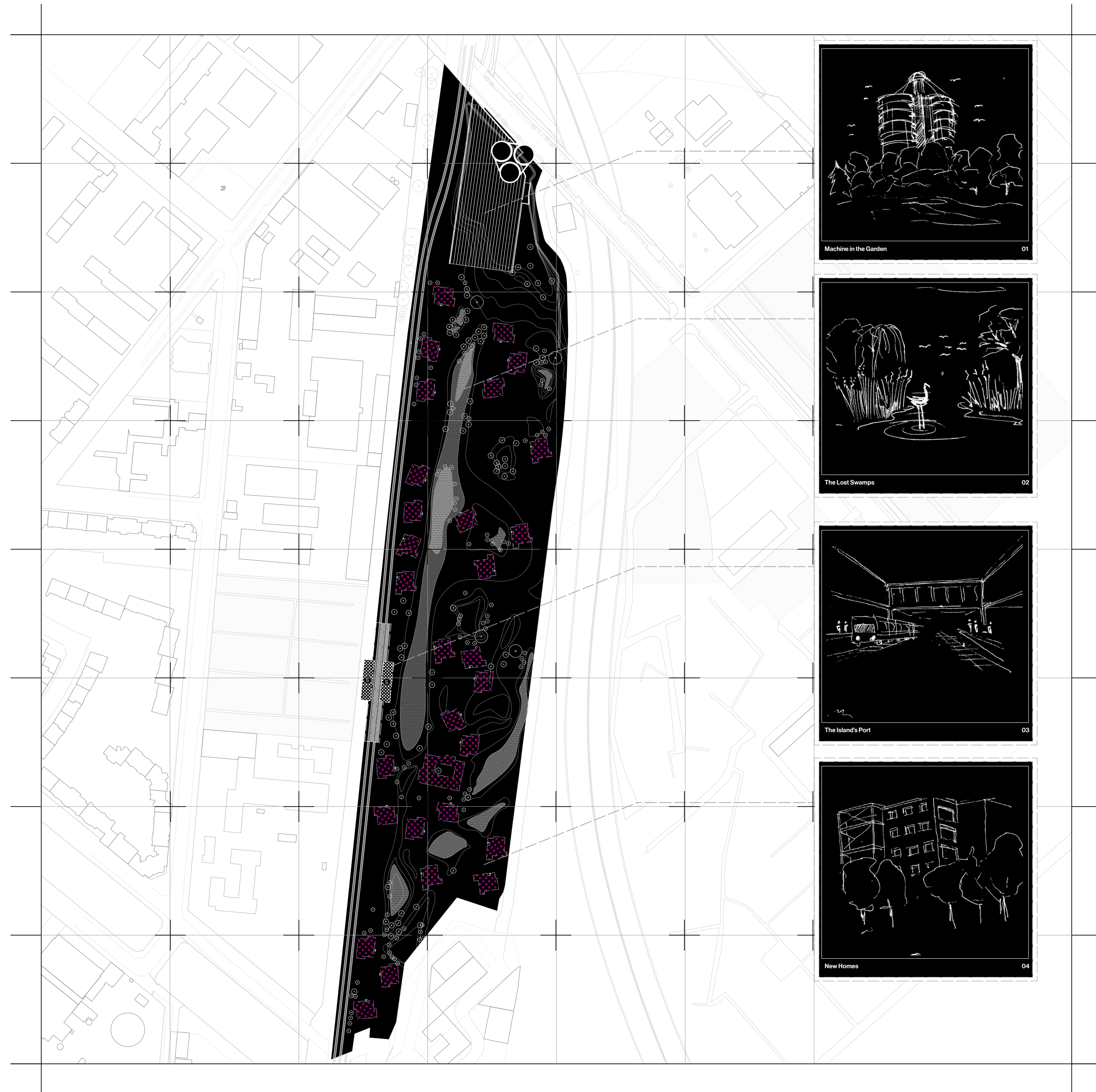


Time







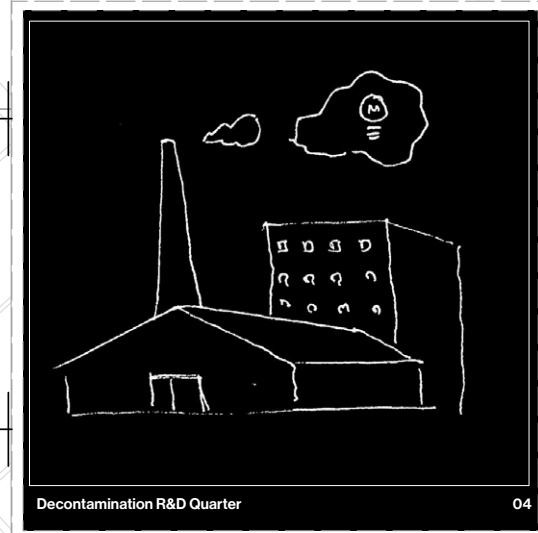
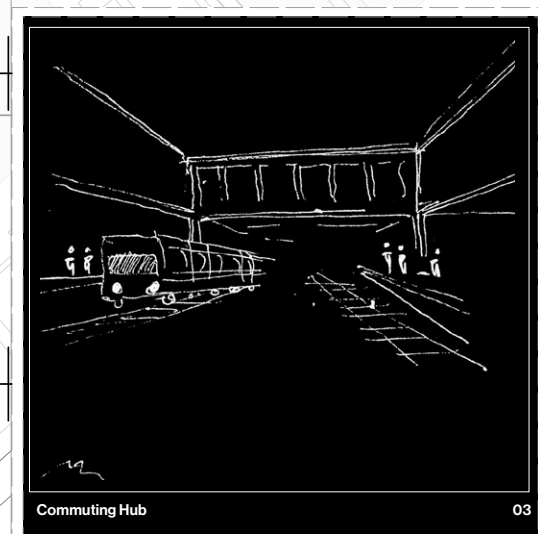
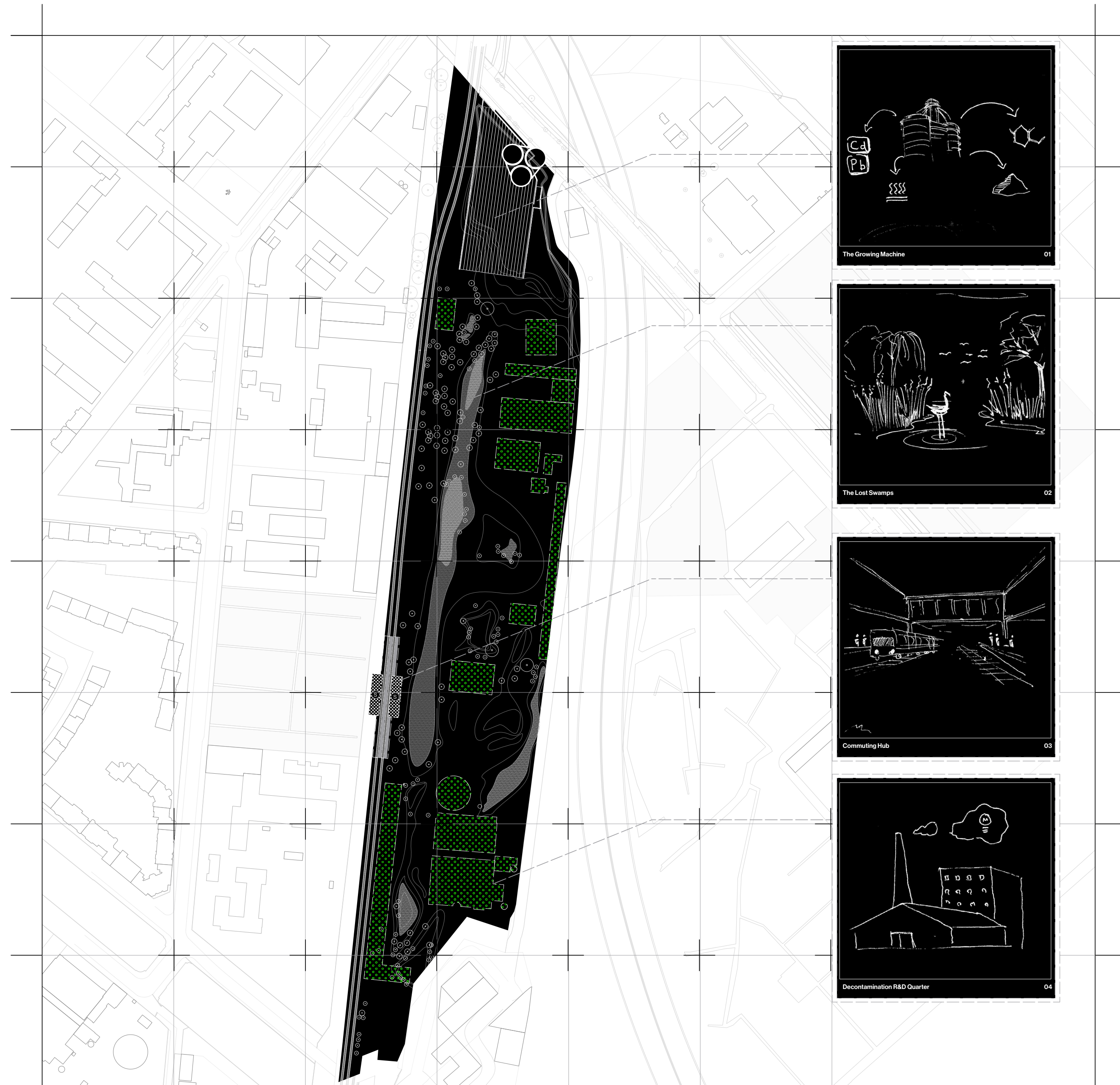


# Scenario 1: Cohab-Housing







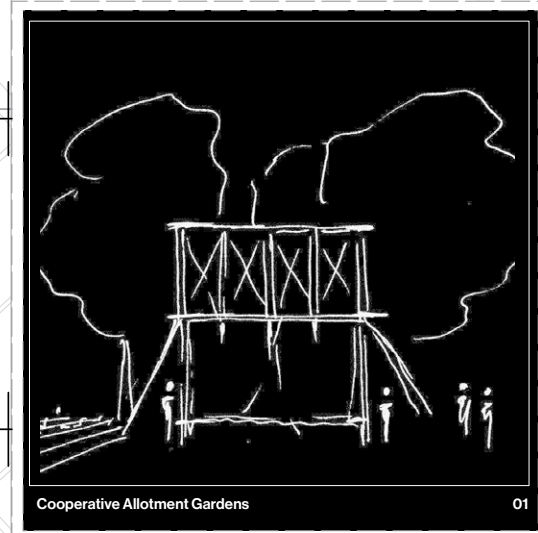
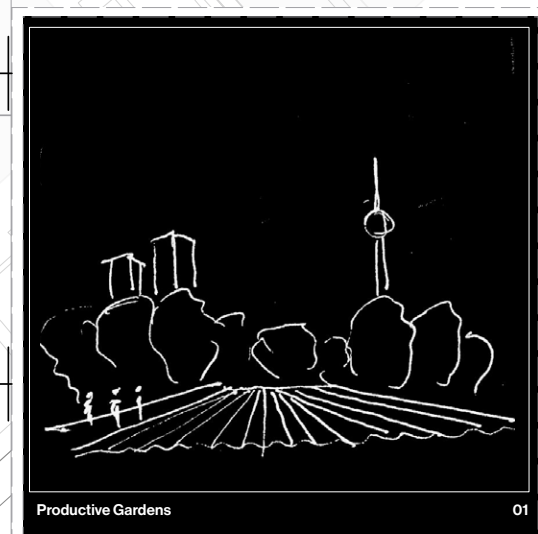
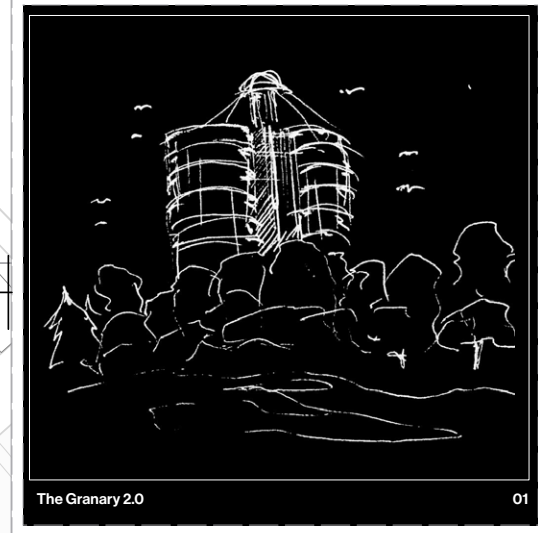
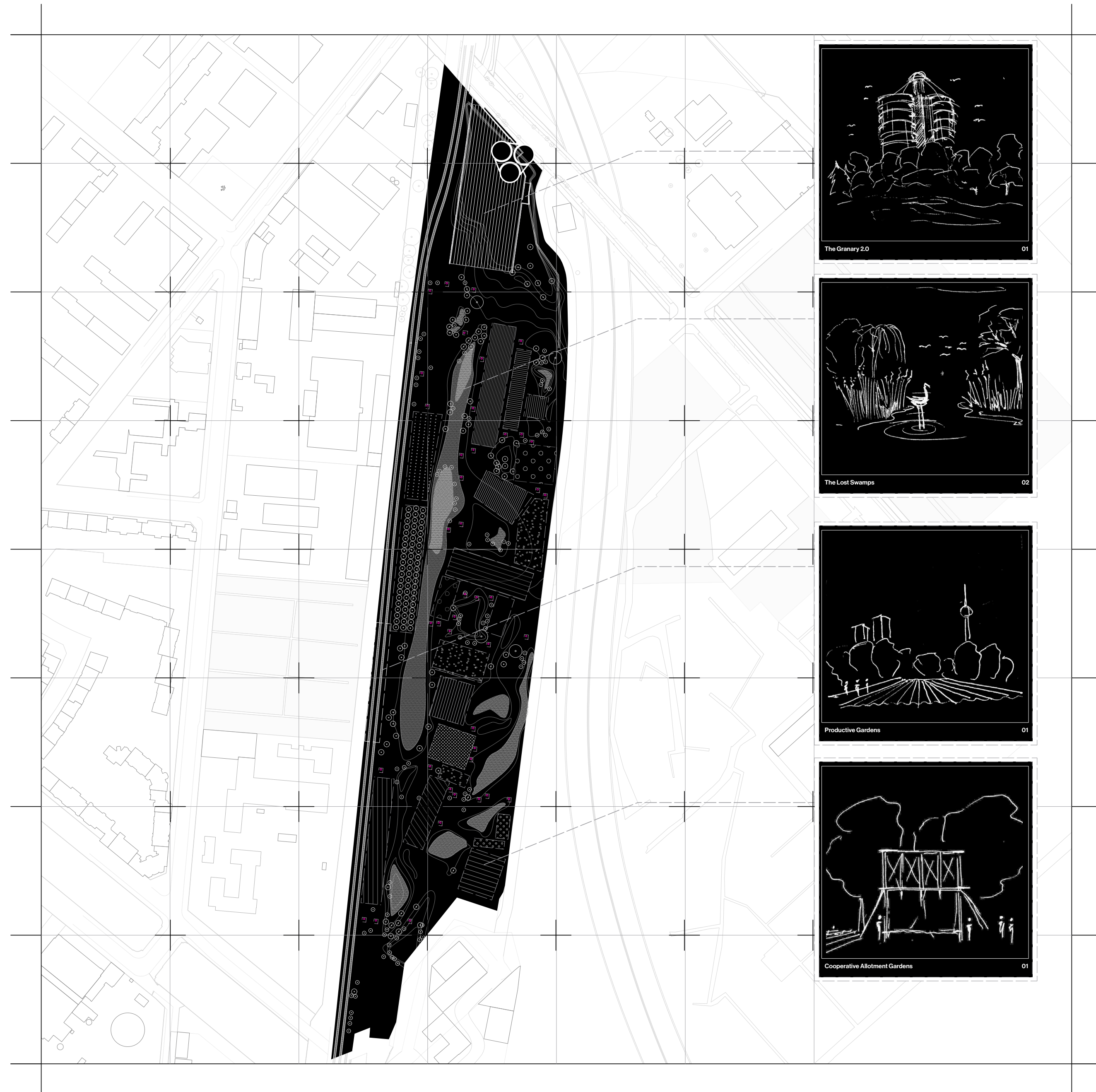


# Scenario 2: Post-Toxic Industry







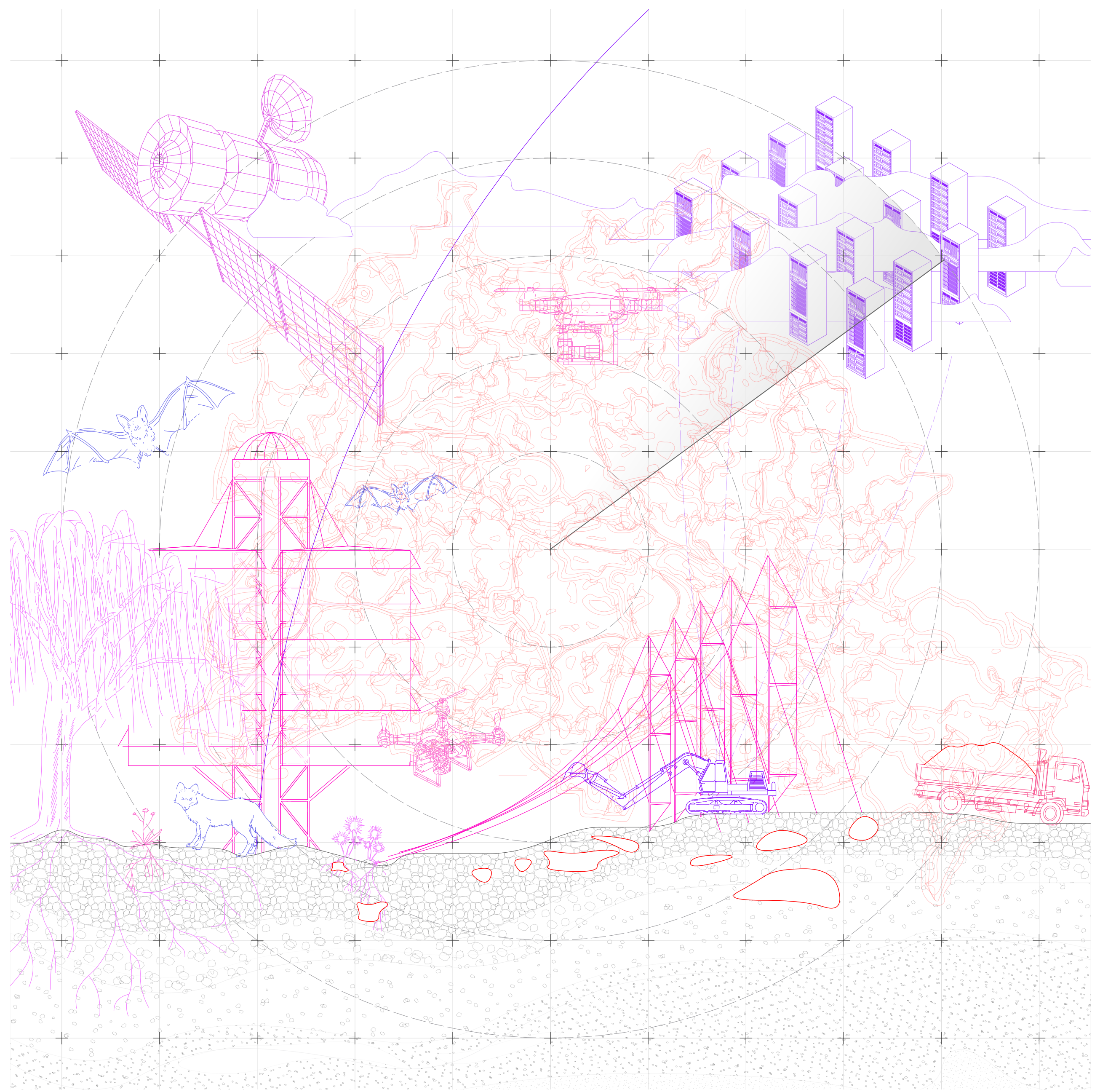


# Scenario 3: Edible Gardens









Thanks