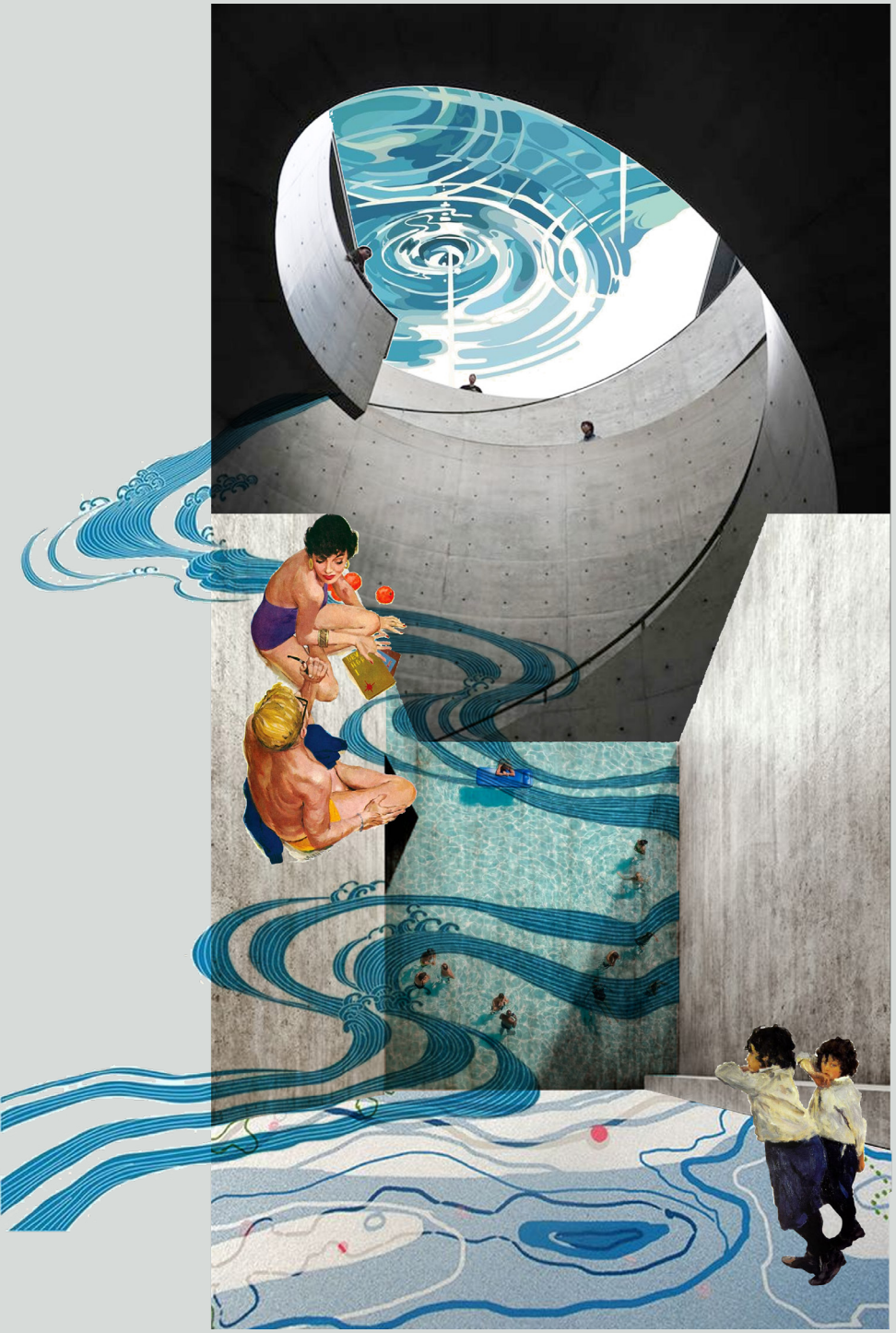


Re-commoning Water

The Public Grounds of Water
in Urban Ecosystems

RESEARCH-BY-DESIGN JOURNAL

SHERYL SI 5482933

PUBLIC BUILDING GRADUATION STUDIO 2022/2023

CONTENT

A. GRADUATION PLAN

ARGUMENTATION OF CHOICE OF THE STUDIO

The studio focuses on the Public Condenser as a new type of public communal building that facilitates community building on an urban scale. We investigate future-proof designs and offer a systematic and holistic approach to designing public projects through the Research-by-Design approach. The project brings much-needed public facilities and institutions closer to a plethora of people that may come from different backgrounds. Furthermore, it plays a vital role in enhancing social lives and improving the quality of life in cities. This aligns with my personal interest in the relationship between the health of the city and its access to public spaces.

TITLE OF THE GRADUATION PROJECT

Re-commoning Water

The Public Grounds of Water in Urban Ecosystems

LOCATION

Friedrichshain, Berlin

THE POSED PROBLEM

As surveyed by the Federal Ministry of Family Affairs in 2017, single-child families make up the majority of Berlin households. This coupled with several interviews I conducted with parents around Friedrichshain, the building provides family resources and water recreation activities that are either overcrowded or severely lacking in Friedrichshain. On a wider level, the building will address the topic of water as a public right and a threatened resource.

RESEARCH QUESTION

Given the amorphous nature of water, how can it be used as a design material to form spaces that foster social interactions?

Can water be used to develop a new public building typology that not only acts as a recreation and gathering device but also an education and communing tool?

DESIGN ASSIGNMENT IN WHICH THESE RESULT

The building aims to use water to address issues on two levels. Firstly, on a local level, it is a public condenser aiming to provide family resources and water recreation activities that are lacking in the neighbourhood of Friedrichshain, Berlin. Single child families make up for the majority of households in Berlin which leaves the bulk of peer-to-peer socialisation of children outside of the home. I conducted several interviews on the street with young parents that expressed how the district has enough parks and playgrounds for their children but would love more water-related activities that also catered to younger children such as toddlers.

On a wider level, the building addresses water as a public right and a threatened resource. Public consciousness of water issues in Germany may not be prevalent as Germany enjoys high-quality drinking water all year round but with the recent droughts and effects of climate change, this is projected to change in the coming future. As future decision-makers of the country, water literacy at a young age is paramount in ensuring we do what is best for our society and the environment.

Furthermore, my fascination with using water as a design device lies with how water has always been a gathering point, a place to meet, socialise and relax. It signifies nature, cleanliness and rejuvenation and has always been an attractor for social spaces. The state of water can exist in several forms: gaseous (steam, mist, fog), liquid (rain, river, pond), solid (ice) or crystalline (snow). The dynamic state of water presents numerous opportunities for it to be used as a spatial tool both indoors and outdoors. Utilising thermodynamic principles, i.e. the relationship between temperature and humidity, I am in search of thermal landscapes that will foster different social interactions.

Water is used as a building material in this case. It forms boundaries that guide the user through several pavilion-like spaces on the ground floor as they sit within ponds consisting of wetland ponds. Spaces such as learning spaces and an exhibition hall form large tectonic blocks surrounded by these ponds, allowing the user to experience water through all the senses. Large cylindrical columns punctuate the space giving either light or a passageway to the first floor. These columns are not only structural but bear the weight of the water tanks above where the rainwater is collected and stored from the surrounding roofs of the site. The first floor houses a natural wading pool that serves as both recreation and also a place to teach toddlers and young children how to swim. The greenhouse sits at the back with the largest of the water tanks that also contains a top layer of wetland for testing and monitoring purposes. The building aims to use water to foster different social interactions through water, space, and the in-between.

METHOD DESCRIPTION

This project follows the studio method of Research-by-Design starting with investigating the meaning of a public condenser through several assignments focusing on specific techniques such as collages and diagrams. Meanwhile, in-depth research of Berlin in all several aspects such as history, culture, demographics, politics and architecture and city planning coupled with a week-long excursion to the city helped further shape our research into the public's needs, wants and aspirations. Site analysis was done on three potential sites through diagrams and drawings which coupled with research and focused readings on our main topic of the Public Condenser. In this case, it was on water in architecture, water literacy in Germany, family centres in Berlin, climatic control, the and communing of water.

Process diagrams and sequential mapping were used to illustrate and further explain the role of water in the building. From harnessing rainwater to the water life path through the building, these diagrams help establish water's role in the building. Specific elements of the case studies were studied such as circulation, materiality, scale, climatic control etc. Drawings at various scales will also be used to explain the circulation route of the building and its relation to the site. After P2, these schematic designs will progress to a concrete building form and structure with clear building technologies components that demonstrate its materiality, circularity and urban ecology. Research into circularity and sustainability will be done on a deeper and more specific level that suits the building.

LITERATURE

As said before, the reading process journeyed through topics such as water in architecture, water literacy in Germany, family centres in Berlin, climatic control, the and communing of water.

Literature:

1. Clément, G. et al. (eds) (2006) Gilles Clément, Philippe Rahm: environ(ne)ment: manières d'agir pour demain = approaches for tomorrow. 1st ed. Milano : Montréal : New York: Skira ; CCA ; Distributed in North America by rizzoli.

2. Heckenast, G., Ferencz, M. and Kertész, A.T. (2021) 'The impact of water in architectural thinking', Pollack Periodica, 16(1), pp. 138–144. Available at: https://doi.org/10.1556/606.2020.00131.

3. Group, C.S. (2017) 'Patterns of Commoning: Water Beyond the State', P2P Foundation, 7 February. Available at: https://blog.p2pfoundation.net/patterns-of-commoning-water-beyond-the-state/2017/02/07 (Accessed: 17 January 2023).

4. Tillie, N. et al. (2009) REAP Rotterdam Energy Approach and Planning: Towards CO2-Neutral Urban Development.

5. Schneiderhan-Opel, J. and Bogner, F.X. (2021) 'The Effect of Environmental Values on German Primary School Students' Knowledge on Water Supply', Water, 13(5), p. 702. Available at: https://doi.org/10.3390/w13050702.

Case Studies:
1. gh3* — Borden Park Natural Swimming Pool (no date) gh3*. Available at: https://www.gh3.ca/work/natural-swimming-pool-02 (Accessed: 17 January 2023).

2. Jade Eco Park - Philippe Rahm architectes (no date). Available at: http://www.philipperahm.com/data/projects/taiwan/index.html (Accessed: 9 November 2022).

3. MVRDV - Expo Pavilion 2.0 (no date). Available at: https://www.mvrdv.nl/projects/432/expo-pavilion-20 (Accessed: 14 December 2022).

4. Glass Pavilion at the Toledo Museum of Art / SANAA (2010) ArchDaily. Available at: https://www.archdaily.com/54199/glass-pavilion-at-the-toledo-museum-of-art-sanaa-pritzker-prize-2010 (Accessed: 17 January 2023).

5. IranAvada (no date) 'CONCAVE ROOF SYSTEM', BMDesign. Available at: https://bmdesignstudios.com/portfolio/concave-roof-system/ (Accessed: 14 December 2022).

REFLECTION

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

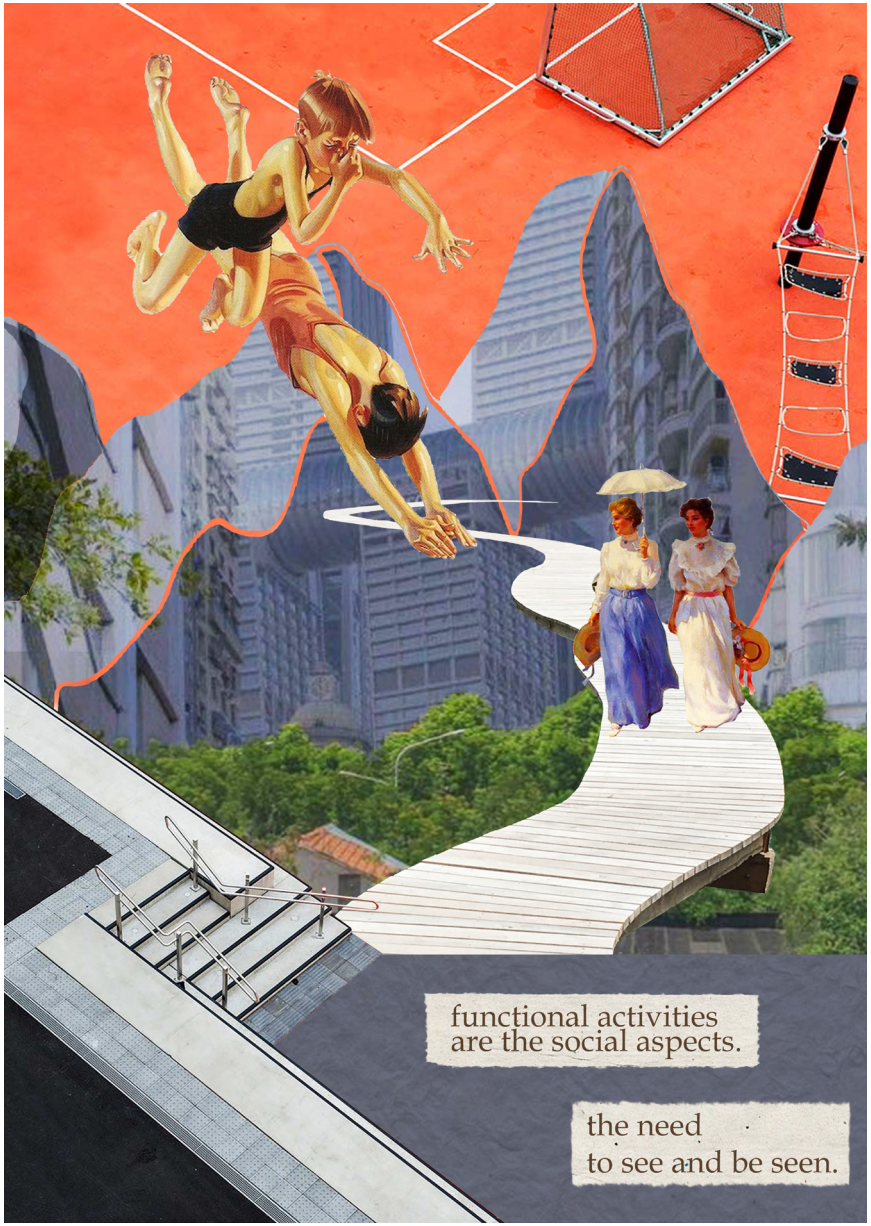
2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

The education path at TU Delft I have undertook has followed a path of architecture in the public realm. From designing a new Urban Living Room in Rotterdam in MSc1 Complex Projects Studio to addressing the regeneration of Strahov Stadium in Prague in MSc2 Borders & Territories Studio, my focus on civil architecture has exposed me to projects varying in size, scale, culture, history and so on. It has challenged me to reframe the notion of how a public building may serve its city and understanding the varied ways of tackling these challenges has further solidified my focus on public works.

My graduation project is a public building in Berlin that addresses the needs of young families in the district and also speaks on the social, environmental and political issues of water we are facing today. The project speaks on water as a commons and the importance of water literacy in our society. This is especially important as water in urban areas is managed by wider governing bodies and not the individual and thus I believe requires more transparency, accountability and public awareness. It fulfils the brief of the Public Building Graduation Studio 2022/2023 in which we are to investigate and design a Public Condenser. The different issues and needs addressed in my building tackles the notion of Multiplicity and act as a new framework for public engagement and exchanges.

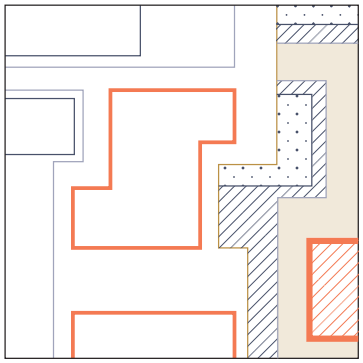
B. THEORY&DELINEATION RESEARCH OUTCOMES

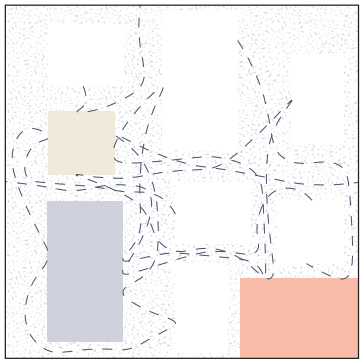
ASSIGNMENT 1: COLLAGE/MONTAGE

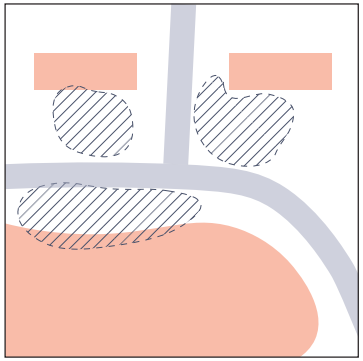


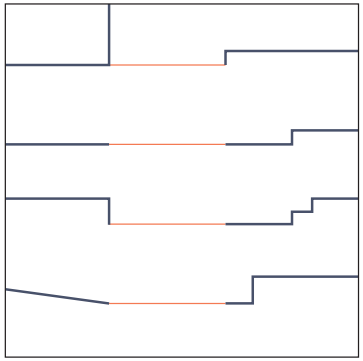
REVISED VERSION

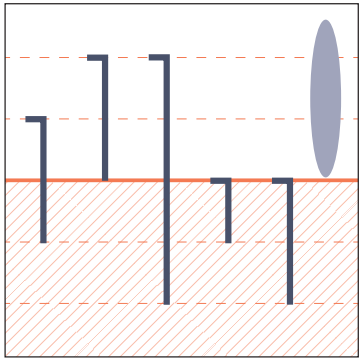
ASSIGNMENT 2: DIAGRAMS









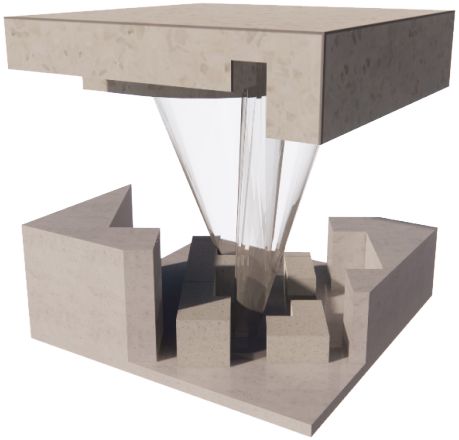


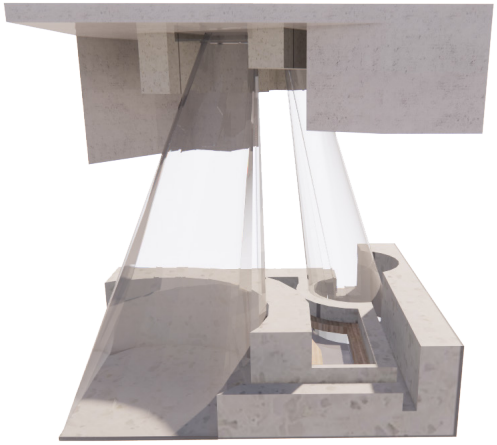
ASSIGNMENT 3: PSYCHOGEOGRAPHY MAP

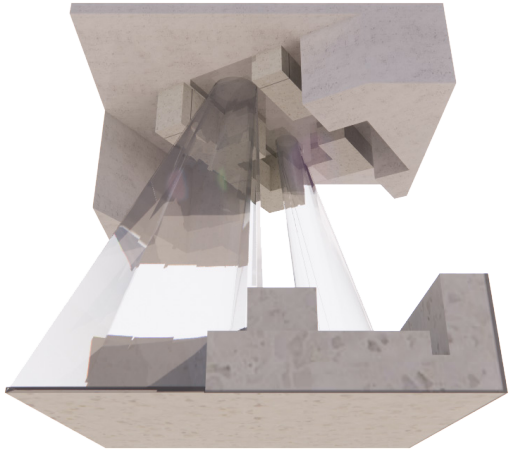
REVISED VERSION

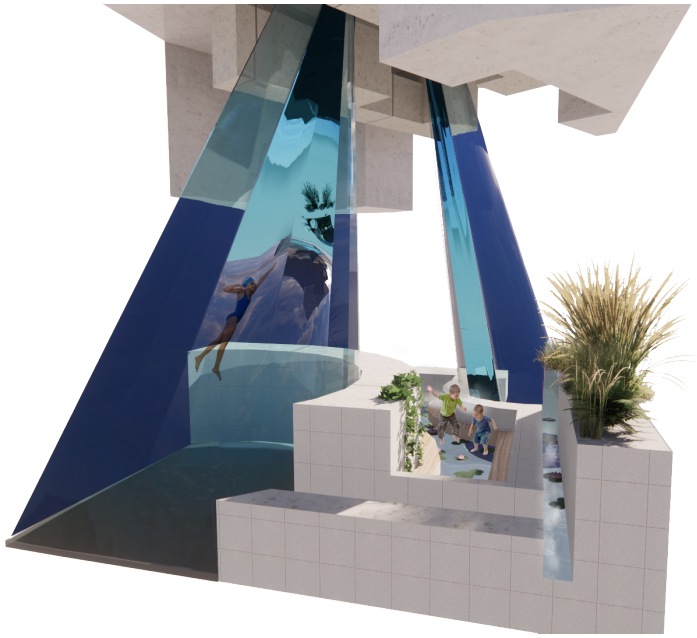
ASSIGNMENT 4: CONCEPT MODEL

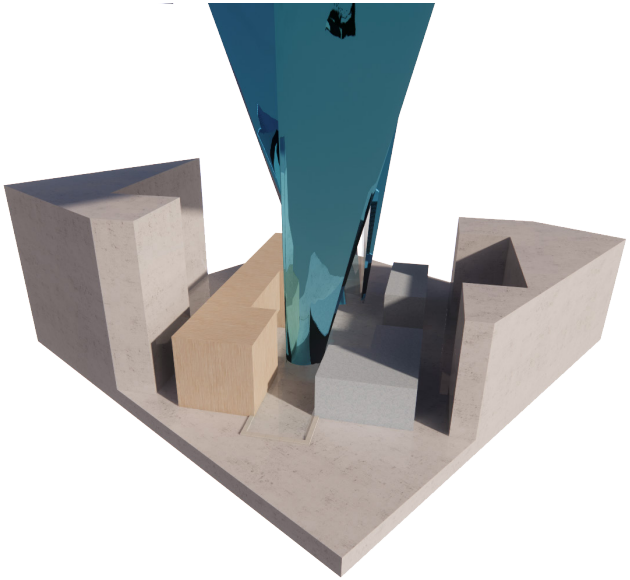
ASSIGNMENT 5: DIGITAL MODEL



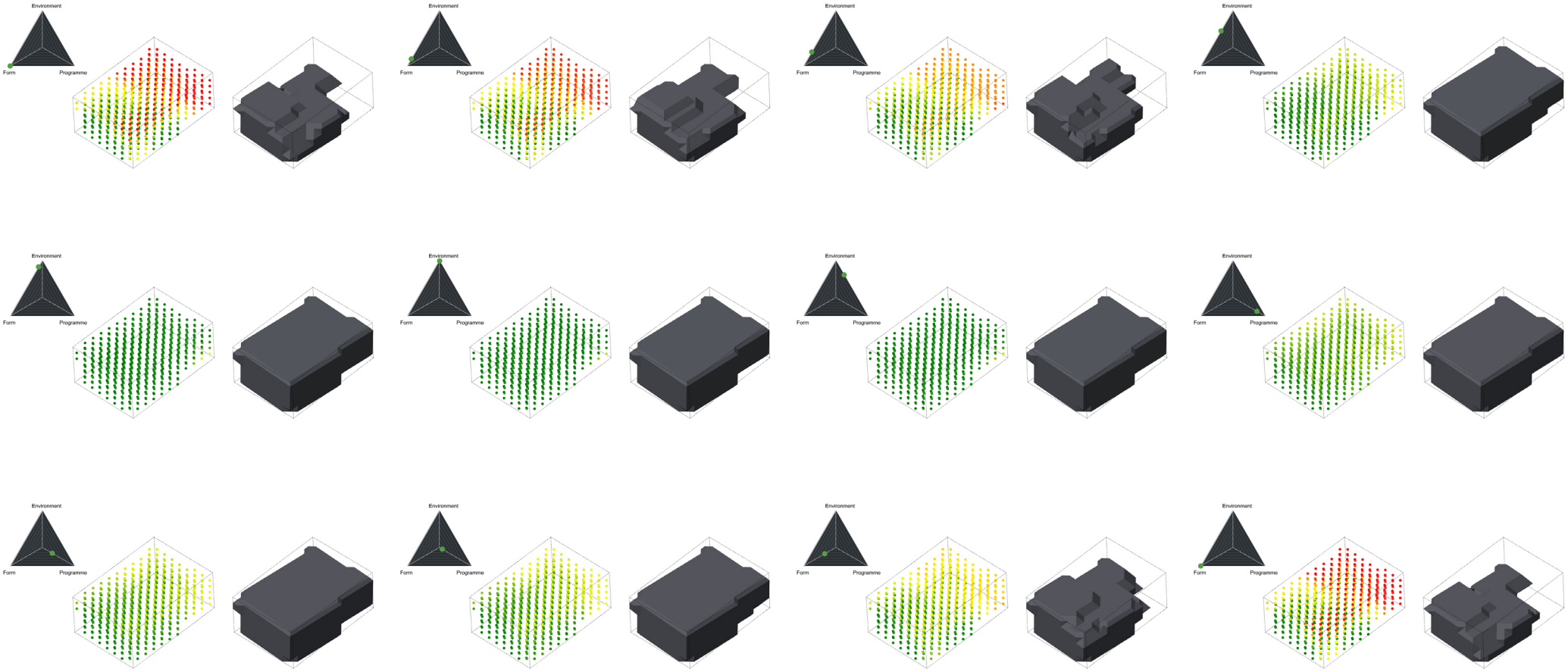




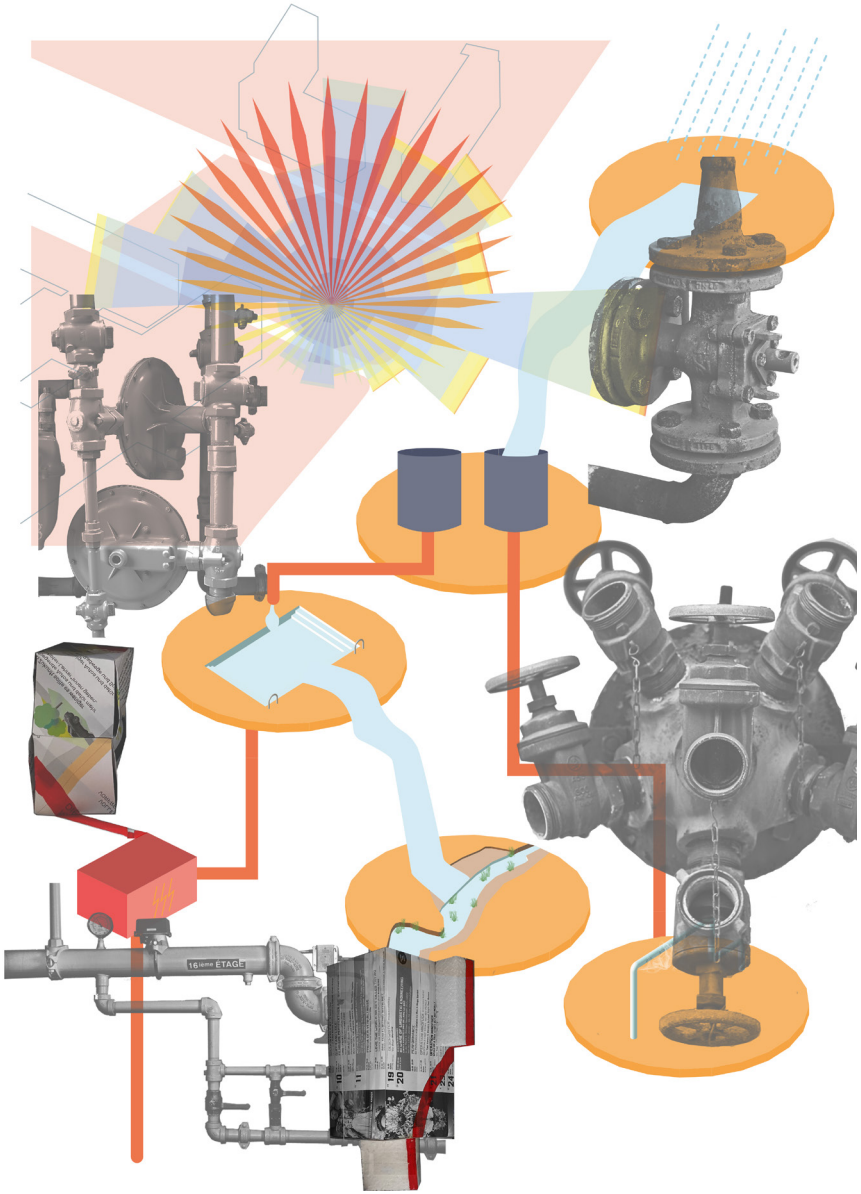




ASSIGNMENT 6: ARCHITECTURAL FIELDS MODEL ANALYSIS



ASSIGNMENT 7: REMIX



RESEARCH PLAN ABSTRACT

RESEARCH QUESTION

My graduation project aims to provide a public condenser for the ever-growing population of families in Friedrichshain, Berlin. Based on research and on-site interviews conducted during the study trip to Berlin, the community centre aims to serve the district of Friedrichshain and its growing population of young families and children. I conducted several interviews on the street with young parents that expressed how the district has enough parks and playgrounds for their children but would love to have more indoor activities that also catered to younger children such as toddlers. The desire for certain communal facilities, namely a swimming pool, and more indoor communal spaces for families and young children has led me to utilise water and thermodynamic properties as a design device.

My fascination with using water as a design device lies with how water has always been a gathering point, a place to meet, socialise and relax. It signifies nature, cleanliness and rejuvenation and has always been an attractor for social spaces. The state of water can exist in several forms: gaseous (steam, mist, fog), liquid (rain, river, pond), solid (ice) or crystalline (snow). The dynamic state of water presents numerous opportunities for it to be used as a spatial tool both indoors and outdoors. Utilising thermodynamic principles, i.e. the relationship between temperature and humidity, I am in search of thermal landscapes that will foster different social interactions. My research question lies in how I can combine providing for the growing population of families in Berlin and water as a design device.

METHODOLOGY

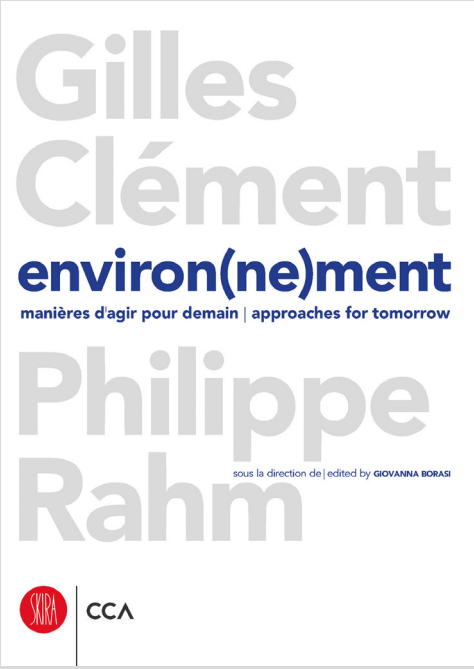
The works by Phillipe Rahm serve as my main inspiration for utilising water and temperature as design devices. The Jade Eco Park in Taichung, Taiwan was designed so that a diversity of microclimates and a multitude of different sensory experiences in different areas of the park depend on the hour of the day or the month of the year. These areas were identified as 'cool areas' (temperature), 'dry areas' (humidity), and 'clean areas' (purification of air). By naturally and artificially changing the temperature, humidity and pollution, the park generates spaces of varying levels of comfort and enjoyment where users can move freely through and choose to occupy as they see fit. I aim to study and utilise his methods and design principles within my own project.

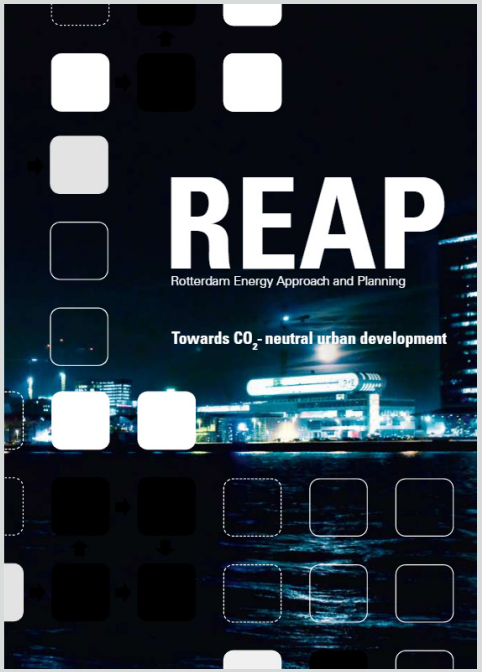
My research also takes on the technical side of passive house principles. The REAP Rotterdam Energy Approach and Planning (Tillie et al., 2009) presents the theory of pairing functions that have opposite heat and energy needs so that they may feed each other's energy streams. For example: pairing a supermarket (that gives off excess heat) and housing (that requires constant heat). More research into similar principles will be needed to truly optimise energy usage within my building.

CASE STUDIES

Jade Eco Park - Philippe Rahm architectes (no date). Available at: http://www.philipperahm.com/data/projects/taiwan/index.html (Accessed: 9 November 2022).

MVRDV - Tainan Spring (no date). Available at: https://www.mvrdv.nl/projects/272/tainan-spring (Accessed: 9 November 2022).





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Clément, G. et al. (eds) (2006) Gilles Clément, Philippe Rahm: environ(ne)ment: manières d'agir pour demain = approaches for tomorrow. 1st ed. Milano : Montréal : New York: Skira ; CCA ; Distributed in North America by rizzoli.

Heckenast, G., Ferencz, M. and Kertész, A.T. (2021) 'The impact of water in architectural thinking', Pollack Periodica, 16(1), pp. 138–144. Available at: https://doi.org/10.1556/606.2020.00131.

Tillie, N. et al. (2009) REAP Rotterdam Energy Approach and Planning: Towards CO2-Neutral Urban Development.

C. DESIGN BRIEF

CORE PROGRAM

SPACES	SIZE (SQM)
WADING POOL	1200
MEETING SPACES - LANGUAGE CLASSES - FAMILY SUPPORT MEETINGS - COOKING CLASSES - BABY YOGA - PARENT MEET-UPS	600
FAMILY CAFE	190
GREENHOUSE GARDEN	370
EXHIBITION SPACE	560
RECEPTION/LOCKERS	140
TOTAL	3060

SERVICE PROGRAM

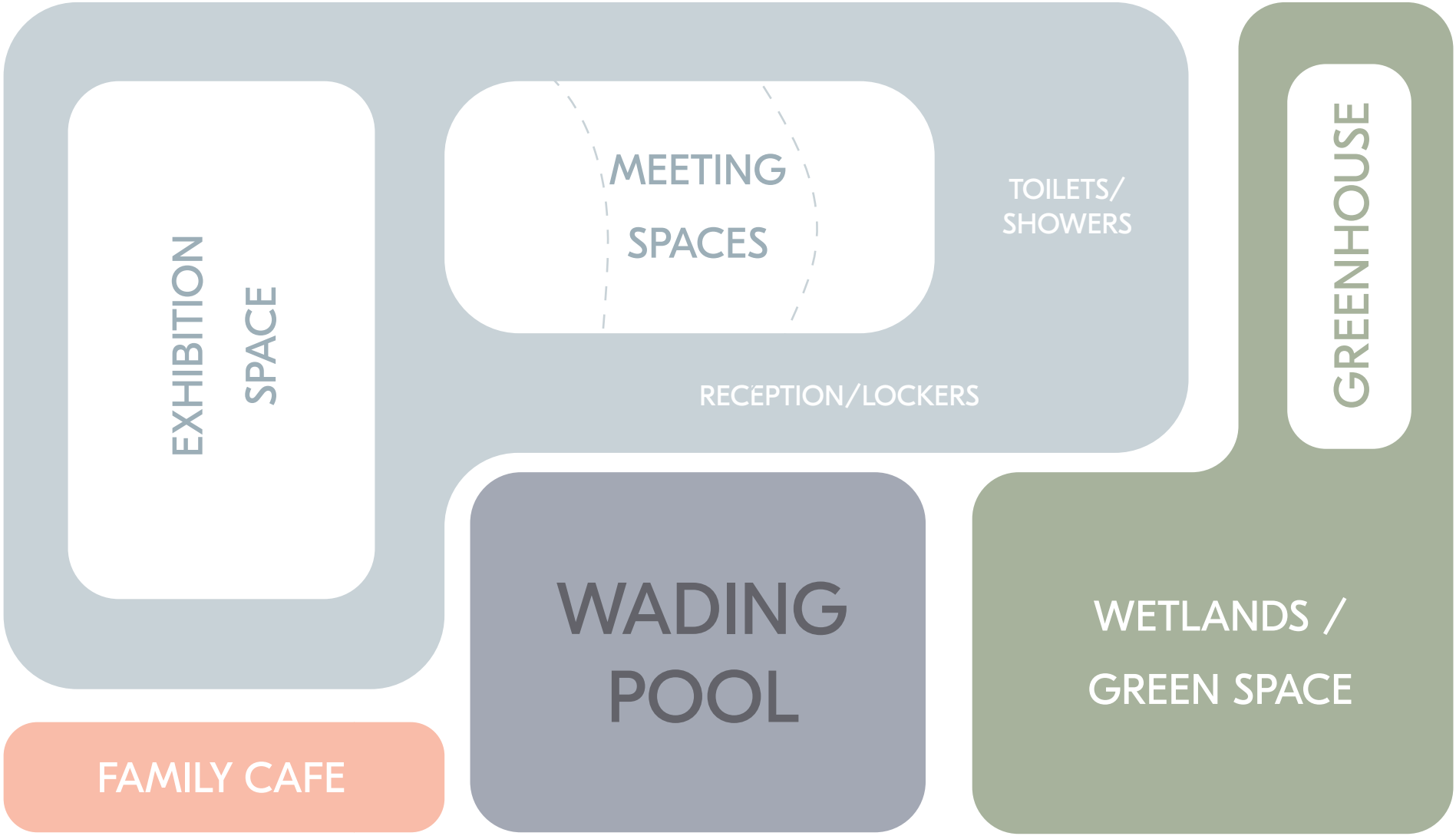
SPACES	SIZE (SQM)
RECEPTION/LOCKERS	200
TOILETS/SHOWERS	200
MECHANICAL ROOM	100
WETLAND/GREEN SPACE	3970
TOTAL	4470

The program is loosely based on existing family centres. The main objective is for parents in the district to meet and build a network with each other. Meeting spaces that can host a variety of community building exercises such as language classes and parent meet-ups are an important part of the program as Friedrichshain has a high population of immigrant families that require support.

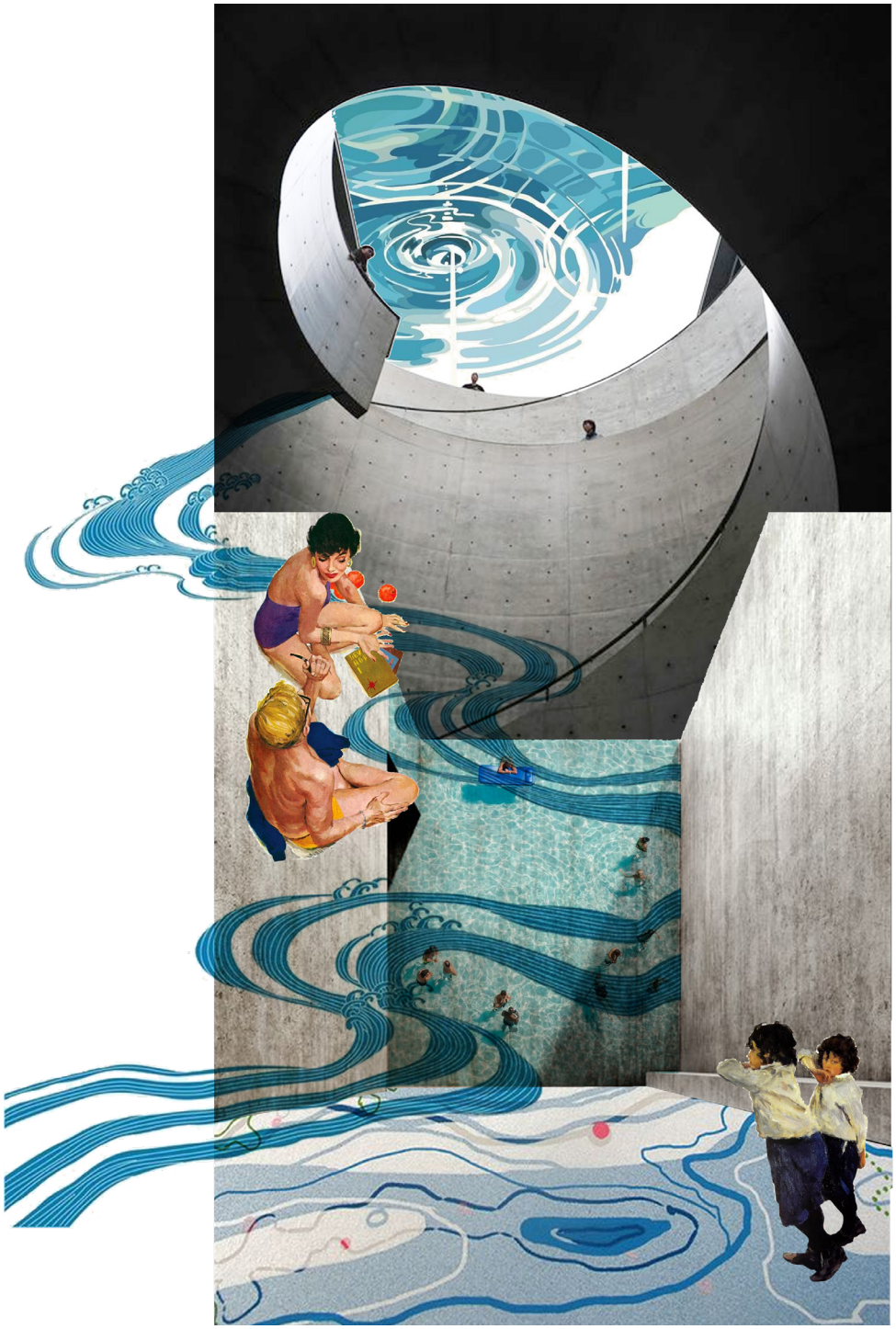
The wading pool and family cafe serve as a more informal meeting area that is open to all. I am still unsure how the wading pool would take form and if it will be a pool at all.

PROGRAM

DISTRIBUTION OF SPACES



D. PROCESS DOCUMENTATION



INITIAL RESEARCH QUESTION

> *"Form and Function Follow Climate"*
>
> -Philippe Rahm

The public condenser utilises thermodynamic principles to create several micro-climatic spaces that generate complimentary functions and thus, architectural programmes. Climatic conditions (i.e. the balance between heat and humidity) have been the traditional influence upon our bodies and our activities. This montage talks about using water and heat that influences us in using the space a certain way that is the most comfortable for our bodies. It could be meeting with friends, relaxing by yourself, playing with others... Everything points back to water as a social condenser.

BERLIN FINDINGS

This psychogerography map focuses on two points I gathered from Berlin: family life and water.

Through many on street interviews and observations on-site in Friedrichshain, it is clear that the district has a huge population of families. There were many parents on the street at any time of the day pushing their stroller and minding their children as they went about their daily chores. I included a quote from a young parent I interviewed on the map whereby she described how the district was changing and more young families were moving to the area. Friedrichshain is definitely a sought after place for families with children as there are numerous schools from kindergarten to high school level in the area (highlighted on the map). Many parents also mentioned how they wished for a swimming pool when prompted if they felt like the district was lacking in anything.

Water *as climate control*
as education
as a spatial device
as a boundary
as a gathering space

as life

amstelhouse.de (2018) Berliner rosa Rohre - das Geheimnis der rosa Rohre in Berlin | Amstel Travel Blog, Amstel House. Available at: https://www.amstelhouse.de/blog/culture/berlin-pink-pipes/ (Accessed: 3 November 2022).

BERLIN FINDINGS

15% of Friedrichshain-Kreuzberg is ***under 18***

43,558 inhabitants as of 2019

the average age is ***38 years old.*** *The district's inhabitants are mainly young people and young families*

single child families make up for the majority (58%) in Berlin

a quarter of the population is married 68,300 [25.3 %] 2009

http://www.wilcoproject.eu/wordpress/wp-content/uploads/WILCO_WP3_Berlin1.pdf

FAMILY CENTRE PROGRAMME EXAMPLES

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
STUDIO 1 ESMARCHSTR. 5 10407 BERLIN		15:30–16:15 **Pre-Ballet** 3–5 Y · JEMMA	15:30–16:15 **Acrobatics** 4–6 Y · MORIN	15:45–16:30 **Musical Theater** 3–5 Y · JEMMA	15:00–15:45 **Pre-Ballet** 3–5 Y · COURTNEY		
		16:15–17:00 **Pre-Ballet** 4–5 Y · JEMMA	16:15–17:00 **Acrobatics** 5–7 Y · MORIN	16:30–17:15 **Ballet** 5–7 Y · JEMMA	15:45–16:30 **Ballet** 5–7 Y · COURTNEY	10:30–11:30 **Ballet** 5–7 Y · GEORGIA	
		17:30–18:30 **Jazz Dance** 10–13 Y · ANDI	17:00–17:45 **Musical Theater** 5–7 Y · JEMMA	17:15–18:15 **Jazz Dance** 8–10 Y · JEMMA	16:45–17:45 **Ballet** 8–10 Y · COURTNEY		
		18:30–19:30 **Jazz Dance** TEENS · ANDI	17:45–18:45 **Musical Theater** 8–10 Y · JEMMA	18:30–19:30 **Lyrical Jazz** TEENS · ZAHRA	17:45–18:45 **Ballet** TEENS L1 · COURTNEY		
		19:45–20:45 **Jazz Dance** ADULTS		19:45–20:45 **Body Toning** ADULTS	19:00–20:30 **Workshop** 4X1.5H · ADULTS		

▼ Overview

	Monday	Tuesday	Wednesday	Thursday	Friday
Club	Tennis	Tennis	Coordination & Balance	Coordination & Balance	Coordination & Balance
Grades:	K3, 1-2	3-5	K2, K3 & Grade 1	K2, K3, Grade 1-2	Grades 2-5
Time:	16:00-17:00	16:00-17:00	15:30-16:30	15:30-16:30	15:30-16:30
Max. No. Students	10	10	18	18	18
Costs:	€ 195 per term	€ 195 per term	€ 170 per term	€ 170 per term	€ 170 per term
Note:	Students meet the tennis coach infront of the small gym. Bus shuttle leaves from Primary School around 15:50, **pick-up directly from tennis court by parents at 17:00 from VfK Berlin, Maikäferpfad 36, 14055 Berlin.**	Students meet the tennis coach infront of the small gym. Bus shuttle leaves from Primary School around 15:50, **pick-up directly from tennis court by parents at 17:00 from VfK Berlin, Maikäferpfad 36, 14055 Berlin.**	Students should wear appropriate, functional clothing. Indoor activities require non-marking, clean indoor shoes.	Students should wear appropriate, functional clothing. Indoor activities require non-marking, clean indoor shoes.	Students should wear appropriate, functional clothing. Indoor activities require non-marking, clean indoor shoes.
Club	Basketball	Art	Art	Art	Ballet
Grades:	3-5	K3, Grades 1-5	K3, Grades 1-5	K3, Grades 1-5	K2-K3, Grade 1
Time:	15:30-16:30	15:30-16:30	15:30-16:30	15:30-16:30	15:30-16:15
Max. No. Students	10	13	13	13	15
Costs:	€ 18 per session	€ 215 per term	€ 215 per term	€ 215 per term	€ 10 per session
Note:	Students should wear appropriate, functional clothing. Indoor activities require non-marking, clean indoor shoes.	Please bring an old shirt or apron to protect clothes.	Please bring an old shirt or apron to protect clothes.	Please bring an old shirt or apron to protect clothes.	Please bring ballet shoes.
Club		Dance	Turkish Club	Chess	Chess
Grades:		1-5	1-5	1-5	1-5
Time:		15:30-16:30	15:30-16:30	15:30-16:30	15:30-16:30
Max. No. Students		20	10	10	10
Costs:		no charge	no charge	€ 220 per term	€ 220 per term
Note:		Students should wear appropriate, functional clothing. Indoor activities require non-marking, clean indoor shoes.	**Available for native speaker only.**	Chess exercise book available for € 7 with Mr Neumann.	Chess exercise book available for € 7 with Mr Neumann.
Club		Samba Drums		Samba Drums	Samba Drums
Grades:		1-5		1-5	1-5
Time:		15:30-16:00		15:30-16:00	15:30-16:00
Max. No. Students		15		15	15
Costs:		€ 7 per session		€ 7 per session	€ 7 per session
Note:		Be part of the bateria playing Samba Batacuda from Brazil! This energetic group is perfect for improving ensemble skills, rhythm training, improvising, and massively helps boost confidence as a performer.		Be part of the bateria playing Samba Batacuda from Brazil! This energetic group is perfect for improving ensemble skills, rhythm training, improvising, and massively helps boost confidence as a performer.	Be part of the bateria playing Samba Batacuda from Brazil! This energetic group is perfect for improving ensemble skills, rhythm training, improvising, and massively helps boost confidence as a performer.
Club		Football (only until 15.11.2022)		Football (only until 17.11.2022)	
Grades:		Grades 1-3		Grades 4-5	
Time:		15:30-16:30		15:30-16:30	
Max. No. Students		15		15	
Costs:		€ 175 per term		€ 175 per term	
Note:		Students should wear appropriate, functional clothing. Indoor activities require non-marking, clean indoor shoes.		Students should wear appropriate, functional clothing. Indoor activities require non-marking, clean indoor shoes.	

https://www.menschenskinder-berlin.eu/familienzentrum/

PHYSICAL CONCEPT MODEL

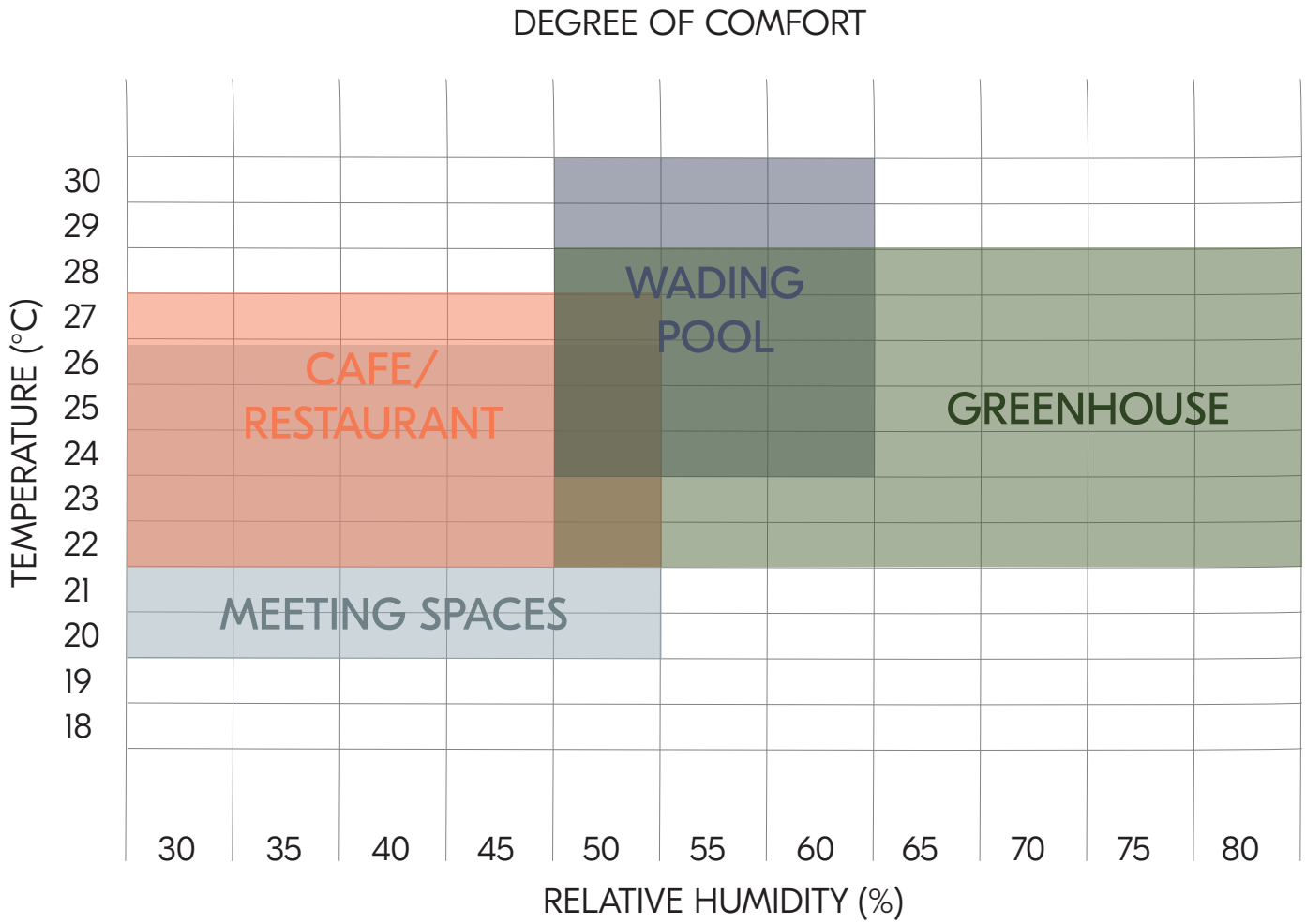
The model was made so its components could expand and contract to create different compositions within the frame. The pregnant queer coded figure at the back signifies the target group of my project: young Berlin families that might not necessarily fit the mold of a traditional nuclear family.

Surely my building does not need to fit this mold either. Hence, the chance to expand and breath out into space with functions and intentions needed at the time.

The model speaks of the opporunity to grow when needed, to fit and form whatever its users want it to be. The chance for exploration and growth.

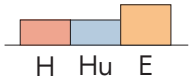
PROGRAM

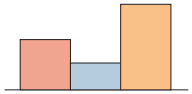
RELATIONSHIP BETWEEN TEMPERATURE & HUMIDITY

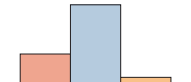


Designing with climate means designing with data. The general programmatic spaces are plotted against temperature, humidity, and energy consumption to understand not only the extremities but also the commonplace climate zones of certain functions. This was not only to understand the different climate parameters needed for a variety of functions but also for energy optimisation reasons.

ENERGY DEMAND

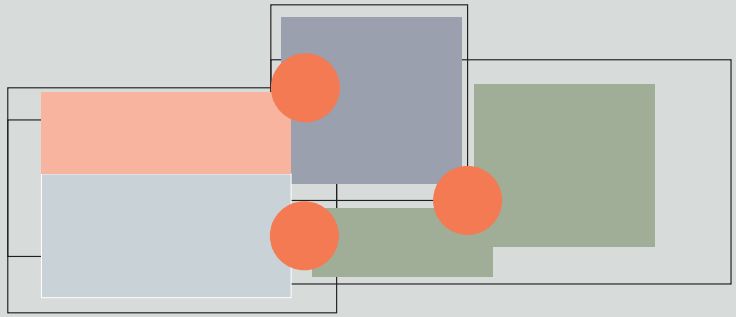


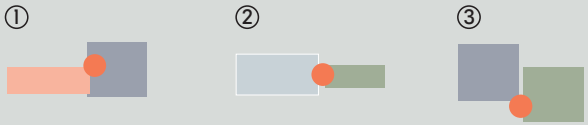


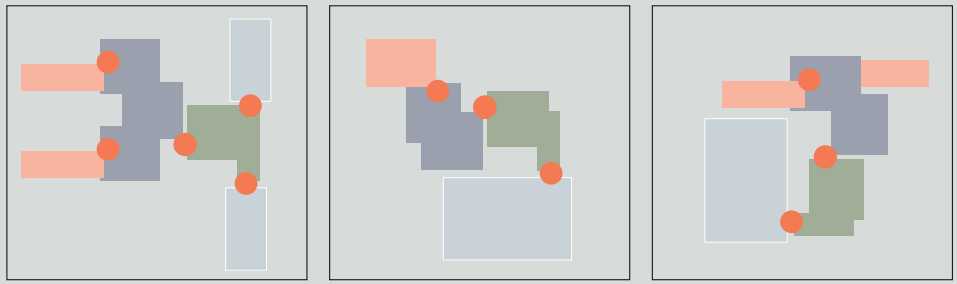


H = Heat
Hu = Humidity
E = Energy

INITIAL ANALYSIS



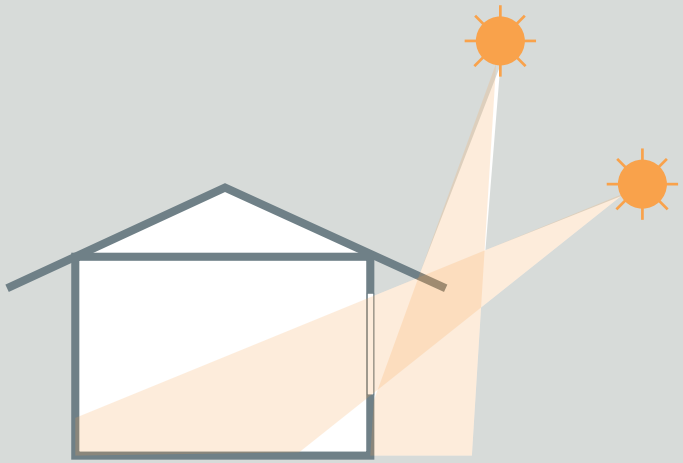




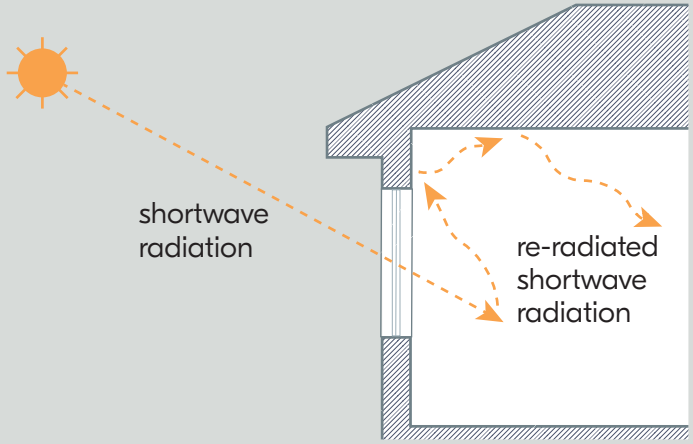
The initial analysis focused too much on the differences of each climate zones when the strength laid with the zones that overlapped and shared similarities. Maybe certain functions could happen simultaneously or they could share the same space and thus the same climate zone...

ENERGY PRINCIPLES

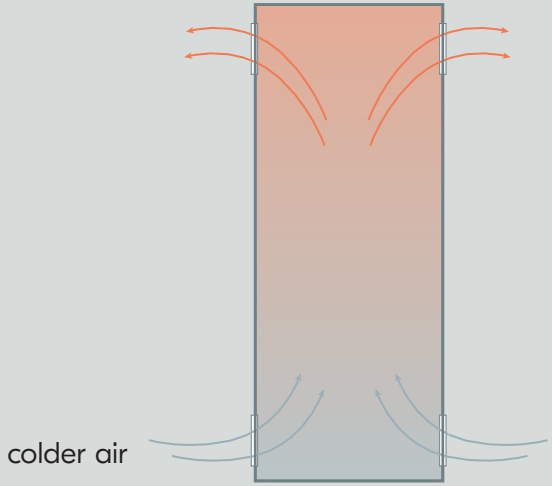
PASSIVE HOUSE PRINCIPLES



Orientation of sun angles during summer & winter



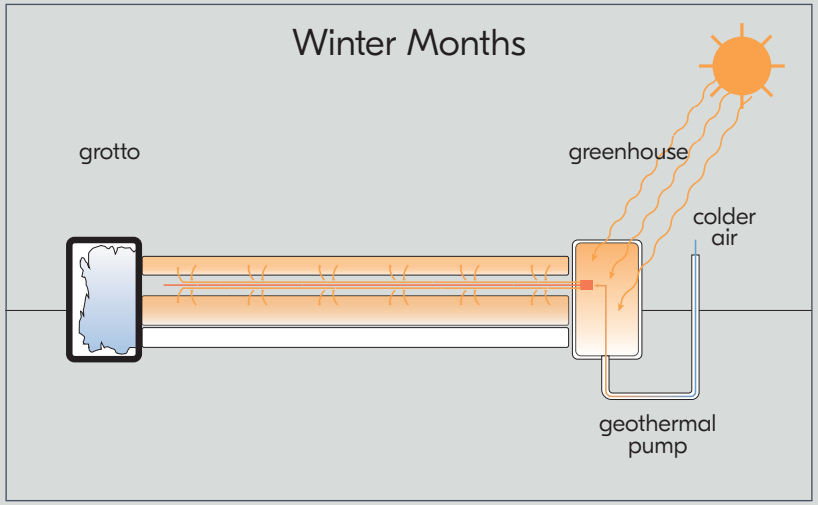
Greenhouse effect to trap solar radiation



Stack ventilation effect

ENERGY PRINCIPLES

PHILIPPE RAHM: OFFICE BUILDING IN FRANCE
working with polarity

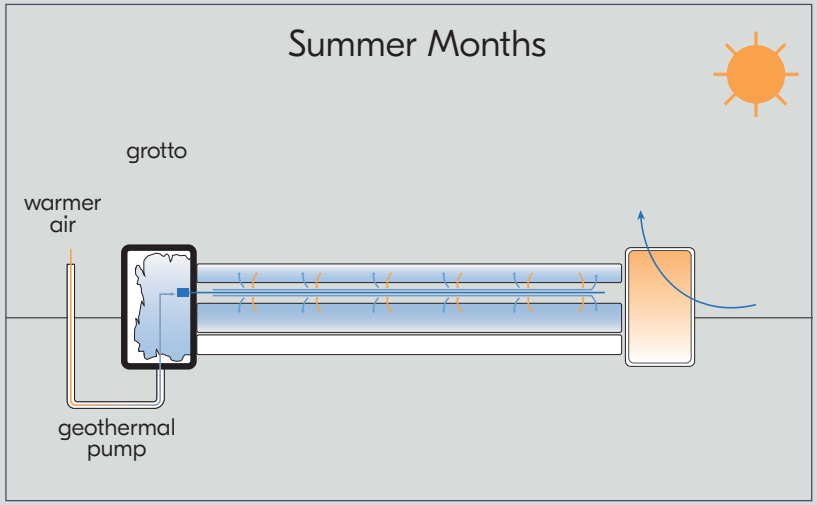


This office building has two polar cores on each side of the building that act as a climate regulators for the winter and summer months.

During the winter months, hot air generated in the greenhouse and through geothermal warming will be pushed through and circulated through the building to raise the indoor temperature.

Conversely, during the summer months, the air would be cooled in the 'grotto' by inertia and the fountain that is placed there. This cooled air will be then pumped through the building.

This creates a summer and winter living room in the building.



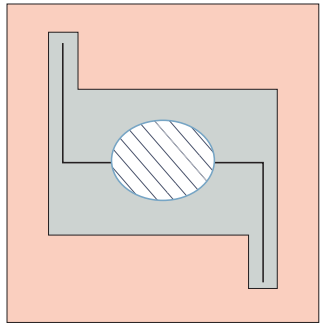
https://www.youtube.com/watch?v=qGETwT3ZumE&ab_channel=TheWorldAround

SPATIAL PRINCIPLES & THERMODYNAMICS

DESIGNING WITH DATA

cool	20°C, 30%	dry
	24°C, 30%	dry
	24°C, 50%	
warm	28°C, 50%	
warm	28°C, 70%	wet

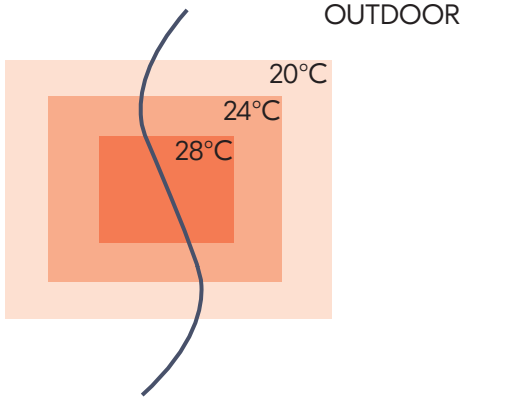
The relationship between temperature and humidy are paired up and divided in 5 different climate zones. The coloured dots next to them represent the types of functions that they could inhabit. Applying simple principles of heat transfer, I envision a core with the highest temperature radiating outwards and heating up the surrounding spaces. Water spaces may surround and weave inbetween the outer spaces in which their difference in temperature would facilitate movement of heat and humidity.

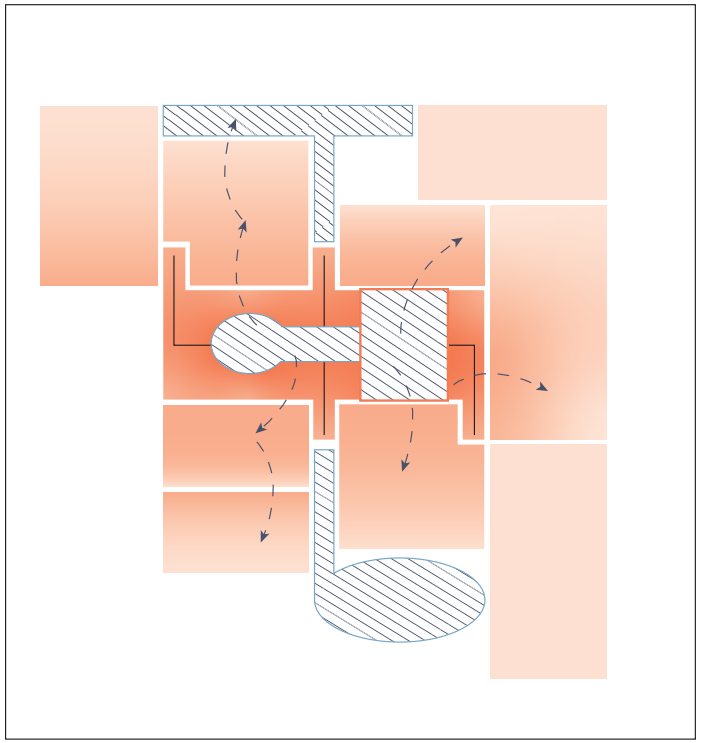


water

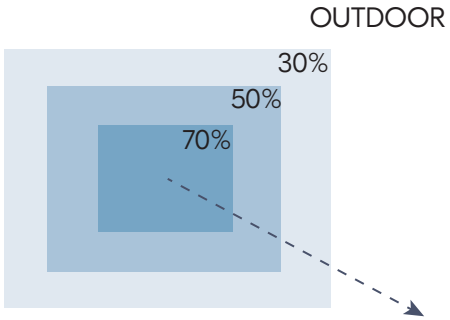
DESIGNING WITH DATA

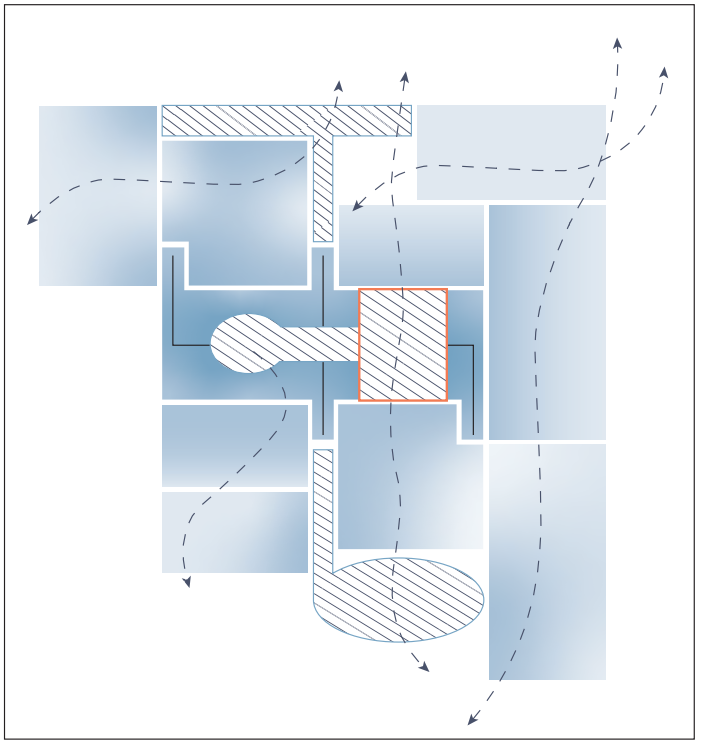
Temperature



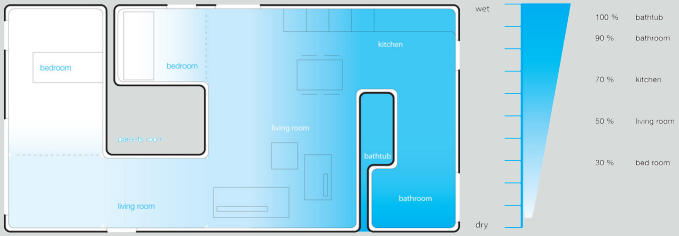


Humidity

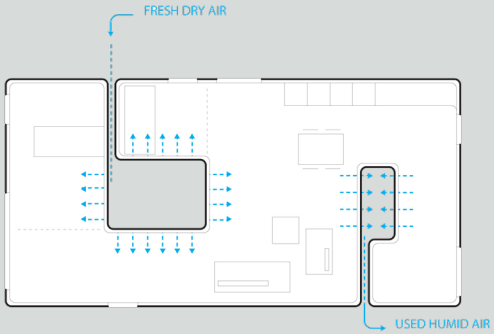




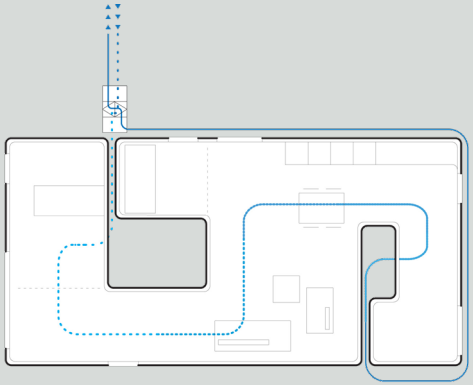
PHILIPPE RAHM: VAPOR APARTMENTS DESIGN PRINCIPLES



floor plan_apartment
functions related to humidity



floor plan_apartment
air-flow related to the double flux air-renewal with heat-exchanger



floor plan_apartment
air-flow related to the double flux air-renewal with heat-exchanger

Description from Philippe Rahm's website:

One man produces 40 grams of vapor during one hour when he is sleeping, 150 grams of vapor when he is awake, 1500 grams when he cooks, 2400 grams of vapor when he takes a shower.

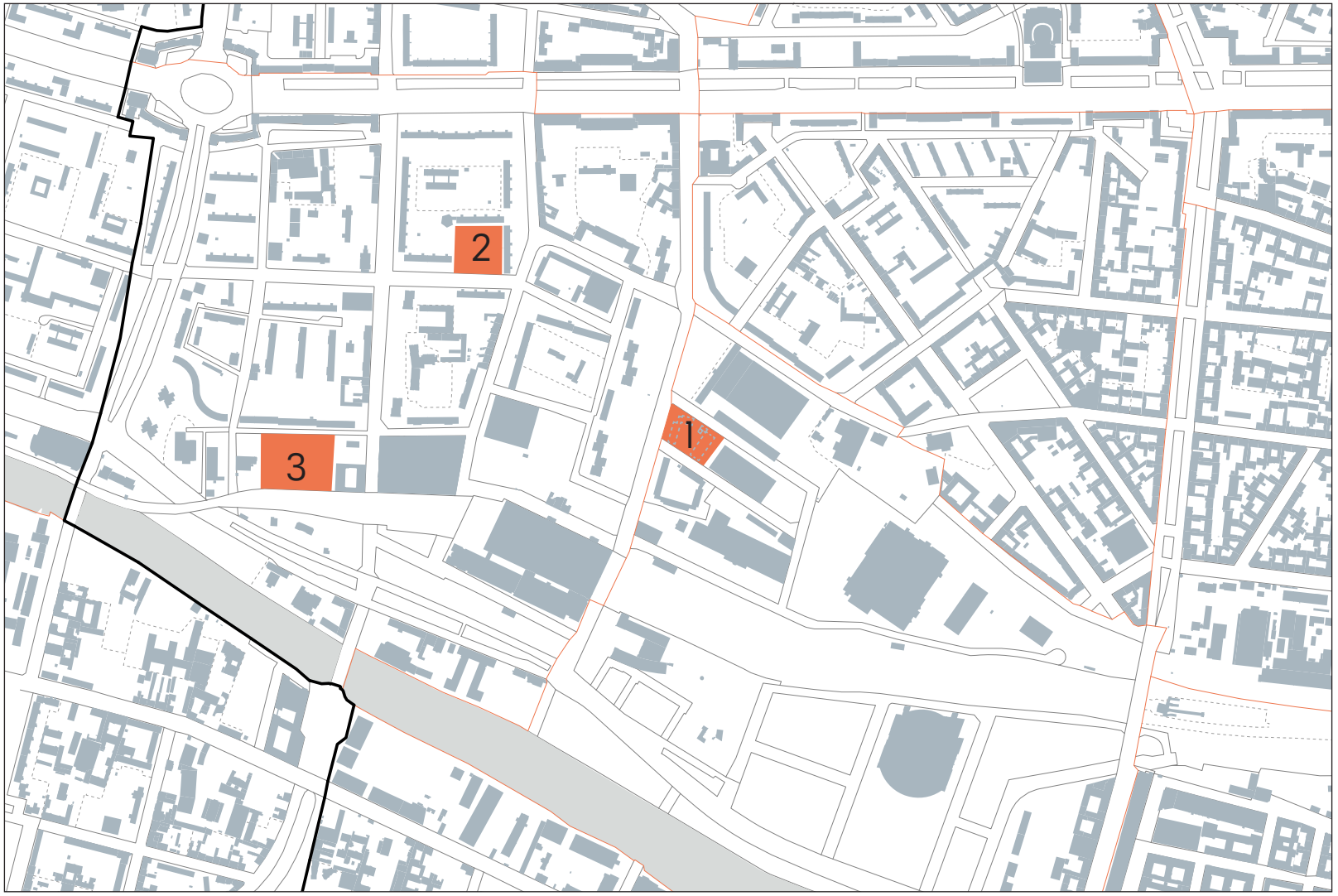
The design of this building is based on the route of vapor throughout the house. The air renewal starts in the driest part of the house and finishes in the most humid part of the house, because we don't want to bring back humidity in the dry area of the house. This route of this air is determined by the use of the space and the vapor produced by the body in relation with the physical activity performed there.

The apartment becomes an interior geography, stretched between a miniature desert and an indoor tropical jungle, between a dry area at 30% of relative humidity and a wet region at 90% of relative humidity where the inhabitants could freely wander.

http://www.philipperahm.com/data/projects/vaporapartments/index.html

POTENTIAL SITES

FRIEDRICHSHAIN DISTRICT MAP



Scale 1 : 10 000

PHOTOS OF POTENTIAL SITES

SITE 1

The site currently has an old abandoned hotel that will undergo demolition. It is surrounded by industry/office spaces.

It sits in between all three neighbourhoods and along one of the main roads between them.

SITE 2

The site is in the heart of Andreasviertel amidst several tall housing blocks. The existing site is a carpark which will need to be added back.

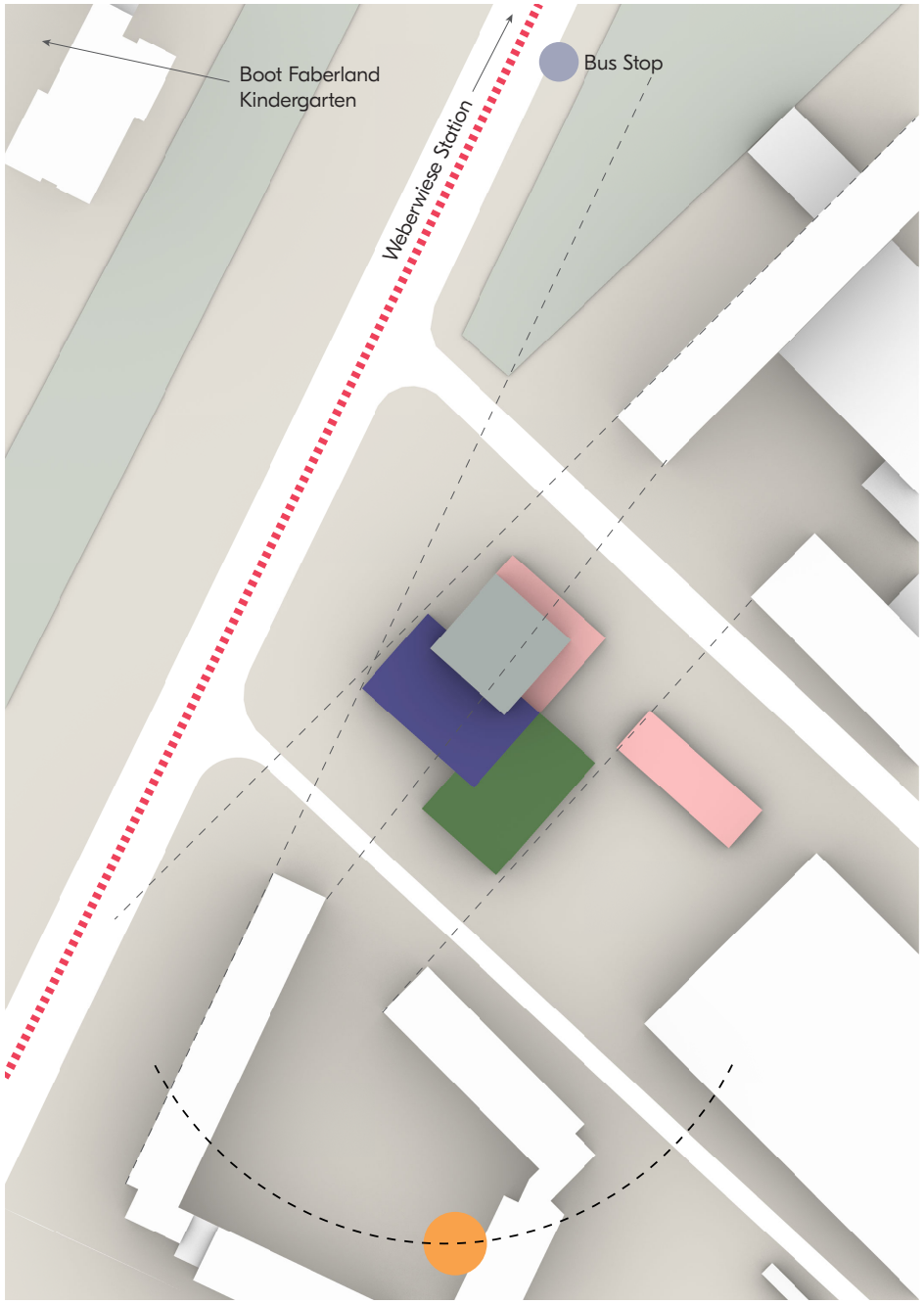
Due to the smaller footprint of the site, the programs will need to be vertically stacked.

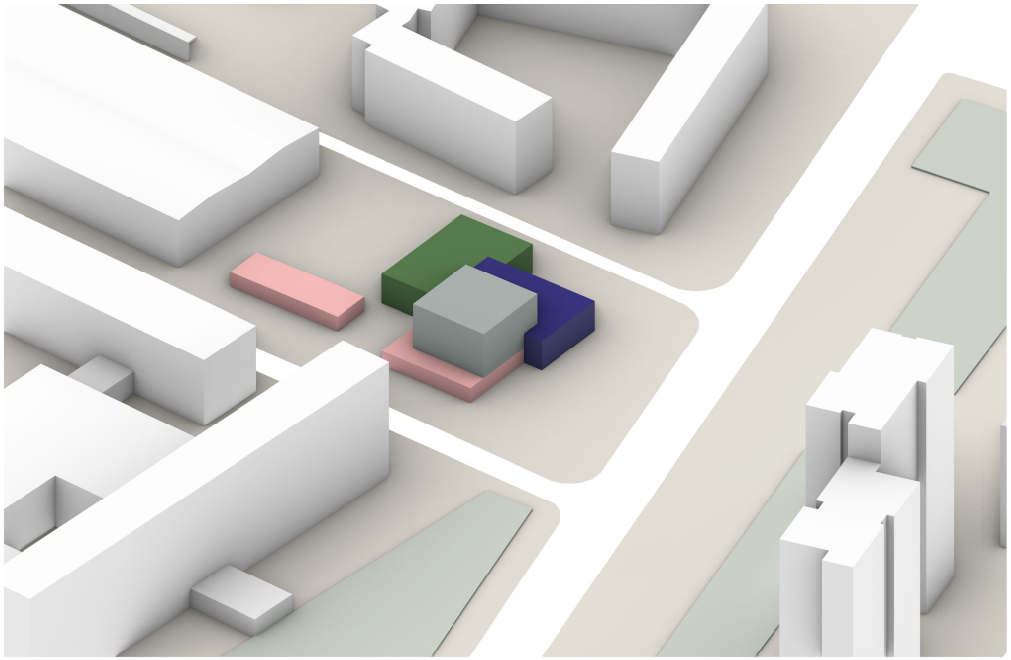
SITE 3

The site sits south of Andreasviertel near a railway line and is surrounded by housing. The site is the biggest amongst the the three which can accomodate future expansions.

It fronts a tall residential block of flat and backs up on the railway tracks.

SITE 1: MASSING





SITE 1 CONDITIONS

PROS:

- Sits in-between all 3 neighbourhoods.
- Fronts a busy main road that would be a great attractor to the building.
- Has space to expand.

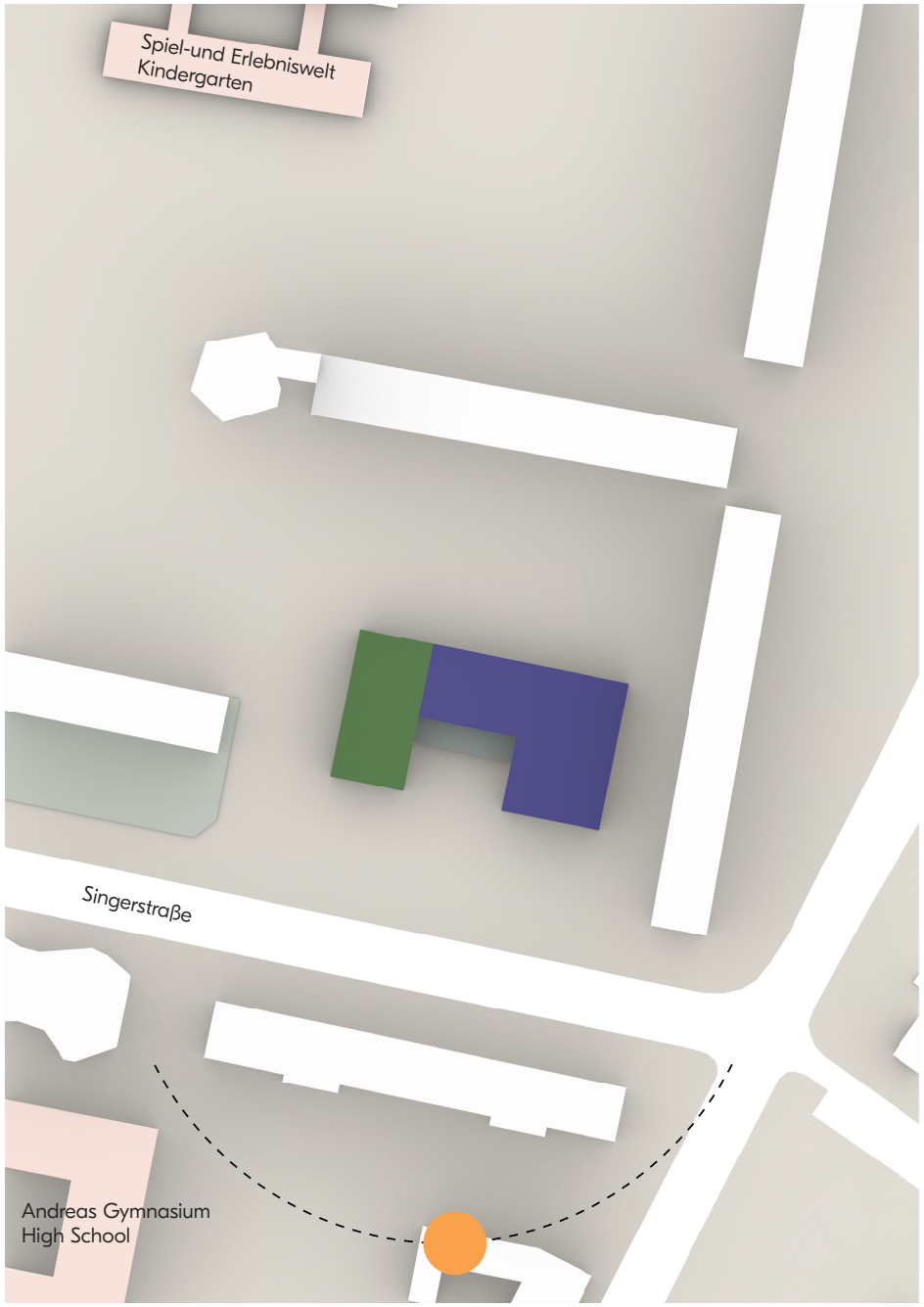
CONS:

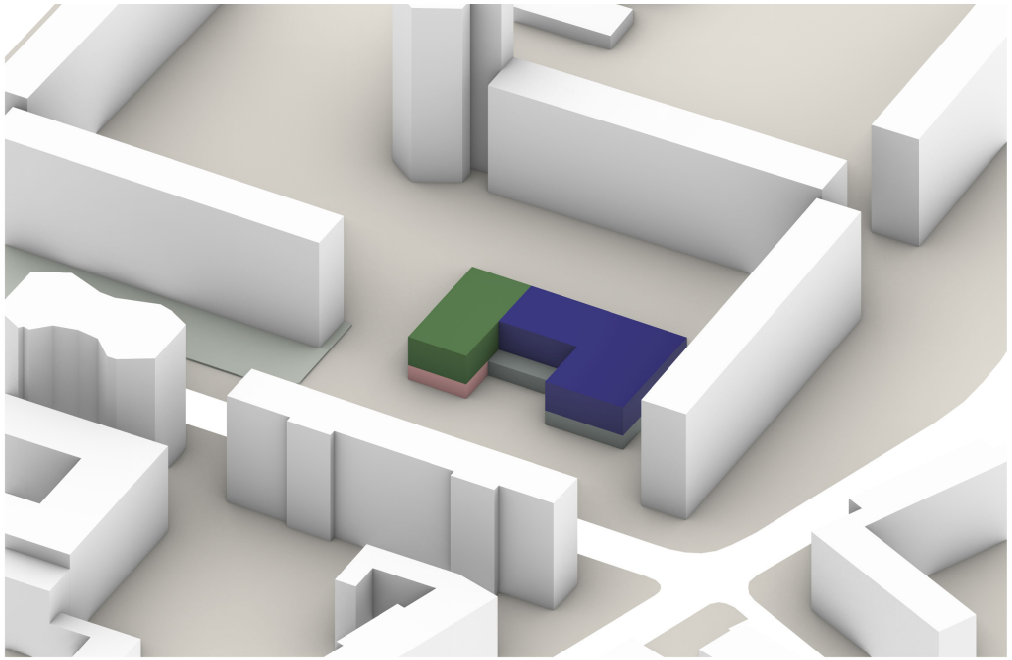
- The site sits on an industrial area and might not be suited to the program.

CONCLUSION

This site would be the most suited out of the three sites to place my building.

SITE 2: MASSING





SITE 2 CONDITIONS

PROS:

- Next to two schools.

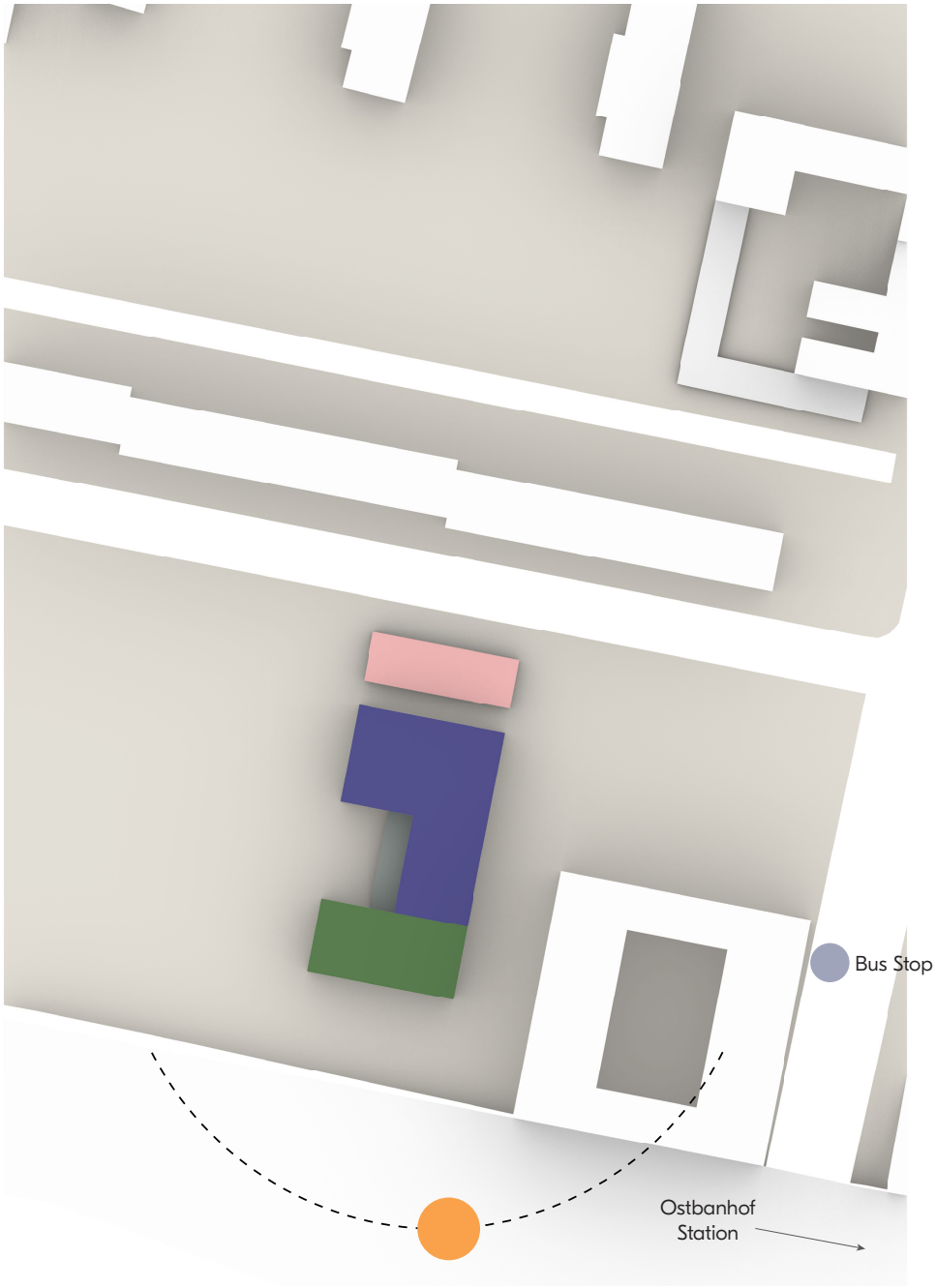
CONS:

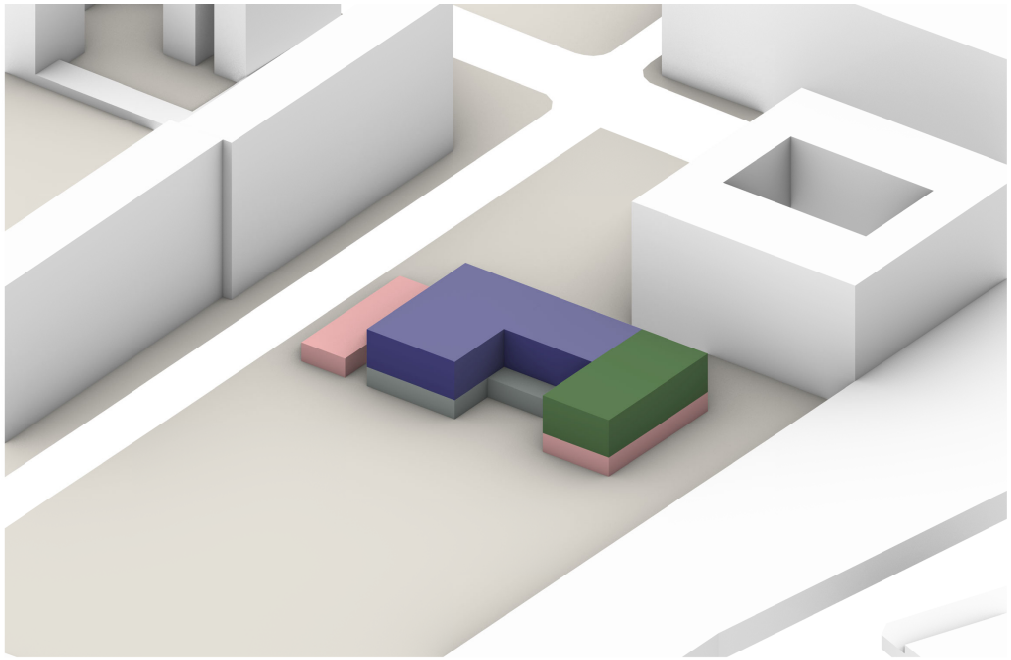
- Very close very tall housing blocks which may pose a privacy issue.
- Tall housing blocks may tower over the building.

CONCLUSION

The site is slightly secluded and is surrounded by towering housing blocks which may overpower the building.

SITE 3: MASSING





SITE 3 CONDITIONS

PROS:

- Very near Ostbanhof which will attract a wider crowd.
- Has space to expand.

CONS:

- The site backs onto railway tracks which may not suit the program of water.

CONCLUSION

This site is not as attractive or suited for the building and program.

E. SCHEMATIC DESIGN

THE COMMONS

Water and The Commons

Commoning is a **process of negotiation differences and conflicts** between the individual, the community and society.

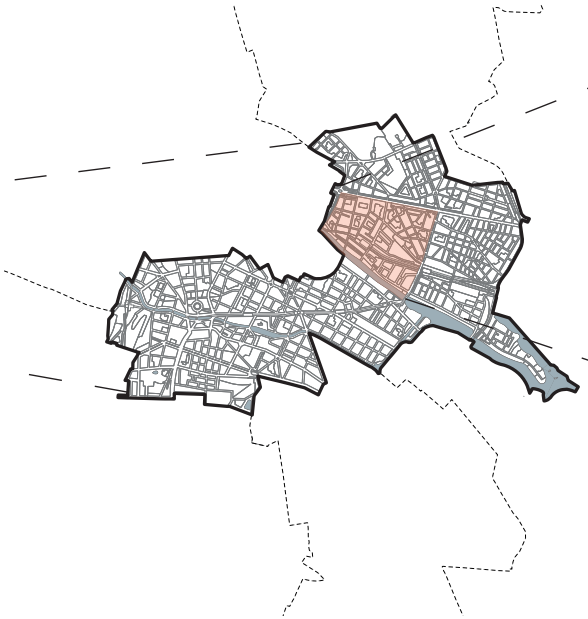
A water commons means that **water is available for all people and ecosystems**, and that the resource be passed on undiminished and intact for future generations' enjoyment

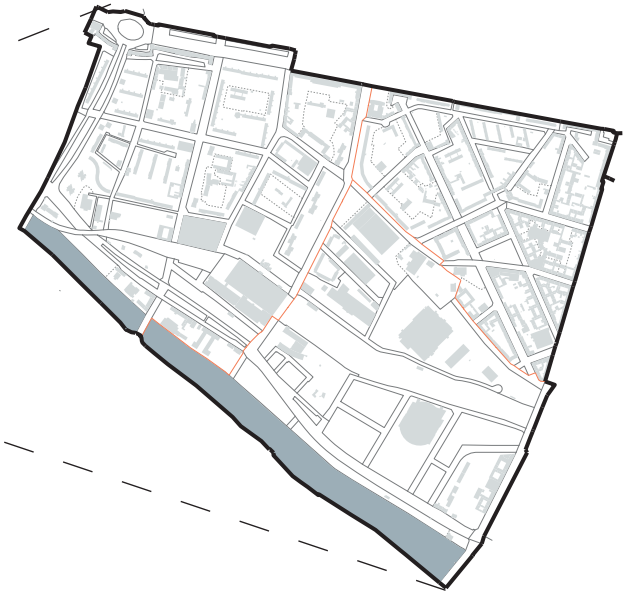
WHERE ARE WE? BERLIN, FRIEDRICHSHAIN!

CITY : BERLIN

DISTRICT: FRIEDRICHSHAIN-KREUZBERG

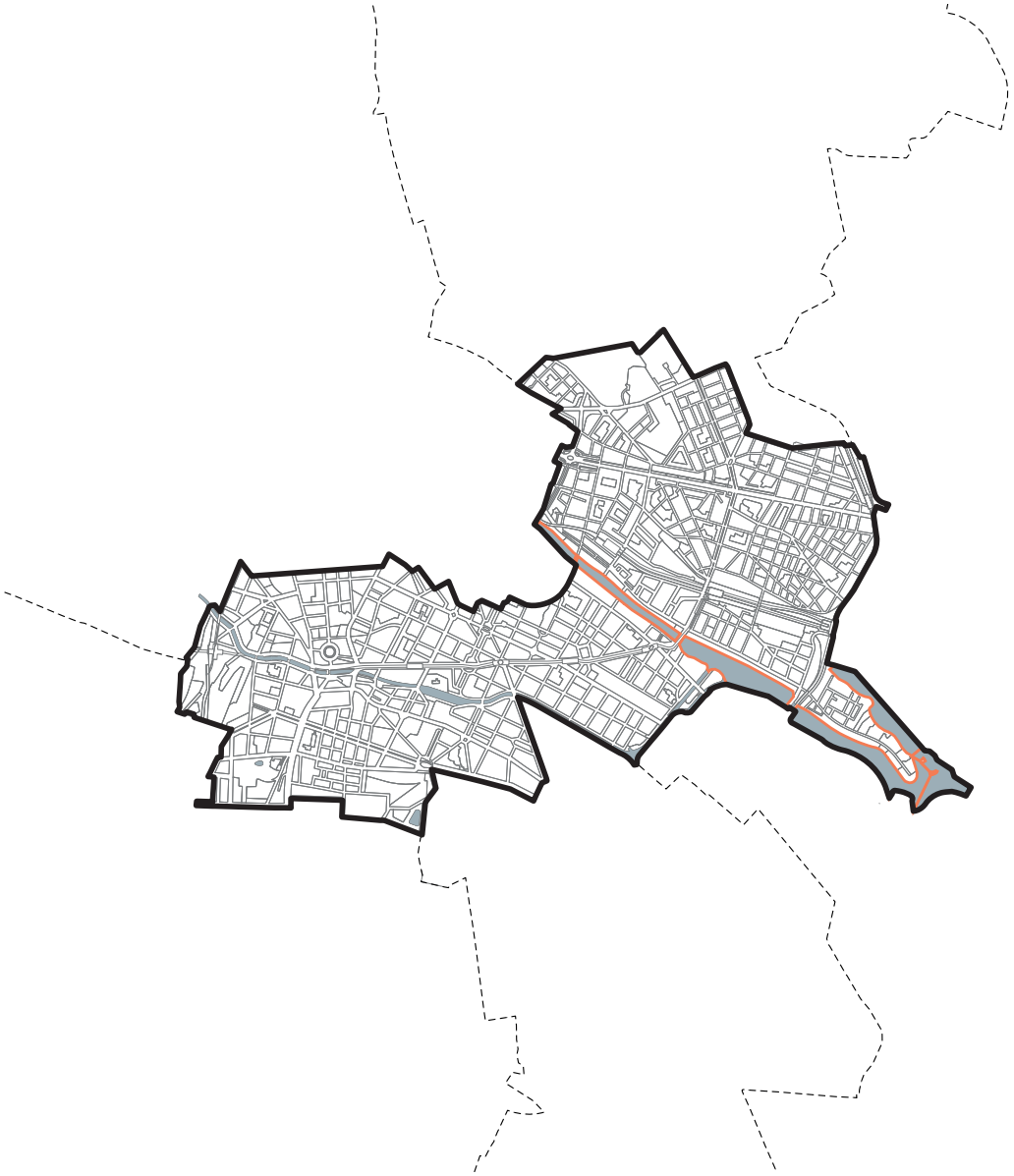
KIEZ: FRIEDRICHSHAIN



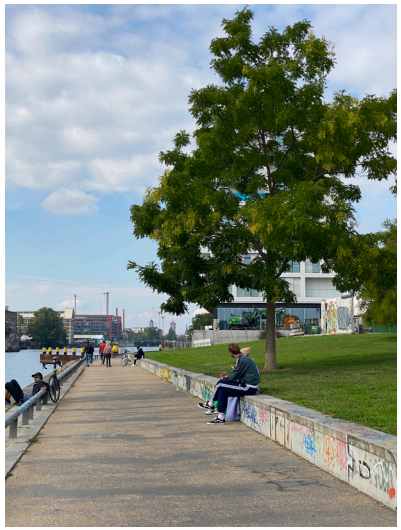


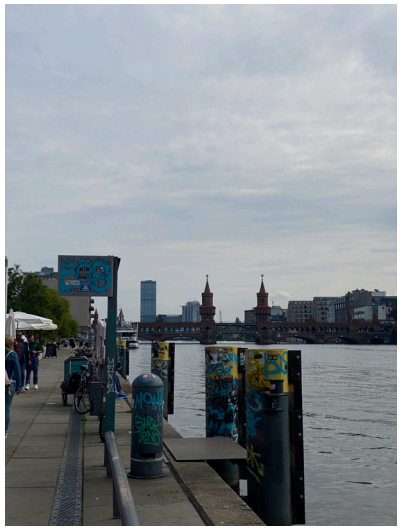
WATER CONNECTION

DISTRICT: FRIEDRICHSHAIN-KREUZBERG



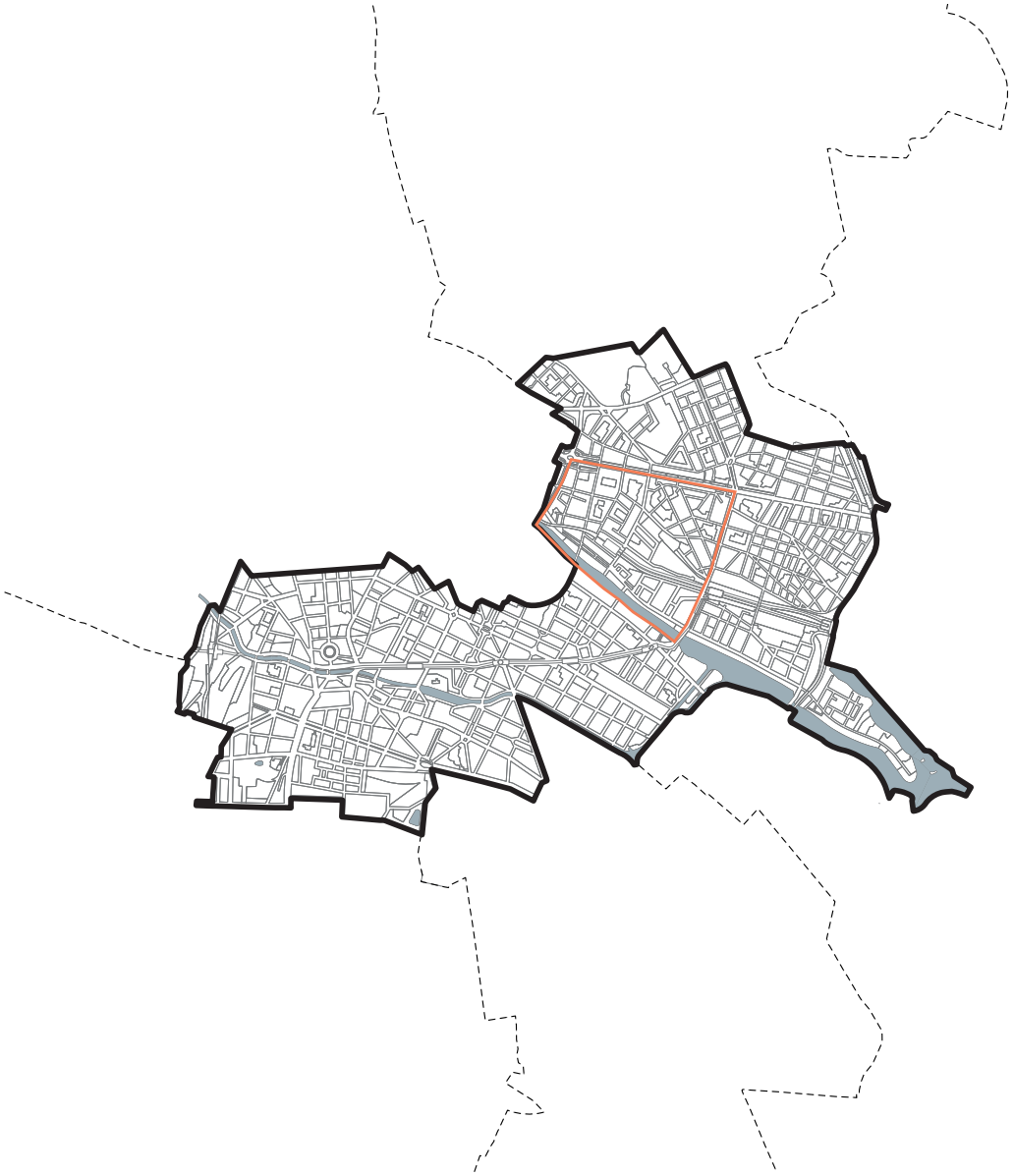
SPREE RIVER WATERFRONT





WATER CONNECTION

DISTRICT: FRIEDRICHSHAIN-KREUZBERG



WATER PIPES SNAKING THROUGH THE CITY

SITE MAP

FRIEDRICHSHAIN DISTRICT MAP

SITE PICTURES

The site sits in the middle of all three neighbourhoods, forming the heart of the Friedrichshain and giving an opportunity to connect them all through a public condenser.

SITE ANALYSIS

PUBLIC TRANSPORTS AND MAJOR ROADS

HOUSING

25,279 inhabitants

15,780 households

SITE ANALYSIS

SCHOOLS & DAYCARES

Einhorn Family Centre

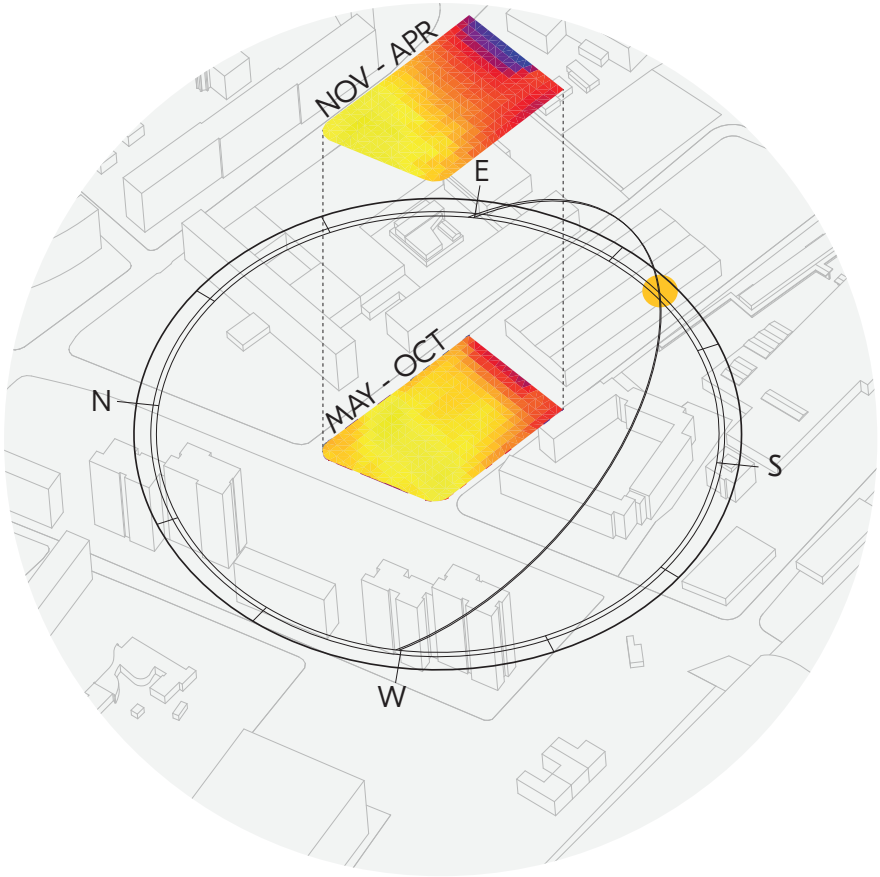
Total Schools/ Daycare : 11

WATER RECREATION

Groundwater Observation Point

CLIMATE ANALYSIS

SUNLIGHT HOURS ANALYSIS



MAY - OCT

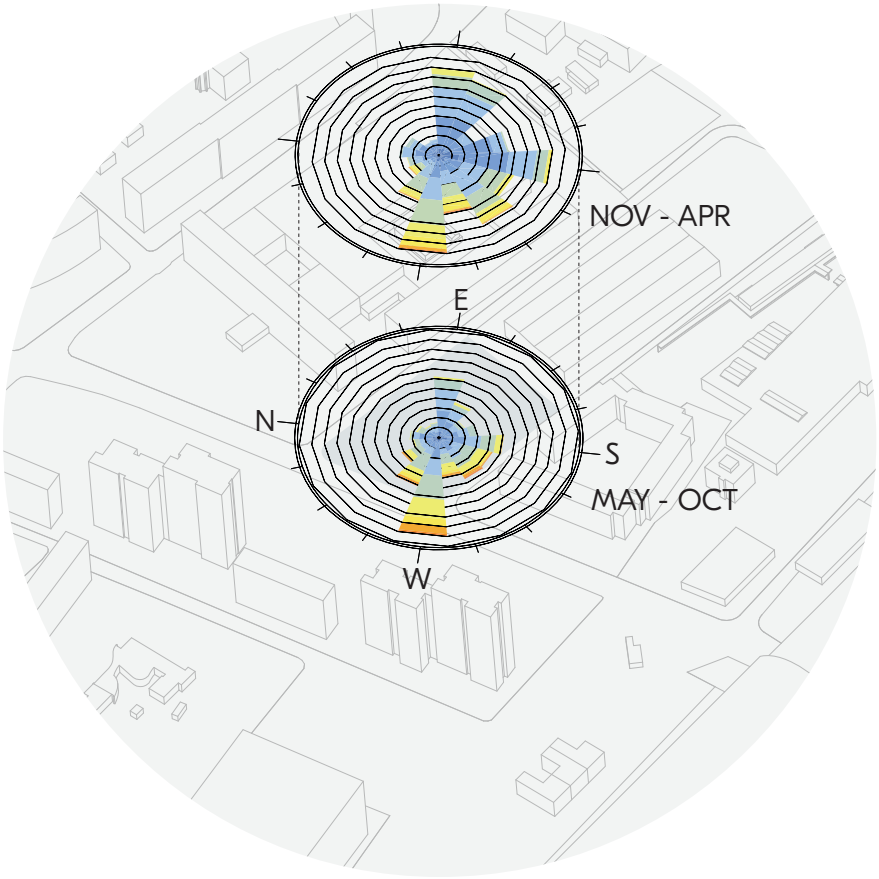
Hours
2185.00
1966.50
1748.00
1529.50
1311.00
1092.50
874.00
655.50
437.00
218.50
0.00

NOV - APR

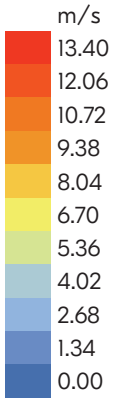
Hours
1445.00
1300.50
1156.00
1011.50
867.00
722.50
578.00
433.50
289.00
144.50
0.00

CLIMATE ANALYSIS

WIND SPEED ANALYSIS

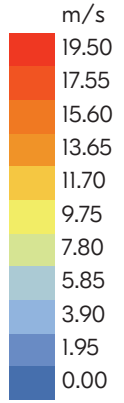


MAY - OCT



Hourly Data: Wind Speed (m/s)
Calm for 2.72% of the time = 120 hours.

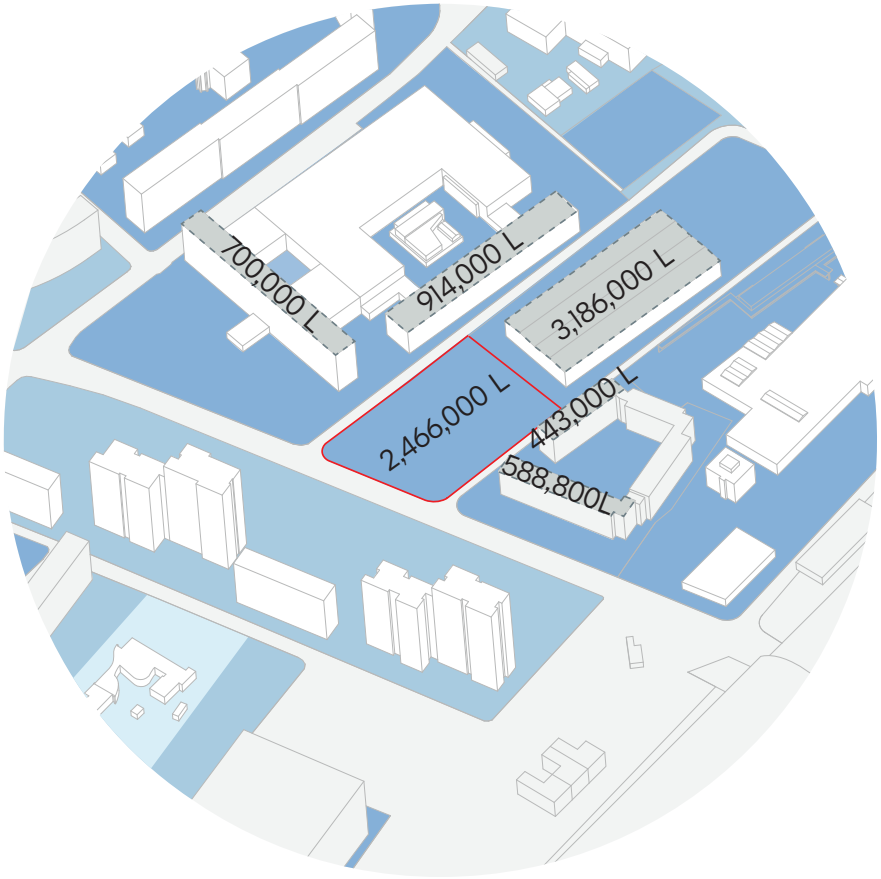
NOV - APR



Hourly Data: Wind Speed (m/s)
Calm for 1.43% of the time = 62 hours.

CLIMATE ANALYSIS

TOTAL YEARLY RUNOFF FROM PRECIPITATION



250 - 300mm
350 - 400mm
400mm

Total Yearly Runoff from Precipitation

TOTAL RAINWATER COLLECTED FROM SURROUNDING ROOFS = **5,831,8000 L**

MINIMUM RAINWATER TANK SIZE = **1,944,667 L**

ASSUME THE RAINWATER TANKS CAN FILL 3 TIMES PER YEAR

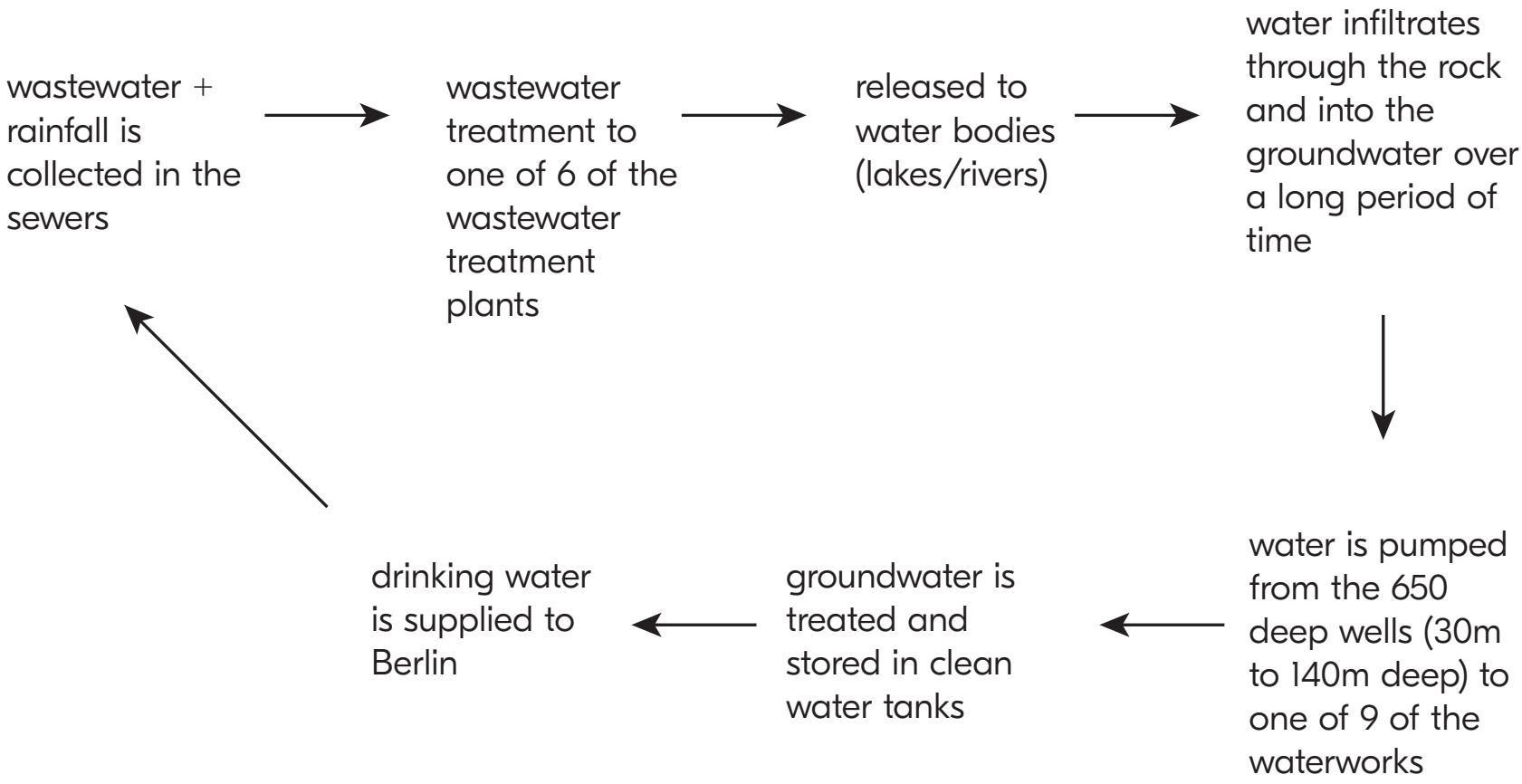
PART 1 : WATER SYSTEMS

PART 2 : RESILIENCE IN PROGRAMMING

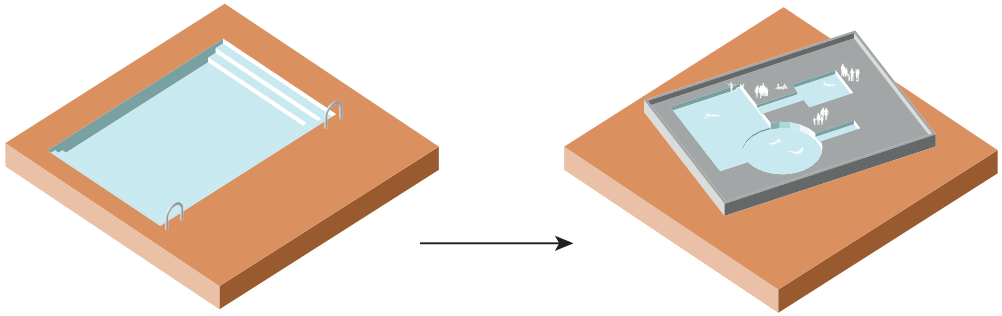
PART 3 : COMBINATION

WATER CYCLE ANALYSIS

URBAN WATER CYCLE IN BERLIN

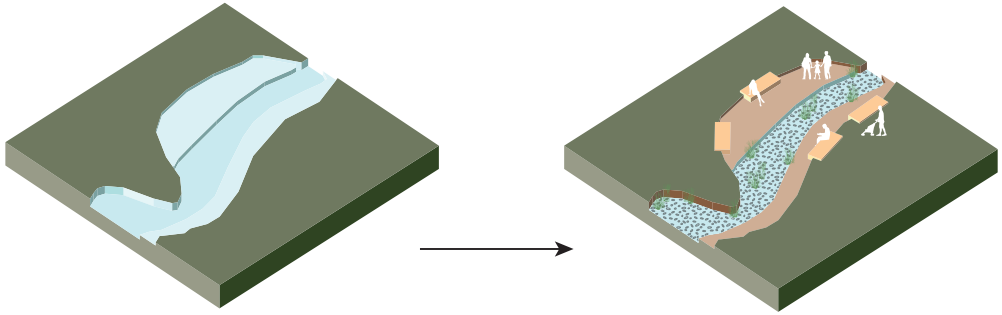


WATERSCAPES IN THE BUILDING



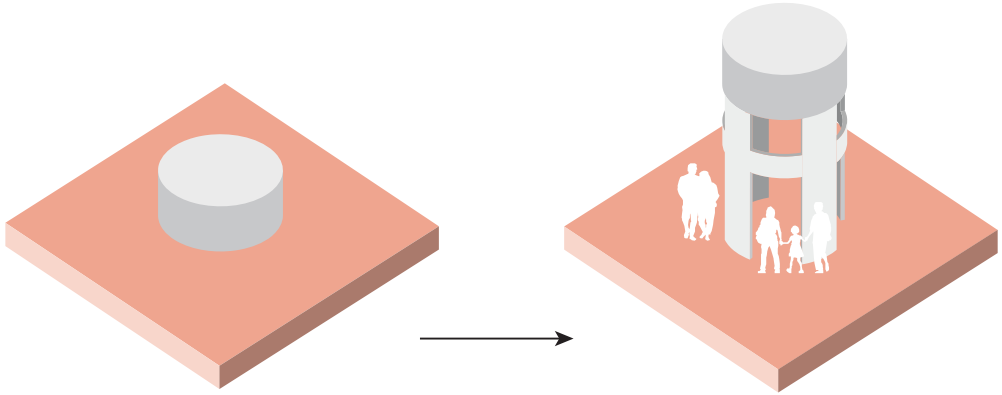
SWIMMING POOL

PUBLIC CONDENSER



POND

CONSTRUCTED WETLAND

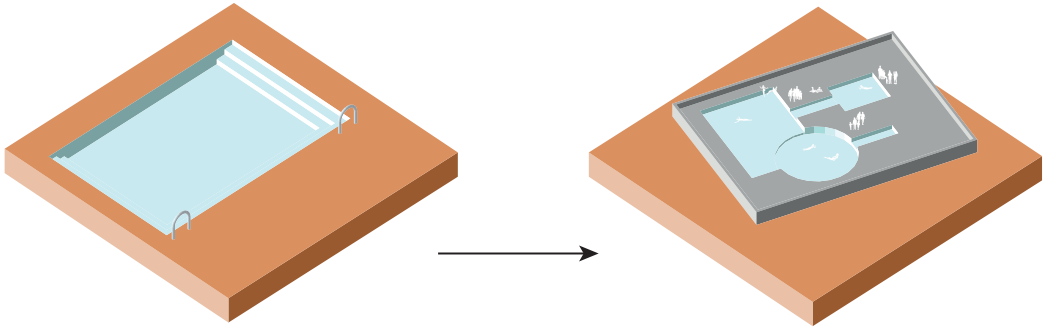


WATER TANK

STRUCTURAL FEATURE

The multifunctionality of the waterscapes within the building contribute to the scheme's overall **multiplicity, hybridity, sustainability and resilience.**

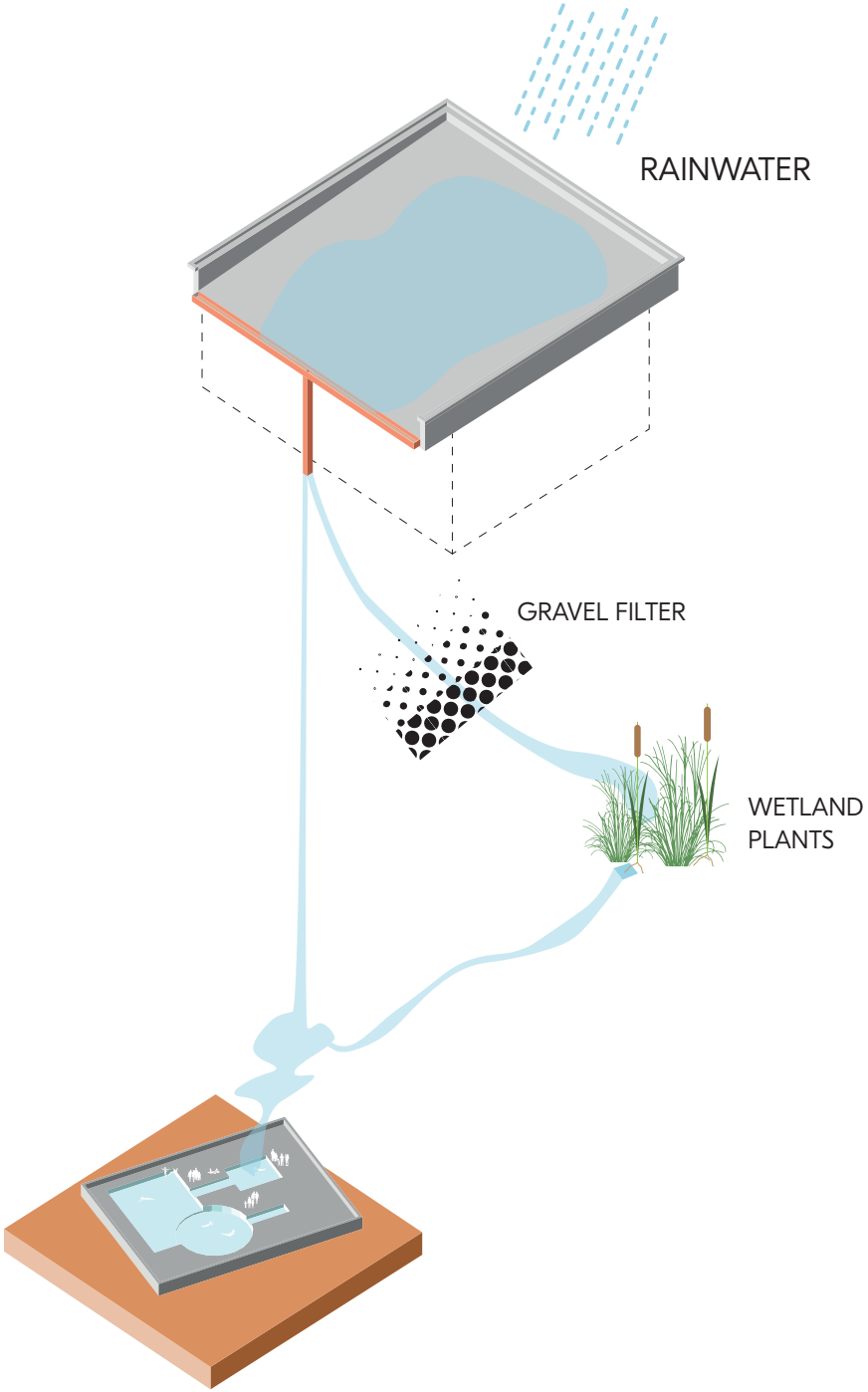
NATURAL SWIMMING POOL



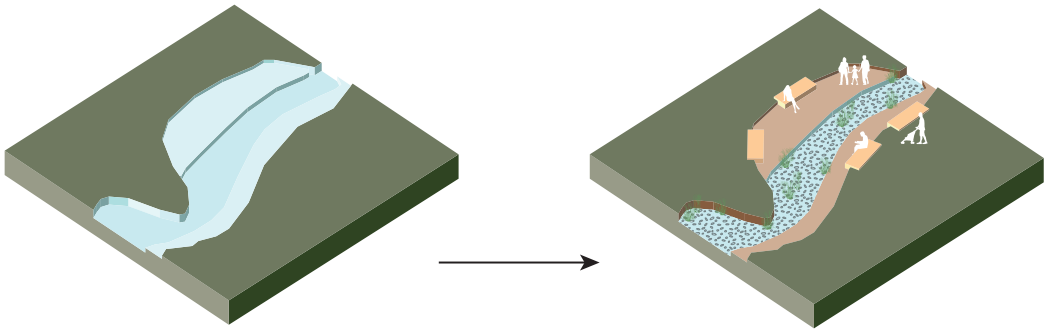
SWIMMING POOL

PUBLIC CONDENSER

Humboldt Park wading pool, USA

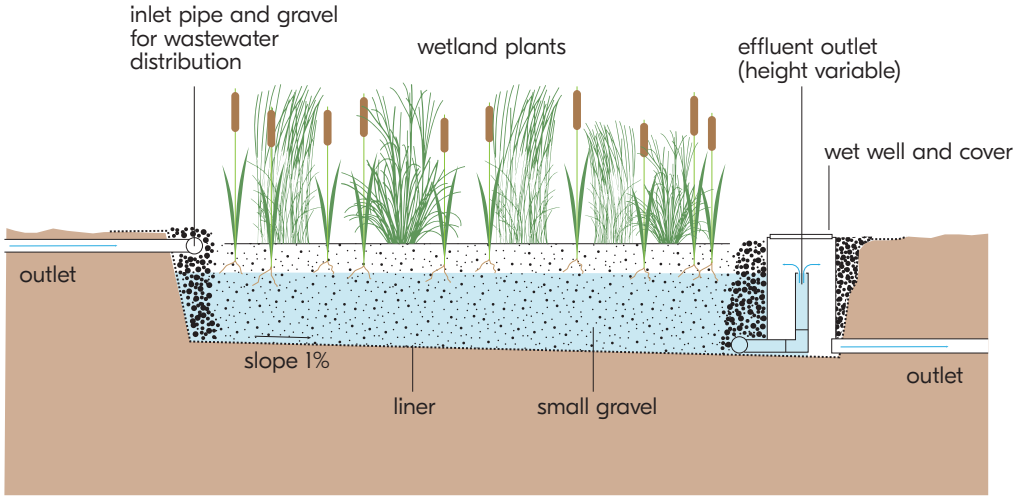


POND



POND CONSTRUCTED WETLAND

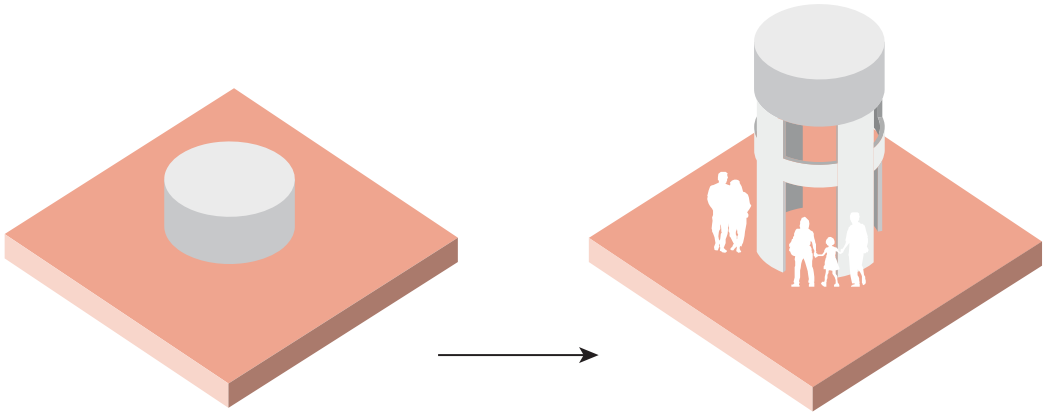
Shanghai Houtan Park, China



constructed wetland

Emmen Zoo, The Netherlands

WATER TANKS

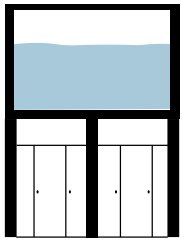


WATER TANK

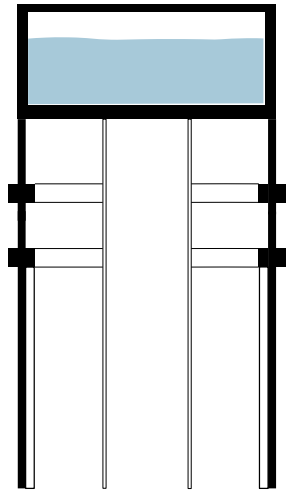
STRUCTURAL FEATURE

Waterzuivering Berenplaat, The Netherlands

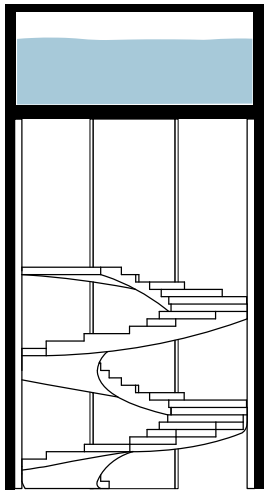
WATER TANK TYPOLOGIES IN THE BUILDING



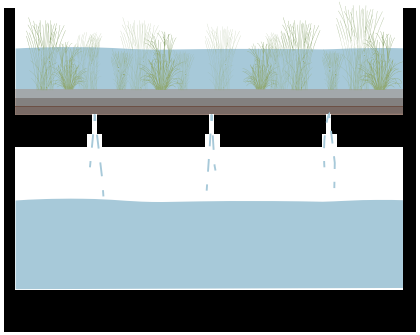
TOILETS



STRUCTURAL

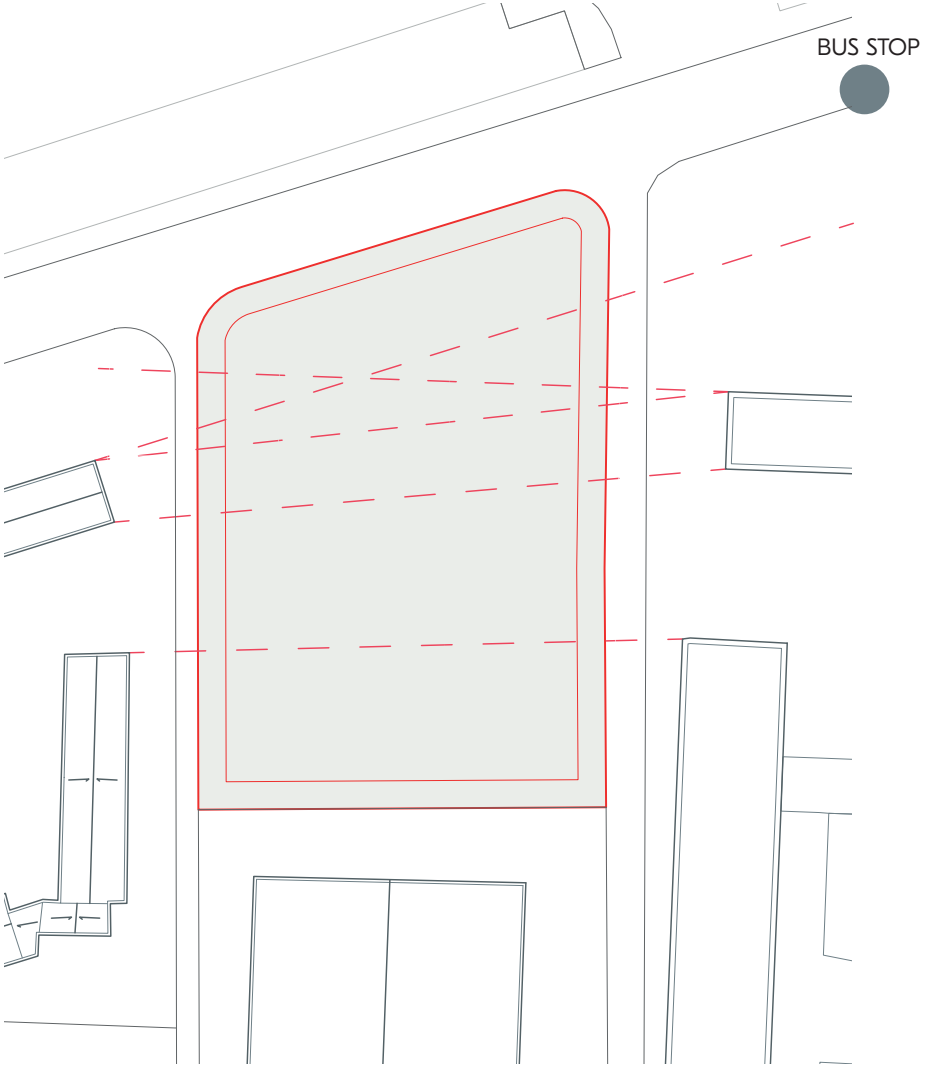


STAIRS

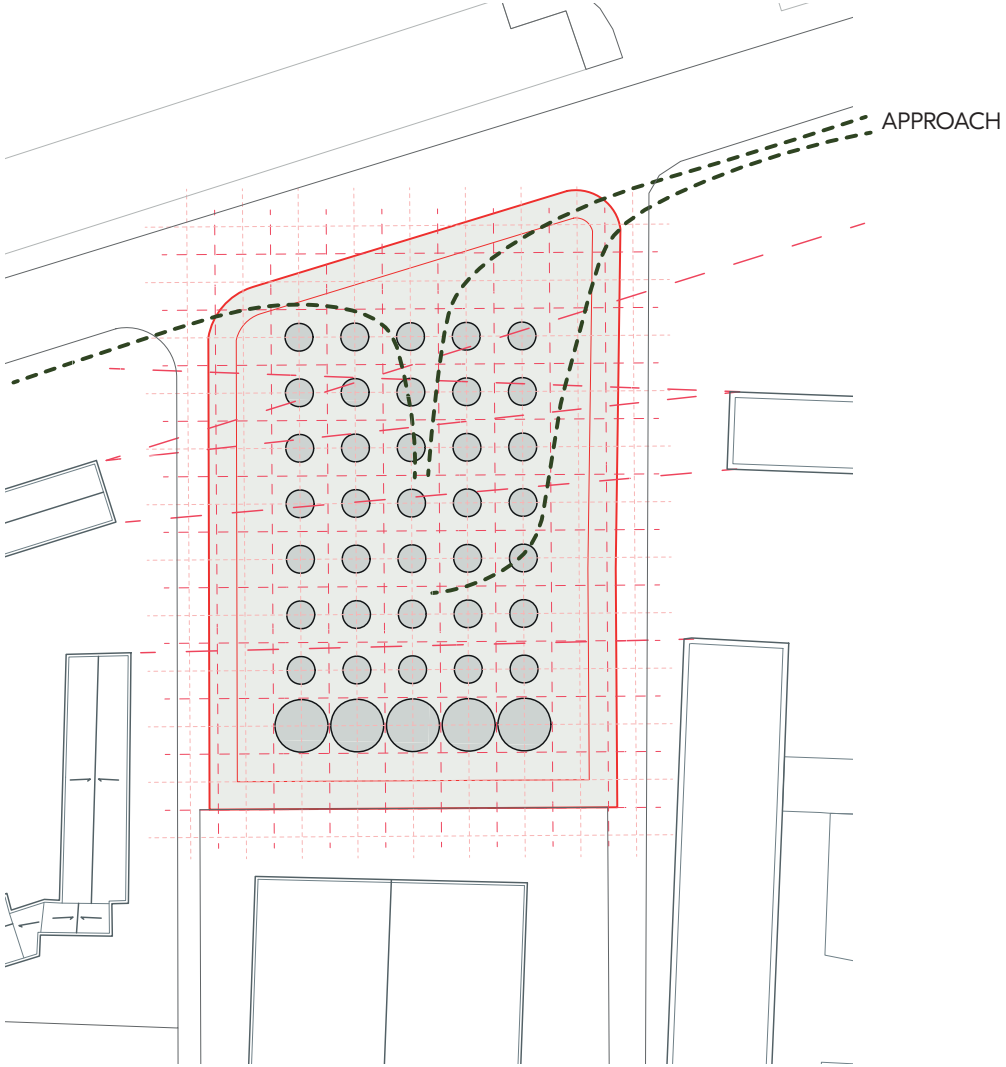


WETLAND

ORGANISATIONAL DIAGRAM

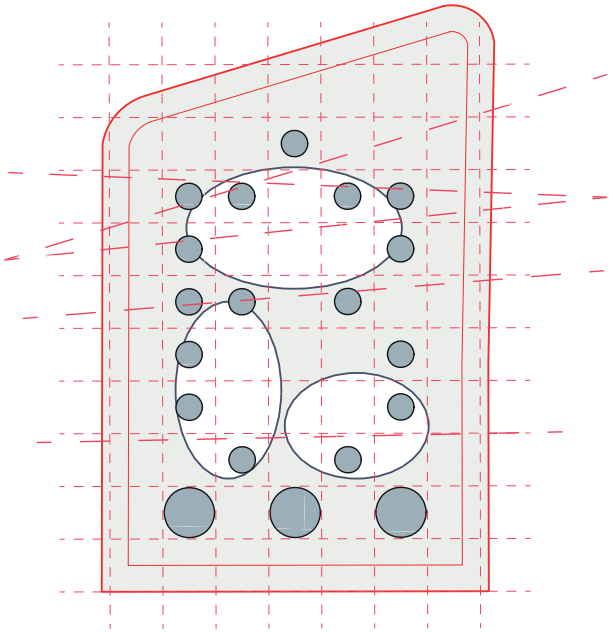


SITE LINES

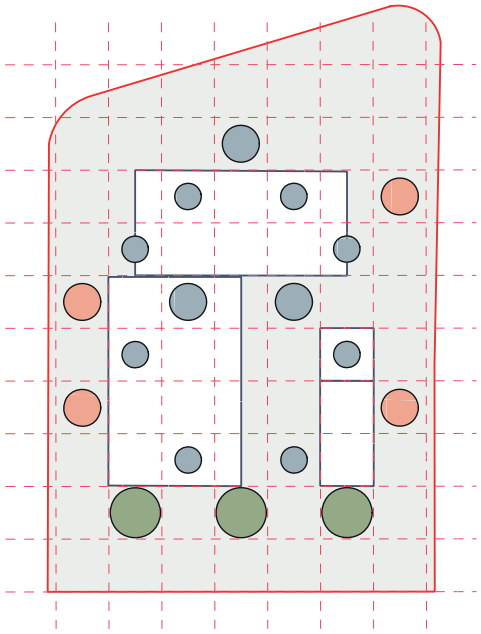


ESTABLISHING A GRID

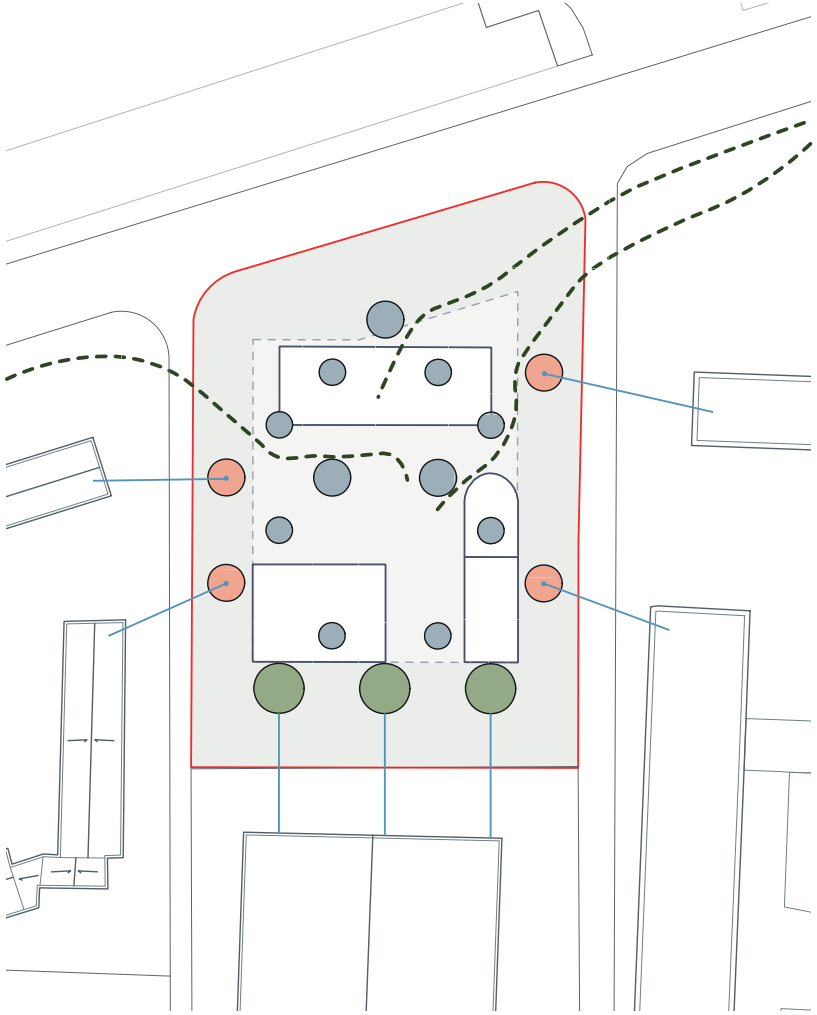
ORGANISATIONAL DIAGRAM



ESTABLISHING THE INNER SPACES WITHIN THE TANKS



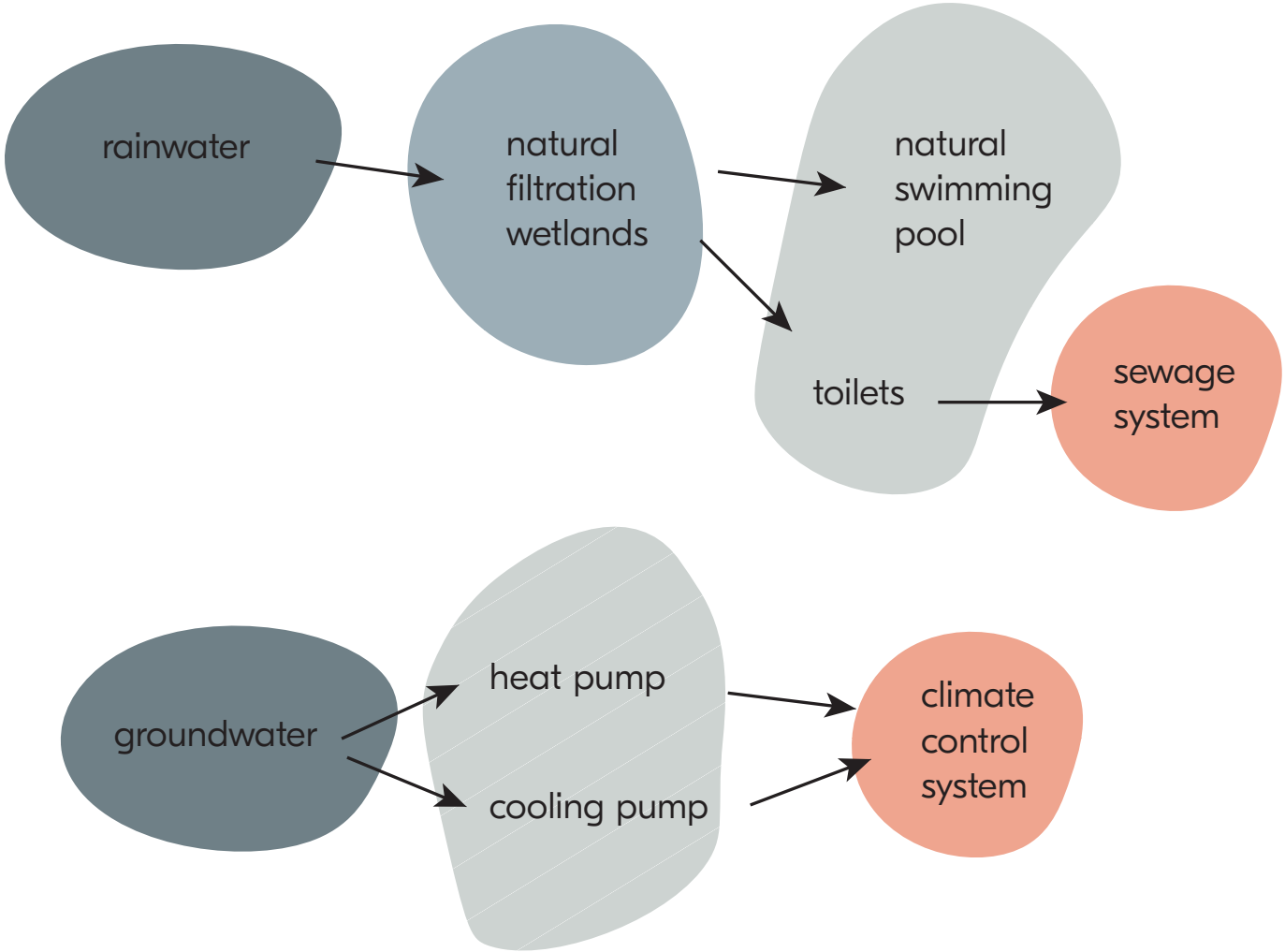
TANK DIFFERENTIATION



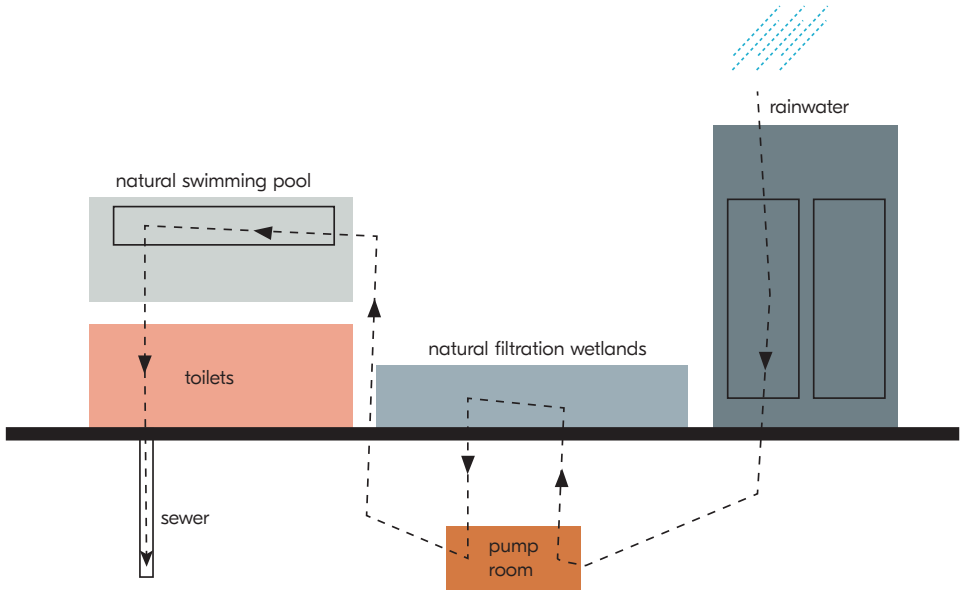
PAVILIONS WITHIN THE TANKS

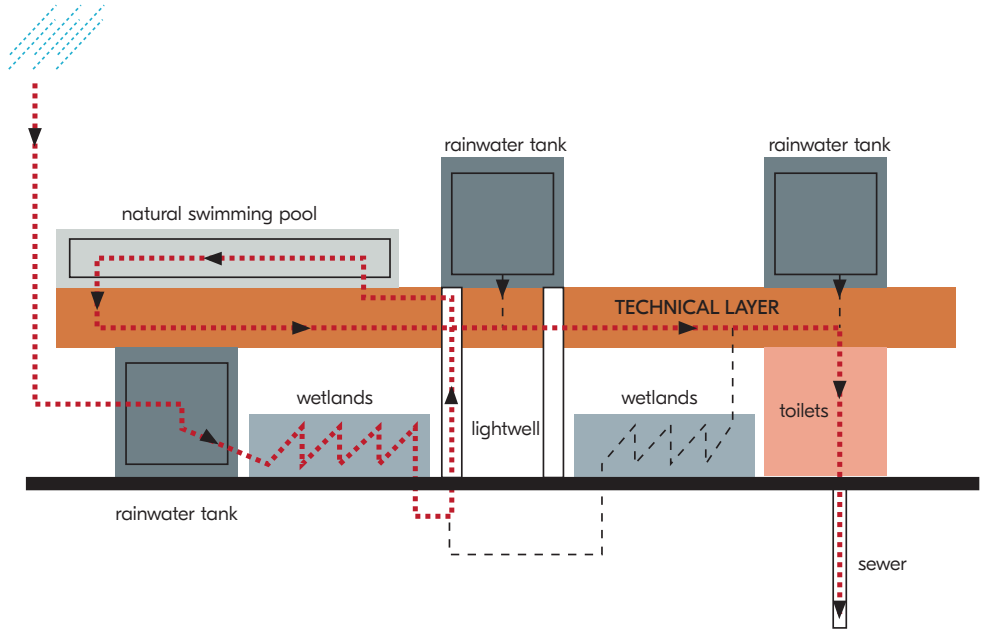
WATER CYCLE ANALYSIS

WATER CYCLE IN THE BUILDING



WATER PATH THROUGH THE BUILDING

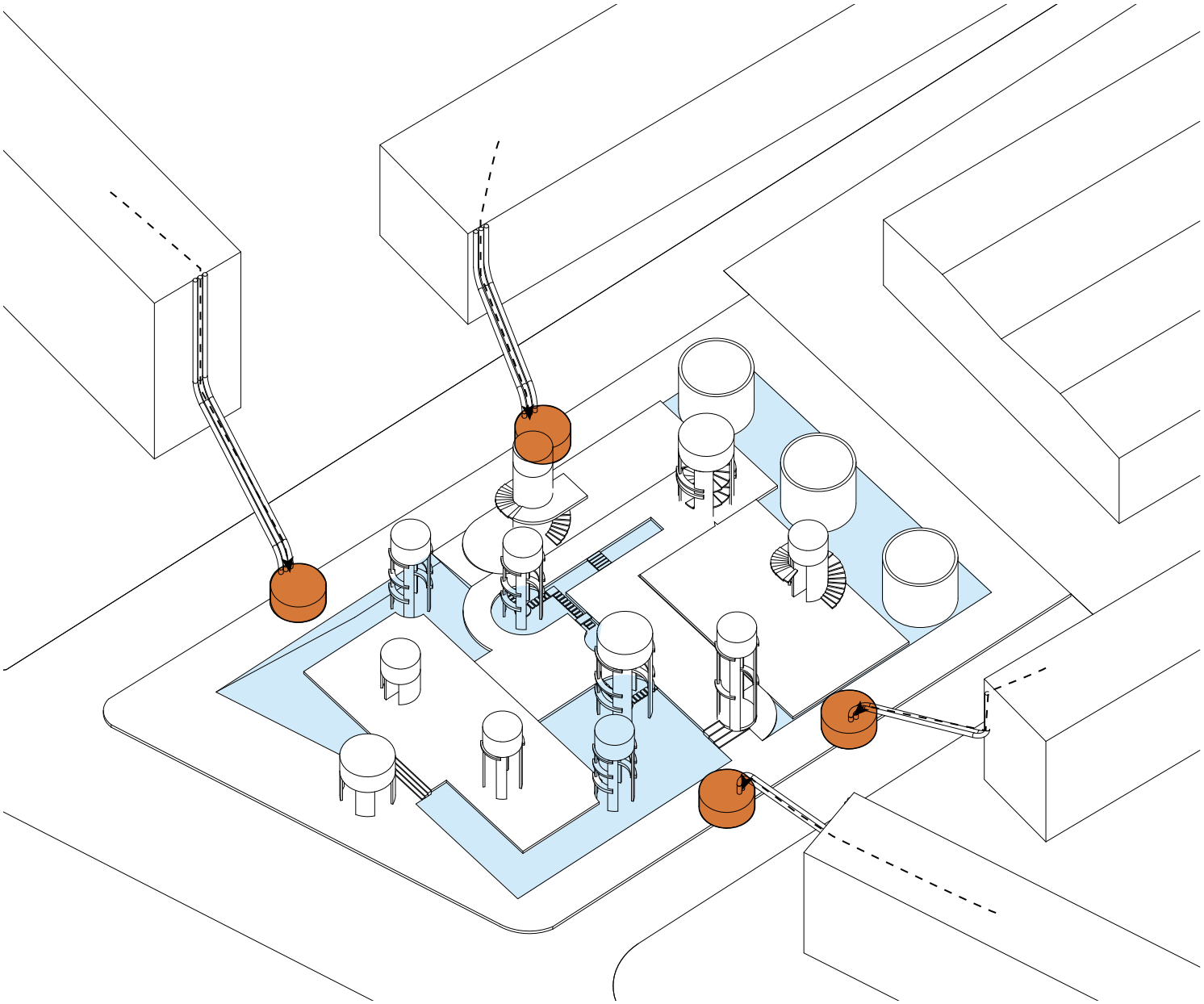




Rainwater is collected from the roofs of the surrounding buildings into rainwater tanks and purified through the wetland ponds. This water is used in the natural swimming pool, free of chemicals, before being used to flush toilets

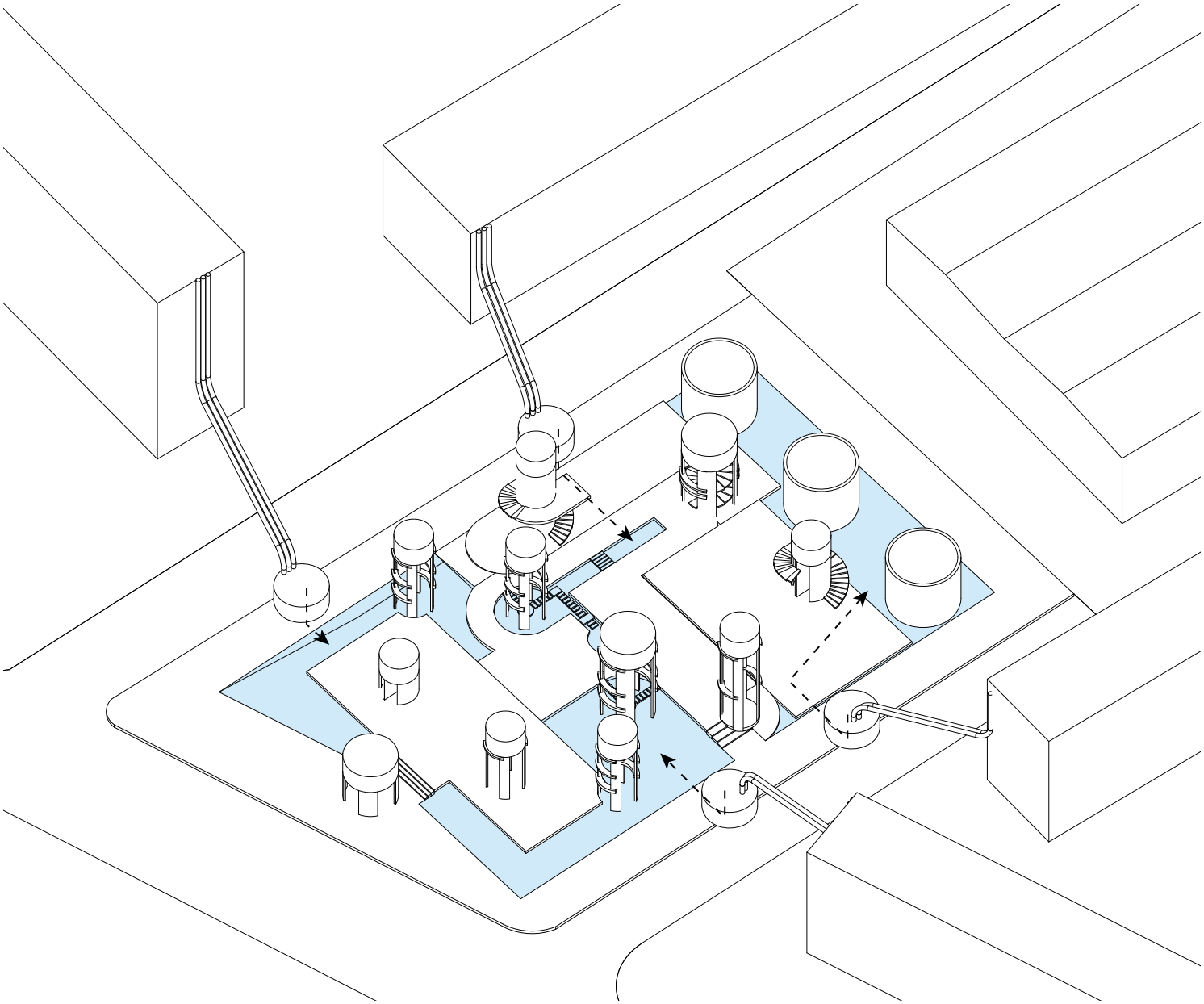
The rainwater tanks either form the structure or part of it as oversized columns. The rainwater collected is purified and used in the swimming pool before either being re-purified and sent back to the pool or used in the toilets before flushing it down to the sewage system. The building acts as a water collection point, a water purification tool and a recreation point. It helps in reducing storm water runoff and urban heat island effect in the area.

WATER PATH THROUGH THE BUILDING



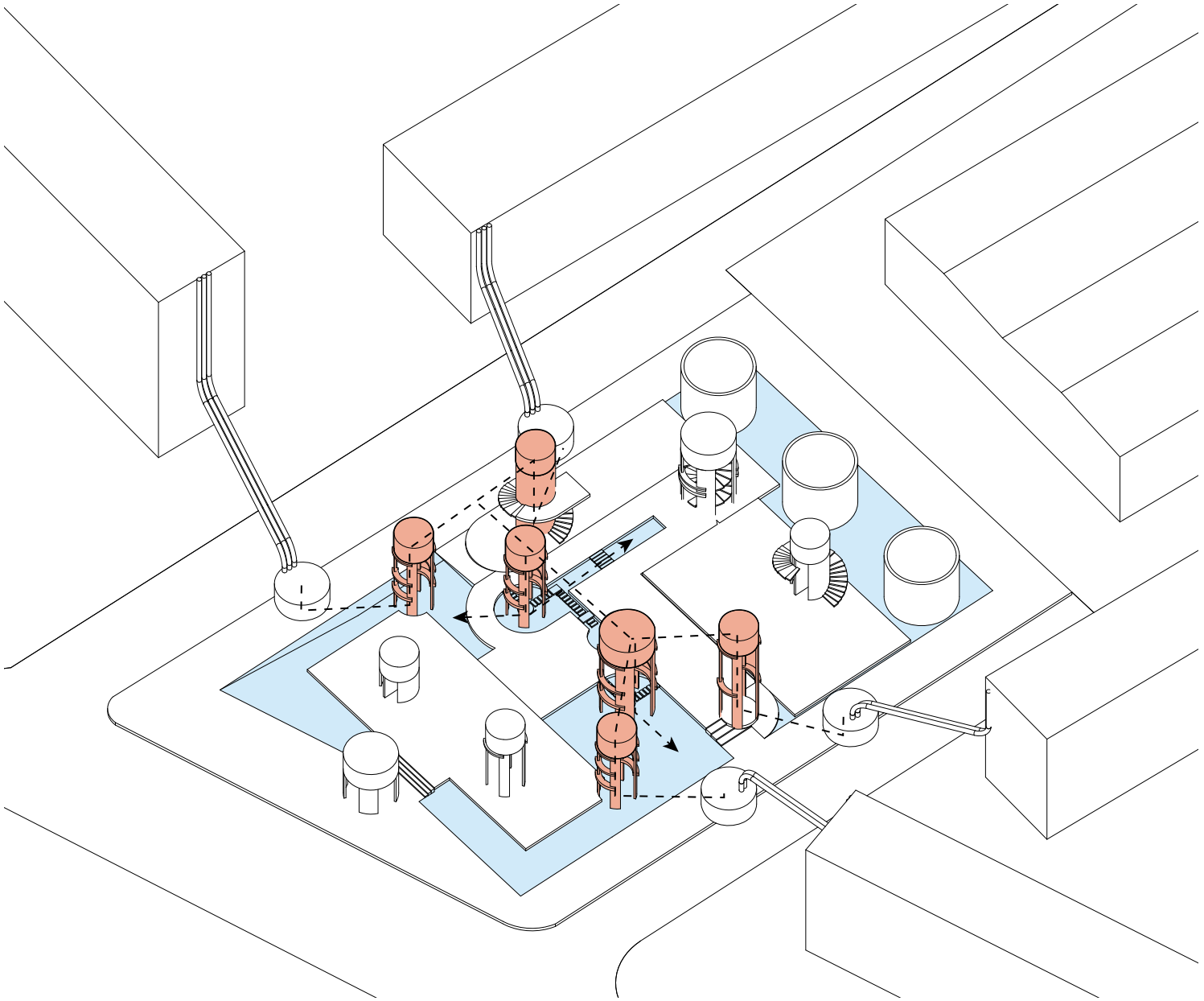
RAINWATER COLLECTED IS FILTERED THROUGH THE INLET TANKS

WATER PATH THROUGH THE BUILDING



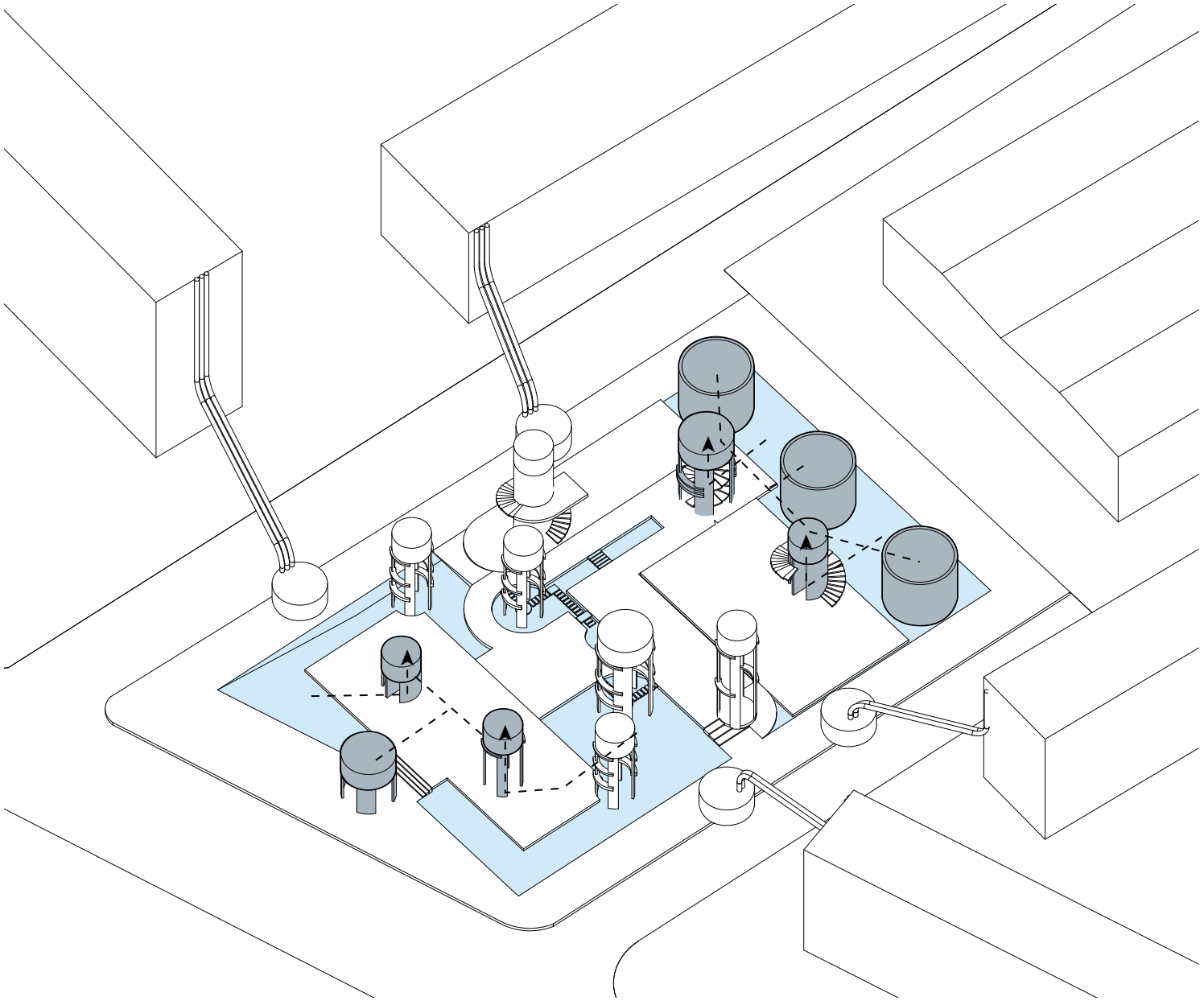
RAINWATER IS DISCHARGED INTO THE WETLANDS

WATER PATH THROUGH THE BUILDING



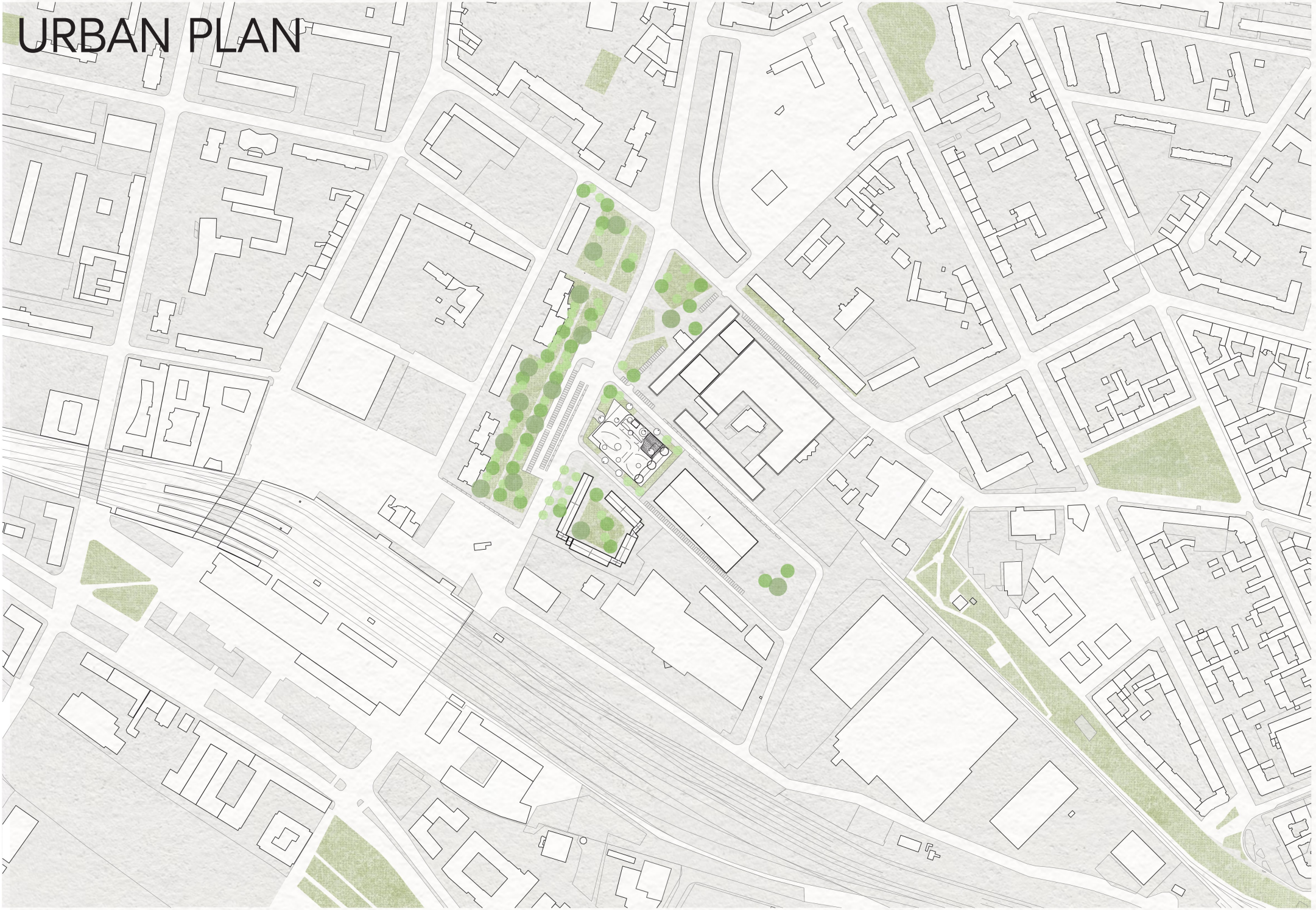
DURING HEAVY STORMS, THE EXCESS WATER IS STORED IN THE MIDDLE TANKS TEMPORARILY

WATER PATH THROUGH THE BUILDING



THE EXCESS CLEAN WATER IS STORED IN THE FRONT & BACK TANKS FOR THE SWIMMING POOL

URBAN PLAN



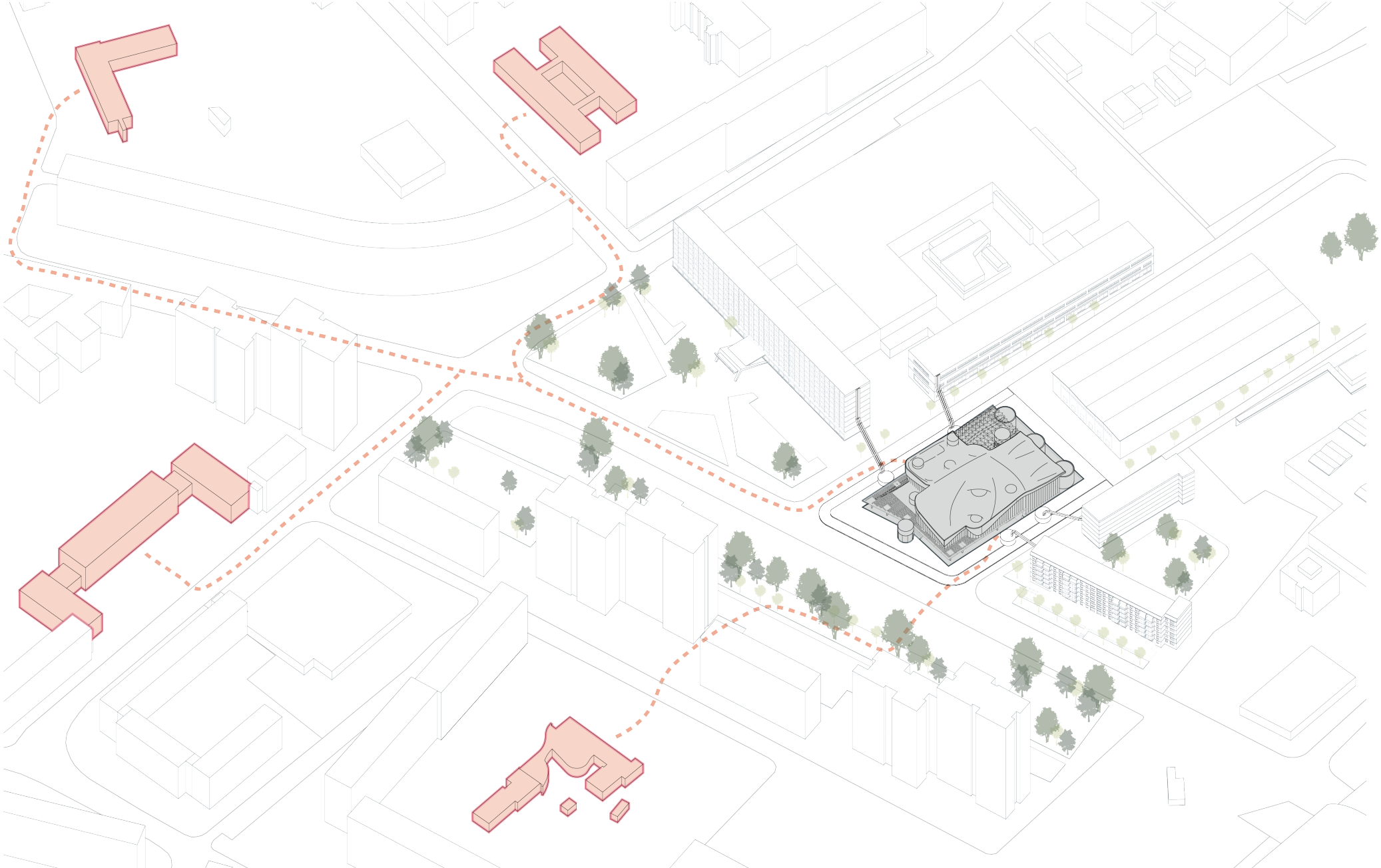
PART 1 : WATER SYSTEMS

PART 2 : RESILIENCE IN PROGRAMMING

PART 3 : COMBINATION

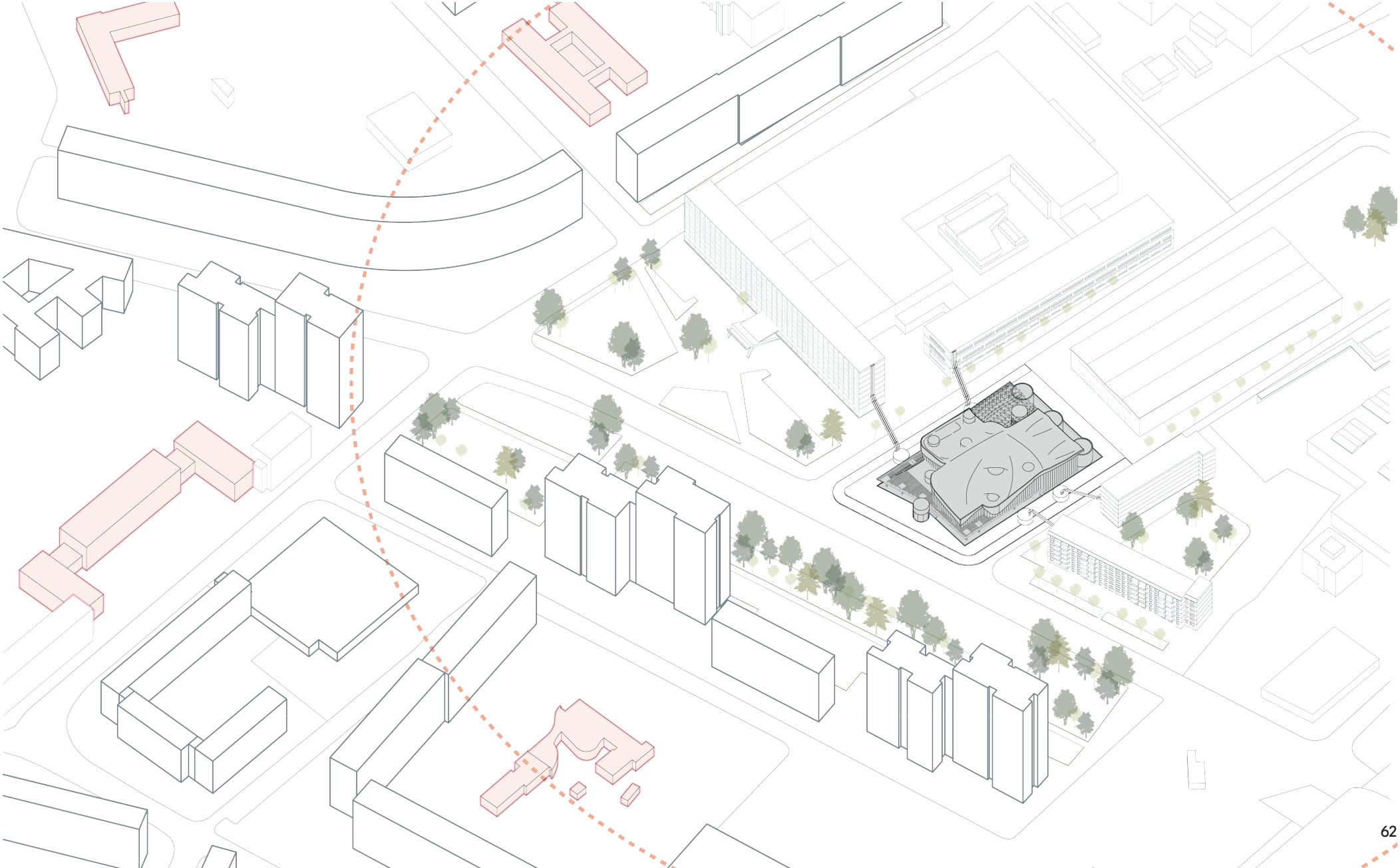
RESILIENCE

SCHOOLS NEARBY



RESILIENCE

RESIDENTIAL NEARBY



F. FINAL DESIGN

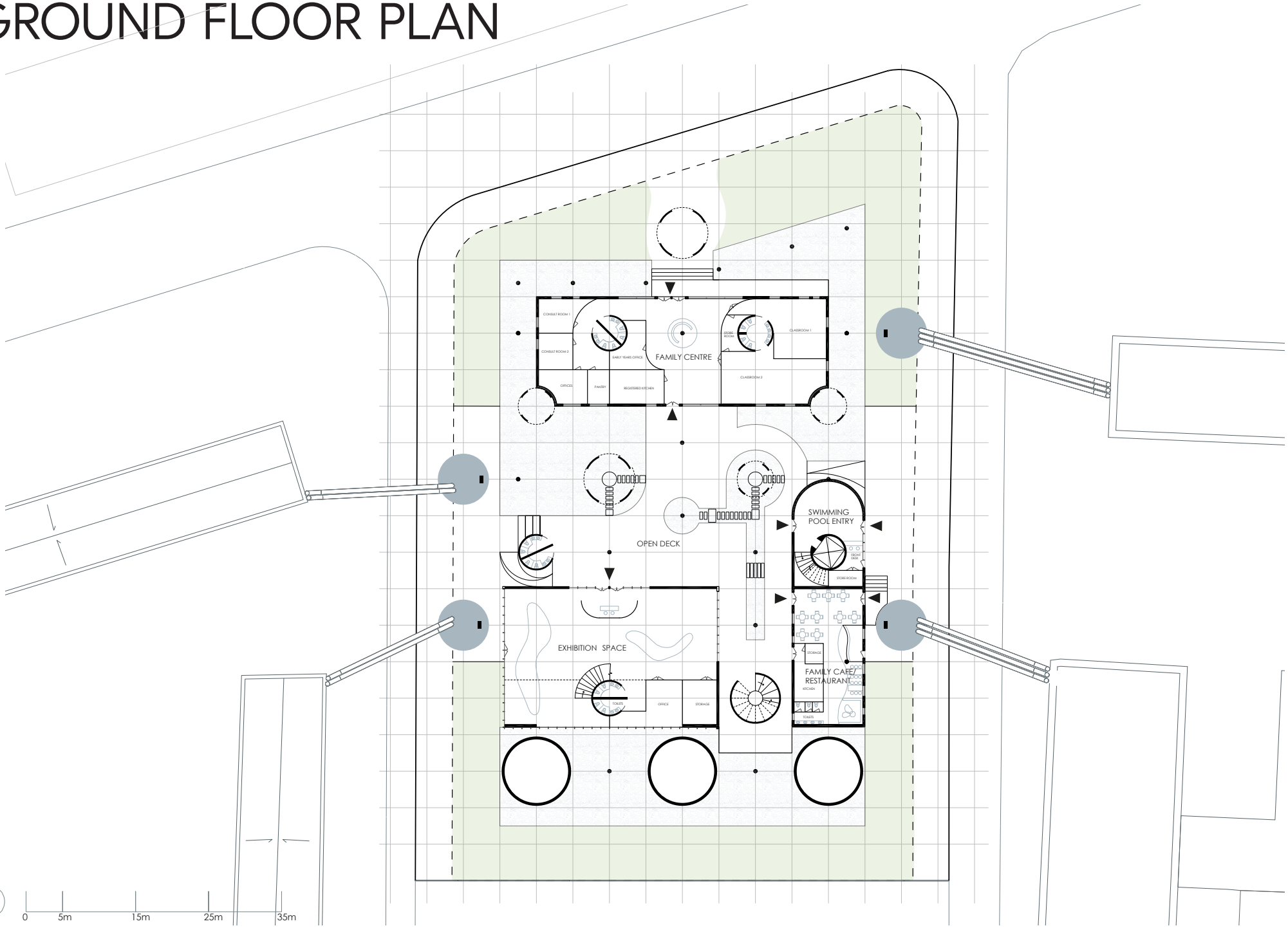
PART 1 : WATER SYSTEMS

PART 2 : RESILIENCE IN PROGRAMMING

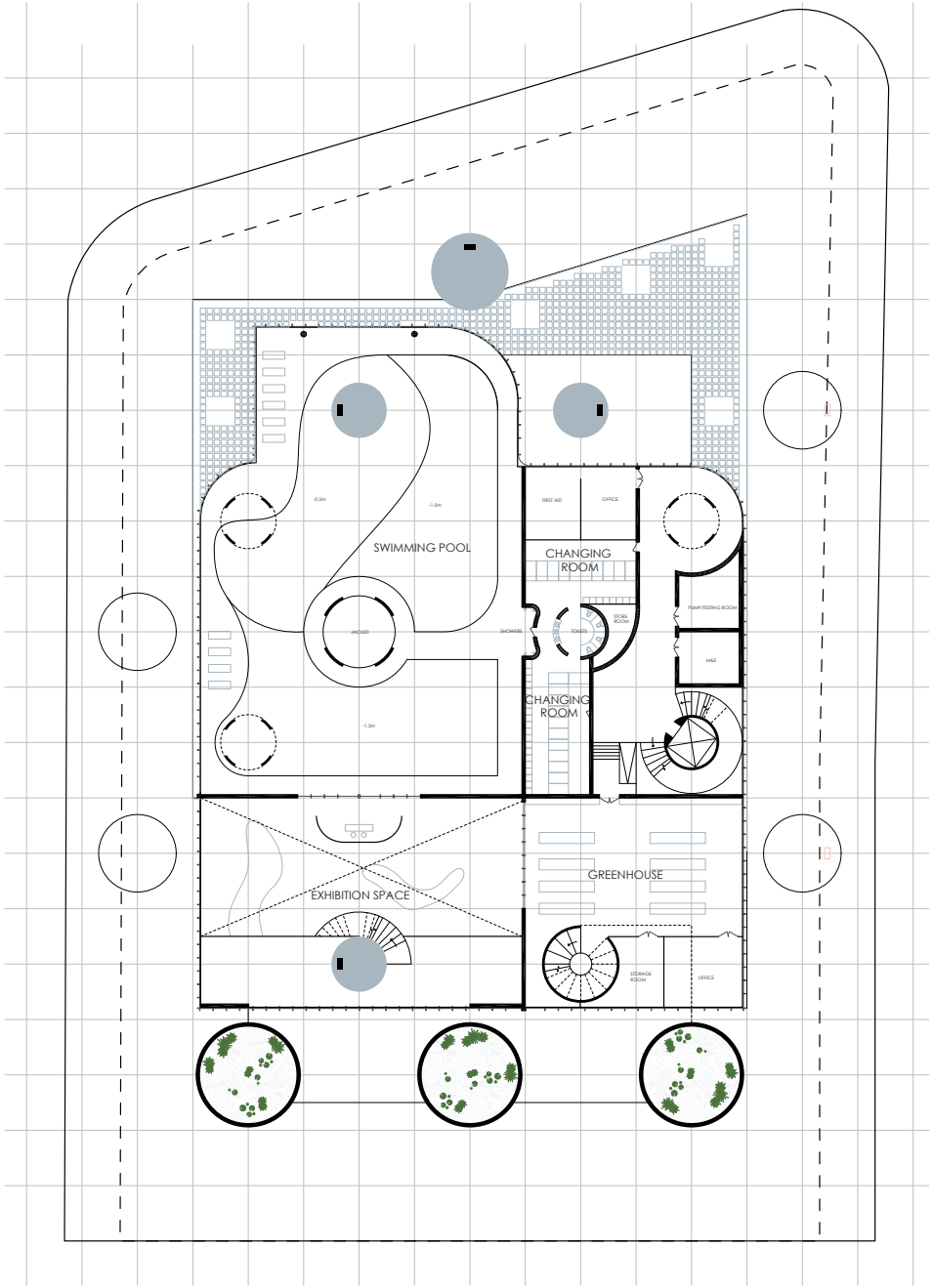
PART 3 : COMBINATION

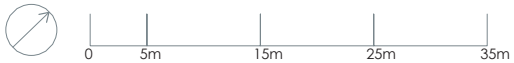
BUILDING FRAGMENT
THE LAYERS OF THE BUILDING

GROUND FLOOR PLAN

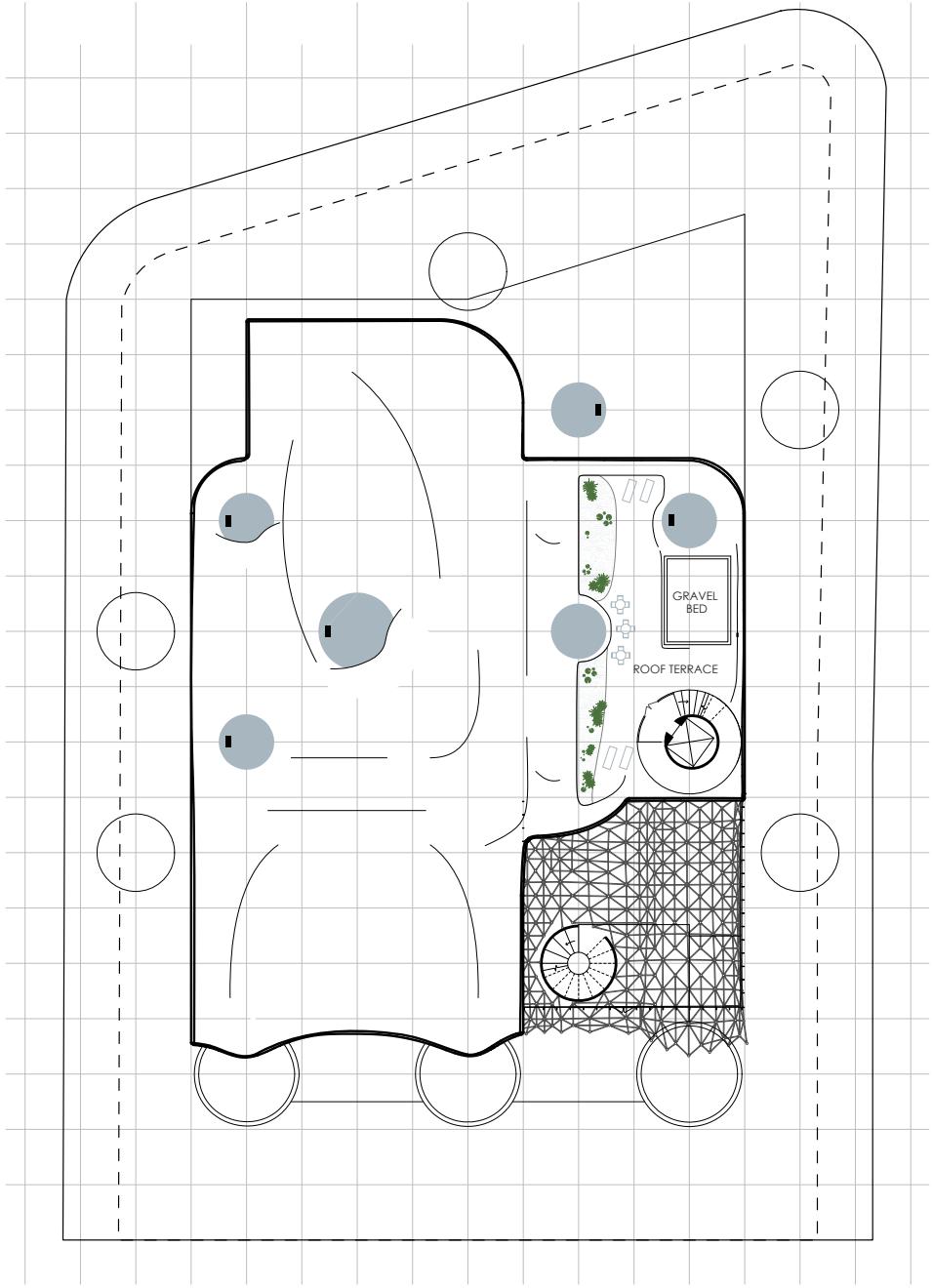


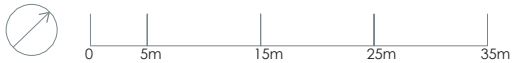
FIRST FLOOR PLAN



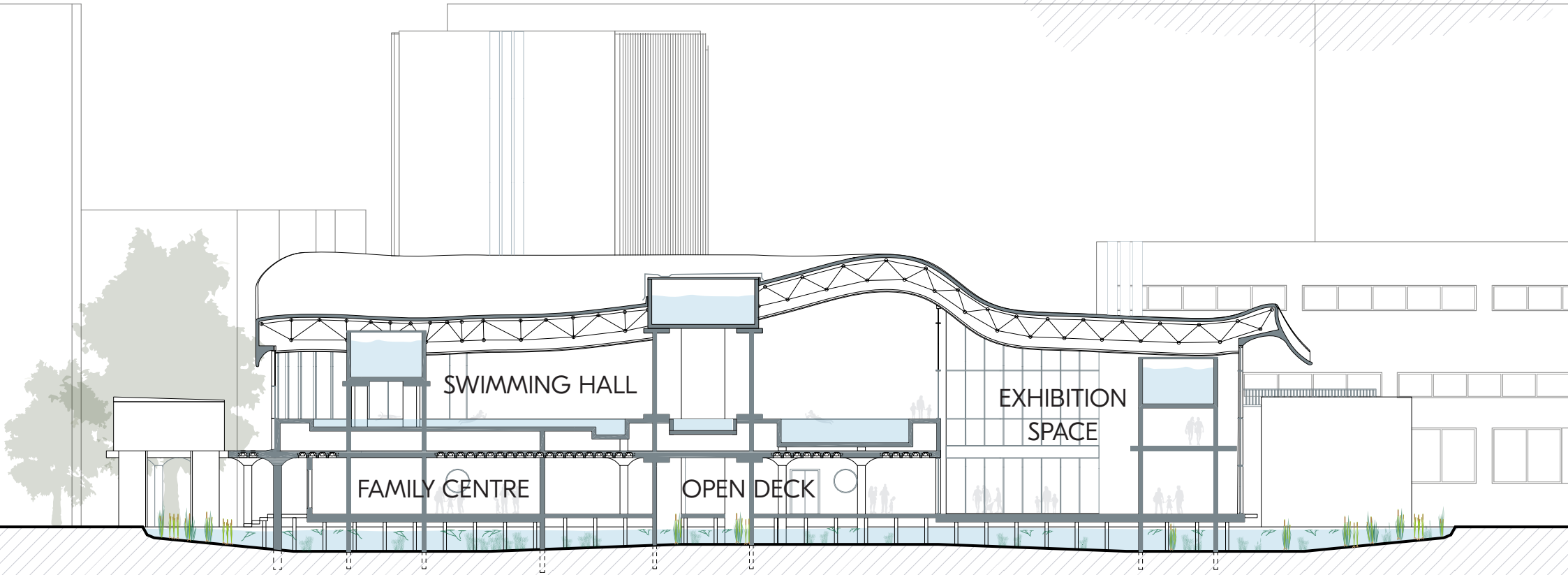


ROOF PLAN

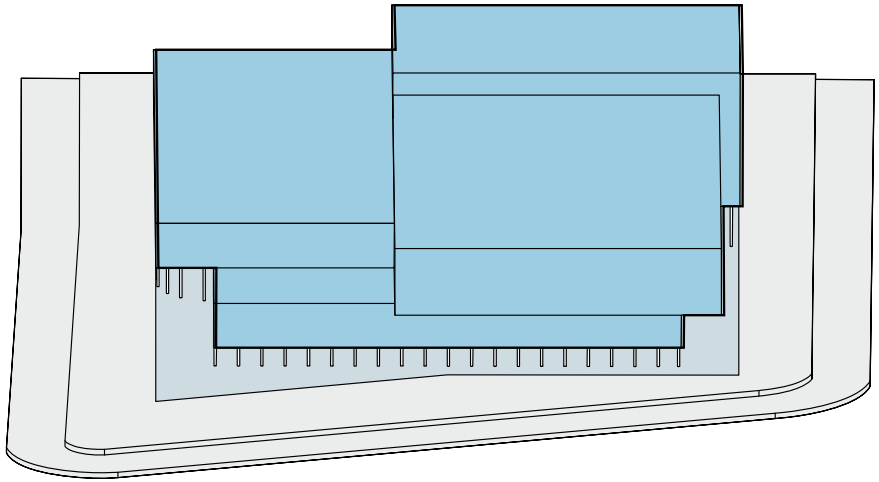




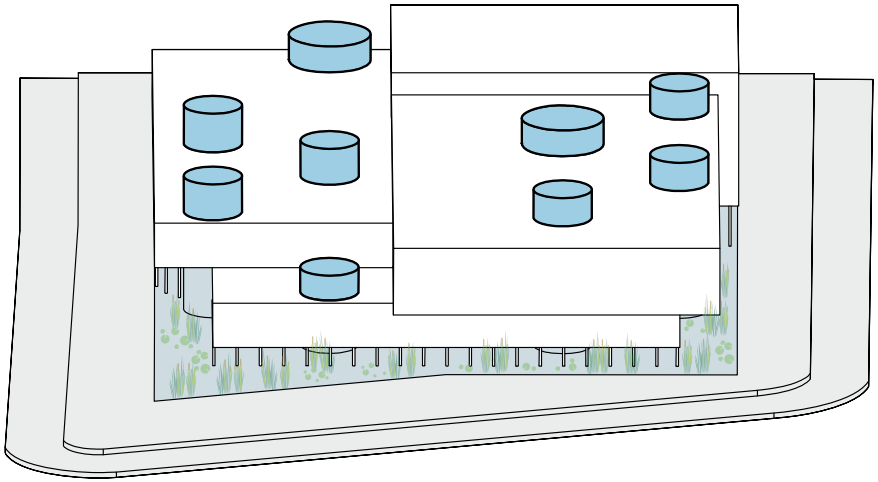
SECTION



DESIGN SEQUENCE

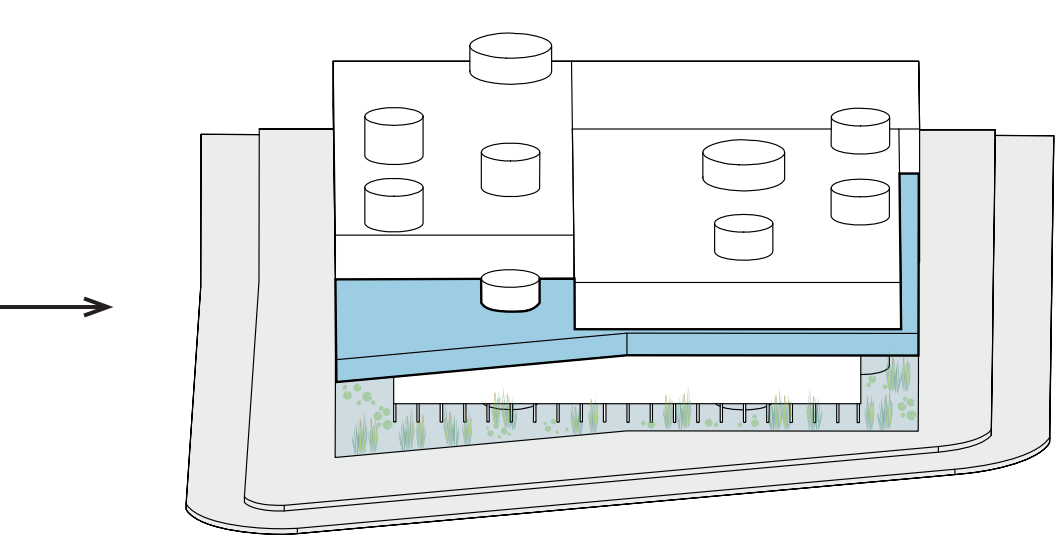


BLOCKS STACKED UPON EACH OTHER OVER WATER

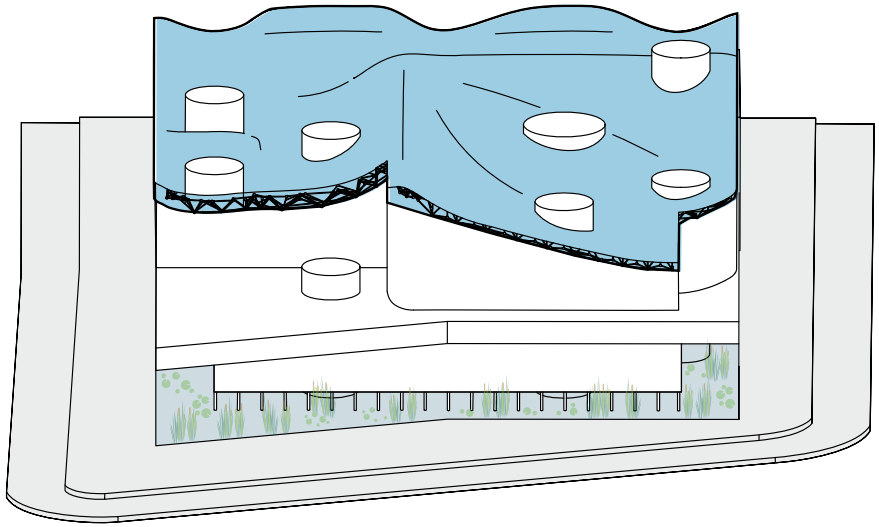


WATER TANKS PUNCH THROUGH THE MASS

DESIGN SEQUENCE



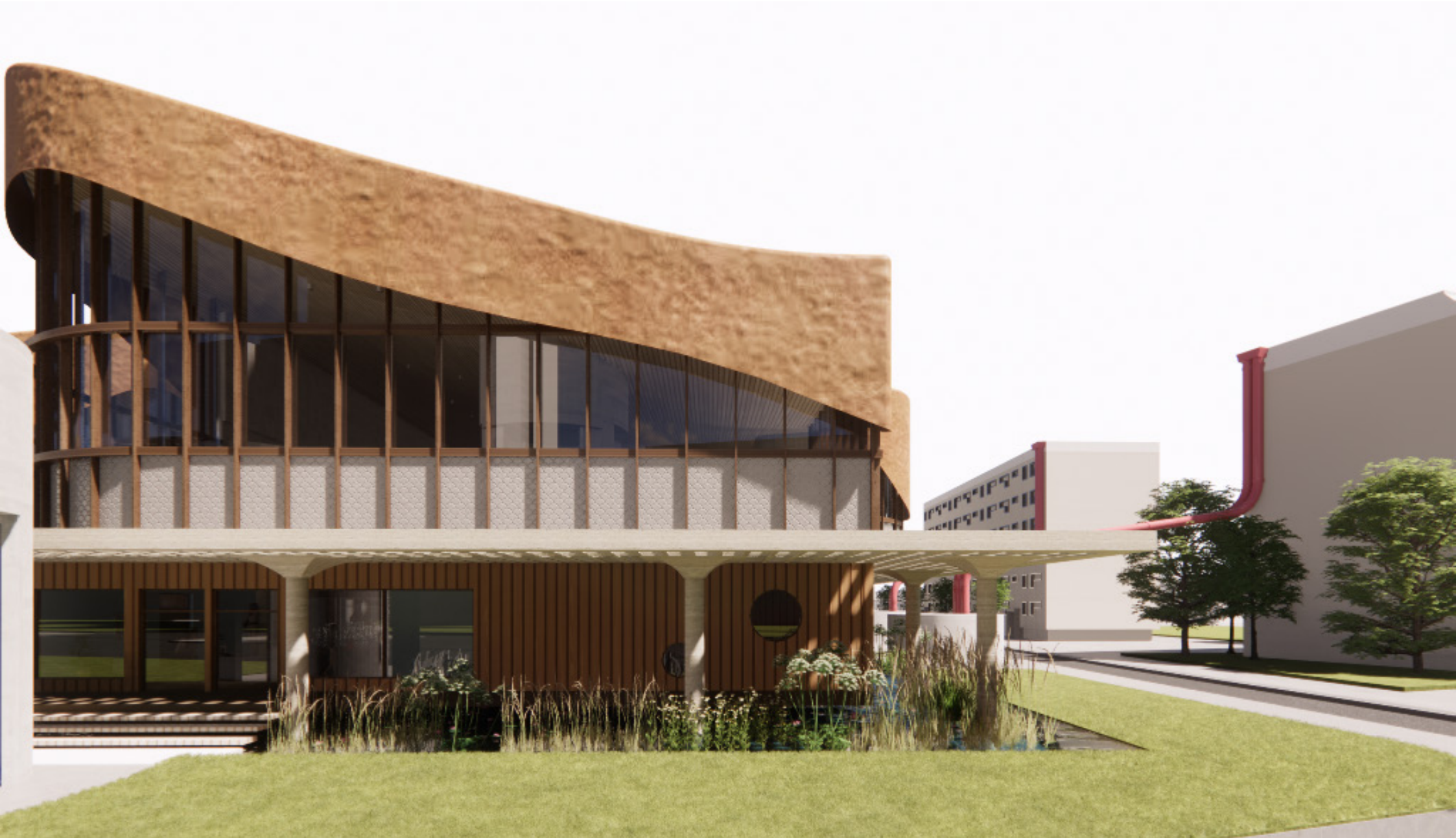
A TECHNICAL LAYER IS INTRODUCED BETWEEN FLOORS



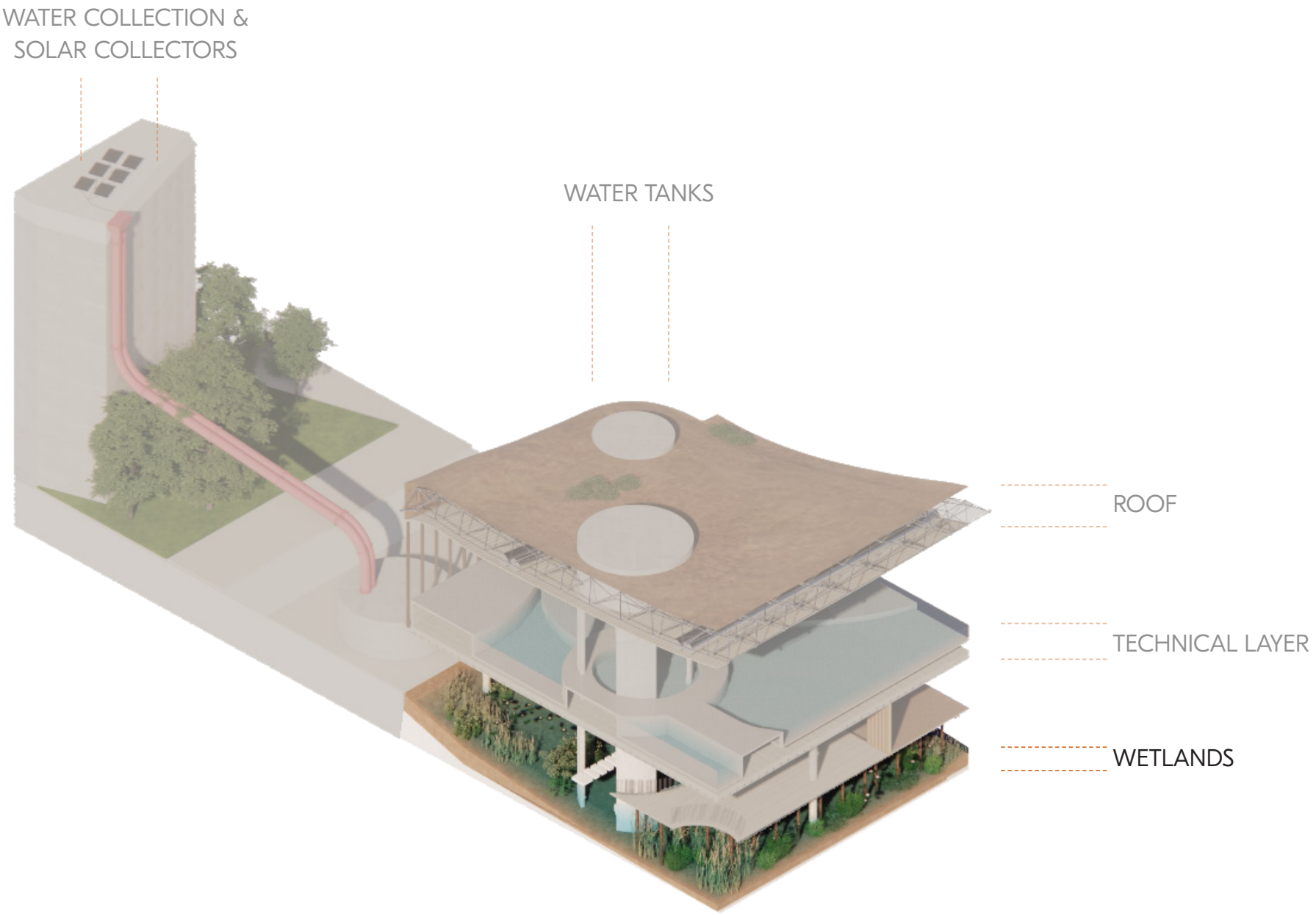
THE ROOF IS SHAPED BY AND FOR WATER

VIEW

THE LAYERS OF THE BUILDING

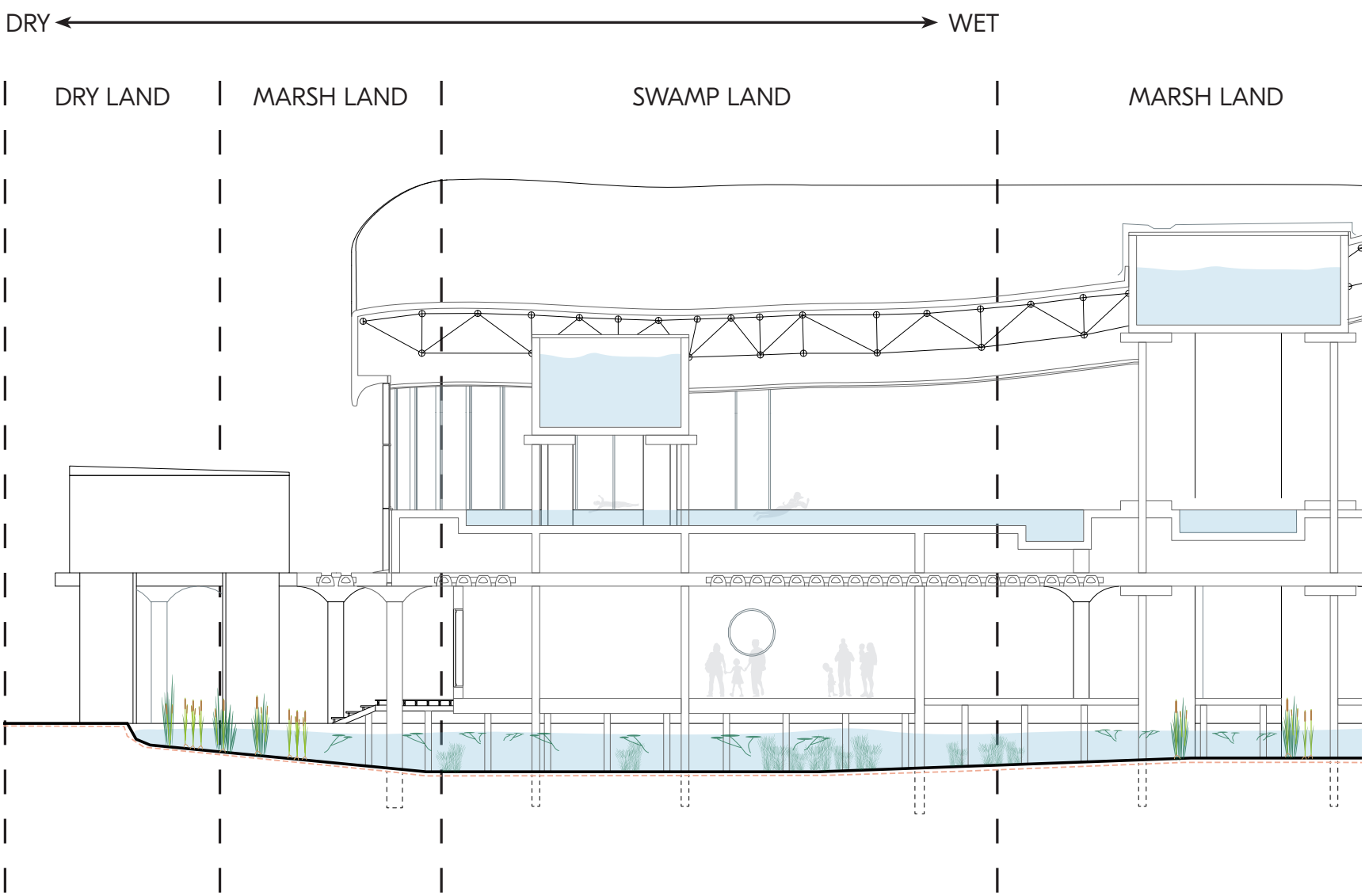


WETLAND LAYER



ECOLOGY

WETLAND ZONES



Soil PH should be 6.5 - 8.5PH

Medium textured/ loamy soils are a good choice.

For stormwater wetlands, the goal should be a diverse assemblage of plants not only for it to be aesthetically pleasing but also it will be more likely to resist invasive species and pests.

The water should only reach up to 3m, otherwise light cannot penetrate to the bottom of the pond

ECOLOGY

WETLAND PLANT TYPES

Emergent aquatic macrophytes

These are the dominating life form in wetlands andmarshes, growing within a water table range from 50 cm below the soil surface to awater depth of 150 cm or more.


Common Reed


Mannagrasses


Oenanthe Conioides

Floating-leaved aquatic macrophytes

The freelyfloating species are highly diverse in form and habit, ranging from large plants withrosettes of aerial and/or floating leaves and well-developed submerged roots to minute surface-floating plants with few or no roots


Water Lilies


Water Lettuce


Water Hyacinth

Submerged aquatic macrophytes:

These have their photosynthetic tissue entirelysubmerged but usually the flowers exposed to the atmosphere


Elodea


Myriophyllum


Deschampsia wibeliana

endemic to Europe

ECOLOGY

PLANTING PLAN

WETLAND ZONES

Dry land

Marsh land

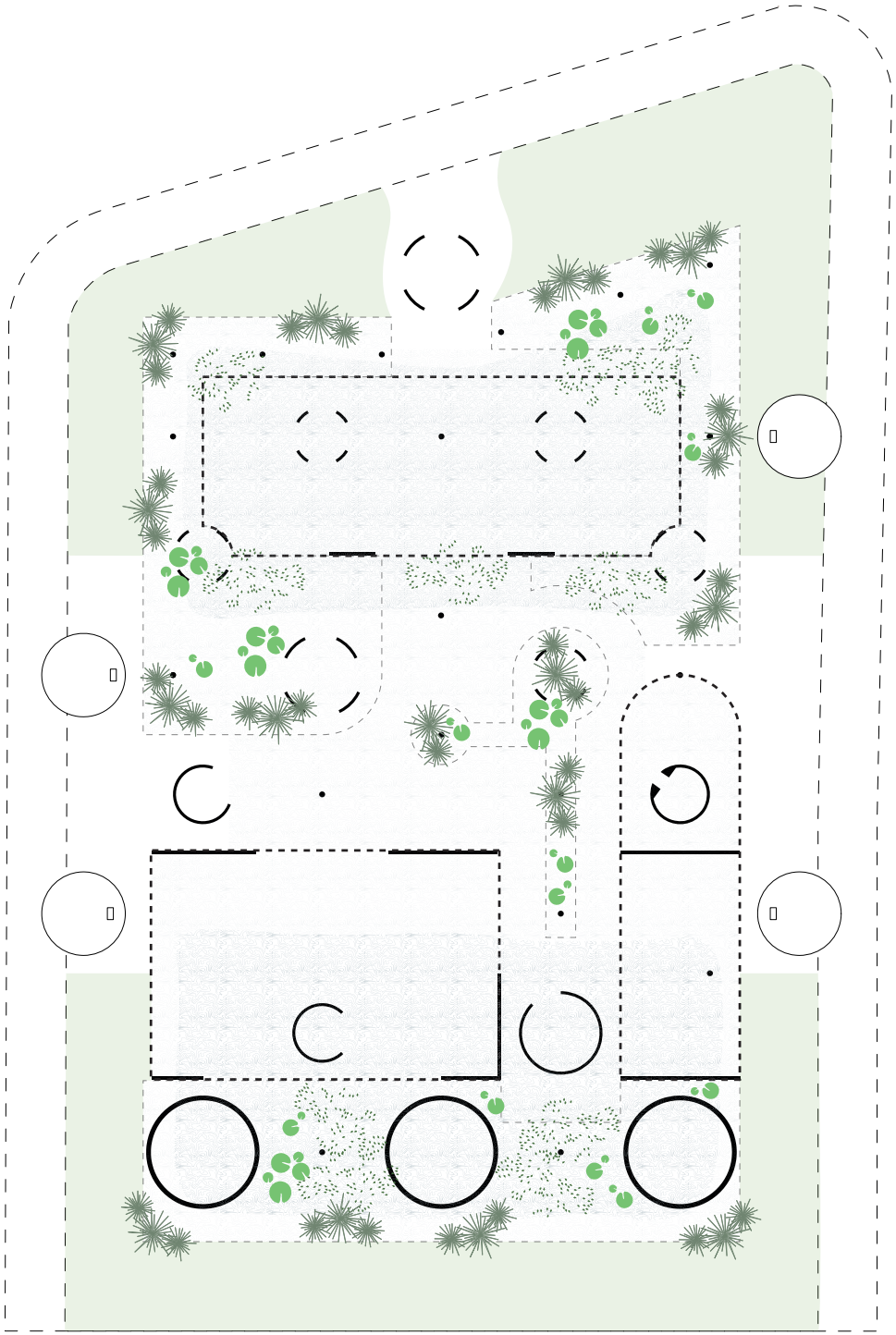
Swamp land

WETLAND PLANT TYPES

Emergent aquatic macrophytes

Floating-leaved aquatic macrophytes

Submerged aquatic macrophytes:

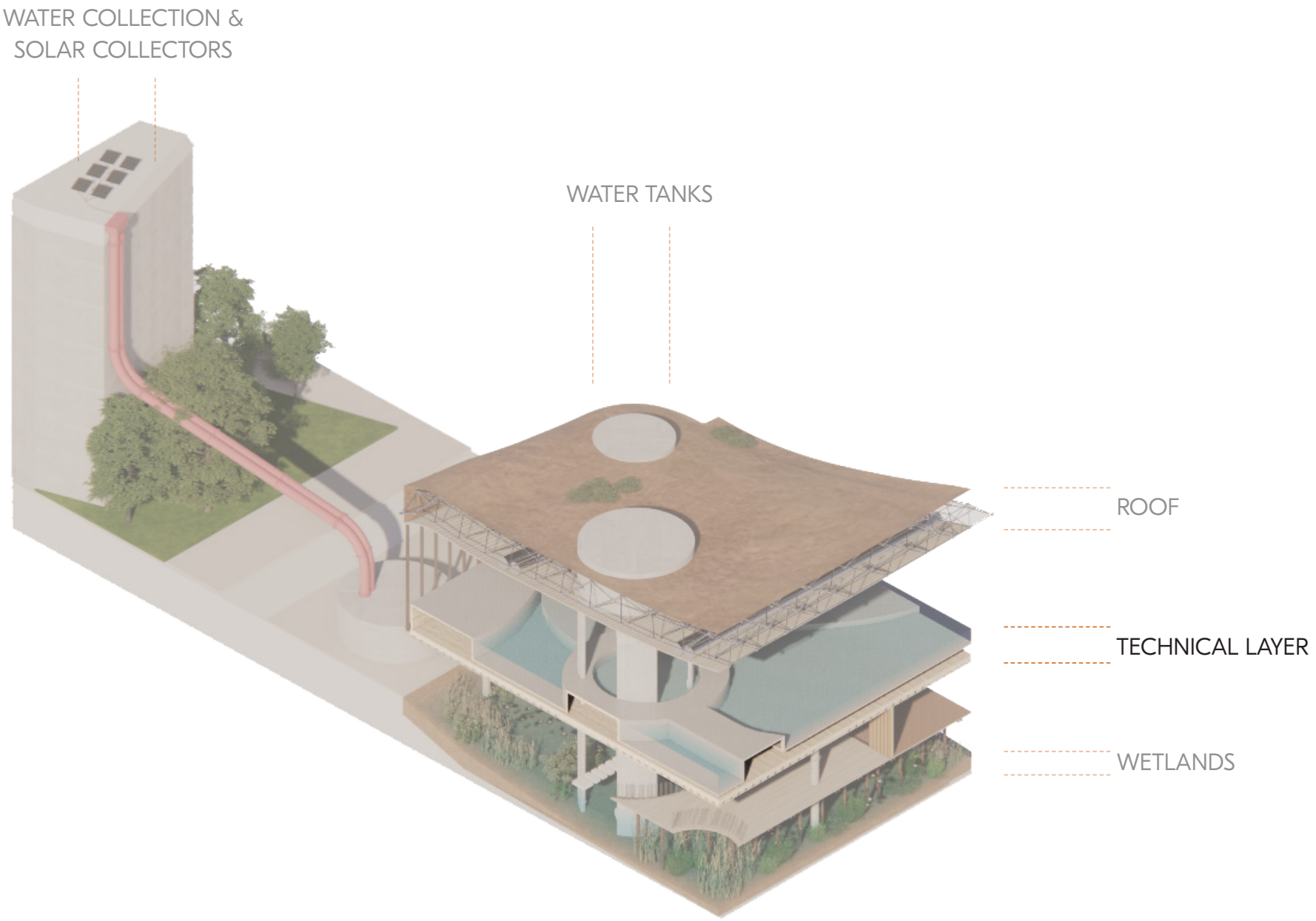


ECOLOGY
OPEN DECK VIEW

ECOLOGY
EXHIBITION HALL VIEW

ECOLOGY
EXTERIOR VIEW

TECHNICAL LAYER



CLIMATE

MATERIAL CATALOG: FAMILY CENTRE

HIGH MOISTURE ADSORPTION CAPACITY → LOW MOISTURE ADSORPTION CAPACITY

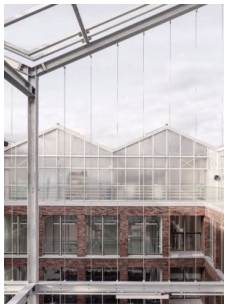
INORGANIC

Gypsum block 6%

Shotcrete+clay >0.95%

Concrete 0.95%

Tiles 0.5%



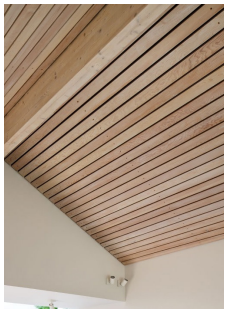
Glass 0%

ORGANIC

Sheep wool 35%

Sisal 15.4%

Hemp 14.4%



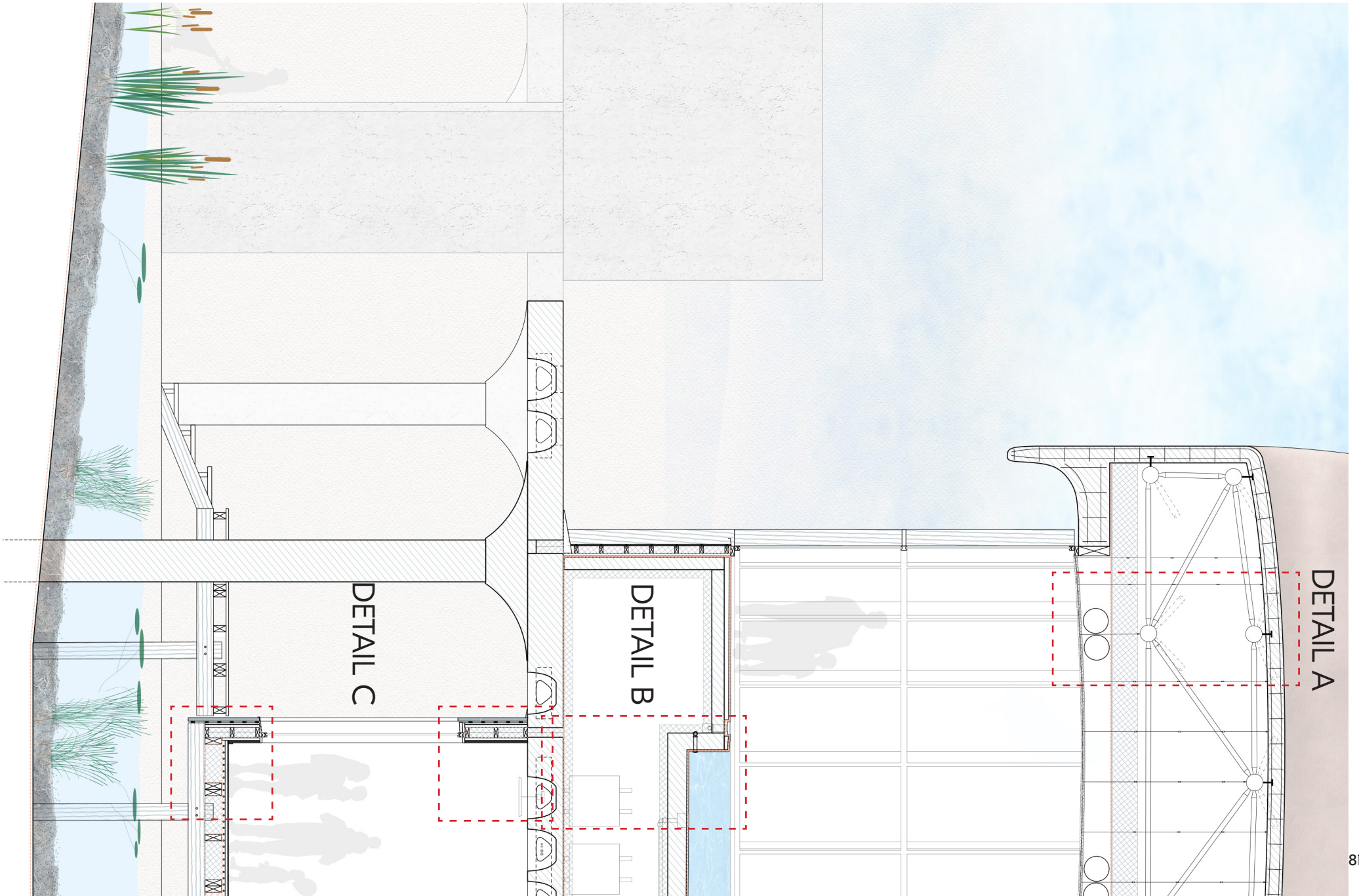
Douglas Fir 9%

Clay 0.98%

https://iopscience.iop.org/article/10.1088/1742-6596/2069/1/012003/pdf
https://koreascience.kr/article/JAKO202021262090515.pdf

STRUCTURE

1:20 FRAGMENT @ A1



TECHNICAL LAYER

1:10 FAMILY CENTRE DETAIL

Wall

Timber mullion

Batons & counter batons

Breathable bitumen fireboard 35mm

Windtight breathable membrane

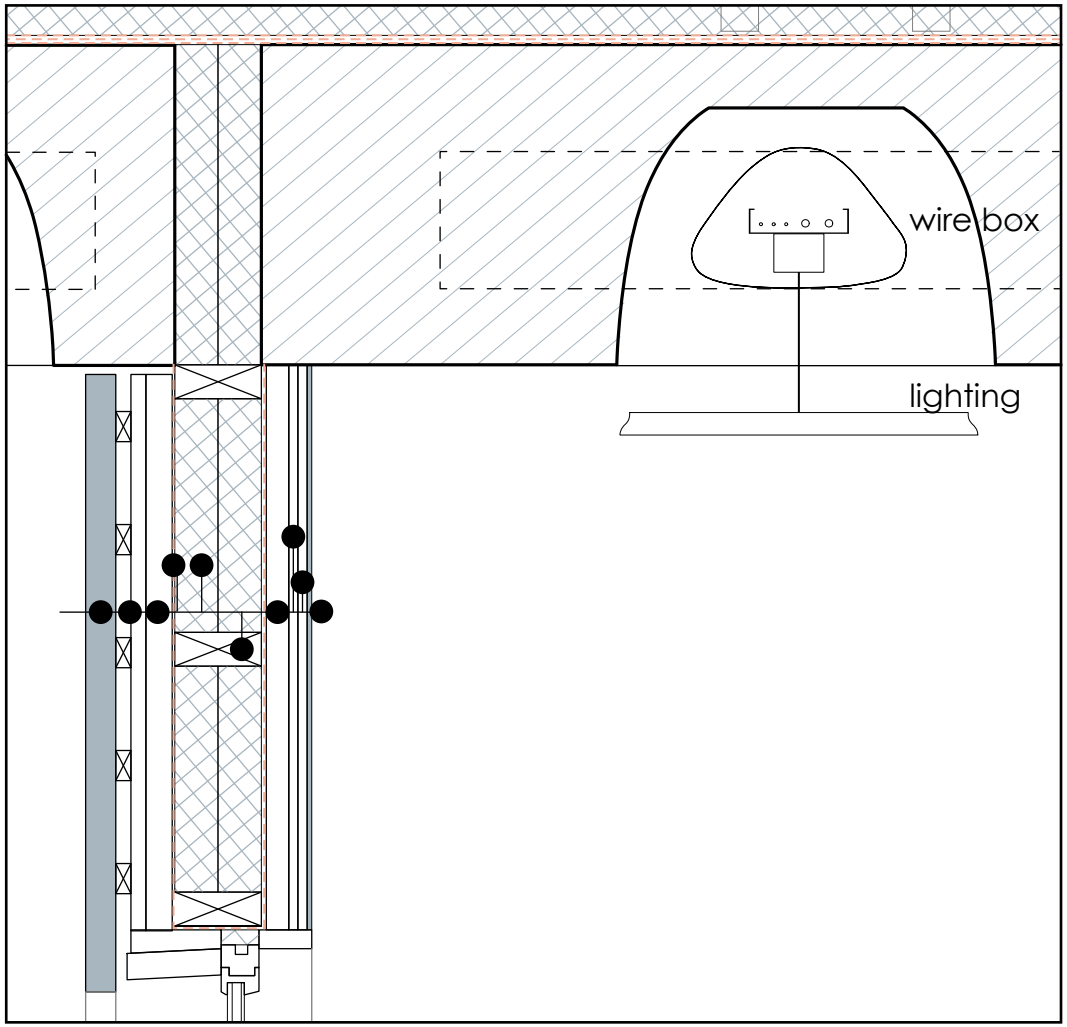
Hemp insulation

Laminated wood section

Plywood 12mm

Plasterboard 12.5mm

Clay plaster topcoat 6mm



TECHNICAL LAYER

1:10 FAMILY CENTRE DETAIL

Floor

Sisal flooring

Timber floor joists

Underfloor heating

Airtightness membrane

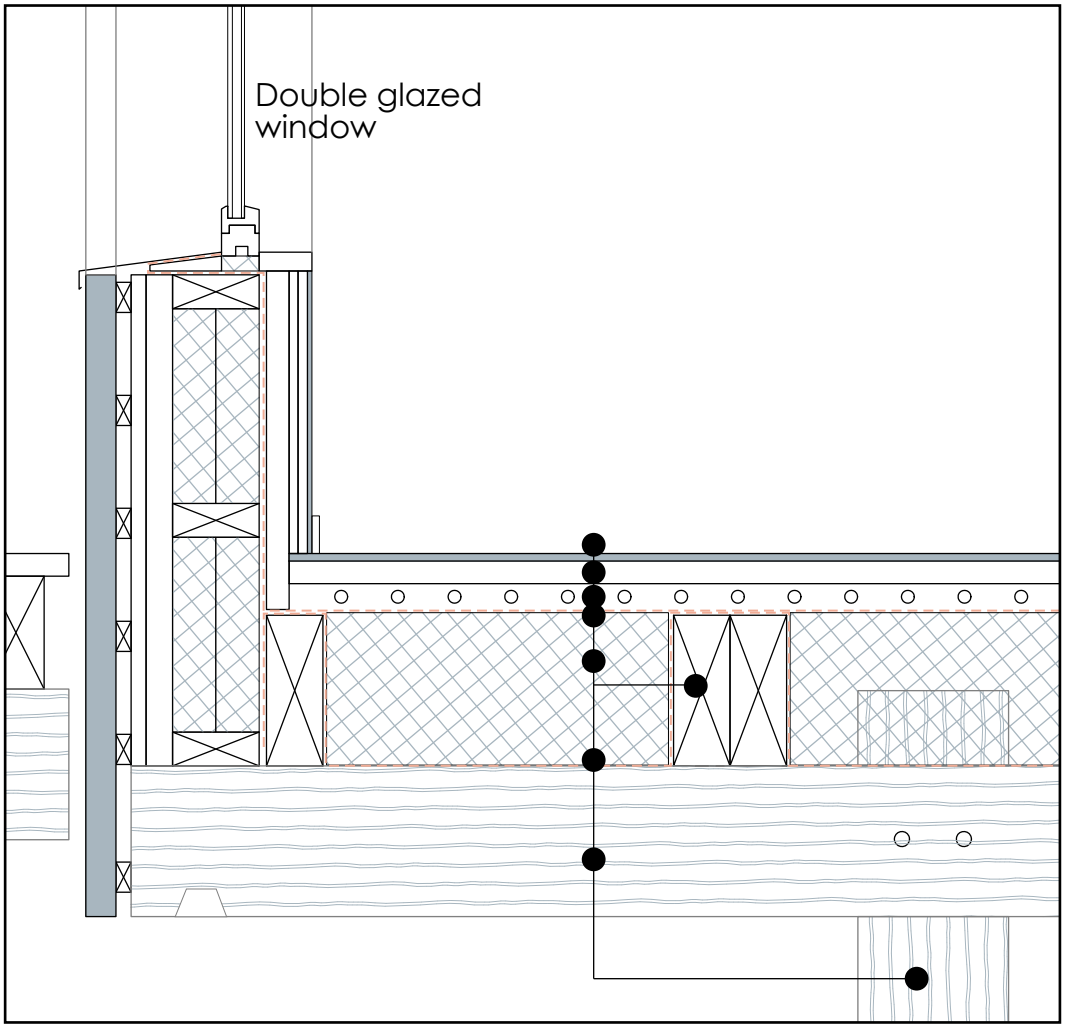
Insulation

Joists

Windtight breathable membrane

Headstock

Pile



TECHNICAL LAYER

FAMILY CENTRE VIEW

CLIMATE

MATERIAL CATALOG: SWIMMING POOL

HIGH MOISTURE ADSORPTION CAPACITY → LOW MOISTURE ADSORPTION CAPACITY

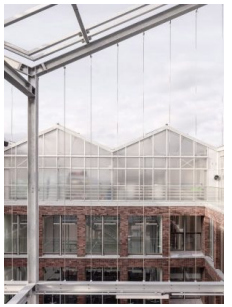
INORGANIC

Gypsum block 6%

Shotcrete+clay >0.95%

Concrete 0.95%

Tiles 0.5%



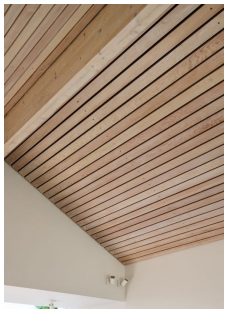
Glass 0%

ORGANIC

Sheep wool 35%

Sisal 15.4%

Hemp 14.4%



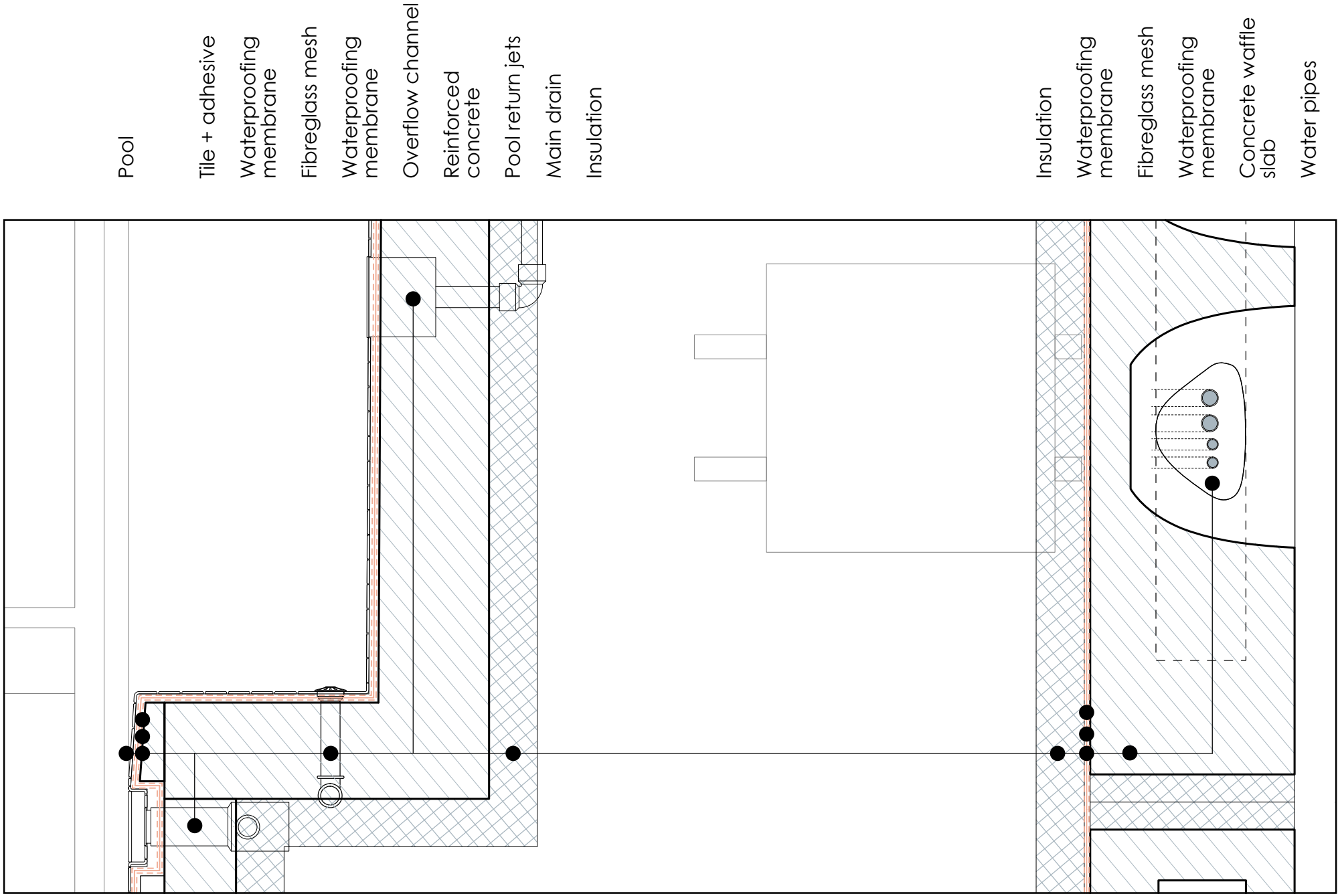
Douglas Fir 9%

Clay 0.98%

https://iopscience.iop.org/article/10.1088/1742-6596/2069/1/012003/pdf
https://koreascience.kr/article/JAKO202021262090515.pdf

TECHNICAL LAYER

1:10 SWIMMING POOL DETAIL



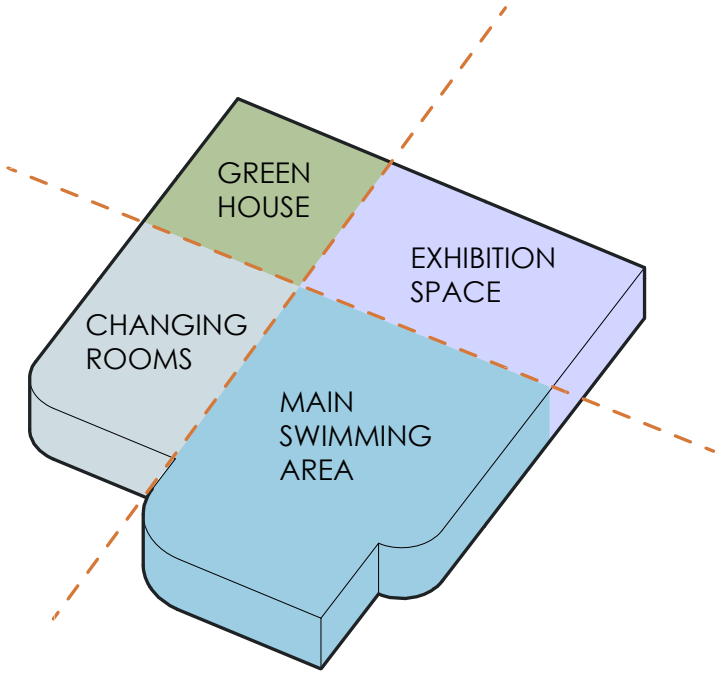
TECHNICAL LAYER

SWIMMING POOL VIEW

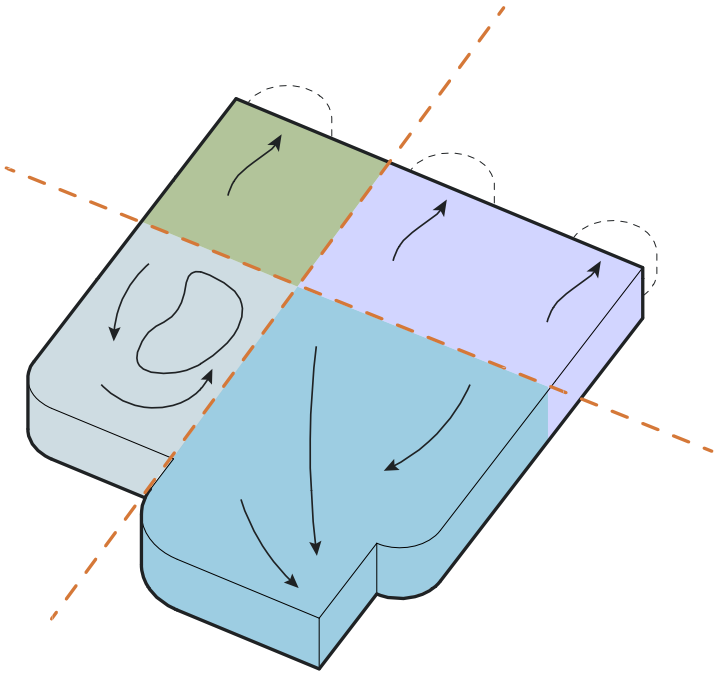
ROOF LAYER


WATER COLLECTION &
SOLAR COLLECTORS
WATER TANKS
ROOF
TECHNICAL LAYER
WETLANDS

ROOF FORM DIAGRAM

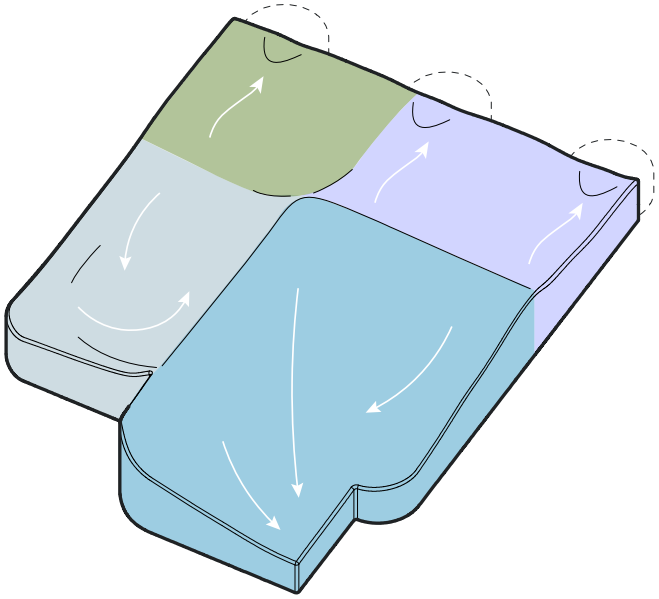


PROGRAM ESTABLISHING THE AXIS

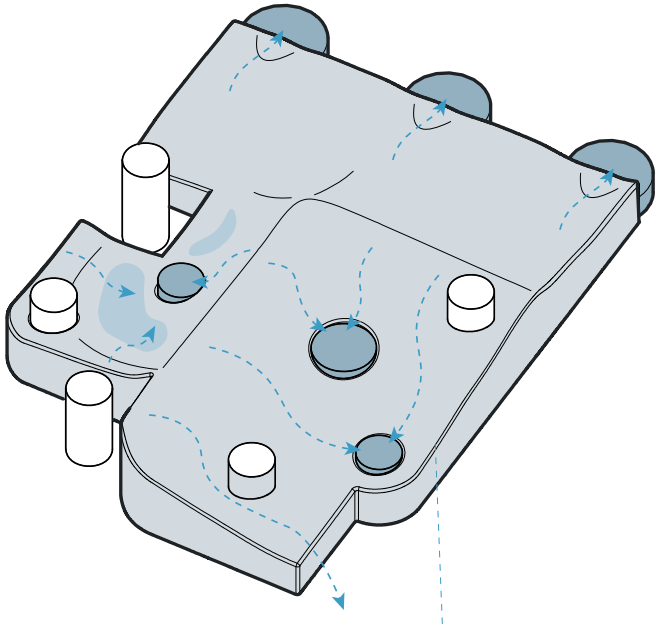


DIRECTION OF WATER FLOW

ROOF FORM DIAGRAM



ROOF FORM

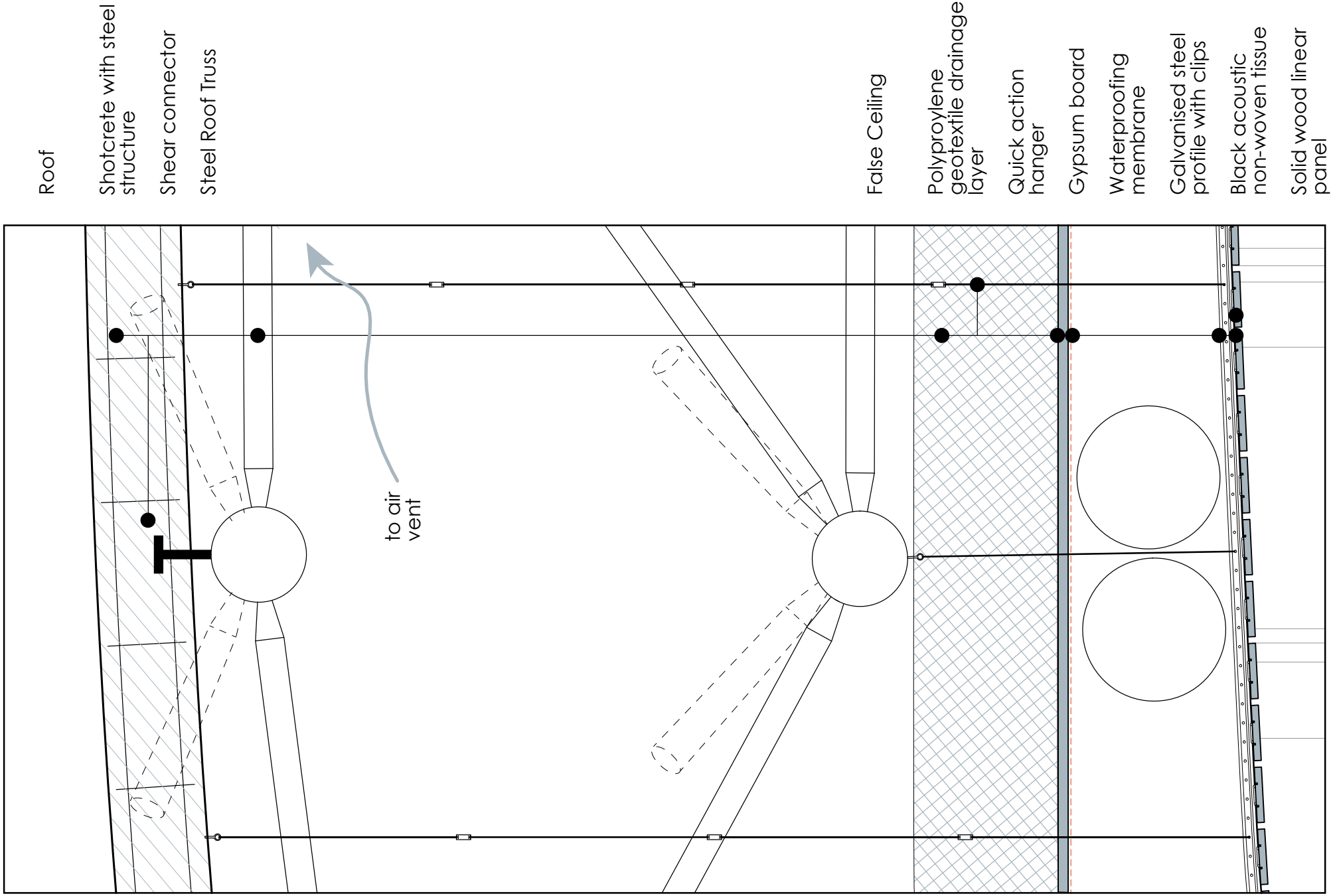


CREATING 3 TYPES OF WATER SCAPES

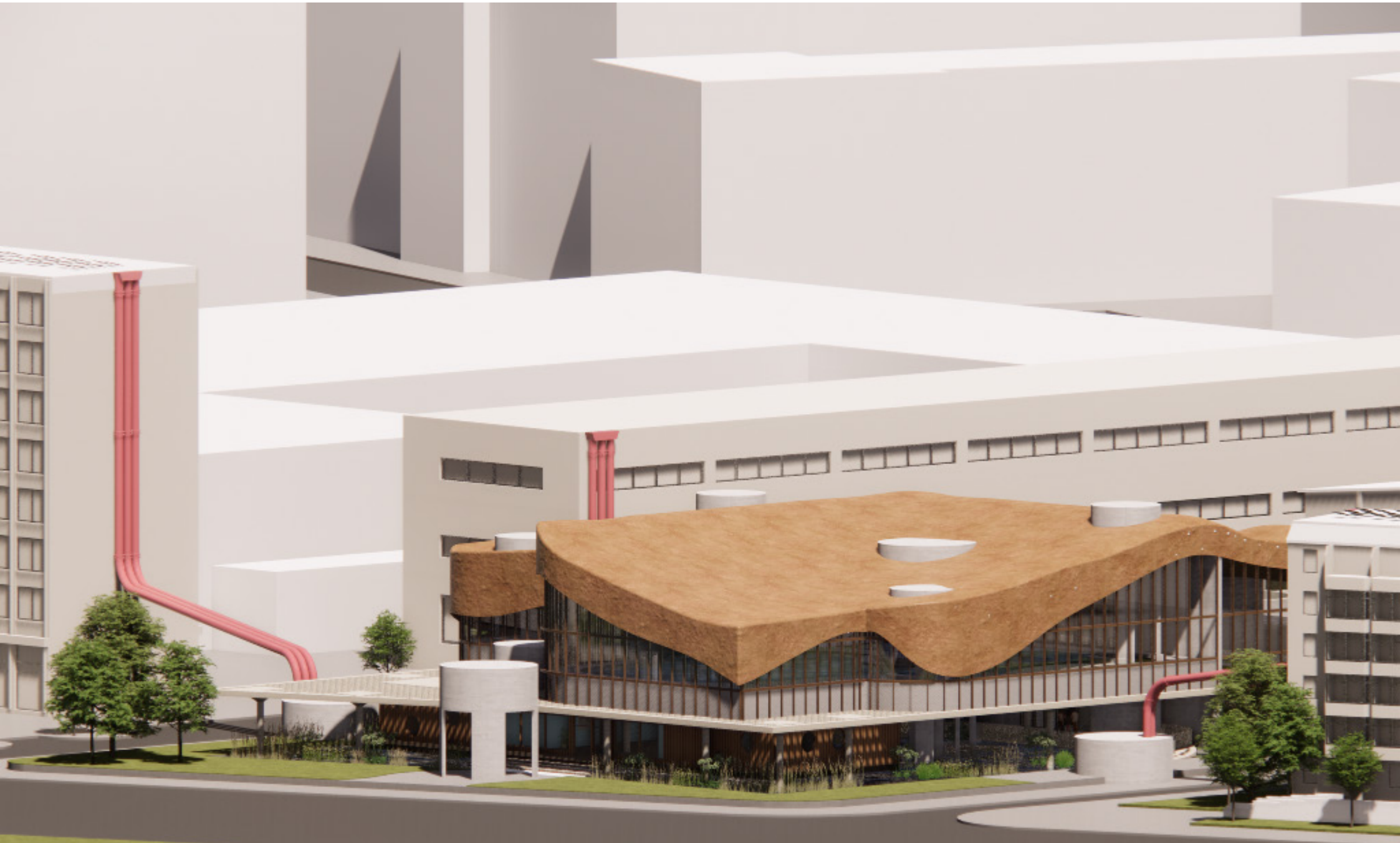
1. WATER FLOWING INTO SELECTED TANKS
2. WATER POOLING ON THE ACCESSIBLE ROOF
3. WATER FLOWING DOWN THE BUILDING INTO THE WETLANDS BELOW

ROOF LAYER

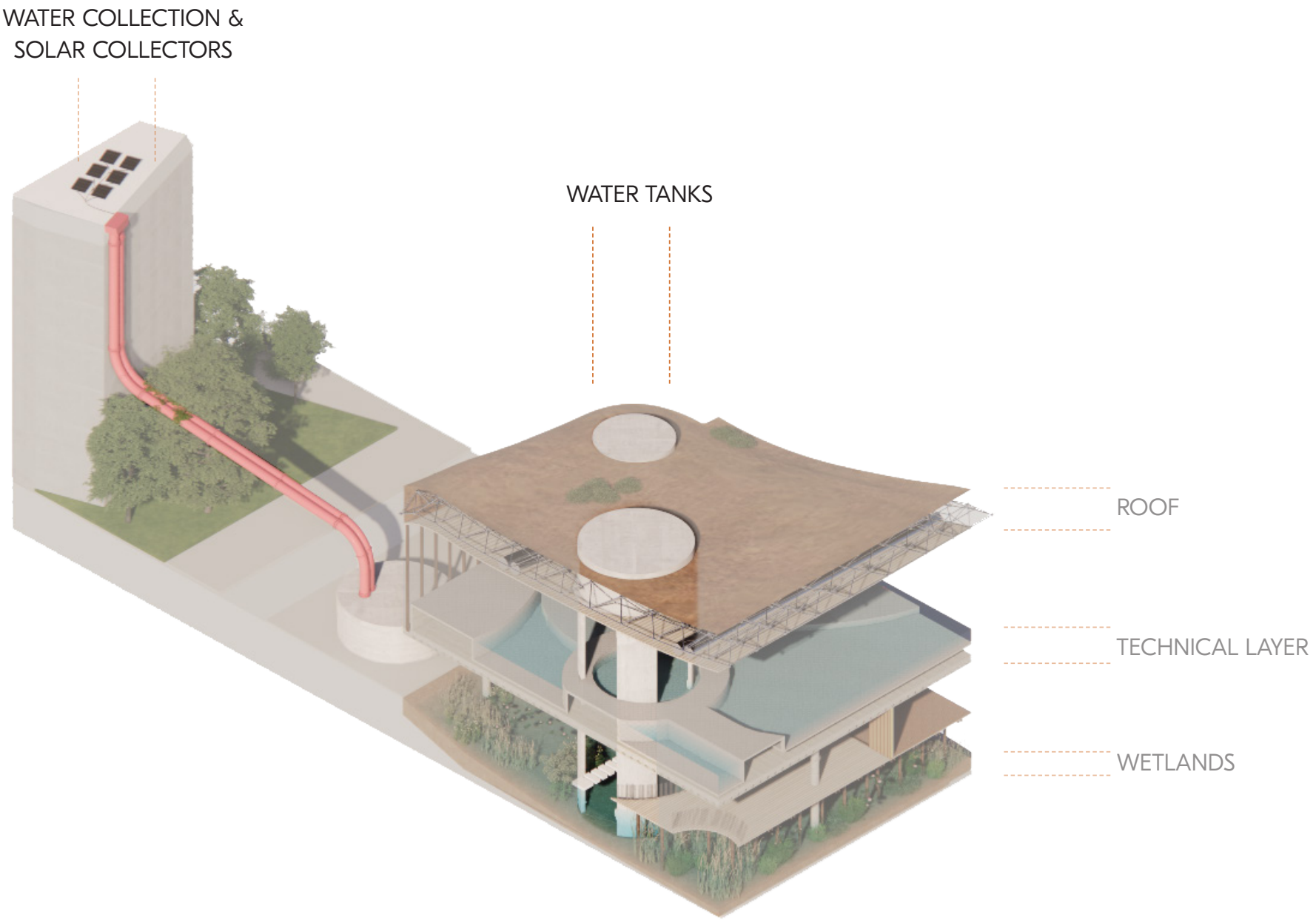
1:10 ROOF DETAIL



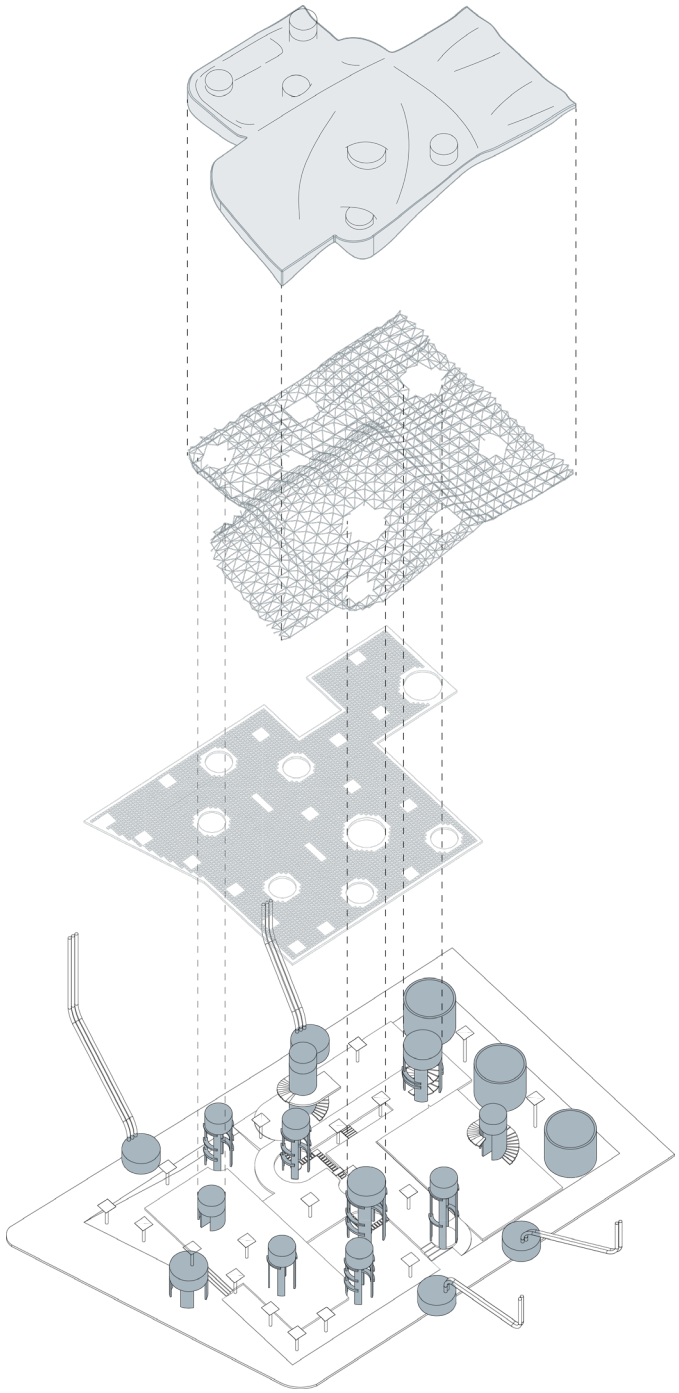
ROOF LAYER VIEW



WATER TANKS


WATER COLLECTION &
SOLAR COLLECTORS
WATER TANKS
ROOF
TECHNICAL LAYER
WETLANDS

STRUCTURE



SHOTCRETE MIXED WITH
CLAY ROOF FORM

STEEL TRUSS SYSTEM

WAFFLE SLAB
STRUCTURE

WATER TANKS &
COLUMNS

Water Tank Detail

Metal cover

Grate cover

Concrete water tank

Outlet pipe

Shotcrete with steel structure

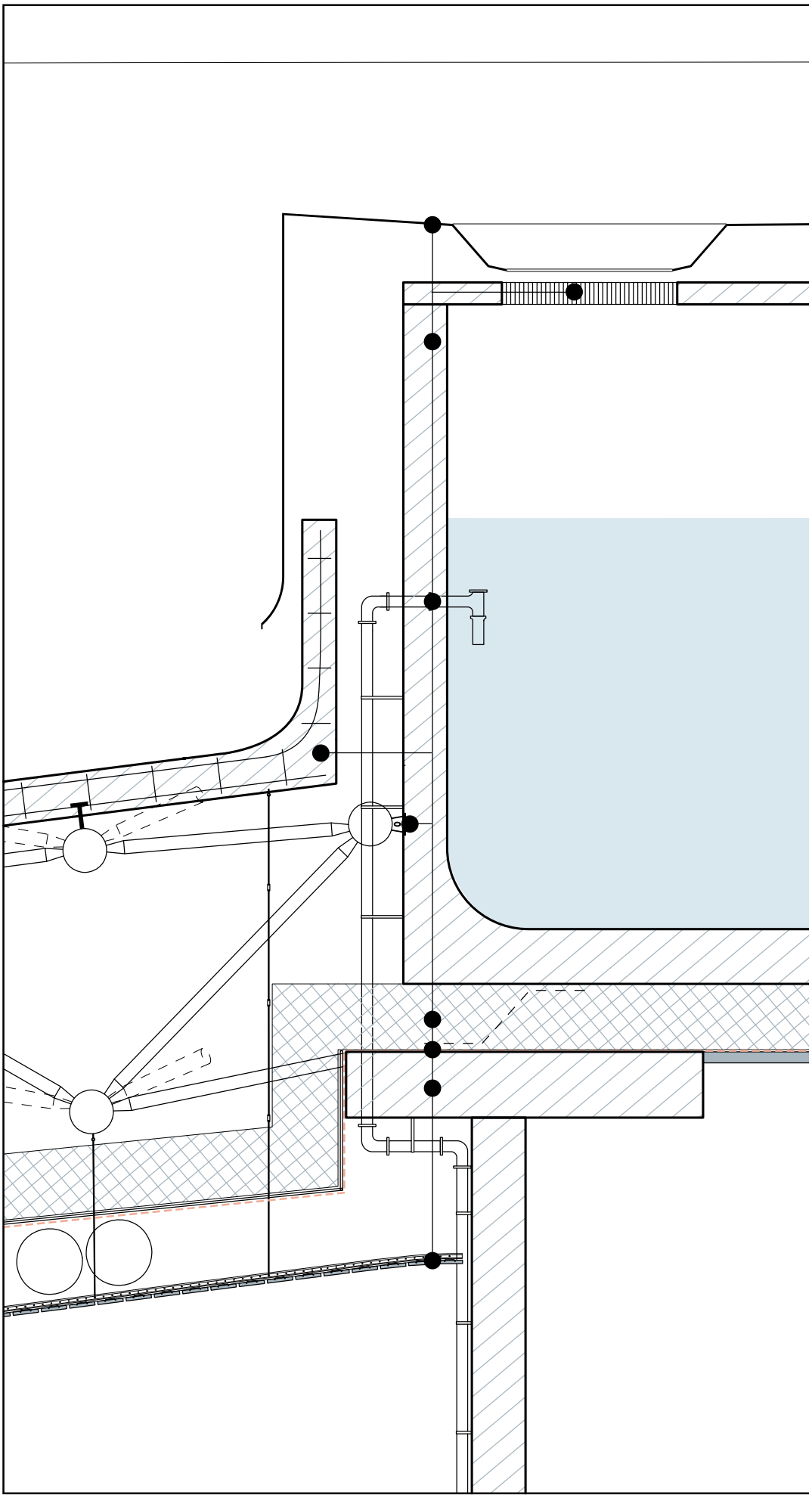
Steel truss connector

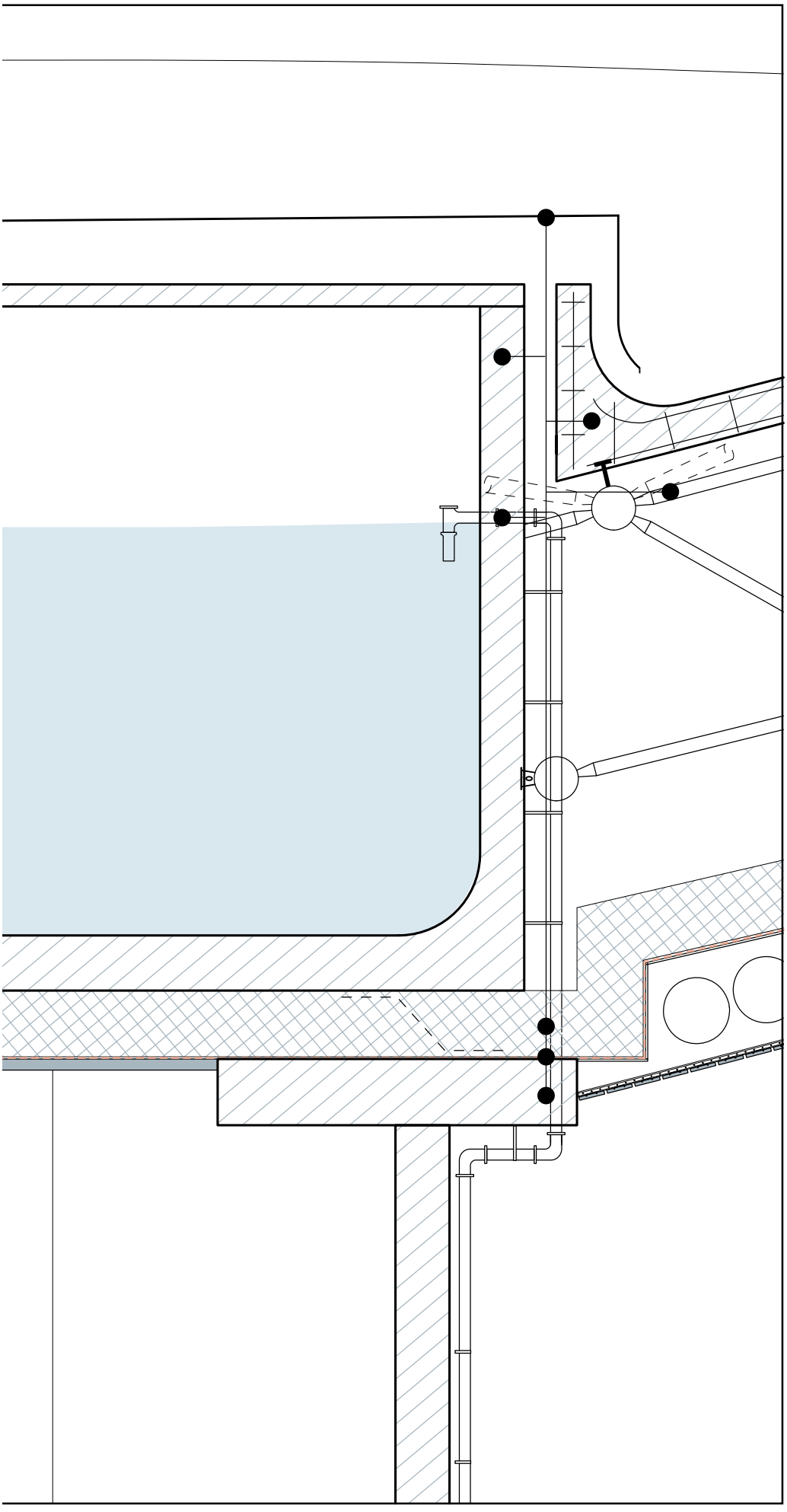
Hard insulation

Waterproofing membrane

Concrete column

False ceiling





Water Tank Detail

Metal cover

Concrete water tank

Shotcrete with steel structure

Steel truss

Outlet pipe

Hard insulation

Waterproofing membrane

Concrete column

VIEW

G FINAL REFLECTION

BACKGROUND

The studio focuses on the Public Condenser as a new type of public communal building that facilitates community building on an urban scale. We investigate future-proof designs and offer a systematic and holistic approach to designing public projects through the Research-by-Design approach. The project brings much-needed public facilities and institutions closer to a plethora of people that may come from different backgrounds. Furthermore, it plays a vital role in enhancing social lives and improving the quality of life in cities. This aligns with my personal interest in the relationship between the health of the city and its access to public spaces.

The relationship between the health of a city and its access to public spaces has always been crucial one. The development of the project started with three main interconnecting topics: investigating the future of public buildings in Berlin, the main design assignment, and the Public Condenser building typology introduced by this Graduation Studio. Through the research of these topics, the aim of my Public Condenser is a family centre and swimming pool hall which part and parcel is a water purifying plant.

The research on Berlin helped shape the contextual framework of how the city worked but it was not until the excursion that my findings and observations gave a direction in shaping the main design assignment. Spending a week in the district of Friedrichshain, it became clear that its inhabitants were quite content with what the area provided for them. Many people I interviewed on the street reaffirmed how they felt like the district was not really lacking in anything they desperately desired. At first, it was daunting how sufficient the area seemed to be and finding a direction on how this project would go seemed redundant. However, I observed how much more present families or parent-and-child pedestrians seem to occupy the daily goings of the area. I quickly realised Friedrichshain had a high proportion of families and I quickly focused my interviews on this demographic.

Thus, this project was borne from a very simple reason: many parents I interviewed wished for a place for their toddlers to learn how to swim. To further understand the relationship between swimming pools and their neighbourhood, I myself took up swimming at a local pool hall in The Hague. I went at various times of the week from weekday mornings to weekend afternoons and I observed a very telling difference in the demographic of the pool goers. Early weekday mornings were regularly reserved for children's swimming lessons and after the pool is free, the elderly would arrive to commence their regimen. The weekends were usually extremely busy with crowds of families coming and going. I observed a very diverse age range in this busy

atmosphere ranging from parents with their toddlers in the splash pool, to young children playing around in the wading pool. The deeper pools were occupied by older children and teenagers; numerous adults were also peppered around aiming to get their swimming laps in. The swimming pool hall was a vibrant zone for social interaction, family bonding and recreation.

DESIGN AIM

This encompassing experience across several age groups started a journey of using water as a design material. It forms boundaries that guide the user through several pavilion-like spaces on the ground floor as they sit within ponds consisting of wetland vegetation. The family centre and an exhibition hall form large tectonic blocks surrounded by these ponds, allowing the user to experience water through all the senses. Large cylindrical columns punctuate the space giving either light or a passageway to the first floor. These columns are not only structural but bear the weight of the water tanks above where the rainwater is collected and stored from the surrounding roofs of the site. The first floor houses a natural wading pool that serves as both recreation and also a place to teach toddlers and young children how to swim. The greenhouse sits at the back with the largest of the water tanks that also contains a top layer of wetland for testing and monitoring purposes. The building aims to use water to foster different social interactions through water, space, and the in-between.

My design process was a two-fold strategy of designing the building both as an infrastructural machine and as a multi-layered atmospheric waterscape. Water has always been a gathering point, a place to meet, socialise and relax. It signifies nature, cleanliness and rejuvenation and has always been an attractor for social spaces. The different waterscapes in the building (swimming pool, wetland pond, rooftop garden etc.) all feed into the multisensory experience of water for the visitor. Several methods were used in my research and design process concerning waterscapes and architecture; the technique of collage and mapping helped collate my ideas on water, public space and Berlin. Diagrams and drawings aided in bringing this research contextually to the site I picked.

On the technical side, the building aims to collect, store and purify rainwater to be used in the swimming pools. This technical process inspired the possibility to showcase, expose and at times, exaggerate the role of water in the building. It was also important to the foundation of the project that I picked case studies existing in climates similar to Berlin. As Berlin is influenced by a temperate seasonal climate, water is usually bountiful and needs to be directed, controlled and channelled away from the building as opposed to hotter climates that may want to collect and store the water to cool the building. Case studies such as the Borden Park Natural Swimming Pool in Canada, Muttenz Water Purification Plant in Switzerland and Noorderpark Swimming Pool.

REFLECTION

The design started with the placement of the water tanks. Much of the work was done on the volume of water that would be collected and stored, the materiality, sizing, and structural capabilities of the tanks and the water systems in the building. As I needed to store an estimated minimum of 6 million litres of water annually, the building has a number of sizable water tanks ranging from 5m to 9.5m in diameter. I chose concrete as the main material for the water tanks after comparing it to the other options (steel, plastic, wood etc.) and deciding it was the most suitable. Concrete was the best option as it prevents algae growth, keeps a stable temperature throughout the year, is highly durable and prevents the water from changing in taste. These large tanks became influential in the spatial arrangement of the whole scheme as their cylindrical form shaped the design language of the rest of the building.

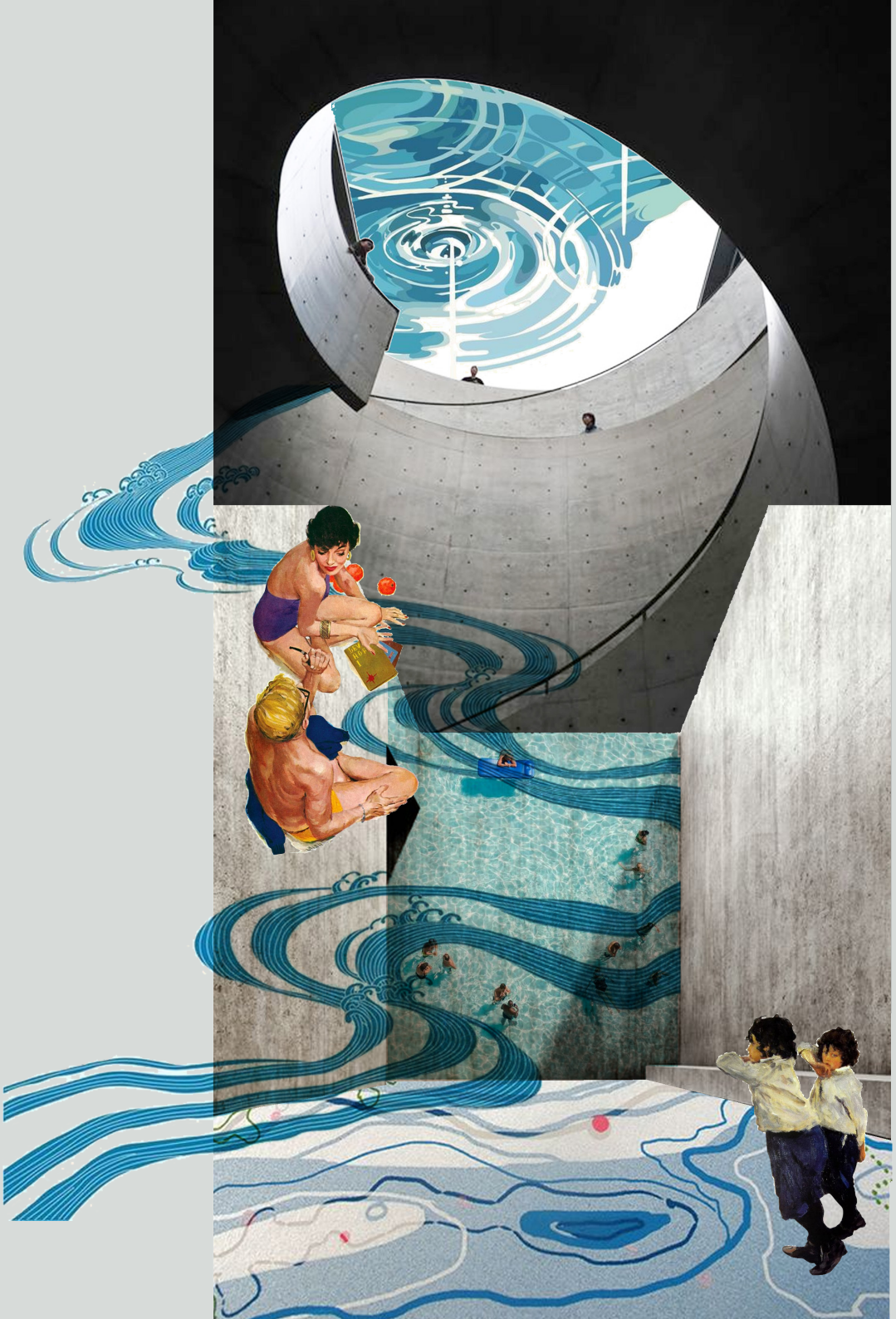
The P2 presentations solidified that I had a strong theoretical base for my design and that I needed to further develop in communicating the building as a machine, as a prototype, and to connect it to its context socially and ecologically. I realised that the building at this point was an amalgamation of spaces and water tanks and did not come together cohesively. The water tanks themselves had a logic in the way they were configured but as they punch upward through the building, there was not a strong relation to the spaces vertically.

Thus, the design pivoted into researching and developing further the structural systems and materiality of the building. Material selection was very important to the project as its effect on water and/or water vapour was paramount in creating the optimum climates. The research was done with a catalogue of scientific journals that tested the performances of different materials with humidity. This led to a very specific material catalogue from the surfaces to the specific insulation material used for each individual space in relation to its humidity adsorption capabilities.

Although I had all the ingredients, the feedback I received at P3 rightfully pointed out that the building was lacking in the development of form. Reflecting back, it would have been better if I had started the building form studies earlier and focused less on the technicalities. As technical as the project is with the usage of water, climate and materiality, I should not have ignored the process of form studies and developing a design language for so long as they go hand in hand. This was helpful in kickstarting the rigorous process of form-finding through hand modelling with clay and foam and then translating that to 3D in Rhino. The identity of the building quickly started to materialise and tied together many of the building's elements.

This project developed into a multi-layered instrument whereby

not only is it a public condenser aiming to provide family resources and water recreation activities that are lacking in the neighbourhood but also addresses water as a public right and a threatened resource. These layers of complexity were probably the cause of my intense research process as I felt that I needed to prove it was feasible. Going forward, I aim to achieve a better balanced design and research process. As important as a solid foundation is, there comes a time when you have to start building on top of it.



RESEARCH-BY-DESIGN
JOURNAL

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GRADUATION STUDIO
2022/2023