

BEYOND ARTIFACT: REFRAMING THE CHILEAN DESERT

**A Thesis Submitted to the Department of Landscape Architecture,
Harvard University Graduate School of Design**

by

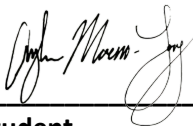
ANGELA MORENO-LONG

In Partial Fulfillment of the Requirements for the Degree of

MASTER IN LANDSCAPE ARCHITECTURE

DECEMBER 2021

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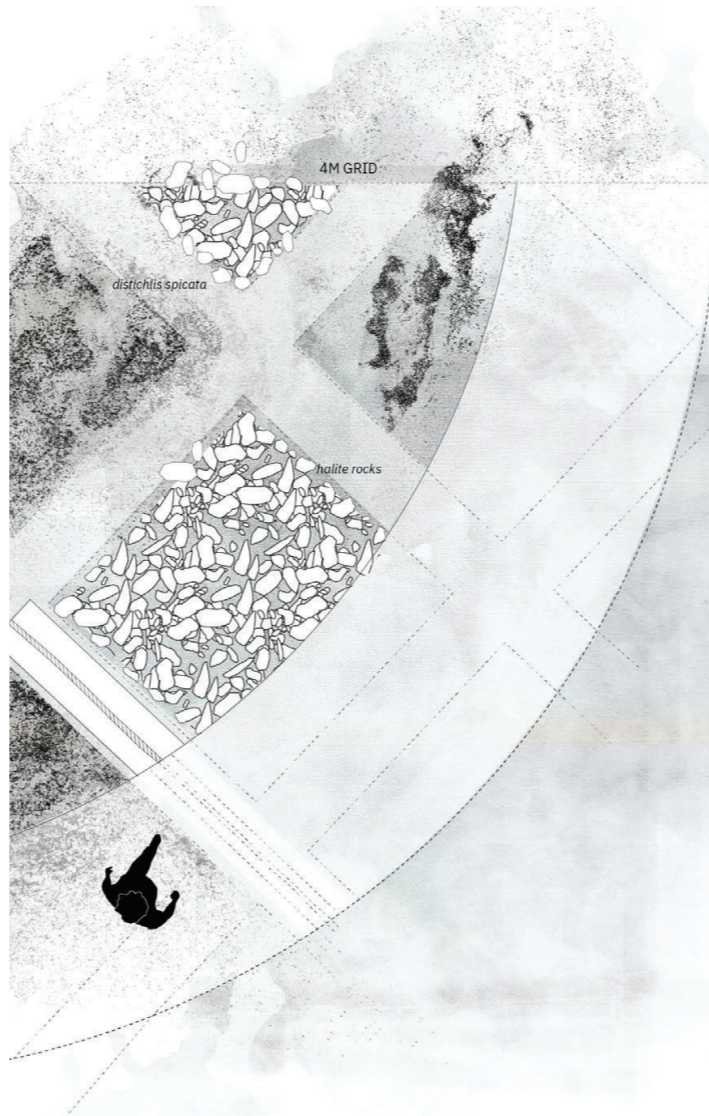
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BEYOND ARTIFACT

Reframing the Chilean Desert



Angela Moreno-Long
Thesis Advisor: Rosalea Monacella
December 2021

ABSTRACT

This thesis explores design as a mode to challenge dominant cultural narratives of the Atacama Desert in Chile. The project reframes an understanding of life in the desert through alternate knowledge systems specific to this landscape and material actors plant, rock, and water. The proposed reframing is in response to a cultural imaginary that treats the Atacama as a desolate extractive zone, with a myopic focus on industrial artifacts and a legal policy framework that classifies all materials in the desert through a logic of mineral wealth and extraction. An observatory and garden program connect histories, living cultures, and ecologies while fostering submerged multi-species life to reframe living matter in the desert.

ACKNOWLEDGEMENTS

I am deeply grateful to my advisor Rose Monacella for her mentorship, guidance and support throughout my time at the GSD and the thesis year. Without Rose, this thesis would not have been possible.

To Gareth Doherty, Jill Desimini, Craig Douglas, and Charles Waldheim, thank you for your critical feedback throughout the project.

Thank you to Danielle Choi for guidance on early research phases of this project.

Thank you to Gary Hilderbrand for invaluable support and guidance as an academic advisor.

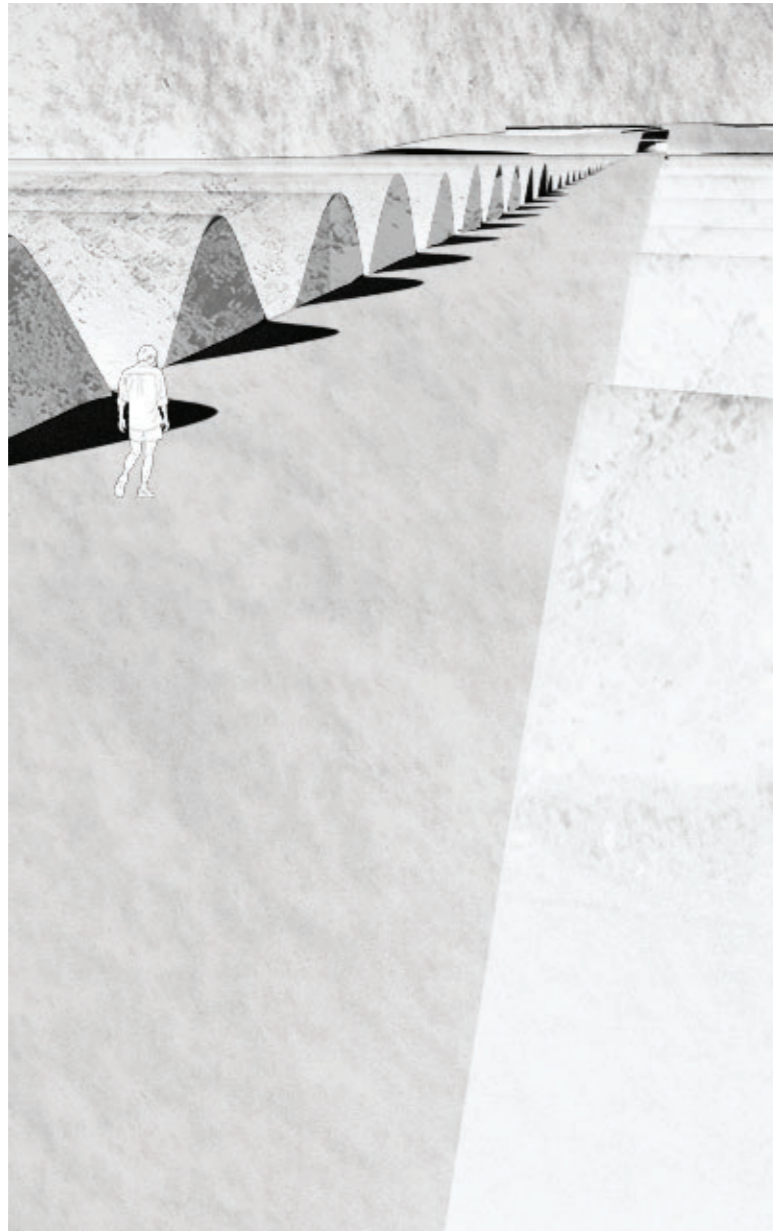
And lastly, thank you to my classmates Alison Maurer, Benjamin Hackenberger, and Alana Godner-Abravanel for their support throughout this project.

CONTENTS

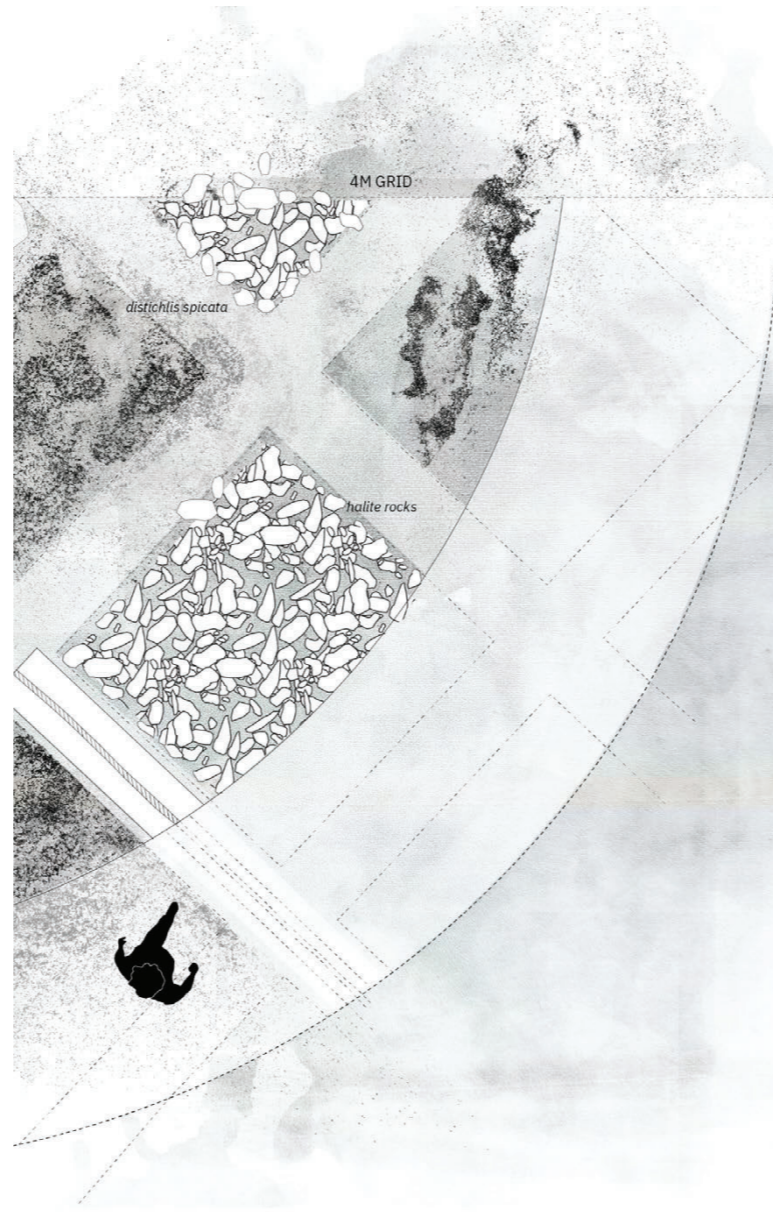
INTRODUCTION	5
“THROUGH”	19
“BELOW”	26
“ABOVE”	34
REFERENCES	43

INTRODUCTION

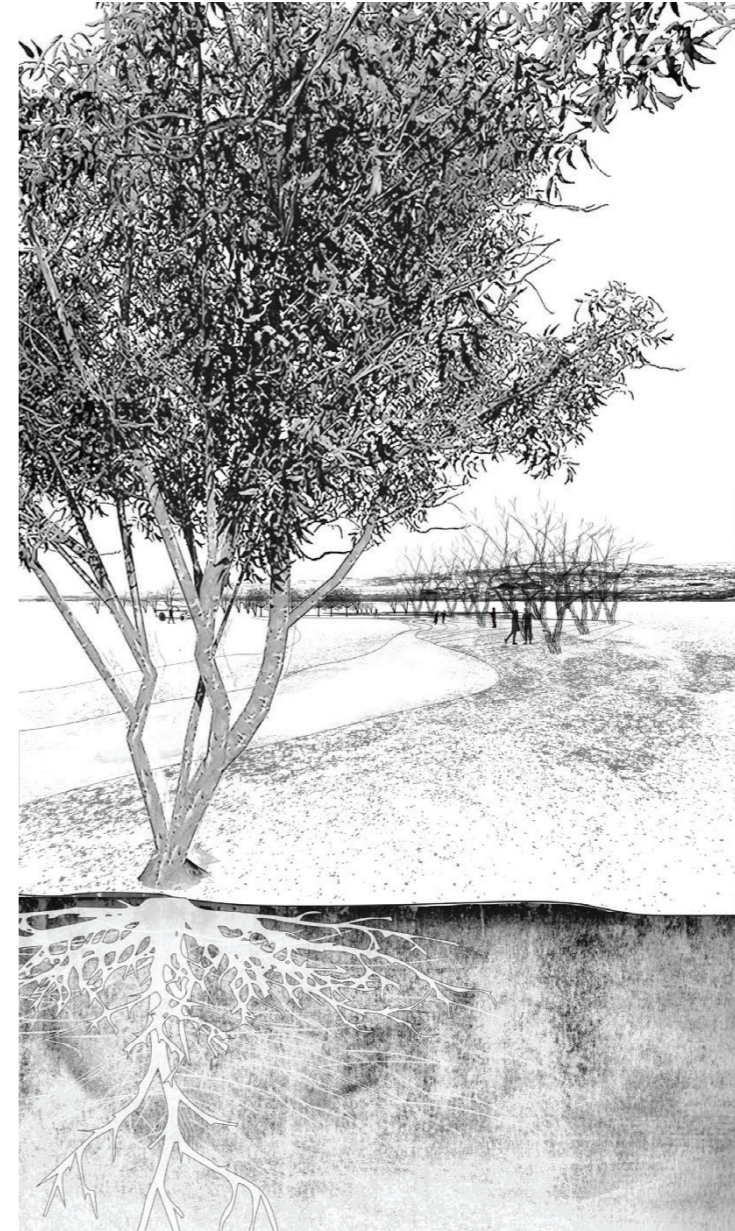
THROUGH



BELOW



ABOVE



This project explores design as a mode to challenge dominant cultural narratives of the Atacama Desert in Chile. I aim to connect histories, living cultures, and ecologies through the program of an observatory and garden. Each celebrates alternate forms of knowledge and classification in the desert. The observatory and garden are framed through three material operations: through, below, and above that shape the program. The designs use an alternate subterranean logic to reframe the matter of the desert as living matter.

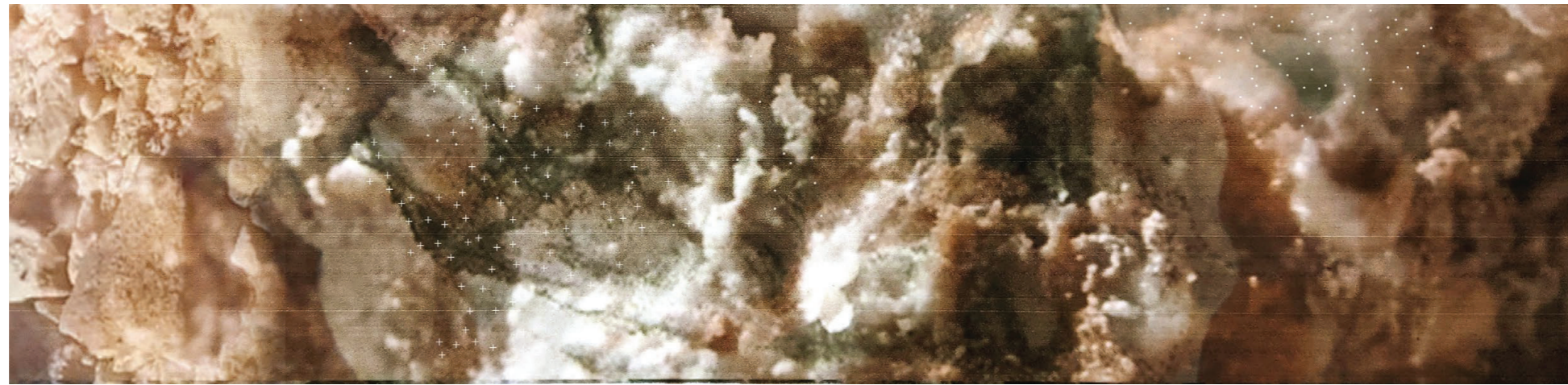
WELCOME TO MARIA ELENA
NATIONAL CAPITAL OF NITRATE HERITAGE



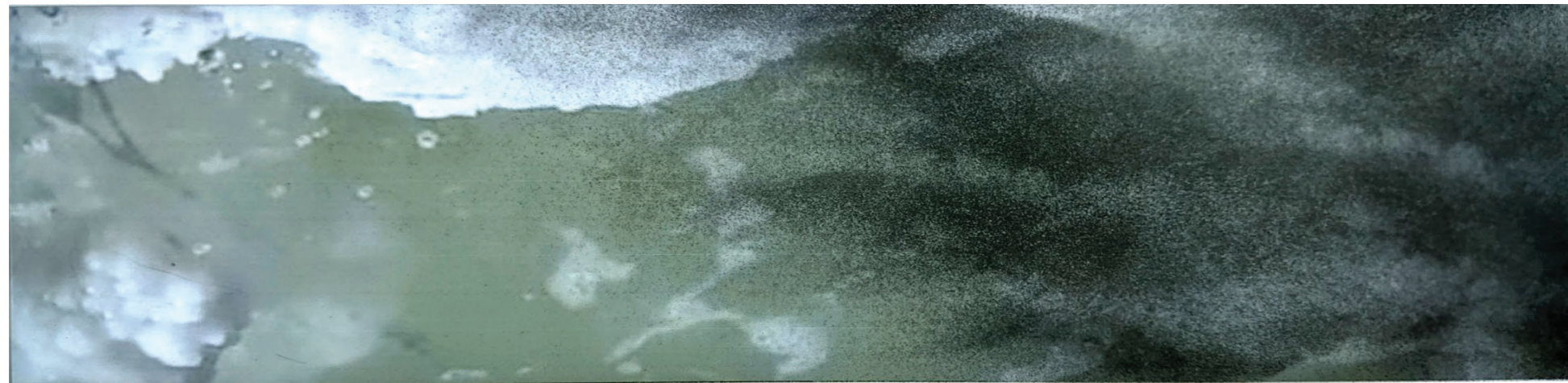
My proposed counterreading is in response to a cultural imaginary that treats the Atacama as a desolate extractive zone, with a myopic focus on industrial artifacts and a legal policy framework that classifies all materials in the desert through a logic of mineral wealth and extraction.

**image source: INGEOP. 2015. Plan de Desarrollo de María Elena*

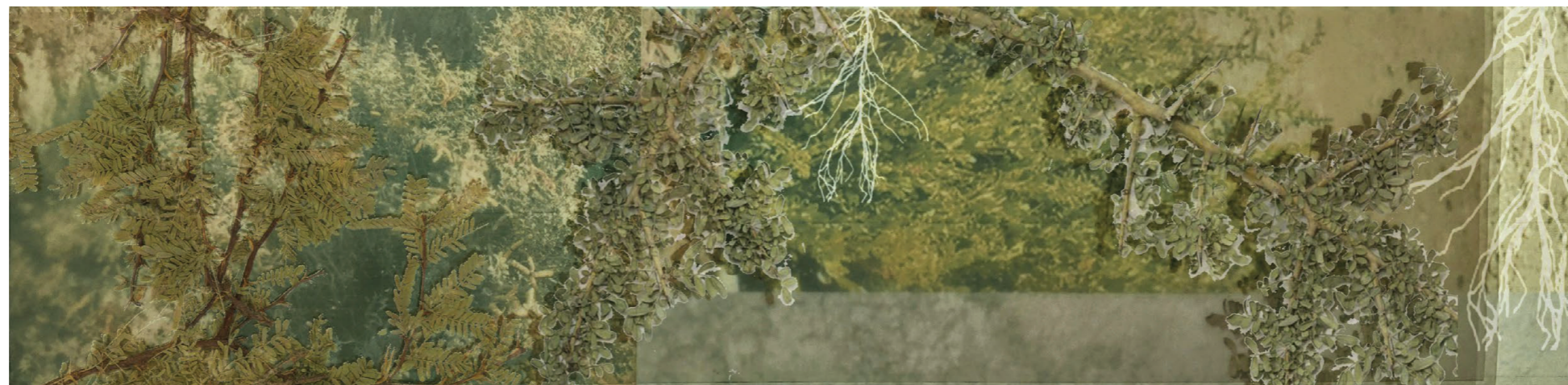
ROCK



WATER



PLANT



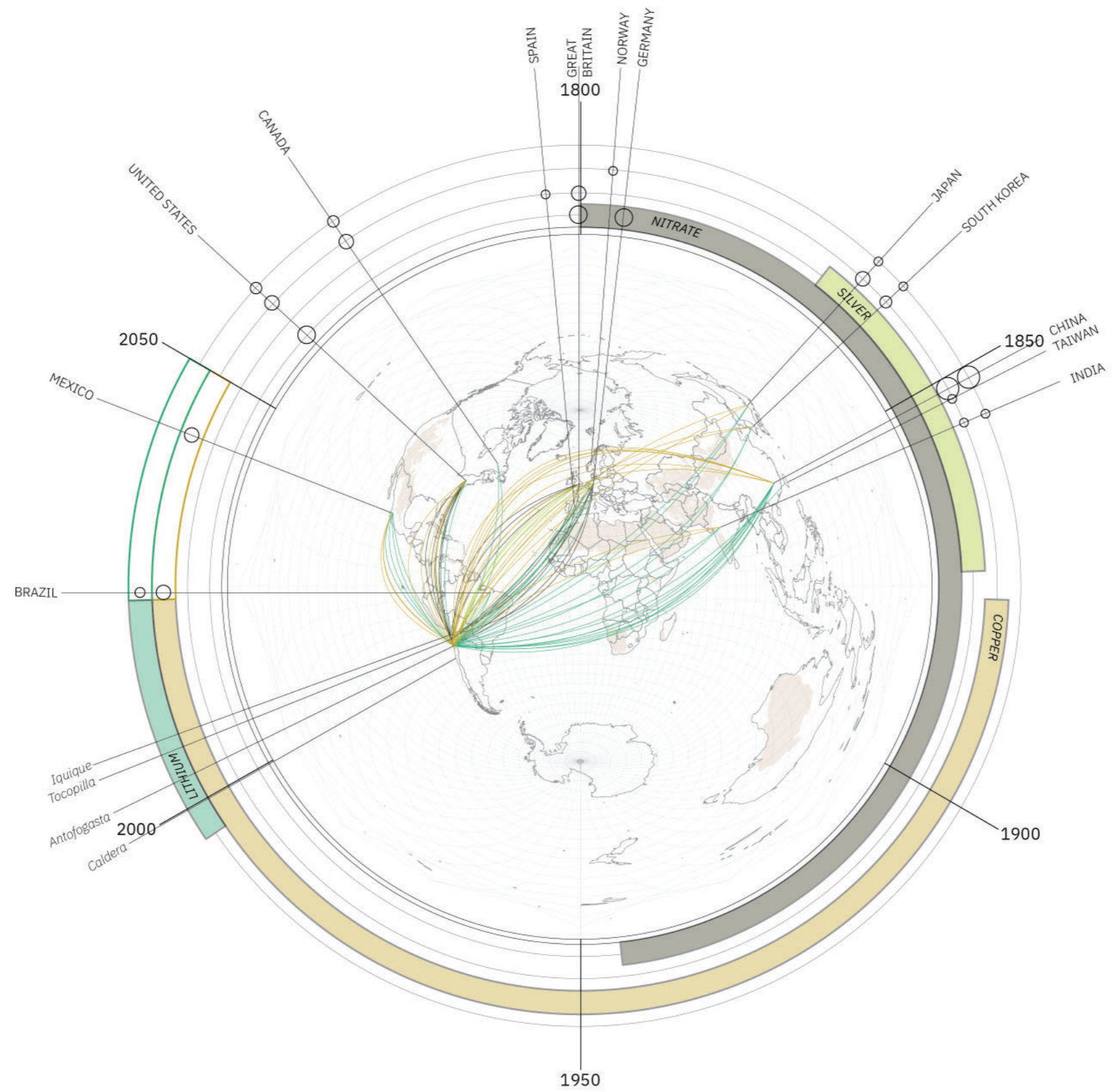
I question what lies beneath the visible world of the extractive zone and propose a counter-reading of the desert as a complex, performative system with human and non-human entanglements.
The observatory and garden foster submerged multi-species life in the desert through material actors: rock, water, and plant.



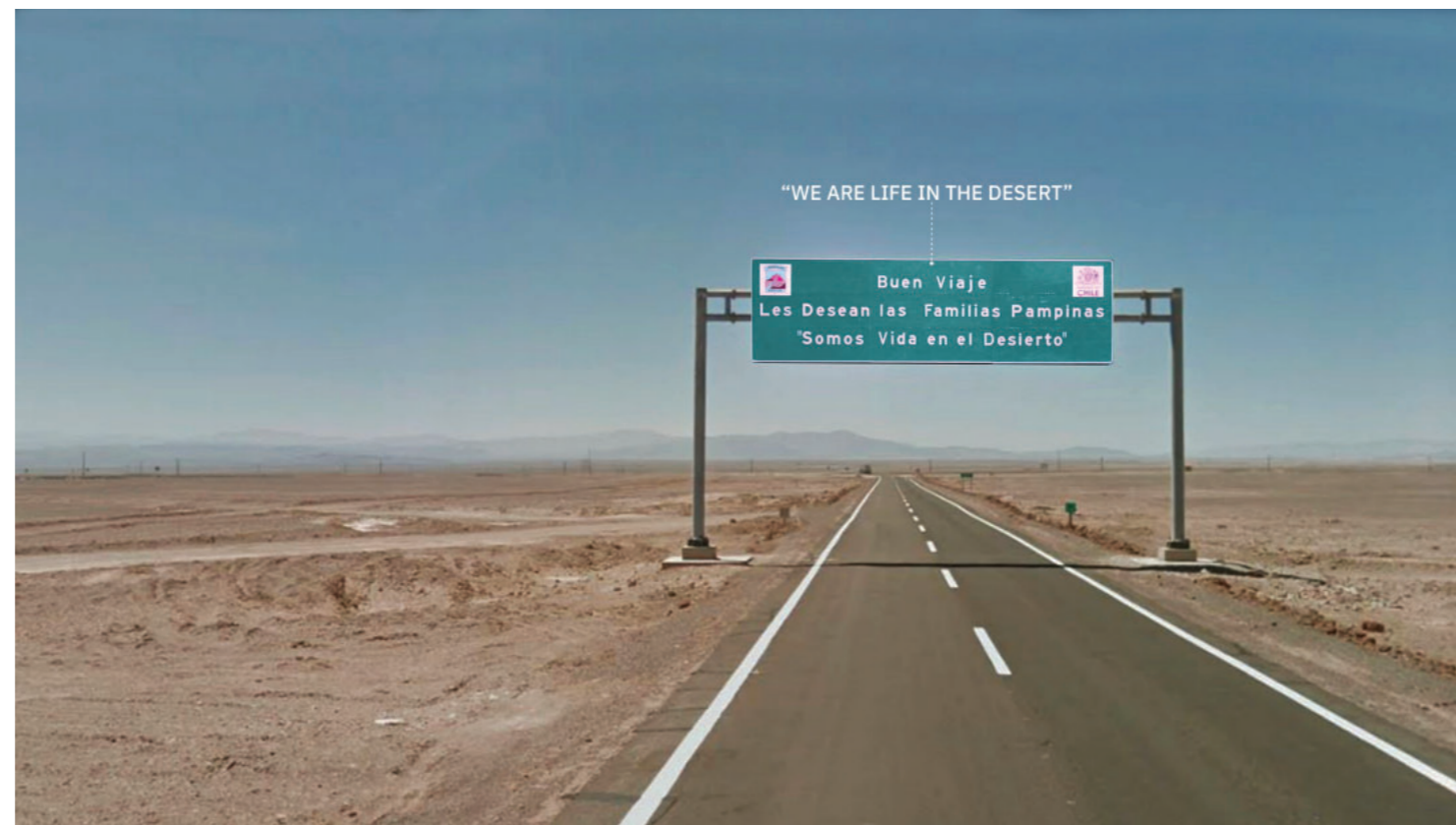
The project is situated in the mining town of Maria Elena, in the northern Antofagasta province. Maria Elena is a 4,500 person privatized town owned by SQM- currently the world's largest lithium producer. Maria Elena is a unique site as it is a spatial bridge between multiple histories of extraction. Remnants of the 19th century nitrate industry are at Coya Norte and present day Lithium and potassium nitrate processing happens at Coya Sur.

**image source: Ignacio Infante, from Correa (2016) "Beyond the City"*





The subterranean logic of mineral wealth has fueled multiple cycles of resource extraction in the Atacama.



In the hyperarid core where the main mode of transit is across highways and roads that cut across the desert expanse this extractive history is announced upon arrival, celebrating Maria Elena as a capital of nitrate heritage. “Salitrero” is the word for both the nitrate factories and also the nitrate miner. However, the underpinning for life in the desert is beyond mineral. Residents living in the high altitude desert pampa possess a deep “pampino” identity tied to ways of knowing and being in the desert. “We are life in the desert” reads the opposite side of the same road sign.

**image source: Google Earth Street View*

“Acá hay algo muy especial que yo diría que no lo he encontrado en otra parte, es el tremendo arraigo que tiene el pampino con su tierra...el sentirse pampino es algo muy distinto.”

“Here, I would say there is something very special that I have not found in any other place, the profound connection that the pampino has to the land. To feel like a pampino is very distinct. ”

JAIME GUERRA YÁÑEZ, María Elena Resident

“María Elena: Voces Pampinas” Documentary, February 2021

The ruggedness required to survive in a place with such climactic extremes produces a profound connection to the pampa.

“...Es importante que nos sintamos pampinos, que nos sintamos salitreros, pero también que nos sintamos que desde antes de eso ya fuimos vida, ya fuimos importantes como sector.”

“It is important that we feel like *pampinos*, that we feel like *salitreros*, but also that we feel that before any of that we were already life, we were already an important sector.”

MAUREEN MANSILLA, María Elena Resident

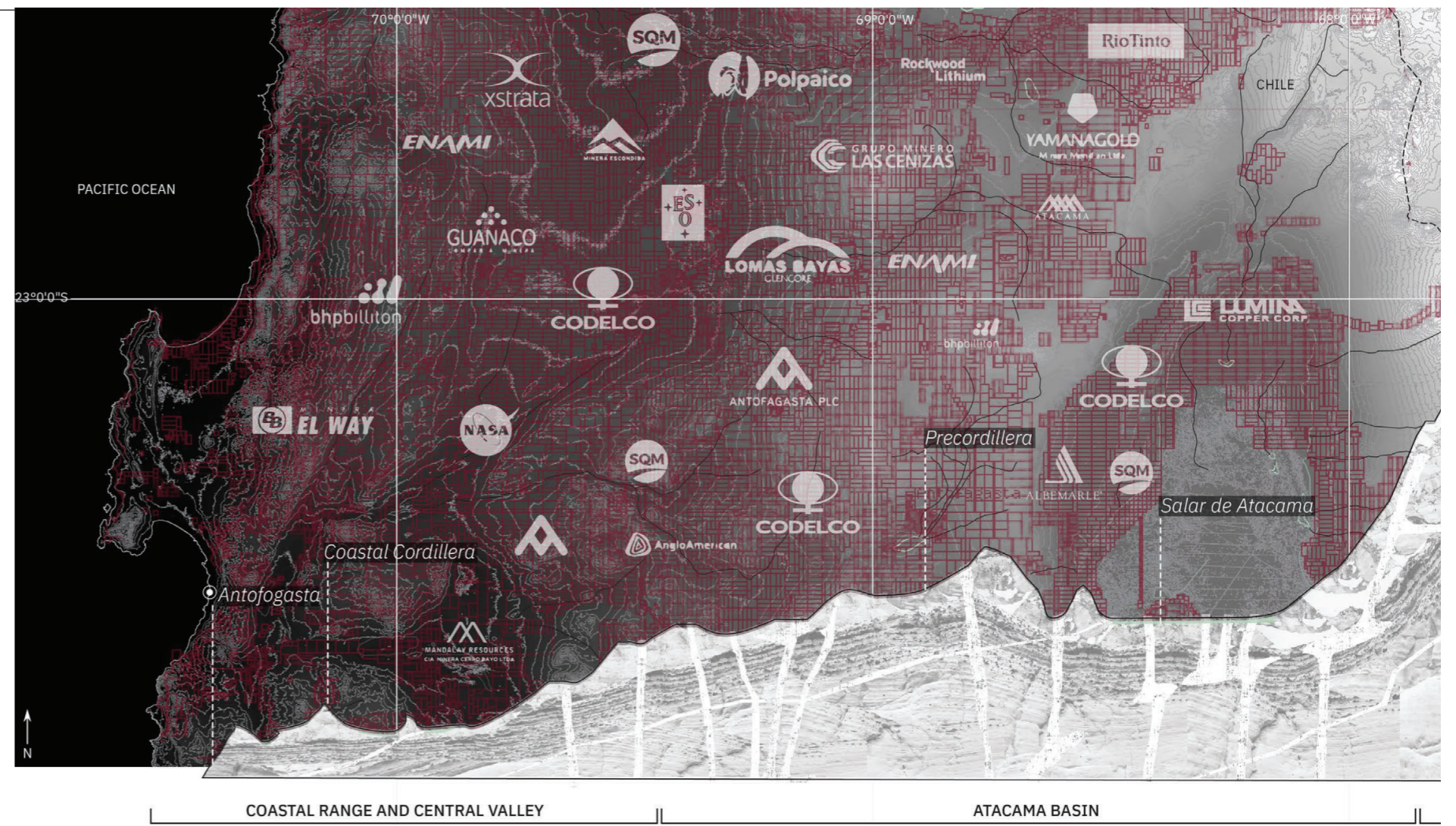
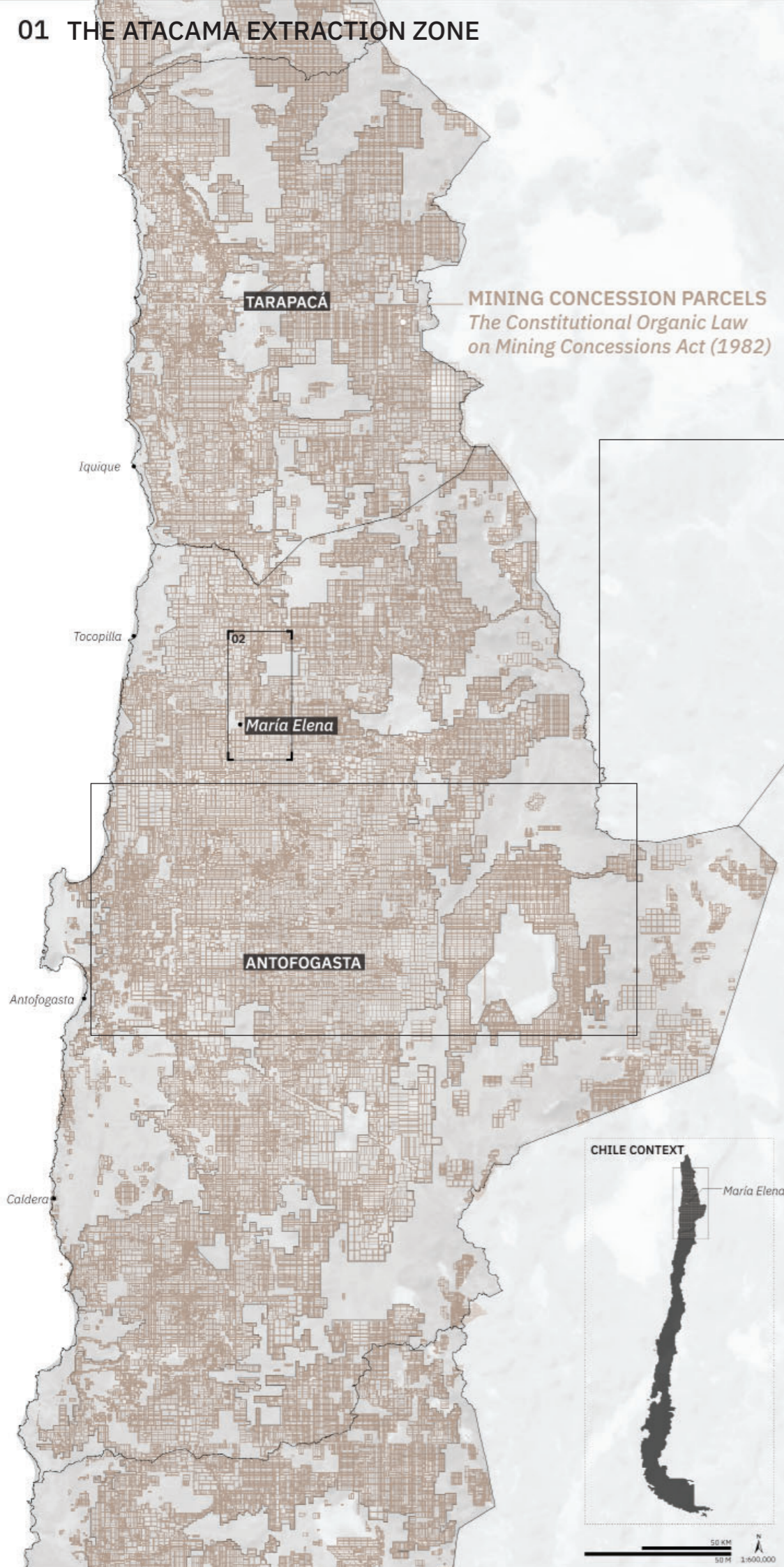
February 2020, “Pampinos Por Siempre” interview, Mesa de Cultura, Maria Elena

María Elena may be a mining town but residents identify as much more than that, one resident notes that it is important to have an identity tied to the land, an identity tied to mining but also “that we feel that before any of that we were already life, we were already an important sector.”

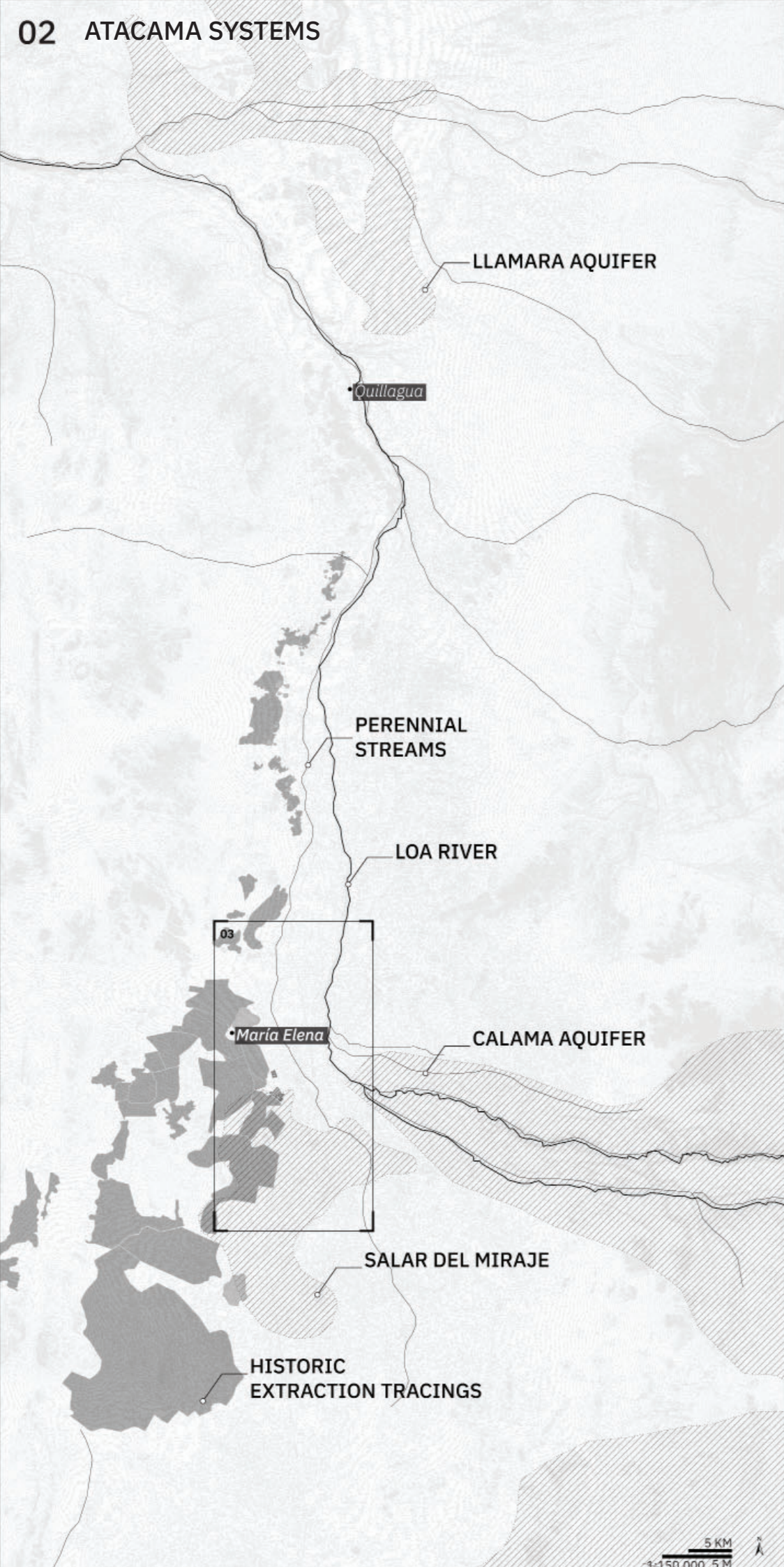


Largely invisible but linked across the territory, water is the underpinning for life in the desert. It has shaped the ground, it's nourished species unique to the Atacama, has supported human life in the most arid place in the world, and it supports ongoing mineral extraction.

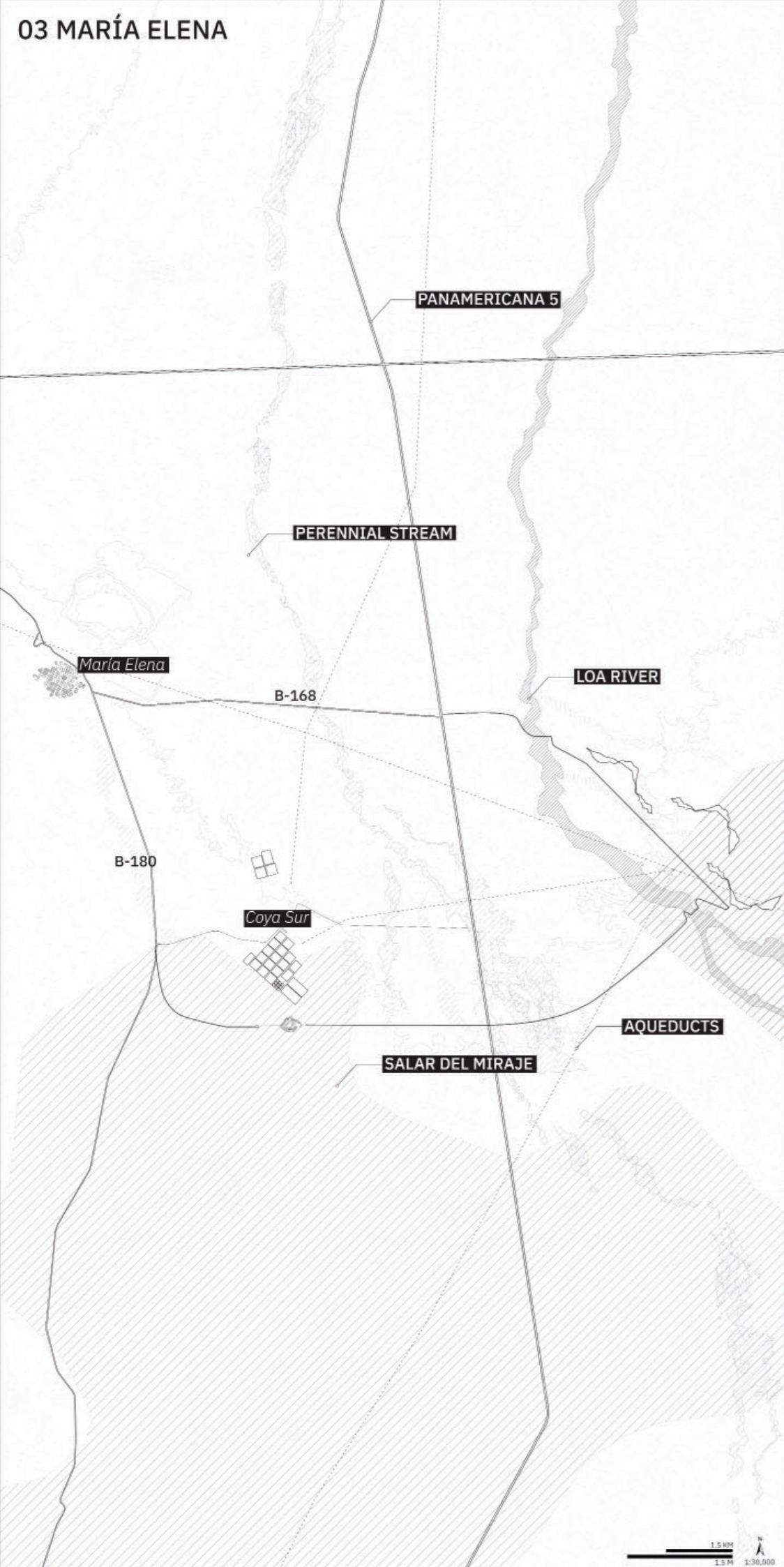
01 THE ATACAMA EXTRACTION ZONE



Water, along with all living matter in the desert, is classified and controlled through the 1982 Constitutional Organic Law on Mining Concession Act which breaks up the desert along mining concession parcels where private investors are granted concessions with no time or depth limit. All substances, metallic, non-metallic and fossil, in any form that they present in nature are subject to concession (Article 03). The policy treats water as mineral, inseparable from the mining concession.



Historic traces of extraction overlap with water systems extending through the desert, the Salar del Miraje, Calama Aquifer, Loa River, and perennial streams are all connected to Maria Elena. Through the extraction zone lens, tracings of past and present are currently understood and visualized through mineral and inert matter like mine tailings piles.



“...I ask us to see differently and to question what lies beneath the visible world of the extractive zone and to seek out less perceivable worlds, life forms, and the organization of relations within them...”

...I lift submerged perspectives that perceive local terrains as sources of knowledge, vitality, and livability.”

MACARENA GÓMEZ-BARRIS

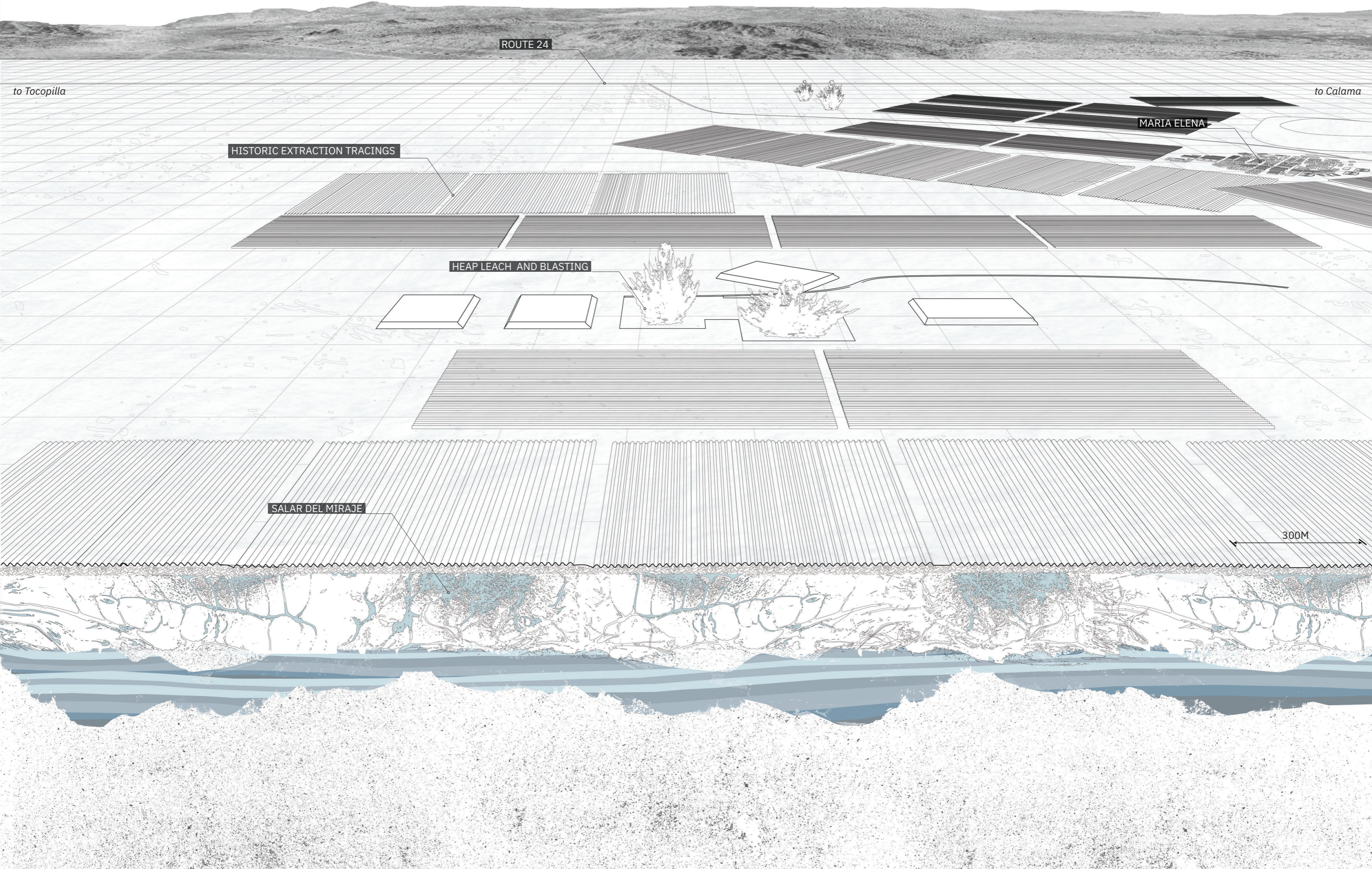
The Extractive Zone (2017)

My proposed counter reading of the desert is informed by theorist Macarena Gomez Barris’s proposal to consider realms of differently organized reality that are linked to, yet move outside of colonial boundaries. In contrast to extractive views she considers submerged perspectives that perceive local terrains as sources of knowledge, vitality, and livability.

THROUGH

Rock is the material actor at through, just south of coya sur. In this landscape, rock has been treated as waste and inert, the left over material after mineral is removed. But rock carries history and life, hidden in the desert. Moving across the land around Maria Elena there are endless rows of rock and dirt piles that extend for kilometers.

THROUGH



ROUTE 24

to Tocopilla

to Calama

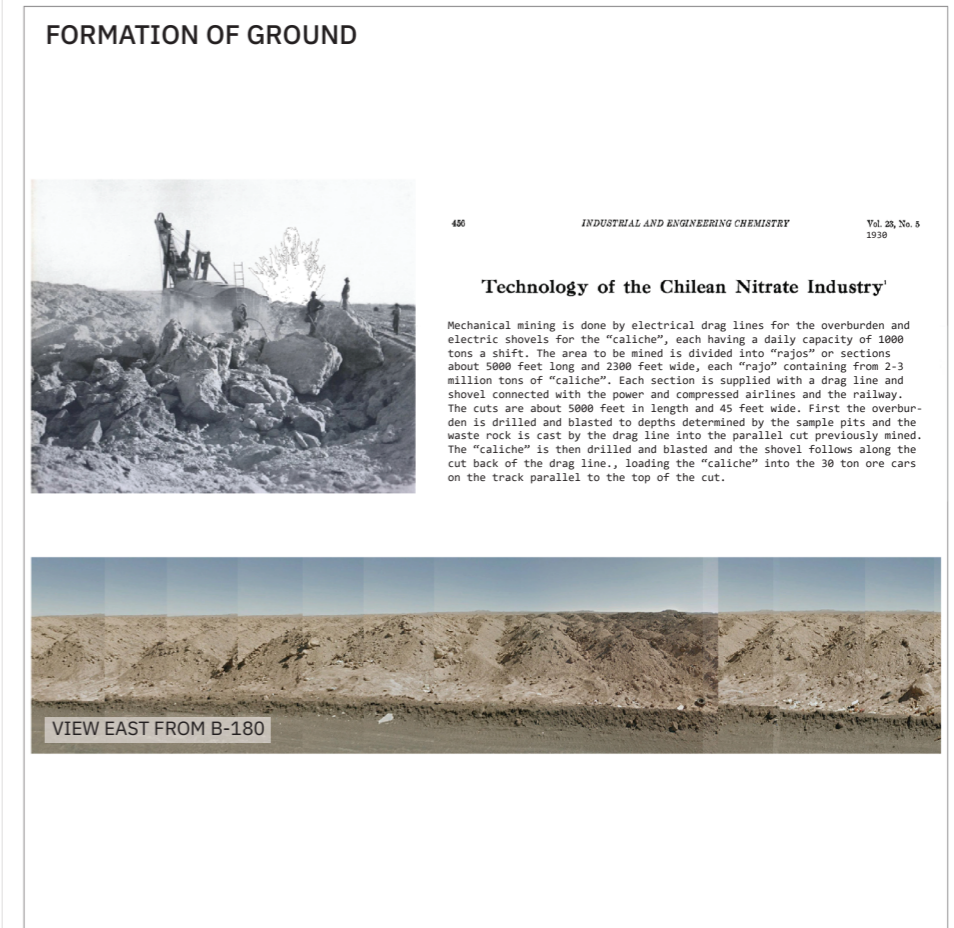
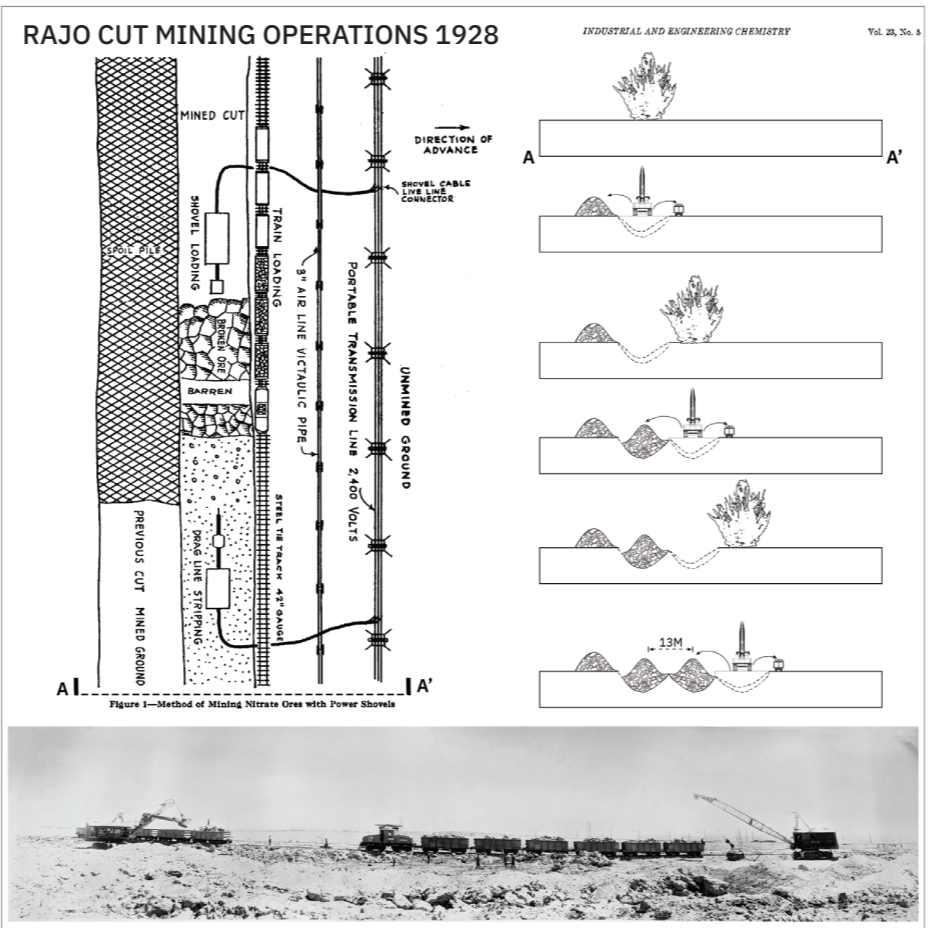
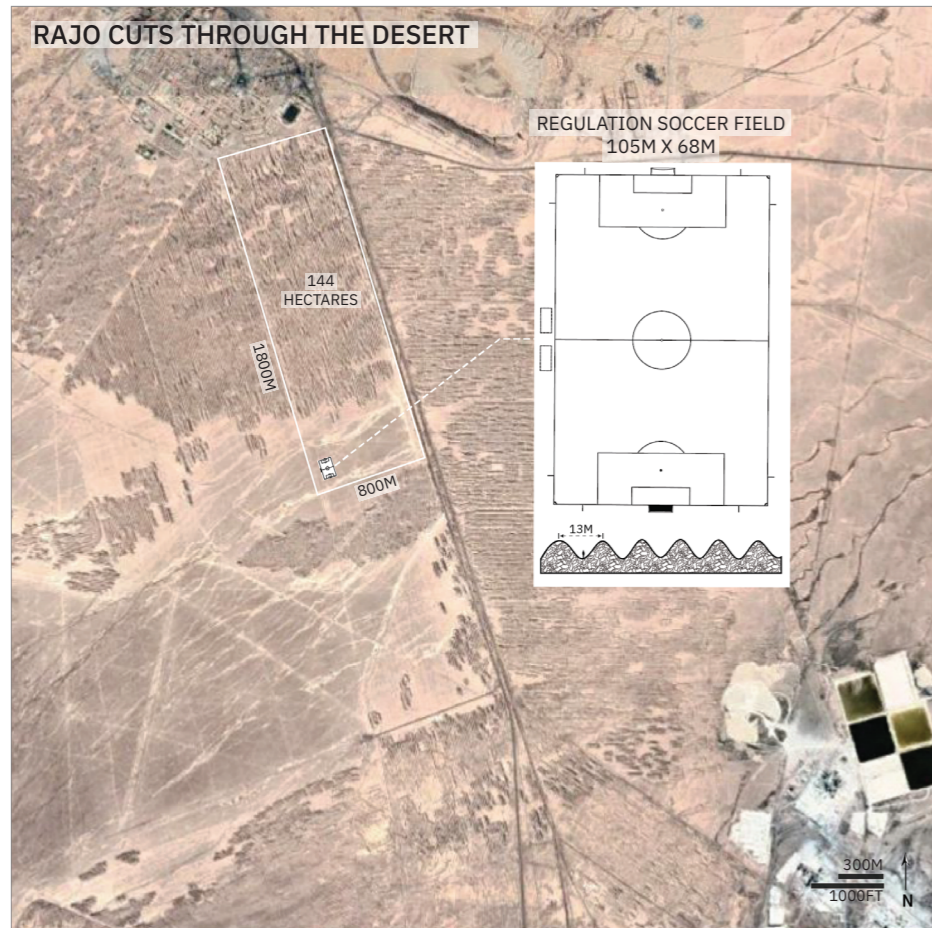
HISTORIC EXTRACTION TRACINGS

MARIA ELENA

HEAP LEACH AND BLASTING

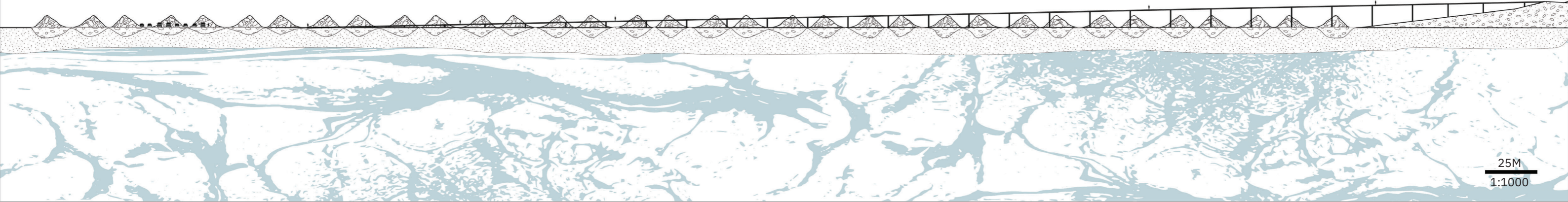
SALAR DEL MIRAJE

300M



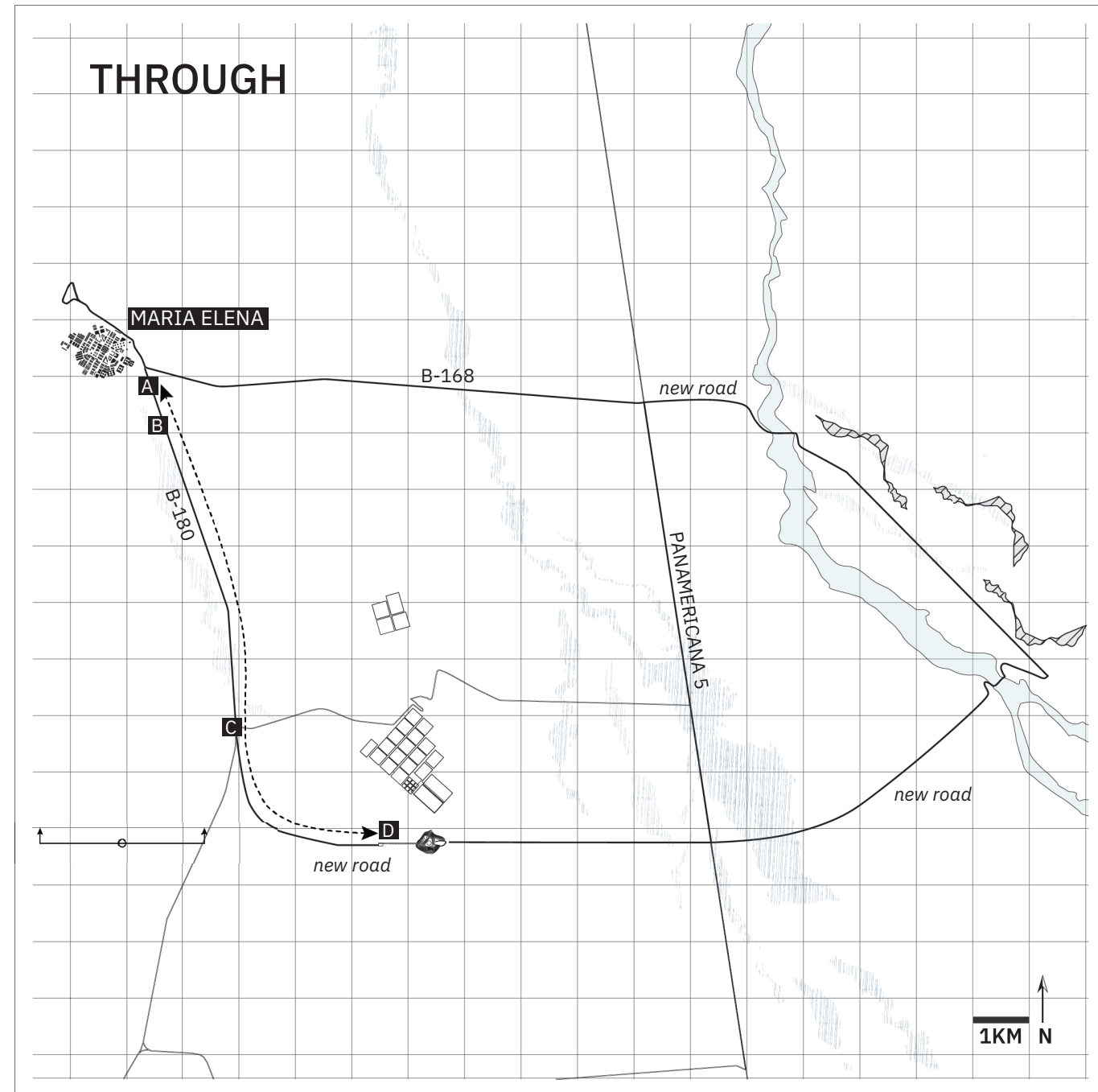
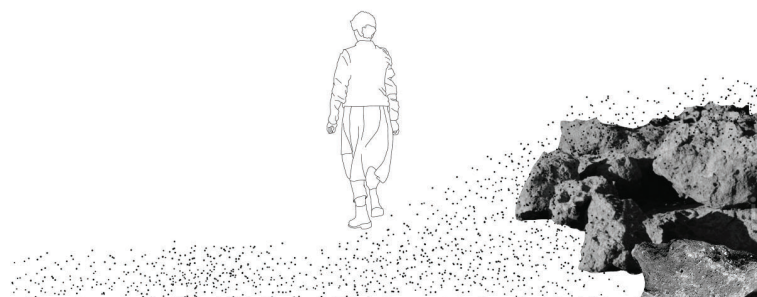
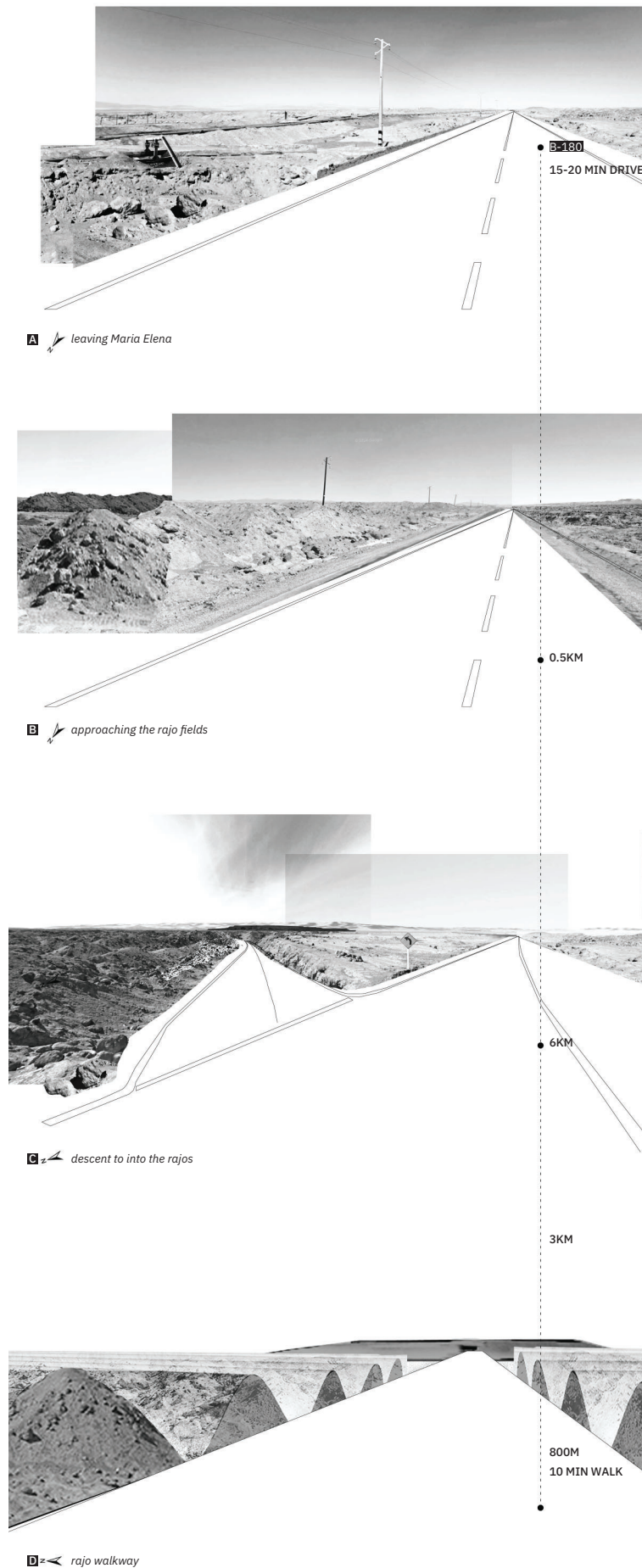
These piles are the remnant traces of past nitrate ore extraction. So called “rajo” cuts were formed through the blasting and drag line stripping of the desert surface. Measuring 1800 by 800 meters and encompassing 144 hectares, each rajo was excavated in long, narrow 13 meter strips. As ore was removed, waste rock was cast into the drag line of the parallel cut previously mined. The hills that now surround Maria Elena and extend throughout the desert were formed as the strip mining advanced. Each hill a tracing of a salitrero miners work, excavating ground.

SECTION 01-THROUGH



The salitrero history is traced through rock as an 800m walkway bisects the rajo hills and leads to the observatory. The walkway begins at the foot of the 4.5 meter tall mounds and gradually ascends along a 2% slope towards the observatory landform.

THROUGH-ARRIVAL



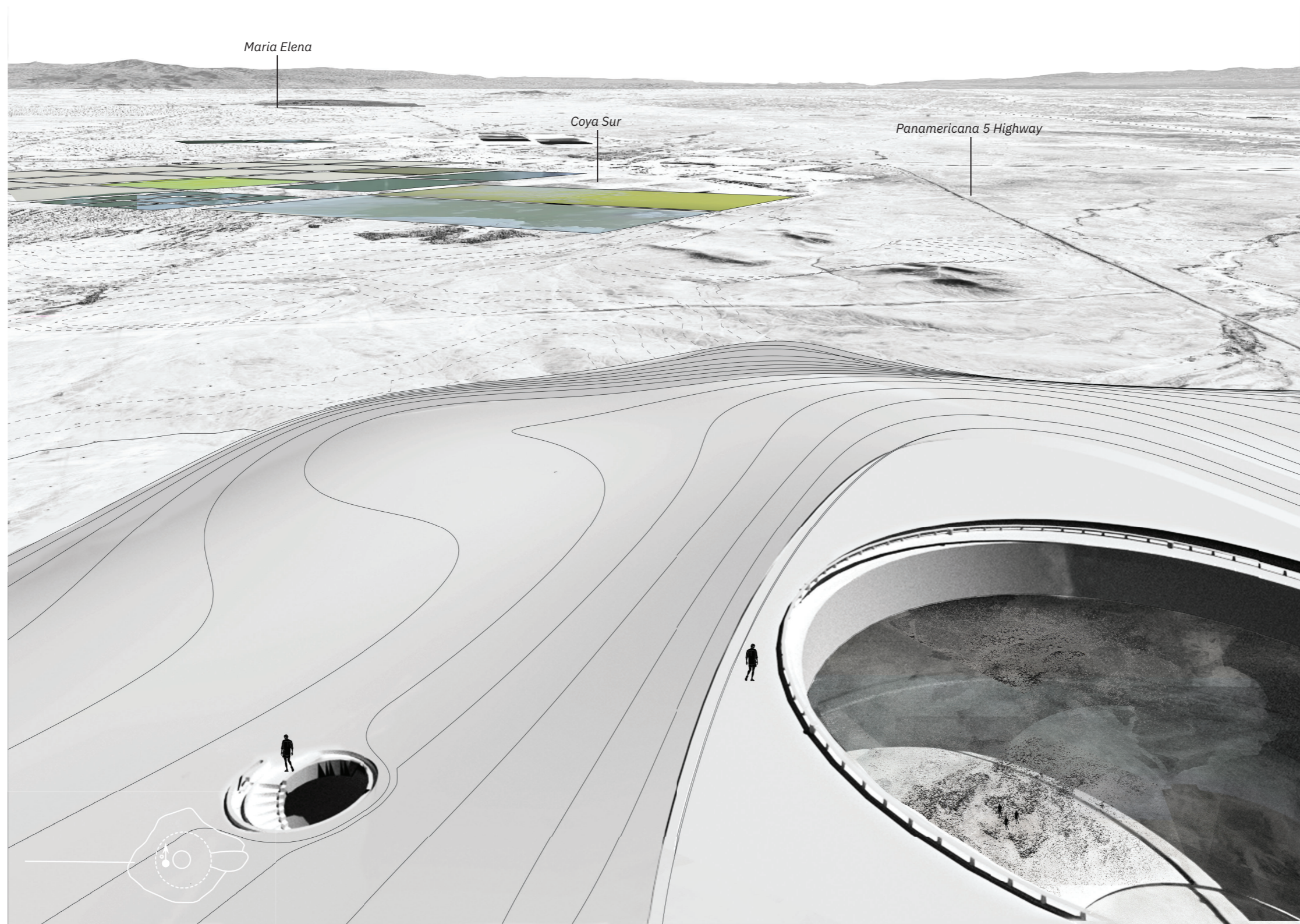
The walkway is reached via car from Maria Elena along a 15 minute, 9 kilometer drive south of the town. Leaving Maria Elena on route B-180 the drive follows a familiar travel route through the desert, approaching the rajo fields. The dominant fast highway oriented mode of travel through the desert is shifted as a new road descends into the rajos and then the observatory is approached by foot.

RAJOS WALKWAY TO OBSERVATORY



The roughly 8 minute walk cuts perpendicular through rajo hills. The edges of the mounds retained in place as a constant against changing erosion. The slow ascent brings a bodily encounter with rock before rising up over the rajo fields.

VIEW NORTH OVER COYA SUR

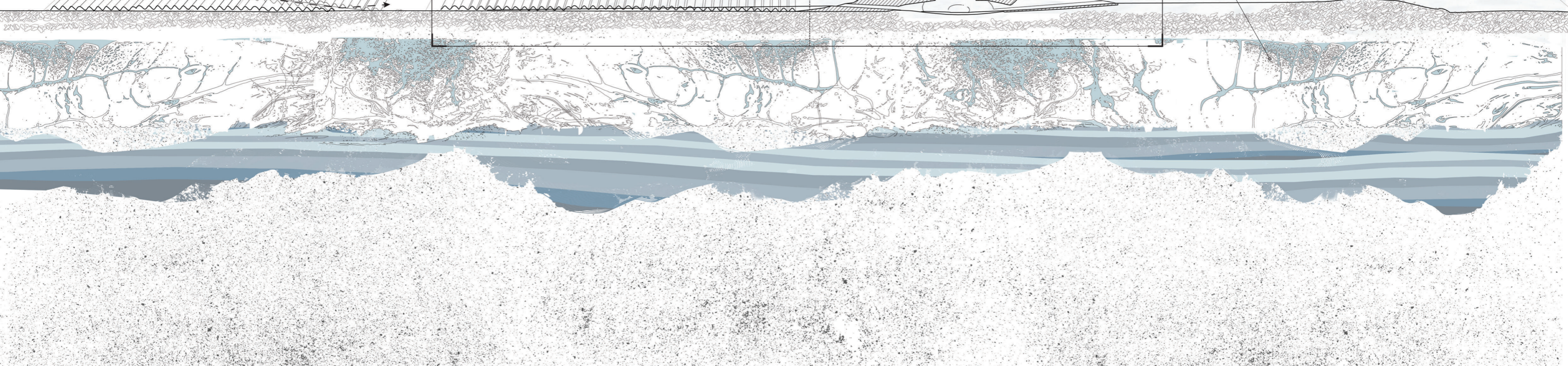
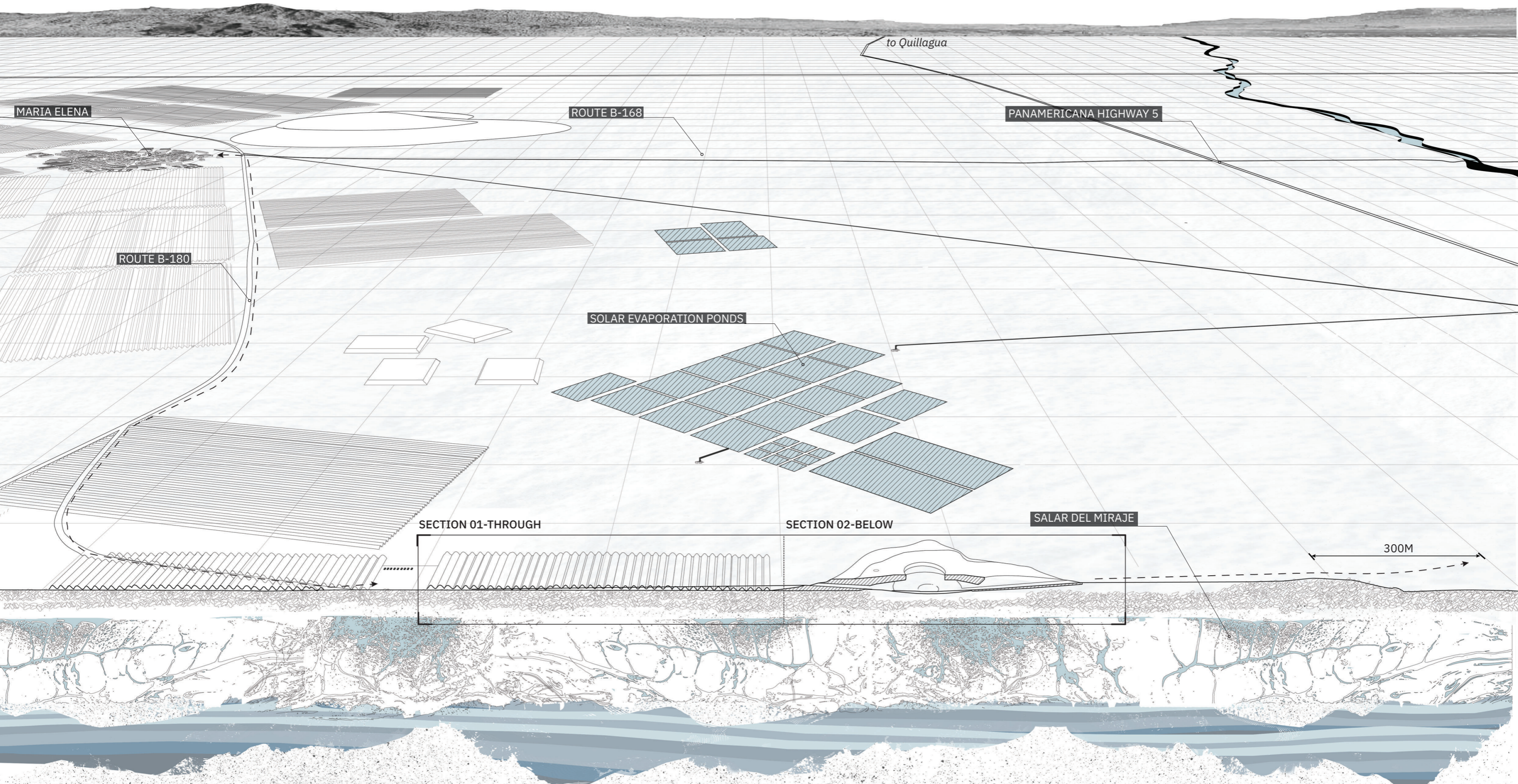


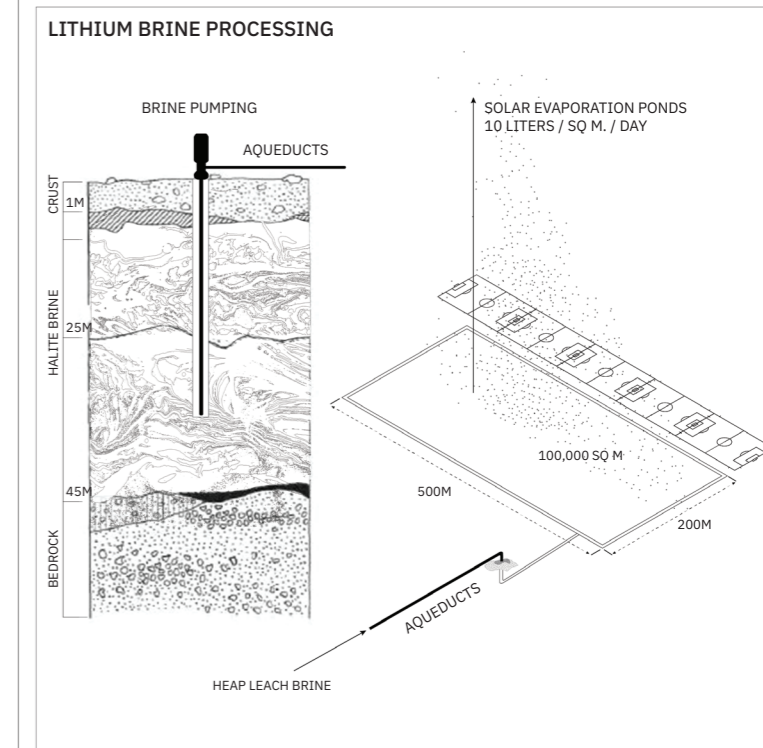
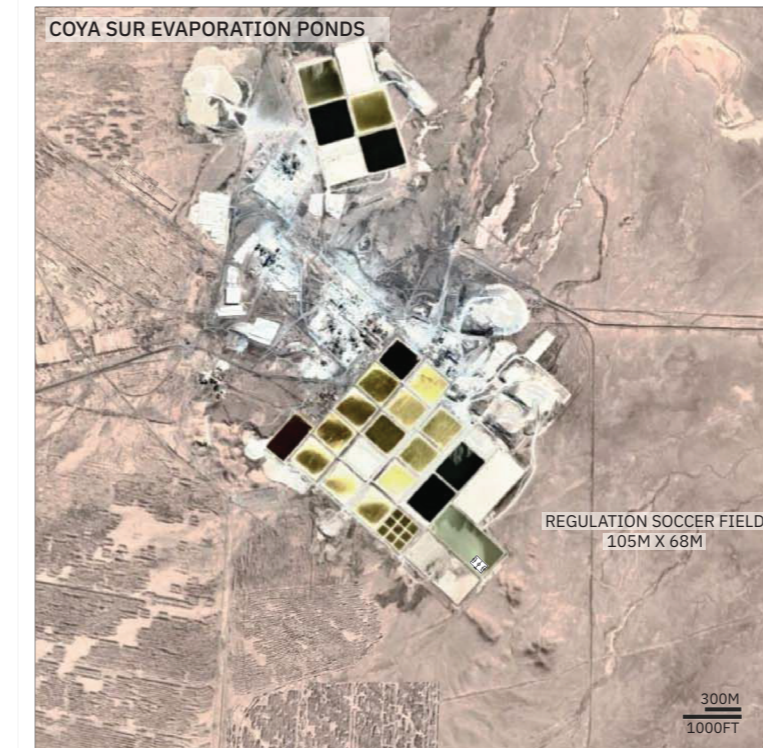
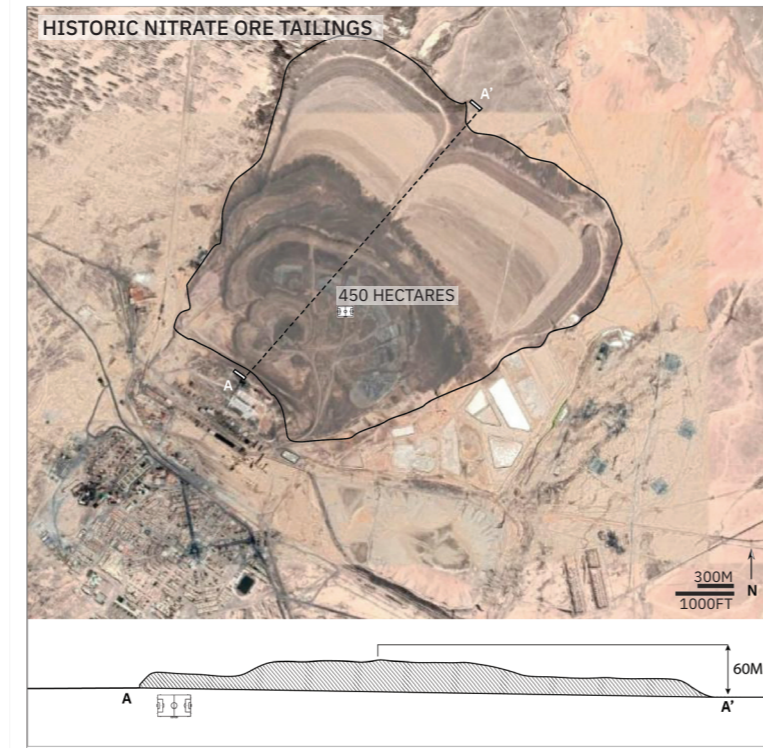
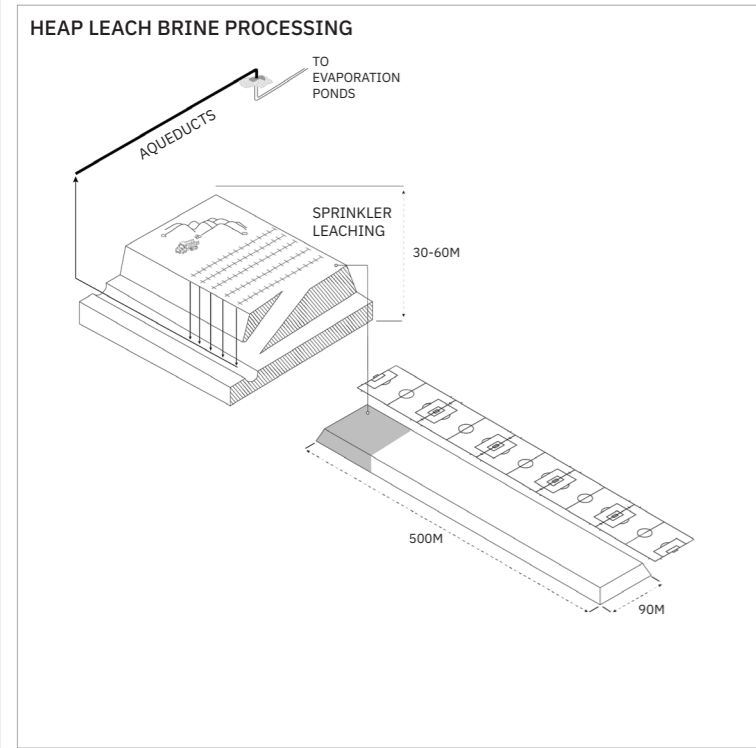
The walkway ends at the observatory where a walk up the landform provides a view out across the evaporation ponds at coya sur and also below to the observatory interior where rock is alive as it interacts with water.

BELOW

Where the rajo walkway ends at observatory landform we descend below.
Water fosters life inside rock and through plant at the observatory, situated in the salt flat Salar del Miraje-the same system that Coya Sur taps into for extraction.

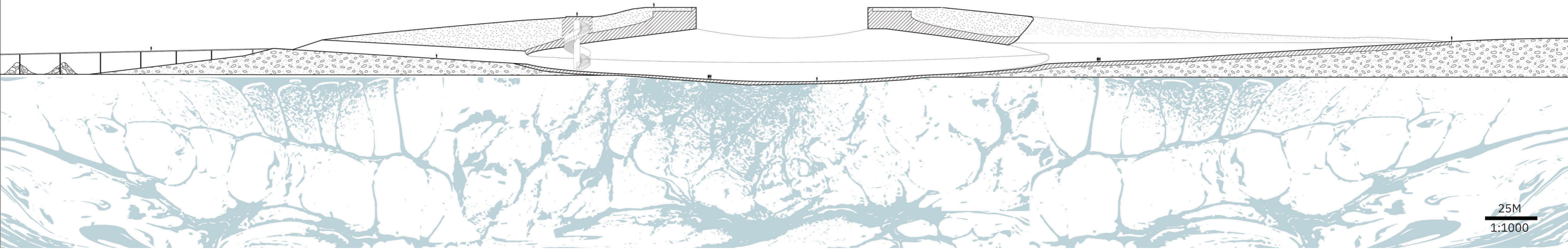
BELOW





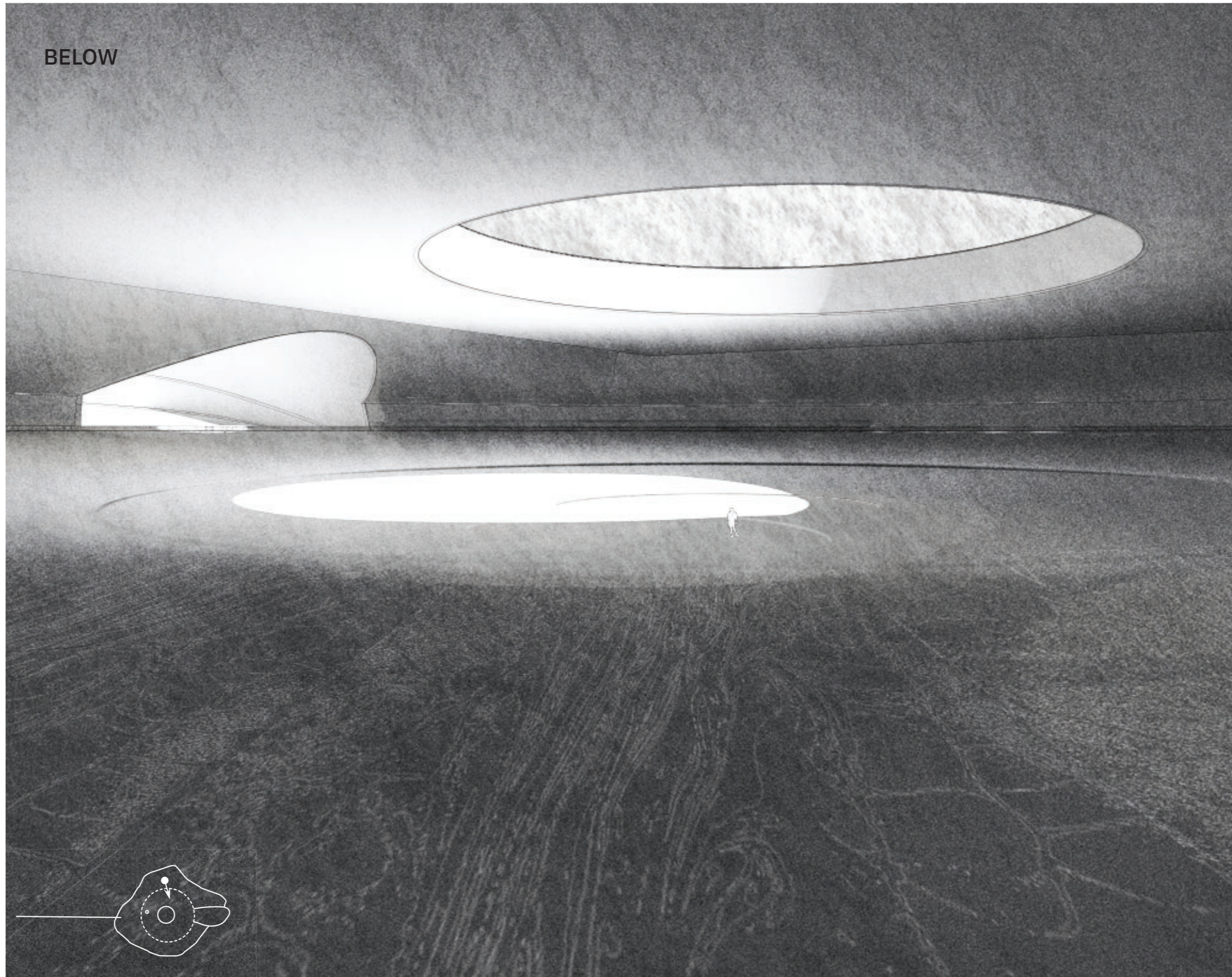
In the extractive zone water is only rendered visible at the evaporation ponds where deep deposits of lithium brine water are pumped up from the salar into ponds 500 by 200 meters in size. 10 liters per square meter per day is evaporated off leaving mineral to be collected. Mineral is also collected through the heap leach process in which mineral rich rocks are piled into 500 meter by 90 meter heaps rising up 30-60 meters. Water is then pumped through the heaps, leaching mineral from rock and these brines are carried via aqueduct to the evaporation ponds. These processes treat water and rock as waste materials. Inert tailings mountains are left in the landscape, and water is removed and discarded as quickly as possible.

SECTION 02-BELOW

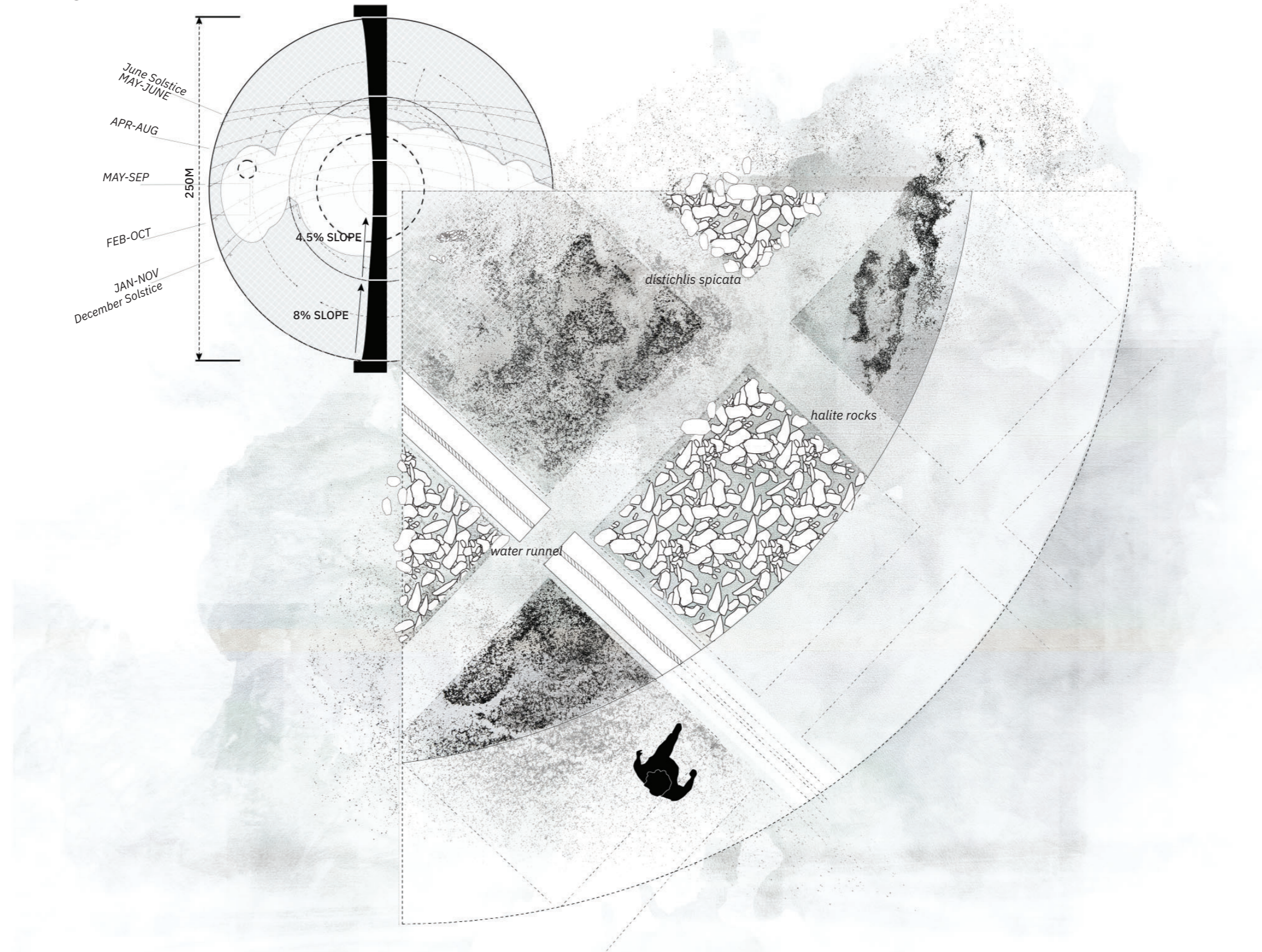


The observatory introduces a relationship with water and rock from below, rather than the desolate surface treatment that obscures. The rajo cut walkway descends at an 8% slope into the central observatory. The 65 meter high landform covers a sloped central space with an 80 meter opening to the sky (view). From the top of the landform a stair descends into the space, both the stair and ramp entrances a bodily experience of the subterranean and a new relationship with what lies below .

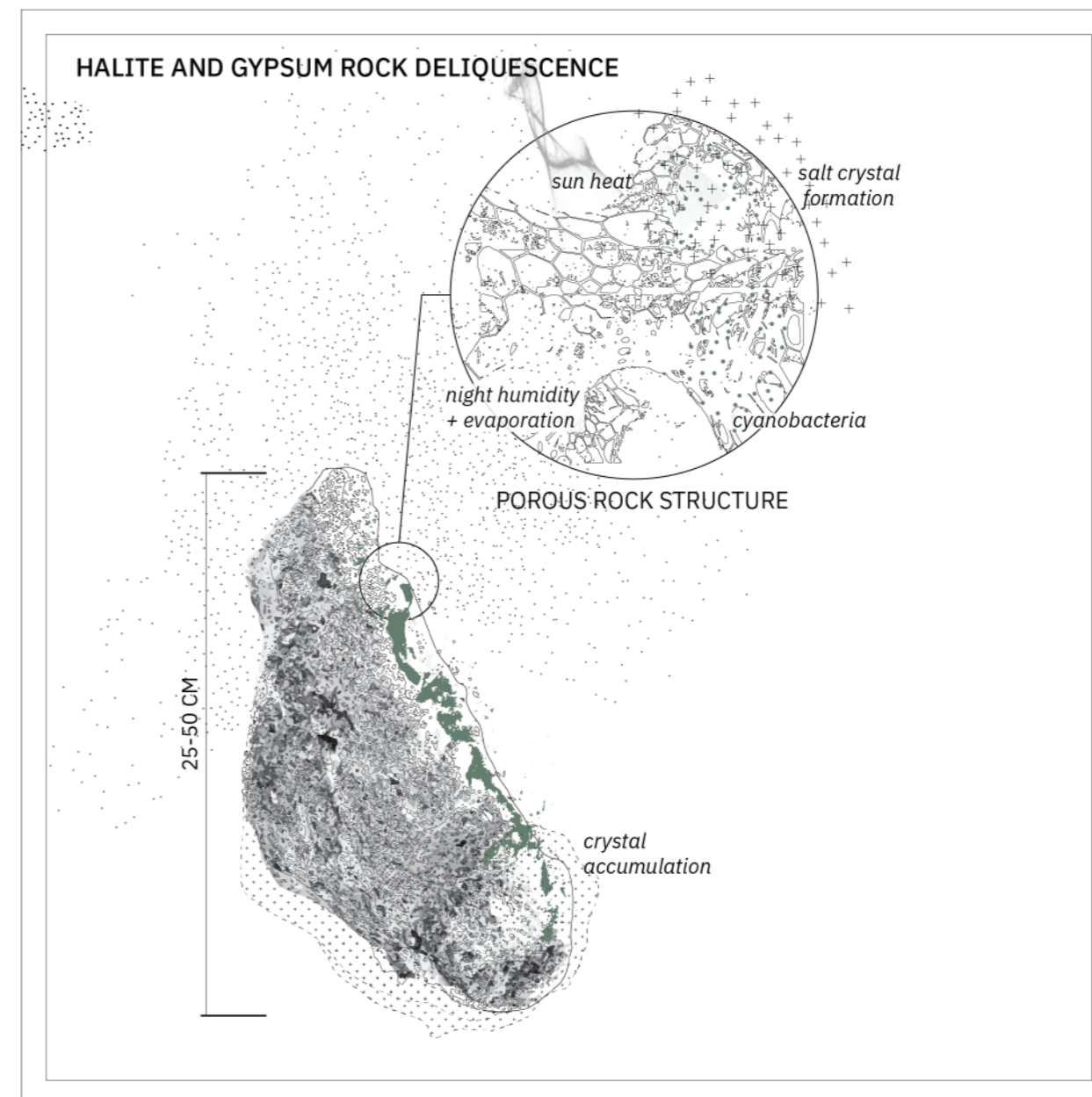
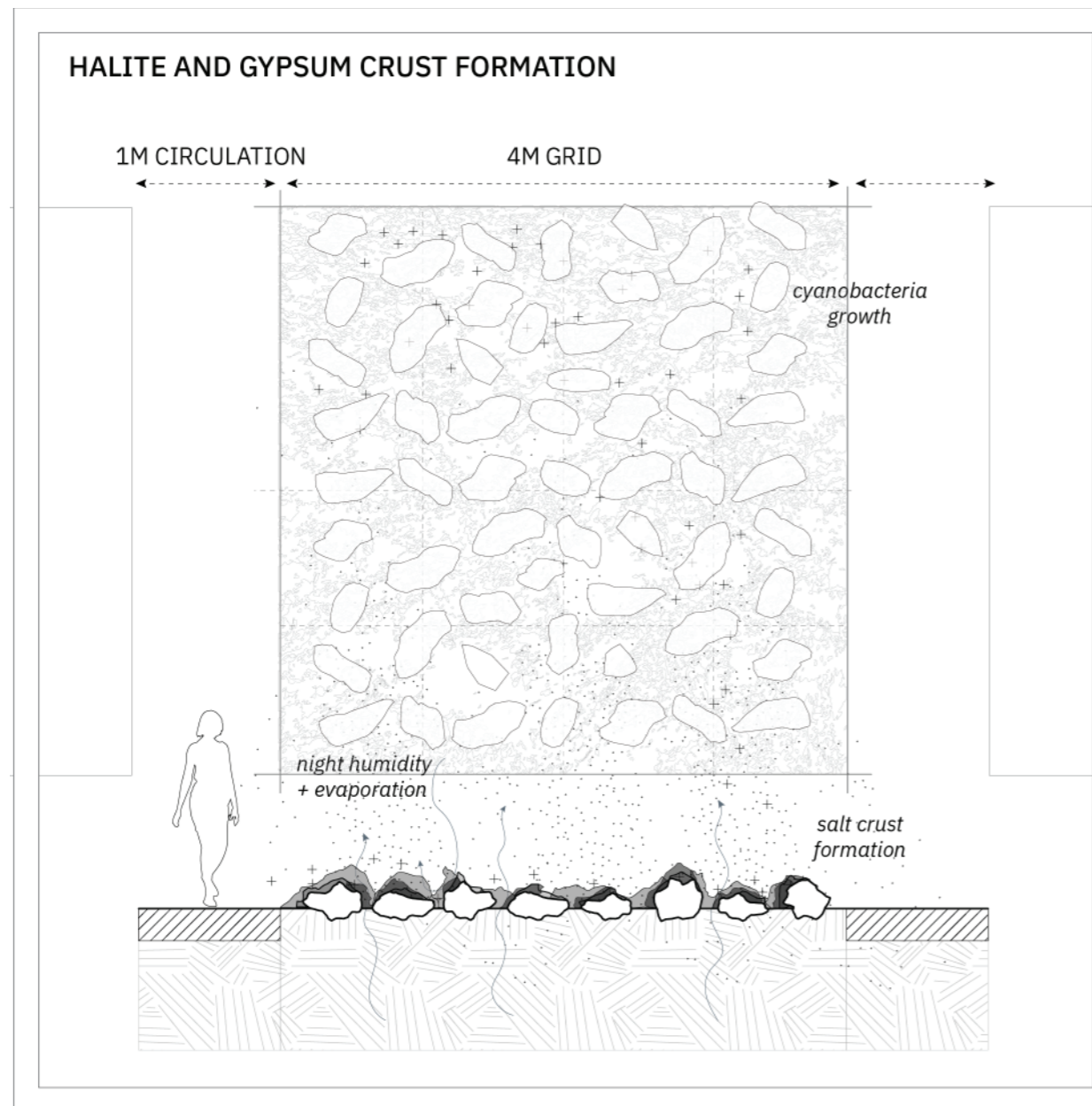
BELOW



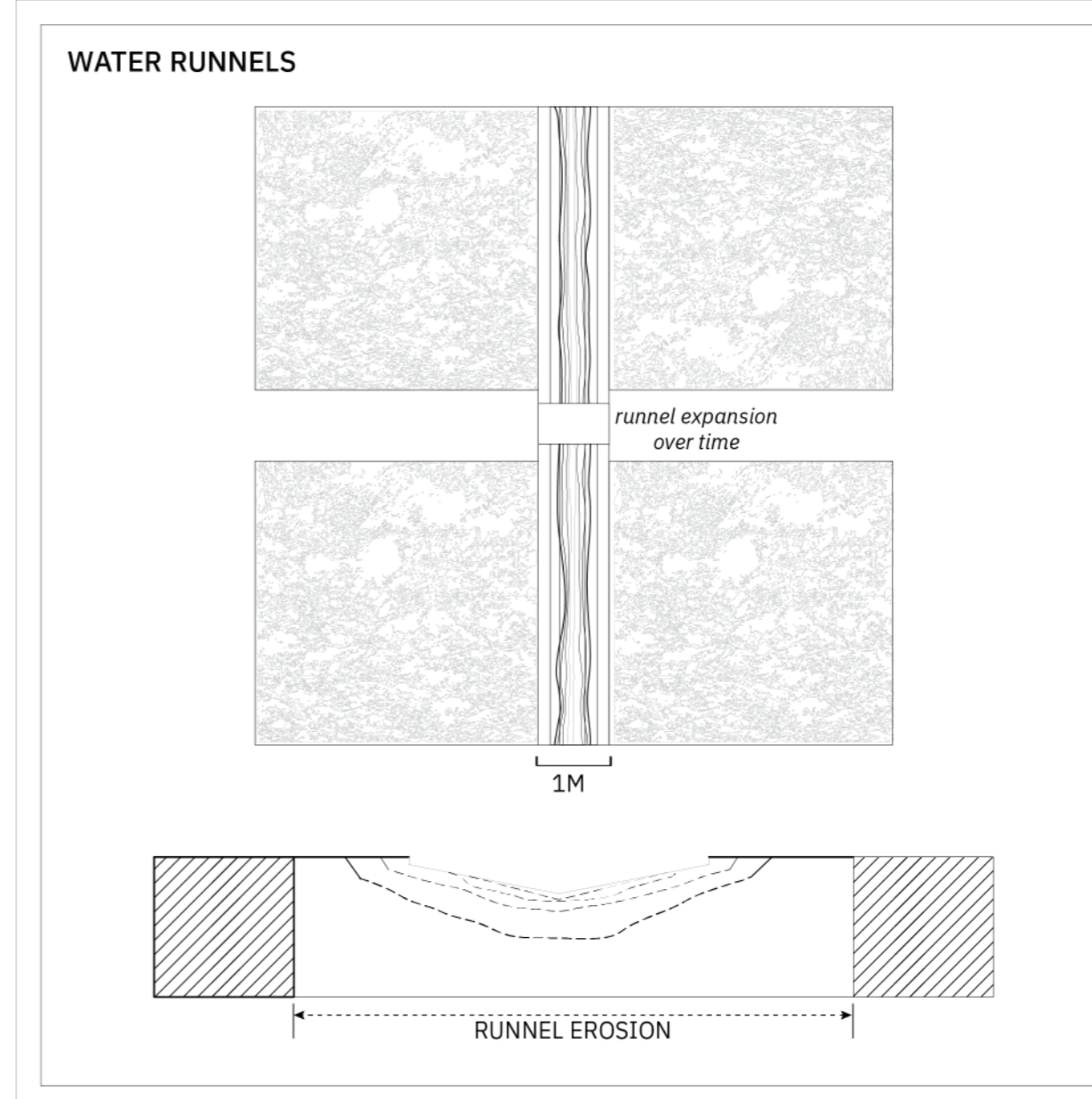
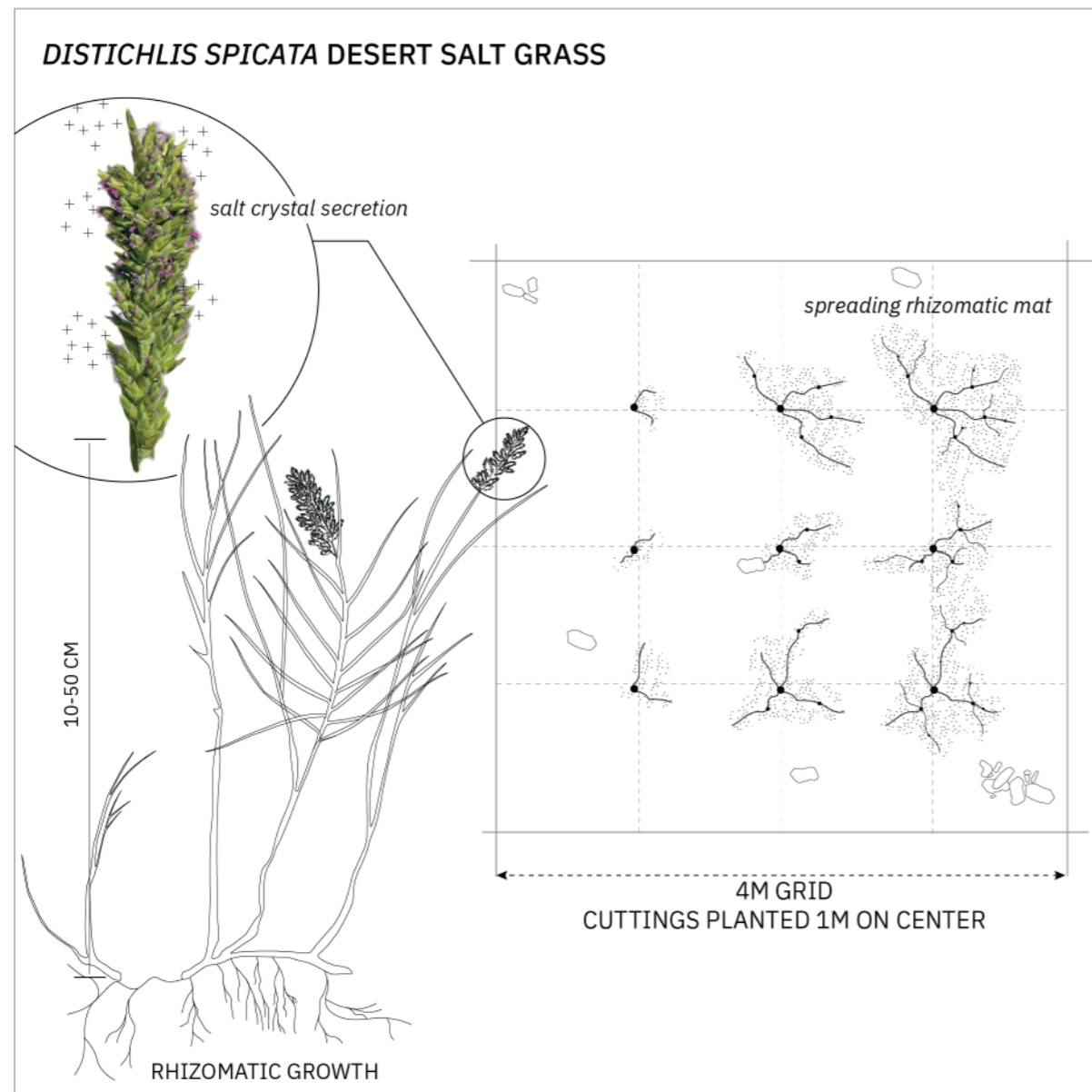
BELOW DETAIL PLAN



Water interacts with halite rock and desert salt grass-*distichlis spicata* –in the central space with runnels along a 4 meter grid transporting salar water across the observatory. Halite rock–which is treated as inert and waste on the surface– interacts with nighttime humidity and daytime solar heat entering from above. Salt grass is planted inside the grid spreading into mats through rhizomes.



Inside the porous rock structure, evaporation leaves behind salt crystal formations that cyanobacteria live in between. The surface of the observatory changes as crystal and microorganism accumulate forming a crusty ever changing layer with hints of color tracing cyanobacteria growth.

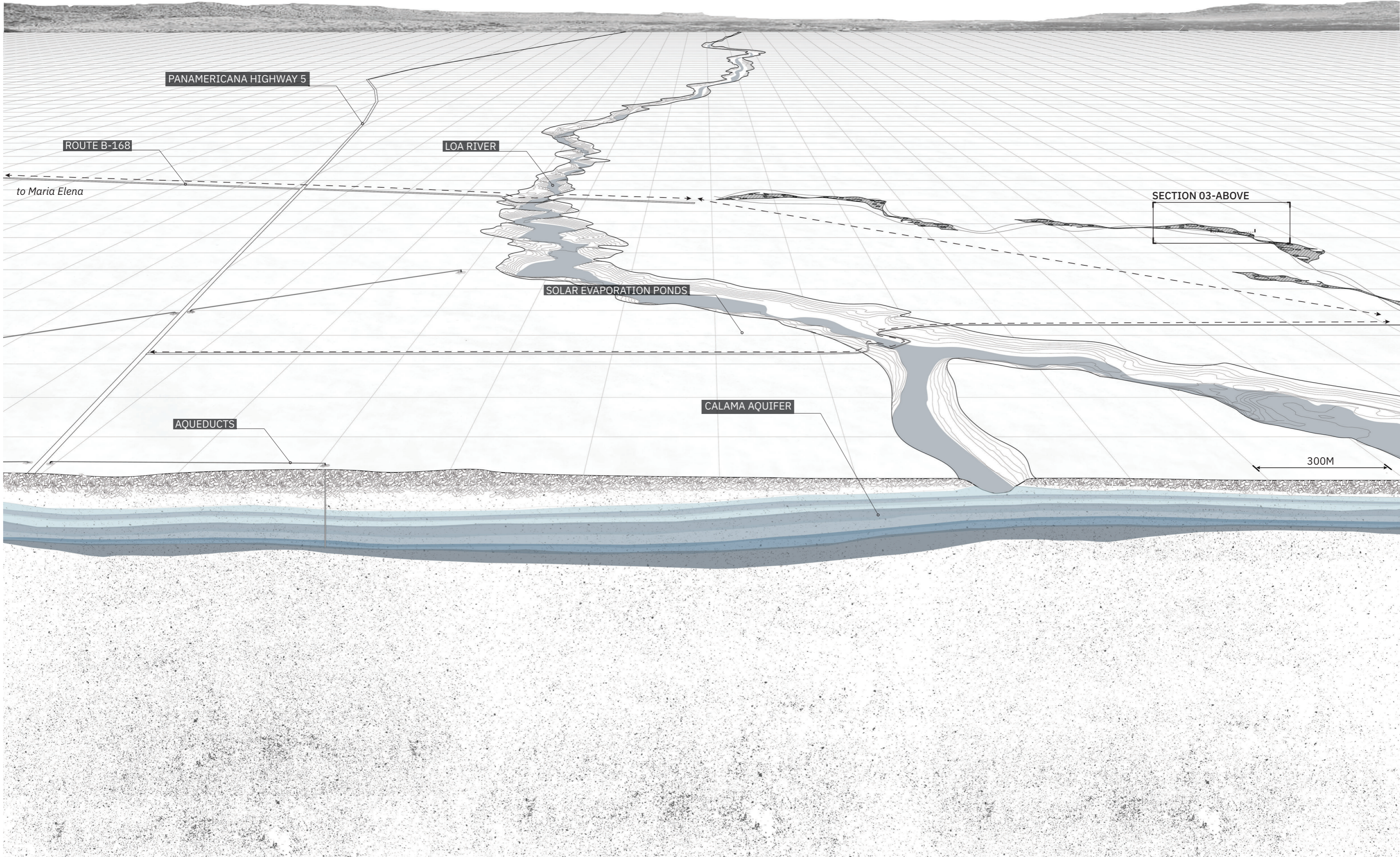


Patterns of change follow the seasonal movement of sun as it shines through to below. Measures of time and the life of water are traced in the runnels as they slowly erode and widen. The interactions of water, rock, and plant below reveal life in connected salar systems that are missing from the extraction surface narrative.

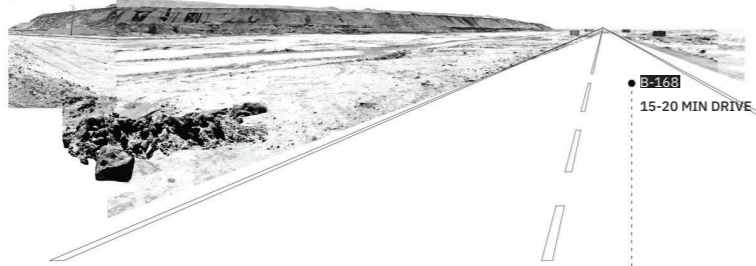
ABOVE

Above, plant mediates water systems and humans.

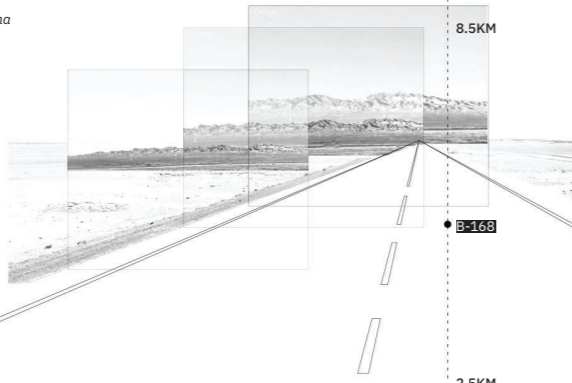
ABOVE



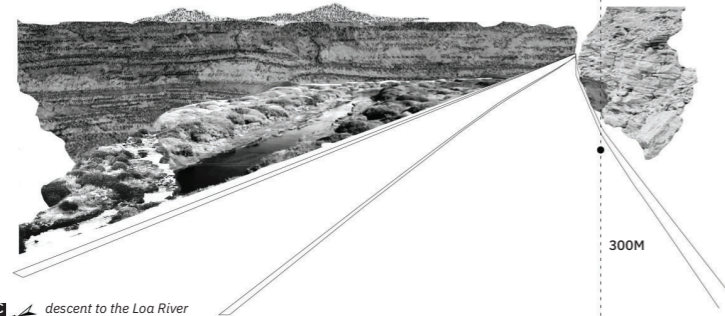
ABOVE-ARRIVAL



A ← leaving Maria Elena



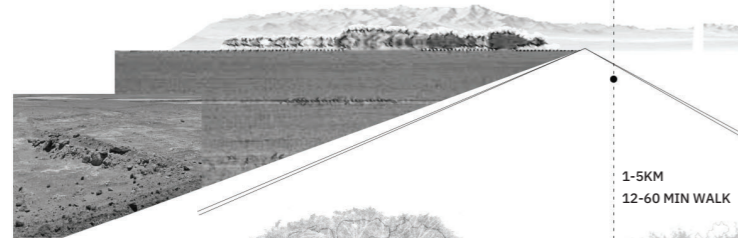
B ← approaching the foothills-crossing the Panamericana



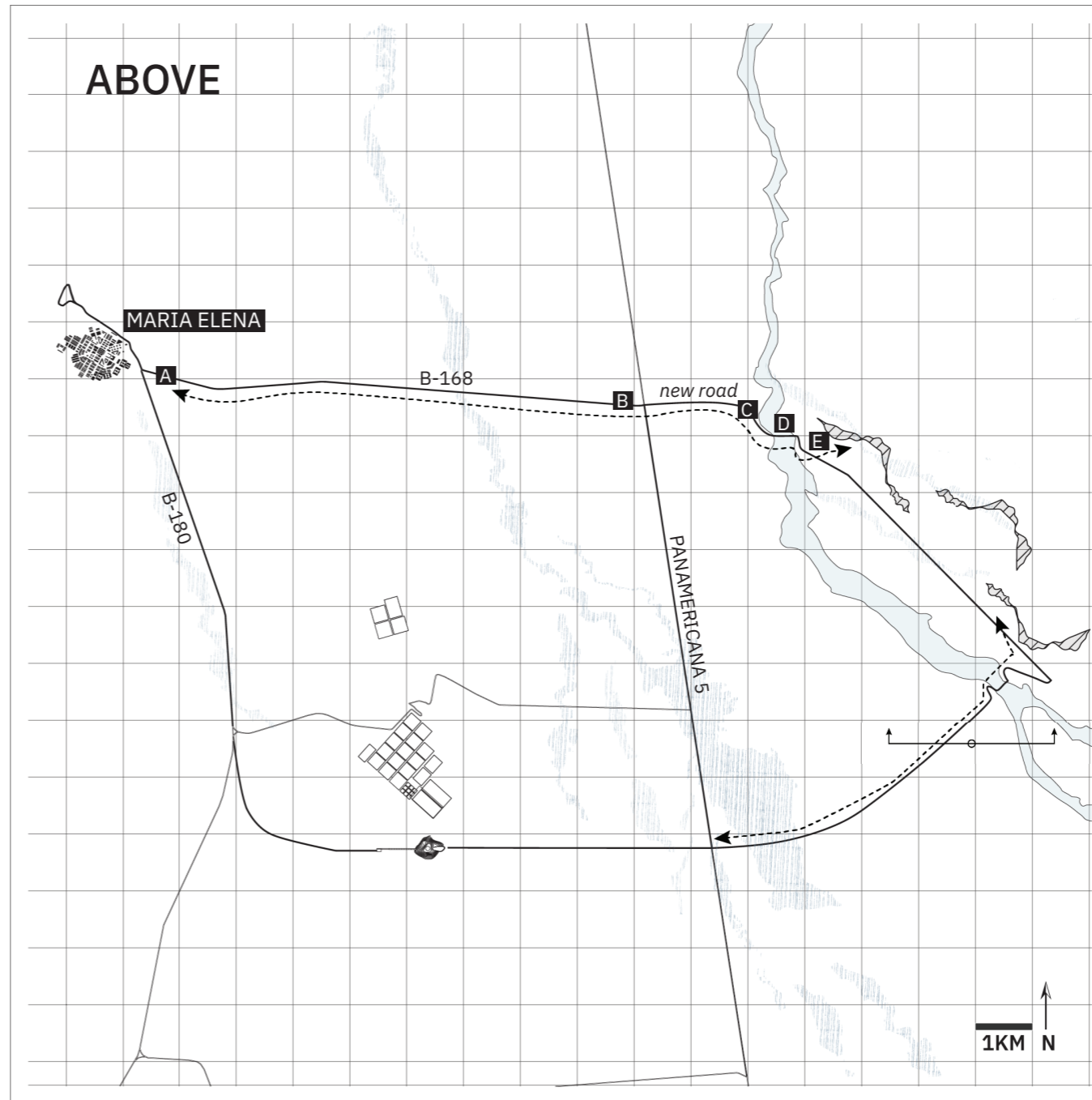
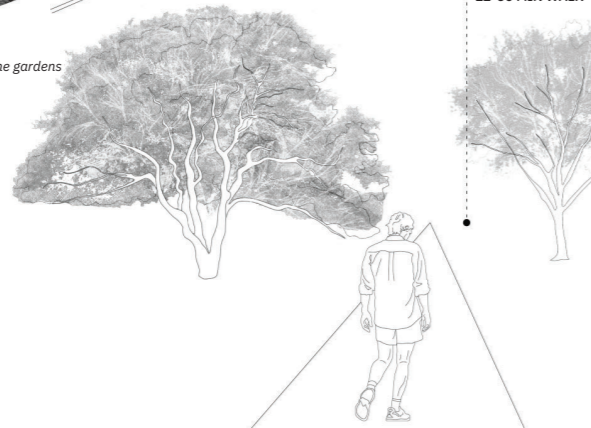
C ← descent to the Loa River



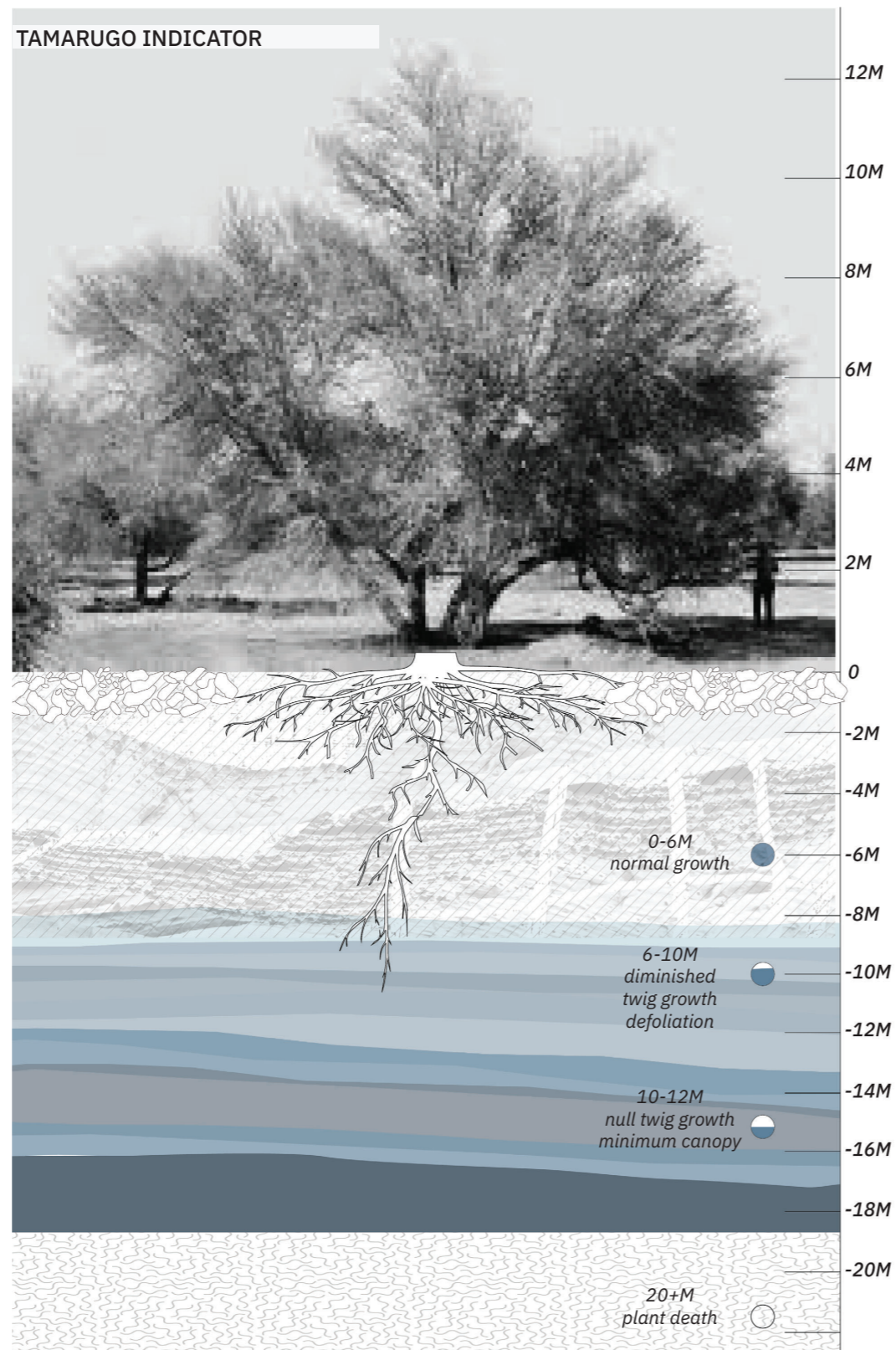
D ← crossing the Loa River



E ← approaching the gardens



In the pre-foothills to the Andes, across the Loa River from Maria Elena, perennial streams run in the Pampa in relation to the underground aquifer system that underpins the territory. Here, native plant species unique to the Atacama are introduced into the garden. Travelling east out of Maria Elena along B-168 a 10 kilometer drive approaches the foothills, crossing the Panamericana highway and descending to the Loa River. As this new road ascends to the other side the garden is revealed, extending into the desert, adjacent to the Loa.



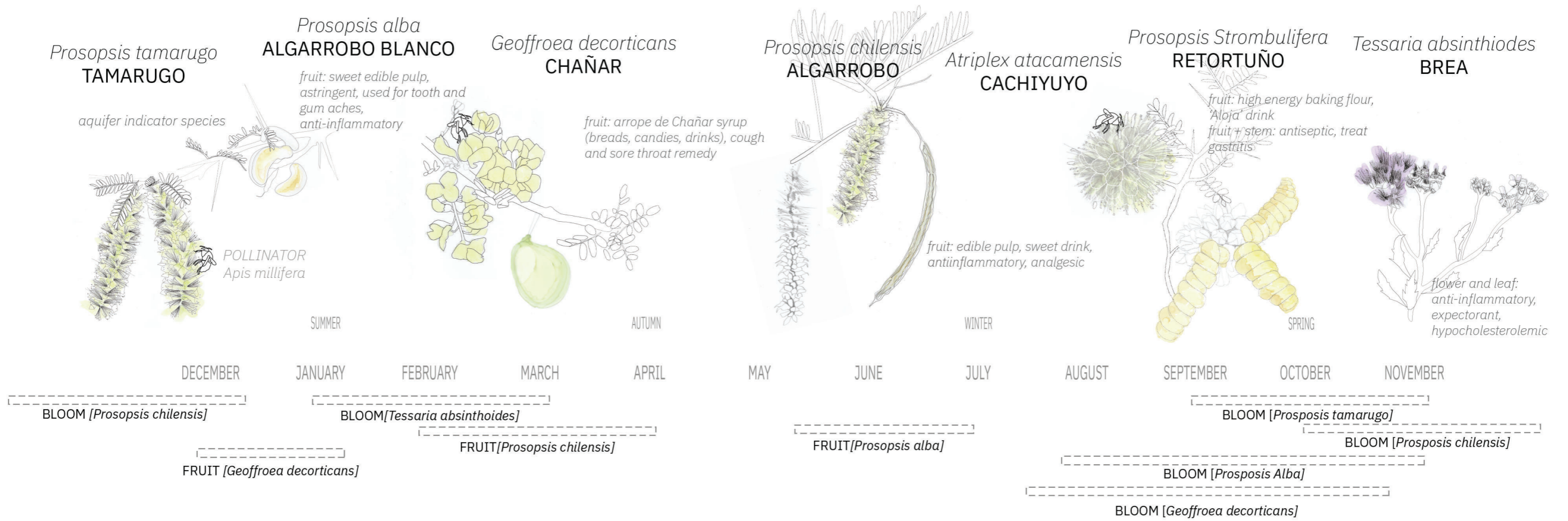
PAMPA DEL TAMARUGAL AFFORESTATION



ALTERNATE RELATIONSHIPS WITH PLANTS

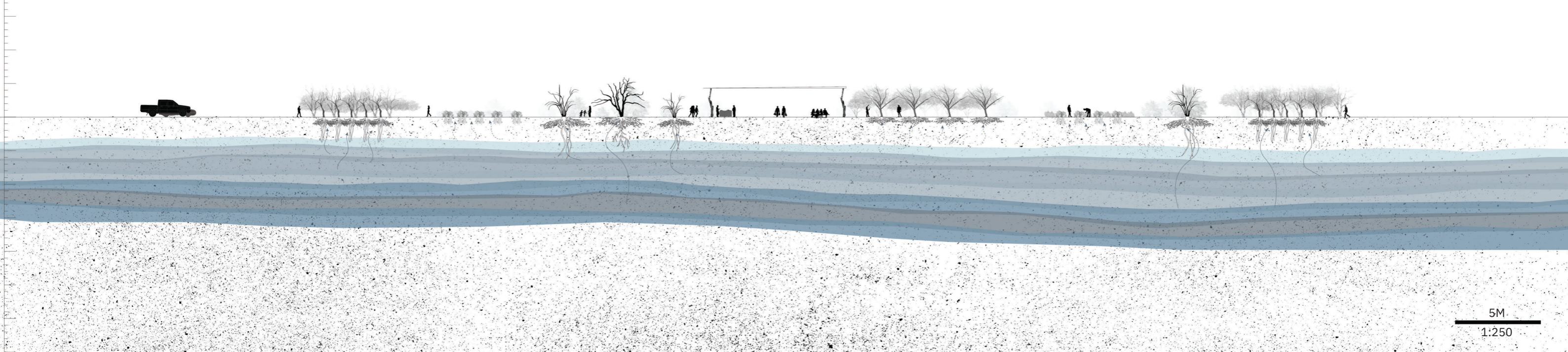
The species here use deep tap root systems to access the aquifer. The garden is different from afforestation projects in the desert that plant vast monoculture plantations

*image source: *FAO Production and Protection Paper 25. n.d.*



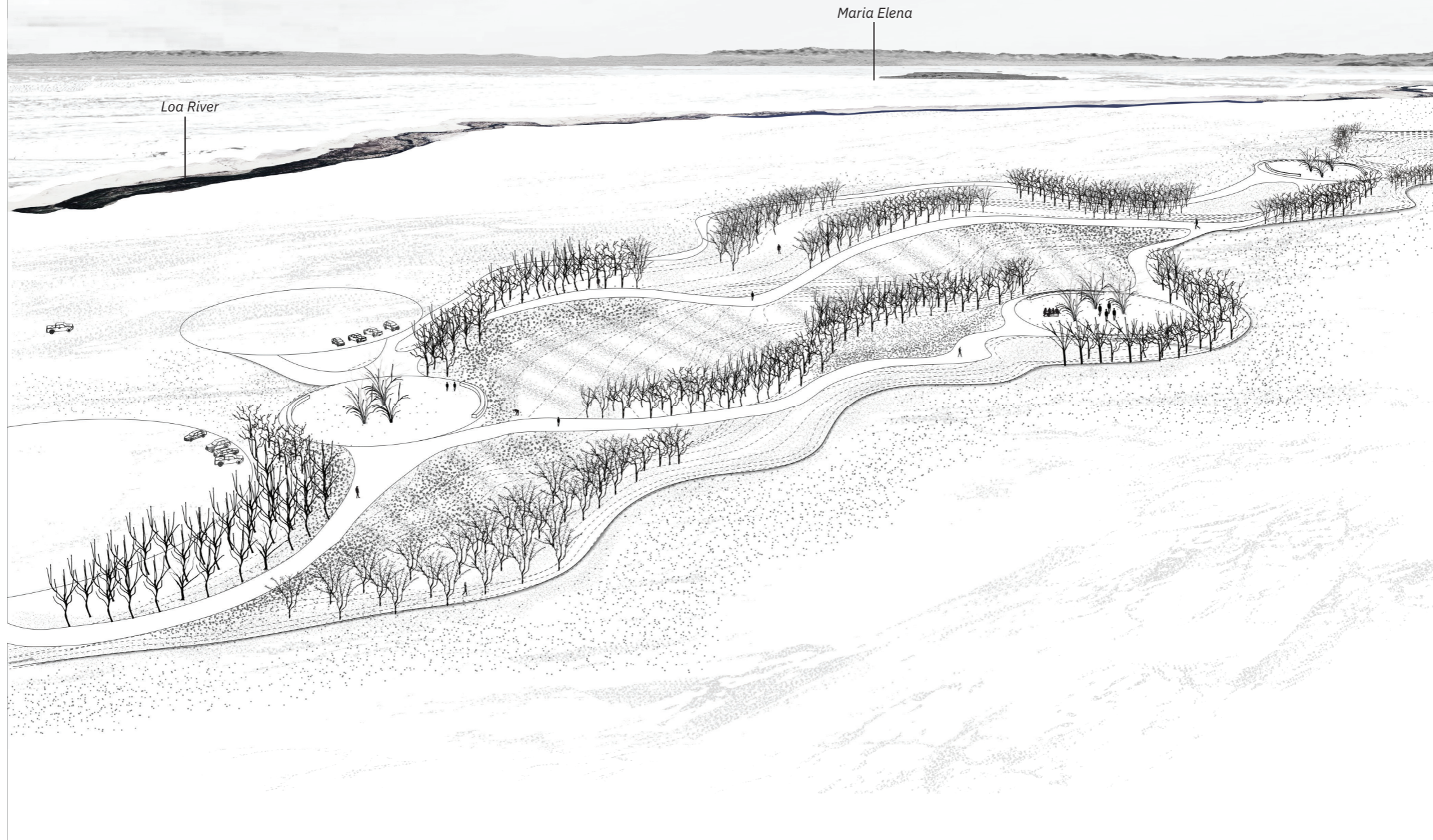
Tamarugo, Algarrobo, Chanar, Cachiuyuyo, Retortuno and Brea carry life in the form of knowledge. Each species holds a history of medicinal and food use in the desert. Sweet syrups, candies, high-energy baking flours, anti-inflammatories, and antiseptics are some of the uses of these species.

SECTION 03-ABOVE

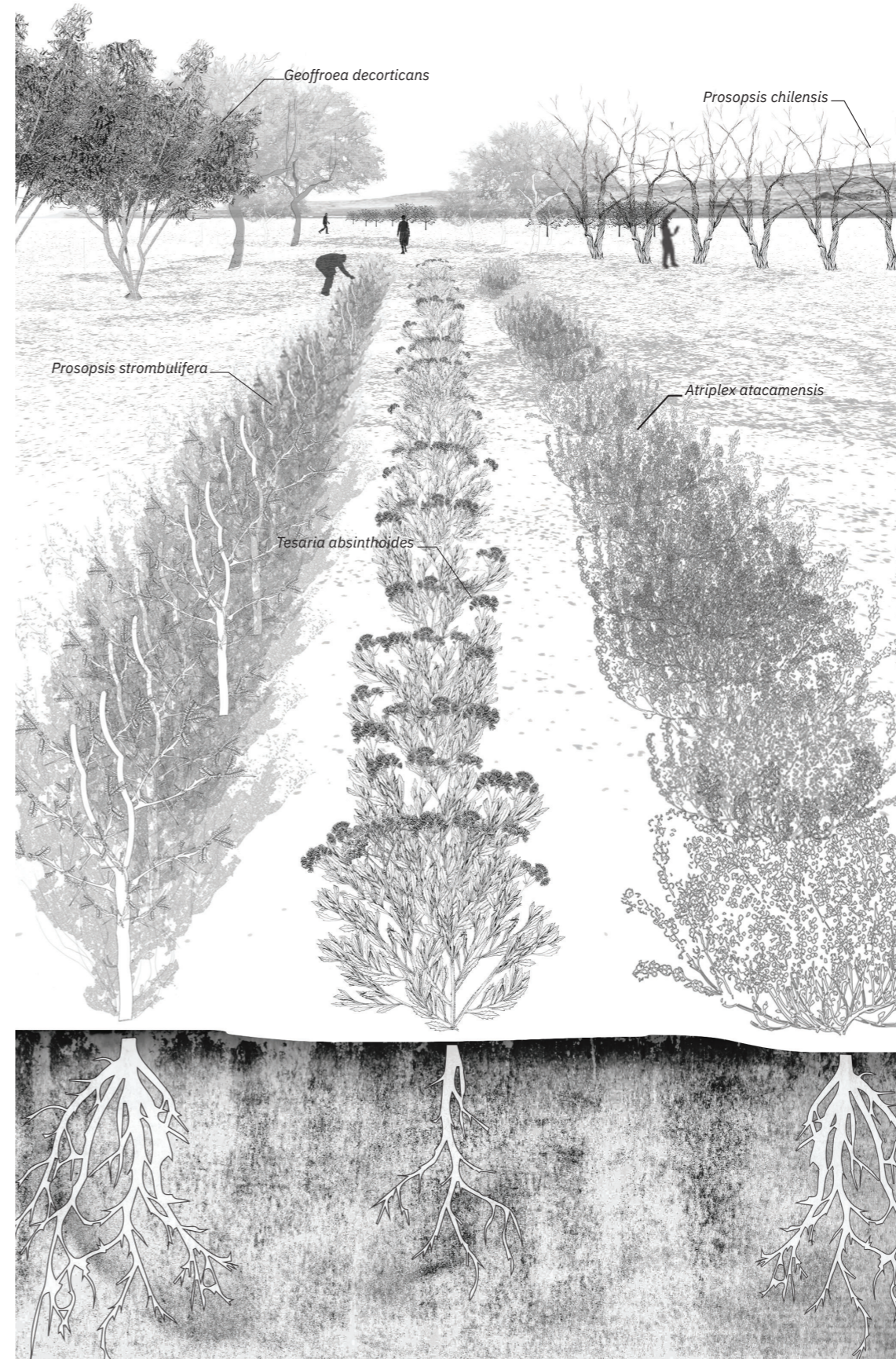
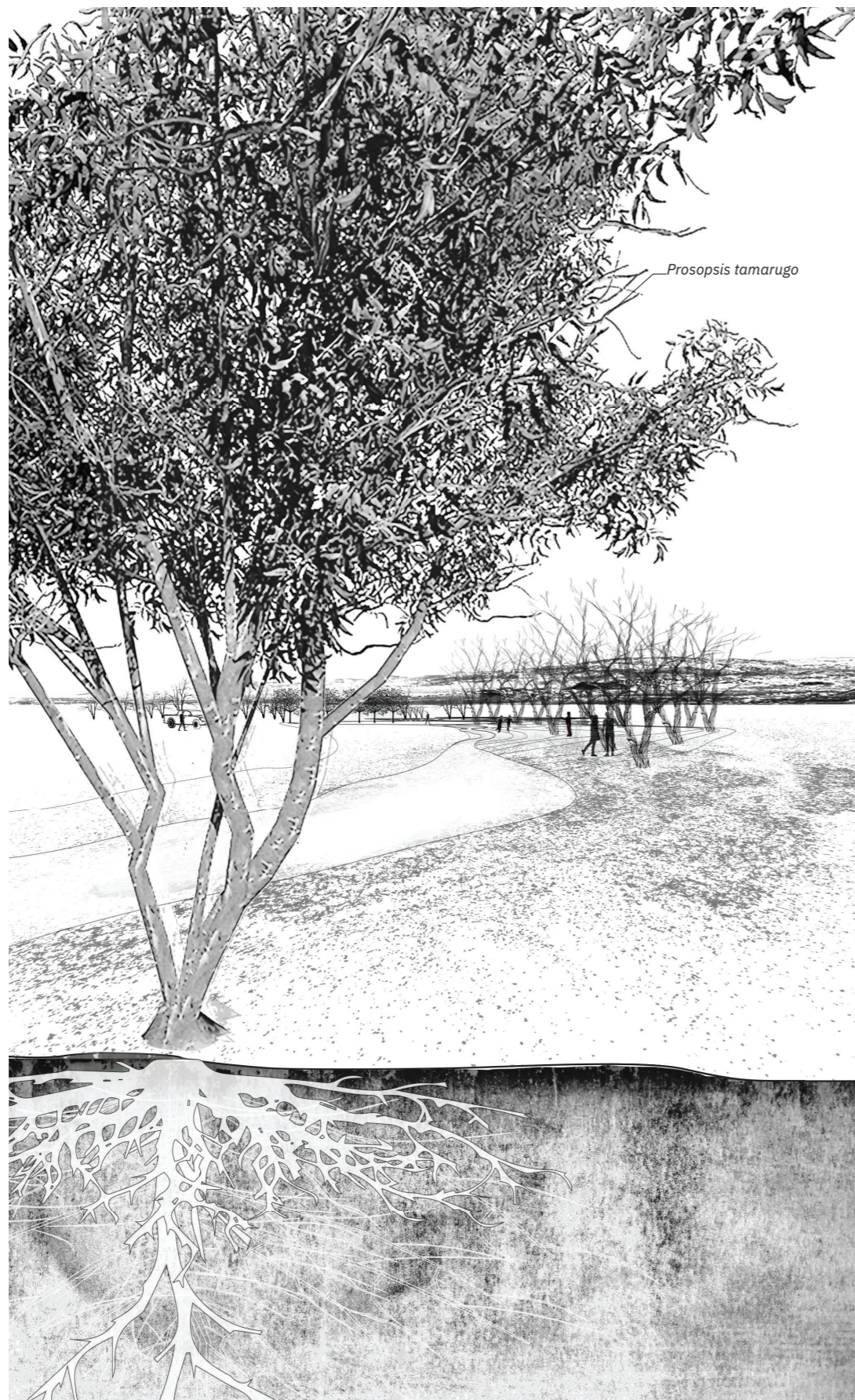


Groves of trees are planted alongside halophyte shrubs, occupying the cracks of the perennial streams. The garden is narrow, 150 meters in width, and 400 meters in length.

GARDEN VIEW WEST



The 400 meter garden pattern extends as an evolving 5 kilometer linear system through the maintenance and preservation of plants as they grow and evolve alongside the perennial streams.



The garden is both an intimate encounter with place through plant and water and a way of knowing the entire system, removed from the mining town.

CONCLUSION

The logic of the extraction zone treats all living material in the Atacama system as mineral. Through the observatory and garden, this thesis reframes an understanding of life in the desert through alternate knowledge systems specific to this landscape and uses an alternate subterranean logic to reframe matter in the desert as living matter.

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