

[super] structure

expanding the network | reclaiming the path

Anna Albrecht

[super] structure

expanding the network | reclaiming the path

by Anna Albrecht
2019

A thesis presented in partial fulfillment of the requirements for the degree Master of Design in Interior Architecture [Adaptive Reuse] in the Department of Interior Architecture of the Rhode Island School of Design, Providence, Rhode Island.

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ABSTRACT

In 2016, the Human Rights Council at the United Nations declared internet access to be a basic human right. In rural West Virginia, 30% of residents do not have access to reliable broadband internet. This lack of access limits economic development and opportunities and contributes to the divide between rural and urban communities. That divide has resulted in, among many things, a dearth of innovative design in rural America.

Often with technological and economic progress comes homogeneity, erasure, and environmental devastation; the latter has been endemic in the region since the Industrial Age. By reviving a network of fire lookout towers across the Allegheny Mountain range of central West Virginia as both wireless internet infrastructure and a route of trail shelters, the region will benefit from an improved level of global connection while preserving its unique relationship to the breathtaking landscape celebrated in the state slogan, "Wild and Wonderful."

Connecting the towers to each other via a 200-mile trail invites the intrepid trekker to move between these shelters-in-the-sky intentionally; the structures become both a refuge and a path of pilgrimage. The towers situate each visitor within their own personal journey: quiet spaces with a language born of the natural world, grounded by the surrounding palette of place.

The towers embody the push and pull of progress and poetry. The network, both the tangible trail of towers and the intangible radio waves propagating between, re-frames this complex relationship within a balanced embrace of duality. [Super]structure asks whether we can hold both progress and poetry in harmony, highlighting the living tension between speeding up and slowing down.



SITE ANALYSIS AND CONTEXT

West Virginia | Allegheny Mountains | Monongahela National Forest

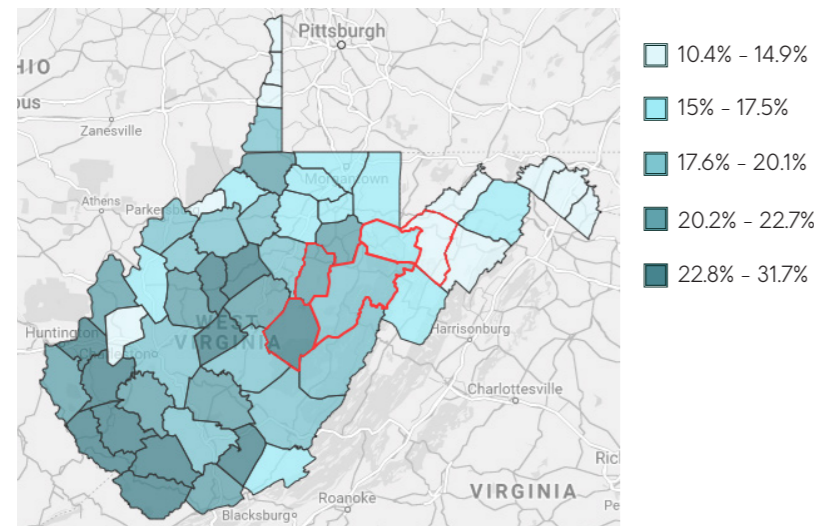


fig. 1: Poverty rates in West Virginia as of 2017

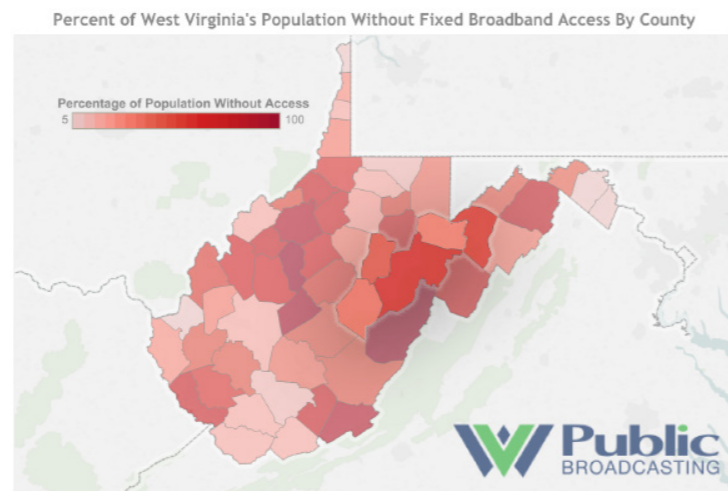
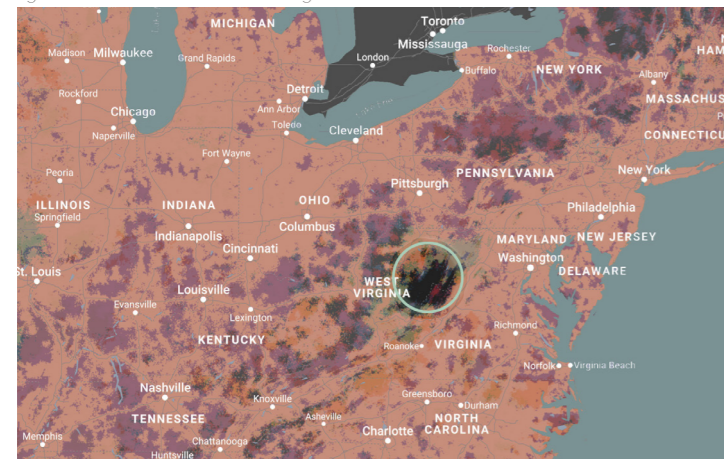


fig. 2: West Virginians without broadband access (2016)

fig. 3: Data and LTE network coverage in the US



The towers reside across five counties in Central Eastern West Virginia. All these counties struggle economically, with a poverty rate of 13.9% and 22% (fig. 1).

These counties are also five of the many in West Virginia with limited access to fixed broadband (fig. 2). Most residents subscribe to unreliable DSL and Satellite service for their internet. Data or LTE wireless is not an option, as the big four networks (Verizon, Sprint, AT&T, T-Mobile) have a distinct blind spot in the region (fig. 3).



fig. 4: CCC Recruitment Poster, 1935

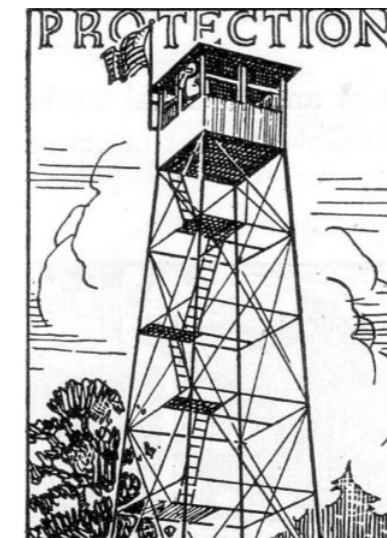
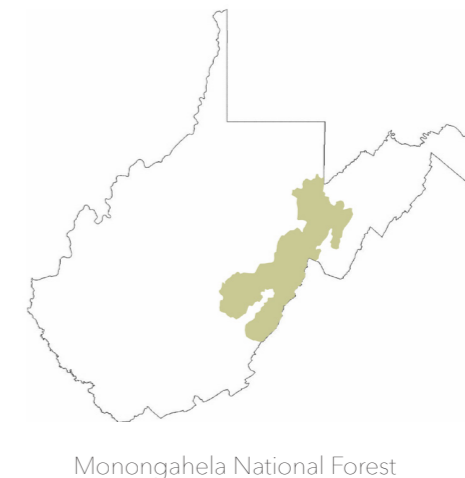


fig. 5: US Forest Service promotional poster, 1940



fig. 6: Lookout ranger using an alidade table



West Virginia has a long history of large-scale infrastructural projects. Most of the fire towers, along with almost all existing trail networks, forest roads, recreation shelters, and camp grounds in the area were built in the 1930s and 40s by the young men of the Civilian Conservation Corps (CCC).

The CCC was a New Deal Era work relief program which enlisted single men aged 18-25 to conserve and develop natural resources on federal land. The Monongahela National Forest (founded 1911), where 5 of the 8 towers are located, was the site of hundreds of CCC projects.

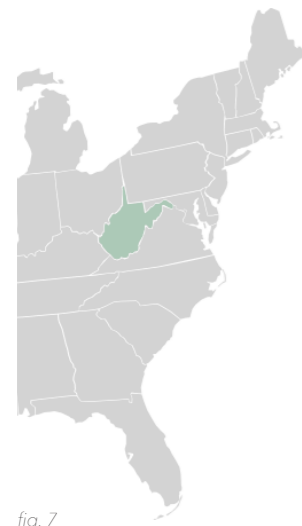


fig. 7



fig. 8

Clockwise from top left: West Virginia within US map; Monongahela National Forest with site range indicated; map of region showing tower site locations; Dolly Sods Wilderness in Monongahela National Forest.

The Allegheny Mountains are a part of the Appalachian Mountain range, which runs northeast from Georgia to Maine.

Monongahela National Forest is home to eight federally designated Wilderness Areas, as well as over 300 acres of old-growth forest. The forest's unique ecology ranges from highland rhododendron bogs to deciduous second-growth spruce, oak, and mountain laurel, to native cactus and shrubs on the drier eastern slopes of the Allegheny mountain chain. While not designated "dark sky reserves," much of the region boasts incredible night sky viewing.



fig. 9



fig. 10



fig. 11



fig. 12

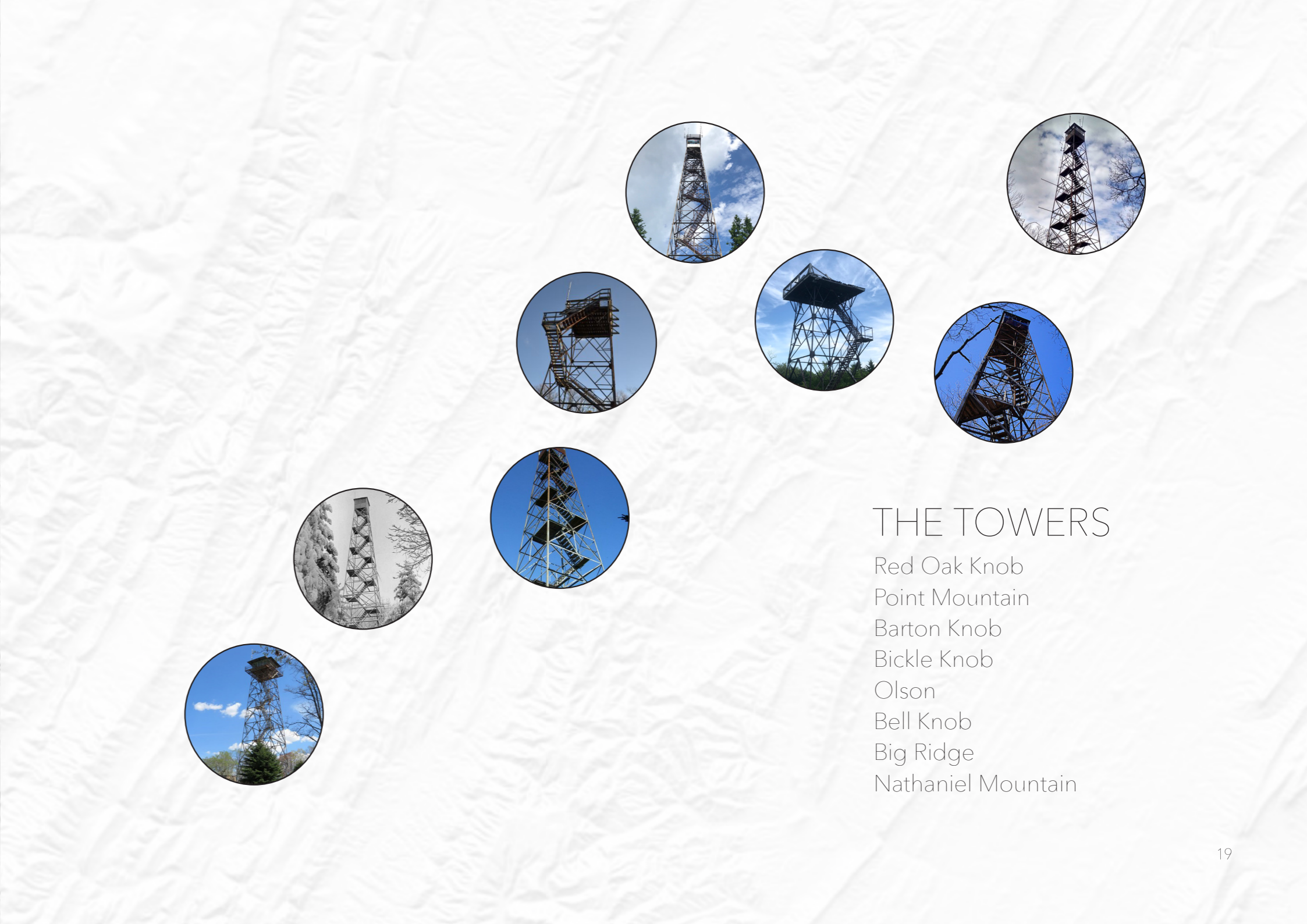
Clockwise from top left: Greenbriar County, WV; Mount Porte Crayon Preserve; Elkins, WV; view from Olson Tower, Randolph County.



fig. 13



fig. 14



THE TOWERS

- Red Oak Knob
- Point Mountain
- Barton Knob
- Bickle Knob
- Olson
- Bell Knob
- Big Ridge
- Nathaniel Mountain

RED OAK KNOB TOWER

elevation: 3,705ft
height: 83'-2"
base dimension: 27'-3" x 27'-3"
cabin dimension: 14' x 14'

Galvanized steel members
Wood (stair treads + cab)
Concrete foundation pads



fig. 15

Clockwise from top left: Red Oak Knob Tower; original plan and elevation drawings; Webster Springs, WV.

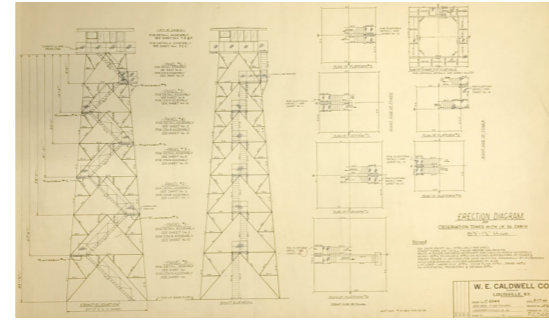


fig. 16



fig. 17



fig. 18

Clockwise from top left: nearby Holly River; historic photo of Point Mountain Tower



fig. 19

POINT MOUNTAIN TOWER

elevation: 3,364ft
height: 100'
base dimension: 22'3" x 22'3"
cab dimension: 7' x 7'

Galvanized steel members
Wood (stair treads + cab)
Concrete foundation pads

BARTON KNOB TOWER

elevation: 4,432ft
 height: 73'
 base dimension: 18'3" x 18'3"
 cab dimension: 7' x 7'

Galvanized steel members
 Wood (stair treads + cab)
 Concrete foundation pads



fig. 20



fig. 21

Left to right: Barton Knob tower; view from Barton Knob Tower

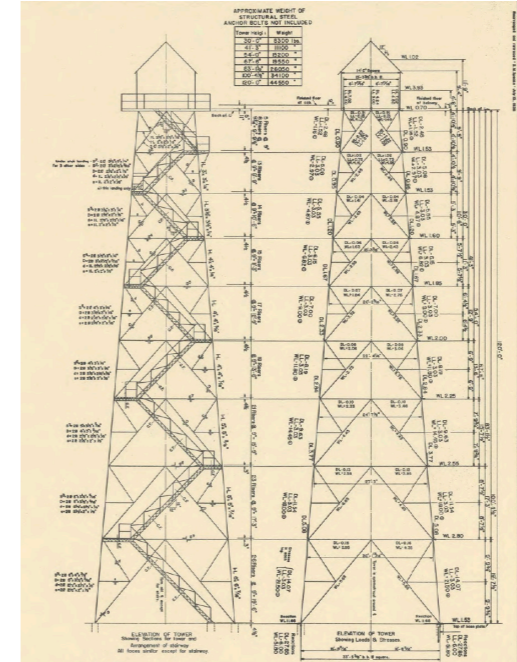


fig. 22



fig. 23

Clockwise from top left:
 original plans for Bickle
 Knob Tower typology;
 Bickle Knob Tower; detail
 of joint.



fig. 24

BICKLE KNOB TOWER

elevation: 4,012ft
 height: 54'-0"
 base dimension: 20'-2" x 20'-2"
 deck dimension: 14' x 14'

Galvanized steel members
 Wood (stair treads + cab)
 Concrete foundation pads

OLSON TOWER

elevation: 3,736ft
height: 99'-9"
base dimension: 22'-1" x 22'-1"
cab dimension: 7' x 7'

Galvanized steel members
Galvanized steel stair + treads
Wood (cab floor)
Concrete foundation pads



fig. 25



fig. 26



fig. 27

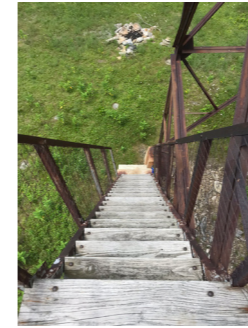


fig. 28

*Clockwise from top left:
stairs at Bell Knob; Bell
Knob Tower; surrounding
landscape - Dolly Sods
Wilderness Area.*



fig. 29



fig. 30

BELL KNOB TOWER

elevation: 4,143ft
height: 41'-3"
base dimension: 18'-4" x 18'-4"
cab dimension: 14' x 14'

Galvanized steel members
Wood (stair treads + cab)
Concrete foundation pads

BIG RIDGE TOWER

Dimensions

elevation: 3,211ft
 height: 80'
 base dimension: 19' x 19'
 cab dimension: 7' x 7'

Materials

Galvanized steel members
 Wood (stair treads + cab)
 Concrete foundation pads



fig. 31



fig. 32

Left to right: Big Ridge Tower; from below; original drawings for Big Ridge Tower typology.

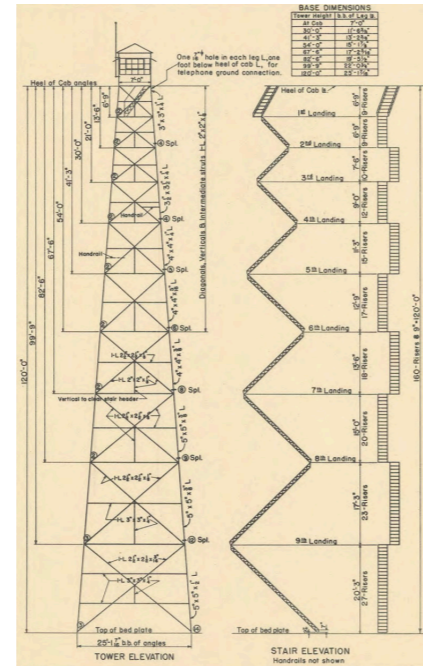


fig. 33

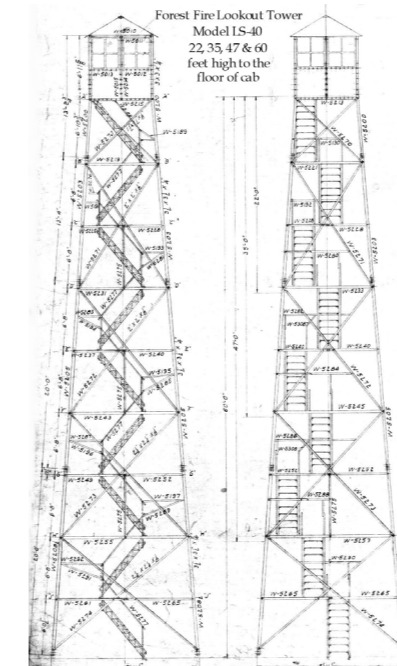


fig. 34



fig. 35

Left to right: original drawings for Nathaniel Mtn typology; Nathaniel Mtn Tower.

NATHANIEL MOUNTAIN TOWER

Dimensions

elevation: 2,994ft
 height: 90'
 base dimension: 18'3" x 18'3"
 cab dimension: 7' x 7'

Materials

Galvanized steel members
 Wood (stair treads + cab)
 Concrete foundation pads



PROGRAM[S]

Wireless Internet Infrastructure | Wilderness Trail Shelters

PROGRAM : "WHITE SPACE"
WIRELESS INTERNET INFRASTRUCTURE

[Super] structure ultimately aims to embrace the duality of modern life; connecting the region to the "world-wide web" by harnessing the network of towers while preserving the region's special relationship with the land, especially the Appalachian Mountains. The technology that [super] structure employs is called "white space" internet.

White space utilizes another abandoned network - parts of the radio spectrum formerly occupied by analog TV channels. Because of its lower frequency, white space allows for non-line-of-sight propagation. This means that the waves can pass more easily through topographical challenges in the area. Laying fiber optic cable across Appalachia, in addition to being expensive and labor-intensive, would require excavation and a deep disturbance of the land.

White space requires a base node with a fiber optic connection, which would be at the Monongahela National Forest Headquarters building in Elkins, WV (the largest town in the area, also centrally located along the trail). Using this technology in addition to channel bonding (using a number of channels at once to strengthen the signal - a practice recently approved by the FCC) will provide remote communities with a more reliable internet connection.

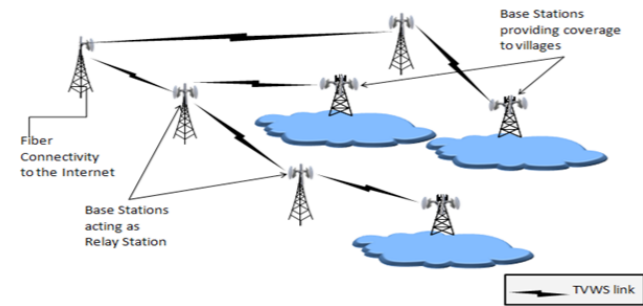


fig. 36

Clockwise from top left:
White Space diagram;
additional diagram;
Monongahela National
Forest Headquarters
building, Elkins, WV.



fig. 38

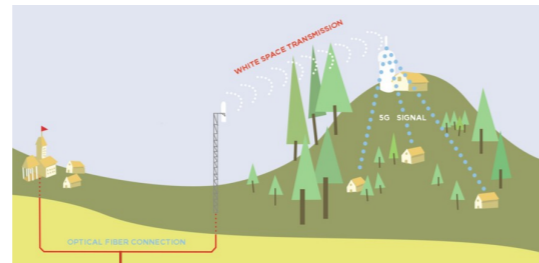


fig. 37

PROGRAM: NETWORK OF
SLEEPING SHELTERS + WILDERNESS TRAIL

Although the towers will be beacons of technology and serve as nodes in a larger network, the parameters of white space internet mean that in order to access that network, a specific receiver must be installed. This in turn means that, even as they are surrounded by the radio waves that are radiating in the region, hikers on the trail will not be able to access the internet.

This imposition allows for those undertaking the journey to temporarily remove themselves from the network in order to reconnect and commune with the land. The act of walking, especially over long distances, has a rich and diverse history as a form of self-exploration, healing, growth, and ritual. From Catholic pilgrimage to Australian Aboriginal walk-about, cultures across the world and across time have acknowledged the meditative and restorative qualities of a good, long walk.

In addition to the infrastructural intervention of the white space network and the trail itself, the final intervention activates the tower hosts as overnight shelters along the trail. Fire lookout towers across the United States are being renovated and re-purposed as rental cabins (fig. 39); [super] structure takes this reuse a step further, enriching each individual tower site with its own architectural character and its own story to tell.



fig. 39

above: view from Slate Point lookout, Idaho;
below: Camino de Santiago, northern Spain



fig. 40



PRECEDENTS



fig. 41

ALLMANNAJUVET ZINC MINE MUSEUM

Peter Zumthor

Sauda, Norway - 2016

Peter Zumthor's Allmannajuvet Zinc Mine Museum is a group of striking and simple timber and plywood structures, designed to encourage tourism and recall bygone zinc mines in the area.

Though not a reuse project, the interaction between the timber framing and the black plywood boxes contained within it spoke to the essence of the towers and my interventions therein.

The character of the design as a group of outposts along a trail was another point of influence. All the buildings have the



fig. 42



fig. 43



fig. 44



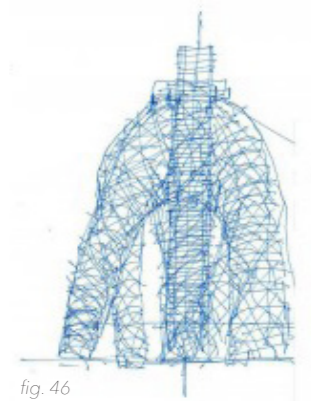
fig. 45

same vocabulary, but distinct forms that tell a visual, formal story.

The simplicity of the boxes, and the openings Zumthor makes in them, pushed the design of **super [structure]** away from initial organic forms and towards a cleaner, more rectilinear motif.

DOUBRAVKA TOWER

Huť architektury EN - Martin Rajniš,
David Kubík, Tomáš Kosnar, Sven Nevlida - 2014



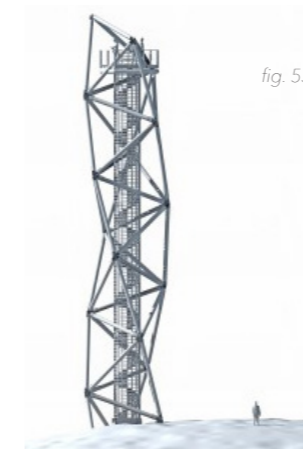
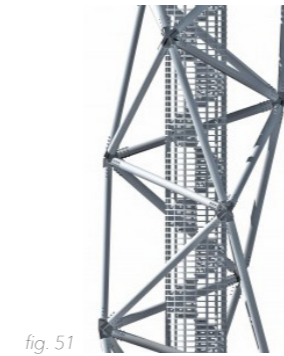
The treatment of the tower typology is taken to a breathtaking level by Czech firm Huť Architektury and its principal designer Martin Rajniš. I selected two of the most formally exciting projects, neither of which were realized. The firm does have several realized tower projects which served as inspiration as well.

These particular superstructures feel sentient and otherworldly, a quality which the Monongahela Towers exude as well. It was important to maintain the "super-terrestrial" character of the hosts, whatever form the intervention took.



TETRAHEDRON + ARTEFACT

Huť architektury EN - 2013-2014



WHITE SPACE PRECEDENT

GARRETT COUNTY WHITE SPACE NETWORK Garrett Co, Maryland - 2017

Neighboring Garrett County, Maryland is piloting a rural white space program. Antennae are installed on posts (fig. 57), as well as on barns, houses, outbuildings, and even trees. Installing powerful extenders on the towers would create a more effective program.

The topography of Garrett Co. is nearly identical to Tucker and Randolph Co. The mountainous makeup actually strengthens the white space signal, since there is little interference from cities.

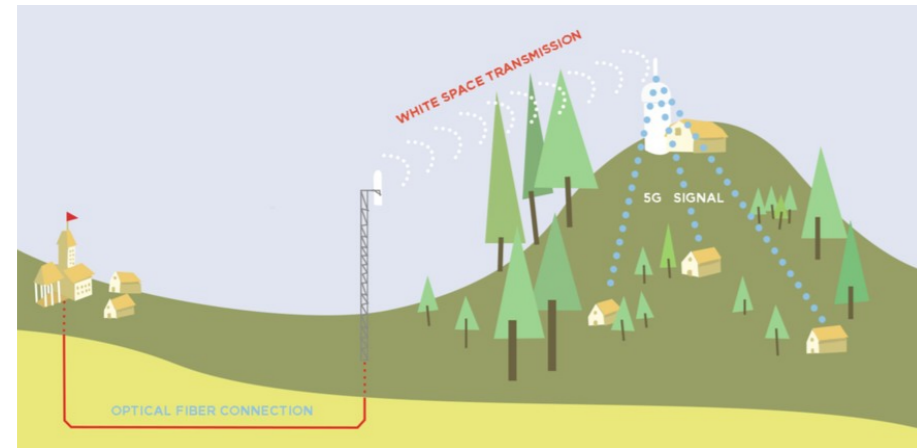


fig. 58



fig. 56



fig. 57

Clockwise from top left: Carlson Wireless RuralConnect antenna mast; antenna installed in Garrett County, MD; white space diagram.

RURAL INTERNET PRECEDENT

ZERO-CARBON LEARNING CENTRE Rural Cambodia - 2015

Designed and executed by students at Hong Kong Polytechnic University in the Service Learning and Computing departments. It was presented at the Institute of Electrical and Electronics Engineers annual conference in 2016.

The brightly decorated container brought a wi-fi hotspot and computers to a village outside of Phnom Penh, and involved the community in developing the design. The drawback of only one hub is that fewer people at a time can benefit from the service.

This project follows the traditional model of bringing resources rural areas - the traveling caravan. From mobile libraries to the eye exam truck, this method is certainly practical and cost-efficient.

[super] strucutre aims to give the people of the area ownership of their resources and lay a foundation for future generations. A rural internet cooperative would be integrated into the installation and proliferation of the network.



fig. 59

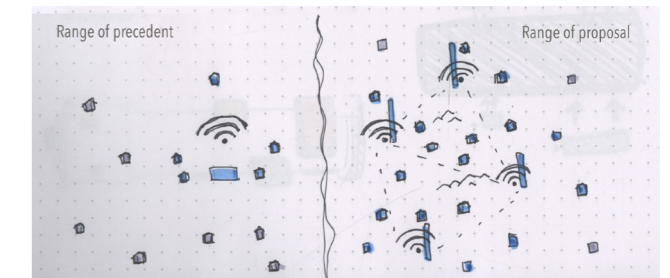


fig. 60



fig. 61

TRAIL + SHELTERS PRECEDENT

MOUNTAIN BOTHIES

Architects unknown
across United Kingdom

The mountain bothies of Britain served as a spiritual precedent for the project.

These rustic and rudimentary shelters speak to the sanctity of simple spaces, sprinkled amongst a remote, awe-inspiring landscape.

Bothies are left unlocked, free to use, and they are unofficially maintained by those who visit them, according to the "Bothy Code." Most often their locations are spread by word of mouth, and it's no uncommon to simply stumble upon one.

There is a vibrant hill-walking culture in the UK; bothies usually have a book or journal for trekkers to document their visit, serving as a witness and a record of the bothy's life.



fig. 62



fig. 63



fig. 64



fig. 65



fig. 66



fig. 67



fig. 68

TRAIL + SHELTERS PRECEDENT

LA RUTA DEL PEREGRINO
 Various architects and artists
 Jalisco, Mexico - 2009-2012

La Ruta del Peregrino is a 72-mile pilgrimage route through the mountainous Jalisco region of Mexico. Extant since the 17th century, pilgrims travel the route to visit a shrine to La Virgen de Talpa. Between 2009 and 2012, eight different artists and architects designed nine landmarks. Some are lookout points, some are shelters, some sanctuaries.

All are formally fascinating and have been designed with the intention of impacting travelers along the path. The use of clean concrete or stone defines the spaces amongst the surrounding landscape, and the resulting contrast gives them an otherworldly, sacred aura.



fig. 69



fig. 71



fig. 72



fig. 73

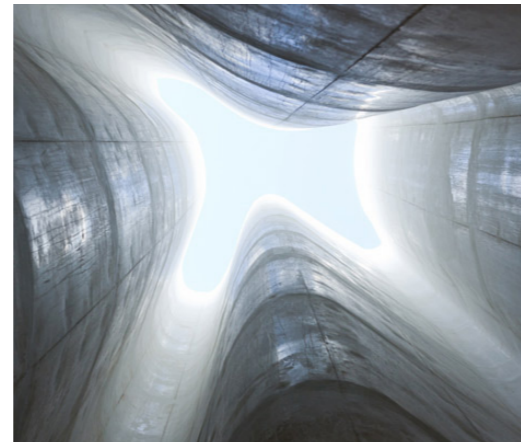


fig. 70



fig. 74



fig. 75



DESIGN PROPOSAL

MONONGAHELA TOWER TRAIL

The idea of the pilgrimage can feel antiquated and overly religious. **The Monongahela Tower Trail**, as an embodiment of the balance we seek in modern life, is more peregrination than pilgrimage: a journey for the sake of the journey. All sleeping spaces are designed for 1-2 occupants at a time.

Those undertaking the trail will depart from Webster Springs, and spend their first night at **Embark** (formerly Red Oak Knob Tower). This first tower includes paper trail maps and is stocked with informational materials about the trail and the local area.

Spring (Point Mountain Tower) boasts an open air rainwater shower built into the existing stair cavity, a small cantilevered sleeping shelter, and a foot-washing pool at the base.

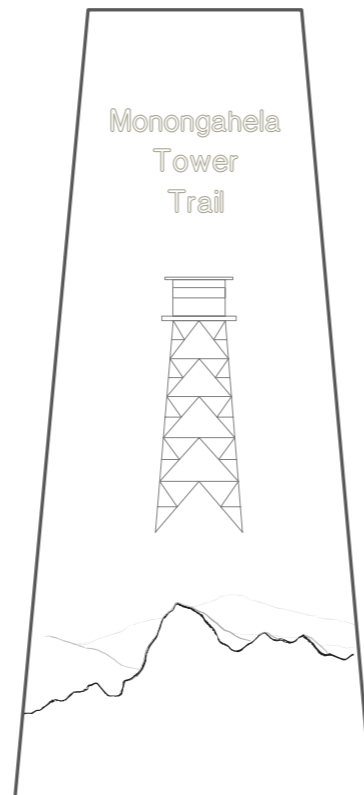
Cave (Barton Knob Tower) is inserted to the void at the center of the tower, with irregular openings providing a unique daylight experience.

Hearth's fire pit and cortend steel chimney emerge from Bickle Knob Tower's relatively low structure, allowing for bonfires below that in turn provide a low-level heat to the sleeping platform above.






Eyrie (Olson Tower), a bird-lover's dream, brings perspective: the lower intervention is oriented to view small brush and song birds, the middle is directed to higher trees and the valley below, for migrations and birds of prey.

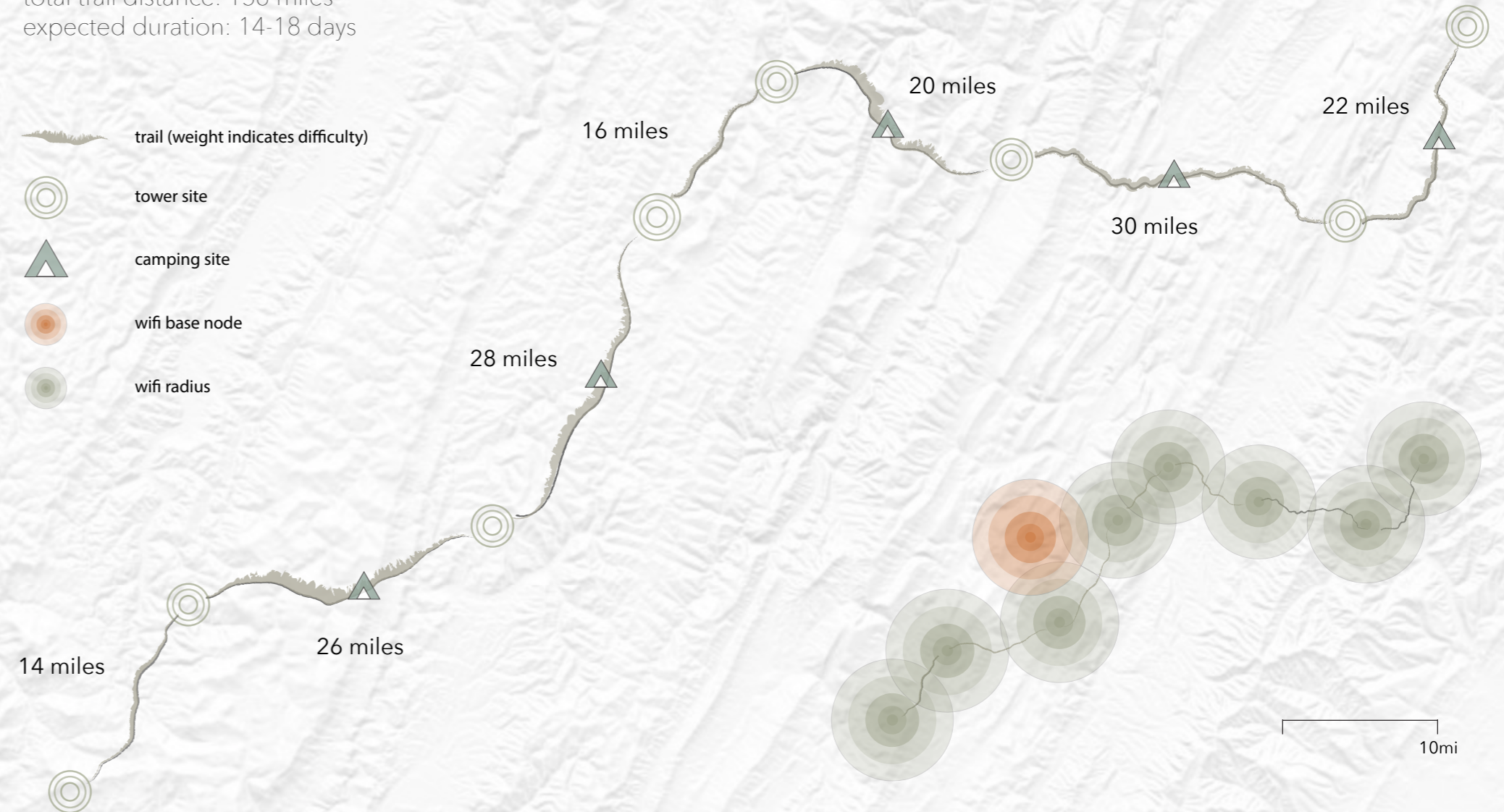
Outcrop reflects the scrubby, limestone cliffs surrounding Bell Knob Tower, incorporating a dramatic cantilevered platform to evoke the sense of hovering over the ridge. **Cosmos** is purely designed to sleep under a blanket of stars, situated at the top of Big Ridge Tower's 100 foot structure.

Brook (Nathaniel Mountain Tower) is the final stop on the trail - the bunks are suspended above a small pool, encouraging the trekker to ruminate and reflect on their experience.



total trail distance: 156 miles
expected duration: 14-18 days

-  trail (weight indicates difficulty)
-  tower site
-  camping site
-  wifi base node
-  wifi radius





EMBARK
RED OAK KNOB TOWER
N 38.353250° W 080.440679°

ELEVATION: 3,705 ft
TOWER HEIGHT: 83'2"



SPRING
POINT MOUNTAIN TOWER
N 38.525711° W 080.299243°

ELEVATION: 3,364 ft
TOWER HEIGHT: 73'



CAVE
BARTON KNOB TOWER
N 38.610811° W 079.529575°

ELEVATION: 4,432 ft
TOWER HEIGHT: 73'



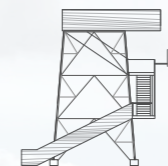
HEARTH
BICKLE KNOB TOWER
N 38.934454° W 079.731430°

ELEVATION: 4,012 ft
TOWER HEIGHT: 54'



EYRIE
OLSON TOWER
N 39.106811° W 079.403355°

ELEVATION: 3,736 ft
TOWER HEIGHT: 99'9"



OUTCROP
BECK KNOB TOWER
N 39.060141° W 079.323228°

ELEVATION: 4,143 ft
TOWER HEIGHT: 41'3"



COSMOS
BIG RIDGE TOWER
N 38.913990° W 078.895300°

ELEVATION: 3,211 ft
TOWER HEIGHT: 73'



BROOK
NATHANIEL MOUNTAIN TOWER
N 39.199041° W 078.790553°

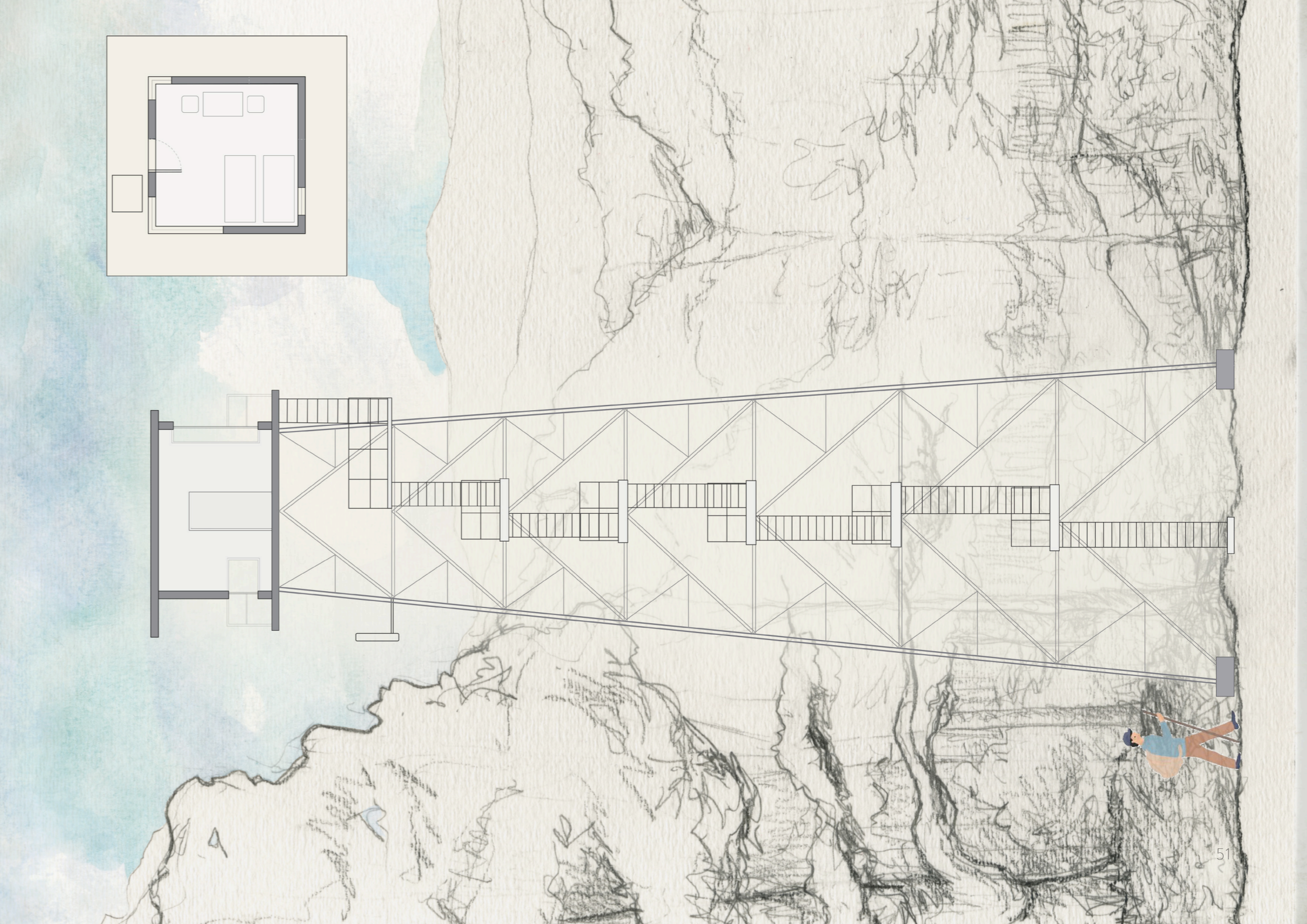
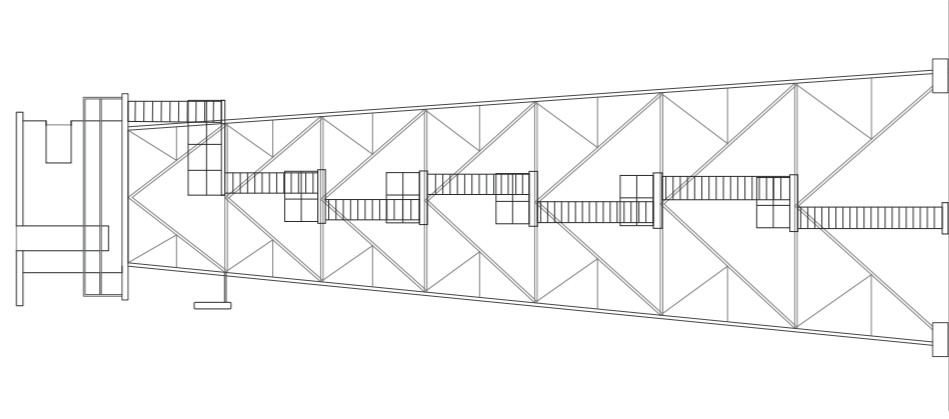
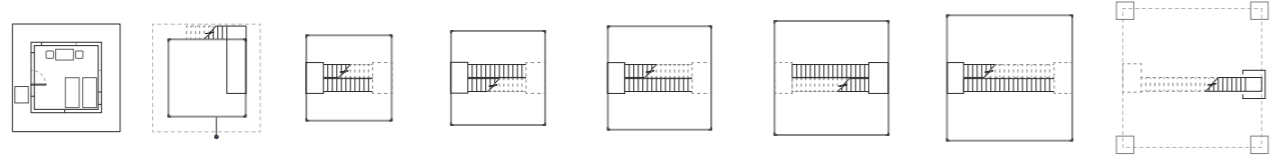
ELEVATION: 2,944 ft
TOWER HEIGHT: 100'



EMBARK

Red Oak Knob Tower

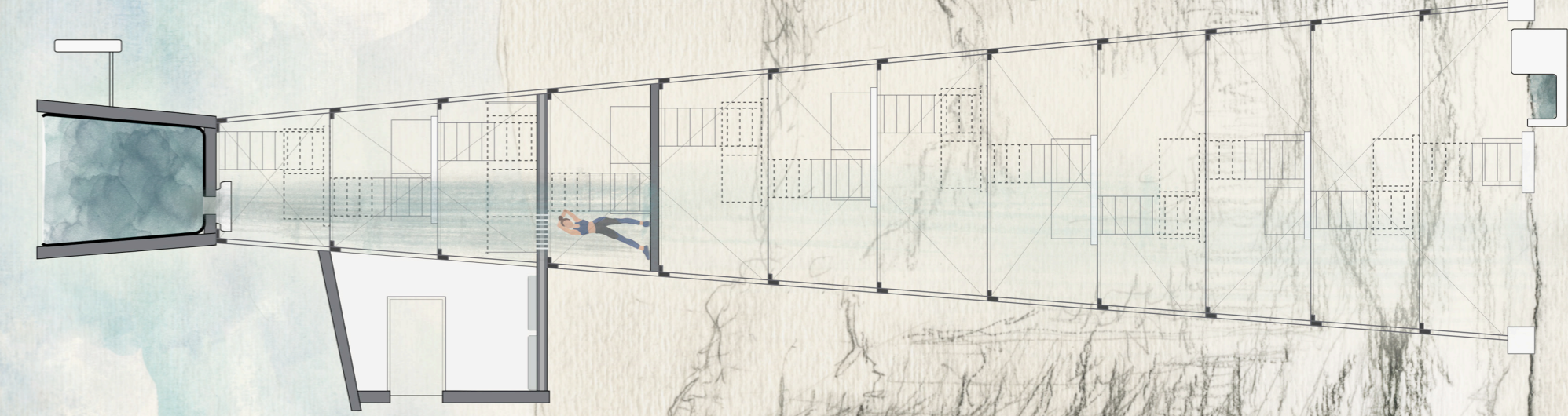
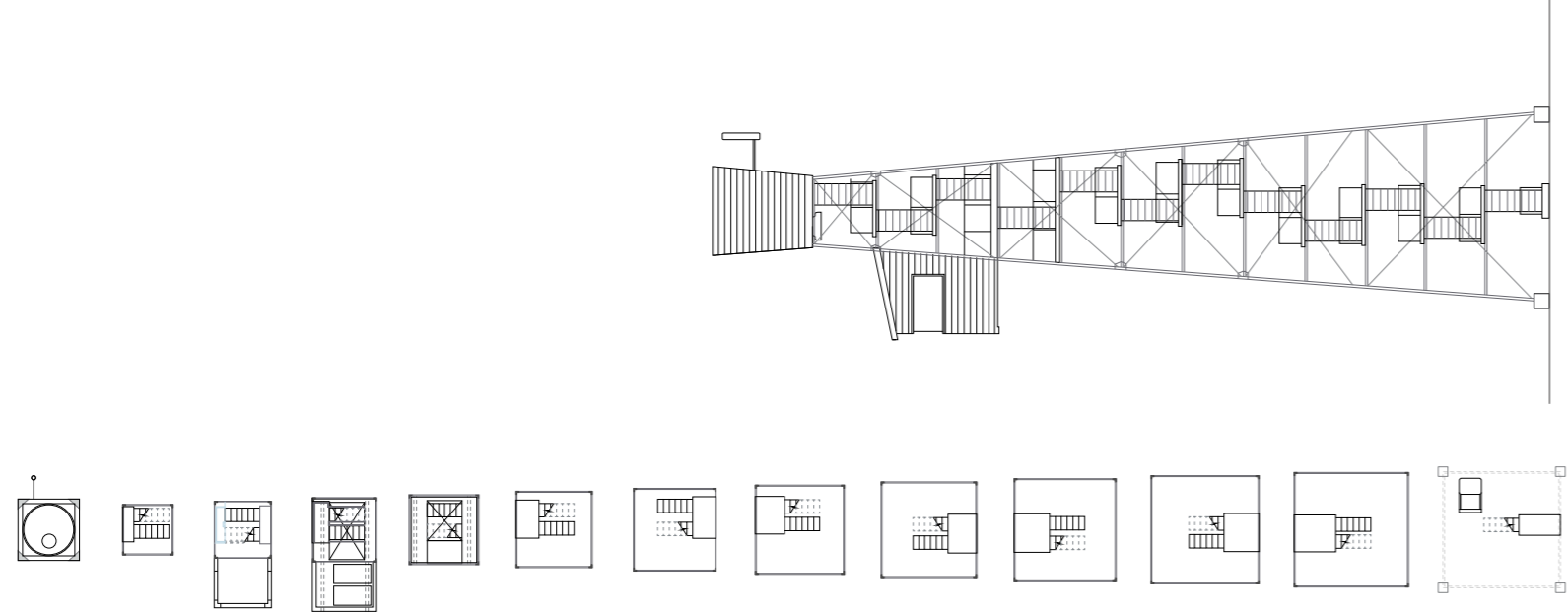
Readied, entering the between:
A glimpse of who will return
And how.



SPRING

Point Mountain Tower

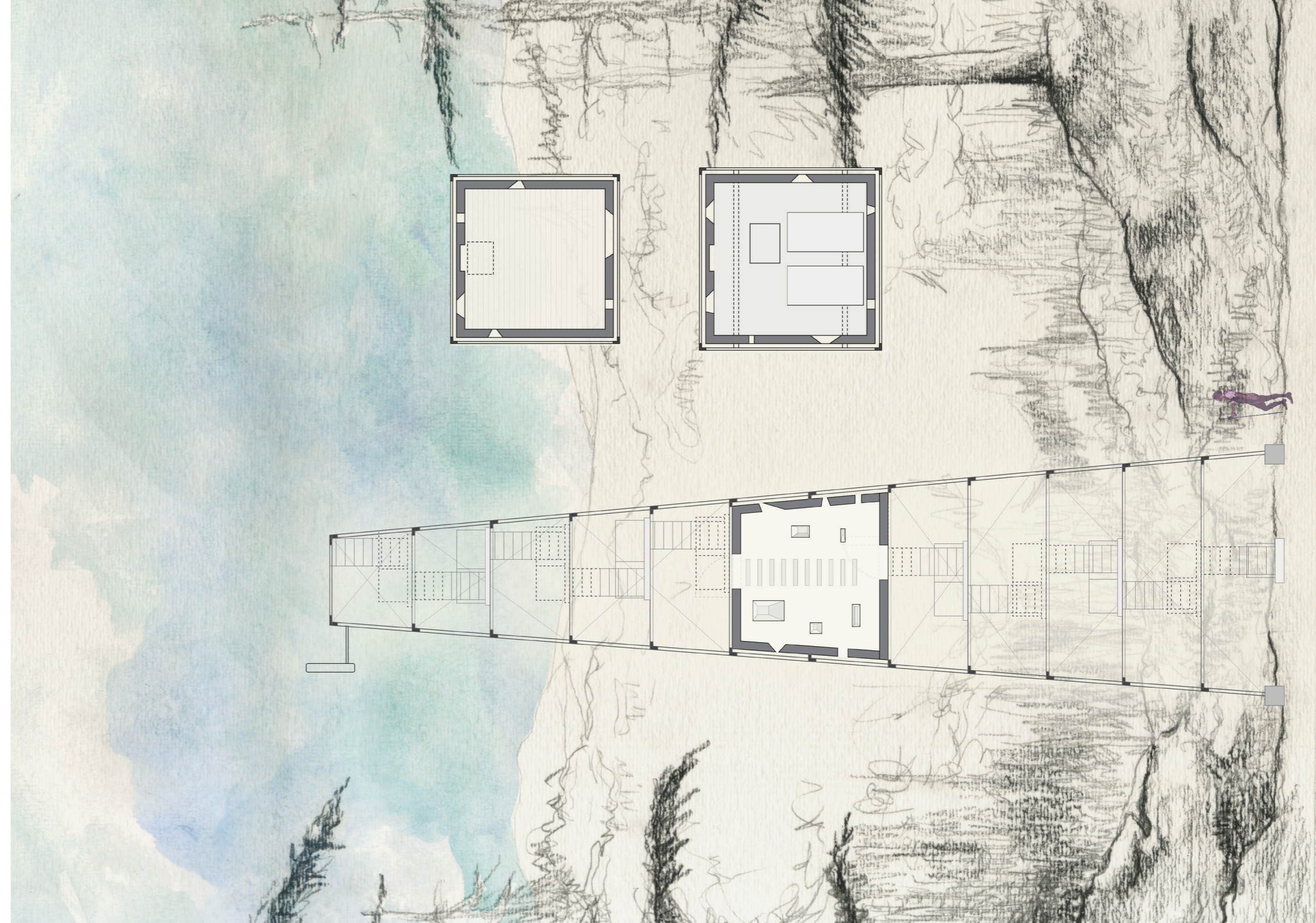
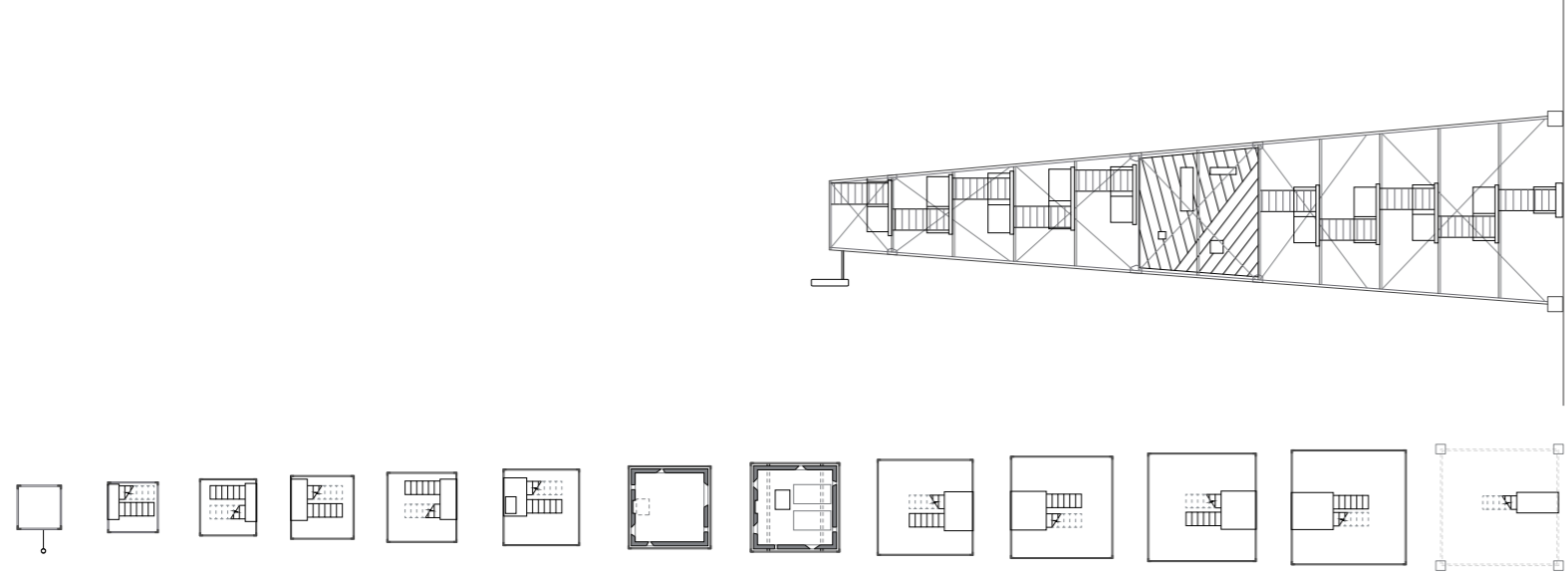
Rebegun, shedding the vestiges of
The supposed and imposed.
Tapped and flowing -
clarity.



CAVE

Barton Knob Tower

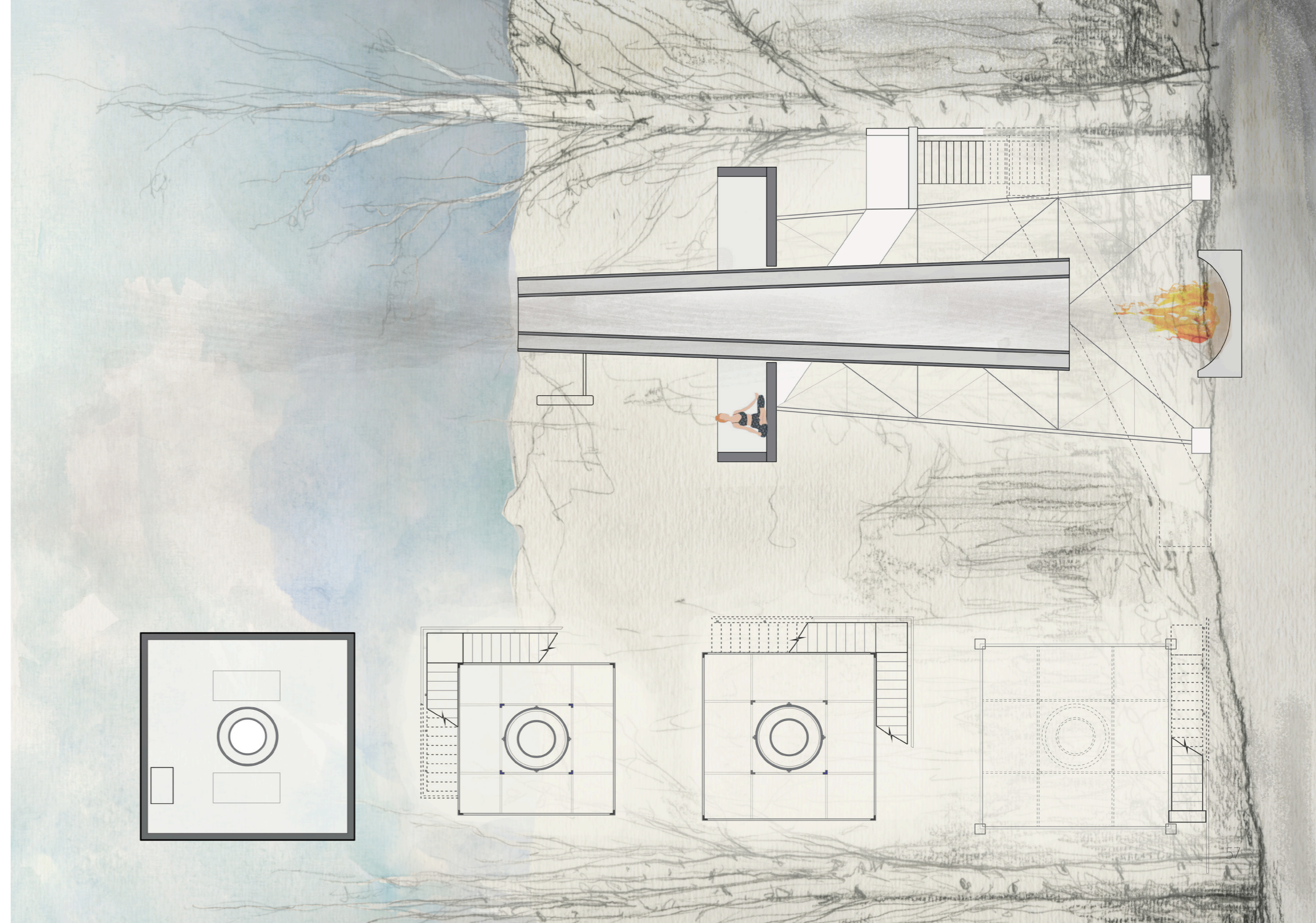
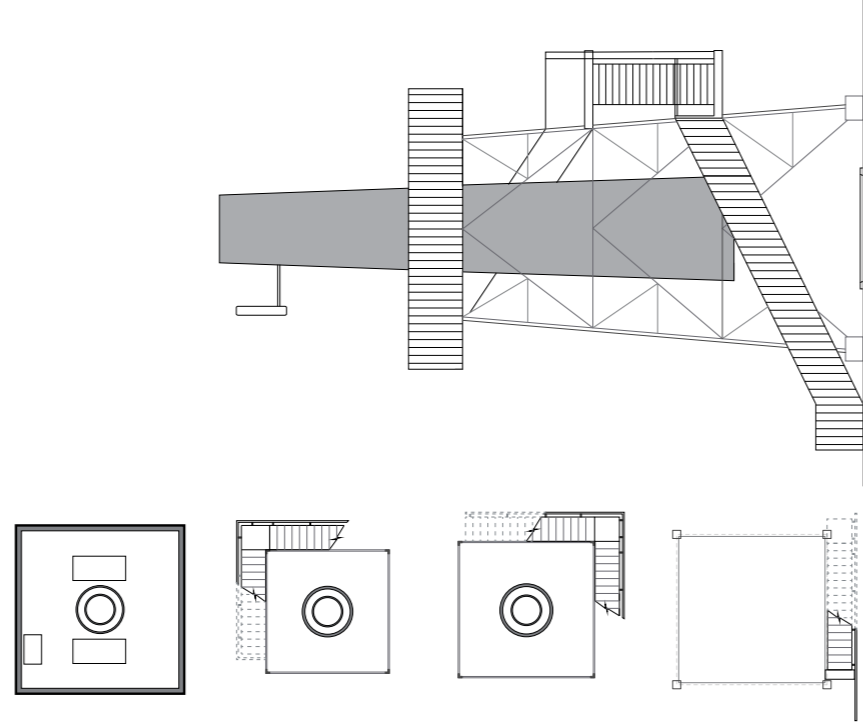
The deep dark, comfort
To look inside and find strength
in the shadow
Flecked with light, a deep yawn.



HEARTH

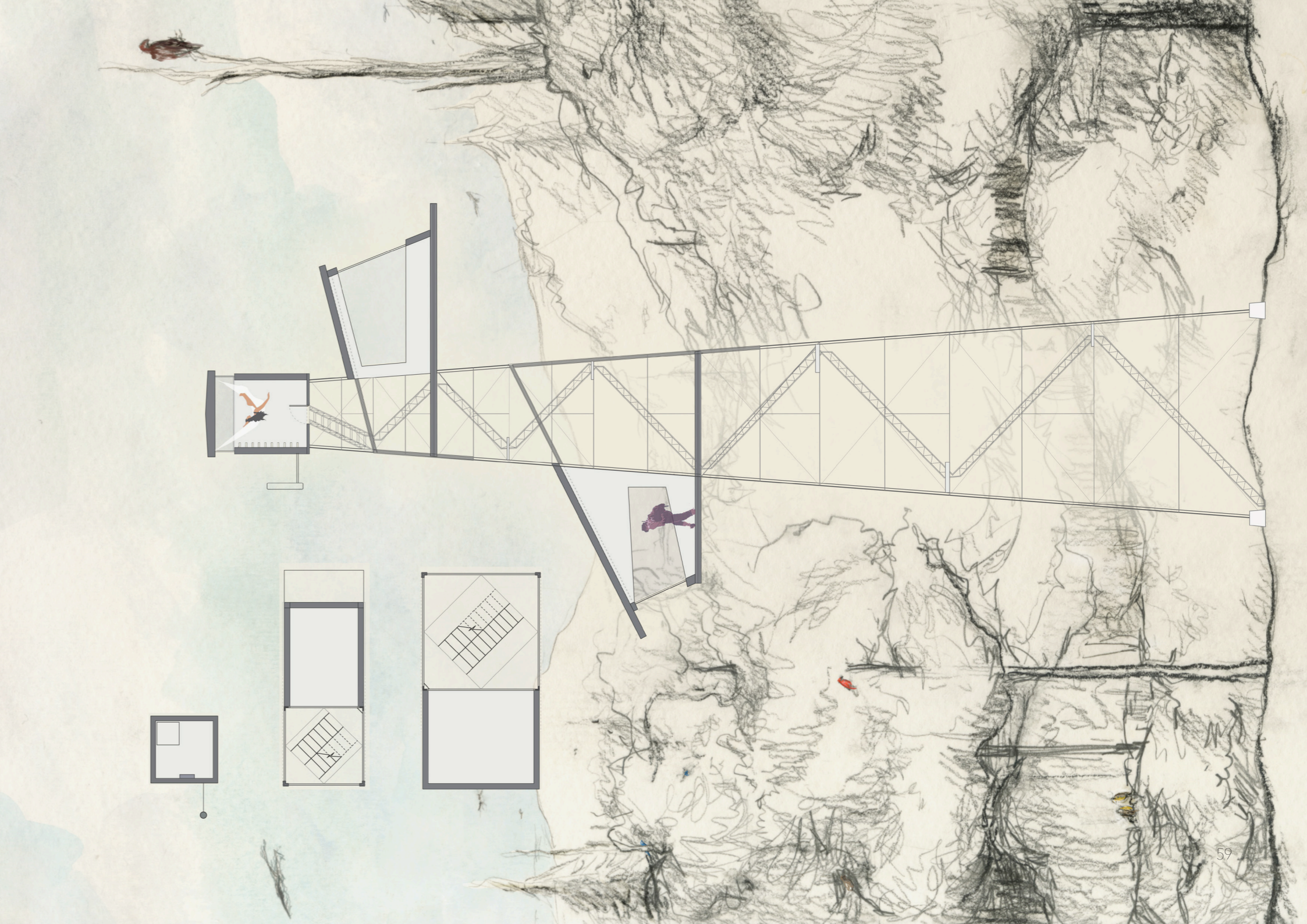
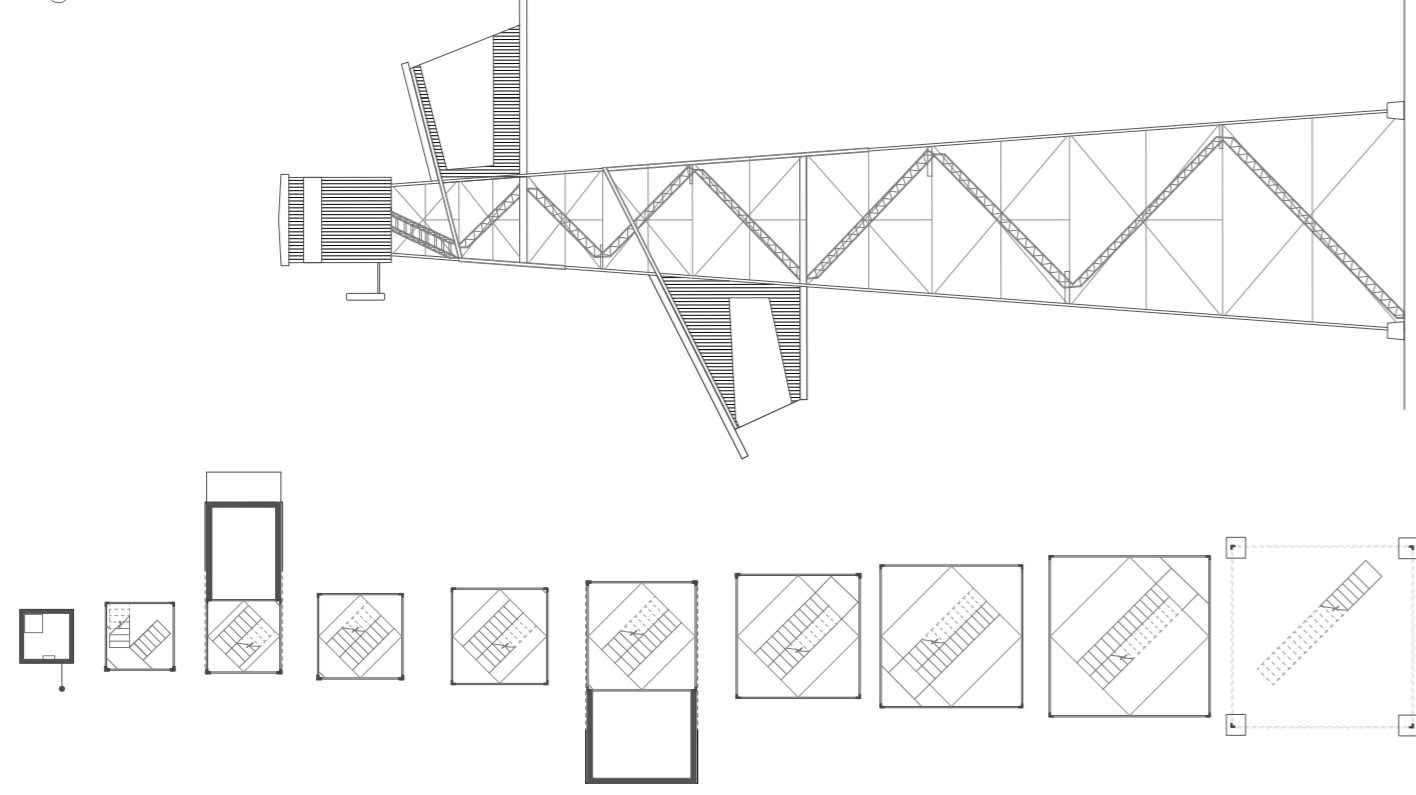
Bickle Knob Tower

A return, centering and grounding -
Gathering up the lush blanketed earth,
Emerging warmed and renewed.



EYRIE Olson Tower

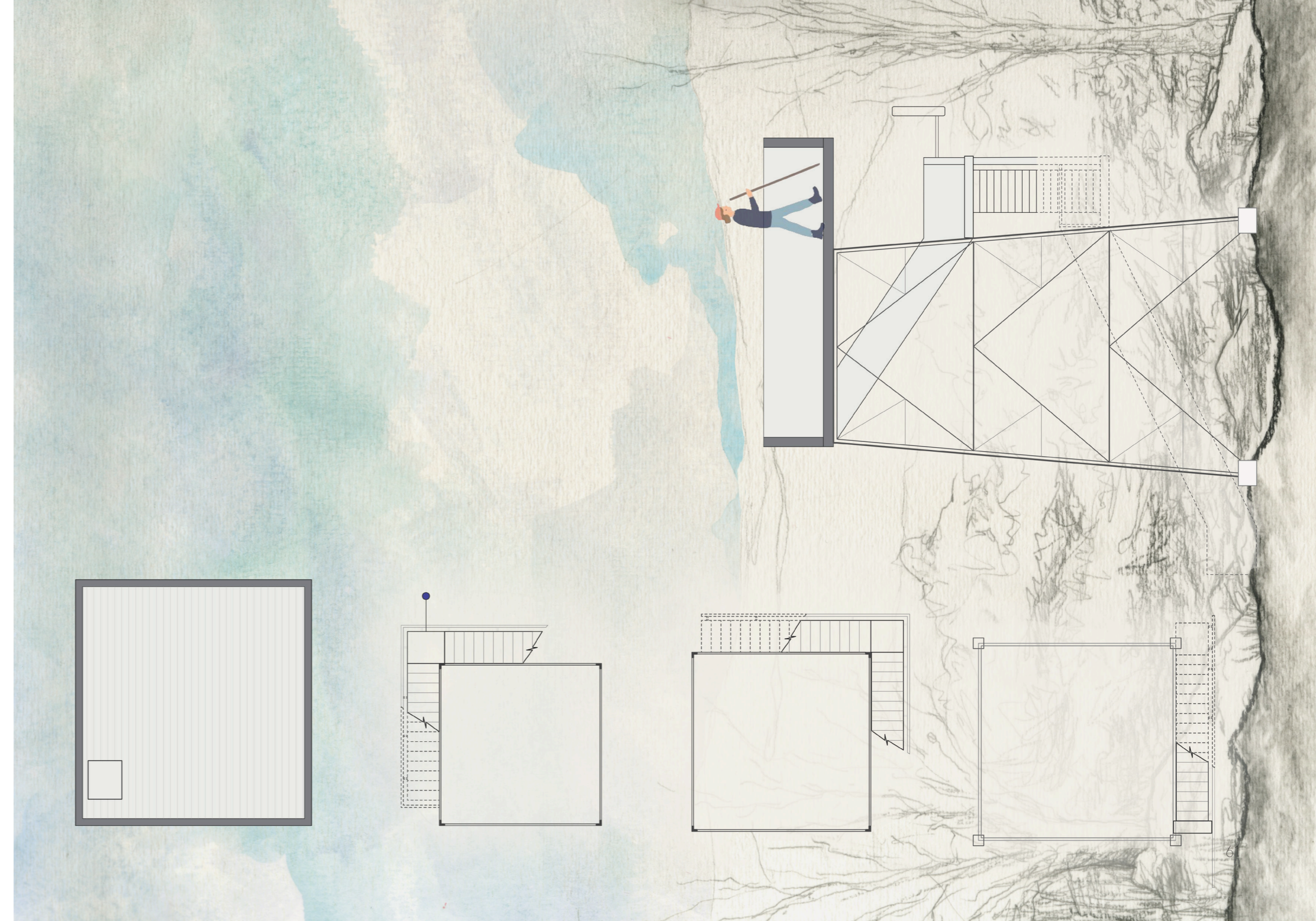
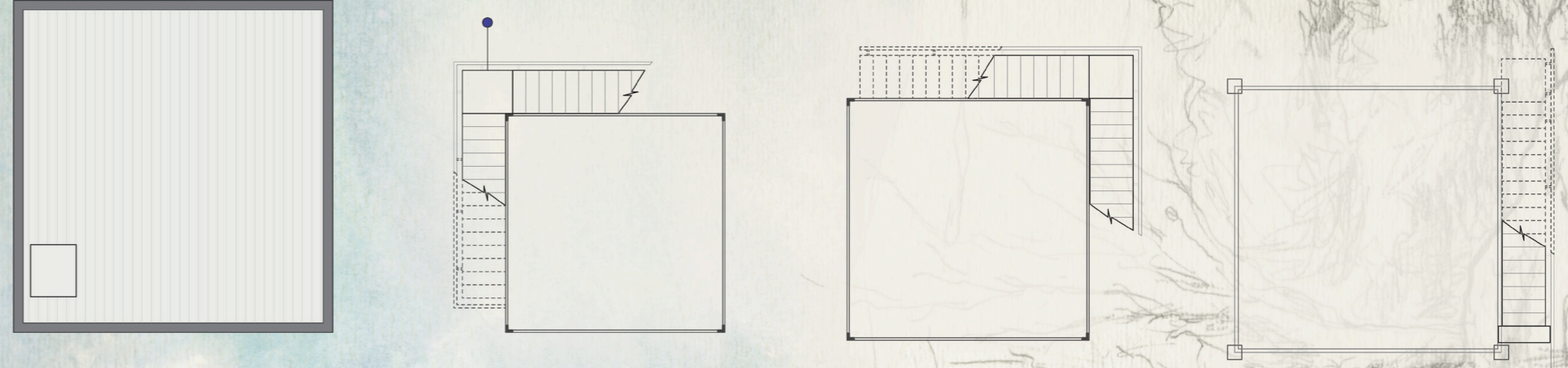
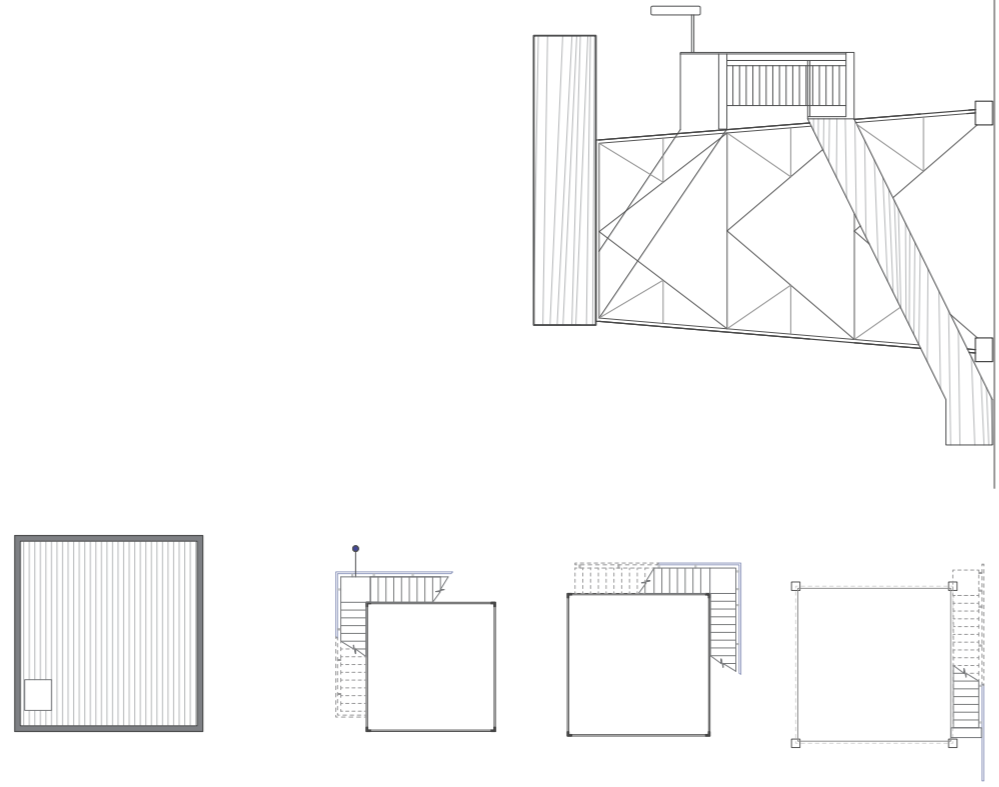
Held aloft
Observing small wonders
A quiet, sparking hymn -
A stirring call from afar.



OUTCROP

Bell Knob Tower

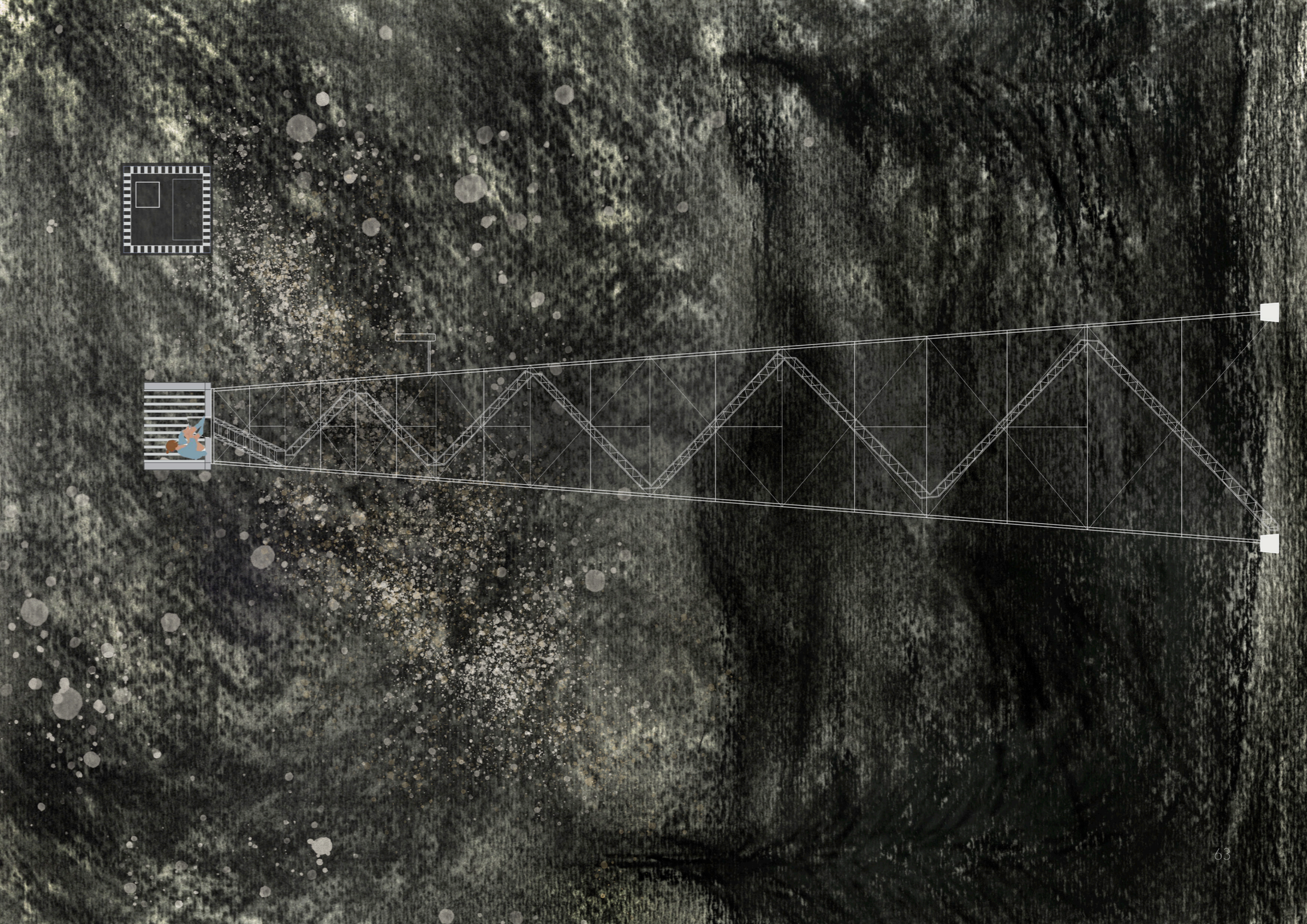
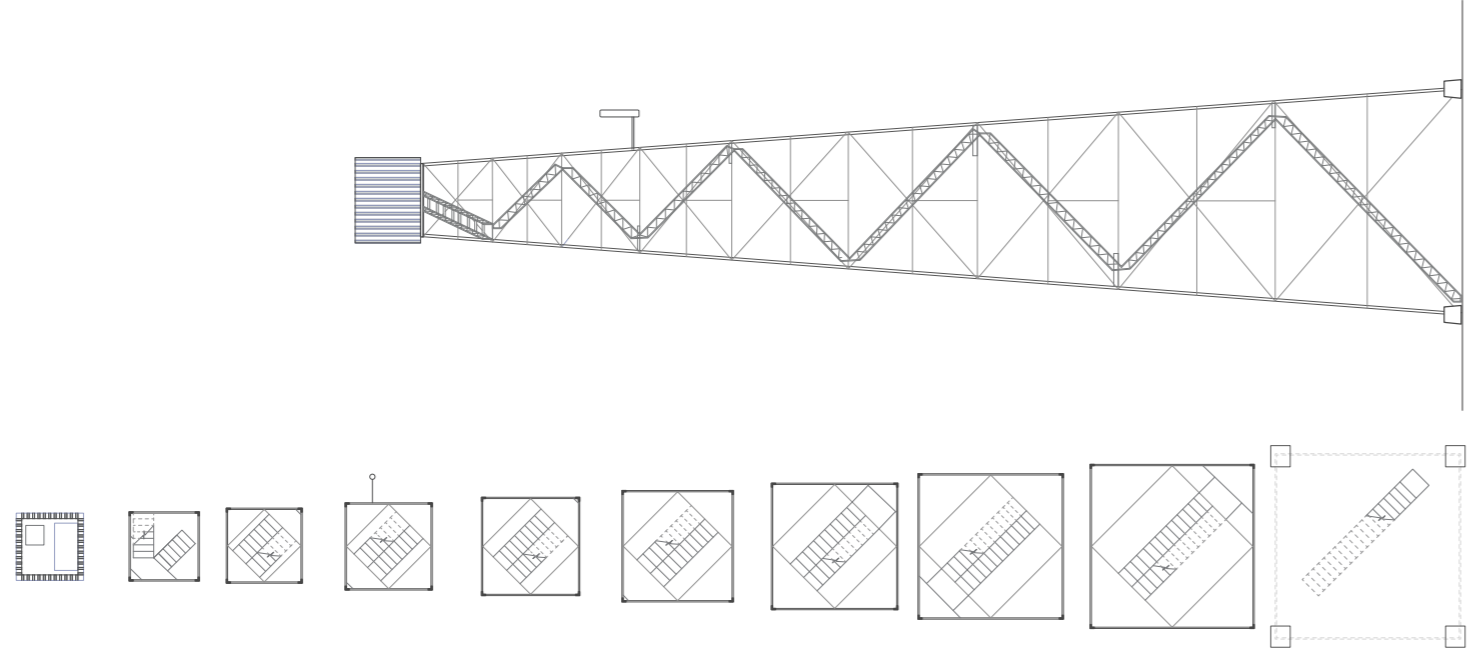
Weightless, yet bound to
A cliff, an edge.
Held breath, suspended in time.



COSMOS

Big Ridge Tower

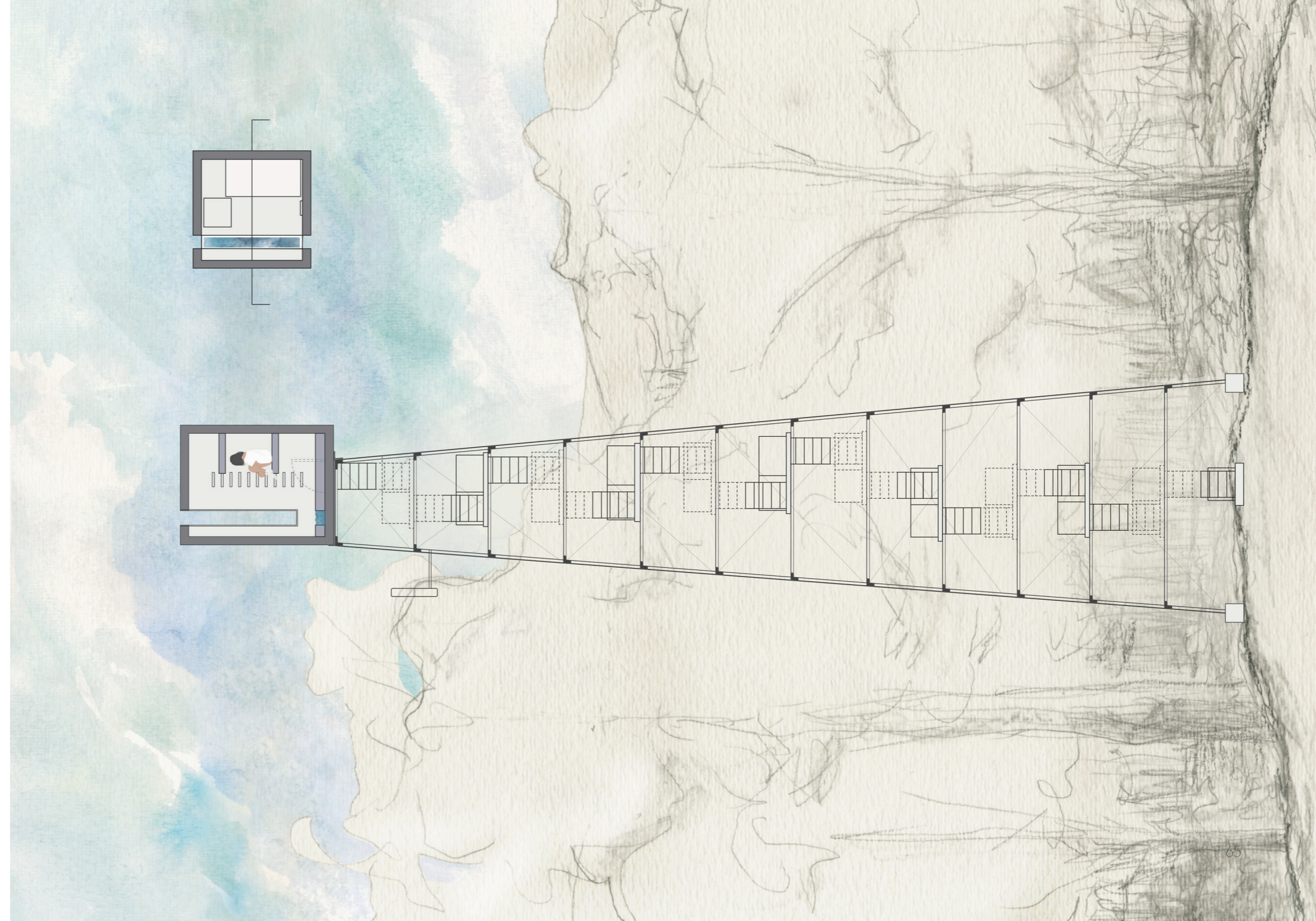
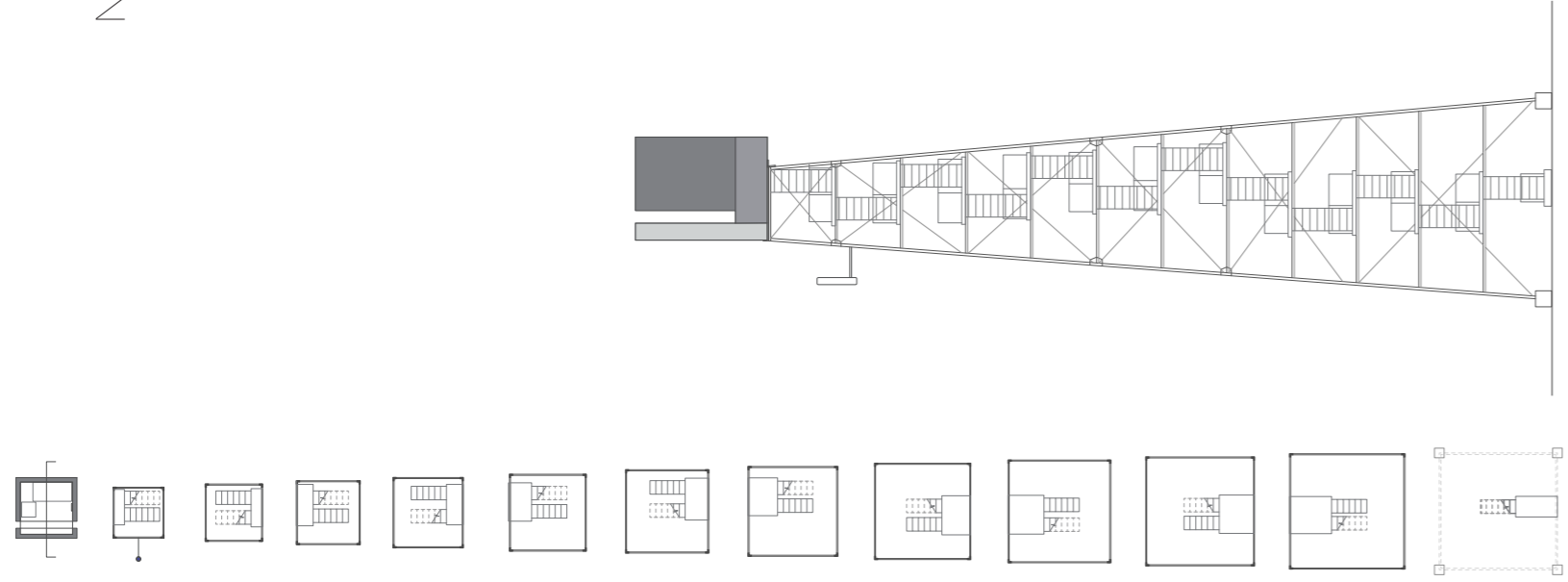
Awash in infinity,
Opening and collapsing -
Giants and dust.
Awakening in humility.



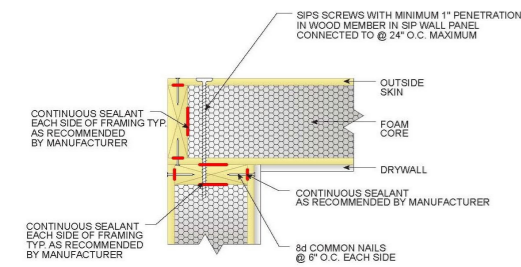
BROOK

Nathaniel Mountain Tower

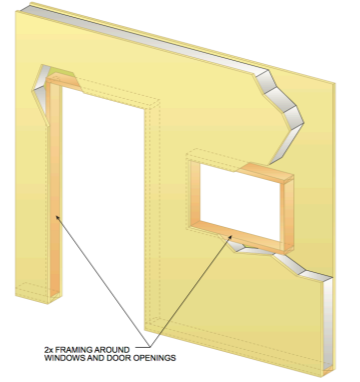
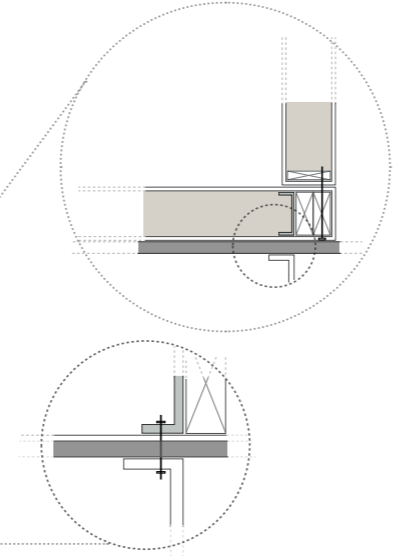
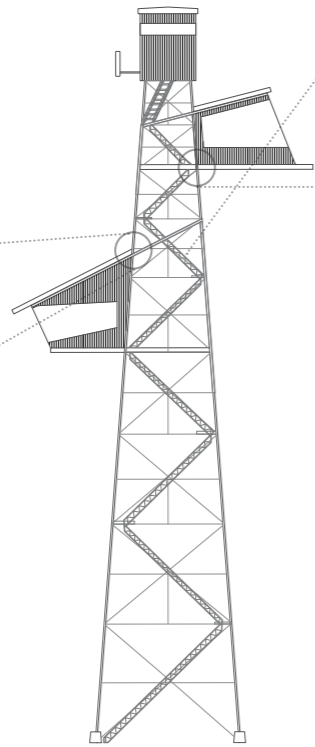
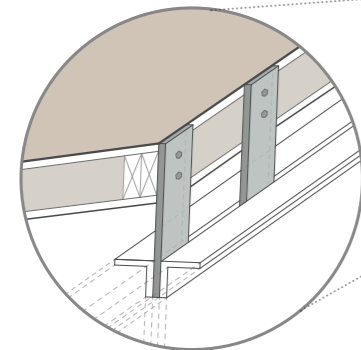
The path's end:
Reflections and revelations.
The journey continues,
A constant companion.



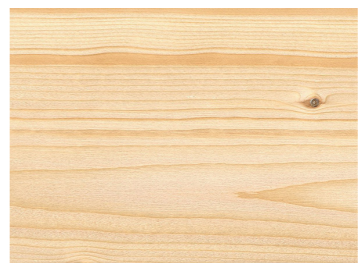
STRUCTURAL DETAILS



WALL-TO-WALL PANEL CONNECTIONS
CORNER WALL CONNECTION



DOOR AND WINDOW FRAMING



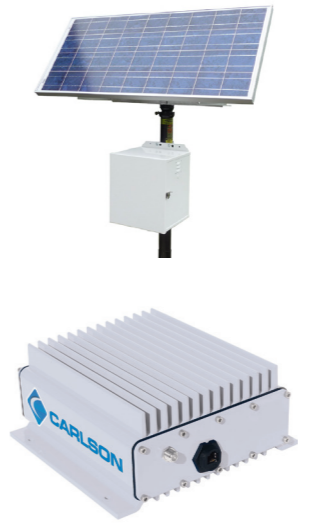
Normanton Laminating Services LTD

MATERIALS AND CONSTRUCTION

Structural Insulated Panels, or SIPs, will be the primary material used in construction. Ease of construction and installation is crucial to the project, and SIPs fulfill this requirement.

They can be faced in any material - the exteriors are faced in Red Spruce panels, while the interiors remain as the original rough oriented strand board (OSB).

WHITESPACE EQUIPMENT + INSTALLATION



The antennae mast is a proprietary solar-powered design of Carlson Wireless, a leader in the white space field. The system needs only 12V to operate and would be self-sustaining. Area residents install their receiver to get service.

ANNOTATED BIBLIOGRAPHY

Andreea-Loreta Cercleux, Florentina-Cristina Merciu, and Daniel Peptenatu. "Conversion of Water Towers – an Instrument for Conserving Heritage Assets." *Urbanism. Arhitectura. Constructii*, Vol 5, Iss 2, Pp 3-20 (2014), no. 2 (2014)
Academic assessment of background and context of water tower reuse, specifically in Europe. A useful jumping-off point for typological and design treatment. Its bibliography in turn led me to several precedent cases.

Elizabeth Catte, "A fierce desire to stay: looking at West Virginia through its people's eyes," *The Guardian*, May 7, 2019, <https://www.theguardian.com/us-news/2019/may/07/a-fierce-desire-to-stay-looking-at-west-virginia-through-its-peoples-eyes?fbclid=IwAR07cQo1eZ9yT6JMP88D2P9HDwwOViztrpA8PHK-GR-1wRmZVA6ePw37eP-s>.
A long form piece, part of the Guardian's "On the Ground: reporting from all corners of America" series. Interwoven with compelling photographs and poems, this article shows just how much community and sense of place and home means to the people of West Virginia.

Chatwin, Bruce. *The Songlines*. New York: Penguin Books, 1987.
An engrossing and rich work of fiction based in the magic of the

path, in this case the Aboriginal "dreaming-tracks." A wonderful distraction from denser research.

Alfred Miller, "Kentucky's \$1.5 Billion Information Highway to Nowhere," *ProPublica*, May 8, 2019, <https://www.propublica.org/article/matt-bevin-kentucky-information-highway-high-speed-internet>.
Article about the challenges of bringing internet to rugged mountainous Appalachia, from bureaucratic to financial to logistical.

Harr, Milton. *The CCC Camps in West Virginia: A Record of the Civilian Conservation Corps in the Mountain State 1933-1942*. Charleston: Quarrier Press, 1992.
My main source for the history of the CCC in the area. Detailed descriptions of the work done at each camp, including dates. This book helped me verify that Bell and Bickle Knob towers were in fact built by the CCC.

Muir, John. *The Wilderness Journeys*. Edinburgh: Canongate Classic, 1996.
Anthology collection of the writings on John Muir, whose portrayal of the American wilderness is quintessential. Some excerpts were used as inspiration in developing the design and other ideas.

Porter, Eliot. *In Wildness Is the Preservation of the World*. New York: Ballantine Books & The Sierra Club, 1967.
Selections of poetry and prose from Henry David Thoreau with accompanying photographs. Thoreau has served as a philosophical backdrop to my thinking, especially as my approach to program moved toward contemplation and conservatoin. Treatise on wildness and its value in our lives.

Kaleigh Rogers, "Rural America Is Building Its Own Internet Because No One Else Will," *Motherboard*, August 29, 2017, https://motherboard.vice.com/en_us/article/paax9n/rural-america-is-building-its-own-internet-because-no-one-else-will.
Part of Motherboard's "Broadband Land" series, this article examines three case studies of grassroots rural internet initiatives (one of which is my precedent in Garrett Co, MD). The whole Broadband Land series brings personal stories of the digital divide into sharp relief.

United States Forest Service. "Fernow Experimental Forest." Accessed November 12, 2018. <https://www.nrs.fs.fed.us/ef/locations/ww/fernow>.
Important resource in identifying the ecological and topographical landscape of the region.

Winstead, Lindsay. "Breathe, Look, Stand Up: The Second Life of Water Infrastructure." *IntAR* vol. 8, (2017): 9-19.
Fascinating piece about reuse of infrastructure, one of which was the Shengyang tower experience. Other projects provided inspiration, as did the diagrams.

ANNOTATED BIBLIOGRAPHY

IMAGE CREDITS

Fig. 1: map and data courtesy of census.gov

Fig. 2: map courtesy of the FCC Broadband Progress Report

Fig. 3: map courtesy of T-Mobile

Fig. 4: CCC image courtesy Works Progress Administration, Federal Art Project; Albert M. Bender, designer

Figs. 10, 12, 29: Kent Mason for The Nature Conservancy

Fig. 11: image courtesy of ForestWander.com;

Fig. 13: image courtesy of randolphcounty.gov.

Fig. 17: image courtesy of webstercountywv.gov

Figs. 19-20, 23, 31-32, 35: tower images from nhlr.org

Fig. 21: image courtesy of Matthew Saffle

Figs. 36-37, 58: Nate Milton/Motherboard

Fig. 40: image courtesy of Oscar Corral

Figs. 41-45: Per Berntsen for Arch Daily

Fig. 48-55: images courtesy of Hut' Architektury

Fig. 56: courtesy of Carlson Wireless

Fig. 57: image courtesy of garrettcountry.gov

Fig. 62-68: Stephen Hiltner, for the New York Times

Fig. 69-75: images courtesy of Iwan Baan

Figs. 5-6, 15-16, 22, 33-34, 38-39: courtesy of the United States Forest Service and the Monongahela National Forest Archives.

