

MODERN HOMESTEAD
The Elemental Farmer and the Subversion of the Agrarian Grid

by
Adele D. Phillips
Bachelor of Science in Architecture
University of Nebraska-Lincoln, 2003

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARCHITECTURE
at the
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
February 2009

© 2009 Adele D. Phillips

All Rights Reserved

The author hereby grants to MIT permission to reproduce and to distribute publicly paper and electronic copies of this
thesis document in whole or in part in any medium now known or hereafter created.

Signature of Author

Department of Architecture
January 15, 2009

Certified by

J. Meejin Yoon
Associate professor of Architecture
Thesis Supervisor

Accepted by

Julian Beinart
Professor of Architecture
Chairman, Department Committee on Graduate Students

THESIS COMMITTEE

Supervisor:

J. Meejin Yoon

Associate Professor of Architecture

Reader:

Ana Miljacki

Assistant Professor of Architecture

Reader:

Alan Berger

Associate Professor of Urban Design and Landscape Architecture

MODERN HOMESTEAD

The Elemental Farmer and the Subversion of the Agrarian Grid

by
Adele D. Phillips

Submitted to the Department of Architecture
on January 15, 2009, in Partial Fulfillment of the Requirements for the Degree of
Master of Architecture

ABSTRACT

America's Heartland is nearing a state of cardiac arrest. The practice of Industrial Agriculture has caused the Central Plains to fail not only environmentally, but socially and economically as well. The problem is not an intrinsically architectural one; but can design, through its practice of rethinking relationships, provide a solution?

This thesis is situated on the boundary between Jeffersonian ideals and those of Sustainability. It proposes a linear architecture of synthesis. The final design is a farming infrastructure with the sole purpose of harvesting 'atmospheric crops' such as wind energy, fog, dew and precipitation. Furthermore, new type of farmer is introduced: the Elemental Farmer. His products are precious commodities, and his territory is not bounded by The Grid.

Thesis Supervisor: J. Meejin Yoon
Title: Associate Professor of Architecture

DEDICATION

This thesis is dedicated in loving memory to my grandmothers, Lois Hohnbaum and Gladys Phillips, and great aunt, Ruby Smith. Without the instruction, guidance, and inspiration of these talented, intelligent, curious and adventuresome women I would not have achieved this end.

GRATITUDE

To Nathan, for unwaveringly weathering my failures, rejoicing in successes, and providing the most steadfast support.

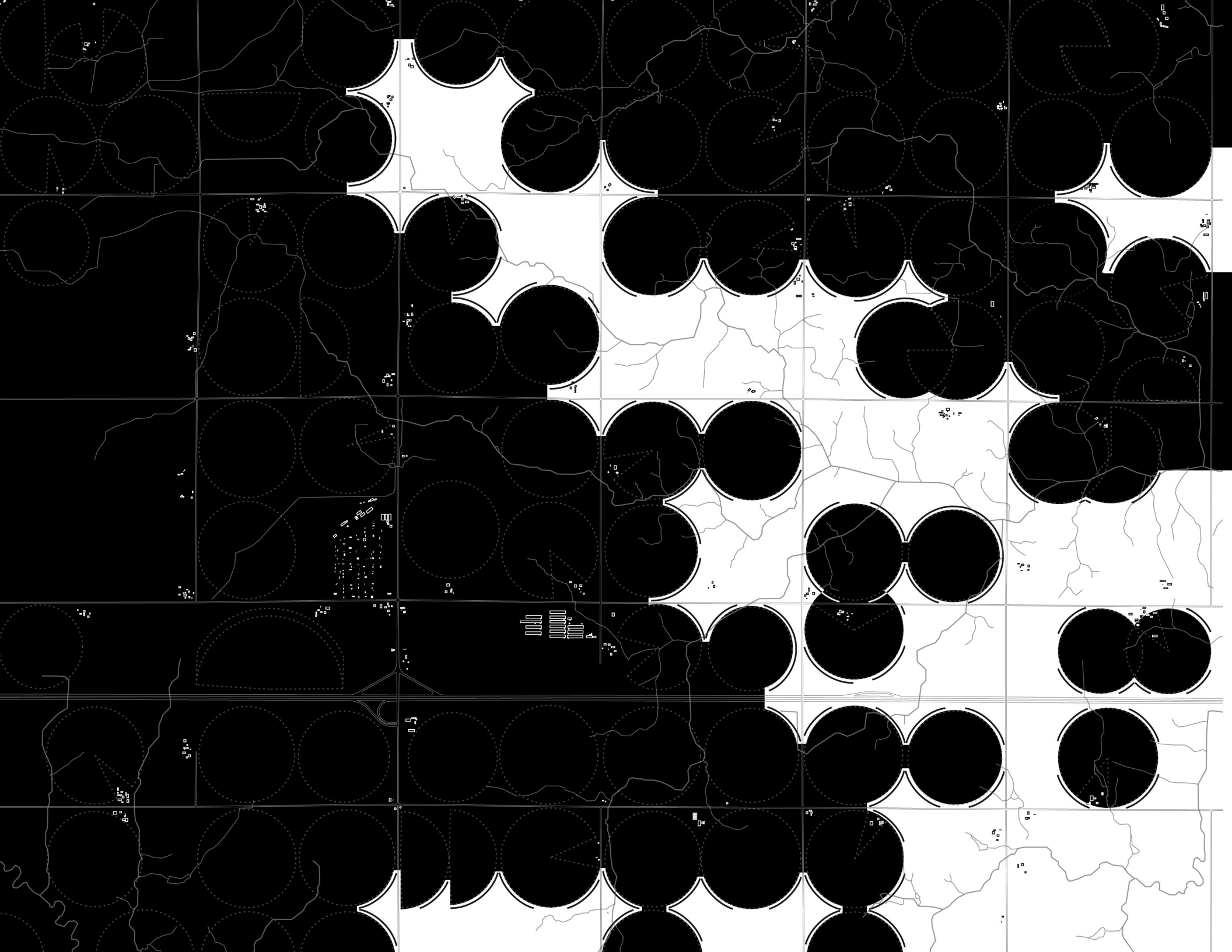
To my parents, Ted and Elaine Phillips, for their loving patience and assistance.

To Gladys Phillips, for her interest in *all things* and for unwittingly commencing the collection of my thesis materials as early as 1955.

To my committee, Arindam, Salome, Erica, Charlie and Sonia, for your time, patience, wisdom and assistance.

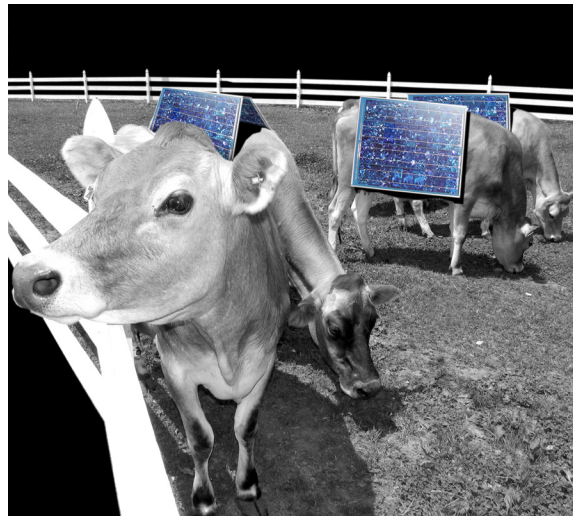
TABLE of CONTENTS

Premise	9 - 31
Final Design	32 - 77
The Elemental Farmer	37 - 40
Infrastructure	41 - 77
Site and Program Analysis	78 - 123
Resources	90 - 107
Site Refinement	108 - 117
Concept Collages	118 - 123
The Townie's Illustrated Prairie Guide	124 - 136
Bibliography	137 - 140
Image Credits	141



Modern Homestead

The Elemental Farmer and the Subversion of the Agrarian Grid

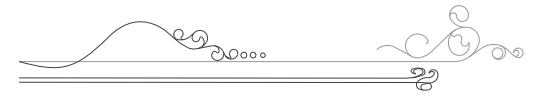


Adele Phillips

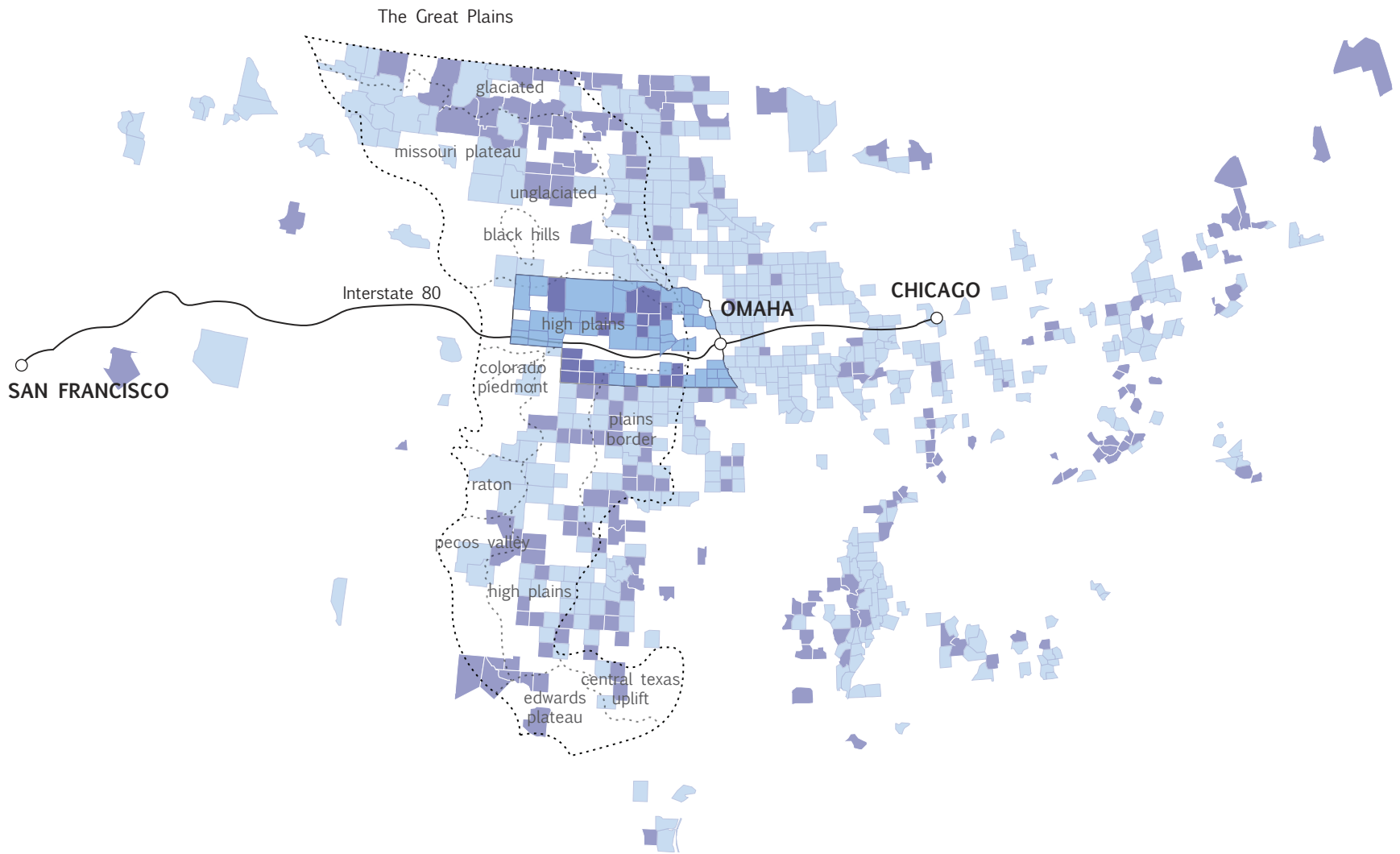
M.Arch Thesis



Premise



The Argument for Agrarian Architecture



The United States of America, 2000 Census

- Declining: 547 Counties
- Accelerated Decline: 232 Counties

The middle of the United States is very young. Settled last and stuck between two poles, a clear latitudinal movement and grain prevails. In 1974, the interstate highway system crossed Nebraska, reinforcing the already existent pattern of movement, increasing its speed, and creating a corridor of unquestionable significance and steadfastness. Interstate 80 ultimately connects Teaneck, New Jersey to San Francisco, California, and when it crosses Nebraska it follows such historic routes as the Oregon Trail, the California Trail and the Mormon Trail. Nebraska's section of the interstate is 455 miles long, and the state's only stable populations are along the interstate. Indeed, one can generalize that the livelihood of the entire state depends upon only 2 of the 3 spatial axes: the x-axis of the East and West coasts, and the z-axis of rainfall and ground water supply.

The current population trend in Nebraska and the rest of rural America is that of decline: an out-migration from farms and farming communities. This is due to the fact that as farming technology has grown, and farmers require a greater number of acres to earn a living, and as companies become vertically integrated as a means to reduce costs and gain profits, our romantic American Gothic has become a being entirely different than what it was 50 years ago. Today, farming is a factory endeavor and the romantic west is actually a blanket monoculture. Rural America is just as *developed* as any city. The difference between the developed urban condition and the developed rural condition is mere diversity.

The aim of this thesis is not to reconcile the depopulation of the Plains through architecture, but rather to reconcile the region's *lack of diversity*. Architecture is a discipline of rethinking relationships and is suited for this task.

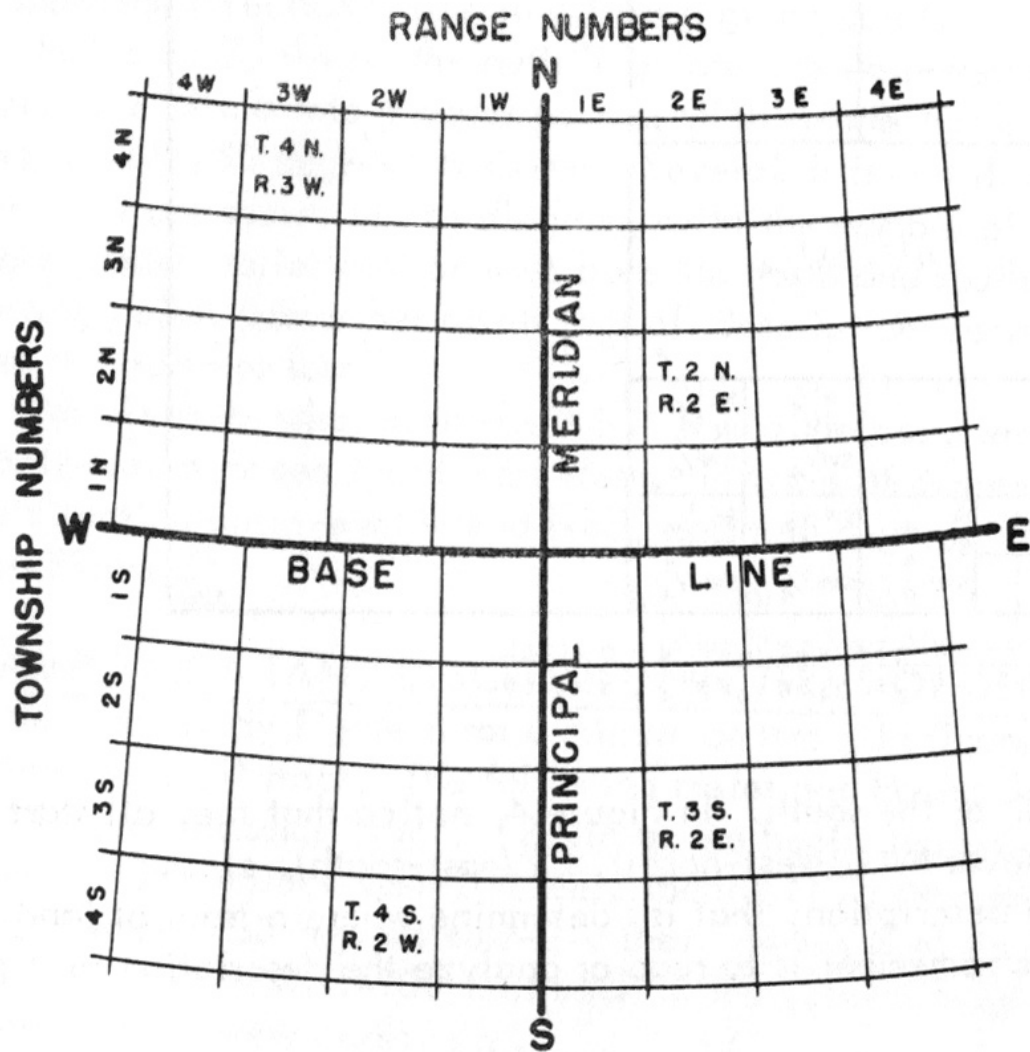
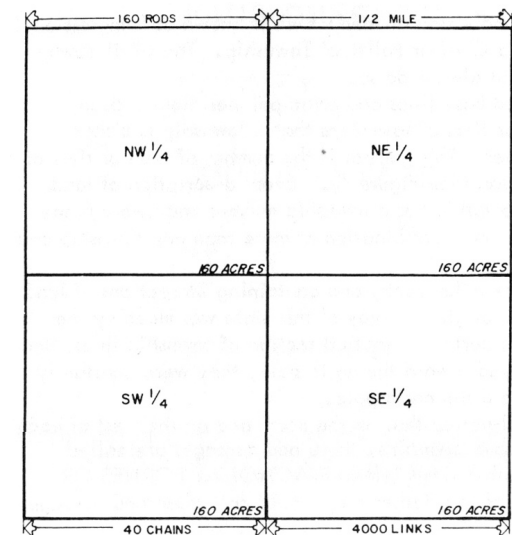


Diagram describing how the Land Survey System took into account the curvature of the earth.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

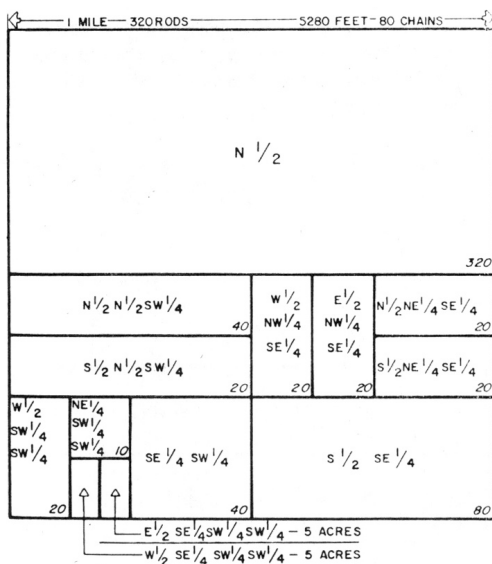
A regularly laid out township.



In the land rush, a settler would get a claim for 160 acres.

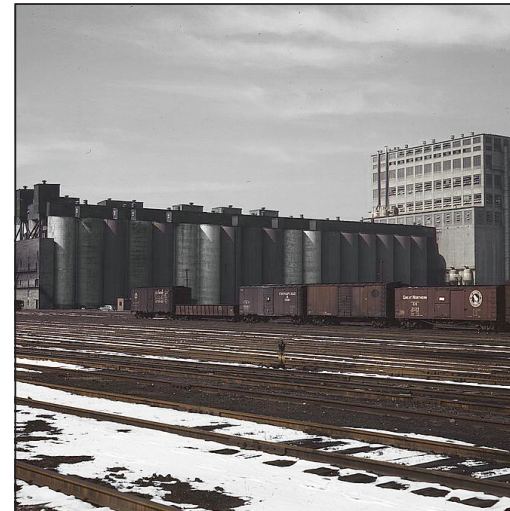
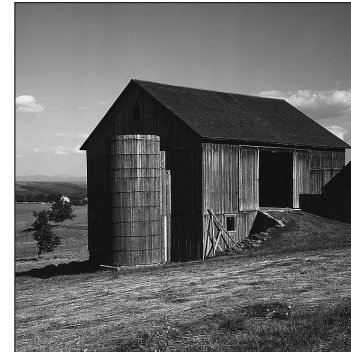
Millions of years ago, North America's great inland sea retreated. The ancient waters were sequestered in porous rock, and the sea bed became fertile land which became a great grassy plain. Hundreds of years ago Native Americans, Spanish, French and English walked the region. In 1785, sprouting from the northern shore of the Ohio River grew the Public Land Survey System as a means of generating tax revenue for the budding United States government. In the mid 1800's The Grid had reached The Plains region and quantified it.

In the figure directly to the left, the dashed line represents a river separating two counties and flowing through the layout of a township. The land north and west of the river could be a township in one county, and the land south and east could be a township in another county. Which ever county the land is in, it retains the same section, township and range numbers for purposes of property descriptions. This is how the grid blanketing system took hold, set in, and began erasing the landscape's inherent distinctions.



Today the soils drift, the rivers and aquifers go dry, the young seek lives elsewhere, the chemicals compound, linger and contaminate, and Industrial Agriculture annually rapes the Great Plains. The grid today, and the consequential sub-grid of center-pivot irrigation, is uniformly and efficiently marching the nation's and the world's primary food source toward self-destruction.

Standard means of further parceling the square mile.



LIVESTOCK

EQUIPMENT

STORAGE



HISTORY



YESTERYEAR



TODAY

IRRIGATION

The failures of the current agricultural landscape in the Grain Belt are varied and can be categorized as: environmental, economical, and social.

Environmentally.

There is air and water pollution due to soil erosion; which is caused by overworking the soil and inadequately rotating crops. There is water pollution through the over application of fertilizers, fungicides, pesticides, and over-population of mono-species.

Economically.

Subsidies entice farmers to grow only a set handful of crops because they guarantee a permissible degree of non-failure. Food and seed giants such as ConAgra and Monsanto have their hands in all levels of commodity production, thereby reaping the lion's share of any profits to be had.

Socially.

The scale at which the region's agriculture operates makes getting a start in farming difficult, confusing, costly and fearful endeavor. The low, and certainly questionable, profitability of farming is widely unappealing.

Through intensification, expansion, exploitation, specification and so on, Industrial Agriculture has literally leveled the playing field.

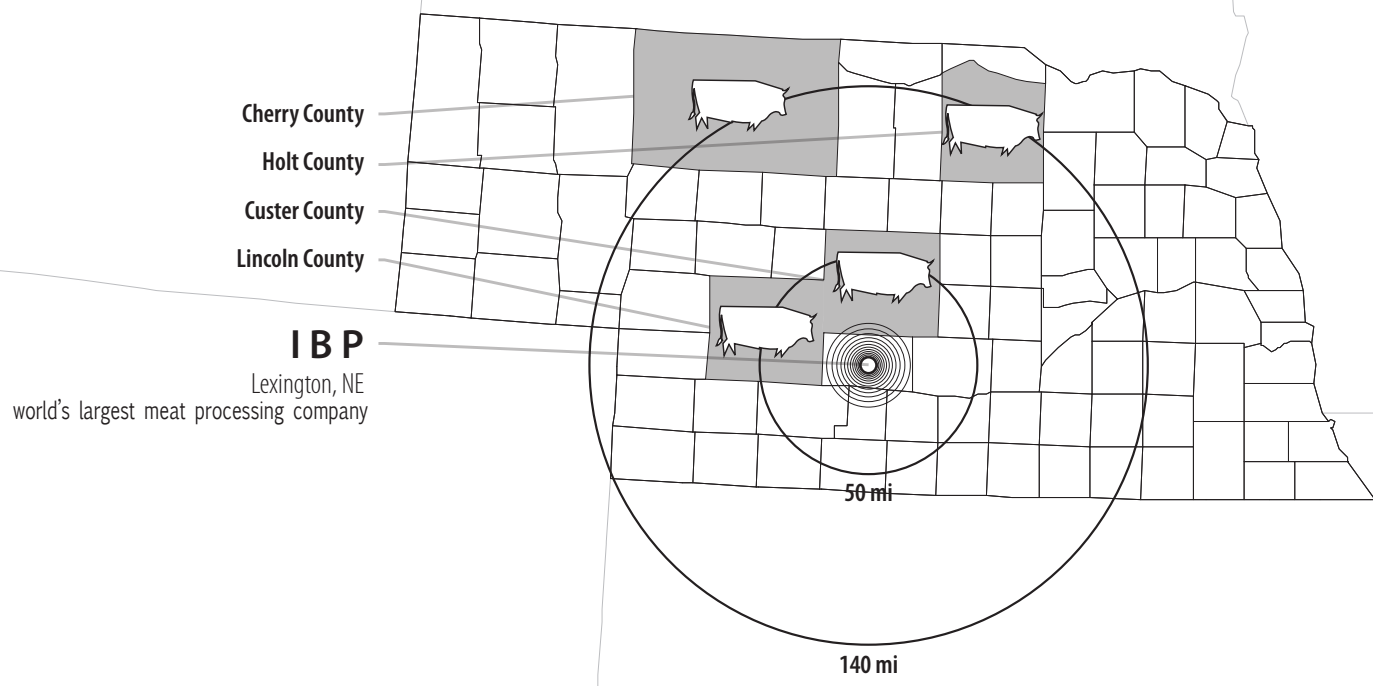
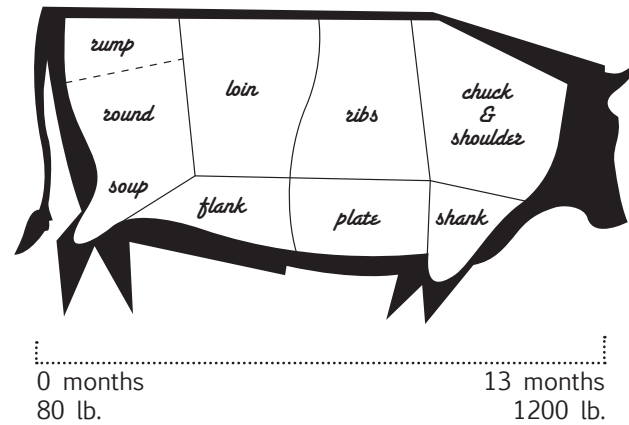


Illustration of the geographic concentrations of the example commodity: BEEF.



Nebraska's Cow to Human Ratio = 4:1

Cherry County = 27:1

Holt County = 9:1

Custer County = 8.5:1

first in the United States

second in the United States

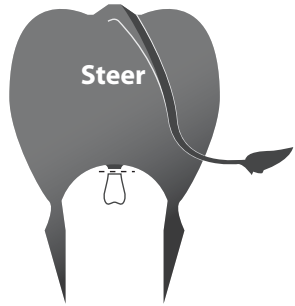
third in the United States

The Power of Beef.

A key element in Nebraska's agricultural foundation, the Beef Industry has had both significant environmental and economic impacts.

Today, it takes a mere 13 months to grow your steak. Fifty years ago, it took 4 - 5 years. What has sped up the process?

- The introduction of 'animal cities' or Concentrated Animal Feeding Operations.
- Intensified breeding cycles and the popularization of Artificial Insemination.
- Colossal volumes of corn, mixed with protein and fat supplements.
- A battery of drugs [hormones, vaccines, vitamins and minerals] administered by in-house veterinarians.

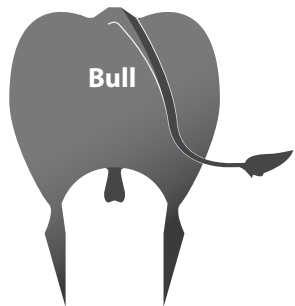


Once they have reached appropriate weight at the 'finishing lot' --between 1100 and 1200 lbs-- steers are broken down into various cuts at a meat processing plant.

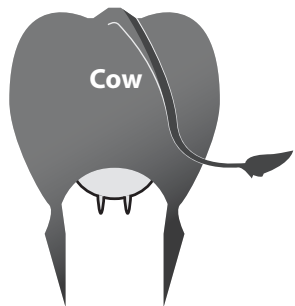
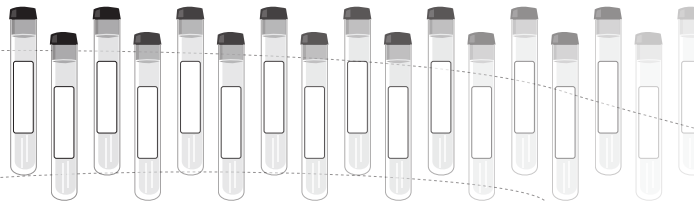
Portions which cannot be formed into food product continue on to the rendering plant.



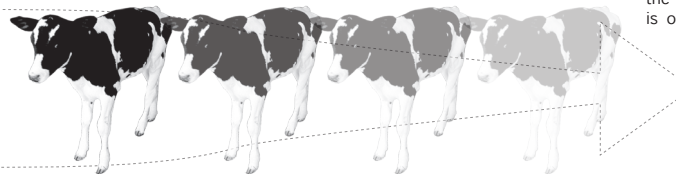
As with cows, bulls eventually make their way to the rendering plant where they, too, are processed into leather, tallow, bone meal, blood meal, meat meal and oils. These products are used in candles, cosmetics, gelatin, leather goods, pet foods, fertilizers and weight-gaining feeds for other livestock.



Few bulls are so genetically desirable that their sperm becomes a marketable product. But if a bull is of ideal genetic makeup, the bull can sire tens of thousands of calves via Artificial Insemination.



Young females, called 'Heifers' become sexually mature at approximately 18 months, from which time they will calve once per year.

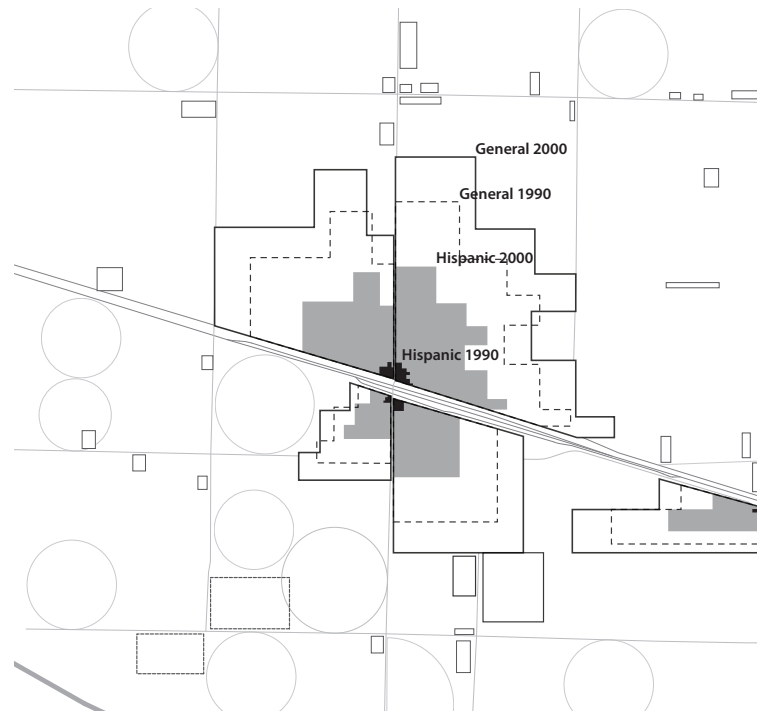


A cow will give birth to 3-4 calves in her lifetime. Due to the intense breeding, milking and feeding schedules of the beef and dairy industries, the average cow's life span is only 5 years.

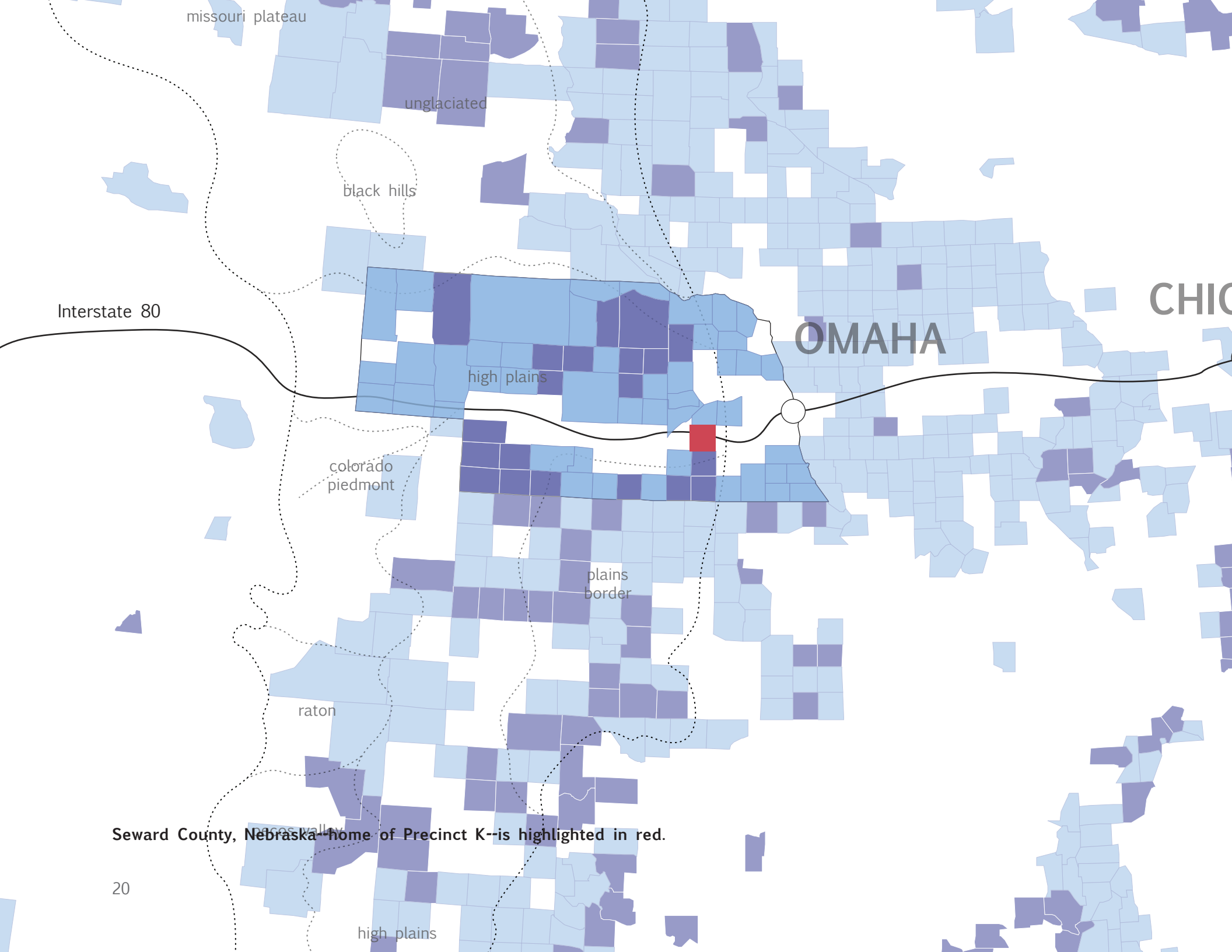


Once a cow has become too costly to maintain due to her inability to produce, the cow is sold to a rendering plant in order to be processed into ingredients for other products..

Migrant populations have been a boon to the survival of cities such as Lexington, Nebraska.



Vertically integrated companies such as ConAgra and Tyson Foods are the key owners and producers of beef products within the state of Nebraska; making them also key employers. Such powers create imbalances that are readily evident, such huge demographic changes within rural areas via a single processing plant's hiring practices. Interestingly, the often disregarded and stigmatized Migrant Labor force has become the saviour of many rural communities.



missouri plateau

unglaciated

black hills

Interstate 80

OMAHA

CHICAGO

high plains

colorado piedmont

plains border

raton

Seward County, Nebraska valley home of Precinct K--is highlighted in red.

20

high plains



CAGO

The chosen site for the thesis is Precinct K, Township 10 North, Range 2 East of the 6th Prime Meridian.

This location is at once both The Middle of Nowhere and The Middle of Everywhere. The 36 square miles comprising Precinct K are typical of the region. The earth is fertile and gently rolling. The ‘regulars’ are Republican. Corn, ‘beans, wheat and alfalfa are the standard colors of the farmer’s palette. Rain is modest, but groundwater is accessible, so center-pivot irrigation is the means by which to raise a hearty stand.

The precinct maps on the following pages illustrate how the scale of individual farming efforts has had to increase over the years in order to remain competitive, or simply survive. They also illustrate the death of diversity.

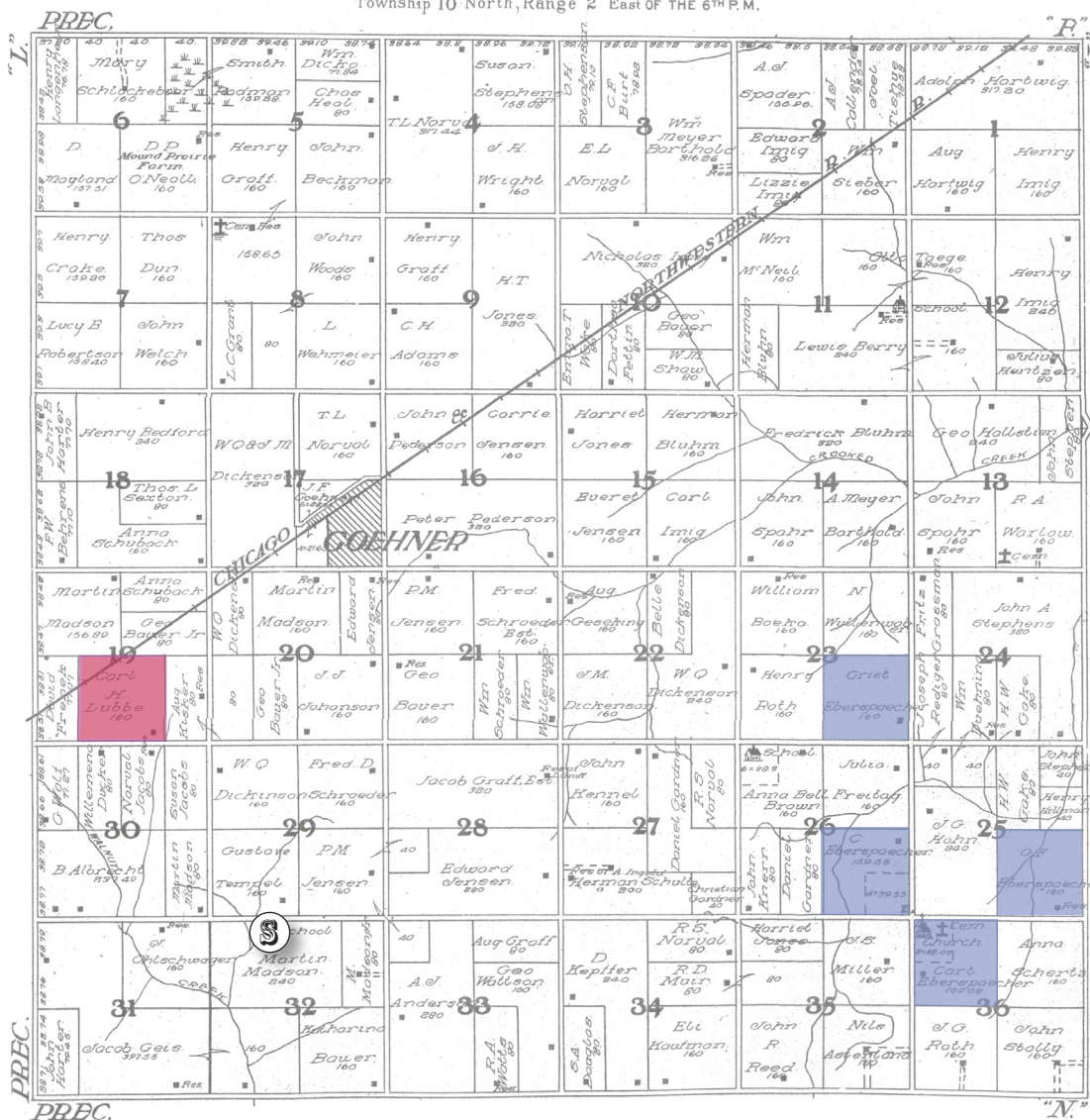
MAP OF PRECINCT K

Date: Feb 14 1908

Township 10 - North, Range 2 East OF THE 6TH P.M.

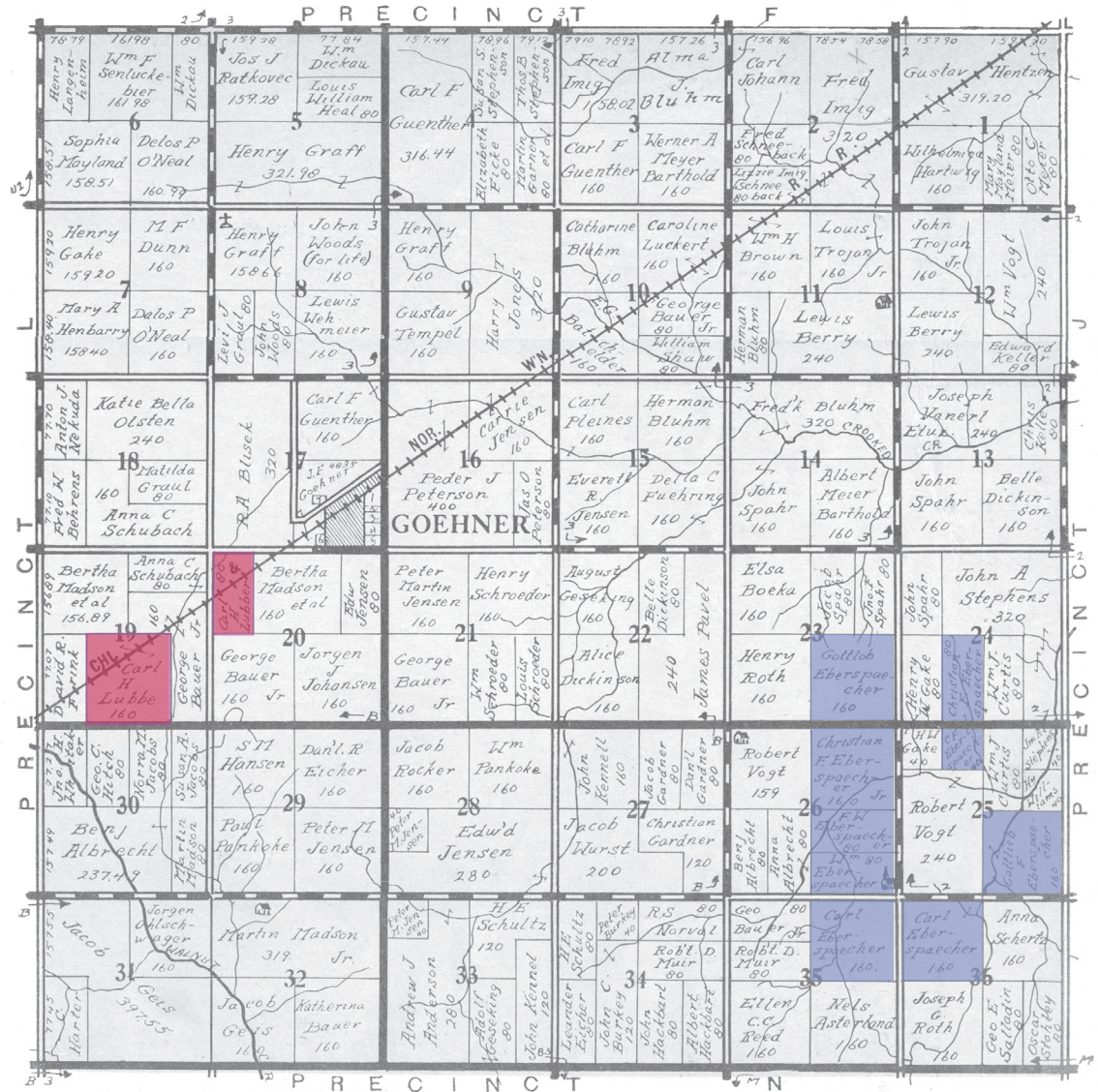
Precinct K - 1908

In 1908, all roads are dirt. Goods travel to or from the area via a short branch of the Chicago - Northwestern rail line. A handful of country schools exist. Carl Luebbe (red) farms 160 acres at the western edge of the township, while the Eberspacher family (blue) has settled to the east.



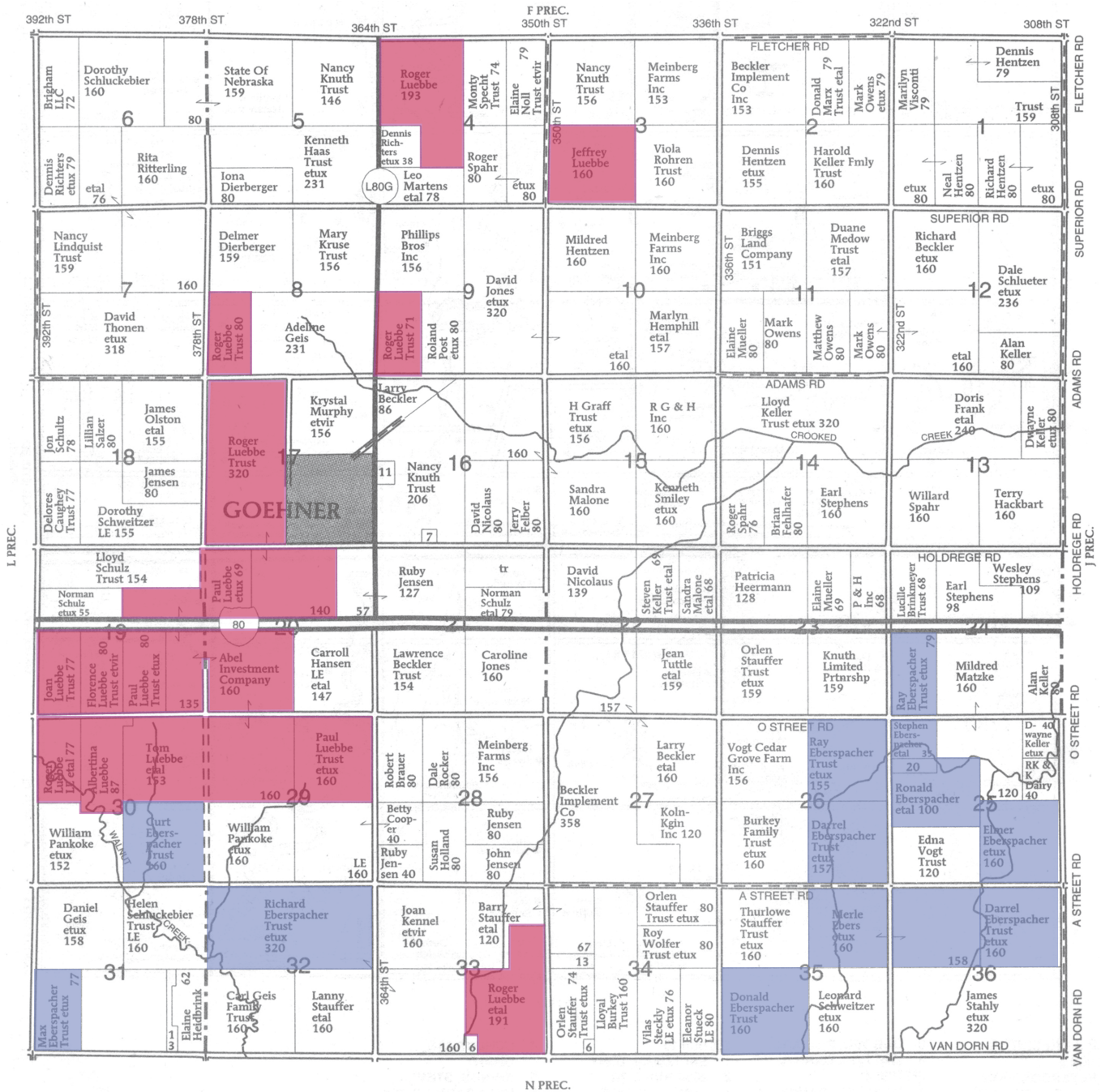
Precinct K - pre 1955

Country schools and minimal dirt roads were the norm in Nebraska well into the 20th century. In fact, it was not until the advent of the interstate highway that Nebraska began to invest in its roads and begin a number of improvement measures. Ted Phillips and Elaine Cast, who were born in 1948 and grew up in a town not far from Goehner, can recall carting eggs and milk to the local train depot for transport on the railway, in addition to walking to country school until as recently as 1959.



Precinct K - 1996

Nearly all roads are manicured gravel and Interstate 80 bisects the precinct. The Luebbes (red) have significantly increased their territory and likely farm ground outside these 36 square miles. Farming is their primary means of making a living.



N PREC.



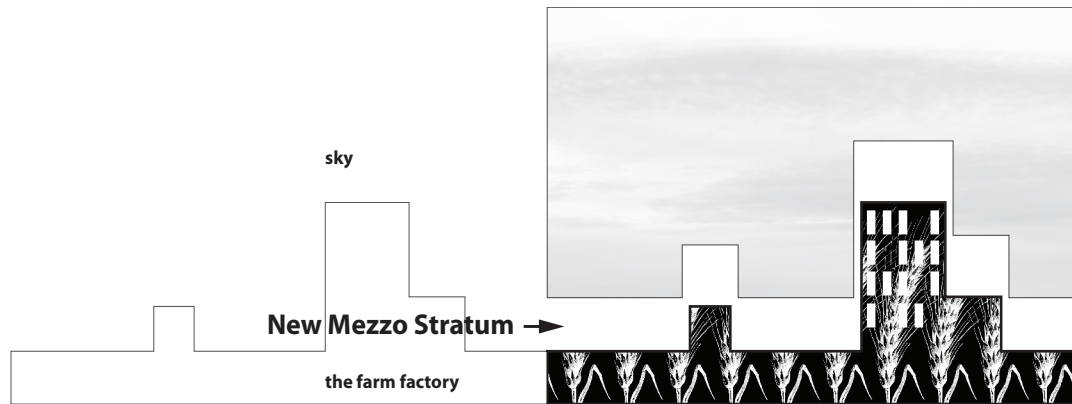
Panoramas of typical center-pivot adjacent gravel road intersections.





Panoramas of typical center-pivot adjacent gravel road intersections.



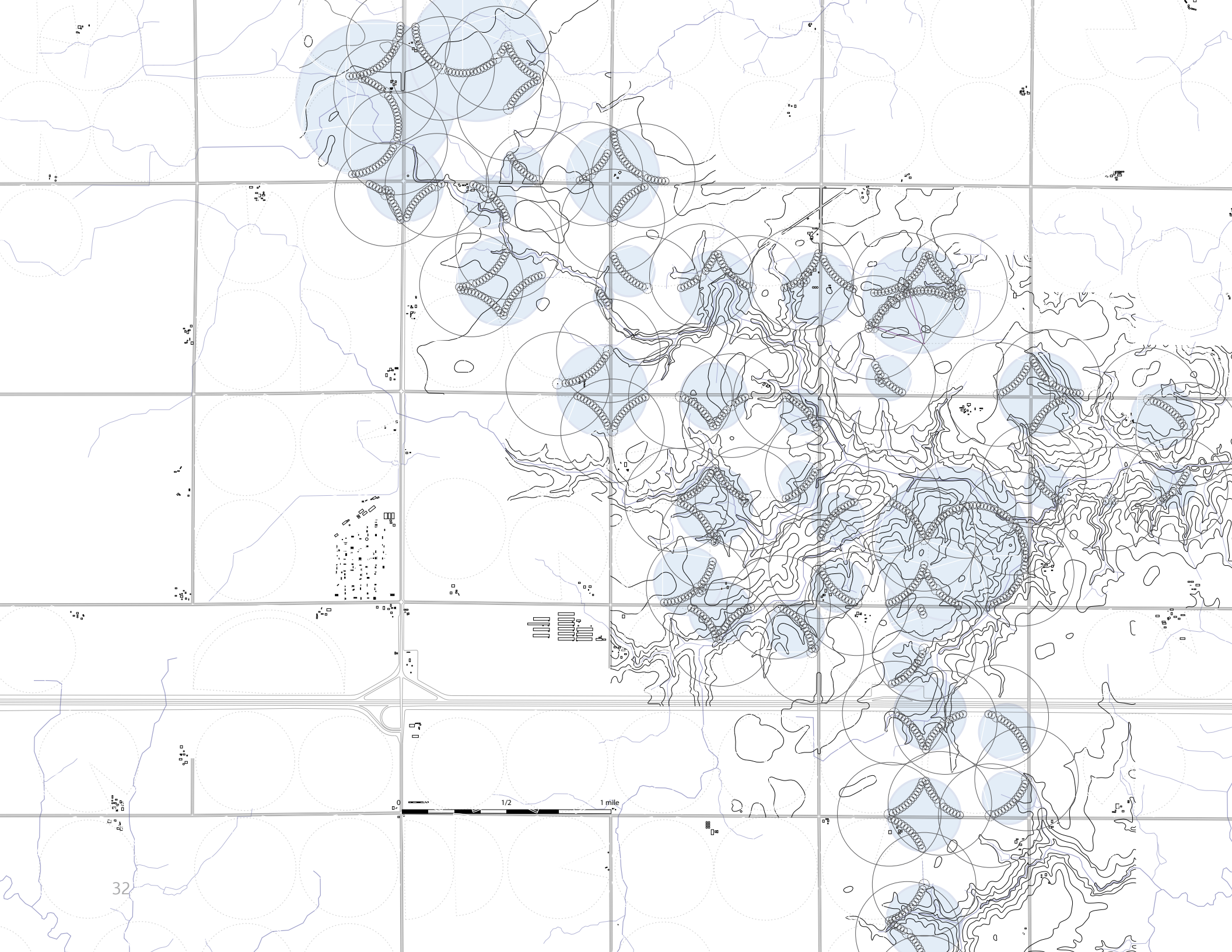


Industrial Agriculture is a program which, as a result of the thoroughness of an age-old method for tax generation, has successfully overridden an inherently beautiful landscape. It is an entrenched, immovable reality. However, the implications of leaving the situation unchanged are just as real, and have already been exceedingly damaging. A counter-program must be developed and deployed.

This counter-architecture must be off of the ground, must not hinder the horizon, must facilitate diversity, must be competitive at the agricultural landscape scale, and must sustain itself.

Diagrams illustrating where one could introduce 'Architectural Inter-cropping.'



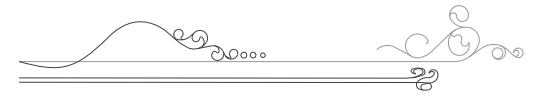


32

1/2 1 mile



The Final Design
The Elemental Farmer and
Modern Homesteading

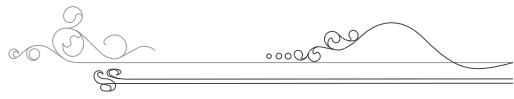


The presence of ground-water makes farming in much of the plains states possible. The ancient Ogallala Aquifer--a thick substrate of porous, water-collecting rock--feeds the nations burgeoning grain production. It is the primary source of water for the most prevalent form of irrigation, 'center-pivot' sprinkler irrigation. Developed in the 1950s, pivot irrigation had within the first 20 years of its utilization, already left its significant mark on the agrarian landscape. The seemingly endless expanse of 'pivot circles' is readily visible from the sky. From the ground, it is the skeletal, wheeled machines simply called 'pivots' which draw our attention. Creeping along at imperceptible speeds, their movement goes unnoticed.

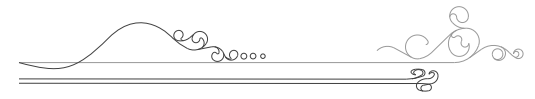
It is the combination of this unique irrigation system and a fairly rigid road structure which creates the Great Plains' interesting patchwork. Oddly, it is also this patchwork which promotes the region's negative image of being monotonous, uninspired and essentially invisible. Can this patchwork be reworked and used to generate a new type of regional architecture?

Yes. Illustrated in the following pages is an architecture that has been generated by focusing on the physical and programmatic relationship between a) the native, non-irrigated and nearly-erased hydrological characteristics of the site, and b) the non-native center-pivot hydrology; followed by c) the introduction of a synthesizing agent.

The synthesizing agent is The Elemental Farmer and his radical, atmosphere-harvesting home-stead situated on the border between Mother Nature and Father Jefferson. The Elemental Farmer is perhaps in his mid thirties, lives in an apartment, is thinking about raising children but not sure about doing it in the city, grows herbs and salad greens in carefully tended pots on the windowsill, and maybe even buys into a farm-share produce program. The following matrix is what Mr. New Farmer will use to guide the implementation of his agrarian dreams.



The Elemental Farmer



A Program Guide to Sustainable Farming

RESOURCE TYPE	FORMS MANIFESTED	PRODUCT	METHODS	
water	groundwater	water	well, screens & pump, pipes, windmill, water tank	
	fog	water	screen, standards, pipes & cisterns, filtration equip.	
	falling precipitation: rain, snow, hail	water	non-porous catch surface, pipes & cisterns, filtration equip.	
	surface run-off	water	non-porous catch surface, slope, pipes & cisterns, filtration & remediation equip.	
solar	radiation	heat > electricity	reflective parabolic trough, Dewar tube, boilers, power station, grid access	
		heat > hot water	parabolic solar reflectors & Dewar pipes	
		electricity	photovoltaic cells, batteries & power grid access	
wind	wind	electricity	horizontal or vertical- access turbines, crane pad, power grid access	
	tornado			
biomass	prairies	soil [conserved]	threshing & planting equipment, routine burns	
		habitat [restored] > wildlife	threshing & planting equipment, routine burns	
		fodder [bale or loose]	threshing equipment, protected dry storage or sealed anaerobic storage	
	sod	sod [building material]	cutting, lifting and hauling equipment	
	stover	fodder [forage or bale feed]		baling equipment, protected dry storage or sealed anaerobic storage
			fuel [cellulose]	baling equipment, appropriate storage
	timber	bale [building material]		baling equipment, protected dry storage
			soil [conserved]	planting, watering
		habitat [restored] > wildlife	planting, watering	
		fuel [burning]	felling & de-limbing equipment, appropriate storage	
building materials		felling & de-limbing equipment, protected dry storage		

SCALE of INTEREST & TYPE of USER*

municipal / agricultural / private
 agricultural / private
 agricultural / private
 agricultural / private

municipal / agricultural / private
 private
 municipal / agricultural / private

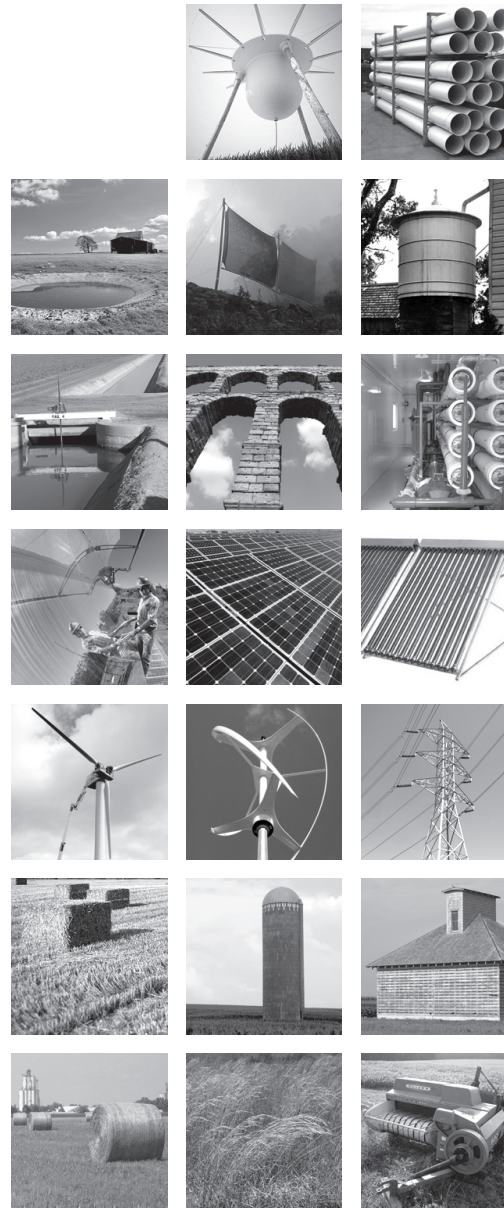
municipal / agricultural / private

municipal / agricultural / private
 agricultural / private
 agricultural / private

private
 agricultural / private

municipal / agricultural / private
 private
 municipal / agricultural / private
 agricultural / private
 private
 municipal / private

COMPONENTS



LOCATION [appropriate]

Ogallala Aquifer
 valleys
 anywhere non-covered
 ditches & draws / anywhere

 north-south orientation / flats / S. E. & W. slopes
 anywhere non-shaded, appropriately angled
 anywhere non-shaded, appropriately angled

 turbine elevation: 100'+

 anywhere
 anywhere
 minimum area: 1 acre [= one 1000 lb. animal unit]
 established prairie with low erosion risk
 minimum area: 80 acre

 harvested crop-land
 harvested crop-land
 field edges, road edges
 anywhere
 minimum area: 1 acre
 established forest, minimum area: 5 acre

* municipal: high public demand, small area, Townie
 agricultural: low public demand, large area, Today's Common Farmer
 private: low public demand, low area, The New Elemental Farmer

ARCHITECTURAL SERVICE

wall, screen, partition

roof, tent, wall

ground, landscape, dew pond

wall

screen, wall

roof, wall, floor

column, post

landscape / pastoral aesthetic

landscape / pastoral aesthetic

wall

wall

landscape / pastoral aesthetic

wall

landscape

landscape

seasonal wall

'NATURAL' SERVICE

water filtration & storage

protection from wind & sun

protection from precipitation & sun

water filtration & storage

protection from precipitation & sun

water filtration, protection from wind

water filtration, protection from wind

protection from wind & sun

protection from wind & sun

fertilizer

protection from wind & sun

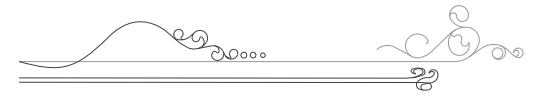
water filtration, protection from wind & sun

water filtration, protection from wind & sun

protection from wind

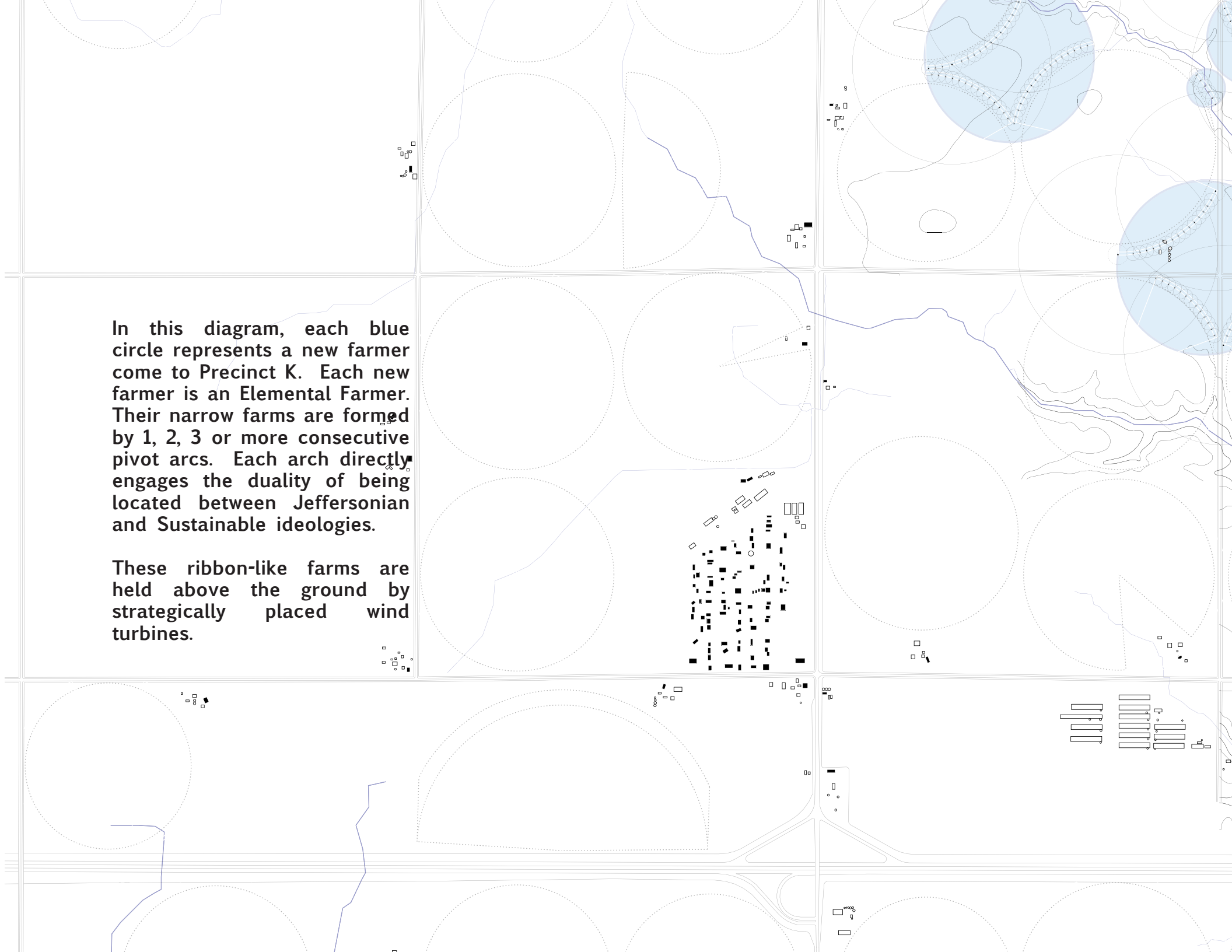


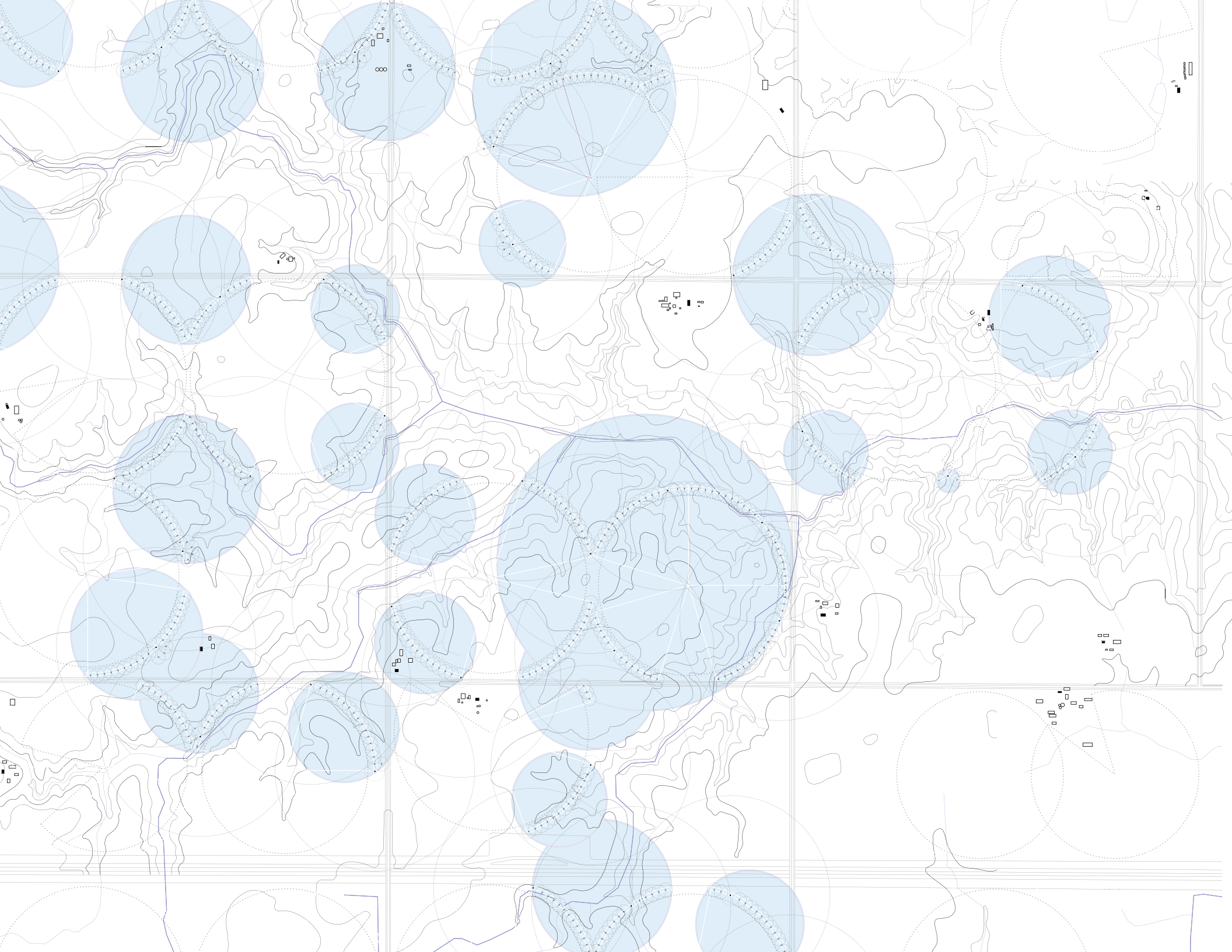
Infrastructure
Designing a Fog and Wind Farm

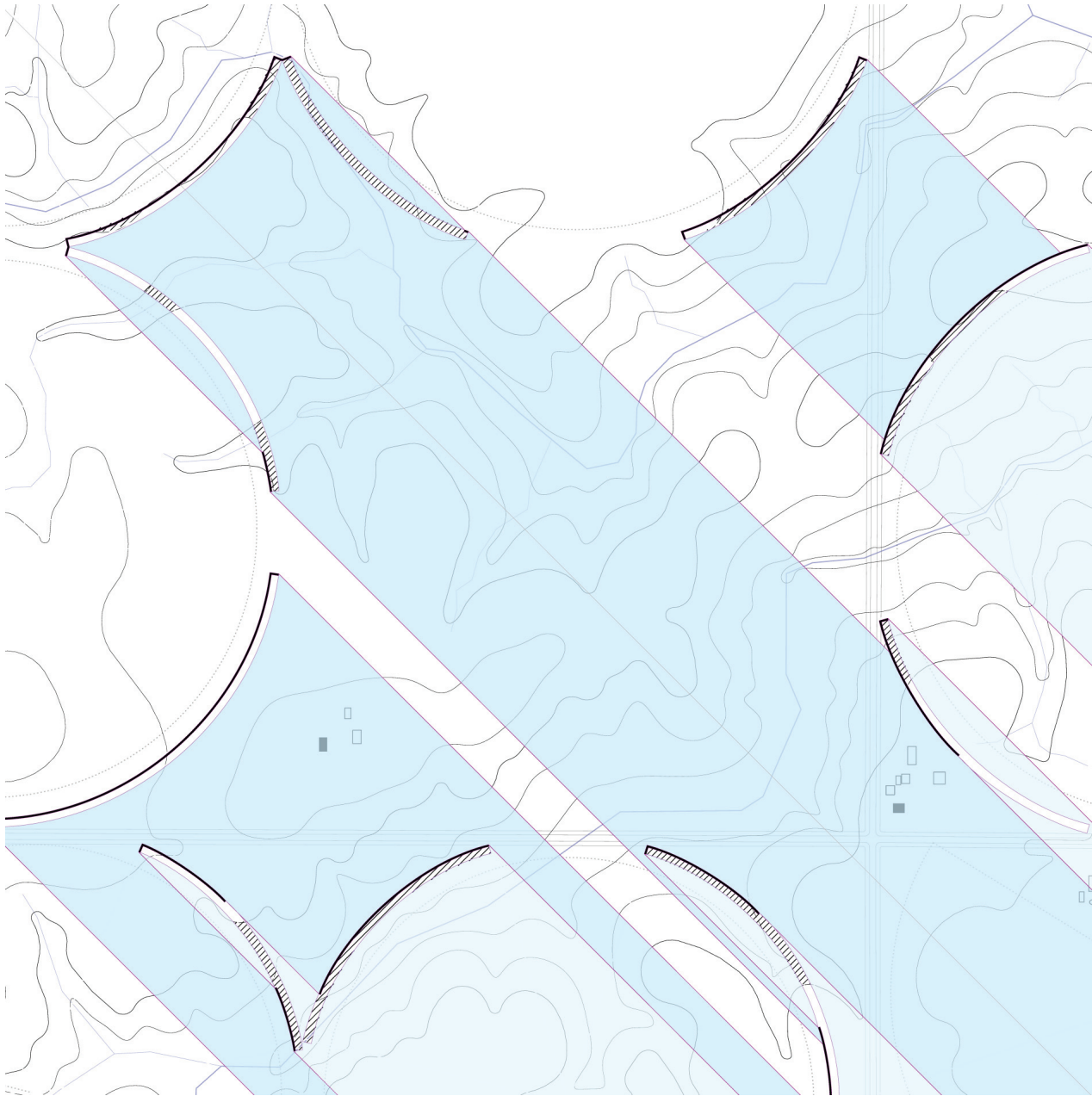


In this diagram, each blue circle represents a new farmer come to Precinct K. Each new farmer is an Elemental Farmer. Their narrow farms are formed by 1, 2, 3 or more consecutive pivot arcs. Each arch directly engages the duality of being located between Jeffersonian and Sustainable ideologies.

These ribbon-like farms are held above the ground by strategically placed wind turbines.



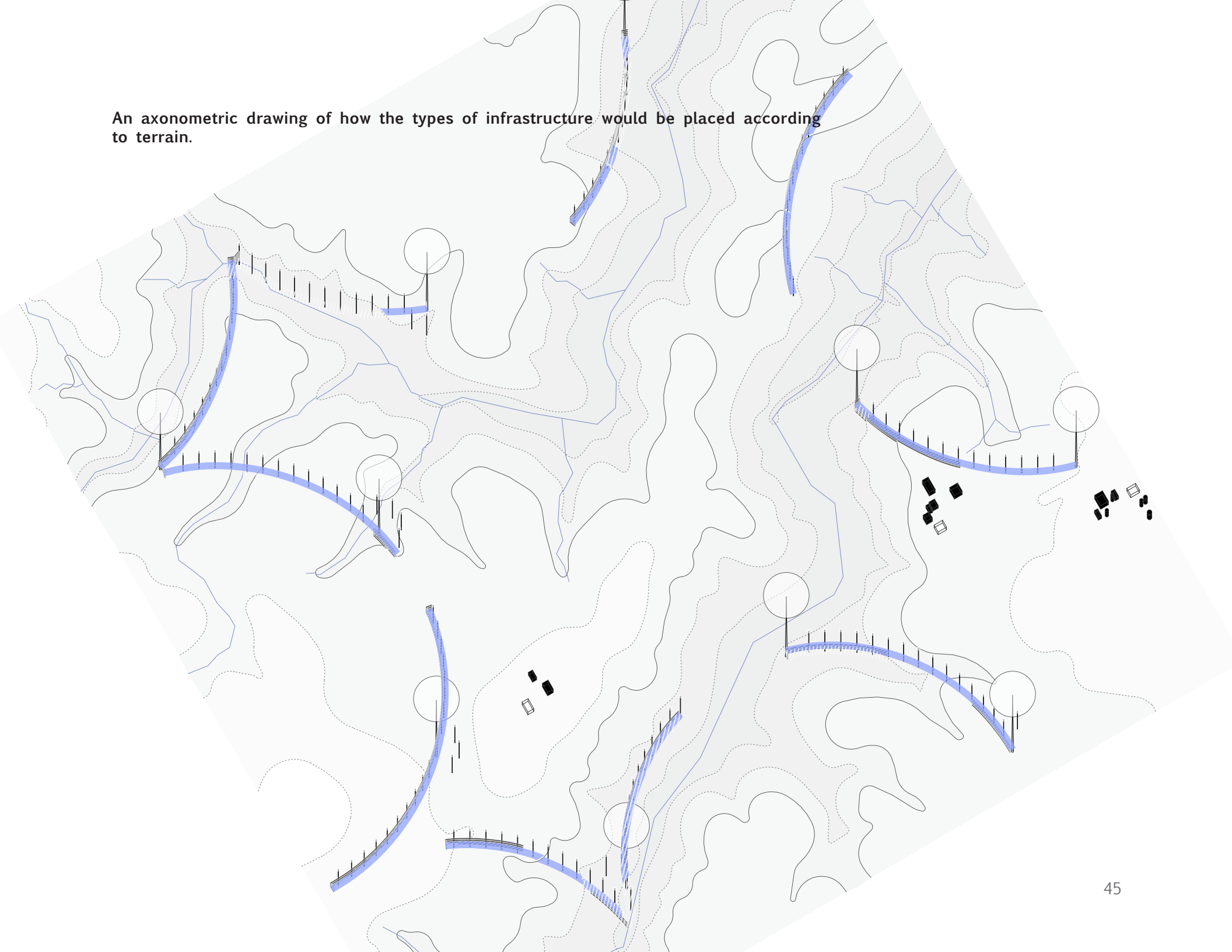




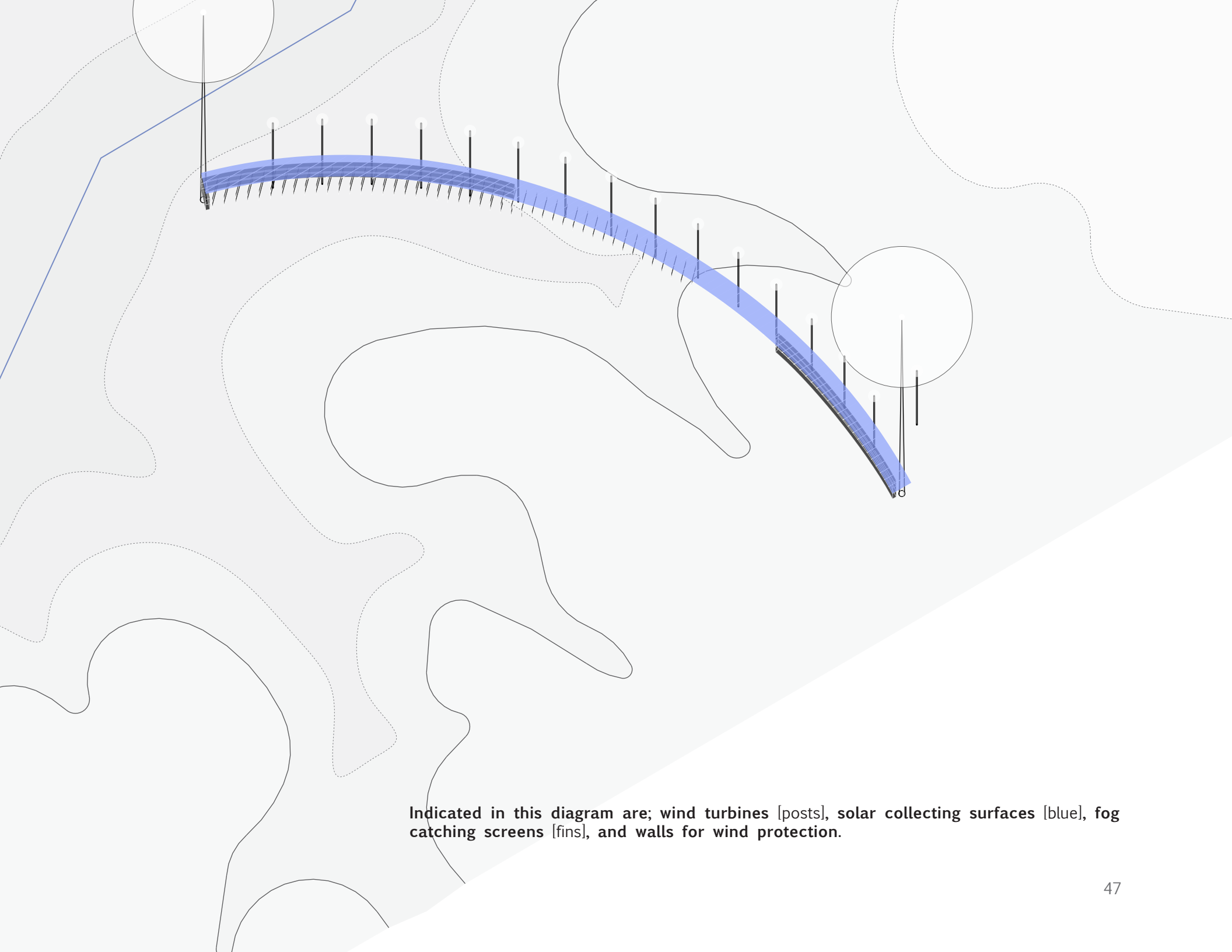
The context of the site is the determining factor in what infrastructure occurs where. For example; walls are only indicated where there would be wind to block, and fog screens are only indicated in areas where it is likely to collect.

This drawing illustrates the placement of fog screens and walls, in addition to the wind-shadow that would be created

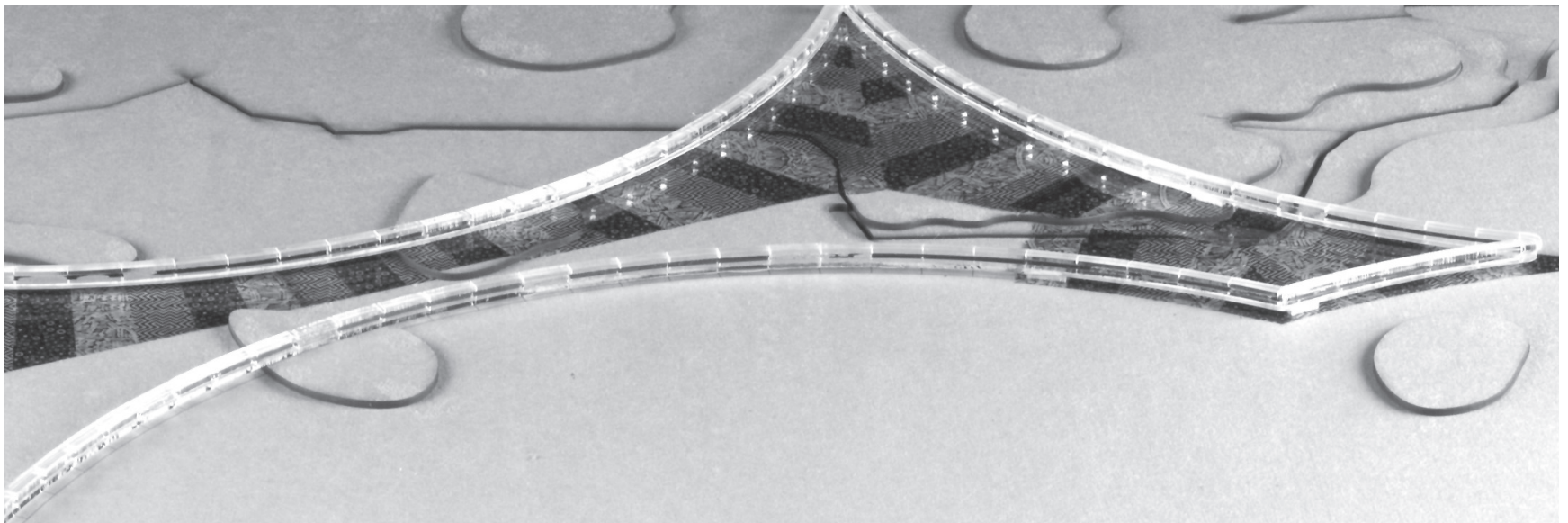
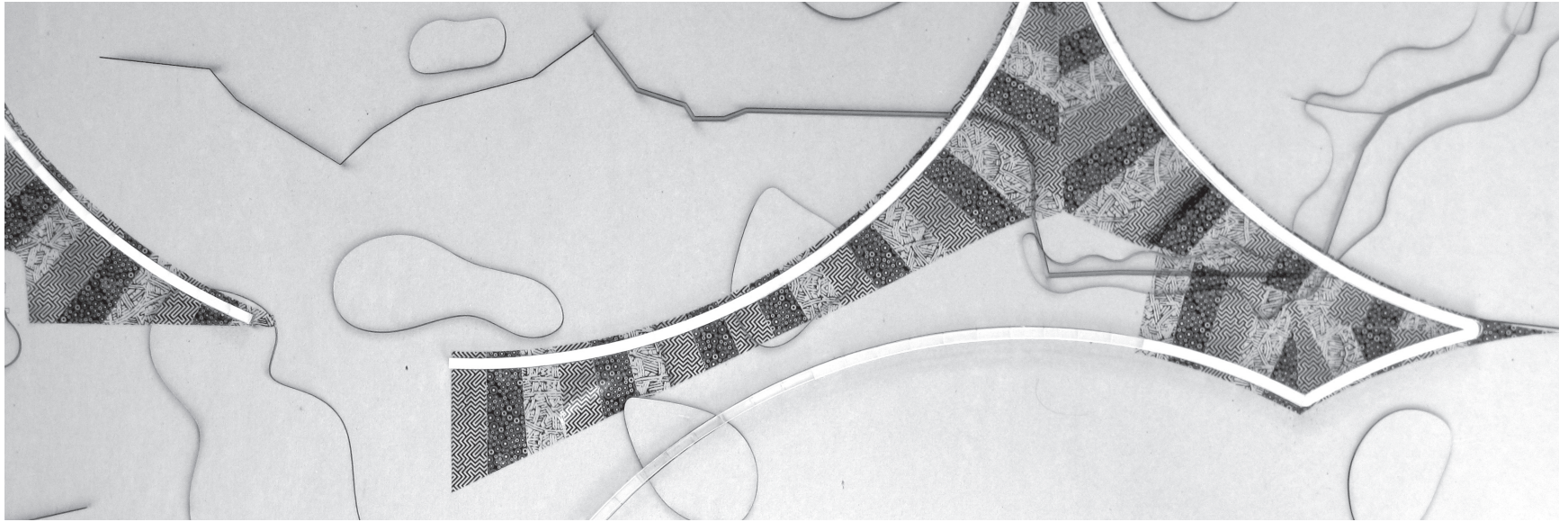
An axonometric drawing of how the types of infrastructure would be placed according to terrain.

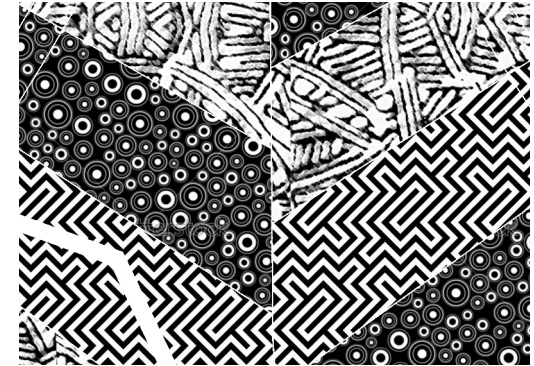
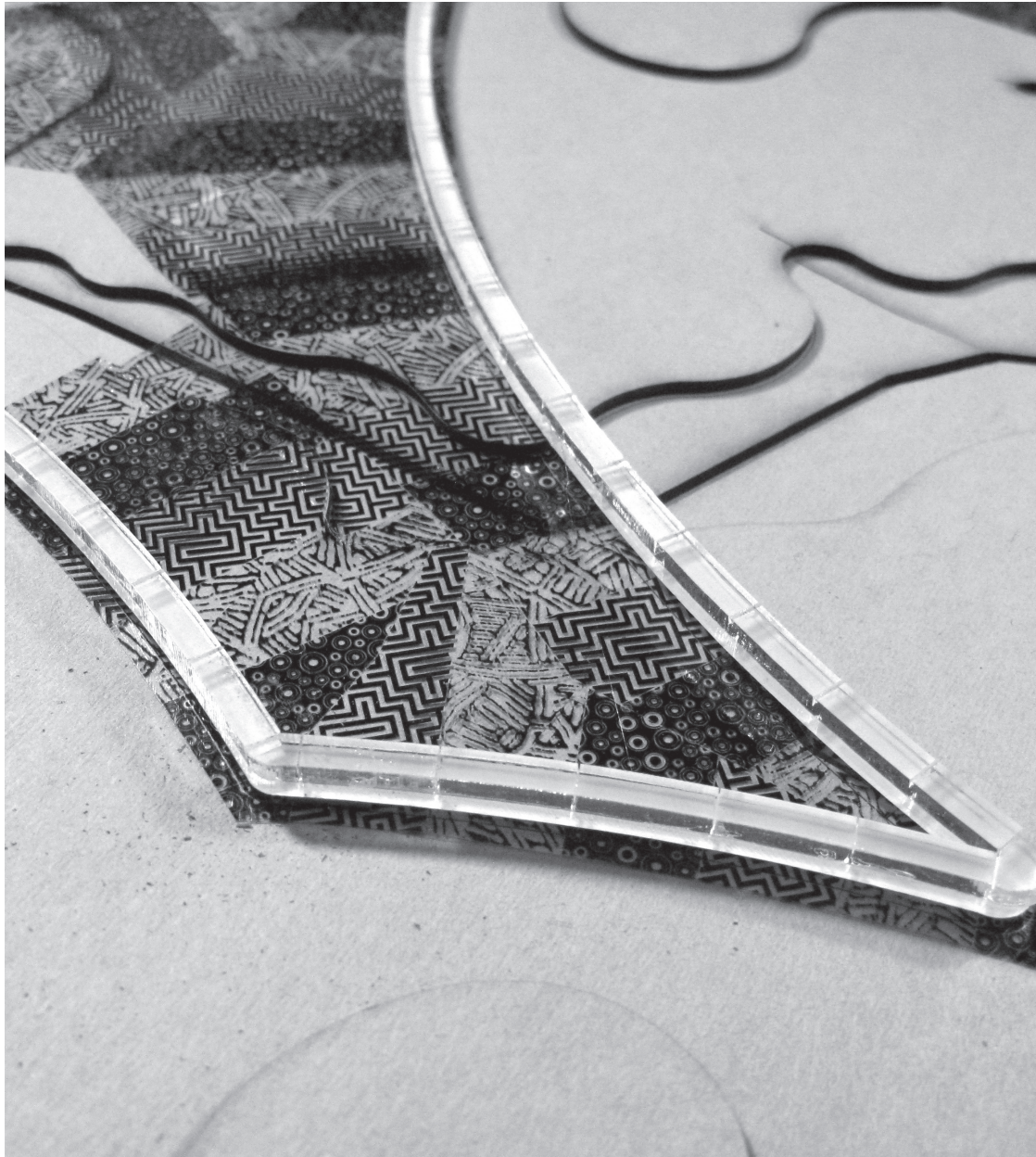




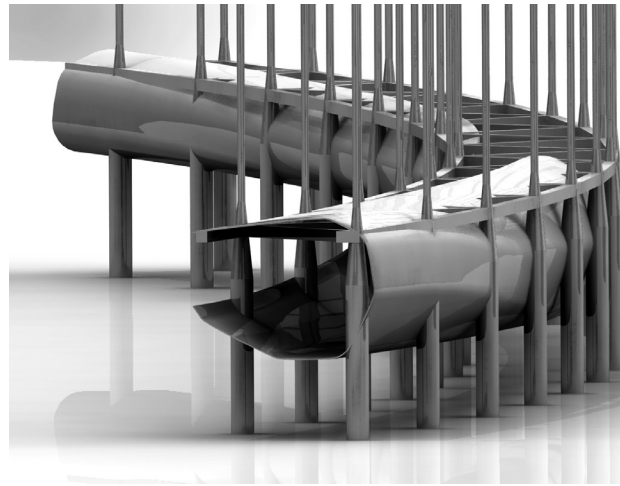
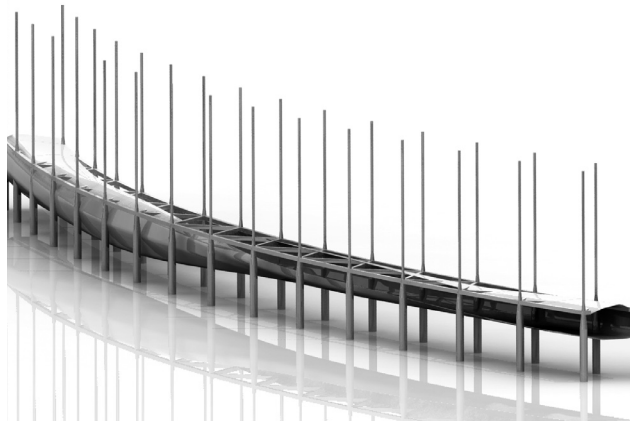


Indicated in this diagram are; wind turbines [posts], solar collecting surfaces [blue], fog catching screens [fins], and walls for wind protection.

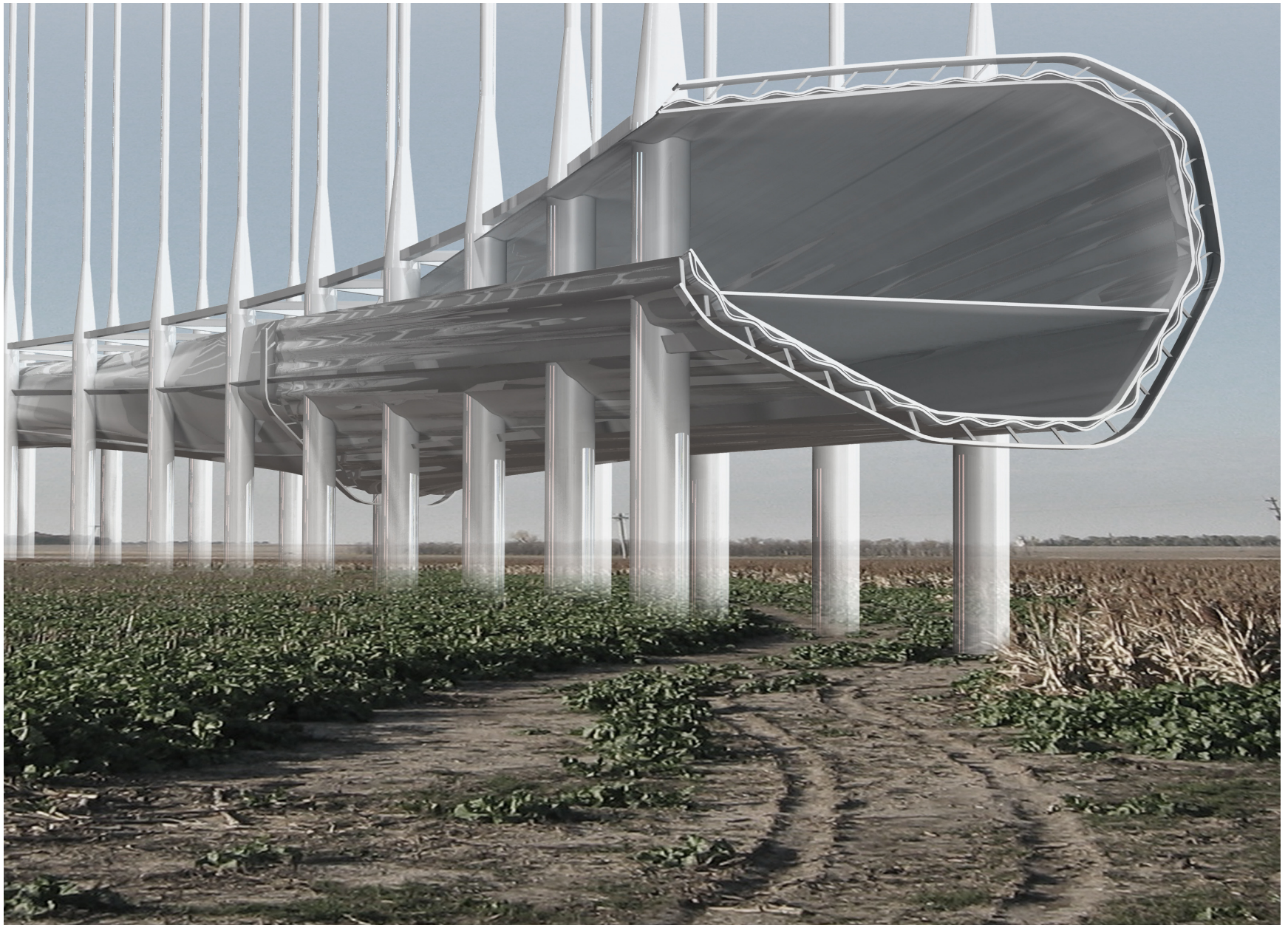




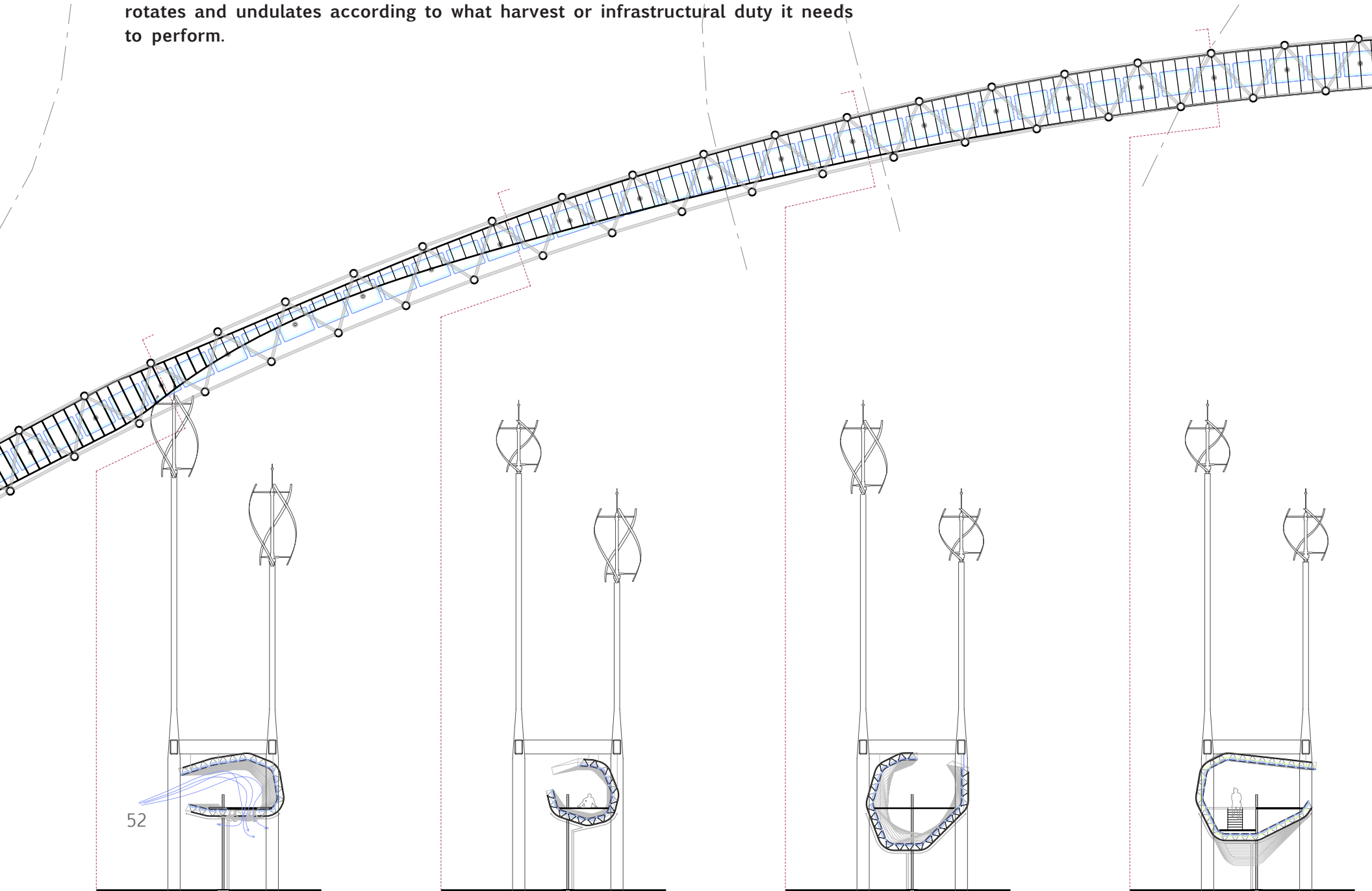
The 1:1500 scale model illustrates a varied patchwork of crops on the interior, sustainability side of the fog and wind farming arcs. The Plexiglas represents the building mass of said farms.

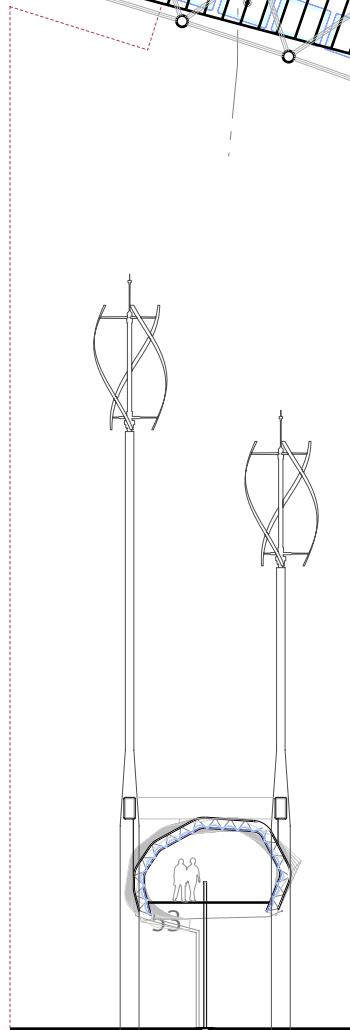
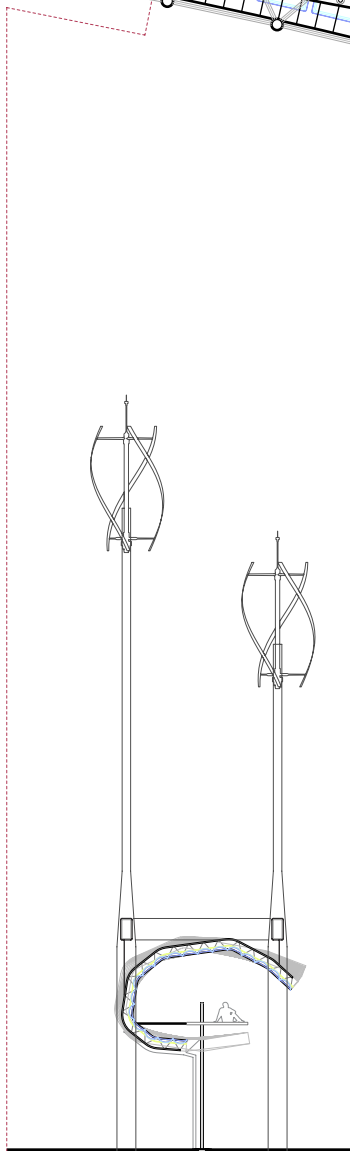
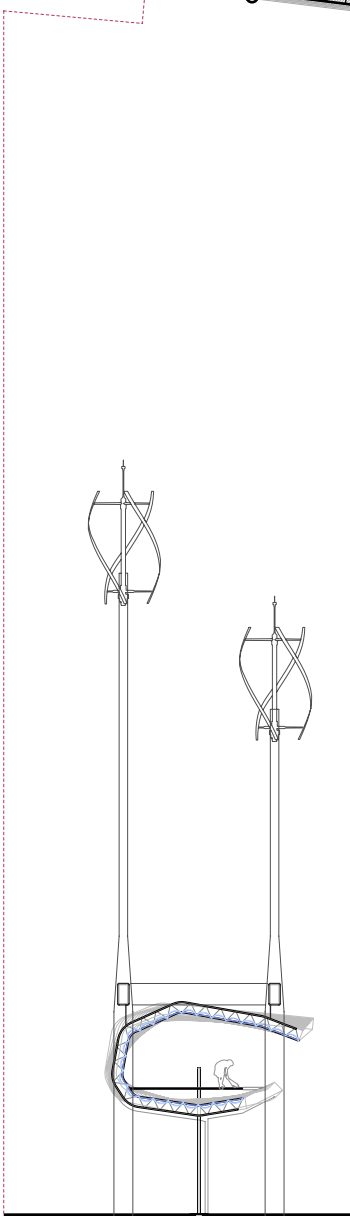
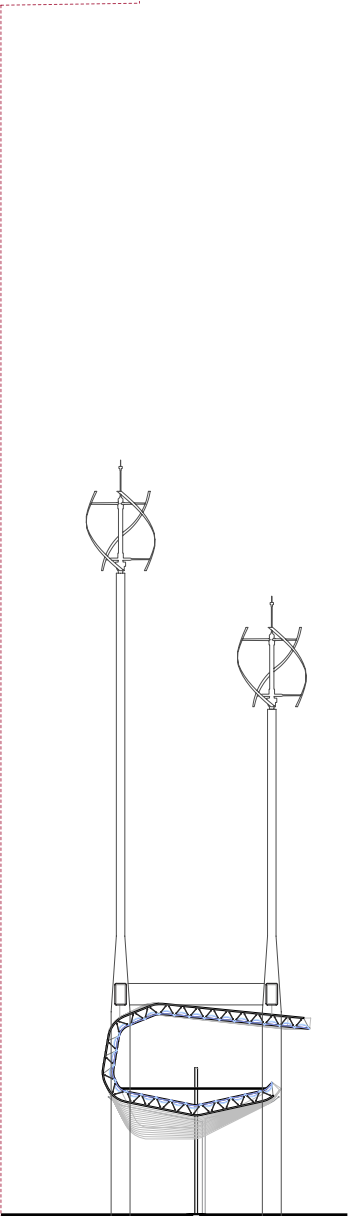
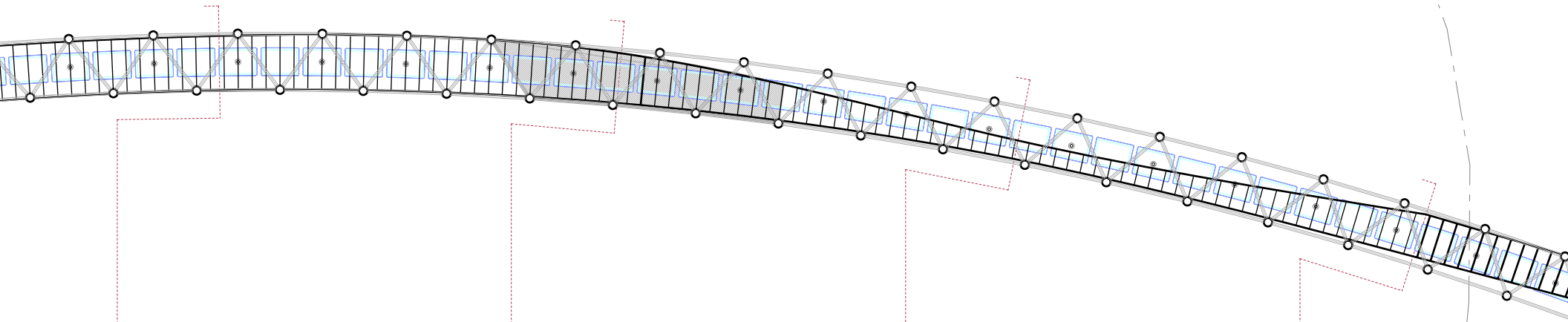


The tubular structure is supported by small-scale wind turbines, and clad in a multi-layered performative skin of ETFE and nylon fog screens. Elevated above the ground, the structure does not obstruct the standard farming tasks of Industrial Agriculture, nor does it erase the horizon.

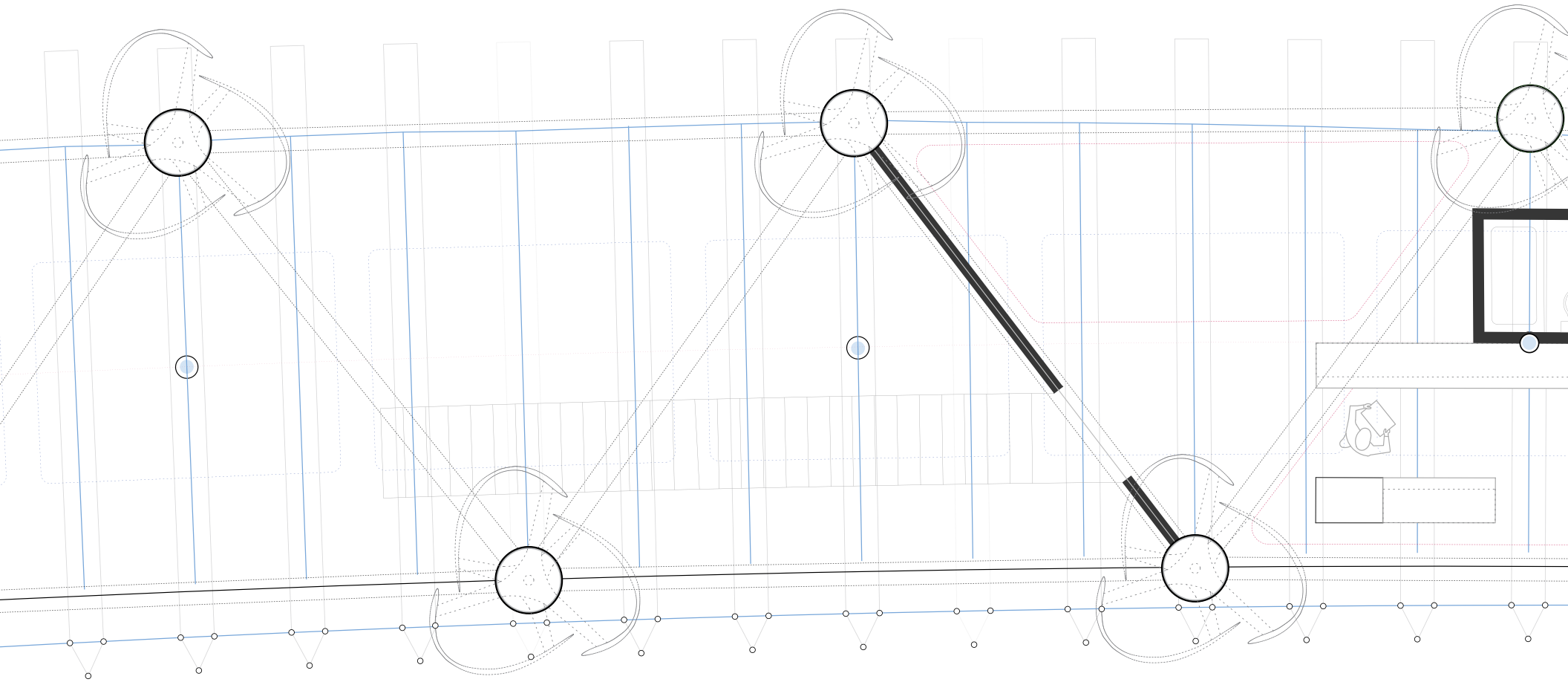


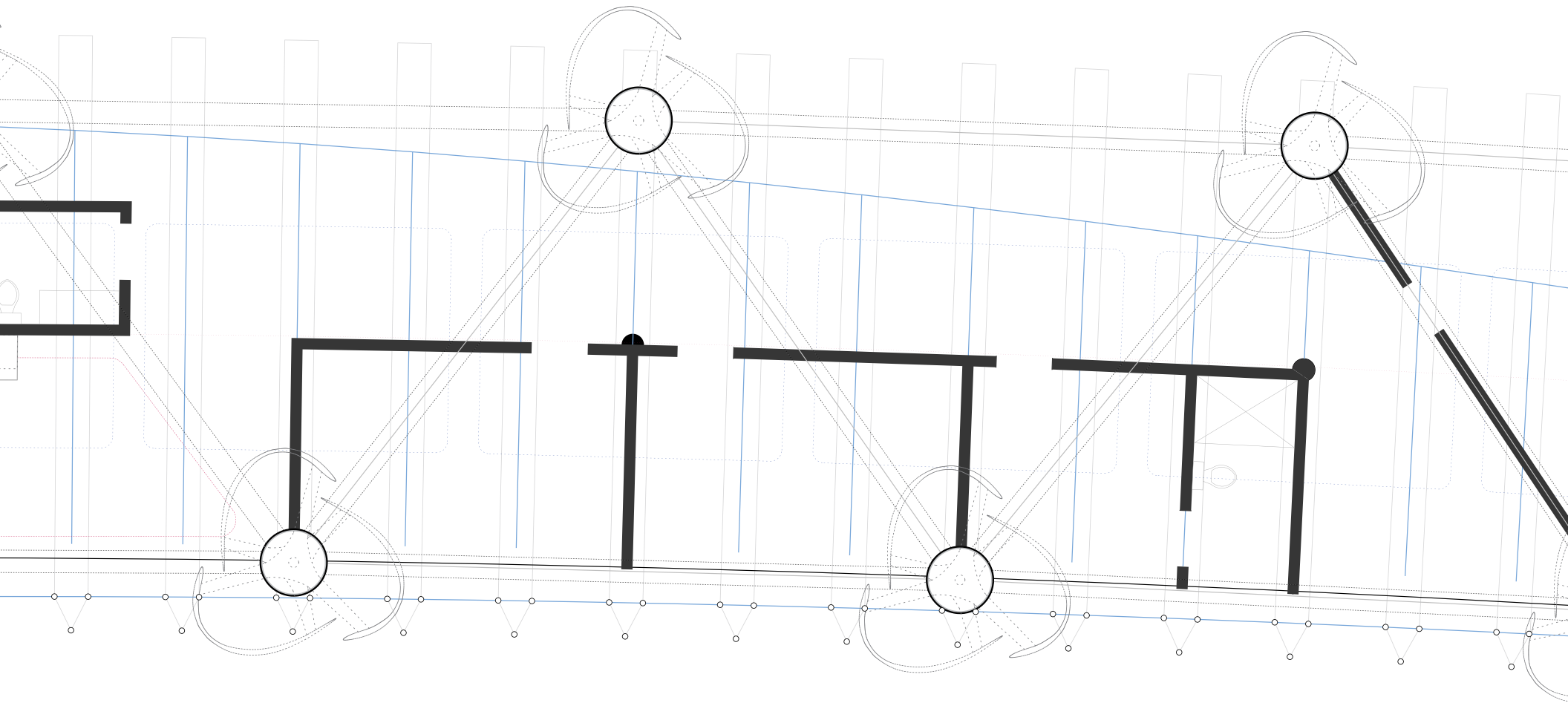
While the turbines march along the arc in a steady succession, the enclosure--a series of triangular truss ribs suspended from the turbine structure--slowly rotates and undulates according to what harvest or infrastructural duty it needs to perform.

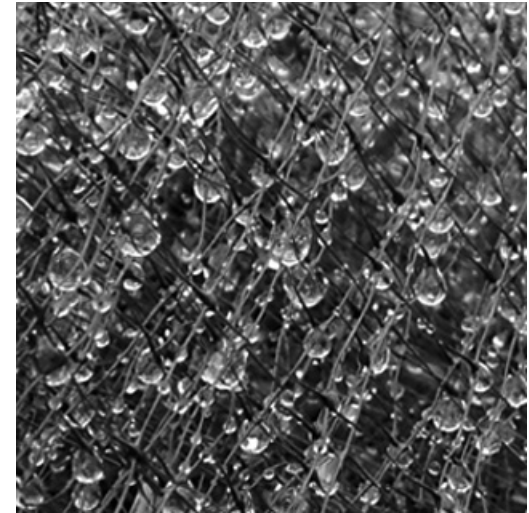




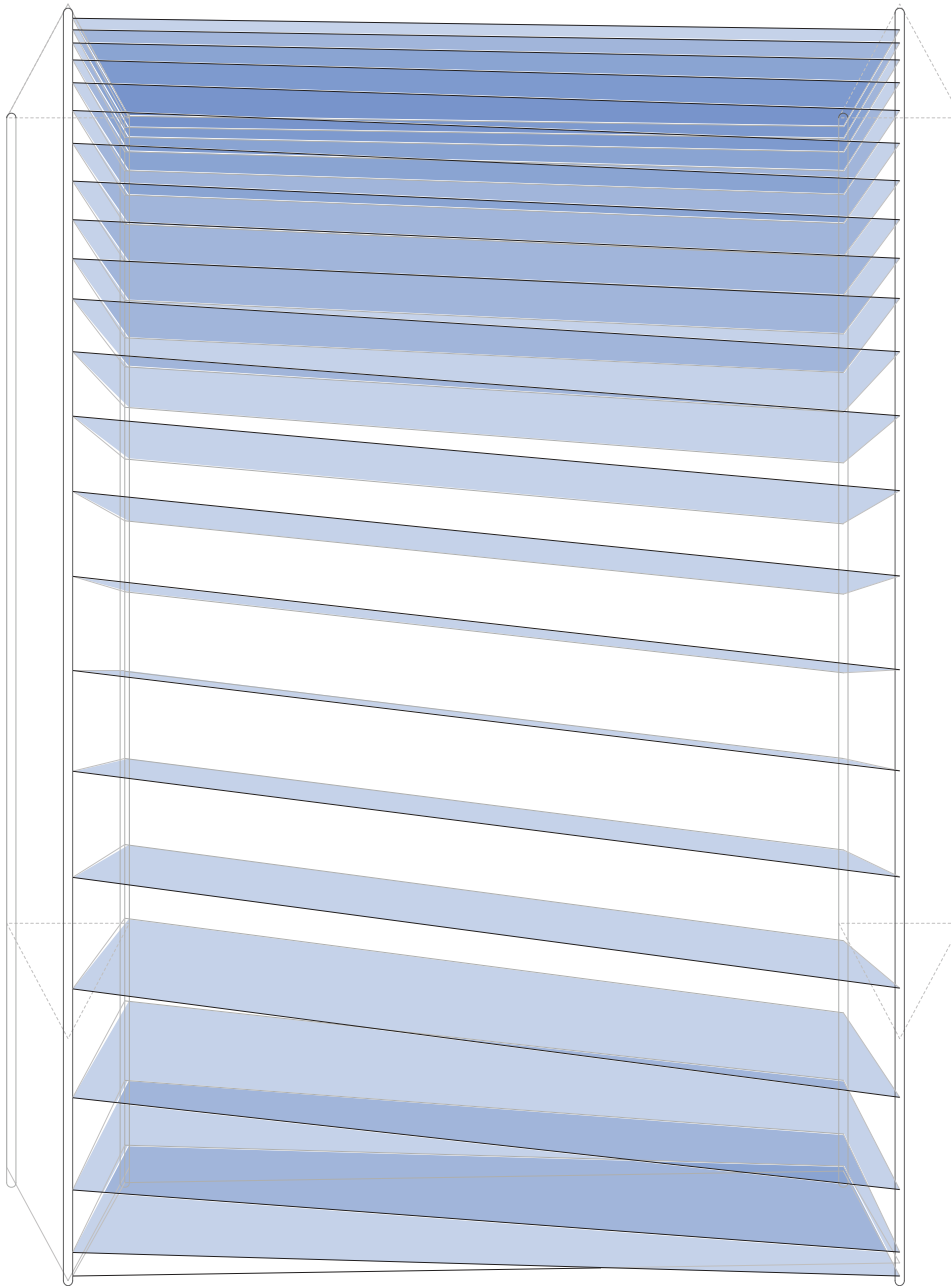
Running along the center of the fog and wind harvesting arc, is a series of cisterns. These cisterns reserve the water captured by the architecture. Located every 30 feet is pipe providing the internal elevated programs above access to the water stored below. This relationship necessarily informs the arrangement of interior space.



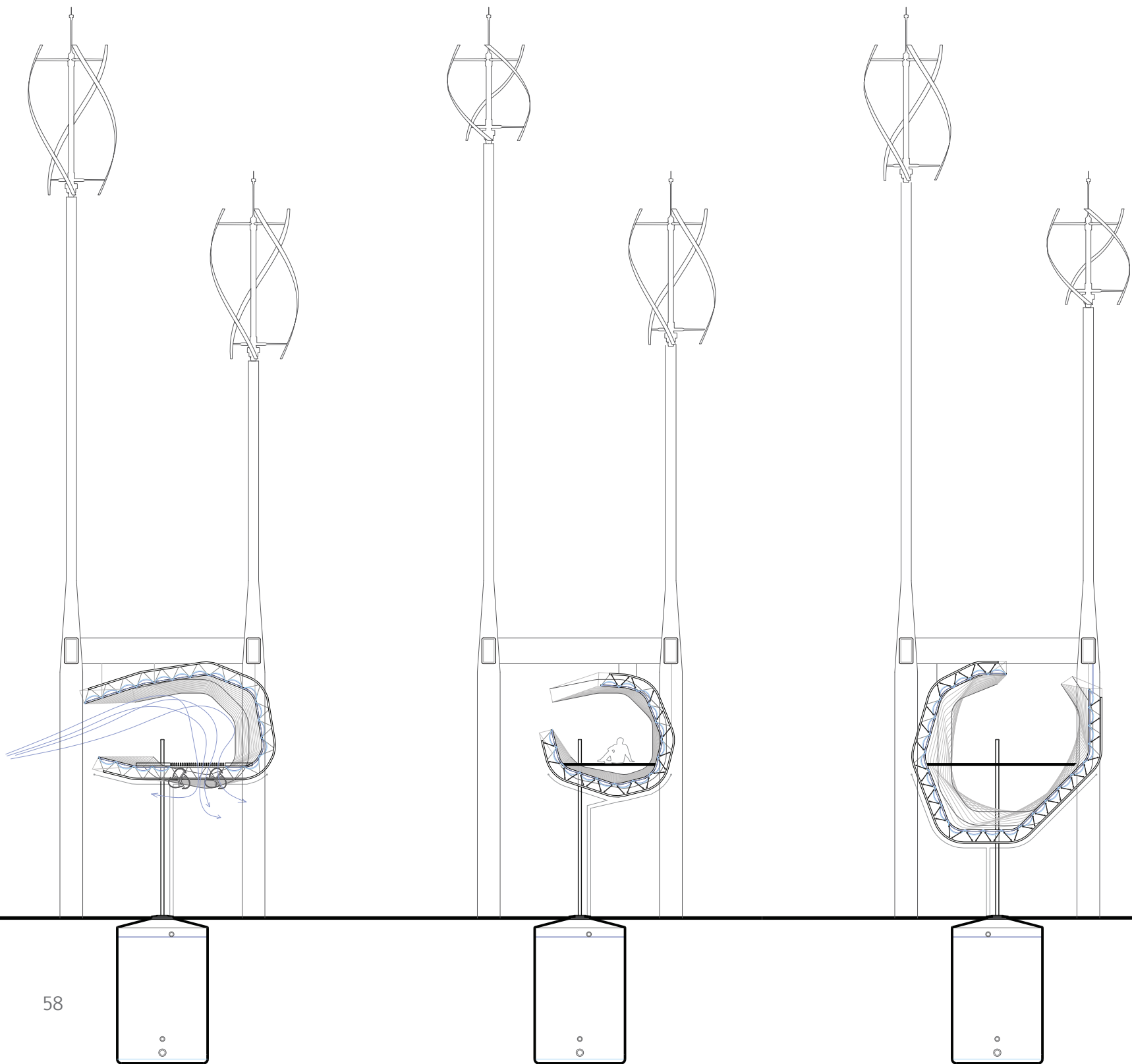


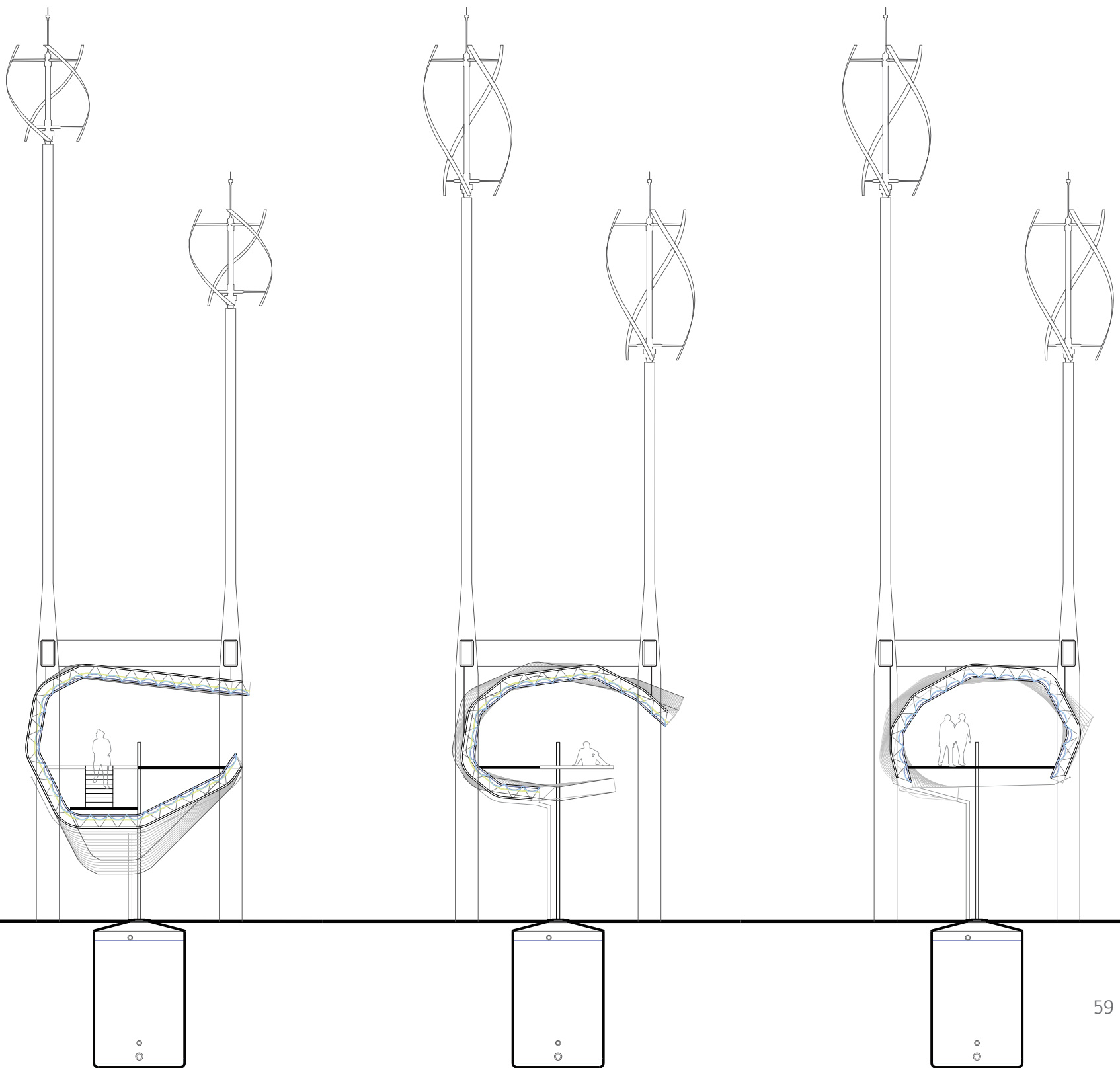


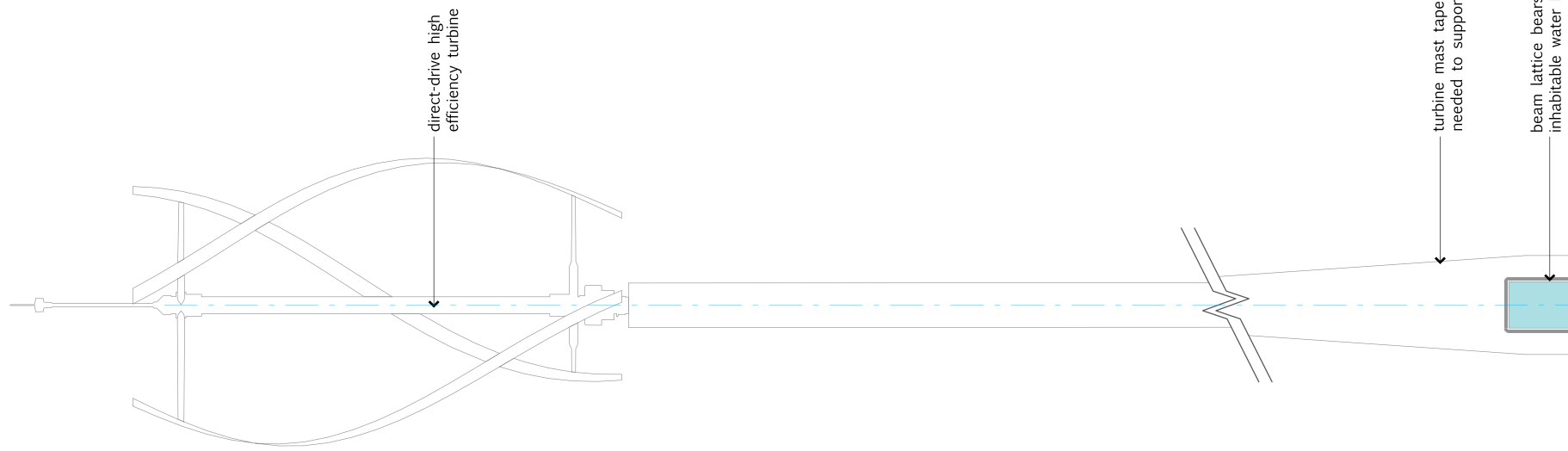
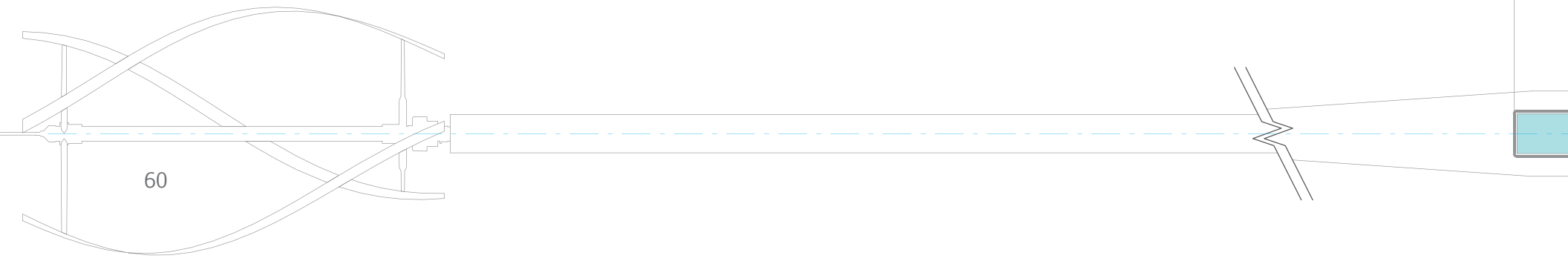
Fog screens are in use in many countries where water is difficult to come by, and also in remote locations to which it is difficult to pipe water. The systems are completely passive.



The fog collectors on body of the building are stretched between the triangular truss ribs of the tubular farm. Condensate beads and then drains from the surface of the fins to the inner ETFE plastic skin of the building and ultimately down to the cistern system.







structure

suspension cable

space frame

fog and condensation catching screen

ETFE end clip

ETFE membrane

vented floor allows airflow to and from impellers

impellers take advantage of wind currents generated by building form

screen funnels harvests water to cisterns

filtered water uptake pipe

water harvested by building is directed down to cistern system

gardening and small-scale agricultural ventures

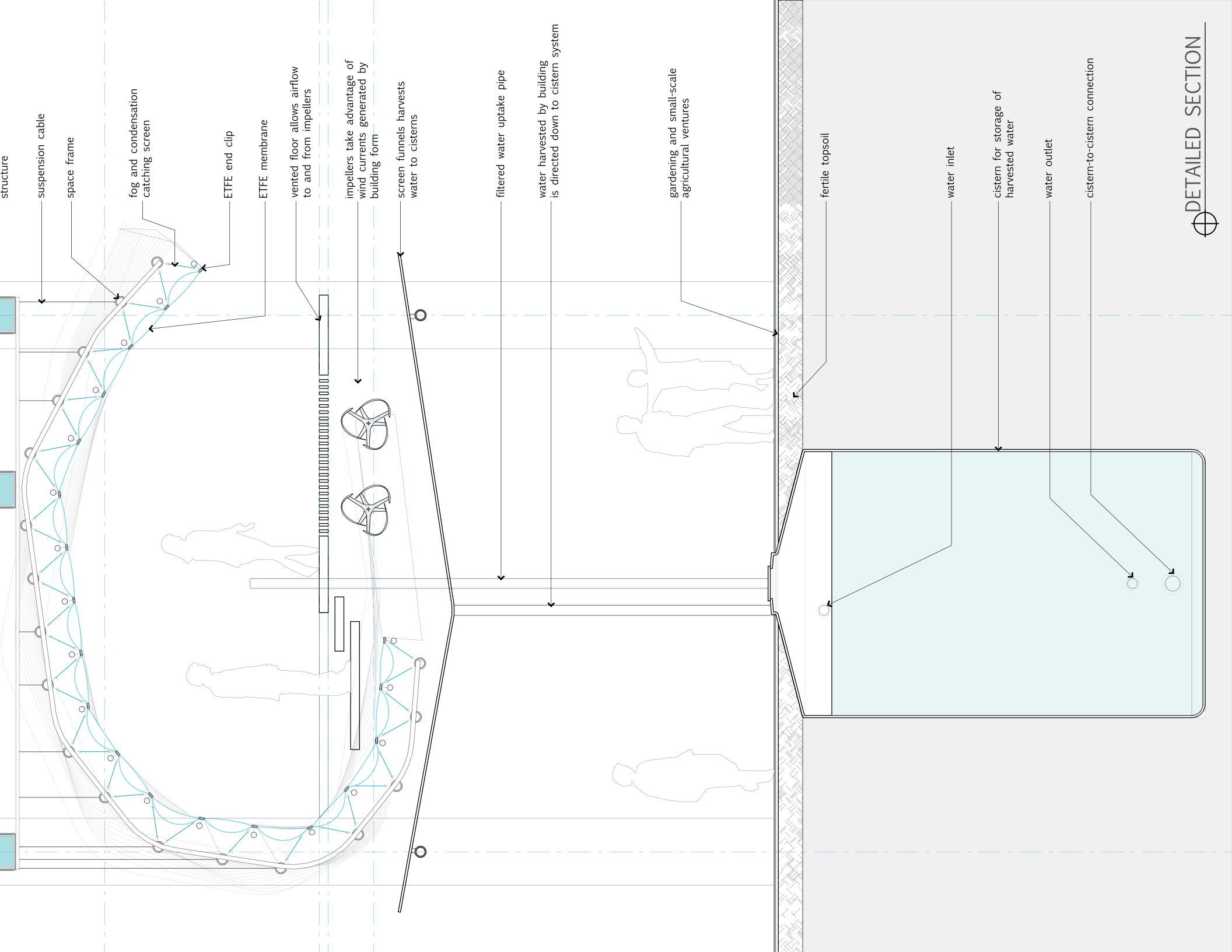
fertile topsoil

water inlet

cistern for storage of harvested water

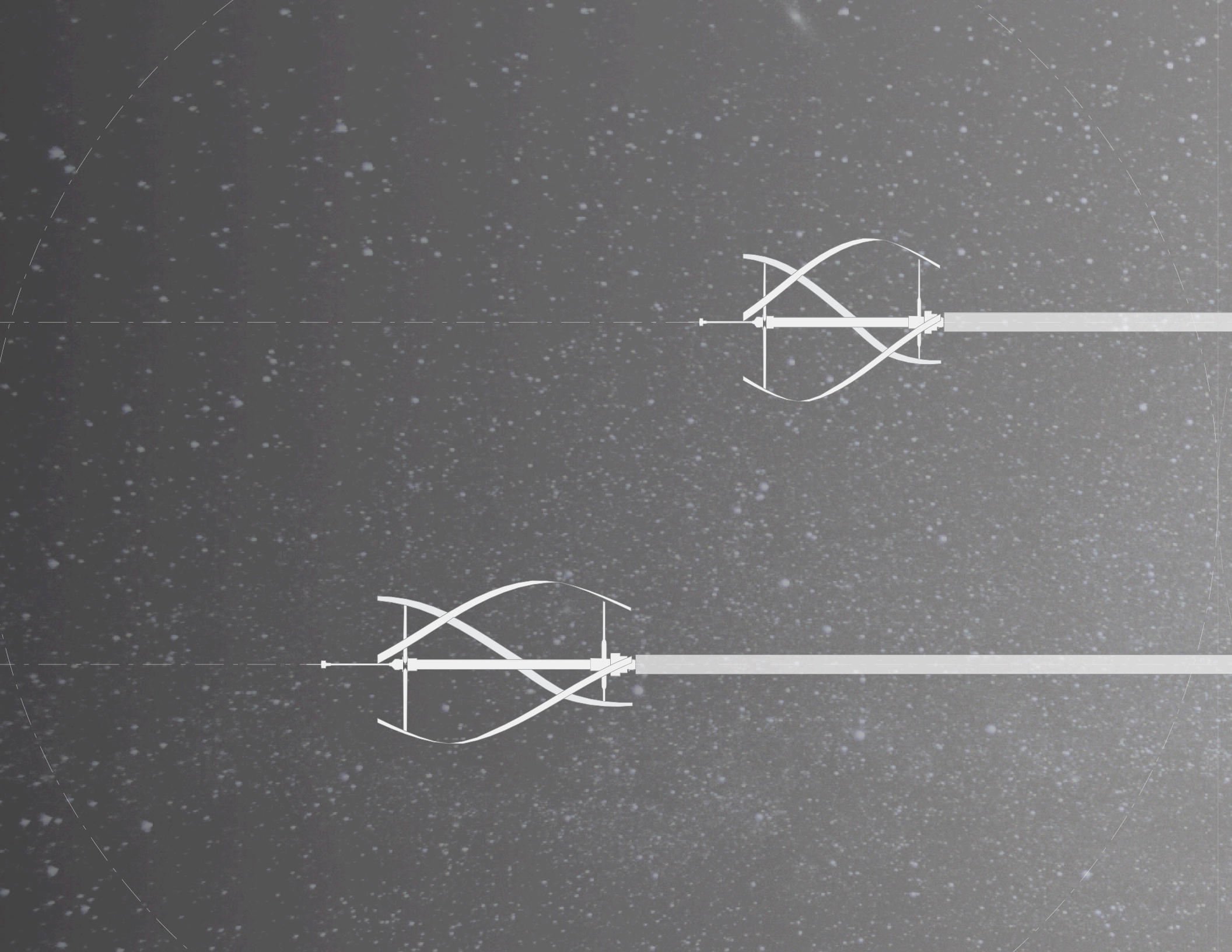
water outlet

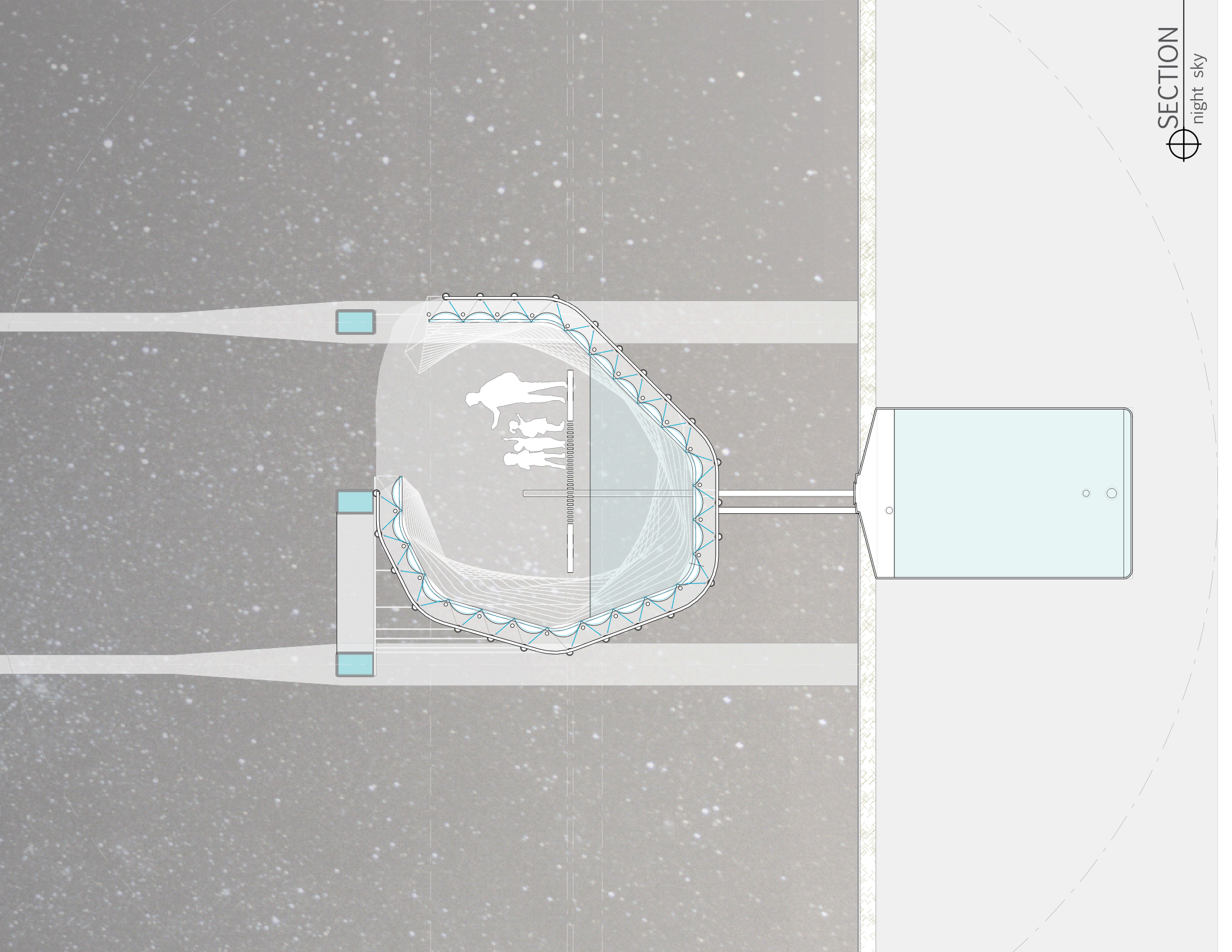
cistern-to-cistern connection





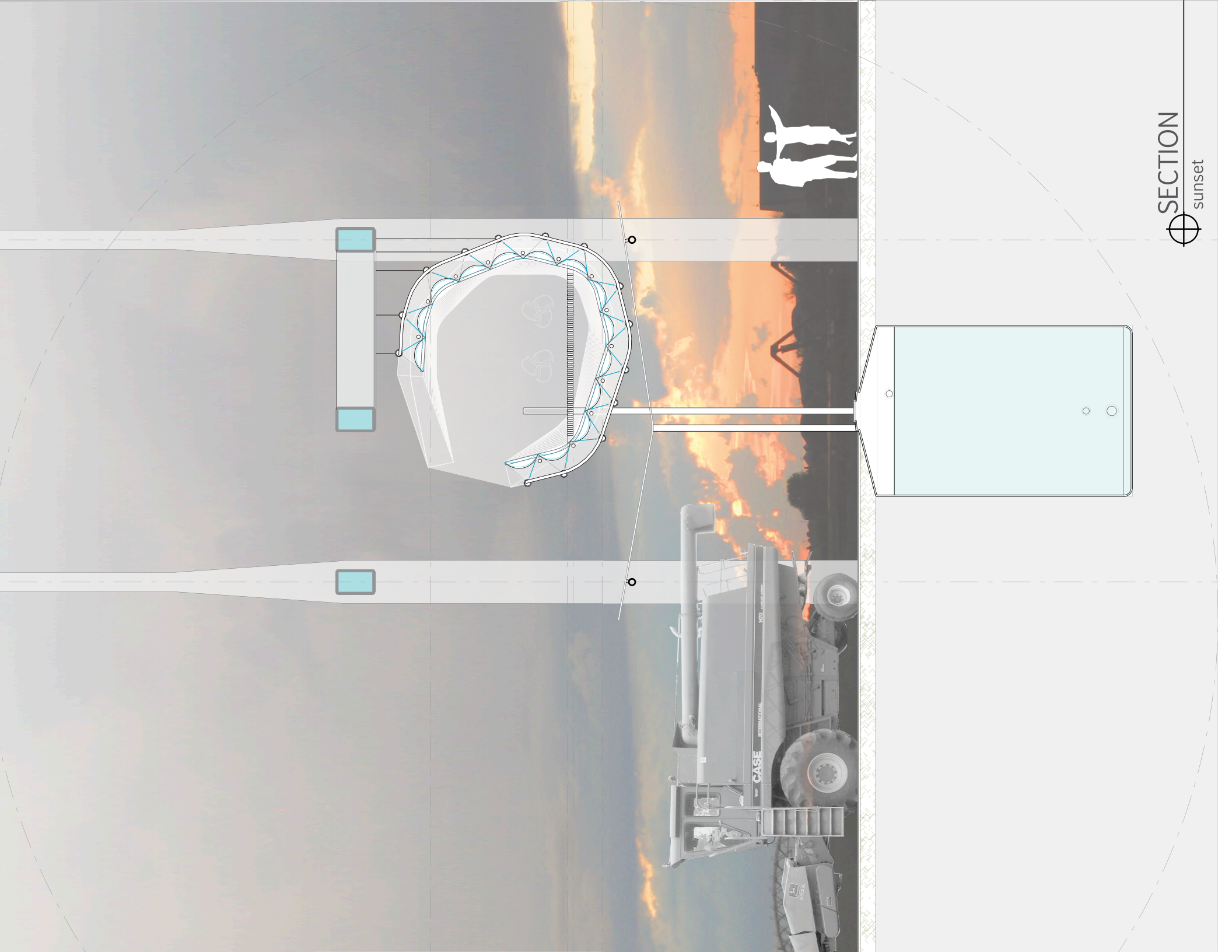






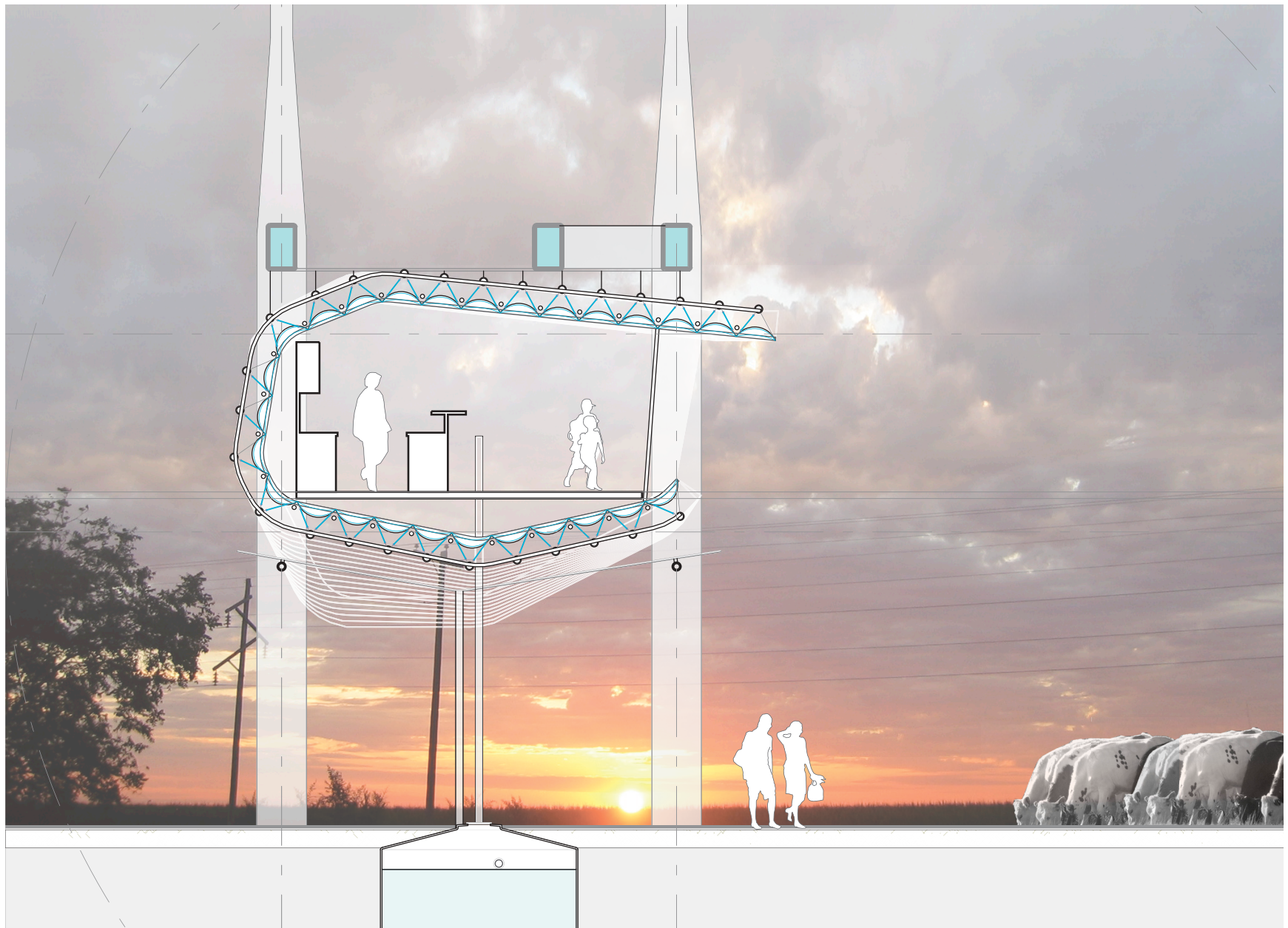
SECTION
night sky



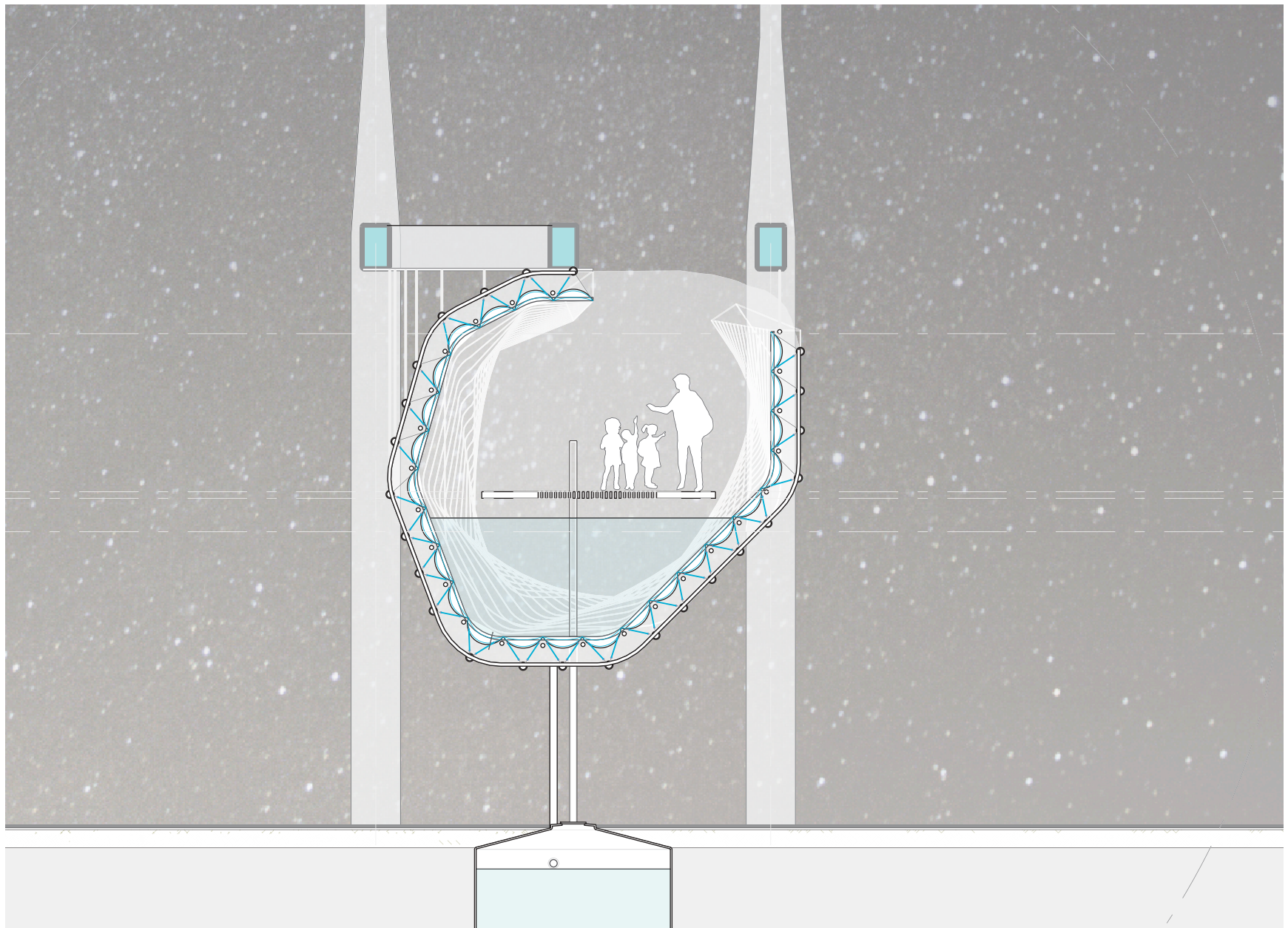


SECTION
sunset

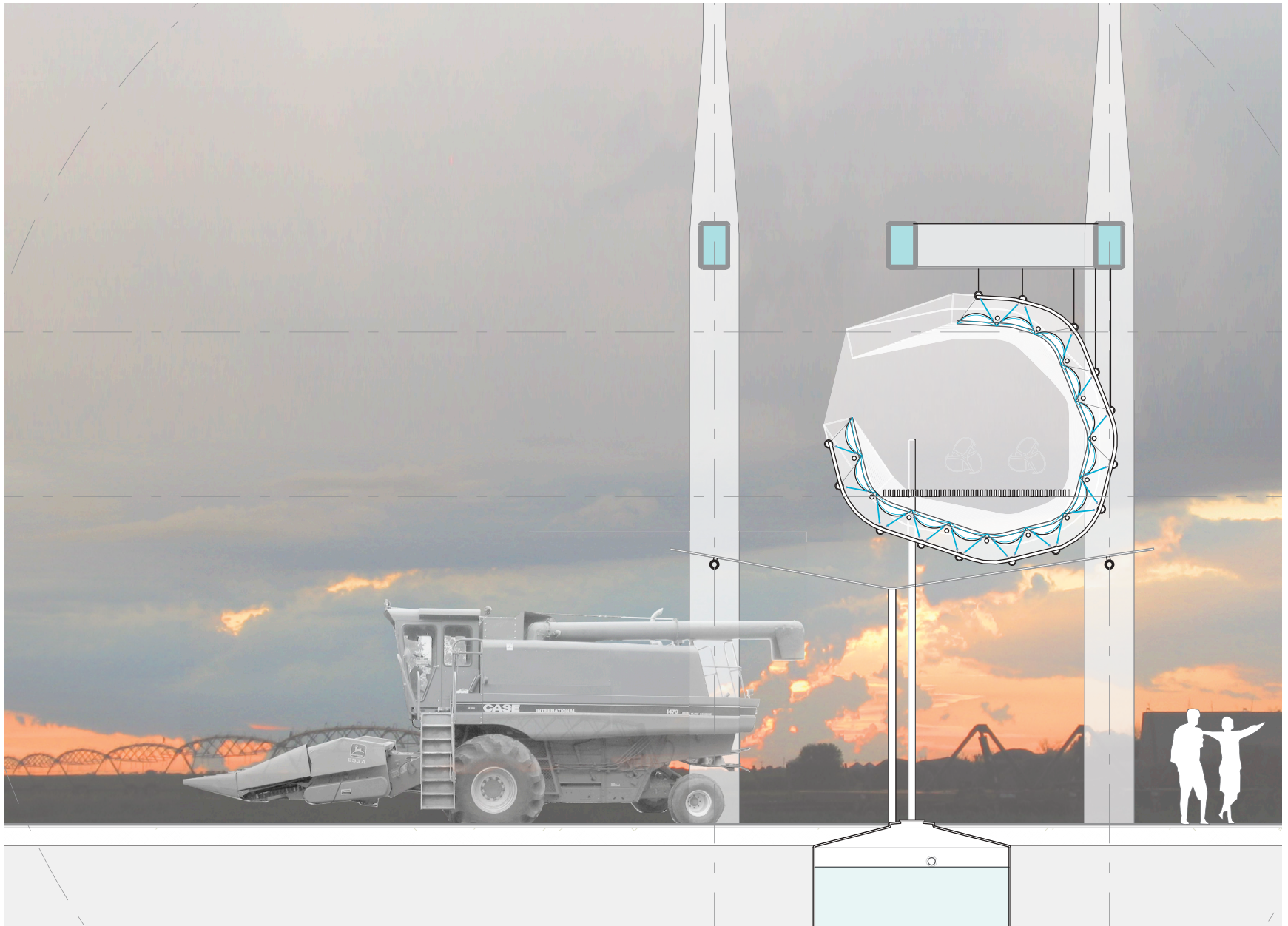
In this orientation, the leeward side faces east and offers an inspiring view for the family as they ready for school and work. On the ground below, organic grass-fed cattle provide an important service to the health of the sustainably-farmed grounds by fertilizing the soil with their manure.



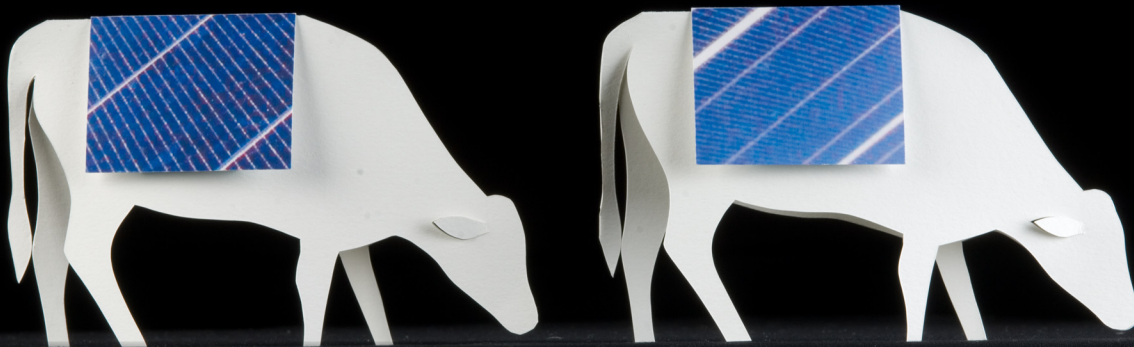
The open structure and slatted floor allow for a more direct means of harvesting water. Children enjoy the stargazing, as well as the way their voices reverberate off of the water's surface. It is a popular place to drop pennies and make wishes.

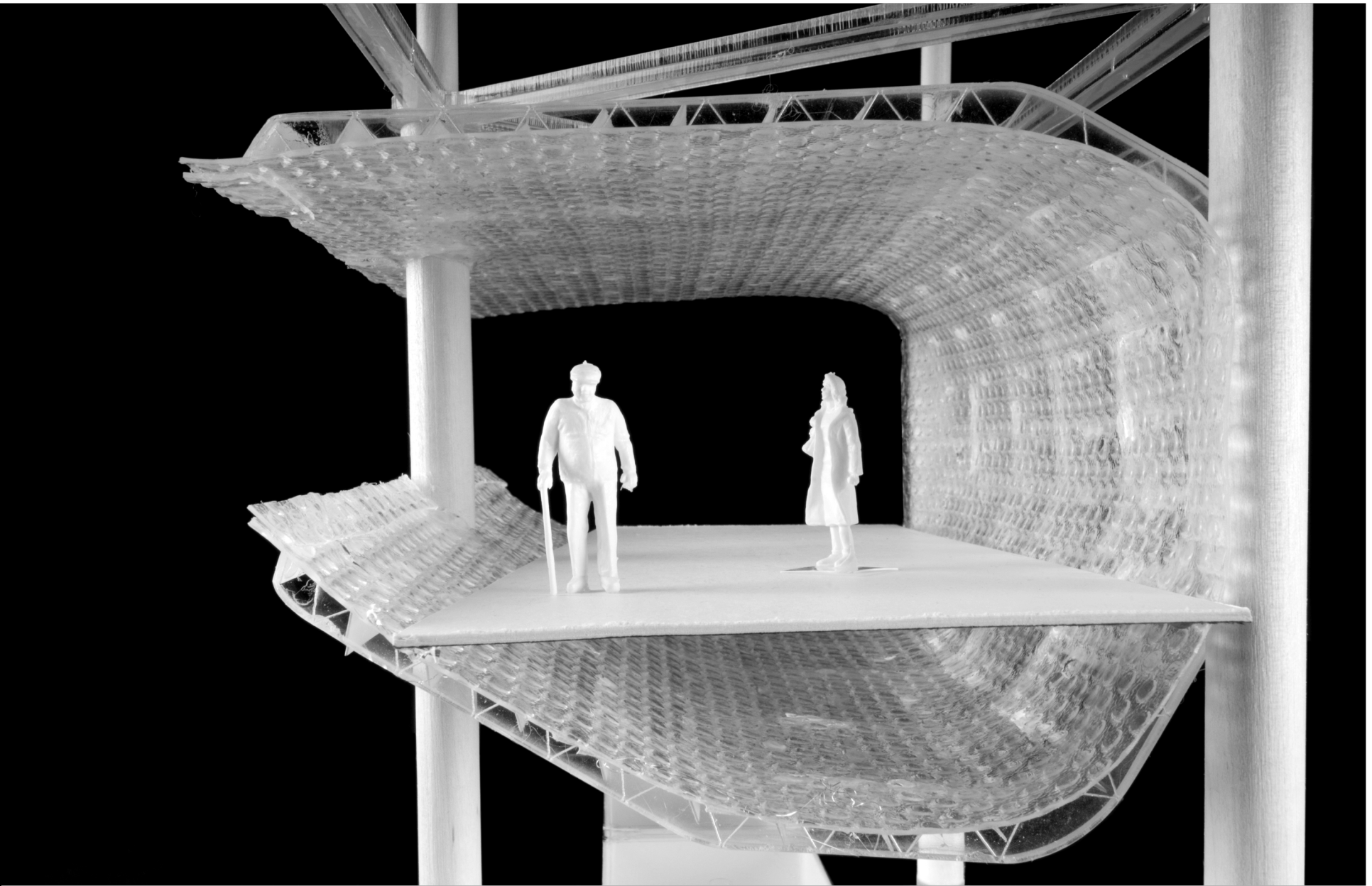


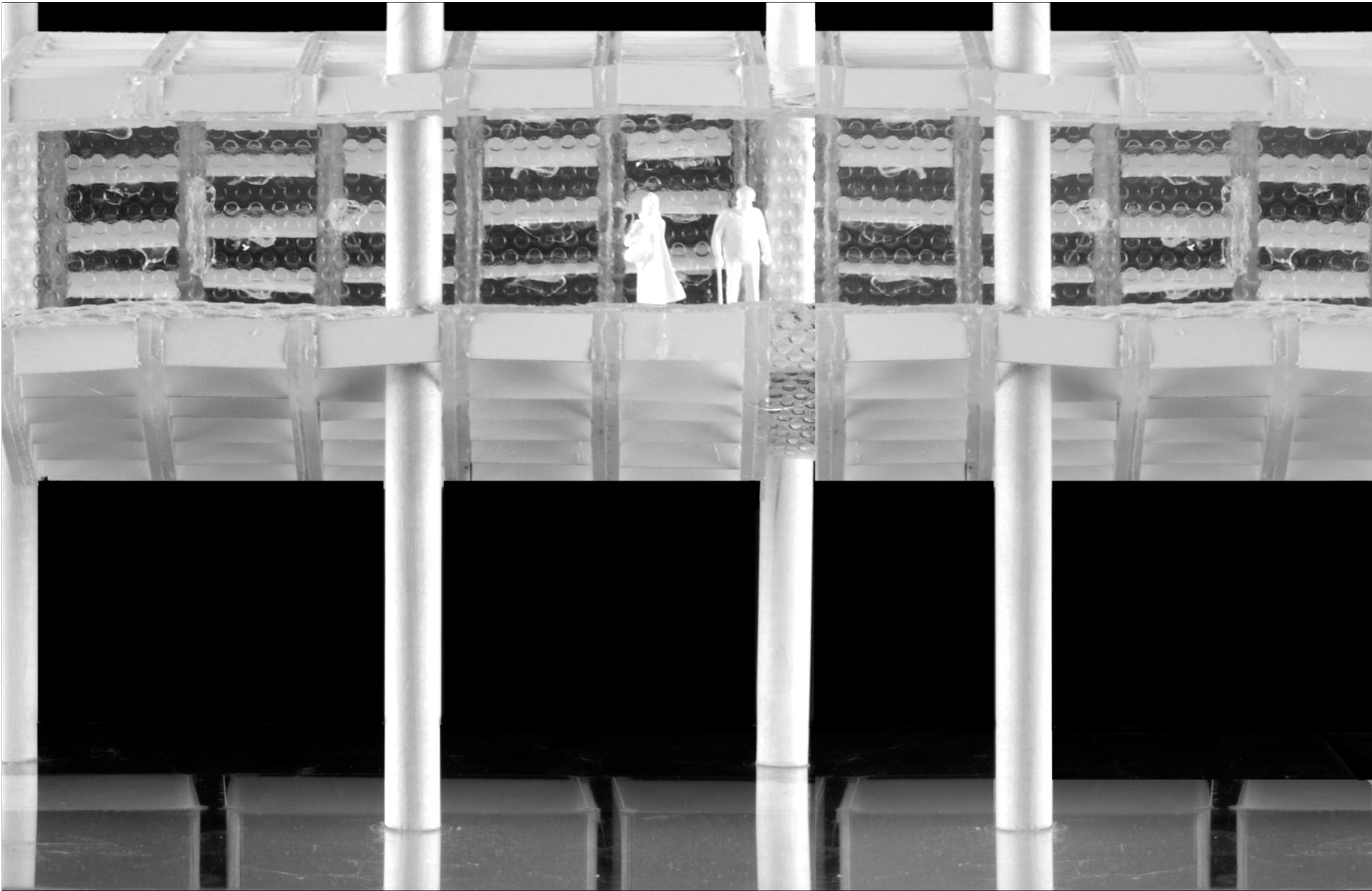
In the windward orientation, occupants are offered a breath-taking view of the long processes, complex and massive machinery, and gigantic storage structures of Industrial Agriculture. They may also take in beautiful sunsets. In the westerly and northerly orientation, the building will generate differences in pressure and streams of air within. Smaller turbines strategically placed below the slatted floor and between structural ribs would be able to take advantage of these currents and pressure differences, thereby broadening the wind-harvesting potential of the structure.

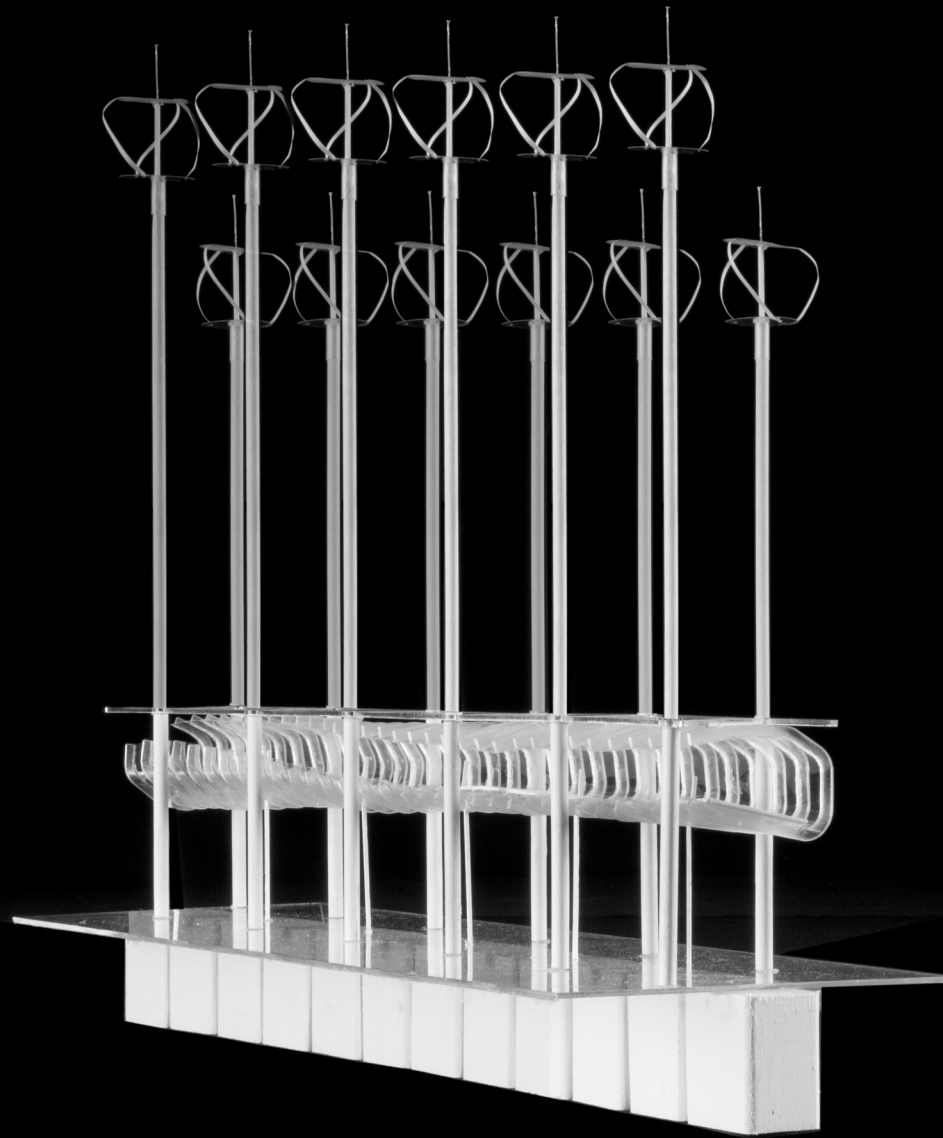


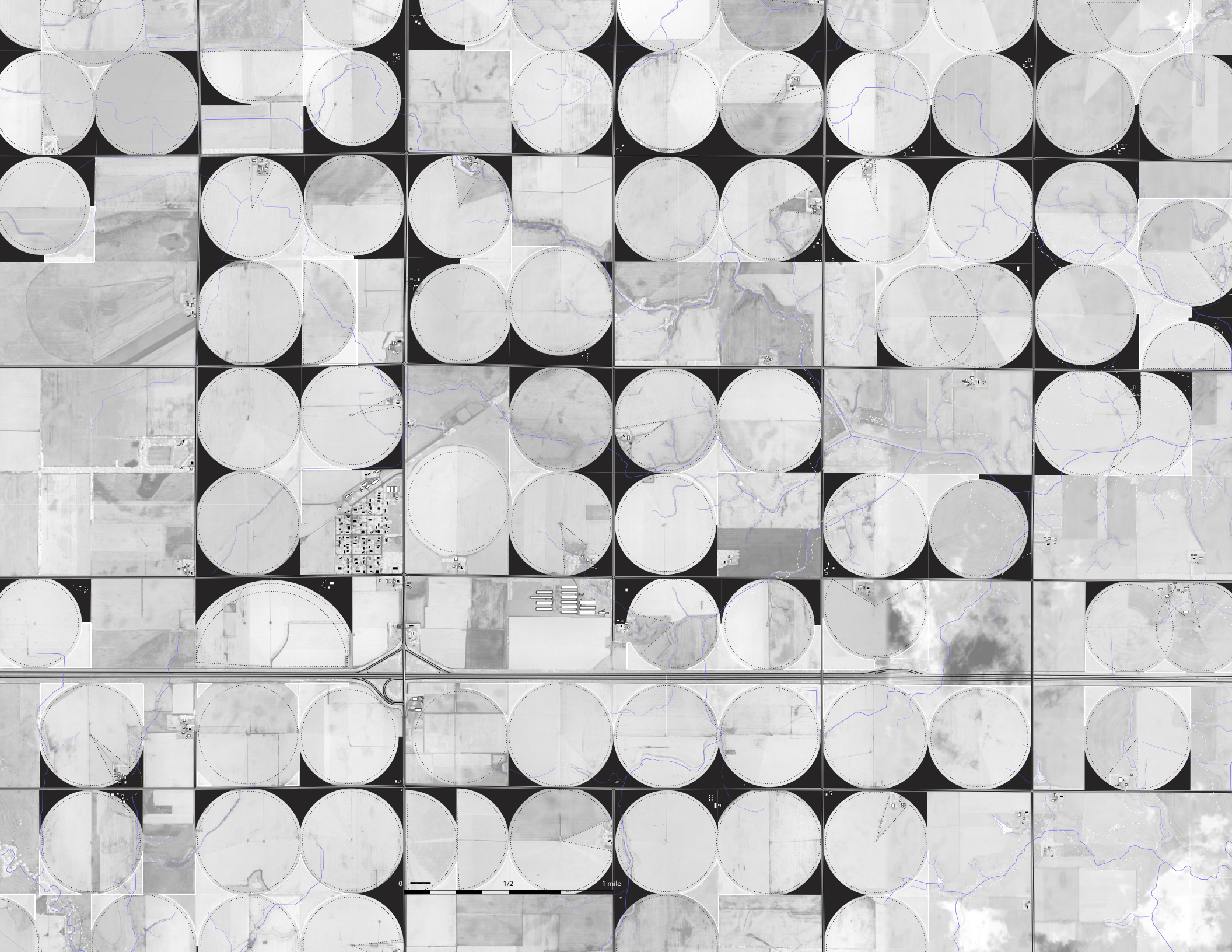
Perhaps the most synthesized aspect of the program, a new kind of milking occurs at the Modern Homestead. As cattle graze, their solar blankets supply power to rechargeable batteries clipped to the blanket hem. As the cows do a service to the farmer, the blankets service them in return by providing protection from wind and cold in the winter months, and from the sun and pesky biting flies in the summer months.

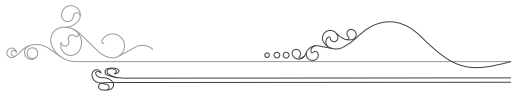






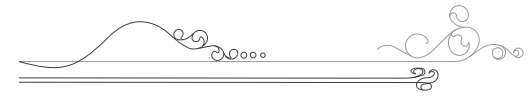




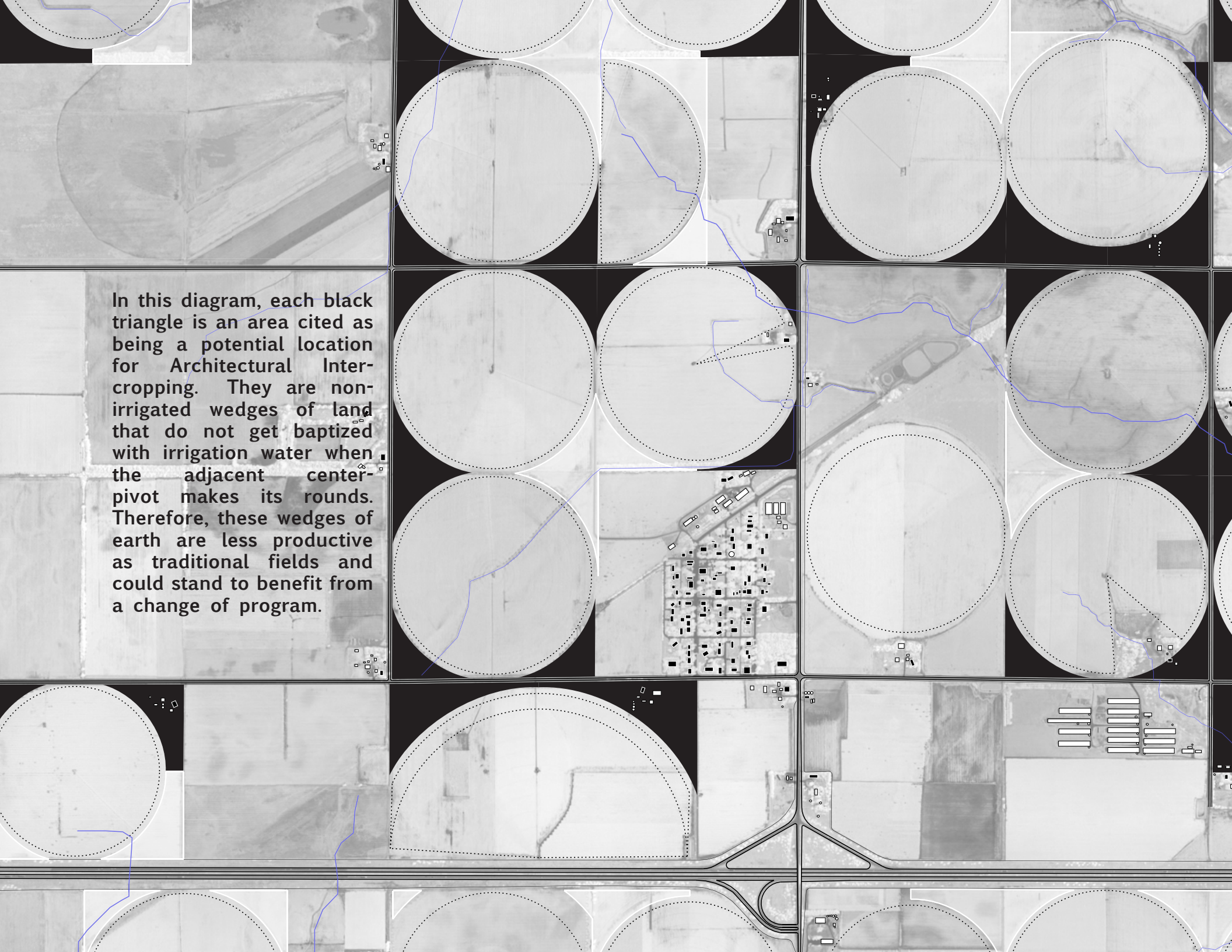


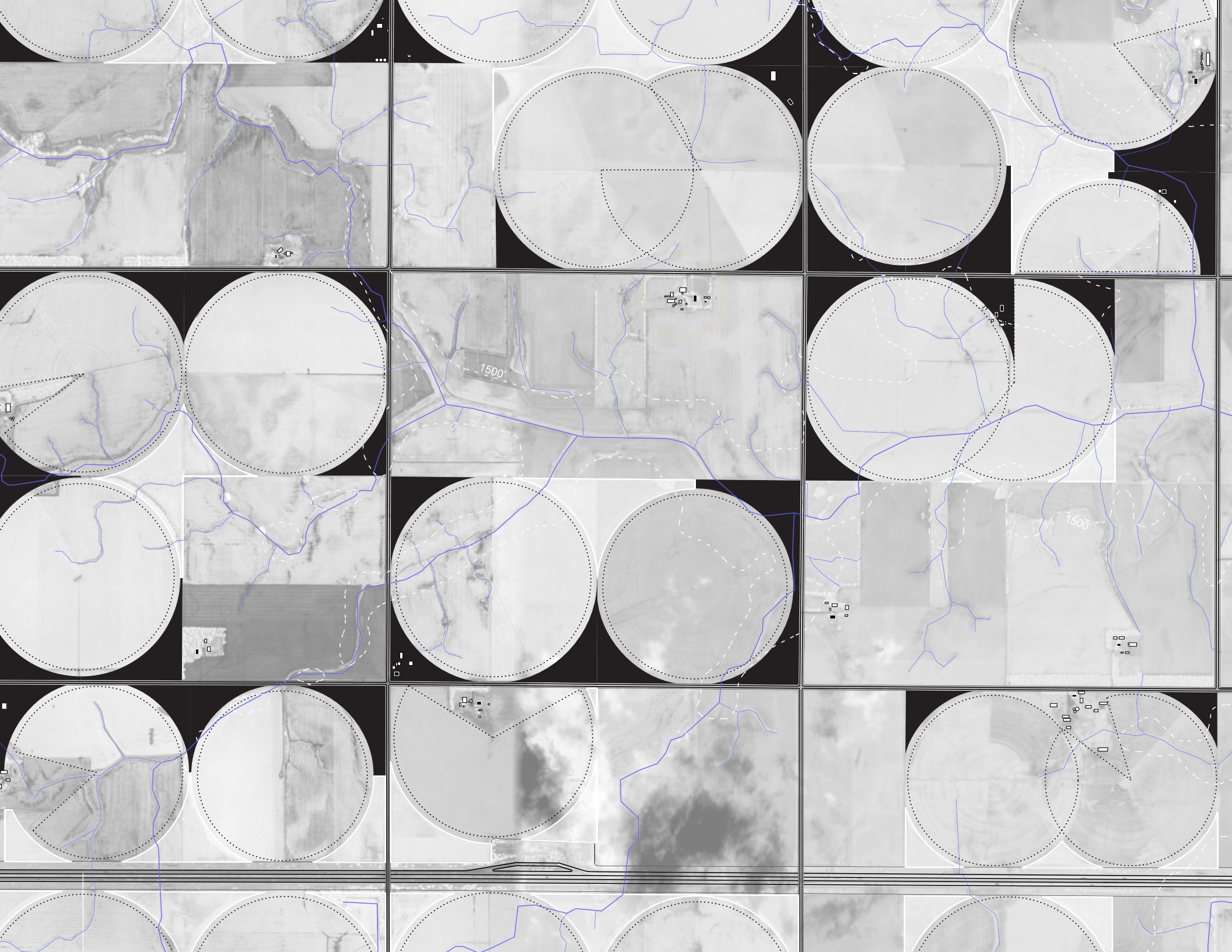
Site and Program Analysis

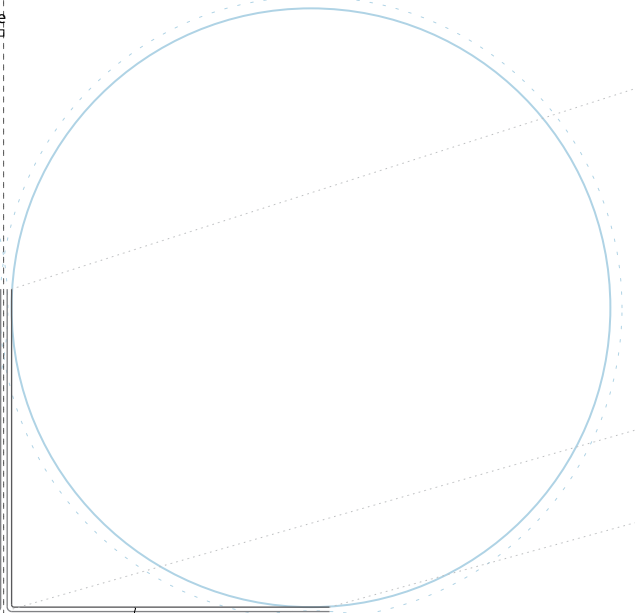
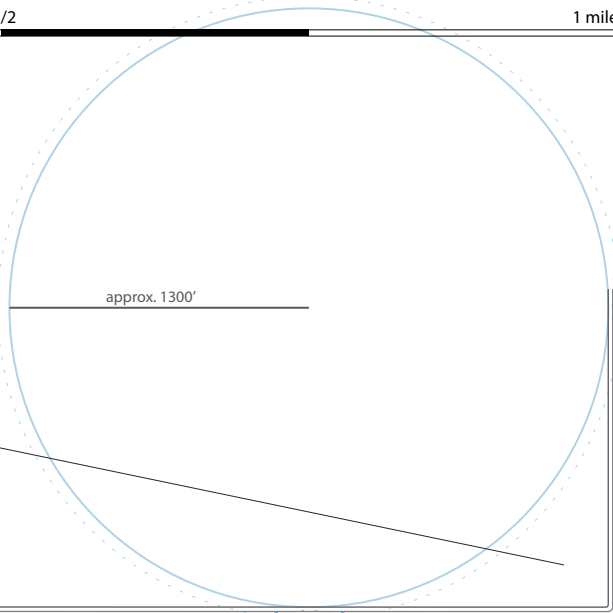
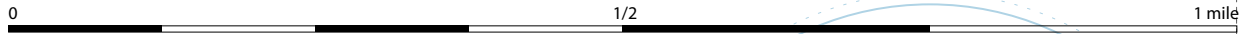
Identifying the Optimal Site and the
Ideal Use



In this diagram, each black triangle is an area cited as being a potential location for Architectural Inter-cropping. They are non-irrigated wedges of land that do not get baptized with irrigation water when the adjacent center-pivot makes its rounds. Therefore, these wedges of earth are less productive as traditional fields and could stand to benefit from a change of program.

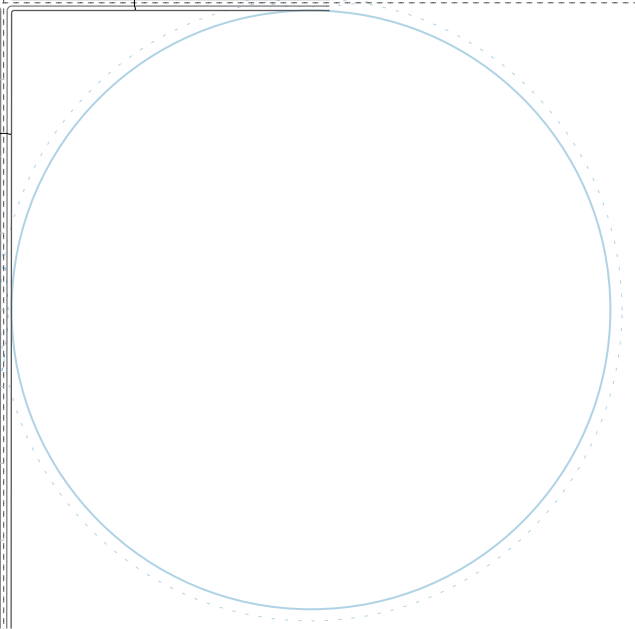
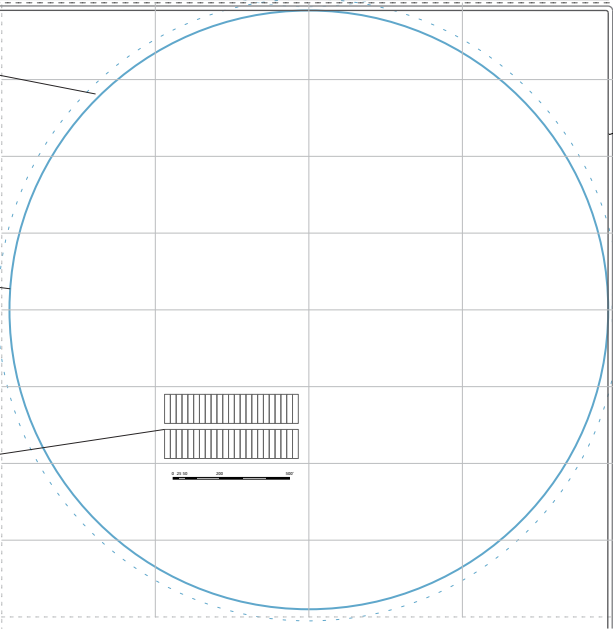






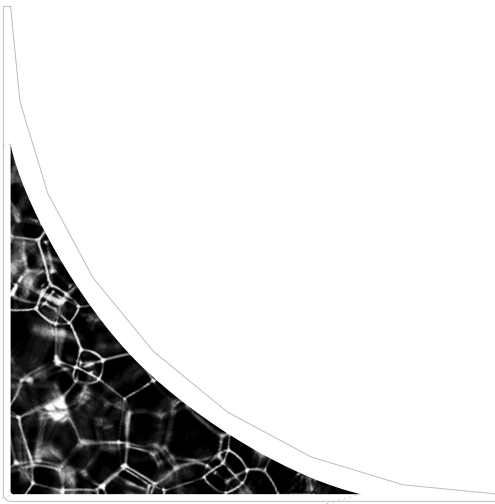
Approximately 6.5 acres of dry-land farm ground. Typically used for alfalfa [for haylage] and wheat [for grain and straw].

An approximately 80' deep spray-zone which receives water from the pivot irrigation system, but does not have to accommodate the passing of the machine.

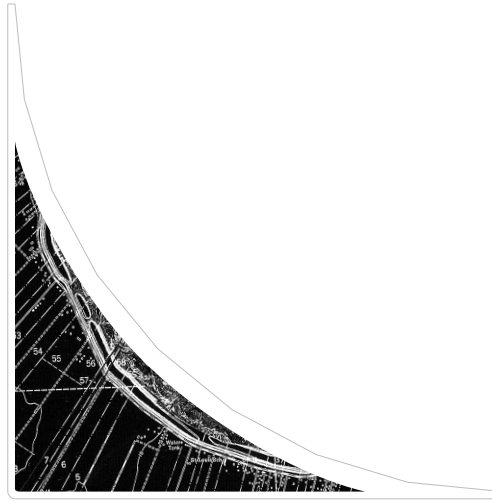


The outer bounds of the machine's ambulation. No objects that could obstruct the pivot may remain in this area permanently.

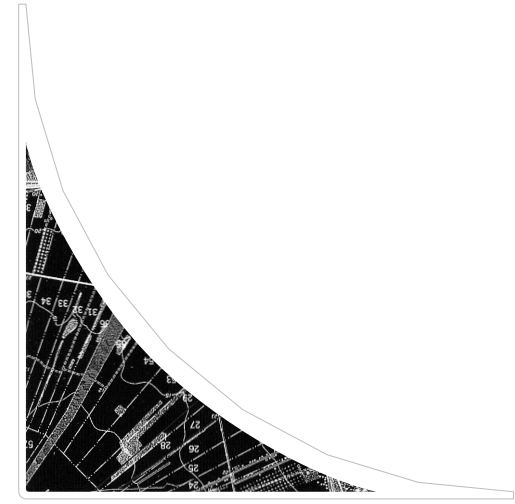
As a demonstration of scale, the city block grid of Chicago has been placed on the site. Additionally, an average lot pattern for 1 block has been included.



Foam.
Bubbles effectively fill any volume with a semi-predictable geometry that leaves no wasted space.



Mississippi Long-Lots.
Each tenant receives an equal share of river frontage and higher ground upon which to retreat during a flood.



Lots are plotted according to what aspect of the site is seen as most valuable. In this model, access to corner frontage is most valued.

Farm planning involves less strategy than one might think. What determines a structure's type and location is typically more a product of convenience and luck than skilled planning or program.



Paul Luebbe

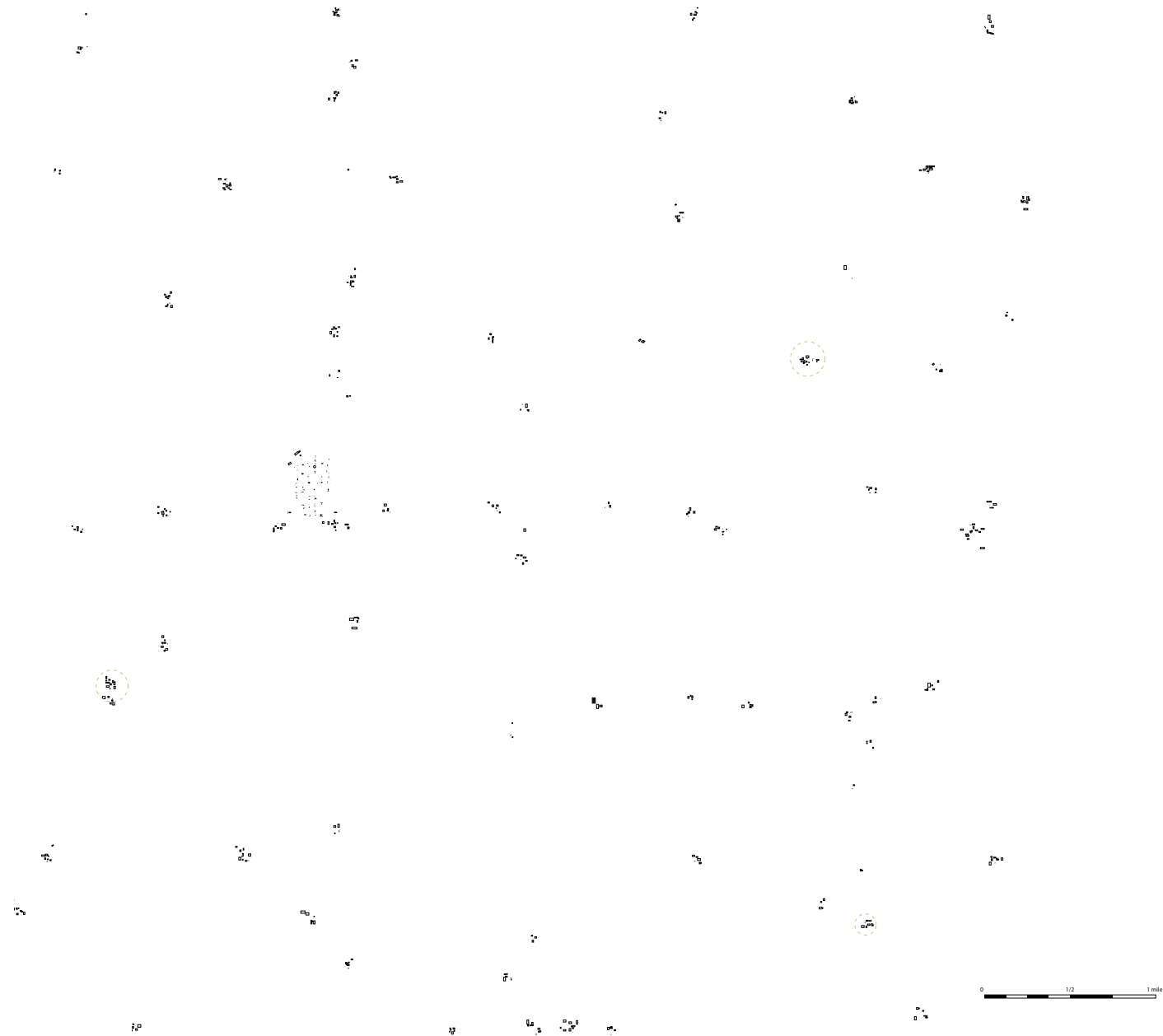


Lloyd Keller

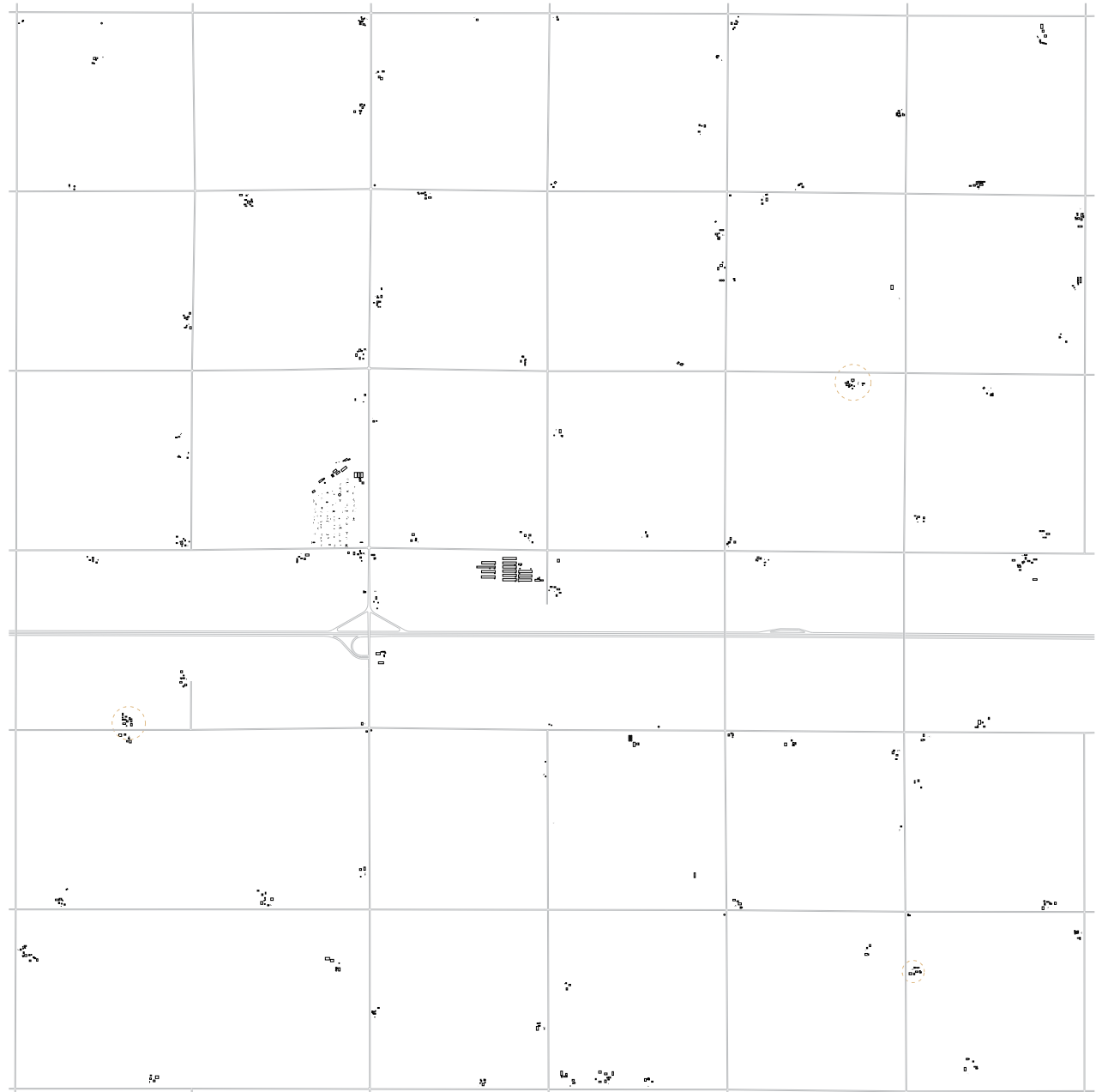


Merle Ebers

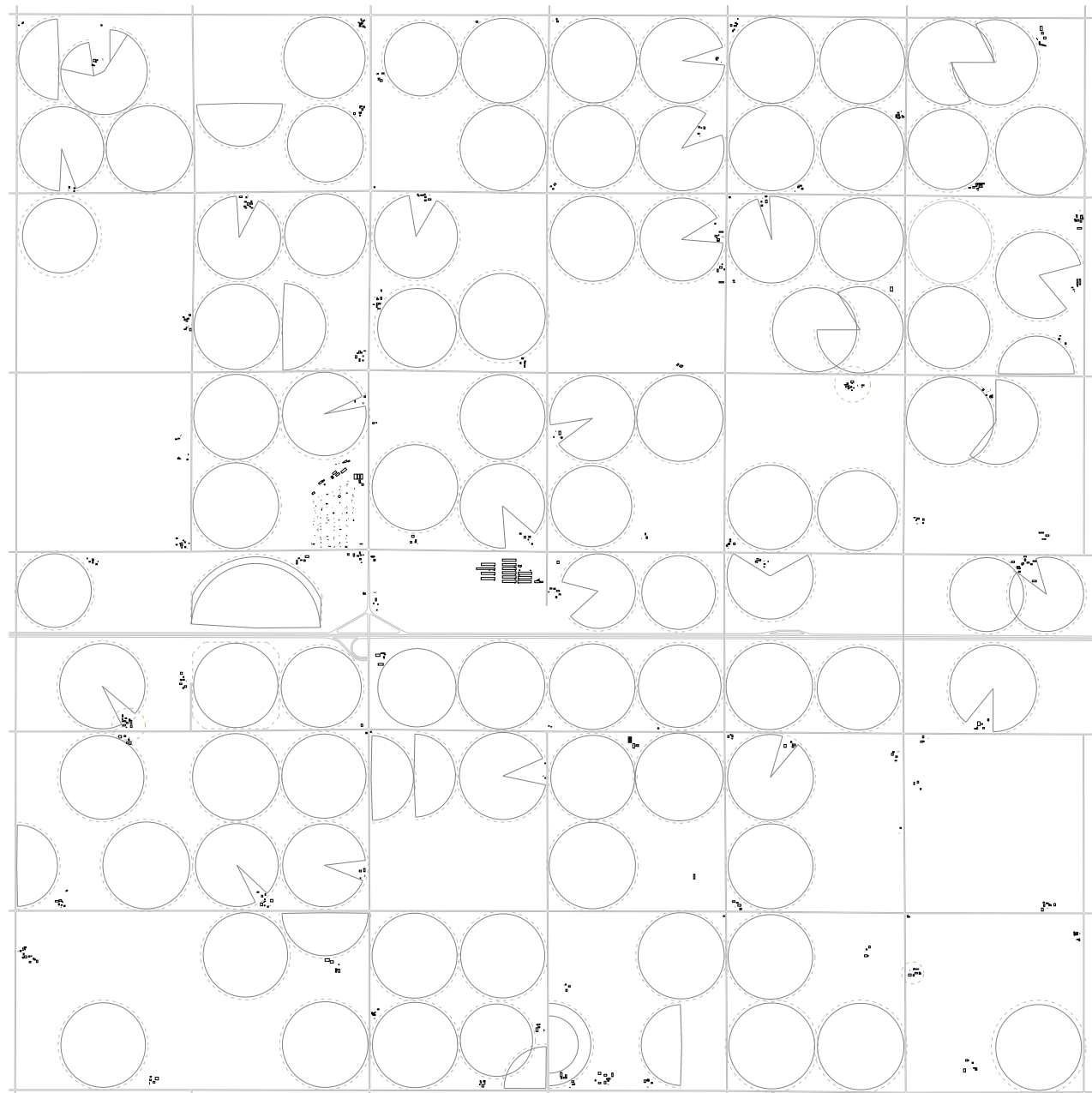
The evolution of Precinct K:
HOMESTEADERS



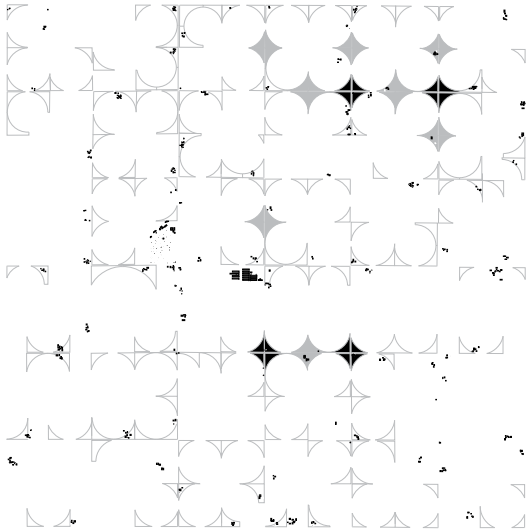
The evolution of Precinct K:
FARMERS + ROADS



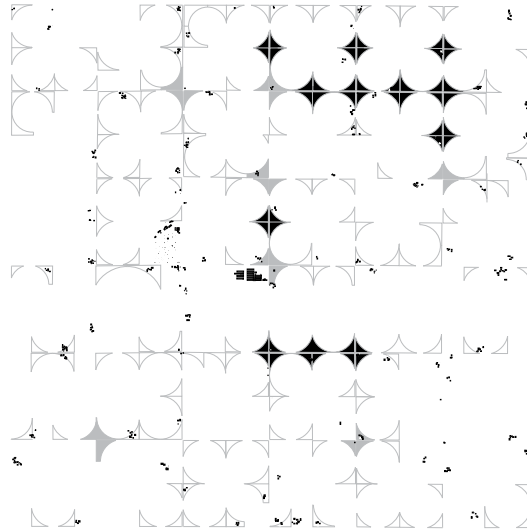
The evolution of Precinct K:
AGRONOMISTS + CENTER PIVOTS



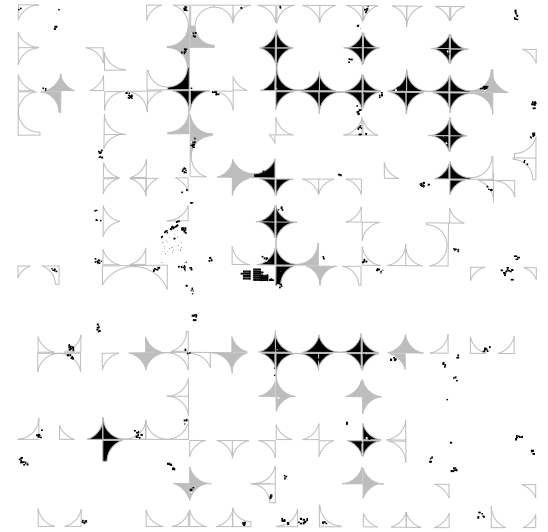
1. Full, diamond-shaped communities are established



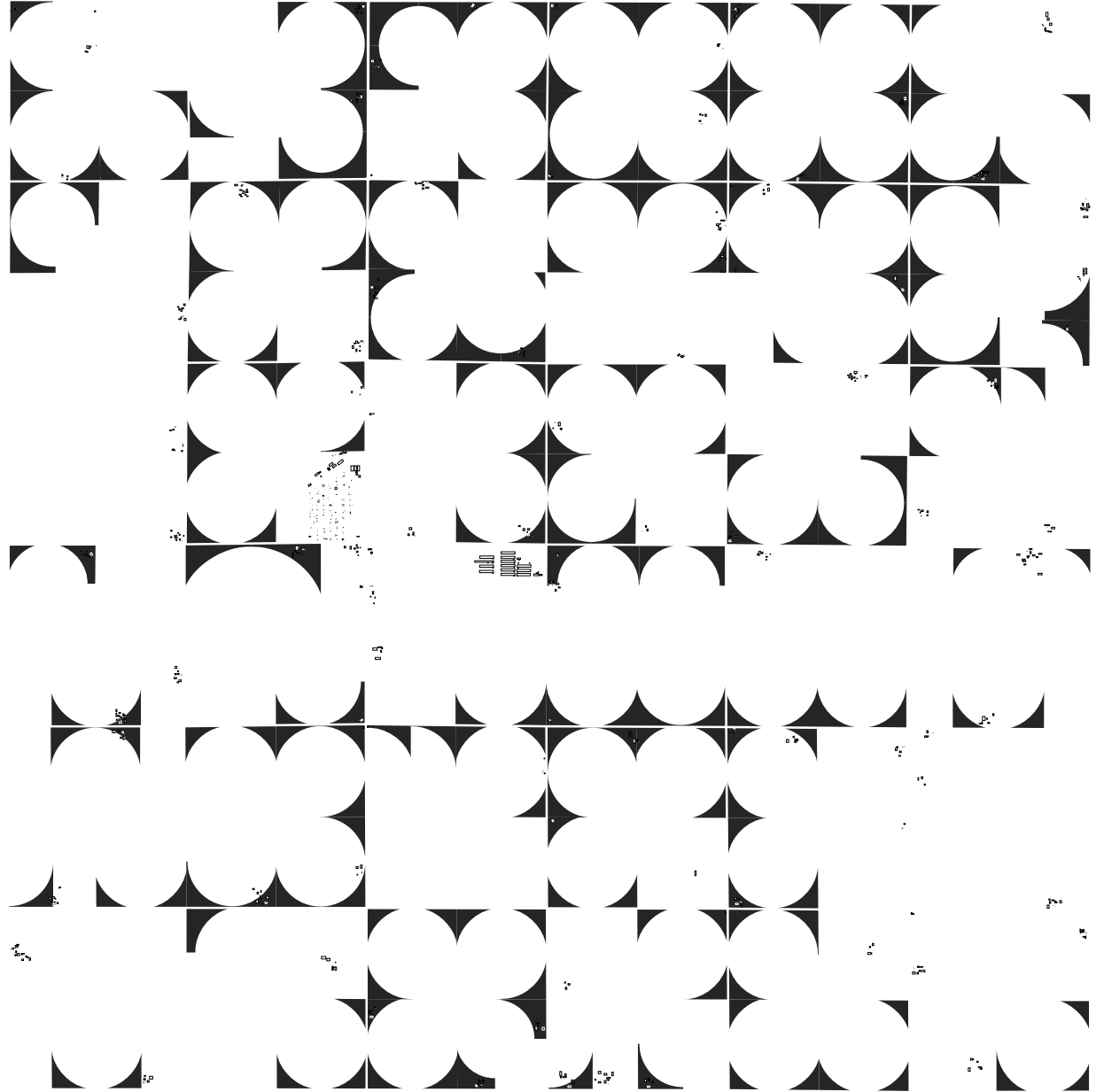
2. Settlement grows to incorporate partial-diamond sites

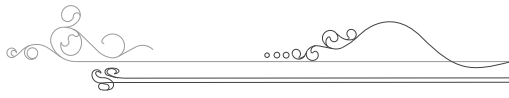


3. Network continues to appropriate outliers



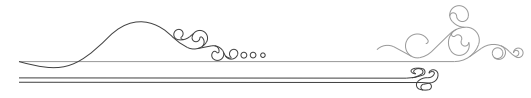
4. A substantial secondary population is in place without having compromised the 'original' tenant of the land

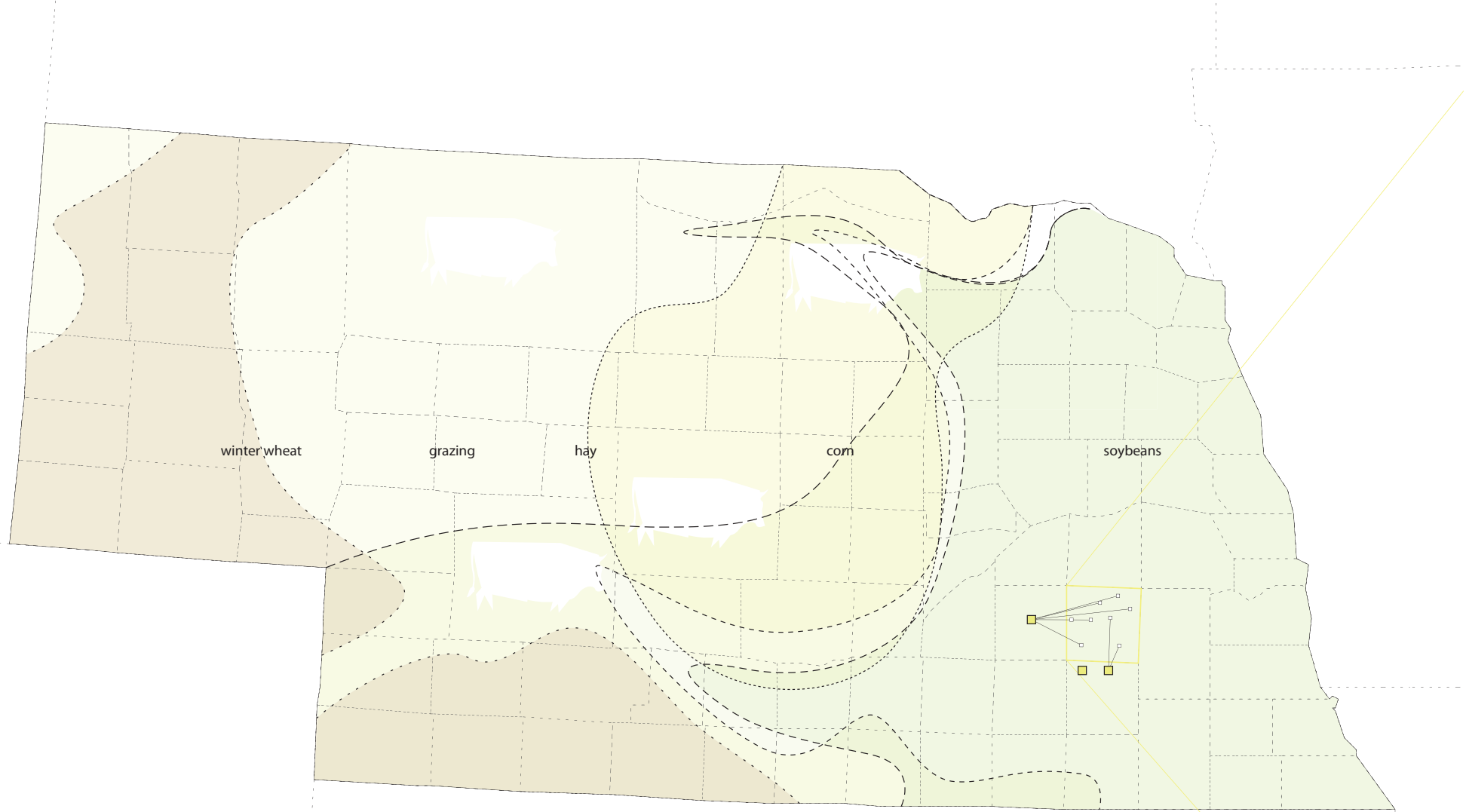




Resources

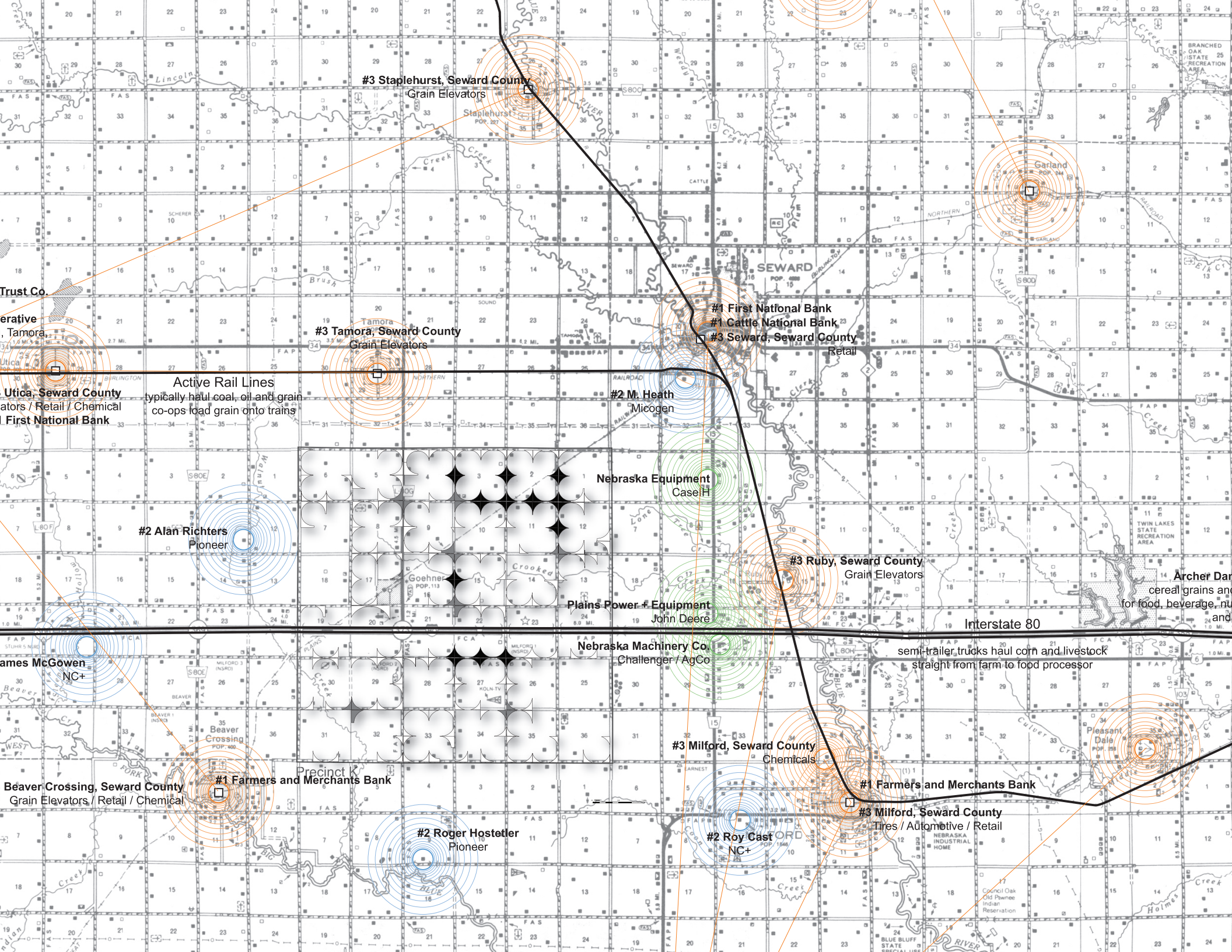
The Facilitators of Farming and
Their Implementations





Nebraska 2006 Productivity

corn	1.178 billion bushels	152 bushels per acre
soybeans	250 million bushels	36 bushels per acre
wheat	60 million bushels	50 bushels per acre
<small>1 bushel = 64 pints = 35.2 liters</small>		
hay	73,500 thousand tons	1.95 ton per acre
beef	25,975 million pounds	100 head per farm



#3 Staplehurst, Seward County
Grain Elevators

#3 Tamora, Seward County
Grain Elevators

#1 First National Bank
#1 Cattle National Bank
#3 Seward, Seward County
Retail

Active Rail Lines
typically haul coal, oil and grain
co-ops load grain onto trains

#2 M. Heath
Micogen

Nebraska Equipment
CaseIH

#2 Alan Richters
Pioneer

#3 Ruby, Seward County
Grain Elevators

Plains Power & Equipment
John Deere

Interstate 80

semi-trailer trucks haul corn and livestock
straight from farm to food processor

Archer Dan
cereal grains and
for food, beverage, nu
and

Nebraska Machinery Co
Challenger / AgCo

#3 Milford, Seward County
Chemicals

#1 Farmers and Merchants Bank

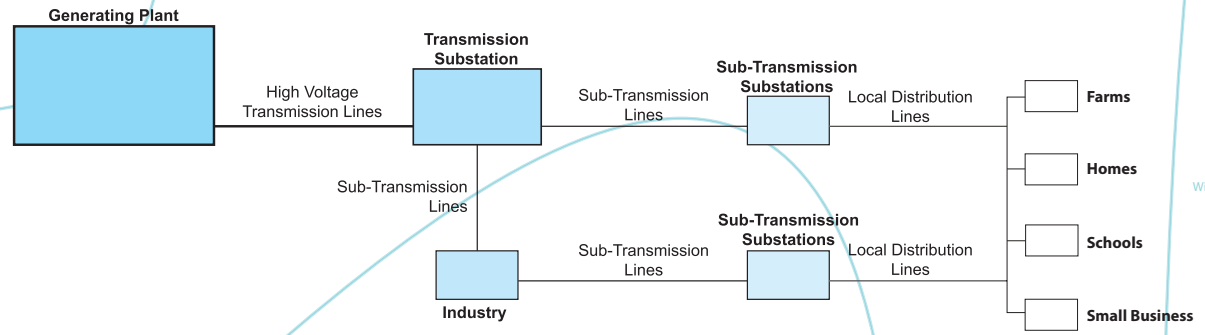
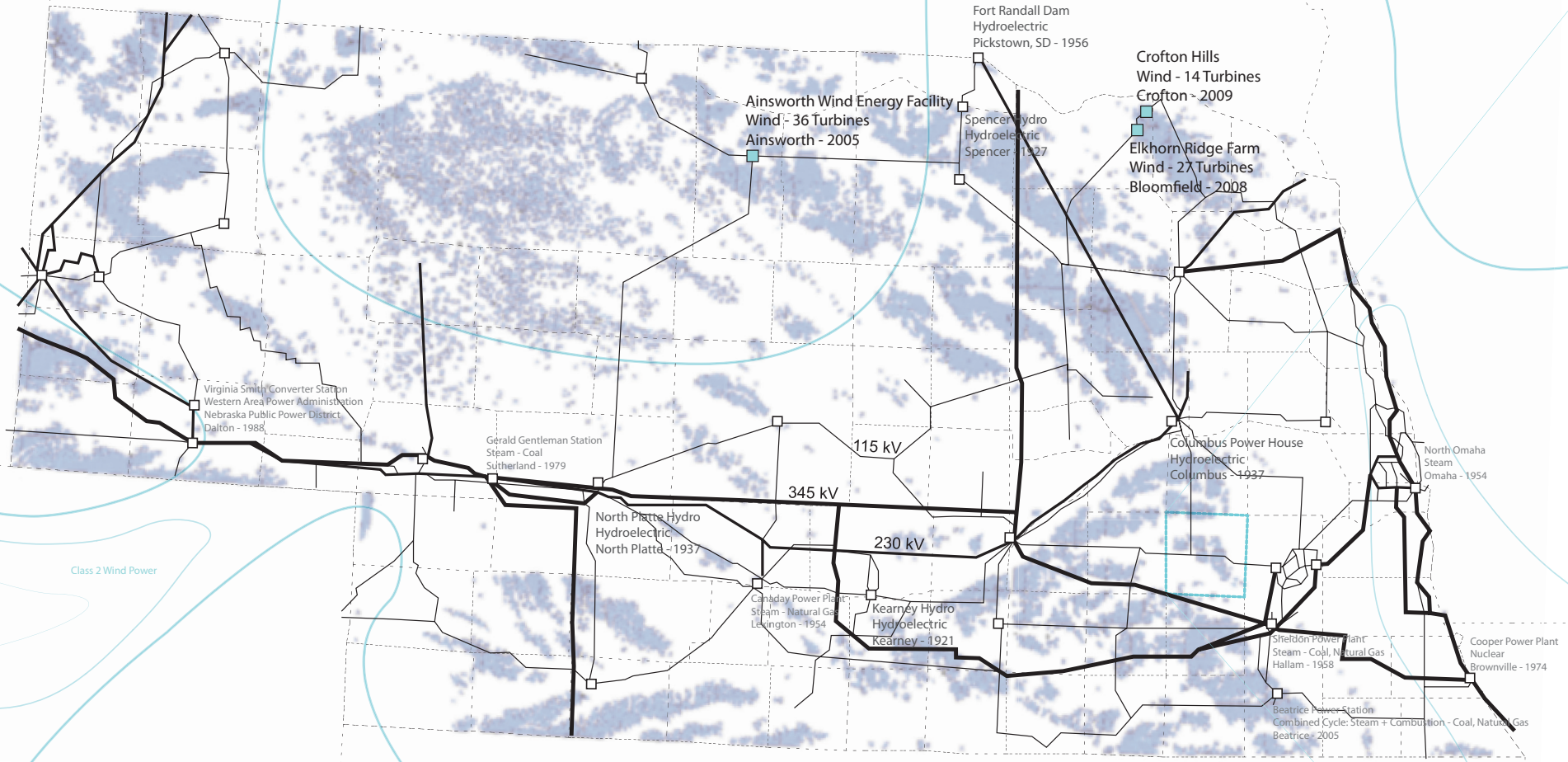
Beaver Crossing, Seward County
Grain Elevators / Retail / Chemical

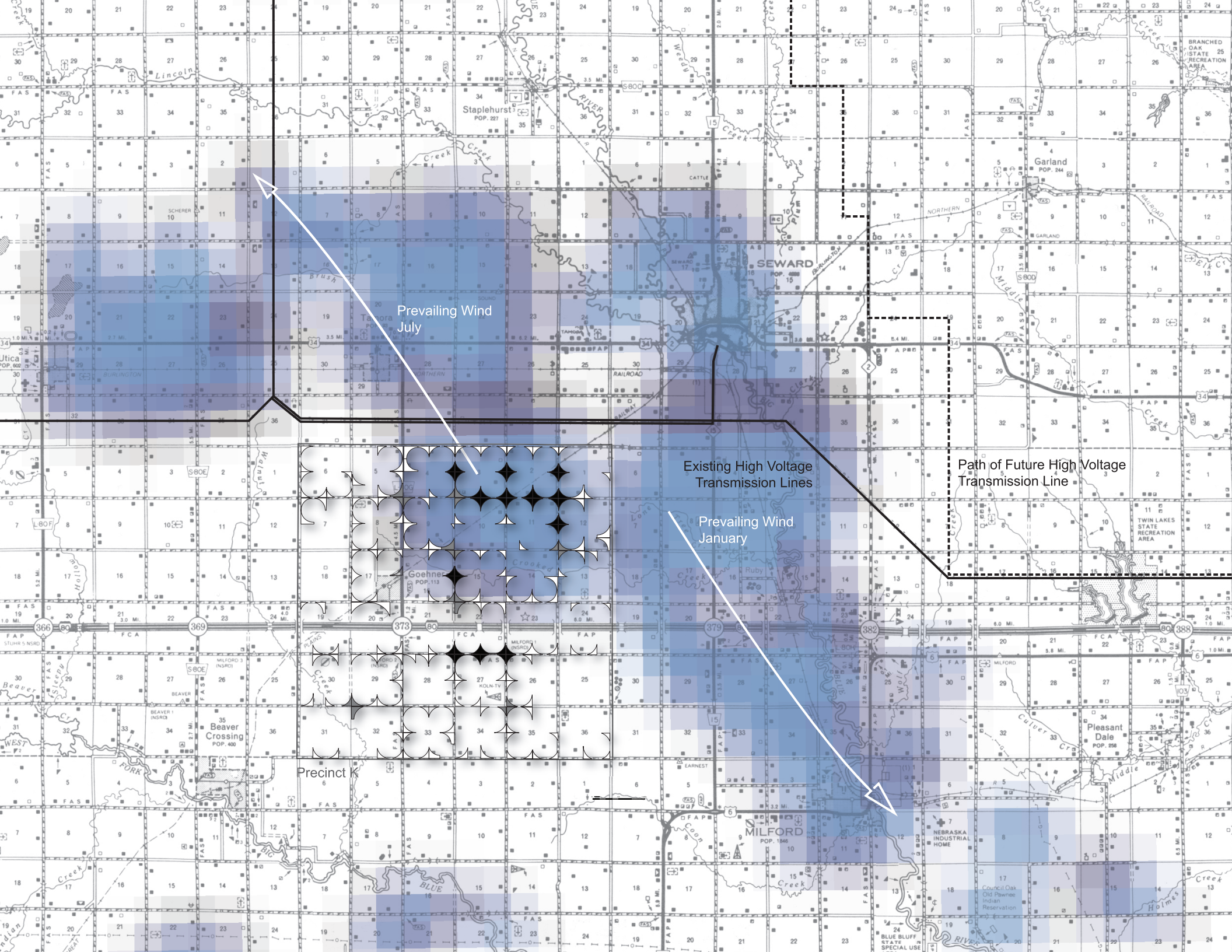
#1 Farmers and Merchants Bank

#2 Roger Hostetler
Pioneer

#2 Roy Cast
NC+

#3 Milford, Seward County
Tires / Automotive / Retail





Prevailing Wind July

Existing High Voltage Transmission Lines

Path of Future High Voltage Transmission Line

Prevailing Wind January

Precinct K

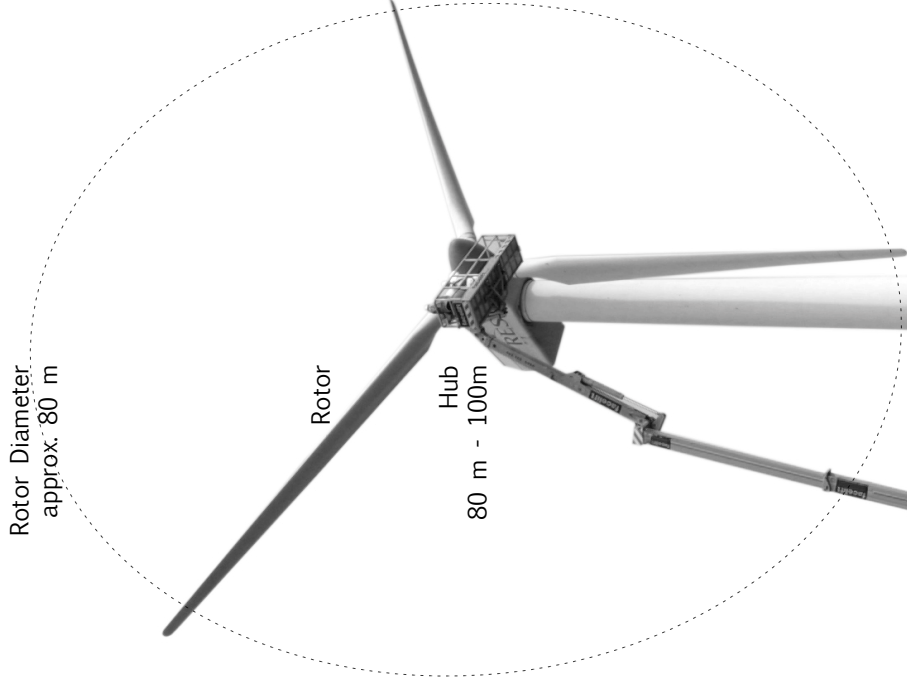
MILFORD POP. 1940

NEBRASKA INDUSTRIAL HOME

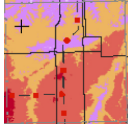
Council Oak Oil Shales Indian Reservation

BLUE BLUFF STATE SPECIAL USE

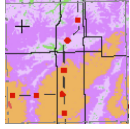
Scale Comparison
 left: large-scale geared turbine
 right: urban-scale direct-drive turbine



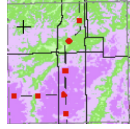
Mean Annual Wind Speed
in Seward County



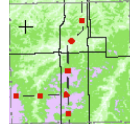
100 m / 328' high
19.0 - 20.1 mph



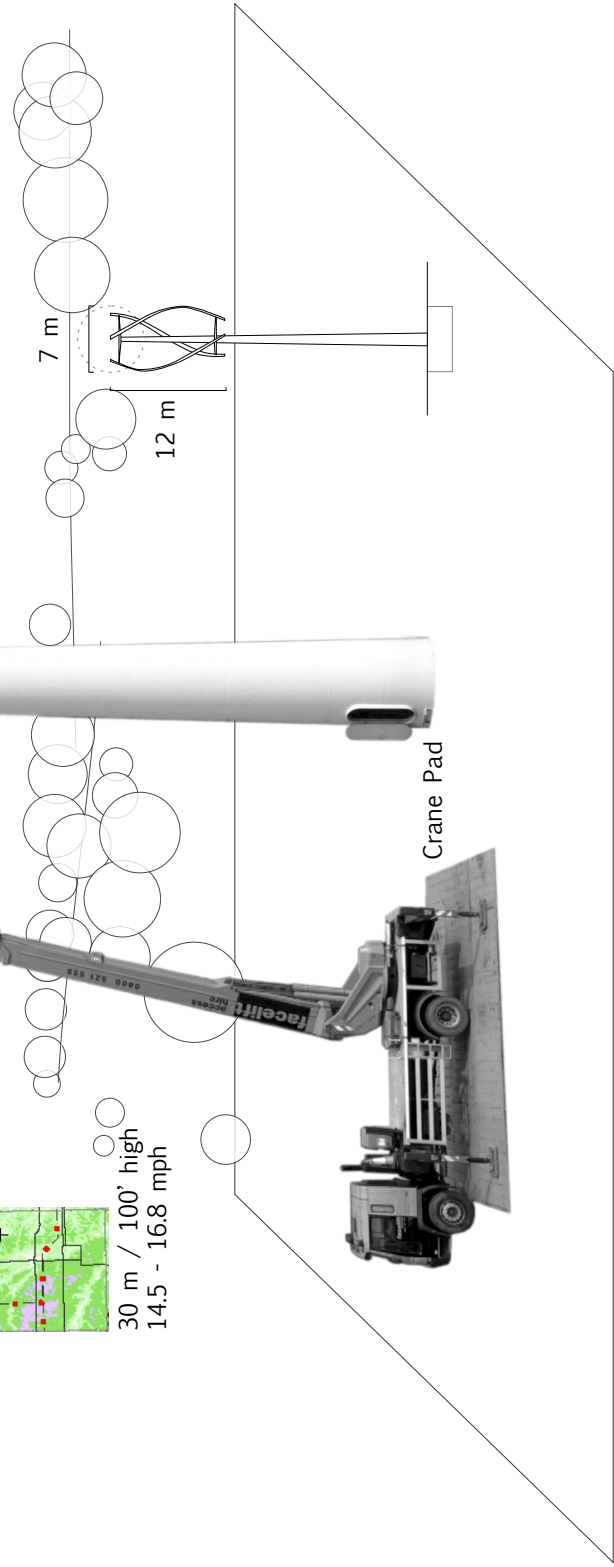
70 m / 230' high
17.9 - 19 mph

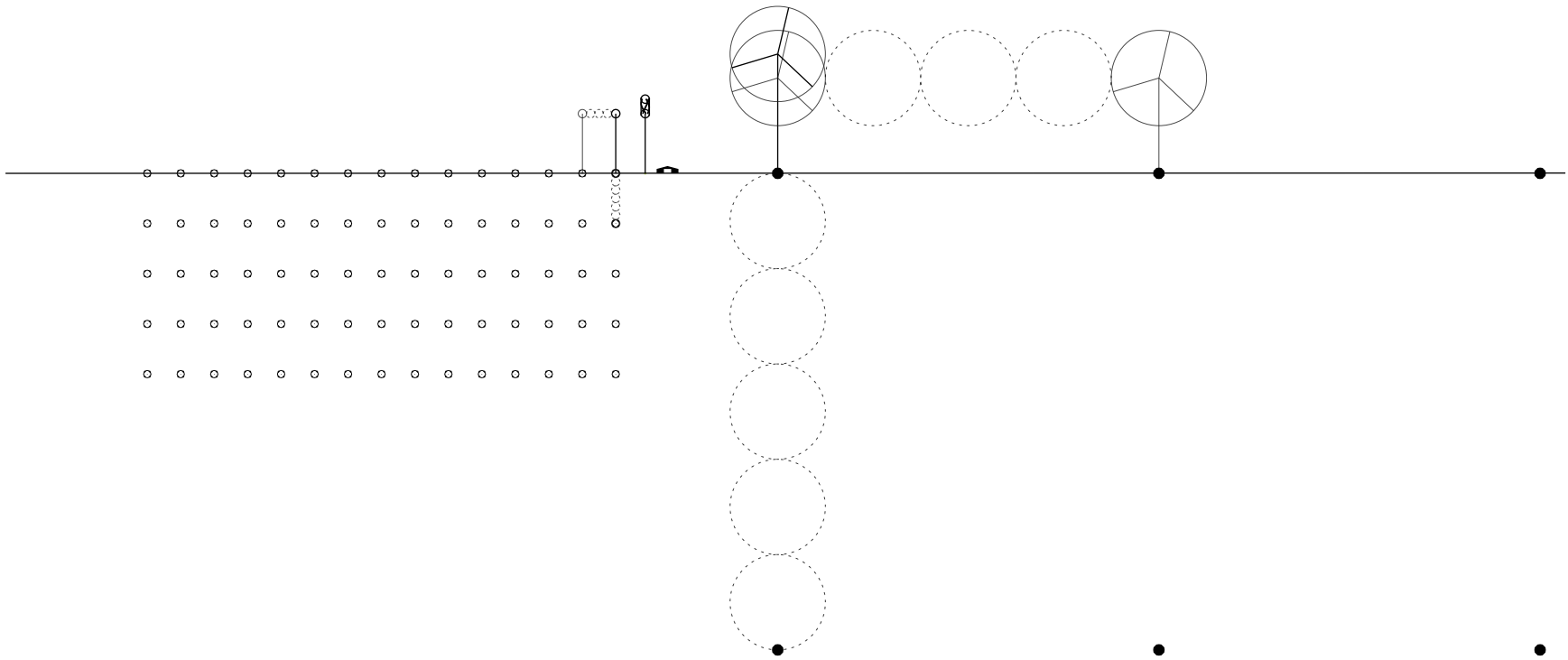


50 m / 165' high
16.8 - 17.9 mph

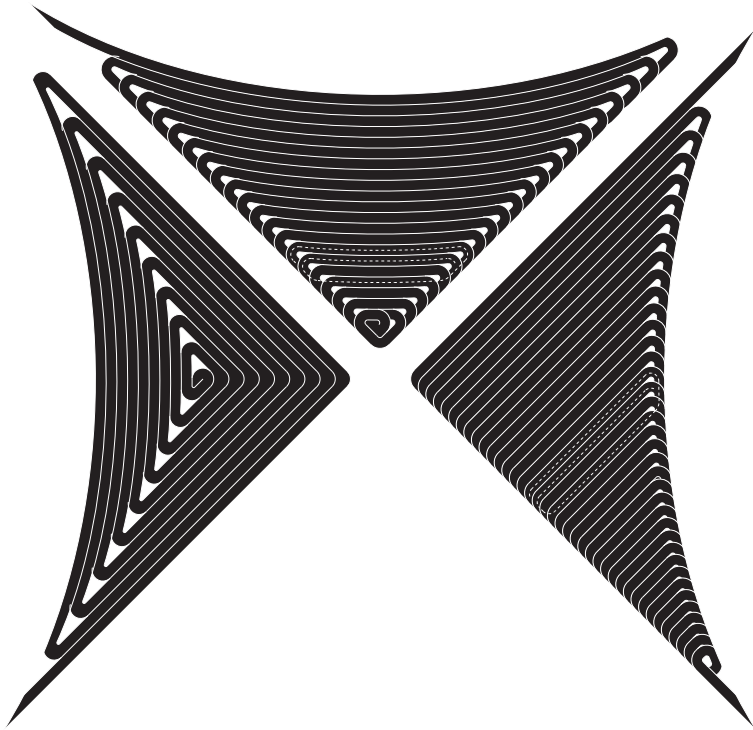


30 m / 100' high
14.5 - 16.8 mph

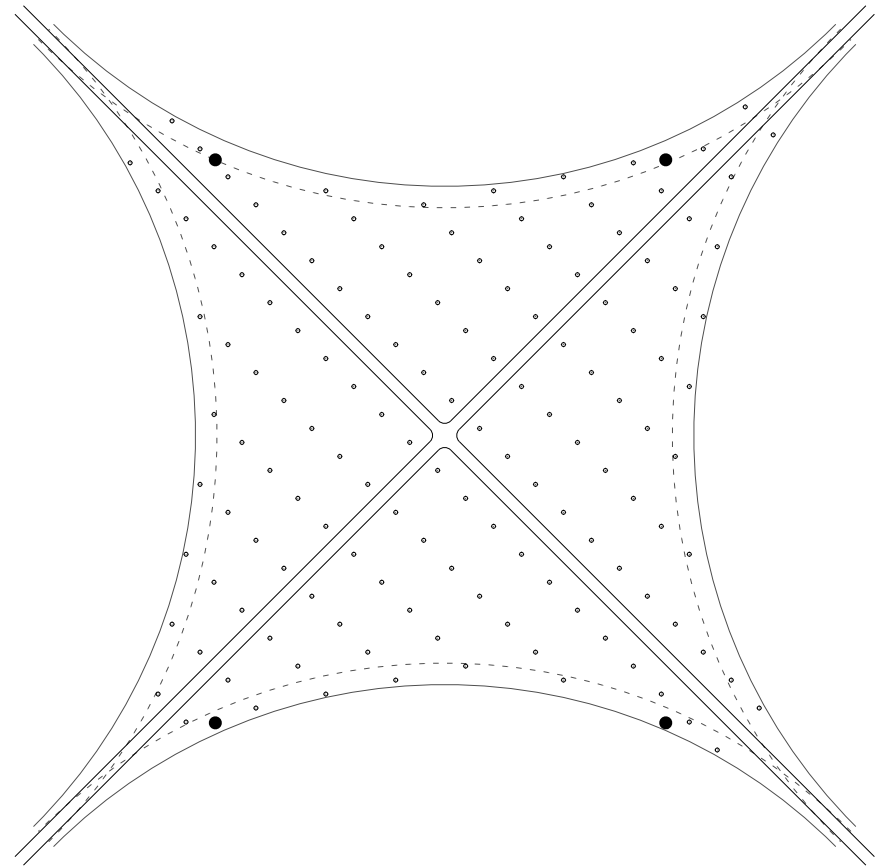




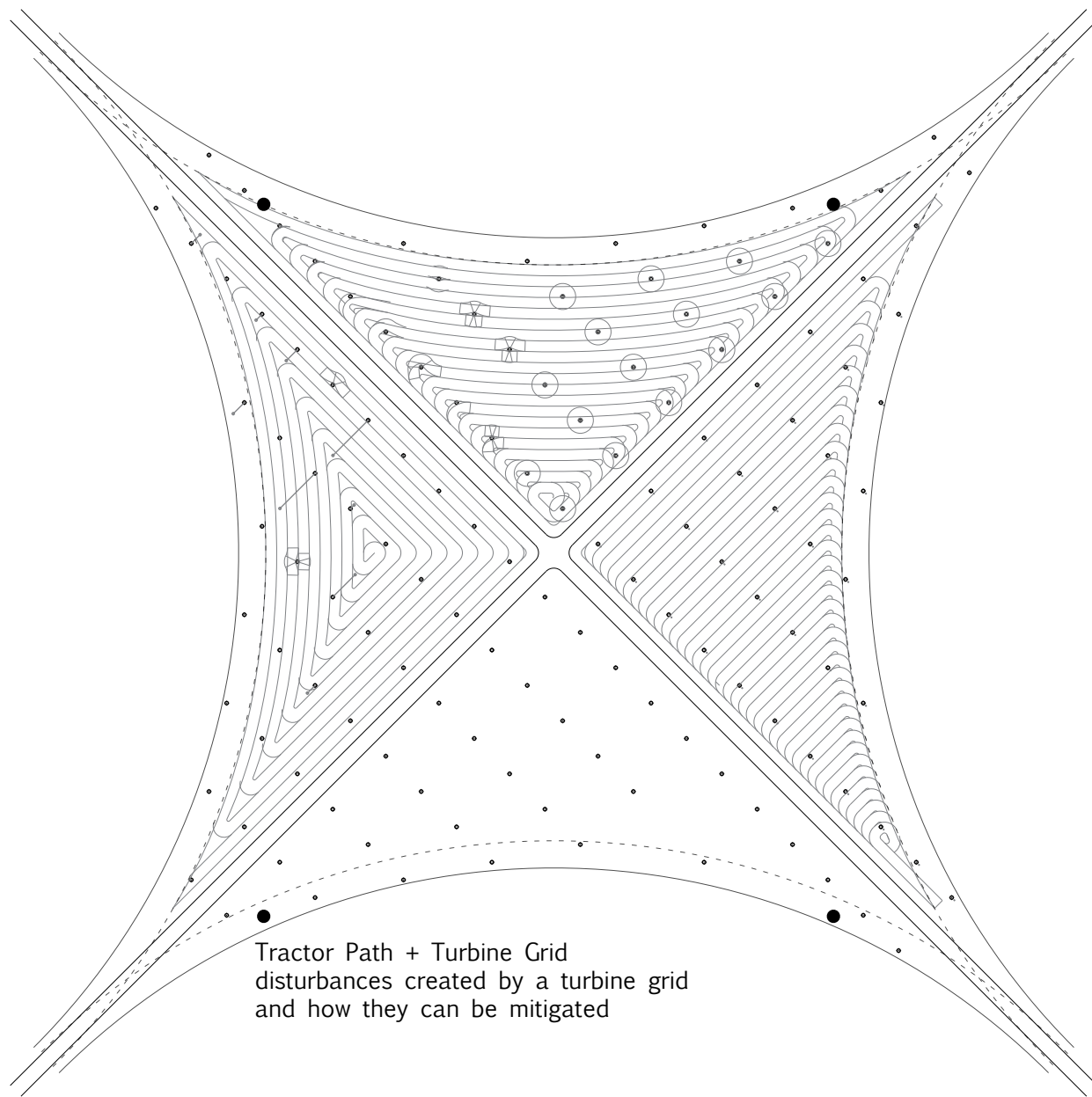
Comparison of Spacing requirements for small and large-scale turbine types



Tractor Path
three options with a
20' wide implement



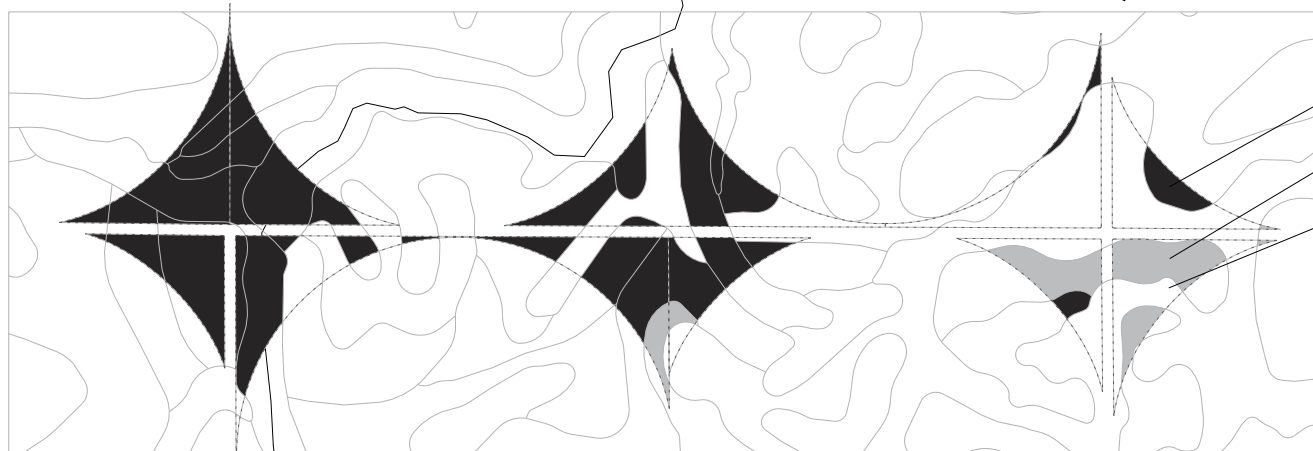
Large + Small-Scale Turbine Grids
placed on site in an array that
maximizes land and wind



Tractor Path + Turbine Grid
disturbances created by a turbine grid
and how they can be mitigated

Further contextual information--soil types--is compiled and layered over the irrigation layer.

Map of Soil Types

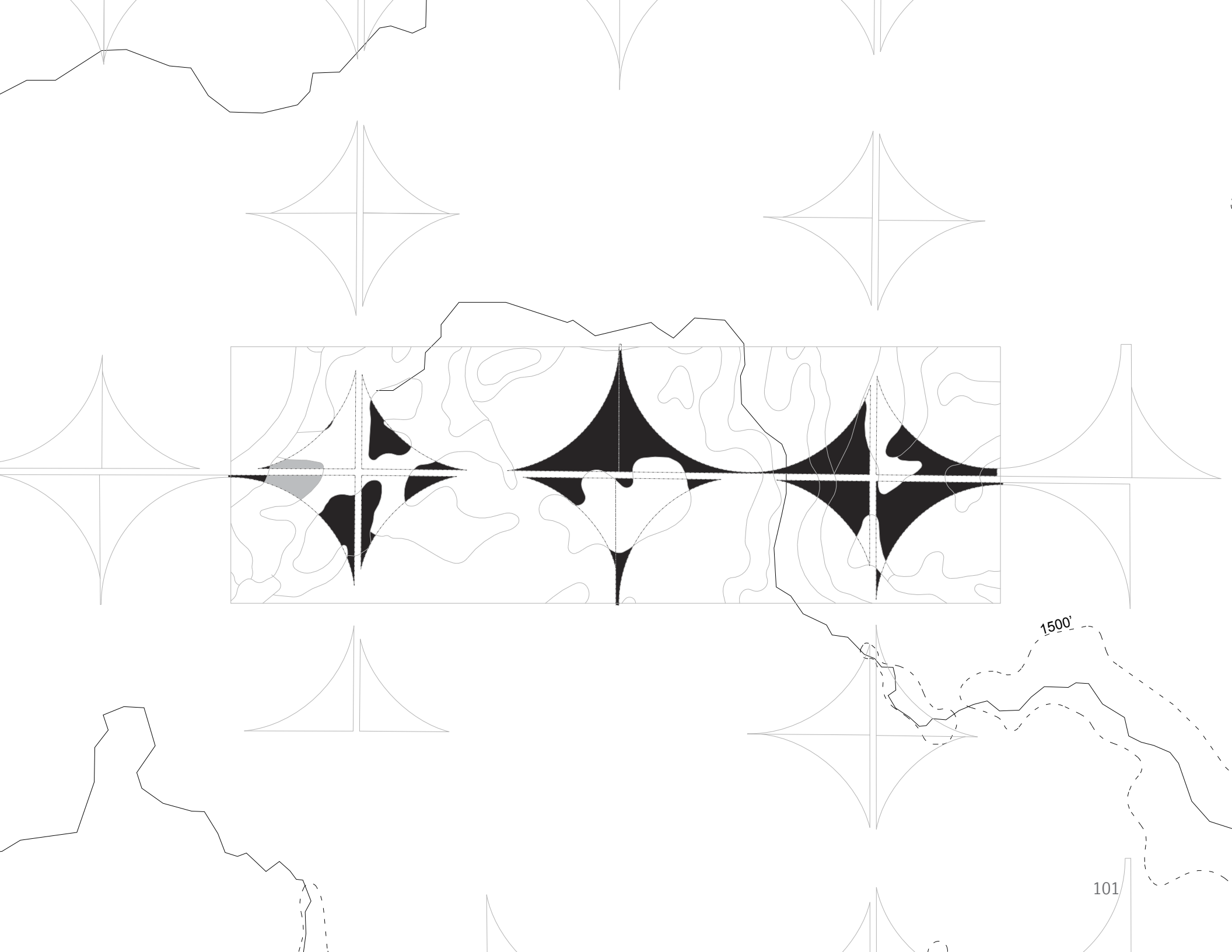


a soil type with:

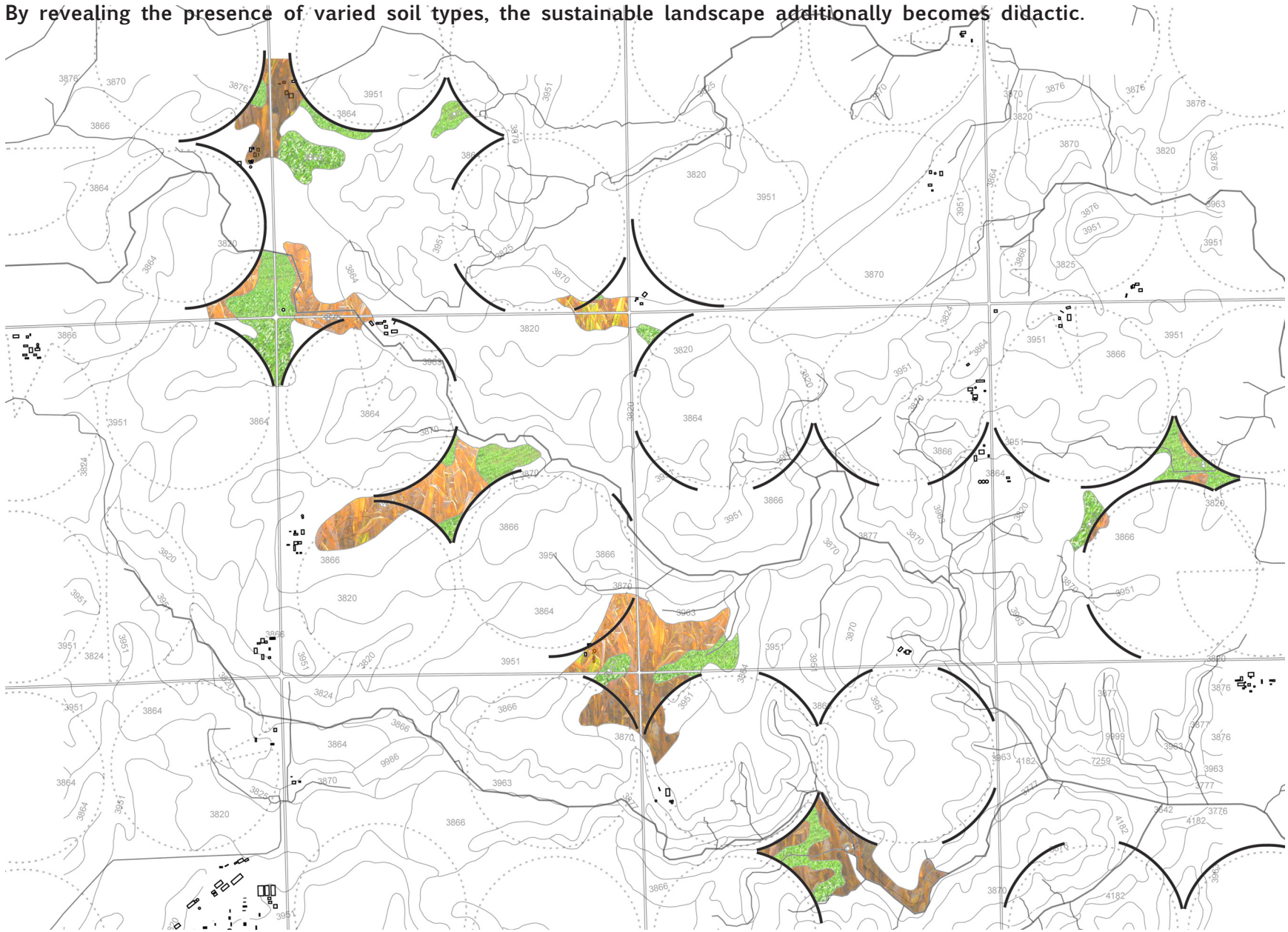
good drainage

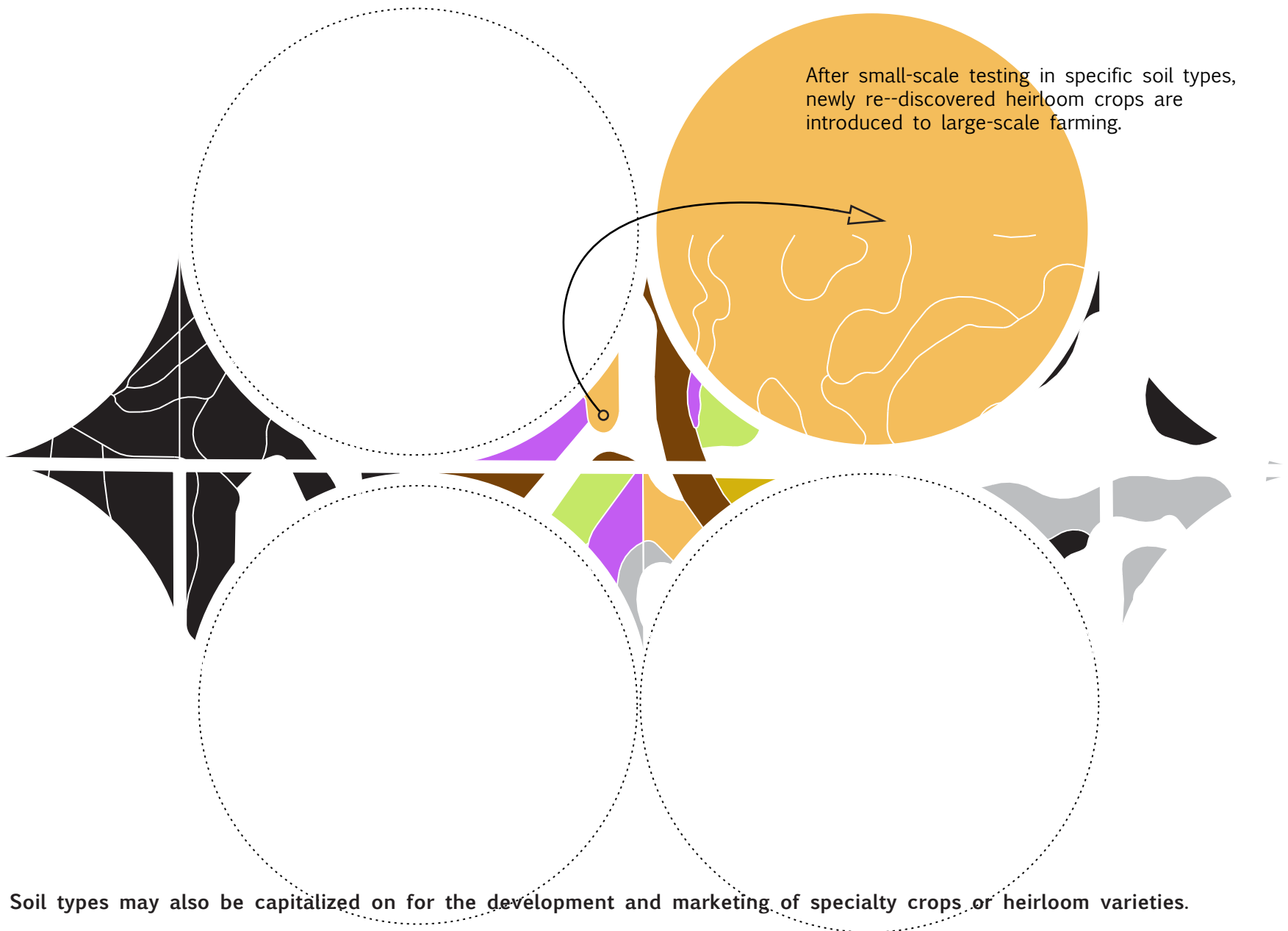
moderate drainage

poor drainage



By revealing the presence of varied soil types, the sustainable landscape additionally becomes didactic.





Soil types may also be capitalized on for the development and marketing of specialty crops or heirloom varieties.

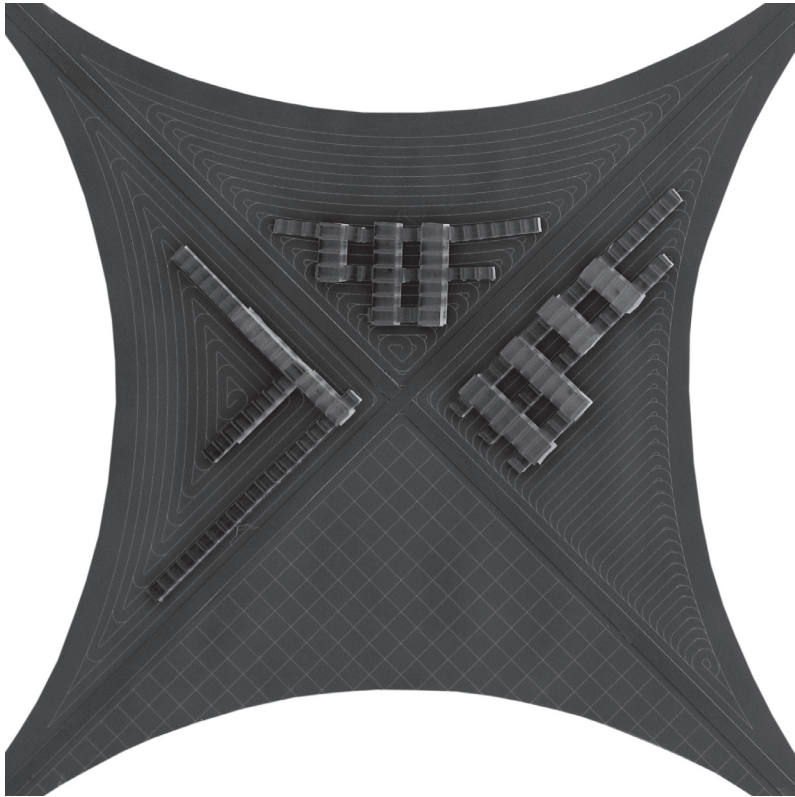
Developing concept and massing possibilities for a site which is surprisingly open-ended.



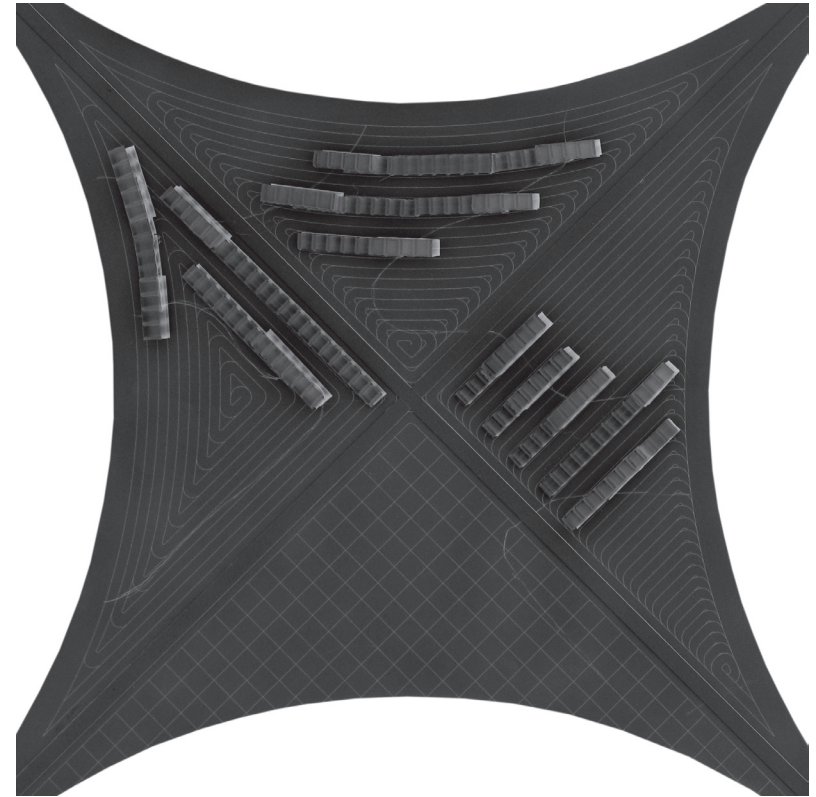
Building up areas of poor soil content generates secondary, alternative ground for alternative uses.



Subtraction of ground from an 'invaluable' location.

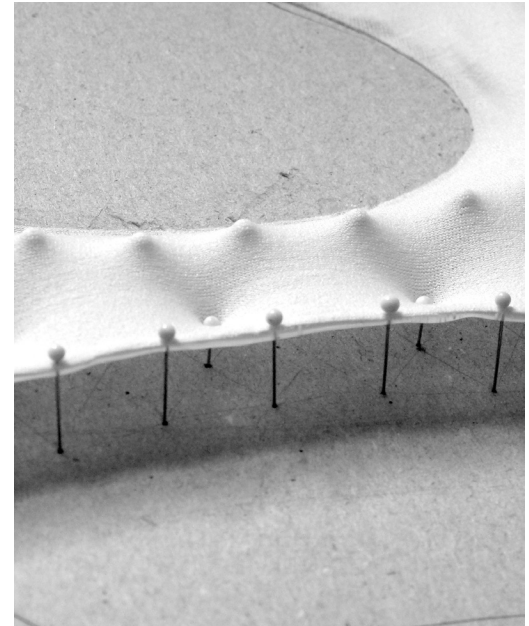
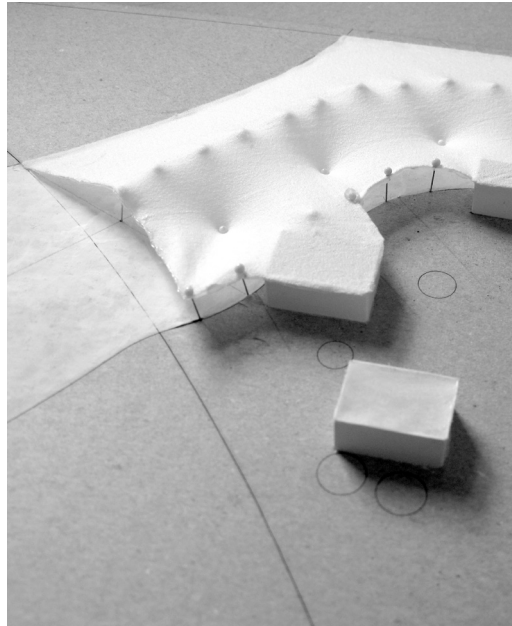
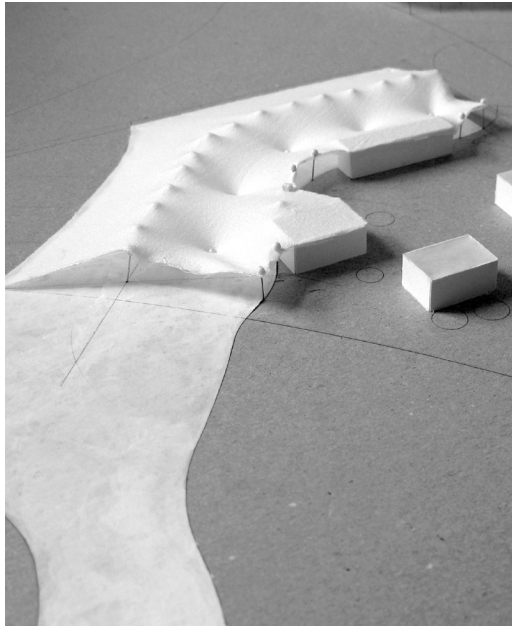


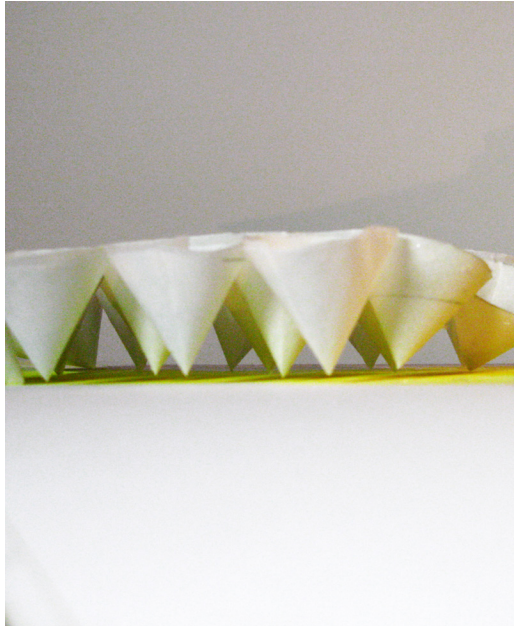
Mat buildings oriented according to tractor paths.

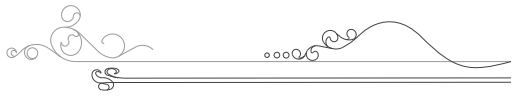


Bar buildings oriented according to tractor paths and soil type.

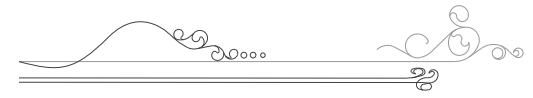
Modeling performative canopies which also serve to duplicate the ground, harvest elements, and address the landscape at an agrarian scale.



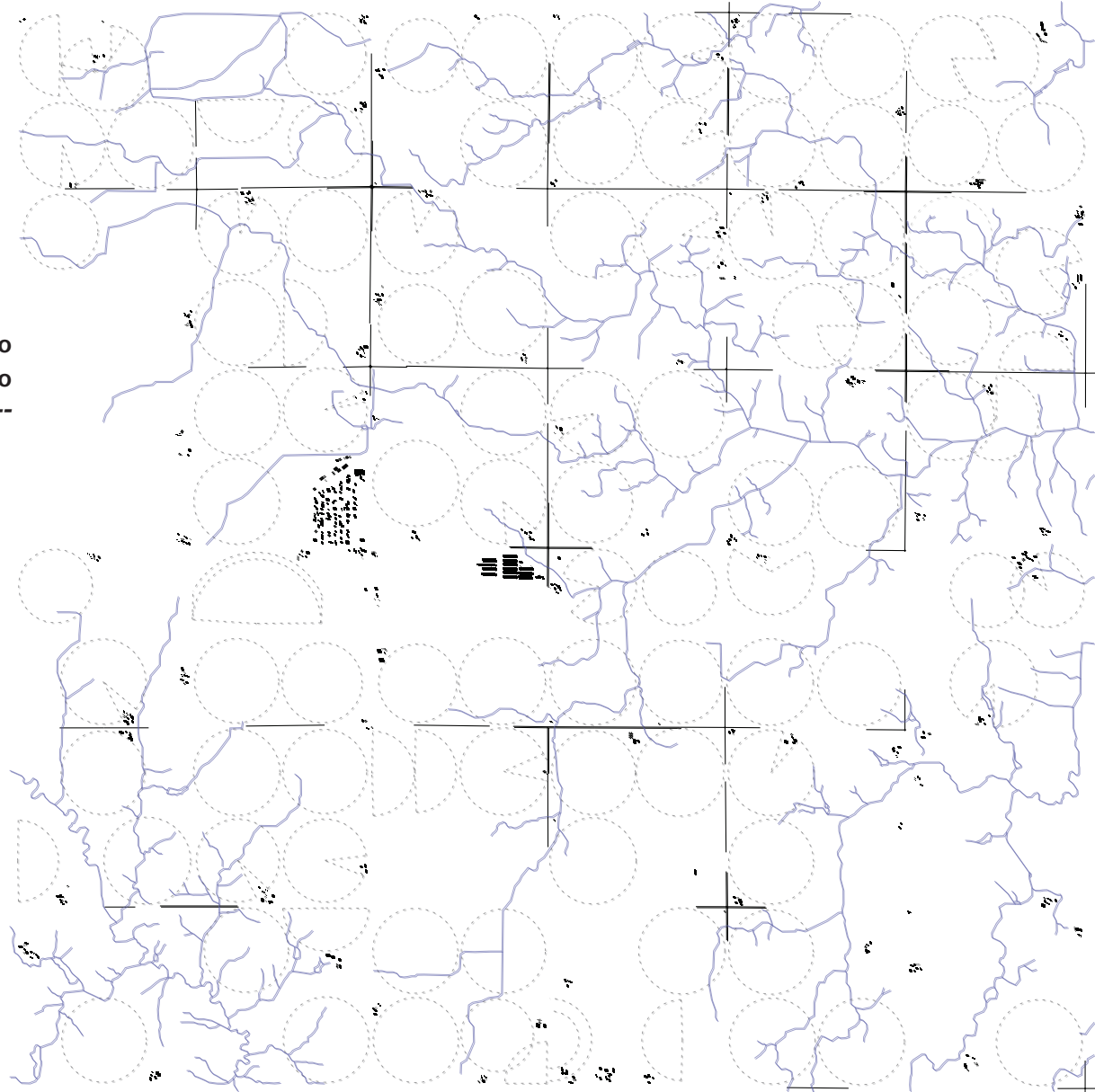




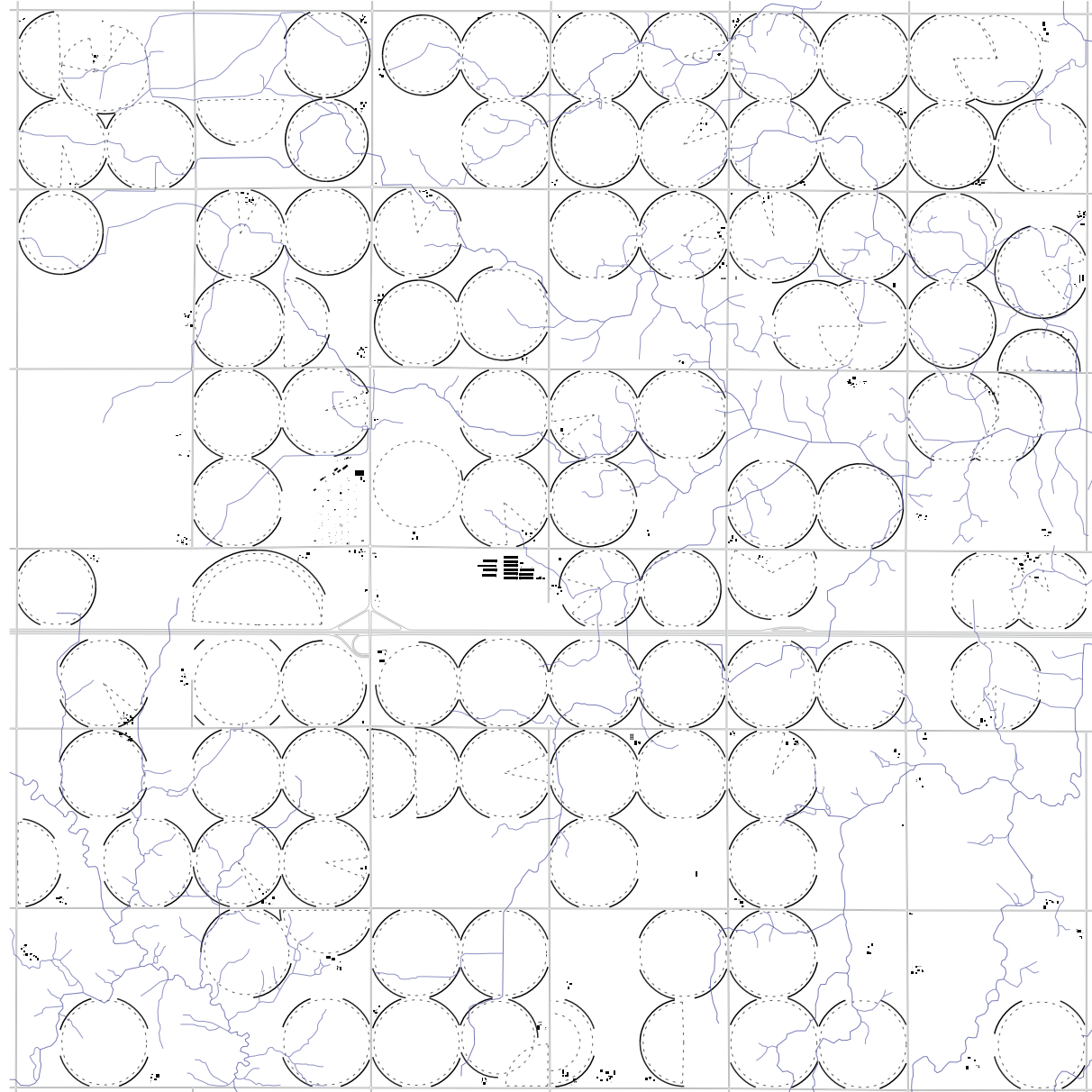
Site Refinement
Focussing on Boundaries



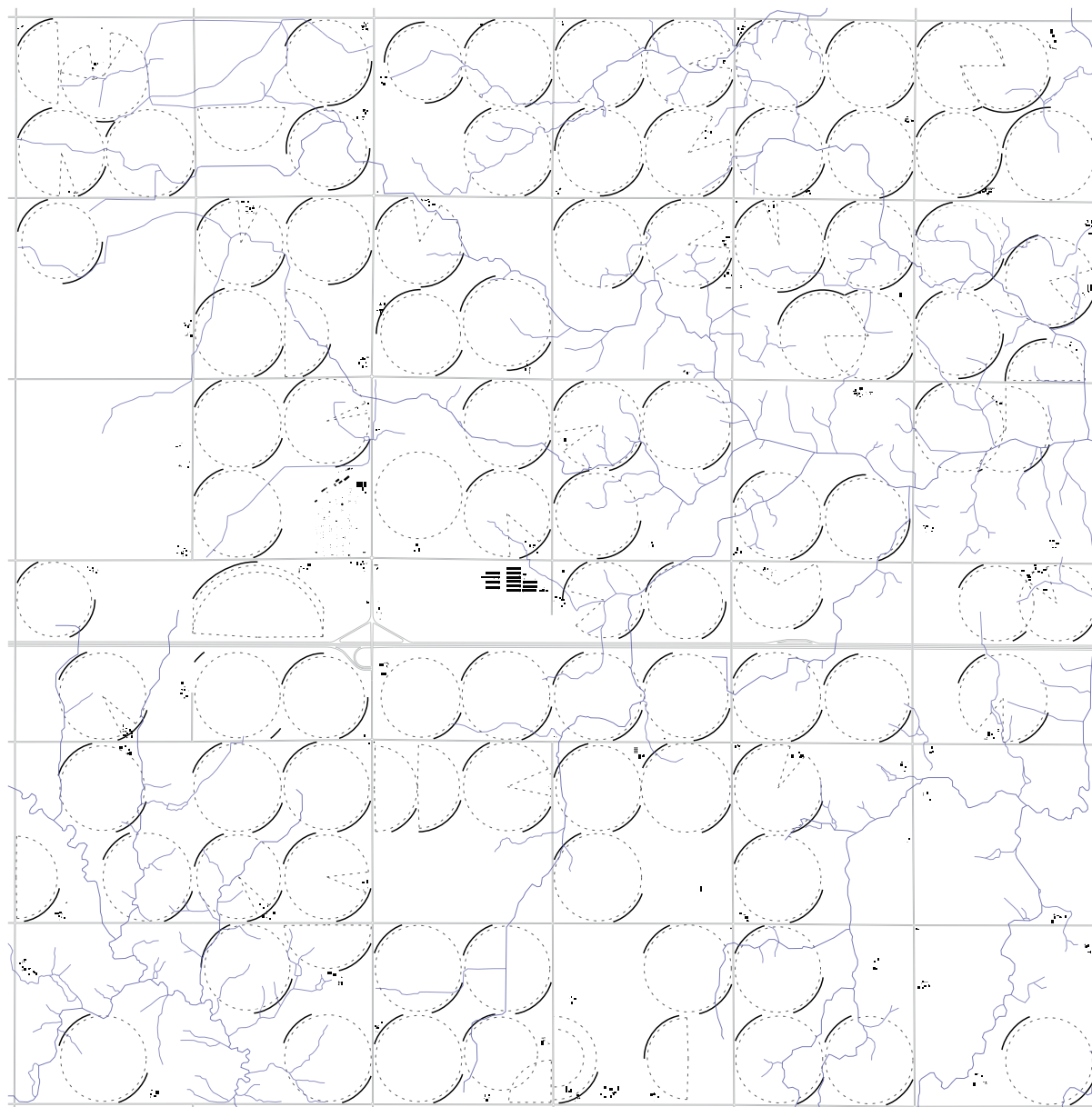
After limited success looking into triangular units, attention is turned to the edges--both arced and straight--of the triangles.



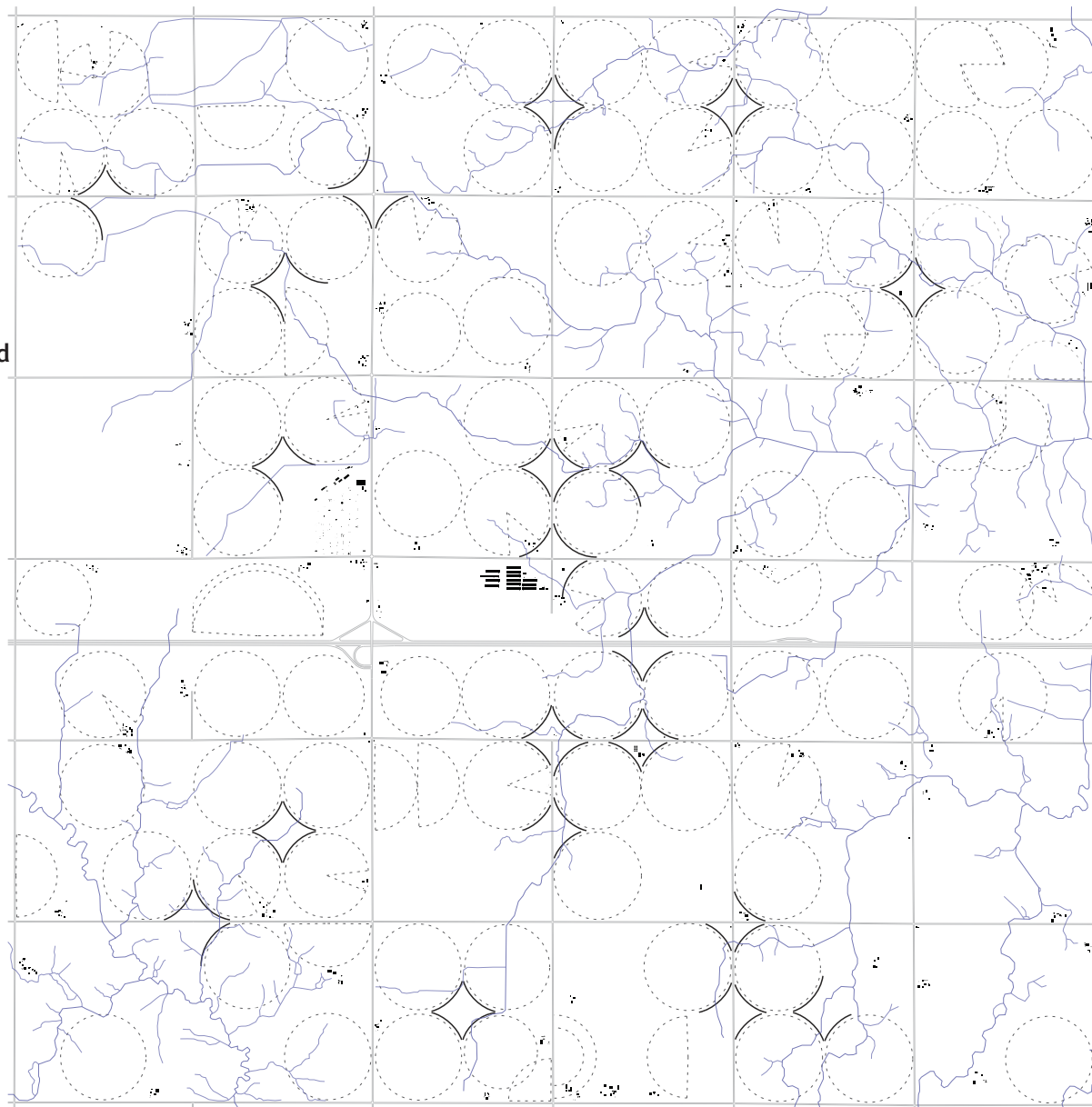
All the arcs on the site.



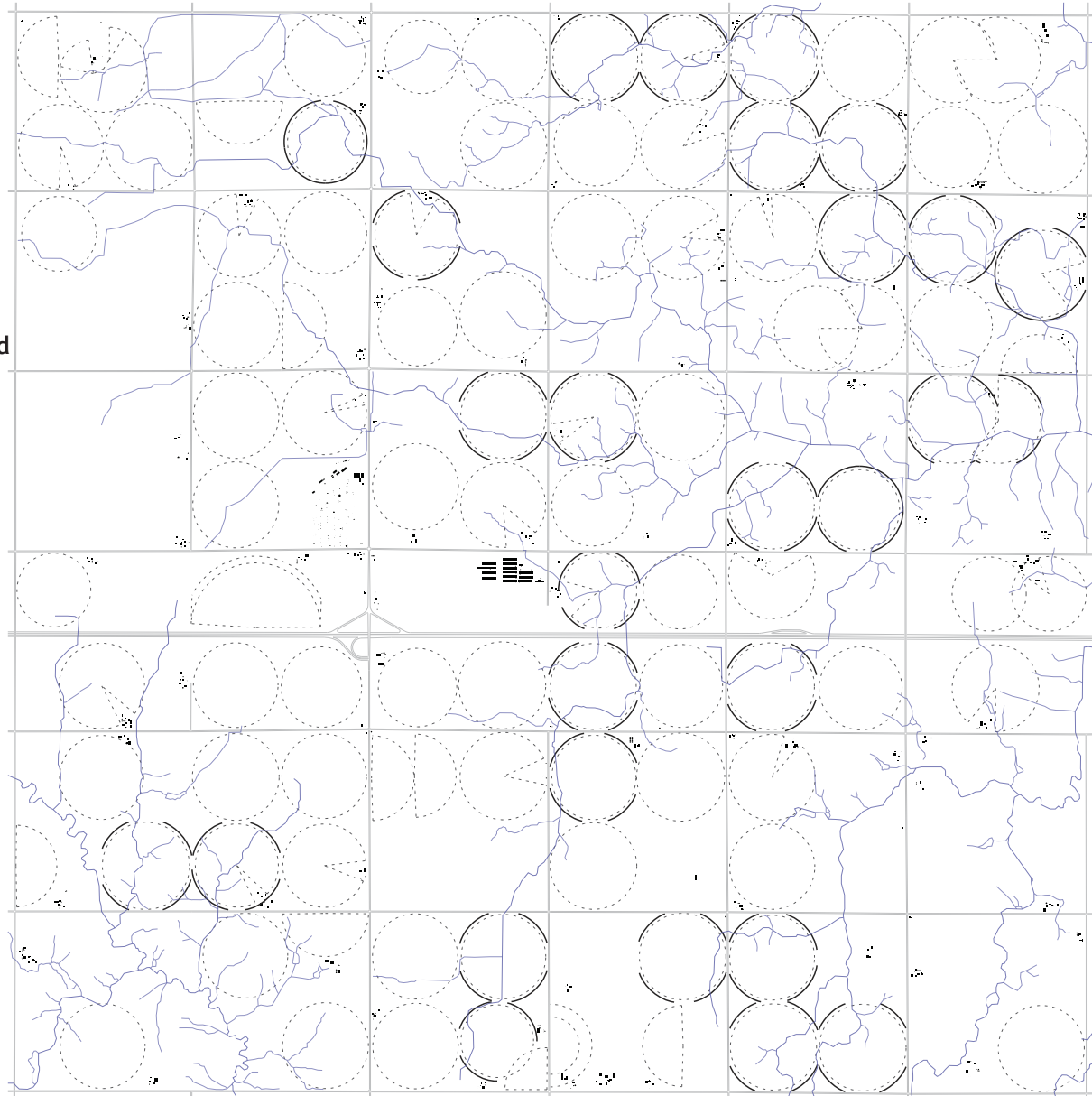
Arcs selected for wind protection.



Arcs used to generate 3 and 4 sided compounds.

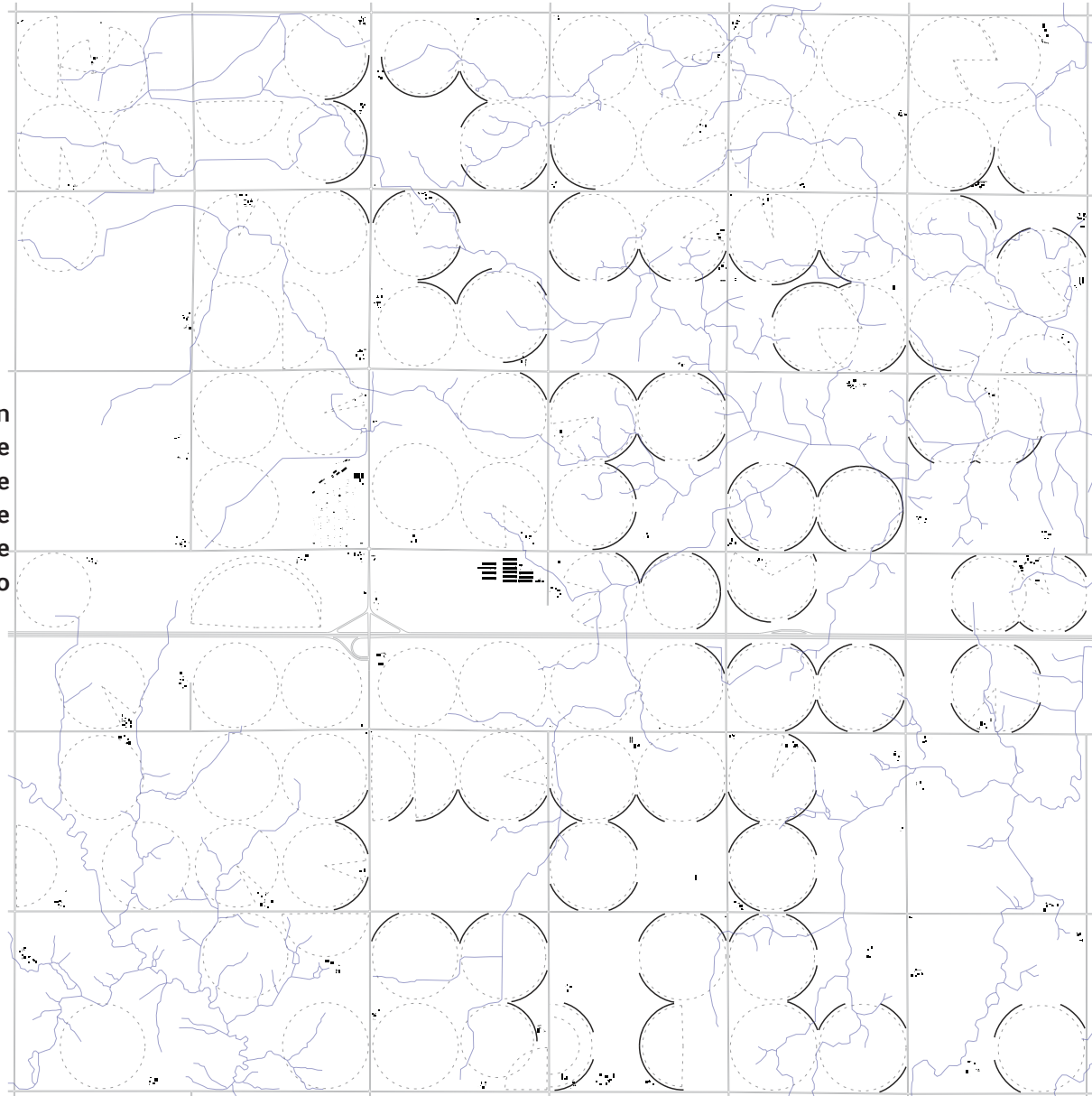


Arcs used to generate round enclosures with water access.



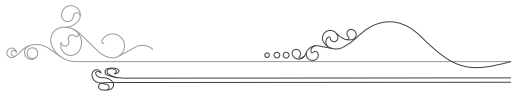
FINAL SELECTION

Arcs which run the boundary between man-made irrigation and nature-made drainage. Considered as a collective system, the arcs unbend and unbuckle to form a 26 mile long sub-structure and sub-program complimentary to Industrial Agriculture.

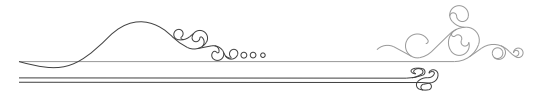


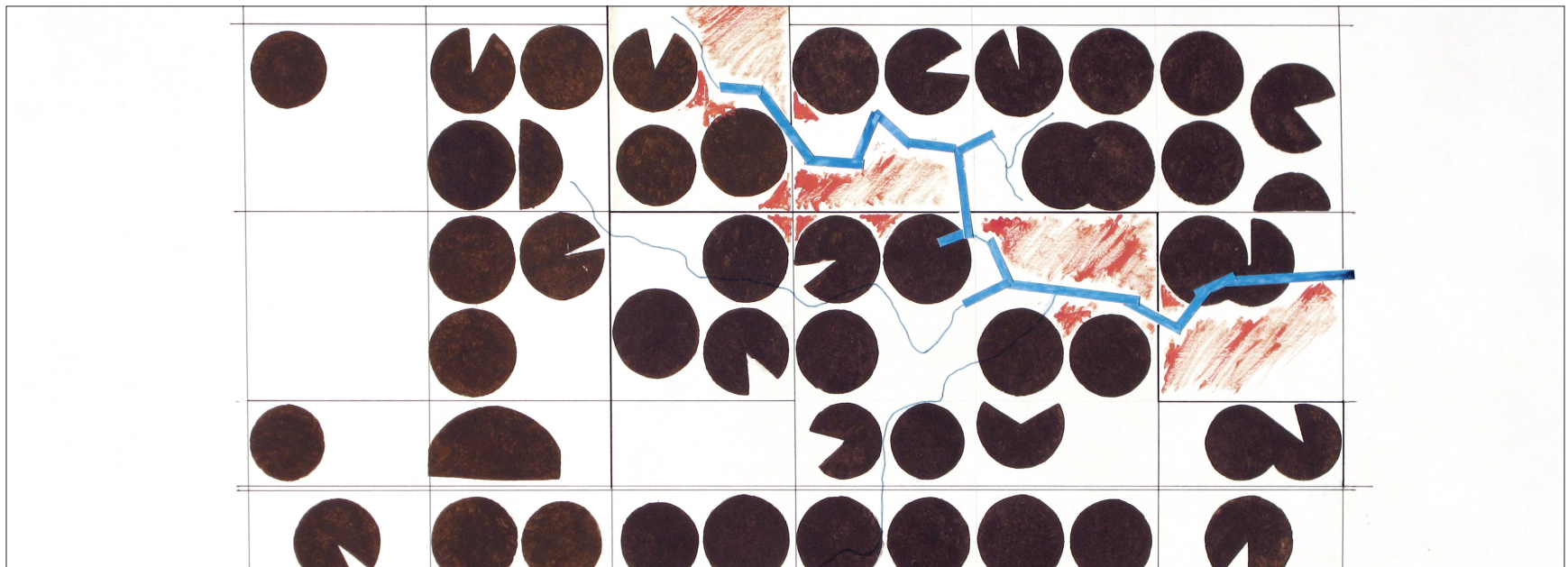
The arc sequence in the previous panel became the backbone of the alternative farming program introduced in the Final Design portion of this thesis, and finally brings us full *center-pivot* circle.





Concept Collages
Illustrations of Primary Design Ideas







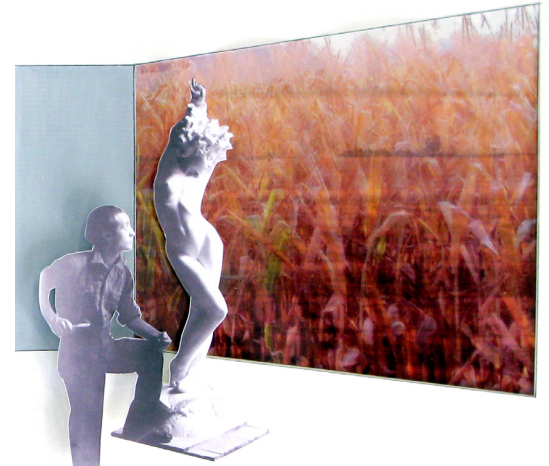




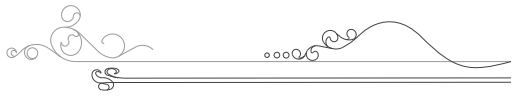
SPRING



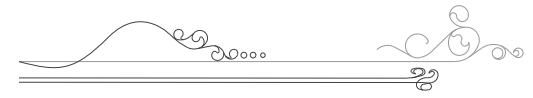
SUMMER



FALL



*The Townie's Illustrated
Prairie Guide*



The Vernacular and Vocabulary of
Contemporary Farming

acre

a unit of land area equal to 4,840 square yards. Origin: Old English, denoting the amount of land a yoke of oxen could plow in a day.[†]

acreage

connotes a former farm site used as the residence of a non-farmer. Typically, original farm buildings have been removed and the farm ground has either been sold or is being rented out.^a

air strip

connotes runway for local airport.^a

American Foursquare

1900-1930. Popularized by mail-order catalogues and speculative builders in the early twentieth century. Style is typified by its box-like massing, two stories, hipped roof, wide overhanging eaves, central dormers, and one-story porch spanning the front facade.ⁿ

“anhydrous” :: anhydrous ammonia

the most common nitrogen fertilizer source, it is a hazardous substance requiring specially designed equipment and specially trained handlers. While not as effective, a safe alternative to anhydrous fertilizer is nitrogen-fixing crops such as the leguminous soybean and alfalfa.^a

aquifer

a body of permeable rock that can contain or transmit groundwater.[†]

auger

connotes the device commonly used to transfer grain or feeds from ground level to elevated storage. Consists of a pipe and helical shaft connected to a powertrain.^a

bale

a bundle of paper, hay, straw, stover, cotton, etc., tightly wrapped and bound with cords or hoops.[†]



Large round hay bales near Aurora, Nebraska. July, 2008. Photographed by author.

barn

a large farm building used for storing grain, hay or straw, and machinery, or for housing livestock. Prior to 1900, most barns were post and beam construction. Gambrel and gable roof barns were built between 1900 and 1940 in order to accommodate dairy operations.[†]

bean hook

a long wooden handle with small sickle fixed at one end. Used to remove undesirable plants from a field by cutting off the plant just above the roots and permitting the laborer to work without stooping or crouching.^a

“bedding”

sand, straw or other like material used to make a comfortable ground for livestock to lie down upon.^a

building site

connotes the site of a former farm. Usually lacks farmhouse and other wooden structures. Shelter belts may remain, but are often removed to make more land available for crops.^a



Historic barn north of Fairbury, Nebraska. June, 2008. Photographed by author.

Bungalow :: Craftsman Style
1890-1940. An architectural style characterized by overhanging eaves, open porches with large piers and low-pitched roofs.¹

bunker silo
a three-sided trench or above-ground concrete slab-walled space into which green crops are compressed and stored as silage.^a

Butler® building
a brand of all-steel, pre-engineered metal building commonly erected to suit today's farmers' 'barn' needs.^a

buttonweed :: *Abutilon theophrasti*
also called 'velvetleaf', the weed is common in the Plains and distinctive because of its large, velvety leaves and distinct seed pods.^{a†}

calf hutch
a small shelter which houses a single calf as it matures through its earliest stage of development.^a

“cane” :: shatter cane
a common volunteer plant, it is a regressive form of sorghum. As with many grasses, it is difficult to kill and can occur as a volunteer crop long after a field has housed a stand of sorghum.^a

catch pond
a lagoon which catches the run-off--waste water and liquid waste--from cattle lots, and swine and dairy operations, where it decomposes and becomes fit for fertilizer.^a

cattle
large ruminant animals with horns and cloven hoofs, domesticated for meat or milk, or as beasts of burden; cows. Related terms: *bull, cow, heifer, steer, yearling, stirk, calf, poll.*^{a†}

cattle tank
or *stock tank*, is used to provide drinking water for animals such as cattle or horses. Ranging from 30 to 1500 gallons, the tanks are typically constructed of galvanized steel and filled either by a pump, windmill, creek or spring.[‡]



A relatively modern gable-roof barn, located east of Beaver Crossing, Nebraska. Roof, windows and window shashes, and doors have been replaced. August, 2008. Photographed by author.



The co-op of Aurora, Nebraska. July, 2008. Photographed by author.

“chopper” :: forage harvester
 a machine used to collect and cut green feed materials for packing into bunker silos where it will become silage.^a

cocklebur :: *Xanthium strumarium*
 an herbaceous plant of the daisy family, with broad leaves and burred fruits. Originated in tropical America but is now considered an invasive species worldwide. Poisonous to livestock: horses, cattle, sheep and swine.^{††}

combine :: combine harvester
 an agricultural machine that cuts, threshes, and cleans a grain crop in one operation. The waste straw--dried stems and leaves--is left on the field for other uses and is called ‘stover’.^{a†}

commodity
 a raw material or primary agricultural product that can be bought and sold, and is supplied without qualitative differentiation across a market. Common Great Plains commodities include: soybeans, wheat, corn, ethanol, beef, pork, etc.^{a†}

co-op

connotes an agricultural cooperative. Widespread in rural areas, farmers entrust their grain crops to the co-op for bulk storage. Grain must meet specific quality standards in moisture content and purity. When commodity prices are favorable, the farmer elects to sell specified amounts of his grain for profit. Grain must be sold within a year of it’s harvest.^a

coop

a cage or pen for confining poultry.[†]

corncrib

a bin or ventilated building for storing unhusked ears of corn. First used by Native Americans, slatted walls allow the corn to dry and stay dry. Cribs are elevated above the ground to keep the grain beyond the reach of pests.^{a†}

“corn knife”

a machete--a broad, heavy knife--used to cut down stalks of corn of undesirable genetic make-up from within a field of desirable types.^a



Unique square corncrib near Beaver Crossing, Nebraska. August, 2008. Photographed by author.

corral

a temporary holding pen for livestock, especially cattle or horses, on a farm or ranch. Historically, a defensive arrangement of Conestoga wagons.[†]

courthouse square

common town planning strategy which set aside a large, centrally-located square lot, oriented to the cardinal directions, for the county's courthouse building. Lining the opposite sides of the streets around the courthouse, were small businesses and storefronts.^a

cover crop

a crop grown, either before or after the primary crop, for the protection and enrichment of the soil.^a

cow tipping

the purported activity of sneaking up on a sleeping, upright cow and pushing it over for fun. However, in reality cows typically do not sleep standing up.^{a†}

“crick” :: creek

a stream, brook, or minor tributary of a river.[†]



A crop duster makes a pass over a Beaver Crossing, Nebraska, field while applying insecticide to prohibit grasshopper infestation. August, 2008. Photographed by author.

crop duster

an aircraft that has been built or converted for agricultural use: usually the application of pesticides (“crop dusting”) or fertilizer (“aerial topdressing”). Begun in the 1920s in the U.S., the first widely used aircraft were converted war-surplus biplanes.^{a†}

crop rotation

the action or system of rotating crops over a series of years for both the promotion of soil nutrients, crop health, and reduction of weeds and erosion.^a

detasseling

the act of removing the pollen-producing tassel from a corn plant and dropping it on the ground. This is done to cross-breed, or hybridize, two different varieties of corn. The resulting seed is used to plant corn hybrids for next year's grain crop. Detasseling is a common summer job for youths tall enough to reach the tassels and for immigrant labor. Detasseling occurs mid July through early August.^{a†}



A seed corn field after it has been detasselled to ensure proper hybridization. August, 2008. Photographed by author.

dirt road

a road base maintained without addition of gravel or aggregate. The road is not travelled enough to justify the maintenance expense or addition of a harder surface.^{a†}

“disc” :: disc-harrow

machine used to till and hill the soil in preparation for planting, and the removal of competing weeds.^a

“dryer” :: grain dryer

machine through which grain crops pass so that their moisture is reduced and they are rendered suitable for long-term storage.^a

“elevator” :: grain elevator

a tall building used for storing and distributing large quantities of grain. Invented in 1842 in Buffalo, New York, today they are typically constructed of slip-formed concrete and rebar. Smaller galvanized steel versions also exist. Grain dust is highly combustible, and explosions and fires sometimes occur in these bulk storage facilities.^{a†}



A private farm elevator near Aurora, Nebraska, comprised of augers and grain bins. July, 2008. Photographed by author.

ethanol :: grain alcohol

systematic chemical name for ethyl alcohol, many production plants exist in the Great Plains. Distillers' grain, a by-product, is a common livestock feed source.^{a†}

fairgrounds

an outdoor area where a fair is held. Typically occurring in late July through late August, fairs in the Central Plains are often closely associated with '4-H'.^{a†}

farmers' market

a food market, often held in a public place outdoors at regular intervals, at which local growers sell fruit and vegetables, and often meat, cheese, bakery products, and flowers directly to consumers.^{a†}

farmstead

a farm and its building. Typically connotes a functioning farm.^{a†}

feed

connotes man-made grain-based food for livestock.^a

finger wave

the act of raising one or two fingers from the steering wheel in a salutary gesture towards an oncoming vehicle. Applicable on country roads and small highways.^a

four-wheeler

a four-wheeled, motorized all-terrain vehicle commonly used by farmers in order to save time running errands about the farmgrounds or ranch.^a

frost

a deposit of small white ice crystals formed on the ground or other surfaces when the temperature falls below freezing. Seen as the definitive end to the growing season.^{a†}

“go in to town”

common phrase referencing the closest town in the farmer’s vicinity. Towns are so few, it is not necessary to specify which one.^a

Good Friday

the Friday before Easter Sunday of the Christian Church. Having one’s potatoes planted before this day is thought to be a good gardener’s practice.^a

gooseneck trailer

built for larger or heavier loads, such as bales or livestock, the hitch arches over and attaches near the front of a pickup truck’s bed.^a

grain bin

a round single-story, conical-roofed steel structure for storing grain or feed for relatively short periods of time.^a



The remain of a former farmstead, a grain bin stands northwest of Beaver Crossing, Nebraska. August, 2008. Photographed by author.

gravel road

the most common road type in the Central Plains, it is a dirt road which is routinely maintained with fresh coats of gravel and passes by a “road grader”.^a

gristmill

a mill for grinding grain.[†]

Harvestore®

a more technical type of silo, specifically designed to store not dry grains but rather haylage, high-moisture grains and silage.^a

hay

grass or alfalfa that has been mown and dried for use as fodder.^{a†}

hay shed

typically of post-and-beam construction, a large open shed accessible by loader tractor and accommodating of tall stacks of hay and straw bales.^a

hayloft

a loft over a stable or barn used for storing hay, straw or grain, for the animals housed below.^{a†}

haystack

a packed pile of hay, typically with a pointed or ridged top to enable the shedding of rain. Because of the limited transportability of haystacks, bales are the more popular hay storage method.^{a†}

highway

connotes a main, paved road with two or four lanes, and connecting major towns or cities. Not interchangeable with ‘expressway’.^{a†}

horse

a solid-hoofed plant-eating domesticated mammal with a flowing mane and tail, used for pleasure riding, racing, animal herding, and to carry and pull loads. Related terms: *stallion, gelding, mare, pony, filly, colt, yearling, foal*.^{a††}

hydrant

an outlet from a water main consisting of an upright pipe, with a valve and handle, and serving as an outdoor groundwater source on a farm. Can also connote a hand pump, used to draw water from a rainwater tank or well.^{a†}

“innerstate” :: “I-80”

Interstate Highway 80. The major road in Nebraska, it connects downtown San Francisco, California, to Teaneck, New Jersey, a New York City suburb. Starting from Nebraska, it follows the historic routes of the Oregon Trail, the California Trail and the Transcontinental Railroad. Nebraska’s section was completed in the early 1970s.^{a†}

intercrop

often associated with sustainable agriculture and organic farming, it is the practice of cultivating two or more crops in the same space at the same time.[†]

irrigation

the artificial application of water to the soil to assist growing crops. In agriculture, the practice is mainly used in dry regions and over periods of rainfall shortage.^{a†}

Italianate

1870-1890. A popular style for houses, these square, rectangular, or L-shaped, two-story buildings have low-pitched hip roofs, with wide eaves usually supported by heavy brackets, tall narrow windows, and front porches.ⁿ

landing strip

connotes a grass airstrip, or runway, intended for private use.ⁿ

lean-to

a building sharing one wall with a larger building, and having a roof that leans against that wall. Often used for hay storage or livestock shelter.^{a†}

legume

a leguminous plant, especially one grown as a crop: soybeans, alfalfa, peanuts.^{a†}

machine shed

a typical metal building used for the storage and maintenance of tractors and other farm equipment.^a

“maintainer”

common term for the machine used to grade and maintain the surface of dirt and gravel roads.^a

manure

animal dung used for fertilizing land.[†]

manure spreader

a wagon with an internal conveyor system, pulled behind a tractor, which evenly distributes manure over a field.^a

“market”

the commodities market.^a

milkweed :: *Asclepias*.

a herbaceous American plant with milky sap and commonly considered a weed in the Great Plains. It is possible to cultivate some varieties as a fiber crop.^{a††}

“mill”

connotes a grist mill.^a

milo :: *Sorghum*.

commercial sorghum of a drought-resistant variety that is an important grain in the central U.S., Africa, and Asia. Sorghum is used to produce food, fodder and alcoholic beverages. ^{a††}

minimum maintenance road

a road base maintained without addition of gravel or aggregate. The road is not travelled enough to justify the maintenance expense or addition of a harder surface, hence the term.^{a†}

Morton® Building

a brand of post-and-beam, metal-clad building commonly erected to suit today's farmers' 'barn' needs.^a

mulberry :: *Morus*.

a small deciduous tree with broad, glossy leaves, native to the Far East and long cultivated elsewhere. Black, red and white varieties can be found growing 'wild' in the Central Plains.^{a††}

nitrogen fixer

refers to a crop which aids the chemical process by which atmospheric nitrogen is assimilated into organic compounds (nitrogen fixation).^{a†}

noxious weed

a plant considered harmful to animals or the environment and the spreading of which farmers are mandated to inhibit. For example: cocklebur, thistles, purple loosestrife and saltcedar.^{a††}

Ogallala Aquifer

a vast groundwater resource under eight U.S. states, used especially for crop irrigation, that stretches from southern South Dakota to western Texas and eastern New Mexico.^{a†}

“organic”

pesticide-free, additive-free, hormone-free, “natural”.^{a†}

organic growers

farmers who grow certified organic produce: dairy, meats, vegetables, fruits and grains. Typically, organic farms are smaller operations than non-organic farms.^{a†}

parlor

connotes a room or building equipped for milking cows. May also refer to the local beautician's shop.^a

pen

a small fence enclosure in which sheep, pigs, cattle, or other domestic animals are kept.[†]

pickup

any small truck with an enclosed cab and an open back.[†]

“pigweed” :: *Amaranthus hybridus*.

an erect, freely branching summer annual with heights up to 2m. It is troublesome to corn, soybean and tobacco crops.[†]

pitchfork

a farm tool with a long handle and sharp metal prongs used especially for lifting hay.[†]

“pivot”

connotes a center-pivot sprinkler irrigation system in which a wheeled, segmented water main approximately 400 meters long pivots about a central water source. Sprinkler heads attached along the full length of the center-pivot release a fine spray close to the earth, with minimal loss to evaporation and wind drift.^{a†}

pole shed

typically used for fodder or machinery storage, shed is constructed by setting round posts into the ground so as to create multiple, wide bays, and attaching a simple lean-to roof. Often clad on 1 to 3 sides with sheet metal siding.^a

“pop”

soda pop.^a

poultry

domestic fowl--chickens, turkeys, ducks and geese--kept for meat, eggs and feathers. Also includes meat and game birds such as pigeons, doves and pheasants.^{††}

pump

can refer to a hydrant, hand pump, the irrigation well, or the engine and mechanism drawing water from the well.^a



A typical Quonset hut, located south of Grand Island, Nebraska. July, 2008. Photographed by author.

Quonset™ hut

a building made of corrugated metal and having a semicircular cross section. Named after Quonset Point, Rhode Island, where, during World War II, such huts were first made. Used on farms for housing of poultry and livestock, such as sheep and swine.^{a†}

ranch

a large farm, especially in western U.S. and Canada where cattle or other grazing animals are bred and raised.^{††}

“road grader”

common term for the machine used to grade and maintain the surface of dirt and gravel roads.^a

roguing

removing inferior or defective plants or seedlings from a crop. A common summer job for youths and immigrant labor, workers use ‘corn knives’ and ‘bean hooks’. Roguing occurs in early July when the corn is nearing mature height, but before it has begun pollination.^{a†}

runway

a leveled strip of smooth ground along which aircraft take off and land. Connotes either a grass or concrete airstrip.^{a†}

runza

of German-Russian heritage, a yeast dough bread pocket with a filling consisting of beef, pork, cabbage or sauerkraut, onions and seasonings. Baked in various shapes such as half-moon, round, square or triangle. Also called *bierock*, *fleischkucke* and *kraut pirok*.^{a†}

sack

large, rectangular, multi-layered bag of paper, sewn at both ends in order to hold sale units of livestock feed and crop seed.^a

sheep

are quadrupedal, domesticated ruminant mammals with a thick woolly coat and curving horns. It is kept in flocks for its wool or meat, and is proverbial for its tendency to follow other in the flock. Sheep-raising has a large lexicon on unique terms which vary considerably by region and dialect.^{††}



A lone, concrete block silo stands in a corn field, the only remnant of a former farmstead near Beaver Crossing, Nebraska. August, 2008. Photographed by author.

“silage” :: ensilage

is fermented, high-moisture fodder that can be fed to ruminants. Compacted and stored in airtight conditions such as; a Harvestore® silo, large UV resistant ‘bags’ or bunker silo. Utilizing the entire plant, the process is ‘ensilage’ or ‘silaging’ and makes use of grass crops--maize or sorghum--and many other field crops.^{a††}

silo

a structure for storing bulk materials. Silos are used in agriculture to store grain or fermented feed known as silage. Three types exist: tower, bunker and bag.^{a†}

spray plane

an aircraft that has been built or converted for agricultural use: usually the application of pesticides (“crop dusting”) or fertiliser (“aerial topdressing”). Begun in the 1920s in the U.S., the first widely used aircraft were converted war-surplus biplanes.^{a†}

sprayer

a specialized vehicle used for pesticide application with tall, narrow wheels for driving between crop rows without damaging plants, an elevated cab and deck to clear (corn) plants at maximum height, and long booms extending from either side with multiple spray outlets so as to cover a large area with minimal drift, with each pass.^a

stacker

a lifting mechanism which piles fodder into haystacks for storage.^a

stover

plant stems and leaves left in a field after the crop has been harvested. Often baled for later use as bedding.^a

straw

the dried stems of grain crops such as wheat, used as ‘bedding’, thatching, packing or weaving.^{a†}

swine

also called pigs or hogs, are omnivorous hoofed animals with sparse bristly hair and flat snouts which have been domesticated as sources of food, leather and similar products. More recently, they have become involved in biomedical research and treatments. Related terms: *boar, sow, barrow, piglet.*^{a††}

thistle

a widely distributed herbaceous plant of the daisy family, which typically has a prickly stem and leaves, and rounded heads of purple flowers. A noxious weed, farmers are mandated by state government to remove the spreading plants from their property.^{a†}

three-wheeler

a three-wheeled, motorized all-terrain vehicle commonly used by farmers in order to save time running errands about the farm grounds or ranch.^a

tractor

a powerful motor vehicle with large rear wheels, used chiefly on farms for hauling equipment and trailers. The first powered farm implements in the early 1800s were portable steam engines, and in 1840 the first traction engines were introduced.^{††}

trailer

an non-motorized vehicle towed by another, typically used to haul bales, machinery and livestock.^{a†}

trough

a long, narrow open container for livestock to eat or drink out of. Commonly fashioned out of recycled lumber or plastic barrels.^{a†}

truck

typically connotes a pickup-truck.^a



Aurora, Nebraska's water tower is typical of those found at larger towns. July, 2008. Photographed by author.

velvetleaf :: *Abutilon theophrasti*
also called 'buttonweed', the weed is common in the Plains and distinctive because of its large, velvety leaves and distinct seed pods.^{a†}

volunteer-
undesirable plants within a field crop which sprouted from the grain dropped during the previous year's harvest. For example, volunteer corn may be found in soybean fields, but also in fields of a different corn hybrid.^a

"walking the beans"
to walk, with a bean hook, up and down the rows of a soybean field, removing weeds and volunteer plants. Also called "off-typing" and "roguing."^a

water tower
a tower supporting an elevated water tank, whose height creates the pressure required to distribute the water through a piped system. Many towns use their water towers to advertise local tourism, their local high school sports teams or other local factoids.^{†‡}

wind turbine
a modern windmill, also called a wind generator, primarily used to generate electricity.[†]

weed
a wild plant growing where it is not wanted and in competition with cultivated plants.[†]

well
the most common means of obtaining water for irrigation in the Great Plains, it is an excavation into the ground made by drilling. Well water is drawn via either an electric submersible pump or a mechanical pump--eg a windmill.^{†‡}

windmill
connotes a relatively short, metal or wood tower truss topped with a horizontal, many-bladed fan attached to a simple pump mechanism. Used to draw up ground water with which to water livestock and crops, several still remain in the Midwest as unused relics of an environmentally sustainable technology.^{a†‡}



East of Beaver Crossing, Nebraska, a water-pumping windmill and trees mark where a farm used to be. August, 2008. Photographed by author.

Sources:
^a - as defined by the author
[†] - as defined by the New Oxford American Dictionary
[‡] - as defined by Wikipedia
[^] - as defined by the Nebraska State Historical Society Building Survey







BIBLIOGRAPHY

- Ascher, Steven and Jeanne Jordan. *Troublesome Creek: A Midwestern*. [Video: Documentary] 1995.
- Corner, James and Alex MacLean. *Taking Measures Across the American Landscape*. Yale University Press, 1996.
- Federal Writers' Project. *Nebraska: A Guide to the Cornhusker State*. Nebraska State Historical Society, University of Nebraska Press: 1939, 2005.
- Gouveia, Lourdes and Donald Stull. *Latino Immigrants, Meatpacking, and Rural Communities: A Case Study of Lexington, Nebraska*. [Research Paper] University of Nebraska-Omaha, 1997.
- Grandin, Temple. *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. New York: Scribner, 2005.
- Huffman, Wallace and John Miranowski. *Immigration, Meat Packing, and Trade: Implications for Iowa*. [Research Paper] Iowa State University, 1996
- Lettow, Ashley. *Ground Cover*. [Thesis] Princeton University, 2004.



BIBLIOGRAPHY

Marx, Leo. *The Machine in the Garden; Technology and the Pastoral Ideal in America*. London; New York; Oxford University Press, 1967.

Pollan, Michael. *The Omnivore's Dilemma: a Natural History of Four Meals*. New York: Penguin Press, 2006.

Popper, Deborah and Frank Popper. *The Buffalo Commons: Its Antecedents and Their Implications*. [Research Paper] Princeton University, 2007.

Seward County Atlas and Family Directory, 1985

Sinclair, Upton. *The Jungle*. Boston, MA: Bedford/St. Martin's, 2005.

Wilkins, Ophelia. *Decomposing the Grid*. [Thesis] Massachusetts Institute of Technology, 2007.

ianrhome.unl.edu Institute of Agriculture and Natural Resources

www.neo.ne.gov Nebraska Energy Office

www.quietrevolution.co.uk Quiet Revolution Wind Turbines

www.usda.gov United States Department of Agriculture

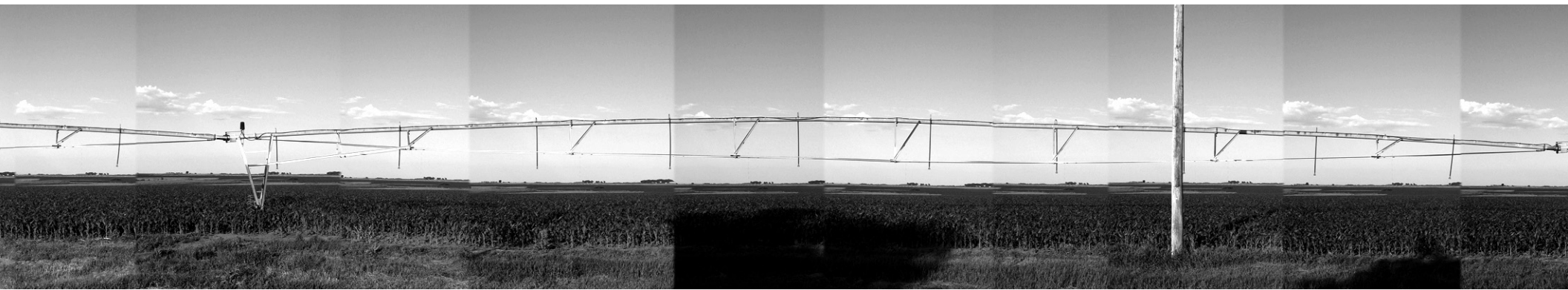
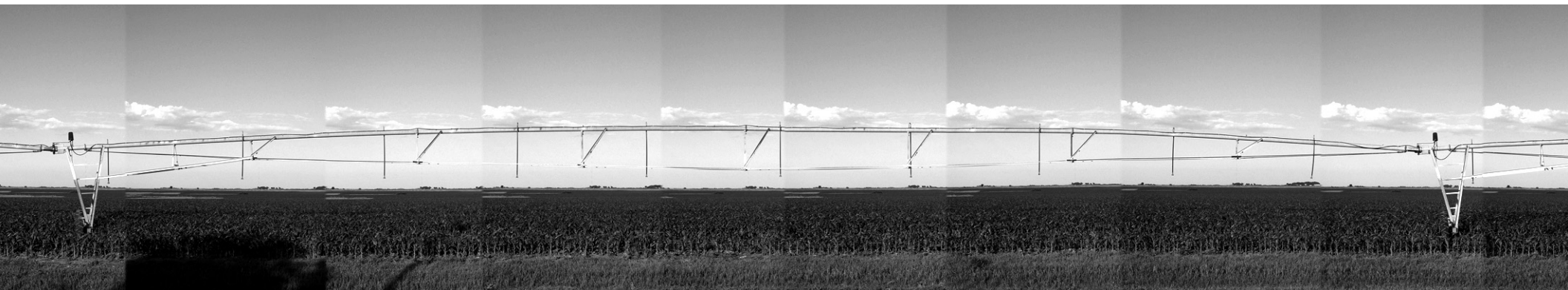


IMAGE CREDITS

- p. 12 - 13, 93, 95 [diagrams and maps] Seward County Atlas and Directory, 1985
- p. 14 - 15 www.flickr.com/photos/smithsonian
- p. 22 - 23 [maps] Seward County Plat Maps, authors unknown
- p. 39 author / unknown
- p. 56 www.fogquest.org
- p. 80 - 81, 83 [aerial imaging] Google Earth





THE END