

Picturesque Prairies

*productive preservation
on a petroleum planet*

Produced by:

Tyler R. Swingle

Bachelor of Environmental Design
Montana State University, 2012

*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.*

2018 February

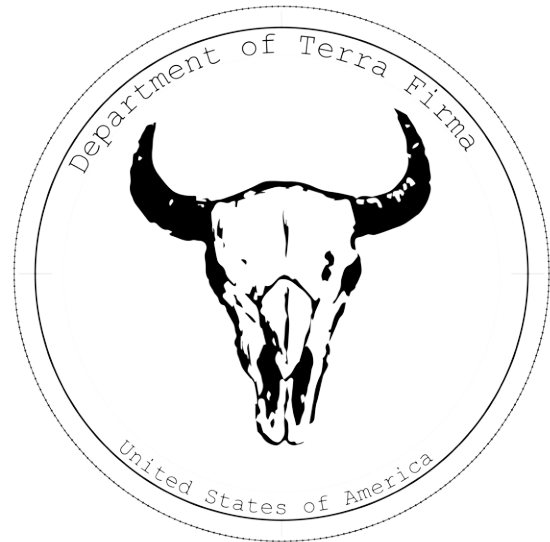
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Department of Architecture
2018.01.18

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Chair of the Committee on Graduate Students



Department of Terra Firma

United States of America

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Abstract:

Fires burn bright atop the flare stacks in the distance as bison watch from behind the two-meter high fence of the Theodore Roosevelt National Park. In this modern scene, complex geographic formations in North Dakota's badlands have established a unique shared topography between an assemblage of seemingly disparate actors: engines, bison and humans. The Bakken formation 6 km below the surface of the earth provides enough resources to encourage rhizomatic deployment of oil and gas wells while the sedimentary surface, eroded from melting snow, provides 'scenic' lands for tourists and prairie ecosystems for bison.

The socio-political distinction between actors has produced abstract borders and delineations in the form of habitats and land-use policies. Materialized through fences, these policies have created autonomous operating systems like fracture drilling and wildlife conservation that are specified for a single or hierarchical

order of actors. This not only facilitates settler practices of separation and domination, but also encourages unaccountable externalities outside of the operating systems.

Located between two [and a half] National Park units, this project embraces the multiple identities of the subterranean region and proposes a design strategy that engages the three actors as equal shareholders. Acknowledging the actors as an assemblage reveals material kinships and commitments to the geography that offer design considerations for shared spaces and memories. The project is composed of three archetypes, each weaving and entangling the actors within each other's programs and seasonal patterns. Through this built environment, the archetypes frame a physical and conceptual shared geography.

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Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

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all the time

Joel, Roi and Pierre
for the support, guidance and
patience

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for the companionship

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Introduction to the Department of Terra Firma

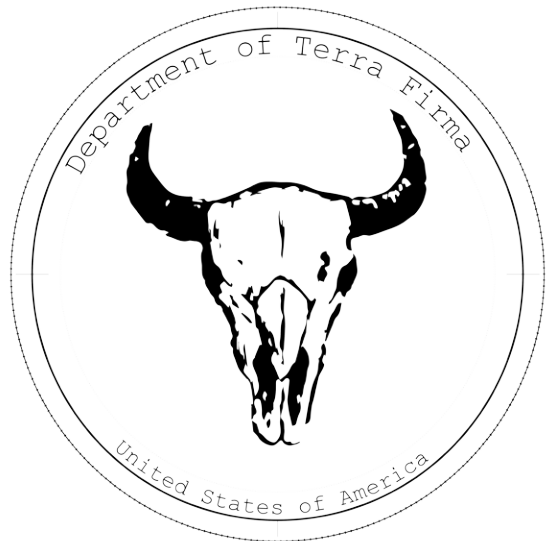
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Department of Terra Firma

United States of America

United States of America



top
Seal,
Department of
Terra Firma

opposite
Modern National
Monument

Department of Terra Firma

The United States Department of Interior has a long history of internal land conflicts centered around ownership, territorial disputes, indigenous life and subterranean geography. Today, the Department of Interior has several branches of bureaus that engage these conflicts by maintaining management practices on federal land, including the National Park Service, the Bureau of Indian Affairs, the Management of Mineral Services and the Bureau of Land Management. These offices stem from, and have helped shape, a very brief history of land purchases, land treaties, land allotments, land ownership and generally land relations in the United States of America.

One example of the efficiency of the U.S. Department of Interior is the *Six Grandfathers*, a mountain that provided a spiritual journey for the Lakota Sioux in what is now know as South Dakota. Forced to relocate by the Bureau of Indian Affairs, the Lakota Sioux were replaced by camps of gold miners supported by the now

Bureau of Land Management and the Mineral Management Service. After this, the National Park Service and four white presidents replaced the six grandfathers and Black Elk Point was renamed after a lawyer from New York City: Rushmore.

These policies and practices, and many others like them within the Department of Interior and Department of Agriculture, frame a mental construction of land relations [people relations, animal relations and spiritual relations] based on a settler mentality of conquering the west. In order to facilitate western expansion, the United States congress relied upon agricultural production and the distribution of federal and native lands by establishing the Homestead Act, the Morill Act, the Department of Agriculture in 1862 and the Dawes Act of 1887. Each congressional act had encouraged the allotment of land into either private or state ownership with a focus on a Jacksonian agricultural development and the domination of

land through agricultural technologies.

In turn, the policies reflect a modern dichotomy between nature and society, natural order and symbolic order, that distinguish mankind from all other organisms and emphasize the triumph of white man over wilderness, over empty acres, over land. Within this framework, there is no possibility for entities or assemblages to emerge that are neither societal or natural, or both natural and societal.

“For the benefit and the enjoyment of the people.”

-National Park Service

From this dichotomy and resulting dominant relationship of mankind over land, dividing ideologies between John Muir and Gifford Pinchot set the platform for the debate between land use in the United States: Conservation and Preservation. While Muir, Father of the National Park System, argued for federal protection and management of wildlife,

Pinchot, first director of the United States Forest Service, emphasized a controlled production of natural resources.

From this split of land use, the US government identified certain territories for economic reserves and historic protection. The Yosemite Act of 1864 designated the Yosemite Valley as a public park and set the precedent for the national park idea. Soon after, Yellowstone National Park was established due to the help of the landscape artist Thomas Moran who painted the area. Other national parks followed, and the management of these areas was transferred from the military to the newly formed National Park Service in 1916.

At the same time, the Mining Laws of 1866 and 1871 opened and regulated the federal lands in the west for mining¹ while the

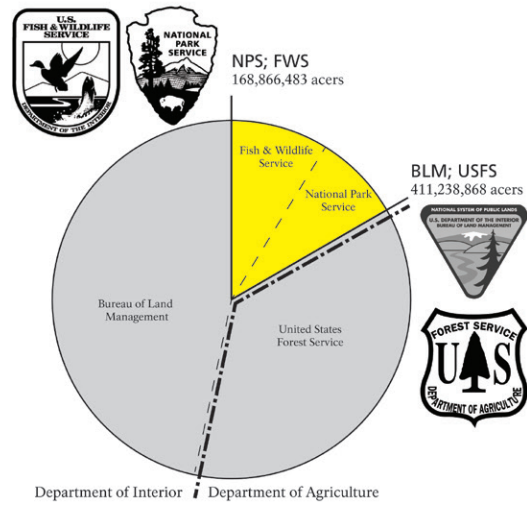
¹ Because mining was already being practiced in the west, the laws generally followed the existing riles and property right developed by the miners.



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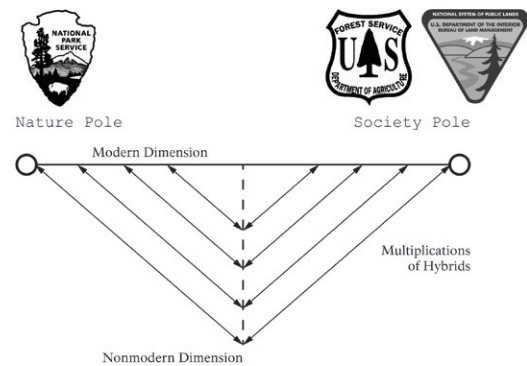
United States of America

United States of America



Forest Reserve Act enabled presidents to set aside forests on federal lands and the Forest Management Act of 1897 gave agency for the government to regulate occupancy and use within the reserves, develop mineral resources, provide fire protection, and allow timber sales.

In 1934, the Indian Reorganization Act and the Taylor Grazing Act effectively ended the distribution of federal land in the west that help encourage agriculture as a settlement practice.² The remaining federal land under the United States Forest Service and the Bureau of Land Management was conceptualized as an economic platform that could be leased to generate a revenue. Subsequent laws followed in order to properly manage the distribution of energy, support of agriculture and the protection of wildlife, water and air.



Federal lands mostly fell into three major categories: national parks, organized by the National Park Service under the Department of Interior; national forests, organized by the United States Forest Service under the Department of Agriculture; and remaining other, that were managed by the General Land Office [future Bureau of Land Management] under the Department of Interior. Regardless of the different objectives, all three land types are based on the fundamental belief that society

² The General Public Lands Reform Act of 1891 was passed in response to the widespread land fraud and ended the land actions as well as repealed other acts that facilitated privatization of land.

and nature are two different and separate constructs.

While the borders of the different federal lands were clearly drawn by the United States Geological Survey and the bureaus clearly divided by objectives, the regions themselves were part of larger ecological systems that were not, and are not, easily divided and separated by abstract order. This environmental entanglement became increasingly clear beginning in the 1950's as pollution acts³, agriculture acts⁴, conservation acts⁵, restoration acts⁶ and preservation acts⁷ responded to land use processes that effected the production and preservation of resources beyond the designated federal lands.

A modern rhetoric of land relations emerged from the policies and practices of the United

³ Water Pollution Control Act PL 80-845; Air Pollution Control Act PL 84-159; Federal Water Pollution Control Amendments of 1972 PL 92-500
⁴ The Farmers Home Administration; A new Agriculture Adjustment Act; The Agricultural Trade Development and Assistance Act
⁵ Wilderness Act PL 88-577; Land and Water Conservation Fund Act; Endangered Species Conservation Act PL 91-135
⁶ Clean Waters Restoration Act PL 89-753; Water Quality Improvement Act PL 91-224
⁷ National Historic Preservation Act; Wild and Scenic Rivers Act PL 90-542; Marine Mammal Protection Act PL 92-522; Endangered Species Act;

States federal government. It does not include responsibility and reciprocity, but promotes preservation, reservation, conservation, management and development.

“It matters what ideas we use to think other ideas.”

-Strathern [Haraway]

Within the context of critical legal studies, several themed critiques can be aligned to the rhetoric of the laws that govern humankind's relation with land and indigenous species. The first theme acknowledges that legal frameworks are inherently contradictory and are based upon a binary system, leaving little to no room for interpretations or an acknowledgment of what Bruno Latour would term a “hybrid” or what Donna Haraway would call a “cyborg.” The second theme question's the assumption of the autonomous individual and the independence they have from political, social and economic apparatuses. Parallel to ecological thought, Haraway parallels that “something is not connected to everything, but everything is connected to something.”⁸

“As political institutions continued to develop under modernity, the meanings of sovereignty changed with them, signifying such matters as the right to make and enforce laws, notions of political legitimacy and international recognition, and national self-determination.

While the meanings of sovereignty have shifted

⁸ Haraway. Staying with the Trouble. Durham and London: Duke University Press, 2016.

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United States of America

top
distribution of federal land

bottom
modern split between federal bureaus

“Some people think that the natural resources [...] should be controlled by a small handful of very distant bureaucrats located in Washington. And guess what? They’re wrong.”

-Donald
President of the United States of America

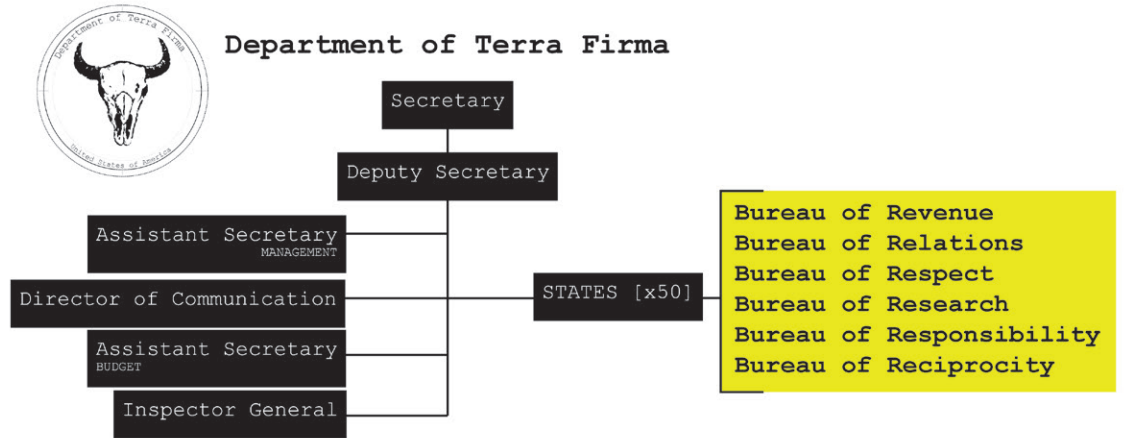
and continue to shift over time, the concept has nonetheless carried with it a sense of locatable and recognizable power. In fact, the location of power has depended upon the crucial act of recognition-and vice versa.”⁹

9 Lyons, Scott Richard. Rhetorical Sovereignty: What Do American Indians Want from Writing? *College Composition and Communication*, Vol. 51, No. 3. (February 2000), 447-468. <http://www.jstor.org/stable/358744>

The failure of the federal government’s rhetoric and legislature to recognize any other relationship other than a Jacksonian domination and the inability to accept new taxonomies that do not fit into Latin names and hierarchical roles demands the assemblage of a government department that can foster and promote the web of relations between mankind, land and indigenous species in a non-modern dimension. Therefore the Department of Terra Firma calls for a hard and abrupt stop to the Department of Interior and mandates that both the Department of Interior and the Department of Agriculture relinquish all land to the Department of Terra Firma.

above
quote regarding
the first
reversal of the
Antiquities Act

opposite
organization of
Department of
Terra Firma



Organized at the largest level by states, the Department of Terra Firma is a composition of assemblages across the United States that focuses on both a productive and preservative relationship between organisms and the land. It produces a set of regional or local standards in which land relations can be established. The rhetoric and structure of the department is open to recognize other actors and objectives beyond humankind in order to frame a mental construction of shared landscapes and construct physical frameworks for shared encounters.

Within the department, there are many different assemblages between states, cities, rivers, plains, mankind, bison, grass and ghosts. “Assemblages are ad hoc groupings of diverse elements, of vibrant materials of all sorts. Assemblages are living, throbbing confederations that are able to function despite the persistent presence of energies that confound them from within. They have uneven topographies, because some of the points at

which the various affects and bodies cross paths are more heavily trafficked than others, and so power is not distributed equally across its surface. Assemblages are not governed by any central head: no one materiality or type of material has sufficient competence to determine consistently the trajectory or impact of the group.”¹⁰ The assemblages give voice to actors in the area and help shape the regional / local standards.

The immediate conflict between government and assemblages is not resolved, nor may it ever be resolved: the proposal of the Department of Terra Firma is an attempt to dismantle the structures and rhetoric that limit the flow of land-based assemblages and recognize new sets of relations that produce their own sovereignty.

10 Bennett, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press, 2010.

Picturesque Prairies

*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Probing the Picturesque

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United States of America



Department of Terra Firma

above
view of
bison heard
in Theodore
Roosevelt
National Park

Among other theoretical and aesthetic capabilities, the early picturesque of 18th century England was a medium in which an upper class could see and imagine ideologies represented in modified landscapes and prescriptive views. With contemporary agricultural technology at the time, landscape icons like Capability Brown and Humphry Repton engaged the borders between seemingly natural environments and productive agricultural fields through visual and physical

land appropriation and programmatic layering of visual space. Embedded in picturesque projects like Armley Mill, Akwright Mill at Night and house at Sheringham, there was a discursive and adaptable dialog between the land/building relationship and the embedded societal ideologies of the time.

In the United States, the same dialog took place during the western expansion and the fulfilling march of Manifest Destiny. Although picturesque estates were replaced by infrastructural feats like Hoover Dam, the land/infrastructure relation reflected and embedded an American identity and ideology of conquering empty lands of the west during the 19th and early 20th century. The role of contemporary technology was vital because it enabled a management of seemingly natural environments and it evoked what David E. Nye termed the *American Technological Sublime*; the insurance that technology, although not fully understood by the viewer, can overcome the mystic and vastness of natural formations in the United States.

While this thesis may not reflect historical methods of programmatic visual layering or produce a calmness from a conquered land, it is genuinely interested in the picturesque dialog in which built forms on the land are in conversation with, and reflect, cultural ideologies.

If breaking the modern dichotomy and making political space for assemblages are both results of a change in cultural ideology, then this thesis follows the picturesque dialog and proposes built infrastructure, dependent on current technology, for actors in a non-hierarchical relationship.

Can mankind find formal beauty in the materialization of assemblages?

Can these built forms evoke visceral and emotional responses that are not settled by the reassurance of a modern dominant relationship?

Department of Terra Firma

United States of America

**Picturesque
Prairies**

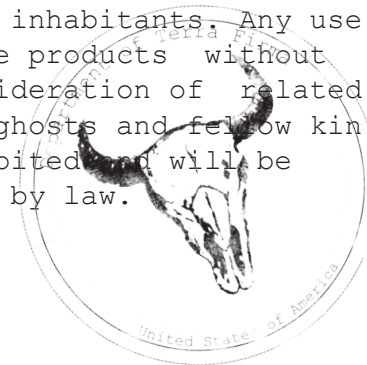
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on a petroleum planet*

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to Ports Partnership*

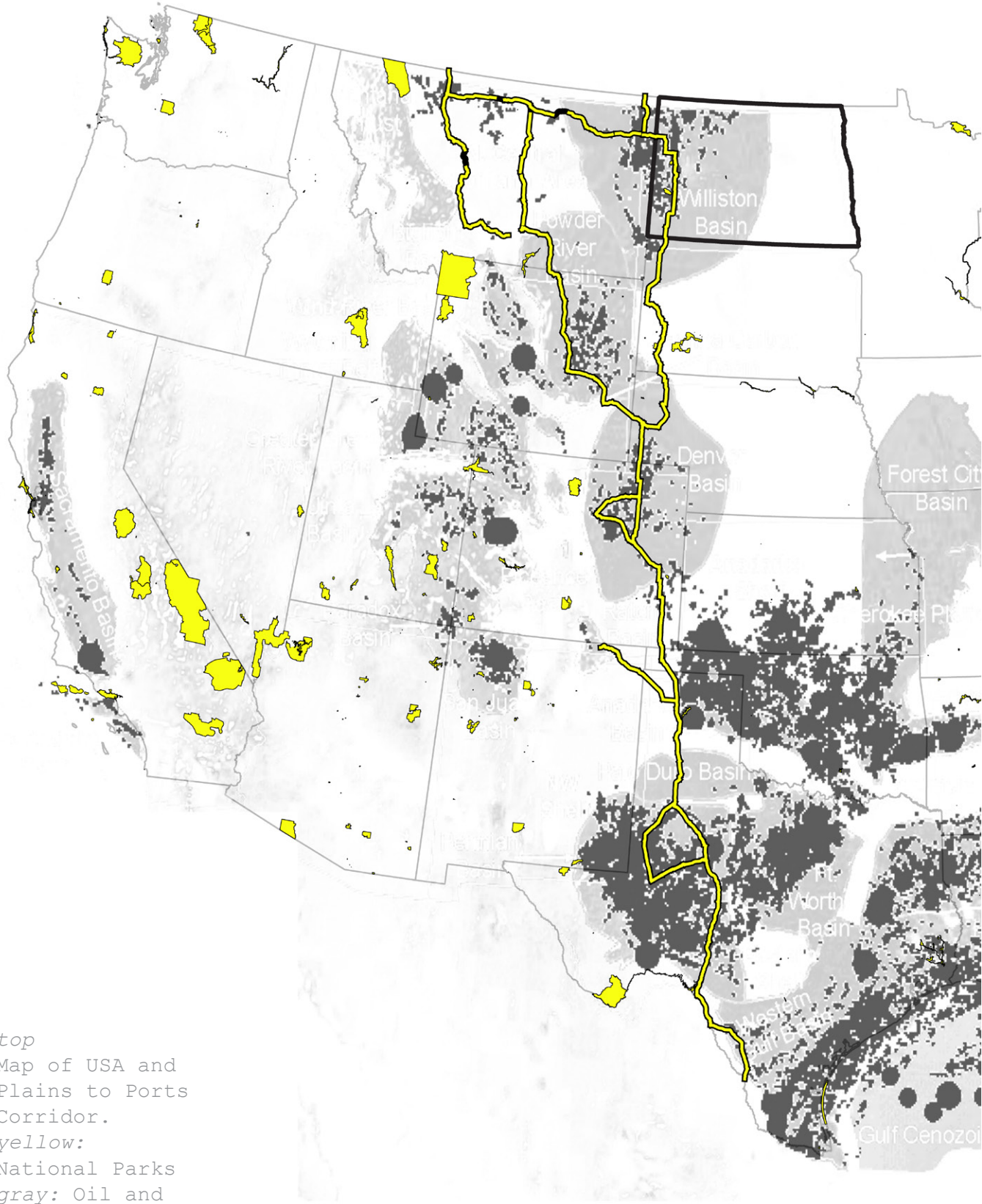
**Plains to Ports
Partnership**

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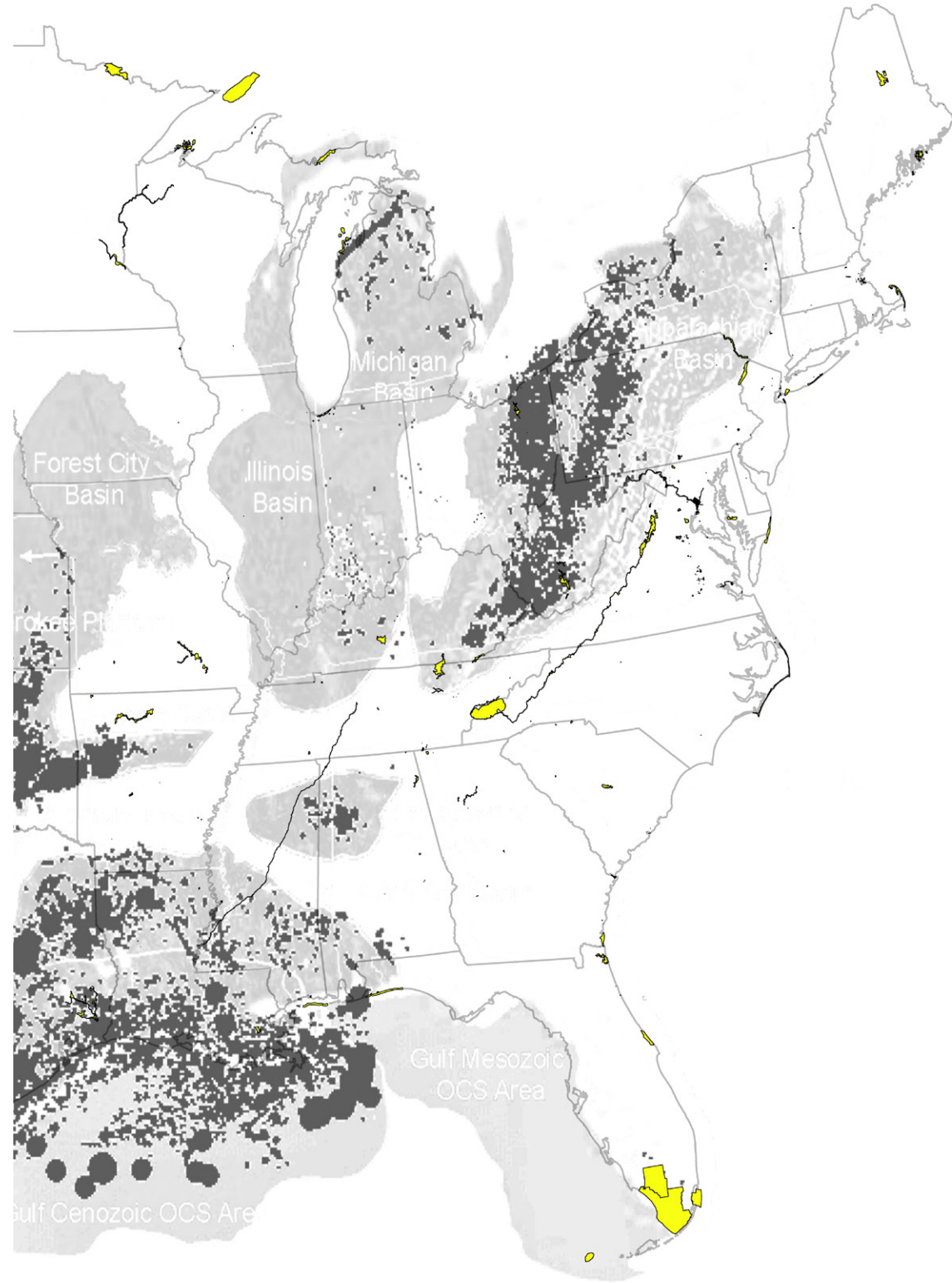
United States of America



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top
 Map of USA and
 Plains to Ports
 Corridor.
 yellow:
 National Parks
 gray: Oil and
 Gas Reserves

Department of Terra Firma

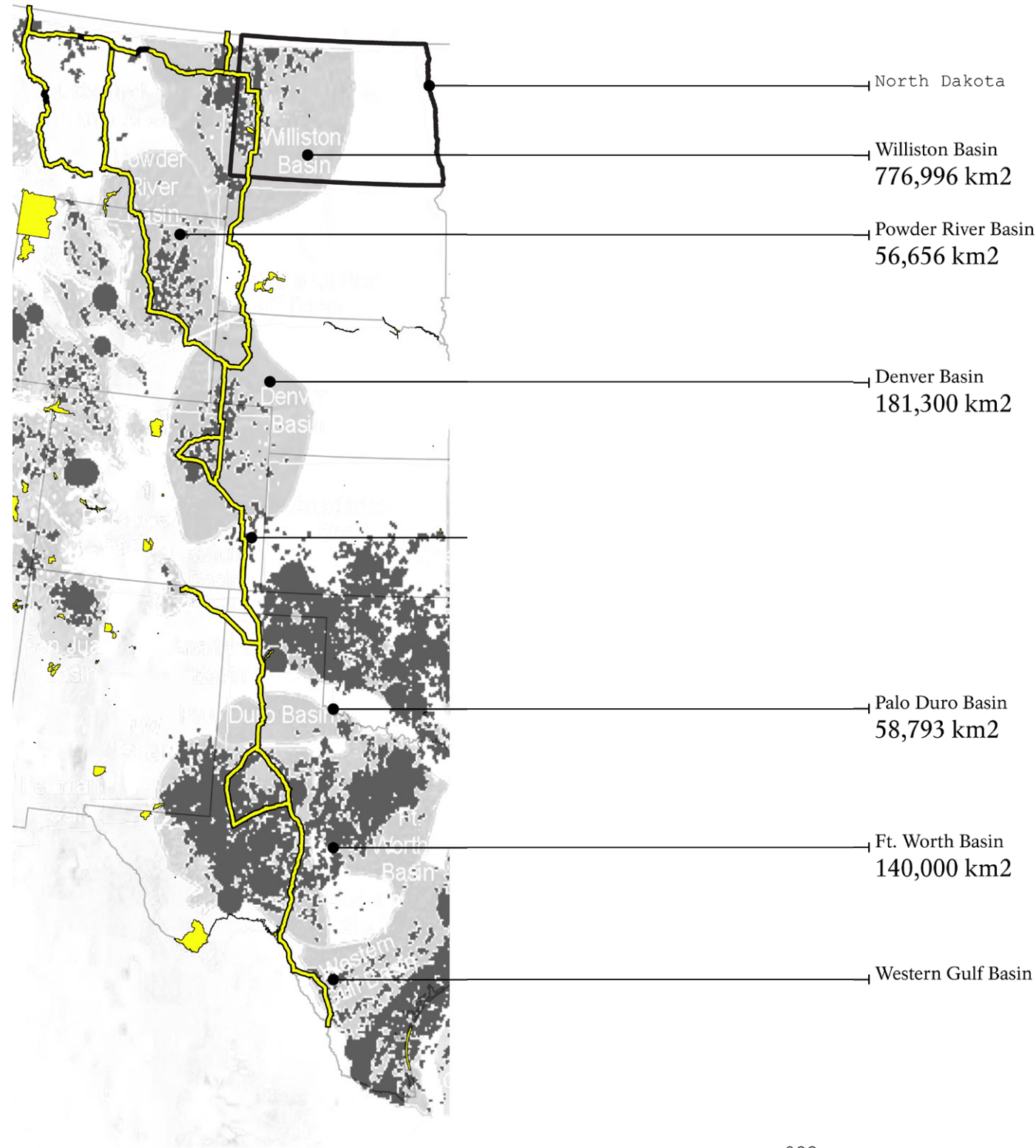


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The Plains to Ports Partnership is an assemblage inside the Department of Terra Firma.

Geographically, it is a corridor that runs North and South through the United States prairies from Canada to Mexico. Like the Yucatan to Yellowstone Conservation Initiative, Park-to-Park Highway Route and the Spine of the Continent Initiative, these territories are the first step in re-conceptualizing geography at a state-scale with humankind interconnected between flora and fauna actors and material flows like watersheds and tectonic plates. Corridors evoke movement and ephemeral qualities that do not literally translate to migration patterns [although they most certainly can] but speak to the temporality and permanence of life cycles within them.

Programmatically, there are two conflicting modern land identities that overlap and are the current focus of the assemblage along the Plains to Ports Partnership: National Parks/Wildlife Refuges and oil and gas basins. The overlap occurs in more than five locations along the corridor, each with a specific qualities, actors and processes. Standing



middle
Map of Plains to Ports Corridor and North Dakota.
yellow: National Parks
gray: Oil and Gas Reserves

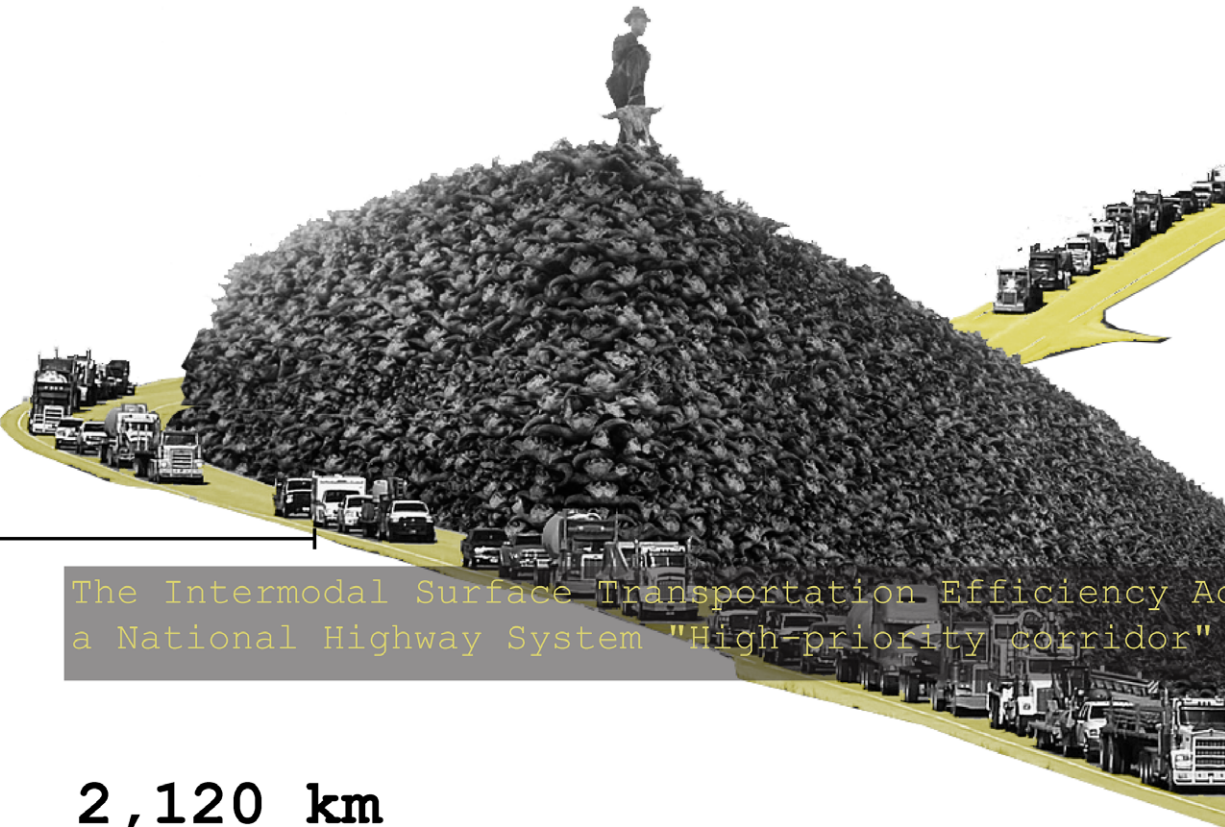
in the shadow of the bison range that flourished around 200 years ago, the most prolific highway in the corridor runs North and South and provides tractor-trailer access from all the oil and gas basins along the route to the ports in Texas. Seemingly, the modernization of the United States replaced one thriving organism with another.

Maah Daah Prairie is one location along the northern bounds of the corridor inside the state of North Dakota. Located on the surface is Theodore Roosevelt National Park and the Little Missouri Grasslands, both federal allocations of land. The national park is scattered into three units and is surrounded by the grassland. Below the surface is the Williston Basin, a fairly recent oil and gas play that has attracted a lot of wells in the recent 10 years. Because of the scattered parks and the spreading wells, it is an ideal starting region for the Plains to Ports Partnership and the Department of Terra Firma.

The framework of the corridor is not intended to conflate the different locations into one identity, problem or example so to solve one scenario means to solve all scenarios. The emphasis is to building upon existing routes, patterns and life cycles and think beyond isolated locations to establish a territory. Following the Children of Compost, the corridor asks and responds to “ the question of how to live in the ruins that were still inhabited, with ghosts and with the living too.”¹

¹ Harraway, Donna. *Staying with the Trouble, Making Kin in the Chthulucene*. Durham and London: Duke University Press, 2016

United States of America



The Intermodal Surface Transportation Efficiency Act of 1991 made the Ports-to-Plains Corridor a National Highway System "High-priority corridor"

2,120 km

Mexico
United States of America
Canada

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The Intermodal Surface Transportation Efficiency Act of 1991 made the Ports-to-Plains Corridor a National Highway System "High-priority corridor" known as Corridor 38.

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Maah Daah Prairie: Geology

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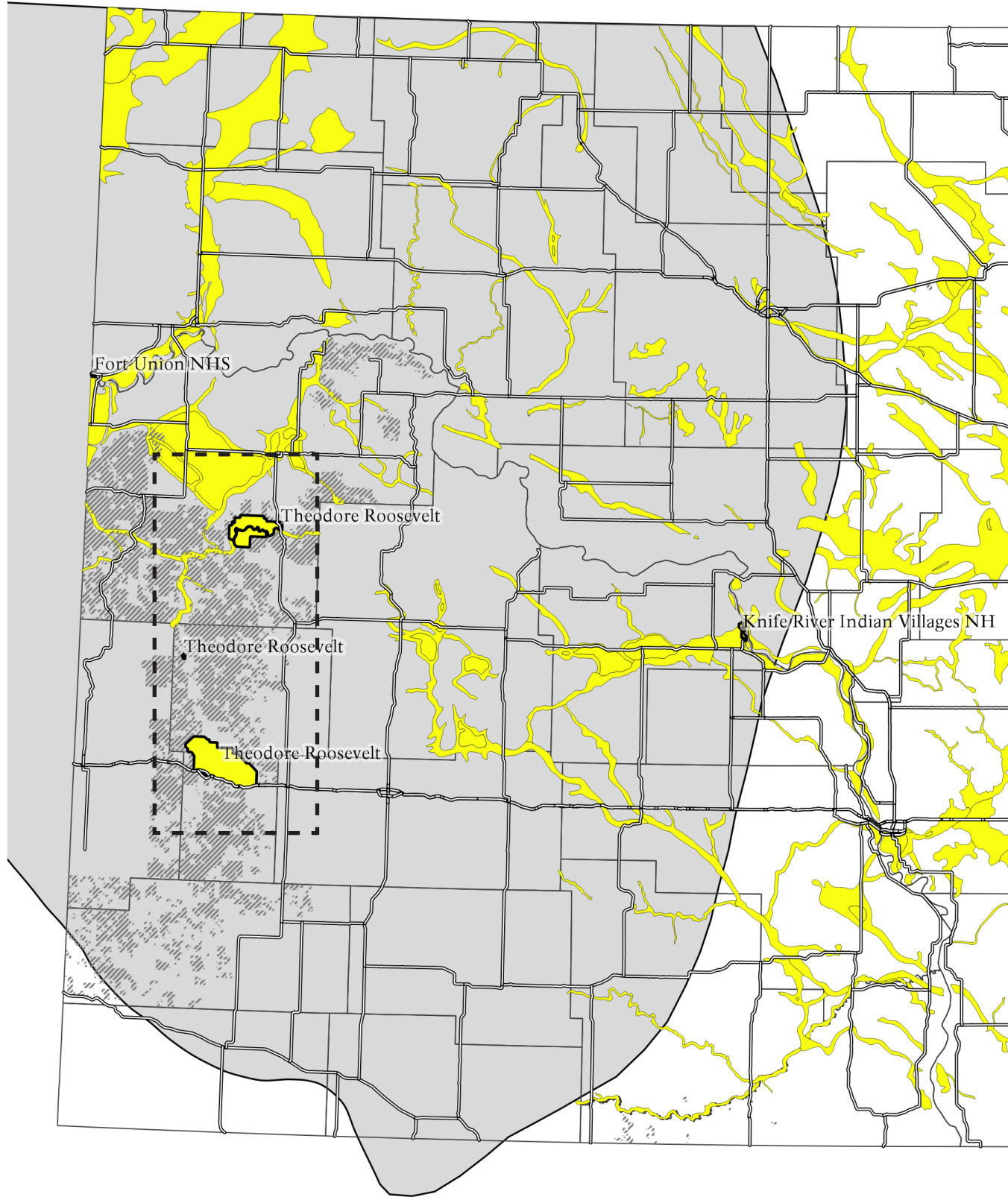


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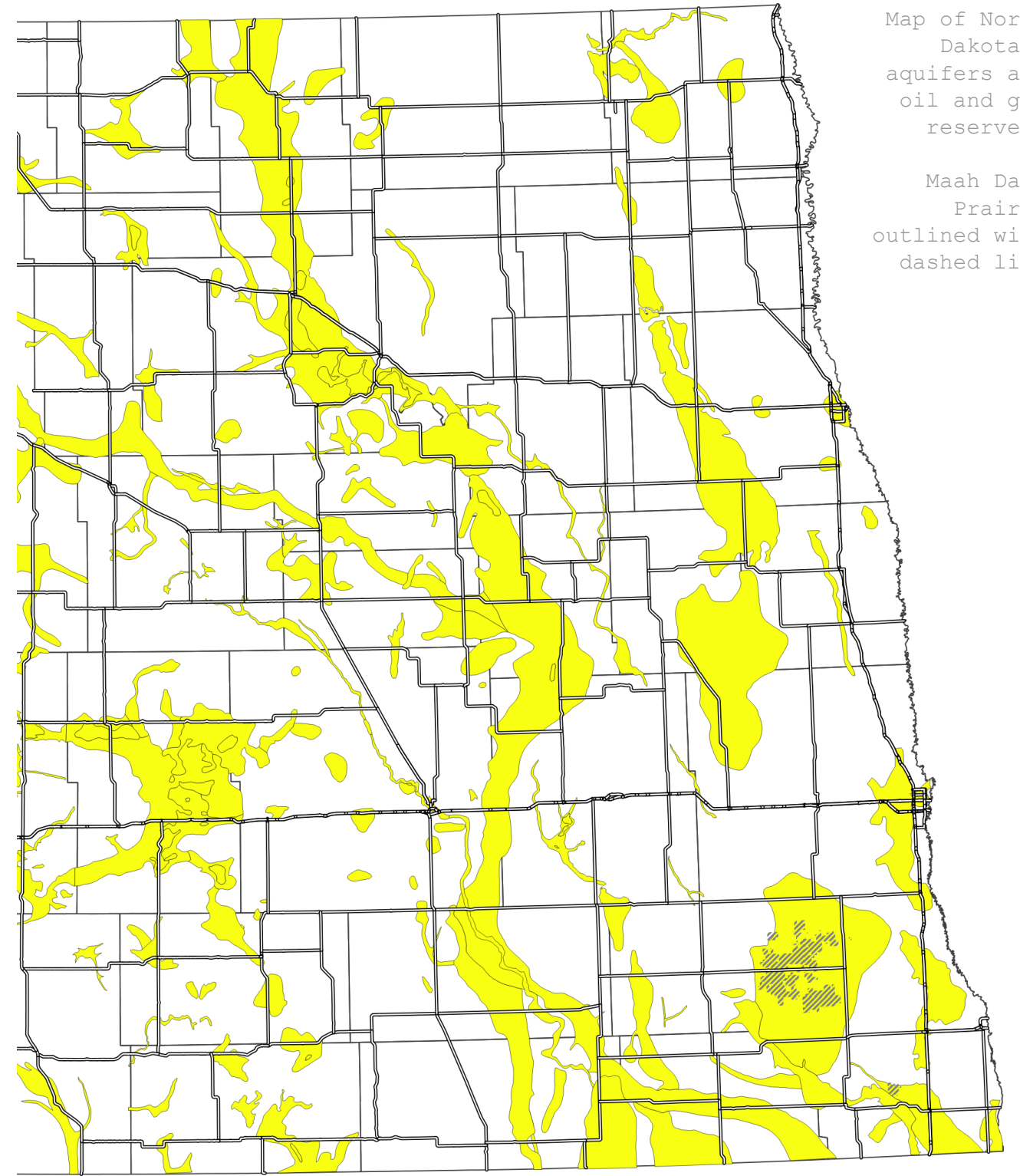


middle
Map of North
Dakota's
aquifers and
oil and gas
reserves.

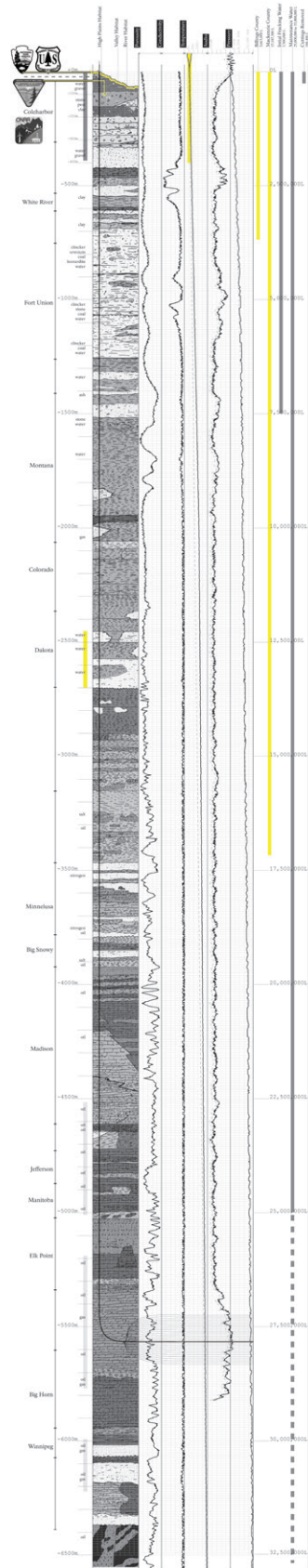
Maah Daah
Prairie
outlined with
dashed line

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United States of America



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The subterranean formations under the Maah Daah Prairie has determined much of the use on the surface. Sediment composition near the surface is easily eroded from the snow melt runoff in the spring and summer. This not only has developed the *scenic*¹ topography that we see today, and established itself as a landscape of beauty and distinction, but also provides winter relief from prairie winds and snow.

The sediment topography and fast erosion has limited the possibility for runoff water to sink into the earth and create an aquifer. In the badlands region of North Dakota, there are no freshwater aquifers because the water flows too rapidly into the Little Missouri River. Flora in the area is accustomed to the intense water runoff. Short and long grass grow on the plains of the prairie and larger shrubs can be found near runoff tributaries.² In order to support the human development of the region, either as urban or agricultural, farms and cities need a consistent

1 United States Government Printing Office. Printed for the use of the Committee on the Public Lands. "Hearings before the Committee on the Public Lands; House of Representatives Seventy-Ninth Congress, Second Session on H.R. 4435. 1946

2 Miller, Jennifer and Johnathan Friedman. "Influence of flow variability on floodplain formation and destruction, Little Missouri River, North Dakota." GSA Bulletin; May/June 2009; v. 121; no. 5/6; p. 752-759; doi: 10.1130/B26355.1; 9 figures; 1 table; Data Repository item 2008248.



opposite left
Core Sample

opposite right
Topography
of Maah Daah
Prairie

top
rock formation
in Theodore
Roosevelt
National Park

Department of Terra Firma

United States of America

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Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Liliopsida – Monocotyledons
Commelinidae

Cyperales
Poaceae/Gramineae – Grass family
Nassella (Trin.) Desv. – needlegrass
Nassella viridula (Trin.) Barkw. – green
needlegrass



Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Liliopsida – Monocotyledons
Commelinidae

Cyperales
Poaceae/Gramineae – Grass family
Pascopyrum A. Löve – wheatgrass
Pascopyrum smithii (Rydb.) A. Löve – western
wheatgrass



Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Liliopsida – Monocotyledons
Commelinidae

Cyperales
Poaceae/Gramineae – Grass family
Bouteloua L. – grama
Bouteloua gracilis (Willd. ex Kunth) Lag. ex
Griffiths – blue grama



Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Magnoliopsida – Dicotyledons
Asteridae

Asterales
Asteraceae/Compositae – Aster family
Artemisia L. – sagebrush
Artemisia tridentata Pursh – silver cholla



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Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Magnoliopsida – Dicotyledons
Dilleniidae
Salicales
Salicaceae – Willow family
Salix L. – willow
Salix amygdaloides Andersson – peachleaf
willow



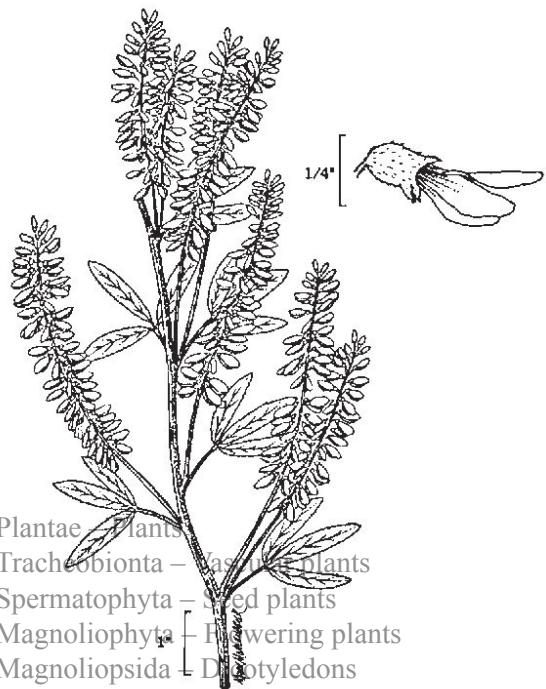
Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Magnoliopsida – Dicotyledons
Asteridae
Dipsacales
Caprifoliaceae – Honeysuckle family
Symphoricarpos Duham. – snowberry
Symphoricarpos occidentalis Hook. – western
snowberry



Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Magnoliopsida – Dicotyledons
Dilleniidae
Salicales
Salicaceae – Willow family
Populus L. – cottonwood
Populus deltoides – eastern cottonwood
Populus deltoides monilifera (Aiton)
Eckenwalder – plains cottonwood



Plantae – Plants
Tracheobionta – Vascular plants
Spermatophyta – Seed plants
Magnoliophyta – Flowering plants
Magnoliopsida – Dicotyledons
Rosidae
Fabales
Fabaceae/Leguminosae – Pea family
Melilotus Mill. – sweetclover
Melilotus officinalis (L.) Lam. – sweetclover



United States of America

source of fresh water.³

Deeper, almost 6 km, is the Bakken 'play' or the "Bakken Total Petroleum System (TPS) encompasses strata from the Devonian Three Forks Formation, Bakken Formation, and lower part of the Mississippian Lodgepole Formation that may contain Bakken-sourced oil."⁴ Within these geological formations, the USGS has estimated there is 7,383 MMBO⁵, 6,726 BCFG⁶ and 527 MMBNGL^{7,8}. As an increase from 2008, the assessment spurred an increase in extraction development in the area.

Besides the main highway, dirt roads make up most of the access infrastructure for eco-

³ See Buffalo Common proposal. Analysis of plains. Deborah Epstein Popper and Frank J. Popper, "Great Plains: From Dust to Dust" , Planning, December 1987

⁴ USGS. National Assessment of Oil and Gas Fact Sheet. Assessment of Undiscovered Oil Resources in the Bakken and Three Forks Formations, Williston Basin Province, Montana, North Dakota, and South Dakota, 2013.

⁵ Millions Barrels of Oil

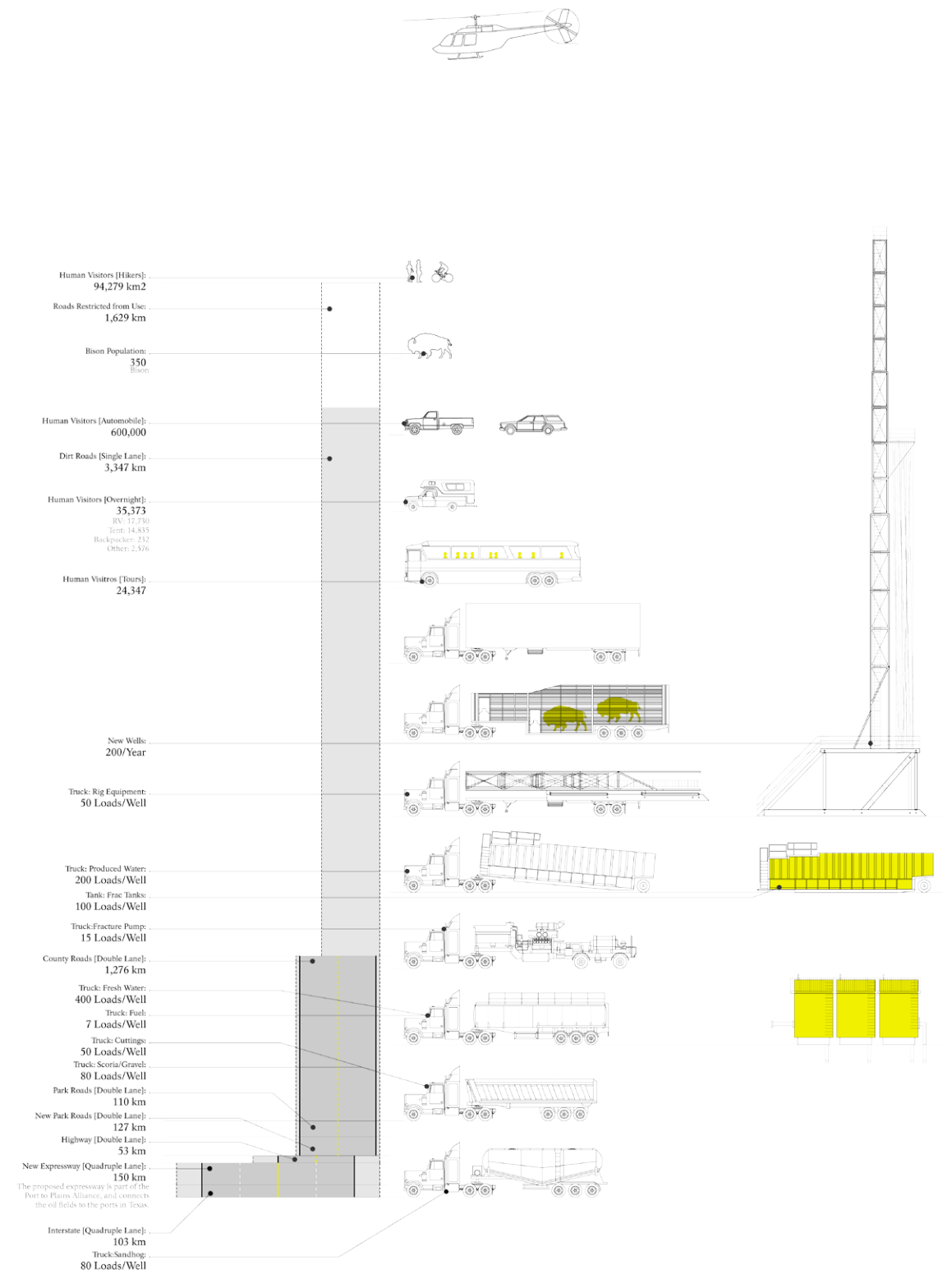
⁶ Billion Cubic Feet of Gas

⁷ Million Barrels of Natural Gas Liquid

⁸ USGS. National Assessment of Oil and Gas Fact Sheet. Assessment of Undiscovered Oil Resources in the Bakken and Three Forks Formations, Williston Basin Province, Montana, North Dakota, and South Dakota, 2013.

tourists, ranchers and the fracture drilling industry. If the land has not been deemed scenic and falls within the boundary of the national parks or developed into a drill pad, it is most likely used as grassland grazing for cattle. Tall grasses thrive in the aquifer-less region and provide a good food source for cattle and bison, as well as other large and small mammals in the area.

opposite comparative graph of road surfaces in Maah Daah Prairie



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Picturesque Prairies

*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Maah Daah Prairie: Actors & Seasonal Round

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How are we to succeed in a long-term enterprise with short-term means?

- Michel Serres

Too often short-term solutions have been proposed to address long-term goals. Serres argues we are “inept at finding reasonable solutions because we’re immersed in the brief time of our powers and imprisoned in our narrow domains.”¹ Unable to escape the confinement of short-term goals and processes,

¹ Serres, Michel. *The Natural Contract*. University of Michigan Press. 1995. 31

our decisions and impacts have produced long-term results within a remarkably short amount of time.

The increase in National Parks and modern conservation is shadowed by the increase development of fracture drilling supported by deregulation and new techniques. Both of these processes rely on an invisible infrastructure that attempts to blend in, hide or have a minimal impact on the land. While roads, bridges, lodges, outposts and lookouts in the National

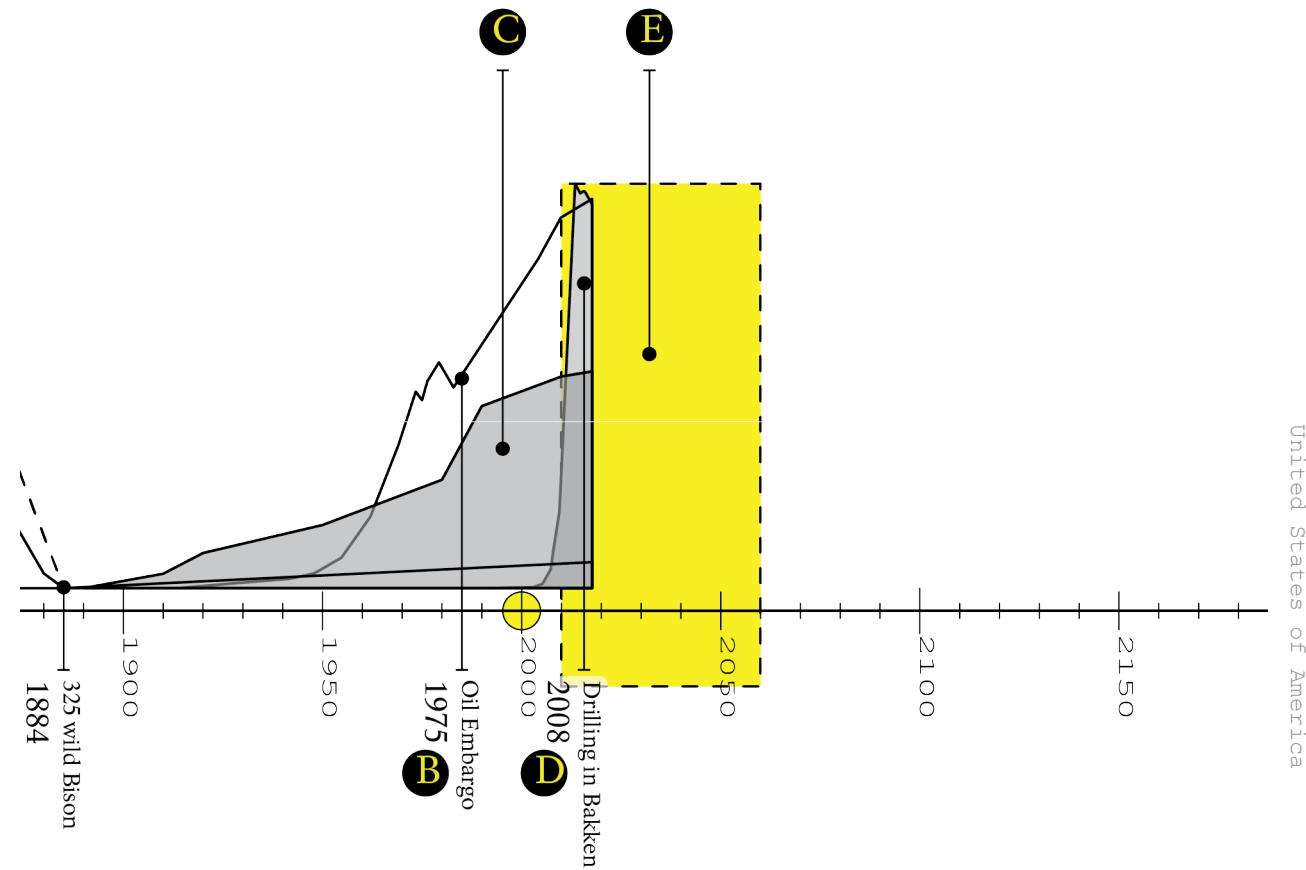
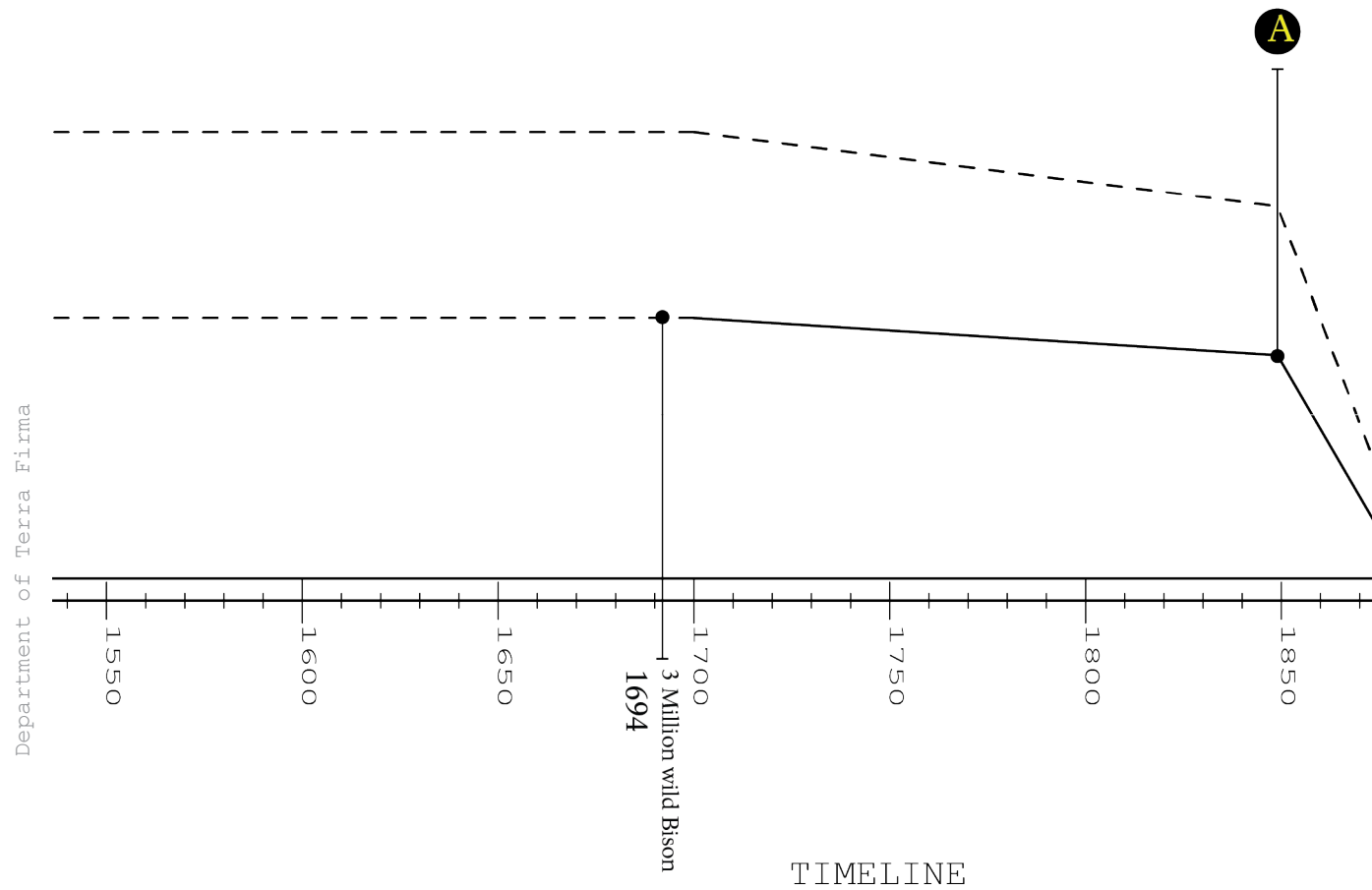
Parks are built with rustic materials to decrease the contrast between them and the scenery that they focus our attention on, the temporary and ephemeral mechanisms and structures of the fracture drilling development are intended to leave no trace of existence on the surface while pipelines and contaminated water tables remain as molar remnants.

Both of these short-term changes are prefaced by yet another; the rapid decline in the bison population and the socio-territorial impacts

- A** Bison fur introduced to market
- B** 1970-Emphasis on environmental protection leads to increase in 'environmental laws.'
- C** Increase in National Parks
- D** Fracture drilling begins as a boom in North Dakota's Bakken
- E** 50 year life span expectancy of fracture drilling wells.

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it had on indigenous people. Arguably, the destruction of the bison was engineered by the United States Department of Interior in order to tame the wilderness of the newly obtained land and to remove the natives who lived on it. On the surface, market demands pushed the bison to brink of destruction. However, a more intricate and entangled need for more natural resources caused the near extinction of the bison. Federal authorities supported the reinvented equestrian hunters because they saw the extermination of the bison as a means to force native populations into the reservation system.² Bison were the main food source for many Native Americans that had adapted to a plains lifestyle, and who were rebelling their domestication and assimilation by the United States Department of Interior. Without the bison, natives soon submitted to the forced boundaries of the reservations of the 20th century.

In general, this thesis looks to the possibility of embedding long-term ideology into short-term processes through designed built environments based on a new rhetoric and relations in which domination over land and other species no longer exists. Following a similar future narrative from Peter Gallison of warning an unknown future about past radioactive waste³,

² Isenberg, Andrew. "The destruction of the Bison." Cambridge University Press. Cambridge. 2000. pg3

³ Friends of the Pleistocene. "Waste-Wilderness: A conversation with Peter L. Galison." Last Accessed

the thesis proposes a short-term infrastructure visible and instrumental in establishing a long-term future composition shared between species. Specifically, the thesis acknowledges the relatively short life span of the fracture drilling industry and the invisible impacts it leaves on its habitat as an opportunity to encourage a rising bison population and territorially distinguish an invisible toxicity.

Ideologically, any decision, short or long, made within the Department of Terra Firma is never isolated and always requires consideration for other actors. Therefore, the design of the built environment must function as a quasi-object [quasi-infrastructure] that engages bison, fracture drilling and mankind. These three actors are the focal species of the Maah Daah Prairie because of their contentious histories, public perceptions and unknown futures. Although there are indeed more actors to include in the Plains to Ports Partnership, these three are by far the most successful species in the Maah Daah Prairie and the corridor in general and therefore serve as a baseline assemblage.

In order to imagine a built environment that engages the future growth and decline of the assemblage, a study of each actor over the course of a year is required to understand the patterns and material flows within their environment. However, this information alone is useless unless compared to the overall

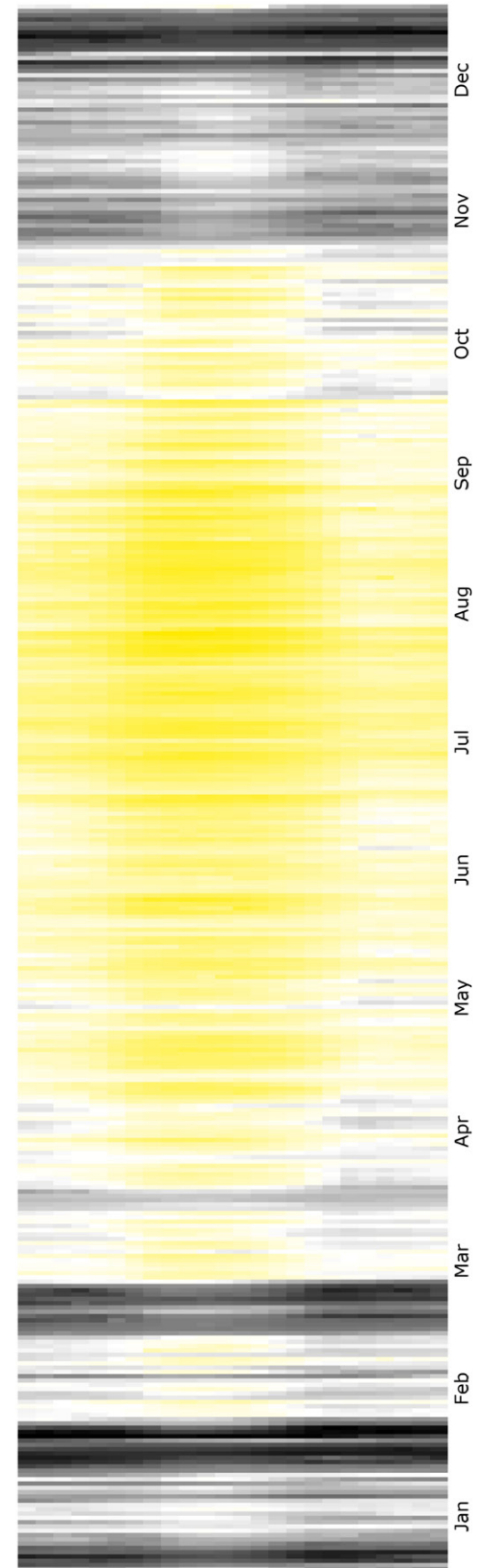
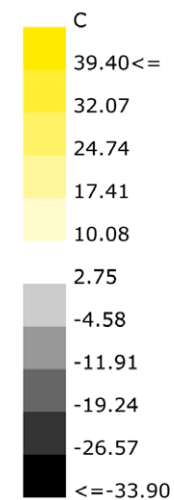
January 2018. <https://fopnews.wordpress.com/2011/03/31/galison/>

environment in which all actors reside and amongst themselves as a shared residency.

Michel Serres reminds us there is a simple word that describes a rich and complete model of equilibrium between time and weather: *temps*. In understanding the two as disparate and separate things, humans have become accustom to only living in time and not out in the weather, a possible result of architecture itself.

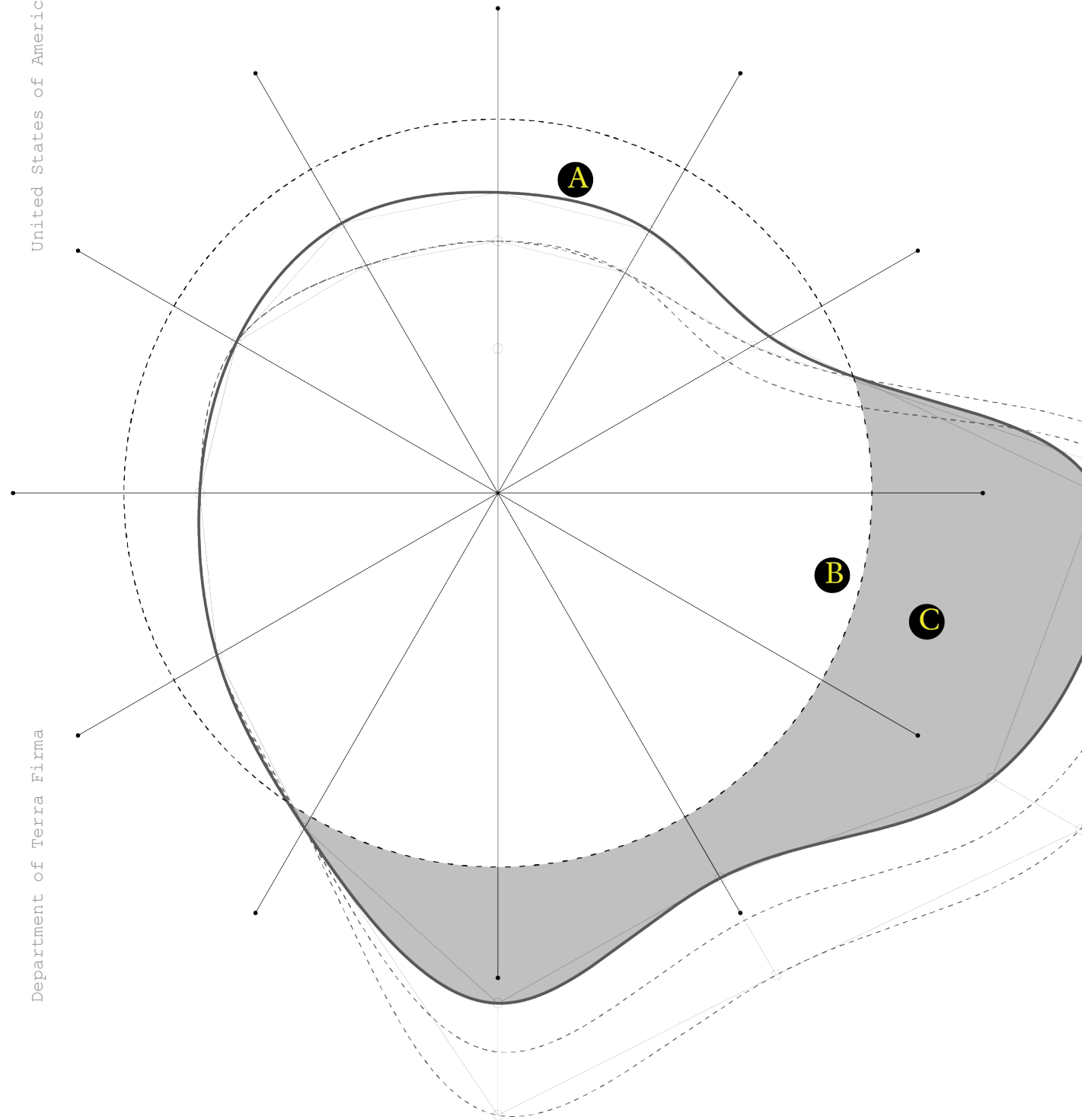
The temperature in the Maah Daah Prairie fluctuates dramatically because of the low moisture in the region. Although many days in the summer season are well above freezing, many nights rapidly loose heat and cool down to near freezing levels. Throughout the winter season, the temperature rarely rises above freezing and provides little opportunity for snow melt until late February and early March. Because the snow does not typically melt during the winter, there is a large spring runoff in March that temporarily floods the

right
annual
temperature
graph of Maah
Daah Prairie



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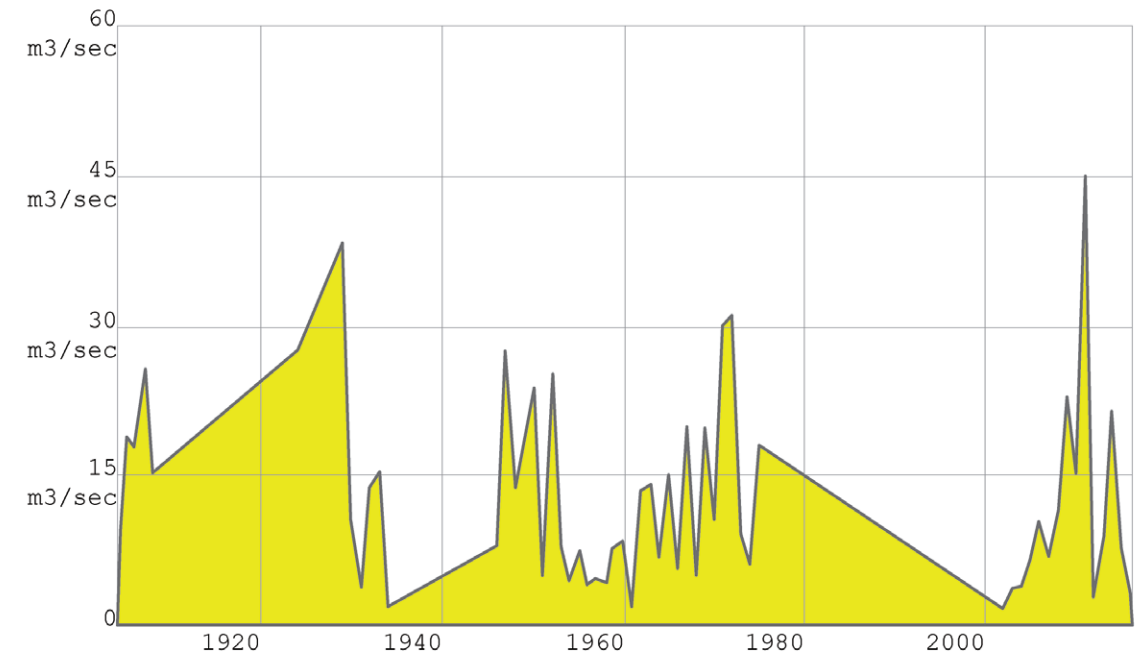
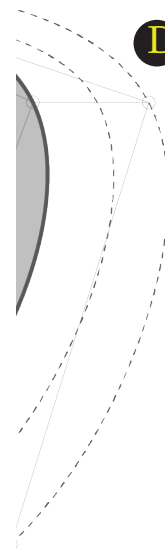
opposite
water-seasonal
round

middle
average run off
flow of Little
Missouri per
year

- A** Proposed fresh water distribution pattern and use from snow melt
- B** Minimal fresh water required for Little Missouri River
- C** Amount of fresh water not used or captured from snow melt
- D** Existing fresh water pattern of snow melt and run-off

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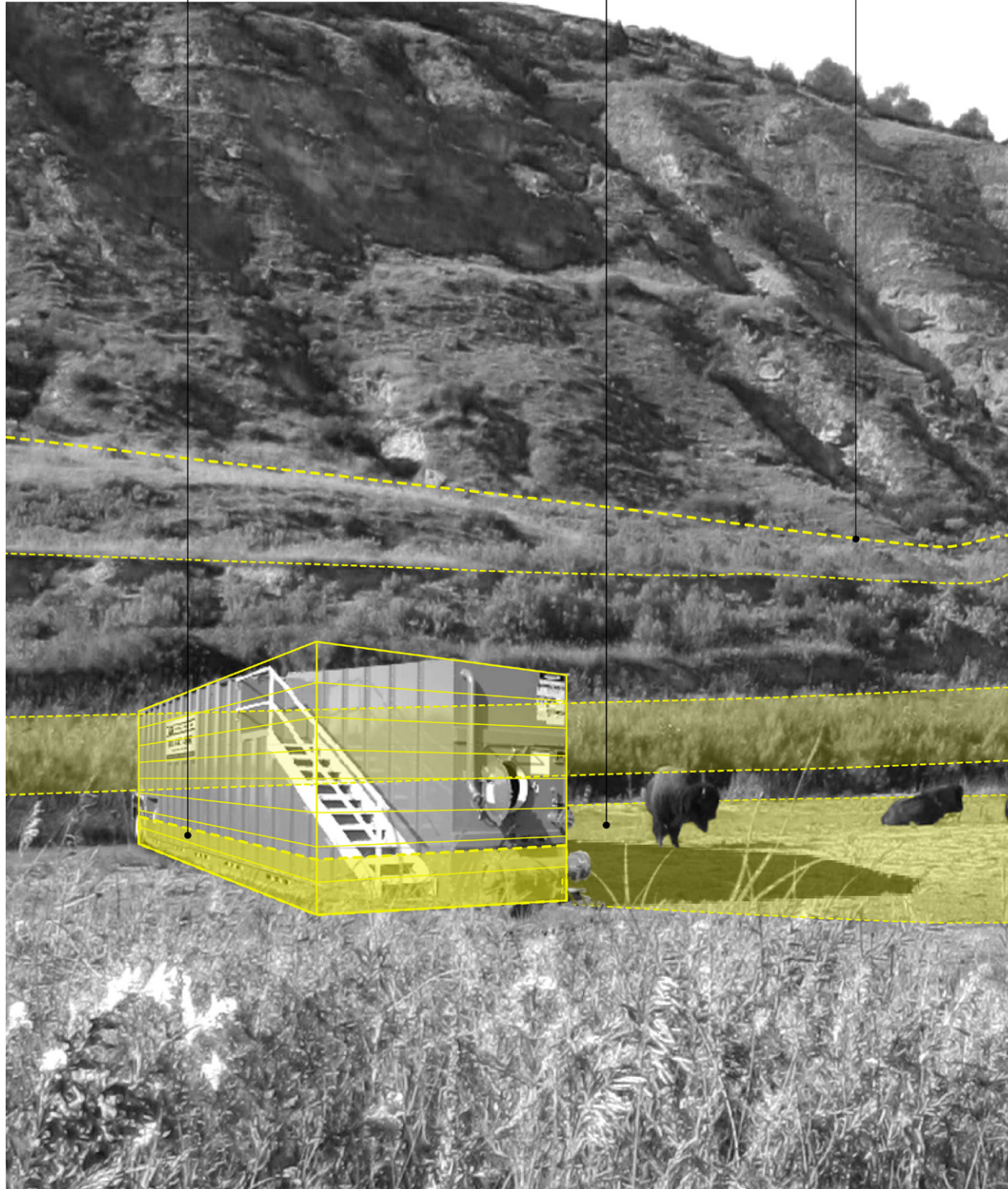


Little Missouri and the connected tributaries. This runoff period is crucial for the flora in the prairie because it is the highest amount of water exposure throughout the year. Like most floral distribution, larger shrubs and small trees can be found close to tributaries and other floodplains that have not eroded. Unlike cattle that are attracted to permanent water sources, bison are typically attracted to seasonal water sources when available, allowing them to roam further away from rivers.⁴ However, during

the mating season bison are drawn to the dried floodplains near permanent water sources to wallow.⁵

M. Leslie, JR., and James H. Shaw. "Botanical composition of bison diets on tallgrass prairie in Oklahoma." *Journal of Range Management*, 51(4), (July 1998), 379-382.

⁵ Cunfer, Geoff and Bill Waiser. *Bison and the People on the North American Great Plains*. College Station: Texas A&M University Press, 2016.



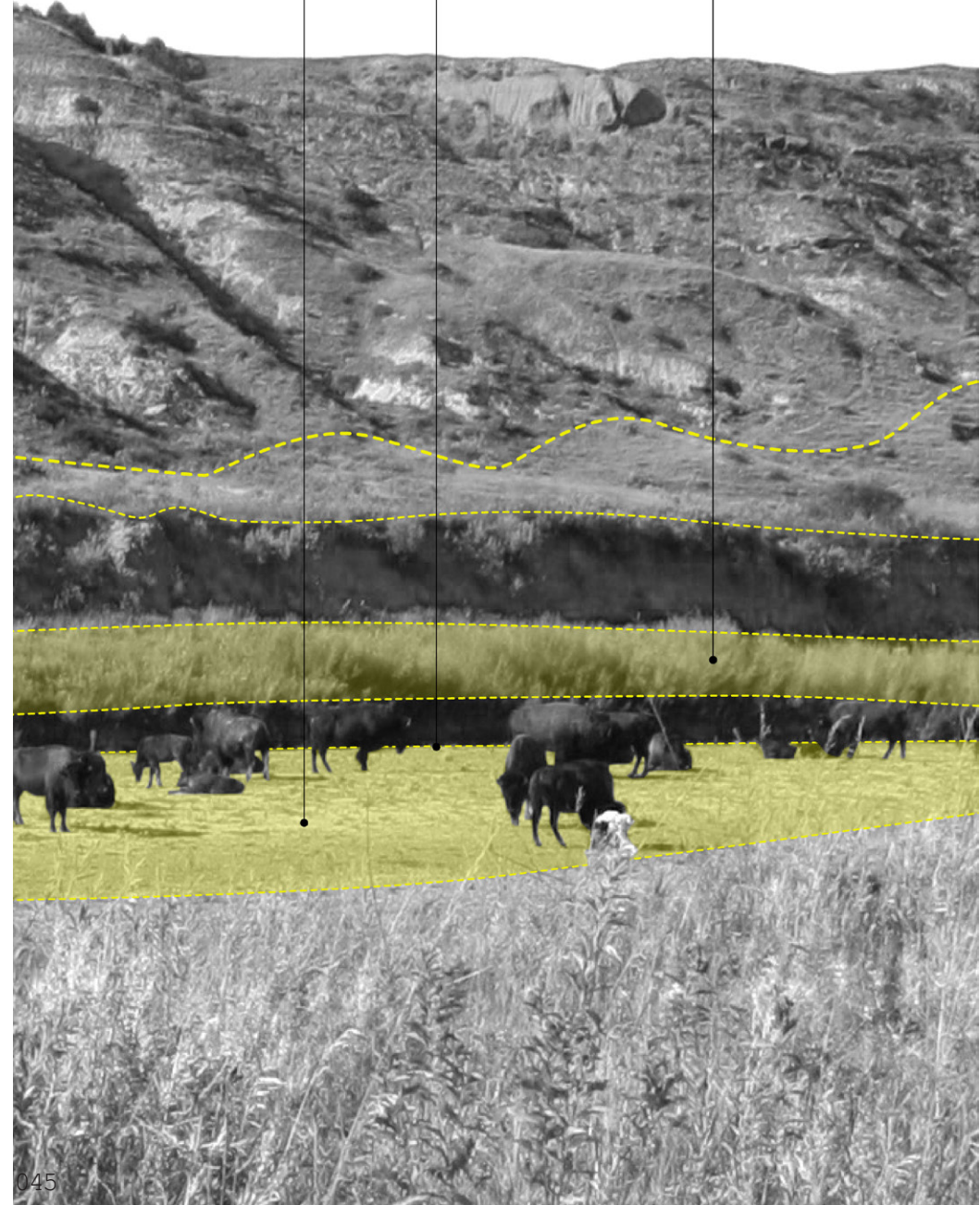
Average Water Use [Bison]:
27.8 m³/yr

This is an estimate based on the liters per day consumed by cattle. The amount is multiplied by weight. It is suspected that water contained in flora contribute to some of the water requirement.

Preferred Land [Bison]:
Short Grass

Bison prefer shorter grass, more specifically recently mowed grass, as opposed to native grass because it is softer. Bison have been known to share camping sites with humans because of the grass in the area.

Average Grazing Range [Bison]:
100,000 m²/yr



Bison are attracted to depressions in the land that are filled with dry or wet mud called wallows. Bison cover themselves with dirt or mud by rolling in the wallow. Biologist hypothesize the dirt or mud works for insect protection and plays a role in the mating season as a grooming technique.

Preferred Land [Bison]:
Wallow

Average Distance from Permanent Water Source [Bison]:
2 km

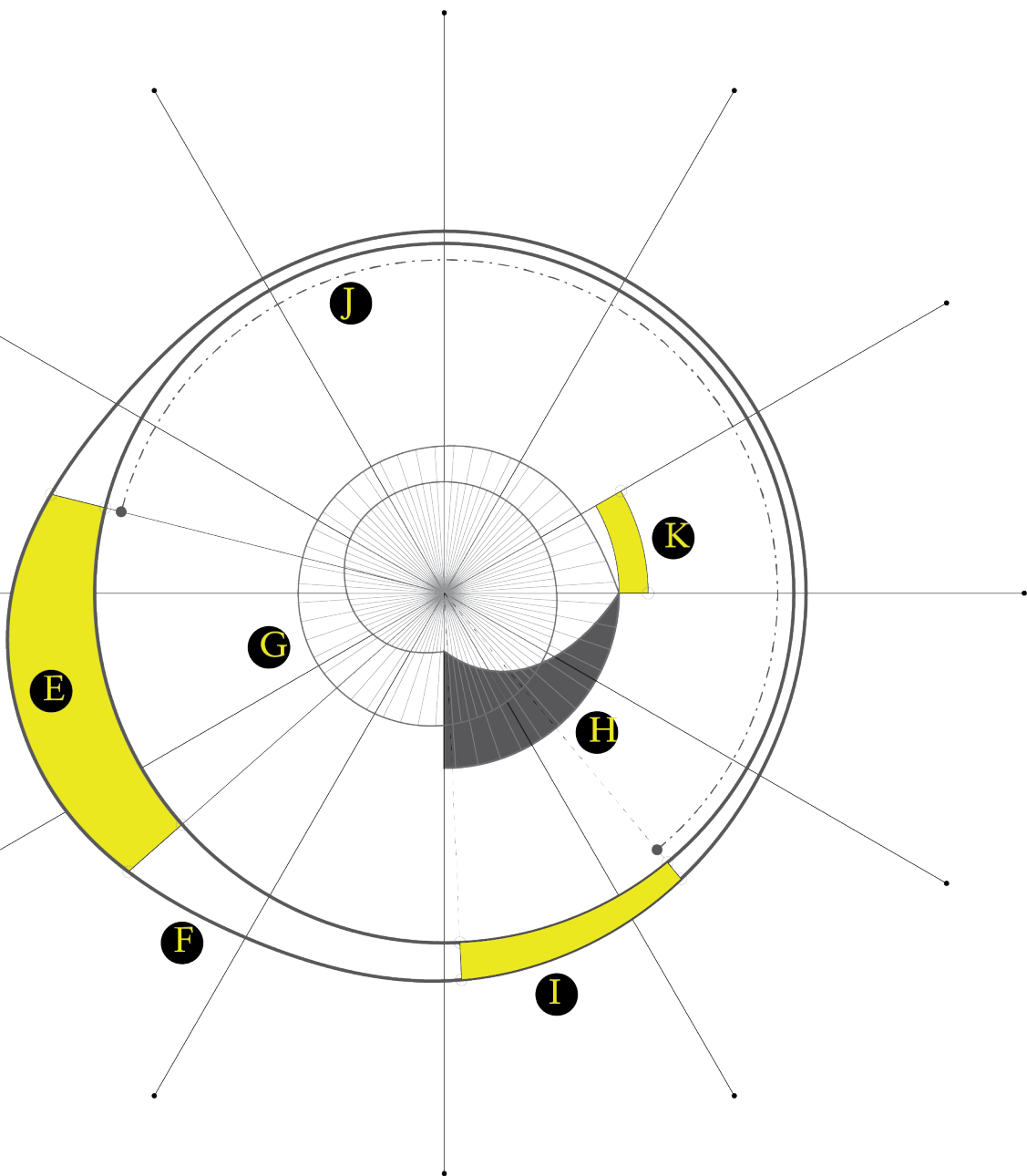
Research has shown that bison do not prefer permanent water sources such as rivers or streams outside of the winter months. Typically bison find seasonal water sources while ranging.

Preferred Land [Bison]:
Flood Plain

Contrary to avoid permanent water sources, bison have been known to graze the flood plains of rivers, taking advantage of the different flora and abundance of wallows.

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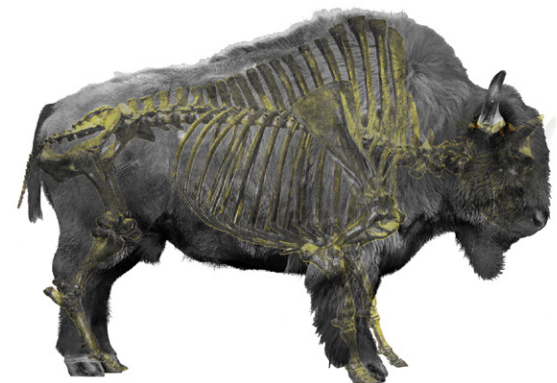
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Memorialized as a living tribute to a romanticized conquest of the American Frontier, bison carry many identities with them. The state recognizes bison in two ways: either livestock or wildlife depending on the type of land in which they are contained. Bison, compared to the domesticated cattle, are almost uncontrollable because they can run up to speeds of 50 km/hr, can jump over barbed wire fences and unlike other large mammals on the prairie, they are not afraid of humans. Now at a population of less than 20,000, the bison are confined behind large fences on reservations and conservations. The cattle industry is especially persistent in confining and limiting the bison because they do eat their placentas after giving birth and therefore increase the risk of spreading Brucellosis easily to domestic cattle.

Within the confines of fenced areas, bison typically gather as a large heard in spring, summer and fall for mating and birthing and then separate during the winter. Regardless of the season, all bison are attracted to new, soft grass that grows in the prairie after a fire.⁶ While some research has been done on eating habits and roaming characteristics, all information is generally understood to be incomplete because the confinement in which bison live do not accurately depict an ideal living condition.

⁶ Coppedge, Bryan R., and James H. Shaw. "Bison grazing patterns on seasonally burned tallgrass prairie." *Journal of Range Management*, 51(4), (July 1998), 258-264.

- E** Bison rut or mating season
- F** Bison herd size: larger during the summer and smaller in winter
- G** Growth of short grass over two years
- H** Biannual burning of short grass
- I** Bison birthing season
- J** Bison gestation period [high fat volumes]
- K** Snow fence remains

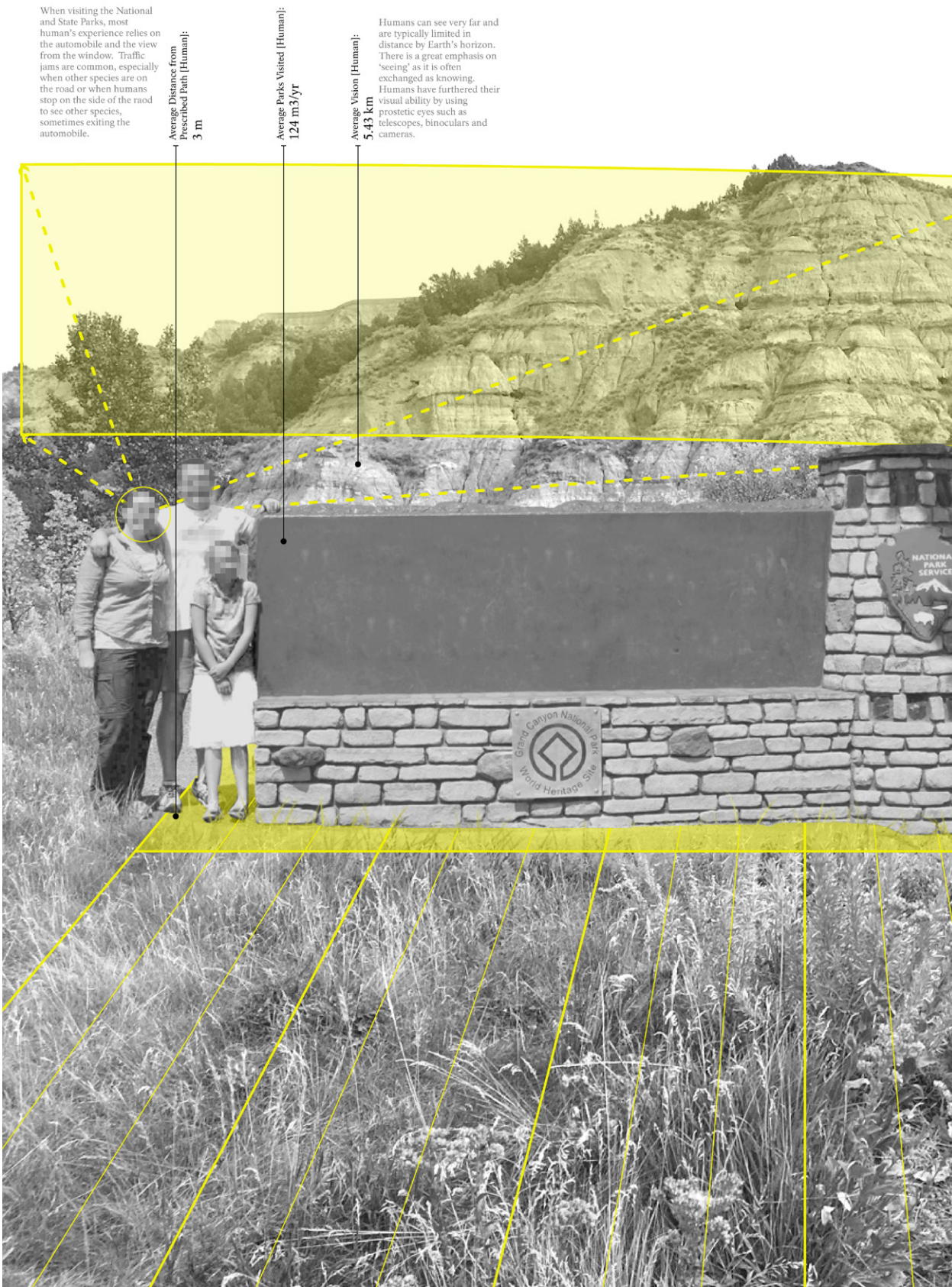


opposite
Bison-seasonal
round

middle
bison collage

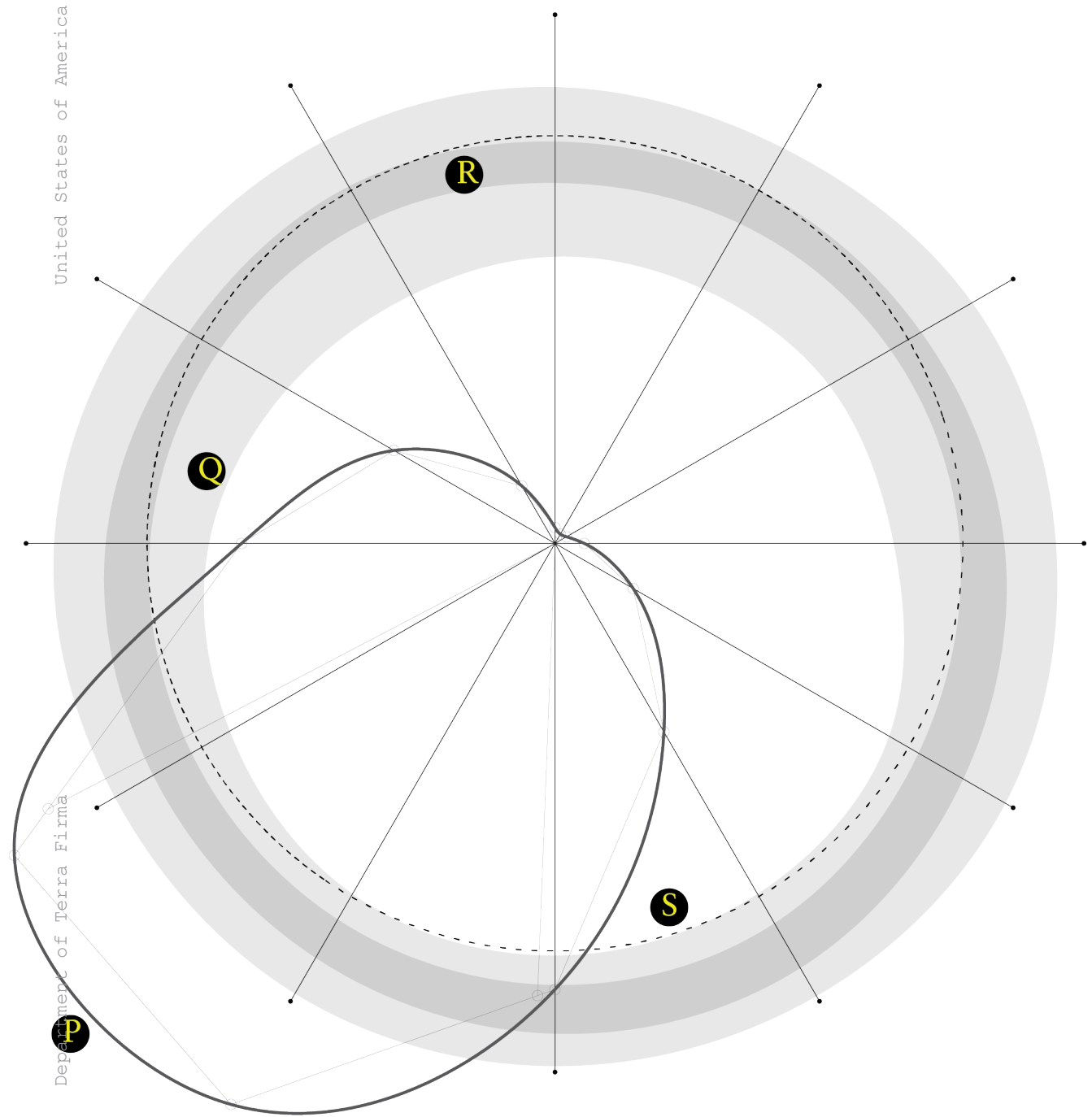
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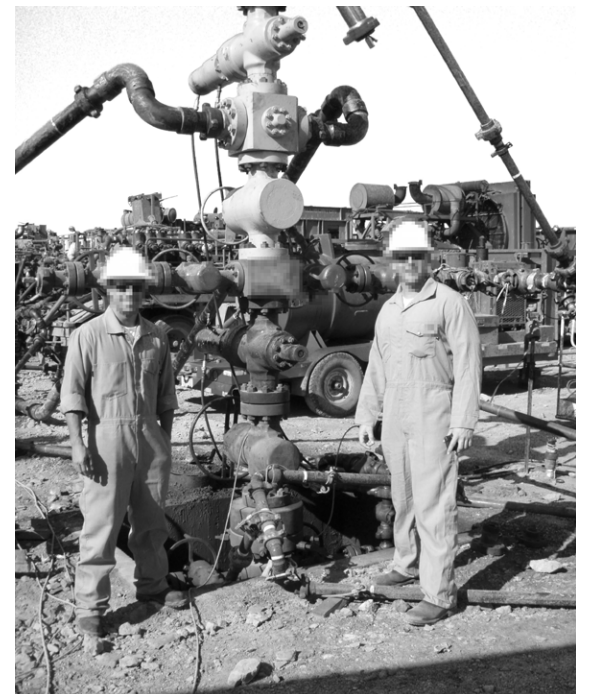


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- P** Human visitor population
- Q** Extreme temperature bounds
- R** Average temperature bounds
- S** 0 Celsius

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opposite
Sapien-seasonal
round

top right
selfie taken
in front of
National Park

bottom right
selfie taken in
front of well
head

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Average Volume of Water Pumped for Initial Fracture [Engine]:
7,500 m³

The initial fracture of the earth was the only time fracturing fluids [water with additives] was injected into the earth. The water broke open the earth, and left sand particles to keep it open. As pressure pushed the water back, most of it was collected as produced water and stored in frac-tanks for remediation.

Average Production of Gas [Engine]:
70 m³/yr

Gas was a byproduct of oil extraction and burned off until a pipeline network was established to immediately transport it to refinement. Engine compressors, running off said gas, compress and pump the gas offsite.

Average Volume of Produced Water [Engine]:
839.5 m³/yr

Due to the salinity of the geography, the wells in North Dakota require maintenance water to be injected each year to maintain flow rates. Like the initial fracture, this water returns as produced, and needs to be stored before remediation.

Average Composition of Fracturing Fluids [Engine]:
98-99.5% Slickwater

Chemical additives typically might make up just 0.5-2% of the fluid. The remaining 98-99.5% is water with friction-reducing additives to make slickwater.



Average Area of Frack Pad [Engine]:
0.014-0.006 km²

Average Volume of Evaporated Water [Engine]:
7,500 m³ + 839.5 m³/yr

Most wells store produced water in frac-tanks before it is picked up and taken to a cleaning facility. In North Dakota, the weather is dry enough to use evaporation techniques to separate the water from the other additives.

Average Volume of Proppant Added into Fracture Fluid [Engine]:

The total amount depends on the diameter of the proppant, the viscosity of the Fracturing Fluid and assorted pressures on from the earth.

Average Production of Oil [Engine]:
92 m³/yr

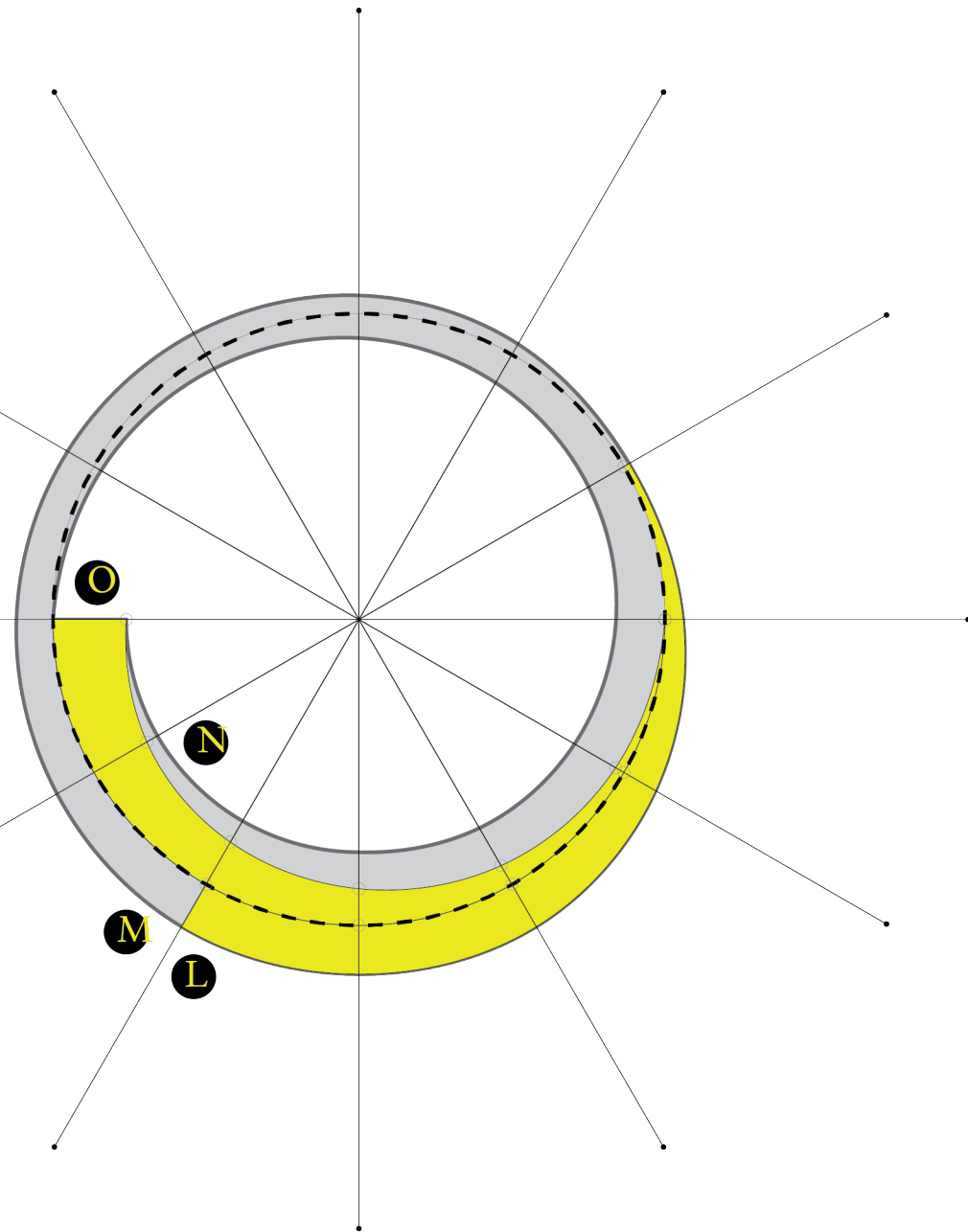
The oil produced from the wells are typically stored onsite in field storage tanks until they are picked up by a transportation truck. At this time, the oil is measured for purity. If it passes, the volume received is recorded and the oil is delivered to a station where it is mixed with oil from other wells and transported for refinement and use.

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Particularly in the Plains to Ports corridor, many nomadic humans and bison perished during the 19th century and the remaining retreated- only to be replaced by new nomads: oil and gas derricks. The new nomads systematically fracture the earth 6km below the surface to release trapped gas and oil from geological formations. Leaving a network of dirt roads and buried extraction pipes, the new organism spreads across the land like a rhizome, molar and interconnected.

Tractor-trailers facilitating the organism's movement carry construction materials, resources, waste and extracted forms of energy from the northern plains to the southern ports. It is estimated 2,024 inbound/outbound truckloads are required per well along the corridor.⁷ Sometimes pipelines are constructed in areas with large material traffic. Movement of the resources crosses many state boundaries and even reaches across national borders to include parts of Canada and Mexico.

The low populations in the area and along the corridor combined with the growing appetite for energy in the western worlds created a breeding ground for the organism as the direct result of petroculture externalities. In this

⁷ Upper Great Plains Transportation Institute, North Dakota State University. "Additional Road Investments Needed to Support Oil and Gas Production and Distribution in North Dakota." Report Submitted to North Dakota Department of Commerce and funded by the North Dakota Association of Oil & Gas Producing Counties. December 9, 2010.

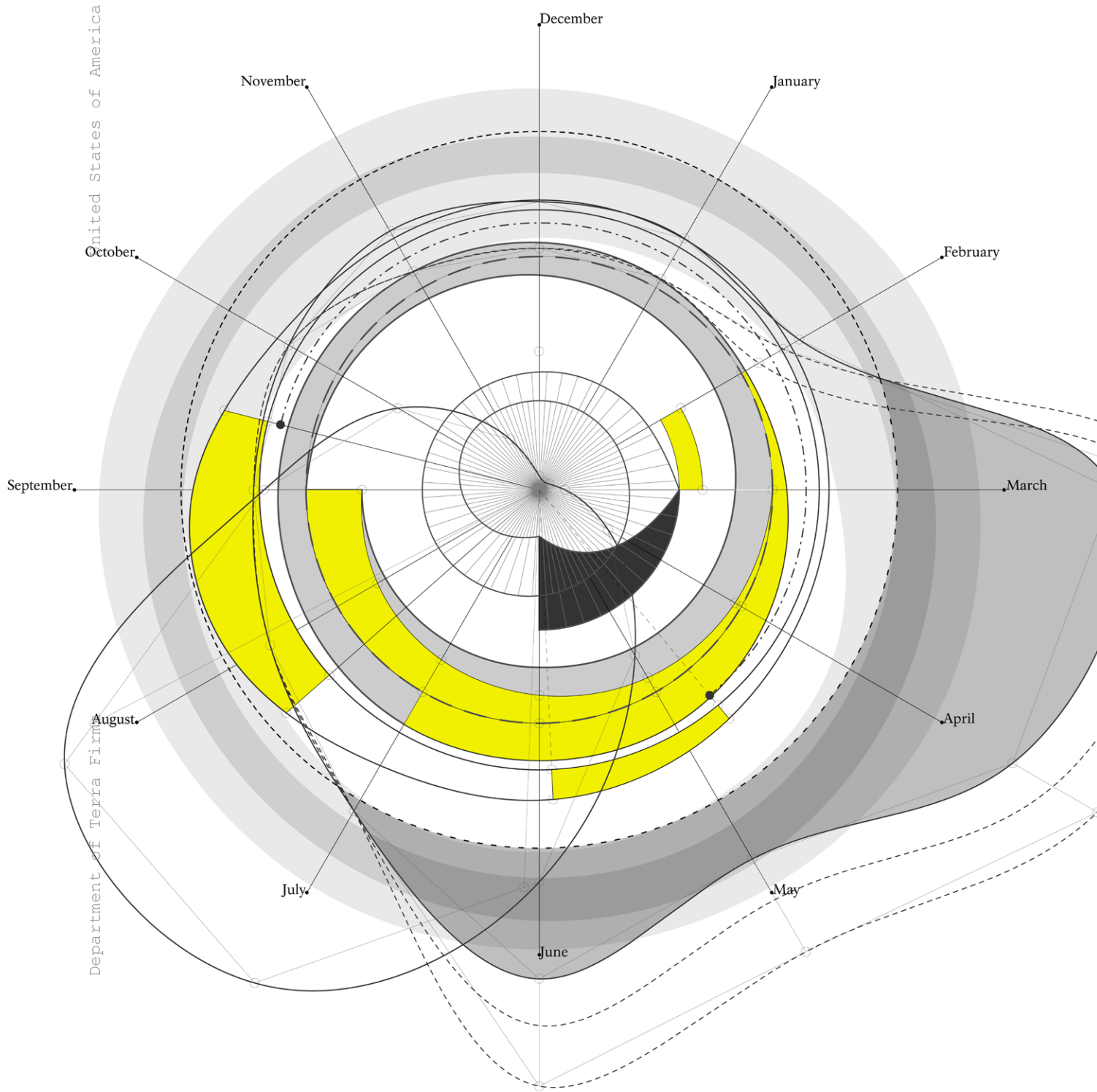
- L** Fresh water use/capture from snow melt and run-off
- M** Fresh water storage
- N** Produced water storage
- O** Evaporation of produced water

ecosystem , mismanagement between federal government bureaus and departments created geopolitical fractures that enabled ubiquitous and general practices for regionally unique land and removed almost all local incentives for best practices.⁸

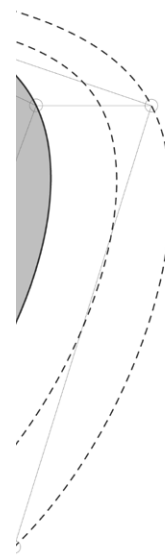
⁸ Chris Edwards and Randal O'Toole. Reforming Federal Land Management: Downsizing the Federal Government.

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Together, the habits and patterns of the three species offer a fragmented picture of a potential reciprocal and relational seasonal cycle. Although fragmented, the cycle offers a scope and limit in which design can engage all three actors. Using this seasonal round composition, the following maps and building permits attempt to offer a glimpse of designing built structures that drill for oil and gas and create attractive environments for bison.



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Picturesque Prairies

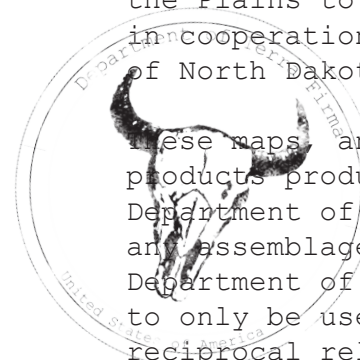
*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Maah Daah Prairie: Cartography

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left
map key for
discretization

opposite right
B series; Maah
Daah Prairie
existing map

p.62

p.64

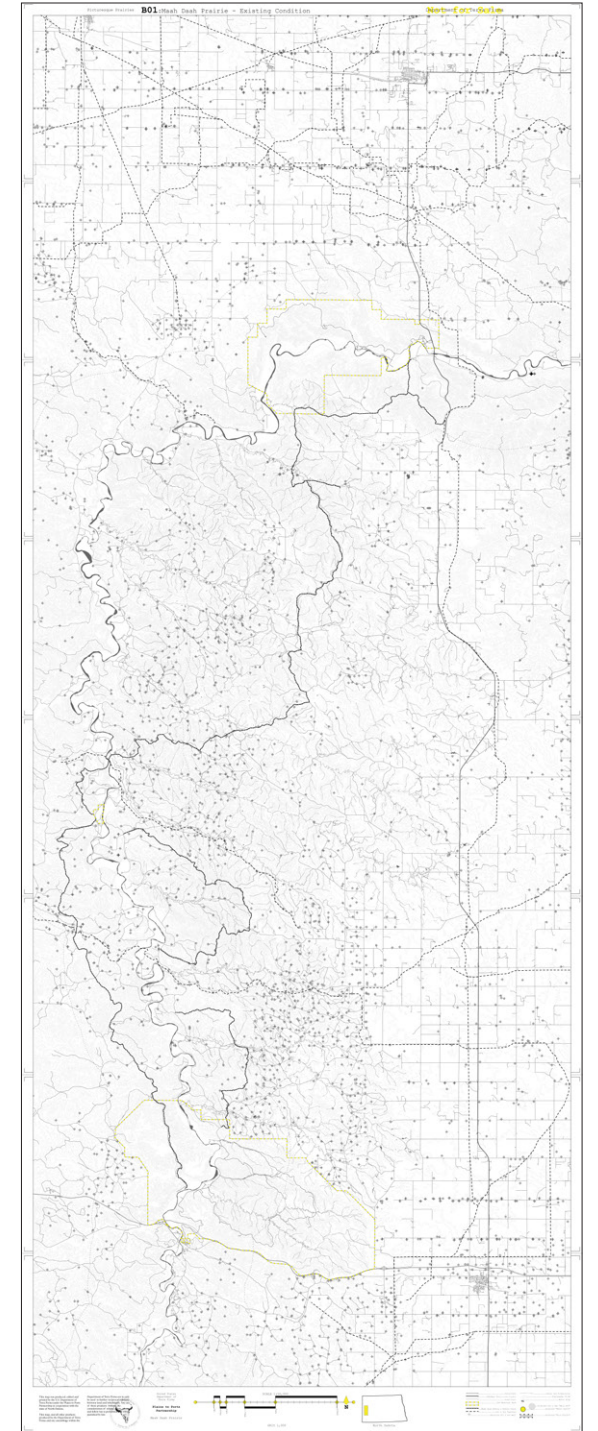
p.66

p.68

**Maah Daah Prairie:
Existing Condition**

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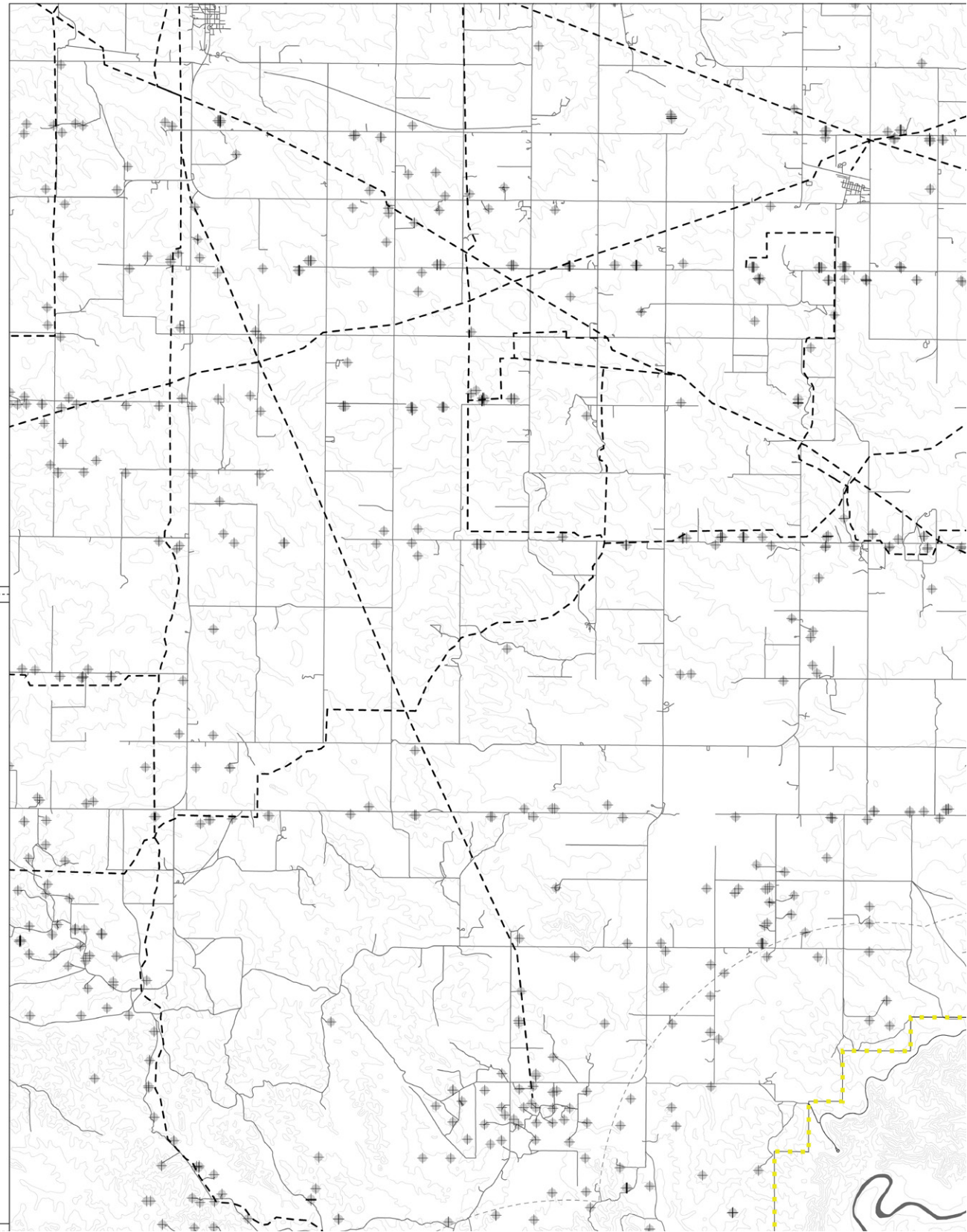
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Picturesque Prairies **B01:Maah Daah Prairie - Existing Condi**

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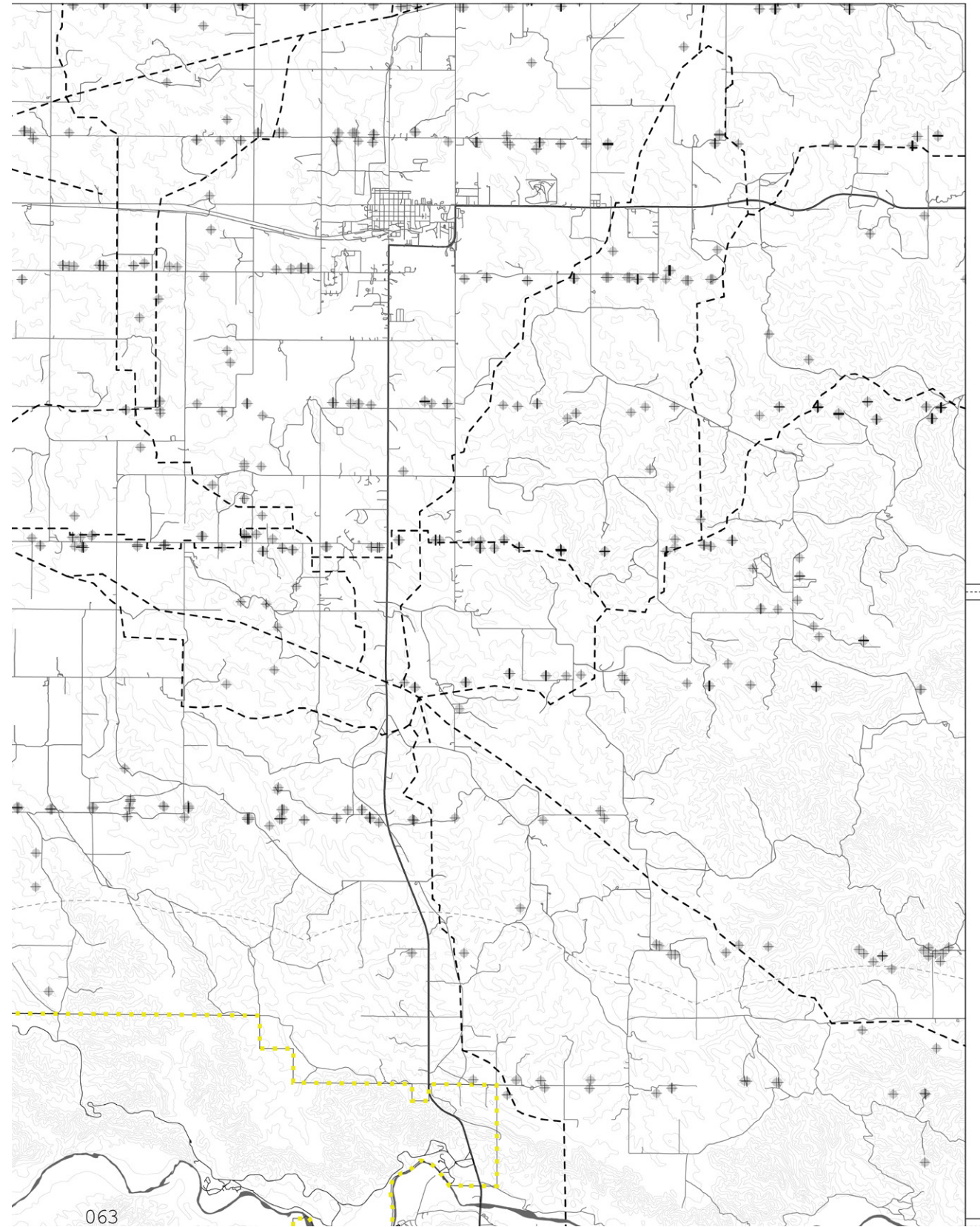


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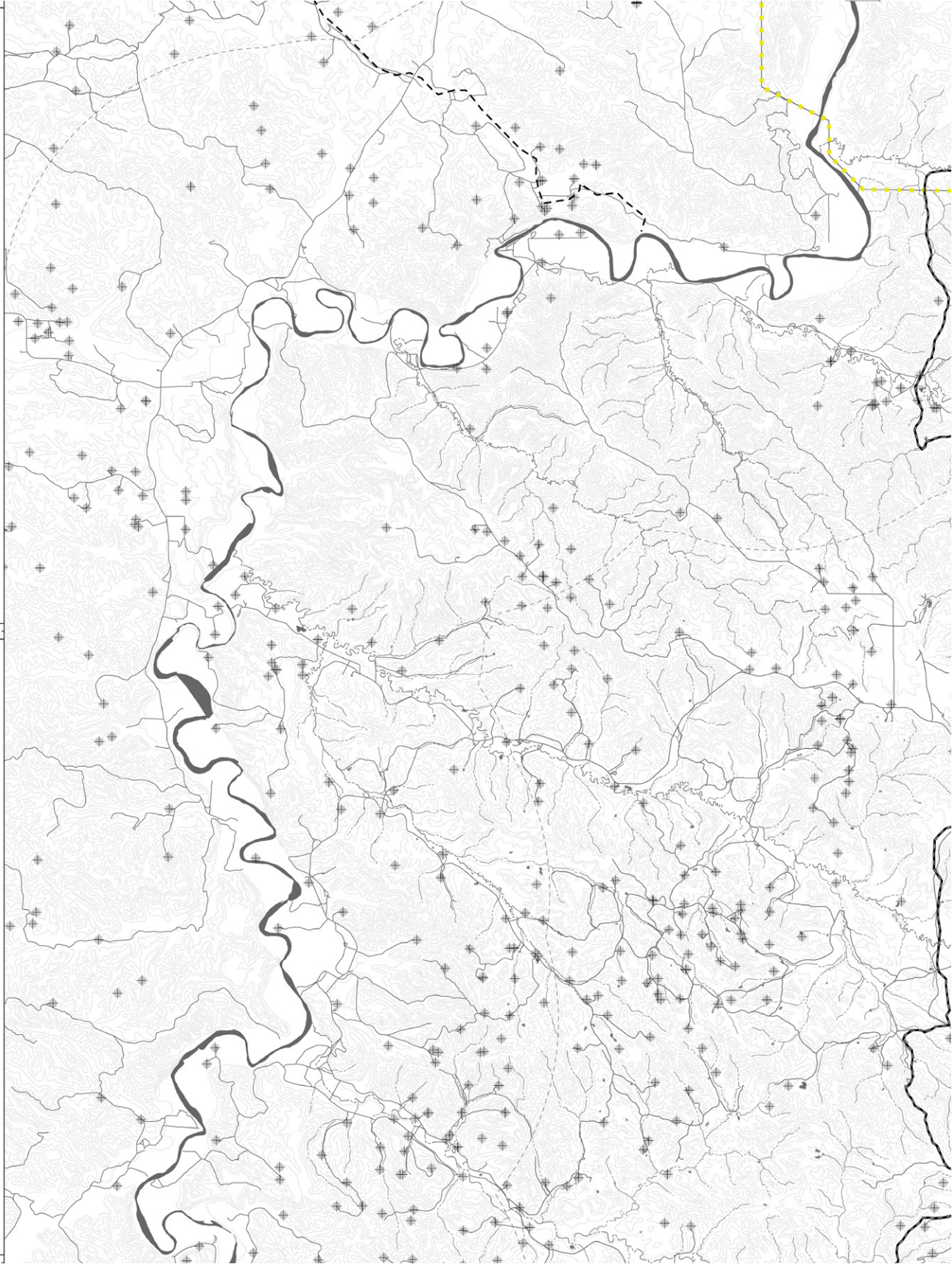
United States of America



063

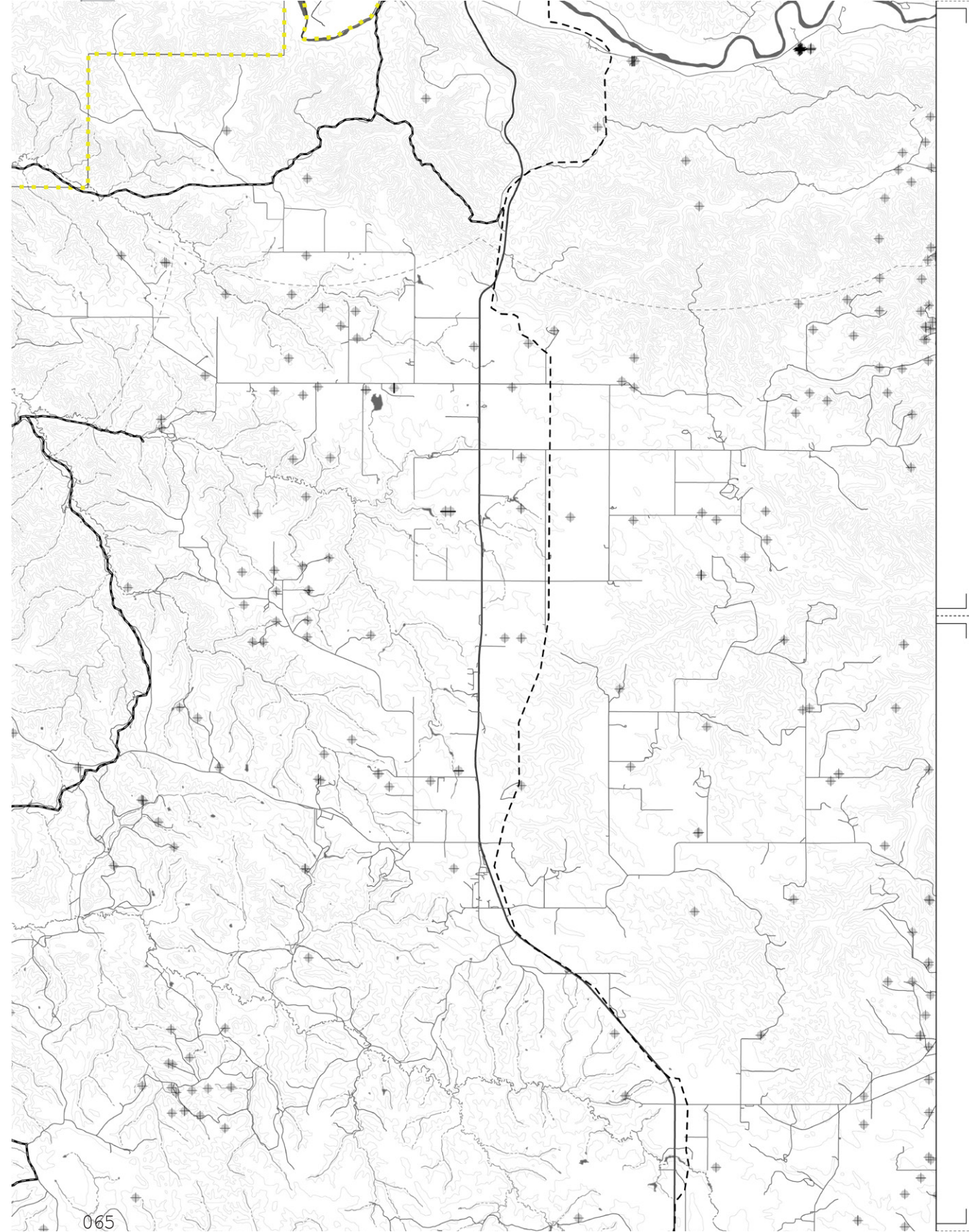
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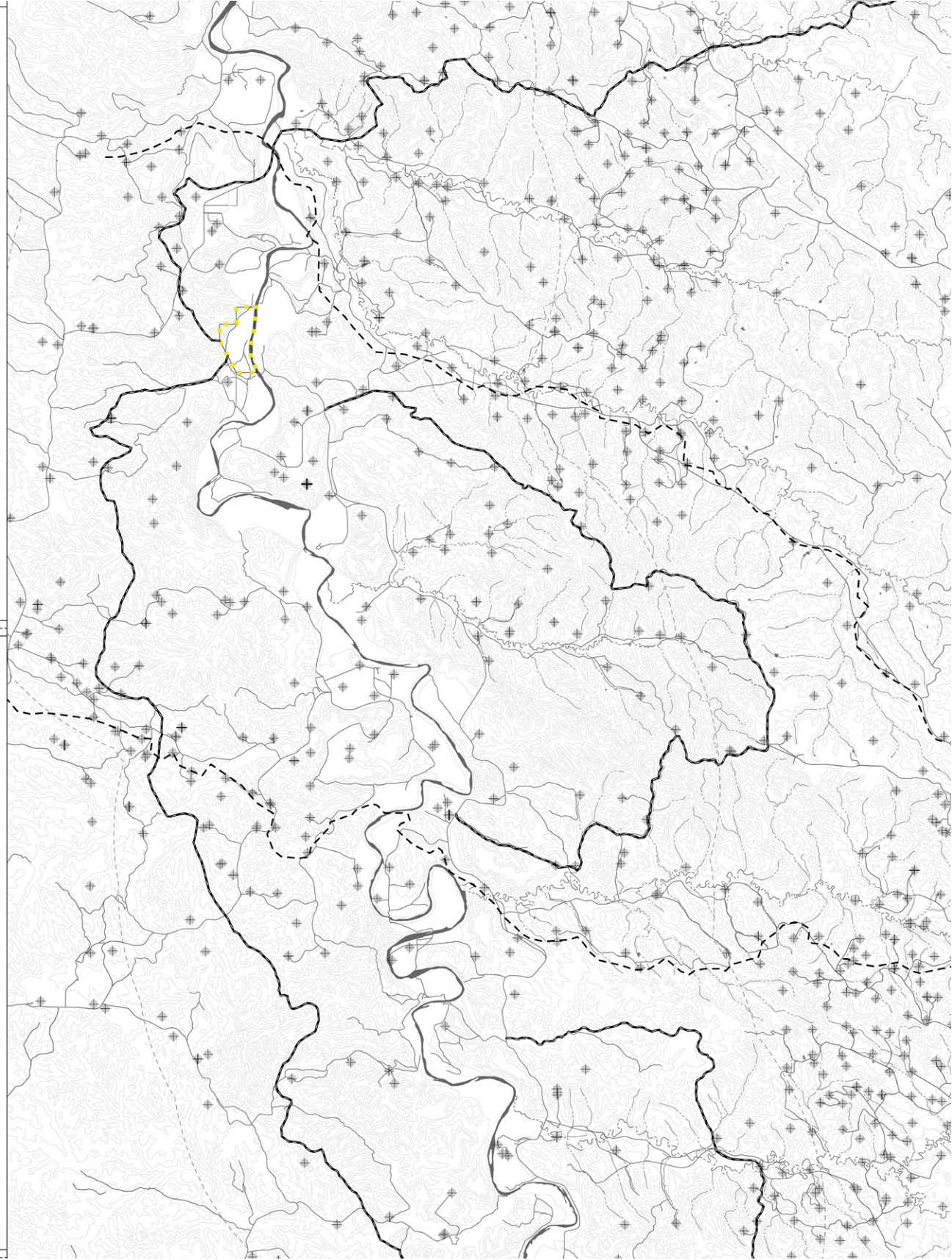
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065

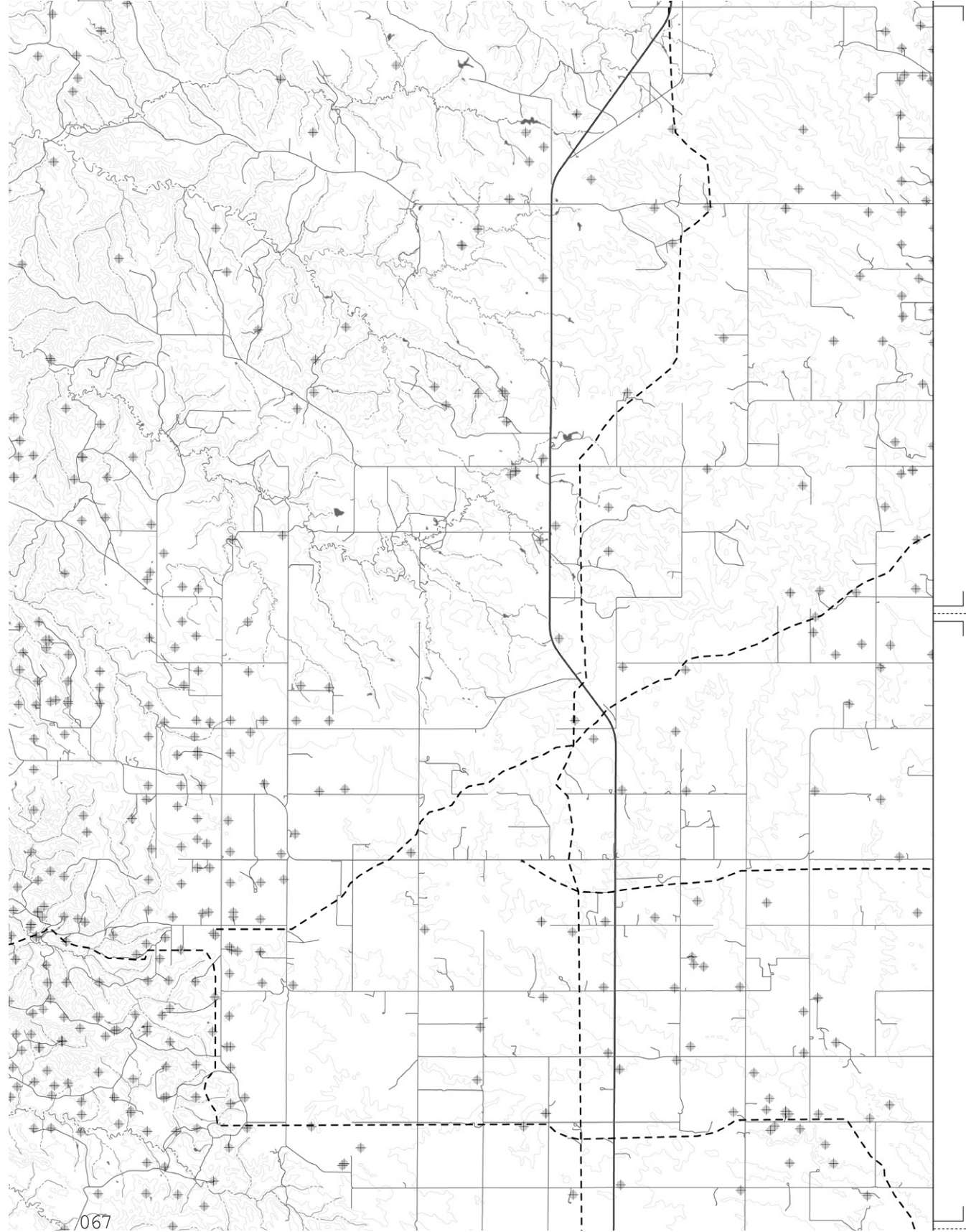
United States of America

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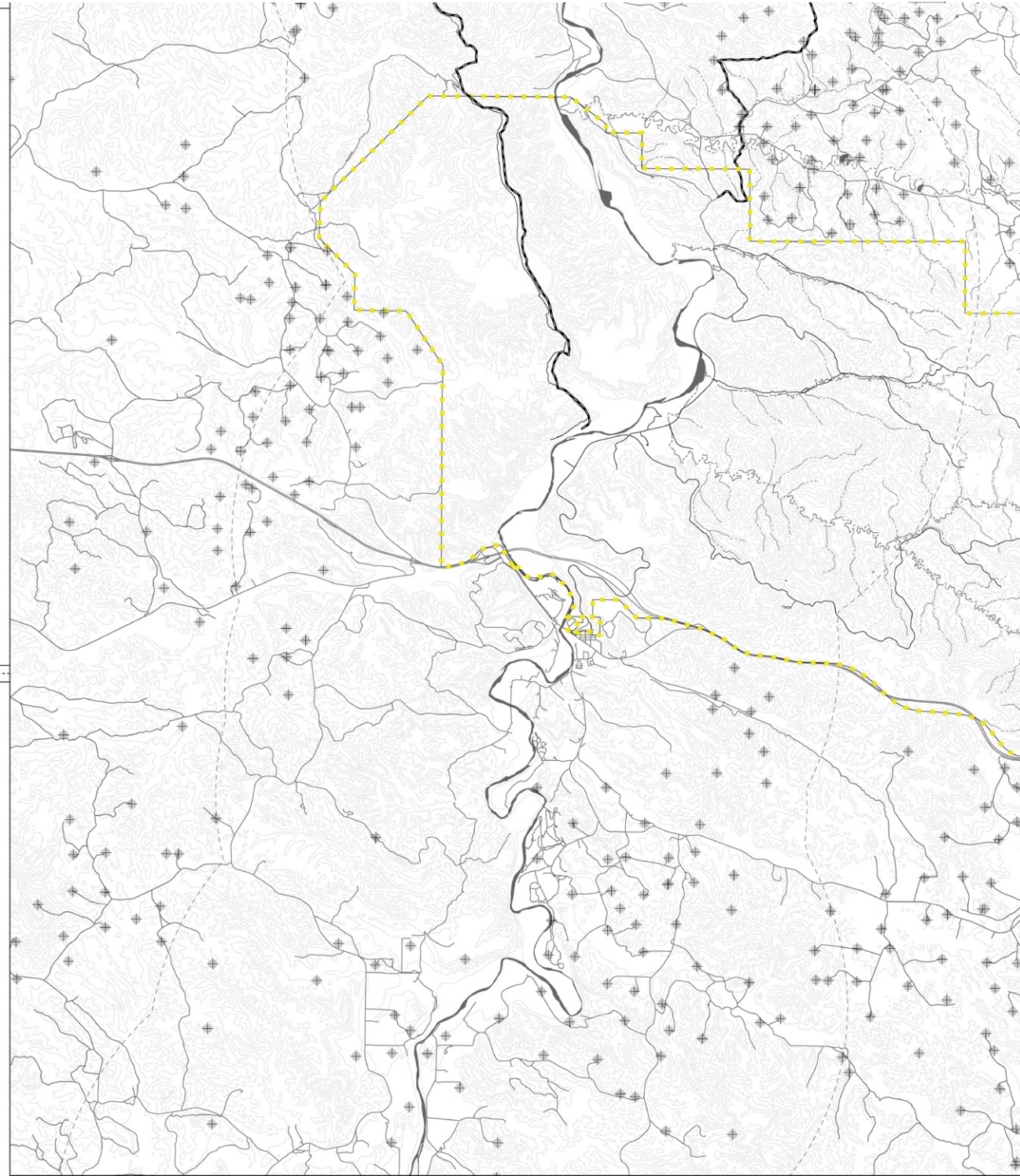
United States of America



067

United States of America

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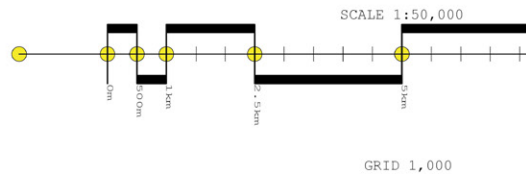
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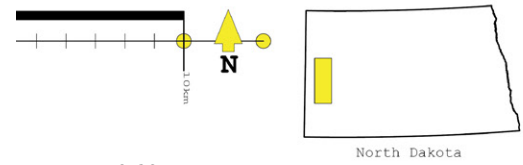
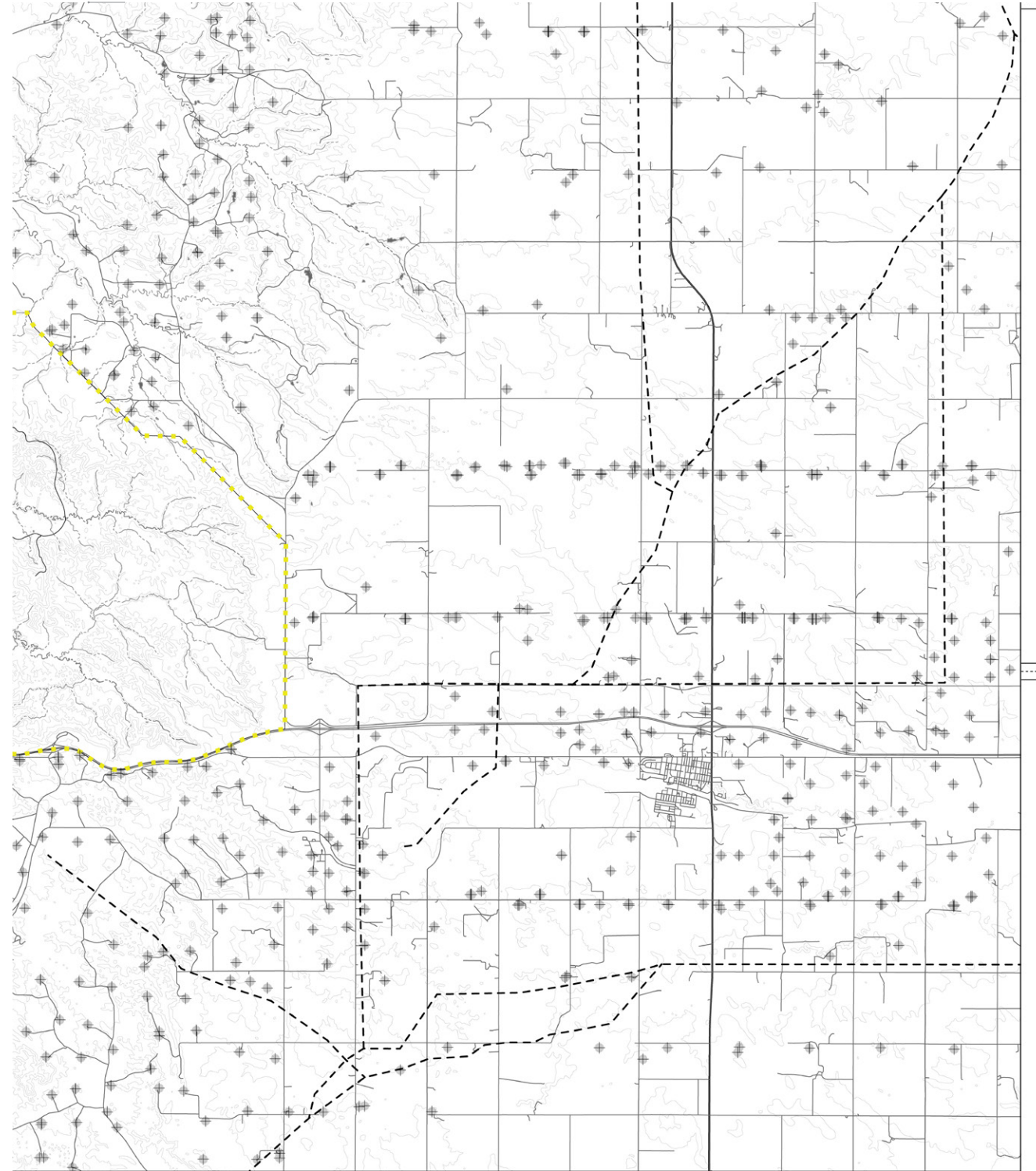


United States
Department of
Terra Firma
**Plains to Ports
Partnership**
Maah Daah Prairie



Department of Terra Firma

United States of America



- Interstate
- Highway (side to side center)
- Road (side)
- Old National Park
- Mash Daah Hiking & Biking Trail
- Oil & Gas Pipeline
- Existing Oil & Gas Well
- River and Tributaries
- Topography +5.0m
- Water Body
- Proposed Oil & Gas "Well Pad"
- Proposed "Water Valve"
- Proposed "Fire Fields"

United States of America

Department of Terra Firma

left
map key for
discretization

opposite right
B series;
Little Missouri
Watershed

p.72

p.74

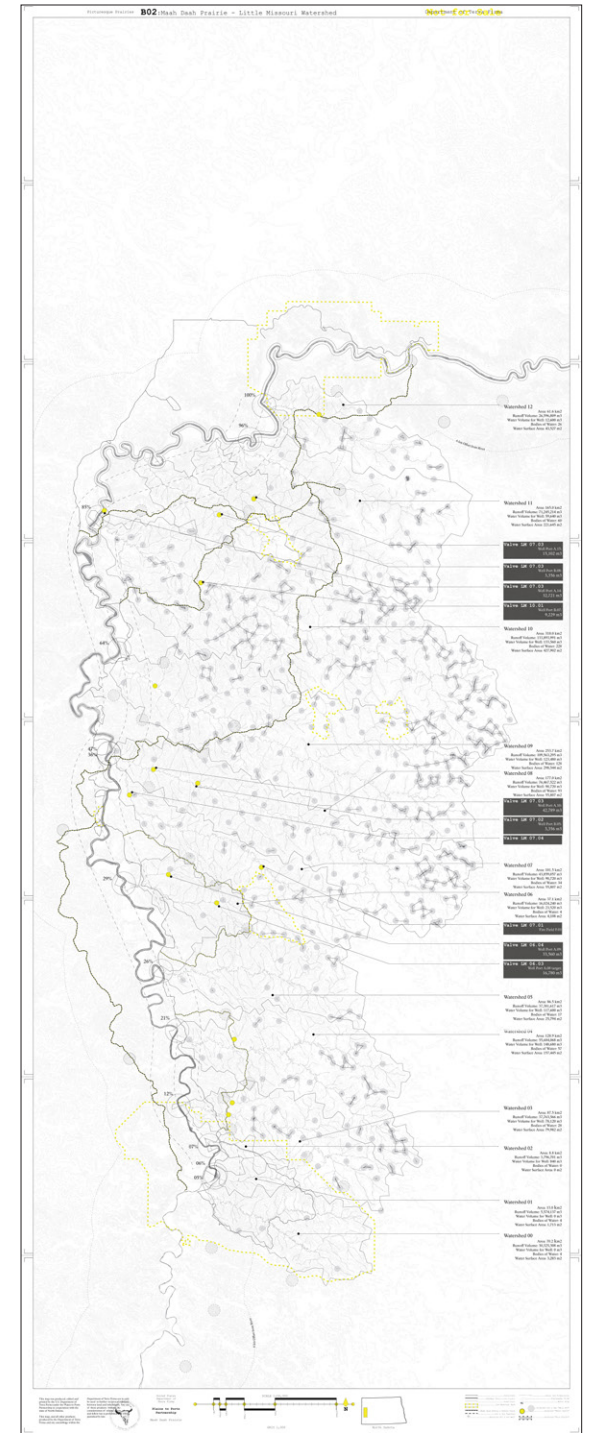
p.76

p.78

Maah Daah Prairie: Little Missouri Watershed

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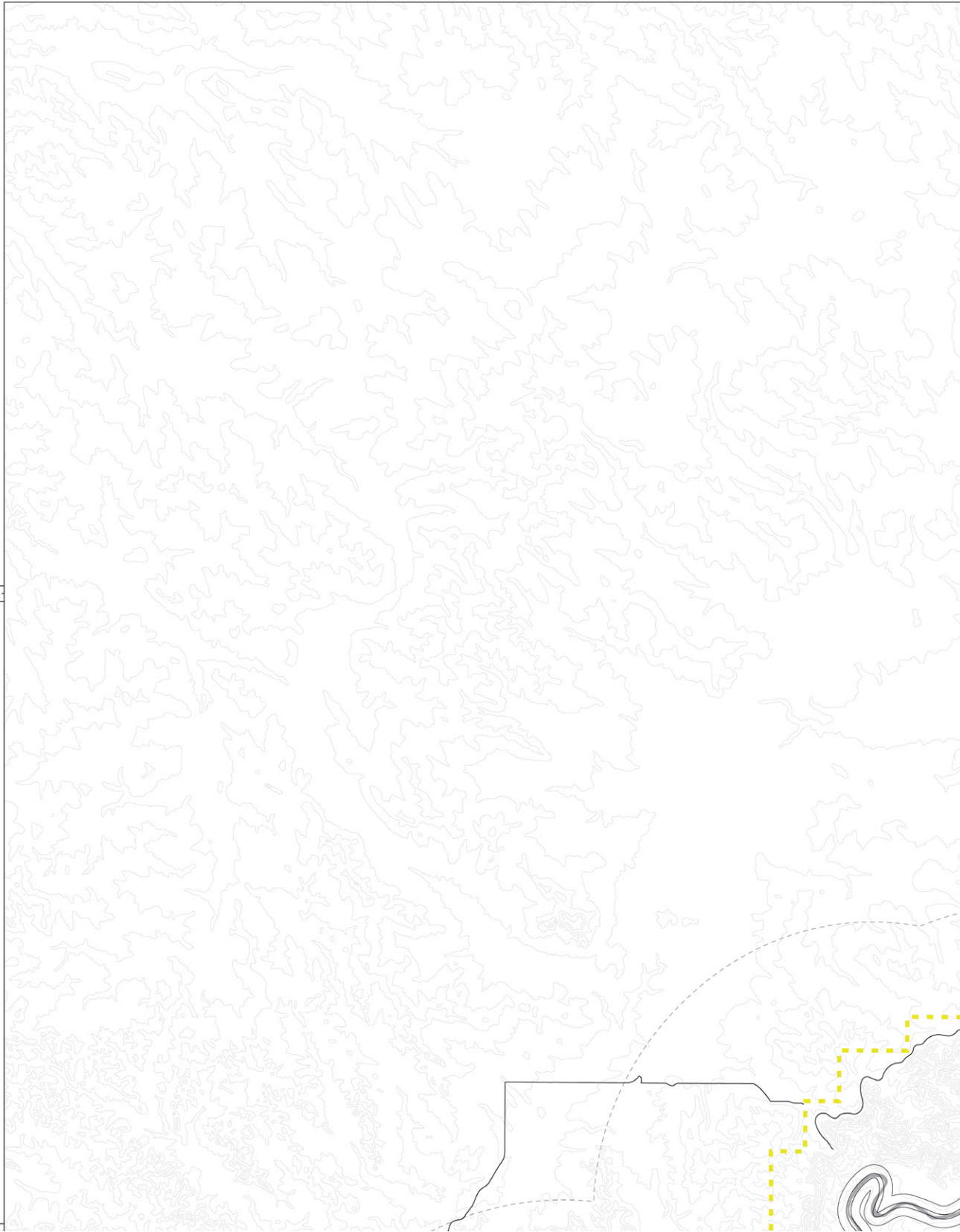
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Picturesque Prairies **B02**:Maah Daah Prairie - Little Missouri

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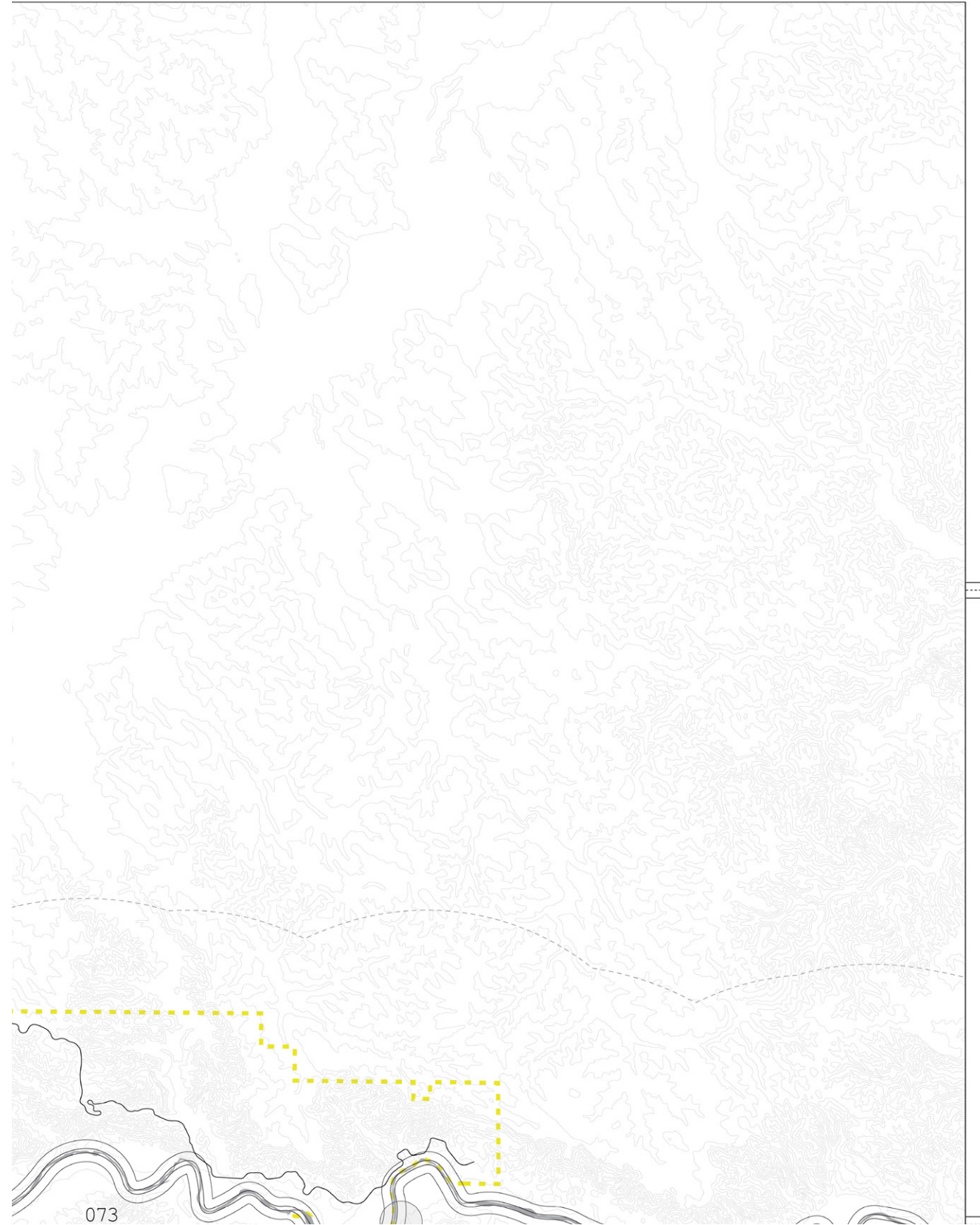


Watershed

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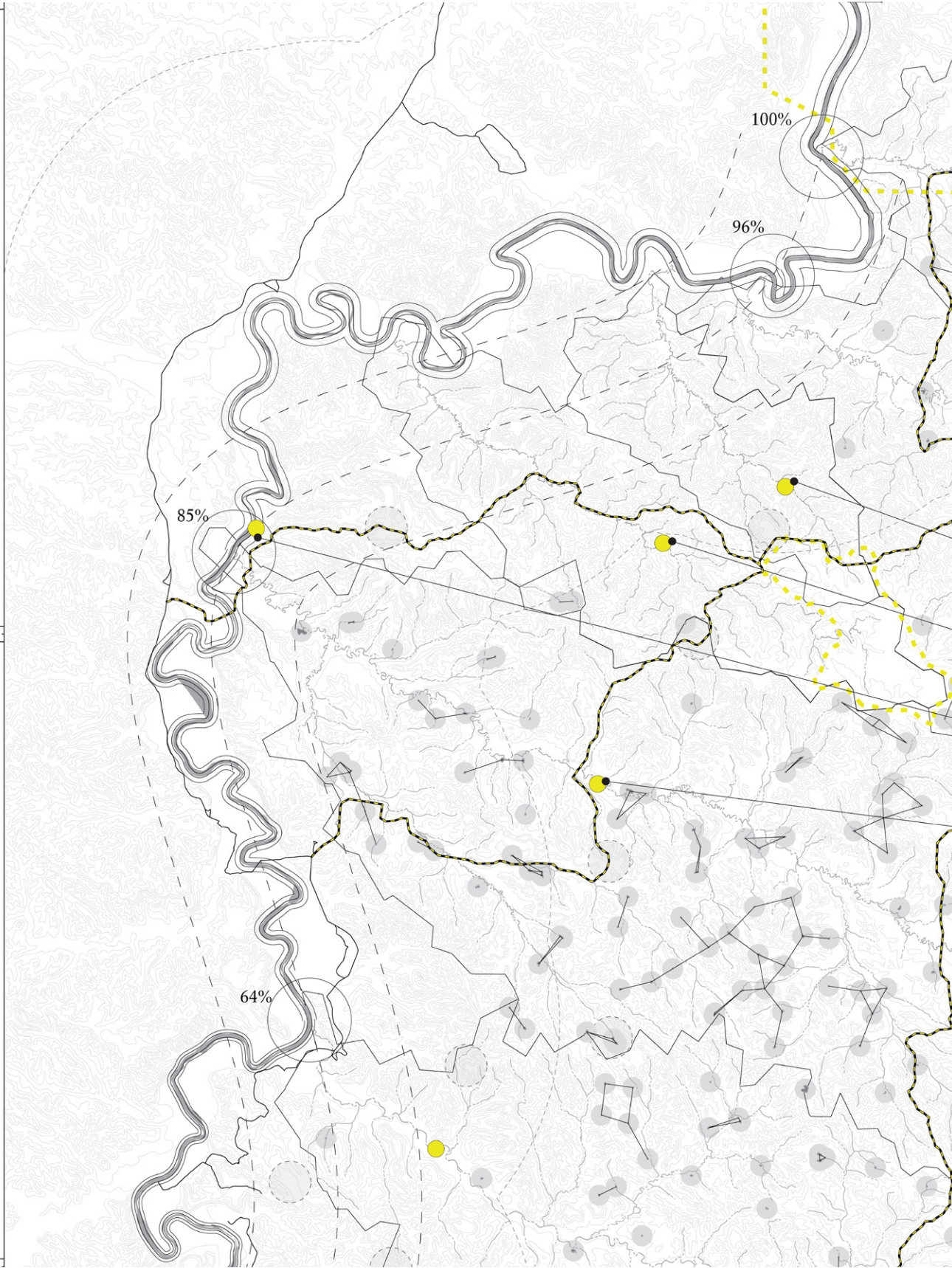
Department of Terra Firma

United States of America



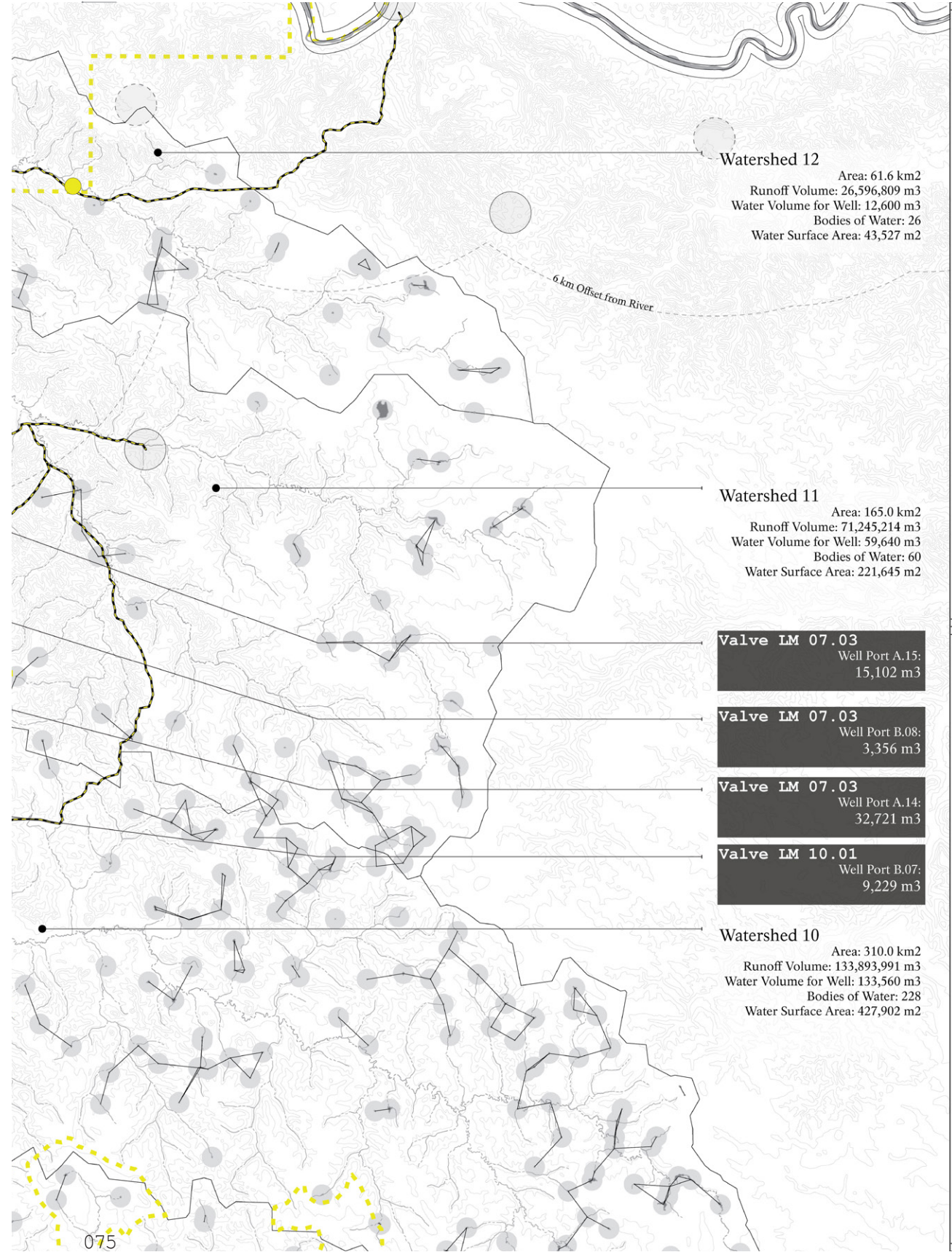
United States of America

Department of Terra Firma



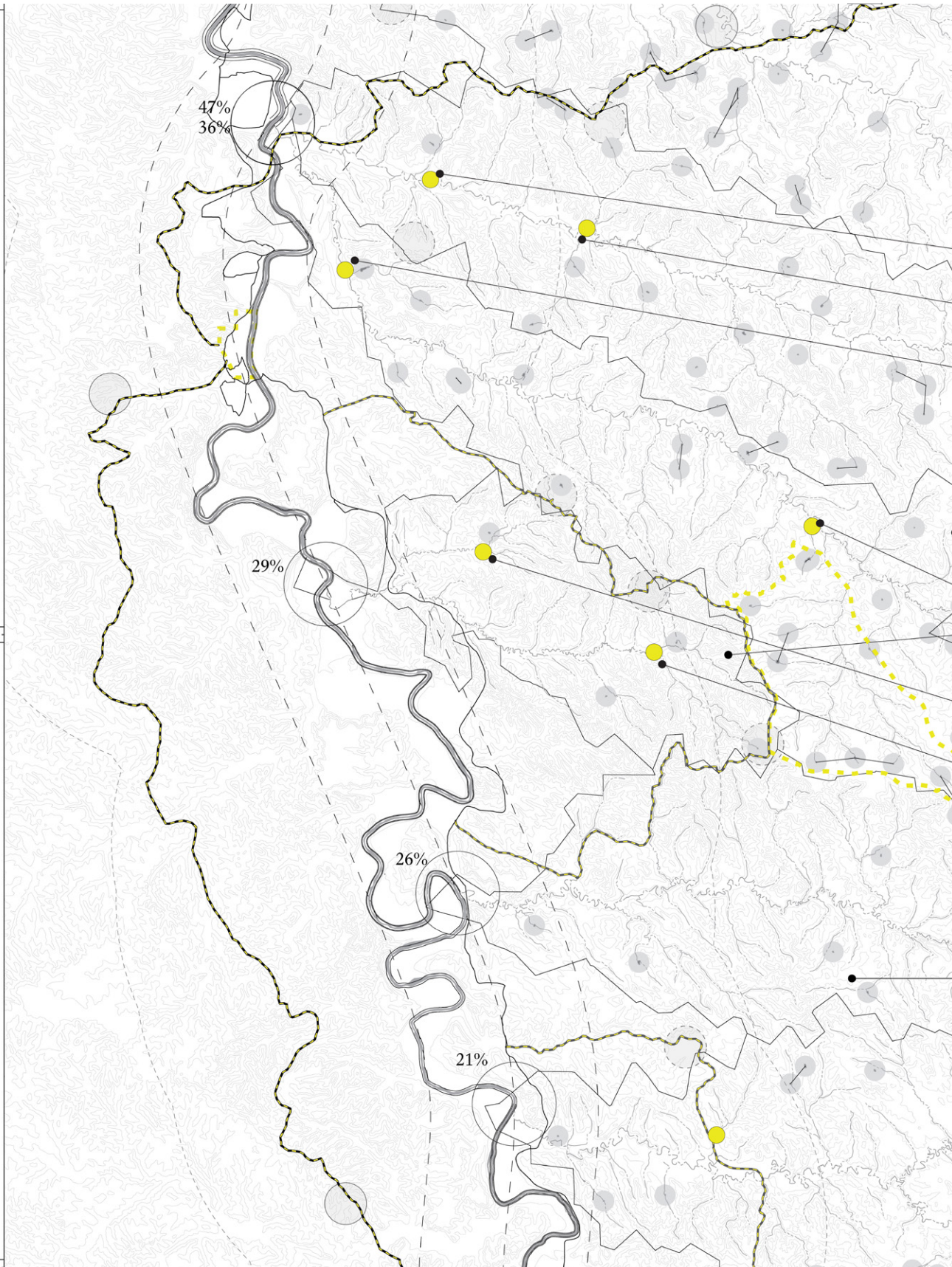
Department of Terra Firma

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Department of Terra Firma



Department of Terra Firma

United States of America

Watershed 09
 Area: 253.7 km2
 Runoff Volume: 109,563,295 m3
 Water Volume for Well: 123,480 m3
 Bodies of Water: 128
 Water Surface Area: 298,544 m2

Watershed 08
 Area: 177.0 km2
 Runoff Volume: 76,467,522 m3
 Water Volume for Well: 90,720 m3
 Bodies of Water: 93
 Water Surface Area: 55,807 m2

Valve LM 07.03
 Well Port A.10:
 42,789 m3

Valve LM 07.02
 Well Port B.05:
 3,356 m3

Valve LM 07.04

Watershed 07
 Area: 101.5 km2
 Runoff Volume: 43,859,057 m3
 Water Volume for Well: 90,720 m3
 Bodies of Water: 34
 Water Surface Area: 55,807 m2

Watershed 06
 Area: 37.1 km2
 Runoff Volume: 16,024,240 m3
 Water Volume for Well: 23,520 m3
 Bodies of Water: 4
 Water Surface Area: 4,108 m2

Valve LM 07.01
 Fire Field F.01

Valve LM 06.04
 Well Port A.09:
 33,560 m3

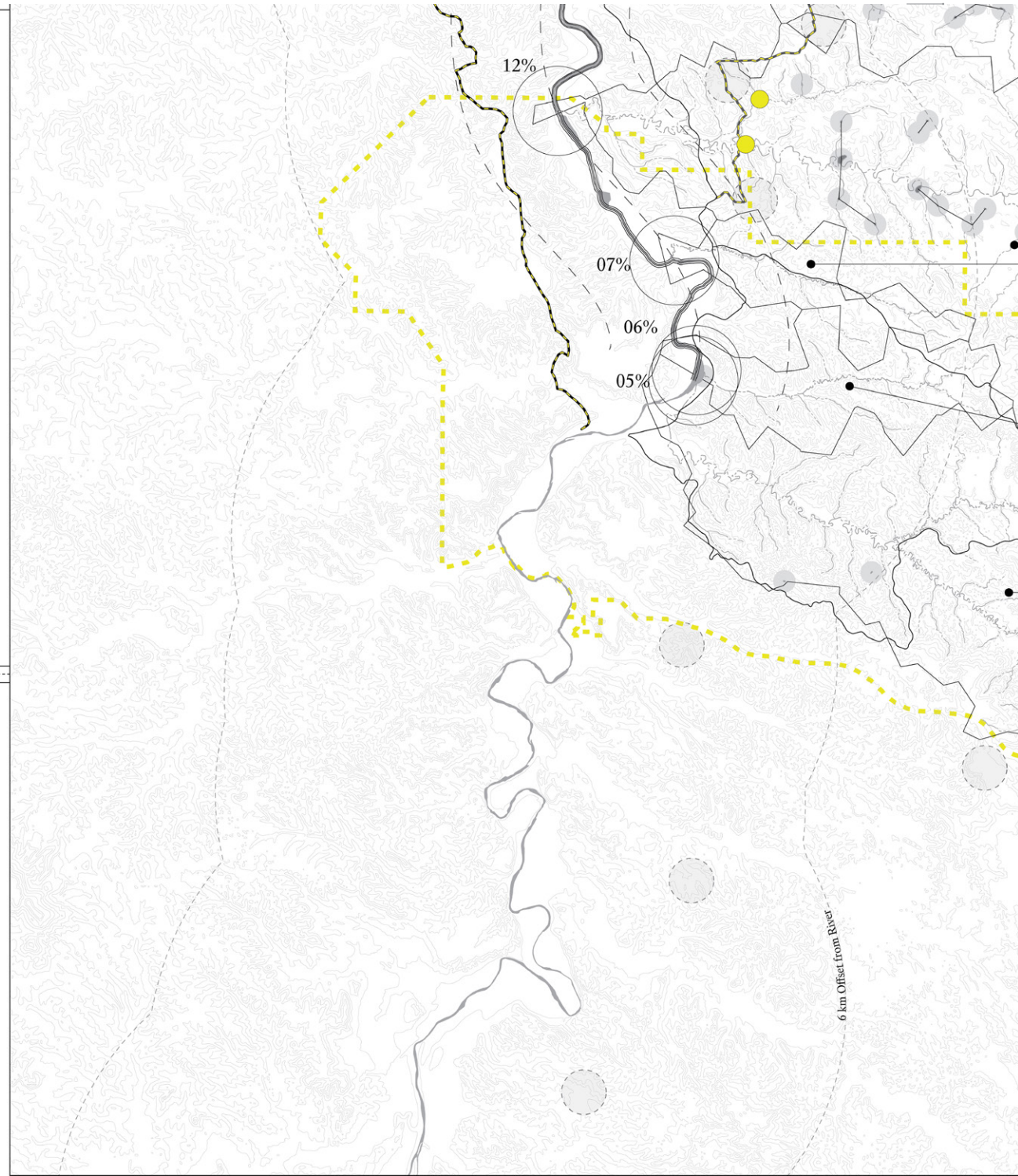
Valve LM 06.03
 Well Port A.08 target:
 16,780 m3

Watershed 05
 Area: 86.5 km2
 Runoff Volume: 37,381,617 m3
 Water Volume for Well: 117,600 m3
 Bodies of Water: 17
 Water Surface Area: 25,794 m2

Watershed 04
 Area: 128.9 km2
 Runoff Volume: 55,684,068 m3
 Water Volume for Well: 148,680 m3
 Bodies of Water: 57
 Water Surface Area: 157,445 m2

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Watershed 03
 Area: 87.5 km²
 Runoff Volume: 37,763,566 m³
 Water Volume for Well: 78,120 m³
 Bodies of Water: 28
 Water Surface Area: 79,982 m²

Watershed 02
 Area: 8.8 km²
 Runoff Volume: 3,796,701 m³
 Water Volume for Well: 840 m³
 Bodies of Water: 0
 Water Surface Area: 0 m²

Watershed 01
 Area: 13.0 km²
 Runoff Volume: 5,574,137 m³
 Water Volume for Well: 0 m³
 Bodies of Water: 4
 Water Surface Area: 1,713 m²

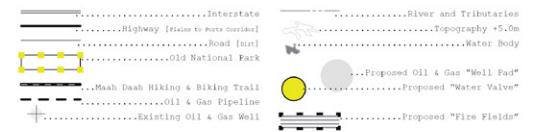
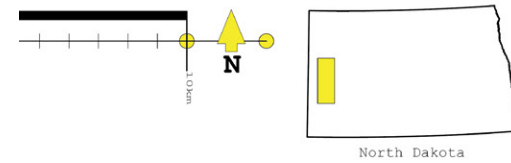
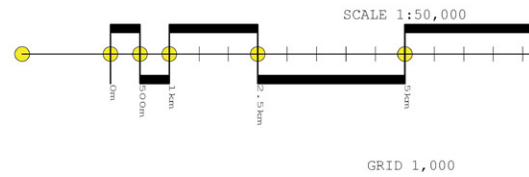
Watershed 00
 Area: 70.2 km²
 Runoff Volume: 30,325,308 m³
 Water Volume for Well: 0 m³
 Bodies of Water: 4
 Water Surface Area: 3,283 m²

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**Plains to Ports
 Partnership**
 Maah Daah Prairie



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Department of Terra Firma

left
map key for
discretization

opposite right
B series; Maah
Daah Prairie
Road Network

p.82

p.84

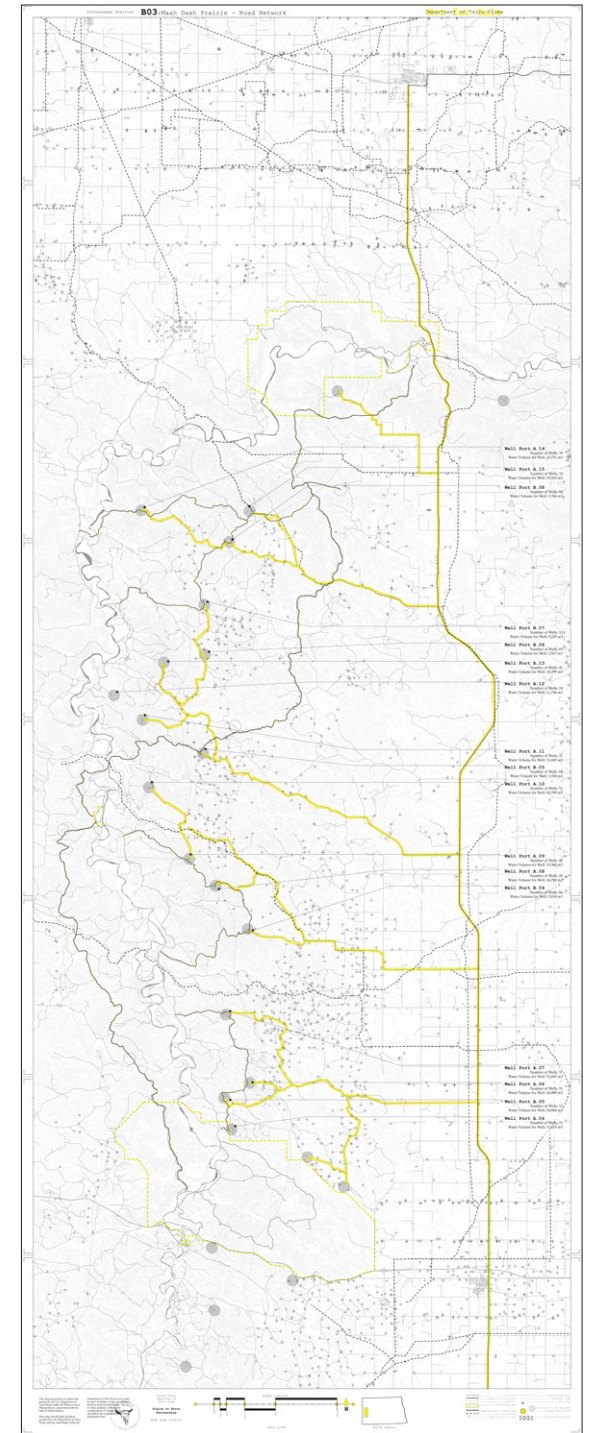
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p.88

Maah Daah Prairie: Road Network

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Picturesque Prairies **B03:Maah Daah Prairie - Road Network**

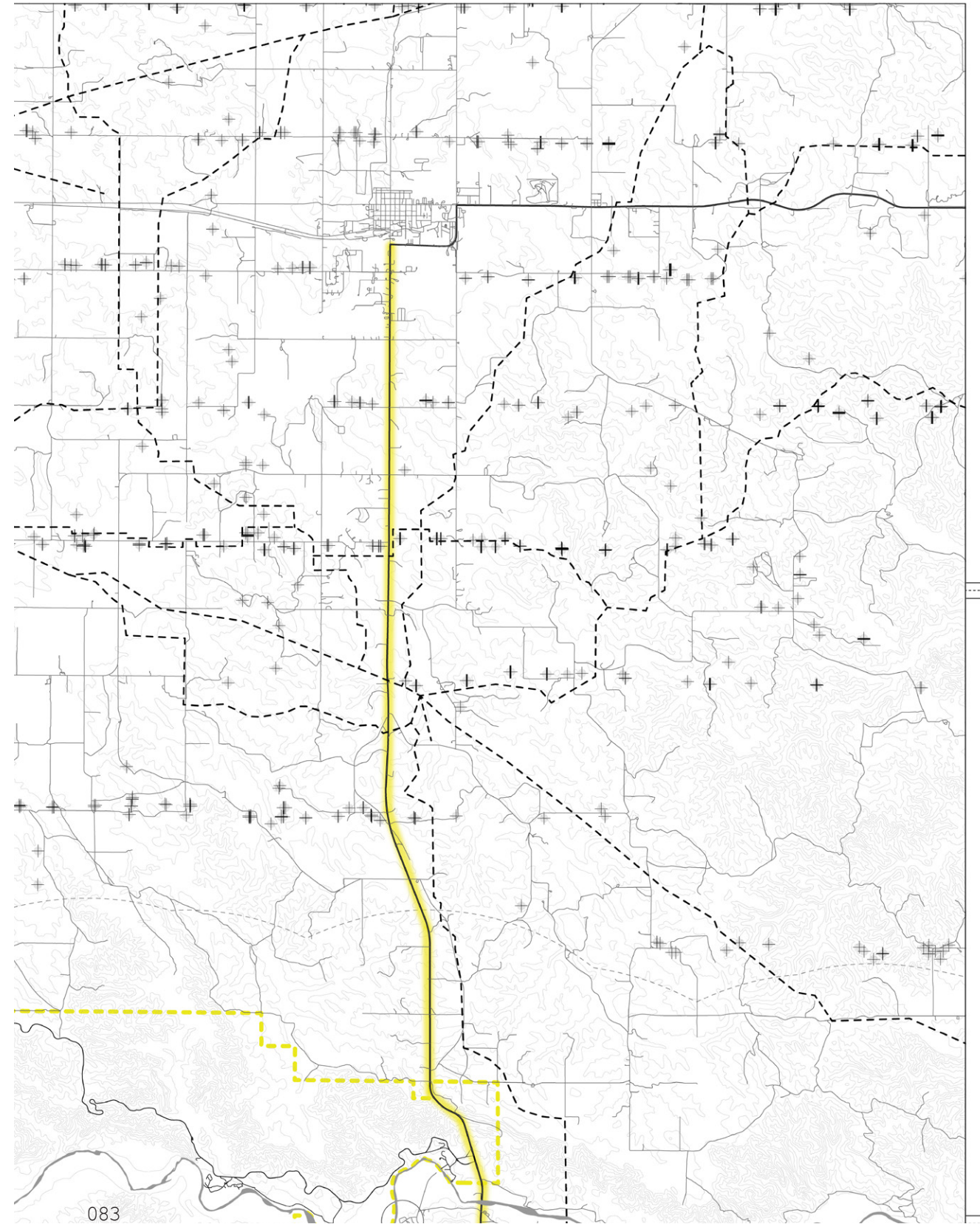
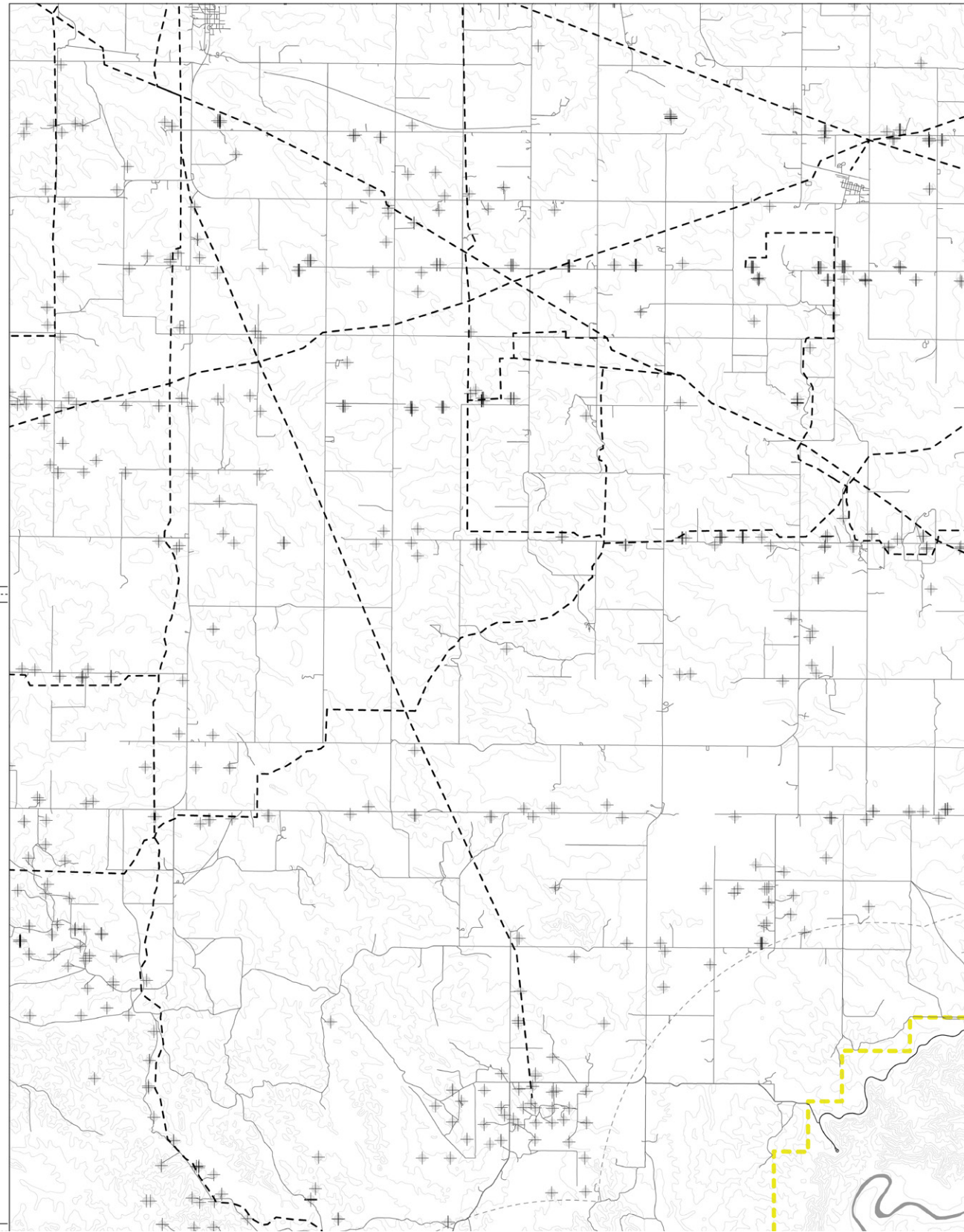
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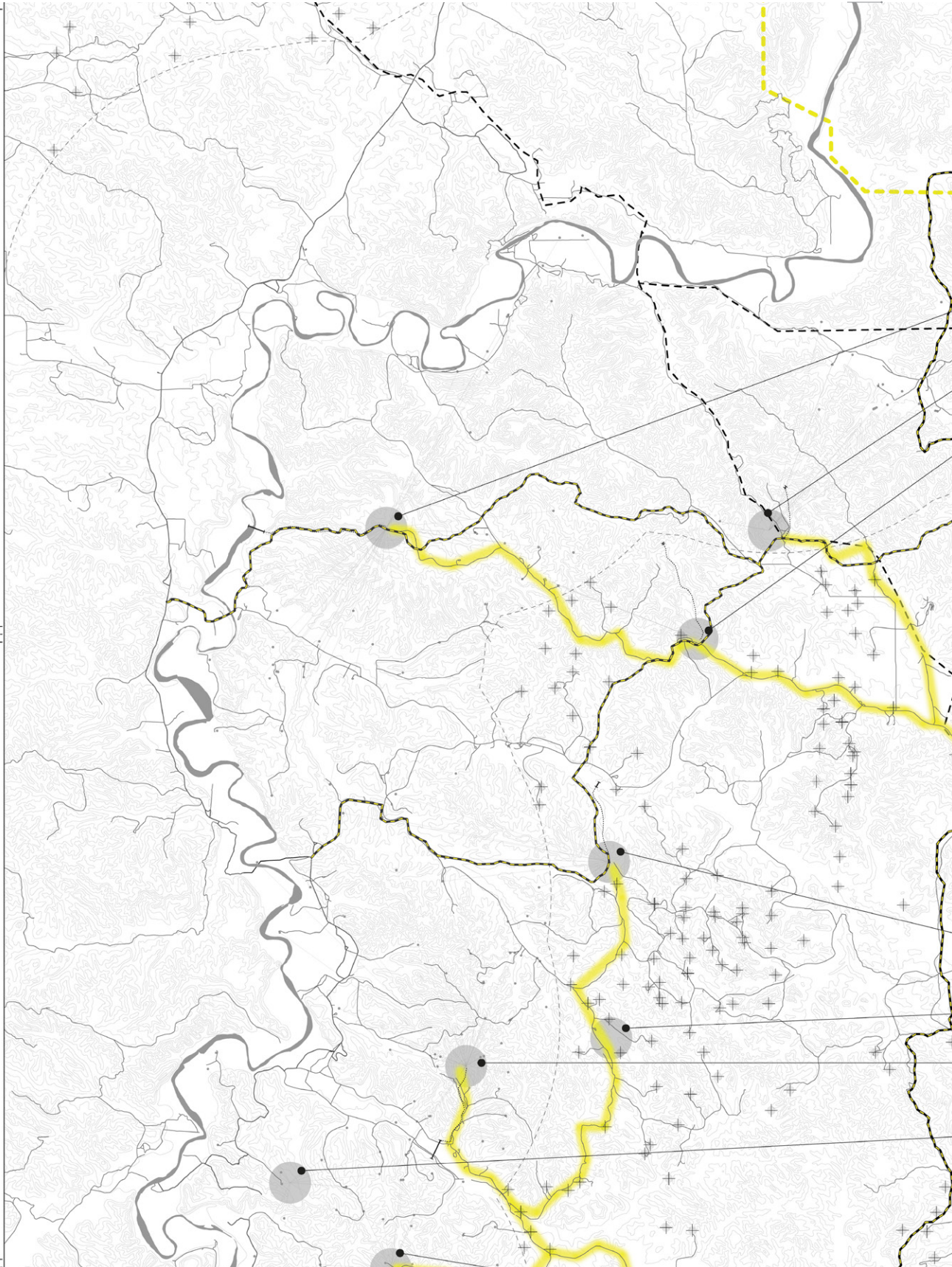
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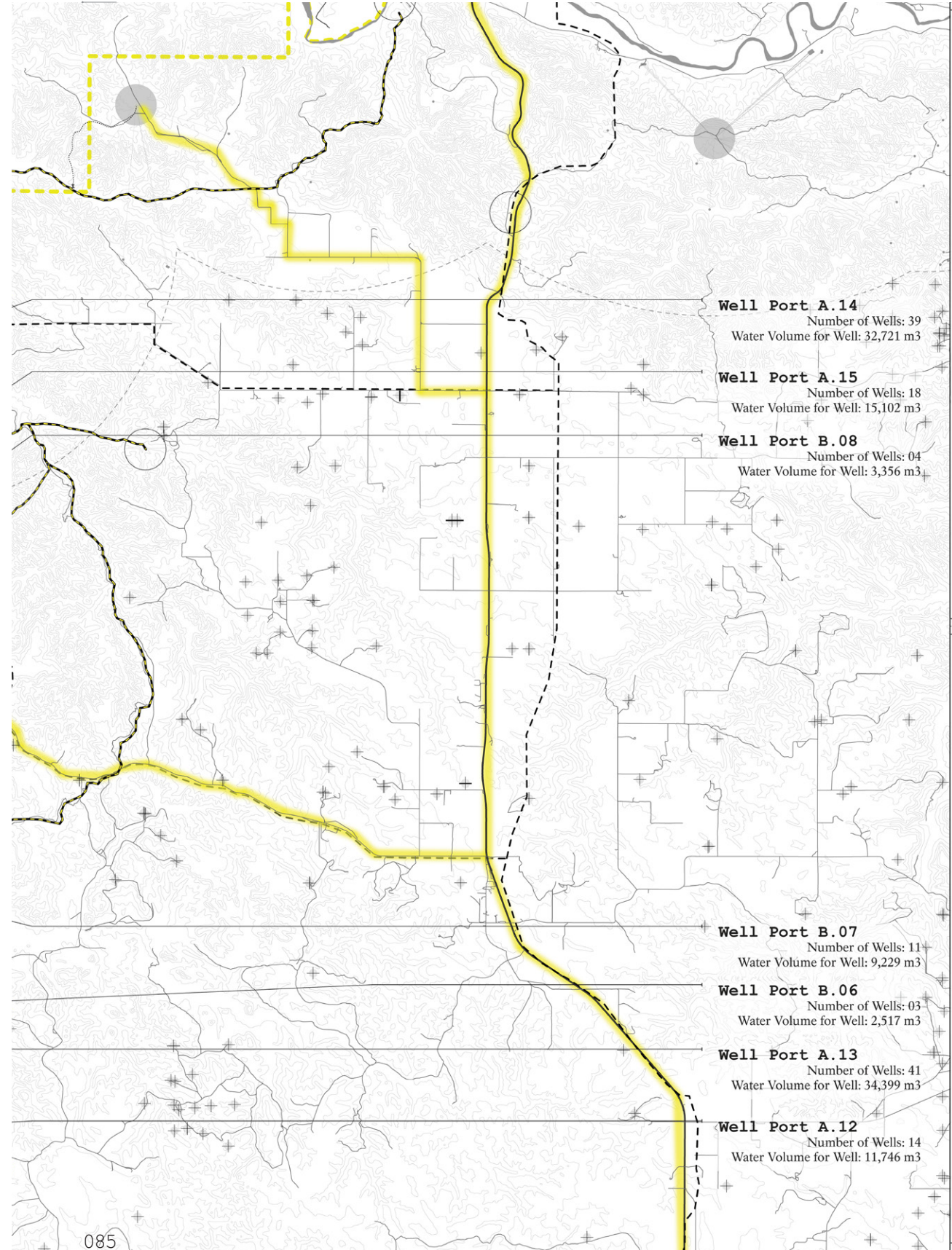
United States of America

Department of Terra Firma



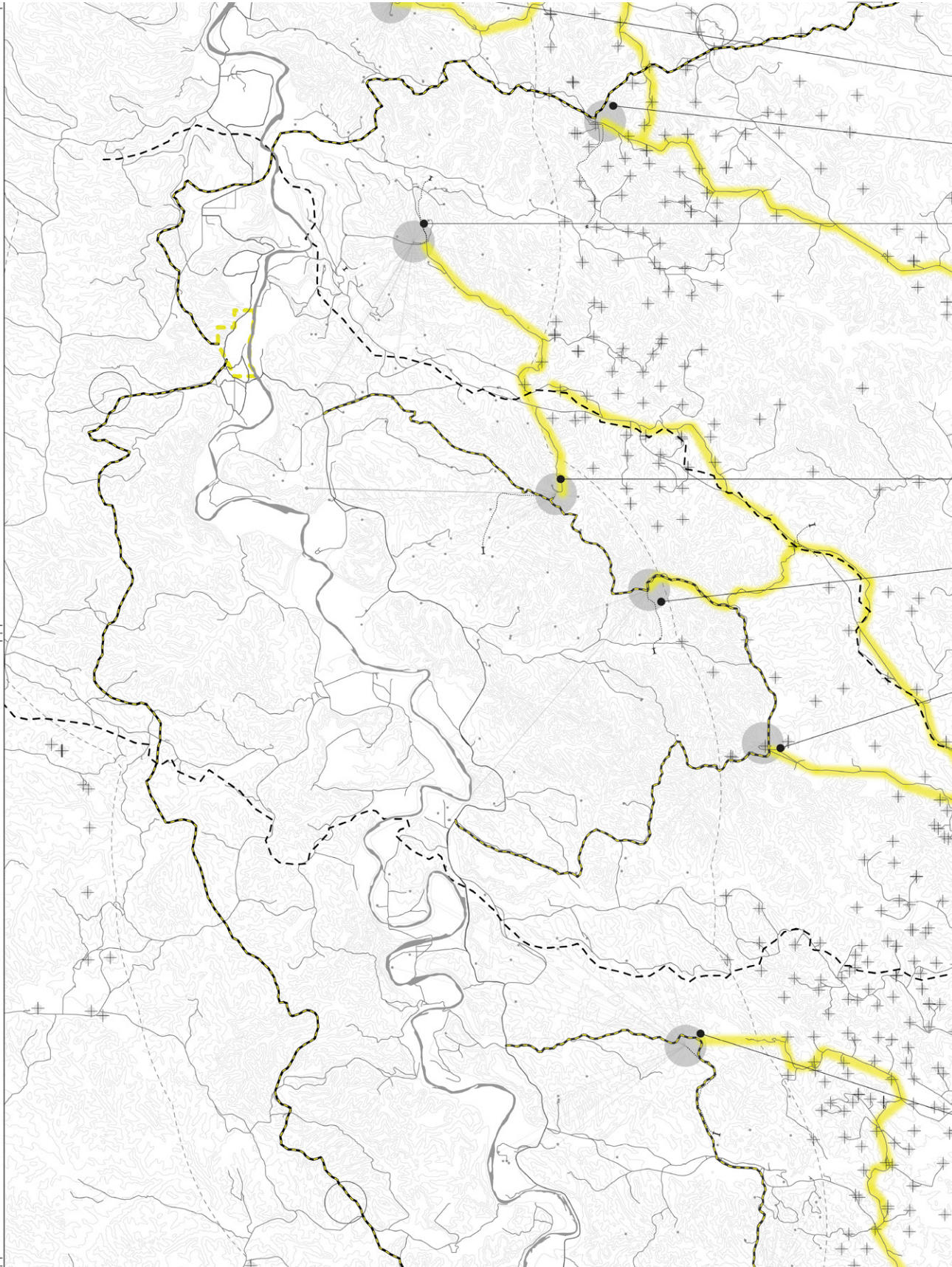
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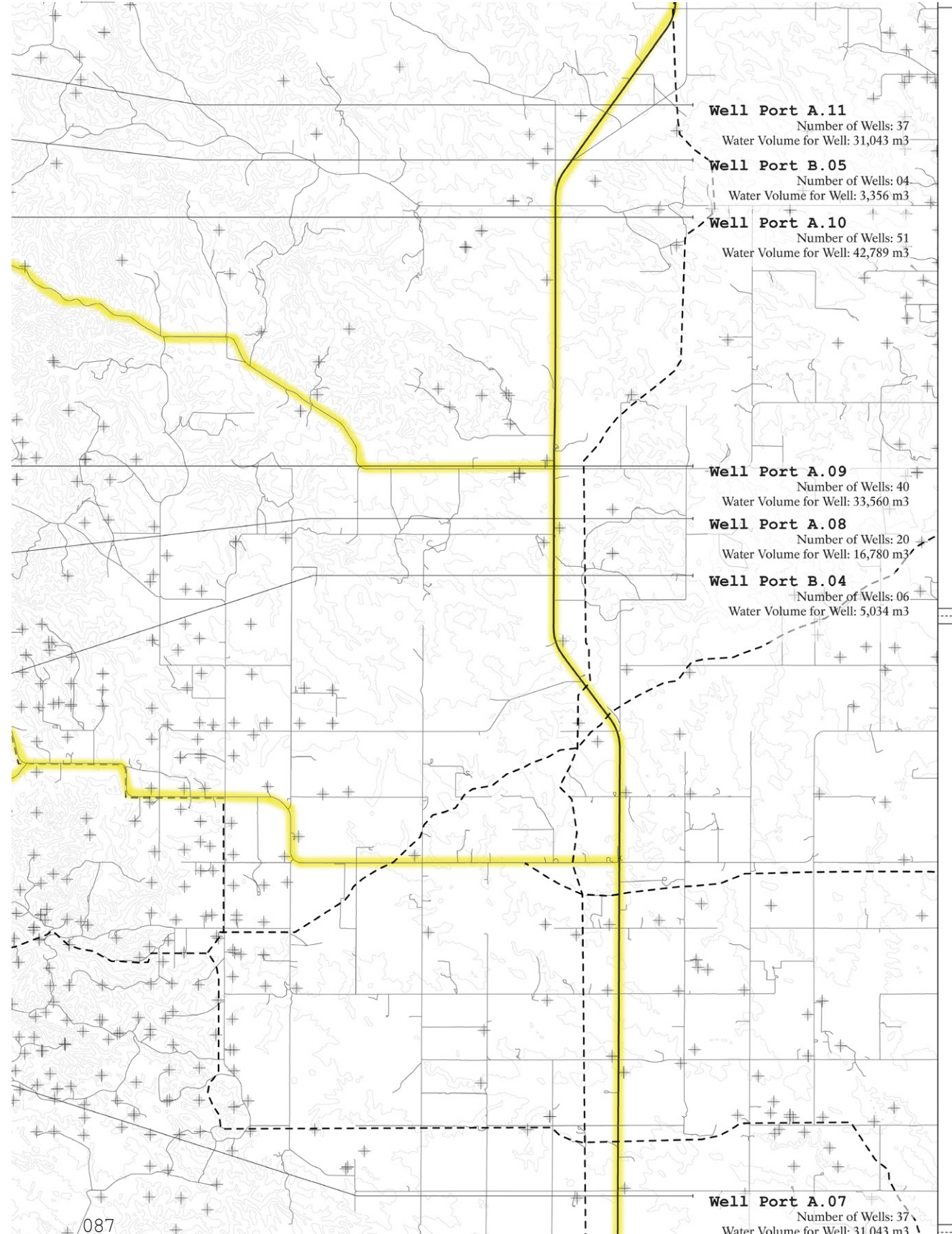
United States of America

Department of Terra Firma



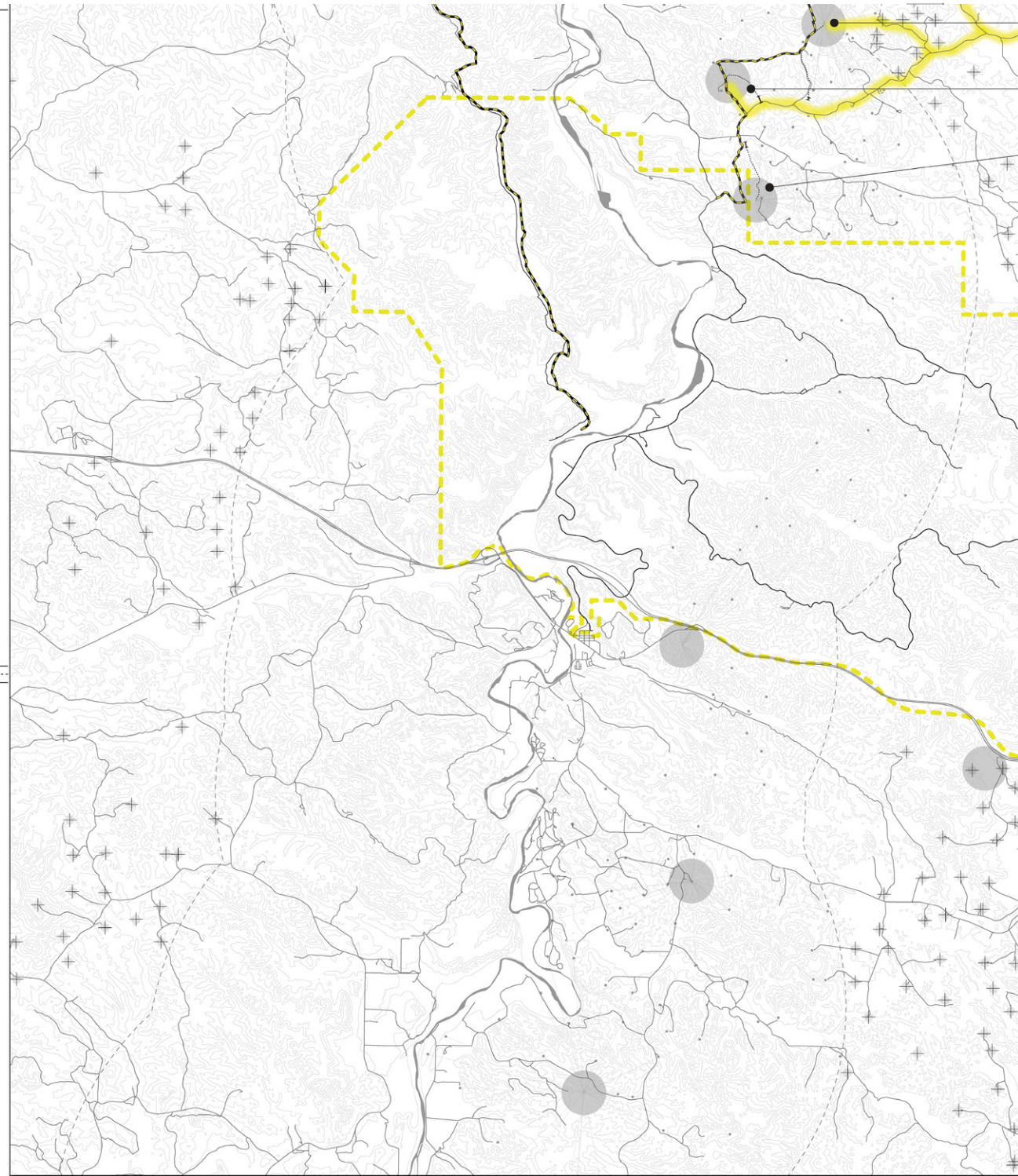
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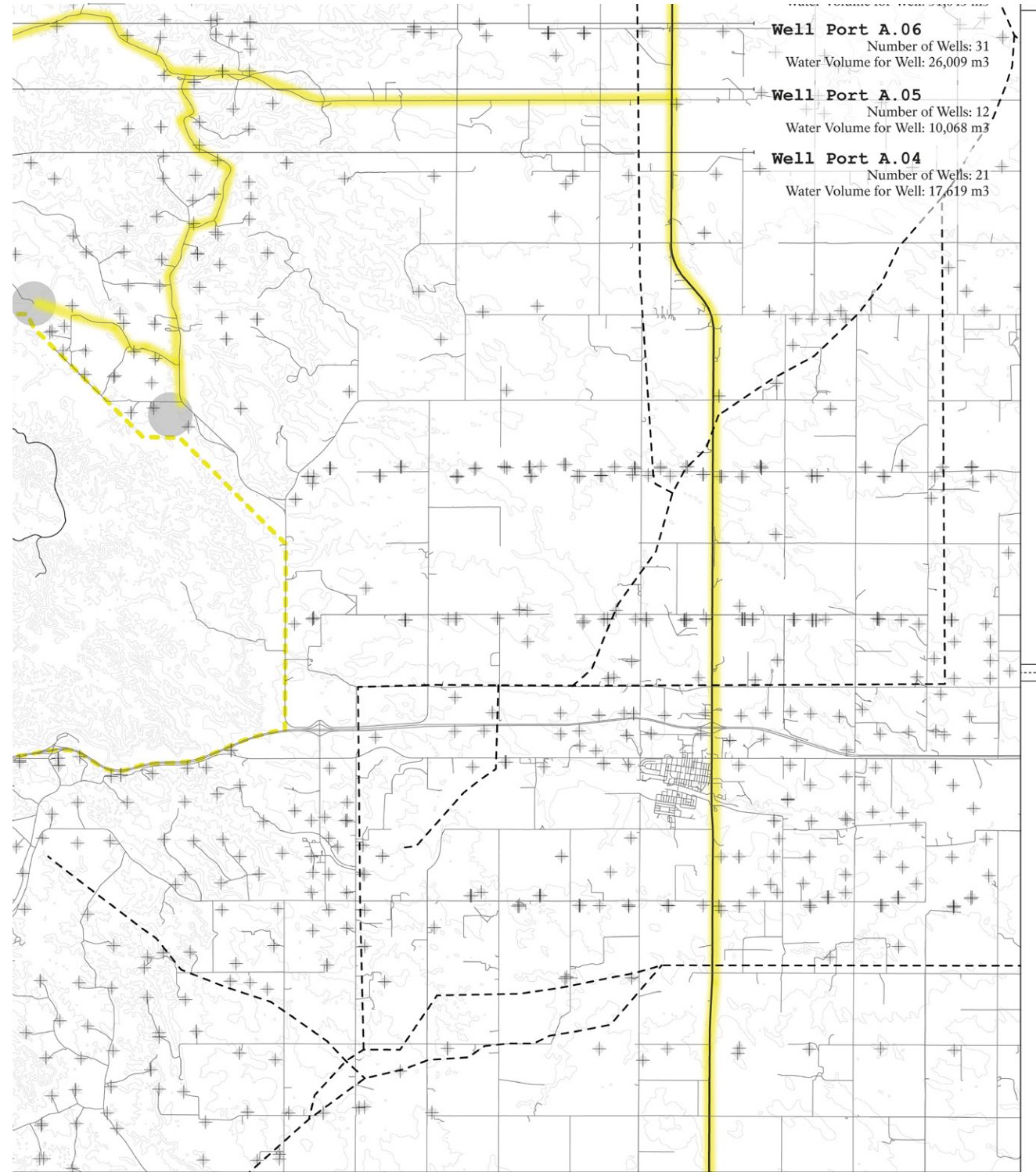
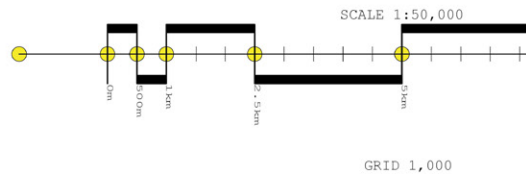


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**Plains to Ports
Partnership**
Maah Daah Prairie

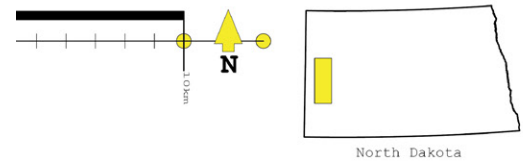


Well Port A.06
Number of Wells: 31
Water Volume for Well: 26,009 m3

Well Port A.05
Number of Wells: 12
Water Volume for Well: 10,068 m3

Well Port A.04
Number of Wells: 21
Water Volume for Well: 17,619 m3

- Interstate
- Highway (side to side center)
- Road (side)
- Old National Park
- Mash Daah Hiking & Biking Trail
- Oil & Gas Pipeline
- Existing Oil & Gas Well
- River and Tributaries
- Topography +5.0m
- Water Body
- Proposed Oil & Gas "Well Pad"
- Proposed "Water Valve"
- Proposed "Fire Fields"



Department of Terra Firma

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Department of Terra Firma

left
map key for
discretization

opposite left
B series; Maah
Daah Prairie -
Plains to Ports
Partnership
Proposal

p.92

p.94

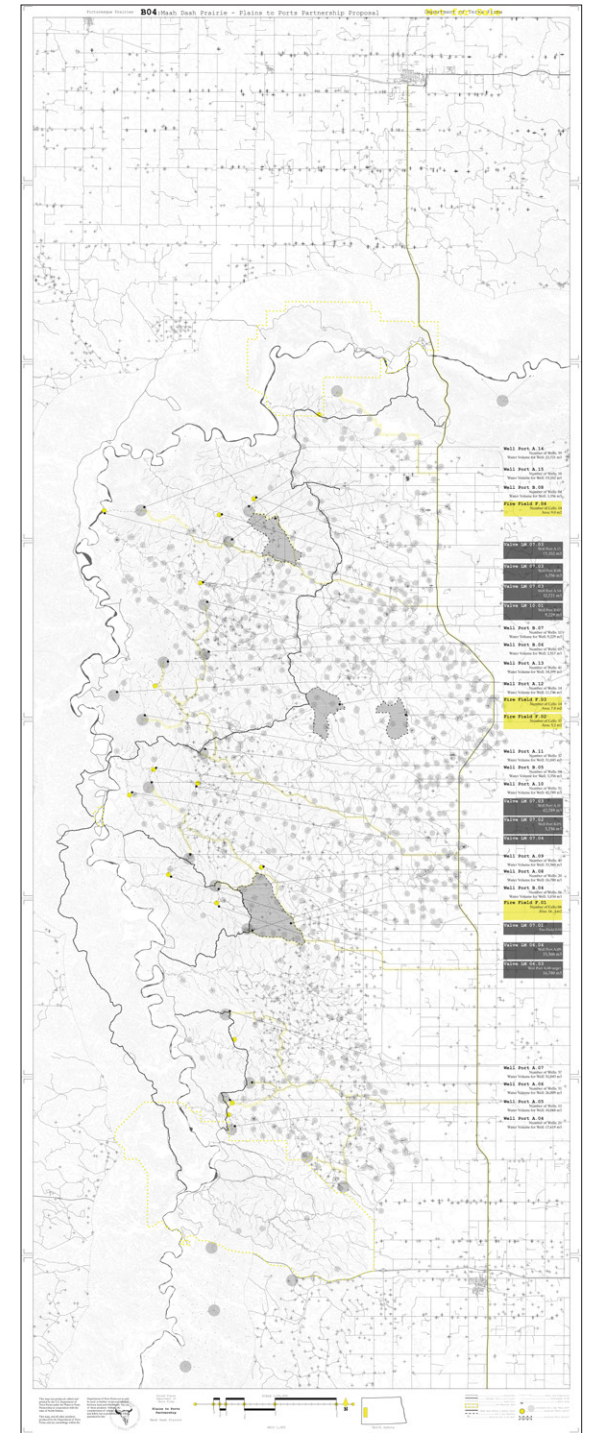
p.96

p.98

Maah Daah Prairie: Plains to Ports Partnership Proposals

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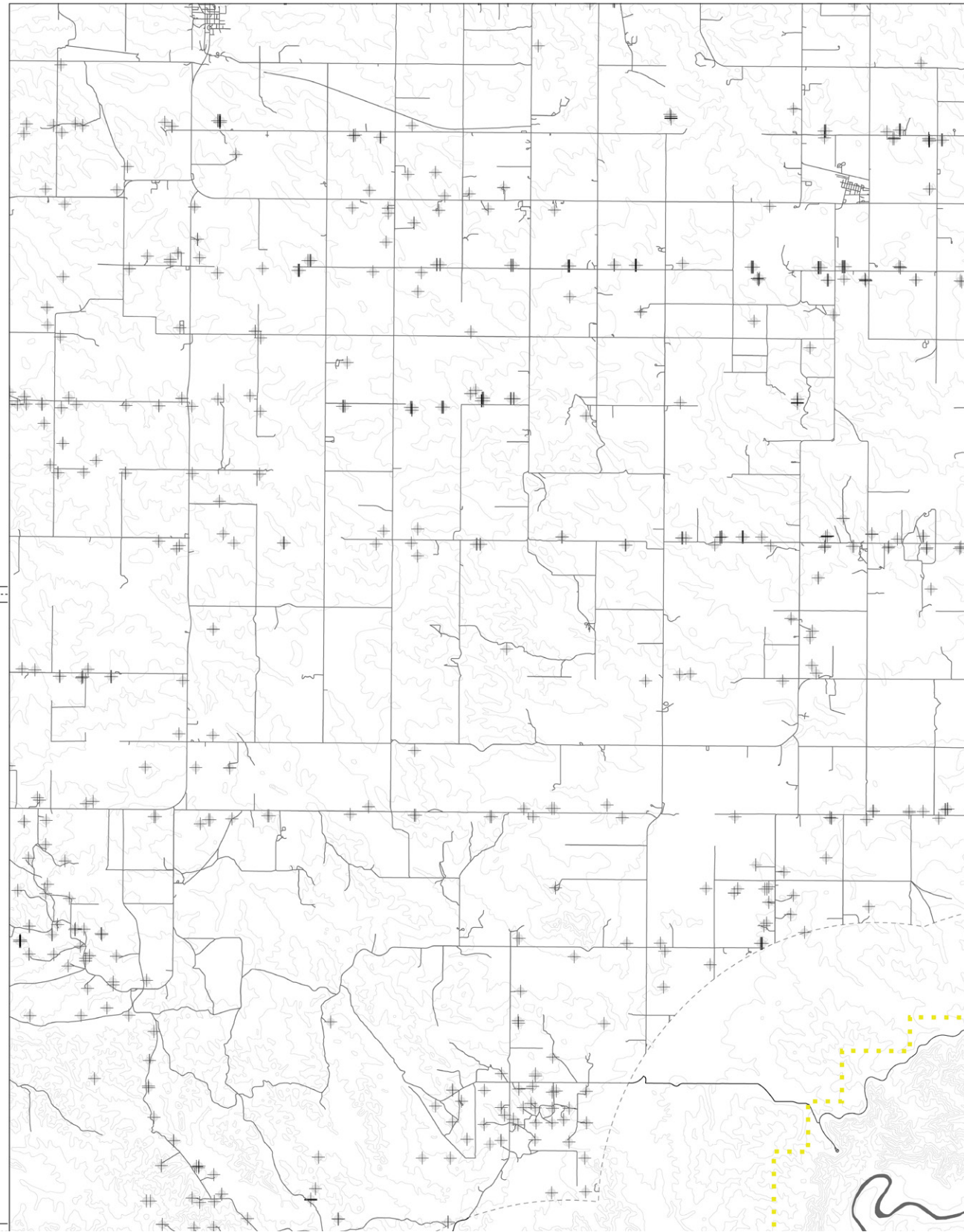
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Picturesque Prairies **B04:Maah Daah Prairie - Plains to Ports**

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Department of Terra Firma

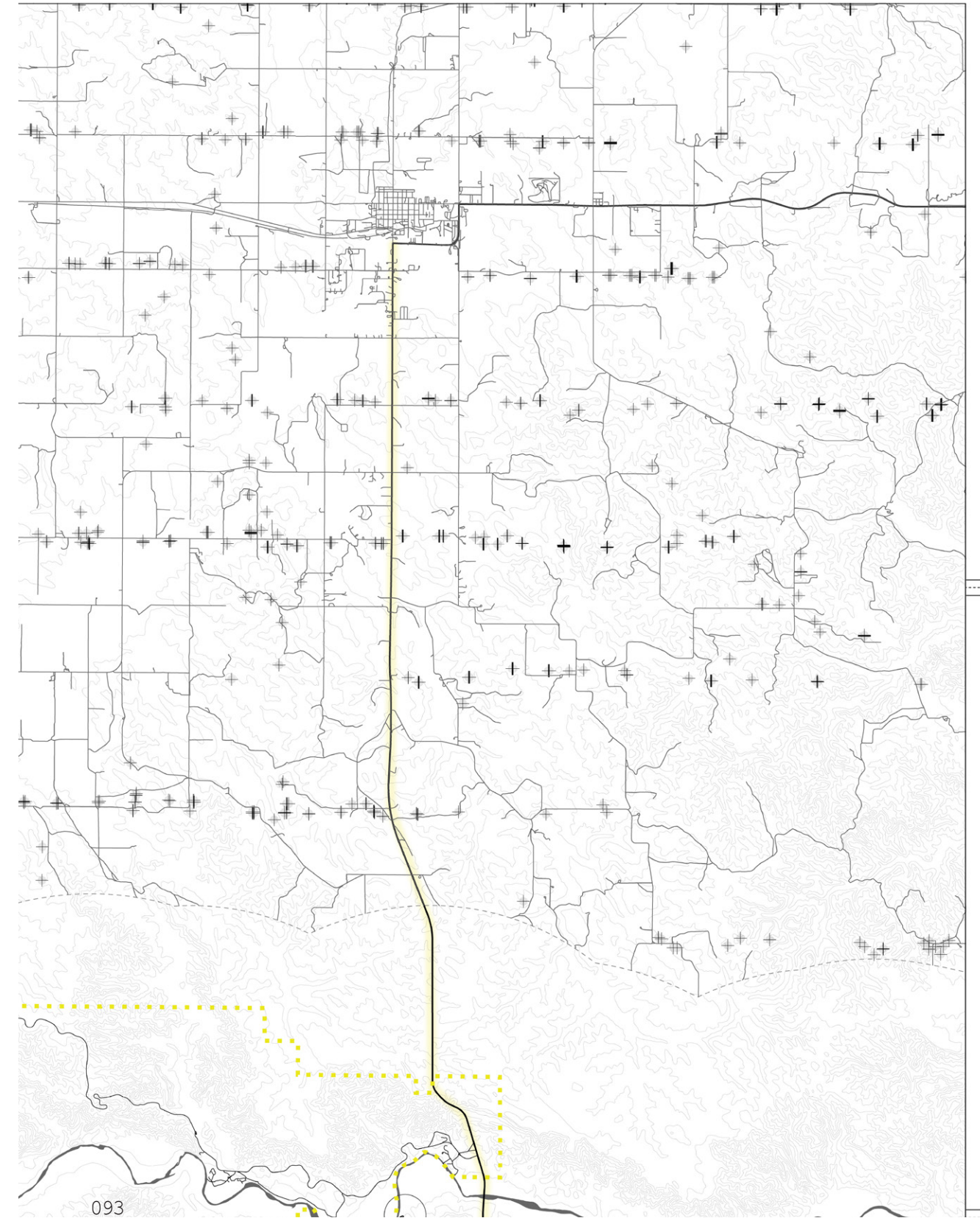


Partnership Proposal

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Department of Terra Firma

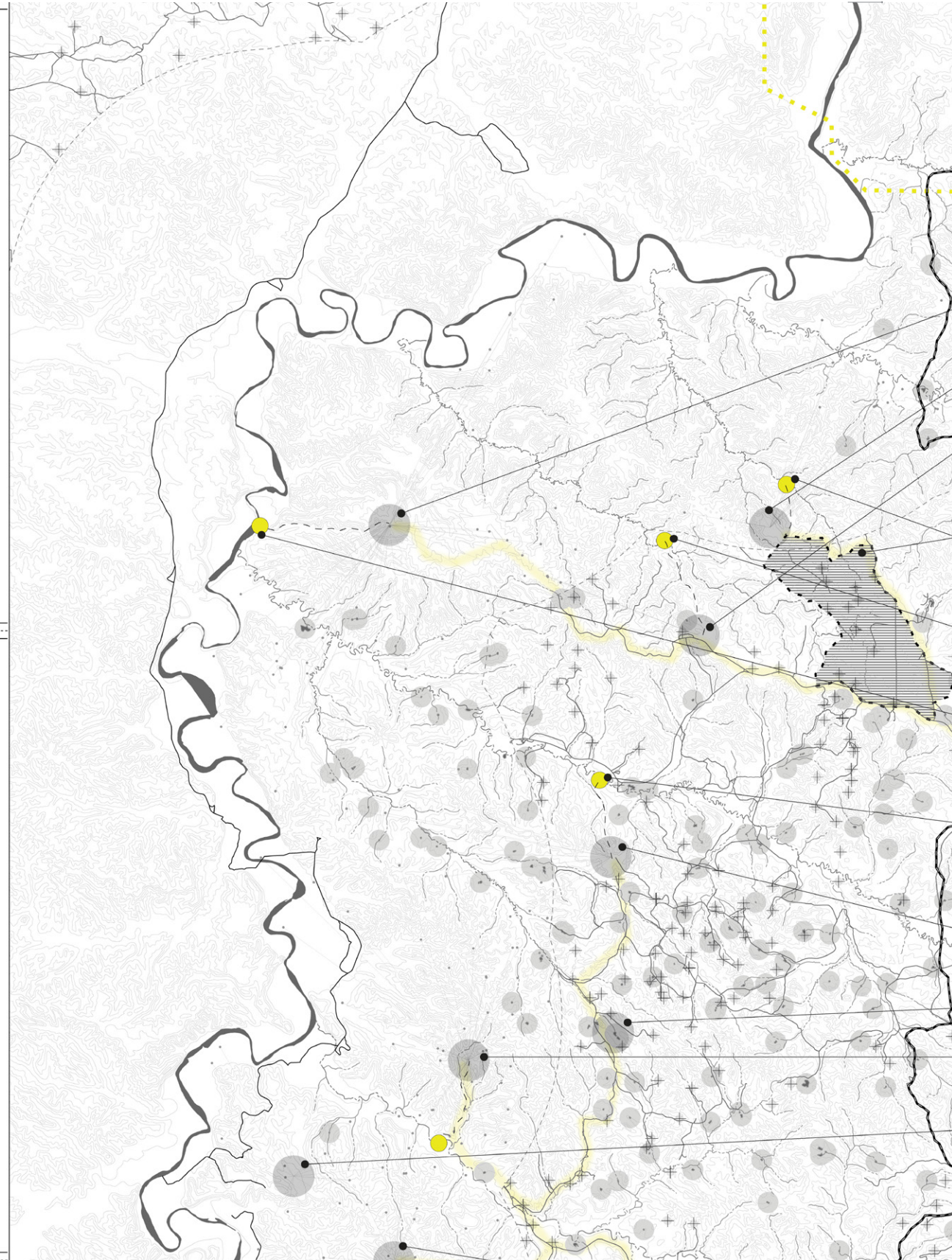
United States of America



093

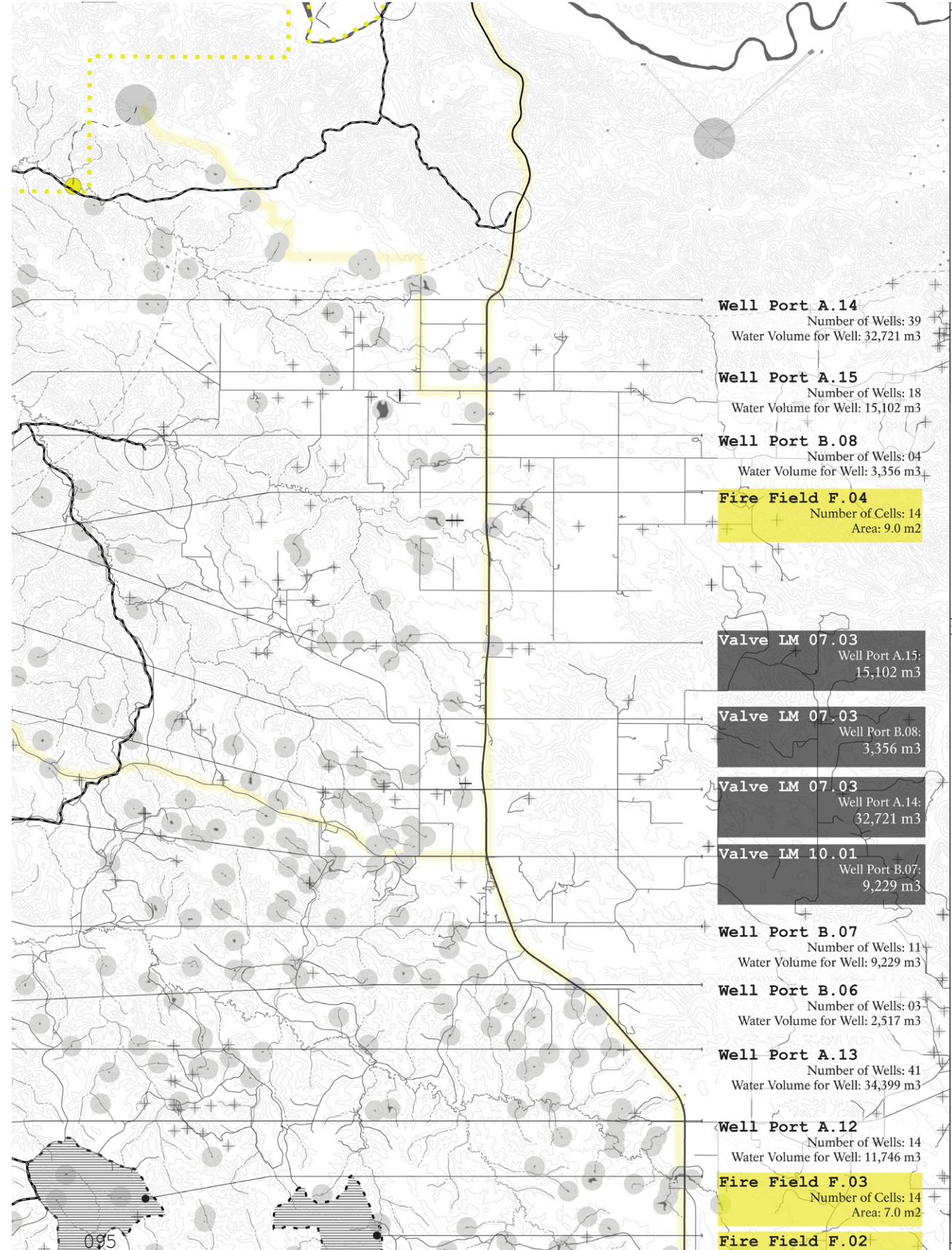
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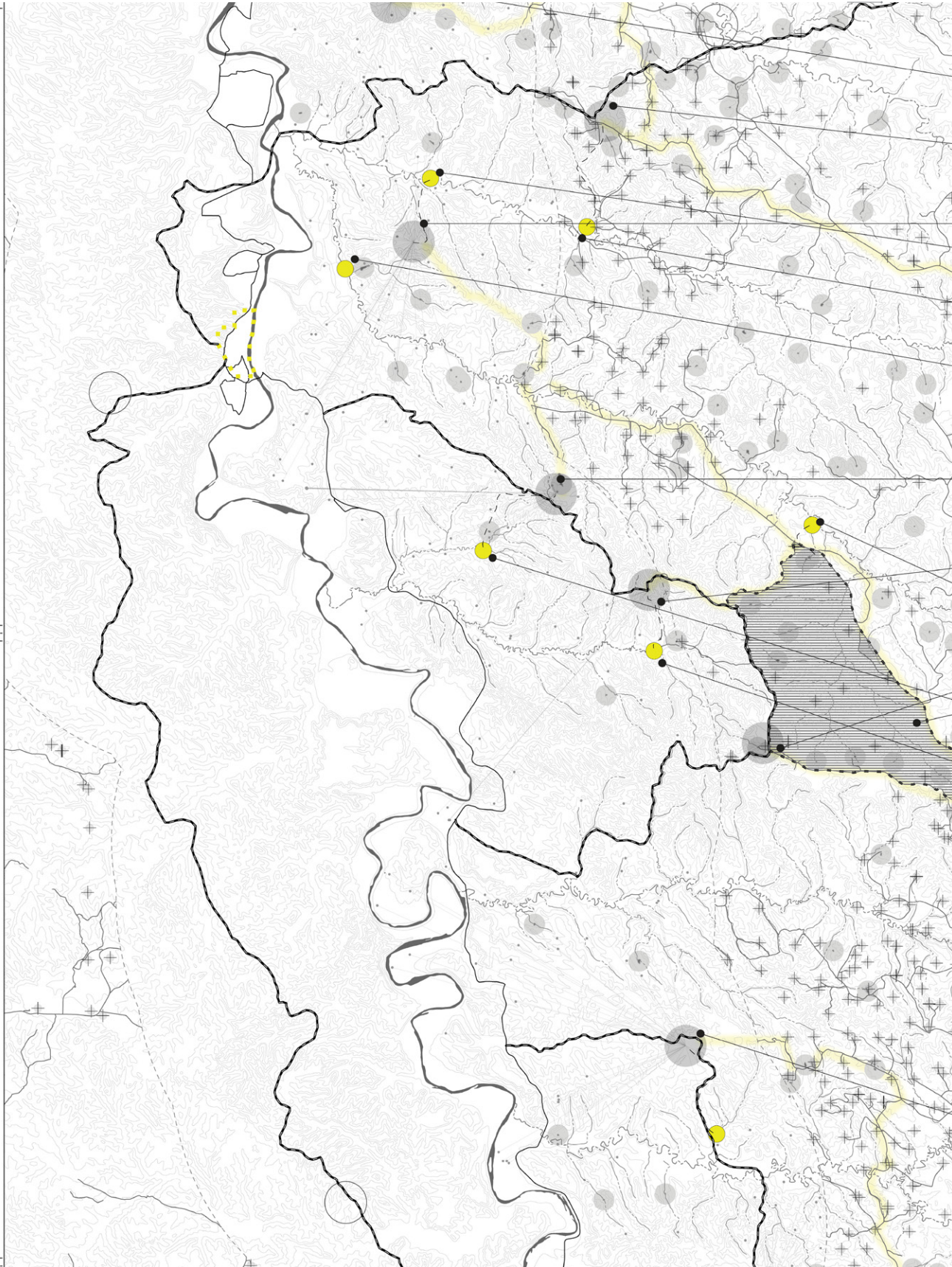
United States of America



095

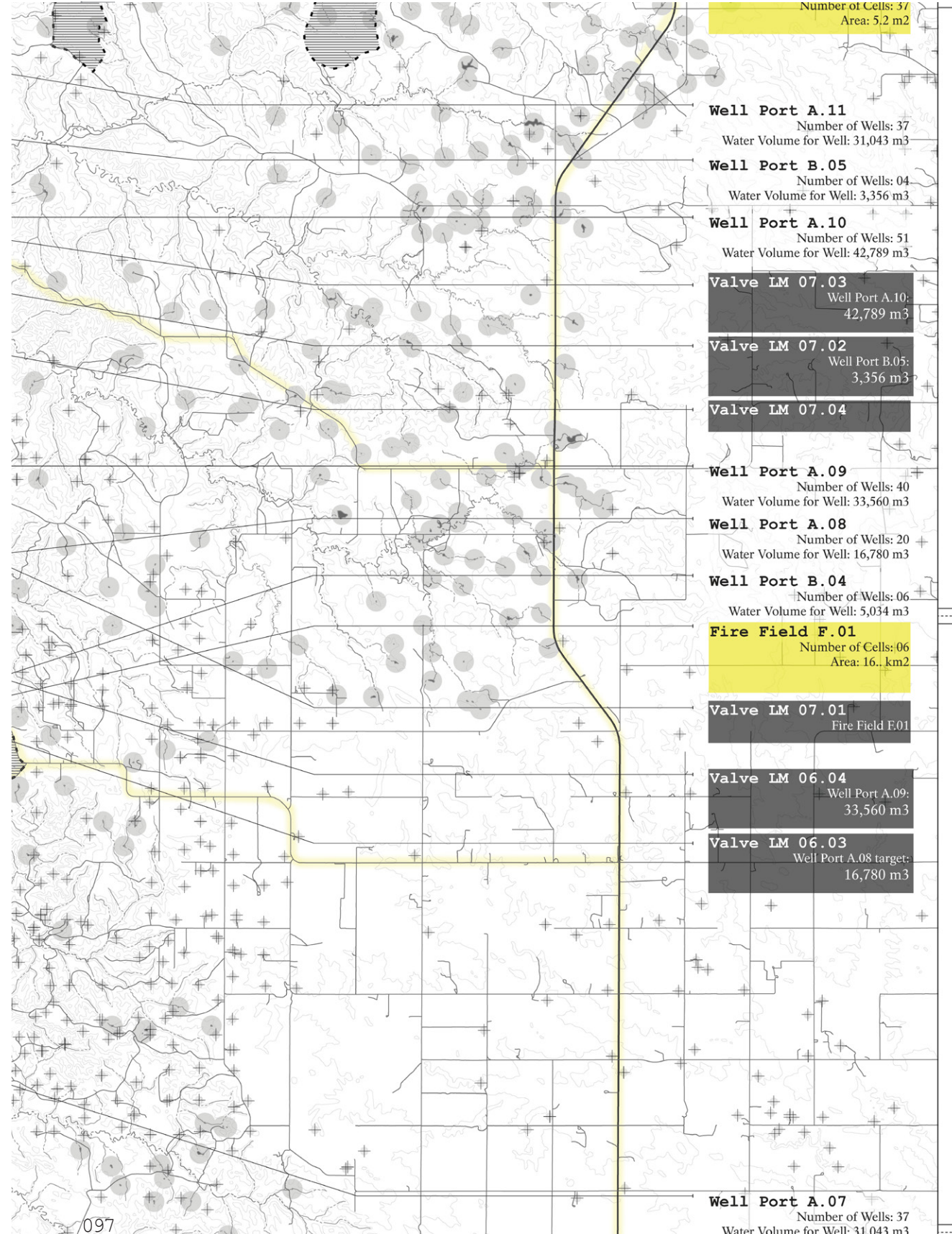
United States of America

Department of Terra Firma



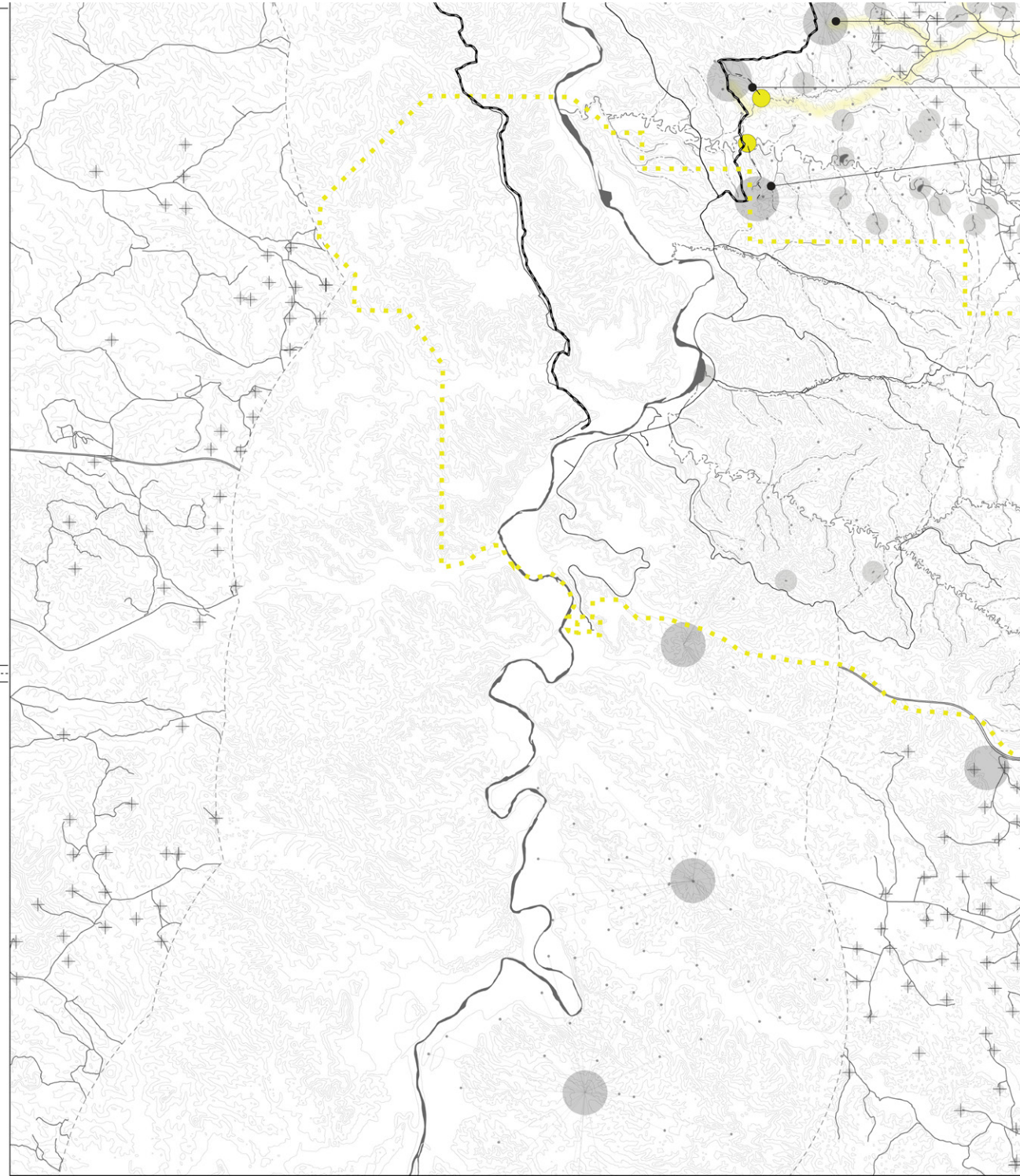
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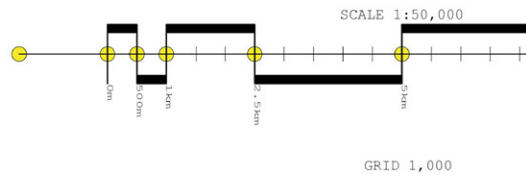
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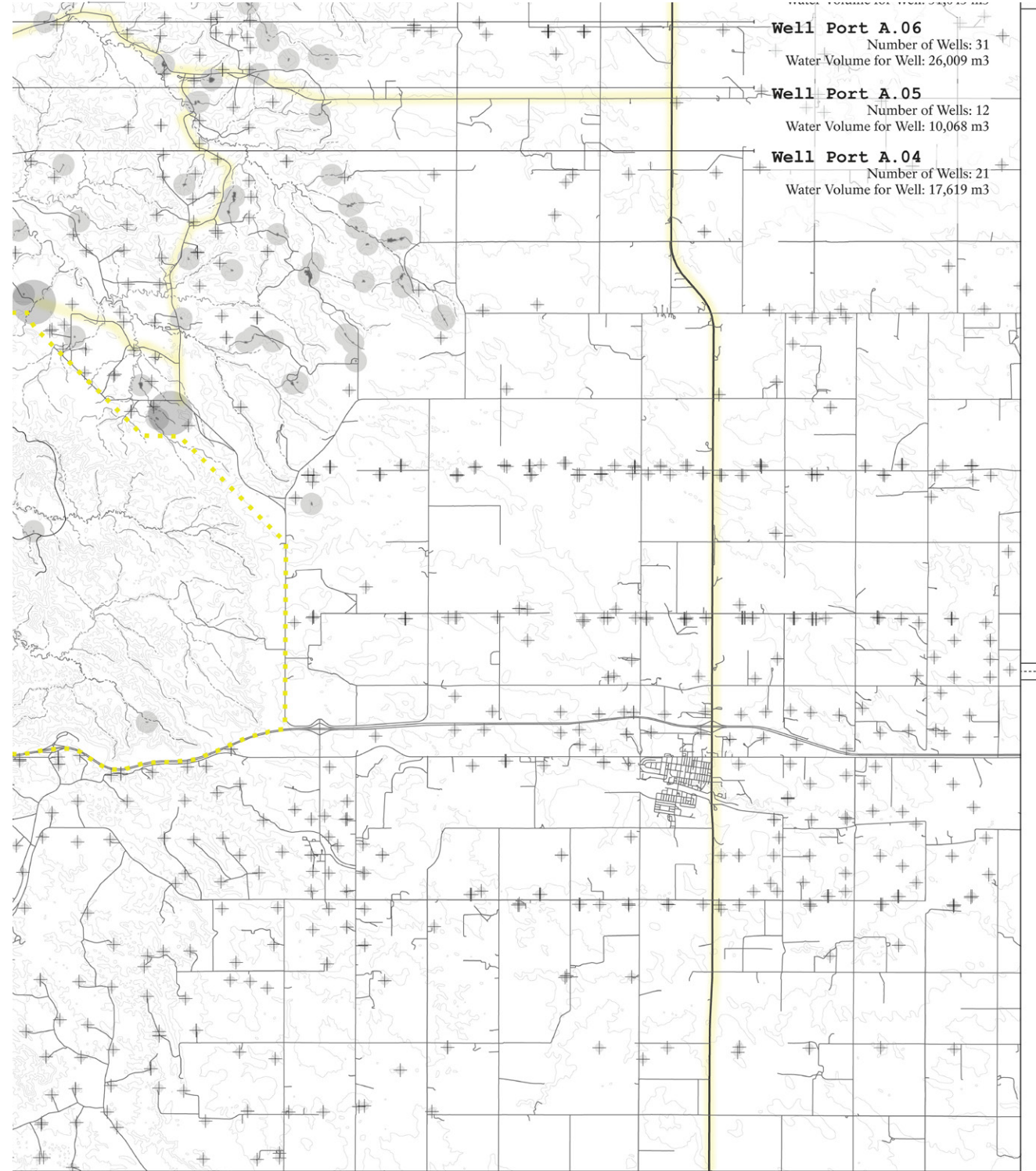
**Plains to Ports
Partnership**

Maah Daah Prairie



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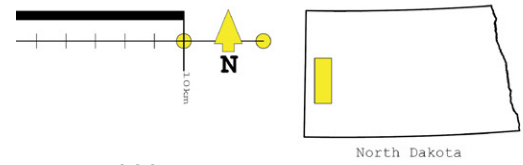
United States of America



Well Port A.06
Number of Wells: 31
Water Volume for Well: 26,009 m3

Well Port A.05
Number of Wells: 12
Water Volume for Well: 10,068 m3

Well Port A.04
Number of Wells: 21
Water Volume for Well: 17,619 m3



- Interstate
- Highway (side to side center)
- Road (side)
- Old National Park
- Mash Daah Hiking & Biking Trail
- Oil & Gas Pipeline
- Existing Oil & Gas Well
- River and Tributaries
- Topography +5.0m
- Water Body
- Proposed Oil & Gas "Well Pad"
- Proposed "Water Valve"
- Proposed "Fire Fields"

Picturesque Prairies

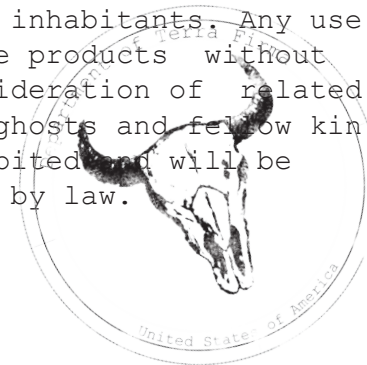
*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Application for Valve Permit

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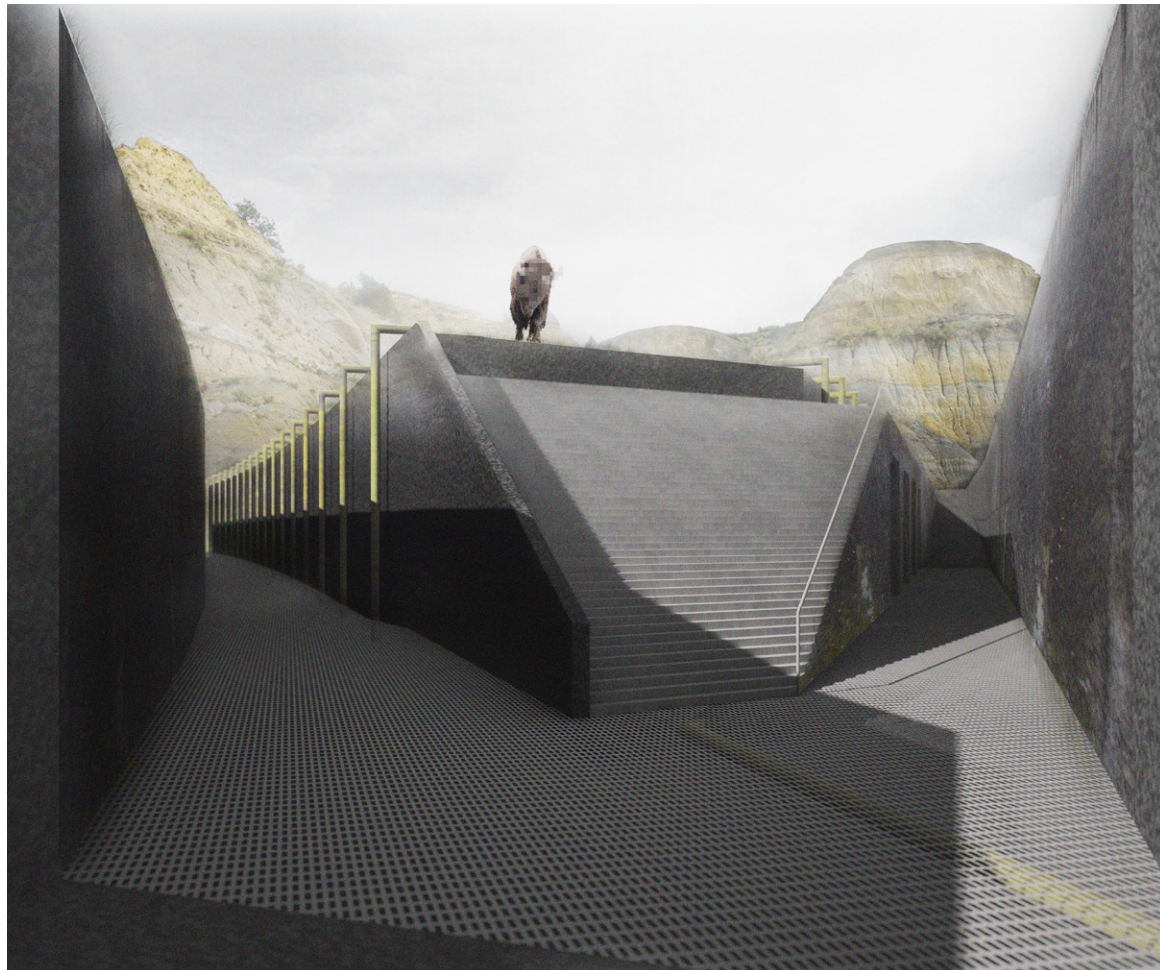
Notes:

bottom view of valve interior

opposite filed application for valve permit

United States of America

Department of Terra Firma



Application for Valve Permit - Form V.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Department of Terra Firma

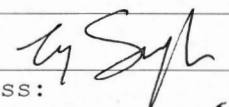
United States of America

Valve Type:	<input checked="" type="radio"/> Earth	<input checked="" type="radio"/> Stone	<input type="radio"/> Cutting	<input type="radio"/> Concrete
Operator:	MIT		Telephone: 617 253 7791	
Address:	77 MASS AVE		City: CAMBRIDGE	State: MA
Partnership Sponsor[s]: BOVINA BISON, HOMO SAPIEN, FRANGERE HYDRO				
Valve Name:	CAMILLE	Valve Number:	03.04	Tributary:
Latitude:	47° 0'49.96" N		Longitude: 103° 28'43.40" W	
Height:	5M		Top Layer:	PERVIOUS
Water Available[Average]:		44,580 m ²	Domain of Years: 1920-2016	
Number of Groins:		5	Proposed Wetland Area: 16,616 m ²	
Proposed Observation Area:			Description:	
OBSERVATION DECK ABOVE WATER PUMPS, REFLECTION TOWER, OBSERVATION DECK WITH STAIR ACCESS TO FLOODPLAIN				
Is the proposed valve connected to a trail/road?				<input checked="" type="radio"/> Y / <input type="radio"/> N
Name & Number of Supported Well Ports:			Required Water Volume:	
WELLPORT A.04			17,619 m ³ (21)	
WELLPORT A.05			10,068 m ³ (12)	
Total Number of Supported Well Ports:			Total Water Volume:	
2			27,687 m ³	



Application for Valve Permit - Form V.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Name & Number of Supported Distribution Pads:	Required Water Volume:
	
	
	
	
	
	
	
	
	
Total Number of Supported Well Ports:	Total Water Volume:
Combined Total Water Volume: 27,687 m³	
Area Reserved for Sediment Redistribution:	
Comments:	
I hereby swear or affirm the information provided is true, complete and correct as determined from all available records; and I commit my self above all else to the partnership to which this application binds me.	
Signature: 	Printed Name: TYLER SWINGLE
Email Address: swingle@mit.edu	Date: 2018 01 18
For Department Use Only	
Permit and File Number:	Pool:
Date Approved:	By: Partnership:



opposite
filed
application for
valve permit

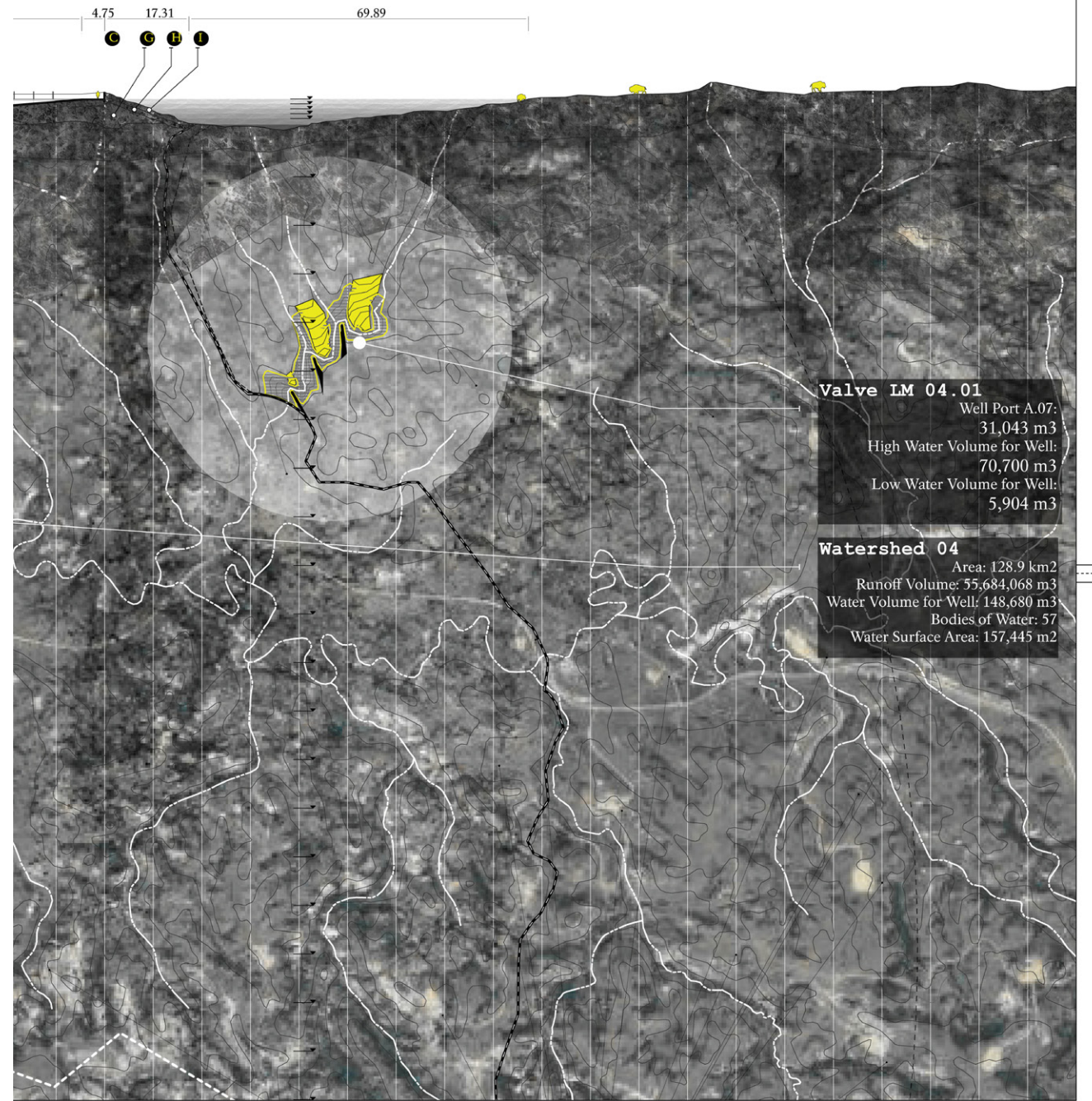
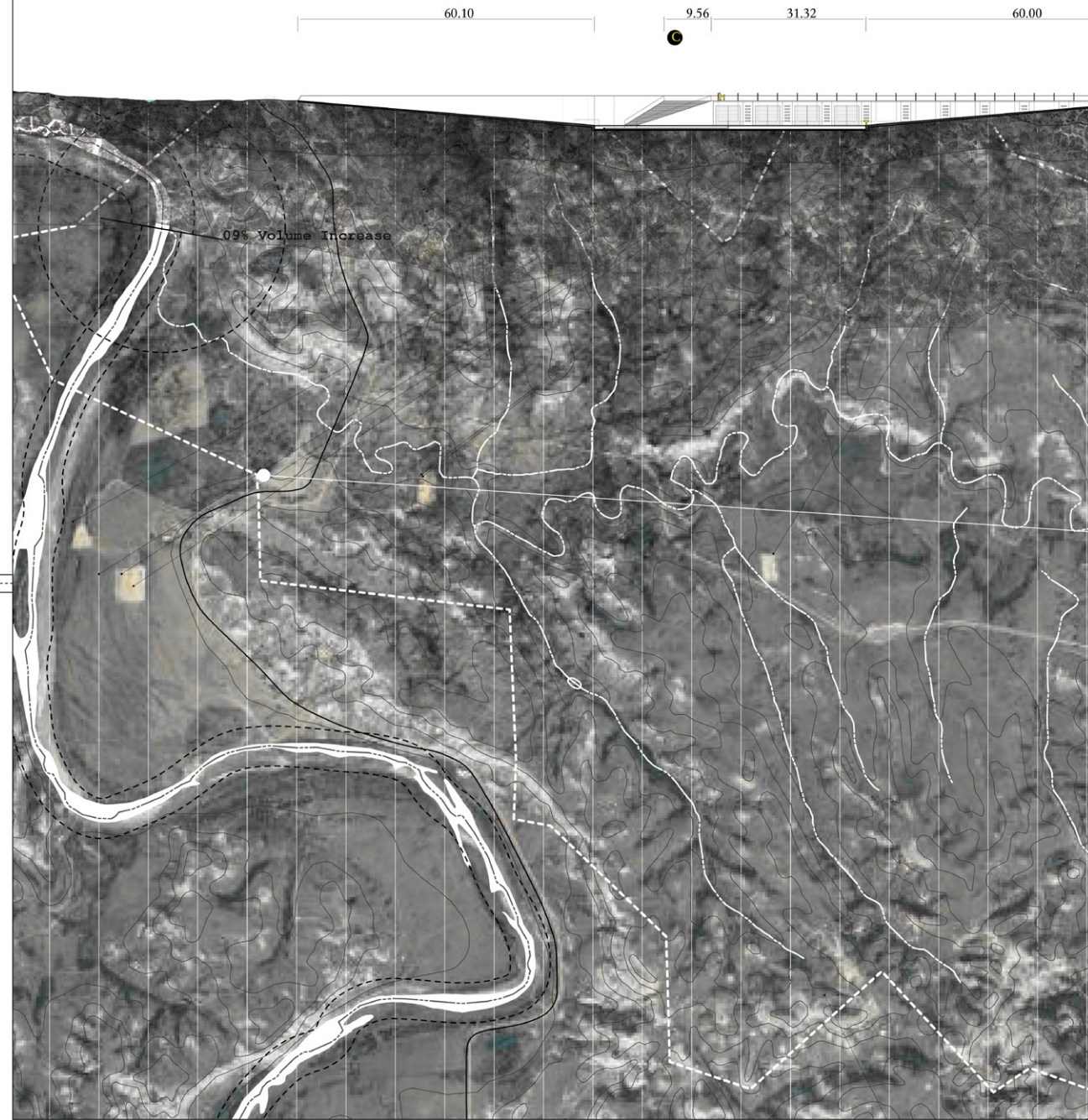
middle
view from
reflection tower

Picturesque Prairies **F01: Water Valve 04.01**

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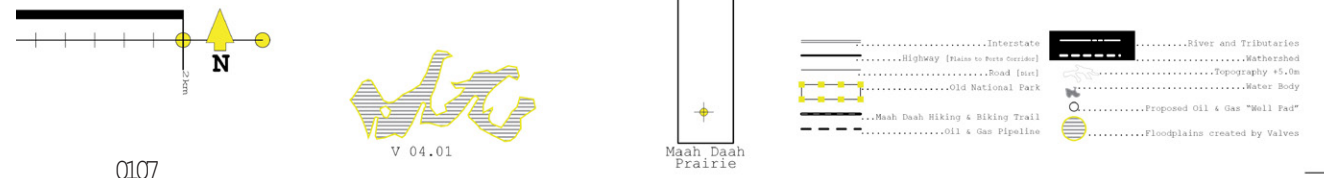
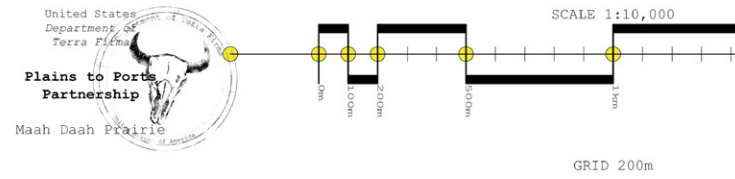
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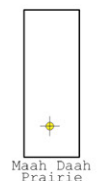
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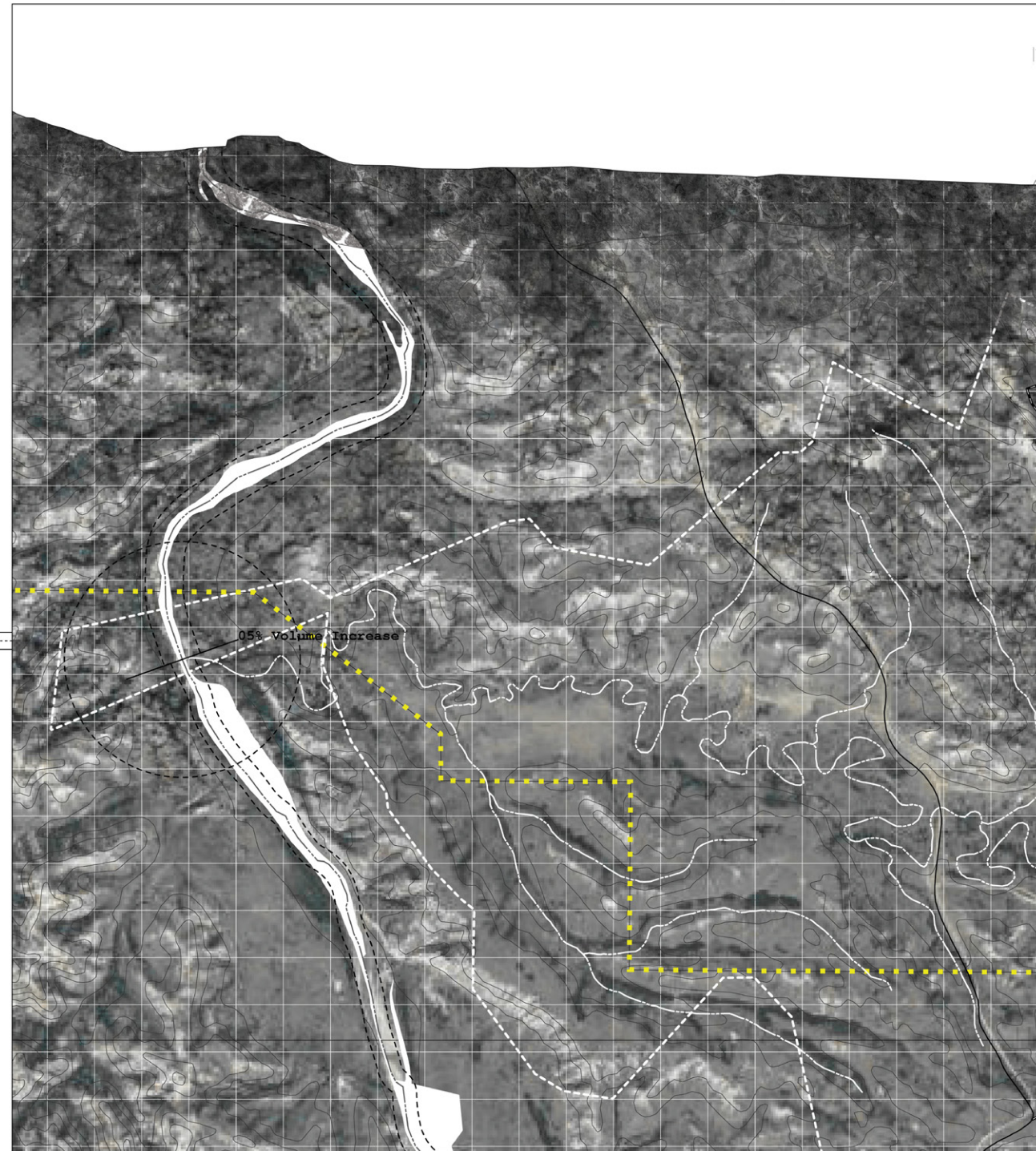


Picturesque Prairies **F02: Water Valve 03.03; 03.04**

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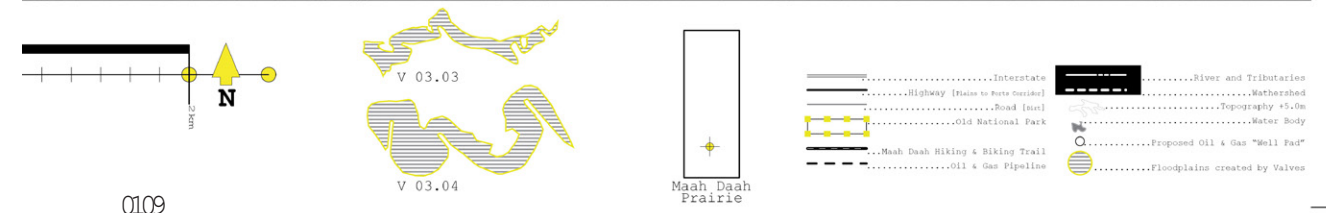
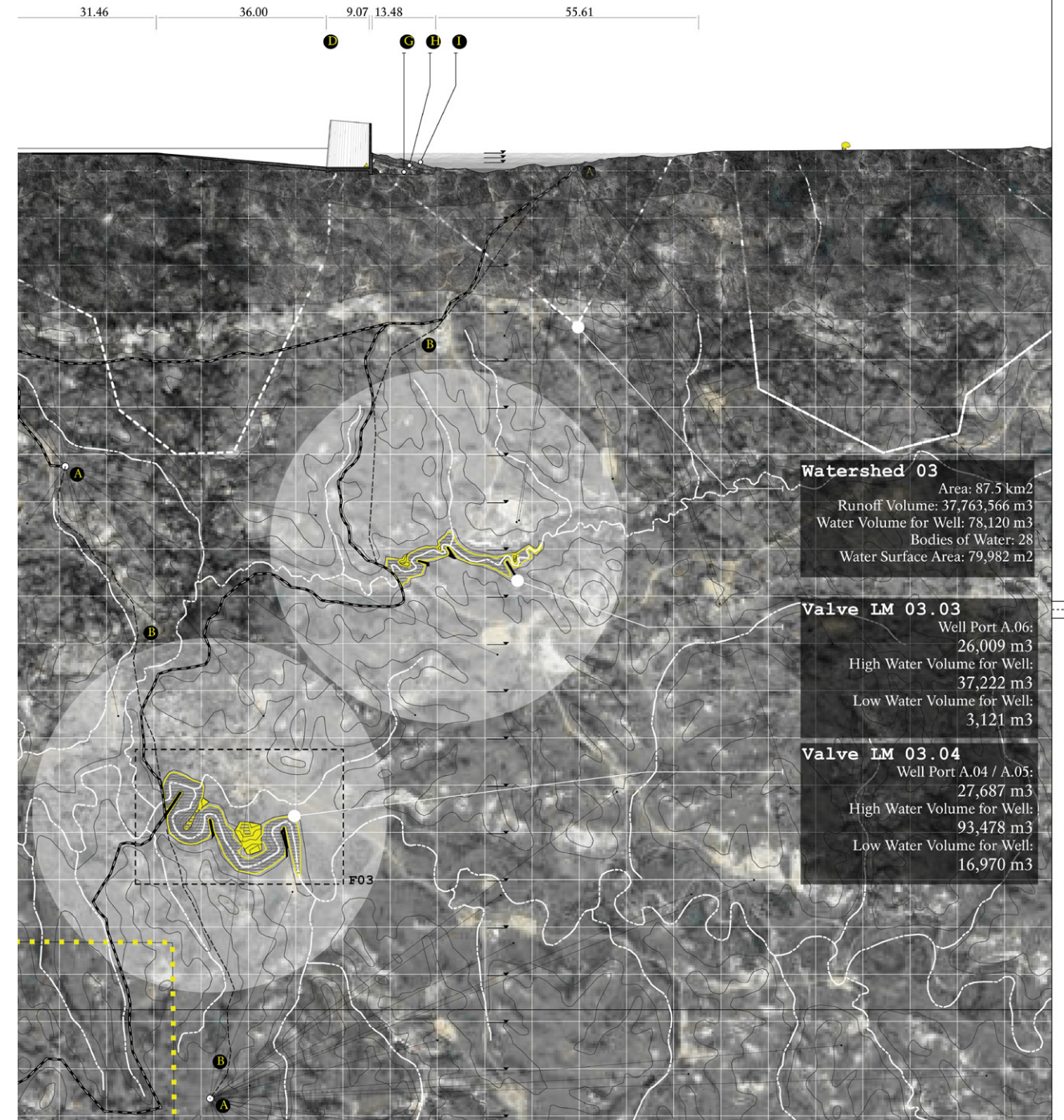
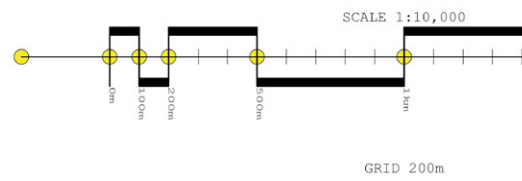
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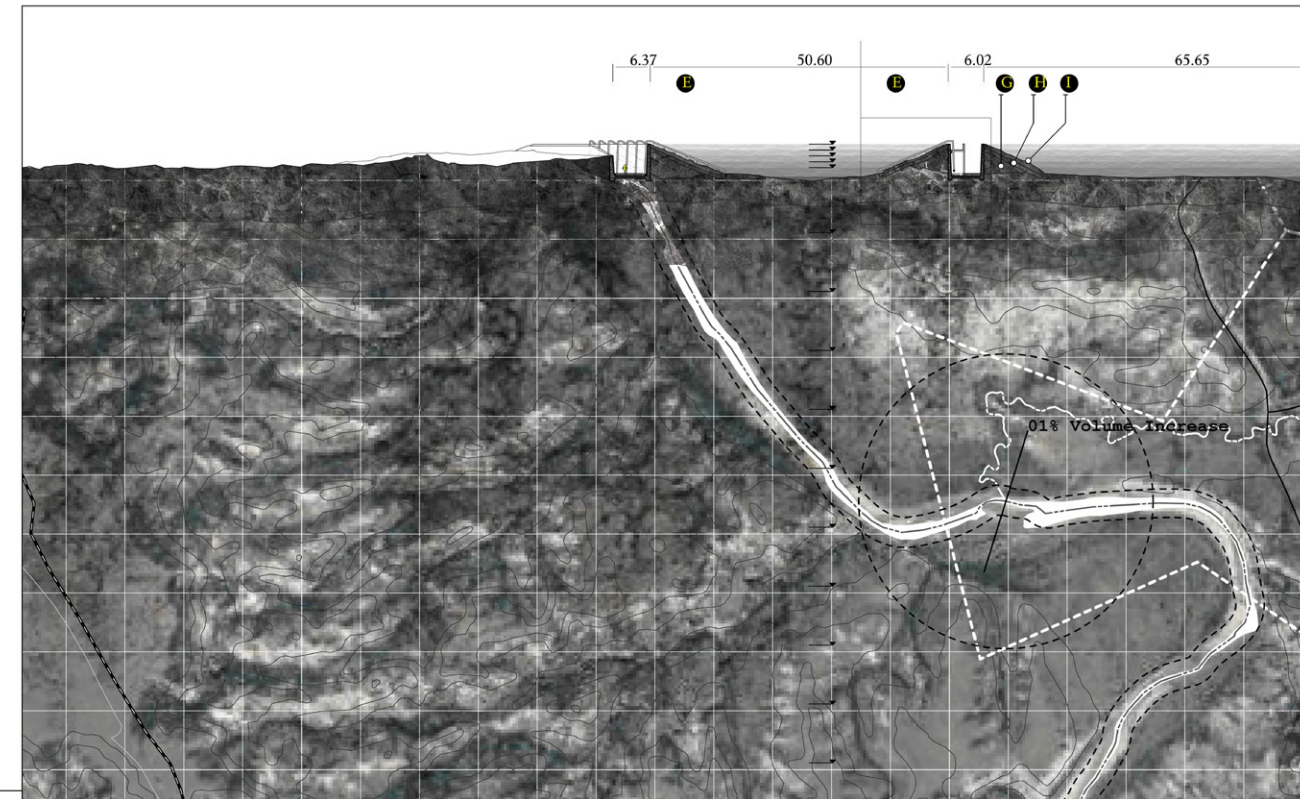
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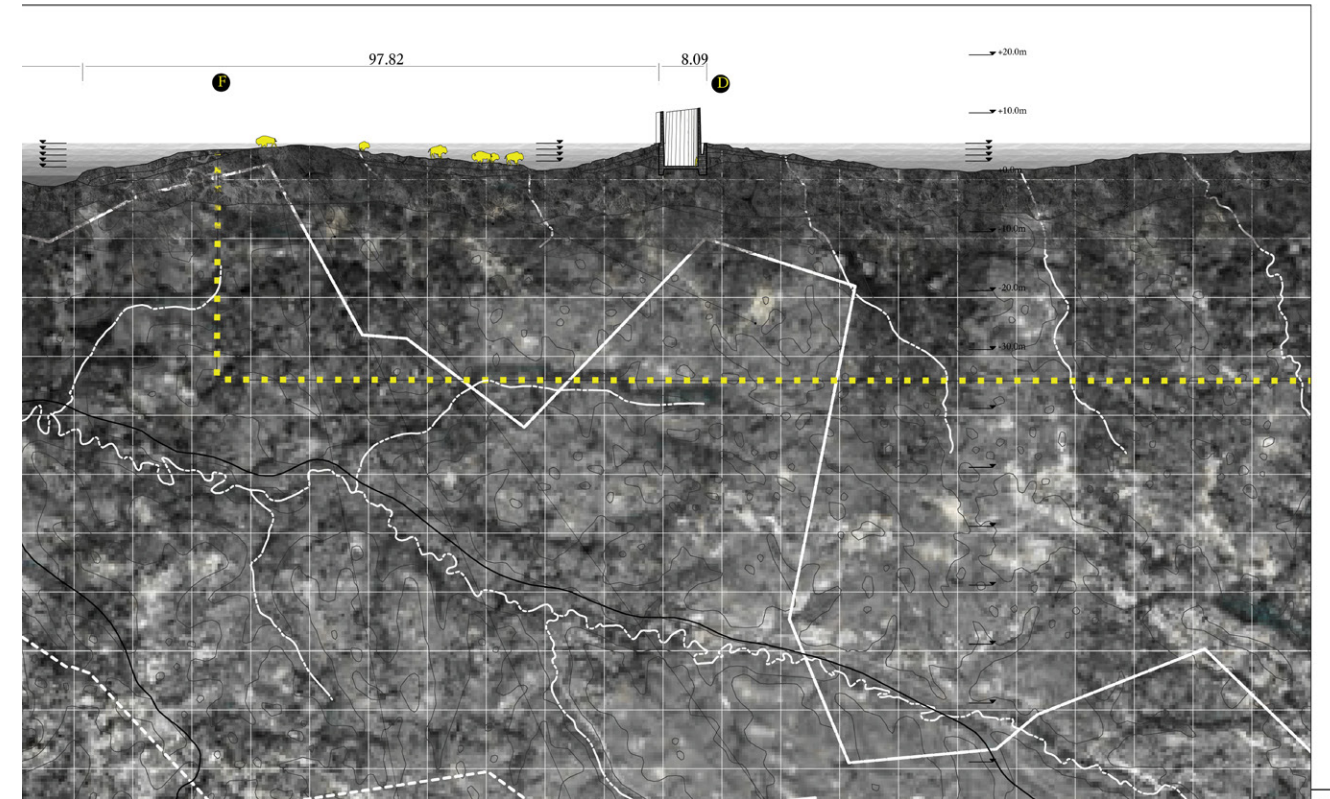
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**Plains to Ports
Partnership**
Maah Daah Prairie



Picturesque Prairies **F03: Water Valve 03.04**



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The valves function in the Maah Daah Prairie is to create flooding zones that attract bison during the spring and collect water for the connected well ports..

in a region that does not typically have any. This could dramatically or insignificantly change the flora distribution near the valves.

The artificial flooding introduces more opportunity for bison wallowing spaces by creating quasi-floodplains along the tributaries to the Little Missouri River. The new floodplains offer some chance of water absorption into the soil and aquifer creation

During the flooding, water is pulled from the body of water to the well ports for use. Each tributary and reciprocal watershed is measured before applications for the valves. Valves are only allowed to transport 10% of the average run off to well ports

and are only allowed to hinder 30% of the average run off to create new floodplains for bison.

flowing at the same rate through the valve. The plug-flow offers the best chance for the most amount of sediment to deposit on the bottom of the water body. Each groin is designed within the standards of the Department of Interior and is designed to be inhabited by humans traveling through the Maah Daah Prairie or bison searching for wetland terrain.

The proposed designs have a groin design so that the body of water from the run off during the spring months has some sinuosity. The water has lots of floating sediment particles from the run off, so the sinuosity regulates the flow to follow a plug-flow scenario where all water is

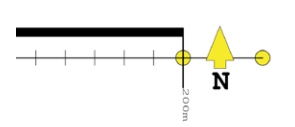
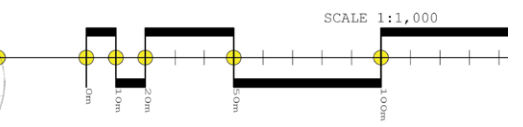
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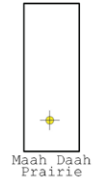
Department of Terra Firma

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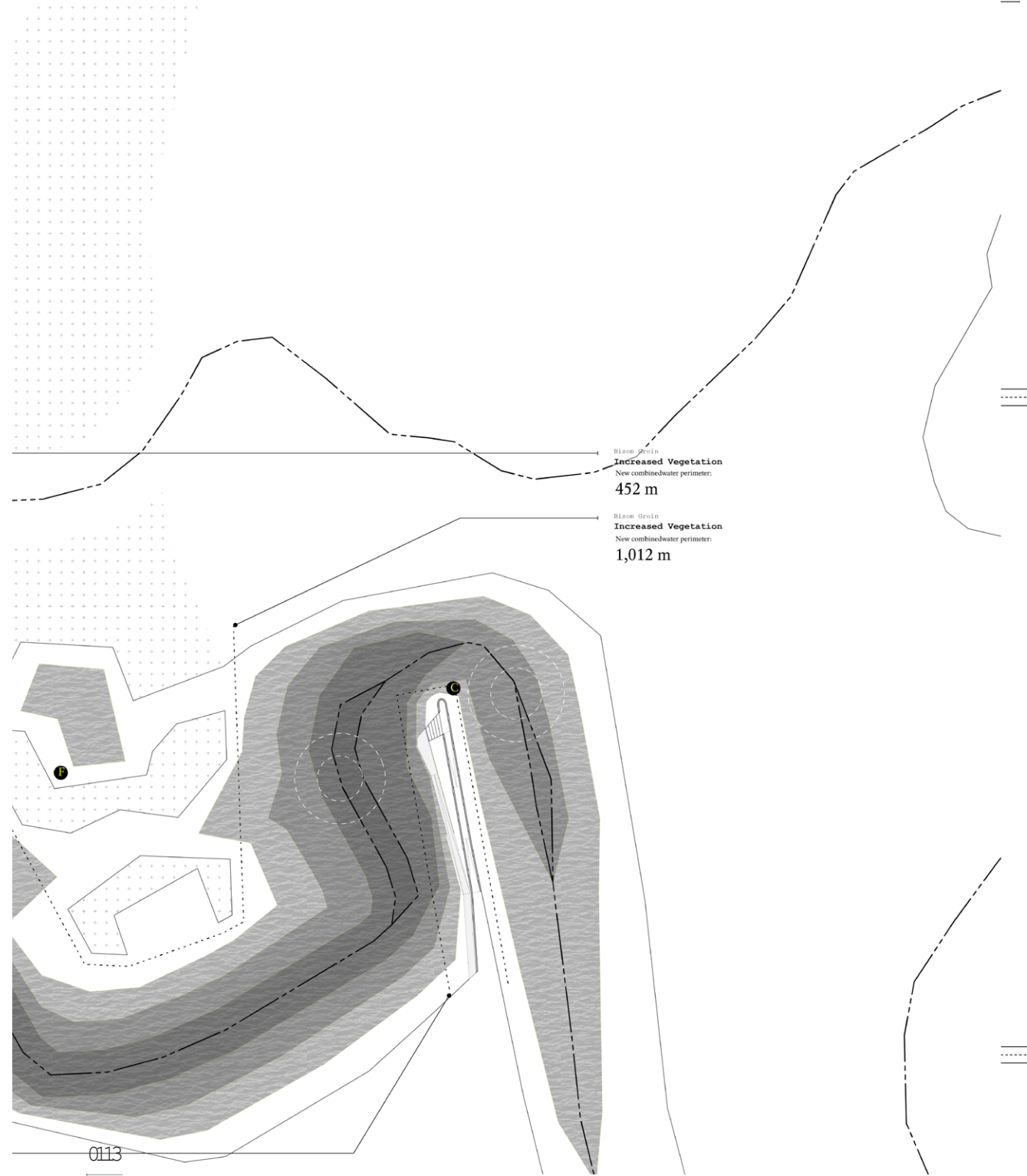
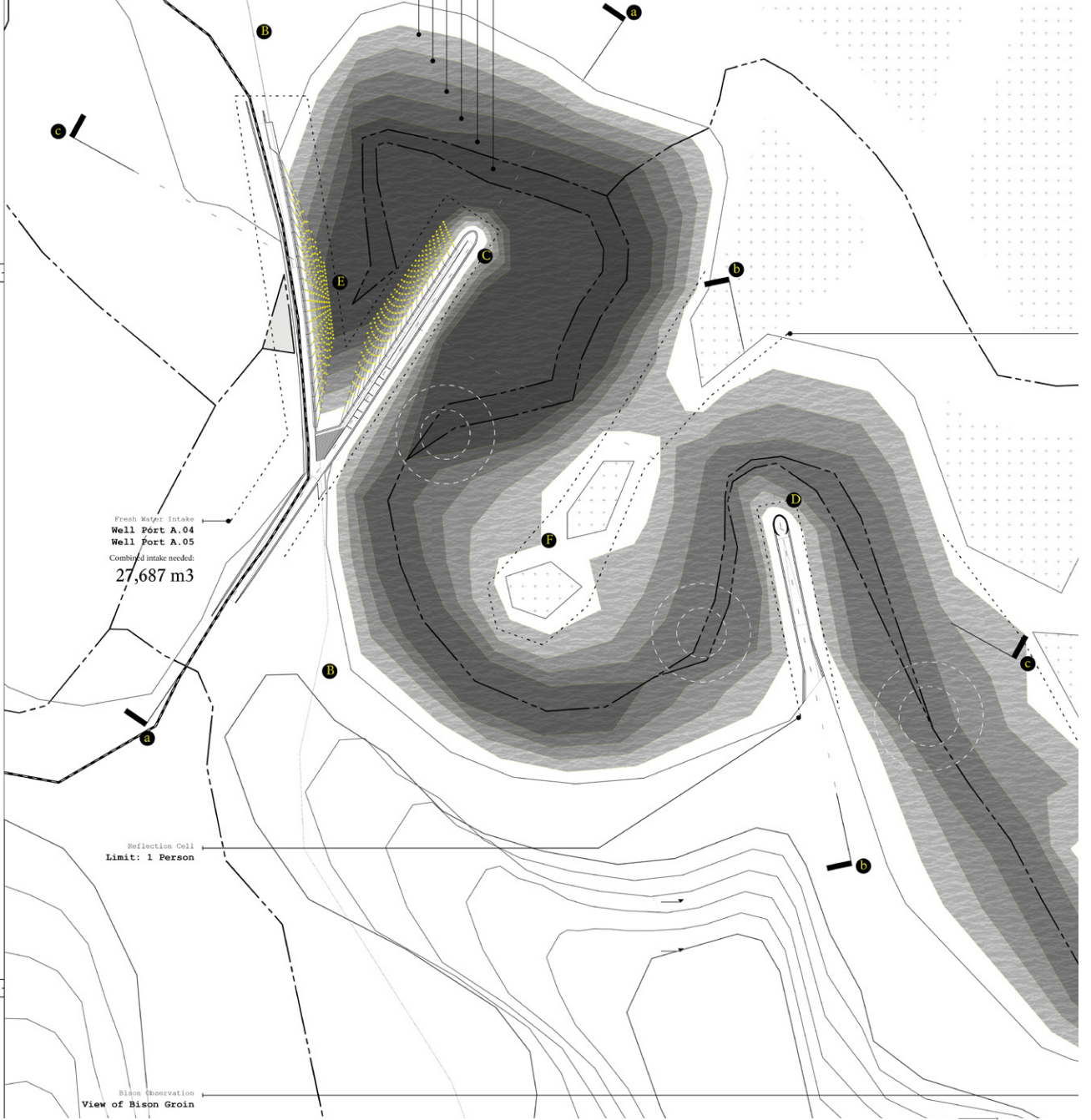
- Flood Plain 00
Seasonal Water
Not Consistent
- Flood Plain 01
10,879 m3
- Flood Plain 02
16,970 m3
- Flood Plain 03
39,512 m3
- Flood Plain 04
62,061 m3
- Flood Plain 05
93,478 m3



- A Well Pad
- B Water Pipeline
- C Look out
- D Reflection Cell
- E Water In-Take
- F Bison Groin: accessible flood plain
- G Vegetation Growth



- Interstate
- Highway (tissue to route casing)
- Road (cut)
- Old National Park
- Maah Daah Hiking & Biking Trail
- Oil & Gas Pipeline
- River and Tributaries
- Watershed
- Topography +5.0m
- Water Body
- Floodplains created by Valves

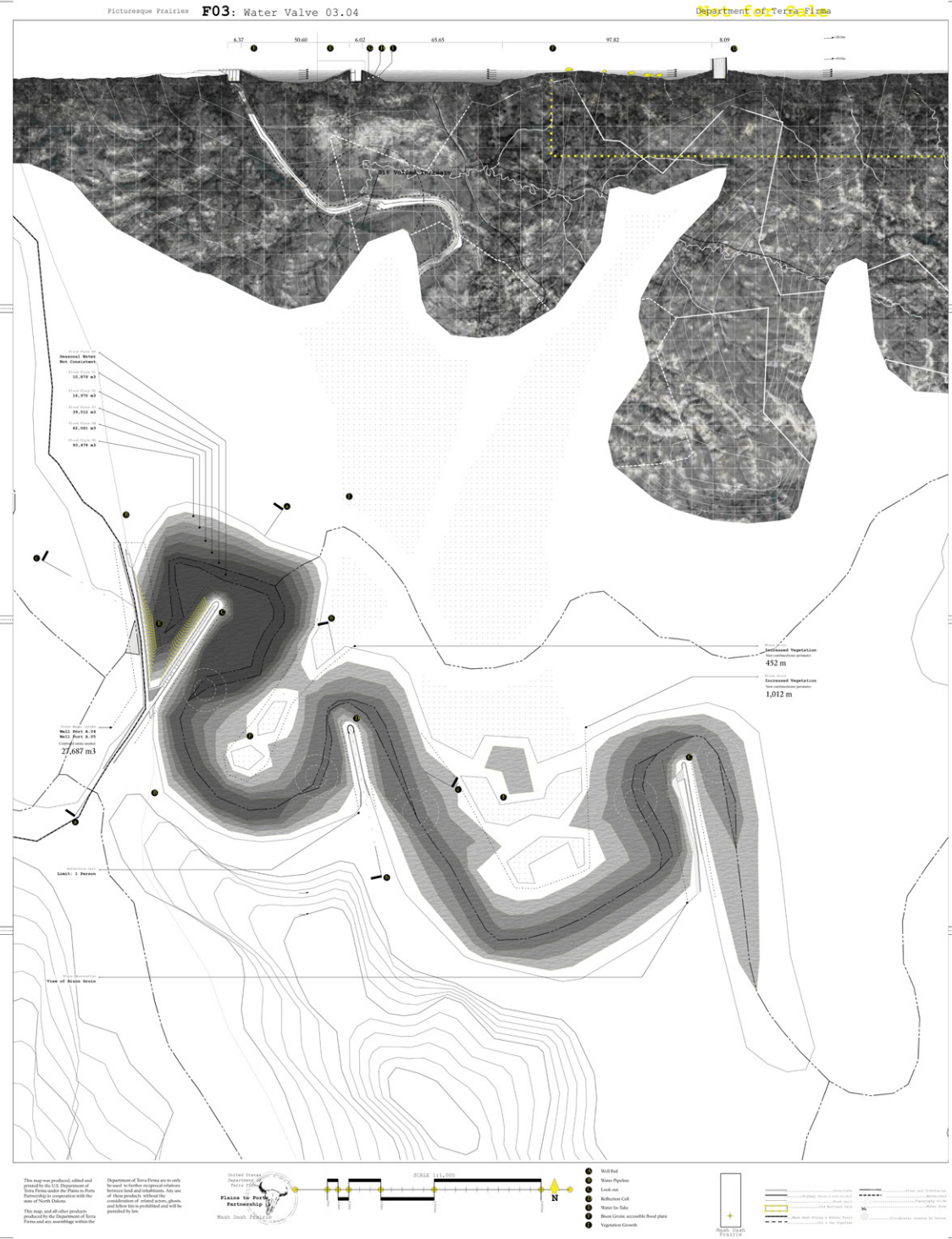


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Department of Terra Firma

Picturesque Prairies

*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*



Application for Well Port Permit

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top
view of well
port from trail

opposite
filed
application
for well port
permit



Application for Well Port Permit - Form WP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Well Types:	<input checked="" type="radio"/> New	<input type="radio"/> Converted	P.W.Storage:	<input checked="" type="radio"/> Y / <input type="radio"/> N
Operator:	MIT		Telephone:	617 253 7791
Address:	77 MASS AVE	City:	CAMBRIDGE	State: MA
Partnership Sponsor[s]:	BOXINA BISON, HOMO SAPIEN, FRANGERE HYDRO			
Port Name:	CAMILLE	Port Number:	A.15	Wells Count: 18
Latitude:	47° 28' 13.53" N	Longitude:	103° 27' 13.57" W	
Height:	30 M	Radius:	30 M	Tank Count: 07
Fresh Water Storage:	28,475 m ³	Fuel Storage:	793 m ³	
Snow Fence Length:	4,900 M	Proposed Wallow Area:	4,743 m ²	
Proposed Observation Area:	1,397 m ²	Description:	DECK ON TOP OF ENGINE ROOM (PUMPS), OBSERVATION DECK ON TOP OF WATER TANKS	
Is the proposed valve connected to a trail/road?	<input checked="" type="radio"/> Y / <input type="radio"/> N			
Name & Number of Supported Wells:	Depth:	Reach:		
01. JEFFERSON 01		2,359 M		
02. JEFFERSON 02		1,469 M		
03. MANITOBA 01		5,178 M		
04. BIGHORN 01		4,254 M		
05. JEFFERSON 03		4,262 M		
06. MANITOBA 02		3,143 M		
07. MANITOBA 03		4,644 M		
08. MANITOBA 04		4,275 M		
Continue List on Form WP.02 and Attach for Permit				
Total Number of Supported Wells:	18		Accumulated Reach:	73,138 M



Application for Valve Permit - Form WP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Lowest Fresh Water Formation: DAKOTA		Depth to Base: -2500 m	
Proposed Surface Casing Depth: -500 m	Radius: 0.3 m	Vol.: 50 m³	
Proposed Longstring Casing Depth: -1200 m	Radius: 0.2 m 0.2 m	Vol.: 120 m³	
Number of Pumps: 15	Number of Manifolds: 4		
Estimated Average Injection Rate: 50 BPD			
Estimated Maximum Injection Rate: 5,000 BPD			
Number of Tanks without Engine Deck: 2			
Number of Line Heaters: 5	Fueled by Extraction: <input checked="" type="radio"/> Y / <input type="radio"/> N		
Estimated Temperature [C] of Tank Surface: 15-20 °C		Months: 10-03	
Total Annual Produced Water Volume: ≈ 12,000 m³ (ESTIMATE)			
Total Annual Fresh Water Volume: 15,102 m³			
Name & Number of Required Distribution Pads:		Annual Water Volume:	
FIRE FIELD F.04 / DP.04		≈ 12,000 m³	
Comments:			
<p><i>I hereby swear or affirm the information provided is true, complete and correct as determined from all available records; and I commit my self above all else to the partnership to which this application binds me.</i></p>			
Signature: ty Swingle	Printed Name: TYLER SWINGLE	Date: 20180118	
Email Address: swingle@mit.edu			
For Department Use Only			
Permit and File Number:		Pool:	
Date Approved:	By:	Partnership:	



Application for Well Port Permit - Form WP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form WP.01 for Permit

Name & Number of Supported Wells:	Depth:	Reach:
09. BIGHORN 02	-5870 m	4,368 m
10. BIGHORN 03	-5900 m	3,763 m
11. MANITOBA 05	-4,900 m -3,150 m	3,798 m
12. BIGHORN 04	-5,750 m	3,834 m
13. MANITOBA 06	-5,000 m	4,045 m
14. MANITOBA 07	-4,850 m	4,521 m
15. MANITOBA 08	-4,900 m	5,057 m
16. MANITOBA 09	-4,750 m	4,585 m
17. BIGHORN 05	-5,800 m	4,774 m
18. MANITOBA 10	-4,950 m	4,807 m
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Application for Well Port Permit - Form WP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form WP.01 for Permit

Name & Number of Supported Wells:	Depth:	Reach:
33.		
34.		
35.		
36.		
37.		
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52.		
53.		
54.		
55.		
56.		

United States of America

Department of Terra Firma

0123



*opposite
filed
application
for well port
permit*

*middle
view from well
port stairway
interior*

Department of Terra Firma

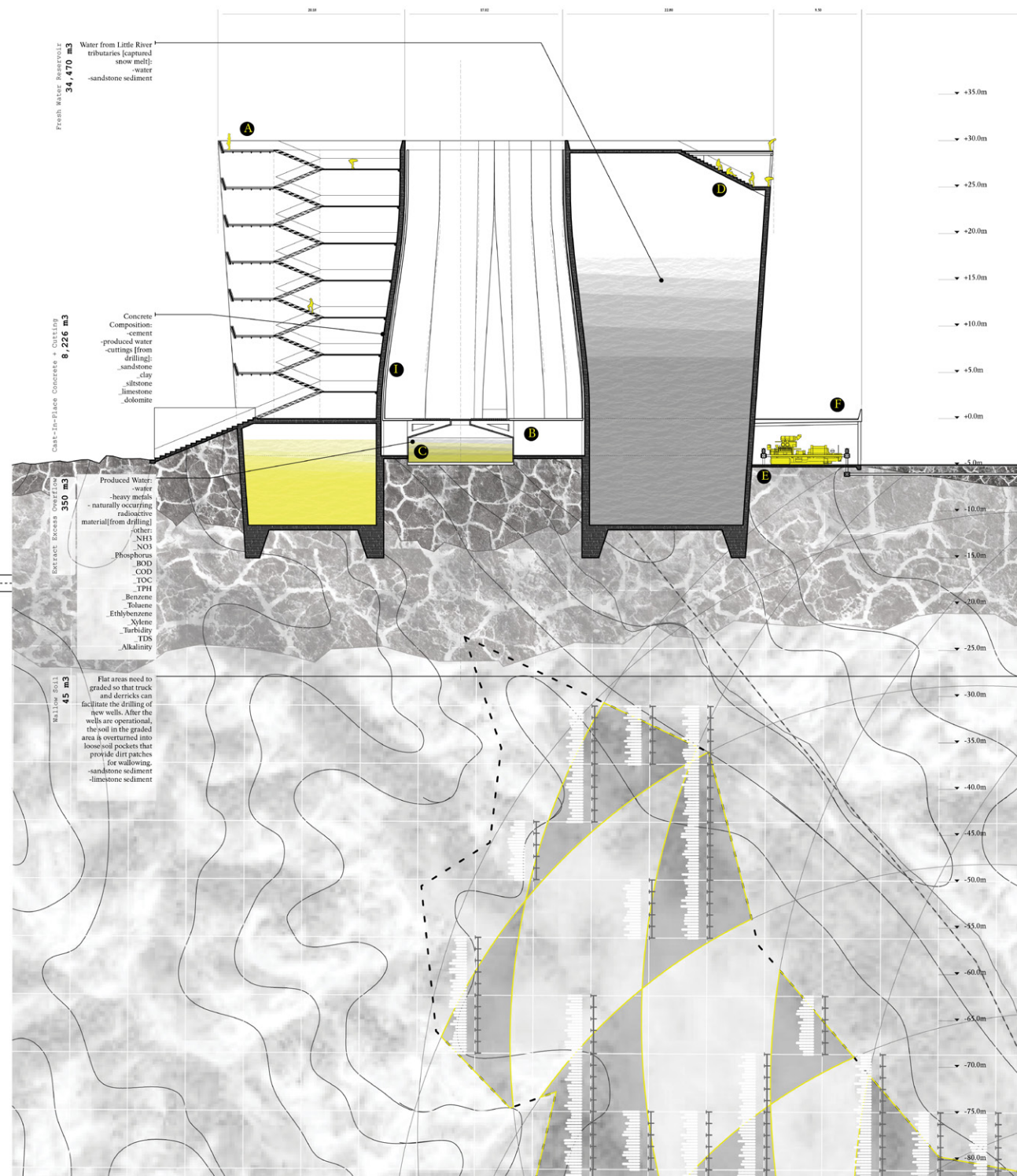
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Picturesque Prairies **D01: Well Port A.15**

Department of Terra Firma
Not for Sale

United States of America

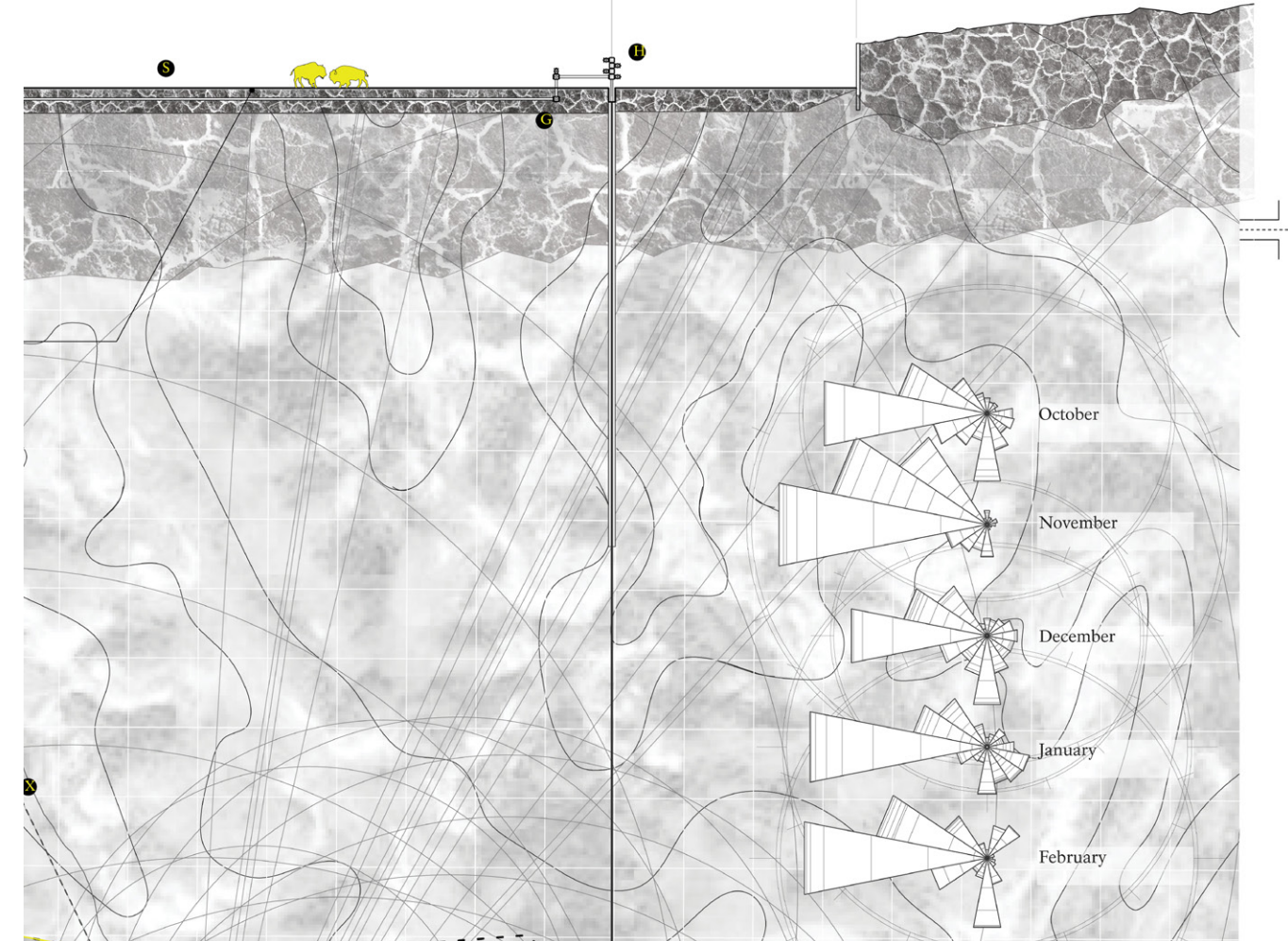
Department of Terra Firma



Department of Terra Firma

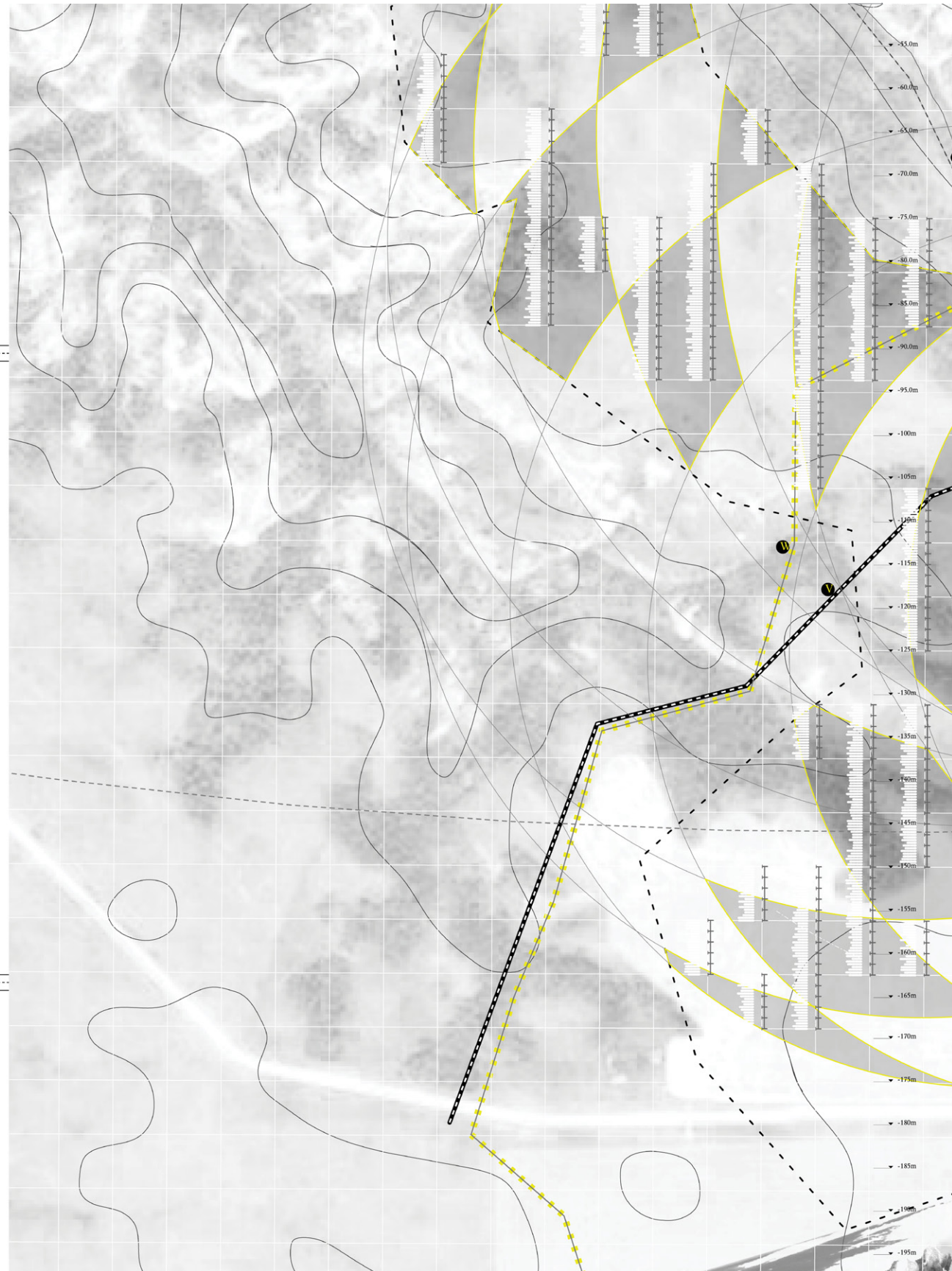
United States of America

- A** Observation deck for humans. Horizon at +30m: 19.6 km
- B** Underground work space: housing for pipeline manifold
- C** Extract overflow: 333 m³
- D** Observation deck for humans. Horizon at +25m: 17.9 km
- E** Underground room for engines [sound-proof]
- F** Observation deck for humans and bison. Horizon at +25m: 5.1 km
- G** Manifold for pressurized fracking fluid and fresh water
- H** Well head. Cuttings produced: 186 m³/well [x29 = 5,394 m³]
- I** Thermal chimney for underground engine room
- S** Wallow Dirt / Well Ground: 7,177 m²



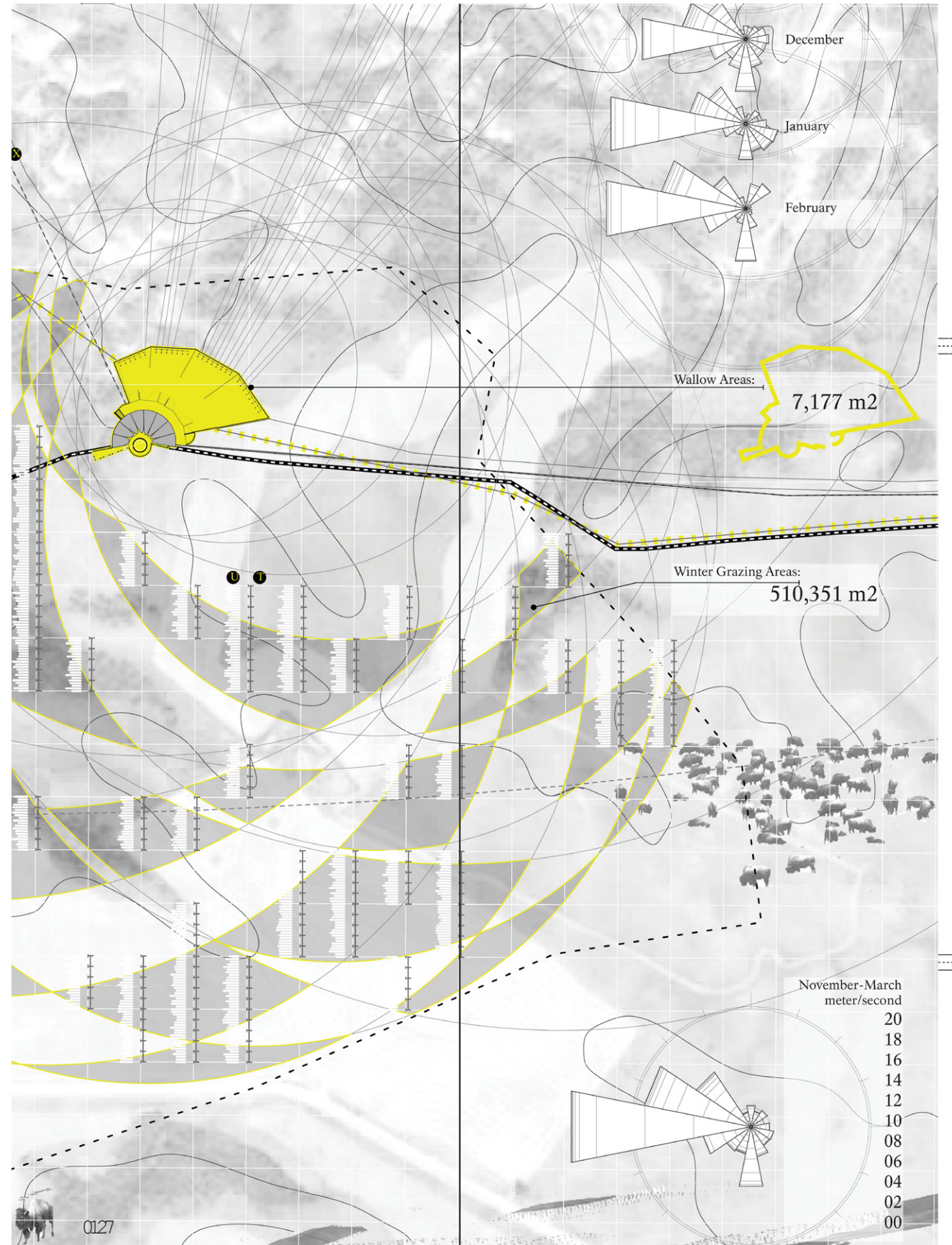
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Department of Terra Firma

United States of America



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United States of America



Department of Terra Firma

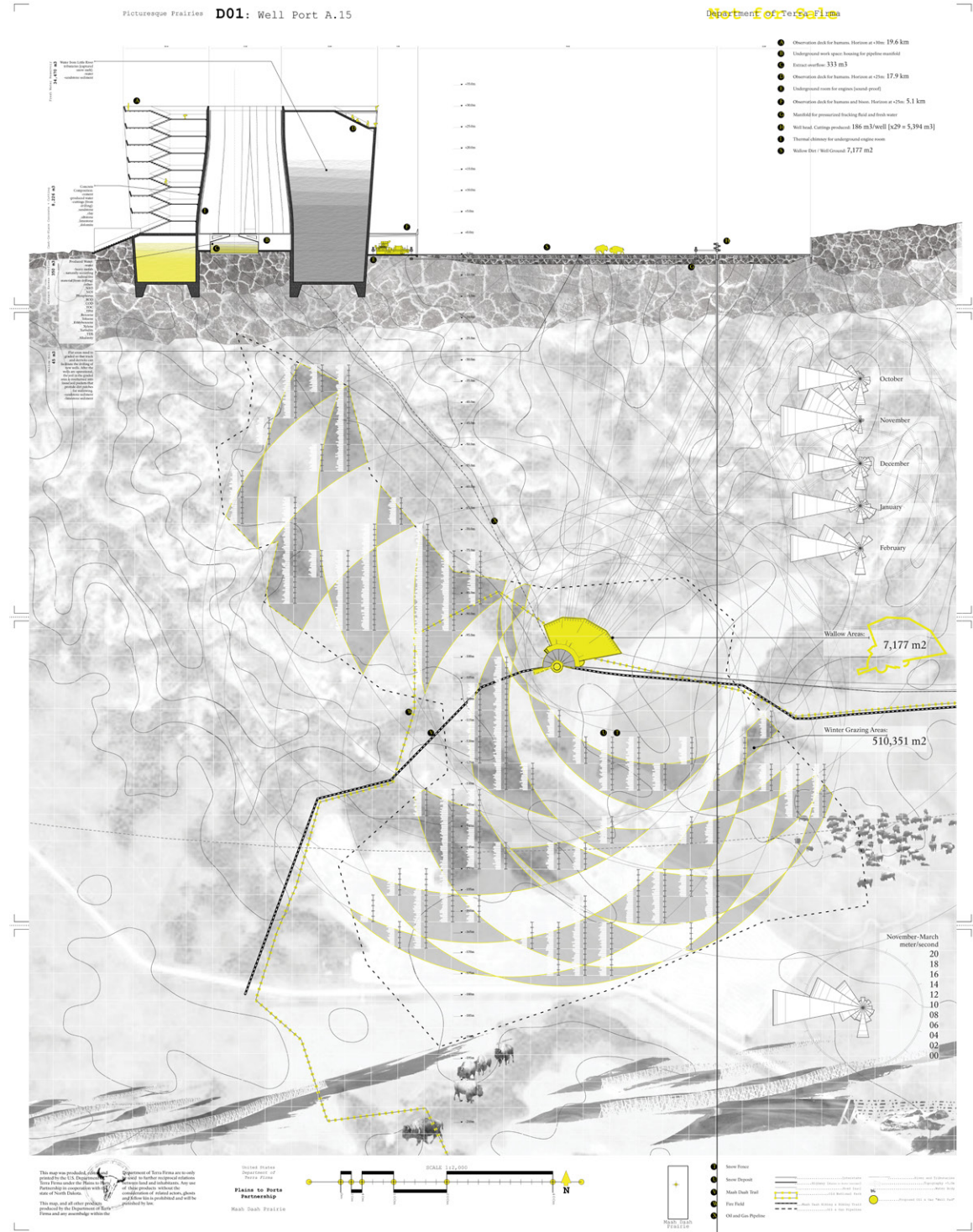
previous
plan of well
port and
surrounding
snow fences

top
view of well
port from
connected
pipeline

opposite
D.01 board
layout

Department of Terra Firma

United States of America



Picturesque Prairies **D02: Well Port A.15**

Department of Terra Firma
Not for Sale

United States of America

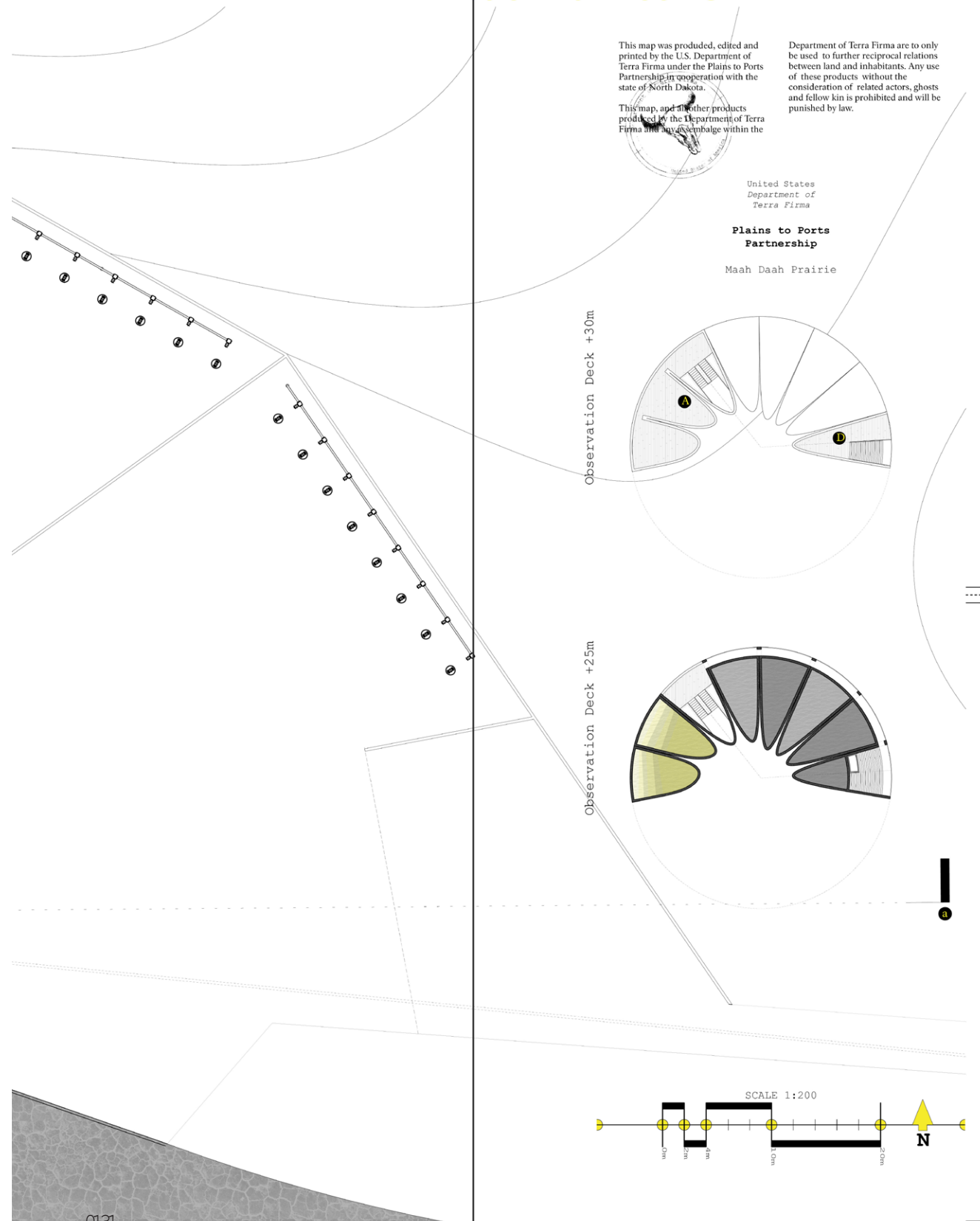
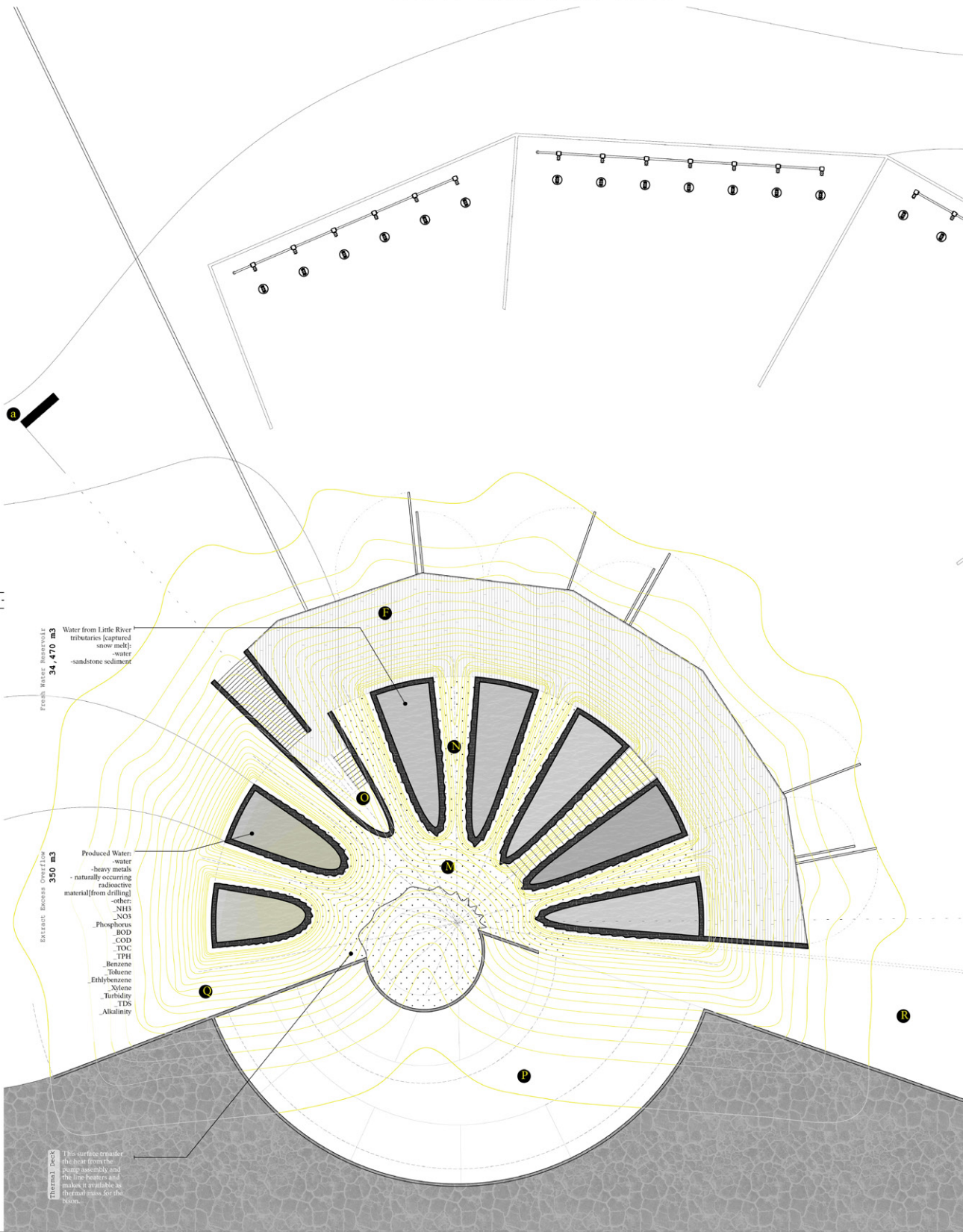
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Department of Terra Firma

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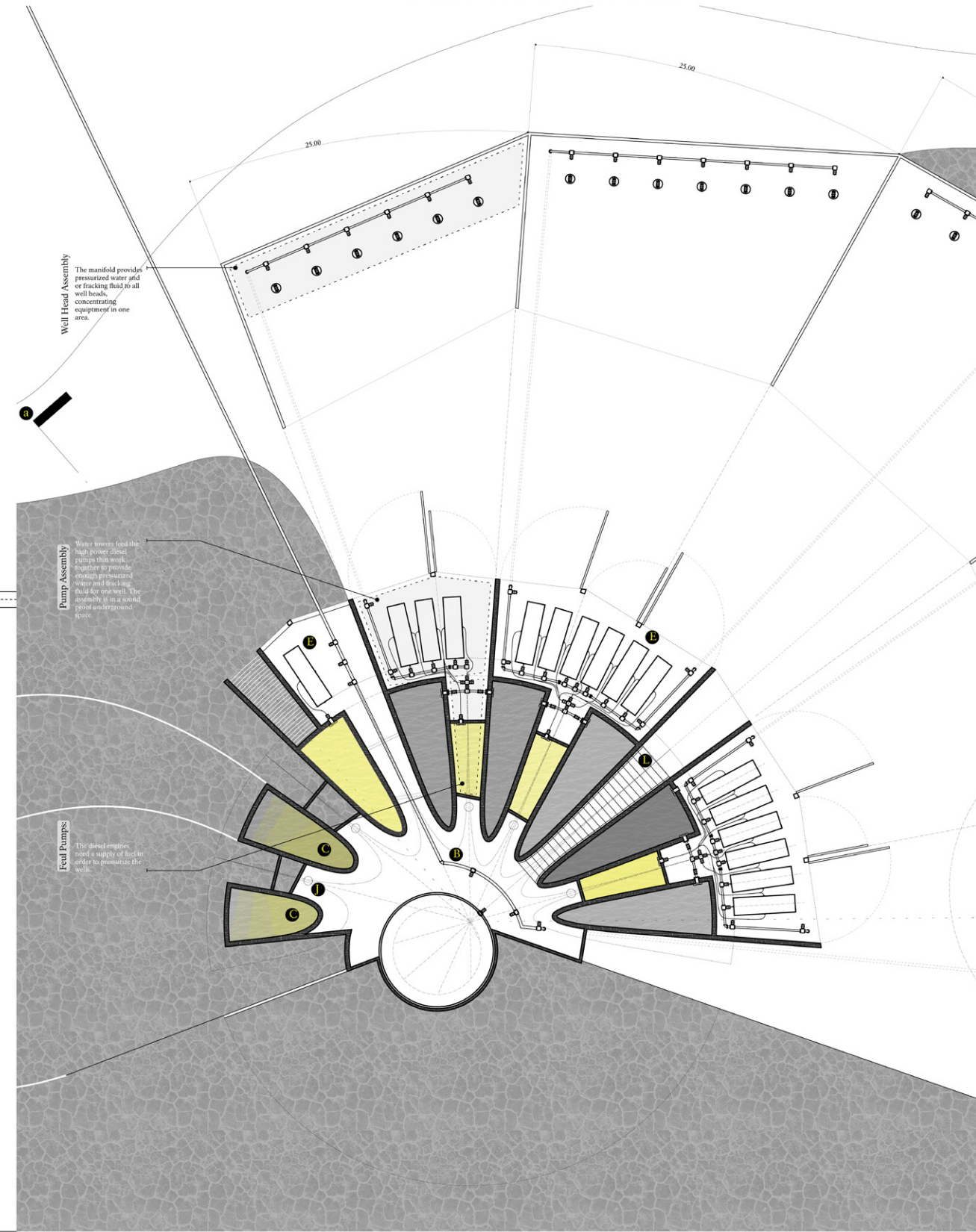
United States
Department of
Terra Firma
**Plains to Ports
Partnership**
Maah Daah Prairie



Picturesque Prairies **D03: Well Port A.15**

United States of America

Department of Terra Firma

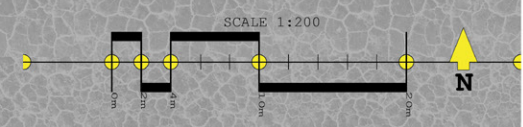


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United States
Department of
Terra Firma
**Plains to Ports
Partnership**
Maah Daah Prairie

- A** Observation deck for humans. Horizon at +30m: 19.6 km
- B** Underground work space: housing for pipeline manifold
- C** Extract overflow: 333 m3
- D** Observation deck for humans. Horizon at +25m: 17.9 km
- E** Underground room for engines (sound-proof)
- F** Observation deck for humans and bison. Horizon at +25m: 5.1 km
- G** Manifold for pressurized fracking fluid and fresh water
- H** Well head. Cuttings produced: 186 m3/well [x29 = 5,394 m3]
- I** Thermal chimney for underground engine room
- J** Line Heater connected to thermal chimney
- K** Underground pipe connecting pump assembly to well manifold
- L** Stair from thermal deck to well ground/wallowing dirt
- M** Thermal Deck for Bison: 645 m2
- N** Bison Heating area
- O** Stair to observation deck
- P** Parking
- Q** Trail Access
- R** Road Access
- S** Wallow Dirt / Well Ground: 7,177 m2
- T** Snow Fence
- U** Snow Deposit
- V** Maah Daah Trail
- W** Fire Field
- X** Oil and Gas Pipeline



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The well ports are condensed mechanisms of fracture drilling the operate on the efficiency of shared resources and machines. The material production is formally organized to create a micro-environment for bison during the winter seasons.

The towers store fresh and produced water from the drilling process and are heated from the heat output of line heaters. Below, the pumps and manifolds are hidden from sight and enclosed within soundproof areas so that not frighten or disturb any bison or humans in the area. A large flat dirt pad separates the pumps and resources from the well heads for installation logistics.

The heated towers provide a source of warmth for the bison during the cold temperatures in the Maah Daah Prairie. The texture of the cutting-mixed concrete is rough and attractive for bison to rub and scratch against. Melted snow reveals sought-after tallgrass and the dirt pad between the well heads and the pumps offers more wallowing space for bison.

One of the towers contains a staircase and provides access for humans to climb and view the prairie from the top of the towers.

top
well port model

opposite
view from well
port interior
looking out;
bison using
surface for
warmth

Department of Terra Firma



Department of Terra Firma

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Department of Terra Firma

**Picturesque
Prairies**

*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*



**Application for
Distribution Pad Permit**

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Department of Terra Firma

opposite
filed
application for
distribution
pad permit



Application for Distribution

Pad Permit - Form DP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Department of Terra Firma

United States of America

Main Source of Separation: EVAPORATION	
Operator: MIT	Telephone: 677 293 7791
Address: 77 MASS AVE	City: CAMBRIDGE State: MA
Partnership Sponsor[s]: BOVINA BISON, HOMO SAPIEN, FRINGERE HYDRO	
Pad Name: CAMILLE	Pad Number: 4.01
Latitude:	Longitude:
Adjacent to Fire Field: <input checked="" type="checkbox"/> Y / N	Field Name: F.04
Fresh Water Storage: NONE	Produced Water Storage: <input checked="" type="checkbox"/>
Main Pipe Length: 315 m	Proposed Wallow Area: <input checked="" type="checkbox"/>
Proposed Observation Area:	Description: LOOKOUTS & CAT WALK
ABOVE MAIN PIPE LINE	
Is the proposed valve connected to a trail/road? <input checked="" type="checkbox"/> Y / N	
Name & Number of Supported Well Ports:	Well Count:
01. A.14	39
02. A.15	18
03. B.08	04
04. B.07	17
05.	
06.	
07.	
08.	
<i>Continue List on Form DP.02 and Attach for Permit</i>	
Total Number of Supported Well Ports:	Accumulated Wells:
04	72

United States of America



Application for Distribution

Pad Permit - Form DP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Name & Number of Connected Valves:		Required Water Volume:
01.	07.03	42,789 m ³
02.	07.02	5,356 m ³
Continue List on Form DP.03 and Attach for Permit		
Total Number of Supported Well Ports:		Total Water Volume:
5		96,485 m ³
Number of Pumps:	11	Fueled by Extraction: <input checked="" type="radio"/> Y / N
Number of Separation Tanks:	5	Fueled by Extraction: <input checked="" type="radio"/> Y / N
Number of Evaporation Pads:	9	Total Area: 80,000 m ²
Additional Facilities within Main Pipe: <input checked="" type="radio"/> Y / N		List Below:
MACHINE REPAIR		
Area Reserved for Sediment Redistribution: <input checked="" type="checkbox"/>		
Comments:		
I hereby swear or affirm the information provided is true, complete and correct as determined from all available records; and I commit my self above all else to the partnership to which this application binds me.		
Signature:	Printed Name: TYLER SWINGLE	Date: 20180118
Email Address: swingle@mit.edu		
For Department Use Only		
Permit and File Number:		Pool:
Date Approved:	By:	Partnership:

Department of Terra Firma

0141

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Application for Distribution

Pad Permit - Form DP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form DP.01 for Permit	
Name & Number of Supported Well Ports:	Well Count:
09.	NA
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
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Application for Distribution

Pad Permit - Form DP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form DP.01 for Permit

Name & Number of Supported Well Ports:	Well Count:
33.	
34.	
35.	
36.	
37.	
38.	
39.	
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41.	
42.	
43.	
44.	
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United States of America

Department of Terra Firma



Application for Distribution

Pad Permit - Form DP.03

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form DP.01 for Permit

Name & Number of Connected Valves:	Required Water Volume:
03. 07.01	NONE → FIRE
04. 06.04	33,560 m ³
05. 06.03	16,780 m ³
06.	
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Department of Terra Firma

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Application for Distribution

Pad Permit - Form DP.03

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

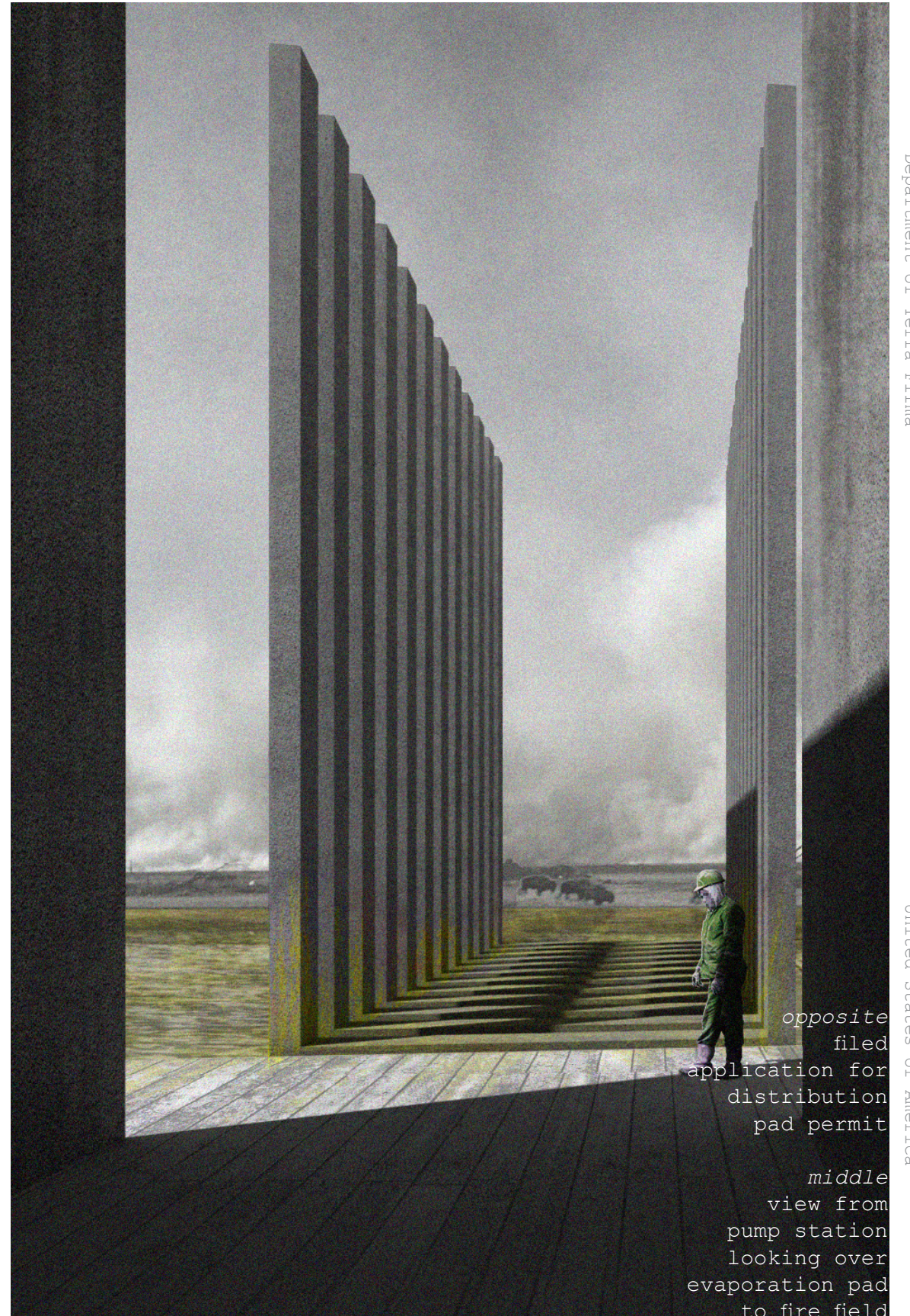
Attach to Form DP.01 for Permit

Name & Number of Connected Valves:	Required Water Volume:
27.	
28.	
29.	
30.	
31.	
32.	
33.	
34.	
35.	
36.	
37.	
38.	
39.	
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50.	

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Department of Terra Firma

0145



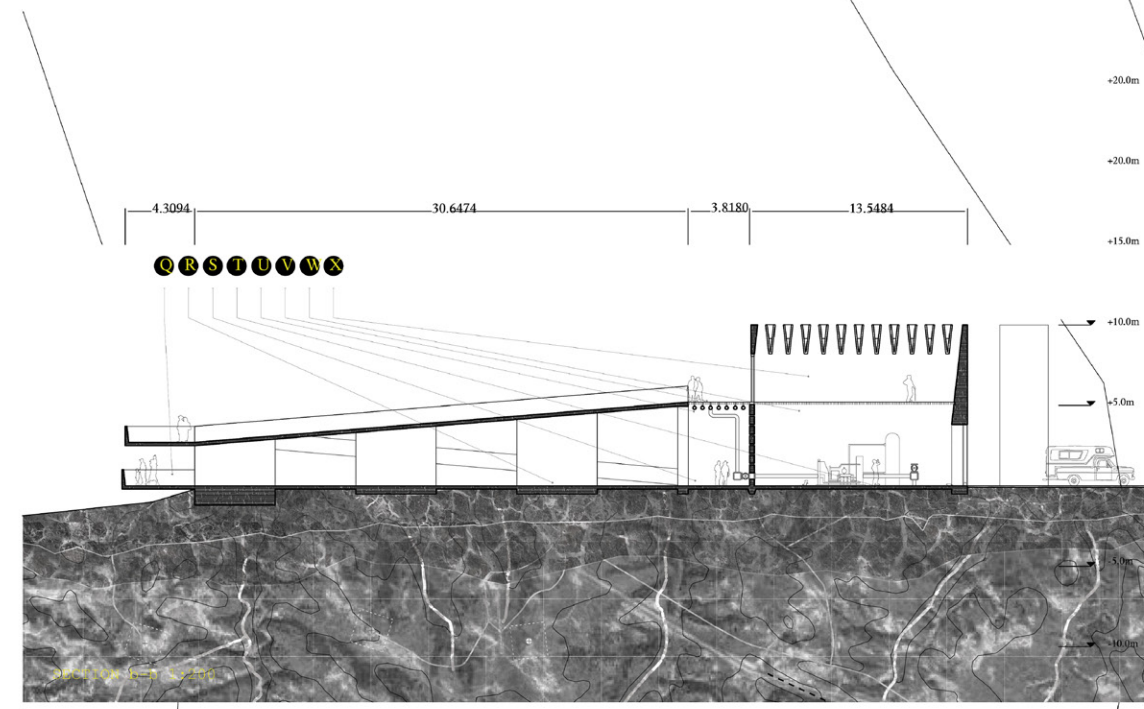
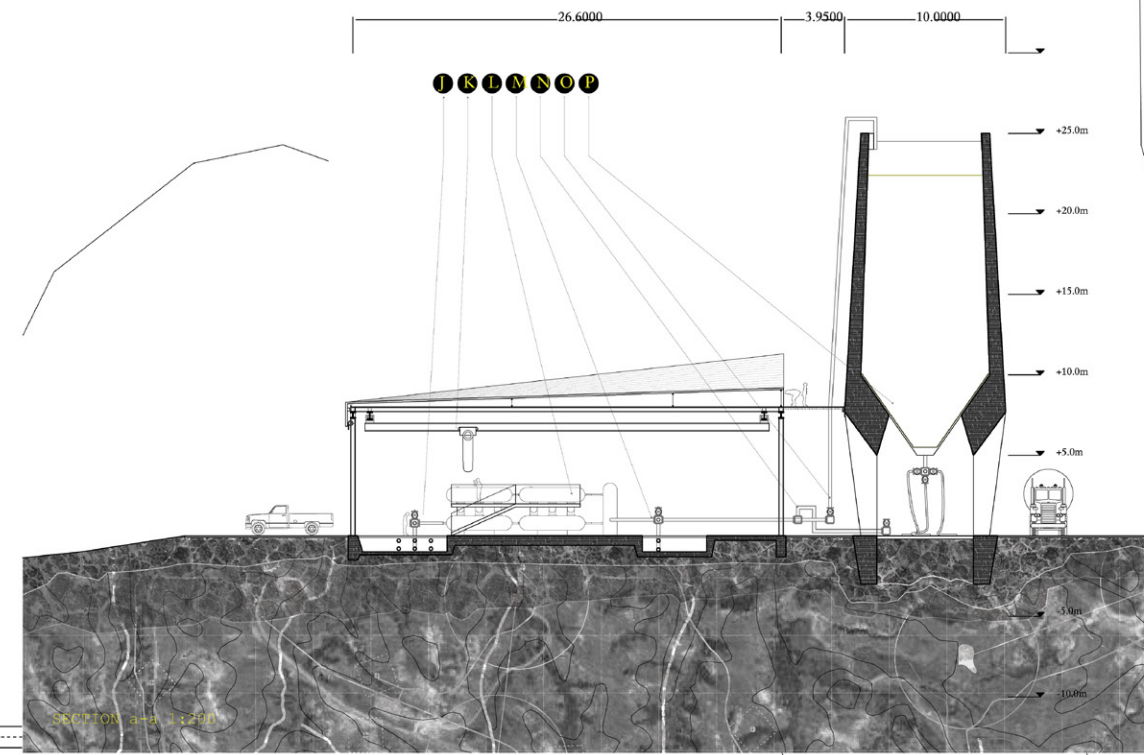
*opposite
filed
application for
distribution
pad permit

middle
view from
pump station
looking over
evaporation pad
to fire field*

Department of Terra Firma

United States of America

Picturesque Prairies **E01: Distribution Pad**

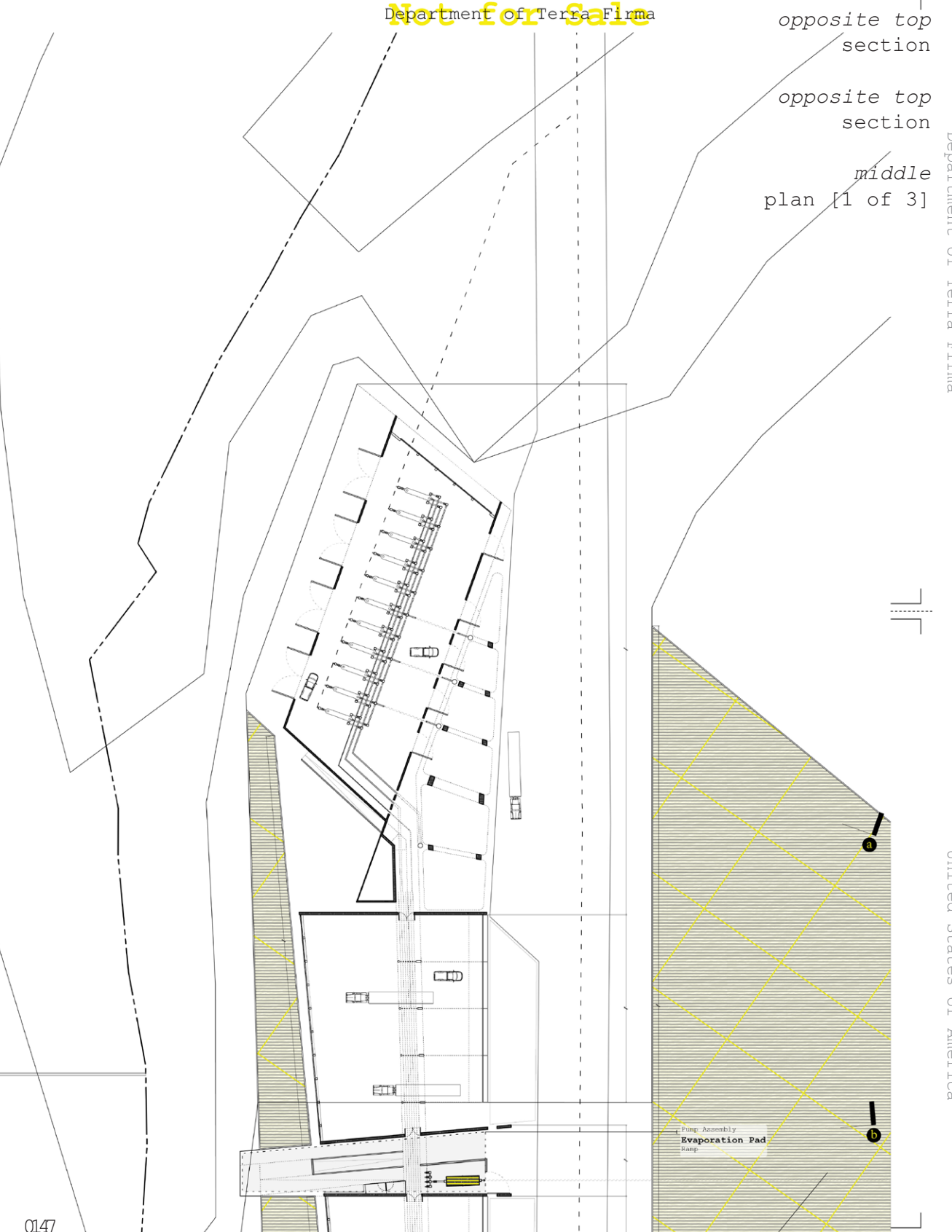


Department of Terra Firma
Not for Sale

opposite top section

opposite top section

middle plan [1 of 3]



Department of Terra Firma

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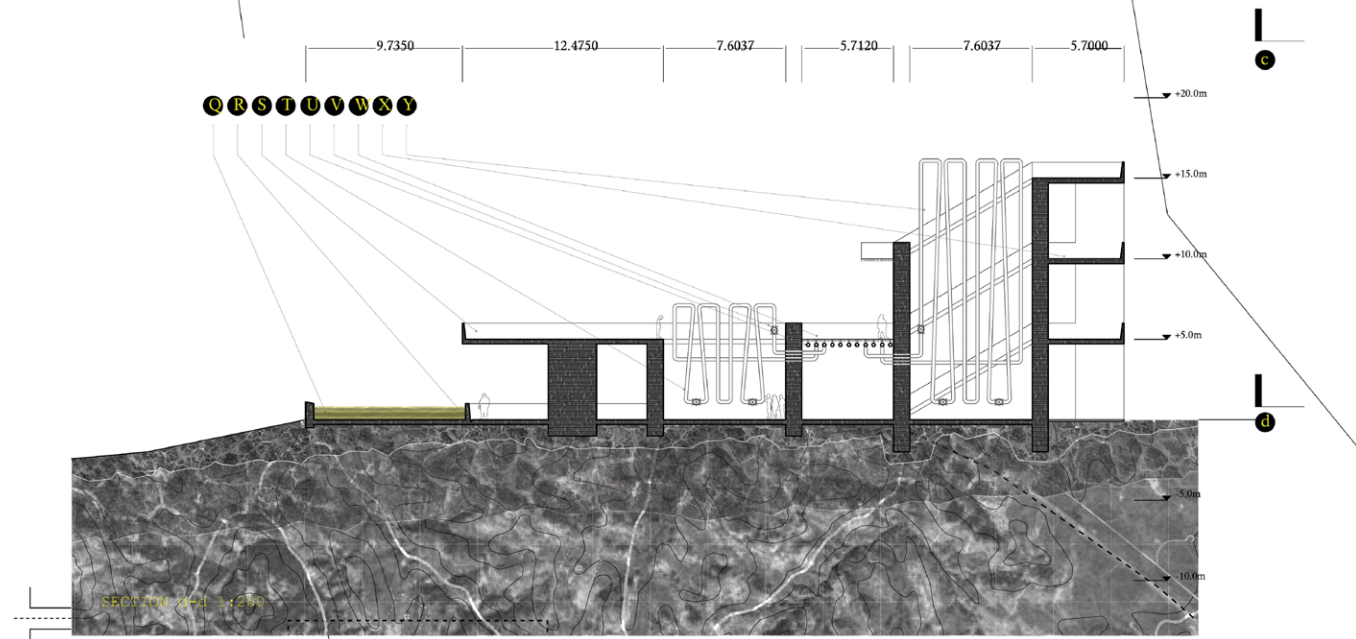
Department of Terra Firma

Notes:

middle
section

opposite
plan [2 of 3]

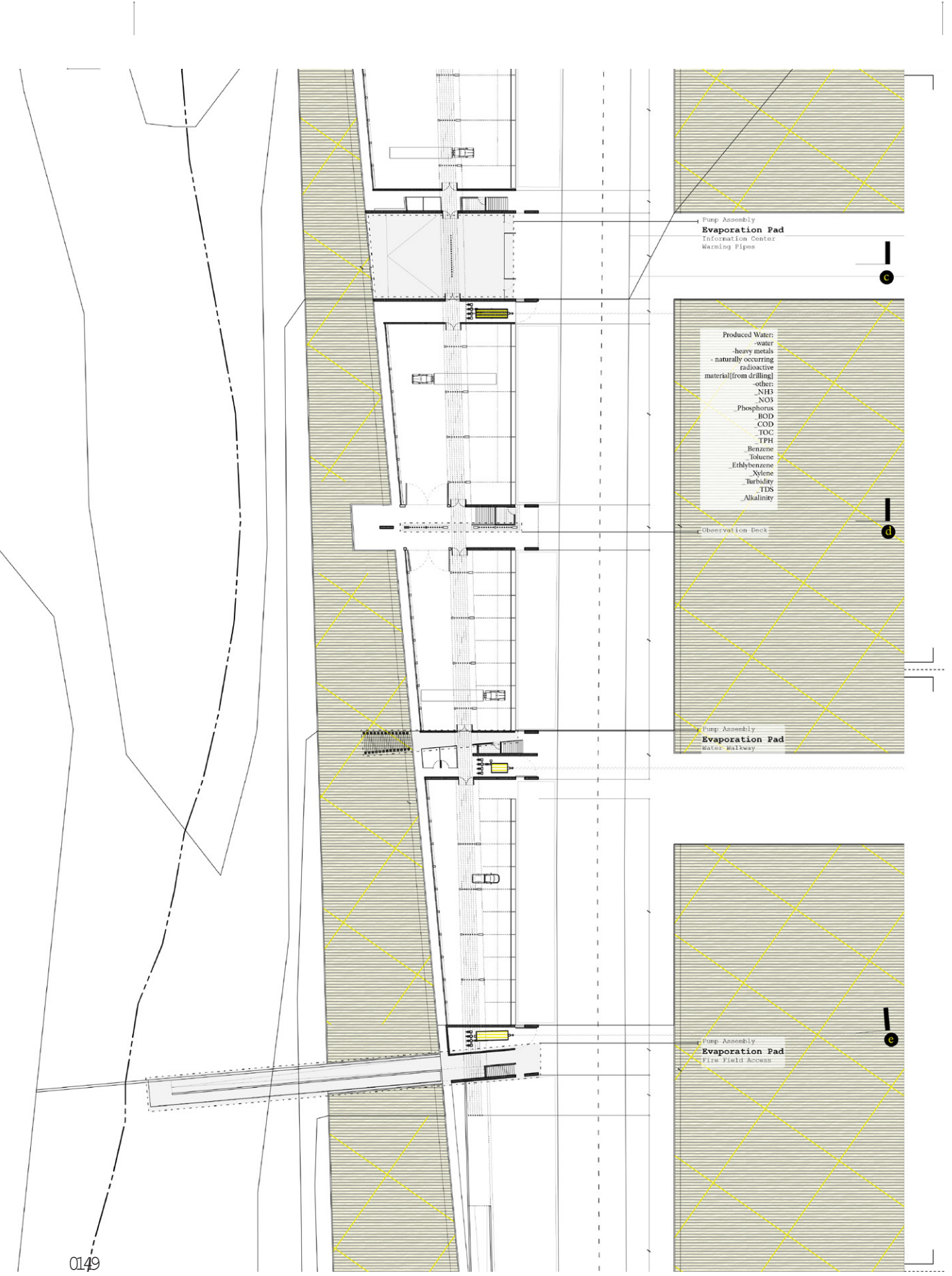
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0149



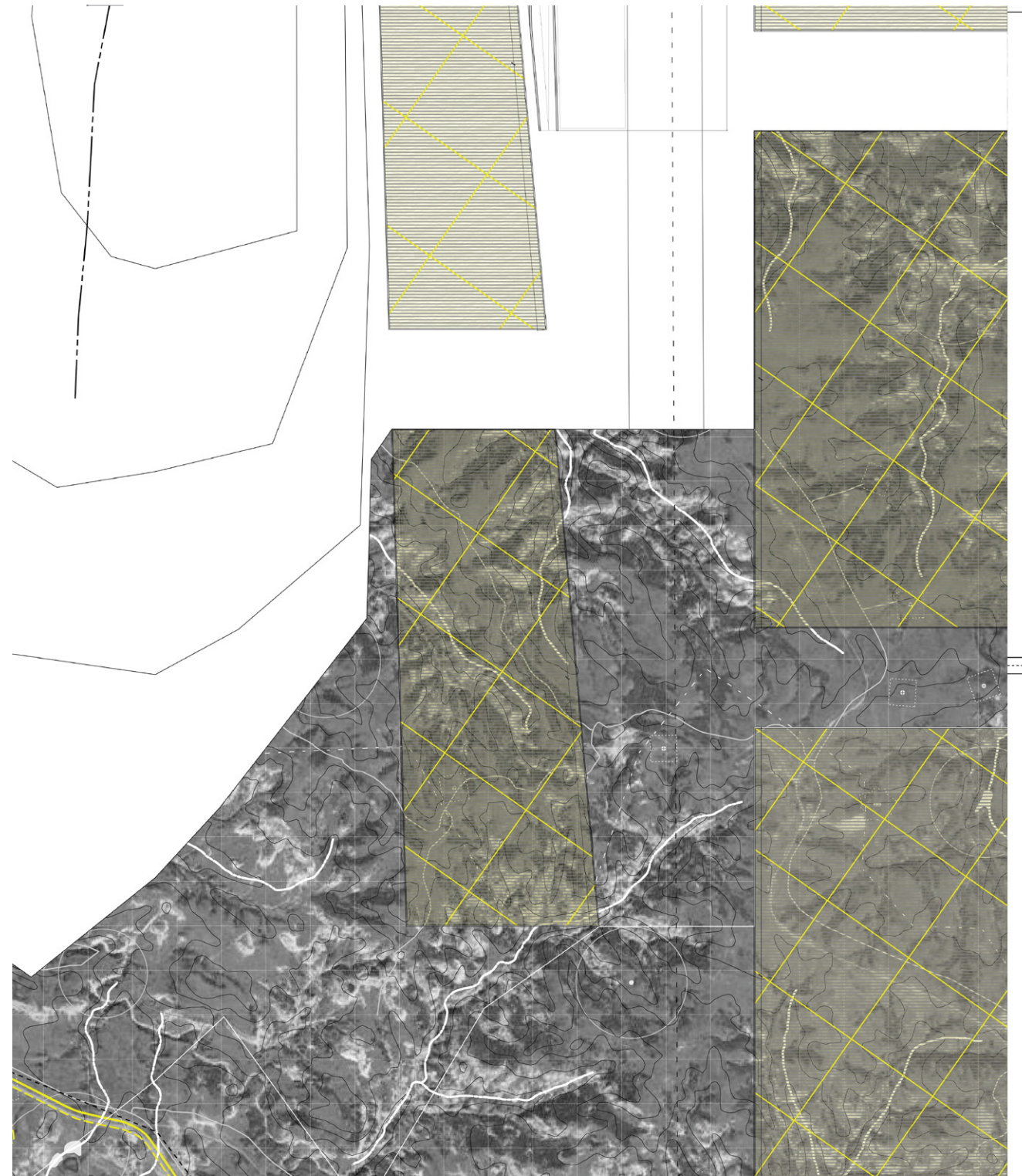
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The distribution pads are located inside the Maah Daah Prairie in an attempt to locally contain most of the materials from the drilling process. Before the Department of Terra Firma, most resources including waste were transported via tractor trailer off site to recycle or disposal facilities. Before transportation, separating and distributing the extracted resources was typically done on site.

Distribution pads are equipped with pumps, separation tanks and evaporation pads in order to thoroughly separate and distribute the extracted material. The pads need flat areas for evaporation, so they are typically located outside of the tributaries and scenic areas. Because burning tallgrass requires a similar terrain, the two programs are typically located next to one another and share resources like water and pumps.

The burnt fields attract large populations of bison after the burning, so observation stations are interwoven within the distribution pad so that humans can not only view the bison but also celebrate the burning of the fields.

opposite
plan [3 of 3]



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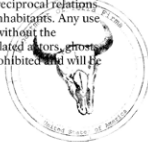
Department of Terra Firma

Department of Terra Firma

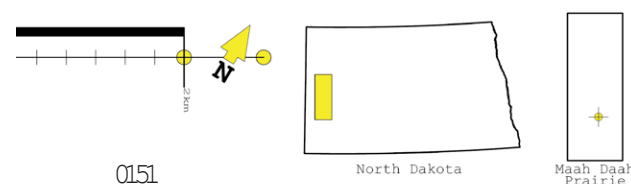
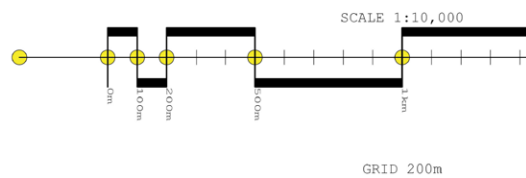
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**Plains to Ports
Partnership**
Maah Daah Prairie



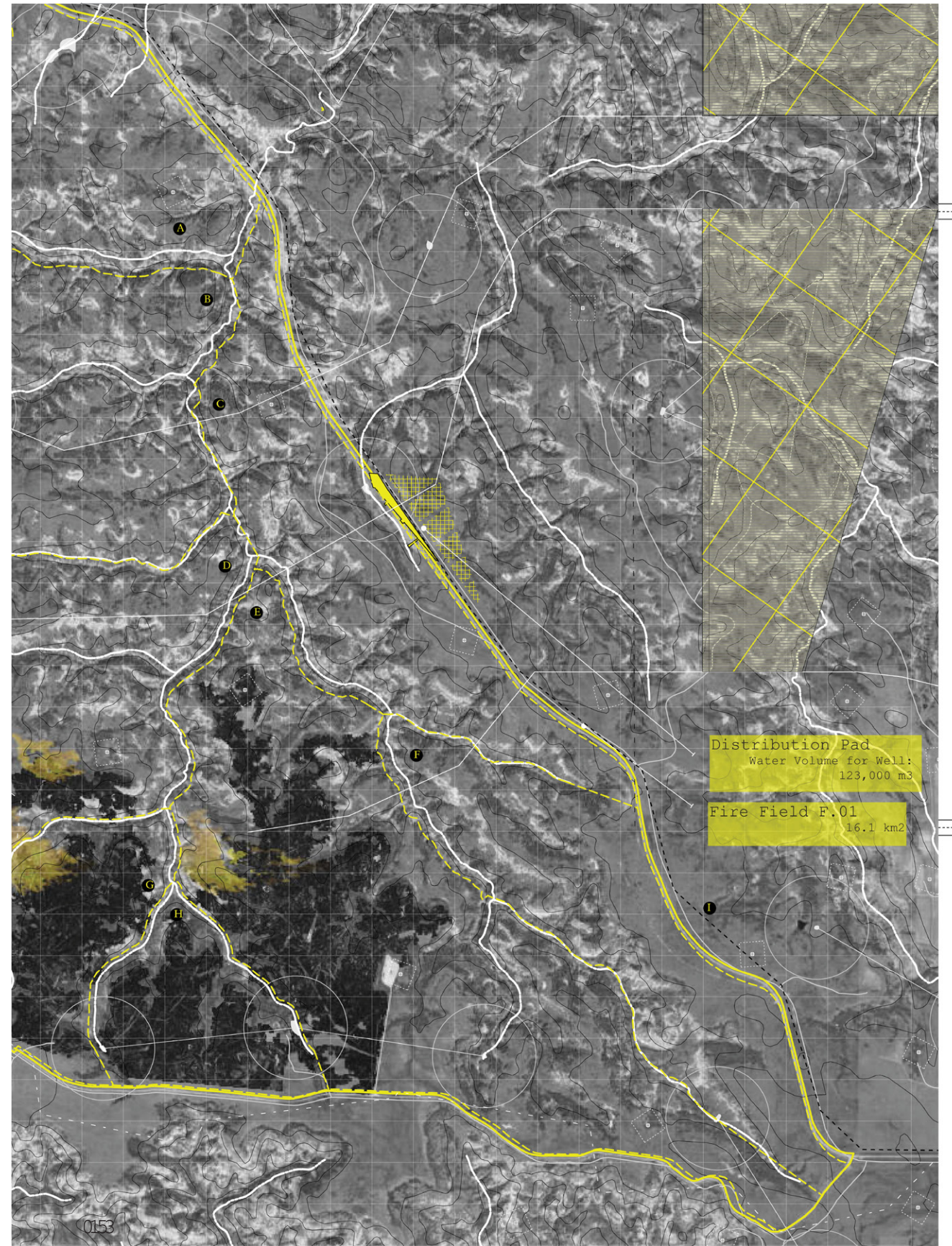
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Department of Terra Firma

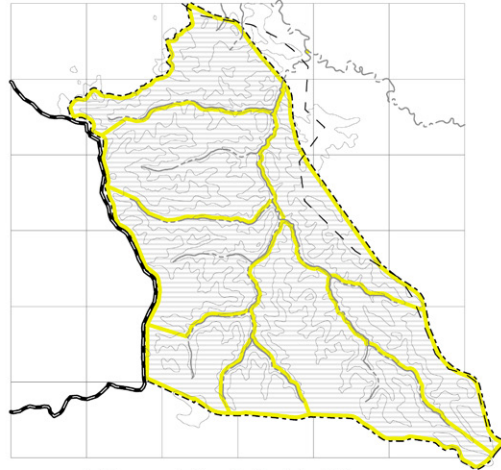


Department of Terra Firma

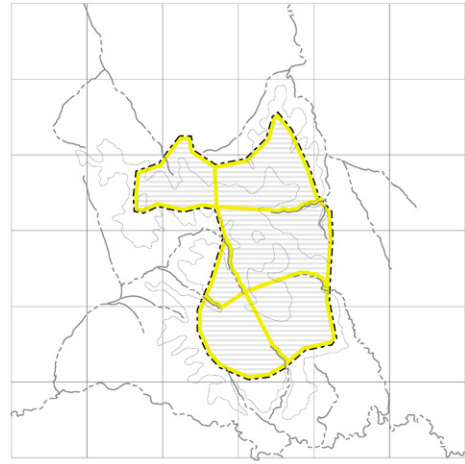
United States of America



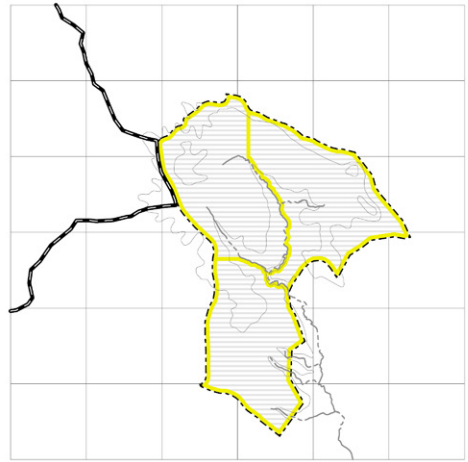
United States of America



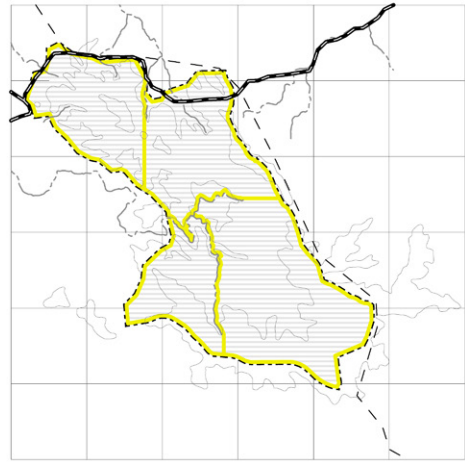
Fire Field F.01
Number of Cells: 08
Area: 16.. km2



Fire Field F.02
Number of Cells: 06
Area: 5.2 m2



Fire Field F.03
Number of Cells: 03
Area: 7.0 m2

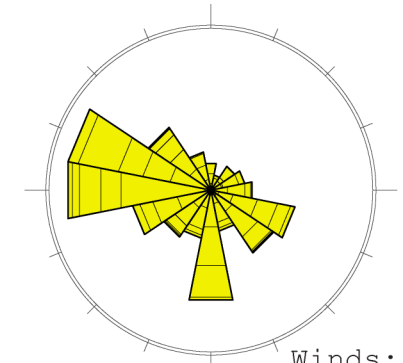


Fire Field F.04
Number of Cells: 04
Area: 9.0 m2

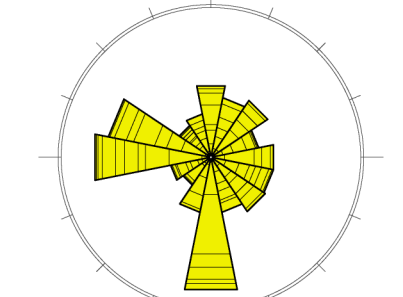
Department of Terra Firma

There is only a small seasonal window in which fields can be safely burned. The wind direction during these months is extremely important because it will dictate how the fire moves across the field. Each fire field is compartmentalized so reduce the chance of the fire growing too large.

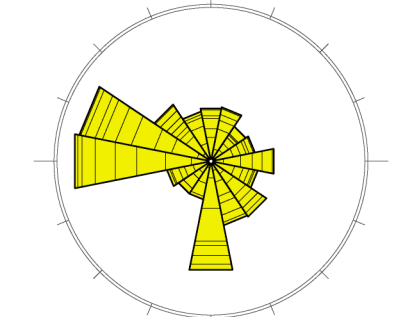
Burning is a common practice in many farms along the corridor, but has been restricted in areas focused on preservation and conservation. Within the Department of Terra Firma, burning is understood as a common practice in order to encourage the growth of tallgrass instead of other flora that are not as successful in the region.



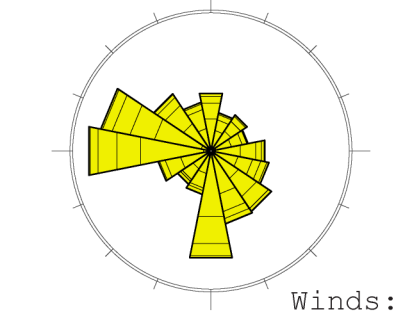
Winds: MARCH



Winds: APRIL



Winds: MAY



Winds: JUNE

Department of Terra Firma

United States of America

opposite
fire fields in
Maah Daah
Prairie

right
wind direction
in summer
months

United States of America

Department of Terra Firma

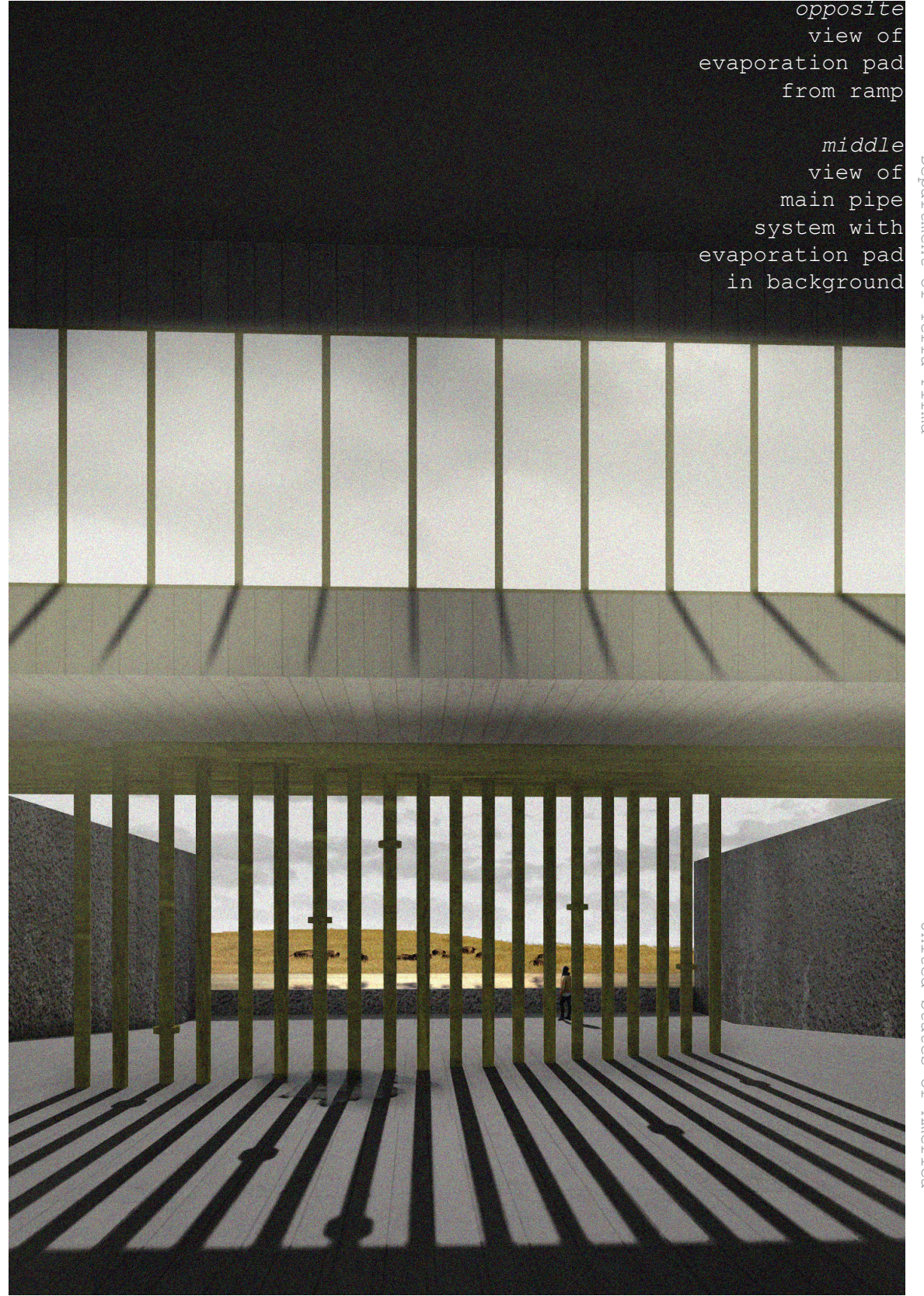


opposite
view of
evaporation pad
from ramp

middle
view of
main pipe
system with
evaporation pad
in background

Department of Terra Firma

United States of America



United States of America

Department of Terra Firma

Picturesque Prairies

*productive preservation
on a petroleum planet*



Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Bibliography

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Department of Terra Firma

United States of America

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Picturesque Prairies

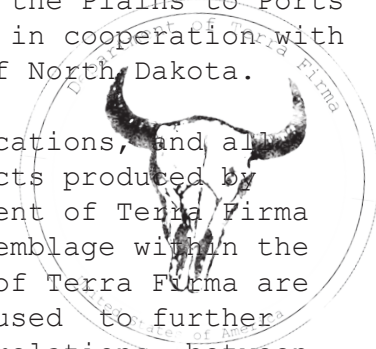
*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Appendix A - Applications

These applications were produced, edited and printed by the U.S. Department of Terra Firma under the Plains to Ports Partnership in cooperation with the state of North Dakota.

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Application for Valve Permit - Form V.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

United States of America

Department of Terra Firma

Valve Type:	Earth	Stone	Cutting	Concrete
Operator:	Telephone:			
Address:	City:	State:		
Partnership Sponsor[s]:				
Valve Name:	Valve Number:	Tributary:		
Latitude:	Longitude:			
Height:	Top Layer:	Slope:		
Water Available[Average]:			Domain of Years:	
Number of Groins:		Proposed Wetland Area:		
Proposed Observation Area:			Description:	
Is the proposed valve connected to a trail/road? Y / N				
Name & Number of Supported Well Ports:			Required Water Volume:	
Total Number of Supported Well Ports:			Total Water Volume:	

Department of Terra Firma

United States of America



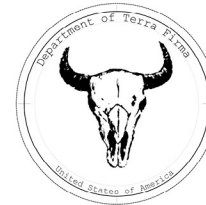
Application for Valve Permit - Form V.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

United States of America

Department of Terra Firma

Name & Number of Supported Distribution Pads:	Required Water Volume:
Total Number of Supported Well Ports:	Total Water Volume:
Combined Total Water Volume:	
Area Reserved for Sediment Redistribution:	
Comments:	
<i>I hereby swear or affirm the information provided is true, complete and correct as determined from all available records; and I commit my self above all else to the partnership to which this application binds me.</i>	
Signature:	Printed Name:
Date:	
Email Address:	
For Department Use Only	
Permit and File Number:	Pool:
Date Approved:	By:
	Partnership:



Application for Well Port Permit - Form WP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Department of Terra Firma

United States of America

Well Types:	New	Converted	P.W.Storage:	Y / N
Operator:	Telephone:			
Address:	City:	State:		
Partnership Sponsor[s]:				
Port Name:	Port Number:	Well Count:		
Latitude:	Longitude:			
Height:	Radius:	Tank Count:		
Fresh Water Storage:		Fuel Storage:		
Snow Fence Length:		Proposed Wallow Area:		
Proposed Observation Area:		Description:		
Is the proposed valve connected to a trail/road?				Y / N
Name & Number of Supported Wells:	Depth:	Reach:		
01.				
02.				
03.				
04.				
05.				
06.				
07.				
08.				
<i>Continue List on Form WP.02 and Attach for Permit</i>				
Total Number of Supported Wells:		Accumulated Reach:		



Application for Valve Permit - Form WP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

United States of America

Department of Terra Firma

Lowest Fresh Water Formation:		Depth to Base:	
Proposed Surface Casing Depth:	Radius:	Vol.:	
Proposed Longstring Casing Depth:	Radius:	Vol.:	
Number of Pumps:	Number of Manifolds:		
Estimated Average Injection Rate:			
Estimated Maximum Injection Rate:			
Number of Tanks without Engine Deck:			
Number of Line Heaters:	Fueled by Extraction:	Y / N	
Estimated Temperature [C] of Tank Surface:		Months:	
Total Annual Produced Water Volume:			
Total Annual Fresh Water Volume:			
Name & Number of Required Distribution Pads:		Annual Water Volume:	
Comments:			
<p><i>I hereby swear or affirm the information provided is true, complete and correct as determined from all available records; and I commit my self above all else to the partnership to which this application binds me.</i></p>			
Signature:	Printed Name:	Date:	
Email Address:			
For Department Use Only			
Permit and File Number:		Pool:	
Date Approved:	By:	Partnership:	



Application for Well Port Permit - Form WP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Department of Terra Firma

United States of America

<i>Attach to Form WP.01 for Permit</i>		
Name & Number of Supported Wells:	Depth:	Reach:
09.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		
29.		
30.		
31.		
32.		



Application for Well Port Permit - Form WP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

United States of America

Department of Terra Firma

Attach to Form WP.01 for Permit

Name & Number of Supported Wells:	Depth:	Reach:
33.		
34.		
35.		
36.		
37.		
38.		
39.		
40.		
41.		
42.		
43.		
44.		
45.		
46.		
47.		
48.		
49.		
50.		
51.		
52.		
53.		
54.		
55.		
56.		



Application for Distribution Pad Permit - Form DP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Department of Terra Firma

United States of America

Main Source of Separation:		
Operator:	Telephone:	
Address:	City:	State:
Partnership Sponsor[s]:		
Pad Name:	Pad Number:	
Latitude:	Longitude:	
Adjacent to Fire Field: Y / N	Field Name:	
Fresh Water Storage:	Produced Water Storage:	
Main Pipe Length:	Proposed Wallow Area:	
Proposed Observation Area:	Description:	
Is the proposed valve connected to a trail/road? Y / N		
Name & Number of Supported Well Ports:	Well Count:	
01.		
02.		
03.		
04.		
05.		
06.		
07.		
08.		
<i>Continue List on Form DP.02 and Attach for Permit</i>		
Total Number of Supported Well Ports:	Accumulated Wells:	



Application for Distribution

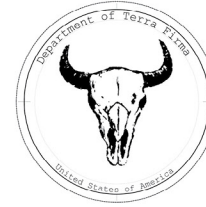
Pad Permit - Form DP.01

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

United States of America

Name & Number of Connected Valves:		Required Water Volume:	
01.			
02.			
<i>Continue List on Form DP.03 and Attach for Permit</i>			
Total Number of Supported Well Ports:		Total Water Volume:	
Number of Pumps:	Fueled by Extraction: Y / N		
Number of Separation Tanks:	Fueled by Extraction: Y / N		
Number of Evaporation Pads:	Total Area:		
Additional Facilities within Main Pipe: Y / N List Below:			
Area Reserved for Sediment Redistribution:			
Comments:			
<i>I hereby swear or affirm the information provided is true, complete and correct as determined from all available records; and I commit my self above all else to the partnership to which this application binds me.</i>			
Signature:	Printed Name:	Date:	
Email Address:			
For Department Use Only			
Permit and File Number:		Pool:	
Date Approved:	By:	Partnership:	

Department of Terra Firma



Application for Distribution

Pad Permit - Form DP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Department of Terra Firma

<i>Attach to Form DP.01 for Permit</i>	
Name & Number of Supported Well Ports:	Well Count:
09.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	
21.	
22.	
23.	
24.	
25.	
26.	
27.	
28.	
29.	
30.	
31.	
32.	

United States of America



Application for Distribution

Pad Permit - Form DP.02

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form DP.01 for Permit

Name & Number of Supported Well Ports:	Well Count:
33.	
34.	
35.	
36.	
37.	
38.	
39.	
40.	
41.	
42.	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	
51.	
52.	
53.	
54.	
55.	
56.	

United States of America

Department of Terra Firma



Application for Distribution

Pad Permit - Form DP.03

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form DP.01 for Permit

Name & Number of Connected Valves:	Required Water Volume:
03.	
04.	
05.	
06.	
07.	
08.	
09.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
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18.	
19.	
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24.	
25.	
26.	

Department of Terra Firma

United States of America



Application for Distribution

Pad Permit - Form DP.03

Department of Terra Firma
Plains to Ports Partnership
Bureau of Responsibility
600 East Boulevard
Bismark ND, 58505-0840

Attach to Form DP.01 for Permit

United States of America

Department of Terra Firma

Department of Terra Firma

United States of America

Name & Number of Connected Valves:	Required Water Volume:
27.	
28.	
29.	
30.	
31.	
32.	
33.	
34.	
35.	
36.	
37.	
38.	
39.	
40.	
41.	
42.	
43.	
44.	
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47.	
48.	
49.	
50.	

United States of America

Department of Terra Firma

Picturesque Prairies

*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Appendix B - Boards

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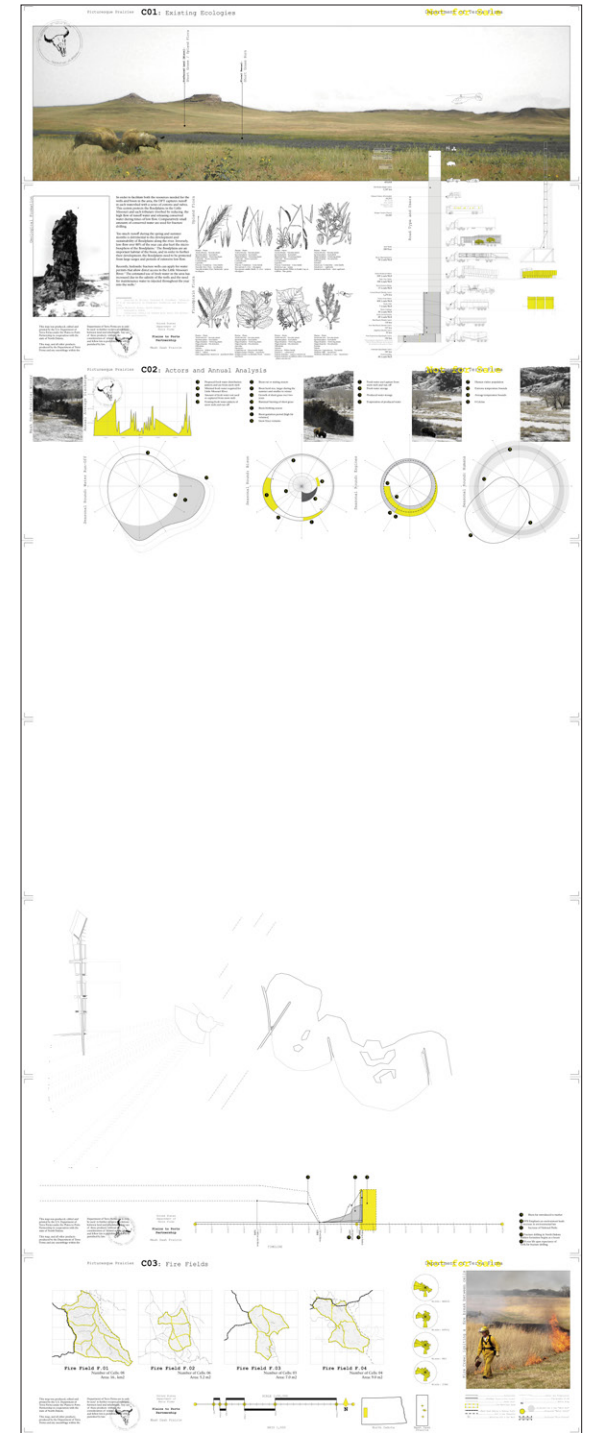
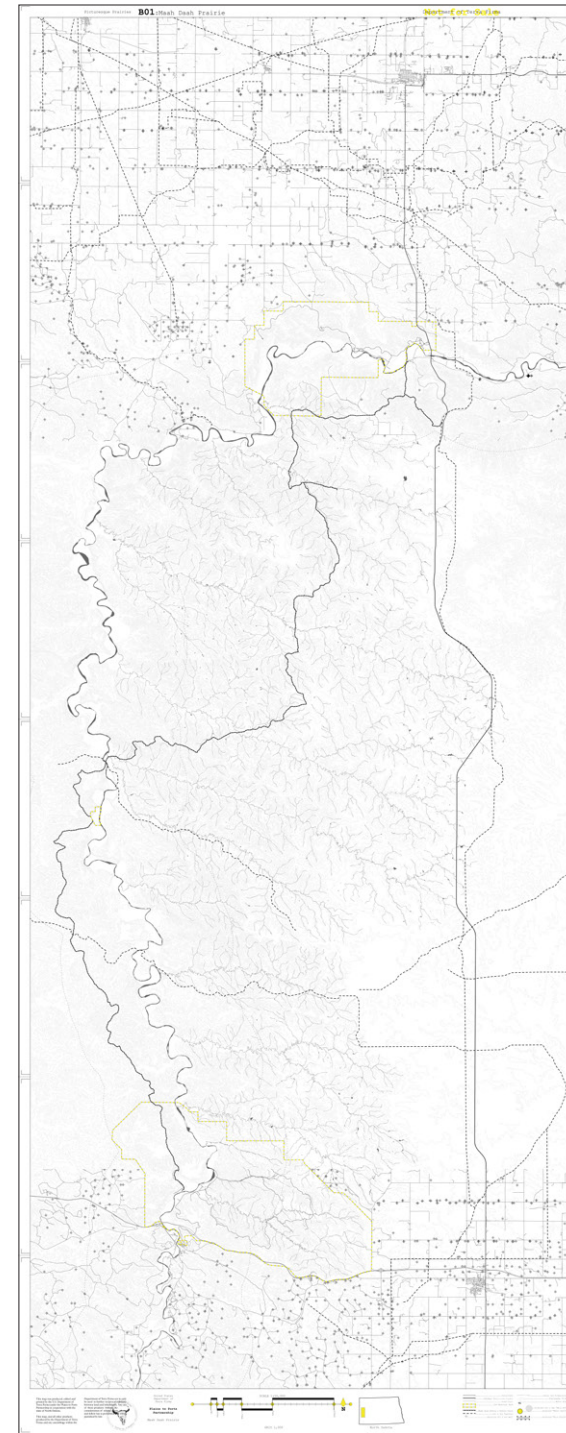
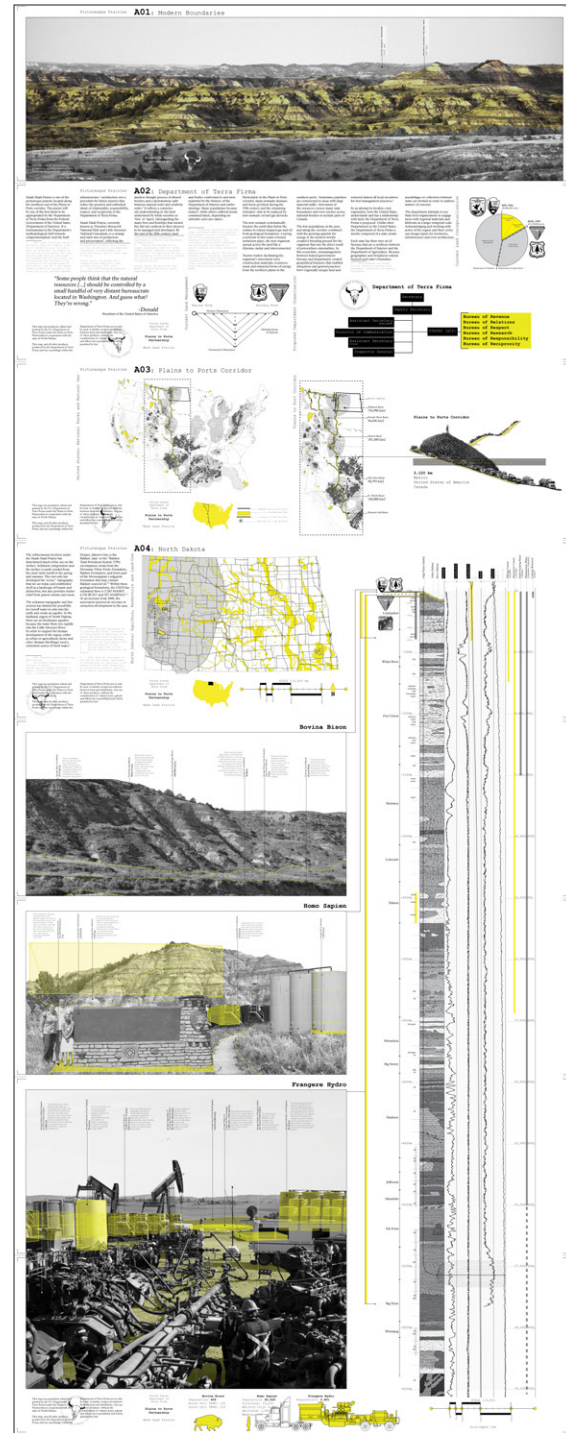
Department of Terra Firma

United States of America

right
A series;
introduction to
Department of
Terra Firma,
Plains to Ports
Corridor and
actors

opposite left
B series; Maah
Daah Prairie
base map used
for projection

opposite right
C series;
Maah Daah
Prairie
interpretation
and seasonal
round base used
for projection



United States of America

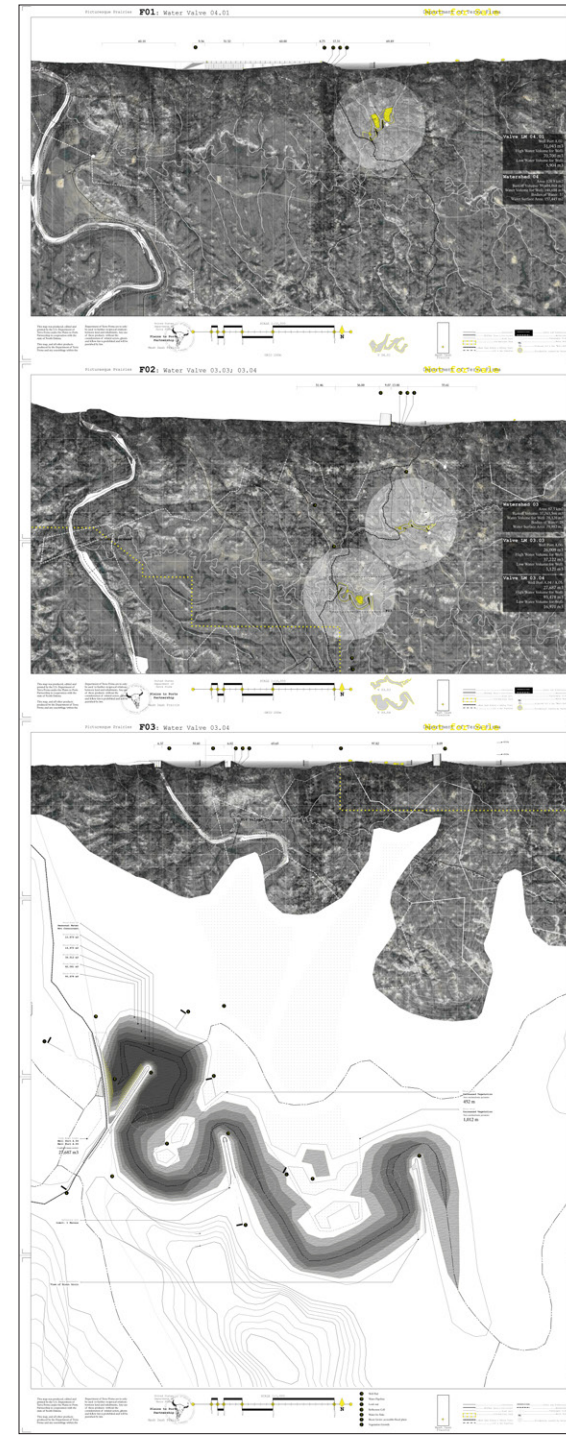
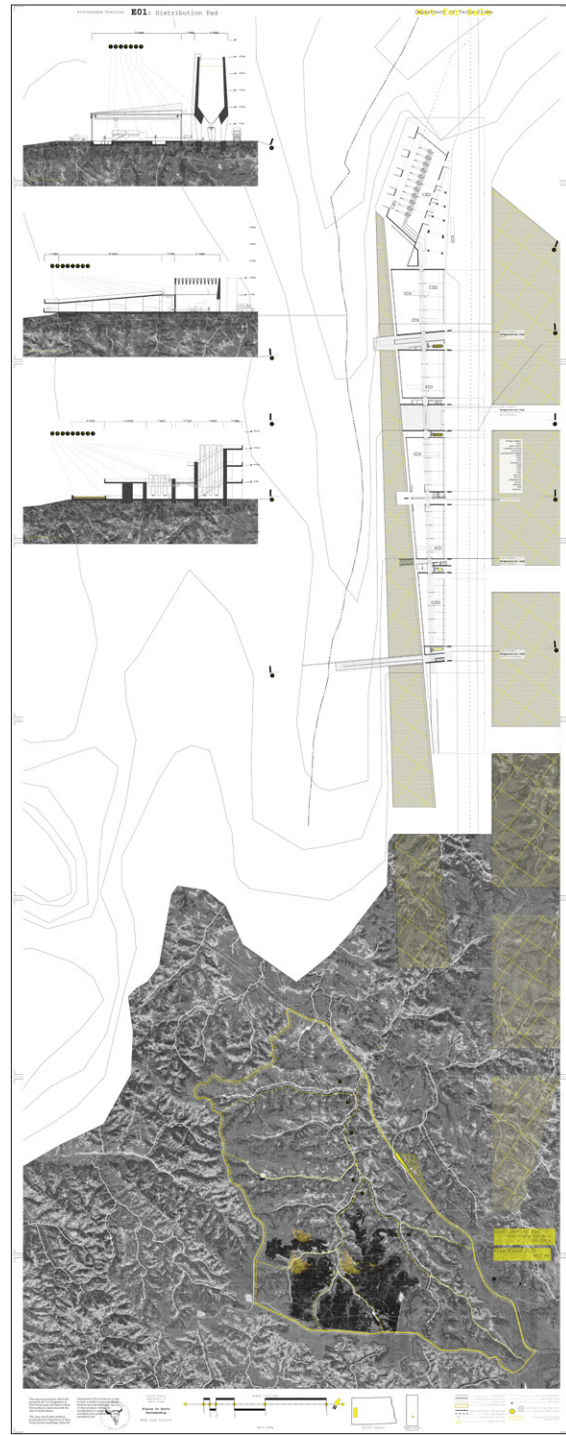
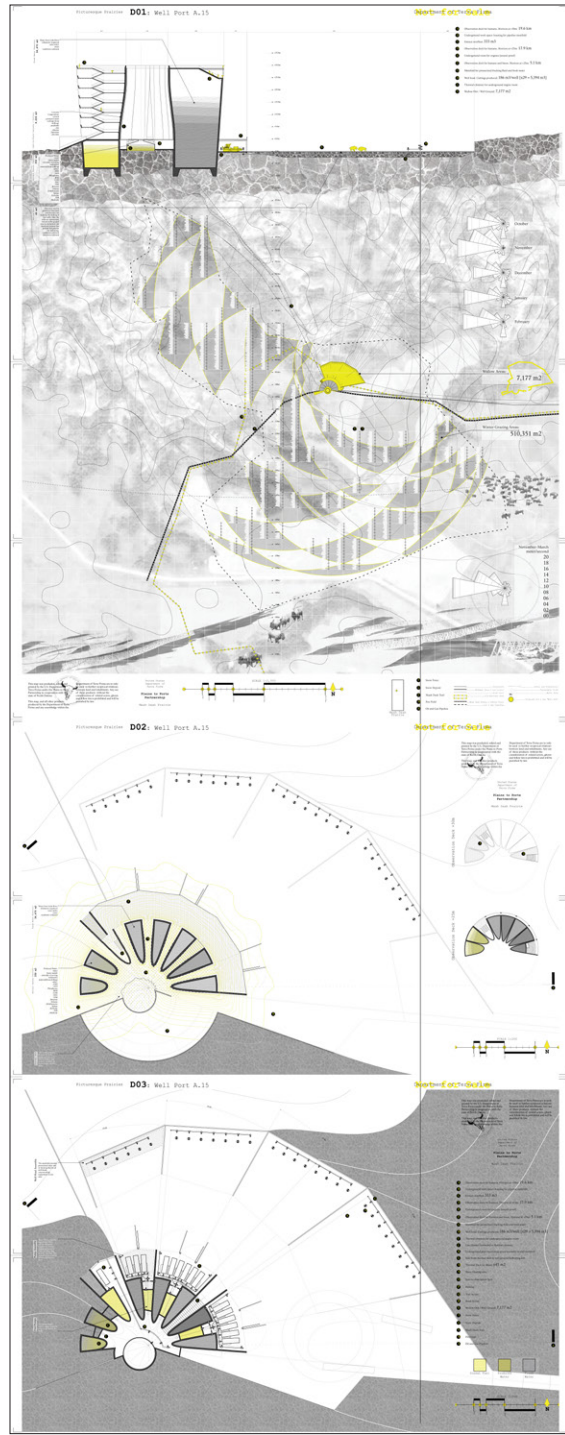
Department of Terra Firma

Department of Terra Firma

United States of America

United States of America

Department of Terra Firma



opposite left
D series;
well port proposal

opposite right
E series;
distribution pad proposal

left
F series;
valve proposal

following
opposite top
presentation
with projector

following
opposite bottom
presentation
with projector

following
middle
topography
model and A
series

Department of Terra Firma

United States of America

United States of America



Department of Terra Firma



Department of Terra Firma



United States of America

United States of America

Department of Terra Firma

Picturesque Prairies

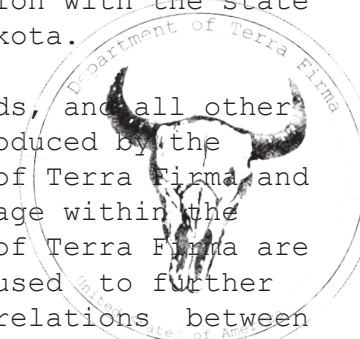
*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Appendix L - Legends

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of these products without
the consideration of related
actors, ghosts and fellow kin
is prohibited and will be
punished by law.



Department of Terra Firma

United States of America

United States of America

Department of Terra Firma

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

Legend:
 - Highway (lane to lane corridor)
 - Old National Park
 - Plains to Ports Corridor
 - Existing Oil & Gas Reserves

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:2,000 km

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

Bovina Bison
Population: 400
North Unit TRNP: 150
South Unit TRNP: 250

Homo Sapien
Population: 30,520
Dickinson: 23,000
Watford City: 6,000
Belfield: 1,000
Medora: 132

Frangere Hydro
Population: 3,801

SCALE 1:5,000

Grid Depth 10m

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:50,000

GRID 1,000

North Dakota

Legend:
 - Interstate
 - Highway (lane to lane corridor)
 - Road (one)
 - Old National Park
 - Maah Daah Biking & Biking Trail
 - Oil & Gas Pipeline
 - Existing Oil & Gas Well
 - River and Tributaries
 - Topography (+5m)
 - Water Body
 - Proposed Oil & Gas Well Path
 - Proposed Water Valve
 - Proposed Fire Field

Department of Terra Firma

United States of America

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:50,000

GRID 1,000

North Dakota

Maah Daah Prairie

Legend:
 - Interstate
 - Highway (lane to lane corridor)
 - Road (one)
 - Old National Park
 - Maah Daah Biking & Biking Trail
 - Oil & Gas Pipeline
 - Existing Oil & Gas Well
 - River and Tributaries
 - Topography (+5m)
 - Water Body
 - Proposed Oil & Gas Well Path
 - Proposed Water Valve
 - Proposed Fire Field

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:2,000

Maah Daah Prairie

Legend:
 - Snow Fence
 - Snow Deposit
 - Maah Daah Trail
 - Fire Field
 - Oil and Gas Pipeline
 - Interstate
 - Highway (lane to lane corridor)
 - Road (one)
 - Old National Park
 - Maah Daah Biking & Biking Trail
 - Oil & Gas Pipeline
 - River and Tributaries
 - Topography (+5m)
 - Water Body
 - Proposed Oil & Gas Well Path
 - Proposed Water Valve
 - Proposed Fire Field

United States of America

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:10,000
GRID 200m

North Dakota
Maah Daah Prairie

- Interstate
- Highway (two to four lanes)
- Road (one)
- Old National Park
- Maah Daah Biking & Biking Trail
- Oil & Gas Pipeline
- Existing Oil & Gas Well
- Cooperation Pad
- River and Tributaries
- Topography +5.0m
- Water Body
- Proposed Oil & Gas Well Pad
- Proposed Water Valve
- Proposed "Fire Field" and Fire Wells

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:10,000
GRID 200m

V 03.03
V 03.04
Maah Daah Prairie

- Interstate
- Highway (two to four lanes)
- Road (one)
- Old National Park
- Maah Daah Biking & Biking Trail
- Oil & Gas Pipeline
- River and Tributaries
- Waterholes
- Topography +5.0m
- Water Body
- Proposed Oil & Gas Well Pad
- Floodplains created by Valves

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United States Department of Terra Firma
Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:10,000
GRID 200m

V 04.01
Maah Daah Prairie

- Interstate
- Highway (two to four lanes)
- Road (one)
- Old National Park
- Maah Daah Biking & Biking Trail
- Oil & Gas Pipeline
- River and Tributaries
- Waterholes
- Topography +5.0m
- Water Body
- Proposed Oil & Gas Well Pad
- Floodplains created by Valves

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Plains to Ports Partnership
Maah Daah Prairie

SCALE 1:1,000
GRID 200m

Maah Daah Prairie

- A Well Pad
- B Water Pipeline
- C Look out
- D Reflection Cell
- E Water In-Take
- F Bison Groom: accessible flood plain
- I Vegetation Growth

- Interstate
- Highway (two to four lanes)
- Road (one)
- Old National Park
- Maah Daah Biking & Biking Trail
- Oil & Gas Pipeline
- River and Tributaries
- Waterholes
- Topography +5.0m
- Water Body
- Floodplains created by Valves

Department of Terra Firma

United States of America

Picturesque Prairies

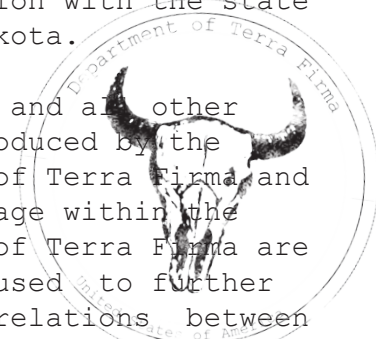
*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Appendix M - Map

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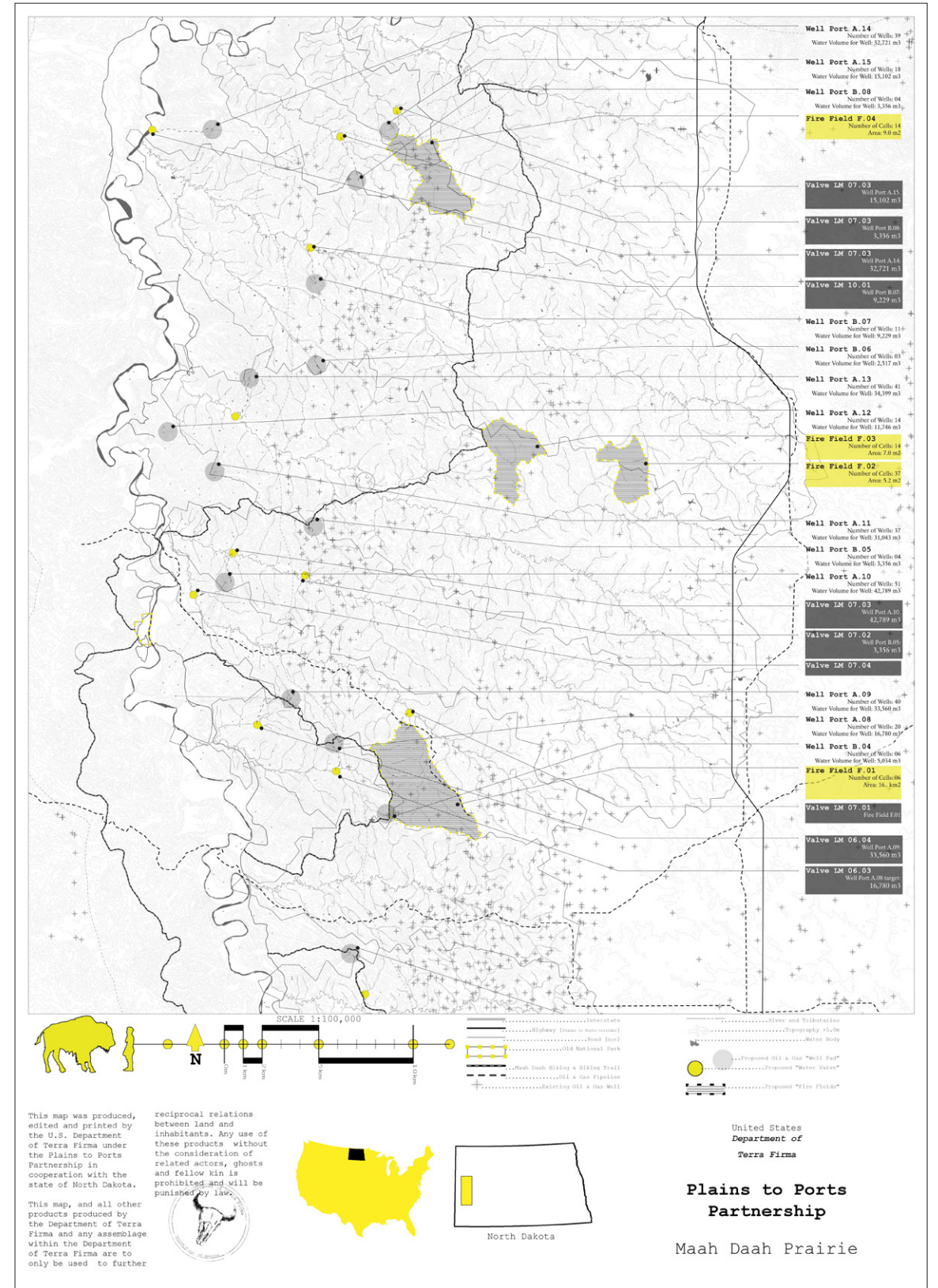
Department of Terra Firma

top
photo of critic
with map during
review

opposite
map-map side

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United States of America



United States of America

Department of Terra Firma



Maah Daah Prairie Actors



BISON



MOUNTAIN BIKER



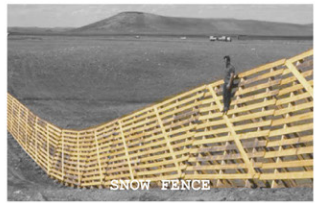
SILVER SAGEBRUSH



BLUE GRAMA



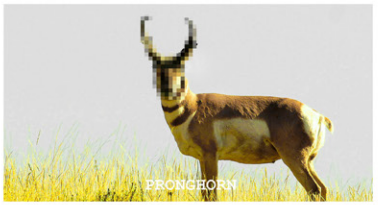
PRAIRIE DOG



SNOW FENCE



COTTONWOOD



PRONGHORN



TRAIL MANAGER



COWS



PUMP TRUCK



WESTERN MEADOWLARK



DERRICK



RECREATION VEHICLE



WELL HEAD



HIKER



SAGE GROUSE



WESTERN WHEATGRASS

Department of Terra Firma

United States of America

United States of America

Department of Terra Firma

Picturesque Prairies

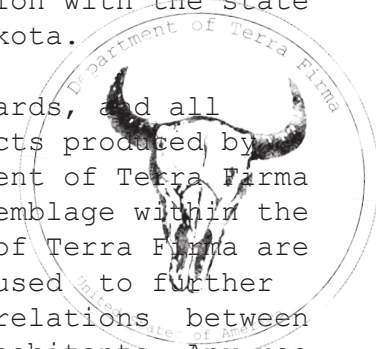
*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Appendix P - Postcards

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Four horizontal lines for an address, with a square box for a postage stamp in the top right corner.

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Department of Terra Firma

Four horizontal lines for an address, with a square box for a postage stamp in the top right corner.

Department of Terra Firma

Greetings from the Picturesque Plains!



United States of America

Greetings from the Picturesque Plains!



United States of America



Department of Terra Firma

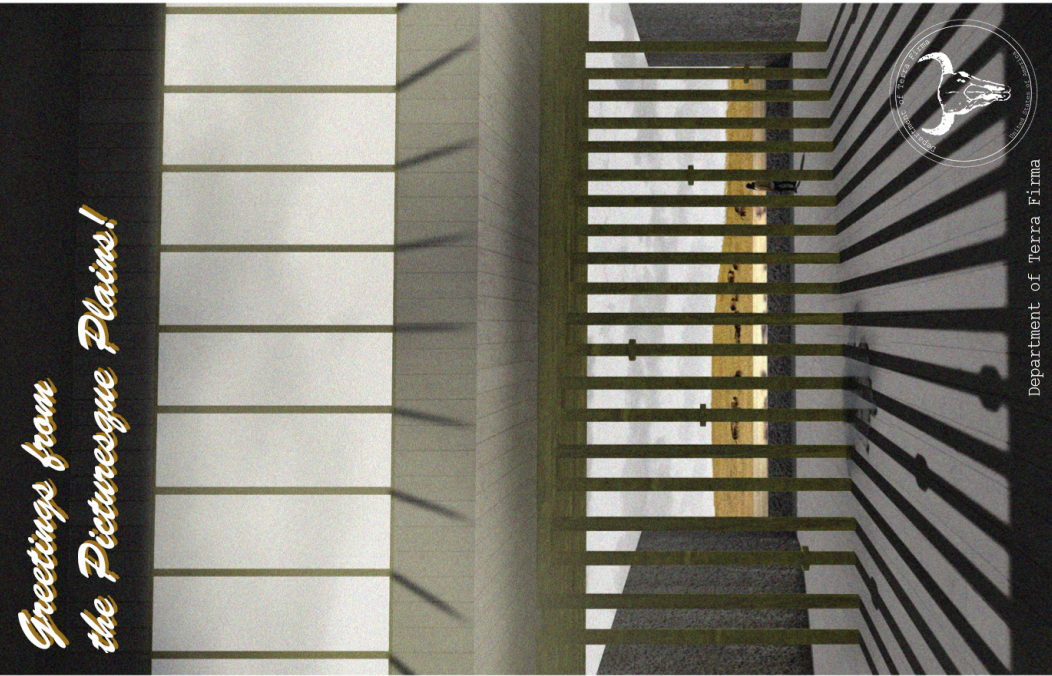
Four horizontal lines for an address, with a rectangular box to the right for a postage stamp.

Department of Terra Firma



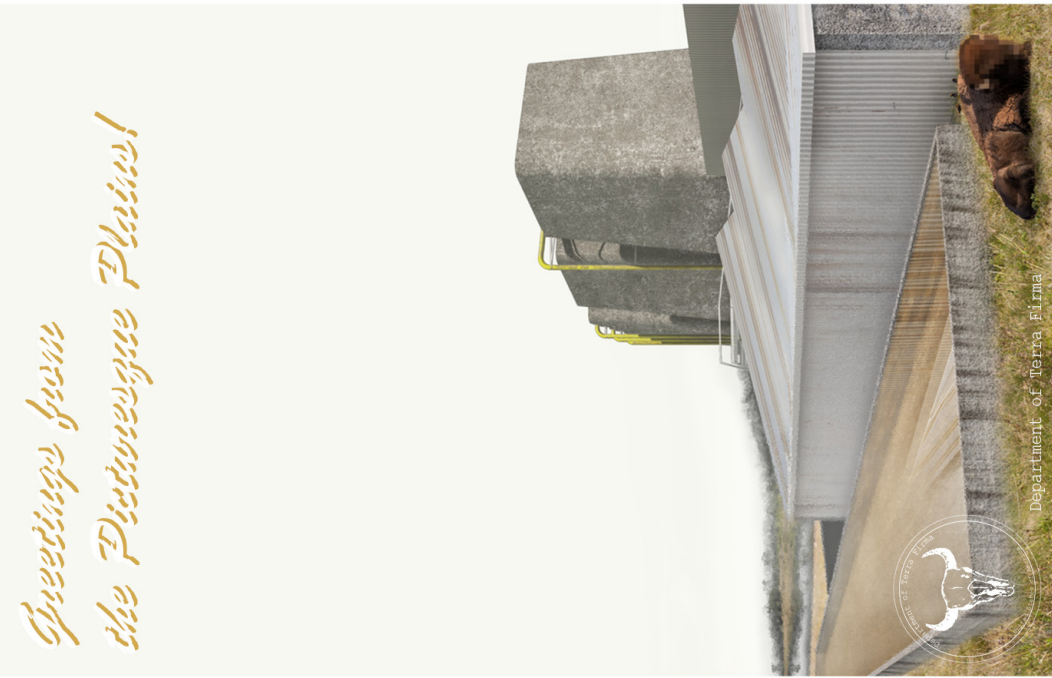
Department of Terra Firma

Four horizontal lines for an address, with a rectangular box to the right for a postage stamp.



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United States of America

United States of America



Department of Terra Firma

Four horizontal lines for an address, with a rectangular box for a postage stamp to the right.

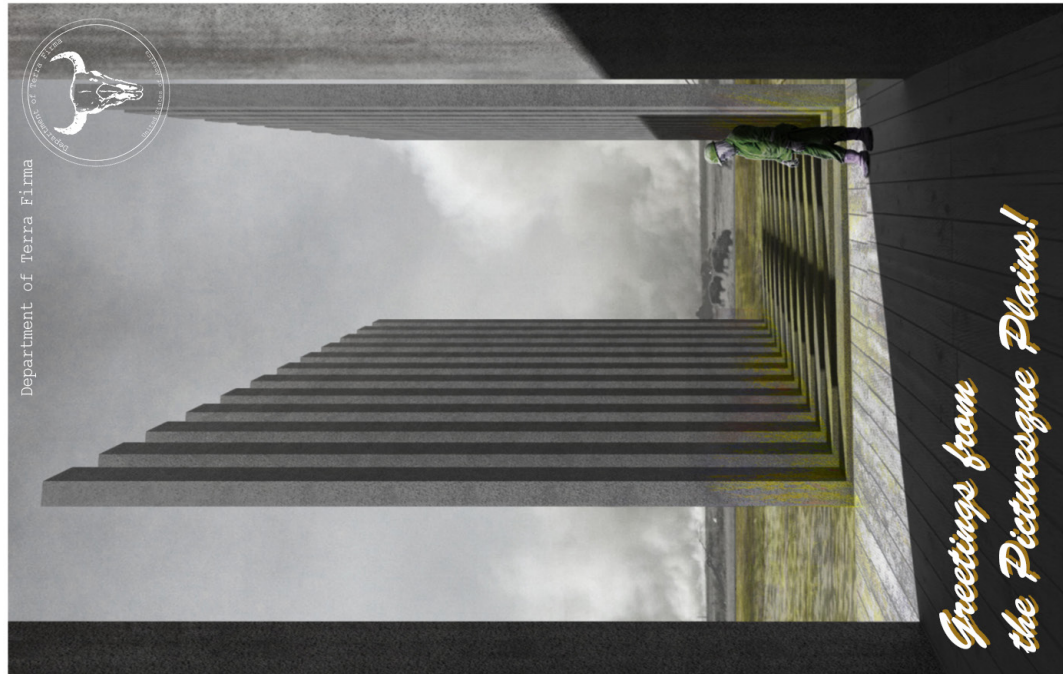
Department of Terra Firma



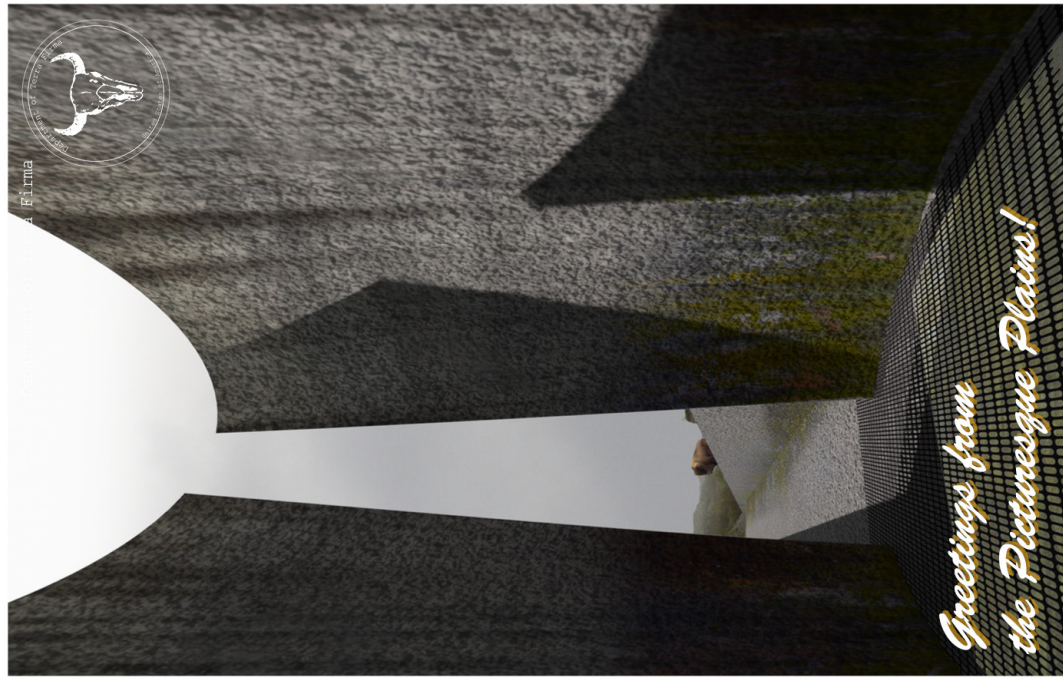
Department of Terra Firma

Four horizontal lines for an address, with a rectangular box for a postage stamp to the right.

Department of Terra Firma



United States of America



United States of America



Department of Terra Firma

Four horizontal lines for an address.

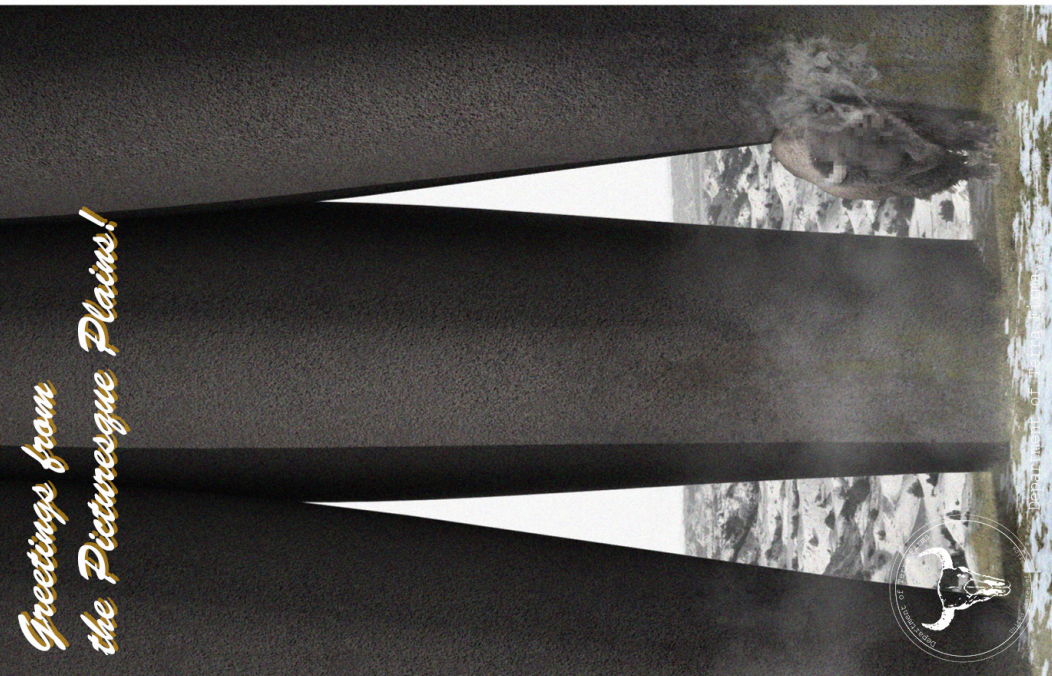
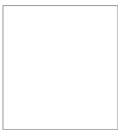


Department of Terra Firma

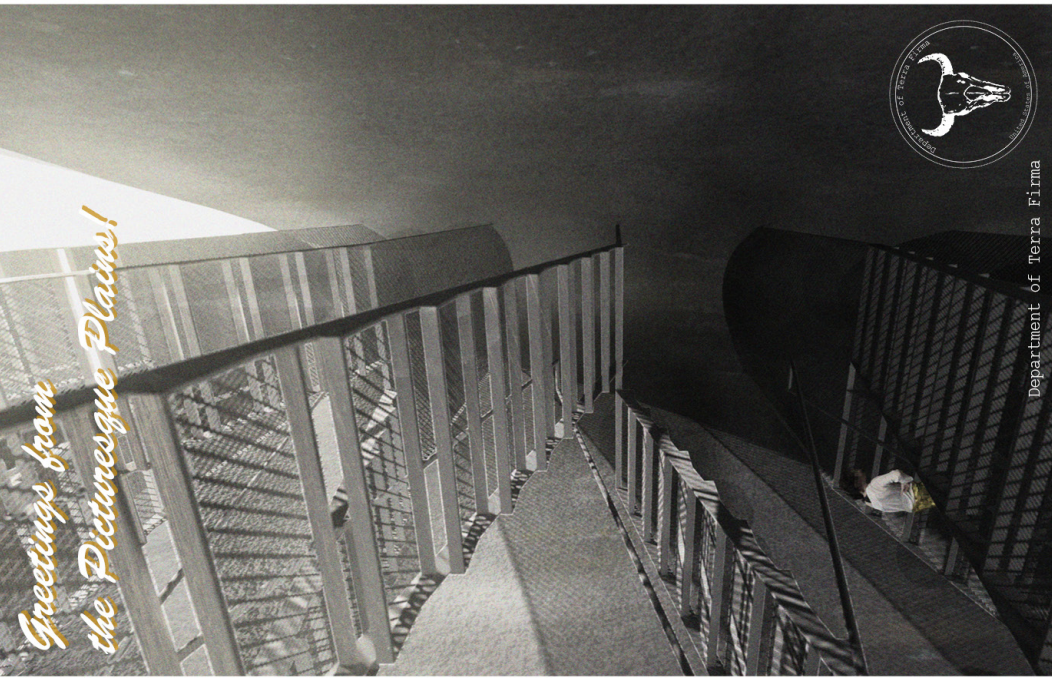


Department of Terra Firma

Four horizontal lines for an address.



Department of Terra Firma



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United States of America

Department of Terra Firma

Picturesque Prairies

*productive preservation
on a petroleum planet*

Permit Proposal:
*Maah Daah Prairie; Plains
to Ports Partnership*

Appendix S - Seasonal Study

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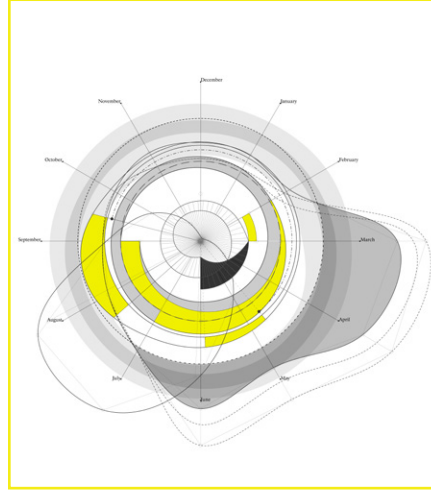
Department of Terra Firma

Department of Terra Firma

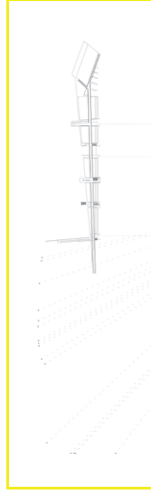
United States of America

Month [TEMPLATE]
-[TEMPLATE]material flow and/or
characteristic emphasis

months



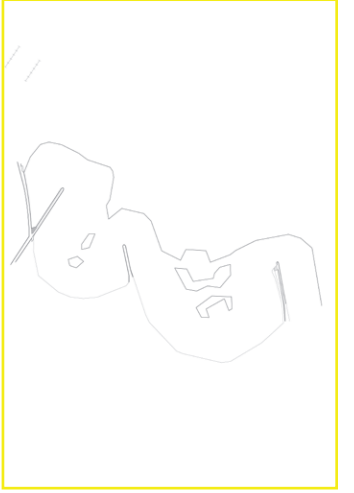
distribution pad



well port



valve



opposite
seasonal
studies

January

- well port is producing heat for bison
- snow fences are exposing grass
- valleys remain good food source for bison

February

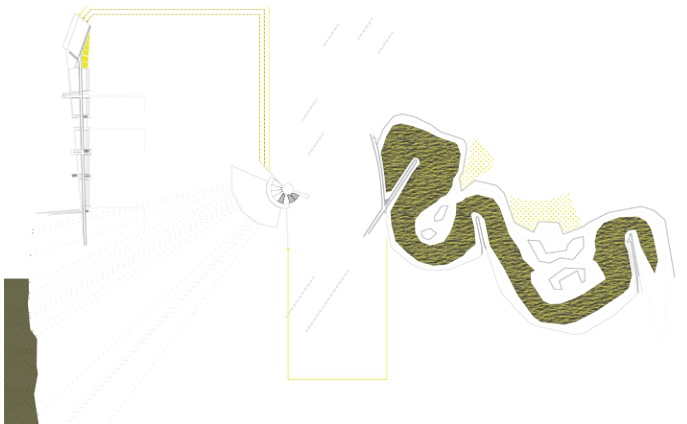
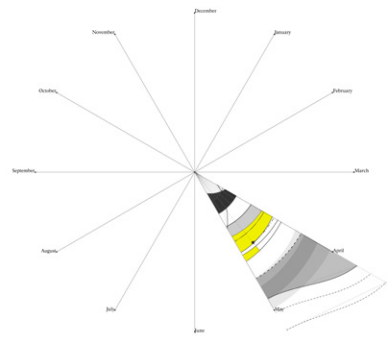
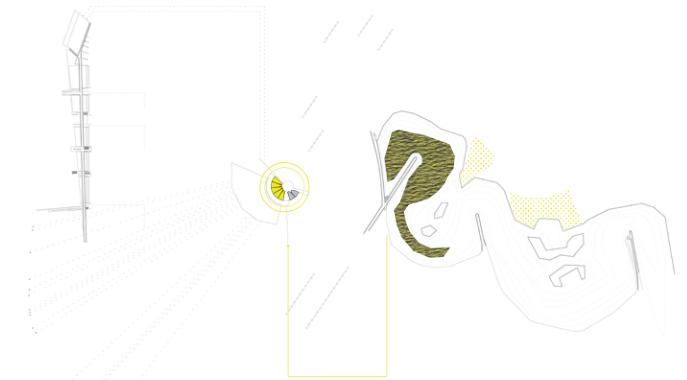
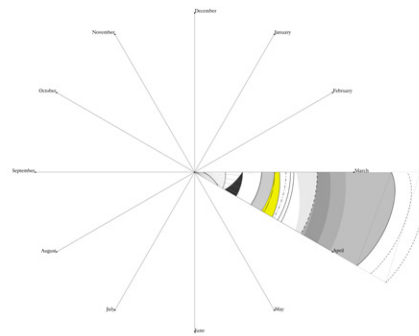
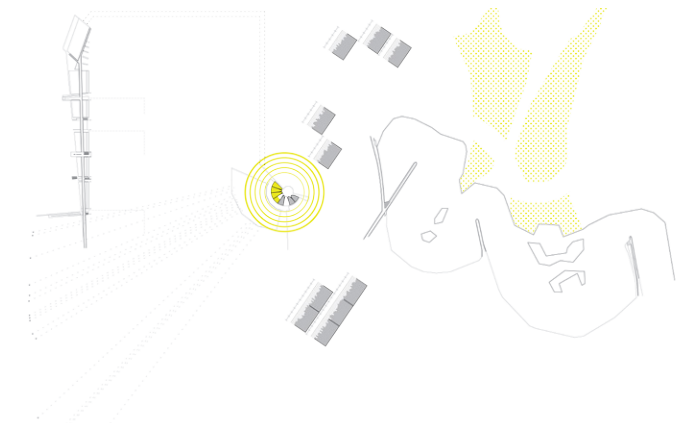
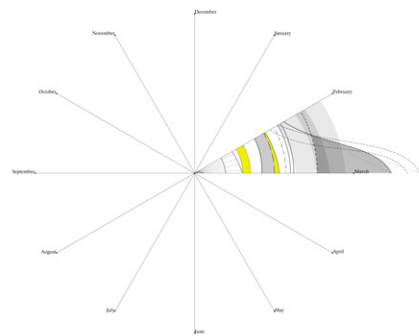
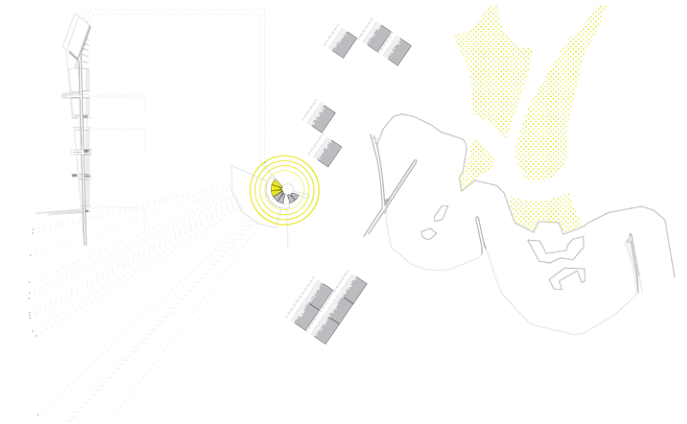
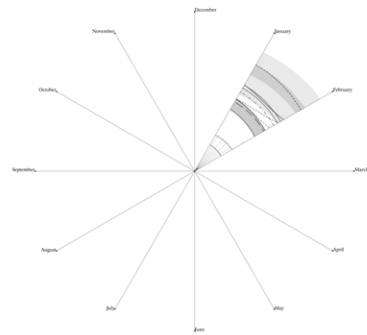
- well port is producing heat for bison
- snow fences are exposing grass
- valleys remain good food source for bison

March

- well port is producing heat for bison
- valve retain melting snow run off

April

- burning of fire fields
- produced water is transferred to distribution pad for evaporation
- valve retain melting snow run off
- floodplain used for wallowing and mating



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opposite
seasonal
studies

May

- burning of fire fields
- evaporation of produced water
- produced water is transfered to distribution pad for evaporation
- valve retain melting snow run off and transfer to well port
- floodplain used for wallowing and mating

June

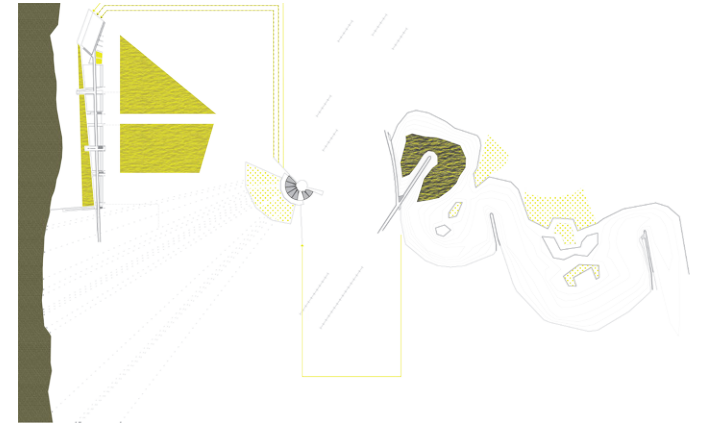
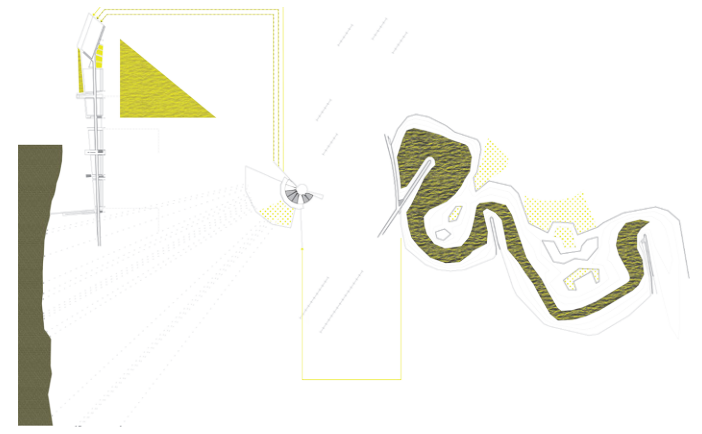
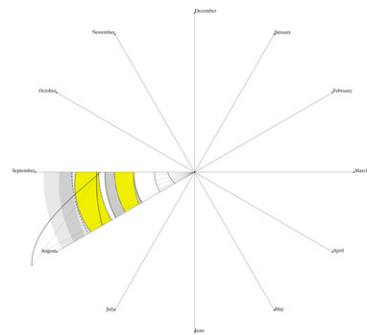
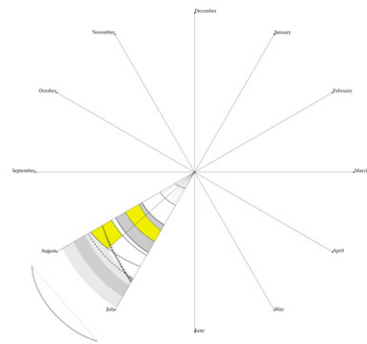
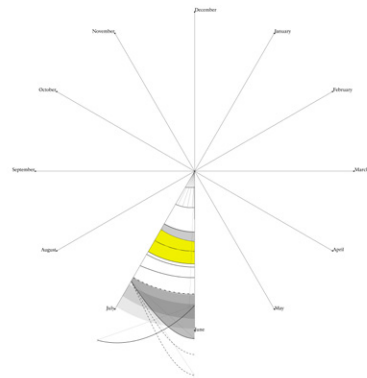
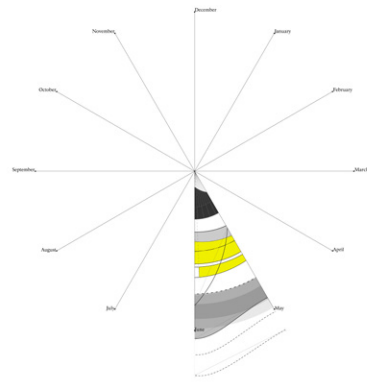
- tourist season
- burning of fire fields
- evaporation of produced water
- produced water is transfered to distribution pad for evaporation
- valve retain melting snow run off and transfer to well port

July

- tourist season
- calving [red dogs]
- burning of fire fields
- tall grass regrows
- evaporation of produced water
- produced water is transfered to distribution pad for evaporation

August

- tourist season
- calving [red dogs]
- burning of fire fields
- tall grass regrows
- bison attracted to new grass
- evaporation of produced water
- produced water is transfered to distribution pad for evaporation



opposite
seasonal
studies

September

- calving [red dogs]
- evaporation of produced water
- tall grass regrows
- bison attracted to new grass

October

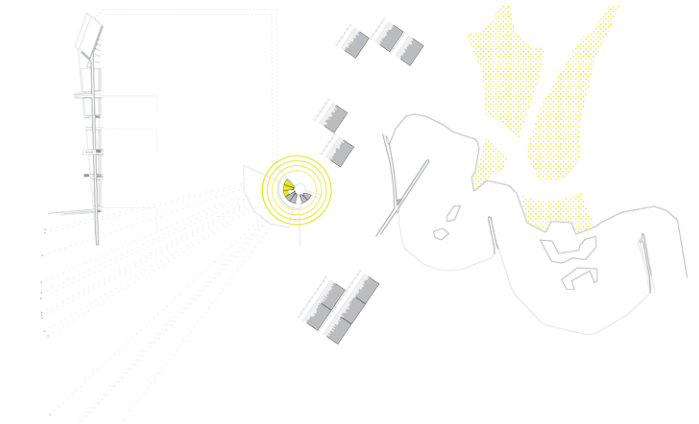
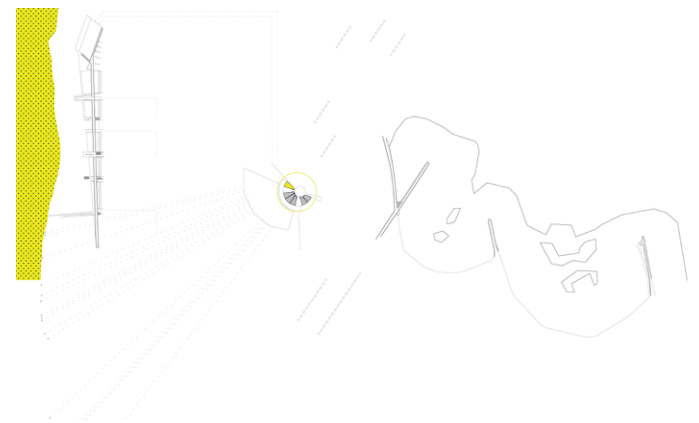
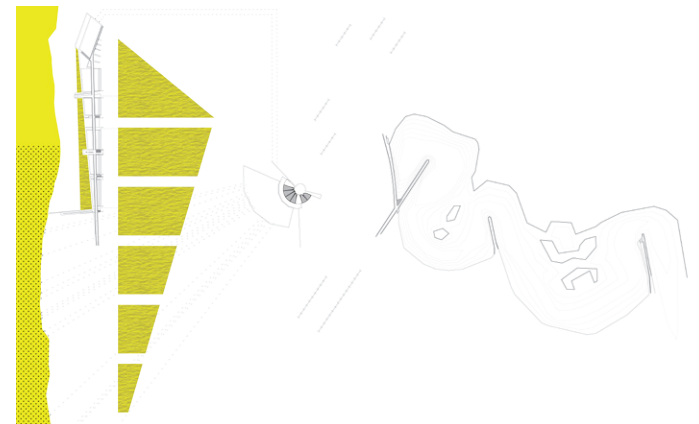
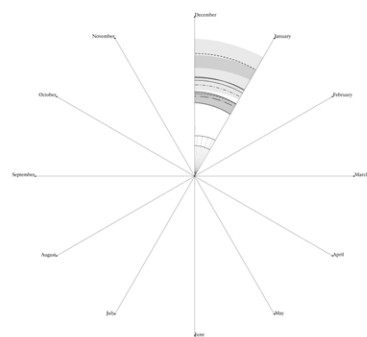
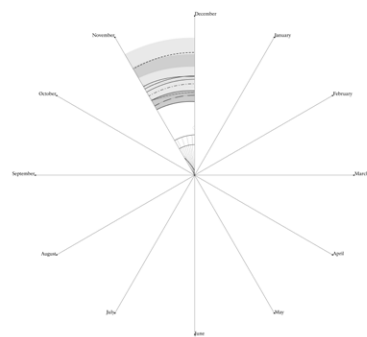
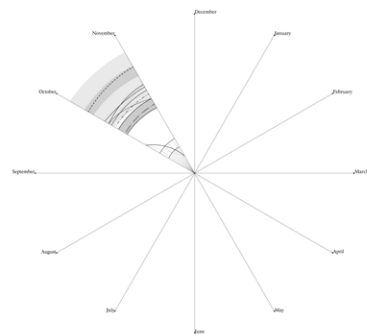
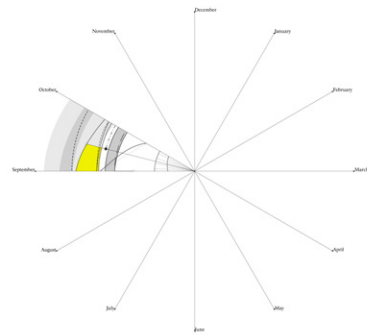
- well port is producing heat for bison
- bison attracted to new grass

November

- well port is producing heat for bison
- snow fences are exposing grass
- bison attracted to new grass

December

- well port is producing heat for bison
- snow fences are exposing grass
- valleys remain good food source for bison



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