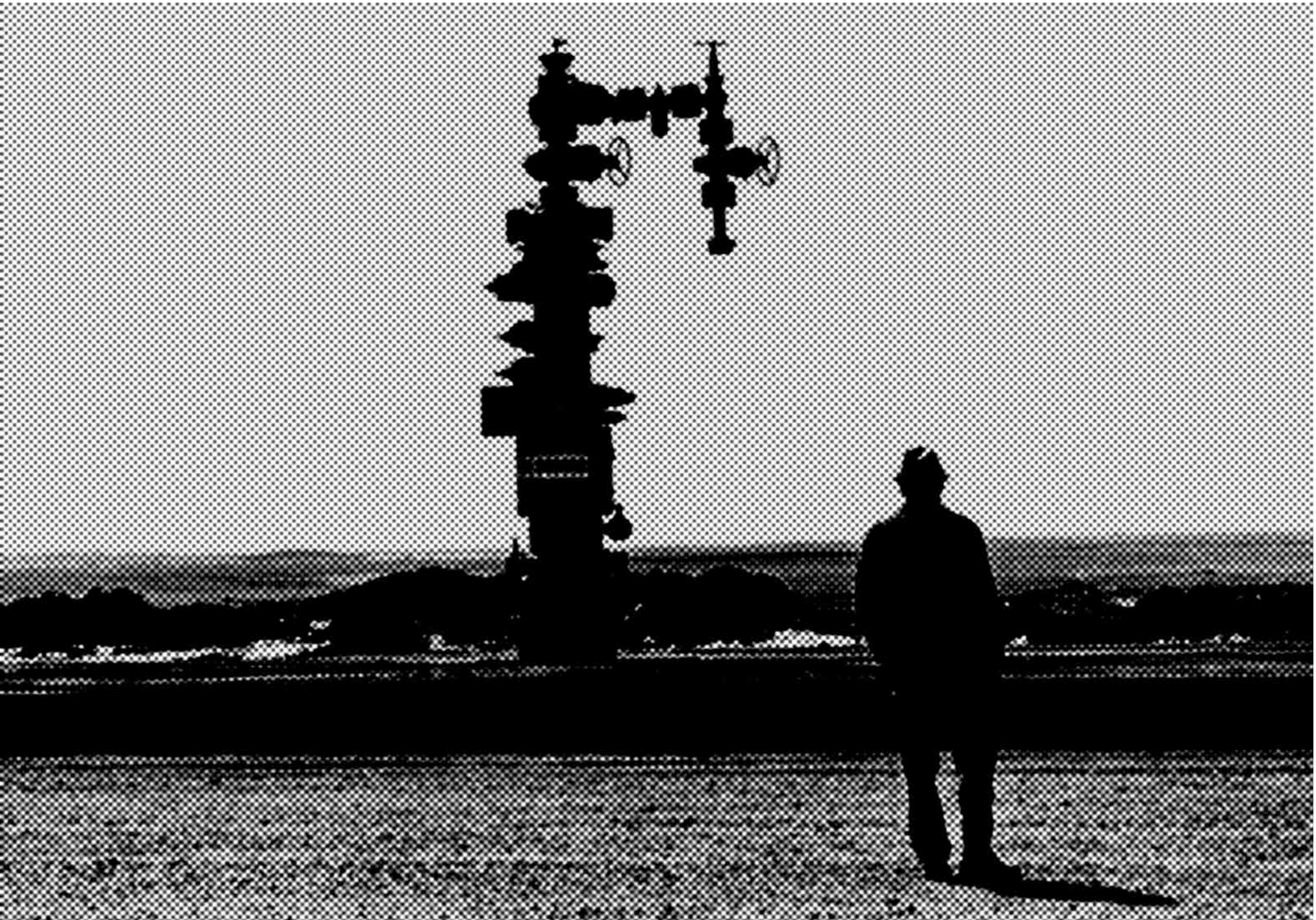
Pipeline_Ecologies:
The Geopolitical Expansion of the North West Territory



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_Contents

In 1909 explorer, Robert Edwin Peary sent a telegraph to U.S. president William H. Taft announcing that the stars and stripes had been nailed to the North Pole, and offering to put the place at his disposal. Taft bewildered replied,

"Thanks for your interesting and generous offer.
I do not know what exactly I could do with it."

(Emmerson, Charles,)

In 1977 the Trans Alaska Pipeline was dedicated forming a 800 mile long seam of infrastructure in Alaska's pristine wilderness. This is a preemptive history of the pipeline and the greater region which inherently it will effect.

Fig. 2


Fig. 3


Fig. 4


Fig. 5


Fig. 6

The date was March, 13 1968 when the Atlantic Richfield Company (ARCO) and Humble Oil and Refining Company (now Exxon Company, U.S.A.) announce Prudhoe Bay discovery well. This announcement sparked speculation and production efforts across multiple scales and disciplines.

As a result of the proclamation of the new oil field in the north slope of Alaska speculation began to form on how this oil might make it to market. Due to the eminent presence of ice in the north west passage and Bering Strait another mode of transit was necessary. With the SS Manhattan being the only documented passage by a sea bearing vessel to date land transport was the only other plausible option.

Thousands of pipeline field study teams were deployed to map and chart the most logical location for the development of an oil pipeline.

On February, 7 1969 the Atlantic Pipeline, Humble Pipe Line and BP Oil Corporation (formerly BP Exploration U.S.A., Inc.) approved an amendment to their original agreement, electing to proceed with design and construction, and changing the name of the project to "Trans Alaska Pipeline System" (TAPS).


Fig. 7

The sudden population increase of a 30,000 person work force in Alaska resulted in the creation of twenty nine temporary base camps and fourteen airfields.

Airfields:

Seven 2,500 ft. to 3,000 ft. long
Seven: 5,000 ft. long

Construction camps:
Total number 1974 to 1977 – 29

Largest camp:
Marine Terminal, 3,480 beds

Largest pipeline camp:
Isabel Pass, 1,652 beds

Smallest pipeline camp:
Sourdough, 112 beds


Fig. 8


Fig. 11

Fig. 9


Fig. 12


Fig. 10


Fig. 13


Fig. 14

A highly mobile transportation and supply network sprang up to support the logistical fiasco of constructing 800 miles of pipeline. Hercules transport jumbo jets, helicopters, haul trucks, and 966 caterpillar trains moved as figures in a foreign landscape. A new high-tech system of support defined the work forces existence. As though part a machine, or worker drone in a bee hive, each worker was secluded to their specific task. Sustenance and leisure became regimented systems.


Fig. 15

The work pad that underlaid the pipeline flowed through the pristine wilderness and defined its scar of progress. Resource extraction and administration evolved along the line as each construction and sustenance pattern became necessary. These critical operations redefined the ecologies surrounding the pipeline. Raw materials were scraped from borrow pits that were tactically located to the prescribed path. Water was siphoned from streams and lakes to fuel workers and construction tasks. Fuel spills and exposed sediments seeped into the water shed system as if precursors of things to come.


Fig. 16

The ATCO work trailers created transient villages that anticipated their own decommissioning. Each unit plugged into the network creating a hermetic linear pattern of everyday life. The sleeping pod became as ambiguous as the kitchen pod that it was attached to. The raw area of each construction camp literally represented the capacity and equipment that it could house. In this case the diagram and engineering plan became the architecture and built environment. Subsequently blurring ones personal perspective on constructing their own lived environment.


Fig. 17

Even though the pipeline, its construction methods, and its development were state of the art; as an infrastructural system the pipeline was not agile. The notion of an agile infrastructure became the impetus of this thesis work. The Alaskan Pipeline fostered and ecology of infrastructure and civility defined by disparate nodes of material and energy flows.


Fig. 18

Like the proliferation of ATCO trailers designed into the system of the pipeline was its eminent failure. The capital investment and material labor which produced the pipeline could be seen as an eight billion dollar crap-shoot. The harsh reality of infrastructure's gross anatomy in the Alaskan wilderness created an interesting dichotomy between planed occupations and fostered habitation.


Fig. 19

Regardless if something was planned or spawned the end result is an 800 mile long industrial palimpsest. This palimpsest starts in Valdez Alaska at the Valdez Marine Terminal and ends fanning out in Prudhoe Bay by infiltrating the Arctic coastline. Dead Horse, Alaska, put on the map with the dedication of the Trans Alaska Pipeline in 1977. Since this date the landscape of the Prudhoe Bay oil field has as Robert Smithson puts it, become a "ruin in reverse" . Vacancy and adjustment define this landscape without holism and fusion.

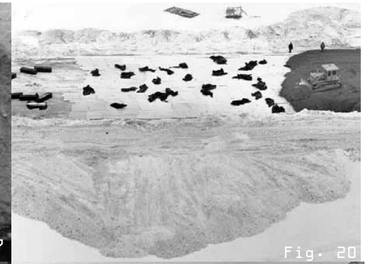


Fig. 20


Fig. 21


Fig. 22

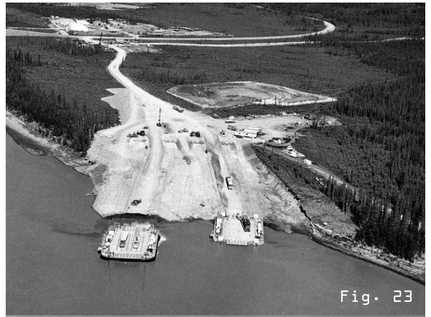


Fig. 23

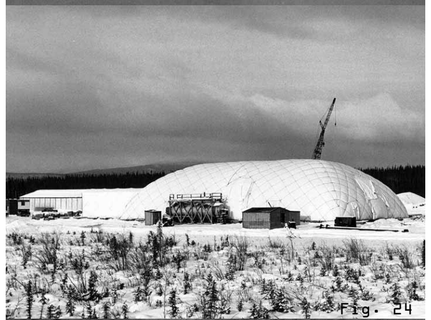


Fig. 24


Fig. 25


Fig. 26


Fig. 27


Fig. 28


Fig. 29

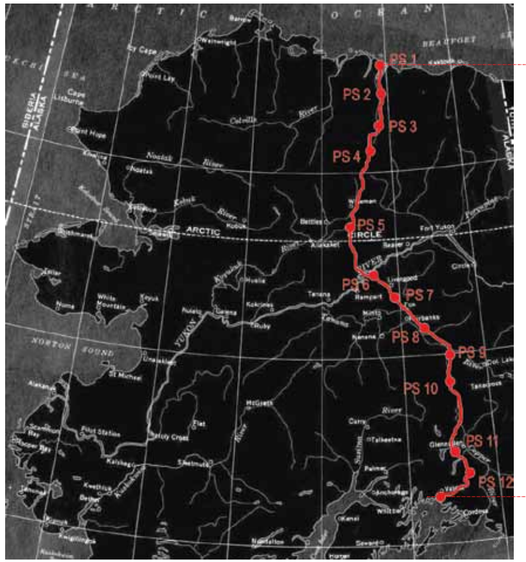

Fig. 30

Fig. 31

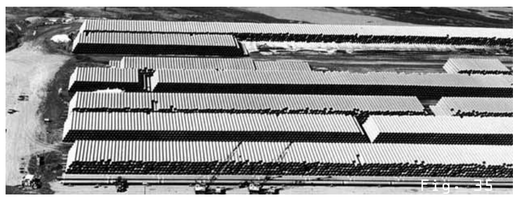

Fig. 32


Fig. 33


Fig. 34

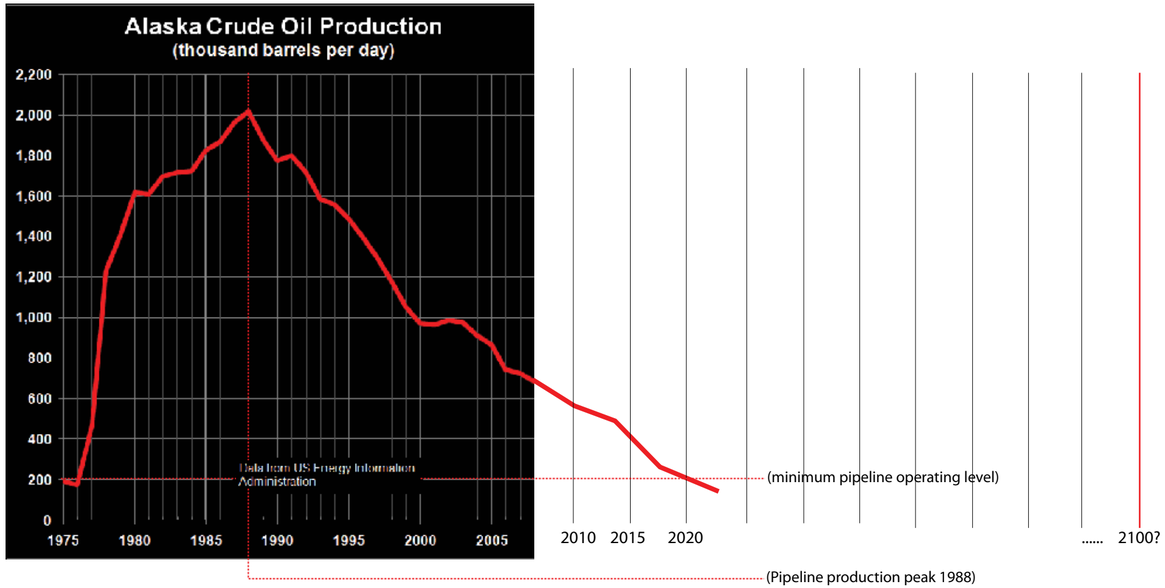


$8 Billion	800.03 mi	500 rivers and streams	11.9 days @ 3.7mph	48 in diam



Overall the construction cost of the 800 miles of pipe, eleven pump stations, and the Valdez Marine Terminal (VMT) was estimated at eight billion dollars. The largest oil pipeline to date had been constructed with the line fill of the pipeline topping the scales at 9 million bbl (bbl refers to the volume of one barrel of oil 150 Lt. or 42 gal.).

On July 28th of 1977 at 11:02 PM the first oil reached the VMT and departed with the first ARCO tanker four days later.



In 1988 oil production in the North Slope of Alaska peaked and will reach its minimum operating level of 200,000 barrels per day by 2020. By the year 2020 the Northwest Passage and Bering Strait (if continued melting patterns persist) will be navigable by major shipping vessels. Along with the passage new landscapes, containing vast amounts of natural resources will become accessible. This will reinvigorate the nostalgia of the late 1800's gold rushes. The hard rock miner will return, the boomtown will come—the only question is how.

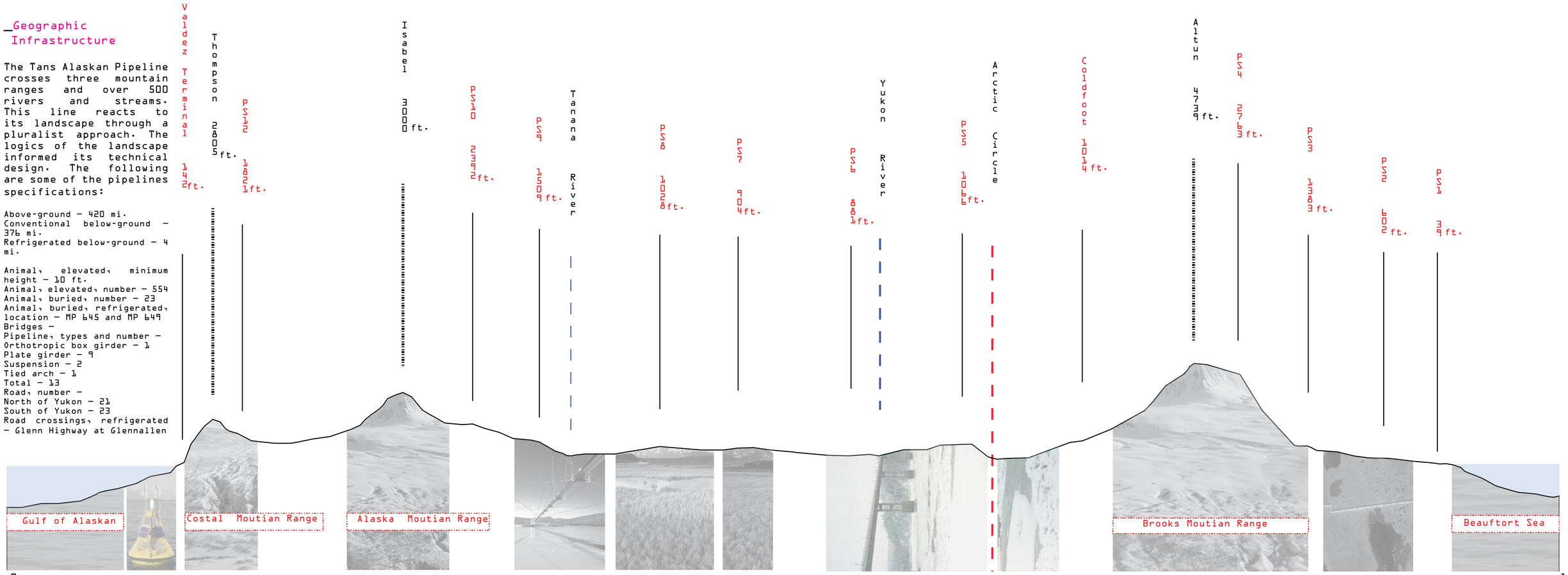
With the potential of new landscapes of speculation this document can be seen as a road map for the Trans Alaskan Pipeline and the delineation of its subsequent infrastructure. The ecological, economic, and political boundaries defined by the pipeline will serve as the first underlay, from which development projections and plausible fictions will form.

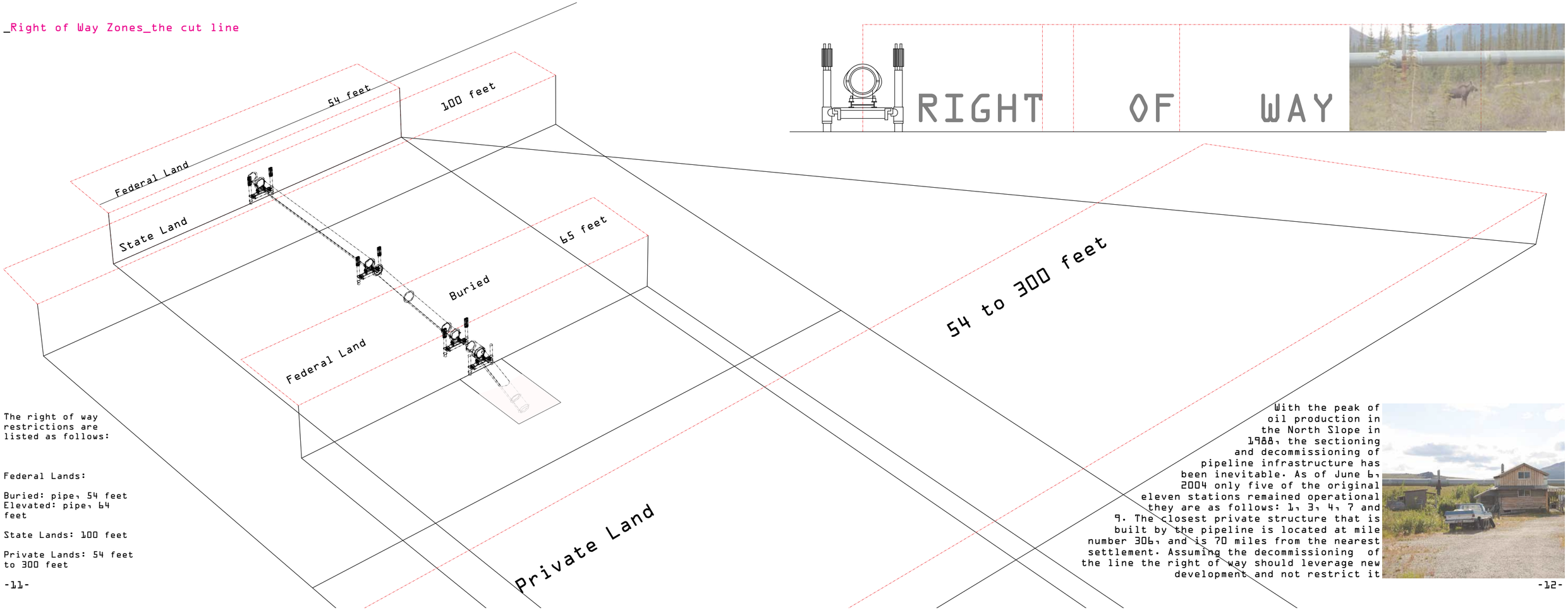
_Geographic Infrastructure

The Tans Alaskan Pipeline crosses three mountain ranges and over 500 rivers and streams. This line reacts to its landscape through a pluralist approach. The logics of the landscape informed its technical design. The following are some of the pipelines specifications:

Above-ground – 420 mi.
Conventional below-ground – 376 mi.
Refrigerated below-ground – 4 mi.

Animal, elevated, minimum height – 10 ft.
Animal, elevated, number – 554
Animal, buried, number – 23
Animal, buried, refrigerated, location – MP 645 and MP 649
Bridges –
Pipeline, types and number –
Orthotropic box girder – 1
Plate girder – 9
Suspension – 2
Tied arch – 1
Total – 13
Road, number –
North of Yukon – 21
South of Yukon – 23
Road crossings, refrigerated – Glenn Highway at Glennallen





RIGHT OF WAY

The right of way restrictions are listed as follows:

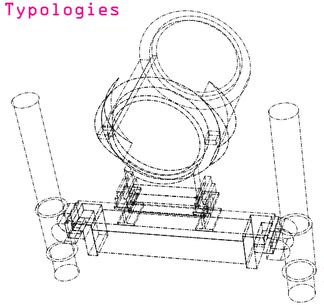
Federal Lands:

Buried: pipe, 54 feet
Elevated: pipe, 64 feet

State Lands: 100 feet

Private Lands: 54 feet to 300 feet

With the peak of oil production in the North Slope in 1988, the sectioning and decommissioning of pipeline infrastructure has been inevitable. As of June 6, 2004 only five of the original eleven stations remained operational they are as follows: 1, 3, 4, 7 and 9. The closest private structure that is built by the pipeline is located at mile number 306, and is 70 miles from the nearest settlement. Assuming the decommissioning of the line the right of way should leverage new development and not restrict it



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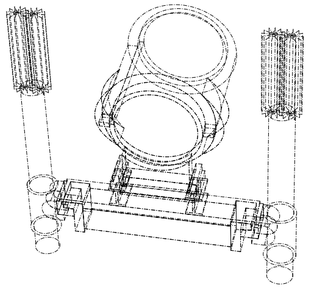

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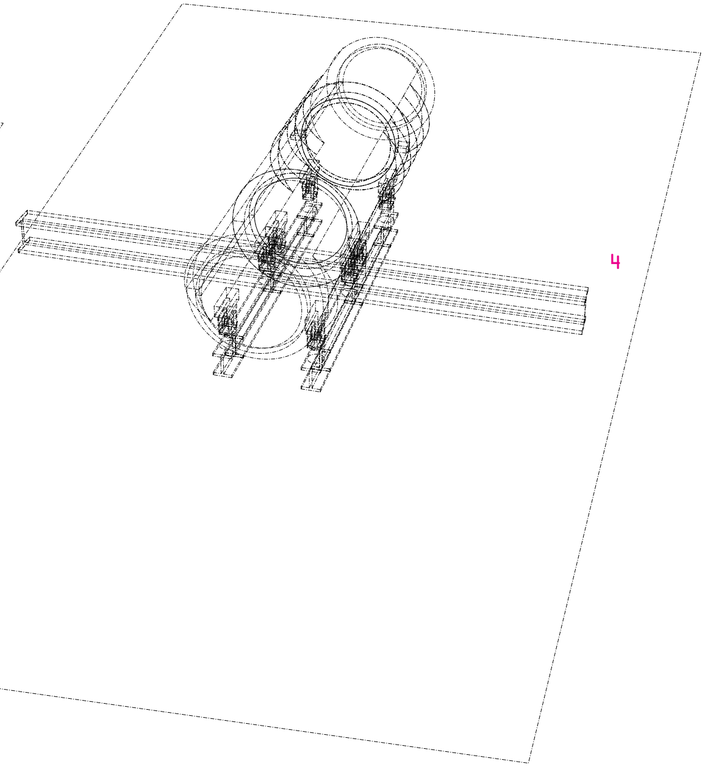


4

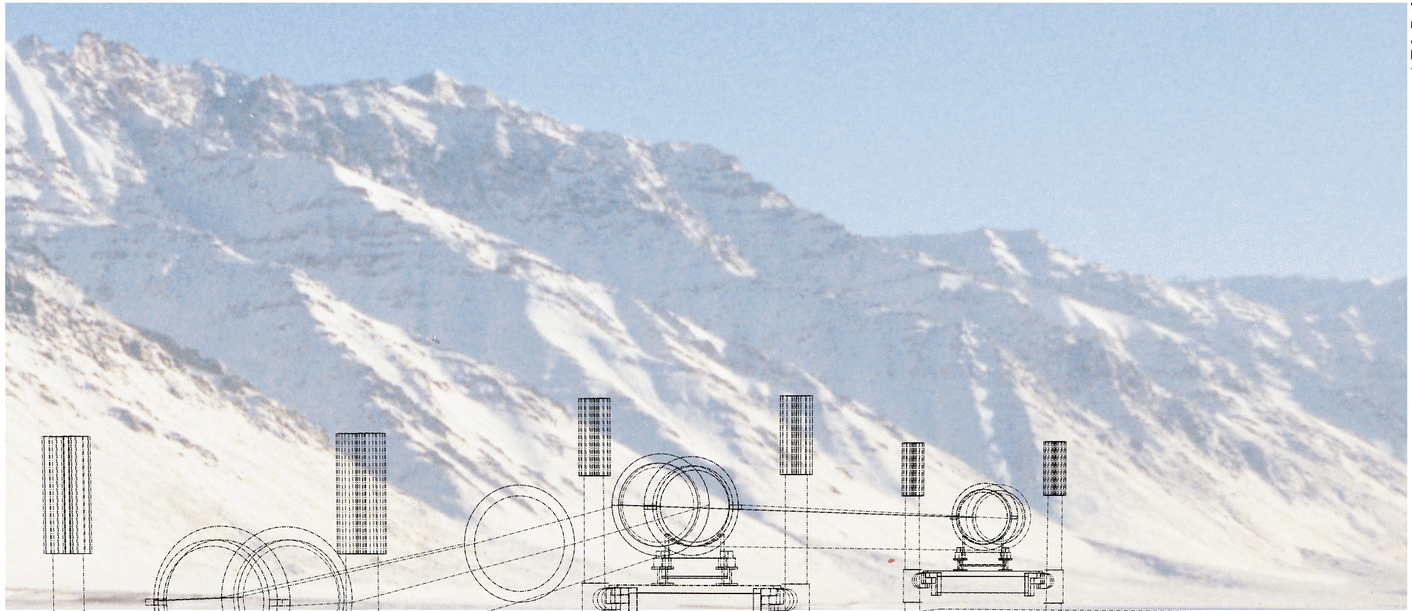
Pipeline ecology: A complex set of simple systems that directly relate to specific site and contextual issues.

1. Typical assembly, utilized in at specific intervals depending on soil and localized ecological factors.

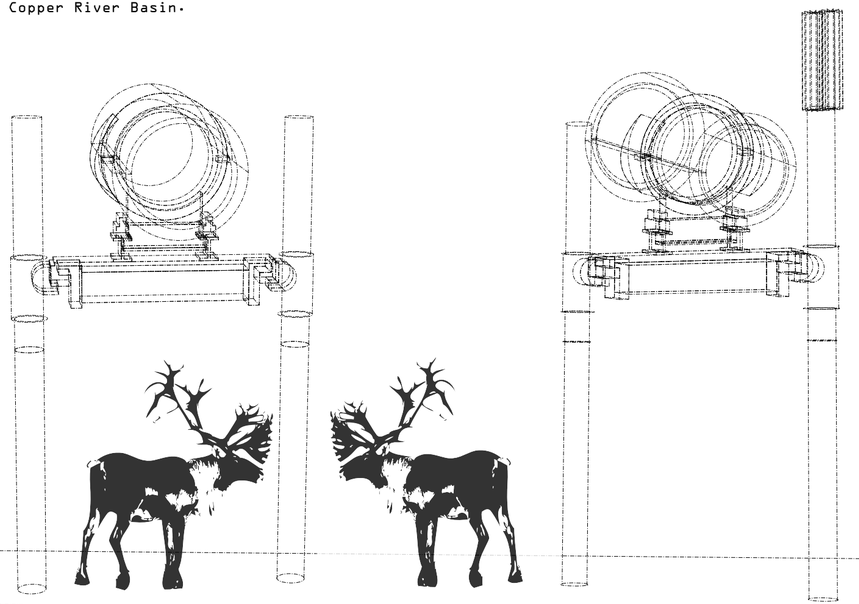
2. Typical assembly equipped with heat exhaustion manifolds in order to prevent permafrost thawing (oil ambient temperature in pipe ranges from 111°F at the origin to 60°F at its terminus)

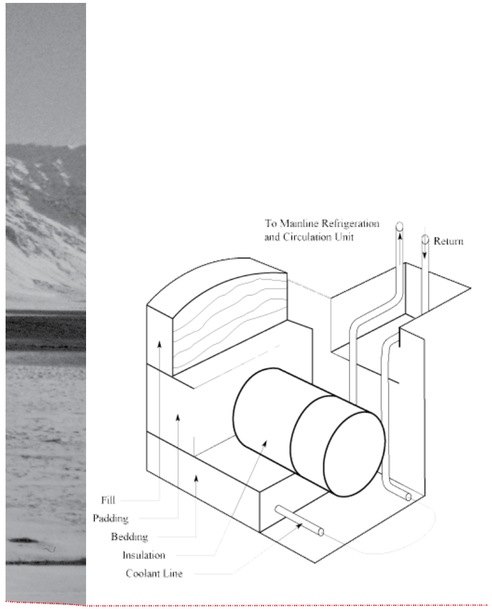
3. Buried pipe, conventional for pipelines, buried length in total 376 mi (non-refrigerated) of the 800 mi of pipe with 4 mi refrigerated.

4. Earthquake adaptation, allowing the pipe to move up to twenty feet horizontally and five feet vertically.



Three Caribou herds are affected by the pipeline and require elevated or buried crossing points they are as follows: Central Arctic Herd and the Porcupine herd on the North Slope, and the Nelchina Herd in the Copper River Basin.





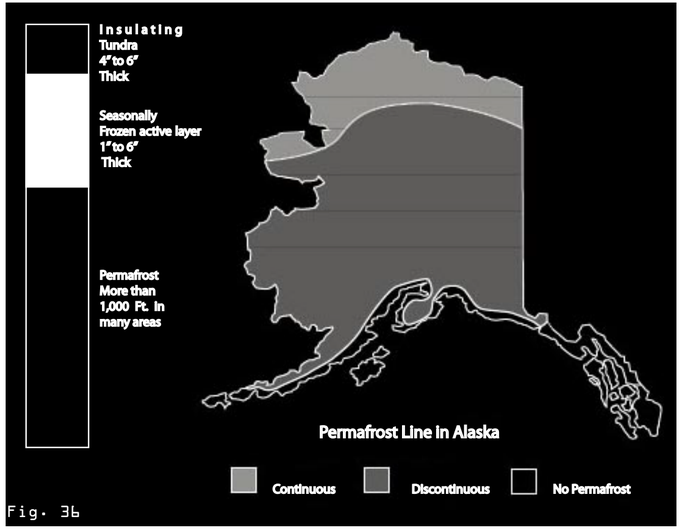


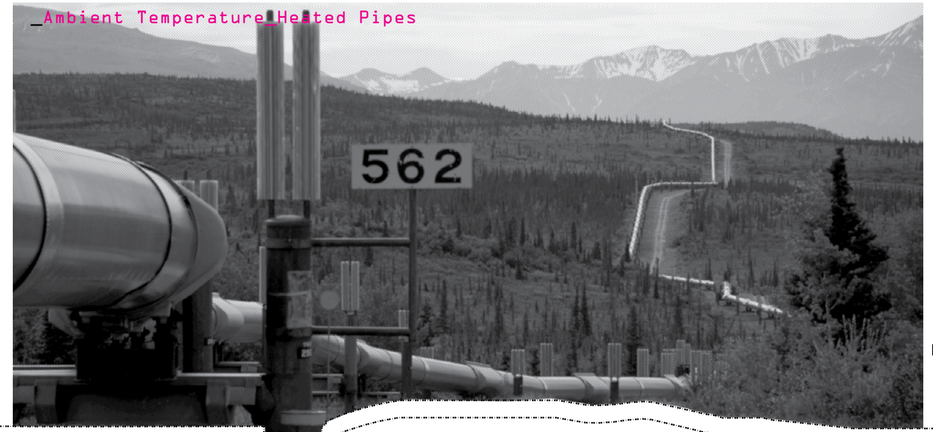
Fig. 36

Permafrost is a ground condition that occurs when soil remains below freezing for an extended period of time. This causes any porosity within the soil that is filled with water vapor to expand, thus heaving sections of the ground. Permafrost soil ranges are from four inches to over 2,000 feet in some areas.

The potential hazard for development on permafrost zones relates to the instability of soil during thaw cycles. Thaw can also be caused by disturbing the soil strata or by elevating localized temperatures because of the built environment.

Sections of the pipeline which are buried in permafrost zones maintain a constant temperature via a refrigeration coolant system.

_Ambient Temperature Heated Pipes



Heat aeration fins
Insulation module
Insulation pipe
Bumpers
Bumper Beam
Horizontal friction beam
Shoe

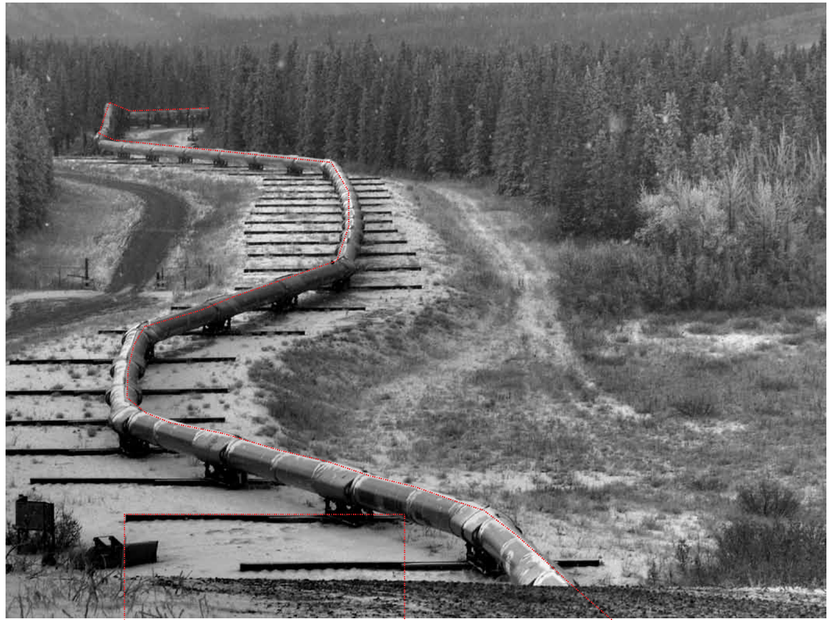
Top Soil Fill

Gravel Fill

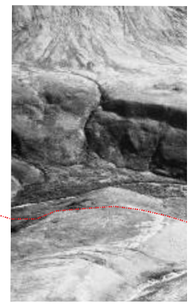
Insulation

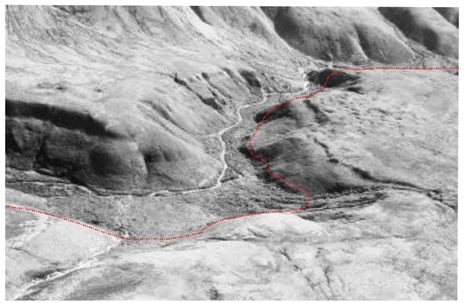
Vertical Support Member Bore depth: 15'min 70' max

4'0"
8"
4'0"
4"
15'0"



The Denali Fault_earthquake stabilization





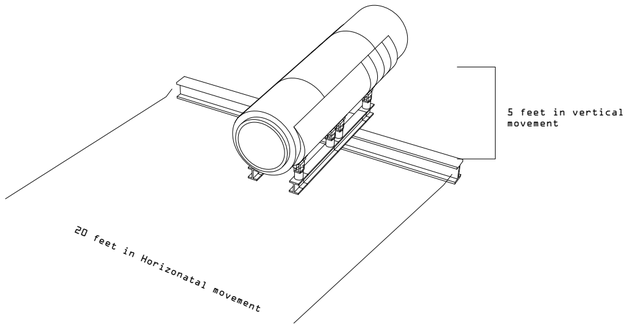


Fig. 37

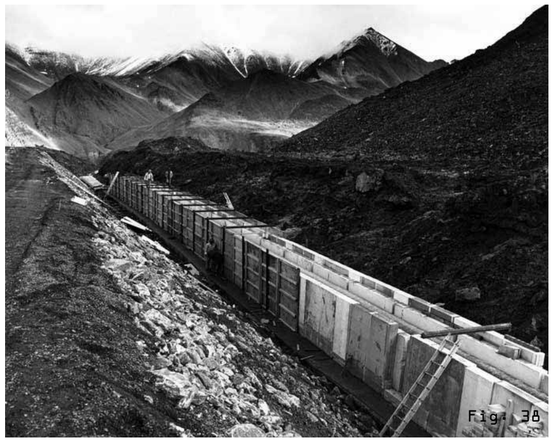


Fig. 38

_Transportation economies

Boeing 73S — 1.75 Hours @ 164mph

Bullet Train — 4.8 Hours @ 164mph

Freight Train — 9.6 Hours @ 99mph

Freight Truck — 14.4 Hours @ 55mph

Passanger Car — 12 Hours @ 60mph

Caribou — 1.3 Days @ 30mph

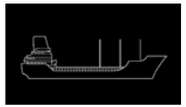
Hiker — 6.67 Days @ 5mph

Pipeline Oil — 11.9 Days @ 3.7mph

Nonexisting Connections Across Section

14 Days via Bering Strait @ 15mph

9,059,057 Barrels within line fill.

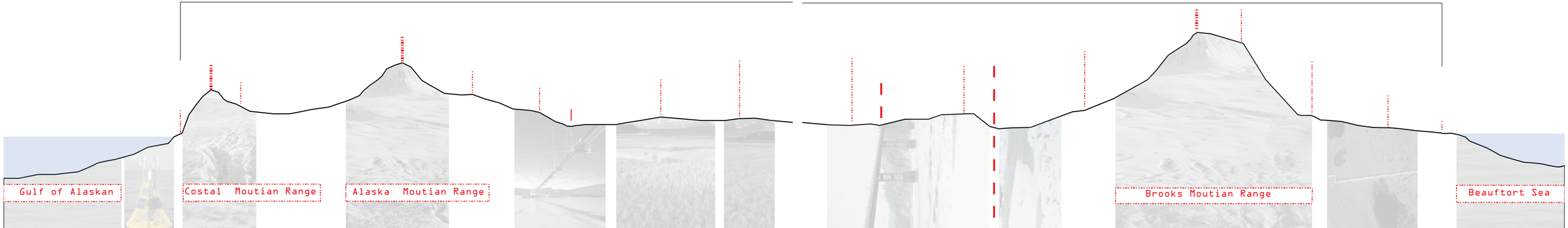


2,000,000 Barrels Average capacity

200 Barrels Average capacity

"

1million barrels



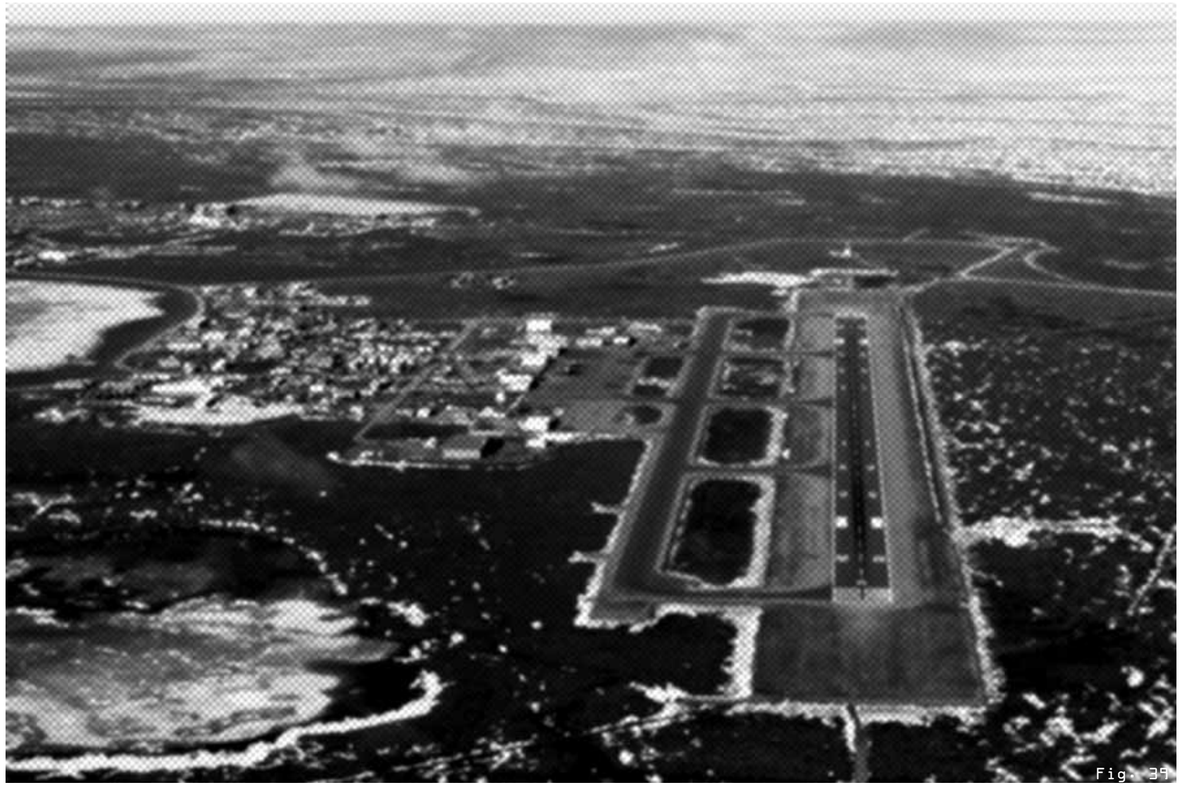
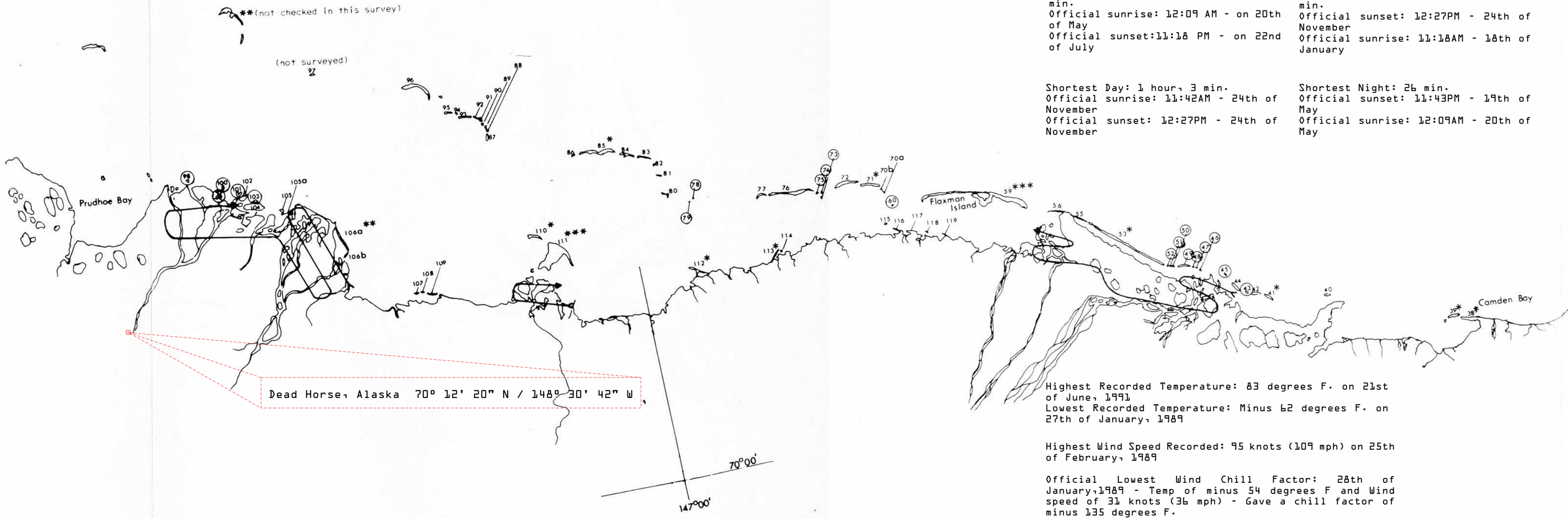


Fig. 39

Fig. 40



Longest Day: 63 days, 23 hours, 40 min.
Official sunrise: 12:09 AM - on 20th of May
Official sunset:11:18 PM - on 22nd of July

Longest Night: 54 days, 22 hours, 51 min.
Official sunset: 12:27PM - 24th of November
Official sunrise: 11:18AM - 18th of January

Shortest Day: 1 hour, 3 min.
Official sunrise: 11:42AM - 24th of November
Official sunset: 12:27PM - 24th of November

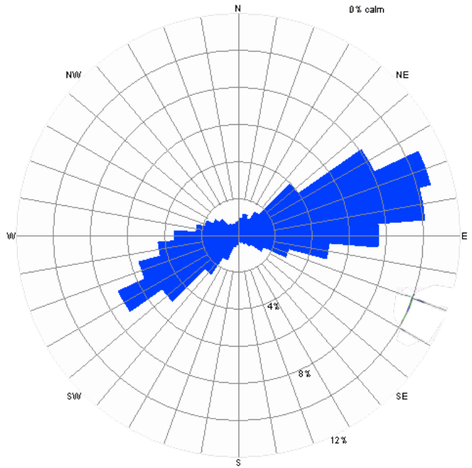
Shortest Night: 26 min.
Official sunset: 11:43PM - 19th of May
Official sunrise: 12:09AM - 20th of May

Highest Recorded Temperature: 83 degrees F. on 21st of June, 1991
Lowest Recorded Temperature: Minus 62 degrees F. on 27th of January, 1989

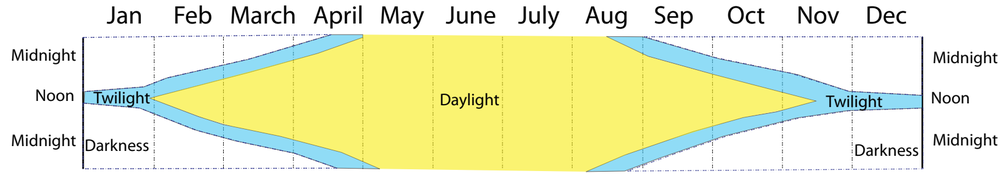
Highest Wind Speed Recorded: 95 knots (109 mph) on 25th of February, 1989

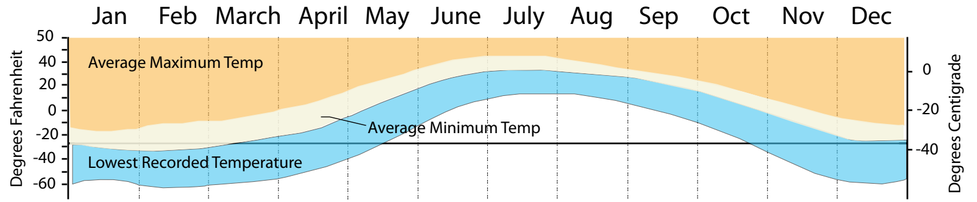
Official Lowest Wind Chill Factor: 28th of January,1989 - Temp of minus 54 degrees F and Wind speed of 31 knots (36 mph) - Gave a chill factor of minus 135 degrees F.

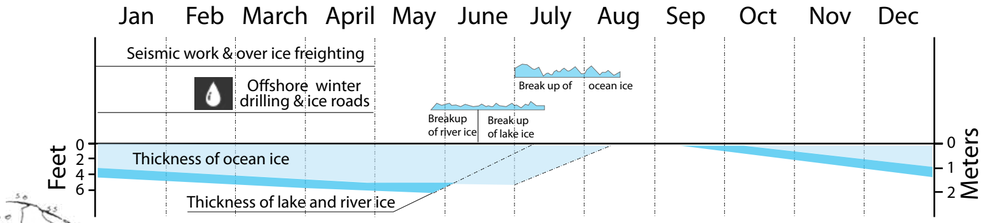
_Deadhorse_Climatic Ecologies

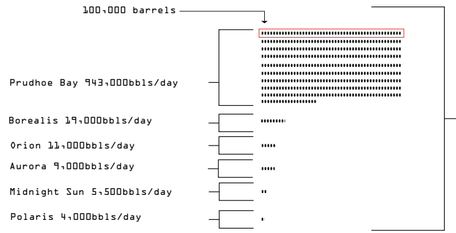


Deadhorse Annual Windrose Data









991,500 bbls/day

bp

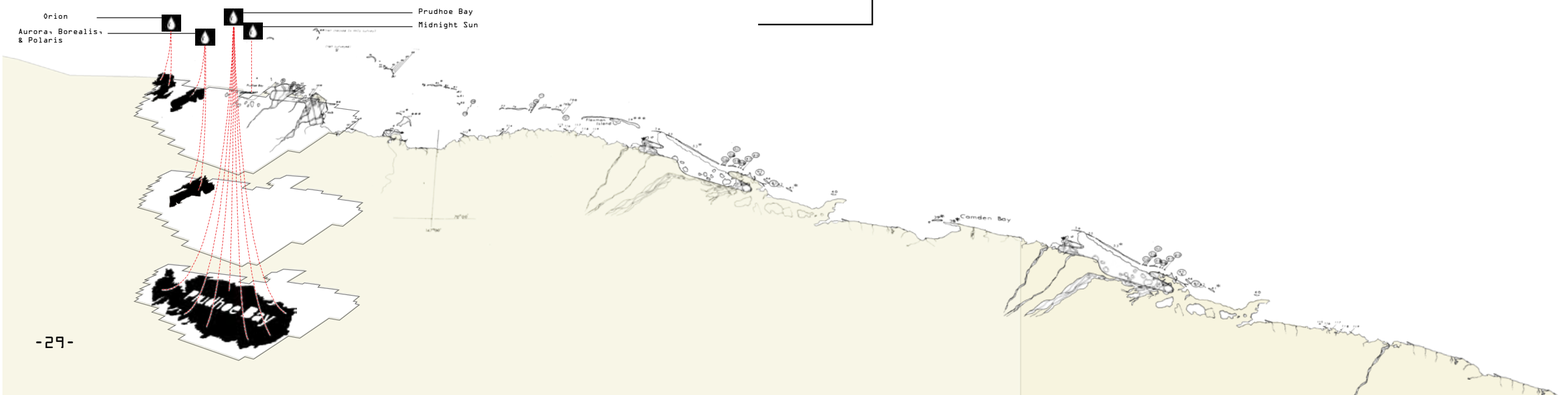
EXXON Mobil

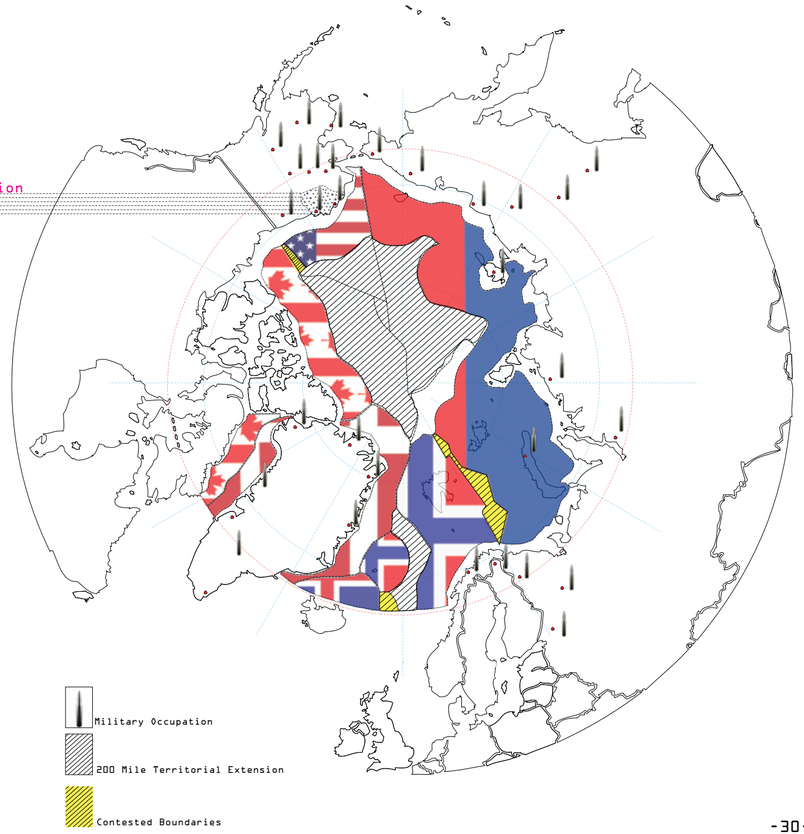
ConocoPhillips

Alyeska pipeline

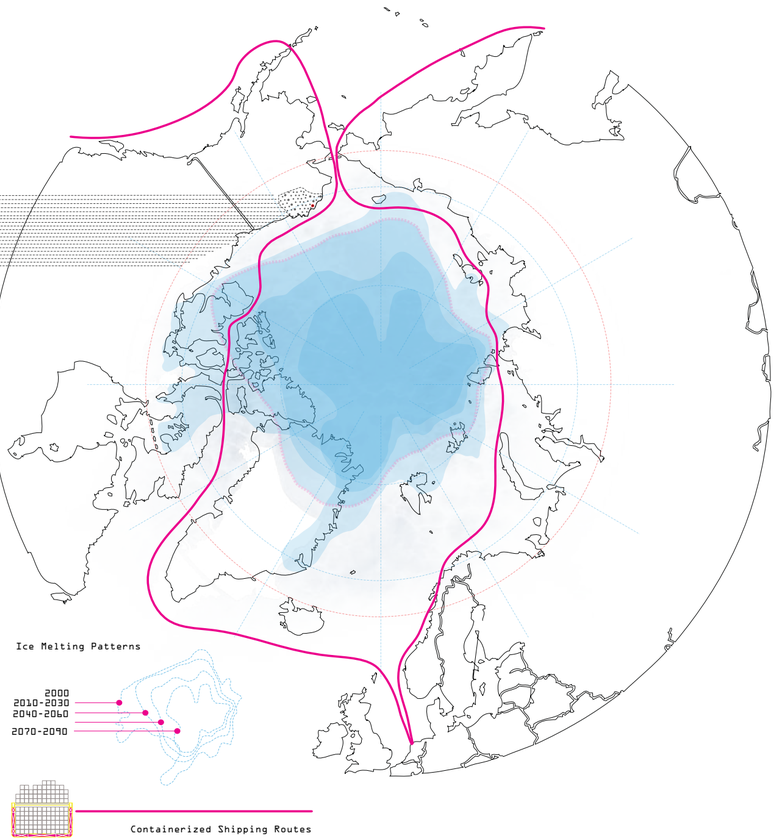
39,648,779 bbls/year
3.2 billion @ $81/bbl

Deadhorse_Region

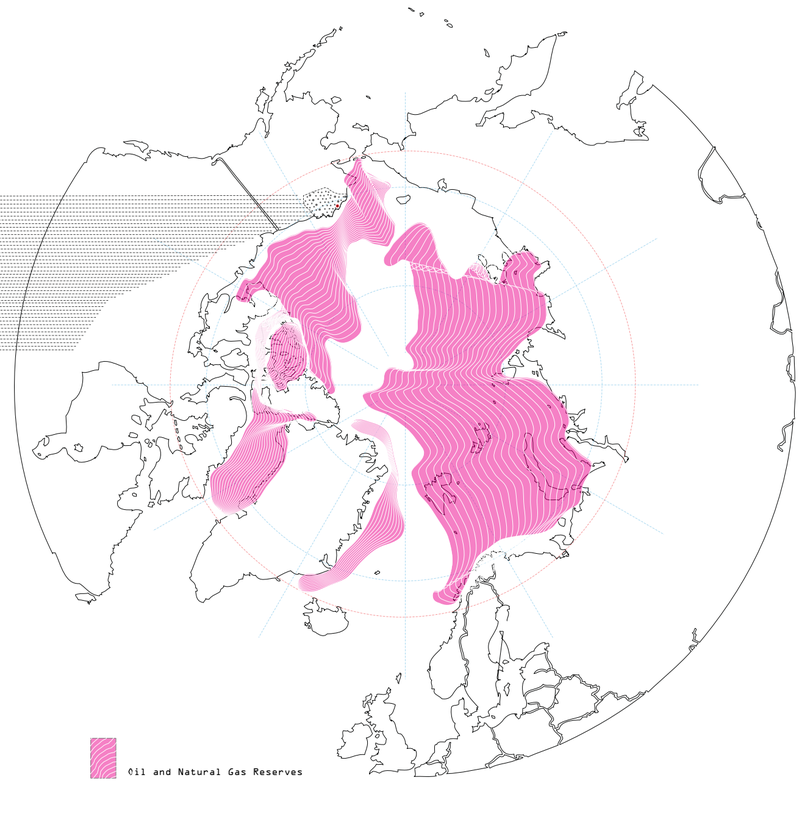




_Northwest Passage

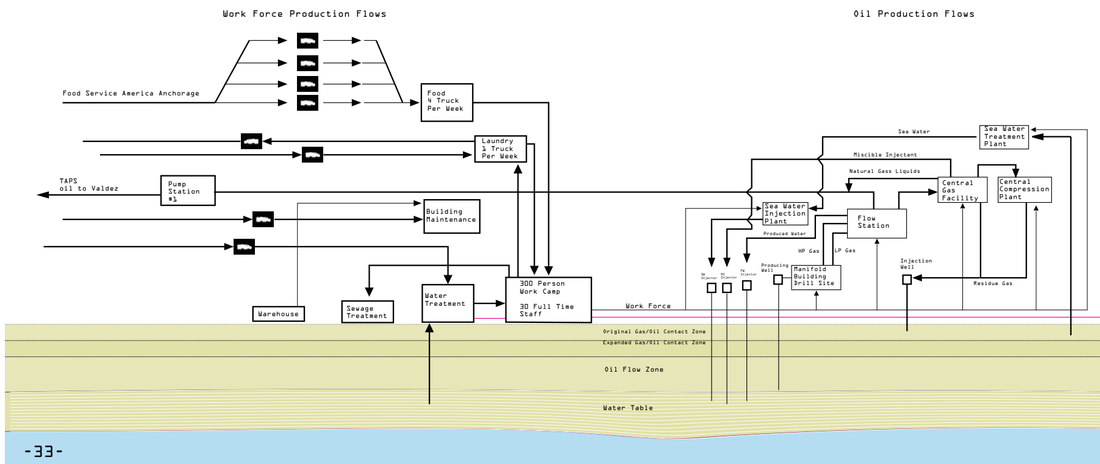


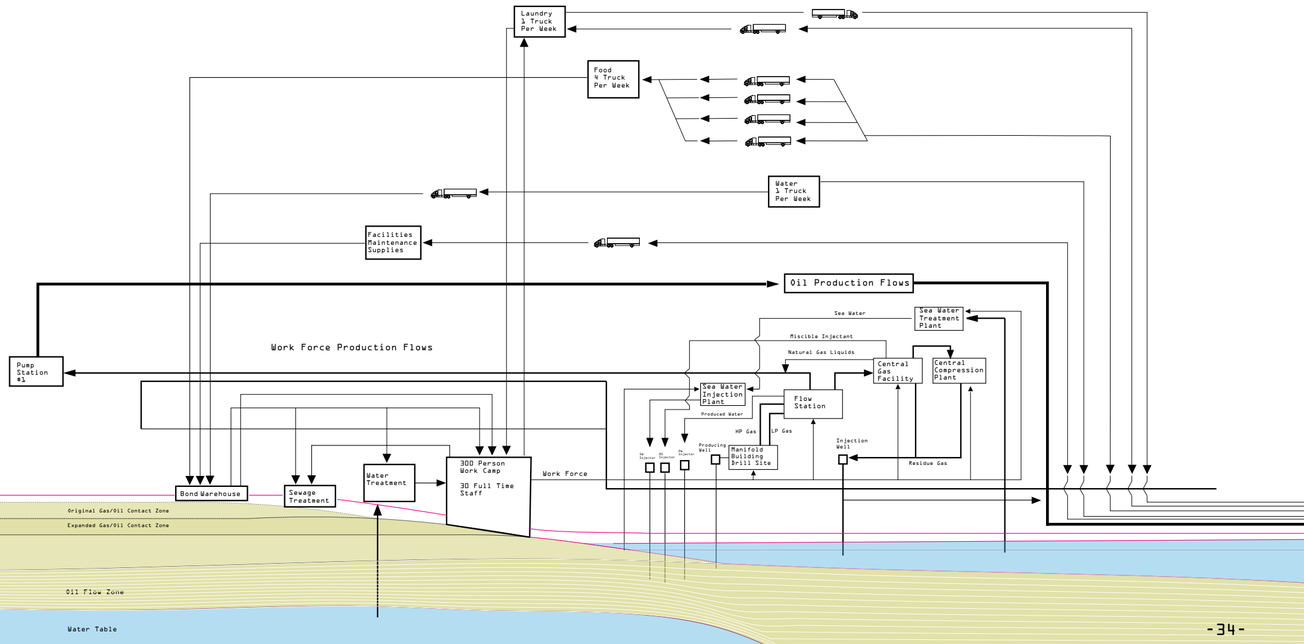
_Arctic Region



1977 2000 2010 2030 2050

(Historical Logic of Flows 1977-2010)





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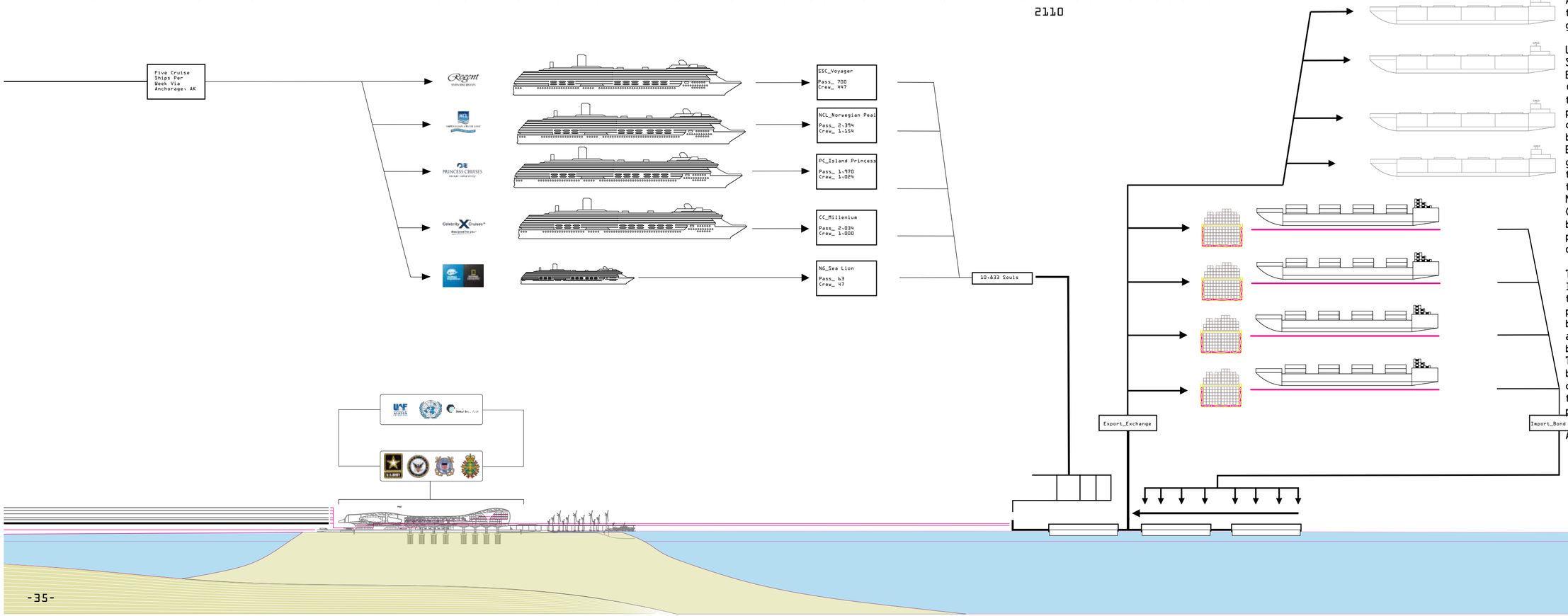
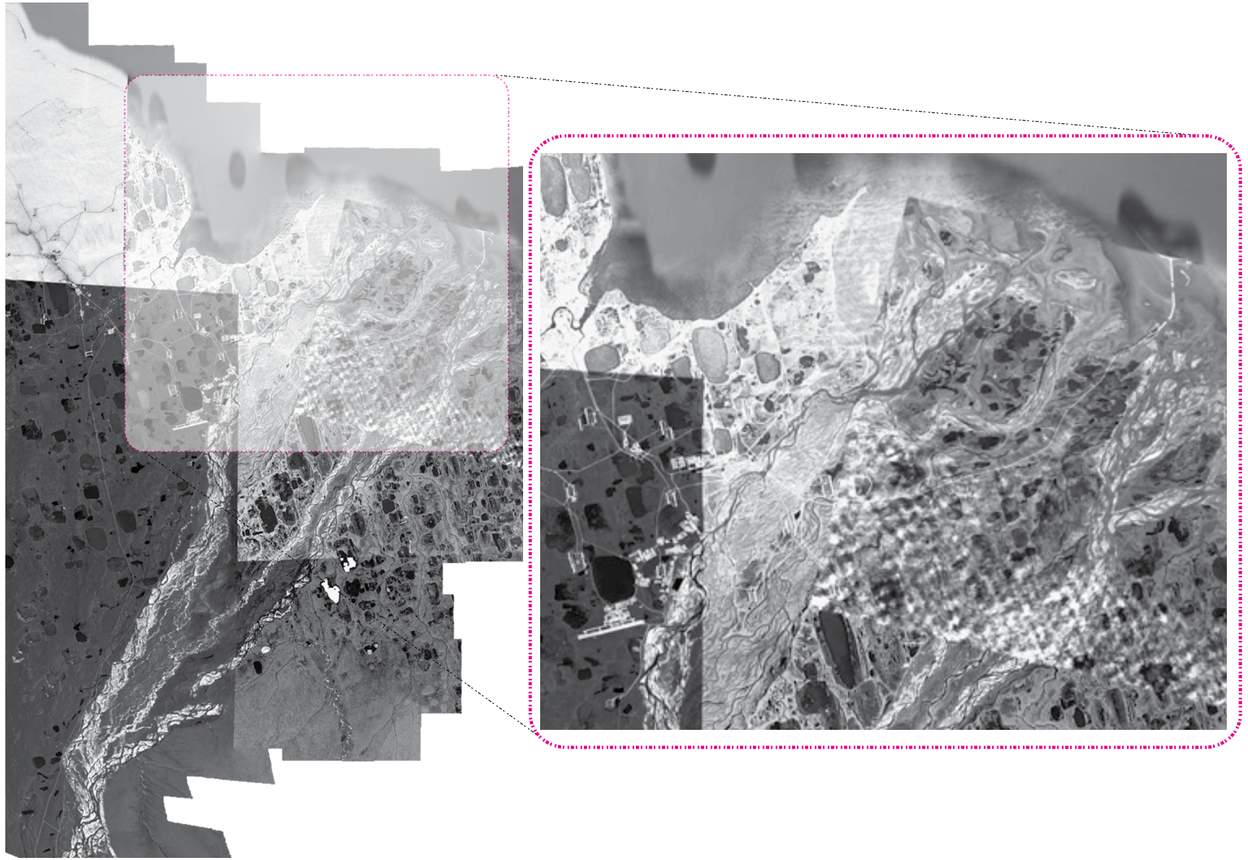


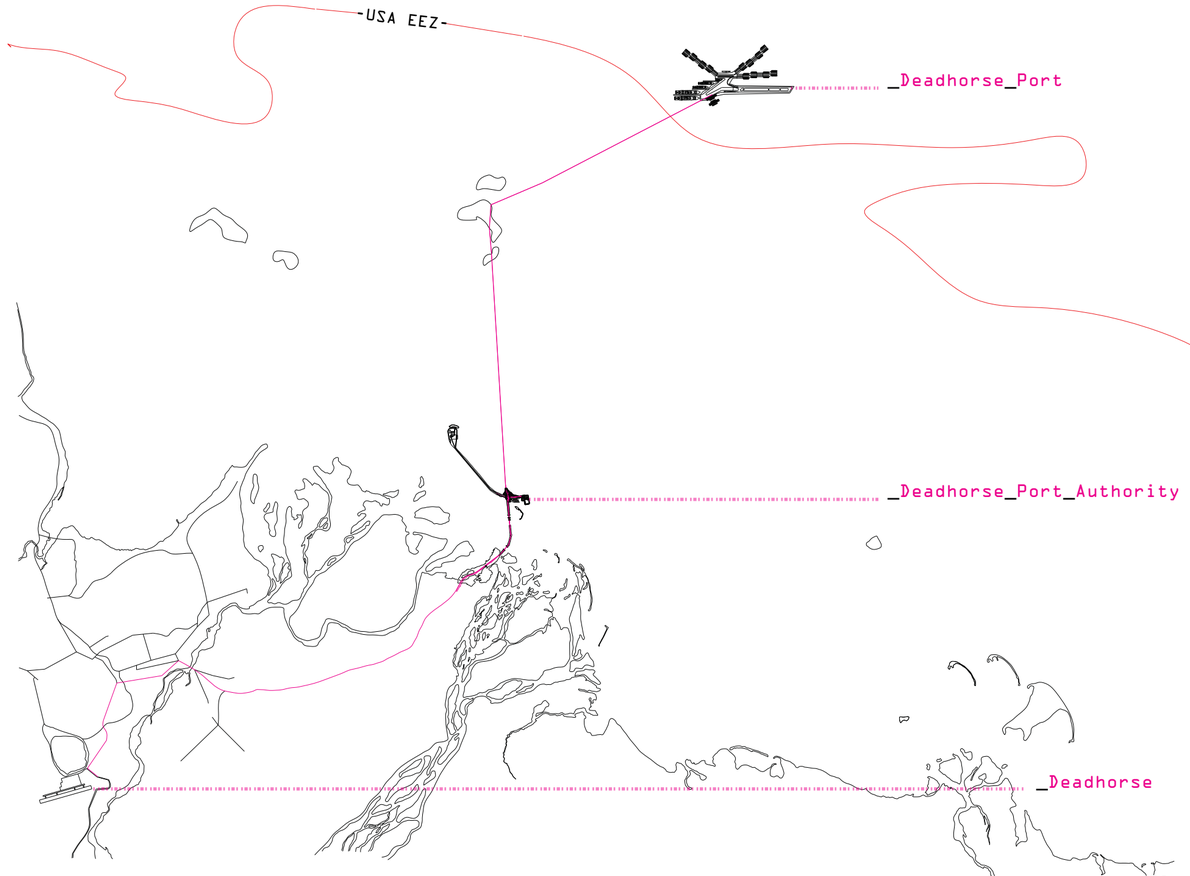
Increased activity in the Arctic region has begun to redefine physical and geopolitical boundaries.

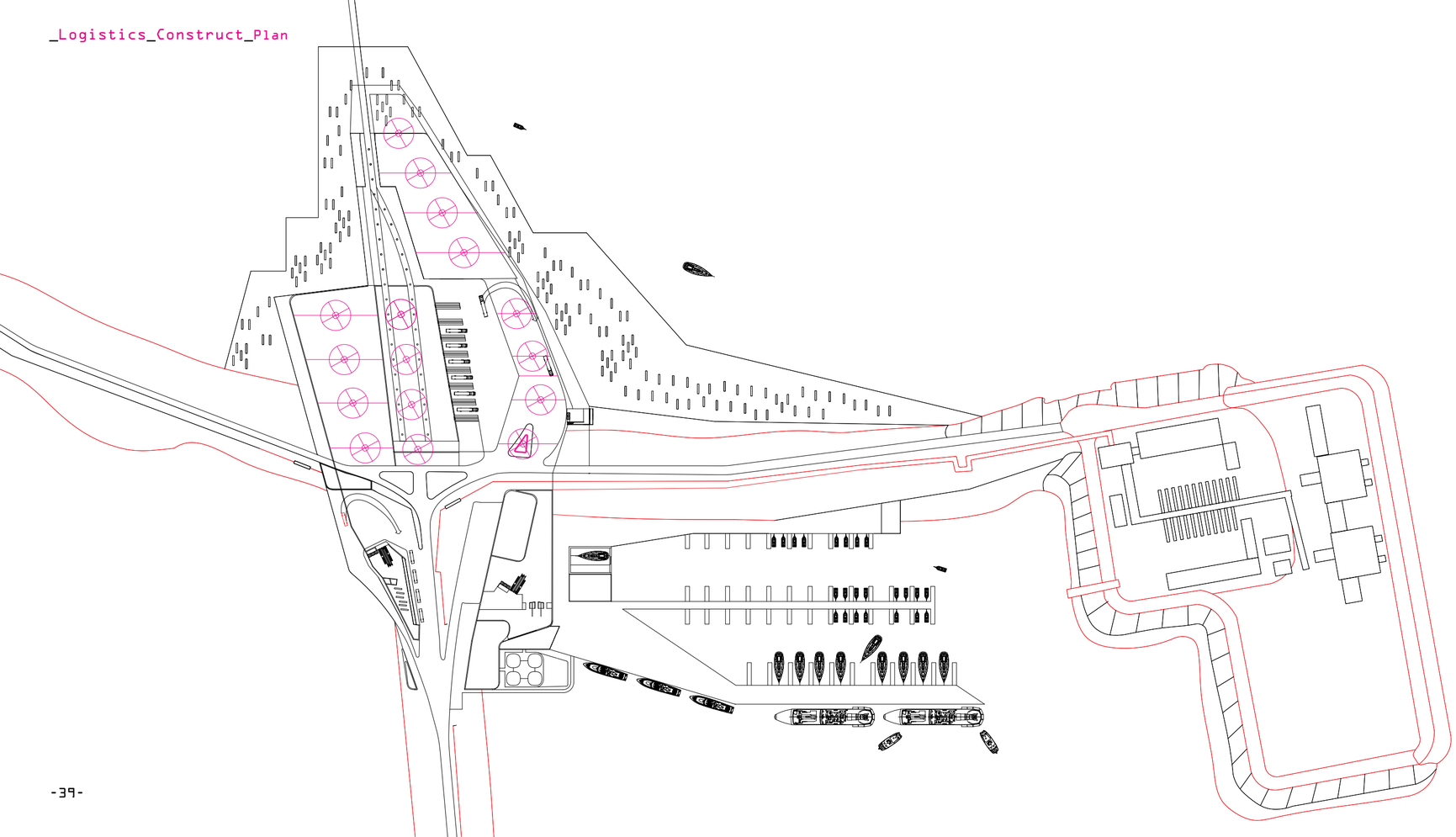
Under the Law of the Sea a 200 nautical mile Exclusive Economic Zone (EEZ) can be extended if the governing country can prove that the connecting continental shelf extends beyond the current charted EEZ. Countries who have governing rights over the Arctic Region such as the USA, Russia, Denmark, Norway, Iceland, and Canada are amending the EEZ boundary to gain governing power over larger portions of the Arctic.

These actions have created large areas of conflict termed grey zones. The primary grey zones are between the EEZ of Canada and the US with the other between Russia and Norway. The zone of conflict between the US and Canada creates an opportunity for the two governing bodies to possess governance over almost half of the Arctic Region

_Deadhorse_Development_Distribution







Current Melting patterns within the last three decades have begun to redefine the Arctic Ice Pack. By the year 2030 the Arctic will have year round navigable seas. With this development containerized shipping routes from Rotterdam, NL to Shanghai, CN will be cut in half.

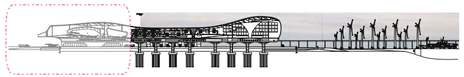
The Northwest Passage is positioned to serve as an expanded territory between the Canada and the US. This territory will become a new gateway to the global economic network. A new cosmopolitan region not unlike Venice and the Mediterranean Sea during the Renaissance.

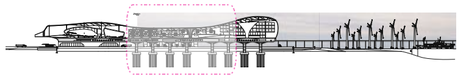
Lying dormant below the Arctic ice according to the US geological survey is 25% of the worlds untapped fossil fuel reserve. This reserve will be short-lived and have an underwhelming effect in reference to the worlds lust for oil. Yet in the end the reserve is guaranteed to be exploited. Therefore the development and planing of this region is paramount and a global concern.

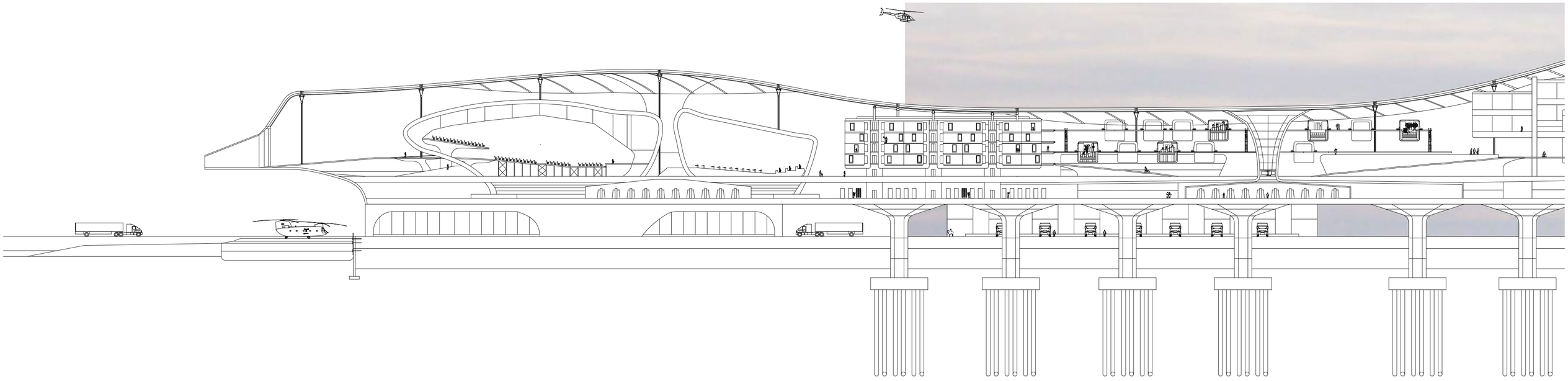
The positioning of a containerized shipping hub and intermodal governance center outside of Deadhorse Alaska will fill the void in this situation. Deadhorse represents an existing node of infrastructure which is equipped to process gas and petroleum.

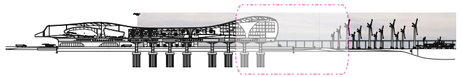
The intermodal governance center will receive and regulate material flows to sustain the town of Deadhorse and the greater region. As the primary umbilical cord to this region this center will also act as a social catalyst. Cultural efficacy is gained by positioning a United Nations Arctic Council at this new center. Future expansion at a regional scale will be filtered and distilled through this new governing body.

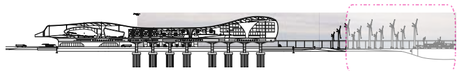
As a proving grounds, this amplification of governance will create a reservoir of knowledge. This knowledge will be utilized to order expansion and sustenance beyond oil and gas extraction.

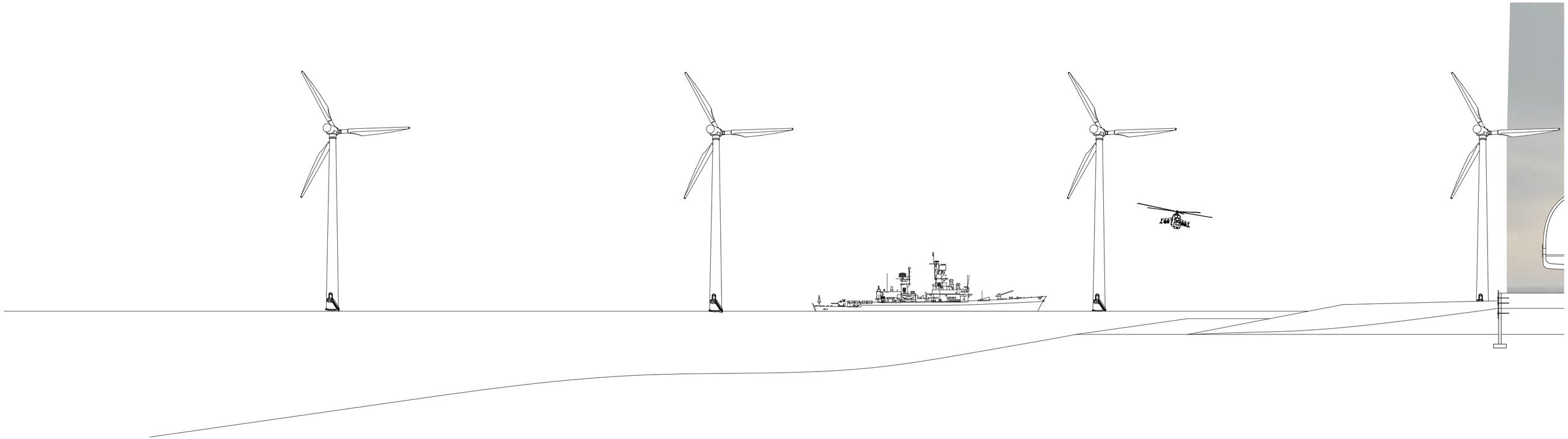


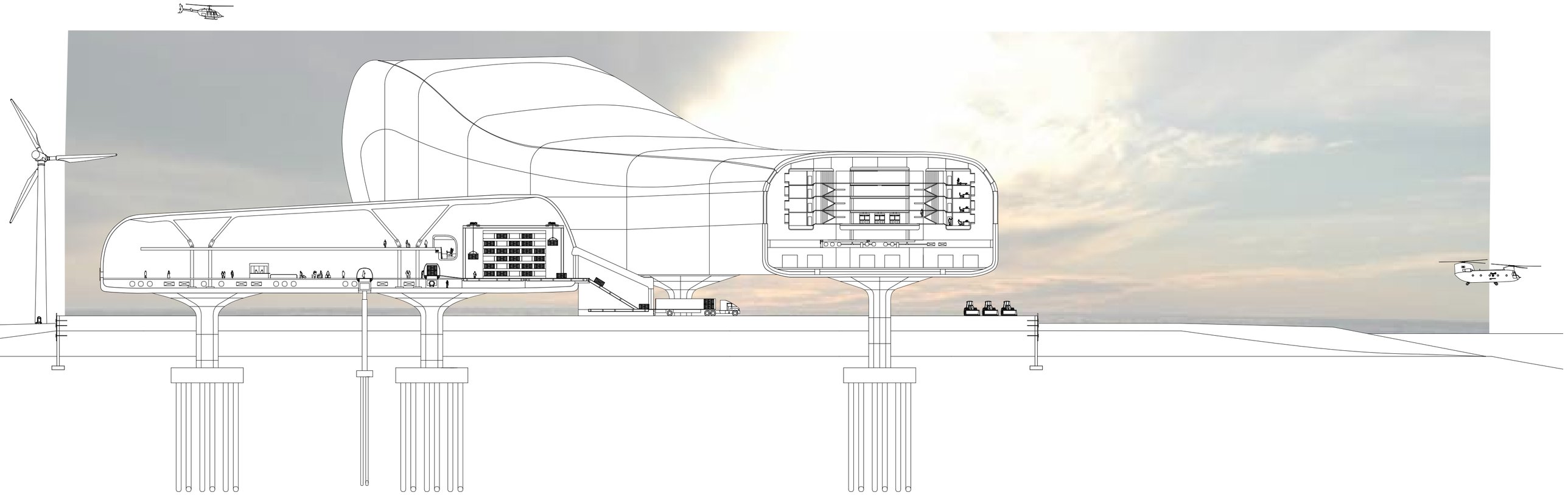


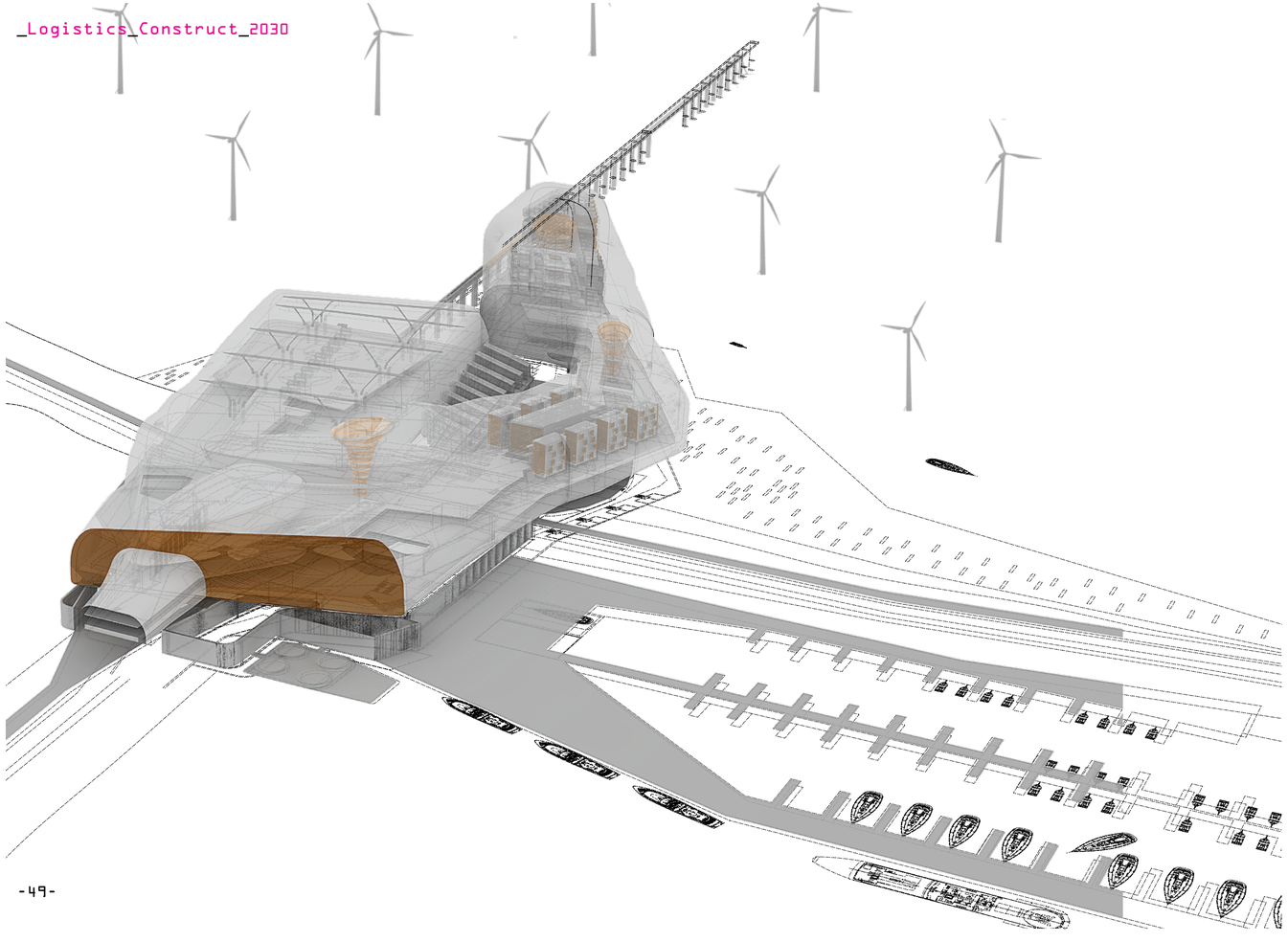


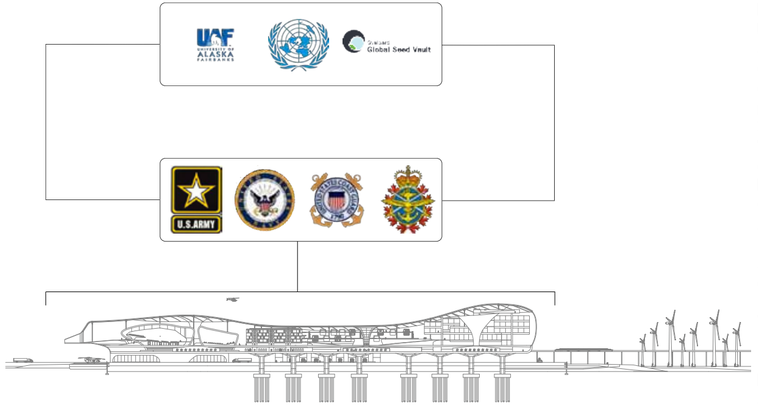








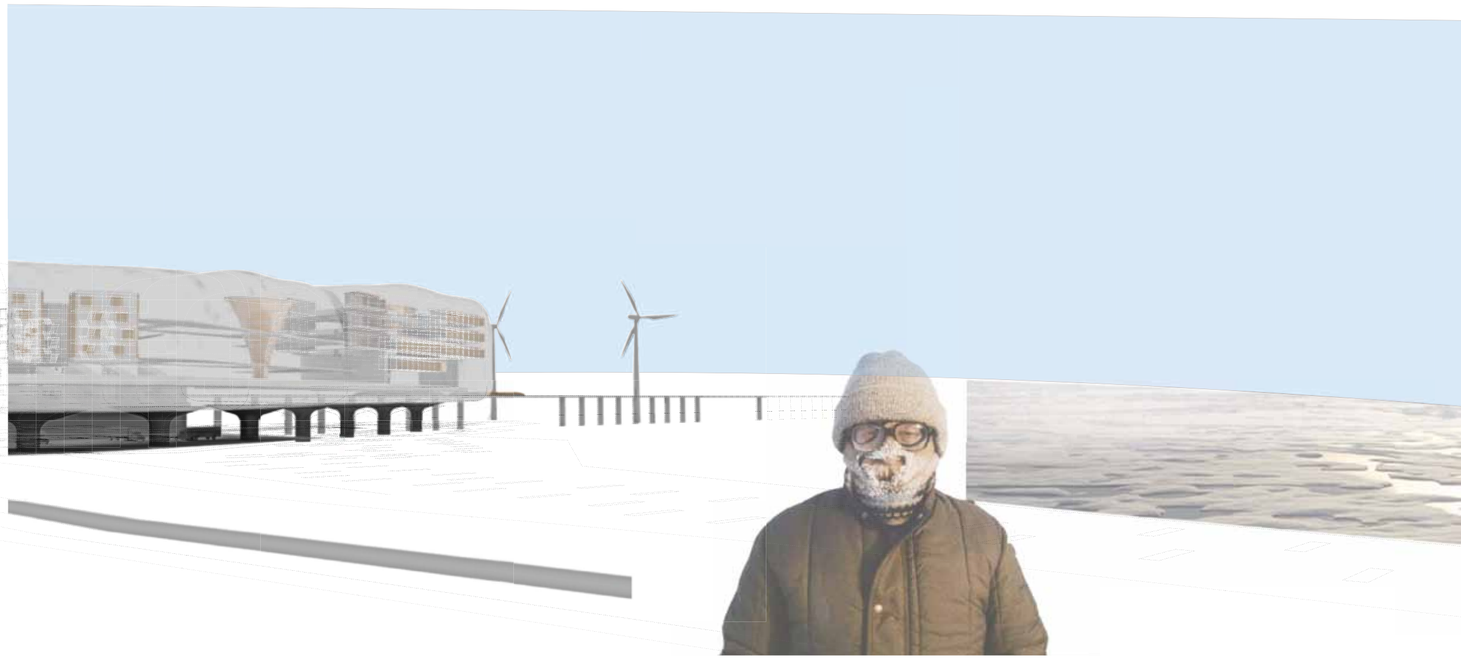


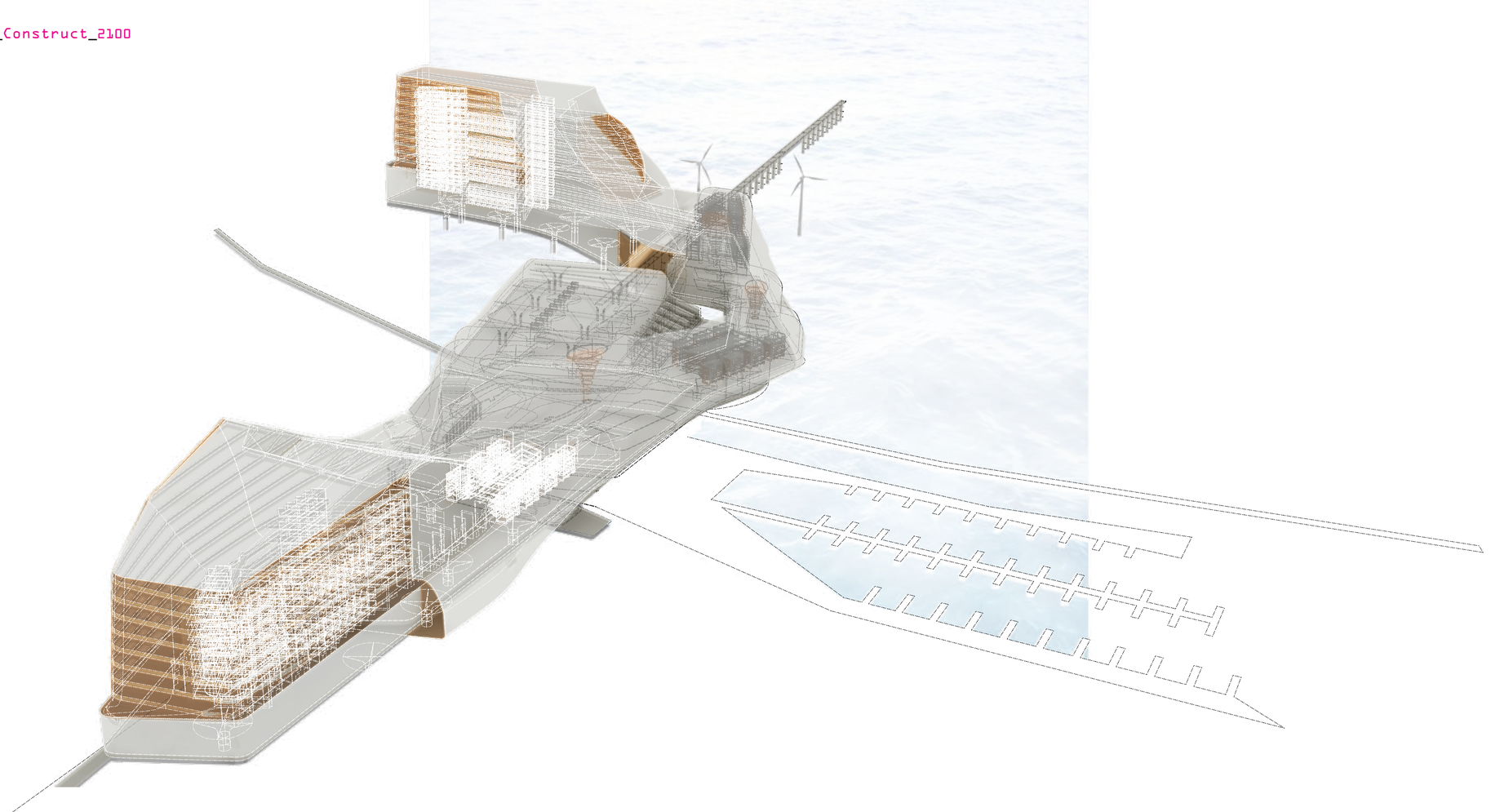


Building off of the United Nations center and other military occupations are research opportunities. A partnership between the Svalbard Arctic Seed Vault, an expansion of the University of Fairbanks Arctic Super Computer, and the Alaskan Oil and Gas institute is created to stimulate this research opportunity.

These entities occupy the construct and are layered strategically. Built off of the artificial island are the military operations. The supper computers occupy the lowest levels where interior cooling is not necessary. This also allows the heat energy created by the servers to heat the rest of the construct.

The rest of the structure is divided into research and office modules in the center with the UN and living quarters book ending the research zone on each end. This system creates an interior urbanism which is divided and layered to react to the extreme weather conditions outside.





The logistics of the pipeline helped me to conclude that the projected future of the Arctic Region and the Northwest Passage is not defined by liminal establishments of industry and civility, but rather crystallized nodes of concentrated flows of energy, materials, and economic growth.

The construct of my project serves as a variegated manifold for these flows of capital and people. Moving another 100 years in the future, I see this construct acting as a prosthetic armature that is utilized in the name of expansion as a surrogate host for future developments.

As the oil and gas resources are tapped out on land the industry will move to the sea. The industrial palimpsest of the land will decay and be lost buried beneath the ocean and time. The hinterland expands, is ordered and stages new occupations.

Fig. 41

Thesis Provocations

_In reference to the discourse of architecture how does one negotiation the historicity of location, geography, and landscape without being caught in the statistical paradigm. A new paradigm will question the visibility of infrastructure and its agility.

(The statistical paradigm limits the designer's authority to create value and craft, by substituting (or garnishing) design with scientific operations and statistical analysis.)

_As a projective architecture of the near future how can the discourse escape its own self fulfilling prophecy, and gain efficacy for design.

_What agency as designers and spatial thinkers can architects leverage through politicized territories founded on capital gained from natural resources speculation.

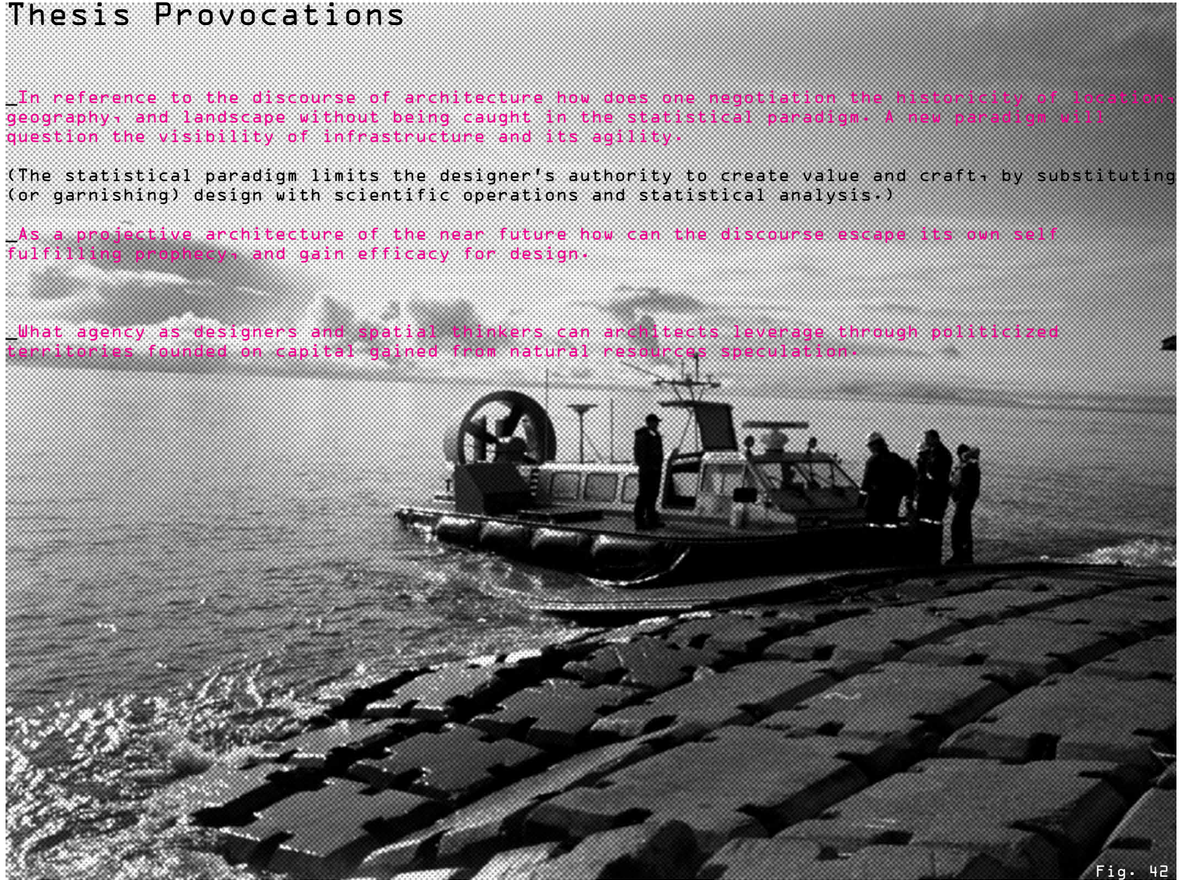


Fig. 42

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1. See. http://www.popularmechanics.com/ Big pipe dreams come true at last, April 1975

2. See. http://www.gi.alaska.edu/ScienceForum/ASF6/639.html

3. See. http://vilda.alaska.edu/, Digital Library Archives. The soils crew for the oil companies flew through the landscape in a helicopter. Their transient existences were defined two perspectives, that of the aerial object within a landscape and that of a figure experiencing a landscape.

4. _____Digital Library Archive Soil engineers set up camp for a week at a time to test a given area. Once this area was documented a helicopter pick them up and they moved on.

5. _____Digital Library Archives. Soil engineers at camp.
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6. _____Digital Library Archives. Soil engineers at camp.

7. _____Digital Library Archives. Seen here is one of the first productions of the pipeline pig's. Pigs are used to clean and detect areas of corrosion within the pipe.

8. _____Digital Library Archives. ATCO structures inc. developed job site trailers that were used at each of the construction camp sites.

9. _____Digital Library Archives. Before assembly each ATCO unit sat in a vacant feild devoid of any of its previous natural character.

10. _____Digital Library Archives. Once the camp had been assembled in its final form final logistical details needed to be finished before it could be inhabited.

11. _____Digital Library Archives. Fuel cell bladders were carved into the earth and used to supply the camp's needs for generating electricity along with fueling the fleet of machinery used for construction.

12. _____Digital Library Archives. Seen here is the process of laying out the fuel cell blader.

13. _____Digital Library Archives. Seen here is a filled fuel cell blader.

14. _____Digital Library Archives. Hercules transport planes supplied the work camps around the clock in order to maintain proper production levels.

15. _____Digital Library Archives. Seen here is an array of pallets at one of the temporary air fields. The supplies ranged from medicine to construction materials.

16. _____Digital Library Archives. Seen here, ATCO units wait along side ice road between Four Corners and its prospect camp site.

17. _____Digital Library Archives. Seen here is the pipeline work pad near pump station 1.

_Images Sited

18. _____Digital Library Archives. Seen here is the work pad traveling through the landscape.

19. _____Digital Library Archives. Seen here is the interior of the ATCO trailers at five mile camp

20. _____Digital Library Archives. Seen here is the pipeline pad construction approaching Pump Station 1 near Prudhoe.

21. _____Digital Library Archives. Seen here is the pipeline pad near Willow Lake.

22. _____Digital Library Archives. Seen here is the final leg of the work pad to Prudhoe Bay.

23. _____Digital Library Archives. Seen here is the ACV (air cushioned vehicle) beaching site located at the construction camp for the Yukon River bridge. ACV's were used as primary transport units as long as the weather and ice was permitting.

24. _____Digital Library Archives. Seen here is an inflatable structure named Baluga (after the whale species) located at the Yukon bridge construction site. It was used by concrete contractors to maintain the necessary ambient temperature for curing concrete.

25. _____Digital Library Archives. Seen here is the waste fill area near pump station 2.

26. _____Digital Library Archives. Seen here is a line of bulldozers waiting dormant in a materials storage yard.

27. _____Digital Library Archives. Seen here is the mile 82 storage yard often called Klutina.

28. _____Digital Library Archives. Seen here is the grade minerals borrow site near mile 86 of the Richardson Highway

29. _____Digital Library Archives. Seen here is the work pad near the North Slope.

30. _____Digital Library Archives. Seen here are tourists visiting Deadhorse facilities in 1978.

31. _____Digital Library Archives. Seen here are tourists visiting Deadhorse facilities in 1978.

32. _____Digital Library Archives. Seen here are supply barges making a summer delivery to Deadhose.

33. _____Digital Library Archives. Seen here is an ice breaker cleaning a path for supply barges in the Arctic Ocean.

34._____Digital Library Archives. Seen here is an oil worker on location in Deadhorse.

35. _____Digital Library Archives. Seen here is the pipe stockyard near Fairbanks Alaska.

36. The Facts, Trans Alaskan Pipeline System, The Alyeska Pipeline Service Company (2007) P. 41 Seen here is a the permafrost chart created by the Alyeska pipeline service company.

37. _____Digital Library Archives. Seen here is the form work for the concrete shell surrounding the pipe at Atigun Pass which is through the Brooks Mountain Range.

38. _____Digital Library Archives. Seen here is the form work for the concrete shell surrounding the pipe at Atigun Pass which is through the Brooks Mountain Range.

39. _____Digital Library Archives. Seen here is the approach to dead horse by plane.

40. _____Digital Library Archives. Seen here is a view of the Porcupine Caribou Herd.

41. _____Digital Library Archives. Seen here is the Arctic Coast Guard practicing search and rescue in the frozen waters.

42. _____Digital Library Archives. Seen here is North Star Island the fist artificial island used for oil production in the Arctic Ocean.