ASTAR
TRIANGLE COMMUNITY ROAD PEL STUDY

Technical Memorandum

Recommended Alternative Screening Criteria

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From:	Renee Whitesell, PEL Study Lead
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Project:	Triangle Community Road PEL Study
	NFHWY00769

PEL Study Description

The Arctic Strategic Transportation and Resources (ASTAR) program is a partnership between the Alaska Department of Natural Resources (DNR) and North Slope Borough (NSB) created to identify, evaluate, and advance opportunities to enhance the quality of life and economic opportunities in North Slope communities through responsible infrastructure development. The ASTAR team identified community connectivity between Atqasuk, Utqiaġvik, and Wainwright as a top priority of community members in the region[1]. To advance this project, DNR and NSB are working in partnership with the Department of Transportation and Public Facilities (DOT&PF) to deliver a Planning and Environmental Linkages (PEL) Study.

The Triangle Community Road PEL Study is advancing to consider transportation connections between the communities, while concurrently working with stakeholders and the community to receive feedback on whether a roadway connection is desired.

The study area boundary, where the community road may be located, is shown in Figure 1.

[1] *Road Network for Utqiaġvik, Atqasuk, and Wainwright - Arctic Strategic Transportation and Resources Project North Slope, Alaska. April 2020*

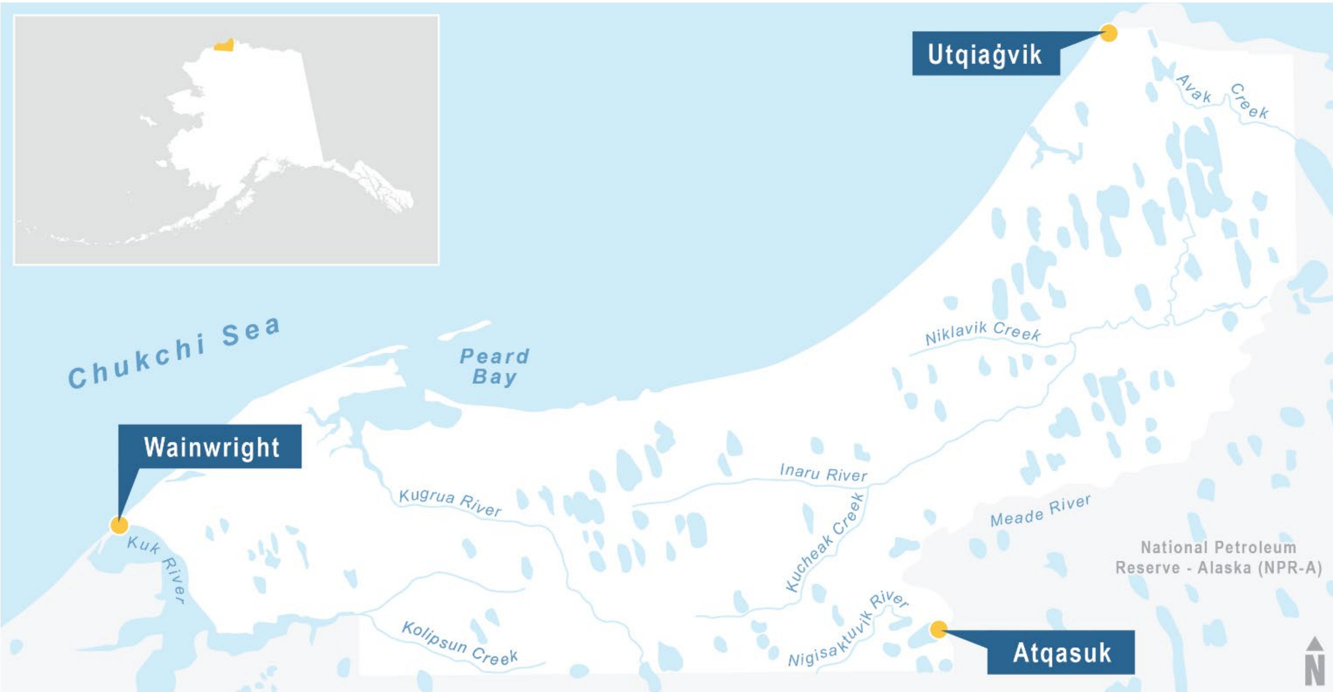

Figure 1: Study Area

Purpose of the Technical Memorandum

This technical memorandum describes the alternative screening process used for the alternative selection during the Triangle Community Road PEL Study (Project Numbers: NFHWY00769/0002[521]).

The alternative screening process provides critical information about how well an alternative satisfies a proposed project's purpose and if it will meet the transportation needs of its users. If an alternative does not meet the project's purpose and needs (P&N), it will be eliminated. Also, the screening process will determine if an alternative follows adopted planning documents, is technically implementable and constructable from an engineering perspective, and is financially feasible, as well as reasonable under the National Environmental Policy Act (NEPA), practicable under the Clean Water Act, and prudent and feasible under Section 4(f) of the Department of Transportation Act of 1966.

The alternative screening process is designed to accommodate the development of new alternatives throughout the PEL process and will be applied to all alternatives to give confidence all alternatives are evaluated consistently.

Alternative Selection Process

The screening process is a decision-making framework to determine how well each alternative meets the P&N and the additional goals. NEPA requires that a reasonable range of alternatives be considered and reviewed objectively, and that the selection process and alternatives eliminated be well documented. This screening process will meet these documentation requirements including the elimination of alternatives from further consideration during a future NEPA process and the identification of reasonable alternatives that will be evaluated during future project development under NEPA.

Under NEPA, reasonable alternatives are those that are practical and feasible from a technical, engineering, environmental, economic, and social standpoint, and which meet the P&N for the project. The screening process compares the advantages and disadvantages of a broad range of alternatives for advancement through stages of development into more refined alternatives and, ultimately, the recommended reasonable alternative(s).

An iterative step alternative selection process is planned for this PEL Study as described below. Further details defining criteria and methods for each screening step are provided in later sections of this memorandum.

The alternatives development and screening process uses the following steps:

1. **Develop the purpose and need statement.** The P&N statement states why the project is being proposed (the purpose) and describes the key problems to be addressed and underlying causes (the need). The P&N statement guides the development of alternatives and is the primary focus of the alternative screening criteria.
2. **Source preliminary alternatives from previous ASTAR work and community meetings.** Alternatives are drawn from previous planning efforts developed through ASTAR and suggested alternatives from early public involvement. These alternatives have been evaluated by the Advisory Committee to build consensus on what alternatives will advance through the screening and evaluation process.
3. **Confirm possible alternatives.** Early evaluation based on available data, professional judgment, and review against the P&N to eliminate alternatives that are not feasible based on location and buildability. Draft alternatives that have similar characteristics will be grouped as variants of a single alternative during this step. Alternatives remaining after the pre-screening will be considered “preliminary alternatives”.
4. **Apply screening.** Screening of the alternatives using a range of qualitative and quantitative criteria including engineering constraints, and environmental and social and economic impacts. The goal is to compare and rank the alternatives and to identify a recommended alternative(s).
5. **Documentation:** The screening results will be documented in the PEL Study and PEL Questionnaire.

The screening process is summarized in the following figure:

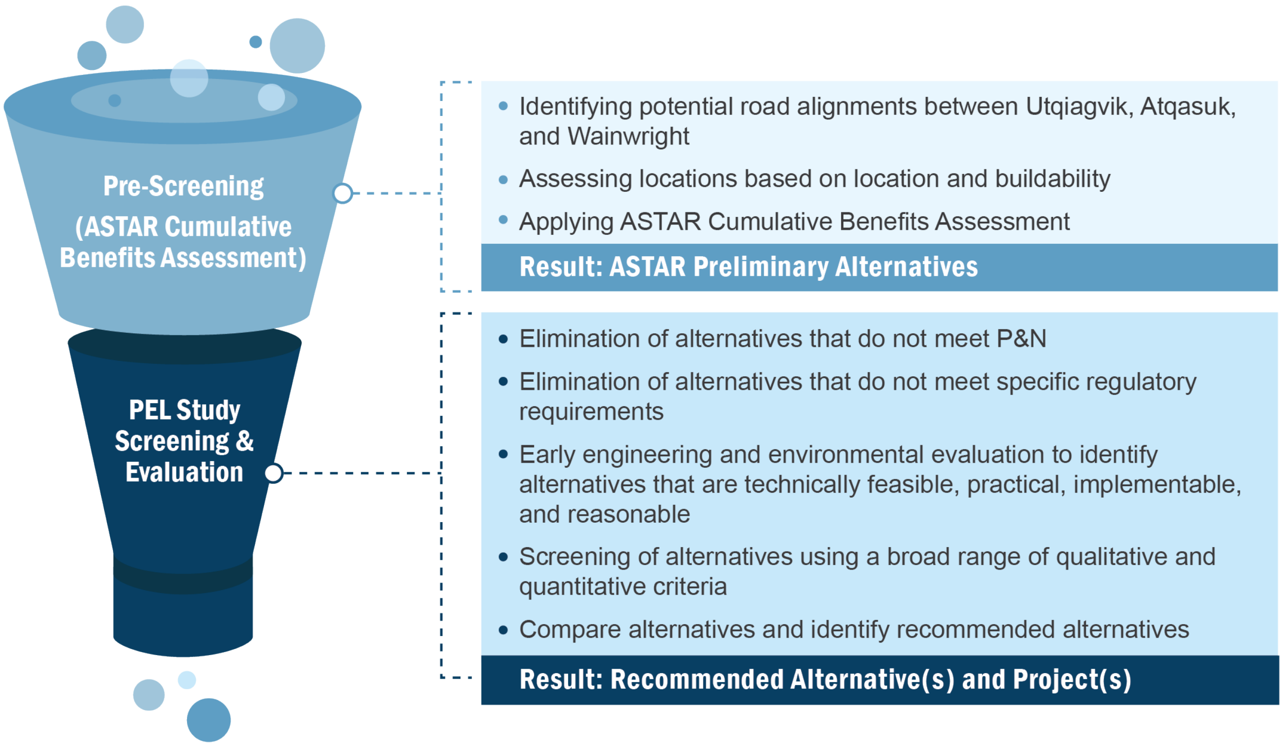

Figure 2: Alternative Screening Process

Identifying Screening Criteria

The alternative screening criteria are established before any alternatives are evaluated to make sure each alternative is examined consistently and without bias. The screening criteria are the basis for the selection and recommended advancement of alternatives to a NEPA review. The potential alternatives are reviewed against the project P&N to eliminate non-viable alternatives prior to applying the screening criteria. The screening criteria are based on engineering constraints and environmental considerations.

The alternative screening process has been developed to objectively consider how well each alternative performs in relation to specific engineering and environmental criteria. A “no build” alternative is carried through the screening process to provide a baseline for the evaluation of the alternatives. The following sections discuss the P&N evaluation and the screening criteria in more detail.

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Purpose and Need

The following P&N statement is the starting point for the alternatives analysis:

Purpose

The ASTAR team has partnered with DOT&PF to conduct a PEL study to identify ways to improve the transportation connection between Atqasuk, Utqiaġvik, and Wainwright through responsible infrastructure. The purpose of the PEL study is to evaluate an all-season roadway connection between the three communities. The PEL study team will also work with stakeholders and the community to understand whether an all-season road connection between the communities is desired and should move forward to a NEPA and design phase.

An all-season gravel road connection between the three communities would meet the following objectives:

- Lower the cost of energy, basic goods, utilities and other services
- Improve health and wellness through improved access to health services
- Create opportunities to strengthen cultural exchange, share traditional knowledge, enhance community and family connectivity, and improve emotional well-being
- Provide an evacuation route to higher elevation areas, allowing efficient transportation away from the coast, in case of severe storm surges and/or coastal flooding.
- Reduce fossil fuel use through reduction of reliance on air travel and advancing the opportunity for energy alternatives to diesel fuel

Need

The communities of Utqiaġvik, Atqasuk, and Wainwright are only accessible by air year-round or snowmachines/ rolligons during winter as no permanent road exists between these communities, or to the Alaska road system. The lack of an all-season surface transportation connection between the communities continues the following undesirable conditions:

- Lack of year-round, reliable, and cost-efficient transport of goods and services
- Unrealized economic growth
- Uneconomical and unreliable access to family and friends between communities
- Difficult and costly access to subsistence resources
- Prolonged response times for medical emergencies
- Lack of evacuation route to allow efficient transportation of residents away from coastal communities that are threatened by increasingly substantial coastal storm surges and flooding.
- Limited / uneconomical access by Wainwright and Atqasuk residents to educational opportunities, training, and workforce development available in Utqiaġvik

Pre-Screening Alternatives Considered

A broad range of alternatives were considered when identifying transportation solutions that meet the P&N. Surface and non-surface transportation alternatives that connect all three communities were considered but dismissed due to deficiencies in meeting the P&N, as described below.

Marine

No major freight travels directly to Atqasuk via marine lines; however, barge freight from Utqiaġvik is hauled by land to Atqasuk. Improving existing barge landings or constructing new ports or docks would facilitate additional landing points for cargo and passengers but only for Wainwright and Utqiaġvik. Therefore, although new marine facilities would provide better siting for cargo landing locations and create efficiencies, it would not meet the project meet P&N of meaningfully connecting all three communities. Additionally, marine facilities would be subject to interruptions from storms and ice formation creating seasonal issues that would not result in a year-round connection.

Air

Utqiaġvik and Deadhorse (Prudhoe Bay) are the main hubs on the North Slope, with flights to and from Anchorage and Fairbanks. In addition to travel between communities, the North Slope requires transportation in support of the oil and gas industry. In addition to chartered Shared Services Aviation for ConocoPhillips Alaska, Inc. (CPAI), workers use commercial airlines for transportation to and from Deadhorse/Prudhoe Bay. Cargo is often delivered to the communities via air transportation. The following describes air facilities currently serving Utqiaġvik, Wainwright and Atqasuk

- The Wiley Post-Will Rogers Memorial Airport in Barrow (BRW) is owned and managed by DOT&PF. It is the hub airport on the North Slope and provides key access to Anchorage, villages, and facilitates borough-wide search and rescue activities. The airport has a 7,100-ft x 150-ft paved runway and two 75-foot-wide taxiways connect the approximately 620,000-square-foot apron to the runway. The airport can accommodate a Boeing 737 series aircraft, or similar.
- Wainwright Airport (AIN) is owned and operated by the NSB. Wainwright has no road access; the airport is the only year round access to the community. The airport has a 4,494-ft x 110-ft gravel runway with turnaround areas on both ends. A 80-ft by 570-ft taxiway connects from the runway to a 280-ft by 475-ft parking apron. The runway has medium intensity lighting and Precision Approach Path Indicators on both runway ends. The airport is unmanned and has no terminal. Wright Air Service offers air service with Cessna Grand Caravans six days a week.
- The Atqasuk Edward Burnell Sr. Memorial Airport (AIK) is owned and maintained by the NSB. Atqasuk has no road access; the airport is the only year-round access to the community. As a small village airport, it is unattended and consists of a 4,370-ft x 90-ft gravel-surfaced runway with turnaround areas on both ends. The runway has medium intensity lighting and visual approach slope indicators on both runway ends. Wright Air Service offers air service with Cessna Grand Caravans six days a week.

Improving existing air facilities to accommodate use during inclement weather would increase the reliability and frequency of moving cargo and passengers. This alternative would improve air service reliability, however this alternative would not meet the P&N due to increased cost for residents to fly to meet simple objectives, such as attending school or medical appointments. Also, reliability issues related to weather exclude this alternative from meeting the P&N. In addition, this alternative would not provide a timely and reliable evacuation route for Wainwright.

Terrestrial

Two reasonable and feasible terrestrial options exist, constructing a seasonal ice road between all three communities, or developing a gravel road.

Ice Road: Constructing an annual ice road to connect all three communities would increase reliability for travel and provide evacuation options for Wainwright. However, these benefits would not be realized year-round, only in winter when conditions support the ice road, and therefore this alternative does not meet the P&N.

Gravel Road: Creating a gravel road between all three communities would specifically meet the need for year-round, reliable, and cost-efficient transport of goods and services and therefore creates a differentiator for the gravel road alternative versus the non-surface transportation alternatives, and the ice road alternative. Additionally, the gravel road is unique in meeting the need for an all-season evacuation road and easier, more cost-effective year-round subsistence access. Potential all-season gravel road routes were first identified to align with likely river crossings and account for other natural features and constraints. Four corridors were identified that link Atqasuk, Wainwright and Utqiaġvik and are shown in Figure 3 below:

- Corridor A: Utqiaġvik to Atqasuk
- Corridor D: Coastal Route Extension
- Corridor E: Middle Route
- Corridor F: Southern Route

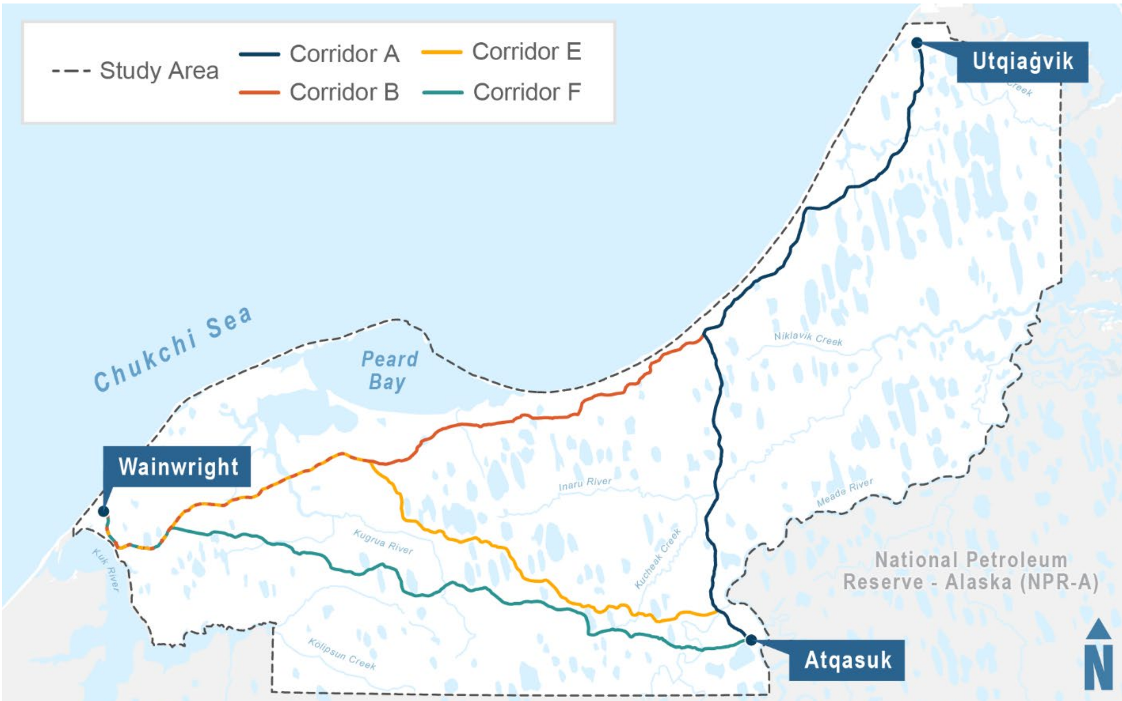

Figure 3: PEL Study Area Road Corridors

Corridors are not comparable as stand-alone road network alternatives therefore these corridors were further developed into six road network alternatives (henceforth referred to as alternatives) and will be advanced into engineering constraints and environmental-based criteria screening. A comparison of each alternative is summarized in Table 1 and shown in Figures 4 through 9.

Table 1: Road Network Alternatives

Road Network Alternative	Distance Between Communities (miles)			Total Network (road miles)
	Utqiaġvik and Atqasuk	Utqiaġvik and Wainwright	Wainwright and Atqasuk	
1	67	135	69	135
2	67	101	95	131
3	67	132	73	136
4	67	101	73	171
5	67	101	69	190
6	116	101	73	144

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Figure 4: Alternative 1

Figure 5: Alternative 2

Figure 6: Alternative 3

Figure 7: Alternative 4

Figure 8: Alternative 5

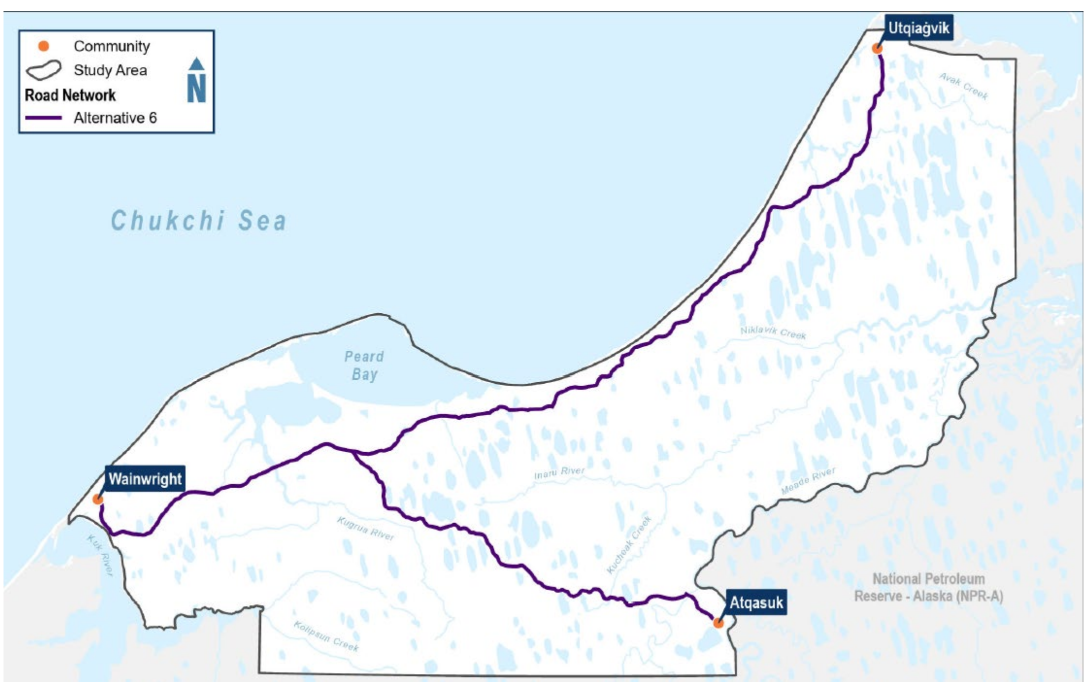

Figure 9: Alternative 6

Engineering Constraints and Environmental-Based Criteria

The engineering constraints and environmental-based criteria consider, at a high level, the costs of engineering constraints (e.g., material sources, stream crossings) and the potential impact of an alternative on a range of environmental resources. Each two-lane roadway would be constructed atop the existing tundra. Starting with the existing tundra surface, contractors would establish a road base. Engineered gravel would be placed and then compacted in layers until the designed height of the new roadway surface is achieved, which a minimum of five feet above the tundra. The finished travel surface would be a flat roadway surface with two, 10-foot travel lanes side by side, flanked by approximately 2.3-foot shoulders. Outside of the shoulders reflective roadway delineator posts are set at 50-foot intervals, one foot outside the shoulder edge, to guide drivers and improve visibility. This stepwise build creates a stable, consistent roadway structure across the soft tundra. Although each alternative would be similarly designed for consistency in evaluating constraints and impacts associated with different routes, three typical sections were developed to conform to site conditions based on location within the study area, as described below and summarized in Table 1.

Table 1: Screening Criteria

Typical Name	Road Prism Width (ft)	Height (ft)	Geotextile
Typical A (Utqiaġvik)	44.6	5.3	Separation (Class 1) Stabilization (Class 1)
Typical B (Wainwright)	46	5.6	Separation (Class 1) Stabilization (Class 1)
Typical C (Atqasuk)	52.4	7.2	Separation (Class 1) Stabilization (Class 1) 2-inch thick polystyrene

Typical A (Utqiaġvik) would be used between Utqiaġvik and the first intersection with the road north out of Atqasuk.

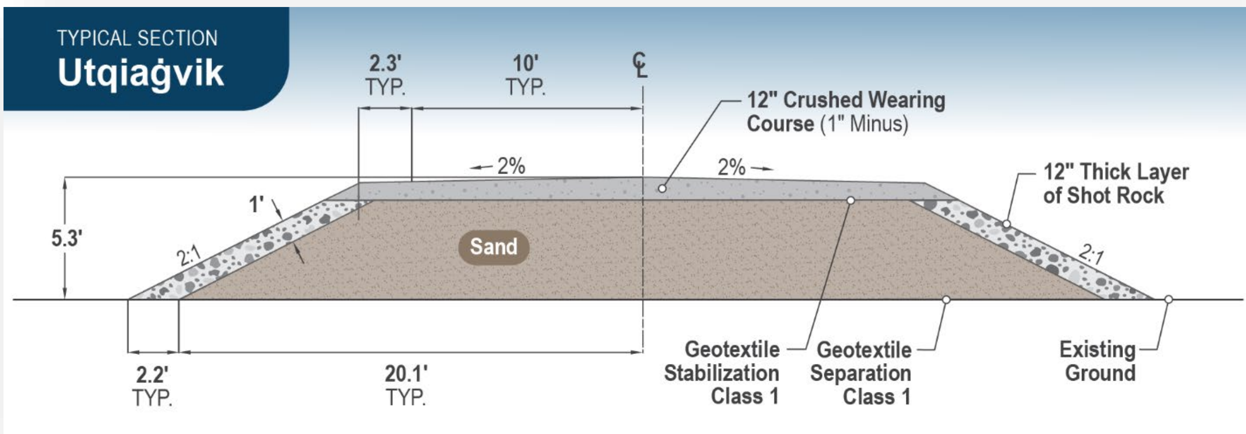

Figure 10: Roadway Typical Section A

Typical B (Wainwright) would be used on segments that traverse the coastal area south of Typical A.

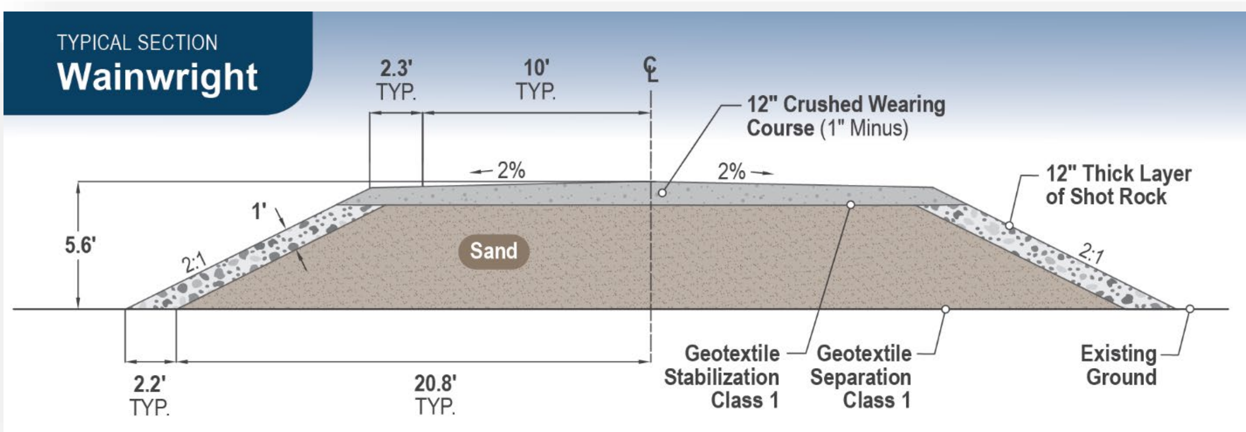

Figure 11: Roadway Typical Section B

Typical C (Atqasuk) would be used on all other segments.

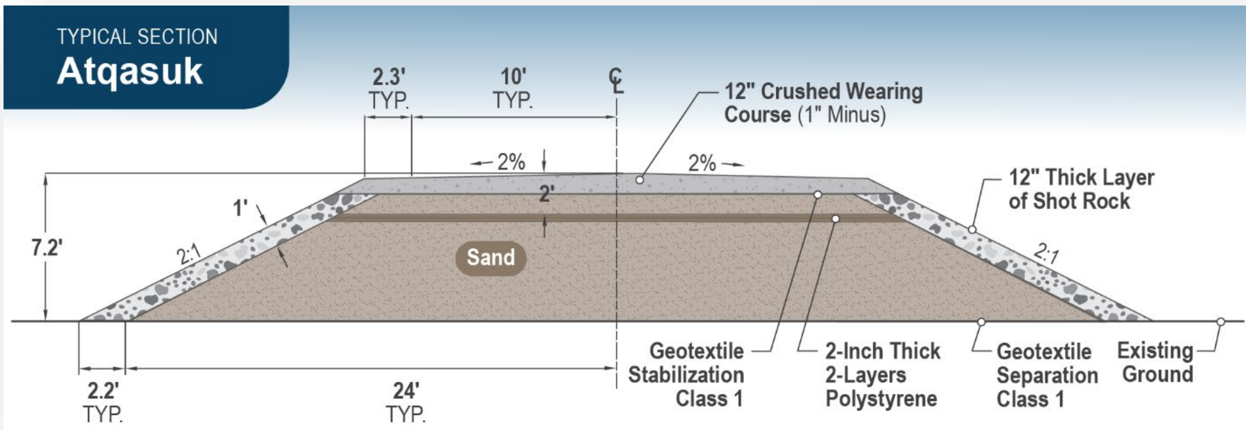

Figure 12: Roadway Typical Section C

The engineering constraints and environmental-based criteria screening process includes the following steps:

- Identify if resources will be potentially affected by an alternative, and to what extent
- Evaluate the key engineering challenges in a comparative analysis, or ranking of complexity according to engineering constraints
- Evaluate the costs of each alternative, logistical considerations, and technical feasibility
- Determine whether any of the alternatives would have substantially greater costs (monetary or environmental) without having substantially greater benefits

Given the consistency of the study area terrain, many of the environmental resources will be similarly impacted by each of the alternatives. Given the intent of the alternatives analysis is to rank and show differentiation between the alternatives, environmental categories that do not display meaningful differences between alternatives have been removed from focus in the screening.

For example, all alternatives are in close proximity to the same number of cultural resources. If this criterion was used to determine the 'recommended' road alternative, all the alternatives would score the same, which does not aid in decision-making. Instead, criteria which differentiate one alternative from another were selected. Environmental resource categories that did not provide substantive differentiation between the alternatives included:

- Land Ownership
- Hydrology
- Cultural and Paleontological Resources
- Avian Resources and Habitat
- Subsistence Patterns
- Threatened and Endangered Species
- Terrestrial Mammals
- Fish and Fish Habitat

The following criteria were selected as screening criteria as the differences in impacts between the alternatives will create meaningful separation when evaluating the alternatives against each other. Additionally in Table 2 below, there are descriptions of the measures for which we are quantifying impacts.

Table 2: Screening Criteria

Constraint	*To What Degree Does the Alternative…*
Protected Species	Impact K-1 and K-2 BLM setbacks. K-2 deep lakes are of particular importance to waterfowl, eiders, and yellow-billed loons.
Geology/ Geotechnical	Consider geology and geotechnical considerations, such as road construction in high heave/thaw areas that could significantly impact construction and maintenance costs. Additionally, extended travel distances to gravel resources would significantly increase transportation times and fuel costs.

Constraint	*To What Degree Does the Alternative…*
Vehicle Bridges	Require the construction of bridges or culverts, which represent the vast majority of built infrastructure beyond the road itself. Significant differences exist between the road alternatives in the number, length, and cost of road infrastructure.
Subsistence Patterns	Potentially impact subsistence resources. This evaluation would encompass components of many criteria such as fish, wildlife, and waterfowl.
Wetlands	Avoid or minimize impacts to wetlands and especially sensitive wetlands.
Construction Cost Estimate	Minimize construction cost. This calculation is not intended to be interpreted as a financial construction quote, only as a method for evaluating environmental impacts and understanding at a planning level the potential costs of a route alternative. Significant components of the ASTAR project are unknown (such as gravel resources) which would likely significantly impact the final cost of the project.

Scoring

Using the screening criteria selected above, environmental impacts and engineering constraints would be quantified according to the measurements listed in Table 2 above and be ranked mathematically using standard deviations to represent the degree by which alternatives differ from each other. In this approach, a value of 1 corresponds to most favorable result and identifies the alternative(s) with the lowest impact.

Higher scores would be assigned to alternatives that, in comparison to the lowest impact alternative, had progressively higher impacts. Application of this scale can be generalized as follows in Table 3:

Table 3: Environmental-Based Criteria Screening

	Score	Impacts	Impacts Summary
Greater Impacts ↓	1	Lowest	Lowest identified impacts for that criteria.
	2	Moderately high	Impacts are noticeably above average and start to stand out.
	3	High	These impacts are well above average and differ significantly from the lowest impact alternative.

To accomplish this quantitative comparison, standard deviations are used which demonstrate how far from the average a given impact is. For example, if Alternative A has substantially fewer impacts on protected species, than Alternatives B and C, then Alternative A would be assigned an impact of '1' while Alternatives B and C would be given a score of '3' for the substantial increase in impacts to protected species they respectively encounter. By using a statistical approach, the PEL Study team can interpret data so that patterns and trends become clear when evaluating alternatives.

Weighting

According to information provided by the Advisory Committee, the screening criteria for environmental impacts and engineering constraints are not equal in importance, with some impacts holding greater significance. To address this, and to ensure that each Advisory Committee member's environmental and engineering priorities were represented, a weighted screening criteria was established which further refines the base score (described above as a 1 to 3 scale) by a multiplier.

The range of weighting multiplier is on a similar 1-3 scale so that abnormally high multipliers do not overpower minor impacts to maintain objectivity; as would have been possible with a 1-6 scale, for example. Advisory Committee members were provided with the environmental constraints to provide feedback regarding appropriate weighting criteria which will then be averaged to create a numerical weight to be applied to the category. Table 4 below represents the priority screening options given to the Advisory Committee.

Table 4: Environmental-Based Criteria Weight

	Multiplier	Priority	Weight Summary
Greater Importance ↓	1	Lowest	This criteria has a lower level of priority when compared to other criteria.
	2	Moderately high	This criteria is a higher priority consideration and should be given extra weighting.
	3	High	This criteria has the highest level of significance and these impacts are given the highest priority of consideration.

The need for further refinement of the screening process may be revisited during the application of the screening. Further refinement may include:

- updating a criterion to provide greater clarity
- clearer or more consistent measurement
- changing the scale to provide for a greater level of granularity in the evaluation of impacts, or
- modification of weighting to assist with measuring the performance and/or effects of the alternatives against key screening criteria.

Any changes to the screening process will be clearly documented with associated explanations for why revisions have occurred.

Below are the alternative screening criteria. The criteria are measured using the following scale to determine how the alternatives compare:

Table 5: Environmental-Based Criteria Matrix

Constraint	*To What Degree Does the Alternative…*	Measure	Weight
Protected Species	Impact K-1 and K-2 BLM setbacks. K-2 deep lakes are of particular importance to waterfowl, eiders, and yellow-billed loons.	1-3	1-3
Geology/ Geotechnical	Consider geology and geotechnical considerations, such as road construction in high heave/thaw areas that could significantly impact construction and maintenance costs. Additionally, extended travel distances to gravel resources would significantly increase transportation times and fuel costs.	1-3	1-3
Vehicle Bridges	Require the construction of bridges or culverts, which represent the vast majority of built infrastructure beyond the road itself. Significant differences exist between the road alternatives in the number, length, and cost of road infrastructure.	1-3	1-3
Subsistence Patterns	Potentially impact subsistence resources. This evaluation would encompass components of many criteria such as fish, wildlife, and waterfowl.	1-3	1-3
Wetlands	Avoid or minimize impacts to wetlands and especially sensitive wetlands.	1-3	1-3
Construction Cost Estimate	Minimize construction cost. This calculation is not intended to be interpreted as a financial construction quote, only as a method for evaluating environmental impacts and understanding at a planning level the potential costs of a route alternative. Significant components of the ASTAR project are unknown (such as gravel resources) which would likely significantly impact the final cost of the project.	1-3	1-3

In this quantitative evaluation of the environmental impacts from the proposed alternatives, the total of corresponding alternatives with the lowest value would correspond to the alternative with the lowest environmental impacts; essentially, a low score is desirable while a high score is undesirable as the score represents the extent of environmental impacts and engineering constraints.