Executive Summary

This Plan has 14 sections and Appendices A-U. The executive summary provides an overview and key conclusions of each Section.

The report is based on the known conditions and thinking as of October 1, 2024, including projects in the Statewide Transportation Improvement Plan, Amendment #1 (STIP).

Section 1-Introduction

The Alaska/Richardson/Steese Highways Corridor Action Plan (ARS CAP or CAP) is a comprehensive planning document for the corridor between Tetlin Village access road on the Alaska Highway and Fort Knox access road on the Steese Highway.

Kinney Engineering, LLC was the prime consultant on this project providing management, engineering, and public involvement services. Agnew::Beck served as a subconsultant to Kinney, providing facilitation and planning services. Kinney/Agnew::Beck are collectively referred to as the Project Team.

The ARS CAP was conducted in two phases. Phase 1 is this document, a short- and medium-term plan addressing conditions between 2024 and 2034 that primarily involve Manh Choh Mine haul operations and impacts. Double trailer ore-haul vehicles, configured as B-Trains, will haul ore from the Kinross Manh Choh Mine near Tetlin to the mill at Kinross Fort Knox Mine north of Fairbanks. The planned ore haul will make 60 roundtrips – 60 loaded trucks northbound and 60 unloaded trucks southbound, daily for a four-to-five-year time frame. Early in the CAP development, the Project Team's understanding was that ore haul was to start in 2024 and be done in 2029. However, the ore haul commenced in the Fall of 2023 and has been on-going since. The analysis year for the Phase 1 studies is 2030 instead of 2029 (for analysis convenience) because once the ore haul concludes, the traffic volume on most of the corridor drops precipitously.

Phase 2 intends to address a long-term planning horizon of 20 to 25 years and is pending upon the completion of Phase 1. Many of the recommendations of Phase 1 short/medium-term plan will apply to the Phase 2 long-term plan.

This document summarizes the Phase 1 corridor planning efforts performed between April 2022 and February 2024 including existing and future corridor performance assessments, analysis results, and recommendations for potential transportation projects and strategies to address identified goals and objectives.

DOT&PF may utilize this document along with other state, regional, and local plans, to identify projects for inclusion in the Statewide Transportation Program (STIP).

Section 2- Public Involvement

Public Involvement was an integral part of this plan. The Public Involvement Plan (PIP) is included under Appendix F.

The project formed an interest Transportation Advisory Committee (TAC) consisting of members of entities with diverse interests, including *ad hoc* organizations, cities, boroughs, villages, community centers, and public agencies. There were 13 formal, facilitated TAC meetings between May 2022 and November 2023. At each TAC meeting the Project Team identified issues raised by either the Project Team or the TAC as well as data analysis on a variety of technical topics. The TAC asked questions or provided input on direction of the study. This input was then addressed by the Project Team, often in the form of white papers and presentations during the next TAC meeting.

The TAC was instrumental in identifying many of the substantive issues evaluated in the report as well as potential alternatives for the corridor. The Project Team crafted and refined alternatives to address issues. TAC then provided feedback on the alternatives.

Other public outreach efforts included:

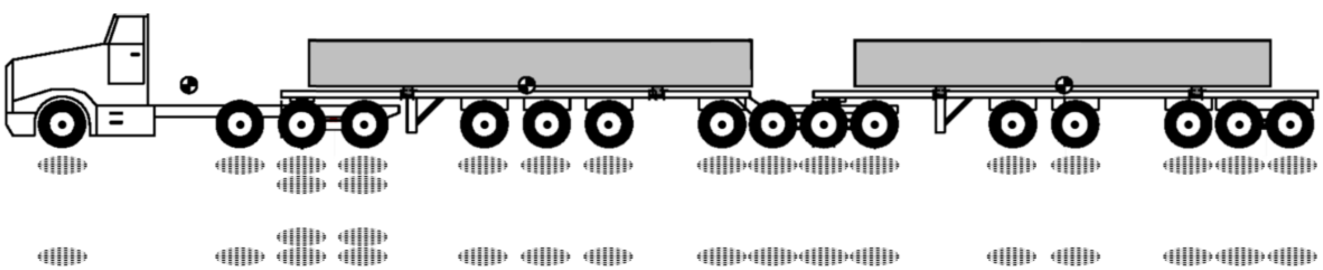
- Facilitated public comment opportunities at two TAC meetings.
- E-newsletters
- Website in which project materials were available.

Once the draft document was released to the public, the Project Team held public meetings in Fairbanks, Delta Junction, and Tok. These meetings were publicly noticed, and the proceedings were recorded by a court reporter. These meeting details and comment analysis is discussed under Section 12. Materials provided at these meetings and a summary of the comments that were made at them, are contained in Appendix F.

Section 3- Corridor Action Plan Design Vehicle and Performance Characteristics

The CAP Phase 1 design vehicle is the B-Train and is shown below in Exhibit A.

Exhibit A: B-Train



This vehicle is about 95 feet long with a double trailer (second trailer connects directly to the first trailer without a dolly) and as such, qualifies as a Long Combination Vehicle. The gross vehicle weight of the loaded B-Train is 162,815 pounds. The B-Train will likely be the heaviest vehicle and dominant vehicle type that regularly and frequently travels this corridor during the ore-haul period.

The B-Train is a legal vehicle that complies with Alaska Administrative Code and other Regulatory requirements for a Long Combination Vehicle. It is permissible on all the ARS Highways between Tetlin and Fort Knox. The fully loaded B-Train will meet expected seasonal load restrictions (based on past restrictions for ARS Highways on the corridor that may change in the future). A fully loaded B-Train gross vehicle weight will be allowable on all bridges on the ARS route except the Chena Hot Springs service interchange bridge over Chena Hot Springs Road. This can be bypassed on northbound off and on ramps.

Some of the B-Train's key performance parameters are superior to standard passenger cars, the usual high design vehicle. For example, the B-Train has braking capabilities that exceed those which are used in the geometric design of highways. That, and the elevated driver eye height and headlight height, results in superior stopping sight distance characteristics over the standard passenger cars.

Other of the B-Train's key performance parameters are poorer than a standard passenger car, due to the B-Train's high gross vehicle weight and the high weight-to-power ratio of approximately 292 pounds/horsepower (most commercial truck-trailers on highways are in the 150 pounds/horsepower range). In summary, these weight issues are:

- The loaded B-Train has a much poorer acceleration rate than other vehicles on the roadway, which becomes an operational issue at traffic signals.
- The loaded B-Train will lose speed on many of the mild- to moderate-grade sections of the ARS, which may hold up following vehicles waiting for passing opportunities.
- B-Trains, as configured, can maneuver the corridor without encroaching outside of their designated lanes.

Section 3 also establishes the pavement design attributes of a B-Train in units known as Equivalent Single Axle Loads (ESALs). Loaded B-Trains impose 5.5 ESALs per vehicle pass and empty B-Trains impose about 0.78 ESALs per vehicle pass. The loaded B-Train ESAL impact is over double the normal large commercial truck-trailer combination vehicles. The additional annual ESALs over the route computes to be:

(5.5 x 60 x 365) + (0.78 x 60 x 365) = 137,000 ESALs (rounded).

This significantly affects the costs and level of effort required for Maintenance and Operations as well as pavement life.

These ESAL computations were reviewed by DOT&PF's Northern Region Materials Engineer (NRME) and Statewide Pavement Management Engineer, who are the DOT&PF's subject matter experts on pavement design and maintenance. They indicated that the computed ESALs for a loaded B-Train may be lower than the 5.5 ESAL load factor presented here. However, they were unable to identify alternative computational methodology to document their opinion. The authors assumed the super single tire on a B-Train imparts higher pavement stress than a dual tire configuration. Admittedly, this assumption was not confirmed with research, even though the authors performed an exhaustive web-search of pavement research repositories. The DOT&PF experts contend the super single tire is not as damaging as stated in the repot, but they could not find research or alternative computation methods for the reduced load factor value.

B-Train ESAL calculations are used to determine how the ore haul would affect the pavement's life, maintenance costs, pavement life and replacement costs. Kinney Engineering and DOT&PF agreed to run the pavement analyses with both a 5.5 ESAL B-Train loading (upper likely value, derived by computations found in Appendix R) and a 3.0 ESAL B-train loading (DOT&PF assumed lower likely value using engineering judgement). This provides a sensitivity analysis of costs and accounts for reasonable differences in engineering opinions about the ESALs computations.

If the loaded B-Train is assumed to have a load factor of 3.0 ESALs per pass, then the annual northbound ESALs is computed to be 3.0 x 60 x 365 ≈66,000 (rounded). The southbound B-Train is assumed to have 0.78 ESALs as shown above. Under this reduced ESAL scenario, the sum of annual ESALs, both directions, by the B-Trains is 83,000.

Therefore, maintenance and asset computations are performed for both ESAL conditions: 83,000 and 137,000.

Section 4- Corridor Context

Section 4 provides an inventory of DOT&PF's transportation system infrastructure and an overview of existing socioeconomic, land use, and other corridor attributes. This provides a baseline condition for much of the analysis. A comprehensive review of agency and organization planning documents and efforts that may affect the corridor is provided under Appendix E.

Section 5- Traffic Parameters

This section summarizes traffic data and analysis for past, present, and future parameters that were used in traffic safety and traffic operational analyses. These include:

- Average Annual Daily Traffic (AADT) for the corridor during past years and forecasted future years through 2030. Future scenarios include peak hours without and with B-Trains.
- Design Hour Volume (DHV) Directional Design Hour Volume (DDHV) for corridor during past years and future years.
- Percent Heavy Vehicles or Trucks (%HV or %T) for the corridor.
- Peak Hour Factors (PHF) converts volumes to flow rates.
- Key intersection turning movement volumes for 2024 and 2030 morning and evening peak hours without and with B-Trains.

- Future traffic (segments AADT, DHV, DDHV and intersection turning movements) was derived by using a short-term average annual growth rate of 1% per year.

Highways AADTs by mile post are presented in the following exhibits, which graphically summarizes information found in Section 5.3.1, and the more detailed information is found under Appendix J.

Exhibit B: Corridor Existing AADT

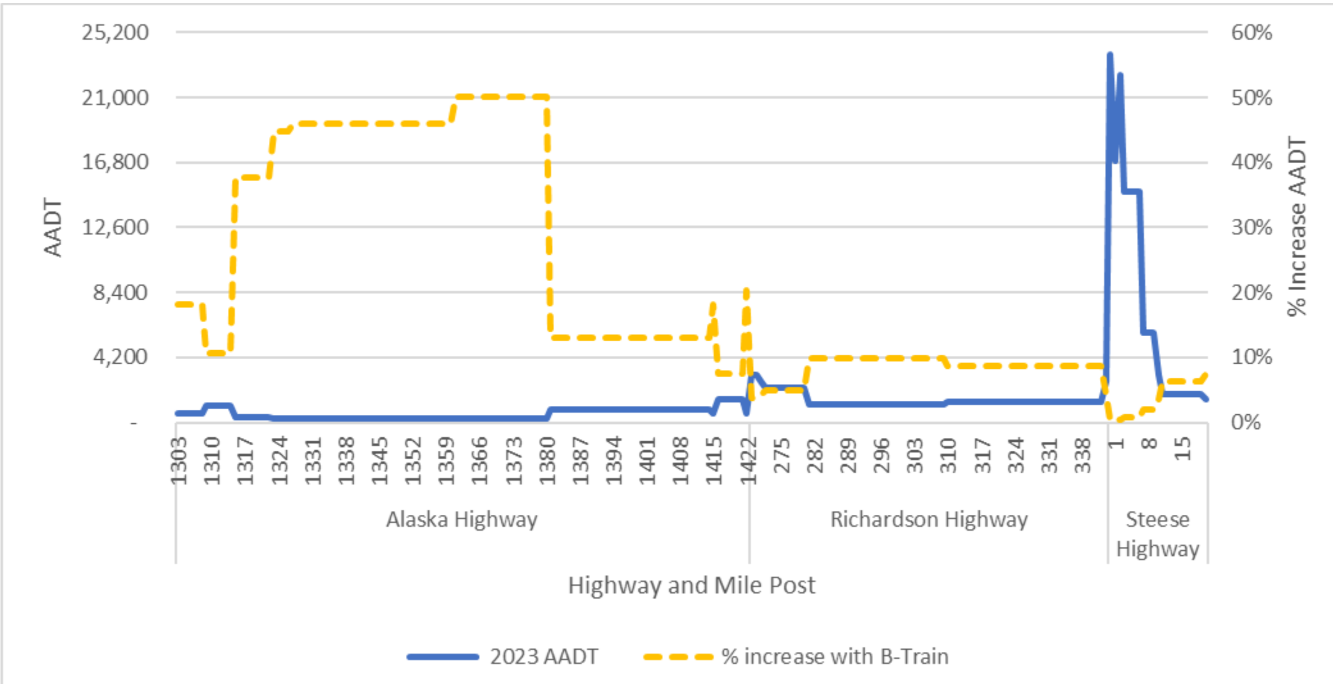


Exhibit C: Alaska and Richardson Highways Two-Lane Existing and Projected AADT

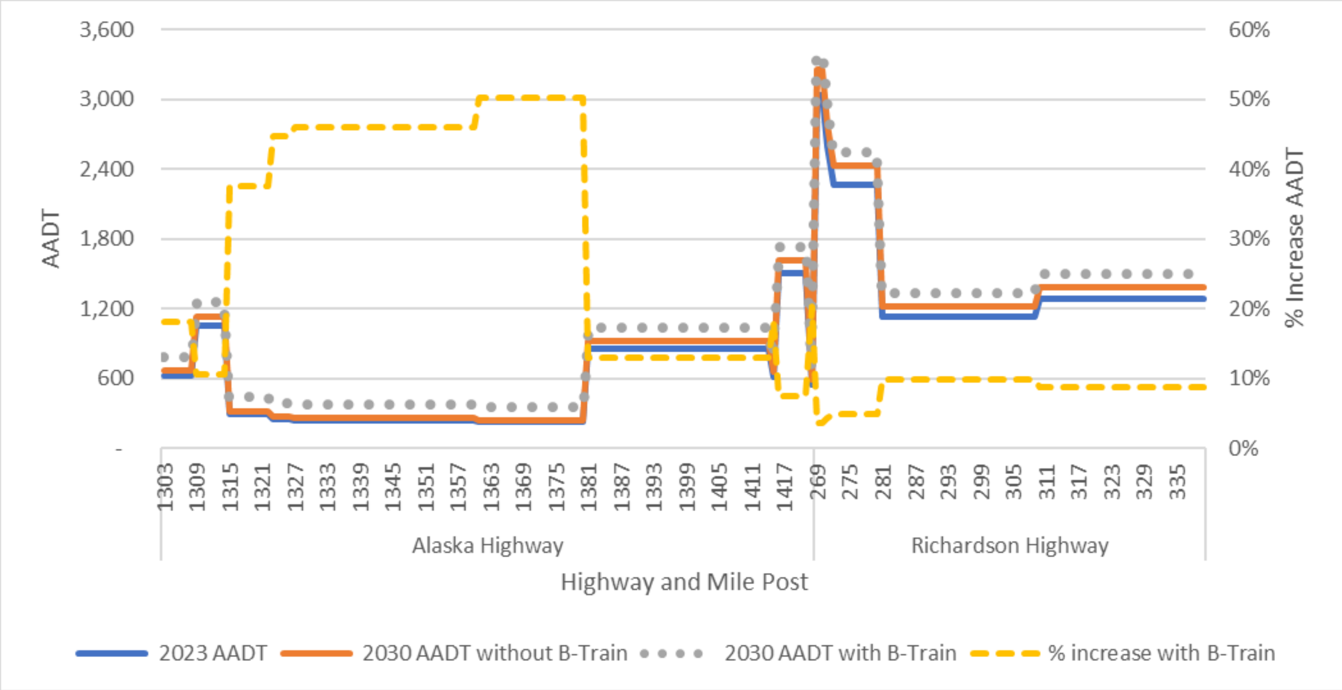
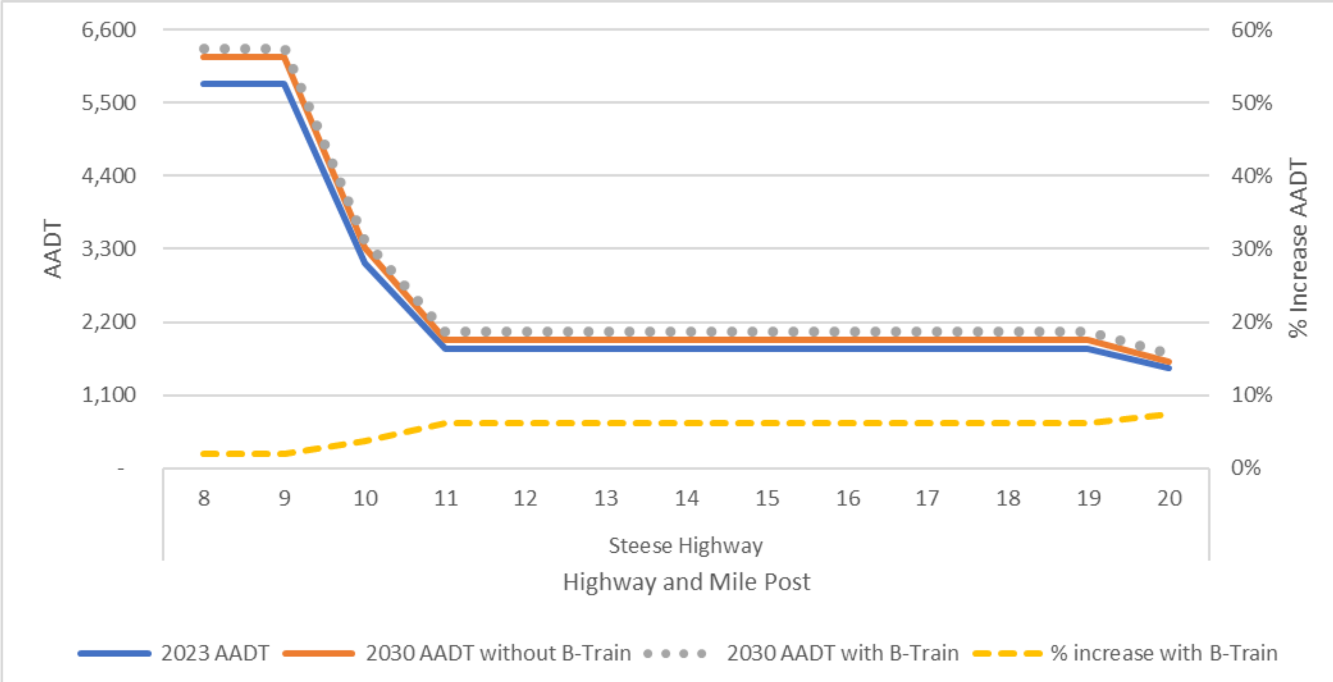


Exhibit D: Richardson and Steese Highways Four-Lane Existing and Projected AADT

Exhibit E: Steese Highway Two-Lane Existing and Projected AADT



Appendix K has the signalized intersection turning movements for 2024 and 2030 morning and evening peak hours without and with B-Train traffic.

Section 6- Traffic Safety Analysis

Section 6 addresses corridor safety based on past crash experience and predictive safety both with and without B-Train traffic.

Crash rates for highways and intersections were computed and are presented in Section 6.2.

All signalized intersections have crash rates that are below the average Statewide signalized intersection crash rates. As such, there is no evidence that these intersections have unusual safety issues.

Several of the major unsignalized intersection crash rates are below the average Statewide unsignalized intersection crash rates. As such, there is no evidence that these intersections have unusual safety issues. The unsignalized Steese/Elliott intersection rate is above average and below the “critical rate”; that is a rate that indicates statistical significance, discussed in Section 6. We conclude there is no statistical evidence that there is a crash issue at the Steese/Elliott intersection and the elevated rate may be due, in part, to randomness.

The Steese/Hagelbarger-Steele Creek intersection crash rate exceeds the critical rate for unsignalized intersections of similar type. A closer look at this intersection reveals that nine of the crashes there involved single vehicles and the intersection geometrics or control were not likely contributing factors. If these single vehicles were removed from the intersection, then the crash rate would have been less than the critical rate.

Similarly, the Steese/Goldstream intersection crash rate exceeds the critical rate. A review of crashes indicates that these five crashes were probably not due to intersection deficiencies, and instead are due to driver and environmental factors. Removing these five single vehicles from the intersection crashes would result in a rate that is below the critical rate.

From the crash rate evaluations, there is no evidence to conclude that there are abnormal crash issues for intersections and highways. However, the highways segments are long enough and while overall there are no issues, there may spot locations or short segments with crash issues that are not detected by this high-level planning analysis.

A predictive safety analysis was prepared for the future years 2024 to 2030 using predictive methodologies from the Highway Safety Manual (HSM) and the companion software package Highway Safety Software (HSS). The analyses of future conditions were performed without B-Trains and with B-Trains. This is presented in the following exhibit, with additional, detailed analysis in Appendix L.

Exhibit F: ARS Corridor Expected Crashes and Crash Severity Without and With B-Trains

Without B-Train Operations				**With B-Train Operations**			
2024 Crashes per Year		**2030 Crashes per Year**		**2024 Crashes per Year**		**2030 Crashes per Year**	
PDO*	FI**	PDO*	FI**	PDO*	FI**	PDO*	FI**
134.5	85.1	143.6	90.9	141.1	88.6	150.1	94.3
61.3%	38.7%	61.3%	38.7%	61.4%	38.6%	61.4%	38.6%
219.7 Total		234.5 Total		229.7 Total		244.5 Total	
[redacted]				**Analysis of B-Train Impact**			
				2024 Crashes per Year		**2030 Crashes per Year**	
				PDO*	FI**	PDO*	FI**
Crash Increase with B-Trains				6.5	3.5	6.5	3.5
% Increase with B-Trains				4.9%	4.1%	4.5%	3.8%
*PDO = Property damage only expected crashes							
**FI = Fatal/Injury expected crashes including fatal, incapacitating injury, non-incapacitating injury, and possible injury. Note that these are crash classifications only, not individual persons.							

The HSS model predicts an additional 10 crashes per year. The model does not distinguish between vehicle types and is not adjusted from default values for predicting the proportion of crashes that would result in injuries or fatalities.

Researchers at the University of Alaska Anchorage have developed calibration factors to use with the HSS model for determining the total number of crashes expected with the state's current truck fleet, including long combination vehicles. This calibrated model does not include the impact of B-Trains in operation. As such, we conducted additional research to ascertain if, and how, the B-Train affects HSS predictive modeling.

This additional research led us to draw these conclusions:

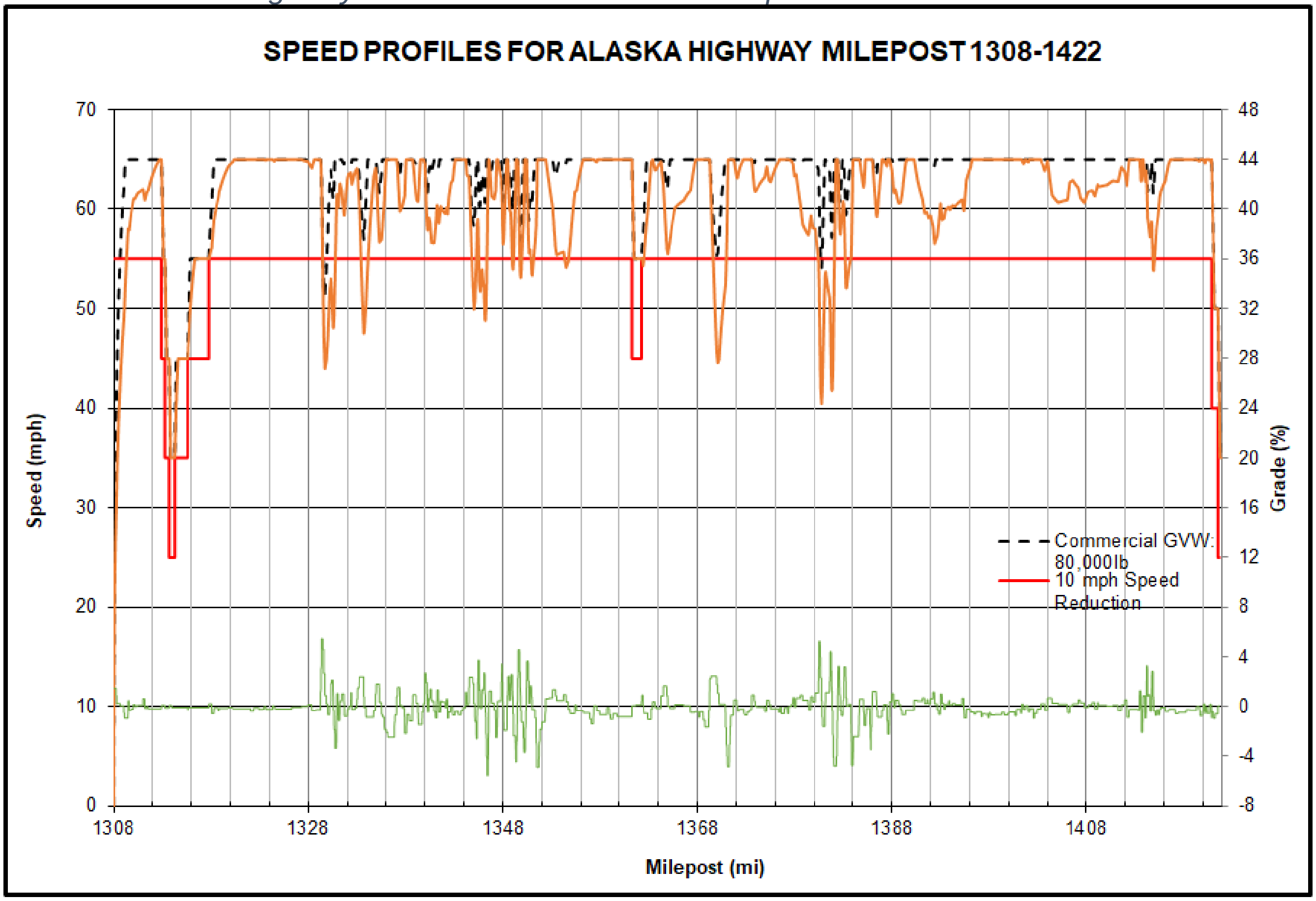
- The HSM/HSS model does not account for B-Train performance and physical attributes and thus, crash frequency and severity consequences may be overlooked.
- The HSS model may underpredict the severity of crashes caused by the infusion of B-Trains into the truck traffic stream as a dominant vehicle in on the corridor; however, the research is inconclusive.
- It may be challenging for other traffic to pass the slower moving B-Trains on two-lane highways, which could contribute to crashes. This would be exacerbated by the inability for B-Trains to maintain highway speeds on mild upgrades.

Integrating this information with the results of the HSS model informed the development of our Alternatives. A primary focus of the Alternatives was to separate conflicts between B-Trains and other traffic.

Several other specific issues emerged during the TAC process. They are identified in this CAP, but were discarded as the process evolved. The significant concerns that remain are described below.

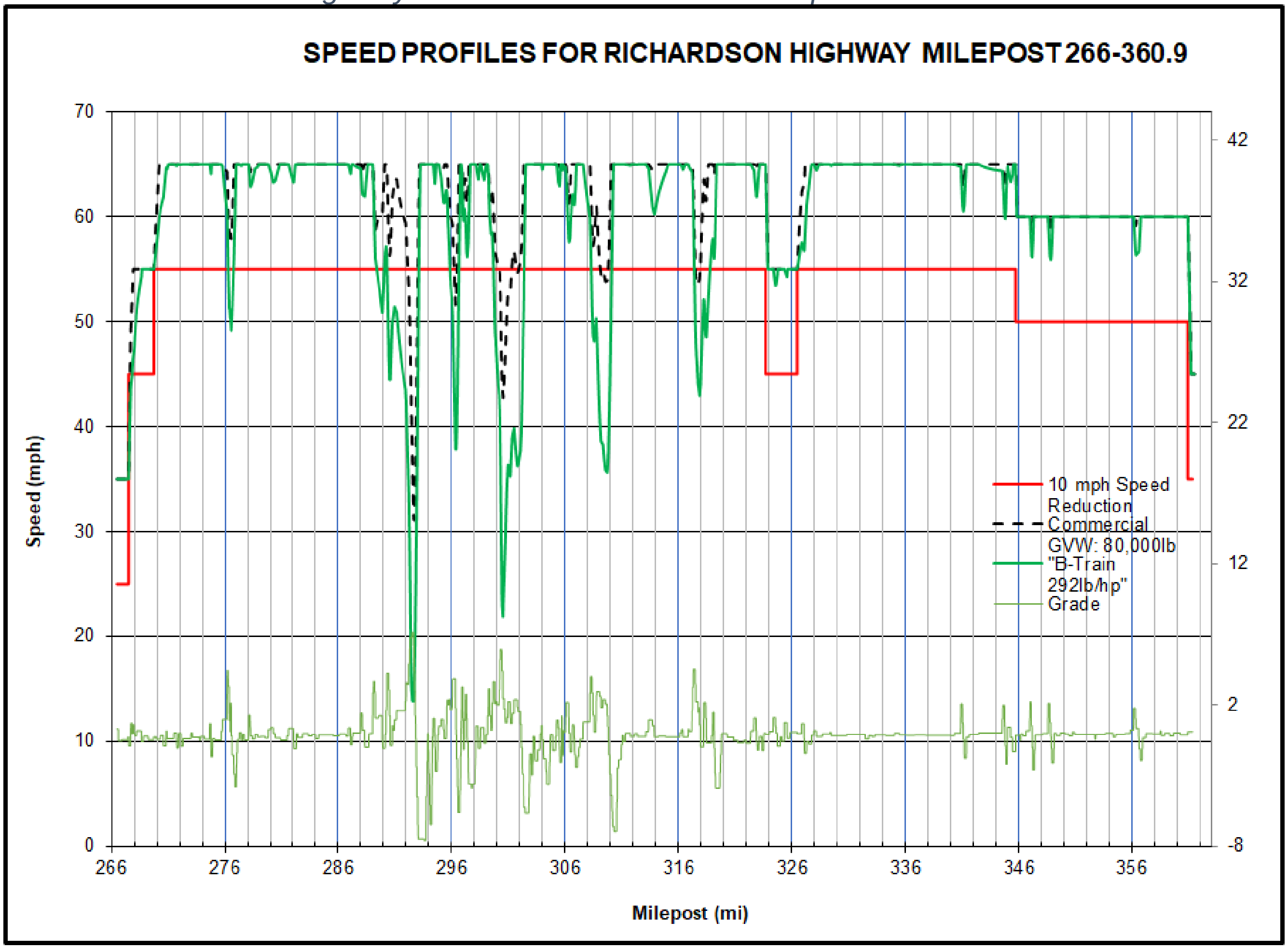
Speed consistency related to safety is of concern because slower (or faster) vehicles inserted into a traffic stream creates an inconsistency that will increase conflicts and potential crashes. Appendix I has technical memoranda addressing this in detail. The speed differential of vehicles in the traffic stream should be less than 10 MPH. The following exhibits illustrated speed profiles of B-Trains on the Alaska, Richardson, and Steese Highways.

Exhibit G: Alaska Highway Northbound Loaded B-Train Speed Profile



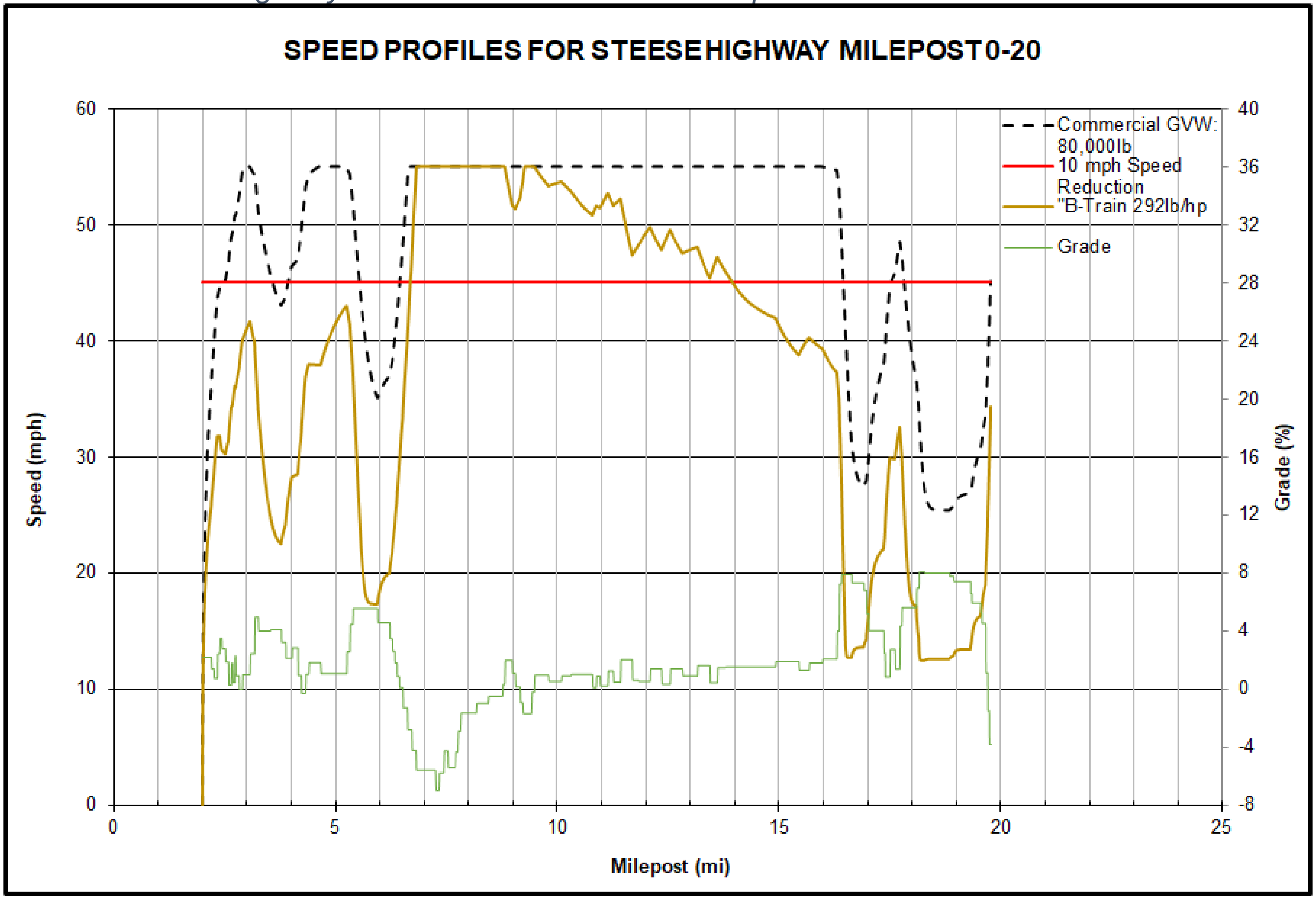
Alaska Highway has about 6 or 7 grade segments where B-Trains could drop to less than 55-MPH, or more than 10-MPH below the posted speed. These is an existing passing lane in the vicinity of MP 1332, which would mitigate differential speed risks at that location.

Exhibit H: Richardson Highway Northbound Loaded B-Train Speed Profile



Richardson Highway has about 6 or 7 grade segments where B-Trains could drop to less than 55 MPH, or more than 10 MPH below the posted speed. There are existing climbing/passing lanes in the vicinity of MP 291.5 to MP 292.5 (Tenderfoot) and in the vicinity of MP 309.5 to MP 310.5. These would mitigate differential speed issues.

Exhibit I: Steese Highway Northbound Loaded B-Train Speed Profile



Steese Highway has two extensive grade segments, where the speed of B-Train could drop below 45 MPH (10 MPH less than the posted speed limit of 55 MPH. However, there is a 4-lane, divided highway between MP 2 and MP 8 which would mitigate the speed differential issue.

***Added to Executive Summary After Public Review Draft**: Speed differential crashes that would be mitigated by 4-lanes (2 in each direction) include same direction rear-end and sideswipe and passing related run-off-road and head-on crashes. However, larger and slower moving vehicles in the outside lane may block intersection sight distance between intersection stopped vehicle and the faster moving vehicles in the inside lane. This may result in the stopped intersection vehicle to enter the intersection without awareness of the faster overtaking vehicle in the outside lane.*

This differential speed safety impact was addressed by alternatives that would separate B-Trains from the main traffic stream at grade sections.

School bus stop safety was a concern that TAC members and the general public brought to light during the TAC meeting. Of particular concern is the B-Train capabilities in stopping for a bus boarding or alighting pupil passengers. School bus stops along the ARS corridor were inventoried and evaluated for stopping sight distance (SSD), and, in fact, all 86 bus stops have good stopping sight distance under normal and wet pavement conditions (see Appendix M). However, 35 of them do not have adequate SSD at full posted speed when pavements are icy. Several alternatives were formulated to address these issues.

Red light running was an issue brought before the TAC, especially if B-Trains are involved. The B-Train weights would likely result in high severity crashes. There are several operator policy alternatives and Intelligent Transportation System (ITS) alternatives that would mitigate this.

Section 6 also address other TAC issues such as, bridge diversions, lane encroachments, and funding which were resolved during the process.

Section 7 Operational Analyses

ARS highway segments and intersections were evaluated for peak hour traffic conditions in 2024 and 2030. Operational results are presented as level of service (LOS) ratings A to F. Highway Capacity Manual (HCM) methods were applied to these facilities using Highway Capacity Software (HCS) for uninterrupted highway segments and Synchro software for interrupted flow signalized intersections.

On the whole, uninterrupted flow two-lane and multilane highways have no significant loss in LOS with the additional B-Trains and will be at the desirable LOS or better for the planning horizon year. This is illustrated in the following exhibits.

Exhibit J: 2030 Design Year Uninterrupted Flow ARS Corridor LOS, Northbound

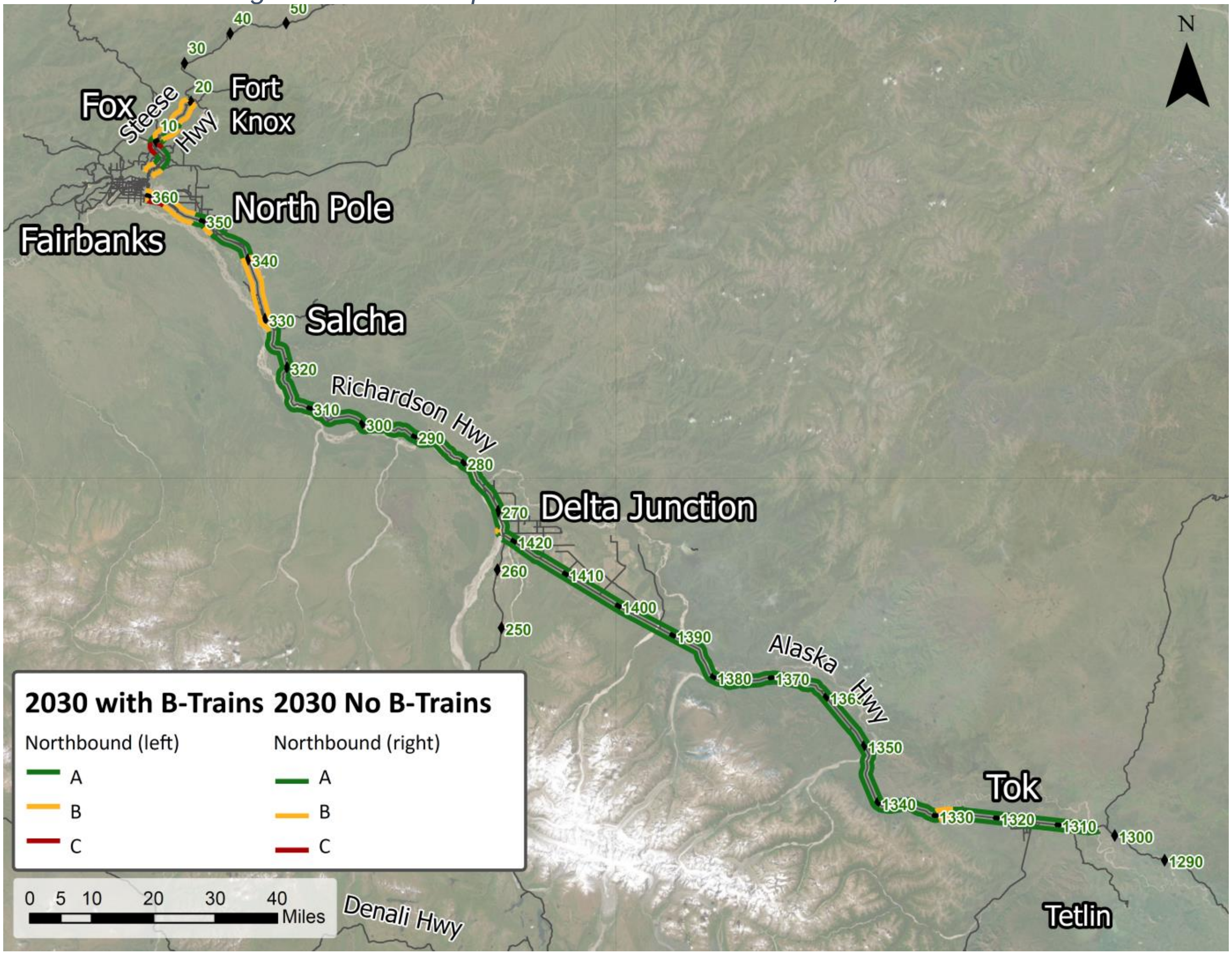
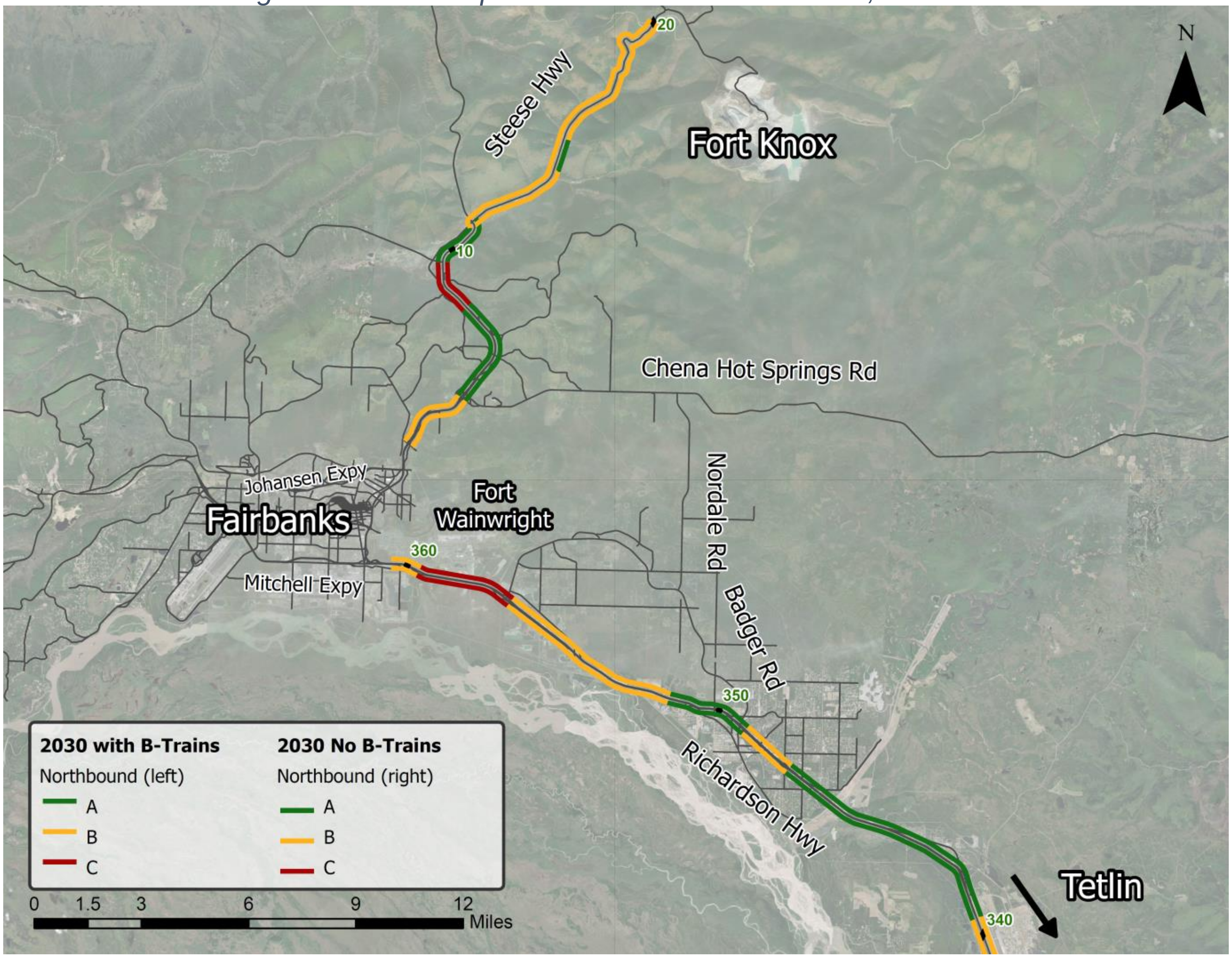


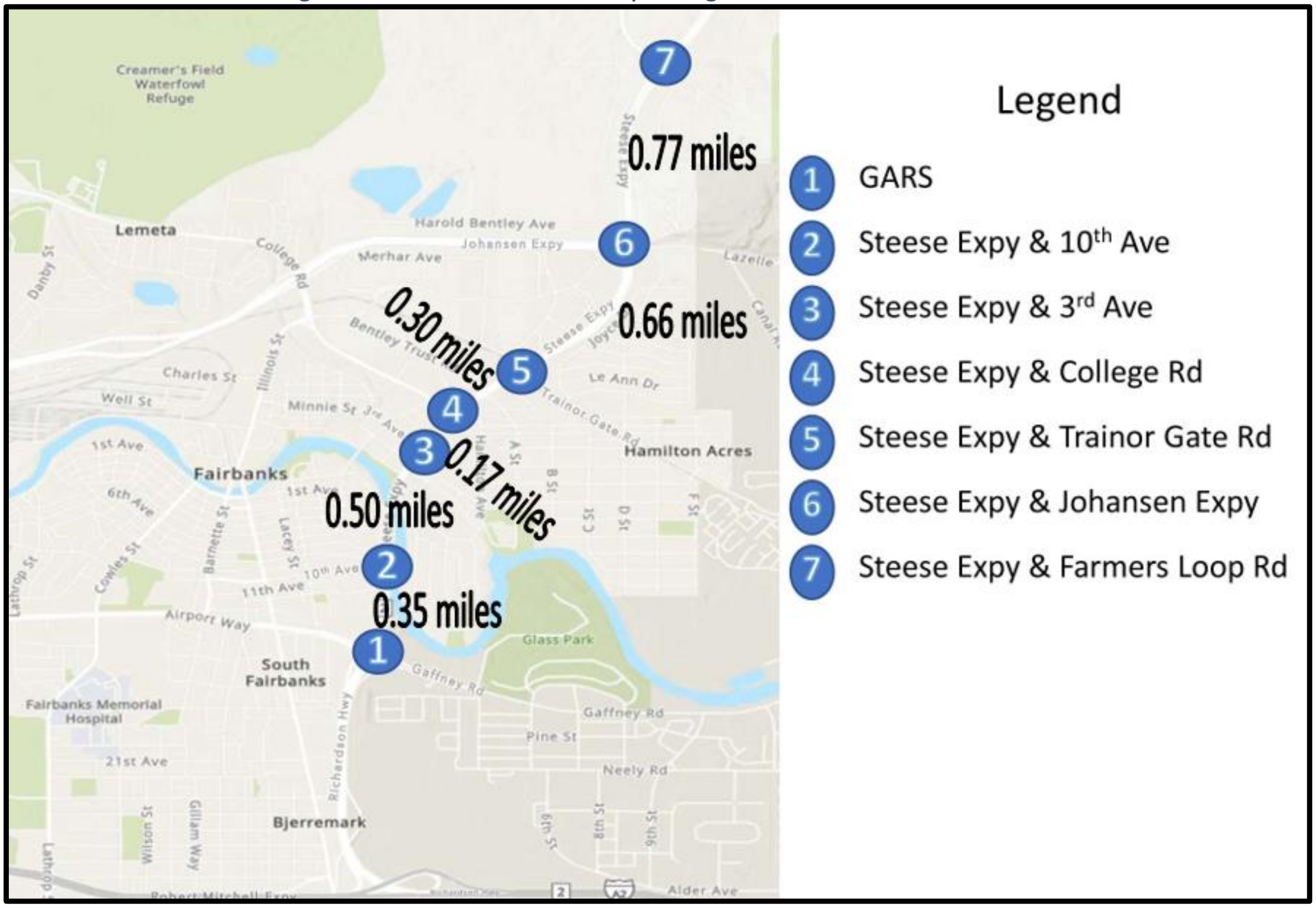
Exhibit K: 2030 Design Year Uninterrupted Flow Fairbanks Area LOS, Northbound



In addition to the discussion and analysis presented in Section 7, detailed technical memoranda and backup data are provided in Appendices N and T, respectively.

There are seven signals in the Fairbanks urban corridor. These all will be under the interrupted traffic flow regime, where the intersection performance quality dominated the network. These are discussed in detail under Section 7, as well as Appendices O and U. The following exhibit presents signalized intersections on the ARS corridor.

Exhibit L: Fairbanks Signalized Locations and Spacing ARS Corridor



Signalized intersection operations were not significantly affected by the additional northbound and southbound B-Trains in the AM and PM peak hours. The analysis considered the diminished acceleration capabilities of the loaded B-Train and the consequences of one, two, or three or more B-Trains concurrently in queue at each signal. While that particular signal cycle would be impacted, the overall peak hour operational level of service is not significantly affected as indicated in the following exhibit, replicating a table in Section 7.

Exhibit M: Signalized Intersection Performance Measures

	Without B Trains							
	Morning AM Peak Hour				**Evening PM Peak Hour**			
	2024		**2030**		**2024**		**2030**	
	Avg Delay (sec/veh)	**LOS**	**Avg Delay (sec/veh)**	**LOS**	**Avg Delay (sec/veh)**	**LOS**	**Avg Delay (sec/veh)**	**LOS**
Steese Expressway/Richardson Highway & Airport Way/Gaffney Road (GARS)**								
Without B-Trains	57.9	E	57.1	E	49.1	D	49.9	D
With B-Trains	57.7	E	57.0	E	49.3	D	50.2	D
Change	-0.2		-0.1		0.2		0.3	

	Without B Trains							
	Morning AM Peak Hour				Evening PM Peak Hour			
	2024		2030		2024		2030	
	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS
Steese Expressway & 10th Avenue								
Without B-Trains	8.2	A	8.4	A	9.6	A	9.9	A
With B-Trains	8.2	A	8.5	A	9.8	A	10.2	B
Change	0.0		0.1		0.2		0.3	A > B
Steese Expressway & 3rd Avenue								
Without B-Trains	32.5	C	35.2	D	37.8	D	42.8	D
With B-Trains	32.6	C	35.3	D	38.6	D	44.1	D
Change	0.1		0.1		0.8		1.3	
Steese Expressway & College Road								
Without B-Trains	26.5	C	29.3	C	26.4	C	28.9	C
With B-Trains	26.6	C	29.4	C	26.7	C	29.2	C
Change	0.1		0.1		0.3		0.3	
Steese Expressway & Trainor Gate Road								
Without B-Trains	25.3	C	26.3	C	31.3	C	34.2	C
With B-Trains	25.3	C	26.3	C	31.7	C	34.8	C
Change	0.0		0.0		0.4		0.6	
Steese Expressway & Johansen Expressway								
Without B-Trains	18.7	B	9.2	A	51.3	D	8.5	A
With B-Trains	18.7	B	9.2	A	51.4	D	8.5	A
Change	0.0		0.0		0.1		0.0	
Steese Expressway & Farmers Loop Road								
Without B-Trains	22.3	C	80.3	*F	21.2	C	30.2	C
With B-Trains	22.4	C	80.6	*F	22.1	C	31.0	C
Change	0.1		0.3		0.9		0.8	

**Operational issues are because of timing provided by others.*

**GARS intersection operations are based on the combined movement delays through all the individual signals. Results are shown in this manner to be comparable with the results of the other signalized intersections analyzed on the corridor. Although there are significant queuing issues at these intersections, the B-Trains do not contribute additional queue impacts compared to operations without B-Trains. In fact, the closely spaced intersections in interior of the urban corridor are the primary contributing factor for damaging queues that develop; that is, ones that spill back into upstream intersection or block access to auxiliary turn lane.

The TAC was concerned about the consistency of speeds on open highways, which was discussed above, but in the context of delay when B-Trains cannot be passed. In fact, HCM methods do not fully account for the B-Train characteristics and treats them as generic trucks. This was addressed in the Alternatives that separate B-Trains from main traffic stream at grade sections.

The TAC also expressed concern about the individual impacts of sluggish B-Trains at signals, which prompted the Project Team to make adjustments to the model to account for both the B-Train's low rate of acceleration and longer length.

Intersection maneuverability by B-Trains was an initial TAC concern and is addressed in this report.

Section 8- Maintenance and Operations

Section 8, technical memoranda in Appendix G, and data in Appendix R address the impacts of B-Train traffic on summer and winter Maintenance and Operations ("M&O") .

In the summer B-Train operations are expected to cause enough wear on the pavement to require more pavement treatment than what is currently required. To estimate the additional costs, we assigned, about 75% of the pavement maintenance effort and costs to traffic, primarily truck traffic, and 25% of costs to environmental degradation. Current maintenance costs for pavement work are about $2.25 per square foot of pavement. The following exhibit summarizes 2022 pavement area maintained on each highway, costs, and the portion of costs attributed to traffic loads.

Exhibit N: Historic DOT&PF Northern Region M&O Costs

Route	SF YEAR 2022	$ YEAR @2.25/SF 2022	Traffic Damage 75% (2022 Costs)
Alaska Highway	295,845	$665,651	$499,238
Richardson Highway	554,278	$1,247,126	$935,344
Steese Expressway/Highway	265,242	$596,795	$447,596
TOTAL CURRENT COSTS/YEAR =		**$2,509,571**	**$1,882,178**

Notes:

1. Assumes 25% of M&O costs attributed to Environmental Factors, 75% attributed to Traffic Damage.

2. Maintenance includes hot mix asphalt paving, high float, chip seal, asphalt banding, crack sealing, etc.

The need for traffic pavement maintenance is expected to increase because of the increase in B-Train ESALs. On the higher end, a 5.5 ESAL loaded B-Train will add 137,000 ESALs annually to all roadway segments. On the lower end, the 3.0 ESAL loaded B-Train will add 83,000 ESALs annually to roadway segments. This represents about an average 620% increase for annual ESALs on the Alaska Highway, an average 210% increase for annual ESALs on the Richardson Highway, and about an average 240% increase for annual ESALs on the Steese Highway (based on higher 5.5 ESAL load factor). Exhibit O summarizes pavement costs with, and without, B-Trains.

Exhibit O: Annual Pavement M&O Costs (Rural Only, Does not include Urban Roadways)

Route	M&O Cost Without B-Train	M&O Cost With B-Train	Added Cost Attributed to B-Train ESALs
Loaded B-Train Load Factor of 5.5 ESALs			
Alaska Highway	$ 499,238	$ 3,073,609	$2,574,371
Richardson Highway	$935,344	$1,950,715	$ 1,015,371
Steese Expressway/Highway	$447,596	$1,066,590	$618,994
Totals	$1,882,178	$ 6,090,914	$4,208,736
Loaded B-Train Load Factor of 3.0 ESALs			
Alaska Highway	$ 499,238	$2,058,893	$1,559,655
Richardson Highway	$935,344	$1,550,496	$615,152
Steese Expressway/Highway	$447,596	$822,607	$375,011
Totals	$1,882,178	$4,431,996	$2,549,818

When fully mobilized, B-Trains will run 60 trips northbound and 60 trips southbound 24 hours per day, 7 days per week throughout the winter for the duration of the mine operations. As such, DOT&PF will likely increase their M&O operations accordingly to keep the road open continuously. They provided the following conceptual costs for increasing winter M&O:

- A one-time capital cost Increase for facilities upgrades and additional heavy equipment: $3,180,000.
- An annual cost increase for added personnel, equipment, commodities, and travel: $3,464,139.

The TAC made M&O issues their focus early in the process. Some members expressed concerns that the M&O funding levels in the current State budgets are insufficient for the additional summer pavement maintenance and winter maintenance needed once B-Train full-time operations commence. A second concern is that even if funded, the additional staff and equipment needed for implementation of the elevated effort would not be available in the current labor and equipment marketplace.

Section 9- Assets

Section 9 addresses impacts to the pavement structure (outside of increased maintenance) and bridges, both of which are the most valuable State assets affected by B-Train traffic.

Pavement assets were addressed by the project team, and bridge assets were addressed by the DOT&PF Bridge Design Section.

In addition to the generalized discussion on pavements in Section 9, Appendices G and P have technical memoranda that provide detailed methodology and analysis. Appendix R has data analysis and computational backup.

The project team assigned priorities of one to three to sections based on computed damages, which in our judgement sets the order to which pavements would be replaced or rehabilitated. It is a subjective rating based on the below criteria; Priority 1 segments are in most need of immediate pavement structure upgrades and Priority 3 segments the least need. It is quantified on the percentage of Base Course Total Damage in Year 2030 with B-Train Loading for each segment, as follows:

- Priority 1: Base Course layer Total Damage > 250%. Costs are estimated at $2.5 Million/mile: Heavily damaged, most urgent, likely highest construction cost, e.g. remove and replace pavement structure- deeper reclamation/ reconstruction.
- Priority 2: < 75% Base Course layer Total Damage <250%. Costs are estimated at $2.0 Million/Mile: Significant damage, near-term urgency.
- Priority 3: Base Course layer Total Damage < 75%. Costs are estimated at $1.5 Million/mile: Least damaged, can be deferred, likely lowest construction cost, e.g., overlay pavement.

The following exhibit, replicated from Section 9 summarizes pavement priority segments and the costs for the ore-haul traffic using a loaded B-Train load factor of 5.5 ESALs.

Exhibit P: Pavement Segment Priority Cost Summary (Using Loaded B-Train Load Factor of 5.5 ESALs)

PRIORITY ONE	MP Begin	MP End	MILES	PRIORITY	Treatment - $2.5M/Mile	STIP
AK-HWY: SEGMENT #2	1325	1354	29	1	$72,500,000	PL-A
AK-HWY: SEGMENT #4 *	1365	1412	47	1	$117,500,000	PL-A
RICH-HWY: SEGMENT #3	308	331	23	1	$57,500,000	PL-R
RICH-HWY: SEGMENT #4	331	341	10	1	$25,000,000	PL-R
TOTAL MILES=			109	TOTAL COST =	$272,500,000	
PRIORITY TWO	**MP Begin**	**MP End**	**MILES**	**PRIORITY**	**Treatment @- $2.0M/Mile**	**STIP**
AK-HWY: SEGMENT #1	1308	1325	17	2	$34,000,000	PL-A
AK-HWY: SEGMENT #5	1412	1422	10	2	$20,000,000	PL-A
RICH-HWY: SEGMENT #1	266	276	10	2	$20,000,000	PL-R
RICH-HWY: SEGMENT #2	276	308	32	2	$64,000,000	PLR&REHAB
RICH-HWY: SEGMENT #6	353	360	7	2	$14,000,000	-
STEESE: SEGMENT #2	5	11	6	2	$12,000,000	-
STEESE: SEGMENT #3	11	20	9	2	$18,000,000	-
TOTAL MILES=			91	TOTAL COST =	$182,000,000	
PRIORITY THREE	**MP Begin**	**MP End**	**MILES**	**PRIORITY**	**Treatment - $1.50M/Mile**	**STIP**
AK-HWY: SEGMENT #3	1354	1365	11	3	$16,500,000	PL-A

RICH-HWY: SEGMENT #5	341	353	12	3	$18,000,000	-
STEESE: SEGMENT #1 **	2	5	3	3	Not applicable	RESURF
		TOTAL MILES=	26	TOTAL COST =	$34,500,000	
				TOTAL COST ALL SEGMENTS =	**$489,000,000**	

** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*
** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*
PL-A STIP ID: 22315 Passing Lanes Alaska Highway-(Construction Year 2024-2027)
PL-R STIP ID: 29811 Passing Lanes Richardson Highway-(Construction Year 2024-2027)
REHAB STIP ID: 33720 Richardson Highway MP 275-295 Rehab-(Construction Year 2024-2027)

The analysis could not determine the proportion of pavement damages and treatment costs to be assigned to B-Trains because most of the issue layers were above 100% damage without B-Trains, and prior to the commencement of the ore haul.

The analysis was also performed for a loaded B-Train load factor of 3.0 ESALs. Treatment costs for this scenario was computed to be $478 Million, a small change from the 5.5 load factor case.

With this information, it is reasonable to conclude that most of the pavement costs are due to pre-existing conditions of pavement and underlying structural material layers.

The 2024-2027 Statewide Transportation Improvement Program, Amendment 1 has these planned bridge improvements on the ARS route:

- STIP ID 34126. Replace the Robertson River Bridge #509 located on the Alaska Highway at MP 1348.). [***This entry is updated for final report.***] Project includes drainage improvements, roadside hardware, roadway reconstruction, and utilities. Project Cost 2024-2027: $3,050,000. Construction year is pending.
- STIP ID 33824 (Parent and Final) and 34445 (Stage 1). [***This entry is updated for final report.***] Replace Johnson River Bridge #518 on the Alaska Highway at Milepost 1380. Project includes drainage improvements, roadside hardware, and utilities. The project will be a Construction Manager/General Contractor delivery. Project Cost 2024-2027: $24,000,000 (34445, Stage 1) and $65,900,000 (33824, Parent and Final). Construction Year is 2026.
- STIP ID 22322 (Parent and Final) and 34447 (Stage1). [***This entry is updated for final report.***] Replace the Gerstle River Bridge #520 located on the Alaska Highway at Milepost 1393. Project includes drainage improvements, road reconstruction, roadside hardware, and utilities. Project Cost 2024-2027: $35,100,000 (34447, Stage 1) and $94,400,000 (22322, Parent and Final). Construction Year is 2027.
- STIP ID 34130. Replace the Northbound Chena Flood Control Bridge #1364 and rehabilitate the Southbound Chena Flood Control Bridge #1866 on the Richardson Highway at MP 346. [***This entry is updated for final report.***] Project will include

drainage improvements, roadside hardware, and utilities. Project Cost 2024-2027: $96,200,000. Construction Year is 2025.

Many of these bridges are nearing the end of their useful lives, and do not meet current design standards.

Members of the TAC had significant concerns regarding the bridges along the ARS corridor and their suitability for B-Train loads, citing alternative interpretations of Federal Highway Administration standards. DOT&PF Bridge Design had a contrary viewpoint and interpretation, allowing B-Trains to use the bridges.

The cost of pavement reconstruction, almost $500 million is concerning to other TAC members because it may divert funds from other Statewide projects and programs.

Section 10- Environmental

Section 10 provides an overview of water, wildlife, air quality, noise, visual, and community effects impacts. This section finds that there are no compulsory actions required on the ARS corridor because of ore haul. This analysis in confined to the limits of the ARS CAP.

Section 11- Alternatives

The project team, with the TAC's input, developed a range of alternatives and recommendations to address needs along the ARS corridor. Alternatives and recommendations are based on the analysis sections above and are meant to provide strategies for maintaining the safety, operation, and functional integrity of the ARS corridor. Moreover, most of the alternatives presented in this section enhance safety and operations for all vehicle types, and not just the B-Train traffic. As such, the benefits of these will continue beyond the life of the Manh Choh Mine.

Not included in the proposed list of alternatives to the TAC are actions that are out of DOT&PF's control, such as building a mill at Tetlin, or the extension of the ARRC Track. Building a parallel or by-pass route was also proposed but considered infeasible given the ore-haul timeline, high costs, environmental impact and more. Legislative alternatives to prohibit double trailers within City and borough boundaries was also considered but ultimately deemed outside the scope of this report.

A total of 59 discrete alternatives were presented for consideration to the TAC. Of the 59 alternatives the following alternatives were not advanced for discussion in this CAP:

- Modify pavement markings on Peger Road Northbound off-ramp for merge onto Eastbound Johansen Expressway—*Unnecessary after route changed from Mitchell-Peger-Johansen to Steese.*
- Apply High-Friction Surface Treatment—*Original concept was to enhance snow and ice braking; additional research concluded that this was not a correct application.*

- Straighten/flatten roadway—*No specific areas were identified as needing to be reconstructed to current design standards; most of corridor is satisfactory for the selected design speed.*
- Construct By-Pass in Channel on North Side (upstream) of Chena Floodway Bridge —*Originally proposed to eliminate B-Train median crossovers to a by-pass on the floodway floor to avoid overweight crossings, the weight reduction of the B-Train allowed those vehicles to cross the Chena Floodway Bridge (see discussion in Section 6.5.4.1 on page 111).*
- Modify Chena Hot Springs Roundabout if needed for B-Train Maneuverability—*Not an issue, B-Trains pass through roundabout (see discussion in Section 6.5.4.2 on page 112*).
- Install scale on north side of road on Alaska HWY at Tetlin Access, across from existing WIM Scale—*Not feasible, use existing scale*.
- Evaluate need for runaway lane(s)—*Terrain is such that these are not required.*
- Adjust Signal Timing/Coordinate Signals for existing intersections on route —*Since this was proposed, the route through Fairbanks changed from Mitchell-Peger-Johansen to the Steese corridor. Although timing may be adjusted periodically to facilitate overall traffic flow efficiency, to do so for the 2 or 3 B-Trains per hour is not practical. Change interval adjustments (yellow and red time durations) would not be adjusted either for safety reasons.*
- Establish open communication between Kinross commercial vehicle operators and Troopers—*In place currently.*
- Install Onsite Truck Scale at Manh Choh Mine—*Reported as being done.*
- Install Vehicle Tracking Beacons on Kinross Trucks—*Because of privacy and commercial competition, B-Train operators are unlikely to give the public visibility of truck locations.*
- Relax Weight Restrictions—*This is not feasible.*
- Inventory Shoulders—*This alternative was originally conceived as a potential way for slow moving vehicles to plan pullovers The inventory was completed and presented in this plan.*

The remaining alternatives in Section 11 are summarized below, some with more detail than others depending upon the robustness of the alternative. Cost estimates are parametric and have a wide range of uncertainty at this level. Also, the implementation dates are estimates depending on the method of implementation. If construction is required, the implementation dates are determined depending on the method of implementation. Work by State of Alaska DOT&PF M&O forces may be performed within a compressed schedule (within two years) If implemented through the Statewide Transportation Improvement Program (STIP) or Federal funding participation program, it is estimated that the earliest year for implementation would be 2028; assuming preconstruction activities in 2025 and 2026, and construction in 2027.

Alternative: Construct Truck Climbing and Passing Lanes—This alternative will install climbing lanes as proactive treatments for safety and operational issues that can occur when there are high differential speeds with a traffic flow stream. These auxiliary lanes will be located on uphill northbound grades on the ARS corridor where the B-Train slows to 10 MPH or more below the posted speed limit. This is a countermeasure that would mitigate passing-related head-on, sideswipe, and run-off road crashes resulting from the slow-moving B-Train traffic and may be justified because of the potential high severity of those B-Train involved crashes. In addition, these help to maintain good operations and levels of service by providing increased passing opportunities.

Locations are presented in Section 11. There are eight or nine proposed locations on the Alaska Highway vary in lengths but are a total of about nine miles. There are five proposed locations on the Richardson Highway about seven miles in length. The Steese Highway would benefit from a single 2-mile-long climbing lane on the ascent of Cleary Summit. Costs are estimated to be:

Exhibit Q: Climbing Lane Costs

Route	Total Recommended Added Northbound Climbing Lane (Miles)	Climbing Lane Only ($million)	Full Road Width Plus Climbing Lane ($million)
Alaska Highway	9.4	$11.3	$26.3
Richardson Highway	6.8	$8.2	$19.0
Steese Highway	1.9	$2.3	$5.3
Total (rounded)	**$18 Million**	**$22 Million**	**$51 Million**

TAC input is summarized in the following exhibit.

Exhibit R: TAC Response to Construct Truck Climbing Lanes

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Construct Truck Climbing	10	0	4	1	0	15

*Addition comments are in this report.

Because of project development time, this alternative would likely not to be in place until 2028 at the earliest. However, this alternative is beneficial for all traveling public and will have utility beyond the life of the Manh Choh mine and the ore haul.

Alternative: Slow Vehicle Turnouts (SVT) — This Alternative would improve highway function and reduce crashes in a similar manner as the climbing lanes because they provide off-road refuges for slow moving vehicle and allow following vehicles to pass. The crash reduction and operational effectiveness of SVTs are not well documented and are believed to be less effective than climbing lanes in reducing crashes since not all slow-moving vehicles are willing to pull over and wait for others to pass. The following exhibit summarizes the recommended number and costs of SVTs on the ARS corridor. SVT locations are presented in Section 11.

Exhibit S: Estimate Of Turnouts and Costs For SVTs

Route	Total Recommended Slow Vehicle Turnouts (Each)	Slow Vehicle Turnout
Alaska Highway	9	$3,300,000
Richardson Highway	2	$720,000
Steese Highway	2	$720,000
Totals	**13**	**$4 Million (rounded)**

TAC input on this alternative is summarized in the following exhibit.

Exhibit T: TAC Position On SVTs

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Speed Consistency (removal of slower vehicles from thru traffic with SVT)	9	0	5	1	0	15

*Addition comments are in this report.

Because of project development time, this alternative would not likely be in place until 2028 at the earliest. However, this alternative is beneficial for all traveling public and would have utility beyond the life of the Manh Choh mine and the ore haul. SVTs can be combined with climbing lanes as a hybrid alternative.

Alternative: School Bus Stop Improvements—This alternative improves safety at bus stops on the ARS corridor for both school buses and waiting students. These are a collection of improvement alternatives, either individually or combined that mitigate traffic and school bus crashes while picking up or dropping off students. These also improve safety for the students waiting for buses at a stop. Of particular concern for TAC members was that the B-Train ore haul degrades safety in not being able to stop in time for buses. In fact, B-Trains comply with highway design stopping sight distance used for geometric design. However, the stopping sighting sight distance at 35 locations on the ARS corridor was determined to be insufficient when vehicles were approaching the stops at highway speeds under icy pavement conditions. The increased stopping sight distance on ice affects all vehicles uniformly, and B-Trains will not have worse stopping performance than other types of vehicles.

Alternatives are as described below.

- For those 35 stops with icy pavement sight distance issues, Table 71 and Table 72 provide analysis and recommendations for improvements that include clearing to right-of-way, erecting advisory warning signs to reduce speed, and/or bus stop relocation. Except for sign costs discussed below, no construction costs were formulated for clearing (would be performed by M&O forces) or relocation (would be done by the local school districts).
- Illumination at permanent stops, for example street intersections, may be feasible and would enhance safety for awaiting pupils and stopped buses. These could be applied to any permanent bus stop location, whether it has ample or restricted sight distance in icy conditions. Cost per installation would be about $40,000. Because of project development time, these would not be implemented until 2028, but would have utility for the traveling public after the ore haul is completed.
- Warning signs, including advisory speed plaques, are an alternative for sight restricted locations. These would cost about $4,000 to $5,000 per location. The implementation schedule would depend on how these are installed; short term if state funded and if M&O has available resources, or 3 years or more out (2028) if developed for contractor construction.
- There are several policies suggested to improve school bus safety but are subject to approval by school districts and transportation contractors. This includes:
    - Eliminating the need for students to cross the road for bus stops.
    - Choose locations with sufficient space for students to wait at least 12 feet from the edge of roadway.
    - Locate stops near a streetlight or other light source.
    - Establish “no transport zones”.
    - Establish guidelines for school districts to use to plan their bus stops.
    - Standardize policies and guidelines among school districts.

Intelligent Transportation Systems (ITS) is another resource available to promote additional safety for school bus stops. Vehicle-to-network communications on a cellular band can locate stopping school buses and alert the commercial truck drivers, thereby providing the driver additional reaction time to reduce speeds. Another ITS alternative is privately owned mobile phone applications, such as Waze, are currently used to inform motorists of roadside hazards. HAAS Alert is one such application that could be used to alert ore-haul drivers of school buses stopping. Alerts are provided visually and/or audibly. However, for the HAAS Alert system to work there needs to be cellular network coverage as well as a transponder in the school bus and in the commercial vehicle (B-Train).

The following exhibit summarizes the TAC input on the alternatives to improve school bus safety.

Exhibit U: TAC Position on School Bus Safety Improvements

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Vegetation	11	0	3	1	0	15

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Clearing						
Install Lighting	11	0	4	0	0	15
Install Signage	13	0	1	0	1*	15
Standardize Policies among districts	10	0	1	3	0	14
Remove and Relocate Bus Stops	10	0	2	3	0	15

*See Report this and other comments.

<u>Alternative: Operator (Kinross) Alternatives</u> — We expect Kinross and its trucking contractor will comply with State and Federal laws. This collection of alternatives would be voluntary additional steps they could take that are above what is currently required by law. . These alternatives are largely operational protocols that could be adopted by the companies as Operating Plans and Policies. The costs of implementation or loss of efficiency would be borne by Kinross and their trucking contractor. The alternatives include:

- Adopt a policy that requires slow moving B-Trains to pull over and let followers pass. This augments a State law which required vehicles to pull over when leading a platoon of 5 or more cars.
- Adopt a policy that prevents B-Trains from platooning or bunching up together both on the highway and in town at intersections.
- Adopt a policy to avoid travel in poor weather. Note that there are Alaska Administration requirements that prohibit B-Train travel in poor weather conditions.
- Provide driver training for the route and special conditions, laws, and policies.
- Policy to create Emergency Response Plan for implementation if B-Train is in an accident.
- Reduce payload (note that this has been done once to allow B-Trains to use a bridge).
- Address additional weight from snow/ice accumulation on trucks.
- Install In-Vehicle Technology on B-Train vehicles to bypass scale.

The TAC provided input on the above list. In addition, another policy alternative was formulated by the project team which recommends a speed reduction of 5 to 10-MPH below posted speeds to decrease B-Train red-light-running. TAC input is summarized in the following exhibit.

Exhibit V: TAC Response to Operator Alternatives

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	**5. None of the above. See comment.**	**Total Responses**
Policy that requires B-Trains to pull over and let followers pass	12	0	0	2	0	14
Policy that prevents B-Trains from platooning or bunching up together	6	0	3	4	1*	14
Policy to Avoid Travel in Poor Weather	8	0	3	3	0	14
Provide Driver Training	10	0	3	1	0	14
Policy to create Emergency Response Plan for if B-Train is in an accident	9	0	3	2	0	14
Reduce Payload	10	0	0	4	0	14
Address additional weight from snow/ice accumulation on trucks	7	0	3	3	1*	14
Install In-Vehicle Technology on B-Train vehicles to bypass scale	8	0	2	3	1*	14

*See report for this and other comments.

<u>Alternative: Bridge Monitoring and Improvements</u> —This alternative would include monitoring of selected bridges by DOT&PF Bridge Design on a periodic basis while B-Trains are in operation, as well as the planned bridge improvements described above in the Assets summary. This is an additional effort over what they have normally done in the past. Details of this monitoring plan have not been shared with the project team.

The costs of this will be borne by DOT&PF. TAC input on this is presented in the following exhibit.

Exhibit W: Response to Bridge Monitoring and Improvements Alternatives

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Increased monitoring of bridges by DOT&PF	9	0	3	1	0	13

*Addition comments are in this report.

Alternative: Increase Scale Hours of Operations —This alternative would provide funding and resources to expand Fox and Tok scales to full time. Presently, scales on the ARS corridor, Fox, and Tok are not open 24 hours per day. In order to ensure compliance with limits on GVW for the B-Train ore haul, the scales hours can be increased to 24 hours per day. The costs for this would be borne by the State.

TAC input on this is presented in the following exhibit.

Exhibit X: TAC Response to Increase Scale Hours Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Increase scale hours of operation	7	0	3	2	*2	14

*See report for these and other comments.

Alternative: Increase Summer and Winter Maintenance and Operations (M&O)—This alternative increase funding and resources for DOT&PF so that they can expand M&O services on the ARS corridor to accommodate B-Train impacts.

On the upper end, B-Trains with load factors of 5.5 ESALs will increase ESALs on the ARS corridor two to six times that which is currently experienced. Pavement maintenance is proportional to ESALs, and, as such, additional damage will occur and require repair to preserve the life of the asset and provide safe and reliable service.

As discussed in the M&O summary above, current summer pavement cost for the ARS corridor is $1.9 million. The additional B-Trains are expected to increase required effort and costs to between $2.6 Million (3.0 ESAL Load Factor) to $4.2 Million (5.5 ESAL Load Factor) for the ARS corridor.

With the commencement of continuous, around-the-clock ore haul, DOT&PF would like to increase winter M&O efforts. DOT&PF does not currently have winter maintenance costs broken down by haul route segments. DOT&PF projected costs to accommodate 24 hours service availability during winter:

- A one-time capital Cost Increase for facilities upgrades and additional heavy equipment: $3,180,000.
- An annual cost increase for added personnel, equipment, commodities, and travel: $3,464,139.

This alternative was not brought forward to the TAC.

Alternative: Pavement Projects —This alternative proposes a pavement restoration/reconstruction program for the ARS corridor. The analysis indicates that much of the ARS corridor has pavement structures that are computed to be near or at the end of the useful life. The two most critical layers in a pavement structure, pavement layer and underlying base course, are currently above 100% damage for much of the corridor length. These were computed with back calculations that apply the State of Alaska mechanistic design procedures accounting for past traffic ESAL loads and estimate existing pavement structure. As such, pavement structure rehabilitation or reconstruction costs cannot be attributed to B-Train added ESALs.

The project team assigned three priority levels for pavement structure treatments, summarized in the discussion of Assets above and in Section 9. There are 109 miles of Priority 1 pavement structure reconstruction, forecasted to cost about $273 Million. Priority 2 structure treatments are estimated to be needed on 91 miles of the corridor, with a cost of $182 Million. Priority 3 pavement treatments are slated for 26 miles with a cost of $35 Million. Total pavement program cost for the corridor is $489 Million on the upper end (5.5 ESAL load factor). The lower end of treatment costs is estimated to be about $478 Million.

For a program of this magnitude, it is expected that the ARS pavement projects will extend over several decades. Again, it is emphasized that the deterioration of the pavement is not all attributed to the B-Train. In fact, most of the issue layers were above 100% damage without B-Trains.

This alternative was not brought forward to the TAC.

Alternative: Install Variable Speed Limit Signs—This alternative will install electronic speed limits signs that can be adjusted to display speeds congruent with driving conditions or traffic flow. Reducing speeds will address numerous safety issues, most notably by reducing travel speed to match driving conditions, especially stopping sight distance on icy surfaces. Per the Crash Modification Factor Clearinghouse website, VSLS implementations reduce winter crashes by about 30%.

ARS would have about 200 miles outside of urban areas or about 400 miles both directions of travel to cover. Using 10 mile spacing (ignores entry points) would result in 40 locations.

The VSLS costs are estimated to be about $170,000 per location. VSLS alternative planning-level cost is estimated to be $6,800,000 for 40 locations. VSLS projects would be included in the STIP and funded accordingly.

There is a Richardson Highway VSLS project in the Highway Safety Improvement Program (HSIP) and under development. The timeline for additional ARS VSLS project development would be three to four years, if funded, and would be online in 2028 at the earliest.

The following exhibit summarized TAC response to the VSLS alternative.

Exhibit Y: TAC Response to Variable Speed Limit Signs Alternative

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	***5. None of the above. See comment.**	**Total Responses**
Install Variable Speed Limit Signs	6	0	5	3	*1	15

*See report for these and other comments.

Except for those projects programmed and scheduled in the STIP, most of these project locations will not be constructed until after the ore haul is nearly completed. Once completed, the projects will serve all traveling public.

<u>Alternative: Geospatially Map All Pullover Locations and Integrate with ITS</u> —This alternative will allow drivers to reference pullover spots along the corridor that they can use in pre-planning the trip or adjusting their plans while their journey is underway with their smart devices. This alternative was brought up by TAC members. Costs, sponsors, and funding sources for this alternative have not been conclusively identified.

The following exhibit provides the TAC input on this alternative.

Exhibit Z: TAC Response to Geospatially Map all pullover locations and integrate with ITS Alternative

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	***5. None of the above. See comment.**	**Total Responses**
Geospatially Map all pullover locations and integrate with	8	0	4	2	*1	15

ITS						

*See report for these and other comments.

Alternative: Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives —This alternative would reduce vehicle-animal crashes involving B-Trains and other traffic. Clearing vegetation to the boundaries of the right-of-way allows drivers to perceive and react to wildlife that leaves the tree line and moves into the right-of-way area before the animals dart onto the roadway. This provides more time to for drivers to notice the animals, brake and avoid a crash, sparing the animal (an environmental benefit) as well as avoiding a potentially severe crash (a safety benefit).

Alaska Department of Fish and Game monitors wildlife crashes to provide this data to the public and other agencies.

Costs for this alternative would be borne by DOT&PF and ADF&G.

The TAC provided these responses to this alternative.

Exhibit AA: TAC Response to Vegetation Clearing and ADF&G Monitoring Alternatives

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Vegetation Clearing	11	0	3	1	0	15
Continue Fish and Game Monitoring: re moose crashes	7	0	4	1	*2	14

*See report additional comments.

Alternative: Increase Awareness —This alternative would fund public information campaign or other messaging strategies to educate the public on how to interact with B-Trains and other matters. The costs of this alternative would be borne by the State but could be funded by private sources as well.

The TAC provides these responses to this alternative.

Exhibit BB: TAC Response to Increasing Awareness Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses

Increase Awareness	11	0	3	1	0	15

*See report for additional comments.

<u>Alternative: Increase Enforcement</u>—This alternative funds additional enforcement resources for the ARS corridor. Enforcement is a key element in crash reduction, as well as asset preservation. The costs of the enforcement would be borne by the State. The report discusses targeted infractions (listed below) which are often overlooked or ignored because of enforcement priorities.

The TAC had the following responses for this alternative.

Exhibit CC: TAC Response to Policy Enforcement Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Enforce 5-Car Rule (Passing)	9	0	3	2	0	14
Enforce Speed Reduction For Road Conditions	10	0	3	1	0	14
Targeted Enforcement	8	0	3	4	0	15
Install Automated Red-Light Enforcement	3	0	5	6	0	14
Implement Random Inspections	10	0	0	4	0	14

*See report for additional comments.

<u>Alternative: Install ITS Devices at Traffic Signals</u> —This alternative is focused on reducing dilemma zone and red-light running crashes at traffic signals for all vehicles. There were four systems discussed in this section which either alert drivers of a pending red light signal, or extend green time or change interval times based on approaching vehicle attributes and speeds. Each have advantages and disadvantages, one of note being that drivers will adapt to a system and may use it to their ends rather than promoting safety.

Costs would be borne by the DOT&PF and may be implemented with M&O forces or through STIP capital projects.

This is a highly technical topic, which was challenging to explain to the TAC in a short period of time. The TAC's grasp of the subject matter was not an acceptable level for some TAC members as indicated in their comments. TAC comments are not summarized here but are presented in the report.

Alternative: Install Additional Road Weather Information System (RWIS) Stations —This alternative will provide additional information to enable drivers to better plan their travel. The analysis determined that one, possibly two additional RWIS stations would provide better coverage for the ARS corridor.

The cost of an RWIS station is about $250,000 each. These would likely be funded as capital projects through the STIP and would not be online until 2028 at the earliest. However, they would have utility beyond the life of the ore haul.

The TAC had the following responses.

Exhibit DD: TAC Response to Installing Additional RWIS Stations Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
RWIS	15	0	0	0	0	15

*See report for additional comments.

Alternative: Grants for Emergency Medical Resources/Training —This alternative would increase the capability of professional and volunteer emergency responders along the ARS corridor. Current responders are located at larger community centers.

Costs, sponsors, and funding sources for this alternative have not been conclusively identified.

TAC responses for this alternative are shown in the following exhibit.

Exhibit EE: TAC Response to Securing Grants to Provide EMS Training

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Grants	8	0	3	2	1	14

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Add Sections 12, 13, and 14 to this Executive Summary

Section 12-Public Review Draft Report Process, Comments, and Public Input Analysis and Section 14-Comments / Questions and Responses Summary

Section 12 and Section 14 was added to the final report after the public review draft report. The section describes the public outreach process prior to public meetings. The meetings were held in Tok (April 30, 2024), Fairbanks (May 1, 2024), and Delta Junction (May 2, 2024). Meeting formats include a 15-to-20-minute presentation by the project team, followed by public testimony.

In total there were 127 commentors that provided substantive comments or questions through e-mails, public testimony, and written comment forms to submit comments. There were about 123 private citizen or business commentors and 4 commentors that represented government agencies. The following eight categories that dominated comments and these included:

- *Overall Mine and Ore-Haul Support (106 oppose mine, 4 in support, 17 no opinion).*
- *Use Alternatives Besides Current Ore haul (53 stated preference other alternatives).*
- *B-Train and Pavement Damage (62 observed pavement damage or expressed concerns).*
- *B-Train Impacts on Maintenance and Operations Costs (57 cited concerns)*
- *B-Train Bridge Impacts (26 are concerned about bridge overloads, 5 concerned about B-Trains on narrow bridges).*
- *B-Train Impacts on Traffic Operations and Mobility (16 cited experience or concern regarding B-Train effects on traffic flow).*
- *B-Train Impacts on Traffic Safety (55 cited concerns on safety impacts for school students and bus transportation, pedestrians and bicycles, and vehicular traffic safety).*
- *B-Train Impacts on Environment (51 cited concerns about environmental impacts; noise, water quality, fish and wildlife, and air quality).*

Each of these categories were discussed and evaluated. Alternatives developed in Section 11 that addressed the concerns under each of the categories were listed and analyzed on how they address the above categories.

The original intent, or desired outcome of public involvement efforts following the ARS CAP Public Review Draft was to gather information on public attitudes on analysis and alternatives *presented in Sections 1 through Section 11 of this report. There were only a few commentors who provided substantive input on alternatives.*

Section 14 has a table of commentors and their individual comments. Each comment that could be addressed had a prepared response from the report authors. Otherwise, the response was “No response”.

Section 13-Recommendations

This section addresses report gaps and presents recommended alternatives.

Traffic Safety Gaps- A gap in traffic safety analysis is due to the uncertainty of safety predictions that involve B-Trains. The predictive model primarily used traffic volume increases and do not consider vehicle attributes. The B-Train physical characteristics and the frequency of the ore-haul vehicles are not unique model inputs.

Alternatives and recommendations are crafted to compensate for this gap. In addition, it is the author’s understanding that DOT&PF has formed working relationships with the trucking industry in which safety, among other issues of mutual interest, are addressed. If they are not already doing so, Kinross/BGT should join these groups to collaborate on trucking safety issues.

Environmental Gaps- There was considerable general public and agency comments about ore-haul impacts on the environment. Almost all elements within the environmental sphere were found in the body of comments; noise, air quality, water quality, fish and wildlife (animals and birds) habitats, wetlands, social-economic issues, and transported and corridor-distributed toxicants shed from tires, refugee dust, and mud.

Environmental impacts of B-Train traffic would be addressed in any future environmental documentation required to advance projects on the corridor.

Maintenance and Operation Funding Gaps- M&O annual effort and costs are expected to increase because of the pavement impacts imposed by B-Trains. These additional B-Train ESALs are significantly higher than background traffic pavement loads, and assuming that M&O efforts are proportional to cumulative ESALs, then additional M&O costs can be apportioned to ore-haul operations.

Currently there is no regulatory means in place to recover M&O costs from legal users of the roadway. The additional summer M&O costs because of the B-Train ESAL impacts are estimated to be $2.5 to $4.2 Million per year. There are winter costs as well, about $3.5 Million per year primarily for implementation of a 24-hour full time snow and ice management service. However, the ore-haul operation is not necessarily mandating the increased winter service. Rather it would be a choice of the Department to improve safety for all of the traveling public with the increased service.

The ARS CAP analysis provides an estimate of M&O costs that will occur with ore-haul activities. M&O Staff should evaluate actual M&O expenditures seasonally and determine if pavement maintenance and repair costs are increased because of the ore haul. If incremental *cost increases are significant, there may be cause for recovering these costs from specific users. Recovering pavement M&O costs from specific highway users would likely require changes to the Alaska Administrative Code. There are no clear paths to recovering M&O costs from industry with current regulations. If a mechanism is desired, requiring new AAC or Statutes, one based on ESALs should be considered.*

<u>Alternatives Considered and Dismissed-</u> Following the Public Review Draft ARS CAP, the ensuing public meetings, and comments, several alternatives discussed in Section 11 were dismissed. In all cases, additional research, interviews, and analysis determined the alternatives to be unfeasible or not effective. The following alternatives are not recommended.

- *Section 11.4 Alternatives: School Bus Stop Improvements includes school bus stop illumination and signing. These should be preceded by a collaborative planning or study effort by DOT&PF and affected school districts to establish permanent school bus stops. This planning effort is an ARS CAP recommendation. This does not supersede the current signing practices by DOT&PF.*

- *Section 11.5 Operator (Kinross) Alternatives has policy Alternative(s) that are required by the Alaska Administrative Code but included in recommendations. The alternative to use B-Train transponders to by-pass scales is dismissed for reasons stated in Section 11.5.*

- *Section 11.7 Alternative: Increase Scale Hours of Operation would increase corridor monitoring of B-Trains. This action may be warranted because of the frequency that B-Trains have exceeded the agreed weight limit of 162,815 pounds during the 12.5-month period between October 2023 and October 2024. This prompted the DOT&PF to post an 80-ton weight limit on the Chena Flood Control bridges. However, there are periods during the day in which trucks are not subject to being weighed because ARS corridor scales are not staffed. In order to ensure full compliance with weight limits by the ore haul and other trucks, at least one or more of the ARS weigh stations would have to be open all hours of the day. This would incentivize trucking firms to always comply with weight limits. Expanding weigh station hours is not possible at this time because of funding and staff recruitment constraints. Furthermore, under current practice, the ARS weigh stations would not be prioritized over the other ones on the State highway systems. Any increase in funding or staff would be allocated to all system weigh stations.*

- *Section 11.14 Alternative: Increased Enforcement includes focused enforcement programs. However, upon further consideration, these would not be feasible with current resources. This also included red-light running cameras for Fairbanks signals. Again, this in not feasible for just the traffic signalized intersections on the ARS corridor because of the required administrative support. Red-light running camera treatments would be feasible with a network implementation program.*

<u>Recommended Alternatives-</u> The following exhibit presents recommend alternatives. More detail, on these recommendations can be found in Section 13.2.2 on page 294. The table includes these attributes.

- *<u>Majority TAC Support-</u> The table indicates if the TAC supported the alternative, with a "Y" meaning yes, a majority of TAC member who provided input stated support. A "N" indicates that the majority of TAC members did not support the alternative. There were several alternatives in which the TAC was not given opportunity to provide input.*
- *<u>Additional Cost-</u> The additional incremental cost for alternatives is presented for some of the alternatives. However, many of the alternatives do not have cost computations, in which case the cost is assigned as "UNK" for unknown.*
- *<u>Implementation Horizon-</u> The alternatives implementation horizon is presented as short-term ("S" 0 to 5 +/- year), medium-term ("M", 5 to 10 +/- years), and long-term ("L", >10 years).*
- *<u>Sustained Benefits-</u> Alternatives that provide ongoing benefits for the travelling public beyond the ore-haul duration are assigned "Y" for yes, the alternative provides continued benefits.*
- *<u>Implementation Program-</u> This provide guidance on how the alternative is implemented. "STIP" is DOT&PF funded improvement. "Local" indicates a local agency will participate. "M&O, "Bridge Section", or "DOT&PF" indicates that the State forces would likely perform the work. "Kinross/BGT" indicates that the ore-haul operator would likely perform the alternative. "UNK" is unknown.*

Exhibit FF: ARS CAP Recommended Alternatives

Report Section	Alternative(s)	Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
11.2	Construct Truck Climbing / Passing Lanes	Y	$22M - $51M	M, L	Yes	STIP	Preliminary engineering required to establish locations of climbing lanes, SVT, or combination thereof.
11.3	Slow Vehicle Turnouts	Y	$4.7M	M, L	Yes	STIP	
11.4	School Bus Stop Improvements						
	ROW Clearing to Improve Winter Sight Distance	Y	UNK	S	Yes	M&O	Short-term brush clearing by State M&O
	DOT&PF and School Districts to Establish Permanent Bus Stops	Y	UNK	S, M	Yes	STIP or Local	Specialized study effort preceding permanent lighting and signing. TAC supports signing and lighting
	Transponders- HAAS Alert, or Mobile notification (511 School Bus Alert Project)	NA	UNK	S	UNK	UNK	Requires private-public partnerships. DOT&PF Traveler 511 Info has a pilot project in Fairbanks to alert smart phone with 511 app of an approaching or near proximity school bus.
11.5	Operator (Kinross) Alternatives						
	Internal Policies on Allowing Passing	Y	UNK	S	N	Kinross / BGT	Policy to yield to following vehicles to avoid unsafe passing.
	Internal Policies to Prevent B-Trains Platooning and Queuing	N	UNK	S	N	Kinross / BGT	
	Policy to Avoid Travel in Poor Weather	Y	UNK	S	N	Kinross / BGT	Required by AAC
	Policy to Reduce Speeds (5 to 10 MPH) Between Traffic Signals	No Input Asked	UNK	S	N	Kinross / BGT	Reduce red-light running
	Driver Training, B-Train Snow and Ice Removal, Emergency Response Plan, Safety Plan	Y	UNK	S	N	Kinross / BGT	These are presumed to be in place.

Report Section	Alternative(s)	Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
11.6	Bridge Monitoring and Improvements	Y	UNK	S	N	Bridge Section	Addresses Monitoring only. Bridge improvements and replacements are underway under STIP
11.8	Increase Summer and Winter Maintenance and Operations	No Input Asked	Varies	S, M	Y	O&M, STIP	Additional Costs: Summer Pavement M&O- $4.2M Winter M&O- $3.5M Winter Facilities- $3.2M
11.9	Pavement Projects	No Input Asked	$490M	M, L	Y	STIP	
11.10	Install Variable Speed Limit Signs	N	$7M	M, L	Y	STIP	Ten-mile spacing on ARS corridor. Continues current project on Richardson Hwy south of Fairbanks.
11.11	Geospatially Map All Pullover Locations and Integrate With ITS	Y	UNK	S, M	Y	STIP	
11.12	Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives	Y	UNK	S	Y	M&O	ADF&G monitoring would identify increased collisions areas. M&O can provide spot clearing. Reduces wildlife mortality and crashes.
11.13	Increase Awareness of B-Train Characteristics (and Operational Requirements)	Y	UNK	S	Y	DOT&PF, Kinross	Use public service announcements or advertisements to improve awareness of B-Train operations and promote safety. This could be a Private-public venture.
11.15	Install Intelligent Transportation System (ITS) Devices at Traffic Signals	N	$0.4M	S	Y	STIP	Systems that dynamically adjust signal timing and prevent red-light-running .
11.16	Install Additional Road Weather Information System Stations	Y	$0.5M	S, M	Y	STIP	One or two additional RWIS stations (Alaska Highway).
11.17	Grants for Emergency Medical Services Resources and Training	Y	UNK	S, M	Y	UNK	

END OF EXECUTIVE SUMMARY