Southeast Alaska Mid-Region Access Independent Review Technical Memorandum

Prepared for

Federal Highway Administration

Prepared by

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April 2011.

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1 INTRODUCTION

As part of the review process for the various memorandums developed as part of this project, the Federal Highway Administration (FHWA) tasked Robert Peccia and Associates with finding experts to complete an independent review of the following five documents:

- Southeast Alaska Mid-Region Access Summary Technical Memorandum
- Southeast Alaska Mid-Region Access Traffic Projections Technical Memorandum
- Southeast Alaska Mid-Region Access Port and Ferry Terminal Technical Memorandum
- Southeast Alaska Mid-Region Access Air-Cushion Vehicle Technical Memorandum
- Southeast Alaska Mid-Region Access Engineering Technical Memorandum

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2 INDEPENDENT REVIEWERS

Five individuals reviewed the documents. The individuals and their area of expertise are as follows:

Economics—John H. Leeper (Independent). Mr. Leeper has more than 40 years of experience in managing projects relating to transportation, trade, and economic development. He has provided consulting services to the Congress of the United States, the U.S. Departments of Justice, Transportation, Defense, and Commerce, and Transport Canada.

Ports and ACVs—Bradley P. Erickson, PE, SE (AECOM). Mr. Erickson is a Senior Project Manager and Director of Marine Services in the Pacific Northwest. He has more than 39 years of experience on complex port terminals, highway bridges, earth retaining structures, fishery facilities, and other civil and structural engineering projects.

Engineering and Traffic—John Perlic, PE (Parametrix). Mr. Perlic is the Transportation and Engineering Division Manager for Parametrix in Bellevue, Washington. He has more than 25 years of experience working on a wide range of transportation planning and engineering projects throughout the United States.

Engineering—Mark Burrus, PE (Parametrix). Mr. Burrus is a registered Professional Engineer in the state of Washington. He has 11 years of roadway design and construction experience, including corridor improvements, horizontal and vertical alignment design, intersection design, access management, safety, and mobility.

Traffic—Ryan Abbotts, AICP (Parametrix). Mr. Abbotts is a senior planner for Parametrix in Bellevue, Washington. He has 10 years of experience in the transportation planning and engineering field, including numerous corridor and interstate concept, planning, and operation studies throughout the United States and Canada.

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3 INDEPENDENT REVIEW PROCESS

The review process started with a kickoff meeting that included all of the reviewers and preparers of each of the documents. Reviewers received a brief project history and some of the background used to develop the individual memorandums. Participants discussed the purpose of the review, and the philosophy of an independent review was emphasized. The meeting provided an opportunity for the reviewers to ask questions about the individual reports that they would review.

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4 INDEPENDENT REVIEW SUMMARY

The intent of the independent review was to provide peer review of each of the documents. These reviews provided an opportunity to take an independent look at and recommend changes in the documents. Recommendations from the reviews were considered and, where applicable, incorporated as the documents were finalized.

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APPENDIX A

Traffic Independent Review Memorandum

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TECHNICAL MEMORANDUM

Date:	November 23, 2009
To:	Brian Wacker, PE Robert Peccia & Associates
From:	Ryan Abbotts, AICP John Perlic, PE
Subject:	Southeast Mid-Region Access, Draft Summary Technical Memorandum Independent Review to Technical Studies
cc:	
Project Number:	274-5574-001
Project Name:	Southeast Mid-Region Access Feasibility Study

INDEPENDENT REVIEW

Document Titles: Southeast Alaska Mid-Region Access Traffic Projections Technical Memorandum and Southeast Mid-Region Access Draft Summary Technical Memorandum

Original Documentation Prepared by: Robert Peccia & Associates, Northern Economics, Parametrix culminated into final document around: April 2009.

Parametrix Peer Review Authors: Ryan Abbotts, AICP and John Perlic, PE

OVERVIEW

The purpose of this Memorandum is to provide an independent peer review of transportation and traffic assumptions, methodologies, and trip generation for the Southeast Alaska mid-region access (MRA) highway corridor, as compiled in the two documents listed above by Robert Peccia & Associates, Northern Economics, and Parametrix.

The request for the independent peer review of technical documents was made by the Federal Highway Administration (FHWA) and the Alaska Department of Transportation and Public Facilities (DOT&PF). The documents were developed for the Southeast Alaska MRA highway corridor near the Bradfield Canal, which would connect Southeast Alaska to the continental highway system via the Cassiar Highway (State Route 37).

The review includes an assessment of key assumptions and methodologies, identifying any fatal flaws, and making recommendations to improve the accuracy of the results with specific focus on trip projections. A review of the transportation data used to develop trip assumptions for the Bradfield, Stikine, and Aaron Creek alternatives was also conducted. No travel demand modeling or corridor operations analysis by alternative was completed in preparation of this Memorandum. The review was limited to those documents provided by the client. Any additional modeling or work efforts identified as a recommendation resulting from this peer review are included in the findings.

Additional independent reviews were conducted concurrently for Economic Projections, Port and Ferry/Air Cushion Vehicle Feasibility, and Engineering Feasibility. All of the independent reviews should be considered holistically as the project assumptions and findings are interrelated and could have an impact on assumptions and findings in the other elements.

SUMMARY OF PEER REVIEW FINDINGS

A number of factors and assumptions influence how many, by what mode (e.g. ferry, private automobile), and when trips are occurring. These factors are organized in the evaluation section into several components and findings in each category are summarized as follows:

1. Design Volume and Seasonal Trip Volume Variation
    a. Due to potentially significant differences in AADT and Seasonal ADT, use of an alternative method for Design Volume is recommended such as using the Institute of Transportation Engineers *Traffic Engineering Handbook*'s 30th highest hour method.
    b. Conduct an assessment of seasonal variation in trips due to the potential impact on daily trips over the months of June, July, and August.
    c. Integrate the design volume and seasonal trip volume variation analyses with the Engineering Feasibility efforts to confirm the design parameters for the engineering of the roadway.
2. Future Recreation Potential
    a. Conduct a sensitivity analysis based on low and high potential for tourist operations in this area, including any new recreation potential in Canada.
3. Passenger Ferry Passenger Forecasts
    a. Provide a discussion on the rationale for selecting the straight-line 20-year, 20 percent reduction, no-change, and 20 percent increase in passenger ferry trips (these values result in less than 1 percent annual growth changes).
    b. Consider a sensitivity analysis comparing historical ridership trends (up and down) to develop a sample of growth rates, which could be applied to trip generation.
4. Average Vehicle Occupancy
    a. Provide additional context (values used and rationale for using those values) for average vehicle occupancy for residents, non-residents, freight, and other modes presented in the trip generation numbers.

5. Future Freight Trip Estimates

    a. Examine the relationship between freight trips internal to the southwest region (those trips that would decline as the population base declines) to freight trips serving external markets (those trips not likely impacted by local population change but by economic conditions). If a significant portion of these freight trips are external, an alternative growth rate not based on the population change rate could be considered.

6. Existing and Future Natural Resource Operations

    a. Expand discussion of existing and future resource operations to include the cost limiting factors that resource operations could experience in the area.

    b. Provide a discussion of the differences between the 149 estimated annual average daily traffic (AADT) from area mining operations (existing and future) and the 60 AADT used in the analysis.

    c. Include an assessment of freight operations that could potentially make use of a new deep water port access in Wrangell and provide the anticipated change in trip generation.

7. Proportion of Trips in Future Years

    a. Develop a visual representation of future mode share for a reasonableness check to compare how varying growth rates are changing the proportion of how people travel in the future.

8. Travel Cost by Mode and Alternative

    a. Conduct a sensitivity analysis to evaluate trip generation differences resulting from a cost per mile of how people relate to their cost to travel (typically gas only costs) versus the report stated American Automobile Associate (AAA) rate of $0.522, which includes the cost of ownership and operation (2007 value).

    b. Provide a discussion on how travel costs for other modes were developed and whether they reflect seasonal variations in price, such as air fare, accommodations, and others as appropriate.

9. Description of Approach and Data used for Trip Diversion Estimates

    a. Conduct a sensitivity analysis based on actual travel times and costs for trips between Wrangell and the communities of Haines, Skagway, Juneau, Sitka, Petersburg, and Ketchikan versus using an equal weighted value.

10. Cost Effectiveness Evaluation

    a. Conduct a cost effectiveness evaluation to provide a comparison among the corridor alternatives.

The impact of the factors described above on trip generation is difficult to determine based on the information provided. There are several external variables that appear to impact the number and type of future trips, which are hard to predict and isolate for trip generation. It is evident the regions trip generation is impacted by multiple variables, which could be explored to provide a future trip generation range. These ranges should include descriptions of the assumptions influencing the result.

For example, Table 1 is an attempt to recreate the average daily traffic (ADT) volumes presented in the *Traffic Projections Technical Memorandum* and present reasonable alternative assumptions. Traffic values provided are as follows:

- Bradfield Canal: 210 average ADT and 390 peak ADT
- Stikine River: 290 average ADT and 270 peak ADT
- Aaron Creek: 240 average ADT and 420 peak ADT

Table 1 (below) summarizes the breakdown of the original ADT numbers for the MRA highway corridor alternatives as found in the *Traffic Projections Technical Memorandum* and the original assumptions generating the trip projections. The original ADT has been adjusted based on a modified assumption to explore the difference in range of trips possible for forecasted trips. This exercise is theoretical and should be developed further using data available from the original analysis. As shown in Table 1, the average ADT presented in Table 8-1, Comparison of Corridors and Stages, in the *Traffic Projections Technical Memorandum* (pp. 8-3) was not able to be fully recreated from the report (a gap of 30 to 100 trips depending on the alignment).

Table 1. Potential ADT Based on Modified Trip Generation Assumptions

Mode	Original ADT on MRA	Original Assumption	Modified Assumption	Potential ADT (Rounded)
Diverted Traffic	57	Based on travel time and cost, which is held constant for all corridors.	Average vehicle occupancy is not 2.0, but closer to 1.2 for local trips.	95
Interaction Among Residents	13	Wrangell and Petersburg are connected, developed from model.	Average vehicle occupancy is not 2.0, but closer to 1.2.	20
Local Recreational Trips	50 – 60	Generated from modeling assumptions.	No change, recreational average vehicle occupancy likely close to 2.0 or above.	50 – 60
	0	None	Estimated trips from additional recreational opportunities as they become available.	10 – 20
Freight	*(Note A)*	Vans change at the same rate of population	Only a portion of the van trips serving internal freight needs change at the same rate as population, the rest remains constant or grow consistent with export industry growth.	*(Note B)*
			Rate of future trip change is different than the -20, no change, and +20 change over 20 years stated in report.	*(Note C)*
	60	Large mine could produce 120 ADT, Potential mine-related truck trips per day could be 149	Maximum number of truck trips is realized per day.	60 - 150
	0	No additional resource extraction activities would occur	At least two new major mines are developed in the area.	0 – 240 *(Note D)*
	0	No diversion from existing deep water port, such as Stewart.	Trucks trips divert from places such as Stewart to Wrangell.	0 – 60 *(Note E)*
Seasonal Trip Variation	--	Peak (high trend) assumes large increases in resource and economic development and general traffic. *(Note F)*	Assume season variation of trips. *(Note G)*	0 – 170 *(Note H)*
Rounded Totals	180 – 190 *(Note I)*			235 – 815 *(Note J)*

Notes From Above Table 1: Potential ADT Based on Modified Trip Generation Assumptions.

A. Data was not found in the documents provided.
B. A positive growth in trips is expected but it is difficult to quantify the number of trips with the data provided.
C. It is expected that a greater reduction and a greater increase in trips than the original estimate would occur based on using trends from past changes and carrying the same growth change forward into future years.
D. It was assumed the MRA highway corridor could provide access to two new large mining operations—based on the statement on pp. 6-1 of the *Traffic Projections Technical Memorandum* stating "the mining potential in the area is large, but it is limited by the cost of development". These two new mines could produce as much as 240 AADT (120 AADT per mine, pp. 2-2, *Draft Summary Technical Memorandum*).
E. Trip diversion was estimated from similar population centers and using Table 3-15 for freight volumes (pp. 3-13, *Traffic Projections Technical Memorandum).* If trip data was provided for areas, such as Stewart, a sensitivity analysis examining the impact of the degrees of diversion (varying percentages), which could occur with new access to Wrangell, could be conducted. The following is population and corresponding freight volumes for each area used to estimate freight volumes shown in the table above:
    a. Hoonah, AK: 715 people in 2008 with 41 freight trips in 2001 (population from www.city-data.com)
    b. Kake, AK: 635 people in 2008 with 66 freight trips in 2006 (population from www.city-data.com)
F. The High Trends, which is the Peak ADT value, does not list seasonal variation (the large increase in the number of trips in the summer months) as a factor for the increased ADT.
G. The seasonal variation examined a rough approximation of the average values shown in Figure 5-1 Monthly AMHS Traffic, Southeast Alaska in the *Traffic Projections Technical Memorandum*, which shows June, July, and August ferry borne passengers being almost double the yearly average. Using a seasonal variation would lead to some increase in freight trips but not likely at the same magnitude as non-resident and resident trips.
H. The 170 trips represent a doubling in the Diverted Traffic, Interaction Among Residents, and Local Recreational Trips and does not include any change in the number of freight trips.
I. The total in this column should be reflective of the total ADT presented in Table 8-1 of the *Traffic Projections Technical Memorandum*, but was not able to be fully recreated. Based on the report, it is unclear what composition of trips makes up the difference of about 30 to 100 trips.
J. The upper range of this modified assumptions analysis is significantly higher than the peak presented in the *Traffic Projections Technical Memorandum*.

Summary Recommendations

Overall summary recommendations from the peer review include:

- The MRA highway corridor analyses should summarize how the trip generation was developed for each MRA highway corridor alternative for each mode. This would allow the reader to fully recreate the number of trips presented for each corridor and for each of the stated conditions (average and peak).

- The trip projections in Table 1 present a range in the number of trips that could occur based on varying external variable assumptions. Some or all of these assumptions should be considered and discussed in the report to provide a more thorough evaluation of the possible future travel demand for each corridor alternative,

- A cost effectiveness analysis should be considered to provide a ranking of the costs and benefits of the alternative corridors. The evaluation of benefits could include:
    - improving redundancy and emergency preparedness in the region by providing residents with a transportation alternative to the ferry,
    - improving access to potential natural resources areas,
    - providing increased mobility and access to areas for recreation,
    - increasing safety, route reliability, and travel time benefit, and
    - providing access to a deep water port.

EVALUATION OF TRANSPORTATION METHODOLOGY AND ASSUMPTIONS

This section presents findings, comments, and suggests possible additional efforts to document the travel demand forecasts developed for the Southeast Alaska MRA Highway Corridor alignment alternatives. One objective of this review was to identify elements that could modify the trip generation by a significant amount—an increase in trips and vehicle composition that could impact the type of facility being constructed (elevates traffic volumes to a point where a different roadway facility is required) would be considered significant. This information was developed based on a review of existing documents and is provided in the following categories: Seasonal Trip Volume Variation, Future Recreation Potential, Passenger Ferry Passenger Forecasts, Average Vehicle Occupancy, Future Freight Trip Estimates, Existing and Future Natural Resource Operations, Proportion of Trips in Future Years, Travel Cost by Mode and Alternative, Description of Approach and Data used for Traffic Diversion Estimates, and Cost Effectiveness Evaluation.

Design Volume and Seasonal Trip Volume Variation

The volume and distributional characteristics of traffic are fundamental design controls (*Traffic Engineering Handbook, pp. 353).* Traffic projections for the MRA highway corridor indicate an annual average daily traffic (AADT) projection was used to determine the design volume. The "High Trend" or Peak trip projection assumes increases in resource and economic development but does not appear to evaluate seasonal variation as a factor (*Traffic Projections Technical Memorandum,* pp. 4-2).

Use of the AADT as a 'design volume' is generally not suitable for most roadway design decisions as it masks traffic fluctuations within the days and months—AADT volumes can by much lower in areas experiencing significant seasonal trip volume variation. In some cases, the average trip volume is much higher than off-peak conditions and much lower than peak conditions, where peak conditions could represent 4 months of the year. Also, the "High Trend" or Peak trip projection appears to modify some of the trip projection assumptions but does not examine using something other than an average of the potentially generated trips.

Current trends indicate a significant portion of trips occur during the summer season—60 percent of passengers and vehicles traveling on the ferries in 2008 traveled during the summer season (pp 2-1). *Monthly AMHS Traffic, Southeast Alaska* (Figure 5-1, pp-5-7) illustrates the peak season as June, July, and August. Using a seasonal time frame of June through August is recommended for a seasonal variation assessment as the number of trips occurring in July and August represent almost double the AADT. Furthermore, the statement on pp. 2-1 of the *Traffic Projections Technical Memorandum* supports examining seasonal trip patterns by indicating "the large seasonal variations are important when considering new infrastructure and future traffic projections."

Use of the AADT as a design volume for the MRA highway corridor will likely result in the roadways capacity and potentially design criteria (based on design volume) being significantly exceeded during some days, even months, of a year. According to the *Traffic Engineering Handbook,* the level of detail required for design purposes is based on the type of highway improvement—most designs are based on a 'design hour volume'. Using the 30th highest hourly volume is generally applicable to rural highways; whereas the 200th highest hour is typical of a weekday peak hour in an urban area (pp. 353).

Therefore, the roadway design volume should include an assessment of the 30th Highest Hour and clearly describe the difference in traffic projections between the AADT and seasonal ADT. Also, an assessment of the range of trip generation by mode is recommended to illustrate the seasonal variation in the alternative corridors with a summer season peak of June, July, and August (based on 2000 to 2008 AMHS annual traffic volume report).

Future Recreation Potential

With the significant increase shown in the *Traffic Projection Technical Memorandum* for Cruise Arrivals (Figure 3-3, pp. 3-5) in Alaska and within the region, a discussion of the potential for future recreational and leisure activities in the area should be included. Although this type of activity can be difficult to estimate, a sensitivity analysis based on a low and high potential for tourist operations could be provided based on similar areas in Alaska. This recreation potential could include access to the Misty Fiords National Monument Wilderness (made possible by the Bradfield Canal alternative), the Stikine-Le Conte Wilderness, Craig Headways Provincial Park areas, and other potential sites such as Stewart, British Columbia, Canada.

Passenger Ferry Passenger Forecasts

The regression analyses and curve-fitting equations mentioned (pp. 3-6) were not reviewed as part of this Memorandum. A discussion on the rationale for selecting a straight-line 20-year, 20 percent reduction, no-change, and 20 percent increase in passenger ferry trips should be included—as presented, this represents a less than a 1 percent per year decrease or increase. The historical trends could be examined for representative upward and downward trip change trends. For example, The Southeast Ferry Passenger Counts from 1999 to 2005 show a 5-year down trend of about 4 percent per year (approximated from Figure 3-3, pp. 3-5, *Traffic Projections Technical Memorandum)*. Similarly, a 3-year up-trend is shown from 1997 to 1999. It should be clearly noted in the report that future ferry trips are not capacity constrained (specifically that ferry boats and air cushioned vehicles will be added to the route to meet any demand needs).

Average Vehicle Occupancy

A discussion of average vehicle occupancy assumptions should be included in the document. It appears both resident and non-resident trips were factored using the same average vehicle occupancy rates. Higher rates could lessen the impact in the number of vehicular trips being made by mode. If possible, these rates should be stated independently for local trips, freight trips, and work-based versus non-work-based trips. It is anticipated resident trips in the area are not experiencing the same average vehicle occupancy as non-resident trips.

Future Freight Trip Estimates

The change in freight trips should include a discussion of the number of trips serving internal and external markets. Although the change in existing freight operations in the Southeast Region does not appear to impact traffic volumes on the MRA Highway Corridor significantly based on existing land use and activities, it may be appropriate to estimate the amount of freight trips independently. For example, an existing company's freight operation (the amount of trip generation) may not change at the same rate as the population change of the region as freight trips are serving external markets. By establishing the number of freight trips serving the existing Southeast Region market, the proportion of freight trips impacted by a change in population could be more accurately represented.

Existing and Future Natural Resource Operations

This discussion pertains to existing and future potential trips generated for natural resource operations in the area including facilities and operations to support fishing, logging, mining and other similar types of operations. As stated in the *Traffic Projections Technical Memorandum,* the mining potential in the area is large, but is limited by the cost of development (pp. 6-1). The trip generation for a future mining operation provided in *Draft Summary Technical Memorandum* states a mine producing one million tons of ore concentrate per day would generate 120 AADT (pp. 2-2); but, only 60 AADT from this operation was used in the trip generation analysis. Also, in the *Traffic Projections Technical Memorandum,* Appendix B-1 and B-2 (pp. B-2), a discussion is provided on potential future mining projects in the area which could generate a total of 149 trips per day.

Chapter 3, Current Transportation System Traffic Projections of the *Traffic Projections Technical Memorandum*, could be expanded to include a discussion of natural resource operations, such as mining and cost limitations for development. This discussion should include a rationale for assuming only 60 AADT. This section could also include a sensitivity analysis resulting from low, moderate, and high potential for resource extraction operations including an assessment of freight and worker generated trips.

The revised freight discussion could also include an assessment of providing a new deep water access point at Wrangell proposed in the alternatives. If the MRA highway corridor provides a high degree of transport reliability, the existing extraction operations could choose to use a port in Wrangell. Since the number of these freight trips to the other ports in the region was not provided, it is difficult to estimate the number of trips that could be potentially added to the MRA highway corridor—therefore, an assessment of existing operations and a sensitivity analysis is suggested. The sensitivity analysis could include any impact to shipment scheduling. For example, an assessment of how likely the MRA highway corridor would remain open during adverse weather could be conducted, especially during the winter season (some effort was made to quantify the number of inoperable days for air cushion vehicles in the provided materials). If the roadway is not passable, stockpiling of material could occur and result in additional operator expenses and increased seasonal variation in the number of trips. Stockpiled material, however, would likely be moved immediately upon reopening of the roadway and may not impact trips occurring in the peak summer months.

Proportion of Trips in Future Years

With growth rates for different modes being modeled somewhat independent of each other, a summary of total trips by mode should be provided for existing and the final build-out year (2030). This assessment would provide a visual check to show the mode split percentages and evaluate if the total mode share seems balanced.

Travel Cost by Mode and Alternative

The methodology employed to calculate trip costs appears to be based on reasonable assumptions, however, a sensitivity analysis or discussion on the following points would be helpful: 1) the cost of $0.522 per mile for travel by vehicle is considered to be conservatively high and could be evaluated based on the costs people consider when traveling—it may be less than the full vehicle ownership rate, such as the cost for gas only (this sensitivity analysis should consider the higher national average in fuel prices for the State's of Washington and Alaska as shown on the American Automobile Association's *Daily Fuel Gauge Report* (www.fuelgaugereport.com); 2) fluctuations in the cost of air fare based on seasonal variation or rates most likely to correspond with the analysis period; and 3) a discussion of costs associated with potential rental car or ground transport associated with air or cruise travel.

Description of Approach and Data used for Traffic Diversion Estimates

Additional background information should be provided on the values used in the equation developed for estimating induced trips within the region (pp. 6-2). For example, why is the combined population of the communities multiplied by 0.067934 and how was this number generated?

A sensitivity analysis examining changes in trip generation resulting from changes in the weighted travel times should be developed for trips between Wrangell and the communities of Haines, Skagway, Juneau, Sitka, Petersburg, and Ketchikan (pp. 6-3). This would provide additional information on the significance of travel time differences and its effect resulting from the employed gravity model.

As stated in the *Traffic Projections Technical Memorandum,* the adjusted R-squared value for this equation is 0.88 and not statistically significant for the distance variable and caution should be used in employing the results of this equation. The statement regarding employing caution should be expanded to describe the cautionary elements.

Cost Effectiveness Evaluation

A cost effectiveness evaluation should be conducted to provide a comparison among the proposed alternatives. Trip projection and alternative cost data from the Engineering Feasibility Report should be used to support this evaluation. Measures of effectiveness for the analysis could include:

- improving redundancy and emergency preparedness in the region by providing residents with a transportation alternative to the ferry,
- improving access to potential natural resources areas,
- providing increased mobility and access to areas for recreation,
- increasing safety, route reliability, and travel time benefit, and
- providing access to a deep water port.

AUTHOR'S BIOGRAPHY

Ryan Abbotts, AICP, is a Senior Planner for Parametrix in Bellevue, Washington. Ryan has been working for 10 years in the transportation planning and engineering field. He has been a project manager and principal planning and operation lead on many multimodal demand and operational analyses projects and has been responsible for developing solutions for a wide range of transportation projects. His experience includes numerous corridor and interstate concept, planning, and operation studies throughout the United States and Canada.

John Perlic, PE, is the Transportation and Engineering Division Manager for Parametrix in Bellevue, Washington. For over 25 years, John has worked on a wide-range of transportation planning and engineering projects throughout the United States. He serves as a senior advisor and project manager for many complex projects and is often involved in alternative development, environmental analysis, demand modeling, operations analysis, alternatives analysis and screening, and cost-estimating.

APPENDIX B

Economic Independent Review Memorandum

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Southeast Alaska Mid-Region Access Study Independent Review

11/15/09

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Purpose: The purpose of this review is to provide an independent opinion of the work completed in the Southeast Alaska Mid-Region Access Traffic Projections Technical Memorandum dated April 2009 with focus on Economic Analysis.

Qualifications of Reviewer: John Leeper has over 40 years experience in managing projects relating to transportation, trade, and economic development. He has provided consulting services to the Congress of the United States, the U.S. Departments of Justice, Transportation, Defense, and Commerce, and Transport Canada. His experience in Canada includes assignments for the Canadian Pacific and Canadian National Railways as well as projects in Ontario, Nova Scotia, British Columbia and Alberta. He has worked for the State of Alaska, the Port of Anchorage and the Anchorage Economic Development Corporation on trade flows and transportation issues. He has prepared foreign trade zone applications for Canadian border grantees in Bellingham, Blaine, Sumas, Sweetgrass, Shelby, Great Falls, Grand Rapids and Detroit. His transborder transportation feasibility studies have included ferry operations at Victoria, Port Stanley, Toronto and Bellingham. He conducted an evaluation of Ports of Entry along the Canadian border for the US Department of Transportation as part of the Rocky Mountain Corridor Study. He has prepared strategic plans and capital construction feasibility studies for approximately 30 US and foreign ports, airports and intermodal centers. Mr. Leeper has a BS degree from the University of Colorado and an MBA degree from American University. He is a graduate of the American Association of Port Authorities' Executive Management Course and has been certified by the American Society of Transportation and Logistics.

Scope: The scope of work for Southeast Alaska Mid-Region Access Study requires traffic projections in three scenarios (current, low and high). There is a requirement to determine how much traffic will be diverted from the ferry system and the volume of new traffic that can be expected from transportation cost savings and enhanced convenience. Three corridor alignments under various stages were specified.

General: The study in general and the traffic/economic task in particular (as proscribed by the scope of work) are well done and adhere to generally accepted professional standards for transportation analytical work. Aside from selected assumptions and analytical techniques, there is very little in the study that can be classified as economic analysis. Typically, feasibility studies for so called "Greenfield" transportation projects will feature an 'Economic Impact" section and a "Cost/Benefit" analysis. In some cases, the alignment and engineering studies precede the economic analysis so that potentially controversial benefit estimates do not distract from the structural evaluation. This may have been the case in this instance. The specific traffic counts are the subject of a separate review and will be addressed here only where they may apply to existing or potential economic analyses.

1. Introduction: This chapter treats the history of the region, the access corridors and the Alaska Transportation Plan. No comment.

2. Summary of Traffic Estimates: This chapter summarizes the traffic projects. No comment as this topic is addressed in subsequent chapters.

3. Current Transportation System Traffic Projections: This chapter covers the various transportation systems now serving the area and the existing traffic counts.

Introduction: The introduction states that there is no connection to the highway system south of Haines/Skagway. There is a connection from Hyder/Stewart to the Cassiar Highway. Ferry service by the AMHS to Hyder was suspended in 2001.

Current Traffic and Trends: The reference to a new pricing strategy demonstrates that the concept of "Price Elasticity of Demand" can be applied to the AMHS. That means that traffic will increase or decrease depending on the price. In transportation economics, inventory can not be stored and sold later. Once a vessel leaves the terminal the excess capacity is worth zero. If marginal capacity can be sold at more than the out of pocket cost of acquiring and handling the added traffic, the average cost per passenger and vehicle carried goes down and total revenues increase. Measuring this elasticity can be useful for future economic analyses of the various corridor options.

Passengers: An Extrapolation from Table 3.2 suggests that Alaskans in the SE will increase the use of short term ferry service to access mainland highway systems during the summer months. Ketchikan to Prince Rupert increases 77% in the summer vs. Ketchikan to Bellingham which increases only 8% in the summer. These and similar data could serve as additional predictors for measuring induced traffic.

Cruise Passengers: The assumption that an MRA project would not impact the volume of future cruise passengers may need a fresh examination. Most observers agree that the major obstacles to future cruise growth in Alaska are the lack of new venues and congestion in existing ports. Adding a new terminal with hinterland access to the Cassiar highway could provide new options including cruise/bus/cruise or cruise/bus/air scenarios. Another consideration from an economic prospective is the continuing slide in the US dollar. This may force more US tourists to opt for domestic tourist options as opposed to foreign travel. By the same token it would make North American tourist options more affordable to foreign visitors.

4. Corridor Alternatives and Stages: This chapter describes the three alternative routes selected for the MRA. There are no significant economic assumptions or issues in the chapter with the exception of the SATP goal of shifting from a network based on long distance ferry services to a system of shorter ferry links and more access for SE Alaska to the intercontinental highway system via the Cassiar Highway. This goal is significant because it recognizes a shift in social and economic behavior in Alaska. New generations of Alaskans and contemporary industries are less likely to remain in remote locations where many of the advantages of modern society such as energy, education, communications, recreation and health care services are not state of the art or simply may not be available. Improved access to hinterland highway systems mitigates some of these disadvantages and enhances the prospects for economic growth in the region.

5. Effects of Corridor Alternatives and Stages of Diverting Traffic: This chapter addresses the question of diverting traffic from existing modes.

Description of Approach and Data Used for Traffic Diversion Estimates: The technique used of combining actual costs with the value of time savings is an accepted approach. The destination point for the travel times and cost is assumed to be Bellingham for all modes since a rental car value is added to the air fare. There would also be diversion from SE Alaska to Prince Rupert and to Haines and Skagway. Some diversion could also occur from decisions to substitute other cities for Seattle such as Prince George, Edmonton, Calgary and Spokane since all of these locations would have driving time from Wrangle comparable or less then Seattle.

The argument that paving a road does not increase traffic may be applicable to some roads in Alaska but that assumption should be reviewed. The author lives on a semi-rural road in Montana that was recently paved and traffic has more doubled in a single year. The World Bank has assumed in some analyses that paving a road reduces costs through improved speeds, maintenance costs and fuel consumption. They have used an elasticity function of 1 to 1. This means that for every percentage in cost saving there is a comparable percentage increase in traffic volume. Since the Cassiar Highway is now 85% hard service, it should be possible to document the use levels at various stages of improvement. Similar data should be available for the Klondike Highway. The Transportation Research Board of the National Academy of Sciences/ National Research Council maintains and extensive data base on all aspects of highway use and may provide other experience which can serve as a predictor variable.

Diverted Traffic: The assumption that 50% of the resident ferry vehicle traffic would divert for cost saving of $0 to $100 is not illogical but some empirical basis would be helpful.

6. Effects of Alternatives and Stages on Inducing Additional Traffic: This chapter treats induced or stimulated traffic which is traffic that would not occur without the improvements in the MRA corridor.

Current versus Potential Traffic Levels: Conceptually there are several assumptions that could be questioned with regard to local and region induced traffic but the population base is so low that it would not substantially change the AADT projections. For instance the assumption that the MRA would not induce new trips regionally to Alaska and British Columbia is questionable. The potential for SE Alaskans to motor to cities such as Prince George, Prince Rupert, Calgary, Edmonton, and Spokane in roughly the same or less time then it takes to drive to Seattle, will most certainly induce traffic. Currently some 650 Alaskans from Ketchikan travel by ferry to Prince Rupert in July (table 3.2), presumably to intersect the intercontinental highway system. The travel time by ferry from Wrangle to Prince Rupert is 12 hours. From Wrangle by the proposed MRA is roughly 8 hours.

The gravity model is an acceptable tool for predicting induced regional trips although I agree with the comment that using AMHS data may not be appropriate. Those data would seem to be more useful for analyzing diverted traffic rather than induced.

The greatest potential however, comes from industrial traffic and there is no explanation in this chapter for how that traffic is evaluated. A terminal that can accommodate deep draft bulk vessels could significantly enhance the viability of potential natural recourse assets in the region. It should be noted that the asbestos mine at Cassiar was profitable using the Cassiar Highway to the bulk terminal at Stewart B. C., a distance of 678 miles round trip. The need to insure a deep water terminal for bulk transport can not be overstated. Controlling channel and alongside depths of 65 ft MLLW recommended.

Also there was no treatment of cruise ship potential. As mention previously, the opportunity for new ports of call with sightseeing bus tours into the hinterland or cruise/bus/cruise options may become more important with time.

The existence of population centers such as Wrangle and Petersburg as potential destinations accessible via the Cassiar Highway should stimulate significant new tourist visits from campers, hikers and RV's transiting from other Alaska location, the lower 48 and Canada. For instance, the author recently drove to Seattle and flew to Sitka for a kayak excursion aboard a mother ship. Had the option been available to drive directly Wrangle or Petersburg to meet the mother ship, the trip would have been enhanced by the drive and the cost would have been less.

7. Methodology: This chapter summarizes the techniques and assumptions detailed in the previous chapters.

8. Findings and Conclusions: This chapter summarizes the finding of the traffic and economic section of the report. The findings and conclusions were not presented in the high/mid/low case scenarios that were apparently contemplated in the scope and in the data development in the first chapter. However, the results are conveyed in an understandable format. Table 8.1 needs to specify the case and clarify the Ferry Peak column. The findings are conservative and credible. The work constitutes and important contribution to the project. As stated in he beginning, there is little in the study that can be viewed as economic analysis.

APPENDIX C

Port and ACV Independent Review Memorandum

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Southeast Mid-region Access Draft Peer Review		Document No:		Rev	April 2009
		Document Title:	Multiple		
Review By: Brad Erickson	**Comments Date:** November 30, 2009	**Received Date:**	November 11, 2009		

Comment No.	Document Reference	Comment	Comment Category	Action
1.	General	a) I reviewed each of the component documents: Summary Technical Memorandum (STM), Traffic Projections Technical Memorandum (TPTM), Task 7 - Port and Ferry Terminal Feasibility Study (PTFS), Task 7a – Air Cushion Vehicle Feasibility Study (ACV), and Engineering Feasibility Study (EFS). Each was dated April 2009. b) Primary review was focused on Summary Technical Memorandum, Task 7 - Port and Ferry Terminal Feasibility Study, and Task 7a – Air Cushion Vehicle Feasibility Study and a cursory background review was done of the other documents. c) The titles of each document are not consistent. A 'feasibility study' gives the reader a different sense of what to expect compared to a 'technical memorandum'. Suggest making the titles consistent to avoid confusion.	N/A S	
2.		a) The appearance and organization of all documents is very professional and the background documentation appears solid. However, the conclusions and recommendations for how the **FHWA (and AK DOTPF decision maker** should proceed to the next stage and what future work might be necessary are not clear. Another way to state this concern is: the document should more clearly **address the decision maker** and **describe alternative next steps** to be accomplished.	SS	
3.	STM	a) Complicated options should be simplified to the extent possible to improve readability. Ideas that may help include: 1) Add maps such as provided in the 1984 Stikine River Reconnaissance Study. 2) Describe some of the routes as using "Combined Corridor" over as much as ½ the overall route.	S	
4.	STM, 1-1	a) Section 1.1.1 first paragraph sounds rather defensive suggesting the original report was not adequate. I did not get that impression, but I thought that the document lacked focus or definition of goals and a summary of how well it met those goals. I understand that this study is pre-NEPA and much added work is planned before	SS	

Comment Category Codes:
Designer to Review: **DR**
Suggestion: **S**
Strong Suggestion: **SS**

Comment No.	Document Reference	Comment	Comment Category	Action
		implementation. It seems that it would be helpful to provide a clear set of directions on where this study/report is going. It appears that the order of documents is expected to be similar to the 3-ring binder provided: STM, TPTM, PTFS, ACV, and EFS. On that basis, I suggest expanding the STM to more thoroughly describe the entire set of documents.		
5.	STM, 1-2	a) The approval process certainly involves both governments as well as previous wilderness commitments, etc. It also hinges on planned use and potential governmental funding and/or private mining interest involvement which is foundational to how this moves forward. It would be helpful to lay these various foundation background items out clearly at the beginning of the document.	S	
6.	STM, 1-3	a) The Unuk River corridor sounds rather simple in word description but was determined impractical. Consider reviewing and adding background.	S	
7.	STM, 1-5	a) The route which starts from the SE corner of island Petersburg is on begs the question of why not start on eastern side of channel. I am guessing it has to do with providing better access from Petersburg, but it is not clear. Suggest adding some further discussion.	S	
8.	STM, 2-1	a) Why measure the time from SEATAC rather than a local connection such as Wrangle? I was surprised with this statement, so think it should be reviewed.	DR	
9.	STM, 2-7	a) In Section 2.10, the interest of mining organizations is not clear; however, the amount of traffic is taken as half of the hypothetical maximum volume. This may easily be incorrect on either the high or low side. Suggest further definition of what is needed to provide background and how to measure this impact or demand changes.	SS	
10.	STM, 5-3	a) Section 5.7.2 discusses acquisition and operating costs not being included. It appears these costs should be roughly estimated so they could be better understood.	S	
11.	STM. Costs	a) The overall ACV cost information is not comparable to highway construction costs because the ACV is primarily operations and maintenance rather than initial capital cost. Because implementation of an ACV requires out-of-pocket cost to the traveling public, the importance of ACV fees may be more important than what is currently	SS	

Comment Category Codes:
Designer to Review: **DR**
Suggestion: **S**
Strong Suggestion: **SS**

Comment No.	Document Reference	Comment	Comment Category	Action
		discussed. Suggest discussion of this important issue and what near term studies should be done to address this perspective.		
12.	ACV	a) The discussion on different ACVs provides good background, but the focus of this document is not clear. For example, the Hoverbarge appears to provide good value for mine export service, but the speed is significantly slower than the ACV from GHS that provides transport of smaller payload and a mix of smaller vehicles as well as truck size transport. It appears this could be a major choice that could only be addressed once mine input/commitment was received or it could be that type of decision is not an acceptable alternative decision driver to AK DOTPF, particularly since the existing mining appears to be primarily Canadian in location. b) Combining this information with the TPTM, it appears the mining operations might swing the preferred choice of ACV vs. Hoverbarge either way; the stated vehicle plan is only ½ of the stated mining need so the reader does not know if this 'average 60 AADT projection' is good to plan for or is undersized by a factor of 2 or more or might become zero if not used by mining.	SS SS	
13.	ACV, ES-1	a) The sea limitation of ten feet and 35 knots is noted. A general indication of the significance of this limitation would be helpful. Wind records are likely easily available from the airport and anecdotal information from the river areas. The sea limitation of ten feet is probably unusual in this mostly protected island area but could be validated by conversations with local mariners or Coast Guard.	S	
14.	ACV, ES-1	a) The 3rd paragraph states "It contains an evaluation of the feasibility…." This is a broad generalization that is not fully achieved. This might more accurately be described as a "discussion" of different ACV operations.	S	
15.	ACV, ES-2	a) The pricing by GHS for $85M for 3 arctic class ACVs 5 years is very interesting and specific information. The beginning comparison to Hovertrans Hoverbarge for an 8 year lease not including operation and maintenance costs leaves the reader thinking this is an 'apples and oranges comparison' and finding limited value to the discussion. It seems possible to very roughly provide an extension of the Hoverbarge costs to allow comparison; or alternatively, state this is a topic of future work and what the scope of that future work might be. b) The description of capabilities provided by an arctic class ACV compared to the Hoverbarge is very different. The reader needs to understand why the variation is	SS SS	

Comment Category Codes:
Designer to Review: **DR**
Suggestion: **S**
Strong Suggestion: **SS**

Comment No.	Document Reference	Comment	Comment Category	Action
		appropriate for this discussion and how the final selection might get accomplished. Otherwise, the document appears somewhat random and without direction.		
16.	ACV, 3-3	a) Top paragraph discusses "lower upfront costs" but does not give any background and is counterintuitive. Are multiple smaller units less costly than a single larger one?	S	
17.	ACV, 3-3	a) Section 3.5 discusses Environmental Considerations and is only a single short paragraph. This seems inconsistent with lawsuit mentioning ACV presented earlier. b) The following section 3.6 Noise seems like it would better fit in previous section 3.5 rather than to have it separate.	S S	
18.	ACV, 4-1ff	a) The discussion in sections 4.4.1 through 4.1.9 seems to be copied from the promotional material from GHS. The following sections seem to be re-worded from the Hovertrans material. Both could be improved by a solid introduction by this team describing what the writer agrees with and how the two are compared.	S	
19.	ACV, 4-1	a) There is little to no discussion of military versions of ACVs. This seems very unexpected because of the large use of ACV by the military, so it appears that use should be addressed in some way.	S	
20.	ACV & PTFS	a) The PTFS includes a substantial number of pages that discuss ACVs to one degree or another. This may be fine to provide depth of understanding, but the conflicts within the two documents are troublesome and should be improved or explained. For example: 1) The PTFS on 3-1 says "The hovercraft training master for the Stikine and Iskut Rivers service indicated ……. would be unreliable and unsafe". The unreliable may be due to environmental conditions, but the unsafe part appears to require either clarification or deletion. 2) The impact of Jones Act legislation is discussed differently and generally opposite in the two documents and should be clarified.	SS	
21.	PTFS, ES-1	a) The discussion of using both conventional ferry and ACV within the system should be clarified to provide some background: **why** both types are discussed, **where** each might be used, **when** a transition might occur from one type to the other, and **how** a selection might be made. This would be a good segue into future work anticipated.	SS	

Comment Category Codes:
Designer to Review: **DR**
Suggestion: **S**
Strong Suggestion: **SS**

Comment No.	Document Reference	Comment	Comment Category	Action
22.	PTFS, 5-13	a) Last paragraph indicates that vessel could be flagged to either Canada or United States. This is in direct opposition to discussion of Jones Act restrictions in the ACV, 4-1 discussion and elsewhere in the report. The logic is important to convey, particularly to FHWA so these should be consistent.	SS	

Comment Category Codes:
Designer to Review: **DR**
Suggestion: **S**
Strong Suggestion: **SS**

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APPENDIX D

Engineering Independent Review Memorandum

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TECHNICAL MEMORANDUM

Date:	November 18, 2009
To:	Brian Wacker, PE Robert Peccia & Associates, Inc.
From:	Mark Burrus, PE
Subject:	Engineering Technical Review
cc:	File
Project Number:	274-5574-001
Project Name:	Southeast Alaska Mid Region Access Feasibility Study

SUMMARY

The Federal Highway Administration (FHWA), in cooperation with the Alaska Department of Transportation and Public Facilities (DOT & PF), developed a draft plan in 2004 titled the Southeast Alaska Transportation Plan (SATP). This plan, along with numerous prior studies, identified over-land transportation corridors that would connect southeast Alaska communities to the continental highway system in British Columbia (BC). Currently, traveling from these communities requires a lengthy maritime connection south to Prince Rupert or north to Haines or Skagway.

In 2005, the FHWA completed the Bradfield River Engineering Feasibility Study. This scoping and pre-NEPA document was an in-depth feasibility analysis for developing a corridor from the Bradfield Canal in southeast Alaska approximately 29 miles northerly to the US/Canada border. Independently, the DOT&PF studied a potential 35 mile link to connect the Bradfield alignment with the Cassiar Highway in BC.

In 2006, the FHWA produced the "Southeast Alaska Mid Region Access Draft Study Delivery Plan. This plan explored multiple routes to link southeast Alaska with the Cassiar Highway in BC. FHWA and the DOT&PF determined additional studies were needed to augment the plan. The studies were developed by Robert Peccia and Associates, (RPA) and include the Preliminary Traffic/Economic Projections Technical Memorandum, the Preliminary Ports and Ferry Terminal Feasibility Study, the Preliminary Air Cushion Vehicle (ACV) Feasibility Study, the Preliminary Engineering Feasibility Study and a Summary Technical Memorandum.

These feasibility studies identified three preferred alternatives for a mid-region access (MRA) surface transportation corridor that would connect the communities of Wrangell and Petersburg in southeast Alaska to the Canadian border. These are the Stikine River corridor, the Aaron Creek corridor, and the previously studied, Bradfield Canal corridor. These conceptual corridors all link to a common proposed Iskut River alignment in British Columbia. The Iskut River alignment follows the existing Eskey Creek Gold Mine road that ultimately connects to the Cassier Highway in British Columbia, thereby completing the MRA corridor.

PURPOSE

In 2009 FHWA, at the request of the DOT&PF, requested independent reviews of each of the discipline studies prepared by the RPA team. This independent review includes review of the Summary Technical Memorandum and the Preliminary Engineering Feasibility study including design assumptions and methodology, conceptual alignments and cost estimates.

This independent review evaluates the assumptions and engineering judgment used in developing the conceptual alignments and staging, design criteria, the various cost analyses and methodology used. Findings and recommendations are provided below.

APPROACH

The technical review began with a kick-off meeting with the project team that developed the feasibility studies and the technical review team members. The project team, led by Brian Wacker of RPA, gave an overview of the project including a discussion of the need for the project, the stake holders involved, and some of the challenges encountered. The process used by the team to develop these studies was also discussed, including review of the previously prepared documents; particularly, the Bradfield River Engineering Feasibility Study.

Following the project overview, the team separated into discipline specific groups for a more in-depth discussion. Brian Wacker led the group discussion for the engineering feasibility portion of the study. The design process used to develop and evaluate the conceptual alignments and the cost estimating methodology was discussed. A review of the relevant documents including the Engineering Feasibility Study, the Summary Technical Memorandum and the Bradfield River Feasibility Study was also part of the discussion.

Using WSDOTs Planning Level Cost Estimating program, estimates for the Bradfield Canal Alignment (Segment B-1 or Segment 1B with 2 thru 5) and the Aaron Creek Alignment (Segment A-1a) were prepared for comparison purposes. The assumptions and quantities used in the Bradfield River Road Feasibility Study were used for this exercise. The results are attached to this review.

FINDINGS

Summary Technical Memorandum (TM)

The summary TM was concise; however, it was necessary to review the full studies for an explanation of some of the terms and acronyms. The Summary TM does not provide justification for constructing the road, or in National Environmental Policy Act (NEPA) terms, what is the purpose and the need for the project?. Rationalization for the project would be helpful near the beginning of the TM for readers to understand the basic purpose and need for the project.

Engineering Feasibility Study

Similar to the TM, providing an in-depth discussion of the purpose and need for the project would be helpful given the low end cost is in excess of $700 M.

RECOMMENDATIONS

Summary Technical Memorandum (TM)

The summary TM should provide a detailed description and timeline of the previous studies/plans that have been completed. This would provide important background information to the reader by describing the significant amount of work completed and used as the basis for the current feasibility studies.

Engineering Feasibility Study

Design Assumptions:
Section 2.3 describes how funding may be limited resulting in an option to construct a one-lane gravel alternative on a two lane base. Information regarding the major structures related to this option should be provided. Would the bridges, tunnels and large culverts be sized for the ultimate design configuration?

The design assumptions consider two surfacing alternatives; one-lane gravel and ultimately, two-lane paved. A more cost effective and durable ultimate surface to consider would be a chip-seal treatment instead of paving. Given the remote location, harsh climate, and mountainous terrain, it is likely that maintenance costs each spring would be significant. A chip-seal surface would be faster to repair and less expensive to maintain.

The table below compares the three surface treatment options for one (1) mile of two (2) lane roadway and assumes a total roadway width of 24' with a top lift depth of 0.3'.

Table 1:

Material	Unit	Unit Price[4]	Quantity	Total
Gravel (CSTC[1])	TON	$14.74	2604	$38,383
Chip Seal (BST[2])	CY	$43.42	1408	$61,135
HMA[3]	TON	$85.50	2893	$247,352

Table notes:
1. Crushed Surfacing Top Course
2. Bituminous Surface Treatment
3. Hot Mix Asphalt
4. State of Washington average low bid.

The ADT for each option would not exceed 400 vehicles. This number was taken from the 2005 Bradfield River study. This ADT should be validated for each alignment. If the ADT increases above 400 vehicles, the typical section assumed for the conceptual design and cost estimate could need to increase accordingly.

Another factor that should be considered for the typical section is the anticipated truck percentages. It is likely that a majority of the users would be logging/mining vehicles. Ten foot lanes and two foot shoulders provide very little margin for error for trucks in mountainous terrain. Increasing the roadway width to account for high truck percentages should be considered.

Similarly, the maximum grade of 10% seems excessive given the truck percentages. A lower maximum grade should be considered.

Corridor Alternatives and Stages
Figures 1-3 through 1-12 should show more detail. The descriptions below these figures refer to landmarks that do not show up on the figures such as:

- Eskey Creek Gold Mine Road
- Zimovia Highway
- Farm and Dry Island
- FR 6265 and FR 6270
- Log Transfer Station

It is apparent that these figures are provided for point of reference; however, it would be helpful if more detailed, topographical figures where provided with these descriptions if possible. More detailed figures could also show approximate locations of significant structures such as retaining walls, bridges, tunnels, and major culverts, to provide a better understanding of the complexity of each alignment for comparison purposes. The significant structures are shown adequately on the plan/profile sheets.

Adding alignment names to the vicinity and segment maps would help to orient the reader. It would also be helpful to have a closer correlation between the stage descriptions shown on pages 1-6 thru 1-16 and the conceptual design plans and cost estimates shown in appendices A and B.

The segment maps show milepost (MP) labels and the plan/profile sheets show stations. Recommend Adding some stations to the segment map would be helpful for reference. Alternatively, a sheet layout “key”on the segment map could be provided. Also, the red text is difficult to read.

Should Wrangell Island’s alignment connect to Zimovia Highway on Figure 3-1? There currently is a gap on the figure. Labels for Zimovia Highway, FR 6270 and FR 6265 should also be added.

Cost Estimates:
A cost-benefit/return-on-investment analysis is suggested to understand the value of the improvements. Total project costs (including engineering), induced ADT, and maintenance costs should be considered. Measures of effectiveness could include regional mobility improvements, resource access, and emergency preparedness.

The cost estimates were developed by using unit bid prices from the 2006 Coffman Cove projects inflated by a total of 3% to arrive at 2009 prices. Construction of the preferred alignment would likely not begin for several years however, so consider additional inflation percentage to coincide with the year construction is anticipated to begin.

Turning roadway width was not considered because of the order-of-magnitude nature of the estimates; however, because it is assumed the truck percentage will be high and the alignments have many horizontal curves, the increased quantities could be quite significant. Increasing the typical section width to 12’ is suggested to account for increased quantities from added pavement in horizontal curves.

ACV ferry terminal ports would provide interim service during the phased construction of the Stikine Corridor and Aaron Creek alignments. The cost of the ACV ferry terminals is included in the cost estimate at $10,000,000 each. The cost of constructing, operating and maintaining 3 ACVs for five years is however, $85,000,000. Although maintenance costs are not assumed for other sections of the alignment, this capital expenditure, being so significant, should be included in the estimates. There is also likely to be some salvage costs that could be included.

The bid item, “Mobilization, Contractor QC, Surveying and Sampling” is assumed to be 13%. Mobilization for current Washington State Department of Transportation (WSDOT) projects averages approximately 8% and Construction Engineering around 15%. Since mobilization and construction in this remote area would likely be equal or greater than the average for WSDOT projects, we recommend increasing the item to at least 20% - 25%.

Cost estimates do not account for the following:

- Permits
- Right-of-way
- Early design contingencies – (15%)
- Border crossing station

These items should be added to the cost estimates, or at minimum, should be noted as exclusions to the estimates for clarity.

Comparison estimate #1: Using WSDOT's Planning Level Project Cost Estimation software, a cost estimate for the Bradfield Canal alignment (Segment B-1 or 1B with 2 thru 5) was developed. The results achieved were more than 3 times that shown in appendix B1, page B9 and did not include $20 M for the ACV and conventional ferry terminal. This software generally produces conservatively high results; however, the difference for this comparison is excessive. Results of this comparison estimate are attached.

The most significant cost difference was that of the tunnel. The unit price found in the feasibility report was $10,800 per linear foot while the WSDOT software used $65,000 per linear foot. The unit price for tunnel used in the WSDOT software is an all inclusive cost including the superstructure, excavation and shoring and extra excavation. If this is not the case with the feasibility report estimate, this should be noted and the additional cost captured as separate line items.

Other items in the comparison estimate with significant unit price difference are mobilization and wetland mitigation.

Comparison estimate #2: Using WSDOT's Planning Level Project Cost Estimation software, a cost estimate for the Aaron Creek Pass Alignment (Segment A-1a) was developed. The results had a range of $262 M on the low end to $349 M on the high. This does not include $20 M assumed in the study for ferry terminals. The estimate shown in Appendix B for the combined AK and BC sections totaling $307 M is close to the midpoint between the low and high end range. Therefore, this estimate appears to be reasonable. The comparison estimate results are attached.

INDEPENDENT REVIEWER BIO SKETCH

Mark Burrus, a registered Professional Engineer in the State of Washington with 11 years of roadway design and construction experience. Mark has experience with projects that include corridor improvements, horizontal and vertical alignment design, intersection design, access management, safety, and mobility. While serving as a transportation design engineer with Parametrix and WSDOT, Mark has gained experience in many aspects of transportation design and construction including survey, utility conflict identification, environmental support, design documentation, and development of contract plans, specifications, and estimates. Some of his additional experience includes environmental compliance on transportation projects, stormwater modeling, and water system design.

John Perlic, PE, is the Transportation and Engineering Division Manager for Parametrix in Bellevue, Washington. For over 25 years, John has worked on a wide-range of transportation planning and engineering projects throughout the United States. He serves as a senior advisor and project manager for many complex projects and is often involved in alternative development, environmental analysis, engineering feasibility, alternatives analysis and screening, and cost-estimating.

*Planning Level Cost Estimate**

(2008 dollars)

SR: **000** Beginning ARM: **0.00** Ending ARM: **40.58** Length(mile): **40.58**

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

# of NoBuild Lane(s) in NB/EB Direction:	**0**	# of Build Lane(s) in NB/EB Direction:	**1**
# of NoBuild Lane(s) in SB/WB Direction:	**0**	# of Build Lane(s) in SB/WB Direction:	**1**

PROJECT COST SUMMARY

	Low (in $1000s)	High (in $1000s)
Preliminary Engineering:	**$18,086**	**$24,115**
Right Of Way:	**$0**	**$0**
Environmental Mitigation:	**$70,364**	**$93,818**
Construction:	**$173,408**	**$231,211**
Total Project Cost:	**$261,859**	**$349,145**

Note: Generally planning estimates are done with no design information. Therefore, many unknown factors may lead to changes in the estimates later on. This is why a range approach has been used in reporting project costs. Low is 10% below and high is 20% above the estimated cost.

***** *This estimate is based on little or no design work, and hence intended for use for planning purposes only.***

Date Printed: ***Monday, November 30, 2009***

Planning Level Cost Estimate Summary*

(2008 dollars)

SR: **000** Beginning ARM: **0.00** Ending ARM: **40.58** Length(mile): **40.58**

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

# of NoBuild Lane(s) in NB/EB Direction: **0**

# of NoBuild Lane(s) in SB/WB Direction: **0**

Improvement Type: **Freight**

# of Build Lane(s) in NB/EB Direction: **1**

# of Build Lane(s) in SB/WB Direction: **1**

Terrain Type: **M**

PRELIMINARY ENGINEERING $20,096,000

RIGHT-OF-WAY $0

CONSTRUCTION / PREPARATION

Mobilization:	$9,369,000
Utility Relocation:	$468,000
Grading:	$42,143,000
Staging:	$1,874,000
Construction Engineering:	$20,096,000

STRUCTURES

Bridges and Tunnels:	$85,347,000
Retaining Walls:	$16,256,000
Noise Walls:	$0

PAVEMENT $13,936,000

ENVIRONMENTAL MITIGATION

Drainage:	$14,008,000
Stormwater Detention and Treatment:	$4,165,000
Temporary Water Pollution Control:	$1,874,000
Wetland Mitigation:	$49,800,000
Roadside Development:	$8,335,000

TRAFFIC

Traffic Services and Safety:	$3,076,000
Workzone Traffic Control:	$0

ADDITIONAL ITEMS $109,800

SALES TAX $0

Project Cost Summary:

	Low	High
PE	$18,086,000	$24,115,000
ROW	$0	$0
CN	$243,772,000	$325,030,000
Total	$261,859,000	$349,145,000

Note: Generally planning estimates are done with no design information. Therefore, many unknown factors may lead to changes in the estimates later on. This is why a range approach has been used in reporting project costs. Low is 10% below and high is 20% above the estimated cost.

**** This estimate is based on little or no design work, and hence intended for use for planning purposes only.***

Date Printed: ***Monday, November 30, 2009***

Project Quantity and Unit Cost

SR: **000** BARM: **0.00** EARM: **40.58**

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

	Quantity	Unit Cost	Unit
GRADING			
Clear and grub (Acre):	146.09	$700	per Acre
Building demolition (Lump sum):	0.00	$10,000	per Lump sum
Removal of structures (Lump sum):	0.00	$25,000	per Lump sum
Pavement removal (SY):	0	$3	per SY
Roadside cleanup (Lump sum):	81.16	$10,000	per Lump sum
Roadway excavation (CY):	3,002,920	$4	per CY
Gravel borrow/embankment compaction (Ton):	4,869,600	$6	per Ton
DRAINAGE			
Removal of drainage Structure (Each):	0	$650	per Each
Conveyance: 24" RCSSP (LF):	0	$60	per LF
Catch basin: Type 2-48" (Each):	0	$3,000	per Each
Collection pipe:12" PCSSP (LF):	0	$45	per LF
Large culvert (LF):	8,116	$1,600	per LF
Ditch excavation (LF):	113,624	$9	per LF
STORMWATER DETENTION AND TREATMENT			
Detention pond (SF of imperv surface):	6,427,872	$0.36	per SF
Water quality pond (SF of imperv surface):	7,713,447	$0.24	per SF
Detention vault (SF of new impervious surface):	0	$3.00	per SF
Filtration water treatment (SF of imperv surface):	0	$0.00	per SF
WALLS			
Retaining walls (SF):	250,100	65	per SF
Noise walls (LF):	0	275	per SF

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Quantity and Unit Cost

SR: **000** BARM: **0.00** EARM: **40.58**

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

BRIDGES

Removal of existing bridges (SF):	0	36	per SF
Bridge widening (SF):	0	225	per SF
Bridge - span up to 140' (SF):	39,000	108	per SF
Bridge - span up to 200' (SF):	201,000	135	per SF
Bridge - span up to 400' (SF):	240,000	225	per SF
Bridge - span more than 400' (SF):	0	250	per SF
Floating bridge (SF):	0	400	per SF
Movable bridge (SF):	0	1,500	per SF
Lids without Ventilation (SF):	0	135	per SF
Tunnel (LF):	0	65,000	per LF
Pedestrian Bridge (SF):	0	125	per SF
Railroad bridge replacement (LF):	0	10,000	per LF

PAVEMENTS

Asphalt Concrete Pavement, ACP (SF):	5,142,298	$2.71	per SF
PCC Pavement (SF):	0	$5.02	per SF

ROADSIDE DEVELOPMENT

Fencing (LF):	0	15	per LF
Seeding, mulching and fertilizing (Acre):	146.09	1,500	per Acre
Roadside Restoration (Lump sum):	81.16	100,000	per Lump sum

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Quantity and Unit Cost

SR: **000** BARM: **0.00** EARM: **40.58**

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

TRAFFIC SERVICES AND SAFETY

Guardrail (LF):	42,852	$13	per LF
Guardrail terminal (Each):	162	$1,700	per Each
Concrete barrier(LF):	0	$25	per LF
Impact attenuator (Each):	0	$30,000	per Each
Signal (Each):	0	$150,000	per Each
Roundabout (Each):	0	$0	per Each
Illumination (Each):	0	$8,000	per Each
ITS (Lump sum):	81.16	$200,000	per Lump sum
Signing (Lump sum):	81.16	$25,000	per Lump sum
Cantilever sign bridge (Each):	0	$30,000	per Each
Sign bridge (Each):	0	$80,000	per Each
Traffic marking (LF):	857,050	$0.25	per LF
Raised channelization (LF):	0	$6	per LF
Curb, gutter and sidewalk (LF):	0	$32	per LF

WETLAND MITIGATION

Category I - High value wetland (Acre):	0.00	$2,500,000	per Acre
Category II and III - Medium value wetland (Acre):	0.00	$1,900,000	per Acre
Category IV - Low value wetland (Acre):	91.00	$300,000	per Acre
Stream culvert (Each):	15	$1,500,000	per Each
Beach restoration (Each):	0	$1,000,000	per Each

RIGHT OF WAY

Vacant land (Acre):	0.00	$27,000	per Acre
Residential land (Acre):	0.00	$336,000	per Acre
Commercial land (Acre):	0.00	$368,000	per Acre

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Cost: Detailed Report

SR: **000** BARM: **0.00** EARM: **40.58**

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

GRADING — **Grading Total:**	**$42,143,143**
Clear and grub (Acre):	$102,262
Building demolition (Lump sum):	$0
Removal of structures (Lump sum):	$0
Pavement removal (SY):	$0
Roadside cleanup (Lump sum):	$811,600
Roadway excavation (CY):	$12,011,681
Gravel borrow/embankment compaction (Ton):	$29,217,601
DRAINAGE — **Drainage Total:**	**$14,008,217**
Removal of drainage Structure (Each):	$0
Conveyance: 24" RCSSP (LF):	$0
Catch basin: Type 2-48" (Each):	$0
Collection pipe:12" PCSSP (LF):	$0
Large culvert (LF):	$12,985,601
Ditch excavation (LF):	$1,022,616
STORMWATER DETENTION AND TREATMENT — **Total:**	**$4,165,261**
Detention pond (SF of new impervious surface):	$2,314,034
Water quality pond (SF of new impervious surface):	$1,851,227
Detention vault (SF of new impervious surface):	$0
Filtration water treatment (SF of new impervious surface):	$0
WALLS — **Walls Total:**	**$16,256,500**
Retaining walls (SF):	$16,256,500
Noise walls (LF):	$0

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Cost: Detailed Report

SR: 000 BARM: 0.00 EARM: 40.58

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

BRIDGES	**Bridge Total:**	**$85,347,000**
	Removal of existing bridges (SF):	$0
	Bridge widening (SF):	$0
	Bridge - span up to 140' (SF):	$4,212,000
	Bridge - span up to 200' (SF):	$27,135,000
	Bridge - span up to 400' (SF):	$54,000,000
	Bridge - span more than 400' (SF):	$0
	Floating bridge (SF):	$0
	Movable bridge (SF):	$0
	Lids without Ventilation (SF):	$0
	Tunnel (LF):	$0
	Pedestrian Bridge (SF):	$0
	Railroad bridge replacement (LF):	$0
PAVEMENTS	**Pavement Total:**	**$13,935,627**
	Asphalt Concrete Pavement, ACP (SF):	$13,935,627
	Portland Cement Concrete Pavement, PCCP (SF):	$0
ROADSIDE DEVELOPMENT	**Roadside Dev. Total:**	**$8,335,132**
	Fencing (LF):	$0
	Seeding, mulching and fertilizing (Acre):	$219,132
	Roadside Restoration (Lump sum):	$8,116,000

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Cost: Detailed Report

SR: **000** BARM: **0.00** EARM: **40.58**

Project Title: **SE Alaska MRA - Aaron Creek Pass Sement A-1a**

\# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

\# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

TRAFFIC SERVICES AND SAFETY	**Traffic Total:**	**$3,076,289**
	Guardrail (LF):	$557,082
	Guardrail terminal (Each):	$275,944
	Concrete barrier(LF):	$0
	Impact attenuator (Each):	$0
	Signal (Each):	$0
	Roundabout (Each):	$0
	Illumination (Each):	$0
	ITS (Lump sum):	$0
	Signing (Lump sum):	$2,029,000
	Cantilever sign bridge (Each):	$0
	Sign bridge (Each):	$0
	Traffic marking (LF):	$214,262
	Raised channelization (LF):	$0
	Curb, gutter and sidewalk (LF):	$0
WETLAND MITIGATION	**Wetland Total:**	**$49,800,000**
	Category I - High value wetland (Acre):	$0
	Category II and III - Medium value wetland (Acre):	$0
	Category IV - Low value wetland (Acre):	$27,300,000
	Stream culvert (Each):	$22,500,000
	Beach restoration (Each):	$0
RIGHT OF WAY	**ROW Total:**	**$0**
	Vacant land (Acre):	$0
	Residential land (Acre):	$0
	Commercial land (Acre):	$0
OTHER ITEMS	**User defined additional items:**	$109,800

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

*Planning Level Cost Estimate**

(2008 dollars)

SR: **000** Beginning ARM: **0.00** Ending ARM: **46.44** Length(mile): **46.44**

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

# of NoBuild Lane(s) in NB/EB Direction:	**0**	# of Build Lane(s) in NB/EB Direction:	**1**
# of NoBuild Lane(s) in SB/WB Direction:	**0**	# of Build Lane(s) in SB/WB Direction:	**1**

PROJECT COST SUMMARY

	Low (in $1000s)	High (in $1000s)
Preliminary Engineering:	**$64,588**	**$86,117**
Right Of Way:	**$0**	**$0**
Environmental Mitigation:	**$63,025**	**$84,034**
Construction:	**$677,134**	**$902,845**
Total Project Cost:	**$804,747**	**$1,072,996**

Note: Generally planning estimates are done with no design information. Therefore, many unknown factors may lead to changes in the estimates later on. This is why a range approach has been used in reporting project costs. Low is 10% below and high is 20% above the estimated cost.

**** This estimate is based on little or no design work, and hence intended for use for planning purposes only.***

Date Printed: ***Monday, November 30, 2009***

Planning Level Cost Estimate Summary*

(2008 dollars)

SR: **000** Beginning ARM: **0.00** Ending ARM: **46.44** Length(mile): **46.44**

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

# of NoBuild Lane(s) in NB/EB Direction: **0**

# of NoBuild Lane(s) in SB/WB Direction: **0**

Improvement Type: **Freight**

# of Build Lane(s) in NB/EB Direction: **1**

# of Build Lane(s) in SB/WB Direction: **1**

Terrain Type: **M**

PRELIMINARY ENGINEERING	$71,764,000
RIGHT-OF-WAY	$0
CONSTRUCTION / PREPARATION	
Mobilization:	$33,456,000
Utility Relocation:	$1,673,000
Grading:	$48,229,000
Staging:	$6,691,000
Construction Engineering:	$71,764,000
STRUCTURES	
Bridges and Tunnels:	$547,404,000
Retaining Walls:	$23,686,000
Noise Walls:	$0
PAVEMENT	$15,948,000
ENVIRONMENTAL MITIGATION	
Drainage:	$16,031,000
Stormwater Detention and Treatment:	$4,767,000
Temporary Water Pollution Control:	$6,691,000
Wetland Mitigation:	$33,000,000
Roadside Development:	$9,539,000
TRAFFIC	
Traffic Services and Safety:	$3,521,000
Workzone Traffic Control:	$0
ADDITIONAL ITEMS	$0
SALES TAX	$0

Project Cost Summary:

	Low	High
PE	$64,588,000	$86,117,000
ROW	$0	$0
CN	$740,159,000	$986,879,000
Total	$804,747,000	$1,072,996,000

Note: Generally planning estimates are done with no design information. Therefore, many unknown factors may lead to changes in the estimates later on. This is why a range approach has been used in reporting project costs. Low is 10% below and high is 20% above the estimated cost.

**** This estimate is based on little or no design work, and hence intended for use for planning purposes only.***

Date Printed: ***Monday, November 30, 2009***

Project Quantity and Unit Cost

SR: **000** BARM: **0.00** EARM: **46.44**

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

\# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

\# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

GRADING	Quantity	Unit Cost	Unit
Clear and grub (Acre):	167.18	$700	per Acre
Building demolition (Lump sum):	0.00	$10,000	per Lump sum
Removal of structures (Lump sum):	0.00	$25,000	per Lump sum
Pavement removal (SY):	0	$3	per SY
Roadside cleanup (Lump sum):	92.88	$10,000	per Lump sum
Roadway excavation (CY):	3,436,560	$4	per CY
Gravel borrow/embankment compaction (Ton):	5,572,800	$6	per Ton
DRAINAGE			
Removal of drainage Structure (Each):	0	$650	per Each
Conveyance: 24" RCSSP (LF):	0	$60	per LF
Catch basin: Type 2-48" (Each):	0	$3,000	per Each
Collection pipe:12" PCSSP (LF):	0	$45	per LF
Large culvert (LF):	9,288	$1,600	per LF
Ditch excavation (LF):	130,032	$9	per LF
STORMWATER DETENTION AND TREATMENT			
Detention pond (SF of imperv surface):	7,356,096	$0.36	per SF
Water quality pond (SF of imperv surface):	8,827,315	$0.24	per SF
Detention vault (SF of new impervious surface):	0	$3.00	per SF
Filtration water treatment (SF of imperv surface):	0	$0.00	per SF
WALLS			
Retaining walls (SF):	364,400	65	per SF
Noise walls (LF):	0	275	per SF

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Quantity and Unit Cost

SR: **000** BARM: **0.00** EARM: **46.44**

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

\# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

\# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

BRIDGES

Removal of existing bridges (SF):	0	36 per SF
Bridge widening (SF):	0	225 per SF
Bridge - span up to 140' (SF):	8,250	108 per SF
Bridge - span up to 200' (SF):	58,350	135 per SF
Bridge - span up to 400' (SF):	25,050	225 per SF
Bridge - span more than 400' (SF):	0	250 per SF
Floating bridge (SF):	0	400 per SF
Movable bridge (SF):	0	1,500 per SF
Lids without Ventilation (SF):	0	135 per SF
Tunnel (LF):	8,200	65,000 per LF
Pedestrian Bridge (SF):	0	125 per SF
Railroad bridge replacement (LF):	0	10,000 per LF

PAVEMENTS

Asphalt Concrete Pavement, ACP (SF):	5,884,877	$2.71 per SF
PCC Pavement (SF):	0	$5.02 per SF

ROADSIDE DEVELOPMENT

Fencing (LF):	0	15 per LF
Seeding, mulching and fertilizing (Acre):	167.18	1,500 per Acre
Roadside Restoration (Lump sum):	92.88	100,000 per Lump sum

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Quantity and Unit Cost

SR: **000** BARM: **0.00** EARM: **46.44**

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

\# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

\# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

TRAFFIC SERVICES AND SAFETY

Guardrail (LF):	49,041	$13	per LF
Guardrail terminal (Each):	186	$1,700	per Each
Concrete barrier(LF):	0	$25	per LF
Impact attenuator (Each):	0	$30,000	per Each
Signal (Each):	0	$150,000	per Each
Roundabout (Each):	0	$0	per Each
Illumination (Each):	0	$8,000	per Each
ITS (Lump sum):	92.88	$200,000	per Lump sum
Signing (Lump sum):	92.88	$25,000	per Lump sum
Cantilever sign bridge (Each):	0	$30,000	per Each
Sign bridge (Each):	0	$80,000	per Each
Traffic marking (LF):	980,813	$0.25	per LF
Raised channelization (LF):	0	$6	per LF
Curb, gutter and sidewalk (LF):	0	$32	per LF

WETLAND MITIGATION

Category I - High value wetland (Acre):	0.00	$2,500,000	per Acre
Category II and III - Medium value wetland (Acre):	0.00	$1,900,000	per Acre
Category IV - Low value wetland (Acre):	75.00	$300,000	per Acre
Stream culvert (Each):	7	$1,500,000	per Each
Beach restoration (Each):	0	$1,000,000	per Each

RIGHT OF WAY

Vacant land (Acre):	0.00	$27,000	per Acre
Residential land (Acre):	0.00	$336,000	per Acre
Commercial land (Acre):	0.00	$368,000	per Acre

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Cost: Detailed Report

SR: **000** BARM: **0.00** EARM: **46.44**

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

GRADING	**Grading Total:**	**$48,228,867**
	Clear and grub (Acre):	$117,029
	Building demolition (Lump sum):	$0
	Removal of structures (Lump sum):	$0
	Pavement removal (SY):	$0
	Roadside cleanup (Lump sum):	$928,800
	Roadway excavation (CY):	$13,746,240
	Gravel borrow/embankment compaction (Ton):	$33,436,799
DRAINAGE	**Drainage Total:**	**$16,031,088**
	Removal of drainage Structure (Each):	$0
	Conveyance: 24" RCSSP (LF):	$0
	Catch basin: Type 2-48" (Each):	$0
	Collection pipe:12" PCSSP (LF):	$0
	Large culvert (LF):	$14,860,800
	Ditch excavation (LF):	$1,170,288
STORMWATER DETENTION AND TREATMENT	**Total:**	**$4,766,750**
	Detention pond (SF of new impervious surface):	$2,648,194
	Water quality pond (SF of new impervious surface):	$2,118,556
	Detention vault (SF of new impervious surface):	$0
	Filtration water treatment (SF of new impervious surface):	$0
WALLS	**Walls Total:**	**$23,686,000**
	Retaining walls (SF):	$23,686,000
	Noise walls (LF):	$0

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Cost: Detailed Report

SR: **000** BARM: **0.00** EARM: **46.44**

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

\# of NoBuild Lane in NB/EB direction: **0** # of NoBuild Lane in SB/WB direction: **0**

\# of Build Lane in NB/EB direction: **1** # of Build Lane in SB/WB direction: **1**

BRIDGES

Bridge Total:	**$547,404,500**
Removal of existing bridges (SF):	$0
Bridge widening (SF):	$0
Bridge - span up to 140' (SF):	$891,000
Bridge - span up to 200' (SF):	$7,877,250
Bridge - span up to 400' (SF):	$5,636,250
Bridge - span more than 400' (SF):	$0
Floating bridge (SF):	$0
Movable bridge (SF):	$0
Lids without Ventilation (SF):	$0
Tunnel (LF):	$533,000,000
Pedestrian Bridge (SF):	$0
Railroad bridge replacement (LF):	$0

PAVEMENTS

Pavement Total:	**$15,948,016**
Asphalt Concrete Pavement, ACP (SF):	$15,948,016
Portland Cement Concrete Pavement, PCCP (SF):	$0

ROADSIDE DEVELOPMENT

Roadside Dev. Total:	**$9,538,776**
Fencing (LF):	$0
Seeding, mulching and fertilizing (Acre):	$250,776
Roadside Restoration (Lump sum):	$9,288,000

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

Project Cost: Detailed Report

SR: 000 BARM: 0.00 EARM: 46.44

Project Title: **SE Alaska MRA - Bradield Canal Segment B-1**

# of NoBuild Lane in NB/EB direction:	**0**	# of NoBuild Lane in SB/WB direction:	**0**
# of Build Lane in NB/EB direction:	**1**	# of Build Lane in SB/WB direction:	**1**

TRAFFIC SERVICES AND SAFETY	**Traffic Total:**	**$3,520,523**
	Guardrail (LF):	$637,528
	Guardrail terminal (Each):	$315,792
	Concrete barrier(LF):	$0
	Impact attenuator (Each):	$0
	Signal (Each):	$0
	Roundabout (Each):	$0
	Illumination (Each):	$0
	ITS (Lump sum):	$0
	Signing (Lump sum):	$2,322,000
	Cantilever sign bridge (Each):	$0
	Sign bridge (Each):	$0
	Traffic marking (LF):	$245,203
	Raised channelization (LF):	$0
	Curb, gutter and sidewalk (LF):	$0
WETLAND MITIGATION	**Wetland Total:**	**$33,000,000**
	Category I - High value wetland (Acre):	$0
	Category II and III - Medium value wetland (Acre):	$0
	Category IV - Low value wetland (Acre):	$22,500,000
	Stream culvert (Each):	$10,500,000
	Beach restoration (Each):	$0
RIGHT OF WAY	**ROW Total:**	**$0**
	Vacant land (Acre):	$0
	Residential land (Acre):	$0
	Commercial land (Acre):	$0
OTHER ITEMS	**User defined additional items:**	$0

These quantities have been calculated by using quantities per lane-mile from WSDOT's past projects.

Date Printed: Monday, November 30, 2009

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