

**Gravina Access Project**  
***Economic Impact Assessment***  
***Draft***



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## 1.0 Summary

### 1.1 Scope of the Study

This draft memorandum describes the direct and indirect economic effects that would likely arise from implementation of each of the nine proposed alternatives of the Gravina Access Project (GAP). Eight build alternatives to improve access between Gravina Island and Revillagigedo (commonly called Revilla) Island in the Ketchikan Gateway Borough of southeastern Alaska, and the no-action alternative, were evaluated. Although differing in scope, cost, and effects, each alternative can be classified as one of three types: no-action, improved ferry service (alternatives G2, G3, and G4) or bridge access (alternatives C3(a), C3(b), C4, D1, and F3). Descriptions of the alternatives are provided in Sections 1.2 and 2.1. Figure 2-1 shows the proposed route of each alternative.

The following analysis uses reasonably foreseeable estimates of the economic effects, whether they are positive or negative. In some instances this may result in use of an estimate that is above or below a medium or base case scenario presented for a specific parameter. The analysis does not automatically use the high case for all parameters since this would create a situation that is not likely and foreseeable. Nor does the analysis use only the base case for all parameters since, in some situations, combinations of certain parameters may result in other parameters being above or below the medium or base case. The intent of this analysis is to evaluate a future situation that can be foreseen.

Under the National Environmental Policy Act (NEPA), direct effects are those that “are caused by the action and occur at the same time and place.”<sup>1</sup> The direct economic effects of the alternatives evaluated in this report include:

- Economic effects associated with construction spending
- Effects on cruise ship operating patterns
- Acquisition and relocation effects

Additional construction spending would increase business revenues in the community, especially retail establishments near the area of construction activity, for the duration of the construction work. Several of the bridge alternatives may reduce both the number of cruise ship dockings and the time spent in port for some of the cruise ships that continue to visit Ketchikan. Acquisition and relocation effects include the purchase of business, residential, and other property for project right-of-way and the potential need to relocate residents or businesses elsewhere in the community. These displacement effects will begin prior to construction work.

Under NEPA, indirect effects are those that “are caused by the action and are later in time or farther removed in distance (*than direct effects*), but are still reasonably foreseeable.”<sup>2</sup> Indirect effects that might arise from one of the GAP alternatives include:

- Economic effects of changes in cruise ship operations
- Economic effects of changes in float plane operations
- Employment effects
- Changes in income

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<sup>1</sup> Federal Highway Administration, US Department of Transportation. Secondary and Cumulative Effects. [http://www.fhwa.dot.gov/environment/nepa/2nd\\_cml.htm](http://www.fhwa.dot.gov/environment/nepa/2nd_cml.htm)

<sup>2</sup> *ibid.*

- Regional economic development effects
- Effects on government finances, services and infrastructure provision

**1.2 The Alternatives**

Table 1-1 describes each alternative and Figure 2-1 shows the planned routes for the various options. See Section 2.1 for more information about the GAP.

**Table 1-1 GAP Bridge and Ferry Alternatives**

Alternative	Description
No-action	Existing ferry service
C3 (a)	200-foot High Bridge – Airport Area to Signal Road
C3 (b)	120-foot High Bridge – Airport Area to Signal Road
C4	200-foot High Bridge – Airport Area to Cambria Drive Area
D1	120-foot High Bridge – Airport Area
F3	Pennock Island Crossing – 60-foot High Bridge & 200-foot High Bridge
G2	Ferry Route from Peninsula Point
G3	Ferry Route from Plaza Mall
G4	Ferry Route Adjacent to Existing Ferry

Source: [http://www.gravina-access.com/design\\_center/Default.htm](http://www.gravina-access.com/design_center/Default.htm)

**1.3 Summary**

Table 1-2 summarizes some of the economic effects of the access alternatives on the community of Ketchikan. The dollar values are the discounted sums over the period from 2001-2025. The employment figures are the of sum the total number of jobs per year; if a construction job lasts 3 years it accounts for 3 of the jobs in the table.

The monetary gains to Ketchikan reflect the effects of local construction, operations and maintenance expenditures, and the potential reductions from certain bridge alternatives of cruise-related and air charter spending. The employment effects are the sum of jobs created from the beginning of the construction period (2003) through the end of 20 years of operations (2025).

The reductions in cruise-related spending and subsequent employment losses of the low-bridge alternatives C3(b) and D1, are substantially larger than for the other bridge alternatives because these options preclude cruise ship transits of Tongass Narrows and are expected to reduce the number and duration of cruise ship port calls in Ketchikan. Alternative F3 could reduce the length and number of port calls, but less than anticipated under alternatives C3(b) and D1. A bridge alternative may eliminate special visual flight rules for certain weather conditions that exist for air taxi operators flying near Ketchikan. This may reduce the number of cruise passenger flightseeing trips by about 2 percent, and result in delays for persons traveling to other communities in the region.

Virtually all of the employment effects with a bridge would be concentrated during the construction phase, while those of the ferry alternatives would be distributed over the 20-year period when the ferries are operating. The bridge and ferry options will result in different development patterns on Gravina and Pennock Islands and the number of additional jobs for each type of access (above the no-action alternative) reflects this effect.

**Table 1-2. Summary of Economic Effects on Ketchikan Gateway Borough 2001-2025.**

Measures of Economic Effects	Alternative							
	Bridge				Ferry			
	C3(a)	C3(b)	C4	D1	F3	G2	G3	G4
Monetary Measures (Net Present Value, 2001\$, 2001-2025)	(\$Millions)							
Local construction and operations and maintenance expenditures	\$99.3	\$100.0	\$110.9	\$71.5	\$104.3	\$63.9	\$63.7	\$55.9
Additional activity in local economy <sup>1</sup>	\$32.4	\$25.0	\$27.8	\$18.1	\$26.0	\$16.9	\$16.7	\$15.1
Cruise-related Spending	<i>n.e.</i>	(\$127.4)	<i>n.e.</i>	(\$127.4)	(\$34.7)	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>
Charter Air Spending	(\$10.9)	(\$10.9)	(\$10.9)	(\$10.9)	(\$10.9)	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>
Net Monetary Effect	\$120.9	(\$13.2)	\$127.8	(\$48.6)	\$84.7	\$80.8	\$80.3	\$71.0
Total Employment <sup>2</sup> Through 2025 Associated With:	Number of Employees (Cumulative for 2003-2025)							
Local construction and operations and maintenance expenditures and additional activity in local economy	1,430	1,050	1,210	700	1,120	1,260	1,240	1,180
Cruise- and charter air-related spending	(230)	(2,950)	(230)	(2,970)	(1,200)	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>
Subtotal	1,200	(1,900)	980	(2,270)	(80)	1,260	1,240	1,180
Access type employment <sup>3</sup>								
Gravina	2,850	2,850	2,850	2,850	2,850	1,800	1,800	1,800
Pennock (F3 only)	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>	90	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>
Subtotal	2,850	2,850	2,850	2,850	2,940	1,800	1,800	1,800
Net	4,050	950	3,830	580	2,860	3,060	3,040	2,980
Other Measures								
Potential Acres of Land Use in 2020								
Gravina	370	370	370	370	370	170	170	170
Pennock (F3 only)	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>	208	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>
Additional Population in 2020								
Gravina	690	690	690	690	690	300	300	300
Pennock (F3 only)	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>	330	<i>n.e.</i>	<i>n.e.</i>	<i>n.e.</i>

*n.e.*: No effect.

<sup>1</sup> Includes indirect and induced effects of local construction and operations and maintenance expenditures.

<sup>2</sup> Employment is cumulative total of jobs over the 2003-2025 study period, which incorporates the construction period and 20-years of operating life.

<sup>3</sup> Incremental employment above the no-action low case.

### 1.3.1 Direct Effects

- Construction Spending.** It is estimated that the local share of construction spending for a bridge would directly contribute between \$70 million and \$110 million to the economy of Ketchikan during the construction period. Furthermore, there are additional effects that arise because each dollar of construction spending which goes to local sources (local labor or materials providers, for example) will generate more spending as the local recipients make purchases. Similarly, if expanded ferry service is selected as the preferred alternative, the local share of the construction spending could be between \$20 million and \$28 million with

additional indirect effects, assuming that the ferries are constructed at the Ketchikan shipyard. Construction spending outside Ketchikan is lost to the community and does not generate these additional effects locally regardless of the alternative.

- Acquisition and Relocation Effects.** The residences and businesses that would be relocated under each of the alternatives are located on Revilla Island. Some of the bridge alternatives might also displace the floatplane facility near the airport on Gravina Island although this issue is presently unresolved. Otherwise only undeveloped land would be acquired for project right-of-way on Gravina and Pennock Islands. Table 1-3 shows initial estimates of the number of businesses, residences, and other structures that might be acquired for rights-of-way for each alternative. The table also shows the acres of private land to be acquired for each option. Additional public land requirements are presented in the Land Use Technical Memorandum.

**Table 1-3 Estimated Number and Value of Structures and Private Acreage to be Acquired for Project Right-of-Way**

Project Alternative	Residences and Businesses	Other Structures	Private Land	Value
	(Number)	(Number)	(Acres)	(\$ Thousands)
C3(a)	2	1	13.3	1,500
C3(b)	3	1	13.4	1,805
C4(a)	1	1	12.1	365
D1	1	1	7.7	660
F3	1	0	23.7	485
G2	3	0	3.9	1,885
G3	3	0	6.0	2,900
G4	0	0	1.4	570

<sup>a</sup> Other refers to the floatplane facility which might be moved under a bridge alternative. Whether the floatplane facility would be displaced is presently unresolved.

<sup>b</sup> Public refers to any property owned by a local government, the State of Alaska, or the United States government. The F3 alternative includes a small amount of land owned by the US Coast Guard.

- Cruise Ship Effects.** The selection of a ferry alternative is not anticipated to have an effect on cruise ship operations. An increase in ferry crossings could increase the potential risk of a collision between a cruise ship and ferry, but the probability of such collisions is anticipated to be small. A study of this potential interaction has not been conducted. Bridge options C3(b) or D1 have a 120-foot vertical clearance and would require all large cruise ships making port calls in Ketchikan to approach from and depart to the south if no additional berthing facilities were built to the north of the bridge. This transit would add approximately 30 nautical miles to the route between Ketchikan and Juneau.<sup>3</sup> For some cruise ships the extra distance could reduce the port time spent in Ketchikan. Other cruise ships may eliminate some port calls in Ketchikan if their time in port would be inadequate to achieve their desired revenue goals from shore excursions. Bridge alternative F3 would require additional maneuvering to and from the city docks and could increase cruise ship costs and reduce the time in port.

<sup>3</sup> Glostén and Associates fax to HDR Alaska, Inc. on the Cruise Ship Operations August 28, 2001.

### **1.3.2 Indirect Effects**

There are a number of potential indirect effects from construction of a bridge or the expansion of ferry service. The effects addressed in this study are the effects of construction and operations expenditures on the local economy, the effects of the low clearance bridges on cruise-related spending, and the overall effects on regional economic development.

- **Construction and Operations:** Depending on the build alternative being considered, between \$25 million and \$132 million would be added directly to the local economy through construction-related employment and local purchases of construction materials and equipment. These expenditures would generate additional local spending and government revenues as the recipients spend and save. These direct and secondary effects could increase local employment by more than 600 jobs in addition to those jobs created by local construction hiring. State and local government tax revenues could increase by as much as \$2 million during construction of one of the bridge alternatives.

In addition, operation of a bridge could add from about \$90 thousand to \$140 thousand in additional economic activity to the local economy annually. Because expanded ferry service has a higher operating cost than a bridge, the annual additional increment to local economic activity is larger and estimated to be about \$3.8 million. The amount of ferry tolls paid by local residents would have to be subtracted from this increment to determine the net gain in regional economic activity.

- **Cruise-related Spending:** The potential direct economic effect of bridge alternative C3(b) or D1 is expected to be a reduction in cruise ship-related spending of about \$10.8 million in 2006, the first year of operation, with a possible range of \$3.1 million to \$22.2 million. Bridge option F3 may also affect cruise ship operations by restricting travel to the west channel of the Tongass Narrows or requiring ships to transit to the west of Gravina Island if they do not wish to use the west channel. The base case estimate indicates a potential reduction in cruise-related spending of about \$3.6 million, with a range from \$0.8 to \$9.9 million. Option F3, as well as C3(b) and D1 would raise cruise ship operating costs through increased fuel consumption and tug assist expenditures as well.
- **Regional Economic Development:** Any of the build alternatives will improve access to the Ketchikan International Airport and publicly owned and private lands on Gravina Island. Travel costs for businesses operating at the airport will be reduced with a bridge alternative but remain at current levels or possibly increase with a ferry alternative. It is anticipated that a bridge would result in more development on Gravina Island than improved ferry service. Ferry service would result in lower growth because of the greater travel time and cost compared to a bridge. A high level of economic growth on Gravina Island is not likely with a ferry alternative but possible with a bridge alternative.

## **2.0 Introduction**

### **2.1 Proposed Alternatives**

Nine alternatives are currently under evaluation for the Gravina Access Project. The no-action alternative and three of the build alternatives involve ferry service, the primary means of access between Revilla and Gravina Islands at present. The other five alternatives are bridge options to link the two islands. A brief description of the alternatives follows. All options, except no-action, provide for additional road construction on Gravina Island. The plans include a proposed road south and west of the airport, henceforth referred to as the planned Gravina road. The proposed design of the planned Gravina road varies somewhat with the alternatives.

- No-action-Under this alternative there would be no change in access between Gravina and Revilla Islands. The current ferry service would continue without change.
- C3(a)-A bridge with 200 feet of vertical clearance to allow the one-way passage of large cruise ships would connect the two islands. The bridge access road would meet Signal Road on Revilla Island. The bridge would cross the Tongass Narrows to Gravina Island landing north of the airport terminal, then turn to the south, parallel to the airport runway, where it would connect with the planned Gravina road at the south end of the airport.
- C3(b)-The alignment of this bridge option is very similar to that of C3(a). The primary difference is that the maximum vertical clearance of the bridge would be 120 feet, a distance sufficient for Columbia class ferries but not for large cruise ships. Road access on Revilla and Gravina Islands would be essentially the same as C3(a).
- C4-This alternative provides for a bridge with a vertical clearance of 200 feet, sufficient for large cruise ships. Near Gravina Island, this bridge has essentially the same alignment as C3(a). On Gravina Island the bridge would connect with the planned Gravina road south of the airport. On Revilla Island, the proposed bridge access road would connect with Tongass Avenue just north of Cambria Drive.
- D1-This option calls for a bridge having a vertical clearance of 120 feet, insufficient for the passage of large cruise ships. The Gravina Island portion of this alternative would be very similar to that of the four preceding bridge alternatives in that the bridge would connect to the planned Gravina road on the south side of the airport. On Revilla Island the bridge access road would intersect Tongass Avenue near Cambria Drive.
- F3-This alternative would involve construction of a bridge across the east channel of the Tongass Narrows from the South Tongass Highway to Pennock Island. This bridge would have a vertical clearance of 60 feet, thus precluding use of the east channel by cruise ships and Alaska state ferries. A road across Pennock Island would connect this bridge with a bridge with 200 feet of vertical clearance, sufficient for cruise ship passage, across the west channel of the Tongass Narrows. The road across Pennock Island would not provide access for Pennock Island residents. On Gravina Island, another road would be constructed from the proposed Gravina road near the airport to the west channel bridge.



- G2-Ferry service for vehicles and pedestrians would be established between Peninsula Point on Revilla Island and Lewis Point on Gravina Island. New terminals would be built in both locations. A new road would be constructed to link Lewis Point on Gravina Island with the planned Gravina road. Current ferry service would continue without change.
- G3-A new ferry route between Ketchikan and a location just south of the airport would be established. On Revilla Island a new terminal would be constructed between the Plaza, a mall, and Bar Harbor. On Gravina Island this option would involve a new terminal and another road connecting the terminal to the proposed Gravina road. Current ferry service would continue without change.
- G4-Ferry service along the current route would be expanded with the construction of new terminals near the present terminal sites on Revilla and Gravina Islands and the addition of two ferries. A connecting road from the new terminal to the proposed Gravina road would be constructed as part of this alternative. Current ferry service would continue without change.

The proposed routes for the alternatives are shown in Figure 2-1. The dotted lines indicate a proposed or existing ferry route. The solid lines indicate a bridge and road construction associated with the bridge and ferry options.

**Figure 2-1. Proposed Routes for the GAP Bridge and Ferry Alternatives**



## **2.2 Summary**

The potential direct and indirect economic effects of the different Gravina Access Project alternatives are described in this memorandum. Direct effects are those that are likely to be attributable to the selected alternative and which occur at the same time and place. These direct effects are grouped into three categories: (1) Direct effects from additional construction spending, (2) effects on cruise ship operating patterns, and (3) acquisition and relocation effects.

The additional construction spending for any of the alternatives will increase construction-related employment and the revenues of local businesses that provide materials and equipment for the project. The greater the capital cost, the greater the short-run effect on the local economy. These additions to local employment and business revenues will then stimulate further indirect economic effects (addressed below).

Some of the bridge alternatives would require changes in current cruise ship operations possibly leading to reductions in Ketchikan port calls and the time spent in port. The information on changes presented in this report is summarized from the Cruise Ship Operations Technical Memorandum prepared by Northern Economics and Klugherz and Associates. The bridge alternatives will also affect floatplane and general aviation operations.

Acquisition and relocation effects refer to the developed and undeveloped property that would be acquired for project rights-of-way. Under some of the alternatives a few residences and/or businesses are likely to be acquired for project right-of-way and the residents or businesses would need to be relocated elsewhere in the community. Except for the no-action alternative, all of the options require the acquisition of land for right-of way. Much of the undeveloped land to be acquired for the build alternatives is for roads proposed on Gravina Island and much of the undeveloped land is owned by various governmental entities.

Indirect effects happen later or at a distance but can be foreseen and attributed to an alternative. Five indirect effects, identified earlier in Section 1.1, are considered in this study:

1. Economic effects of changes in cruise ship operations
2. Regional economic development effects
3. Government service and infrastructure provision
4. Traffic safety
5. Recreational activity.

Four additional effects are assessed with an economic model for the Ketchikan Gateway Borough (KGB). These effects include:

1. Employment and income effects
2. Reduced cruise-related spending associated with certain alternatives<sup>4</sup>
3. Economic effect on the KGB associated with additional construction spending
4. Fiscal effects on local governments.

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<sup>4</sup> It is anticipated that some of the bridge alternatives will reduce the number of cruise ship visits and the lengths of the port calls. Such reductions are expected to reduce spending in Ketchikan by passengers, crew, and the cruise lines. Such spending reductions are also included in the IMPLAN model in order to estimate their effects on other sectors of the local economy.

As noted in the Cruise Ship Operations Technical Memorandum prepared by Northern Economics, Inc. and Klugherz and Associates, a direct effect of some alternatives is likely to be changes in cruise ship operations. For example, selection of one of the bridge alternatives having a vertical clearance of 120 feet would block the passage of all large cruise ships that currently call in Ketchikan. Such ships would be required to detour to the west of Gravina Island in order to enter or depart the port of Ketchikan. Detours would require extra sailing time and fuel costs for the cruise ships. The extra sailing time may lead some cruise lines to reduce the number of port calls or time spent in Ketchikan. Such reductions could cause reduced spending by passengers, crew, and the cruise lines. The cruise-related spending reductions identified in the Cruise Ship Operations Technical Memorandum are evaluated with the regional economic model in order to determine their effects on other sectors of the local economy.

Regional development plans may be affected by the alternative selected.<sup>5</sup> The access to Gravina Island, whether bridge or ferry, will affect private location decisions. These decisions, in turn, are likely to have effects on the provision of public services and infrastructure and on access to recreational activities on Gravina Island. Furthermore, development or its absence on Gravina Island is likely to have implications for land prices on Gravina and Revilla Islands.

## **2.3 Approach**

The following subsections of this document describe the basic methodology used in the analysis. The first subsection addresses the methods related to construction and acquisition and relocation effects of each alternative. The second deals with the methods used to determine the operational effects of each alternative. Each subsection is further subdivided into direct and indirect effects.

### ***2.3.1 Construction and Acquisition and Relocation Effects***

Construction spending associated with the selection of one of the alternatives will last for the duration of project construction although the indirect effects of further circulation of this spending through the local economy may benefit local businesses and households for up to a year beyond the date construction is completed. The direct effects of such spending are restricted to the construction-related employment and the extra revenue received by local businesses for the provision of materials and equipment to the project. A regional economic model is used to assess the indirect effects of construction expenditures on different economic sectors of the community and the fiscal situation of the local governments.

In order to assess the acquisition and relocation effects of each alternative, a geographic information system identified each piece of property affected by each alternative and determined the affected share of each property. This information was matched with the KGB Tax Assessor's property tax rolls to determine the assessed value of the affected share of the property. Maps provided information about structures that are within the proposed rights-of-way. The sum of the values of any affected structure and the values of the affected lands yield the estimates of acquisition costs. However, the routes of the alternatives are only proposed routes at this time; as planning progresses, routes may shift so that estimates of acquisition costs could change.

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<sup>5</sup> Officials with the KGB Planning Office have indicated that selection of a ferry option rather than a bridge would not alter the Gravina development plans of the Borough.

### **2.3.2 Operations Effects**

Adoption of a bridge alternative could imply substantial changes in cruise ship operating procedures. Two direct effects of construction of a bridge are assessed. A bridge having a vertical clearance of 120 feet (alternatives C3[b] and D1) would block the channel currently used by large cruise ships due to insufficient vertical clearance. Such vessels would be required to sail to the west of Gravina Island for part of their voyages thus lengthening sailing time. Consequently, such a bridge is likely to reduce the number of cruise ship port calls and the time spent in the port of Ketchikan.

Because of the importance of tourism in the Ketchikan economy, the possible indirect economic effects of changes in cruise ship operations are assessed. Based on analyses presented in the Cruise Ship Operations Technical Memorandum, the estimated economic effect of reduced cruise ship port calls and reduced time in port is summarized for the different alternatives. Based on these estimates, additional indirect effects of these spending reductions are determined using the regional economic model. Additional indirect effects addressed in this document are the likely effects of a bridge or ferry operation on the provision of government services and public infrastructure, regional economic development, traffic safety, and recreational opportunities.

## 3.0 Findings

### 3.1 Construction Effects

#### 3.1.1 Direct Effects

##### *Construction Spending*

The effects from additional construction spending will depend on the alternative that is selected since the construction costs of each can vary substantially. The estimates of construction-related spending expected to occur within Ketchikan Gateway Borough shown in Table 3-1 do not include any indirect or multiplier effects of the spending in the local area. These indirect effects will be discussed in a later section.

As the most expensive of the project alternatives, selection of the F3 option would contribute the most to the local economy over the three-year construction period. But each bridge alternative would require a substantial amount of local labor with a local payroll of at least \$32.3 million during the three years of work. Even the least expensive of the build options, ferry alternative G4, would likely add more than \$6.2 million to the employment payrolls of the businesses in the Borough during the construction period, assuming the ferries are built in the Ketchikan Shipyard. If one or more of the new ferries are built outside of Ketchikan, the construction spending and employment shown in Table 3-1 will decrease substantially. Replacement of one of the existing ferries is anticipated to occur in 2015 under the no-action alternative with \$3.6 million in local spending, assuming construction of the ferry in Ketchikan.

**Table 3-1. Estimated Local Construction Spending and Construction Jobs in Ketchikan Gateway Borough**

Alternative	Construction Spending (\$Millions)				Total	Construction Jobs <sup>1</sup> (Total / Annual)
	Materials	Labor	Equipment			
C3(a)	76.9	38.4	12.8	128.1	840/280	
C3(b)	64.5	32.3	10.8	107.5	860/290	
C4	74.9	37.4	12.5	124.8	970/320	
D1	51.4	25.7	8.6	85.7	630/210	
F3	75.1	37.5	12.5	125.2	900/300	
G2	16.5	8.2	8.2	32.9	230/80	
G3	16.2	8.1	8.1	32.5	220/70	
G4	12.5	6.3	6.3	25.0	180/60	
No-action	1.8	1.1	0.7	3.6	50/30	

<sup>1</sup> Annual jobs estimated by dividing total cumulative jobs created by a three-year construction period, except for the no-action alternative that has a two-year construction period. Numbers may not calculate due to rounding.

##### *Acquisition and Relocation Effects*

Assessment of the acquisition and relocation effects is based on purchasing rights-of-way for the proposed routes. Slight changes in project plans and routes can occur as planning progresses and the acquisition costs described in this document should be considered as approximations. The costs shown in Table 3-2 do not include potential costs for relocating residents and businesses. A more precise estimate of acquisition effects and costs can be made when the preferred alternative is selected

and more detailed design information is available. Additional information on the amount of public and private land required for the rights-of-way are presented in the Land Use Technical Memorandum prepared by HDR Alaska. A summary of the value of land and structures that would need to be acquired is shown in Table 3-2.

**Table 3-2 Estimated Acquisition Costs**

Project Alternative	(\$Thousands)		
	Residences and Businesses <sup>a</sup>	Private Land	Total <sup>b</sup>
C3(a)	1,085	415	1,500
C3(b)	1,300	505	1,805
C4(a)	65	300	365
D1	420	240	660
F3	85	400	485
G2	1,375	510	1,885
G3	1,550	1,350	2,900
G4	0	570	570

<sup>a</sup> Excludes the value of the floatplane facility.

<sup>b</sup> Based on assessor value information and may not match right-of-way costs presented in engineers' estimates.

The estimated acquisition costs include the value of any private land that would be acquired for right-of-way under each alternative. Public lands are assumed to be available at no cost to the project. To determine private land values, the fraction of each parcel of land to be acquired for the right-of-way is multiplied by the assessed value of the unimproved land. Once the land value is determined, maps of the rights-of-way are consulted to determine if structures are affected by the rights-of-way. The values of any affected structure is then added to the land value. For property with structures within a right-of-way, it is always assumed either none or all of the structure is acquired. In cases where the right-of-way acquisition takes a large portion of the parcel, an attempt is made to determine whether the remaining section(s) has usefulness to the original owner. If the remaining portion is determined to not be useful to the owner, then it is assumed that ADOT&PF acquires the entire property. No developed property owned by a nonprofit organization is affected by any of the alternatives. The floatplane facility is owned by the state of Alaska and leased to the Ketchikan Gateway Borough. It is the only government-owned facility that might be displaced by the project.

Ferry alternatives G2 and G3 have the highest acquisition costs because the new ferry terminals for these alternatives would require purchasing lands that have some of the highest property values in the community, and substantial structures would be affected as well. Most of the land required for the bridge alternatives is undeveloped or owned by public entities and the planned bridge routes have lesser effects than G2 and G3 on businesses and residences in the community. There is sufficient existing housing in the community to accommodate those residents whose residences would be acquired, although they may have to locate elsewhere in the community. Businesses that may be displaced by an alternative would also have to locate in a different area of the community. The cost of relocating would be covered as part of the acquisition process.

If a bridge alternative is selected, one additional effect would be the elimination of the ferry service between Gravina and Revilla Islands. Based on past performance, elimination of the ferry would represent a small net financial gain to the operator, Ketchikan Gateway Borough, since, historically, the ferry has been an unprofitable operation. In addition, the borough may be able to garner additional revenue if it can sell the ferries and the ferry terminal on Revilla Island. The newest ferry was built with Federal Aviation Administration funding and it is unknown if the Borough would be able to sell the ferry and retain the funds. The ferry terminal and land on Gravina Island may be displaced by some bridge alternatives.

There are several potential issues in the process of estimating right-of-way acquisition costs. These issues may result in the acquisition cost estimates presented here being lower than the cost when the property is actually acquired.

- Property value assessments for tax purposes may differ from market prices, the basis for paying a property owner for land acquisition. Generally, assessed values in many localities are below market values. To the extent property assessments are below market prices in the Ketchikan Gateway Borough, the actual right-of-way costs will be higher.
- In order to develop the cost estimates, it is implicitly assumed that the value per acre is constant across an entire parcel. If such is not the case, the right-of-way acquisition estimate for a parcel may understate or overstate the actual cost.
- The estimates for property which is not in the Tax Assessor's database or which has an assessed value of zero are drawn from the available information on similar properties. However, the other properties from which the assigned values are drawn display a wide range of values. The prices per acre (see above) used to assign a right-of-way acquisition cost to a property with zero assessed value are based upon properties that appear similar but may, in fact, differ substantially.
- The costs of moving the floatplane facility are not included in the analysis. If the floatplane facility is relocated as a result of the selection of C3a, C3b, C4, or D1, acquisition costs will be higher than shown in Table 3-2.

### **3.1.2 Indirect Effects**

The potential indirect economic effects of construction activities are estimated using an input-output (I-O) model of the Ketchikan Gateway Borough economy, available from the Minnesota IMPLAN<sup>6</sup> Group. The company uses a large number of data sources to construct economic models of the economy of each state, county, or borough in the U.S. The I-O model captures the inter-industry transactions generated by the construction firms and their suppliers and the additional economic activity generated by household and government spending that will result construction of an alternative.

When money enters an economy, it affects more than the initial recipient. When a bridge or road is built in Alaska, construction firms are the direct beneficiaries. The construction firms, in turn, buy supplies from other Alaska firms and hire workers. The shops selling the supplies make additional purchases, as do the project workers. A large share of local purchases may also be transferred out of the local economy by out-of-state purchases. The money spent locally on the project flows through the economy until it is dissipated by these out-of-region purchases. This is often called the multiplier effect. The effects of purchases from suppliers outside the state are excluded from the estimates. I-O

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<sup>6</sup> Impact analysis for planning

models do not indicate the period of time when the effects of the initial spending will be felt throughout the economy. Because subsequent rounds of spending may be spread out over several years, the total effect suggested by the I-O models may not be realized in the initial year. The money that goes directly to the construction firms is part of the direct effect of the construction activities. Those effects are provided in the previous section. The additional rounds of spending caused by construction firm expenditures are part of the subsequent indirect and induced effects, which are often collectively referred to as secondary effects. It is typical that much of the secondary effect from any project occurs through expenditures by households and the government. The data shown in Sections 0 through 0 were estimated using the Ketchikan Gateway Borough I-O model.

### *Employment*

The construction activities will result in additional jobs being created in the region (other than workers directly hired by construction contractors). The employment estimates shown here represent the potential full-time and part-time employment created as a result of the secondary round of spending by businesses, households, and local governments that support the project.

The estimates in Table 3-3 include the number of persons employed in activities stimulated by inter-industry transaction and the employment created by additional household and government spending. The estimates do not include direct employment for laborers involved in construction activities. The improved ferry alternatives assume that the ferries are built at the Ketchikan Shipyard, and the no build alternative anticipates replacement of an existing ferry, also built at the Ketchikan Shipyard, in 2015. Construction elsewhere will reduce the jobs in Ketchikan.

**Table 3-3 Total Indirect Effects of Construction Activities on Employment by Alternative**

<b>Alternatives</b>	<b>Total Jobs/Annual Jobs<sup>1</sup></b>
Bridge Alternatives	
C3(a)	390/130
C3(b)	410/140
C4(a)	450/150
D1	290/100
F3	420/140
Ferry Alternatives	
G2	110/40
G3	110/40
G4	80/30
No Build Alternative	20/10

<sup>1</sup> Annual jobs estimated by dividing total employment by three-year construction period except for a two-year estimate for the no-build alternative. Numbers may not calculate due to rounding.

### *Gross Regional Product and Labor Income*

This section summarizes the estimated changes in the economic activity of the region (gross regional product) and labor income generated by the different project scenarios (see Table 3-4). The gross regional product (also called output) is a measure of the total change in economic activity, including both inputs into other industries and outputs consumed by governments and households. Labor income is a measure of the change in payments made to labor as well as proprietor's income (income received by self-employed individuals).



**Table 3-4 Total Indirect Effects of Construction Activities on Income by Alternative**

Alternatives	Output (Millions of 2001\$)	Labor Income (Millions of 2001\$)
Bridge Alternatives		
C3(a)	\$27.3	\$10.4
C3(b)	\$27.9	\$10.7
C4	\$31.1	\$11.9
D1	\$20.2	\$7.7
F3	\$29.0	\$11.1
Ferry Alternatives		
G2	\$7.8	\$3.0
G3	\$7.5	\$2.9
G4	\$5.7	\$2.2
No Build Alternative	\$0.9	\$0.3

*Fiscal Effects*

This section reports the projected local government revenues generated from the construction activities. The IMPLAN model uses state and county-level data sources as well as the *Annual Survey of Government Finances* in estimating the state and local government revenues that can result from additional economic activity in the region.

Based on the social accounts of the region, the build alternatives can potentially generate additional government revenues of between \$0.5 million (G2) to \$2 million (C3a) (see Table 3-5). These estimates include indirect business taxes such as excise taxes, property taxes, fees, licenses, and sales taxes paid by business. The estimates also include payments to state and local governments from the household sectors for estate and gift taxes, motor vehicle licenses, property taxes, and other taxes, fees, and charges including fishing and hunting fees. Unemployment taxes from both sectors are also included.

**Table 3-5. Potential State and Local Government Revenues from Construction Activities**

Alternatives	Government Revenues (Thousands of 2001\$)	
	State	Local Government
Bridge Alternatives		
C3(a)	900	1,060
C3(b)	780	920
C4(a)	860	1,010
D1	560	660
F3	810	950
Ferry Alternatives		
G2	320	380
G3	320	380
G4	250	300
No Build Alternative	40	40

### 3.2 Operations Effects

In addition to the local, economic effects arising from construction spending, there would be further expenditures and other effects from the operation and maintenance of a bridge or expanded ferry service. The presence of a bridge will have direct effects on traffic and, possibly, cruise ship operations, as well as indirect effects including additional economic activity occurring in Ketchikan as a result of spending on operations and maintenance, possible changes in accident rates, and effects on regional economic development.

#### 3.2.1 Direct Effects

##### *Changes in Cruise Ship Operations*

The various ferry alternatives and the high bridge alternatives C3a and C4 are not anticipated to have any effect on cruise ship operations. F3, the Pennock Island crossing will require cruise ships to use the west channel which they use infrequently at present because of the additional maneuvers required and need for tug boat assistance, which can reduce the time in port. The low bridge options C3(b) and D1 provide less than 200 feet of air draft (clearance) and will prevent the passage of large cruise ships in Tongass Narrows, necessitating routing changes, additional maneuvers, tug boat assistance, reduced port time, and higher cruising speeds (and fuel costs) to regain time lost entering or leaving the Ketchikan dock area. Because cruise ships receive substantial revenues from commissions on the on-board sale of shore excursions and attractions, the potential loss of port time may reduce opportunities for shore excursions, and their operators may choose to reduce port calls in Ketchikan as a result.

The Cruise Ship Operations Technical Memorandum provides a detailed explanation of the additional cost of tug assistance and fuel costs that cruise ships might incur with the various alternatives, and the manner in which the alternatives may result in reduced spending by cruise passengers. Table 3-6 summarizes the information presented for the base case in that technical memorandum. The estimates are based on the potential effects of the alternatives on cruise activity that occurred in 2001.

**Table 3-6. Effects on Cruise Ships and Cruise-related Spending and Employment**

Alternatives	Base Case Estimates for 2001 Cruise Season				Decreased Employment
	(\$Millions)				
Bridge Alternatives	Tug Costs	Fuel Costs	Reduced Spending	Total	
C3(a)	0	0	0	0	230
C3(b)	0.8	1.1	10.6	12.4	2,950
C4	0	0	0	0	230
D1	0.8	1.1	10.6	12.4	2,950
F3	0.8	0.9	4.9	6.6	1,200
Ferry Alternatives					
G2	0	0	0	0	0
G3	0	0	0	0	0
G4	0	0	0	0	0
No Build Alternative	0	0	0	0	0

*Aviation Effects*

The construction of a bridge alternative may lead to the elimination of the Special Visual Flight Rules (SVFR) clearance that currently governs some air traffic in the Ketchikan Gateway Borough.<sup>7</sup> Based on estimates of flight operations, it is estimated that a maximum of 418 flightseeing trips would have been cancelled in 2001 had the SVFR clearance not been present. The net loss to the Ketchikan economy of these eliminated trips would have been approximately \$669,000.<sup>8</sup> This figure represents the spending reduction in the region that would have occurred in the situation without the SVFR clearance.

In addition, it is estimated that an additional 1,149 flight operations would have been delayed in 2001 without the SVFR clearance. Such flight delays also impose costs upon travelers. The value of the delays to travelers would have been more than \$151,000 had the SVFR clearance not been in effect during 2001. Most of this cost represents the value of the time delay to travelers. Because there would be no significant cash outlays to travelers associated with the delays, there would be minimal repercussions for total economic activity in the region and the costs are not included in this analysis; such costs are addressed in benefit-cost analyses.

Flight operators also would have experienced additional costs for the delays. However, since the calculated loss of flightseeing trips is based on maximum losses, losses for delays are assumed to be incorporated in flightseeing losses in order to portray a foreseeable situation.

*Annual Indirect Effects of Operations and Maintenance Activities*

Table 3-7 shows the projected increase in gross regional product and total value-added that could be generated from the annual operations and maintenance of the structures and equipment associated with the alternatives. The value-added includes labor income, other property type income, and indirect business taxes.

**Table 3-7. Total Estimated Output, Value-added, and Employment Effects of Operations and Maintenance Activities by Alternative**

Alternative(s)	(\$Thousands)		
	Output	Value-Added	Employment <sup>1</sup>
C3(a), C3(b), C4	27	17	-210
D1	22	14	-220
F3	33	21	-210
G2, G3, G4	924	597	920
No-action	296	191	310

<sup>1</sup> Cumulative total number of jobs over the 20-year study period, 2006-2025.

<sup>7</sup> A decision has not yet been made regarding elimination of the SVFR clearance if a bridge is constructed. Safety considerations will be the main decision factor but it does not appear that manmade structures are associated with many aircraft accidents in Alaska. According to data from the National Transportation Safety Board, there were 9 aircraft crashes in Alaska between 1983 and 2001 that occurred when a plane or helicopter struck a building, tower, and other manmade structure. A brief synopsis of each crash is shown in Appendix B. None of those crashes involved a bridge.

<sup>8</sup> See the Appendix for the assumptions and calculations. The reduction in spending on flightseeing operations due to elimination of the SVFR clearance would have decreased local revenue from sightseeing activities by about 2%. Sightseeing revenues in Ketchikan are estimated to have been approximately \$38.0 million in 2001. Flightseeing activities are thought to account for a substantial share of total sightseeing expenditures.

*Regional Economic Development*

As part of the Gravina Access Project, Northern Economics has prepared a series of economic forecasts for the Ketchikan Gateway Borough and which are summarized in *Ketchikan Gateway Borough Economic Forecasts*. The mid-range forecast, termed the base case, suggests that the sectors of highest growth until 2025 are likely to be in the trade and services sector and in tourism. Improvements in the Alaska Marine Highway System (AMHS), development of the Inter-Island Ferry Authority, and a new ferry dock are likely to attract shoppers and other visitors from parts of southeast Alaska to Ketchikan. Increases in tourism are expected because of the anticipated growth in cruise ship visits and potential mineral development in the area may provide further stimulus to the local economy. Population in the KGB is predicted to grow slightly more than one percent annually during this period.

Although the various alternatives may not alter the magnitude of economic activity in the KGB significantly, improved ferry service, and particularly a bridge, could create some new growth as well as shift some economic activity from Revilla Island to Gravina Island. For example, a bridge could be a catalyst for a new harbor on Gravina Island as well as associated commercial and industrial development. This growth may not occur in the community with ferry service. Anticipated population growth of just slightly higher than one percent annually suggests that some expansion of local housing will occur in the future. If additional land on Gravina Island is available for residential development, then more interest in Gravina housing would be generated by a bridge than expanded ferry service. With expanded ferry service, most of the additional housing required by a growing population would be located on Revilla Island.

In addition, a bridge along with the availability of additional land on Gravina, would likely lower regional land prices and housing costs or, at least, slow their rate of increase over time in the Borough.<sup>9</sup> Lower land costs may stimulate some purchases of homes, or business starts, that would not otherwise have been made. This effect on land costs is certainly beneficial for potential buyers. However, each market transaction requires a seller, too, and landowners would receive lower prices with the sale of their property. With expanded ferry service rather than a bridge and base case level of economic activity or below, only limited residential development will occur on Gravina Island in the foreseeable future.

The availability of large tracts of industrial or commercially-zoned land on Gravina Island, at lower prices than on Revilla Island, may attract firms and types of development that are presently constrained by the availability or price of such lands on Revilla Island. Firms that are not presently located in Ketchikan might be attracted to the community with the availability of such land.

Businesses presently operating at the Ketchikan International Airport incur several types of costs with the existing ferry service:

- Air cargo and passengers sometimes miss flights because of ferry delays
- Deliveries of fuel, cargo, and other goods must be planned in advance with the result that fuel and goods inventories are kept higher than necessary

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<sup>9</sup> The magnitude of the effect on land prices will depend, in part, on how much additional land becomes available. Although overall, regional land prices are likely to fall, initially, those on Gravina would be expected to rise. At present there are no clear indications how Gravina property owners might react to higher prices, thus there are no indications of the amount of development that might occur.

- During extreme tides, fuel tank trucks can't load onto the ferry and fuel tank trucks are limited on the amount of fuel that can be transported, thus requiring more trips with smaller trucks or trucks that are not loaded to capacity
- The amount of time the driver and truck spend waiting for and traveling by the ferry could be spent on other more productive activities and improve business operations.
- Seafood products and other goods can only be transported to the airport during the ferry hours of operation which may not be the most convenient time for businesses
- The ferry cost for delivery trucks is \$12.50 for a round trip

Improved ferry service could address some of these costs, but a bridge alternative could address all of the issues identified by airport businesses.

Table 3-8 shows several indicators of the level of economic development on Gravina and Pennock Islands that might be achieved with a ferry alternative or a bridge alternative if there is a high level of economic activity in the region. The development forecasts, which were created with the participation of Ketchikan Gateway Borough planning staff, anticipate that the ferry alternatives will constrain development on Gravina Island if there is a high level of economic activity in the community. As a result, only a medium-growth projection is achievable on Gravina Island with the ferry alternatives. Table 3-8 compares potential growth on Gravina Island associated with a bridge or ferry alternative (the medium growth projection for Gravina Island, which is the maximum level of development anticipated with a ferry alternative, with the high growth projection that is achievable with a bridge alternative). As noted previously, much of the growth on Gravina or Pennock Island represents a transfer of development that would have occurred on Revilla Island.

**Table 3-8. Additional Development Achievable With Alternative Type, Given High Level of Regional Economic Activity**

Category	Additional Achievable Development	
	Ferry (Medium)	Bridge (High)
Land Use (Acres)		
Gravina Island	170	370
Pennock Island (F3 Only)	0	210
Total	170	580
Population <sup>1</sup>		
Gravina Island	300	690
Pennock Island (F3 Only)	0	330
Total	300	1,020
Employment <sup>2</sup>		
Gravina Island	1,800	2,850
Pennock Island (F3 Only)	0	90
Total	1,800	2,940

<sup>1</sup> Permanent, year-round residents in 2020; with a bridge alternative a large population is expected to have seasonal or second homes on Gravina Island.

<sup>2</sup> Calculated as the incremental number of jobs above the no-action low case for the 2006-2025 time period.

#### *Additional Infrastructure and Government Services*

With a bridge, development on Gravina Island would require additional infrastructure and government services. These effects depend on the nature of the development. A high-density residential

development, for example, would probably require street lighting and sewage services. Low-density development would probably not. However, separate satellite facilities for police, fire, and other emergency services would almost certainly be necessary if there is substantial residential development. Similar facilities might be necessary on Revilla Island with residential development at Point Higgins and other distant locations.

With the no-action alternative or an improved ferry service alternative, a greater portion of regional economic development can be expected to occur on Revilla Island. Current development on the periphery of Ketchikan would likely continue. Such development will also require additional government services and infrastructure.

*Fiscal Effect on the City of Ketchikan and the Ketchikan Gateway Borough*

Most of the anticipated fiscal effects on local governments were addressed earlier. The only omission concerns possible land sales and property values arising from economic development on Gravina Island. With a bridge and a base case or better level of economic activity, some residential development would be expected on Gravina Island. As a result, property values on Gravina would probably increase thus generating additional property tax revenue for the Borough. Offsetting this effect, to at least some extent, would be probable decreases in property values on Revilla Island. The net effect on property tax revenue is uncertain.

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## Appendix A

The construction of the bridge alternatives across the Tongass Narrows may result in the elimination of the Special Visual Flight Rules (SVFR) clearance for this area. This clearance is currently applicable to all aircraft including those operating under Part 135 rules (generally air taxi operators). In order to assess the potential effects incurred by the loss of this clearance, the following analysis shows what could have occurred in Ketchikan in 2001 if the SVFR clearance had not existed. A more complete description of SVFR and projected air traffic operations for 2001 is contained in *Gravina Access Project: Special Visual Flight Rules (SVFR) Analysis-Draft*, prepared by HDR Alaska. All operations data used in the analysis presented below are drawn or developed from that document.<sup>10</sup> The goal of the analysis is to present a ‘worst case scenario,’ to describe the likely upper limit of what might happen if the SVFR clearance is no longer allowed for flight operations in Tongass Narrows.

If construction of a bridge leads to the elimination of the SVFR clearance, then some flights are likely to be cancelled while others are delayed. Since it is likely that cruise passengers and local travelers would be affected differently by the elimination of the SVFR clearance, it is necessary to distinguish those operations carrying flightseeing passengers from those transporting locals for work, commerce, and other reasons. Two assumptions describe the worst-case scenario.

- Cruise ship passengers have a limited amount of time available during a port call in Ketchikan and are unable to wait an extended period for better weather conditions that might permit flight. Thus it is assumed that all flightseeing trips that were projected to occur during SVFR conditions in 2001 were cancelled.
- Local residents of Southeast Alaska and other non-cruise passengers traveling for work, commerce, or other reasons, however, can wait but incur delay-associated costs while doing so. Consequently, it is assumed that all other trips during SVFR conditions are delayed by an average of three hours.<sup>11</sup>

The situation described by the two assumptions is considered the worst-case scenario because all flightseeing trips which would have been undertaken under the SVFR operations are assumed to be cancelled. However, without the clearance it is likely that some of these flights would have been delayed rather than cancelled. Thus, the cost estimates derived for the worst-case scenario should represent an upper limit of the negative effects. Historical data on monthly flight operations, the source of the 2001 projections, do not distinguish the purpose of the flight. Thus, the number of flightseeing trips must be estimated. In order to do so, two additional assumptions are made:

- Only non-cruise passengers take flights during the October-April period.

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<sup>10</sup> An operation is a takeoff or a landing. Thus any plane that departs from and then returns to Ketchikan has undertaken two flight operations.

<sup>11</sup> Naturally, some of these other, non-flightseeing trips could have been cancelled as well. However, any local resident who planned a flight that was cancelled could arrange a flight at another time. Although there is likely to be inconvenience and perhaps, annoyance, at any such cancellation the economic losses are not as severe because these trips are probably deferred rather than eliminated. To capture the losses associated with such travel delays for local residents, the average daily duration for SVFR conditions (3 hours) calculated by HDR is used in the analysis. The value of that three-hour delay, then, represents the loss to the passenger. Since these are assumed to be deferred rather than cancelled trips, there is no revenue loss to the flight service.

- For flight operations subject to SVFR restrictions, the monthly average during the October-April period represents the monthly number of such flight operations affecting non-cruise passengers during the May-September period.

During the October -April period, HDR Alaska projects 669 flight operations are SVFR operations. For this seven-month period, then, the monthly average is 96 SVFR operations. For May-September 1,315 SVFR operations are projected for a monthly average of 263. Employing the assumptions it is estimated that an average of 167 flight operations carrying cruise ship passengers occur each month under the SVFR clearance during the May-September period. Thus, of the 1,984 flight operations under SVFR conditions for 2001, 835 or 42% are attributable to flightseeing and 1,149 or 58% are attributable to non-cruise travel. These data and the projection for total operations in 2001 are shown in Table A-1. Thus, for the analysis of the costs associated with elimination of SVFR clearance, it is assumed that all 835 flight operations would have been cancelled in 2001 and 1,149 flight operations would have been delayed by three hours without the SVFR clearance.

**Table A-1-Flight Operations-Total and Potentially Cancelled Operations, 2001**

	Number	Percent of total	Percent of Cancelled
Total Operations	105,193	100%	NA
Potential Cancelled Operations (w/o SVFR Clearance)			
Flightseeing	835	.79	42.1
Non-cruise Travel	1,149	1.09	57.9
Total	1,984	1.89	100%

NA: Not Applicable

In order to estimate the potential losses arising from delayed and cancelled flights, some additional assumptions about travel cost, trip prices, and spending patterns are needed. Some additional assumptions are required to complete the analysis.

- Internet advertisements for flightseeing tours in Ketchikan have a wide range of prices depending on the characteristics of the trip. These prices vary from \$79 to \$379 per person. An average price of \$250 per passenger is used for a flightseeing trip.
- Similarly, a wide variety of aircraft are employed for flightseeing. Passenger capacity ranges from a low of three or four on small aircraft to fifteen passengers on larger planes. An average of eight passengers per trip on flightseeing excursions is assumed in this analysis.
- For trips made by local residents and other non-cruise passengers, each flight carries 5.5 passengers during the May-September period and three passengers during the remainder of the year.

Since each trip involves two operations, a takeoff and a landing, the estimated 835 flightseeing operations under SVFR conditions during 2001 implies 417.5 flightseeing trips. Thus the removal of the SVFR clearance would probably have caused the cancellation of a maximum about 418 flights carrying cruise ship tourists in 2001. With an estimated eight passengers each paying a price of \$250, the revenue loss per cancelled trip would be \$2,000 or a total annual revenue loss of \$836,000.

Cruise ship passengers whose flightseeing tour is cancelled will have additional time for other activities. Thus the revenue losses incurred by the flight services are likely to be offset, in part, by

more spending on other activities and goods in Ketchikan. In order to capture this effect, it is assumed that each passenger who had booked a cancelled flight spends an additional \$50 on other goods and services such as souvenirs and food. This extra spending amounts to \$167,000 annually. Thus, the direct net revenue losses to the community amount to \$669,000 for the year. In terms of net indirect losses to the community, the input-output analysis estimated the following additional effects: a \$21,000 reduction in local government revenues for the year, and a \$161,000 reduction in production of goods and services, and employment in the region for the year.

Out of the 1,984 SVFR operations projected for 2001, an estimated 835 are attributable to cruise ship activity. Therefore, the remaining 1149 SVFR operations, or 574.5 excursions, affect local travelers. Based on the average daily duration of SVFR conditions calculated by HDR, the elimination of the SVFR clearance is anticipated to cause an average three-hour delay for each of these trips. For each passenger, the purpose of the trip determines the value placed on the delay. In transportation analysis, the value of time for a person traveling on business is normally estimated at the average wage in the community. This wage in Ketchikan is estimated at \$16.23.<sup>12</sup> Thus someone traveling for work who incurs a three-hour delay, places a value of \$48.69 on the delay.

It is assumed that a person traveling for other reasons values time at a third of the average wage, or \$5.41 per hour.<sup>13</sup> Thus such a traveler incurs a cost of \$16.23 during a three-hour delay.

Each flight carrying local residents and other non-cruise travelers will transport some passengers for work-related activities and others who are traveling for other reasons. No data provides any indication of the percentage of passengers traveling by reason. Arbitrarily, a 50-50 split is assumed; with each flight operation being 50% travelers for work-related reasons and 50% travelers for other reasons.

A flight originating in Ketchikan and carrying residents of the region will have one operation, a takeoff, in Ketchikan and the landing elsewhere. As mentioned earlier, 5.5 passengers are assumed to be on each such flight between May and September. If this flight is delayed the 5.5 passengers leaving Ketchikan are assumed to incur a loss of valuable time. But, the assumed 5.5 passengers on the return trip to Ketchikan are also affected by the delay since their plane arrived three hours later than scheduled.<sup>14</sup> Since these passengers also incur the delay eleven passengers are affected; half are assumed to be traveling for work-related matters and the other half for other reasons. The eleven passengers during the May-September period who incur the delay are estimated to incur losses of \$357.06.

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<sup>12</sup> This hourly wage estimate is developed from Alaska Department of Labor and Workforce Development figures for average monthly earnings by industry in the Ketchikan Gateway Borough in 1999. The wage rate is then increased by 3.9% to reflect inflation occurring since 1999. The Consumer Price Index for Anchorage was used to determine the rate of inflation since 1999.

<sup>13</sup> There is no general consensus on this valuation. The one-third or 33% assumption falls within the range suggested by Adler (1987).

<sup>14</sup> For simplicity it is assumed that a three-hour delay on takeoff affects only the next departure of that plane and not any subsequent departures. To illustrate, imagine a plane makes three daily round trips between Ketchikan and another location with just a short period for refueling and loading between the landing and the next takeoff. If the first departure is delayed by three hours, every one of the five subsequent departures could also be delayed by three hours. Such a possibility is ruled out by assumption.

For the remainder of the year, when there are fewer local residents and non-cruise travelers (three per trip is assumed) a delay due to elimination of SVFR operations affects six passengers. The three affected passengers traveling for work reasons incur costs of \$146.07. The delay imposes costs of \$48.69 on the other three.

Applying these per flight figures to the projected SVFR operations which would not be undertaken in 2001 without the clearance suggests that the total costs incurred in 2001 due to flight delays would be \$151,135 (see Table A-2). Summing the costs of cancelled and delayed flights and adding the extra cruise passengers spending on other items expected when flights are cancelled yields a total loss of \$820,135 for 2001 if the SVFR clearance had not been in effect.

**Table A-2-Potential Losses From Flight Operations Cancellations and Delays Due to Elimination of SVFR Clearance, 2001**

	Amount (\$)
a) Potential Lost Flightseeing Revenue	\$836,000
b) Cruise Passenger Spending after Cancelled Flights	167,000
<b>Subtotal (a-b)</b>	<b>669,000</b>
c) Travel Delay Costs for Local Flights	
Passengers Flying for Work	113,351
Passengers Flying for Other Reasons	37,784
<b>Subtotal</b>	<b>151,135</b>
<b>Total Costs of SVFR Clearance Elimination (a - b + c)</b>	<b>\$820,135</b>

## Appendix B

**Table B-1 Aircraft Accidents Involving Manmade Structures in Alaska  
January 1, 1983-December 6, 2001**

<b>NTSB ID Number</b>	<b>Location</b>	<b>Date</b>	<b>Type of Aircraft</b>	<b>Incident</b>
ANC84LA012	Kodiak	October 30, 1983	Helicopter, Bell 206-B	Hit transmission tower
ANC84LA086	Deadhorse	June 8, 1984	Douglas C-118A	Struck radio beacon tower
ANC85LA034	Mt. Village	January 9, 1985	Cessna 207	Hit roof of abandoned building on takeoff
ANC88LA081	Naknek	July 2, 1988	Cessna 206	Hit radio tower
ANC93LA043	Ketchikan	March 12, 1993	De Havilland DHC-2	Struck one story building on takeoff
ANC95LA120	Kenai	July 28, 1995	Cessna 182	Struck small wooden building (duck shack) on takeoff
ANC97FA092	Nome	June 27, 1997	Cessna 207A	Struck radio tower while under SVFR conditions
ANC00FA110	Juneau	August 31, 2000	Cessna 172G	Shortly after takeoff hit spruce tree then hangar.
ANC01FA106	Kotzebue	August 13, 2001	Maule M-6-235	Collided with radio antenna tower.

Note: Includes only aircraft in the air at or just before the time of impact. Does not include taxiing aircraft or aircraft that had just landed.