

# Pederson Hill Access Study

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# Pederson Hill Access Study

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## 1. Introduction

The City and Borough of Juneau (CBJ) is facing a significant housing shortage. The 2008 CBJ Comprehensive Plan documents the insufficient supply of housing to provide residents adequate choice in housing size, location and price. According to the comprehensive plan, many households are paying more than 30% of their household income for shelter, and many live in overcrowded and/or unsafe and unsanitary conditions. Therefore, providing affordable housing is a major goal of the CBJ.

The CBJ and University of Alaska (UA) own several parcels of land on Hill 560 (referred to generally as Pederson Hill) between Auke Lake and the Mendenhall Valley in Juneau (Figure 1). This access study was performed to evaluate potential development areas, potential development densities, and transportation access for future residential development of the area. The specific areas addressed in this access study were areas A (20 acres), B (18 acres) and C (23 acres) along the southern boundary of the hill, north of Glacier Highway and west of Montana Creek and the Mendenhall River (Figure 2).

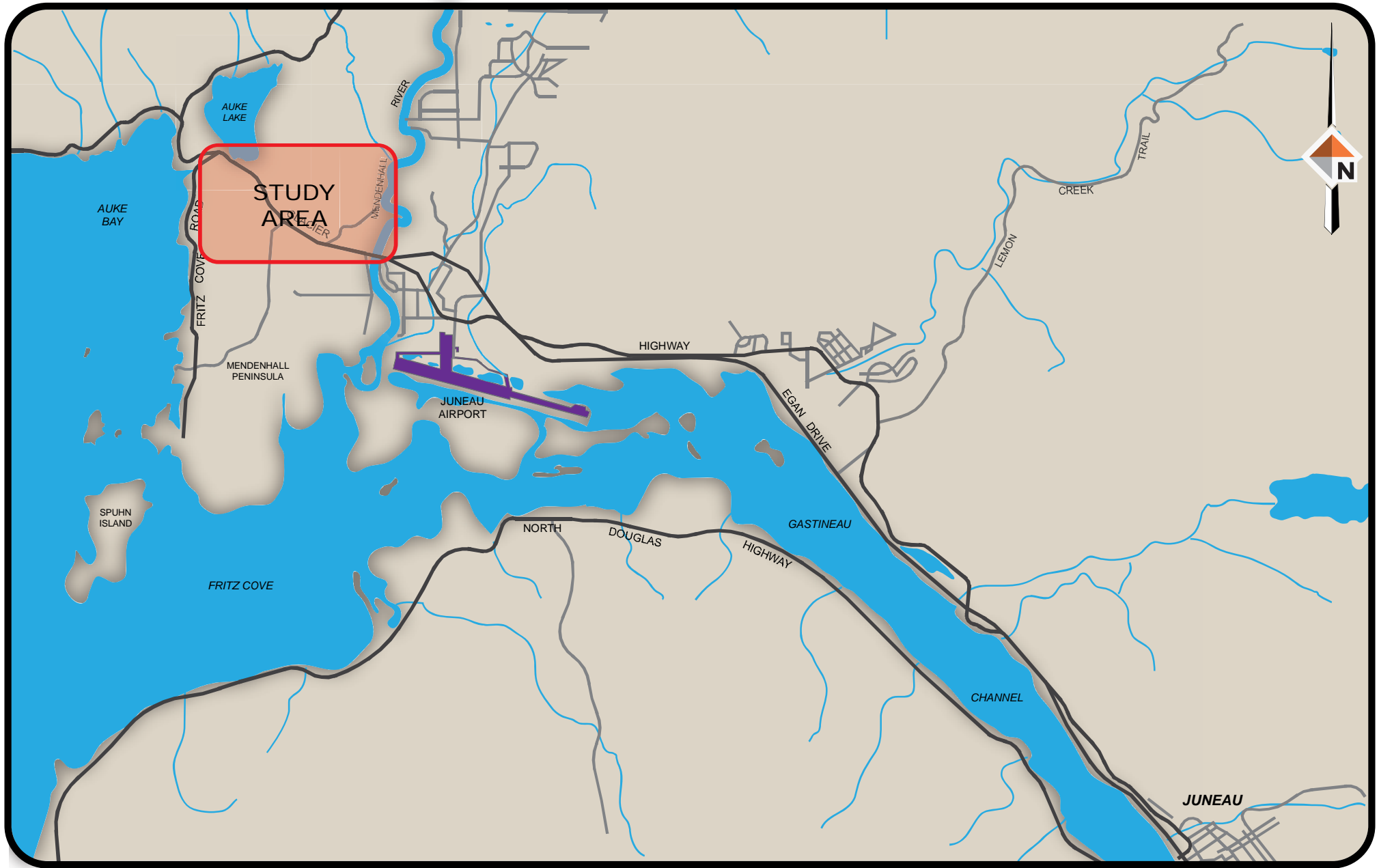
This study also addresses in a very conceptual manner, access to potential future development areas located to the north of the development areas evaluated in this study, both on top of the hill and along the north side of the hill.

## 2. Development Constraints

The CBJ and UA parcels pose several challenges for development, including steep slopes, wetlands, numerous creeks and drainages, anadromous fish habitat, challenging access, and eagle nests. Figure 3 illustrates the development constraints for Areas A, B and C. Constraints include steep slopes along the perimeter of the proposed development areas as well as wetlands and drainages throughout the areas. Although the forested wetlands in the study area were classified as B wetlands, this study assumes that the CBJ can obtain a permit from the Corps of Engineers for developing needed housing in the forested wetlands. The shrub/skunk cabbage fen, classified as A wetlands, was not included in the development area.

Existing data from the USFWS indicates that there are several eagle nests in the vicinity of the project. CBJ personnel report that one nest was identified directly north of the north end of Wildmeadow Lane. Anadromous streams are also common in the vicinity but are mostly south of Glacier Highway. According to the Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes, there are five streams designated as being anadromous in the vicinity of the development areas. These streams provide rearing habitat for Dolly Varden and coho salmon. Most of the anadromous reaches are south or downstream of Glacier Highway. North of Glacier Highway, two stream reaches through Brotherhood Meadow, west of Wildmeadow Lane, are listed as anadromous.

The lower two miles of Casa Del Sol Creek, also called Pederson Creek, has been listed as an impaired water body by the Alaska Department of Environmental Conservation for fecal coliform levels. The fecal coliform levels are thought to be primarily related to septic systems within the watershed. The on-going



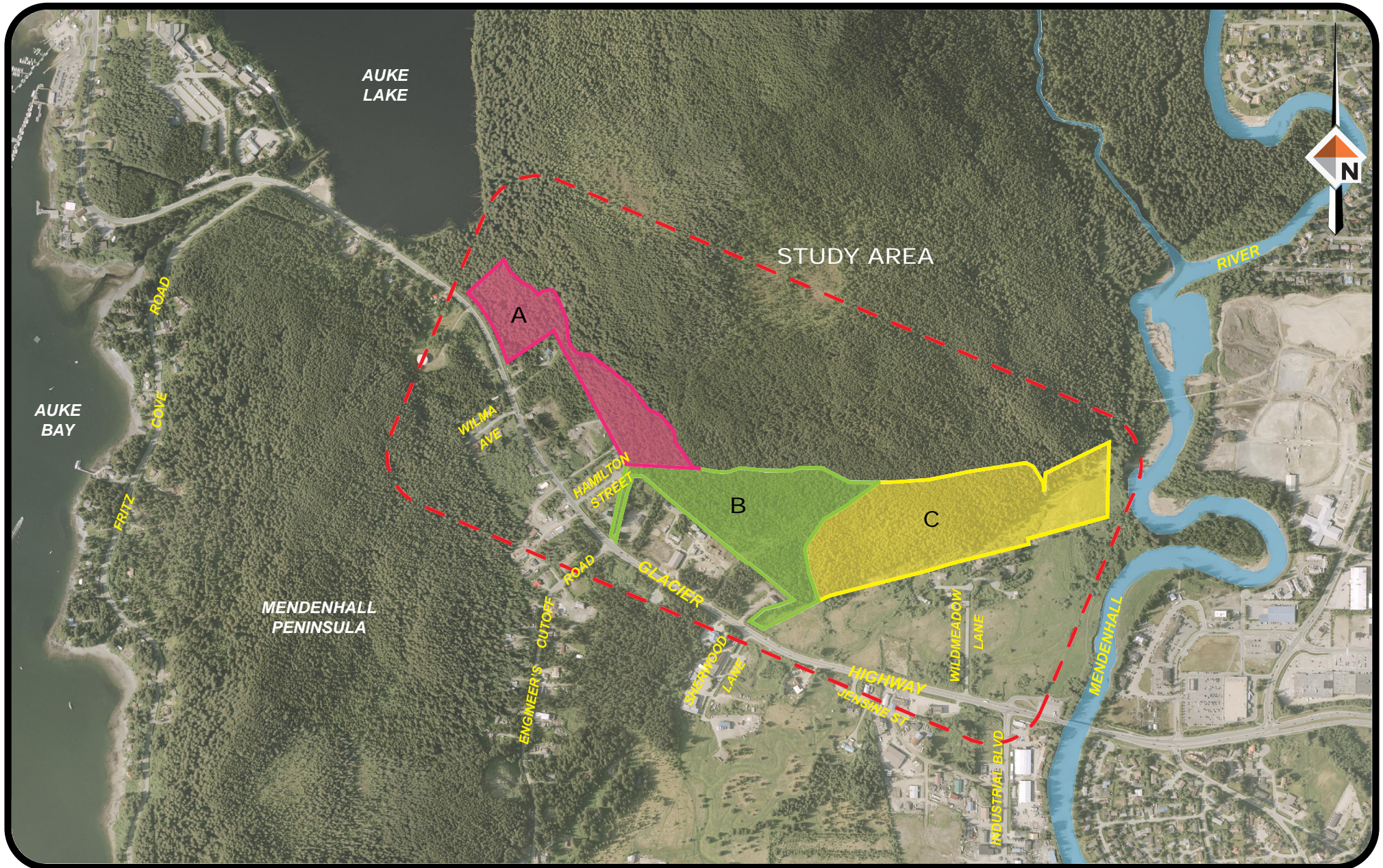
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VICINITY MAP  
 PEDERSON HILL ACCESS STUDY  
 JUNEAU, ALASKA

Figure 1





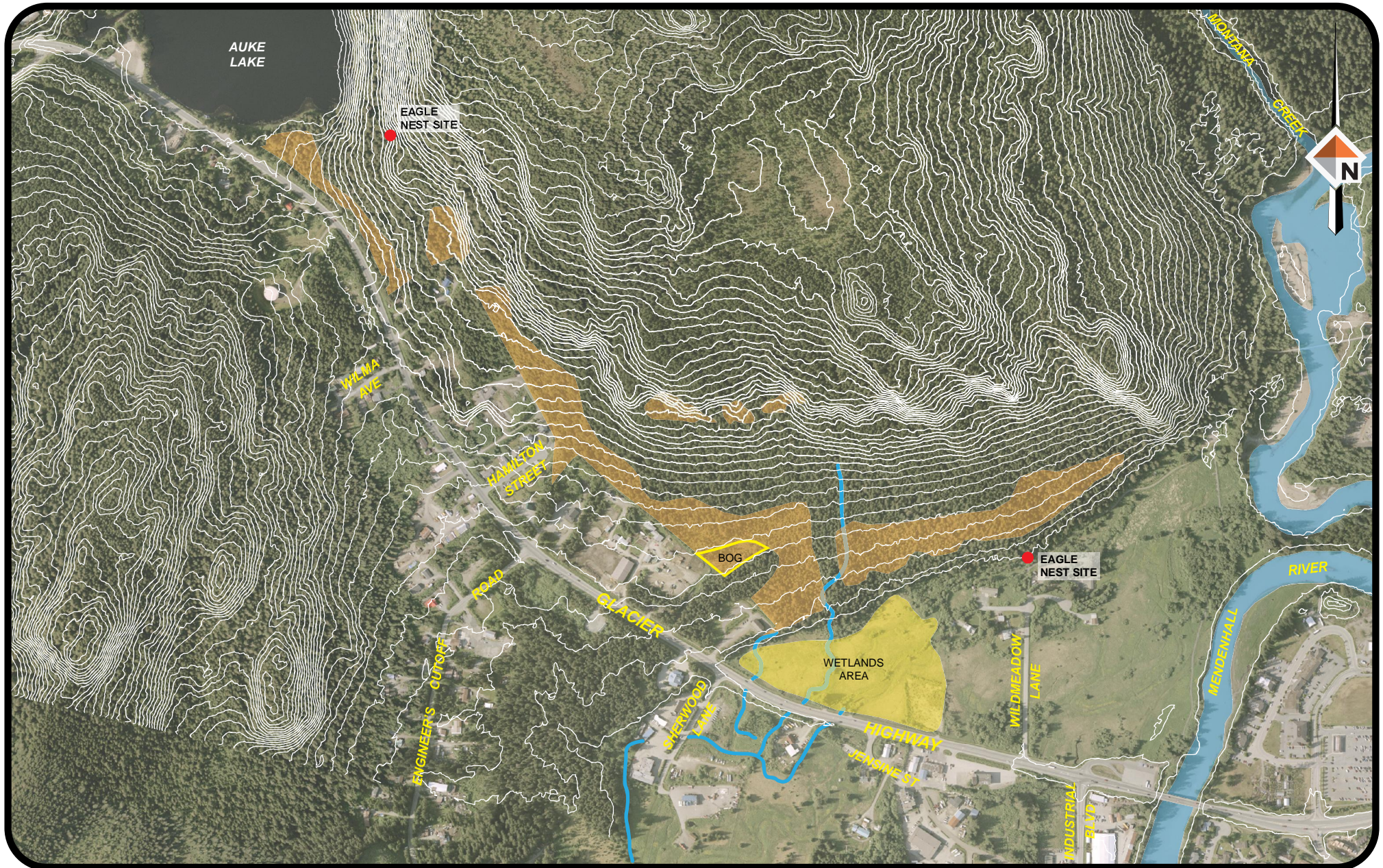
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STUDY AREA  
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Figure 2





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ENVIRONMENTAL CONSTRAINTS MAP  
 PEDERSON HILL ACCESS STUDY  
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Figure 3



- MAPPED FORESTED WETLAND AREAS
- GENERALIZED WETLAND AREAS
- ANADROMOUS STREAM
- EAGLE NEST SITES

expansion of the CBJ wastewater system in the area is expected to contribute to reduced fecal coliform levels in the future.

### 3. Conceptual Master Plan

The CBJ adopted an updated comprehensive plan in 2008. One of the major issues addressed in the plan was the insufficient supply of housing for Juneau residents. As a result of this concern, the CBJ has adopted policies designed to facilitate the provision of a variety of housing sizes and types to provide more opportunities for various populations in Juneau to find affordable housing.

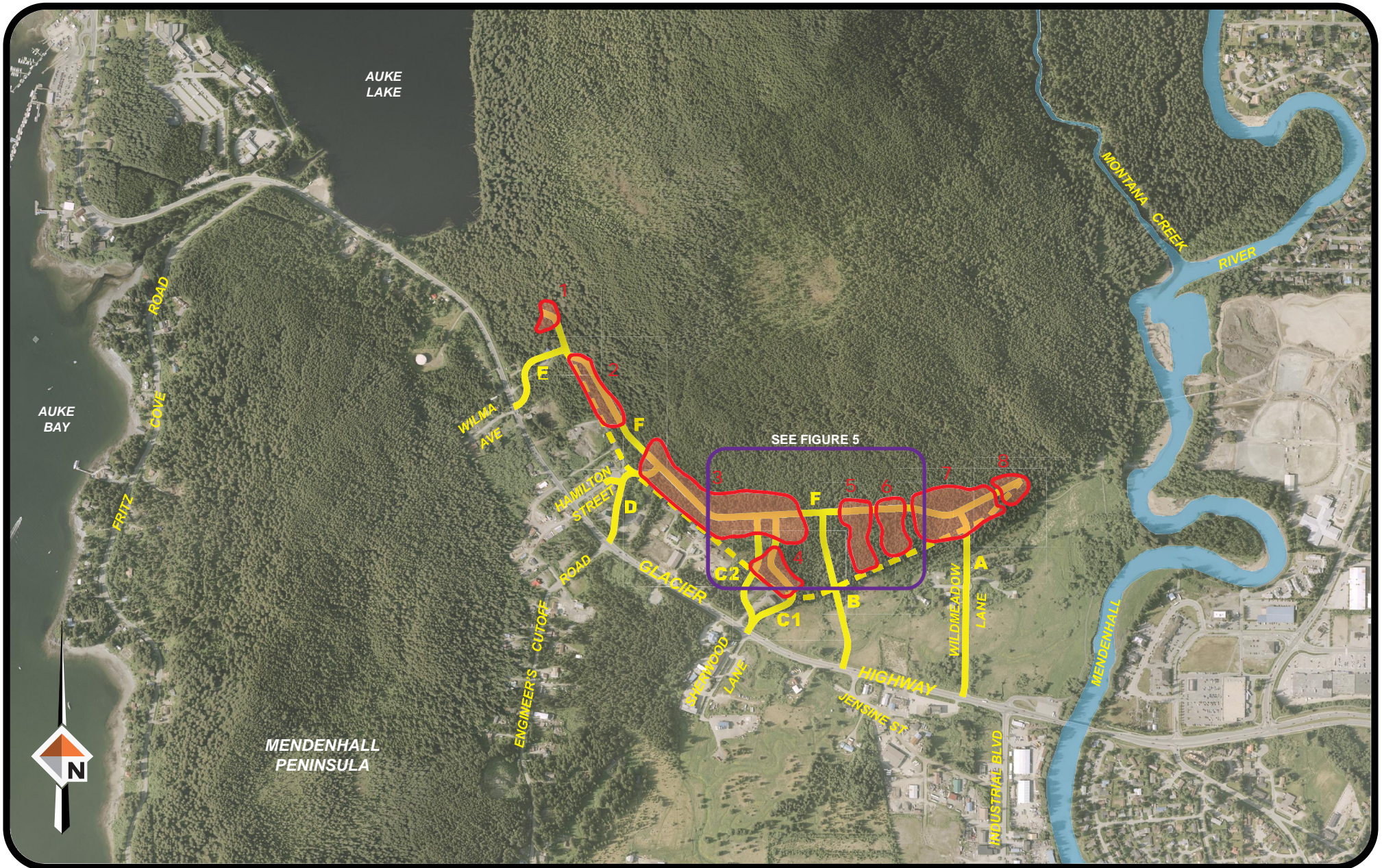
The study area is located in Subarea 3: Auke Bay, Mendenhall Peninsula & West Mendenhall Valley on the comprehensive plan's land use maps. The land use policies for this area call for providing medium- to high-density development on CBJ and UA lands that are served with utilities, roads and other infrastructure, where high-value wetlands, steep slopes, and hazard areas are not present, and that are outside airport hazard zones. The plan also calls for the public sanitary sewer system to be expanded in this area to accommodate higher-density, affordable student and faculty housing.

The land use designation for the study area is RDR(T)MDR or Rural Dispersed Residential (RDR) transitioning to Medium Density Residential (MDR). The RDR designation is designed for low density rural development that is not supported by utility and road infrastructure. The area is designated for medium density development once utilities and road improvements are constructed. The MDR designation allows for densities ranging from 5 to 20 units per acre. This is particularly important in areas such as Pederson Hill where economically-feasible development will require higher densities and more creative design solutions.

The area is zoned D-1(T)D-5. The D-1 residential district is intended for areas without public utility service, while the D-5 allows for higher density development once utilities are provided. Public sanitary sewer and water is available along Glacier Highway and this concept plan assumes that water and sanitary sewer will be extended to these development areas. As noted above, the new comprehensive plan calls for higher density development in this area once utilities are provided. Given the current transitional zoning, the area could be rezoned to D-5 (maximum density of 5 units per acre) through an expedited process requiring approval by the Planning Commission once utilities are in place. A rezone to a higher density (such as D-10, D-15 or D-18) would be consistent with the comprehensive plan, but would require approval by the Juneau City Assembly.

A conceptual master plan was prepared identifying developable areas and potential access and circulation routes. This concept assumes that public utilities and road improvements will be constructed prior to development and that development will occur consistent with the MDR designation. The developable areas were identified as areas with a slope under 20%, outside fen and bog wetlands, and set back approximately 50 feet from creeks and drainages. This resulted in a total developable acreage of almost 27 acres in eight development areas or pods (Figure 4 and Table 1). Assuming an average development density of 10 units per acre, these areas could potentially provide up to 273 units of housing. Figure 5 illustrates the type of high density development that could be designed to maximize housing while minimizing environmental impacts.








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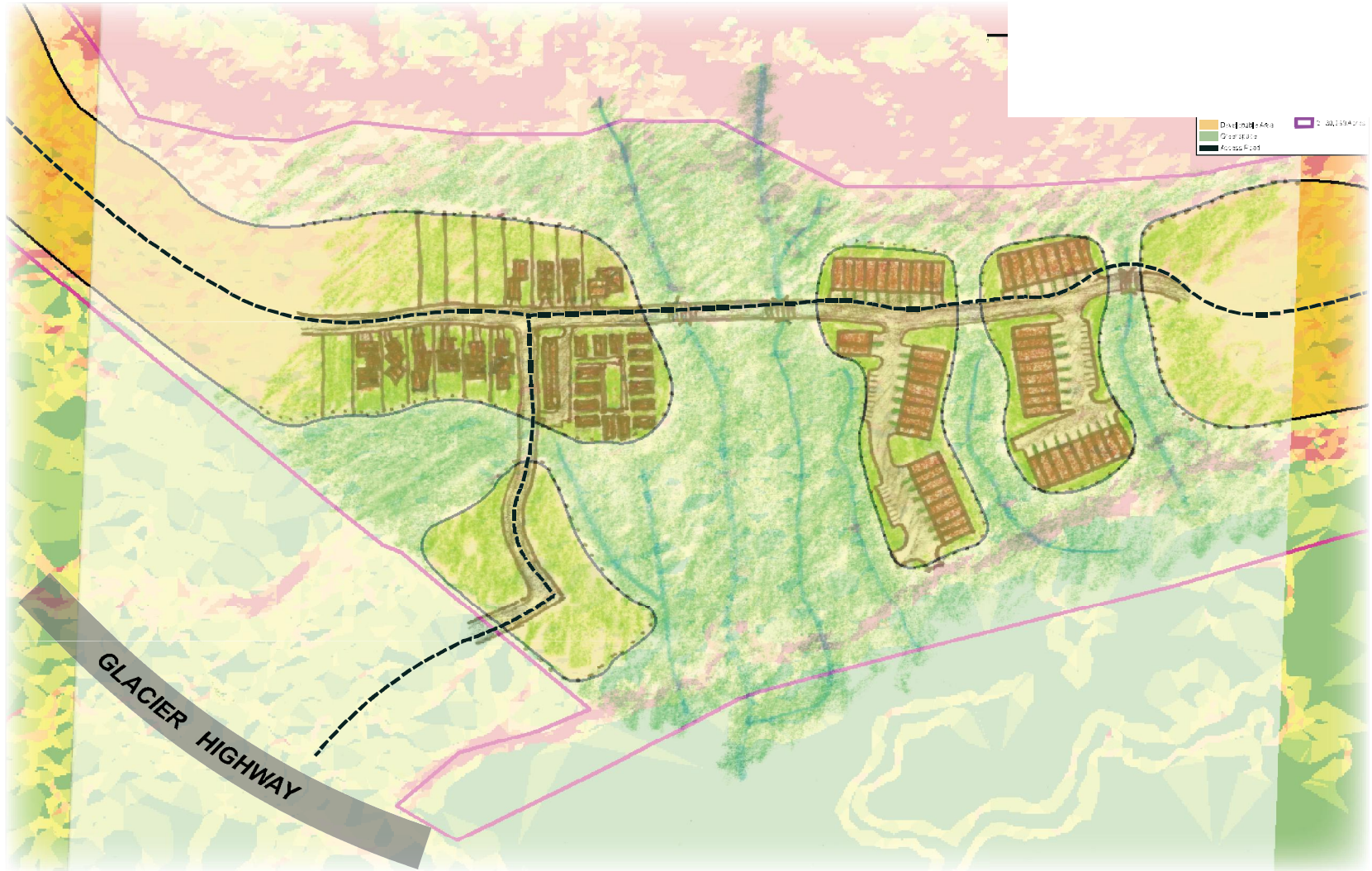
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CONCEPTUAL MASTER PLAN  
 PEDERSON HILL ACCESS STUDY  
 JUNEAU, ALASKA

Figure 4



-  DEVELOPMENT AREAS
-  PROPOSED ROUTES
-  ALTERNATE ROUTE F



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POTENTIAL CLUSTER DEVELOPMENT CONCEPTS  
 PEDERSON HILL ACCESS STUDY  
 JUNEAU, ALASKA

Figure 5



## 4. Access Alignment Analysis

Given the developable areas identified in the conceptual master plan discussed above, various road access alignments were identified as shown in Figure 4. Profiles were run for each road alignment to evaluate the grade required for each option. The CBJ road design criteria call for collector road grades to remain below 12% grade. Grades below 8% are desired to allow for school and transit bus access. A planning-level traffic and safety analysis was conducted to evaluate the feasibility of each access option based on an assumed development density of 10 units per acre.

**Table 1. Concept Plan Development Pods**

<b>Area ID</b>	<b>Acres</b>	<b>Units</b>
1	0.718	8
2	2.399	24
3	10.338	104
4	1.990	20
5	2.518	26
6	2.140	22
7	5.647	57
8	1.107	12
<b><i>Total</i></b>	<b><i>26.857</i></b>	<b><i>273</i></b>

### 4.1 Glacier Highway

#### 4.1.1 Wilma Avenue to Engineer's Cutoff Road

This section of the Glacier Highway is classified as a Major Arterial with an Annual Average Daily Traffic (AADT) of 8,013 vehicles per day (DOT&PF 2010). The posted speed is 50 miles per hour (mph). The cross section consists of two 12-foot lanes with 8-foot shoulders. No dedicated pedestrian facilities, roadway lighting, or turn lanes exist along this section.

#### 4.1.2 Engineer's Cutoff Road to Wildmeadow Lane

This section of the Glacier Highway is classified as a Major Arterial and has an AADT of 11,481 vehicles per day (DOT&PF 2010). The posted speed is 50 mph. The cross section consists of two 12-foot lanes, a 15-foot center two-way left-turn lane, and 8-foot paved shoulders. Dedicated left-turn lanes and intersection illumination are present at several major intersections along the corridor. No dedicated pedestrian facilities exist.

#### 4.2 Transit and Pedestrian Facilities

Capital Transit provides public transit service in the study area. Three routes provide service along Glacier Highway: Route 3, Route 4 and an express route to downtown Juneau. Routes 3 and 4 provide access along the Mendenhall Loop. Service is provided seven days per week. Buses run every half-hour, from 7:45 a.m. to 11:45 p.m., except for Sunday service which runs from 8:45 a.m. to 6:45 p.m. Bus stop shelters are located along Glacier Highway near Wildmeadow Lane, Sherwood Lane and Engineer’s Cutoff Road (Figure 6).

No formal pedestrian facilities currently exist on Glacier Highway between Wilma Avenue and Wildmeadow Lane. A new 10-foot wide separated multi-use trail facility has been designed along the north side of Glacier Highway and is expected to be constructed in the near future (Figure 6).

#### 4.3 Trip Generation

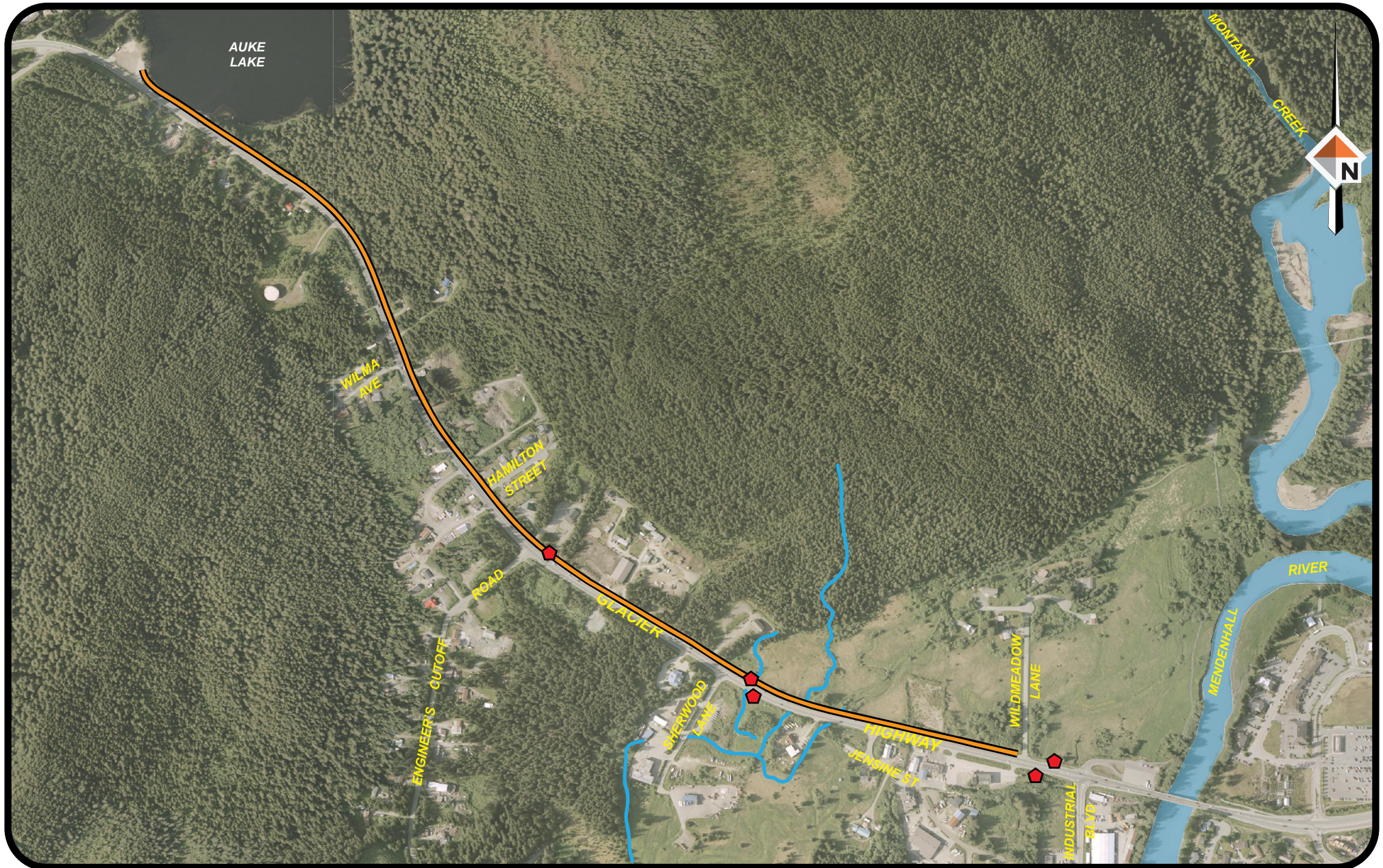
Future traffic projections were generated using the Institute of Traffic Engineers (ITE) Trip Generation Handbook 8th Edition. The trip generation was based on a land use of Residential Condominium/Townhouse (ITE Land Use Code 230), and approximately 10 units per acre. Estimated trips for each development area are given in Table 2.

**Table 2. Trip Generation**

<b>Area ID</b>	<b>Acres</b>	<b>Units</b>	<b>Trips (per day)</b>
1	0.718	8	47
2	2.399	24	140
3	10.338	104	605
4	1.99	20	117
5	2.518	26	152
6	2.14	22	128
7	5.647	57	332
8	1.107	12	70
<b><i>Total</i></b>	<b><i>26.857</i></b>	<b><i>273</i></b>	<b><i>1,591</i></b>

#### 4.4 Access Alternatives

Five potential access routes to the development areas were evaluated. Each route is evaluated as an independent access alternative, but the effect of having additional access points is also addressed. Each of these alternatives assumes that Route F is constructed as a collector road that connects all of the various development pods. Plan and profile sheets for each access route alignment are included in Appendix A.





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PEDESTRIAN AND TRANSIT IMPROVEMENTS  
 PEDERSON HILL ACCESS STUDY  
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Figure 6



-  BUS STOP / SHELTER
-  GLACIER HIGHWAY MULTI-USE TRAIL

#### 4.4.1 Access Route A

Access Route A would connect the northern end of Wildmeadow Lane to Route F and use the existing roadway to connect to Glacier Highway. If this was the sole access for development throughout the eight development areas, this access would need to serve approximately 1,600 vehicles per day or approximately 180 vehicles during the peak hour. An intersection with this level of operations would potentially require auxiliary (turn) lanes and an evaluation of signalization warrants. If Access Route A was constructed in conjunction with another access road to the west (options B through E), so that Access Route A served only the traffic from development areas 5 through 8, it would be expected to serve approximately 680 vehicles per day or approximately 70 vehicles during the peak hour. This diffusion of traffic volumes would likely enable Wildmeadow Lane to remain unsignalized with no additional lanes needed.

Wildmeadow Lane is an existing local street, serving seven single-family homes. The roadway is approximately 24 feet wide with a strip paved surface and swales on each side. Wildmeadow Lane is stop-controlled at the Glacier Highway intersection. The existing intersection layout is less than 90-degree angle. Previous comments from the Southeast Region DOT&PF requested the roadways be realigned to intersect perpendicular to Glacier Highway. DOT&PF has obtained the right-of-way for this improvement in conjunction with relocating access to a neighboring trailhead to a frontage road along Glacier Highway. These improvements are expected to be complete before the housing project is constructed.

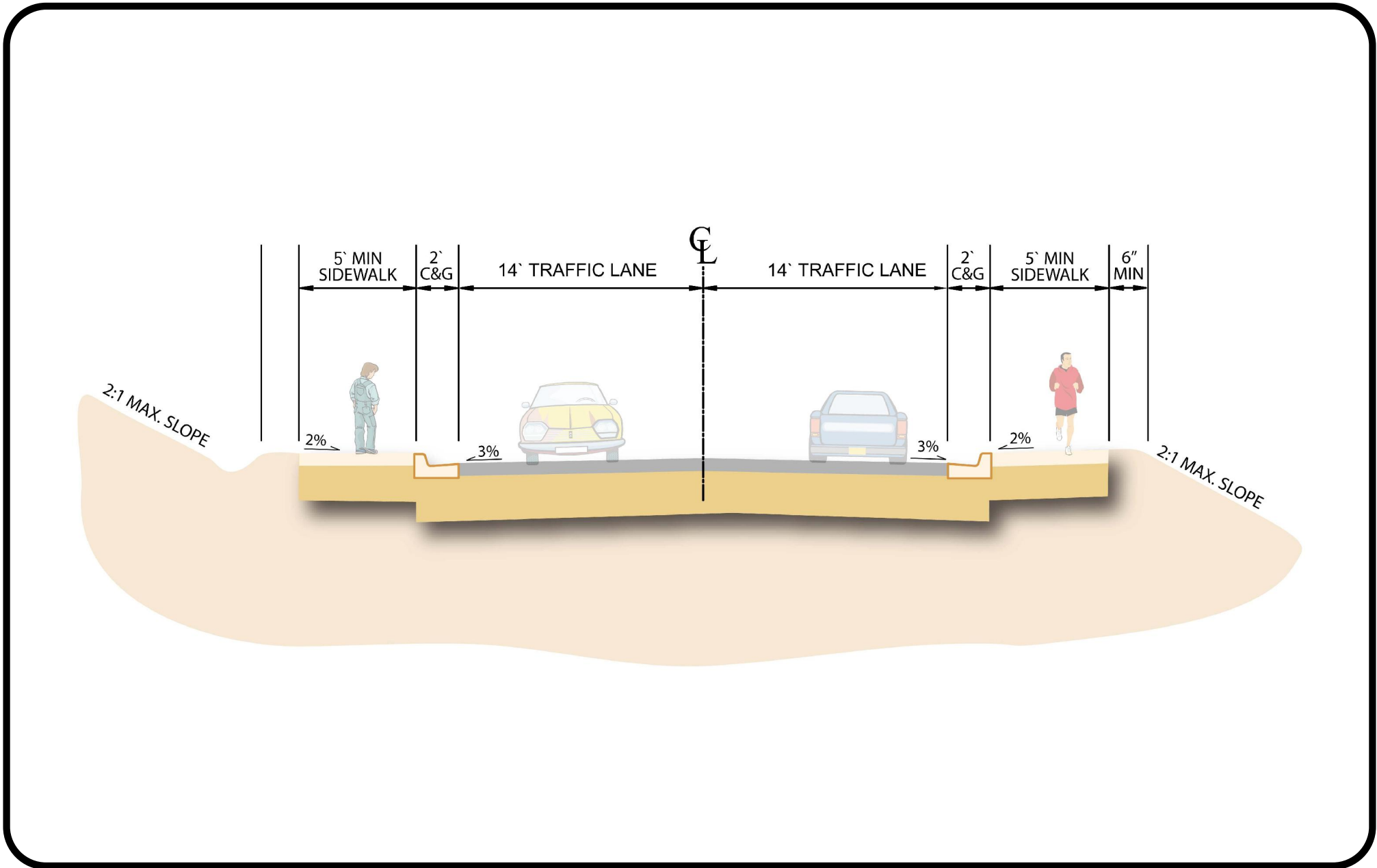
The Glacier Highway cross-section at Wildmeadow Lane consists of two 12-foot lanes, a 15-foot two-way-left-turn-lane, and 4-foot paved shoulders. An existing Capital Transit bus stop is located on Glacier Highway just east of the Wildmeadow Lane intersection. If auxiliary lanes on Glacier Highway are needed at Wildmeadow Lane, it may be feasible to convert the 15-foot center turn lane to a dedicated left-turn lane with a 4-foot median.

Under the Access Route A scenario, Wildmeadow Lane would be extended to the north/northwest at an approximate grade of 10 percent which meets the maximum allowable grade specified in the CBJ design criteria. This option also assumes that improvements to Wildmeadow Lane would be required to upgrade the existing roadway to Collector standards per CBJ Land Use Code Chapter 49.35. Specifically, the section would include two 14-foot traffic lanes, curb and gutter, and sidewalks on both sides, as shown in Figure 7. Based on this section, a 60-foot right-of-way (ROW) was assumed for each route evaluated. It is possible that the right-of-way may need to be greater based on the grade of the road. The actual right-of-way needed would be based on a final decision on the road section required for this access road, including the level of pedestrian amenities and utilities incorporated into the route.

No wetlands or anadromous streams would be affected by Access Route A; however, an eagle nest is located just north of the current terminus of Wildmeadow Lane. Construction of an access road through this area would require coordination with the U.S. Fish and Wildlife Service to ensure that the alignment and construction activities were designed to avoid or minimize disturbance of the eagle nest when actively used.

#### 4.4.2 Access Route B

Access Route B would provide access from the development areas to the Glacier Highway at Jensine Street. If only Access Route B were constructed to support all of the development in areas 1 through 8, it



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CONCEPTUAL ROAD SECTION  
 PEDERSON HILL ACCESS STUDY  
 JUNEAU, ALASKA

Figure 7



would need to serve approximately 1,600 vehicles per day or approximately 180 vehicles during the peak hour. Again, an intersection with this level of operations would potentially require auxiliary (turn) lanes and an evaluation of signalization warrants.

Volumes served would drop to approximately 1,556 vehicles per day or 170 vehicles per peak hour if this route only provided access for areas 3 through 8 and another road to the west (option E) provided access for areas 1 and 2. Alternatively, if Access Route D was constructed in addition to Access Route B, Route D could also draw some of area 3 away from Route B, decreasing the volume on B to approximately 1,350 vehicles per day or 140 vehicles during the peak hour. The Glacier Highway at this location consists of two 12-foot lanes, a 15-foot center two-way left-turn lane, and 8-foot paved shoulders. If auxiliary lanes are needed on the Glacier Highway, it may be feasible to convert the 15-foot center left-turn lane to a dedicated left-turn lane with a median.

The maximum grade of this alternative is approximately 9 percent. This meets the design criteria and is close to the desired grade of 8%.

Access Route B would bisect the Brotherhood Meadow wetland area located west of Wildmeadow Park Subdivision and could impact stream reaches listed as anadromous by the Alaska Department of Fish and Game (ADF&G). In order to acquire a wetland permit for this option, the CBJ would need to demonstrate that there are no other feasible alternatives to provide access that have less impact to wetlands; this standard may be difficult to demonstrate. In addition, the CBJ would need to look at alternatives to minimize the impact of the road, such as elevating the roadway on pilings to minimize fill in the wetland. Finally, if a permit were issued, the CBJ would be required to mitigate the wetland impact. A permit would also be required from the ADF&G for the anadromous stream crossing. The streams in this area provide rearing habitat for Dolly Varden and coho salmon and any final design and construction would need to minimize potential impacts on these resources. Due to the concentration of sensitive resources in this area, this alignment may be the most difficult to permit.

#### 4.4.3 Access Routes C

Access Route C would provide a collector road from the Glacier Highway at Sherwood Lane to Route F. Again, it would need to serve approximately 1,600 vehicles per day or approximately 180 vehicles during the peak hour if it was the only access road for development areas 1 through 8. An intersection with this level of operations would potentially require auxiliary (turn) lanes and an evaluation of signalization warrants. If this route was used only to access development areas 3 and 4, traffic levels would be estimated at 722 vehicles per day, or 80 vehicles during the peak hour. If Route C and Route A were constructed, volumes on C would decrease to approximately 682 vehicles per day or 75 vehicles during the peak hour. Alternatively, if Routes C and E were constructed, volumes on C would be approximately 1,400 vehicles per day, with 155 in the peak hour. Peak hour volumes greater than 80 vehicles will likely require analysis of auxiliary lanes and intersection controls on the Glacier Highway.

Access Route C has a maximum grade of 9 percent, which meets the design criteria and is close to the desired grade. This route would require the purchase of ROW, and would be proposed to wrap around to the southeast of the existing church. Due to the proximity of the driveways, the existing church access would be removed and a new church access would be constructed to the northeast to connect with Route C. An alternative that may reduce the impact on the church is shown as Route C2. Access Route C would be designed to create a perpendicular connection at Glacier Highway, which aligns with



the existing Sherwood Lane. Glacier Highway at this location has two 12-foot lanes, a 15-foot two-way-left-turn-lane east of Sherwood Lane, and a hatched transition area of varying width to the west. Due to the existing widened pavement section on Glacier Highway, turn-lanes could be installed at this location with minimal work.

This route does not cross any anadromous streams or wetlands. This route is close to an existing church and any final alignment would need to be coordinated with the affected land owners and designed to minimize or mitigate impacts on this existing use.

#### 4.4.4 Access Route D

Access Route D would start at the Glacier Highway and Engineer's Cutoff Road and travel north to Route F. Access Route D would need to serve approximately 1,600 vehicles per day or approximately 180 vehicles during the peak hour if it was the only access road for development areas 1 through 8. An intersection with this level of operations would potentially require auxiliary (turn) lanes and an evaluation of signalization warrants. If this route were combined with an access road along Route A (for areas 5 to 8) and Route D provided access only for development areas 1 through 4, volumes would be reduced to approximately 900 vehicles per day or about 95 vehicles during the evening peak hour.

The maximum grade along Access Route D would be 9 percent. This access would tie into the Glacier Highway at a 90-degree angle southeast of the church at Engineer's Cutoff Road. Engineer's Cutoff Road is a minor north-south arterial with a 2008 AADT of 1657 that connects Glacier Highway to the south end of Fritz Cove Road. Glacier Highway at Engineer's Cutoff Road currently consists of two 12-foot through lanes, 6-foot paved shoulders, and a northwest bound left-turn lane. A southeast left-turn lane could be added to the 12-foot hatched transition area of the pavement on Glacier Highway; however, some widening would be required.

In order to consolidate access to the Glacier Highway, access to the church and residences along Hamilton Street would be rerouted to the Glacier Highway along Access Route D eliminating the intersection at Hamilton Street and the Glacier Highway. These improvements would require property acquisition along the east boundary of the church property, but would conserve their parking. Several developed lots currently have access from Hamilton Street to the Glacier Highway. The changes to access along Hamilton Street might be viewed negatively by residents in this area.

Casa Del Sol Creek runs through the existing right-of-way used for this access alternative. This creek is anadromous in its lower reaches, and is also listed as an impaired water body for high levels of fecal coliform. The creek is fairly channelized within the study area and there has been some discussion of the potential to reroute a portion of the creek within the study area to avoid areas used for livestock that could contribute further to the fecal coliform levels downstream.

#### 4.4.5 Access Route E

Access Route E connects the development areas to Glacier Highway at Wilma Avenue. Again, it would need to serve approximately 1,600 vehicles per day or approximately 180 vehicles during the peak hour if it was the only access road for development areas 1 through 8. An intersection with this level of operations would potentially require auxiliary (turn) lanes and an evaluation of signalization warrants. If this road provided access to only development areas 1 and 2, the demand would be reduced to about

200 vehicles per day or about 22 vehicles per peak hour and no dedicated turn lanes would be required. This access would tie into the Glacier Highway at 90 degrees.

The maximum grade of this alternative would be 12 percent, which is the maximum allowed under the CBJ design criteria. Private property would need to be acquired for this route, as there is no existing right-of-way to the north from the Glacier Highway at this location. Glacier Highway in this vicinity currently consists of two 12-foot lanes and 8-foot paved shoulders. If turn lanes were required on Glacier Highway, the highway would need to be widened, which would be much more difficult in this area as compared to the other routes. There are also safety concerns regarding placing another intersection on this portion of the highway due to icing concerns in this area and sight-distance limitations related to the highway geometry issues in this area.

No environmental issues were identified for this access alternative.

#### 4.4.6 Route F

Route F connects the development areas with each other and the proposed accesses to Glacier Highway. It does not provide a connection to Glacier Highway. This road is assumed to be designed and constructed to the same collector level as the access routes. Route F has a maximum grade of 7 percent, which meets the CBJ design criteria and is below the desired maximum grade. Traffic along this road will vary depending on the construction of other access routes. As discussed above, approximately 1,600 trips per day would be expected to be generated based on the development assumptions for the conceptual master plan area. The distribution of trips along this road would depend on the location of the access to the Glacier Highway. An alternative alignment along the southern boundary of the development areas may provide an opportunity for more efficient co-location of utility services within the road corridor.

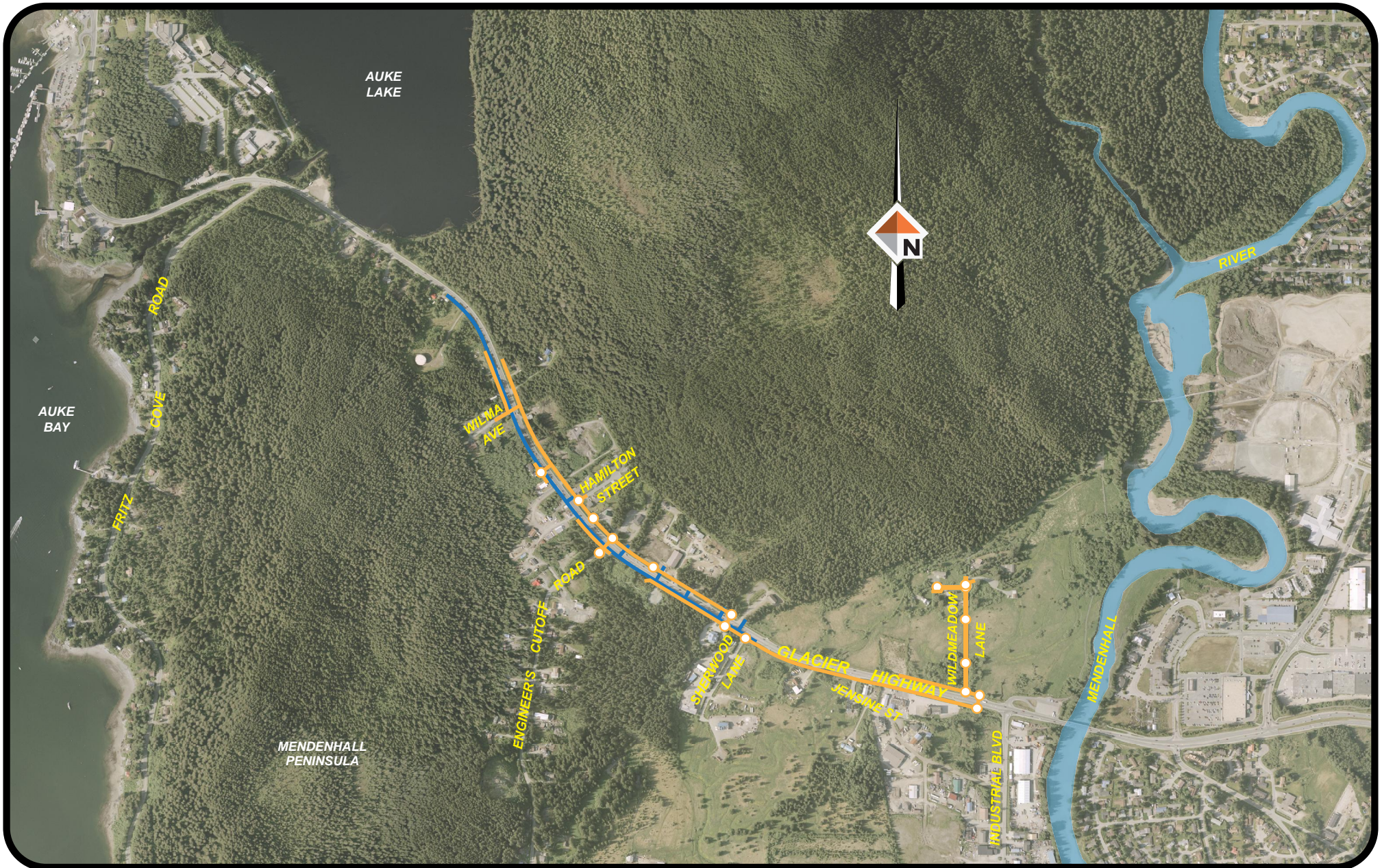
## 5. Utility Analysis

### 5.1 Existing Water

An 18-inch ductile iron pipe (DIP) water main runs along the south side of Glacier Highway through the study area (Figure 8). Two smaller mains branch off the water main and run north towards the proposed development area.

At Wildmeadow Lane, a 10-inch DIP water main line branches off the 18-inch DIP water main line and runs under Glacier Highway. At approximately 40 feet past the northern edge of Glacier Highway, the 10-inch DIP line is reduced to 6-inch DIP water main line. The 6-inch water main line runs to end of Wildmeadow Court and terminates at a cap and thrust block. A fire hydrant is located near the end of the line; static pressure at the fire hydrant was most recently measured at 76 pounds per square inch (psi) with a flow at 1,190 gallons per minute (gpm) at 58 psi residual.

At Hamilton Street, an 8-inch DIP water main line branches off the 18-inch DIP water main line and runs under Glacier Highway. This 8-inch DIP water main line runs the length of Hamilton Street and terminates at a cap. A blow-off hydrant is located near the end of the line; static pressure at the fire hydrant was most recently measured at 55 psi and with a flow at 1,160 gpm at 50 psi residual.



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UTILITIES  
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Figure 8



- WATER LINES
- SEWER LINES & MANHOLE

## 5.2 Existing Sanitary Sewer

The CBJ is proposing to install an 18-inch polyvinyl chloride (PVC) sanitary sewer main line along Glacier Highway in the study area. The sanitary sewer extension along Glacier Highway has been designed but is not yet constructed. This analysis assumes that it will be constructed as currently designed prior to development of the CBJ and UA lands.

At Wildmeadow Lane, a 10-inch PVC sanitary sewer main line runs from a manhole at the north end of Wildmeadow Lane to a manhole at the intersection with Glacier Highway. The line turns east at the manhole and runs approximately 280 feet to a second manhole. The line turns south at the second manhole and crosses under Glacier Highway in a 20-inch casing and connects to the 18-inch sanitary sewer main line at a manhole on the south side of Glacier Highway. The design grade of this entire section of 10-inch sanitary sewer main line is 0.28%.

A 15-foot stub out of 8-inch PVC is located at the undeveloped right-of-way across from the intersection of Glacier Highway and Engineer's Cutoff Road. This line stubs out from a manhole on the 18-inch PVC sanitary sewer main line on the north side of Glacier Highway.

At Hamilton Street, an 8-inch PVC sanitary sewer main line runs from a manhole at the north end of the street to a second manhole mid-block of Hamilton Street, and then to a third manhole at the intersection of Hamilton Street and Glacier Highway. At this point, it connects at a manhole on the 18-inch PVC sanitary sewer main line on the north side Glacier Highway. The upper section of the Hamilton Street main has a design grade of 9.43%; the lower section has a design grade of 5.70%.

## 5.3 Conceptual Utility Requirements

A sanitary sewer capacity analysis (Table 3) was conducted using the housing units per acre information and the following assumptions:

- 3 residents per unit;
- Average water consumption of 100 gallons per capita per day (gpcd);
- Water consumption directly correlates to sanitary sewer effluent volume;
- Peak consumption and flow occur during the morning hours between 7 and 9 a.m.; and
- One third of the daily water consumption occurs during the peak hours.

Groundwater infiltration is not taken into account in this estimate. However, the 3 residents per unit and 100 gpcd assumptions are conservative and offset the need to account for infiltration.

Table 4 below shows the full flow characteristics of 8" PVC pipe at various slopes. Based on a total area peak flow rate of 0.502 ft<sup>3</sup>/sec, 8-inch PVC sanitary sewer pipe would be adequate.

**Table 3. Sanitary Sewer Analysis**

Area ID	Acres	Units	Residents (3 per unit)	Usage at 100 gpcd (1000 GPD)	ft <sup>3</sup> /day	Estimated Peak Flow Rate 7-9 AM (ft <sup>3</sup> /s)
1	0.718	8	24	2.4	321	0.015
2	2.399	24	72	7.2	963	0.044
3	10.338	104	312	31.2	4171	0.191
4	1.990	20	60	6.0	802	0.037
5	2.518	26	78	7.8	1043	0.048
6	2.140	22	66	6.6	882	0.040
7	5.647	57	171	17.1	2286	0.105
8	1.107	12	36	3.6	481	0.022
<b><u>Total</u></b>	<b><u>27</u></b>	<b><u>273</u></b>	<b><u>819</u></b>	<b><u>82</u></b>	<b><u>10951</u></b>	<b><u>0.502</u></b>

**Table 4. Eight Inch PVC Flow Characteristics**

Pipe Size (in.)	Inside Diameter (in.)	Manning # (n)	Slope (%)	Velocity (ft/s)	Discharge (ft <sup>3</sup> /s)	Rate (1000 GPD)
8	7.920	0.009	0.1	1.57	0.54	347
			0.2	2.22	0.76	491
			0.3	2.72	0.93	601
			0.4	3.14	1.07	694
			0.5	3.51	1.20	776
			0.6	3.85	1.32	850
			0.7	4.16	1.42	919
			0.8	4.44	1.52	982
			0.9	4.71	1.61	1042
			1.0	4.97	1.70	1098

## 5.4 Access Route Alternative Utility Analysis

Utility requirements were evaluated for each route alternative, assuming that utilities would be placed in the road corridor. These utility costs do not account for any sanitary sewer infrastructure needed within the development areas. Costs within each development area will vary based on lot layout, type of development, and location within the development area. Depending on the final road alignment, it may be more cost effective to place the main sanitary sewer line in a separate easement along the southern part of each development area.

In each case, a water booster station is required to provide adequate water pressure to areas at elevations above 110 feet mean sea level (msl). Development areas 1, 2 and a portion of 3 are located at or above this elevation.

### 5.4.1 Access Route A

If Wildmeadow Lane was used as the only development access to all of the development areas, the following utility infrastructure would be required: approximately 6,100 linear feet (lf) of 8-inch DIP water main line, 6,100 lf of 8-inch DIP gravity sanitary sewer main line, 1,300 lf of 4-inch DIP sanitary sewer force main, two lift stations (one to serve Area 4 and another to serve Area 8 and approximately half of Area 7), and the reconstruction of 900 lf of 8-inch DIP water main line (to replace the existing 6-inch DIP water main line).

### 5.4.2 Access Route B

If Route B were developed as the only access to all of the development areas, the following utility infrastructure would be required: approximately 6,850 lf of 8-inch DIP water main line, 6,850 lf of 8-inch DIP gravity sanitary sewer main line, 2,500 lf of 6-inch DIP sanitary sewer force main, and two lift stations (one to serve Area 4 and another to serve Areas 8, 7, 6, and 5).

### 5.4.3 Access Route C

If Route C was the only access route to all of the development areas, the following utility infrastructure would be required: approximately 6,000 lf of 8-inch DIP water main line, 6,000 lf of 8-inch DIP gravity sanitary sewer main line, 2,100 lf of 6-inch DIP sanitary sewer force main, and one lift station (to serve Areas 5, 6, 7, 8, and a portion of Area 3).

### 5.4.4 Access Route D

If Route D (Hamilton Street) were the only access to all of the development areas, the following utility infrastructure would be required: approximately 6,200 lf of 8-inch DIP water main line, 6,200 lf of 8-inch DIP gravity sanitary sewer main line, 3,950 lf of 8-inch DIP sanitary sewer force main, and two lift stations (one to serve Area 4 and another to serve Areas 8, 7, 6, 5, and 3).

### 5.4.5 Access Route E

If Route E was developed as the main access road for all of the development areas, the following utility infrastructure would be required: approximately 6,300 lf of 8-inch DIP water main line, 6,300 lf 8-inch

DIP gravity sanitary sewer main line, 5,225 lf of 8-inch DIP sanitary sewer force main, and two lift stations (one to serve Area 4 and another to serve Areas 8, 7, 6, 5, 3, and 2).

## 6. Infrastructure Costs

Rough order of magnitude costs were developed for constructing roads and utilities for this study area. A conservative estimate of the total cost per linear foot is \$1,060. This does not include the required sanitary sewer lift station(s), the water booster station, or sanitary sewer force main. The cost of a lift station is estimated at \$100,000 and the cost of a booster station is approximately \$400,000 - \$700,000. The rough cost for each access alternative is shown in Table 5. Cost estimates could be further refined based on future decisions regarding the configuration of development parcels and other factors.

**Table 5. Order of Magnitude Cost Estimates**

Access Route	Linear Feet	Additional Utilities <sup>1</sup>	Cost <sup>2</sup>
		(\$000s)	(\$M)
A	6,100	\$820-1,020	\$7.3-7.5
B	6,850	\$850-1,050	\$8.2-8.4
C	6,000	\$710-910	\$7.1-7.3
D	6,450	\$995-1,195	\$7.8-8.0
E	6,300	\$1,120-1,320	\$7.8-8.0

<sup>1</sup> Additional utilities include water booster station, sanitary sewer lift station(s) and force main.

<sup>2</sup> Cost does not include any ROW acquisition or needed improvements on Glacier Highway.

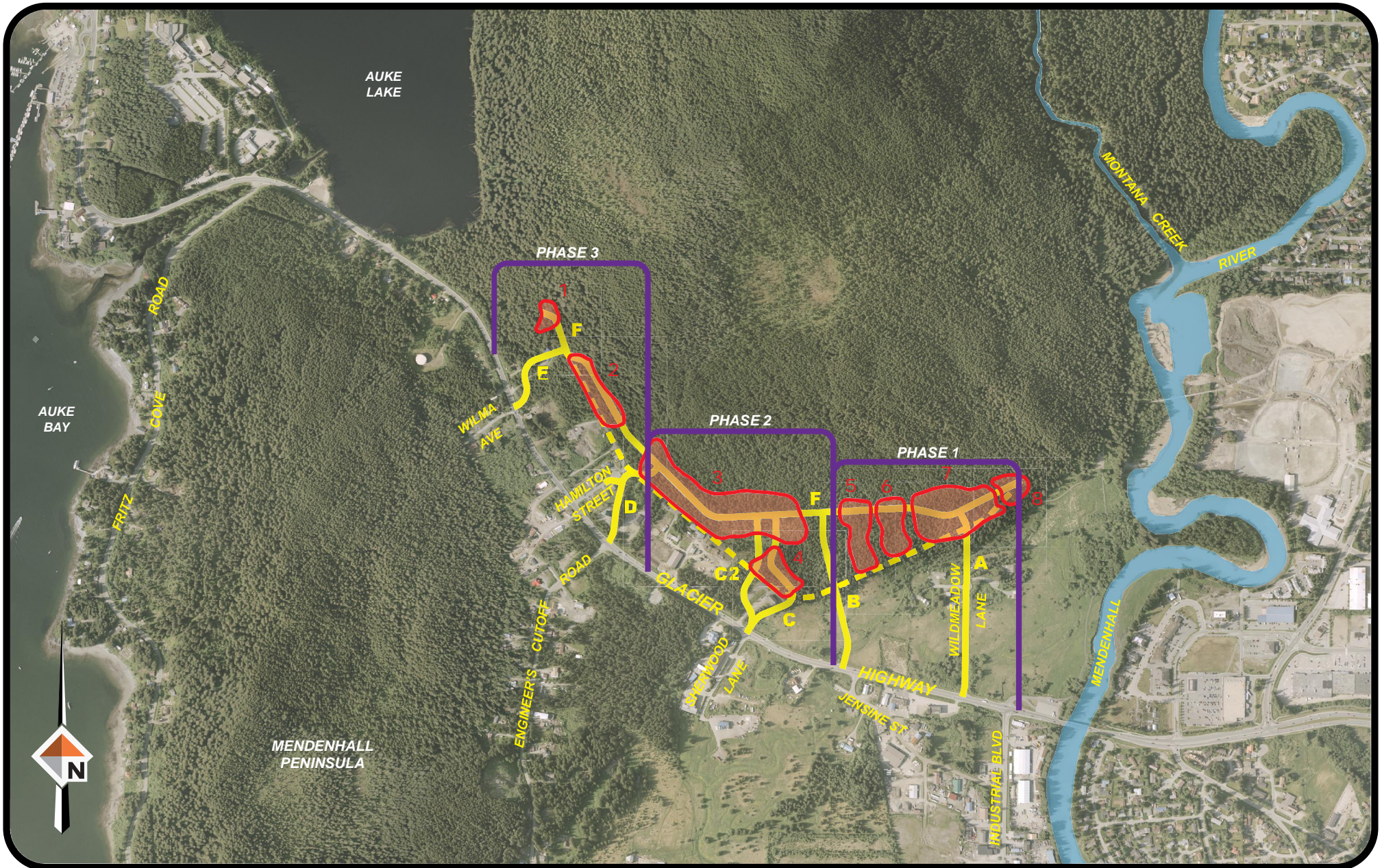
## 7. Phasing and Long-term Planning Issues

### 7.1 Phasing

The costs estimated above assumed that all development areas were served via one access road. There are several drawbacks to this assumption, including higher utility costs, poorer emergency access, and higher Glacier Highway intersection improvements required. Development phasing could also reduce costs, as some areas could be accessed and provided with utilities at a much lower cost than other areas. Potential phasing is discussed below (Figure 9).

**Phase 1.** This phase would include development of areas 5 through 8 with Access Route A. These areas could be developed without the need for a water booster station or sanitary sewer lift station and with a minimal amount of new road construction. The lower volume of traffic associated with these areas would minimize the need for additional improvements at Glacier Highway.

**Phase 2.** This phase would include development of areas 3 and 4 with Access Route C. Again, most of this area could be developed without a water booster station or sanitary sewer lift station. This phase






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June 2010

CONCEPTUAL MASTER PLAN PHASING  
 PEDERSON HILL ACCESS STUDY  
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Figure 9



-  DEVELOPMENT AREAS
-  PROPOSED ROUTES
-  ALTERNATE ROUTE F



could also be constructed without Access Route C and could rely solely on Access Route A; however, that could trigger a need for a sanitary sewer lift station and additional improvements at Glacier Highway.

**Phase 3.** Development of areas 1 and 2 and the western portion of area 3 would be proposed as the last phase. These areas would require a water booster station to achieve an acceptable water pressure. Access Routes D or E could provide additional access for emergency services and reduce travel time for residents heading west on Glacier Highway.

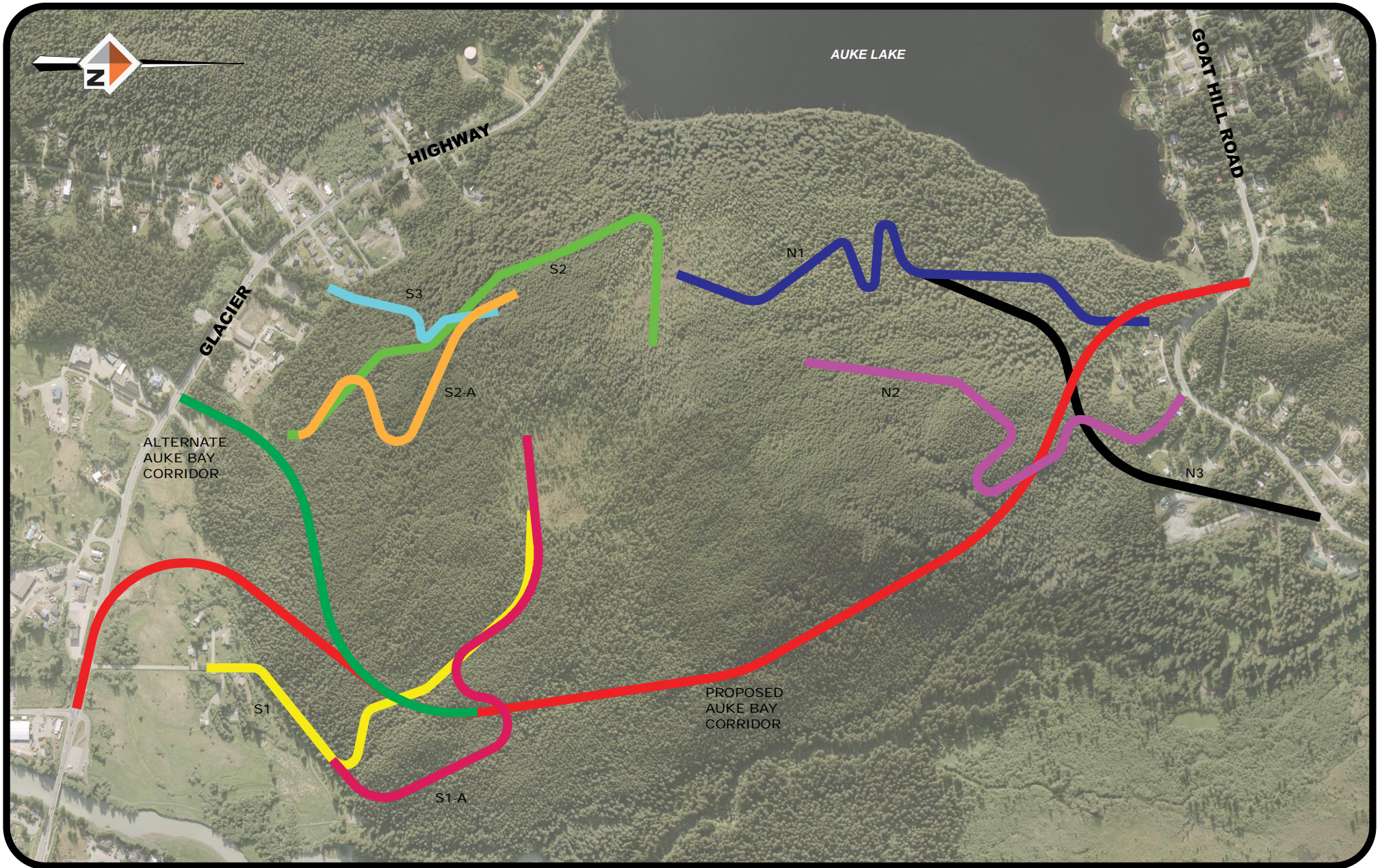
## 7.2 Long-term Planning Issues

The CBJ and UA also own property located north of the development areas addressed in this access study. A number of potential access routes to the top of the hill from the study area were evaluated from the south and from the north (Figure 10). Revisions to the eastern route from the south (S-1) were successful in reducing the maximum grade to under 10% (at 9.24%). The western route from the south exceeded 12%. Two potential routes from Goat Hill Road were preliminarily estimated to have maximum grades of 9-10%. These preliminary routing evaluations indicate that, by using switchbacks, acceptable road grades may be within reach but could result in longer access roads and higher construction costs.

The Alaska Department of Transportation & Public Facilities (DOT&PF) conducted an Auke Bay Corridor Reconnaissance Study in 2004. This study identified a possible bypass corridor that leaves the Glacier Highway near Industrial Boulevard and follows the east side of Pederson Hill around the hill to Goat Hill Road. This Auke Bay Corridor route has a maximum grade of just under 10%. The reconnaissance study shows this route beginning from the Brotherhood Meadow just west of Wildmeadow Lane and swinging through this wetland area, through development areas 5 through 8, and then to the north around the east side of the hill (Figure 10). This proposed corridor alignment would reduce the developable areas on the CBJ and UA properties; the extent of the impact would depend on the width of the right-of-way required. Impacts to the developable area of the properties could be minimized while maintaining a reasonable road grade if the bypass route instead headed east and then north from the north end of Wildmeadow Lane. An alternative alignment from this point is shown in Figure 10.

## 8. Conclusion

The CBJ is facing a significant housing shortage. In response to the need for additional housing, the CBJ is evaluating the potential to use CBJ and UA properties on Pederson Hill for medium density residential development. The properties owned by the CBJ and UA on Pederson Hill have development constraints, including wetlands, streams and drainages, steep slopes and a lack of existing access and utility infrastructure. Five access alternatives were evaluated for providing access to developable areas. Although technically feasible, providing service to all of the potential development areas with one access road to the Glacier Highway has significant drawbacks including higher utility costs, poorer emergency access, and a greater need for improvements at the intersection with Glacier Highway. Therefore, the CBJ may want to consider multiple access routes and/or phased development starting with the development areas to the east that are the closest to existing infrastructure.



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LONG-TERM ROAD ALIGNMENTS EVALUATED  
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Figure 10



The chart below summarizes the advantages and disadvantages of the various access routes, if used to provide access to all 8 development areas. Access Route A has the fewest non-favorable ratings, while Access Route C has the most favorable ratings. Access Routes A and C appear to be the most favorable based on the generalized criteria considered. From a circulation and utility service perspective, constructing both Routes A and C would reduce utility costs and provide better circulation and emergency access to the development areas. Cost estimates for providing utility service using these two access routes for development areas 3 through 8 could be refined with further analysis of the development areas in terms of lot configuration, type of development and density. Given the cost of extending infrastructure to these area and the development constraints in the area, development concepts will need to achieve a fairly high density of development in smaller areas with large areas of open space to be financially feasible while being sensitive to the natural environment.

	Access Route A	Access Route B	Access Route C	Access Route D	Access Route E
 Yes/Favorable  Maybe/Moderate  No/Not Favorable					
Creates Favorable Intersection Geometry at Glacier Highway					
Maximizes Intersection Sight Distance					
Provides Better Access to Larger Development Areas					
Minimizes Construction Cost					
Minimizes ROW Acquisition Needs					
Minimizes Roadway Grades					
Decreases Number of Roads Accessing Glacier Highway					
Impacts to Private Lands/Existing Residences/Access					
Environmental Concerns (wetlands, anadromous streams, eagle nests, etc.)					

DOT&PF was asked to review and comment on a draft copy of this access study. DOT&PF’s comments noted that the Access Route A (Wildmeadow Lane) was the most likely location for a future signalized

intersection, making this the best location for access to the development areas. DOT&PF also indicated that they were open to the possibility of also constructing access along Access Route C, but would need to see more analysis on the need for two access points to Glacier Highway prior to making any final decisions. Finally, DOT&PF acknowledged that although no final decision has been made on the specific routing of the proposed Auke Bay Corridor, nothing in this access study appears to be inconsistent with their future plans for this corridor.