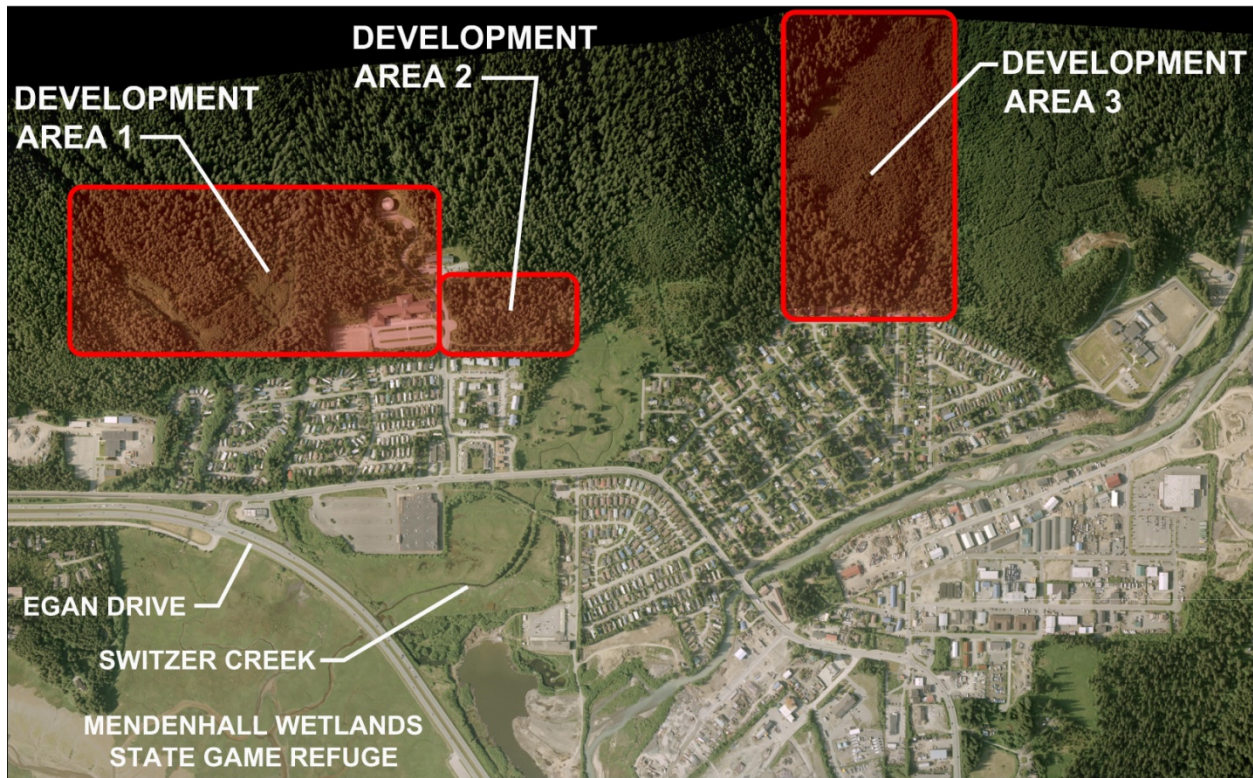


CBJ SWITZER LANDS RESIDENTIAL DEVELOPMENT STUDY



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R&M Project No. 111379
May 7, 2012

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CITY AND BOROUGH OF JUNEAU
CBJ SWITZER LANDS RESIDENTIAL DEVELOPMENT STUDY

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CBJ SWITZER LANDS RESIDENTIAL DEVELOPMENT STUDY

1. Introduction

City and Borough of Juneau (CBJ) residents are suffering from a housing shortage. The 2008 CBJ Comprehensive Plan documents the following:

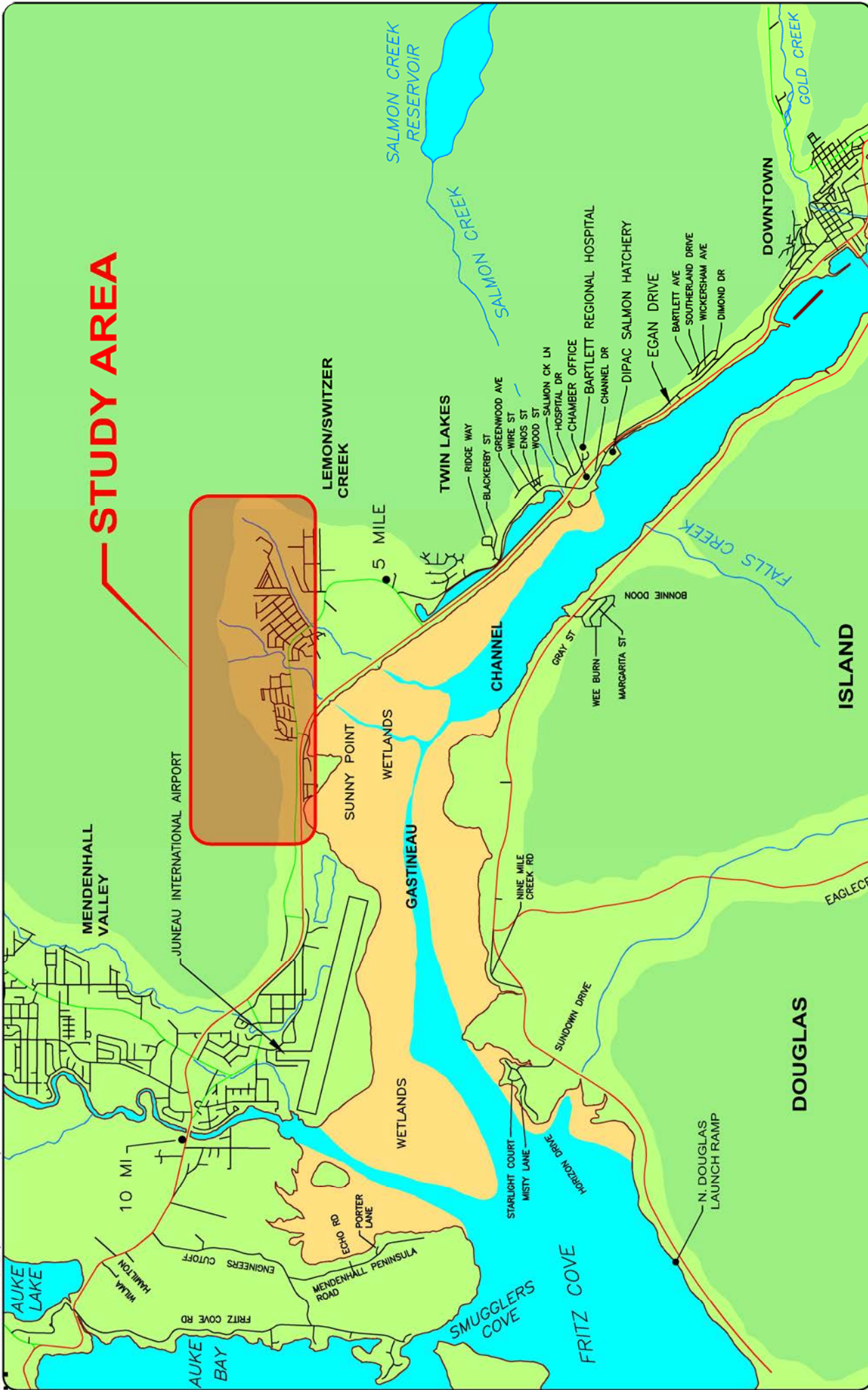
- Insufficient supply of housing to provide residents adequate choice in housing size, location and price.
- Many residents live in overcrowded and/or unsafe and unsanitary conditions.
- Many households are paying more than 30% of their household income for shelter.

Providing affordable housing has been a top priority of the CBJ for quite some time. In the last 5 to 10 years, the CBJ has been trying to encourage development of lands in the existing service areas that already have CBJ sewer, water and transit service. The CBJ has also added sewer to North Douglas and the Pederson Hill area to encourage development in those areas.

The CBJ owns land on Pederson Hill and in the Switzer area and is currently focusing on these two areas to offer CBJ land residential development. The CBJ engaged R&M Engineering, Inc. (R&M) to produce this study of their Switzer lands. The intent of this, CBJ Switzer Lands Residential Development Study is to evaluate potential development areas, development costs and phasing for CBJ owned property in the Switzer area. The CBJ engaged DOWL HKM to prepare a report titled *Pederson Hill Access Study* (July 22, 2010) to evaluate similar issues for CBJ owned property on Pederson Hill.

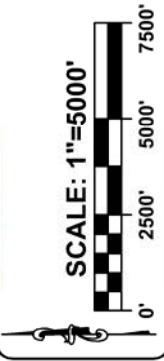
In 1997, R&M prepared a report for the CBJ titled *CBJ Switzer Area Land Study*. That study investigated 741 acres of CBJ property. This 2011 study focuses on a smaller portion of the *CBJ Switzer Area Lands Study*, about 130 acres, zoned and suitable for residential development, see Figure 1, evaluating potential development areas, costs and phasing. The specific development areas addressed in this study are shown in Figure 2. The development areas were determined by excluding land steeper than 18%, which would be difficult and thus expensive to develop. This resulted in three distinct areas labeled from west to east, Development Areas 1, 2 and 3. Development Area 1 is west of Renninger Street and Dzantik'i Heeni Middle School (DZMS); north of Renninger and DZMS; and consists of approximately 58 acres. Development Area 2 is East of Renninger Street; north of Gruening Park; and consists of approximately 7.8 acres. Development Area 3 is the furthest east; is northwest of the Lemon Creek Jail; and consists of approximately 61 acres.

There are privately owned properties and properties owned by Mental Health Trust in the Switzer area that are undeveloped, and zoned for residential development. A property ownership map is included as Figure 3.

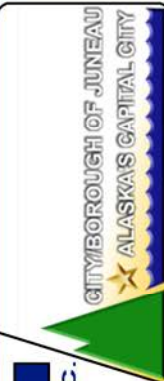


STUDY AREA

FIGURE 1

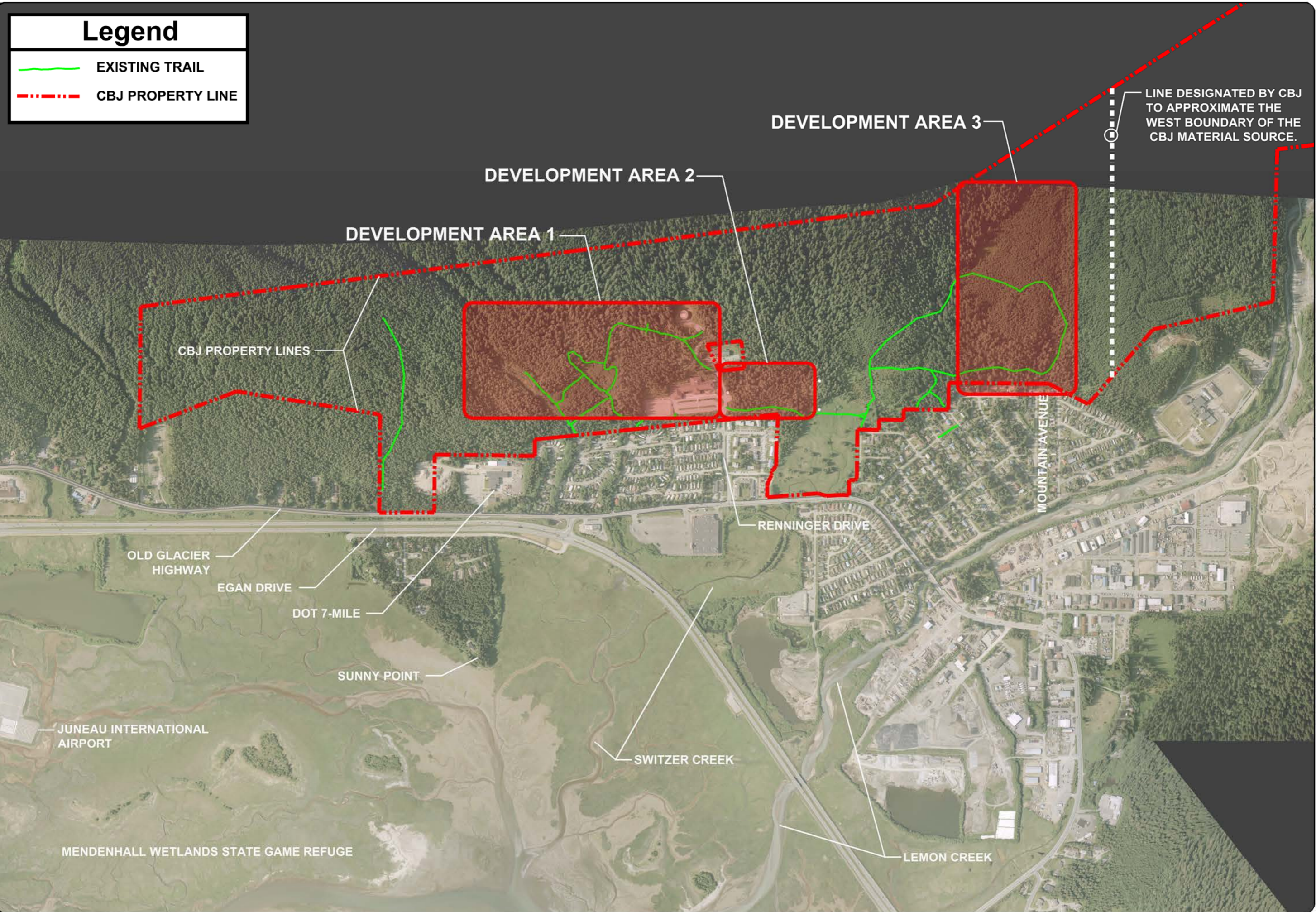


**VICINITY MAP
 CBJ SWITZER LANDS
 RESIDENTIAL DEVELOPMENT STUDY
 JUNEAU, ALASKA**





STUDY AREA
 CBJ SWITZER LANDS
 RESIDENTIAL DEVELOPMENT STUDY
 JUNEAU, ALASKA



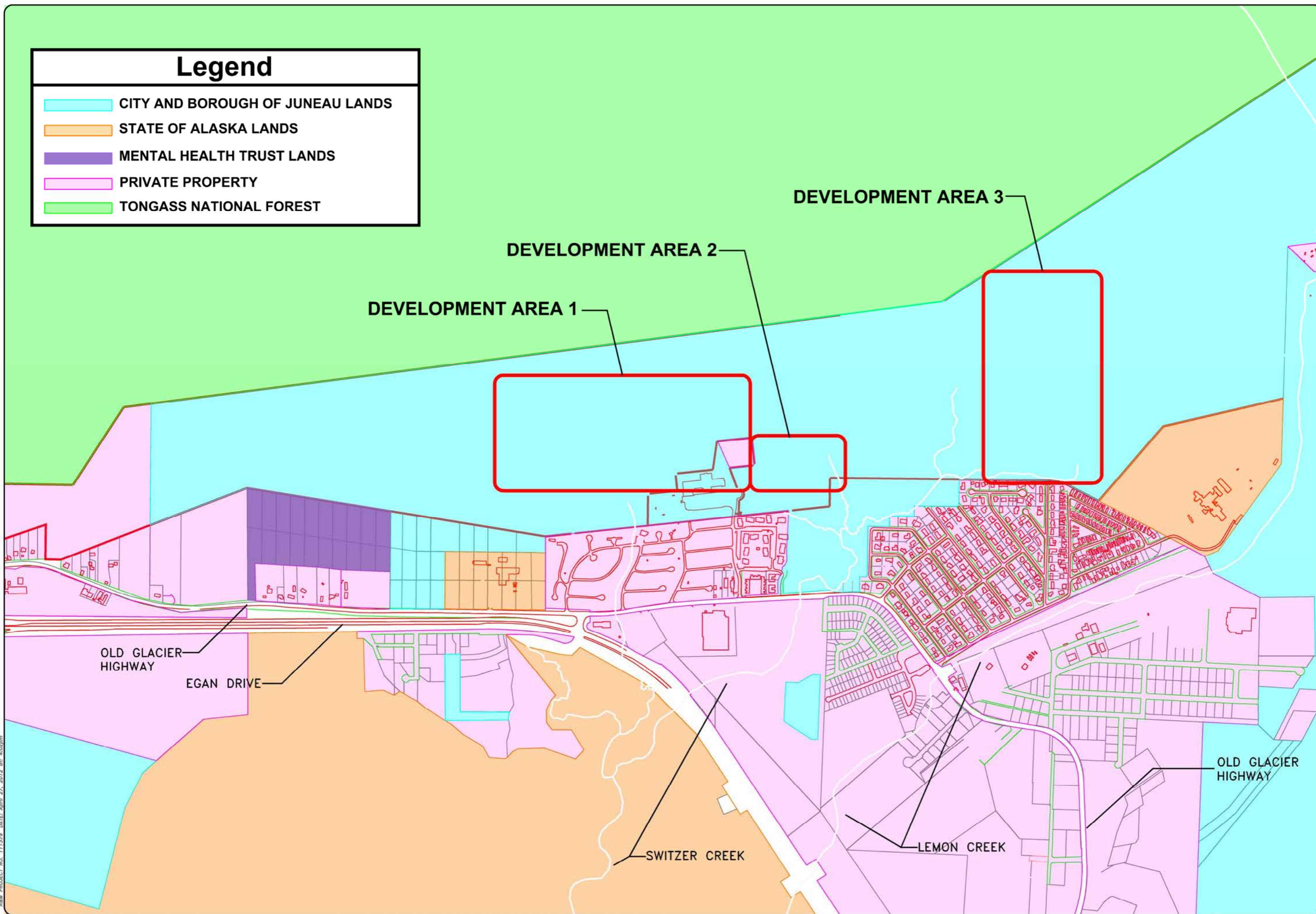


PROPERTY OWNERSHIP MAP
 CBJ SWITZER LANDS
 RESIDENTIAL DEVELOPMENT STUDY
 JUNEAU, ALASKA



Legend

- CITY AND BOROUGH OF JUNEAU LANDS
- STATE OF ALASKA LANDS
- MENTAL HEALTH TRUST LANDS
- PRIVATE PROPERTY
- TONGASS NATIONAL FOREST



RAW PROJECT NO. 111579 DATE: April 27, 2019 chr: 4602pm

2. Environmental Development Constraints

Development constraints typically include wetlands, rivers, creeks, drainages, waters of the United States, flood zones, unsuitable soils, lack of road access, steep terrain, anadromous fish habitat, eagle nests and other habitat issues. The Switzer areas under study are constrained by most of these issues.

The primary environmental development constraints in this area are steep terrain, wetlands and waters of the United States; anadromous fish streams; and bald eagle nest trees. These constraints are discussed below and are depicted on Development Area 1, Figure 6; Development Area 2, Figure 7; and Development Area 3, Figure 8.

2.1 Steep Terrain

To determine unsuitably steep terrain, 2001 LIDAR mapping provided by the CBJ was used to identify areas where slopes exceed 18%. For the purposes of this report, land with a slope greater than 18% is considered too steep to support development. Since maximum road grades are limited to 15% for short distances and desirable road grades are no greater than 8%, gaining access to land with slopes exceeding 18% becomes extremely expensive. After examining the study area, three parcels of land have large enough contiguous areas with slopes acceptable for development. These are called Development Areas 1, 2 and 3 and are shown in Figures 6 through 8.

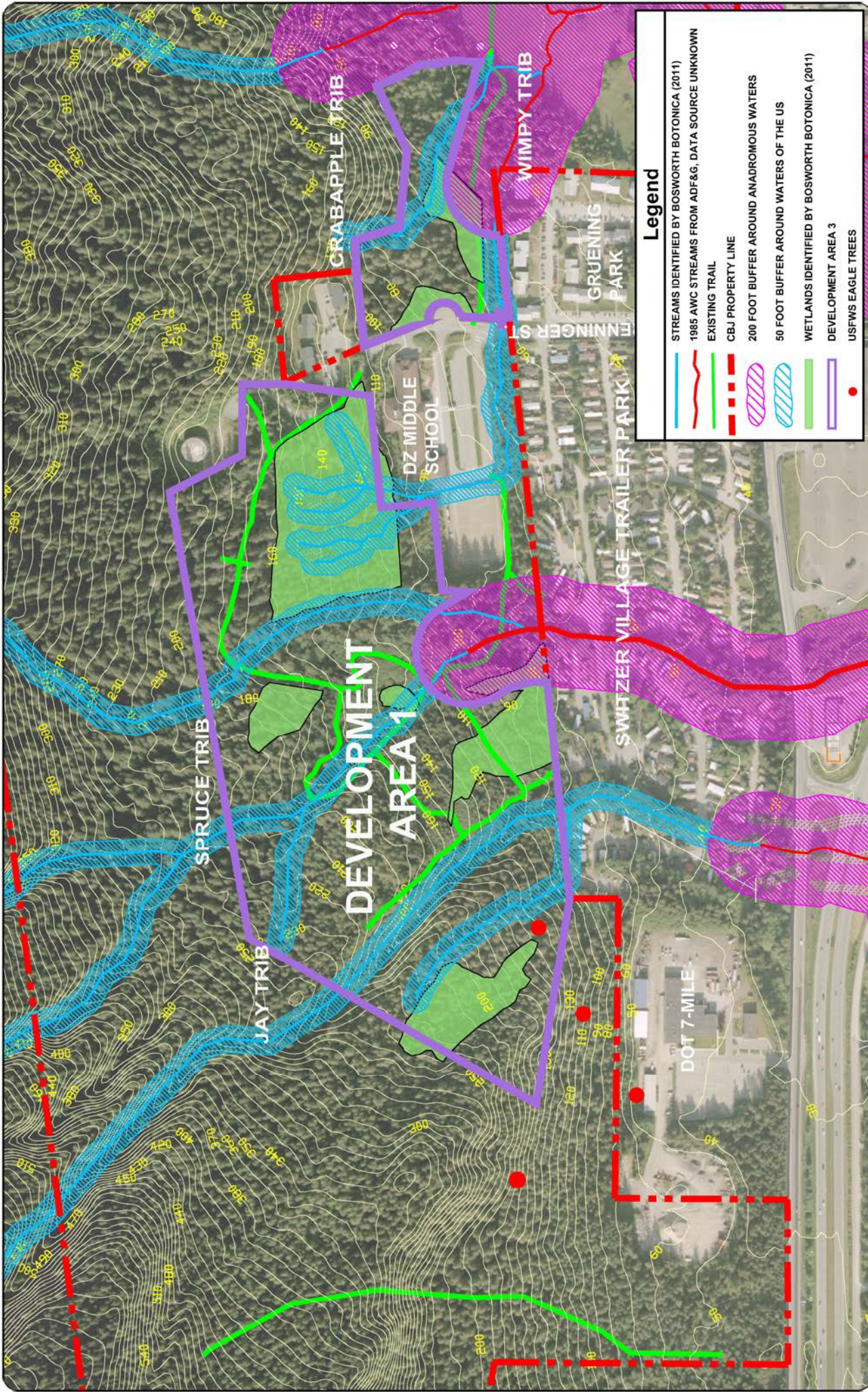
2.2 Wetlands and Waters of the United States

The United States Army Corp of Engineers (USACE) has jurisdiction over wetlands and over Waters of the United States (WOTUS). Wetlands on this site are primarily fen and bog type wetlands.

Koren Bosworth, of Bosworth Botanical, was subcontracted to trace streams and outline wetland boundaries. A comprehensive wetland survey was performed and an AutoCAD drawing produced with wetland boundaries and streams. All streams require a 50 foot buffer in accordance with CBJ code. All proposed access alignments in the development areas attempt to minimize wetland impact, as well as stream crossings.

2.3 Anadromous Fish Streams

The study area contains three main anadromous fish streams: Switzer Creek, East Creek and West Creek. These are noted by the Alaska Department of Fish and Game (ADF&G) in their Anadromous Waters Catalog (AWC) as anadromous stream numbers 111-40-10070, 111-40-10060, and 111-40-10050, respectively. In addition, a number of tributaries of these streams contain anadromous fish habitat, although not all have been catalogued. We received and used AutoCAD drawings from ADF&G Division of Sports Fish (September 1, 2011) showing the extent of the anadromous fish streams.



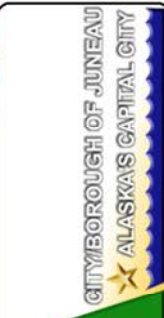
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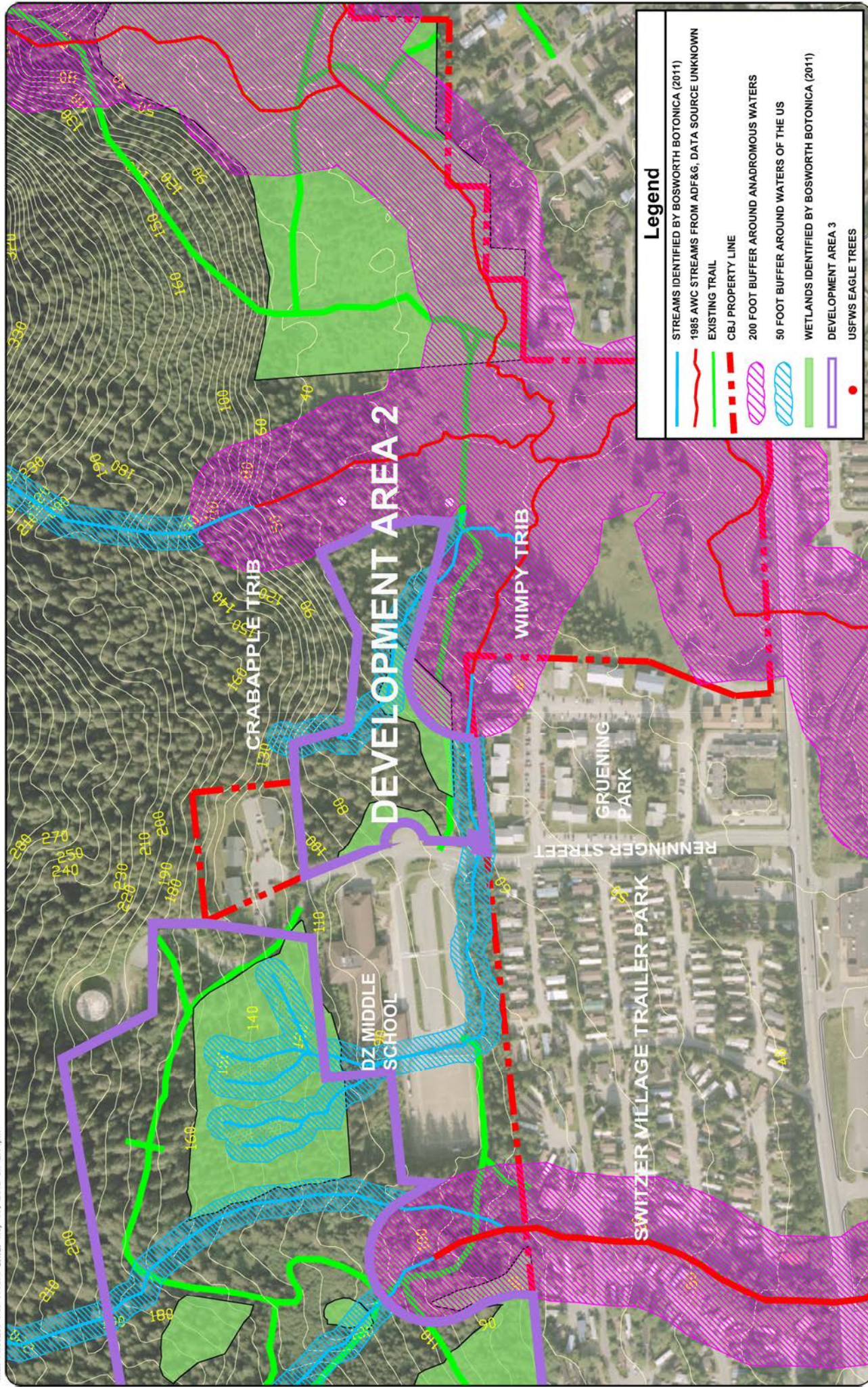
- STREAMS IDENTIFIED BY BOSWORTH BOTONICA (2011)
- 1985 AWC STREAMS FROM ADF&G. DATA SOURCE UNKNOWN
- EXISTING TRAIL
- CBJ PROPERTY LINE
- 200 FOOT BUFFER AROUND ANADROMOUS WATERS
- 50 FOOT BUFFER AROUND WATERS OF THE US
- WETLANDS IDENTIFIED BY BOSWORTH BOTONICA (2011)
- DEVELOPMENT AREA 3
- USFWS EAGLE TREES

FIGURE 4
PAGE 6 OF 29



ENVIRONMENTAL CONSTRAINTS MAP AREA 1
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA





Legend

- STREAMS IDENTIFIED BY BOSWORTH BOTONICA (2011)
- 1985 AWC STREAMS FROM ADF&G. DATA SOURCE UNKNOWN
- EXISTING TRAIL
- CBJ PROPERTY LINE
- 200 FOOT BUFFER AROUND ANADROMOUS WATERS
- 50 FOOT BUFFER AROUND WATERS OF THE US
- WETLANDS IDENTIFIED BY BOSWORTH BOTONICA (2011)
- DEVELOPMENT AREA 3
- USFWS EAGLE TREES

FIGURE 5
PAGE 7 OF 29










SCALE: 1"=400'

ENVIRONMENTAL CONSTRAINTS MAP AREA 2
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA

F&M ENGINEERING, INC.

CITYBOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY

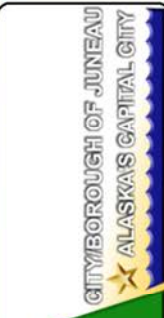
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-  STREAMS IDENTIFIED BY BOSWORTH BOTONICA (2011)
-  1985 AWC STREAMS FROM ADF&G, DATA SOURCE UNKNOWN
-  EXISTING TRAIL
-  CBJ PROPERTY LINE
-  200 FOOT BUFFER AROUND ANADROMOUS WATERS
-  50 FOOT BUFFER AROUND WATERS OF THE US
-  WETLANDS IDENTIFIED BY BOSWORTH BOTONICA (2011)
-  DEVELOPMENT AREA 3
-  USFWS EAGLE TREES

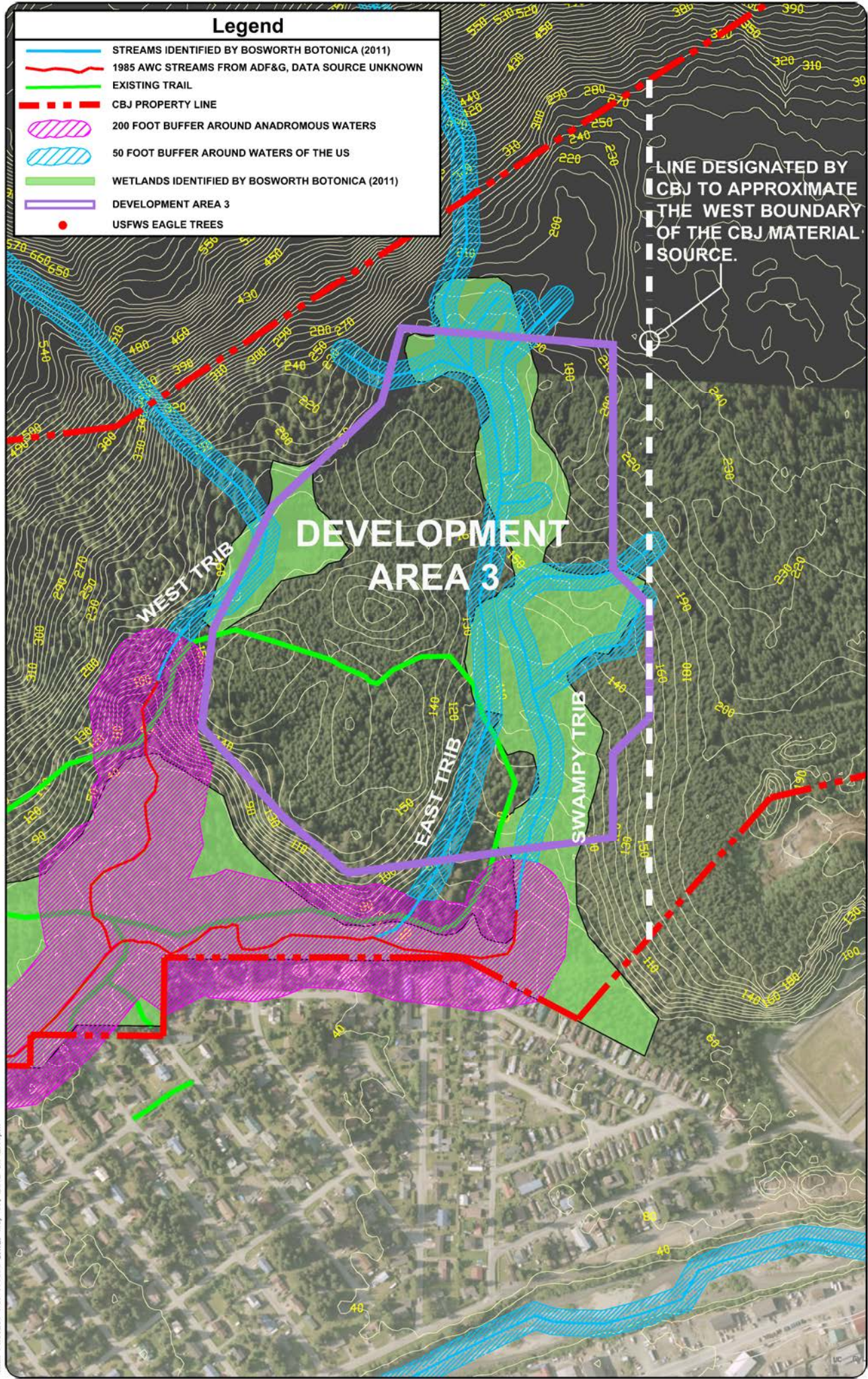
LINE DESIGNATED BY CBJ TO APPROXIMATE THE WEST BOUNDARY OF THE CBJ MATERIAL SOURCE.



ENVIRONMENTAL CONSTRAINTS MAP AREA 3
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA



R&M PROJECT NO. 111579 DATE: May 07, 2013 at: 2:16pm



The locations from ADF&G were adjusted using handheld GPS data obtained by BBC in August and September of 2011. ADF&G Division of Habitat field staff reviewed and approved these adjusted locations in October and November of 2011. They indicated they will nominate these locations for the next AWC catalog revision. All anadromous salmon streams are shown on our constraints figures with a 200-foot buffer, which is recommended by ADF&G. It is noted that road access is allowed through these buffers when designed to meet agency permitting requirements.

2.4 Bald Eagle Nest Trees

Bald eagles and their nests are protected by the Bald Eagle Protection Act of 1940. This act prohibits taking or disturbing bald eagles or their nests, and is regulated by the US Fish and Wildlife Service (USFWS). Bald eagles are most susceptible to disturbance during the nesting season, which generally runs from early March through August. The USFWS provided maps with the location of eagle nests. The nests were catalogued into their data base between 1994 and 1996. Bald eagles were recently removed from the endangered species list; which has changed the USFS permitting process.

We could not locate the catalogued USFWS eagle trees in the field. However, we did find a tree that appeared to have an eagle's nest that was not catalogued by USFWS. Eagle nests can be abandoned and new nests can occur each year; so any development will need to reevaluate current nest locations just prior to permitting and construction.

The USFWS catalogued eagles' nests are shown on our constraints figures and on Figure 5.

2.5 Geology and Geotechnical

Glaciation is the major geologic event that produced the topographic features and soils in the study area. During the late Pleistocene time (10,000 years ago) ice was as much as 4,000 feet thick in this area. Between 8,000 and 10,000 years ago the climate began warming and the ice melted. The glacial-scoured fjords filled with sea water, which was 600 feet higher relative to the land than it is today. The unloading of the ice and tectonic forces combined to produce a steady, but slow rise of the land (isostatic rebound). Glacial outwash poured silt, sand and icebergs into the fjords. The glaciomarine Gastineau Channel Formation was deposited from the glacial outwash material settling out of the seawater during this time of emergence.

As sea level lowered, wave cut benches and elevated beach deposits were left "stranded" above present day sea level.

2.6 Surficial Soil Units

The study area is located on the south slope of Heintzleman Ridge. There are six distinct surficial geologic deposits in the study area (*Surficial Geologic Map of the Juneau Urban area and Vicinity, Alaska*), by Robert D. Miller, 1975). Bedrock dominates at elevations above 300 feet to 500 feet, it outcrops or is covered with a thin mantle of soil, trees and brush. The bedrock is metamorphosed sedimentary and volcanic rocks (greywacke, schist and greenstone).

Weathering of the bedrock on steep slopes has produced a variety of gravity deposits (colluvium, talus, rubble and rock falls) downslope from the bedrock outcrops. These deposits consist of angular particles that range in size from silt to boulders. They are generally poorly consolidated and very porous. Their thickness ranges from 2 feet to 20 feet.

Mantling the lower slopes (generally below elevation 300 feet) are the extensive glaciomarine deposits for the Gastineau Channel Formation (Robert D. Miller, 1973). These are blue-gray silts and sands that range in consistency from soft and slippery to dense and rock hard. Their thickness ranges from 4 feet to 60 feet. At their lower elevations they are often covered with elevated silty gravelly raised beach deposits that are less than 5 feet thick.

There is a large, ancient (pre-1500) landslide deposit at the base of Heintzleman Ridge southeast of Switzer Creek. It is a heterogeneous mixture of angular rocks, soil, silt and sand. It probably ranges in thickness from 2 feet to 20 feet. These deposits are stabilized, but likely to be poorly consolidated. Development area 3 is almost entirely on this stabilized landslide deposit.

On the flat terrain in lower Switzer Creek and below Glacier Highway are large areas of emergent intertidal silts and sands that are typically loose and poorly consolidated. Some areas of peat have been noted ranging in thickness from 3 feet to 10 feet.

2.7 Geologic Hazards

Small landslides and avalanches are common on the steep upper slopes of Heintzleman Ridge. However, none of the active slide tracks extend below 2,000 foot elevation in this study area. Timberline is at approximately 2,000 foot elevation and the slope is heavily forested and less steep below this elevation.

Previously published work show that slopes in Juneau steeper than 37 degrees are generally highly unstable with regard to landslide hazards and slopes between 28-37 degrees are generally considered potentially unstable (*Geophysical Hazards Investigation for the City and Borough of Juneau, Alaska, a Summary Report*, by DMJM, 1972).

2.8 Geotechnical Investigations

R&M conducted over 100 test pits and soil boring logs in the vicinity of Development Areas 1 and 2 in conjunction with housing projects and the Dzantik'i Heeni Middle School (DZMS) geotechnical reports

and studies. This sub-surface information is not site specific and may not indicate exact conditions for infrastructure and housing construction; but it does give a general idea what to expect.

2.8.1 Geotechnical Investigations in Development Area 1

R&M performed 46 test pits, probes and bore holes in 1990 related to the geotechnical report for DZMS. There was no strong pattern of stratification or segregation found on the site. Soil conditions at the site satisfy most of the criteria for definition of “fan deposits”. Rapid Channel changes have resulted in the burial of peat deposits and fallen or standing trees by granular material. Some stream cut banks reveal cross sections of stream channels crossing stream channels which were subsequently filled.

Ground water level varies considerably over the site. In certain test pits, three to four pervious water-bearing soil levels were encountered during excavation; while in the test pits in the most northeasterly corner of the school site, no water was encountered in the highly pervious gravelly soil.

Soil conditions were marginal for the design and construction of the conventional reinforced concrete spread footing foundations used for the school; however, by over-excavating and removing organic soils and over-excavating and re-compacting soft soils in the building footprint, the school foundation has performed very well.

2.8.2 Geotechnical Investigations near Development Area 2

R&M performed subsurface investigations for the original Gruening Park complex in 1972. Some of these borings are just south of Development Area 2. In addition, R&M performed subsurface investigations for the Gruening Park complex addition 1992. Three holes were done for the building in the northeast corner of the complex. In 1994, Crowther Associates did a subsurface investigation north of Development Area 2. After construction of three housing units north of Development Area 2, there were settlement problems with Building C; and R&M did test pits and borings to identify the problem and determine a solution. R&M’s borings and test pits were just north of Development Area 2. Several of the borings for DZMS were just west of Development Area 2, on the west side of Renninger Street.

While none of the existing subsurface information is directly in Development Area 2, the information near the west portion of Development Area 2 is favorable for conventional foundations. The information south of the eastern portion of Development Area 2 led to a piling foundation.

2.8.3 Soils in Development Area 3

We are not aware of any geotechnical investigations in this area; however as noted above, Development Area 3 is almost entirely on a stabilized landslide deposit consisting of a mixture of angular rocks, soil, silt and sand, which may be poorly consolidated. To the east, the CBI is extracting gravel and R&M has done probes in that area that indicates fairly good sand and gravels; but also includes some peat and organic deposits.

It is our assumption that conventional foundations would be appropriate in Development Area 3; but specific subsurface investigations would be required once housing locations are known.

3. Future Elementary School Site

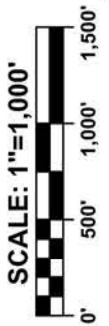
The CBJ and the Juneau School District (JSD) agree that long term community development includes land set aside for a future elementary school in the Switzer Creek area. To support this concept, the CBJ Comprehensive Plan references a future elementary school in the Switzer Creek area. The JSD envisions that the new school would be above the Switzer Creek Mobile Home Park, and separated from DZMS by a trail system and wetlands. However, a specific amount of land and a precise location for the future school has not been established. For this study, and for conceptual planning purposes, the future school site is represented proximate to DZMS. Considering the siting and location needs of an elementary school, this study concludes that a future elementary school could be located in any of the development areas.

The State of Alaska Department of Education and Early Development (DEED) currently use a *Selection Criteria and Evaluation Handbook* (1997), to recommend the site size. That handbook recommends 10 acres plus one acre for every 100 students. Using the average, or the high value of the current Juneau elementary student population, would yield a recommended site of between 13 and 14 acres. DEED is currently drafting a new method which will follow the current recommendations of the Council of Educational Facility Planners publication *The Guide for Planning Educational Facilities*, which will result in a recommendation of less land area for site size. For comparison, we obtained rough site acreage of the existing six elementary schools from Google Earth. The existing school sites average just over 8 acres. The largest is 15 acres and most are less than 8 acres.

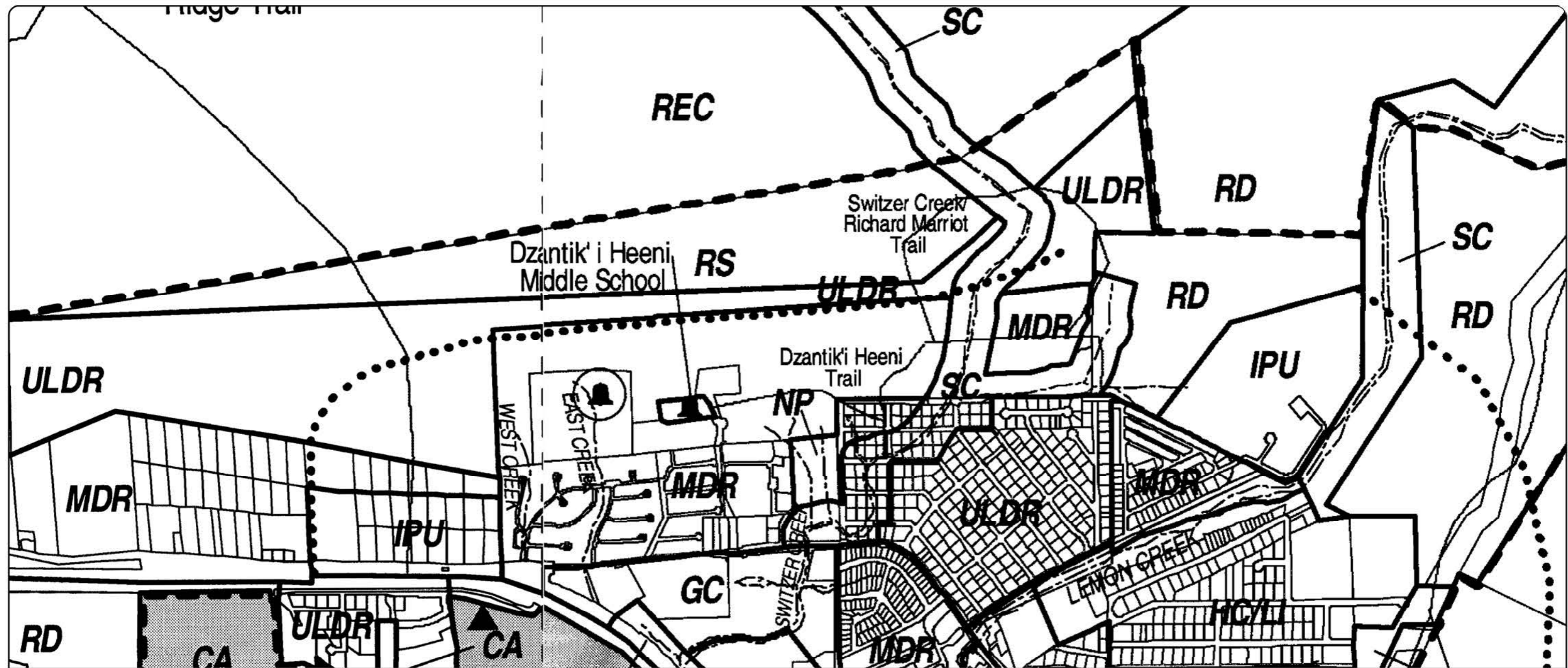
Members of the project team met with JSD representatives in November 2011. The JSD expressed interest in maintaining the trails and a future school site west of DZMS. They showed some interest in the 8 acres east of DZMS on the east side of Renninger Street. They were also interested in a planned unit housing development around a future school site in Development Area 3, similar to the way housing is laid out around Glacier Valley School. The need for another elementary school is not immediate and based on recent population trends is probably decades in the future. More consideration will be appropriate as demand for the future school is realized and the CBJ initializes planning for the development areas. For planning purposes, a ten acre site is identified in Development Area 1; but actual size and location would be determined in the future, Figure 11. This school site as depicted could displace up to 230 potential dwelling units.

4. Conceptual Development Areas

The Switzer Study Area is located primarily in subarea 5 of the Juneau Comprehensive Plan, which is the Switzer Creek, Lemon Creek and Vanderbilt Creek area land use maps, Figure 7. The Comprehensive Plan lists 15 guidelines and considerations for subarea 5.



2008 CBJ COMPREHENSIVE PLAN MAP
 CBJ SWITZER LANDS
 RESIDENTIAL DEVELOPMENT STUDY
 JUNEAU, ALASKA



NATURAL RESOURCE

- REC** Recreational Resource
- RD** Resource Development
- SP** State Park
- FP** Federal Park
- NP** CBJ Natural Area Park
- RS** CBJ Recreational Service Park
- CA** CBJ Conservation Area
- SC** Stream Protection Corridor

COMMERCIAL INDUSTRIAL

- GC** General Commercial
- WC** Waterfront Commercial
- WCI** Waterfront Commercial Industrial
- HC/LI** Heavy Commercial/Light Industrial
- IND** Industrial

RESIDENTIAL

- RDR** Rural Dispersed Residential
- RLDR** Rural Low Density Residential
- ULDR** Urban Low Density Residential
- MDR/SF** Medium Density Residential- Single Family
- MDR** Medium Density Residential
- HDR** High Density Residential
- MU** Mixed Use
- M/MU** Marine Mixed Use

PUBLIC

- IPU** Institutional and Public Use
- Existing School
- Potential School Location

ROADS TRAILS

- Potential Arterial (alignment not specific)
- Potential Road (alignment not specific)
- Trails

OTHER

- New Growth Areas
- Mendenhall Wetlands
- State Game Refuge
- Subarea Boundary
- Urban Service Area
- Beach Access
- Streams

City & Borough of Juneau
COMPREHENSIVE PLAN

Adopted October 20th, 2008
 Ordinance No. 2008-30

NOTE: Potential geophysical hazards, wetlands, flood zones, natural resource setbacks or other features which can affect properties may be present. CONTACT THE COMMUNITY DEVELOPMENT DEPARTMENT FOR DETAILED INFORMATION.

Comprehensive Plan guidelines and consideration numbers 2, 7 and 13 are relevant to this study and are listed in part as follows:

2. Provide for additional medium to high density residential development in areas with access to arterial roadways from collector streets.
7. Reserve wetlands and tidelands in public ownership for fish and wildlife habitat and open space/natural areas.
13. Parks and Recreation recommends a number of parks, trails, a community garden and stream corridor improvements. Those recommendations include:
 - (b) Upgrade the DZMS and the Switzer Creek/Richard Marriott trail;
 - (d) Reserve a stream corridor on Switzer Creek;
 - (i) Review the area for suitability for mini-parks;
 - (k) Establish a community garden area.

Currently, the study area contains areas zoned for D-5 (maximum density of 5 units per acre) and D-15 (maximum density of 15 units per acre), Figure 8. It is assumed that development will occur consistent with current zoning. Rezoning to a higher density is a possibility; but would require approval by the CBJ Planning Commission and Assembly.

Developable areas are identified as areas with slopes under 18%. Once the developable areas are identified, three distinct areas result and they are Development Areas 1, 2 and 3; which are 58 acres, 8.0 acres and 62 acres respectively.

These areas are further reduced for high value wetlands; 200 foot minimum setbacks for anadromous fish streams; 50 foot minimum setbacks for creeks, drainages and Waters of the United States; initial development right-of-way; and for awkwardly shaped pieces not likely to be developed.

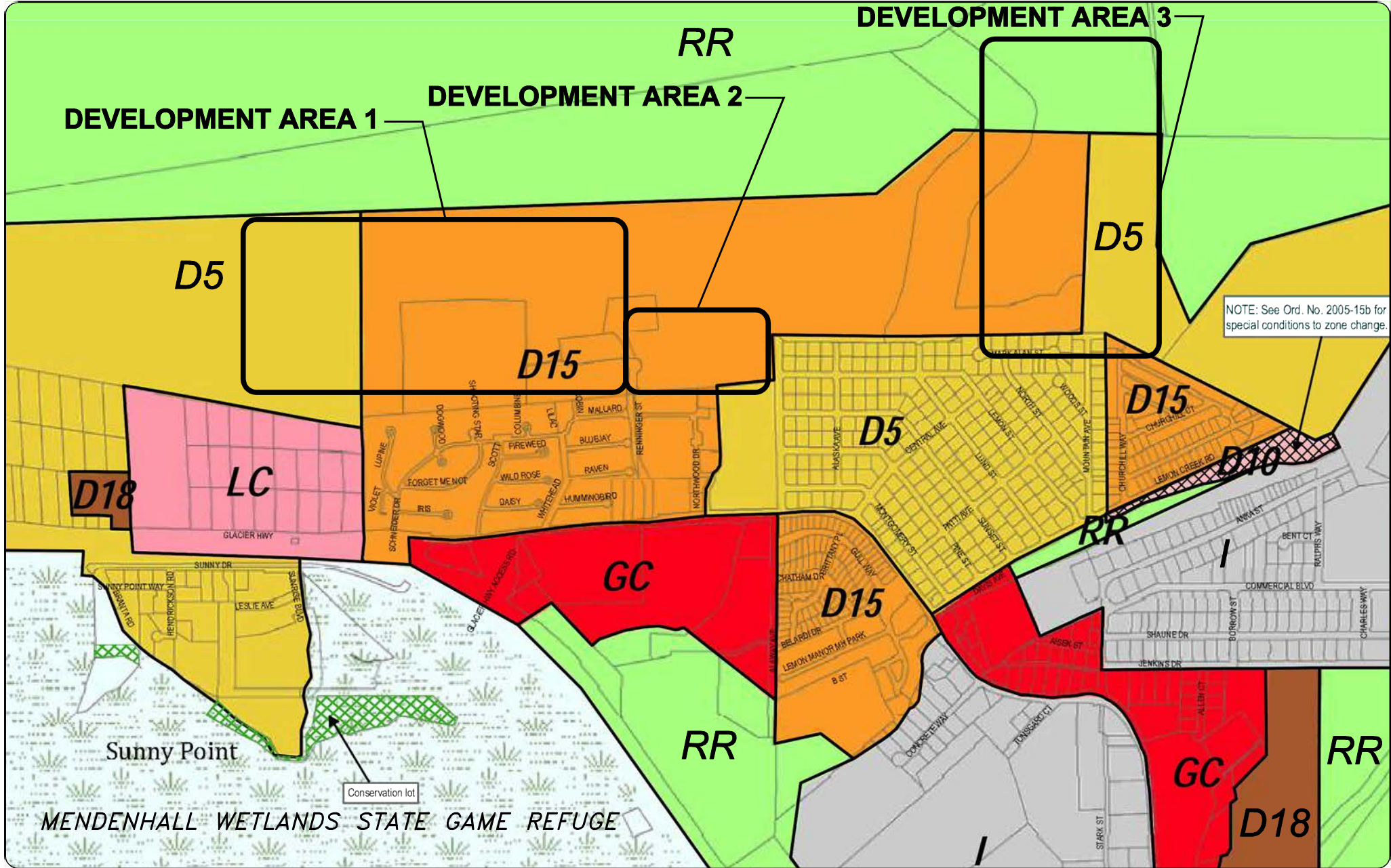
Once the above constraints are accounted for, Development Area 1 is reduced to 31 acres. We identified 4.4 acres north of DZMS and 6.8 acres in the southwest corner of the development area for possible residential development. The remaining 20 acres could yield some additional housing; but is left as the future school site and for preservation of the existing trail system at this time.

Development Area 2 is reduced to 4.6 acres once the above reductions are made. We identified 3.2 acres immediately east of Renninger Street and an additional 1.4 acres further to the east for possible residential development.

Development Area 3 is now 27 acres once the above reductions are made. Some of this acreage would likely be lost to future Right-of-Way (ROW) development; but would still yield a substantial acreage for possible residential development.

The total area available for residential development is 42 acres; 13 acres in D-5 and 29 acres in D-15. It appears that the area zoned D-5 could be up-zoned to D-15 without conflict. D-15 zoning would yield over 700 dwelling units at maximum density; however, to conform to the existing housing in the area and development of the existing shape and contours of the land; the actual development will likely be significantly less dense. Development in Lemon Creek and the Mendenhall Valley in D-15 zoning usually results in a density closer to D-10. The Pederson Hill Access Study used D-10 zoning for projects and for purposes of uniformity, we suggest using D-10 to determine the probable number of dwelling units that could be developed in the Switzer area, which yields approximately 473 dwelling units. Table 1 shows the possible dwelling units assuming D-15 zoning being developed at a D-10 density.

Table 1. Development Areas and Probable Densities		
Development Area	Probable Developed Acreage (1)	Approximate Dwelling Units (2)
1A	4.4	43
1B	6.8	68
Remainder of Development Area 1 (3)	Possible Future School Site with Existing Trails	NA
2A	3.2	32
2B	1.4	14
2A & 2B	4.6	46.0
3A (4)	5.0	50
3B (5)	5.0	50
3C	14.3	143
Totals:	43	400
Footnotes:	<p>(1) Probable Developed Acreage represents area not impacted by stream or fish buffers, steep slopes, high value wetlands, Right-of-Way (ROW), or unusual shape.</p> <p>(2) Approximate Dwelling Units are based on D-10 density of the Probable Developed Acreage.</p> <p>(3) The remainder of DA 1 is tentatively reserved for a future school and existing trails. The 23 acres that could be developed for housing would be reduced by ROW.</p> <p>(4) DA 3A could up be up to 100 units, but it is thought 50 units would be the size of an initial development.</p> <p>(5) The Fire Marshall cited Section D-106 in the Fire Code, and noted that up to 100 units would be allowed before a second access is necessary.</p>	



5. Transportation Access Analysis

An overview of potential future roads through the project area was developed and is shown in Figure 9. Some of these roads are necessary to access the three development areas: The roads west and north of Renninger Street provide access to Development Area 1; the road east of Renninger Street provides access to Development Area 2. The extension of Mountain Avenue provides access into development Area 3. There is also a road link shown between Development Area 2 and 3, which could improve local traffic circulation and would be desirable if both areas are developed. The road at the top of Figure 9 is identified in the Juneau Comprehensive Plan as a potential road. The other roads shown on Figure 9 are possible links to that potential road.

The road access alignments are identified for each of the development areas and profiles were generated for each road alignment to evaluate the required profile grade for each option. The CBI road design criteria calls for collector road grades to be below 12%. Grades below 8% are desired to allow for school and transit bus access. Base level traffic information was obtained and a brief discussion of existing and future traffic issues was conducted to evaluate the feasibility of each access option. A detailed traffic study will likely be required once actual development of any phase is known.

5.1 Transportation Infrastructure

5.1.1 Glacier Highway





Glacier Highway is under State of Alaska Department of Transportation and Public Facilities (ADOT&PF) jurisdiction and is classified as a major arterial with an Annual Average Daily Traffic (AADT) of 12,278 vehicles per day (ADOT&PF 2010). The posted speed is 40 miles per hour (mph). The road in this section has two, 12-foot lanes, and a 12-foot center, two way, left–turn lane. Through the project area, there is curb and gutter and a sidewalk along the north side of the highway. From the underpass to Sunny Point east through the Walmart area, there is also curb and gutter and a sidewalk on the south side of the highway. This section of Glacier Highway is illuminated. There are bus stop shelters on both sides of the street, near Walmart. Near Davis Avenue, there is a bus stop on the south side and there is another bus stop on Davis Avenue just north of Glacier Highway.

The 2012-2015 ADOT&PF STIP includes project #26112 to add sidewalks on the south side of Glacier Highway from Anka Street to Wal-Mart, and improve bike lanes on Glacier Highway (consistent width, install and maintain signage, etc.). It is scheduled for design in FY 12-14 and construction in FY 15.

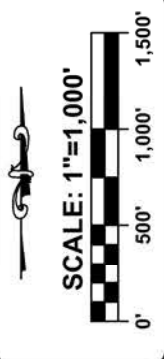
5.1.2 Renninger Street

Renninger Street is a CBI street and is classified as a collector street based on AASHTO criteria. ADOT&PF data indicates the Peak Hour Volume of the Intersection is 1091. The posted speed is 25 mph. The road in this section has two 12-foot lanes; curb, gutter and sidewalk on the western side of the street; and a 5.5-foot bike path on the eastern side of the street. Intersections along Renninger Street are illuminated.

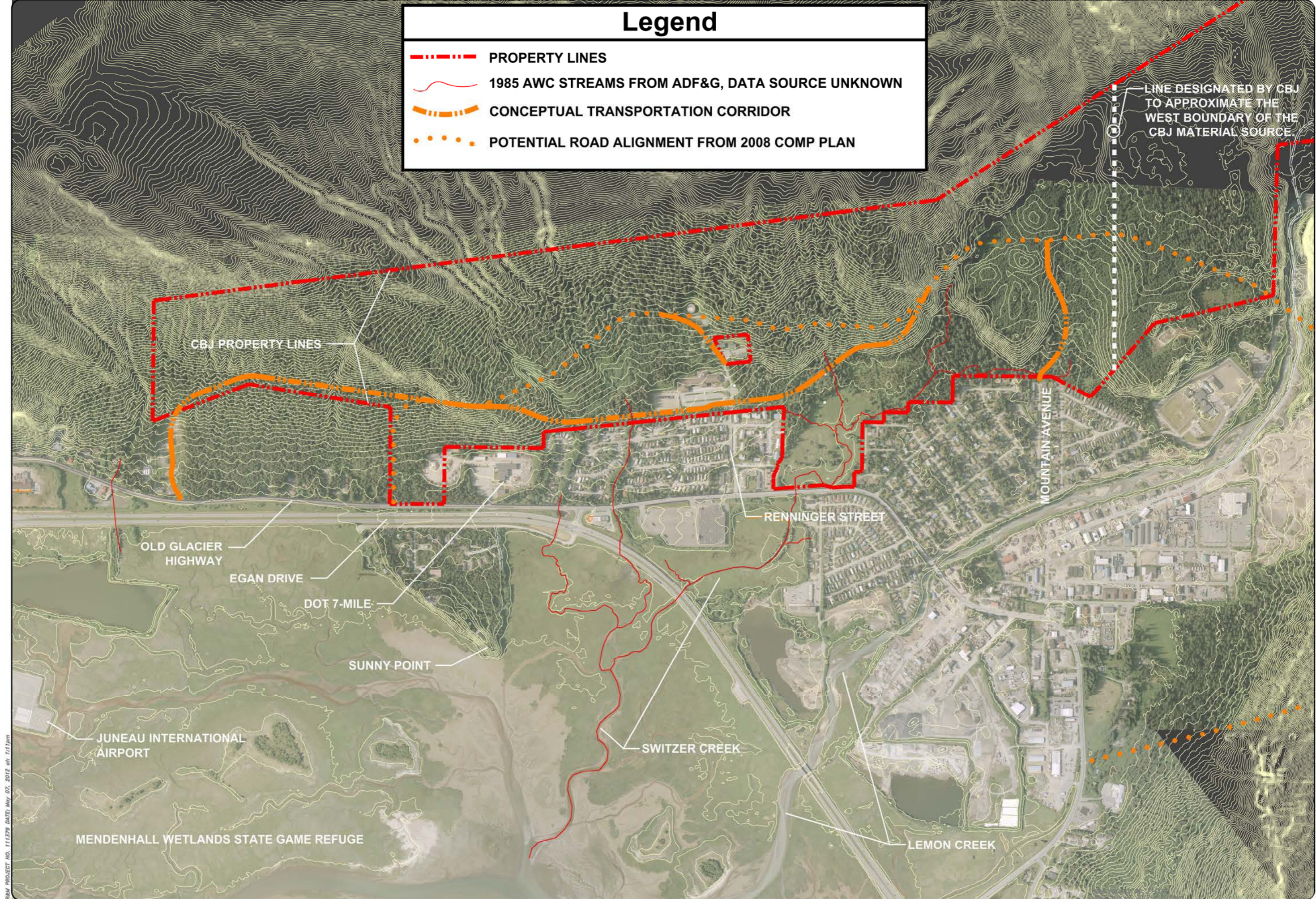
Legend

-  PROPERTY LINES
-  1985 AWC STREAMS FROM ADF&G, DATA SOURCE UNKNOWN
-  CONCEPTUAL TRANSPORTATION CORRIDOR
-  POTENTIAL ROAD ALIGNMENT FROM 2008 COMP PLAN

LINE DESIGNATED BY CBJ
TO APPROXIMATE THE
WEST BOUNDARY OF THE
CBJ MATERIAL SOURCE



CONCEPTUAL ROAD ALIGNMENTS
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA



RAW PROJECT NO. 111579 DATE: May 07, 2012 4:11 pm

Bus stops on both sides of Glacier Highway are just west of the Renninger Street and Glacier Highway intersection.

5.1.3 Davis Avenue

Davis Avenue is a CBJ street and is classified as a collector street based on AASHTO criteria. ADOT&PF data indicates an AADT of 2,637 vehicles per day (ADOT&PF 2010). The posted speed is 25 mph. The avenue has two 11-foot lanes; curb, gutter and sidewalk along the northern side of the avenue; and a separated bike path on the southern side of the avenue. The entire avenue is illuminated. There is bus service down Davis Avenue to the end of Lemon Road near the Lemon Creek Jail. There is a bus shelter on Davis Avenue near the intersection with Glacier Highway; and one on the south side of Glacier Highway near the intersection.

5.1.4 Mountain Avenue

Mountain Avenue is a CBJ street and is classified as a Local Street based on AASHTO criteria. The posted speed is 25 mph. The avenue has two 12-foot lanes and a 1.5-foot shoulder on each side of the street. The entire avenue is illuminated. There is no bus service on Mountain Avenue, but there is bus service at the intersection of Mountain and Davis Avenues. The nearest bus stop shelter is on Davis Avenue near the intersection with Glacier Highway.

5.2 Transit and Pedestrian Facilities

Capital Transit provides bus service to the Lemon Creek area. Routes three and four make stops in Lemon Creek going towards both the Valley and Downtown. Buses run every half an hour from 7:30 AM to 11 PM Monday through Saturday. On Sundays, buses run every half an hour from 9:30 AM to 6 PM. The bus stops at the turnaround by the jail, at the intersection of Mountain Avenue and Davis Avenue and on Davis just before the Glacier Highway intersection. In development Area 1 and 2, pedestrians would need to walk to the current bus stops on Glacier Highway just west of the intersection of Renninger Street and Glacier Highway. In development Area 3, pedestrians would need to walk to the intersection of Mountain and Davis Avenues. If a connection between Development Area 2 and 3 was created, Capital Transit should add a loop from the jail turnaround down Mountain and then west to Renninger Street.

5.3 Typical Section

The proposed typical section for new access roads would follow the current CBJ Standard Details, which is shown in Figure 7. All cost estimates use this typical section as a basis for improvements. A narrower width of the traffic lanes could be considered as a cost savings measure. Most of the proposed roads would be low volume and AASHTO recommends a minimum traveled way width of 12 feet; but allows a 10 foot width for low-speed facilities, which all of the access roads would be.

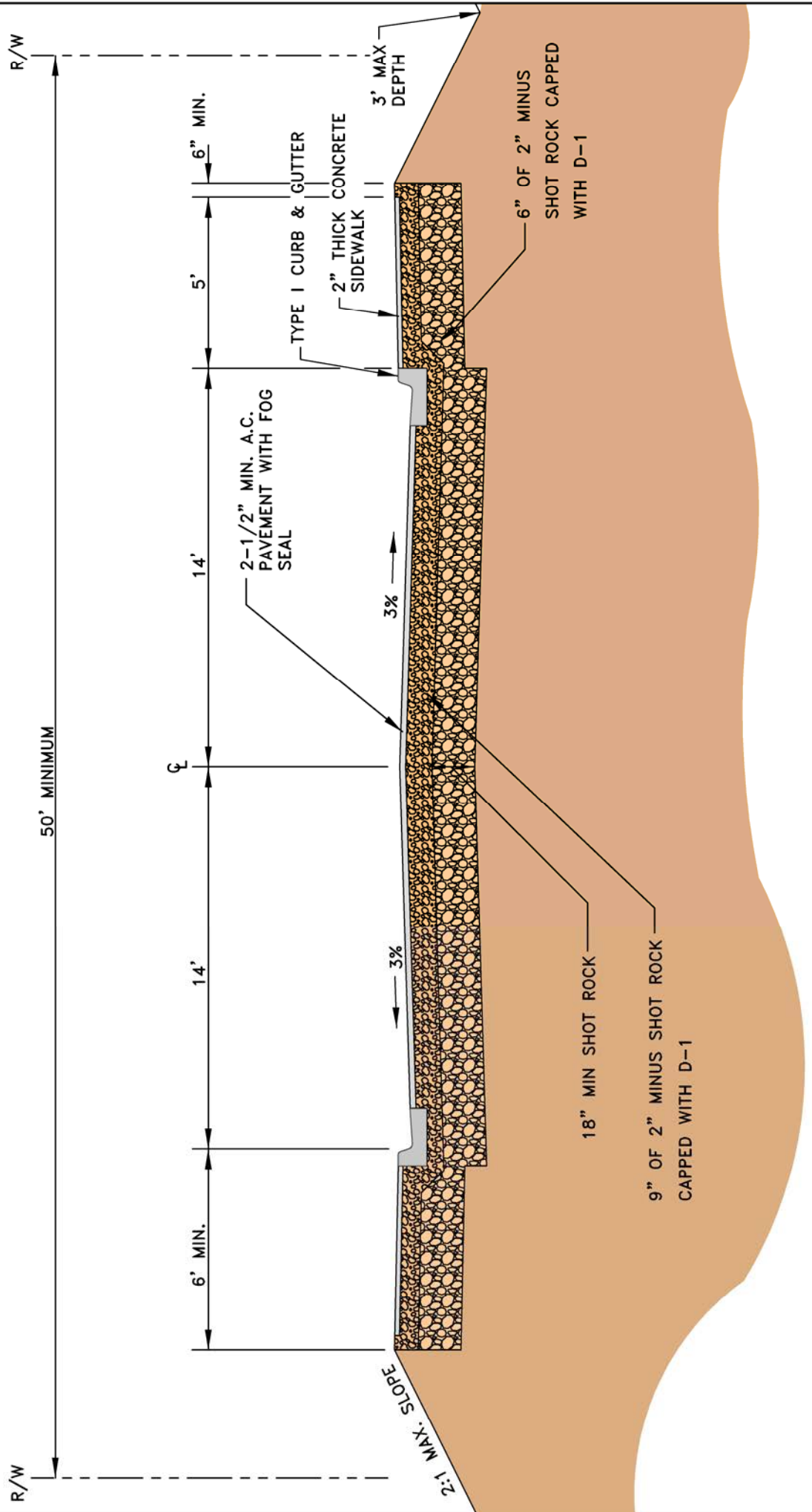
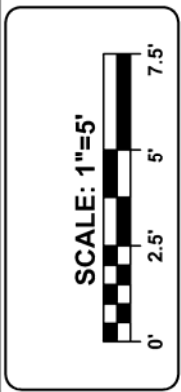


FIGURE 10
PAGE 20 OF 29



**TYPICAL SECTION
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA**



AASHTO allows 9 foot lane widths for low-volume residential areas; which most of these roads would be; however, if bus service up Mountain Avenue is a possibility in the future, a 10 foot width should probably be the minimum considered. The widths discussed above would not include the curb and gutter.

5.4 Access Alternatives

Four access routes were considered for reaching developable lands, but three were determined to be the most efficient to reach each of the developable areas. Plan and profile sheets for each access route alignment are included in Appendix A.

5.4.1 Access to Development Area 1A, north of Renninger Street

This alignment would allow access to a portion of Development Area 1 north of DZMS. It would be 1,162 feet long. The maximum grade on this alignment would be approximately 12 percent. The access would continue north on Renninger Street along the water tower access road and then turn west accessing potential residential development areas. It is our belief that residential development generated by this access will not create enough traffic to require any additional capacity development of Renninger Street.

5.4.2 Access to Development Area 1B, west of Renninger Street

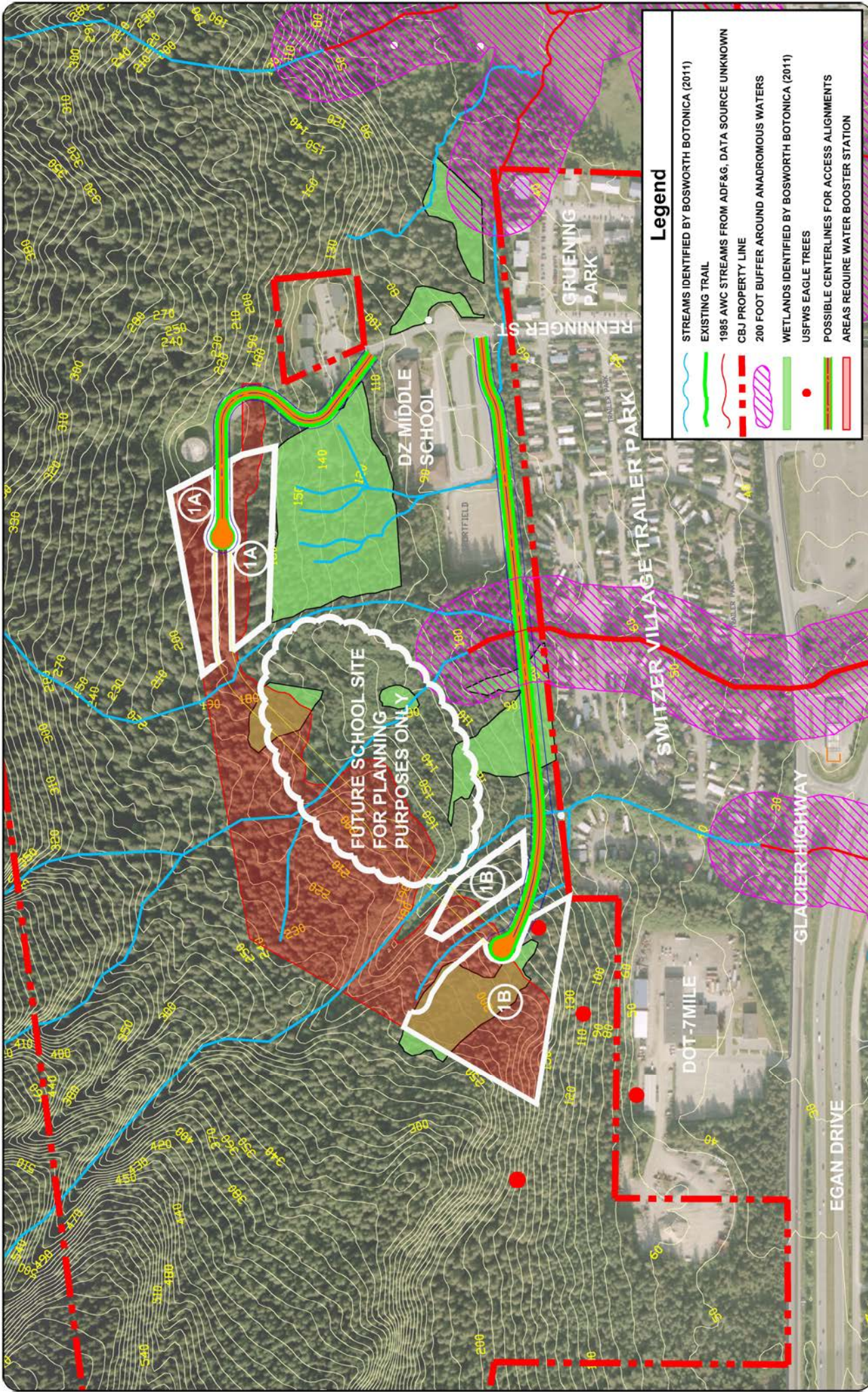
This alignment would allow access to the southwest portion of Development Area 1. It would be 2,330 feet long. The maximum grade on this alignment would be approximately 12 percent. The access would intersect Renninger Street in the first one hundred feet of the southeastern end of the DZMS parking lot and be stop controlled. It is our belief that residential development generated by this access will not create enough traffic to require any additional capacity development of Renninger Street.

This alignment crosses Spruce Trib where it has a 200 foot anadromous stream buffer. It also crosses Jay Trib, Wimpy Trib and an unnamed creek that all have 50 foot stream buffers. In addition, it runs parallel to and has impact to the Wimpy Trib buffer for approximately 400 feet. The alignment would also impact 0.69 acres of high value wetland.

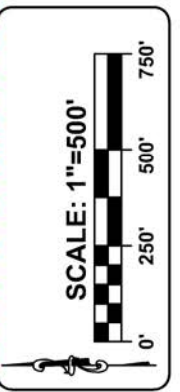
In addition, this access may have issues with eagle trees that are in, or near, the southwest portion of this development area.

5.4.3 Access to Development Area 2, east of Renninger Street

This alignment would allow access to Development Area 2. Access to 2A would be approximately 220' plus a cul-de-sac; however 2A could be accessed from the existing cul-de-sac on Renninger Street at a lower cost. Access to 2B would be approximately 780 feet long plus a cul-de-sac. The maximum grade on these alignments would be approximately 5 percent. The access would intersect Renninger Street at the southern end of the DZMS and be stop controlled.



- Legend**
- STREAMS IDENTIFIED BY BOSWORTH BOTONICA (2011)
 - EXISTING TRAIL
 - 1985 AWC STREAMS FROM ADF&G, DATA SOURCE UNKNOWN
 - CBJ PROPERTY LINE
 - 200 FOOT BUFFER AROUND ANADROMOUS WATERS
 - WETLANDS IDENTIFIED BY BOSWORTH BOTONICA (2011)
 - USFWS EAGLE TREES
 - POSSIBLE CENTERLINES FOR ACCESS ALIGNMENTS
 - AREAS REQUIRE WATER BOOSTER STATION



**DEVELOPMENT AREA 1
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA**



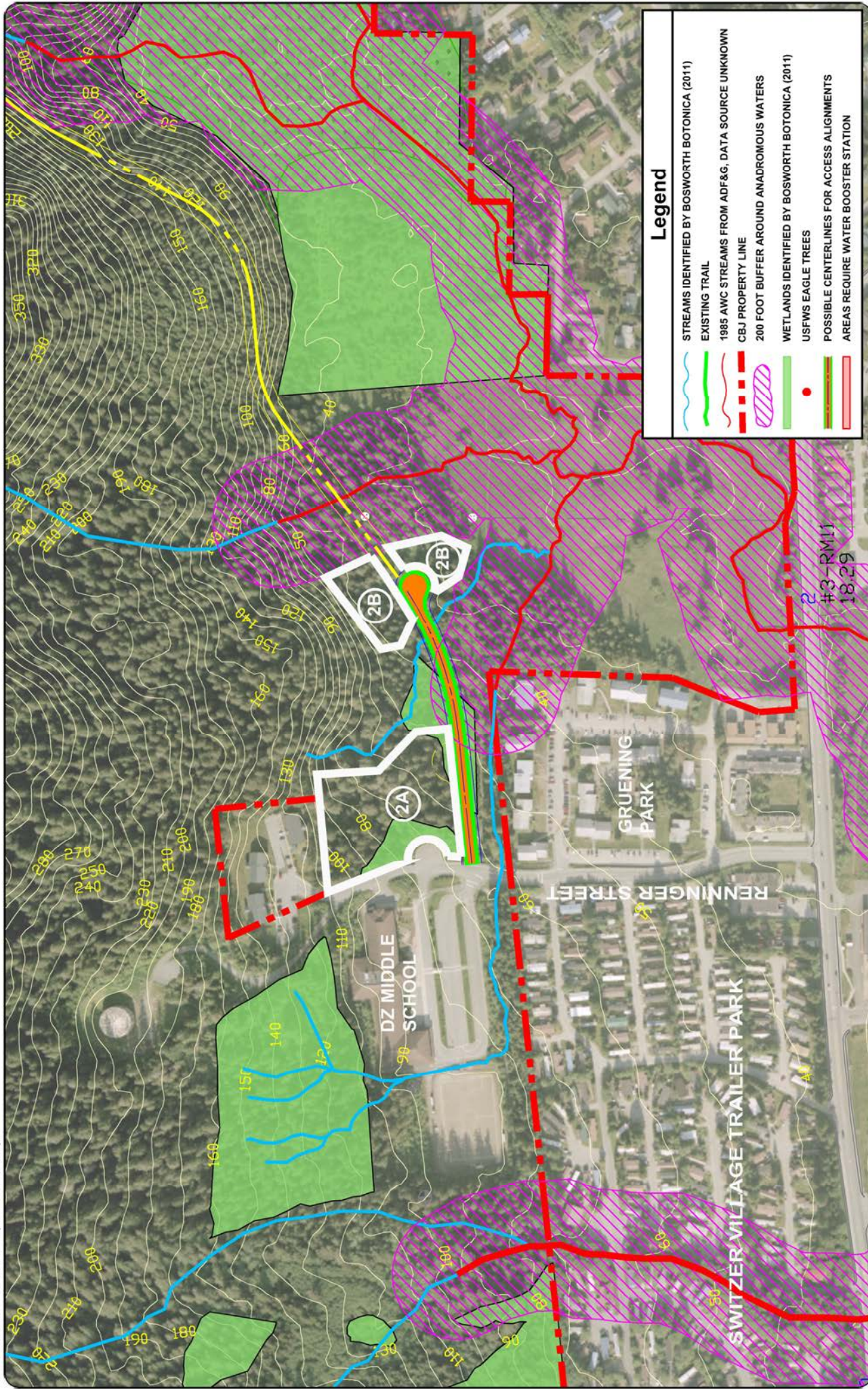












FIGURE 12
PAGE 23 OF 29



**DEVELOPMENT AREA 2
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA**

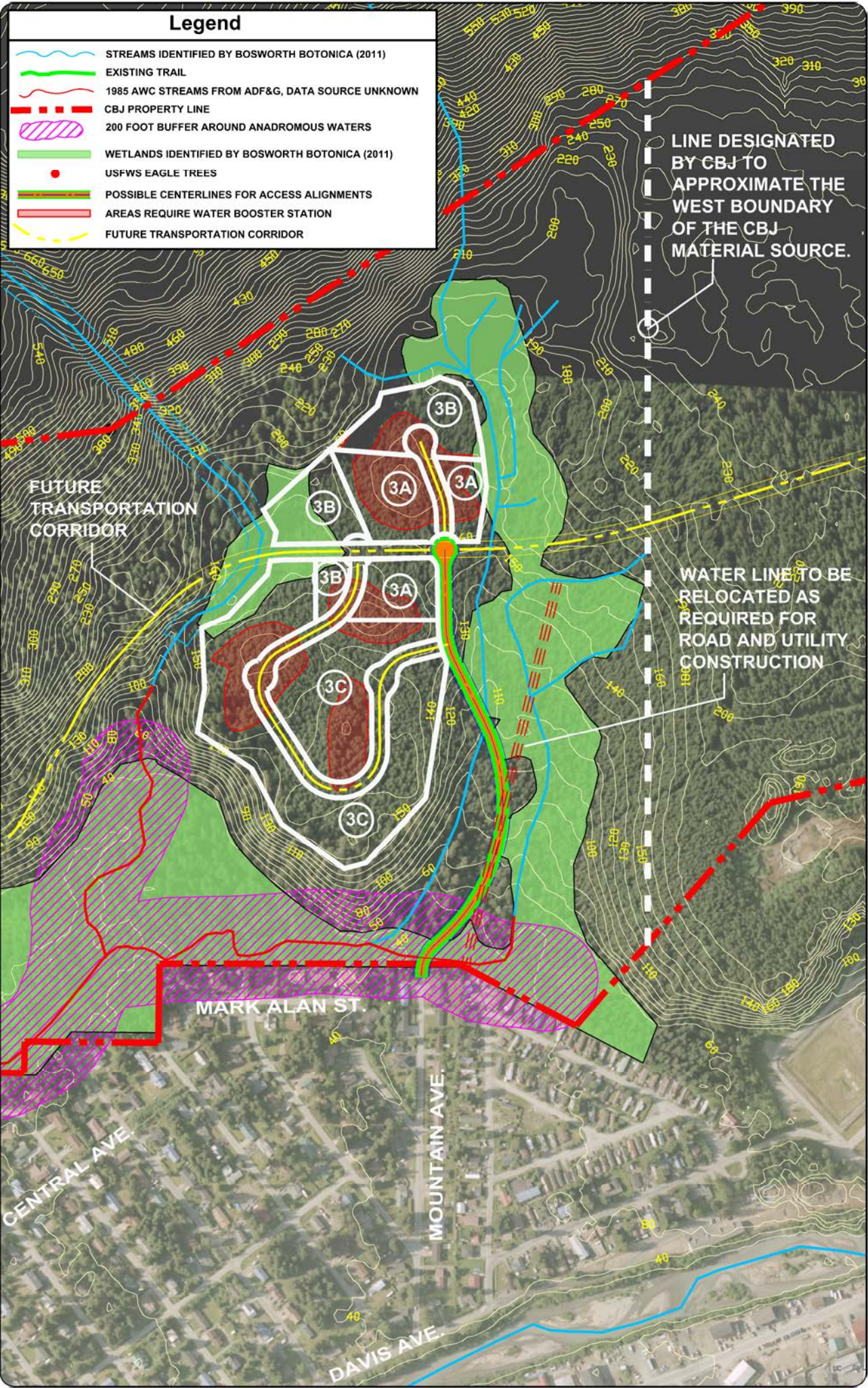


Legend

-  STREAMS IDENTIFIED BY BOSWORTH BOTONICA (2011)
-  EXISTING TRAIL
-  1985 AWC STREAMS FROM ADF&G, DATA SOURCE UNKNOWN
-  CBJ PROPERTY LINE
-  200 FOOT BUFFER AROUND ANADROMOUS WATERS
-  WETLANDS IDENTIFIED BY BOSWORTH BOTONICA (2011)
-  USFWS EAGLE TREES
-  POSSIBLE CENTERLINES FOR ACCESS ALIGNMENTS
-  AREAS REQUIRE WATER BOOSTER STATION
-  FUTURE TRANSPORTATION CORRIDOR

LINE DESIGNATED BY CBJ TO APPROXIMATE THE WEST BOUNDARY OF THE CBJ MATERIAL SOURCE.

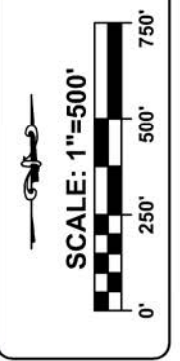
WATER LINE TO BE RELOCATED AS REQUIRED FOR ROAD AND UTILITY CONSTRUCTION



**DEVELOPMENT AREA 3A, B & C
CBJ SWITZER LANDS
RESIDENTIAL DEVELOPMENT STUDY
JUNEAU, ALASKA**

CITYBOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY

F&M
R&M ENGINEERING, INC.



R&M PROJECT NO. 111579 DATE: May 07, 2012 at: 2:04pm

For approximately the first 270 feet, these alignments would be within the 200-foot buffer zone of a listed anadromous salmon stream, coming within 135 feet at its closest point. The alignment would also impact 0.47 acres of high value wetland on Wimpy Tributary of Switzer Creek. To get to Development Area 2B, the alignment would go over Crabapple tributary of Switzer Creek.

It is our belief that residential development generated by this access will not create enough traffic to require any additional capacity development of Renninger Street; however if Development Area 2 and 3 are connected at some point in the future, a traffic study would be warranted to address specific details.

5.4.4 Access to Development Area 3, north of Mountain Avenue

This alignment would allow access to Development Area 3. It would be 1,714 feet long. The maximum grade on this alignment would be approximately 10 percent. This access would extend Mountain Avenue north. The existing portion of Mountain Avenue would almost certainly be required to be upgraded with sidewalk to Davis Avenue as a condition of the Planning Commission approval of the development. Residential development generated by this access would create traffic that would be routed on to Davis Avenue. Davis Avenue and Glacier Highway intersection capacity utilization is at 51.7 percent which is a level of service A. A traffic study would likely be required for any substantial development of this area.

This alignment would go over the east tributary of Switzer Creek, which is a listed anadromous fish stream. It would cross the east tributary again further north beyond the extent of the salmon stream. The alignment would also impact 0.51 acres of wetland.

5.5 Non-Motorized and Pedestrian Access

It is important to designate and develop a connected trail system between new neighborhoods in this area, DZMS and a future elementary school. Trails should be built at the same time that roads are constructed. This will prevent problems that have occurred elsewhere in Juneau when homeowners protest against trail construction close to their homes that was designated, but not built, when they purchased their property. A connected non-motorized system in affordable housing neighborhoods, and this area in particular is important to promote safe access to and from school, encourage active and healthy lifestyles, and ensure social justice. Development Area 3 should have a new trail to DZMS and an upgrade of the Marriott Trail system. Pocket parks should be also be designated and connected via the trail system. These features should be identified in a master plan for the development area.

6. Utility Analysis

6.1 Existing Water

Water pressure in the Switzer Creek area is controlled by the water storage tank built on the hill above Renninger Street. Leaving the water storage tank is a 16-inch ductile iron pipe (DIP). The water passes through a pressure sensor and then through a reducer to control water pressure. The pipe follows

Renninger Street until connecting with the 16-inch DIP pipe that runs under Glacier Highway. This pipe is connected to another 16-inch DIP pipe that goes up Central Avenue and takes a right on Montgomery Street. At the intersection of Montgomery Street and Pattie Avenue, the pipe is scaled down to a 10-inch DIP pipe. This pipe is connected to a 10-inch DIP that runs along Davis Avenue. Mountain Avenue has an 8-inch DIP pipe connected to the 10-inch pipe running down Davis Avenue.

The existing mains are adequate for the three development areas, although Development Area 3 would benefit by a loop system. Development Area 3 would benefit from a second access to Renninger Street; but that should be compared to the costs of upgrading existing traffic; reconstructing existing sewer mains and the adequacy of “dead-end” water main system.

CBJ Water Department has determined that any development above elevation 170 feet will require a water pressure booster station. Portions of the Development Areas 1 and 3 are above 170 feet and we are assuming a water pressure booster station would be required. However, a survey should be conducted to verify elevations prior to spending time on water pressure booster station design.

6.2 Existing Sanitary Sewer

An 8-inch polyvinyl chloride (PVC) runs south the length of Renninger Street and connects into a 10-inch main in Glacier Highway and from there it goes to a CBJ sewer pump station on the south side of Glacier Highway just east of Renninger Street.

From Mountain Avenue, sewage flows down an 8-inch PVC through a network of 8-inch PVC pipes going up Woods Street, across Mark Alan Street to Central Avenue. At the intersection of Central Avenue and Montgomery Street, the PVC pipe is scaled up to a 10-inch line that connects to the 12-inch PVC line that runs west down Glacier Highway.

A sanitary sewer capacity analysis 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 am; and
- One third of the daily water consumption occurs during the peak hours.

Groundwater infiltration is not taken into account in this estimate.

The 10-inch PVC from Central and Montgomery to Glacier Highway is the most restrictive sanitary sewer segment with respect to additional capacity. Assuming a minimum slope providing 2 feet per second velocity, the 10-inch line should accommodate approximately 140 additional dwelling units. The 8-inch and 12-inch lines should be able to accommodate approximately 250 and 230 additional dwelling units. If development in Area 3 exceeds the existing sewer capacity, the access between Development Area 2

and 3 could be considered; but there will likely be a high point in that access that would likely require another lift station, which might offset any savings of not up-sizing the existing sewer mains.

7. Infrastructure Costs

Costs estimates were developed for the four road ways to access the tracts in Development Areas 1, 2 and 3. The roadways would be similar to the roadways shown in Figures 11, 12 and 13. Costs are depicted in Table 2, below.

Table 2. Development Costs					
Development Area	Costs for Streets, Sewer & Water Mains, Phone, Cable, & Illumination	Costs for Sanitary Sewer Lift Station & Water Pressure Booster Station	Construction Costs	Dwelling Units	Cost per Dwelling Unit
1A	\$1,160,000	\$400,000	\$1,560,000	43	\$36,279
1B	\$2,180,000	\$800,000	\$2,980,000	68	\$43,824
Remainder of Development Area 1	Possible Future School Site with Existing Trails				NA
2A	\$419,000	\$0	\$419,000	32	\$13,094
2B	\$524,000	\$400,000	\$924,000	14	\$66,000
2A & 2B	\$943,000	\$400,000	\$1,343,000	46	\$29,196
3A (1)	\$2,240,000	\$800,000	\$3,040,000	50	\$60,800
3B (2)	\$950,000	\$0	\$950,000	50	\$19,000
3C (3)	\$9,380,000	\$400,000	\$9,780,000	143	\$68,392
Footnotes: (1) The Cost per Dwelling for Development Area 3A is based on an assumption that 50 units would be built in this initial phase. (2) The Cost per Dwelling for Development Area 3B is based on road construction for 100 units, which according to section d-106 of the Fire Code is the number of units allowed before the fire department would require a second access. The costs assume 3A is constructed and only includes the cost to add an additional 50 units in 3B. (3) The Cost per Dwelling for Development Area 3 based on road construction for ultimate build out, including a connector from Development Area 2A to Development Area 3. The costs assume 3A and 3B are constructed and includes the cost to build addition roads in DA3; the costs to construct a link to DA2 and the costs for another sewage lift station, which may be required.					

3A, 3B, and 3C were done for conceptual estimation. The sequence of 3A, 3B, and 3C could be determined in a subsequent planning project and costs may change as a result.

In an effort to provide numbers that can be compared to the Pederson Hill Study, the costs above do not have any contingency. With the level of design and the use of LIDAR contours, we would suggest minimum contingency of 15%. Surveying, geotechnical, design, permitting, inspection, construction administration, nor the CBJ's internal costs for design are included in the costs above.

8. Phasing

8.1 First Phase

Development Area 2A would be the least expensive to develop and offers the lowest cost per dwelling unit. It is a very short piece of road being constructed and utility costs are minimal. It is zoned D-15, which would allow up to 48 units; but the cost per dwelling unit is based on a more conservative 32 units. There are some wetlands near Renninger Street that would require permitting; but these are not high-functioning wetlands; and they may be able to be avoided. The existing Switzer Trail that connects DZMS and neighborhoods off Alaska and Lund Street is used by students coming to and from school. The Juneau Safe Routes to Schools Plan (March 2012 public review draft) recommends adding lights and improving the narrow bridges on this trail through area 2A. Design of housing in this area should improve or relocate and improve this non-motorized route to and from school as well as Renninger Street.

8.2 Phase 2

Development Area 3 would have a high initial cost for access; but offers a lower cost per dwelling unit than development area 2B. Development Area 3A has higher development cost per dwelling unit than 1A or 1B; however, if you combine 3A and 3B, you get a development cost of \$3,990,000 and \$39,900 per dwelling unit, which makes 3A and 3B more attractive per dwelling unit than 1B, and close to the same cost as 1A. The soils are assumed to be better in Development Area 3 than Development Area 1, although this should be verified at some point in the future. Also, the road grades should be more accommodating to 3A and 3B than they would be to 1A.

Per the current Fire Code, Development Area 3C will need to be connected to Development Area 2. This would allow improved traffic circulation; possibly allow a bus route between Mountain Avenue and Renninger Street; provide a looped water system; and would be the best opportunity to develop area 2B.

8.3 Third Phase

Development Area 2B would be the second least expensive to develop and the second lowest cost per dwelling unit. If developed in conjunction with Development Area 2A, it would benefit from economy of scale and eliminate the costs associated with developing two cul-de-sacs and the cost of removing the first cul-de-sac.

Development Area 2B is zoned D-15 which would allow up to 21 units; but the cost per dwelling is based on a more conservative 14 units. However:

1. The soils for area 2B are suspect and may have higher site development and foundation costs.
2. Also, the cost per dwelling unit in Development Area 3 is not significantly higher and creates opportunity for additional housing units.

For the two reasons above, we recommend Area 2B as the third phase.

8.4 Fourth Phase

Development Area 1 has two areas with relatively high cost per dwelling unit. Area 1A and 1B have some steep and difficult access issues. Area 1B also has a very difficult access with multiple stream crossings and an anadromous stream crossing. Area 1B may have more merit if the access costs could be shared with a future school site development.

9. Conclusion

The CBJ needs more affordable housing. By developing the Switzer Creek area the CBJ will increase the number of dwellings available for Juneau residents and hopefully lower the cost of housing. Development areas are identified in the study area with consideration given to steep terrain, wetlands, creeks, waters of the United States, flood zones, anadromous fish habitat, and eagle nesting areas. Development costs are calculated to provide access, and sewer and water utilities to the sites.

Phasing is discussed, and Development Area 2A is recommended for the first phase because it is the easiest and least expensive to develop and offers the lowest cost per dwelling unit ratio. Developing Development Areas 2A and 2B at the same time may have merit for a first phase. However, we recommend that Development Area 3 be the second phase as area 2B would be best developed in the future if Development Areas 2 and 3 are ever connected.

Development area 3 would have a high initial cost for access; but 3A and 3B offers a lower cost per dwelling unit than Development Areas 2B, or 1B. It has a per dwelling cost slightly higher than 1A; but offers better soils (an assumption to be verified) and better road grades than 1A. We recommend that 3A and 3B be developed after Development Area 2A.