FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, ALASKA

COMMUNITY NAME	COMMUNITY NUMBER
CITY AND BOROUGH OF JUNEAU	020009

PRELIMINARY
8/25/2017

REVISED:

TO BE DETERMINED

FLOOD INSURANCE STUDY NUMBER
02110CV000B

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FLOOD INSURANCE STUDY REPORT
CITY AND BOROUGH OF JUNEAU, ALASKA

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60, *Criteria for land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal

Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as “Post-FIRM” buildings.

1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community’s regulations.

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of the City and Borough of Juneau, Alaska.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 1. The FIRM panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

The location of flood hazard data for participating communities in multiple jurisdictions is also indicated in the table.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
City and Borough of Juneau	020009	19010206, 19010301, 19010304, 19010500	PRINTED 0869, 0888, 1180, 1185, 1236, 1237, 1194, 1213, 1214, 1195, 1217, 0550, 0575, 1050, 1075, 0865, 0866, 0867,	N/A

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
			0868, 0850, 0855, 1182, 1218, 1219, 1238, 1239, 1375, 1209, 1503, 1504, 1508, 1509, 1528, 1243, 1500, 1501, 1502, 1506, 1507, 1526, 1527, 1531, 1532, 1551, 1529, 1533, 1534, 1553, 1554, 1515, 1516, 1520, 1562, 1566, 1567, 1586, 1595, 1569, 1588, 1589, 1875, 1900, 1905, 1910	
City and Borough of Juneau	020009	19010206, 19010301, 19010304, 19010500	NOT PRINTED* 0650, 0675, 0700, 0725, 0750, 0775, 0800, 1150, 1175, 2675, 1245, 2100, 2025, 2075, 2050, 2250, 2275, 2300, 2500, 2325, 1915, 1920, 2175, 2200, 2225, 1190, 1211, 1212, 1216, 2475, 2350, 2450, 2375, 2425, 2400, 2525, 2625, 2550, 2600, 2575, 2650, 2700, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0375, 0400, 0425, 0450, 0475, 0500, 0525, 0600, 0625, 0975, 1000, 1025, 1125, 1100, 0890, 0025, 0050, 0075, 0100, 0125, 1235, 1275, 0825, 0860, 0900, 0925, 0950, 1205, 1210, 1230, 1300, 1325, 1350, 1475, 1400, 1450, 1425, 0150, 0175, 1800, 1675, 1775, 1700, 1750, 1725, 1552, 1560, 1580, 1585, 1625,	N/A

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
			1650, 1540, 1545, 1565, 1975, 2125, 2000, 1587, 1568, 1825, 1850, 1950, 2150	

*PANEL NOT PRINTED – NO SPECIAL FLOOD HAZARD AREAS

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

  It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 31, "Map Repositories," within this FIS Report.

- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

  The initial Countywide FIS Report for the City and Borough of Juneau, Alaska became effective on May 9, 1970. Refer to Table 28 for information about subsequent revisions to the FIRMs.

- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is shown on the FIRM, it is being provided by FEMA as information only. For communities that do adopt Zone VE building standards in the area defined by the LiMWA, additional Community Rating System (CRS) credits are available. Refer to Section 2.5.4 for additional information about the LiMWA.

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at http://www.fema.gov or contact your appropriate FEMA Regional Office for more information about this program.

- Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems."

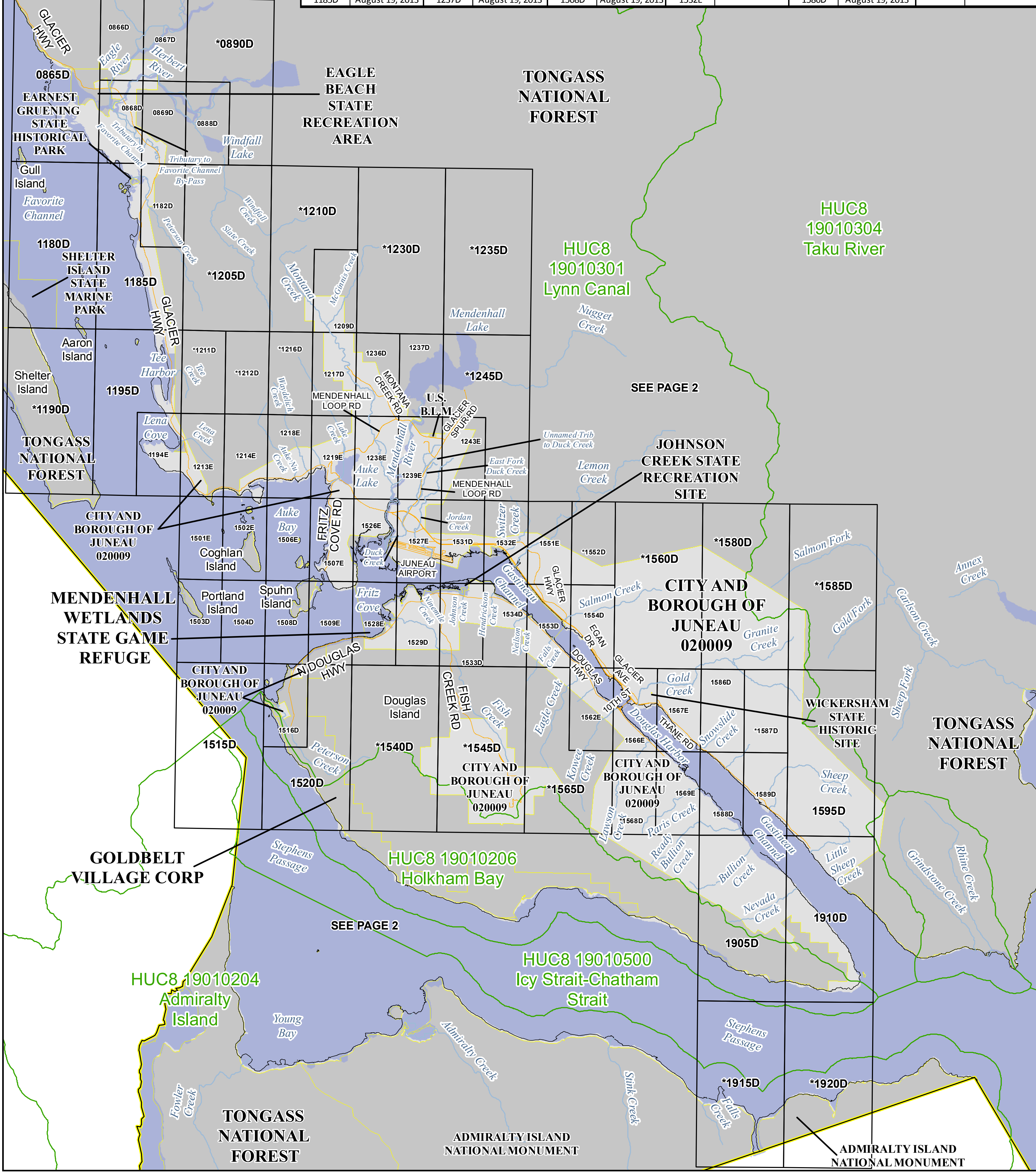
  Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE National Levee Database (nld.usace.army.mil). For all other levees, the user is encouraged to contact the appropriate local community.

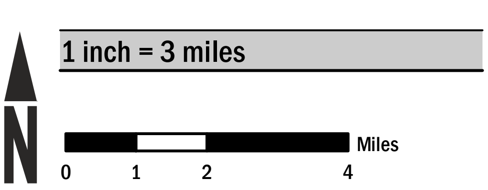
- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at www.fema.gov/online-tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within City and Borough of Juneau, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, flooding sources, watershed boundaries, and United States Geological Survey (USGS) Hydrologic Unit Code – 8 (HUC-8) codes.

FIGURE 1: FIRM PANEL INDEX

FIRM Panel Dates for Printed Panels of Juneau City and Borough, AK											
FIRM PANEL 02110C	EFFECTIVE DATE	FIRM PANEL 02110C	EFFECTIVE DATE	FIRM PANEL 02110C	EFFECTIVE DATE	FIRM PANEL 02110C	EFFECTIVE DATE	FIRM PANEL 02110C	EFFECTIVE DATE	FIRM PANEL 02110C	EFFECTIVE DATE
0855D	August 19, 2013	1194E		1238E		1509E		1533D	August 19, 2013	1588D	August 19, 2013
0865D	August 19, 2013	1195D	August 19, 2013	1239E		1515D	August 19, 2013	1534D	August 19, 2013	1589D	August 19, 2013
0866D	August 19, 2013	1209D	August 19, 2013	1243E		1516D	August 19, 2013	1551E		1595D	August 19, 2013
0867D	August 19, 2013	1213E		1501E		1520D	August 19, 2013	1553D	August 19, 2013	1905D	August 19, 2013
0868D	August 19, 2013	1214E		1502E		1526E		1554D	August 19, 2013	1910D	August 19, 2013
0869D	August 19, 2013	1217D	August 19, 2013	1503D	August 19, 2013	1527E		1562E			
0888D	August 19, 2013	1218E		1504D	August 19, 2013	1528E		1566E			
1180D	August 19, 2013	1219E		1506E		1529D	August 19, 2013	1567E			
1182D	August 19, 2013	1236D	August 19, 2013	1507E		1531D	August 19, 2013	1569E			
1185D	August 19, 2013	1237D	August 19, 2013	1508D	August 19, 2013	1532E		1586D	August 19, 2013		





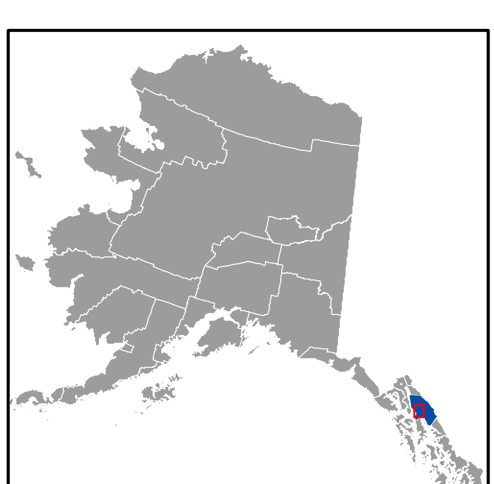
Map Projection:
NAD 1983 StatePlane Alaska 1 FIPS 5001 Feet
North American Datum of 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SEE FIS REPORT FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS
**SMALL ISLANDS ARE PART OF THE TONGASS NATIONAL FOREST



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

CITY AND BOROUGH OF JUNEAU, AK

PANELS PRINTED: 0855D, 0865D, 0866D, 0867D, 0868D, 0869D, 1180D, 1182D, 1185D, 1194E, 1195D, 1209D, 1213E, 1214E, 1217D, 1218E, 1219E, 1236D, 1237D, 1238E, 1239E, 1243E, 1501E, 1502E, 1503D, 1504D, 1506E, 1507E, 1508D, 1509E, 1515D, 1516D, 1520D, 1526E, 1527E, 1528E, 1529D, 1531D, 1532E, 1533D, 1534D, 1551E, 1553D, 1554D, 1562E, 1566E, 1567E, 1569E, 1586D, 1588D, 1589D, 1595D, 1905D, 1910D

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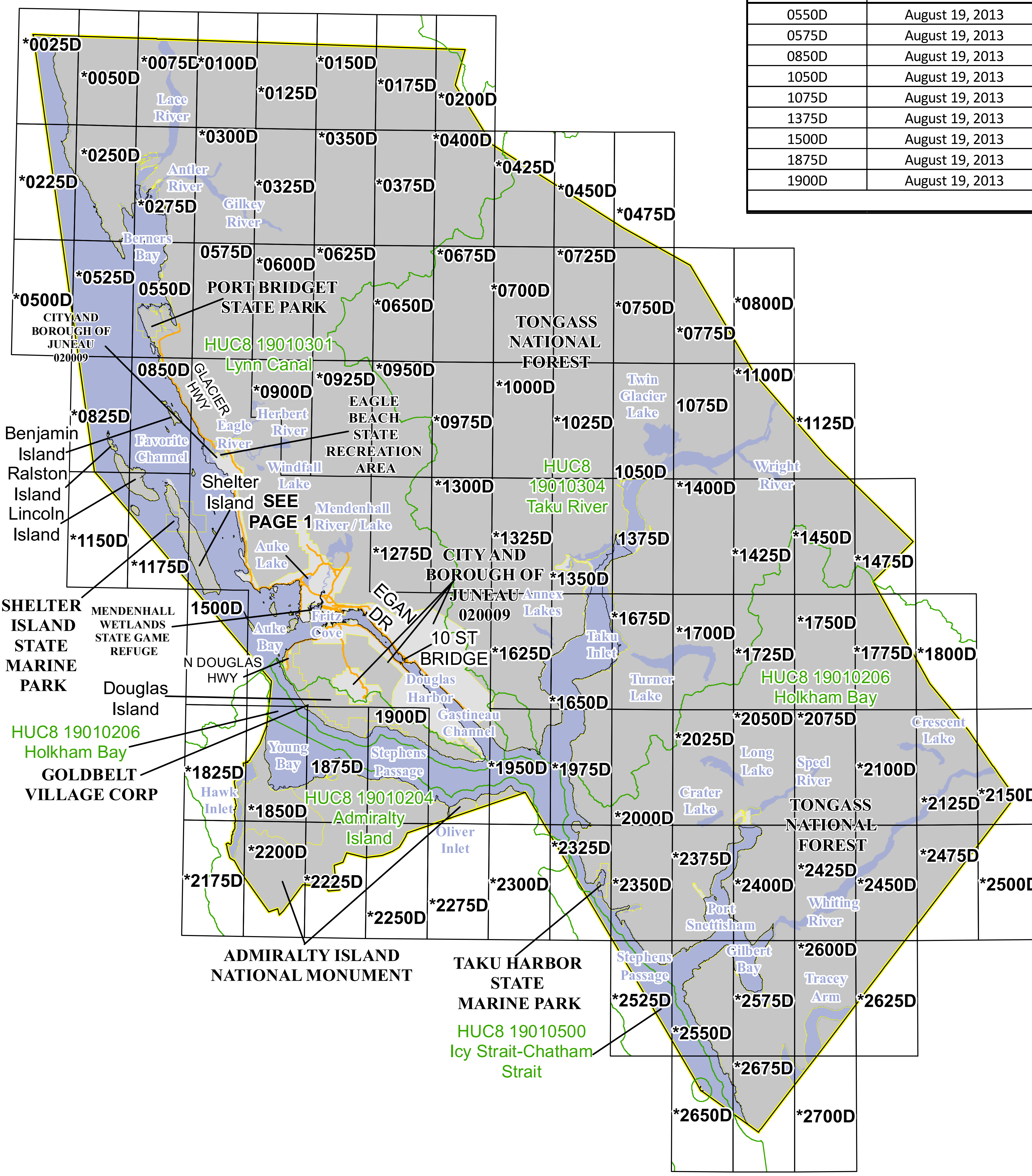
8/25/2017

MAP NUMBER
02110CIND1B

MAP REVISED
PRELIMINARY

FIRM Panel Dates for Printed Panels of Juneau City and Borough, AK

FIRM PANEL 02110C	EFFECTIVE DATE
0550D	August 19, 2013
0575D	August 19, 2013
0850D	August 19, 2013
1050D	August 19, 2013
1075D	August 19, 2013
1375D	August 19, 2013
1500D	August 19, 2013
1875D	August 19, 2013
1900D	August 19, 2013



1 inch = 8 miles

N

0 2.5 5 10 Miles

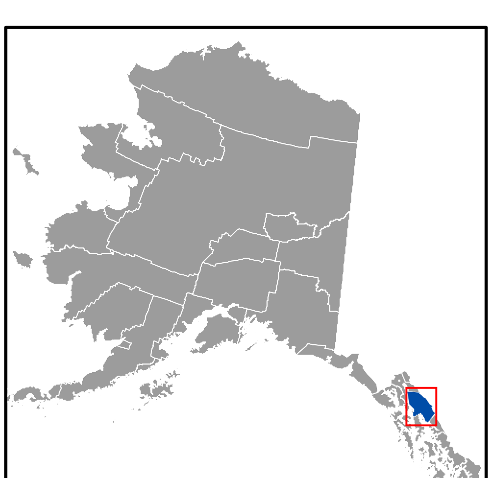
Map Projection:
NAD 1983 StatePlane Alaska 1 FIPS 5001 Feet
North American Datum of 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SEE FIS REPORT FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS
**SMALL ISLANDS ARE PART OF THE TONGASS NATIONAL FOREST



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

CITY AND BOROUGH OF JUNEAU, AK

PANELS PRINTED: 0550D, 0575D, 0850D, 1050D, 1075D, 1375D, 1500D, 1875D, 1900D

FEMA

PRELIMINARY
8/25/2017

MAP NUMBER
02110CIND2B

MAP REVISED
PRELIMINARY

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 28 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

Figure 2. FIRM Notes to Users

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was NAD 1983 StatePlane Alaska 1 FIPS 5001 Feet**.** The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the Mean Lower Low Water (MLLW). The borough-wide conversion factor from NGDVD29 to MLLW is minus 8.2 feet (Reference 9). These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the MLWW**,** visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 31 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided by in digital format by the City and Borough of Juneau, Alaska Deptarment of Natural Resources (AK DNR), Bureau of Land Management (BLM), U.S. Forest Service (USFS), and the United States Geological Survey (USGS).This information was compiled at varius map scales during the time period 1997 – 2016. Other information was derived from digital orthophotography at a 6-inch resolution from photography dated 2013. For information about base maps, refer to Section 6.2 “Base Map” in this FIS Report.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Figure 2. FIRM Notes to Users

NOTES FOR FIRM INDEX
REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within City and Borough of Juneau, Alaska, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 28 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.
SPECIAL NOTES FOR SPECIFIC FIRM PANELS This Notes to Users section was created specifically for City and Borough of Juneau, Alaska**,** effective "To Be Determined".
FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

	Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone, either at cross section locations or as static whole-foot elevations that apply throughout the zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.
	Regulatory Floodway determined in Zone AE.

Figure 3: Map Legend for FIRM

Non-encroachment zone (see Section 2.4 of this FIS Report for more information)

FLOOD INSURANCE IS NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER APRIL 8, 1987, IN THE DESIGNATED COLORADO RIVER FLOODWAY

The Colorado River Floodway was established by Congress in the Colorado River Floodway Protection Act of 1986, Public Law 99-450 (100 Statute 1129). The Act imposes certain restrictions within the Floodway.

OTHER AREAS OF FLOOD HAZARD

Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.

Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.

Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood. See Notes to Users for important information.

OTHER AREAS

Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

NO SCREEN — Unshaded Zone X: Areas of minimal flood hazard.

FLOOD HAZARD AND OTHER BOUNDARY LINES

(ortho) (vector) — Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)

Limit of Study

Jurisdiction Boundary

Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet

GENERAL STRUCTURES

Aqueduct
Channel
Culvert
Storm Sewer

Channel, Culvert, Aqueduct, or Storm Sewer

Figure 3: Map Legend for FIRM

Dam Jetty Weir	Dam, Jetty, Weir
	Levee, Dike, or Floodwall accredited or provisionally accredited to reduce the flood risk from the 1% annual chance flood.
	Levee, Dike or Floodwall not accredited to reduce the flood risk from the 1% annual chance flood.
Bridge	Bridge
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas. See Notes to Users for important information.*	
CBRS AREA 09/30/2009	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
OTHERWISE PROTECTED AREA 09/30/2009	Otherwise Protected Area
REFERENCE MARKERS	
22.0	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
B 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
5280 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
8	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.

Figure 3: Map Legend for FIRM

~~ 513 ~~~~	Base Flood Elevation Line (shown for flooding sources for which no cross sections or profile are available)
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity
BASE MAP FEATURES	
Auke Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}E$	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and the City and Borough of Juneau, Alaska as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 23), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, "Map Legend for FIRM", describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within the City and Borough of Juneau, Alaska respectively.

Table 2, "Flooding Sources Included in this FIS Report," lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 13. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Auke Bay	City and Borough of Juneau	Auke Cape	Sphun Island	19010301	15	NA	N	AE, VE, X	2010 & 2016
Auke Creek & Lake	City and Borough of Juneau	Outlet into Auke Bay	Approx. 1,100 feet above Mendenhall Loop Road	19010301	1.3	NA	N	A	January 2016
Berners Bay	City and Borough of Juneau	Gastineau Channel	Sawmill Creek	19010301	7	NA	N	V	2010
Cowee Creek	City and Borough of Juneau	Outlet into Berners Bay	Headwaters at Thiel Glacier	19010301	10.2	NA	N	A	1990
Douglas Harbor	City and Borough of Juneau	Approx. 1,000 FT SE of Mayflower Island Rd. Bridge	Approximately 1,500 FT NW of 10 St. Bridge	19010301	4	NA	N	AE, VE, X	2016
Duck Creek	City and Borough of Juneau	Radcliffe Road	Approx. 400 feet above Taku Blvd.	19010301	3.4	NA	Y	A, AE AH, X	January 2016
Eagle Creek	City and Borough of Juneau	Outlet into Gastineau Channel	Headwaters northwest of Mt. Troy	19010301	0.1	NA	N	A	1990
Eagle River	City and Borough of Juneau	Confluence with Herbert River	Approx. 1,000 feet above inlet to Eagle River By-Pass	19010301	3.1	NA	Y	AE, X	1990
Eagle River By-Pass	City and Borough of Juneau	Confluence with Eagle River	Inlet from Eagle River	19010301	1.2	NA	Y	AE, X	1990
East Fork Duck Creek	City and Borough of Juneau	Confluence with Duck Creek	Kiowa Drive	19010301	1.3	NA	Y	AE, X	January 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Echo Cove	City and Borough of Juneau	Outlet into Berners Bay	Echo Cove Drive	19010301	3.5	NA	N	V	2010
Favorite Channel	City and Borough of Juneau	Point Lena	Tee Harbor	19010301	3	NA	N	VE	2010
Favorite Channel	City and Borough of Juneau	Huffman Harbor	Eagle Harbor	19010301	7.5	NA	N	V, AE, VE, X	2010
Gastineau Channel	City and Borough of Juneau	Juneau Bridge	Bullion Creek	19010301	8	NA	N	V, AE, VE, X	2010
Gastineau Channel & Fritz Cove	City and Borough of Juneau	Auke Bay (Douglas Island Side)	Juneau Bridge	19010301	12	NA	N	V, AE, VE, X	2010
Gold Creek	City and Borough of Juneau	Outlet into Gastineau Channel	Approx. 600 feet above unnamed tributary	19010301	2.0	NA	N	A	January 2016
Grant Creek	City and Borough of Juneau	Outlet into Gastineau Channel	0.61 mile above outlet	19010301	0.61	NA	N	A	1990
Hendrickson Creek	City and Borough of Juneau	Outlet into Gastineau Channel	0.71 mile above outlet	19010301	0.71	NA	N	A	1990
Herbert River	City and Borough of Juneau	Confluence with Eagle River	Inlet to Herbert River By-Pass	19010301	3.8	NA	Y	AE	1990
Herbert River By-Pass	City and Borough of Juneau	Confluence with Herbert River	Inlet from Herbert River	19010301	1.2	NA	Y	AE	1990
Johnson Creek	City and Borough of Juneau	Outlet into Gastineau Channel	0.77 mile above outlet	19010301	0.77	NA	N	AE	1990
Jordan Creek	City and Borough of Juneau	Airport Access Road	Approx. 1,300 feet above Amalga Street	19010301	3.1	NA	Y	AE	January 2016

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Lemon Creek	City and Borough of Juneau	Approx. 4,600 feet above Gastineau Channel	Approx. 500 feet above private bridge	19010301	1.6	NA	Y	AE	January 2016
Mendenhall River	City and Borough of Juneau	Confluence with Fritz Cove	Approx. 4,750 feet above Mendenhall Loop Road	19010301	5.5	NA	Y	A, AE AH	2010
Montana Creek	City and Borough of Juneau	Confluence with Mendenhall River	Confluence with McGinnis Creek	19010301	5.9	NA	Y	A, AE	1990
Montana Creek Overbank Flow	City and Borough of Juneau	Confluence with Montana Creek	Divergence from Montana Creek	19010301	0.7	NA	Y	AE	1990
Paris Creek	City and Borough of Juneau	Outlet into Gastineau Channel	Headwaters at Mt. Bradley	19010301	2.4	NA	N	A	1990
Peterson Creek	City and Borough of Juneau	Mouth of creek	Approx. 1,500 feet above Glacier Highway	19010301	1.2	NA	Y	A, AE	1990
Peterson Creek (Douglas Island)	City and Borough of Juneau	Outlet into Fritz Cove	Approx. 3.8 miles above outlet	19010301	3.8	NA	N	A	1990
Salmon Creek	City and Borough of Juneau	Seventy feet downstream of Glacier Highway	Approx. 1,330 feet above Glacier Highway	19010301	0.27	NA	Y	AE	1990
Sheep Creek	City and Borough of Juneau	Outlet into Gastineau Channel	Approx. 3.5 miles above outlet	19010301	3.5	NA	N	A	1990
South Fork Cowee Creek	City and Borough of Juneau	Confluence with Cowee Creek	Yankee Basin headwaters	19010301	4.7	NA	N	A	1990
Stephens Passage	City and Borough of Juneau	Hilda Creek	Outer Point	19010206, 19010500	6.7	NA	N	V	2010

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Switzer Creek (Backwater from Lemon Creek & Tidal flooding)	City and Borough of Juneau	Outlet into Gastineau Channel	Approx. 0.3 miles above Glacier Hwy	19010301	0.7	NA	N	AE, X	2016
Taku River	City and Borough of Juneau	Taku Inlet	U.S – Canada Border	19010304	19.2	NA	N	V, D	2010
Tee Harbor	City and Borough of Juneau	Point Stevens	Shrine Creek	19010301	7	NA	N	A	2010
Tributary to Favorite Channel	City and Borough of Juneau	Confluence with Favorite Channel	Glacier Highway	19010301	1.8	NA	Y	AE, X	1990
Tributary to Favorite Channel	City and Borough of Juneau	Glacier Highway	Approx. 1 mile upstream at Glacier Highway	19010301	1	NA	N	A	1990
Tributary to Favorite Channel By-Pass	City and Borough of Juneau	Confluence with Tributary to Favorite Channel	Approx. 3,200 feet above Herbert River Road	19010301	0.8	NA	Y	AE, AO A	1990
Unnamed Tributary to Duck Creek	City and Borough of Juneau	Confluence with Duck Creek	Approx. 100 feet above Mendenhall Loop Road	19010301	0.3	NA	Y	AE, X	January 2016

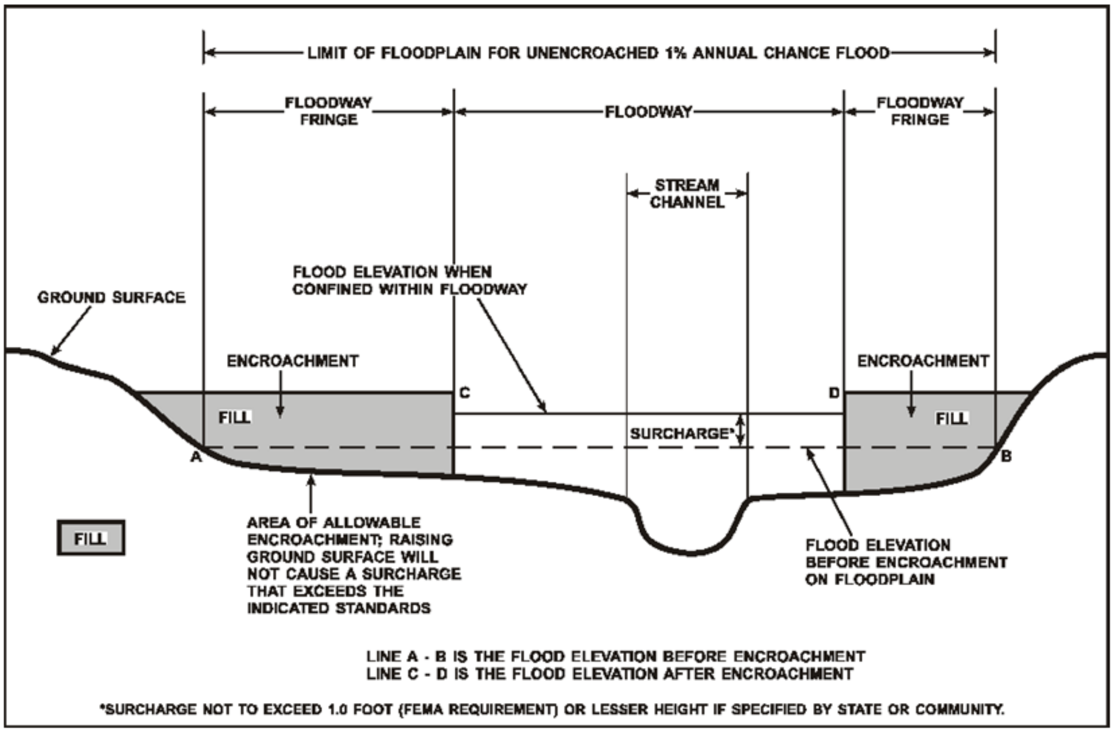
2.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard.

For purposes of the NFIP, a floodway is used as a tool to assist local communities in balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. Regulations for Alaska require communities in the City and Borough of Juneau to limit increases caused by encroachment to 0.5 foot and several communities have adopted additional restrictions. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 24, “Floodway Data.”

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and l% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM.

2.4 Non-Encroachment Zones

Some States and communities use non-encroachment zones to manage floodplain development. While not a FEMA designated floodway, the non-encroachment zone represents that area around the stream that should be reserved to convey the 1% annual chance flood event.

Regulations for Alaska require communities in the City and Borough of Juneau to limit increases caused by encroachment to 1.0 foot.

Non-encroachment determinations may be delineated where it is not possible to delineate floodways because specific channel profiles with bridge and culvert geometry were not developed. Any non-encroachment determinations for this Flood Risk Project have been tabulated for selected cross sections and are shown in Table 25, "Flood Hazard and Non-Encroachment Data for Selected Streams."

2.5 Coastal Flood Hazard Areas

For most areas along rivers, streams, and small lakes, BFEs and floodplain boundaries are based on the amount of water expected to enter the area during a 1% annual chance flood and the geometry of the floodplain. Floods in these areas are typically caused by storm events. However, for areas on or near ocean coasts, large rivers, or large bodies of water, BFE and floodplain boundaries may need to be based on additional components, including storm surges and waves. Communities on or near ocean coasts face flood hazards caused by offshore seismic events as well as storm events.

Coastal flooding sources that are included in this Flood Risk Project are shown in Table 2.

2.5.1 Water Elevations and the Effects of Waves

Specific terminology is used in coastal analyses to indicate which components have been included in evaluating flood hazards.

The stillwater elevation (SWEL or still water level) is the surface of the water resulting from astronomical tides, storm surge, and freshwater inputs, but excluding wave setup contribution or the effects of waves.

- *Astronomical tides* are periodic rises and falls in large bodies of water caused by the rotation of the earth and by the gravitational forces exerted by the earth, moon and sun.
- *Storm surge* is the additional water depth that occurs during large storm events. These events can bring air pressure changes and strong winds that force water up against the shore.
- *Freshwater inputs* include rainfall that falls directly on the body of water, runoff from surfaces and overland flow, and inputs from rivers.

The 1% annual chance stillwater elevation is the stillwater elevation that has been calculated for a storm surge from a 1% annual chance storm. The 1% annual chance storm surge can be determined from analyses of tidal gage records, statistical study of regional historical storms, or other modeling approaches. Stillwater elevations for storms of other frequencies can be developed using similar approaches.

The total stillwater elevation (also referred to as the mean water level) is the stillwater elevation plus wave setup contribution but excluding the effects of waves.

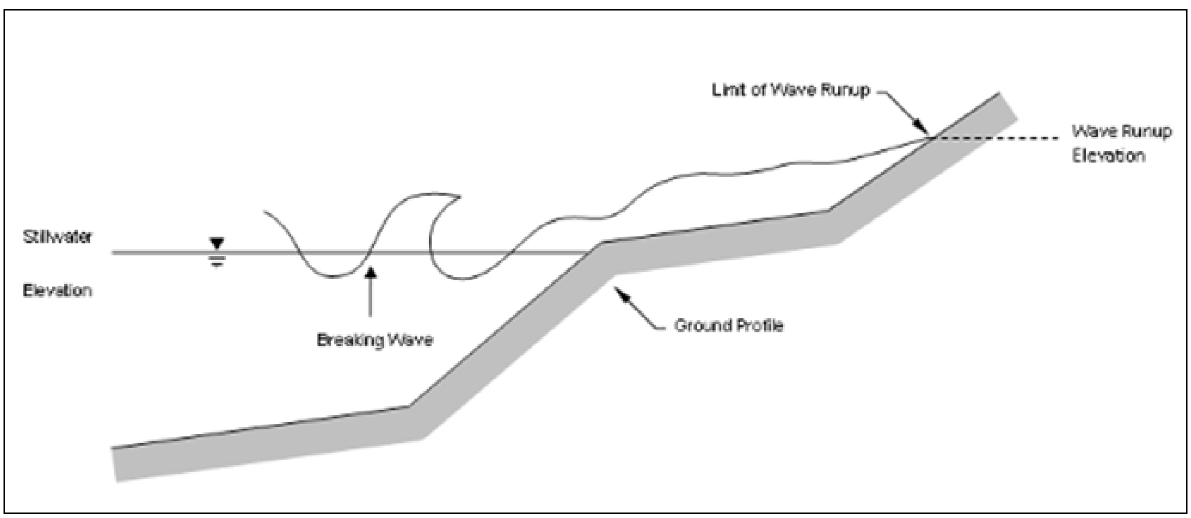
- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column.

Like the stillwater elevation, the total stillwater elevation is based on a storm of a particular frequency, such as the 1% annual chance storm. Wave setup is typically estimated using standard engineering practices or calculated using models, since tidal gages are often sited in areas sheltered from wave action and do not capture this information.

Coastal analyses may examine the effects of overland waves by analyzing storm-induced erosion, overland wave propagation, wave runup, and/or wave overtopping.

- *Storm-induced erosion* is the modification of existing topography by erosion caused by a specific storm event, as opposed to general erosion that occurs at a more constant rate.
- *Overland wave propagation* describes the combined effects of variation in ground elevation, vegetation, and physical features on wave characteristics as waves move onshore.
- *Wave runup* is the uprush of water from wave action on a shore barrier. It is a function of the roughness and geometry of the shoreline at the point where the stillwater elevation intersects the land.
- *Wave overtopping* refers to wave runup that occurs when waves pass over the crest of a barrier.

Figure 5: Wave Runup Transect Schematic



2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

For coastal communities along the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea, flood hazards must take into account how storm surges, waves, and extreme tides interact with factors such as topography and vegetation. Storm surge and waves must also be considered in assessing flood risk for certain communities on rivers or large inland bodies of water.

Beyond areas that are affected by waves and tides, coastal communities can also have riverine floodplains with designated floodways, as described in previous sections.

Floodplain Boundaries

In many coastal areas, storm surge is the principle component of flooding. The extent of the 1% annual chance floodplain in these areas is derived from the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm. The methods that were used for calculation of total stillwater elevations for coastal areas are described in Section 5.3 of this FIS Report. Location of total stillwater elevations for coastal areas are shown in Figure 8, “1% Annual Chance Total Stillwater Levels for Coastal Areas.”

In some areas, the 1% annual chance floodplain is determined based on the limit of wave runup or wave overtopping for the 1% annual chance storm surge. The methods that were used for calculation of wave hazards are described in Section 5.3 of this FIS Report.

Table 26 presents the types of coastal analyses that were used in mapping the 1% annual chance floodplain in coastal areas.

Coastal BFEs

Coastal BFEs are calculated as the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm plus the additional flood hazard from overland wave effects (storm-induced erosion, overland wave propagation, wave runup and wave overtopping).

Where they apply, coastal BFEs are calculated along transects extending from offshore to the limit of coastal flooding onshore. Results of these analyses are accurate until local topography, vegetation, or development type and density within the community undergoes major changes.

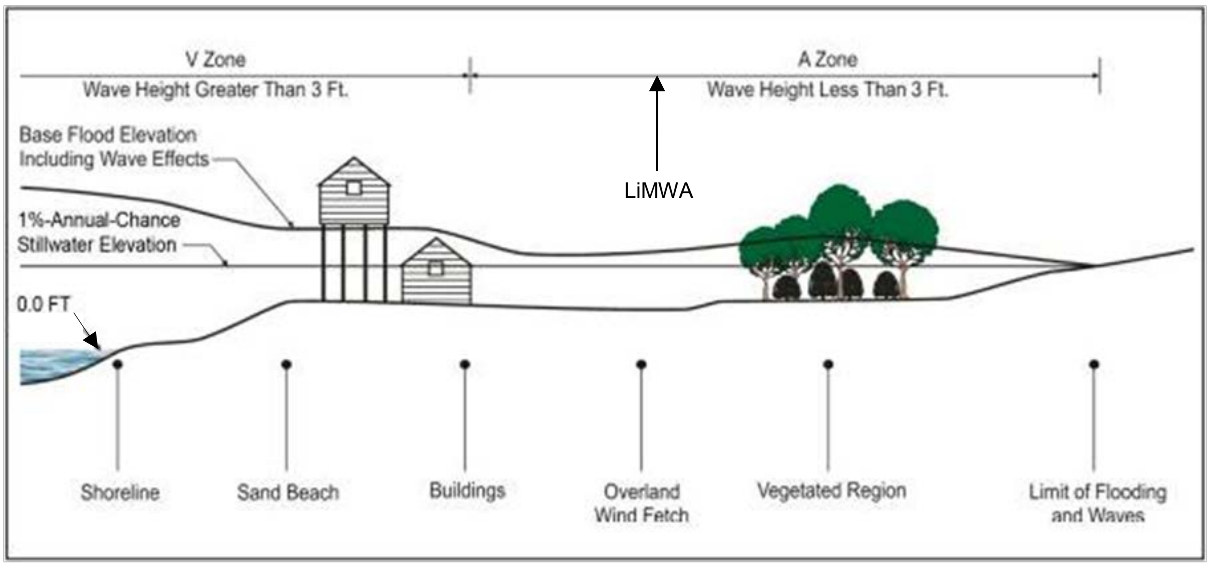
Parameters that were included in calculating coastal BFEs for each transect included in this FIS Report are presented in Table 17 “Coastal Transect Parameters.” The locations of transects are shown in Figure 9, “Transect Location Map.” More detailed information about the methods used in coastal analyses and the results of intermediate steps in the coastal analyses are presented in Section 5.3 of this FIS Report. Additional information on specific mapping methods is provided in Section 6.4 of this FIS Report.

2.5.3 Coastal High Hazard Areas

This section is not applicable to this Flood Risk Project.

Figure 6, "Coastal Transect Schematic," illustrates the relationship between the base flood elevation, the 1% annual chance stillwater elevation, and the ground profile as well as the location of the Zone VE and Zone AE areas in an area without a PFD subject to overland wave propagation. This figure also illustrates energy dissipation and regeneration of a wave as it moves inland.

Figure 6: Coastal Transect Schematic



Methods used in coastal analyses in this Flood Risk Project are presented in Section 5.3 and mapping methods are provided in Section 6.4 of this FIS Report.

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, "Map Legend for FIRM." In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 17 due to the presence of wave effects. The higher elevation should be used for construction and/or floodplain management purposes.

2.5.4 Limit of Moderate Wave Action

Laboratory tests and field investigations have shown that wave heights as little as 1.5 feet can cause damage to and failure of typical Zone AE building construction. Wood-frame, light gage steel, or masonry walls on shallow footings or slabs are subject to damage when exposed to waves less than 3 feet in height. Other flood hazards associated with coastal waves (floating debris, high velocity flow, erosion, and scour) can also damage Zone AE construction.

Therefore, a LiMWA boundary may be shown on the FIRM as an informational layer to assist coastal communities in safe rebuilding practices. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The location of the

LiMWArelative to Zone VE and Zone AE is shown in Figure 6.

The effects of wave hazards in Zone AE between Zone VE (or the shoreline where Zone VE is not identified) and the limit of the LiMWA boundary are similar to, but less severe than, those in Zone VE where 3-foot or greater breaking waves are projected to occur during the 1% annual chance flooding event. Communities are therefore encouraged to adopt and enforce more stringent floodplain management requirements than the minimum NFIP requirements in the LiMWA. The NFIP Community Rating System provides credits for these actions.

Where wave runup elevations dominate over wave heights, there is no evidence to date of significant damage to residential structures by runup depths less than 3 feet. Examples of these areas include areas with steeply sloped beaches, bluffs, or flood protection structures that lie parallel to the shore. In these areas, the FIRM shows the LiMWA immediately landward of the VE/AE boundary. Similarly, in areas where the zone VE designation is based on the presence of a primary frontal dune or wave overtopping, the LiMWA is delineated immediately landward of the Zone VE/AE boundary.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, "Map Legend for FIRM." Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in the unincorporated and incorporated areas of the City and Borough of Juneau, Alaska.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
The City and Borough of Juneau	A, AE, AO, AH, V, VE, X

3.2 Coastal Barrier Resources System

This section is Not Applicable to this Flood Risk Project.

Table 4: Coastal Barrier Resources System Information

[Not Applicable to this Flood Risk Project]

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 5 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 5: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Lynn Canal	19010301	Lynn Canal, Gastineau Channel	Sparsely-populated, remote and mountainous landscape with peaks rising to 4,000 and more, region has undergone severe glacial action, exaggerating steep mountain slopes and leaving U-shaped valleys through which larger rivers flow. Juneau and Douglas are only incorporated towns.	3,303
Taku River	19010304	Taku River	Sparsely-populated, remote and mountainous landscape.	N/A
Holkham Bay	19010206	Holkham Bay	Sparsely-populated, remote and mountainous landscape	N/A
Admiralty Island	19010204	Stephens Passage	Admiralty Island. Sparsely-populated, remote and mountainous landscape.	N/A
Icy Strait-Chatham Strait	19010500	Stephens Passage	Frederick Sound and Stephens Passage Open Water	N/A

4.2 Principal Flood Problems

Table 6 contains a description of the principal flood problems that have been noted for the City and Borough of Juneau, Alaska by flooding source.

Table 6: Principal Flood Problems

Flooding Source	Description of Flood Problems
All sources	Floods in the Juneau area can occur as a result of a combination of factors including heavy snowpack, temperature fluctuations, and precipitation. Since most development is along coastlines, most serious stream flooding will result when peak stream flows occur simultaneously with high tides. This causes streams to back up and flooding at higher elevations. High winds combined with high tides create storm surge and wave runup, representing the greatest flooding threat to the coastal areas. In addition to high tides and coastal storms, other flood problems are inadequate culverts and bridges which become blocked by debris and ice, developments that encroach onto and obstruct natural floodplains, high velocity flow, and siltation of culverts. Along some creeks, there are stockpiles of logs which increase flooding if carried downstream to a constriction.
Mendenhall River	Moderate flooding has occurred in the past in Mendenhall Valley, primarily resulting from flood flows on the smaller streams. Except for Montana Creek, the streams in the valley flow through fairly dense residential areas with numerous bridges and culverts which cause most of the flooding. Largest recorded floods occurred in 1927 and 1943 (USACE, 1970).
Lemon Creek	Along Lemon Creek is the Old Glacier Highway bridge, the only major constriction to this stream's flow. The most serious flooding of Lemon Creek occurs just above this bridge. Dredging of lower Lemon Creek ended in the mid-1980s and increased sedimentation within the channel will likely increase flooding risks in the vicinity.
Gold Creek	Flooding occurred Prior to channelization in 1958. No serious events since.
Coastal – Gastineau Channel & Fritz Cove	Coastal flooding influences occur on the downstream reaches of the Mendenhall River, Duck Creek, and Lemon Creek. One-percent chance flood of 23.4 feet occurs at the downstream end of each stream study reach.

Table 7 contains information about historic flood elevations in the communities within the City and Borough of Juneau, Alaska.

Table 7: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAD83)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Jordan Creek	USGS Gage	10.07	9/30/15	*	National Weather Service
Lemon Creek	USGS Gage	12.3	9/30/15	*	National Weather Service
Mendenhall River	All along river	*	1927 & 1943	*	Flood Insurance Study 8/19/2013

* Data not Available

4.3 Non-Levee Flood Protection Measures

Table 8 contains information about non-levee flood protection measures within City and Borough of Juneau, Alaska such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 8: Non-Levee Flood Protection Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Gastinau Channel	Glacier Highway	Rock Revetments	Tidal area between Juneau and Juneau Airport	To provide protection against coastal storms and flooding
Gastinau Channel	Juneau International Airport	Dikes	Perimiter of property facing channel	To protect airport from coastal flooding

4.4 Levees

This section is not applicable to this Flood Risk Project.

Table 9: Levees

[Not Applicable to this Flood Risk Project]

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

In addition to these flood events, the “1-percent-plus”, or “1%+”, annual chance flood elevation has been modeled and included on the flood profile for certain flooding sources in this FIS Report. While not used for regulatory or insurance purposes, this flood event has been calculated to help illustrate the variability range that exists between the regulatory 1% annual chance flood elevation and a 1% annual chance elevation that has taken into account an additional amount of uncertainty in the flood discharges (thus, the 1% “plus”). For flooding sources whose discharges were estimated using regression equations, the 1%+ flood elevations are derived by taking the 1% annual chance flood discharges and increasing the modeled discharges by a percentage equal to the average predictive error for the regression equation. For flooding sources with gage- or rainfall-runoff-based discharge estimates, the upper 84-percent confidence limit of the discharges is used to compute the 1%+ flood elevations.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 27, “Incorporated Letters of Map Change”, which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, “FIRM Revisions.”

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 13. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 10. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure 7 for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 11. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 15.) Stream gage information is provided in Table 12.

The hydrologic analysis conducted by the USACE included a review of all existing flood-frequency data for the area and the utilization of analytical techniques best suited to the specific stream databases. All of the streams were evaluated on a regional frequency basis. However, the final analysis of each stream was made using an annual series frequency analysis, USGS and U.S. Department of Agriculture regression equations, and a model study using the Streamflow Synthesis and Reservoir Regulation (SSARR) computer program developed by the USACE (Reference 12). Statistical analyses were conducted in accordance with Water Resources Council guidelines for the determination of log-Pearson Type III frequency distributions (Reference 13). Model studies consisted of basin calibration based on historic information and the subsequent generation of peak floods as determined from the 10-, 2-, 1-, and 0.2-percent-annual-chance precipitation inputs obtained from the Weather Bureau (References 14 and 15). The maximum precipitation level was also obtained from the National Weather Service.

The SSARR model was developed initially without urbanization to ensure that the peak runoff values were consistent with other local unurbanized drainage basins. The basins were then broken down into subbasins which were consistent with culverts and other physical constraints. The relationships of storage versus elevation and discharge were developed for each control point. Discharge relationships were further influenced by tailwater encroachment from the downstream pondage. The total outflow volumes and subsequent area of inundation under this analysis remained similar to that of the analysis for uncontrolled conditions. The net change is a reduction in peak flow throughout the two basins.

During the summer months, runoff from Montana Creek is dependent on the amount of precipitation and not on the temperature. By contrast, the effect of higher temperatures on glacial melt is dramatic throughout the summer and masks the runoff due to precipitation in the Mendenhall River basin. About 90 percent of the runoff from the Mendenhall River occurs during the summer indicating that glacial melt accounts for a substantial amount of the total flow. However, the runoff characteristics of the Mendenhall River are not common to most of the streams in Juneau. Runoff patterns for the majority of the streams were found to be more closely related to those of Montana Creek.

The revised flood frequency analysis for the Mendenhall River was conducted using USGS gage data from both the Mendenhall River and Montana Creek (Reference 6). The USGS maintains a gage station at the upstream end of the Mendenhall River (Stat.15052500), and on Montana Creek (Stat.15052800) upstream of the confluence, with 34 and 17 years of peak-flow records, respectively. The 0.2-percent annual chance peak discharge for the Mendenhall River was obtained from a separate USGS report (Reference 16).

Coastal

Determination of tidal elevations used for the USACE's coastal study in the original FIS (Reference 8) was made by utilizing the local tide exceedance frequency combined with a wind exceedance frequency. Therefore, there is some overlap in the data provided. These data reflect a more conservative approach. Elevations were only determined for the 10- and 1-percent-annual-chance frequency floods. The tidal information was obtained from the National Oceanic and Atmospheric Administration (Reference 17). This information indicated that an extreme tide range of 28 feet was prevalent in the Juneau area and the maximum high tide varied from 22.0 feet in the area north of Juneau to 22.5 feet at Douglas Island. These elevations were modified slightly for sheltered areas that are protected from wave runup. These maximum tides are the highest recorded or the highest estimated tides which include meteorological effects and therefore have no determinable frequency.

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Plus	0.2% Annual Chance
Auke Creek	Upstream from Glacier Highway	3.85	266	318	358	397	497	490
Auke Creek	Upstream from Mendenhall Loop Road	2.33	161	193	216	240	301	296
Duck Creek[1]	Confluence with the Mendenhall River near Fritz Cove	1.62	77	95	109	125	167	165
Duck Creek[1]	Upstream from Cessna Drive	1.5	74	90	104	119	160	157
Duck Creek[1]	Upstream from Egan Drive	1.36	65	80	92	105	141	139
Duck Creek[1]	Upstream from Mendenhall Loop Road / Confluence with East Fork Duck Creek	0.51	24	30	34	39	53	52
Duck Creek[1]	Upstream from Stephen Richards Memorial Drive	0.4	19	24	27	31	42	41
Duck Creek[1]	Upstream from Confluence with Unnamed Tributary to Duck Creek, near McGinnis Road	0.34	16	20	23	26	35	34
Duck Creek[1]	Upstream from Mendenhall Boulevard	0.25	12	15	17	19	26	25
Duck Creek[1]	Upstream from Taku Boulevard	0.13	6	8	9	10	14	13
Eagle River	At Mouth	47.5	6,400	*	8,300	9,500	*	11,850
Eagle River	Upstream of Confluence with Eagle River By-Pass	47.5	3,800	*	4,750	5,125	*	6,250
Eagle River By-Pass	At Mouth	47.5	2,600	*	3,550	4,375	*	5,600

Table 10: Summary of Discharges (*continued*)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Plus	0.2% Annual Chance
East Fork Duck Creek[1]	Upstream from Nancy Street (Confluence with Duck Creek)	0.72	125	154	175	197	277	250
East Fork Duck Creek[1]	Upstream from Lakeside Condos Drive	0.69	134	165	188	210	297	267
East Fork Duck Creek[1]	Upstream from Dudley Street	0.57	141	173	197	221	311	280
East Fork Duck Creek[1]	Upstream from Valley Boulevard	0.48	119	146	167	187	264	237
Gold Creek	Upstream from Egan Drive	10.52	2,309	2,762	3,113	3,477	3,875	4,386
Gold Creek	Upstream from Basin Road	9.71	2,132	2,550	2,875	3,211	3,578	4,050
Gold Creek	Upstream from Perseverance Trailhead Parking Area	8	1,666	1,756	2,100	2,367	2,947	3,335
Herbert River	At Mouth	56.9	7,500	*	9,800	11,000	*	13,700
Herbert River	Upstream of Outlet of Herbert River By-Pass	56.9	3,425	*	4,450	4,990	*	5,980
Herbert River By-Pass	At Mouth	56.9	4,075	*	5,350	6,010	*	7,660
Jordan Creek[2]	Upstream from Juneau Airport	3.08	181	223	257	292	442	378
Jordan Creek[2]	Upstream from Egan Drive	2.74	161	199	229	260	394	337
Jordan Creek[2]	Near Gail Avenue	2.08	122	151	173	197	298	255
Jordan Creek[2]	Upstream from Amalga Street	1.25	73	91	104	119	180	154
Jordan Creek[2]	Upstream from Valley Blvd	1.05	61	76	87	99	150	129
Lemon Creek[3]	Confluence with Gastineau Channel	23.97	3,940	4,753	5,371	5,969	8,416	7,437

Table 10: Summary of Discharges (*continued*)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Plus	0.2% Annual Chance
Lemon Creek[3]	Anka Street Bridge	22.23	3,731	4,501	5,087	5,653	7,971	7,043
Mendenhall River	At mouth	102.8	14,370	*	18,660	20,480	*	26,060
Mendenhall River	At Lake Outlet	85.1	12,300	*	15,700	17,100	*	20,200
Montanna Creek	At Mouth	16.2	2,100	*	3,000	3,500	*	4,900
Montanna Creek	At Confluence with Overbank Flow	*	1,350	*	1,780	2,050	*	2,750
Montanna Creek-Overbank Flow	At Mouth	14.6	750	*	1,220	1,450	*	2,150
Peterson Creek	At Mouth	9.72	1,980	*	2,310	2,670	*	3,220
Salmon Creek	At Mouth	10	1,980	*	2,170	2,430	*	2,970
Tributary to Favorite Channel	Confluence of Tributary to Favorite Channel By-Pass	2.43	450	*	700	800	*	1,050
Tributary to Favorite Channel By-Pass	Access Road Upstream of Confluence with Tributary to Favorite Channel	2.43	75	*	110	125	*	175
Unnamed Tributary to Duck Creek[1]	Confluence with Duck Creek	0.03	15	18	20	23	32	29

1 The Duck Creek watershed and associated tributaries are affected by urbanization. In addition, the unnamed tributary to Duck Creek and the East Fork of Duck Creek have drainage areas outside of the permissible range for use of Region 1 regression equations.

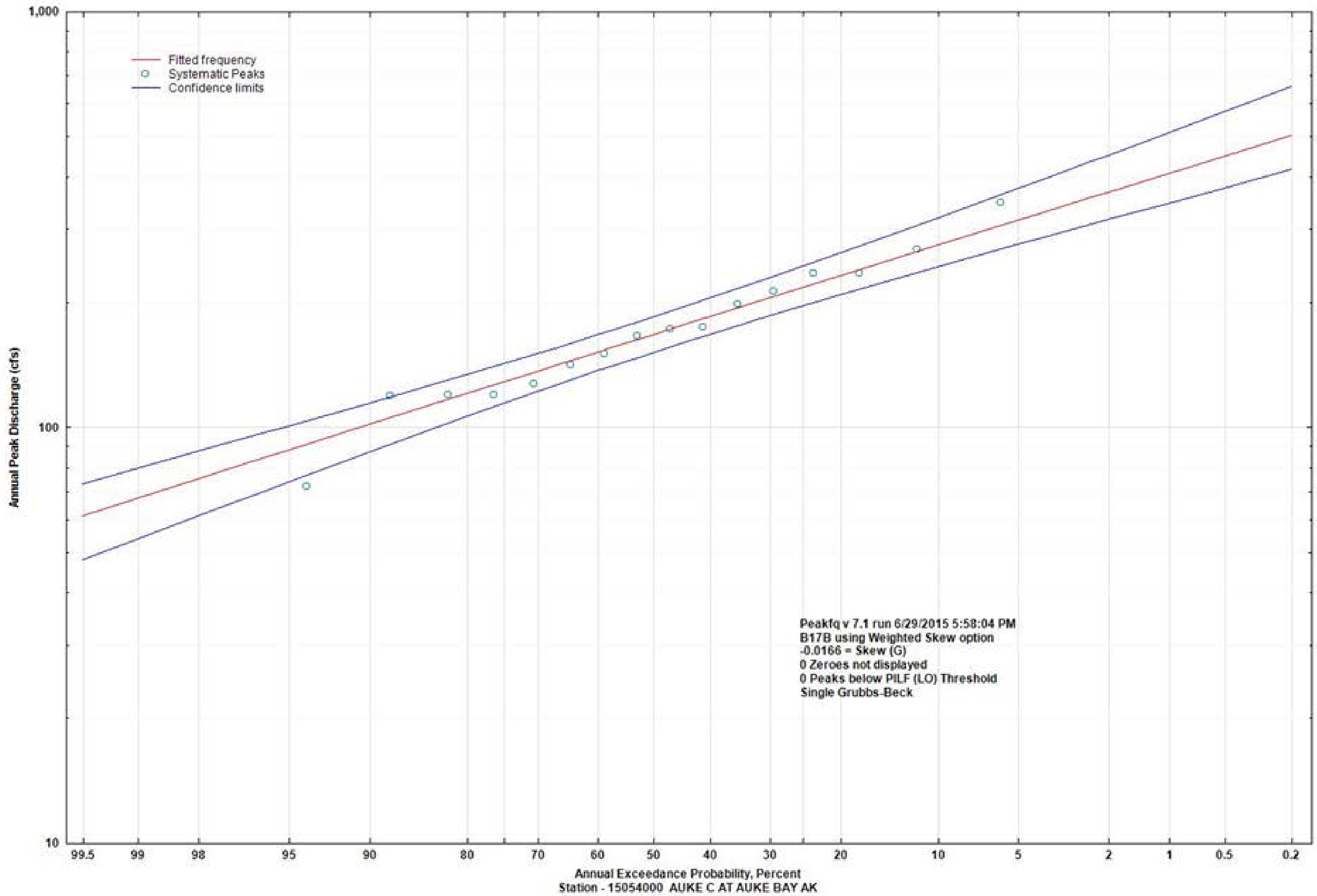
2 The Jordan Creek watershed gage peak-flow record is limited to 9 years.

3 The Lemon Creek watershed includes a portion of the Lemon Creek Glacier and therefore Lemon Creek may be subject to periodic release of glacial impoundments.

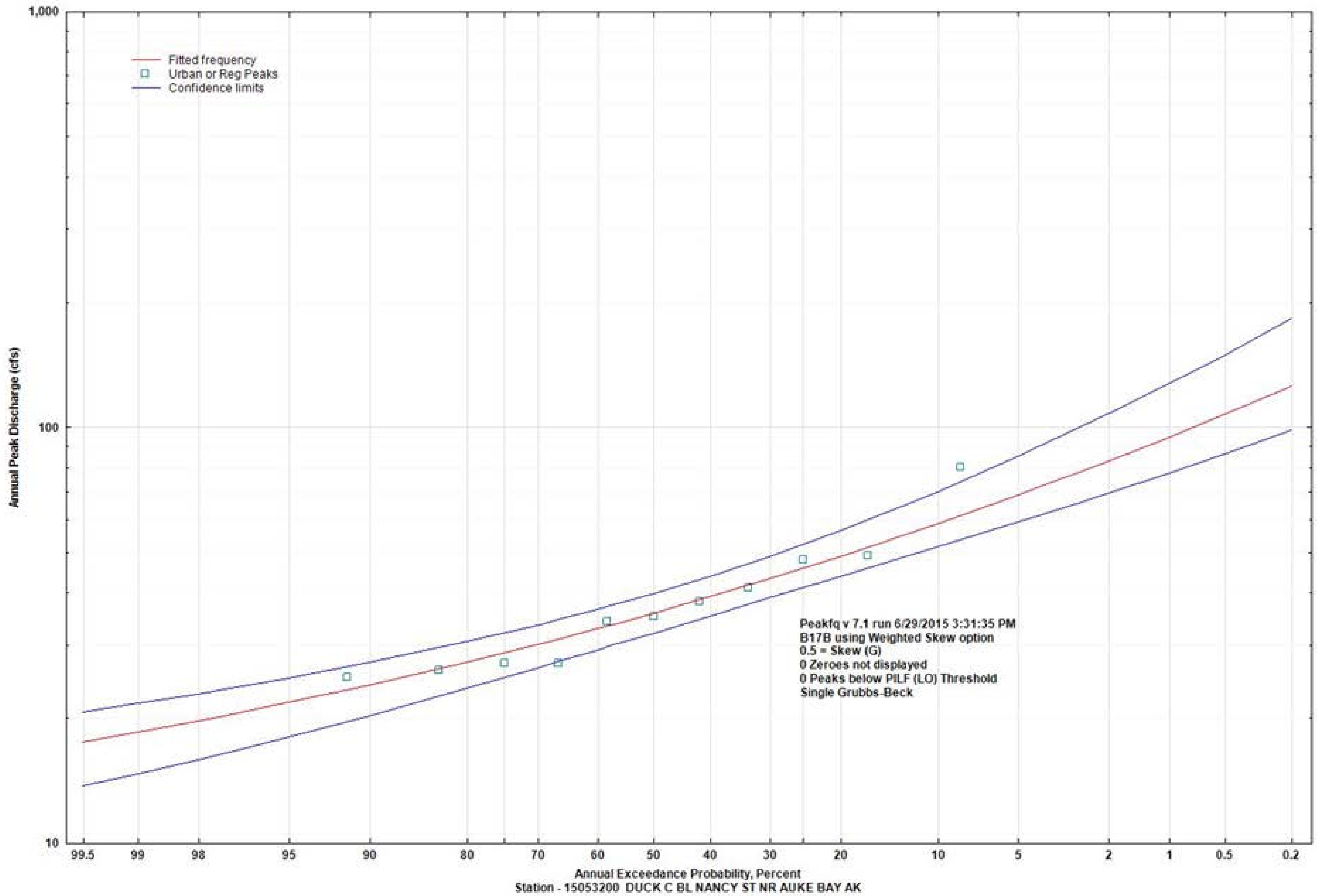
*Not calculated for this Flood Risk Project

Figure 7: Gage Analysis Results

Auke Creek



Duck Creek



1,000
100
10
Annual Peak Discharge (cfs)
Fitted frequency
Urban or Reg Peaks
Confidence limits
Peakfq v 7.1 run 6/29/2015 3:31:35 PM
B17B using Weighted Skew option
0.5 = Skew (G)
0 Zeroes not displayed
0 Peaks below PILF (LO) Threshold
Single Grubbs-Beck
99.5
99
98
95
90
80
70
60
50
40
30
20
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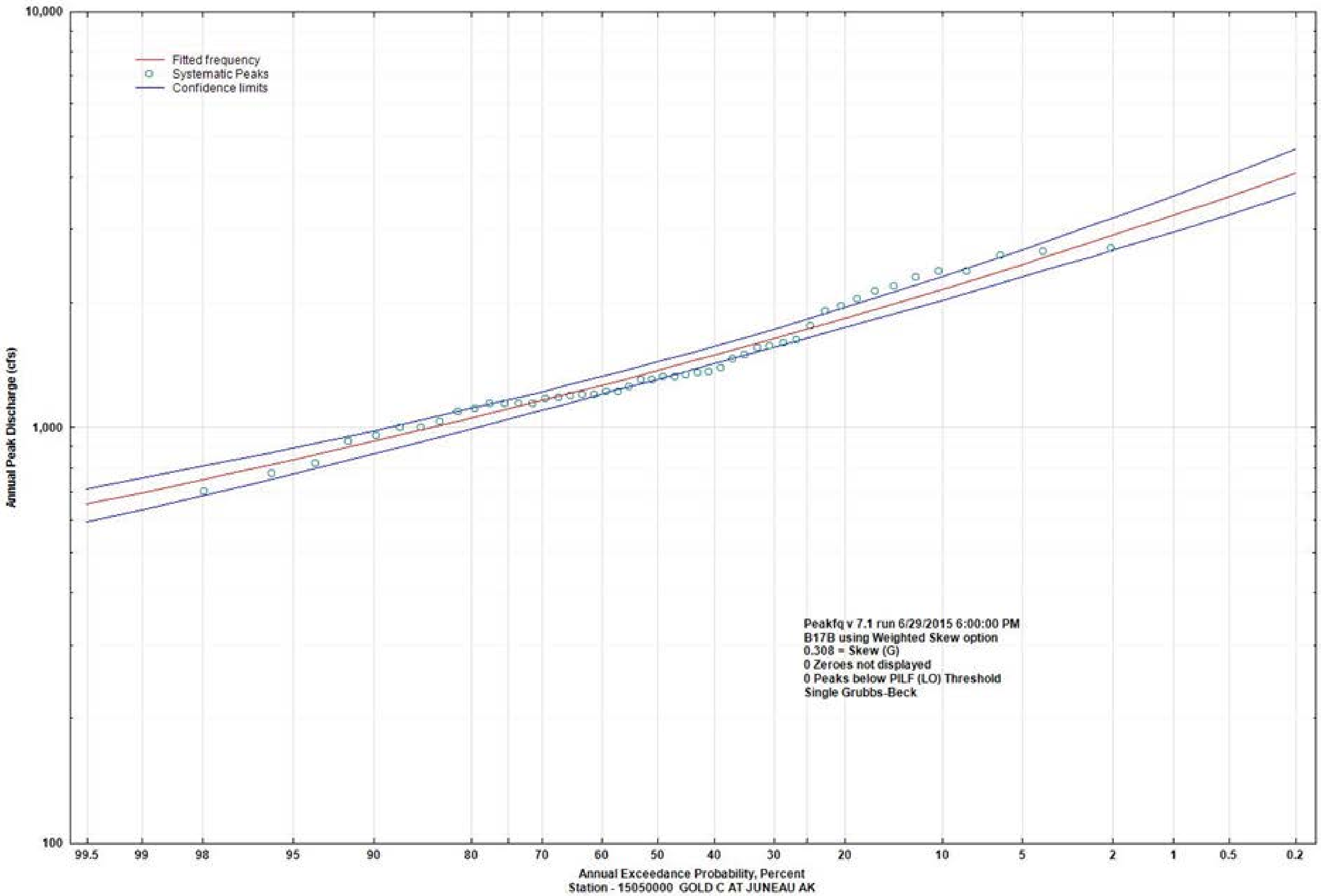
5
2
1
0.5
0.2
Annual Exceedance Probability, Percent
Station - 15053200 DUCK C BL NANCY ST NR AUKE BAY AK

Gold Creek



10,000
1,000
100
Annual Peak Discharge (cfs)
Fitted frequency
Systematic Peaks
Confidence limits
Peakfq v 7.1 run 6/29/2015 6:00:00 PM
B17B using Weighted Skew option
0.308 = Skew (G)
0 Zeroes not displayed
0 Peaks below PILF (LO) Threshold
Single Grubbs-Beck
99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2
Annual Exceedance Probability, Percent
Station - 15050000 GOLD C AT JUNEAU AK

Jordan Creek

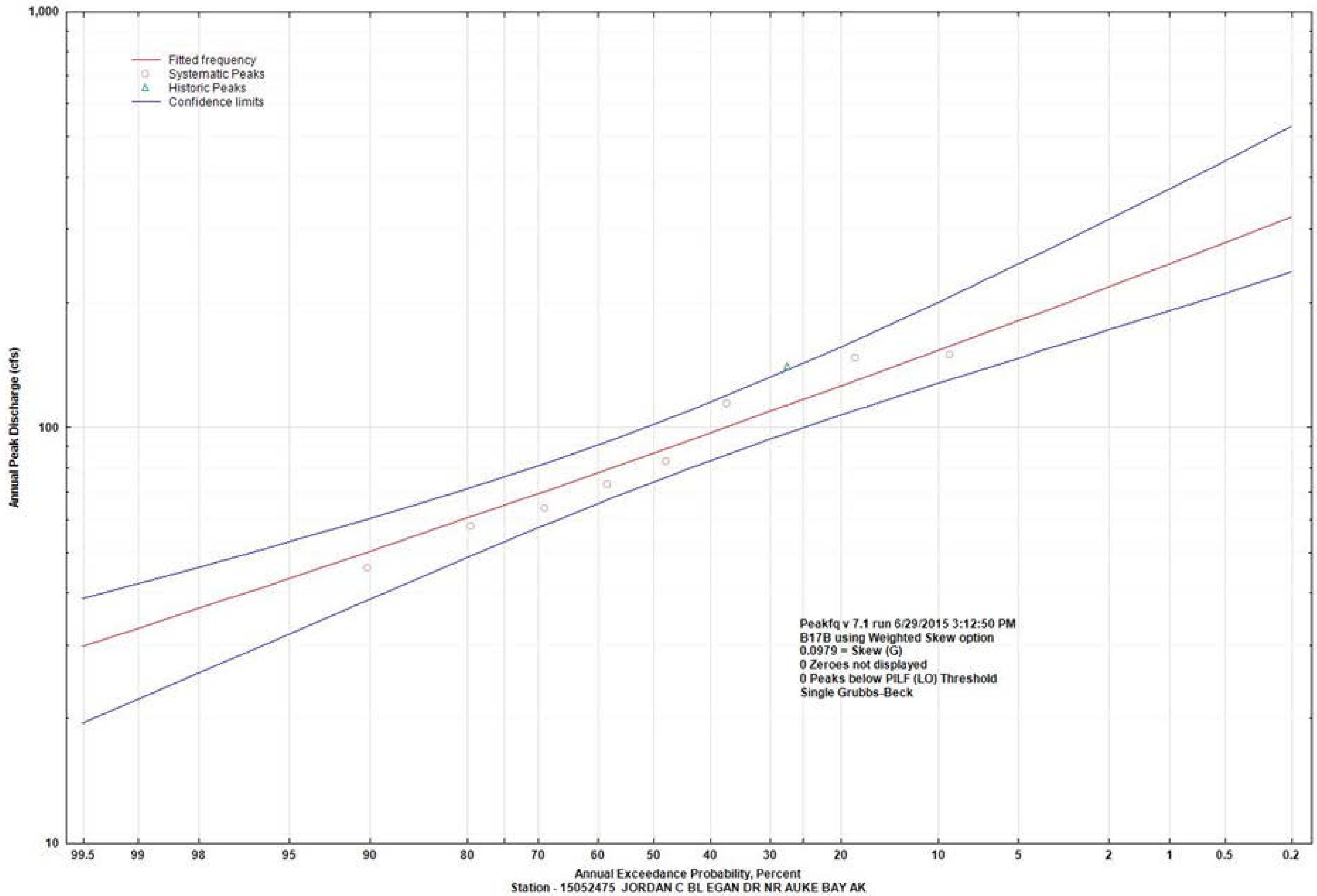


Table 11: Summary of Non-Coastal Stillwater Elevations

Flooding Source	Location	Elevations (feet, MLLW)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Auke Bay[1]	Auke Creek to Mendenhall Peninsula Rd	22.5 – 24.7	*	23.3 – 26.2	23.4 – 26.9	23.7 – 28.5
Auke Bay[1]	Pt. Louisa Rd to Auke Creek	22.7 – 26.5	*	23.3 – 28.9	23.5 – 30.0	23.8 – 32.7
Auke Bay[1]	Pt. Louisa Rd to Auke Creek	22.7 – 26.5	*	23.3 – 28.9	23.5 – 30.0	23.8 – 32.7
Favorite Channel	Huffman Harbor to Eagle Harbor	22.0	*	*	24.5	*
Favorite Channel	Lena Cove to Tee Harbor	24.0	*	*	26.5	*
Favorite Channel	Point Lena to Lena Cove	27.5	*	*	30.5	*
Fritz Cove[1]	Peterson Creek to Hendrickson Creek	22.6 – 24.3	*	23.2 – 25.5	23.4 – 25.9	23.7 – 26.9
Gastineau Channel[1]	Hendrickson Creek to Paris Creek	22.7 – 24.7	*	23.4 – 26.0	23.5 – 26.4	23.7 – 27.4
Gastineau Channel[1]	Hendrickson Rd to Little Sheep Creek	22.6 – 25.5	*	23.2 – 27.4	23.4 – 28.2	23.6 – 30.0
Gastineau Channel[1]	Mendenhall Peninsula Rd to Hendrickson Rd	22.7 – 24.0	*	23.2 – 24.9	23.4 – 25.4	23.7 – 26.2
Gastineau Channel[1]	Paris Creek to Bullion Creek	23.0	*	*	26.0	*

*Not calculated for this Flood Risk Project

[1]Coastal Flooding

Table 12: Stream Gage Information Used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Auke Creek	15054000	USGS	Auke Creek at Auke Bay, Alaska	3.9	1948	1975
Duck Creek	15053200	USGS	Duck Creek below Nancy Street near Auke Bay, Alaska	1.62	1994	2004
Gold Creek	15050000	USGS	Gold Creek at Juneau, Alaska	10.5	1917	2006
Jordan Creek	15052475	USGS	Jordan Creek below Egan Drive near Auke Bay, Alaska	3.0	1996	2005

5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 24, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 13. Roughness coefficients are provided in Table 14. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Detailed studies for the Eagle River, Eagle River By-Pass, Herbert River, Herbert River By-Pass, Tributary to Favorite Channel, Tributary to Favorite Channel By-Pass, Peterson Creek, Montana Creek, Montana Creek Overflow, and Salmon Creek, were conducted by the USACE as part of the original FIS study [33]. Detailed restudies of the Mendenhall River were initiated by the USGS, and finalized with analyses conducted by NHC (References 6,9,10,18.

The Alaska District of the USACE conducted field reconnaissance and surveys of key structures as part of the original FIS study. Bridges and culvert openings were field surveyed to obtain elevation data and structural geometry. Cross section data were developed from survey notes, field reconnaissance, photographs, and the use of the contour maps (References 19, 20, 21, and 22). For purposes of this study, the footbridge over the Herbert River and a private, decayed wooden bridge across Peterson Creek adjacent to the highway bridge were considered washed out and not restricting flow. All other bridges were considered to remain intact during flooding.

For the detailed restudies of the Mendenhall River the USGS conducted surveys to collect bridge, culvert, and cross-section geometry data. On the Mendenhall River, 57 cross-sections and two bridge structures were surveyed (Reference 9). On Lemon Creek, 40 cross-sections and two bridge structures were surveyed (Reference 6).

Water-surface profiles for detailed studies conducted by the USACE as part of the original FIS were computed with the USACE's HEC-2 step-backwater computer program (Reference 23). For the detailed restudies conducted by the USGS and NHC, water surface profiles were computed using the COE's HEC-RAS step-backwater computer program (Reference 24). Both programs compute the water-surface profile for stream channels at any cross section for either subcritical or supercritical flow conditions. The effects of various hydraulic structures such as bridges, culverts, weirs, and embankments are considered in the computation. This method applies Bernoulli's Theorem for the local energy at each cross section, and Manning's formula for the friction slope of a reach between two cross sections, determined in terms of the average of the conveyances at the two ends of the reach.

The HEC-RAS models provided to NHC by the USGS did not include the entire effective detailed study reaches from the original FIS of the Mendenhall River (Reference 8). As a result, merging the effective studies with the newer models was required. On the upper 0.5 mile of the Mendenhall River, upstream of cross section AB, the original effective mapping and BFEs were adopted.

Starting water-surface elevations for Eagle River, Herbert River, Tributary to Favorite Channel, Peterson Creek, Mendenhall River, and Salmon Creek were based on a high tide that would occur during a month in which the 10-, 2-, 1-, or 0.2-percent-annual-chance floods were likely to occur. Starting water-surface elevations of the Eagle River By-Pass, the Herbert River By-Pass, Tributary to Favorite Channel By-Pass, and Montana Creek-

Overbank Flow were determined from the backwater computations of their respective main channels.

On Montana Creek, starting water-surface elevations were determined as those originally computed on the Mendenhall River at the confluence of the two reaches (Reference 8). Subsequently, results of the revised detailed study of the Mendenhall River yielded lower computed water-surface elevation than those reported in the original FIS. Despite this difference no adjustment was made to the starting water-surface elevations on Montana Creek because the reach was not restudied, thus the required computations to adjust the flood profiles and floodway data table could not be performed.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1).

A backwater study of Switzer Creek was performed starting at a water-surface elevation of 21 feet (Lemon Creek Backwater); but since the creek bed is low and does not rise appreciably until it leaves the study area, the rise in water-surface 2,000 feet upstream has increased only 0.23 foot at the 0.2-percent-annual-chance flood.

Coastal flooding influences also occur on the downstream reaches of the Mendenhall River and Duck Creek. A computed 1-percent-annual-chance coastal flood elevation of 23.4 feet occurs at the downstream end of each study reach.

The approximate study for the 1990 Effective streams was performed by running computed flood flows through cross sections determined by visual inspection and map and photographic interpretation. The Manning equation for open-channel flow was utilized in an iterative process to determine the depth of flow and to determine the area flooded. This method is explained in the Uniform Flow Equation method stated in the publication, Approximate Method for Quick Flood Plain Mapping [27]. The elevations were computed to known elevations obtained from historical information and high-water marks.

Table 13: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Auke Creek	Mouth at Auke Bay	Upstream end of Auke Lake	Gage Analysis	HEC-RAS 4.1	12/15/2015	A	STARR - Data for hydraulic structures was provided by the City or approximated
Cowee Creek	Outlet into Berners Bay	Headwaters at Thiel Glacier	Regression	Mannings Equation & High Water Marks	1990	A	USACE
Duck Creek	Confluence with Montana Creek	0.1 miles upstream of Taku Boulevard	Gage Analysis	HEC-RAS 4.1	12/15/2015	AE w/ Floodway	STARR
Eagle Creek	Outlet into Gastineau Channel	Headwaters northwest of Mt. Troy	Regression	Mannings Equation & High Water Marks	1990	A	USACE
Eagle River	Feet above confluence with herbert river	Approx. 1,000 feet above inlet to Eagle River By-Pass	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Eagle River By-Pass	Feet above confluence with eagle river	Inlet from Eagle River	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
East Fork Duck Creek	Confluence with Duck Creek	Amalga Street	Regression USGS Region 10 & Gage Analysis	HEC-RAS 4.1	12/15/2015	AE w/ Floodway	STARR - Channel alignment from approximately 400 feet upstream of Floyd Dryden Middle School Driveway culvert to upstream limit of detailed study corrected from previous study

Table 13: Summary of Hydrologic and Hydraulic Analyses (*continued*)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Gold Creek	Mouth at Gastineau Channel	0.9 miles upstream of Basin Road	Gage Analysis	HEC-RAS 4.1	12/15/2015	A	STARR -Data for hydraulic structures was provided by the City or approximated
Grant Creek	Outlet into Gastineau Channel	0.61 mile above outlet	Regression	Mannings Equation & High Water Marks	1990	A	USACE
Hendrickson Creek	Outlet into Gastineau Channel	0.71 mile above outlet	Regression	Mannings Equation & High Water Marks	1990	A	USACE
Herbert River	Feet above confluence with eagle river	Inlet to Herbert River By-Pass	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Herbert River By-Pass	Feet above confluence with eagle river	Inlet from Herbert River	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Jordan Creek	Downstream face of Juneau International Airport Runway Culvert	0.4 miles upstream of Amalga Street	Gage Analysis	HEC-RAS 4.1	1/11/2016	AE w/ Floodway	STARR
Lemon Creek	Upstream face of Egan Drive	0.1 miles upstream of Anke Street	Regression USGS Region 10	HEC-RAS 4.1	12/15/2015	AE w/ Floodway	STARR
Mendenhall River	Feet above confluence with fritz cove	Approx. 4,750 feet above Mendenhall Loop Road	Gage Analysis	HEC-RAS	2008	AE w/ Floodway	NHC
Montana Creek	Feet above confluence with mendenhall river	Confluence with McGinnis Creek	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE

Table 13: Summary of Hydrologic and Hydraulic Analyses (*continued*)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Montana Creek Overbank Flow	Feet above convergence with montana creek	Divergence from Montana Creek	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Paris Creek	Outlet into Gastineau Channel	Headwaters at Mt. Bradley	Regression	Mannings Equation & High Water Marks	1990	A	USACE
Peterson Creek	Feet above mouth	Approx. 1,500 feet above Glacier Highway	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Peterson Creek, (Douglas Island)	Outlet into Fritz Cove	Approx. 3.8 miles above outlet	Regression	Mannings Equation & High Water Marks	1990	A	USACE
Salmon Creek	Feet above origin of study (70 feet downstream of glacier highway)	Approx. 1,330 feet above Glacier Highway	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Sheep Creek	Outlet into Gastineau Channel	Approx. 3.5 miles above outlet	Regression	Mannings Equation & High Water Marks	1990	A	USACE
South Fork Cowee Creek	Confluence with Cowee Creek	Yankee Basin headwaters	Regression	Mannings Equation & High Water Marks	1990	A	USACE
Tributary to Favorite Channel	Feet above confluence with favorite channel	Confluence with Favorite Channel	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Tributary to Favorite Channel By-Pass	Feet above confluence with tributary to favorite channel	Confluence with Tributary to Favorite Channel	Regression USGS Region 10 & SSARR	HEC-2	1990	AE w/ Floodway	USACE
Unnamed Tributary to Duck Creek	Confluence with Duck Creek	Kiowa Drive	Regression USGS Region 10 & Gage Analysis	HEC-RAS 4.1	12/15/2015	AE w/ Floodway	STARR

Table 14: Roughness Coefficients

Flooding Source	Channel "n"	Overbank "n"
Duck Creek	0.030-0.060	0.040-0.070
Eagle River	0.035-0.040	0.040-0.085
Eagle River By-Pass	0.035-0.040	0.040-0.085
East Fork Duck Creek	0.040	0.080
Herbert River	0.035-0.040	0.085
Herbert River By-Pass	0.040	0.085
Jordan Creek	0.040-0.060	0.035-0.085
Lemon Creek	0.035-0.080	0.035-0.080
Mendenhall River	0.025-0.060	0.025-0.075
Montana Creek	0.037-0.045	0.075-0.090
Montana Creek Overbank Flow	0.025-0.070	0.025-0.075
Peterson Creek	0.030-0.035	0.050-0.065
Salmon Creek	0.040-0.045	0.050-0.070
Tributary to Favorite Channel	0.035-0.060	0.060-0.110
Tributary to Favorite Channel By-Pass	0.035-0.060	0.060-0.110
Unnamed Tributary to Duck Creek	0.030-0.035	0.040-0.060

5.3 Coastal Analyses

For the areas of City and Borough of Juneau that are impacted by coastal flooding processes, coastal flood hazard analyses were performed to provide estimates of coastal BFEs. Coastal BFEs reflect the increase in water levels during a flood event due to extreme tides and storm surge as well as overland wave effects.

The following subsections provide summaries of how each coastal process was considered for this FIS Report. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. Table 15 summarizes the methods and/or models used for the coastal analyses. Refer to Section 2.5.1 for descriptions of the terms used in this section.

Table 15: Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Auke Bay	Pt. Louisa Rd	Auke Creek	Wave Setup	Simulating Waves Nearshore Models (SWAN)	2008 (Redelineation 2016)
Auke Bay	Auke Creek	Mendenhall Peninsula Rd	Wave Setup	Simulating Waves Nearshore Models (SWAN)	2008 (Redelineation 2016)
Douglas Harbor (Gastineau Channel)	Kowee Creek	St Anns Ave Turn Around	Wave Setup	Simulating Waves Nearshore Models (SWAN)	2008 (Redelineation 2016)
Favorite Channel	Point Lena	Lena Cove	Wave Run Up	USACE Shore Protection Manual (SPM)	1990
Favorite Channel	Lena Cove	Tee Harbor	Wave Run Up	USACE Shore Protection Manual (SPM)	1990
Favorite Channel	Huffman Harbor	Eagle Harbor	Wave Run Up	USACE Shore Protection Manual (SPM)	1990
Fritz Cove	Peterson Creek	Hendrickson Creek	Wave Setup	Simulating Waves Nearshore Models (SWAN)	2008
Gastineau Channel	Paris Creek	Bullion Creek	Wave Run Up	USACE Shore Protection Manual (SPM)	1990
Gastineau Channel	Mendenhall Peninsula Rd	Hendrickson Rd	Wave Setup	Simulating Waves Nearshore Models (SWAN)	2008
Gastineau Channel	Hendrickson Rd	Paris Creek	Wave Setup	Simulating Waves Nearshore Models (SWAN)	2008
Gastineau Channel	Hendrickson Rd	Little Sheep Creek	Wave Setup	Simulating Waves Nearshore Models (SWAN)	2008

5.3.1 Total Stillwater Elevations

The total stillwater elevations (stillwater including storm surge plus wave setup) for the 1% annual chance flood were determined for areas subject to coastal flooding. The models and methods that were used to determine storm surge and wave setup are listed in Table 15. The stillwater elevation that was used for each transect in coastal analyses is shown in Table 17, “Coastal Transect Parameters.” Figure 8 shows the total stillwater elevations for the 1% annual chance flood that was determined for this coastal analysis.

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas

[Not Applicable to this Flood Risk Project]

Astronomical Tide

Astronomical tidal statistics were generated directly from local tidal constituents by sampling the predicted tide at random times throughout the tidal epoch.

Storm Surge Statistics
Storm surge is modeled based on characteristics of actual storms responsible for significant coastal flooding. The characteristics of these storms are typically determined by statistical study of the regional historical record of storms or by statistical study of tidal gages.

When historic records are used to calculate storm surge, characteristics such as the strength, size, track, etc., of storms are identified by site.

Tidal gages can be used instead of historic records of storms when the available tidal gage record for the area represents both the astronomical tide component and the storm surge component. Table 16 provides the gage name, managing agency, gage type, gage identifier, start date, end date, and statistical methodology applied to each gage used to determine the stillwater elevations.

Table 16: Tide Gage Analysis Specifics

[Not Applicable to this Flood Risk Project]

Combined Riverine and Tidal Effects
Riverine and surge rates for the lower reaches of the Mendenhall River were combined by developing curves for rate of occurrence vs. flood level for each flood source.

Wave Setup Analysis
Wave setup was computed during the storm surge modeling through the methods and models listed in Table 15 and included in the frequency analysis for the determination of the total stillwater elevations.

5.3.2 Waves

The detailed coastal study performed by the USACE as part of the original FIS relied on methodologies outlined in the USACE's Shore Protection Manual for their analysis (Reference 29). A detailed study was performed in Favorite Channel at Point Lena, Lena Cove, and Eagle Harbor. Each location was analyzed for possible approaches of storm-driven waves. The fetch and wind speed for the most critical directions were then determined. With the aid of the fetch and wind speed, the manual provided the significant deepwater wave height, period, and length. To determine the depth classification, the average depth in the fetch was divided by the wave length. The transitional water was found in all cases. Therefore, the transitional water equations from the manual were used. The transitional water wave height, period, and length were then calculated and adjusted to account for refraction and shoaling. Refraction was negligible in most cases due to the steep beach slopes. Only Lena Cove and Eagle Harbor had measurable refraction, but other conditions made this refraction insignificant.

The manual produced the shoaling coefficient which allowed the calculating of the maximum deepwater wave height. With this and Figures 2-65 and 2-66 of the Shore Protection Manual, the breaking height and the breaking depth were determined. Figures 7-10 and 7-13 then provided the runup for each beach slope at each location.

Wave setup was calculated from equation 3-49 and wind setup from equation 3-83. These two values provided the storm surge component. The actual runup elevations were finally determined by adding storm surge and runup values to the tide level from the combined wind and tide frequency curve developed by the study contractor. Various tide elevations and wind speeds were tried to determine the highest possible 1-percent-annual-chance water-surface level. Wind setup was never greater than 0.2 foot due to the relatively short fetches and low wind speeds. The highest wave setup, 1.5 feet, occurred at Lena Cove. The underwater and above-water beach slopes were determined by available mapping, as well as by visual inspection.

5.3.3 Coastal Erosion

A single storm episode can cause extensive erosion in coastal areas. Storm-induced erosion was evaluated to determine the modification to existing topography that is expected to be associated with flooding events. Erosion was evaluated using the methods listed in Table 15.

5.3.4 Wave Hazard Analyses

Overland wave hazards were evaluated to determine the combined effects of ground elevation, vegetation, and physical features on overland wave propagation and wave runup. These analyses were performed at representative transects along all shorelines for which waves were expected to be present during the floods of the selected recurrence intervals. The results of these analyses were used to determine elevations for the 1% annual chance flood.

Transect locations were chosen with consideration given to the physical land characteristics as well as development type and density so that they would closely represent conditions in their locality. Additional consideration was given to changes in the total stillwater elevation. Transects were spaced close together in areas of complex topography and dense development or where total stillwater elevations varied. In areas having more uniform characteristics, transects were spaced at larger intervals. Transects shown in Figure 9, “Transect Location Map,” Table17 provides the location, stillwater elevations, and starting wave conditions for each transect evaluated for overland wave hazards. In this table, “starting” indicates the parameter value at the beginning of the transect.

Wave Height Analysis
Wave height analyses were performed to determine wave heights and corresponding wave crest elevations for the areas inundated by coastal flooding and subject to overland wave propagation hazards. Refer to Figure 6 for a schematic of a coastal transect evaluated for overland wave propagationErr hazards.

Wave heights and wave crest elevations were modeled using the methods and models listed in Table 15, “Summary of Coastal Analyses”.

Wave Runup Analysis
Wave runup analyses were performed to determine the height and extent of runup beyond the limit of stillwater inundation for the 1% annual chance flood. Wave runup elevations were modeled using the methods and models listed in Table 15.

The tidal data from Juneau and the wind data from Juneau and the Five Fingers Light Station (Reference 17) were used in the original analysis to derive tide exceedance frequency curves and combined wind and tide frequencies for the 10-, 2-, 1-, and 0.2-percent-annual-chance events for Point Lena, Lena Cove, and Eagle Harbor (southeasterly winds). Because the winds are relatively light and there is significant tidal influence, the higher tides combined with lighter winds caused the highest runups. This combined frequency method has been determined to be more reasonable than applying a certain year wind to a fixed level.

Flood levels observed by local residents, as well as high-water marks, compared favorably with calculated flood levels. In determining the actual storm surge and wave runup elevation, allowances were made for the irregular coastline. Refraction, beach slope, and the materials making up the shore and beach were considered. It is impossible to determine the frequency associated with the highest recorded tide, which included storm surge, but it is assumed to approximate the 1-percent-annual-chance event since it does not vary significantly from the computed 1-percent-annual-chance storm surge and wave runup.

The coastal areas specified for approximate study were compared to the areas in the detailed study, and approximate elevations for storm surge and wave runup were derived. Between the coastal high-hazard zone and the riverine zones, an approximate study is shown to tie these areas together. The water-surface plotted for this approximate study is the result of tidal flooding from a 1-percent-annual-chance tide. A smooth transition is made from the exposed beach with high runup to the sheltered areas blocked from runup but subject to storm surge.

NHC performed a detailed restudy of the shoreline along Gastineau Channel, Fritz Cove, and Auke Bay that consisted of offshore wave modeling, nearshore hydraulic analysis, and coastal floodplain mapping (Reference 30). The purpose of this study was to apply FEMA's adopted Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States (Pacific Coast Guidelines) to analyze and map coastal hazards (Reference 31).

The Pacific Coast Guidelines provide recommended methods for analyzing the 1-percent annual-chance conditions for mapping. For open coast and sheltered waters along the Pacific Coast, the recommended approach is to simulate conditions for a series of historical events and then conduct statistical analyses on the resultant flood hazard data. This method, termed the Response-Based Method, typically involves modeling 10 to 20 large water level and wind events per year for a minimum of 30 years. Runup, overtopping, total water levels, and other hazard parameters are then calculated for each of these events. The annual maxima are then extracted for each year and fit with the Generalized Extreme Value distribution, typically using maximum likelihood or L-moments. One-percent-chance (i.e. 100-year) values are then calculated from the frequency analysis.

Computations progress from the offshore zone landward to the backshore zone, where they are used to define hazard zones. These zones provide a simple framework for wave and water-level analysis. The two-dimensional numerical model SWAN (Simulating Waves Nearshore) was used to simulate waves and water levels offshore, including shoaling effects. SWAN is a numerical model which simulates the growth, dissipation, and propagation of wind waves in coastal and inland waters. The model is available as free software under the terms of the GNU General Public License from the Technical University Delft or as a commercial version from Delft Hydraulics. The SWAN model is well documented and is widely used for wave predictions (Reference 32). To simplify the computation process, Gastineau Channel was modeled separately from Auke Bay and Fritz Cove.

The SWAN model requires three main types of input: 1) topographic and bathymetric elevations, 2) water levels, and 3) winds. In Juneau, elevation data used to develop the elevation grids came from multiple sources. The municipality provided bare-earth LiDAR topography as well as bathymetry from the National Oceanic and Atmospheric Association (NOAA) (Reference 23). Areas beyond the LiDAR coverage were supplemented with topography data from the Shuttle Radar Topography Mission (SRTM) (Reference 31). For this study, measured water level data were retrieved from NOAA Station 9452210. Hourly measurements were obtained from 1970 to 1979, and half-hourly measurements were obtained from 1980 to 2005.

The times of the occurrence of high tide (and low tide) are nearly uniform throughout the region. Also, the magnitudes of the tides are quite similar; therefore, no spatial corrections were used to adjust the measured tide data for the phase or amplitude in the Gastineau or Auke Bay/Fritz Cove domains. Hourly wind data from 1948 to 2008 were collected from the NOAA station at the Juneau Municipal Airport and a second, much shorter record (1998 to 2004), was obtained for Mayflower Island in Gastineau Channel. To understand the spatial variation in wind direction, frequency analyses of wind direction were performed at both the Juneau and Mayflower Island gages.

As mentioned previously, the Pacific Coast Guidelines recommend selecting the largest 10 to 20 events of each year for analysis for a minimum of 30 years. For this project, the 10 highest tides and 10 highest winds were selected for each year between 1970 and 2005 (35years). For any given year, some of the 10 highest wind events coincided with 10 highest tide events, so ultimately there were 10 to 20 storms selected for each year. With runs defined for each storm, the tide data and the wind data were paired together with the domain grid for analysis. SWAN results for each simulated event were then saved at select computational points, called pass points.

Each of these pass points corresponds to a unique transect that defines the cross-shore geometry and physical characteristics of the shoreline at a specific location. To represent the varied coastline, over 900 pass points and cross-shore transects spaced approximately every 328 feet (100 meters), were defined along the shoreline of Gastineau Channel and Auke Bay/Fritz Cove. Transects were positioned perpendicular to the shoreline and generally extended from the pass point to an elevation well above the predicted flood extents. Each transect was visually inspected to determine the location of the shore crest. The crest divides the transect into two general regions: the foreshore and the backshore. Each transect was cut from the same bathymetric/topographic surface used for the SWAN model using HEC-GeoRAS.

The nearshore hydraulic analysis was conducted using the equations and methods outlined in the Pacific Coast Guidelines. Wave runup and overtopping were calculated at every time step, for every event, at each transect. To expedite this analysis, a FORTRAN program named RUNUP was developed by NHC to read in data from SWAN, calculate runup and overtopping at each transect, and output the annual maxima for later use in frequency analyses. The shape of the transect profile determine which equations RUNUP uses to compute runup and overtopping. In order to assign roughness and runup values to the transects, a site investigation was performed to observe the study area from a boat. This investigation utilized a video camera and GPS equipment to create a geo-referenced video of the shoreline. This video along with aerial photography and field notes was used to define the remaining physical features at each transect.

The annual maximums from the RUNUP analysis were then extracted for each transect and used to perform a frequency analysis. Following the recommended approach outlined in the Pacific Coast Guidelines, the annual maximums at each transect were fit to a generalized extreme value (GEV) distribution using the method of maximum likelihood. The frequency analysis of the computed total water levels was used to determine the 10-, 2-, 1-, and 0.2-percent annual chance flood events. These elevations were reviewed to ensure that the results were reasonable based on observed historical flood data.

Coastal flood hazard areas with water depths less than 3 feet or runup less than 2 feet were classified as AE Zones because they were not considered high velocity impact zones.

Table 17: Coastal Transect Parameters[1]

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft MLLW) Range of Stillwater Elevations (ft MLLW)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Favorite Channel - Point Lena to Lena Cove	*	*	*	27.5	*	*	30.5	*
Favorite Channel - Lena Cove to Tee Harbor	*	*	*	24.0	*	*	26.5	*
Favorite Channel - Huffman Harbor to Eagle Harbor	*	*	*	22.0	*	*	24.5	*
Gastineau Channel – Paris Creek to Ready Bullion Creek	*	*	*	23.0	*	*	26.0	*
Auke Bay – Pt. Lena Loop Rd to Auke Creek	Transect Numbers 1-183	*	*	22.7 – 26.5	*	23.3 – 28.9	23.5 – 30.0	23.8 – 32.7
Auke Bay – Auke Creek to Mendenhall Peninsula Rd	Transect Numbers 184-320	*	*	22.5 – 24.7	*	23.3 – 26.2	23.4 – 26.9	23.7 – 28.5

*Not applicable/calculated for this Flood Risk Project

[1] Summary of coastal transect information from NHC's detailed restudy of the shoreline along Gastineau Channel, Fritz Cove, and Auke Bay (Reference 30). For information on specific transects, see "S_Cst_Tsct_Ln" layer in DFIRM Database.

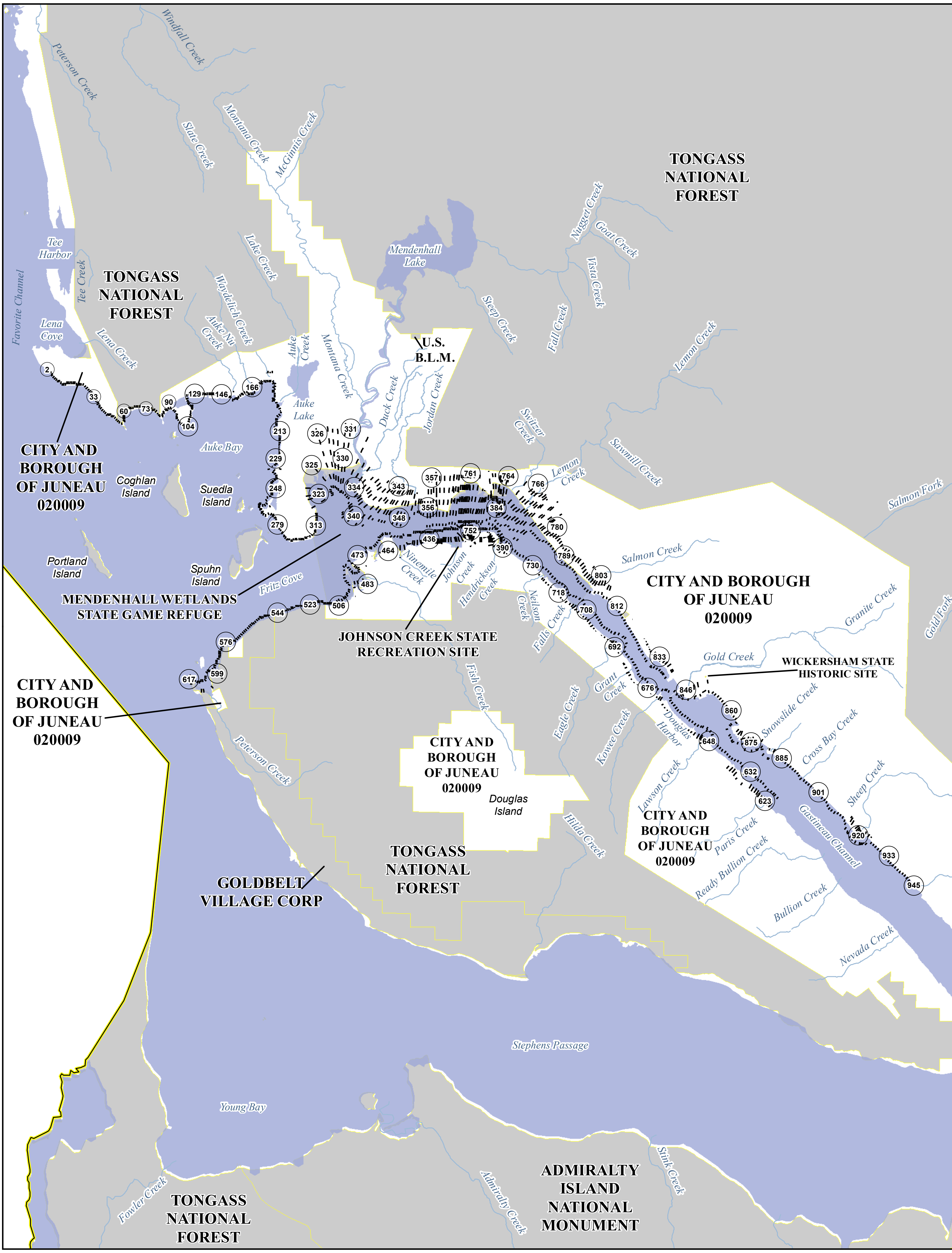
Table 17: Coastal Transect Parameters[1]

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft MLLW) Range of Stillwater Elevations (ft MLLW)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Fritz Cove – Hendrickson Creek to Peterson Creek	Transect Numbers 390-620 & 742-756	*	*	22.6 – 24.3	*	23.2 – 25.5	23.4 – 25.9	23.7 – 26.9
Gastineau Channel – Mendenhall Peninsula Rd to Hendrickson Rd	Transect Numbers 321-374 & 757-761	*	*	22.7 – 24.0	*	23.2 – 24.9	23.4 – 25.4	23.7 – 26.2
Gastineau Channel – Hendrickson Creek to Paris Creek ; Douglas Harbor	Transect Numbers 621-742	*	*	22.7 – 24.7	*	23.4 – 26.0	23.5 – 26.4	23.7 – 27.4
Gastineau Channel – Hendrickson Rd to Little Sheep Creek	Transect Numbers 375-389 & 762-945	*	*	22.6 – 25.5	*	23.2 – 27.4	23.4 – 28.2	23.6 – 30.0

*Not applicable/calculated for this Flood Risk Project

[1] Summary of coastal transect information from NHC's detailed restudy of the shoreline along Gastineau Channel, Fritz Cove, and Auke Bay (Reference 30). For information on specific transects, see "S_Cst_Tsct_Ln" layer in DFIRM Database.

FIGURE 9: TRANSECT LOCATION MAP

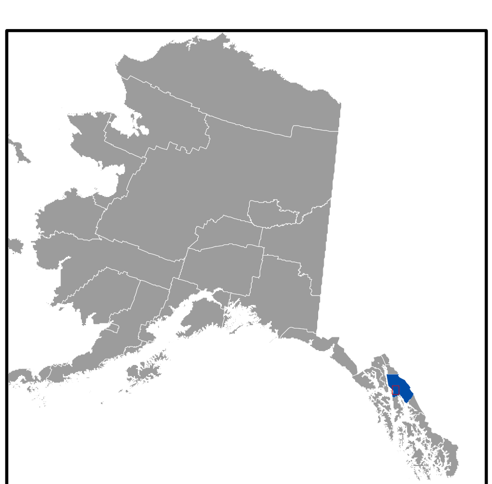


1 inch = 2 miles

N

0 0.5 1 2 Miles

Map Projection:
NAD 1983 State Plane Alaska 1 FIPS 5001 Feet
North American Datum 1983



NATIONAL FLOOD INSURANCE PROGRAM

Transect Locator Map

CITY AND BOROUGH OF JUNEAU, AK

PANELS PRINTED:

0550D, 0575D, 0850D, 0855D, 0865D, 0866D, 0867D, 0868D, 0869D, 1050D, 1075D, 1180D, 1182D, 1185D, 1194E, 1195D, 1209D, 1213E, 1214E, 1217D, 1218E, 1219E, 1236D, 1237D, 1238E, 1239E, 1243E, 1375D, 1500D, 1501E, 1502E, 1503D, 1504D, 1506E, 1507E, 1508D, 1509E, 1515D, 1516D, 1520D, 1526E, 1527E, 1528E, 1529D, 1531D, 1532E, 1533D, 1534D, 1551E, 1553D, 1554D, 1562E, 1566E, 1567E, 1569E, 1586D, 1588D, 1589D, 1595D, 1875D, 1900D, 1905D, 1910D,

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FEMA

5.4 Alluvial Fan Analyses

This section is not npplicable to this Flood Risk Project.

Table 18: Summary of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

Table 19: Results of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

All FIS Reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Because the City and Borough of Juneau is a coastal community that has historically referenced elevations to a tidal datum, all flood elevations shown in this FIS report and on the DFIRM are referenced to the Mean Lower Low Water (MLLW) vertical datum at station 9454050 for the Modified Procedure for Tidal Datum Calculation Epoch of 2002 to 2006 (MPTDC epoch 2002-2006).

The shoreline displayed on the maps is based on a MHW elevation of 15.3 feet (MLLW).

For information, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please contact information services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

The datum conversion locations and values that were calculated for the City and Borough of Juneau, Alaska are provided in Table 20.

Table 20: Countywide Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

A countywide conversion factor could not be generated for the City and Borough of Juneau, Alaska because the maximum variance from average exceeds 0.25 feet. Calculations for the vertical offsets on a stream by stream basis are depicted in Table 21.

Table 21: Stream-Based Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM Database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs.

Additional information about the FIRM Database and its contents can be found in FEMA's *Guidelines and Standards for Flood Risk Analysis and Mapping*, www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping.

Base map information shown on the FIRM was derived from the sources described in Table 22.

Table 22: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
Digital Orthophoto & LiDAR	City and Borough of Juneau, AK	May-June, 2013	n/a	To be used for modeling, floodplain development, and work maps
Street Centerlines	City and Borough of Juneau, AK	2014	n/a	
Parcels	City and Borough of Juneau, AK	2014	n/a	Parcel boundary lines
Right-of-Way	City and Borough of Juneau, AK	2014	n/a	Public and utility rights-of-way
Zoning	City and Borough of Juneau, AK	2014	n/a	Municipal zoning district boundaries

Data Type	Data Provider	Data Date	Data Scale	Data Description
Stream/Water Body	City and Borough of Juneau, AK	2014	n/a	Waterway and water body boundaries
PLSS	USGS	1990	n/a	Public Land Survey System
NHD	USGS		n/a	Waterway and water body boundaries

6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 23. For each coastal flooding source studied as part of this FIS Report, the mapped floodplain boundaries on the FIRM have been delineated using the flood and wave elevations determined at each transect; between transects, boundaries were delineated using land use and land cover data, the topographic elevation data described in Table 23, and knowledge of coastal flood processes. In ponding areas, flood elevations were determined at each junction of the model; between junctions, boundaries were interpolated using the topographic elevation data described in Table 23.

In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

The floodway widths presented in this FIS Report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 24, “Floodway Data.”

Table 23: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Scale	Contour Interval	Citation
City and Borough of Juneau, AK	All within HUC 19010301	Bare Earth DEM - LiDAR			38
City and Borough of Juneau, AK	All within HUC 19010301	Highest Hit DEM - LiDAR			38
City and Borough of Juneau, AK	All within HUC 19010301	Contours		1-foot	38
City and Borough of Juneau, AK	Gastineau Channel & Auke Bay / Fritz Cove	Bathymetery (NOAA) & LiDAR (SRTM)			34 & 35

BFEs shown at cross sections on the FIRM represent the 1% annual chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations.

Table 24: Floodway Data

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Duck Creek								
A	409	34	73	2.5	23.4	15.3[2]	16.3[2]	1.0
B	685	22	7	1.0	23.4	16.4[2]	16.7[2]	0.4
C	1,256	16	21	6.5	23.4	17.6[2]	17.7[2]	0.1
D	1,400	18	66	2.8	23.4	18.6[2]	18.7[2]	0.1
E	2,019	25	55	2.4	23.4	19.6[2]	19.7[2]	0.1
F	2,583	36	31	4.3	23.4	20.4[2]	20.5[2]	0.1
G	2,643	18	59	2.4	23.4	21.1[2]	21.1[2]	0.0
H	2,917	33	64	2.8	23.4	21.2[2]	21.2[2]	0.0
I	3,256	33	53	2.6	23.4	21.8[2]	21.9[2]	0.1
J	3,594	40	37	3.4	23.4	22.6[2]	22.6[2]	0.0
K	3,866	15	57	2.5	23.7	23.7	23.8	0.1
L	4,010	49	129	1.0	24.6	24.6	24.7	0.1
M	4,292	18	75	1.9	25.8	25.8	25.8	0.1
N	4,440	43	99	1.3	26.6	26.6	26.7	0.1
O	4,587	26	147	0.9	27.4	27.4	27.5	0.1
P	4,991	27	108	1.2	27.4	27.4	27.5	0.1
Q	5,070	54	185	0.8	28.6	28.6	28.7	0.1
R	5,418	88	507	0.3	28.6	28.6	28.7	0.1
S	6,061	35	251	1.8	28.6	28.6	28.7	0.1
T	6,276	36	112	1.0	29.6	29.6	29.7	0.1
U	6,610	57	451	0.3	29.7	29.7	29.8	0.1
V	7,068	155	110	1.0	29.9	29.9	30.0	0.1
W	7,223	214	797	0.1	29.9	29.9	30.0	0.1
X	7,508	120	175	0.6	29.9	29.9	30.0	0.1
Y	7,642	31	122	1.0	30.7	15.3	16.3	1.0

[1]Feet above Confluence with Mendenhall River

[2]Elevations computed without consideration of coastal flooding effects from Fritz Cove

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: DUCK CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Duck Creek (continued)								
Z	8,998	18	98	1.5	30.9	30.7	30.8	0.1
AA	9,229	20	73	1.0	31.6	30.9	31.1	0.2
AB	10,578	50	182	0.4	34.5	31.6	31.7	0.1
AC	11,452	10	19	4.2	34.6	34.5	34.9	0.4
AD	11,525	17	37	1.9	36.5	34.5	34.9	0.4
AE	12,075	12	43	2.9	36.7	36.5	36.5	0.0
AF	12,337	18	83	1.5	37.6	36.7	36.8	0.1
AG	12,574	13	28	2.5	37.9	37.6	37.8	0.2
AH	13,039	18	39	1.6	38.9	37.9	38.2	0.3
AI	13,380	29	54	1.1	39.3	38.9	39.0	0.1
AJ	13,535	23	31	1.9	39.4	39.3	39.4	0.1
AK	13,598	28	61	1.0	39.5	39.4	39.5	0.1
AL	13,905	21	75	1.2	39.5	39.5	39.6	0.0
AM	14,184	35	30	1.5	39.6	39.5	39.6	0.1
AN	14,764	27	16	2.8	39.8	39.6	39.7	0.1
AO	14,953	24	56	0.8	40.9	39.8	39.8	0.0
AP	15,410	23	19	2.3	41.0	40.9	40.9	0.0
AQ	15,561	42	46	1.0	41.8	41.0	41.0	0.0
AR	16,069	24	11	4.3	42.8	41.8	41.8	0.0
AS	16,247	12	34	2.1	43.7	42.8	42.8	0.0
AT	16,660	8	15	3.6	44.0	43.7	43.8	0.1
AU	16,718	13	22	1.8	44.3	44.0	44.3	0.3
AV	17,185	11	7	5.0	45.7	44.3	44.5	0.3
AW	17,438	13	16	2.6	47.7	45.7	45.6	0.0
AX	17,902	20	21	2.1	48.4	47.7	47.7	0.0
AY	18,115	14	21	1.2	49.7	48.4	48.4	0.0

[1]Feet above Confluence with Mendenhall River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: DUCK CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Eagle River								
A	1,465	180	1341	7.1	25.0	25.0	25.1	0.1
B	2,095	218	1494	6.4	26.1	26.1	26.3	0.2
C	2,505	211	1608	5.9	26.9	26.9	27.8	0.9
D	2,870	355	2763	3.4	27.7	27.7	28.4	0.7
E	3,310	200	1552	6.1	27.9	27.9	28.6	0.7
F	3,760	420	2070	4.6	29.0	29.0	29.4	0.4
G	4,080	170	1284	7.4	29.3	29.3	29.6	0.3
H	4,650	163	1116	8.5	30.8	30.8	31.0	0.2
I	5,415	137	1035	9.2	33.1	33.1	33.3	0.2
J	6,090	180	1592	6.0	34.5	34.5	35.4	0.9
K	6,855	160	1181	8.0	35.8	35.8	36.5	0.7
L	7,325	182	1192	8.0	37.6	37.6	37.9	0.3
M	7,820	140	1059	9.0	39.1	39.1	39.2	0.1
N	8,380	200	1349	7.0	41.0	41.0	41.2	0.2
O	8,780	190	1401	6.8	41.8	41.8	42.1	0.3
P	9,225	183	1224	7.8	42.5	42.5	42.9	0.4
Q	9,725	650	2259	4.2	44.1	44.1	44.3	0.2
R	10,555	136	817	6.3	45.6	45.6	45.8	0.2
S	11,085	170	1104	4.6	46.7	46.7	46.9	0.2
T	11,730	240	1035	5.0	47.6	47.6	47.7	0.1
U	12,400	190	852	6.0	49.2	49.2	49.3	0.1
V	12,730	280	1243	4.1	50.1	50.1	50.2	0.1

[1]Feet above confluence with Herbert River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: EAGLE RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Eagle River (continued)								
W	13,310	225	623	8.2	52.8	52.8	52.8	0.0
X	14,010	295	1142	4.5	55.8	55.8	55.8	0.0
Y	14,740	160	606	8.5	58.4	58.4	58.4	0.0
Z	15,490	670	2143	4.4	61.7	61.7	62.0	0.3
AA	16,480	194	891	10.8	66.1	66.1	66.5	0.4

[1]Feet above confluence with Herbert River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: EAGLE RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Eagle River By-Pass								
A	180	421	1844	2.4	44.4	44.4	44.6	0.2
B	1,450	294	875	5.0	46.3	46.3	47.3	1.0
C	2,225	403	1400	3.1	47.5	47.5	48.5	1.0
D	2,495	285	628	7.0	48.3	48.3	49.0	0.7
E	3,255	442	1161	3.8	51.7	51.7	52.4	0.7
F	3,645	520	1587	2.8	52.5	52.5	53.2	0.7
G	3,935	500	1551	2.8	53.1	53.1	53.8	0.7
H	4,295	450	1022	4.3	54.1	54.1	54.9	0.8
I	5,130	650	1600	2.7	57.3	57.3	57.4	0.1
J	5,730	750	1062	4.1	59.3	59.3	59.4	0.1

[1]Feet above confluence with Eagle River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: EAGLE RIVER BY-PASS

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
East Fork Duck Creek								
A	88	19	58	0.2	31.0	31.0	31.1	0.1
B	160	21	48	0.2	31.0	31.0	31.2	0.2
C	1,215	30	128	0.1	31.0	31.0	31.2	0.2
D	2,158	47	140	0.1	31.1	31.1	31.3	0.2
E	2,552	37	85	0.1	31.1	31.1	31.3	0.2
F	2,625	69	145	0.1	31.1	31.1	31.3	0.2
G	3,145	323	583	0.0	31.1	31.1	31.3	0.2
H	3,433	200	5	2.1	31.1	31.1	31.3	0.2
I	3,704	12	80	0.3	40.0	40.0	40.0	0.0
J	4,149	32	92	0.2	41.6	41.6	41.8	0.2
K	4,567	12	27	0.4	41.9	41.9	42.1	0.2
L	5,012	13	11	0.9	42.3	42.3	42.6	0.3
M	5,066	15	28	0.4	44.5	44.5	44.5	0.0
N	5,800	16	16	0.6	44.6	44.6	44.6	0.0
O	5,897	12	12	0.9	46.1	46.1	46.1	0.0
P	6,002	6	5	2.0	46.1	46.1	46.1	0.0
Q	6,062	27	49	0.2	46.7	46.7	46.7	0.0
R	6,520	6	7	1.5	46.7	46.7	46.7	0.0
S	6,778	6	9	1.2	47.0	47.0	47.0	0.0
T	6,802	10	13	0.8	47.3	47.3	47.3	0.0
U	7,028	8	7	1.4	47.3	47.3	47.3	0.0
V	7,112	20	25	0.4	48.2	48.2	48.2	0.0

[1]Feet above Confluence with Duck Creek

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: EAST FORK DUCK CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Herbert River								
A	1,755	110	1253	8.8	23.7	23.7	24.3	0.6
B	2,345	141	1417	7.8	25.8	25.8	26.6	0.8
C	2,545	100	1021	10.8	25.8	25.8	26.6	0.8
D	2,945	95	988	11.1	27.2	27.2	27.9	0.7
E	3,465	155	1961	5.6	29.6	29.6	30.1	0.5
F	3,690	222	1640	6.7	29.6	29.6	30.1	0.5
G	4,405	380	2630	4.2	33.0	33.0	33.0	0.0
H	4,800	400	3011	3.7	33.2	33.2	33.3	0.1
I	5,305	190	1490	7.4	33.5	33.5	33.6	0.1
J	5,705	140	1080	10.2	34.1	34.1	34.3	0.2
K	6,125	120	1061	10.4	35.6	35.6	35.7	0.1
L	6,445	290	1287	8.5	37.6	37.6	37.6	0.0
M	6,875	350	3350	3.3	39.1	39.1	39.1	0.0
N	7,365	140	1191	9.2	39.2	39.2	39.3	0.1
O	7,925	125	1141	9.6	41.2	41.2	41.6	0.4
P	8,335	140	1261	8.7	42.5	42.5	43.3	0.8
Q	8,735	240	1905	5.8	44.4	44.4	44.9	0.5
R	9,155	200	1718	6.4	45.2	45.2	45.5	0.3
S	9,615	160	1400	7.9	46.0	46.0	46.3	0.3
T	10,115	153	1290	8.5	47.4	47.4	47.7	0.3
U	10,365	210	1132	9.7	48.6	48.6	48.7	0.1
V	10,765	128	798	13.8	51.7	51.7	51.7	0.0
W	11,155	187	1549	7.1	55.5	55.5	55.8	0.3

[1]Feet above confluence with Eagle River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: HERBERT RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Herbert River (continued)								
X	11,385	115	1027	10.7	55.8	55.8	56.3	0.5
Y	11,875	130	1344	8.2	58.2	58.2	58.6	0.4
Z	12,235	200	2102	5.2	59.6	59.6	59.9	0.3
AA	12,665	67	544	9.2	60.4	60.4	60.6	0.2
AB	13,135	100	1044	4.8	62.0	62.0	62.5	0.5
AC	13,825	160	1543	3.2	62.7	62.7	63.2	0.5
AD	14,475	110	919	5.4	63.2	63.2	63.8	0.6
AE	15,355	122	908	5.5	65.1	65.1	65.5	0.4
AF	16,005	139	830	6.0	66.9	66.9	67.1	0.2
AG	16,515	200	1302	3.8	68.2	68.2	68.3	0.1
AH	17,045	200	1512	3.3	68.7	68.7	68.9	0.2
AI	17,805	220	1551	3.2	69.2	69.2	69.4	0.2
AJ	18,255	260	1703	1.3	69.5	69.5	69.8	0.3
AK	19,005	99	343	6.2	71.9	71.9	72.0	0.1
AL	19,395	66	307	7.0	74.5	74.5	74.5	0.0
AM	19,835	50	267	8.0	77.1	77.1	77.2	0.1
AN	20,195	106	763	10.7	79.3	79.3	79.4	0.1

[1]Feet above confluence with Eagle River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: HERBERT RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Herbert River By-Pass								
A	360	100	949	6.3	59.8	59.8	60.1	0.3
B	860	110	907	6.6	60.8	60.8	61.3	0.5
C	1,410	100	673	8.9	63.0	63.0	63.3	0.3
D	1,840	95	717	8.4	65.5	65.5	65.8	0.3
E	2,300	138	965	6.2	67.8	67.8	67.9	0.1
F	2,880	103	717	8.4	69.8	69.8	69.9	0.1
G	3,480	135	1003	6.0	72.4	72.4	72.4	0.0
H	4,330	160	1081	5.6	74.4	74.4	74.5	0.1
I	5,380	110	845	7.1	77.0	77.0	77.3	0.3

[1]Feet above confluence with Herbert River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: HERBERT RIVER BY-PASS

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Jordan Creek								
A	841	38	91	3.2	23.4	17.6	17.9	0.3
B	1,091	65	188	1.6	23.4	18.6	18.8	0.2
C	2,266	21	69	4.2	23.4	19.1	19.2	0.2
D	2,356	24	119	2.5	23.4	20.5	20.6	0.1
E	3,081	19	314	1.4	23.4	20.7	21.0	0.3
F	3,339	35	99	4.7	23.4	21.1	22.0	0.8
G	3,461	49	111	2.7	23.4	21.7	22.3	0.6
H	3,998	45	107	3.2	23.4	22.1	22.6	0.5
I	4,412	75	133	2.9	23.4	23.1	24.0	0.9
J	4,654	24	101	4.2	23.7	23.7	24.4	0.7
K	5,189	16	34	8.6	24.4	24.4	24.4	0.0
L	5,306	33	67	4.4	26.0	26.0	26.0	0.0
M	5,651	39	139	2.1	26.9	26.9	26.9	0.0
N	5,828	59	484	0.7	28.5	28.5	28.7	0.2
O	6,672	48	196	1.7	28.7	28.7	29.1	0.4
P	7,079	41	285	1.4	28.8	28.8	29.5	0.7
Q	7,563	44	156	2.0	28.9	28.9	29.7	0.8
R	7,808	20	224	1.6	29.9	29.9	30.8	0.9
S	8,840	24	202	2.4	30.2	30.2	31.2	1.0
T	9,775	44	159	2.2	31.4	31.4	31.9	0.5
U	10,418	48	194	2.0	31.9	31.9	32.5	0.6
V	11,647	27	72	4.1	33.6	33.6	34.2	0.7
W	12,146	35	214	2.8	34.9	34.9	35.3	0.4
X	13,177	45	301	1.9	36.9	36.9	37.8	0.9
Y	13,755	293	316	1.0	37.3	37.3	38.2	0.9
Z	14,471	332	220	1.7	38.2	38.2	39.2	1.0

[1]Feet above Downstream Face of Taxiway Culvert

[2]Elevations computed without consideration of coastal flooding effects from Gastineau Channel

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: JORDAN CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Jordan Creek (continued)								
AA	14,853	144	244	1.9	39.8	39.8	40.8	1.0
AB	15,676	23	119	3.8	42.5	42.5	43.1	0.6
AC	16,285	51	85	2.4	44.2	44.2	44.3	0.1
AD	16,847	45	97	3.9	46.1	46.1	46.7	0.6
AE	17,956	86	150	0.8	48.0	48.0	48.4	0.3
AF	18,604	24	43	4.9	49.3	49.3	49.6	0.3
AG	18,821	21	85	2.5	50.5	50.5	50.8	0.3
AH	19,899	21	25	4.0	53.3	53.3	53.4	0.1

[1]Feet above Downstream Face of Taxiway Culvert

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: JORDAN CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Lemon Creek								
A	332	168	1093	5.9	23.4	18.9	19.9	1.0
B	942	157	2089	4.5	23.4	20.1	20.9	0.8
C	1,471	216	1528	5.0	23.4	20.5	21.4	0.9
D	1,842	134	1726	5.6	23.4	21.1	21.8	0.7
E	1,975	163	1696	4.5	23.4	21.6	22.6	1.0
F	2,358	73	504	12.8	23.4	21.8	22.7	0.9
G	2,650	76	710	8.6	24.9	24.9	25.2	0.3
H	3,018	52	753	10.0	26.4	26.4	26.7	0.3
I	3,325	52	668	9.9	27.2	27.1	27.8	0.7
J	3,463	53	665	10.1	27.7	27.7	28.3	0.6
K	3,563	72	1094	6.9	28.9	28.9	29.6	0.7
L	4,737	152	1449	4.3	30.5	30.5	31.5	1.0
M	5,184	175	1767	3.7	31.0	31.0	31.9	0.9
N	5,724	188	1261	4.8	31.4	31.3	32.3	1.0
O	6,125	219	775	7.7	31.8	31.8	32.7	0.9
P	6,513	198	945	6.4	34.2	34.2	34.4	0.2
Q	6,806	114	582	11.3	35.9	35.9	36.0	0.1
R	6,918	130	863	7.4	38.0	38.0	38.1	0.1
S	7,454	205	946	6.3	40.5	40.5	40.6	0.1
T	7,968	83	515	11.7	45.8	45.8	45.8	0.0
U	8,411	95	537	11.3	50.5	50.5	50.7	0.2
V	8,706	76	436	13.7	55.4	55.4	55.4	0.0
W	8,765	80	562	10.6	58.1	58.1	58.1	0.0
X	9,189	57	429	13.9	66.7	66.7	66.7	0.0
Y	9,788	48	392	15.2	85.5	85.5	85.5	0.0
Z	9,935	39	372	16.7	91.9	91.9	91.9	0.0

[1]Feet above location 175 feet downstream of Egan Drive
[2]Elevations computed without consideration of coastal flooding effects from Gastineau Channel

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY AND BOROUGH OF JUNEAU, AK
AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: LEMON CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Lemon Creek (continued)								
AA	10,164	50	630	9.9	97.2	97.2	97.4	0.2
AB	10,296	126	1167	5.4	98.7	98.7	98.9	0.2
AC	10,439	73	578	10.4	99.1	99.1	99.4	0.3
AD	10,471	79	730	8.2	100.6	100.6	100.7	0.1
AE	10,604	157	1796	3.8	101.9	101.9	102.0	0.1
AF	10,738	136	867	6.9	101.9	101.9	102.1	0.2

[1]Feet above origin of study (approximately 175 feet downstream of Egan Drive)

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: LEMON CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Mendenhall River								
A	0	n/a	n/a	n/a	23.4	20.0[2]	n/a[2]	n/a
B	2,566	558	7852	2.6	23.4	20.2[2]	20.2[2]	0.0
C	4,190	270	2907	7.1	23.4	20.2[2]	20.2[2]	0.0
D	5,575	279	3017	6.8	23.4	20.8[2]	20.8[2]	0.0
E	6,020	252	2996	6.8	23.4	21.1[2]	21.1[2]	0.0
F	6,070	239	2990	6.9	23.4	21.1[2]	21.1[2]	0.0
G	6,332	237	2850	7.2	23.4	21.2[2]	21.2[2]	0.0
H	6,876	281	3281	6.2	23.4	21.8[2]	21.8[2]	0.0
I	7,615	348	3367	6.1	23.4	22.3[2]	22.3[2]	0.0
J	8,815	348	3260	6.3	23.5	23.5	23.5	0.0
K	9,363	203	2522	8.1	24.0	24.0	24.0	0.0
L	10,591	438	4249	4.8	25.9	25.9	25.9	0.0
M	11,462	478	8310	2.5	26.5	26.5	26.5	0.0
N	12,041	647	6634	7.5	26.5	26.5	26.5	0.0
O	13,450	166	2019	8.5	27.5	27.5	27.5	0.0
P	14,138	207	2241	7.6	28.3	28.3	28.3	0.0
Q	15,506	236	2496	6.9	30.1	30.1	30.1	0.0
R	16,791	225	2166	7.9	31.4	31.4	31.4	0.0
S	17,423	397	3023	8.6	32.2	32.2	32.2	0.0
T	18,804	184	2423	7.1	34.5	34.5	34.5	0.0
U	19,940	279	3009	5.7	35.6	35.6	35.8	0.2

[1]Feet above confluence with Fritz Cove
[2]Elevations computed without consideration of coastal flooding effects from Fritz Cove

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: MENDENHALL RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Mendenhall River (continued)								
V	20,720	650	6110	2.8	36.4	36.4	36.5	0.1
W	21,442	201	1893	9.0	36.4	36.4	36.5	0.1
X	22,827	174	1994	8.6	43.0	43.0	43.0	0.0
Y	23,338	185	2122	8.1	45.5	45.5	45.6	0.1
Z	24,031	245	1654	10.3	50.3	50.3	50.3	0.0
AA	24,501	167	1483	11.5	55.2	55.2	55.2	0.0
AB	24,561	145	1479	11.6	56.1	56.1	56.1	0.0
AC	25,426	410	2705	6.6	59.6	59.6	59.7	0.1
AD	26,166	630	3796	4.7	60.2	60.2	60.5	0.3
AE	26,791	410	2902	6.1	60.5	60.5	60.9	0.4
AF	28,216	585	3710	4.8	61.9	61.9	62.5	0.6
AG	29,296	325	1910	9.3	62.9	62.9	63.2	0.3

[1]Feet above confluence with Fritz Cove
[2]Elevations computed without consideration of coastal flooding effects from Fritz Cove

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: MENDENHALL RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Montana Creek								
A	280	145	1421	2.5	29.2	29.2	29.2	0.0
B	745	70	797	4.4	29.2	29.2	29.2	0.0
C	1,585	85	676	5.2	29.7	29.7	29.7	0.0
D	2,450	174	556	6.3	31.1	31.1	31.2	0.1
E	3,370	395	784	4.5	34.5	34.5	35.3	0.8
F	4,160	1075	2643	1.3	36.4	36.4	37.2	0.8
G	5,010	60	199	10.3	38.0	38.0	38.0	0.0
H	5,980	65	380	5.4	43.0	43.0	43.4	0.4
I	6,965	90	432	4.7	45.0	45.0	45.4	0.4
J	7,955	73	456	4.5	46.5	46.5	47.0	0.4
K	8,075	96	476	7.3	46.6	46.6	47.0	0.5
L	8,105	92	397	8.8	46.7	46.7	47.1	0.4
M	8,320	145	916	3.8	48.5	48.5	48.6	0.1
N	9,020	230	768	4.6	49.2	49.2	50.1	0.9
O	13,935	500	899	3.9	72.6	72.6	73.6	1.0
P	14,965	510	917	3.8	80.1	80.1	80.1	0.0
Q	16,595	554	1296	2.7	88.9	88.9	89.9	1.0
R	17,375	132	390	9.0	101.2	101.2	101.2	0.0
S	20,060	102	577	6.1	122.1	122.1	122.1	0.0
T	22,730	66	291	12.0	167.1	167.1	167.1	0.0
U	22,780	66	405	8.6	168.4	168.4	168.7	0.3

[1]Feet above confluence with Mendenhall River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: MONTANA CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Montana Creek (continued)								
V	22,800	66	388	9.0	168.6	168.6	168.9	0.3
W	22,850	66	426	8.2	169.2	169.2	169.4	0.2
X	26,955	80	310	11.3	226.4	226.4	226.4	0.0
Y	28,780	57	277	12.6	264.3	264.3	264.3	0.0
Z	31,040	60	378	9.3	291.5	291.5	291.9	0.4

[1]Feet above confluence with Mendenhall River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: MONTANA CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Montana Creek-Overbank Flow								
A	1,560	455	603	2.4	37.0	37.0	37.8	0.8
B	2,125	400	514	2.8	40.9	40.9	41.0	0.1
C	2,925	385	895	1.6	43.9	43.9	44.7	0.8
D	4,200	165	677	2.1	46.7	46.7	47.1	0.4

[1]Feet above confluence with Montana Creek

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: MONTANA CREEK - OVERBANK FLOW

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Peterson Creek								
A	1,420	80	581	4.6	21.5	21.5	21.6	0.1
B	3,195	55	549	4.9	22.7	22.7	23.3	0.6
C	3,815	115	828	3.2	23.6	23.6	24.4	0.8
D	3,980	225	1142	2.3	23.9	23.9	24.7	0.8
E	4,940	115	304	8.8	25.2	25.2	25.2	0.0
F	5,230	33	201	13.3	28.5	28.5	29.1	0.6

[1]Feet above mouth

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: PETERSON CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Salmon Creek								
A	140	90	410	5.9	23.4	20.4[2]	21.2	0.8
B	540	70	325	7.5	23.4	22.7[2]	23.2	0.5
C	800	45	246	9.9	24.9	24.9	25.6	0.7
D	1,030	59	280	8.7	29.1	29.1	29.1	0.0
E	1,165	51	250	9.7	30.1	30.1	30.5	0.4
F	1,435	68	384	6.3	33.5	33.5	33.6	0.1

[1]Feet above origin of study (origin of study is located 70 feet downstream of Glacier Highway)
[2]Elevations computed without consideration of coastal flooding effects from Gastineau Channel

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: SALMON CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tributary to Favorite Channel								
A	1,590	58	188	3.2	24.3	24.3	24.3	0.0
B	2,105	67	170	3.6	25.2	25.2	25.7	0.5
C	3,075	35	183	3.2	27.0	27.0	27.3	0.3
D	4,225	66	275	2.1	27.7	27.7	28.1	0.4
E	5,170	45	272	2.1	27.9	27.9	28.4	0.5
F	5,950	40	254	2.2	28.1	28.1	28.6	0.5
G	7,480	78	292	1.9	28.5	28.5	29.1	0.6
H	8,600	102	313	1.8	28.9	28.9	29.7	0.8
I	9,290	30	195	2.8	29.3	29.3	30.2	0.9

[1]Feet above confluence with Favorite Channel

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: TRIBUTARY TO FAVORITE CHANNEL

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tributary to Favorite Channel By-Pass								
A	1,100	25	74	1.7	23.0	23.0	23.0	0.0
B	1,560	20	37	3.4	23.9	23.9	23.9	0.0
C	2,400	20	53	1.5	25.2	25.2	25.2	0.0
D	3,090	12	13	6.0	26.4	26.4	26.4	0.0
E	4,000	60	88	0.9	27.9	27.9	28.6	0.7

[1]Feet above confluence with Favorite Channel

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: TRIBUTARY TO FAVORITE CHANNEL BY-PASS

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET MLLW)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Unnamed Tributary to Duck Creek								
A	271	18	12	0.6	41.3	41.2	41.2	0.0
B	330	8	3	2.3	41.6	41.4	41.4	0.0
C	490	9	3	2.5	43.4	43.3	43.3	0.0
D	685	8	7	1.0	44.4	44.3	44.3	0.0
E	755	10	13	0.6	44.8	44.5	44.5	0.0
F	1,157	10	11	0.7	44.9	44.6	44.6	0.0
G	1,216	10	10	0.7	45.6	45.3	45.3	0.0
H	1,406	11	4	1.9	45.9	45.8	45.8	0.0
I	1,578	12	6	1.2	46.5	46.3	46.3	0.0
J	1,726	11	5	1.0	46.5	46.4	46.4	0.0
K	1,830	6	3	1.5	47.1	47.3	47.3	0.0

[1]Feet above confluence with Duck Creek

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: UNNAMED TRIBUTARY TO DUCK CREEK

Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams

[Not Applicable to this Flood Risk Project]

6.4 Coastal Flood Hazard Mapping

Flood insurance zones and BFEs including the wave effects were identified on each transect based on the results from the onshore wave hazard analyses. Between transects, elevations were interpolated using topographic maps, land-use and land-cover data, and knowledge of coastal flood processes to determine the aerial extent of flooding. Sources for topographic data are shown in Table 23.

Zone VE is subdivided into elevation zones and BFEs are provided on the FIRM.

The limit of Zone VE shown on the FIRM is defined as the farthest inland extent of any of these criteria (determined for the 1% annual chance flood condition):

- The *primary frontal dune zone* is defined in 44 CFR Section 59.1 of the NFIP regulations. The primary frontal dune represents a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes that occur immediately landward and adjacent to the beach. The primary frontal dune zone is subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the primary frontal dune zone occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.

- The *wave runup zone* occurs where the (eroded) ground profile is 3.0 feet or more below the 2-percent wave runup elevation.

- The *wave overtopping splash zone* is the area landward of the crest of an overtopped barrier, in cases where the potential 2-percent wave runup exceeds the barrier crest elevation by 3.0 feet or more.

- The *breaking wave height zone* occurs where 3-foot or greater wave heights could occur (this is the area where the wave crest profile is 2.1 feet or more above the total stillwater elevation).

- The *high-velocity flow zone* is landward of the overtopping splash zone (or area on a sloping beach or other shore type), where the product of depth of flow times the flow velocity squared (hv^2) is greater than or equal to 200 ft^3/sec^2. This zone may only be used on the Pacific Coast.

The SFHA boundary indicates the limit of SFHAs shown on the FIRM as either “V” zones or “A” zones.

Table 26 indicates the coastal analyses used for floodplain mapping and the criteria used to determine the inland limit of the open-coast Zone VE and the SFHA boundary at each transect.

Table 26: Summary of Coastal Transect Mapping Considerations

[Not Applicable to this Flood Risk Project]
* See Flood Insurance Rate Map for Base Flood Elevations

6.5 FIRM Revisions

This FIS Report and the FIRM are based on the most up-to-date information available to FEMA at the time of its publication; however, flood hazard conditions change over time. Communities or private parties may request flood map revisions at any time. Certain types of requests require submission of supporting data. FEMA may also initiate a revision. Revisions may take several forms, including Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs) (referred to collectively as Letters of Map Change (LOMCs)), Physical Map Revisions (PMRs), and FEMA-contracted restudies. These types of revisions are further described below. Some of these types of revisions do not result in the republishing of the FIS Report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data (shown in Table 31, "Map Repositories").

6.5.1 Letters of Map Amendment

A LOMA is an official revision by letter to an effective NFIP map. A LOMA results from an administrative process that involves the review of scientific or technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a specific property is not located in a SFHA. A LOMA cannot be issued for properties located on the PFD (primary frontal dune).

To obtain an application for a LOMA, visit http://www.fema.gov and download the form "MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill". Visit the "Flood Map-Related Fees" section to determine the cost, if any, of applying for a LOMA.

FEMA offers a tutorial on how to apply for a LOMA. The LOMA Tutorial Series can be accessed at http://www.fema.gov/plan/prevent/fhm/ot_lmreq.shtm.

For more information about how to apply for a LOMA, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627).

6.5.2 Letters of Map Revision Based on Fill

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states FEMA's determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

Information about obtaining an application for a LOMR-F can be obtained in the same manner as that for a LOMA, by visiting http://www.fema.gov for the "MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill" or by calling the FEMA Map Information eXchange, toll free, at 1-877-FEMA MAP (1-877-336-2627). Fees for applying for a LOMR-F, if any, are listed in the "Flood Map-Related Fees" section.

A tutorial for LOMR-F is available at
http://www.fema.gov/plan/prevent/fhm/ot_lmreq.shtm.

6.5.3 Letters of Map Revision

A LOMR is an official revision to the currently effective FEMA map. It is used to change flood zones, floodplain and floodway delineations, flood elevations and planimetric features. All requests for LOMRs should be made to FEMA through the chief executive officer of the community, since it is the community that must adopt any changes and revisions to the map. If the request for a LOMR is not submitted through the chief executive officer of the community, evidence must be submitted that the community has been notified of the request.

To obtain an application for a LOMR, visit http://www.fema.gov and download the form "MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision". Visit the "Flood Map-Related Fees" section to determine the cost of applying for a LOMR. For more information about how to apply for a LOMR, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627) to speak to a Map Specialist.

Previously issued mappable LOMCs (including LOMRs) that have been incorporated into the City and Borough of Juneau, Alaska FIRM are listed in Table 27. Please note that this table only includes LOMCs that have been issued on the FIRM panels updated by this map revision. For all other areas within this county, users should be aware that revisions to the FIS Report made by prior LOMRs may not be reflected herein and users will need to continue to use the previously issued LOMRs to obtain the most current data.

Table 27: Incorporated Letters of Map Change

[Not Applicable to this Flood Risk Project]

6.5.4 Physical Map Revisions

Physical Map Revisions (PMRs) are an official republication of a community's NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

The community's chief executive officer must submit scientific and technical data to FEMA to support the request for a PMR. The data will be analyzed and the map will be revised if warranted. The community is provided with copies of the revised information and is afforded a review period. When the base flood elevations are changed, a 90-day appeal period is provided. A 6-month adoption period for formal approval of the revised map(s) is also provided.

For more information about the PMR process, please visit http://www.fema.gov and visit the "Flood Map Revision Processes" section.

6.5.5 Contracted Restudies

The NFIP provides for a periodic review and restudy of flood hazards within a given community. FEMA accomplishes this through a national watershed-based mapping needs assessment strategy, known as the Coordinated Needs Management Strategy (CNMS).

The CNMS is used by FEMA to assign priorities and allocate funding for new flood hazard analyses used to update the FIS Report and FIRM. The goal of CNMS is to define the validity of the engineering study data within a mapped inventory. The CNMS is used to track the assessment process, document engineering gaps and their resolution, and aid in prioritization for using flood risk as a key factor for areas identified for flood map updates. Visit www.fema.gov to learn more about the CNMS or contact the FEMA Regional Office listed in Section 8 of this FIS Report.

6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of the City and Borough of Juneau, Alaska. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBMs) and/or Flood Boundary and Floodway Maps (FBFMs) may have been prepared for the incorporated communities and the unincorporated areas in the county that had identified SFHAs. Current and historical data relating to the maps prepared for the project area are presented in Table 28, "Community Map History." A description of each of the column headings and the source of the date is also listed below.

- *Community Name* includes communities falling within the geographic area shown on the FIRM, including those that fall on the boundary line, nonparticipating communities, and communities with maps that have been rescinded. Communities with No Special Flood Hazards are indicated by a footnote. If all maps (FHBM, FBFM, and FIRM) were rescinded for a community, it is not listed in this table unless SFHAs have been identified in this community.

- *Initial Identification Date (First NFIP Map Published)* is the date of the first NFIP map that identified flood hazards in the community. If the FHBM has been converted to a FIRM, the initial FHBM date is shown. If the community has never been mapped, the upcoming effective date or "pending" (for Preliminary FIS Reports) is shown. If the community is listed in Table 28 but not identified on the map, the community is treated as if it were unmapped.

- *Initial FHBM Effective Date* is the effective date of the first Flood Hazard Boundary Map (FHBM). This date may be the same date as the Initial NFIP Map Date.

- *FHBM Revision Date(s)* is the date(s) that the FHBM was revised, if applicable.

- *Initial FIRM Effective Date* is the date of the first effective FIRM for the community. This is the first effective date that is shown on the FIRM panel.

- *FIRM Revision Date(s)* is the date(s) the FIRM was revised, if applicable. This is the revised date that is shown on the FIRM panel, if applicable. As countywide studies are completed or revised, each community listed should have its FIRM dates updated accordingly to reflect the date of the countywide study. Once the FIRMs exist in countywide format, as Physical Map Revisions (PMR) of FIRM panels within the county are completed, the FIRM Revision Dates in the table for each community affected by the PMR are updated with the date of the PMR, even if the PMR did not revise all the panels within that community.

The initial effective date for the City and Borough of Juneau, Alaska FIRMs in countywide format was February 4, 1981.

Table 28: Community Map History

Community Name	Initial Identification Date (First NFIP Map Published)	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
City and Borough of Juneau, Alaska	05/09/70	N/A	05/20/77	02/04/81	09/28/90 08/19/13

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

Table 29 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

Table 29: Summary of Contracted Studies Included in this FIS Report

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
All within HUC 19010301	March, 1977	Alaska District, US Army COE	IAA-H-7-76	March 1977	City and Borough of Juneau, AK
Montana Creek	September 28, 1990	Alaska District, US Army COE	EMW-87-E-2509	September 28, 1990	City and Borough of Juneau, AK
Mendenhall River	September 28, 1990	Alaska District, US Army COE	EMW-87-E-2509	September 28, 1990	City and Borough of Juneau, AK
Mendenhall River	August 19, 2013	Northwest Hydraulic Consultants	EMS-2001-C0-0067	2010	City and Borough of Juneau, AK
Auke Bay	August 19, 2013	Northwest Hydraulic Consultants	EMS-2001-C0-0067	2010	City and Borough of Juneau, AK
Fritz Cove	August 19, 2013	Northwest Hydraulic Consultants	EMS-2001-C0-0067	2010	City and Borough of Juneau, AK
Gastineau Channel	August 19, 2013	Northwest Hydraulic Consultants	EMS-2001-C0-0067	2010	City and Borough of Juneau, AK

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Lemon Creek	TBD	STARR	HSFEHQ-09-D-370	1/21/2016	City and Borough of Juneau, AK
Duck Creek	TBD	STARR	HSFEHQ-09-D-370	1/21/2016	City and Borough of Juneau, AK
East Fork Duck Creek	TBD	STARR	HSFEHQ-09-D-370	1/21/2016	City and Borough of Juneau, AK
Jordan Creek	TBD	STARR	HSFEHQ-09-D-370	1/21/2016	City and Borough of Juneau, AK
Unammed Tributary to Duck Creek	TBD	STARR	HSFEHQ-09-D-370	1/21/2016	City and Borough of Juneau, AK
Gold Creek, Auke Lake	TBD	STARR	HSFEHQ-09-D-370	1/21/2016	City and Borough of Juneau, AK

7.2 Community Meetings

The dates of the community meetings held for this Flood Risk Project and any previous Flood Risk Projects are shown in Table 30. These meetings may have previously been referred to by a variety of names (Community Coordination Officer (CCO), Scoping, Discovery, etc.), but all meetings represent opportunities for FEMA, community officials, study contractors, and other invited guests to discuss the planning for and results of the project.

Table 30: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
City and Borough of Juneau, Alaska	08/04/80	07/21/77	CCO Initial	FEMA, City and Borough of Juneau, Study Contractor
		08/22/77	CCO Final	FEMA, City and Borough of Juneau, Study Contractor
City and Borough of Juneau, Alaska	09/28/90	N/A	N/A	N/A
City and Borough of Juneau, Alaska	08/19/13	04/27/05	CCO Initial	FEMA, USGS, State of Alaska, City and Borough of Juneau, Study Contractor
		12/02/10	CCO Final	FEMA, City and Borough of Juneau, Study Contractor, Developers, Public

SECTION 8.0 – ADDITIONAL INFORMATION

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see http://www.fema.gov.

In May 1969, the Army Corps of Engineers prepared a Special Flood Hazard Report on Salmon Creek (Reference 5). In June 1970, they conducted Flood Plain Information reports on the Mendenhall River and Lemon Creek (References 3 and 4). Flood Insurance Studies for the Mendenhall River and Lemon Creek were prepared in 1971 (References 36 and 37). A Flood Hazard Boundary Map for the City and Borough of Juneau was published on May 20, 1977 (Reference 38).

Table 31 is a list of the locations where FIRMs for the City and Borough of Juneau, Alaska can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 31: Map Repositories

Community	Address	City	State	Zip Code
City and Borough of Juneau, Alaska	230 South Franklin Street	Juneau	AK	99801

The National Flood Hazard Layer (NFHL) dataset is a compilation of effective FIRM databases and LOMCs. Together they create a GIS data layer for a State or Territory. The NFHL is updated as studies become effective and extracts are made available to the public monthly. NFHL data can be viewed or ordered from the website shown in Table 32.

Table 32 contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the state NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of state and local GIS data in their state.

Table 32: Additional Information

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/engineering-library
NFIP website	www.fema.gov/national-flood-insurance-program

NFHL Dataset	msc.fema.gov
FEMA Region X	Federal Regional Center, 130 228th Street SW, Bothell, WA 98021-9796 (425) 487-4657
Other Federal Agencies	
USGS website	http://www.usgs.gov
Hydraulic Engineering Center website	http://www.hec.usace.army.mil
State Agencies and Organizations	
State NFIP Coordinator	Sally Russell Cox Alaska Dept. Community & Econ. Dev. 550 West 7th Avenue, Suite 1770 Anchorage, AK 99501-3510 Phone: (907) 269-4588 sally.cox@alaska.gov
State GIS Coordinator	Richard McMahon Chief, Land Records Information System State of Alaska, Department of Natural Resources 550 West 7th Avenue, Suite 706 Anchorage, AK 99501 Phone: (907) 269-8836 richard_mcmahon@dnr.state.ak.us
Statewide Hazard Mitigation Lead Facilitator	Ann Gravier Alaska Division of Homeland Security and Emergency Management P.O. Box 5750 Ft. Richardson, AK 99505-5750 Phone: (907) 428-7000 / (Toll Free) (800) 478-2337 mark.roberts@alaska.gov

SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES

Table 33 includes sources used in the preparation of and cited in this FIS Report as well as additional studies that have been conducted in the study area.

Table 33: Bibliography and References

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
1	U.S. Department of Commerce	*Climatological Data for Alaska, Annual Summary for 1976*		Asheville, NC	1976	
2	U.S. Department of the Army, Corps of Engineers	*Flood Plain Information, Mendenhall River, Juneau, Alaska*		Anchorage, AK	1970	
3	U.S. Department of the Army, Corps of Engineers	*Flood Plain Information, Lemon Creek, Juneau, Alaska*		Anchorage, AK	1970	
4	U.S. Department of the Army, Corps of Engineers	*Special Flood Hazard Report, Salmon Creek, Juneau, Alaska*		Anchorage, AK	1969	
5	City and Borough of Juneau	*Alaska Flood Plain Ordinance, Number 71-69, Section 3*		Juneau, AK	1972	
6	U.S. Geological Survey	*Hydrology Geomorphology, and Flood Profiles of Lemon Creek, Juneau, Alaska*		NA	2005	
7	U.S. Department of the Army, Corps of Engineers	*Flood Control Channel Improvements, Gold Creek and Its Tributaries*		Anchorage, AK	1956, 1961	
8	Federal Emergency Management Agency	*Flood Insurance Study, City and Borough of Juneau, Alaska*		NA	1990	

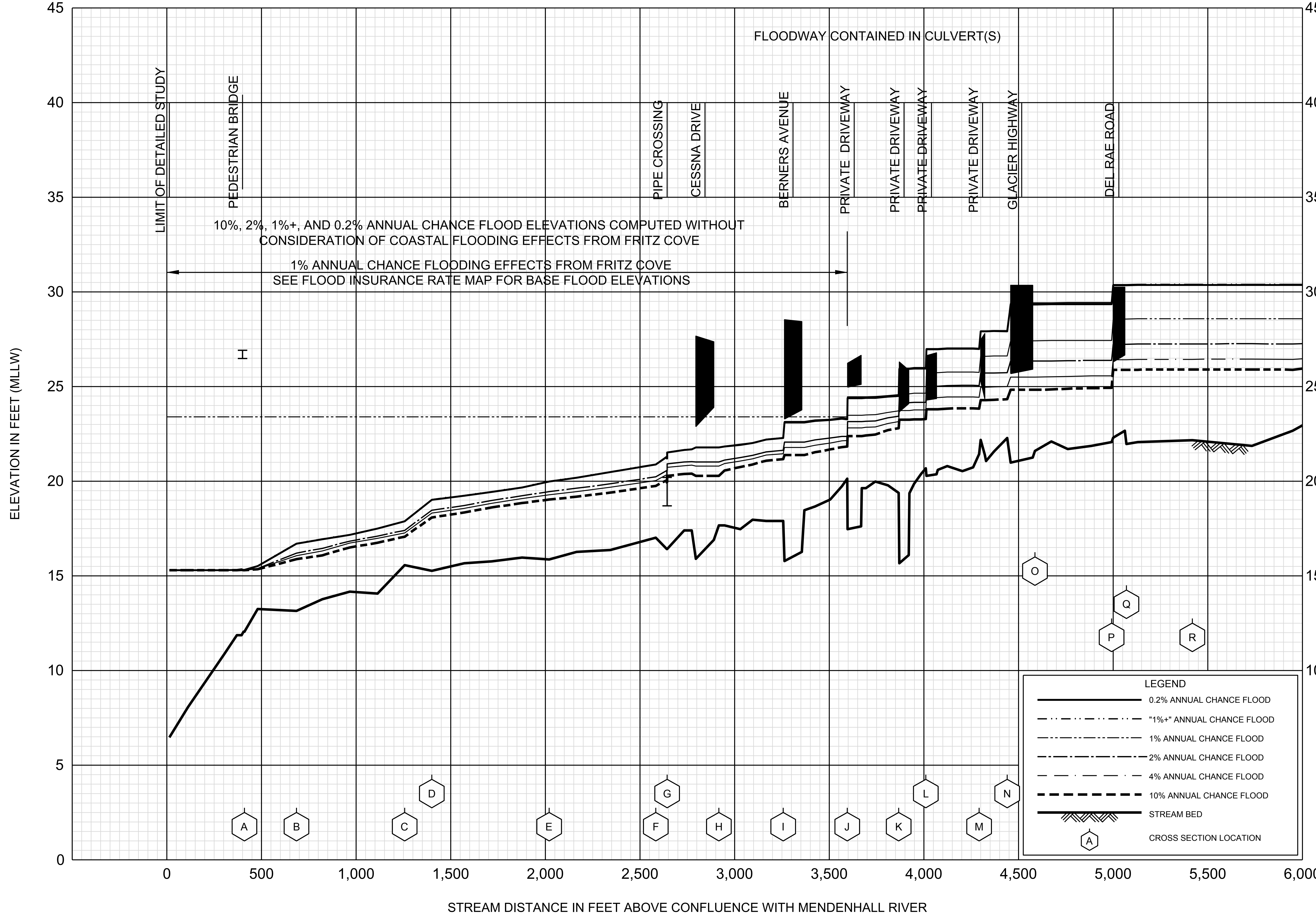
Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
9	U.S. Geological Survey	*Hydrology, Geomorphology, and Flood Profiles of the Mendenhall River, Juneau, Alaska, Water-Resources Investigations Report 99-4150*	Edward G. Neal and Randy H. Host	NA	1999	
10	U.S. Geological Survey	*Hydrology and Flood Profiles of Duck Creek and Jordan Creek Downstream from Egan Drive, Juneau, Alaska*		NA	2007	
11	Northwest Hydraulic Consultants, Inc.	*Hydrology for Detailed Riverine Floodplain Mapping, Juneau, Alaska*		NA	2008	
12	U.S. Department of the Army, Corps of Engineers	*Streamflow Synthesis and Reservoir Regulation*		Portland, OR	1972	
13	Water Resources Council	*Guidelines for Determining Flood Flow Frequency*		Washington, DC	1976	

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
14	U.S. Department of Commerce, Weather Bureau	*Technical Paper No. 47, Probable Maximum Precipitation and Rainfall Data for Alaska for Areas to Four Square Miles, Durations to Twenty-Four Hours and Return Period from One to One Hundred Years*		Washington, DC	1963	
15	U.S. Department of Commerce, Weather Bureau	*Technical Paper No. 52 Two to Ten Day Precipitation for Return Periods of Two to One Hundred Years in Alaska*		Washington, DC	1965	
16	U.S. Geological Survey	*Estimating the Magnitude and Frequency of Peak Streamflows for Ungaged Sites on Streams in Alaska and Conterminous Basins in Canada*		NA	2003	
17	U.S. Department of Commerce, National Oceanic and Atmospheric Administration	*Climatological Data for Alaska, Annual Summary for 1975*		Asheville, NC	1976	

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
18	Northwest Hydraulic Consultants, Inc.	*Hydraulic Analysis and Preliminary Floodplain Mapping for Detailed Reaches, Juneau, Alaska*		NA	2008	
19	City and Borough of Juneau	*Topographic Maps, MLLW Datum*		Juneau, AK	1976	
20	U.S. Geological Survey	*15-Minute Series Topographic Maps, Scale 1:63,360, Contour Interval 100 Feet: Juneau Series*			1951-1962	
21	U.S. Department of the Army, Corps of Engineers	*Topographic Maps, MSL Datum, Peterson Creek and Tributary to Favorite Channel*		Anchorage, AK	1975	
22	U.S. Department of the Army, Corps of Engineers	*Topographic Maps, MSL Datum, Gastineau Channel and Adjacent Area*		Anchorage, AK	1962	
23	U.S. Department of the Army, Corps of Engineers	*HEC-2 Water-Surface Profiles, Users Manual*		Davis, CA	1973	
24	U.S. Department of the Army, Corps of Engineers	*HEC-RAS River Analysis System*		Davis, CA	2005	

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
25	City and Borough of Juneau	*Juneau LiDAR Topography Metadata, Memorandum to Floodzone Mapping Partners*		Juneau, AK	2007	
26	American Concrete Pipe Association	*Concrete Pipe Handbook*		Chicago, IL	1958	
27	American Iron and Steel Institute	*Handbook of Steel Drainage and Highway Construction Products*		Washington, DC	1971	
28	American Society of Civil Engineers	*Approximate Method for Quick Floodplain Mapping*		New York, NY	1975	
29	U.S. Department of the Army, Corps of Engineers	*Shore Protection Manual*		Fort Belvoir, VA	1975	
30	Northwest Hydraulic Consultants, Inc.	*FEMA Coastal Flood Insurance Study City and Borough of Juneau, Alaska*		NA	2009	
31	Federal Emergency Management Agency	*Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States*		NA	2005	
32	Delft University of Technology	*SWAN Users Manual*		Delft, The Netherlands	2004	
33	National Oceanic and Atmospheric Administration	*National Geophysical Data Center*				http://www.ngdc.noaa.gov/mgg/bathymetry/hydro.html

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
34	Reviews of Geophysics	*The Shuttle Radar Topography Mission*	Farr. T.G. et al	NA	2007	
35	U.S. Department of Housing and Urban Development	*Flood Insurance Study, Mendenhall River, Greater Juneau Borough, Alaska*		Anchorage, AK	1971	
36	U.S. Department of Housing and Urban Development	*Flood Hazard Boundary Map, City and Borough of Juneau, Alaska*		NA	1977	
37	U.S. Department of Housing and Urban Development	*Flood Insurance Study, Lemon Creek, Greater Juneau Borough, Alaska*		Anchorage, Alaska	April 1971	
38	City and Borough of Juneau	*Juneau LiDAR and Orthophotos*	WSI – Corvallis, OR office	Juneau, AK	2013	



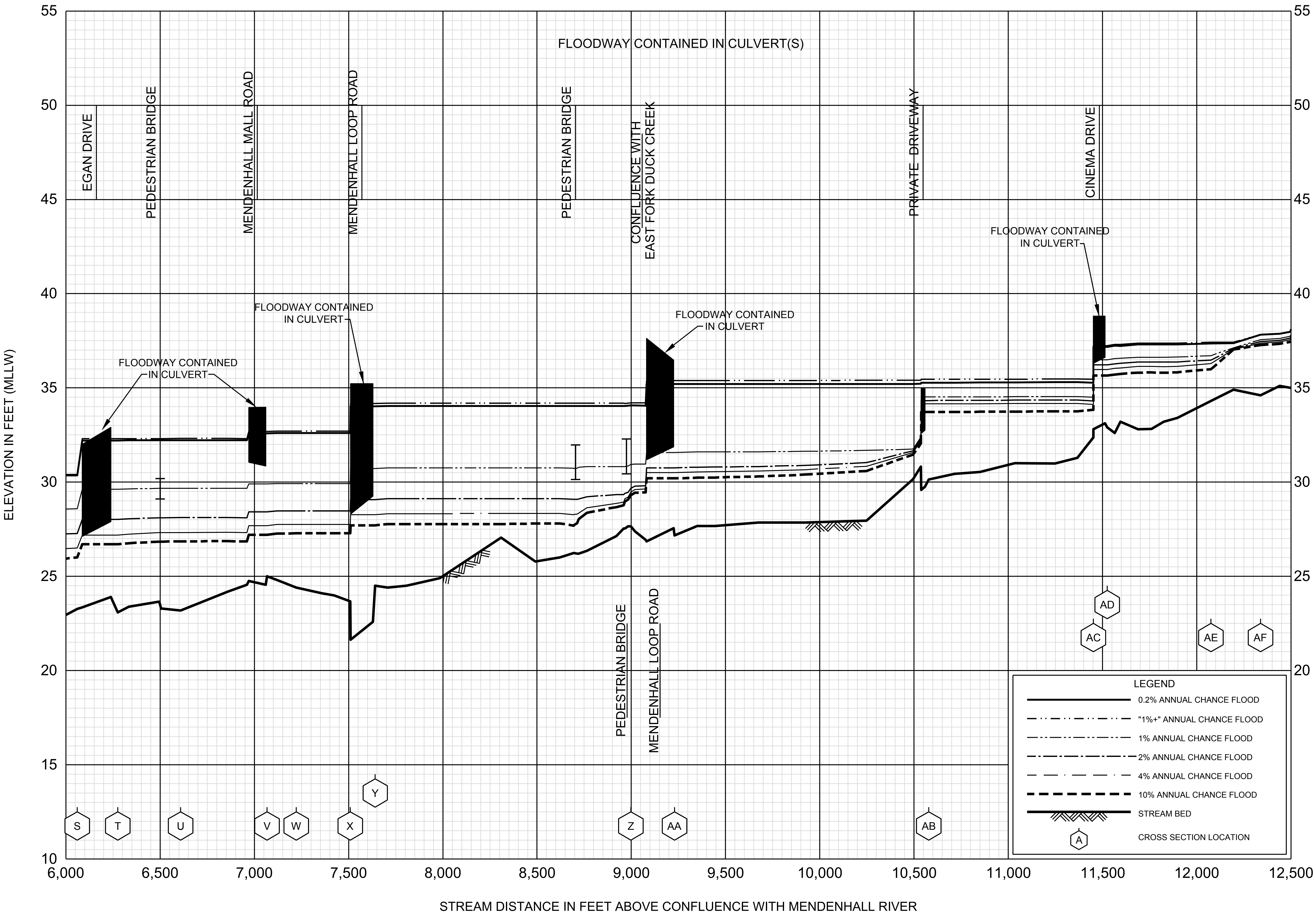
FLOOD PROFILES

DUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

01P



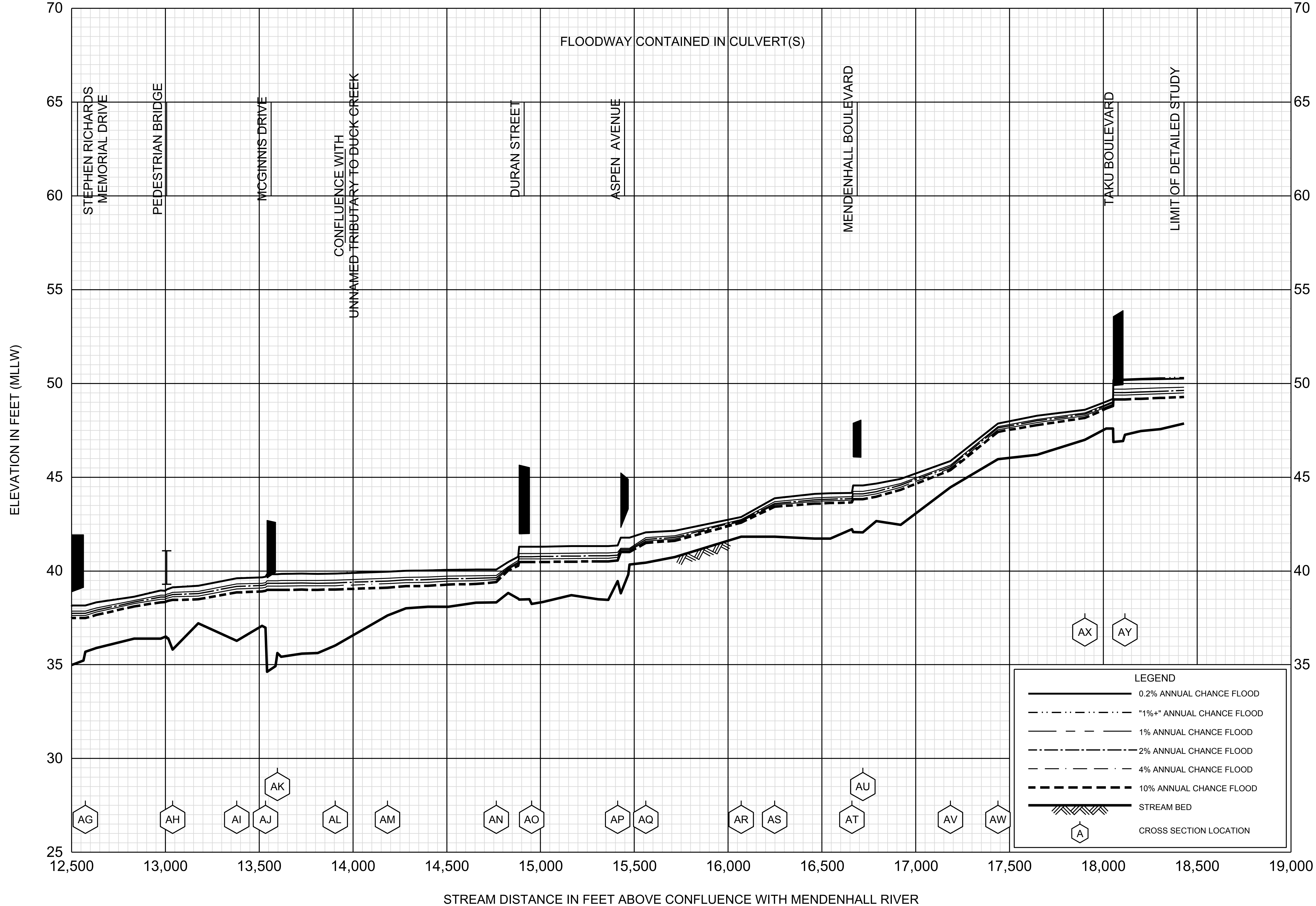
FLOOD PROFILES

DUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

02P



FLOOD PROFILES

DUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

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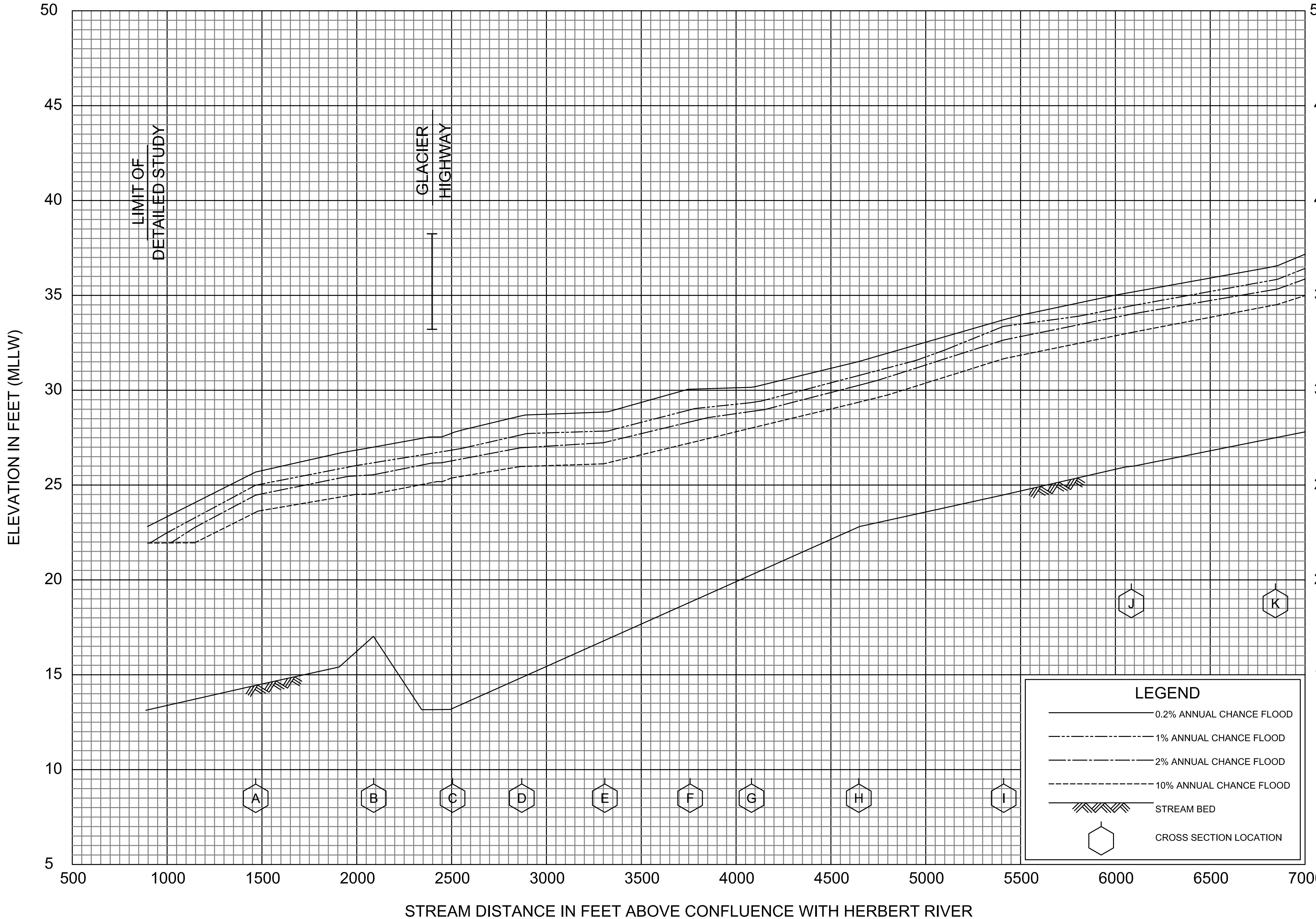


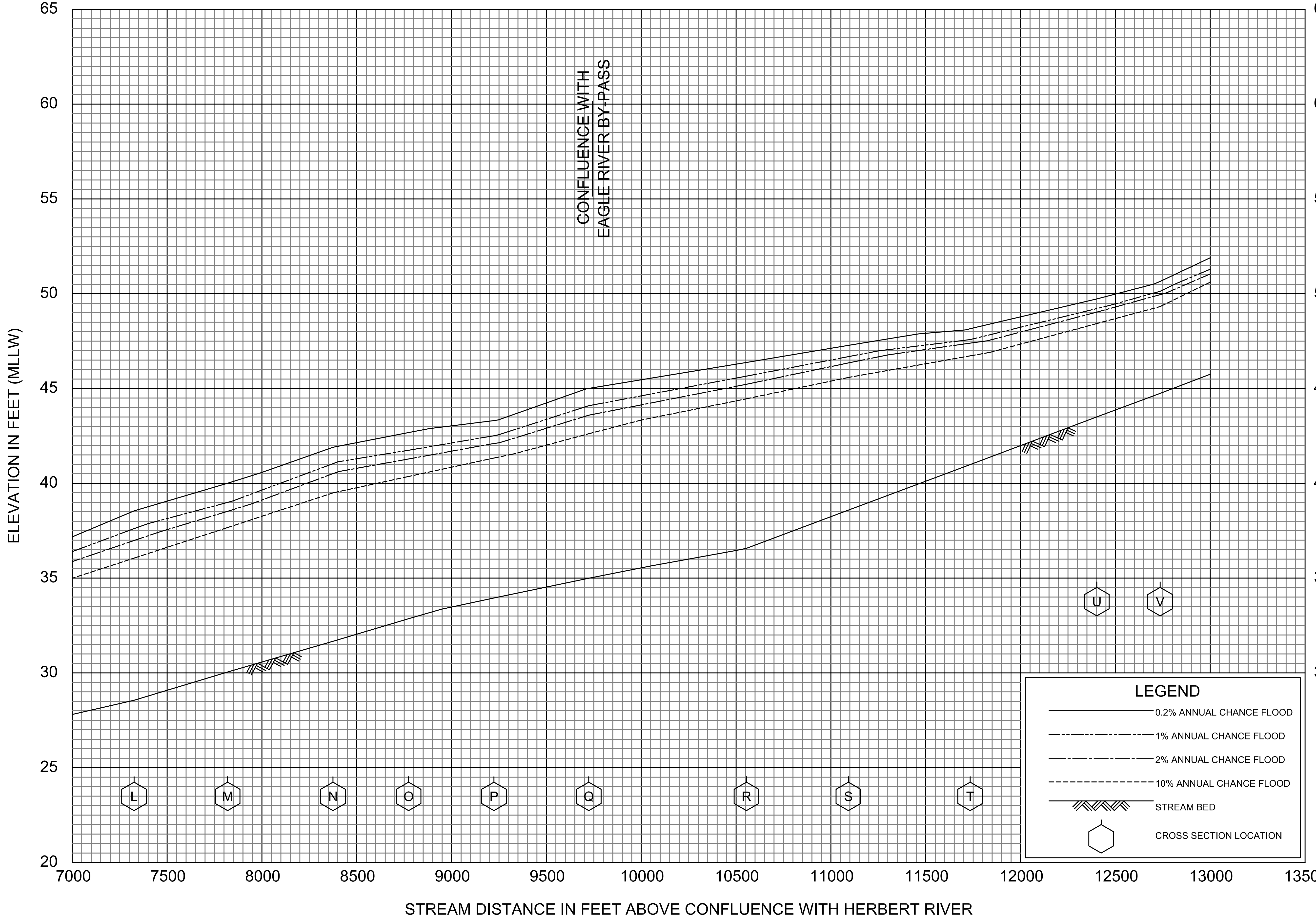
FLOOD PROFILES

EAGLE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

04P



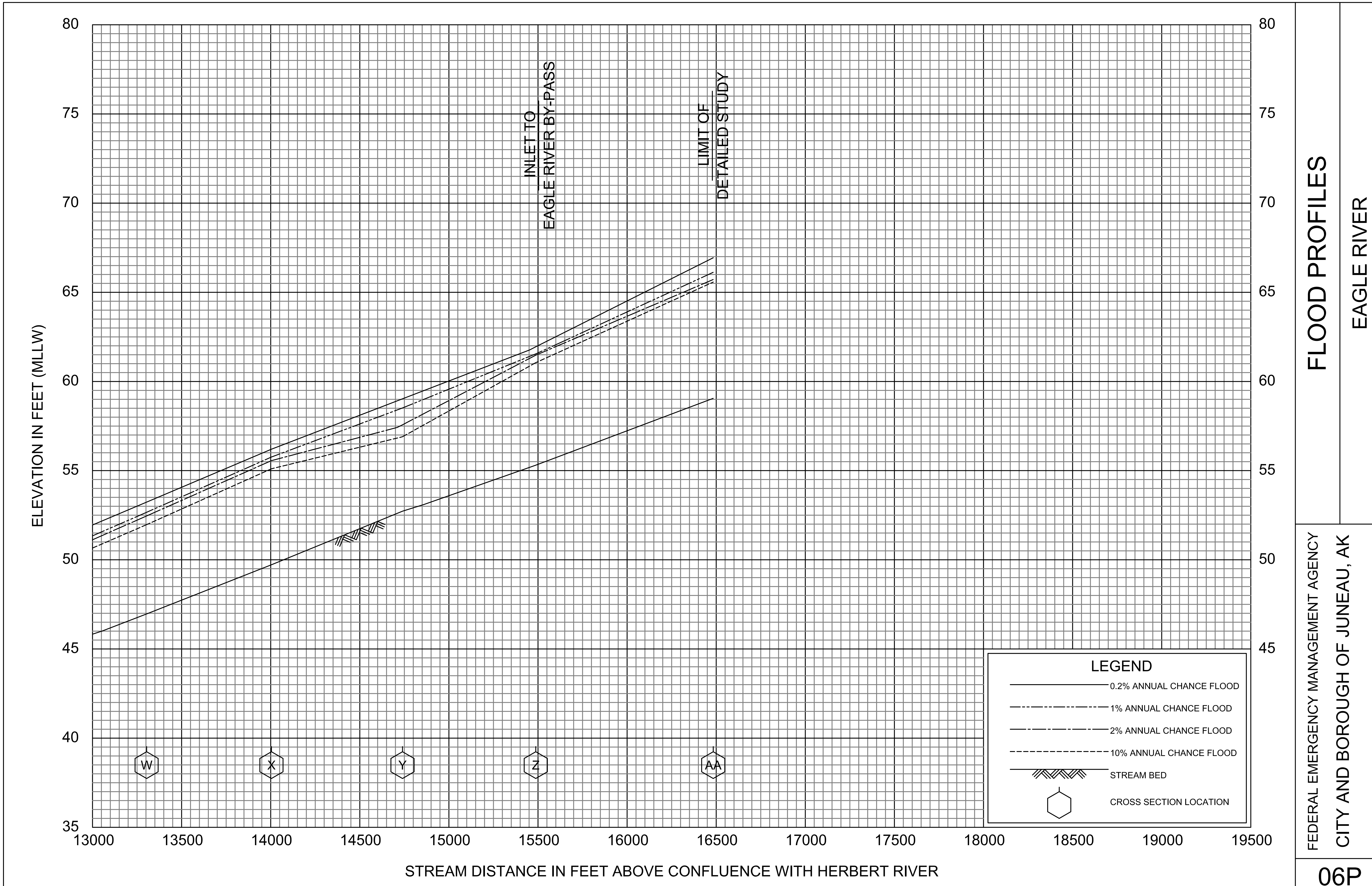
FLOOD PROFILES

EAGLE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

05P



FLOOD PROFILES
EAGLE RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY AND BOROUGH OF JUNEAU, AK
06P
ELEVATION IN FEET (MLLW)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH HERBERT RIVER
INLET TO EAGLE RIVER BY-PASS
LIMIT OF DETAILED STUDY
80
75
70
65
60
55
50
45
40
35
13000
13500
14000
14500
15000
15500
16000
16500
17000
17500
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18500
19000
19500
W
X
Y
Z
AA
LEGEND
0.2% ANNUAL CHANCE FLOOD
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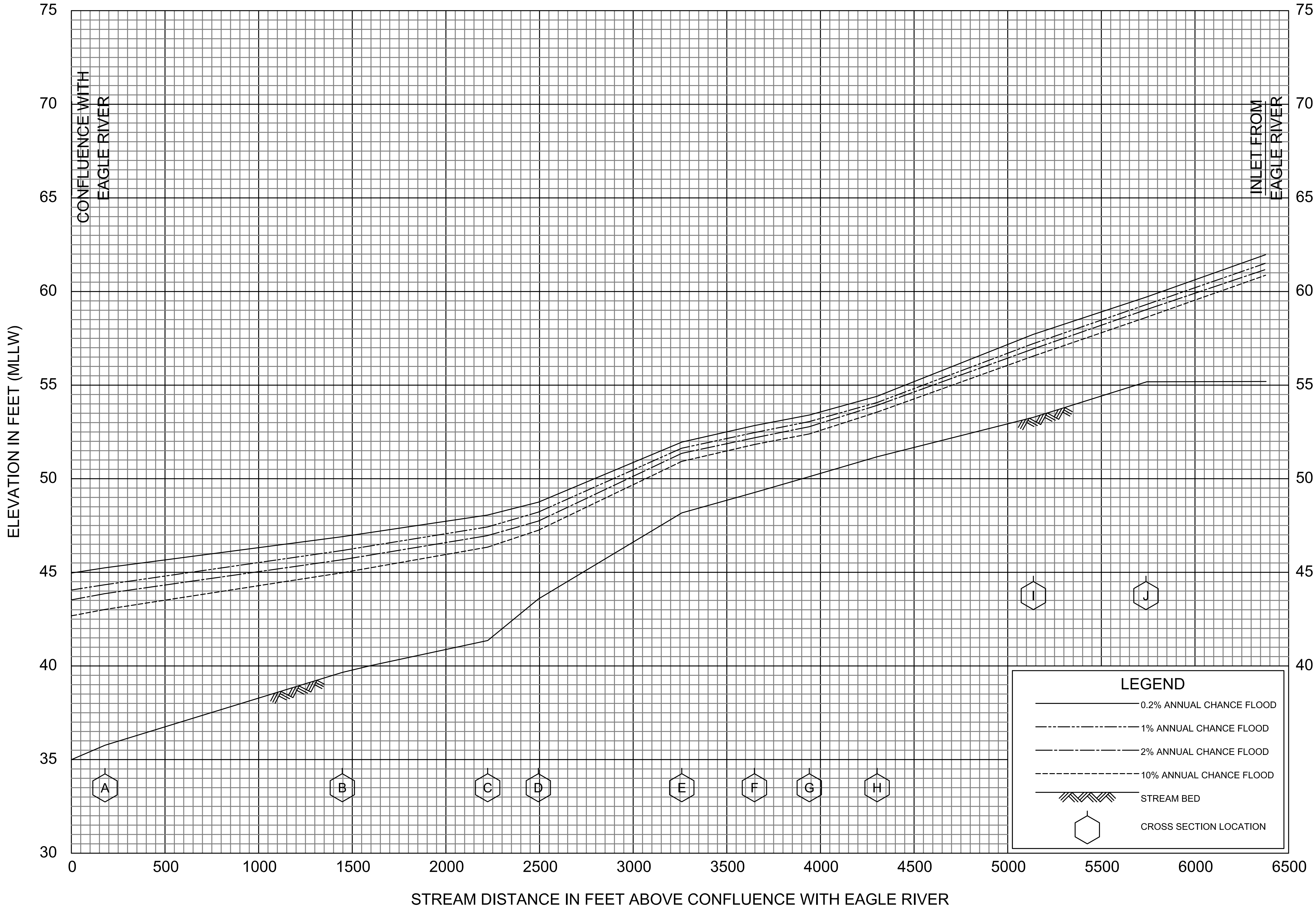
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION



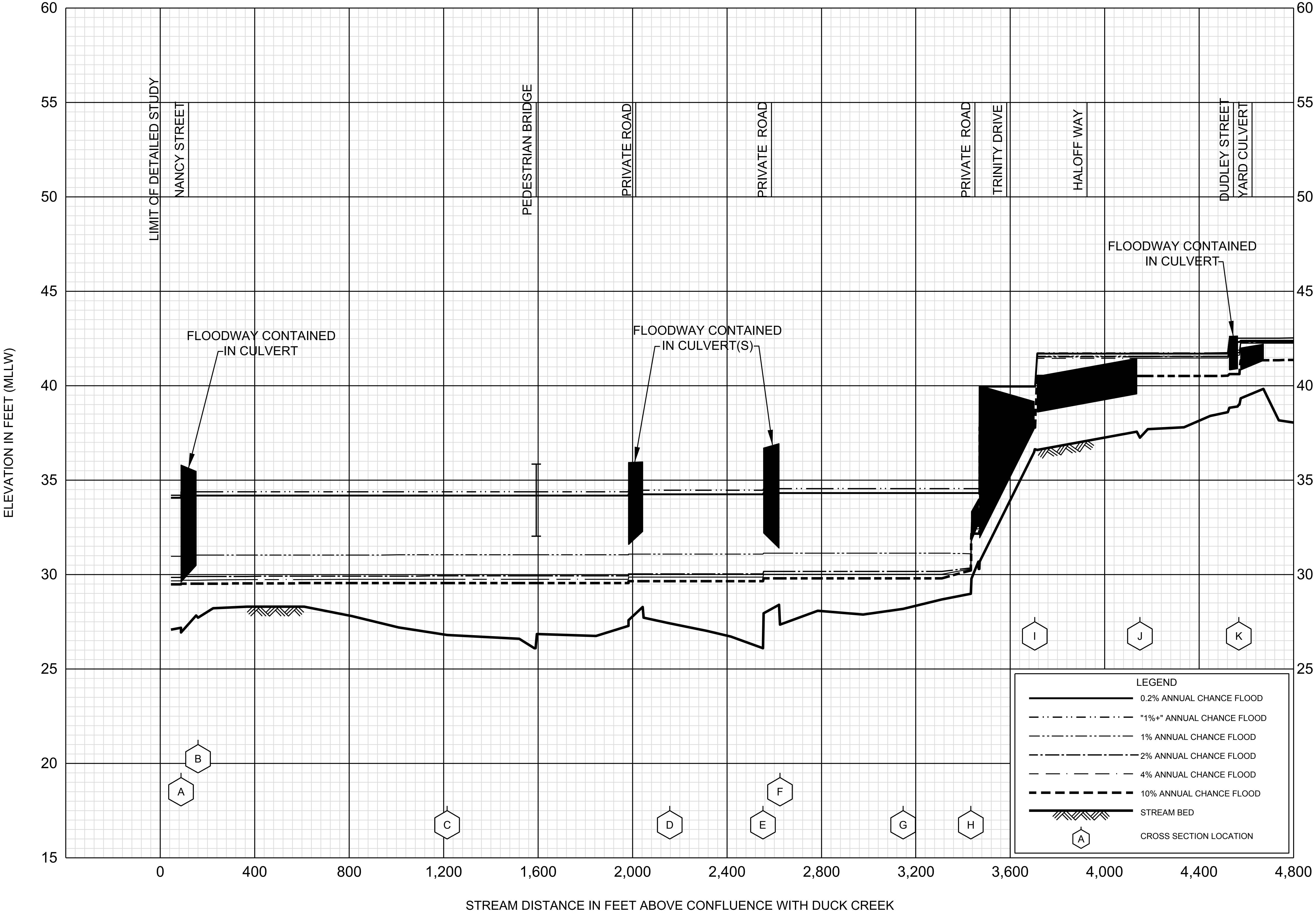
FLOOD PROFILES

EAGLE RIVER BY-PASS

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

07P



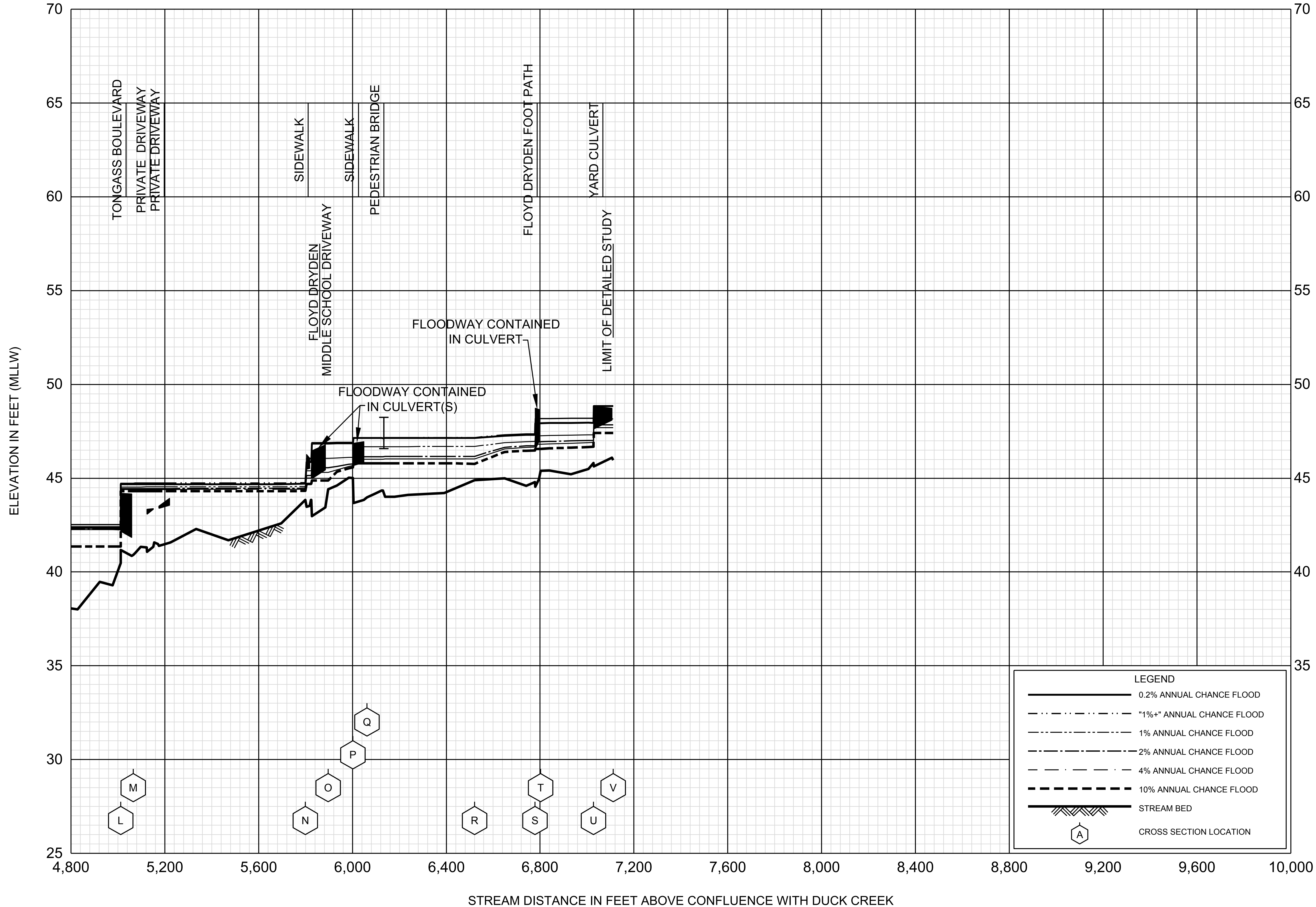
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

FLOOD PROFILES

EAST FORK DUCK CREEK

08P

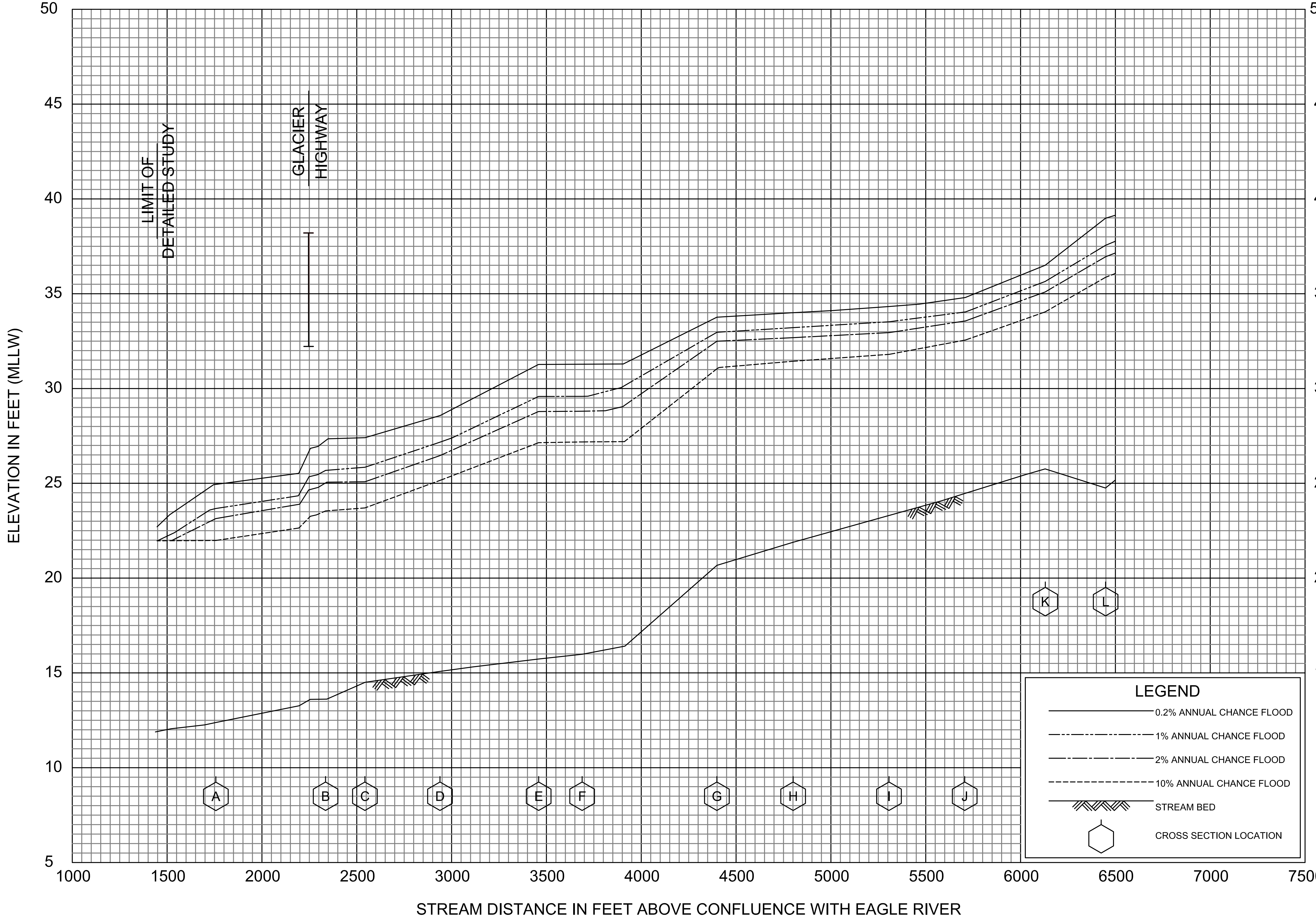


FLOOD PROFILES

EAST FORK DUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK



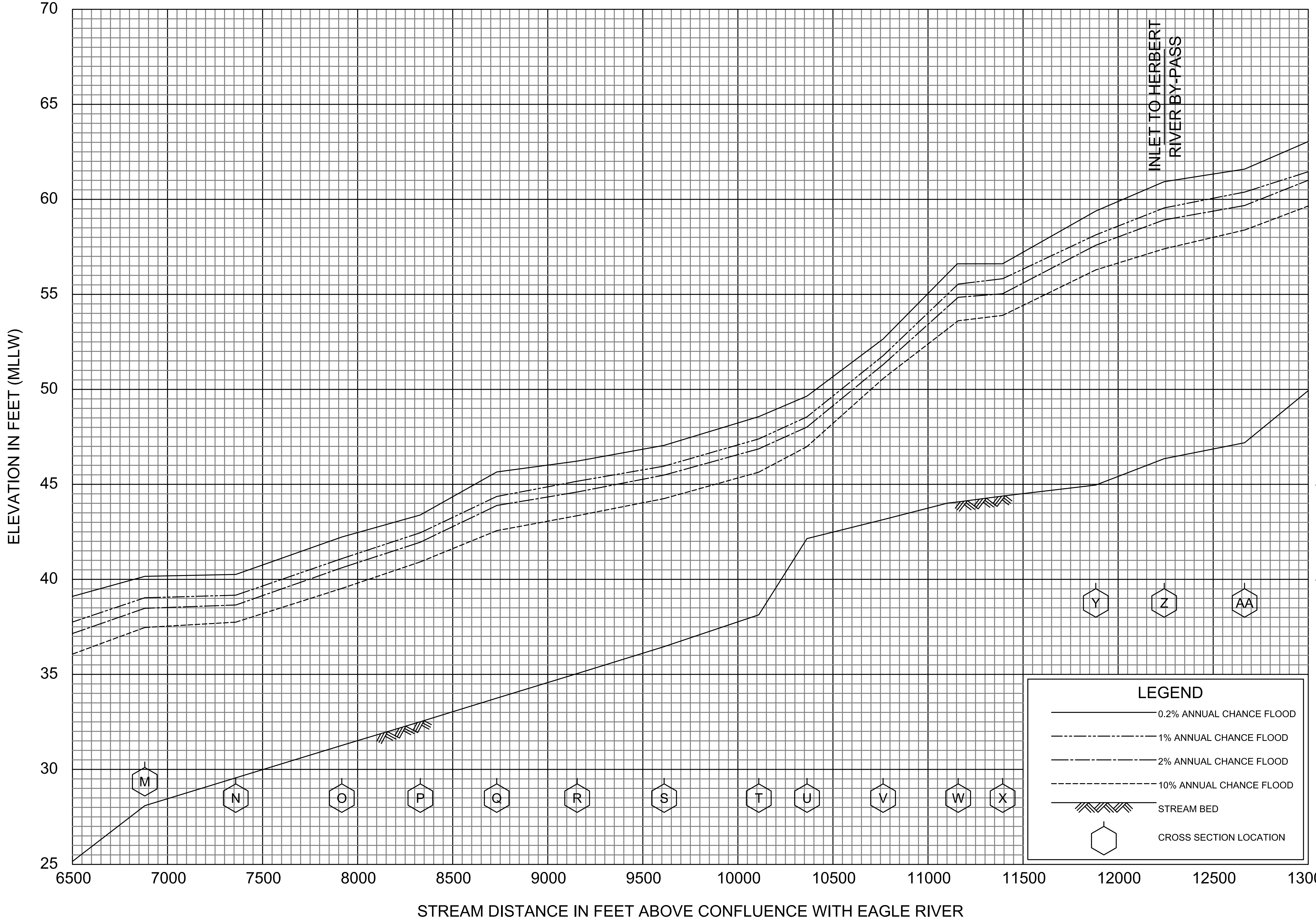
FLOOD PROFILES

HERBERT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

10P

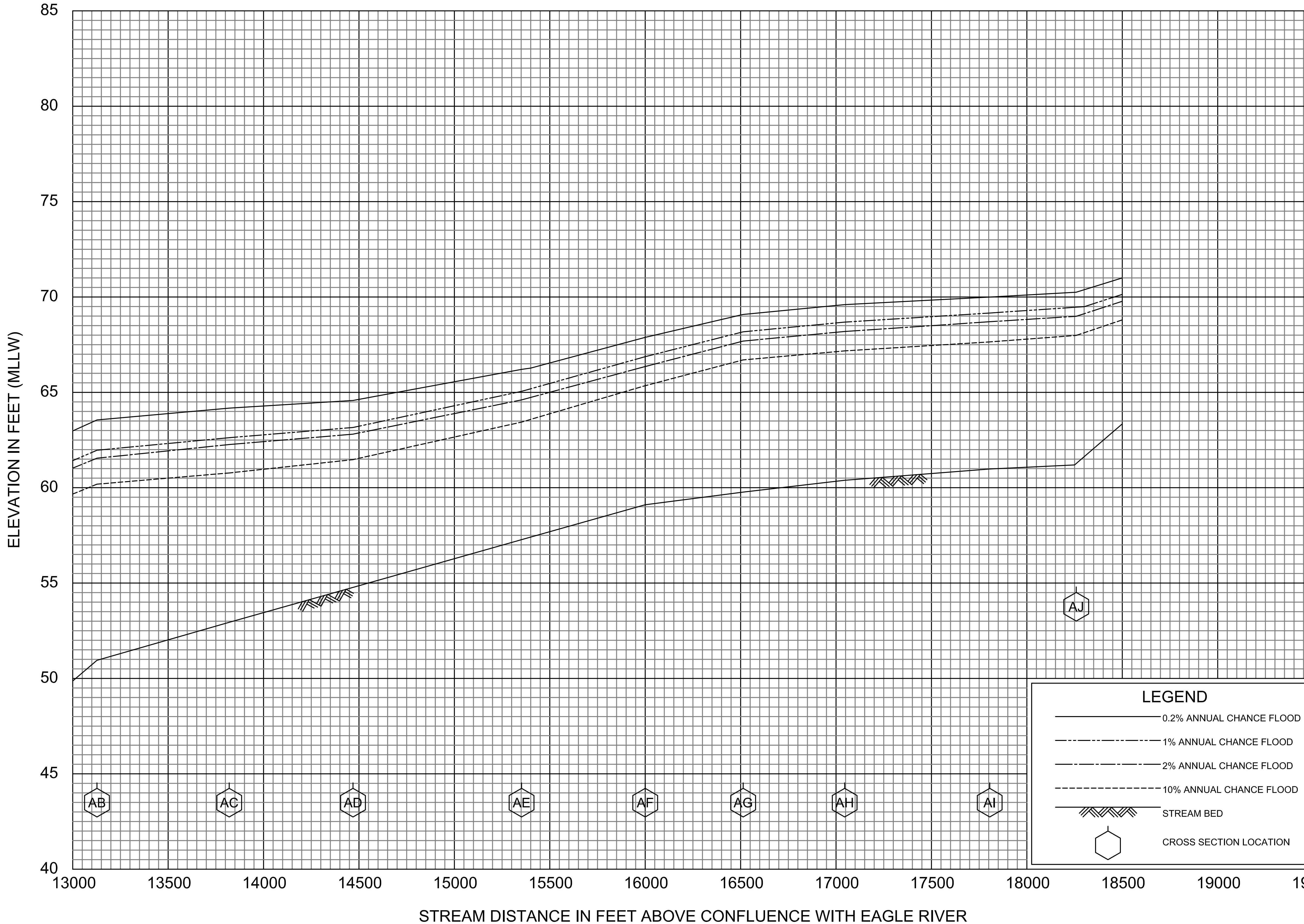


FLOOD PROFILES

HERBERT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

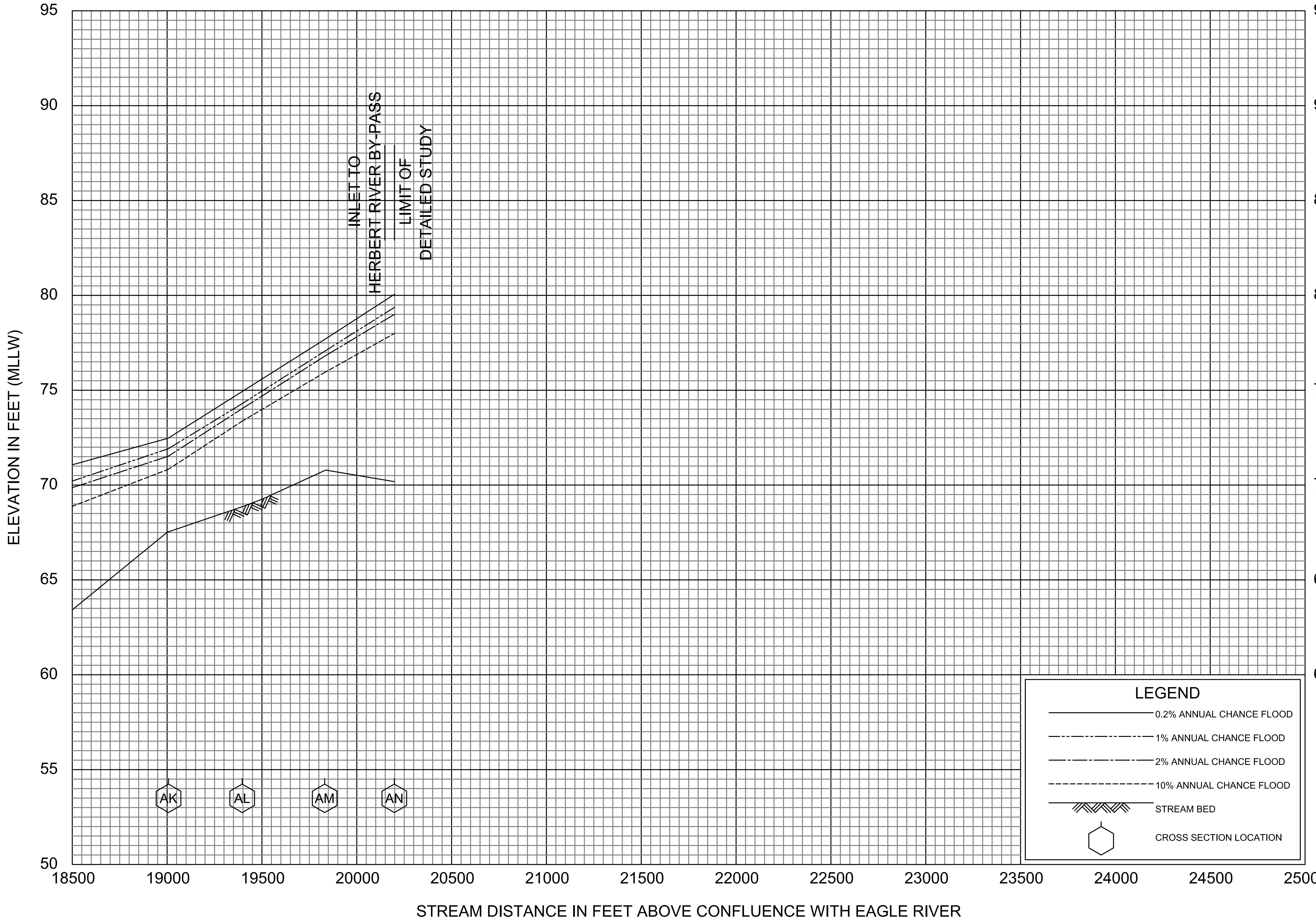


FLOOD PROFILES

HERBERT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

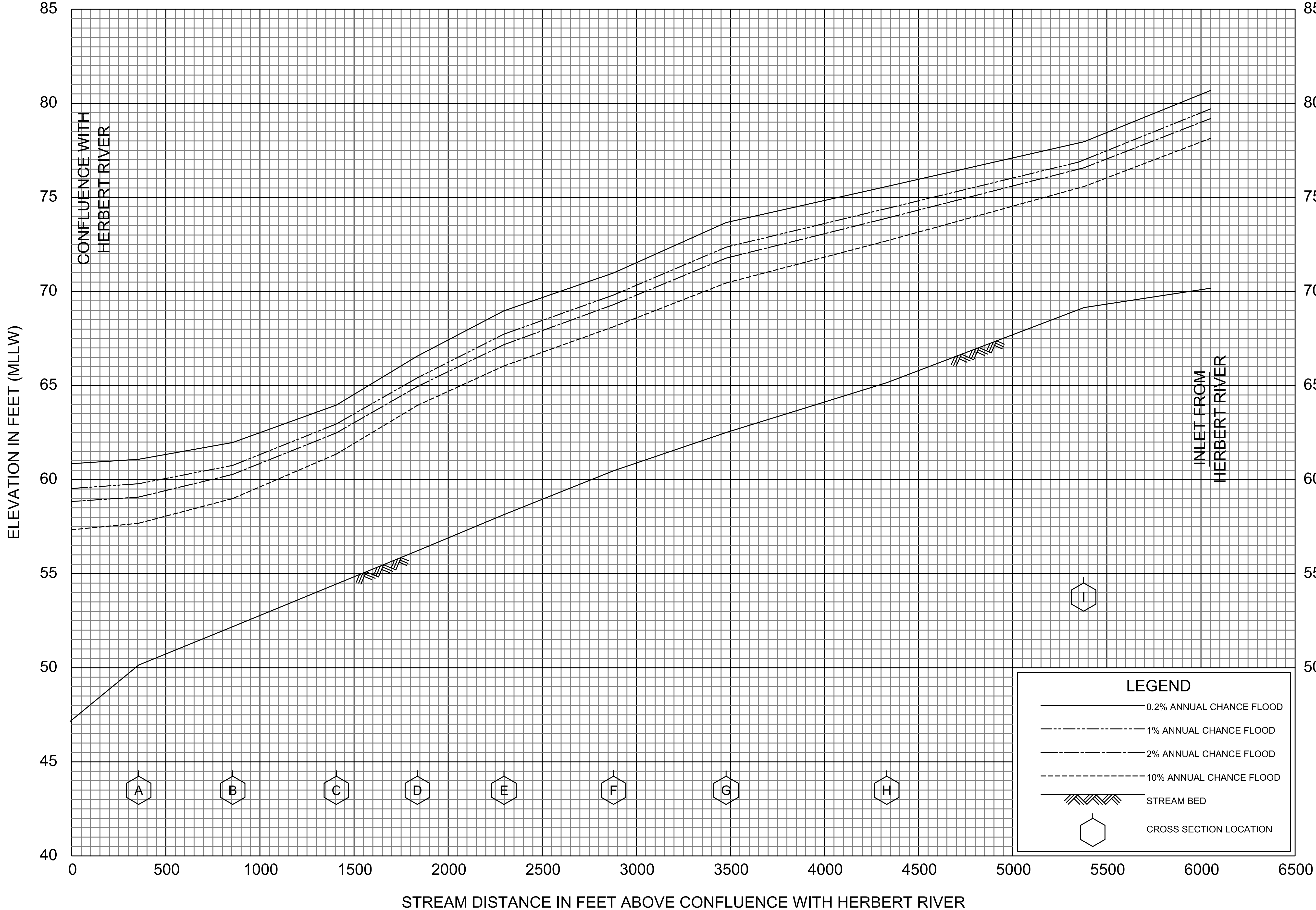


FLOOD PROFILES

HERBERT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK



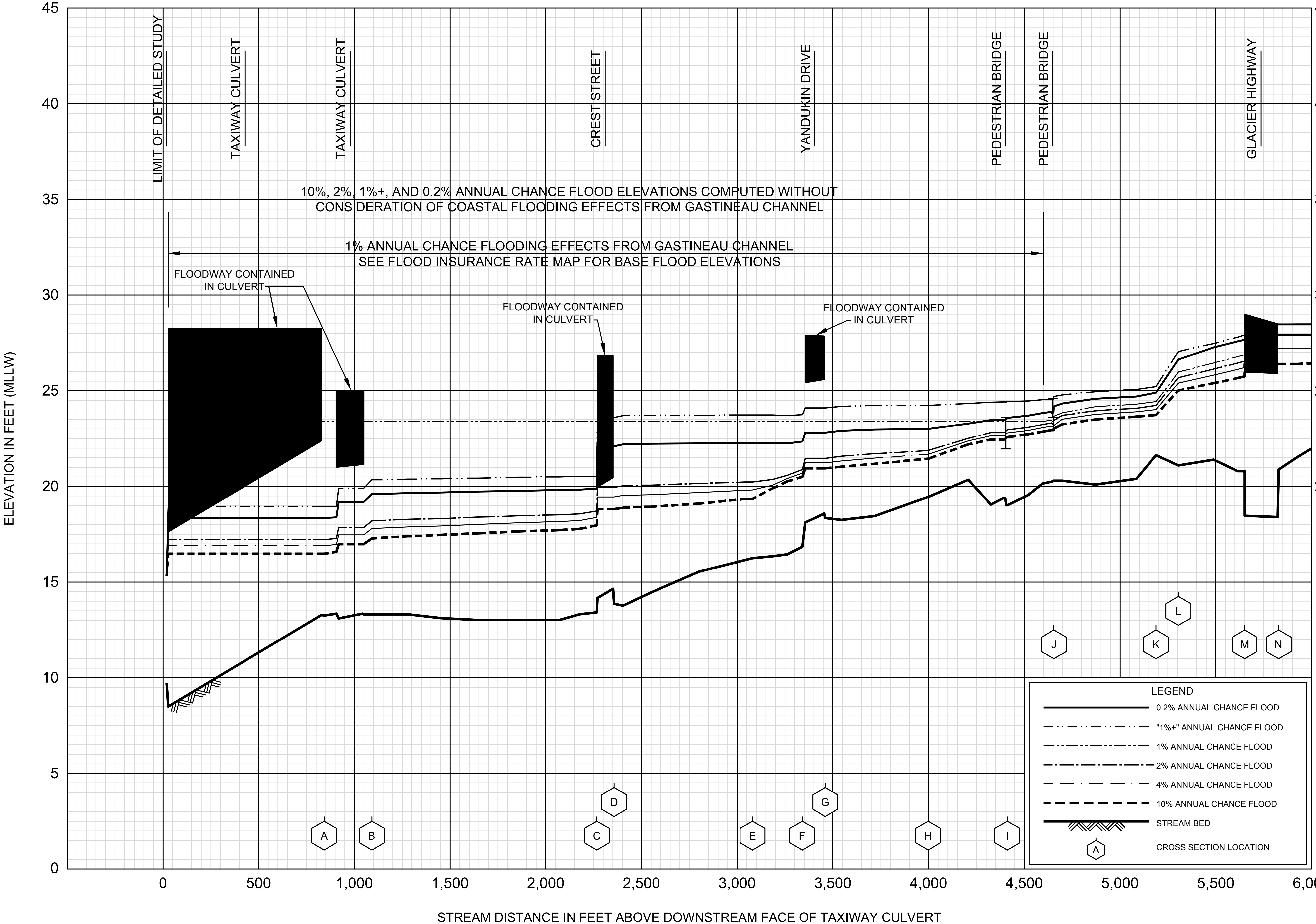
FLOOD PROFILES

HERBERT RIVER BY-PASS

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

14P

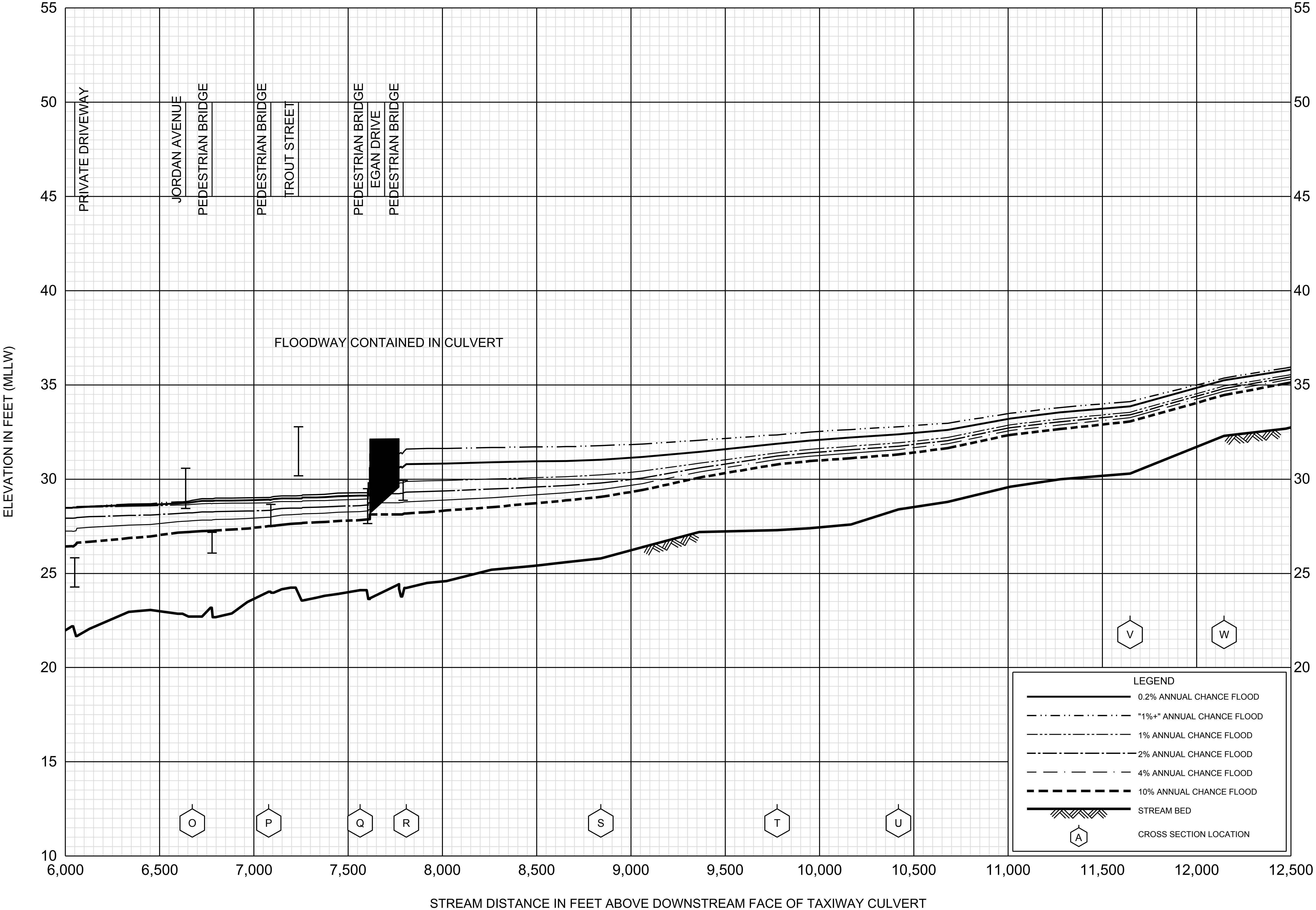


FLOOD PROFILES

JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK



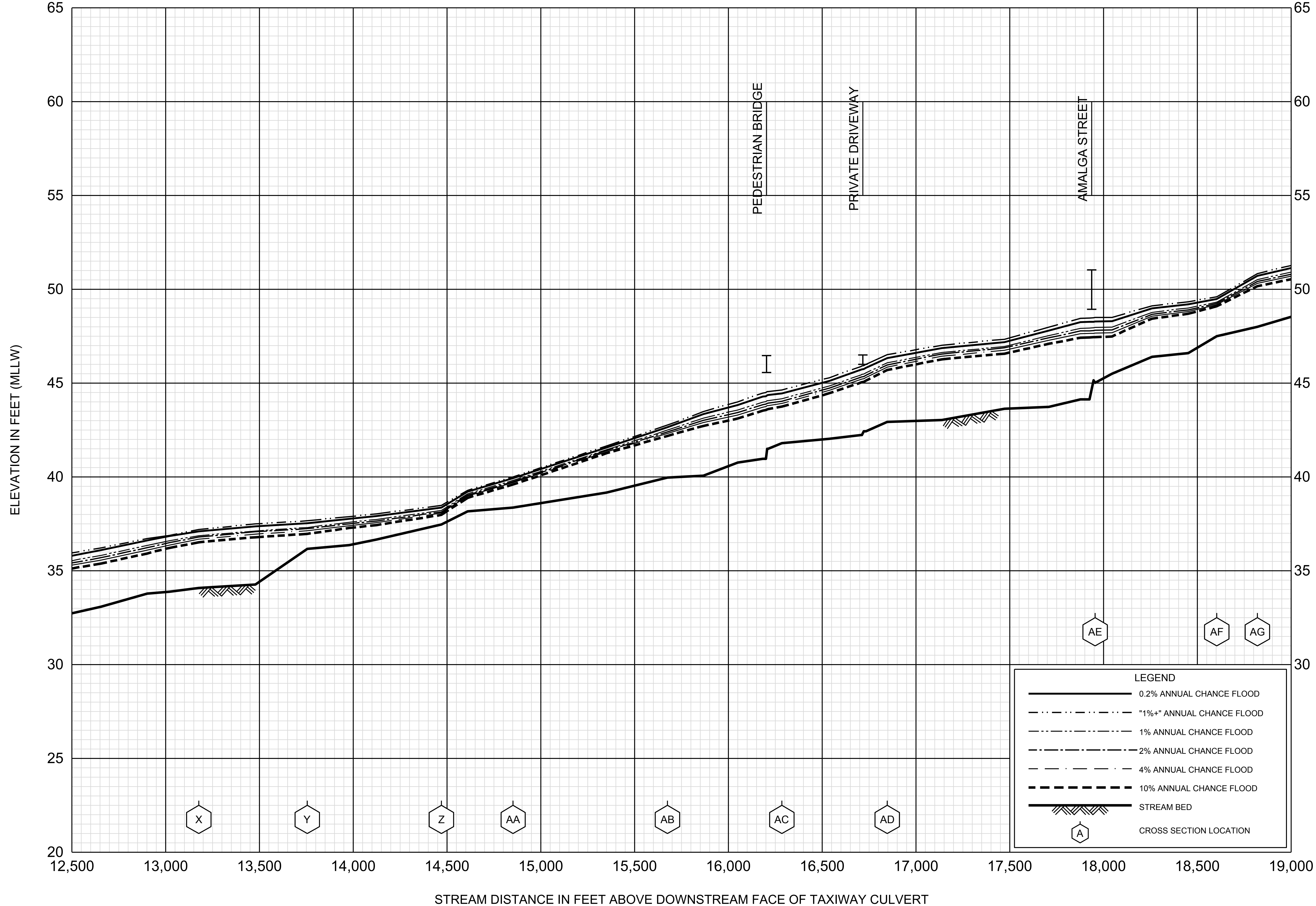
FLOOD PROFILES

JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

16P

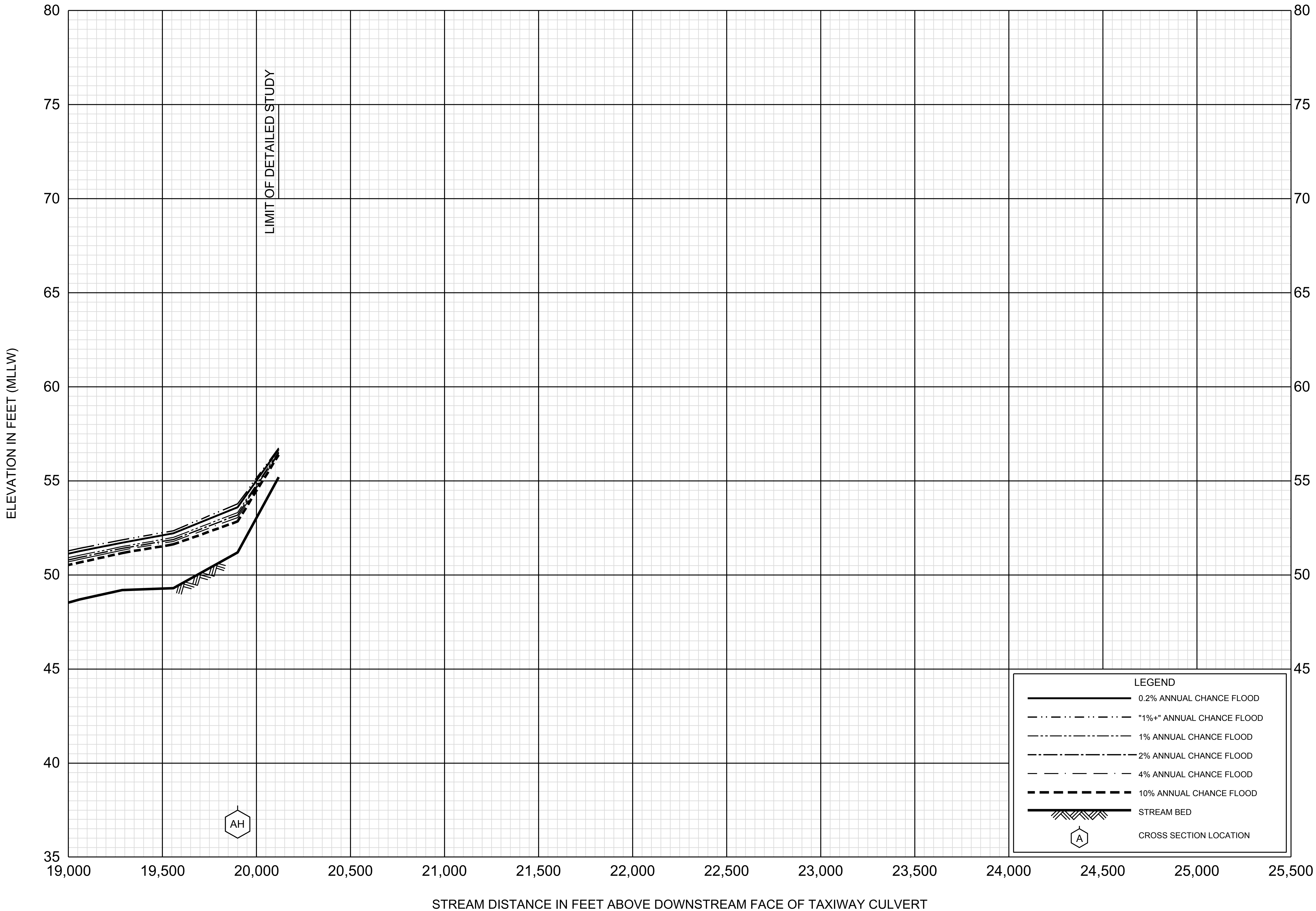


FLOOD PROFILES

JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

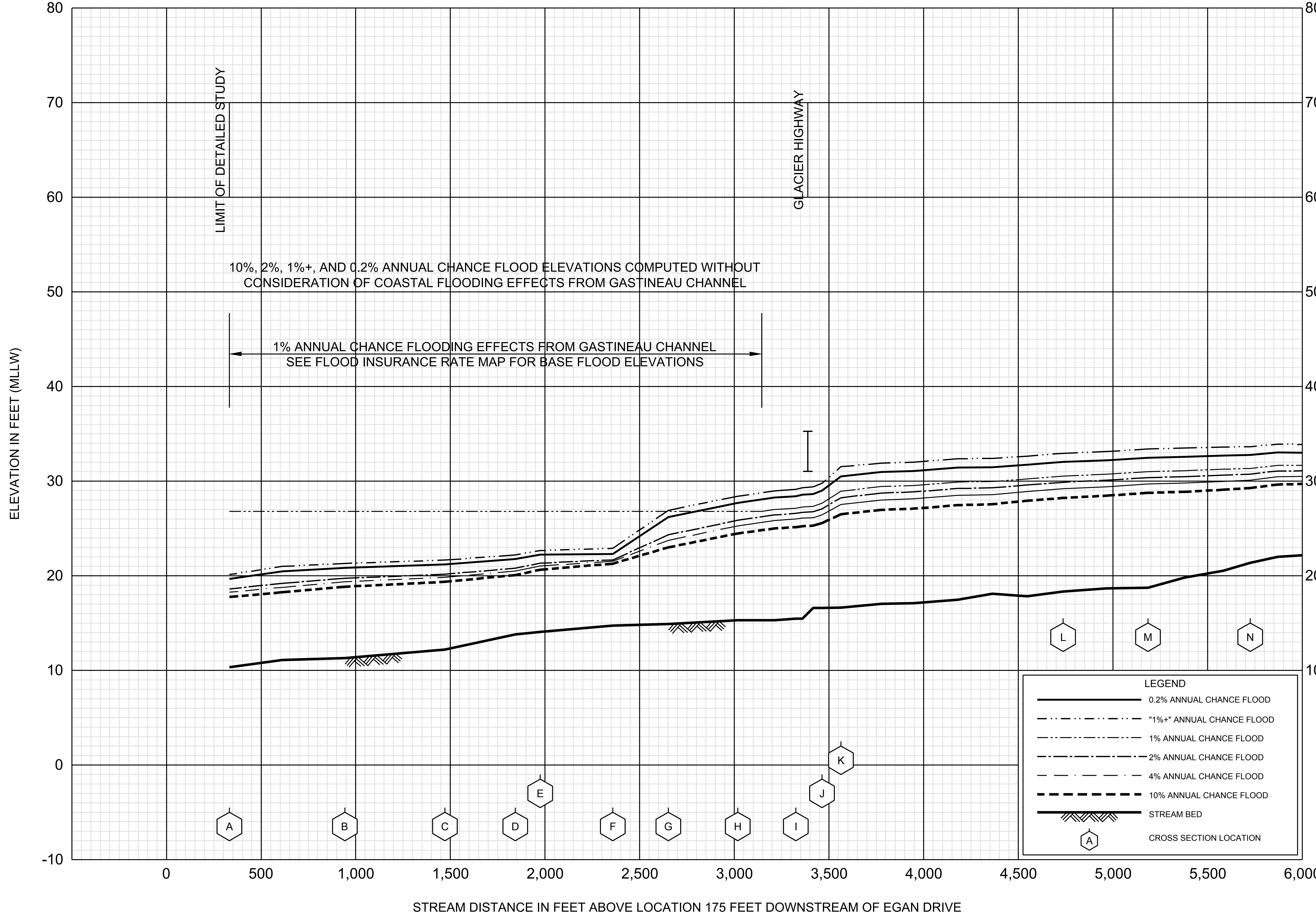


FLOOD PROFILES

JORDAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

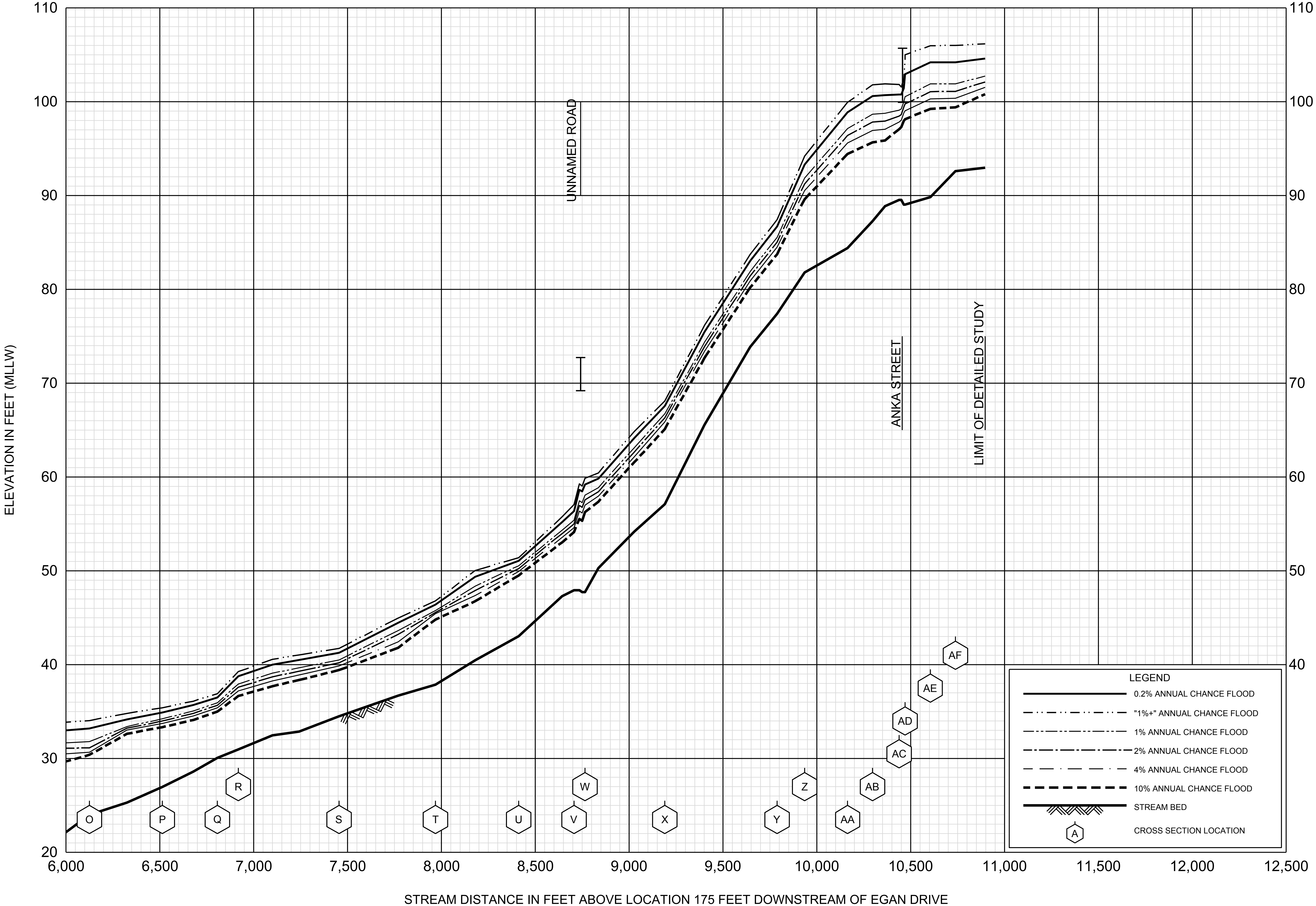


FLOOD PROFILES

LEMON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

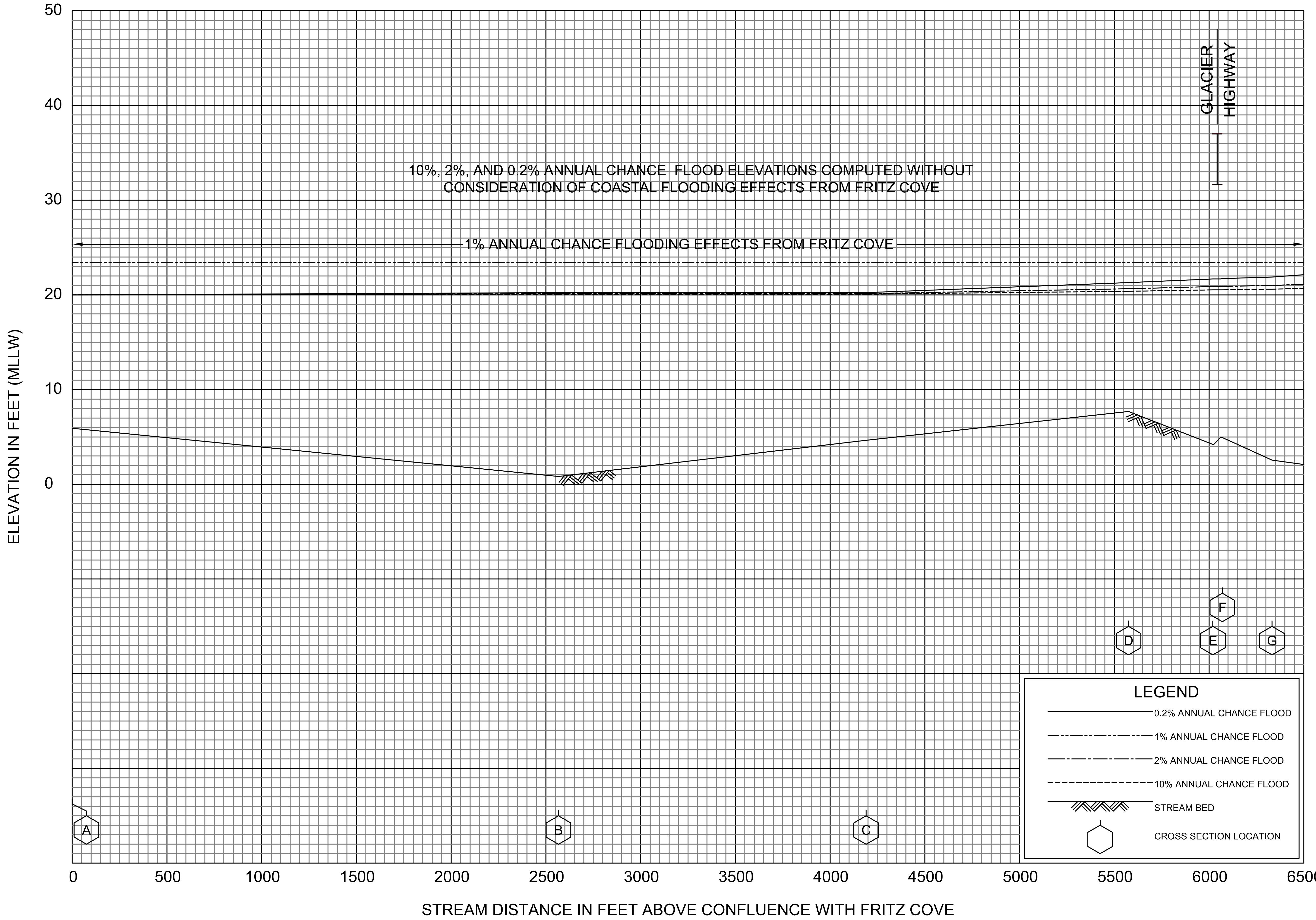


FLOOD PROFILES

LEMON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

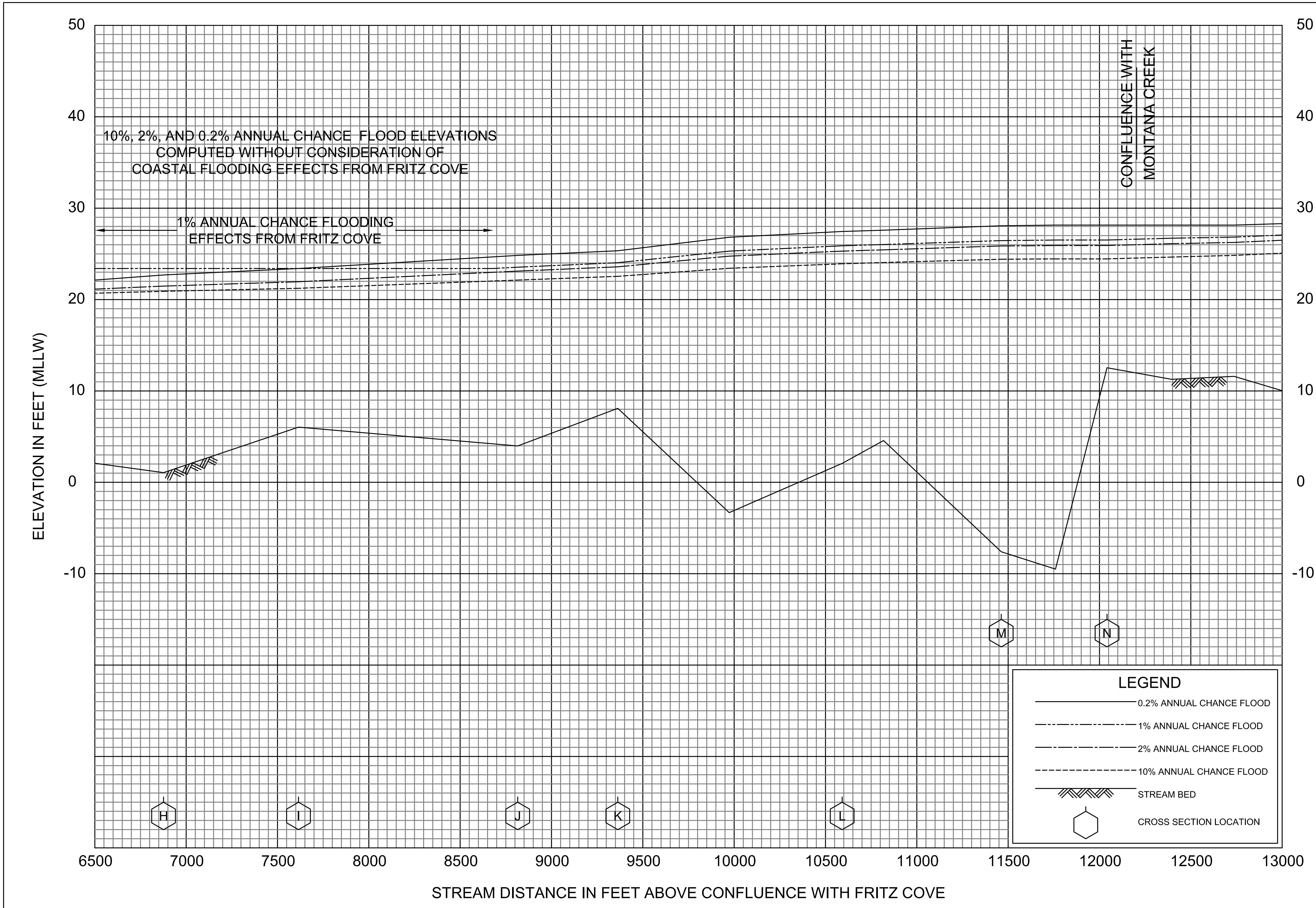


FLOOD PROFILES

MENDENHALL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK



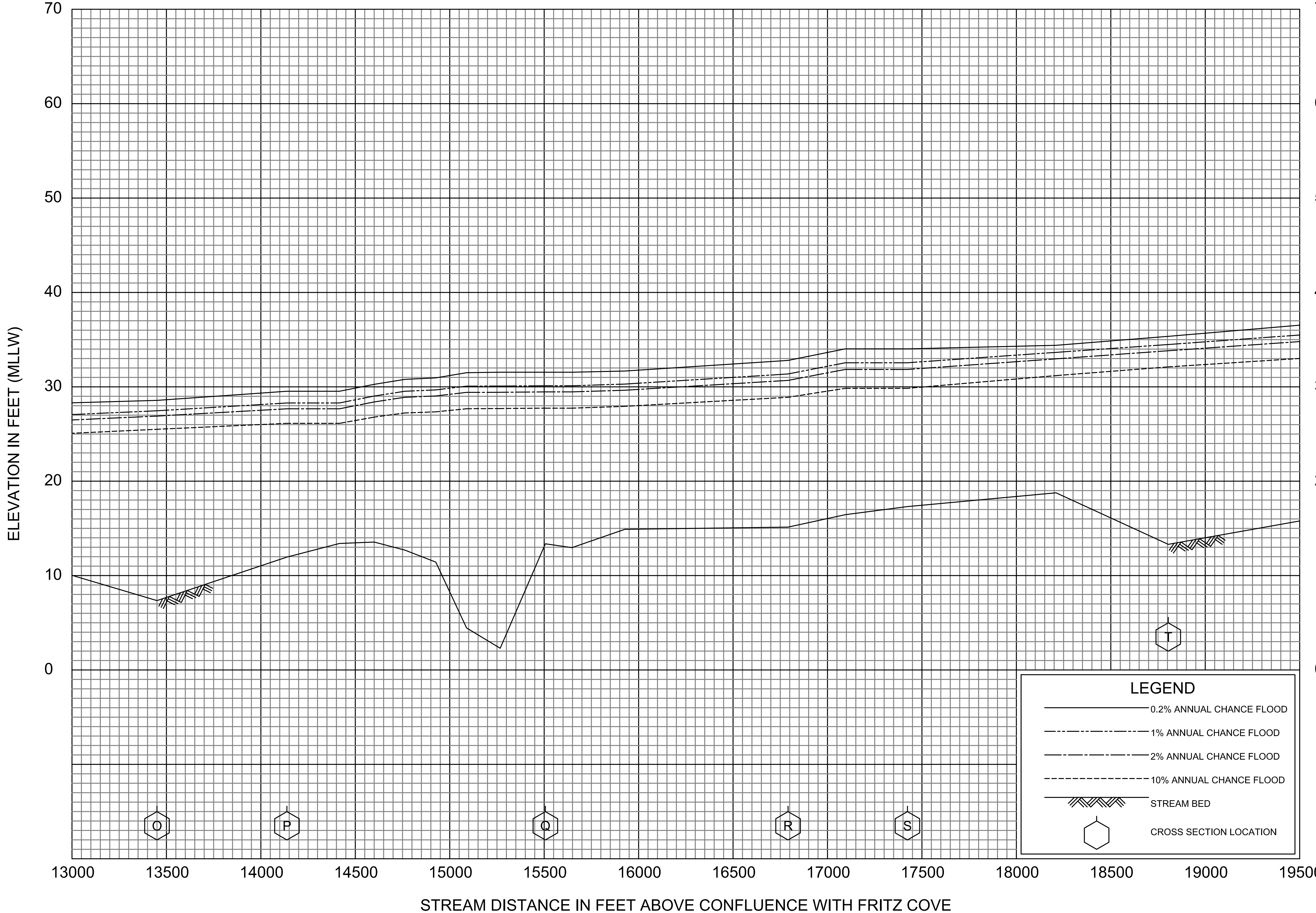
FLOOD PROFILES

MENDENHALL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

22P



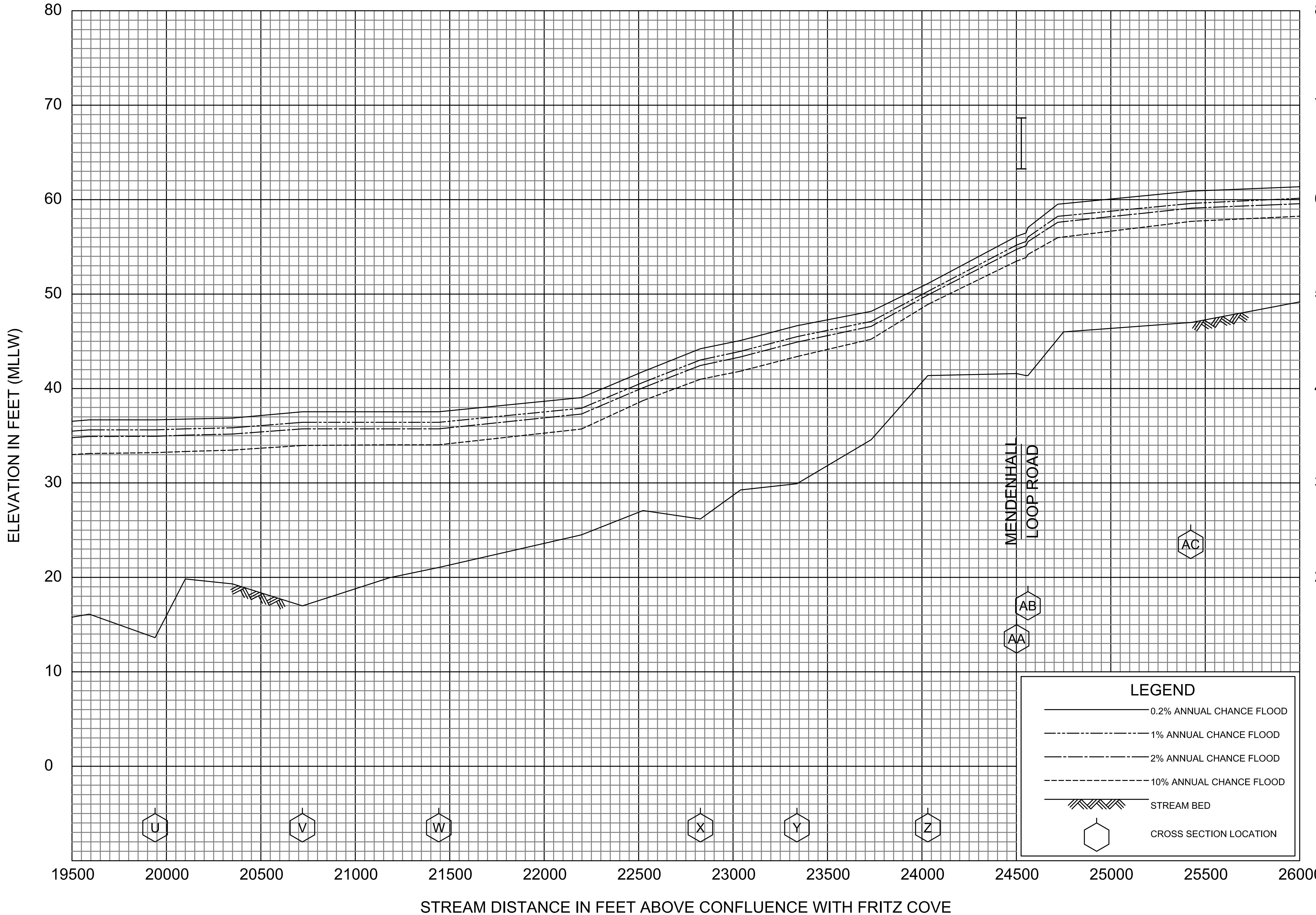
FLOOD PROFILES

MENDENHALL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

23P



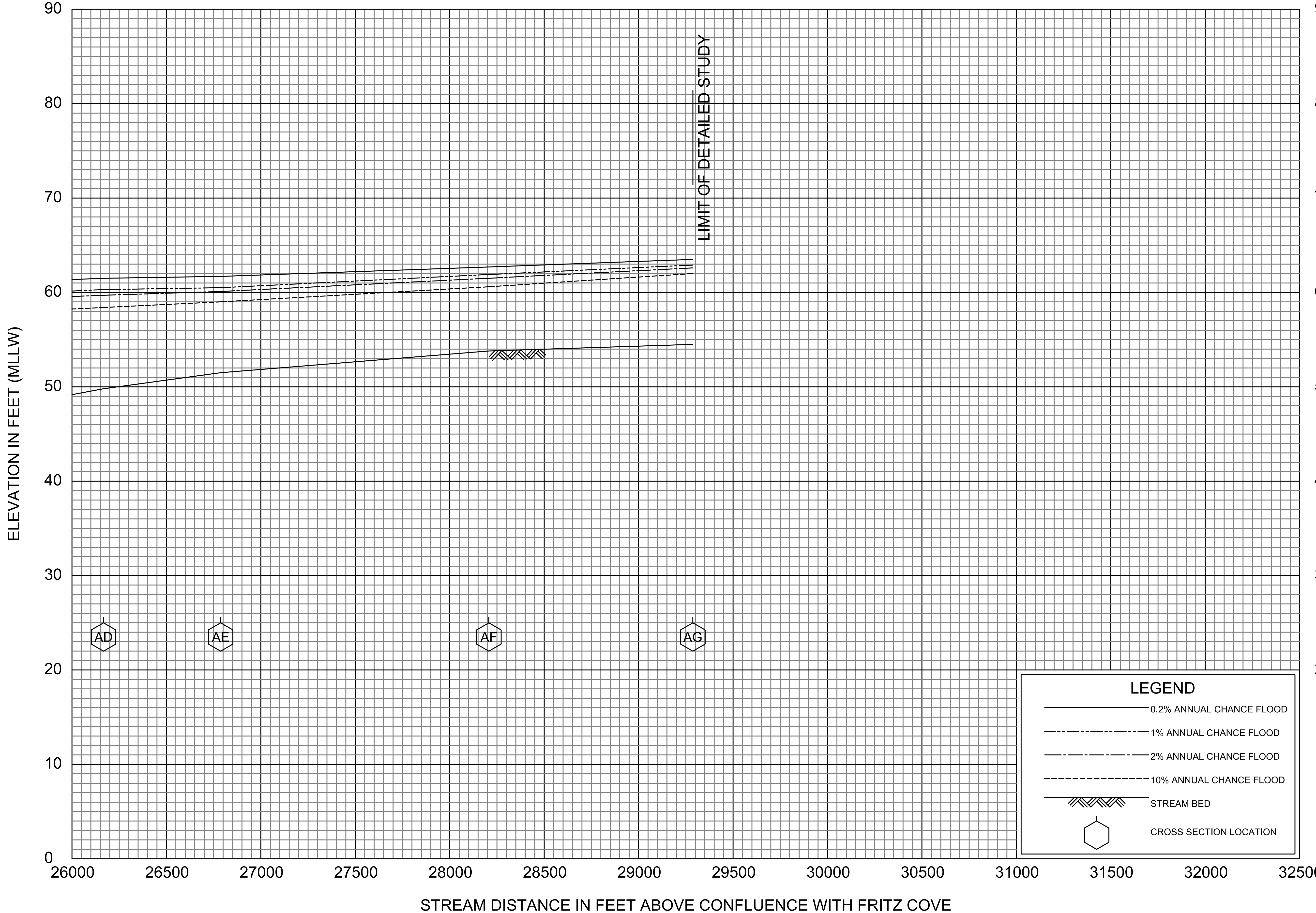
FLOOD PROFILES

MENDENHALL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

24P



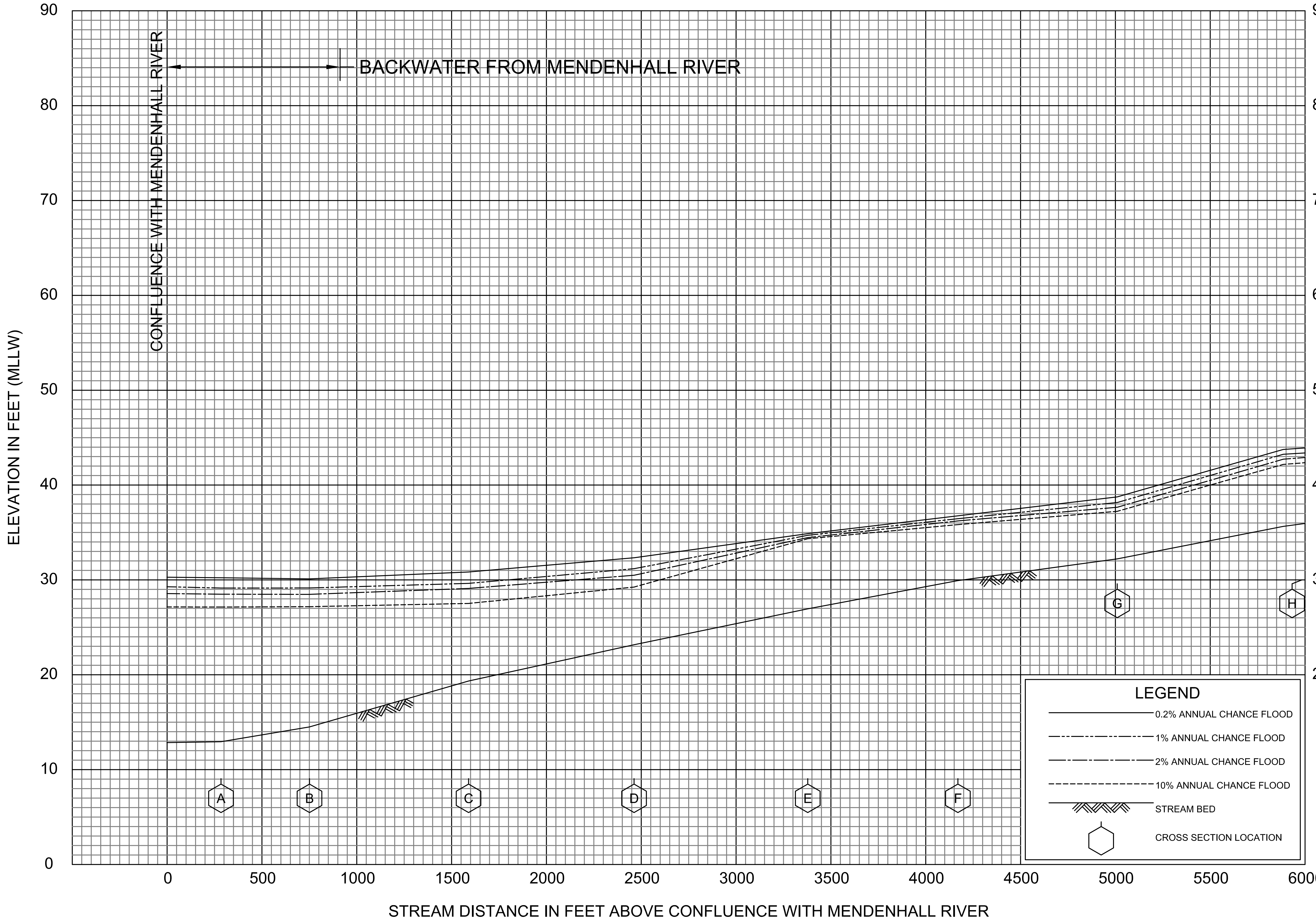
FLOOD PROFILES

MENDENHALL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

25P

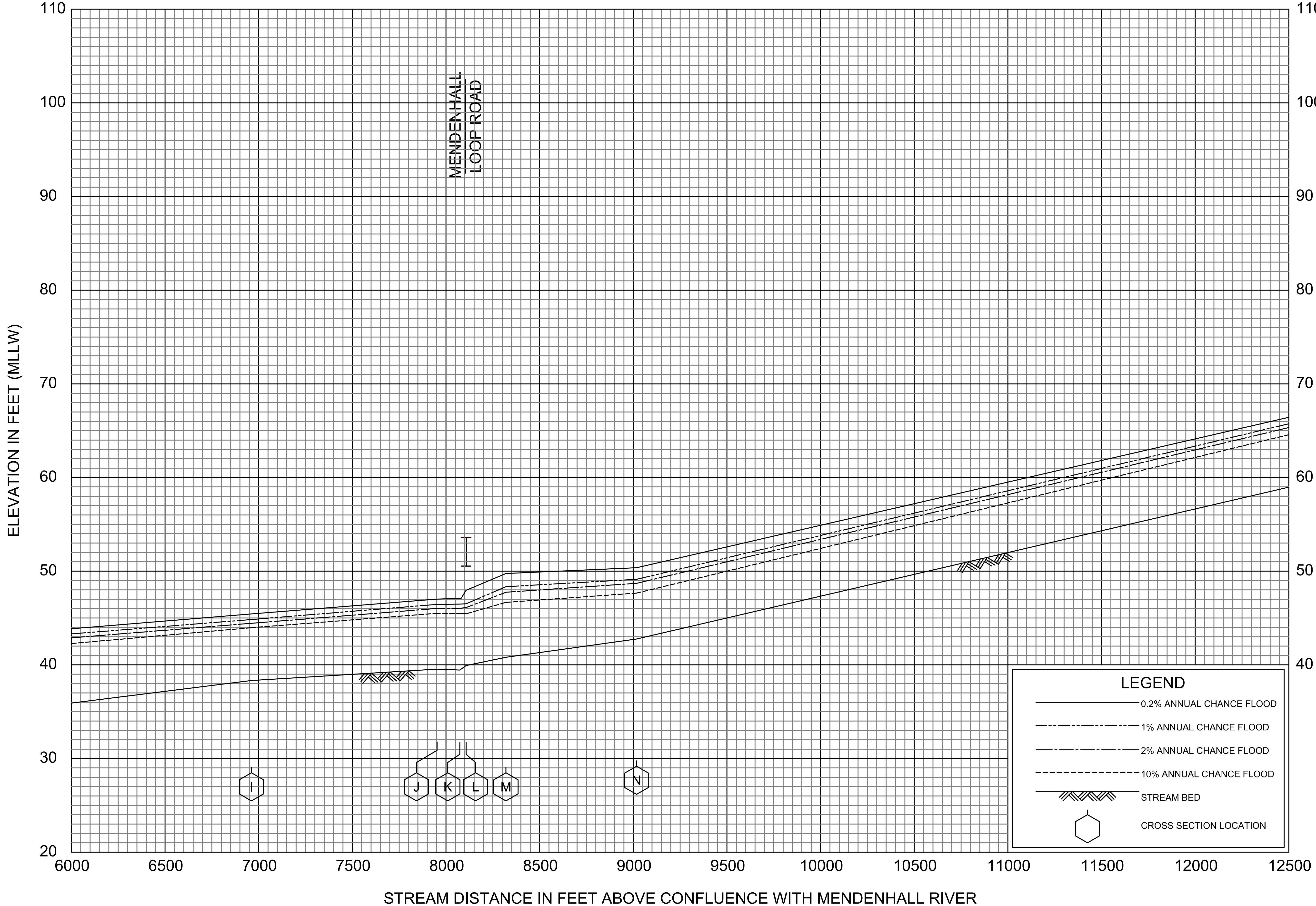


FLOOD PROFILES

MONTANA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

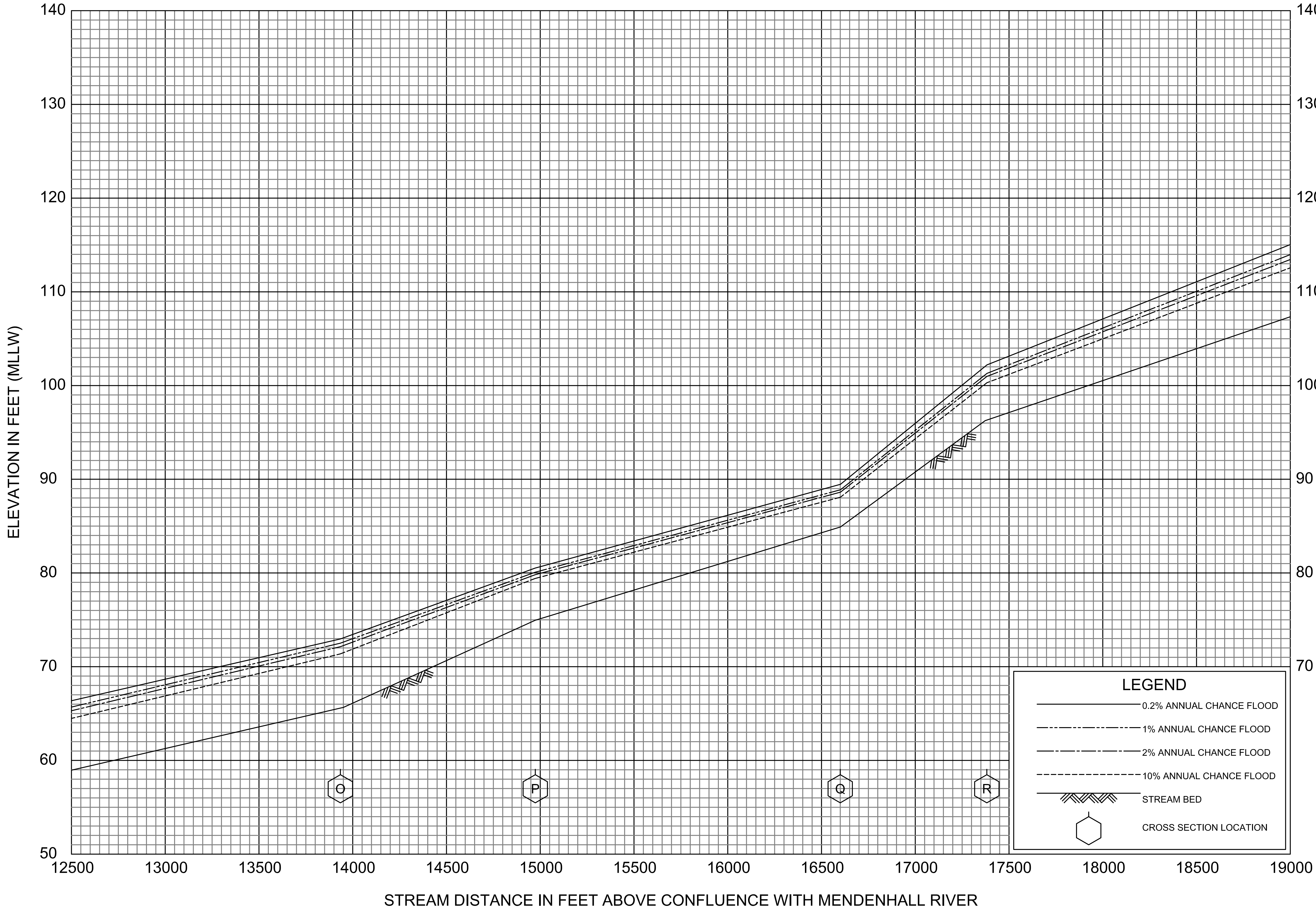


FLOOD PROFILES

MONTANA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

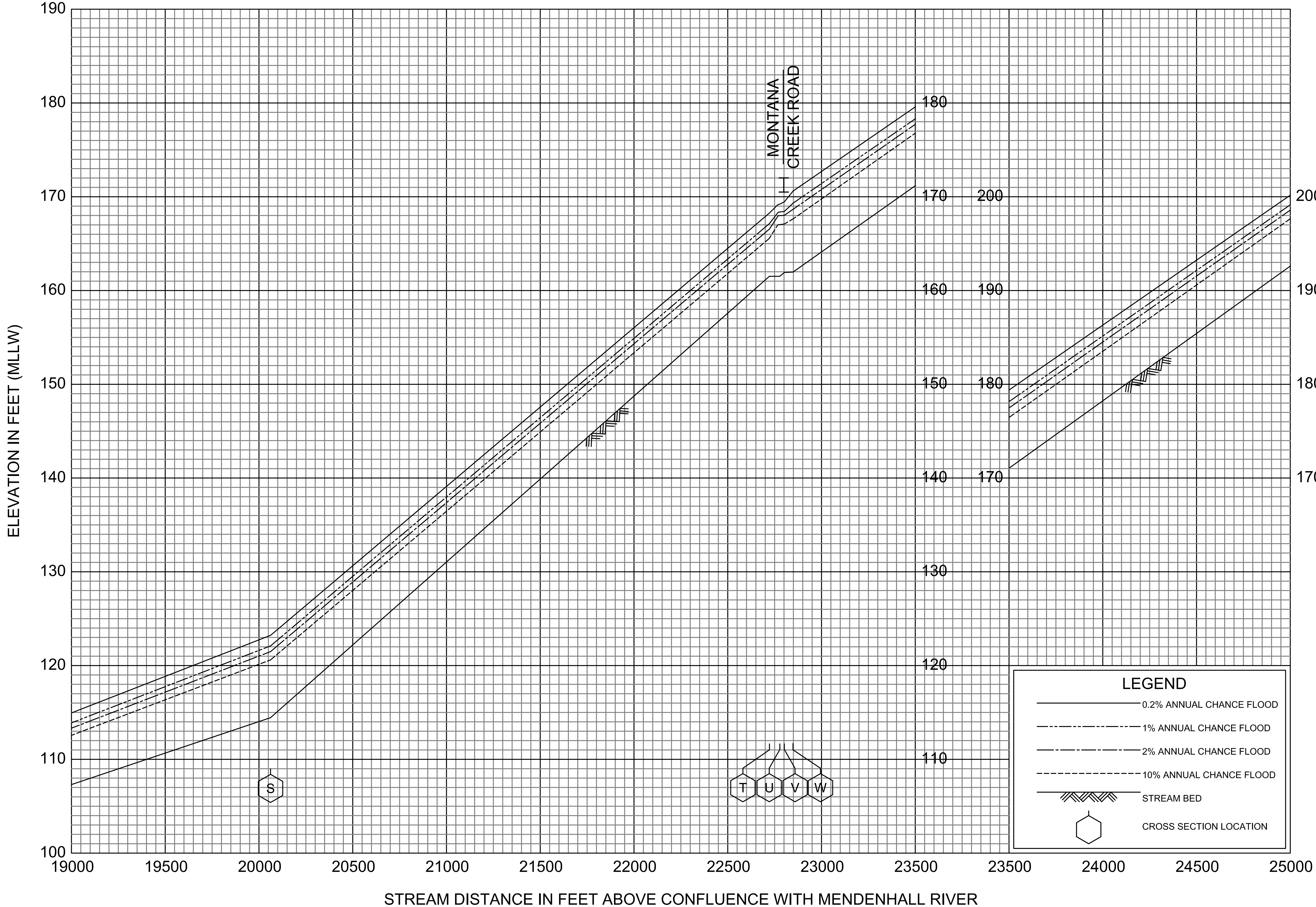


FLOOD PROFILES

MONTANA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

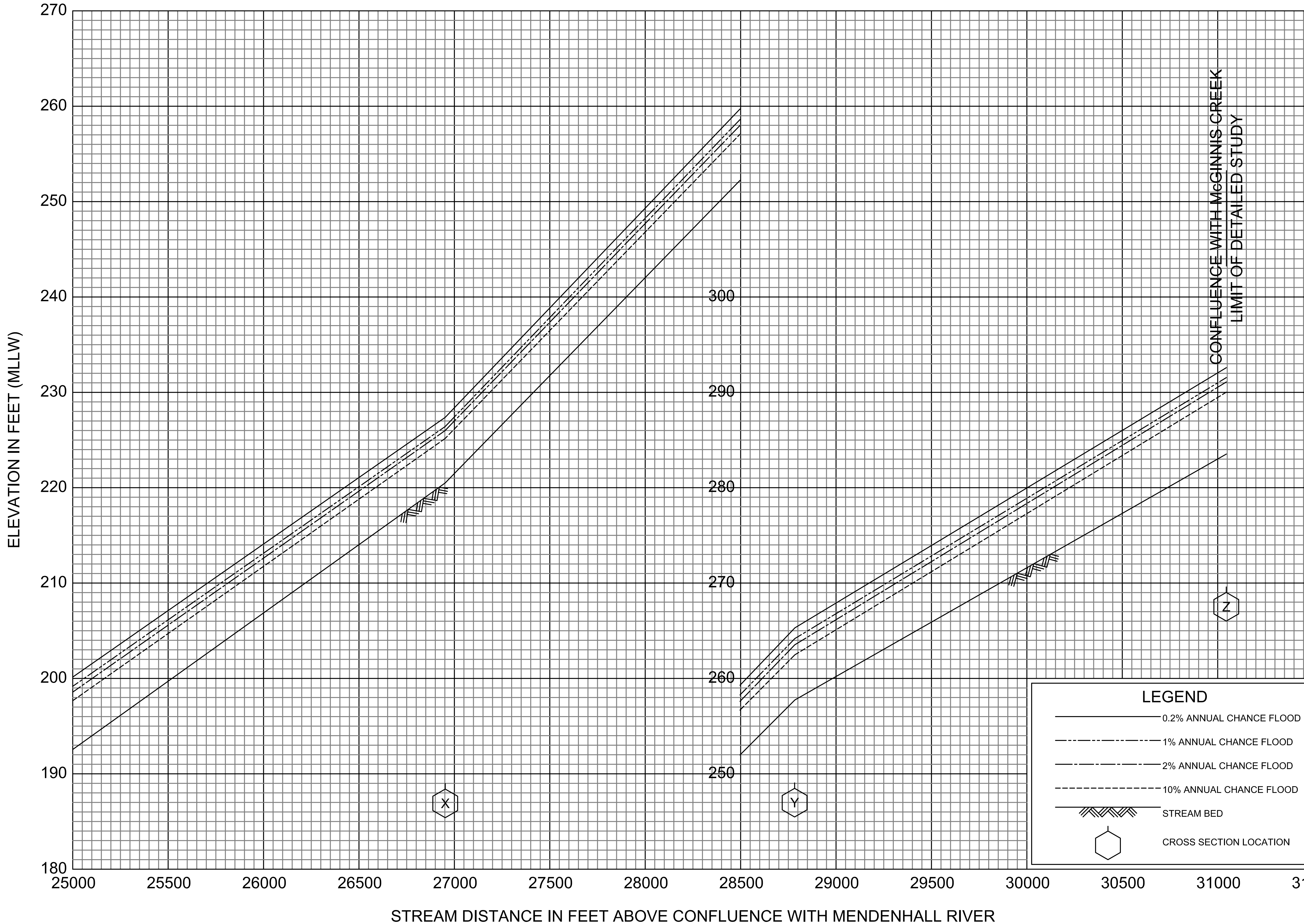


FLOOD PROFILES

MONTANA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

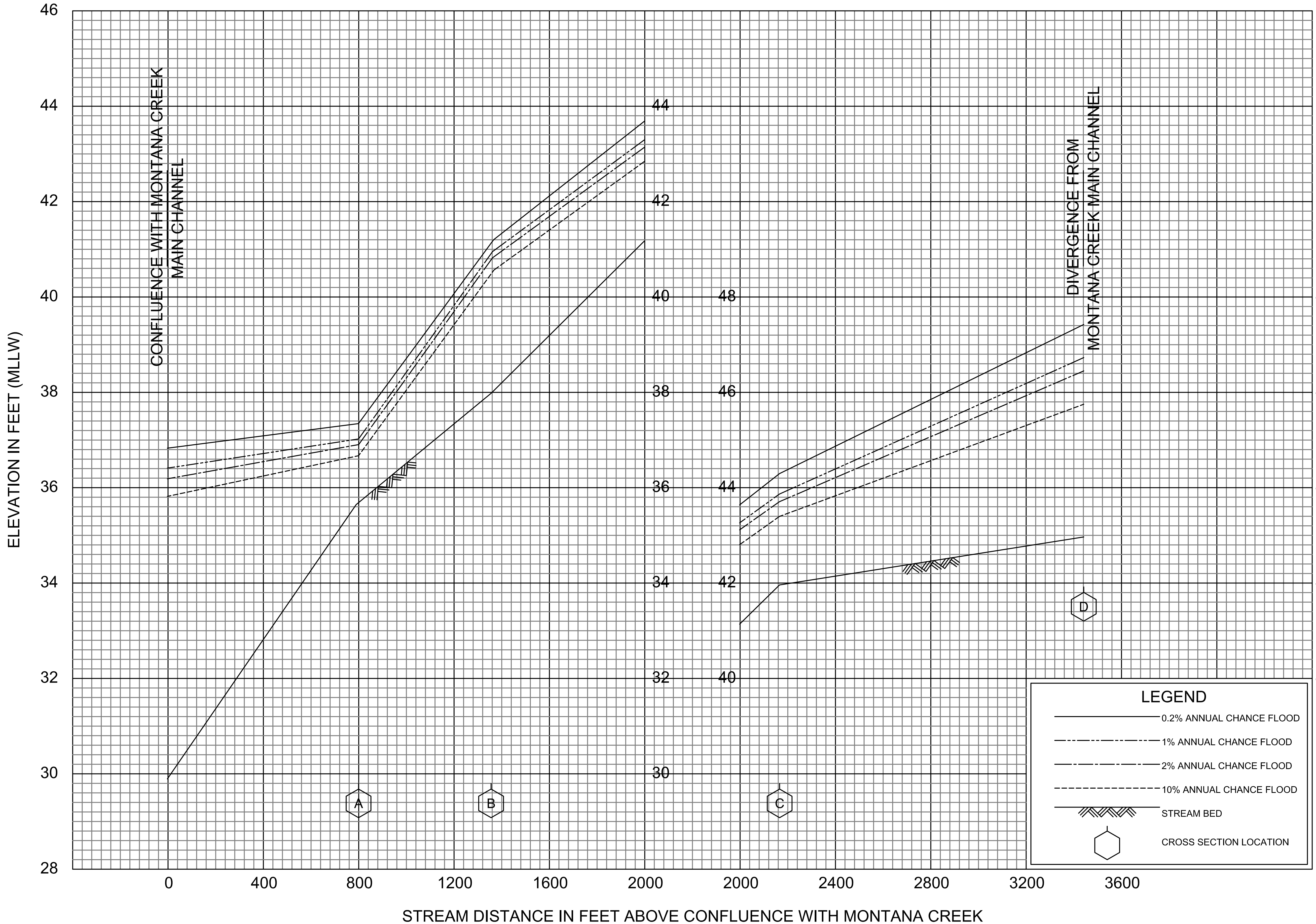


FLOOD PROFILES

MONTANA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

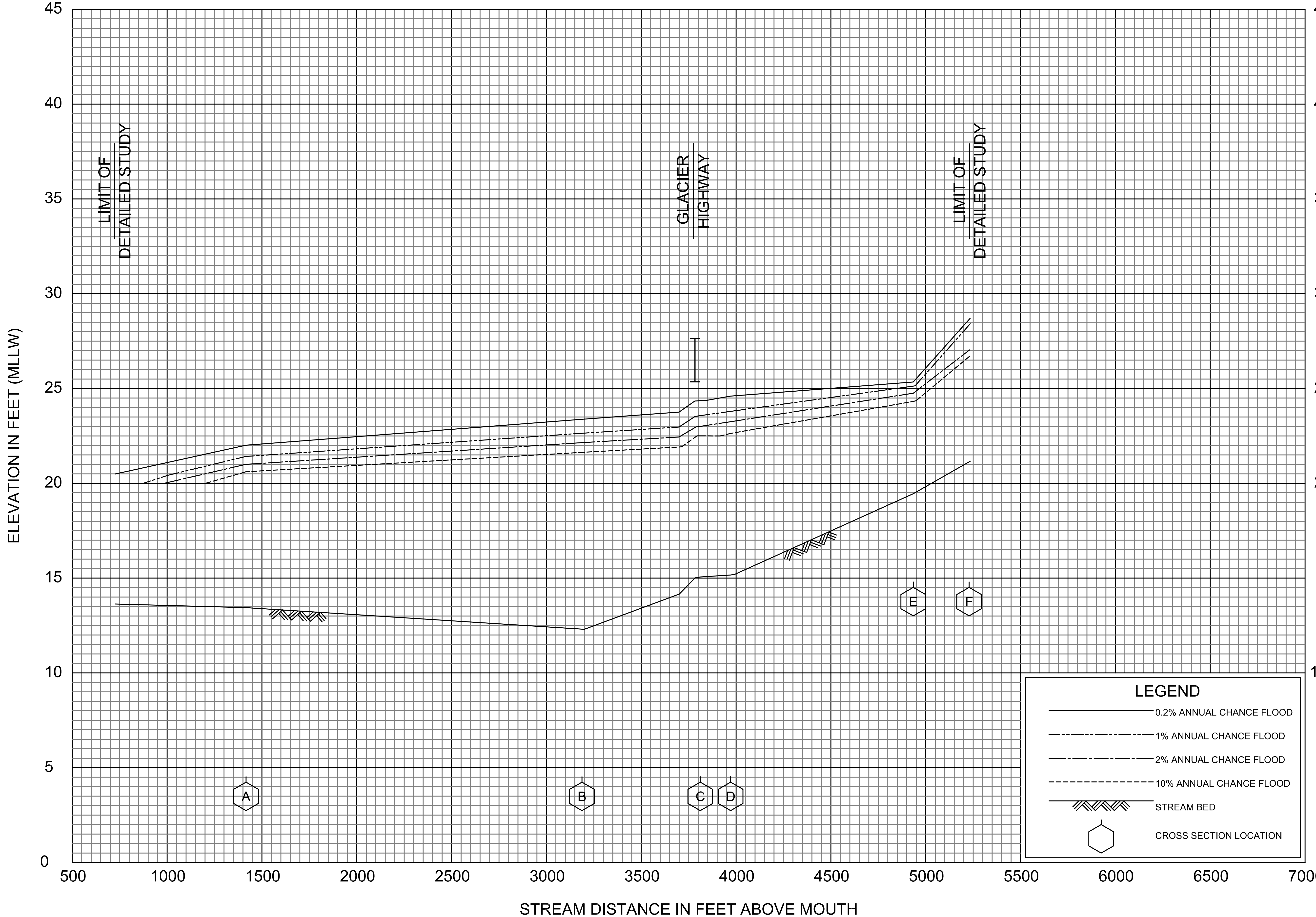


FLOOD PROFILES

MONTANA CREEK - OVERBANK FLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

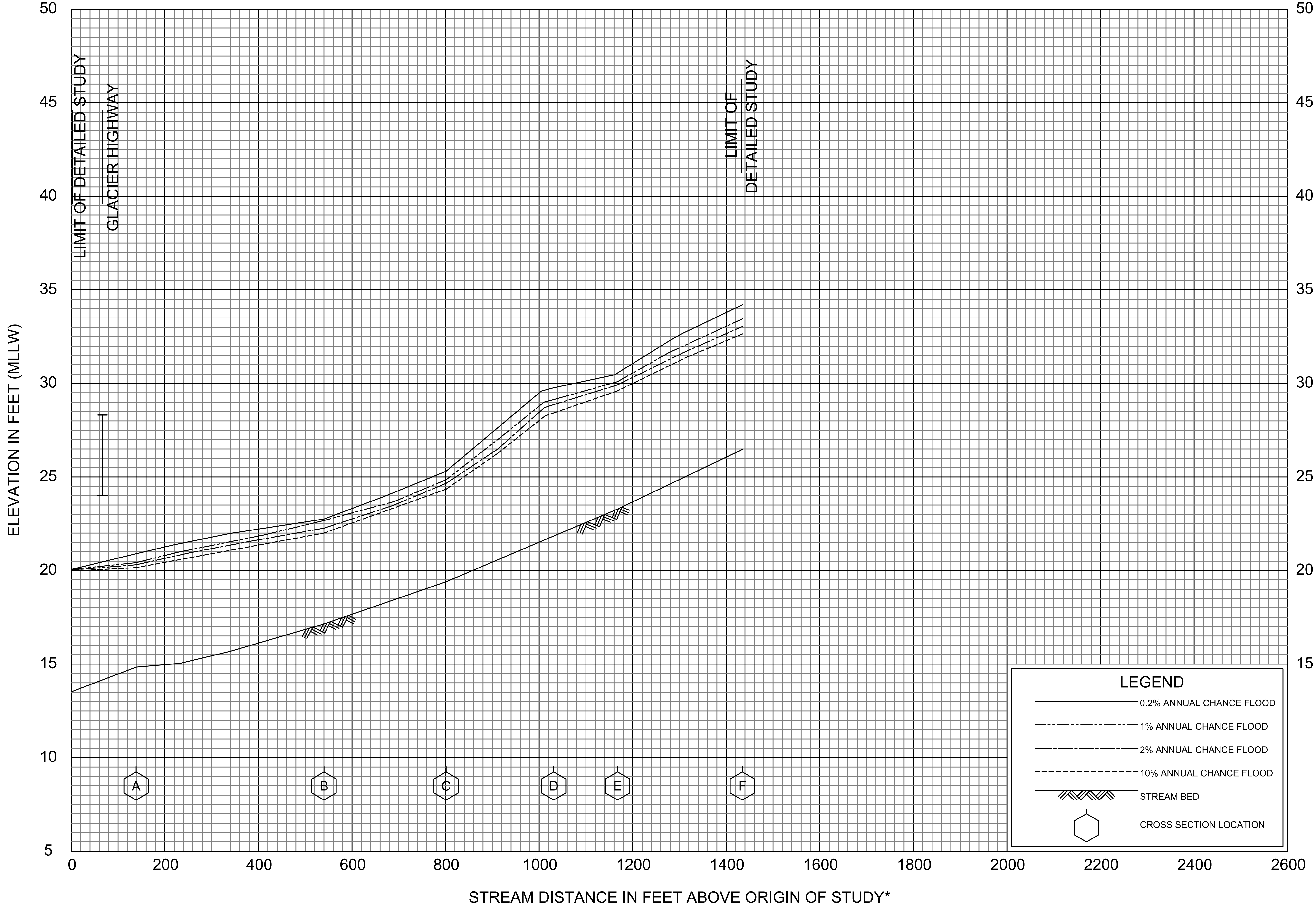


FLOOD PROFILES

PETERSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK



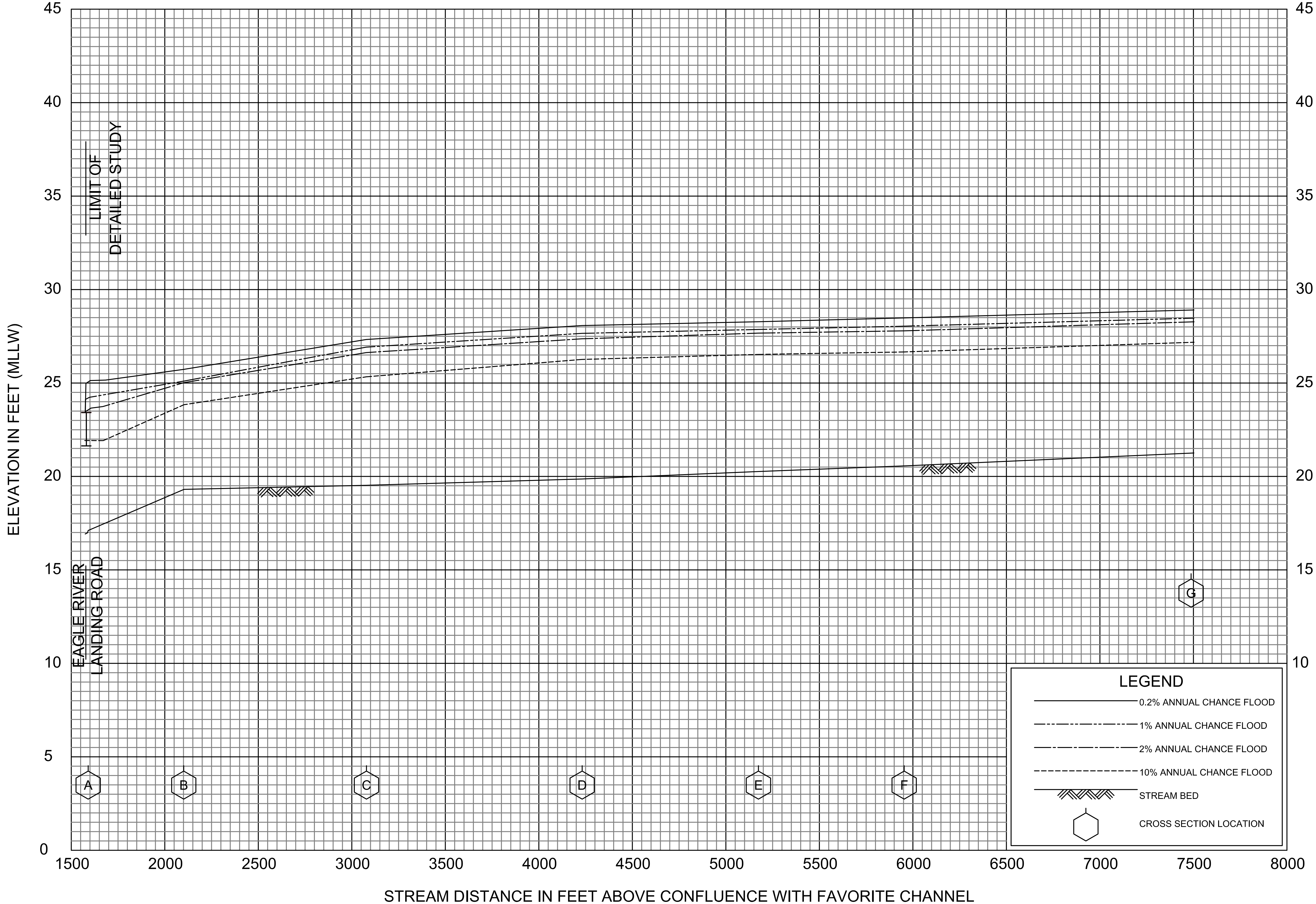
*ORIGIN OF STUDY IS LOCATED 70 FEET DOWNSTREAM OF GLACIER HIGHWAY

FLOOD PROFILES

SALMON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

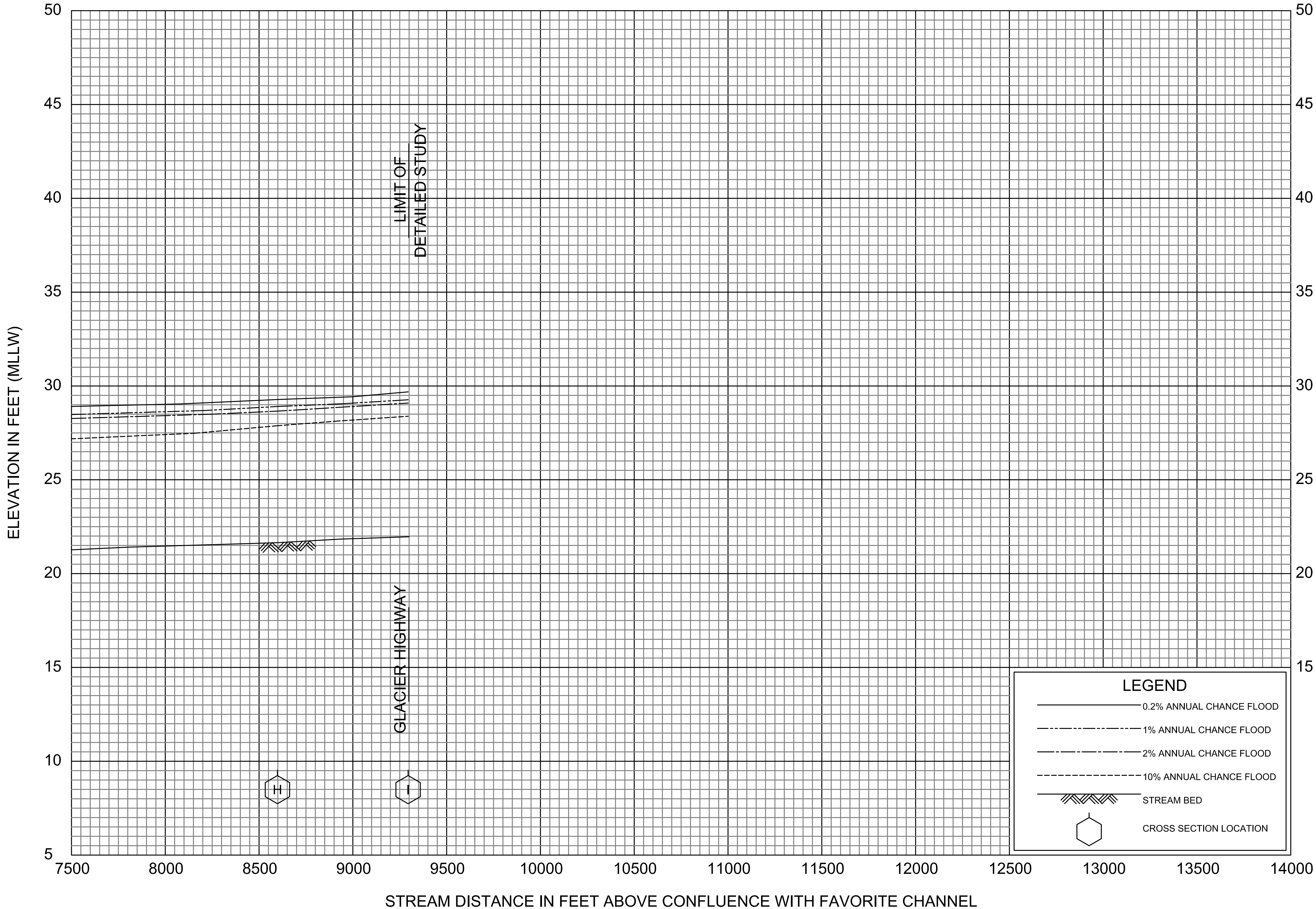


FLOOD PROFILES

TRIBUTARY TO FAVORITE CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

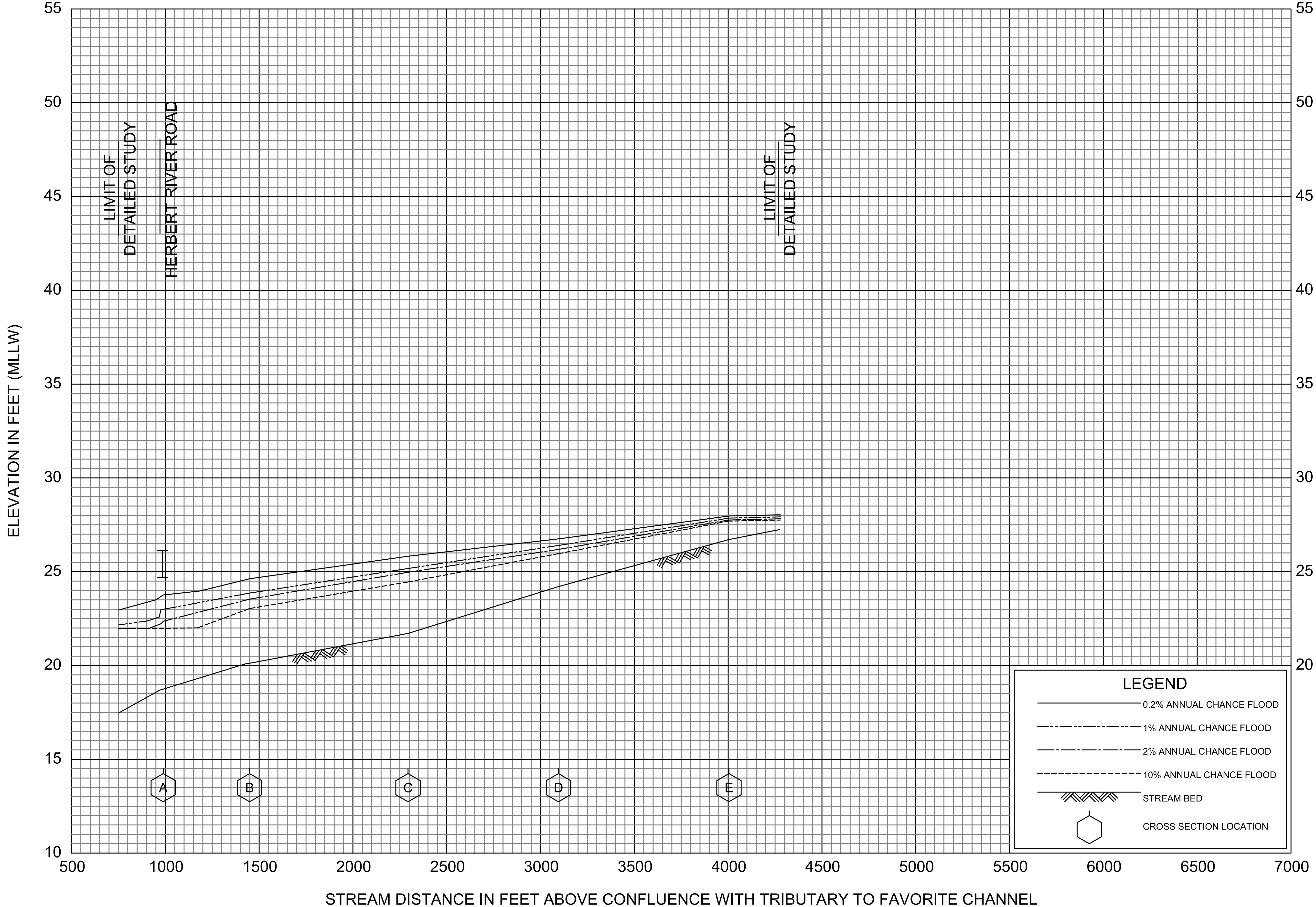


FLOOD PROFILES

TRIBUTARY TO FAVORITE CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK

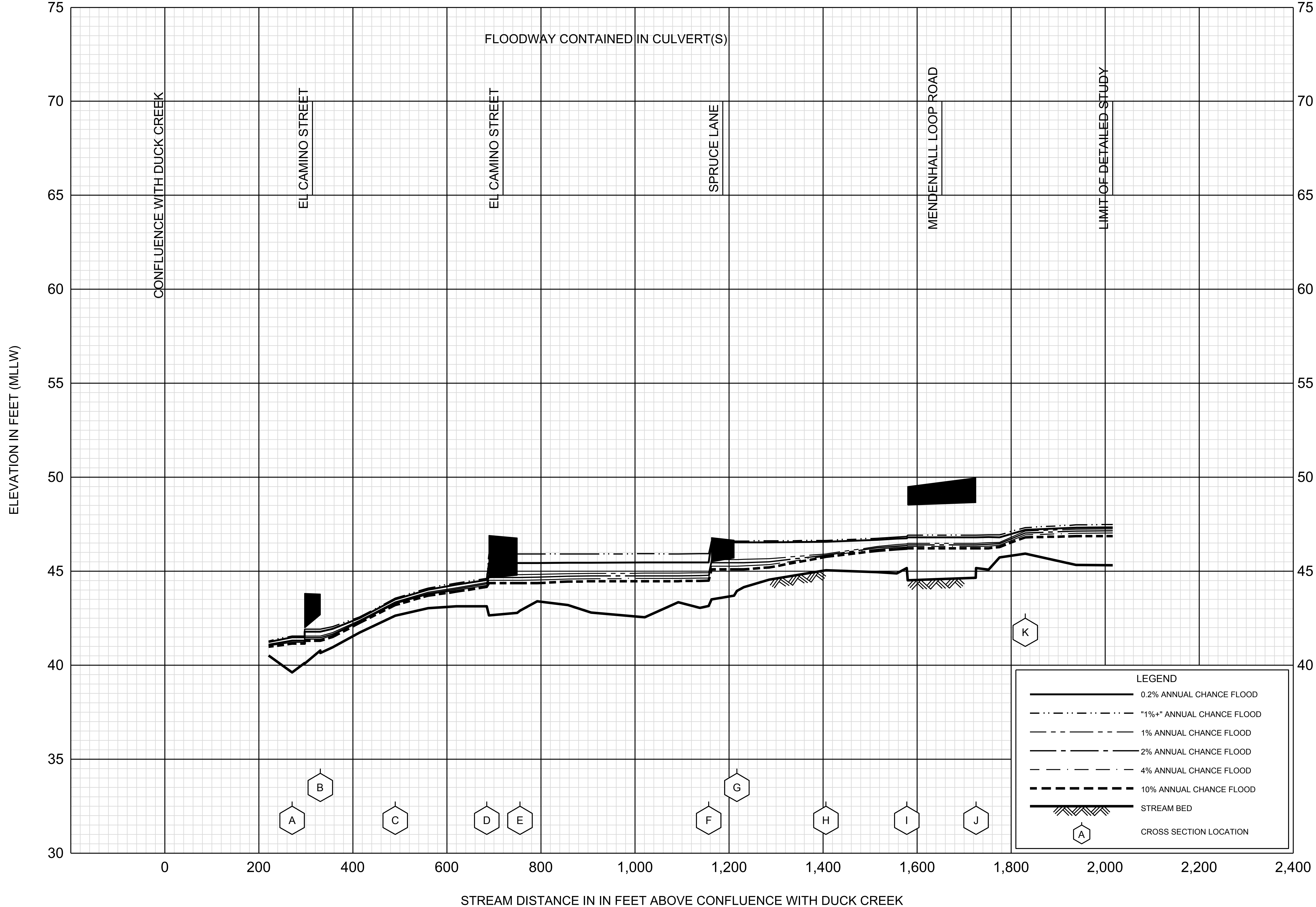


FLOOD PROFILES

TRIBUTARY TO FAVORITE CHANNEL BY-PASS

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK



FLOOD PROFILES

UNNAMED TRIBUTARY TO DUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY AND BOROUGH OF JUNEAU, AK