

<b>AP/AL:</b> Appropriation <b>Category:</b> Development <b>Location:</b> Seward <b>Impact House District:</b> Kenai Areawide (HD 29-31) <b>Estimated Project Dates:</b> 07/01/2016 - 06/30/2021	<b>Project Type:</b> Life / Health / Safety <b>Recipient:</b> City of Seward <b>House District:</b> Kenai Areawide (HD 29-31) <b>Contact:</b> Catherine Reardon <b>Contact Phone:</b> (907)465-2506
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**Brief Summary and Statement of Need:**

Over the past 110 years, there have been multiple attempts to build and maintain a diversion channel and tunnel in Seward, Alaska. The Army Corps of Engineers have historically had the biggest role in this effort. At issue is that the current tunnel is in need of significant repair, but is now considered inadequate to handle flood waters. So, during heavy rain, there is a significant flooding threat to the town. Rather than continuing to repair an inadequate system, the city and the Army Corps of Engineers are partnering to evaluate alternative ways to address the flood threat.

Funding:	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	Total
1004 Gen Fund	\$300,000						\$300,000
<b>Total:</b>	<b>\$300,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$300,000</b>

<input type="checkbox"/> State Match Required	<input checked="" type="checkbox"/> One-Time Project	<input type="checkbox"/> Phased - new	<input type="checkbox"/> Phased - underway	<input type="checkbox"/> On-Going
0% = Minimum State Match % Required		<input type="checkbox"/> Amendment	<input type="checkbox"/> Mental Health Bill	

**Operating & Maintenance Costs:**

	<u>Amount</u>	<u>Staff</u>
Project Development:	0	0
Ongoing Operating:	0	0
One-Time Startup:	0	0
<b>Totals:</b>	<b>0</b>	<b>0</b>

**Prior Funding History / Additional Information:**

No prior funding history.

**Project Description/Justification:**

The federal process requires a scoping effort, followed by a feasibility study, then design and construction. Funding from this project will be used to conduct the scoping and feasibility study and other pre-construction requirements. These funds will assist the City of Seward in meeting the match requirements of the Army Corps of Engineers.



# DAM SAFETY

## Lowell Creek Dam



**James Hunt**  
Seward City Manager

**COL Reinhard Koenig, PE**  
Commander, USACE Alaska District

**David J. Frenier, PE**  
Chief, Engineering Division  
Dam Safety Officer  
USACE Alaska District

***April 25, 2012***  
***Seward, Alaska***





# Agenda



- City of Seward's Welcome & Introductions
  - James Hunt, City Manager of Seward
- History of Lowell Creek
  - City of Seward
- Corps Welcome & Introductions
  - COL Reinhard Koenig, PE, U.S. Army Corps of Engineers, Alaska District Commander
- Dam Safety at Lowell Creek Dam
  - David Frenier, PE, U.S. Army Corps of Engineers, Chief of the Engineering Division and Dam Safety Officer for the Alaska District
- Closing Remarks
  - City of Seward
  - U.S. Army Corps of Engineers
- Questions & Answers



# Welcome



- Cities Welcome Message



# City of Seward Representatives



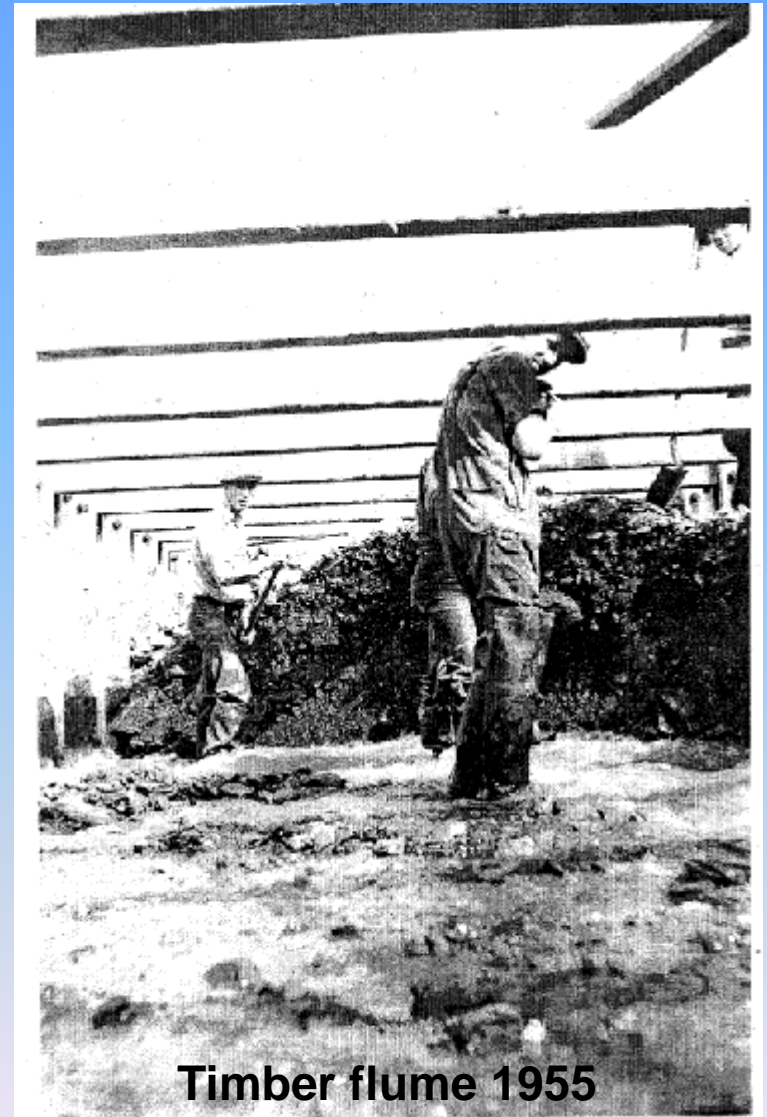
- James Hunt, City Manager
- Dave Seaward, Mayor
- Ron Long, Assistant City Manager
- William Casey, Public Works Director



# Historical Timeline



- 1917: Flooding from Lowell Creek washed away the school house and destroyed or damaged a number of homes
- 1926-27: Timber flume construction routed flow through city down Jefferson Street)
- 1935: Flume fails because of debris (estimated 10,000 cubic yards) causing major damage to the power plant and railroad facilities
- 1937: Federal Flood Control Act provided authorization and funding for a diversion dam and concrete lined tunnel through Bear Mountain
- 1939-41: Construction of the diversion dam and tunnel. Project turned over to the City of Seward



**Timber flume 1955**





# Historical Timeline



- 1964: Magnitude 9.2 earthquake of 1964 did not cause major damage to project
- 1978: First periodic inspection conducted by USACE under authority of National Dam Inspection Act
- Several instances of emergency authorization repairs & one time Congressional authorization
- 2007: Water Resources and Development Act gave USACE long term maintenance responsibility of the Lowell Creek Tunnel (excludes the Dam)
- 2010: Second periodic inspection conducted by USACE in October.



Tunnel inlet – during construction



# Federal-Local Partnerships



- **City of Seward**
  - Responsible for the operation, maintenance, repair, replacement and rehabilitation of the diversion dam.
  - Responsible for the day to day maintenance of the system.
  - Issues inundation maps to public.
  - Oversees notification and evacuation of public.
  - Provides emergency management services.
  - Coordinates emergency response.
- **U.S. Army Corps of Engineers**
  - Assumed long term maintenance and major repair responsibility for the concrete lined tunnel (and inlet and outlet structures) until completion of construction of an alternative method of flood diversion or until 8 Nov 2022 whichever is earlier.
  - Provided inundation mapping to the City of Seward.
  - Provided one-time periodic inspection of dam and recurring inspections of tunnel.





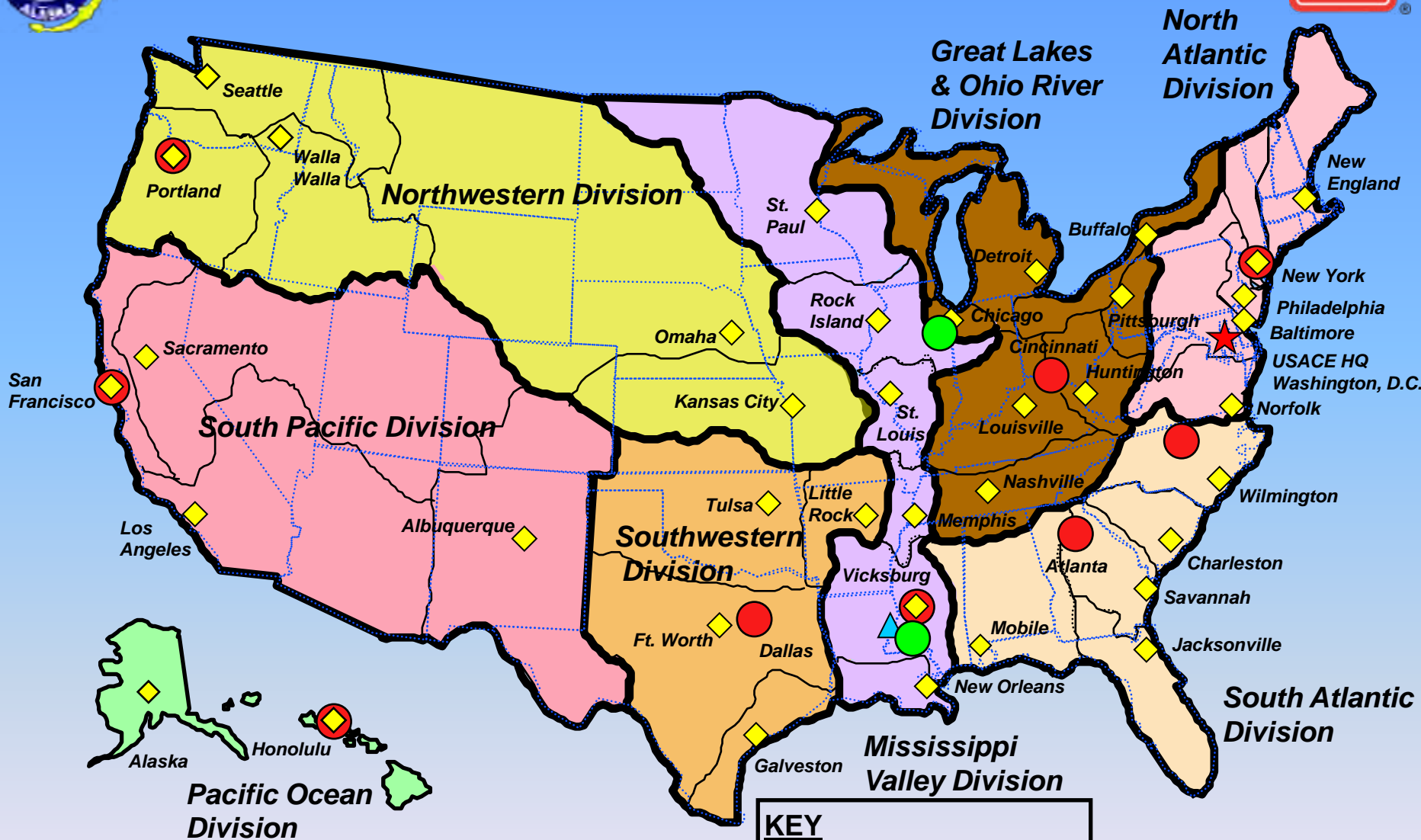
# Corps Representatives



- COL Reinhard Koenig, PE, Commander and District Engineer
- David Frenier, PE, Chief of Engineering Division & Dam Safety Officer
- Steve Boardman, PE, Chief of Civil Project Management Branch
- Tina McMaster-Goering, Project Manager
- Marcus Palmer, PE, Dam Safety Program Manager
- Crane Johnson, PE, Hydraulics & Hydrology Engineer
- Tom Findtner, Public Affairs Officer



# USACE BOUNDARIES



**KEY**

- Engineer Commands
- Divisions
- District
- ERDC
- Division Boundary



# MAJOR PROGRAMS



## MILITARY

Barracks at Fort Wainwright



## CIVIL WORKS

Rock Placement  
in Wrangell Harbor



## REGULATORY

Wetlands Assessment  
in Mat-Su Valley



Removal Action  
at Tanaga Island



Temporary Facilities  
in Eagle Village



Armed Forces Career Center



Military Recruiting Station

## ENVIRONMENTAL AND SPECIAL PROJECTS

## EMERGENCY MANAGEMENT

## REAL ESTATE



# Commander's Welcome

## U.S. Army Corps of Engineers



- Who we are
  - Serves as a community partner responsible for long-term maintenance of the Lowell Creek Project (excluding the Dam).
- What we've done
  - Identified risks to the public that exceed the Corps' Tolerable Risk Guidelines.
  - Recommended implementation of risk-reduction measures and development of an emergency action plan.
- What we're doing
  - Continuing to inspect and monitor the project for necessary repairs under our authorities.
  - Advising City officials on Dam Safety issues.



# Corps Dam Safety Assessments



- Risk-Informed program initiated in 2001
- National teams evaluate all Corps dams beginning in 2005
- Process applied to Lowell Creek after WRDA 2007
- Screening Level Risk Assessment showed Lowell Creek Risk as “Conditionally Unsafe”





# Project Overview



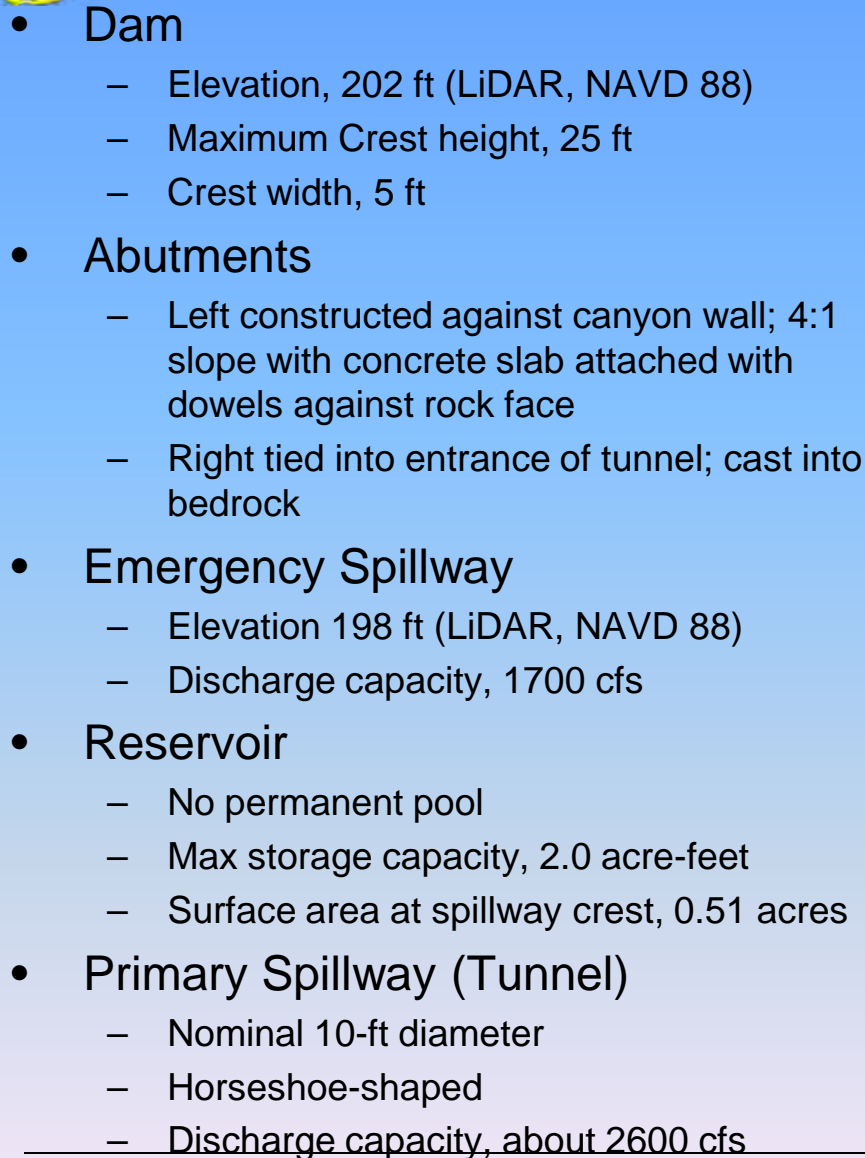




# Project Features



- Dam - 400 ft long rock-fill diversion structure; reinforced concrete upstream slope; grouted rubble rock crest and downstream slope; maximum height of 25 ft
- Emergency spillway – 70 ft long lowered portion in crest of dam; reinforced concrete upstream slope; grouted rubble rock crest and downstream slope
- Tunnel – 10-ft diameter, 2068 ft long horseshoe-shaped; invert lined with steel rail armoring; concrete flume outlet





# Dam Screening Recommendation

- Develop interim risk reduction measures
- Remove trees and woody vegetation
- Develop an Emergency Action Plan (EAP)
- Complete inundation mapping
- Inspect drainage pipe beneath dam
- Update hydraulics and hydrology used in analysis
- Continue routine inspections of tunnel
- Relocate fence from the top of the dam
- Upstream survey to remove trees and possibly landslide material



# Interim Risk Reduction Measures

- Measures for Seward to complete as funding allows:
  - Develop and Exercise the Emergency Action Plan
  - Remove/Reduce Debris from Upstream Channel
  - Clear Vegetation on and near the Dam
  - Refurbish Fence on top of Dam and Emergency Spillway
  - Identify Equipment for Safe Tunnel Debris Removal
  - Increase Monitoring and Surveillance
- Completed by the U.S. Army Corps of Engineers
  - Interim Risk Reduction Measures plan in cooperation with the City of Seward
  - Updated Hydraulics and Hydrology for project
  - Completed 2D modeling for use as inundation mapping



# Lowell Creek Flood Scenario Mapping



- 2-D Hydraulic Modeling of three Lowell Creek Flooding Scenarios.
- One flow path uncertain scenario using alluvial fan flooding equations.
- Results showing the limits of flooding are approximate and should be used ***solely as a guideline*** for planning purposes and facilitating an evacuation.





# Lowell Creek – Flood Mapping Scenario



Inundation Scenario	Total estimated Flow	Flow mode (cubic feet per second – cfs )	Warning Time	Hazard
<b>Scenario 1</b> Tunnel Blocked	2,000 cfs	No flow through the tunnel 2,000 cfs overtopping dam	Seconds	Velocities at the entrance of the canyon 6-7 ft/sec. Structural damage expected, cars and large objects to be moved by flood waters.
<b>Scenario 2</b> Probable Maximum Flood (PMF) with tunnel operational	7,600 cfs	~3,000* cfs through tunnel 4,600 cfs overtopping dam	Minutes to possible 1 hour or more	Velocities at the entrance of the canyon 8-10 ft/sec. Structural damage expected, cars and large objects moved by flood waters.
<b>Scenario 3</b> PMF Surge Release, tunnel operational	19,000 cfs	~3,000* cfs through tunnel 15,800 cfs overtopping	Seconds	Velocities at the entrance of the canyon 10-14 ft/sec. Structural damage expected, large objects moved by flood waters.
<b>Scenario 4</b> Uncertain Flow Path – PMF w/ tunnel operational	7,600 cfs	~3,000* cfs through tunnel 4,600 cfs overtopping dam	Minutes to possible 1 hour or more	Depth and velocity based on empirical relationships for alluvial flooding.



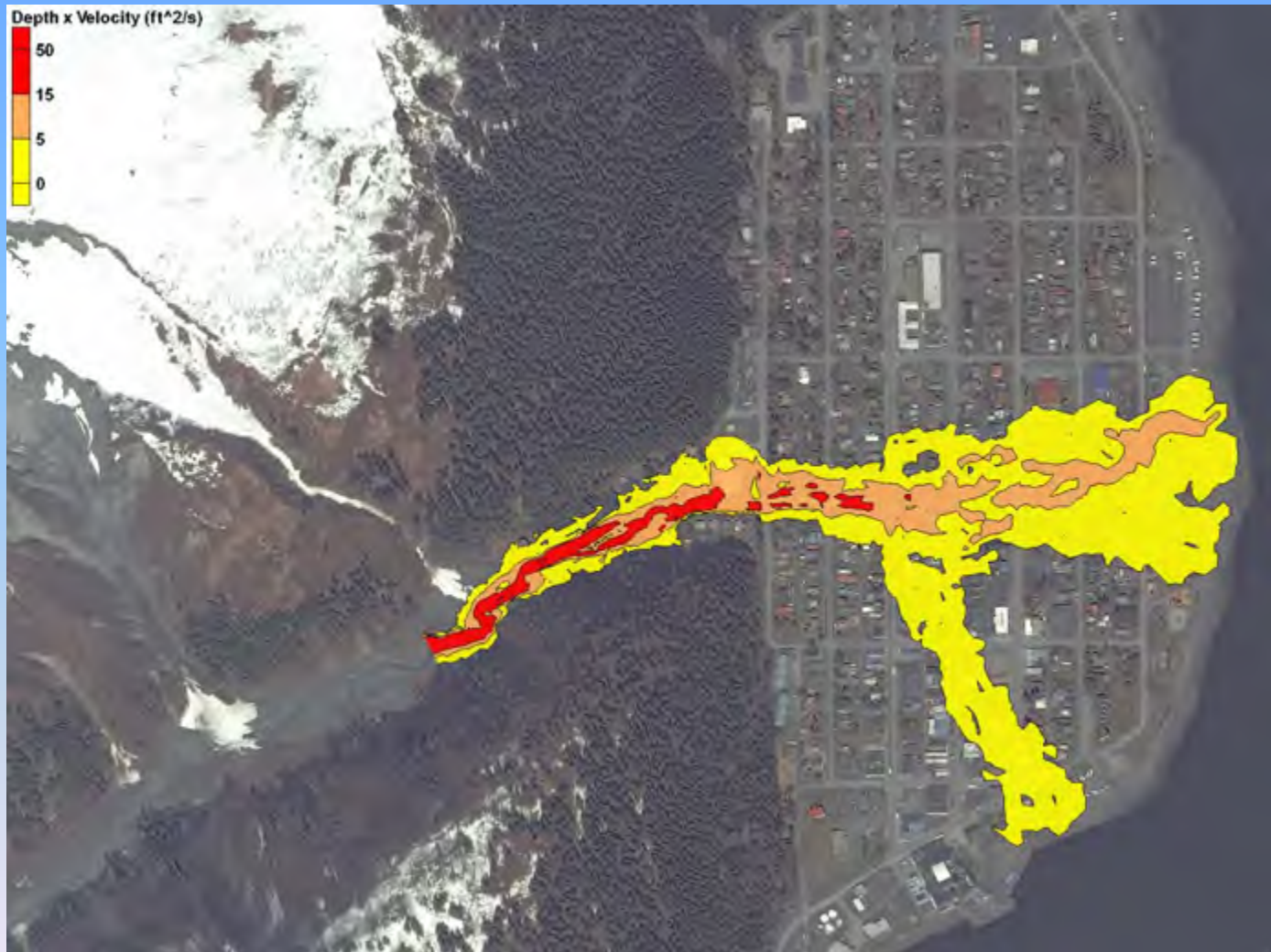


FIGURE 4.--Before the existing project was constructed, Lowell Creek was carried through Seward in an elevated wooden flume. A flood in 1939 (inset) plugged the flume and buried the lower part of the city. The power plant building (right) was buried to the top of the first floor; the house next door was buried to the eaves.





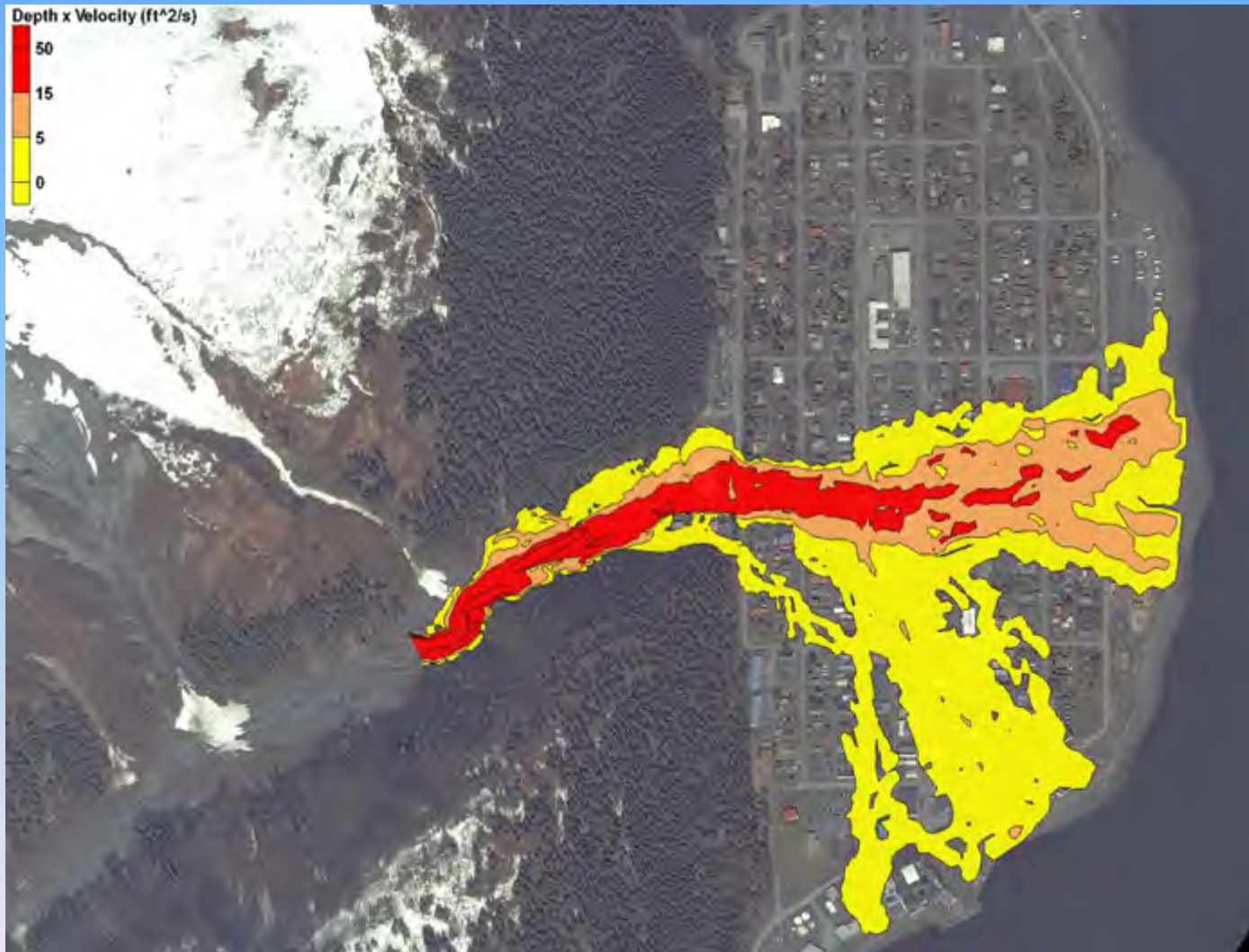
# Scenario 1 - 1% Exceedance Flood – Tunnel Blocked est. flow – 2,000 cfs (overtopping the dam), warning time - seconds, velocities 6-7 ft/sec







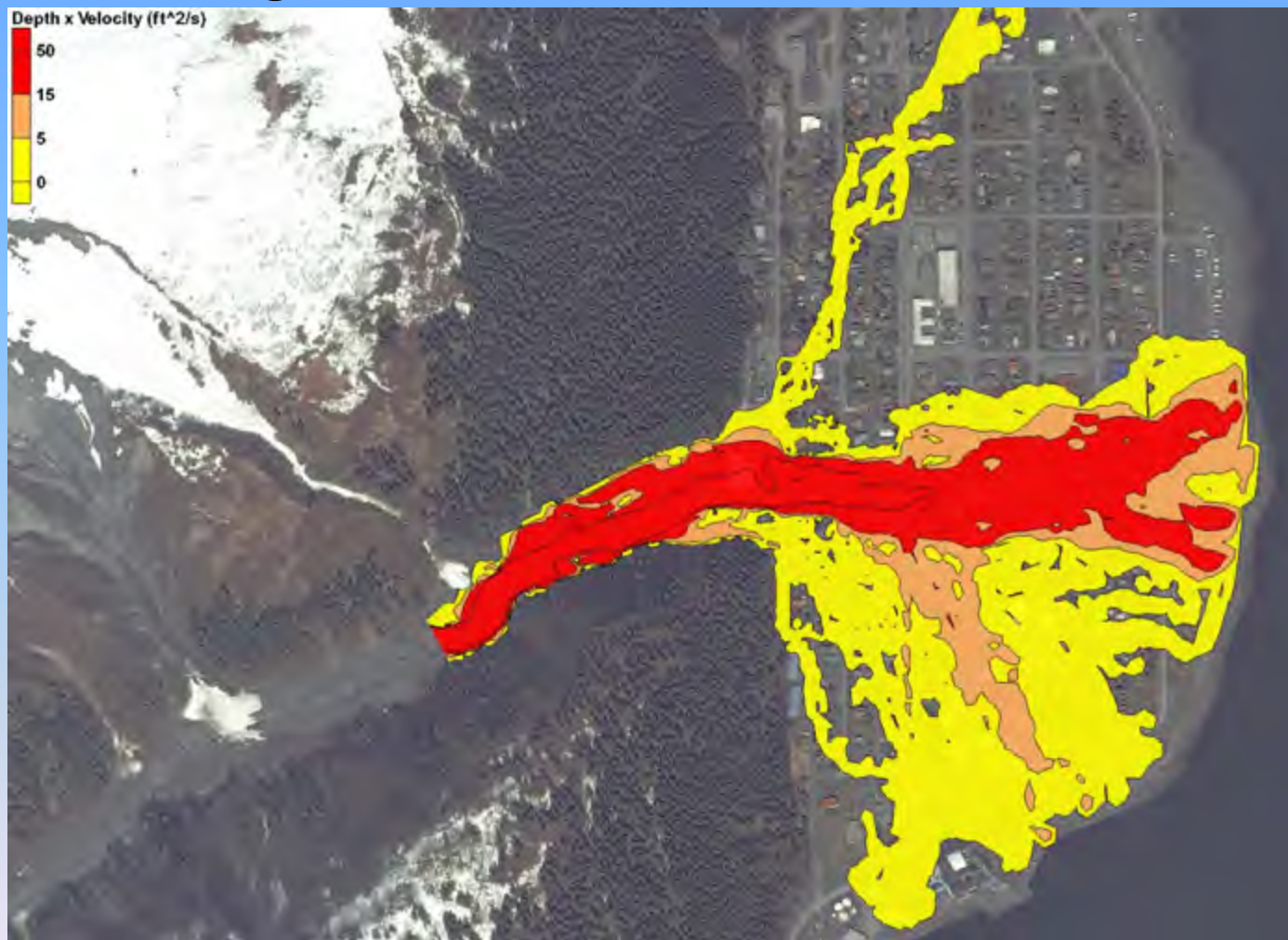
**Scenario 2 - Flood PMF – Tunnel Operational**  
**est. flow 7,600 cfs (3,000 cfs thru tunnel, 4,600 cfs over topping)**  
**warning time – minutes to 1 hour, velocities 8-10 ft/sec**





# Scenario 3 - Flood PMF with Surge Release, Tunnel Operational

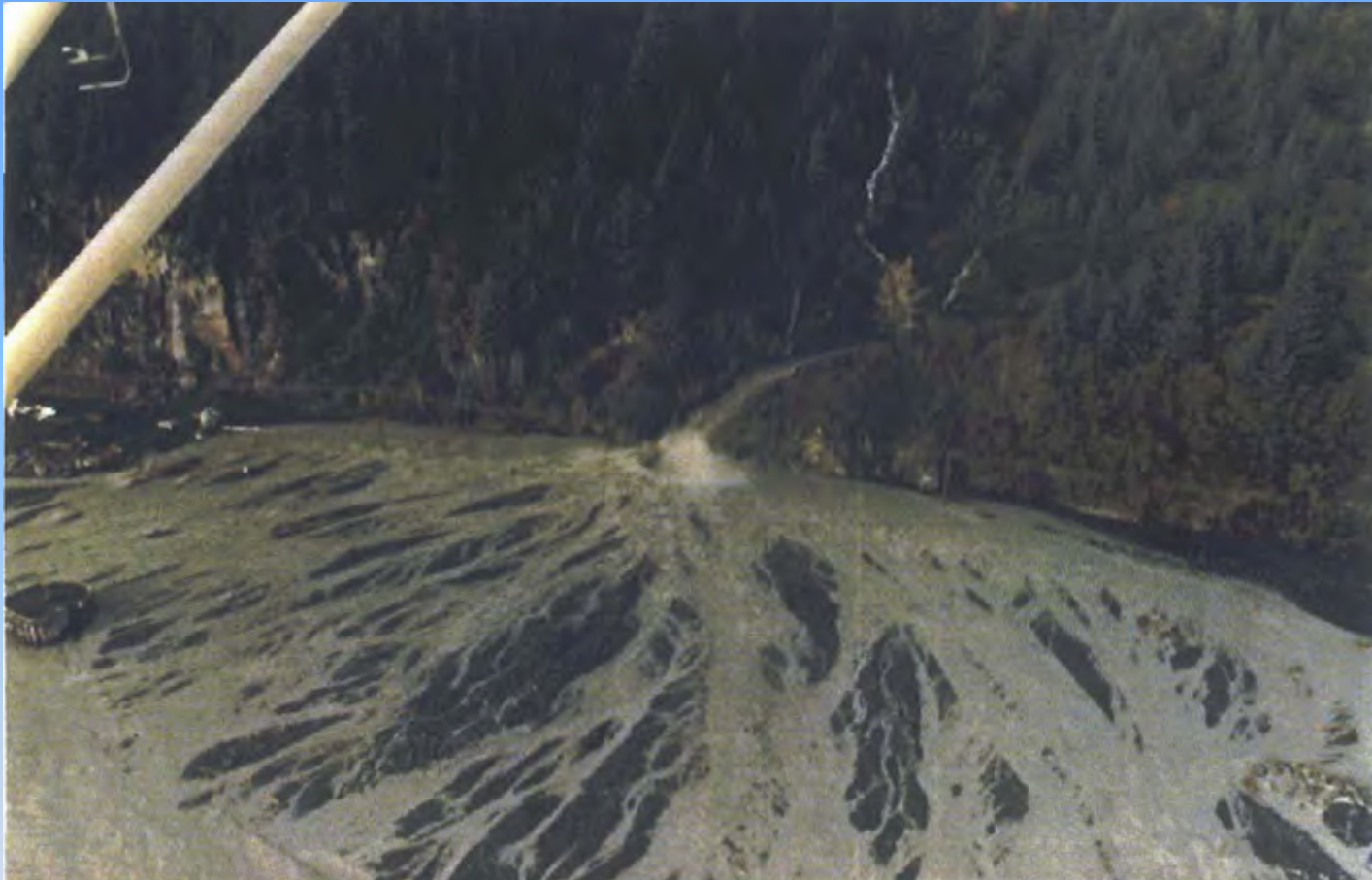
est. flow 19,000 cfs (3,000 cfs thru tunnel, 15,800 cfs over dam),  
warning time – seconds, velocities 10 –14 ft/sec







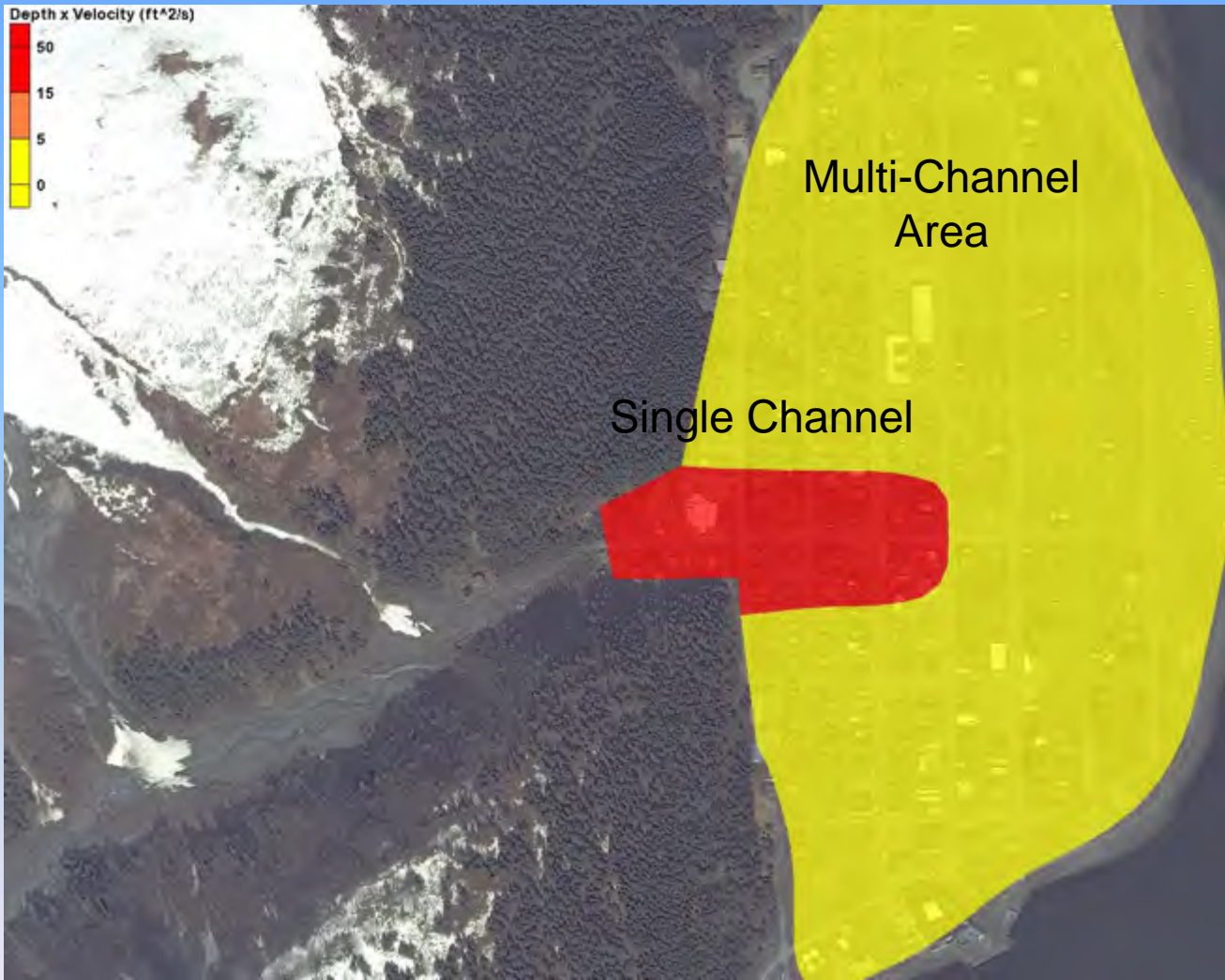
# Lowell Creek Tunnel Outlet – Alluvial Fan Flooding 1986





# Scenario 4 - Uncertain Flow Path Flood PMF, Tunnel Operational

est. flow 7,600 cfs (3,000 cfs thru tunnel, 4,600 cfs over dam)  
warning time – minutes to 1 hour







# What is next for the CORPS?

- Continue inspecting the tunnel under the Inspection of Completed Works program.
- Upon request, enter into an agreement to study alternative flood damage reduction methods for Lowell Creek drainage.
- Serve in an advisory role for Dam Safety.



# Conclusion

- Public safety
  - Inundation maps can be viewed at the Seward Bear Creek Flood Service, City of Seward and Kenai Peninsula offices
  - City of Seward's Emergency Action Plan
  - Inspections of the tunnel



# QUESTIONS?



# Background



- Authorization
- Long-Term Maintenance and Repair
  - Responsible for the long-term maintenance and repair of the tunnel shall continue until an alternative method of flood diversions is constructed and operational, or 15 years after the date of enactment of this Act
- Study
  - Conduct a study to determine whether an alternative method of flood diversion in Lowell Canyon is feasible.
- Construction
  - If under the study an alternative method of flood division is feasible then the alternative method shall be carried out.
  - The Federal share of the cost of carrying out an alternative shall be the same as the Federal share of the cost of construction of the Lowell Creek tunnel (100% Federal).



# Background



- A new study would update alternatives identified in the 1992 Reconnaissance Report.
  - Depressed Jefferson Street channel
  - Construct a second tunnel.





December 2015

## **INFORMATION PAPER**

**SUBJECT:** Lowell Creek Flood Control Project, Seward, Alaska

1. Purpose. Lowell Creek Flood Control Project is located in Seward, Alaska 125 miles south of Anchorage at the head of Resurrection Bay. The project reroutes Lowell Creek through Bear Mountain and around the city of Seward. The project was completed in 1940 and responsibility for operation and maintenance was transferred to the City of Seward. Structures consists of an upstream diversion dam, inlet structure, tunnel outlet control structure, and a spillway. Alaska District has repaired the tunnel four times under the authority of P.L. 84-99 and one additional time under the authority and direction of Section 510 of P.L. 106-60 (WRDA 2000).

2. Major Points of Interest and Facts.

a. The Water Resource Development Act of 2007 Section 5032 directs the Corps to (1) assume O&M responsibility for the tunnel including the inlet and outlet structures until 8 November 2022 but excludes the diversion dam; (2) study whether “an alternative method of flood diversion in Lowell Canyon is feasible”. If the study results in a feasible alternative, the Secretary shall carry out the construction on a cost shared basis equivalent to the Federal share of the cost of construction of the Lowell Creek Tunnel.

1. The Diversion Dam is subject to overtopping from a probable maximum flood (PMF) event, a plugged tunnel, or a surge-release event and is unusual in that the dam provides essentially no flood water storage, functioning only to divert water into the Lowell Creek Tunnel. Development of residential and commercial properties (to include the hospital and senior citizens home) are in the inundation area, and subject to high velocities and water depths along with the presence of large debris should overtopping occur.

2. The Screening Portfolio Risk Analysis Cadre evaluated the dam in the winter of 2011 and the Senior Oversight Group classified the project as a DSAC III in March 2011. An Interim Risk Reduction Measures Plan was prepared, followed by a public meeting in Seward in April of 2012. USACE IRRMs are complete.

3. The Alaska District also provided a one-time periodic inspection of the dam and annually inspects the tunnel.

b. The City of Seward has the following responsibilities:

1. Operation, maintenance, repair, replacement and rehabilitation of the diversion dam.
2. Day to day maintenance of the system.

3. Issues inundation maps to the public.
4. Oversees notification and evacuation of the public.
5. Provides emergency management services.
6. Coordinates emergency response.
7. Comply with State of Alaska Dam Safety Statutes and Regulations (AS 46.17 and Article 3 in 11 AAC 93).

### 3. Current Status

a. State Dam Safety Officer Concerns/Project Risk. The State of Alaska Dam Safety Office has public safety concerns and wants a complete Emergency Preparedness Plan from the City of Seward. Alaska District involvement is to provide technical analysis of its products.

b. O&M Responsibility for Tunnel. A Fall 2012 storm accelerated tunnel wear. A letter report documenting the need for the current repairs and projected repairs through 2022 is being prepared. ASA(CW) approval of the letter report is required prior to appropriation of funds for repairs.

c. Long Term Feasibility Study. Federal funds have not been received for the feasibility study to evaluate long-term alternatives. The feasibility study would be performed under the Corps specifically authorized study program also referred to as the General Investigation program. New studies initiated under this program are generically scoped for \$3 million total with a schedule of three years. Once a feasibility cost share agreement is executed, a detailed scoping process is undertaken to refine the particulars of the scope in a planning charrette. Funding for this study would require a study new start through the Federal budgetary process.

4. Congressional Interest. Senator Lisa Murkowski (R), Senator Dan Sullivan (R), and Representative Don Young (R) all have interest in the subject project.