FLOOD REPORT
South Central Alaska Floods

September 19 - October 2, 1995

United States Department of Commerce
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NATIONAL WEATHER SERVICE
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ALASKA REGION

Foreword

The Alaska Region of the National Weather Service has broad Federal responsibility to provide public forecasts and warnings of weather and river conditions in Alaska. These services are for the protection of life and property and in support of Alaska's commerce.

The Alaska Region conducts surveys of significant natural disasters in Alaska to thoroughly assess the performance of its warning system in all aspects, from data collection and assimilation through creation and dissemination of products and, ultimately, effective customer response. This report of the flood survey team's findings regarding the damaging floods of south central Alaska in September and October 1995 identifies opportunities to improve the NWS's weather and flood warning system, not only in the affected area but throughout the Nation.

I express the special gratitude of the Alaska Region to the Federal, state, and local officials and media representatives in Alaska who helped the survey team.

Richard Hutcheon
Regional Director
Alaska Region
National Weather Service

Flood Survey Team

The Alaska Region Director formed a flood survey team immediately after the last south central Alaska flood warning was canceled on October 2, 1995. The team spent the next several months gathering information and data from within the National Weather Service and meeting with the customers of the National Weather Service. One of the primary customers during the flood event was the emergency management organization consisting of the Alaska Division of Emergency Services and the Emergency Services in the Kenai and Matanuska-Susitna Boroughs. These meetings also gave the team the opportunity to interview representatives of the public and the media.

The team also visited several flood impacted locations which visually confirmed impacts of the flood and allowed the team to interview residents.

Everyone with whom the team met stressed the importance of timely and fresh forecast and warning information in their life and work.

The flood survey team was composed of:

James E. Kemper, Chief, Environmental and Scientific Services Division of the Alaska Region,

Larry A. Rundquist, Development and Operations Hydrologist at the Alaska River Forecast Center,

David B. Goldstein, Warning and Coordination Meteorologist at the Anchorage Weather Service Forecast Office,

Gregory E. Matzen, Public and Warning Program Manager at the Alaska Region,

Jeff E. Perry, Service Hydrologist at the Anchorage Weather Service Forecast Office,

J. Neal Marchbanks, Radar Program Manager for the Alaska Region.

The team acknowledges **Pat Claar**, secretary of the Environmental and Scientific Services Division, for ably providing essential clerical and staff assistance to the team.

James E. Kemper
Team Leader

Survey Team

Executive Summary

Persistent, southerly, warm, moist flow over south central Alaska from mid- to late-September 1995 produced heavy rain of up to 21 inches in a 4 day stretch. The rain was orographically focused along the Chugach-Kenai mountains, the Alaska Range, and the mountains around Valdez and Cordova.

Extensive flooding occurred in south central Alaska from September 19 to October 2 in response to the rain and flow pattern. No loss of life or serious injury were directly attributable to the flooding, but property damage totals approached 10 million dollars. The flooded areas were declared a federal disaster area.

A National Weather Service (NWS) Alaska Region flood response assessment team conducted a disaster survey immediately after the flooding subsided. The survey included visits to the Kenai, Matanuska-Susitna, Girdwood, and Knik locations impacted by the flooding.

A summary of the major findings of the survey are:

(1) ***The Anchorage Weather Service Forecast Office (WSFO) provided forecasts of heavy precipitation 5 days in advance of the onset of the flooding. Forecasts of general precipitation amounts were also provided during the flooding period. The development of quantitative precipitation forecasts (QPF) will provide better support to flood forecasting.***

(2) ***The Alaska River Forecast Center (RFC) issued timely, extensive, and informative flood statements, watches, and warnings. Lead times for flood warnings were as much as 17 hours at specific locations.***

(3) The new WSR-88D doppler radar, a technology part of the NWS modernization, installed near Kenai indicated the dramatic orgraphic focusing of the heavy precipitation. High resolution precipitation patterns were available for the first time to the Anchorage forecasters and hydrologists. The Storm Total Precipitation product illustrated the significant impact the radar will have on forecast and warning operations during heavy precipitation events. Operational radar and precipitation gauge network improvements to compensate for orographic beam blocking, freezing level contamination, and precipitation amount biases in Alaska are recommended.

(4) Some residents in the affected areas did not receive the NWS flood product information because of slow or inadequate dissemination processes. Those that did receive the information did not always recognize the threat because of a lack of historical information upon which to base a response. Improved outreach and preparedness programs can improve the response.

(5) There was frequent interaction during the flooding between the NWS forecast and warning operations and the state emergency service agencies. However, the information flow and pathways between these two vital hazard response organizations needs modernizing to take advantage of advances in communications technologies. There also needs to be a better mutual understanding of the operating procedures in both the NWS and the emergency service agencies. Frequent contact is necessary to improve the operating relationships between the two hazard response groups.

Several new positions associated with the NWS modernization have recently been put in place at the Anchorage WSFO and RFC. These new positions should respond significantly to the recommendations from this report.

The Warning Coordination Meteorologist (WCM) position at the Anchorage WSFO was filled in 1994. This is a new NWS modernization position at each WSFO. The responsibilities of the WCM include developing and maintaining the flood warning and preparedness program. The WCM position is recognized in the NWS as vital to a vigorous and healthy warning/preparedness program.

The Development and Operations Hydrologist (DOH) is another NWS modernization position recently filled at the RFC. The DOH teams with the WCM in the area of flood warning and preparedness.

A Service Hydrologist was added to the staff at the Anchorage WSFO in 1994. The Service Hydrologist is responsible for developing and maintaining hydrologic operations at the WSFO by (1) training WSFO forecasters in hydrologic operations, (2) developing and maintaining a hydrologic observing network and the flow of data from the network into the WSFO, and (3) developing and maintaining the WSFO hydrologic service program. The Service Hydrologist had completed most of the training required for the position at the time of the flood and was just starting to have an impact on the WSFO hydrologic operations.

The new Science and Operations Officer (SOO) at the WSFO was filled in 1994. The SOO is responsible for training and

integrating new meteorological and hydrologic scientific developments into operations. The SOO can provide a major contribution toward developing a successful QPF program and training forecasters in the hydrologic program.

The findings and recommendations in this flood report will serve as a target of significant opportunity and focus for the WCMs, the Service Hydrologists, the DOH, and the SOOs in the Alaska Region. They can also greatly assist in improving the linkages with the emergency services agencies.

There has already been a response to some of the recommendations because of the assessment team's visits to the Alaska Division of Emergency Services and the Kenai/Matanuska-Susitna Borough emergency service groups. The groups submitted flood mitigation plans for funding to the Federal Emergency Management Administration. These plans have included some of the team's recommendations, such as funding the purchase and installation of NOAA Weather Radio transmitters, precipitation gauges, and river gauges.

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ACRONYMS AND ABBREVIATIONS

ADES	Alaska Division of Emergency Services
AKRFC	Alaska River Forecast Center
AMOS	Automatic Meteorological Observing System
AP	Associated Press
APS	Alaska Products Service
ARR	Alaska Railroad
ARONET	Alaska Region Operations Network
ASOS	Automatic Surface Observing System
ATWC	Alaska Tsunami Warning Center
AVN	Aviation Numerical Weather Prediction Model
AWIPS	Advanced Weather Information Processing System
AWL	Alaska Weather Line (800 toll free)
AWOS	Automatic Weather Observing System
BLM	Bureau of Land Management
CFS	Cubic Feet Per Second
CY	Cubic Yard
DOH	Development and Operations Hydrologist
DOT	Department of Transportation
EAS	Emergency Alerting System
EBS	Emergency Broadcast System
ECS	Electronic Communications System
EOC	Emergency Operations Center
ESIS	Emergency Services Information System
ESSD	Environmental and Scientific Services Division
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Administration
GMS	Geostationary Meteorological Satellite
GOES	Geostationary Observational Environmental Satellite
HAS	Hydrometeorology Analysis and Support
HSA	Hydrologic Services Area
HMD	Hydrometeorological Discussion
hPa	Hecta Pascal
ICS	Incident Command System
KPB	Kenai Peninsula Borough
LEPC	Local Emergency Planning Committee
M&O	Maintenance and Operations
MIC	Meteorologist-in-Charge
Mat-Su	Matanuska-Susitna
MSL	Mean sea level
NAWAS	National Warning System
NCEP	National Centers for Environmental Prediction
NGM	Nested Grid Numerical Weather Prediction Model
NM	Nautical Mile
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration
NWR	NOAA Weather Radio
NWS	National Weather Service

NWWS	NOAA Weather Wire Service
PTA	Parent Teacher Association
QPF	Quantitative Precipitation Forecast
RAMOS	Remote Automated Meteorological Observing System
RATNET	Rural Area Television Network
RFC	River Forecast Center
SAWRS	Supplemental Aviation Weather Reporting Station
SOO	Science and Operations Officer
USCG	United States Coast Guard
USGS	United States Geological Survey
UPS	Uninterruptable Power Supply
UTC	Universal Coordinated Time
WCM	Warning Coordination Meteorologist
WSO	Weather Service Office
WSFO	Weather Service Forecast Office
WSR-88D	Weather Surveillance Radar-1988 Doppler

CHAPTER I

Findings and Recommendations

I.1 Introduction

A NWS Alaska Region flood response assessment team was formed shortly after the September 20-October 2 1995 flooding period. The assessment included visits to the Kenai, Matanuska-Susitna, Girdwood, and Knik locations impacted by the flooding. The team met with emergency services groups, including the Alaska Division of Emergency Services (ADES), the Kenai Peninsula Borough Emergency Services, the Girdwood Emergency Operations Center (EOC), and the Matanuska-Susitna (Mat-Su) Borough Emergency Services.

The team reviewed the flood response activities of the NWS and the interaction between the emergency services groups and the NWS. They especially reviewed the dissemination of NWS products to the ADES, to the emergency services in the Boroughs and EOCs, and to residents in south central Alaska. The team also discussed the flow of flood reports and information back to the NWS.

The following **Findings** and associated **Recommendations** are the result of the assessment. There has already been a response to some of the recommendations because of the assessment team's visits to the ADES and the Kenai/Mat-Su Borough emergency service groups. The groups submitted flood mitigation plans for funding to the Federal Emergency Management Administration (FEMA). These plans have included some of the recommendations given below, such as funding the purchase and installation of NOAA Weather Radio (NWR) transmitters, precipitation gauges, and river gauges.

In general, any activities in response to the recommendations are noted within the recommendations below.

I.2 Findings and Recommendations

The **Findings** and **Recommendations** are identified by Chapter number in Roman numerals and a sequential number beginning with 1 for the first finding in a Chapter. When there is more than one recommendation for a finding, an addition sequential number is appended to the first sequential number in the recommendation.

Finding IV.1

Additional river stage and precipitation gauge data in Alaska, especially in the area impacted by this flood event, would improve river level forecasts.

Recommendation IV.1.1

General locations where precipitation gauges are required: (1) the Kenai Mountains south of the Kenai River, (2) the western Susitna River basin, and (3) along the Richardson Highway between Valdez and the Alaska Range.

Specific locations for automated precipitation gauges on the Kenai Peninsula in the vicinity of rivers are recommended:

(1) Near the Cooper Lake project where two non-automated precipitation gauges already exist, one of which needs telemetry,
(2) Near the prison in Seward,
(3) Near Bradley Lake, and
(4) With the existing Cooper Landing river gauge where telemetry already exists,

***Note (1)*: The purchase and installation of automated precipitation gauges at these 4 locations has been included in the Kenai Borough's Flood Mitigation Plan submitted to the FEMA for funding.**

In the western Susitna basin:

(1) At Rainy Pass Lodge,
(2) At Hayes River Lodge,
(3) At Judd and/or Hiline Lakes,
(4) At Midway Lakes,
(5) At Chelatna Lake Lodge, and
(6) Near Peters Creek on Petersville Road,

Along the Richardson Highway:

(1) At Thompson Pass, and
(2) Near Lake Louise, Susitna Lake, or Tyone Lake.

Recommendation IV.1.2

Automated stream gauges, coordinated with the USGS, are recommended at the following sites:

(1) Kenai River below Skilak Lake,
(2) Kenai River at Kenai Keys (rating development),
(3) Kenai River at Soldotna (automate existing site),
(4) Grouse Creek at canyon mouth,
(5) Spruce Creek (automate existing site),
(6) Lowell Creek below tunnel, and
(7) Snow River at highway bridge (rating development).

***Note (2)*: The purchase and installation of automated stream gauges at these 7 locations has been included in the Kenai Borough's Flood Mitigation Plan submitted to the FEMA for funding.**

Finding IV.2

Precipitation and other meteorological data from several key locations are not available in real-time. Valuable data from cooperative observers are recorded daily, but not available to forecast operations until after the end of the month through the mail.

Recommendation IV.2

The cooperative observations should be brought into the real-time operations as much as possible. This calls for a simple data entry and electronic information pathway for cooperative observations into NWS operations. Automated processing (decoding and database posting) of the cooperative observations is required once they are collected to provide forecast operations with efficient access to the data.

Finding V.1

The precipitation generating the flood event was highly influenced by the orography in south central Alaska. The existing precipitation gauge network did not accurately reflect the location and amount of precipitation. The WSR-88D radar at Kenai was an extremely powerful alternative to precipitation gauges for estimating quantitative precipitation amounts and location. The heaviest amounts in the radar data were over the Chugach/Kenai mountains and the eastern slopes of the Alaska Range.

Precipitation gauges are necessary to calibrate the WSR-88D radar precipitation estimates, especially for significant precipitation amounts over the mountains, as in this flood event. The location of any new precipitation gauges must take into account the surrounding orography and beam elevation characteristics.

Recommendation V.1

New automated precipitation gauges should be located to optimally support the WSR-88D estimation of precipitation location and amount. Several specific locations have been identified for the Kenai radar:

(1) The eastern intersection of the Skilak Lake road and the Sterling Highway. This is in a gap area just inside the western slopes of the mountains where little if any beam blockage occurs.

(2) North of Seward: one near Woodrow, and one near Exit Glacier. These are in an area where only partial beam blockage occurs.

(3) On the proposed Skilak Lake Outlet USGS river gauge platform. This would be in an area before the mountains and with no beam blockage.

***Note (3)*: The purchase and installation of automated precipitation gauges selected locations has been included in the Kenai Borough's Flood Mitigation Plan submitted to the FEMA for funding.**

Finding VI.1

Residents along many of the flooded streams were unaware of the impacts of floods. This was based in part on no known history of previous flooding on these streams.

Recommendation VI.1

The WSFO WCMs and the RFC should use this event to develop preparedness material to distribute to emergency managers and the media in similar communities to try to overcome the lack of awareness of flood potential and to promote better community preparedness. Also, lessons learned from this event should be used in educational material for schools and community outreach programs.

Finding VI.2

Routine "customer service" visits to emergency management officials by the RFC staff and the WSFO WCMs are important to maintain operations relationships. Visits are also particularly important for areas with limited emergency management programs or for locations without local flood warning plans in known flood-prone areas. Examples are Girdwood or at the Knik River Fire Station.

Recommendation VI.2

Routine coordination and preparedness visits by WCMs and RFC staff should be made to key emergency management agencies. For Anchorage, these include the Kenai Peninsula, the Mat-Su Borough, and the Local Emergency Planning Committees (LEPC). Attendance is also recommended at the meetings organized by the Alaskan Association of Emergency Managers.

Finding VI.3

The RFC and the WSFOs can improve warning services by participating in ADES/NWS jointly organized emergency event exercises.

Recommendation VI.3

The WSFO WCMs and the RFC should work with the ADES to design and participate in emergency response drills applicable to NWS services.

Finding VI.4

The emergency management staff's knowledge of hazardous weather/water events can be improved so they understand the NWS' technological and response capabilities. The NWS needs to also understand the emergency services capabilities and priorities in responding to these events.

Recommendation VI.4

The Alaska Region (Environmental Scientific and Services Division, WSFOs, RFC) should work with the ADES to develop such an educational program involving the Regional staff, the WCMs,

and the staff of the RFC with the ADES/Borough emergency management staff.

Finding VI.6

Flood response groups like the NWS and the emergency services agencies need to share their post-event reflections.

Recommendation VI.6

The assessment team should meet with the ADES, Borough emergency service agencies, and the LEPCs to jointly discuss our **Findings and Recommendations**. Joint activities to implement the emergency services related recommendations should be explored.

> ***Note (4)*: The assessment team has met with the above groups to discuss the NWS response and the interactions between the NWS and the groups during the flood. A number of cooperative activities are taking place in response to the joint assessments.**

Finding VII.1

The Anchorage WSFO/RFC operations staff had just moved into their new facility in mid-September. They were not completely adjusted to their new surroundings and office support systems.

Recommendation VII.1

The support systems and the WSFO/RFC staff familiarization with the systems in the new WSFO/RFC facility should be arranged to provide for efficient operations. This has been accomplished.

Finding VII.2

The multi-year transfer of operational applications and database from the Prime computers to the Unix workstations was not yet completed. Operations access to observations required manual processing some of the time.

Recommendation VII.2.1

The conversion from Prime computers to Unix workstations should

be completed as quickly as possible. As of March 1996, the NWS operations in Alaska successfully operate without the Prime computer.

Recommendation VII.2.2

An improved data quality control operation should be developed to support forecast and warning operations. The objective of the operation is to ensure that all observations are checked for proper decoding and processing. This should be the responsibility of the WSFO hydrometeorological technician staff which is consistent with the modernization of NWS operations.

Finding VII.3

Spotters provide valuable observations for hazardous weather/water events to supplement existing observations systems. The new WCM at the Anchorage WSFO can begin to expand and enhance the spotter network.

Recommendation VII.3

The new WCM at the Anchorage WSFO should begin to expand and enhance the spotter network. The WCMs at the other Alaska WSFO should also establish more effective spotter networks.

The WCMs should emphasize to the emergency management and law enforcement organizations the importance of having them relay significant weather and water reports to the NWS.

Finding VII.4

Very little of the real-time flood and heavy rain reports reaching the ADES were relayed to the WSFO/RFC operations.

Recommendation VII.4

An electronic pathway for reports to reach the emergency service offices should be developed to get the reports to NWS operations. This is addressed in **Recommendation VIII.1**.

One of the plans in the NWS modernization is also to provide a 1-800 telephone service dedicated to telephone communications between emergency operations centers, the forecast offices, and the RFC. This should be implemented in Alaska as soon as possible.

Finding VII.5

Telephones in the new forecast office were inoperable for a critical period of about 2-3 hours on the morning of September 21.

Recommendation VII.5

Cellular telephones should be provided to the forecast offices and the RFC for back-up telephone service when normal telephone service is disrupted. The cellular phone numbers should be provided to the emergency services and law enforcement agencies. There should be a procedure in place at the WSFO for ensuring the telephone company is alerted, preferably automatically, when there is a telephone system failure.

Finding VII.6

Operational coordination and communication between the WSFO and the RFC can be strengthened through a routine daily coordination process.

Recommendation VII.6

An effective daily coordination process should designed and implemented among the Center Weather Service Unit, the RFC, the Alaska Aviation Weather Unit, and the 3 Forecast Offices. This has been implemented in January 1996.

The "daily" aspect of the coordination should develop routine operational interaction between the WSFOs and the RFC. During events, such as the south central flood, coordination should be more frequent between the impacted WSFO and the RFC. The coordination process should also include precipitation forecasts to support RFC and WSFO hydrologic operations.

Finding VII.7

There was an extraordinary number of telephone calls into the WSFO and the RFC for information during the flood event which heavily impacted the operations staff.

Recommendation VII.7

Automatic answering systems should be explored which can provide cost effective and efficient service state-wide for public and emergency service information.

Finding VII.8

The RFC prepares and issues flood watch and warning products for the WSFO Anchorage area of responsibility when the RFC is in operation.

Recommendation VII.8

The WSFO Anchorage should prepare and issue all hydrologic watches, warnings, and statements during flood threats in the Anchorage area of responsibility. The RFC should be the hydrologic operations support facility to the WSFO in providing hydrologic information, data, and guidance. This is consistent with the modernization plan for WSFO/RFC operations. This requires a hydrology training program for the WSFO operations staff so they can fulfill their hydrologic responsibilities.

Finding VII.9

A Service Hydrologist had been added to the Anchorage WSFO staff in 1994. This should improve the WSFO hydrology services program.

Recommendation VII.9

The new Service Hydrologist at WSFO Anchorage should be involved in the design and implementation of the procedures in **Recommendation VII.8**. The Service Hydrologist should team with the WSFO Science and Operations Officer to design the hydrologic training for the WSFO staff.

Finding VII.10

A Quantitative Precipitation Forecast (QPF) program is needed at the Alaska Region WSFOs to support river forecasting at the RFC. The QPFs can improve the flood forecasting capability. The new SOO will be an important factor in developing the new QPF program.

Recommendation VII.10

The Alaska Region should design and implement an operational QPF program. A QPF development team composed of the Regional Scientist, the SOOs, the DOH, a Hydrometeorology Analysis and Support (HAS) forecaster, and selected lead forecasters should develop the program. The program should begin with operational QPFs to support the RFC in some form in 1996.

Finding VII.11

The flood product lead times ranged from 0 hours to over 17 hours. Most areas with 0 hour lead time are areas containing no real-time stream gauges. The areas with the lead time of 16 hours or more have stream gauges.

Recommendation VII.11

The recommended additional automatic (**Recommendation VI.1.2**) or manual stream gauges in areas with flood potential will provide monitoring capabilities to increase the lead time in data-sparse areas.

Finding VII.12

Significant damage can and did occur because of debris flows rather than water inundation.

Recommendation VII.12

The RFC should develop criteria to identify the potential for debris threats in high intensity rainfall events. The threat should be coordinated with the WSFO in the flood threat area so debris potential is included in any flood products.

Finding VII.13

The information content of the watch and warning products was appropriate for the data-sparse areas affected by the flooding. The products for the areas in which there were no real-time river gauges for reference were, by necessity, somewhat vague on the details of the water levels. Products for areas with real-time stream gauges specified the reported stages and the estimated time of crest, but were not specific on the crest stage forecast.

Recommendation VII.13

The recommended increase in the network of precipitation and river gauges should improve water level forecasts. WSR-88D radar and satellite precipitation estimates should also improve the specific forecasts of crest stage and time.

Finding VII.14

Residents and emergency service agencies in flooded areas want to have action statements in our products to help guide residents in responding to the flood threat. The emergency service agencies can provide the best guidance for which statements to include.

Recommendation VII.14

Action statements should be coordinated with emergency services agencies to ensure applicability to the events taking place. The statements should be relevant to the potential impact of the event. The list of applicable statements should be readily available to the operations staff. The operations staff should coordinate with the emergency service agencies in the impacted areas during events to ensure proper statements are being included in the products.

Finding VII.15

WSFO Anchorage **Hydrology Manual** had been updated just prior to the flood event with a list of station identifiers used by the RFC.

Recommendation VII.15

The WSFO staff should review the **Hydrology Manual** periodically to remain familiar with site identifiers. There should be hydrologic services drills at least annually to keep the staff well practiced in hydrologic events.

Finding VII.16

Mudslides often occur in heavy rain events. The State Department of Public Safety is responsible for issuing alerts for mudslides.

Recommendation VII.16

The WCMs should develop general guidelines for mudslide information in coordination with the RFC and the Department of

Public Safety. During heavy rain events or potential heavy rain events, WSFOs should coordinate with the RFC and the Department of Public Safety on including a threat of mudslides in our watch and warning products to provide better customer service.

Finding VIII.1

The pathway for NWS watch, warning, and statement information to the ADES Emergency Operations Center (EOC) on Ft. Richardson was through the NWWS. The ADES staff manually transferred the NWS products into the new ADES Emergency Services Information System (ESIS) for distribution to a limited number of other emergency management offices.

Recommendation VIII.1

The Alaska Region should work with the ADES to develop a more robust ESIS. The system should support information flow among all the emergency services organizations and the WSFOs/RFC. The system should be based on modern communications alternatives.

The ESIS would allow the free flow of timely and vital weather information among the ADES, emergency services organizations, and the NWS offices. Information would include watches, warning, and statements along with a flow of reports from the affected areas.

> ***Note (5)*: Meetings have been held since the flood with the ADES and Alaska Region headquarters staff to discuss the ADES ESIS and including the NWS as a participant on the ESIS. The planning, designing, and implementation of NWS participation in the ESIS is currently an active project of the Region.**

Finding VIII.2

The ADES did not have comprehensive knowledge on NWS products.

Recommendation VIII.2

The ESSD should prepare a comprehensive list of NWS products and services, listed by each WSFO and the RFC. These lists will also contain office hours of operations, phone numbers, and names of points of contact.

Finding VIII.3

The dissemination of NWS flood products was hampered by:

- The lack of coverage by NWR transmitters in the flood impacted areas,
- The lack of comprehensive broadcast media dissemination,
- The lack of an effective dissemination capability within the emergency management community.
- The lack of easy access to NWS products by telephone.

Recommendation VIII.3.1

NWR transmitters should be provided in the Kenai/Soldotna area and the Mat-Su Valley. Ideal transmitters sites would be at the Borough emergency management offices and/or their dispatch centers. The Alaska Region should encourage the ADES and the Borough Emergency Services to apply for FEMA flood mitigation funding for the purchase and installation of the NWR transmitters.

> ***Note (6)*: The purchase and installation of NWR transmitters for the Kenai and Mat-Su Boroughs has been included in the flood mitigation planning and funding initiatives for each of the Boroughs.**

Recommendation VIII.3.2

The Alaska Region should participate in the ADES' ESIS, which is to include all of the state's emergency management offices in the system. Other key state and federal organizations, such as the State Troopers and the NWS' Alaska Tsunami Warning Center, will also be included.

> ***Note (7)*: This project is currently under way. See Note (5) under Recommendation VIII.1.**

Recommendation VIII.3.3

Repeating **Recommendation VII.7**, automatic answering systems should be explored which can provide cost effective and efficient service state-wide for public and emergency service information.

I.3 Final Remarks

Our goal in this report is to properly illuminate the strengths and weaknesses in the National Weather Service Alaska Region flood warning services. The Alaska Region is committed to further strengthening the flood preparedness and warning program. Steps have already been taken to accomplish that goal, such as taking advantage of the new modernization positions (WCMs, SOOs, Service Hydrologist) and technologies such as the WSR-88D doppler radar, the new GOES 9 satellite, and the Alaska Region Operations Network (ARONET).

Chapter II

Description and Impact of Floods

September 1995 was a very wet month in south central Alaska. Included in a series of cyclones was a single cyclone that produced in excess of 20 inches of rainfall in several days in some locations. The rain caused flooding on many streams in south central Alaska that caused an estimated $10 million damage to private homes and public facilities. Areas reporting flooding are shown in Figure 1.

This report will focus on the period from September 19 through October 2, 1995, which is when the flooding reached warning levels. There was no loss of life and no reports of serious

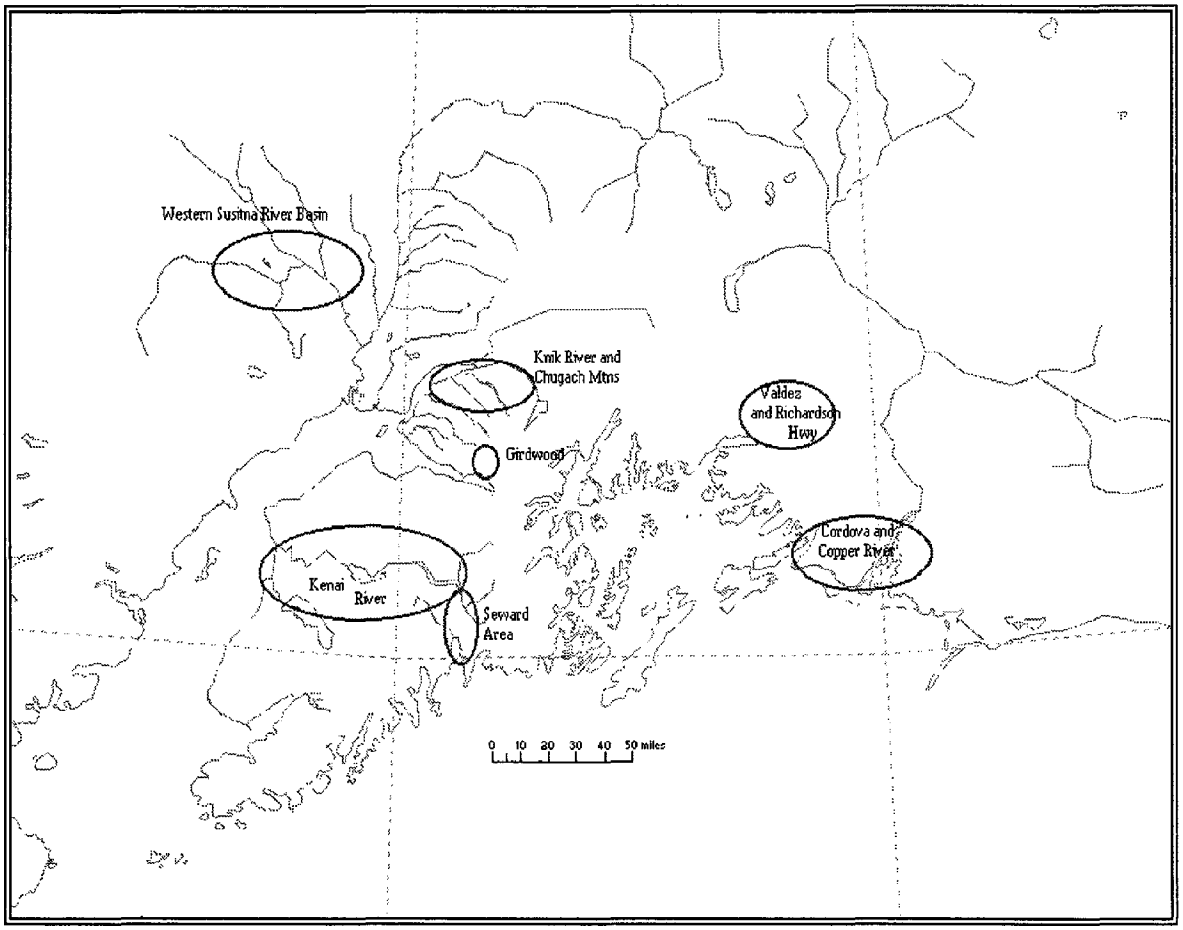

Figure 1. Areas reporting flooding during the September - October 1995 south central Alaska flood event.

injury due to this flood. However, a hiker was swept to her death while attempting to cross a swollen stream from a precursor storm on September 17.

During the latter half of September 1995, the precipitation rich regime had its roots in a persistent long wave pattern. A long wave trough in the north Pacific Ocean and a blocking long wave anticyclone in eastern Alaska and western Canada provided a continuous flow of warm, moisture laden air over south central Alaska. The heaviest rainfall came with the shorter wave cyclones moving north in the long wave flow, bringing a new surge of rain into south central Alaska every couple of days. The warm air associated with one of the cyclones set record high temperatures in many areas of the state.

The series of cyclones prior to September 19 generated saturated soil conditions and greater than normal glacial melt in south central Alaska. Heavy rainfall began along the southern coastline of the Kenai Peninsula on the afternoon of September 19 and spread inland overnight. Strong southeast wind, aloft during the storm, forced against southeast-facing mountain slopes of the Kenai, Chugach, and Alaska mountain ranges generated the greatest rainfall intensities. This rain caused the flooding in the areas shown in Figure 1.

The strong southeast wind also led to the typical downslope conditions west of the Chugach and Kenai mountain ranges that resulted in very little rainfall in these areas. Thus, highly variable rainfall amounts were reported.

Residents recounted being able to see surface runoff on the mountain slopes. Steep mountain terrain caused rapid runoff that carried heavy sediment loads onto flatter terrain. There, the current slowed and sediments deposited in and adjacent to the channels. The sediment deposition decreased the capacity of the channels, thereby increasing the degree of flooding. Most streams in south central Alaska crested on the 20th, 21st, or 22nd of September. The lower Kenai River on the Kenai Peninsula did not crest until September 24, then remained above flood stage for over 10 days.

Impact of the flooding includes damage to cabins, permanent homes, sewage treatment facilities, roads, trails, bridges, power transmission lines, airports, and railroad facilities. Fast currents caused significant bank erosion, channel shifting, and damage to dikes and levees. Figure 2 shows some of the impact of the flooding.

Figure 2a. Flooding in Seward.

Figure 2b. Erosion damage in Seward that cut through a street and exposed utility lines.

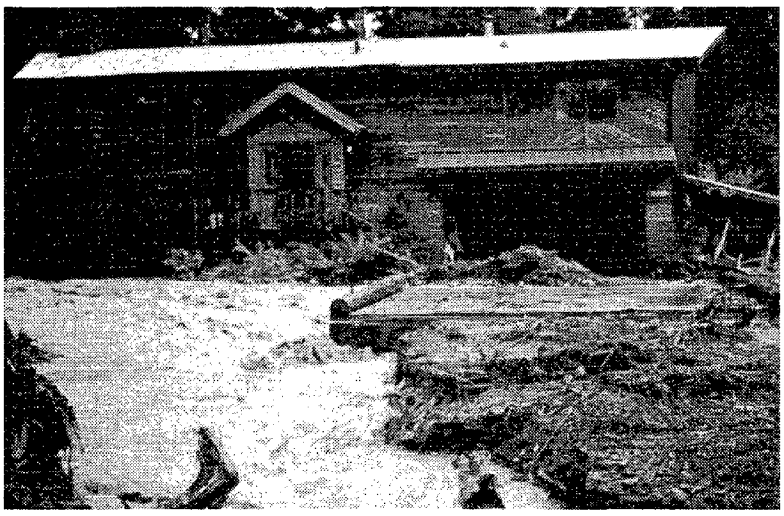

Figure 2c. Stream flowing through yard of home in Girdwood.

Chapter III

Meteorological Summary

III.1 Meteorological Origins - September 14-18, 1995

Surface analyses from the National Meteorological Center (NMC) and the Anchorage Weather Service Forecast Office (WSFO) were consistent in locating, tracking, and representing the intensity of cyclones preceding and during the flood event. These analyses are a major meteorological diagnostic information source over the North Pacific Ocean during real-time Alaska forecast operations.

Satellite information is the other major source of diagnostic information. Forecasters had been monitoring typhoon "Oscar" for several days on both the Japanese Geostationary Meteorological Satellite (GMS) and the NMC's Pacific Surface Analysis as the typhoon departed the vicinity of Japan. Cooling infrared temperatures near the center of the cyclone in the satellite imagery confirmed its extra-tropical evolution before the flood event.

Long range prognoses indicated that this cyclone could pose a problem for the state. The 0000 UTC September 16 cycle forecast from the aviation model (AVN) carried the remains of "Oscar" and a frontal cyclone initially some 1500 miles to the east southeast of Oscar to the Gulf of Alaska in the 60-hour forecast. Cyclone central pressures were 15-20 hecta Pascals (hPa) too weak in the forecasts. This is a typical under forecast for the aviation model. Cyclone positions were well forecasted by the models.

Model forecasts of quantitative precipitation and vertical air motion in the North Pacific with these two cyclones began to give indications of a large precipitation potential. Succeeding model forecasts varied in the specific handling of events and continued to under forecast cyclone central pressures. At one point, the aviation model under forecasted the intensity of the lead system by 37hPa, forecasting a weak ridge where the cyclone actually verified. All models did improve their performance closer to the onset of heavy rains.

The pattern that prevailed aloft prior to and during the flooding period was a long wave ridge along southeast Alaska with a long wave trough persisting in the western Gulf of Alaska. Shorter waves moved through the persisting trough across south central Alaska. This flow regime established a continuous flow of very warm, high moisture air ripe for precipitating on the Kenai and

Chugach Mountains.

On Sunday and Monday (September 17 and 18), very high geopotential heights aloft covered south central Alaska. Very warm temperatures, typical of a near-subtropical airmass at mid- and high-levels, resulted in unusually high freezing levels (9,000-12,000 feet) across the Prince William Sound area during this period and again during the heavy rains several days later (Figure 3). A precursor "rain storm" brought heavy rains (5+ inches) to Kodiak on Sunday and prompted a flood watch for rivers and streams in the Seward area Sunday.

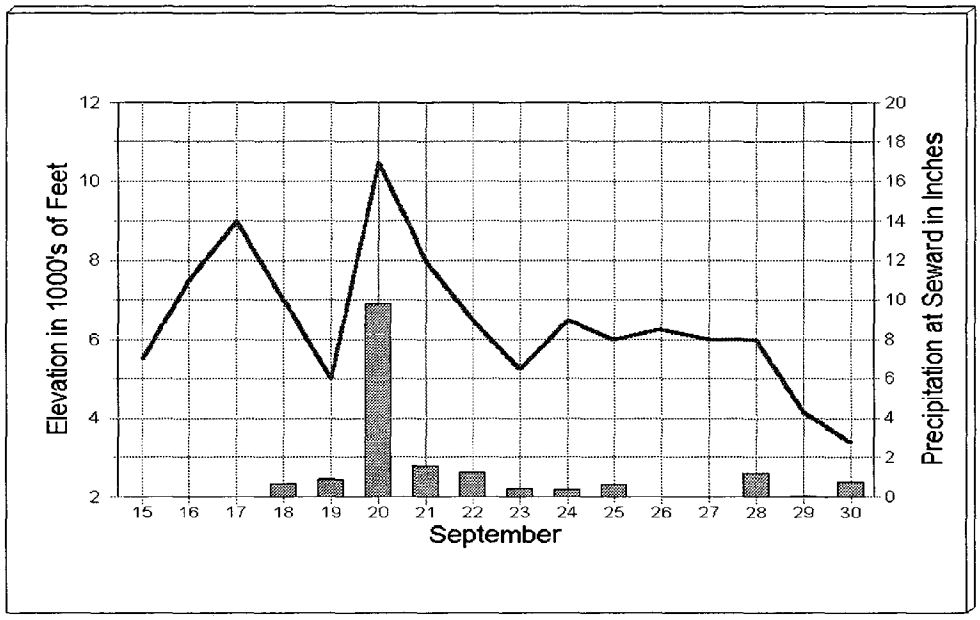

Figure 3. Approximate freezing level in south central Alaska and precipitation in Seward in September 1995.

On Monday, September 18, the lead cyclone which produced the heavy rains several days later intensified rapidly in the eastern Pacific. Central pressure fell from 994hPa to at least 978hPa on both the NMC and WSFO Anchorage surface maps. Satellite imagery at this time came from 3 sources: the Japanese GMS, the U.S. Geostationary Observational Environmental Satellite (GOES)-7, and polar satellite imagery. Water vapor channels on the GOES-7 began to show a substantial contribution of moisture to the lead cyclone from the remains of "Oscar" further to the west and northwest. All satellite imagery continued to suggest a decrease in tops of clouds associated with ex-typhoon "Oscar," indicating a diminishing threat of heavy rains.

Figures 4 and 5 illustrate the pattern which persisted for the flood event. The "bright" white cloud masses evident in Figures 4b and 4c over and approaching south central Alaska are correlated with deep concentrations of moisture and high amounts of precipitation. The Nested Grid Model (NGM) forecasts in Figure 5, which show a typical model flow pattern for this event, were generally accurate. The QPFs from the models are quite another matter. The NGM 12-hour integrated QPF valid at the 24-hour forecast time peaks at 0.42 inches over Prince William Sound. The forecast precipitation pattern is not representative of the extreme variations forced by the south central Alaska orography. This will be discussed more in detail in the description of the performance of the radar in Chapter V.

III.2 Flooding Period: September 19 - October 2, 1995

By 0000 UTC Wednesday, September 20, the lead cyclone had moved north to 360 miles south of King Salmon as a 960hPa center. A strong front extended southeast and then south from the center. Because of the subtropical origins of this lead system, the moisture content was very high.

Atmospheric temperatures were significantly higher than normal during the precipitation event. Precipitation fell in the form of rain at nearly all elevations of the mountainous terrain surrounding Prince William Sound and along the Kenai Peninsula. Dewpoints were also above normal. Strong east and southeast wind accompanied the heavy rain. South central Alaska freezing levels remained at or above 5000 feet from September 15 through September 28 (see Figure 3).

Precipitation amounts during the event were substantial, particularly along southeast-facing slopes. Strong southeast wind during the event caused substantial orographic lifting that enhanced precipitation along the mountains. Precipitation totals during the period of heaviest rain, from the morning of the September 18 through the morning of September 22, ranged from 10 to 20 inches in coastal areas, with amounts diminishing rapidly inland where down slope wind caused a "rain shadow" effect. Frequent rains persisted through the remainder of the month into early October.

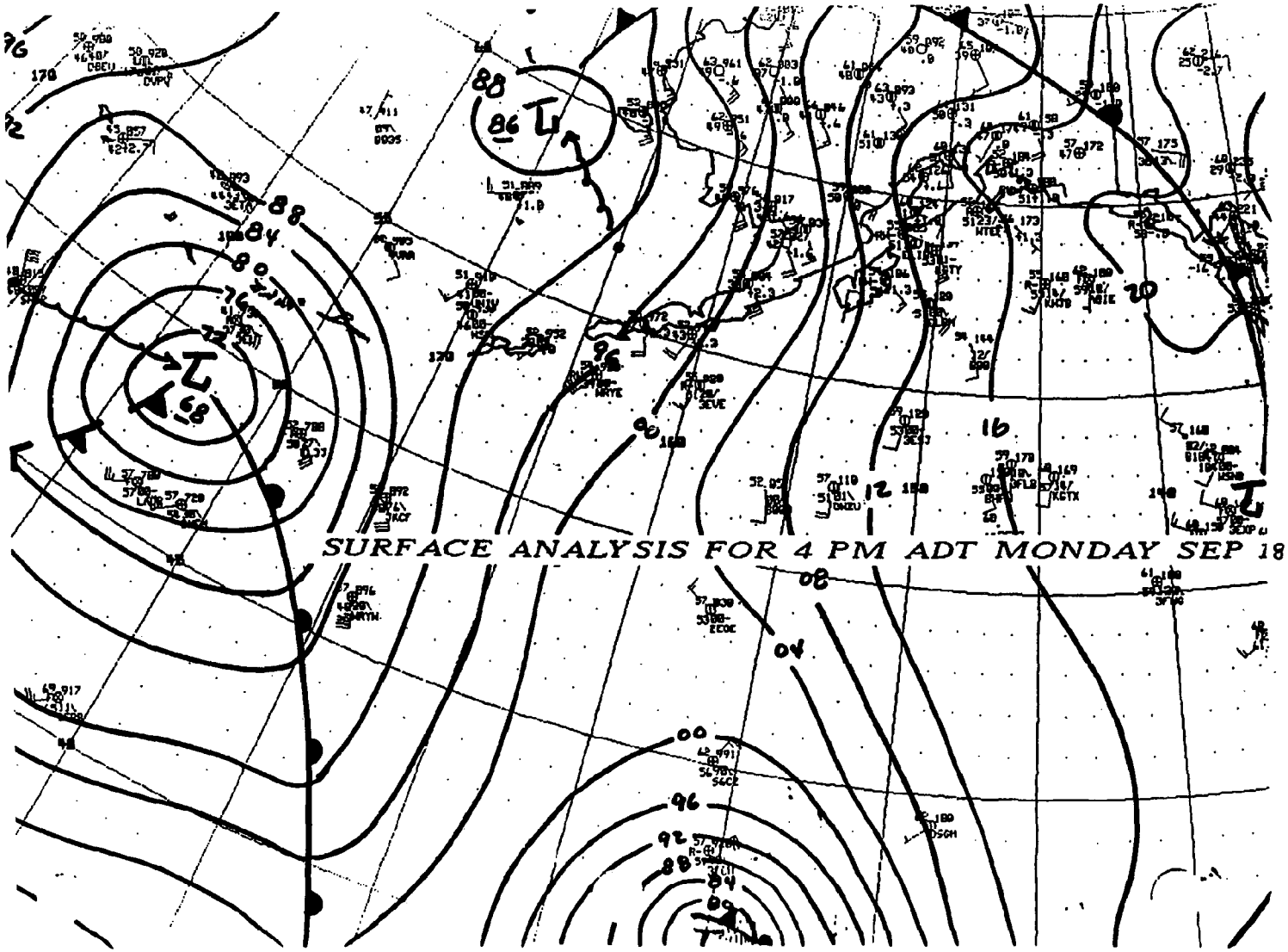

Figure 4a. Surface analysis prepared by WSFO Anchorage for data time 1600 Alaska Daylight Time on September 18, 1995 (0000 UTC September 19).

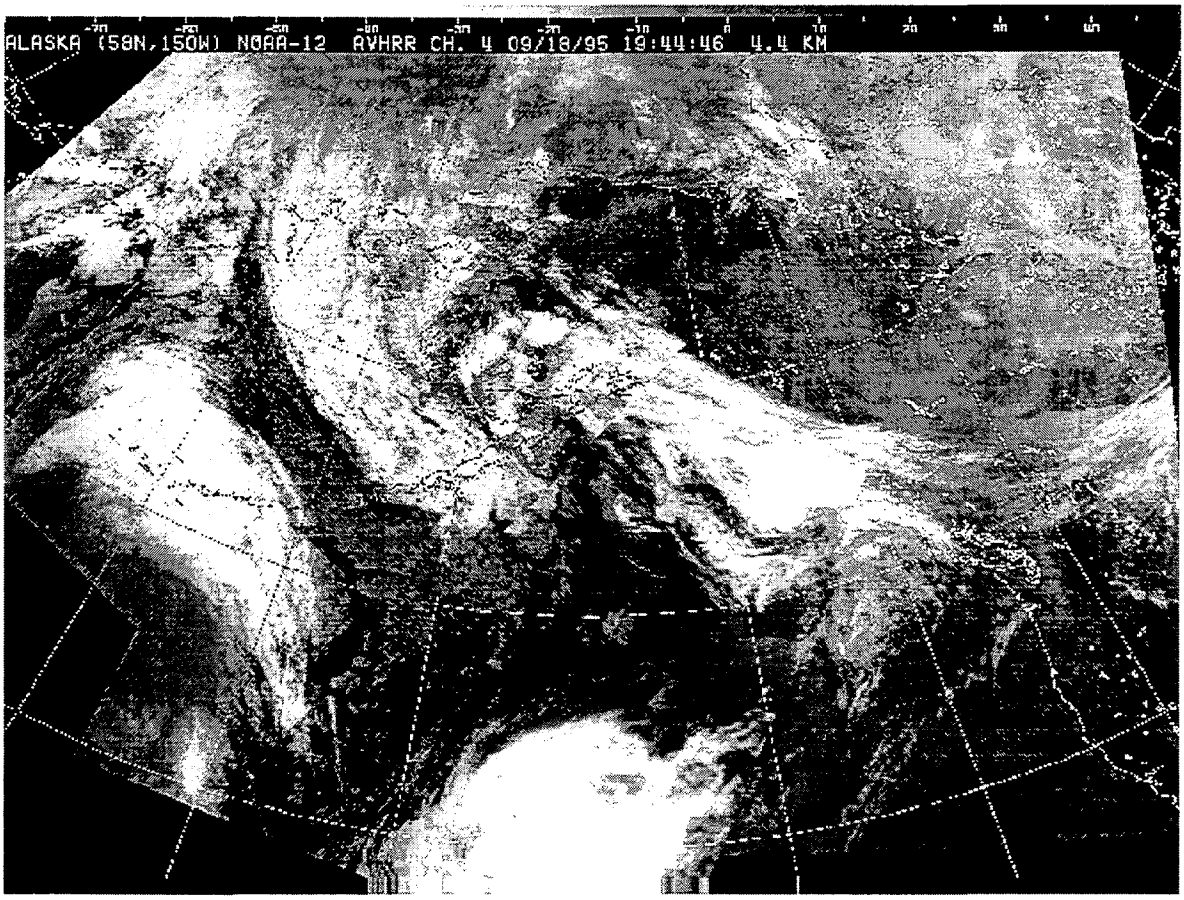

Figure 4b. NOAA-12 polar orbiter infrared (Channel 4) mosaic of 3 passes. Youngest pass is on the left with an image time of 1145 Alaska Daylight Time on September 18, 1995 (1945 UTC).

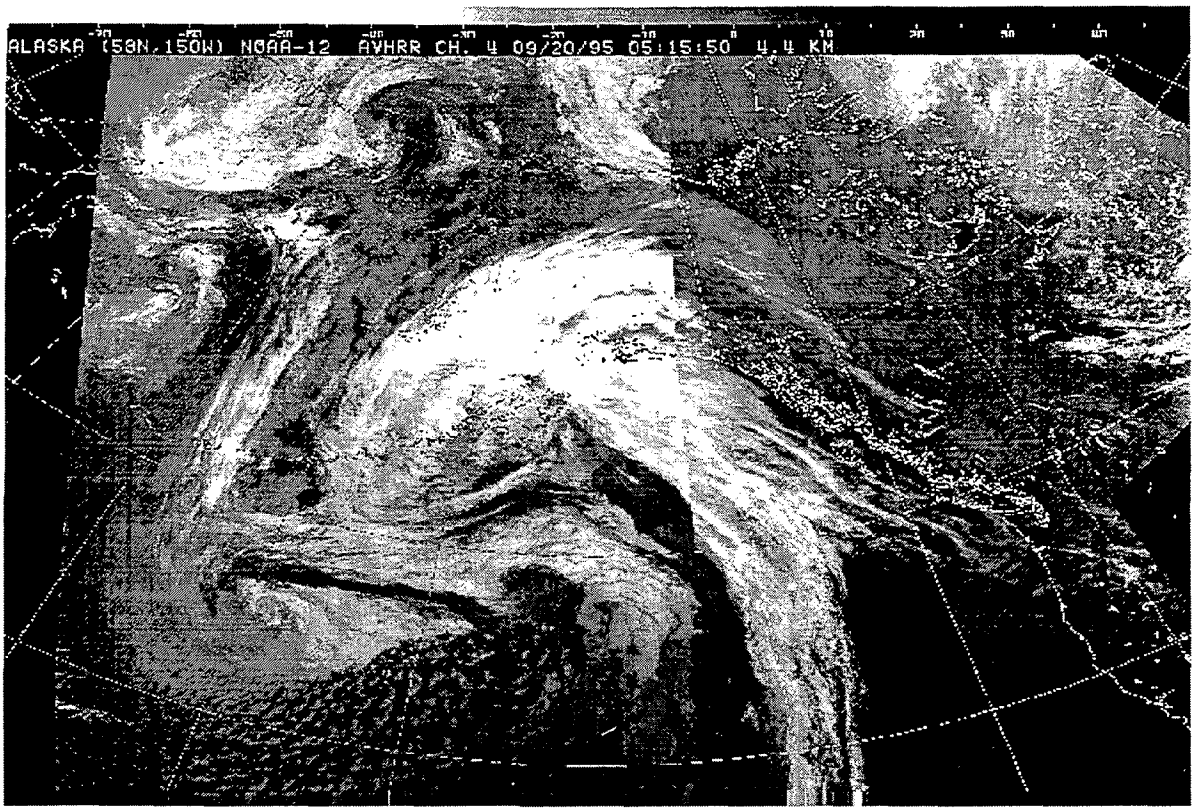

Figure 4c. NOAA-12 polar orbiter infrared (Channel 4) mosaic made up of 3 satellite passes. The left most pass is the youngest with an image time of 2116 Alaska Daylight Time on September 19, 1995 (0516 UTC September 20).

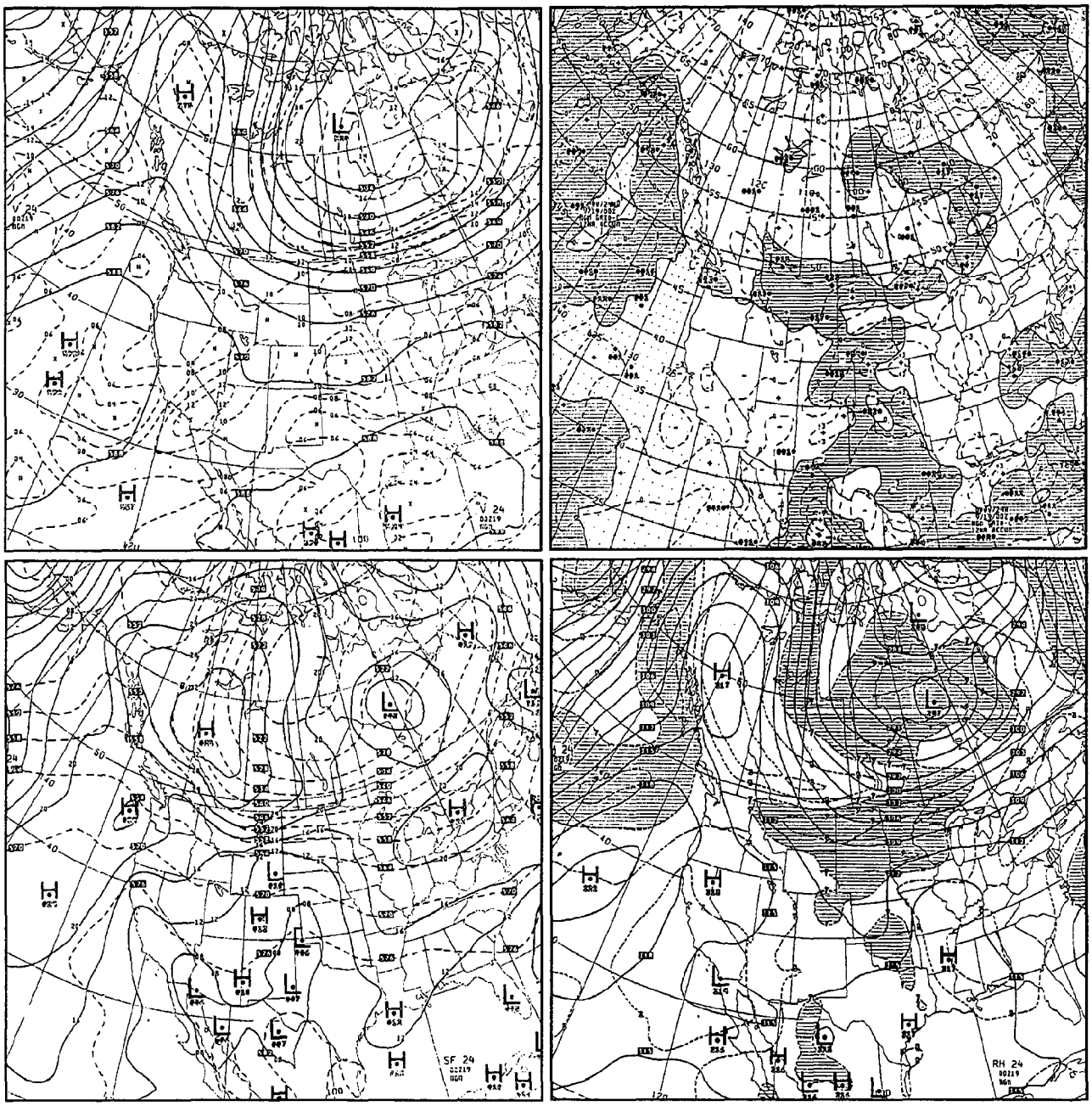

Figure 5. Nested grid model 4-panel 24-hour prognoses valid 1600 Alaska Daylight time September 18, 1995 (0000 UTC September 19, 1995). ***Upper left***: 500hPa geopotential (m) in solid, absolute vorticity in dashed; ***Upper right***:vertical velocity at 700hPa dashed and 12-h accumulated precipitation in solid; ***Lower left***: mean sea level pressure (hPa) in solid and 1000-500hPa geopotential difference in meters dashed; ***Lower right***: 700hPa geopotential (m) in solid and relative humidity (tens of percent) dashed.

Chapter IV

Hydrological Summary

IV.1 Introduction

The significant hydrologic characteristics that contributed to the flooding of streams in south central Alaska September 19 - October 2, 1995, include wet antecedent conditions, warm temperatures, sediment transport, and abundant precipitation amounts.

South central Alaska was very wet in September. For the first half of the month, coastal areas had received more than the normal *monthly* precipitation, putting these areas at twice the normal rainfall rate leading into the event. The wet antecedent conditions caused saturated snow conditions and resultant above-normal outflow from glaciers. The large flow enlarged drainage tunnels through the ice, which contributed to rapid runoff of rainfall and melt. Rainfall rates inland were slightly in excess of normal, except for the Palmer vicinity, which was less than normal.

Temperatures increased significantly during this event, causing the precipitation to fall as rain at all elevations and, coupled with high dewpoints and strong wind, increased the melt rate of glacier ice. South central Alaska freezing levels remained at or above 5000 feet from September 15 through September 28.

Precipitation amounts during the event were substantial, with the heaviest amounts on southeast-facing slopes (Figure 6). Strong southeast wind during the event caused substantial orographic forcing that enhanced the precipitation in these areas. Total precipitation during the period of heaviest rain ranged from 10 to 20 inches in coastal areas, with amounts diminishing rapidly inland (Table 1). Persistent rainy weather through the remainder of the month and into early October contributed to a slow decline of water levels in affected areas.

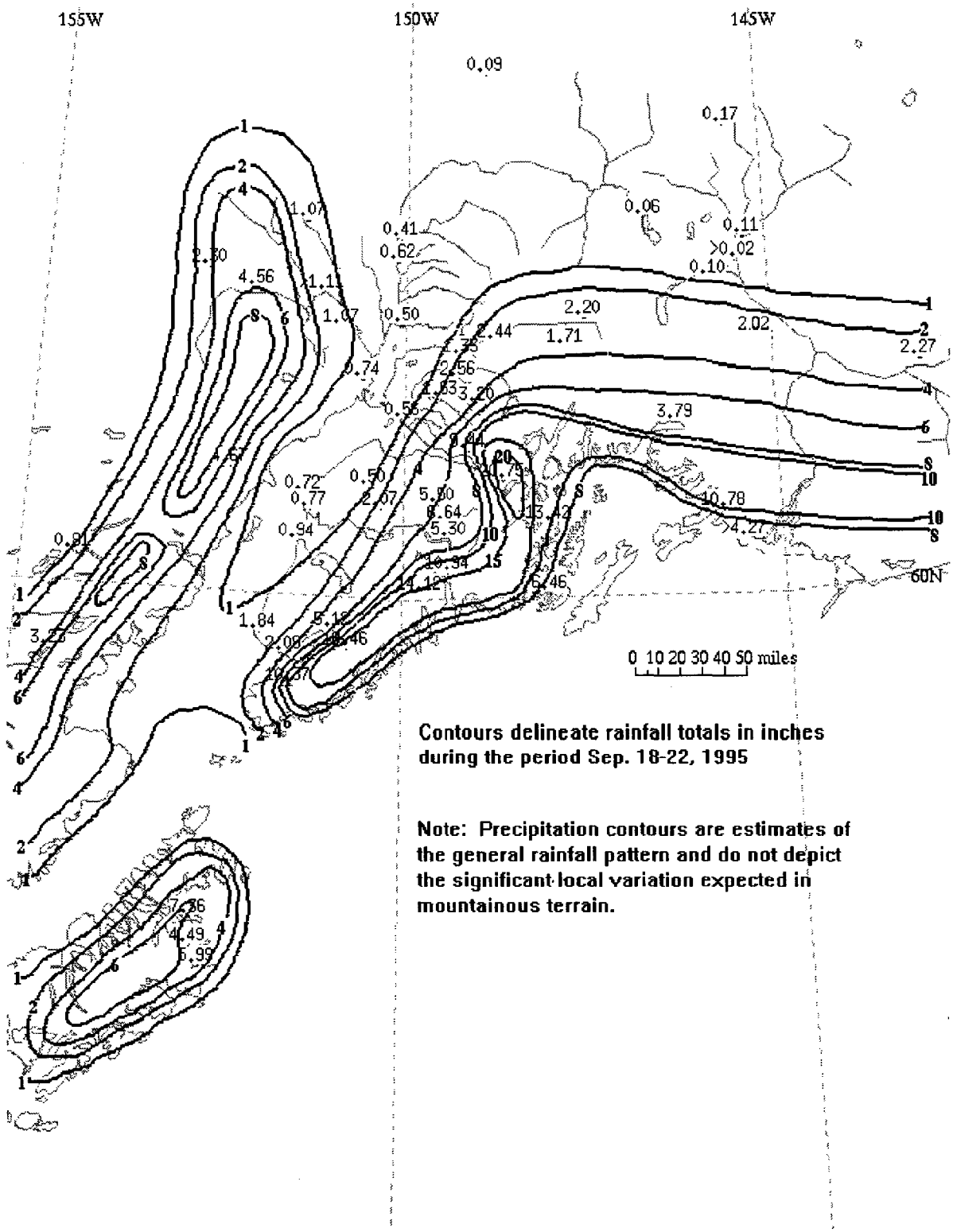

Figure 6. Precipitation totals during September 1995 event.

Table 1 Precipitation Totals for Storm and Last Half of September
(See App II, Table 4 for Locations & Table 5 for Daily Data)

Site I.D.	Location	Observn (loc std)	Sep 18-22 (inches)	Sep 17-30 (inches)	Sep Pcp (inches)	of Normal (%)
Anchorage and Chugach Mountains						
AAA	INDIAN PASS	mid	3.90	4.80		
ALYS	ALYESKA	8	9.44	11.58	6.00	386
ANC	ANCHORAGE INTERNATIONAL AIRPORT	mid	0.56	1.36	2.70	101
APU	ALASKA PACIFIC UNIVERSITY	9	0.98	1.67		
AQY	GIRDWOOD	4	6.20	>7.00		
CER	CHICHAGOF LOOP, EAGLE RIVER	msg	1.63	1.93		
EKPR	EKLUTNA PROJECT	16	>2.85	>2.99		
ER5	EAGLE RIVER 5 SE	18	2.18	2.46		
ERP	EAGLE RIVER VISITORS CENTR.	4	3.20	3.40		
GLP	GLEN ALPS	4	3.50	4.30		
LRC	LITTLE RABBIT CK.	4	2.70	3.50		
MLSC	MIRROR LAKE SCOUT CAMP	9	1.20	1.36		
PAFR	FORT RICHARDSON WTP	8	1.45	1.83		
RBT	RABBIT CK.	4	2.36	3.30		
SEG	SO FK. EAGLE RV.	4	2.09	>2.09		
TUX	TUXEDNI PARK	4	1.40	2.00		
Kenai Peninsula						
519	19 MILES NORTH OF SEWARD	7	6.34	9.24		
5WD	SEWARD, AT THE HOTEL	2	14.12	17.57	10.01	351
ABD	TURNAGAIN PASS	4	6.49	9.12		
ABM	SUMMIT CREEK	mid	5.50	7.90		
ABR	GRANDVIEW	mid	6.50	8.00		
APT	ANCHOR RIVER	8	>1.58	>2.82		
APT1	ANCHOR RV. NR ANCHOR PT.	4	1.84	3.06		
BRM	MIDDLE FK BRADLEY RIVER	mid	>2.31	>3.59		
BRRE	BRADLEY RESV. OUTLET	mid	6.55	8.74		
BRT	BRADLEY RIVER @ TIDEWATER	mid	5.12	6.26		
CLK	COOPER LAKE	mid	7.60	9.00		
COLK	COOPER LAKE PROJECT	15	6.86	>8.77	5.31	>330
ENA	KENAI FAA AIRPORT	4	0.77	2.33		
EXT	EXIT GLACIER VISITOR CENTER	17	10.54	14.49		
GLC	GLACIER CK. @ BRUNO RD.	4	10.94	12.26		
H9E	HOMER 9 EAST	18	1.85	3.00		
HCOV	HALIBUT COVE, SOUTH OF HOMER	9	>5.06	>6.23		
HOM	HOMER	mid	2.09	3.15	3.29	191
K9N	KENAI 9 NORTH	7	0.72	2.09		
KASI	KASILOF	7	0.94	2.22	3.01	148
KMR	KENAI MOOSE PENS	mid	0.50	1.30		
LWG	TRAIL RV. NR LAWING	4	5.30	7.90		
MPAS	MOOSE PASS	17	6.64	10.34		
MYS	MYSTERY CK. @ KENAI NWR	4	2.07	2.88		
PRK	NUKA RIVER @ PARK BOUNDARY	mid	18.46	22.86		
SILV	SILVER LAKE NEAR MOOSE RIVER	7	1.36	1.93		
SWD	SEWARD ASOS	mid	>2.42	>5.31		
SXQ	SOLDOTNA	4	0.20	0.33		
TUT	TUTKA BAY LAGOON	15	10.37	16.47		

Table 1 Precipitation Totals for Storm and Last Half of September

(See App II, Table 4 for Locations & Table 5 for Daily Data)

Site I.D.	Location	Observn (loc std)	Sep 18-22 (inches)	Sep 17-30 (inches)	Sep Pcp (inches)	of Normal (%)
Kodiak Island and Western Cook Inlet						
5BI	BIG RIVER LAKES	21	4.67	7.72	5.52	280
ADQ	KODIAK- KODIAK ISLAND	mid	4.49	>6.27	6.99	>179
CHIN	SOUTH COAST OF KODIAK ISLAND	19	5.99	>12.18		
INT	INTRICATE BAY	18	3.23	4.16	4.39	190
OUZ	OUZINKIE	7	7.36	11.16		
Z30	PORT ALSWORTH	18	0.81	1.27	2.49	102
Matanuska and Knik Basins						
5WO	LAZY MOUNTAIN	7	2.44	2.69		
AK42	SUTTON 2 EAST	13	1.74	1.89		
ANDL	ANDERSON LAKE	7	0.73	1.07		
LSU	LITTLE SUSITNA RIVER	7	1.33	>1.70		
LSUS	LITTLE SUSITNA LARC	4	1.20	1.20		
MAES	MATANUSKA AGRI EXP STATION	9	2.56	2.88	2.43	237
MAG	GLACIER PARK- MATANUSKA GLACIER	8	1.71	1.81		
PAES	PAMER IAS	9	1.58	1.79	2.50	143
PAQ	PALMER MUNICIPAL AIRPORT	4	>1.68	>1.68		
SUT	SUTTON LARC	4	>2.3	>2.3		
WAS	WASILLA CREEK AT HYER ROAD	8	1.26	>1.48		
WAS3	WASILLA 3 SOUTH	17	0.74	0.98	2.84	69
Susitna Basin						
5HR	HAYES RIVER	16	4.56	5.89		
ACR	SU RIVER AND ALEXANDER CK CONFL	8	0.74	>1.50		
CANT	CANTWELL 2 EAST	20	0.09	0.39		
CLAK	CHELATNA LAKE	8	1.07	2.21		
LAK	YENTNA RIVER AND LAKE CK CONFL	9	1.07	>1.48		
PTI	PUNTILLA LAKE	16	2.30	2.95	3.27	180
SKW	SKWENTNA	16	>1.11	>1.48	3.31	>89
SUN	SUNSHINE	9	0.62	1.18		
TKA	TALKEETNA	20	0.41	>1.36	4.23	>64
TML	TWELVE MILE LAKE	4	0.00	0.00		
WIL	WILLOW CREEK AT WILLOW	8	0.50	0.87		
WILW	WILLOW WEST	11	>0.45	>0.74		
Copper River Basin						
5GN	TAHNETA PASS	17	2.20	2.37		
5PX	PAXSON	20	0.17	0.66		
GAK	GAKONA	9	0.11	0.39		
GKN	GULKANA FAA	4	>0.02	>0.02		
KCAM	GLENNALLEN KCAM	9	0.10	0.67	1.30	103
LKSU	LAKE SUSITNA	17	0.06	0.38		
MXY	MCCARTHY 3 SOUTHWEST	18	2.27	2.77		
TON	TONSINA	7	2.02	2.28	1.24	368
Prince William Sound and Gulf of Alaska Coastline						
5WT	WHITTIER	21	20.75	31.05		
CDN	CORDOVA NORTH	14	10.78	15.60		
CDV	CORDOVA	4	>4.27	>7.49	13.78	>109
MAIN	MAIN BAY	10	13.42	22.31		
PTSW	PORT SAN JUAN	12	6.46	11.80		
VWS	VALDEZ	mid	3.79	>5.61	8.37	>134
YAK	YAKUTAT	mid	6.98	>11.59	18.65	>124

IV.2 Data Acquisition

Steep, mountainous terrain contributes to highly variable precipitation patterns. Stream flows in steep mountains respond rapidly to precipitation. Numerous and strategically placed real-time stream and rain gauges are required to ascertain hydrologic response. The real-time stream and rain gauge network in the areas impacted by this event is sparse with an average of about one stream gauge per 1000 square miles and one rain gauge per 750 square miles (Figures 7 and 8).

Stream gauges that are read manually by observers typically have a lower temporal resolution than automated gauges because the observer is not always available to read the gauge. Such gauges are scheduled to be read and the readings telephoned to the RFC once per day, with more frequent readings and reports during significant water level rises. The frequency of readings and reports at manual sites ranged from daily to hourly during the event, with most sites providing only one or two readings per day. Some river stage observers also measure and report precipitation amounts.

Automated gauges are realistic alternatives in Alaska because of mountainous and people sparse locations. Data transfer from on-site sensors is by telephone, satellite, or meteorburst technologies. Automated gauges provide high temporal resolution of data and data are available within a few minutes to a few hours of the reading.

Cooperative observers for the NWS climate program measure precipitation daily, but do not routinely report the data until the end of the month when they send in their written report of the data. This is useful for post-event analyses, but not available when forecasting the event.

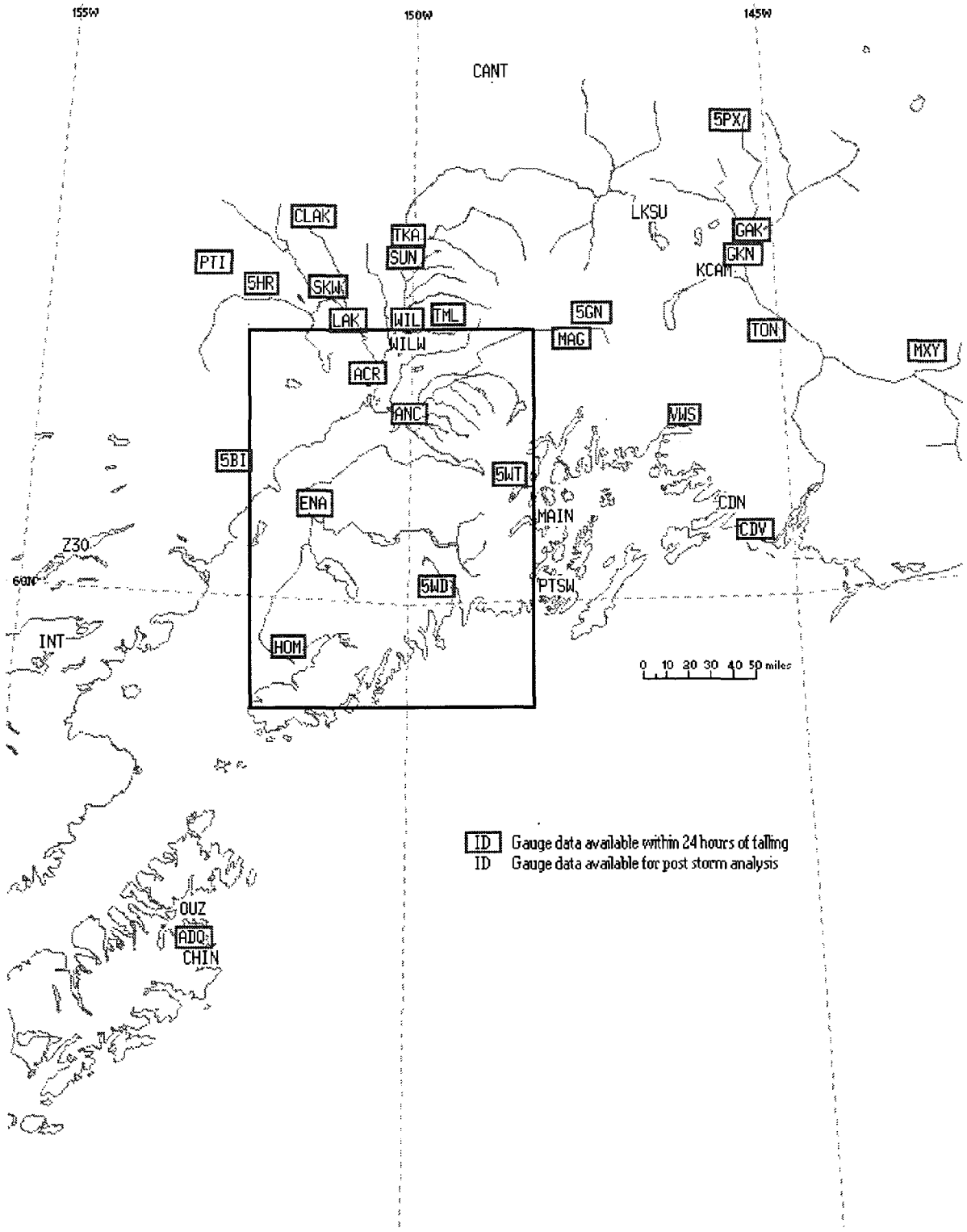

Figure 7. Location of precipitation gauges in south central Alaska (see Figure 8 for gauges inside inset box).

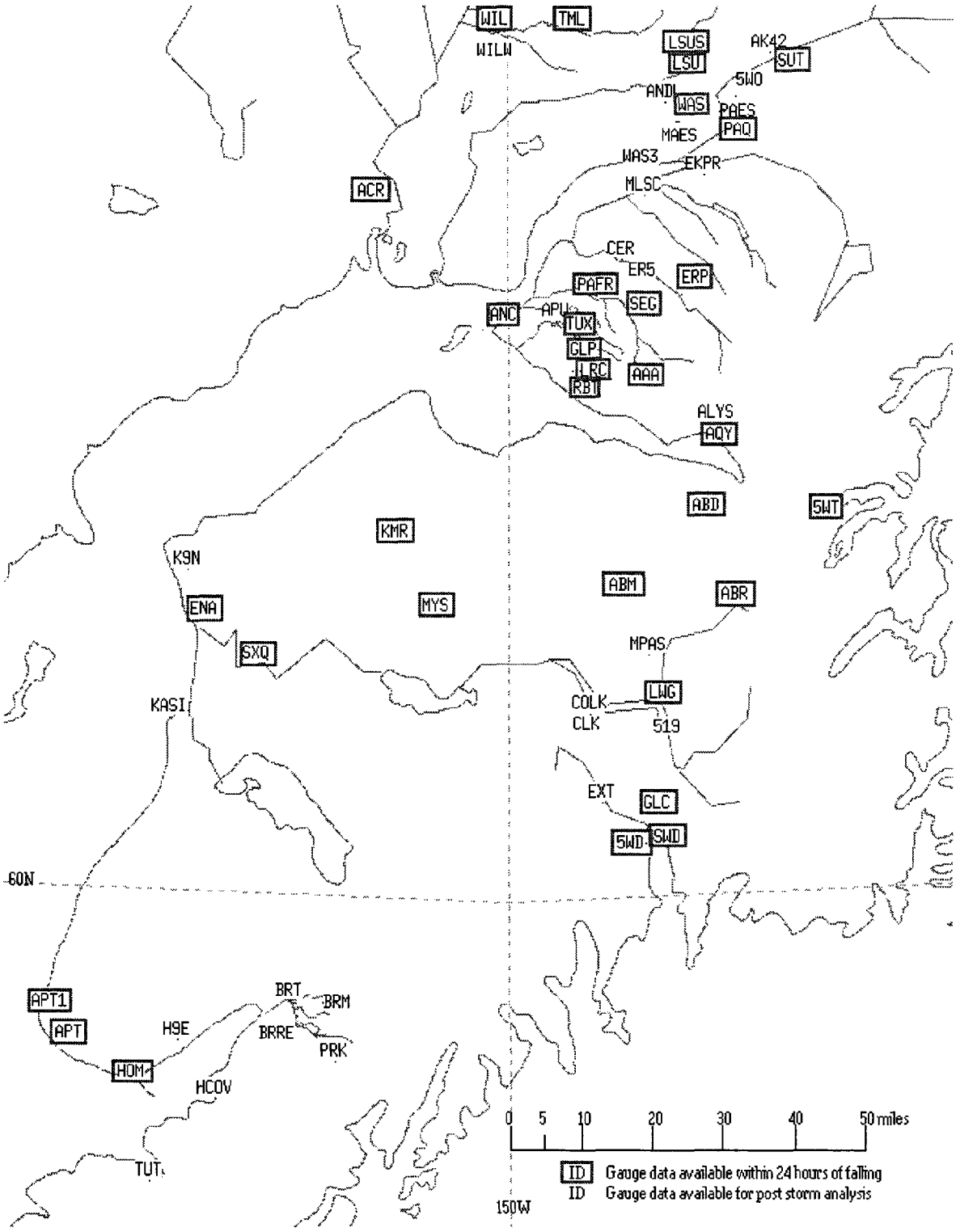

Figure 8. Location of precipitation gauges in Palmer, Anchorage, and Kenai Peninsula areas.

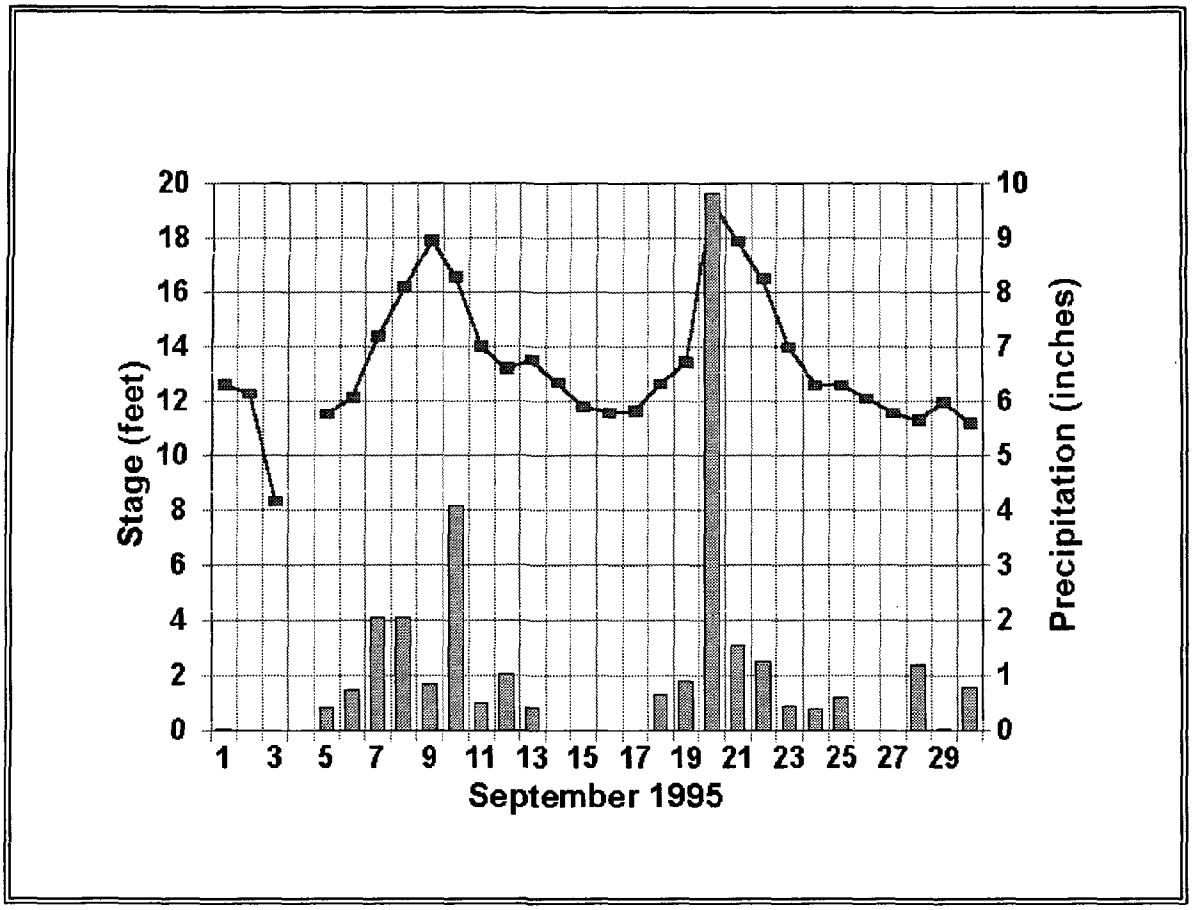

Figure 9. Resurrection River stages at Exit Glacier Road bridge and precipitation at the Seward Hotel.

IV.3 Hydrologic Characteristics

IV.3.1 Seward Area

September was also a very wet month in the Seward area. Rain gauges in the area collected from 4 inches north of Seward to 12 inches in town during September prior to the 17th. This caused saturated soil conditions that lead to increased runoff from rainfall. Rain two weeks prior to this flood event caused minor flooding on Resurrection River (Figure 9) and area streams.

On the night of September 19-20, the Resurrection River began to rise sharply due to high intensity rainfall (Figure 9). Although rainfall intensities are difficult to ascertain due to the poor spatial and temporal resolution, it appears that the recurrence interval is approximately 50 years for the 24-hour duration (Table 2). Freezing levels were also high, which increased the glacial melt contribution to the river. At 10 a.m. on September 20, the Resurrection River crested after rising over 8 feet at the Seward Highway bridge in 30 hours; this is approximately 4 feet above flood stage. Numerous other streams in the Seward area also flooded. Severe bank erosion and deposition were

reported. Roads were closed and standing water flooded numerous low lying areas. Flood damage was reported at the Lowell Creek bridge, University of Alaska Marine Center, airport, small boat harbor, and sewage and power facilities. Water levels on the Resurrection River and local streams receded very slowly and it was not until September 22 that the flood warning was canceled.

Table 2 Rainfall Amount, Time of Occurrance, and Estimated Recurrence Interval at Selected Sites

Precipitation Duration	1 hr	2 hr	3 hr	4 hr	5 hr	6 hr	12 hr	24 hr	36 hr	48 hr
Kodiak										
Time of Observation	20/00z	20/01z	20/02z	20/02z	20/02z	20/03z	20/09z	20/20z	21/08z	21/20z
Precipitation	0.38	0.73	1.04	1.39	1.64	1.81	2.20	2.69	3.07	4.08
Recurrence Interval	1	1	2			1	1	1		<2
Bradley Lake Dam										
Time of Observation	20/11z	20/12z	20/12z	20/12z	20/12z	20/12z	20/14z	21/02z	21/11z	21/23z
Precipitation	0.27	0.54	0.75	1.00	1.24	1.51	2.37	3.62	3.84	4.36
Recurrence Interval	<1	<1	<1			1	1	2		2
Seward										
Time of Observation		20/18z		20/20z			20/18z	21/00z	21/12z	
Precipitation		1.26		2.50			6.76	9.29	10.69	
Recurrence Interval		5					50	50		
Glacier Ck nr Seward										
Time of Observation	19/18z	19/18z	19/18z	19/12z	19/13z	19/14z	19/20z	20/05z	20/17z	21/05z
Precipitation	0.34	0.65	0.97	1.27	1.50	1.75	2.99	5.81	7.34	8.34
Recurrence Interval	<1	<1	<1			<1	1	5		5
Lawing										
Time of Observation	20/10z	20/11z	20/12z	20/13z	20/14z	20/15z	20/21z	21/03z	21/15z	22/03z
Precipitation	0.30	0.50	0.70	1.00	1.20	1.30	2.50	3.80	4.60	4.80
Recurrence Interval	<1	<1	<1			<1	2	2		2
Turnagain Pass										
Time of Observation	20/09z	20/10z	20/11z		20/13z	20/14z	20/20z	21/04z	21/15z	22/00z
Precipitation	0.40	0.60	0.90		1.30	1.60	2.60	4.20	5.20	5.50
Recurrence Interval	5	2	5			2	5	25		10
Whittier *										
Time of Observation								21/06z		22/06z
Precipitation								10.92		14.01
Recurrence Interval								50		25
Girdwood										
Time of Observation	20/09z	20/10z	20/11z	20/12z	20/13z	20/14z	20/20z	21/03z	21/14z	21/22z
Precipitation	0.50	0.80	1.20	1.40	1.60	1.80	3.20	4.60	5.30	5.60
Recurrence Interval	25	10	10			5	25	50		25
Eagle River Visitors Center										
Time of Observation	20/19z	20/20z	20/20z	20/20z	20/20z	20/20z	20/20z	21/08z	21/20z	22/08z
Precipitation	0.20	0.40	0.50	0.70	0.80	1.00	1.60	2.30	3.00	3.20
Recurrence Interval	<1	1	1			2	2	5		10
Matanuska Glacier Park										
Time of Observation	21/13z	21/13z	21/13z	21/13z	21/13z	21/13z	21/13z	22/01z	22/13z	23/01z
Precipitation	0.30	0.40	0.50	0.60	0.60	0.80	1.40	1.70	1.70	1.80
Recurrence Interval	5	2	2			2	5	5		2
Hayes River *										
Time of Observation								21/00z		22/00z
Precipitation								2.83		3.83
Recurrence Interval								10		10
Valdez										
Time of Observation			21/12z			21/15z	21/15z	22/09z	22/09z	22/09z
Precipitation			0.65			1.01	1.33	2.43	3.10	3.36
Recurrence Interval			<1			<1	<1	<1		<2
Cordova Town *										
Time of Observation								21/23z		21/23z
Precipitation								6.02		8.32
Recurrence Interval								1		2

* Observed on a 24-hour interval

IV.3.2 Kenai River Basin

Heavy rain in the upper Kenai River basin beginning September 18 caused the Kenai River to begin rising. Water levels on the Kenai River were above flood stage at all locations by the 22nd (Figure 10). Water levels crested at Cooper Landing on the upper river on September 23 and at Kenai Keys and Soldotna on the lower

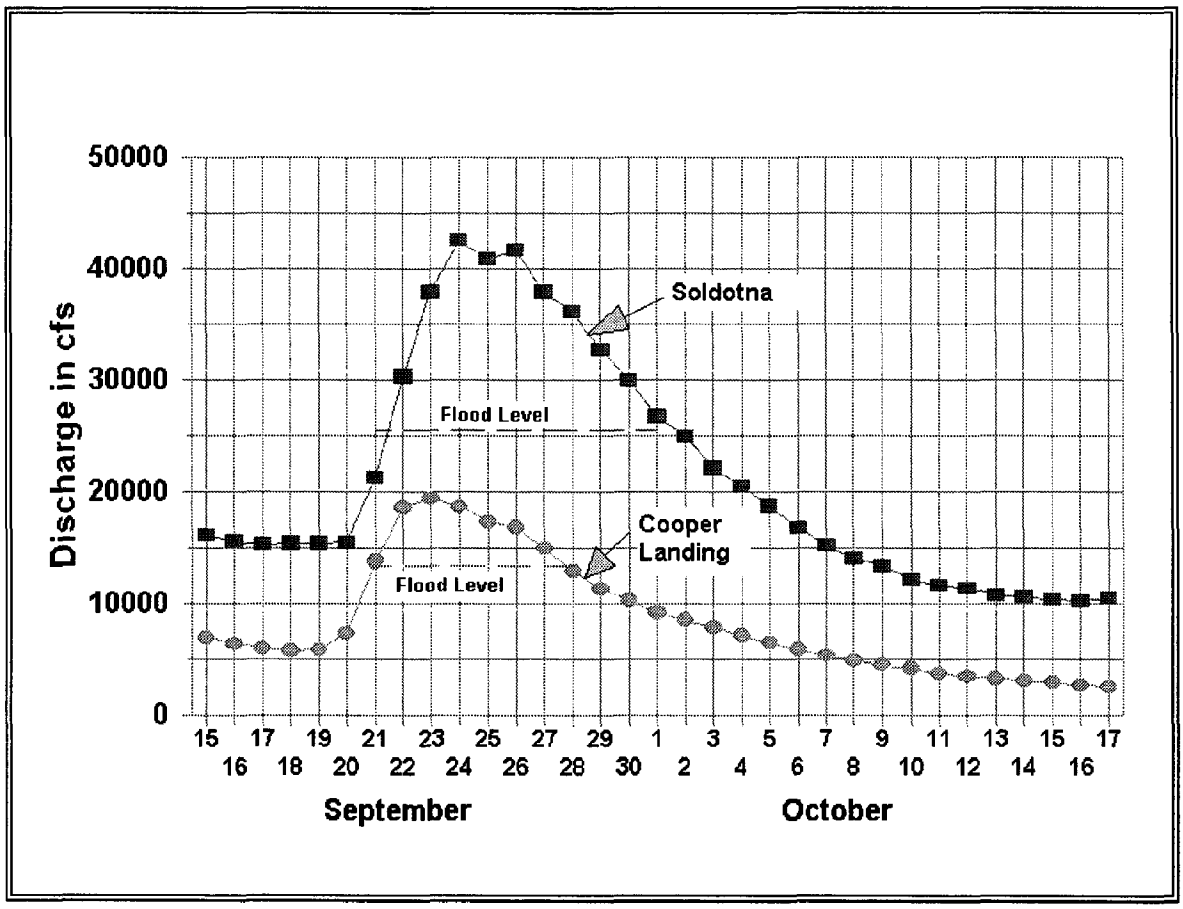

Figure 10. Kenai River discharges during flood event.

river on September 24. At the time of the crest, water levels were 2.1 feet above flood stage at Cooper Landing, 3.5 feet above flood stage at Kenai Keys, and 2.5 feet above flood stage at Soldotna. The peak discharge at Soldotna was estimated at 42,300 cubic feet per second (cfs), which has a recurrence interval of >100 years (Table 6 in Appendix II). The highest recorded discharge in 30 years of record at Soldotna prior to this event was 33,700 cfs, which resulted from a combined rainfall and glacier dammed lake release on September 9, 1977. Water levels

fell below flood stage on September 28 at Cooper Landing and on October 2 at the Kenai Keys and Soldotna.

Based on a preliminary analysis of the resulting hydrographs at Cooper Landing and Soldotna, runoff in the upper basin above Cooper Landing would have been on the order of 7 inches. The entire basin runoff is estimated to be on the order of 4.5 inches. If the intervening area is split between mountainous and non-mountainous terrain, approximately 7 inches of runoff from the mountainous terrain and 1 inch of runoff from the non-mountainous terrain would correspond with the reporting rain gauge sites and produce the required volume.

Post analysis of all the precipitation gauges has indicated that about half of the flood runoff came from the area to the south of the Kenai River, including the Harding Icefield. This means that runoff from the basins of tributaries such as Cooper Creek, Russian, Skilak, and Killey rivers was substantial. Runoff from the Juneau Creek and Moose River basins is unquantifiable, but they appear to drain areas that received much lighter amounts of rain.

One unique aspect of this event is the possible large role of the runoff from the Harding Icefield. The following information leads to the conclusion that rainfall runoff from the icefield (differentiating between rainfall runoff and snow/ice melt runoff), was large:

1. **Freezing levels** ranged from 6000 to over 9000 ft during the September 18-23 period. Much of the icefield was bare ice or firn. Precipitation from this warm, sub-tropical storm fell as rain, even at the highest elevations over the icefield.

2. **Tustumena Lake** rose over 3 feet, leading to minor flooding on the Kasilof River, during this same time period. With precipitation gauges in that area only recording light amounts of rain, the only other source of this runoff was drainage from the icefield.

3. **Exit Glacier Ranger Station** received 10.5 inches of rain from September 18-22. Exit Glacier Creek, which only drains Exit Glacier and some unknown area of the Harding Icefield, rose roughly 5 feet from September 17 to September 20 before the gauge washed away. This rise represents close to a order of magnitude increase in the flow from the glacier.

4. **Bradley Lake Hydroelectric Project,** located southwest of the Harding Icefield in similar terrain, received substantial inflow to the lake during this event. A precipitation gauge near Nuka Pass collected 18.5 inches of rainfall from September 18-22.

The reason why this rainfall runoff from the Harding Icefield is unique is that, in general, large glaciers and icefields act as storage elements in the hydrologic budget of a basin, storing snow and rain, to slowly release it sometime later. Rainfall on a unsaturated snowcover is absorbed by the snow much the same as dry soil absorbs infiltrating water. In the case of the Harding Icefield in mid-September, snowcover on the ice was at its minimum for the year and crevasses were abundant. In addition, firn layers would likely have been saturated and at the freezing point due to previous warm rains. In late summer, most glaciers have enlarged englacial/subglacial water conduits since the summer's meltwater enlarges these conduits faster than the plastic strain rate closes them. What this means, hydrologically, is that heavy rain is able to pass through the englacial/subglacial drainage systems on the order of days instead of weeks, with little loss of volume in transit. The contribution from the Harding Icefield to the flooding of the Kenai and Resurrection Rivers is unknown exactly, but is most likely significant.

IV.3.3 Chugach Mountains Basins

During the early morning hours of September 20, Glacier Creek and other streams in Girdwood rose sharply. By mid-morning, overbank flooding and severe bank erosion had caused damage to various structures and roads. The peak flow at California Creek was estimated to have a recurrence interval of about 50 years (Table 6 in Appendix II). Channel deposition and erosion was severe on Glacier Creek and other local streams. The 24-hour precipitation of 4.6 inches measured in one gauge had an estimated recurrence interval of 50 years (Table 2). On September 21 streams were receding and the flood warning for Girdwood was canceled.

Periods of moderate to heavy rain in the Chugach Mountains on September 20-21 caused Ship Creek, Eagle River, Peters Creek, Eklutna River, Hunter Creek, and other tributaries to the Knik River to rise sharply. Debris accumulated on the bridge pier on Hunter Creek that caused severe erosion of the abutment that resulted in bridge failure. Bridge failure and abandonment due to channel shifting were also reported in the upper Eklutna River

basin. The lower Knik River continued to rise until early September 21, when it crested, inundating the Old Glenn Highway on the north approach to the Knik River bridge. Low-lying areas were flooded, including homes in the Wind Song Subdivision. Significant sediment loads were transported by steep mountain streams. The loads were deposited as stream gradients reduced, covering roads in some locations. The recurrence interval of the peak flow on the Knik River, Eagle River, and Peters Creek were estimated by U. S. Geologic Survey (USGS) to be >500 years (Table 6 in Appendix II).

IV.3.4 Western Susitna Basin

Heavy rain during September 19-21 in the Alaska Range and in the Tordrillo Mountains caused the Skwentna and Yentna Rivers as well as Lake Creek to rise sharply. The Yentna River at its confluence with Lake Creek rose over 10 feet and flooding was reported at numerous locations. The Skwentna River flooded numerous structures in Skwentna on September 21. Damage to the Skwentna airport was reported. The Yentna River began flooding structures on September 21. Water levels receded slowly and the flood warning was canceled on September 25.

IV.3.5 Cordova, Valdez, and Richardson Highway Areas

Rain began in the Valdez and lower Copper River areas on September 19, with the greatest intensities on September 20 and September 21. Rain in the Valdez area brought streams out of their banks on September 21. Water flowed over the Richardson Highway in several locations and threatened a bridge in the Lowe River Canyon, forcing a road closure. Water also flowed over sections of the Copper River Highway near Cordova and flooded some homes in Cordova. A previously existing problem with a migrating channel of the glacial Scott River near Cordova was made worse by the rains, contributing to the flooding in Cordova. The lower Copper River reached record high levels on September 23 that threatened the historic Million Dollar Bridge. The flood warnings for the Valdez and Cordova areas were canceled on September 22, while a flood watch for the Tonsina vicinity remained in effect until September 24.

Chapter V

WSR-88D Performance

V.1 Introduction

A new Weather Surveillance Radar-1988 Doppler (WSR-88D) was installed in Kenai during the fall of 1993. This radar was upgraded with a Federal Aviation Administration (FAA) redundant (two-channel) system in June of 1995. This meteorological radar with improved sensitivity and resolution gives forecasters real-time information on wind and precipitation. The WSR-88D uses precipitation echoes from one of the lowest four slices to calculate a rainfall intensity. The rainfall intensity is summed over time to create one hour, three hour, and storm total accumulations. These three products are then available in the form of color graphic display for the forecasters to examine.

During the flooding period, forecasters were able to use the radar to determine areas with persistent, heavy rain. These areas included the Kenai Mountains, the Chugach Mountains, and the eastern slopes of the Alaska Range. However, accurate rainfall totals are difficult to determine because surrounding mountain ranges block the radar signal and the real-time rain gauge network is inadequate for calibration.

Portions of the event were archived on Archive Level IV. Archive Level II is unavailable on the FAA radars in Alaska. Other problems included system outages at the radar during periods before the event and for brief periods during the event. At least one forecaster mentioned that problems with the radar communication lines also caused brief outages during the event. Additionally, the newness of the radar and the lack of any earlier heavy rain events meant that forecasters had few experiences using the radar during flooding situations.

V.2 Beam Blockage

The Kenai WSR-88D is located to the northwest of the Kenai Mountains and to the southwest of the Chugach Mountains. This greatly reduced the effectiveness of the radar precipitation products, because the heavy rains which occurred were predominantly confined to the eastern and central portions of the Kenai and Chugach Mountains. This will be a continual problem for stratiform precipitation which is often, as in this case, greatly enhanced by orography and typically falls predominately

on the southeastern slopes of the Kenai Mountains.

Except for a few gaps, beam blockage from the Kenai Mountain Range occurs over most of the lowest slice, which is 0.5 degrees elevation angle (Figure 11). Therefore, the precipitation algorithm automatically selects the next higher slice, 1.5 degrees elevation, to compute rainfall estimates over the opposite side of the mountain range. Elevations of the 1.5 degree slice range from 10,000 to 21,000 feet mean sea level (MSL) over the Kenai Mountains and their southeastern slopes are shown in Figure 12. This results in three major problems which leads to a significant underestimate of rainfall totals. First, 1.5 degrees elevation places the radar beam above the areas of heavy orographically enhanced rainfall. Secondly, the radar beam was above the freezing level, where reflectivity returns from frozen precipitation are much less than from liquid precipitation. And lastly, any partial beam blockage of either slice eliminates a percentage of the return, which will also lead to underestimation.

Radar precipitation products also indicated the presence of heavy rain on the eastern slopes of the Alaska Range. This area was in an up-slope flow region to the west of the radar and rainfall estimates for this area may have been more accurate because no beam blockage was occurring.

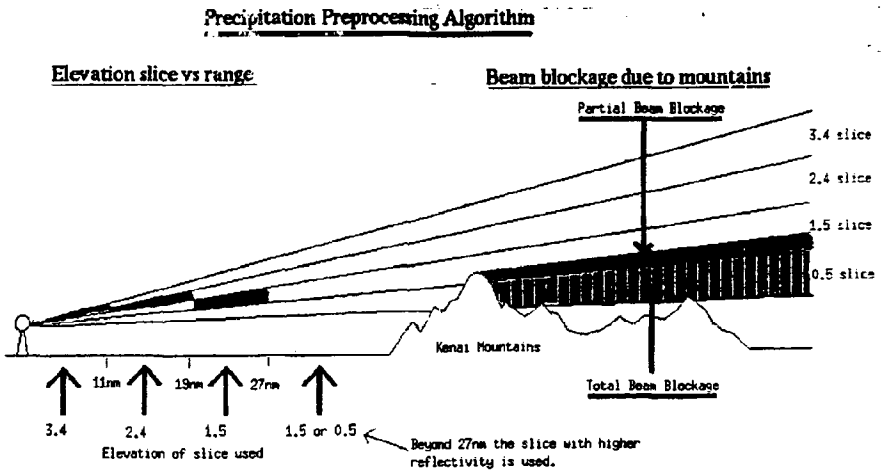

Figure 11. Precipitation preprocessing algorithm characteristics in response to beam blockage because of mountains.

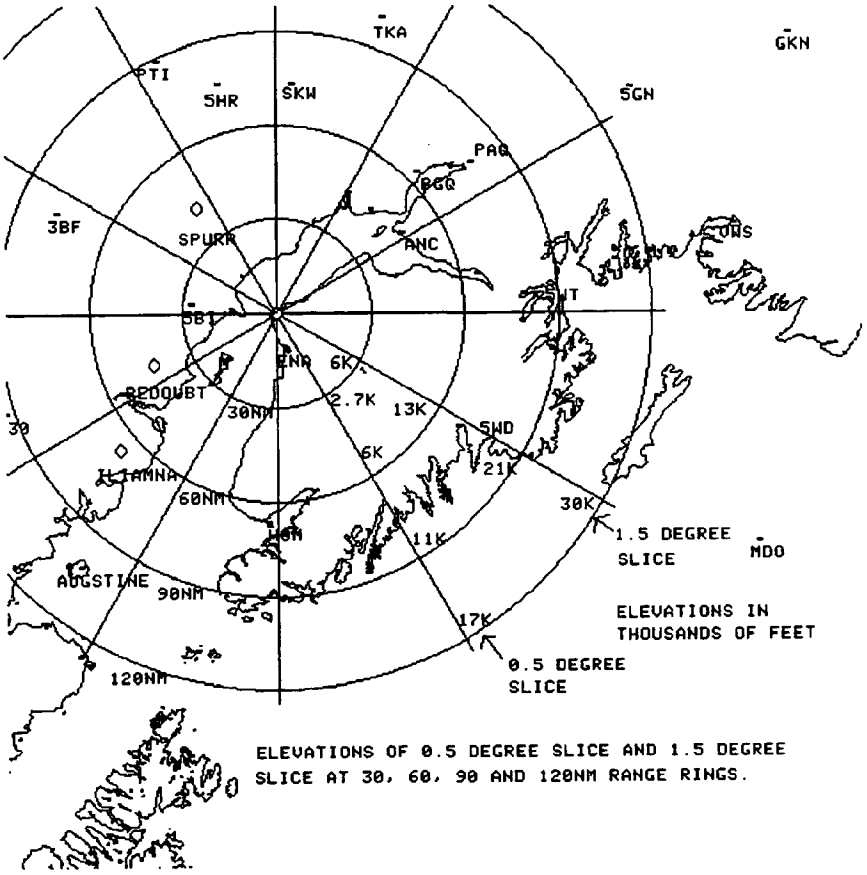

Figure 12. Elevations of 0.5 degree slice and 1.5 degree slice at 30, 60, 90 and 120mm range markers.

V.3 Gauge Comparison

The radar products underestimated the rainfall at all gauge locations in the central and eastern portions of the Kenai Mountains (Figure 13). However, this was expected due to the beam blockage. Real-time gauge precipitation data, plotted in Figure 13, shows comparative gauge data under the radar umbrella is very limited. Only a few gauges are available in the Kenai Mountains, and none of these are available in an area where no beam blockage of the lowest beam occurs. As mentioned earlier, in most cases the 1.5 degree elevation slice will be too high to produce accurate precipitation products. Another problem is that the Hourly Digital Precipitation Accumulation product is not yet available from the Alaska radars.

The only locations where radar data can be compared to gauge data are west of the Kenai and Chugach Mountain ranges. However, this was an area on the leeward side of the mountains that experienced very little rainfall due to down slope conditions.

Only very crude comparisons can be made to gauge data because the Digital Product is not available. Build 7.0 software was running at the WSR-88D at the time of the event. With this version, the data levels for precipitation are at a set scale which is designed for heavy convective precipitation. Total gauge rainfall over the lower elevations and on the leeward side of the mountains from the September 18 to September 22 ranged from near one-half inch to about two inches. Eight of 12 selected gauges in this area were within the range of the displayed data levels on the Storm Total Precipitation product.

V.4 Bright Band Contamination

The precipitation products during this event appeared to have been partially contaminated due to the high reflectivity returns in the melting layer. Determining whether or not bright band contamination is occurring is much more difficult due to the topography around the Kenai radar than at many other radar sites. Mountain ranges are located to the northwest and southeast of the radar at similar distances. With heavy rains normally occurring over the mountains, this creates a higher precipitation pattern in a slight arc over both mountain ranges. In a strong southeasterly flow, down sloping occurs on the western slopes of the Kenai Mountains and can extend across much of Cook Inlet. This leads to an echo return minimum over the lower areas and around the radar.

Determining whether higher returns are a reflection of the melting layer or orographic enhancement is very difficult due to the lack of gauges in the mountains. This event was a case where the radar products indicated larger rainfall totals occurring in areas in which the 0.5 and 1.5 degree slice would have been traveling through the melting layer. This would suggest that the precipitation totals from the radar would overestimate the rainfall in these areas. No gauge data were available from any of these areas to verify the radar data.

The radar uses a Bi-Scan Maximization beyond 27 nautical miles (nm) to select the radar slice to use for determining rainfall. When both the 0.5 and 1.5 degree slice are available, the slice which has the higher reflectivity is used to compute precipitation estimates. A semicircular pattern was visible in

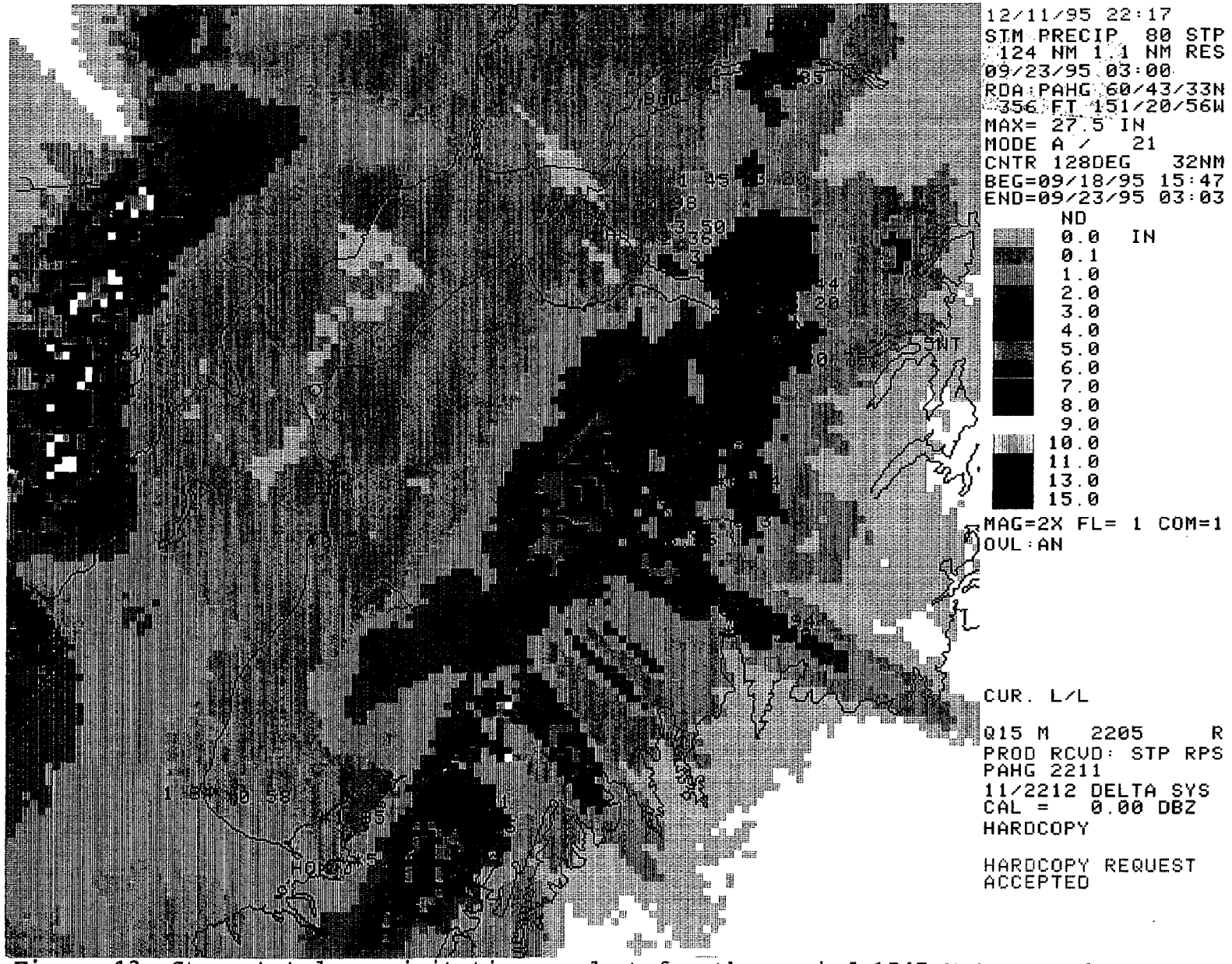

Figure 13. Storm total precipitation product for the period 1547 UTC September 18 to 0303 UTC September 23, 1995. Precipitation amounts from gauges are also plotted.

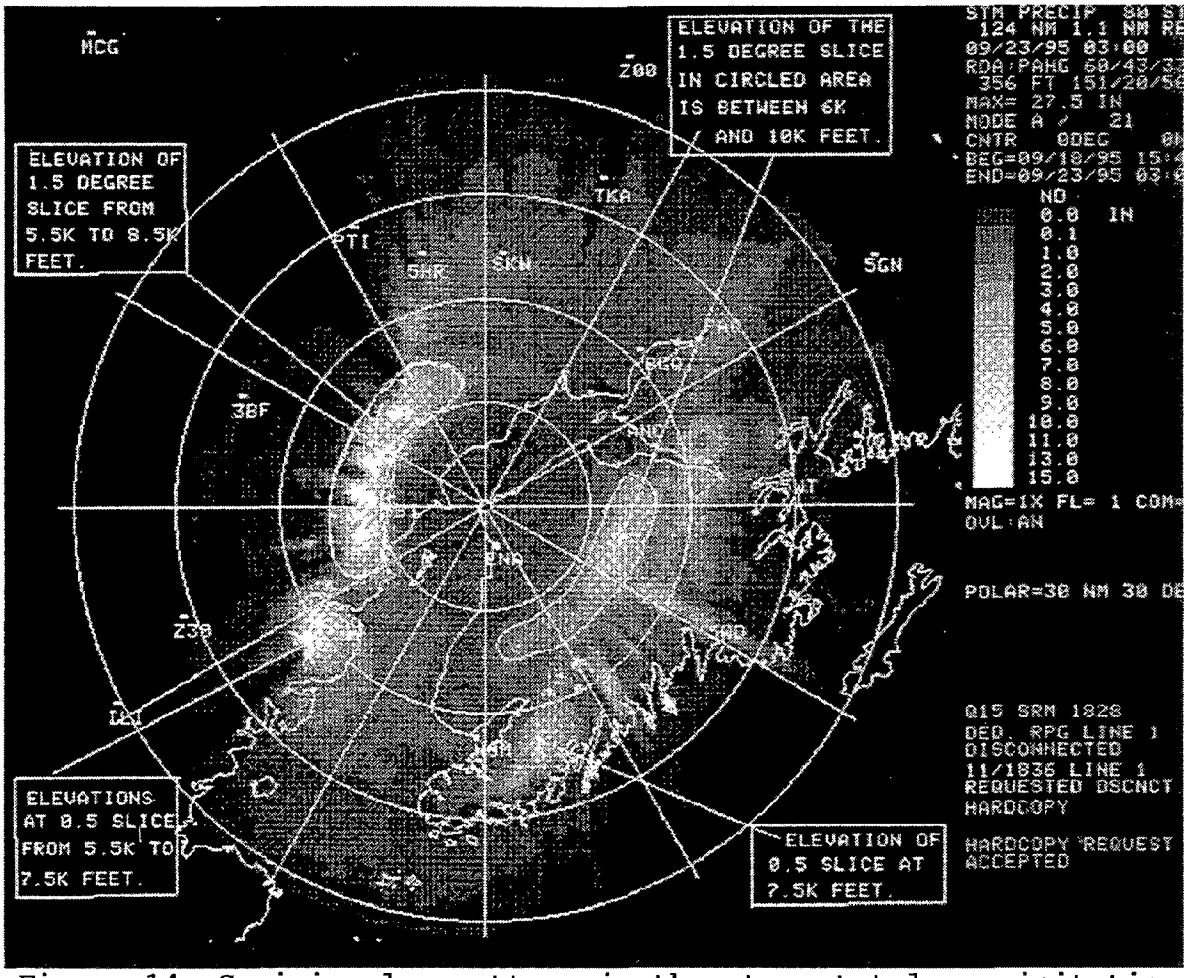

Figure 14. Semicircular pattern in the storm total precipitation product.

the Storm Total Precipitation product (Figure 14). Higher precipitation totals were evident to the northwest and southeast of the radar between the ranges of 35 and 45 nm. This area matches a level of near 7500 ft at the 1.5 degree slice. A second semicircular area of high totals is visible from 60 to 70 nm to the east through south and to the southwest of the radar. At the 0.5 degree slice, this area would also appear near the melting level at 6200 ft to the southwest and 7500 ft to the southeast. The second semicircular pattern to the southeast of the radar is broken up where most of the rain totals were created from the 1.5 degree slice due to the beam blockage of the 0.5 degree slice.

V.5 Conclusion

The WSR-88D radar provides an abundance of new information which

has never been available to the forecaster. However, precipitation products need to be calibrated with ground truth from real-time rain gauges.

Rainfall amounts in areas which have partial beam blockage may improve as terrain data is scheduled to be added to the radar. This will help correct for beam blockage by adding additional reflectivities in areas which contain up to 50 percent beam blockage. For the eastern slopes of the Kenai Mountains, where total beam blockage occurs, the radar products will need to be supplemented with satellite-derived rainfall estimates and gauge data.

In this event, partial and total beam blockage from the Kenai Mountains resulted in the radar precipitation products greatly underestimating the rainfall in the central and eastern mountains. This was because the second elevation slice of the radar was scanning above the freezing level and above the areas of orographically enhanced precipitation.

It was possible that bright band contamination occurred over the central and western Kenai Mountains. This would have led to an overestimate of precipitation; however, the beam blockage in these areas led to an underestimation that countered this effect. The lack of any gauges in appropriate locations made it impossible to quantify the real effects of bright band contamination.

Chapter VI

Flood Preparedness

VI.1 Introduction

The primary mission of the NWS is the issuance of hazardous weather and flood warnings in order to reduce the loss of life, injury, and property damage resulting from natural disasters. However, the NWS also conducts a preparedness program to go beyond just the issuance of warnings. Preparedness programs are usually composed of at least four major activities: (1) coordination with local agencies to establish good communications, (2) organization and training of spotter groups and rainfall observers, (3) identification of areas vulnerable to specific hazards, and (4) a public hazardous weather and flooding education program. Moreover, the successful accomplishment of these programs depends upon the cooperative efforts between NWS field offices and local government officials, private organizations and the general public.

The WCM position at the Anchorage WSFO was filled in 1994. This is a new NWS modernization position at each WSFO. The responsibilities of the WCM include developing and maintaining the preparedness program, as listed above. The WCM position is recognized in the NWS as vital to a vigorous and healthy preparedness program.

The DOH is another NWS modernization position recently filled at the RFC. The DOH teams with the WCM in the area of flood preparedness.

The findings and recommendations in this flood report will serve as a target of significant opportunity and focus for the WCMs and the DOH in the Alaska Region.

VI.2 Coordination with Local Agencies

Strong lines of communication are necessary between the NWS, local agencies, and the media. In Alaska, these agencies are borough and city emergency management agencies and law enforcement departments. These local agencies are often the first to either observe hazardous weather or flooding events or to receive reports from the public. The NWS receipt of these on-site reports provides "ground truth" which can verify previous warnings or be the basis for the issuance of new warnings.

On the other hand, local agencies must receive hazardous weather and flood forecasts and warnings consistently from the NWS in order to respond to the events. It is important that information flows freely in both directions between the NWS and these agencies.

Local authorities were aware of reports of heavy rain and of flooding conditions in some areas, but did not provide the reports to the NWS.

Several means of communication are used to distribute the NWS hazardous weather and flooding information. NWS watches, warnings and statements are transmitted over NOAA Weather Radio (NWR) and NOAA Weather Wire Service (NWWS), and can be transmitted by telephone with facsimile or voice. However, the telephone is considered to be the least efficient and the least preferred of these methods because only one person or agency can be contacted at a time.

It was the understanding of the NWS that NWS flood watches, warnings, and statements were re-transmitted to affected agencies and relevant media by ADES upon notification. The affected community and associated media would receive watches, warnings and statements from ADES. It was learned after the flood that it is not ADES policy to re-transmit NWS products except those pertaining to spring breakup and tsunami products. Thus, some communities needed to rely on regional and statewide radio/TV media for flood information.

The news media generally broadcasted the flood watches and warnings in a timely manner. In fact, many of the residents interviewed were aware that a flood watch was in effect for their local area prior to the onset of the flooding. These residents stated that they received the watch through television and commercial radio, but were not inclined to take any immediate action.

VI.3 Organization and Training of Spotter Groups

Spotter groups organized to collect hazardous weather, rainfall, and high stream level observations can provide "ground truth" information during events and can also serve as a source of vital information for local short-fuse community action.

The RFC has a network of stream water level observers in Alaska. However, few of the observers were located in the headwater

areas, which experienced the greatest precipitation. Moreover, as many as half of the observers did not have rain gauges.

River observer training has been conducted by sending instruction sheets to each observer and by conducting on-site training sessions.

VI.4 Identification of Areas Vulnerable to Flooding

Although flood warnings from the NWS were issued for all flooded areas, many people did not react to the warnings due to the lack of knowledge of the immediate threat to life and property. Specific information needs to be disseminated to the public to identify the location and magnitude of flood problems along the river.

VI.5 Public Education Program

The NWS conducts a public education program concerning weather and flooding hazards. However, emphasis in public education awareness in recent years has not been directed toward flooding safety.

VI.6 Emergency Services Relationships

Routine interagency activities among the emergency services agencies, the forecast offices, and the RFC are essential in developing smooth coordination and efficient information flow during hazardous events. The agencies need to know the NWS's hazardous event operating procedures. Similarly, the NWS operating facilities need to know the emergency services agencies' operating procedures.

Two-way information flow is essential during the hazardous events to exchange information concerning the event. Information flow when hazardous events are not occurring is just as essential but takes a different form. There should be continuous and routine interaction between the forecast offices, the RFC, and the emergency services agencies to develop a close working relationship and understanding of the other's procedures.

This flood event makes it clear both the hazardous event and the routine activities between the NWS and the emergency service

agencies need significant improvement. For example, the ADES organizes emergency event exercises to drill the state's emergency response services. These include earthquakes and hazardous releases. The Alaska Tsunami Warning Center (ATWC) participates in the earthquake exercises and its warning system has benefited. The WCMs and the RFC should work with the ADES to design and drill the emergency response associated with major hazardous weather and flood events.

During the flood event survey activities, the survey team met several times with the ADES and borough emergency services staff. These meetings were extremely valuable in developing an understanding of each others procedures and operations as well as for comparing and sharing lessons from the flood event.

Chapter VII

Warning Services

VII.1 Introduction

This chapter presents a summary of the warning services provided by the NWS during the September flooding. A detailed chronology of the events and NWS actions is provided in Appendix I. Products issued by the NWS are also provided in Appendix I.

There were no fatalities attributed to this flood. There were no serious injuries reported as a result of the flooding. The impact of the flood was extensive damage to public and private property.

VII.2 WSFO and RFC Operations Support Environment

The environment in which the forecasters and hydrologists were working during the flood impacted the services provided. Included in the environmental factors are the office space, computer systems, data acquisition, and communications systems.

VII.2.1 WSFO/RFC Facility

The WSFO and RFC moved into a new building during the second week in September, just shortly before the flood event began. Forecasters and hydrologists were in new surroundings and had new supporting equipment such as telephones, fax machines, and printers. Some routine supplies were unavailable or took the staff longer to locate. The unfamiliarity of the operations staff with the new office and its organization was likely the cause of some delays and occupied forecaster time. This will be remedied as forecasters gain familiarity with their new surroundings.

VII.2.2 System Environment

The WSFO and RFC have been working in a Unix operating system based workstation and network environment, known as the ARONET, for several years. A Prime mini-computer, which had been the basic computer support system since the early 1980s, was also in the network. The Prime had served as the sole applications and database support system until the introduction of the ARONET beginning in 1993. At the time of the flood, the Alaska Region was nearing the end of a multi-year project to migrate all support systems off the Prime computer completely. Some key

support features, however, still remained on the Prime during the flood event.

Precipitation data were being decoded and accessible only through the non-Prime database. The data processing software had not yet been perfected which created errors in the decoding and the transfer of the data. Some storm precipitation data had to be manually decoded which slowed down the process. Other key meteorological parameters at certain sites were displayed on the new workstations in ways which the operations staff were unfamiliar. The result of these inefficiencies during the flooding further limited the amount of data easily available to operations.

VII.2.3 Data Acquisition

Chapter IV presented the hydrologic perspective of the precipitation and river gauge network in the flooded area. That chapter pointed out the real-time sparsity of precipitation and river gauge measurements. There are, however, precipitation gauge data from a large number of sites that are not available in real-time. Most of the non-real-time sites send in written reports at the end of each month, while many private and other government agencies do not provide the data to the National Weather Service at all. These non-real-time precipitation reporting sites need to be brought into the real-time data collection system to support the entire hydrometeorological operation. The increased density of gauges could improve the quality of flooding forecasts and the forecasts of meteorological hazards.

VII.2.4 Spotter Information

Spotters are people who voluntarily report both routine and significant weather events to the WSFO. Their reports supplement existing observations and often provide critical information during hazardous weather and flooding events. Routine and significant river information can be reported to the RFC by spotters who also can observe river conditions. In addition to volunteer spotters, paid observers often report significant events over and above their routine responsibilities.

The spotter network supporting the WSFO Anchorage is extremely limited. Other than a handful of significant event reports from observers, it is generally dependent upon spontaneous reports from the public.

The responsibilities of the new WCM at the Anchorage WSFO include

developing the spotter network. This flooding event can serve as a springboard to build and maintain an improved network.

There is another source of significant event reports that was unavailable to the WSFO and RFC operations staff during the flood. Following the flood, the ADES provided the Flood Report group with a copy of their Flood-Incident Log (Appendix IV). This Log is part of the ADES' new emergency services information systems described later in **Chapter VIII (Dissemination)**. On scene reports of flooding and heavy rain reaching the ADES' Emergency Operations Center were routinely included in the Log. Very little of these potentially valuable real-time reports reached the WSFO/RFC operations except perhaps through verbal remarks during discussions between the RFC and the ADES staff.

VII.2.5 Communications

The communications systems influenced the warning services in three ways: (1) telephone communications failure, (2) inter-office communication, and (3) communication with the public:

(1) Telephone communication failure: All telephones in the new forecast office were inoperable for a critical period of about 2-3 hours on the morning of September 21. A hydrologist had to drive to his home nearby to report the outage to the telephone company. The outage prevented the verbal flow of information into and out of the WSFO and the RFC during a hazardous event.

(2) Inter-office communication: The WSFO communicates meteorological information and qualitative precipitation forecasts, when included, to the RFC through the Anchorage Forecast Discussion (see Appendix I). Operational interaction between the WSFO and the RFC staff is informal and left to the initiative of the staff. During this flood event, the hydrologist or the hydrometeorological analysis and support (HAS) forecaster on duty at the RFC would periodically consult with the WSFO lead forecasters to determine the latest meteorological picture.

(3) Communication with the public: There was an extremely high number of telephone calls from the public for information during the flooding. More than 1000 calls per day came into the WSFO and RFC during the busiest period between September 21 - 23. There were frequent periods when all available staff in the RFC, including the Regional Hydrologist and the secretary, were on the telephone at the same time. During these periods, the staff were unable to accomplish their hydrologic analyses and forecast product preparation operations. Incoming telephone calls were a

significant impact on the warning and forecast services during the flooding.

A high volume of telephone calls is not surprising during such a major event. However, this may reflect on a larger dissemination problem. Following sections and chapters document the flood information products issued by the RFC and the WSFO. There was plenty of information, but there may have been difficulties in getting the information to the public. This is discussed in the next chapter on dissemination.

VII.3 WSFO and RFC Joint Operations

The current Regional Operations Manual Letter (A-08-92) assigns hydrologic responsibilities for issuing Flood/Flash Flood Watch and Warning products for the WSFO Anchorage hydrologic services area (HSA) to the RFC when the RFC is in operation.

Because the RFC has had the responsibility over the years, staff at the WSFO Anchorage are not routinely involved in and have limited knowledge about the hydrologic warning program. During the evening and nighttime hours when the RFC is not normally operating, the WSFO is responsible for issuing hydrologic products. WSFO forecasters can call the hydrologic forecaster at home to discuss flood threats during these hours. In most of these cases, the hydrologic forecaster issues the flood product. On other occasions, guidance is given to the WSFO forecaster who then issues the product.

A new Service Hydrologist position was filled at the Anchorage WSFO in mid-1994 as a part of the NWS modernization. The Service Hydrologist is responsible for developing and maintaining hydrologic operations at the WSFO by (1) training WSFO forecasters in hydrologic operations, (2) developing and maintaining a hydrologic observing network and the flow of data from the network into the WSFO, and (3) developing and maintaining the WSFO hydrologic service program. The Service Hydrologist had completed most of the training required for the position at the time of the flood and was just starting to have an impact on the WSFO hydrologic operations.

The precipitation forecast information provided to the RFC by the WSFO was through (1) the Forecast Discussion, which was qualitative, and (2) through discussions between the WSFO lead forecaster and the RFC staff. The latter was generally a review of the precipitation forecasts from the NMC models and a recommendation by the lead forecasters as to which was the best model QPF. The NMC models and model QPFs available during the

flood were:

- Aviation in 12 hour intervals out to 72 hours,
- Medium fine range in 24 hour intervals out to 240 hours,
- eta (80km) in 6 hour intervals out to 48 hours,
- Nested grid model in 12 hour intervals out to 48 hours,
- Limited fine mesh in 12 hour intervals out to 48 hours.

None of these models sufficiently resolve the south central Alaska orography to provide useful QPF guidance. The precipitation pattern generating the flood was dictated by the orography as was shown in **Chapter V.** The new 48km eta, which resolves the orography much better, was not available to operations in Alaska at the time of the flood. Products from the 48km eta model will be available to forecasters beginning mid-1996.

A formal QPF program to support the RFC had not been implemented in the Alaska Region at the time of the flood. Planning for such a program had already begun in August 1995 at a meeting involving the Alaska Region SOOs and Regional staff. The program is planned for operational implementation in 1996.

The SOO is another new position at each WSFO resulting from the NWS modernization. The SOO is responsible for staff training and introducing new science, technology, and applications into operations. They focus on keeping the staff scientifically up to date on the latest developments in operational forecast methodologies and will be important in the development of a QPF program.

VII.4 RFC Warning Services

During the flood event, the RFC increased their hours of operations from 10 hours to 17 hours a day. The RFC staff prepared and transmitted public release hydrologic products, faxed products to ADES and other selected agencies, and communicated with ADES by telephone.

The products issued by the RFC are provided in Appendix I. The three main criteria for evaluating the warning service during this flood event are: **(1) the timeliness of the products, (2) the content of the products, and (3) the dissemination of the products.**

VII.4.1 Product: Timeliness

The timeliness of the products is summarized in Table 3. The table lists product lead time, defined here as the time between the first issuance of a product alerting of high water potential and the time when flooding was first reported. The use of the time when flooding was first reported is made necessary due to the sparsity of information on when flooding actually began in many of the flooded areas. Of the nine areas listed in the table, real-time stage data were available in only five areas. Of those five areas, two areas had flooding on streams other than the gauged streams. Thus, only three of the flooded areas had real-time stage data that were indicators of the flooding in the area. These three areas are the Seward area, Kenai River, and western Susitna basin.

Table 3. Listing of product lead times for flooded areas

Location	Initial Notification Type	Issuance Date/Time		Flooding Start Date/Time		Hours of Lead Time
*Seward Area	Watch	09/19	04:00 PM	09/20	08:00 AM	16
Girdwood Area	Warning	09/20	12:40 PM	09/20	12:40 PM	0
*Chugach Streams	Statement	09/20	08:30 PM	09/21	11:30 AM	15
*Kenai River	Watch	09/20	03:15 PM	09/21	08:30 AM	17.25
*Western Susitna Basin	Watch	09/21	10:30 AM	09/21	02:00 PM	3.5
Valdez Area	Warning	09/21	12:30 PM	09/21	12:30 PM	0
Knik River	Watch	09/21	03:00 PM	09/22	11:00 AM	20
Cordova Area	Warning	09/21	05:00 PM	09/21	05:00 PM	0
*Tonsina Area	Watch	09/22	11:00 AM	09/22	11:00 AM	0

* indicates areas with real-time stage data

The product lead times range from 0 hours to over 17 hours. The areas with 0 hour lead time are areas containing no real-time stream gauges except for the Tonsina area, where a gauge on the Tonsina River is read daily. Flooding in that area was minor along a tributary to the Tonsina River; no flooding along the Tonsina River was reported. The areas of greatest impact at Seward and along the Kenai River had 16 hours or more of lead time.

Another limitation in documenting the details of flooding in data-sparse areas was when significant damage occurred on streams due to debris flows rather than water inundation. The bridge failure on Hunter Creek was attributed to debris accumulating on the bridge pier that caused erosive velocities to damage the approaches, which led to loss of the bridge. Hunter Creek was reported to have remained in its banks throughout the event. Other Knik River tributaries caused road closures due to debris that clogged the channel and spread over the road. Criteria need to be developed to identify the potential for debris threats in

high intensity rainfall events.

VII.4.2 Product: Information Content

The content of the watch and warning products was appropriate for the data-sparse areas affected by the flooding. During post flood interviews, a common complaint of those impacted by the flood centered around "lack of information." Forecast staff in both the RFC and WSFO telefaxed and phoned information to EOCs, river observers and callers. Many of those directly impacted by the flood, however, were without specifics on "how much higher the water was going to get," "when the rain would end," etc.

The products for the areas with no real-time river gauges to provide a reference were by necessity somewhat vague on the details of the water levels, but they contained reasonable information on the rainfall timing and qualitative amount. The products for areas with real-time stream gauges specified the reported stages and the estimated time of crest. These products were not specific on the crest stage forecast except during the latter portion of the flooding on the Kenai River. Stage forecasts then were provided for the next 24 hours **at the three gauge locations along the Kenai River.**

The lack of specifics is due to the sparsity of precipitation data in the headwaters of the flooding streams, which minimized the capability to quantify the runoff volumes, and the large ungauged tributary streams in the drainage basin contributing unknown amounts of flow. Additional rain and stream gauges combined with increased use of radar and other remote sensing techniques should increase the information for making more specific forecasts in future events.

Another concern expressed by some residents in flooded areas was that they had never been in a flood before and did not know what to expect. They indicated that potential impacts such as contamination of wells, overtopping of septic systems, or possible erosion of inundated roads should be stated to give them guidance on actions that they should take in such an event. The RFC had been directed only weeks before the flood to remove the call to action statements from all products and thus did not include any guidance statements in the products.

During post event interviews, emergency management officials and residents in the flooded areas agreed that "call to action" statements are valuable as long as they are relevant to events taking place. Action statement content can be coordinated between the operations staff and the emergency services agencies

to make them more effective. The coordination can be done as a preparedness activity before events or during events as long as there is sufficient time.

VII.5 WSFO Warning Services

The WSFO products included flood watch and warning information in forecasts and special statements. No flood watches or warnings were issued by the WSFO during the hours when the RFC was not in operation. The WSFO provided updates to the RFC on the meteorological conditions, kept the NOAA Weather Radio up to date, and answered telephone calls from the public.

The new Service Hydrologist had in the summer of 1995 included a list of the precipitation gauge identifiers specific to the RFC precipitation gauge network in the WSFO Hydrology Manual. There had been insufficient opportunity for the WSFO staff to become familiar with the new identifiers. This event has already improved the familiarity. Routine hydrology drills and periodic operations manual reviews will re-enforce the familiarity.

Mudslides along the steep Alaskan terrain often occur in heavy rain events. RFC hydrologists identified this potential on Kodiak Island during the rainstorm on the previous weekend and during this storm and worked with the Anchorage forecasters to include mention of mudslides in special weather statements. There is no formal mudslide watch or warning statement that is issued by the Weather Service. These and avalanche warnings are understood to be the responsibility of the State Department of Public Safety.

In the spirit of all-hazard response partnerships, the NWS should cooperate with the State Department of Public Safety and include mudslide threat information in heavy precipitation and flood products as a result of the coordination.

Chapter VIII

Dissemination

VIII.1 Introduction

The NWS Alaska Region flood response assessment team met with emergency services groups following the flood event. The team discussed with these groups the dissemination of NWS products to the ADES, the emergency services in the Boroughs and EOCs, and to residents in south central Alaska. The team also discussed the flow of information back to the NWS.

VIII.2 Flood Area Demographics

Local demographics have to be considered everywhere the NWS provides services. Services need to account for climate characteristics, weather and water sensitivities, geography, population demographics, political organization, commerce, transportation, and communications infrastructure.

Alaska is politically organized into Boroughs, although the state is not completely covered by Boroughs. Non-Borough areas are Federal government land areas, i.e., Bureau of Land Management, Fish and Wildlife Refuge, National Forest, which are quite extensive and are very sparsely settled.

The Boroughs each have an emergency services unit. The two Boroughs most significantly impacted by this flood event were the Kenai Peninsula (pop. 45,000) and the Matanuska-Susitna (pop. 45,000). The population in these Boroughs is not at all remarkable in numbers relative to our fellow states. For Alaska, though, these are concentrations of a relatively large population.

NWS public services are provided in zone and local forecast areas. Zones are not aligned with the Boroughs, as some zones and counties are in other Regions. The zones are fit to the climatology as much as possible, are quite large, and have very sparse population. The local forecasts serve the population centers. For example in the flood impacted areas, local forecasts are prepared for Seward, Kenai, Homer, Valdez, Willow, Talkeetna, Palmer, and Cordova. A large part of the Matanuska-Susitna Borough is currently not within a zone or served by local forecasts, simply because the population is so sparse. The RFC has stated a requirement for a Susitna basin zone forecast within

the past year.

Specific characteristics:

Kenai Peninsula Borough

The two population centers impacted by the flood in the Kenai Peninsula Borough were Seward (pop. 3,000) and Kenai/Soldotna (pop. 10,000). These two centers are part of the Kenai Peninsula Borough which has a total population of 44,411. Homer (pop. 4,300) is the other major population center in the Borough. This means roughly 30,000 residents are scattered outside these three cities.

Seward and Homer are served by NWR transmitters operated by one of the two NWR consoles at the Anchorage WSFO. These locations for the NWR transmitters were based on the intent to support the maximum number of marine customers. Kenai, while it is on the Cook Inlet to the Gulf of Alaska, has only a very small salt water marine customer base compared to Seward and Homer.

There are 4 AM/FM radio stations in Seward and 10 in Kenai/Soldotna. Cable television is the primary method for access to television programming. The Rural Area Television Network (RATNET), which is operated by the state, is also available.

The Kenai/Soldotna population has soared, by Alaskan standards, in recent years in response to year-round recreation and commerce growth. The Kenai salmon fishery is world famous and the living environment has been discovered as desirable which has attracted many new residents. This growth will continue.

Matanuska-Susitna Borough

The major population centers in the Matanuska-Susitna Borough (pop. 45,000) are Palmer (pop. 3,500) and Wasilla (pop. 4,000). Just as in the Kenai Peninsula Borough, most of the population (37,500) is not concentrated in cities. The Borough population numbers are on a slow upswing. Palmer and Wasilla are regarded as Anchorage commuting centers, both roughly 65 miles from Anchorage mostly along a limited access highway.

There are no NWR transmitters which reliably reach the residents in the Matanuska-Susitna Borough. The Anchorage transmitter, located in downtown Anchorage, provides only fringe reception in the southernmost sections of the Borough.

Most of Anchorage's 21 AM/FM radio stations reach Wasilla and Palmer. Television is generally received over cable.

Valdez/Cordova Borough

Valdez (pop. 4,000) and Cordova (pop. 2,500) are both marine communities embedded along the coastal mountains surrounding the famous Prince William Sound. Valdez is well-known as the terminus of the Alaska oil pipeline, an oil tanker embarkation port, and is usually the recipient of more than 600 inches of snow every year. Cordova is a fishing village that climatologically receives large amounts of rain (173.36 inches/year in town, 91.05 inches/year 20 miles east at the FAA airport site).

The Weather Service Office (WSO) at Valdez provides the NWR service which is broadcast over transmitters in each city. Again, it is primarily the marine customer who is the target of the NWR.

VIII.3 Dissemination in Alaska

The NWWS in Alaska has three subscribers: (1) the NWS subsidized service to the ADES, (2) the U.S. Coast Guard (USCG) outlet at the 17th District Headquarters in Juneau, and (3) the Associated Press (AP). The AP service is the primary source of NWS products for the broadcast and print media. Weather products can be "bumped" on the AP service by higher priority news, such as election results.

The dissemination of routine weather information to most of south central Alaska residents is accomplished primarily by a combination of commercial radio, television and newspaper media. However, commercial radio stations in smaller communities are generally not staffed 24 hours a day. Television is limited to one pre-programmed channel in some areas. This was the case during the flood event.

The Alaska Weather Line (AWL) was established by the Alaska Region in May 1995. The AWL is a toll free telephone weather information service available throughout Alaska. NWS WSOs record weather information on the AWL, including general public forecasts, marine weather forecasts, watches, warnings, and more. Alaskan residents can call 1-800-472-0391 at any time to get the latest weather information for many areas in the state. Weather information for south central Alaska, including RFC information, is not yet available on the AWL.

VIII.4 Dissemination during the Flood Event

The two primary customers for NWS products during the flood were (1) the general public, and (2) the emergency services agencies. The products issued by the WSFO/RFC and disseminated to the two customers may be the same, but the weather and flood information requirements are different for each of the customers. The dissemination issues during the flood for each of the two customers are described.

VIII.4.1 Dissemination to the Public

Interviews with emergency management staff in the boroughs and with local residents indicated that weather and flood forecast information was very limited overall. Residents in the Kenai/Soldotna area, the Matanuska/Susitna valley, and Girdwood are out of range of existing NWR broadcasts. Bits and pieces of weather information were picked up from commercial radio and television stations, word of mouth, and mostly by simply watching flood conditions and reacting to them. They did not know what to expect next, nor how long existing conditions were expected to last.

Due to the remoteness of several of the affected locations, notification was accomplished by some residents going door to door to pass along limited information. In the spirit of living in Alaska, they fended for themselves.

Commercial radio station hours of operation are limited in many of the flooded areas. Few, if any, of the stations are staffed 24 hours a day. During the flooding event, staffing hours were increased, but few, if any, stations went to a full 24 hour operation. They relied upon the AP service or phone calls to and from an emergency management agency to receive weather information for broadcast. Most residents know that their local radio station(s) are not staffed 24 hours a day.

Television, whether received over cable or via antenna, was not a good source of NWS flood information. While there was television media attention paid to the impact of the floods, there was virtually no distribution of NWS products over television.

This was not an Emergency Broadcast System (EBS) event. Therefore, no television or radio broadcast was interrupted by EBS. It may not have even mattered. As an example, the flooded Kenai Keys community along the Kenai River has few full-time residents. The Keys is mostly recreation homes. The people in

residence in the Keys or who had homes in the Keys, but were not staying there, did not "hear" NWS products. Few of the Keys residents who were staying in the Keys routinely listen to the radio or television. Some residents have marine VHF radios. Dissemination of products to such hard to reach customers is a challenging task.

Access to flood information via telephone was not easy. The demand far exceeded the capability to deliver the information. The AWL with its wide area, toll free access to fresh weather product recordings did not include south central Alaska products at the time of the flood.

VIII.4.2 Dissemination to the Emergency Service Offices

NWS products, including flood watches, warnings, and statements issued by WSFO Anchorage and the RFC, are distributed directly to the ADES EOC on Ft. Richardson via the NWWS. The ADES does not automatically process the products received from the NWS over the NWWS. The ADES staff transfer the products onto the new Emergency Services Information System (ESIS) the ADES is starting to implement. The transfer is accomplished through a manual search of the products for significant weather information, such as advisories, watches, warnings, or statements. Once located, they "copy/paste" the selected information into the ESIS. The ADES staff did not have a comprehensive knowledge of NWS product headers and contents.

The ESIS is based on "First Class" electronic mail software. The system is a dial-in communications link between the ADES EOC on Ft. Richardson and the Anchorage Emergency Service Office, and the Kenai and Mat-Su Boroughs. This was in place during the flood. Since the flood, the ADES has added many fire stations onto the system. The fire stations in the smaller communities, like Girdwood, serve as EOCs during emergency events such as the flood.

The NWS announces only watches and warnings over the National Warning Service (NAWAS). These are received at some emergency management borough offices or their dispatch centers depending on the time of day. NWS statements, issued at least every six hours when watches and/or warnings are in effect, are not announced.

EOCs activated in smaller communities like Girdwood during this flood event were not linked to NAWAS. Dissemination from the ADES to local authorities in these samller communities during the flood was by telephone and telefax. NWS products were subsequently passed on to local agencies and residents via

telephone fan-out and telephone fax.

Emergency management staff relied upon information from field reports from residents, agencies, and work crews as to what was happening in the flooded areas. Some of this information was included in the ESIS information database.

Appendix I

Operations Chronology of Events

The chronology of operations events and excerpts from RFC/WSFO products begins on September 12 and ends October 2, 1995. Time is in Alaska Daylight time, which is UTC-8 hours:

Tuesday, September 12

WSFO Anchorage Ice Forecaster Russ Page mentions to KTUU Channel 2 Weathercaster Jackie Purcell, "It will take about 9 days for the effects of Typhoon "Oscar" to reach south central Alaska."

Thursday, September 14

0800 At the end of the midnight shift, Meteorologist-in-Charge Robert Hopkins and Lead Forecaster Joel Curtis discussed the potential for heavy rains in south central Alaska.

Friday, September 15

0800 Lead Forecaster Joel Curtis on midnight shift mentions heavy rains expected across areas near Prince William Sound in State Forecast Discussion (FPAK20 PANC). He also uses satellite loops from the Japanese GMS to identify moisture feed around ex-typhoon "Oscar."

1600 RFC issues Bradley Lake Hydroelectric Project product to Homer Electric refering to "heavy rain possible toward the middle of next week."

Saturday, September 16

0311 WSFO Anchorage Forecast Discussion excerpts: **"UPR LVL MSTR STRM FROM TYPHOON OSCAR MOVG TWDS THIS LOW ... W/FLOW ALF BCMG SE OVR MOST OF FCST AREA. BERING SEA LOW BCMS UPR TROF A LTTL FURTHR W & AN UPR LOW CNTR ESTABLSHD ABT 400 NM S OF ADQ. GOTTA ACCPT THIS CAUSE ANALYSES..TREND..& SATL PIX ALL SUPPORT THIS IDEA. ... LONGR TERM: MRF INSISTS THAT UPR LOW WELL S OF ADQ WILL MOV INTO BERING BY THU W/STG SSE JETSTRM DVLPG OVR CNTRL & ERN FCST AREA FOR HVY RAIN."**

1500 RFC issues Hydro-meteorological Discussion (HMD) indicating tropical moisture expected to impact Alaska beginning Monday. Excerpts:

HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE AK

300 PM SEPT 16 1995

WET SOILS IN SOUTHCENTRAL AND SOUTHEAST ALASKA INCREASE FLOOD POTENTIAL IN THESE AREAS. TROPICAL MOISTURE FROM TYPHOON OSCAR EXPECTED TO IMPACT ALASKA BEGINNING MONDAY. (16/1700)

A HIGH PRESSURE RIDGE OVER THE CENTRAL AND EASTERN PORTION OF ALASKA IS KEEPING MOST OF THE STATE RELATIVELY DRY THIS WEEKEND. LOW PRESSURE CENTERS IN THE BERING SEA AND SOUTH OF KODIAK WILL MAINTAIN CLOUDS AND LIGHT RAIN IN SOUTHWEST ALASKA AND KODIAK ISLAND THIS WEEKEND. RAINFALL AMOUNTS ARE EXPECTED TO BE GREATEST ON KODIAK ISLAND, WITH AS MUCH AS 2-3 INCHES ACCUMULATING THROUGH THE WEEKEND.

RECENT RAINFALL IN SOUTHCENTRAL AND SOUTHEAST ALASKA HAS SATURATED SOILS. ANY RAIN THAT DOES FALL WILL THUS CAUSE MORE SIGNIFICANT RISES IN WATER LEVELS ON AREA STREAMS AND RIVERS THAN WOULD NORMALLY BE EXPECTED.

FREEZING LEVELS OVER SOUTHEAST ALASKA RANGE FROM ABOUT 6000 FT IN NORTHERN SECTIONS TO 12000 FT IN SOUTHERN SECTIONS, WITH SLIGHT COOLING EXPECTED ON SUNDAY. FREEZING LEVELS IN SOUTHCENTRAL ARE ABOUT 6000 TO 9000 FT AND ARE EXPECTED TO REMAIN FAIRLY STEADY DURING THE NEXT 24 HOURS. FREEZING LEVELS IN INTERIOR ALASKA RANGE FROM ABOUT 6000 FT IN WESTERN SECTIONS TO 2000 FT IN

EASTERN SECTIONS, WITH LEVELS EXPECTED TO RISE ABOUT 4000 FT DURING THE NEXT 24 HOURS IN MOST AREAS. NORTH SLOPE FREEZING LEVELS ARE EXPECTED TO CLIMB TO ABOUT 8000 FT BY SUNDAY. (16/1700)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
RIVER AND STREAMS BEGAN TO FALL OVER THE PAST 24 HOURS FROM THEIR HIGH LEVELS EARLIER IN THE WEEK, BUT LEVELS REMAIN HIGHER THAN NORMAL FOR THIS TIME OF YEAR. LITTLE PRECIPITATION IS FORECAST FOR THE AREA, THEREFORE RIVER LEVELS ARE EXPECTED TO CONTINUE TO FALL THROUGH THE WEEKEND. (16/2200)

WEST
SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
MOST RIVERS AND STREAMS ARE NOW FALLING AS TEMPERATURES DROP AND GLACIAL CONTRIBUTIONS DIMINISH. MOST STREAMS SHOULD EXPERIENCE FALLING TO STEADY LEVELS OVER THE NEXT COUPLE OF DAYS. (16/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
RIVER AND STREAM LEVELS IN THE SEWARD AREA WERE FALLING SATURDAY. RIVERS AND STREAMS SHOULD CONTINUE TO FALL THROUGH THE WEEKEND. (16/2200)

COPPER RIVER BASIN...
HEAVY RAIN EXPECTED IN THE LOWER COPPER RIVER BASIN DID NOT OCCUR AND LEVELS ARE DROPPING ON MOST STREAMS IN THE AREA, PARTICULARLY ON STREAMS THAT GET MOST OF THEIR FLOW FROM GLACIAL MELT. THIS IS A RESULT OF COOLER TEMPERATURES. (16/2200)

SDL/LAR
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1600 WSFO Anchorage Forecast Discussion excerpts: **"INHOUSE COMMUNICATIONS/COMPUTER PROBLEMS STILL EXIST. THERE MAY BE SOME DELAY ON IN-HOUSE GENERATED PRODUCTS."**

Sunday, September 17

0253 WSFO Anchorage Forecast Discussion excerpts: **"...ETA AND NGM FAIRLY CLOSE AGRMNT IN BOTH MASS FIELD AND MOISTURE FCS BOTH MDLS SHOW GOOD SHOT OF PRECIP FOR KODIAK ISL SUN WITH DRIER AIR MASS MOVING OVR ISLAND SUN NGT AND MON AS FRONTAL BNDRY MOVES SLOLY EWD. LOOKS LIKE GOOD SHOT OF RAIN FOR SEWARD AND UPSLOPE AREAS KENAI PEN MON AND MON NGT AS MOIST.. QSTNRY SELY FLOW BCMS ESTABLISHED OVR THE WESTERN N GLF CST."**

1133 WSFO Anchorage Forecast Discussion excerpts: **"AVN LOOKS TO BE BETTER OF THE FIELD MDLS. RIDGE OVR CANADA CONTS SE DRIFT NR 36 HRS. 986 MB LOW S OF THE AK PEN MOVS TO JUST N OF THE PRIBILOFS BY 4 PM MON WITH A CNTRL PRES IN THE LOW 980'S. THE REMNANTS OF TYPHOON OCSAR MOVS TO NR 50N 160W WITH A CNTRL PRES IN THE LOW 960'S 4 AM WED. IN THE NEAR TERM..BRISK E-SE WNDS WILL WORK INTO THE NRN GLFAK..S CNTRL AK THRU TDY. BRISK WINDS OVR BRISTOL BAY/SW AK WILL INTENSIFY THIS THRU TNGT AS LOW PUSHES N OF AK PEN. WNDS ADQ WILL DMSHG THIS EVE. RA SHOULD DMSH OVR ADQ LTR THIS AFTN AS OCFNT PUSHES N. RA SHOULD SPREAD TO S CNTRL AK/N GLFAK THIS EVE/TNGT AND CONT THRU MON.**

.ADQ..RA SHOULD DMSH IN INTENSITY LTR THIS AFTN. ANOTHER 1-2 INCHES IS EXPECTED THRU THIS AFTN. I WILL CALL YOU ON MUD SLIDE POTENTIAL."

1453 WSFO Anchorage Forecast Disccusion excerpts: **"NEXT WK WV OVR THE NE PAC MOVS TO THE NRN GLFAK TUE. THE REMNANTS OF TYPHOON OCSAR MOVS TO NR 50N 160W WITH A CNTRL PRES IN THE LOW 960'S 4 AM WED. BRISK E-SE WNDS WILL WORK INTO THE NRN GLFAK..S CNTRL AK THRU TNGT. AS EXPECTED..THE N GLFAK CST AND WNDWARD EXPOSURES OF S CNTRL AK SHOULD CATCH MOST OF THE PCPN..STRONG DOWNSLOPING WNDS SHOULD ONLY PRODUCE MINIMAL PCPN OVR VALLEY SECTIONS OF SCNTRAL AK TNGT AND MON. CONT SE FLOW AT THE LOW AND MID LEVEL WITH CONT THE THREAT OF RA ALG THE N GLFAK CST THRU TUE.**

.ADQ..LKS LIKE HVR RA OVR..SHWRS MON..BUT WK WV SE OF MAIN CNTR MOVS N AND PRODUCES E-SE FLOW MON NGT/TNGT.

.VWS..RA DVLPG AFT MDNGT AND CONTG MON. 850-700 MB LOW CONTS SE THRU TUE..SOOO THREAT OF PCPN CONTS."

1500 The HMD Flood Potential discussion expects heavy rain for Monday in the Western Gulf of Alaska that may persist for several days and may cause flooding in Seward.

2125 WSFO Anchorage Forecast Discussion excerpts: **"FORMER TYPHOON OSCAR WILL S OF KAMCHATKA PEN WILL BE ABT 300 S ADK MON AFTN AND ABT 450 S CDB AS A 966 MB BY TUE AFTN. 1010 MB LOW NR 37N AND 152W WILL GRADLY MOV UP E SIDE OF FORMER TYPHOON TO BE A 982 MB LOW 250 SE ADQ BY TUE AFTN. WND AND RA MOVG BACK INTO KODIAK ISL TUE."**

Appendix I-2

Rain Sunday night and Monday in the Seward through Girdwood area is not heavy, but it sets up a wet antecedent condition going into the big event.

Monday, September 18

0321 WSFO Anchorage Forecast Discussion excerpts: **"HI AMP UPR AIR PTRN CONTG AS BLKG RDG CONTS TO BLD FM ERN PAC NWD THRU NW CANADA..RSLTG IN STG WRM ADVCTN NWD ACRS WRN GLF AK INTO SRN AND SWRN AK..PDS HVY RA..SPCLY SRN EXPSRS..STG WNDS AND ABV NRML TMPS NEXT SVRL DAYS. AT SFC NOT MUCH DIFF IN MODELS ON HNLDG LOW MVG NWWD FM AK PEN INTO NE BERING SEA THRU 36 HRS WITH SLGT DIFF AT 48 HRS ON CNTRL PRES..LCTNS OF OLD TYPHOON OSCAR AND SMALLER LOW DVLPG AHD OF OLD TYPHOON. WSO'S USE AVN 48 HR SFC PNL. SAT IMGRY SHOWS EXTV MOISTURE FEEDING INTO THIS DVLPG LOW..CNTRD ABT 37N 162W AT 06Z TUE..AND THIS WILL BE A BIG RA/WND PRDCR..AS MNTD ABV WILL GO WITH AVN ATTM ON THIS SYS. AT 60 HRS..4AM WED..AVN ROTATES THIS LOW OVR KODIAK ISL..AT ABT 978MB WITH FNT ONSHR LWR KENAI PEN AND EWD. DRY SLOT VSBL OVR N-CNTRL GLF FM S SIDE OF KODIAK ISL TO ABT 90 S MDO..SEC BAND MOISTURE APCHG 55N ..SO RA PRBLY END OR AT LEAST BCM LGT INTMT GLF AK BRDG AREAS BY LATE MRNG THEN DVLPG AGAIN TNGT..THEN IMPVG A BIT LATE TNGT/EARLY TUE AHD OF NEXT SYS."**

Midnight shift Lead forecaster Donald Finch briefs RFC Development and Operations Hydrologist Larry Rundquist that the 6 - 8 inch QPF by the NMC models was probably conservative.

1500 The HMD Flood Potential discussion expects heavy rain Tuesday night and Wednesday in Western Gulf of Alaska that may cause flooding in Seward.

1540 WSFO Anchorage Forecast Discussion excerpts: **"OLD OCFNT NOW EXTDG FM XTRM NE GLF AK-JST S TURNAGAIN ARM-THENCE WWD ARC..CONTG N AND NW DSIPTG NXT 12 HRS. FAIRLY NARROW AREA RA INVOF FNT..MORE SHWRY W AK RNG AND XPCD BE SO IN COPPER RVR BASIN. ... VIGOROUS 979MB LOW INVOF 38N 153W NOW BGG TURN NWD..XPCD VERIFY 12Z AVN PROG WELL..THEN TO NR 53N 153W AS ARND 970MB CNTR 00Z WED WITH SHORT OCFNT NE TO MDT WMFNT IN ARC THRU 55N 150W THENCE ENE TO 180 S YAK SAME TIME. CDFNT TO LIE IN ARC THRU 53N 145W BY 00Z WED. "BULLS EYE" PRECIP MOVG TWD E AND SE EXPOSURES KENAI PEN AND KODIAK IS. TUE. WAY OUT W..RMNS "OSCAR" VRY DFCLT TO SEE ON I.R...ESTMD ARND 966MBS..180 S AHT CONTG ON EWD TRACK..XPCD LIE NR 48N 166W 00Z WED WITH FNTL SYS IN E AND S ARC."**

ADQ 047/W/SE15 054/8R/ENE30G 052/+R/E35 056/+R/E35 WOULD HDLN STG E WND AND HVY RA AT TIMES LATER TUE/TUE NGT AND WED.

VWS 047/W/LW 058/E6W/LW 047/8R/LW 055/7R/LW LYNN..THANKS FOR CALL ON 2C..AS USUAL YOU'RE RIGHT ON TOP OF SITUATION. CHC SHWRS TUE MOSTLY FOR MRG..MAY BE AT LEAST SHORT BREAK IN SYSTEMS TUE. INCOMING WMFNT SO STG..RA XPCTD LATE TUE AND TUE NGT..DESPITE ERLY WNDS ALF."

2125 WSFO Anchorage Forecast Discussion excerpts: **"COMPUTER PRPBLEMS AT NMC HAVE CAUSE MODEL RUNS TO BE DELAYED. I HAVE GOTTEN ONLY ETA MDL SO FAR AND WILL GO WITH IT.**

SYNOPSIS...STLT PIX SHOWS INTENSE LOW 200 S ADK IS MOVG E AT ABT 40 KTS. SECOND LOW S OF GLF AK IS MOVG N AT ABT 30 KTS. 968 MB LOW S CNTRL AUTNS WILL SLOW DOWN TO BE ABT 300 NM S Z11 BY 4PM TUE AND WILL CONT TO MOV E TO 450 NM S SDP BY 4AM WED. 977 MB LOW OVR NE PAC WILL MOV TO 300 NM S KODIAK ISL BY 4PM TUE..TO ABT 140 NM S SDP BY 4AM WED AND WILL MERG WILL MERG WILL OLD ALUTN LOW ABT 300 NM SSE SNP BY 4PM WED. ASSOCD FNT WILL MOV N WITH LOW TO LIE ACRS AK PEN..SRN BRISTOL BAY AND KODIAK ISL BY TUE EVE. FNT WILL CONT TO MOV NW TO LIE ACRS ERN ALUTNS..SRN Y-K DELTA..LWR COOK INLET THEN TURN SE INTO CNTRL GLF AK. AND WILL LIE ACRS NORTON SD KUSKOKWIM VLY AND COOK INLET WED AFTN. WNDS INCRG OVR KODIAK ISL AND AK PEN LATE NGT AND TUE AHD OF FNT WILL ONLY SLWLY DMSHG BHD FNT. GUSTY WNDS MOVG INTO COOK INLET..BRISTOL BAY AND Y-K DELTA TUE NGT AND INTO KUSKOKWIM VLY WED. STG WNDS ALG CNTRL GLF CST INCRG AGN TUE. RA MOVG BACK INTO KODIAK ISL AND AK PEN TUE AND WILL SPRD INTO COOK INLET.. BRISTOL BAY AND Y-K DELTA TUE NGT. RA OVR CNTRL GLF CST WILL DMSH TO SHWR TUE MRNG BUT WILL BCM STEADY RA BY LATE TUE. OCNL RA MOVG INTO KUSKOKWIM VLY..SUSITNA VLY AND COPPER RVR BASIN TUE NGT."

Tuesday, September 19

0312 WSFO Anchorage Forecast Disccusion excerpts: **"HI AMP BLCKG PTRN CONTG WITH MRF SHWG SHIFT TO MORE ZONAL FLOW ACRS NRN PAC/SRN BERING BY SAT. IMDT FCST PRBLM IS STG SFC DVLPMNT APCHG SW GLF AK EARLY THIS MRNG AHD OF OLD TYPHOON OSCAR. LATE 06Z SHIP ABT 90 N OF LOW SUGGESTS CNTRL PRES PRBLY NR 972MB WHICH IS ALREADY DPR THAN MODEL 12Z PRJTN. 0746Z DMSP SHOWS CNTR NR 44N 153W AND LEADING EDGE CI TO 55N 150W. THIS MAY BE A BIT AHD OF MODEL TRACK..ALL IN GNL AGRMNT..BUT DMBLG WITH OLD OSCAR FCST TO BEGIN BY 24 HRS..SO WILL STICK**

WITH MODELS ATTM AND GO WITH ETA..SLTLY BETTER ON CNTRL PRES..972MB NR 52N 155W AT 00Z WED WITH OCLN THRU 53N 150W AND ESE..OLD OSCAR NR 48N 168W AT 960MB. AT 06Z WED..LOW NR 53N 160W..965MB WITH OCLN THRU S SKJ-57N 150W AND ESE..DMBLG CNTR TO 48N 165W..961MB. AT 36 HRS..12Z WED..LOW TO 53N 161W..961MB WITH OCLN THRU S CDB-N ADQ AND ESE THRU 60 S MDO. SEC LOW 48N 161W..965MB. AT 48 HRS..00Z THU..LOW NR CDB AT 971MB WITH WKNG OCLN THRU N BET-PWS AND SEWD. OLD OSCAR..968MB NR 51N 158W AT 00Z THU. DRY SLOT VSBL JUST TO N OF CI EDGE OVR NRN GLF AK..SO SOME IMPRVMNT THIS MRNG THEN HI CLDS MVG OVR KODIAK ISL BY LATE MRNG AND OVR N GLF CST BY MID AFTN. RA/WND BGNG KODIAK BY EARLY AFTN AND N GLF CST BY LATE AFTN. RCMD HI WND WRNG THIS AFTN/TNGT FOR ADQ. HVST RA TNGT.. KODIAK ISL/LWR COOK INLET AND KENAI PEN AND KENAI PEN/PWS WED. SOME HVY RA PSBL W SIDE INLET AND SW SUSITNA VLY LATE TNGT/WED."

0929 WSFO Anchorage Forecast Discussion excerpts: **"HI AMPLTD UPR FLOW TO RSLT IN ACTV WX PTRN NXT 48 HRS. STG LOW CNTR NR 50N 155W MOVG NNW AND WILL BGN MOVG MR NW AS STGR LOW S OF THE ERN ALUTNS DRPS SE. MDLS AGREE IN MOVG A 960 MB LOW NR CDB BY WED AFTN. CI CLD SHLD SPRDG RPDLY N ACRS SRN AK CST. R TO START AT ANY TIME ADQ AND THE REST OF SRN CSTL AREAS LTR THIS MRNG OR AFTN. HVY R ADQ THIS EVE SPRDG TO SRN AND ERN KENAI PEN AS WELL AS PRINCE WILLAM SOUND ARND MDNGT OR SO CONTG THRU WED. PREFNTL WNDS CONT TO INCR ADQ WITH GUSTS TO 60 MPH PSBL THIS EVE WITH 1ST FNTL PASSAGE AND AGN WED MRNG WITH SCND WVI. WRM AIR ALF TO ALLOW HVY RNS TO FALL AT HIGHER ELEVTNS WHICH WILL ADD TO FLDG PTNTL SRN AK CST FM ADQ TO CDVI. FCSTS LK GD."**

1500 River Forecast Center (RFC) issues Bradley Lake Hydroelectric Project product to Homer Electric forecasting heavy rain beginning Tuesday evening and continuing at variable intensities through Thursday with amounts of 5 to 7 inches possible. HMD issued at 3 p.m. says, "Rain will likely cause flooding in Seward." Flooding is also possible in western Susitna basin.

1500 WSFO Anchorage Forecast Discussion excerpts: **"NO CHNG FM MRNG SYNOPSIS. TWO INTNS LOWS DMBLG WITH LOW S OF KODIAK IS MOVG NW TO NR CDB BY WED AFTN..CONTG TO NR ST. MATHEW IS WED NGT..BCMG QSTNRY AS A 965 MB LOW THEREAFTR. 957 MB S OF THE ERN ALUTNS MOVG ESE SWINGS NE ACRS KODIAK IS AS A STG NEG TILT TROF LT WED NGT WITH WNDS PICKING UP AGN ERLY WED EVE. HVST RAIN ADQ OCRS THIS EVE THRU WED AFTN. BOTH ETA AND NGM PULL DRY SLOT UP ACRS ISLAND LATE WED AFTN FOR A DCR IN OR TEMPORY END OF PCPN INTO EVENING BFR STARTG AGN WITH NXT TROF."**

1600 RFC issues Flood Watch for Seward area. RFC begins faxing flood products to the Kenai Peninsula Borough, Alaska Division of Emergency Services (ADES), Seward Emergency Managers and the DOT. Faxing to these agencies continues throughout the event.

Forecaster Wanda Likens on evening shift coordinates with the RFC on precipitation forecasts.

2129 WSFO Anchorage Forecast Discussion excerpts: **"NOT MUCH CHG FM PREV DISCS..ALL MODELS IN AGRMNT AND SMLR TO PREV RUNS. MODELS MOVE 960MB LOW AT 55N/158W TO 60N/175W BY THURS AFTN WITHOUT MUCH CHG IN INTNSTY. SCND 956MB LOW AT 45N/167W OPENS UP INTO A NEG TILT TROF WED AFTN WHICH ROTATES OVR ADQ BY THURS AFTN. RAIN OVR ADQ AND SRN KENAI PEN SPRDG NWD WITH RAIN BGNG OVR N GLF CST THIS HOUR. FCSTS LK GD."**

Significant wind damage reported from Girdwood.

Wednesday, September 20

0314 WSFO Anchorage Forecast Discussion excerpts: **"AT 500MB THE STG BLKG PTRN IS FCST TO CONT THRU FRI WITH MEAN RIDGE AXIS SHFTD FM 130W-120W WITH HI AMP NEG TILT TROF FM NRN BERING ACRS AK PEN AT 72 HRS..4PM FRI. EUROPEAN MDLS CONT TO BE UNAVBL IN AK AND MRF NOT IN AT PRESENT..BUT SEEMS LIKELY WITH STG WLYS DVLPG OVR KAMCHATKA AND WRN BERING BY 72 HRS THAT UPR TROF SHD BE KICKED EWD ACRS STATE OVER THE WKEND. IN THE SHORT RUN MODELS CONT TO BE IN XCLNT AGRMNT. ETA/AVN HAVE MEAN CNTR ABT 4 MB HIGHER THAN NGM AT 24 HRS AND WILL GO WITH THESE MODELS THRU FCST PD..WSO'S USE AVN PNLS FOR LCTN OF SFC CNTRS THRU 48 HRS. BOTTOM LINE IS MAIN FNTL BACLN ZONE IS UNDER STG SLY JET EXTNDG NWD ACRS KODIAK ISL AT THE MOMENT AND WILL SHIFT TO LWR COOK INLET/KENAI PEN BY 4PM WED AND TO PWS BY 4AM THU AND TO ERN N GLF CST BY 4PM THU..GRDLY SHFTG THE HVY..ORGRPHC ENHNCD PCPN EWD. SAT IMGRY SHOWS A THIRD CRCLN CNTR HAS DVLPD AT THE TRIP PT OF THE FNT ASSOCD WITH OLD TYPHOON OSCAR NR 50N 155W AT 06Z WED. 0734Z DMSP SHOWS THIS CNTR HAS MVD TO NR 50N 153W WITH XTV AREA OF CLSRTD CUFRM CLDS WITH SMALL EMBBD CBS VSBL..THIS BNDRY SHD MOVE NWD AS CRLCN CNTR MOVES NW TO MERGE WITH LOW NR AK PEN BY THIS AFTN..XPCT HVY SHWRS KODIAK ISL/AK PEN LATE THIS MRNG AND THIS AFTN.**

ADQ..FNT HAS MVD N OF STN AND WNDS DRPG OFF..HWVR LETS HOLD WND ADVSRY THRU EARLY AFTN AS

THEY ARE LIKLY TO PICK UP AGAIN AHD OF NEXT SYS.
AKN...CONT ADVSRY TIL 8AM..THEN WNDS DMSNG SLOWLY.
VWS...MTN RA HVY AT TIMES TNGT/THU."

0800 RFC issues Flood Warning for Seward area.

FLOOD WARNING FOR THE RESURRECTION RIVER AND OTHER STREAMS IN THE
SEWARD AREA.
NATIONAL WEATHER SERVICE ANCHORAGE AK
800 AM WED SEPT 20 1995

...IMMEDIATE BROADCAST REQUESTED...

THE NATIONAL WEATHER SERVICE HAS UPGRADED THE FLOOD WATCH TO A FLOOD WARNING FOR THE RIVER AND STREAMS IN THE SEWARD AREA. THIS WARNING WILL REMAIN IN EFFECT THROUGH 4 PM THURSDAY SEPTEMBER 21.

HEAVY RAIN OVERNIGHT HAS CAUSED WATER TO POND ON ROADWAYS AND IN PARKING LOTS. THE RESURRECTION RIVER ROSE FROM 8.0 FT YESTERDAY MORNING TO 14.0 FT THIS MORNING. RAIN, HEAVY AT TIMES IS EXPECTED TO CONTINUE THROUGHOUT THE DAY TODAY. THE FORECAST FOR TONIGHT IS RAIN, HEAVY AT TIMES, WITH RAIN DIMINISHING ON THURSDAY. EXPECT FURTHER RISES IN THE WATER LEVELS OF SEWARD AND VICINITY RIVERS AND STREAMS.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 4 PM SEPT 20 OR EARLIER IF CONDITIONS WARRANT.

JMP
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FLOOD STATEMENT FOR THE RESURRECTION RIVER AND OTHER STREAMS IN THE SEWARD AREA.
NATIONAL WEATHER SERVICE ANCHORAGE AK
1130 AM WED SEPT 20 1995

THE FLOOD WARNING FOR THE RIVER AND STREAMS IN THE SEWARD AREA WILL REMAIN IN EFFECT THROUGH 4 PM THURSDAY SEPTEMBER 21. HEAVY RAIN OVERNIGHT HAS CAUSED WATER TO POND ON ROADWAYS AND IN PARKING LOTS. THE RESURRECTION RIVER ROSE FROM 8.0 FT YESTERDAY MORNING TO 15.4 FT LATE THIS MORNING. REPORTS OF ROAD CLOSURES ARE: EXIT GLACIER ROAD, LOWELL POINT ROAD, AND OLD MILL ROAD. REPORTS ALSO INDICATE HIGH WATER IN BOX CANYON.

RAIN, HEAVY AT TIMES IS EXPECTED TO CONTINUE THROUGHOUT THE DAY WEDNESDAY. THE FORECAST FOR WEDNESDAY NIGHT IS RAIN, HEAVY AT TIMES, WITH RAINFALL INTENSITY DIMINISHING ON THURSDAY. EXPECT FURTHER RISES IN THE WATER LEVELS OF SEWARD AND VICINITY RIVERS AND STREAMS.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 4 PM SEPT 20 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1240 RFC issues Flood Warning for Girdwood.

...IMMEDIATE BROADCAST REQUESTED...

FLOOD WARNING FOR GIRDWOOD NEAR ANCHORAGE
NATIONAL WEATHER SERVICE ANCHORAGE AK
1240 PM ADT WED SEPT 20 1995

A FLOOD WARNING FOR THE CITY OF GIRDWOOD HAS BEEN ISSUED AND WILL REMAIN IN EFFECT UNTIL 3 PM THURSDAY SEPT 21.

HEAVY RAIN HAS CAUSED SEVER FLOODING IN THE TOWN OF GIRDWOOD. WATER FROM GLACIER CREEK AND OTHER STREAMS IN THE AREA HAVE INUNDATED MANY OF THE ROADS IN TOWN AND THE SCHOOL IS BEING EVACUATED. HIGH WATER ON GLACIER CREEK IS CAUSING EROSION OF THE BANKS AND THERE IS MUCH DEBRIS IN THE STREAM. HEAVY RAIN HAS ALSO CAUSED SOME MUD AND LAND SLIDES. PRESENTLY THERE IS CONCERN

THAT THE CHAIR 4 TOWER AT ALEYSKA MAY TOPPLE. HIGH WINDS ASSOCIATED WITH THIS RAIN HAVE ALSO CAUSED MANY POWER LINES TO BREAK.

HEAVY RAIN CONTINUING WEDNESDAY AFTERNOON, AND RAIN CONTINUING INTO THURSDAY WILL CAUSE CONDITIONS TO WORSEN THROUGHOUT THE DAY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 3 PM WEDNESDAY SEPT 20 OR EARLIER IF CONDITIONS WARRANT.

ADA
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HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA

NATIONAL WEATHER SERVICE ANCHORAGE AK
0300 PM ADT WED SEP 20 1995

WET SOILS IN SOUTHCENTRAL ALASKA INCREASE FLOOD POTENTIAL IN THIS AREA. A FLOOD WARNING IS IN EFFECT FOR SEWARD AND SURROUNDING RIVERS THROUGH 4PM THURSDAY. KODIAK HAS POTENTIAL FOR CONTINUED MUD SLIDE ACTIVITY DUE TO MORE RAIN. THE WESTERN SUSITNA BASIN IS ALSO SUBJECT TO FLOODING ASSOCIATED WITH THIS RAIN EVENT. OTHER AREAS OF THE STATE HAVE A LOW FLOOD POTENTIAL AT THIS TIME. (20/1800)

A HIGH PRESSURE RIDGE OVER THE EASTERN PORTION OF ALASKA AND WESTERN CANADA SHOULD REMAIN RELATIVELY STATIONARY THROUGH FRIDAY. THIS WILL PREVENT LOW PRESSURE SYSTEMS FROM PROGRESSING EASTWARD, RESULTING IN PERSISTENT RAIN INTO FRIDAY ALONG THE NORTH GULF COAST, KODIAK ISLAND AND KENAI PENINSULA. MORE THAN TWO INCHES OF RAIN FELL IN THE SEWARD AREA IN THE LAST 24 HOURS AND MORE THAN AN INCH FELL IN KODIAK. RECENT RAINFALL IN SOUTHCENTRAL ALASKA HAS SATURATED SOILS AND RAPID RISES ARE NOW BEING EXPERIENCED ON MANY RIVERS AND STREAMS DUE TO THE CONTINUED RAIN.

LITTLE TO NO RAIN FELL IN THE REST OF THE STATE IN THE PAST 24 HOURS. RAIN MAY BEGIN IN THE NORHWEST PORTION OF THE STATE LATER ON THURSDAY, BUT AMOUNTS SHOULD BE LESS THAN A QUARTER INCH. GENERALLY CLOUDY AND RAINY CONDITIONS IS EXPECTED OVER MOST OF ALASKA FOR THE REMAINDER OF THIS WEEK. WARM WINDS IN THE INTERIOR ARE HELPING TO DRY SOILS IN THAT AREA.

WARM AIR HAS MOVED OVER THE STATE RAISING FREEZING LEVELS ABOVE 9000 FT AT MOST LOCATIONS IN SOUTHEAST, SOUTHCENTRAL AND INTERIOR ALASKA. EVEN AT NOME AND BARROW FREEZING LEVELS ARE OVER 6000 FT. A WARMING TREND IS EXPECTED FOR NORTHERN LOCATIONS THURSDAY. (20/1800)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
RIVERS ARE ON THE RISE DUE TO SOME MODERATE RAIN IN THE BASIN. EXPECT WATER LEVELS TO RISE ON THURSDAY, DEPENDING ON HOW MUCH RAIN FALLS IN THE REGION. (20/2200)

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
RAIN RUNOFF WILL CAUSE THE WATER LEVELS ON AREA STREAMS TO BE ON THE RISE THURSDAY AND POSSIBLY FRIDAY. (20/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
HEAVY RAIN HAS FALLEN AND CONTINUES TO FALL OVER MUCH OF THE SEWARD AREA. THE FLOOD WARNING WILL CONTINUE THROUGH 4 PM THURSDAY. A NUMBER OF ROADS ARE CLOSED DUE TO FLOODING. MORE RAIN IS EXPECTED TONIGHT, BUT WITH THE INTENSITY TAPPERING OFF TOMORROW. WATER LEVELS WILL CONTINUE TO RISE TONIGHT ON MOST STREAMS AND RIVERS. WATER LEVELS ON KENAI LAKE AND STATIONS DOWNSTREAM ARE ALREADY RISING AS 3+ INCHES OF RAIN HAS FALLEN OVER THE BASIN IN THE PAST 24 HOURS. (20/2200)

COPPER RIVER BASIN...
WATER LEVELS ARE EITHER HOLDING STEADY OR SLOWLY FALLING EXCEPT MILLION DOLLAR BRIDGE WHICH IS ON THE RISE. (20/2200)

JMP/ADA
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1515 RFC issues Flood Watch for Kenai River.

FLOOD WATCH FOR THE KENAI RIVER AND OTHER RIVERS IN THE KENAI RIVER BASIN.

NATIONAL WEATHER SERVICE ANCHORAGE AK

315 PM ADT WED SEPT 20 1995

...IMMEDIATE BROADCAST REQUESTED...

THE NATIONAL WEATHER SERVICE HAS ISSUED A FLOOD WATCH FOR THE KENAI RIVER AND OTHER STREAMS IN THE KENAI BASIN. THIS WATCHWILL REMAIN IN EFFECT UNTIL 10 AM THURSDAY SEPTEMBER 21.

APPROXIMATELY 3.0+ INCHES OF RAIN HAS FALLEN IN THE UPPER KENAI RIVER BASIN SINCE TUESDAY AFTERNOON. THE GAGE AT COOPER LANDING HAS RISEN1.0 FT IN THE PAST 24 HOURS, AND 0.4 FT AT KENAI KEYS OVER THE PAST 8 HOURS. WITH MORE RAIN IN THE FORECAST FOR THIS EVENING AND OVERNIGHT TONIGHT, BANKFULL CONDITIONS ARE A REAL POSSIBILITY FOR SOME PORTIONS OF THE KENAI RIVER. LOW LYING AREAS COULD ALSO BE INUNDATED AS HIGH WATER OVERFLOWS AND ERODES RIVER BANKS.

A FLOOD WATCH MEANS THAT FLOODING IS POSSIBLE.

THIS STATEMENT WILL BE UPDATED AT 10 AM THURSDAY SEPT 21 OR EARLIER IF CONDITIONS WARRANT.

JMP
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FLOOD STATEMENT FOR GIRDWOOD NEAR ANCHORAGE
NATIONAL WEATHER SERVICE ANCHORAGE AK
330 PM ADT WED SEPT 20 1995

A FLOOD WARNING FOR THE CITY OF GIRDWOOD REMAINS IN EFFECT UNTIL 3 PM THURSDAY SEPT 21.

HEAVY RAIN HAS CAUSED FLOODING IN THE TOWN OF GIRDWOOD. WATER FROM AREA CREEKS INUNDATED ROADS IN TOWN, BUT WORK CREWS HAVE BUILT UP DIKES AND DIVERTED MUCH OF THE WATER BACK INTO THEIR CHANNELS. HIGH WATER ON GLACIER CREEK IS CAUSING EROSION OF THE BANKS AND THERE IS MUCH DEBRIS IN AREA STREAMS. HEAVY RAIN HAS ALSO CAUSED SOME MUD AND LAND SLIDES. HOWEVER, AN EARLIER REPORT THAT THE CHAIR 4 TOWER AT ALEYSKA MAY TOPPLE WAS LATER FOUND TO BE IN ERROR. HIGH WINDS ASSOCIATED WITH THIS RAIN HAVE CAUSED DOWNED POWER LINES AND TEMPORARY OUTAGES AROUND GIRDWOOD.

WITH RAIN CONTINUING INTO THURSDAY, CONDITIONS ARE NOT EXPECTED TO IMPROVE CONSIDERABLY UNTIL LATER ON THURSDAY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 11 AM THURSDAY SEPT 21 OR EARLIER IF CONDITIONS WARRANT.

ADA
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1600 **RFC begins evening shift operations, ending at 11 p.m.**

2030 **RFC issues River Statement for streams draining the Chugach Mountains in the Anchorage area.**

2217 **WSFO Anchorage Forecast Discussion excerpts: "MDLS IN FAIR AGRMNT ON POSITION AND MOVMNT OF 962MB LOW..MOVG LOW NW TO 64N/177W BY FRI AFTN. NGM/AVN HAVE LOW CNTR PRES ABT 11MB LWR THAN ETA AT 48 HRS WITH A 978MB CNTR FRI AFTN. NGM/AVN IN AGRMNT ON NXT LOW SW OF THE ALUTNS...MOVG IT TO ABT 52N/156W BY FRI AFTN AS A 984MB LOW..5MB HIER THAN ETA. ALL MDLS SMLR AT 500MB..KEEPING TH STG BLKG PTRN THRU FRI AFTN WITH MEAN RIDGE AXIS SHFTG FM 130W TO 120W. HI AMP NEG TILT TROF FM NW BERING ACRS AK PEN BY FRI AFTN. 0401Z SATLT SHOWS FNT THRU NRN COOK INLET WITH GUD DRY SLOT BEHIND FNT. DRY SLOT MOVG OVR KENAI PEN/WRN PWS."**

Thursday , September 21

0325 WSFO Anchorage Forecast Discussion excerpts: **"LTST SAT IMGRY SHOWS FNTL BACLN ZONE CONTG TO SHIFT SLOWLY EWD..IN LN WITH NGM 500MB PNLS SHWG JET AXIS..FLAT WV MVG NWD TWD MDO..VSBL ON 0722Z DMSP..SHD HOLD HVY RA OVR KENAI PEN/PWS THRU MRNG HRS..THEN HVY PCPN SHFTG EWD UNDER JET AXIS TO PWS BY AFTN AND ERN N GLF CST FRI. WILL PRBLY DROP HI WND ADVSRYS FOR WRN S CNTRL AK BUT HOLD FOR ERN PWS..AREA TO E FNTL BNDRY."**

0500 Telephones at the WSFO/RFC out of service.

0730 Telephones back in service.

0830 RFC issues Flood Warning for Kenai River.

Appendix I-7

...IMMEDIATE BROADCAST REQUESTED...

FLOOD WARNING FOR KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
830 AM THUR SEPT 21 1995

A FLOOD WARNING FOR THE KENAI RIVER, INCLUDING KENAI LAKE, COOPER LANDING, KENAI KEYS, AND SOLDOTNA.

HEAVY RAIN OVER THE UPPER PORTION OF THE KENAI BASIN ON TUESDAY NIGHT THROUGH THURSDAY MORNING HAS CAUSED A MAJOR RISE IN WATER LEVELS ON KENAI LAKE AND ITS TRIBUTARIES. THE GAGE AT COOPER LANDING HAS RISEN 2.5 FT IN THE PAST 24 HOURS. WATER LEVELS AT COOPER LANDING WILL PROBABLY CREST SOMETIME LATE THURSDAY OR EARLY FRIDAY, WITH A STAGE BETWEEN 14 AND 15 FT. FLOOD STAGE AT COOPER LANDING IS 14.0 FT.

MINOR FLOODING IS OCCURING AT KENAI KEYS THIS MORNING. RISING STAGES ARE EXPECTED TO CONTINUE THROUGH THURSDAY AT KENAI KEYS AND AT SOLDOTNA. FLOODING IS EXPECTED TO OCCUR AT BOTH KENAI KEYS AND SOLDOTNA TODAY AND FRIDAY.

THE HEAVY RAINS OVER THE KENAI PENINSULA APPEAR TO BE OVER, WITH LIGHTER AMOUNTS OF RAIN FORECASTED FOR THURSDAY. SMALLER STREAMS SHOULD BEGIN FALLING TODAY, WITH THE KENAI RIVER FALLING OVER THE WEEKEND.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 9 AM SEPTEMBER 22 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1030 RFC issues Flood Watch for Western Susitna Valley.

1230 RFC issues Flood Warning for streams around Valdez.

...IMMEDIATE BROADCAST REQUESTED...

FLOOD WARNING FOR RICHARDSON HWY NEAR VALDEZ
NATIONAL WEATHER SERVICE ANCHORAGE AK
1230 PM THUR SEPT 21 1995

THE NATIONAL WEATHER SERVICE HAS ISSSUED A FLOOD WARNING FOR THE RICHARDSON HIGHWAY IN THE VICINITY OF VALDEZ. THIS WARNING WILL REMAIN IN EFFECT UNTIL 4PM FRIDAY SEPT 23.

HEAVY RAIN IN THE MOUNTAINS ABOVE VALDEZ HAVE RAISED RIVER AND STREAM LEVELS CONSIDERABLY. THE TIEKEL AND LOWE RIVERS HAVE RISEN OUT OF THEIR BANKS AND HAVE CAUSED THE RICHARDSON HIGHWAY TO BE CLOSED AT MILE 47 AND 19 RESPECTIVELY. WATER IS OVER THE HIGHWAY AT SEVERAL LOCATIONS ALONG THAT STRETCH OF THE HIGHWAY.

RAIN IS EXPECTED TO CONTINUE IN THE VALDEZ AREA THROUGH THURSDAY NIGHT AND SHOWERS ARE EXPECTED TO CONTINUE INTO FRIDAY. THEREFORE RIVERS AND STREAMS ARE EXPECTED TO CONTINUE TO RISE THROUGH THURSDAY NIGHT.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED THURSDAY 7 PM SEPT 21 OR EARLIER IF CONDITIONS WARRANT.

ADA
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1400 RFC issues upgrade from Flood Watch to Flood Warning for Western Susitna Valley .

FLOOD WARNING FOR THE WESTERN SUSITNA BASIN
NATIONAL WEATHER SERVICE ANCHORAGE AK
2 PM ADT THU SEP 21 1995

...IMMEDIATE BROADCAST REQUESTED...

THE NATIONAL WEATHER SERVICE HAS UPGRADED THE FLOOD WATCH TO A FLOOD WARNING FOR SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES. THIS WARNING WILL REMAIN IN EFFECT UNTIL 11 AM FRIDAY SEPT 22.

THE RADAR SHOWED RAIN, HEAVY AT TIMES, THROUGHOUT WEDNESDAY AND CONTINUING INTO THURSDAY. WITH STRONG WINDS COMING FROM THE EAST, THE PRECIPITATION WAS ENHANCED ALONG THE ALASKA RANGE, ONE REPORT INDICATES ABOUT 4 IN. FELL THIS MORNING AT FINGER LAKES. RIVERS HAVE RESPONDED TO THIS RAIN, WITH LAKE CREEK RISING BY FIVE FEET.

A REPORT FROM SKWENTNA INDICATES THE A NUMBER OR ROADS AROUND TOWN ARE UNDERWATER. WATER IS NOT UP TO THE AIRPORT AT THIS TIME BUT IS STEADILY RISING. A LARGE NUMBER OF LOGS ARE RAFTING DOWN THE RIVER, ADDING TO THE FLOODING PROBLEM.

RADAR IS INDICATING CONTINUED MODERATE TO HEAVY RAIN OCCURRING OVER THE WESTERN PORTION OF THE SUSITNA BASIN. INTERMITTENT RAIN SHOWERS WILL PROBABLY CONTINUE THROUGH THURSDAY NIGHT, TAPPERING OFF ON FRIDAY.

THIS STATEMENT WILL BE UPDATED AT 8 PM THURSDAY SEPT 21 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1458 WSFO Anchorage Forecast Discussion excerpts: **"IT LKS LIKE LOW S OF KODIAK ISL HAS DSIPTD. MN BAROCLINIC ZN STILL LINK WITH 300 MB JET OVR ERN GLF AK AND ERN MNLD. LOW NR ALUTNS STILL MOVG E WITH CDFNT EXTNDG TO S AND SW OF LOW. SFC TROF ASSOCD WITH LOW WILL SWING N ACRS KODIAK ISL THIS EVE AND ACRS S CNTRL AK FRI MRNG.** RDG OVR WRN CANADA WILL BLD INTO SRN AK FRI AND MOV INTO CNTRL INTR SAT. PRESS GRAD ALG CNTRL GLF CST WILL RELAX THRU FRI. **OCNL RA/SHWR WILL CONT OVR S CNTRL INTR TNGT AND END FRI MRNG. RA ALG CNTRL GLF CST WILL DMSH TO SHWR BY FRI AFTN. WND ARE STILL LCLY GUSTY ALG CNTRL GLF CST BUT WILL DMSH THRU TNGT."**

1500 RFC issues Flood Watch for Knik River area.

HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE AK
0300 PM ADT THU SEP 21 1995

...FLOOD POTENTIAL...

HEAVY RAINS ON THE KENAI PENINSULA AND IN THE CHUGACH MOUNTAINS HAVE CAUSED FLOODING IN THE SEWARD AREA, ON THE KENAI RIVER, AT GIRDWOOD IN TURNIGAN ARM, AND STREAMS DRAINING INTO THE MATANUSKA RIVER FROM THE CHUGACH MOUNTAINS. THE POTENTIAL FOR FLOODING ON THE WESTERN SIDE OF THE SUSITNA RIVER AND ALONG THE NORTH GULF COAST IS ALSO HIGH. IN THE REST OF THE SUSITNA AND MATANUSKA VALLEYS, ALONG WITH THE COPPER RIVER BASIN THE FLOOD POTENTIAL IS MODERATE. THE REST OF THE STATE IS AT A LOW FLOOD POTENTIAL. (21/1800)

...HYDROMETEOROLOGICAL CONDITIONS...

THE HIGH PRESSURE RIDGE WHICH HAS REMAINED OVER THE EASTERN PORTION OF ALASKA AND WESTERN CANADA IS EXPECTED TO SLOWLY MOVE OFF TO THE EAST. THIS WILL ALLOW THE LOW IN THE GULF OF ALASKA, WHICH HAS PRODUCED A SIGNIFICANT AMOUNT OF RAIN ON KODIAK ISLAND AND THE KENAI PENINSULA, TO DRIFT EASTWARD. RAINS, MODERATE TO HEAVY AT TIMES, WILL THEREFORE MOVE EAST OVER THE NORTH GULF COAST AND YAKUTAT. NEARLY 5 INCHES OF RAIN FELL IN THE SEWARD AREA AND IN THE KENAI MOUNTAINS. TURNIGAN ARM, GIRDWOOD AREA, RECEIVED MORE THAN 3 INCHES, AS DID PALMER AND CORDOVA.

RAIN SHOULD TURN TO SHOWERS DURING THURSDAY ON THE KENAI PENINSULA BUT SHOULD CONTINUE ALONG THE NORTH GULF COAST AND WESTERN SUSITNA VALLEY.

LITTLE TO NO RAIN FELL IN THE REST OF THE STATE IN THE PAST 24 HOURS. RAIN MAY BEGIN IN THE NORHWEST PORTION OF THE STATE LATER ON THURSDAY, BUT AMOUNTS SHOULD BE LESS THAN A QUARTER INCH. GENERALLY CLOUDY AND RAINY CONDITIONS IS EXPECTED OVER MOST OF ALASKA FOR THE REMAINDER OF THIS WEEK. WARM WINDS IN THE INTERIOR ARE HELPING TO DRY SOILS IN THAT AREA.

FREEZING LEVELS WILL NOT CHANGE SIGNIFICANTLY IN SOUTHEAST ALASKA, BUT THE REST OF THE STATE SHOULD SEE FREEZING LEVELS DROP TO AROUND 4500 FEET BY SATURDAY. (21/1800)

...HYDROLOGIC CONDITIONS...

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
A RIVER FLOOD WARNING IS IN EFFECT FOR THE WESTERN SUSITNA BASIN, INCLUDING THE SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES. RAIN WAS ENHANCED BY STRONG WINDS AGAINST THE ALASKA RANGE CAUSING HEAVY RAINS IN THE MOUNTAINS. RIVERS WILL LIKELY FALL SATURDAY AS THE RAIN SUBSIDES. (21/2200)

Appendix I-9

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
HEAVY RAIN IN THE CHUGACH AND KENAI MOUNTAINS HAS CAUSED FLOODING OF STREAMS AND RIVERS DRAINING THE NORTH SLOPES OF THE CHUGACH MOUNTAINS AND AREAS OF THE KENAI MOUNTAINS. NO FLOODING WAS REPORTED ON RIVERS AND STREAMS NEAR HOMER BUT LEVELS THERE ARE ALSO NEAR BANKFUL. THE KENAI RIVER IS FLOODING ALONG NEARLY ITS ENTIRE REACH AND HAS NOT YET CRESTED. STREAMS MAY BEGIN TO FALL LATER THURSDAY BUT RIVERS MAY NOT CREST UNTIL LATER ON FRIDAY OR INTO SATURDAY. (21/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
HEAVY RAIN HAS FALLEN AND CONTINUES TO FALL OVER MUCH OF THE NORTH GULF COAST. THERE IS A FLOOD WARNING IN EFFECT FOR RIVERS AND STREAMS IN THE VICINITY OF SEWARD AND A FLOOD WARNING FOR THE RICHARDSON HIGHWAY NEAR VALDEZ. HEAVY RAIN IS EXPECTED TO CONTINUE MOVING EAST AND WILL CAUSE HIGH WATER ON STREAMS IN CORDOVA AND YAKUTAK LATER THURSDAY NIGHT. (21/2200)

COPPER RIVER BASIN...
RAIN IN THE COPPER RIVER BASIN WILL RAISE LEVELS ON STREAMS AND RIVERS, ESPECIALLY IN THE LOWER BASIN INTO FRIDAY. FALLING STAGES ARE NOT EXPECTED UNTIL LATER THIS WEEKEND. (21/2200)

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FLOOD STATEMENT FOR GIRDWOOD NEAR ANCHORAGE
NATIONAL WEATHER SERVICE ANCHORAGE AK
300 PM ADT THUR SEPT 21 1995

A FLOOD WARNING FOR THE CITY OF GIRDWOOD REMAINS IN EFFECT UNTIL 11 AM FRIDAY SEPTEMBER 22.

RAIN HAS BEEN LIGHT TO MODERATE OVER THE PAST SIX HOURS IN AND AROUND GIRDWOOD. GLAICER CREEK AND ITS TRIBUTARIES ARE STILL CAUSING MINOR FLOODING PROBLEMS. THE HEAVY EQUIPMENT OPPERATORS HAVE BEEN ABLE TO DIVERT MUCH OF THE RUNOFF AND ARE CONTINUING TO DO SO. BY LATE THURSDAY, WATER LEVELS IN GIRDWOOD STREAMS AND CREEKS SHOULD DROP SIGNIFICANTLY. RAINFALL SHOULD REMAIN LIGHT FOR THE REMAINDER OF THURSDAY AND FRIDAY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 11 AM FRIDAY SEPTEMBER 22 OR EARLIER IF CONDITIONS WARRANT.

JMP
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FLOOD STATEMENT FOR THE RESURRECTION RIVER AND OTHER STREAMS IN THE SEWARD AREA.
NATIONAL WEATHER SERVICE ANCHORAGE AK
400 PM SEPT 21 1995

THE FLOOD WARNING FOR THE RIVER AND STREAMS IN THE SEWARD AREA WILL REMAIN IN EFFECT THROUGH 11 AM FRIDAY SEPTEMBER 22.

LIGHT TO MODERATE RAIN CONTINUES TO FALL IN THE SEWARD AREA. THE WEATHER FORECAST IS FOR LIGHT RAIN THROUGH TONIGHT AND SCATTERED SHOWERS ON FRIDAY.

THERE IS STILL THE THREAT OF FLOODING FROM SOME OF THE SMALLER STREAMS AND CREEKS IN THE SEWARD AREA. REPORTS OF ROAD CLOSURES ARE: PORT AVE, LOWELL POINT ROAD, NASH ROAD, EXIT GLACIER ROAD, AND PRIMROSE ROAD. WE ALSO HAVE HEARD THAT THE BOX CANYON LEVEE WAS BREACHED EARLY THIS MORNING, WITH THE RESULT THAT THE OLD EXIT GLACIER ROAD IS UNDER WATER. WE HAVE RECEIVED A REPORT THAT THE WATER IN SEWARD WAS SLOWLY STARTING TO RECEED THIS MORNING.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 11 AM SEPTEMBER 22 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1700 RFC issues Flood Warning for Cordova area.

...IMMEDIATE BROADCAST REQUESTED...

FLOOD WARNING FOR STREAMS IN THE CORDOVA AREA
NATIONAL WEATHER SERVICE ANCHORAGE AK
5 PM THUR SEPT 21 1995

THE NATIONAL WEATHER SERVICE HAS ISSUED A FLOOD WARNING FOR STREAMS IN THE CORDOVA AREA. THIS WARNING WILL REMAIN IN EFFECT UNTIL 9 AM SATURDAY SEPTEMBER 23.

HEAVY RAIN IN THE CORDOVA AREA OVER THE LAST 2 DAYS HAS CAUSED A MAJOR RISE IN WATER LEVELS ON STREAMS IN THE CORDOVA AREA. LEVELS ON ALL STREAMS ARE HIGH. WATER IS FLOWING OVER THE COPPER RIVER HIGHWAY AT MILE 14, AND WATER IS THREATENING THE ROADWAY AT 9 MILE. THE RAIN IS EXPECTED TO CONTINUE THROUGH FRIDAY, AND STREAMS ARE EXPECTED TO CONTINUE TO RISE.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 1 PM FRIDAY SEPTEMBER 22 OR EARLIER IF CONDITIONS WARRANT.

ACL
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FLOOD STATEMENT FOR RICHARDSON HWY NEAR VALDEZ
NATIONAL WEATHER SERVICE ANCHORAGE AK
700 PM THUR SEPT 21 1995

THE FLOOD WARNING FOR THE RICHARDSON HIGHWAY AND STREAMS IN THE VICINITY OF VALDEZ WILL REMAIN IN EFFECT UNTIL 12 PM FRIDAY SEPT 22.

HEAVY RAIN IN THE MOUNTAINS ABOVE VALDEZ HAS RAISED RIVER AND STREAM LEVELS CONSIDERABLY. THE TIEKEL AND LOWE RIVERS HAVE RISEN OUT OF THEIR BANKS AND HAVE CAUSED THE RICHARDSON HIGHWAY TO BE CLOSED AT MILE 47 AND 19 RESPECTIVELY. WATER IS OVER THE HIGHWAY AT SEVERAL LOCATIONS ALONG THAT STRETCH OF THE HIGHWAY.

RAIN IS EXPECTED TO CONTINUE IN THE VALDEZ AREA THROUGH THURSDAY NIGHT AND SHOWERS ARE EXPECTED TO CONTINUE INTO SATURDAY. THEREFORE RIVERS AND STREAMS ARE EXPECTED TO CONTINUE TO RISE THROUGH THURSDAY NIGHT.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED FRIDAY 12 PM SEPT 22 OR EARLIER IF CONDITIONS WARRANT.

ACL
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FLOOD STATEMENT FOR THE WESTERN SUSITNA BASIN
NATIONAL WEATHER SERVICE ANCHORAGE AK
8 PM ADT THU SEP 21 1995

THE FLOOD WARNING FOR THE SKWENTA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES, REMAINS IN EFFECT UNTIL 11 AM FRIDAY SEPT 22.

THE RADAR SHOWED RAIN, HEAVY AT TIMES, IN THE WESTERN PORTION OF THE SUSTITNA BASIN BOTH WEDNESDAY AND THURSDAY. WITH STRONG WINDS COMING FROM THE EAST, THE PRECIPITATION WAS ENHANCED ALONG THE ALASKA RANGE, ONE REPORT INDICATES ABOUT 4 IN. FELL THIS MORNING AT FINGER LAKES.

RIVERS HAVE RESPONDED TO THIS RAIN, WITH LAKE CREEK RISING BY FIVE FEET. REPORTS THURSDAY EVENING INDICATE THAT LAKE CREEK IS THREATENING SOME HOMES.

A REPORT FROM SKWENTNA INDICATES THE A NUMBER OR ROADS AROUND TOWN ARE UNDERWATER. SEVERAL HOMES ARE ALSO IN DANGER OF FLOODING THURSDAY EVENING. WATER IS NOT UP TO THE AIRPORT AT THIS TIME BUT IS STEADILY RISING. A LARGE NUMBER OF LOGS ARE RAFTING DOWN THE RIVER, ADDING TO THE FLOODING PROBLEM.

RADAR IS INDICATING CONTINUED MODERATE TO HEAVY RAIN OCCURRING OVER THE WESTERN PORTION OF THE SUSITNA BASIN. INTERMITTENT RAIN SHOWERS WILL PROBABLY CONTINUE THROUGH THURSDAY NIGHT, TAPPERING OFF ON FRIDAY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 930 AM FRIDAY SEPT 22 OR EARLIER IF CONDITIONS WARRANT.

ACL
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2127 WSFO Anchorage Forecast Discussion excerpts: **"STG BACLIN ZONE ERN GLFAK ASSOCD WITH UPR JET PRSTNT AND REFLECTED WELL BY PROGS RH/PCP PATTERN. PROGS GENLY SIMILAR IN SYNOPTIC**

SOLUTIONS. MAIN FEATURES ARE DP AND PRSTNT MOISTURE/PCPN ERN GLFAK AND DPNG BINARY SYSTEM..ONE NR DUT WITH CONECTION TO LOW ALG 43N.

WATCH/WARNING SUMMARY
PUBLIC...FLD WRNG YENTNA,SKWENTA RVRS,KENAI RVR, CDV STREAMS.
FLD WRNG RICHARDSON HIWAY.
FLD WRNG CITY OF GIRDWOOD.
FLD WATCH KNIK RVR."

Friday, September 22

0314 WSFO Anchorage Forecast Discussion excerpts: **"ALL SATL PIX SHW HVY PCPN ASSOCD W/FNT & JTSTRM CDV EWD BUT ALL NRN GLFASK STILL UNDER SLY FLOW ALF FOR CONTD RAIN. 2ND TROF XTNDG SW OF ADQ WILL CONT TO MOV NWD BEST HANDLD BY ETA/NGM. WARM MX TEMPS CONT DUE TO LACK OF COLD ADVCTN XCP INTO DVLPG LOW. AS DEEP LOW DVLPS IN SRN GLFASK FLOW ALF BCMS MORE SE OVR CNTRL & ERN XNS FOR SOME BRKS THEN BACK IN LOTS MSTR BY 00Z SUN. LONGR TERM: BERING LOW BCMS DOMINANT CIRCULATN BY 00Z MON W/SWLY FLOW ALF OVR ENTR FCST AREA TUE WHCH LUKS WET BUT DOESNT LUK LIKE DOWNPOUR ATTM.**

WATCH/WARNING SUMMARY
Public...**FLD WRNG YENTA,SKWENTA,KENAI,CDV AREA,RICHARDSON HWY, GIRDWOOD, VWS, 5WD. FLOOD WATCH KNIK."**

FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
900 AM SEPT 22 1995

THE FLOOD STATEMENT FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH NOON ON SATURDAY SEPTEMBER 23.

OVER NIGHT THE GAGE AT COOPER LANDING WAS STILL RISING, BUT AT ABOUT HALF THE RATE OF THE PREVIOUS 12 HOUR PERIOD. AS OF 7 AM THIS MORNING THE GAGE AT COOPER LANDING WAS AT 15.6 FT, KENAI KEYS 13.8 FT, AND AT SOLDOTNA 12.8 FT. WATER LEVELS AT THE KEYS AND SOLDOTNA WILL CONTINUE TO RISE TODAY, THEY MAY CREST SOMETIME LATER ON FRIDAY.

THE WEATHER OUTLOOK IS FOR SHOWERS TODAY OVER THE WESTERN PORTIONS OF THE KENAI PEN, WITH LIGHT RAIN OVER THE EASTERN SECTIONS. THE NATIONAL GUARD FLEW UP TO SNOW LAKE GLACIER DAM YESTERDAY AFTERNOON, THE LAKE HAD NOT RELEASED AT THAT TIME.

FLOODING IS OCCURING AT KENAI KEYS AND SOLDOTNA AND AT VARIOUS OTHER LOCATIONS ALONG THE RIVER. AS WATER FLOWS OVER BANKS GAGE READINGS WILL BE ONLY ROUGH ESTIMATES OF WATER LEVELS AS MUCH OF THE ADDED FLOW SPREADS OUT HORIZONTALLY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 4 PM SEPTEMBER 22 OR EARLIER IF CONDITIONS WARRANT.

JMP
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0943 WSFO Anchorage Forecast Discussion excerpts: **"CURRENT GOES STLT PIXS SHOWS THERE IS STILL A STRG BAROCLINIC ZONE ASSOCD WITH 300 MB SLY JET OVR ERN GLF AK AND ERN AK. WTR VPR CHNL SHOW GOOD MOISTURE PLUME FM MID LATITUDE CONTG TO MOV INTO ERN AK. ALL MDLS DRFT MN AXIS OF JET EWD INTO SE AK AND WRN CANADA BY AND SHORTEN SRN FETCH BY SAT NGT. MN SOURCE OF MOISTURE INTO SRN AK WILL GRADLY DMSH AND SHFT E THRU 48 HRS."**

FLOOD STATEMENT FOR THE WESTERN SUSITNA BASIN
NATIONAL WEATHER SERVICE ANCHORAGE AK
1000 AM FRI SEPT 22 1995

THE FLOOD WARNING FOR THE SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES, REMAINS IN EFFECT UNTIL 11 AM SATURDAY 23.

FLOODING IS OCCURING ALONG THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK. WATER LEVELS HAVE BEEN RISING ALL NIGHT LONG AT THE CONFLUENCE OF LAKE CREEK INTO THE YENTNA RIVER, DUE TO RAIN WHICH HAS BEEN FALLING OVER THE FOOT HILLS OF THE ALASKA RANGE FOR THE PAST THREE DAYS.

RADAR THIS MORNING IS SHOWING SOME MODERATE RAIN SHOWERS OVER THE UPPER SKWENTNA BASIN, THE WEATHER FORECAST FOR SATURDAY IS FOR THE RAIN TO DECREASE TO INTERMITTENT SHOWERS. WATER LEVELS MIGHT NOT CREST UNTIL SOMETIME ON SATURDAY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 11 AM SATURDAY SEPT 23 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1100 RFC issues Flood Warning for Knik River.

FLOOD WARNING FOR THE KNIK RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
11 AM ADT FRI SEPT 22 1995

...IMMEDIATE BROADCAST REQUESTED...

THE NATIONAL WEATHER SERVICE HAS UPGRADED THE FLOOD WATCH TO A FLOOD WARNING FOR THE KNIK RIVER. THIS WARNING WILL REMAIN IN EFFECT THROUGH 9 AM SAT SEPT 23.

RAIN HAS DIMINISHED ALONG THE NORTH SIDE OF THE CHUGACH MOUNTAINS. THIS HAS ALLOWED AREA STREAMS TO BEGIN FALLING. THIS FALLING TREND ON STREAMS IS EXPECTED TO CONTINUE INTO SATURDAY. HOWEVER, THE KNIK RIVER CONTINUES TO RISE AND IS NOT EXPECTED TO CREST UNTIL LATE FRIDAY. PRESENTLY THE OLD GLENN HIGHWAY IS INUNDATED WHERE IT CROSSES THE KNIK RIVER. ALSO THE FISH HATCHERY ON THE OLD GLENN IS FLOODED. THIS HIGH WATER ON THE KNIK RIVER IS CAUSING BANK EROSION AND IS CARRYING MUCH DEBRIS DOWNSTREAM. FLOODING IS EXPECTED TO CONTINUE THROUGH FRIDAY NIGHT.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 3 PM FRIDAY SEPT 22 OR EARLIER IF CONDITIONS WARRANT.

ADA
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1100 RFC issues Flood Watch for Tonsina area.

FLOOD WATCH FOR THE TONSINA VIDINITY STREAMS
NATIONAL WEATHER SERVICE ANCHORAGE AK
1100 AM FRI SEPT 22 1995

...IMMEDIATE BROADCAST REQUESTED...

THE NATIONAL WEATHER SERVICE HAS ISSUED A FLOOD WATCH FOR THE RIVERS AND STREAMS IN THE AREA SURROUNDING THE TOWN OF TONSINA. THIS WATCH WILL REMAIN IN EFFECT THROUGH NOON SATURDAY SEPTEMBER 23.

HEAVY RAIN HAS FALLEN OVERNIGHT IN THE TONSINA AREA. BERNARD CREEK HAS BEGUN TO FLOOD ONE HOUSE AND IS THREATING ANOTHER. RAIN IS SPILLING OVER FROM A NORTH GULF COAST STORM WHICH HAS DUMPED HEAVY RAIN FROM CORDOVA TO YAKUTAT. RAIN FOR THE NORTH GULF COAST IS EXPECTED TO REMAIN MODERATE TO HEAVY TODAY AND TOMORROW. THIS MEANS THAT RAIN IS MOSTLY LIKELY TO CONTINUE IN THE TONSINA AREA TODAY.

A FLOOD WATCH MEANS THAT FLOODING IS POSSIBLE.

THIS STATEMENT WILL BE UPDATED AT NOON SATURDAY SEPTEMBER 23 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1100 RFC cancels Flood Warning for Girdwood.

FLOOD STATEMENT FOR GIRDWOOD NEAR ANCHORAGE
NATIONAL WEATHER SERVICE ANCHORAGE AK
1100 AM ADT FRI SEPT 22 1995

A FLOOD WARNING FOR THE CITY OF GIRDWOOD HAS BEEN CANCELLED.

THERE WAS NO RAIN IN GIRDWOOD THURSDAY NIGHT, AND NO SIGNIFICANT RAIN IS EXPECTED IN THE GIRDWOOD AREA THROUGH FRIDAY NIGHT. LATE THURSDAY WATER LEVELS ON STREAMS IN THE GIRDWOOD AREA WERE FALLING, AND WATER LEVELS WILL CONTINUE TO FALL THROUGH FRIDAY.

THIS STATEMENT WILL NOT BE UPDATED.

ACL
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1130 RFC cancels Flood Warning for Seward.

FLOOD STATEMENT FOR THE RESURRECTION RIVER AND OTHER STREAMS IN THE SEWARD AREA.

NATIONAL WEATHER SERVICE ANCHORAGE AK
1130 AM FRI SEPT 22 1995

THE FLOOD WARNING FOR THE RESURRECTION RIVER AND STREAMS IN THE SEWARD AREA HAS BEEN CANCELLED.

LIGHT TO MODERATE RAIN CONTINUES TO FALL IN THE SEWARD AREA, HOWEVER THE RESURRECTION RIVER IS DOWN TO 12.9 FT AND MUCH OF THE WATER IN AND ROUND SEWARD HAS RECEEDED. CREWS ARE NOW IN THE PROCESS OF REPAIRING WASHED OUT ROADS AND OTHER STORM RELATED DAMAGE.

THE WEATHER FORECAST IS FOR LIGHT TO MODERATE RAIN TO CONTINUE THROUGH EARLY SATURDAY. HOWEVER THE RAINFALL TOTALS SHOULD BE WELL BELOW THOSE EXPERIENCED EARLIER IN THE WEEK.

THIS STATEMENT WILL NOT BE UPDATED

JMP
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1200 RFC cancels Flood Warning for Valdez area.

FLOOD STATEMENT FOR RICHARDSON HWY NEAR VALDEZ
NATIONAL WEATHER SERVICE ANCHORAGE AK
1200 PM FRI SEPT 22 1995

THE FLOOD WARNING FOR THE RICHARDSON HIGHWAY AND STREAMS IN THE VICINITY OF VALDEZ HAS BEEN CANCELLED.

VALDEZ HAS RECEIVED NO RAIN IN NEARLY 12 HOURS, AND WATER LEVELS ON STREAMS IN THE AREA HAVE BEGUN TO FALL. SCATTERED SHOWERS ARE LIKELY IN THE VALDEZ AREA AND ALONG THE RICHARDSON HIGHWAY INTO SATURDAY, BUT THESE SHOWERS ARE NOT EXPECTED TO BE HEAVY ENOUGH TO BRING STREAM LEVELS BACK TO HAZARDOUS LEVELS. ONE LANE OF THE RICHARDSON HIGHWAY HAS BEEN REOPENED TO TRAFFIC AT MILE 47 AND 60.

THIS STATEMENT WILL NOT BE UPDATED.

ACL
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1300 RFC cancels Flood Warning for Cordova area.

FLOOD STATEMENT FOR STREAMS IN THE CORDOVA AREA
NATIONAL WEATHER SERVICE ANCHORAGE AK
100 PM FRI SEPT 22 1995

THE FLOOD WARNING FOR STREAMS IN THE CORDOVA AREA HAS BEEN CANCELLED.

RAIN HAS BECOME LIGHT AND SHOWERY IN THE CORDOVA AREA FRIDAY MORNING, AND STREAM LEVELS ARE BEGINING TO FALL. THE COPPER RIVER HIGHWAY AT MILE 14 WAS STILL CLOSED AT NOON ON FRIDAY, BUT THE WATER LEVEL WAS DROPPING. LIGHT SHOWERS ARE EXPECTED TO CONTINUE THROUGH THE WEEKEND, AND STREAM LEVELS SHOULD CONTINUE TO FALL THROUGH THE WEEKEND.

THIS STATEMENT WILL NOT BE UPDATED.

ACL
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1503 WSFO Anchorage Forecast Discussion excerpts: **"BAROCLINIC ZONE STILL OVR ERN GLF AK AND ERN AK UNDER 300 MB JET. STLT PIX SHOW WV MOVG ALG FNT INTO ERN GLF. 300 MB JET WILL CONT TO DRFT E INTO WRN CANADA SUN AFTN."**

FLOOD STATEMENT FOR THE KNIK RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
3:45 PM ADT FRI SEPT 22 1995

THE FLOOD WARNING FOR THE KNIK RIVER AND STREAMS DRAINING THE NORTH SIDE OF THE CHUGACH MOUNTAINS REMAINS IN EFFECT THROUGH 9 AM SAT SEPT 23.

RAIN HAS DIMINISHED ALONG THE NORTH SIDE OF THE CHUGACH MOUNTAINS. THIS HAS ALLOWED AREA STREAMS TO BEGIN FALLING. THIS FALLING TREND ON STREAMS IS EXPECTED TO CONTINUE INTO SATURDAY. THE KNIK RIVER HAD CRESTED BY EARLY AFTERNOON FRIDAY, BUT WATER LEVELS WILL REMAIN HIGH THROUGH SATURDAY. FRIDAY MORNING THE OLD GLENN HIGHWAY WAS INUNDATED WHERE IT CROSSES THE KNIK RIVER, THE FISH HATCHERY ON THE OLD GLENN WAS ALSO FLOODED. A PORTION OF THE KNIK RIVER ROAD WAS STILL UNDERWATER FRIDAY AFTERNOON. WATER WAS ALSO STILL SURROUNDING SOME HOUSES NEAR THE FISH HATCHERY. THE HIGH WATER ON THE KNIK RIVER AND ASSOCIATED STREAMS IS CAUSING BANK EROSION AND THERE IS A LOT OF DEBRIS IN THE RIVER. FLOODING IS EXPECTED TO CONTINUE THROUGH FRIDAY NIGHT.

THE EAGLE RIVER CRESTED AT THE GLENN HIGHWAY BRIDGE FRIDAY MORNING, BUT WATER LEVELS REMAIN HIGH AND THE FLOW IS VERY TURBULENT. THERE HAS BEEN A LOT OF BANK EROSION ALONG EAGLE RIVER, AND A GAS LINE IS THREATENED AT THE EAGLE RIVER LOOP BRIDGE. THERE ARE REPORTS THAT A COUPLE OF BRIDGES ON THE LOWER EAGLE RIVER ON FORT RICHARDSON ARE UNDERWATER, THEREFORE BOATING IS NOT BEING PERMITTED ON THE LOWER RIVER FRIDAY, AND BOATING IS NOT ADVISED ON THE UPPER RIVER. SEVERAL FOOTBRIDGES ON HIKING TRAILS IN THE AREA HAVE ALSO BEEN WASHED OUT.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 9 AM SAT SEPT 23 OR EARLIER IF CONDITIONS WARRANT.

ACL
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HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE AK
0345 PM FRI SEPT 22 1995

-FLOOD OCCURING ALONG KENAI RIVER
-FLOODING ALONG UPPER YENTNA RIVER, AND THE SKWENTNA RIVER
-FLOODING ALONG KINK RIVER AT OLD GLENN HIGHWAY
-MINOR FLOODING IN STREAMS IN VICINITY OF TONSINA

HEAVY RAIN HAS FALLEN ALONG THE NORTH GULF COAST AND IN THE WESTERN PORTION OF SUSITNA BASIN, NEAR PTARMAGIN PASS. LIGHT TO MODERATE AMOUNTS HAVE FALLEN OVER THE MOUNTAINS OF THE KENAI PEN. AND OVER THE WESTERN CHUGACH. IT DOES APPEAR FROM SATELITE PHOTOS. AND MODEL QPF'S THAT THE HEAVY PRECIPITATION IS AROUND YAKUTAT AND WILL SLOWLY MOVE SOUTHEASTWARD TODAY. RAIN FOR THE KENAI PEN. SHOULD REMAIN LIGHT TO MODERATE TODAY, TAPERING OFF ON SATURDAY. AS FOR THE WESTERN SUSTINA BASIN, THE MIDLEVEL WINDS WILL STILL FAVOUR OROGRPAHIC RAINFALL, BUT AS 500 MB LOW TRACKS EASTWARD, MOISTURE SUPPLY SHOULD BEGIN TO DIMINISH SOMETIME ON SATURDAY.

SOILS ARE SATURATED OVER THE ENTIRE SOUTHCENTRAL AREA AS WELL AS ALONG THE NORTH GULF COAST, INCLUDING THE LOWER COPPER RIVER VALLEY. THROUGHOUT THE PRESENT STORM, MUCH OF THE CURRENT DATA SUGGEST THAT OROGRAPHIC ENHACEMENT OF PRECIPITATION HAS BEEN SIGNIFICANT. LOW LYING RAIN GAGES HAVE OFTEN NOT BEEN GOOD INDICATORS OF RAINFALL TOTALS AT HIGHER ELEVATIONS. FREEZING LEVELS: ANC 6500 FT, ADQ 6500 AND 11000 FT OVER YAK. EXPECT FL TO DROP OVER SOUTHCENTRAL ABOUT A THOUSAND FEET ON SATURDAY. (22/2000)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
A RIVER FLOOD WARNING IS IN EFFECT FOR THE WESTERN SUSITNA BASIN, INCLUDING THE SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES. RAIN WAS ENHANCED BY STRONG WINDS AGAINST THE ALASKA RANGE CAUSING HEAVY RAINS IN THE MOUNTAINS. RIVERS WILL LIKELY FALL SATURDAY AS THE RAIN SUBSIDES. (22/2200)

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
THE KNIK RIVER IS STILL HIGH. IT MAY CREST SOME TIME SATURDAY MORNING. EAGLE RIVER AT THE GLENN HIGHWAY BRIDGE IS STILL VERY HIGH, IT HOWEVER IS STARTING TO RECEED SLOWLY. BOTH SHIP CREEK AND MIDDEL FORK OF CAMPBELL CREEK HAVE LOWERING WATER LEVELS. (22/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
HEAVY RAIN HAS FALLEN AND CONTINUES TO FALL OVER MUCH OF THE NORTH GULF COAST, ALTHOUGH THERE ARE NO PROBLEMS TO REPORT AT THIS TIME. A FLOOD WARNING STILL REMAINS IN EFFECT FOR THE KENAI RIVER. (22/2200)

COPPER RIVER BASIN...

THE COOPER RIVER AT THE MILLION DOLLAR BRIDGE HAS TRIPLED ITS FLOW OVER THE PAST 48 HOURS. A FLOOD WATCH IS IN EFFECT FOR THE AREA AROUND THE COMMUNITY OF TONSINA. (22/2200)

JMP/ADA
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FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
0430 PM SEPT 22 1995

THE FLOOD STATEMENT FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH NOON ON SATURDAY SEPTEMBER 23.

AS OF 1 PM THIS AFTERNOON COOPER LANDING GAGE READ 15.86 FT, UP ABOUT 4 INCHES OVER THE PAST 6 HOURS. BOTH TRAIL AND SNOW RIVERS HAVE STEADY WATER LEVELS. STILL EXPECTING KENAI LAKE TO CREST OUT SOMETIME TONIGHT. AS OF 4 PM KENAI KEYS MEASURED 14.11 FT, WHILE AT 1 PM AT SOLDOTNA THE GAGE READ 12.98 FT. WATER LEVELS WILL CONTINUE TO RISE THROUGH MIDDAY TOMORROW.

THE WEATHER OUTLOOK IS FOR SHOWERS TODAY OVER THE WESTERN PORTIONS OF THE KENAI PEN, WITH LIGHT RAIN OVER THE EASTERN SECTIONS. THE NATIONAL GUARD FLEW UP TO SNOW LAKE GLACIER DAM YESTERDAY AFTERNOON, THE LAKE HAD NOT RELEASED AT THAT TIME.

FLOODING IS OCCURING AT KENAI KEYS AND SOLDOTNA AND AT VARIOUS OTHER LOCATIONS ALONG THE RIVER. AS WATER FLOWS OVER BANKS GAGE READINGS WILL BE ONLY ROUGH ESTIMATES OF WATER LEVELS AS MUCH OF THE ADDED FLOW SPREADS OUT HORIZONTALLY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 8 PM FRI SEPT 22 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1700 Hydrologist-in-Charge Jerry Nibler and Warning Coordination Meteorologist Dave Goldstein brief ADES.

FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
0830 PM SEPT 22 1995

THE FLOOD STATEMENT FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 4PM ON SATURDAY SEPTEMBER 23.

AS OF 3 PM THIS AFTERNOON COOPER LANDING GAGE READ 15.96 FT, UP ABOUT 3 INCHES OVER THE PAST 6 HOURS. AT THE KENAI KEYS, WATER LEVELS ARE CONTINUING TO RISE AT A RATE OF ALMOST 0.5 INCH PER HOUR. INFLOW INTO KENAI LAKE HAS BEGAN TO FALL AND WATER LEVELS AT COOPERS LANDING ARE EXPECTED TO CREST SOMETIME FRIDAY NIGHT. AS OF 7 PM WATER LEVELS AT THE KENAI KEYS MEASURED 14.32 FT, AND AT 8 PM AT SOLDOTNA THE RIVER GAGE READ 13.40 FT. WATER LEVELS ARE EXPECTED TO CONTINUE TO RISE TONIGHT AT THE KENAI KEYS AND SOLDOTNA WITH CRESTING WATER LEVELS EXPECTED AT THE KENAI KEYS BY SATURDAY AFTERNOON.

THE WEATHER OUTLOOK IS FOR SHOWERS TODAY OVER THE WESTERN PORTIONS OF THE KENAI PEN, WITH LIGHT RAIN OVER THE EASTERN SECTIONS. THE NATIONAL GUARD FLEW UP TO SNOW LAKE GLACIER DAM YESTERDAY AFTERNOON, THE LAKE HAD NOT RELEASED AT THAT TIME.

FLOODING IS OCCURING AT KENAI KEYS AND SOLDOTNA AND AT VARIOUS OTHER LOCATIONS ALONG THE RIVER. AS WATER FLOWS OVER BANKS GAGE READINGS WILL BE ONLY ROUGH ESTIMATES OF WATER LEVELS AS MUCH OF THE ADDED FLOW SPREADS OUT HORIZONTALLY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 9 AM FRI SAT 23 OR EARLIER IF CONDITIONS WARRANT.

JMP
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Saturday, September 23

Day Shift Lead forecaster Neil Murakami briefs ADES and EOCs in Kenai and Seward on weather conditions.

0200 Forecaster Sam Albanese receives call from a resident on the Kenai River wanting information about the rising water. Last statement issued by RFC was at 9 p.m. Friday

calling for continued rising water through mid-day. Caller says he has about 2 inches to go before he is in the water. Caller suggests including the rate of rise of river in flood products.

0250 WSFO Anchorage Forecast Discussion excerpts: **"FLOW ALOFT AND AT SFC WILL BECOME EASTERLY AND ANTICYCLONIC FOR THE NORTH GULF COAST AND GIVE THEM A MUCH NEEDED BREAK IN THE RAIN..BUT EXPECT SHOWERS THROUGH THE WEEKEND. ALSO EXPECT SHOWERY WX FOR S CNTRL AK.**

FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
0930 AM SAT SEPT 23 1995

THE FLOOD STATEMENT FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 4PM ON SUNDAY SEPTEMBER 24.

RAIN WAS VERY LIGHT LAST NIGHT OVER THE UPPER KENAI RIVER BASIN, BOTH TRAIL AND SNOW RIVERS ARE SLOWLY DROPPING. AS OF 7 AM THIS MORNING THE GAGE AT COOPER LANDING WAS 16.08 FT. IT APPEARS THAT THE MUCH ANTICIPATED CREST OF KENAI LAKE IS IN PROGRESS. AS OF 9 AM KENAI KEYS READ 15.03 FT, A RISE OF ABOUT 0.5 IN PER HOUR. NO READING FROM SOLDOTNA THIS MORNING. EVEN WITH THE LEVELING OFF OF KENAI LAKE KENAI KEYS AND POINTS DOWNSTREAM SHOULD EXPECT SOME KIND OF RISE IN WATER LEVELS THROUGH THIS AFTERNOON, SOMEWHERE IN THE 3 TO 6 IN RANGE. THIS IS A ROUGH ESTIMATE SINCE THE ACTUAL AMOUNT DEPENDS ON THE LOCAL TOPOGRAPY, ETC.

THE WEATHER OUTLOOK IS FOR SHOWERS TODAY OVER THE KENAI BASIN TODAY AND SUNDAY MORNING, WITH SHOWERS TAPERING OFF ON SUNDAY AFTERNOON. NOT EXPECTING THIS RAIN TO IMPACT THE FLOOD SITUATION VERY MUCH.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 4 PM SATURDAY SEPTEMBER 23 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1000 RFC cancels Flood Warning for the Knik River.

HIC Jerry Nibler flies to Kenai to provide on-site support for the EOC through the weekend.

FLOOD STATEMENT FOR THE KNIK RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
10 AM ADT SAT SEPT 23 1995

THE FLOOD WARNING FOR THE KNIK RIVER AND STREAMS DRAINING THE NORTH SIDE OF THE CHUGACH MOUNTAINS HAS BEEN CANCELLED.

RAIN HAS DIMINISHED ALONG THE NORTH SIDE OF THE CHUGACH MOUNTAINS AND RIVERS AND STREAMS ARE FALLING. WATER LEVELS ARE EXPECTED TO REMAIN HIGH THROUGH MONDAY BUT NOT SIGNIFICANT RAINFALL IS EXPECTED DURING THIS PERIOD. BANK EROSION AND FLOATING DEBRIS WILL CONTINUE FOR THE NEXT SEVERAL DAYS AS WELL SO PERSONS NEAR THESE WATER COURSES SHOULD REMAIN ALERT, BUT NO FURTHER RISES OR FLOODING IS EXPECTED FROM THIS EVENT.

THIS STATEMENT WILL NOT BE UPDATED.

ADA
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FLOOD STATEMENT FOR THE WESTERN SUSITNA BASIN
NATIONAL WEATHER SERVICE ANCHORAGE AK
1100 AM SAT SEPT 23 1995

THE FLOOD WARNING FOR THE SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES, REMAINS IN EFFECT UNTIL 10 AM SUNDAY SEPTEMBER 24.

FLOODING IS OCCURING ALONG THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK. A REPORT OUT OF SKWENTNA THIS MORNING INDICATES THAT THE RIVER THERE DROPED ABOUT ONE FOOT OVER NIGHT, IN ADDITON THE AIRSTRIP WAS NEVER UNDERWATER, AS SOME OF THE TV STATIONS ERRONOUSLY REPORTED.
ON LAKE CREEK, THE WATER ROSE ANOTHER 6 INCHES OVER NIGHT, CHELATNA LAKE IS STILL HIGH AS OF 9 AM THIS MORNING.

RADAR EARLY THIS MORNING WAS SHOWING SOME MODERATE RAIN SHOWERS OVER THE UPPER SKWENTNA BASIN,

HOWEVER AT THE PRESENT TIME IT LOOKS LIKE THERE IS VERY LITTLE RAIN FALLING OVER THE ALAKSA RANGE. AS A ROUGH ESTIMATE WATER LEVELS ON THE YENTNA RIVER AND LAKE CREEK SHOULD START TO DROP SOMETIME LATE SATURDAY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 10 AM SUN SEPT 24 OR EARLIER IF CONDITIONS WARRANT.

JMP
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HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE AK

300 PM SAT SEPT 23 1995

-FLOOD OCCURING ALONG KENAI RIVER
-FLOODING ALONG UPPER YENTNA RIVER, AND THE SKWENTNA RIVER

OVER THE PAST 24 HOURS RAINFALL TOTALS AROUND THE STATE ARE LOWER THAN THE PREVIOUS DAY'S VALUES. VERY LIGHT AMOUNTS RECORDED OVER THE UPPER KENAI RIVER BASIN, AS LIGHT AMOUNTS OVER VALDEZ AND CORDOVA. BASED ON RADAR RETURNS THERE WAS SOME SHOWER ACTIVITY EARLY THIS MORNING, ALONG THE MTNS. BORDERING THE WESTERN SECTIONS OF THE SUSITNA BASIN. AT THE PRESENT TIME THE RADAR IS NOT INDICATING ANY RAIN OVER THIS VERY SATURATED BASIN.

IT APPEARS THAT THE COOPER LANDING GAGE IS IN THE PROCESS OF CRESTING (16.1 FT), WHICH MEANS THAT THE KENAI KEYS AND SOLDOTNA AREAS MAY ONLY SEE A 3 TO 6 IN RISE IN WATER LEVELS OVER THE REMAINDER OF SATURDAY.

RAIN OVER SOUTHCENTRAL ALASKA TODAY SHOULD BE ON A SCATTERED BASIS WITH TOTALS LESS THAN ONE INCH. MODERATE RAIN OVER THE NO. GULF. COAST BY LATER TODAY. FREEZING LEVELS THIS MORNING OVER ANC WAS 6000 FT, 4500 FT OVER ADQ, 9500 FT OVER YAK, AND 7500 FT OVER FAI. EXPECT FREEZING LEVEL OVER SOUTHCENTRAL TO BE IN THE 6000 FT RANGE ON SUNDAY. (23/1830)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
A RIVER FLOOD WARNING IS IN EFFECT FOR THE WESTERN SUSITNA BASIN, INCLUDING THE SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES. BOTH THE YENTNA RIVER AND LAKE CREEK WERE RISING THIS MORNING. RAIN IS DECREASING IN THE AREA, WHATER LEVELS SHOULD BEGIN TO DROP OVERNIGHT. WATER LEVELS HAVE ALREADY BEGUN TO DROP ON THE SKWENTNA RIVER AT THE TOWN OF SKWENTNA. (23/2230)

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
MOST OF THE SMALLER RIVERS WHICH DRAINING THESE RANGES HAVE DROPPING WATER LEVELS. THE SUSITNA RIVER HAS A MODEST RISE WHICH SHOULD NOT LAST THROUGH SUNDAY. (23/2230)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
LIGHT RAIN IS FALLING THIS AFTERNOON OVER THE KENAI PENINSULA, TOTALS ARE IN THE LIGHT CATEGORY. THE KENAI RIVER HAS CRESTED AT COOPER LANDING, AND IS EXPECTED TO CREST AT KENAI KEYS AND SOLDOTNA ON SATURDAY EVENING. (23/2230)

COPPER RIVER BASIN...
THE RIVER LEVEL AT THE MILLION DOLLAR BRIDGE IS STILL VERY HIGH BUT DROPED A SLIGHT AMOUNT FROM YESTERDAYS VALUE. RAIN OVER THE SOUTHERN PORTION OF THE BASIN IS CAUSING SOME PROBLEMS IN THE TONSINA AREA. EXPECT RAIN TO BE MODERATE OVER MTNS. OF THIS BASIN, RIVERS HOLDING STEADY FOR SUNDAY. SMALLER RIVERS AND STREAMS COULD RISE TOMORROW IF RAIN TURNS OUT TO BE HEAVIER THAN IS EXPECTED. (23/2230)

JMP/ADA
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FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
420 PM SAT SEPT 23 1995

THE FLOOD STATEMENT FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 4PM ON SUNDAY SEPTEMBER 24.

COOPER LANDING GAGE IS HOLDING STEADY AT 16.0 FT AS OF 1 PM. KENAIKEYS WAS 15.27 FT AT 4 PM, SODOTNA WAS 14.0 FT AT 1 PM. AT THEPRESENT TIME MODERATE RAIN IS FALLING OVER THE MIDDLE AND LOWER PARTS OF THE KENAI BASIN. ESTIMATING CREST IN KENAI KEYS AND SOLDOTNA THIS EVENING.

THE WEATHER OUTLOOK IS FOR SHOWERS TONIGHT WITH A 40% CHANCE OF SHOWERS TOMORROW.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 8 PM SAT SEPT 23 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1700 DOH Larry Rundquist briefs ADES in person.

FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
400 PM SUN SEPT 24 1995

THE FLOOD WARNING FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 12 PM TUESDAY SEPTEMBER 26.

WATER LEVELS ALONG THE ENTIRE LENGTH OF THE KENAI RIVER REMAIN ABOVE FLOOD STAGE.

STATION	FLD STAGE	OBSERVATION	LST 24 HR	FORECAST(24HR)
COOPER LANDING	14.0 FT	15.7 FT @21Z	-0.4 FT	15.0 FT @23Z
KENAI KEYS	12.0 FT	15.5 FT @23Z	+0.2 FT	15.3 FT @23Z
SOLDOTNA	12.0 FT	14.6 FT @20Z	+0.5 FT	14.3 FT @23Z

STATION	RAIN (LAST 24 HR)	RAIN FORECAST (24 HR)
SEWARD	0.5 IN	0.4 IN
KENAI	0.4 IN	0.3 IN
HOMER	0.3 IN	0.3 IN

FREEZING LEVELS SUNDAY:6000-6500 FT MONDAY:5500-6000 FT

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 9 AM MONDAY SEPTEMBER 25 OR EARLIER IF CONDITIONS WARRANT.

JMP
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Sunday, September 24

FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
0900 SUN SEPT 24 1995

THE FLOOD WARNING FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 4 PM ON SUNDAY SEPTEMBER 24.

THE WATER LEVEL AT COOPER LANDING DROPED SLIGHTLY OVER TWO INCHES LAST NIGHT, AND NOW MEASURES 15.75 FT. KENAI KEYS ROSE JUST LESS THAN A INCH OVERNIGHT AND NOW MEASURES 15.44 FT. SOLDOTNA IS NOW AT 14.50 FT, A RISE OF ABOUT 4 INCHES SINCE YESTERDAY EVENINGS OBSERVATION. AN ADDITONAL RISE OF ONE TO TWO INCHES AT SOLDOTNA IS POSSIBLE. KENAI KEYS APPEARS TO BE ABOUT AT ITS CREST.

LIGHT RAIN FELL OVER NIGHT AND IS STILL IN THE FORECAST FOR SUNDAY AND SUNDAY NIGHT. 24 HOUR RAINFALL TOTALS ENDING A 4 AM THIS MORNING ARE:

KENAI	0.31 IN
HOMER	0.26 IN
SEWARD	0.43 IN

NOT EXPECTING THIS RAIN TO ADD VERY MUCH WATER INTO THE KENAI BASIN.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 4 PM SUN SEPTEMBER 24 OR EARLIER IF CONDITIONS WARRANT.

JMP
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FLOOD STATEMENT FOR THE WESTERN SUSITNA BASIN
NATIONAL WEATHER SERVICE ANCHORAGE AK
1000 AM SUN SEPT 24 1995

THE FLOOD WARNING FOR THE SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES, REMAINS IN EFFECT UNTIL 10 AM MONDAY SEPTEMBER 25.

WATER LEVELS ON THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK ARE DECREASING. AT THE VILLAGE OF SKWENTNA, THE RIVER IS NOW BACK TO BANKFULL. ON LAKE CREEK, WHERE IT FLOWS INTO THE YENTNA, WATER LEVELS DROPED ABOUT 12 INCHES OVER NIGHT. LIGHT RAIN FELL OVER THE BASIN VERNIGHT, ALTHOUGH IT LOOKS LIKE THE HEAVY RAIN IN THE ALASKA RANGE IS OVER FOR NOW. WATER LEVELS WILL CONTINUE TO DROP THROUGHOUT SUNDAY.

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 10 AM SUN SEPT 24 OR EARLIER IF CONDITIONS WARRANT.

JMP
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1300 RFC cancels Flood Watch for Tonsina area.

FLOOD STATEMENT FOR THE TONSINA AREA
NATIONAL WEATHER SERVICE ANCHORAGE AK
0100 PM SUN SEPT 24 1995

...IMMEDIATE BROADCAST REQUESTED...

THE FLOOD WATCH FOR BERNARD CREEK AND OTHER STREAMS IN THE VINCINITY OF TONSINA, HAS BEEN CANCELLED.

BERNARD CREEK HAS CONTINUED TO DROP OVER THE LAST 24 HOURS, AND POSES A MINOR THREAT TO NEARBY PROPERTY OWNERS AT THIS TIME. RAIN APPEARS TO HAVE BEEN LIGHT OVER THE LOWER COPPER RIVER BASIN LAST NIGHT. THE FORECAST IS FOR LIGHT RAIN TODAY.

THE FLOODING OF BERNARD CREEK ERODED THE ACCESS ROAD INTO THE SUBDIVSION, AT SEVERAL LOCATIONS. IT ALSO ERODED AWAY A 70 FT STRETCH OF THE BANK AS WELL AS TRANSPORT A NUMBER OR LARGE TREES.

THIS STATEMENT WILL NOT BE UPDATED.

JMP
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1700 DOH Larry Rundquist briefs ADES in person.

HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA

NATIONAL WEATHER SERVICE ANCHORAGE AK
0300 PM SUN SEPT 24 1995

-FLOOD OCCURING ALONG KENAI RIVER
-FLOODING ALONG UPPER YENTNA RIVER, AND THE SKWENTNA RIVER

RAINFALL TOTALS OVER THE PAST 24 HOURS WERE LIGHT. ANYWHERE FROM 0.2 TO 0.4 INCHES FELL OVER THE KENAI PENINSULA. THE FORECAST FOR SOUTHCENTRAL IS CALLING FOR LIGHT RAIN THROUGH TOMORROW. STILL RAINING IN SUSITNA BASIN, BUT THE RAIN HAS SHIFTED AWAY FROM THE MOUNTAINS TO OVER THE CENTRAL PORTIONS OF THE BASIN. FREEZING LEVEL OVER SOUTHCENTRAL AROUND 6500 FT, 7500 FT AT FAIRBANKS, 10000 FT OVER YAKUTAT AND MUCH OF SOUTHEAST. (24/1900)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
WATER LEVELS ON THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK ARE ON THE WAY DOWN AFTER THE RECENT VERY HIGH LEVELS. RAIN IS LIGHT OVER THE CENTRAL SUSITNA BASIN, ARE NOT EXPECTING ANY ADDITONAL RISES IN THE NEXT FEW DAYS. (24/2200)

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
THESE AREAS ARE EXPERIENCING DROPPING WATER LEVELS TODAY AND TOMORROW. (24/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
LIGHT RAIN IS FALLING THIS AFTERNOON OVER THE KENAI PENINSULA, TOTALS ARE IN THE LIGHT CATEGORY. THE KENAI RIVER HAS CRESTED AT COOPER LANDING, AND IS IN THE MIDST OF A BORAD CREST AT KEANI KEYS AND SOLDOTNA. (24/2200)

COPPER RIVER BASIN...
THE COOPER RIVER IS DROPPING AS WELL AS ITS TRIBUATARIES. RAIN OVER THE PAST 48 HOURS IN THE LOWER BASIN HAS BEEN LIGHT. (24/2200)

JMP/ADA
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FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
400 PM SUN SEPT 24 1995

THE FLOOD WARNING FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 12 PM TUESDAY SEPTEMBER 26.

WATER LEVELS ALONG THE ENTIRE LENGTH OF THE KENAI RIVER REMAIN ABOVEFLOOD STAGE.

STATION	FLD STAGE	OBSERVATION	LST 24 HR	FORECAST(24HR)
COOPER LANDING	14.0 FT	15.7 FT @21Z	-0.4 FT	15.0 FT @23Z
KENAI KEYS	12.0 FT	15.5 FT @23Z	+0.2 FT	15.3 FT @23Z
SOLDOTNA	12.0 FT	14.6 FT @20Z	+0.5 FT	14.3 FT @23Z

STATION	RAIN (LAST 24 HR)	RAIN FORECAST (24 HR)
SEWARD	0.5 IN	0.4 IN
KENAI	0.4 IN	0.3 IN
HOMER	0.3 IN	0.3 IN

FREEZING LEVELS SUNDAY:6000-6500 FT MONDAY:5500-6000 FT

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 9 AM MONDAY SEPTEMBER 25 OR EARLIER IF CONDITIONS WARRANT.

JMP
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Monday, September 25

0815 DOH Larry Rundquist briefs Alaska Military Affairs Commissioner at ADES.

1000 RFC cancels Flood Warning for Western Susitna Basin.

FLOOD STATEMENT FOR THE WESTERN SUSITNA BASIN
NATIONAL WEATHER SERVICE ANCHORAGE AK
1000 AM MON SEPT 25 1995

THE FLOOD WARNING FOR THE SKWENTNA AND YENTNA RIVERS, ALONG WITH THEIR TRIBUTARIES HAS BEEN CANCELLED.

WATER LEVELS ON THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK CONTINUE TO FALL. AT THE VILLAGE OF SKWENTNA AND ALONG THE YENTNA RIVER AND LAKE CREEK, WATER LEVELS ARE NOW WITHIN THEIR BANKS AT MOST LOCATIONS. NEAR THE CONFLUENCE OF LAKE CREEK AND THE YENTNA WATER LEVELS HAVE FALLEN 48 INCHES FROM THEIR HIGHEST LEVEL ON SATURDAY.

WATER LEVELS ARE EXPECTED TO CONTINUE TO FALL OVER THE NEXT COUPLE OF DAYS. NO FURTHER THREAT OF FLOODING EXISTS DUE TO THIS EVENT.

THIS STATEMENT WILL NOT BE UPDATED.

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HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE AK

0300 PM MON SEPT 25 1995

-FLOOD OCCURING ALONG KENAI RIVER

RAINFALL TOTALS OVER THE PAST 24 HOURS WERE LIGHT. RAIFALL AMOUNTS RANGED FROM 0.13 IN ANCHORAGE TO ALMOST 0.5 INCHES IN SEWARD. THE FORECAST FOR SOUTHCENTRAL IS CALLING FOR LIGHT RAIN AND SHOWERS THROUGH TUESDAY... LITTLE ADDITIONAL RUNOFF IS EXPECTED FROM THIS PRECIPITAION. IN THE

CENTRAL PORTION OF THE STATE LIGHT SHOWERS AND DRIZZLE IS FORECAST OVER THE CHENA BASIN. RAIN SHOWERS ARE MOVING INTO INTO NORTHWESTERN ALASKA. QPF FROM BETHEL ACROSS THE SEWARD PEN. ARE BETWEEN 0.25 AND 0.75 INCHES OVER THE NEXT 36 HOURS. FREEZING LEVEL OVER SOUTHCENTRAL ARE AROUND 6000 FT AND APPROX. 7000 FT IN FAIRBANKS.

COOLER AIR WILL MOVE INTO THE STATE FROM THE WEST AND FREEZING LEVELS WILL DROP OVER THE NEXT SEVERAL DAYS. (25/1900)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
WATER LEVELS ON THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK ARE ON THE WAY DOWN AFTER THE RECENT VERY HIGH LEVELS. RIVERS AND STREAMS ARE WITHIN THEIR BANKS AT MOST LOCATIONS. RAIN IS LIGHT OVER THE CENTRAL SUSITNA BASIN AND SHOWERS ARE EXPECTED TO END MONDAY NIGHT. THEREFORE NO ADDITONAL RISES ARE EXPECTED IN THE NEXT FEW DAYS. (25/2200)

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
THESE AREAS ARE EXPERIENCING SLOWLY FALLING LEVELS MONDAY AND CONTINUING INTO WEDNESDAY. (25/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
RIVERS AND STREAMS ON KODIAK ISLAND ARE FALLING AFTER THE CREST CAUSED BY EARLIER RAIN. LIGHT RAIN HAS FALLEN OVER THE KENAI PENINSULA DURING THE PAST SEVERAL DAYS, BUT TOTALS HAVE BEEN IN THE LIGHT CATEGORY. THE RAIN HAS NOT SIGNIFICANTLY AFFECTED LEVELS ON THE KENAI RIVER, WHICH IS PRESENTLY SEVERAL FEET ABOVE FLOOD STAGE ALONG ITS ENTIRE REACH. LEVELS ARE NOT EXPECTED TO FALL BELOW FLOOD STAGE ON MOST OF THE KENAI RIVER UNTIL THE END OF THIS WEEK. RIVERS AND STREAMS IN THE SEWARD AREA ARE FALLING. (25/2200)

COPPER RIVER BASIN...
THE COOPER RIVER IS DROPPING AS WELL AS ITS TRIBUATARIES. RAIN OVER THE PAST 48 HOURS IN THE LOWER BASIN HAS BEEN LIGHT. WITH ONLY SHOWERS OVER THE NEXT TWO DAYS AND FREEZING LEVELS FALLING SOME, MOST RIVERS WILL EXPERIENCE A FALLING TREND THROUGH MID WEEK. (25/2200)

JMP/ADA
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FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
400 PM MON SEPT 25 1995

THE FLOOD WARNING FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 12 PM TUESDAY SEPTEMBER 26.

WATER LEVELS ALONG THE ENTIRE LENGTH OF THE KENAI RIVER REMAIN ABOVE FLOOD STAGE.

STATION	FLD STAGE	OBSERVATION	LST 24 HR	FORECAST(24HR)
COOPER LANDING	14.0 FT	15.4 FT @1PM	-0.3 FT	14.9 FT @4PM
KENAI KEYS	12.0 FT	15.4 FT @3PM	-0.1 FT	15.1 FT @4PM
SOLDOTNA	12.0 FT	14.2 FT @1PM	-0.3 FT	13.8 FT @4PM

STATION	RAIN (LAST 24 HR) @9AM	RAIN FORECAST (24 HR) STARTING @3PM
SEWARD	0.4 IN	0.2 IN
KENAI	0.3 IN	0.2 IN
HOMER	0.2 IN	0.2 IN

FREEZING LEVELS MONDAY:5000-5500 FT TUESDAY:5000 FT

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 9 AM TUE SEPT 26 OR EARLIER IF CONDITIONS WARRANT.

JMP
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Tuesday, September 26

0815 DOH Larry Rundquist briefs ADES in person.

0900 DOH Larry Rundquist briefs Alaska Lt. Governor Ulmer at ADES.

FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
900 AM SEPT 26 1995

THE FLOOD WARNING FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 1 PM SATURDAY SEPTEMBER 30.

WATER LEVELS ALONG THE ENTIRE LENGTH OF THE KENAI RIVER REMAIN ABOVE FLOOD STAGE.

STATION	FLD STAGE	OBSERVATION	LST 24 HR	FORECAST(24HR)
COOPER LANDING	14.0 FT	15.2 FT @7AM	-0.2 FT	14.8 FT @7AM
KENAI KEYS	12.0 FT	15.3 FT @8AM	-0.1 FT	15.0 FT @8AM
SOLDOTNA	12.0 FT	14.4 FT @8AM	+0.2 FT	14.1 FT @8AM

THE SOLDOTNA GAGE IS LOCATED IN AN AREA OF ROUGH WATER, CAUSING
THE MEASUREMENTS TO FLUCTUATE.

STATION	RAIN (LAST 24 HR) @9AM	RAIN FORECAST (24 HR) STARTING @9AM
SEWARD	0.3 IN	0.1 IN
KENAI	0.3 IN	0.0 IN
HOMER	0.2 IN	0.0 IN

FREEZING LEVELS TUESDAY:6500 FT WENDESDAY:5500-6000 FT

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 4 PM TUE SEPT 26 OR EARLIER IF CONDITIONS WARRANT.

JMP.
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HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE AK
0300 PM TUE SEPT 26 1995

-FLOOD OCCURING ALONG KENAI RIVER
-FLOOD POTENTIAL MODERATE FOR REST OF SOUTHCENTRAL AK
-FLOOD POTENTIAL LOW TO MODERATE FOR FAIRBANKS AREA AND PORCUPINE RIVER BASIN.
-FLOOD POTENTIAL LOW FOR THE REST OF THE STATE.

THE CUTOFF LOW IN THE GULF OF ALASKA IS PRODUCING SHOWERS ON THE KENAI PENINSULA AND ALONG THE NORTH GULF COAST. SHOWERS SHOULD END LATER TUESDAY. RAIN IS ALSO OCCURING IN THE PORCUPINE RIVER BASIN TUESDAY MORNING. THE TANANA VALLEY ALSO EXPERIENCING RAIN TUESDAY MORNING. RAIN SHOULD MOVE ONTO THE WESTERN COAST BY WEDNESDAY MORNING DUE TO ALOW IN THE BERING SEA. THIS LOW WILL ALSO BRING RAIN INTO SOUTHCENTRAL ALASKA WEDNESDAY NIGHT AND MOST OF THURSDAY. TOTALS ARE NOT EXPECTED TO EXCEED AN INCH AT MOST LOCATIONS IN SOUTHCENTRAL. COOLER AIR WILL ALSO MOVE INTO THE STATE FROM THE WEST AND FREEZING LEVELS WILL DROP OVER THE NEXT SEVERAL DAYS. (26/1900)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
WATER LEVELS ON THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK ARE ON THE WAY DOWN AFTER THE RECENT VERY HIGH LEVELS. RIVERS AND STREAMS ARE WITHIN THEIR BANKS AT MOST LOCATIONS. RAIN WAS LIGHT OVER THE BASIN YESTERDAY, HENCE RIVERS SHOULD CONTINUE TO DROP TO NORMAL LEVELS. (26/2200)

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
THESE AREAS ARE EXPERIENCING SLOWLY FALLING STAGES. (26/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...

RIVERS ON KODIAK IS. AND ON THE KENAI PEN. CONTINUE TO DROP. THE

LOWER KENAI RIVER SHOULD REMAIN AOBVE FLOOD STAGE FROM 4 TO 6 DAYS AT MOST LOCATIONS. (26/2200)

COPPER RIVER BASIN...
BOTH THE GAKONA AND THE GULKANA RIVERS HAD VERY SLIGHT RISES, WHILE THE TONSINA AND MILLION DOLLAR BRIDGE GAGES WERE DROPPING. RAINFALL TOTALS WERE LIGHT OVER THIS BASIN, SO NOT LOOKING FOR MUCH CHANGE TO WEDNESDAY'S OBSERVATIONS. (26/2200)

JMP/ADA/SDL

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FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
400 PM TUE SEPT 26 1995

THE FLOOD WARNING FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 1 PM SATURDAY SEPTEMBER 30.
WATER LEVELS ALONG THE ENTIRE LENGTH OF THE KENAI RIVER REMAIN ABOVE FLOOD STAGE.

STATION	FLD STAGE	OBSERVATION	LST 24 HR	FORECAST(24HR)
COOPER LANDING	14.0 FT	15.1 FT @1PM	-0.3 FT	14.7 FT @4PM
KENAI KEYS	12.0 FT	15.2 FT @1PM	-0.2 FT	14.9 FT @4PM
SOLDOTNA	12.0 FT	14.4 FT @8AM	+0.2 FT	13.9 FT @4PM

THE SOLDOTNA GAGE IS LOCATED IN AN AREA OF ROUGH WATER, CAUSING THE MEASUREMENTS TO FLUCTUATE.

STATION	RAIN (LAST 24 HR) @9AM	RAIN FORECAST (24 HR) STARTING @4PM
SEWARD	0.3 IN	0.0 IN
KENAI	0.3 IN	0.0 IN
HOMER	0.2 IN	0.0 IN

FREEZING LEVELS TUESDAY:6500 FT WENDESDAY:5500-6000 FT

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 9 AM WED SEPT 27 OR EARLIER IF CONDITIONS WARRANT.

JMP
$$

Wednesday, September 27

0700 RFC hours of operation change from 7:00 a.m. - 11:00 p.m. to 7:00 a.m. - 6:00 p.m.

FLOOD STATEMENT FOR THE KENAI RIVER
NATIONAL WEATHER SERVICE ANCHORAGE AK
900 AM WED SEPT 27 1995

THE FLOOD WARNING FOR THE KENAI RIVER WILL REMAIN IN EFFECT THROUGH 1 PM SATURDAY SEPTEMBER 30.

WATER LEVELS ALONG THE ENTIRE LENGTH OF THE KENAI RIVER REMAIN ABOVE FLOOD STAGE.

STATION	FLD STAGE	OBSERVATION	LST 24 HR	FORECAST(24HR)
COOPER LANDING	14.0 FT	14.6 FT @7AM	-0.6 FT	14.1 FT @9AM
KENAI KEYS	12.0 FT	14.9 FT @8AM	-0.6 FT	14.3 FT @9AM
SOLDOTNA	12.0 FT	13.9 FT @8AM	-0.5 FT	13.5 FT @9AM

THE SOLDOTNA GAGE IS LOCATED IN AN AREA OF ROUGH WATER, CAUSING THE MEASUREMENTS TO FLUCTUATE.

STATION	RAIN (LAST 24 HR) @9AM	RAIN FORECAST (24 HR) STARTING @9AM
SEWARD	0.01 IN	0.0 IN
KENAI	0.01 IN	0.0 IN
HOMER	0.04 IN	0.05 IN

FREEZING LEVELS WEDNESDAY:6000 FT THURSDAY:4500-5000 FT

A FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.

THIS STATEMENT WILL BE UPDATED AT 4 PM WED SEPT 27 OR EARLIER IF CONDITIONS WARRANT.

DPS
$$

HYDROMETEOROLOGICAL DISCUSSION FOR THE STATE OF ALASKA

NATIONAL WEATHER SERVICE ANCHORAGE AK
0300 PM WED SEPT 27 1995

-FLOOD OCCURING ALONG KENAI RIVER
-FLOOD POTENTIAL MODERATE FOR REST OF SOUTHCENTRAL AK
-FLOOD POTENTIAL LOW TO MODERATE FOR FAIRBANKS AREA AND PORCUPINE RIVER BASIN.
-FLOOD POTENTIAL LOW FOR THE REST OF THE STATE.

TUESDAY LIGHT RAIN WAS REPORTED IN NORTHERN ALASKA, THE FAIRBANKS AREA, ACROSS AK PEN AND KENAI PEN, AND IN SOUTHEAST ALASKA. THE LARGEST 24 HOUR TOTAL WAS .41 INCHES AT KODIAK. SCATTERED LIGHT RAIN AND SNOW IS EXPECTED TO CONTINUE IN NORTHEAST ALASKA WEDNESDAY, DIMINISHING TO SCATTERED SHOWERS/FLURRIES THURSDAY. ISOLATED SHOWERS ARE POSSIBLE IN THE INTERIOR WEDNESDAY AND THURSDAY. THE MAJOR PRECIPITATION PRODUCERS ARE EXPECTED TO BE A LOW IN THE BERING SEA AND A LOW FORMING SOUTH OF KODIAK IS. RAIN ASSOCIATED WITH THE BERING SEA SYSTEM SHOULD BEGIN SPREADING INTO THE Y-K DELTA AND THE BRISTOL BAY AREA WEDNESDAY, MODEL QPFS ARE GENERALLY LESS THAN 0.5 INCH. THE SYSTEM FORMING SOUTH OF KODIAK IS EXPECTED TO SPREAD RAIN INTO KODIAK WEDNESDAY NIGHT, AND UP THE KENAI PEN AND ALONG THE GULF COAST AND SOUTHEAST COAST DURING THE DAY THURSDAY. MODEL QPFS ALONG THE KENAI MOUNTAINS AND THE GULF COAST ARE AROUND 0.5 INCH, WITH QPFS OF AROUND 0.2 INCH FOR WESTERN KENAI PEN.

WEDNESDAY MORNING FREEZING LEVELS IN SOUTHCENTRAL ARE BETWEEN 5500 AND 6500 FT, AND ARE EXPECTED TO FALL OVER THE NEXT 24-36 HOURS. FREEZING LEVELS OVER CENTRAL AND NORTHERN ALASKA GENERALLY RANGE BETWEEN 3800 AND 5000 FT, AND ARE EXPECTED TO BE FAIRLY STEADY OVER THE NEXT 24-36 HOURS. (27/1900)

ALASKA RANGE EAST SLOPE DRAINAGES FROM WINDY TO LAKE CLARK PASS...
WATER LEVELS ON THE SKWENTNA AND YENTNA RIVERS AS WELL AS LAKE CREEK ARE ON THE WAY DOWN AFTER THE RECENT VERY HIGH LEVELS. LIGHT RAINS SHOWERS OVER THE AREA YESTERDAY DID NOT AFFECT THE FALLING WATER LEVEL TREND. RIVER AND STREAMS SHOULD CONTINUE TO FALL THROUGH THURSDAY. (27/2200)

WEST SLOPE DRAINAGES OF THE TALKEETNA, CHUGACH, AND KENAI MOUNTAINS..
WATER LEVELS ARE FALLING IN THIS AREA AND ARE EXPECTED TO CONTINUE TO FALL THROUGH THURSDAY. RAIN SHOWERS ARE MOVING INTO THE AREA LATE THURSDAY FROM THE SOUTH AND THE RATE OF THE FALLING TREND ON FRIDAY WILL LIKELY BE REDUCED. THE KENAI RIVER WILL CONTINUE TO FALL OVER THE NEXT SEVERAL DAYS. HOWEVER, THE LOWER RIVER WILL REMAIN ABOVE FLOOD STAGE FOR 3 TO 5 DAYS AT MOST LOCATIONS. (27/2200)

NORTH GULF COAST, EASTERN KENAI PENINSULA, AND KODIAK ISLAND...
RIVERS ON KODIAK ISLAND AND IN THE SEWARD AREA CONTINUE TO FALL. LIGHT RAIN MOVING INTO THE REGION OVER NEXT 48 HOURS WILL CAUSE MOST STREAMS TO REMAIN STEADY OR RISE SLIGHTLY IN THE SEWARD AREA AND ON KODIAK ISLAND THROUGH FRIDAY. (27/2200)

COPPER RIVER BASIN...
THE GULKANA AND GAKONA RIVER WERE RELATIVELY STEADY WHILE THE COPPER RIVER WAS FALLING AT MILLION DOLLAR BRIDGE. RELATIVELY STEADY STAGES ARE EXPECTED ON RIVERS AND STREAMS IN THE UPPER COPPER RIVER BASIN WHILE FALLING STAGES SHOULD CONINUE ON THE COPPER RIVER AT MILLION DOLLAR BRIDGE OVER THE NEXT COUPLE OF DAYS. (27/2200)

ACL/DPS
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Friday, September 29

1600 RFC cancels Upper Kenai River Flood Warning.

2116 WSFO Anchorage Forecast Discussion excerpts:**"HWVR DUE HIGH MOISTURE CONTENT OF THIS SYS PRFR ETA QPF VALUES WHICH IN THE 24-36HR AND 36-48 HR PDS OVR THE WRN AND CNTRL N GLF CSTL AREAS ARE ABT TWICE THE NGM VALUES..RSNBL AGRMNT OVR KODIAK ISL..THIS COULD SET STAGE FOR ADNL FLOOD PRBLMS ON THE KENAI PEN...**LESSER AMTNS..GNLY BLO ½ INCH IN 24 HR PD..N OF CSTL RANGE AS LOW STALLS N OF KODIAK AND FNT WKNS AS IT ROTATES NWD OVR CSTL RANGE. MAX DPNG OF THIS SYS AT 30 HRS..06Z SUN..NR CDB AT 968MB WITH OCLN IN ARC THRU N PTH-N SKJ-55N 148W AND TRLG FNT SSW. AT 48 HRS..LOW MVD TO LWR SHELIKOF STRAIT..974MB WITH OCLN IN ARC THRU N ILI-S TKA-VCNTY VWS-S YAK-55N 137W AND TRLG CDFNT SSW. GALE TO STORM FORCE WNDS TO 150 NM IN ADVN FNT N/NW GALES PSBLY STORM GUSTS TO ABT 300 NM W OF LOW CNTR OVR SE BERING/ALUTNS AND AK PEN. **BACLN ZONE ACRS KENAI PEN-PWS AND EWD ALG N GLF CST QSNTRY WITH WWD MVG FNTL WVS..PRDCG MDT RA OVR THE NRN PENISULA AND PSBLY IN THE GIRDWOOD AREA."**

2330 RFC issues River Statement for streams draining the southern Chugach Mountains and northern Kenai Mountains.

Sunday, October 1

RFC returns to normal hours of operation: 7:00 a.m. - 5 p.m.

Monday, October 2

0900 DOH Larry Rundquist briefs ADES and the press at the ADES.

1600 Lower Kenai River Flood Warning canceled.

Appendix II

Precipitation and Streamflow Gauge Locations and Data

Appendix II contains Tables 4,5, and 6. Table 4 lists the location of precipitation gauges used for the analyses in this report. These locations are shown in Figures 7 and 8 in Chapter III. Table 5 provides the daily precipitation amounts collected during the period September 17-30, 1995. Table 6 lists discharge and recurrence interval data provided by the U.S. Geological Survey.

Table 4 Location of Precipitation Stations

Site I.D.	Location	Latitude Deg	Latitude Min	Longitude Deg	Longitude Min	Elevation (feet)	Gauge Type*
Anchorage and Chugach Mountains (Figure 16)							
AAA	INDIAN PASS	61	4	149	29	2350	R1
ALYS	ALYESKA	60	58	149	8	250	C
ANC	ANCHORAGE INTERNATIONAL AIRPORT	61	10	150	1	114	R3
APU	ALASKA PACIFIC UNIVERSITY	61	11	149	48	220	C
AQY	GIRDWOOD	60	58	149	7	msg	R1
CER	CHICHAGOF LOOP, EAGLE RIVER	61	18	149	31	msg	C
EKPR	EKLUTNA PROJECT	61	28	149	10	38	C
ER5	EAGLE RIVER 5 SE	61	18	149	26	600	C
ERP	EAGLE RIVER VISITORS CENTR.	61	14	149	16	msg	R1
GLP	GLEN ALPS	61	6	149	41	msg	R1
LRC	LITTLE RABBIT CK.	61	5	149	42	msg	R1
MLSC	MIRROR LAKE SCOUT CAMP	61	26	149	25	405	C
PAFR	FORT RICHARDSON WTP	61	14	149	38	490	R3I
RBT	RABBIT CK.	61	5	149	44	1480	R1
SEG	SO FK. EAGLE RV.	61	14	149	26	msg	R1
TUX	TUXEDNI PARK	61	9	149	42	msg	R1
Kenai Peninsula (Figure 16)							
519	19 MILES NORTH OF SEWARD	60	20	149	21	495	C
5WD	SEWARD, AT THE HOTEL	60	7	149	27	35	R6I
ABD	TURNAGAIN PASS	60	47	149	11	1880	R1
ABM	SUMMIT CREEK	60	37	149	32	1400	R1
ABR	GRANDVIEW	60	36	149	4	1100	R1
APT	ANCHOR RIVER	59	45	151	45	msg	R24
APT1	ANCHOR RV. NR ANCHOR PT.	59	46	151	50	msg	R1
BRM	MIDDLE FK BRADLEY RIVER	59	48	150	45	2300	RW
BRRE	BRADLEY RESV. OUTLET	59	46	150	51	1050	RW
BRT	BRADLEY RIVER @ TIDEWATER	59	48	150	53	90	RW
CLK	COOPER LAKE	60	23	149	41	1200	C
COLK	COOPER LAKE PROJECT	60	23	149	40	445	C
ENA	KENAI FAA AIRPORT	60	34	151	15	86	R3I
EXT	EXIT GLACIER VISITOR CENTER	60	12	149	37	490	C
GLC	GLACIER CK. @ BRUNO RD.	60	11	149	24	msg	R1
H9E	HOMER 9 EAST	59	43	151	19	900	C
HCOV	HALIBUT COVE, SOUTH OF HOMER	59	36	151	10	30	C
HOM	HOMER	59	38	151	30	89	R3
K9N	KENAI 9 NORTH	60	40	151	19	130	C
KASI	KASILOF	60	22	151	23	70	C
KMR	KENAI MOOSE PENS	60	44	150	28	300	R1
LWG	TRAIL RV. NR LAWING	60	24	149	22	msg	R1
MPAS	MOOSE PASS	60	30	149	26	485	C
MYS	MYSTERY CK. @ KENAI NWR	60	35	150	18	msg	R1
PRK	NUKA RIVER @ PARK BOUNDARY	59	41	150	42	1300	RW
SILV	SILVER LAKE NEAR MOOSE RIVER	69	31	144	11	1200	C
SWD	SEWARD ASOS	60	8	149	25	9	R1
SXQ	SOLDOTNA	60	29	151	2	107	R1I
TUT	TUTKA BAY LAGOON	59	26	151	25	20	C

* C Climate station - monthly reports
R Real-time reports (n=interval in hrs; W=weekly; I=intermittent reports)

Table 4 Location of Precipitation Stations

Site I.D.	Location	Latitude Deg	Latitude Min	Longitude Deg	Longitude Min	Elevation (feet)	Gauge Type*
Kodiak Island and Western Cook Inlet (Figure 15)							
5BI	BIG RIVER LAKES	60	49	152	18	40	R24I
ADQ	KODIAK- KODIAK ISLAND	57	45	152	30	15	R3
CHIN	SOUTH COAST OF KODIAK ISLAND	57	37	152	22	48	C
INT	INTRICATE BAY	59	34	154	28	170	C
OUZ	OUZINKIE	57	56	152	30	70	C
Z30	PORT ALSWORTH	60	12	154	18	260	C
Matanuska and Knik River Basins (Figure 16)							
5WO	LAZY MOUNTAIN	61	38	149	2	790	R24I
AK42	SUTTON 2 EAST	61	43	148	53	550	R24I
ANDL	ANDERSON LAKE	61	37	149	20	495	C
LSU	LITTLE SUSITNA RIVER	61	43	149	14	920	R24
LSUS	LITTLE SUSITNA LARC	61	43	149	14	920	R1
MAES	MATANUSKA AGRI EXP STATION	61	34	149	16	150	C
MAG	GLACIER PARK- MATANUSKA GLACIER	61	47	147	48	msg	R1
PAES	PAMER IAS	61	36	149	6	225	C
PAQ	PALMER MUNICIPAL AIRPORT	61	36	149	5	232	R6I
SUT	SUTTON LARC	61	42	148	51	msg	R1
WAS	WASILLA CREEK AT PALMR-WAS HWY	61	35	149	17	msg	R24
WAS3	WASILLA 3 SOUTH	61	32	149	26	50	C
Susitna River Basin (Figure 15)							
5HR	HAYES RIVER	61	59	152	5	1000	R24I
ACR	SU RIVER AND ALEXANDER CK CONFL	61	25	150	35	msg	R24
CANT	CANTWELL 2 EAST	63	24	148	54	2150	C
CLAK	CHELATNA LAKE	62	26	151	25	msg	R24
LAK	YENTNA RIVER AND LAKE CK CONFL	61	54	150	54	msg	R24
PTI	PUNTILLA LAKE	62	6	152	45	1832	R24I
SKW	SKWENTNA	61	58	151	11	150	R24I
SUN	SUNSHINE	62	11	150	8	280	R24
TKA	TALKEETNA	62	19	150	6	345	R3I
TML	TWELVE MILE LAKE	61	46	149	43	msg	R1
WIL	WILLOW CREEK AT WILLOW	61	46	150	4	200	R24
WILW	WILLOW WEST	61	45	150	3	205	C
Copper River Basin (Figure 15)							
5GN	TAHNETA PASS	61	49	147	33	2621	R24
5PX	PAXSON	63	2	145	30	2701	R24I
GAK	GAKONA	62	18	145	18	msg	R24
GKN	GULKANA FAA	62	9	145	27	1570	R24I
KCAM	GLENNALLEN KCAM	62	7	145	32	1456	C
LKSU	LAKE SUSITNA	62	27	146	41	2100	C
MXY	MCCARTHY 3 SOUTHWEST	61	25	143	0	1250	R24
TON	TONSINA	61	39	145	11	1500	R24I
Prince Willaim Sound and Gulf of Alaska Coastline (Figure 15)							
5WT	WHITTIER	60	46	148	41	60	R24I
CDN	CORDOVA NORTH	60	33	145	46	25	C
CDV	CORDOVA	60	30	145	30	41	R3I
MAIN	MAIN BAY	60	30	148	5	40	C
PTSW	PORT SAN JUAN	60	3	148	4	0	C
VWS	VALDEZ	61	8	146	21	23	R3
YAK	YAKUTAT	59	31	139	40	28	R3

* C Climate station - monthly reports
R Real-time reports (n=interval in hrs; W=weekly; I=intermittent reports)

Table 5 Daily Precipitation for Last Half of September at Selected Stations

Site	Obs Time (Loc Std)	09/17	09/18	09/19	09/20	09/21	09/22	09/23	09/24	09/25	09/26	09/27	09/28	09/29	09/30
Anchorage and Chugach Mountains															
AAA	mid	0.00	0.00	0.10	3.20	0.60	0.00	0.10	0.00	0.10	0.00	0.00	0.10	0.50	0.10
ALYS	8	0.00	0.05	0.92	4.20	3.65	0.62	0.37	0.13	0.52	0.17	0.00	0.00	0.08	0.87
ANC	mid	0.00	0.20	0.02	0.03	0.31	0.00	0.09	0.07	0.00	0.00	0.00	0.07	0.50	0.07
APU	9	0.00	0.02	0.09	0.17	0.69	0.01	0.00	0.04	0.03	0.01	0.01	0.00	0.06	0.54
AQY	4	0.0	0.0	0.5	2.3	3.0	0.4	0.2	0.2	0.2	0.2	0.0	0.0	msg	msg
CER	17	0.02	0.00	0.03	1.21	0.36	0.03	0.00	0.04	0.00	0.00	0.00	0.02	0.06	0.16
EKPR	16	msg	0.02	0.00	1.55	1.28	msg	msg	msg	0.14	0.00	msg	msg	msg	msg
ER5	18	0.00	0.00	0.05	1.60	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
ERP	4	0.0	0.0	0.0	0.4	2.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
GLP	4	0.1	0.0	0.4	2.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2
LRC	4	0.0	0.1	0.0	0.2	1.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
MLSC	9	0.00	0.00	0.07	0.24	0.87	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.13
PAFR	8	0.00	0.00	0.00	0.30	1.13	0.02	0.00	0.02	0.05	0.00	0.00	0.00	0.02	0.29
RBT	4	0.00	0.00	0.01	0.15	1.72	0.48	0.00	0.03	0.06	0.00	0.01	0.00	0.00	0.84
SEG	4	0.0	0.0	0.0	0.1	1.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	msg
TUX	4	0.0	0.0	0.0	0.0	1.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6

Table 5 Daily Precipitation for Last Half of September at Selected Stations

Site	Obs Time (Loc Std)	09/17	09/18	09/19	09/20	09/21	09/22	09/23	09/24	09/25	09/26	09/27	09/28	09/29	09/30
Kenai Peninsula															
519	7	0.00	0.04	0.28	2.74	2.50	0.78	0.56	0.48	0.53	0.35	0.01	0.00	0.25	0.72
5WD	2	0.00	0.65	0.89	9.81	1.53	1.24	0.43	0.39	0.61	0.00	0.00	1.20	0.04	0.78
ABD	4	0.30	0.00	0.50	2.10	2.89	1.00	0.31	0.04	0.20	0.90	0.10	0.19	0.00	0.59
ABM	mid	0.90	0.20	0.60	3.70	0.70	0.30	0.20	0.20	0.10	0.00	0.00	0.20	0.60	0.20
ABR	mid	0.00	0.40	2.00	3.50	0.50	0.10	0.20	0.10	0.50	0.00	0.00	0.00	0.00	0.70
APT	8	0.05	0.10	0.06	>1	0.12	0.30	0.09	0.32	0.27	0.00	0.08	0.00	0.00	0.43
APT1	4	0.02	0.07	0.05	1.08	0.42	0.22	0.19	0.29	0.21	0.13	0.03	0.10	0.25	0.00
BRM	mid	0.00	0.18	2.13	msg	msg	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.00	0.27
BRRE	mid	0.05	0.49	1.31	2.74	0.96	1.05	0.42	0.15	0.65	0.04	0.01	0.68	0.00	0.19
BRT	mid	0.00	0.02	0.25	1.35	2.84	0.66	0.21	0.11	0.38	0.03	0.00	0.34	0.01	0.06
CLK	mid	0.00	0.10	0.60	4.50	1.60	0.80	0.30	0.20	0.30	0.00	0.00	0.00	0.60	0.00
COLK	15	0.00	0.04	0.32	3.20	2.25	1.05	0.30	msg	0.80	0.00	0.05	0.00	0.48	0.28
ENA	4	0.00	0.02	0.05	0.07	0.59	0.04	0.00	0.47	0.25	0.27	0.01	0.00	0.54	0.02
EXT	17	0.00	0.70	0.25	2.50	4.49	2.60	0.83	0.46	0.85	0.02	0.00	0.75	0.89	0.15
GLC	4	0.07	0.81	2.14	4.86	2.01	1.12	0.32	0.26	0.36	0.04	0.00	0.00	0.10	0.17
H9E	18	0.00	0.02	0.06	1.56	0.03	0.18	0.07	0.29	0.24	0.10	0.17	0.16	0.11	0.01
HCOV	9	msg	msg	0.62	2.75	0.81	0.88	0.08	0.35	0.18	0.16	0.00	0.12	0.28	0.00
HOM	mid	0.00	0.30	0.53	0.88	0.16	0.22	0.25	0.17	0.22	0.09	0.00	0.29	0.00	0.04
K9N	7	0.02	0.01	0.12	0.43	0.15	0.01	0.03	0.00	0.42	0.23	0.14	0.00	0.05	0.48
KASI	7	0.02	0.00	0.08	0.55	0.25	0.06	0.00	0.33	0.00	0.33	0.03	0.07	0.50	0.00
KMR	mid	0.00	0.00	0.00	0.20	0.30	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.20	0.30
LWG	4	0.00	0.00	0.00	1.50	3.00	0.80	0.40	0.40	0.20	0.50	0.00	0.00	0.10	1.00
MPAS	17	0.00	0.08	0.50	3.50	1.56	1.00	0.69	0.64	0.51	0.04	0.63	0.00	0.72	0.47
MYS	4	0.00	0.00	0.00	0.58	1.32	0.17	0.00	0.06	0.06	0.01	0.00	0.00	0.05	0.63
PRK	mid	0.00	0.96	3.80	6.82	2.72	4.16	0.55	0.20	1.05	0.09	0.01	1.66	0.00	0.84
SILV	7	0.00	0.00	0.10	0.00	0.75	0.51	0.22	0.00	0.09	0.21	0.00	0.00	0.05	0.00
SWD	mid	msg	msg	msg	msg	>.84	1.58	0.34	0.26	0.58	0.01	0.00	1.10	0.39	0.21
SXQ	4	0.00	0.00	0.03	0.00	0.17	0.00	0.00	0.06	0.01	0.00	0.00	0.00	0.06	0.00
TUT	15	0.00	0.55	0.37	5.60	2.20	1.65	0.15	4.20	0.08	0.14	0.00	1.27	0.00	0.26

Table 5 Daily Precipitation for Last Half of September at Selected Stations

Site	Obs Time (Loc Std)	09/17	09/18	09/19	09/20	09/21	09/22	09/23	09/24	09/25	09/26	09/27	09/28	09/29	09/30
Kodiak Island and Western Cook Inlet															
5BI	21	0.08	0.45	0.39	1.98	0.85	1.00	0.35	0.15	0.45	0.00	0.00	1.46	0.51	0.05
ADQ	mid	msg	0.21	2.30	0.83	1.01	0.14	0.02	0.11	0.26	0.42	0.02	0.13	0.00	0.82
CHIN	19	3.44	1.00	2.13	0.97	1.77	0.12	0.06	0.11	0.19	0.44	msg	0.43	0.00	1.52
INT	18	0.08	0.13	0.15	1.53	1.00	0.42	0.02	0.01	0.12	0.03	0.00	0.55	0.00	0.12
OUZ	7	2.16	3.66	0.05	2.45	0.75	0.45	0.08	0.38	0.50	0.37	0.20	0.06	0.05	0.00
Z30	18	0.00	0.01	0.00	0.62	0.18	0.00	0.00	0.00	0.15	0.02	0.00	0.29	0.00	0.00
Matanuska and Knik Basins															
5WO	7	0.00	0.00	0.00	0.08	2.15	0.21	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.22
AK42	13	0.00	0.00	0.00	0.38	1.32	0.04	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.11
ANDL	7	0.00	0.00	0.07	0.16	0.48	0.02	0.01	0.04	0.06	0.05	0.02	0.00	0.00	0.16
LSU	7	0.00	0.00	0.04	0.18	0.96	0.15	0.00	0.02	0.03	0.00	msg	0.04	0.03	0.25
LSUS	4	0.0	0.0	0.0	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAES	9	0.00	0.00	0.02	0.34	2.13	0.07	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.30
MAG	8	0.0	0.0	0.0	0.0	1.1	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAES	9	0.00	0.00	0.02	0.14	1.41	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.18
PAQ	4	0.00	0.00	0.00	0.08	>.71	>.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	msg
SUT	4	0.0	0.0	0.0	0.0	>2.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WAS	8	msg	0.02	0.07	0.23	0.92	0.02	msg	0.02	0.03	0.00	0.00	0.00	0.00	0.17
WAS3	17	0.00	0.00	0.07	0.40	0.27	0.00	0.03	0.02	0.00	0.02	0.00	0.00	0.00	0.17
Susitna Basin															
5HR	16	0.00	0.11	0.25	2.83	1.00	0.37	0.15	0.24	0.09	0.03	0.09	0.07	0.61	0.05
ACR	8	0.00	0.00	0.02	0.11	0.61	0.00	0.11	0.22	0.09	0.04	0.00	0.00	0.30	msg
CANT	20	0.00	0.00	0.00	0.00	0.06	0.03	0.02	0.03	0.14	0.05	0.00	0.00	0.02	0.04
CLAK	8	0.00	0.00	0.16	0.10	0.57	0.24	0.12	0.22	0.06	0.12	0.00	0.00	0.30	0.32
LAK	9	0.00	0.02	0.24	0.15	0.56	0.10	0.06	0.31	msg	0.02	0.02	msg	msg	msg
PTI	16	0.00	0.00	0.06	1.54	0.63	0.07	0.00	0.29	0.08	0.00	0.00	0.05	0.14	0.09
SKW	16	0.00	0.00	0.08	0.42	0.61	msg	msg	msg	msg	0.00	0.00	0.03	0.34	0.00
SUN	9	0.00	0.08	0.20	0.03	0.31	0.00	0.00	0.13	0.09	0.04	0.00	0.00	0.15	0.15
TKA	20	msg	0.00	0.16	0.03	0.21	0.01	0.05	0.05	0.24	0.00	0.01	0.07	0.25	0.28
TML	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WIL	8	0.00	0.00	0.22	0.02	0.26	0.00	0.00	0.17	0.06	0.00	0.00	0.00	0.00	0.14
WILW	11	0.00	msg	0.20	0.05	0.19	0.01	0.01	0.13	0.00	msg	0.04	msg	0.07	0.04

Table 5 Daily Precipitation for Last Half of September at Selected Stations

Site	Obs Time (Loc Std)	09/17	09/18	09/19	09/20	09/21	09/22	09/23	09/24	09/25	09/26	09/27	09/28	09/29	09/30
Copper River Basin															
5GN	17	0.00	0.00	0.00	0.20	1.68	0.32	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.13
5PX	20	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.15	0.20	0.00	0.00	0.00	0.11	0.03
GAK	9	0.00	0.00	0.00	0.00	0.00	0.11	0.04	0.05	0.12	0.03	0.00	0.00	0.04	0.00
GKN	4	0.00	0.00	0.00	0.00	msg	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KCAM	9	0.00	0.00	0.00	0.00	0.05	0.05	0.10	0.07	0.28	0.12	0.00	0.00	0.00	0.00
LKSU	17	0.00	0.00	0.00	0.00	0.06	0.00	0.08	0.11	0.13	0.00	0.00	0.00	0.00	0.00
MXY	18	0.00	0.00	0.09	0.09	1.39	0.70	0.32	0.03	0.09	0.00	0.00	0.00	0.03	0.03
TON	7	0.00	0.00	0.00	0.00	1.32	0.70	0.04	0.06	0.11	0.00	0.00	0.00	0.00	0.05
Prince William Sound and Gulf of Alaska Coastline															
5WT	21	0.00	2.75	1.82	10.92	3.09	2.17	1.06	1.65	2.64	0.26	0.00	1.09	1.96	1.64
CDN	14	0.00	0.00	0.91	2.30	6.02	1.55	0.21	0.80	1.43	1.15	0.00	0.00	0.70	0.53
CDV	4	0.00	0.00	0.53	0.29	3.45	msg	0.12	0.06	1.59	0.68	0.00	0.00	0.12	0.65
MAIN	10	0.00	1.05	1.32	6.65	3.50	0.90	0.37	1.26	2.79	0.81	0.05	0.00	2.39	1.22
PTSW	12	0.00	0.67	0.22	3.13	1.81	0.63	0.39	0.39	1.23	0.77	0.00	0.12	1.91	0.53
VWS	mid	msg	0.00	0.16	0.27	0.93	2.43	0.08	0.20	0.51	0.49	0.04	0.00	0.10	0.40
YAK	mid	msg	0.00	0.11	0.06	1.41	5.40	3.48	0.00	0.02	0.15	0.00	0.00	0.10	0.86

Table 6 Preliminary Estimates of Flood Recurrance Intervals Supplied by the U. S. Geological Survey Water Resources Division

Station Number	Station Name	Peak Stage of Record	Peak Discharge of Record	Sept 95 Peak Stage	Date of Peak	Sept 95 Peak Discharge	Recurrance Interval Estimates
xxxxxxxx	Lowe R nr Valdez				9/21	-19,000[b]	-100 year[a]
xxxxxxxx	Tiekel R nr Tiekel					to be det	
15208000	Tonsina R at Tonsina	n.a.	8,400	22.13	9/22	7,000	10 year
15208200	Rock Creek nr Tonsina	6.26	225	5.85	9/22	115	10 year
15211700	Strelna Cr nr Chitina	n.a.	670	17.54	9/22	76	< mean annual
15211900	O'Brien Cr nr Chitina	2.70	1,850	3.91		to be det	
15212000	Copper R nr Chitina	37.30	380,000	28.09		244,000	15-20 year
15212500	Boulder Cr nr Tiekel	11.72	1,330	10.58	9/22	484	10 year
15214000	Copper R at Million	48.54	309,000	51.73	9/23	365,000	>100 year
15216000	Power Cr nr Cordova	7.18	6,060	5.68	9/21	2,680	2 year
15212800	Ptarmigan Cr trib Valdez	n.a.	85		9/22	to be det	
15215990	Nicolet Cr nr Cordova	19.54	940	18.50		-580	<annual peak
15227500	Mineral Cr nr Valdez	n.a.	5,570	13.14	9/22	2,930	not peak of record
15236200	Shakespeare Cr	12.81	620	15.05		to be det	

Station Number	Station Name	Peak Stage of Record	Peak Discharge of Record	Sept 95 Peak Stage	Date of Peak	Sept 95 Peak Discharge	Recurrance Interval Estimates
15236000	Hobo Cr nr Whittier	5.14	994	7.90	9/19	2,900[b]	
15237360	San Juan R nr Seward	9.08	3,930	8.19	9/20	3,810	25 year
15237550	Mt. Alice Cr nr Seward	18.77	1,340	18.07	9/20	822	
15237900	Glacier Cr at Bruno Rd	15.70	4,200	9.61 9.91[l]	9/20 9/24[l]	945 1040[l]	<5 year
15238010	Salmon Cr nr Seward	n.a.	8,500[i]	9.43	9/20	1610	
15238400	Rudolph Cr at Sewaard	unknown	1,020	14.09	9/20	134	2 year
15238490	Lowell Cr at city wells	unknown	unknown	10.89		1690	
15238600	Spruce Cr nr Seward	13.96 unknown	13,600[i] 5,420[i]	7.29	9/20	2,600	5 year
15238990	Upper Bradley R	13.54	774	15.1	9/20	3,300[b]	>50 year
15239050	Middle Fork Bradley R	8.53	1,120	8.86	9/20	1,470	>100 year
15239500	Fritz Cr nr Homer	datum	852	10.77			> annual peak
15239900	Anchor nr Anchor Pt	7.42	6,050	3.90		1,060	<2 year
15240000	Anchor at Anchor Pt	——	3,030	4.10		1,750	<2 year
15258000	Kenai R Cooper Landing	17.18	23,100	16.23	9/23	20,300	25 year [c]
15266300	Kenai at Soldotna	13.45	33,700	14.50	9/24	42,300	>100 year
15272530	California Cr at Girdwood	datum	600	16.4		760[b]	>100 year

Station Number	Station Name	Peak Stage of Record	Peak Discharge of Record	Sept 95 Peak Stage	Date of Peak	Sept 95 Peak Discharge	Recurrance Interval Estimates
15272550	Glacier Cr at Girdwood	7.90	7,710	6.75	9/20	5,600	<10 year
15276000	Ship Cr nr Anchorage	6.38	2,100	6.52 inst 7.4 hwm 4.74 (old ga.)	9/21	1,890[b] 1,700	>50 year
15271900	Cub Cr nr Hope	12.09	54	12.90		to be det	possible peak of record
15277100	Eagle R at Eagle River	9.49	6,240	11.0		10,300	>500 year
15277410	Peters Cr nr Birchwood	5.73	1,200	10.4	9/21	5,000	>500 year
15280000	Eklutna Cr nr Palmer			[k]			
15281000	Knik R nr Palmer	25.30[f] 15.16[g]	359,000[f] 84,000[g]	17.6	9/22	152,000	>500 year[g]
15284000	Matanuska R at Palmer	13.60[h]	82,000[h]	13.04	9/22	46,000	<100 year
15294700	Johnson nr Tuxedni Bay			15.0		to be det	
15294900	Paint R Kamishak	14.46	17,400	16.12	9/20	26,300	>100 year
15295700	Terror R nr Kodiak	3.89	2,170[d]	7.67	9/19	9.700[b]	>100 year [d]
15297485	Kizhuyak R at Port Lions	9.19	2,740	11.2	9/19	6,560	15 year
15272280	Portage Creek	10.69	13,100	10.69	9/20	13,100	15 year

< less than
> greater than
- approximately
n.a. not applicable
a.--computed from regional regressions (Jones and Fahl, 1994)
b.--this value was determined from an indirect measurement of peak flow
c.--floods at this station usually caused by glacier-lake breakouts on the Snow River
d.--flow regulated

f.--caused by release of stored water (Lake George) behind Knik Glacier
g.--excluding glacial breakout floods
h.--result of a lake breakout
i.--result of release of impounded water from an avalanche-debris dam
j.--excluding debris dam breakout
k.--high water marks flagged and leveled, unable to locate old datum, no further work planned
l.--after Bear Creek diversion into Glacier Creek

Appendix III

Damage Reports

Appendix III.1 Introduction

The damage reports given here were compiled from interviews with and reports by road crews, emergency operations center staff, Alaska State Troopers, and city government staff.

Appendix III.2 Cordova and Surrounding Area

Much of this information is courtesty of George Keeny, Cordova Public Works Department. His phone number is 424-6220. Cordova received close to 9½ inches of rain in 2 days (September 19-20). Warm temperatures caused the glacier-fed Scott River to rise which then caused the Eyak River, which drains Eyak Lake, to backup to levels nearly 6 feet above normal.

Other problems caused by the rain and glacial melt due to warm temperatures were as follows:

Copper River highway

Bridge number 349 Scott River number 2 - Some loss of riprap under the bridge.

Bridge number 351 Scott River number 4 - Abutment fill and riprap washout, pavement failure.

Bridge number 410 Scott River number 10 - Some loss of riprap near the bridge.

Bridge number 230 Sheridan Glacier River - Abutment riprap washout, both abutments. Wash out of spur dike riprap.

Bridge number 333 Copper River - Abutment number 1 fill washout, some damage to dike.

Bridge number 334 Copper River - Debris on piers.

Bridge 339 - Debris on piers.

Bridge number 340 Copper River - Abutment number 1 riprap and fill washout. Damage to spur dike nose. 2,000 feet of erosion

along road fill upstream side.

Bridge 342 - No new damage above that which occurred to east spur dike this summer. More water is now going back toward 340 and ahead toward 344. Embankment fill is washed out at mile 37.5 between 342 and 344. Debris on piers at 342.

Bridge number 345 Copper River - Debris on piers.

Mile 41-43 - Several surface washouts in low spots. Adjustments will be made to 37-49 contract now being advertised.

Bridge number 206 Million Dollar Bridge - A false bent, near the '64 earthquake damaged pier 3, which apparently supported, at least in part, the north end of the 450 foot third span truss, has been lost. The false bent is now downstream of and completely free of the superstructure. Existing cracks in the quake damaged pier appear to have widened. This bridge has been closed indefinately until structural assessments can be made.

Dayville road bridges - Debris on piers, no other damage noted at this time.

DOT Future Projects

Scott River Flood Control (George Keeny) - "We had just completed the Scott River Dike project prior to the September 21 storm. Although the grade of the dike was raised more than 3 feet, the water came to within less than a foot of the top of the dike. It appears that Scott River is tending to flow more on the west side (where the dike is) than on the east (toward the aiport). Further grade raises of the dike are limited by low steel elevations and hydraulic capacity of the Scott Tiver bridges. This project must be in close coordination with the City of Cordova because the Scott River is now causing problems downstream of the highway where it dumps into, and back up Eyak River."

Additional information via phone conversation with George Keeny (some of which apparently duplicates above DOT information) indicated this damage:

7 - 13 mile - Bridge washouts due to high water. Bridge at 8 mile had only asphalt hanging in the air.

Eyak River - Flooded the 6 mile and 6 1/2 mile subdivisions.

Eyak Lake - Ketchum Air building had 2½ - 3 feet of water on

the first level. Six houses had basement flooding. The Municipal airport was submerged.

Mile 14-16 - 1½ lanes were washed away by the Sheridan Glacier River. At the 14 mile bridge, one abutment was washed out.

Mile 34-35 - ½ of a lane was washed out.

Mile 37 - Dykes on either side of the bridge began to wash away.

Mile 38 - Water over the road washed the road topping off.

Million Dollar Bridge - High water took out one support on the eastern approach.

Appendix III.3 Valdez and Surrounding Area

Information supplied by Lynn Chrystal, Official in Charge of the Valdez Weather Service Office.

Valdez received 3.63 inches of rain during the three day period from September 19-21. Warm temperatures were also cited as contributing factors to high water levels along glacial fed and snowmelt fed streams and rivers in the area. Here are Lynn's comments:

"The rain event of September 20 -21 throughout much of south central Alaska did not really hit Valdez proper with a lot of rain. Water levels in Keystone Canyon, however, were the highest since the big flood of August, 1981.

As the storm unfolded, it looked like Valdez would not receive the really heavy amounts forecasted for areas around Seward due to the upper level wind direction (more southeast as opposed to the really wet south to southwesterlies).

This turned out to be true for the immediate Valdez area, as rainfall amounts for the three day period ending on the 21st were 3.63 inches, which is a lot of rain but nothing really heavy. In fact, just about ten days earlier, we had a stretch of rain that brought 4.63 inches in four days (7.08 inches in eight days) with no flooding at all.

The first indication that something more serious was going on was when Gene Petrescu (a meteorologist intern), was driving out of Valdez on his way to a new assignment in Montana. Gene

called from Thompson Pass to say that it was really raining hard all the way from Keystone Canyon to the Pass and that the river was way up. At the same time, we had less than a tenth of an inch in town in several hours. About an hour later, Gene called back and said that the DOT had closed the road at mile 47 and that he could not get through. He also relayed that it was still raining hard. This was all taking place Thursday morning, the 21st.

I then called the River Forecast Center in Anchorage and brought them up to speed on what was happening just east of Valdez. They then included Valdez in the flood warnings already out for much of south central Alaska.

In the flood of 1981, we had a very wet July with 8.96 inches of water. As we went into August of 1995, we already had high water levels in the rivers due to the heavier than normal rain. Warmer than normal temperatures also caused high water levels due to snow melt in the high country and glacial melt.

In the first 20 days of August, we had over 18 inches or rain, including 14.44 inches in a ten day stretch (5th - 15th). This caused a thousand feet of road in the canyon to completely wash out and also was responsible for heavy damage in the 40 - 60 mile area of the Richardson Highway. In this case, the rain we had in Valdez was at least a good indicator of what was happening just east and north of town.

In this most recent event, this was not the case. We had no idea a serious problem was developing. Information is lacking between Valdez and Gulkana. I live just a few feet away from Mineral Creek, which drains a large canyon just north of downtown Valdez. Whenever it rains hard, I personally check it at least twice a day. During this period, the creek was not anything out of the ordinary, considering the rainfall we recorded in Valdez, itself.

Based on my past observations (and having witnessed not only the flood of 1981 but many other rain events since that time), I concluded that we had some serious rainfall just out of Valdez, where we have no recording devices. To **have water in Keystone Canyon come up to almost the same level seen in 1981 would require an incredible amount of rain in a short time.**

This storm was not only a real rain producer, but was also very warm and most likely caused by quite a bit of snow melt in the high country and also considerable glacial melt that just added to the heavy rainfall.

In the wintertime, when we do get snowfall data at Thompson Pass from DOT, storms that drop a foot of snow in Valdez will sometimes drop two to three feet in the Pass. This is not a hard and fast rule, of course, and without more information on upper level wind flow into and near the Prince William Sound area, we will never be able to pinpoint which storms will dump more rain over that area and not in Valdez itself (the Middleton Island radar may provide a significant amount of help in this area). This particular storm was probably like some of those winter storms that dump heavy snow in Thompson Pass. In this case, however, because it was all rain with quick "runoff", the results were more serious."

Lynn also sent back this damage information:

Richardson Highway

Lowe River drainage - Keystone Canyon - Milepost 14 - 15...500+ feet of riprap damage. Some loss of shoulder material.

Bridge number 557...Lowe River lower crossing - Had water on the superstructure. Richardson Highway closed September 21. This is not the first time this has occurred. A project to raise the grade/bridge should be considered. Debris on piers. Some loss of rock around abutments. 3,000 CY +/- gravel needs to be excavated from under and downstream of the bridge.

Bridge number 1383...Lowe River lower Keystone - Loss of all remaining rock protection upstream of abutment 1.

Tsaina River drainage

Milepost 33 - River ran along and cut into embankment. Need for bank protection or finger dikes for 2,000 feet.

Tiekel River drainage

Bridge number 1221 Tiekel River number 1 - Loss or riprap and abutment fill abutment 1. Pavement removed by maintenance. Abutment fill has been repaired by M&O.

Milepost 47 - Washout due to creek overflow on Alyeska pipeline. Material and debris deposited on road closed the Richardson Highway September 21. Erosion of shoulders and

foreslopes. Deposition of debris in ditches. Billy Mitchell Wayside overrun by flood, erosion and debris.

Milepost 58 - Washout of embankment, no loss of pavement. Cut bank is approximately 30 feet high and daylights within 10 feet of pavement.

Milepost 60 - Washout of highway including one lane of pavement. Richardson Highway closed to traffic September 21 - 22.

Tonsina River drainage

Milepost 76 - Lost 200 feet of bank, need 600 feet of bank protection.

Edgerton Highway

Milepost 20.4 - Estimated 320 CY material on road from slide.

Milepost 20.7 - Estimated 400 CY material on road from slide.

Copper River Highway - south of Chitina

Bridge 1306 O'Brien Creek - Abutment sills have scoured and the cribs have lost all gravel fill. Bridge appears to be in original position.

Bridge 1307 Haley Creek - Some scour at abutments. River too high to fully assess.

There are six known mudslides between Fox Creek and Haley Creek.

Future Projects

Richardson Highway Milepost 45 -79 erosion - More than 15 problem areas and potential problem areas have been identified by M&O in the Tiekel and Upper Tonsina drainages.

Bridge 557 - Grade raise and/or replacement. The water in Keystone Canyon came up against the superstructure on September 21 and also back in 1981. Loss of this bridge would close the Richardson Highway for an extended period.

Appendix III.4 Knik River and Hunter Creek

This information was compiled through discussions with area residents and State of Alaska workers who were building a new bridge across Hunter Creek at the time of the flood.

One resident, who lives just west of the Hunter Creek Bridge, reported 3¾ inches of rain in a two day period (probably September 19-20). He commented, "Who knows how much rain fell in the surrounding mountains?" Warm temperatures, which caused increased glacial melt, were also cited as contributors to high water levels on Hunter Creek. Several residents mentioned that these rains were the heaviest rains they had ever experienced in this location. One local said he had not seen rainfall as hard or heavy in the area for over 25 years (he was also interested in any instrumentation the Weather Service might want to place on his property to monitor either the creek or weather conditions). These were the highest water levels he had ever seen. Large trees were washed downstream, lodging in bridge supports. The fast moving water then scoured out these supports. It did not take long for the one lane bridge to collapse into the raging creek. One pickup truck barely escaped the bridge failure. A reported 27 people were airlifted from the east side of the creek by National Guard helicopters, including at least 2 hunters whose vehicle was stranded on the east side of the creek for close to 2 weeks.

Hunter Creek rises sharply upstream from the bridge. There are apparently two glaciers which feed Hunter Creek. In the past, there have been slides in the mountainous areas upstream from the bridge. These created "mini" natural dams. When these dams break, sometimes due to heavy rainfall, water levels rise sharply for an hour or two, then fall very quickly. Hunter Creek has had at least a few "flash" floods in the past from this sequence of events. The new bridge, which should be finished in the next few weeks, will be two lanes (as opposed to one on the old one) and will be constructed in such a way as to greatly diminish the threat of a washout.

Other problems caused by the rain and glacial melt due to warm temperatures were as follows:

Just west of the Old Glenn Highway Bridge across the Knik River was evidence of a new, very large slide, apparently triggered by these same heavy rains in the mountains. Although the road was clear and open, it was very apparent that the slide had crossed the entire road, closing it for a short time.

Gravel and rock also washed down from the mountains during the heavy rains. These were cleared from the smaller creeks that drain into the Knik from the mountains to the south. Workers cleaned fresh gravel out of many of the creeks along the Old Knik River Road, piling the rocks in stacks close to the road next to the streams.

Piles of gravel were left along Goat Creek, just upstream along the Knik from the Eklutna Tailrace.

Appendix IV

Flood-Incident Log

Alaska Department of Emergency Services

The following are excerpts from the Alaska Department of Emergency Service's Electronic Communications System. The system is based on a commercial software package called "First Class" to electronically support composition, storage, and distribution flood information to selected emergency management organizations. First Class is essentially an electronic mail type of system. All dates are in year 1995. Times are in Alaska Standard Time (24 hour clock).

September 20 14:12 Emergency Operations Center (EOC)

EOC started their flood log.

September 20 15:51 Girdwood

Twenty percent of the roads in the Girdwood area are impassable because of high water and the backup of water in the Culverts. Real concern is the next high tide and the water backing up even farther in the area.

September 20 16:02 Seward

Water is running across 1/4 mile of the Seward Highway 3-6" deep. Debris is being washed across the road. The water is going through the rail yard. Port Road is over topped. The old meal plant building is damaged. Lowell Point bridge is now completely washed away. The water from the Lowell Creek area backs up to Rail Road Street and Seward Highway about 1/4 mile. The Institute of Marine Science has had water in the laboratory.

September 20 16:13 Girdwood

There have been some reports of homes flooding. Public works is presently trying to fill in the edges of the roads and bridges with rocks to prevent erosion. Many of the culverts are stopped up with debris which is causing some roads to over flow with water. The stream that did cause some flooding at the school was diverted by public works personnel; therefore the flooding at the school is no

longer a problem.

September 20 16:45 Girdwood

The main concerns are: 1) The creek that flows off of the ski slope has overflowed in the vicinity of the jade shop and has caused some damage to a few streets and driveways. 2) In the area of the junction of Old Seward and Old Girdwood when the tide comes in, they may have to move about 100 people.

September 20 16:50 Kodiak

Everything in Kodiak is presently holding. Public works is monitoring all culverts and retainer walls. They have cleared several small mud slides behind the retainer walls. Also a person was swept away from his truck at the American River. He was rescued.

September 20 17:27 Seward

There is an amateur radio operator standing by there to assist if needed. His name is Ed, call sign is VE6NH.

September 20 17:33 Seward

This city is experiencing extensive damage to roads and bridges, flood control dikes and levees, water and sewer facilities, power and harbor facilities, as well as personal property and real property.

September 20 17:50 Seward

STATUS REPORT:

Roads closed: Numerous
Bridges closed: Several
Flooded areas: UAF Institute of Marine Science, lagoon, Army Recreation Camp.
Airport: Closed except for helicopter service.
Potential problems: Lagoon full, Exit Glacier full to bridge, Japanese Creek at dump, mile 3 Seward Highway.

September 20 18:14 Seward

The ALASCOM fiber between Seward and Anchorage may be preempted at two points. The circuits current on fiber have been moved to satellite. HF communications may be the only

way out. INMARSAT may not be available if the DES Team is not allowed to use the highway into Seward. With the Rural Television System down, no EBS can be used.

September 20 18:57 Mat Su Valley

One bridge out on Hunter Creek Road Bridge, the approaches are gone on Knik River Road.

September 20 19:29 Girdwood

Currently one family has been evacuated. Two to three homes are in danger. Glacier Creek is 6" from breeching it's banks. It could continue until the Seward Highway becomes flooded. ***No known prediction yet.*** Twenty percent of the side roads in Girdwood Valley are impassable. Conditions at Girdwood (16:00) constant 10 to 20 mph winds, rain increasing again.

September 20 19:52 Seward

Mud slide at mile 16 Seward Highway is clear but water remains high at river crossing.

September 20 21:53 Seward

PRESS RELEASE--#1

The City of Seward and the Kenai Peninsula Borough continue to operate under a state of emergency. Several evacuation orders are in effect. Several area roads remain closed. Flooding has occurred in numerous areas.

September 21 02:25 Girdwood

22:34 update: Conditions stable, water treatment plant shut down. Sewage into Glacier Creek. Fire Department officials report a drop in water level throughout the night.

September 21 03:06 Seward

Seward reports stable conditions.

September 21 03:10 Cooper Landing

Kenai River is bank full, but holding.

September 21 06:29 Seward

Seward reports water level dropping, no significant changes from last night.

September 21 06:31 Girdwood

Girdwood remains stable.

September 21 07:24 Unknown

Unconfirmed reports of damage to the Alaska Rail Road facilities. Police department reports possible damage to bridge. The bridge appears to have structural damage.

September 21 07:46 Whittier

Work being done on bridge outside Whittier today. They are also working on mud slides at mile 18 and mile 21.

September 21 08:07 All Areas

STATUS REPORT - Problem Areas this Morning after Heavy Rain

Between mile 75 and 83 of the Glenn Highway, continuing problems with rocks slides due to rain.

Approximately 75 to 100 feet of south bound lane at Knik River Bridge has almost all been washed out.

Hunter Creek - Palmer/Old Glenn Highway, the creek has overflowed and washed out.

The Old Glenn Highway at mile 8.5 in Palmer is currently closed due to mud and rock slides.

The town of Girdwood is still experiencing some other problems due to the volume of rain.

Girdwood: The state roads are currently open. Crow Creek Mine Road had a washout last night. Currently it is clear and open.

The dike outside the town of Seward by Exit Glacier is a major concern this morning. If the dike does not hold and

breaks, the town could be flooded with at least 4 feet of water.

The town of Seward has had over 9 inches of rain since Tuesday. Mile 3 of the Seward Highway is currently closed.

September 21 09:14 Seward

Alaska State Troopers report the dike above town in Seward has broken; Helo 1 will be tied up evacuating people.

September 21 09:18 Palmer - Knik

At 08:19, Alaska State Troopers received a report that road north of Hunter Creek was flooding.

The river is reportedly rising at 1 foot per hour. If this continues, an immediate flooding problem could occur.

September 21 09:24 Seward

Confirmed...Exit Glacier dike had broken and the Bear Creek Fire Department was evacuating the Camelo subdivision.

September 21 09:58 Knik

Peters Creek Bridge on the Old Glenn Highway is collapsing. The road is being barricaded.

September 21 10:21 Knik

The Hunter Creek bridge has been lost. The bridge has dropped about five feet today.

September 21 10:33 Mat Su Valley

Mile 90 of the Glenn Highway (Cascade Creek), water reported over 2/3rds of the highway, eroding ditch and washing out the highway.

Severe erosion problems exist along the bridges as well as power poles.

September 21 11:01 Seward

Rolf Bardarson reports his home is threatened by flood waters.

September 21 11:32 Kodiak

No flood problems at Kodiak.

September 21 11:36 Seward

11:44: Old Mill subdivision at mile 8 Seward Highway was also evacuated as a result of the Box Canyon levy breaking.

September 21 11:36 Eagle River

Report that the Eagle River Camp Ground was flooding.

September 21 12:04 Moose Pass

Moose Pass School is shut down and water is running through the school.

September 21 12:22 Girdwood

Girdwood creeks were going down. Maintenance workers are shoring Aleyeska Bridge. The Old Glenn Highway is closed because the Peters Creek Bridge is out.

September 21 12:27 Kenai

Field report from Kenai Keys indicates water 12" deep in places with some roads covered. Water entering some cabins.

September 21 12:45 Seward

STATUS REPORT - Seward Flood Report

Current Threats:
Wash out of Box Canyon Levy. Sewer Lagoon may have flooded.

Public Facilities:
Alaska Railroad-one bridge out.
School closed
Waterfall Bridge is out.
Seward Harbor - silting up
Seward Airport - partially flooded

Roads and Highways:

Numerous highways flooded and some bridges out.

September 21 12:51 Seward

The northeast side of the ramp at Port Avenue and Harbor road has a large washout 6-8' deep, 200' wide and 800' long. The Lowell Creek Tunnel water flow has removed the abutment and access on both sides of the bridge. The bridge is severely damaged and may need to be replaced.

September 21 12:53 Skwentna

Alaska State Troopers report the Skwentna River was flooding in Skwentna. River has risen 9-10 feet since yesterday. Also 2 feet in the last 2 hours. Waters is 2 feet from the airport and has surrounded the school. Several roads have flooded. Worse than the 1986 flood.

September 21 14:08 Girdwood

Culvert failure is on Crow Creek Road. Bridge abutment damage at Glacier Creek.

September 21 14:30 Knik

The Hunter Creek 77 foot bridge is now a 100 foot gap. Water is about 4 feet below the ARR bridge and over the highway. The windsong subdivision is impacted and there is water close to the houses.

September 21 14:47 Knik

Alaska State Troopers--the Old Glenn Highway has been closed at the Knik River bridge as of 14:30 Thursday due to high water and flooding.

September 21 14:48 Knik

Palmer alternate is closed due to high water. Vehicles are stalling.

September 21 15:17 Eagle River

Tom Brooks of the Alaska Railroad stated the temporary Eagle River bridge above the railroad trestle was in danger of washing away.

September 21 15:35 Seward

SEWARD HIGHWAY --STATUS REPORT

1 Mile...approximately 12 to 14 inches of water over the top of the Seward Highway for approximately 1,000 feet. There did not appear to be any damage to the highway surface. The city of Seward closed the highway to regular traffic at Nash Road and the northern most access road to the Seward small boat harbor. There was some loss of material at the shoulder.

The airport...the long runway is under water. Minimal damage is estimated. The approach to Cemetery Road bridge was washed out.

September 21 15:51 Seward

Crow Creek Road, there has been damage and the culvert has been removed.

September 21 17:34 Eagle River

The Eagle River, Fort Richardson lower bridge has sustained major damage; it appears that the bridge will fail within a short time.

September 21 22:55 Girdwood

Glacier Creek area, the bridge and creek bank were/are in jeopardy.

September 21 22:37 Mat Su Valley

Knik River Road north of Hunter Creek cut off due to loss of bridge. Knik River Road at mile 2 is underwater. Old Glenn Highway at Knik River bridge under water. Highway is currently closed. Skwentna Townsite mostly under water.

September 22 01:50 Seward

The Snow Glacier dam has not broken.

September 22 02:00 Valdez

Valdez Police report at 01:30, Richardson Highway closed at mile 12. High water in area.

September 22 02:03 Cordova

Cordova Police report at 01:45, water is high and some

families have left homes. Airfield in town is closed.

September 22 03:49 Seward

Seward reports water level dropping in most areas. Japanese Creek is still a problem. Most roads are open.

September 22 03:52 Kenai

Kenai reports that water is still rising but has not caused evacuation or loss of services yet. There is a small landslide on the Sterling Highway (milepost unknown).

September 22 05:55 All Areas

OVERALL ASSESSMENT

The area from Seward to Moose Pass has suffered extensive flooding. Flooding in Seward and Bear Creek has stablizied.

Roads and Highways
Mostly open a couple washed out and closed.

Public Facilities
Alaska Railroad -- Substantial damage sustained; service to Seward suspended indefinitely.

Seward Airport -- Debris on runways, closed to aircraft, open to helicopters.

Waterfall Bridge -- out.

Residential Areas
Crown Point and Moose Pass -- flooding
Old Mill subdivision -- threatened by flooding

Current Threats
Accumulated silt in northeast basin may shift into small boat harbor. Kenai Lake is very high and Trail Lake at Moose Pass is rapidly rising. Glacier Creek and Lost Creek continue to rise.

September 22 07:13 Eagle River

Both bridges crossing Eagle River on Fort Richardson were damaged, but had not washed away during the night.

September 22 07:34 Palmer/Skwentna

The Mat Su EOC is staffed beginning at 06:00 today.

September 22 07:54 Kenai

PRESS RELEASE--#2

All three areas (Cooper Landing, Kenai Keys, and Soldotna) are above flood stage. Persons living along the river and streams in the affected areas are urged to remain alert and take appropriate precautions. Estimated times that the Kenai River will crest are as follows:

Cooper Landing	**Early Friday**
Kenai Keys	**Mid to Late Friday**
Soldotna	**Saturday**

September 22 08:43 Seward

The Alaska Railroad stated they have five places of significant damage on the tracks and up to 24 places they will need to do maintenance repairs. The major problem is Moose Pass. It is under water at this time ***with no real prediction as to when the water will go down.***

September 22 10:22 Valdez/Glennallen

Call from Division of Forestry. Reported an individual from mile 78.5 of the Richardson Highway (Bernard Creek area) reported flooding down a road that leads to about 6 homes.

September 22 10:58 Palmer/Seward

Call from Alaska Railroad. They have concerns about Knik River rail bridge receiving damage from high water and debris collecting above the bridge and causing damage. ***Tom Brook wanted specific information on weather service hydraulics. Gave him Art Armour's (Alaska RFC) number at the National Weather Service.*** He was also concerned about high water in Moose Pass.

September 22 11:05 Valdez/Glennallen

Situation is Bernard Creek is now running down the private

drive which leads to 6 homes. One cabin has been damaged.

September 22 11:10 Seward

ALASKA RAILROAD STATUS REPORT

From mile post 3.5 to mile post 75 there are numerous reports of flooding and debris affecting bridges, culverts, and undercutting track bed. Eight bridges are being impacted.

September 22 12:15 Cordova

Mayor Margy Johnson reports that the Scott River Glacier drainage is causing flooding conditions. There are about 40 families affected. DOT has closed the Copper River Highway, and are working on a road washout at mile 4.

September 22 12:28 Valdez/Glennallen

Received call from the DNR concerning Bernard Creek area at mile 78.5 of the Richardson Highway. The creek has changed channels and has taken the road as its main channel. This is caused by log jams at the beginning of the road.

September 22 12:44 Seward

SEWARD FLOOD STATUS REPORT

As of 10:45

Overall Assessment
The area from Seward to Mosse pass has suffered extensive flooding. Flooding in Seward and Bear Creek has stablizied and local government is beginning to make damage assessments. Most evacuees have returned to their homes.

Roads and Highways
Most roads are open. Several however remain closed due to flooding.

Public Facilities
Alaska Railroad--substantial damage sustained. Service to Seward is suspended indefinitely.
Seward Airport--Closed to aircraft, open to helicopters.
Moose Pass School--closed.
Waterfall bridge--out.

Other facilities--several affected.

Residential Areas
Several affected, some evacuation continues.

Current Threats
Crown point, Moose Pass, Old Mill subdivision, Exit Glacier Road, Resurrection Road, and Meridian Park subdivision.

September 22 12:49 Skwentna

The Skwenta River has risen more since yesterday. Also many more families up the Yetna River are evacuating.

September 22 13:05 Valdez

The city manager stated the dikes along the lower river held overnight and they had no problems.

September 22 13:20 Whittier

Department of Public Safety reported some damage to the DoD fuel tank farm. Also reported was damage to the vehicle bridge that goes to the farm. Some of the pilings are washed out.

September 22 14:17 Kenai EOC

Flooding continues in the Kenai Keys area, some roads under water. Also, flooding in Big Eddy and Poachers Cove.

September 22 15:02 Richardson Highway mile 60

Trooper made a rescue of an individual up Falls Creek. The individual had spent two days in a front-end loader in the middle of the creek. Individual had vacated his travel trailer which was located in the old creek bed and jumped to the front-end loader.

September 22 15:49 Kenai EOC

PRESS RELEASE #4

Kenai River
Water continues to rise. Roads to Kenai Keys are flooded and other roads are threatened. Rivers are expected to crest Friday noon in Cooper Landing area; later Friday in

Kenai Keys. Rate of rise has slowed, but water is spreading more than rising at this point.

Seward Area
Blooding continues in low-lying areas and many roads have been damaged or have water over the road. Bridges may have suffered damage. Rain is light and water in flooded areas has begun to gradually recede. No further rise is expected, but water may spread further.

September 22 16:09 Richardson Highway mile 78.5

Local logging company diverted creek back into the original channel.

September 22 16:09 Fort Richardson Armory

Power outage.

September 22 16:16 Benard Creek (Richardson highway)

Lower Benard Creek overflowing at mile 79 and it was over flowing the Tonsina Airstrip through the Tonsina Lodge: some small buildings damaged and driveway damage.

September 22 17:10 Fort Richardson Armory

Power restored. Reason for the outage is unknown.

September 22 18:47 Seward

STATUS REPORT--SEWARD FLOOD **(as of 1300 hours)**

Resurrection River continues to rage and is making new channels adjacent to the airport and in the industrial area. Kenai Lake and Trail Lake are very high. Glacier Creek and Lost Creek continue to rise.

September 22 21:11 Kenai Pen Borough

"Declaration of Local Disaster Emergency" in the Kenai river and Snow river drainages and the Kenai lake area (including Moose Point, Crown Point, and Cooper Landing)

September 23 10:46 Seward

Seward Flood Status Report (as of 0900 hrs):
Flooding from Seward to Moose Pass has stabilized. Resurrection river continues to rage and is making new channels adjacent to the airport and in the industrial area. Upper Kenai Lake still very high.

September 23 13:08 Windsong subdivision (mile 5 Old Glenn)

Received approximately 2 feet of water throughout the area. Septic systems and holding tanks have failed. Raw sewage in the ditches.

September 23 13:09 Kenai EOC

PRESS RELEASE--#8

Kenai River levels continue to rise. Checks at Moose Range Meadows Subdivision, Soldotna Creek Park, Poacher's Cove, and Riverbend show a rise of about 6 inches between 10 PM Friday night and 5 AM Saturday morning.

September 23 14:25 Valdez

Some flooding reported in the Alpine Woods subdivision (mile 10 Richardson Highway), which is mostly mobile homes. They are experiencing 18 to 24 inches of water from the Lowe River.

September 23 15:34 Kenai EOC

PRESS RELEASE--#9

The Kenai River is expected to crest today. The river has crested at Cooper Landing at 16.08 feet. The river crested at noon in Kenai Keys at 15,3 feet. The river is expected to crest in the Soldotna area at 2 PM at 14.3 feet.

September 23 15:42 Kenai EOC

News Release
The Kenai Peninsula Borough Emergency Management Office has issued evacuation for the following areas: Kenai Keys, Poacher's Cove, Riverside Campground, Big Edd Road area, west of Salmon Run drive, Birch Circle, Salmon Run Drive, and Aurora Court.

September 23 19:28 Skwentna and Yetna Rivers

A private pilot called in with a report of the Skwenta and Yetna River area as of 1500. He reports the Skwenta airport is open to light aircraft, but the lights are out and the non-directional beacon is out. The Yetna River is over the banks and the Skwenta River is over the banks at about 20 miles west of Skwentna. The rest of the river appeared extremely high.

September 24 08:22 Anchorage EOC

Situation Update
The river levels at Cooper Landing have drooped 3 to 4 inches as of 4 AM this morning. Kenai Keys level rose from 15.37 at 1 AM to 15.44 at 7 AM. Overflights of Skwentna to upper Yetna shows water level dropping slowly.

September 24 08:35 Kenai River

Kenai river levels at Cooper Landing have dropped from 3 to 4 inches from midnight to 0400 this morning. In the Kenai Keys area the water level rose from 15.37 at 1 am to 15.44 at 7 am.

September 24 09:52 Windsong Subdivision

Area inspected, found no immediate health hazard. Some yards have suffered sewage holding tank overflow, which can be treated by spreading lime.

September 24 12:42 Eagle River and Raven Creek

Damage to trail system and day use cabins estimated at $2 M.

September 25 11:26 Eagle River (south fork)

Bridge collapsed. (Washed out a couple of minutes later.) (It was later determined that this bridge located on a private road and was privately owned.)

September 25 15:15 Seward

They have lost 200' of embankment protecting the north side of the runway. They have no rip-rap and are tearing up sidewalks to re-establish the embankment.

September 25 16:20 Kenai River

Kenai River level dropping in Kenai Keys area.

September 26 07:22 Anchorage

Plans for Lt. Governor to visit damage site in Kenai, Soldotna, and Seward.

September 26 09:12 Kenai Pen Borough

PRESS RELEASE--#13

Alaska Governor Tony Knowles in Washington D.C. is scheduled to meet later this week with Senator Ted Stevens regarding a possible federal disaster declaration for flood damaged communities. Lt. Governor Fran Ulmer will be traveling to the Kenai Peninsula to inspect flood damage on Tuesday, September 26, 1995.

September 26 10:41 Anchorage

Two helicopters departed (one for press and one for Lt. Governor)

September 26 13:21 Kenai

Lt. Governor departed Soldotna en route to Seward aboard Black Hawk helicopters.

September 26 14:34 Benard Creek

(78.5 Richardson Highway) Damage 1A

September 26 14:39 Seward

Lt. Governor landed

September 26 15:23 Benard Creek and the Tosina River

The locals made a dike to protect their homes. Approximately 6 homes damaged in the area.

September 26 15:41 Benard Creek

Martin Mirical reports they hauled 100 yards of material to dike the creek. The water is going down.

September 26 15:53 Seward

The first aircraft with the press is departing Seward at 1600 hours. The second aircraft with the Lt. Gov. Will

depart approximately 20 minutes later.

September 26 15:55 Washington D.C.

Senator Stevens expresses concern for Kenai Flooding in Senate statement.

September 26 16:04 Seward

Both aircraft are en route to Anchorage.

September 26 18:19 Girdwood

Coliform bacteria is spreading in Class A public wells.

September 26 21:15 Homer

3.5 earthquake, no damage reported.

September 27 07:39 Girdwood

Downed power poles and transformer problems.

September 27 08:23 Skwentna

Downed power poles and transformer problems.

September 27 09:16 Girdwood

Creek threatening airport.

September 27 20:24 EOC

Damage reports: Diamond Willow sub division one house off foundation, Cooper Landing three houses and one business with minor damage, and Poachers Cove 21 houses and 8 businesses with minor damages, one house and four businesses with major damage.

September 27 20:55 EOC

Reports from Girdwood, Moose Pass, and Seward have very little observable 1A damage, but extensive PA damage. Knik team did not find extensive 1A damage, however there was extensive minor damage to homes , businesses, and rentals in Skwentna.

September 28 11:11 Kenai-Soldotna

Soldotna EOC issues Flood Status Report.

September 28 11:44 Cordova

City of Cordova issues a "Declaration of Emergency".

September 28 18:07 Moose Pass

Alaska Pioneer Museum at Mile 30 (right on highway) has flooded, washed out footing of foundation in back of building.

September 29 11:50 Matanuska-Susitna Borough

Issued an "Amended Disaster Declaration".

September 29 12:32 Mat-Su

Temporary bridge opened up at Hunter Creek. Contracted out a replacement bridge, which will be done in 3 to 4 weeks.

September 29 13:18 Juneau

Statement by Alaska State Legislature.

September 29 16:35 Kenai Pen. Bour.

"Declaration of Local Disaster Emergency"

September 29 17:56 Juneau

"Amendment to Declaration of Disaster Emergency"

September 30 15:07 EOC

Damage report: several areas.

October 04 13:08 EOC

Incident Status Summary.

October 18 11:10 RFC

Statement by Jerry Nibler: Skilak Glacier dammed lake had released about 25% of its releasable contents.