UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 25 1980

Docket No. 50-344

FACILITY: Trojan Nuclear Plant

LICENSEE: Portland General Electric Company (PGE)

SUBJECT: SUMMARY OF SITE VISIT AND MEETING WITH PGE ON JUNE 17 AND 18, 1980 TO OBSERVE AND DISCUSS THE EFFECT OF VOLCANIC ACTIVITY AT MOUNT ST. HELENS ON THE TROJAN NUCLEAR PLANT

On June 17 and 18, 1980, the NRC staff met with representatives of PGE and visited the Trojan site and environs for an assessment of the effect of the recent volcanic activity at Mount St. Helens on the Trojan Nuclear Plant. A member of the ACRS was present on June 18. Those participating are listed in Enclosure 1. Highlights of the site visit and meeting are summarized below, and in Enclosure 2 (W. Bivins, Hydrology) and Enclosure 3 (H. LeFevre, Geology).

The site visit included a helicopter tour of the Trojan site, and three nearby rivers which originate near Mount St. Helens (Toutle, Kalama, Lewis) and Mount St. Helens. Photographs were taken.

The impacts of the volcanic activity at Trojan can be divided into two broad areas: ashfall in the vicinity of the site and silting/shoaling of the Columbia River.

1. Ashfall

To date, ash has fallen at the Trojan site on two occasions: April 29 and May 25, 1980. The amount which fell on April 29 was described as a light "dusting". The May 25 ashfall was about 1/8 inch, and, since it was raining at the time, was described as 1/8 inch of "mud". Neither event had any measurable impact on the plant.

Ashfall has a potential impact on ventilation systems for any building or equipment which "breathes" air, and could effect outside electrical insulators.

a. Ventilation All building ventilation systems were examined. PGE had installed temporary prefilters* in most ventilation intakes, which have proved to be effective. Since these filters are temporarily only taped in place, PGE has requested Bechtel to study a more permanent arrangement since the volcanic activity could go on for years.

* FARR 30/30 (disposable)

Efficiencies:	98%	5 micron
	95%	4 micron
	90%	3 micron
	80%	2 micron

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POOR QUALITY PAGES

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PGE has conducted a survey and evaluation to see in which spaces and/or buildings ventilation can be stopped during severe ashfall conditions to eliminate ash ingress.

Summary:

- Auxiliary Feed Pump Room Air can be drawn thru door in turbine building instead of from outside, altho temporary prefilters were fitted on the outside air intake.

- Control Building (including Control Room). The control room ventilation system can be put on recirculation (accident mode) and thereby greatly reduce the flowrate of outside makeup air. By operating dampers, outside air makeup can be eliminated. PGE stated that the control room could operate for 100 hours (4 days) with no outside air.

  Other spaces in the control building (cable spreading room, electrical auxiliaries room) have room coolers and therefore no need for outside air for extended periods of time.

- Auxiliary and Fuel Buildings All safety-related equipment have room coolers and therefore no need for outside air.

- West Safeguards Room Has room coolers. No outside air is supplied to this space.

- Service Water Intake Structure This structure has no room coolers, but outside air could be shut down or reduced for awhile depending on ambient temperature and heat load.

PGE has also installed prefilters at the entrance to the diesel generator ventilation/combustion air intake. These filters are well protected from ash since they are located in a long sheltered railroad bay. PGE will leave these filters in place indefinitely since they are more difficult to install quickly. Differential pressure instruments have been installed. All emergency diesels have combustion air filters (as part of the original design) with pressure drop taps.

PGE ran a diesel generator during the May 25 ashfall for several hours. Although the diesel was shut down before the test was finished (since there was no need to run it), the temporary prefilters were visually clean. No change in filter diff. pressure occurred.

The combustion air (engine) filters cannot be changed with the engine running. The new prefilters, however, can be changed under these conditions.

Burlington Northern railroad's operating experience with their locomotive diesel engines under ashfall (as of May 23) has been acceptable. Filters to compressors are changed about every 7 hours, as opposed to a much longer interval under normal conditions. Most of their problems have been "people problems", not problems with machinery.

b. Electrical Insulators Ashfall can affect electrical distribution/transmission reliability by causing flashovers on electrical insulators.

After the large May 18 eruption, there were general area problems with 15 KV distribution lines-ash causing pole fires and flashovers. BPA had two trip-outs on their 500 KV transmission system-perhaps due to ashfall. The 500 KV transmission system uses "V" string-type insulators which may be more vulnerable to ash since they are not vertical.

There have been no reported outages on 230 KV transmission lines in the area (230 KV lines feed the Trojan site and switchyard). These insulators are vertical (standard suspension insulators).

Outages have occurred in the distribution system-60 KV and below. Areas of Longview, Washington were without power for several hours (5 miles from Trojan). Most problems have been in substations with horizontal insulators. Experience downwind of the May 18 eruption has been generally excellent, however.

PGE has equipment for washing insulators while deenergized, ("cold") and is developing (by about mid-July) equipment for doing this while energized ("hot")-both switchyards and transmission lines. The Trojan switchyard has been cold-washed successfully.

Corrective action for insulators with ash consists of: 1. Blowing it off with compressed air before it gets wet, or 2. Water washing-"cold" or "hot".

PGE and BPA have engaged in an ash test program for insulators in a test lab. While dry, the ash is electrically inert. When wet, it is highly conductive due to sulfates, chlorides, etc. Insulators have been tested up to 500 KV.

At this point, results seem to indicate that the insulator will function normally provided 1/3 of the insulator remains either clear of ash or dry. With 1/16" inch of ash, no failures occurred. With 1/4-1/2" distributed in a "snow" fashion, insulating ability was normal when dry, and when wet as well, provided the 1/3 rule above was maintained.

2. Silting/Shoaling of Columbia River

Following the May 18 eruption, a massive mudslide occurred on the Toutle River and thence to the Cowlitz River. The mouth of the Cowlitz River is at Longview, WA about 5 miles downstream from Trojan.

The silting which resulted caused large ocean-going ships to be immobilized due to shallow water. Over a relatively short period of time, the depth of the Columbia shoaled significantly over a seven mile stretch. For example, the depth of the water in the vicinity of the Trojan intake structure changed from about 75' to 48' (mid-channel) and about 48' to 30' (intake structure) over a period of about 24 hours.

In the event of severe shoaling at the intake structure (leading to its inability to function), Trojan is designed to be able to use the cooling tower as a heat sink. The cooling tower basin normally contains 5 million gallons of water which is sufficient for seven days. In addition, makeup can be provided by the fire pumps (if available) or via siamese hose fittings by a local fire station pumper truck.

Portland General Electric Company

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In the unlikely event of silting leading to a loss of the intake structure in coincidence with severe ashfall leading to a loss of offsite power, the cooling tower basin can still be used as a heat sink.

PGE stated that dredging equipment, which is normally in service on the Columbia, could be obtained in a 24-36 hour time frame. In addition, a crane with clamshell bucket could be obtained in a shorter period.

PGE's environmental services group has the capability of conducting river profiles with sounding equipment.

PGE is designing an improved filter system for the service water pump packing glands and bearing cooling in an effort to improve the service life of the pumps. To date, pump life has been shorter than desirable due to normal silt levels in the river.

3. Other

PGE has established a firm contact with the U. S. Forest Service in Vancouver, WA to receive notice of volcanic activity. The shift supervisor receives these advisories directly. A plant Administrative Order (AO-T-20) has been written to provide guidance under these conditions.

CM Trammell

C. M. Trammell, Project Manager
Operating Reactors Branch #3
Division of Licensing

Enclosures:
1. Attendance List
2. Meeting Summary-W. Bivins, Hydrology
3. Meeting Summary-H. LeFevre, Geology

cc w/enclosures:
See next page

TROJAN SITE VISIT AND MEETING-JUNE 17 & 18, 1980

NRC Staff

C. Trammell

J. Donohew

H. LeFevre

W. Bivins

R. A. Clark

M. Malmros

W. Mathis-ACRS

BECHTEL POWER CORPORATION

K. Jindal

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P. Yundt

J. Belden

S. Hoag

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A. Olmstead

D. Miller

W. Lindblad

R. Halicki

Enclosure (2)

Trojan Nuclear Plant
Portland General Electric Company
Docket No. 50-344

Trip Report of William S. Bivins
for June 18-19, 1980

Purpose

On June 18-19, 1980, I participated in conferences and familiarization tours directed towards assessing the impacts of the Mt. St. Helen's eruption on the Trojan Nuclear Plant. Concerns, dealing with hydrologic engineering issues included:

- Actual aggradation of the Columbia River in the vicinity of the Trojan intake due to mud flows from Mount Saint Helens.
- Potential future aggradation of the Columbia River in the vicinity of Trojan.
- Potential adverse impacts of the agradation on the ability of the plant operators to obtain an uninterrupted supply of cooling water to shut the plant down and maintain it in a safe shut down condition.
- Preparations, if any, by the licensee for the removal of any adverse deposition.

These concerns were discussed with the licensee, consultants to the licensee, the USGS, and the Corps of Engineers. The following paragraphs describe the various conferences and tours, and document the information relative to Hydrologic Engineering, which I obtained.

Meeting with the Trojan Licensee - Portland, Oregon

On June 18, 1980, meetings were held with Portland General Electric (licensee), the licensee's consultants, and NRC representatives. The morning meeting was held in the licensee's Portland office. A list of attendees is appended to a trip report by H. Lefevre and Philip Justus dated July 14, 1980 (enclosure 3). H. Lefevre and W. Bivins represented NRC during this meeting. I deem the following information of interest in considering the Hydrologic Engineering issues.

1. The ash fall in the vicinity of the plant was less than 1/8 inch.
2. The accumulation of mud in the Columbia River offshore from Trojan is associated with the mud flow from the Cowlitz River. The confluence of the Cowlitz and Columbia Rivers is about 6 miles downstream of Trojan. (See also the Corps of Engineers Meeting Summary.)
3. No significant mud flow from the Columbia upstream of the plant was noted.
4. No significant mud was evident from the Kalama River which enters the Columbia River from the east, opposite Trojan (about 2500 feet upstream). (See also the Overflight Summary.)
5. The Lewis River produced no mud. About 15,000 acre feet of mud did flow into Swift Reservoir, the uppermost of three reservoirs on the Lewis River. The Swift Reservoir is drawn down to the top of spillway and no water was currently being released. Two reservoirs downstream, Yale and Merwin (in downstream order) should serve as further "sediment basins" and remove most of the mud from the Lewis River discharge.
6. Dr. A. McBirney, licensee consultant, in assessing my questions about potential future eruptions provided the following:
   a. previous eruptions have occured on the north slope (see as evidence the creation of Spirit Lake in about 1500 A.D. when volcanic mudflows dammed the lake outlet),

b. the current eruption was signaled by frequent seismic activity beneath the north slope,

c. no such seismic activity was noted previously beneath other quadrants of the mountain and no activity is now observed beneath other quadrants,

d. the mountain has expelled several thousand feet of overburden from the north slope and structurally weakened basement formation in that vicinity, and

e. for an eruption to occur in other quadrants (e.g., west towards Trojan) energy would have to seek the path of greatest resistance, ignoring an existing path of least resistance; a phenomena not recognized in nature.

Summary of Overflight

Following the morning meeting held in Portland, Oregon, Messers. W. Bivins, H. Lefevre, P. Justus (all of NRC), and R. Morris (USGS), made an aerial reconnaissance of Mount St. Helens area. The overflight generally took a counter-clockwise path flying up the Lewis River around and east of Mount Saint Helens, down the Toutle River across to the Kalama River, and then to the Trojan Nuclear Plant. Following observations are related to Hydrologic Engineering issues or are included for the potential value to other reviewers.

1. The color of Merwin Reservoir was a translucent green showing no evidence of mud or of significant ash fall.

2. The Yale Reservoir was an opaque green showing some impact of ash fall but of no significant mud inflow.

3. The upper reservoir, the Swift Reservoir, has a dark brown coffee color showing the evidence of significant inflow of mud. The upper end of the reservoir is completely filled with mud and trees. Approximately 15,000 acre feet of mud have entered the reservoir Mud banks are evidence of the drawdown of the reservoir to the tops of the spillway.
4. Early maps of the area suggested that the mud flow eminated only from Pine Creek. This is incorrect and based on my observations the inflow to Swift Reservoir came from (appropriately) Muddy River and Pine Creek.
5. As we approached the top of the mountain ridges we entered the area of major blast damage. This was an area of total and complete destruction and desolation. There was no evidence of any living thing either animal or vegetable.
6. We flew into the upper reaches of the Toutle River, which is now nonexistent. Debris from the eruption has completely filled the flood plains of the upper reaches of the Toutle; large sediment loads can be anticipated in the future, as well as debris consisting mostly of logs. Hydrologic assessment of flooding potential from the Toutle River is a new ball game. An entirely new Hydrologic regime now exists. The channel is essentially totally choked with logs as are most reaches of the flood plain. The river will produce significant amounts of sediment in the future. The logs, if they remain in the channel, may compound, or mitigate, the flooding potential.
7. We overflew the lower reaches of the Kalama River. There was no evidence of mud flow indicated either by color of water or of sediment load at the mouth. The Kalama River discharges at a point about 2500 feet upstream of the Trojan Nuclear Power Plant, but on the opposite side of the river.

8. Completing the overflight we crossed the Columbia River on our way to the Trojan Power Plant. There was only moderate discoloration and no surface evidence of any sediment problems in the area. However, working dredges in the area were apparent.

Meeting with Trojan Licensee - Trojan Nuclear Plant

W. Bivins deplaned at the plant joining a meeting in progress. (Previous sessions of this meeting had delt more intensively with equipment problems including those of filtration of incoming air supplies.) Later portions of the meeting were devoted to identifying the effects of mud flow and future sediments on the safety related cooling supply of Trojan Nuclear Plant. Following information was provided by representatives of PG&E, either from headquarters in Portland or from plant personnel.

1. At present there is no blockage of the intake structure and no significant buildup therein, as determined by divers who were sent down to check on conditions.
2. Equipment (described as a clam shell) is expected on the site in the near future. Purpose of the importation of the equipment is actually to remove construction debris from the vicinity of the intake structure. However, it will be on site to help remove any silt accumulation if that should occur.
3. There are fittings, "a Christmas Tree", at the intake structure which would allow the connection of fire hoses into the plant water system to withdraw water from the river regardless of depth.

4. The licensee has experienced previous problems with sediment damage to pumps. Two actions have or will be taken: the shaft surfaces which were previously chrome plated have been replaced with ceramics; a centrifical separator is being installed in the bearing cooling water line.

Meeting with the U.S. Army Corps of Engineers - Portland, Oregon

On June 19, 1980, W. Bivins met with representatives of the Corps of Engineers to discuss potential effects of siltation on Trojan. Messers. Jack Bechly and Patrick Keough provided the following information about the Corps of Engineers activities and resources available in the area.

1. It is anticipated the 55 million acre feet of silt entered the Columbia River of which 22 million will have to be removed from the navigation channel in the vicinity of and downstream of Trojan Nuclear Plant. This removal is necessary to maintain the navigation channel which has a project depth of 40 feet.
2. Mud flow from the Cowlitz River formed a wedge extending upstream from the confluence of the Cowlitz River and the Columbia. The upper boundary of the wedge is in the vicinity of the Trojan Nuclear Plant. Some degradation is occuring but this removal is not significant.
3. The Corps of Engineers has five dredges in the area, two more are expected in the near future. These dredges will be working in both the Columbia and in the Cowlitz Rivers. There is about 30 million acre feet of mud in the Cowlitz River downstream of the Toutle River confluence.
4. If needed the Corps of Engineers could move into the Trojan area to maintain a waterway to the intake structure. It is anticipated that contact with the Corps of Engineers directly or through FEMA would be sufficient to mobilize the Corps of Engineers dredges for such an activity.

Ground Reconnaissance on June 19, 1980

An automobile tour by W. Bivins, H. Lefevre, P. Justus and R. Morris was undertaken originating in Vancouver, Washington. We traveled northward on the east side of the Columbia River to Kelso, which is at the confluence of the Cowlitz and Columbia Rivers. Walking tours of the flood plain in the area of Kelso indicated a buildup of from 3-4 feet of very compact mud which originated from the Toutle River basin. The tour continued to the confluence of the Cowlitz and Toutle Rivers. This is in the vicinity of Castlerock. We traveled route 504 to two bridge locations along the Toutle River. We observed widespread, but lighter than expected, volcanic ash deposits. Mud flows along the valley of the Cowlitz and Toutle Rivers are extreme; the suspended sediment contents of the Cowlitz and Toutle are remarkably high. The Toutle River is the highest of the two. Numerous bridges have been destroyed in the watershed but of particular interest is the deposition of sediments along the flood plains of the rivers. It can be anticipated that this mud will be remobilized during extensive run-off periods.

Summary

It appears that the actual aggregation of the Columbia River, due to mud flows from Mount Saint Helens, is extensive but poses no particular threat to the Trojan intake. Potential future aggregation of the Columbia River in the vicinity of Trojan might be expected to be low since the reservoirs on the Lewis will act as effective sediment traps. It would appear that the plant licensee, being forwarned by previous problems with sediments, is taking necessary action to protect the plant equipment from the abrasive nature of this sediment. Finally, the licensee will have onsite for a temporary period equipment which would serve to remove any sediment deposition in the immediate vicinity of the intake structure if that is necessary. However, it would appear that the long term effects of buildup will be small, none the less the plant licensee has the ability to obtain water from the Columbia River with equipment at hand.

Enclosure (3)

GEOSCIENCES BRANCH TRIP REPORT OF JUNE 17-19, 1980

TROJAN NUCLEAR PLANT
PORTLAND GENERAL ELECTRIC CO.
DOCKET NO. 50-344

Purpose of Meetings and Field Trip

The Trojan Nuclear Plant area has been subjected to volcanism and related phenomena (seismicity and flooding) since reactivation of Mount St. Helens on March 20, 1980. In order to assess the effect of these recent events on the Trojan plant and to gain some insight into the potential extent of future volcanic activity, discussions were held with the representatives of several organizations including the Trojan licensee on June 17 and 18 and with the U. S. Geological Survey, the Federal Emergency Management Agency (FEMA), the U. S. Forest Service, and the State of Washington (Department of Emergency Services) on June 19. A field trip of the Mount St. Helens area was made by air on June 18 and by auto on June 19 in order to observe the impact of the recent volcanic-related phenomena on the Trojan plant and adjacent area.

Meetings with Trojan Licensee

On June 17 and 18, meetings were held at Portland General Electric Company's (PGE) Portland office with the Licensee, PGE's geologic and volcanic consultants, and NRC representatives attending. A list of those present at these meetings is appended. H. Lefevre and W. Bivins represented the NRC. Discussion items included:

1. PGE's volcanic hazards appraisal notification procedures including interaction between PGE's consultants (Foundation Services, Incorporated) and the U. S. Geological Survey.

2. Volcanic ash sampling program and ash analysis
3. Volcanic ash distribution and isopach maps.
4. Effect of the May 18, May 25 and June 12 volcanic-associated events on the Trojan plant vicinity including ash fall, seismicity, flooding, and channel-filling of the Toutle, Cowlitz and Columbia Rivers.
5. Comparability of the Pine Creek-Muddy River mudflows volume to mudflow volume estimate provided in U. S. Geological Survey Bulletin 1383-C.

Following the meeting of June 18, P. Justus (NRC) and R. Morris (USGS) joined H. Lefevre and W. Bivins and made an aerial reconnaissance of the Mount St. Helens area, including the vicinity of the Trojan plant. We gained, through direct observation, valuable information regarding the impact of volcano-related phenomena on engineered structures located at considerable distances from the volcanic source. Other than minor ashfall (fractions of an inch) only Columbia River channel filling resulting from the May 18 eruption has affected the area in the vicinity of the Trojan plant. According to W. Bivins, NRC Hydrologist, this channel filling would have had no impact on the Trojan facility, had it been operating.

Meetings with the U. S. Geological Survey

On June 19, 1980, a meeting was held at the Vancouver, Washington field offices of the U. S. Geological Survey-first with Dr. Donal R. Mullineaux and later with Dr. Pete Rowley. Drs. Mullineaux and Rowley constitute a portion of the USGS contingency of geologists and geophysicists (approximately 40) monitoring the present activity, evaluating the accumulating data, and mapping the effects of the post May 18 volcanic events. P. Justus and H. Lefevre of NRC and R. Morris of the USGS (Reston, VA) participated both at the meetings/discussions with the USGS, FEMA, and other State and Federal agencies and the auto reconnaissanc of the Columbia, Cowlitz and Toutle River areas. Dr. Mullineaux is responsible for the volcanic hazards evaluation aspects at Mount St. Helens while Pete Rowley serves as the USGS spokesman through the coordinated FEMA efforts to the news media, governmental agencies and other interested parties regarding (1) ever-changing status both of Mount St. Helens activity and (2) the geologic and seismologic investigations at the volcano. The most relevant information gathered from Don Mullineaux and Pete Rowley as it relates to our continuing assessment of the Trojan Nuclear Plant includes the following:

1. May 18, 1980 Event- The May 18, 1980 north slope event consisted of a massive avalanche, followed by an unusually-large horizontal (lateral) blast and debris flow-pyroclastic flow. Volume estimates of the event are unconfirmed, but range up to 0.6 cubic mile of debris.
2. Instability of North Slope - As evidenced by numerous domes and plugs the northern half of the volcano, during the geologic past, has been less stable than the southern half.
3. Instrumentation - Geodimeters, tilt meters, and seismometers are installed throughout the Mount St. Helens area and are continuously monitored for changes in reference markers which may be indicators of the changing behavior of the volcano.
4. Mudflows-Pyroclastic Flow Volume - Based upon an assessment of past events (pyroclatic flow of 2,500 to 3,000 years ago) the largest single mudflow that might be expected to enter Swift Reservoir (located on the Lewis River south of the volcano) would be approximately 100,000 acre feet (USGS Bulletin 1383 C, 1978, p. C15). The May 18, 1980 eruption resulted in a mudflow extending down the valleys of Pine Creek and Muddy River on the east and southeast flanks of the volcano and converging at the Lewis River depositing from 11,000 to 15,000 acre-feet of debris into the upper portion of Swift Reservoir. This inflow resulted in a 6 in. rise in the

reservoir level which had been lowered sufficiently to accommodate mudflows well in excess of the volume (100,000 acre feet) suggested in the 1978 USGS bulletin. Don Mullineaux suggests that the previous mudflow estimate of 100,000 acre feet still appears reasonable, however, a larger volume may result from an event (massive avalanche-lateral blast-debris and pyroclastic flow) similar to the event that occurred on May 18. Volume estimates cannot be anticipated for such an event but would be developed on a case-by-case basis.

Discussions with FEMA, U. S. Forest Service, and the State of Washington

Brief discussions were held with representatives of FEMA (Richard Buck), U. S. Forest Service (Paul Rea and B. Johnson) and the State of Washington, Dept. of Emergency Services (James Thomas) in order to familiarize ourselves with the interaction of these and other agencies in the timely dissemination (through FEMA) of vital information (including geologic and seismological) to the public. The FEMA representative stated that mechanics for coordinating the Federal effort operated smoothly and the cooperation extended by the various Federal, State, and Local governmental agencies was commendable. We were particularly impressed with the rapid, accurate method of accumulation and distribution of geologic-seismologic-volcanologic information to the media through daily press conferences, telephone communication and the continual issuance of printed information through multi-discipline bulletins. H. Lefevre (at the meeting of June 18, 1980) was impressed by the continuing communication between the Trojan licensee's volcano-hazards consultants (Foundation Sciences, Incorporated), the U. S. Geological Survey, and Pacific Power and Light Company (operators of the hydro-generating facilities on the Lewis River). This cooperation resulted in the alerting of the Trojan licensee prior to the June 12, 1980 eruption which deposited ash at Portland and other areas to the south and southeast of the volcano. There was no ash fall at the Trojan plant as a result of this eruption.

Ground Reconnaissance of June 19, 1980

By auto, P. Justus, H. Lefevre, W. Bivins and R. Morris traveled from Vancouver, Washington northward on the east side of the Columbia River, to Kelso at the confluence of the Cowlitz and Columbia Rivers, then to Castle Rock where the Cowlitz and Toutle Rivers merge. From Castle Rock we traveled northeastward on Route 504 to two bridge locations along the Toutle River. We observed (1) the widespread, but thin and erratic volcanic ash deposits, (2) mud flows along the valleys of the Cowlitz and Toutle Rivers, (3) flood high-water (mud) marks around homes and at the Castle Rock fairgrounds, (4) bridges partially destroyed by flood waters and (5) log jams and debris. Of particular interest was the observation that the volcanic ash was negligible to absent along Interstate 5 at the Kalama-Columbia River juncture-directly east of the Trojan Nuclear Plant.

Summary

It appears that all that can be done is being done, geologically, by the Trojan licensee, Portland General Electric Company (PGE), in acquiring, receiving, assembling, correlating, and utilizing data and information relative to those volcanic-related hazards that may impact the Trojan Nuclear Plant some 33 miles southwest of Mount St. Helens. Portland General Electric Company, through its consultants- Foundation Sciences, Inc., Drs. Howard Coombs and A. R. McBirney and others, in conjunction with the vast data gathering and interpretative organization assembled under FEMA (including the U. S. Geological Survey, the Corps of Engineers, and the U. S. Forest Service) at the Federal Coordinating office at Vancouver, Washington-is kept well informed of the status of the Mount St. Helens activity. PGE is constantly appraised of ash emissions, the direction of high altitude winds, and the magnitude of seismic events. In addition, PGE is conducting field and laboratory geologic studies as well as a long-term ash sampling and analysis program. At the present time we consider the geologic and seismologic monitoring of Mount St. Helens, principally through the USGS and the University of Washington, to be completely satisfactory, providing the Trojan licensee, through its consultants, the best possible timely information relative to the status of Mount St. Helens, its potential for future eruptions and consequent possibility for impact on the Trojan Nuclear Plant. Additionally, the volcanic-related phenomena to date (including floods, ashfall, seismicity and river channel filling) have had no impact on the operation of the Trojan Nuclear Plant.

Mount St. Helens is located within the Gifford Pinchot National Forest which is administered by the U. S. Forest Service. In this role, the Forest Service has the primary responsibility for controlling emergencies occurring within the confines of its forests. Since widespread emergencies such as floods and fires frequently occur within their lands the Forest Service (unlike many other Federal agencies) is apparently well-suited for handling an event such as the Mount St. Helens eruption.

Attachment A

TROJAN NUCLEAR POWER PLANT
PORTLAND GENERAL ELECTRIC CO.
DOCKET NO. 50-344

MEETINGS AND FIELD TRIPS OF JUNE 17-19, 1980

List of Attendees

	June 17	June 18	June 19
NRC			
W. Bivins	-	X[1,2]	X[3]
P. Justus	-	X[2]	X[3]
H. Lefevre	X[1]	X[1,2]	X[3]
State of OR			
D. Hull	-	X	-
USGS			
R. Morris	-	X[2]	X[3]
PGE			
S. Christensen	X	X	-
R. Halicki	X	X	-
J. Lentsch	X	X	-
K. Murakami	-	X	-
G. Zimmerman	X	-	-
PGE Consultants			
H. Coombs	X	X	-
R. Kienle	X	X	-
A. McBirney	X	X	-

[3] Meeting w/USGS and others at Vancouver, WA & Auto Trip

[2] Mount St. Helens Overflight

[1] Meeting with PGE and consultants

FEDERAL COORDINATING OFFICE

federal emergency management agency

MOUNT ST. HELENS TECHNICAL INFORMATION NETWORK

Thursday, May 29,1980

BULLETIN #4 -"Current Volcanic Hazards at Mount St.Helens,Washington"

The following description of the continuing and potential hazards associated with the eruption of Mt.St.Helens was prepared by Dwight R. Crandell, of the U.S.Geological Survey.

The text accompanying the map describes five types of hazards - ashfall, mudflow, pyroclastic flow, lateral blast and lava.

ASHFALL HAZARD

The volcano began erupting ash in large quantity early 5/25 after only minor activity since 5/19. Thus, Mt. St. Helens is still in an explosive eruptive phase and we should expect similar eruptions in the future. Eventually we expect either a coarser grained pumice and ash to be erupted or the magma to form a dome within the present crater. The formation of a dome in the crater also could be accompanied by the eruption of ash, but probably on a smaller scale than the eruptions of 5/18 and 5/25. At present (5/25) we don't know whether this change will take days or weeks.

In the event of a maximum expectable pumice-ash eruption, we anticipate that the distance-thickness relations would be as shown on the volcanic-hazards map. These amounts could fall in any direction from the volcano, but are more likely to fall

- MORE -

in southeasterly-easterly-northeasterly directions than to the opposite points of the compass. The actual ash-fallout sector will be determined by directions and strengths of winds at altitudes reached by the ash column at the time of the eruption.

MUD FLOW HAZARD

The debris flow that now forms the floor of the Upper North Toutle Valley appears to be stable, in the opinion of soil-mechanics experts who have examined it. The possibility of piping, or of sudden liquefaction during a strong earthquake appears to be negligible in view of the slope of the deposit and its poorly sorted texture. Mudflows may occur as streams cut down through the debris-flow deposit, but these probably will be of small volume in the immediate future, and will not reach the heights or distances of the 5/18 - 5/19 mudflows. The principal danger zone of such mudflows will be in the North Toutle River Valley.

Mudflows can also be caused by pyroclastic flows which occur during heavy rainfall, or which move down snow-covered flanks of the volcano. Mudflows caused in this way could occur in any valley which heads at the volcano, but are most likely in the North and South Toutle, Pine Creek and Muddy River Valleys because these valleys are the most probable routes of pyroclastic flows.

Mudflow hazard zones are not shown in the portions of valleys within the pyroclastic-flow hazard zones, but mudflow-hazard zones should be regarded as extending up to the flanks of the volcano.

In the longer term, increased discharge into Spirit Lake by streams in its drainage basin could occur during periods of very heavy precipitation and/or rapid snow melt. It is possible that water would enter the lake faster than seepage through the debris flow could carry it away. In this situation, it is possible that the lake would rise to the top of the valley fill west of the lake and spill over. If this occurred, mudflows could form in the North Toutle Valley, but it is not possible now to predict their size.

PYROCLASTIC-FLOW HAZARD

Pyroclastic flows can be formed during the eruption of pumice and ash or during the eruption of a dome. The largest and longest pyroclastic flows could be expected during the eruption of coarse pumice, and would occur at the same time that a large eruption column was rising above the volcano. The maximum probable extent of pyroclastic flows is shown on the hazards map. Pyroclastic flows of this kind are most probable in the North and South Toutle Valleys and in the Muddy-Pine Creek Valleys because of the present configuration of the crater rim. They are less likely, although possible, in areas southwest and south of the volcano.

Pyroclastic flows probably would also occur during the eruption of a dome. These could be formed as the steep and unstable flanks of the dome crumble and avalanche, or are disrupted by earthquakes and volcanic explosions. Pyroclastic flows of this type probably will not extend more than 10 miles from the dome in the North Toutle Valley, and would not occur in the other valleys because of the present shape of the crater rim.

LATERAL BLAST HAZARD

The present situation at the volcano suggests that another lateral blast of the force of the blast on 5/18 is not likely. It is possible, however, that the eruption of a dome within the crater would be accompanied by lateral blasts which could carry rock debris outward at very high velocity. The present shape of the crater suggests that lateral blasts from a growing dome would initially be directed northward. Blasts in other directions would be deflected upward by the crater walls. If a dome grew to a height above the crater rim, lateral blasts could also affect the west, south or east sides of the volcano.

The wedge-shaped blast-hazard zone extending northward from the crater is based on the low rim of the crater in that direction, and on the distance to which rock debris was transported by a lateral blast at Sugar Bowl Dome about 1,200 years ago. This distance was about 6 miles; a safety factor of 100 percent was added, so the limit of the zone all around the volcano is shown at a distance of 12 miles.

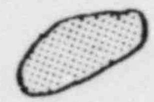
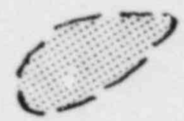
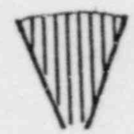
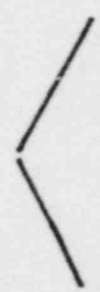
It is possible that magma could move into the volcano at some point east, south or west of the existing crater. This probably could be detected by surveying those flanks of the volcano, and perhaps also by visual observation, as was the case of the north flank bulge of 3/27-5/18. Surveying has been resumed. No such bulge or other sign of instability on the other flanks of the volcano has been detected.

LAVA-FLOW HAZARD

Explosive eruptions of dacite, like those of 5/18 and 5/25, typically are not accompanied by lava flows. If molten rock is erupted, it probably will be relatively viscous, and will tend to pile up around the vent and form a dome rather than a lava flow.

The past history of the volcano suggests that as this eruption progresses, the magma being erupted may be more fluid, and may form lava flows, but these are not anticipated in the next few weeks or months.

H A Z A R D   M A P

PYROCLASTIC FLOWS	 High Risk  Moderate Risk
MUDFLOWS AND FLOODS	
LATERAL BLAST	
Sector toward which winds blow most frequently	

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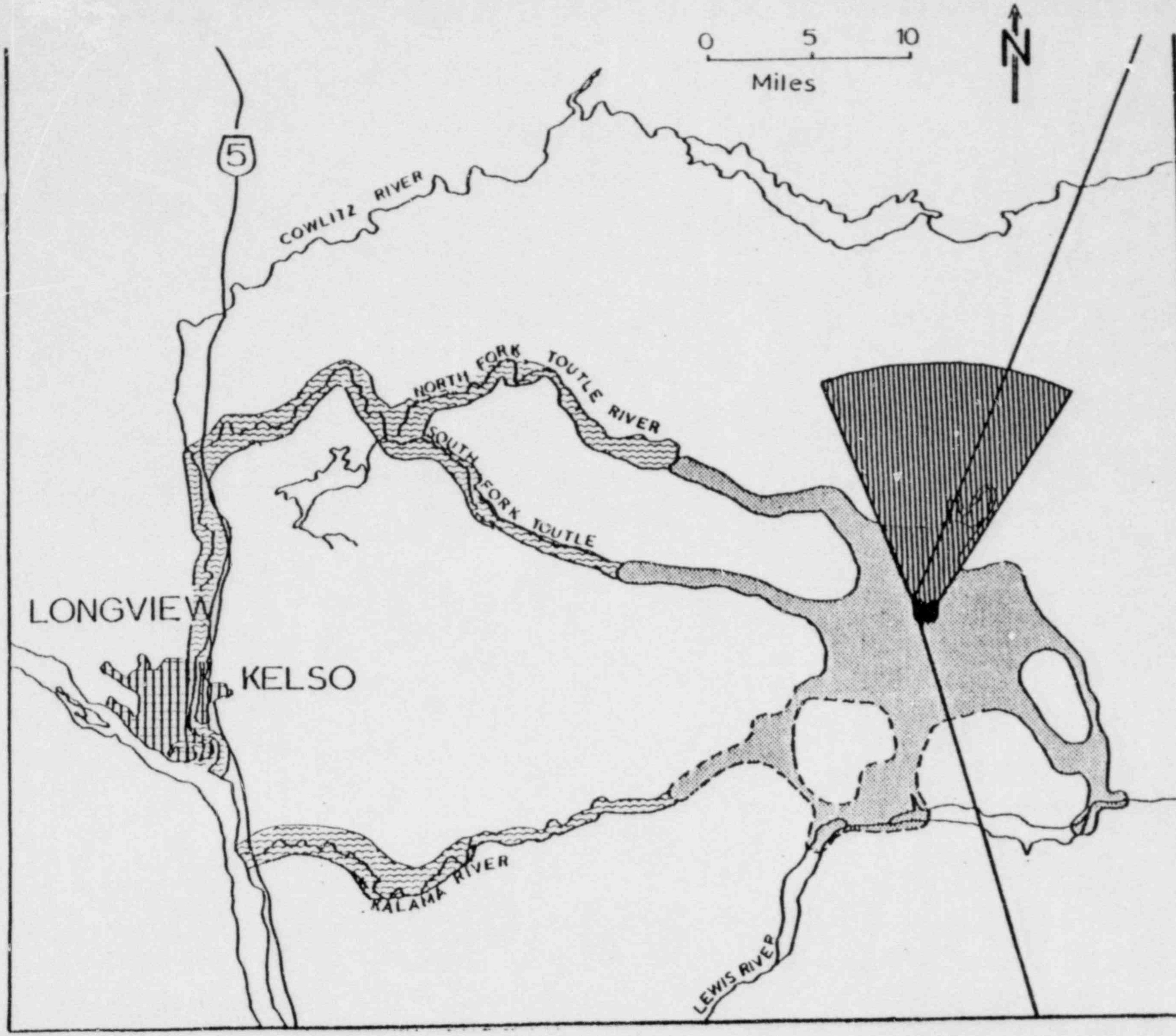
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Miles
N
5
COWLITZ RIVER
NORTH FORK TOUTLE RIVER
SOUTH FORK TOUTLE
LONGVIEW
KELSO
KALAMA RIVER
LEWIS RIVER

HOW ASH WAS BLOWN

In the eruption of 4000 years ago winds carried fine pumice fragments toward the north-northeast. The amount of ash that fell was greatest near the source. At a distance of 10 miles, more than three feet of ash fell; at 20 miles, about 35 inches; at 30 miles, about 22 inches; at 40 miles, 17 inches; and about a foot fell at 50 miles. The diagram shows the relationship between the distance from the eruption and the depth of ash.

Ash from eruptions may be carried in any direction, depending upon the wind, although winds in this area blow most frequently toward the east.

The size of particles deposited was largest near the source, where individual pumice fragments were as large as a football. Twenty miles away, the particles were about pea size, while still smaller particles were blown farther.

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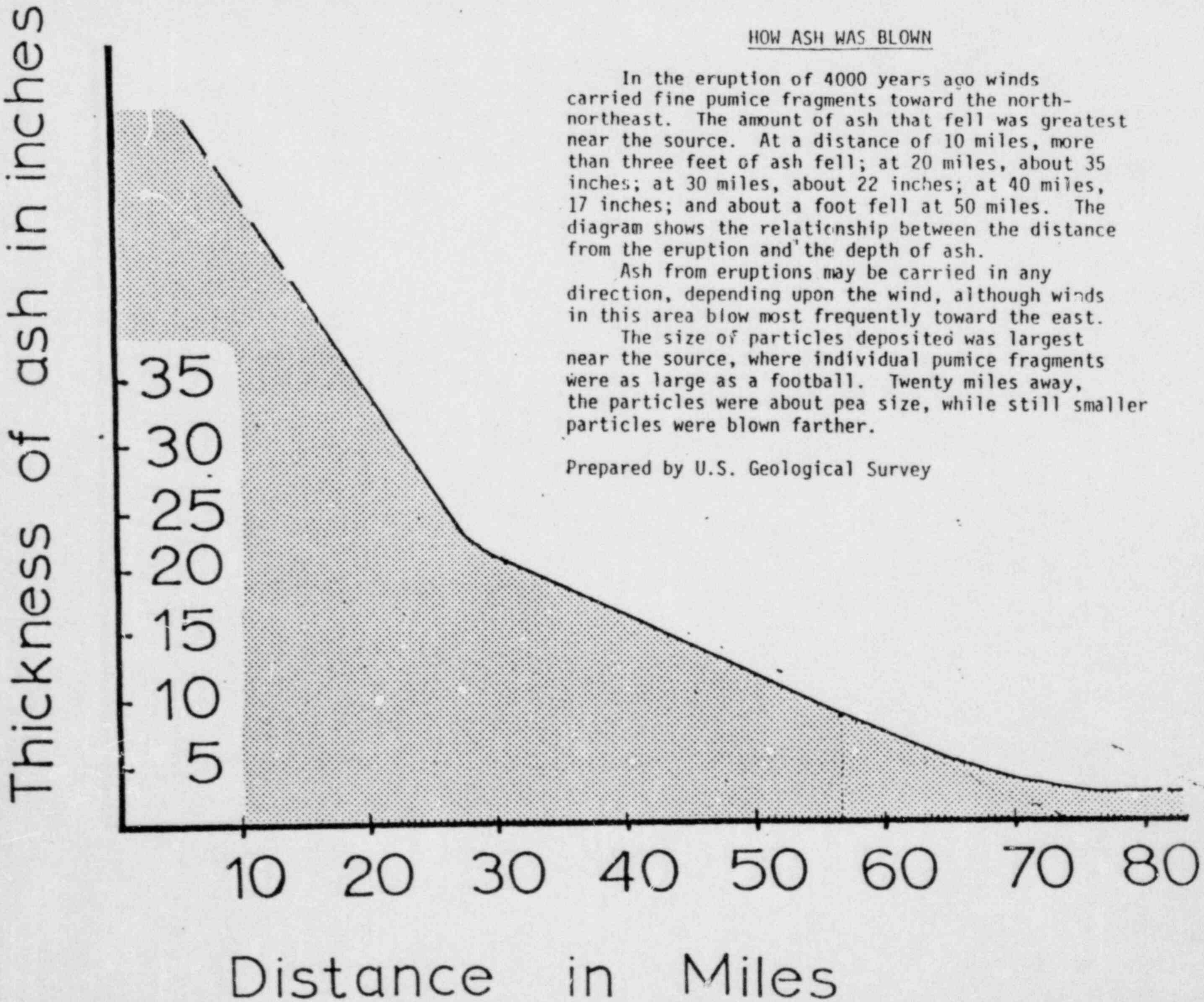

Geosciences Branch File on

MT. ST. HELENS SITUATION

List of Maps and Literature Gleaned from Vancouver, WA offices of U. S. Geological Survey and National Forest Service on June 19, 1980 and received (mail) on July 7, 1980.

Maps

Gifford Pinchot National Forest, USDA, 1973, 1:126,770, shows Mt. St. Helens, Mt. Ranier, Mt. Adams, Mt. Hood, drainage, sections, roads, checkerboard forest pattern

Mount St. Helens and Vicinity, Wash-Oreg., USGS Special Edition; April, 1980, 1:100,000 shows topography by contours at 50 m intervals, drainage, sections, roads

Mt. St. Helens Closure Map, Gifford Pinchot National Forest, Forest Service, USDA, June 11, 1980, shows red and blue restricted zones and text of closure order.

Local Agency Brochure

Volcano, Volcano, Volcano, A Citizens Guide, Emergency Action Plan; Clark County, WA Public Information Division

State Agency Flier

Warning, Mt. St. Helens is an Active Volcano; Washington State Dept. of Emergency Services

Federal Emergency Management Agency Handouts

Mt. St. Helens Technical Information Network Bulletins:

Bulletin	Title	Date
-	Welcome to the Mt. St. Helens Technical Information Network, 2 p.	June 1, 1980
1	The Nature of Mt. St. Helens Ash, 2 p.	n.d.
2b	Driving and Vehicle Maintenance in Heavy Ash Areas, 3 p.	May 30, 1980
3	Precautions in Handling Volcanic Ash, 3 p.	May 27, 1980
4	Current Volcanic Hazards at Mount St. Helens, Washington, 8 p.	May 29, 1980

Bulletin	Title	Date
5	Volcanic Ash Could Reduce Insect Populations..Temporarily, 3 p.	May 30, 1980
6	Advice for Farmers from Washington State University-Tractors and Water Pumps, 2 p.	June 1, 1980
7	Ash Particles and Home Clean-Up Problems Advice from the University of Idaho, 2 p.	May 30, 1980
8	Physical and Chemical Characteristics of the Mt. St. Helens Deposits of May 18, 1980, 4 p.	June 2, 1980
9	Volcanic Ash Advice to Berry Growers, 2 p.	June 2, 1980
10	Center for Disease Control (CDC) Community Based Health Surveillance Program (Update), 4 p.	June 3, 1980
11	Poultry-Bees-Livestock, 5 p.	June 5, 1980
12	Foodstuffs and Volcanic Ashfall, 2 p.	June 5, 1980
13	Research Into the Free Crystalline Silica Content of Mount St. Helens Ash, 4 p.	June 6, 1980
14	Protecting Children from Volcanic Ash-Related Health Hazards, 3 p.	June 6, 1980
15	Volcanic Ash and Your Water Supply, 4 p.	June 7, 1980
16	Health and Medical Update, 4 p.	June 8, 1980
17	Insurance Concerns, 4 p.	June 9, 1980
18	Health and Medical Update, 11 p.	June 10, 1980
19	Controlling Blowing Dust from Volcanic Ash, 4 p.	June 16, 1980
20	Health and Medical Update, 4 p.	June 16, 1980
26	Volcanic Ash Effects on Municipal Water Supply and Sewage Treatment Plants	June 26, 1980
27	Air Quality Monitoring Network for Volcanic Ash	June 26, 1980
28	Volcanic Hazards Analysis	June 27, 1980
30	Management Approaches to Dust Exposure Control	June 28, 1980

FEMA News Releases

Numbers 56-60, 16-'7 June 1980, mainly give Disaster Hotlines for resident's in Washington, Oregon, Idaho, 1p. each

U. S. Army Corps of Engineers News Release

June 18, 1980, Announces Columbia River dredging operations and restoration of Cowlitz River, 1 p.

U. S. Small Business Association News Releases

Numbers 18-20, June 18, 1980, announce branch offices openings

U. S. Geological Survey Daily Newsbriefs

Reports of 9-am news briefings of 17, 18, 19 June 1980, 1 p. each

Forest Service News Releases

June 4th release announces procedure for securing permits to work in restricted zones
June 13th release announces Ass't. Secy, USDA, visit

Forest Service Emergency Planning Document

Mt. St. Helens Contingency Plan, April 1980, 46 pp.

Glossary of Selected Volcanological Terms

avalanche - downslope movement of pulverized flank of volcano en masse but without cohesion; includes previously solidified or consolidated lava and pyroclastics, soil and forest cover mobilized by the lateral blast

debris flow - downslope movement of solidifed or consolidated lava and pyroclastics and/or soil and forest cover of various size grades (must have fractions larger than cobbles) as a cohesive mass; cohesion is provided by water and/or fluids (cf. mud flow)

dome - domal-shaped or bulbous extrusion of viscous lava on volcano surface, usually in crater floor.

lateral blast - sudden release of gas pressure and heat directed nearly horizontally through the crater rim and flank of the volcano; as opposed to the usual energy release directed vertically through the crater or vent area.

mud flow - downslope movement of predominantly clay-or-silt-sized particles as a cohesive mass; cohesion is provided by water and/or fluids (cf. debris flow in which larger particles predominate).

plug - volcanic vent filling usually by solidified magma and/or by solidified lava and conslidated pyroclastics.

pyroclastic flow - fragments of previously formed volcanic material and/or solid and semi-solid material emanating from a volcano entrained within volcanic gas and ash which moves as a viscous fluid (when water is added it may become a debirs or mud flow depending upon the size fractions of the constituents).

MEETING SUMMARY DISTRIBUTION

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