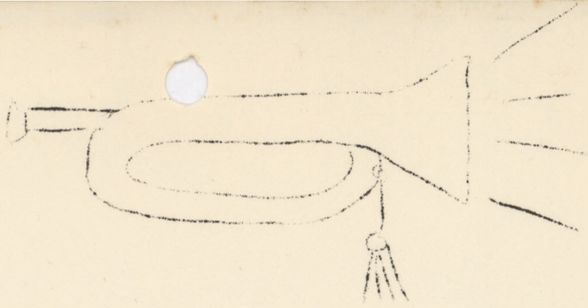
THE VALDEZ EARTHQUAKE BUGLE



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VALDEZ CITY COUNCIL MEETING
April 20, 1964

The U.S. Geological Survey report by Dr. Henry W. Coulter, Geologist, was read giving a summary and recommendations. See

A letter was read from Owen E. Meals to the City of Valdez. Mr. Meals offered 654 acres which was his father's and his father's partner and which has been in the family for many years. Mr. Meals made the offer for the Meals family only, but is proceeding to contact the heirs of his father's partner. This gesture is unpresidented in the history of Valdez and could well be a very important fact in all our lives.

The U.S. Army Engineers were granted permission and right of access to their lots so they can proceed with their recreation program in Valdez.

Larry and Pearl Parker were granted permission by the council to relocate the Club Bar and Restaurant in their home on Wickersham Ave. Permission was granted by the council for relocation of the Canteen Bar to the Pettit house on 513 Hobart St.

Councilman Donald J. Williams was appointed Public Works Director for the City of Valdez. This appointment to begin immediately.

Mayor Woodford announced that the Urban Renewal Delegation of the Alaska State Housing Authority is due in town on Tuesday and will possibly be able to give us some preliminary answers. Watch for notice of next council meeting.

Walt Farmer inquired as to temporary housing to get his family back into town. This was discussed at length and more answers should be available in a few days.

Mr. Henry Eichman of the Red Cross announced clothing distribution is at the High School. At present the contract for feeding facilities at Harborview expires on the 30th. Plans for rehabilitation are indefinite due to the indefinite plans of the town. RC is ready to fill immediate needs and hopes to plan with us as we go along.

State Construction Engineer, Bruce Campbell indicated that state construction would be held up until the city plans are firm.

P.W. Director Williams reported the sewer system work is progressing. There are a number of problems pertaining to the water system. We might expect a report by the Corps of Engineers at the next council meeting.

* * *

The only copy of the USGS Report is in use by the City Council at press time.

SBA Disaster Loan Representative, Mr. Shemaker, is due in Wednesday or Thursday.

The Salvation Army Snack Corner may be used at night. The Coleman stove may be lit and coffee made. Anyone requiring infant formula or baby food, disposable diapers, etc., please let the officers know. Appreciation is expressed to all for continued courtesies shown.

Ralph Taylor, of the Fairbanks group, is in Valdez for the purpose of inspecting privately owned buildings to render advice as to the amount of damage and methods to be used for correcting the faults.

Fairbanks Daily News Miner papers are available at the Post Office.

PRELIMINARY REPORT ON THE GEOLOGIC EFFECTS OF THE MARCH 27th EARTHQUAKE AT VALDEZ, ALASKA

The following report summarizes observations relating to the geological effects of the March 27th earthquake. It incorporates information supplied by the following persons:

Ralph R. Migliaccio, District Geologist
Alaska State Highway Department
Valdez, Alaska

E.O. Bracken, Geologist
Alaska State Highway Department
Valdez, Alaska

R.M. Chapman, Geologist
U.S. Geological Survey
Fairbanks, Alaska

The results of preliminary, post-quake, sounding in the harbor area were made available to the author by Mr. MacNamara of the Alaska District Corp of Engineers.

GEOLOGIC SETTING

Valdez is located at the head of Port Valdez, a narrow, steep-walled glaciated valley in the Chugach Mountains. The town is situated at tidewater on a glacial outwash delta at the head of the valley, immediately west of the confluence of the Valdez Glacier Stream and Lowe River. The slope of the delta is southwest from approximately 50 feet at the northeast end of town to sea level at the harbor. It is composed of poorly sorted sand and gravel with a very high silt content. The silt is found in beds and stringers within the section and is also widely disseminated as interstitial material throughout the coarser fractions. The surficial beds of alluvially deposited material dip gently to the southwest but more steeply dipping deltaic bedding probably occurs at depth. The configuration of the bedrock balley and depth of water in Port Valdez suggest that the thickness of this section of unconsolidated material may be as much as 600 feet thick, however the deepest well, which did not reach bedrock, is only 250 feet. The ground water table within the town is from two to three feet below the surface so this entire unconsolidated section is saturated.

The bedrock in the surrounding valley walls is phyllitic graywacke of the Valdez group (Cret?). The strike of the foliation is east-west and is steeply dipping to verticle. The steep foliation controls the major east-west drainage system of the area. Tributary drainage is controled by a steeply dipping north south joint set.

EFFECTS OF THE MARCH 27th EARTHQUAKE

All observed dislocations resulting from the March 27th quake are confined to the unconsolidated material of the delta except for slides of loose rock and snow from the surrounding mountains. No faults with perceptable displacement involving the bedrock have been observed or reported in the Valdez vicinity. It is possible that bedrock faults may exist beneath the snow, however the ease with which fissures of minor displacement (one to several inches) in the unconsolidated deposits may be traced across snow covered areas militates against this.

The most violent effects of the earthquake were centered in the waterfront areas. There the tremors triggered a massive submarine landslide along the steeply sloping face of the delta. A slice of the saturated silty, sand and gravel measuring at least 600 feet wide by 4000 feet long and of an undetermined thickness, broke away from the face and slid outward and downward into the bay. This slice carried with it the two docks, trucks, boats and buildings. The tragic loss of life was confined to this area involved in the slide.

Comparison of pre and post earthquake soundings indicates the profound changes in submarine topography which resulted from this slide. In the area where the north dock formerly stood in 30 feet of water, there is now 110 feet. Along

the former alignment of the breakwater protecting the small boat harbor which was previously exposed at low water there is now 70 feet of water. Comparable changes have taken place throughout the affected area. Ralph Migliaccio who examined the upper portion of the slide area, using skin diving gear, characterized the appearance of the bottom as hummocky, chaotic, typical landslide topography. Projected profiles across the seaward face of the slide area indicate that portions of the displaced material are standing at slopes greater than 30 degrees. In an immediate post-slide disequilibruim environment involving disturbed saturated material of high silt content 30 degrees must be considered an unstable slope angle.

Complete assessment of the extent of this slide must await the results of extensive hydrographic surveys currently being carried out by the U.S. Coast and Geodetic Survey, but these preliminary data give some appreciation of the magnitude of this geologic event. Historical records and recollections of local inhabitants indicate that submarine slides and slumps, some of relatively large scale have taken place in the past in this locality.

Immediately following the waterfront slide and the disappearance of the docks a violent surging wave, reported to have been 30-40 feet high struck the beach extensively damaging property and installations well beyond the limits of the submarine slide. All of these events took place within 2-3 minutes of the initial tremors at 5:36 P.M. Approximately 10 minutes later a second wave of lesser magnitude struck the shore adding to the damage. At approximately 11:30 P.M. a third, less violent, wave carried large quanities of debris and wreckage across the beach and into town as far as McKinley Street. At 1:45 A.M. a fourth wave described as a tidal bore advanced, doing extensive water damage up to levels of 5-6 feet along McKinley Street.

During the earthquake and while the slide was taking place along the seaward face of the delta, an extensive system of cracks and fissures developed throughout the extent of the unconsolidated deposits comprising the delta. During the tremors these fissures were reported to have been actively working and marks on buildings and trees indicate that a considerable volume of water and suspended silt was pumped from many of them. Some of this water undoubtedly issued from broken water lines and sewers. The most widely developed fissure system trends (N. 40° W.) approximately parallel to the waterfront. The width of these fissures ranges from a few inches to a maximum of more than two feet. In general the width increases toward the shore but there are exceptions. The frequency of these fissures is greatest near the shore (approximately 5 per 100 feet) and decreases eastward to 2 per 100 feet at the east end of town. Few of these fissures show any evidence of differential movement. In the few instances where there is evidence of differential movement is consistantly southwest side down.

A second fissure system trending N. 60° W. is strongly developed in the area west of Sherman Street but is less apparant in the outlying areas. A third system trending N. 30° W. appears to be controled to a large extent by the alignment of thaw zones and compaction zones related to streets, and water and sewer lines. Many randomly oriented cracks also exist. No evidence of a lateral component of movement was noted on any of the fissures or cracks. Observation of these features was made difficult by the new snow cover.

Most of the structural damage to buildings away from the waterfront was related to the extension of cracks or fissures under or close to them.

CHANGES IN LEVEL

As yet no reliable datum has been established from which dependable level lines can be run. An approximation of the amount of deleveling has been attempted by the State Highway Department. This attempt has involved a resurveying of the highway profile from the concrete bridge on the outskirts of town to Front Street, and a comparison of the new profile with the pre-existing profile. The two profiles are comparable as far west as Hobart Street. At McKinley Street there is an apparant depression of the land of 1 foot. There is an apparant 4 foot depression at Front Street and an estimated additional 6 feet at the remaining end of the dock. These figures must be regarded as extremely tentative until adequate control can be restablished, however the nature and extent of present flooding of areas formerly above high tide level suggest that

deleveling of this order of magnitude has taken place.

FLOODING

The town of Valdez has always been subject to intermittent flooding from Valdez Glacier Stream. At present the channel of this stream is artificially controled by a levee and the town itself is protected by a dike. An unusual advance of Valdez Glacier, such as occured along the coast after the 1899 Yakutat earthquake, could change the present drainage system sufficiently to bypass the levee with resultant potential damage to the highway and the town.

Three large, and several smaller ice-dammed lakes along the flanks of Valdez Glacier pose an additional potential flooding hazzard to the town. The possible developement of new crevasse systems in the glacier during the earthquake could result in a sudden release of large volumes of water with consequent flooding in the glacier drainage system.

The present condition of Valdez Glacier cannot be determined because of the thick snow cover in the area.

SUMMARY

A massive submarine slide, triggered by the March 27th earthquake destroyed the harbor facilities and nearshore installations at Valdez. Waves generated by this slide and subsequent tsunami did additional damage in the downtown area. Stresses generated by the tremors developed an extensive system of fissures throughout the saturated unconsolidated alluvium of the Valdez delta. These fissures plus the tremors caused structural damage to a large percentage of the buildings in Valdez and completely destroyed the water and sewer system. Removal of support from the seaward face of the delta, plus, perhaps, some differential compaction has resulted in depression below high tide level of portions of the area west of Front Street.

RECOMMENDATIONS

1. No heavy loads either in the form of extensive fill, storage or structures should be imposed on the shore area west of McKinley Street at the head of the submarine slide area. Further slumping and settling in the immediate off shore area may be expected until a more stable natural slope has been acheived.

2. An earthquake of comparable intensity to that of March 27th could conceivably result in a slide equal in magnatude to that of March 27th consequently no habitation should be permitted west of Front Street between Rudolph Alley and Dewey Avenue.

3. A comprehensive inspection, repair and maintenance program of the dike and levee system should be instituted to preclude damage resulting from unexpected abnormal drainage conditions in the Valdez Glacier area.

GEOLOGIC EVALUATION OF THE OLD TOWNSITE

The old townsite lies approximately 4 miles northwest of Valdez on the north side of Port Valdez immediately east of the mouth of Mineral Creek. It is situated on an alluvial fan confined on the south side by an almost continous bedrock boss. The south flank of this bedrock boss is steep with deep water flanking it throughout most of its length. The elevation of the alluvial fan is higher than, and the slope of the fan is greater than, that of the Valdez delta. Reports of gravel pits at the old townsite indicate that the material comprising the alluvial fan contains a much higher proportion of coarse gravel and a lower proportion of silt than the Valdez delta. Also the ground water table is appreciably lower (approximately 10 feet). A reconnaissance examination of the old townsite revealed no evidence of cracks and fissures comparable to those in the Valdez delta. The bedrock configuration at the mouth of Mineral Creek

effectively prevents the stream from swinging east into or near the townsite.

In summary the old townsite provides the following advantages:

1. A bedrock boss providing a resistant buttress retaining and protecting the toe of the alluvial fan from danger of sliding and slumping.

2. A stable foundation anchor on the bedrock boss for a major dock facility, with favorable offshore conditions, and a protected locality for a small boat harbor.

3. Judging from the negligible evidence of fissures and cracks, the coarse alluvium of the old townsite fan appears to be more stable under seismic conditions than the Valdez delta.

4. Effective protection from floods.

5. Drainage, water table conditions, and potential water supply from Mineral Creek appear to be favorable.

In view of the foregoing, it is strongly recommended that serious consideration be given to relocation of the dock facilities and ultimately the entire town at the old townsite.

(s) Henry W. Coulter, Geologist
U.S. Geological Survey