

RELATED CORRESPONDENCE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD



In the Matter of)	
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PUGET SOUND POWER & LIGHT)	DOCKET NOS. STN 50-522
COMPANY, et al.,)	50-523
)	
)	
(Skagit Nuclear Power Project,)	
Units 1 and 2))	
)	
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PREFILED TESTIMONY OF SAMUEL Y. JOHNSON
October 18, 1979

- Q. Would you state your name and occupation?
- A. Samuel Yorks Johnson, graduate student and teaching assistant in the Department of Geology, University of Washington.
- Q. What documents have you reviewed in preparation for your testimony?
- A. I have read Section 3.4.1 of Bechtel's three volume investigation entitled "Report of Geologic Investigations in 1978-1979".
- Q. What special qualifications do you have which permit you to comment on this report?
- A. I am quite familiar with the geology of the North Cascades. I consider sedimentology, sedimentary petrology and physical stratigraphy to be my particular fields of expertise. My research is being conducted

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under the supervision of Dr. John Whetten (supervisor), Dr. Joseph Vance, Dr. Peter Misch, Dr. Samuel Cowen, and Dr. Richard Stewart, all affiliated with the Department of Geological Sciences, University of Washington.

For the last three years, my research has focused on Mesozoic and Cenozoic sedimentary rocks of N.W. Washington. My initial research concerned the Upper Triassic Naro Formation, the Upper Jurassic and Lower Cretaceous Spreden Formation, and the Upper Cretaceous Hasla Formation (Nanaimo Group) of the northwestern San Juan Islands (my M.S. thesis field area). While pursuing this research, and while working as a research assistant in an N.S.F. supported research project concerning the geology of the entire San Juan Island archipelago, I became very familiar with San Juan Island geology.

I have recently begun Ph.D. research concerning the sedimentology, petrology, stratigraphy, and structure of Upper Cretaceous and Lower Tertiary sedimentary rocks in northwest Washington. My goals are to develop paired sedimentologic and tectonic models for the geologic evolution of this area through rigorous field and lab examination of these rocks.

- Q. What conclusions have you reached with respect to this report?

A. My opinion is that the applicants have not presented enough evidence to determine whether the Nanaimo strata of the northeastern San Juan Islands are correlative and/or coextensive with the Chuckanut Formation of Whatcom County and other portions of Washington. Their inference that no significant northwesterly trending fault exists between Lummi Island on the northeast and Clark and Matia Islands on the southwest cannot be substantiated. That is, until more detailed work is done, the existence of the so-called "Ward Fault" is a possibility.

The applicants' principal grounds for correlating the strata of northeastern Sucia Island with the Chuckanut Formation strata on Chuckanut Drive were hand specimen petrology and sedimentology (i.e., the occurrence of similar sedimentary structures in rocks of both areas).

Sedimentologically, the units are not as simple to interpret as presented. There is unanimous agreement in the literature and among interested workers regarding the fluvial origin of the Chuckanut Formation on Chuckanut Drive. The nature of the fluvial environment may change upsection from deposits more typical of meandering streams, to those more characteristic of braided streams. Conversely, there is disagreement concerning

the origin of the strata of northeastern Sucia Island, Patos Island, and Matia Island. Two detailed studies of the Sucia strata have been pursued (Janby, 1972; Wash. State Univ. - M.S.thesis; Pacht, 1979, GSA cord. abstract, pers. comm., and Ohio State Univ. Ph.D. thesis in prep.), and in each the conclusion is that these strata were formed in shallow marine environments. Therefore, the applicants contention that these strata have a fluvial origin is contradicted by these studies. The large scale trough cross beds found in each unit are not specific to a single depositional environment and could be associated with either a fluvial or shallow marine depositional system. I consider the question as to the origin of the Sucia strata open.

I think I have noted in the field two significant differences between the rocks of these areas. First, organic matter (ancient logs, leaves, etc.) is ubiquitous and very abundant in channel lags and flood plain deposits in the strata on Chuckanut Drive. Conversely, only a small amount of organic matter (in contradiction to the applicants' findings) seems to be associated with the rocks of purported similar origin, on Sucia Island. Secondly, the degree and style of interbedding between coarse and fine gravel strata is different. It is rare to pass through more than

100-200 feet of strata on Chuckanut Drive without finding fine grained level or flood plain deposits. In many stratigraphic horizons the proportion of these deposits is quite high. Conversely, on Sucia, there are very few fine grained deposits in any part of the exposed section. It has been suggested several times that the fine-grained strata of the Sucia section has been eroded and are now represented by indentations and coves in the Sucia coastline. This may be the case, but it still does not account for the anomalous absence of fine grained beds in the thick sections of exposed strata.

Lithologically, the applicants state that each unit is a buff-colored, honeycomb weathered sandstone, and it is implied that these features are unique to Chuckanut Formation strata. However, Nanaimo Group strata lower in the section (turbidites of the Haslan Formation) are also buff-colored, and honeycomb weathered, and are not Chuckanut Formation correlatives. In short, there is nothing particularly diagnostic about the lithology. My own recollection is that the Sucia sandstones and conglomerates contain more chert fragments than those of Chuckanut Drive strata.

I have noted a few problems with the applicants' correlation. However, the main problem does not

lie with the material and data they have included, but rather with what they have failed to collect and/or report. Any positive correlation between clastic sedimentary units requires point counts of sandstones (using modern methods and techniques) and pebble counts in conglomerates. Hard specimen descriptions would not be considered sufficient in anything but a very broad reconnaissance survey. If the applicants wish to establish lithologic similarity between these two areas, then there is no other way to rigorously approach the problem. If the units were once part of the same ancient, non-fragmented sedimentary basin, then their lithology should be nearly identical.

The applicants also need to look at the sedimentology of the units far more rigorously. Detailed stratigraphic sections could be measured and interpreted. If it is concluded that the Sucia strata are indeed fluvial in origin, then an attempt should be made to match the 2,000 feet of Sucia strata with an equivalent section of Chuckanut Drive strata, both lithologically and sedimentologically.

Finally, a sedimentary basin and paleocurrent analysis should be conducted in the Chuckanut Formation of Whatcom County and on Sucia Island to determine the original geology of the basin and the distribution

of depositional facies within the basin. This would be very important in the evaluation of proposed later structural disruptions.

In rocks such as these, which can not presently be accurately dated, these types of investigations are absolutely essential. Until they are conducted, correlation between the Sucia and Chuckanut rocks can only be regarded as tentative and questionable. Subsequent interpretations, using this correlation as a premise, would also be suspect.

Statement of Qualifications

Name: Samuel Yorks Johnson

Born: 8/12/51 Sar Diego, California

Education:

B.A., Earth Sciences, 1975, University of California, Santa Cruz, California, 95060; B.A. with honors in Arts and Crafts and Their Histories, 1975, Univ. of Cal., Santa Cruz, California; M.S. in Geological Sciences, University of Washington, Seattle, Washington, 98195; presently pursuing Ph.D. in Department of Geological Sciences, University of Washington.

Work and Research Experience:

1974-1975: Completed Senior Thesis research on "The Chemistry, Mineralogy, and Ceramic Properties of Santa Cruz County Clays, Supervisor: Dr. Leo LePorte, U.C., Santa Cruz, California 95060.

4/75-6/75: Scientific crew member on United States Geological Survey research cruise to the eastern Gulf of Alaska. Supervisor: Dr. Bruce Molnia, U.S.G.S., 345 Middlefield Rd., Menlo Park, Ca.

3/76-7/76: Research and lab assistant in study of sediment contamination in the Bay of Naples, Italy. Supervisor: Dr. Gary Griggs, U.C., Santa Cruz, California, 95060.

7/76-9/76: Scientific crew member on United States Geological Survey research cruise in the Bering Sea. Supervisor: Dr. Tracy Vallier.

9/76-6/77: Teaching Asst. in Introductory Geology; Department of Geology, AK-20, U.S., Seattle, Washington 98195. Supervisor: Dr. Larry Hansen

9/77: Teaching Asst. in Introductory Field Geology, Dept. of Geological Sciences, U.W., Supervisor: Dr. Randall Giesens.

9/77-12/77: Field Asst. in U.S.G.S. reconnaissance mapping project in the foothills of the North Cascades, Wash. Supervisor: Dr. John Whetten, U.W. and U.S.G.S., Puget Sound Proj., 1107 45th, Seattle, Wn. 98105.

1/78-3/78 and 9/78-12/78: Research Asst. in N.S.F. supported research project concerning the geology of the San Juan Islands, Wash. Supervisor: Dr. John Whetten, U.W.

3/78-6/78 and 3/79-6/79: T.A. in Geology of the Northwest; Dept. of Geological Sciences, U.W. Supervisor: Dr. Robert Filson.

1/79-3/79: T.A. in Sedimentary Petrology; Dept. of Geological Sciences, AK-20, U.W. Supervisor: Dr. John Whetten.

6/79-8/79: Ph.D. Thesis research concerning upper cretaceous and lower tertiary sedimentary rocks of N.W. Wash. partially supported by U.S.G.S., Puget Sound Project, 1107 N.E. 45th, Suite 125, Seattle, 98105. Supervisor: Dr. John Whetten.

8/79-9/79: T.A. in Advanced Field Geology, Dept. of Geological Sciences, U.W., Supervisor: Dr. Richard Stewart.

Theses:

Johnson, Samuel Y., 1975, The Chemistry, Mineralogy, and Ceramic Properties of Santa Cruz County Clays, Santa Cruz, California: Senior Thesis, University of California, Santa Cruz, California 95060.

Johnson, Samuel Y., 1978, Sedimentary, Petrology, & Structure of Mesozoic Strata in the Northwestern San Juan Islands, Washington: M.S. Thesis, Dept. of Geol. Sci., AK 20, University of Washington, Seattle 98195. 114 p.

Publications:

Johnson, Samuel Y., 1978, The Geology of Spieden Island, San Juan Islands, Wash: Northwest Science Proceedings Abstract No.

Griggs, G.B., and Johnson, S.Y., 1978, Sediment Contamination in the Bay of Naples, Italy: Bulletin of Marine Pollution, Vol. , , pp.

Johnson, Samuel Y., 1979: Submarine ... Deposition in the Upper Cretaceous Nanaimo Basin, San Juan Islands, Washington: Northwest Science Proceedings, Abstract No.

Johnson, Samuel Y., 1979, Sedimentology, Petrology and Structure of Mesozoic Strata in the Northwestern San Juan Islands, Washington: G.S.A. Cordillera Abstracts with Programs, Vol. .