JUN 20 1975

R. C. DeYoung, Assistant Director
for LWR's, Group 1, RL

SER INPUT FOR FOUNDATION ENGINEERING SECTION, SITE ANALYSIS BRANCH, TR

PLANT NAME: WPPSS Nuclear Projects 3/5
LICENSING STAGE: CP
DOCKET NUMBERS: 50-508/509
MILESTONE NO.: 24/324
RESPONSIBLE BRANCH: LWR 1-3, P. O'Reilly, LPM
REQUESTED COMPLETION DATE: 6/16/75
APPLICANTS RESPONSE DATE NECESSARY FOR
NEXT ACTION PLANNED ON PROJECT: N/A
DESCRIPTION OF RESPONSE: N/A
REVIEW STATUS: CP

Enclosed is our draft SER input for the foundation engineering aspects of the subject station for your use. This enclosure was prepared by J. Greeves, SAB.

Original Signed by
H. R. Denton

Harold R. Denton, Assistant Director
for Site Safety
Division of Technical Review
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Enclosure:
As stated

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DATE ▶	6/19/75	6/20/75	6/20/75	6/20/75		

WPPSS NUCLEAR PROJECT UNITS 3 & 5
DOCKET NO.: 1 STN: 50-508/509
DRAFT SAFETY EVALUATION REPORT BY: J. Greeves

Foundation Engineering

The site is located on a ridge at the northern edge of the Willapa Hills approximately 1.5 miles south of the confluence of the Chihalis River and Satsop River in Grays Harbor County in the State of Washington.

Foundation Stability:

The plant area is underlain by the Astoria formation, a sandstone in various degrees of alteration. This formation also contains some siltstone strata and several tuff beds. The various material types at the plant location include residual soil, weathered sandstone, fresh sandstone and tuff. The static and dynamic properties of the foundation materials were determined by field measurements and laboratory tests.

All residual soil will be excavated from the plant area. The plant grade will be established at El. 390. The excavation for the Category I structures will penetrate the overlying weathered sandstone and the foundation mat will be supported on fresh sandstone at elevation 320. Vertical cuts will be made in sandstone formations. The Category I structure walls will be cast directly against the prepared vertical rock surfaces. The building will be protected from ground water by use of a drainage system constructed at the interface of the exterior walls of the building and the face of the excavated rock.

Groundwater control requirements during excavation are expected to be minimal based on the low permeability of the sandstone formation. Groundwater will be controlled with a drainage system within the common mat excavation during construction. Water collected will be drained through a gravity flow drainage tunnel. This system will consist of vertical drain pipes which will intercept any water at the rock interface and convey it down to a horizontal collector pipe located at the mat level. This collector pipe will in turn be connected to a permanent drainage tunnel which will discharge the water to the slope south of the plant. Manholes from grade level will be provided to allow for periodic inspection and cleanout, if required, of the collector pipes.

The fresh sandstone bearing formation has very high strength properties and very low compressibility properties for both static and dynamic conditions. Therefore, bearing capacity is adequate and settlement of structures is negligible for the design of the plant. The bearing stresses are approximately 8 KSF. Post-construction settlement and

differential settlement will also be negligible. The staff has concluded that the fresh Astoria Sandstone is a competent bearing formation and is suitable for support of the proposed structures.

Slope Stability:

As shown in the PSAR, figure 2.5.64, there are permanent slopes in the north-south direction and in the east-west direction whose failure could affect the safe operation of the plant. Both natural and man-made slopes were evaluated by the applicant both for static and dynamic (earthquake) conditions. Representative slopes and material properties were selected for stability analysis. Variations in slope geometry and material properties were considered. Based on the results of static and dynamic stability analyses, using conservative material properties, the staff concludes that permanent slopes have an adequate safety factor for all design conditions.

In addition to conventional slope stability analyses, the applicant performed a detailed investigation to evaluate previous natural slope failures and landslides which have occurred within the Astoria Formation. These natural slopes are located at distances of 450 to 10,000 ft. from the plant. These slope failures are identified and discussed in Appendix 2.5L.

The purpose of the natural slope failure investigation was to determine the factors which initiated these slides and to consider these factors in the evaluation of slope stability at the plant location. The results of the investigation show that sliding along weathered siltstone beds was the primary mechanism of sliding. The factors normally required for landslide development were found to be: (1) the presence of siltstone layers; (2) the weathering of the siltstone forms a soft slick material, (3) ground surface sloping in the direction of the dip of the Astoria Formation; (4) bedding planes undercut at the toe of the slope; and (5) adverse groundwater conditions increase the driving forces and decrease the strength of the material along slip surfaces. At the plant location, all of these conditions are not encountered, so slope failures should not occur; excavation for the plant will remove all weathered materials from below the Category I structures, and bedding will not be undercut in the down dip direction. Earth cuts will remove the top of the ridge above final plant grade and fill material will be placed to form a level grade in the plant area.

Based on the results of the applicant's slope investigation and the proposed excavation to fresh sandstone in the plant area we conclude that the applicant has provided reasonable assurance that landslides will not affect the Category I structures. The applicant should provide

data in the FSAR to confirm that the properties of the excavated formation conform with the anticipated conditions and that adverse slope and foundation stability conditions are not present in the final grading configuration.

In summary, based on the information available, we conclude that the applicant can design and construct the power plant facilities to meet the foundation engineering requirements of 10 CFR Part 100.