ORDER NUMBER: 568
DATE: October 8, 1979

BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of the National Pollutant Discharge Elimination System Waste Discharge Permit (WA-002496-1) for Nuclear Projects Nos. 3 and 5	FINDINGS OF FACT, CONCLUSIONS OF LAW, AND ORDER

The Applicant's Petition to Modify its existing NPDES permit came on regularly for hearing, pursuant to notice duly given, before the Washington State Energy Facility Site Evaluation Council and Administrative Law Judge Patrick Biggs on the following dates and at the following places: Olympia, March 27-29, April 4,5, and 13, May 2, 15-16, and 23-25, and June 6,7,19, and 20; Pullman, April 3; and Elma, April 10-12, 1979.

The parties were represented as follows:

APPLICANT: WASHINGTON PUBLIC POWER SUPPLY SYSTEM
By John A. Granger
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Seattle, Washington 98104

and

By Richard Quigley
Chief Counsel
Washington Public Power Supply System
P.O. Box 968
Richland, Washington 99352

and

By John Riley
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PARTIES RESPONDING:

COUNSEL FOR THE ENVIRONMENT
By Malachy Murphy
Deputy Attorney General
Temple of Justice
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DEPARTMENT OF ECOLOGY
By Charles W. Lean
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DEPARTMENT OF FISHERIES AND
DEPARTMENT OF GAME
By James M. Johnson
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Departments of Fisheries and Game
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and

By Dennis Reynolds
Assistant Attorney General
Departments of Fisheries and Game
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INTERVENOR: CITIZENS FOR A SAFE ENVIRONMENT
By James E. Duree
Attorney at Law
P.O. Box 483
Westport, Washington 98595

The following witnesses testified on behalf of the applicant:

Kenneth R. Wise
John P. Lekstutis
Fred J. Emmer
Thomas F. Kelleher
James W. Wilson
Dr. James F. Roetzer
Howard D. Copp
Dr. Akhileshwar P. Verma
Rex G. Wescott
Dr. Nagalapur S. Sashidara
Dr. Roy E. Nakatani
Samuel P. Felton
Dr. Arthur Chu

Dr. Richard E. Thorne
Dr. Donald L. Beyer
Wayne D. Goodyear
Duane Renberger

The following witness testified on behalf of the Counsel for the Environment:

John Calambokidis

The following witnesses testified on behalf of the Departments of Fisheries and Game:

Patrick H. Davies
Randall John Peard (pre-filed only)
Robert J. Gerke
James G. Fenton III
John Andrew (pursuant to subpoena)

The following witness testified on behalf of the Citizens for a Safe Evironment:

Donald F. Samuelson

The following public witnesses testified in the course of the proceeding:

John Erak
Carol Monohon
Jim Todd
David Howard
Don Samuelson
Robert Watson
Christina Peterson
Tom Clingman
John Day
Linda Fricke
Martha Russell
Lanny Carpenter
Charles Stevens
Terrence Wold
Mike Blum
Ralph Blankenship
Steven Rust
Mrs. Dale Willis
Robert Olsen
Karen Blankenship
Jan Sharer
Stanley Grohimovich
Tom Casey
Russ Rattie
Anne Olsen
Chuck Towslee
June E. Savage
Richard V. Wickett

The following exhibits were admitted into evidence:

EXHIBITS

PRE-FILED EXHIBITS

Designation	Description
JFR-1	Maximum Projected Concentrations in Blowdown Contributions (in mg/l) - Chart
JFR-2	Predicted Forms of Copper in Blowdown Discharge and Blowdown Diluted in River - Chart
RGW-1	Monthly Summary of Daily Average Flow Chehalis River - Chart
REN-1	Results of 96-hr Bioassay using Chehalis River Water - Chart
AC-1	Generalized Scheme of Distribution of Copper Species in Aquatic Systems - Chart
DLB-1	Development of Recommended Limitations relating to Discharge Temperatures From WPPSS Nuclear Projects Nos. 3 and 5 - Report
Summary Data Base Report	Summary of Studies-Chehalis River Site, Including Site Physical Environment, Site Biotic Environment, and Plant Discharge Characteristics and Plume Behavior
Appendix A	Hydrological Characteristics and Analytical Modeling of the Chehalis River in the Vicinity of the Site - Report
Appendix B	Thermal-Hydraulic Model Studies of Diffuser Performance, WPPSS Nos. 3 and 5, Washington State University, Dec. 1978
Appendix C	Chehalis River Low Flow Monitoring Studies Aug. - Oct. 1977 - Report
Appendix D	Aquatic and Terrestrial Ecological monitoring Program 1976 - Report
Appendix E	Environmental Monitoring Program 1977 WPPSS Nos. 3 and 5 - Report

Appendix F	Chehalis River Ultrasonic Tracking Studies in Vicinity of Site - Report
Appendix G	Copper in the Aquatic Environment, November, 1978 - Literature Review
Appendix H (with supplement)	Effect of Copper and Zinc on Juvenile Salmonids Exposed to Simulated Cooling Tower Blowdown Water, November 1978 - Report
Appendix I	Copper and Zinc in Ground and Surface Water in Site Vicinity - Report
Appendix J (with supplement)	Copper Complexing Capacity of Chehalis River Water, November 1978 - Report
DOE Exhibit 1	Questions of the Department of Ecology to the Supply System and Responses Concerning the Subject of the Summary Data Base Report - Letter with attachments
Counsel for Environment #1	Study of Chehalis River Regulatory Criteria for Withdrawal and Discharge - Report
Counsel for Environment #2	Copper Toxicity: A Question of Form, EPA July 1977 - Report
F & G Exhibit 1	"Effects of Copper or Zinc in Fresh Water on the Adaptation to Sea Water and ATPase Activity, and the Effects of Copper on Migratory Disposition of Coho Salmon," March 1976 - Article
F & G Exhibit 2	A Review of the EPA Red Book: Quality Criteria for Water, June 1978 - Excerpts from a Report
F & G Exhibit 3	"Copper Lethality to Rainbow Trout in Waters of Various Hardness and PH," December 1977 - Article
F & G Exhibit 4	"Toxicity of Copper to Cutthroat Trout under Different Conditions of Alkalinity, PH, and Hardness, Februray 1979 - Article
F & G Exhibit 5	WPPSS Engineering Alternatives to NPDES Permit Modification for WNP 3/5, March 1, 1979 - Memorandum with attached Report

Joint Exhibit 1	Review of EPA Criteria - Duplicate of F & G Exhibit 2
Joint Exhibit 2	Relation of Alkalinity to Copper Ionization - Graph
Joint Exhibit 3	A Comparison of Fisheries' Predictions of Chemical Forms in Water to That of WPPSS - Chart
Joint Exhibit 4	A Comparison of Fisheries' Predicted Copper Complexing with Predictions of WPPSS - Chart
Joint Exhibit 4A	Joint Exhibit 4 Corrected for Typographical Error - Chart
Joint Exhibit 5	Number of Juvenile Chinooks Seined Per 1000 Square Meters from 1976 to 1979 at various Sampling Stations on Chehalis River Near Plant Site - Chart
WPPSS Cross-Examination #1	"Determination of Copper Complexing Capacity of Natural River Water, Well Water and Artificially Reconstituted Water," September 1978 - Article
WPPSS Cross-Examination #2	"The Need to Establish Heavy Metal Standards on the Basis of Dissolved Metals," Patrick Davies - Article
WPPSS Cross-Examination #3	"Heavy Metal Binding Components of River Water," June 1975 - Article
WPPSS - Cross-Examination #4	"Copper Toxicity to Phytoplankton, as affected by Organic Ligands, Other Cations and Inherent Tolerance of Algae to Copper," Stokes and Hutchinson - Article
WPPSS Cross-Examination #5	"Importance of Laboratory Derived Metal Toxicity Results in Predicting Instream Response of Resident Salmonids," Patrick Davies and John Woodling - Article
WPPSS Cross-Examination #6	"Toxicities of Cadmium, Copper, and Zinc to Four Stages of Chinook Salmon and Steelhead," Chapman 1978 - Article

WPPSS Cross-Examination #7	Nisqually River Fishkill Report, October 1977 - Memorandum with attached Report
WPPSS Cross-Examination #8	Duplicate of F& G Exhibit 1
Supply System Exhibit #9	Effects of Copper and Zinc on Smoltification of Coho Salmon, EPA, March 1977 - Report
Supply System Exhibit #10	Equations Showing Calculated Dilution of Blowdown with Chehalis River
Supply System Exhibit #11	Projected Copper Concentrations After Dilution - Chart
Supply System Exhibit #12	Application Factors for Adjusting Bioassay Results - Charts
Supply System Exhibit #13	Calculation of Safe Concentration of Copper in Chehalis River - Charts
Supply System Exhibit #14	Summary of Acute and Chronic Effects of Copper on Salmonids - Chart
Supply System Exhibit #15	Copper Concentration Dilution from Discharge Downstream - Chart
Supply System Exhibit #16	None Offered
Supply System Exhibit #17	Confidence Intervals of Supply System on 96hr LC50 Bioassays - Memorandum
Supply System Exhibit #18	River Bottom Stability at WPPSS Intake and Discharge - Memoranda and Maps
Supply System Exhibit #19	Additional Hydrogeological Studies, Ranney Collector Water Supply - Report
EFSEC #1	Illustration of Dilution - Chart

Samuelson Exhibit #1	Copies of Tweny Professional Articles on the General Subject of Toxicities of Heavy Metals to Biological Organisms - Memorandum with Attached Articles
CASE Exhibit 1	Documentation of Water Quality Analysis Performed at Corvallis, Oregon at Request of Donald Samuelson - Admission Denied

With the exception of CASE Exhibit 1, all offered exhibits were admitted into evidence.

MEMORANDUM

The Chehalis River is a Pacific coastal stream which flows throughout the year and drains into Grays Harbor, over twenty miles below the discharge site.

Size of the river in terms of flow is variable throughout the year, with highest flows in the winter and spring and lowest in the summer and fall. The river is subject to tidal influence which has, under extreme conditions, caused it to flow upstream at the discharge site.

The water quality is generally excellent and a full range of aquatic biota are resident. Major species of anadromous salmonids are present and spawn in the river system, using the stretch of the river near the discharge site principally for passage to and from the spawning and rearing areas. The fish resource is viable and productive, though it has declined significantly over its recorded history.

This order modifies the existing permit by changing certain overly restrictive conditions where good cause exists for making such changes.

The resolution of the petition proceeds directly from an interprtation of the term "cause" as it appears in the following context:

> "..... any permit issued under NPDES can be modified, suspended or revoked for cause, in whole or in part during its term." WAC 463-38-062

Since there has been no judicial or administrative interpretation of this provision, the Council is presented with a matter of first instance.

The existing permit was compared with the proposed modifications in each area identified in the Council's order setting the hearings. The basis for each proposed modification was considered as well as a variety of related circumstances. The following factors and principles were considered and applied.

Legal definitions of "cause" are many and varied. They are always determined by the setting in which they arise. Cause for granting a new trial, for instance, or cause for setting aside the verdict of a jury require a burdensome showing by the moving party. The most flexible applications of the term in a formal setting occur when an administrative determination is reconsidered or changed based on express legal mandate, in rule or

statute. Such is the case here.

Nevertheless, policy favors finality, predictability, and an end to the decision-making process. As a consequence, "cause" in this setting does not have the ultimately "fluid" character suggested by the Applicant. There must be some structured end or the administrative process might be swamped by modification petitions occasioned by a total failure of initial preparation and foresight, perhaps based on nothing but simple afterthought. This must not be allowed, and it has not been allowed wherever the concept of cause has been carefully applied.

Burden on the energy facility siting process has been considered: the number of existing and anticipated applications to be administered; the available staff; the costs, administrative and legal, ultimately to be paid by ratepayers and taxpayers; and the simple capacity of the Council to render informed decisions, when with the exception of the Chairman, each member is assigned to primary responsibilities in other state agencies. This modification proceeding involved the testimony of twenty-four professional witnesses over twenty full hearing days. Is each adjudicative determination of the Council to be followed by a similar modification proceeding?

Determining cause in each instance involves the balancing of many factors. Necessarily, cause is determined by the exercise of sound discretion, leading to a determination of ultimate fairness, or essential justice, considering all related circumstances.

Consideration has been given to the administrative history of each claimed basis in cause. Was the present claim part of the Applicant's initial proposal? Was the position consistently held throughout? Was timely exception taken to the portion of the permit sought now to be modified? If not, why not? If there is new information, could it have been discovered and presented in the initial hearing? If some condition has changed, was it brought about by the Petitioner's own hand?

Finally, consideration has been given to the impacts on the environment from the proposed modification as well as any benefits which might accrue to the Applicant from the granting of its request. These factors are not alone determinative nor are they necessarily simply resolved. If no adverse impact on the environment is suggested or established by the evidence, inquiry must be made whether the evidence was strong or persuasive evidence, was it tested by the adversarial process, for instance? If there is a saving to the Applicant, is it a substantial saving, one so important that it justifies the imposition the modification has place on the administrative process. All of these questions must be considered.

FINDINGS OF FACT

1. The Washington Public Power Supply System (WPPSS or "the Supply System") is presently constructing two nuclear electric generating units along the Chehalis River, near its confluence with the Satsop. These plants are known as WPPSS Nos. 3 and 5. Each unit is intended to produce a net output of approximately 1240 megawatts. Water will be taken from a well system adjacent to the river and circulated throughout the system. In the process, most of it is evaporated and joins the atmosphere as steam from natural draft cooling towers. Wastes will be discharged into the Chehalis River. These hearings have been concerned with the discharge effluent and its affect on the environment in the river.

2. On December 17, 1973, WPPSS filed with the Council an application for a National Pollutant Discharge Elimination System (NPDES) Permit. The Council published a tentative permit on March 5, 1975 and a contested case hearing on the application commenced on April 10, 1975, before John von Reis, Hearings Examiner. He issued his findings on January 22, 1976. Extensive exceptions, over one-hundred pages, were taken by the Supply System to those findings and conclusions. The Council denied these exceptions and issued Findings of Fact, Conclusions of Law and Order very similar to those of Examiner von Reis. The NPDES Permit was issued allowing the Supply System to operate according to its terms, as amended. It is this permit for which modification is sought in the Petition to Modify of August 18, 1978 and the present contested case proceeding.

Prior to commencing these proceedings WPPSS appealed the Council's Order to the Superior Court for Thurston County. That action was dismissed by the Supply System shortly after the Petition for Modification was filed. The Council issued an order on October 9, 1979 granting public hearings, limiting the issues, and authorizing the appointment of a hearings examiner. Prehearing conferences were held and the first witness testified on March 27, 1979. Final arguments were held on June 20, 1979.

3. The Chehalis River is a Pacific coastal stream with high water quality . It flows the year round, though flows vary by a factor of twenty times from the lowest mean monthly flow to the highest. The temperature is seasonally affected as well. Because of the proximity of the plant site to Grays Harbor the size of flows and their velocity are dramatically affected by combinations of low flows and high tides. The river is known to flow upstream for brief periods of time when conditions are extreme. The Satsop River joins the Chehalis one-half mile above the proposed diffuser location. These rivers drain into Grays Harbor, some twenty-one miles to the west.

There can be no fixed or finite definition for "cause" in each instance. Cause for modification has been found to exist on certain issues and has been found not to have been established on others. Determinations have been made in the exercise of discretion considering all of the factors described above as well as the policy, provisions and purpose of the statutes and rules on energy facility siting.

Having considered the evidence and record in the matter, the Council makes the following findings of fact and conclusions of law:

4. The Chehalis River in the area of the discharge is designated Class A water by the Washington Water Quality Standards set forth in WAC 173, ch. 201. The ambient river water is relatively clean, soft water, being low in hardness and alkalinity and containing low levels of heavy metals. The mean pH is approximately 7.0.

5. The diffuser location is towards the head of a relatively straight stretch of the river thousands of feet long. The channel is tight to sandstone along its south bank. It drains into a flood plain approximately two miles wide in its lower reaches.

6. The river channel in the discharge area is of fairly constant width, being from 250 to 270' at very low flows. The river bed elevation at that point varies between 0 and 2 feet below mean sea level (msl). Water depth is stage-flow dependent, varying constantly. At the mean flow for the year the average water depth is nine feet.

7. River flows vary from monthly averages of 15,000 cubic feet per second (cfs) in the winter months to 900 cfs in the late summer. The lowest average monthly flow found was 397 cfs in October, 1952. The lowest average monthly flow in 1977 was 573 cfs in August. Average monthly flows below 500 cfs have been historically recorded for every month from July through November. Data on the lowest average flow for seven consecutive days in any year have been produced and probabilities of recurrence calculated. This data is reflected in Figure A-10, Appendix A of the Summary Data Base Report. Seven consecutive day flows of 500 cfs occur on average every four years, and therefore in any given year there is calculated to be a 30% probability of such a flow occurring at some time during the year. Seven consecutive day flows below approximately 400 cfs have not been recorded and it is projected that a seven day flow of 400 cfs would occur every forty years and have a three per cent possibility of occurring in a given year. Channel depth at the diffuser site is directly affected by flow volume and a depth of four feet was recorded at the lowest flow recorded during field studies, 570 cfs.

8. Flow velocity of the river is tidally affected as extreme high tides coincide with low flows, though the river is over twenty miles from Grays Harbor. The resulting instability of flow is expressed in river velocity, feet per second (fps). As the high tide pushes up the Chehalis it reduces downstream flow to 0 fps, or stagnation, then causes a minus flow, or flow reversal. At this point the river runs upstream for a period of time until the forces of tide and flow shift and the downstream flow once again continues. This phenomenon totally halts the natural flushing action of the downstream flow which is the primary assumption necessary to all of the Supply System's assertions of minimal adverse impact to the environment. There has been a large and complex body of evidence submitted which speaks to the

subject of flow reversal and closely related matters. However, there is no historical data on the flow reversal itself. Specifically, there are no actual measurements or recorded durations of velocities less than zero. Historical instream flow and velocity measurements conducted by the United States Geological Survey (USGS) were developed from stations upstream from the diffuser location and downstream data are only projections. All statistics of flow reversal are computer projections based on USGS flow and velocity data and projections from that data. The data base is by and large for average flows and projections might vary for instantaneous circumstances of flow and tide. Nevertheless, it is projected that in an average year there will be 38 instances of 0 or minus fps velocity - stagnation or reversal. Of the 38, 14 will occur in both August and September. With the six occurrences projected for October, 34 of 38 will, on average, occur in August, September and October. When viewed from the perspective of worst case conditions, the low flow history of the month of October demonstrates a particular susceptibility to low flows in extreme years. The lowest average monthly flow recorded, 397 cfs, occurred in October, 1952. In that month forty-three reversal instances are projected to have occurred, including six with flows up to -.3 fps. The phenomenon of reversal has been projected by hydrology modeling, including the extensive project of the Albrook Hydraulics Laboratory, demonstrated by Professor Copp.

Professor Copp modeled three tide/flow combination situations. At the extreme of 440 cfs flow and tide in Aberdeen of 5.6 msl the project effluent stayed substantially within the proposed dilution zone for up to three hours and twenty eight minutes until it was dissipated by continuing downstream flow. This combination was the most extreme tested.

9. The water temperature near the diffuser site reflects the influence of the colder Satsop River water entering the Chehalis River one-half mile upstream. Monthly mean temperatures range from 42°F (5.6°C) in January to 60°F (15.6°C) in July, measured at the Satsop River USGS station. There is constant variation occurring in temperature at the diffuser site. The south bank temperature is consistently higher than the north bank. There are diurnal and day-to-day temperature variations of several degrees Fahrenheit.

10. The background copper levels in the Chehalis River have been recorded at widely varying levels. USGS STORET Data suggest an average level of .013 miligrams per liter (mg/l). However, this average includes recorded values of .46 mg/l and .20 mg/l, considered to be anomolous. Recent measurements show discharge area concentrations of .007 mg/l of copper. Dr. Nakatani showed mean copper concentrations of .004 mg/l in the Chehalis River water he used for his copper bioassay experiments. There are many sources of copper and there may be localized concentrations.

11. Many animal and plant species inhabit the river. Among the fish, the salmonids are considered to be the most valuable commercially and recreationally. There are runs of fall and spring chinook, coho, chum, steelhead trout, and cutthroat trout which use the river to spawn and rear. These are anadromous species and migrate to and from the saltwater areas into which the Chehalis drains. Other important species are mountain whitefish and shad.

12. Mature coho salmon start upriver migration in October with a distinct early run. Migration continues to February. They spawn upstream from the diffuser site and the juvenile salmon migrate out to sea in the spring and early summer of the second year. The runs of coho in the Chehalis have been declining historically. Runs have declined from 88,000 in 1974 to below 20,000 in 1977 and 1978. Adverse environmental challenges in Grays Harbor and overharvesting in the ocean are suspected to be the causes for this decline.

13. There are two runs of chinook salmon which utilize the river. The fall chinook is the larger and more important run. The mature fish enter the river in late August through November with peaks in later September and October. The juvenile fall chinook outmigrate in the period from January to August a year later.

The spring chinook adults return to the river from March to early June and the juvenile fish reside in the river for one year before out-migrating. The Chinook run was larger in 1977 compared to its historical low of 10,152 in 1976. The run was estimated at 17,133, the highest estimated chinook run since 1973.

14. Winter steelhead migrate upstream during the high cold flows of December to April. The offspring of this run reside in the river for one year or more before migrating to sea. There is a summer run of steelhead which enters the river in the summer months of June to early August.

15. Cutthroat trout migrate into the river over the entire period from July to January. Spawning begins in December.

16. Chum salmon spawn from late October to early December. The juvenile chum migrate to sea the following spring.

17. The discharge area is located at the head of a long pool which runs approximately 3/4 of a mile downstream of the diffuser. This stretch of the river is characterized by uniform width, depth, river bottom contour and flow velocity. There exist areas of greater biological significance above and below this stretch of the river. There is a riffle area, characterized by shallower depths and higher velocity water, approximately 3/4

of a mile below the discharge area. This riffle is approximately ½ mile long and would routinely have salmon present in larger numbers than the stretch of the discharge area. A third area is the stretch of river immediately above the discharge area upstream some 2000 feet to the confluence with the Satsop River. This area has been denoted "the holding area." It is an area used by upstream migrants as a pause in their journey. It is an established rearing area for juvenile coho and is used by most other salmonid species in the river. Although the stretch adjacent to the discharge area is biologically suited to rearing of juvenile salmonids, it is not considered a significant rearing area and its actual use as such has not been firmly established. Apparently the other areas are preferred. Essentially, it appears this area is used for passage to higher or lower areas by both migrating fish and residents.

18. Prime upstream migration months are late August, September and October, months that are subject to extreme low flows in dry years. Salmon are among the most sensitive of all aquatic biota to significant alterations of their environment. In contrast to the plant and macroinvertebrate communities, if significant losses should occur to salmonids, the replacement period would be lengthy because the populations are much smaller and the reproductive cycles much longer. When a mature chinook salmon returns to the river to spawn and die it will weigh from fifteen to twenty pounds on average. Its progeny, after emerging from the gravel nests, migrate to the ocean and do not return for another three to five years. If a significant number of a particular year class were eliminated, for any reason, it might be years before that particular cycle of salmon would regain its former status. They are sensitive, valuable and highly complex animals and it is for these reasons that such emphasis has been placed on the protection of salmon.

19. Since the issuance of the present permit, WPPSS has announced or implemented design changes to reduce impacts from discharges. These changes were made in an effort to comply with the permit. They include the replacement of 95% of the copper tubing with stainless steel, thus significantly reducing anticipated copper discharges.

The diffuser was formerly proposed to be located close to the south bank of the river. Sonic fish tracking studies showed that the south bank was a major migration route and the proposed location of the diffuser has been moved to the river's center.

Supplementary cooling facilities, principally heat exchangers have been designed to cool blowdown prior to discharge. Engineering alternatives were examined as set out in Counsel for the Environment Exhibit #1 and Fish and Game Exhibit #5. A number of field, laboratory, modeling and literature studies have been conducted and, for the most part, admitted into evidence in the proceeding.

20. Operation of WPPSS Nos. 3 and 5 requires the use of large volumes of water. This water is to be taken from a Ranney well system, located some one and one-half miles downstream from the proposed diffuser site. The water is essentially river water which has passed through a porous aquifer adjacent to the river. It is chemically treated to control pH, eliminate biological organisms, and provide demineralized water for certain high water purity purposes. Water is circulated throughout the system. Five-sixths (5/6) of the water taken in is evaporated as steam in a natural draft cooling tower. The resulting water is laden with a 6X concentration of chemicals and metals. Up to 50% of the particulate background material will precipitate and be periodically removed as solid waste from the cooling tower basin. Though there is more than one waste stream, by far the largest is the blowdown discharge, the product of this recirculation-evaporation cycle. The projected average daily blowdown for each unit is 4,080,000 gallons. All waste streams are monitored and chemically treated resulting in an effluent stream which is the main interest of these proceedings.

21. A periodic chlorine dosage of the recirculating water is made to control biological organisms fouling plant systems. The entire circulating water flow may be chlorinated as often as twice every 24 hours for approximately 20-30 minutes each time, a total of 40-60 minutes a day. The chlorinated discharge water will then be dosed with dechlorinating chemicals. The Supply System will install an automatic feed sulfur dioxide dechlorination system. A monitor upstream of the injection point will monitor the level of chlorine. The amount of sulfur dioxide will be adjusted according to the level monitored. A downstream chlorine monitor will check for residual chlorine and set off an alarm if any be detected.

The chlorine monitors are continuous mechanical monitors utilizing the amperometric titration method of analysis which enables a constant readout of chlorine levels in the line as low as .05 to .01 mg/l. .01 mg/l of chlorine is considered the lowest level detectible by using a manual amperometric titration method under controlled laboratory conditions.

In addition, a grab sample of downstream effluent will be taken once a week after a chlorination sequence for analysis under controlled laboratory conditions. This analysis will serve as a calibration and performance check for the mechanical analyzer being used on a continuous basis. Should the mechanical equipment malfunction, grab samples shall be taken and analyzed every four hours.

By implementing this design, it is practically feasible for the plants to reduce chlorine discharges to, or near, zero, a level

described as "no detectible amount." This term means continuous monitored chlorine levels at or below .05 mg/l of chlorine.

22. Makeup water to the steam supply system must be demineralized to prevent damage to the steam generators and the turbine. Makeup water demineralization is accomplished by means of ion-exchange in a series of resin beds using sulfuric acid and caustic soda for regeneration. In addition, condensate demineralizers (polishers) are provided to maintain condensate purity. Regeneration of the make-up demineralizers and condensate demineralizers results in the generation of chemical waste waters which require neutralization prior to disposal. These wastes, plus air conditioner chiller blowdown, auxiliary boiler blowdown, and certain low volume oily wastes are handled by the Chemical Waste Treatment System and collectively comprise the low volume waste sources.

The low volume wastes are a much smaller waste stream than the blowdown. WPPSS projects that a maximum of 150,000 gallons per day (GPD) will be discharged during preoperation and startup. A maximum of 84,000 GPD is projected during normal plant operations.

23. Initially, metal cleaning wastes will be composed of construction debris left in the lines and corrosion products from plant systems after fabrication and prior to normal system operation. Metal cleaning and flushing will be accomplished by means of a high velocity flow of water.

Construction debris and suspended oxides will be settled out of the metal cleaning waste flows in temporary ponds. Treatment will be provided as required to further reduce metal concentrations to meet effluent limitations. Subsequent metal cleaning operations may be required at various times during normal plant operations, such as after scheduled shutdowns.

Grab samples will be taken of each metal cleaning waste discharge. Analysis will be performed for iron, copper, nickel, chromium, total suspended solids, pH, and oil and grease prior to discharge. The calculated flow volume of each discharge will also be recorded.

Due to the higher corrosion rates of certain metals prior to the formation of corrosion inhibiting protective coatings, certain levels, particularly copper, will be higher following the cleaning operations.

24. The copper bearing surfaces designed into the plants prior to the first hearings in 1976 have been substantially replaced with stainless steel in order to attempt to meet copper discharge limitations in the initial permit. Stainless steel surfaces are subject to lower corrosion and erosion rates than copper surfaces

and the corrosion products are less toxic to the aquatic ecosystem. Concentrations of chromium and nickel in the blowdown discharge will increase as a consequence of the stainless steel corrosion. The maximum predicted concentrations are .1 mg/l for chromium and .065 mg/l of nickel. No significant adverse affects to the environment are predicted due to the addition of these daily maximum amounts to the blowdown discharge and cause exists for modifying the existing permit to add these limitations.

25. The plants will be fitted with a supplemental cooling system consisting of a counter-current heat exchanger and associated control and monitoring equipment. Blowdown water is cooled in the heat exchanger using plant makeup water as the cooling medium. The heat exchanger is designed to provide a 3^{o}F approach to makeup water temperature.

The thermal monitoring system for the circulating water system blowdown consists of temperature sensors for the river, makeup well water, and blowdown; and flow sensors for the makeup and blowdown streams. Temperature control of the blowdown will be effected by use of a variable bypass around the heat exchanger. These controls will maintain the discharge temperature within the limits of the proposed operating permit. The designed plants are capable of meeting the temperature discharge restrictions of this proposed permit.

26. Projected levels of copper and zinc in the blowdown discharge depend on a number of variables. The copper in the blowdown discharge is totally the product of background levels in the intake water, concentrated six times, and the corrosion products of the remaining copper tubing. Zinc in the blowdown is totally the product of background zinc levels in the intake water plus a small amount of corrosion from zinc reference electrodes used to monitor the potential for corrosion of the condenser waterboxes by the recirculated cooling water. Major variables in predicting effluent levels are the variation in the samples of ambient river levels of copper and zinc and the tendency for up to 50% of these metals to precipitate and settle in the cooling tower basin, being then removed as solid waste. The per cent figure is a projection and has not been measured.

Background copper levels in ambient Chehalis River water have ranged from .0013 mg/l to .013 mg/l (see findings of fact no. 10). Sampling done for the Supply System from 1977 to 1978 show zinc levels ranging from .0076 to .0097 mg/l, with .0084 mg/l at the discharge area. Appendix I. Historical data for the area suggest a figure .025 mg/l of zinc. Dr Nakatani reports a mean zinc level of.006 mg/l in the Chehalis river water used in his bioassay experiments. Both copper and zinc can be toxic to salmonids depending on concentrations and forms.

27. All waste streams controlled by this proposed permit will enter the river by a diffuser located near the center of the river at outfall 001. The discharge water will be carried by pipe-

line from the plant to the heat exchangers and then to the river through a submerged diffuser discharge structure. The pipeline leading to the diffuser section will extend approximately 118 feet from the south bank of the river, extending northward under the river bed.

The diffuser itself will consist of a 30 foot section of 18 inch diameter pipe perforated with 46 discharge ports. The ports will be two inch diameter and will be spaced at eight inch intervals. The diffuser will be located so that the projecting ports are one foot above the river bottom and will direct the discharge jets downstream at a 12 degree angle above the horizontal. Discharge jet velocity will be about 12.5 fps during two unit operation and 6.25 fps during one unit operation.

28. Certain forms of copper are toxic to fish. Though there is some disagreement within the scientific community as to precisely which forms may be toxic, it is generally now agreed that ionic copper forms are the primary source of copper toxicity. A number of factors affect the toxic availability of copper to biological organisms. The amount of ionic copper in a given sample of water is affected by a number of water quality factors, including pH, hardness, alkalinity, carbonates, phosphates, inorganic and organic ligands.

29. As hardness, alkalinity and pH decrease the proportion of ionic to total copper increases. The levels of hardness, alkalinity and pH in the Chehalis River are relatively low compared to waters cited in the literature. The Supply System, by concentrating the blowdown effluent, raises the levels of alkalinity and hardness and thus, temporarily produces total copper levels that show a relatively low ionic copper concentration. On mixing with the receiving water, chemical reactions take place which convert nonionic copper in the blowdown effluent into ionic copper in the river. Once in the river, some binding or "complexing" of copper occurs which reduces the availability of ionic copper to organisms in the river.

The binding capacity of the Chehalis River has not been demonstrated to be any higher than rivers similarly situated. Though binding does occur from the reaction of copper with both organic and inorganic substances in the river, the quantification of these reactions depends upon variables which are theoretical. It is known that binding capacity is dramatically affected by pH, with low pH levels inhibiting binding thus leaving ionic copper levels relatively high.

30. It is apparent from the literature on the subject of copper toxicity to fish that the differentiation between total copper and ionic copper is one only recently made and in the process of

continuing study. Ionic copper is difficult to measure at low levels. Studies of fish toxicity from copper have, up to the very present, related toxicity to total copper concentrations. A wide range of suggested lethal levels have resulted, no doubt influenced by the forms of copper in the test solutions and the water quality of the water used.

There has been considerable emphasis from all parties on the subject of potential copper toxicity from plant emissions. A number of witnesses have testified directly to the point, most particularly Nakatani, Chu, Calambokidis, Davies and Samuelson. All of these witnesses possess expertise. They variously propose "safe" levels for point of discharge copper concentrations which rise from .005 mg/l to .300 mg/l.

31. To date most toxicity investigations with copper have been concerned with the lethal or sublethal effects. "Lethal effects" are those which directly cause the death of the exposed organism. "Sublethal effects" are those in which copper does not directly cause an organism's death, but may cause adverse changes in growth, behavior, or reproduction. The length of time the organism is exposed to copper has been the other major variable studied.

The relative sensitivity of specific strains of salmonids to different metals varies. Establishing orders of sensitivity to certain forms of metals is difficult. Rainbow trout are commonly thought to be the most sensitive by researchers, yet Dr. Nakatani's bioassays show juvenile chinook salmon as the most sensitive species he tested. Further, the lowest 96 hr LC50 value he found was the sensitivity of chinooks to zinc, rather than copper, as suspected.

Most studies on toxicity of salmonids have been performed with early-life stages ranging from eggs to juveniles. Few studies have been performed to determine the relative sensitivity of mature fish.

32. Investigations of toxicity of copper to salmonids have generally produced a concentration of copper (LC) which has proved lethal to fish in a test solution for a certain period of time, commonly 96 hours. The lethality is expressed in a percentage of the fish killed in a particular replicate. The 96 hr LC50 values are considered standards for acute toxicity. A number of studies have computed LC values for various periods of time and percent kills of test fishes.

Very little is known about the physiologic process of toxication. Various investigations have suggested lethal and sublethal impacts on test fishes for a wide variety of physiologic processes. At highest concentrations interference with cellular

structure is suspected to be the cause of death. Lower concentrations have been suspected of causing inhibited enzyme activity. There is evidence that copper has a profound effect on the hormone activity of salmonids. Adverse effects on respiration and osmoregulation have been established and respiratory disorder is widely suspected to be the immediate cause of death in acute toxicity studies. There is a scarcity of information on the effects of copper on reproduction, though most sublethal factors eventually have an adverse effect. The effect of copper on gonadal tissue is unknown. It has apparently not been studied yet.

33. There is an established avoidance response of salmonids to copper. A threshold concentration of .0023 mg/l has been estimated for the initiation of avoidance responses. Atlantic salmon in one study could detect copper at 10 percent of the lethal concentration. Cough frequency, locomotor activity, feeding response, and other behavioral reactions have been observed in salmon in response to copper. These responses might cause the adult salmon migrating upstream, in a progressively debilitated state from its journey, to fail to reach spawning grounds above locations of copper concentrations.

One study found that less than one-half of the 96 hour lethal threshold value, or about .025 mg/l, caused a marked increase in the number of spawning adults returning downstream without spawning. This factor should be considered related to the possibility of low flows and high tides coinciding with upstream migration of chinook and coho salmon in September and October. The pH values also begin to drop in October, thus increasing the levels of ionic copper in the total copper background.

Lorz and McPherson (1976) found that there was a marked reduction in downstream migration of juvenile coho from concentrations of .005 mg/l to .030 mg/l copper. Though no fish died in their long term experiments, a significant percentage of the juveniles that reached the saltwater died within a short time after entering it. It was suspected that the appetite loss and reduced growth pattern that occurred during exposure produced a general lack of endurance capacity needed for the saltwater challenge.

34. Zinc can also be toxic to salmonids. Apparently it affects different physiologic systems than does copper, though considerably less is known of the effects of zinc than is known of copper. Synergistic effects when copper is combined with zinc have been reported. However, Dr. Nakatani failed to note any synergism in his bioassays. The toxic effects of zinc are additive, however, and the lowest 96 hr LC50 value found in his static aerated bioassays for any combination was .094 mg/l of zinc for juvenile chinook. Findings on zinc toxicity vary widely however, Nominal concentrations of zinc up to 2.5 mg/l in a 144 hour test showed 100% survival in the toxicant and 87% survival in sea water for yearling coho.

35. Exposure time of salmonids to toxicities of heat, copper and zinc are important factors in determining environmental effect. Brief exposures of relatively highly toxic levels will have no effect whatsoever. On the other hand, lengthy exposures to low levels may produce sublethal effects as injurious to the total run as acute toxic levels.

Juvenile salmon and smolts migrating to sea do so rapidly, with the river current, generally at times of relatively high flow. The likelihood of detrimental exposure during that migration from the plant effluent considered here is negligible. Adverse exposure during residency in the river is a much greater concern for juvenile fish.

Upstream migration of mature adults, during times of low flows and possible flow reversals presents a more critical situation. At an ultimate point in its cycle the adult salmon will be physically and physiologically debilitated on its run, significantly weakened. Faced with the plant effluent at a time of reversal and in a place subject to continued and various changes in temperature and river velocity, there exists the possibility that the production of some of those adults might be lost to the run. The process occasioning this loss might be elusive to identify or describe. Such an instance has not been widely examined by expert biologists. Any significantly large loss would certainly be a serious adverse environmental effect. Loss of the migrating adult is a loss of its reproduction.

The remaining significant period related to exposure time is the time that all salmonid species will spend rearing in the river and its systems. In most instances these periods exceed one year. Most of the rearing occurs upstream in the smaller creeks and tributaries used for spawning. Two significant rearing areas have been identified just upstream and just downstream from the discharge site. The stretch immediately adjacent to the diffuser is probably used almost exclusively for traverse to other rearing areas. Though it is suitable for rearing and may be used as such, it is not a significant rearing area. If environmental impacts of any significance result from the discharge of the plant effluent, it is likely they will occur in the stretch of river from the diffuser to the riffle area below it.

36. The discharge from the diffuser will create a turbulent mixing zone with rapid dilution occurring. The characteristics of this dilution plume have been studied carefully and the record is full with evidence of its movements under different circumstances of velocity and tide.

The following principles are incorporated in the design of the dilution system:

a) jet entrainment and turbulent mixing - the varying velocities of the stream and the diffuser create a mixing similar to mechanical stirring;

b) buoyancy - diffuser flow is warmer and lighter in weight than the stream flow and so it rises, causing mixing as it moves to cooler water;

c) mass transport - stream velocities move the warm water forward and away from the heat source;

d) heat transfer across air/water interface - temperature differences between air and water cause conductive heat transfer out or into the water surface. Evaporation causes additional heat transfer from water to air.

Close to the diffuser, turbulent mixing is the dominant process. Buoyancy and mass transport have a more pronounced affect as distance from the diffuser increases, into the intermediate and far fields.

Dilution of heat and dissolved materials will occur at the same rate in the river, under similar conditions. Matter and energy issuing from the diffuser will be diluted by a factor of four to one within four feet of the diffuser ports. Dilution of at least ten to one at the edge of the mixing zone will occur at all river stages during which discharge is allowed according to the terms of the proposed permit.

37. The tolerance of salmonids to temperature changes involves consideration of minimum and maximum temperature tolerance and the maximum temperature differential tolerance, by species. The ultimate upper lethal limit of the most sensitive species residing in the Chehalis is 25.1°C. (Chinook, Brett 1952) At temperatures above that level, the river can be assumed to be fatal to the salmonid species that inhabit the river.

Acclimation occurs when the salmon adjust to a change in temperature. At the outer limit of tolerance, Brett has shown that chinook acclimated to a temperature of 5°C can survive a rise to 21.5°C without acute mortality. As the acclimation temperature rises so does the upper lethal limit until it reaches the level at which death results regardless of temperature variation, 25.1°C, in the case of chinook. Stated a different way, salmon will die at lower temperatures if there is great variation between the temperature in which they are residing and the higher (lethal) temperature to which they are exposed.

Juvenile salmon cannot maintain their swimming positions in currents of greater than about 1 fps. Velocity of the diffuser flow at four feet from the ports is projected to be at least 3 fps. It is likely that few salmon will enter the dilution zone. Sonic tracking studies demonstrate that salmon prefer to pass by the discharge area along the south bank, outside of the dilution zone under all river conditions for which discharge is allowed by the proposed permit.

38. Evidence has been received concerning a "blowdown recycle" system and its application to the WPPSS No. 3 and 5 plants. Elimination of all discharge into the Chehalis River is technically feasible by application of this system. It utilizes chemical treatments and continuously recycling water as the principal design concepts.

A major deficiency with this system is the daily production of solid waste, estimated to weigh sixty tons, for two unit operation. This waste would consist of one-third residue of chemicals added and two-thirds the concentrated background materials in the makeup water. All materials would be concentrated. It is not specifically known what the practical and regulatory problems associated with disposal of this waste may be.

SUMMARY FINDINGS OF FACT

39. The record in the initial hearing conducted in 1976 for NPDES permit encompassed 1600 pages of transcript with exhibits. At that hearing there was extensive treatment of the subject of discharge levels of construction runoff and radioactive waste potential. From the record it appears that there is insubstantial evidence as to copper levels and toxicity, thermal discharge, plume dispersion, diffuser characteristics, chemical background data of river water, and effluent effects on aquatic biota. It is obvious from the previous proceedings that there is a need for additional evidence on such factors in order to more properly protect the environment and maximize plant efficiencies. In view of the above and under the present provisions of the NPDES permit which was issued by the Council, it is not feasible to operate the plants while discharging effluents into the Chehalis River. The permit should be modified so as to serve the policy of the State of Washington in order to achieve minimal adverse effects to the environment and energy at a reasonable cost.

40. There exists cause for modifying the existing permit limitations on the discharge of copper.

The present permit limits copper discharges to .0013 mg/l. This is a point of discharge limitation which could probably not be met if river water were itself discharged from the pipe. It is a level which is beyond the state-of-the-art ability of investigators to detect. It is not feasible for the plant to meet this limitation without shutting off all discharge to the river.

At all times during downstream flow copper discharged into the river through the multiport diffuser will be rapidly diluted and a dilution of at least ten to one will be achieved at the edge of the dilution zone.

Under the proposed permit the plants will be allowed to discharge a maximum of 65 ppb total copper for the first 180 days of operation. However, during the months of August, September and October the limit is 30 ppb regardless of the stage of plant operations. The long term operating level is 30 ppb. It is assumed that the Supply System will schedule the high copper corrosion startup period so as not to affect the upstream migration in August through October. This is not necessary as long as the plants discharge no more than 30 ppb in those months.

The figure of 30 ppb is chosen for the other nine months of the year and for long term operation because it is well within the plant's capacity to achieve. Dr. Roetzer projects long term discharge levels of 26 ppb and he assumes a contribution of 90 ppb from the concentrated well water. If the heated graphite tube direct analysis of copper in well and river water demonstrated background levels which made meeting the long term level of 30 improbable, cause for modification should lie to raise that level accordingly.

The level of 65 ppb was determined by allowing a twenty-to-one dilution after which the maximum level of 7 ppb would be found. This level is considered a minimal effect level in the fully mixed river. At least twenty-to-one mixing will occur before any areas or routes of biological significance, considering all areas in the river, are encountered. The effluent well could be routinely mixed twenty-to-one before encountering any fish. Assuming a background copper concentration of 4 ppb or less, a discharge of 65 ppb total copper would result in a concentration of 7 ppb at twenty-to-one dilution.

Studies will be conducted of the background copper concentration in the river for fifty-two weeks, commencing as soon as practicable and utilizing the heated graphite tube method of atomic absorption. It is expected that copper levels will not exceed 4 ppb, the assumed background level in these findings. Background concentrations of significantly greater levels of copper might provide basis for modification of the permit, depending on the totality of findings and principles set out here.

In addition, bioassay experiments will be commenced as soon as possible as ordered in these findings. These are intended to address the subject of sublethal effects. Any finding that would raise significant concern about the figure of 7 ppb in the fully mixed river as a level of minimal adverse effect may provide cause for modification.

41. Concerning background copper concentrations, the historical USGS data have been judged inadequate for setting effluent limitations. The figure of .013 mg/l is inflated by aberrant values and the methods of measurement lack the precision needed for application to environmental regulation. Though Envirosphere reported levels of .007 and .008 mg/l (7 and 8 ppb), the intial, direct, analysis of those samples showed no detectable amounts, and it was only after concentrating the samples that the reported levels were found. Dr. Roetzer used the USGS and Envirosphere data, or some combination of both, to project 90 ppb contribution form the river to the copper levels in the effluent. In this regard the discharge levels offered for copper in the blowdown are inflated.

Table 14, Appendix G shows mean copper levels of 0 ppb to 2 ppb for four stations in the Chehalis System for June 1973 to June 1974. Samuelson testified to a level of 1.3 ppb + or - .5, taken from a water quality analysis of Chehalis River water done at his request. Perhaps more compelling evidence is Samuelson's water quality sampling of 37 rivers in Oregon, which demonstrates a total mean level for all samples of 1.8 ppb. The copper levels tended to be lower moving from south to north and approximately 70% of the samples taken showed levels too low to detect. The highest recorded level was 5 ppb. He utilized the heated graphite tube method of direct analysis. From the perspective provided by Samuelson's evidence, background levels of 8 - 13 ppb of copper appear extremely high. Dr. Nakatani recorded a mean copper level of 4 ppb for the Chehalis River water used in his bioassay experiments, and measurements made by bioassay laboratories are considered more reliable than field measurements. Based on all of this evidence, the real mean background level for the Chehalis is probably less than 4 ppb.

42. The long term operating level of 30 ppb is essentially dependent on the background copper levels in the river. It is assumed that the corrosion rate of copper in the plant will have slowed to such an extent that concentrating the background copper levels is the only significant function in determining discharge levels. At 4 ppb, under no circumstance should the effluent contain more than 30 ppb of copper. The 30 level allows for no settling in the cooling tower basin and a 20% contribution from corrosion, both factors which shouldn't happen and which work to the plant's advantage. Dr. Roetzer estimated that probable long term discharge would be 26 ppb and he assumed contribution from background levels of 8 - 13 ppb. At 30 ppb in the effluent and 4 ppb in the river, concentration at the edge of the dilution zone would be 6.6 ppb, at twenty-to-one dilution, the level would be 5.3 ppb, very close to the recommendation of Mr. Davies. If the background copper levels prove to be lower, these figures would also be lower, or further from potential harmful impact.

43. Determining how high the long term copper discharge can be without detrimental effect is more difficult. Reported LC50 values were considered. The lowest LC50 values reported were the following, by species: steelhead trout, 20 ppb, Western Fish Toxicology Station (unpublished); rainbow trout, 22 ppb, Colorado Game, Fish, & Parks (1971); chinook swimup, 19 ppb, Chapman (1977); chinook parr, 38 ppb, Chapman (1977); chinook smolt, 26 ppb, Chapman (1977); coho juvenile, 28-38 ppb, Chapman (1977); coho adult; 46 ppb, Chapman (1977); and cutthroat trout, 24.7 ppb, Chakoumakos (1979). Each of these levels produced 50% mortality to test fishes in a 96 hour bioassay with water quality expressed in hardness, alkalinity and pH very similar to that of the Chehalis River.

By contrast, the central most important piece of evidence to the Supply System is the bioassay results of Dr. Nakatani. Without this site specific information and with the work of Chapman so clearly relevant, considering all things that affect bioassay comparability, the sensitivity of salmonids to copper would have been considered four times that shown by Nakatani's bioassays. In favor of the bioassays of FRI is the fact that they used Chehalis River water.

Though the levels of hardness, alkalinity and pH in the Chehalis water would indicate even greater toxicity to salmon than the other investigators showed, Dr. Nakatani produced bioassays which had levels four times higher than the work of the others. It was claimed that these results simply reflected the binding capacity of the river, a factor not controlled by any of the other investigators. The Respondents showed how the high levels could be explained by Dr. Nakatani's use of experimental techniques that deviated from Standard Methods. Each deviation, it was shown, tended to make higher LC50 values, to undervalue sensitivity. It was admitted that long term, non-aerated, flow-through bioassays using measured copper levels and resident species would have been preferred, but the Applicant claimed the resulting variation was not large or significant. Various statistical manipulations were performed by Dr. Chu to demonstrate how a figure of 13 ppb at the edge of the dilution zone would have no effect. Mr. Davies suggested a level of 5 ppb, when fully mixed with the river. Mr. Samuelson recommended that no discharge be allowed until extensive studies were done.

These findings and the order require that thorough and carefully controlled bioassays be performed.

44. The subject of binding capacity of the Chehalis River has been considered. The copper in the river is involved in changes of chemical form. As a consequence, as these changes occur, some

portion of the copper becomes non-toxic to fish, though it had been previously toxic. Complexing is a difficult and confusing subtopic in the general field of water chemistry. Extrapolations in this area have been assailed with charges of theoretical bias. The field is only now developing and is some distance from being able to produce the kind of hard information needed for environmental management.

The bioassays done by Dr. Nakatani appear to be the only studies ever done anywhere which seek to demonstrate the principles of binding capacity with numbers of dead fish. That is to say, there seem to be no other bioassays done which were structured in any way around the concept of copper complexing. It is a theoretical field and its use for setting environmental limits at this time does not seem warranted. It should play the role of an unquantifiable conservative factor in the environment's favor. It has been used as such in these findings.

45. Consideration was given to the use of application factors. The EPA application factor of .1 times the 96 hour LC50 value for the most sensitive resident species was considered. This application factor is an example of how little is known about copper toxicity, particularly sublethal effects. The Supply System asserts that it has no application where there is abundant site specific information. The application factor has a national view, it is true, but most probably the subject of these hearings reflects a need for the most conservative use of that factor-a western stream, subject to extreme low flows and tide reversals, even running upstream for periods of time, a full array of valuable salmonid species acclimated to relatively pristine levels of alkalinity, hardness, pH and heavy metals, no strong complexers in the water, and two nuclear plants discharging into it.

Nevertheless, much of the conservatism of the .1 application factor is due to its use for non-draining bodies of water and the consequent potential for background accumulation. These factors are not significant here and particularly since there is ample mixing prior to probable contact with salmon, the .1 application factor was considered too restrictive.

46. Consideration has been given to potential sublethal effects. It is likely that altered behavior and disruption of physiological processes will result somewhere between 7 and 10 ppb of copper in soft water. Avoidance probably occurs in the same range for fish in the Chehalis. Brief exposures at these levels would probably have no effect whatsoever. Lorz and McPherson reported variously 5 to 7 ppb as a presumed no effect level for coho smolts. The exposure time was lengthy, 160 days, but the hardness and alkalinity of those flow-through experiments was 2½ to 4 times higher than ambient Chehalis River water. McKim and Benoit, studying a full life cycle of the brook trout found no

effect concentrations for survival (9.4 ppb), growth (6.1 ppb), and reproductive capacity (4.5 ppb). This study involved the continuous exposure of two generations of brook trout to low levels of copper. The water was mostly continuous flow, with pH about 7.5 and hardness and alkalinity twice that of the Chehalis. Little is known about sublethal effects. Apparently, sublethal is a relative term with a full range of meaning from irritation to ultimate system failure and death. Some sublethal effects, affecting reproduction for instance, can have far greater detrimental effects on a run than incidents of acute toxicity.

The figure of 7 ppb was determined because of the information on sublethal effects which suggests it as a level of no effect. Further, it is assumed that there will be further mixing and it is possible that the effluent will be at or near ambient levels before any fish is encountered. This is due to the demonstrated preference of fish for parts of the river other than that where the bulk of the mixing will occur. In addition, the ambient copper levels are now probably quite low and fish may not even be threatened by copper until ambient concentrations reach a critically higher level.

Further, the needs of the plant were considered. Corrosion will occur from the copper in the heat exchangers. The corrosion rates commence high and fall as protective coatings are formed on the copper. The Supply System first asked for a limitation of 300 ppb as a consequence of this early corrosion. The higher limit would last for 180 days. At the end of the hearings a limit of 100 ppb was requested by WPPSS. There have been constant assurances about the ability of the plant to meet the proposed permit. Dr. Roetzer projected 164 ppb contribution from corrosion. This is a maximum figure and, in any case it would recede with time. It is composed of more particulate forms than exist in the concentrated river water. The use of settling ponds might be required to meet the 65 ppb level in the months after startup. It is feasible to meet the limit, and for above 65 ppb it has been determined there exists a signficant potential for adverse impact to the fish resources of the river.

47. Cause exists for modifying the low flow restrictions of the existing permit, S 1 B, Note (4), which relate to the discharge of blowdown under certain flow volumes and river velocities. The present permit requires shutdown whenever instantaneous river velocities are less than 1 fps or when instantaneous flow volumes are less than 550 cfs.

This provision was unnecessarily restrictive in that it required the plant to shutdown for instantaneous situations that occur frequently. At river velocity of 1 fps, the river will normally

carry a flow of 1700 cfs. Under that restriction it is likely that the plants would have to be simply shut down for much of the period from June to September, with no consequent benefit to the environment.

The modified restriction requires the plant to cease discharging whenever instantaneous river velocity is .3 fps or less. Under this provision, the plant will cease discharge under all stagnation and reversal situations. Further, discharge shutdown will have occurred well in advance of stagnation (.3 to 0 fps) and for a period after downstream flow is again established (0 to .3 fps). This will assure the essential dilutions of ten-to-one at the edge of the dilution zone (heat) and twenty-to-one before probable encounter with fish (metals and other toxicants). The plant should be able to cease discharge with no loss of production for none of the discharge shutdown periods involved should materially exceed six hours. A six hour cessation of discharge is within the plant's present design capability and this period could be significantly extended by construction of more settling ponds and holding areas.

As for flow volume, the lowest flow recorded moves at a river velocity of greater than .3 fps. Therefore, the flow must be under some tidal influence before the velocity drops below .3 fps. As long as a velocity of .3 fps or greater is moving downstream in the river, there will be sufficient mixing to assure only minimal adverse effect under the terms of the modified permit, regardless of flow volume.

48. Good cause exists for modifying the existing permit provisions relating to chlorine. The proposed modification reduces chlorine discharge to "no detectable amount," recognized in the Special Chlorine Limitation of the existing permit to be synonymous with "no discharge." There is no evidence to support the level of detectability set out in the existing permit of .002 mg/l. It must be changed. Though a level of detectability of .02 mg/l is possible, .05 mg/l is realistically attainable and no significant threat to the environment is presented by the difference in the monitoring levels, where, as here, the Applicant has pledged to discharge no chlorine.

49. Cause exists for modification of the existing permit provisions relating to temperature.

The conditions proposed by the Applicant based on its stipulation with the Department of Ecology have been adopted with one exception. The only indications of what the plant expects to discharge in terms of temperature are Table 2, Appendix B, and Table 7-2, Summary Data Base Document. The maximum discharge temperature addressed in those references is 18.3^{o}C. It is not known why

the Supply System and the Department of Ecology agree to allow discharges of 21°C for a plant that may discharge no more than 18.3°C though there will probably be no significant adverse affects at either level, considering circumstances of dilution and the other restrictions in the proposed permit, there is evidence of sublethal effects (downstream migration of adult chinook without spawning) and critical sensitivities of salmonids generally at the level of 67°F (Gerke), a level quite close to the 20°C limit set in this permit.

There will be sufficient dilution under all river conditions during which discharge is allowed by the modified permit that no significant adverse effect will occur to the aquatic environment. There will be full compliance with the Washington Water Quality Standards. The plume is not expected to intersect areas of biological significance until such time as dilutions assure virtually a no effect difference between plume temperature and ambient river temperature.

The allowed dilution zone is within the unpublished guidelines of the Department of Ecology and has in fact been uncontested by Ecology in these proceedings. It is highly unlikely that fish will enter the dilution zone on even an occasional basis, let alone reside there.

The principal modification is the allowance of a dilution zone. Under the old permit it was not feasible for the plant to meet the Water Quality Standards at the point of discharge and still discharge into the river. The dilution zone is required for that compliance. It was not allowed in the initial permit. Cause for modification is found principally in the hydraulics evidence of river modeling and diffuser performance.

50. Cause exists for modification of the existing permit to change the Daily Maximum and Daily Average Blowdown Effluent Flow (S 1 B) from 4.03×10^6 (6.3 cfs) and 3.7×10^6 to 4.15×10^6 (6.47 cfs) and 4.08×10^6 (6.36 cfs).

The change is minimal and conforms more specifically and accurately to plant design capacities while presenting no measurable impact to the environment.

51. Cause exists for addition of limits on zinc in the blowdown discharge. The sources of zinc are two - the background river concentrations and "very small" quantities of zinc fom zinc reference electrode corrosion in the condenser waterboxes. The level requested is 150 ppb of zinc. In its initial application the Applicant stated concerning zinc "..... Zinc, while present in trace amounts in the influent water, will appear in the effluent in uncertain concentrations due primarily to corrosion of

plant components during operation." Apparently redesigns eliminated almost all of the corrosion for now the Supply System suggests "very small" quantities of corrosion from the zinc electrodes. They requested no zinc limit in the draft application offered in the initial hearing. They took no exception to the exclusion of zinc limits in the initial permit and only first raised the matter in this petition to modify. It was a matter which should have been raised much earlier.

Because the contribution of zinc to the discharge from corrosion within the recirculating cooling water system will be minute, for pratical purposes the discharge level will be composed of concentrated background levels. Conservative projections for background levels presented at the hearings used a value of 20 ppb based upon USGS data. The lowest makeup level of zinc supportable by available data is about 10 ppb based upon an average of values obtained in the monitoring program conducted by Envirosphere and reported in Appendix I of the Summary Data Base Report. Based upon a six-fold concentration of this makeup level, the discharge can be expected to contain an average of about 60 ppb of zinc.

The zinc level, therefore, allowed in this proposed permit is 75 ppb. This level will allow some small range of variation around the six-fold concentration of the average ambient level in the makeup water. On discharge, a 10 to 1 dilution, with an assumed background level of 10 ppb, will result in a level of approximately 16 ppb at the edge of the dilution zone and 13 ppb downstream at 20 to 1 dilution.

52. Good cause exists for modifying the existing permit by adding the following blowdown effluent limitations for chromium, nickel and iron:

	Daily Maximum
Chromium	0.1
Nickel	0.065
Iron	1.0

The levels allowed are the maximum expected blowdown concentrations as testified to by Dr. Roetzer. They are the result of concentrating river water and the corrosion of the stainless steel tubing which replaced the copper tubing on redesign. No significant adverse affect will result to the environment by the addition of these concentrations of metals to the blowdown effluent.

53. The information concerning background river levels of heavy metals is insufficient. Many of the basic premises for extrapolations in these proceedings have come from background copper data which might be inaccurate by an order of eight times. There is the distinct need to know the expected background river concentrations of metals identified in this permit. Weekly samples should be taken for a one-year period at the diffuser, the intake area, and upstream from the confluence with the Satsop, using state-of-the-art technique, preferably the heated graphite tube method of atomic absorption testified to by Samuelson, and commencing as soon as is practicable.

54. There is a further need for site specific bioassays, using Chehalis River water as the test medium, as may be approved by the Council.

55. There is no cause to modify the low volume waste portion of the existing NPDES permit. All proposed modifications of this portion of the permit are the result of a reevaluation of the low volume and metal cleaning waste discharge streams conducted by James Wilson. Mr. Wilson was employed by the Supply System in 1975. Hearings on the present permit were taking place in April of 1975. The Supply System gave no indication of its proposed position on low volume waste discharges at that time. It took no exceptions to the findings of the Council on the original permit which in any way related to the present basis for the proposed changes.

The basis for the proposed modifications of low volume wastes are asserted to be "increased operational efficiency." Proposed lack of impact on the environment has been assumed and asserted but not proven. The position of the Supply System in this hearing is completely different on the subject of low volume wastes than it was at the earlier hearing.

Any benefits accruing to the Supply System resulting in reduced energy costs as a consequence of these proposed modifications to the low volume waste limits is elusive, unproven by convincing evidence, and certainly not substantial.

It is feasible for the low volume waste restrictions in the existing permit to be met and the environment would be better served if that is done.

56. There exists no cause to modify the limitations in the metal cleaning waste portion of the existing permit, except for changes in heavy metals consistent with the rest of these findings. S 1 C has been altered only to add levels for heavy metals concentrations and other provisions consistent with these findings.

The requested modifications again are supported only by the testimony of Mr. Wilson. The interests of operational efficiency and flexibility are again the interests served. The reason given for failing to provide or discover the information underlying the request at an earlier time was the asserted fact that nuclear plant operators had not retained their experience with metal cleaning and startup and that acquisition of that information was difficult to obtain. Such an assertion is difficult to credit. The application for siting of these plants was filed in 1973.

Mr. Wilson is a nuclear plant operator. He candidly admitted his interest is efficient and continuous plant performance. He was apparently in some regard limited in his wishes related to metal cleaning by environmental interests within the Supply System's management. Mr. Wilson testified to being placed under environmental constraints by those with expertise. Whoever the latter people were did not, however, step forward and testify to the point, so inquiry could be made. Rather, the Supply System asserts that no environmental effect has been proved by the testimony of Mr. Wilson.

The metal cleaning waste portion of the existing permit is almost precisely the same as the draft offered to the Council by the Supply System in the last proceeding. The existing permit is essentially their request. No exception was taken to that portion of the permit. Mr. Wilson did his reassessment and now the Supply System wants increased average flows fifteen times higher with consequently higher loading limits.

It is feasible for the plant to meet the conditions in the proposed permit on metal cleaning wastes, thus avoiding the potential for significant adverse effects to the aquatic environment.

57. There is no cause to modify the existing permit insofar as the daily maximum effluent limitation for blowdown discharge of oil and grease. After the hearing in this matter was closed on June 20, 1979, the Supply System, by counsel, requested a modification of the existing permit by submitting a request for allowance of 15 mg/l as a daily maximum for such blowdown discharge. The request was based upon an affidavit of Mr. Lekstutis submitted on July 10, 1979. Applicant accompanied the request with a motion to reopen this matter and receive the affidavit as evidence of cause to support the modification. No other support for the modification was offered.

The affiant appeared as witness in the recently closed hearing on behalf of the Applicant; his appearance involved several issues for permit modification, however, he did not give testimony on

the issue raised by the instant motion. In the opinion of the Council, Applicant has had full opportunity to present its evidence as to permit modifications and other parties have had the opportunity to challenge the evidence. However, belatedly Applicant seeks to reopen this matter for additional considerations based solely on the affidavit and without indication that other evidence of substantial nature would be presented should the matter be reopened. In the opinion of the Council the motion should be denied; a reopened hearing would be an unnecessary burden on other parties as well as on the Council. It appears from the motion and from the affidavit that Applicant had the information during the hearing, but now seeks to reopen the matter at a later date. The Council desires to bring the issues in this matter to resolution at the earliest time and believes that a reopening of the hearing would only prolong such decision without guarantee that substantive evidence is involved.

CONCLUSIONS OF LAW

1. The Washington State Energy Facility Site Evaluation Council has jurisdiction over the persons and subject matter of this proceeding.

2. The Council has authority to issue and modify NPDES Permits for the discharge of wastes into state waters. This authority exists pursuant to statutes of the state and United States and is set out in detail in Title 463-38 of the Washington Administrative Code, RCW 80.50, 90.48 and 33 USC 1314, et. seq.

3. Except as authorized herein, no discharges of pollutants into state waters can be permitted by virtue of this order.

4. Adherence to this order and to the NPDES Permit identified in Appendix A, attached hereto, will reasonably assure that discharges made from outfall 001 in the course of operation of the proposed project will comply with provisions of 33 USC 1311, 1312, 1316, and 1317. A certificate so stating may issue.

5. Effluent limitations contained in this order and Appendix A, attached hereto, constitute operational safeguards at least as stringent as applicable Federal standards. These safeguards reasonably assure the public's protection and welfare.

6. The NPDES Permit adopted April 12, 1976 and amended April 26, July 12, and July 26 of 1976 should be modified according to the provisions of WAC 463-38-062, and consistent with the findings and conclusions issued herein. The changes made are set out in the proposed permit, Appendix A, attached hereto.

7. The proposed permit assures compliance with the Washington Water Quality Standards, WAC 173-201, for all discharges made in compliance with the terms and conditions of Appendix A, attached hereto.

8. The proposed permit conforms to the policy and provisions set out in RCW 80.50.010 for all discharges made in compliance with the terms and conditions of Appendix A, attached hereto.

From the foregoing findings of fact and conclusions of law, the Council makes the following order.

O R D E R

IT IS THEREFORE ORDERED That the application of the Washington Public Power Supply System for modification of its existing NPDES Permit authorizing the discharge of pollutants from its WPPSS Nos. 3 and 5 projects be, and the same is hereby, granted only upon conditions as noted in these findings of fact and conclusions of law and order and in the permit set forth in Appendix A, attached hereto and by this reference made a part hereof.

IT IS FURTHER ORDERED That upon issuance of an NPDES Permit as set forth in Appendix A, attached hereto, a certificate issued pursuant to 33 USC 1341, stating and affirming that conditions set forth in the NPDES Permit now issued reasonably assure that any discharges made from the operation of these two projects will be made in compliance with 33 USC 1311, 1312, 1316, and 1317.

DATED At Olympia, Washington, and effective this 8th day of October 1979.

Nicholas D. Lewis
Chairman

ATTEST:

BY
William L. Fitch
Executive Secretary

APPROVED AS TO FORM

By
Kevin M. Ryan
Assistant Attorney General

APPENDIX A

Permit No. WA-002496-1
Issuance Date: 10-27-76
Expiration Date: 10-27-81

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE PERMIT

State of Washington
Energy Facility Site Evaluation Council
Olympia, Washington 98504

In Compliance With the Provisions of
Chapter 155, Laws of 1973, (RCW 90.48) as Amended

and

The Federal Water Pollution Control Act Amendments of 1972,
Public Law 92-500

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
3000 George Washington Way
Richland, Washington 99352

Plant Location:	Section 17 T. 17N, R 6W W.M. South of Satsop Grays Harbor County, Washington	Receiving Water: See Page 2 Discharge Location: See Page2
Industry Type:	Nuclear Steam Electric Generating Plant (WPPSS Nos. 3 & 5)	Waterway Segment No.: See Page 2

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is authorized to discharge in accordance with the special and general conditions which follow.

Nicholas D. Lewis, Chairman
Energy Facility Site
Evaluation Council

APPROVED: April 12, 1976

AMENDED: April 26, 1976

AMENDED: July 12, 1976

AMENDED: July 26, 1976

AMENDED: October 8, 1979

OUTFALL IDENTIFICATION (1)

OUTFALL	RECEIVING WATER	DISCHARGE LOCATION	WATER SEGMENT NO.
001	Chehalis River	Lat. 46°58'26"N Lo. 123°29'19"W	10-22-12
002	Fuller Creek	Lat. 46°58'22"N Lo. 123°27'43"W	10-22-12
003	Workman's Creek	Lat. 46°57'27"N Lo. 123°27'49"W	10-22-12
004	Fuller Creek	Lat. 46°57'55"N Lo. 123°28'27"W	10-22-12
005	Fuller Creek	Lat. 46°58'1" N Lo. 123°28'20"W	10-22-12
006	Fuller Creek	Lat. 46°58'6" N Lo. 123°28'9" W	10-22-12
007	Fuller Creek	Lat. 46°58'12"N Lo. 123°28'9" W	10-22-12
008	Fuller Creek	Lat. 46°58'22"N Lo. 123°47'21"W	10-22-12
009	Chehalis River	Lat. 46°58'30"N Lo. 123°27'15"W	10-22-12
010	Purgatory Creek	Lat. 46°58'20"N Lo. 123°27'19"W	10-22-12

(1) No pollutant discharge from any construction activity or operation associated with this project is authorized from any outfall other than those ten outfalls identified above.

SPECIAL CONDITIONS

S.1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning with the issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge effluents from Outfall Discharge Serial Number 001 subject to the following limitations and monitoring requirements:

A. LOW VOLUME WASTE SOURCES PORTION OF DISCHARGE SERIAL NUMBER 001 PER UNIT(1)

PARAMETER	EFFLUENT LIMITATIONS (2)		MONITORING REQUIREMENTS (3)	
	Daily Maximum	Daily Average	Minimum Frequency	Sample Type
Total Suspended Solids (lb/day)	70	12.5	3 times per week	Grab
(mg/l)	100			
pH	Between 6.5 and 8.5 at all times		3 times per week	Grab
Oil and grease (lb/day)	10.5	6.3	weekly	Grab
(mg/l)	15			
Flow (GPD)(4)	8.4×10^4	$5. \times 10^4$	Each discharge	Log tank contents prior to discharge

Note (1) Permittee shall mix effluent from this source with cooling water blowdown when either cooling tower is operational.

Note (2) When neither cooling tower is operational, low volume wastes must be retained except that during metal cleaning operations the associated low volume wastes flows may be discharged through the equalizing reservoir, settling pond and outfall 009.

Note (3) Permittee shall monitor the effluent from the low volume waste sources for TSS, pH, oil and grease and flow volume prior to mixing with cooling tower blowdown or other in-plant streams.

Note (4) Permittee shall discharge from this source only on an intermittent basis.

B. RECIRCULATED COOLING WATER BLOWDOWN PORTION OF DIFFUSER DISCHARGE SERIAL NUMBER 001 PER UNIT

PARAMETER	EFFLUENT LIMITATIONS		MONITORING REQUIREMENT	
	Daily Maximum	Daily Average	Minimum Frequency	Sample Type
Temperature	Note (2)		Continuous	Instantaneous
Total Residual Chlorine (mg/l)	No detectible amount		Continuous (3)	Instantaneous
pH	Between 6.5 and 8.5 at all times		Continuous (3)	Instantaneous
Flow (GPD) (CFS)	4.15×10^6 6.47	4.08×10^6 6.38	Continuous	Instantaneous
Copper (mg/l)	0.030 See Note (4)		Weekly	Grab
Chromium (mg/l)	0.1		Weekly	Grab
Zinc (mg/l)	0.075		Weekly	Grab
Iron (mg/l)	1.0		Weekly	Grab
Nickel (mg/l)	0.065		Weekly	Grab

Special Chlorine Limitation

Permittee shall be deemed to have satisified the no detectible chlorine limitation if chlorine is continuously monitored by mechanical amperometric analysis with no concentration above .05 mg/l being shown by the monitor (if monitoring equipment malfunctions, grab samples every four hours shall be substituted). A grab sample shall be taken and analyzed under laboratory controls using standard amperometric titration techniques at least weekly to demonstrate continuous monitor performance. Dechlorination facilities shall be started at the same time chlorination begins, and the dechlorination facilities shall be operated for 15 minutes after the dechlorinated effluent from these facilities is monitored at .05 mg/l or less of total residual chlorine.

Note (1) Permittee shall monitor the effluent for temperature, total residual chlorine, pH, copper and flow prior to being mixed with other inplant streams. The amperometric titration method as described in "Standard Methods For The Examination of Water and Wastewater" and in "Annual Book of Standards, Part 23, Water Atmospheric Analysis" shall be used to meet the monitoring requirements specified for total residual chlorine.

RECIRCULATED COOLING WATER BLOWDOWN PORTION OF DIFFUSER DISCHARGE SERIAL NUMBER 001 PER UNIT (continued)

Note (2) The discharge temperature shall be such that the applicable Water Quality Standards for temperature will be complied with at the edge of the dilution zone described in Condition G4. The temperature of the blowdown for recirculated cooling water systems shall not exceed at any time the lowest temperature of the recirculated cooling water prior to addition of the makeup water. Additionally, when ambient river temperatures are 20°C or less, the temperature of the effluent at the point of discharge shall be 20°C or less and shall not exceed the ambient river temperature by more than 15°C; and when ambient river temperatures are greater than 20°C, the temperature of the effluent at the point of discharge shall be equal to or less than the ambient river temperature.

Note (3) Permittee shall include alarm systems for pH control and for total residual chlorine to provide indication of any variance from established limits.

Note (4) Permittee is authorized to discharge total copper up to a daily maximum of 0.065 mg/l for 180 days after initial startup of a unit and for 30 days after a unit is shut down for maintenance, except in the months from August 1 to November 1. During the three months of August, September, and October the maximum allowed daily discharge of copper is 0.030 mg/l.

Note (5) No discharge is permitted from this source at any time when instantaneous river velocities are slower than 0.3 feet per second, at the diffuser, in a downstream direction.

C. METAL CLEANING WASTES PORTION OF DISCHARGE SERIAL NUMBER 001 PER UNIT

PARAMETER	EFFLUENT LIMITATIONS (1)		MONITORING REQUIREMENTS (2)	
	Daily Maximum	Daily Average	Minimum Frequency	Sample Type
Total Iron (lb/day)			3 times per day when discharging	Grab
(mg/l)	1.0			
Total Copper (lb/day)			3 times per day when discharging	Grab
(mg/l)	0.065 (3)			
Nickel (mg/l)	0.065		3 times per day when discharging	Grab
Chromium (mg/l)	0.1		3 times per day when discharging	Grab
Total Suspended Solids (lb/day)	42	5	3 times per day when discharging	Grab
(mg/l)	100			
pH	Between 6.5 and 8.5 at all times		3 times per day when discharging	Grab
Oil and Grease (lb/day)	6.3	2.5	3 times per day when discharging	Grab
(mg/l)	15			
Flow (GPD)	5×10^4	2×10^4	Each Discharge	Calculated Total Volume

Note (1) The daily values indicated are permitted for one cleaning operation only and the discharges are limited to one unit at a time. The cleaning operation discharges may be made only at times when river flow volume at the outfall exceeds 6600 cfs.

Note (2) Permittee shall monitor the metal cleaning wastes prior to their confluence with any other discharge stream emitting from the project except that metal cleaning wastes flows may be discharged through the equalizing reservoir, settling pond and outfall 009 in which case the flow rate limitations shall apply to their discharge from the settling pond.

Note (3) Under no circumstances will more than a daily maximum of .030 mg/l of copper be discharged during the period from August 1 to November 1 in any year.

Amd 10-8-79

D. SANITARY SERVICE PORTION OF DISCHARGE SERIAL NUMBER 001 (1)

PARAMETER	EFFLUENT LIMITATIONS (2)		MONITORING REQUIREMENTS (3)	
	Daily Maximum	Daily Average	Minimum Frequency	Sample Type
Biochemical Oxygen Demand (5 day) (lb/day)	7.5	5.0	Weekly	Composite
(mg/l)	45	30		
Total Suspended Solids (lb/day)	7.5	5.0	Weekly	Composite
(mg/l)	45	30		
Fecal Coliform Bacteria	400 per 100 ml	200 per 100 ml	Weekly	Day shift grab
pH	Between 6.5 and 8.5	at all times	3 times weekly	Day shift grab
Flow (GPD)	2×10^4	2×10^4	Continuous	Instantaneous
Total Residual Chlorine (mg/l)	0.5 mg/l maximum prior to mixing with cooling tower blowdown		3 times weekly	Grab

Note (1) When neither cooling tower is operational, sanitary wastes must be retained.

Note (2) Permittee shall mix effluent from this source with cooling water blowdown when either cooling tower is operational.

Note (3) Permittee shall monitor the effluent prior to mixing with other inplant streams.

S.2 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL DISCHARGE SERIAL NUMBERS 002, 003, 004, 005, 006, 007, 008, 009 and 010.

During the period beginning with the issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge effluents from Outfall Discharge Serial Numbers 002, 003, 004, 005, 006, 007, 008, 009 and 010 subject to the following limitations and monitoring requirements:

1. pH factor, coliform content, dissolved oxygen, total dissolved gas content and temperature should not exceed normal area runoff amounts.

2. The presence of oil, grease, or polychlorinated biphenyl in outfall discharges will not be tolerated.

A. COLLECTED STORM RUN-OFF DRAINAGE OF DISCHARGE SERIAL NUMBERS 002, 003, 004, 005, 006, 007, 008, 009 and 010.

PARAMETER	EFFLUENT LIMITATIONS (1)	MONITORING REQUIREMENTS	
		Minimum Frequency	Sample Type
Total Suspended Solids	50 (mg/l) maximum	Once per ½ day when there is discharge from the storm collector basins	Grab 2-hours after discharge begins
Settleable Solids (ml/l)	0.1		
pH	Between 6.5 and 8.5 at all times	Once per ½ day when there is discharge from the storm collector basins	Grab 2-hours after discharge begins
Flow (2)	Pond Discharges shall not cause tributary creeks to exceed their immediately previous maximum storm levels.		

Note (1) Any untreated overflow from facilities designed, constructed and operated to treat the volume of material storage runoff and construction runoff which results from a 10-year 24-hour rainfall event (5.5 inches per 24-hours) to the levels specified above shall not be subject to the limitations above for total suspended solids, settleable solids, and pH.

Note (2) All ditches must be appropriately routed to sedimentation and erosion control ponds.

GENERAL CONDITIONS

G1. No discharge of polychlorinated biphenyl compounds, such as transformer fluid, is permitted. No discharge of materials added for corrosion inhibition including but not limited to zinc, chromium and phosphorous is permitted.

G2. All discharges and activities authorized herein shall be consistent with the terms and conditions of this permit. Permittee is authorized to discharge those pollutants which are: (1) contained in the untreated water supply, (2) entrained from the atmosphere, or (3) quantitatively identified in the permit application; except as modified or limited by the special or general conditions of this permit. However, the effluent concentrations in the permittee's waste water shall be determined on a gross basis and the effluent limitations in this permit mean gross concentrations and not net additions of pollutants. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit. The discharge of liquid radioactive wastes during normal plant operations, shall be in accordance with Appendix I (10 CFR 50).

G3. Permittee shall notify the Council no later than 120 days before the date of anticipated first discharge from outfall 001 under this permit.

G4. Notwithstanding any other condition of this permit, the permittee shall not discharge any effluent which shall cause a violation of State of Washington Water Quality Standards as they exist now or hereafter are amended, at the edge of a dilution zone described as:

a) Extending from the surface to the bottom of the river:
b) Extending upstream from the diffuser to 50 feet and downstream from the diffuser 100 feet; and
c) Extending 25 feet laterally towards the river banks from the midpoint of the diffuser.

G5. The permittee shall provide an adequate operating staff which is qualified and shall carry out the operation, maintenance, testing and reporting activities required to assure compliance with the conditions of this permit.

G6. Notwithstanding any other condition of this permit, permittee shall handle and dispose of all solid waste material from plant operations, including settled silts, sludges, and any other source in such a manner as to prevent any pollution of ground or surface water quality. Prior to the production of solid wastes, the permittee shall obtain Council approval of the proposed method of handling and disposing of solid wastes.

G7. Whenever a facility expansion, associated construction operation, production increase, or process modification is anticipated which will result in a new or increased discharge, or which will cause any of the conditions of this permit to be exceeded, a new NPDES application must be submitted together with the necessary reports and engineering plans for the proposed changes. No such change

shall be made until plans have been approved and a new permit or permit modification has been issued. If such changes will not violate the effluent limitations specified in this permit, permittee shall notify the Council of such changes prior to such facility expansion, production increase or process modification.

G8. If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under state law or under Section 307(a) of the Federal Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee shall be so notified.

G9. If, for any reason, the permittee does not comply with or will not be able to comply with any effluent limitations specified in this permit, the permittee shall:

a) Immediately take appropriate action to stop, contain, and clean up the unauthorized discharge and correct the problem.

b) Provide the Council and Department of Ecology with the following information, in writing, within 48 hours of becoming aware of such conditions:

(1) A description of the discharge and cause of noncompliance; and

(2) The period of noncompliance, including dates and times; or if not corrected, the anticipated time the noncompliance is expected to continue and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G10. The permittee shall at all times maintain in good working order and efficiently operate all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

G11. The diversion of any discharge or bypass of any facilities utilized by the permittee to maintain compliance with the terms and conditions of this permit is prohibited, except (a) where unavoidable to prevent loss of life or severe property damage, or (b) where excessive storm drainage or runoff (See Special Condition 2(a) Note (1).) would clearly damage any facilities necessary for compliance with the terms and conditions of this permit. The permittee shall

promptly notify the Council and the Department of Ecology in writing of each such diversion or bypass (See Special Condition 2(A) Note (2).) in accordance with the procedure specified in condition G9.

G12. Permittee shall install an alternative electric power source capable of operating all electrically powered pollution control and monitoring facilities; or, alternatively, permittee shall certify to the Council that the terms and conditions of this permit will be met in case of a loss of primary power to any pollution control or monitoring equipment by controlling production.

Monitoring

G13. Permittee shall comply with the Monitoring Program requirements set forth herein:

Monitoring results for the previous quarter shall be summarized on a monthly basis and reported on a Discharge Monitoring Report Form (EPA 3320-1), postmarked no later than the 28th day of the month following the end of the quarter. The first report is due by the 28th day of the first month following the end of the quarter in which the first discharge under this permit occurs. Duplicate signed copies of these, and all other reports required herein shall be submitted to EPA, the Council and DOE at the following addresses:

U.S. EPA Region X
1200 6th Avenue
Seattle, WA 98101
Attention: Permits Branch

Dept. of Ecology
Olympia, WA 98504

EFSEC
Attention:
Executive Secretary
820 East Fifth Ave.
Olympia, WA 98504

G14. The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentations, record of analysis performed and calibration and maintenance of instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Council.

G15. All samples and measurements made under this program shall be representative of the volume and nature of the monitored discharge.

G16. The permittee shall record such measurement or sample taken pursuant to the requirements of this permit for the following information: (1) the date, place and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of the analyses.

G17. As used in this permit, the following terms are as defined herein:

a) The "daily maximum" discharge means the total pollutant discharge by weight during any calendar day and where specified, the maximum permissible pollutant concentration.

b) The "daily average" discharge means the total pollutant discharge by weight and where specified the average pollutant concentration during a calendar month divided by the number of days in the month that the respective discharges occur. Where less than daily sampling is required by the permit, the daily average discharge shall be determined by the summation of the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

c) "Composite sample" is a sample consisting of a minimum of six grab samples collected at regular intervals over a normal operating day and combined proportional to flow, or a sample continuously collected proportional to flow over a normal collecting day.

d) "Grab sample" is an individual sample collected in a time span of less than 15 minutes.

G18. All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall conform to regulations published pursuant to Section 304(g) of the Federal Act, or if there is no applicable procedure, shall conform to the latest edition of the following references:

a) American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.

b) American Society for Testing and Materials, A.S.T.M. Standards, Part 23, Water, Atmospheric Analysis.

c) Environmental Protection Agency, Water Quality Office Analytical Control Laboratory, Methods for Chemicals Analysis of Water and Wastes.

Alternative methods may be utilized if approval pursuant to 40 CFR 136 or as amended is received by permittee. The Council shall be notified of each such alternative method approved for use.

G19. Except for data determined confidential under Section 308 of the Federal Act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Council and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making a false statement on any such report may result in the imposition of criminal penalties as provided in Section 309 of the Federal Act.

Other Provisions

G20. After notice and opportunity for a hearing this permit may be modified, suspended or revoked in whole or in part during its term for cause including but not limited to the following:

a) Violation of any terms or conditions of this permit;

b) Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;

c) A change in conditions of the receiving waters that requires either a temporary or permanent reduction or elimination of the authorized discharge;

d) If any provision of this permit is declared invalid by the courts.

G21. The permittee shall, at all reasonable times, allow authorized representatives of the Council upon the presentation of credentials:

a. To enter upon the permittee's premises for the purposes of inspecting and investigating conditions relating to the pollution of, or possible pollution of any of the waters of the State, or for the purpose of investigating compliance with any of the terms of this permit;

b) To have access to and copy any records required to be kept under the terms and conditions of this permit;

c) To inspect any monitoring equipment or monitoring method required by this permit; or

d) To sample any discharge of pollutants.

G22. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable, Federal, State or local statutes, ordinances, or regulations.

G23. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject.

G24. The permittee shall notify and afford the Council reasonable opportunity to review and comment on completed design drawings, specifications, and operational procedures for facilities including, but not limited to, the following:

a) Liquid radioactive waste discharge prevention;
b) Sanitary sewage treatment;
c) Low volume waste treatment, including frequency of discharges;
d) Construction run-off ponds;

e) Outfalls and diffusers;
f) River flow measuring stations and tidal effect measuring stations;
g) Metal cleaning waste discharges;
h) Water composition and condition stations.

The Council reserves the right to reject any drawing or procedural manuals for failure to conform to conditions stated in this permit and accompanying order. The Council further reserves the right to require amendments to any drawings or procedural manuals to produce conformance with conditions stated in this order or accompanying permit. Nothing contained herein shall be construed to relieve permittee from any liability arising from deficiencies or omissions in drawings, specifications, or operating procedures.

G25. Prior to the on-site storage of oil and hazardous waste materials the permittee shall obtain Council approval of a spill prevention containment and counter-measure plan which shall include:

a) A description of the reporting system which will be used to alert responsible facility management and appropriate legal authorities.

b) A description of preventive facilities (including overall facility plot) which prevent, contain, or treat spills and unplanned discharges and a compliance schedule to install any necessary facilities in accordance with the approved plan.

c) A list of all hazardous materials used, processed or stored at the facility which may be spilled directly or indirectly into state waters.

Submittal of this plan in accordance with this requirement does not relieve the permittee from compliance with, nor ensure compliance with, the Federal spill prevention requirement contained in 40 CFR part 112 of the Federal Register. Oil Spill Prevention, Containment and Counter-measure Plans prepared in accordance with the above federal requirement may be used in partial fulfillment of this permit requirement.

G26. Permittee must, where applicable, continuously, efficiently, and assiduously operate all pollutant control facilities required by this permit for the duration of this certification.

G27. All necessary action must be taken to eliminate any new unforeseen surface runoff problems threatening to cause discharge of pollutants in quantities or concentrations greater than those authorized by this permit. Permittee must obtain Council approval of all such actions and must promptly notify the Council in writing of all such problems.

G28. All construction related bid documents and construction and installation contracts must contain explicit provisions which adequately and specifically inform contractors of contractors' obligations to adhere to all sedimentation and erosion control standards set forth herein. These contracts shall be made available to the Council on request.

G29. Applicant must monitor and record on a daily basis, water conditions and compositions at the water intake location, should its proposed project be authorized, to detect any variation which may have a significant effect on water quality downstream from the diffuser.

G30. The Council may order applicant to take all appropriate steps, including management of discharges, to maintain water quality conditions. Instantaneous river flow conditions, including any tidal influence, shall be continuously monitored in the vicinity of the diffuser at outfall 001.

G31. Prior to the start of construction, applicant shall submit to the Council for its review, sedimentation and erosion control plan modifications sufficient to insure that no construction runoff discharges wherein suspended solids concentrations exceed 50 mg/l are made and that water quality criteria will be met at construction runoff discharge points, except on occurrence of specific circumstances described in S 2 (a) and G11 of this permit.

G32. In addition to complying with other conditions of this permit, applicant must at all times adhere tc all standards of practice and performance it committed to in the course of hearings held on April 10, 11, 15, 16 and 17, and July 24 and 25, 1975, in this matter.

G33. Empirical measurements of turbidity resulting from discharges must be made at earliest possible times for all outfall locations and as necessary thereafter; measurements taken together with measurement methods must be submitted to the Council for the Council's review and determination that water quality criteria relating to turbidity have been met; and applicant must at the earliest practicable date perform such modifications as are necessary and approved by the Council to assure that discharges made at outfall locations 001 through 010 meet state water criteria relating to turbidity without causing such discharges to exceed other limits set herein.

G34. River flow volumes, which accurately represent outflow conditions immediately above the diffuser pipe, shall be measured on a continuous and permanent recording basis by such method as may be proposed by the permittee and approved by the Council.

Special Studies

G35. Within 14 months after the startup of each unit, permittee shall conduct special studies directed toward determining the temperature and levels and forms of copper and zinc in the receiving water both inside and outside the dilution zone during critical low flow periods as may be approved by the Council.

G36. Studies shall be commenced as soon as practicable and as may be approved by the Council to determine the background levels of heavy metals in the Chehalis River.

Matters to be considered should include, but may not be limited to the following: sampling should occur once a week for fifty-two weeks commencing from the taking of first samples. Sampling should occur at least in the following areas: the diffuser site; upstream immediately above the confluence of the Satsop River; and downstream in the intake area. Analysis should be by heated graphite tube method of atomic absorption. No concentration of samples will occur and analysis in each instance shall be direct. Sampling should occur for each constituent metal limited by this permit.

G37. Thorough bioassays, as may be approved by the Council, shall be commenced as soon as practicable to determine sensitivities of resident salmonids to potential toxicants in the effluent, specifically, copper and zinc.

Matters to be considered should include, but may not be limited to the following: the bioassays should conform as closely as possible to the procedures set out in Standard Methods for The Examination of Water and Wastewater. Specifically, the bioassays should use nonaerated continuous flow sampling of sensitive resident salmonids, using measured amounts of toxicants with strict laboratory controls. The bioassays should be performed on-site and use Chehalis River water as the test medium. A complete record of water quality, particularly pH, hardness and alkalinity should be kept for each replicate. A 96 hour LC50 should be reported for each species tested. The incipient lethal threshhold should be established for each species tested. Long term exposures, at least sixty days, should be tested. Sublethal effects should be studied and assessed. An in-stream "no effect" level should be estimated for each species tested. Species chosen should be within the meaning of "sensitive resident species" as that term is used in the EPA Redbook. Wherever possible strains and families for the Chehalis System should be used for test purposes. There should be assessment of additive

and synergistic effects of toxicants at varying seasonal river temperatures. Various life stages should be studied if practical and some effort to assess the sublethal effects of the toxicants on migrating adult salmon should be attempted. The toxicants to be tested should be zinc and copper.