in the Environmental Impact Statement draft. The EIS failed to consider the impact of risk in the proposal to use plutonium fuel. It fails to disclose and consider the impact of six major safety problems that were formerly reported as unresolved by NRC Staff as of September 2011. The dangerous location of the reactor on the Hanford Nuclear Reservation, the Environmental Impact Statement must disclose and consider the impacts of climate change events, fire, earthquake, explosions that could lead to leaking of radiation from Hanford facilities. It failed to address the spent fuel pools at risk. It failed to address what will happen to the waste. And there has been no seismic analysis, which is of particular concern in light of the Fukushima accident combined with new research findings related to potential seismic habits of the region.

Comment [A71]: 101-72

Comment [A72]: 101-73

Comment [A73]: 101-74

Comment [A74]: 101-75

Comment [A75]: 101-76

Comment [A76]: 101-77

If I understand correctly, the NRC position is that environmental risks exposed by Fukushima will be handled through their normal regulatory process. I find this dangerously ironic, in light of the Associated Press's investigative report published in June of this year that federal regulators have been repeatedly weakening safety standards or simply failing to enforce them in order to keep aging reactors operating within "safety standards." This is simply unacceptable, given the NRC's charge to ensure adequate protection of public health and safety.

Comment [A77]: 101-78

If the NRC truly intends on ensuring the adequate protection of public health and safety, it should deny this license renewal and apply the money that would be spent on operating safety to invest in conservation and renewable energy sources to replace the power of this reactor. Thank you.

Comment [A78]: 101-79

MS. FEHST: Thank you for your comment and thank you for your willingness to give your statement a second time.

Mr. Panfilio would be next. Mr. Panfilio, could you identify yourself by name and also by any organization you might be affiliated with pertaining to your comment?

MR. PANFILIO: It is Madya Panfilio, M-A-D-Y-A, P, as in Paul, A-N, F as in Frank, I-L-I-O, from Vancouver, Washington and a private citizen.

For the citizens of the Northwest, owners of the Columbia Generating Station, and the world, Fukushima is a wake-up call to the world as to the dangerous world we have created. And now we must take responsibility for the arcane nuclear energy causing global climate change. It is time to get to the truth of how gravely dangerous the chemicals are. More public hearings are extremely important.

Comment [A79]: 101-80

Comment [A80]: 101-81

To say that nuclear energy is clean is to say that drinking poison is healthy. Hearts must be open for the courage to do good for the earth in order for us to have good health, long lives, prosperity, and leave a legacy of well-being for future generations.

Comment [A81]: 101-82

Thank you.

MS. FEHST: Thank you for your comment.

Dave, do we have anyone else on the line who is prepared to make a comment?

DAVID: Currently at this time, there are just the parties that you had mentioned already asked their questions; Nancy Morris, Rachel Stierling, Carolyn Mann, Cathryn Chudy, and Madya is the only party left on the call.

MS. FEHST: Okay, there isn't a Lindsey on the line waiting to make a comment?

(Pause.)

MS. FEHST: And maybe while you are checking that, we have another audience member who would like to make a comment. Ed May.

And we will get back to the line one more time after this comment.

MR. MAY: I hope I don't speak too loud. My name is Ed May. I am a union ironworker. I really just have a few brief comments. Having built nuclear plants, worked in coal-fired plants and built them, and worked in and built refineries, there is no easy way for me to say this. I feel much safer working in a nuke plant than I did at the previous two. Thank you.

Comment [A82]: 101-83

MS. FEHST: Thank you for your comment.

Dave on the line, is there any other caller who would like to make a comment at tonight's meeting?

DAVID: Apparently at this time I can open up the lines if you would like me to.

MS. FEHST: Let's do that. Let's take that chance and see if there is anyone remaining who would like to make a comment.

DAVID: The lines are open.

MS. MORRIS: This is Nancy Morris. Can you hear me?

MS. FEHST: Yes, Nancy, we can hear you. I believe you made a comment earlier or asked a question.

MS. MORRIS: Given the fact that you asked for questions in the beginning for clarification, --

MS. FEHST: Yes.

MS. MORRIS: -- I made no comments. I asked a question.

MS. FEHST: Excellent. Okay. Yes, we have you down for questions and now it is your time to make your comment. Please go ahead.

MS. MORRIS: You said to wait to make a comment when it was over.

MS. FEHST: Yes, that's fine. Thank you.

MS. MORRIS: Anyway, I wanted to make a comment that -- Is it okay to go ahead?

MS. FEHST: Yes. Please make your comment. Go ahead. It is your turn. Please make a comment.

MS. MORRIS: Yes, this is Nancy Morris. I wanted to comment, first of all, I agree with Gerry Pollet and I agree with the two previous women who made comments so I won't try to belabor what they said. They said it very, very well.

But I wanted to add that I think it is very disconcerting to have our PUD use the Columbia Generating Station to use nuclear power and also in one case denying documents that are necessary for further clarification on types of hardened casks for the spent fuel waste.

Comment [A83]: 101-84

I also find that the use of clean power is a form of propaganda literally and also anyone who says nuclear power is safe has continually ignored all of the dangers. Essentially that is what is happening.

And if you continually, if the industry continually ignores long-term health effects or long-term environmental impacts when they are assessing safety standards, then anyone can say anything is safe.

Comment [A84]: 101-85

And quite frankly, given the way these type of reviews are going and the way the industry is observing itself in terms of always these low-level dangers. I think not that the licensee system should be completely reviewed and have different and higher standards instigated. That would certainly allow them to compare Fukushima and what happened there.

Comment [A85]: 101-86

And also, too, again, too, actually recognize all the standards that have been improved in terms of wind energy and solar energy to incorporate that in terms of cost of what it would be to have those over the next 20 years versus having the safety standards improved at this plant is very unsafe.

Comment [A86]: 101-87

And I really feel insulted when we have a power analyst or any representative who would continually use the term of nuclear clean power waste in a world of scientist who completely disagree if this were a physicist forum.

Comment [A87]: 101-88

Thank you.

MS. FEHST: Thank you for your comment and your patience. Do we have any other callers who would like to make a comment tonight?

MS. STIERLING: This is Rachel Stierling from Heart of America Northwest and I would like to follow-up a little bit on what Nancy had to say and say that I am just as shocked as she is. And that if we can all sit by and let regulatory commissions sort of to perceive things that we already know are common sense, I think we are, gosh, we are giving this by extension to our children. And maybe it is the tree-hugger philosophy, maybe it's not but it is bullshit and we all know what it is, to be frank. I hear a giggle in the background but you know what I mean. It is ridiculous that we sit around and look at this and in light of what we have seen in the last couple of months, we don't actually have some sort of balance on this and really start to look at it in terms of what it means for our future generations, even when my grandchildren. It is either our grandchildren or either our kids. We are irresponsible if we are not doing better than that and we should be.

Comment [A88]: 101-89

So that is all I am going to have to say about that.

MS. FEHST: Thank you for your comment. Is there anyone else on the line who would like to add to a comment or make an initial comment?

(Pause.)

MS. FEHST: I'll take that as a no. I think we are finished with the callers. Dave, are you there?

DAVID: Yes, I am.

MS. FEHST: Okay. I just wanted to make sure we hadn't lost the line. It sounds like there are no further callers who are interested in making a comment tonight.

Okay. Is there anyone else in the audience who would like to make a comment or add to a comment before we close the meeting for tonight?

Yes, okay. So Gerry Pollet would like to. Come on up to the podium, please.

MR. POLLET: Gerry Pollet with Heart of America Northwest. I cut myself short because I wanted to let other people go. Again, thank you for the Staff's patience. You have been remarkably patient with the technical problems. I really appreciate it.

The safety issues that need to be disclosed and discussed include mitigation for this reactor of the effects of Hanford accidents and the ability to recover from an accident. For instance, we all know in light of Fukushima, or we should know that being able to restore power is a rather critical function. The impact of a release at Hanford could very easily preclude the restoration of power to the reactor and that this EIS also needs to examine the question of what happens when there are multiple failures. CGS is not going to be the only facility at Hanford in the event of a serious design-basis earthquakes or some other accident that requires restoration of power on an urgent basis. There aren't enough linemen available to bring that power in. If there is a take cover on the Hanford site, who is going to being in diesel fuel or lay in lines?

And if the fuel pool for cesium and strontium or another facility has potential for criticality at the same time, or there is a tank rupture and release or aligned leak and release, we need to consider how in the world we are going to mitigate that and restore functionality at this reactor at the same time.

Comment [A89]: 101-90

And it is with great dismay I have to say to read in the EIS that based on NRC's incredibly lax rules, restoration of power, even after the Staff identified it as a concern and suggested being able to survive without power for ten hours instead of seven and five, that was rejected by the applicant, Energy Northwest, and the NRC accepts the rejection of that as "not being cost-effective." That is ridiculous.

The notion that restoration of power having to wait ten hours instead of seven hours can be rejected on the basis of saying that we have done a cost-benefit analysis and the cost doesn't justify being able to do that. The same with being able to have effective diesel backup.

Comment [A90]: 101-91

I just really felt that it is very important that we look at what the interrelationships are on the Hanford site. This is the only commercial reactor in the entire country located in frankly what is the stupidest possible location. It is on the river for cooling water. We all know that. Back in the 1970s, it was free land, the Hanford Nuclear Reservation. Let's build five reactors here. But it was a stupid idea. And at the time in the '70s, no one really knew what was going on at Hanford and what the risks were. The public didn't know. The utility districts that comprised WPPSS didn't know what the risks were from high level nuclear waste tanks at that time from other nuclear facilities.

Now we know. And it is not wise to ignore it. Thank you.

Comment [A91]: 101-92

MS. FEHST: Thank you for your comment. Does anyone else have anything to add? Any final comment? Any new comment?

If not, we will adjourn the meeting and close it for now. And I really want to thank you for your patience throughout all these technical difficulties. I want to really thank you for your respectful listening to all the participants, both the callers and your fellow audience members and I want to remind you of what Dan said earlier. There are many different ways to make comments. Public participation at this meeting is not the only one. Written comments are received by email, by snail mail, by fax. And we do take into account every single comment, every single substantive comment that we receive. And we do hope that we hear from you.

And once again, I really want to thank you for your attention and your attendance. And thank you again. Good night.

(Whereupon, at 9:53 p.m., the foregoing proceeding was adjourned.)

APPENDIX B
NATIONAL ENVIRONMENTAL POLICY ACT ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER PLANTS

B NATIONAL ENVIRONMENTAL POLICY ACT ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER PLANTS

NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants* (referred to as the GEIS), documents the results of the U.S. Nuclear Regulatory Commission (NRC) staff's (staff's) systematic approach to evaluating the environmental impacts of renewing the licenses of individual nuclear power plants. Of the 92 total environmental issues that the staff identified in the GEIS, the staff determined that 69 are generic to all plants (Category 1), while 21 issues must be discussed on a site-specific basis (Category 2). Two other issues, environmental justice and the chronic effects of electromagnetic fields, are uncategorized and must be evaluated on a site-specific basis.

Table B-1 is a listing of all 92 environmental issues, including the possible environmental significance (SMALL, MODERATE, LARGE, or uncategorized) as appropriate. This table is provided in Chapter 9 of the GEIS, is codified in the NRC regulations as Table B-1 in Appendix B, Subpart A, to Title 10 of the *Code of Federal Regulations* (CFR) Part 51, and is provided here for convenience.

Table B-1. Summary of issues and findings

Issue	Type of issue	Finding
	Surface water quality, hydrology, and use	
Impacts of refurbishment on surface water quality	Generic	SMALL. Impacts are expected to be negligible during refurbishment because best management practices are expected to be employed to control soil erosion and spills.
Impacts of refurbishment on surface water use	Generic	SMALL. Water use during refurbishment will not increase appreciably or will be reduced during plant outage.
Altered current patterns at intake and discharge structures	Generic	SMALL. Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Altered salinity gradients	Generic	SMALL. Salinity gradients have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Altered thermal stratification of lakes	Generic	SMALL. Generally, lake stratification has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Temperature effects on sediment transport capacity	Generic	SMALL. These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Scouring caused by discharged cooling water	Generic	SMALL. Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.
Eutrophication	Generic	SMALL. Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Discharge of chlorine or other biocides	Generic	SMALL. Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.

Issue	Type of issue	Finding
Discharge of sanitary wastes and minor chemical spills	Generic	SMALL. Effects are readily controlled through National Pollutant Discharge Elimination System (NPDES) permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.
Discharge of other metals in wastewater	Generic	SMALL. These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat-dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.
Water use conflicts (plants with once-through cooling systems)	Generic	SMALL. These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat-dissipation systems.
Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	Site-specific	SMALL OR MODERATE. The issue has been a concern at nuclear power plants with cooling ponds and at plants with cooling towers. Impacts on instream and riparian communities near these plants could be of moderate significance in some situations. See § 51.53(c)(3)(ii)(A).
		Aquatic ecology
Refurbishment	Generic	SMALL. During plant shutdown and refurbishment, there will be negligible effects on aquatic biota because of a reduction of entrainment and impingement of organisms or a reduced release of chemicals.
Accumulation of contaminants in sediments or biota	Generic	SMALL. Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.
Entrainment of phytoplankton and zooplankton	Generic	SMALL. Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Cold shock	Generic	SMALL. Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations, or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.
Thermal plume barrier to migrating fish	Generic	SMALL. Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Distribution of aquatic organisms	Generic	SMALL. Thermal discharge may have localized effects but is not expected to affect the larger geographical distribution of aquatic organisms.
Premature emergence of aquatic insects	Generic	SMALL. Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.
Gas supersaturation (gas bubble disease)	Generic	SMALL. Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.
Low dissolved oxygen in the discharge	Generic	SMALL. Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

Issue	Type of issue	Finding
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	Generic	SMALL. These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Stimulation of nuisance organisms (e.g., shipworms)	Generic	SMALL. Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.
Aquatic ecology (for plants with once-through and cooling-pond heat-dissipation systems)		
Entrainment of fish and shellfish in early life stages	Site-specific	SMALL, MODERATE, OR LARGE. The impacts of entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. Further, ongoing efforts in the vicinity of these plants to restore fish populations may increase the numbers of fish susceptible to intake effects during the license renewal period, such that entrainment studies conducted in support of the original license may no longer be valid. See § 51.53(c)(3)(ii)(B).
Impingement of fish and shellfish	Site-specific	SMALL, MODERATE, OR LARGE. The impacts of impingement are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. See § 51.53(c)(3)(ii)(B).
Heat shock	Site-specific	SMALL, MODERATE, OR LARGE. Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants. See § 51.53(c)(3)(ii)(B).
Aquatic ecology (for plants with cooling-tower-based heat-dissipation systems)		
Entrainment of fish and shellfish in early life stages	Generic	SMALL. Entrainment of fish has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.
Impingement of fish and shellfish	Generic	SMALL. The impingement has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.
Heat shock	Generic	SMALL. Heat shock has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.
Groundwater use and quality		
Impacts of refurbishment on groundwater use and quality	Generic	SMALL. Extensive dewatering during the original construction on some sites will not be repeated during refurbishment on any sites. Any plant wastes produced during refurbishment will be handled in the same manner as in current operating practices and are not expected to be a problem during the license renewal term.
Groundwater use conflicts (potable and service water; plants that use <100 gallons per minute (gpm)	Generic	SMALL. Plants using less than 100 gpm are not expected to cause any groundwater use conflicts.

Issue	Type of issue	Finding
Groundwater use conflicts (potable and service water, and dewatering plants that use >100 gpm	Site-specific	SMALL, MODERATE, OR LARGE. Plants that use more than 100 gpm may cause groundwater use conflicts with nearby groundwater users. See § 51.53(c)(3)(ii)(C).
Groundwater use conflicts (plants using cooling towers withdrawing makeup water from a small river)	Site-specific	SMALL, MODERATE, OR LARGE. Water use conflicts may result from surface water withdrawals from small water bodies during low flow conditions which may affect aquifer recharge, especially if other groundwater or upstream surface water users come online before the time of license renewal. See § 51.53(c)(3)(ii)(A).
Groundwater use conflicts (Ranney wells)	Site-specific	SMALL, MODERATE, OR LARGE. Ranney wells can result in potential groundwater depression beyond the site boundary. Impacts of large groundwater withdrawal for cooling tower makeup at nuclear power plants using Ranney wells must be evaluated at the time of application for license renewal. See § 51.53(c)(3)(ii)(C).
Groundwater quality degradation (Ranney wells)	Generic	SMALL. Groundwater quality at river sites may be degraded by induced infiltration of poor-quality river water into an aquifer that supplies large quantities of reactor cooling water. However, the lower quality infiltrating water would not preclude the current uses of groundwater and is not expected to be a problem during the license renewal term.
Groundwater quality degradation (saltwater intrusion)	Generic	SMALL. Nuclear power plants do not contribute significantly to saltwater intrusion.
Groundwater quality degradation (cooling ponds in salt marshes)	Generic	SMALL. Sites with closed-cycle cooling ponds may degrade groundwater quality. Because water in salt marshes is brackish, this is not a concern for plants located in salt marshes.
Groundwater quality degradation (cooling ponds at inland sites)	Site-specific	SMALL, MODERATE, OR LARGE. Sites with closed-cycle cooling ponds may degrade groundwater quality. For plants located inland, the quality of the groundwater in the vicinity of the ponds must be shown to be adequate to allow continuation of current uses. See § 51.53(c)(3)(ii)(D).
		Terrestrial ecology
Refurbishment impacts	Site-specific	SMALL, MODERATE, OR LARGE. Refurbishment impacts are insignificant if no loss of important plant and animal habitat occurs. However, it cannot be known whether important plant and animal communities may be affected until the specific proposal is presented with the license renewal application. See § 51.53(c)(3)(ii)(E).
Cooling tower impacts on crops and ornamental vegetation	Generic	SMALL. Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Cooling tower impacts on native plants	Generic	SMALL. Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Bird collisions with cooling towers	Generic	SMALL. These collisions have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Cooling pond impacts on terrestrial resources	Generic	SMALL. Impacts of cooling ponds on terrestrial ecological resources are considered to be of small significance at all sites.

Issue	Type of issue	Finding
Powerline right-of-way (ROW) management (cutting and herbicide application)	Generic	SMALL. The impacts of ROW maintenance on wildlife are expected to be of small significance at all sites.
Bird collisions with powerlines	Generic	SMALL. Impacts are expected to be of small significance at all sites.
Impacts of electromagnetic fields on flora and fauna	Generic	SMALL. No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.
Floodplains and wetland on powerline ROW	Generic	SMALL. Periodic vegetation control is necessary in forested wetlands underneath powerlines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.
	Threatened and endangered species	
Threatened or endangered species	Site-specific	SMALL, MODERATE, OR LARGE. Generally, plant refurbishment and continued operation are not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies would be needed at the time of license renewal to determine whether or not threatened or endangered species are present and whether or not they would be adversely affected. See § 51.53(c)(3)(ii)(E).
	Air quality	
Air quality during refurbishment (non-attainment and maintenance areas)	Site-specific	SMALL, MODERATE, OR LARGE. Air quality impacts from plant refurbishment associated with license renewal are expected to be small. However, vehicle exhaust emissions could be cause for concern at locations in or near non-attainment or maintenance areas. The significance of the potential impact cannot be determined without considering the compliance status of each site and the number of workers expected to be employed during the outage. See § 51.53(c)(3)(ii)(F).
Air quality effects of transmission lines	Generic	SMALL. Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.
	Land use	
Onsite land use	Generic	SMALL. Projected onsite land use changes required during refurbishment and the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.
Powerline ROW	Generic	SMALL. Ongoing use of powerline ROWs would continue with no change in restrictions. The effects of these restrictions are of small significance.
	Human health	
Radiation exposures to the public during refurbishment	Generic	SMALL. During refurbishment, the gaseous effluents would result in doses that are similar to those from current operation. Applicable regulatory dose limits to the public are not expected to be exceeded.
Occupational radiation exposures during refurbishment	Generic	SMALL. Occupational doses from refurbishment are expected to be within the range of annual average collective doses experienced for pressurized-water reactors and boiling-water reactors. Occupational mortality risk from all causes including radiation is in the mid-range for industrial settings.
Microbiological organisms (occupational health)	Generic	SMALL. Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize exposure to workers.

Issue	Type of issue	Finding
Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	Site-specific	SMALL, MODERATE, OR LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals that discharge to small rivers. Without site-specific data, it is not possible to predict the effects generically. See § 51.53(c)(3)(ii)(G).
Noise	Generic	SMALL. Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.
Electromagnetic fields – acute effects (electric shock)	Site-specific	SMALL, MODERATE, OR LARGE. Electrical shock resulting from direct access to energized conductors or from induced charges in metallic structures have not been found to be a problem at most operating plants and generally are not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential at the site. See § 51.53(c)(3)(ii)(H).
Electromagnetic fields – chronic effects	Uncategorized	UNCERTAIN. Biological and physical studies of 60-hertz electromagnetic fields have not found consistent evidence linking harmful effects with field exposures. However, research is continuing in this area and a consensus scientific view has not been reached.
Radiation exposures to public (license renewal term)	Generic	SMALL. Radiation doses to the public will continue at current levels associated with normal operations.
Occupational radiation exposures (license renewal term)	Generic	SMALL. Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.
		Socioeconomic impacts
Housing impacts	Site-specific	SMALL, MODERATE, OR LARGE. Housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or in areas with growth control measures that limit housing development. See § 51.53(c)(3)(ii)(I).
Public services: public safety, social services, and tourism and recreation	Generic	SMALL. Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.
Public services: public utilities	Site-specific	SMALL OR MODERATE. An increased problem with water shortages at some sites may lead to impacts of moderate significance on public water supply availability. See § 51.53(c)(3)(ii)(I).
Public services: education (refurbishment)	Site-specific	SMALL, MODERATE, OR LARGE. Most sites would experience impacts of small significance but larger impacts are possible depending on site- and project-specific factors. See § 51.53(c)(3)(ii)(I).
Public services: education (license renewal term)	Generic	SMALL. Only impacts of small significance are expected.
Offsite land use (refurbishment)	Site-specific	SMALL OR MODERATE. Impacts may be of moderate significance at plants in low population areas. See § 51.53(c)(3)(ii)(I).

Issue	Type of issue	Finding
Offsite land use (license renewal term)	Site-specific	SMALL, MODERATE, OR LARGE. Significant changes in land use may be associated with population and tax revenue changes resulting from license renewal. See § 51.53(c)(3)(ii)(I).
Public services: transportation	Site-specific	SMALL, MODERATE, OR LARGE. Transportation impacts (level of service) of highway traffic generated during plant refurbishment and during the term of the renewed license are generally expected to be of small significance. However, the increase in traffic associated with the additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites. See § 51.53(c)(3)(ii)(J).
Historic and archaeological resources	Site-specific	SMALL, MODERATE, OR LARGE. Generally, plant refurbishment and continued operation are expected to have no more than small adverse impacts on historic and archaeological resources. However, the National Historic Preservation Act requires the Federal agency to consult with the State Historic Preservation Officer to determine whether or not there are properties present that require protection. See § 51.53(c)(3)(ii)(K).
Aesthetic impacts (refurbishment)	Generic	SMALL. No significant impacts are expected during refurbishment.
Aesthetic impacts (license renewal term)	Generic	SMALL. No significant impacts are expected during the license renewal term.
Aesthetic impacts of transmission lines (license renewal term)	Generic	SMALL. No significant impacts are expected during the license renewal term.
		Postulated accidents
Design basis accidents	Generic	SMALL. The staff has concluded that the environmental impacts of design-basis accidents are of small significance for all plants.
Severe accidents	Site-specific	SMALL. The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. See § 51.53(c)(3)(ii)(L).
		Uranium fuel cycle and waste management
Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	Generic	SMALL. Offsite impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of this part. Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases including radon-222 and technetium-99 are small.
Offsite radiological impacts (collective effects)	Generic	The 100-year environmental dose commitment to the U.S. population from the fuel cycle, high-level waste, and spent fuel disposal excepted, is calculated to be about 14,800 person rem, or 12 cancer fatalities, for each additional 20-year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the United States. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect which will not ever be mitigated (for example no cancer cure in the next thousand years), and that these doses projected over thousands of years are meaningful; however, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses

Issue	Type of issue	Finding
		are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations. Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1 (Generic).
Offsite radiological impacts (spent fuel and high-level waste disposal)	Generic	For the high-level waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of radionuclides for the current candidate repository site. However, if it is assumed that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, “Technical Bases for Yucca Mountain Standards,” and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 100 millirem per year or less. However, while the Commission has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty since the limits are yet to be developed, no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 100 millirem per year should be considered as a starting point for limits for individual doses, but notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 100 millirem per year. The lifetime individual risk from 100 millirem annual dose limit is about 3 x 10-3. Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the Department of Energy in the “Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste,” October 1980. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1,000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other Federal agencies have expended considerable effort to develop models for the design and for the licensing of a high-level waste repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, the EPA's generic repository standards in 40 CFR Part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR Part 191 protect the population by imposing the amount of radioactive material released over 10,000 years. The cumulative release limits are based on the EPA's population impact goal of 1,000 premature

Issue	Type of issue	Finding
		cancer deaths worldwide for a 100,000 metric ton (MT) repository. Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high-level waste disposal, this issue is considered in Category 1 (Generic).
Nonradiological impacts of the uranium fuel cycle	Generic	SMALL. The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.
Low-level waste storage and disposal	Generic	SMALL. The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional onsite land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.
Mixed waste storage and disposal	Generic	SMALL. The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.
Onsite spent fuel	Generic	SMALL. The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated onsite with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.
Nonradiological waste	Generic	SMALL. No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.
Transportation	Generic	SMALL. The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 megawatt days per metric-ton uranium and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S–4 – Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in § 51.52.

Issue	Type of issue	Finding
		Decommissioning
Radiation doses	Generic	SMALL. Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem caused by buildup of long-lived radionuclides during the license renewal term.
Waste management	Generic	SMALL. Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.
Air quality	Generic	SMALL. Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.
Water quality	Generic	SMALL. The potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.
Ecological resources	Generic	SMALL. Decommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.
Socioeconomic impacts	Generic	SMALL. Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.
		Environmental justice
Environmental justice	Uncategorized	NONE. The need for and the content of an analysis of environmental justice will be addressed in plant-specific reviews.

B.1 References

U.S. Code of Federal Regulations, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Part 51, Chapter 1, Title 10, "Energy."

Department of Energy (DOE), "Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste," October 1980.

National Academy of Sciences (NAS), "Technical Bases for Yucca Mountain Standards," 1995.

APPENDIX C
APPLICABLE REGULATIONS, LAWS, AND AGREEMENTS

C APPLICABLE REGULATIONS, LAWS, AND AGREEMENTS

The Atomic Energy Act (42 USC § 2021) authorizes the U.S. Nuclear Regulatory Commission (NRC) to enter into agreement with any state to assume regulatory authority for certain activities. For example, through the Agreement State Program, Washington assumed regulatory responsibility over certain byproduct, source, and quantities of special nuclear materials not sufficient to form a critical mass. The Washington State Agreement Program is administered by the Office of Radiation Protection in the Washington State Department of Health.

In addition to carrying out some Federal programs, state legislatures develop their own laws. State statutes supplement, as well as implement, Federal laws for protection of air, water quality, and groundwater. State legislation may address solid waste management programs, locally rare or endangered species, and historic and cultural resources.

The Clean Water Act (CWA) allows for primary enforcement and administration through state agencies, given that the state program is at least as stringent as the Federal program. The state program must conform to the CWA and to the delegation of authority for the Federal National Pollutant Discharge Elimination System (NPDES) Program from the Environmental Protection Agency (EPA) to the State. The primary mechanism to control water pollution is the requirement for direct dischargers to obtain an NPDES permit, or in the case of states where the authority has been delegated from the EPA, a State Pollutant Discharge Elimination System permit, under the CWA. In Washington, the Energy Facility Site Evaluation Council (EFSEC) issues and enforces NPDES permits.

One important difference between Federal regulations and certain state regulations is the definition of waters regulated by the state. Certain state regulations may include underground waters, while the CWA only regulates surface waters.

C.1 Federal and State Environmental Requirements

Columbia Generating Station (CGS) is subject to Federal and state requirements for its environmental program. Those requirements are briefly described below. See Section 1.9 of this supplemental environmental impact statement for CGS's compliance status with these requirements.

Table C-1 lists the principal Federal and state environmental regulations and laws that are applicable to the review of the environmental resources that could be affected by this project that may affect license renewal applications for nuclear power plants.

Table C-1. Federal and state environmental requirements

Law/regulation	Requirements
	Current operating license and license renewal
10 CFR Part 51. *Code of Federal Regulations* (CFR), Title 10, *Energy*, Part 51	"Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." This part contains environmental protection regulations applicable to NRC's domestic licensing and related regulatory functions.

Law/regulation	Requirements
10 CFR Part 54	"Requirements for Renewal of Operating Licenses for Nuclear Power Plants." This part focuses on managing adverse effects of aging rather than noting all aging mechanisms. The rule is intended to ensure that important systems, structures, and components will maintain their intended function during the period of extended operation.
10 CFR Part 50	"Domestic Licensing of Production and Utilization Facilities." Regulations issued by the NRC under the Atomic Energy Act of 1954, as amended (68 Stat. 919), and Title II of the Energy Reorganization Act of 1974 (88 Stat. 1242), provide for the licensing of production and utilization facilities. This part also gives notice to all persons who knowingly supply—to any licensee, applicant, contractor, or subcontractor—components, equipment, materials, or other goods or services, that relate to a licensee's or applicant's activities subject to this part, that they may be individually subject to NRC enforcement action for violation of § 50.5.
Air Quality protection	
Clean Air Act (CAA) (42 USC §7401 et seq.)	The Clean Air Act (CAA) is a comprehensive Federal law that regulates air emissions. Under CAA, Federal actions cannot thwart state and local efforts to remedy long-standing air quality problems that threaten public health issues associated with the six criteria air pollutants (i.e., ozone, nitrogen dioxide, sulfur dioxide, particulate matter, carbon monoxide, and lead).
Water resources protection	
Clean Water Act (CWA) (33 USC 1251 et seq.) and the NPDES (40 CFR 122)	The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. and regulating quality standards for surface waters.
Wild and Scenic River Act (16 USC 1271 et seq.)	The Wild and Scenic River Act created the National Wild and Scenic Rivers System, established to protect the environmental values of free flowing streams from degradation by impacting activities including water resources projects.
Water Code of 1917 (Revised Code of Washington (RCW) 90.03)	The Water Code of 1917 establishes the procedures for water management in the state of Washington, including administration and adjudication and water rights.
The 1945 Groundwater Code (RCW 90.44)	This code extends the surface water code and its permitting process to groundwater.
1969 Minimum Water Flows and Levels (RCW 90.22)	RCW 90.22 establishes minimum flow levels to protect fish, wildlife, water quality, and other instream resources.
Water Resources Act of 1971 (RCW 90.54)	RCW 90.54 sets forth fundamentals of water resource policy to ensure that waters of the state are protected and fully used for the greatest benefit.
Water Pollution Control Act (RCW 90.48)	RCW 90.48 establishes water quality policy to insure the purity of all waters of the state and to prevent and control pollution of the waters of the State of Washington.
Growth Management Act (RCW 36.70A)	RCW 36.70A sets forth the provisions providing a clearer link between the development of land and water availability.
Waste management and pollution prevention	
Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.)	Before a material can be classified as a hazardous waste, it must first be a solid waste as defined under the RCRA. Hazardous waste is classified under Subtitle C of the RCRA. Parts 261 and 262 of Title 40 CFR contain all applicable generators of hazardous waste regulations. Part 261.5 (a) and (e) contains requirements for conditionally exempt small quantity generators. Part 262.34(d) contains requirements for small quantity generators. Parts 262 and 261.5(e) contain requirements for large quantity generators.
Pollution Prevention Act (42 USC § 13101 et seq.)	The Pollution Prevention Act formally established a national policy to prevent or reduce pollution at its source whenever possible. The Act supplies funds for state and local pollution prevention programs through a grant program to promote the use of pollution prevention techniques by business.

Law/regulation	Requirements
	Endangered species
Endangered Species Act (ESA) (16 USC § 1531 et seq.)	ESA forbids any government agency, corporation, or citizen from taking (harming or killing) endangered animals without an Endangered Species Permit.
Fish and Wildlife Coordination Act (16 USC § 661 et seq.)	To minimize adverse impacts of proposed actions on fish and wildlife resources and habitat, the Fish and Wildlife Coordination Act requires that Federal agencies consult government agencies regarding activities that affect, control, or modify waters of any stream or bodies of water. It also requires that justifiable means and measures be used in modifying plans to protect fish and wildlife in these waters.
	Historic preservation
National Historic Preservation Act (NHPA) (16 USC § 470 et seq.)	NHPA directs Federal agencies to consider the impact of their actions on historic properties. NHPA also encourages state and local preservation societies.

C.2 Operating Permits and Other Requirements

Table C-2 lists the permits and licenses issued by Federal, state, and local authorities for activities at CGS.

Table C-2. Licenses and permits

Existing environmental authorizations for CGS operations

Permit	Number	Dates	Responsible agency
Operating license	NPF-21	Issued: 12/20/1983 Expires: 12/20/2023	NRC
NPDES Permit	WA-002515-1	Issued: 5/25/2006 Expires: 5/25/2011*	Washington Energy Facility Site Evaluation Council
Lease contract for construction and operation of CGS on Department of Energy (DOE) land	AT(45-1)-2269	Issued: 12/10/1971 Expires: Parcel A 1/01/2022 Parcel B 1/01/2052	DOE
Easement for use of DOE land for CGS access road		Issued: 6/16/1981	DOE
Easement for use of DOE land for CGS security barrier	Contract R006-02ES-14208	Issued: 6/11/2002 Expires: 6/11/2012	DOE
State permit to construct & operate	N/A	Issued: 5/17/1972	Washington Energy Facility Site Evaluation Council
Resolution for multipurpose use of cooling water	122	Issued: 6/27/1977	Washington Energy Facility Site Evaluation Council
Resolution for site restoration plan	244	Issued: 8/22/1988	Washington Energy Facility Site Evaluation Council
Resolution for Radiological Environmental Monitoring Program	260	Issued: 1/13/1992	Washington Energy Facility Site Evaluation Council
Resolution for reactor power uprate from 3,323 MW thermal (MWt) to 3,486 MWt	273	Issued: 9/12/1994	Washington Energy Facility Site Evaluation Council
Resolution for operation of inert waste landfill	288	Issued: 11/10/1997	Washington Energy Facility Site Evaluation Council

Permit	Number	Dates	Responsible agency
Resolution for construction & operation of independent spent fuel storage installation (ISFSI)	295	Issued: 9/11/2000	Washington Energy Facility Site Evaluation Council
Resolution for onsite disposal of cooling system sediment	299	Issued: 8/3/2001	Washington Energy Facility Site Evaluation Council
Resolution for operation of sanitary waste treatment facility	300	Issued: 9/10/2001	Washington Energy Facility Site Evaluation Council
Resolution for fulfillment of wildlife mitigation requirements	302	Issued: 12/15/2003	Washington Energy Facility Site Evaluation Council
Resolution for construction & operation of hydrogen storage facility	303	Issued: 2/18/2003	Washington Energy Facility Site Evaluation Council
Permit for construction & maintenance of river intake & discharge structures	071-OYC-1-000221-75-9	Issued: 3/14/1975	U.S. Army Corps of Engineers
Easement for use of aquatic lands (riverbed and shoreline) for construction & operation of in-river structures	51-076659	Issued: 4/2/2005 Expires: 4/1/2035	Washington Department of Natural Resources
Certificate for withdrawal & consumption of surface water	S3-20141C	Issued: 2/4/1983	Washington Department of Ecology
Certificate for withdrawal & consumption of groundwater	G3-20142C	Issued: 2/5/1979	Washington Department of Ecology
Notification of regulated waste activity	WAD980738488	Issued: 8/11/1982	Washington Department of Ecology
Order about air emissions	672	Issued: 1/8/1996	Washington Energy Facility Site Evaluation Council
Order about air emission from painting & blasting	837	Issued: 2/11/2009	Washington Energy Facility Site Evaluation Council
Registration for operation of miscellaneous x-ray sources	03311	Annual registration Expires: 6/30/2012	Washington Department of Health (through Department of Licensing)
Registration for operation of underground storage tanks	034 003 333	Annual registration Expires: 6/30/2012	Washington Department of Health (through Department of Licensing)
Permit for operation of public water system	920240	Annual registration Expires: 11/30/2012	Washington Department of Health
Certification for operation of public water system	011452	Annual renewal Expires: 12/31/2012	Washington Department of Health
Certification for operation of wastewater treatment system	5835	Annual renewal Expires: 12/31/2012	Washington Department of Ecology
Certification for operation of solid waste landfill	42551	Expires: 4/8/2013	Washington Department of Ecology
Permit for use of commercial low-level radwaste disposal facility	G1018	Annual permit Expires: 2/29/2012**	Washington Department of Ecology
Certification for operation of accredited laboratory	11242	Annual renewal Expires: 8/7/2012	Washington Department of Ecology

Permit	Number	Dates	Responsible agency
License for use of radioactive material in laboratory	WN-L0217-1	Expires: 1/31/2016	Washington Department of Health

Source: Energy Northwest ER (EN, 2010), (EN, 2011), (EN, 2012)

* On 11/19/2010, Energy Northwest submitted an application for renewal. By letter dated 12/29/2010, the Washington Energy Facility Site Evaluation Council (EFSEC) acknowledged receipt and advised that processing of the application would be suspended until the cooling water discharge could be characterized after replacement of the CGS steam condenser. The condenser was replaced during the Spring 2011 maintenance and refueling outage. EFSEC has recommended that Energy Northwest delay characterization of the NPDES discharge until EFSEC finalizes technical support contracting services from the WA Dept. of Ecology. As allowed by Washington Administrative Code section 463-76-061(4), the current permit remains in effect.

** Permit renewal application sent to WA Dept. of Ecology on 1/27/2012.

C.3 References

Energy Northwest (EN), “License Renewal Application, Columbia Generating Station, Appendix E, Applicant’s Environmental Report” 2010, ADAMS Accession No. ML100250666

EN, “Columbia Generating Station, Docket No. 50-397, Environmental Authorizations for CGS Operation,” April 20, 2011, ADAMS Accession No. ML11112A130

EN, “Columbia Generating Station, Docket No. 50-397, Environmental Authorizations for CGS Operation,” June 23, 2011, ADAMS Accession No. ML111750188.

EN, “Columbia Generating Station, Docket No. 50-397, Response to Request for Additional Information, License Renewal." Richland, WA, February 7, 2012, ADAMS Accession No. ML12040A017.

APPENDIX D
CONSULTATION CORRESPONDENCE

D CONSULTATION CORRESPONDENCE

The Endangered Species Act of 1973, as amended; the Magnuson-Stevens Fisheries Management Act of 1996, as amended; and the National Historic Preservation Act of 1966 (NHPA) require that Federal agencies consult with applicable state and Federal agencies and groups before taking action that may affect threatened or endangered species, essential fish habitat, or historic and archaeological resources, respectively. This appendix contains consultation documentation.

Table D-1 lists the consultation documents sent between the U.S. Nuclear Regulatory Commission (NRC) and other agencies. The NRC staff is required to consult with these agencies based on the National Environmental Policy Act of 1969 (NEPA) requirements.

Table D-1. Consultation correspondence

Author	Recipient	Date of letter/email
Pham, B., NRC	A. Brooks, Washington State Historic Preservation Officer	March 18, 2010 (ML100610084)
Pham, B., NRC	L. Cloud, Yakama Nation	March 19, 2010 (ML100770417)
Pham, B., NRC	E. Patawa, Confederated Tribes of the Umatilla Indian Reservation	March 19, 2010 (ML100770417)
Pham, B., NRC	S. Penney, Nez Perce Tribe	March 19, 2010 (ML100770417)
Pham, B., NRC	R. Thorson, U.S. Fish & Wildlife Service (USFWS), Pacific Region	March 22, 2010 (ML100710046)
Whitlam, R., State of Washington Department of Archaeology & Historic Preservation	B. Pham, NRC	March 29, 2010 (ML100900230)
Pham, B., NRC	R. Whitlam, State of Washington Department of Archaeology & Historic Preservation	April 15, 2010 (ML100960116)
Pham, B., NRC	R. Nelson, Advisory Council on Historic Preservation	April 20, 2010 (ML100970721)
Whitlam, R., State of Washington Department of Archaeology & Historic Preservation	B. Pham, NRC	April 21, 2010 (ML101160095)
Pham, B., NRC	B. Thom, National Marine Fisheries Service (NMFS), Northwest Region	May 3, 2010 (ML100980161)
Suzumoto, B., NMFS	B. Pham, NRC	June 23, 2010 (ML101830405)
Doyle, D., NRC	G. Kurz, USFWS, Central Washington Field Office	November 5, 2010 (ML103120452)
Kurz, G., USFWS, Central Washington Field Office	D. Doyle, NRC	November 8, 2010 (ML103120486)
Pham, B., NRC	R. Whitlam, State of Washington Department of Archaeology & Historic Preservation	November 30, 2010 (ML103280421)
Whitlam, R., State of Washington Department of Archaeology & Historic Preservation	B. Pham, NRC	December 1, 2010 (ML103350680)

Author	Recipient	Date of letter/email
Domingue, R., NMFS	D. Doyle, NRC	December 17, 2010 (ML103510668)
Kurz, G., USFWS, Central Washington Field Office	D. Doyle, NRC	June 16, 2011 (ML111680221)
Domingue, R., NMFS	D. Doyle, NRC	June 27, 2011 (ML111821975)
Wrona, D., NRC	C. Miller, Confederated Tribes of the Umatilla Indian Reservation	August 23, 2011 (ML11161A011)
Wrona, D., NRC	V. Kate Valdez, Yakama Nation	August 23, 2011 (ML11161A011)
Wrona, D., NRC	R. Buck, Wanapum Band	August 23, 2011 (ML11161A011)
Wrona, D., NRC	P. Baird, Nez Perce Tribe	August 23, 2011 (ML11161A011)
Wrona, D., NRC	C. Pleasants, Confederated Tribes of the Colville Reservation	August 23, 2011 (ML11161A011)
Wrona, D., NRC	R. Whitlam, State of Washington Department of Archaeology & Historic Preservation	August 23, 2011 (ML11161A061)
Wrona, D., NRC	R. Thorson, USFWS, Pacific Region	August 23, 2011 (ML11161A003)
Wrona, D., NRC	R. Domingue, NMFS	August 23, 2011 (ML11165A023)
Whitlam, R., State of Washington Department of Archaeology & Historic Preservation	D. Wrona, NRC	September 1, 2011 (ML11252B053)
Logan, D., NRC	L. Gauthier, USFWS, Central Washington Field Office	September 28, 2011 (ML11272A066)
Berg, K., USFWS	D. Wrona, NRC	October 5, 2011 (ML11291A157)
Stelle, W., NMFS	D. Wrona, NRC	October 24, 2011 (ML11307A393)
Longenecker, J., Confederated Tribes of the Umatilla Indian Reservation	D. Doyle, NRC	November 15, 2011 (ML11325A183)
Reichgott, C., U.S. Environmental Protection Agency (EPA), Region 10	C. Bladey, NRC	November 16, 2011 (ML11334A069)
Wrona, D., NRC	W. Stelle, NMFS	December 20, 2011 (ML11335A127)
Wrona, D., NRC	J. Longenecker, Confederated Tribes of the Umatilla Indian Reservation	January 31, 2012 (ML11355A042)
Wrona, D., NRC	R. Whitlam, State of Washington Department of Archaeology & Historic Preservation	January 31, 2012 (ML11356A254)
Domingue, R., NMFS	D. Doyle, NRC	February 10, 2012 (ML12044A329)

D.1 Consultation Correspondence

The following pages contain copies of the letters listed in Table D-1.

March 18, 2010

Allyson Brooks, Ph.D.
State Historic Preservation Officer
PO Box 48343
Olympia, WA 98504-8343

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION (LOG NO.: 121007-20-NRC)

Dear Dr. Brooks:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating license for Columbia Generating Station (CGS), which is located in Benton County, Washington approximately 12 miles northwest of Richland. CGS is operated by Energy Northwest. The application for renewal, dated January 19, 2010, was submitted by Energy Northwest pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54).

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants", NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC regulation that implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and cultural resources.

In the context of the National Historic Preservation Act of 1966, as amended, the NRC staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs that may be impacted by post-license renewal land-disturbing operations or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land-disturbing operations or projected refurbishment activities specifically related to license renewal may potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

On April 6, 2010, the NRC will conduct two public NEPA scoping meetings at the Richland Public Library, located at 955 Northgate Drive, Richland, Washington 99352. You and your staff are invited to attend. Your office will receive a copy of the draft SEIS along with a request for comments. The staff expects to publish the draft SEIS in December 2010.

A. Brooks - 2 -

If you have any questions or require additional information, please contact Mr. Daniel Doyle, Environmental Project Manager, by phone at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

/RA/

Bo M. Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

cc: See next page

March 19, 2010

The Honorable Louis Cloud
Yakama Nation
P.O. Box 151
Toppenish, WA 98948-0151

SUBJECT: REQUEST FOR SCOPING COMMENTS CONCERNING THE COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Chairman Cloud:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Energy Northwest for the renewal of the operating license for the Columbia Generating Station (CGS), located approximately 12 miles northwest of Richland, Washington. CGS is in close proximity to lands that may be of interest to the Yakama Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Yakama Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969 (NEPA).

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for CGS will expire on December 20, 2023. Energy Northwest submitted its application for renewal of the CGS operating license in a letter dated January 19, 2010.

The NRC is gathering information for a CGS site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the CGS site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the CGS Site Area Map (Enclosure 1).

L. Cloud - 2 -

To accommodate interested members of the public and inter-governmental officials, the NRC will hold two NEPA scoping meetings for the CGS license renewal supplement to the GEIS on Tuesday, April 6, 2010 at the Richland Public Library, located at 955 Northgate Drive, Richland, Washington 99352. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 6:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 8:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The CGS license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland, 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams.html. The accession number for the license renewal application is ML100250668. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr@nrc.gov.

The CGS license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html. In addition, the Richland Public Library, located in Richland, WA, and the Kennewick Branch of Mid-Columbia Libraries, located in Kennewick, WA, have agreed to make the license renewal application available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Yakama Nation may have to offer on the scope of the environmental review by May 14, 2010. Written comments should be submitted by mail to the Chief, Rulemaking and Directives Branch, Division of Administrative Services, Mail Stop TWB-5B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC via the Federal rulemaking website: http://www.regulations.gov. Search for documents filed under Docket ID NRC-2010-0029. Address questions about NRC dockets to Carol Gallagher at 301-492-3668 or by e-mail at Carol.Gallagher@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

L. Cloud - 3 -

The NRC staff expects to publish the draft supplement to the GEIS in December 2010. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for CGS is planned for July 2011. If you need additional information regarding the environmental review process, please contact Mr. Daniel Doyle, Environmental Project Manager, at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

/RA/

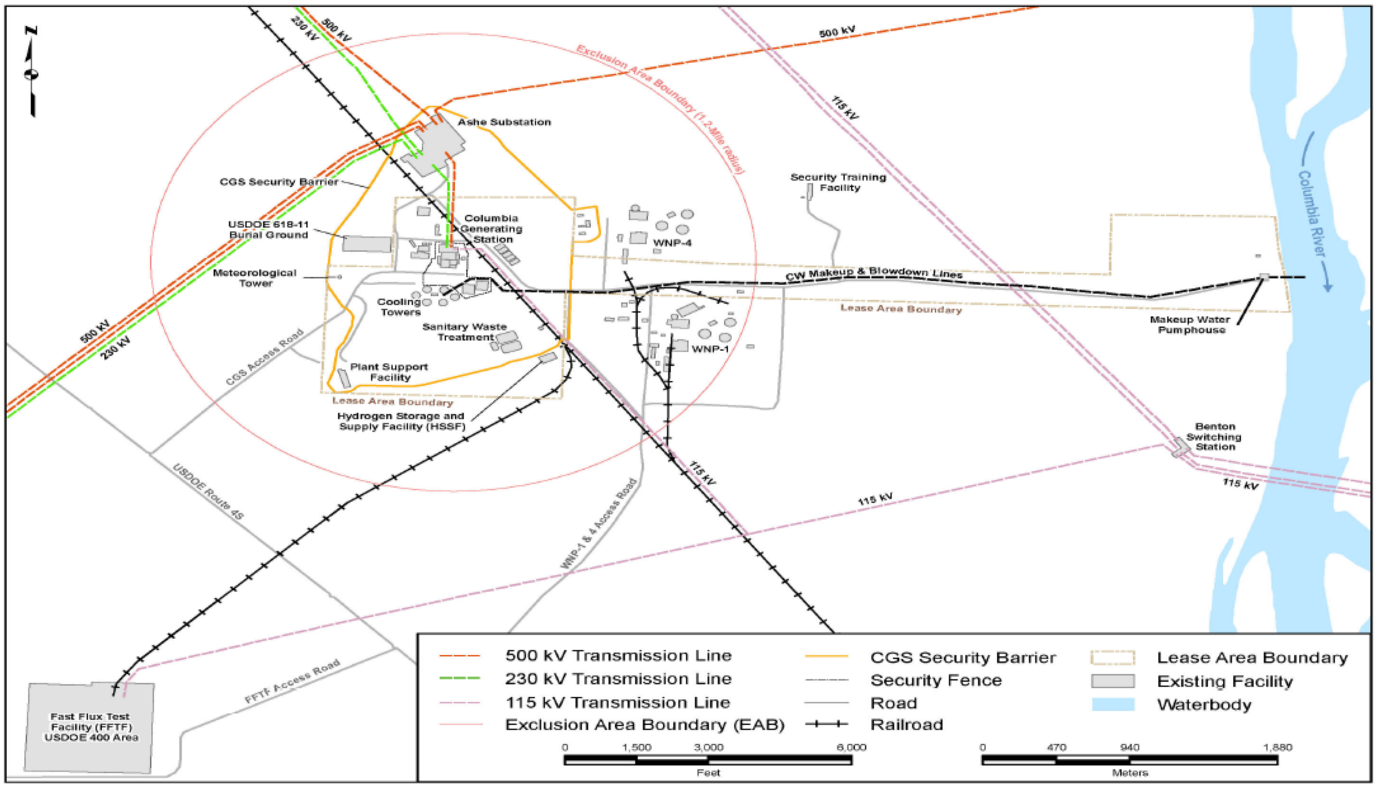
Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
Columbia Generating Station Site Area Map

cc w/encl: See next page

COLUMBIA GENERATING STATION SITE AREA MAP



ENCLOSURE

March 22, 2010

Ms. Robyn Thorson, Regional Director
U.S. Fish & Wildlife Service
Pacific Region
911 NE 11th Ave
Portland, OR 97232

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Thorson:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Energy Northwest for the renewal of the operating license for Columbia Generating Station (CGS). CGS is located on the Columbia River, 12 miles northwest of Richland, WA. As part of the review of the license renewal application, the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of the National Environmental Policy Act (NEPA) of 1969, as amended. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

Energy Northwest stated that it has no plans to alter current operations over the license renewal period and that CGS, operating under a renewed license, would use existing plant facilities and transmission lines and would not require additional construction or disturbance of new areas. Any maintenance activities would be limited to previously disturbed areas. The CGS site is in the southeastern area of the U.S. Department of Energy (USDOE) Hanford Site, a 586 square mile reservation established in 1943 by the federal government for the production of defense nuclear materials. The CGS site comprises 1,089 acres that are leased by Energy Northwest from the USDOE. The lease describes the site in two parcels – a nearly square section containing the plant power block and associated structures and an elongated area running to the river east of the plant.

CGS employs a closed-cycle cooling system that removes heat from its condenser and rejects it to the atmosphere by evaporation using six mechanical draft cooling towers. Water is circulated from the cooling towers through the condenser and back to the circulating water pumphouse at a rate of about 550,000 gpm. Makeup water to replenish water losses due to evaporation, drift, and blowdown is supplied from the makeup water pumphouse located at Columbia River approximately three miles east of the plant. The three 800-hp makeup water pumps are each designed to pump 12,500 gallons per minute (gpm), although normally two pumps are used to supply makeup water to the plant.

The intake system for the makeup water pumps includes two offshore perforated pipe inlets mounted above the riverbed and approximately parallel to the river flow. The intake system is designed for a withdrawal capacity of 25,000 gpm.

Actual makeup water withdrawal during operating periods averages about 17,000 gpm. This is about 0.1% of the minimum river flow in the vicinity of CGS or 0.03% of the average annual flow.

As part of the SEIS, the applicable transmission line corridors will be reviewed. Energy produced at CGS is delivered to the Bonneville Power Authority at the H.J. Ashe Substation located 0.5 mile north of the station. The CGS main generator output is transmitted to Ashe Substation via the step-up main transformer bank and a 2,900-ft long 500-kV tie line. The plant start-up transformer is connected to the Ashe Substation via a 230-kV line. The 230-kV and 500-kV overhead lines run approximately parallel in a 280-ft wide corridor. The lines between CGS and Ashe Substation comprise the transmission intertie that is within the scope of license renewal. The third line supporting CGS is a 115-kV power source that serves as a backup power source for safe shutdown under accident conditions. This line has a right-of-way width of 90 feet and runs between the CGS switchyard and a tap off the 115-kV line that runs from the Benton Switchyard to USDOE Fast Flux Test Facility. This tap is located about 1.8 miles southeast of the plant. (Please see the site area map, Enclosure 3.)

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests a list of species and information on protected, proposed, and candidate species and critical habitat that may be in the vicinity of CGS and its associated transmission line right-of-way. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC staff plans to hold two public NEPA scoping meetings on April 6, 2010 at the Richland Public Library in Richland, WA. You and your staff are invited to attend the public meetings. The first session will convene at 12:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 5:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 8:00 p.m., as necessary.

The week of June 7th, we plan to conduct a site audit. You and your staff are invited to attend both the site audit and the public meetings. Your office will also receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2010.

The CGS license renewal application is available at:

http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

R. Thorson - 3 -

If you have any questions concerning the NRC staff review of this license renewal application, please contact Mr. Daniel Doyle, Project Manager, at (301) 415-3748 or daniel.doyle@nrc.gov.

Sincerely,

/RA/

Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

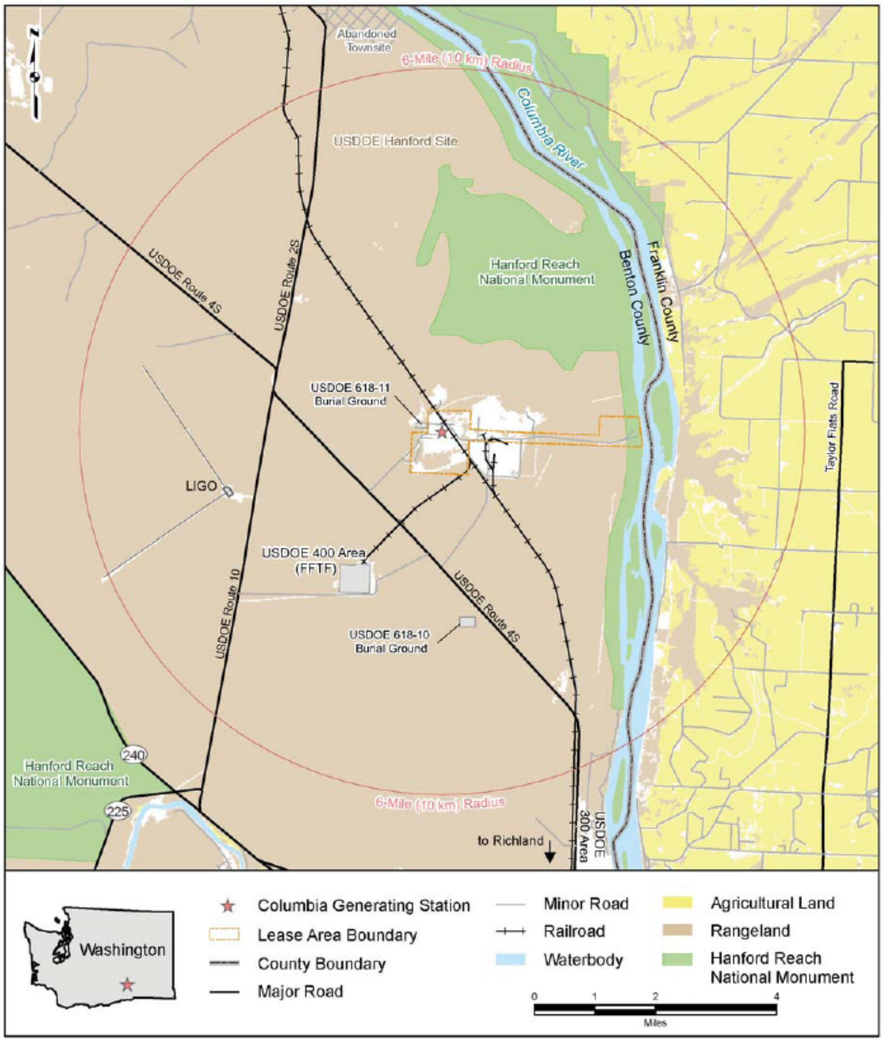
Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map

cc w/encls.: See next page

Area Map, 50-Mile Radius

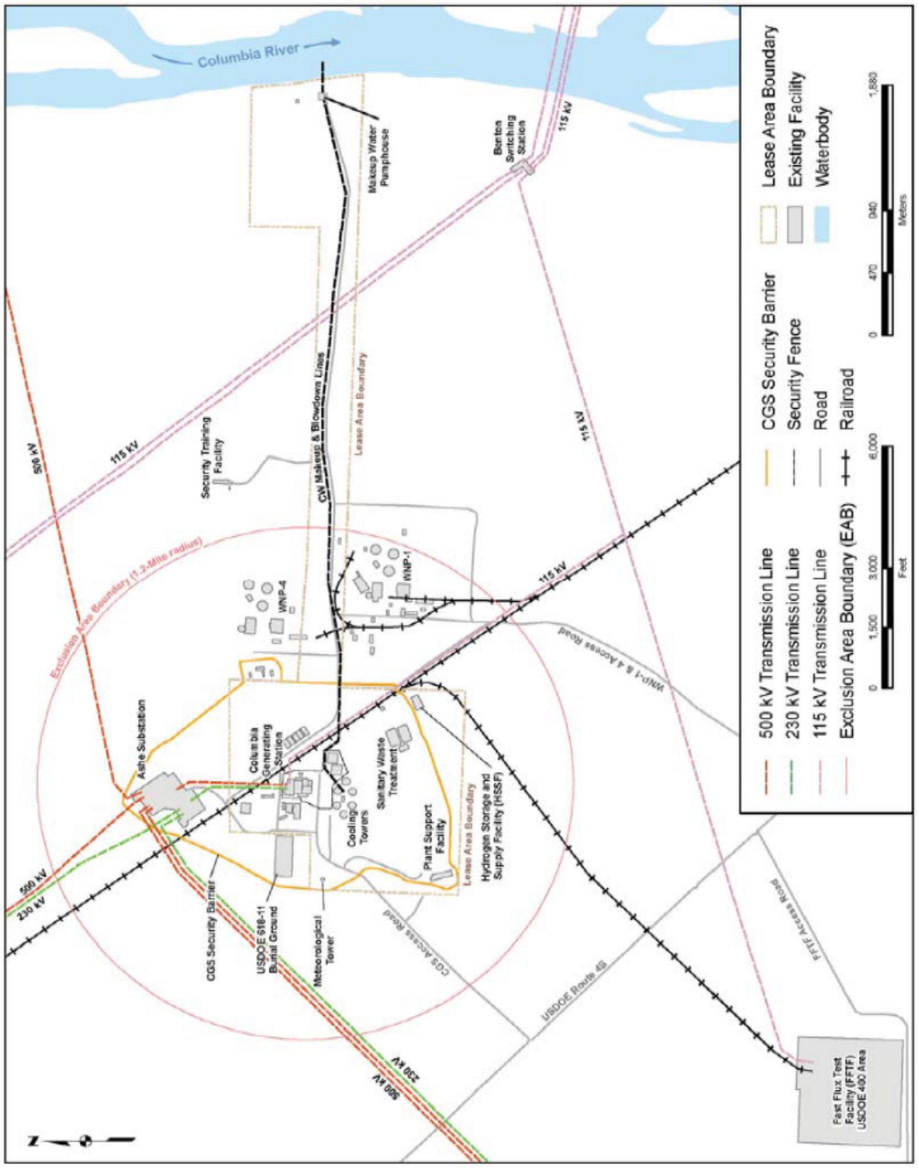
ENCLOSURE 1

Area Map, 6-Mile Radius



ENCLOSURE 2

Site Area Map



ENCLOSURE 3

STATE OF WASHINGTON
DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

March 29, 2010

Mr. Bo M. Pham
Division of License Renewal
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C.

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Pham;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Columbia Generating Station License Renewal at the Hanford Site, Benton County, Washington.

Please provide a map to supplement and illustrate the exact polygon of your proposed Area of Potential Effect (APE) as described in your third paragraph.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the requested materials and further consultation.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

April 15, 2010

Robert G. Whitlam, Ph.D.
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION (LOG NO.: 121007-20-NRC)

Dear Dr. Whitlam:

Enclosed please find the information you have requested regarding the Nuclear Regulatory Commission (NRC) review of the license renewal application for Columbia Generating Station.

The NRC considers the Area of Potential Effect (APE) to include the areas as defined in the enclosed correspondence between Mr. Gregory Cullen, Energy Northwest, and your office.

If you have any questions or require additional information, please contact Mr. Daniel Doyle, Environmental Project Manager, by phone at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

Bo M. Pham, Chief ***/RA/***
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
Applicant's Environmental Report, Attachment D – State Historic Preservation Officer Correspondence

cc w/encl: See next page

ATTACHMENT D

STATE HISTORIC PRESERVATION OFFICER CORRESPONDENCE

TABLE OF CONTENTS

ENERGY NORTHWEST

Gregory V. Cullen
Regulatory Programs
P.O. Box 968, Mail Drop PE20
Richland, WA 99352-0968
Ph. 509-377-6105 F. 509-377-4317
gvcullen@energy-northwest.com

April 10, 2008
GO2-08-055

Allyson Brooks, PhD
State Historic Preservation Officer
Department of Archaeology & Historic Preservation
1063 South Capitol Way, Suite 106
Olympia, WA 98501

Subject: **REQUEST FOR INFORMATION ON ARCHAEOLOGICAL AND HISTORIC RESOURCES**

Dear Dr. Brooks:

Energy Northwest is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Columbia Generating Station (CGS). The renewal term would be for an additional 20 years beyond the current license expiration date in 2023.

As part of the license renewal process, the NRC requires license applicants to "assess whether any historic or archaeological properties will be affected by the proposed project" (10 CFR 51.53). The NRC may also request, under Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470) and Federal Advisory Council on Historic Preservation regulations (36 CFR 800), an informal consultation with your office at a later date. By contacting you early in the application process, we hope to identify any potential issues that need to be addressed or information that your office may require to expedite the NRC consultation.

CGS is located in Benton County in the southeastern portion of the U.S. Department of Energy's Hanford Site. The station is about 3¼ miles west of the Columbia River in Section 5 of Township 11N, Range 28E, Willamette Meridian. The latitude/longitude coordinates are 46° 28' 18" north, 119° 19' 58" west and the approximate Universal Transverse Mercator coordinates are 5,148,840 meters north, 320,930 meters east. The cooling water intake facilities are on the west bank of the river at river mile 352. The station is tied to the Bonneville Power Administration's H.J. Ashe Substation with one-half mile of high-voltage transmission lines. The site location is indicated on the enclosed map.

REQUEST FOR INFORMATION
ON ARCHAEOLOGICAL AND HISTORIC RESOURCES
Page 2

Energy Northwest has no plans to alter current CGS operations over the license renewal period. In addition, maintenance activities necessary to support license renewal would be limited to previously disturbed areas on site. License renewal at CGS would require neither the expansion of existing facilities nor additional land disturbance.

Specifically, we are requesting information on the occurrence or concerns regarding archaeological or historic resources in the site area. We plan to include a copy of this letter and a copy of your response with the license renewal application submitted to the NRC. We would greatly appreciate receiving your reply within 60 days of receipt of this letter to provide ample time to evaluate and incorporate the information into our application.

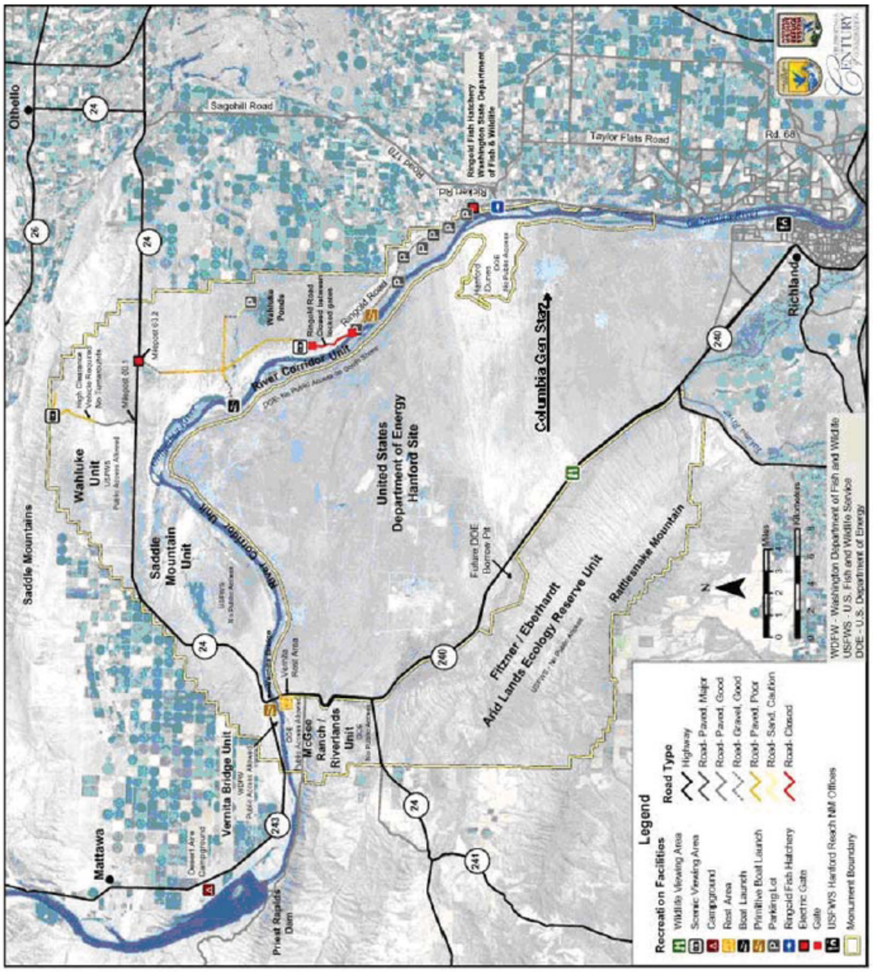
Please contact Abbas Mostala, License Renewal Project Manager, by telephone at (509) 377-4197 or e-mail at aamostala@energy-northwest.com if you have questions or require additional information concerning this request. Thank you for your assistance.

Respectfully,

Gregory V. Cullen

G.V. Cullen
Manager, Regulatory Programs

Enclosure: Location Map



Location Map - Columbia Generating Station

STATE OF WASHINGTON

GI2-08-062

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

April 21, 2008

Mr. Gregory V. Cullen
Energy Northwest
PO Box 968, MS- PE20
Richland, Washington 99352-0968

Re: Columbia Generating Station Project
Log No.: 121007-20-NRC

Dear Mr. Cullen:

Thank you fro contacting our Department. We have reviewed the materials you provided for the proposed Columbia Generating Station Project License at the Hanford Site, Benton County, Washington.

Please provide us your proposed description of the Area of Potential Effect (APE) that conforms with 36CFR 800.16 and 8000.4. We look forward receiving the requested materials illustrating the actual project footprint and the areas subject to planning purposes for response and associated mitigation or treatment.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the reports on the results of your investigations.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
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ENERGY NORTHWEST

Gregory V. Cullen
Regulatory Programs
P.O. Box 968, Mail Drop PE20
Richland, WA 99352-0968
Ph. 509-377-6105 F. 509-377-4317
gvcullen@energy-northwest.com

May 8, 2008
GO2-08-072

Robert G. Whitlam, PhD
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

Subject: **REQUEST FOR INFORMATION ON ARCHAEOLOGICAL AND HISTORIC RESOURCES**

References: 1. Letter dated April 10, 2008, G.V. Cullen (EN) to A. Brooks (DAHS), same subject
2. Letter dated April 21, 2008, R.G. Whitlam (DAHS) to G.V. Cullen (EN) re: Log No. 121007-20-NRC

Dear Dr. Whitlam:

Thank you for the quick response (Reference 2) to our request for information relevant to the possible renewal of the Columbia Generating Station (CGS) operating license. Although the site location was described in some detail in our letter (Reference 1), I can appreciate that the map we provided was not very useful for discerning the project footprint. Hopefully, the attached property map will provide the requested detail. I have also included a vertical photo showing the location of CGS relative to other features in the site area.

As stated previously, our intent is to seek renewal of the current plant operating license. We have no plans to modify the plant or the supporting facilities to accommodate extended operation. To assist in the preparation of the application to be submitted to the U.S. Nuclear Regulatory Commission (NRC), we are requesting information on the occurrence or concerns regarding archaeological or historic resources in the site area. The Department of Archaeology and Historic Preservation can reasonably expect to be approached by the NRC at a later date during the environmental review process.

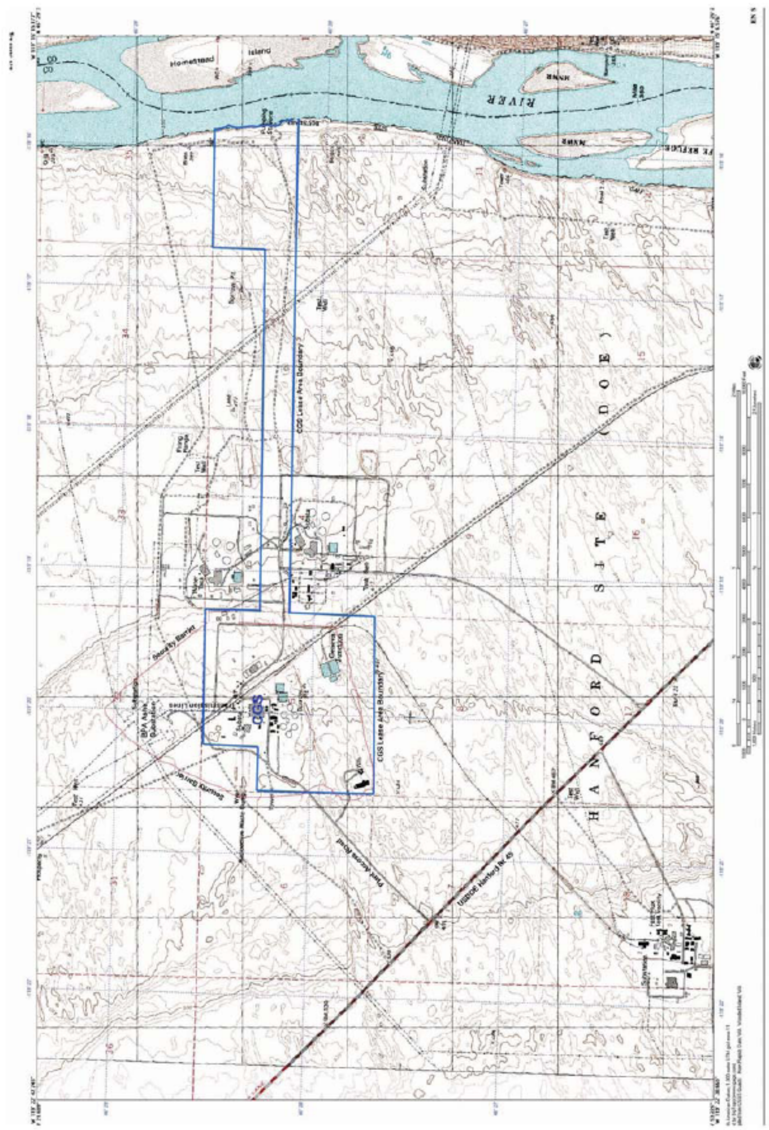
Please contact Abbas Mostala, License Renewal Project Manager, by telephone at (509) 377-4197 or e-mail at aamostala@energy-northwest.com if you require additional information. Thank you again for the assistance.

Respectfully,

Gregory V. Cullen

G.V. Cullen
Manager, Regulatory Programs

Enclosures: Vertical Photo and CGS Site Property Map



Columbia Generating Station – Site Property Map

Columbia Generating Station – Location

STATE OF WASHINGTON GIZ-08-083

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
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(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

May 21, 2008

Mr. G. V. Cullen
Energy Northwest
PO Box 968, MD: PE20
Richland, Washington 99352-0968

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Cullen;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Columbia Generating Station License at the Hanford Site, Benton County, Washington.

We concur with the determination of the Area of Potential Effect (APE). We look forward to receiving the results of your review, consultations with the concerned tribes, and on-site archaeological survey.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the professional report on the results of your investigations.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

ENERGY NORTHWEST

Gregory V. Cullen
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P.O. Box 968, Mail Drop PE20
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Ph. 509-377-6105 F. 509-377-4317
gvcullen@energy-northwest.com

July 31, 2008
GO2-08-114

Robert G. Whitlam, PhD
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

Subject: **REQUEST FOR INFORMATION ON ARCHAEOLOGICAL AND HISTORIC RESOURCES**

References:
1. Letter GO2-08-055, dated April 10, 2008, G.V. Cullen (EN) to A. Brooks (DAHP), same subject
2. Letter dated April 21, 2008, R.G. Whitlam (DAHP) to G.V. Cullen (EN) re: Log No. 121007-20-NRC
3. Letter GO2-08-072, dated May 8, 2008, G.V. Cullen (EN) to R.G. Whitlam (DAHP), same subject

Dear Dr. Whitlam:

The referenced correspondence concerns our request for information relevant to the preparation of an application for renewal of the operating license for the Columbia Generating Station (CGS). As was discussed in a June 4, 2008 phone conversation with Energy Northwest's Jim Chasse, we are expanding the area encompassed by the request to include three transmission lines constructed, operated, and maintained by the Bonneville Power Administration (BPA). We are adding these lines to the project "footprint" because they were included as part of the original project description.

The three transmission lines that are added to our previous description are shown on the enclosed map that depicts a large portion of the U.S. Department of Energy Hanford Site and the Columbia River between river miles 380 and 351. The primary 500-kV line is a nearly straight route between BPA's Ashe Substation and the Hanford Substation 17½ miles to the northwest. The right-of-way width is 350 ft for the first 7¼ miles out of Ashe, 230 ft for about the next 8 miles, and about 125 feet for the last 2¼ miles. It is shown as a red line on the map. The second line is a 230-kV line that shares the 500-kV right-of-way for 7¼ miles and then runs north for about 2½ miles with a right-of-way width of 125 feet. This line is shown as a green line. The third line is a 115-kV back-up power source that taps off another line at a point about 1.8 miles southeast of the plant. The right-of-way width is 90 feet. It is the blue line on the map. The one-half mile segments of 230-kV and 500-kV lines between the power plant and Ashe Substation (described in the Reference 1 and shown on the site property map enclosed with Reference 3) are also shown on the enclosed map.

**REQUEST FOR INFORMATION
ON ARCHAEOLOGICAL AND HISTORIC RESOURCES**
Page 2

A review of the on-line database maintained by the Department of Archaeology & Historic Preservation confirms that there are no properties on the National Register of Historic Places in the immediate site area. The closest listed property is the Wooded Island Archaeological District located about two miles downstream (south) of the CGS makeup water pumphouse at Columbia River mile 352. We note that the 500-kV transmission line crosses Gable Mountain, a location listed on the Washington State register. We are also aware that pre-construction surveys of the mid-1970s noted the presence of two archaeological sites (Nos. 45BN113 and 45BN114) on the west bank of the river approximately one-quarter mile downstream from the pumphouse.

We do not expect continued operation of CGS through the 20-year license renewal period to have an adverse impact on cultural resources because we have no plans to expand the plant or the supporting facilities to accommodate extended operation. Additionally, we have no reason to believe that continued operation would result in changes to the operation and maintenance of the BPA transmission lines. These transmission lines would remain in service as part of the BPA network even if the plant operating license is not renewed.

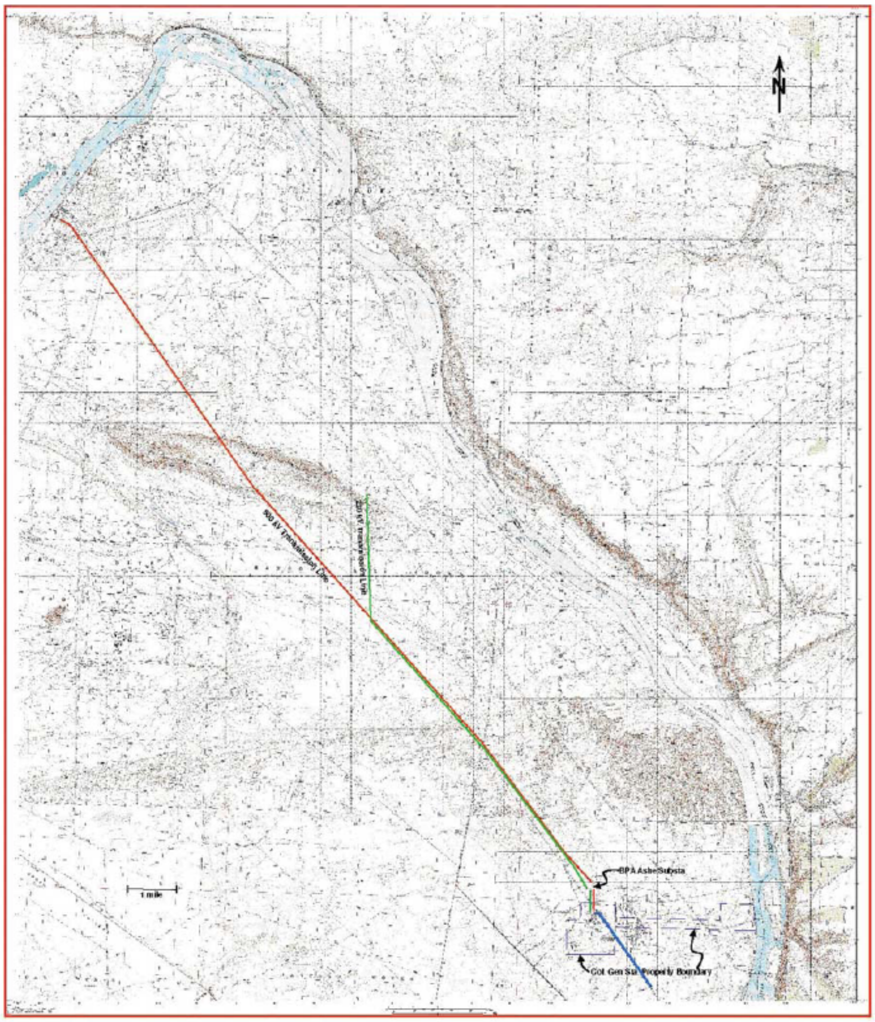
As stated in our previous letters, we would very much appreciate learning of any concerns you may have regarding our license renewal application. Please contact Abbas Mostala, License Renewal Project Manager, by telephone at (509) 377-4197 or e-mail at aamostala@energy-northwest.com if you require additional information. Thank you again for the assistance.

Respectfully,

Gregory V. Cullen

G.V. Cullen
Manager, Regulatory Programs

Enclosure: Property Boundary and Transmission Line Routing Map



Columbia Generating Station

Property Boundary and Transmission Line Routing

GI2-08-124

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

August 5, 2008

Mr. G. V. Cullen
Energy Northwest
PO Box 968, MD: PE20
Richland, Washington 99352-0968

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Cullen;

Thank you for contacting our department. We have reviewed the additional materials you provided for the proposed Columbia Generating Station License at the Hanford Site, Benton County, Washington.

We concur with the revised determination of the Area of Potential Effect (APE). We look forward to receiving the results of your review, consultations with the concerned tribes, and on-site archaeological survey.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the professional report on the results of your investigations.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

April 20, 2010

Mr. Reid Nelson, Director
Advisory Council on Historic Preservation
Office of Federal Agency Programs
1100 Pennsylvania Ave, NW, Suite 803
Washington, DC 20004

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Nelson:

The U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing an application submitted by Energy Northwest for the renewal of the operating license for Columbia Generating Station (CGS). CGS is located on the Columbia River, 12 miles northwest of Richland, WA. Three area maps are enclosed, highlighting the exact location of the site.

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. In accordance with 36 CFR 800.8(c), the SEIS will include analyses of potential impacts to historic and cultural resources.

The NRC staff held two public NEPA scoping meetings on April 6, 2010 at the Richland Public Library in Richland, WA. The week of June 7th, we plan to conduct a site audit, which you and your staff are invited to attend. Your office will also receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2010.

The CGS license renewal application is available at:

http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

R. Nelson -2-

If you have any questions concerning the NRC staff review of this license renewal application, please contact Mr. Daniel Doyle, Project Manager, at (301) 415-3748 or daniel.doyle@nrc.gov.

Sincerely,

/RA Bennet M. Brady for/

Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

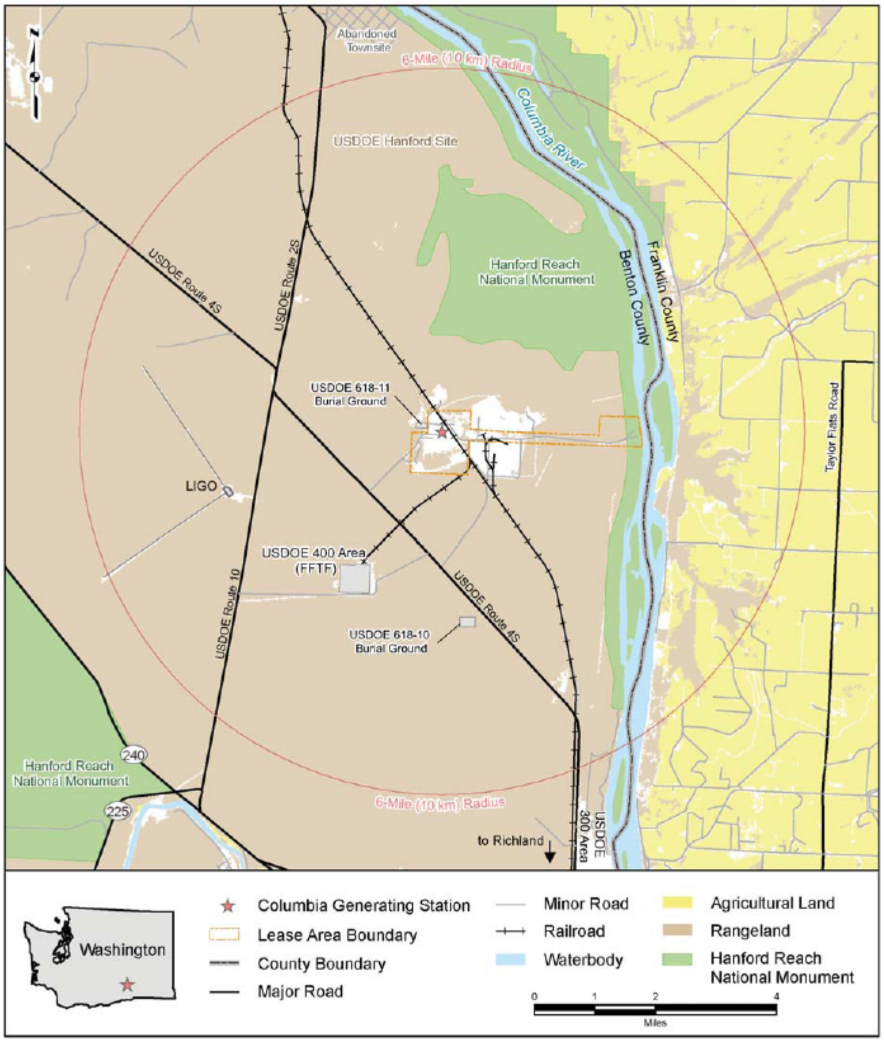
Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map

cc w/encls: See next page

Area Map, 50-Mile Radius

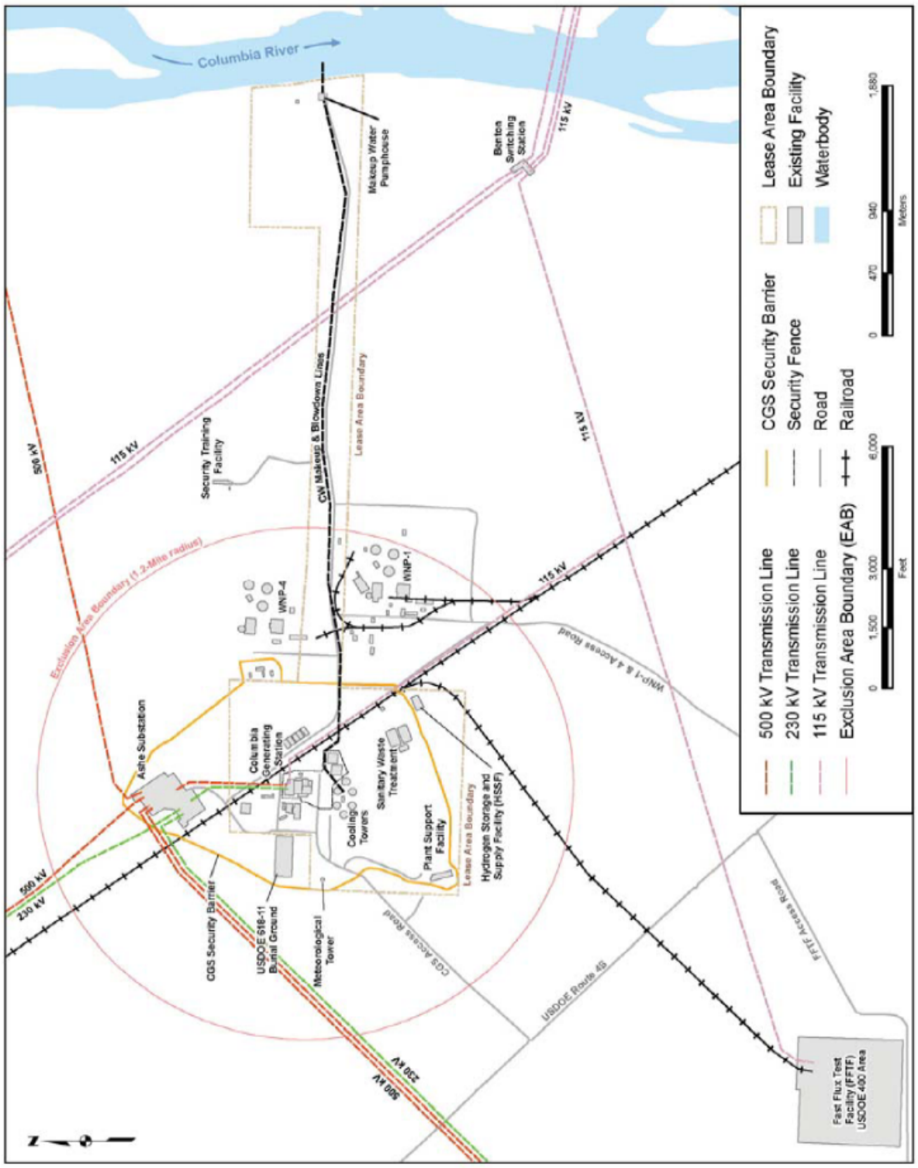
ENCLOSURE 1

Area Map, 6-Mile Radius



ENCLOSURE 2

Site Area Map



ENCLOSURE 3

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

April 21, 2010

Mr. Bo M. Pham
Division of License Renewal
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C.

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Pham;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Columbia Generating Station License Renewal at the Hanford Site, Benton County, Washington.

We concur with your proposed Area of Potential Effect (APE) as described in the accompanying text and figures including the Transmission Lines Routing.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the requested materials and further consultation.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

May 3, 2010

Mr. Barry Thom
Regional Administrator, Northwest Region
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA 98115-0070

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES AND ESSENTIAL FISH HABITAT WITHIN THE AREA UNDER EVALUATION FOR THE COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Thom:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Energy Northwest for the renewal of the operating license for Columbia Generating Station (CGS). CGS is located on the Columbia River, 12 miles northwest of Richland, WA. As part of the review of the license renewal application (LRA), the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of Title 10 of the *Code of Federal Regulations* Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to marine resources and habitat. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended; the Fish and Wildlife Coordination Act of 1934, as amended; and the Magnuson-Stevens Fishery Conservation and Management Act.

Energy Northwest stated that it has no plans to alter current operations over the license renewal period and that CGS, operating under a renewed license, would use existing plant facilities and transmission lines and would not require additional construction or disturbance of new areas. Any maintenance activities would be limited to previously disturbed areas. The CGS site is in the southeastern area of the U.S. Department of Energy (DOE) Hanford Site, a 586 square mile reservation established in 1943 by the federal government for the production of defense nuclear materials. The CGS site comprises 1,089 acres that are leased by Energy Northwest from the DOE. The lease describes the site in two parcels – a nearly square section containing the plant power block and associated structures and an elongated area running to the river east of the plant (Please see the area maps, Enclosures 1, 2, and 3).

CGS employs a closed-cycle cooling system that removes heat from its condenser and rejects it to the atmosphere by evaporation using six mechanical draft cooling towers. Water is circulated from the cooling towers through the condenser and back to the circulating water pumphouse at a rate of about 550,000 gpm. Makeup water to replenish water losses due to evaporation, drift, and blowdown is supplied from the makeup water pumphouse located at Columbia River approximately three miles east of the plant. The three 800-hp makeup water pumps are each designed to pump 12,500 gallons per minute (gpm), although normally two pumps are used to supply makeup water to the plant. The intake system for the makeup water pumps includes two offshore perforated pipe inlets mounted above the riverbed and approximately parallel to the river flow. The intake system is designed for a withdrawal capacity of 25,000 gpm.

Actual makeup water withdrawal during operating periods averages about 17,000 gpm. This is about 0.1% of the minimum river flow in the vicinity of CGS or 0.03% of the average annual flow.

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests information on Federally listed, proposed, and candidate species and critical habitat that may be in the vicinity of the CGS site, as shown on the enclosed maps.. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act. Also in support of the SEIS preparation and to ensure compliance with Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act, the NRC requests a list of essential fish habitat that has been designated in the vicinity of the CGS site.

The NRC staff held two public NEPA scoping meetings on April 6, 2010 at the Richland Public Library in Richland, WA. The week of June 7th, we plan to conduct a site audit, which you and your staff are invited to attend. Your office will also receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2010.

The CGS license renewal application is available at:

http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

B. Thom - 3 -

If you have any questions concerning the NRC staff review of this LRA, please contact Mr. Daniel Doyle, Project Manager at (301) 415-3748 or by e-mail at daniel.doyle@nrc.gov.

Sincerely,

/RA/

Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

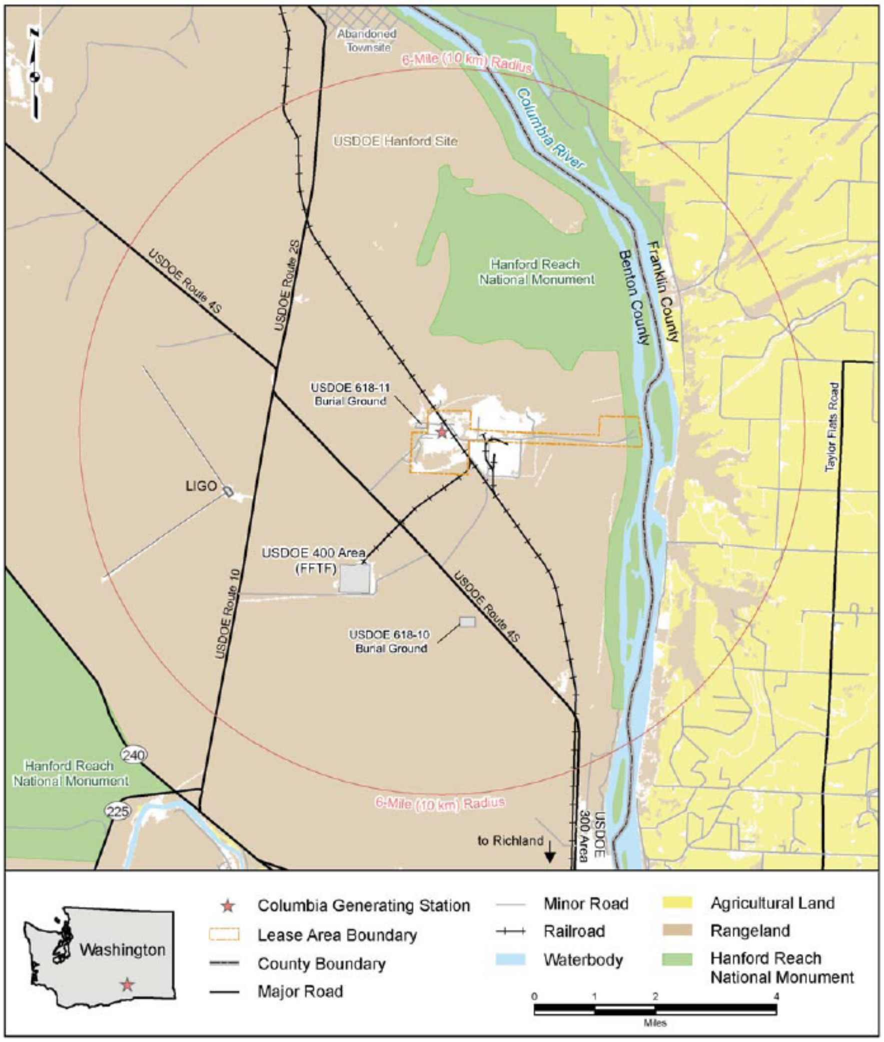
Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map

cc w/encls: See next page

Area Map, 50-Mile Radius

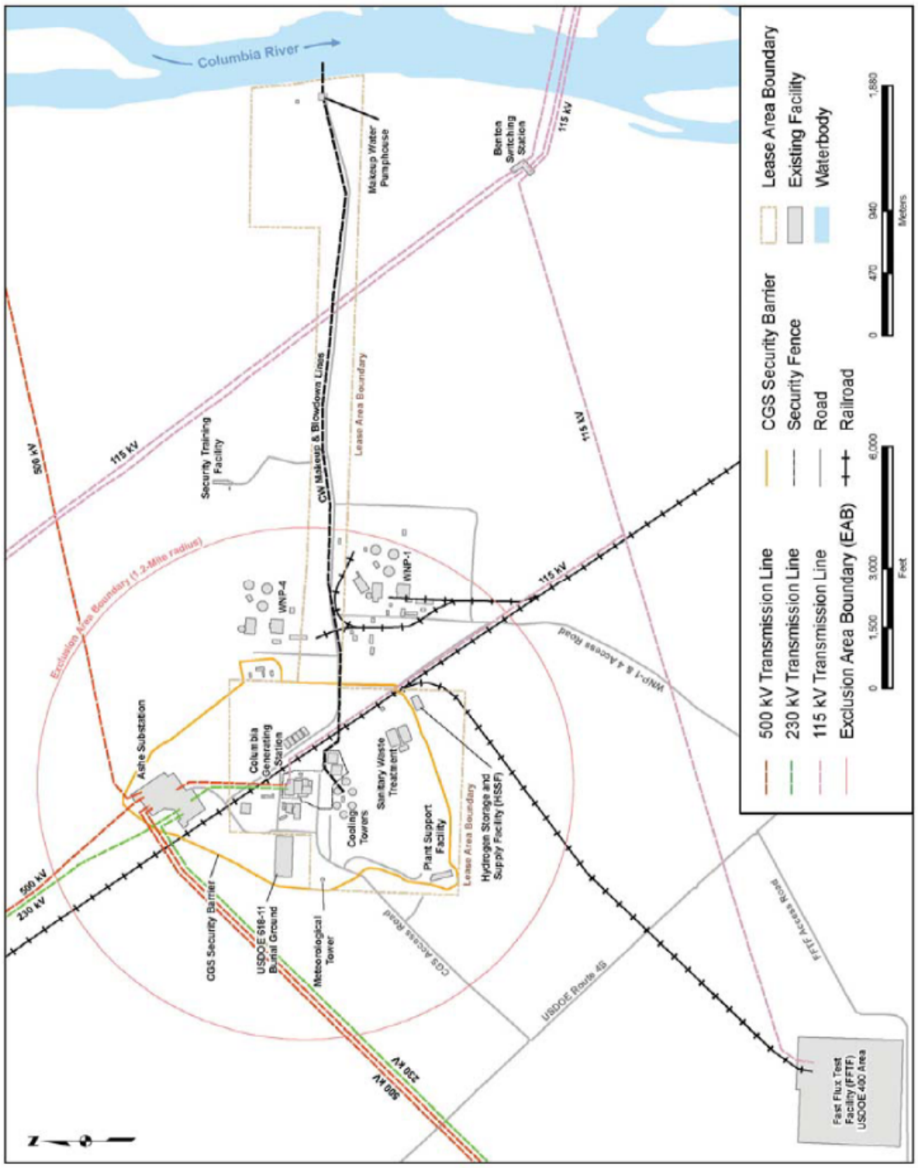
ENCLOSURE 1

Area Map, 6-Mile Radius



ENCLOSURE 2

Site Area Map



ENCLOSURE 3

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274

June 23, 2010

Bo Pham
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, Maryland 20852.

Re: Columbia Generating Station license renewal, request for species list for consultation.

Dear Mr. Pham:

This letter responds to your May 3, 2010 request for a list of species to be considered in Endangered Species Act (ESA) and Magnuson-Stevens Fishery Conservation and Management Act (MSA) consultations on your proposed license renewal action for the Columbia Generating Station. This letter also clarifies how NOAA's National Marine Fisheries Service (NMFS) intends to manage this consultation.

The Columbia Generating Station is located along the Columbia River near Richland, Washington. Through the intake of water from the Columbia River for cooling and the discharge of waste water from the plant to the river, the project has the potential to affect anadromous fish that may occur in the vicinity of the plant's freshwater intake and wastewater release works. Species listed under the Endangered Species Act likely to occur in these areas are:

- Upper Columbia River (UCR) spring Chinook salmon (*O. tshawytscha*; listed as endangered on June 28, 2005 [70 FR 37160]); critical habitat designated on September 2, 2005 [70 FR 52630], and

- Upper Columbia River (UCR) steelhead (*O. mykiss*; listed as endangered on August 24, 2009 [74 FR 42605]); critical habitat designated on September 2, 2005 [70 FR 52630].

This letter constitutes the required notification that Federally-listed threatened or endangered species or critical habitat under NMFS jurisdiction are present within the area affected by this project and may be affected by the proposed action.

Please refer to Section 7 of the ESA and its implementing regulations (50 CFR Part 402) for information on interagency consultation. Additional information on listed species' distribution, copies of Federal Register documents designating listed species status, and links to various ESA consultation policies and tools may be found on our website at: www.nwr.noaa.gov.

Concerning the MSA, the Columbia River, in the plant vicinity, provides essential fish habitat features for both Upper Columbia River Chinook and coho salmon (currently an unlisted reintroduction effort). Water withdrawal and wastewater disposal operations at the project have the potential to adversely affect essential fish habitat for these species. As the information necessary to make the determinations required under ESA are sufficient to support any recommendations under the MSA, we generally conduct these analyses simultaneously using information developed during the ESA consultation. However, as Upper Columbia River coho are not listed under ESA, we request that you include them in any request for concurrence or consultation and assess the likely adverse effects of the project on their essential habitat to facilitate our MSA findings.

NMFS has determined that because the potential effects of the proposed action occur mostly or entirely within the Columbia River and our Hydro Division is most familiar with Columbia River issues, this project will be manned by our Hydro Division staff out of our Portland office. Please send all further correspondence regarding this action to the attention of Rich Domingue, (503) 231-6858 or Richard.Domingue@noaa.gov at this office.

Sincerely,

Bruce Suzumoto
Assistant Regional Administrator
Hydropower Division

From: Doyle, Daniel
Sent: Friday, November 05, 2010 3:11 PM
To: Gregg Kurz (gregg_kurz@fws.gov)
Subject: NRC - Columbia Generating Station license renewal
Attachments: CGS scoping letter to FWS ML100710046.pdf; BentonCounty092910.pdf

Dear Mr. Kurz,

This e-mail is a follow-up to my telephone call on Tuesday, November 2, 2010. As I explained in the call, I am the project manager for the U.S. Nuclear Regulatory Commission's environmental review of the Columbia Generating Station license renewal application. I am following up on the attached letter dated March 22, 2010, that was sent to Ms. Robyn Thorson, Regional Director, U.S. Fish and Wildlife Service, Pacific Region, requesting a list of Federally protected species for this review. This letter was submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

To support preparation of a draft supplemental EIS and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the below list of Federally threatened, endangered, proposed, and candidate species that may be in the vicinity of the Columbia Generating Station site and its associated transmission line rights-of-way (as described in the attached letter to Ms. Thorson). If there are any species that your office would like us to address in addition to the Federally listed, proposed, and candidate species shown below, please let me know. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the Columbia Generating Station site if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC reviewed the attached list of species and habitat in Benton County (revised September 29, 2010) from: http://www.fws.gov/wafwo/pdf/BentonCounty092910.pdf.

LISTED
Bull trout (*Salvelinus confluentus*)
Pygmy rabbit (*Brachylagus idahoensis*)
Ute ladies'-tresses (*Spiranthes diluvialis*)

DESIGNATED
Critical habitat for bull trout

PROPOSED
Revised bull trout critical habitat

CANDIDATE
Greater sage grouse (*Centrocercus urophasianus*)
Yellow-billed cuckoo (*Coccyzus americanus*)
Umtanum desert buckwheat (*Eriogonum codium*)
*White Bluffs bladderpod (*Lesquerella tuplashensis*)
*Louie's western pocket gopher (*Thomomys mazama louiei*)
*Tacoma western pocket gopher (*Thomomys mazama tacomensis*)
* obtained from http://www.fws.gov/endangered

The NRC is also in consultation with the National Marine Fisheries Service regarding this project. We are currently planning on doing a single document that contains the biological assessment on the bull trout (for U.S. Fish and Wildlife Service review), the biological assessment on the Chinook salmon and steelhead (for National Marine Fisheries Service review) and the Essential Fish Habitat (for National Marine Fisheries Service review).

A copy of the draft supplemental EIS containing the NRC staff's analysis and preliminary conclusions will be sent to your office when it is published for your review.

If you have any questions concerning the NRC staff review of this license renewal application, please feel free to contact me.

Sincerely,

Daniel Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

E-mail Properties

Mail Envelope Properties ()

Subject: NRC - Columbia Generating Station license renewal
Sent Date: 11/5/2010 2:57:08 PM
Received Date: 11/5/2010 3:10:00 PM
From: Doyle, Daniel

Created By: Daniel.Doyle@nrc.gov

Recipients:
gregg_kurz@fws.gov (Gregg Kurz (gregg_kurz@fws.gov))
Tracking Status: None

Post Office:

Files	Size	Date & Time
MESSAGE	2872305	11/5/2010
CGS scoping letter to FWS ML100710046.pdf	2837935	
BentonCounty092910.pdf	19422	

Options
Expiration Date:

Priority: olImportanceNormal
ReplyRequested: False
Return Notification: False

Sensitivity: olNormal
Recipients received:

From:	Gregg_Kurz@fws.gov
Sent:	Monday, November 08, 2010 1:12 PM
To:	Doyle, Daniel
Subject:	Re: NRC - Columbia Generating Station license renewal
Attachments:	pic31111.gif
Follow Up Flag:	Follow up
Flag Status:	Completed
Categories:	CGS

Mr. Doyle,

Thank you for forwarding the information regarding this project. The species list you obtained from our website is accurate. Please note that the revised bull trout critical habitat designation currently on the list as Proposed will become Designated on November 17, 2010.

Preparation of a biological assessment for this project should include an analysis of potential effects to all species listed as Endangered or Threatened and to any designated or proposed critical habitat. Information regarding the presence of these species and habitats can be obtained from the Washington Natural Heritage Program at
http://www1.dnr.wa.gov/nhp/refdesk/index.html

We look forward to working with you.

Gregg L. Kurz
Fish and Wildlife Biologist
Central Washington Field Office
Wenatchee, WA 98801
Phone: (509) 665-3508 extension 22
E-mail: Gregg_Kurz@fws.gov
"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

"Doyle, Daniel" <**Daniel.Doyle@nrc.gov**>	To "Gregg Kurz (gregg_kurz@fws.gov)" <gregg_kurz@fws.gov>
11/05/2010 12:10 PM	cc
	Subject NRC - Columbia Generating Station license renewal

Dear Mr. Kurz,

This e-mail is a follow-up to my telephone call on Tuesday, November 2, 2010. As I explained in the call, I am the project manager for the U.S. Nuclear Regulatory Commission's environmental review of the Columbia Generating Station license renewal application. I am following up on the attached letter dated March 22, 2010, that was sent to Ms. Robyn Thorson, Regional Director, U.S. Fish and Wildlife Service, Pacific Region, requesting a list of Federally protected species for this review. This letter was submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

To support preparation of a draft supplemental EIS and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the below list of Federally threatened, endangered, proposed, and candidate species that may be in the vicinity of the Columbia Generating Station site and its associated transmission line rights-of-way (as described in the attached letter to Ms. Thorson). If there are any species that your office would like us to address in addition to the Federally listed, proposed, and candidate species shown below, please let me know. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the Columbia Generating Station site if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC reviewed the attached list of species and habitat in Benton County (revised September 29, 2010) from: http://www.fws.gov/wafwo/pdf/BentonCounty092910.pdf.

LISTED
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*Louie's western pocket gopher (*Thomomys mazama louiei*)
*Tacoma western pocket gopher (*Thomomys mazama tacomensis*)
* obtained from http://www.fws.gov/endangered

The NRC is also in consultation with the National Marine Fisheries Service regarding this project. We are currently planning on doing a single document that contains the biological assessment on the bull trout (for U.S. Fish and Wildlife Service review), the biological assessment on the Chinook salmon and steelhead (for National Marine Fisheries Service review) and the Essential Fish Habitat (for National Marine Fisheries Service review).

A copy of the draft supplemental EIS containing the NRC staff's analysis and preliminary conclusions will be sent to your office when it is published for your review.

If you have any questions concerning the NRC staff review of this license renewal application, please feel free to contact me.

Sincerely,

Daniel Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748
[attachment "CGS scoping letter to FWS ML100710046.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI] [attachment "BentonCounty092910.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI]

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 30, 2010

Robert G. Whitlam, Ph.D.
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION (LOG NO.: 121007-20-NRC)

Dear Dr. Whitlam:

The U.S. Nuclear Regulatory Commission (NRC) is considering a request submitted by Energy Northwest (the applicant) for the renewal of the operating license for Columbia Generating Station (CGS) in Benton County, Washington.

In a previous letter to your office, dated April 15, 2010, the NRC stated that it considers the Area of Potential (APE) to include the areas as defined in the correspondence between Mr. Gregory Cullen, Energy Northwest, and your office. The correspondence was included as an enclosure to that letter.

In a letter from Energy Northwest to your office dated July 22, 2010, the applicant revised their determination of the project footprint to exclude the Bonneville Power Administration (BPA) transmission lines, because the BPA controls the lines and they are not part of the plant's connection to the electrical transmission grid.

At the time, the NRC agreed with that modification to the APE. However, this determination should not have included the 115-kV BPA line which runs 1.8 miles southeast from the plant which the NRC believes should be part of the APE. In order to provide clarification, the following paragraph summarizes the NRC's determination of the APE for this license renewal environmental review.

As part of this license renewal environmental review, the following applicable transmission line corridors will be considered. Energy produced at CGS is delivered to the BPA at the H.J. Ashe Substation located 0.5 mile north of the station. Power from CGS is transmitted to the Ashe Substation via a 2,900-ft long, 280-ft wide transmission line corridor. A separate 1.8 mile 115-kV line provides backup power to CGS during plant shutdowns. This line has a right-of-way width of 90 feet and runs southeast between the CGS switchyard and a tap off the 115-kV line that runs from the Benton Switchyard to the U.S. Department of Energy Fast Flux Test Facility. Please see the enclosed site area map. The transmission line between CGS and the Ashe Substation and the 115-kV transmission line for backup power comprise the transmission lines that the NRC considers to be within the scope of license renewal.

R. Whitlam - 2 -

If you have any questions or require additional information, please contact Mr. Daniel Doyle, Environmental Project Manager, by phone at 301-415-3748 or by e-mail at daniel.doyle@nrc.gov.

Sincerely,

Bennett Brady for B Pham

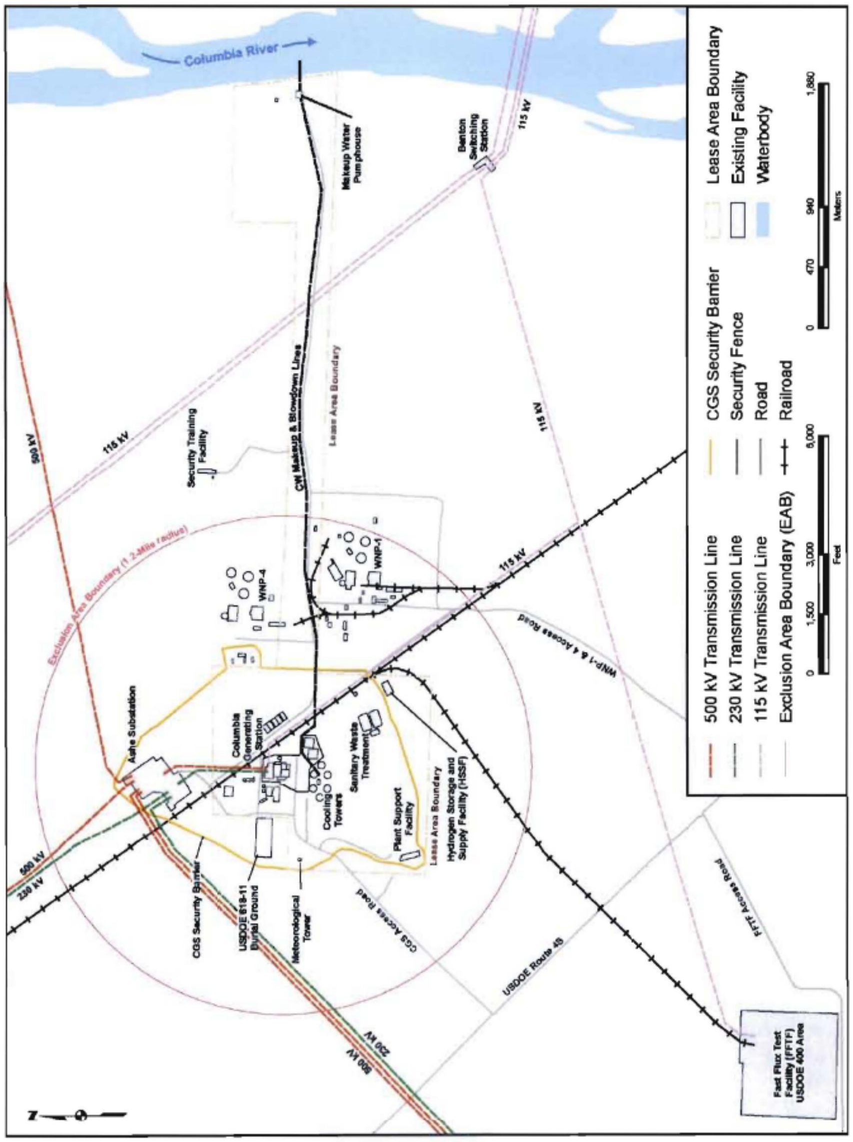
Bo M. Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
Columbia Generating Station Site Area Map

cc w/encl: Distribution via Listserv

Columbia Generating Station Site Area Map



ENCLOSURE

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

December 1, 2010

Mr. Bo M. Pham
Division of License Renewal
Nuclear Regulatory Commission
Washington, D. C., 20555-0001

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Pham;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed revised Area of Potential Effect (APE) for the Columbia Generating Station License Renewal at the Hanford Site, Benton County, Washington.

We concur with your proposed revised Area of Potential Effect (APE) as described in your letter and map as including the backup power line that is 1.8 miles from the CGS Switchyard to the Ashe Substation.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the requested materials and further consultation.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

cc: K. Cannell

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

From: Richard Domingue [Richard.Domingue@noaa.gov]
Sent: Friday, December 17, 2010 3:59 PM
To: Doyle, Daniel
Subject: Re: NRC BA/EFH assessment for Columbia Generating Station license renewal review

Categories: CGS

The species list included in the June 23, 2010 remain the appropriate species for this consultation. Your schedule is fine with us. Thanks.

On 12/17/2010 12:23 PM, Doyle, Daniel wrote:
Rich,

Thanks for your time on the phone this afternoon. As I said explained in the call, I am a project manager at the U.S. Nuclear Regulatory Commission coordinating the environmental review for the Columbia Generating Station license renewal application.

The purpose of this e-mail is to request an extension for the combined BA/EFH assessment for the species and habitats identified in the letter from your office to the NRC dated June 23, 2010 (attached).

We expect to publish our supplementary environmental impact statement in May 2011. The combined BA/EFH assessment will be included as an appendix to that report. The assessment will contain the staff's analysis of the potential impact to those species by the license renewal of Columbia Generating Station.

The website below contains more information about the Columbia Generating Station license renewal review:
http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

If you have any questions about this review, please feel free to contact me or the lead aquatic reviewer, Rebekah Krieg (509-371-7155 or rebekah.krieg@pnl.gov).

Sincerely,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Gregg_Kurz@fws.gov
Sent: Thursday, June 16, 2011 6:36 PM
To: Doyle, Daniel
Subject: RE: NRC - Columbia Generating Station license renewal
Attachments: pic16858.gif

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: CGS

Dan,

There has been an update to the species list since your list was obtained. Your list contains revised critical habitat for the bull trout as being proposed. The proposed revised critical habitat is now **designated** critical habitat for the bull trout. As I stated on our call, this should not result in any changes to your analysis since you have addressed the potential effects to revised critical habitat.

Gregg

Gregg L. Kurz
Fish and Wildlife Biologist
Central Washington Field Office
Wenatchee, WA 98801
Phone: (509) 665-3508 extension 22
E-mail: Gregg_Kurz@fws.gov
"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

06/15/2011 04:39 PM

To "Gregg_Kurz@fws.gov" <Gregg_Kurz@fws.gov>

cc

Subject RE: NRC - Columbia Generating Station license renewal

Mr. Kurz,

Thanks for your time on the phone today. As we discussed, I am contacting you regarding the NRC's review of the Columbia Generating Station license renewal environmental review. I would like to confirm the accuracy of the list of species and habitats in the e-mail below.

We expect to publish our draft environmental impact statement in August 2011. The combined BA/EFH assessment will be included as an appendix to that document. The assessment will contain the NRC staff's analysis of the potential impact to those species and habitats by the license renewal of Columbia Generating Station (detailed analysis for bull trout critical habitat).

This website contains more information about the NRC's review of the Columbia Generating Station license renewal application:
http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

If you have any questions about this review, please feel free to contact me or the lead aquatic reviewer, Rebekah Krieg (509-371-7155 or Rebekah.krieg@pnl.gov).

Sincerely,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Gregg_Kurz@fws.gov [mailto:Gregg_Kurz@fws.gov]
Sent: Monday, November 08, 2010 1:12 PM
To: Doyle, Daniel
Subject: Re: NRC - Columbia Generating Station license renewal

Mr. Doyle,

Thank you for forwarding the information regarding this project. The species list you obtained from our website is accurate. Please note that the revised bull trout critical habitat designation currently on the list as Proposed will become Designated on November 17, 2010.

Preparation of a biological assessment for this project should include an analysis of potential effects to all species listed as Endangered or Threatened and to any designated or proposed critical habitat. Information regarding the presence of these species and habitats can be obtained from the Washington Natural Heritage Program at http://www1.dnr.wa.gov/nhp/refdesk/index.html

We look forward to working with you.

Gregg L. Kurz

Fish and Wildlife Biologist
Central Washington Field Office
Wenatchee, WA 98801
Phone: (509) 665-3508 extension 22
E-mail: Gregg_Kurz@fws.gov
"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

"Doyle, Daniel" <Daniel.Doyle@nrc.gov>
11/05/2010 12:10 PM

To "Gregg Kurz (gregg_kurz@fws.gov)" <gregg_kurz@fws.gov>
cc
Subject NRC - Columbia Generating Station license renewal

Dear Mr. Kurz,

This e-mail is a follow-up to my telephone call on Tuesday, November 2, 2010. As I explained in the call, I am the project manager for the U.S. Nuclear Regulatory Commission's environmental review of the Columbia Generating Station license renewal application. I am following up on the attached letter dated March 22, 2010, that was sent to Ms. Robyn Thorson, Regional Director, U.S. Fish and Wildlife Service, Pacific Region, requesting a list of Federally protected species for this review. This letter was submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

To support preparation of a draft supplemental EIS and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the below list of Federally threatened, endangered, proposed, and candidate species that may be in the vicinity of the Columbia Generating Station site and its associated transmission line rights-of-way (as described in the attached letter to Ms. Thorson). If there are any species that your office would like us to address in addition to the Federally listed, proposed, and candidate species shown below, please let me know. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the Columbia Generating Station site if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC reviewed the attached list of species and habitat in Benton County (revised September 29, 2010) from: http://www.fws.gov/wafwo/pdf/BentonCounty092910.pdf.

LISTED
Bull trout (*Salvelinus confluentus*)
Pygmy rabbit (*Brachylagus idahoensis*)
Ute ladies'-tresses (*Spiranthes diluvialis*)

DESIGNATED
Critical habitat for bull trout

PROPOSED
Revised bull trout critical habitat

CANDIDATE
Greater sage grouse (*Centrocercus urophasianus*)
Yellow-billed cuckoo (*Coccyzus americanus*)
Umtanum desert buckwheat (*Eriogonum codium*)
*White Bluffs bladderpod (*Lesquerella tuplashensis*)
*Louie's western pocket gopher (*Thomomys mazama louiei*)
*Tacoma western pocket gopher (*Thomomys mazama tacomensis*)
* obtained from http://www.fws.gov/endangered

The NRC is also in consultation with the National Marine Fisheries Service regarding this project. We are currently planning on doing a single document that contains the biological assessment on the bull trout (for U.S. Fish and Wildlife Service review), the biological assessment on the Chinook salmon and steelhead (for National Marine Fisheries Service review) and the Essential Fish Habitat (for National Marine Fisheries Service review).

A copy of the draft supplemental EIS containing the NRC staff's analysis and preliminary conclusions will be sent to your office when it is published for your review.

If you have any questions concerning the NRC staff review of this license renewal application, please feel free to contact me.

Sincerely,

Daniel Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748
[attachment "CGS scoping letter to FWS ML100710046.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI] [attachment "BentonCounty092910.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI]

From: Richard Domingue [Richard.Domingue@noaa.gov]
Sent: Monday, June 27, 2011 4:33 PM
To: Doyle, Daniel
Subject: Re: NRC BA/EFH assessment for Columbia Generating Station license renewal review

Follow Up Flag: Follow Up
Flag Status: Flagged

Categories: CGS

Yes. The species list provided last June remains accurate. Please do not overlook potential project effects on coho salmon as we will use your BA to evaluate the project's effects on essential fish habitat as well as ESA needs. Thank you.

On 6/23/2011 7:51 AM, Doyle, Daniel wrote:
Rich,

Can you please confirm if the list of species and habitats in your June 23, 2010, letter (attached) is still accurate? We expect to publish the draft EIS in August 2011. It will include a combined biological assessment and EFH Assessment.

Thanks,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Richard Domingue [mailto:Richard.Domingue@noaa.gov]
Sent: Friday, December 17, 2010 3:59 PM
To: Doyle, Daniel
Subject: Re: NRC BA/EFH assessment for Columbia Generating Station license renewal review

The species list included in the June 23, 2010 remain the appropriate species for this consultation. Your schedule is fine with us. Thanks.

On 12/17/2010 12:23 PM, Doyle, Daniel wrote:
Rich,

Thanks for your time on the phone this afternoon. As I said explained in the call, I am a project manager at the U.S. Nuclear Regulatory Commission coordinating the environmental review for the Columbia Generating Station license renewal application.

The purpose of this e-mail is to request an extension for the combined BA/EFH assessment for the species and habitats identified in the letter from your office to the NRC dated June 23, 2010 (attached).

We expect to publish our supplementary environmental impact statement in May 2011. The combined BA/EFH assessment will be included as an appendix to that report. The assessment will contain the staff's analysis of the potential impact to those species by the license renewal of Columbia Generating Station.

The website below contains more information about the Columbia Generating Station license renewal review:
http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

If you have any questions about this review, please feel free to contact me or the lead aquatic reviewer, Rebekah Krieg (509-371-7155 or rebekah.krieg@pnl.gov).

Sincerely,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

March 18, 2010

Allyson Brooks, Ph.D.
State Historic Preservation Officer
PO Box 48343
Olympia, WA 98504-8343

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION (LOG NO.: 121007-20-NRC)

Dear Dr. Brooks:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating license for Columbia Generating Station (CGS), which is located in Benton County, Washington approximately 12 miles northwest of Richland. CGS is operated by Energy Northwest. The application for renewal, dated January 19, 2010, was submitted by Energy Northwest pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54).

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants", NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC regulation that implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and cultural resources.

In the context of the National Historic Preservation Act of 1966, as amended, the NRC staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs that may be impacted by post-license renewal land-disturbing operations or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land-disturbing operations or projected refurbishment activities specifically related to license renewal may potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

On April 6, 2010, the NRC will conduct two public NEPA scoping meetings at the Richland Public Library, located at 955 Northgate Drive, Richland, Washington 99352. You and your staff are invited to attend. Your office will receive a copy of the draft SEIS along with a request for comments. The staff expects to publish the draft SEIS in December 2010.

If you have any questions or require additional information, please contact Mr. Daniel Doyle, Environmental Project Manager, by phone at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

/RA/

Bo M. Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

cc: See next page

March 19, 2010

The Honorable Louis Cloud
Yakama Nation
P.O. Box 151
Toppenish, WA 98948-0151

SUBJECT: REQUEST FOR SCOPING COMMENTS CONCERNING THE COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Chairman Cloud:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Energy Northwest for the renewal of the operating license for the Columbia Generating Station (CGS), located approximately 12 miles northwest of Richland, Washington. CGS is in close proximity to lands that may be of interest to the Yakama Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Yakama Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969 (NEPA).

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for CGS will expire on December 20, 2023. Energy Northwest submitted its application for renewal of the CGS operating license in a letter dated January 19, 2010.

The NRC is gathering information for a CGS site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the CGS site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the CGS Site Area Map (Enclosure 1).

L. Cloud - 2 -

To accommodate interested members of the public and inter-governmental officials, the NRC will hold two NEPA scoping meetings for the CGS license renewal supplement to the GEIS on Tuesday, April 6, 2010 at the Richland Public Library, located at 955 Northgate Drive, Richland, Washington 99352. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 6:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 8:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The CGS license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland, 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams.html. The accession number for the license renewal application is ML100250668. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr@nrc.gov.

The CGS license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html. In addition, the Richland Public Library, located in Richland, WA, and the Kennewick Branch of Mid-Columbia Libraries, located in Kennewick, WA, have agreed to make the license renewal application available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Yakama Nation may have to offer on the scope of the environmental review by May 14, 2010. Written comments should be submitted by mail to the Chief, Rulemaking and Directives Branch, Division of Administrative Services, Mail Stop TWB-5B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC via the Federal rulemaking website: http://www.regulations.gov. Search for documents filed under Docket ID NRC-2010-0029. Address questions about NRC dockets to Carol Gallagher at 301-492-3668 or by e-mail at Carol.Gallagher@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

L. Cloud - 3 -

The NRC staff expects to publish the draft supplement to the GEIS in December 2010. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for CGS is planned for July 2011. If you need additional information regarding the environmental review process, please contact Mr. Daniel Doyle, Environmental Project Manager, at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

/RA/

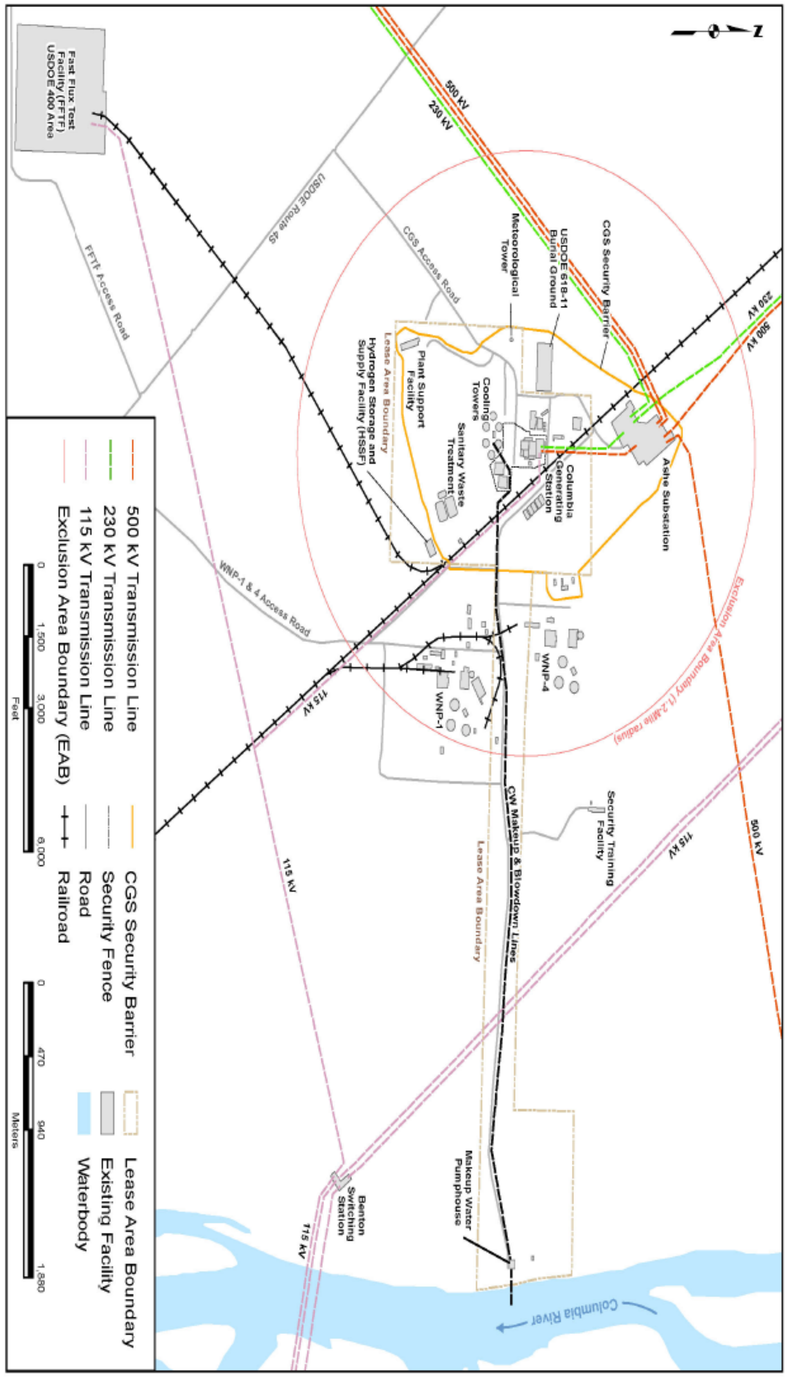
Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
Columbia Generating Station Site Area Map

cc w/encl: See next page

COLUMBIA GENERATING STATION SITE AREA MAP



ENCLOSURE

March 22, 2010

Ms. Robyn Thorson, Regional Director
U.S. Fish & Wildlife Service
Pacific Region
911 NE 11th Ave
Portland, OR 97232

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Thorson:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Energy Northwest for the renewal of the operating license for Columbia Generating Station (CGS). CGS is located on the Columbia River, 12 miles northwest of Richland, WA. As part of the review of the license renewal application, the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of the National Environmental Policy Act (NEPA) of 1969, as amended. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

Energy Northwest stated that it has no plans to alter current operations over the license renewal period and that CGS, operating under a renewed license, would use existing plant facilities and transmission lines and would not require additional construction or disturbance of new areas. Any maintenance activities would be limited to previously disturbed areas. The CGS site is in the southeastern area of the U.S. Department of Energy (USDOE) Hanford Site, a 586 square mile reservation established in 1943 by the federal government for the production of defense nuclear materials. The CGS site comprises 1,089 acres that are leased by Energy Northwest from the USDOE. The lease describes the site in two parcels – a nearly square section containing the plant power block and associated structures and an elongated area running to the river east of the plant.

CGS employs a closed-cycle cooling system that removes heat from its condenser and rejects it to the atmosphere by evaporation using six mechanical draft cooling towers. Water is circulated from the cooling towers through the condenser and back to the circulating water pumphouse at a rate of about 550,000 gpm. Makeup water to replenish water losses due to evaporation, drift, and blowdown is supplied from the makeup water pumphouse located at Columbia River approximately three miles east of the plant. The three 800-hp makeup water pumps are each designed to pump 12,500 gallons per minute (gpm), although normally two pumps are used to supply makeup water to the plant.

The intake system for the makeup water pumps includes two offshore perforated pipe inlets mounted above the riverbed and approximately parallel to the river flow. The intake system is designed for a withdrawal capacity of 25,000 gpm.

Actual makeup water withdrawal during operating periods averages about 17,000 gpm. This is about 0.1% of the minimum river flow in the vicinity of CGS or 0.03% of the average annual flow.

As part of the SEIS, the applicable transmission line corridors will be reviewed. Energy produced at CGS is delivered to the Bonneville Power Authority at the H.J. Ashe Substation located 0.5 mile north of the station. The CGS main generator output is transmitted to Ashe Substation via the step-up main transformer bank and a 2,900-ft long 500-kV tie line. The plant start-up transformer is connected to the Ashe Substation via a 230-kV line. The 230-kV and 500-kV overhead lines run approximately parallel in a 280-ft wide corridor. The lines between CGS and Ashe Substation comprise the transmission intertie that is within the scope of license renewal. The third line supporting CGS is a 115-kV power source that serves as a backup power source for safe shutdown under accident conditions. This line has a right-of-way width of 90 feet and runs between the CGS switchyard and a tap off the 115-kV line that runs from the Benton Switchyard to USDOE Fast Flux Test Facility. This tap is located about 1.8 miles southeast of the plant. (Please see the site area map, Enclosure 3.)

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests a list of species and information on protected, proposed, and candidate species and critical habitat that may be in the vicinity of CGS and its associated transmission line right-of-way. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC staff plans to hold two public NEPA scoping meetings on April 6, 2010 at the Richland Public Library in Richland, WA. You and your staff are invited to attend the public meetings. The first session will convene at 12:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 5:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 8:00 p.m., as necessary.

The week of June 7th, we plan to conduct a site audit. You and your staff are invited to attend both the site audit and the public meetings. Your office will also receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2010.

The CGS license renewal application is available at:

http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

R. Thorson - 3 -

If you have any questions concerning the NRC staff review of this license renewal application, please contact Mr. Daniel Doyle, Project Manager, at (301) 415-3748 or daniel.doyle@nrc.gov.

Sincerely,

/RA/

Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

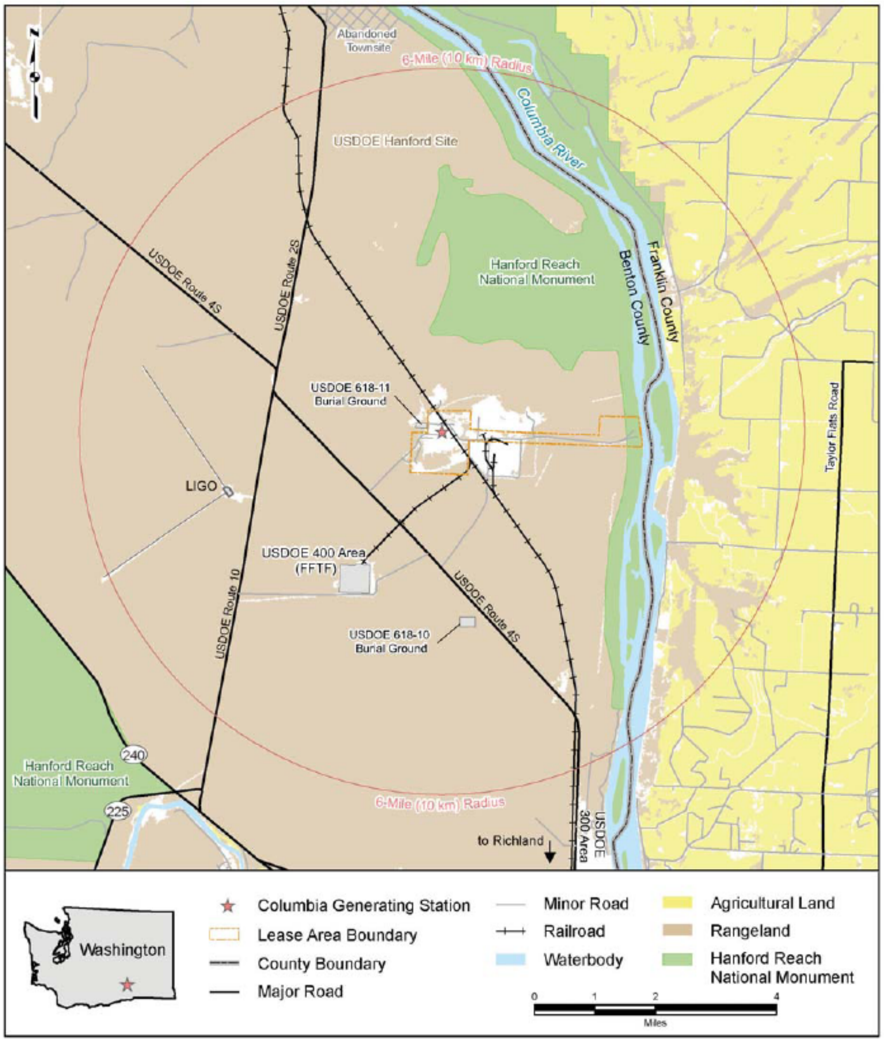
Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map

cc w/encls.: See next page

Area Map, 50-Mile Radius

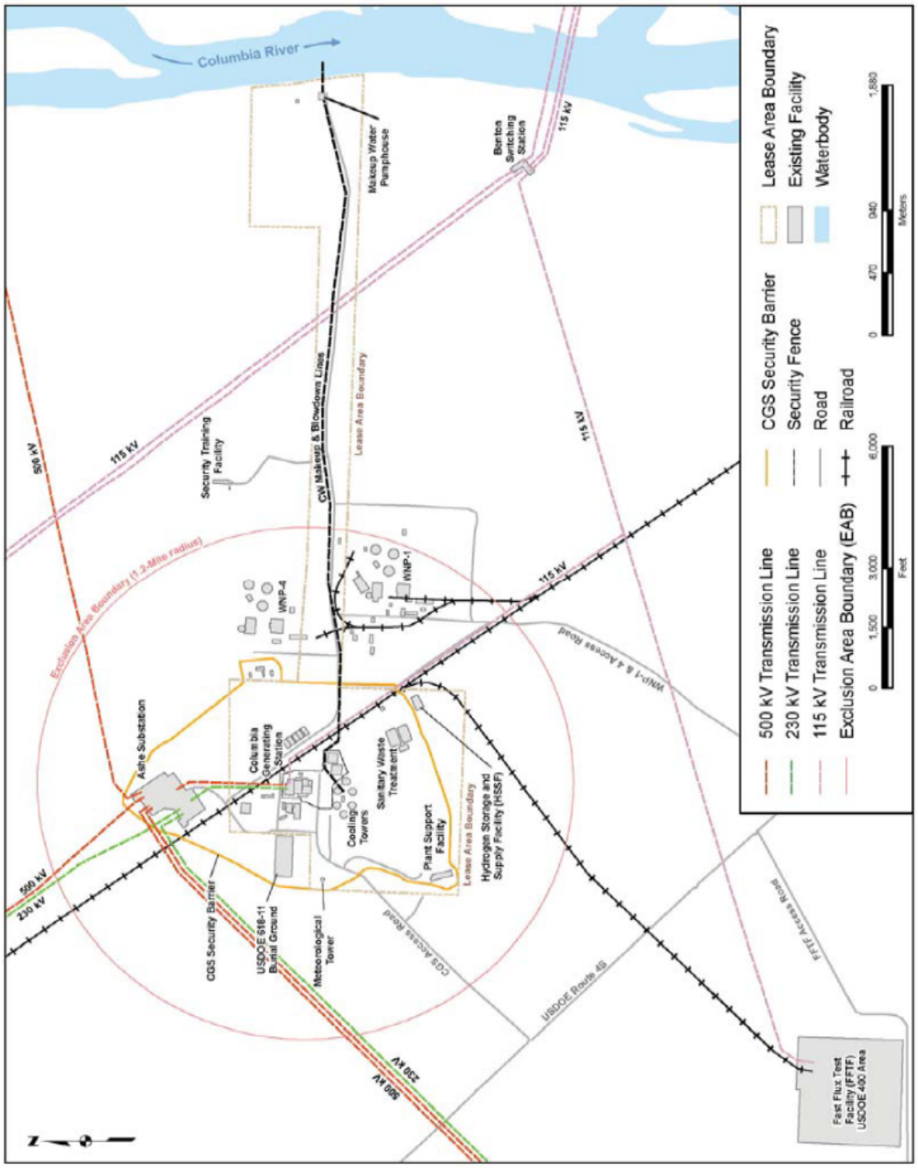
ENCLOSURE 1

Area Map, 6-Mile Radius



ENCLOSURE 2

Site Area Map



ENCLOSURE 3

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

March 29, 2010

Mr. Bo M. Pham
Division of License Renewal
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C.

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Pham;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Columbia Generating Station License Renewal at the Hanford Site, Benton County, Washington.

Please provide a map to supplement and illustrate the exact polygon of your proposed Area of Potential Effect (APE) as described in your third paragraph.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the requested materials and further consultation.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

April 15, 2010

Robert G. Whitlam, Ph.D.
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION (LOG NO.: 121007-20-NRC)

Dear Dr. Whitlam:

Enclosed please find the information you have requested regarding the Nuclear Regulatory Commission (NRC) review of the license renewal application for Columbia Generating Station.

The NRC considers the Area of Potential Effect (APE) to include the areas as defined in the enclosed correspondence between Mr. Gregory Cullen, Energy Northwest, and your office.

If you have any questions or require additional information, please contact Mr. Daniel Doyle, Environmental Project Manager, by phone at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

Bo M. Pham, Chief ***/RA/***
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
Applicant's Environmental Report, Attachment D – State Historic Preservation Officer Correspondence

cc w/encl: See next page

ATTACHMENT D

STATE HISTORIC PRESERVATION OFFICER CORRESPONDENCE

TABLE OF CONTENTS

ENERGY NORTHWEST

Gregory V. Cullen
Regulatory Programs
P.O. Box 968, Mail Drop PE20
Richland, WA 99352-0968
Ph. 509-377-6105 F. 509-377-4317
gvcullen@energy-northwest.com

April 10, 2008
GO2-08-055

Allyson Brooks, PhD
State Historic Preservation Officer
Department of Archaeology & Historic Preservation
1063 South Capitol Way, Suite 106
Olympia, WA 98501

Subject: **REQUEST FOR INFORMATION ON ARCHAEOLOGICAL AND HISTORIC RESOURCES**

Dear Dr. Brooks:

Energy Northwest is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Columbia Generating Station (CGS). The renewal term would be for an additional 20 years beyond the current license expiration date in 2023.

As part of the license renewal process, the NRC requires license applicants to "assess whether any historic or archaeological properties will be affected by the proposed project" (10 CFR 51.53). The NRC may also request, under Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470) and Federal Advisory Council on Historic Preservation regulations (36 CFR 800), an informal consultation with your office at a later date. By contacting you early in the application process, we hope to identify any potential issues that need to be addressed or information that your office may require to expedite the NRC consultation.

CGS is located in Benton County in the southeastern portion of the U.S. Department of Energy's Hanford Site. The station is about 3¼ miles west of the Columbia River in Section 5 of Township 11N, Range 28E, Willamette Meridian. The latitude/longitude coordinates are 46° 28' 18" north, 119° 19' 58" west and the approximate Universal Transverse Mercator coordinates are 5,148,840 meters north, 320,930 meters east. The cooling water intake facilities are on the west bank of the river at river mile 352. The station is tied to the Bonneville Power Administration's H.J. Ashe Substation with one-half mile of high-voltage transmission lines. The site location is indicated on the enclosed map.

REQUEST FOR INFORMATION
ON ARCHAEOLOGICAL AND HISTORIC RESOURCES
Page 2

Energy Northwest has no plans to alter current CGS operations over the license renewal period. In addition, maintenance activities necessary to support license renewal would be limited to previously disturbed areas on site. License renewal at CGS would require neither the expansion of existing facilities nor additional land disturbance.

Specifically, we are requesting information on the occurrence or concerns regarding archaeological or historic resources in the site area. We plan to include a copy of this letter and a copy of your response with the license renewal application submitted to the NRC. We would greatly appreciate receiving your reply within 60 days of receipt of this letter to provide ample time to evaluate and incorporate the information into our application.

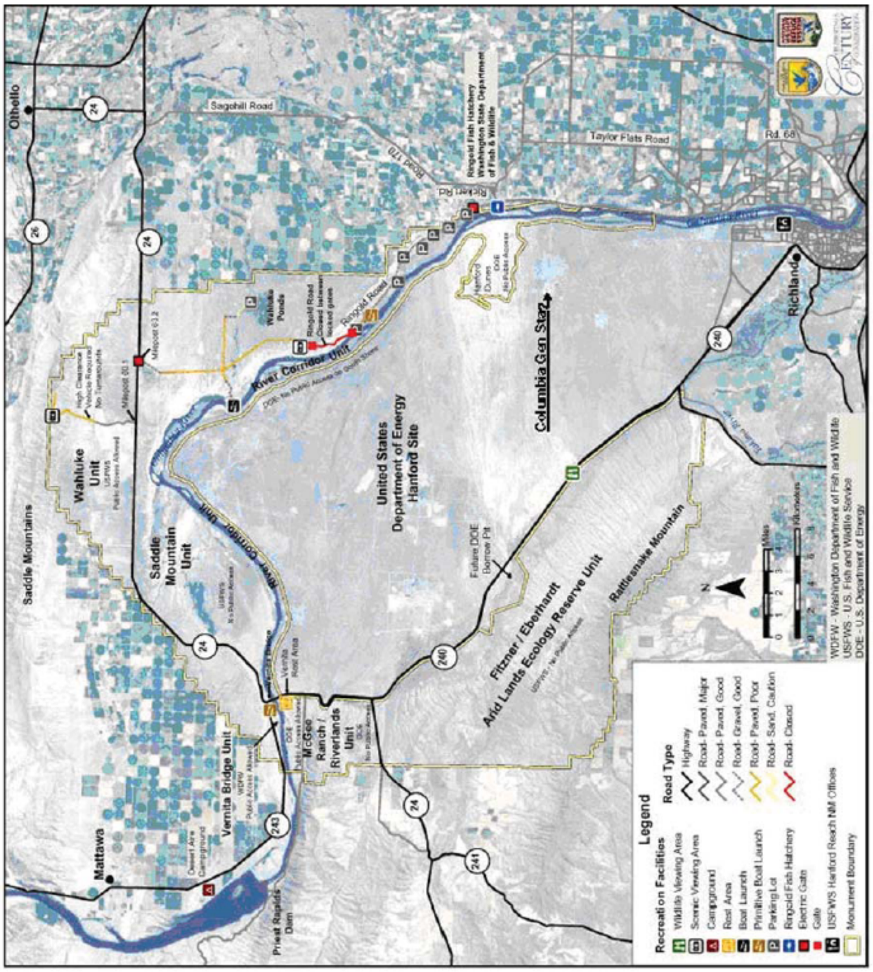
Please contact Abbas Mostala, License Renewal Project Manager, by telephone at (509) 377-4197 or e-mail at aamostala@energy-northwest.com if you have questions or require additional information concerning this request. Thank you for your assistance.

Respectfully,

Gregory V. Cullen

G.V. Cullen
Manager, Regulatory Programs

Enclosure: Location Map



Location Map - Columbia Generating Station

GI2-08-062

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

April 21, 2008

Mr. Gregory V. Cullen
Energy Northwest
PO Box 968, MS- PE20
Richland, Washington 99352-0968

Re: Columbia Generating Station Project
Log No.: 121007-20-NRC

Dear Mr. Cullen:

Thank you fro contacting our Department. We have reviewed the materials you provided for the proposed Columbia Generating Station Project License at the Hanford Site, Benton County, Washington.

Please provide us your proposed description of the Area of Potential Effect (APE) that conforms with 36CFR 800.16 and 8000.4. We look forward receiving the requested materials illustrating the actual project footprint and the areas subject to planning purposes for response and associated mitigation or treatment.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the reports on the results of your investigations.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

ENERGY NORTHWEST

Gregory V. Cullen
Regulatory Programs
P.O. Box 968, Mail Drop PE20
Richland, WA 99352-0968
Ph. 509-377-6105 F. 509-377-4317
gvcullen@energy-northwest.com

May 8, 2008
GO2-08-072

Robert G. Whitlam, PhD
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

Subject: **REQUEST FOR INFORMATION ON ARCHAEOLOGICAL AND HISTORIC RESOURCES**

References: 1. Letter dated April 10, 2008, G.V. Cullen (EN) to A. Brooks (DAHS), same subject
2. Letter dated April 21, 2008, R.G. Whitlam (DAHS) to G.V. Cullen (EN) re: Log No. 121007-20-NRC

Dear Dr. Whitlam:

Thank you for the quick response (Reference 2) to our request for information relevant to the possible renewal of the Columbia Generating Station (CGS) operating license. Although the site location was described in some detail in our letter (Reference 1), I can appreciate that the map we provided was not very useful for discerning the project footprint. Hopefully, the attached property map will provide the requested detail. I have also included a vertical photo showing the location of CGS relative to other features in the site area.

As stated previously, our intent is to seek renewal of the current plant operating license. We have no plans to modify the plant or the supporting facilities to accommodate extended operation. To assist in the preparation of the application to be submitted to the U.S. Nuclear Regulatory Commission (NRC), we are requesting information on the occurrence or concerns regarding archaeological or historic resources in the site area. The Department of Archaeology and Historic Preservation can reasonably expect to be approached by the NRC at a later date during the environmental review process.

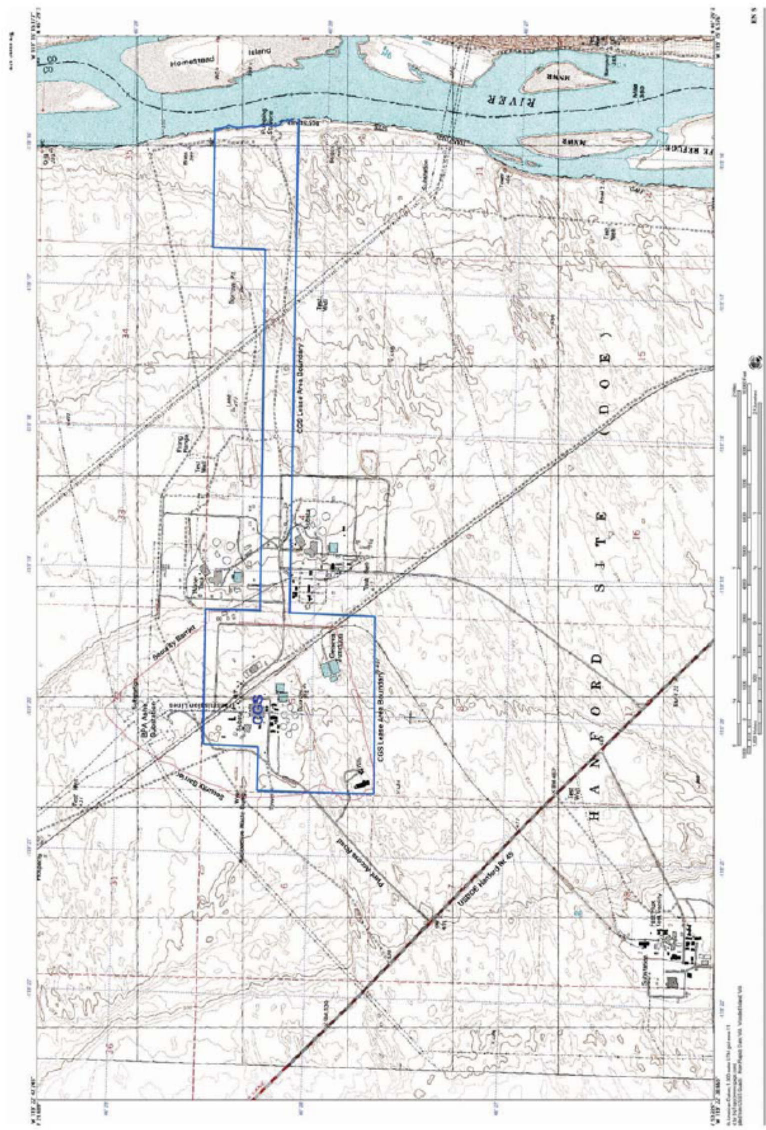
Please contact Abbas Mostala, License Renewal Project Manager, by telephone at (509) 377-4197 or e-mail at aamostala@energy-northwest.com if you require additional information. Thank you again for the assistance.

Respectfully,

Gregory V. Cullen

G.V. Cullen
Manager, Regulatory Programs

Enclosures: Vertical Photo and CGS Site Property Map



Columbia Generating Station – Site Property Map

Columbia Generating Station – Location

STATE OF WASHINGTON GI2-08-083

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

May 21, 2008

Mr. G. V. Cullen
Energy Northwest
PO Box 968, MD: PE20
Richland, Washington 99352-0968

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Cullen;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Columbia Generating Station License at the Hanford Site, Benton County, Washington.

We concur with the determination of the Area of Potential Effect (APE). We look forward to receiving the results of your review, consultations with the concerned tribes, and on-site archaeological survey.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the professional report on the results of your investigations.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

ENERGY NORTHWEST

Gregory V. Cullen
Regulatory Programs
P.O. Box 968, Mail Drop PE20
Richland, WA 99352-0968
Ph. 509-377-6105 F. 509-377-4317
gvcullen@energy-northwest.com

July 31, 2008
GO2-08-114

Robert G. Whitlam, PhD
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

Subject: **REQUEST FOR INFORMATION ON ARCHAEOLOGICAL AND HISTORIC RESOURCES**

References:
1. Letter GO2-08-055, dated April 10, 2008, G.V. Cullen (EN) to A. Brooks (DAHP), same subject
2. Letter dated April 21, 2008, R.G. Whitlam (DAHP) to G.V. Cullen (EN) re: Log No. 121007-20-NRC
3. Letter GO2-08-072, dated May 8, 2008, G.V. Cullen (EN) to R.G. Whitlam (DAHP), same subject

Dear Dr. Whitlam:

The referenced correspondence concerns our request for information relevant to the preparation of an application for renewal of the operating license for the Columbia Generating Station (CGS). As was discussed in a June 4, 2008 phone conversation with Energy Northwest's Jim Chasse, we are expanding the area encompassed by the request to include three transmission lines constructed, operated, and maintained by the Bonneville Power Administration (BPA). We are adding these lines to the project "footprint" because they were included as part of the original project description.

The three transmission lines that are added to our previous description are shown on the enclosed map that depicts a large portion of the U.S. Department of Energy Hanford Site and the Columbia River between river miles 380 and 351. The primary 500-kV line is a nearly straight route between BPA's Ashe Substation and the Hanford Substation 17½ miles to the northwest. The right-of-way width is 350 ft for the first 7¼ miles out of Ashe, 230 ft for about the next 8 miles, and about 125 feet for the last 2¼ miles. It is shown as a red line on the map. The second line is a 230-kV line that shares the 500-kV right-of-way for 7¼ miles and then runs north for about 2½ miles with a right-of-way width of 125 feet. This line is shown as a green line. The third line is a 115-kV back-up power source that taps off another line at a point about 1.8 miles southeast of the plant. The right-of-way width is 90 feet. It is the blue line on the map. The one-half mile segments of 230-kV and 500-kV lines between the power plant and Ashe Substation (described in the Reference 1 and shown on the site property map enclosed with Reference 3) are also shown on the enclosed map.

REQUEST FOR INFORMATION
ON ARCHAEOLOGICAL AND HISTORIC RESOURCES
Page 2

A review of the on-line database maintained by the Department of Archaeology & Historic Preservation confirms that there are no properties on the National Register of Historic Places in the immediate site area. The closest listed property is the Wooded Island Archaeological District located about two miles downstream (south) of the CGS makeup water pumphouse at Columbia River mile 352. We note that the 500-kV transmission line crosses Gable Mountain, a location listed on the Washington State register. We are also aware that pre-construction surveys of the mid-1970s noted the presence of two archaeological sites (Nos. 45BN113 and 45BN114) on the west bank of the river approximately one-quarter mile downstream from the pumphouse.

We do not expect continued operation of CGS through the 20-year license renewal period to have an adverse impact on cultural resources because we have no plans to expand the plant or the supporting facilities to accommodate extended operation. Additionally, we have no reason to believe that continued operation would result in changes to the operation and maintenance of the BPA transmission lines. These transmission lines would remain in service as part of the BPA network even if the plant operating license is not renewed.

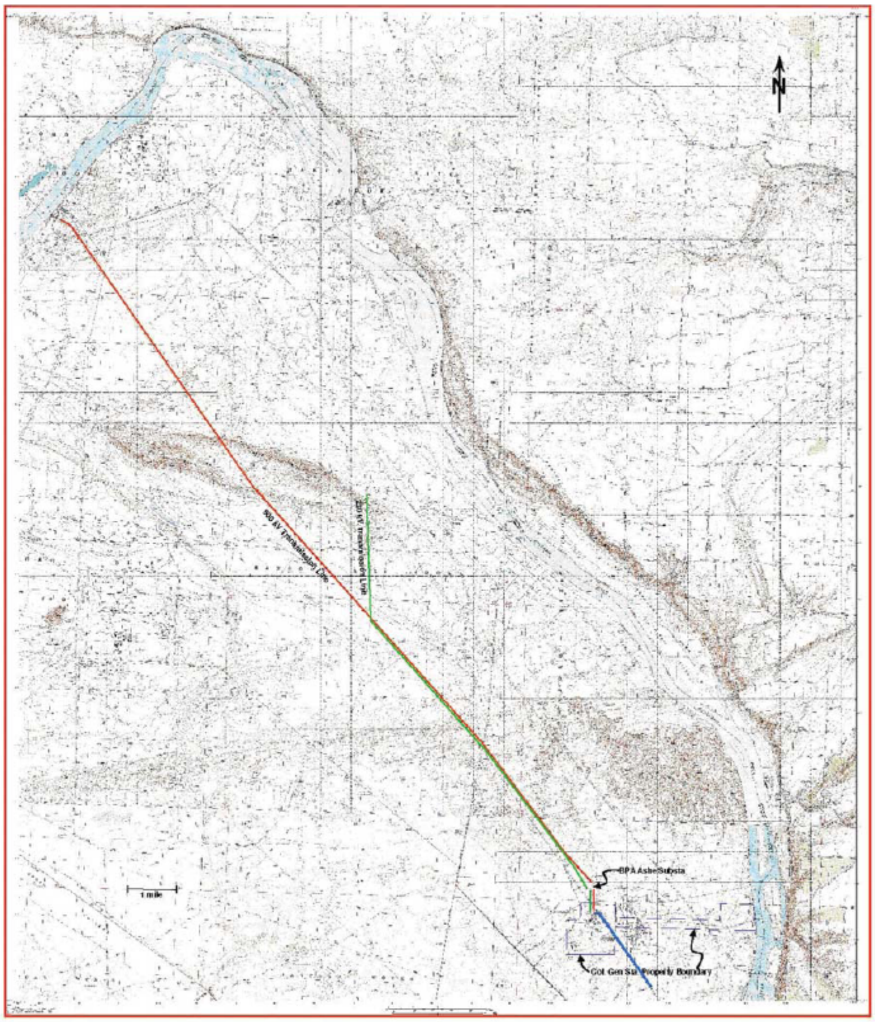
As stated in our previous letters, we would very much appreciate learning of any concerns you may have regarding our license renewal application. Please contact Abbas Mostala, License Renewal Project Manager, by telephone at (509) 377-4197 or e-mail at aamostala@energy-northwest.com if you require additional information. Thank you again for the assistance.

Respectfully,

Gregory V. Cullen

G.V. Cullen
Manager, Regulatory Programs

Enclosure: Property Boundary and Transmission Line Routing Map



Columbia Generating Station
Property Boundary and Transmission Line Routing

GI2-08-124

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

August 5, 2008

Mr. G. V. Cullen
Energy Northwest
PO Box 968, MD: PE20
Richland, Washington 99352-0968

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Cullen;

Thank you for contacting our department. We have reviewed the additional materials you provided for the proposed Columbia Generating Station License at the Hanford Site, Benton County, Washington.

We concur with the revised determination of the Area of Potential Effect (APE). We look forward to receiving the results of your review, consultations with the concerned tribes, and on-site archaeological survey.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the professional report on the results of your investigations.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

April 20, 2010

Mr. Reid Nelson, Director
Advisory Council on Historic Preservation
Office of Federal Agency Programs
1100 Pennsylvania Ave, NW, Suite 803
Washington, DC 20004

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Nelson:

The U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing an application submitted by Energy Northwest for the renewal of the operating license for Columbia Generating Station (CGS). CGS is located on the Columbia River, 12 miles northwest of Richland, WA. Three area maps are enclosed, highlighting the exact location of the site.

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. In accordance with 36 CFR 800.8(c), the SEIS will include analyses of potential impacts to historic and cultural resources.

The NRC staff held two public NEPA scoping meetings on April 6, 2010 at the Richland Public Library in Richland, WA. The week of June 7th, we plan to conduct a site audit, which you and your staff are invited to attend. Your office will also receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2010.

The CGS license renewal application is available at:

http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

R. Nelson -2-

If you have any questions concerning the NRC staff review of this license renewal application, please contact Mr. Daniel Doyle, Project Manager, at (301) 415-3748 or daniel.doyle@nrc.gov.

Sincerely,

/RA Bennet M. Brady for/

Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

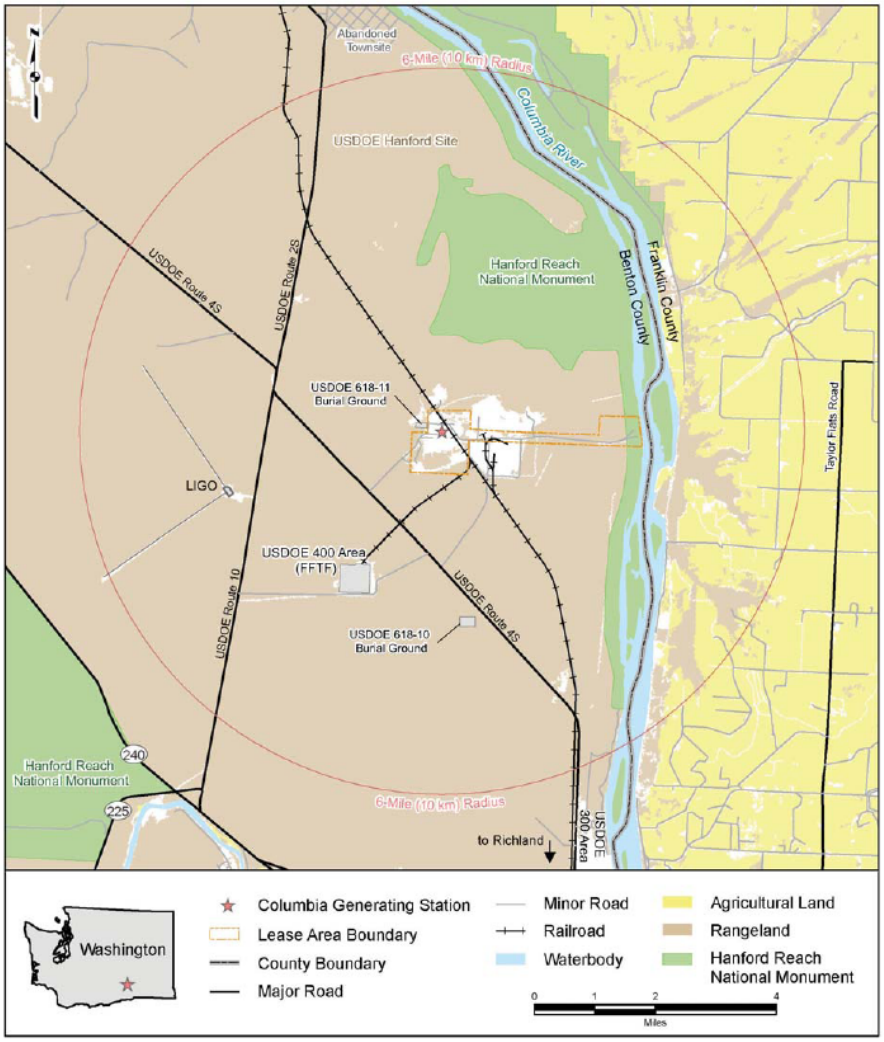
Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map

cc w/encls: See next page

Area Map, 50-Mile Radius

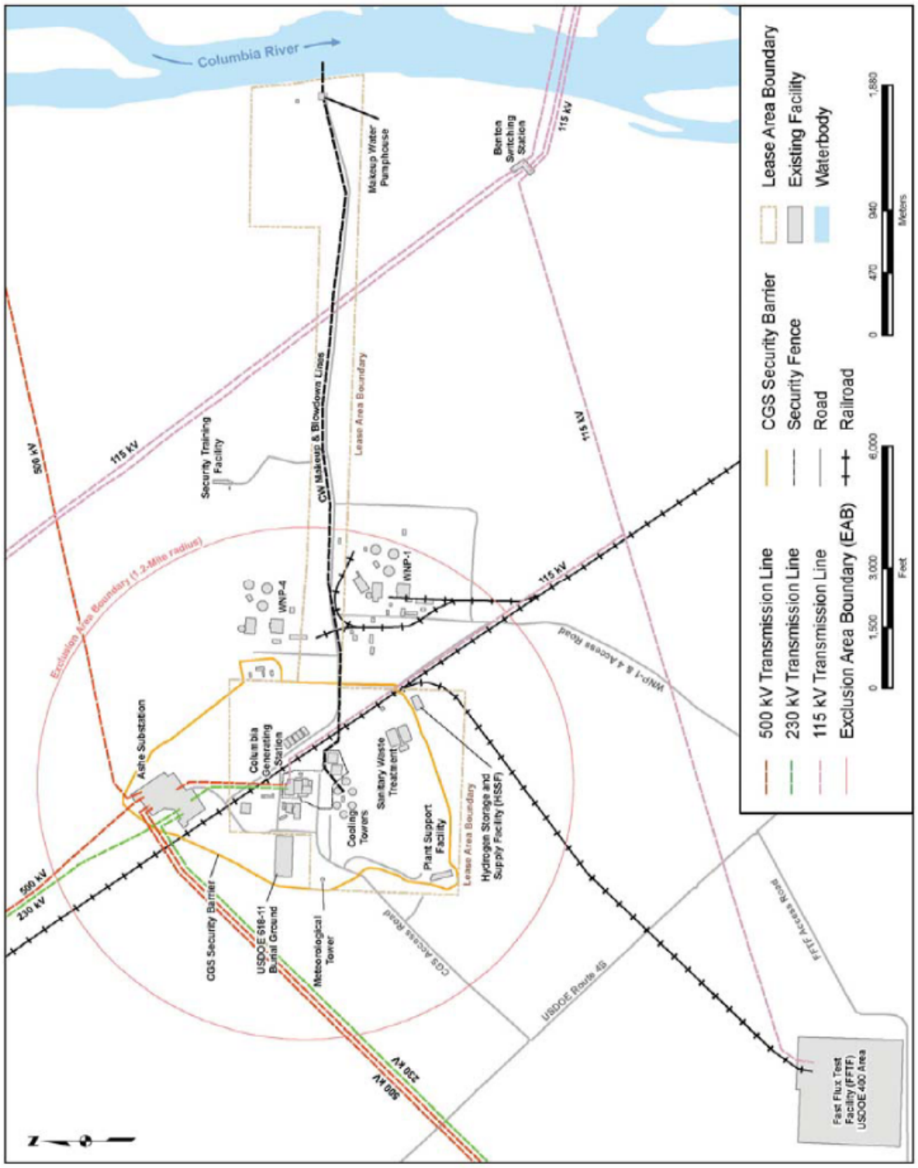
ENCLOSURE 1

Area Map, 6-Mile Radius



ENCLOSURE 2

Site Area Map



ENCLOSURE 3

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

April 21, 2010

Mr. Bo M. Pham
Division of License Renewal
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C.

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Pham;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Columbia Generating Station License Renewal at the Hanford Site, Benton County, Washington.

We concur with your proposed Area of Potential Effect (APE) as described in the accompanying text and figures including the Transmission Lines Routing.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the requested materials and further consultation.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

May 3, 2010

Mr. Barry Thom
Regional Administrator, Northwest Region
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA 98115-0070

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES AND ESSENTIAL FISH HABITAT WITHIN THE AREA UNDER EVALUATION FOR THE COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Thom:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Energy Northwest for the renewal of the operating license for Columbia Generating Station (CGS). CGS is located on the Columbia River, 12 miles northwest of Richland, WA. As part of the review of the license renewal application (LRA), the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of Title 10 of the *Code of Federal Regulations* Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to marine resources and habitat. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended; the Fish and Wildlife Coordination Act of 1934, as amended; and the Magnuson-Stevens Fishery Conservation and Management Act.

Energy Northwest stated that it has no plans to alter current operations over the license renewal period and that CGS, operating under a renewed license, would use existing plant facilities and transmission lines and would not require additional construction or disturbance of new areas. Any maintenance activities would be limited to previously disturbed areas. The CGS site is in the southeastern area of the U.S. Department of Energy (DOE) Hanford Site, a 586 square mile reservation established in 1943 by the federal government for the production of defense nuclear materials. The CGS site comprises 1,089 acres that are leased by Energy Northwest from the DOE. The lease describes the site in two parcels – a nearly square section containing the plant power block and associated structures and an elongated area running to the river east of the plant (Please see the area maps, Enclosures 1, 2, and 3).

CGS employs a closed-cycle cooling system that removes heat from its condenser and rejects it to the atmosphere by evaporation using six mechanical draft cooling towers. Water is circulated from the cooling towers through the condenser and back to the circulating water pumphouse at a rate of about 550,000 gpm. Makeup water to replenish water losses due to evaporation, drift, and blowdown is supplied from the makeup water pumphouse located at Columbia River approximately three miles east of the plant. The three 800-hp makeup water pumps are each designed to pump 12,500 gallons per minute (gpm), although normally two pumps are used to supply makeup water to the plant. The intake system for the makeup water pumps includes two offshore perforated pipe inlets mounted above the riverbed and approximately parallel to the river flow. The intake system is designed for a withdrawal capacity of 25,000 gpm.

Actual makeup water withdrawal during operating periods averages about 17,000 gpm. This is about 0.1% of the minimum river flow in the vicinity of CGS or 0.03% of the average annual flow.

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests information on Federally listed, proposed, and candidate species and critical habitat that may be in the vicinity of the CGS site, as shown on the enclosed maps.. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act. Also in support of the SEIS preparation and to ensure compliance with Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act, the NRC requests a list of essential fish habitat that has been designated in the vicinity of the CGS site.

The NRC staff held two public NEPA scoping meetings on April 6, 2010 at the Richland Public Library in Richland, WA. The week of June 7th, we plan to conduct a site audit, which you and your staff are invited to attend. Your office will also receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2010.

The CGS license renewal application is available at:

http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

B. Thom - 3 -

If you have any questions concerning the NRC staff review of this LRA, please contact Mr. Daniel Doyle, Project Manager at (301) 415-3748 or by e-mail at daniel.doyle@nrc.gov.

Sincerely,

/RA/

Bo Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

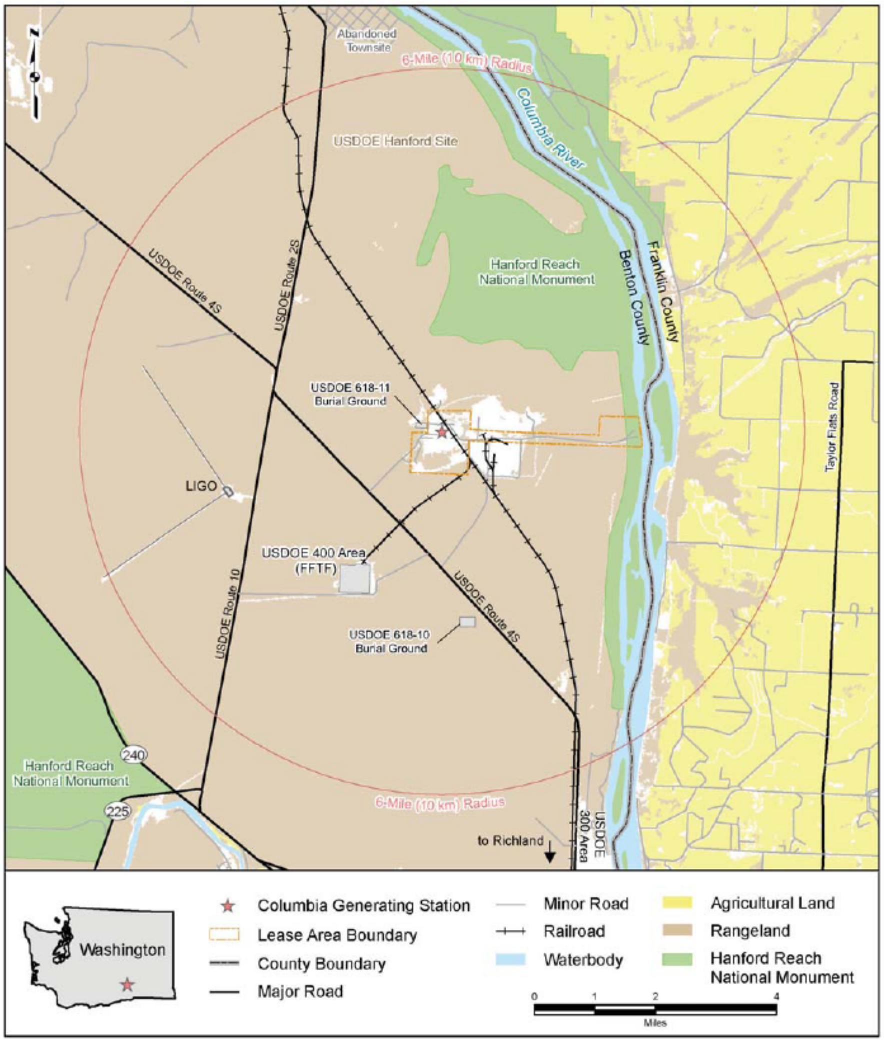
Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map

cc w/encls: See next page

Area Map, 50-Mile Radius

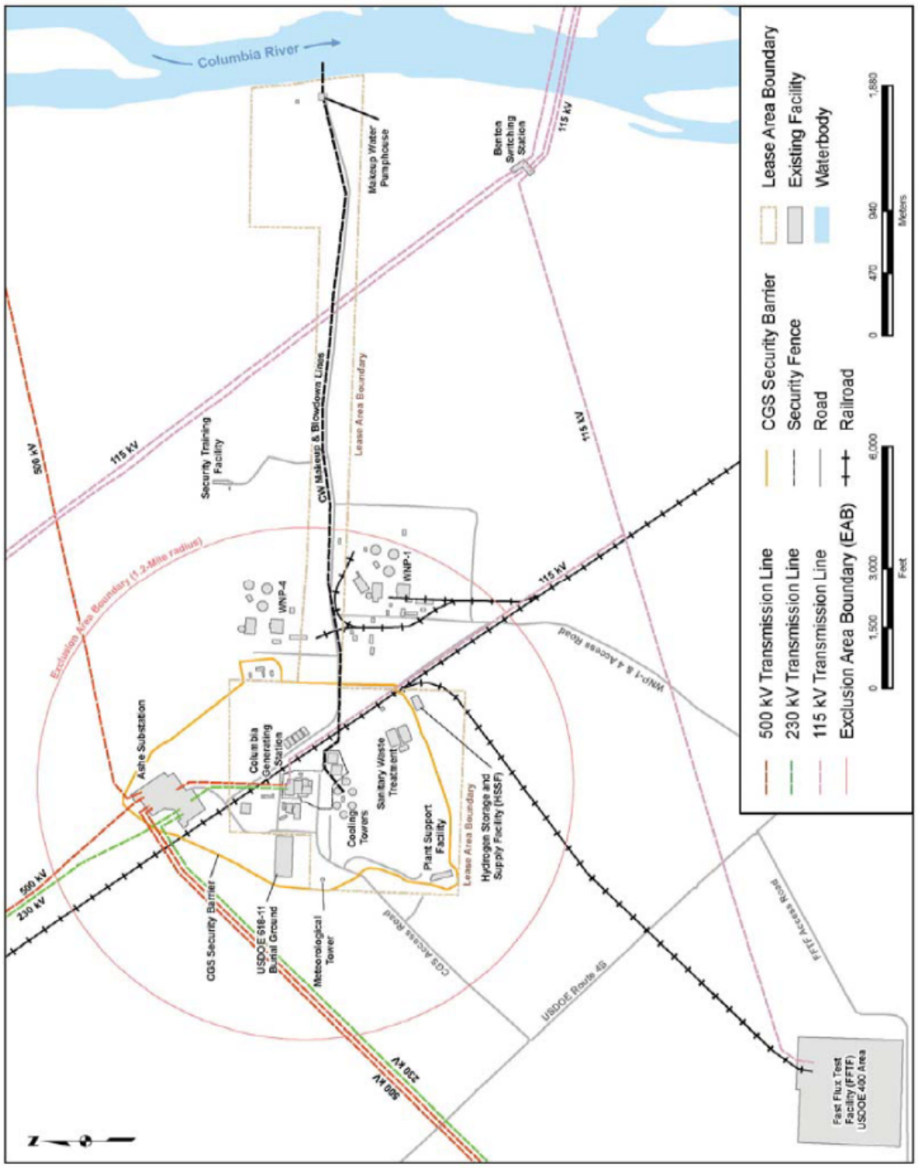
ENCLOSURE 1

Area Map, 6-Mile Radius



ENCLOSURE 2

Site Area Map



ENCLOSURE 3

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274

June 23, 2010

Bo Pham
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, Maryland 20852.

Re: Columbia Generating Station license renewal, request for species list for consultation.

Dear Mr. Pham:

This letter responds to your May 3, 2010 request for a list of species to be considered in Endangered Species Act (ESA) and Magnuson-Stevens Fishery Conservation and Management Act (MSA) consultations on your proposed license renewal action for the Columbia Generating Station. This letter also clarifies how NOAA's National Marine Fisheries Service (NMFS) intends to manage this consultation.

The Columbia Generating Station is located along the Columbia River near Richland, Washington. Through the intake of water from the Columbia River for cooling and the discharge of waste water from the plant to the river, the project has the potential to affect anadromous fish that may occur in the vicinity of the plant's freshwater intake and wastewater release works. Species listed under the Endangered Species Act likely to occur in these areas are:

- Upper Columbia River (UCR) spring Chinook salmon (*O. tshawytscha*; listed as endangered on June 28, 2005 [70 FR 37160]); critical habitat designated on September 2, 2005 [70 FR 52630], and

- Upper Columbia River (UCR) steelhead (*O. mykiss*; listed as endangered on August 24, 2009 [74 FR 42605]); critical habitat designated on September 2, 2005 [70 FR 52630].

This letter constitutes the required notification that Federally-listed threatened or endangered species or critical habitat under NMFS jurisdiction are present within the area affected by this project and may be affected by the proposed action.

Please refer to Section 7 of the ESA and its implementing regulations (50 CFR Part 402) for information on interagency consultation. Additional information on listed species' distribution, copies of Federal Register documents designating listed species status, and links to various ESA consultation policies and tools may be found on our website at: www.nwr.noaa.gov.

Concerning the MSA, the Columbia River, in the plant vicinity, provides essential fish habitat features for both Upper Columbia River Chinook and coho salmon (currently an unlisted reintroduction effort). Water withdrawal and wastewater disposal operations at the project have the potential to adversely affect essential fish habitat for these species. As the information necessary to make the determinations required under ESA are sufficient to support any recommendations under the MSA, we generally conduct these analyses simultaneously using information developed during the ESA consultation. However, as Upper Columbia River coho are not listed under ESA, we request that you include them in any request for concurrence or consultation and assess the likely adverse effects of the project on their essential habitat to facilitate our MSA findings.

NMFS has determined that because the potential effects of the proposed action occur mostly or entirely within the Columbia River and our Hydro Division is most familiar with Columbia River issues, this project will be manned by our Hydro Division staff out of our Portland office. Please send all further correspondence regarding this action to the attention of Rich Domingue, (503) 231-6858 or Richard.Domingue@noaa.gov at this office.

Sincerely,

Bruce Suzumoto
Assistant Regional Administrator
Hydropower Division

From: Doyle, Daniel
Sent: Friday, November 05, 2010 3:11 PM
To: Gregg Kurz (gregg_kurz@fws.gov)
Subject: NRC - Columbia Generating Station license renewal
Attachments: CGS scoping letter to FWS ML100710046.pdf; BentonCounty092910.pdf

Dear Mr. Kurz,

This e-mail is a follow-up to my telephone call on Tuesday, November 2, 2010. As I explained in the call, I am the project manager for the U.S. Nuclear Regulatory Commission's environmental review of the Columbia Generating Station license renewal application. I am following up on the attached letter dated March 22, 2010, that was sent to Ms. Robyn Thorson, Regional Director, U.S. Fish and Wildlife Service, Pacific Region, requesting a list of Federally protected species for this review. This letter was submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

To support preparation of a draft supplemental EIS and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the below list of Federally threatened, endangered, proposed, and candidate species that may be in the vicinity of the Columbia Generating Station site and its associated transmission line rights-of-way (as described in the attached letter to Ms. Thorson). If there are any species that your office would like us to address in addition to the Federally listed, proposed, and candidate species shown below, please let me know. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the Columbia Generating Station site if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC reviewed the attached list of species and habitat in Benton County (revised September 29, 2010) from: http://www.fws.gov/wafwo/pdf/BentonCounty092910.pdf.

LISTED
Bull trout (*Salvelinus confluentus*)
Pygmy rabbit (*Brachylagus idahoensis*)
Ute ladies'-tresses (*Spiranthes diluvialis*)

DESIGNATED
Critical habitat for bull trout

PROPOSED
Revised bull trout critical habitat

CANDIDATE
Greater sage grouse (*Centrocercus urophasianus*)
Yellow-billed cuckoo (*Coccyzus americanus*)
Umtanum desert buckwheat (*Eriogonum codium*)
*White Bluffs bladderpod (*Lesquerella tuplashensis*)
*Louie's western pocket gopher (*Thomomys mazama louiei*)
*Tacoma western pocket gopher (*Thomomys mazama tacomensis*)
* obtained from http://www.fws.gov/endangered

The NRC is also in consultation with the National Marine Fisheries Service regarding this project. We are currently planning on doing a single document that contains the biological assessment on the bull trout (for U.S. Fish and Wildlife Service review), the biological assessment on the Chinook salmon and steelhead (for National Marine Fisheries Service review) and the Essential Fish Habitat (for National Marine Fisheries Service review).

A copy of the draft supplemental EIS containing the NRC staff's analysis and preliminary conclusions will be sent to your office when it is published for your review.

If you have any questions concerning the NRC staff review of this license renewal application, please feel free to contact me.

Sincerely,

Daniel Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

E-mail Properties

Mail Envelope Properties ()

Subject: NRC - Columbia Generating Station license renewal
Sent Date: 11/5/2010 2:57:08 PM
Received Date: 11/5/2010 3:10:00 PM
From: Doyle, Daniel

Created By: Daniel.Doyle@nrc.gov

Recipients:
gregg_kurz@fws.gov (Gregg Kurz (gregg_kurz@fws.gov))
Tracking Status: None

Post Office:

Files	Size	Date & Time
MESSAGE	2872305	11/5/2010
CGS scoping letter to FWS ML100710046.pdf	2837935	
BentonCounty092910.pdf	19422	

Options
Expiration Date:

Priority: olImportanceNormal
ReplyRequested: False
Return Notification: False

Sensitivity: olNormal
Recipients received:

From: Gregg_Kurz@fws.gov
Sent: Monday, November 08, 2010 1:12 PM
To: Doyle, Daniel
Subject: Re: NRC - Columbia Generating Station license renewal
Attachments: pic31111.gif

Follow Up Flag: Follow up
Flag Status: Completed

Categories: CGS

Mr. Doyle,

Thank you for forwarding the information regarding this project. The species list you obtained from our website is accurate. Please note that the revised bull trout critical habitat designation currently on the list as Proposed will become Designated on November 17, 2010.

Preparation of a biological assessment for this project should include an analysis of potential effects to all species listed as Endangered or Threatened and to any designated or proposed critical habitat. Information regarding the presence of these species and habitats can be obtained from the Washington Natural Heritage Program at
http://www1.dnr.wa.gov/nhp/refdesk/index.html

We look forward to working with you.

Gregg L. Kurz
Fish and Wildlife Biologist
Central Washington Field Office
Wenatchee, WA 98801
Phone: (509) 665-3508 extension 22
E-mail: Gregg_Kurz@fws.gov
"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

"Doyle, Daniel"
<Daniel.Doyle@nrc.gov>

11/05/2010 12:10 PM

To "Gregg Kurz (gregg_kurz@fws.gov)" <gregg_kurz@fws.gov>
cc
Subject NRC - Columbia Generating Station license renewal

Dear Mr. Kurz,

This e-mail is a follow-up to my telephone call on Tuesday, November 2, 2010. As I explained in the call, I am the project manager for the U.S. Nuclear Regulatory Commission's environmental review of the Columbia Generating Station license renewal application. I am following up on the attached letter dated March 22, 2010, that was sent to Ms. Robyn Thorson, Regional Director, U.S. Fish and Wildlife Service, Pacific Region, requesting a list of Federally protected species for this review. This letter was submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

To support preparation of a draft supplemental EIS and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the below list of Federally threatened, endangered, proposed, and candidate species that may be in the vicinity of the Columbia Generating Station site and its associated transmission line rights-of-way (as described in the attached letter to Ms. Thorson). If there are any species that your office would like us to address in addition to the Federally listed, proposed, and candidate species shown below, please let me know. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the Columbia Generating Station site if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC reviewed the attached list of species and habitat in Benton County (revised September 29, 2010) from: http://www.fws.gov/wafwo/pdf/BentonCounty092910.pdf.

LISTED
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*White Bluffs bladderpod (*Lesquerella tuplashensis*)
*Louie's western pocket gopher (*Thomomys mazama louiei*)
*Tacoma western pocket gopher (*Thomomys mazama tacomensis*)
* obtained from http://www.fws.gov/endangered

The NRC is also in consultation with the National Marine Fisheries Service regarding this project. We are currently planning on doing a single document that contains the biological assessment on the bull trout (for U.S. Fish and Wildlife Service review), the biological assessment on the Chinook salmon and steelhead (for National Marine Fisheries Service review) and the Essential Fish Habitat (for National Marine Fisheries Service review).

A copy of the draft supplemental EIS containing the NRC staff's analysis and preliminary conclusions will be sent to your office when it is published for your review.

If you have any questions concerning the NRC staff review of this license renewal application, please feel free to contact me.

Sincerely,

Daniel Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748
[attachment "CGS scoping letter to FWS ML100710046.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI] [attachment "BentonCounty092910.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI]

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 30, 2010

Robert G. Whitlam, Ph.D.
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION (LOG NO.: 121007-20-NRC)

Dear Dr. Whitlam:

The U.S. Nuclear Regulatory Commission (NRC) is considering a request submitted by Energy Northwest (the applicant) for the renewal of the operating license for Columbia Generating Station (CGS) in Benton County, Washington.

In a previous letter to your office, dated April 15, 2010, the NRC stated that it considers the Area of Potential (APE) to include the areas as defined in the correspondence between Mr. Gregory Cullen, Energy Northwest, and your office. The correspondence was included as an enclosure to that letter.

In a letter from Energy Northwest to your office dated July 22, 2010, the applicant revised their determination of the project footprint to exclude the Bonneville Power Administration (BPA) transmission lines, because the BPA controls the lines and they are not part of the plant's connection to the electrical transmission grid.

At the time, the NRC agreed with that modification to the APE. However, this determination should not have included the 115-kV BPA line which runs 1.8 miles southeast from the plant which the NRC believes should be part of the APE. In order to provide clarification, the following paragraph summarizes the NRC's determination of the APE for this license renewal environmental review.

As part of this license renewal environmental review, the following applicable transmission line corridors will be considered. Energy produced at CGS is delivered to the BPA at the H.J. Ashe Substation located 0.5 mile north of the station. Power from CGS is transmitted to the Ashe Substation via a 2,900-ft long, 280-ft wide transmission line corridor. A separate 1.8 mile 115-kV line provides backup power to CGS during plant shutdowns. This line has a right-of-way width of 90 feet and runs southeast between the CGS switchyard and a tap off the 115-kV line that runs from the Benton Switchyard to the U.S. Department of Energy Fast Flux Test Facility. Please see the enclosed site area map. The transmission line between CGS and the Ashe Substation and the 115-kV transmission line for backup power comprise the transmission lines that the NRC considers to be within the scope of license renewal.

If you have any questions or require additional information, please contact Mr. Daniel Doyle, Environmental Project Manager, by phone at 301-415-3748 or by e-mail at daniel.doyle@nrc.gov.

Sincerely,

Bennett Brady for B Pham

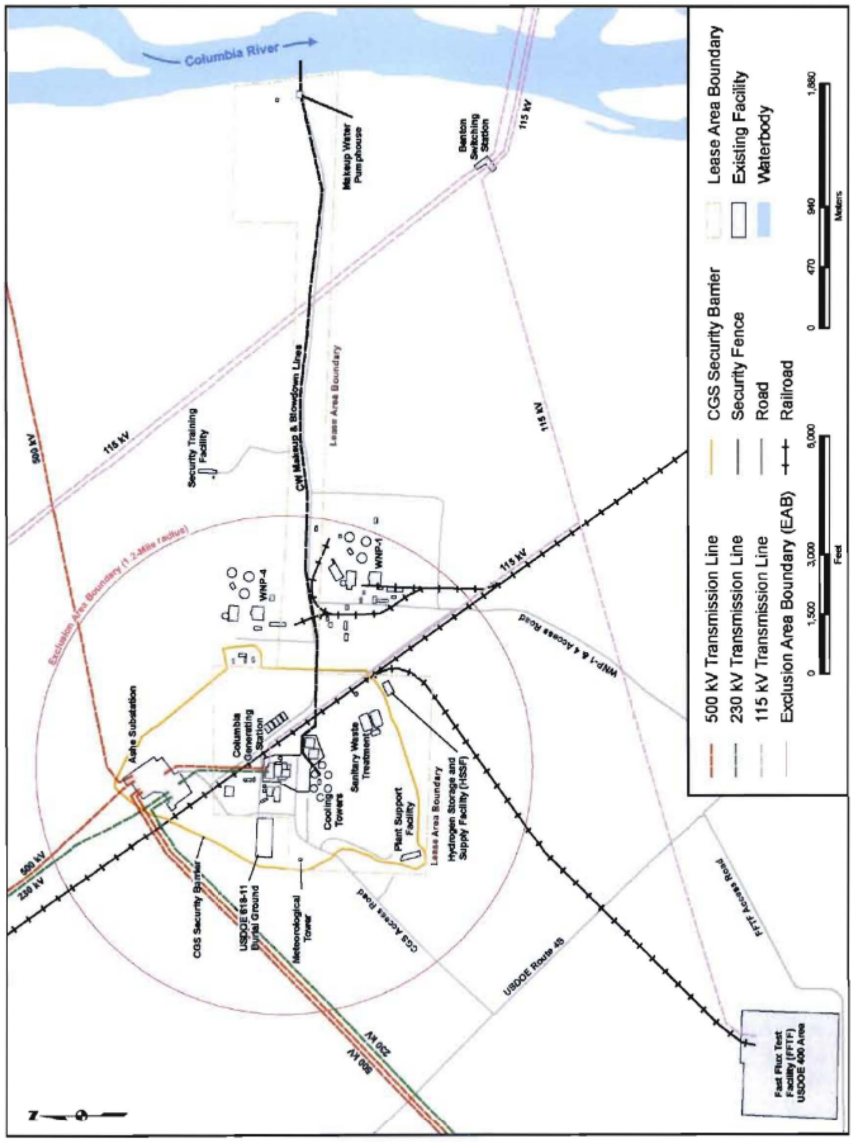
Bo M. Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
Columbia Generating Station Site Area Map

cc w/encl: Distribution via Listserv

Columbia Generating Station Site Area Map



ENCLOSURE

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

December 1, 2010

Mr. Bo M. Pham
Division of License Renewal
Nuclear Regulatory Commission
Washington, D. C., 20555-0001

Re: Columbia Generating Station License
Log No.: 121007-20-NRC

Dear Mr. Pham;

Thank you for contacting our department. We have reviewed the materials you provided for the proposed revised Area of Potential Effect (APE) for the Columbia Generating Station License Renewal at the Hanford Site, Benton County, Washington.

We concur with your proposed revised Area of Potential Effect (APE) as described in your letter and map as including the backup power line that is 1.8 miles from the CGS Switchyard to the Ashe Substation.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the requested materials and further consultation.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

cc: K. Cannell

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

From: Richard Domingue [Richard.Domingue@noaa.gov]
Sent: Friday, December 17, 2010 3:59 PM
To: Doyle, Daniel
Subject: Re: NRC BA/EFH assessment for Columbia Generating Station license renewal review

Categories: CGS

The species list included in the June 23, 2010 remain the appropriate species for this consultation. Your schedule is fine with us. Thanks.

On 12/17/2010 12:23 PM, Doyle, Daniel wrote:
Rich,

Thanks for your time on the phone this afternoon. As I said explained in the call, I am a project manager at the U.S. Nuclear Regulatory Commission coordinating the environmental review for the Columbia Generating Station license renewal application.

The purpose of this e-mail is to request an extension for the combined BA/EFH assessment for the species and habitats identified in the letter from your office to the NRC dated June 23, 2010 (attached).

We expect to publish our supplementary environmental impact statement in May 2011. The combined BA/EFH assessment will be included as an appendix to that report. The assessment will contain the staff's analysis of the potential impact to those species by the license renewal of Columbia Generating Station.

The website below contains more information about the Columbia Generating Station license renewal review:
http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

If you have any questions about this review, please feel free to contact me or the lead aquatic reviewer, Rebekah Krieg (509-371-7155 or rebekah.krieg@pnl.gov).

Sincerely,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Gregg_Kurz@fws.gov
Sent: Thursday, June 16, 2011 6:36 PM
To: Doyle, Daniel
Subject: RE: NRC - Columbia Generating Station license renewal
Attachments: pic16858.gif

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: CGS

Dan,

There has been an update to the species list since your list was obtained. Your list contains revised critical habitat for the bull trout as being proposed. The proposed revised critical habitat is now **designated** critical habitat for the bull trout. As I stated on our call, this should not result in any changes to your analysis since you have addressed the potential effects to revised critical habitat.

Gregg

Gregg L. Kurz
Fish and Wildlife Biologist
Central Washington Field Office
Wenatchee, WA 98801
Phone: (509) 665-3508 extension 22
E-mail: Gregg_Kurz@fws.gov
"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

06/15/2011 04:39 PM

To "Gregg_Kurz@fws.gov" <Gregg_Kurz@fws.gov>

cc

Subject RE: NRC - Columbia Generating Station license renewal

Mr. Kurz,

Thanks for your time on the phone today. As we discussed, I am contacting you regarding the NRC's review of the Columbia Generating Station license renewal environmental review. I would like to confirm the accuracy of the list of species and habitats in the e-mail below.

We expect to publish our draft environmental impact statement in August 2011. The combined BA/EFH assessment will be included as an appendix to that document. The assessment will contain the NRC staff's analysis of the potential impact to those species and habitats by the license renewal of Columbia Generating Station (detailed analysis for bull trout critical habitat).

This website contains more information about the NRC's review of the Columbia Generating Station license renewal application:
http://www.nrc.gov/reactors/operating/licensing/renewal/applications/columbia.html

If you have any questions about this review, please feel free to contact me or the lead aquatic reviewer, Rebekah Krieg (509-371-7155 or Rebekah.krieg@pnl.gov).

Sincerely,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Gregg_Kurz@fws.gov [mailto:Gregg_Kurz@fws.gov]
Sent: Monday, November 08, 2010 1:12 PM
To: Doyle, Daniel
Subject: Re: NRC - Columbia Generating Station license renewal

Mr. Doyle,

Thank you for forwarding the information regarding this project. The species list you obtained from our website is accurate. Please note that the revised bull trout critical habitat designation currently on the list as Proposed will become Designated on November 17, 2010.

Preparation of a biological assessment for this project should include an analysis of potential effects to all species listed as Endangered or Threatened and to any designated or proposed critical habitat. Information regarding the presence of these species and habitats can be obtained from the Washington Natural Heritage Program at http://www1.dnr.wa.gov/nhp/refdesk/index.html

We look forward to working with you.

Gregg L. Kurz

Fish and Wildlife Biologist
Central Washington Field Office
Wenatchee, WA 98801
Phone: (509) 665-3508 extension 22
E-mail: Gregg_Kurz@fws.gov
"Doyle, Daniel" <Daniel.Doyle@nrc.gov>

"Doyle, Daniel" <Daniel.Doyle@nrc.gov>	To "Gregg Kurz (gregg_kurz@fws.gov)" <gregg_kurz@fws.gov>
11/05/2010 12:10 PM	cc
	Subject NRC - Columbia Generating Station license renewal

Dear Mr. Kurz,

This e-mail is a follow-up to my telephone call on Tuesday, November 2, 2010. As I explained in the call, I am the project manager for the U.S. Nuclear Regulatory Commission's environmental review of the Columbia Generating Station license renewal application. I am following up on the attached letter dated March 22, 2010, that was sent to Ms. Robyn Thorson, Regional Director, U.S. Fish and Wildlife Service, Pacific Region, requesting a list of Federally protected species for this review. This letter was submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

To support preparation of a draft supplemental EIS and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the below list of Federally threatened, endangered, proposed, and candidate species that may be in the vicinity of the Columbia Generating Station site and its associated transmission line rights-of-way (as described in the attached letter to Ms. Thorson). If there are any species that your office would like us to address in addition to the Federally listed, proposed, and candidate species shown below, please let me know. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the Columbia Generating Station site if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC reviewed the attached list of species and habitat in Benton County (revised September 29, 2010) from: http://www.fws.gov/wafwo/pdf/BentonCounty092910.pdf.

LISTED
Bull trout (*Salvelinus confluentus*)
Pygmy rabbit (*Brachylagus idahoensis*)
Ute ladies'-tresses (*Spiranthes diluvialis*)

DESIGNATED
Critical habitat for bull trout

PROPOSED
Revised bull trout critical habitat

CANDIDATE
Greater sage grouse (*Centrocercus urophasianus*)
Yellow-billed cuckoo (*Coccyzus americanus*)
Umtanum desert buckwheat (*Eriogonum codium*)
*White Bluffs bladderpod (*Lesquerella tuplashensis*)
*Louie's western pocket gopher (*Thomomys mazama louiei*)
*Tacoma western pocket gopher (*Thomomys mazama tacomensis*)
* obtained from http://www.fws.gov/endangered

The NRC is also in consultation with the National Marine Fisheries Service regarding this project. We are currently planning on doing a single document that contains the biological assessment on the bull trout (for U.S. Fish and Wildlife Service review), the biological assessment on the Chinook salmon and steelhead (for National Marine Fisheries Service review) and the Essential Fish Habitat (for National Marine Fisheries Service review).

A copy of the draft supplemental EIS containing the NRC staff's analysis and preliminary conclusions will be sent to your office when it is published for your review.

If you have any questions concerning the NRC staff review of this license renewal application, please feel free to contact me.

Sincerely,

Daniel Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748
[attachment "CGS scoping letter to FWS ML100710046.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI] [attachment "BentonCounty092910.pdf" deleted by Gregg Kurz/WNES/R1/FWS/DOI]

From: Richard Domingue [Richard.Domingue@noaa.gov]
Sent: Monday, June 27, 2011 4:33 PM
To: Doyle, Daniel
Subject: Re: NRC BA/EFH assessment for Columbia Generating Station license renewal review

Follow Up Flag: Follow Up
Flag Status: Flagged

Categories: CGS

Yes. The species list provided last June remains accurate. Please do not overlook potential project effects on coho salmon as we will use your BA to evaluate the project's effects on essential fish habitat as well as ESA needs. Thank you.

On 6/23/2011 7:51 AM, Doyle, Daniel wrote:
Rich,

Can you please confirm if the list of species and habitats in your June 23, 2010, letter (attached) is still accurate? We expect to publish the draft EIS in August 2011. It will include a combined biological assessment and EFH Assessment.

Thanks,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Richard Domingue [mailto:Richard.Domingue@noaa.gov]
Sent: Friday, December 17, 2010 3:59 PM
To: Doyle, Daniel
Subject: Re: NRC BA/EFH assessment for Columbia Generating Station license renewal review

The species list included in the June 23, 2010 remain the appropriate species for this consultation. Your schedule is fine with us. Thanks.

On 12/17/2010 12:23 PM, Doyle, Daniel wrote:
Rich,

Thanks for your time on the phone this afternoon. As I said explained in the call, I am a project manager at the U.S. Nuclear Regulatory Commission coordinating the environmental review for the Columbia Generating Station license renewal application.

The purpose of this e-mail is to request an extension for the combined BA/EFH assessment for the species and habitats identified in the letter from your office to the NRC dated June 23, 2010 (attached).

We expect to publish our supplementary environmental impact statement in May 2011. The combined BA/EFH assessment will be included as an appendix to that report. The assessment will contain the staff's analysis of the potential impact to those species by the license renewal of Columbia Generating Station.

The website below contains more information about the Columbia Generating Station license renewal review:
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If you have any questions about this review, please feel free to contact me or the lead aquatic reviewer, Rebekah Krieg (509-371-7155 or rebekah.krieg@pnl.gov).

Sincerely,

Dan Doyle

Project Manager
Division of License Renewal
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2011

Ms. Carey Miller
Tribal Historic Preservation Officer
Confederated Tribes of the Umatilla Indian Reservation
46411 Timine Way
Pendleton, OR 97801-9467

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF COLUMBIA GENERATING STATION FOR PUBLIC COMMENT

Dear Ms. Miller:

The U.S. Nuclear Regulatory Commission (NRC) has completed the draft Supplemental Environmental Impact Statement (SEIS) for license renewal of the Columbia Generating Station (CGS) (Supplement 47 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" [GEIS]). Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for CGS will expire on December 20, 2023. This letter is to inform you and members of your tribe that the draft SEIS for the license renewal of CGS is available for public comment.

As required by Title 10 of the *Code of Federal Regulations* Part 51.74(a)(6) (10 CFR 51.74(a)(6)), the NRC is distributing the draft SEIS to your tribe for comment as well as to the Confederated Tribes and Bands of the Yakama Nation, the Nez Perce Tribe, the Confederated Tribes of the Colville Reservation, and the Wanapum Band. As stated in our letter to you dated March 19, 2010, the NRC is conducting Section 106 consultations in compliance with the National Historic Preservation Act of 1966 (NHPA) through the requirements of the National Environmental Policy Act of 1969 (NEPA), as outlined in 36 CFR 800.8(c).

In the context of NEPA, the NRC's preliminary determination is that any impact from continued power plant operations and maintenance activities during the license renewal term on historical and archaeological resources located in the area of potential effect would be small. Under the provisions of the NHPA, the NRC also determined that historic properties would not be adversely affected by this undertaking (the renewal of the CGS operating license). The justification for this conclusion is explained in Section 4.9.6 which begins on page 4-25 in the enclosed draft SEIS.

As discussed in Section 9.4 of the draft SEIS, the NRC's preliminary recommendation is that the adverse environmental impacts of license renewal for CGS are not great enough to deny the option of license renewal for energy-planning decision-makers. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the environmental report submitted by Energy Northwest; (3) consultation with Federal, State, and local agencies; (4) the NRC's environmental review; and (5) consideration of public comments received during the scoping process.

C. Miller et al. - 2 -

Public meetings will be held on September 27, 2011, at 2:00 p.m. and 7:00 p.m. at the Red Lion Hotel in Richland, Washington. A meeting notice will be published shortly providing more details about those public meetings. Please note that the public comment period for the draft SEIS ends on November 16, 2011.

A separate Notice of Availability of the draft supplemental environmental impact statement will be placed in the *Federal Register* through the U.S. Environmental Protection Agency. If you have any questions regarding this matter or wish to comment on the draft SEIS, please contact the Environmental Project Manager, Mr. Daniel Doyle at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
1. Federal Register Notice
2. "Draft Generic Environmental Impact Statement..."

cc w/encls: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2011

Ms. V. Kate Valdez
Tribal Historic Preservation Officer
Confederated Tribes and Bands of the Yakama Nation
P.O. Box 151
Toppenish, WA 98948

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF COLUMBIA GENERATING STATION FOR PUBLIC COMMENT

Dear Ms. Valdez:

The U.S. Nuclear Regulatory Commission (NRC) has completed the draft Supplemental Environmental Impact Statement (SEIS) for license renewal of the Columbia Generating Station (CGS) (Supplement 47 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" [GEIS]). Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for CGS will expire on December 20, 2023. This letter is to inform you and members of your tribe that the draft SEIS for the license renewal of CGS is available for public comment.

As required by Title 10 of the *Code of Federal Regulations* Part 51.74(a)(6) (10 CFR 51.74(a)(6)), the NRC is distributing the draft SEIS to your tribe for comment as well as to the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, the Confederated Tribes of the Colville Reservation, and the Wanapum Band. As stated in our letter to you dated March 19, 2010, the NRC is conducting Section 106 consultations in compliance with the National Historic Preservation Act of 1966 (NHPA) through the requirements of the National Environmental Policy Act of 1969 (NEPA), as outlined in 36 CFR 800.8(c).

In the context of NEPA, the NRC's preliminary determination is that any impact from continued power plant operations and maintenance activities during the license renewal term on historical and archaeological resources located in the area of potential effect would be small. Under the provisions of the NHPA, the NRC also determined that historic properties would not be adversely affected by this undertaking (the renewal of the CGS operating license). The justification for this conclusion is explained in Section 4.9.6 which begins on page 4-25 in the enclosed draft SEIS.

As discussed in Section 9.4 of the draft SEIS, the NRC's preliminary recommendation is that the adverse environmental impacts of license renewal for CGS are not great enough to deny the option of license renewal for energy-planning decision-makers. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the environmental report submitted by Energy Northwest; (3) consultation with Federal, State, and local agencies; (4) the NRC's environmental review; and (5) consideration of public comments received during the scoping process.

V. Valdez - 2 -

Public meetings will be held on September 27, 2011, at 2:00 p.m. and 7:00 p.m. at the Red Lion Hotel in Richland, Washington. A meeting notice will be published shortly providing more details about those public meetings. Please note that the public comment period for the draft SEIS ends on November 16, 2011.

A separate Notice of Availability of the draft supplemental environmental impact statement will be placed in the *Federal Register* through the U.S. Environmental Protection Agency. If you have any questions regarding this matter or wish to comment on the draft SEIS, please contact the Environmental Project Manager, Mr. Daniel Doyle at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
1. Federal Register Notice
2. "Draft Generic Environmental Impact Statement…"

cc w/encls: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2011

Mr. Rex Buck
Wanapum Band
Grant County PUD
P.O. Box 878
Ephrata, WA 98823

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF COLUMBIA GENERATING STATION FOR PUBLIC COMMENT

Dear Mr. Buck:

The U.S. Nuclear Regulatory Commission (NRC) has completed the draft Supplemental Environmental Impact Statement (SEIS) for license renewal of the Columbia Generating Station (CGS) (Supplement 47 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" [GEIS]). Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for CGS will expire on December 20, 2023. This letter is to inform you and members of your tribe that the draft SEIS for the license renewal of CGS is available for public comment.

As required by Title 10 of the *Code of Federal Regulations* Part 51.74(a)(6) (10 CFR 51.74(a)(6)), the NRC is distributing the draft SEIS to your tribe for comment as well as to the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Colville Reservation, and the Nez Perce Tribe. The NRC is conducting Section 106 consultations in compliance with the National Historic Preservation Act of 1966 (NHPA) through the requirements of the National Environmental Policy Act of 1969 (NEPA), as outlined in 36 CFR 800.8(c).

In the context of NEPA, the NRC's preliminary determination is that any impact from continued power plant operations and maintenance activities during the license renewal term on historical and archaeological resources located in the area of potential effect would be small. Under the provisions of the NHPA, the NRC also determined that historic properties would not be adversely affected by this undertaking (the renewal of the CGS operating license). The justification for this conclusion is explained in Section 4.9.6 which begins on page 4-25 in the enclosed draft SEIS.

As discussed in Section 9.4 of the draft SEIS, the NRC's preliminary recommendation is that the adverse environmental impacts of license renewal for CGS are not great enough to deny the option of license renewal for energy-planning decision-makers. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the environmental report submitted by Energy Northwest; (3) consultation with Federal, State, and local agencies; (4) the NRC's environmental review; and (5) consideration of public comments received during the scoping process.

R. Buck - 2 -

Public meetings will be held on September 27, 2011, at 2:00 p.m. and 7:00 p.m. at the Red Lion Hotel in Richland, Washington. A meeting notice will be published shortly providing more details about those public meetings. Please note that the public comment period for the draft SEIS ends on November 16, 2011.

A separate Notice of Availability of the draft supplemental environmental impact statement will be placed in the *Federal Register* through the U.S. Environmental Protection Agency. If you have any questions regarding this matter or wish to comment on the draft SEIS, please contact the Environmental Project Manager, Mr. Daniel Doyle at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
1. Federal Register Notice
2. "Draft Generic Environmental Impact Statement..."

cc w/encls: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2011

Mr. Patrick Baird
Tribal Historic Preservation Officer
Nez Perce Tribe
P.O. Box 365
Lapwai, ID 83540-0365

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF COLUMBIA GENERATING STATION FOR PUBLIC COMMENT

Dear Mr. Baird:

The U.S. Nuclear Regulatory Commission (NRC) has completed the draft Supplemental Environmental Impact Statement (SEIS) for license renewal of the Columbia Generating Station (CGS) (Supplement 47 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" [GEIS]). Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for CGS will expire on December 20, 2023. This letter is to inform you and members of your tribe that the draft SEIS for the license renewal of CGS is available for public comment.

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As discussed in Section 9.4 of the draft SEIS, the NRC's preliminary recommendation is that the adverse environmental impacts of license renewal for CGS are not great enough to deny the option of license renewal for energy-planning decision-makers. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the environmental report submitted by Energy Northwest; (3) consultation with Federal, State, and local agencies; (4) the NRC's environmental review; and (5) consideration of public comments received during the scoping process.

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A separate Notice of Availability of the draft supplemental environmental impact statement will be placed in the *Federal Register* through the U.S. Environmental Protection Agency. If you have any questions regarding this matter or wish to comment on the draft SEIS, please contact the Environmental Project Manager, Mr. Daniel Doyle at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
1. Federal Register Notice
2. "Draft Generic Environmental Impact Statement..."

cc w/encls: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2011

Ms. Camille Pleasants
Tribal Historic Preservation Officer
Confederated Tribes of the Colville Reservation
P.O. Box 150
Nespelem, WA 99155-0150

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF COLUMBIA GENERATING STATION FOR PUBLIC COMMENT

Dear Ms. Pleasants:

The U.S. Nuclear Regulatory Commission (NRC) has completed the draft Supplemental Environmental Impact Statement (SEIS) for license renewal of the Columbia Generating Station (CGS) (Supplement 47 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" [GEIS]). Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for CGS will expire on December 20, 2023. This letter is to inform you and members of your tribe that the draft SEIS for the license renewal of CGS is available for public comment.

As required by Title 10 of the *Code of Federal Regulations* Part 51.74(a)(6) (10 CFR 51.74(a)(6)), the NRC is distributing the draft SEIS to your tribe for comment as well as to the Confederated Tribes and Bands of the Yakama Nation, the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, and the Wanapum Band. As stated in our letter to you dated March 19, 2010, the NRC is conducting Section 106 consultations in compliance with the National Historic Preservation Act of 1966 (NHPA) through the requirements of the National Environmental Policy Act of 1969 (NEPA), as outlined in 36 CFR 800.8(c).

In the context of NEPA, the NRC's preliminary determination is that any impact from continued power plant operations and maintenance activities during the license renewal term on historical and archaeological resources located in the area of potential effect would be small. Under the provisions of the NHPA, the NRC also determined that historic properties would not be adversely affected by this undertaking (the renewal of the CGS operating license). The justification for this conclusion is explained in Section 4.9.6 which begins on page 4-25 in the enclosed draft SEIS.

As discussed in Section 9.4 of the draft SEIS, the NRC's preliminary recommendation is that the adverse environmental impacts of license renewal for CGS are not great enough to deny the option of license renewal for energy-planning decision-makers. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the environmental report submitted by Energy Northwest; (3) consultation with Federal, State, and local agencies; (4) the NRC's environmental review; and (5) consideration of public comments received during the scoping process.

C. Pleasants - 2 -

Public meetings will be held on September 27, 2011, at 2:00 p.m. and 7:00 p.m. at the Red Lion Hotel in Richland, Washington. A meeting notice will be published shortly providing more details about those public meetings. Please note that the public comment period for the draft SEIS ends on November 16, 2011.

A separate Notice of Availability of the draft supplemental environmental impact statement will be placed in the *Federal Register* through the U.S. Environmental Protection Agency. If you have any questions regarding this matter or wish to comment on the draft SEIS, please contact the Environmental Project Manager, Mr. Daniel Doyle at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
1. Federal Register Notice
2. "Draft Generic Environmental Impact Statement…"

cc w/encls: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2011

Robert G. Whitlam, Ph.D.
State Archaeologist
Department of Archaeology & Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL ENVIRONMENTAL REVIEW (LOG NO.: 121007-20-NRC)

Dear Dr. Whitlam:

The U.S. Nuclear Regulatory Commission (NRC) is conducting an environmental review of the effects of renewing the Columbia Generating Station (CGS) operating license. CGS, located in Benton County, Washington, approximately 12 miles northwest of Richland, is operated by Energy Northwest. As part of the environmental review, the NRC has prepared a draft Supplemental Environmental Impact Statement (SEIS) to NRC's "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437. The SEIS includes the results of a site-specific analysis of environmental impacts of license renewal at CGS, including potential impacts to historic properties. A copy of the draft SEIS is enclosed. Pursuant to 36 CFR 800.8(c), we are requesting your comments on the draft SEIS and on our preliminary conclusions regarding potential impacts to historic properties.

As explained in our letter dated November 30, 2010, the NRC determined that the area of potential effect (APE) for this license renewal action (the undertaking) is the CGS site, the two transmission lines that connect CGS to the electrical grid, and the immediate environs. This determination is made irrespective of ownership or control of the lands of interest.

NRC technical staff toured the CGS site and reviewed historic and archaeological records. The NRC also contacted three Native American Tribes identified as having potential interest in the proposed undertaking. The NRC received comments from these tribes during a meeting held on April 27, 2010, as documented in the enclosed meeting summary. Since that meeting, the NRC has not received any further correspondence from any of the tribes or additional comments concerning this review.

In the context of the National Environmental Policy Act of 1969, under which the draft SEIS was prepared, the NRC's preliminary determination is that any impact from continued power plant operations and maintenance activities during the license renewal term on historical and archaeological resources located in the APE would be small. Under the provisions of the National Historic Preservation Act of 1966, the NRC also determined that historic properties would not be adversely affected by this undertaking (the renewal of the CGS operating license). The justification for this conclusion is explained in Section 4.9.6 which begins on page 4-53 in the draft SEIS.

R. Whitlam - 2 -

Please note that the period for public comment ends on November 16, 2011. If you have any questions regarding this environmental review or require additional time, please contact the Environmental Project Manager, Mr. Daniel Doyle, at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
As stated

cc w/encls: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2011

Ms. Robyn Thorson, Regional Director
U.S. Fish and Wildlife Service
Pacific Region
911 NE 11th Ave
Portland, OR 97232

SUBJECT: BIOLOGICAL ASSESSMENT FOR INFORMAL SECTION 7 CONSULTATION RELATED TO THE LICENSE RENEWAL OF COLUMBIA GENERATING STATION

Dear Ms. Thorson:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed the enclosed draft Supplement 47 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," to evaluate the proposed renewal of the Columbia Generating Station (CGS) operating license for a period of an additional 20 years. In accordance with the Endangered Species Act of 1973, as amended, the NRC's biological assessment for license renewal of CGS is included in Appendix D-1 of the enclosed draft supplemental environmental impact statement.

CGS is located in Benton County, Washington, 12.5 miles northwest of Richland. CGS is equipped with a closed-cycle heat dissipation system that withdraws makeup water from, and discharges that water to, the Columbia River from six mechanical draft cooling towers. The plant is operated by Energy Northwest.

In a letter dated March 22, 2010[1], the NRC requested that your office of the U.S. Fish and Wildlife Service (FWS) provide the NRC with information on Federally listed endangered or threatened, proposed, and candidate species, as well as any designated critical habitat that may be in the vicinity of CGS and its associated transmission line rights-of-way. This letter initiated informal section 7 consultation under the Endangered Species Act of 1973, as amended. The FWS responded in an e-mail dated November 8, 2010[2], and identified a single aquatic species—the bull trout (*Salvelinus confluentus*)—under its jurisdiction that is Federally listed as threatened and has been reported in the Hanford Reach in the vicinity of the CGS facility. Further, the FWS indicated that critical habitat for the bull trout occurred within the action area, as previously defined. Because the NRC did not prepare its biological assessment within the 180-day timeframe specified at Title 50 of the *Code of Federal Regulations* (50 CFR) 402.12(i), the NRC confirmed the accuracy of the species list in an e-mail to FWS on June 15, 2011. The FWS responded on June 16, 2011, confirming that the bull trout was the only listed species in the area under the NRC's review.

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[1] [NRC] U.S. Nuclear Regulatory Commission. 2010. Letter from Pham B, Branch Chief, to Thorson R, Pacific Regional Director, FWS. Subject: Request for list of species for Columbia Generating Station license renewal application review. March 22, 2010. ADAMS No. ML100710046.
[2] [FWS] U.S. Fish and Wildlife Service. 2010. E-mail from Kurz GL, Fish and Wildlife Biologist, to Doyle D, Project Manager, NRC. Subject: Columbia Generating Station license renewal. November 8, 2010. ADAMS No. ML103120486.

R. Thorson - 2 -

The NRC's biological assessment provides an evaluation of the potential impact of renewing the CGS operating license for an additional 20 years of operation on the bull trout and its critical habitat. In the biological assessment, the NRC concludes that continued operation of CGS will have **no effect** on the bull trout.

The other species from the list potentially occurring in the vicinity of the plant are addressed in Section 2.2.7.1 (page 2-44), and Section 4.7.2 (page 4-10).

We are requesting your concurrence with our determination within 30 days per 50 CFR 402.12(j). In reaching our conclusion, the NRC staff relied on information provided by your office, information provided by the applicant, and on research performed by NRC staff. Please note that the comment period ends on November 16, 2011. If you have any questions regarding this issue or the staff's request, please contact Daniel Doyle, environmental project manager, or Dennis Logan, aquatic biologist. Mr. Doyle can be reached at 301-415-3748 or Daniel.Doyle@nrc.gov. Mr. Logan can be reached at 301-415-0490 or Dennis.Logan@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
As stated

cc w/encl: Listserv

August 23, 2011

Mr. Richard Domingue
National Marine Fisheries Service
Hydropower Division
1201 NE Lloyd Blvd, Ste 1100
Portland, OR 97232-2182

SUBJECT: BIOLOGICAL ASSESSMENT FOR INFORMAL SECTION 7 CONSULTATION AND REQUEST TO INITIATE ABBREVIATED EFH CONSULTATION FOR LICENSE RENEWAL OF COLUMBIA GENERATING STATION (TAC NO. ME3121)

Dear Mr. Domingue:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed the enclosed draft Supplement 47 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," to evaluate the proposed renewal of Columbia Generating Station (CGS) operating license for a period of an additional 20 years. In accordance with the Endangered Species Act of 1973, as amended (ESA), the NRC's Biological Assessment for license renewal of CGS is included in Appendix D-1 of the enclosed draft supplemental environmental impact statement (SEIS). Additionally, in accordance with the Magnuson-Stevens Fishery Conservation and Management Act, as amended through 2006 (MSA), the NRC requests to initiate abbreviated essential fish habitat (EFH) consultation per 50 CFR 600.920(h)(2) for the proposed CGS license renewal. The NRC's EFH Assessment is also in Appendix D-1 of the enclosed draft SEIS.

CGS is located in Benton County, Washington, 12.5 miles northwest of Richland. CGS is equipped with a closed-cycle heat dissipation system that withdraws makeup water from, and discharges that water to, the Columbia River from six mechanical draft cooling towers.

In a letter dated May 3, 2010[1], the NRC staff requested that your office of the National Marine Fisheries Service (NMFS) provide the NRC with information on Federally listed endangered or threatened, proposed, and candidate species as well as designated critical habitats and EFH in the vicinity of the project site. NMFS responded to the NRC's request in a letter dated June 23, 2010[2], which identified two Federally listed species near the CGS site: the Upper Columbia River spring Chinook salmon (*Oncorhynchus tshawytscha*) and the Upper Columbia River steelhead (*O. mykiss*). NMFS also noted that critical habitat for both species occurs within the proposed action area. Because the NRC did not prepare its biological assessment within the 180-day timeframe specified at 50 CFR 402.12(i), the NRC confirmed the accuracy of

[1] [NRC] U.S. Nuclear Regulatory Commission. 2010. Letter from Pham B, Branch Chief, to Thom B, Northwest Regional Administrator, NMFS. Subject: Request for list of species and essential fish habitat for the Columbia Generating Station license renewal application review. May 3, 2010. ADAMS Accession No. ML100980161.
[2] [NMFS] National Marine Fisheries Service. 2010. Letter from Suzumoto B, Northwest Assistant Regional Manager, to Pham B, Branch Chief, NRC. Subject: Reply to request for species information for Columbia Generating Station license renewal. June 23, 2010. ADAMS Accession No. ML101830405.

R. Domingue - 2 -

the species list in an e-mail to NMFS on June 23, 2011. The NMFS responded on June 27, 2011, confirming that the two salmon species are the only listed species in the area under the NRC's review.

In its June 23, 2010, letter, NMFS indicated that the Columbia River within the CGS plant vicinity contains EFH for both the Upper Columbia River Chinook and the coho salmon (*O. kisutch*). EFH for the Upper Columbia River Chinook includes all three runs (spring, summer, and fall).

To fulfill our duties under the ESA and MSA, the NRC staff developed one document that contains both the biological assessment and EFH Assessment. In the biological assessment, the NRC staff concludes that the proposed CGS license renewal **may affect, but is not likely to adversely affect**, the two Federally listed species. In the EFH Assessment, the NRC staff concludes that the proposed CGS license renewal would have a **minimal adverse effect** on EFH for both the Upper Columbia River Chinook salmon and the coho salmon.

We are requesting your concurrence with our biological assessment determination within 30 days per 50 CFR 402.12(j). We also request your concurrence with our EFH Assessment determination within 30 days per 50 CFR 600.920(h)(2). In reaching these conclusions, the NRC staff relied on information provided by the applicant, on research performed by NRC staff, and on information from NMFS. Please note that if you have comments specifically pertaining to the draft SEIS, the public comment period closes November 16, 2011. If you have any questions regarding the enclosed draft SEIS, the biological assessment, the EFH Assessment, or the staff's requests for concurrence, please contact Daniel Doyle, environmental project manager, or Dennis Logan, aquatic biologist. Mr. Doyle can be reached at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov. Mr. Logan can be reached at 301-415-0490 or Dennis.Logan@nrc.gov.

Sincerely,

/RA/

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
As stated

cc w/encl: Listserv

9/1/2011
76FR 54502 (1)

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

RECEIVED
2011 SEP -6 AM 11:30
RULES AND DIRECTIVES

September 1, 2011

Mr. David J. Wrona
Division of License Renewal
Nuclear Regulatory Commission
Washington, D.C., 10555-0001

Re: Columbia Generating Station License Renewal
Log No.: 121007-20-NRC

Dear Mr. Wrona:

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Columbia Generating Station License Renewal in Richland, Benton County, Washington.

We concur with your Determination of No Adverse Effect based upon the implementation of the Cultural Resources Protection Plan and the identified stipulations on page 4-28 including the training elements on lines 6 thru 15. We look forward to the development of the Training Agendas and the CRPP scheduled revisions.

We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity must stop, the area secured, and this department notified.

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = D. Doyle (did)
S. Freeman (SZF1)

NRR-PMDAPEm Resource

From:	Logan, Dennis
Sent:	Wednesday, September 28, 2011 5:29 PM
To:	luke.gauthier@fws.gov
Cc:	Imboden, Andy; Doyle, Daniel; Balsam, Briana; Krieg, Rebekah; NRR-PMDA-ECapture Resource
Subject:	Revised biological assessment conclusion for bull trout in Columbia Generating Station Section 7 consultation with FWS. NRC Docket 050-00397

Dear Mr. Gauthier:

The NRC staff's August 2011 biological assessment concluded that the continued operation of the Columbia Generating Station (CGS) would have **no effect** on the **bull trout** (*Salvelinus confluentus*). After further consideration, however, the NRC staff has revised its conclusion and now believes that operation of the CGS is **not likely to adversely affect** bull trout. The following discussion summarizes the findings of the biological assessment and presents the justification for the revised conclusion.

Proposed Action
The NRC's Federal action is the decision whether to renew the CGS operating license for an additional 20 years.

CGS Water Withdrawal and Discharge Summary
In generating electricity, CGS produces heat, which is transferred to the atmosphere through evaporation using six mechanical draft cooling towers. CGS also routinely discharges a portion of cooling water to the Columbia River. The total water losses are replaced by withdrawal from the Columbia River (replacement water is called make-up water). During normal operating periods, the average makeup-water withdrawal is about 17,000 gpm (1.1 m^3/s). The plant withdraws water about 300 ft (91 m) from the shoreline through two intake screens that have an outer and inner perforated pipe sleeve to exclude adult fish. The outer sleeve has a 42-in. (107-cm) - diameter sleeve with 3/8-in. (9.5-mm)-diameter holes (composing 40 percent of the surface area). The inner sleeve has a 36-in. (91-cm)-diameter sleeve with 3/4-in. (19-mm)-diameter holes (composing 7 percent of the surface area). For the discharge, the State of Washington authorizes discharge in accordance with the special and general conditions of National Pollutant Discharge Elimination System Permit No. WA-002515-1.

Assessment of Impacts to Bull Trout
The FWS listed bull trout as threatened throughout their range in 1999. The CGS's action is the Hanford Reach, which lies within the Columbia River Distinct Population segment of bull trout. The FWS considers the Hanford Reach of the mainstem Columbia River to be a potential migratory corridor for bull trout. The Mainstem Upper Columbia River critical habitat unit (CHU) provides connectivity to the Mainstem Lower Columbia River CHUs and to 13 additional CHUs. This critical habitat is the main foraging, migration, and overwintering (FMO) habitat for the Entiat River core area and provides connectivity between several other core areas or critical habitat units. The FWS's Bull Trout Final Critical Habitat Justification indicates that bull trout reside year-round in certain areas of the mainstem of the Columbia River as either sub-adults or adults and that spawning adults may also use the mainstem of the Columbia River for up to 9 months.

Observation of bull trout in the Hanford Reach is rare, and the species may seldom use this migratory corridor. Resource scientists at DOE's Hanford Site have characterized the use of the Hanford Reach by bull trout as transient. The FWS Bull Trout Final Critical Habitat Justification indicated that the accounts of bull trout in the Hanford Reach are "anecdotal" and are "likely individuals moved downstream during the spring freshet. Furthermore, the habitat and water temperatures in the Hanford Reach are not ideal for spawning, and the NRC did not identify any reports of spawning activity by bull trout in the vicinity of the CGS during its review for the proposed CGS license renewal.

The lack of spawning in the Hanford Reach means that there is no potential for young bull trout or bull trout eggs to be entrained or impinged at the CGS site. Furthermore, entrainment studies conducted in 1979–1980 and 1985 did not collect any life stage of bull trout. Impingement studies conducted over the same period did not observe any fish impinged on the intake screens. Healthy adult bull trout that commonly inhabit rivers with water velocities above 4 fps (1.2 m/s) would not be susceptible to impingement with a through-screen velocity of 0.5 fps (15 cm/s).

Regarding the heated effluent, bull trout actively select for cooler water, thus there would be little potential for them to be affected by the thermal or chemical discharge from the CGS plant. The thermal effluent from the blowdown discharge during the spring is a long, narrow plume, comprising approximately one percent of the width of the river, and bull trout would likely avoid it while migrating or foraging.

Conclusion

Because the Hanford Reach of the river is neither spawning nor rearing habitat for bull trout and because bull trout are so rare in this area, the NRC staff's biological assessment concluded that the continued operation of CGS would have no effect on the bull trout. After further consideration, however, the NRC staff now believes that because the of the age of entrainment and impingement studies and the consideration that lack of bull trout in those samples would not absolutely preclude a take of bull trout in the future, its conclusion should be more protective and conservative. Therefore, the NRC staff revises its conclusion and now believes that operation of the CGS is **not likely to adversely affect** bull trout.

Please contact me if you have any further questions,

Sincerely,

Dennis Logan, Ph.D.
Ecologist
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop O-11F1
11555 Rockville Pike
Rockville, MD 20852-2738

Phone: 301.415.0490
Fax: 301.415.2002

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
Central Washington Field Office
215 Melody Lane, Suite 119
Wenatchee, Washington 98801

October 5, 2011

In Reply Refer To:
USFWS Reference: 01E00000-2012-0004
Hydrologic Unit Codes: 17-07-01-01-01
RE: NRC-2010-0029

9/1/2011
76FR54502
37

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2011 OCT 14 AM 11: 54

RULES AND DIRECTIVES BRANCH

David J. Wrona, Chief
Division of License Renewal
Office of Nuclear Reactor Regulation

Dear Mr. Wrona:

This responds to your request for informal consultation on the Columbia Generating Station (CGS) License Renewal (Project), located in Benton County, Washington. Your August 23, 2011 cover letter and Biological Assessment (BA) were received in the U.S. Fish and Wildlife Service's (Service) Central Washington Field Office on August 31, 2011. Supplemental information and revisions to the original effects determination were received on September 29, 2011.

The U.S. Nuclear Regulatory Commission (NRC) has requested Service concurrence with the determination of "may affect, not likely to adversely affect" the bull trout (*Salvelinus confluentus*) in accordance with section 7(a)(2) of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*). Effects to other listed or proposed species, or their habitats, are not anticipated to occur.

The NRC is proposing to extend the current license for an additional 20 years. During normal operating periods, CGS withdraws about 17,000 gpm from the mainstem Columbia River. The pipe used to extract river water includes two intake screens and perforated pipe screens to exclude migrating adult bull trout. The pipe extends 300ft from the shoeline, which reduces impacts to near shore fish communities. For a complete description of the proposed license extension and conservation measures, please refer to the Project BA.

The Project BA describes effects that are either extremely unlikely to occur and/or are very small in scale. The Service agrees that the proposed license renewal will result in discountable and insignificant effects to individuals of listed species. Therefore, the Service concurs with your determinations of "may affect, not likely to adversely affect" for the bull trout, based on the

SUNSI Review Complete
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E-RIDS = ADM-03
Add = D. Doyle (did)
S. Freeman (S7F1)

information included in the BA. Our concurrence is conditioned on the nuclear plants normal operation as described in the BA.

This concludes informal consultation pursuant to the implementing regulations of the Endangered Species Act, 50 C.F.R. § 402.13. This Project should be reanalyzed if new information reveals effects of the action that may affect listed or proposed species or designated or proposed critical habitat in a manner or to an extent not considered in this consultation; if the action is subsequently modified in a manner that causes an effect to a listed or proposed species or designated or proposed critical habitat that was not considered in this consultation; and/or, if a new species is listed or critical habitat is designated that may be affected by this Project. If a bull trout is impacted or harmed via harassment, disturbance, or capture during sampling activities, it will trigger a re-initiation of consultation.

Thank you for your assistance in the conservation of listed species. If you have any questions or comments regarding this letter, please contact Luke Gauthier at the Central Washington Field Office in Wenatchee at (509) 665-3508, extension 24, or via e-mail at luke_gauthier@fws.gov.

Sincerely,

Jeffrey M Foyle FOR

Ken S. Berg, Manager
Washington Fish and Wildlife Office

cc: Dennis Logan, USNRC, Dennis.Logan@nrc.gov, 301-415-0490
Dan Doyle, USNRC, Dan.Doyle@nrc.gov, 301-415-3748

RULES AND DIRECTIVES BRANCH

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274

2011 NOV -2 AM 11: 40

October 24, 2011

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9/1/2011
76FR 54502
44

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Subject: Letter of Non-Concurrence on U.S. Nuclear Regulatory Commission's proposed license renewal for Energy Northwest's Columbia Generating Station. Consultation No. F/NWR/2011/05286.

Dear Mr. Wrona:

By letter of August 23, 2011, you requested National Marine Fisheries Service's (NMFS) concurrence with your determination that the above-referenced action may affect but is not likely to adversely affect ESA-listed Upper Columbia River spring Chinook salmon and steelhead in the Columbia River. You submitted a draft environmental impact statement that contains a biological assessment to support that conclusion with your letter. The proposed U.S. Nuclear Regulatory Commission (NRC) action is to renew the operating license for the Columbia Generating Station (located north of Richland, WA in Benton County) for a period of 20 years. Our comments are provided in accordance with Section 7 of the Endangered Species Act.

When considering a request for concurrence with an agency's not-likely-to-adversely-affect determination, we first consider the potential for adverse effects and then determine whether such effects, if any, are discountable or negligible. We cannot concur if the proposed action presents a non-discountable potential to adversely affect listed species. Due to the cooling water intake being located downstream of known spawning areas and within the migration corridor of ESA-listed salmon and steelhead, there is a potential for entrainment of juvenile salmonids under the proposed action. As the intake screening system design is not consistent with NMFS' screen criteria [1] and given the frequency of its operation, we cannot say that adverse effects from entrainment are extremely unlikely to occur, therefore this potential is not discountable.

Therefore, NMFS does not concur with your determination that the proposed action is not likely to adversely affect Upper Columbia River spring Chinook salmon and steelhead and is not likely to modify or destroy designated critical habitat.

[1] Chapter 11: NMFS Anadromous Salmonid Passage Facility Design, February 2011
http://www.nwr.noaa.gov/Publications/Reference-Documents/Passage-Refs.cfm

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Call = D. Doyle (did)
S. Freeman (SXF2)

Thus, formal ESA consultation is warranted to consider this effect and any other adverse effects on listed salmonids attributable to the project. However, prior to initiating a formal ESA Section 7(a)(2) consultation on this proposed action, NRC should develop a cooling water intake system design that meets NMFS' criteria, and a schedule for implementation, as an addition to the proposed action identified in your BA. We have assigned Bryan Nordlund, PE to this project to assist you in developing an acceptable screen design.

Rich Domingue of my staff will lead this consultation. He can be reached at 503-231-6858 or Richard.Domingue@noaa.gov. He will be contacting you shortly to set up a meeting to develop a course of action to facilitate timely consultation on this action. This concludes informal consultation on this proposal. Please include the consultation tracking number shown in the subject line of this letter in all future correspondence on this project.

Sincerely,

For

William W. Stelle, JR.
Regional Administrator

cc: Daniel Doyle, Office of Nuclear Regulation
Ritchie Graves, National Marine Fisheries Service

9/1/2011
76 FR 54502 (64)

Gallagher, Carol

From: Julie Longenecker [julielongenecker@ctuir.org]
Sent: Tuesday, November 15, 2011 3:19 PM
To: Doyle, Daniel
Cc: Ellen Kennedy; Teara Farrow Ferman; Audie Huber; Julie Longenecker
Subject: FW: Comments of the EIS for the License Renewal for the Columbia Generating Station

Dan,
Below are the comments from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Cultural Resources Protection Program (CRPP) Richland Office, on the Draft Supplemental EIS for License Renewal of the Columbia Generating Station for Public Comment. Thank you for your phone calls and correspondence in August and September. I understand the deadline for comments is Nov. 16th, but if you have any questions regarding the comments below, please call or email me today or tomorrow at (541) 429-7977, julielongenecker@ctuir.org and we can get them straightened out. If I am not available, please call Ellen Kennedy at (541) 429-7976, Ellenkennedy@ctuir.org.

Thank you,
Julie Longenecker

Subject: Comments of the EIS for the License Renewal for the Columbia Generating Station

- Include a description of the cooling tower plume in Section 2.2.8.4 Visual and Aesthetic Resources. This plume is quite visible from many places in the region depending upon the time of year and is within the viewshed of both Rattlesnake Mountain and Gable Mountain, traditional cultural properties that are important places to the CTUIR. Include a discussion of this plume and an analysis of potential visual impacts to these properties in the Historic and Archaeological Resources sections.
- CTUIR Cultural Resources Protection Program (CRPP) would like to receive a list of artifacts recovered from 45BN257 during archaeological excavations that occurred prior to the construction of the intake and outfall structures. According to the EIS, these are currently stored within DOE's Hanford Site Cultural and Historic Resources Program Collection.
- CTUIR CRPP recommends that CGS lands be re-surveyed for cultural resources since it has been over 30 years since they were surveyed. CRPP recommends that that this become a condition of the relicensing activity or that a separate PA be developed by NRC and Energy Northwest in consultation with Tribes and SHPO.
- CTUIR CRPP recommends that area next to the Columbia River be monitored annually for cultural resources. Archaeological material may continue to be exposed. CRPP recommends that that this become a condition
- of the relicensing activity or that a separate PA be developed by NRC and Energy Northwest in consultation with Tribes and SHPO.
- On page 2-67, lines 30-32 describe several artifacts as having been observed in the vicinity of the current locations of the intake and outfall structures prior to construction. Although the artifacts were not recorded as part of a site, what happened to these artifacts? Provide a list of these artifacts and confirm if these artifacts were collected and if they are stored with the artifacts from 45BN257 within DOE's Hanford Site Cultural and Historic Resources Program Collection.
- Will these collections be maintained by DOE for ENW and are there agreements in place that direct DOE to protect these collections? Who is responsible for their protection?
- P 2-68, line 27 state that a 1999 survey recorded 45BN706 (lithic core) and 45BN760 (anvil stone). Confirm if these artifacts were collected and if not, how is Energy Northwest protecting them? If so, were they added to DOE's collection?

SUNSI Review Complete
Template = ADM-013

1

E-RIDS = ADM-03
Add: D. Doyle (DID)
S. Freeman (S2F1)

- P.2-68, line 32 indicates that two lithic flakes were observed in the general location of 45BN257. Confirm if these artifacts were collected and if not, how is Energy Northwest protecting them? If so, were they added to DOE's collection?
- As the leasee, is it Energy Northwest's responsibility is it to maintain archaeological site records, collections etc. for the CGS site? Or is it DOE's? Is there an agreement or procedure in place that governs this? CTUIR CRPP recommends that a formal agreement be developed to clarify roles and responsibilities of Tribes, Energy Northwest, NRC and DOE on the CGS site regarding human remains, archaeological sites, collections and cultural resources compliance. CRPP recommends that this agreement be part of the condition of the NRC relicensing activity or that a separate PA be developed by NRC and Energy Northwest in consultation with Tribes and SHPO outlining these.
- P. 4-27, line 26-28 indicates that tribes suggested that Energy Northwest work with tribes to develop cultural resources training for Energy Northwest staff. What is the status of this training and when will it occur? CTUIR recommends that this be a requirement as part of the license renewal or be addressed in a PA developed by NRC in consultation with Tribes and SHPO outlining these.
- The CTUIR CRPP would like to receive and review Energy Northwest's cultural resources protection procedure and be formally consulted on the implementation of this procedure. Does the procedure call for coordination and/or consultation with CTUIR CRPP? CRPP recommends that this procedure be part of a separate PA developed by NRC and Energy Northwest in consultation with SHPO and Tribes.
- The CTUIR CRPP would like to meet with the Energy Northwest personnel who oversee the implementation of the cultural resources protection procedure as well as establish a long-term consultation process and relationship between local staff at Energy Northwest and CTUIR CRPP.
- p.4-27-4-28 of the EIS mentions the MOA for Energy Northwest's communication facility located on Rattlesnake Mountain that was signed by DOE, Energy Northwest and SHPO. CRPP would like to remind Energy Northwest and DOE of stipulation B.2 in the MOA committing Energy Northwest and DOE to evaluating technologies as they become available that enable relocation of this facility off of Rattlesnake Mountain. CRPP recommends that this MOA be tied to the NRC relicensing conditions, as operation of the communications facility is part of the relicensing action either as a condition of the license or through the development of a PA by NRC and Energy Northwest in consultation with Tribes and SHPO.
- P. 2-68, line 37- the survey was completed by the CTUIR not for the CTUIR.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ECOSYSTEMS, TRIBAL AND
PUBLIC AFFAIRS

November 16, 2011

Cindy Bladey
Chief, Rules, Announcements, and Directives Branch
Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

9/1/2011
76FR54502
70

Re: Comments on the Draft Supplemental Environmental Impact Statement (DSEIS) for renewal of the Columbia Generating Station (CGS) license
EPA Project Number: 11-4122-NRC.

Dear Ms. Bladey:

In accordance with our responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA), the Environmental Protection Agency (EPA) has reviewed the US Nuclear Regulatory Agency (NRC) Draft Supplemental Environmental Impact Statement (DSEIS) for the proposed relicense of the Columbia Generating Station (CGS) in the city of Richland, Benton County, Washington.

The EPA believes that the DSEIS provides adequate discussion of the potential environmental impacts associated with the proposed action and we have not identified any potential environmental impacts requiring substantive changes. However, we do recommend that the final SEIS include updated information on the status of the National Pollutant Discharge Elimination System permit application (p. C-5) and measures to protect water quality; and outcomes of consultations with the US Fish and Wildlife Service and the National Marine Fisheries Service, including recommended measures to reduce risks and protect biota and habitat. Correspondingly, it will also be important to continue coordination with Washington State Department of Fish and Wildlife throughout the license period to monitor risks to species and take corrective action.

The EPA has rated the DSEIS as LO - "Lack of Objections". An explanation of this rating is enclosed. We appreciate the opportunity to review this SEIS document and look forward to reviewing the final SEIS for the project.

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = D. Doyle (dxd)
S. Freeman (SZF7)

If you have questions about our comments, please contact me at (206) 553-1601 or by electronic mail at reichgott.christine@epa.gov, or you may contact Theo Mbabaliye of my staff at (206) 553-6322 or by electronic mail at mbabaliye.theogene@epa.gov.

Sincerely,

Christine B. Reichgott

Christine B. Reichgott, Manager
Environmental Review and Sediment Management Unit

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

<u>Environmental Impact of the Action</u>

LO – Lack of Objections
The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns
EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections
EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory
EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

<u>Adequacy of the Impact Statement</u>

Category 1 – Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA <u>Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment</u>. February, 1987.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 20, 2011

Mr. William W. Stelle, Jr.
Regional Administrator
National Marine Fisheries Service
Northwest Regional Office
1201 NE Lloyd Blvd., Suite 1100
Portland, OR 97232-1274

SUBJECT: RESPONSE TO LETTER OF NON-CONCURRENCE ON BIOLOGICAL ASSESSMENT FOR PROPOSED LICENSE RENEWAL OF COLUMBIA GENERATING STATION (TAC NO. ME3121; NMFS CONSULTATION NO. F/NWR/2011/05286)

Dear Mr. Stelle:

The U.S. Nuclear Regulatory Commission (NRC; the staff) received your October 24, 2011, letter in response to the staff's draft supplemental environmental impact statement (SEIS) for the proposed license renewal of Columbia Generating Station (CGS) in Benton County, Washington. Your letter directs NRC to initiate formal consultation under section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA). Before determining whether formal section 7 consultation is the appropriate next step, the NRC staff would like to clarify a few issues raised in your letter.

The NRC staff has prepared a technical attachment to this letter that discusses three main concerns raised in your letter: (1) the potential for CGS to entrain juvenile salmonids; (2) the National Marine Fisheries Service (NMFS)'s intake screen criteria contained in *Anadromous Salmonid Passage Facility Design*, and (3) the NRC's authority related to CGS's cooling water intake system design and any modifications thereto.

In summary, the NRC believes that informal section 7 consultation is the appropriate means of fulfilling NRC's obligations under the ESA for the proposed CGS license renewal. The NRC welcomes any information that your office may have that would indicate that CGS is entraining either Upper Columbia River spring Chinook juveniles or Upper Columbia River steelhead juveniles or other available information that would justify initiation of formal section 7 consultation.

W. Stelle - 2 -

If you have any questions regarding this letter or the proposed CGS license renewal, please contact Daniel Doyle, environmental project manager, or Dennis Logan, aquatic biologist. Mr. Doyle can be reached at 301-415-3748 or by e-mail at Daniel.Doyle@nrc.gov. Mr. Logan can be reached at 301-415-0490 or by e-mail at Dennis.Logan@nrc.gov.

Sincerely,

for

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
As stated

cc w/encl: Listserv

Technical Discussion of NMFS's Concerns Related to Informal Section 7 Consultation at Columbia Generating Station

In a letter dated August 23, 2011 (NRC 2011b), the U.S. Nuclear Regulatory Commission (NRC) submitted a biological assessment (NRC 2011a) to the National Marine Fisheries Service (NMFS) as part of informal section 7 consultation under the Endangered Species Act of 1973, as amended (ESA), for the proposed license renewal of Columbia Generating Station (CGS). The biological assessment considered the potential impacts to Upper Columbia River spring Chinook (*Oncorhynchus tshawytscha*) and the Upper Columbia River steelhead (*O. mykiss*). On October 24, 2011, the NMFS responded with a letter (NMFS 2011b) that raised a number of concerns with the proposed action and its effects on listed species. This technical discussion addresses the three primary concerns identified in NMFS's letter, which are:

- the potential for CGS to entrain juvenile salmonids;
- the NMFS's intake screen criteria; and
- the NRC's authority related to CGS's cooling water intake system design.

As a result of these concerns, NMFS's October 24 letter directed NRC to initiate formal section 7 consultation. However, the NRC believes that informal section 7 consultation is the appropriate means of fulfilling NRC's obligations under the ESA for the proposed CGS license renewal. In addressing each of NMFS's concerns, the NRC staff did not identify any information or statutory requirement that would necessitate the NRC to initiate formal section 7 consultation.

I. Entrainment of Juvenile Salmonids

In its October 24 letter, the NMFS states that the CGS cooling system has the potential to entrain juvenile salmonids during the proposed relicensing period. However, juvenile Upper Columbia River spring Chinook are too large to be entrained into the cooling system at the time they migrate through the Hanford Reach (as adults migrating upstream or, more typically, as one- to two-year-old smolts descending the river from the upper tributaries of the Columbia River). The second salmonid species listed under the ESA is the Upper Columbia River steelhead. Upper Columbia River steelhead historically spawned in the Hanford Reach. Since 2006, no evidence of steelhead spawning has been observed in the Hanford Reach in the vicinity of the CGS intake. Steelhead fry in the Hanford Reach have been well studied, and they do not emerge from the river substrate until they are about 2.5 cm (~1 in.) long and even then, they will tend to seek cover. Further, CGS collected no life stage of Upper Columbia River steelhead in entrainment studies conducted in 1979–1980 and 1985.

If the NMFS has any contradictory information that would indicate that the CGS cooling system is entraining or has the potential to entrain protected juvenile salmonids, NRC would welcome that information for its staff's consideration. Absent of any such additional information, the NRC believes that, consistent with 50 CFR 402.12(k), the staff's conclusion of "may affect, but is not likely to adversely affect" for both the Upper Columbia River spring Chinook salmon and the Upper Columbia River steelhead in NRC's biological assessment does not warrant initiation of formal section 7 consultation.

ENCLOSURE

II. NMFS's Anadromous Salmonid Passage Facility Design

NMFS's October 24 letter states that NMFS does not concur with the NRC's biological assessment effect determinations because CGS's intake screen design is not consistent with NMFS's screen criteria in Anadromous Salmonid Passage Facility Design (NMFS 2011a). The introduction to this document states, however, that:

> *Existing facilities may not adhere to the criteria and guidelines listed in this document. However, that does not mean these facilities must be modified specifically for compliance with this document. The intention of these criteria and guidelines is to ensure future compliance in the context of major upgrades and new designs of fish passage facilities.*

CGS is an existing facility, and the proposed license renewal would not involve any "major upgrades" or "new designs of fish passage facilities." The NMFS letter seems to indicate that compliance with NMFS's screen criteria is required, but the document containing the criteria makes no such claim. Therefore, the NRC staff does not believe that non-compliance with this criterion alone necessitates initiation of formal section 7 consultation.

III. CGS's Cooling Water Intake System

NMFS's October 24 letter directs the NRC to develop a cooling water intake system design that meets NMFS's screen criteria and to create a schedule for implementing such a design. The identification and implementation of best technology available (BTA) for cooling water intake systems is, however, under the authority of the U.S. Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act of 1972 (the Clean Water Act; henceforth, CWA). The EPA delegated its authority under the CWA to issue and oversee National Pollutant Discharge Elimination System (NPDES) permits to the State of Washington in 1973.

The State of Washington authorizes discharge of treated wastewater via three outfalls at CGS, in accordance with special and general conditions of NPDES Permit No. WA-002515-1. Under this permit, the State of Washington can require mitigation measures, such as requiring that a cooling system meet NMFS's screen criteria, BTA, or other modifications of the cooling system to reduce entrainment and impingement impacts to aquatic life.

The evaluation or implementation of NMFS's screen criteria is beyond the NRC's regulatory authority. When Congress amended the CWA in 1972, it assigned statutory authority over water quality matters to the EPA. Portions of the CWA specifically removed water quality oversight authority from other Federal agencies such as the NRC, and, further, sought to prevent duplicative Federal oversight of CWA issues by specifically and solely vesting authority and expertise with the EPA. Section IV of this technical discussion provides more details on the history of NRC's authority in water permitting matters.

NMFS's concerns and modification suggestions regarding CGS's cooling water intake system design would be most appropriately considered as part of the CGS NPDES permit renewal process. Energy Northwest submitted an application to the Washington State Energy Facility Site Evaluation Council (EFSEC) to renew its NPDES permit on November 19, 2010. The EFSEC has administratively extended CGS's previous NPDES permit, which was issued on May 25, 2006, and expired on May 25, 2011, until the EFSEC makes a decision on whether to grant a renewed NPDES permit. Because EFSEC has not yet issued a renewed NPDES permit, NRC encourages NMFS to collaborate with EFSEC to recommend cooling water intake system modifications that would be more protective of aquatic life and, specifically, listed salmon species.

IV. NRC's Historical Efforts in Water Permitting Issues

Prior to the 1972 CWA, the staff of NRC's predecessor agency, the Atomic Energy Commission (AEC) exercised authority for water permitting. However, after the 1972 CWA amendments, the AEC (now the NRC) entered into a memoranda of understanding with EPA regarding EPA's exclusive authority for water permitting. Now, the NRC clearly defers to EPA and its state delegees for water permitting in its review processes (see reference to 10 CFR Part 51.53(c)(3)(ii)(B) below).

NRC staff have previously attempted to impose more-stringent or merely different requirements on licensees that those required by EPA. Notably, in *Tennessee Valley Authority* (Yellow Creek Nuclear Plant, Units 1 and 2), ALAB-515, 8 NRC 702 (1978), the Atomic Safety and Licensing Appeal Board (ALAB) struck down the NRC staff's attempts to require water quality monitoring as a license condition for a proposed nuclear power plant on the grounds that such license conditions challenged Congress's exclusive grant of water quality expertise and authority to EPA under the CWA. The ALAB held that NRC "may not undercut EPA by undertaking its own analyses and reaching its own conclusions on water quality issues already decided by EPA," 8 NRC at 715, and that the NRC may not include any limiting conditions of operation or monitoring requirements of its own in the license for the protection of the aquatic environment. 8 NRC at 713-714. The ALAB was aware that EPA's authority could be delegated to states, and though NRC staff argued that state-level delegation was a reason to allow staff to impose more-stringent standards, the ALAB found no evidence at that time that states would fail to set and enforce water quality standards. 8 NRC at 714-715.

The ALAB, later ruling on an appeal regarding a contention that a power plant's operation with once-through cooling would have an adverse effect upon the aquatic environment in general, held that the NRC staff must take EPA's decisions (in a state where EPA regulated water quality) about the appropriate cooling technologies at face value. *Carolina Power and Light Company* (H.B. Robinson, Unit No. 2), ALAB-569, 10 NRC 557, 561-562 (1979). NRC's lower adjudicatory board had expressed some discomfort with accepting EPA's determination that open-cycle cooling was appropriate, but the ALAB found "We are bound to take EPA's considered decisions at face value, and simply to factor them into our cost-benefit balance." 10 NRC at 561-562.

Currently, NRC's regulations for license renewal environmental reviews, such as the currently ongoing review of CGS's license renewal application, establish the primacy of EPA or states (when applicable) in water quality regulations as they relate to impacts on aquatic species. Specifically, the regulations establishing required contents of an applicant's license renewal environmental report defer to states' determinations of cooling system impacts at plants with once-through cooling (10 CFR Part 51.53(c)(3)(ii)(B)):

> *If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations and, if necessary, a 316(a) variance in accordance with 40 CFR part 125, or equivalent State permits and supporting documentation.*

> *If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from heat shock and impingement and entrainment.*

Thus, not only does NRC *not* regulate intakes and discharges at nuclear power plants (including CGS), but NRC defers the assessment of impacts from heat shock, impingement, and entrainment to the responsible agencies. Only in the absence of such determinations does NRC require an applicant to directly assess impacts.

NRC proceedings have held that a discharge permit and related 316(a) variances and 316(b) determinations, respectively, are valid for the purposes of 10 CFR Part 51.53(c)(3)(ii)(B) even in a case when a discharge permit is under administrative extension at the time of the NRC's review. *Entergy Nuclear Operations Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13, 68 NRC 43, 155-158 (2008); wherein an Atomic Safety and Licensing Board Panel (ASLBP) rejected a contention proffered by New York State that asserted Indian Point lacked a valid 316(b) determination because the associated NPDES permit had been administratively extended while permit renewal proceedings were ongoing. The ASLBP noted:

> *The Commission recently reinforced the need for Licensing Boards to defer to the State's ruling on once-through cooling as reflected in these equivalent permits. It would be futile for the Board to review any of the CWA determinations, given that it is not possible for the Commission to implement any changes that might be deemed appropriate.*

68 NRC at 156-157 (internal footnotes omitted). In CLI-07-16, the Commission noted:

> *As we explain below, section 511(c)(2) of the Clean Water Act does not give us the option of looking behind the agency's permit to make an independent determination as to whether it qualifies as a bona fide section 316(a) determination. That section expressly prohibits us from "review[ing] any effluent limitation or other requirement established pursuant to" the Clean Water Act. And to state the obvious, the Agency's Section 316(a) permit establishes limitations on effluent water temperature and therefore falls within this statutory provision.*

Entergy Nuclear Vermont Yankee, LLC., (Vermont Yankee Nuclear Power Station), CLI-07-16 65 NRC 371, 387 (2007).

NRC deference to EPA's statutory authority, either directly exercised by EPA or as delegated to the states, extends to both operational water quality impacts and aquatic biota protection.

V. Conclusion

The NRC believes that informal section 7 consultation is the appropriate means of fulfilling NRC's obligations under the ESA for the proposed CGS license renewal. The *Endangered Species Consultation Handbook* (FWS and NMFS 1998) also indicates that informal section 7 consultation is sufficient in an instance such as this:

- 5 -

When action agencies request formal consultation on actions not likely to adversely affect listed species or designated critical habitat, the Services should explain that informal consultation/concurrence letters are adequate to complete section 7 compliance…

In conclusion, absent any new and significant information from NMFS indicating that CGS is entraining either Upper Columbia River spring Chinook juveniles or Upper Columbia River steelhead juveniles, the NRC staff has determined that formal section 7 consultation is not warranted at this time.

References:

[FWS and NMFS] U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.* Washington, DC: FWS and NMFS. Available at <http://www.fws.gov/caribbean/es/PDF/Sec%207%20Handbook.pdf> (accessed 29 November 2011).

[NMFS] National Marine Fisheries Service. 2011a. *Anadromous Salmonid Passage Facility Design*. July 2011. Available at <http://www.nwr.noaa.gov/Salmon-Hydropower/FERC/upload/Fish-Passage-Design.pdf> (accessed 29 November 2011).

[NMFS] National Marine Fisheries Service. 2011b. Letter from W. Stelle, Northwest Regional Administrator, to D. Wrona, Branch Chief, NRC. Subject: Non-concurrrence on NRC's proposed license renewal for Energy Northwest's Columbia Generating Station. October 24, 2011. ADAMS No. ML11307A393.

[NRC] U.S. Nuclear Regulatory Commission. 2011a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Columbia Generating Station*; Draft Report for Comment. Washington, DC: NRC. NUREG–1437, Supplement 47. August 2011. ADAMS No. ML11227A007.

[NRC] U.S. Nuclear Regulatory Commission. 2011b. Letter from D. Wrona, Branch Chief, to R. Domingue, NMFS. Subject: Biological assessment for informal section 7 consultation and request to initiate abbreviated EFH Consultation for license renewal of Columbia Generating Station. August 23, 2011. ADAMS No. ML11165A030.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 31, 2012

Ms. Julie Longenecker
Cultural Resources Protection Program (CRPP)
Richland Office
Confederated Tribes of the Umatilla Indian Reservation
3100 George Washington Way
Richland, WA 99352

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL ENVIRONMENTAL REVIEW

Dear Ms. Longenecker:

The U.S. Nuclear Regulatory Commission (NRC) would like to thank you for your email dated November 15, 2001, sent in response the NRC's request for comments concerning the proposed license renewal of Columbia Generating Station (CGS) and the associated environmental review. The NRC values the importance of establishing and maintaining open lines of communication with representatives and leaders of Native American Tribal Nations. Accordingly, the NRC would like to address the concerns identified in your comments.

In the context of the National Environmental Policy Act of 1969, under which the draft supplemental environmental impact statement was prepared, the NRC's preliminary determination is that there would be no construction, land expansion, or ground-disturbing activities associated with the license renewal of CGS. As such, there is currently no need to re-survey CGS property. The previous survey was conducted by a professional archaeologist meeting the Secretary of the Interior's standards with final determinations made by the Department of Energy (DOE) and concurrence by the Washington State Historic Preservation Officer (SHPO).

Regarding your comments concerning Energy Northwest's cultural resource management plan and training, your comments will be forwarded to DOE and Energy Northwest for their consideration because the NRC does not have regulatory authority related to these matters.

In response to the concerns regarding the discovery, handling, and archiving of cultural resources, your comments will be forwarded to DOE and Energy Northwest for their consideration. The NRC does not have jurisdiction over cultural resources previously found on the CGS site for DOE, and the management of these resources is not within the scope of license renewal. When cultural resources are discovered on NRC-licensed sites, they are handled per appropriate Federal procedures and typically curated locally. At CGS, the inadvertent discovery of cultural resources, specifically in the areas of concern near the Columbia River, would be addressed by Energy Northwest's cultural resources protection

J. Longenecker - 2 -

procedure. Ultimately, as CGS is on DOE land, any cultural resources discovered on the CGS site and associated records would be handled per DOE's *Hanford Site Cultural and Historic Resources Program*.

The supplemental environmental impact statement will be revised to address the visual impact of the aerial plume of condensation from the cooling towers in Section 2.2.8.4. Section 2.2.10 will be revised to clarify the origin of the archaeological survey in question. The NRC will also forward the comment regarding the Memorandum of Agreement for the communications facility located on Rattlesnake Mountain to DOE and Energy Northwest as the NRC is not party to the agreement.

Again, thank you for your comments. These and other comments received during the comment period will be addressed in the final supplemental environmental impact statement for license renewal of CGS. If you need additional information regarding the CGS license renewal environmental review process or this letter, please contact Daniel Doyle, environmental project manager, at 301-415-3748 or by email at Daniel.Doyle@nrc.gov.

Sincerely,

For

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 31, 2012

Dr. Robert G. Whitlam, Ph.D.
State Archaeologist
Department of Archaeology & Historic Preservation
1063 S. Capitol Way, Suite 106
Olympia, WA 98501

SUBJECT: COLUMBIA GENERATING STATION LICENSE RENEWAL (LOG NO. 121007-20-NRC)

Dear Dr. Whitlam:

The U.S. Nuclear Regulatory Commission (NRC) would like to thank you for your letter dated September 1, 2011, sent in response to the NRC's request for comments concerning the proposed license renewal of Columbia Generating Station and the associated environmental review. The NRC appreciates your office taking the time to review the draft supplemental environmental impact statement regarding Columbia Generating Station and for submitting comments.

Regarding your comments related to the development of the training agendas and the Cultural Resources Protection Plan (CRPP), the NRC has forwarded your comments to Energy Northwest and has encouraged Energy Northwest to coordinate with your office and the tribes regarding revisions to the CRPP and the development of cultural resource awareness training.

You requested that the NRC forward correspondence and comments from concerned tribes or other parties to your office. Enclosed you will find comments submitted by the Confederated Tribes of the Umatilla Indian Reservation and the NRC's response.

The NRC will continue to keep your office informed should additional information become available that may cause the NRC to revise our assessment. Again, thank you for your comments. These and other comments received during the public comment period will be addressed in the final supplemental environmental impact statement which is scheduled to be published in April 2012.

R. Whitlam - 2 -

If you need additional information regarding this process or this letter, please contact Daniel Doyle, environmental project manager, at 301-415-3748 or by email at Daniel.Doyle@nrc.gov.

Sincerely,

FOR

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
As stated

cc: Listserv

NRR-PMDAPEm Resource

From: Richard Domingue [richard.domingue@noaa.gov]
Sent: Friday, February 10, 2012 8:36 PM
To: Doyle, Daniel
Subject: Columbia Generating Station Additional Information Request
Attachments: Feb 2012 additional Info request - Columbia Generating Station (2).docx

Dan, As per our previous discussion, attached is an additional information request for information needed for the relicensing of CGS. Please feel free to contact me with any questions.

--
Richard Domingue
503-231-6858

February 10, 2012

To: Dan Doyle, Nuclear Regulatory Commission
From: Rich Domingue, National Marine Fisheries Service

RE: Additional Information Request regarding license renewal of The Columbia Generating Station Consultation No. F/NWR/2011/05286.

We have identified two aspects of the Columbia Generating Station configuration and operations as presented in Supplement 47 of the Generic EIS for License Renewal of Nuclear Plants, Regarding the Columbia Generating Station that have a potential to adversely affect fish species listed under the ESA, or covered under the Magnuson Stevens Act: the cooling system make-up water intake, and effluent outfall 001. At present insufficient information is available to NMFS to evaluate these potential adverse effects. We request the following information.

1. Copies of impingement and/or entrainment studies conducted on the existing intake screens. Your letter of December 20, 2011 refers to two entrainment studies that have been conducted on the existing intakes conducted in 1979-1980 and 1985 as providing evidence that the existing screens are not likely to adversely affect ESA-listed fish species. Please provide copies of these studies, including methods and results for our consideration.

2. A complete intake screen design report. NMFS has developed a fish screen design summary form that provides information pertinent to evaluating the likely effectiveness of water intake screens to avoid or minimize take of listed species (attached). Please complete the attached screen design summary form except those areas we have identified as not applicable (N/A). Some of the requested information is available in the Draft EIS you have provided. However, we need all of the information requested and placing all pertinent information in the summary format would assist our timely review.

3. While the 001 outfall discharges a small amount of water, its physical and chemical characteristics are not well defined and could adversely affect individual fish passing in the immediate vicinity of the outfall. Because the condenser tubing has been replaced, effluent data from the period prior to this replacement does not accurately represent the characteristics of this waste stream. NMFS expects that effluent conditions have improved since this upgrade. Please provide water quality characteristics for this outfall collected pursuant to NPDES permit WA0025151-1 summarized on a quarterly basis (seasonal) over a period of at least one year. NRC should estimate the potential effects of this discharge on Upper Columbia River spring Chinook salmon and steelhead and Upper Columbia River summer/fall Chinook salmon and Columbia River coho (for which essential fish habitat has been designated under the Magnuson-Stevens Act). Both direct effects (e.g. toxicity to salmonids) and indirect effects (e.g. in the event that discharged effluent is warmer than the Columbia River, a potential would exist for additional predation by introduced warm water fishes that may be attracted to and enhanced by the warmer water provided by the outfall) should be considered. The potential for adverse effects varies by season and NRC should address potential adverse effects on each inland life stage and pay particular attention to fry and juvenile life stages as these life stages are most susceptible to adverse water quality conditions. Your draft EIS cites thermal drift studies that were conducted in 1985 (WPPSS 1986) as evidence that heated effluent from the cooling system does not adversely affect anadromous fish that may encounter the waste plume. Although we anticipate that the current effluent characteristics are not the same as those prior to the condenser tubing replacement, please provide a copy of this study for our consideration.

Juvenile Fish Screen Design Summary

Provided by: Date:

Contact information:

I. Description of site including name of diverted stream, type of diversion, type of headgate, metering device, site name.

II. Water Surface Elevation (WSE) Data. Generally indicate method used to determine and estimate flows and elevations. Elevations can be relative to local benchmark, and period of record should be limited to the downstream juvenile migration season.

1. River WSE and streamflow near site of bypass return (open channel diversions only) NA

a. 5% exceedence flow = CFS, WSE =

b. 95% exceedence flow = CFS, WSE =

2. River WSE and streamflow at point of diversion

a. 5% exceedence flow = CFS, WSE =

b. 95% exceedence flow = CFS, WSE =

3. Diverted flow and associated WSE on the screen

a. Maximum diversion = CFS, WSE =

b. Normal diversion = CFS, WSE =

c. Minimum diversion = CFS, WSE =

III. Screen structure

1. Type of screen (rotary drum, fixed vertical, etc.): Attach detailed drawing of screen , including dimensions, mesh, seals

2. Angle of screen relative to ditch flow: NA

3. Screen cleaning mechanism (drum rotation, backspray, brushes etc.):

4. Screen cleaner powered by (electric motor, paddlewheel, hydraulic motor etc.):

5. Minimum submerged screen area:

6. Length of screen:

7. Bottom and top elevation of flow area of the screen:

8. Screen diameter (drum or cylindrical screens): NA

9. For pump intake screens, list brand, model, cleaning mechanism:

10. Describe inspection, operations and maintenance program.

IV. Recommended bypass return pipe (if applicable) NA – (probably)

1. Pipe diameter =

2. Length required (to preferred outfall site) =

3. Pipe slope (rise/run) =

4. Bypass flow and flow control device (weir length or orifice size):

5. Outfall type (submerged, free-fall, open channel):

6. Approximate river velocity at outfall =

7. Minimum outfall depth =

8. Ditch invert elevation =

V. Other site characteristics and constraints (examples: fish species/life stage present, access problems, stream characteristics at bypass outfall site, construction site problems, excessive cut/fill, land owner problems, irrigation season, river flow, construction window, ice jam problems, sedimentation potential, winter operation required for stock water, consolidation potential, irrigation methods that impact indicated water surface elevations, screen location constraints, road/bridge construction required, excessive or unusual debris load etc.). Indicate method of coping with constraints.

VI. Site sketch. Include screen location, river geometry near screen site.

VII. Ditch cross sections (if applicable). Include invert elevations relative to benchmark, distance between cross-sections, and water surface elevation. NA

APPENDIX D-1
BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT

Biological Assessment and Essential Fish Habitat Assessment

Columbia Generating Station License Renewal

August 2011

Docket Number 50-397

U.S. Nuclear Regulatory Commission

Rockville, Maryland

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Tables

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

°C	degrees Celsius
°F	degrees Fahrenheit
ac	acre(s)
ADAMS	Agencywide Document Access and Management System
BA	Biological Assessment
BPA	Bonneville Power Administration
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
CGS	Columbia Generating Station
CHU	critical habitat unit
cm	centimeter(s)
DO	dissolved oxygen
DOE	Department of Energy
DPS	distinct population segment
EFH	Essential Fish Habitat
EN	Energy Northwest
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
fm	fathom(s)
FMO	foraging, migration, and overwintering
fps	feet per second
FR	*Federal Register*
ft	foot(feet)
ft^3/s	cubic feet per second
GEIS	Generic Environmental Impact Statement
gpm	gallons per minute
ha	hectare(s)
in.	inch(es)

kg	kilogram(s)
km	kilometer(s)
km^2	square kilometer(s)
lb	pound(s)
m	meter(s)
m/s	meter(s) per second
m^3/s	cubic meter(s) per second
mg/L	milligram(s) per liter
mi	mile(s)
mi^2	square mile(s)
mm	millimeter
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level
NEPA	U.S. National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	U.S. Nuclear Regulatory Commission
RM	river mile(s)
s	second(s)
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WPPSS	Washington Public Power Supply System
WSDOT	Washington State Department of Transportation

D-1 BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT FOR THE PROPOSED LICENSE RENEWAL FOR THE COLUMBIA GENERATING STATION

D-1.1 Introduction

The purpose of this biological assessment (BA)/essential fish habitat (EFH) assessment is to address the effect of the renewing the operating license of Columbia Generating Station (CGS) on endangered or threatened species—under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1536(a)-(d))—or their designated critical habitat. It also addresses the EFH for designated fish species. The U.S. Nuclear Regulatory Commission (NRC) prepared this joint BA/EFH Assessment to support the supplemental environmental impact statement for the renewal of the operating license for CGS, which is operated by Energy Northwest, under the NRC's regulations in Title 10 of the *Code of Federal Regulations* (CFR) Parts 50 and 51.

Under Section 7 of the ESA of 1973, the NRC must consult with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), as appropriate, to provide information on the potential impact that the operation of CGS could have on the Federally listed species near the site. Adherence to the practices set forth in Section 7 ensures that, through consultation with the Service, Federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species or result in the destruction or adverse modification of critical habitat.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. The objective of an EFH Assessment is to determine if the proposed action(s) "may adversely affect" designated EFH for relevant commercially, Federally managed fisheries species within the proposed action area. It also describes any proposed conservation measures to avoid, minimize, or otherwise offset potential adverse effects on designated EFH resulting from the proposed action.

This combined BA/EFH Assessment, as prepared by the NRC, examines the potential impacts of the proposed action on the Federally listed aquatic species within the NMFS and USFWS jurisdiction as well as the designated and revised critical habitat and the EFH.

D-1.2 Description of the Proposed Action

Energy Northwest initiated the proposed Federal action by submitting an application for license renewal for CGS. The existing license for CGS expires on December 20, 2023. The NRC's Federal action is the decision whether or not to renew the license for an additional 20 years.

The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decisionmakers, such as state, utility, and, where authorized, Federal agencies (other than NRC). This definition of purpose and need reflects the NRC's recognition that—unless there are findings in the safety review required by the Atomic Energy Act or findings in the National Environmental Policy Act of 1969 (NEPA) environmental analysis that would lead the NRC to reject a license renewal application—the NRC does not have a role in the energy-planning decisions of state regulators and utility officials as to whether a particular nuclear power plant should continue to operate.

If the renewed license is issued, state regulatory agencies and Energy Northwest will ultimately decide if the plant will continue to operate based on factors such as the need for power or other matters within the state's jurisdiction or the purview of the owners. If the operating license is not renewed, then the facility must be shut down on or before the expiration date of the current operating license—December 20, 2023.

Energy Northwest has indicated it does not plan to conduct refurbishment activities, although routine plant operation and maintenance activities will continue during the license renewal period (EN, 2010). Routine plant operations and maintenance do not include any dredging or in-water equipment replacement or activities.

D-1.2.1 Site Location and Description

CGS is located in south-central Washington State in Benton County. The CGS site is located within the Hanford Site on land leased from the U.S. Department of Energy (DOE). The Columbia River bounds the CGS site on the east side. Figure D-1-1 and Figure D-1-2 provide maps of the 50-mile (mi) (80-kilometer (km)) and 6-mi (10-km) vicinities, respectively. The nearest population center is the Tri-Cities, which includes the cities of Richland, Kennewick, and Pasco. The nearest city is located approximately 15 mi (24 km) southeast of the site. The nearest residence is 4.25 mi (6.8 km) from CGS in an east-southeasterly direction across the Columbia River. There is one Native American reservation within a 50-mi (80-km) radius of CGS—the Yakama Reservation to the west.

CGS is a single unit nuclear power plant that began commercial operation in December 1984. The CGS site boundary encloses approximately 1,089 acres (ac) (441 hectares (ha)) leased to Energy Northwest by the DOE. The most conspicuous structures on the CGS site include the reactor containment building, the turbine building, six cooling towers, and various auxiliary support buildings (EN, 2010). Figure D-1-3 provides a general layout of the CGS site.

Figure D-1-1. Location of CGS, 50-mi (80-km) region

Source: (EN, 2010a)

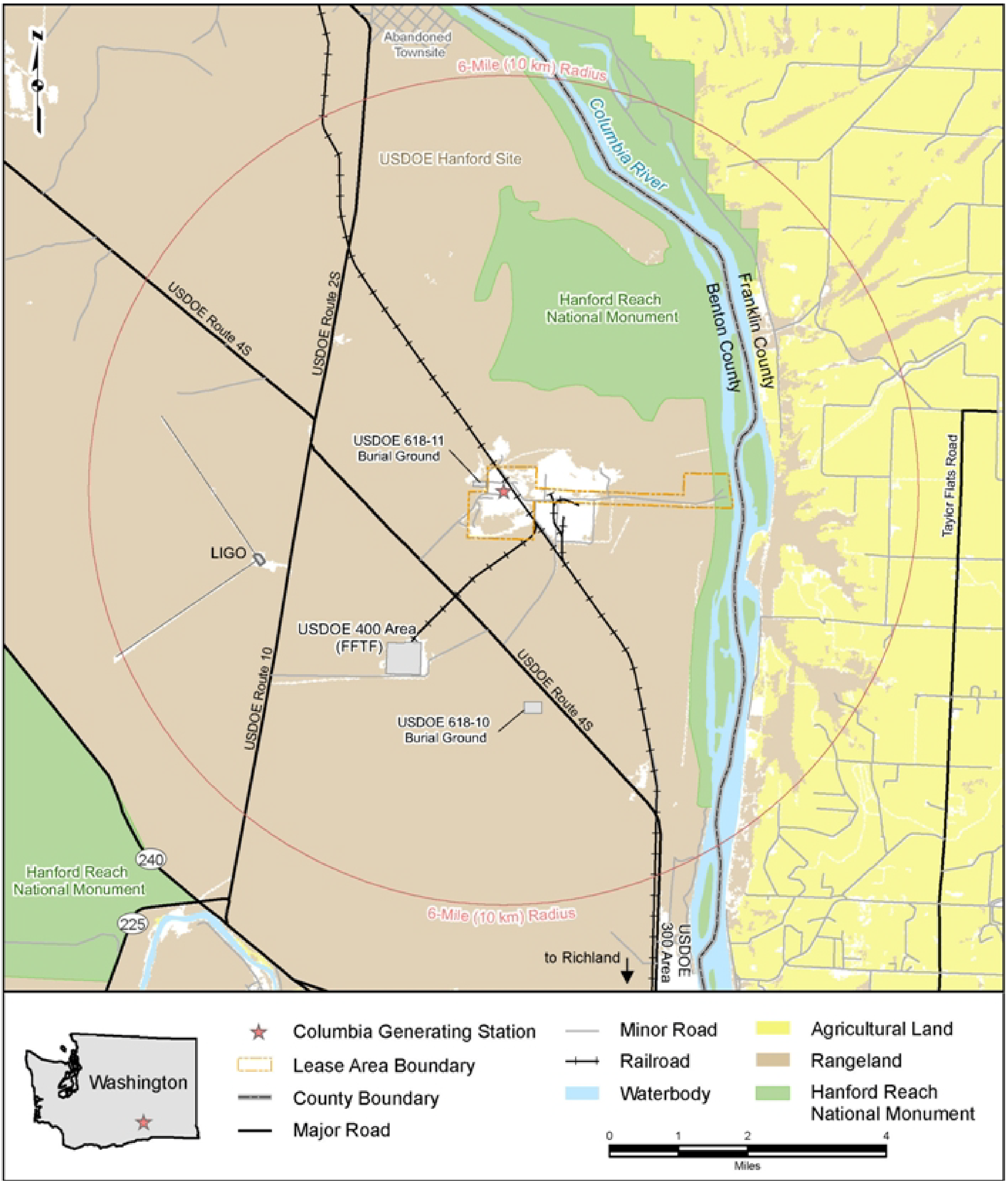

Figure D-1-2. Location of CGS, 6-mi (10-km) region

Source: (EN, 2010a)

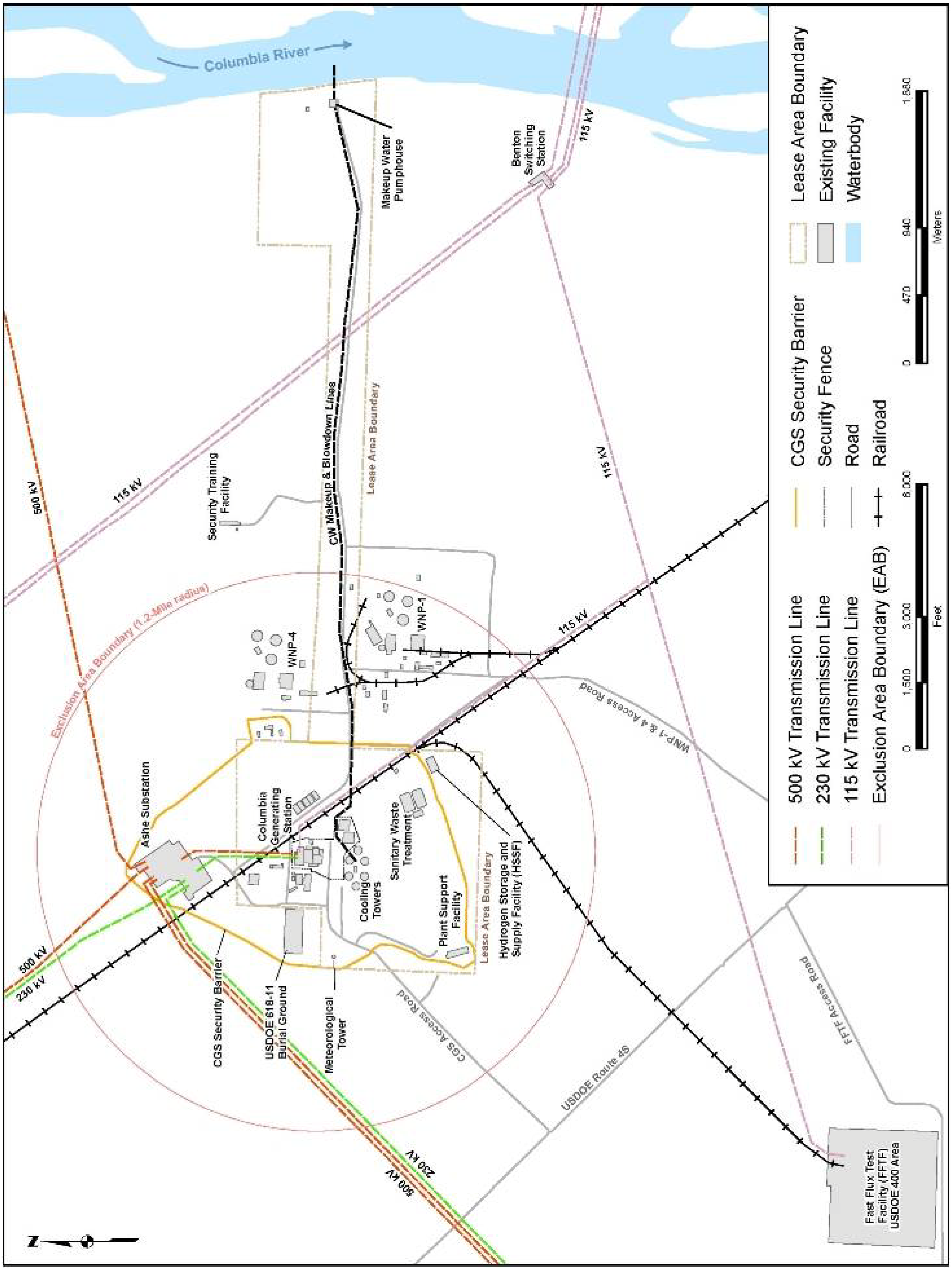

Figure D-1-3. CGS, general site layout

Source: (EN, 2010a)

Nearby industrial sites include those listed below:

- two abandoned power plant construction projects, Washington Nuclear Power (WNP)-1 and WNP-4, located about 1 mi (1.6 km) east-southeast and east-northeast of the CGS plant
- the Bonneville Power Administration's (BPA's) H.J. Ashe Substation located 0.5 mi (0.8 km) north of the plant
- the Laser Interferometer Gravitational-Wave Observatory located 3.5 mi (5.6 km) from the plant
- the Fast Flux Test Facility—a DOE facility located 2.75 mi (4.4 km) south-southwest in the Hanford 400 Area
- three radioactive waste burial grounds (DOE facilities)—618-10 located 3.5 mi (5.6 km) south and 618-11 immediately west of CGS

The Columbia River is the fourth largest North American river flowing to the sea. It is a high-volume, high-gradient river fed by snowmelt in the headwater mountain ranges of the Canadian Rockies of British Columbia (Benke and Cushing, 2005). The river travels over 1,200 mi (1900 km), draining a watershed covering approximately 262,480 square miles (mi^2) (680,000 square kilometers (km^2)) (USFWS, 2010). River flow is regulated by 14 mainstem dams. Ten of the dams are located above the CGS site (including three in British Columbia), and four are below the site. The nearest upstream dam is Priest Rapids, located at river mile (RM) 397, 45 mi (72 km) upstream of the CGS site. The nearest downstream dam is McNary, located at RM 292, 60 mi (97 km) downstream (EN, 2010). The reservoir (Lake Wallula), created by the McNary Dam, extends to about 6 mi (10 km) below the CGS site. The 51-mi (82-km) river reach, extending from Priest Rapids Dam to Lake Wallula (RM 346), is free flowing below Priest Rapids Dam. The elevation drop through this reach is approximately 70 feet (ft) (21 meters (m)). This area, termed the "Hanford Reach" is the last non-impounded, non-tidal segment of the Columbia River in the U.S. (Duncan, et al., 2007).

The flow of the Columbia River typically peaks from April–July, during spring runoff, and is lowest from September–October. The monthly flows recorded by the U.S. Geological Survey (USGS) below Priest Rapids Dam during water years 1960–2009 range from a mean of 79,300 cfs (2,250 cubic meters per second (m^3/s)) during September to a mean of 202,000 cfs (5,700 m^3/s) during June. Mean annual flows for the same period ranged from 80,650 cubic feet per second (cfs) (2,284 m^3/s) in 2001 to 165,600 cfs (4,700 m^3/s) in 1997 and averaged 117,823 cfs (3,336 m^3/s). For water years 1984–2008, coincident with the period of CGS operation, measured flows averaged 113,712 cfs (3,220 m^3/s) (USGS, 2010). BPA regulates the flow of the river to meet electrical demands and limit the impact on spawning salmon (EN, 2010). Flows vary daily and hourly as water is released from Priest Rapids Dam, causing the river stage to fluctuate in excess of 10 ft (3 m) on a daily basis. The river channel near the CGS site varies between 1,200–1,800 ft (370–550 km) wide for the low-water and normal high-water stages, respectively. River depth varies from about 25–45 ft (7.6–13.7 m) for normal high-water and flood high-water levels, and velocities vary from 3 feet per second (fps) (0.9 meters per second (m/s)) to over 11 fps (3.35 m/s), depending on the section and flow (EN, 2005).

Water-quality parameters measured by the USGS from 1996–2003 at Vernita Bridge (USGS Station No. 12472900 at RM 388), 35 mi (56 m) upstream of the CGS site, showed that water temperature ranged between 37–69 degrees Fahrenheit (3–20.5 degrees Celsius) with a median of 54 degrees Fahrenheit (12 degrees Celsius) (EN, 2010), (USGS, 2006). Dissolved oxygen (DO) ranged between 9.2–14.0 milligrams per liter (mg/L) with a median of 12.4 mg/L. The pH fluctuated between 7.4–8.2 standard units (EN, 2010), (USGS, 2006).

The only other significant hydrological feature in the site area is the Yakima River, which flows generally west to east and enters the Columbia River at RM 335 (EN, 2010). At its closest approach, the Yakima is about 8 mi (13 km) southwest of the CGS site.

For this consultation, the overall action area consists of the aquatic resources associated with the Columbia River near and downstream of the CGS site.

D-1.2.2 Cooling Water System Description and Operation

CGS is a single unit, nuclear-powered, steam electric facility that began commercial operation in December 1984. The plant is a boiling-water reactor. The reactor core produces heat that boils water, producing steam for direct use in a turbine generator. The CGS circulating water system is a closed-cycle cooling system that removes heat from the condenser and transfers it to the atmosphere through evaporation using six mechanical draft cooling towers (EN, 2010). A portion of the cooling water is lost through evaporation and drift. The evaporative losses lead to concentration of dissolved solids in the cooling water. Thus, a portion of the cooling water, so-called blowdown water, is routinely discharged back to the Columbia River and replenished with freshwater, thereby controlling the buildup of dissolved solids.

The circulating-water system pumps water from the Columbia River to replenish the water lost from evaporation, drift, and blowdown. The makeup-water pumphouse is located 3 mi (5 km) east of the CGS plant and houses three 800-horse power makeup-water pumps (Figure D-1-3). The pumps are designed to each supply 12,500 gallons per minute (gpm) (0.79 m^3/s), or half the system capacity, at the design head. Two pumps normally supply makeup water to the plant with a withdrawal capacity of 25,000 gpm (1.58 m^3/s). During normal operating periods, the average makeup-water withdrawal is about 17,000 gpm (1.1 m^3/s). The flow of the Columbia River below Priest Rapids Dam for water years 1960–2009 has an average mean annual discharge of 117,823 cfs (3,336 m^3/s) and a minimum mean annual discharge of 80,650 cfs (2,284 m^3/s) (USGS, 2010). Thus, the makeup-water withdrawal of 17,000 gpm (1.1 m^3/s) is about 0.03 percent of the average mean annual discharge and 0.05 percent of the minimum mean annual discharge of the river.

The intake system for the makeup-water pumps consists of two 36-inch (in.) (91-centimeter (cm))-diameter buried pipes that extend 900 ft (274 m) from the pumphouse into the river, about 300 ft (91 m) from the shoreline at Columbia RM 352 (Figure D-1-4 and Figure D-1-5) (WPPSS, 1980). An intake structure is located at the end of each of the pipes. The pipes make a 90-degree bend and extend slightly above the surface of the riverbed. Each of the pipes ends with an intake structure (20 ft (6 m) long) mounted above the riverbed and approximately parallel to the river flow, as shown in Figure D-1-6. Each intake structure is composed of two intake screens that are each 6.5 ft (2 m) in length (Figure D-1-7) and mounted end to end. The remaining length of the intake structure consists of two solid cones at either end of the structure. The intake screens consist of an outer and inner perforated pipe sleeve (WPPSS, 1986). The outer sleeve has a 42-in. (107-cm)-diameter sleeve with $^3/_8$-in. (9.5-millimeter (mm))-diameter holes (composing 40 percent of the surface area). The inner sleeve has a 36-in. (91-cm)-diameter sleeve with $^3/_4$-in. (19-mm)-diameter holes (composing 7 percent of the surface area). The intake screens are designed to distribute the water flow evenly along its surface.

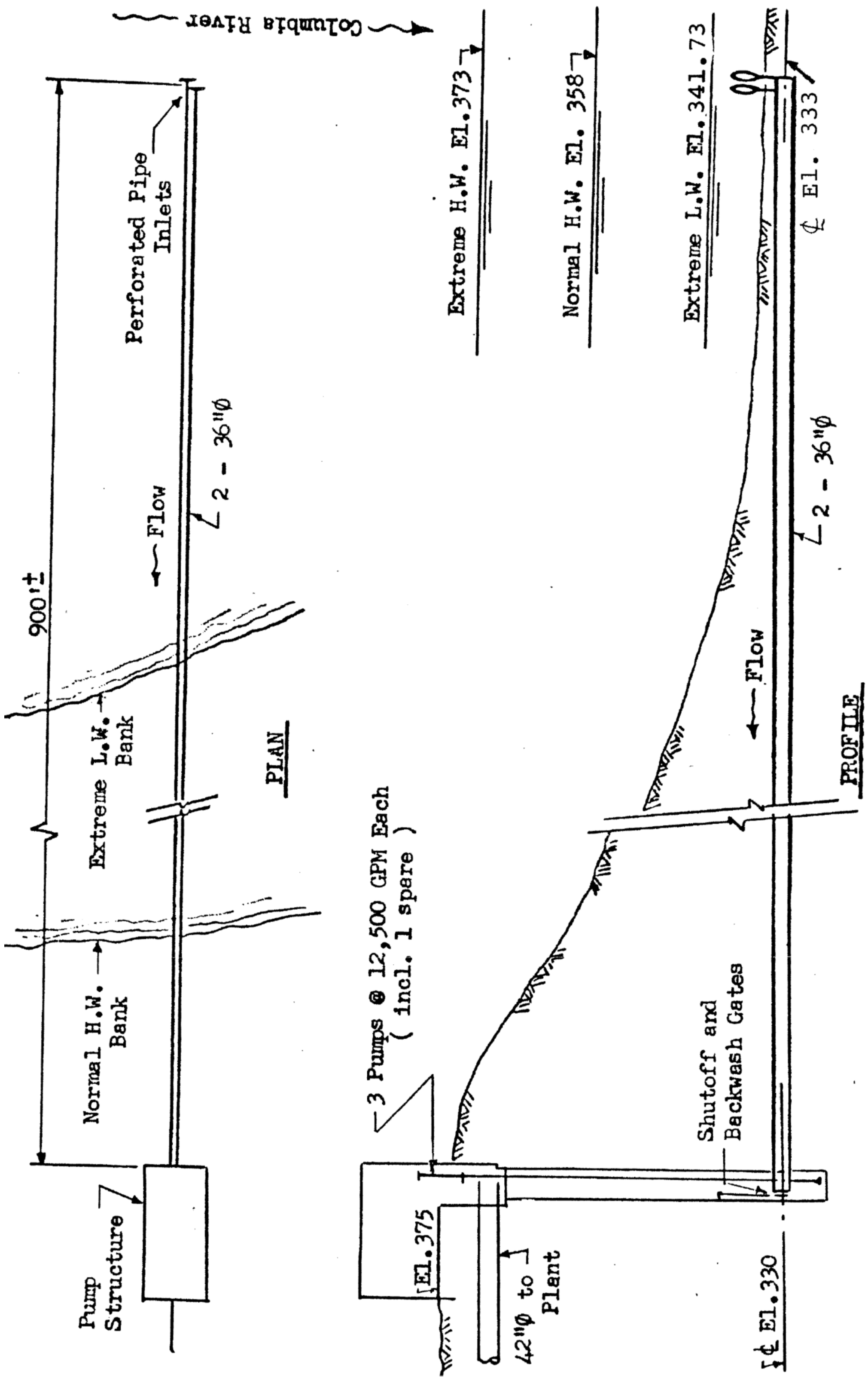

Figure D-1-4. Intake system plan and profile

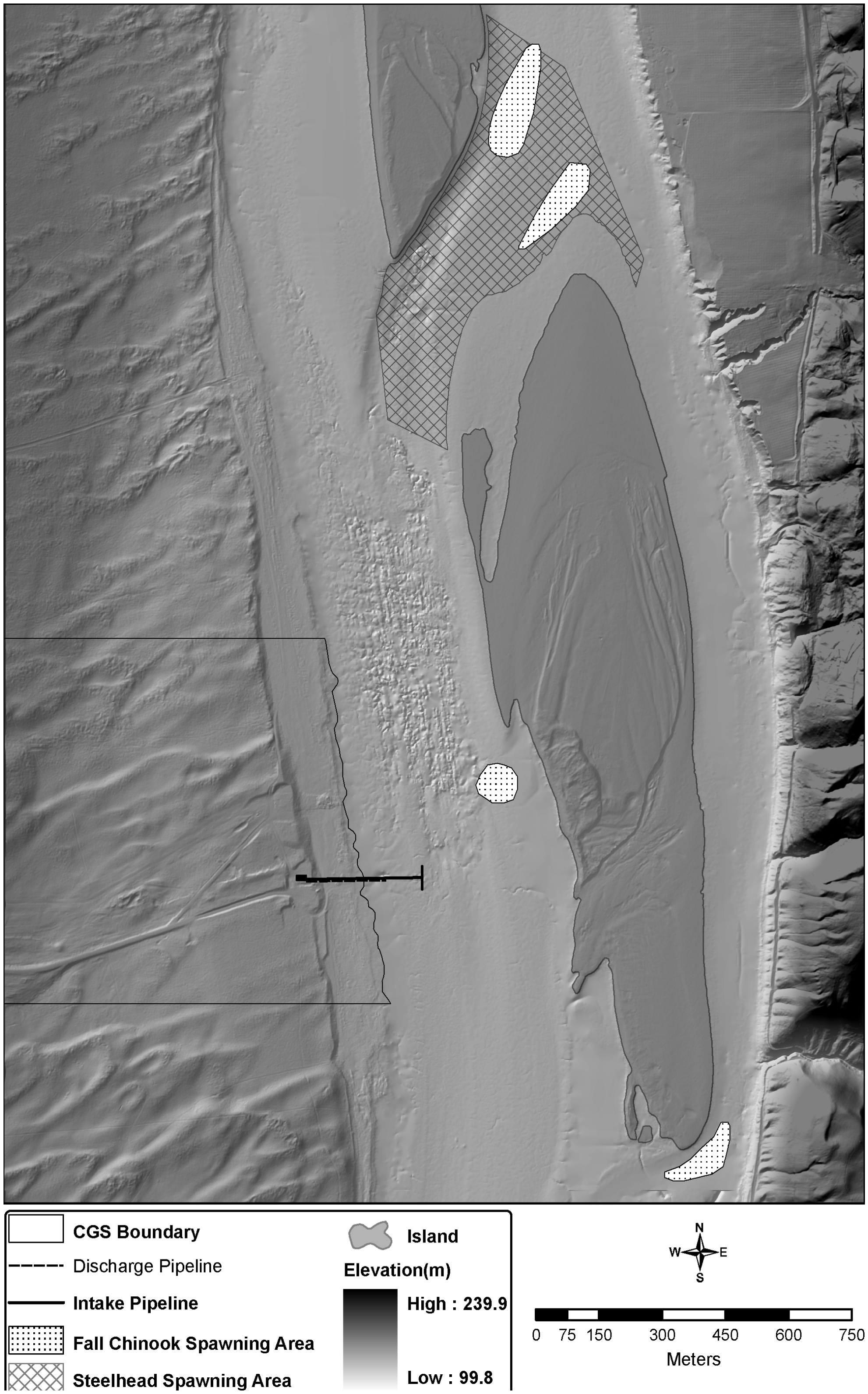

Figure D-1-5. Location of pumphouse, pipelines, intakes, and outfalls showing historical steelhead and fall Chinook salmon spawning locations

Source: (Gambhir, 2010), (Poston, et al., 2008)

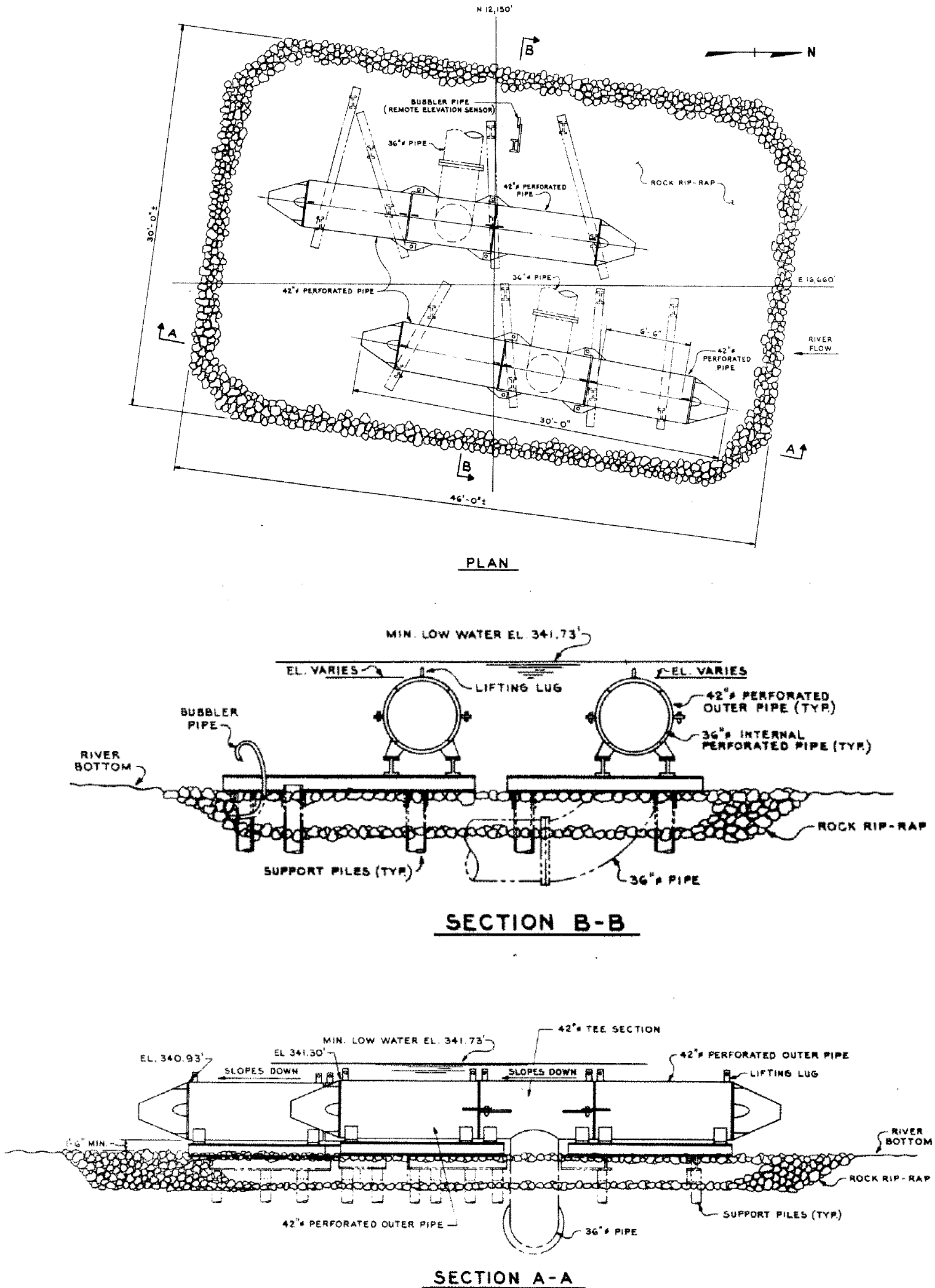

Figure D-1-6. Perforated intake plan and section

Source: (WPPSS, 1980)

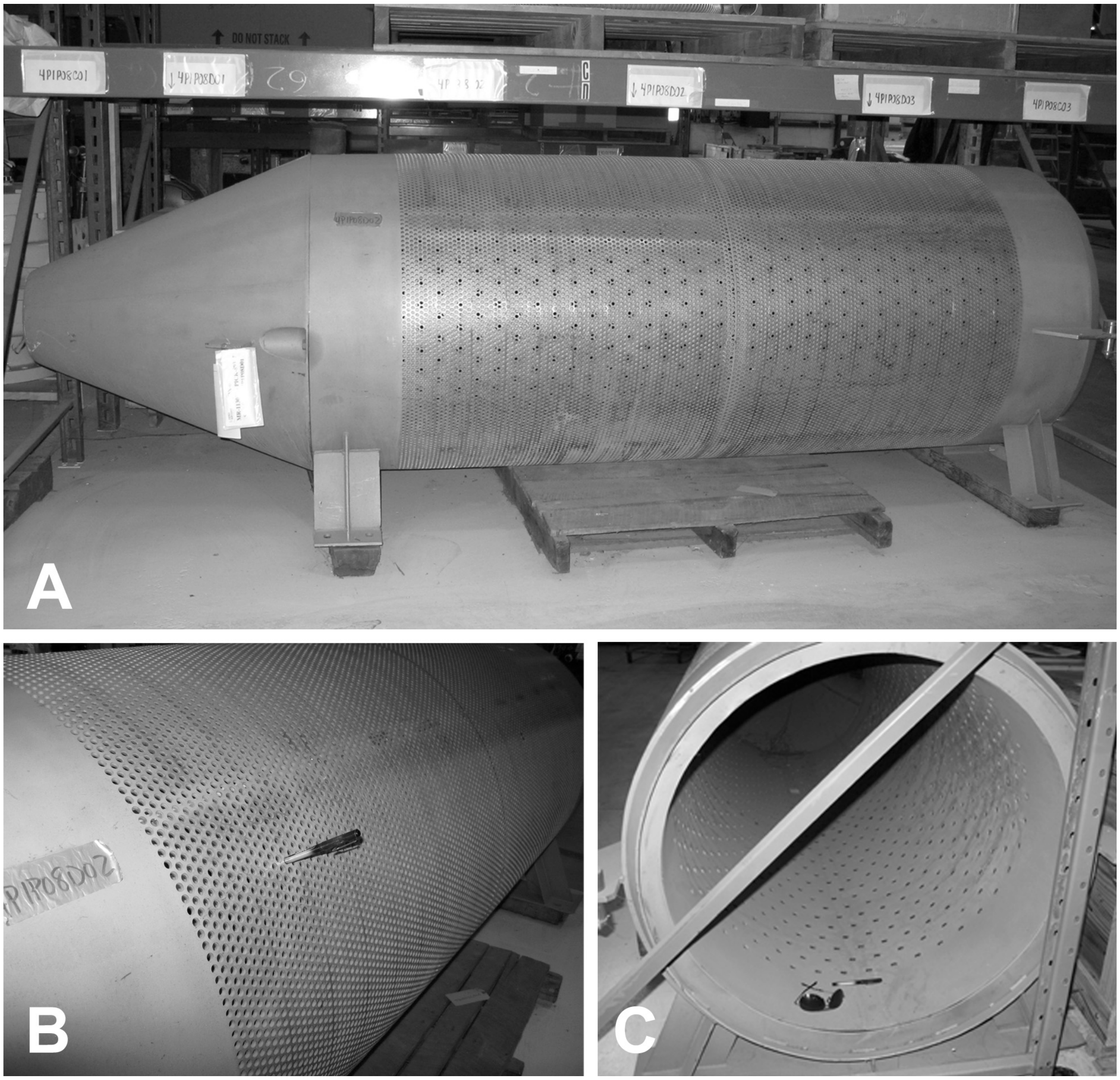

Figure D-1-7. Spare perforated pipe for the intake screen at CGS. “A” side view; “B” close up of outer sleeve; and “C” end view showing inner sleeve of perforated pipe.

The inlet velocities of the intake screens are within acceptable limits for best available technology for minimizing impacts (69 FR 41576). The velocity through the external screen openings is approximately 0.5 fps under normal operating conditions where 12,500 gpm is removed through both intake structures. The approach velocity to the intake screens under the same conditions is less than 0.2 fps (0.06 m/s) (WPPSS, 1980). This compares to river velocities measured near the perforated pipes ranging from 4–5 fps (1.2–1.5 m/s) (WPPSS, 1986).

Biocides (sodium hypochlorite and sodium bromide) are added to the water in the circulating-water system to retard biological growth. Other chemicals are added to control corrosion (orthophosphates and a halogen-resistant azole), scale (polyacrylate dispersant) and for pH control (sulfuric acid) (EN, 2011). On an annual basis, blowdown into the river averages about 2,000 gpm (0.1 m^3/s). Blowdown water returns to the river from the cooling towers through a line that extends out into the river next to the makeup-water pumphouse. The 18-in.

(46-cm)-diameter, buried blowdown pipe extends about 175 ft (53 m) from the shoreline at low river stage. The pipe ends above the riverbed at a 15-degree angle in a rectangular slot outfall port that measures 8 in. by 32 in. (20 cm by 81 cm) and is perpendicular to the river flow (Figure D-1-8) (NRC, 1981).

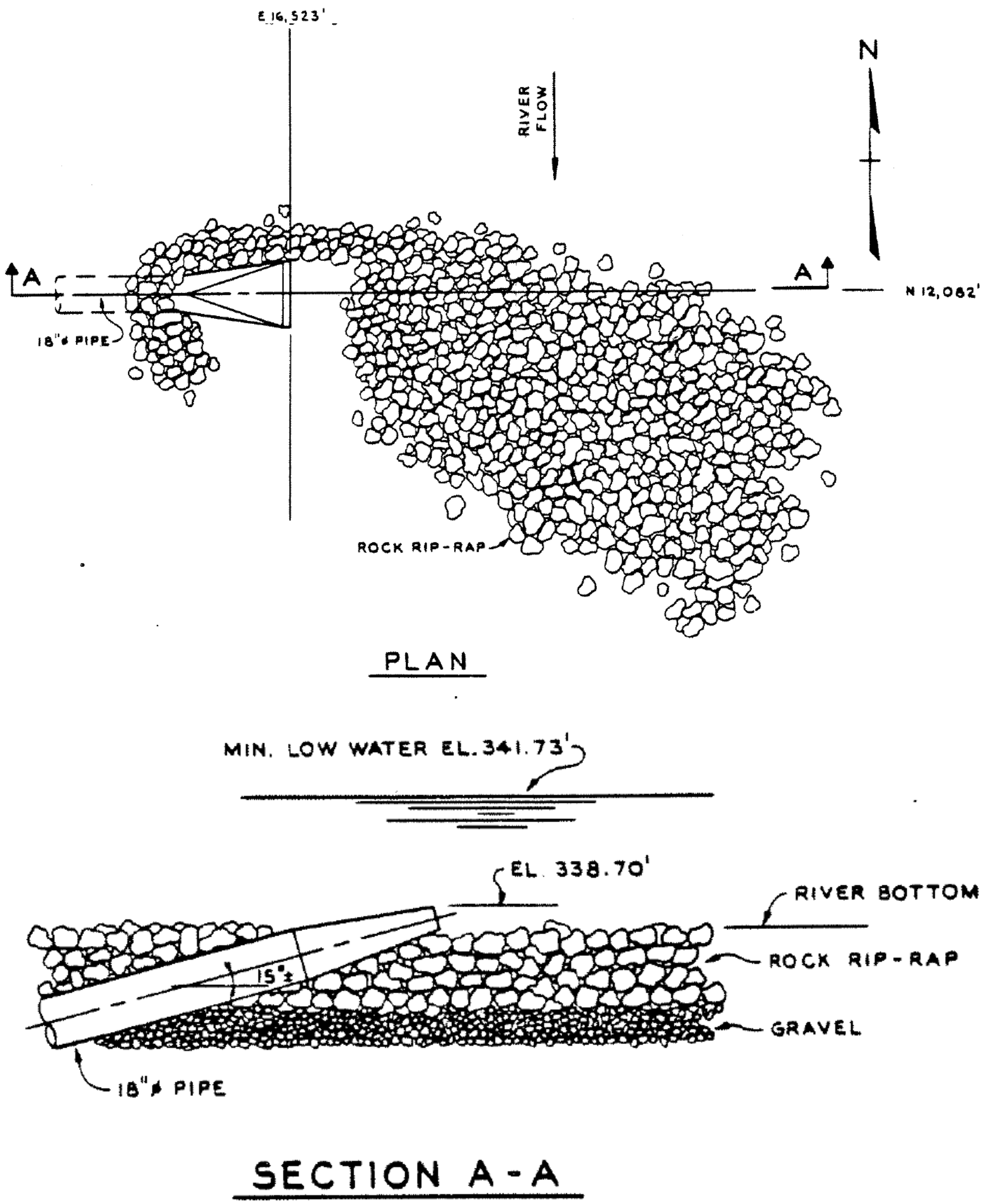

Figure D-1-8. Rectangular slot discharge

Source: (WPPSS, 1980)

The State of Washington authorizes discharge in accordance with the special and general conditions of National Pollutant Discharge Elimination System (NPDES) Permit No. WA-002515-1. Three outfalls are listed in the permit, but the Outfall 001 system is the only outfall that discharges directly to the river. In addition to the cooling-water blowdown, this outfall serves as the outfall for the condenser-cleaning effluent, the radioactive waste-treatment system effluent, and the discharge from the standby service water.

D-1.3 Endangered Species Act and Essential Fish Habitat Species Considered for Preliminary Analysis

The NRC conducted coordination and pre-consultation with the USFWS and the NMFS during a series of site visits, meetings, and phone conversations. Representatives of both services attended the CGS site audit in June 2010 and toured the project area. Specific actions that were related to the Federally listed species, designated critical habitat, or EFH are discussed below.

D-1.3.1 Federally Listed Species and Designated Critical Habitat Near the Site

The NRC staff (staff) requested in letters dated March 22, 2010, (NRC, 2010a) and May 3, 2010, (NRC, 2010b) that the USFWS and NMFS, respectively, provide information on Federally listed endangered or threatened species, proposed or candidate species, and designated critical habitats that may occur in the vicinity of the CGS site.

Kurz (2010), working for the USFWS, responded in an e-mail dated November 8, 2010, and identified a single aquatic species—the bull trout (*Salvelinus confluentus*)—under its jurisdiction that is Federally listed as threatened and has been reported in the Hanford Reach in the vicinity of the CGS facility (Table D-1-1). USFWS also indicated that critical habitat for the bull trout occurred within the action area, as previously defined.

Table D-1-1. Threatened and endangered aquatic species of the Hanford Reach of the Columbia River in the vicinity of CGS

Scientific name	Common name	Federal status[a]	Critical habitat designation
	Fish		
Oncorhynchus tshawytscha	Upper Columbia River spring Chinook salmon	FE	Critical habitat designated September 2, 2005; 70 FR 52630
Oncorhynchus mykiss	Upper Columbia River steelhead	FT	Critical habitat designated September 2, 2005; 70 FR 52630
Salvelinus confluentus	bull trout	FT	Critical habitat designated October 6, 2004; 69 FR 59995; revised October 18, 2010; 75 FR 63898

[a] Federal status listings: FE = Endangered; FT = Threatened; FC= Candidate

Source: (Kurz, 2010), (Suzumoto, 2010)

NMFS responded to the NRC's request in a letter dated June 23, 2010 (Suzumoto, 2010), and identified two Federally listed species near the CGS site. The two species listed in Table D-1-2 are the Upper Columbia River spring Chinook salmon (*Oncorhynchus tshawytscha*) and the

Upper Columbia River steelhead (*Oncorhynchus mykiss*). Critical habitat for both species occurs within the action area.

Table D-1-2. Aquatic fish species with EFH in the vicinity of the Hanford Reach of the Columbia River in the vicinity of CGS

Scientific name	Common name
Oncorhynchus tshawytscha	Upper Columbia River Chinook salmon
Oncorhynchus kisutch	coho salmon

Source: (Suzumoto, 2010)

Critical habitat is defined in the ESA as a specific geographic area that contains features that are essential for the conservation of a threatened or endangered species (USFWS, 2010a). Critical habitat may require special management and protections. It also may include an area that the species may not currently occupy but that it may need for its recovery. Federal agencies are required to consult with the USFWS or NMFS on any actions that they authorize to ensure that their actions will not destroy or adversely modify critical habitat to the point that it will no longer aid in the species' recovery.

D-1.3.2 Essential Fish Habitat Near the Site

In the letter dated June 23, 2010, the NMFS (Suzumoto, 2010) also indicated that the Columbia River in the CGS plant vicinity provides EFH features for both the Upper Columbia River Chinook and the coho salmon (currently an unlisted reintroduction effort), as listed in Table D-1-2. The EFH for the Upper Columbia River Chinook includes all three runs (spring, summer, and fall).

D-1.4 Endangered Species Act and Essential Fish Habitat Species Considered for In-Depth Analysis

The following subsections discuss the identified ESA and EFH aquatic species. Because all of the aquatic species are salmonids (family Salmonidae), a brief generic life-history of salmonids is presented first, and then, the specific differences between the listed and EFH species are described in each section.

In general, anadromous adult salmonids return from the Pacific Ocean to the Columbia River to spawn in either the mainstem or tributaries. The female lays her eggs in a nest or "redd." The eggs hatch and produce an alevin, which is the lifestage between the egg and fry. Alevins cannot swim, but they can move their tails to readjust their position. Because of the yolk sac, alevins do not need to eat. They remain in the gravel riverbed and obtain nutrition from their yolk sac. Once the alevin has absorbed its egg sac, it is called a "fry," and it is capable of swimming and needs to forage for food. When the fry are approximately 2 in. (5 cm) long, they are termed parr (for the vertical brown-green bars on their sides, parr marks, which provide camouflage) or fingerlings. The length of time that a salmon is in the fry stage varies between species. In this document, fry and fingerlings are considered young juveniles. Fish that are in a transitional stage of adapting to life in a marine environment are called smolts and are considered juvenile salmon. Smolts can be found in freshwater as they begin their migration downstream, they can be in the process of migrating, or they can be in an estuarine environment. The timing of the development of a smolt varies between, and even within, salmon species (Quinn, 2005). Juvenile salmon adapt to the saltwater before traveling to the ocean, where they remain from 6 months–5 years or more before reentering the estuaries and migrating to their natal stream or river to spawn.

D-1.4.1 Bull Trout (*Salvelinus confluentus*)

D-1.4.1.1 Life History

Bull trout are amphidromous, meaning they may return seasonally to freshwater as subadults, sometimes for several years before they spawn. However, they have also been characterized as anadromous (migrating from the sea up rivers to spawn), adfluvial (living in lakes and migrating to rivers or streams to spawn), fluvial (inhabiting a river or stream), or resident (completing their life cycle in freshwater) (Quinn, 2005). The bull trout in the mainstem of the Columbia River are considered to be fluvial and migrate between multiple core areas. There are accounts of amphidromous life-history forms that are present downstream of the Hanford Reach (between the Yakima and John Day rivers), and it is thought that bull trout in this area may still have the potential to be anadromous (USFWS, 2010b).

Bull trout differ from other salmonids based on their specific habitat requirements. They are extremely sensitive to their environment and have more specific habitat requirements than most other salmonids (75 FR 2270). These requirements include channel stability, substrate composition, cover, and temperature (Rieman and McIntyre, 1993).

Channel stability is important for bull trout because juvenile fish, including embryos and alevins, are found near the bottom of channels, where they use the substrate for cover. Rieman and McIntyre (1993) found high variation in the number of bull trout redds that occurred in areas with low channel stability and frequent winter floods. This observation confirmed findings from other studies that showed high bed load movement and low channel stability were associated with low numbers of bull trout in the Coeur d'Alene River drainage (Rieman and McIntyre, 1993).

Substrate composition and cover. Bull trout associate with complex forms of cover as well as with pools. Juveniles associate with in-channel wood, substrate, or banks that are undercut. The young-of-the-year associate with side channels, margins of streams, or other areas of low velocity. The older fish use pools and areas with large and complex debris and undercut banks (Rieman and McIntyre, 1993).

Thermal sensitivity. Bull trout are likely the most thermally sensitive species in coldwater habitats in western North America (Dunham, et al., 2003). They are rarely found in streams or rivers with summer temperatures that exceed temperatures of 59 degrees Fahrenheit (15 degrees Celsius) for extended periods of time (McPhail and Baxter, 1996). A study performed in a large plunge pool, created by the confluence of two streams located in Granite Creek in Northern Idaho, illustrated the degree of the marked preference of bull trout for cooler water. The pool had a strong side-to-side gradient of 46–59 degrees Fahrenheit (8–15 degrees Celsius). Juvenile bull trout consistently chose the coldest water available (46–48 degrees Fahrenheit (8–9 degrees Celsius)) despite the lowest-velocity water (also preferred by bull trout) being located on the side of the pool with the warmer water. Other factors—including water depth, substrate, overhanging cover, or interactions with other fish—could not account for the distribution of the bull trout in the pool (Bonneau and Scarnecchia, 1996).

Bull trout generally spawn from late August to late December, with the peak spawning in September and early October, when the water temperature drops below 48 degrees Fahrenheit

(9 degrees Celsius) (Wydoski and Whitney, 2003). Their preferred spawning location is in streams with cold, clean water and clean gravel and cobble substrates with gentle stream slopes.

Egg development appears to be dependent on water temperature (Wydoski and Whitney, 2003), and the 4–5 month incubation period that occurs during winter is longer than it is for other salmonids (USFWS, 2003). The incubation period occurs over the winter. The optimum temperature for development ranges from 36–39 degrees Fahrenheit (2–4 degrees Celsius) (McPhail and Baxter, 1996). Wydoski and Whitney (2003) reported that alevins (life stage between eggs and fry) emerging from the redds (nests) were between 0.9–1.1 in. (2–3 cm) long. Fry remained in the streambed substrate for 3 weeks before emerging and, subsequently, tended to be bottom oriented. Fry preferred the shallow edges of rivers or streams where they can use the interstitial habitat in loose gravel for cover. At other times, they were associated with shallow water in the side channels where the velocity is lower and where in-stream cover is greater. Bull trout fry feed at various locations on the bottom, on the surface, and in the water column and mostly eat aquatic insects (McPhail and Baxter, 1996).

Juvenile bull trout remain in the streams and concentrate in pools, rather than riffles or runs. These sites are strongly associated with overhead cover (McPhail and Baxter, 1996). They forage near the substrate and in the water column but not on at the surface (McPhail and Baxter, 1996). Wydoski and Whitney (2003) reported the diet of juvenile bull trout in streams in southeastern Washington as being insects such as flies, midges, stoneflies, mayflies, caddisflies, and some fish such as sculpins (Wydoski and Whitney, 2003). They are also known to ingest worms, snails, clams, leeches, earthworms, and amphibians and terrestrial insects such as beetles and moths (Wydoski and Whitney, 2003)

The bull trout diet shifts as they mature, eventually feeding exclusively on fish. The species of fish depends on their availability but may include sculpins, trout fry, whitefish, kokanee, minnow, suckers, and yellow perch (McPhail and Baxter, 1996), (Wydoski and Whitney, 2003). Bull trout in Lake Wenatchee were also seen preying on hatchery-reared sockeye salmon shortly after stocking (Wydoski and Whitney, 2003).

D-1.4.1.2 Population Trends

Bull trout are native to the Pacific Northwest. Their range—which once included northern California, western Montana, Nevada, Idaho, British Columbia, and Alberta—is thought to be shrinking, primarily at the southern end of their range (Quinn, 2005). Prior to 1978, bull trout and Dolly Varden (*Salvelinus malma*) were thought to be the same species, and, although their ranges overlap, the bull trout are found in the south and the interior regions while the Dolly Varden are coastal and found more towards the north (Quinn, 2005). The USFWS listed bull trout as threatened throughout their range in 1999 (63 FR 31647).

The decline of bull trout has been characterized as being primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of non-native species (64 FR 58910), (75 FR 2270).

Bull trout have been documented both upstream and downstream of the Hanford Reach, including Priest Rapids reservoir (Pfeiffer, et al., 2001) and the Yakima River (McMichael and Pearsons, 2001), (Pearsons, et al., 1998). The areas of the upper Columbia River with the greatest number of bull trout are in the vicinity of tributaries with strong local populations and suitable migration corridors (Marten, 2007). This includes the lower reaches of the Methow, Entiat, and Wenatchee rivers. There are fewer occurrences of bull trout in the Columbia River in areas with poorer habitat conditions, in tributaries that have fragmented migration corridors, or in tributaries with smaller populations of bull trout, such as in the Yakima and Walla Walla. Bull trout would possibly use the mainstem of the Columbia River to a greater degree if the habitat conditions improve and if the populations in the adjacent tributaries increase (Marten, 2007).

Gray and Dauble (1977) reported bull trout in the Hanford Reach, but the location of the collection was unclear. Pfieffer, et al. (2001) also observed bull trout during an inventory of fish in the Priest Rapids Project Area in Wanapum and Priest Rapids reservoirs between RM 398 and 453 using a variety of gear (set lines, gill nets, beach seines, minnow traps and electrofishing). Collections occurred during day, dawn, dusk, and nighttime hours, stratified by season and habitat. The sampling study captured 2 bull trout in electrofishing samples from the more than 58,000 fish sampled. One bull trout was found at RM 299 (2 mi above Priest Rapids Dam) and one at RM 430 (above Wanapum Dam). Pfieffer, et al. (2001) noted that the bull trout showed a preference for the lowest macrophyte abundance, water temperature, and surface velocity.

Furthermore, the Grant County Public Utility District indicated only a “handful” of documented observations of bull trout in the fishway observations located at Priest Rapids Dam. Results from a 2001–2003 study indicated that, of 79 bull trout tagged at Rock Island, Rocky Reach, and Wells Dams, only 9 (11 percent) were detected within the Wanapum Reservoir. Only one of these continued to migrate downstream past the Wanapum and Priest Rapid Dams (Stevenson, et al., 2003).

As reported in the biological opinion for the Priest Rapids Project license renewal, removal of fish within gatewells at Priest Rapids dam during juvenile salmonid outmigration did not result in any observed bull trout. However, three bull trout were observed during operations to remove fish from within gatewells at Wanapum Dam (1997–2003). During fish ladder maintenance at Priest Rapids Dam in 2000, one bull trout was found and released. At Wanapum Dam, a single bull trout was found in 2000 during fish ladder maintenance effort and another in 2002. The biological opinion suggests that the fish could be from the Yakima populations because the fish were found in December, they were of a smaller migratory size, and the Yakima is the closest core area (Marten, 2007). If these assumptions were correct, then they would have had to travel upstream through the Hanford Reach.

Research scientists at DOE’s Hanford Site have characterized the use of the Hanford Reach by bull trout as transient (Poston, et al., 2009). USFWS (2008) indicates that the accounts of bull trout in the Hanford Reach are “anecdotal” and are “likely individuals moved downstream during the spring freshet.” The presence of bull trout in the Hanford Reach and in the vicinity of CGS can be considered to be for purposes of foraging, migration, and possibly overwintering.

D-1.4.1.3 Endangered Species Act Listing History and Critical Habitat

Bull trout were listed as threatened throughout their range in 1999 (63 FR 31647).

The action area lies within the Columbia River distinct population segment (DPS). On October 18, 2010, the USFWS published a final rule that revised the critical habitat for the bull trout (75 FR 63898). Unit 22, the Mainstem Upper Columbia River Unit, extends from John Day Dam to Chief Joseph Dam (221.7 mi (357 km)) and encompasses the Hanford Reach. The core areas within the Mainstem Upper Columbia River Unit support 35 local populations of bull trout—16 populations in the Yakima River, 7 in Wenatchee River, 2 in the Entiat River, and 10 in the Methow River core areas. The populations are well distributed across the action area, although they tend to have low abundance and, in general, have a declining or slightly increasing toward stable population trend. None of the populations is considered stable or clearly increasing in size (Marten, 2007).

The Mainstem Upper Columbia River critical habitat unit (CHU) provides connectivity to the Mainstem Lower Columbia River CHUs and to 13 additional CHUs. This CHU is the main foraging, migration, and overwintering (FMO) habitat for the Entiat River core area and provides connectivity between several other core areas or CHUs. Because the Mainstem Upper Columbia River Unit is FMO habitat for other populations, the population size is not estimated separately for this CHU (USFWS, 2010b). The USFWS indicates that bull trout reside year-round in certain areas of the mainstem of the Columbia River as either subadults or adults. The USFWS (2010b) indicates that spawning adults may also use the mainstem of the Columbia River for up to 9 months.

The migratory form of the bull trout is not present in many of the populations within these core areas, and connectivity between the core areas is fragmented. The main habitat issues within these core areas are relatively high water temperature, passage barriers, and prolonged low-flow conditions (Marten, 2007).

D-1.4.2 Upper Columbia River Chinook Salmon (*Ocorhynchus tshawytscha*)

D-1.4.2.1 Life History

Chinook salmon are anadromous and migrate up streams and rivers to spawn, including the Columbia River in the Pacific Northwest.

Although the general life history of the Chinook salmon follows the stages of an anadromous salmonid, as discussed in the introduction to Section D-1.4, the entire life history of Chinook salmon varies depending on the “race” of the fish. Within this life history, there are diverse and complex patterns of behavior that allow differentiation between different groups of salmon. Although all adults return to spawn in their natal streams or rivers, different races of fish return at different times of the year. Chinook salmon are classified as spring, summer, or fall races—or runs (as will be used in this document)—depending on the time at which the adults pass the first dam (Bonneville) and begin their migration upstream. All of the fish spawn in the fall and early winter, in the order in which they entered the river (spring first, followed by summer and then winter). Genetic differences can distinguish most fish between the runs.

In the Columbia River, spring Chinook return to the river in March, migrate upstream from March through June, and spawn in early fall. Summer Chinook return to the freshwater in June, migrate from June through August, and spawn in late September through November. Fall Chinook salmon return in August, migrate upstream from August into November, and generally spawn later that fall, although they are also known to spawn as late as the following April (University of Washington, 2011), (Wydoski and Whitney, 2003).

In general, spring Chinook salmon spawn in the upper reaches of tributaries, summer Chinook spawn in the mouths and mid-portions of tributaries, and fall Chinook spawn in the mainstem. For example, summer Chinook salmon in the Methow River spawned between RM 2 and RM 42 at elevations ranging from 900–1,800 ft (274–549 m) above mean sea level (MSL). In contrast, spring Chinook spawned between RM 46 and RM 72, corresponding to elevations between

1,750–2,300 ft (530–700 m). However, some overlap of the spawning grounds has been reported with individuals of both runs spawning between RM 38 and RM 52 (elevations between 1,550–2,200 ft (470–670 m)) (Wydoski and Whitney, 2003). During the 1970s and mid-1980s, more than 80 percent of fall Chinook salmon returning to spawning regions upstream of McNary Dam, spawned in the Hanford Reach (Dauble and Watson, 1997). More recently, from 2000–2009, the escapement to the Hanford Reach dropped to an average of 40 percent (Hoffarth, 2010).

In addition to different runs, Chinook salmon have two behavioral forms that are distinguished by the time the migration to the sea occurs. Chinook salmon can be differentiated by their behavior as having either a “stream-type” or an “ocean-type” life history. The type of life history depends on when the parr become smolts and begin their migration downriver to the ocean. If the juvenile Chinook begin their migration immediately after emergence or after a few months in the river (as subyearlings, age 0), migrate gradually downstream, and reside in the estuary for a few weeks or more before they move out to the sea, then they are termed “ocean-types.” However, if they begin their migration as yearlings (age 1) and rapidly move through the estuaries to the ocean, they are called “stream-types” (Quinn, 2005).

In general, the summer and fall runs of Chinook salmon migrate as subyearlings during their first spring or fall and are, thus, considered to be ocean-type, although some also migrate as fry or yearling juveniles (during their second spring) and would be considered stream-type. In Washington State, the ocean-type consist of adults—over 80 percent of which had emigrated as subyearlings, while the remaining 20 percent had emigrated as yearlings (Wydoski and Whitney, 2003). Most of the ocean-type salmon spawn in the larger rivers, such as the Columbia River mainstem.

The stream-types consist of 80–100 percent adults that emigrated as yearlings. Upper Columbia River spring Chinook salmon have a stream-type life history where the young salmon (alevins, parr, and smolts) spend 1–2 years in freshwater before making a rapid migration trip downstream to the Pacific Ocean (Wydoski and Whitney, 2003). In the Columbia River, the stream-type adults typically spawn in the small streams where the juveniles are reared (Quinn, 2005).

Adults return to their natal spawning areas and build redds in the river substrate. Chinook salmon spawn in small tributaries 7–10 ft (2–3 m) wide and in large rivers such as the Columbia (Healey, 1991). They spawn in depths as shallow as 2 in. (5 cm) to depths greater than 23 ft (7 m). Water velocities range from 0.3–5 fps (10–150 cm/s) (Healey, 1991). Quinn (2005) indicated that in the mainstem of the Columbia, Chinook salmon spawn in water as deep as 21 ft (6.5 m), with water velocities along the bottom of up to 6.6 fps (2 m/s).

Chapman, et al. (1986) examined the redds of fall Chinook salmon spawning in the Hanford Reach, specifically on the Vernita Bar, which is located 4 mi (6.5 km) downstream from Priest Rapids Dam. Water depth ranged from less than 1 in. (2.5 cm) at a flow rate of 70,000 cfs (1,982 m^3/s) to 23 ft (7 m) below the water’s surface measured at a discharge of 36,000 cfs (1,020 m^3/s). Water velocities were generally greater than 2.2 fps (0.67 m/s) when measured 9 in. (23 cm) above the substrate. Some redds were in areas with velocities near 6.6 fps (2 m/s) for at least part of the day. Spawning occurred from early October to the third week of November.

A female may deposit up to 5,000 eggs (range from less than 2,000 to greater than 17,000) per redd (Healey, 1991). The depth at which eggs are buried depends partly on the water velocity. The depth of gravel or cobble over the eggs is reported to range from 4–13 in. (10–33 cm) with an average of 7.4 in. (18.8 cm) (Healey, 1991). Survival of the eggs depends on intragraval flow rates, which must equal or exceed about 24 in. per hour for good survival. Eggs hatch in approximately 2 months, depending on the water temperature.

Geist, et al. (2006) examined the variation in temperature and DO levels during the first 40 days of incubation. There were no significant differences in the survival of fall Chinook salmon at temperatures equal to or below 62 degrees Fahrenheit (16.5 degrees Celsius). However, a rapid decline in survival occurred between 62–63 degrees Fahrenheit (16.5–17 degrees Celsius) and embryo mortality increased greatly above incubation temperatures of 63 degrees Fahrenheit (17 degrees Celsius).

Upon hatching, the alevins live in the gravel for about 2–3 weeks, foraging on small invertebrates such as aquatic insect larvae and terrestrial insects (Wydoski and Whitney, 2003). In general, alevins move deeper into the gravel after hatching. Later, they start to move laterally in the gravel and, after the yolk has been absorbed, they become fry moving upward, emerging from the gravel, and orienting into the water current (Quinn, 2005).

Stream-type fry or juveniles remain in the stream or river and migrate to the ocean during their second spring (Quinn, 2005), (Wydoski and Whitney, 2003). Juveniles from the spring runs in the Columbia River are generally stream-type. They prefer a water depth of less than 3 ft (0.9 m) during the first few months (Wydoski and Whitney, 2003), although they exhibit other habitat preferences that determine their location. Preferences include water velocity, in-stream cover, and abundance of other fish species. A study of young-of the-year spring Chinook in the upper Yakima River Basin during summer and fall reported that they preferred water depths from 1.6–1.8 ft deep (49–55 cm) and a bottom velocity 0.8–0.9 fps (0.24–0.27 m/s). By spring they occupied habitats that were shallower (0.8 ft (24 cm) deep) with bottom water velocities of 1.4 fps (0.43 m/s) (Wydoski and Whitney, 2003).

In the Hanford Reach, fall Chinook remain in the area for the first few months after emergence at water depths of less than 3 ft (0.9 m). They move to deeper water when they are larger and closer to the time of their migration (Dauble, et al., 1989), (Wydoski and Whitney, 2003). In general, ocean-type juveniles orient toward the current and are able to maintain their positions during the day for velocities ranging from 0.16 to less than 0.83 fps (5–25 cm/s). They drifted downstream at velocities of 0.83–1.3 fps (25–41 cm/s) during the day and at lower velocities at night. Fall Chinook, however, maintained their position in waters with velocities up to 1.3 fps (41 cm/s), which appears to be an upper threshold for their habitat. At night, fall Chinook juveniles maintained positions near the bottom of the river where the water velocities were lower. They move upstream and downstream during both the day and the night to find food and suitable habitat (Wydoski and Whitney, 2003).

The optimal water temperature for spring Chinook salmon is 54–55 degrees Fahrenheit (12–13 degrees Celsius) (Wydoski and Whitney, 2003). The optimal temperature for fall salmon, 59–64 degrees Fahrenheit (15–18 degrees Celsius), is higher than it is for stream-type Chinook salmon. Water temperatures above 73 degrees Fahrenheit (22.7 degrees Celsius) are lethal to Chinook salmon smolts and juveniles (Wydoski and Whitney, 2003).

Early juvenile diet consists of midge larvae and zooplankton, progressing to adult caddisflies and other aquatic insect larvae and some terrestrial insects. Juveniles forage on zooplankton and macroinvertebrates as they migrate through the Columbia River Basin, and they are prey to other fish, birds, and mammals (Dauble, 2009). Passage time for a juvenile spring Chinook through the Hanford Reach lasts no more than 1 week; outmigration of the juvenile spring Chinook extends from April to the end of August (DOE, 2000). As the young-of-year migrate to the mainstem Columbia, they are surface-oriented; however, they may migrate at deeper depths in the Hanford Reach (Dauble, 2009), (Lohn, 2004).

Juvenile ocean-type Chinook salmon generally spend up to 2 months in the estuary before migrating to the ocean (Healy, 1991). In the estuaries, the smaller salmon feed on aquatic and terrestrial insects, including chironomid larvae, dipterans, cladocerans such as *Daphinia*, amphipods, and other crustaceans. As they become larger, they feed on juvenile fish such as anchovy (Engraulidae), smelt (Osmeridae), herring (Clupeidae), and stickleback (Gasterosteidae). Ocean-type fish have a longer estuarine residence than the stream-type Chinook salmon (Healey, 1991), (PFMC, 2000).

Smaller juvenile salmon in the ocean initially feed on small crustaceans, but as they grow, their diet becomes primarily larval and juvenile fish to include Pacific herring, northern anchovy, smelt, pilchard, sand lance, rockfish, and ratfish (Wydoski and Whitney, 2003). They remain in the ocean from 3–4 years (ranging from 2–8 years) while they mature. Adult Chinook salmon range throughout the North Pacific Ocean and the Bering Sea. Chinook salmon from the Columbia River drainage migrate north and west along the Pacific coast and up to the Gulf of Alaska.

The age that adult Chinook salmon return to their natal rivers to spawn varies depending on the stock. Most fish from the Columbia River streams return at age 3–4 years. However, some males return 1–2 years earlier than their counterparts. These “jack salmon” are generally smaller and can constitute a substantial part of the overall run (see Table D-1-3). Adult Chinook salmon returning from the ocean to spawn in the rivers stop feeding entirely after they pass through the estuaries (Higgs, et al., 1995) and migrate to their natal streams.

D-1.4.2.2 Population Trends

Chinook salmon are generally found in coastal rivers as far south as the San Joaquin River in California, although they are also occasionally observed in the San Luis Obispo or Carmel rivers south of San Francisco Bay and have been reported in Baja California, Mexico (Pacific Fishery Management Council, 2000), (Wydoski and Whitney, 2003). They extend as far north as Point Hope, Alaska, along the Pacific coast, and from the Anadyr River south to Hokkaido, Japan (Wydoski and Whitney, 2003). In marine environments, they extend from as far south as the U.S. and Mexico border (Baja California, Mexico) throughout the North Pacific Ocean and the Bering Sea (PFMC, 2000), (Wydoski and Whitney, 2003).

The number of Chinook salmon migrating up the Columbia River started to decrease in the late 1880s as a result of commercial fishing on the lower Columbia River. Degradation and loss of habitat accelerated their decline in numbers. It was further accelerated by the installation of hydroelectric dams on the river, including Grand Coulee Dam constructed in 1941, which permanently blocked the salmon migrations past RM 597 and Chief Joseph Dam (RM 545) that was constructed downstream from Grand Coulee Dam, which also blocks anadromous fish migrations (Good, et al., 2005). The Construction of Hells Canyon Dam on the Snake River in 1967 and Dworshak Dam on the Clearwater River also blocked upstream migrations and contributed to the declining number of Chinook salmon runs overall in the Columbia River, even though these fish did not pass through the Hanford Reach.

Chinook salmon has been an important species for the Native Americans as well as other people in the Columbia River Basin. Commercial canning of salmon in the lower Columbia River peaked in the 1880s when the catch was more than 40 million pounds (lb) (18 million kilograms (kg)). By the 1890s, hatcheries were releasing salmon to replenish the declining spring runs (Dauble, 2009). From 1938–1940, the Grand Coulee Fish Maintenance Program trapped returning spring-run Chinook salmon at Rock Island Dam and either transplanted them as adults or released juveniles into selected areas within the drainages below Grand Coulee (Good, et al., 2005). This action homogenized the stocks of Chinook across the currently designated evolutionarily significant unit (ESU) for the spring run and influenced the present-day loss of genetic diversity (Lohn, 2004). Subsequent construction of numerous dams and other projects on the mainstem Columbia River also contributed to the obstacles for recovery of the Upper Columbia River spring Chinook salmon (Lohn, 2004).

Table D-1-3 provides the current returns of Chinook salmon in the Columbia River for the past 6 years. The numbers for spring and summer Chinook include only those that passed through Priest Rapids Dam and, thus, through the Hanford Reach. Table D-1-3 also shows the counts that pass through McNary Dam but not Ice Harbor. This eliminates the fish that moved up the Snake River, but it includes fish that spawn in the Yakima River and those returning to the Priest Rapids Hatchery.

Table D-1-3. Chinook population within or migrating through the Hanford Reach

Year	Fish counts at Priest Rapids Dam						Counts passing McNary minus the Ice Harbor counts	
	Spring Chinook adults	Adults plus Jacks	Summer Chinook adults	Adults plus Jacks	Fall Chinook adults	Adults plus Jacks	Fall Chinook adults	Adults plus Jacks
2005	14,148	14,663	61,227	63,125	31,289	31,641	119,360	127,966
2006	8,538	8,616	57,236	57,792	18,851	20,678	78,809	85,778
2007	6,708	7,197	30,644	31,732	22,650	27,033	43,860	62,111
2008	12,178	12,798	39,174	42,616	34,012	48,552	79,973	88,354
2009	13,469	16,379	49,417	51,534	40,723	46,552	79,720	103,010
2010	30,539	31,471	49,265	50,482	38,614	42,490	151,180	166,383

Source: (University of Washington, 2011) (Columbia River DART (Data Access in Real Time) http://www.cbr.washington.edu/dart/dart.html

Estimated returns (escapement) of adult fish to the Hanford Reach are calculated annually by the Washington Department of Fish and Wildlife. Escapement of spring Chinook to the Upper Columbia River for 2010 was 57,300 total, with 5700 wild spring Chinook. Escapement of summer Chinook was 72,300 (Washington Department of Fish and Wildlife, 2011). In 2010, the latest year to be reported, total escapement of adult fall Chinook salmon to the Hanford Reach was estimated to be 80,408 fish, and the number of redds observed was 8,817 (PNNL unpublished data). Escapement numbers may vary from fish counts as a result of tribal and sports fishing as well as adults that ascend the hydroelectric dams and then fall back, biasing the fishway escapement estimates. Biases can range from 1–38 percent for fall Chinook salmon from fallback at dams. It is less for spring and summer Chinook (Boggs, et al., 2004).

Figure D-1-9 illustrates the locations of the fall Chinook spawning areas in the Hanford Reach of the Columbia River. The number of fall-run Chinook salmon redds in the Hanford Reach is identified in Figure D-1-10 for years 1948–2009. From 1964–1982, estimated escapement of adult fall Chinook salmon to the Hanford Reach (the number of adults that survive natural mortality and harvest to reach the spawning grounds) averaged about 25,000 fish annually. In 2003, the adult Chinook escapement peaked at 89,300, and the number of redds observed also peaked at 9,465 (Hoffarth, 2010).

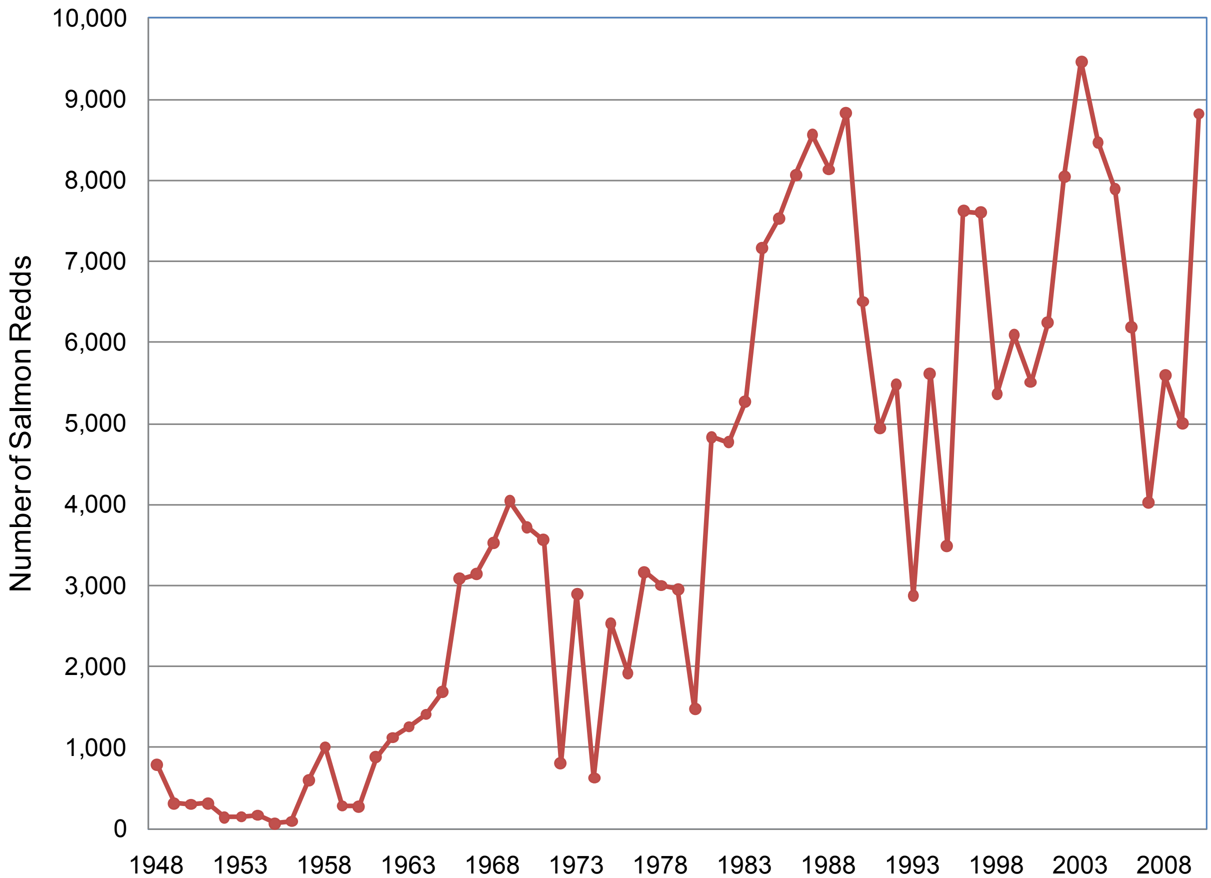

Figure D-1-9. Number of Fall Chinook Salmon Redds in the Hanford Reach of the Columbia River, 1948–2009.

Source: (Duncan, et al., 2010); unpublished data for 2010

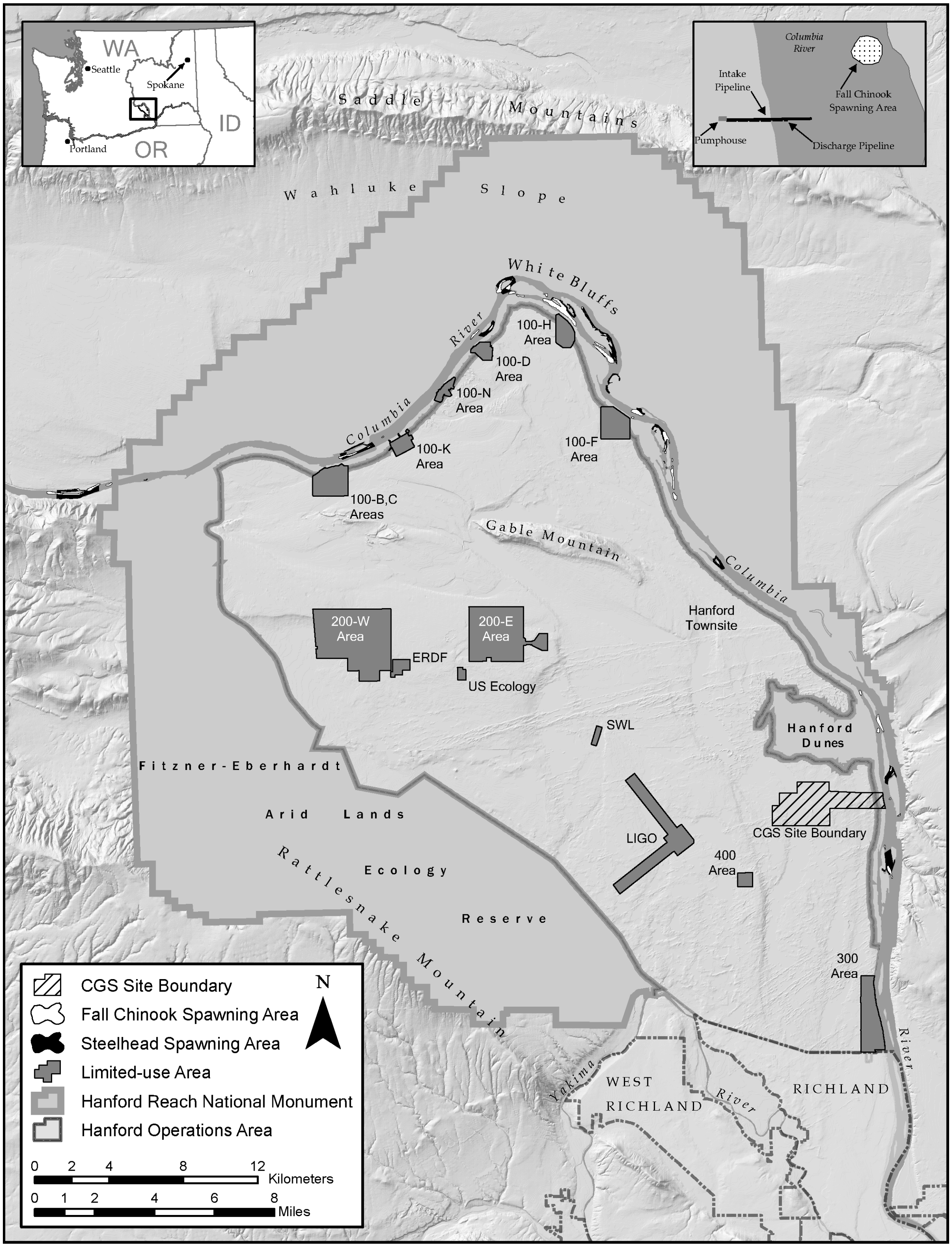

Figure D-1-10. Fall Chinook and Steelhead spawning areas in the Hanford Reach and vicinity of the CGS site

Source: (DOE, 2000), (Poston, et al., 2009)

Salmon population abundance in Pacific Northwest and Alaskan stocks appears to relate to the ocean productivity. Ocean productivity, in turn, seems to correlate with a recurring, decadal-scale pattern of ocean-atmosphere climate variability that occurs in the Northern Pacific Ocean (Good, et al., 2005). Marine productivity was not favorable for the majority of salmon populations for the two decades that began in 1977, but a shift in ocean-atmospheric conditions occurred around 1998 and the increased returns of salmon to Pacific Northwest rivers since that time may be a result of this shift to more favorable conditions.

D-1.4.2.3 Endangered Species Act Listing History

NMFS listed the Upper Columbia River spring Chinook salmon as an endangered species in 1999 and reaffirmed this status in 2005. The main consideration for NMFS when listing the Upper Columbia River spring Chinook salmon as an endangered species was the concern that the species was at risk of becoming extinct in the foreseeable future (64 FR 14308).

On September 2, 2005, NMFS published a final rule that revised the critical habitat for the designation of critical habitat for 12 ESUs of West Coast salmon and steelhead including the spring-run Chinook salmon (70 FR 52630). NMFS designated all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam, excluding the Okanogan River, as being within the ESU for the species (64 FR 14308), (70 FR 37160). The ESU contains the only remaining genetic resources of those spring-run Chinook salmon that migrate into the upper Columbia River Basin, and those salmon are distinct from other stream-type Chinook salmon ESUs (64 FR 14308). Chinook salmon have characteristics specific to the location of their spawning areas and the time they spend in the river. The drainages (Wenatchee, Methow, and Entiat rivers) that support this ESU for the spring-run Chinook salmon are all above Rock Island Dam, which is upstream of CGS. Historically, the spring-run Chinook may also have used portions of the Okanogan River (Good, 2005)

NMFS has been developing a series of biological opinions to address the restoration of the species from the operation of the Federal Columbia River Power System (FCRPS). The FCRPS consists of 31 Federally owned and operated (U.S. Army Corps of Engineers and the Bureau of Reclamation) hydro projects in the Columbia and Snake rivers. The BPA markets and distributes the power generated by these dams and CGS (BPA, 2010). In addition, NMFS has prepared biological opinions for the relicensing of the five dams on the Columbia River that are owned and operated by public utilities, including Priest Rapids Dam, which is owned and operated by Public Utility District No. 2 of Grant County (Lohn, 2004).

The actions covered by the NMFS' biological opinions for the Upper Columbia River spring Chinook salmon range from modification of the dams to habitat improvements in areas away from the dams. NMFS characterizes the program that is responsible for implementing the biological opinion as being a "large and complicated program that is commensurate with the scale of the FCRPS and its impact on the listed species and critical habitat." The program calls for the following (NMFS, 2010):

> increasing survival rates of fish passing through the dams; managing water to improve fish survival; reducing the numbers of juvenile and adult fish consumed by fish, avian, and marine mammal predators; improving juvenile and adult fish survival by protecting and enhancing tributary and estuary habitat; implementing safety net and conservation hatchery programs to assist recovery; and ensuring that hatchery operations do not impede recovery.

A recent review of the NMFS 2008 biological opinion for the FCRPS (NMFS, 2010) included evaluation of the status of the Upper Columbia River spring Chinook salmon and additional actions to build on the 2008 biological opinion. The evaluation of new information collected across the critical habitat for spring-run Chinook salmon indicates that the aggregate populations of the species have been stable or increasing over the last decade. These results suggest that the actions identified in the reasonable and prudent alternative may be working and are encouraging for the new Adaptive Management Implementation Plan.

D-1.4.2.4 Designated Essential Fish Habitat in the Vicinity of Columbia Generating Station

The staff has determined that EFH exists in the vicinity of CGS for all three runs of the Upper Columbia River Chinook salmon. Table D-1-4 lists the environmental requirements for all three runs of the Upper Columbia River Chinook EFH. Table D-1-5 lists the lifestages of the Upper Columbia River Chinook salmon that are present in the Hanford Reach.

Table D-1-4. Upper Columbia River Chinook Salmon EFH descriptions by life stage

Life stage	Habitat type	Temperature	Water depth	Flow	Seasonal occurrence in estuaries
		Spring run			
Eggs	Upper reaches of tributaries upstream of the Hanford Reach (Freshwater)	41–58 °F (5–4.4 °C)	0.2–23 ft (0.05–7 m)	0.3–6.6 fps (10–200 cm/s)	Not applicable
Alevins	Upper reaches of tributaries upstream of the Hanford Reach (Freshwater)	54–55 °F (12–13 °C)	0.2–23 ft (0.05–7 m)	0.3–6.6 fps (10–200 cm/s)	Not applicable
Young juveniles	Tributaries upstream of the Hanford Reach (Freshwater)	54–55 °F (12–13 °C)	3 ft (1 m)	0.8–0.9 fps (24–27 cm/s)	Not applicable
Migrating smolts	Mainstem Columbia River (Freshwater to saline estuary)	54–55 °F (12–13 °C)	midchannel–lower depths	1.4 fps (43 cm/s)	March–June
Juveniles	Mainstem Columbia River/Estuary/ocean (Estuary to seawater)	54–55 °F (12–13 °C)	variable	----	March–June
Adults	Pacific Ocean (Seawater)	41–59 °F (5–15 °C)	0–>60 fathoms (fm) (110 m) but most abundant in 30–40 fm (57–73 m)	----	Not applicable
Migrating adults	Estuary/Mainstem Columbia River/Tributaries (Seawater to freshwater)	38–56 °F (3.3–13.3 °C)	variable	3.6–22.3 fps (1.1–6.8 m/s); 8 fps (2.44 m/s)	March–May
Spawning adults	Tributaries (Freshwater)	42–57°F (5.6–13.9°C)	0.2–23 ft (0.05–7 m)	0.3–5 fps (10–150 cm/s)	Not applicable

Life stage	Habitat type	Temperature	Water depth	Flow	Seasonal occurrence in estuaries
		Summer run			
Eggs	Lower reaches of tributaries upstream of the Hanford Reach (Freshwater)	41–58 °F (5–14.4 °C)	2 in.–23 ft (0.05–7 m)	1–3.6 fps (32–109 cm/s)	Not applicable
Alevins	Lower reaches of tributaries upstream of the Hanford Reach (Freshwater)	54–55 °F (12–13 °C)	0.2–23 ft (0.05–7 m)	1–3.6 fps (32–109 cm/s)	Not applicable
Young juveniles	Tributaries upstream of the Hanford Reach (Freshwater)	54–55 °F (12–13 °C)	3 ft (1 m)	0.16–0.83 fps (5–25 cm/s)	Not applicable
Migrating smolts	Mainstem Columbia River including Hanford Reach; to estuary (Freshwater to saline estuary)	54–55 °F (12–13 °C)	midchannel–lower depths	0.16–0.83 fps (5–25 cm/s)	April–July until Aug/Sept
Juveniles	Estuary/Ocean (Saline estuary to seawater)	54–55 °F (12–13 °C)	variable	----	April–July until Aug/Sept
Adults	Ocean (Seawater)	41–59 °F (5–15 °C)	0–>60 fm (110 m) but most abundant in 30–40 fm (57–73 m)	----	Not applicable
Migrating adults	Mainstem Columbia River including Hanford Reach (Seawater to freshwater)	57–68 °F (13.9–20 °C	variable	3 fps (0.9 m/s) to over 11 fps (3.35 m/s)	June–July
Spawning adults	Lower reaches of tributaries upstream of Hanford Reach (Freshwater)	42–57 °F (5.6–13.9°C)	2 in.–23 ft (0.05–7 m)		Not applicable
		Fall run			
Eggs	Mainstem Columbia River including the Hanford Reach buried under 10 to 33 cm of gravel (Freshwater)	Below 62 °F (17 °C) 41–58 °F (5–14.4 °C)	1 in–23 ft (2.5 cm–7 m)	2.2–6.6 fps (0.67–2 m/s)	Not applicable
Alevins	Mainstem Columbia River including the Hanford Reach (Freshwater)	59–64 °F (15–18 °C)	1 in–23 ft (2.5 cm–7 m)	2.2–6.6 fps (0.67–2 m/s)	Not applicable
Young juveniles	Mainstem Columbia River including the Hanford Reach (Freshwater)	59–64 °F (15–18 °C)	Greater than 3 ft (1 m) deep	0.16–1.3 fps (5–41 cm/s)	Not applicable
Migrating smolts	Mainstem Columbia River (Freshwater to saline estuary)	54–55 °F (12–13 °C)	Greater than 3 ft (1 m) deep	0.16–1.3 fps (5–41 cm/s)	April–July until Aug/Sept
Juveniles	Estuary/Ocean (Saline estuary to seawater)	54–55 °F (12–13 °C)	variable	----	April–July until Aug/Sept

Life stage	Habitat type	Temperature	Water depth	Flow	Seasonal occurrence in estuaries
Adults	Ocean (Seawater)	41–59 °F (5–15 °C)	0–>60 fm (110 m) but most abundant in 30–40 fm (57–73 m)	----	Not applicable
Migrating adults	Mainstem Columbia River including Hanford Reach (Seawater to freshwater)	51–67°F (10.6–19.4°C)	variable	3.6–22.3 fps (1.1–6.8 m/s) 8 fps (2.44 m/s)	August–November
Spawning adults	Mainstem Columbia River including the Hanford Reach (Freshwater)	42–57°F (5.6–13.9°C)	1 in–23 ft (2.5 cm–7 m)	6.6 fps (2 m/s)	Not applicable

Sources: (Chapman, et al., 1986), (Dauble, et al., 1989), (Healy, 1991), (Levy and Slaney, 1993), (Quinn, 2005), (University of Washington, 2011), (Wydoski and Whitney, 2003)

Table D-1-5. Upper Columbia River Chinook Salmon life stages present in the Hanford Reach

Life stage	Spring run	Summer run	Fall run
Eggs			x
Alevins			x
Young juveniles			x
Migrating smolts	x	x	x
Juveniles			
Adults			
Migrating adults	x	x	x
Spawning adults			x

D-1.4.3 Upper Columbia River Steelhead (*Oncorhynchus mykiss*)

D-1.4.3.1 Life History

Steelhead are the anadromous form of rainbow trout, and both forms can coexist in the same river system. Steelhead migrate to the ocean as smolts. However, they may spend 1–7 years in freshwater before they migrate into the ocean. Most steelhead in Washington state become smolts at age 2 (70–90 percent) and the remainder at age 3 (55–100 percent). Although most steelhead make their first spawning migration after 2 years in the ocean, the stocks that originate in the Columbia River drainage mature after 1 year in the ocean (Wydoski and Whitney, 2003). There are two types of steelhead—stream-maturing, which enter the freshwater earlier in the summer to early fall and then spawn in the spring and ocean-maturing, which enter freshwater between November and April and spawn shortly thereafter. The steelhead in the upper Columbia River Basin are almost exclusively the stream-maturing type that is considered the summer run (NOAA, 2011b). The peak runs of steelhead in the upper

Columbia River Basin pass Bonneville Dam between June and August and arrive in the Hanford Reach area in late summer (Wydoski and Whitney, 2003). The adult steelhead do not spawn until the following spring (March–June, possibly as late as July). Some of the adults survive and return downstream to the ocean (termed “kelts”) (FERC, 2006).

Spawning in the Hanford Reach likely occurs between February and early June, with a peak in mid-May (Mueller and Geist, 1999). Steelhead construct redds in gravel substrate for their eggs. The redds are larger than those of other salmonids. Redds are located in water depths that range from 0.7–1.34 ft deep with a water velocities of 1.8–2.3 fps. Several inches to a foot of gravel are used to cover the eggs. Incubation time is about 40 days with water temperatures of 50 degrees Fahrenheit (Wydoski and Whitney, 2003. Fry emerge from the gravel 2–3 weeks after hatching (FERC, 2006) and remain in the peripheral waters of the pools until they are large enough to maintain themselves in the current (Wydoski and Whitney, 2003). As steelhead fry emerge from the river substrate and start to feed, they are about 1-in. (2.5-cm) long and vulnerable to predation, so they seek cover. Juveniles usually remain in tributary streams for 2 years before becoming smolts and migrating to the ocean (Dauble, 2009). Depending on the temperature and productivity of the stream, it may take 1–7 years to reach smolt size (6–8 in. (15–20 cm)) (FERC, 2006), (Wydoski and Whitney, 2003). If they remain in freshwater for their entire lives, they are considered rainbow trout (Dauble, 2009). Smolt migrate downriver primarily in the late spring.

Juvenile steelhead behave differently in the Hanford Reach than they do in the slower moving reservoirs of the Columbia River. They move through the area in the vicinity of the CGS site in the deepest part of the river, although they tend to stay towards the surface when they are migrating through reservoirs. Most of the migration is at night, and the juvenile steelhead rest and feed near the shore during the day (Dauble, 2009).

Juvenile steelhead in freshwater feed on drifting mayflies, caddisflies, and chironomids as well as terrestrial insects and earthworms. Juvenile and adult steelhead in the ocean consume invertebrates such as barnacle larvae, copepods, squid, and amphipods as well as fish such as juvenile rockfish, sandlance, brown Irish lord (sculpin), and greenlings (Wydoski and Whitney, 2003)

D-1.4.3.2 Population Trends

Identification of steelhead redds is difficult because, unlike the fall Chinook salmon, they spawn primarily in the spring, and the high, turbid spring runoff obscures visibility (DOE, 2000). Aerial surveys, boat-deployed video, and digging in the gravels are methods used to confirm the existence of steelhead redds in the Hanford Reach. However, known historic areas where steelhead have prepared redds are shown in Figure D-1-10. Aerial surveys identified two regions having characteristics associated with steelhead redd characteristics, including the area upstream of the CGS intake structure between Islands 12 and 13 (RM 352) and another downstream near Island 15 (RM 349). In 2005, four redds were observed near Island 15 using a boat-deployed video camera, but no indication of spawning activity was observed; no redds were found around Islands 12 and 13 (Hanf, et al., 2006). From 2006–2008, aerial surveys did not find any evidence of steelhead spawning near the CGS intake and discharge structure (Duncan, et al., 2008), (Hanf, et al., 2006), (Hanf, et al., 2007), (Poston, et al., 2009).

Hatchery programs, including the Ringold Facility upstream of the CGS site, augment the natural spawning efforts in the mainstem Columbia River (Lohn, 2004). A total of six artificial propagation programs exist in the upper Columbia River, including in the Wenatchee, Methow, and Okanogan rivers and near Winthrop and Omak.

Fish counts for steelhead (both hatchery and wild counts) are listed in Table D-1-6.

Table D-1-6. Fish counts for Steelhead, 2005–2010

	Steelhead (wild & hatchery)				Steelhead (wild only)		
Year	**McNary**	**Ice Harbor**	**Difference**	**Priest Rapids**	**McNary**	**Ice Harbor**	**Difference**
2005	224,611	156,801	67,810	12,472	58,727	35,571	23,156
2006	205,235	124,813	80,422	10,408	46,630	27,697	18,933
2007	216,631	154,739	61,892	15,183	53,064	31,675	21,389
2008	221,377	172,410	48,967	16,625	58,780	42,003	16,777
2009	408,157	328,105	80,052	39,968	10,8792	76,434	32,358
2010	262,527	206,971	55,556	26,476	89,504	58,743	30,761

Source: (University of Washington, 2011)

D-1.4.3.3 Endangered Species Act Listing History

The Upper Columbia River steelhead was listed as an endangered species on August 18, 1997 (62 FR 43937). The status was upgraded to threatened on January 5, 2006 (71 FR 834), reinstated to endangered in June 2007 based on a district court ruling (*Trout Unlimited v. Lohn*, C06-0483-JCC, 2007), and then upgraded to threatened by U.S. District Court order in June 2009. The Upper Columbia River steelhead is currently listed as threatened (74 FR 42605) by the NMFS. The listing is defined as the "Distinct Population Segment (DPS) including all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in streams in the Columbia River Basin, upstream from the Yakima River, Washington, to the U.S.-Canada border" (71 FR 834). The steelhead associated with six artificial propagation programs are also part of the listing, including the Wenatchee River, Wells Hatchery (in the Methow and Okanogan rivers), Winthrop National Fish Hatchery, Omak Creek, and the Ringold steelhead hatchery programs (71 FR 834). NMFS reports that, based on genetic evidence, hatchery stocks remain closely related to the naturally spawned populations, and they maintain the local genetic distinctiveness of populations that are within the DPS. Critical habitat for the Upper Columbia River steelhead was designated on September 2, 2005 (70 FR 52630), and final revised protective regulations were issued for this DPS on February 1, 2006 (71 FR 5178). The revised protective regulations apply take prohibitions from ESA Section 9 (a)(1) to unmarked anadromous fish with an intact adipose fin that are part of the Upper Columbia River steelhead DPS. Clipping the adipose fins of hatchery fish just prior to their release differentiates them from wild fish.

D-1.4.4 Coho Salmon (*Oncorhynchus kisutch*)

D-1.4.4.1 Life History

Coho salmon are anadromous. They have a slightly different life history than Chinook salmon, although they both spawn in freshwater and both die after spawning. The juvenile coho normally spend a year in freshwater before they become smolts and migrate to the ocean. They live in the ocean for about 18 months, although some fish return after only 5–7 months. The fish that return after less than a year in the ocean are termed jacks (precocious male coho salmon that become sexually mature 1 year earlier than the typical adult coho). Mature adults return at age 3 (Wydoski and Whitney, 2003) and enter freshwater between early August to mid-November in Washington State after spending about 18 months in the Pacific Ocean. Like the Chinook salmon, there is also a summer run of coho salmon that enter the rivers in late spring or early summer. However, unlike the Chinook, they tend to spawn at the same time no matter when they enter the freshwater (PFMC, 2000), (Wydoski and Whitney, 2003).

Coho have been described as the least particular salmonid in terms of their choice of spawning area. They spawn in mountain streams in riffles or on gravel bars in large rivers and tributaries (Sandercock, 1991). However, they tend to select gravel sites that have good circulation of oxygenated water and nearby cover (PFMC, 2000), (Sandercock, 1991). After spawning, the adults die. The alevins hatch in about 6–8 weeks (depending on the temperature of the water), and the young emerge from the gravel about 2–3 weeks after hatching (Dauble, 2009). Days to emergence are reported to range from 28 days at 51 degrees Fahrenheit (10.7 degrees Celsius) to 137 days at 36 degrees Fahrenheit (2.2 degrees Celsius) has been reported (PFMC, 2000). The young usually congregate in pools in the stream after emergence (Wydoski and Whitney, 2003). Their preferred habitat includes areas with abundant prey and different types of pools, glides, and riffles with large woody debris, undercut banks, and overhanging vegetation. They prefer temperatures in the water to be around 50–59 degrees Fahrenheit (10–15 degrees Celsius), although they can tolerate temperatures between 32–79 degrees Fahrenheit (0–26 degrees Celsius). DO levels need to be above 4 mg/L; a sustained concentration less than 2 mg/L is lethal (PFMC, 2000).

Dauble (2009) indicated that coho in the upper Columbia River remain 1–2 years before becoming smolts and are approximately 3–6 in. (8–15 cm) long when they migrate. Migration occurs between March and late June, with the peak from late April to mid-June, depending on the stock and the run (Wydoski and Whitney, 2003). Downstream migration timing for Priest Rapids Dam is April–June (FERC, 2006).

The diet of juvenile coho consists primarily of zooplankton, such as *Daphnia*, and emerging aquatic insects. In streams, coho feed on insects, mayflies, and stone flies as well as worms, fish eggs, and fish. They are also known to eat steelhead larvae. It is thought that the Columbia River coho salmon juveniles remain in the estuary for several days to weeks. In the estuary, the salmon consume large planktonic or small nektonic animals, including amphipods, insects, decapods larvae, and larval and juvenile fish. While in the ocean, juvenile coho off the coast of Oregon and Washington feed on Pacific herring and smelt during strong upwelling years or on northern anchovy and juvenile rockfish during poor upwelling years. They consume invertebrates such as crab larvae, amphipods, copepods, squid, and euphausiid shrimp (Wydoski and Whitney, 2003).

D-1.4.4.2 Population Trends

Coho are found from Monterey Bay, California, north to Point Hope, Alaska. They are also found in northeast Asia from the Anadyr River south to Hokkaido, Japan. They are anadromous and were once abundant in the tributaries of the upper Columbia and Snake rivers. Commercial harvest of coho peaked in the Columbia and Snake rivers in 1925 and then declined. Spawning populations were observed in the Columbia River as recently as 1970, and natural migrations disappeared by the mid-1970s (Wydoski and Whitney, 2003). Factors that caused the loss of coho to the upper Columbia River include the construction and operation of hydroelectric, irrigation and splash dams (used as reservoirs to transport logs), degradation of streams, and high fishing mortality (Wydoski and Whitney, 2003). Hatcheries were built in the lower part of the river to mitigate the loss of habitat caused by dams. Building the hatcheries in the lower part of the river was meant to minimize mortality from dams. However, the salmon from these hatcheries concentrated in the lower river, which resulted in heavy fishing pressure. The wild fish also mixed with the hatchery fish and were unable to maintain themselves; thus, they were eliminated. Currently, coho salmon are being restocked into the Methow, Wenatchee, and Yakima rivers in an effort to reestablish the runs in the mid-Columbia.

In the late 1990s, coho salmon catches in Alaska were at historically high levels, and the abundance trends were stable (PFMC, 2000). However, stocks of wild coho salmon from the Columbia River Basin above Bonneville Dam are thought to extirpated, and natural migrations disappeared in the mid-1970s (Dauble, 2009), (FERC, 2006). Hatcheries in the Methow and Wenatchee rivers supplement the current population. Efforts are being made to reestablish runs (FERC, 2006).

Table D-1-7 shows the numbers of adult (not jack) coho that passed through the Hanford Reach and by Priest Rapids Dam from 2005–2010.

Table D-1-7. Numbers of adult (not jack) Coho that passed through the Hanford Reach and by Priest Rapids Dam, 2005–2010

Year	Adult Coho
2005	17,779
2006	11,838
2007	18,436
2008	15,867
2009	28,411
2010	12,152

Source: (University of Washington, 2011)

D-1.4.4.3 Endangered Species Act Listing History

The wild coho salmon is extinct in the upper Columbia River. The NMFS lists coho salmon as threatened for the lower Columbia River from the mouth of the river upstream to and including the Big White Salmon and Hood rivers, downstream of the Hanford Reach. It does not have

ESA status or include critical habitat in the Hanford Reach or the upper Columbia River or critical habitat. However, the Columbia River in the vicinity of the CGS plant (the Hanford Reach) provides EFH features for the coho salmon, which is currently an unlisted reintroduction effort. The NMFS, in its letter to the NRC dated June 23, 2010 (Suzumoto, 2010), asked that the staff include the Upper Columbia River coho in consultation and assess the likely adverse effects of the project on their essential habitat.

D-1.4.4.4 Designated Essential Fish Habitat in the Vicinity of Columbia Generating Station

The staff has determined that EFH for coho salmon may exist in the vicinity of CGS. The NMFS has designated coho salmon EFH in the Columbia River in the vicinity of the CGS plant. Environmental requirements for coho salmon EFH are listed in Table D-1-8. Table D-1-9 illustrates the lifestages of the Upper Columbia River Chinook salmon that are present in the Hanford Reach.

Table D-1-8. Coho Salmon EFH descriptions by life stage

Life stage	Habitat type	Temperature	Depth	Flow	Seasonal occurrence in estuaries
Eggs	Gravel sites with good circulation of oxygenated water & nearby cover; 20% fine sediment, 0.5–4 in. (1.3–10.2 cm) gravel (Freshwater)	39–52 °F (4–11 °C)	9.8 in. (25 cm) (range 7–15.4 in. (17.8–39.1 cm)) in gravel; depth of water 6.2 in. (15.7 cm) (range 4.0–7.99 in. (10.2–20.3 cm))	0.98–1.8 fps (0.30–0.55 m/s)	Not applicable
Alevins	Remain in the redds (Freshwater)	33–51 °F (0.8–10.7 °C)	May move downward in redds 2–8 in. (5–20 cm); depends on size of gravel spaces	0.98–1.8 fps (0.30–0.55 m/s)	Not applicable
Young juveniles	Pools, glides, and riffles with large woody debris, undercut banks, & overhanging vegetation (Freshwater)	Preferred 54–57 °F (12–14 °C) (can tolerate 32–77 °F (0–25 °C)	Summer—10–11 in. (25–28 cm) deep; by December 17.7-in. (45-cm) depth	0.3–<1 fps (9–<30 cm/s) <1.5 fps (47 cm/s)	Not applicable
Migrating smolts (juveniles)	Mainstem of river to estuary (Freshwater to saline)	41–56 °F (5–13.3 °C) (Alaska)	Surface oriented	<8 fps (2.44 m/s)	April–July
Adults	Ocean—normally stay south of Vancouver Island (Saltwater)	Highest minimum ocean temperatures 41–43 °F (5–5.9 °C); not generally found in water cooler than 7 °C	Up to 100 ft (30 m)	Ocean	Not applicable
Migrating adults	Estuary/River (saltwater to freshwater)	Variable	Variable	<8 fps (2.44 m/s)	August–November

Life stage	Habitat type	Temperature	Depth	Flow	Seasonal occurrence in estuaries
Spawning adults	Mountain streams in riffles or gravel bars in large rivers & tributaries (Freshwater)	45–60 °F (7.2–15.6 °C)	Minimum depth 7 in. (18 cm)	1 fps (31 cm/s)	Not applicable

Source: (Laufle, et al., 1986), (Lestelle, 2007), (PFMC, 2000), (Sandercock, 1991), (University of Washington, 2011), (Wydoski and Whitney, 2003)

Table D-1-9. Coho life stages currently present in the Hanford Reach

Life stages	Present in Hanford Reach
Eggs	
Alevins	
Young juveniles	
Migrating smolts	x
Juveniles	
Adults	
Migrating adults	x
Spawning adults	

D-1.5 Endangered Species Act Effects Analysis

D-1.5.1 Bull Trout

The USFWS considers the Hanford Reach of the mainstem Columbia River to be a potential migratory corridor for bull trout (USFWS, 2010b). Migratory corridors are important for bull trout. According to Rieman and McIntyre (1993), migratory corridors allow salmonids to stray and interbreed with individuals in non-natal streams. Migration is also important for the reestablishment of populations following catastrophic events that decimate the population.

However, observation of bull trout in the Hanford Reach is rare, and it is likely that they seldom use this migratory corridor. Resource scientists at DOE's Hanford Site have characterized the use of the Hanford Reach by bull trout as transient (Poston, et al., 2009). USFWS (2008) indicated that the accounts of bull trout in the Hanford Reach are "anecdotal," and it is "likely individuals moved downstream during the spring freshet."

Furthermore, the habitat and water temperatures in the Hanford Reach are not ideal for spawning, and there are no reports of spawning activity by bull trout in the vicinity of CGS (Dauble, 2009), (Marten, 2007). Variation in the size of the river channel as a result of changing flows from Priest Rapids Dam and the lack of cover also make it unlikely that the bull trout are spawning in the Hanford Reach. The temperature range in the Hanford Reach exceeds the maximum temperature for the bull trout spawning. Data from previous years (WPPSS, 1986) show that the temperature of the river is above 59 degrees Fahrenheit (15 degrees Celsius) from the end of June or July until at least the middle of October. During these periods, the bull trout are unlikely to even be present in the Hanford Reach.

The lack of spawning in the Hanford Reach means that there is no potential for young bull trout or bull trout eggs to be entrained or impinged at the CGS site. Furthermore, entrainment studies conducted in 1979–1980 and 1985 did not collect any life stage of fish (EN, 2010), (WPPSS, 1986). Impingement studies conducted over the same period did not observe any fish impinged on the intake screens (EN, 2010), (WPPSS, 1986). Healthy adult bull trout that commonly inhabit rivers with water velocities above 4 fps (1.2 m/s) would not be susceptible to impingement with a through-screen velocity of 0.5 fps (15 cm/s).

As discussed previously, bull trout actively select cooler water, so there would be little potential for them to be affected by the thermal or chemical discharge from the CGS plant. The thermal effluent from the blowdown discharge during the spring is a long, narrow plume, comprising approximately 1 percent of the width of the river, and bull trout would likely avoid it while migrating or foraging.

Because this stretch of the river is not spawning or rearing habitat for bull trout, and because bull trout are so rare in this area, the staff has determined that the continued operation of CGS will have no effect on the bull trout.

D-1.5.2 Upper Columbia River Chinook Salmon

The endangered Upper Columbia River spring Chinook salmon are found in the vicinity of the intake and discharge systems for CGS as they migrate through the Hanford Reach as adults or as juveniles as they migrate downstream. As a result, there is a potential for the continued operation of the CGS plant during the renewal period to affect the Upper Columbia River spring Chinook.

As discussed in Section D-1.4.2.1, Upper Columbia River spring Chinook salmon do not spawn in the Hanford Reach. Adults start returning from the ocean in early spring and pass through the Hanford Reach while migrating to upstream spawning grounds in the Wenatchee, Entiat, Methow, and Okanogan river basins (70 FR 52630), (Lohn, 2004). Juveniles pass through the Hanford Reach while migrating downstream toward the ocean after spending 1–2 years in the upper tributaries (Wydoski and Whitney, 2003). The travel time for a juvenile through the Hanford Reach is generally less than 1 week; outmigration of the juvenile spring Chinook extends from April to the end of August (DOE, 2000).

Young-of the-year spring Chinook in the upper Yakima River Basin preferred water depths from 1.6–1.8 ft deep (49–55 cm), with bottom velocities of 0.8–0.9 fps (0.24–0.27 m/s). By spring they occupied habitats that were shallower (0.8 ft deep (24 cm)) with a bottom water velocity of 1.4 fps (0.43 m/s) (Wydoski and Whitney, 2003).

Entrainment studies conducted in 1979–1980 and 1985 did not collect any life stage of fish (EN, 2010), (WPPSS 1986). Impingement studies conducted over the same period did not observe any fish impinged on the intake screens (EN, 2010), (WPPSS 1986). Furthermore, juvenile spring Chinook are too large to be entrained in an intake with openings of $^3/_8$-in. (9.5 mm)-diameter holes. In addition, juvenile spring Chinook occupying habitats with a water velocity of 1.4 fps (0.43 m/s) are easily able to avoid impingement in an intake with a through-screen velocity of 0.5 fps (15 cm/s). Healthy migrating adult Chinook are also able to avoid impingement. Migrating Chinook salmon would also be able to avoid the narrow thermal plume, comprising approximately 1 percent of the width of the river. During thermal drift studies in 1985, juvenile fall Chinook floated in cages through the thermal and chemical effluent of the blowdown discharge had no measurable impacts from the exposure to the heated water and blowdown chemicals (WPPSS, 1986).

Because no fish, including spring Chinook, were collected during entrainment and impingement studies, and because thermal drift studies of fall Chinook and steelhead had no measurable impact on the fish, the staff determines that the continued operation of CGS may affect, but is not likely to adversely affect, the Upper Columbia River Chinook salmon.

D-1.5.3 Upper Columbia River Steelhead

Upper Columbia River steelhead have been observed spawning in the Hanford Reach and in the vicinity of the intake and discharge structures for the CGS plant in the past. The most recent confirmed observations of active steelhead redds were in 2003, below the CGS intake. From 2006–2009, the aerial surveys did not find any evidence of steelhead spawning near the CGS intake and discharge structure or in the Hanford Reach (Hanf, et al., 2007), (Poston, et al., 2008), (Poston, et al., 2010). Considering the distance upstream of previously observed redds, it is unlikely that steelhead eggs would travel to the intake structure. Steelhead redds that may, in the future, be located near the intake and discharge structures could experience entrainment of eggs that do not settle within the redd. However, eggs that do not settle are already lost from the population due to predation or other causes.

Larval steelhead from upstream redds are also vulnerable to entrainment. Upon hatching, the alevin remain in the gravel for 2–3 weeks or in the vicinity of the redd until they are able to maintain themselves in the current. Once they are able to maintain themselves in the river current, they are able to avoid the 0.5-fps (0.15 m/s) through-screen intake velocity.

Entrainment studies conducted in 1979–1980 and 1985 did not collect any life stage of fish (EN, 2010), (WPPSS, 1986). Impingement studies conducted over the same period did not observe any fish impinged on the intake screens (EN, 2010), (WPPSS, 1986).

As observed by divers in 1985, the support and riprap around the intake structure provides shelter for fish species that consume other fish (WPPSS, 1986); thus, indirectly, the intake structure might affect the survival of the fry.

Adults and juveniles can avoid the influence of the intake and discharge structures. Juvenile steelhead that migrate through the Hanford Reach do so in the deepest part of the river and stay near the river bottom (Dauble, 2009).

As mentioned previously during thermal drift studies in 1985, juvenile steelhead floated in cages through the thermal and chemical effluent of the blowdown discharge had no measurable impacts from the exposure to the heated water and blowdown chemicals (WPPSS, 1986).

D-1.6 Potential Adverse Effects to EFH

The provisions of the MSA define an “adverse effect” to EFH as the following (50 CFR 600.810):

> *Adverse effect* means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

For the purposes of conducting NEPA reviews, the staff published the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" or "GEIS" (NRC, 1996), which identifies 13 impacts on aquatic resources as either "Category 1" or "Category 2." Category 1 issues are generic in that they are similar at all nuclear plants and have one impact level (SMALL, MODERATE, or LARGE) for all nuclear plants, and mitigation measures for Category 1 issues are not likely to be sufficiently beneficial to warrant implementation. Category 2 issues vary from site to site and must be evaluated on a site-specific basis. Table D-1-10 lists the aquatic resource issues identified in the GEIS.

Table D-1-10. Aquatic resource issues identified in the GEIS

Issues	Category	Impact level
For All Plants[(a)]		
Accumulation of contaminants in sediments or biota	1	SMALL
Entrainment of phytoplankton & zooplankton	1	SMALL
Cold shock	1	SMALL
Thermal plume barrier to migrating fish	1	SMALL
Distribution of aquatic organisms	1	SMALL
Premature emergence of aquatic insects	1	SMALL
Gas supersaturation (gas bubble disease)	1	SMALL
Low DO in the discharge	1	SMALL
Losses from parasitism, predation, & disease among organisms exposed to sublethal stresses	1	SMALL
Stimulation of nuisance organisms	1	SMALL
For plants with cooling-tower-based heat-dissipation systems[(a)]		
Entrainment of fish & shellfish in early life stages	1	SMALL
Impingement of fish & shellfish	1	SMALL
Heat shock	1	SMALL
For plants with once-through heat-dissipation systems[(b)]		
Impingement of fish & shellfish	2	SMALL, MODERATE, or LARGE
Entrainment of fish & shellfish in early life stages	2	SMALL, MODERATE, or LARGE
Heat shock	2	SMALL, MODERATE, or LARGE

[(a)] Applicable to CGS

[(b)] Not applicable to CGS because CGS has a closed-cycle cooling system

Source: (NRC, 1996)

The GEIS classifies all impacts levels for aquatic resources as "SMALL" except impingement, entrainment, and heat shock. "SMALL" is defined as "having environmental effects that are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource" (10 CFR Part 51, App. B, Table B-1). The staff believes that the impacts concluded to be "SMALL" will also be small for EFH. Therefore, this EFH Assessment focuses on the potential adverse effects of impingement, entrainment, and heat shock on EFH.

- **Impingement** occurs when aquatic organisms are pinned against intake screens or other parts of the cooling-water-system intake structure.
- **Entrainment** occurs when aquatic organisms (usually eggs, larvae, and other small organisms) are drawn into the cooling-water system and are subjected the thermal, physical, and chemical stress.
- **Heat shock** is acute thermal stress caused by exposure to a sudden elevation of water temperature that adversely affects the metabolism and behavior of fish and other aquatic organisms. In addition to heat shock, increased water temperatures at the discharge can also reduce the available habitat for fish species if the discharged water is higher than the environmental preferences of a particular species. This issue is discussed together with heat shock.

In addition to impingement, entrainment, and heat shock, the staff assessed the impacts on EFH species' food (forage species) in the form of displacement or loss of forage species and loss of forage species habitat. The staff also assessed cumulative impacts on EFH species or their habitat resulting from the past, present, and reasonably foreseeable future projects in the vicinity of CGS.

In summary, the staff has identified the following potential adverse effects on EFH as a result of the proposed license renewal of CGS:

- loss of habitat
- impingement
- entrainment
- thermal effects (heat shock and loss of habitat)
- loss of forage species.

The following sections address each of these issues for each of the three species identified for in-depth analysis in Section D-1.3.2. Section D-1.7 discusses cumulative effects.

D-1.6.1 Upper Columbia River Chinook Salmon

As discussed in Section D-1.4.2, the NMFS has designated EFH for Upper Columbia River Chinook salmon migrating smolts and migrating adults (spring and summer runs) as well as EFH for all life stages (fall runs) within the vicinity of CGS. The potential effects on this species' EFH as a result of the proposed action are considered in the following sections.

D-1.6.1.1 Loss of Habitat

The spring and summer runs of Upper Columbia River Chinook use the stretch of the river along the Hanford Reach as migratory and foraging habitat for the juveniles and as migratory habitat for the adults that rarely feed during their upstream migration. The fall run uses the Hanford Reach as spawning and nursery habitat. However, the removal of approximately 0.03 percent of the average mean annual discharge past the site, or 0.05 percent of the minimum mean annual discharge past the site, does not significantly alter the amount of habitat available to the Upper Columbia River Chinook salmon.

D-1.6.1.2 Impingement

Spring-run Chinook life stages are not susceptible to impingement, as discussed in Section D-1.5.2. Each individual juvenile spring Chinook salmon is only present in the Reach for a short time (approximately 1 week) and is accustomed to living in flows greater than that encountered near the intake 0.2–0.5 fps (0.06–0.15 m/s). Juvenile summer-run Chinook are also migrating through the site, but they move downriver more slowly than the juvenile spring-run Chinook. However, they are also are able to maintain themselves in flows that are faster than the intake flow velocities and, thus, are not susceptible to impingement. In general, ocean-type juveniles orient toward the current and are able to maintain their positions during the day for velocities that range from 0.16 to less than 0.83 fps (5–25 cm/s). They drift downstream at velocities of 0.83–1.3 fps (25–41 cm/s) during the day and at lower velocities at night (Wydoski and Whitney, 2003).

In the Hanford Reach, the fall Chinook remain in the area for the first few months after emergence generally at water depths of less than 3 ft (0.9 m). They move to deeper water when they are larger and closer to the time of their migration (Wydoski and Whitney, 2003). Fall Chinook in the Hanford Reach are reported to be able to maintain their position in waters with velocities up to 1.3 fps (41 cm/s); thus, they are not susceptible to the approach velocity of an intake of less than 0.2 fps (0.06 m/s) (WPPSS, 1980) or a through-screen velocity of less than 0.5 fps (0.15 m/s). Studies conducted in 1978, 1979, and 1985 looked for—but did not find—any fish or debris impinged on the screens (EN, 2010), (WPPSS, 1986). However, the 1985 study did find that fish were using the intake support system for cover and resting, including largescale suckers (*Catostomus macrocheilus*), mountain whitefish (*Prosopium williamsoni*), sculpins (*Cottus* spp.), Northern pikeminnow (*Ptychocheilus oregonensis*), bass (*Micropterus* spp.), redside shiner (*Richardsonius balteatus*), and American shad (*Alosa sapidissima*) (WPPSS, 1986). During one of the observation periods for impingement in 1985, samples of juvenile Chinook were collected, showing that anadromous species were in the area of the intake screens but were not being affected by the water withdrawal (WPPSS, 1986).

D-1.6.1.3 Entrainment

Spring-run Chinook salmon life stages are not susceptible to entrainment. Juvenile spring Chinook migrating through the Hanford Reach are too large to be entrained through the $^{3}/_{8}$-in. (9.5-mm) holes in the intake structure screen. Summer-run Chinook salmon life stages that pass thorough the Hanford Reach are also not susceptible to entrainment.

Fall-run Chinook salmon spawn in the Hanford Reach and, therefore, need to be considered further to determine the potential for entrainment of the eggs and alevins or smolts that occur upstream of the intake. As discussed in Section D-1.4.2, the adult salmon lay their eggs in redds in gravel with an approximate 4–13 in. (10–33 cm), averaging 7.4 in. (18.8 cm) of gravel covering the eggs (Healey, 1991). The eggs in the redds are not susceptible to entrainment unless disturbed. Although some eggs are lost during spawning, these eggs will not survive even in the absence of entrainment.

Upon hatching, the alevins live in the gravel for about 2–3 weeks and, in general, move deeper into the gravel after hatching (Quinn, 2005). Because the alevins remain close to the redds, they would not be susceptible to entrainment. Young juveniles can maintain their position in the current and would not be susceptible to entrainment by the intake, which has a slower approach velocity then the current.

No fish, fish eggs, or larvae were collected during entrainment studies completed in 1979–1980 and 1985. In the 1985 study, beach seine samples collected juvenile Chinook salmon (averaging 43 mm in length), confirming their presence in the area (EN, 2010), (WPPSS, 1986).

D-1.6.1.4 Thermal Effects

Migrating Chinook salmon would also be able to avoid the thermal plume that forms a long, narrow plume, approximately 1 percent of the width of the river. During thermal drift studies in 1985, juvenile fall Chinook floated in cages through the thermal effluent of the blowdown discharge had no measurable impacts from the exposure to the heated water (WPPSS, 1986).

D-1.6.1.5 Loss of Forage Species

As mentioned previously, adult Chinook salmon do not feed during upstream spawning migration. However, the smolts descending downstream do feed. The juveniles forage on aquatic insects (Dauble, 2009). The movement of a juvenile through the Hanford Reach lasts no more than 1 week; outmigration of the juvenile spring Chinook extends from April to the end of August (DOE, 2000). Fall Chinook salmon juveniles spend more time in the Hanford Reach than the spring or summer Chinook. They feed on midege larva and zooplankton, progressing to caddisfly larvae and other aquatic insect larvae and some terrestrial insects (Dauble, 2009). The loss of food as a function of the water withdrawn is likely less than the 0.03 percent of the average mean annual discharge because the water for the CGS plant is drawn from the bottom of the river, rather than from the more productive shallower areas of the river

D-1.6.2 Coho Salmon

As discussed in Section 4.4, the NMFS has designated EFH for coho salmon, which is currently an unlisted reintroduction effort. Currently, coho are being stocked in the Wentachee and Methow rivers in an effort to supplement the current population and reestablish the runs. Migrating adults rarely feed as they pass through the Reach. Migrating smolts do feed, most likely on insects, mayflies, and stoneflies as well as worms, fish eggs, and fish.

D-1.6.2.1 Loss of Habitat

The coho salmon use the stretch of the river along the Hanford Reach as migratory and feeding habitat for the juveniles and as migratory habitat for the adults that rarely feed during their upstream migration. The continued operation of the CGS facility will affect the habitat primarily through the removal of approximately 0.03 percent of the average mean annual discharge past the site or 0.05 percent of the minimum mean annual discharge past the site. This does not significantly alter the amount of habitat available to the coho salmon.

D-1.6.2.2 Impingement

Migrating coho smolts are too large to be impinged at the intake structure, and they are used to swimming in currents that have a higher velocity than the intake velocity. Healthy adult coho are not susceptible to impingement.

D-1.6.2.3 Entrainment

Migrating coho smolts and adult coho salmon are not susceptible to entrainment.

D-1.6.2.4 Thermal Effects

Migrating coho salmon would also be able to avoid the thermal plume that forms a long, narrow plume, approximately 1 percent of the width of the river. Migration of coho smolts occurs during the spring when the water temperature is coldest and the water velocities are the highest. In addition, thermal studies in 1985—on other salmonids that floated through the thermal effluent—indicated that the blowdown discharge had no measurable impacts from the exposure to the heated water (WPPSS, 1986).

D-1.6.2.5 Loss of Forage Species

The diet of juvenile coho consists primarily of zooplankton, such as *Daphnia*, and emerging aquatic insects. In streams, the coho feed on insects, mayflies, and stone flies as well as worms, fish eggs, and fish. They are also known to eat steelhead larvae (Wydoski and Whitney, 2003). The loss of food as a function of the water withdrawn is likely less than the 0.03 percent of the average mean annual discharge because the water for the CGS plant is drawn from the bottom of the river rather than from the more productive shallower areas of the river.

D-1.7 Endangered Species Act and Essential Fish Habitat Cumulative Effects Analysis

The irreversible changes to aquatic life in the Columbia River started with the completion of the first hydropower project, Rock Island Dam, in 1933. Specific alterations are documented with the completion of other dams in the Columbia River basin. Hydropower has been a significant contributor to the decline of native anadromous species, including the Upper Columbia River spring Chinook salmon (Dauble, 2009), (Dauble and Watson, 1997), (Wydoski and Whitney, 2003).

The upper Columbia River migratory salmonids are subjected to passage mortalities from four lower Columbia River Federal dam projects and a variety of Mid-Columbia River Public Utility District dam projects (seven mainstem dams for the Wenatchee River; eight dams for the Methow, and nine for the Okanagan River). Hydropower projects affect passage mortality during upstream and downstream migrations, cause river fluctuations associated with upstream dam operations that affect habitat and spawning success, create migratory blocks, and increase fishing pressure. Fall Chinook and steelhead that spawn in the Hanford Reach are affected by the fluctuations of Priest Rapids Dam. This primarily affects the juvenile fall Chinook that use the shallow, low-velocity nearshore areas for rearing, feeding, cover, and protection from predators. Because fall Chinook spawn in the late fall, the river level fluctuations in the winter have resulted in the desiccation of redds. In addition, fluctuations in water level can strand juvenile Chinook salmon on either gently sloped shorelines, gravel bars, or in shallow depressions created by receding water (Anglin, et al., 2006), (Geist, 1999), (Nugent, et al., 2002), (Wagner, 1995). Juvenile fall Chinook salmon loss estimates due to water fluctuations ranged from 45,000–1,630,000 fish a year from 1999–2003 for an 8.7 mi (14 km) section of the Hanford Reach (Anglin, et al., 2006), (Nugent, et al., 2002).

River fluctuations are now intentionally managed at Priest Rapids Dam during the fall-run Chinook spawning season in order to confine the spawning activity to lower river elevations by discouraging the salmon from spawning in areas that are exposed at low river flow in the winter. Although water management efforts at Priest Rapids Dam are improving fall Chinook salmon spawning and rearing survival, there are still concerns relating to the effects of frequent water level alterations on migration and habitat displacement.

The construction and operation of nine nuclear reactors on the Hanford Site from 1943–1987 influenced the aquatic environment of the Hanford Reach. Cofferdams restricted water flow during the placement of shoreline intake structures and discharge lines within the river. The operation of the Hanford Site led to the release of more than 60 radionuclides, numerous process chemicals, and waste heat into the Hanford Reach (Becker, 1990), (Duncan, et al., 2007). The overall impact on the aquatic resources from the operation of the Hanford Site has yet to be determined and drives ongoing cleanup activities as well as a natural resource damage assessment (Poston, et al., 2009).

The seasonal and daily water fluctuations associated with the operation of Priest Rapids Dam also may affect exposure of aquatic life to environmental contaminants from the Hanford Site. Groundwater transports contaminants from the Hanford Site to the Columbia River. High river stages can retard groundwater transport and concentrate the contaminants in the riverbank at low river stage. The benthic organisms in the river are the first receptors of contaminated groundwater. Groundwater plumes from the Hanford Site that are close to or flowing into the river include chemicals and radionuclides such as chromium, nitrate, strontium-90, tritium, and uranium. Concentrations of the chemical contaminants in the river are below ambient-water quality criteria for the protection of aquatic species. Although small amounts of radioactive materials are detectable in the Columbia River water and sediment samples downstream from the Hanford Site, the amounts are far below Federal and state limits. Other sources that may contribute to the cumulative effect of chemical contaminant exposure to aquatic resources in the Hanford Reach include high concentrations of nitrate in the groundwater across from the Hanford Site, agricultural returns flowing into the river, and upstream mining activities. DOE's monitoring and remediation programs are addressing the risk to aquatic species in the Hanford Reach from the influence of contaminated groundwater (DOE, 2009), (Duncan, et al., 2007), (Miley, et al., 2007), (Poston, et al., 2009).

Another regional concern is the withdrawal of Columbia River water. Permitting by resource agencies limits the total consumptive loss and balances the need of multiple water users (EN, 2010). While the relatively few water withdrawal systems within 20 mi (32 km) are primarily for municipal use, the number of permitted withdrawals is considerable. Direct impacts on aquatic biota can occur from the intake structures (e.g., entrainment and impingement), and oversight by resource agencies and use of best available technologies that consider protection of aquatic life (e.g., screen systems and fish diversions) may minimize the effects on aquatic life. Indirect impacts on aquatic biota from consumptive water loss in the area of interest range from contributions to extreme seasonal water-level fluctuations to the loss of habitat or fish passage, water quality, and water temperature.

Development also contributes to cumulative effects on aquatic life due to decreases in water quality and available habitat. The increase in urbanization within the Columbia River Basin may lead to changes in water quality from point and non-point contaminant discharges. Water temperatures in the tributaries of the Columbia River can increase because of changes to shorelines and removal of shade structures (USFWS 2007). The recovery programs for Federally listed species (e.g., Upper Columbia River steelhead) may affect some of these changes by enhancing fish habitat (NMFS, 2010). Resource agencies can address and minimize impacts through monitoring and permitting programs, such as the Washington State Department of Transportation's Fish Passage Program, to minimize impacts from highway crossings (WSDOT, 2010).

Pressures from recreational and commercial fishing within the Columbia River Basin contribute to the cumulative effects on the aquatic resources in the vicinity of CGS. Historically, the fitness of some species has declined (e.g., Upper Columbia River spring Chinook salmon) because of the mismanagement of some hatchery programs. Release of fish that are not genetically diverse and have behaviors that may result in increased predation are some of the issues of past hatchery practices that are currently being addressed by new programs (NMFS, 2010). Predation by pinnipeds (seals and sea lions) on adult salmon migrating upstream and smolts migrating downstream can also be substantial (Marten, 2007).

Potential cumulative effects of climate change on the aquatic species of the Columbia River could result from changes in river water flow. Climate changes may include warmer temperatures with more winter rainfall, less snowpack, and lower summer stream flows. These conditions can affect the balance of all aquatic resources in the Columbia River Basin. For the salmonids, redds could be damaged by higher winter stream flows. Less snowpack and lower summer stream flows could prevent salmonid migration into or out of smaller tributaries, and warmer waters could limit the distribution of some species. Conditions in the ocean could also be less favorable for adult salmonids from the Columbia River Basin. Climate change would lead to unfavorable conditions for Federally and state-listed species as well as other resident aquatic species in the vicinity of CGS (Karl, et al., 2009).

D-1.8 Endangered Species Act Conclusions and Determination of Effects

D-1.8.1 Bull Trout

The staff concludes that CGS will have no effect on the threatened bull trout because this stretch of the river is not spawning or rearing habitat for bull trout and because bull trout are not common in the Hanford Reach.

D-1.8.2 Upper Columbia River Spring Chinook Salmon

The staff concludes that CGS may affect, but is not likely to adversely affect, the endangered Upper Columbia River spring Chinook salmon. No fish, including spring Chinook, were collected during entrainment and impingement studies, and thermal drift studies of fall Chinook and steelhead had no measurable impact on the fish.

D-1.8.3 Upper Columbia River Steelhead

The staff concludes that CGS may affect, but is not likely to adversely affect, the threatened Upper Columbia River steelhead. No fish, including steelhead, were collected during entrainment and impingement studies, and thermal drift studies of steelhead had no measurable impact on the fish.

D-1.9 Essential Fish Habitat Conservation Measures and Conclusions

D-1.9.1 Conservation Measures

Closed-cycle cooling systems, such as the one already operating at CGS, are the most reasonable way to mitigate the number of aquatic organisms entrained and impinged in the facility's cooling system. Entrainment studies performed in 1979–1980 and 1985 indicated that no fish, fish eggs, or larvae were collected, even though beach seine samples in 1985 indicated that juvenile salmon (averaging 43 mm in length) were present in the area. In addition, thermal and chemical drift studies showed no effect on the two species of salmonids that were tested

(EN, 2010), (WPPSS, 1986). The thermal plume encompasses approximately 1 percent of the width of the river and would be easily avoidable for migrating and residential salmonids.

D-1.9.2 Upper Columbia River Chinook Salmon

The staff concludes that CGS will have a minimal adverse effect on Upper Columbia River Chinook salmon EFH. The operation of CGS will result in the removal of approximately 0.03 percent of the average mean annual discharge past the site, or 0.05 percent of the minimum mean annual discharge past the site, and an even smaller fraction of the forage for the smolts or juvenile Chinook salmon.

D-1.9.3 Coho Salmon

The staff concludes that CGS will have a minimal adverse effect on coho salmon EFH. The operation of CGS will result in the removal of approximately 0.03 percent of the average mean annual discharge past the site, or 0.05 percent of the minimum mean annual discharge past the site, and an even smaller fraction of the forage for the coho smolts that are migrating downstream.

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APPENDIX E
CHRONOLOGY OF ENVIRONMENTAL REVIEW

CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and external parties as part of its environmental review for Columbia Generating Station (CGS). All documents, with the exception of those containing proprietary information, are available electronically from the NRC's Public Electronic Reading Room found on the Internet at the following Web address: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents in ADAMS. The ADAMS accession number for each document is included in the following list.

E.1 Environmental Review Correspondence

January 19, 2010	Letter from Energy Northwest forwarding the application for renewal of the operating license for CGS to request an extension of the operating license for an additional 20 years (ADAMS Accession No. ML100250668)
January 26, 2010	Letter to Energy Northwest, "Receipt and Availability of the License Renewal Application for Columbia Generating Station" (ADAMS Accession No. ML100220037)
February 2, 2010	*Federal Register* Notice of Receipt and Availability of Application for Renewal of Columbia Generating Station Facility Operating License No. NPF-21 for an Additional 20-Year Period (75 FR 5353) (ADAMS Accession No. ML100220041)
February 3, 2010	NRC press release announcing the availability of license renewal application (LRA) for CGS (ADAMS Accession No. ML100340369)
March 4, 2010	Letter to Energy Northwest, "Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding the Application From Energy Northwest for Renewal of the Operating License for the Columbia Generating Station" (ADAMS Accession No. ML100541619)
March 5, 2010	Letter to Energy Northwest transmitting notice of intent to prepare an environmental impact statement and conduct the scoping process for license renewal for CGS (ADAMS Accession No. ML100570290)
March 8, 2010	NRC press release announcing opportunity for hearing on application to renewal operating license for CGS (ADAMS Accession No. ML100670526)

March 11, 2010	*Federal Register* Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding Renewal of Facility Operating License No. NPF-21 for an Additional 20-Year Period Energy Northwest Columbia Generating Station (75 FR 11572) (ADAMS Accession No. ML100550728)
March 11, 2010	*Federal Register* Notice of Intent to Prepare an Environmental Impact Statement and Conduct the Scoping Process for CGS (75 FR 11576) (ADAMS Accession No. ML100570282)
March 18, 2010	Letter to Dr. Allyson Brooks, State Historic Preservation Officer, Washington Department of Archaeology and Historic Preservation, "Columbia Generating Station License Renewal Application (Log No. 121007-20-NRC)" (ADAMS Accession No. ML100610084)
March 19, 2010	Letter to Mr. Louis Cloud, Chairman, Yakama Nation, "Request for Scoping Comments Concerning the Columbia Generating Station License Renewal Application Review" (ADAMS Accession No. ML100770417)
March 19, 2010	Letter to Mr. Elwood H. Patawa, Chairman, Confederated Tribes of the Umatilla Indian Reservation (CTUIR), "Request for Scoping Comments Concerning the Columbia Generating Station License Renewal Application Review" (ADAMS Accession No. ML100770417)
March 19, 2010	Letter to Mr. Samuel N. Penney, Chairman, Nez Perce Tribe, "Request for Scoping Comments Concerning the Columbia Generating Station License Renewal Application Review" (ADAMS Accession No. ML100770417)
March 22, 2010	Letter to Ms. Robyn Thorson, Regional Director, Pacific Region, U.S. Fish and Wildlife Service (USFWS), "Request for List of Protected Species Within the Area Under Evaluation for the Columbia Generating Station License Renewal Application Review" (ADAMS Accession No. ML100710046)
March 25, 2010	Memo to Bo Pham, NRC, "Forthcoming Meeting to Discuss the License Renewal Process and Environmental Scoping for Columbia Generating Station License Renewal Application Review" (ADAMS Accession No. ML100810412)
March 26, 2010	NRC press release announcing the CGS license renewal environmental scoping meeting (ADAMS Accession No. ML100850318)

March 29, 2010	Letter from Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, requesting a map of the boundaries of the environmental review of the LRA for CGS (ADAMS Accession No. ML100900230)
March 31, 2010	E-mail from John D. Greenhill regarding the license renewal of CGS (ADAMS Accession No. ML100920546)
March 31, 2010	Letter from Jerome Delvin, Washington State Senate, regarding the license renewal of CGS (ADAMS Accession No. ML100980062)
April 2, 2010	Letter from David V. Taylor, et al., Washington State Legislature, regarding the license renewal of CGS (ADAMS Accession No. ML101040675)
April 6, 2010	Letter from James O. Luce, Chair, State of Washington Energy Facility Site Evaluation Council, regarding the license renewal of CGS (ADAMS Accession No. ML101050307)
April 6, 2010	Transcript of the CGS license renewal public meeting—afternoon session, April 6, 2010 (ADAMS Accession No. ML101241002)
April 6, 2010	Transcript of the CGS license renewal public meeting—evening session, April 6, 2010 (ADAMS Accession No. ML101241037)
April 6, 2010	Comments from Gene Kinsey regarding the license renewal of CGS (ADAMS Accession No. ML101960547)
April 7, 2010	Letter from the Franklin County Board of Commissioners regarding the license renewal of CGS (ADAMS Accession No. ML101110052)
April 9, 2010	Letter from Tim Sheldon, Washington State Senate, regarding the license renewal of CGS (ADAMS Accession No. ML101110053)
April 9, 2010	Letter from Mr. Russell Jim, Manager, Environmental Restoration and Waste Management Program, Confederated Tribes and Bands of the Yakama Nation, regarding spent fuel storage and the license renewal of CGS (ADAMS Accession No. ML101160435)

April 12, 2010	Letter from Larry Haler, Brad Klippert, Maureen Walsh, and Terry Nealey, Washington State House of Representatives, regarding the license renewal of CGS (ADAMS Accession No. ML101110054)
April 12, 2010	Letter from Tim Sheldon, et al., Washington State Senate, regarding the license renewal of CGS (ADAMS Accession No. ML101170056)
April 15, 2010	Letter to Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, describing the area of potential effect for the CGS license renewal review (ADAMS Accession No. ML100960116)
April 19, 2010	Letter from Phil Rockefeller, Washington State Senate, regarding the license renewal of CGS (ADAMS Accession No. ML101180459)
April 20, 2010	Letter to Mr. Reid Nelson, Director, Office of Federal Agency Programs, Advisory Council on Historic Preservation, regarding the CGS LRA (ADAMS Accession No. ML100970721)
April 21, 2010	Letter from Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, concurring with the proposed area of potential effect for the CGS license renewal review (ADAMS Accession No. ML101160095)
April 21, 2010	Letter from representatives of Washington public power utilities regarding the license renewal of CGS (ADAMS Accession No. ML103230048)
May 3, 2010	Letter to Mr. Barry Thom, Regional Administrator, Northwest Region, National Marine Fisheries Service (NMFS), “Request for List of Protected Species and Essential Fish Habitat Within the Area Under Evaluation for the Columbia Generating Station License Renewal Application Review” (ADAMS Accession No. ML100980161)
May 10, 2010	Summary of the CGS License Renewal Overview and Environmental Scoping Meetings, April 6, 2010 (ADAMS Accession No. ML101250540)
May 14, 2010	Letter from Gary Robertson, Director, Washington Department of Health, Office of Radiation Protection, regarding the license renewal of CGS (ADAMS Accession No. ML101460059)

June 4, 2010	Letter to Mr. Russell Jim, Manager, Environmental Restoration and Waste Management Program, Confederated Tribes and Bands of the Yakama Nation, regarding spent fuel storage and the license renewal of CGS (ADAMS Accession No. ML101300463)
June 23, 2010	Letter from Bruce Suzumoto, Assistant Regional Administrator, Hydropower Division, NMFS, “Columbia Generating Station license renewal, request for species list for consultation” (ADAMS Accession No. ML101830405)
July 1, 2010	Letter to Energy Northwest, “Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application—[severe accident mitigation alternatives] SAMA review (TAC No. ME3121)” (ADAMS Accession No. ML101760421)
July 2, 2010	Letter to Energy Northwest, “Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application Environmental Review (TAC No. ME3121)” (ADAMS Accession No. ML101750655)
July 8, 2010	Letter to Energy Northwest, “Request for Additional Information Related to the Environmental Site Audit for Columbia Generating Station License Renewal (TAC No. ME3121)” (ADAMS Accession No. ML101810091)
July 15, 2010	Summary of telephone conference call held on June 28, 2010, between the NRC and Energy Northwest concerning draft requests for additional information pertaining to the SAMA review of the CGS LRA (ADAMS Accession No. ML101880289)
July 22, 2010	Letter from Energy Northwest to Dr. Robert G. Whitlam, State Archaeologist, Department of Archaeology and Historic Preservation, regarding the license renewal of CGS (ADAMS Accession No. ML102160123)
July 29, 2010	Letter from Dr. Robert G. Whitlam, State Archaeologist, Department of Archaeology and Historic Preservation, to Energy Northwest regarding the license renewal of CGS (ADAMS Accession No. ML103280572)
August 5, 2010	Letter from Energy Northwest, “Columbia Generating Station, Docket No. 50-397; Response to Request for Additional Information; License Renewal Application” (ADAMS Accession No. ML102300503)

August 9, 2010	Letter from Energy Northwest, "Columbia Generating Station, Docket No. 50-397; Response to Request for Additional Information; License Renewal Application" (ADAMS Accession No. ML102380285)
August 10, 2010	Schedule revision for the environmental review of the CGS LRA (ADAMS Accession No. ML102100303)
September 17, 2010	Letter from Energy Northwest, "Columbia Generating Station, Docket No. 50-397; Response to Request for Additional Information; License Renewal Application" (ADAMS Accession No. ML102660151)
October 1, 2010	Summary of Tribal Outreach Informational Meeting concerning CGS license renewal and Hanford low-level waste, April 27, 2010 (ADAMS Accession No. ML102630228)
November 5, 2010	E-mail to Mr. Gregg L. Kurz, USFWS, requesting concurrence on the list of protected species (ADAMS Accession No. ML103120452)
November 8, 2010	E-mail from Mr. Gregg L. Kurz, USFWS, concurring on the list of protected species (ADAMS Accession No. ML103120486)
November 8, 2010	Summary of telephone conference call held on September 29, 2010, between the NRC and Energy Northwest concerning requests for additional information pertaining to the SAMA review of the CGS LRA (ADAMS Accession No. ML102920382)
November 10, 2010	Letter to Energy Northwest, "Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application—SAMA review (TAC No. ME3121)" (ADAMS Accession No. ML102870984)
November 30, 2010	Letter to Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, revising the area of potential effect for the CGS license renewal review (ADAMS Accession No. ML103280421)
December 1, 2010	Letter from Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, concurring with the revised area of potential effect for the CGS license renewal review (ADAMS Accession No. ML103350680)

December 1, 2010	Summary of telephone conference call held on October 22, 2010, between the NRC and Energy Northwest concerning the SAMA review of the CGS LRA (ADAMS Accession No. ML103330071)
December 2, 2010	Letter to Energy Northwest, “Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application—SAMA review (TAC No. ME3121)” (ADAMS Accession No. ML103330246)
December 17, 2010	E-mail from Richard Domingue, NMFS, regarding the biological assessment and essential fish habitat assessment for the CGS license renewal review (ADAMS Accession No. ML103510668)
December 21, 2010	Letter from Energy Northwest, “Columbia Generating Station, Docket No. 50-397; Response to Request for Additional Information; License Renewal Application” (ADAMS Accession No. ML103620324)
December 29, 2010	Letter to Energy Northwest, “Issuance of Environmental Scoping Summary Report associated with the Staff’s Review of the Application by Energy Northwest for Renewal of the Operating License for Columbia Generating Station (TAC No. ME3121)” (ADAMS Accession No. ML102770232)
January 10, 2011	Schedule revision for the review of the CGS LRA (ADAMS Accession No. ML103430526)
January 18, 2011	Letter to Energy Northwest, “Summary of Site Visit related to the Review of the License Renewal Application for Columbia Generating Station (TAC No. ME3121)” (ADAMS Accession No. ML103400163)
January 28, 2011	Letter from Energy Northwest, “Columbia Generating Station, Docket No. 50-397, Response to Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application” (ADAMS Accession No. ML110330395)
March 1, 2011	Summary of telephone conference call held on January 19, 2011, between the NRC and Energy Northwest concerning the SAMA review of the CGS LRA (ADAMS Accession No. ML110400510)
March 4, 2011	E-mail to Energy Northwest, “RE: Proposed Response to Clarification Question 11” (ADAMS Accession No. ML110670526)

March 10, 2011	Letter to Energy Northwest, "Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application—SAMA review (TAC No. ME3121)" (ADAMS Accession No. ML110670379)
March 28, 2011	Summary of telephone conference call held on February 28, 2011, between the NRC and Energy Northwest concerning the SAMA review of the CGS LRA (ADAMS Accession No. ML110670496)
April 20, 2011	Letter from Energy Northwest, "Columbia Generating Station, Docket No. 50-397, Environmental Authorizations for CGS Operations" (ADAMS Accession No. ML11112A130)
May 6, 2011	Letter from Energy Northwest, "Columbia Generating Station, Docket No. 50-397, Response to Request for Additional Information Related to the Review of the SAMA Analysis" (ADAMS Accession No. ML11129A186)
June 5, 2011	Letter from Mr. Gerry Pollet, Executive Director, Heart of America Northwest, "Public Involvement Lists and Notices, Including Requests to be Added to Lists and Requests for Hearings on the Draft EIS, for Columbia Generating Station License Renewal, NRC Dockets 50-397 and 2010-0029" (ADAMS Accession No. ML11157A036)
June 10, 2011	E-mail to Mr. Gerry Pollet, Executive Director, Heart of America Northwest, "Energy NW, Columbia Generating Station Public Involvement and Notice List, Request for Hearings re: EIS" (ADAMS Accession No. ML111600187)
June 14, 2011	Schedule revision for the environmental review of the CGS LRA (ADAMS Accession No. ML11151A222)
June 16, 2011	E-mail from Mr. Gregg L. Kurz, USFWS, providing update for list of protected species (ADAMS Accession No. ML111680221)
June 23, 2011	E-mail from Mr. Jeff Person, Energy Northwest, "Environmental Authorizations for Current CGS Operations" (ADAMS Accession No. ML111750188)
June 27, 2011	E-mail from Mr. Richard Domingue, NMFS, providing update for list of protected species (ADAMS Accession No. ML111821975)

August 23, 2011	Letter to Energy Northwest, "Notice of Availability of the Draft Plant-Specific Supplement 47 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants regarding Columbia Generating Station (TAC No. ME3121)" (ADAMS Accession No. ML11090A002)
August 23, 2011	Letter to U.S. Environmental Protection Agency, "Notice of Availability of the Draft Plant-Specific Supplement 47 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants regarding Columbia Generating Station" (ADAMS Accession No. ML110900612)
August 23, 2011	Letter to Ms. Robyn Thorson, Regional Director, Pacific Region, USFWS, "Biological Assessment for Informal Section 7 Consultation related to the License Renewal of Columbia Generating Station" (ADAMS Accession No. ML11161A003)
August 23, 2011	Letter to Mr. Richard Domingue, NMFS, "Biological Assessment for Informal Section 7 Consultation and Request to Initiate Abbreviated EFH Consultation for License Renewal of Columbia Generating Station (TAC No. ME3121)" (ADAMS Accession No. ML11165A023)
August 23, 2011	Letter to Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, "Columbia Generating Station License Renewal Environmental Review (Log No.: 121007-20-NRC)" (ADAMS Accession No. ML11161A061)
August 23, 2011	Letter to Ms. Carey Miller, Tribal Historic Preservation Officer, CTUIR, "Notice of Availability of the Draft Supplemental Environmental Impact Statement for License Renewal of Columbia Generating Station for Public Comment" (ADAMS Accession No. ML11161A011)
August 23, 2011	Letter to Ms. V. Kate Valdez, Tribal Historic Preservation Officer, Confederated Tribes and Bands of the Yakama Nation, "Notice of Availability of the Draft Supplemental Environmental Impact Statement for License Renewal of Columbia Generating Station for Public Comment" (ADAMS Accession No. ML11161A011)
August 23, 2011	Letter to Mr. Rex Buck, Wanapum Band, "Notice of Availability of the Draft Supplemental Environmental Impact Statement for License Renewal of Columbia Generating Station for Public Comment" (ADAMS Accession No. ML11161A011)

August 23, 2011	Letter to Mr. Patrick Baird, Tribal Historic Preservation Officer, Nez Perce Tribe, "Notice of Availability of the Draft Supplemental Environmental Impact Statement for License Renewal of Columbia Generating Station for Public Comment" (ADAMS Accession No. ML11161A011)
August 23, 2011	Letter to Ms. Camille Pleasants, Tribal Historic Preservation Officer, Confederated Tribes of the Colville Reservation, "Notice of Availability of the Draft Supplemental Environmental Impact Statement for License Renewal of Columbia Generating Station for Public Comment" (ADAMS Accession No. ML11161A011)
August 24, 2011	Letter to Kennewick Branch Library, "Maintenance of reference materials at the Kennewick Branch Library for the Columbia Generating Station license renewal application" (ADAMS Accession No. ML11166A020)
August 24, 2011	Letter to Richland Public Library, "Maintenance of reference materials at the Richland Public Library for the Columbia Generating Station license renewal application" (ADAMS Accession No. ML11164A009)
August 24, 2011	NRC press release, "NRC Seeks Comment on Draft Environmental Report for Columbia Nuclear Plant License Renewal; Meetings Sept. 27" (ADAMS Accession No. ML11236A288)
August 30, 2011	Letter to Energy Northwest, "Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application—SAMA review (TAC No. ME3121)" (ADAMS Accession No. ML11214A237)
September 1, 2011	*Federal Register* Notice of Availability of Draft Supplement 47 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants and Public Meetings for the License Renewal of CGS (76 FR 54502) (ADAMS Accession No. ML11091A028)
September 1, 2011	Letter from Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, concurring with the determination of no adverse effect (ADAMS Accession No. ML11252B053)
September 6, 2011	Letter from Energy Northwest, "Columbia Generating Station Docket No. 50-397, Public Meeting" (ADAMS Accession No. ML11256A157)

September 7, 2011	Memo to David Wrona, NRC, "Forthcoming Meeting to Discuss the Draft Supplemental Environmental Impact Statement for the License Renewal of Columbia Generating Station" (ADAMS Accession No. ML11238A120)
September 14, 2011	Summary of telephone conference call held on August 25, 2011, between the NRC and Energy Northwest concerning draft requests for additional information pertaining to the SAMA review of the CGS LRA (ADAMS Accession No. ML11238A158)
September 28, 2011	E-mail to Luke Gauthier, USFWS, "Revised biological assessment conclusion for bull trout in Columbia Generating Station Section 7 consultation with [US]FWS. NRC Docket 050-00397" (ADAMS Accession No. ML11272A066)
September 29, 2011	Letter from Energy Northwest, "Columbia Generating Station, Docket No. 50-397, Response to Request for Additional Information, License Renewal Application" (ADAMS Accession No. ML11278A187)
October 5, 2011	Letter from Mr. Ken S. Berg, Manager, Washington Fish and Wildlife Office, USFWS, responding to request for informal consultation (ADAMS Accession No. ML11291A157)
October 24, 2011	Letter from Mr. William W. Stelle, Jr., Regional Administrator, NMFS, "Letter of Non-Concurrence on U.S. Nuclear Regulatory Commission's proposed license renewal for Energy Northwest's Columbia Generating Station. Consultation No. F/NWR/2011/05286" (ADAMS Accession No. ML11307A393)
November 1, 2011	Summary of public meetings conducted to discuss the draft supplemental environmental impact statement related to the review of the CGS LRA (ADAMS Accession No. ML11292A206)
November 2, 2011	Letter to Energy Northwest, "Response to Request for Additional Public Meetings Regarding Columbia Generating Station License Renewal Environmental Review" (ADAMS Accession No. ML11294A509)
November 8, 2011	Letter to Energy Northwest, "Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application Regarding Fire Water and Open Cycle Cooling Aging Management Programs (TAC No. ME3058)" (ADAMS Accession No. ML11305A157)

November 17, 2011	Letter from Energy Northwest, “Columbia Generating Station, Docket No. 50-397, Response to Request for Additional Information, License Renewal Application” (ADAMS Accession No. ML11325A067)
December 20, 2011	Letter to Mr. William W. Stelle, Jr., Regional Administrator, NMFS, “Response to Letter of Non-Concurrence on Biological Assessment for Proposed License Renewal of Columbia Generating Station (TAC No. ME3121; NMFS Consultation No. F/NWR/2011/05286)” (ADAMS Accession No. ML11335A127)
December 20, 2011	Letter to Mr. Gerry Pollet, Executive Director, Heart of America Northwest, “Response to Request to Extend Public Comment Period for Columbia Generating Station License Renewal Environmental Review” (ADAMS Accession No. ML11347A394)
January 6, 2012	Schedule revision for the environmental review of the CGS LRA (ADAMS Accession No. ML11300A124)
January 6, 2012	Letter to Energy Northwest, “Request for Additional Information for the Review of the Columbia Generating Station License Renewal Application (TAC No. ME3121)” (ADAMS Accession No. ML11342A250)
January 31, 2012	Letter to Ms. Julie Longenecker, Cultural Resources Protection Program, CTUIR, “Columbia Generating Station License Renewal Environmental Review” (ADAMS Accession No. ML11355A042)
January 31, 2012	Letter to Dr. Robert G. Whitlam, State Archaeologist, Washington Department of Archaeology and Historic Preservation, “Columbia Generating Station License Renewal (LOG NO. 121007-20-NRC)” (ADAMS Accession No. ML11356A254)
February 3, 2012	Letter to Ms. Mona Wright, DOE-RL Archaeologist, Hanford Cultural Resources Program, "Columbia Generating Station License Renewal Environmental Review" (ADAMS Accession No. ML12018A251)
February 7, 2012	Letter from AL Javorik, Vice President, Engineering, Energy Northwest, to U.S. NRC, "Columbia Generating Station, Docket No. 50-397, Response to Request for Additional Information, License Renewal Application."

February 10, 2012	E-mail from Mr. Richard Domingue, NMFS, requesting additional information for the review of the biological assessment and essential fish habitat assessment (ADAMS Accession No. ML12044A329)

APPENDIX F
U.S. NUCLEAR REGULATORY COMMISSION STAFF EVALUATION OF SEVERE ACCIDENT MITIGATION ALTERNATIVES FOR COLUMBIA GENERATING STATION IN SUPPORT OF LICENSE RENEWAL APPLICATION REVIEW

F U.S. NUCLEAR REGULATORY COMMISSION STAFF EVALUATION OF SEVERE ACCIDENT MITIGATION ALTERNATIVES FOR COLUMBIA GENERATING STATION IN SUPPORT OF LICENSE RENEWAL APPLICATION REVIEW

F.1 Introduction

Energy Northwest, formerly known as Washington Public Power Supply System (WPPSS), submitted an assessment of severe accident mitigation alternatives (SAMAs) for the Columbia Generating Station (CGS), formerly known as Washington Nuclear Plant 2 (WNP-2), as part of the Environmental Report (ER) (EN, 2010). This assessment was based on the most recent CGS probabilistic safety assessment (PSA) available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer code (NRC, 1998), and insights from the CGS individual plant examination (IPE) (Parrish, 1994) and individual plant examination of external events (IPEEE) (Parrish, 1995). In identifying and evaluating potential SAMAs, Energy Northwest considered SAMA candidates that addressed the major contributors to core damage frequency (CDF) and population dose at CGS, as well as SAMA candidates for other operating plants that have submitted license renewal applications (LRAs). Energy Northwest identified 150 potential SAMA candidates. This list was reduced to 28 SAMA candidates by eliminating the following SAMAs that are not applicable to CGS:

- SAMAs with design differences
- SAMAs that have already been implemented at CGS
- SAMAs whose estimated implementation costs would exceed the dollar value associated with eliminating all severe accident risk at CGS
- SAMAs that are related to a non-risk significant system and, therefore, have a very low benefit
- SAMAs that are similar in nature and can be combined with another SAMA candidate

Energy Northwest assessed the costs and benefits associated with each of the remaining SAMA candidates and concluded in the ER that three of the candidate SAMAs evaluated are potentially cost-beneficial.

Based on a review of the SAMA assessment, the U.S. Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI) to Energy Northwest by letters dated July 1, 2010 (Doyle, 2010a), November 10, 2010 (Doyle, 2010b), December 2, 2010 (Doyle, 2010c), and March 10, 2011 (Doyle, 2011a). Key questions concerned the following:

- changes to the internal, fire, and seismic events PSA models since the SAMA analysis was performed
- internal and external reviews of the PSA models since the IPE
- the relationship between the containment event trees (CETs) used for the internal, fire, and seismic events Level 2 analyses
- the process for selecting the representative Modular Accident Analysis Program (MAAP) case for each release category

- population, meteorological, and economic assumptions used in the Level 3 analysis
- the use of internal, fire, and seismic events importance analysis in identifying plant-specific SAMAs
- the use of industry SAMA analyses in identifying SAMAs applicable to CGS
- the potential impact of internal, fire, and seismic events PSA model uncertainty on the SAMA analysis results
- further information on the cost-benefit analysis of several specific SAMA candidates and low-cost alternatives

Energy Northwest submitted additional information by letters dated September 17, 2010 (Gambhir, 2010), January 28, 2011 (Gambhir, 2011), and May 6, 2011 (Swank, 2011). In response to the RAIs, Energy Northwest provided the following:

- a description of the major changes to the PSA models since those used in the ER SAMA analysis
- a detailed sensitivity analysis of the impact on the SAMA analysis from the revised models and internal and external review comments on the PSA models
- a description of the CETs used for the internal, fire, and seismic PSA models and the relationship between each
- the process for selecting representative MAAP cases for each release category
- further details on the population, meteorological, and economic assumptions used in the Level 3 analysis
- basic events importance lists for the internal, fire, and seismic PSA models and the SAMA candidates that mitigate each basic event
- a review of the applicability of industry cost-effective SAMA candidates to CGS
- results of a revised screening and cost-benefit analysis based on consideration of PSA model uncertainties
- additional information regarding several specific SAMAs

Energy Northwest's responses addressed the NRC staff's concerns and resulted in the identification of additional potentially cost-beneficial SAMAs.

An assessment of SAMAs for CGS is presented below.

F.2 Estimate of Risk for CGS

Energy Northwest's estimates of offsite risk at CGS are summarized in Section F.2.1. The summary is followed by the NRC staff's review of CGS's risk estimates in Section F.2.2.

F.2.1 CGS's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis—the CGS Level 1 and 2 PSA models, which is an updated version of the IPE (Parrish, 1994) and a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PSA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent CGS Level 1 and Level 2 PSA models available at the time of the ER, referred to as CGS PSA Revision 6.2. The scope of the CGS PSA includes Level 1 and Level 2 internal, fire, and seismic events risk models. CGS PSA Revision 6.2 is composed of the following:

- CGS internal events PSA Revision 6.2 model
- CGS fire PSA Revision 2 model
- CGS seismic PSA Revision 1 model

The fire PSA and seismic PSA are based on the internal events Level 1 and Level 2 PSA Revision 6.2 model. The ER included a SAMA analysis based on CGS PSA Revision 6.2 (EN, 2010). Subsequently, in response to NRC staff RAIs, a sensitivity analysis of the SAMA results was provided based on the updated CGS PSA Revision 7.1 (Gambhir, 2011), (Swank, 2011).

The baseline CDF for the purposes of the SAMA evaluation, based on CGS PSA Revision 6.2, is approximately 4.8×10^{-6} per year for internal events (which includes internal flooding), 7.4×10^{-6} per year for fire events, and 5.2×10^{-6} per year for seismic events, as determined from quantification of the Level 1 PSA models. The sensitivity analysis CDF, based on CGS PSA Revision 7.1, is approximately 7.4×10^{-6} per year for internal events, 1.4×10^{-5} per year for fire events, and 4.9×10^{-6} per year for seismic events (Gambhir, 2011). For the baseline and sensitivity analysis, the risk reduction benefits associated with internal, fire, and seismic events were separately estimated based on the internal events, fire, and seismic Level 1 and Level 2 PSAs. Energy Northwest accounted for the potential risk reduction benefits associated with non-fire and non-seismic external events (e.g., high wind, external flood, and other (HFO) events) by multiplying the estimated benefits for internal events by a factor of 2 (i.e., the contribution from HFO events was assumed to be the same as that from internal events). The estimated SAMA benefits for internal events, fire events, seismic events, and non-fire and non-seismic external events were then summed to provide an overall benefit. This is discussed further in Sections F.2.2 and F.6.2.

The breakdown of CDF by initiating event is provided in Tables F-1, F-2, and F-3 for internal events, fire compartments, and seismic damage sequences (SDSs), respectively. The results from both the baseline PSA model (Revision 6.2) and the sensitivity analysis PSA model (Revision 7.1) are provided. As shown in Table F-1, events initiated by station blackout (SBO), internal flooding, and special initiators—such as loss direct current (DC) and alternating current (AC) buses, loss of heating, ventilation and air conditioning (HVAC), and loss of service water and air systems—are the dominant contributors to the internal event CDF for CGS PSA Revision 6.2. The dominant contributors to internal event CDF for CGS PSA Revision 7.1 are internal flooding, anticipated transients without scram (ATWS), loss of feedwater (FW), and manual shutdown. In response to an NRC staff RAI (Gambhir, 2010), Energy Northwest explained that SBO and loss-of-offsite power (LOOP) sequences include plant centered, grid-related, and severe weather related contributions and are dominated by the plant centered contribution. As shown in Table F-2, the dominant contributors to fire CDF are fires in the radwaste building for CGS PSA Revisions 6.2 and 7.1. As shown in Table F-3, the dominant contributors to seismic CDF are structural failures of the reactor pressure vessel (RPV) or Category 1 buildings or both and wide-spread failure of safe shutdown equipment list (SSEL) equipment for CGS PSA Revisions 6.2 and 7.1.

Table F-1. CGS CDF for internal events

Initiating event	PSA Model Revision 6.2		PSA Model Revision 7.1	
	CDF (per year)	% contribution to CDF[a]	CDF (per year)	% contribution to CDF[b]
SBO	1.6x10^{-6}	33	1.3x10^{-7}	2
Internal flooding	7.4x10^{-7}	15	2.3x10^{-6}	31
Special initiators	7.2x10^{-7}	15	3.0x10^{-7}	4
LOOP	3.0x10^{-7}	6	9.3x10^{-8}	1
RPV rupture	3.0x10^{-7}	6	1.0x10^{-8}	<1
Loss of condenser	2.2x10^{-7}	5	3.7x10^{-7}	5
Inadvertent stuck open main steam safety relief valve (SRV)	2.1x10^{-7}	4	8.3x10^{-8}	1
Loss of FW	1.9x10^{-7}	4	7.2x10^{-7}	10
Steam line break outside containment	1.5x10^{-7}	3	5.8x10^{-7}	8
Manual shutdown	1.3x10^{-7}	3	7.9x10^{-7}	10
Turbine trip	1.2x10^{-7}	2	1.5x10^{-7}	2
ATWS	8.4x10^{-8}	2	1.4x10^{-6}	19
Main steam isolation valve (MSIV) closure	4.6x10^{-8}	1	3.6x10^{-7}	5
Loss of coolant accidents (LOCAs)	4.8x10^{-9}	<1	2.0x10^{-7}	3
Total CDF (internal events) [c]	**4.8x10^{-6}**	**100**	**7.4x10^{-6}**	**100**

[a] Percentage is based on internal event CDF contribution in ER Table E.3-3 (EN, 2010) and total internal event CDF.

[b] Percentage is based on internal event CDF contribution in Table A-1 (internal events) of the responses to NRC staff RAIs (Gambhir, 2011) and total internal event CDF.

[c] Columns may not sum to reported totals due to round off.

Table F-2. Important CGS fire compartments and their contribution to fire CDF

Fire compartment	PSA Model Revision 6.2		PSA Model Revision 7.1	
	CDF (per year)	% contribution to CDF[a]	CDF (per year)	% contribution to CDF[a]
R1J: Reactor Building 522’[3]	1.2x10^{-6}	16	≤1.2x10^{-6}	≤9
W14: Radwaste 467’ Switchgear Room 1	1.0x10^{-6}	14	1.4x10^{-6}	10
W04: Radwaste 467’ electrical equipment room	8.4x10^{-7}	11	1.7x10^{-6}	12
R1D: Northwest Reactor Building 471’[3]	7.4x10^{-7}	10	≤7.4x10^{-7}	≤5
W11: Radwaste A/C room[3]	7.3x10^{-7}	10	≤7.3x10^{-7}	≤5
W03: Radwaste 467’ cable chase	4.5x10^{-7}	6	9.4x10^{-7}	7
W08: Radwaste 467’ Switchgear Room 2	3.6x10^{-7}	5	9.7x10^{-7}	7

Fire compartment	PSA Model Revision 6.2		PSA Model Revision 7.1	
	CDF (per year)	**% contribution to CDF[(a)]**	**CDF (per year)**	**% contribution to CDF[(a)]**
Y01: Transformer yard[3]	3.2×10^{-7}	4	$\leq 3.2 \times 10^{-7}$	≤2
W10: Radwaste main control room[3]	3.0×10^{-7}	4	$\leq 3.0 \times 10^{-7}$	≤2
W05: Radwaste 467’ Battery Room 1	2.5×10^{-7}	3	3.2×10^{-7}	2
W02: Radwaste cable spreading room	2.2×10^{-7}	3	4.4×10^{-7}	3
W13: Radwaste 525’ emergency chiller	2.0×10^{-7}	3	4.9×10^{-7}	4
T1A: Turbine Generator West 441’	1.6×10^{-7}	2	2.9×10^{-7}	2
T12: Turbine generator south corridors[3]	1.3×10^{-7}	2	$\leq 1.3 \times 10^{-7}$	≤1
W1A: Radwaste Building 437’	1.2×10^{-7}	2	4.4×10^{-7}	3
W07: Radwaste 467’ Division 2 electrical equipment	9.0×10^{-8}	1	1.7×10^{-6}	12
R1B: Northeast Reactor Building 471’	5.8×10^{-8}	<1	1.6×10^{-7}	1
T1C: Turbine Generator East 441’	5.2×10^{-8}	<1	1.3×10^{-6}	9
T1D: Turbine Generator West 471’	4.9×10^{-8}	<1	1.6×10^{-7}	1
R1C: Southeast Reactor Building 471’	2.0×10^{-8}	<1	3.9×10^{-7}	3
R1L: Reactor Building 572’	3.3×10^{-9}	<1	2.4×10^{-7}	2
Total fire CDF[(b)]	**7.4×10^{-6}**	**100**	**1.4×10^{-5}**	**100**

[(a)] Percentage is based on fire CDF contribution in Table A-1 (fire) of the responses to NRC staff RAIs (Gambhir, 2011), (Swank, 2011) and total fire CDF.

[(b)] Columns may not sum to reported totals due to round off or assumptions about bounding values for selected compartments in PSA Revision 7.1 (see footnote 3).

[(c)] Only fire CDF contributions for compartments that increased by at least 1 percent from PSA Revision 6.2 were provided for Revision 7.1. Contributions for these others remaining from Revision 6.2 are shown as bounding values, based on their previous contributions in Revision 6.2, since it was reported that non increased by more than 1 percent.

Table F-3. Important SDSs and their contribution to seismic CDF

SDS sequence	Description of seismic-induced failures	PSA Model Revision 6.2		PSA Model Revision 7.1	
		CDF (per year)	**% contribution to CDF[(a)]**	**CDF (per year)**	**% contribution to CDF[(a)]**
SDS42	Failure of RPV or Category I buildings or both	2.4×10^{-6}	46	2.4×10^{-6}	49
SDS41	Wide-spread failure of safety SSEL equipment	1.6×10^{-6}	31	1.6×10^{-6}	33
SDS2	Balance of plant (BOP), CST, LOOP, small-small LOCA	1.8×10^{-7}	3	0	0
S624	LOOP, small-small LOCA, and Division 1 & 2 AC distribution, BOP, and CST failure	2.2×10^{-7}	4	9.0×10^{-8}	2

SDS sequence	Description of seismic-induced failures	PSA Model Revision 6.2		PSA Model Revision 7.1	
		CDF (per year)	% contribution to CDF[(a)]	CDF (per year)	% contribution to CDF[(a)]
SDS4	BOP, condensate storage tank (CST), LOOP, small-small LOCA, Diesel Generators (DGs) 1 & 2	$1.8x10^{-7}$	3	$8.2x10^{-8}$	2
S523	BOP, CST, LOOP, nitrogen (N_2) tank, small-small LOCA, DGs 1 & 2, Division III	$1.3x10^{-7}$	2	$1.4x10^{-7}$	3
SLAC	BOP, CST, LOOP, N_2 tank, medium LOCA, Division I & II, Division III, offsite AC not recoverable	$1.1x10^{-7}$	2	$1.1x10^{-7}$	2
S725	BOP, CST, LOOP, N_2 tank, small-small LOCA, Division I & II, Division III, offsite AC not recoverable	$1.0x10^{-7}$	2	$1.0x10^{-7}$	2
SDS22	BOP, CST, LOOP, N_2 tank, small-small LOCA, DGs 1 & 2	$6.2x10^{-8}$	1	$2.8x10^{-8}$	1
SDS38	BOP, CST, LOOP, N_2 tank, DGs stalled and not restarted	$5.8x10^{-8}$	1	$9.5x10^{-8}$	2
Other		$1.6x10^{-7}$	3	$1.4x10^{-7}$	3
Total Seismic CDF[(b)]		**$5.2x10^{-6}$**	**100**	**$4.9x10^{-6}$**	**100**

[(a)] Percentage is based on seismic CDF contribution in Table A-1 (Seismic) of the responses to NRC staff RAIs (Gambhir, 2011) and total seismic CDF.

[(b)] Columns may not total to reported totals due to round off.

The Level 2 CGS PSA models that form the basis for the SAMA evaluation are updated versions of the Level 2 IPE (Parrish, 1994) and IPEEE (Parrish, 1995) models. The Level 2 analysis is linked to the Level 1 model by assigning each Level 1 core damage sequence to a plant damage state (PDS). The Level 1 core damage sequences are binned into 21 PDSs for internal and fire events and 12 PDSs for seismic events. The Level 2 model uses a set of CETs, one for each PDS, containing both phenomenological and systemic events. The CET probabilistically evaluates the progression of the damaged core with respect to release to the environment. CET nodes are evaluated using supporting fault trees and logic rules. In the baseline analysis, the CET end states are examined for considerations of timing of release, magnitude of release, and whether the fission products were scrubbed and subsequently assigned to release categories. In the sensitivity analysis, the CET endstates are examined for considerations of timing and magnitude of release and are subsequently assigned to release categories.

The result of the Level 2 PSA is a set of four release categories in the baseline analysis and nine release categories in the sensitivity analysis, with their respective frequency and release characteristics. The frequency of each release category was obtained by summing the frequency of the individual accident progression CET endpoints binned into the release category. Source terms were developed for each of the release categories using the results of MAAP computer code calculations. In response to NRC staff RAIs, Energy Northwest stated that MAAP Version 4.0.4 was used in both the CGS baseline and sensitivity analyses to develop the source terms for input to the Level 3 consequence analyses (Gambhir, 2010). The source terms for each release category are provided in Table E.6-6 of ER Appendix E (EN, 2010) for the baseline analysis and Table 2-4 of the RAI responses (Gambhir, 2011) for the sensitivity analysis. The frequency of each release category is provided in ER Appendix E Tables E.4-3, E.4-5, and E.4-6 for internal, fire, and seismic events, respectively, for the baseline analysis, and in corresponding Tables A-3, A-4, and A-5 of the RAI responses for the sensitivity analysis.

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for these analyses include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution (within an 80-kilometer (km) (50-mile (mi)) radius) for the year 2045, emergency response evacuation modeling, and economic data. The core radionuclide inventory is based on plant-specific evaluation and corresponds to end-of-cycle values for the CGS operating at the current licensed power of 3,486 megawatt-thermal (MWt). The magnitude of the onsite impacts (in terms of clean-up and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184 (NRC, 1997a).

In the ER, Energy Northwest estimated the dose to the population within 80 km (50 mi) of the CGS site to be approximately 0.037 person-Sievert (Sv) (3.7 person-roentgen equivalent man (rem)) per year for internal events, 0.086 person-Sv (8.6 person-rem) per year for fire events, and 0.067 person-Sv (6.7 person-rem) per year for seismic events. These numbers equal a total population dose from internal and external events of 0.190 person-Sv (19.0 person-rem) per year for the baseline analysis using CGS PSA Revision 6.2. The breakdown of the total population dose by containment release mode for internal, fire, and seismic events is summarized in Table F-4. Large, late, not-scrubbed (LLN) release is the dominant contributor to the population dose risk at CGS for all three hazard types.

In response to NRC staff RAIs, Energy Northwest estimated the dose to the population within 80 km (50 mi) of the CGS site to be approximately 0.055 person-Sv (5.5 person-rem) per year for internal events, 0.090 person-Sv (9.0 person-rem) per year for fire events, and 0.059 person-Sv (5.9 person-rem) per year for seismic events. These numbers equal a total population dose from internal and external events of 0.204 person-Sv (20.4 person-rem) per year for the sensitivity analysis using CGS PSA Revision 7.1. The breakdown of the total population dose by containment release mode for internal, fire, and seismic events is summarized in Table F-5. Moderate and intermediate release is the dominant contributor to the population dose risk at CGS for internal and fire events while high and early release is the dominant contributor to population dose risk for seismic events.

Table F-4. Breakdown of population dose by containment release mode for PSA Revision 6.2

	Internal events		Fire events		Seismic events	
Containment release mode	**Population dose (person-rem[a] per year)**	**% contribution[b]**	**Population dose (person-rem[a] per year)**	**% contribution[b]**	**Population dose (person-rem[a] per year)**	**% contribution[b]**
Large, Late, Not-Scrubbed (LLN)	2.1	57	7.6	88	3.9	58
Large, early, not-	0.9	23	0.3	4	2.8	42

Containment release mode	Internal events		Fire events		Seismic events	
	Population dose (person-rem[a] per year)	% contribution[b]	Population dose (person-rem[a] per year)	% contribution[b]	Population dose (person-rem[a] per year)	% contribution[b]
scrubbed (LEN)						
Large, late scrubbed (LLS)	0.7	20	0.7	8	negligible	negligible
Large, early scrubbed (LES)	0.0	0	0.0	0	0.0	0
Containment intact (COK)	negligible	negligible	negligible	negligible	negligible	negligible
Total	**3.7**	**100**	**8.6**	**100**	**6.7**	**100**

(a) One person-rem = 0.01 person-Sv

(b) Percentage is based on population dose contribution in Tables E.7-1, E.7-2, and E.7-3 of the ER (EN, 2010) for internal events, fire events, and seismic events, respectively, and total population dose for each hazard.

Table F-5. Breakdown of population dose by containment release mode for PSA Revision 7.1

Containment release mode	Internal events		Fire events		Seismic events	
	Population dose (person-rem[a] per year)	% contribution[b]	Population dose (person-rem[a] per year)	% contribution[b]	Population dose (person-rem[a] per year)	% contribution[b]
High/early release (H/E)	0.7	13	0.1	1	3.8	64
High/intermediate release (H/I)	0.3	6	0.1	1	0.9	15
Moderate/early release (M/E)	0.2	4	<0.1	<1	negligible	negligible
Moderate/ intermediate release (M/I)	4.0	74	8.5	94	1.1	19
Low/early release (L/E)	<0.1	1	<0.1	<1	<0.1	<1
Low/intermediate release (L/I)	negligible	negligible	<0.1	<1	negligible	negligible
Low-low/early release (LL/E)	<0.1	<1	0.1	1	<0.1	<1
Low-low/ intermediate release (LL/I)	0.1	2	0.1	1	0.1	2
Containment intact (COK)	negligible	0	negligible	0	negligible	0

Containment release mode	Internal events: Population dose (person-rem[a] per year)	Internal events: % contribution[b]	Fire events: Population dose (person-rem[a] per year)	Fire events: % contribution[b]	Seismic events: Population dose (person-rem[a] per year)	Seismic events: % contribution[b]
Total[c]	**5.5**	**100**	**9.0**	**100**	**5.9**	**100**

[a] One person-rem = 0.01 person-Sv

[b] Percentage is based on population dose contribution in Tables A-6, A-7, and A-8 of the RAI responses (Gambhir, 2011) for internal events, fire events, and seismic events, respectively, and total population dose for each hazard.

[c] Column may not total to reported totals due to round off.

F.2.2 Review of CGS's Risk Estimates

Energy Northwest's determination of offsite risk at CGS is based on the following major elements of analysis:

- Level 1 and 2 risk models that form the bases for the original 1992 IPE submittal (Sorensen, 1992) and subsequent Revision 1 IPE submittal (Parrish, 1994), the external event analyses of the 1995 IPEEE submittal (Parrish, 1995), and the major modifications to the IPE model that have been incorporated in the CGS internal events, fire, and seismic PSAs
- MACCS2 analyses performed to translate fission product source terms and release frequencies from the Level 2 PSA model into offsite consequence measures (essentially equates to a Level 3 PSA)

Each of these analyses was reviewed to determine the acceptability of the CGS risk estimates for the SAMA analysis, as summarized below.

The NRC staff's review of the Energy Northwest IPE is described in an NRC report dated April 8, 1997 (NRC, 1997b), which is based on Revision 1 of the IPE. Energy Northwest requested that NRC discontinue its review of the original IPE after Revision 1 of the IPE was submitted. Based on a review of the Revision 1 IPE submittal and responses to RAIs, the NRC staff concluded that the IPE submittal met the intent of GL 88-20 (NRC, 1988); that is, the applicant's IPE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities. Although no vulnerabilities were identified in the IPE, several improvements to the plant or procedures were identified. These improvements have been either implemented at the site or addressed in the SAMA evaluation process, and they are discussed in Section F.3.2.

There have been 13 revisions to the internal events PSA model since the 1992 IPE submittal, or 12 revisions since the 1994 IPE submittal reviewed by the NRC. CGS PSA Revision 6.2 was used as the baseline PSA for the SAMA analysis while the updated CGS PSA Revision 7.1 was used in a sensitivity analysis. A listing of the major changes in each revision of the internal events PSA was provided by Energy Northwest in the ER (EN, 2010) and in response to an NRC staff RAI (Gambhir, 2011) and is summarized in Table F-6. A comparison of the internal events CDF between the 1994 IPE and Revision 6.2 of the CGS PSA model used for the baseline analysis indicates a decrease of approximately 73 percent (from 1.8×10^{-5} per year to

4.8×10^{-6} per year). A subsequent revision, Revision 7.1, used for the sensitivity analysis, resulted in an increase in the internal events CDF to 7.4×10^{-6} per year compared to the Revision 6.2 CDF.

The internal events CDF value from the 1994 Energy Northwest IPE (1.8×10^{-5} per year) is in the middle of the range of the CDF values reported in the IPEs for BWR 5/6 plants. Figure 11.2 of NUREG-1560 shows that the IPE based internal events CDFs for these plants range from about 1×10^{-5} per year to 4×10^{-5} per year, with an average CDF for the group of about 2×10^{-5} per year (NRC, 1997c). It is recognized that other plants have updated the values for CDF subsequent to the IPE submittals to reflect modeling and hardware changes. Based on CDF values reported in the SAMA analyses for LRAs, the internal events CDF result for CGS used for the SAMA analysis (4.8×10^{-6} per year used for the baseline analysis and 7.4×10^{-6} per year used for the sensitivity analysis) is less than the internal event CDF for other plants of similar vintage and characteristics.

The truncation limits for the Revision 6.2 PSA internal events, fire, and seismic models used in the quantification of Level 1 and Level 2 CDFs range from 5×10^{-14} to 1×10^{-8} per year. The NRC staff asked Energy Northwest to explain the basis for the different truncation limits used in the CDF quantification (Doyle, 2010a). In response to the RAI, Energy Northwest explained that in general a four-order difference between the calculated total and truncation limit was maintained, except in a few cases where a lesser difference was appropriate, such as the case where the calculated CDF appeared to converge at a higher truncation limit (Gambhir, 2010). Thus, the truncation limit varied for each hazard model depending upon the level at which convergence occurred. In a followup RAI response, Energy Northwest further explained that at least a four-order difference between the calculated total and truncation limit was maintained in all cases for the Revision 7.1 PSA model (Swank, 2011).

There have been three revisions to the fire PSA model and two revisions to the seismic PSA model since the 1995 IPEEE submittal, as summarized in Tables F-7 and F-8, respectively. A comparison of the fire events CDF between the 1995 IPEEE and Revision 2 of the CGS fire events PSA model used for the baseline SAMA evaluation indicates a decrease of approximately 58 percent (from 1.8×10^{-5} per year to 7.4×10^{-6} per year). A comparison of the seismic events CDF between the 1995 IPEEE and Revision 1 of the CGS seismic events PSA model used for the baseline SAMA evaluation indicates a decrease of approximately 75 percent (from 2.1×10^{-5} per year to 5.2×10^{-6} per year). Subsequently, as a result of integrating Revision 2 of the fire PSA model and Revision 1 of the seismic PSA model with internal events PSA Revision 7.1 (no upgrades to the fire or seismic models were performed), the fire CDF increased to 1.4×10^{-5} per year, and the seismic CDF decreased to 4.9×10^{-6} per year (Gambhir, 2011). The integrated PSA Revision 7.1 model was then used for the sensitivity analysis.

Table F-6. CGS internal events PSA historical summary

PSA version	Summary of changes from prior model	CDF (per year)
Revision 0 08/1992	Original IPE submittal	5.4×10^{-5}

PSA version	Summary of changes from prior model	CDF (per year)
Revision 1 07/1994	Revision 1 IPE submittal • revised common cause failure (CCF) for SRVs, MSIVs, & circuit breakers • revised LOOP initiating frequency, event tree structure, & power recovery factors • revised human reliability analysis (HRA) methodology • enhanced MAAP calculations	1.8×10^{-5}
Revision 2 08/1996	• updated initiating frequencies • developed a failure modes effects analysis • added event trees for loss of Division 2 DC, loss of AC Bus, loss of control room HVAC, & loss of HVAC to switchgear buses SM-7 and SM-8 • deleted event trees for loss of service water, loss of CN • added reactor core isolation cooling (RCIC) as success path in the stuck open relief valve event tree	1.4×10^{-5}
Revision 3 09/1997	• updated “test & maintenance” unavailability data • updated random failure data • updated CCF data • revised the LOCA (large, medium, small) initiating event frequency • recalculated interfacing system LOCA (ISLOCA) initiating event frequency	1.7×10^{-5}
Revision 4 09/1999	• modified the LOOP initiating event frequency • added emergency diesel generator (EDG) recovery • implemented decay heat removal (DHR) success after AC recovery during LOOP • added load shed & offsite recovery during LOOP • deleted the success path using water make-up from the diesel fire pump during LOOP • updated EDG failure rate data using plant-specific data	2.1×10^{-5}
Revision 4.1 09/2001	• updated equipment failure rate & unavailability data	2.2×10^{-5}
Revision 4.2 06/2002	• added mechanism operated cell switch model • added firewater for post containment failure injection	1.8×10^{-5}

PSA version	Summary of changes from prior model	CDF (per year)
Revision 5 01/2004	• added the RPV rupture as an initiating event • revised the LOOP & SBO event tree sequences • updated the transient & LOCA initiating event frequencies • revised the AC fault tree to include a second battery charger • applied the emergency core cooling system (ECCS) pump room HVAC engineering calculations • added reactor building HVAC fault tree • revised non-recovery probabilities for offsite power (Gambhir, 2010) • revised calculation for battery life (Gambhir, 2010) • added success criteria for some systems • updated failure rate data • revised the Level 2 analysis focusing on large early-release frequency (LERF)	7.3×10^{-6}
Revision 5.1 04/2005	• revised the HRA • revised the flooding analysis • updated the equipment test & maintenance data	5.6×10^{-6}
Revision 5.2 04/2005	• corrected an error in the residual heat removal (RHR) fault tree	5.7×10^{-6}
Revision 6 01/2006	• incorporated numerous modeling changes to address the requirements of mitigating system performance indicator (MSPI) implementation, including ATWS, ISLOCA, steam generator HVAC, & LOOP	4.7×10^{-6}
Revision 6.1 05/2006	• removed “Failure to Remain Closed” event for valve RHR-V-48A	4.7×10^{-6}
Revision 6.2 08/2006	• revised the power sources for air handling units WMA-AH-53A/B	4.8×10^{-6}
Revision 7.1 2010	• enhanced CET to enable reflection of plant & procedure changes • expanded CET to address broader spectrum of release end states • added success paths for degraded core conditions • incorporated updated CGS-specific emergency procedures • incorporated results of latest containment safety study • performed additional plant-specific MAAP calculations to support improved system success criteria • explicitly linked the Level 1 & 2 accident sequences	7.4×10^{-6}

(a) CGS internal event PSA version was used as the basis for the SAMA baseline analysis.

(b) CGS internal event PSA version was used as the basis for the SAMA sensitivity analysis.

Table F-7. CGS fire events PSA historical summary

PSA version	Summary of changes from prior model	CDF (per year)
IPEEE 06/1994	IPEEE submittal	1.8×10^{-5}
Revision 0 04/2002	• Upgraded to incorporate NRC comments on IPEEE	1.2×10^{-5}
Revision 1 06/2004	• Incorporated latest Electric Power Research Institute (EPRI) fire events database • Incorporated internal events PSA Revision 5.0 Level 1 model • Re-evaluated cable spreading rooms (RC 2A, 2B, and 2C) as one area • Included Level 2 PSA	1.4×10^{-5}
Revision 2[(a)] 11/2006	• Incorporated internal events PSA Revision 6.2 Level 1 model • Incorporated the updated compartment fire loss data obtained from the revised cable database • Refined compartment fires scenarios to use the internal events PSA LOOP & SBO event trees	7.4×10^{-6}
Revision 2[(b)] 2010	• Incorporated internal events PSA Revision 7.1 model	1.4×10^{-5}

(a) CGS fire event PSA version was used as the basis for the SAMA baseline analysis.

(b) CGS fire event PSA version was used as the basis for the SAMA sensitivity analysis.

Table F-8. CGS seismic events PSA historical summary

PSA version	Summary of changes from prior model	CDF (per year)
IPEEE 06/1995	IPEEE submittal	2.1×10^{-5}
Revision 0 12/2004	• upgraded seismic IPEEE to Level 1 and 2 PSA consistent with the ANSI/ANS-58.21-2003 standard (ANS, 2003) & the EPRI Seismic Probabilistic Risk Assessment Implementation Guide	6.7×10^{-6}
Revision 1[(a)] 02/2007	• incorporated internal events PSA Revision 6.2 Level 1 model • deleted LERF multipliers & incorporated new model based on the internal events PSA Level 2 Revision 6.2 model • re-quantified & revised importance, sensitivity, & uncertainty analysis • updated EDG-3 mission time • revised & added HEPs • added new seismic event trees	5.2×10^{-6}
Revision 1[(b)] 2010	• incorporated internal events PSA Revision 7.1 model	4.9×10^{-6}

[(a)] CGS seismic event PSA version was used as the basis for the SAMA baseline analyses.

[(b)] CGS seismic event PSA version was used as the basis for the SAMA sensitivity analysis.

The NRC staff considered the peer reviews performed for the CGS PSA and the potential impact of the review findings on the SAMA evaluation. In the ER, and in response to an NRC staff RAI (Gambhir, 2010), Energy Northwest identified and described the scope of four external reviews and seven technical reviews. The first external review, conducted by the BWR Owners' Group (BWROG) in 1997 and referred to as the BWROG Certification Peer Review, reviewed PSA model, Revision 3, Level 1 and 2 internal events (including internal flooding). Energy Northwest stated that all comments produced by this review were resolved.

Two external reviews, an industry peer review, and an NRC inspection of the CGS PSA were conducted in 2004 in support of Energy Northwest's participation in the NRC's Regulatory Guide (RG) 1.200 pilot program. Within this pilot program, the CGS internal and fire events PSAs were upgraded and peer reviewed to the American Society of Mechanical Engineering (ASME) Standard RA-Sa-2003 (ASME, 2003) as modified by the trial use version of NRC RG 1.200 (NRC, 2004b). The industry peer review, conducted by ERIN Engineering (Webring, 2004) in 2004, reviewed PSA model, Revision 5.0, Level 1 and 2 internal and fire events PSA. Energy Northwest stated that there were no Level A (extremely important) facts and observations (F&Os) from this review. In response to an NRC staff RAI, Energy Northwest listed and described all unresolved Level B (important) F&Os, with the exception of F&Os categorized as having only documentation impacts, which are not resolved in the Revision 6.2 PSA model (Gambhir, 2010). Energy Northwest explained that all but two of these F&Os address ASME PSA supporting requirements (SRs) that were determined by the peer review team to meet at least capability Category I (CC-I) requirements. Energy Northwest's assessment of the two F&Os against SRs that were determined to not meet at least CC-I determined that one is primarily a documentation issue that limits the ability to identify basic event LERF contributors. The other recommends completing switchgear room heat-up calculations that, after completion, confirmed that the PSA Revision 6.2 modeling used for the SAMA baseline evaluation is conservative. Furthermore, Energy Northwest stated that all of the identified Level B F&Os have been resolved in the PSA Revision 7.1 model used for the SAMA sensitivity analysis.

Subsequent to the industry peer review, the NRC performed an inspection of the CGS PSA documentation, the industry peer review results, and the applicant's self-assessment report in 2004 to determine if RG 1.200 and the ASME standard provide adequate guidance to demonstrate the technical adequacy of a PSA (Benney, 2006). The NRC review was conducted like a typical peer review except that the review also addressed the usability of the ASME standard. The ER provides a list of specific unresolved issues as in-progress at the time of the ER for the next revision of the PSA model based on this review (EN, 2010). These findings include recommendations to credit mitigation systems that are not currently modeled, refinement of initiator frequencies and failure probabilities, and recommendations to refine assessment and modeling of equipment performance related to flooding events and Level 2 phenomena. In response to an NRC staff RAI, Energy Northwest stated that all significant unresolved F&Os or issues that would impact the PSA quantitative results are addressed by the unresolved Level B F&Os discussed above for the 2004 industry peer review, which have been resolved in the PSA Revision 7.1 model used for the SAMA sensitivity analysis.

The last of the four external peer reviews is an NRC inspection of the CGS PSA, performed in 2006, to verify that CGS correctly implemented the MSPI guidance. This included review of the data CGS used to generate the MSPI basis document and actual unavailability and unreliability values. There were no unresolved issues from this NRC inspection (Gambhir, 2010).

The technical reviews of the CGS PSA identified and described by Energy Northwest are as follows:

- A 1994 independent technical review of the Revision 0 and Revision 1 IPE by Scientech (previously NUS)—All review comments were resolved.
- A 2002 internal review of the systems analysis (SY) and initiating events (IE) elements of PSA Revision 4.2—Changes to the SY and IE elements were subsequently evaluated by the 2004 industry peer review and NRC inspection.
- A 2002–2003 technical review by Scientech to upgrade the internal events PSA Revision 4.2 model to support a license amendment request to change the DG completion time technical specification—This request was subsequently evaluated by the 2004 industry peer review and NRC inspection.
- A 2004 technical review by independent consultants to assess a common cause condition associated with the mechanism operated cell switch for the 4160 V switchgear—All identified issues were resolved.
- A 2004 technical review by ERIN Engineering of the PSA Revision 5.0 model HRA related to SBO IEs—The review identified many additional human failures, some of which were resolved in PSA Revision 5.1. Unresolved issues, characterized as an area of model incompleteness, were identified in the ER and subsequently resolved in the PSA Revision 7.1 model used for the SAMA sensitivity analysis.
- A 2006 self-assessment of the Revision 6.0 PSA model to assure it would meet the implementation requirements for MSPI—Unresolved issues, characterized as an area of model incompleteness, were identified in the ER and subsequently resolved in the PSA Revision 7.1 model used for the SAMA sensitivity analysis.
- A 2008 self-assessment of CGS PSA adequacy to support extension of completion time for low-pressure coolant injection (LPCI) and low-pressure core spray (LPCS) systems—Unresolved issues, characterized as an area of model incompleteness, were identified in the ER and subsequently resolved in the PSA Revision 7.1 model used for the SAMA sensitivity analysis.

The NRC staff asked Energy Northwest to identify any changes to the plant, including physical and procedural modifications, since Revision 6.2 of the CGS internal events PSA, Revision 2 of the CGS fire PSA, and Revision 1 of the seismic PSA that could have a significant impact on the results of the SAMA analysis (Doyle, 2010a). In response to the RAI, Energy Northwest identified three physical plant changes since PSA model Revision 6.2 that could potentially impact the SAMA evaluation (Gambhir, 2010). The first change provides for the ability to cross-connect a DG to either the Division 1 or 2 emergency buses during extended SBO and included changes to LOOP and SBO procedures. Implementation of this change reduces CDF and, therefore, the benefits associated with SAMAs identified to improve plant response to LOOP or SBO; Energy Northwest concluded that the SAMA analysis is conservative relative to this modification. The second change added a portable 480 V DG (DG-4) and included associated procedure changes for its use to provide an alternate source of AC power. Implementation of this change improves the ability of CGS to cope with an SBO when one DG is inoperable and, therefore, reduces CDF. The third change was an upgrade of the FW and turbine control systems. The anticipated higher reliability from these improved systems has not been credited in the PSA because of insufficient operational history to support a Bayesian update; therefore, Energy Northwest considers this improvement to be risk neutral for the purposes of the SAMA evaluation. Since each of the three changes either reduces or maintains (i.e., does not increase) plant risk, Energy Northwest concluded that implementation of these changes either reduces or maintains (i.e., does not increase) the benefits calculated for the evaluated SAMA candidates (Gambhir, 2010).

In response to this same RAI, Energy Northwest explained that the CGS internal events PSA model had been updated to Revision 7.1 since the SAMA evaluation reported in the ER, which resulted in a higher CDF and a lower LERF (Gambhir, 2010). Energy Northwest further explained, in a followup response to the NRC staff RAIs, that the PSA Revision 7.1 model incorporated the following:

- resolution of F&Os from the 2004 peer review
- resolution of areas of model incompleteness identified by CGS internal technical reviews
- upgrades to meet NRC RG 1.200 Revision 2 (NRC, 2009a) and the associated ASME standard RA-S-2008 (ASME, 2008) for Level 1, LERF, and flooding modeling
- plant and procedure changes, such as the DG cross-connect discussed previously (Gambhir, 2011)

These changes were first incorporated in the PSA Revision 7.0 model. A peer review of the Revision 7.0 PSA model was performed on Level 1 and 2 internal events (with internal flooding) in 2009, and a report was issued in January 2010. Energy Northwest explains that F&Os from this peer review that could significantly impact the model quantification were incorporated into the Revision 7.1 model, and a review of the remaining F&Os associated with SRs that were graded as CC-I or "not met" identified none that would significantly impact the results of the SAMA analysis (Gambhir, 2011). Energy Northwest performed a sensitivity study using the Revision 7.1 PSA model (which integrates internal, fire, and seismic events) to assess the impact of these modeling updates on the results of the SAMA evaluation. The results of this sensitivity study are discussed throughout this appendix.

In another RAI, the NRC staff noted that several of the peer review and self-identified findings that were characterized as not expected to significantly alter the SAMA results appear to address potential non-conservatisms in the Level 1 and 2 PSA model. The staff asked Energy Northwest to justify its conclusion that resolution of these issues will not impact the SAMA analysis (Doyle, 2010a). In response to the RAI, Energy Northwest concurred that the list of findings identified in the RAI address areas of non-conservatism and explained that each of these findings has since been resolved in PSA Revision 7.1 (Gambhir, 2010). As discussed previously, in response to this and other RAIs, Energy Northwest provided a sensitivity analysis of the SAMA analysis results using PSA Revision 7.1.

The NRC staff asked Energy Northwest to describe the PSA quality control process used at CGS (Doyle, 2010a). In response to the RAI, Energy Northwest explained that the process for controlling the technical adequacy of the PSA is contained in a CGS engineering procedure that is consistent with guidance in NRC RG 1.174 (NRC, 2002). This PSA configuration procedure covers the following:

- monitoring PSA input and collecting new information for incorporation
- updating the PSA to be consistent with the as-built and as-operated plant
- assessing cumulative impact of pending PSA changes
- controlling computer codes supporting the PSA
- preparing documentation
- qualifying PSA reviewers

The CGS internal events PSA model has been peer-reviewed, the peer review findings were all resolved and their impacts assessed in a sensitivity analysis using the updated PSA model. Additionally, Energy Northwest satisfactorily addressed NRC staff questions regarding the PSA.

Based on this information, the NRC staff concludes that the internal events Level 1 PSA model is of sufficient quality to support the SAMA evaluation.

As indicated above, the CGS PSA includes explicit fire and seismic event PSA models, in addition to the internal events PSA model. Both the fire and seismic PSA models have been significantly updated since the IPEEE. The updated fire and seismic CDF results are described in the ER and are included in Tables F-7 and F-8.

The CGS IPEEE was submitted in June 1995 (Parrish, 1995) in response to Supplement 4 of GL 88-20 (NRC, 1991a). This submittal included an internal fire PSA, a seismic PSA, and a screening analysis for other external events. While no fundamental weaknesses or vulnerabilities to severe accident risk in regard to the external events were identified, many opportunities for risk reduction were identified as discussed below. In a letter dated February 26, 2001, the NRC staff concluded that the submittal met the intent of Supplement 4 to GL 88-20, and the applicant's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities (NRC, 2001).

The seismic portion of the IPEEE consisted of a seismic PSA completed in accordance with NRC guidance for IPEEE submittals (NRC, 1991a) and the NRC PSA procedures guide (NRC, 1983). Plant models were primarily based on the IPE (Parrish, 1994). Major inputs to the seismic PSA were from the following:

- plant walkdowns in which components and structures were screened against the review level earthquake of 0.5g conducted in accordance with the EPRI methodology for Seismic Margins Assessment (EPRI, 1991)
- relay chatter evaluation conducted in accordance with NRC guidance for IPEEE submittals
- seismic fragility evaluation conducted per the EPRI methodology for developing seismic fragilities (EPRI, 1994)

A site-specific seismic hazard estimate was developed for CGS by Geomatrix and documented in a hazard report (Geomatrix, 1994a) which is stored as a permanent record by Energy Northwest. Key elements of the seismic PSA included a seismic hazard analysis, a seismic fragility evaluation, system and accident sequence analysis, and evaluation of seismic CDF and public risk.

The seismic CDF resulting from the CGS IPEEE was calculated to be 2.1×10^{-5} per year using a site-specific seismic hazard curve. The CGS IPEEE did not identify any vulnerabilities due to seismic events but did identify several improvements to the plant or procedures to reduce seismic risk. These improvements have been either implemented at the site or addressed in the SAMA evaluation process, and they are discussed in Section F.3.2.

Subsequent to the IPEEE, Energy Northwest upgraded the seismic PSA to be consistent with the American Nuclear Society (ANS) standard for external events PSAs, ANSI/ANS-58.21-2003 (ANS, 2003), and with EPRI seismic PSA implementation guidance (EPRI, 2003). Major inputs to the seismic events PSA include the following:

- a plant-specific hazard curve
- results and insights obtained from seismic plant walkdowns conducted in support of the IPEEE (Parrish, 1995)

- plant-specific structural and component seismic fragility analyses
- relay chatter evaluation
- the Level 1 and 2 Revision 6.2 PSA models

These upgrades to the seismic PSA resulted in a seismic CDF of 5.2×10^{-6} per year, using a site-specific seismic hazard curve, which was used for the SAMA evaluation. In response to NRC staff RAIs, Energy Northwest reported the seismic CDF for PSA Revision 7.1 used in the SAMA sensitivity analysis to be 4.9×10^{-6} per year (Gambhir, 2011). In the RAI responses, Energy Northwest explained that the seismic PSA was not updated for the Revision 7.1 model and that the decrease in seismic CDF from Revision 6.2 to Revision 7.1 is due to integration of the seismic PSA model with the updated internal events model. Energy Northwest identified an increase in seismic CDF, due to the suppression pool no longer being assumed to be available as a source of makeup inventory for RCIC. This increase is more than offset by a decrease in the seismic CDF due to a reduction in CCF probabilities for the DGs and refinement of the likelihood of failure of high-pressure core spray (HPCS) injection given containment failure to remove conservatism.

The NRC staff noted that the seismic CDF contribution was zero for two seismic damage states (i.e., S2P2 and S20P2) reported in Table A-1 of the RAI responses (Gambhir, 2011). The staff asked Energy Northwest to explain the reason for this since the seismic CDF was not zero for the two seismic damage states using the CGS PSA Revision 6.2 model (Doyle, 2011a). In response to the followup RAI, Energy Northwest explained that S2P2 and S20P2 are seismic SBO event trees with RCIC successful; however, the RCIC success criteria for PSA Revision 7.1 requires the CST to be available but that the CST is assumed to fail in seismic events (Swank, 2011). Therefore, all of the S2P2 and S20P2 cutsets transferred to the seismic SBO event trees with RCIC unavailable (i.e., S2P3 and S20P3) (Swank, 2011).

The NRC staff asked Energy Northwest to address if seismic hazard analysis information, developed later for the nearby U.S. Department of Energy (DOE) Hanford Site and by the U.S. Geological Survey (USGS), could impact the results of the SAMA analysis (Doyle, 2010a). In response to the RAI, Energy Northwest emphasizes that the 1994 seismic hazard analysis used in the CGS IPEEE was specifically developed for the CGS site. The seismic hazard analyses developed by Geomatrix Consultants for the DOE Hanford Site in 1994 (Geomatrix, 1994b), and updated in 1996 (Geomatrix, 2006), developed site-specific seismic hazard curves for each location evaluated on the Hanford Site (Gambhir, 2010). Energy Northwest also discussed the results of a 2005 study that develops a site-specific seismic response model for the DOE Hanford Site Waste Treatment Plant (WTP) that better characterizes the effect from deep layers of sediments "interbedded" with basalt (PNNL, 2005). Energy Northwest explains that each of these studies evaluates locations that are at least 10 mi distant from the CGS site, that the soil structure at the CGS site is thicker than at the WTP site, and that the site-specific hazard curves developed for the Hanford Site locations are, therefore, less applicable to the CGS site. Energy Northwest notes that after years of study of the seismic hazard at WTP, it eventually concluded (PNNL, 2007) that the hazard results obtained for WTP using the newest ground motion models at the WTP were similar to the 1996 model results. Energy Northwest also notes that the recently updated USGS assessment of seismic hazards in the U.S. offers an opportunity for an independent verification of the seismic results developed for the CGS site by Geomatrix consultants. In the RAI response, Energy Northwest compares the peak ground acceleration (PGA) at times 500 and 2,500 years calculated using the 2008 USGS data (USGS, 2008) for the coordinates corresponding to the CGS site, which are lower than the PGAs predicted by the Geomatrix CGS model, as shown in Table F-9. Based on these results, Energy Northwest concludes that the CGS seismic model is conservative relative to the latest USGS seismic hazard data in predicting an appropriate ground motion for the CGS site. Accordingly, Energy Northwest concludes that the 1994 seismic hazard study used in the CGS seismic PSA model used in the SAMA evaluation still provides an adequate seismic input to the PSA models to effectively identify relevant SAMA candidates (Gambhir, 2010).

Table F-9. Comparison of USGS and Geomatrix data

Study	PGA for time = 500 years (10% in 50 years)	PGA for time = 2,500 years (2% in 50 years)
USGS, 2008	0.072 g	0.169 g
Geomatrix, 1994	0.081 g	0.178 g

The NRC staff noted that no reviews of the seismic PSA were identified in the ER and asked Energy Northwest to describe any such reviews and to assess the impact of any unresolved findings on the SAMA evaluation (Doyle, 2010a). In response to the RAI, Energy Northwest stated that no external peer reviews have been performed on the seismic PSA while one internal self-assessment has been performed (Gambhir, 2010). The self-assessment was performed on Revision 0 of the seismic PSA against the ANSI/ANS 58.21-2003 (ANS, 2003) standard, and it identified four SRs that were not met (excluding findings that were judged to be documentation only). The assessment also noted that no peer review had been performed. Two of the findings had to do with the adequacy of the ground motion study and soil-structure interaction analysis performed by Geomatrix consultants. Energy Northwest's assessment of these findings is that, based on the evaluation of the more recent seismic hazard analysis information discussed previously, these studies confirm that the CGS site seismic characterization is adequate. Two of the findings questioned the adequacy of existing seismic PSA sensitivity studies. Energy Northwest concluded that the impact of these findings on the SAMA evaluation is addressed by the 95th percentile seismic CDF uncertainty analysis discussed in Section F.6.2. Regarding the lack of a seismic PSA peer review, Energy Northwest noted that the impact on the SAMA evaluation of this finding cannot be determined but that future enhancements to the seismic PSA are planned to make it consistent with the seismic PSA standard (ASME, 2009).

The CGS internal events modeling is an input to the seismic PSA model, the seismic PSA has been updated to a more recent external events PSA standard, the SAMA evaluation included a sensitivity analysis of the seismic CDF, and Energy Northwest has satisfactorily addressed NRC staff RAIs regarding the seismic PSA. Based on this information, the NRC staff concludes that the seismic PSA model, in combination with the sensitivity analysis of the seismic CDF, provides an acceptable basis for identifying and evaluating the benefits of SAMAs.

The IPEEE fire analysis was performed with PSA technology but employed elements of EPRI's fire-induced vulnerability evaluation (FIVE) methodology (EPRI, 1992) for systemic screening and ignition source frequency determination. The IPEEE fire areas were based on definitions of Appendix R fire areas for CGS. A plant walkdown and verification process was employed to verify that all assumptions and calculations were supported by the physical condition of the plant. Fire areas were qualitatively screened if the area did not contain safety equipment, including cabling, or components and cables whose failure would result in a reactor scram. Of the 93 fire areas, 36 were qualitatively screened. Fire initiating event frequencies were estimated for each of the remaining 57 unscreened fire areas using the FIVE methodology. It was assumed that a fire would destroy all equipment and cables in a fire area and that a fire would not propagate to more than one fire area. Computerized fire simulations were performed with COMPBRN III (NRC, 1986) to determine fire growth and spread characteristics in critical fire areas. The likelihood for fire suppression was determined based on the availability of automatic fire suppression as well as the likelihood that fires from specific combustion sources would not significantly affect the PSA-related components and cables located in the fire area. Fire-initiating events in each fire area and fire-induced failures were combined with random equipment failure modes using the internal events PSA to determine the fire CDF for each unscreened fire area. A fire area was quantitatively screened from further analysis if the fire-induced core damage was less than $1x10^{-6}$ per year. All but 16 fire areas were quantitatively screened. The remaining 16 important fire areas were further evaluated for consideration of crediting recovery actions or analysis refinements or both.

As reported in Table 1.4-2 of the IPEEE, the fire CDF for the 16 important fire areas is $9.2x10^{-6}$ per year. A separate control room fire evaluation estimated the fire CDF for the control room to be $8.4x10^{-6}$ per year. The total fire CDF resulting from the CGS IPEEE was calculated to be 1.8×10^{-5} per year. The CGS IPEEE did not identify any vulnerabilities due to fire events but did identify several improvements to plant procedures to reduce fire risk. These improvements have been either implemented at the site or addressed in the SAMA evaluation process, and they are discussed in Section F.3.2.

Subsequent to the IPEEE, Energy Northwest created a fire PSA. Energy Northwest describes the fire PSA model in the ER as being based on the internal events PSA model but developed using elements of NUREG/CR-6850 (NRC, 2005). Energy Northwest explains that, in general, the CGS fire PSA approach was to develop fire event trees for each fire area incorporating extinguishment and propagation split fractions from the EPRI fire events database (EPRI, 1993), automatic suppression when applicable, and likelihood of plant trip for different compartment and loss scenarios. For screening fire event trees, the loss scenarios were simplified into loss of the single worst equipment or cable (for example, as indicated by a calculated importance measure) or loss of all equipment and cables in the compartment. Each compartment has a fire-initiating event tree and two conditional fire event trees for single equipment or cable or compartment losses. The conditional fire event trees are either turbine trip or loss of FW event trees, as appropriate for the compartment losses. In performing the fire analysis, consideration was given to all fire damage mechanisms, including smoke, loss of lighting and indication, and fire suppression system impacts on equipment. The fire PSA explicitly examined the HEPs used for the fire scenarios to ensure that equipment and indication losses, fire-induced stress, communications difficulties, and potential impacts from smoke and heat were included.

The CGS IPEEE demonstrated that only a few fire compartments had the potential for fire propagation from one compartment to another. Based on this finding, a detailed evaluation of potential fire propagation between compartments has not been performed for the fire PSA. However, a set of qualitative assessments was performed to confirm that such scenarios would likely be insignificant contributors. For the fire-initiating event tree, split fractions were developed for each group of fixed ignition sources that defined a scenario. The split fractions are single basic events added to the fault tree. As with the screening event trees, early extinguishment (i.e., de-energization, self-extinguishment, or manual suppression not by the fire brigade) and automatic extinguishment were not credited. For transient fire ignition sources, the locations that could impact overhead or nearby combustibles were determined. Hot gas layer formation was considered qualitatively as either not credible (due to room size or ceiling height above critical cable runs) or included in scenarios involving loss of all equipment and cables in applicable compartments.

For each scenario, fire-induced equipment failures were determined, including hot short events that could spuriously actuate components and result in undesired configurations. To identify the potential hot shorts that should be included in the fire PSA, the internal events basic events were reviewed. Those basic events that represented failure of a valve (or damper) to remain open or closed, depending on which position was desirable, were considered susceptible to hot shorts. Hot short failures (more than 120 locations) were identified and explicitly included in this fire evaluation. The hot short impact included failure of minimum-flow valves in flow paths needed for the emergency core cooling injection and valves and dampers needed for containment isolation. Detailed analysis of the main control room was performed, and the potential for control room evacuation was considered.

These upgrades to the fire PSA resulted in a fire CDF of 7.4×10^{-6} per year for CGS PSA Revision 6.2, which was used for the baseline SAMA evaluation. In response to NRC staff RAIs, Energy Northwest reported the fire CDF for PSA Revision 7.1 used in the SAMA sensitivity analysis to be 1.4×10^{-5} per year (Gambhir, 2011). In the RAI responses, Energy Northwest explained that the fire PSA was not updated for the Revision 7.1 model and that the change in fire CDF from Revision 6.2 to Revision 7.1 is due to integration of the fire PSA model with the updated internal events model. Energy Northwest identified that the predominant reasons for the increase in fire CDF were as follows:

- The reactor coolant system is no longer assumed to be available as a backup source of makeup inventory in the event RCIC fails.
- Reactor feedwater (RFW) is now assumed to fail if a full compartment burnout occurs.
- Some Division 2 equipment is conservatively assumed to fail due to a fire in the Division 1 electrical equipment room.
- One train of RHR is no longer assumed to be available and not failed for a fire in the cable chase.
- Fire-induced loss of offsite power is no longer assumed to be recovered through repair activities.

The NRC staff asked Energy Northwest to clarify the extent to which NUREG/CR-6850 was used to update the fire PSA, to describe the conservatisms in the fire PSA, and to describe how conservatisms in the fire PSA have been reduced since the IPEEE (Doyle, 2010a). In response to the RAI, Energy Northwest clarified that the use of NUREG/CR-6850 was limited to only the refinement of electrical hot short probabilities and that use of the EPRI fire events database does not follow the NUREG/CR-6850 guidance (Gambhir, 2010). Energy Northwest further explained that updates to the fire PSA since the IPEEE reduced conservatisms in the IPEEE analysis by refining the cables selected that impact the fire PSA and by performing plant-specific fire modeling, and no attempt was made to reduce conservatisms in the PSA Revision 6.2 model when performing the SAMA evaluation. In response to a followup NRC staff RAI asking Energy Northwest to describe the remaining conservatisms in the fire PSA (Doyle, 2010c), Energy Northwest summarized the areas of conservatisms in the fire PSA as the assumption that a fire would destroy all equipment and cables in some risk-significant fire areas and in the assumed fire ignition frequencies that newer industry data indicate are lower (Gambhir, 2011).

In a separate RAI, the NRC staff asked Energy Northwest to explain how potentially screening out sequences in the simplified loss scenarios that might have contained risk significant hot short events affects the results of the fire PSA and the SAMA evaluation since hot shorts were only considered for unscreened sequences (Doyle, 2010a). Energy Northwest responded that no sequences were screened out of the analysis but that the purpose of using screening fire event trees was to determine those sequences that required further development before quantification (Gambhir, 2010). After initial quantification, those fire compartments found to have an initial CDF greater than 5.0×10^{-7} per year were analyzed in more detail to be more realistic, which typically involved identifying additional scenarios for each compartment and modeling each scenario with its own fire event tree. Those fire compartments having an initial CDF less than 5.0×10^{-7} per year were not refined further, but the associated cutsets were retained in the fire PSA.

As noted earlier, the fire PSA was included in the industry peer review conducted by ERIN Engineering in 2004. Energy Northwest states in the ER that the review produced 33 findings, that all Level A and B F&Os were addressed and resolved in the Revision 6.2 PSA model used in the SAMA evaluation, and that the remaining unresolved findings are not expected to significantly alter the results of the SAMA analysis. In response to an NRC staff RAI, Energy Northwest clarified that, since the fire PSA standard was not available at the time of the review, the peer review was performed on the fire PSA to the high-level requirements identified in the 2003 ASME standard (Gambhir, 2010). Energy Northwest also identified one unresolved finding that resulted in the grading of the high-level requirement as not met. Energy Northwest's assessment of this finding, which was that the fire PSA does not credit fire brigade response, is that the PSA Revision 6.2 modeling is conservative relative to the SAMA evaluation.

In a separate RAI, the NRC staff noted that many of the unresolved findings identified in the ER appear to be non-conservative and asked Energy Northwest to ensure that resolution of these findings would not significantly alter the results of the SAMA analysis (Doyle, 2010a). Energy Northwest responded that all significant findings from the 2004 peer review, with the exception of the finding discussed above that would reduce model conservatism, have been resolved and that the unresolved findings identified in the ER are from the 2008 self-assessment discussed previously for internal events PSA (Gambhir, 2010). Energy Northwest also discussed each of the areas of potential non-conservatism identified in the RAI and provided the basis for concluding that resolution of these issues will not impact the results of the SAMA evaluation, as follows:

- The electronic database used to select and locate cables does not include all conduit locations. Energy Northwest judged that the 95th percentile CDF uncertainty analysis discussed in Section F.6.2 is sufficient to account for this area of model incompleteness.
- The assumed hot short probability of 0.3 implicitly assumes all circuit failures are intra-cable for multi-conductor cables protected by controlled power transformers. Energy Northwest judged that the 95th percentile CDF uncertainty analysis discussed in Section F.6.2 is sufficient to account for this modeling uncertainty.
- A transformer fire scenario must be re-evaluated for Division 2 switchgear room to remove non-conservatism from current modeling. Energy Northwest stated that, based on a re-evaluation of the transformer fire scenario for the Division 1 switchgear room, which decreased the fire CDF, enhancements to the Division 2 fire PSA modeling are not anticipated to significantly alter the results of the SAMA analysis.
- The fire PSA credits systems or trains that fire-related plant procedures instruct operators to defeat. Energy Northwest stated that since operators have discretion to continue using a system in service during a fire until the fire causes safe shutdown

parameter degradation or visible fire damage to vital plant equipment or cabling, the current PSA modeling is compatible with this acceptable practice.

- The PSA modeling of hot shorts events corresponding to single spurious actuations captures most but not all multiple spurious operations (MSOs). Energy Northwest judged that the 95th percentile CDF uncertainty analysis discussed in Section F.6.2 is sufficient to account for this area of model incompleteness.

Energy Northwest concluded that a future upgrade of the fire PSA will address these issues, that the eventual net risk impact of these refinements cannot be estimated at this time, and that any impacts are judged to be encompassed by the 95th percentile CDF uncertainty analysis discussed in Section F.6.2.

In a followup RAI, the NRC staff asked Energy Northwest to describe any modeling enhancements that have been made to compensate for the incompleteness in the cable location database and in the modeling of MSOs (Doyle, 2010b). Energy Northwest responded by re-emphasizing that conservatisms in the PSA include the use of hot short probabilities of 0.3 unless hot short durations were specifically evaluated and modeled, in lieu of potentially non-conservative lower values, and that loss of all equipment and cables in the compartment was assumed for lower risk fire compartments, in lieu of more realistic modeling of fire scenarios (Gambhir, 2011). Relative to the MSO modeling incompleteness, Energy Northwest stated that conservative treatment of hot short modeling was used in part to respond to this incompleteness, that plant modifications are in progress to address MSOs in safe shutdown circuits in response to Enforcement Guidance Memorandum 09-02 (NRC, 2009b), and that the PSA will be updated once these modifications are implemented in the plant. Relative to the cable database incompleteness, Energy Northwest stated that the cable and raceway database has been updated and now identifies the cables in conduit that were not included in PSA Revision 6.2. The update provided building and, in most cases, fire zone locations of the conduits. Using this updated information, Energy Northwest performed a sensitivity analysis using PSA Revision 7.1 that assumed that conduits whose location was known only at the fire zone level were failed for all fire scenarios within that zone. The sensitivity analysis compared the risk reduction worth (RRW) for six existing fire-related SAMA candidates, representative of important systems and fire compartments at CGS, before and after the model changes were made. The results show that for those SAMA candidates in which the RRW increased, the increase was less than the uncertainty factor applied in the 95th percentile CDF uncertainty analysis discussed in Section F.6.2. Energy Northwest concludes that this sensitivity analysis result supports the conclusion that modeling incompleteness in the fire PSA does not impact the SAMA results.

The NRC staff considers Energy Northwest’s explanation and assessment of the areas of incompleteness in the fire PSA reasonable and determines that, in light of the known conservatisms in the PSA model, resolution of these incompleteness issues is not likely to impact the results of the SAMA analysis.

In other followup RAIs, the NRC staff noted that NUREG/CR-6850 guidance indicates that hot short probabilities may be double the 0.3 value (i.e., 0.6) for circuits not protected by control power transformers. The staff asked Energy Northwest to provide the basis for the 0.3 hot short probability assumption and the basis for the conclusion that the 95th percentile CDF uncertainty analysis discussed in Section F.6.2 accounts for this modeling uncertainty (Doyle, 2010c), (Doyle, 2011a). In response to the RAIs, Energy Northwest provided the results of a sensitivity analysis of selected SAMA candidates that were re-evaluated using a hot short probability of 0.6

for circuits that were not confirmed to have a control power transformer present. The results of the sensitivity analysis are discussed in Section F.4.

The CGS internal events modeling is an input to the fire PSA model, the fire PSA has been updated to incorporate industry fire data and NRC guidance, the fire PSA model has been peer reviewed and the peer review findings were all addressed, and Energy Northwest has satisfactorily addressed NRC staff RAIs regarding the fire PSA. Based on this information, the NRC staff concludes that the fire PSA model provides an acceptable basis for identifying and evaluating the benefits of SAMAs.

The Energy Northwest IPEEE analysis of high winds, tornadoes, external floods, and other external events (HFO) followed the screening and evaluation approaches specified in Supplement 4 to GL 88-20 (NRC, 1991a) and in associated guidance in NUREG-1307 (1991b). For high winds, external floods, volcanic activity, and accidents at nearby facilities, the IPEEE concluded that Energy Northwest meets the 1975 Standard Review Plan criteria (NRC, 1975) and, therefore, the contribution from these hazards to CDF is less than the $1.0x10^{-6}$ per year criterion (EN, 1995). Although the CGS IPEEE did not identify any vulnerabilities due to HFO events, one improvement to reduce risk was identified. This improvement has been implemented, as further discussed in Section F.3.2.

In the SAMA analysis submitted in the ER, the benefit from HFO events was assumed to be equivalent to the benefit that was derived from the internal events model. In response to an NRC staff RAI, Energy Northwest explained that the bases for this assumption are as follows:

- Some of the HFO events are captured in the LOOP contributor.
- The IPEEE analysis found that all of the HFO events contributed less than $1.0x10^{-6}$ per year to the CDF.
- The internal events CDF for is more than a factor of four greater than the HFO screening CDF of $1.0x10^{-6}$ per year.

Based on the low contribution to CDF from HFO events, and the internal events CDF of $4.8x10^{-6}$ per year for CGS PSA Revision 6.2, the NRC staff agrees that assuming the benefits from HFO events is equivalent to the benefits from internal events is reasonable and conservative (Gambhir, 2011). This same assumption, albeit at the higher internal events CDF of 7.4×10^{-6} per year, was also used for CGS PSA Revision 7.1 in the sensitivity analysis.

The NRC staff reviewed the general process used by Energy Northwest to translate the results of the Level 1 PSA into containment releases, as well as the results of the Level 2 analysis, as described in the ER and in response to NRC staff RAIs (Gambhir, 2010), (Gambhir, 2011). The CGS PSA Revision 6.2 Level 2 model used in the baseline analysis is completely revised from the model used in the IPE, including being updated as a result of the peer reviews performed in 1997 and 2004, and it reflects the CGS plant as designed and operated in 2006. The Level 2 model was further updated to support the CGS PSA Revision 7.1 model used in the sensitivity analysis.

The Level 2 analysis is linked to the Level 1 model by assigning each Level 1 core damage sequence to a PDS. Sequences are assigned to one of 21 PDSs based on the functional characteristics of the sequence (e.g., necessary systems are recoverable or not recoverable) and the status of systems that were important to containment performance (e.g., necessary systems are available or not available). Each PDS is described in Table E.4-1 of Appendix E of the ER (EN, 2010).

A CET was developed for each PDS, and quantification of the CETs was facilitated by fault tree analysis and use of split fractions. In response to a NRC staff RAI, Energy Northwest explains that PDSs were organized by accident type (e.g., loss of containment heat removal, loss of coolant injection, and ATWS), initiator type, systems available to mitigate the accident, and power and system recoverability and that the CETs contain both phenomenological and system failure events (Gambhir, 2010). The CETs are constructed with events in the order that they were expected to occur with the exception that events on which other events are dependent were generally placed at the beginning of the CET. Energy Northwest lists fault tree modeled branch points as including the following:

- containment intact after vessel failure
- high-pressure injection
- LPCI and LPCS recovered before containment failure
- debris cooled after vessel failure
- RHR recovered
- containment vent recovered
- power conversion system recovered for containment heat sink
- reactor vessel depressurized prior to containment failure

Energy Northwest further lists phenomenological branch points as including the following:

- containment isolated at time of core damage
- power recovered prior to vessel failure (based on timing)
- power recovered between vessel failure and containment failure (based on timing)
- shell failure due to high pressure melt ejection
- large containment failure mode
- failure in drywell

Containment failure modes identified were in-vessel steam explosion, vessel blow-down, ex-vessel steam explosion, direct heating, and hydrogen explosion.

Each PDS is analyzed through the Level 2 CETs to evaluate the phenomenological progression of the sequence. In the baseline analysis, five release categories were defined based on characteristics that determine the timing (i.e., early and late, for time of initial release less/greater than four hours after general emergency declaration) and magnitude (i.e., large, small, and none, for Cesium Iodide (CsI) inventory release greater than 0.1 percent, less than one percent, and no release) of the release. They were also defined based on whether the fission products were or were not scrubbed prior to release. One release category, large early scrubbed release, was not used; however, Energy Northwest carried this release category in the analysis because its consequences offer insight into the sensitivities of the site-specific data. The CET end states are assigned to one of the five release categories. The frequency of each release category was obtained by summing the frequency of the individual accident progression CET endpoints binned into the release category. The release category frequencies are provided in ER Appendix E Tables E.4-3, E.4-5, and E.4-6 for internal, fire, and seismic events, respectively (EN, 2010).

Source term release fractions were developed for each of the five release categories based on the results of plant-specific calculations using the MAAP Version 4.0.4 (Gambhir, 2010). A single MAAP case was chosen to represent each of the five release categories based primarily on three criteria:

- It represents a CGS accident class that would be expected to be included in the release category.
- It represents the appropriate timing characteristic of the release category.
- The CsI release fraction is representative of the release category.

In response to an NRC staff RAI, Energy Northwest stated that, for release categories in which multiple MAAP cases were available to select from, the representative MAAP case was selected to include reasonable conservatism based on qualitative weighting factors such as the timing and magnitude of the initial and total releases (Gambhir, 2010). The RAI response describes the specific logic used in the selection of the representative MAAP case for each release category. The resulting release characteristics for each release category are provided in Table E.6-6 of Appendix E to the ER (EN, 2010).

The NRC staff noted that approximately 88 percent of the fire release frequency is associated with "late" releases. It asked Energy Northwest to explain the phenomenology that causes this "late" contribution to be much higher than the "late" contribution for internal events, which is approximately 47 percent, and to explain why LERF is less for fire events than for internal events (Doyle, 2010a). In response to the RAI, Energy Northwest provided two tables that compare the internal events and fire events CDF and LERF for each PDS. Energy Northwest also explained that the higher "late" contribution from fires is because the Level 1 fire PSA has a significantly higher contribution from long term loss of DHR scenarios (non-LERF contributors) than the Level 1 internal events PSA results (Gambhir, 2010). The higher contribution to loss of DHR scenarios is due to fire-initiating events that may fail or impact use of the main condenser and containment venting for heat removal and fire-initiating events that may fail a single division of suppression pool cooling. Energy Northwest further clarified that fire-induced LERF is less than internal event LERF primarily because the CDF contribution from SBO sequences with early failure of HPCS and RCIC is less for fire events than for internal events. Additionally, the fire PSA does not include failure scenarios that contribute to LERF that are included in the internal events PSA. For example, there are no fire-induced flooding scenarios, no fire-induced ATWS events, and no fire-induced containment bypass events.

In a followup RAI, the NRC staff noted that fire events, but not internal events, contribute to PDS 2C, transient with stuck-open SRV, or LOCA with loss of containment heat removal and containment failure occurs prior to core damage with the reactor vessel at low pressure. However, internal events, but not fire events, contribute to PDS 2D, transient with loss of containment heat removal, and containment fails prior to core damage with reactor vessel at high pressure. The staff asked Energy Northwest to clarify this discrepancy and to explain why there are no fire-induced containment bypass events (Doyle, 2010c). In response to the RAI, Energy Northwest clarified that the reference to PDS 2C was an error and that the CDF and LERF values reported for PDS 2C should have been reported for PDS 2D. Energy Northwest provided revised tables comparing the internal events and fire events CDF and LERF for each PDS (Gambhir, 2011). Energy Northwest further clarified that fire-induced containment bypass events are addressed in the fire PSA but that PDS 5, LOCA outside containment with failure to isolate the break, is not used in the fire PSA. Rather, Energy Northwest assumes that the dominant impact of a fire to containment isolation is for a fire to cause a major containment isolation pathway to not close or to inadvertently open, and so the fire Level 2 CETs contain a first branch node that asks if the containment is isolated. The split fraction used for this branch node is consistent with that used for the internal events node for loss of containment. The LERF for fire-induced loss of containment isolation is, therefore, reflected in several PDSs, which generally contribute to the LEN release category. Energy Northwest also explained that the likelihood of a fire-induced ISLOCA at CGS is significantly less than that for failure of containment isolation. This is based on the highest potential ISLOCA pathway from the containment at CGS being the RHR shutdown cooling line that contains two motor-operated valves in series. Since one of these motor-operated valves is maintained in the closed position during normal plant operation with power removed from the motor via a protected isolation switch, a spurious signal from a hot short cannot cause the valve motor to energize. Furthermore, the isolated, de-energized power feeder is routed in a grounded steel conduit to protect it against external three-phase hot shorts. A fire-induced three-phase hot short impacting the power feeder is significantly less than the probability for failure of containment isolation assumed in the fire PSA (Gambhir, 2011).

As discussed previously for the Level 1 PSA, the Level 2 model was included in the 1997 BWROG and 2004 ERIN Engineering peer reviews. Energy Northwest stated that all comments produced by the BWROG review were resolved. Of the 11 unresolved Level B F&Os identified in the 2004 ERIN Engineering peer review in response to an NRC staff RAI, 9 of the F&Os had to do with the Level 2 (LERF) analysis (Gambhir, 2010). As discussed previously, Energy Northwest determined that resolution of these F&Os will not impact the SAMA analysis. Furthermore, Energy Northwest stated that all of the identified Level B F&Os have been resolved in the PSA Revision 7.1 model used for the SAMA sensitivity analysis.

In the PSA Revision 7.1 sensitivity analysis, 13 release categories were defined based on characteristics that determine the timing (i.e., early, intermediate, and late, for time of initial release less than 3 hours, between 3 and 24 hours, and greater than 24 hours after general emergency declaration, respectively) and magnitude (i.e., high, medium, low, low-low, and none, for CsI inventory release greater than 10 percent, between 1 and 10 percent, between 0.1 and 1 percent, less than 0.1 percent, and no release, respectively) of release. The "late" time category was not used, leaving nine release categories to which CET end-states were assigned (Swank, 2011). The definition for the "early" time category was changed from "less than 4 hours" assumed in the baseline analysis to "less than 3 hours" based on the latest CGS emergency action levels for declaring a general emergency and the latest evacuation time estimates. The CET end-states are assigned to one of the nine release categories. The frequency of each release category was obtained by summing the frequency of the individual accident progression CET endpoints binned into the release category. The characteristics of each release category are provided in Table 2-4 of the RAI responses, while the release category frequencies are provided in Tables A-3, A-4, and A-5 of the RAI responses for internal, fire, and seismic events, respectively (Gambhir, 2011).

Source-term release fractions were also developed for each of the nine release categories based on the results of plant-specific calculations using MAAP Version 4.0.4 (Gambhir, 2011). In response to an NRC staff RAI, Energy Northwest stated the CGS plant-specific MAAP calculations were revised to represent the current CGS configuration, and additional MAAP calculations were performed to support the development of CGS PSA Revision 7.1 (Gambhir, 2011). Energy Northwest also stated that the representative MAAP cases selected for the nine release categories are updated from those used in the baseline analysis, and a quantitative weighting evaluation was performed based on the dominant cutset contributors to, and the associated MAAP cases available for, each release category. Energy Northwest's RAI response provides an example of how the quantitative weighting evaluation was performed for the H/E category and the logic for selecting the representative MAAP case for this release category. The resulting release characteristics are presented in Table 2.4 of the RAI response (Gambhir, 2011).

The NRC staff noted that the total release frequency determined from the individual release category frequencies provided in Tables A-3, A-4, and A-5 of the RAI responses (Gambhir, 2011) for internal, fire, and seismic events, respectively, are different than the corresponding CDFs reported in Table A-1 of the RAI responses. The staff asked Energy Northwest to clarify the reason for these differences (Doyle, 2011a). In response to the RAI, Energy Northwest explained that the CDF contribution from the "Containment Intact" (COK) release category was incorrect in these table and provided revised Tables A-3, A-4, and A-5 that corrected the errors (Swank, 2011). Energy Northwest also explained that the total release frequency for internal events from revised Table A-3 (i.e., 7.50E-6 per year) is slightly different from the internal events CDF of 7.4E-06 per year reported in Table F-1. This is because the CDF is determined from the sum of the minimal cutsets while the release frequency is determined from the sum of the release category frequencies.

As discussed previously for the PSA Revision 7.1 Level 1 PSA, the Level 2 model was included in the 2009 peer review of PSA Revision 7.0. Energy Northwest stated that F&Os from this peer review that could significantly impact the model quantification were incorporated into the Revision 7.1 model and concluded that resolution of the remaining unresolved F&Os from this review would not impact the SAMA analysis. Energy Northwest performed a sensitivity study using the Revision 7.1 PSA model (which integrates internal, fire, and seismic events) to assess the impact of these modeling updates on the results of the SAMA evaluation. The results of this sensitivity study are discussed throughout this appendix.

Based on the NRC staff's review of the Level 2 methodology, that Energy Northwest has adequately addressed NRC staff RAIs, that the Level 2 PSA model was reviewed in more detail as part of the 1997 BWR owners group peer review and a 2004 peer review, and that the findings from these peer reviews have been resolved and their impact assessed in a sensitivity analysis using the updated PSA model, the NRC staff concludes that the Level 2 PSA provides an acceptable basis for evaluating the benefits associated with various SAMAs.

As indicated in the ER, the reactor core radionuclide inventory used in the consequence analysis was based on the licensed thermal power of 3,486 MWt, the maximum rated power level limit for CGS for the extended period of operations.

The NRC staff reviewed the process used by Energy Northwest to extend the containment performance (Level 2) portion of the PSA to an assessment of offsite consequences (essentially a Level 3 PSA). This included consideration of the source terms used to characterize fission product releases for the applicable containment release categories and the major input assumptions used in the offsite consequence analyses. The MACCS2 code was used to estimate offsite consequences. Plant-specific input to the code includes the source terms for each release category and the reactor core radionuclide inventory (both discussed above), site-specific meteorological data, projected population distribution within an 80-km (50-mile) radius for the year 2045, emergency evacuation modeling, and economic data. This information is provided in Section E.6 of Attachment E to the ER (EN, 2010) and in response to NRC staff RAIs (Gambhir, 2010).

Releases were modeled as occurring at 13 meters (m) above ground level. The thermal content of each of the releases is assumed to be buoyant plume rise, except for intact containment which used an ambient release. Wake affects for the 70-m (246-ft) high and 45-m (148-ft) roughly square containment building were included in the model. Sensitivity analyses were performed for the elevation and release duration. Increasing the release height from 13–44 m for the large early and large late scrubbed releases increased the population dose risk and offsite economic cost risk by less than 1 percent. Increasing the release duration to a maximum value of 24 hr (86,400 seconds) decreased the population dose risk by less than 1 percent and increased the offsite economic cost risk by less than 1 percent. Based on the information provided, the NRC staff concludes that the release parameters used are acceptable for the purposes of the SAMA evaluation.

Energy Northwest used site-specific meteorological data for the 2006 calendar year as input to the MACCS2 code. The development of the meteorological data is discussed in Section E.6.3 of Attachment E to the ER. The data were collected from the onsite meteorological tower located approximately 2,500 feet (ft) west of the reactor building. Data from 2003–2006 were considered, but the 2006 data were chosen because it was found to have the most complete set of data. A sensitivity analysis was performed using the year 2003 meteorological data. The results showed an increase in the population dose risk and offsite economic cost risk of less than 6.1 and 6.6 percent, respectively. In response to an NRC staff RAI, Energy Northwest explained that missing data were filled in depending on the span of unusable data (Gambhir, 2010). If the data gap was less than 10 hours, then the average value of the data on either side was used (for all data points). If the data gap was greater than 10 hours, then data from the previous and subsequent hours were used (one-half filled from the previous data and one-half filled from the subsequent data). The base case analysis assumed no perpetual rainfall in the last spatial segment of the model (40–50 mi). A sensitivity analysis performed using the maximum hourly rainfall from year 2006, 0.14 in. in one hour, showed that neither population dose risk nor offsite economic cost risk was affected. A second sensitivity case was performed using watershed indices of one (maximum runoff). The results showed no impact on the consequence metrics. The NRC staff notes that previous SAMA analysis results have shown little sensitivity to year-to-year differences in meteorological data and concludes that the approach taken for collecting and applying the meteorological data in the SAMA analysis is reasonable.

The population distribution the applicant used as input to the MACCS2 analysis was estimated for the year 2045 using year 2000 U.S. Census Bureau data, as presented in the CGS final safety analysis report (FSAR), and the expected annual population growth rate. This bounds the license renewal extension to year 2043. The population distribution was determined for each of 16 directions and each of 10 concentric rings based on the year 2000 census block data. The population estimate for the year 2045 was projected using a growth rate calculated based on county population projections (WOFM, 2007) and the 2000 U.S Census Bureau data (USCB, 2000a). The NRC staff noted that the population projections provided in Tables E.6-2 and E.6-3 of Appendix E of the ER are inconsistent and asked Energy Northwest to explain the reason for the differences between the two tables (Doyle, 2010a). In response to the RAI, Energy Northwest explained that Table E.6-2 is a population estimate based on Table 2.1-1 of the CGS FSAR, which shows a decreasing trend in population growth rate. Additionally, the population estimate in Table E.6-3, which was used for the SAMA evaluation, assumes a 14.2 percent per decade growth rate based on the State-wide Washington State census data (Gambhir, 2010). Energy Northwest further explained that Table E.6-2 was included in the ER to demonstrate the conservatism of the population projection in Table E.6-3, and the 14.2 percent per decade rate was used to estimate population growth for all sectors for Table E.6-3. Transient population was included within the 10-mi emergency planning zone (EPZ) of CGS. Sensitivity analyses were performed using the estimated year 2060 population assuming 14.2 percent per decade and 20 percent per decade population growth rates. This resulted in an increase in the population dose risk and offsite economic cost risk of approximately 19 percent and 15 percent, respectively, for the 14.2 percent per decade case and an increase of approximately 57 percent and 46 percent, respectively, for the 20 percent per decade case. A sensitivity analysis was also performed assuming an increase of 16 persons in the base 0–1 mi EPZ zone population. This resulted in no change in the population dose risk and less than 1 percent increase in the offsite economic cost risk. The NRC staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

Emergency evacuation was modeled as a single evacuation zone extending out 16 km (10 mi) from the plant. Energy Northwest assumed that 95 percent of the population would evacuate. This assumption is conservative relative to the NUREG-1150 study (NRC, 1990a), which assumed evacuation of 99.5 percent of the population within the EPZ. The evacuated population was assumed to move at an average speed of approximately 2.4 meters per second (m/s) (5.4 mi per hour (mph)) with a delayed start time of 50 minutes after declaration of a general emergency. In response to an NRC staff RAI, Energy Northwest performed a sensitivity study assuming a 15 minute notification delay and an evacuation delay time of 60 minutes (Gambhir, 2010). The results showed no impact on the population dose risk or offsite economic cost risk. Two additional sensitivity analyses were performed in which the evacuation speed was decreased to 2.1 m/s (4.7 mph) and reduced by a factor of 2 to 1.2 m/s (2.7 mph). The results showed no change in the population dose risk or offsite economic cost risk. This was attributed to the low EPZ population. The NRC staff concludes that the evacuation assumptions and analysis are reasonable and acceptable for the purposes of the SAMA evaluation.

Site-specific economic data were provided from the 2002 Census of Agriculture (USDA, 2004a), (USDA, 2004b) for each of the five counties surrounding the plant to a distance of 50 mi. These included the fraction of land devoted to farming, annual farm sales, fraction of farm sales resulting from dairy production, value of farm and non-farm land, and information on regional crops. In addition, generic economic data that apply to the region as a whole were taken from the MACCS2 sample problem input. The daily cost of compensating people for evacuating and relocating was developed from cost data for Washington and Oregon (Oregon, 2002), (USCB, 2000a), (USCB, 2000b), (USGSA, 2008), (Washington, 2002). In response to an NRC staff RAI, Energy Northwest clarified that no escalation was applied to the MACCS2 sample problem input, and a sensitivity study was performed using an escalation factor of 4.1 percent from 1993–2008 (Gambhir, 2010). Applying this escalation factor to the MACCS2 economic data resulted in less than a 1 percent increase in the total benefit for each SAMA analysis case. The NRC staff noted that the default MACCS2 growing season was assumed and asked Energy Northwest to assess the impact of this assumption on the SAMA evaluation (Doyle, 2010a). In response to the RAI, Energy Northwest confirmed that the growing season within the EPZ is longer than the assumed default growing season and performed a sensitivity analysis assuming a longer regional growing season of 302 days (Gambhir, 2010). The results showed no change in population dose risk or offsite economic cost risk. The ER provides the results of a sensitivity analysis of the sheltering shielding factors assumed in the MACCS2 analyses. For this analysis, the sheltering shielding factors were changed from the MACCS2 default assumptions to the minimum values suggested by NUREG/CR-4551 (NRC, 1990b). The results showed no change in the population dose risk and offsite economic cost risk.

The NRC staff concludes that the methodology used by Energy Northwest to estimate the offsite consequences for CGS provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the NRC staff based its assessment of offsite risk on the CDF and offsite doses reported by Energy Northwest.

F.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by CGS are discussed in this section.

F.3.1 Process for Identifying Potential Plant Improvements

Energy Northwest's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of the dominant cutsets and most significant plant systems from the current, plant-specific Level 1 internal events PSA
- review of the most significant IEs and sequences from the current, plant-specific Level 2 internal events PSA contributing to each release category
- review of potential plant improvements and PSA insights identified in the CGS IPE and IPEEE
- review of SAMA candidates identified for LRAs for selected BWR plants
- review of other industry documentation discussing potential plant improvements

Based on this process, an initial set of 150 candidate SAMAs, referred to as Phase I SAMAs, was identified. Subsequently, after further review of the IPEEE, one of these SAMA candidates was further divided into two SAMA candidates, resulting in a total of 151 Phase I SAMAs. In Phase I of the evaluation, Energy Northwest performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- The SAMA is not applicable to CGS due to design differences or it has already been implemented at CGS (66 SAMAs screened).
- The SAMA was determined to provide very little benefit (36 SAMAs screened).
- The SAMA is similar to another SAMA under consideration and was subsumed into the similar SAMA (7 SAMAs screened).
- The SAMA has estimated implementation costs that would exceed the dollar value associated with eliminating all severe accident risk at CGS (15 SAMAs screened).

Based on this screening, 123 SAMAs were eliminated, leaving 28 for further evaluation. The remaining SAMAs, referred to as Phase II SAMAs, are listed in Table E.11-7 of Attachment E to the ER (EN, 2010). In Phase II, a detailed evaluation was performed for each of the 28 remaining SAMA candidates, as discussed in Sections F.4 and F.6 below.

As previously discussed in Section F.2.2, the risk reduction benefits associated with internal, fire, and seismic events were separately estimated by Energy Northwest using the internal events, fire events, and seismic events PSA models, respectively. Energy Northwest accounted for the potential risk reduction benefits associated with HFO events by assuming that the contribution from HFO events was the same as that from internal events. The estimated SAMA benefits for internal events, fire events, seismic events, and HFO events were then summed to provide an overall benefit.

F.3.2 Review of CGS's Process

Energy Northwest's efforts to identify potential SAMAs focused primarily on areas associated with internal IEs but also included explicit consideration of potential SAMAs for fire and seismic events. The initial list of SAMAs generally addressed the accident sequences considered to be important to CDF from functional, initiating event, and RRW perspectives at CGS.

Energy Northwest's SAMA identification process began with a review of the list of potential BWR enhancements in Table 13 of NEI 05-01 (NEI, 2005). Review of this generic SAMA list resulted in 144 SAMAs being identified. The one SAMA from the generic SAMA list not included as a CGS SAMA was for an ice condenser plant, which is not applicable to CGS.

For the Level 1 internal events PSA, Energy Northwest provided tabular listings of the top 100 cutsets sorted according to their contribution to CDF, representing over 56 percent of the Level 1 CDF, and the CGS plant systems having an RRW of 1.0 or greater, sorted according to their RRW (EN, 2010). From the cutsets, Energy Northwest identified the significant contributors and the SAMA candidates that address each of these contributors. Energy Northwest also identified SAMA candidates addressing the CGS systems having the highest RRW values. In response to an NRC staff RAI, Energy Northwest stated that one SAMA candidate, SAMA AC/DC-29, "replace EDG-3 with a diesel diverse from EDG-1 and EDG-2," was identified as a result of a review of the top 100 cutsets (Gambhir, 2010).

The NRC staff noted that the list of top 100 cutsets from the Level 1 PSA identified many operator errors and non-recovery actions and asked Energy Northwest to explain why no plant-specific SAMAs, such as procedure improvements, were identified to address these human failure events (Doyle, 2010a). In response to the RAI, Energy Northwest explained that significant HRA model improvements and procedure enhancements were made to the PSA to incorporate F&Os from the 2004 PSA peer review. Additionally, a review of the important HEPs determined that the Phase I SAMAs identified from the generic industry SAMA list addressed these important human errors, most of which were already implemented at CGS (Gambhir, 2010). Energy Northwest also noted that considerable emphasis has been placed on improving procedures in order to improve operator response at CGS and that its review of CGS procedures did not identify additional inherent weaknesses that could be removed by enhancements to improve operator actions. To support this assessment, Energy Northwest provided a list of important HEPs that have had either risk modeling improvements or procedural enhancements and showed that, in PSA model Revision 7.1, the risk of the most risk-important operator errors based on RRW have significantly decreased. While no new SAMAs were identified to address specific risk-important HEP basic events, Energy Northwest noted that new SAMA OT-07R, "increase operator training on systems and operator actions determined to be important from the PSA," was identified in a separate NRC staff RAI (see below) to assess if a general training and procedural update associated with time critical and high risk important operator actions would be cost-beneficial. Energy Northwest provided a Phase II evaluation of this SAMA using PSA model Revision 7.1, the results of which are provided in Table F-11 and further discussed in Section F.6.2 (Gambhir, 2011).

For the Level 2 PSA model, Energy Northwest identified the major contributors to each of the dominant release categories, representing approximately 100 percent of the population dose-risk (EN, 2010). Energy Northwest also identified the SAMA candidates that address the major contributors to release category LEN. The NRC staff asked Energy Northwest to review each of the major contributors to each of the dominant release categories and identify the SAMA candidates that address each of the contributors (Doyle, 2010a). Energy Northwest responded to the RAI by identifying the SAMA candidates that address the major contributors to release categories LLN and LLS (Gambhir, 2010). No new SAMA candidates were identified from this review.

The NRC staff noted that, although the ER discusses a Level 1 basic events importance analysis and presents high-level insights, it does not provide a basic events importance listing or discuss a Level 2 importance analysis. As a result, the staff asked Energy Northwest to provide Level 1 and 2 importance lists and assess each important basic event for potential SAMAs (Doyle, 2010a). Energy Northwest responded by providing tabular listings of the PSA model Revision 7.1 Level 1 and LERF internal events basic events sorted according to their RRW (Gambhir, 2011). SAMAs impacting these basic events would have the greatest potential for reducing risk. Energy Northwest used an RRW cutoff of 1.025, which corresponds to about a 2.5 percent change in internal events CDF given 100-percent reliability of the equipment or human actions affected by the SAMA. This equates to an internal events benefit of approximately $12,000, the minimum cost of a procedure change at CGS (Gambhir, 2011). Energy Northwest correlated the CDF and LERF events with the SAMAs identified in the ER and in response to other NRC staff RAIs, and it showed that, with some exceptions, all of the significant basic events are addressed by one or more SAMAs. The additional SAMAs identified from this review are as follows:

- SAMA AT-15R, “install modifications to make use of high pressure core spray (HPCS) more likely for ATWS”
- SAMA FL-07R, “protect the HPCS from flooding resulting from ISLOCA events”
- SAMA OT-09R, “for the non-LOCA initiating events, credit the Z (Power Coversion System recovery) function”
- SAMA CB-10R, “provide additional non-destructive evaluation (NDE) and inspections of main steam (MS) piping in Turbine Building”

These SAMAs are included in Table F-11 and are discussed further in Section F.6.2. If a basic event of high risk importance is not addressed by a SAMA, that is because one of the following is true regarding the basic event (Gambhir, 2011):

- It has an RRW value that is too low or the potential enhancement has an implementation cost that is too high to result in a cost-beneficial SAMA.
- It was determined to have no feasible SAMA that would further reduce risk.
- It requires a hardware modification but has an RRW benefit value that is well below the $100,000 minimum implementation cost for a hardware modification.
- It is a LERF-based success event

Based on this additional information, the NRC staff agrees that cost-beneficial improvements for these basic events are unlikely.

Although the IPE did not identify any fundamental vulnerabilities or weaknesses related to internal events, Energy Northwest considered the potential plant improvements described in the IPE in the identification of plant-specific candidate SAMAs for internal events. The CGS IPE identified nine improvements associated with core damage as follows (Parrish, 1994):

(1) modify the isolated phase buses to allow expeditious alignment of the 500 kilovolt (kV) highline to the plant AC distribution system via the main step-up transformer

(2) increase the capacity of the 230 kV/115kV plant bus transfer

(3) install an additional battery charger

(4) evaluate potential improvements to procedures and training for the recognition and isolation of floods identified to cause multiple system failures

(5) evaluate potential improvements to maintenance practices to ameliorate CCFs

(6) modify emergency procedures to allow use of the automatic depressurization system inhibit switch in non-ATWS scenarios

(7) evaluate potential improvements in the SBO emergency procedure to prevent unwanted depressurization

(8) evaluate performing periodic inspection and maintenance of the Omega seal separating the drywell and wetwell air spaces

(9) modify the air supply to the inboard MSIVs and the containment vent valves for backup from the containment N_2 system

Energy Northwest stated in the ER that Improvements 4, 6, and 7 have been implemented at CGS. Additionally, SAMA candidates AC/DC-27, "install permanent hardware changes that make it possible to establish 500 kV backfeed through the main step-up transformer," and AC/DC-28, "reduce common cause failures (CCFs) between EDGs EDG-3 and EDG-1/2," were identified to address Improvements 1 and 5, respectively (EN, 2010). Energy Northwest further stated that Improvement 3 has been partially implemented, but, since battery chargers are not significant contributors to risk, no SAMA is considered for this improvement. The NRC staff agrees that since battery chargers were not identified as risk significant in the importance analysis described previously, a SAMA to address IPE Improvement 3 is unlikely to be cost-beneficial.

Energy Northwest reported that a cost-benefit analysis had previously been performed for Improvement 2 and determined the modification to not be cost-effective. The NRC staff asked Energy Northwest to provide a summary and scope of this cost-benefit analysis (Doyle, 2010a). In response to the RAI, Energy Northwest explained that the cost-benefit analysis focused on increasing the capacity of the 230 kV startup transformer since it is the primary offsite power source, and its loading has less margin than the 115 kV transformer. The decrease in CDF from the modification was estimated to be 7.0E-07 per year in Revision 1 of the IPE. The analysis assumed a benefit of $250,000 for each decrease of 1.0E-06 per year in CDF. The implementation cost of the modification was estimated to be $2 million. Since the implementation cost was greater than the estimated benefit, the modification was determined not to be cost effective (Gambhir, 2010). Energy Northwest also noted that SAMA AC/DC-27 represents a similar SAMA in terms of cost and benefit. The NRC staff considers Energy Northwest's clarification reasonable and agrees that, based on Energy Northwest's evaluation of AC/DC-27, a SAMA to address IPE Improvement 2 is unlikely to be cost-beneficial.

The ER did not address IPE Improvement 8. Since failure of the drywell-to-wetwell Omega seal is not identified as a risk-important system on the RRW listings discussed previously, the NRC staff concludes that a SAMA to address IPE Improvement 8 is unlikely to be cost-beneficial.

The ER did not address IPE Improvement 9. The NRC staff noted that Revision 1 of the IPE identifies this improvement as being marginally cost effective and that the improvement could increase in importance if the other IPE-identified improvements were implemented. Considering that many of the improvements were indeed implemented, the NRC staff asked Energy Northwest to provide an assessment of a SAMA to address IPE Improvement 9 (Doyle, 2010a). In response to the RAI, Energy Northwest explained that the change in CDF by making gas supply to the MSIVs perfect is negligible (RRW = 1.000) and, therefore, a SAMA to do this was screened from further consideration (Gambhir, 2010). Energy Northwest also explained that a procedure to use portable N_2 bottle(s) to manually open the containment vent valves was developed, the RRW for the air supply to the containment vent valves is 1.0002, and the PSA was not updated to incorporate the procedure because of its low risk significance. Therefore, because of the low-risk benefit, a SAMA to provide another air or N_2 supply to the containment vent valves was screened from further consideration. Based on the low risk significance of the air supply to the MSIVs and containment vent valves, the NRC staff agrees that a SAMA to address IPE Improvement 9 is unlikely to be cost-beneficial.

Energy Northwest reviewed the Phase II SAMAs from prior SAMA analyses for 12 General Electric BWR sites and stated in the ER that no additional SAMAs were identified from this review (EN, 2010). The NRC staff noted that Table E.9-3 of the ER identifies two SAMAs that appear to have been identified from the review of prior SAMA analyses and asked Energy Northwest to clarify this discrepancy (Doyle, 2010a). In response to an NRC staff RAI, Energy Northwest stated that two of the SAMAs identified in the ER were identified from this review (Gambhir, 2010). The NRC staff also asked Energy Northwest to provide an assessment of the applicability of each of the cost-beneficial SAMAs from the 12 BWR sites to CGS (Doyle, 2010a). In response to the RAI, Energy Northwest provided the results of the review of the 72 cost-beneficial SAMAs from the prior SAMA analyses. Energy Northwest concluded that 21 are not applicable to CGS, 26 are already implemented at CGS or were screened on very low benefit, 10 had already been identified and evaluated in the ER, 1 was identified and evaluated in response to a separate NRC staff RAI (SAMA FR-08 discussed below), 10 were evaluated further in the Phase II evaluation, and the remaining were duplicate SAMAs identified in more than one of the prior SAMA analyses (Gambhir, 2010), (Gambhir, 2011). The 10 SAMAs identified and evaluated further are as follows:

- SAMA FW-05R, "examine the potential for operators to control reactor feedwater (RFW) and avoid a reactor trip"
- SAMA FL-04R, "install one isolation valve in each of standby service water (SW), plant service water (TSW), and fire protection (FP) lines in the Control Building area of the Radwaste Building to facilitate rapid isolation by the operators upon receipt of a high flow alarm"
- SAMA FL-05R, "install three clamp-on flow instruments to certain drain lines in the Control Building area of the Radwaste Building and alarm in the Control Room"
- SAMA FL-06R, "perform additional NDE inspections to the three lines identified in SAMA FL-04R to verify that degradation is not occurring in these lines"
- SAMA CC-24R, "backfeed the HPCS system with [emergency bus] SM-8 to provide a third power source for HPCS"
- SAMA CC-25R, "enhance alternate injection reliability by including residual heat removal service water and fire water crosstie in maintenance program"
- SAMA CC-26R, "install hard pipe from diesel fire pump to vessel"

- SAMA OT-07R, “increase operator training on systems and operator actions determined to be important from the PSA”
- SAMA OT-08R, “install explosion protection around CGS transformers”
- SAMA OT-10R, “increase fire pump house building integrity to withstand higher winds so the fire system will be capable of withstanding a severe weather event”

These SAMAs are included in Table F-11 and are discussed further in Section F.6.2.

Based on this information, the NRC staff concludes that the set of SAMAs evaluated in the ER, together with those identified in response to NRC staff RAIs, addresses the major contributors to internal event CDF.

Energy Northwest also provided a tabular listing of the Level 1 fire PSA basic events sorted according to their RRW (EN, 2010). Energy Northwest used an RRW cutoff of 1.000, which corresponds to less than a 0.1 percent change in CDF given 100-percent reliability of the SAMA. Energy Northwest also provided a listing of the fire compartments representing over 98 percent of the fire CDF. No additional SAMAs were identified from this review.

The NRC staff asked Energy Northwest to identify and evaluate SAMAs to address each of the risk significant Level 1 fire basic events. In a separate RAI, the NRC staff asked Energy Northwest to provide a listing of the risk significant Level 2 fire basic events and assess each important basic event for potential SAMAs (Doyle, 2010a). In response to the RAIs, Energy Northwest provided the following using PSA model Revision 7.1 (Gambhir, 2010), (Gambhir, 2011):

- a tabular listing of Level 1 fire PSA basic events sorted first according to RAW and then according to their RRW
- a second tabular list of Level 1 fire PSA basic events sorted according to their RRW
- a tabular list of LERF fire basic events

In these listings, Energy Northwest used an RRW cutoff of 1.015, which corresponds to about a 1.5 percent decrease in fire CDF given 100-percent reliability of the equipment or human actions affected by the SAMA. This equates to a fire events benefit of approximately $12,000, the minimum cost of a procedure change at CGS. For each basic event listed, Energy Northwest correlated the CDF and LERF events with the SAMAs identified in the ER and with several newly identified SAMAs and showed that, with some exceptions, all of the significant basic events are addressed by one or more SAMAs. The additional SAMAs identified from this review are as follows:

- SAMA FR-09R, “install early detection for FR1J (physical analysis unit R-1J) and FR1D (physical analysis unit R-1D)”
- SAMA FR-10R, “install early detection in the Control Room (RC-10)”
- SAMA FR-11R, “install early detection for FW14 (analysis unit RC-14), FW04 (analysis unit RC-04), FW11 (analysis unit RC-11), FW03 (analysis unit RC-03), FW08 (analysis unit RC-08), FW05 (analysis unit RC-05), FW02 (analysis unit RC-02), FW13 (analysis unit RC-13), and FW1A (analysis unit RC-1A)”
- SAMA FR-12R, “install early detection for FT1A (physical analysis unit T-1A) and FT12 (physical analysis unit T-12)”

- SAMA AC/DC-30R, "provide an additional diesel generator (DG) diverse from DG-1 and DG-2"

These SAMAs are included in Table F-11 and are discussed further in Section F.6.2. If a basic event of high risk importance is not addressed by a SAMA, that is because one of the following is true in regard to the basic event:

(1) It requires a hardware modification, but it has an RRW benefit value that is well below the $100,000 minimum implementation cost for a hardware modification.

(2) It was determined to have no feasible or viable SAMA that would further reduce risk.

(3) It has no physical meaning or is a parameter required for modeling purposes (such as split fractions, fire source partitioning factors, ratios of fixed source to total source in fire zone, phenomenological values, and success terms).

(4) It is an event for which a plant modification is already being implemented to improve equipment reliability.

(5) It is a LERF-based success event.

(6) It was judged to not be a realistic contribution to risk because the fire PSA conservatively does not credit the air accumulators installed at each of the SRVs.

Regarding Item 6, the NRC asked that Energy Northwest provide an assessment of what the RRW values would be for the associated basic events if the air accumulators were credited (Doyle, 2010c). In response to the RAI and the sensitivity study of PSA Revision 7.1, Energy Northwest showed that each of the fire basic events in question is, in fact, addressed by an existing SAMA (Gambhir, 2010), (Gambhir, 2011). Based on this additional information, the NRC staff agrees that cost-beneficial improvements are unlikely for those basic events for which no SAMA was identified.

The NRC staff also asked Energy Northwest to identify and evaluate SAMAs to address each of the risk significant Level 1 and 2 seismic basic events (Doyle, 2010a). In response to the RAI, Energy Northwest provided tabular listings of the PSA model Revision 7.1 Level 1 and LERF seismic basic events sorted according to their RRW (Gambhir, 2011). SAMAs impacting these basic events would have the greatest potential for reducing risk. Energy Northwest used an RRW cutoff of 1.03, which corresponds to about a 3 percent reduction in seismic CDF given 100-percent reliability of the SAMA. This equates to a seismic events benefit of approximately $12,000, the minimum cost of a procedure change at CGS (Gambhir, 2011). Energy Northwest correlated the CDF and LERF events with the SAMAs identified in the ER and in response to RAIs and showed that, with a few exceptions, all of the significant basic events are addressed by one or more SAMAs. No additional SAMA candidates were identified from this review. For the exceptions in which a basic event of risk importance is not addressed by a SAMA, Energy Northwest explained that this is because the basic event requires hardware modifications for multiple components but has an RRW benefit value that is well below the implementation cost for multiple hardware modifications or has no physical meaning or is a parameter required for modeling purposes (such as split fractions and success terms). Based on this additional information, the NRC staff agrees that cost-beneficial improvements for these basic events are unlikely.

In a followup RAI, the NRC staff noted that the Level 1 and Level 2 seismic basic events importance lists identify only a few basic events and asked Energy Northwest to explain why this is the case (Doyle, 2011a). In response to the RAI, Energy Northwest explained that the seismic PSA model includes random failures but that none of these events showed up in the lists because the random failure events had RRW values less than the 1.03 value used as a cutoff for identifying important basic events (Swank, 2011).

In another followup RAI, the NRC staff noted that the importance analyses reviews performed for internal, fire, and seismic events only addressed CDF and LERF and asked Energy Northwest to provide a review of risk-important basic events for release categories H/I and M/I, which are also significant contributors to the CGS dose-risk (Doyle, 2011a). In response to the RAI, Energy Northwest provided a tabular listing of PSA model Revision 7.1 internal, fire, and seismic basic events contributing to the H/I and M/I release categories that were either not included in the Level 1 and LERF importance analyses discussed previously or whose resolution for the basic event changed (Swank, 2011). Basic events that were found to be events that had no physical meaning (such as flag events and phenomenological events) were not included in the listing. Energy Northwest developed separate basic event listings for internal, fire, and seismic basic events contributing to the H/I and M/I release categories and used RRW cutoffs for each corresponding to a basic event benefit of approximately $12,000, the minimum cost of a procedure change at CGS. Energy Northwest correlated the H/I and M/I basic events with the SAMAs identified in the ER and in response to RAIs and showed that, with a few exceptions, all of the basic events are addressed by one or more SAMAs. No additional SAMA candidates were identified from this review. For the exceptions in which a basic event of risk importance is not addressed by a SAMA, Energy Northwest explained that the reasons for this are as follows:

- No feasible SAMA was identified to address the basic event.
- The only feasible SAMA candidate for the basic event had essentially already been implemented.
- The basic event is a basic PSA model assumption that is not a candidate for a SAMA.

Based on this additional information, the NRC staff agrees that cost-beneficial improvements for these basic events are unlikely.

Although the IPEEE did not identify any fundamental vulnerabilities or weaknesses related to external events, four improvements related to internal fire events, six improvements related to seismic events, and one improvement related to high winds, floods, and other (HFO) external events were identified. All of these improvements have been resolved as either having been implemented (seven improvements) or determined to not be necessary based on an engineering evaluation that determined the existing design or procedure or both was adequate (three improvements), or determined to not be necessary based on a cost-benefit evaluation (one improvement) (NRC, 2001).

Regarding the last improvement, which is to strengthen the motor control center (MCC) base connections, the NRC staff asked Energy Northwest to justify not including it as a SAMA, especially considering that the seismic hazard curve has changed since the IPEEE (Doyle, 2010a). Energy Northwest responded that the newer seismic hazard curves, as discussed in Section F.2.2, have been shown to be consistent with the CGS seismic hazard curves used for the seismic PSA and that the fragility of the MCCs has, therefore, not changed (Gambhir, 2010). Nevertheless, Energy Northwest identified SAMA SR-05R, "improve seismic ruggedness of MCC-7F and MCC-8F," to address this issue. This SAMA is included in Table F-11 and is discussed further in Section F.6.2.

Energy Northwest also reviewed the PSA insights from the CGS IPEEE for fire events, seismic events, and other external events. The review of the fire PSA insights indicated that the dominant fire sequences render containment venting, the power conversion system, and one train of RHR or service water unavailable. Based on the review of these insights, Energy Northwest identified one additional SAMA candidate to improve the fire resistance of critical cables (SAMA FR-07). This SAMA candidate was subsequently divided into two SAMA candidates, one to protect the containment vent valve cables from fires (SAMA FR-07a) and the second to protect the transformer E-TR-S cables from fires (SAMA FR-07b).

The NRC staff noted that both SAMAs FR-07a and FR-07b were determined to be cost-beneficial in the Phase II evaluation and asked Energy Northwest to provide an evaluation of a SAMA to protect RHR and service water cables from fires (Doyle, 2010a), (Doyle, 2010c). In response to the RAI, Energy Northwest stated that since CGS electrical cabling is currently protected from fire to manually shutdown in the RHR alternate shutdown mode (Appendix R), a SAMA was identified and evaluated to provide additional protection from MSOs in auto initiation circuits of RHR and service water (Gambhir, 2010), (Gambhir, 2011). This SAMA, SAMA FR-08, “improve the fire resistance of cables to RHR and SW,” is included in Tables F-10 and F-11 and is discussed further in Section F.6.2.

Based on the applicant’s IPEEE, the review of the results of the CGS PSA, which includes seismic and fire events, and the expected cost associated with further risk analysis and potential plant modifications, the NRC staff concludes that the opportunity for seismic and fire-related SAMAs has been adequately explored. The staff finds that it is unlikely that there are any additional cost-beneficial seismic or fire-related SAMA candidates.

As stated earlier, other external hazards (high winds, external floods, volcanic activity, transportation and nearby facility accidents, and other external events) are below the IPEEE threshold screening frequency, or met the 1975 SRP design criteria, and are not expected to represent opportunities for cost-beneficial SAMA candidates.

For many of the Phase II SAMAs listed in the ER, the information provided did not sufficiently describe the proposed modification. Therefore, the NRC staff asked the applicant to provide more detailed descriptions of the modifications and cost estimates for several of the Phase II SAMA candidates (Doyle, 2010a). In response to the RAI, Energy Northwest provided the requested information (Gambhir, 2010). This is discussed further in Section F.5.

The NRC staff questioned Energy Northwest about lower cost alternatives to some of the SAMAs evaluated (Doyle, 2010a), including the following:

- establishing procedures for opening doors or using portable fans for sequences involving room cooling failures, such as the EDG room
- using a portable independently powered pump to inject into containment
- using the security diesel generator or EDG-4 to extend the life of the 125-V DC batteries
- using a portable generator to provide power to individual 125-V DC MCCs upon loss of a DC bus to improve availability of HPCS

In response to the RAI, Energy Northwest addressed the suggested lower cost alternatives (Gambhir, 2010). This is discussed further in Section F.6.2.

Energy Northwest's Phase I SAMA screening process initially eliminated 124 SAMAs using the criteria discussed in Section F.3.1, leaving 27 for further evaluation. Phase I SAMA SR-01, "increase seismic ruggedness of standby service water (SSW) pumps and RHR heat exchangers," while originally retained for further evaluation was subsequently screened after further consideration and the determination that it would provide very little benefit, thus reducing to 26 the number of SAMAs retained for further evaluation. Three SAMAs—SAMA CB-03, "increase leak testing of valves in ISLOCA paths," SAMA CB-08, "revise emergency operating procedures (EOPs) to improve ISLOCA identification," and SAMA CB-09, "improve operator training on ISLOCA coping"—were originally screened because they were similar to another SAMA but were subsequently included for further evaluation, raising the total to 29 SAMAs retained for further evaluation.

The NRC staff noted that Phase I SAMA CC-21, "revise procedure to align LPCI or core spray to CST on loss of suppression pool cooling," was not eliminated in the Phase I screening evaluation but was not included in the Phase II detailed evaluation and asked Energy Northwest to clarify the screening of this SAMA (Doyle, 2011a). In response to the RAI, Energy Northwest explained that CGS has the following existing water sources from which to provide injection (Swank, 2011):

- service water cross-connect to the RHR system
- fire water through a cross-connect to a condensate booster pump and through a fire hose connection to LPCI piping
- condensate from the hotwell with makeup from the CST via multiple pathways

Energy Northwest further explained that CGS has a direct gravity drain from the CST to both the HPCS and RCIC pumps and that, therefore, CST inventory would only be available for low pressure injection on loss of these systems prior to CST inventory depletion. Based on the ability to provide injection from alternative sources through multiple pathways that are proceduralized, Energy Northwest screened SAMA CC-21, leaving 28 for further evaluation. Based on this information, the NRC staff agrees that SAMA CC-21 is unlikely to be cost-beneficial.

The NRC staff noted that many Phase I SAMAs were screened on very low benefit without an assessment of the RRW for the systems being addressed and asked that Energy Northwest provide the RRW for each of these SAMAs (Doyle, 2010a). Energy Northwest responded by providing an assessment of the RRW, risk significance, or reliability of the systems addressed by each Phase I SAMA screened on very low benefit and concluded that all of these SAMAs were appropriately screened on very low benefit (Gambhir, 2010). Based on this additional information, the NRC staff agrees that the Phase I SAMAs screened on very low benefit are unlikely to be cost-beneficial improvements.

The NRC staff observed that the screening of SAMA FW-04, "add a motor-driven feedwater (FW) pump," in the Phase I evaluation on very low benefit appeared to be based on FW unavailability being more sensitive to loss of flow from the condensate booster pumps and FW pumps than from independent or CCFs of the FW pumps. The staff asked that Energy Northwest justify the screening of the SAMA (Doyle, 2010a). In response to the RAI, Energy Northwest clarified that the top 79 percent of contributors to RFW unavailability are factors other than the RFW pumps and that, as a result, it was concluded that adding an additional motor-driven RFW pump would add little benefit relative to the cost incurred (Gambhir, 2010). Nevertheless, Energy Northwest observed that the importance of RFW has increased in PSA model Revision 7.1 and provided a Phase II evaluation of SAMA FW-04. This SAMA is included in Table F-11 and is discussed further in Section F.6.2.

The NRC staff noted that Section 9.2 of the ER indicates two seismic SAMA candidates were evaluated, yet only one seismic SAMA was included in the Phase II evaluation. The staff asked that Energy Northwest clarify this discrepancy (Doyle, 2010a). Energy Northwest responded that SAMA SR-01, "increase seismic ruggedness of SSW pumps and RHR heat exchangers," was originally assessed during the Phase I screening evaluation to be included in the Phase II evaluation, but it was subsequently screened after a more detailed evaluation determined that strengthening the RHR heat exchangers and SSW pumps would provide very little benefit (Gambhir, 2010). The NRC staff considers Energy Northwest's clarification reasonable.

The NRC staff notes that the set of SAMAs submitted is not all-inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the NRC staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated, and the alternative improvements would not likely cost less than the least expensive alternatives evaluated when the subsidiary costs associated with maintenance, procedures, and training are considered.

The NRC staff concludes that Energy Northwest used a systematic and comprehensive process for identifying potential plant improvements for CGS, and the set of SAMAs evaluated in the ER, together with those evaluated in response to NRC staff inquiries, is reasonably comprehensive and, therefore, acceptable. This search included reviewing insights from the plant-specific risk studies, including internal initiated events as well as fire and seismic initiated events, and reviewing plant improvements considered in previous SAMA analyses.

F.4 Risk Reduction Potential of Plant Improvements

Energy Northwest evaluated the risk-reduction potential of the 28 remaining SAMAs that were applicable to CGS. The majority of the SAMA evaluations were performed in a bounding fashion in that the SAMA was assumed to eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit and are conservative.

Energy Northwest used model re-quantification to determine the potential benefits. The CDF and population dose reductions were estimated using the CGS internal events PSA Revision 6.2 model for internal events, the CGS fire PSA Revision 2 model for fire events, and the CGS seismic PSA Revision 1 model for seismic events. The changes made to the models to quantify the impact of SAMAs are detailed in Table E.11-1 of Attachment E to the ER (EN, 2010). Table F-10 lists the assumptions considered in the ER to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk. The estimated benefits reported in Table F-10 reflect the combined benefit in both internal and external events. The determination of the benefits for the various SAMAs is further discussed in Section F.6.

The NRC staff noted that the risk reduction for many SAMAs was reported to be 0.00E+00 and asked Energy Northwest to clarify if the results for these SAMAs were actually zero or if the results are negligible and, if actually zero, to specifically justify the zero risk reduction reported for four of the SAMAs (Doyle, 2010a). In response to the RAI, Energy Northwest clarified that the reduction in CDF was calculated for CDF results reported to four significant digits and that, therefore, the 0.00E+00 values reported in Table E.11-1 of the ER are known to be zero in almost every instance (Gambhir, 2010). Energy Northwest further identified two specific SAMAs where the change in CDF was judged to be negligible but reported to be 0.00E+00 in Table E.11-1 of the ER. The two SAMAs—SAMA CB-01, “install additional pressure or leak monitoring instruments for detection of ISLOCAs,” and SAMA SR-03, “modify safety related CST”—were reported to have a 0.00E+00 reduction in internal events and seismic events CDF, respectively, when the reduction in each of these CDFs was actually calculated to be 1.0E-09 per year. Energy Northwest also justified the reported 0.00E+00 risk reduction reported for the following SAMAs, as requested by NRC staff in the RAI:

- SAMA AC/DC-01, “provide additional DC battery capacity,” with a reported reduction in fire CDF of 0.00E+00—Energy Northwest explained that this SAMA would increase the time for recovery of offsite power during an SBO and that the fire PSA assumes that recovery of fire-induced offsite power is not feasible in the near term. Therefore, there is no risk reduction from providing additional DC power capacity for fire events (Gambhir, 2010).
- SAMA CC-20, “improve ECCS suction strainers,” with a reported reduction in internal events, fire, and seismic CDFs of 0.00E+00—Energy Northwest explained that modeling of the suction strainers was incomplete in PSA model Revision 6.2 because each of the redundant suction strainers was modeled as independent from one another. Therefore, no reduction in CDF was calculated (Gambhir, 2010). Energy Northwest noted that modeling of the suction strainers was improved in PSA model Revision 7.1 to include CCFs in response to a Level C F&O from the 2004 peer review. The sensitivity study using PSA model Revision 7.1 does report a non-zero reduction in internal event CDF for this SAMA, as provided in Table F-11 (Gambhir, 2011).
- SAMA CB-01, “install additional pressure or leak monitoring instruments for detection of ISLOCAs,” with a reported reduction in internal events, fire, and seismic CDFs of 0.00E+00—Energy Northwest clarified that the risk reduction in internal events CDF was actually calculated to be 1.0E-09 per year as a result of eliminating the ISLOCA contribution but was reported to be 0.00E+00 in Table E.11-1 of the ER (Gambhir, 2010). Energy Northwest further explained that the fire PSA does not currently model the potential for fire-induced ISLOCA but that this area of model incompleteness is judged to be a negligible contributor to fire CDF. The reason for this is that an ISLOCA in the shutdown cooling line composed of two valves in series has a low likelihood because one of the valves (RHR-V-9) is maintained in a closed position during normal plant operation with power removed (via a protected isolation switch) so that hot shorts cannot cause the valve motor to energize and open the valve (and the de-energized power feeder is protected against external three-phase hot shorts). Additionally, a hot short plus random failure of a check valve is required to produce an ISLOCA for other pathways. Regarding the seismic PSA, Energy Northwest explained that both seismic damage states SDS41 and SDS42 include potential ISLOCAs but that ISLOCAs cannot be differentiated from other contributors to core damage.
- SAMA AT-14, “diversify standby liquid control (SLC) explosive valve operation,” with a reported reduction in fire and seismic CDFs of 0.00E+00—Energy Northwest explained that fire-induced ATWS is not modeled in the fire PSA based on its low risk-significance per NUREG/CR-6850 (NRC, 2005) and, thus, has very little risk reduction potential for fire (Gambhir, 2010). Regarding the seismic PSA, Energy Northwest explained that seismic damage state SDS40, an unmitigated seismic-induced ATWS scenario having a seismic CDF contribution of 7.3E-09 per year, is the dominant contributor to seismic-ATWS sequences and that diversification of the SLC explosive valves would not

mitigate this sequence. Energy Northwest further considered that only a significant increase in seismic ruggedness in the SLC explosive valves and its piping would provide significant mitigation, but a significant improvement in seismic ruggedness is not practical due to its connectivity to other systems that would also require a corresponding improvement in seismic ruggedness to be effective.

As indicated in Section F.2.1, in response to an NRC staff RAI, Energy Northwest provided the results of a sensitivity study using PSA model Revision 7.1 (Gambhir, 2011). Table F-11 lists the assumptions considered in the sensitivity analysis to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk. As with Table F-10, the estimated benefits reported in Table F-11 reflect the combined benefit in both internal and external events. Energy Northwest stated in the sensitivity study that the modeling approach used for SAMAs evaluated in the ER was the same as that used in the sensitivity study.

The NRC staff noted that implementation of SAMA CW-02, “add redundant DC control power for pumps,” SAMA CW-03, “replace ECCS pump motors with air-cooled motors,” and SAMA CW-04, “provide self-cooled ECCS seals,” results in an increase in the fire population dose risk. Additionally, implementation of SAMA AC/DC-30R, “provide an additional diesel generator diverse from DG-1 and DG-2,” results in an increase in the internal events CDF and population dose risk. The staff asked that Energy Northwest explain these apparent anomalies (Doyle, 2011a). In response to the RAI, Energy Northwest clarified that the increase in population dose for SAMAs CW-02, CW-03, and CW-04 is due to the modeling assumption that the associated hardware failures were eliminated, which resulted in the redistribution of CDF between PDSs in the CET quantifications (Swank, 2011). The PDSs associated with the modeled success branches are binned to release categories that have higher dose consequences than the modeled failure branches, thus increasing the dose risk for these SAMAs. For SAMA AC/DC-30R, Energy Northwest replied that this SAMA was incorrectly modeled and provided revised results, which are reported in Table F-11. The NRC staff considers Energy Northwest’s clarifications reasonable.

The modeling approaches for SAMA CC-01, “install an independent active or passive high pressure injection system,” and SAMA CC-02, “provide an additional high pressure injection pump with independent diesel,” were reported to be different in the ER yet the estimated benefits for the two SAMAs were identical. In the sensitivity study, Energy Northwest clarified that the same modeling approach was used for both of these SAMAs (Gambhir, 2011).

As mentioned in Section F.2.2, the NRC staff noted that the hot short probability of 0.3 assumption used in the fire PSA is not necessarily consistent with the guidance in NUREG/CR-6850 (NRC, 2005), which recommends doubling the 0.3 value to 0.6 for circuits where control power transformers are not present. The staff asked Energy Northwest to provide an assessment of this potential non-conservatism on the SAMA analysis (Doyle, 2010c), (Doyle, 2011a). In the RAI, the NRC staff asked Energy Northwest to specifically re-evaluate 7 Phase II SAMAs identified to address fire risk and 10 Phase II SAMAs identified to address internal events risk, representing the Phase II SAMAs that have a high baseline benefit relative to the estimated implementation cost. In response to the RAIs, Energy Northwest provided the results of a sensitivity analysis using PSA model Revision 7.1 wherein each of the SAMA was re-evaluated assuming a hot short probability of 0.6 for those circuits that were not confirmed to have a control power transformer present (Gambhir, 2011), (Swank, 2011). Energy Northwest re-quantified the base PSA model using the revised hot short probability assumptions, which increased the fire CDF to 1.43×10^{-5} per year from 1.37×10^{-5} per year, and then re-quantified the PSA model again for each of the SAMAs by making the associated model changes described in Table F-11. Energy Northwest's analysis showed that the reduction in fire CDF increased by a factor of 1.0 to 2 for the SAMA identified to address fire events and by a factor of 1.0 to 1.38 for all but one of the SAMAs identified to address internal events. The re-evaluation of one SAMA resulted in the reduction in fire CDF decreasing by about 8 percent, the reason for which is provided in the RAI response. Based on these results, Energy Northwest concluded that the potential non-conservatism in the SAMA analysis is bounded by the uncertainty analysis using the 95th percentile CDF discussed in Section F.6.2. Based on the results of the sensitivity analysis being bounded by the 95th percentile CDF uncertainty analysis, and that the sensitivity analysis was performed for those SAMAs most likely to be impacted by the hot short probability assumption, the NRC staff concludes that using a hot short probability of 0.3 will not impact the results of the SAMA analysis.

The NRC staff has reviewed Energy Northwest's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the NRC staff based its estimates of averted risk for the various SAMAs on Energy Northwest's risk reduction estimates.

Table F-10. SAMA cost and benefit screening analysis for CGS[a]

SAMA	Assumptions	% Risk Reduction[b,d]		Total Benefit ($)[h]		Cost ($)
		CDF	Population dose	Baseline (internal + external)	Baseline with uncertainty[c]	
Increase availability of DC power	In response to an NRC staff RAI, increase time available to recover offsite and onsite power before RCIC is lost to 10 hours during SBO scenarios from 7 hours with DC power load-shedding and from 5 hours without load-shedding (Gambhir, 2011).	IE—5 F—0 S—1	IE—4 F—0 S—1	37K	100K	
AC/DC-01—Provide additional DC battery capacity						1.8M
AC/DC-02—Replace lead-acid batteries with fuel cells						1.0M
AC/DC-03—Add a portable, diesel-driven battery charger to existing DC system						500K
Increase Availability of Onsite AC Power	In response to an NRC staff RAI, eliminate failure of EDG-1 (Gambhir, 2010).	IE—32 F—11 S—4	IE—15 F—9 S—4	250K	720K	
AC/DC-10—Provide an additional DG						11M
AC/DC-15—Install a gas turbine generator						2.1M
AC/DC-16—Install tornado protection of gas turbine generator						2.1M
AC/DC-23—Develop procedures to repair or replace failed 4 kV breakers	Eliminate failures of the 4 kV breakers.	IE—1 F—2 S—<1	IE—<1 F—2 S—<1	20K	61K	375K

SAMA	Assumptions	% Risk Reduction(b,d)		Total Benefit ($)(h)		Cost ($)
		CDF	Population dose	Baseline (internal + external)	Baseline with uncertainty(c)	
AC/DC-27—Install permanent hardware changes that make it possible to establish 500 kV backfeed through the main step-up transformer	In response to an NRC staff RAI, for internal and fire events, modify fault tree to include a new basic event, having a failure probability of 1.0E-02, representing the unavailability of the 500 kV power source (Gambhir, 2010). The 500 kV power source is not available in seismic events.	IE—24 F—28 S—0	IE—9 F—26 S—0	300K	870K	1.7M
AC/DC-28(g)—Reduce CCFs between EDG-3 and EDG-1/2	**CCFs between EDG-1 and EDG-3, between EDG-2 and EDG-3, and among all three EDGs are reduced by a factor of 2.**	**IE—12 F—2 S—<1**	**IE—6 F—1 S—<1**	**73K**	**200K**	**100K**
AC/DC-29—Replace EDG-3 with a diesel diverse from EDG-1 and EDG-2	Eliminate all CCFs between EDG-3 and EDGs-1/2.	IE—26 F—4 S—<1	IE—12 F—2 S—<1	150K	420K	4.2M
AT-05—Add an independent boron injection system	In response to an NRC staff RAI, eliminate failure of the SLC system and all risk from seismic damage state (SDS) 40 (Gambhir, 2010).	IE—<1 F—0 S—<1	IE—<1 F—0 S—<1	5.6K	16K	800K
AT-07—Add a system of relief valves to prevent equipment damage from pressure spikes during an ATWS	Eliminate all CCFs of SRVs.	IE—0 F—0 S—0	IE—0 F—0 S—0	0K	0K	1.1M
AT-13—Automate SLC injection in response to ATWS event	Eliminate failures of operators to initiate SLC.	IE—≈0 F—0 S—0	IE—≈0 F—0 S—0	0.2K	0.5K	660K
AT-14—Diversify SLC explosive valve operation	Eliminate CCFs between the SLC valves.	IE—≈0 F—0 S—0	IE—≈0 F—0 S—0	0.4K	1.0K	370K
Reduce Probability of an Interfacing Systems Loss of Coolant Accident (ISLOCA)	Eliminate ISLOCA events.	IE—≈0 F—0 S—0	IE—≈0 F—0 S—0	0K	0K	

SAMA	Assumptions	% Risk Reduction[b,d]		Total Benefit ($)[h]		Cost ($)
		CDF	Population dose	Baseline (internal + external)	Baseline with uncertainty[c]	
CB-01—Install additional pressure or leak monitoring instruments for detection of ISLOCAs						5.6M
CB-03—Increase leak testing of valves in ISLOCA paths						400K
CB-08—Revise EOPs to improve ISLOCA identification						5.6M[f]
CB-09—Improve operator training on ISLOCA coping						5.6M[f]
CC-01—Install an independent active or passive high pressure injection system	Reduce probability of failure of the HPCS system to 1.0E-09 (Gambhir, 2011).	IE—63 F—74 S—4	IE—41 F—71 S—4	875K	2.6M	29M
CC-02—Provide an additional high pressure injection pump with independent diesel	Reduce probability of failure of the HPCS system to 1.0E-09 (Gambhir, 2011).	IE—63 F—74 S—4	IE—41 F—71 S—4	875K	2.6M	5.2M
CC-03b—Raise RCIC backpressure trip set points	**Unavailability of RCIC for failure to run events are reduced by a factor of 3.**	**IE—9 F—1 S—<1**	**IE—5 F—1 S—<1**	**54K**	**150K**	**82K**
CC-20—Improve ECCS suction strainers	Eliminate failures of the ECCS suction strainer due to plugging.	IE—≈0 F—≈0 S—≈0	IE—≈0 F—≈0 S—≈0	0K	0K	10M
CP-01—Install an independent method of suppression pool cooling	Eliminate failures of suppression pool cooling.	IE—17 F—52 S—1	IE—28 F—56 S—1	540K	1.6M	6.0M
CW-02—Add redundant DC control power for pumps	In response to an NRC staff RAI, eliminate failure of control power for the ECCS pumps (Gambhir, 2010).	IE—<1 F—3 S—<1	IE—<1 F—3 S—<1	25K	75K	650K

SAMA	Assumptions	% Risk Reduction[b,d]		Total Benefit ($)[h]		Cost ($)
		CDF	Population dose	Baseline (internal + external)	Baseline with uncertainty[c]	
Improve Reliability of ECCS Pumps	In response to an NRC staff RAI, essentially eliminate failure of the low-pressure ECCS pumps due to pump motor cooling dependencies on service water (Gambhir, 2011).	IE—4 F—10 S—<1	IE—6 F—10 S—<1	110K	310K	
CW-03—Replace ECCS pump motors with air-cooled motors						1.1M
CW-04—Provide self-cooled ECCS seals						675K
CW-07—Add a service water pump	In response to an NRC staff RAI, eliminate failure of one train of service water (Gambhir, 2010).	IE—6 F—17 S—<1	IE—8 F—19 S—<1	180K	530K	6.1M
FR-03—Install additional transfer and isolation switches	Reduce the probability of the most risk significant hot shorts to zero.	IE—0 F—30 S—0	IE—0 F—31 S—0	210K	650K	2.0M
FR-07a—Improve the fire resistance of critical cables for containment venting	**In response to an NRC staff RAI, eliminate fire-related failures of the containment vent (Gambhir, 2010).**	**IE—0 F—46 S—0**	**IE—0 F—50 S—0**	**330K**	**1.0M**	**400K**
FR-07b—Improve the fire resistance of critical cables for transformer E-TR-S	**In response to an NRC staff RAI, eliminate hot shorts for transformer E-TR-S (Gambhir, 2010).**	**IE—0 F—11 S—0**	**IE—0 F—11 S—0**	**75K**	**230K**	**100K**
FR-08(e)—Improve the fire resistance of cables to RHR and SW	**Eliminate failure of RHR trains A and B due to a fire.**	**IE—0 F—72 S—0**	**IE—0 F—78 S—0**	**520K**	**1.6M**	**1.25M**
HV-02—Provide a redundant train or means of ventilation [for the critical switchgear room]	**In response to an NRC staff RAI, completely remove switchgear dependencies on HVAC and eliminate the loss of HVAC IEs (Gambhir, 2010).**	**IE—11 F—16 S—<1**	**IE—17 F—16 S—<1**	**210K**	**620K**	**480K**
SR-03—Modify safety-related CST	In response to an NRC staff RAI, availability of the CST is credited during seismic events (Gambhir, 2010).	IE—0 F—0 S—≈0	IE—0 F—0 S—≈0	0K	0K	980K

SAMA	Assumptions	% Risk Reduction[b,d]		Total Benefit ($)[h]		Cost ($)
		CDF	Population dose	Baseline (internal + external)	Baseline with uncertainty[c]	

[a] SAMAs in **bold** are potentially cost-beneficial.

[b] Percent risk reduction values between 0.1 and 1 are shown as "<1," those having a value less than 0.1 are shown as "≈0," and those shown as "0" were reported to be 0 in the ER and in response to NRC staff RAI 5.n (Gambhir, 2010).

[c] Estimated uncertainty benefits are provided in response to NRC staff RAIs 6.j (Gambhir, 2010) and 6.j-1ii (Gambhir, 2011).

[d] IE = internal events; F = fire events; S = seismic events.

[e] SAMA identified and evaluated in response to NRC staff RAIs 5.l (Gambhir, 2010) and 5.l-1 and 6.j-1ii (Gambhir, 2011).

[f] The implementation cost estimate was revised in the PSA Revision 7.1 sensitivity study (Gambhir, 2011).

[g] SAMA AC/DC-28 reduces CCFs among the EDGs by such actions as providing separate fuel supplies, separate maintenance crews, diverse instrumentation, etc., as compared to SAMA AC/DC-29, which replaces EDG-3 with an EDG from a different manufacturer from EDG-1 and EDG-2 (EN, 2010).

[h] The total benefit is the sum of the benefits for internal events, fire events, seismic events, and HFO events.

Table F-11. SAMA cost and benefit screening analysis for CGS sensitivity analysis [a,b]

SAMA	Assumptions	% Risk Reduction[c]		Total Benefit ($)[f]		Cost ($)
		CDF	Population Dose	Baseline (Internal + External)	Baseline With Uncertainty	
Increase Availability of DC Power	Increase time available to recover offsite/onsite power before RCIC is lost to 10 hours during SBO scenarios from 7 hours with DC power load-shedding and from 5 hours without load-shedding (Gambhir, 2011).	IE—1 F—0 S—0	IE—0 F—0 S—<1	3.3K	8.1K	
AC/DC-01—Provide additional DC battery capacity						1.8M
AC/DC-02—Replace lead-acid batteries with fuel cells						1.0M
AC/DC-03—Add a portable, diesel-driven battery charger to existing DC system						500K
Increase Availability of Onsite AC Power	In response to an NRC staff RAI, eliminate failure of EDG-1 (Gambhir, 2010).	IE—2 F—9 S—1	IE—<1 F—7 S—2	88K	230K	
AC/DC-10—Provide an additional DG						11M
AC/DC-15—Install a gas turbine generator						2.1M
AC/DC-16—Install tornado protection of gas turbine generator						2.1M
AC/DC-23—Develop procedures to repair or replace failed 4 kV breakers	Eliminate failures of the 4 kV breakers.	IE—5 F—1 S—0	IE—6 F—2 S—0	71K	170K	375K

SAMA	Assumptions	% Risk Reduction[c]		Total Benefit ($)[f]		Cost ($)
		CDF	Population Dose	Baseline (Internal + External)	Baseline With Uncertainty	
AC/DC-27—Install permanent hardware changes that make it possible to establish 500 kV backfeed through the main step-up transformer	In response to an NRC staff RAI, for internal and fire events, modify fault tree to include a new basic event, having a failure probability of 1.0E-02, representing the unavailability of the 500 kV power source (Gambhir, 2010). The 500 kV power source is not available in seismic events.	IE—10 F—38 S—0	IE—9 F—37 S—0	420K	1.1M	1.7M
AC/DC-28[e]—Reduce CCFs between EDG-3 and EDG 1/2	CCFs between EDG-1 and EDG-3, between EDG-2 and EDG-3 and between all three EDGs are reduced by a factor of 2.	IE—<1 F—1 S—0	IE—0 F—<1 S—<1	6.8K	17K	100K
AC/DC-29—Replace EDG-3 with a diesel diverse from EDG-1 and EDG-2	Eliminate all CCFs between EDG-3 and EDGs-1/2.	IE—1 F—2 S—0	IE—<1 F—1 S—<1	18K	46K	4.2M
AT-05—Add an independent boron injection system	In response to an NRC staff RAI, eliminate failure of the SLC system and all risk from seismic damage state (SDS) 40 (Gambhir, 2010).	IE—2 F—0 S—0	IE—7 F—0 S—<1	41K	100K	800K
AT-07—Add a system of relief valves to prevent equipment damage from pressure spikes during an ATWS	Eliminate all CCFs of SRVs.	IE—0 F—0 S—0	IE—0 F—0 S—0	0	0	1.1M
AT-13—Automate SLC injection in response to ATWS event	Eliminate failures of operators to initiate SLC.	IE—<1 F—0 S—0	IE—1 F—0 S—0	9.7K	23K	660K
AT-14—Diversify SLC explosive valve operation	Eliminate CCFs between the SLC valves.	IE—0 F—0 S—0	IE—0 F—0 S—0	0	0	370K
Reduce Probability of an ISLOCA	Eliminate ISLOCA events.	IE—1 F—0 S—0	IE—3 F—0 S—0	20K	49K	
CB-01—Install additional pressure or leak monitoring instruments for detection of ISLOCAs						5.6M

SAMA	Assumptions	% Risk Reduction[c]		Total Benefit ($)[f]		Cost ($)
		CDF	Population Dose	Baseline (Internal + External)	Baseline With Uncertainty	
CB-03—Increase leak testing of valves in ISLOCA paths						400K
CB-08—Revise EOPs to improve ISLOCA identification						5.6M
CB-09—Improve operator training on ISLOCA coping						5.6M
CC-01—Install an independent active or passive high pressure injection system	Reduce probability of failure of the HPCS system to 1.0E-09 (Gambhir, 2011).	IE—60 F—74 S—2	IE—56 F—66 S—2	1.2M	3.0M	29M
CC-02—Provide an additional high pressure injection pump with independent diesel	Reduce probability of failure of the HPCS system to 1.0E-09 (Gambhir, 2011).	IE—60 F—74 S—2	IE—56 F—66 S—2	1.2M	3.0M	5.2M
CC-03b—Raise RCIC backpressure trip set points	Unavailability of RCIC for failure to run events is reduced by a factor of 3.	IE—<1 F—0 S—0	IE—0 F—0 S—0	<1K	1.4K	82K
CC-20—Improve ECCS suction strainers	Eliminate failures of the ECCS suction strainer due to plugging.	IE—1 F—0 S—0	IE—1 F—<1 S—0	7.4K	18K	10M
CP-01—Install an independent method of suppression pool cooling	eliminate failures of suppression pool cooling.	IE—33 F—54 S—1	IE—56 F—83 S—1	1.0M	2.6M	6.0M
CW-02—Add redundant DC control power for pumps	In response to an NRC staff RAI, eliminate failure of control power for the ECCS pumps (Gambhir, 2010).	IE—10 F—5 S—0	IE—13 F—(-)9 S—0	100K	240K	650K
Improve reliability of ECCS pumps	In response to an NRC staff RAI, essentially eliminate failure of the low-pressure ECCS pumps due to pump motor cooling dependencies on service water (Gambhir, 2011).	IE—3 F—3 S—0	IE—1 F—(-)9 S—0	-5.8K	-18K	
CW-03—Replace ECCS pump motors with air-cooled motors						1.1M

SAMA	Assumptions	% Risk Reduction[c]		Total Benefit ($)[f]		Cost ($)
		CDF	Population Dose	Baseline (Internal + External)	Baseline With Uncertainty	
CW-04—Provide self-cooled ECCS seals						675K
CW-07—Add a service water pump	In response to an NRC staff RAI, eliminate failure of one train of service water (Gambhir, 2010).	IE—11 F—12 S—0	IE—12 F—6 S—<1	190K	480K	6.1M
FR-03—Install additional transfer and isolation switches	Reduce the probability of the most risk significant hot shorts to 0.	IE—0 F—6 S—0	IE—0 F—2 S—0	36K	93K	2.0M
FR-07a—Improve the fire resistance of critical cables	**In response to an NRC staff RAI, eliminate fire-related failures of the containment vent (Gambhir, 2010).**	**IE—0 F—30 S—0**	**IE—0 F—47 S—0**	**320K**	**840K**	**400K**
FR-07b—Improve the fire resistance of critical cables	In response to an NRC staff RAI, eliminate hot shorts for transformer E-TR-S (Gambhir, 2010).	IE—0 F—3 S—0	IE—0 F—4 S—0	31K	81K	100K
FR-08—Improve the fire resistance of cables to RHR and SW	**Eliminate failure of RHR trains A and B due to a fire.**	**IE—0 F—56 S—0**	**IE—0 F—64 S—0**	**510K**	**1.3M**	**1.25M**
HV-02—Provide a redundant train or means of ventilation	In response to an NRC staff RAI, completely removed switchgear dependencies on HVAC and eliminated the loss of HVAC IEs (Gambhir, 2010).	IE—<1 F—0 S—0	IE—<1 F—0 S—0	2.2K	5.3K	480K
SR-03—Modify safety-related CST	In response to an NRC staff RAI, availability of the CST is credited during seismic events (Gambhir, 2010).	IE—0 F—0 S—1	IE—0 F—0 S—1	3.1K	9.3K	980K
SR-05R—Improve seismic ruggedness of MCC-7F and MCC-8F	**Eliminate loss of room cooling for Division 1 and 2 switchgear rooms in a seismic event.**	**IE—0 F—0 S—19**	**IE—0 F—0 S—0**	**57K**	**170K**	**150K**
OT-08R—Install explosion protection around CGS transformers	Eliminate plant-centered LOOP and switchyard-centered LOOP.	IE—1 F—0 S—0	IE—<1 F—0 S—0	9.4K	23K	700K

SAMA	Assumptions	% Risk Reduction[c]		Total Benefit ($)[f]		Cost ($)
		CDF	Population Dose	Baseline (Internal + External)	Baseline With Uncertainty	
FL-05R—Clamp on flow instruments to certain drain lines in the control building of the radwaste building and alarm in the control room	**Control building flood isolation HEPs are reduced to 1.0E-02.**	**IE—16 F—0 S—0**	**IE—35 F—0 S—0**	**250K**	**610K**	**250K**
FL-04R—Add one isolation valve in the service water, turbine SW, and FP lines in the control building area of the radwaste building	**Control building flood isolation HEPs are reduced to 0.0.**	**IE—17 F—0 S—0**	**IE—35 F—0 S—0**	**260K**	**620K**	**380K**
FL-06R—Additional NDE and inspections [in the control building]	**Control building flood isolation HEPs are reduced by a factor of 2.**	**IE—8 F—0 S—0**	**IE—18 F—0 S—0**	**130K**	**310K**	**14K**
CC-24R—Backfeed the HPCS system with SM-8 to provide a third power source for HPCS	**Eliminate loss of HPCS due to loss of AC power (both offsite and onsite).**	**IE—7 F—9 S—0**	**IE—7 F—13 S—0**	**170K**	**420K**	**105K**
CC-25R—Enhance alternate injection reliability by including RHR, SW and fire water cross-tie in the maintenance program	**Reduce the probability of failure of the subject valves to 0.0 from a probability based on a 10-year mean time between surveillance tests.**	**IE—1 F—1 S—0**	**IE—1 F—<1 S—<1**	**12K**	**29K**	**13K**
OT-07R—Increase operator training on systems and operator actions determined to be important from the PSA	**Top 10 most risk-significant HEPs are reduced by a factor of 10.**	**IE—25 F—5 S—0**	**IE—8 F—<1 S—0**	**200K**	**480K**	**40K**
FW-05R—Examine the potential for operators to control RFW and avoid a reactor trip	**Eliminate loss of RFW due to loss of DC power from DC Bus E-DP-S1/7 and reduce unavailability of DC Bus E-DP-S1/7 to 1.0E-09.**	**IE—3 F—7 S—0**	**IE—2 F—4 S—0**	**72K**	**180K**	**29K**
FR-09R—Install early fire detection in the following physical analysis units: R-1B, R-1D, and R-1J	Fire ignition frequencies in the most important fire areas of the reactor building are reduced by a factor of 10.	IE—0 F—15 S—0	IE—0 F—7 S—0	100K	260K	680K

SAMA	Assumptions	% Risk Reduction[c]		Total Benefit ($)[f]		Cost ($)
		CDF	Population Dose	Baseline (Internal + External)	Baseline With Uncertainty	
AT-15R—Modifications to make use of HPCS more likely for ATWS (use of auto bypass, installing throttle valve)	Reduce the HEP of failure to use HPCS during ATWS conditions to 1.0E-03.	IE—15 F—0 S—0	IE—1 F—0 S—0	80K	190K	2.8M
OT-09R—For the non-LOCA IEs, credit the Z (power conversion system recovery) function	**For transient initiators, eliminate tripping of MSIVs on high steam tunnel temperature.**	**IE—4 F—8 S—0**	**IE—5 F—13 S—0**	**130K**	**330K**	**130K**
FR-12R—Install early fire detection in the following physical analysis units: T-1A, T-12, T-1C, and T-1D	Fire ignition frequencies in the most important fire areas of the turbine building are reduced by a factor of 10.	IE—0 F—12 S—0	IE—0 F—12 S—0	110K	270K	725K
FR-11R—Install early fire detection in the following analysis units: RC-02, RC-03, RC-04, RC-05, RC-07, RC-08, RC-11, RC-13, RC-14, and RC-1A	**Fire ignition frequencies in the most important fire areas of the control building are reduced by a factor of 10.**	**IE—0 F—56 S—0**	**IE—0 F—63 S—0**	**510K**	**1.3M**	**1.0M**
FR-10R—Install early fire detection in the main control room: RC-10	Fire ignition frequencies in the main control room are reduced by a factor of 10.	IE—0 F—1 S—0	IE—0 F—2 S—0	14K	36K	535K
FL-07R—Protect the HPCS from flooding that results from ISLOCA events	Reduce the probability of failure of HPCS caused by flooding due to ISLOCA to 0.0.	IE—0 F—0 S—0	IE—2 F—0 S—0	11K	26K	1.05M
AC/DC-30R[d]—Provide an additional DG diverse from DG-1 and DG-2	Eliminate failure of EDG-2.	IE—<1 F—15 S—2	IE—<1 F—12 S—2	130K	350K	10M
CC-26R—Install hard pipe from diesel fire pump to vessel	Reduce HEPs for failure to align the diesel fire pump to the RPV to 0.0.	IE—<1 F—0 S—0	IE—<1 F—1 S—0	5.7K	14K	710K

SAMA	Assumptions	% Risk Reduction[c]		Total Benefit ($)[f]		Cost ($)
		CDF	Population Dose	Baseline (Internal + External)	Baseline With Uncertainty	
OT-10R—Increase fire pump house building integrity to withstand higher winds so the fire system will be capable of withstanding a severe weather event	Reduce the probability of failure of the pump house to 0.0 from a probability of 1.37E-04 for a high wind during a plant-initiating event and reduce the probability of a high wind given LOOP from a probability of 1.0.	IE—<1 F—0 S—0	IE—<1 F—0 S—0	1.5K	3.5K	735K
FW-04—Add a motor-driven FW pump	Reduce the probability of failure of RFW by a factor of 1,000 and eliminate dependencies between FW trains. Reduce the loss of FW initiating event frequency by a factor of 1,000.	IE—40 F—25 S—0	IE—42 F—26 S—0	620K	1.5M	10M
CB-10R—Provide additional NDE and inspections of MS pipe in turbine building	Reduce MS pipe break outside containment initiating event frequencies by a factor of 2.0.	IE—2 F—0 S—0	IE—2 F—0 S—0	20K	48K	125K

(a) SAMAs in **bold** are potentially cost-beneficial.

(b) Screening analysis assumptions and results, unless otherwise noted, are provided in the PSA Revision 7.1 sensitivity study (Gambhir, 2011).

(c) IE = internal events; F = fire events; S = seismic events

(d) Revised risk reduction and benefit results for this SAMA are provided in response to followup NRC staff RAI 8 (Swank, 2011).

(e) SAMA AC/DC-28 reduces CCFs among the EDGs by such actions as: providing separate fuel supplies, separate maintenance crews, diverse instrumentation, etc., as compared to SAMA AC/DC-29, which replaces EDG-3 with an EDG from a different manufacturer from EDG-1 and EDG-2 (EN, 2010).

(f) The total benefit is the sum of the benefits for internal events, fire events, seismic events, and HFO events.

F.5 Cost Impacts of Candidate Plant Improvements

Energy Northwest estimated the costs of implementing the candidate SAMAs through the development of site-specific cost estimates and use of other licensees' estimates for similar improvements. The cost estimates used from other SAMA analyses were adjusted for inflation. In response to an NRC staff RAI, Energy Northwest clarified that the site-specific cost estimates conservatively did not include contingency costs for unforeseen implementation obstacles, the cost of replacement power during extended outages required to implement the modifications, or the costs associated with recurring training, maintenance, and surveillance (Gambhir, 2010).

The NRC staff requested more information on the process Energy Northwest used to develop the site-specific cost estimates and the level of detail used to develop these estimates (Doyle, 2010a). Energy Northwest responded to the RAI by explaining that the cost estimates were developed by a team of three Energy Northwest and consultant personnel having over 50 years of cumulative experience at CGS and over 90 years of collective experience in the nuclear industry in areas of electrical and mechanical engineering, field engineering, design engineering, construction management, operations and maintenance support, licensing, and PSA (Gambhir, 2010). The team consulted with relevant plant experts in the conceptual development of each SAMA and used an interview process to develop the implementation costs. The experts interviewed had expertise in areas such as FP, operations and maintenance procedures, operations, training, design engineering, and system engineering. Cost elements considered in the development of the cost estimates generally included material, labor, engineering, licensing, training, procedures, and surveillance testing. The team also reviewed the cost estimates from published documents such as other SAMA analyses. Energy Northwest noted that if the estimated implementation cost was sufficiently greater than the maximum estimated benefit, a more detailed cost estimate was not developed. Energy Northwest emphasized that team focused on underestimating the actual cost of implementation in order to ensure that the estimates used in the cost-benefit evaluation were conservative. Based on the use of personnel having significant nuclear plant engineering and operating experience, the NRC staff considers the process Energy Northwest used to develop the site-specific cost estimates reasonable.

The NRC staff reviewed the bases for the applicant's cost estimates (presented in Table E.11-6 of Attachment E to the ER). For certain improvements, the NRC staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other applicants' analyses of SAMAs for operating reactors. The NRC staff noted that the estimated cost of $375,000 for SAMA AC/DC-23, "develop procedures to repair or replace failed 4 kV breakers," is high for what is described as procedure development (Doyle, 2010a). In response to the RAI, Energy Northwest clarified that this SAMA assumes that a 4,160 V breaker failure could be repaired within the necessary repair time if roll-in spares were staged and ready for replacing the failed breaker. Therefore, the estimated implementation cost includes the cost of eight spare breakers identified in the RAI response, procedure development, engineering evaluation, and staging restraints (Gambhir, 2010). Energy Northwest further noted that each breaker is estimated to cost $35,000 based on the current manufacturer's cost for a typical Class 1E 4,160 V, 1,200 amp breaker, for a total of $280,000 for procurement of the eight breakers. Installation of staging restraints and setup of the breakers is estimated to cost $45,000 for three different locations where the breakers are located, engineering evaluation and documentation is estimated to cost $30,000, and procedure development is estimated to cost $20,000. The NRC staff considers the estimated cost for CGS to be reasonable and acceptable for purposes of the SAMA evaluation.

The NRC staff noted that the implementation cost for SAMA CC-03b, “raise RCIC backpressure trip set points,” was estimated to be $82,000 and $160,000 in different sections of the ER and that both estimates seem high for what appears to be a minor software change (Doyle, 2010a). In response to the RAI, Energy Northwest clarified that the estimated implementation cost for this SAMA is $82,000, that implementing the SAMA requires an amendment to the CGS technical specifications, and that the cost estimate includes costs for licensing and NRC review in addition to engineering, maintenance, training, and procedures. Based on this additional information, the NRC staff considers the estimated cost to be reasonable and acceptable for purposes of the SAMA evaluation.

As indicated in Section F.3.2., NRC staff asked the applicant to provide more detailed descriptions of the modifications and cost estimates for several of the Phase II SAMA candidates (Doyle, 2010a). In response to the RAI, Energy Northwest provided more detail on both the modification and the estimated implementation costs for the following SAMAs (Gambhir, 2010):

- SAMA AC/DC-27, “install permanent hardware changes that make it possible to establish 500 kV backfeed through the main step-up transformer”
- SAMA CW-04, “provide self-cooled ECCS seals”
- SAMA FR-07a, “improve the fire resistance of cables to the containment vent valve”\
- SAMA FR-07b, “improve the fire resistance of cables to transformer E-TR-S”
- SAMA HV-02, “provide a redundant train or means of ventilation”

The NRC staff reviewed the cost estimates for SAMAs AC/DC-27, CW-04, and HV-02 and considers them to be reasonable and acceptable for purposes of the SAMA evaluation.

Relative to SAMAs FR-07a and FR-07b, the NRC staff noted that the cost estimates were based on replacing the existing cables with metal-sheathed cables and asked Energy Northwest to justify the use of metal-sheathed cables for electrical failure modes that may not be prevented by metal-sheathed cables (Doyle, 2010c). In response to the RAI, Energy Northwest clarified that basing the cost estimate for these SAMAs on metal-jacketed (armored) cable was not intended to imply that armored cable could be used to mitigate all spurious operations. The cost of armored cabling was used because it is among the least costly of a variety of options available to mitigate fire-induced spurious operations. Therefore, using it is conservative for purposes of the SAMA cost-benefit evaluation, and Energy Northwest has actual cost information from installation of armored cable from which to base the cost estimate (Gambhir, 2011). Energy Northwest further explained that during implementation of these SAMAs, specific protective schemes applicable to the circuit failure mode(s) of concern will be selected. Since the cost of armored cabling is a least cost option for protecting against fire-induced spurious operations, the NRC staff considers the cost estimates for these SAMAs reasonable and acceptable for purposes of the SAMA evaluation.

As indicated in Section F.2.1, in response to an NRC staff RAI, Energy Northwest provided the results of a sensitivity study using PSA model Revision 7.1 (Gambhir, 2011). In the sensitivity study, Energy Northwest noted that the estimated implementation costs for the following Phase I SAMAs that were based on industry estimates in the ER were revised in the sensitivity study to reflect site-specific cost estimates:

- SAMA AT-10, “install an ATWS sized filtered containment vent to remove decay heat”

- SAMA CP-12, “install a filtered containment vent to remove decay heat”
- SAMA CP-22, “increase depth of the concrete basemat or use an alternate concrete material to ensure melt-through does not occur”
- SAMA CP-24, “construct a building to be connected to primary/secondary containment and maintained at a vacuum”

Energy Northwest also noted that a cost estimate was developed for Phase I SAMA CC-12, “add a diverse low pressure injection system,” screened in the ER on very low benefit, using a cost estimate developed by another applicant for a similar improvement. The bases for the revised and new cost estimates are provided in Section 4.3 of the sensitivity study (Gambhir, 2011). The NRC staff reviewed the cost estimates for these SAMAs and considers them to be reasonable and acceptable for purposes of the SAMA evaluation.

The estimated costs for SAMA CB-08, “revise EOPs to improve ISLOCA identification,” and SAMA CB-09, “improve operator training on ISLOCA coping,” were reported in the ER to be $20,000 and $30,000, respectively. In the sensitivity study, Energy Northwest clarified that these cost estimates are in addition to the estimated implementation cost for the ISLOCA detection instrumentation provided for in SAMA CB-01, “install additional pressure or leak monitoring instruments for detection of ISLOCA paths” (Gambhir, 2011).

The NRC staff concludes that the cost estimates provided by Energy Northwest are sufficient and appropriate for use in the SAMA evaluation.

F.6 Cost-Benefit Comparison

CGS cost-benefit analysis and the NRC staff’s review are described in the following sections.

F.6.1 CGS’s Evaluation

The methodology used by Energy Northwest was based primarily on NRC’s guidance for performing cost-benefit analysis (i.e., NUREG/BR-0184, “Regulatory Analysis Technical Evaluation Handbook” (NRC, 1997a)). The guidance involves determining the net value for each SAMA according to the following formula:

Net Value = (APE + AOC + AOE + AOSC) - COE where:

APE = present value of averted public exposure ($)

AOC = present value of averted offsite property damage costs ($)

AOE = present value of averted occupational exposure costs ($)

AOSC = present value of averted onsite costs ($)

COE = cost of enhancement ($)

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA, and it is not considered cost-beneficial. Energy Northwest’s derivation of each of the associated costs is summarized below.

NUREG/BR-0058 has recently been revised to reflect the NRC’s policy on discount rates. Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed—one at 3 percent and one at 7 percent (NRC, 2004a). Energy Northwest provided a base set of results using the 7 percent discount rate and a sensitivity study using the 3 percent discount rate (EN, 2010). Energy Northwest also provided similar results for the sensitivity study discussed in Section F.2.1 (Gambhir, 2011).

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δ person-rem per year)
x monetary equivalent of unit dose ($2,000 per person-rem)
x present value conversion factor (13.05 based on a 35-year period with a 7-percent discount rate)

As stated in NUREG/BR-0184 (NRC, 1997a), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, which assumes elimination of all severe accidents due to internal, fire, and seismic events, Energy Northwest calculated an APE of approximately $96,000, $224,000, and $176,000, respectively, for the 35-year time period to expiration of the renewed CGS license (EN, 2010). For the sensitivity analysis using PSA model Revision 7.1, Energy Northwest calculated an APE of approximately $143,000, $234,000, and $154,000 due to internal, fire, and seismic events, respectively (Gambhir, 2011). The NRC staff notes that the benefit evaluation need only to be estimated for the 20-year license renewal period and therefore Energy Northwest's evaluation for CGS is conservative.

Averted Offsite Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction
x offsite economic costs associated with a severe accident (on a per-event basis)
x present value conversion factor

For the purposes of initial screening, which assumes all severe accidents due to internal, fire, and seismic events are eliminated, Energy Northwest calculated an annual offsite economic risk of about $6,100, $15,500, and $11,100, respectively, based on the Level 3 risk analysis. This results in a discounted value of approximately $80,000, $203,000, and $145,000 for internal, fire, and seismic events, respectively, for the 35-year time period to expiration of the renewed CGS license (EN, 2010). For the sensitivity analysis using PSA model Revision 7.1, Energy Northwest calculated an annual offsite economic risk of about $7,100, $11,200, and $8,400 and an AOC of approximately $92,000, $146,000, and $110,000 due to internal, fire, and seismic events, respectively (Gambhir, 2011).

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction

x occupational exposure per core damage event

x monetary equivalent of unit dose

x present value conversion factor

Energy Northwest derived the values for averted occupational exposure from information provided in Section 5.7.3 of the Regulatory Analysis Handbook (NRC, 1997a). Best estimate values provided for immediate occupational dose (3,300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2,000 per person-rem, a real discount rate of 7 percent, and a time period of 35 years to represent the period to expiration of the renewed CGS license. For the purposes of initial screening, which assumes all severe accidents due to internal, fire, and seismic events are eliminated, Energy Northwest calculated an AOE of approximately $2,200, $3,400, and $2,400, respectively, for the 35-year time period to expiration of the renewed CGS license (EN, 2010). For the sensitivity analysis using PSA model Revision 7.1, Energy Northwest calculated an AOE of approximately $3,500, $6,300, and $2,200 due to internal, fire, and seismic events, respectively (Gambhir, 2011).

Averted Onsite Costs (AOSC)

AOSCs include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. Energy Northwest derived the values for AOSC based on information provided in Section 5.7.6 of NUREG/BR-0184, the Regulatory Analysis Handbook (NRC, 1997a).

Energy Northwest divided this cost element into two parts—the onsite cleanup and decontamination cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost (RPC).

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction

x present value of cleanup costs per core damage event

x present value conversion factor

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the regulatory analysis handbook to be $1.5x109 (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed expiration of the renewed CGS license. For the purposes of initial screening, which assumes all severe accidents due to internal, fire, and seismic events are eliminated, Energy Northwest calculated an ACC of approximately $67,500, $104,000, and $73,900, respectively, for the 35-year time period to expiration of the renewed CGS license. For the sensitivity analysis using PSA model Revision 7.1, Energy Northwest calculated an ACC of approximately $105,600, $193,000, and $68,400 due to internal, fire, and seismic events, respectively (Gambhir, 2011).

Long-term RPCs were calculated using the following formula:

RPC = Annual CDF reduction

x present value of replacement power for a single event

x factor to account for remaining service years for which replacement power is required

x reactor power scaling factor

Energy Northwest based its calculations on the rated CGS net electric output of 1,107 megawatt-electric (MWe) per unit and scaled up from the 910 MWe reference plant in NUREG/BR-0184 (NRC, 1997). Therefore, Energy Northwest applied a power scaling factor of 1,107/910 to determine the RPCs. For the purposes of initial screening, which assumes all severe accidents due to internal, fire, and seismic events are eliminated, Energy Northwest calculated an RPC of approximately $99,600, $154,000, and 109,000, respectively, for the 35-year time period to expiration of the renewed CGS license. For the sensitivity analysis using PSA model Revision 7.1, Energy Northwest calculated an RPC of approximately $155,700, $284,000, and $101,000 due to internal, fire, and seismic events, respectively (Gambhir, 2011).

Using the results for ACC and RPC, Energy Northwest calculated an AOSC of approximately $167,000, $258,000, and $183,000 for internal, fire, and seismic events, respectively, for the 35-year time period to expiration of the renewed CGS license (EN, 2010). For the sensitivity analysis using PSA model Revision 7.1, Energy Northwest calculated an AOSC of approximately $261,000, $477,000, and $169,000 due to internal, fire, and seismic events, respectively (Gambhir, 2011).

Using the above equations, Energy Northwest estimated the total present dollar value equivalent associated with eliminating severe accidents from internal, fire, and seismic events at CGS to be about $346,000, $689,000, and $506,000, respectively, for a total of $1,541,000. Use of an internal events multiplier of 2.0 to account for other external events (i.e., high winds, external floods, etc.) increases the value to $1,887,000. This represents the dollar value associated with eliminating all internal and external event severe accident risk at CGS, and is also referred to as the modified maximum averted cost risk.

For the sensitivity analysis using PSA model Revision 7.1, Energy Northwest estimated the total present dollar value equivalent associated with eliminating severe accidents from internal, fire, and seismic events at CGS to be about $500,000, $863,000, and $436,000, respectively, for a total of $1.8 million (Gambhir, 2011). Use of an internal events multiplier of 2.0 to account for other external events (i.e., high winds, external floods, etc.) increases the value to $2.3 million.

Energy Northwest's Results

If the implementation costs for a candidate SAMA exceeded the calculated benefit, the SAMA was considered not to be cost-beneficial. In the baseline analysis contained in the ER (using a 7 percent discount rate), Energy Northwest identified no potentially cost-beneficial SAMAs. Based on a sensitivity analysis using a 3 percent discount rate, three SAMA candidates were determined to be potentially cost-beneficial. The potentially cost-beneficial SAMAs are as follows:

- SAMA AC/DC-28, "reduce CCFs between EDG-3 and EDG 1/2"
- SAMA FR-07a, "improve the fire resistance of cables to the containment vent valve"
- SAMA FR-07b, "improve the fire resistance of cables to transformer E-TR-S"

The potentially cost-beneficial SAMAs, and Energy Northwest's plans for further evaluation of these SAMAs are discussed in more detail in Section F.6.2.

F.6.2 Review of CGS's Cost-Benefit Evaluation

The cost-benefit analysis performed by Energy Northwest was based primarily on NUREG/BR-0184 (NRC, 1997a) and discount rate guidelines in NUREG/BR-0058 (NRC, 2004), and it was executed consistent with this guidance.

The risk reduction benefits associated with internal, fire, and seismic events were separately estimated by Energy Northwest using the internal events, fire events, and seismic events PSA models, respectively. Energy Northwest accounted for the potential risk reduction benefits associated with HFO events by assuming that the contribution from HFO events was the same as that from internal events. The estimated SAMA benefits for internal events, fire events, seismic events, and HFO events were then summed to provide an overall benefit. No SAMAs were determined to be potentially cost-beneficial from this evaluation.

Energy Northwest provided the assumptions and results of sensitivity analyses, including the following:

- RPC is 20 percent of the baseline RPC (Gambhir, 2010)
- use of 3 percent and 10 percent discount rates
- use of 14,000 person-rem for short term dose and 30,000 person-rem for long term doses
- use of an onsite cleanup and decontamination cost of $2 billion
- escalating the annual RPC to 2008 dollars by an average annual inflation rate of 4.1 percent (Gambhir, 2010)
- variations in MACCS2 input parameters (as discussed in Section F.2.2)

The results of the sensitivity case using a 3 percent discount rate resulted in three SAMAs (SAMAs AC/DC-28, FR-07a, and FR-07b, as described above) becoming potentially cost-beneficial (EN, 2010). Although not cost-beneficial in the baseline analysis, Energy Northwest committed to consider implementation of these three SAMAs through normal CGS processes for evaluating possible changes to the plant (EN, 2010).

The NRC staff noted that the ER states that the net and gross electrical power outputs for CGS are 1,190 MWe and 1,230 MWe, respectively, while Energy Northwest used a rated electrical power of 1,107 MWe in estimating RPCs. The staff requested that Energy Northwest provide the rationale for using 1,107 MWe in the SAMA analysis and to assess the sensitivity of the SAMA analysis results to this assumption (Doyle, 2010a). In response to the RAI, Energy Northwest clarified that 1,107 MWe represents a capacity factor of 93 percent of the net electrical output of 1,190 MWe (Gambhir, 2010).[1] Energy Northwest also provided the results of a sensitivity analysis using 1,190 MWe in estimating RPCs and determined that this change in assumption does not impact the conclusions of the SAMA analysis (i.e., none of the SAMAs previously determined to not be cost-beneficial became cost-beneficial).

As indicated in Section F.3.2, in response to an NRC staff RAI, Energy Northwest identified SAMA FR-08, "improve the fire resistance of cables to RHR and SW," to provide additional protection from MSOs in auto initiation circuits of RHR and service water (Gambhir, 2010).

[1] Crediting the reduction in electrical power level due to capacity factor, i.e., 1,190 MWe x 0.93=1,107 MWe, is atypical for SAMA analyses. However, Energy Northwest provided the sensitivity analysis using 1,190 MWe to indicate the reduction does not impact conclusions.

Energy Northwest provided a Phase II evaluation of this SAMA (Gambhir, 2010). Energy Northwest's analysis (using a 7 percent discount rate) determined that this SAMA candidate was not cost-beneficial in the baseline analysis.

As indicated in Section F.2.1, in response to an NRC staff RAI, Energy Northwest provided the results of a sensitivity study using PSA model Revision 7.1 (Gambhir, 2011). Energy Northwest provided a Phase II evaluation of the Phase II SAMAs using PSA model Revision 7.1. Also included in this sensitivity study was SAMA FR-08. Energy Northwest's analysis (using a 7 percent discount rate) determined that none of the SAMAs were cost-beneficial in the baseline sensitivity analysis.

As indicated in Section F.3.2, in response to NRC staff RAIs, Energy Northwest's review of the internal and fire basic events importance lists for PSA model Revision 7.1 resulted in the identification of the following additional SAMAs candidates (Gambhir, 2010), (Gambhir, 2011):

- SAMA AT-15R, "install modifications to make use of HPCS more likely for ATWS"
- SAMA FL-07R, "protect the HPCS from flooding resulting from ISLOCA events"
- SAMA OT-09R, "for the non-LOCA initiating events, credit the Z (power conversion system recovery) function"
- SAMA CB-10R, "provide additional NDE and inspections of MS piping in Turbine Building"
- SAMA FR-09R, "install early detection for FR1J (physical analysis unit R-1J) and FR1D (physical analysis unit R-1D"
- SAMA FR-10R, "install early detection in the Control Room (RC-10)"
- SAMA FR-11R, "install early detection for FW14 (analysis unit RC-14), FW04 (analysis unit RC-04), FW11 (analysis unit RC-11), FW03 (analysis unit RC-03), FW08 (analysis unit RC-08), FW05 (analysis unit RC-05), FW02 (analysis unit RC-02), FW13 (analysis unit RC-13), and FW1A (analysis unit RC-1A)"
- SAMA FR-12R, "install early detection for FT1A (physical analysis unit T-1A) and FT12 (physical analysis unit T-12)"
- SAMA AC/DC-30R, "provide an additional diesel generator (DG) diverse from DG-1 and DG-2"

Energy Northwest provided a Phase II evaluation of these SAMAs in the PSA model Revision 7.1 sensitivity study (Gambhir, 2011). Energy Northwest's analysis (using a 7 percent discount rate) determined that SAMA OT-09R was potentially cost-beneficial in the baseline sensitivity analysis.

As indicated in Section F.3.2, in response to an NRC staff RAI, Energy Northwest's review of the Phase II SAMAs from prior SAMA analyses for 12 General Electric BWR sites resulted in the identification of the following additional SAMA candidates (Gambhir, 2010), (Gambhir, 2011):

- SAMA FW-05R, "examine the potential for operators to control RFW and avoid a reactor trip"

- SAMA FL-04R, “install one isolation valve in each of standby SW, TSW, and FP lines in the Control Building area of the Radwaste Building to facilitate rapid isolation by the operators upon receipt of a high flow alarm”
- SAMA FL-05R, “install three clamp-on flow instruments to certain drain lines in the Control Building area of the Radwaste Building and alarm in the Control Room”
- SAMA FL-06R, “perform additional NDE inspections to the three lines identified in SAMA FL-04R to verify that degradation is not occurring in these lines”
- SAMA CC-24R, “backfeed the HPCS system with [emergency bus] SM-8 to provide a third power source for HPCS”
- SAMA CC-25R, “enhance alternate injection reliability by including residual heat removal service water and fire water crosstie in maintenance program”
- SAMA CC-26R, “install hard pipe from diesel fire pump to vessel”
- SAMA OT-07R, “increase operator training on systems and operator actions determined to be important from the PSA”
- SAMA OT-08R, “install explosion protection around CGS transformers”
- SAMA OT-10R, “increase fire pump house building integrity to withstand higher winds so the fire system will be capable of withstanding a severe weather event”

Energy Northwest provided a Phase II evaluation of each of these SAMAs in the PSA model Revision 7.1 sensitivity study (Gambhir, 2011). Energy Northwest’s analysis (using a 7 percent discount rate) determined that SAMAs FW-05R, FL-05R, FL-06R, CC-24R, and OT-07R were potentially cost-beneficial in the baseline sensitivity analysis.

As indicated in Section F.3.2, in response to an NRC staff RAI, Energy Northwest identified SAMA SR-05R, “improve seismic ruggedness of MCC-7F and MCC-8F,” to address a seismic improvement identified in the IPEEE (Gambhir, 2010). Energy Northwest provided a Phase II evaluation of this SAMA in the PSA model Revision 7.1 sensitivity study (Gambhir, 2011). Energy Northwest’s analysis (using a 7 percent discount rate) determined that this SAMA candidate was not cost-beneficial in the baseline sensitivity analysis.

Energy Northwest did not provide in the ER an assessment of the impact on the SAMA evaluation of CDF uncertainties based on their assumption that there were already a large number of conservative assumptions and inputs included in the baseline evaluation, which are delineated in Section E.12 of the ER. The NRC staff noted that this is not consistent with the guidance in NEI 05-01 and requested Energy Northwest provide an assessment of the impact of CDF uncertainties on the SAMA analysis (Doyle, 2010a), (Doyle, 2010c). In response to the RAI, Energy Northwest presents the results of an uncertainty analysis of the internal, fire, and seismic event CDFs for PSA model Revision 6.2, which indicates that the 95th percentile value is a factor of 2.7, 3.1, and 3.2, respectively, times the corresponding point estimate CDFs for CGS (Gambhir, 2010). Energy Northwest considered whether any additional Phase II SAMAs might be cost-beneficial if the benefits from internal events and other external events were increased by a factor of 2.7, if the benefits from fire events were increased by a factor of 3.1, and if the benefits from seismic events were increased by a factor of 3.2. SAMA FR-08 identified in response to an NRC staff RAI and described above was included in this uncertainty analysis. Energy Northwest ’s analysis (using a 7 percent discount rate) determined that SAMAs CC-03b, HV-02, and FR-08 are potentially cost-beneficial (Gambhir, 2011). SAMAs

AC/DC-28, FR-07a, and FR-07b, which were previously determined to be cost-beneficial in the 3 percent sensitivity case, were also determined to be cost-beneficial in the uncertainty analysis.

The NRC staff noted that Energy Northwest's CDF uncertainty analysis did not reconsider Phase I SAMAs that were screened on very low benefit or excessive implementation cost and asked Energy Northwest to reconsider these screened Phase I SAMAs based on their potential benefit from using the 95th percentile CDF factors (Doyle, 2010b). In response to this RAI, Energy Northwest reconsidered the Phase I SAMAs screened on very low benefit or excessive implementation cost as part of the PSA model Revision 7.1 sensitivity study discussed in Section F.2.2 (Gambhir, 2011). In this sensitivity study, Energy Northwest presents the results of an uncertainty analysis of the PSA model Revision 7.1 internal, fire, and seismic event CDFs, which indicates that the 95th percentile value is a factor of 2.4, 2.6, and 3.0, respectively, times the corresponding point estimate CDFs for CGS. Energy Northwest considered whether any additional Phase I SAMAs might be retained for further analysis based on the RRW benefit of each screened SAMA and the 95th percentile CDF factors. The RRW benefit for each SAMA was calculated as follows:

RRW Benefit = total present dollar value equivalent associated with completely eliminating severe accidents from internal, fire, or seismic events at CGS

x (1 – 1/RRW)

For each SAMA, a CDF and LERF RRW was determined based on its improvement of the specific hazard or hazards that are affected. The CDF and LERF RRW benefit for each hazard was calculated using the above equation. The RRW benefits from internal events were increased by a factor of 2.4, the RRW benefits from fire events were increased by a factor of 2.6, the RRW benefits from seismic events were increased by a factor of 3.0, and the RRW benefits from other external events were assumed to be equal to the RRW benefits from internal events after being increased by the factor of 2.4. The total of the CDF and LERF RRW benefits with uncertainty factors applied (using a 7 percent discount rate) were summed and, if the result was greater than the estimated implementation cost of the SAMA, it was retained for further analysis. One such Phase I SAMA, as indicated in Section F.3.2, was identified—SAMA FW-04, “add a motor-driven feedwater pump.” The specific rationale for screening the other Phase I SAMA candidates is provided in Tables A-15 and A-16 of the sensitivity study (Gambhir, 2011). Several of the Phase I SAMA candidates originally screened in the ER on very low benefit or excessive implementation cost were screened by Energy Northwest in the sensitivity study as not applicable to CGS or already implemented at CGS after further consideration of the SAMA. The NRC staff noted that several of the Phase I SAMAs were screened based on dividing the total estimated benefit by the number of trains or components and asked Energy Northwest to re-assess the screening of these SAMAs by considering the entire risk reduction (Doyle, 2011a). Energy Northwest responded to the RAI by providing an estimated implementation cost to address the entire risk reduction potential for each of these SAMAs and determined that in each of these cases these SAMAs would continue to be screened on excessive implementation cost (Swank, 2011). Based on this additional information, the NRC staff considers the applicant's rationale for screening the other Phase I SAMAs from further consideration in the Phase II evaluation to be reasonable.

In the sensitivity study, Energy Northwest also presents the results of an uncertainty analysis in which the estimated benefits from internal events and other external events, fire events, and seismic events were increased by a factor of 2.4, 2.6, and 3.0, respectively. The additional Phase I SAMA, SAMA FW-04, as described above, was included in this sensitivity analysis.

Also included in this sensitivity analysis were the additional SAMAs identified in response to NRC staff RAIs, as described above. Four SAMAs became cost-beneficial in Energy Northwest's analysis (SAMAs SR-05R, FL-04R, CC-25R, and FR-11R, as described above). SAMAs FR-07a and FR-08, which were previously determined to be cost-beneficial, were also determined to be cost-beneficial in the uncertainty analysis.

In the sensitivity study, Energy Northwest provided the assumptions and results of sensitivity analysis assuming use of 3 percent (Gambhir, 2011). This analysis did not identify any additional potentially cost-beneficial SAMAs.

The NRC staff observed that the SAMA candidates that were screened in the Phase I evaluation by being subsumed could potentially have a lower implementation cost than the SAMA candidate in which it was subsumed. The staff requested that Energy Northwest provide a Phase II evaluation of these SAMAs (Doyle, 2010a), (Doyle, 2010c). In response to the RAI, Energy Northwest provided the estimated benefits and implementation costs for SAMA AC/DC-02, "replace lead-acid batteries with fuel cells," SAMA AC/DC-03, "add a portable diesel-driven battery charger to existing DC system," SAMA AC/DC-15, "install a gas turbine generator," and SAMA AC/DC-16, "install tornado protection on gas turbine generator," using both PSA model Revision 6.2 and Revision 7.1 (Gambhir, 2010), (Gambhir, 2011). Energy Northwest's analysis (using a 7 percent discount rate) determined that none of these SAMA candidates were cost-beneficial in either the baseline or the uncertainty analysis for either PSA model Revision 6.2 or Revision 7.1.

Energy Northwest also noted that the ER provided a cost-benefit evaluation of SAMA CB-03, "increase leak testing of valves in ISLOCA paths," SAMA CB-08, "revise EOPs to improve ISLOCA identification," and SAMA CB-09, "improve operator training on ISLOCA coping," even though these SAMAs were stated to have been screened in the Phase I evaluation by being subsumed. As discussed in Section F.3.1, a Phase II evaluation of these three SAMAs was provided in the ER, the results for which are included in Table F-10 (EN, 2010). Energy Northwest also provided a Phase II evaluation of these SAMAs in the sensitivity study using PSA model Revision 7.1, the results for which are included in Table F-11 (Gambhir, 2011). Energy Northwest's analysis (using a 7 percent discount rate) determined that none of these SAMA candidates was cost-beneficial in either the baseline or the uncertainty analysis for either PSA model Revision 6.2 or Revision 7.1.

As indicated in Section F.3.2, the NRC staff noted that for certain SAMAs considered in the ER, there may be alternatives that could achieve much of the risk reduction at a lower cost (Doyle, 2010a). The NRC staff asked the applicant to evaluate additional lower cost alternatives to the SAMAs considered in the ER, as summarized below:

- Establishing procedures for opening doors or using portable fans or both for sequences involving room cooling failures, such as the EDG room—In response to the NRC staff RAI, Energy Northwest noted that Phase I SAMA HV-03, "enhance procedures for actions on loss of HVAC," considered the opening of doors and use of portable fans as potential improvements at CGS, and existing CGS procedures already included these operator actions if conditions were favorable (Gambhir, 2010). Specific areas where this alternate means of room cooling was found to be effective and proceduralized were the critical switchgear rooms, the ECCS pump rooms, and the MCC rooms in the reactor building. Thermal dynamic analyses were performed where needed to determine that the alternative method of room cooling would be effective and to ensure adequate response time to implement the procedures. Energy Northwest further explained that the proposed alternate means of room cooling is of limited benefit for the DG room areas because of the need to avoid drawing the heat from these areas into the adjacent electrical equipment panel room, in which the electronics have a lower temperature limit than in the DG room areas. Based on this logic, Energy Northwest screened SAMA HV-03 in the Phase I evaluation. The NRC staff concludes that this alternative has been adequately addressed.

- Using a portable independently powered pump to inject into containment—In response to the NRC staff RAI, Energy Northwest clarified that CGS already has the capability and procedures to connect fire water to the condensate system so as to inject fire water into the RPV to flood containment via a breach in the RPV and connect fire water to the containment spray system via a pumper truck so as to inject fire water into containment via containment spray (Gambhir, 2010). Given these existing capabilities, Energy Northwest concluded that the intent of the proposed alternative has already been met at CGS. The NRC staff agrees with this conclusion.
- Using the security DG or EDG-4 or both to extend the life of the 125-V DC batteries—In response to the NRC staff RAI, Energy Northwest stated that Phase I SAMA AC/DC-03, "add a portable, diesel-driven battery charger to existing DC system," consists of constructing a permanent location for the portable EDG-4, which can be aligned to two different MCCs (MC-7A or MC-8A) that provide both AC power and DC power (through the battery charger) to the aligned train (Gambhir, 2010). Energy Northwest further noted that SAMA AC/DC-03, while originally screened in the Phase I evaluation, was evaluated in response to a separate NRC staff RAI (discussed above), the results of which are provided in Tables F-10 and F-11, and determined to not be cost-beneficial. Energy Northwest also explained that SAMA AC/DC-03 is a lower cost alternative to using the CGS security DG because its use would result in multiple use issues and require additional distribution equipment and cabling. The NRC staff concludes that this alternative has been adequately addressed.
- Using a portable generator to provide power to individual 125-V DC MCCs upon loss of a DC bus to improve availability of HPCS—In response to the NRC staff RAI, Energy Northwest stated that this SAMA would only be beneficial for scenarios in which HPCS is operating on its DG (EDF-3) power so that AC power is available and the HPCS DC charger or battery is lost (Gambhir, 2010). Energy Northwest determined that the RRW for the HPCS DC system is less than 1.005 and concluded that this SAMA would be of very little benefit and not be cost-beneficial. Since the RRW of 1.005 corresponds to a benefit of approximately $12,000, which is less than the minimum cost of $100,000 for a hardware change, the NRC staff agrees with Energy Northwest's conclusion that the proposed alternative is unlikely to be cost-beneficial.

Energy Northwest stated that the six potentially cost-beneficial SAMAs (SAMAs AC/DC-28, CC-03b, FR-07a, FR-07b, FR-08, and HV-02), identified in the ER and in response to NRC staff RAIs using PSA model Revision 6.2, will be further evaluated through the normal processes for evaluating possible plant changes at CGS (EN, 2010), (Gambhir, 2011). Energy Northwest also stated that the 10 additional potentially cost-beneficial SAMAs (SAMAs SR-05R, FL-05R, FL-04R, FL-06R, CC-24R, CC-25R, OT-07R, FW-05R, OT-09R, and FR-11R), identified in response to NRC staff RAIs using PSA model Revision 7.1, will be further evaluated through the normal processes for evaluating possible plant changes at CGS (Gambhir, 2011). In response to an NRC staff RAI, Energy Northwest clarified that the normal process for evaluating possible plant changes at CGS involves first entering the cost-beneficial SAMA candidate into the action request system for SAMAs that require plant modifications or procedure changes and submitting a training request for SAMAs that require training (Gambhir, 2011). After the requests are submitted, formal processes are followed for each SAMA type (i.e., hardware modification, procedure change, training) to determine if the SAMA is ultimately implemented.

The NRC staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the other SAMAs evaluated would be higher than the associated benefits.

F.7 Conclusions

Energy Northwest compiled a list of 151 SAMAs based on a review of the dominant cutsets and most significant plant systems from the plant-specific internal events PRA, insights from the plant-specific IPE and IPEEE, Phase II SAMAs from LRAs for other plants, and review of other industry documentation. A qualitative screening removed SAMA candidates that modified features not applicable to Energy Northwest due to design differences or have already been implemented at CGS, were determined to provide very little benefit, were similar to another SAMA under consideration and was subsumed into the similar SAMA, and have implementation costs that exceed that maximum benefit. Based on this screening, 123 SAMAs were eliminated, leaving 28 candidate SAMAs for evaluation.

For the remaining SAMA candidates, more detailed design and cost estimates were developed as shown in Table F-10. The cost-benefit analyses showed that none of the SAMA candidates were potentially cost-beneficial in the baseline analysis. Energy Northwest performed additional analyses to evaluate the impact of parameter choices on the results of the SAMA assessment. As a result, three SAMAs were identified as potentially cost-beneficial in the ER (SAMAs AC/DC-28, FR-07a, and FR-07b). In response to an NRC staff RAI, Energy Northwest evaluated the same SAMA candidates, and additional SAMA candidates identified in response to NRC staff RAIs, using the 95 percentile internal, fire, and seismic event CDFs to account for uncertainties in the PSA models. This analysis identified three additional SAMAs (SAMA CC-03b, FR-08, and HV-02) as being potentially cost-beneficial. In response to another NRC staff RAI, Energy Northwest performed a sensitivity study to address concerns regarding a significant update to the CGS PSA model since the SAMA analysis was developed. In this sensitivity analysis, Energy Northwest re-evaluated, using the updated CGS PSA model, each of the initial 28 candidate SAMAs and several additional SAMA candidates identified in response to NRC staff RAIs. The SAMA candidates evaluated in the sensitivity study are shown in Table F-11. This study showed that 10 additional SAMAs (SAMA SR-05R, FL-05R, FL-04R, FL-06R, CC-24R, CC-25R, OT-07R, FW-05R, OT-09R, and FR-11R) were potentially cost-beneficial. Energy Northwest has indicated that all 16 potentially cost-beneficial SAMAs will be further evaluated through the normal processes for evaluating possible plant changes at CGS.

The NRC staff reviewed the Energy Northwest analysis and concludes that the methods used, and the implementation of those methods, were acceptable. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Energy Northwest are reasonable and sufficient for the license renewal submittal. The level of treatment of SAMAs for external events was deemed sufficient to support the conclusion that the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, separate analysis of fire and seismic events, and inclusion of a multiplier to account for other external events. Therefore, the NRC staff concurs with Energy Northwest’s identification of 16 potentially cost-beneficial SAMAs.

One of these 16 SAMAs—SAMA FL-06R—entails additional NDE and inspection of certain water pipes to lower the risk of flooding due to a pipe break. The NRC noted that SAMA FL-06R appears to relate to managing the effects of aging and may be mandated by the NRC as part of license renewal pursuant to 10 CFR Part 54. The NRC asked for more information about the relationship to the aging management programs proposed in the safety portion of the LRA (Doyle, 2011b), (Cunanan, 2011). Energy Northwest responded by stating that the piping is within the scope of aging management programs (Swank, 2011) but that corrective actions to adjust preventative maintenance activities have already been completed such that SAMA FL-06R would now screen out in Phase 1 as already implemented (Javorik, 2011). Because SAMA FL-06R has already been implemented at CGS, which would have constituted its being screened out during Phase 1 of the SAMA evaluation, the NRC concludes that no further actions are necessary.

Given the potential for cost-beneficial risk reduction, the NRC staff agrees that further evaluation of the remaining 15 SAMAs by Energy Northwest through its long-range planning process is appropriate. The staff concludes that the mitigative alternatives for these 15 do not involve aging management of passive, long-lived systems, structures, and components during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

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APPENDIX G
DESCRIPTION OF PROJECTS CONSIDERED IN THE CUMULATIVE IMPACTS ANALYSIS

G DESCRIPTION OF PROJECTS CONSIDERED IN THE CUMULATIVE IMPACTS ANALYSIS

To evaluate cumulative impacts, the incremental impacts of the proposed action, as described in Sections 4.1–4.9, are combined with other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. The U.S. Nuclear Regulatory Commission (NRC) staff (staff) used the information in the Environmental Report (ER); responses to requests for additional information (RAIs); information from other Federal, state, and local agencies; scoping comments; and information gathered during the visits to the Columbia Generating Station (CGS) site to identify other past, present, and reasonably foreseeable actions. Other actions and projects that were identified during this review, and considered in the staff's independent analysis of the potential cumulative effects, are described in Table G-1.

Table G-1. Other projects and actions considered in the cumulative analysis for Columbia Generating Station

Project name	Summary of project	Location	Status
	Activities on the Hanford Site		
Cleanup & restoration activities at Hanford	Various actions taken to remediate and restore areas of the Hanford Site. For example, the U.S. Department of Energy (DOE) Columbia River Closure Project would stabilize, maintain, or remove retired plutonium production reactors, support facilities, waste sites, and burial grounds used during World War II and the Cold War. This area includes approximately 218 square miles along the Columbia River corridor. DOE would also characterize and remediate the 618-10 and 618-11 burial grounds (DOE, 2011a), (EN, 2010a). A primary goal of the River Corridor Closure Project is to remove materials that could contaminate groundwater (WCH, 2010). Recent efforts to clean up and protect groundwater are described in DOE's CERCLA 5-Year Review Report for the Hanford Site (DOE, 2006) and DOE (2009a). Additional details regarding cleanup activities that would occur throughout the Hanford Site are described in more detail in DOE's Tank Closure and Waste Management EIS for the Hanford Site, Richland, Washington, in Chapter 2, Chapter 6, and Appendix R (DOE, 2009a). Some of these activities include retrieval of suspect transuranic waste buried after 1970, construction and operation of the environmental restoration disposal facilities near the 200-West Area, and final disposition of the canyons, PUREX Plant, PUREX tunnels and other facilities in the 200 Area (DOE, 2009a).	The 618-11 burial ground is adjacent to CGS, and the 618-10 burial ground is approximately 3.5 miles (mi) south of CGS. Other activities would occur throughout Hanford.	Characterization and remediation of burial ground 618-10 is in progress. Characterization and remediation for the 618-11 burial ground is scheduled to begin in February 2011 (EN, 2010a). The entire River Corridor Closure Project, including work at the 618-10 and 618-11 burial grounds, is expected to be completed by 2018 (DOE, 2011a). Cleanup and restoration for other activities would occur through the end of the renewed license term.
Tank Closures at Hanford	DOE is considering tank waste storage, retrieval, treatment, disposal, and final tank closure for the single-shell tank system for approximately 55 million gallons of mixed radioactive and chemically hazardous waste in 177 large underground tanks at Hanford (DOE, 2009a). DOE is currently constructing a waste treatment plant (WTP) in the 200-East Area of Hanford. DOE would operate this facility by separating waste into high-level waste and low-activity waste	WTP is approximately 10 mi northwest from CGS. Tanks and other facilities are located throughout	DOE's draft Tank Closure and Waste Management EIS for the Hanford Site, Richland, Washington, was published in October 2009. WTP is currently under

Project name	Summary of project	Location	Status
	streams, vitrifying the high-level waste stream and immobilizing the low-activity waste stream. The WTP would be powered by diesel fuel or natural gas. If natural gas is used, a new pipeline would be built. DOE is currently analyzing those environmental impacts in a separate EIS (DOE, 2012).	Hanford Site.	construction.
Decommissioning, Deactivation, & Closure of Various Facilities at Hanford	DOE is proposing to decommission the fast flux test facility (FFTF), a nuclear test reactor. Decommissioning activities would include management of decommissioning-generated waste and disposition of Hanford's inventory of radioactively contaminated bulk sodium. DOE also proposes for decommissioning, deactivation, or closure of eight surplus production reactors and their support facilities in the 100 Area, the N Reactor and support facilities, the Plutonium Finishing Plant in the 200-West Area, and the U Plant regional closure (DOE, 2009a).	FFTF is approximately 4 mi southwest of CGS. Other facilities occur throughout Hanford Site.	For the FFTF, the draft EIS was published in October 2009. Decommissioning activities for the N Reactor would occur by 2068 (DOE, 2005) and by 2080 for the eight surplus production reactors (DOE, 1989). Deactivation and closure activities for the Plutonium Finishing Plant in the 200-West Area and the U Plant regional closure is ongoing (DOE, 2009a).
Waste Management at Hanford	DOE is proposing to expand or upgrade the existing waste storage, treatment, and disposal capacity at Hanford in order to support current and future waste management activities for onsite and offsite waste. Proposed management of solid waste operations and proposed disposal of low-level radioactive waste (LLW) and mixed low-level radioactive waste (MLLW) from Hanford and other DOE sites are described in DOE (2009a). Additional waste management programs include construction and operation of facilities of disposal of greater-than-Class C LLW (DOE, 2011b) and operation of the U.S. Ecology commercial LLW disposal site near the 200-East Area (WSDOE and WSDOH, 2004).	Throughout Hanford Site	Activities would occur through license term.
Transportation of radioactive & chemical waste throughout Hanford and removal from the Hanford Site to other locations	DOE would transport radioactive and chemical waste throughout and off the Hanford Site, as described in DOE (2009a). Example activities include transportation and disposal of decommissioned Navy reactor plants (61 FR 41596), transportation of sodium-bonded spent nuclear fuel to Idaho National Lab for treatment (65 FR 56565), and transportation of transuranic waste to a Waste Isolation Pilot Plant in New Mexico (63 FR 3624).	Throughout Hanford Site and to offsite destinations beyond 100 mi of CGS	Transportation of sodium-bonded spent nuclear fuel would occur in 2012 (DOE, 2000). Other activities would occur through the end of the renewed license term.
Energy Park at Hanford	As part of the DOE footprint reduction at Hanford from cleanup, decommissioning, and closure activities described above, an energy park would be built to help sustain the local economy. The goal of the energy park would be to increase the supply of renewable energy (such as solar, wind, and other types of energy) and to sustain the local and regional economies by providing jobs at new energy production facilities	Near 100 and 300 Areas at Hanford	Proposals have been submitted to DOE (Gambhir, 2010).

Project name	Summary of project	Location	Status
	(DOE, 2010a). Mid-Columbia Energy Initiative, which would be operated by Energy Northwest, has submitted a proposal to lease land from DOE to make available for public and private energy demonstration projects and partnerships. Technology that may be pursued as part of this initiative includes solar, biofuels, and small modular nuclear units (Gambhir, 2010).		
Industrial Development Center	Location of terminated nuclear energy projects (WNP-1 and WNP-4) by Energy Northwest—The site is currently leased to DOE contractors and other commercial entities and contains shops, warehouses, and office space (EN, 2010b). Future activity could occur adjacent to the IDC in an area where Energy Northwest is promoting energy generation (EN, 2010b).	Adjacent to CGS	Construction of WNP-1 and WNP-4 was terminated in the early 1980s, and NRC terminated the construction permit in 2007 (NRC, 2007). Other facilities on this site are operational.
Additional ground disturbing activities throughout Hanford	In addition to the cleanup, waste management, transportation, decommissioning and other activities described above, other ground disturbing activities would occur—such as the construction and operation of a Physical Sciences Facility at Pacific Northwest National Laboratory (PNNL), excavation and use of geologic materials from existing borrow pits, and other activities described in Appendix D in DOE (2009a). In addition, DOE is proposing to remove excess communication facilities, infrastructure, and miscellaneous debris within the Fitzner/Eberhardt Arid Lands Ecology Reserve. Communication infrastructure needed by DOE, U.S. Fish and Wildlife Service (USFWS), local governments, and other organizations would be consolidated into a single facility (DOE, 2009b).	Throughout Hanford Site	Activities would occur through license term.
Nuclear fabrication, waste treatment, or medical isotope production facilities not on the Hanford Site			
Perma-Fix Northwest waste treatment facility	The LLW and MLLW treatment facility is licensed under NRC regulations (State of Washington licenses WN-I00393-1 & WN-I00508-1) and permitted under the Resource Conservation and Recovery Act regulations through the State of Washington.	Approximately 9 mi south of CGS	Operational
AREVA NP nuclear fuel fabrication facility	Nuclear fuel fabrication facility located in Richland, Washington—The facility is licensed under NRC regulations and inspected regularly by the NRC (NRC, 2010).	Approximately 9 mi south of CGS	Operational
Westinghouse's Richland Service Center	The Richland Service Center supplies various waste and chemical cleaning services to the nuclear industry.	Approximately 10 mi south of CGS	Operational
IsoRay Medical Isotope facility	IsoRay Medical produces and sells Cesium-131 (131-Cs or 131Cs), which is a medical radioisotope that can be used for the treatment of various cancers and other diseases.	Approximately 10 mi south of CGS	Operational
Moravek Biochemicals facility	Moravek Biochemicals produces and sells radiochemicals and inorganic compounds (DOE, 2009a).	Approximately 10 mi south of CGS	Operational
Cleanup of Environmental	The cleanup of toxic sites throughout the State of Washington, as specified by EPA's National Priorities	Throughout the State of	Sites are currently listed as a national

Project name	Summary of project	Location	Status
Protection Agency (EPA) National Priorities List sites and state toxic waste sites	List, includes areas on the Hanford Site, Pasco sanitary landfill, Umatilla Army Depot, and the Yakima Pit (EPA, 2010).	Washington	priority site for cleanup.
	Energy projects		
Priest Rapids Hydroelectric Project, consisting of the Priest Rapids & Wanapum Dams	There are 3,104 acres of Federal land managed by the U.S. Bureau of Reclamation, U.S. Bureau of Land Management, U.S. Department of the Army, U.S. Fish and Wildlife Service (USFWS), DOE, and Bonneville Power Administration (BPA) and 1,135 hectares (2,804 acres) of Washington State land (FERC, 2006). Future construction proposed by Grant County Public Utility District (PUD) includes installing advanced-design turbines, improving downstream fish bypass facilities, and creating and carrying out programs to protect anadromous and resident fish and wildlife and cultural resources (Grant County PUD, 2003). Habitat restoration activities also occur within the area, as described in the National Marine Fisheries Service's (NMFS) biological opinion for the Upper Columbia River spring-run Chinook salmon and Upper Columbia River steelhead (NMFS, 2004).	Approximately 47 mi upstream	License renewal was granted by the FERC in April 2008, which extends the operations period 44 years.
Wind projects, including Big Horn, Combine Hills II, Desert Claim, & Wild Horse	Four wind projects within 50 mi of Hanford have been proposed, constructed, or are operational, including Big Horn, Combine Hills II, Desert Claim, and Wild Horse (DOE, 2009a), (EFSEC, 2009). Development of addition wind projects within the area is likely given the natural potential for wind power (e.g., wind speeds) (DOE, 2010b) and projected growth rates in the region (see Section 2.2.8), and since Washington State requires new coal-fired power plants to include provisions for carbon capture and storage (see Section 8.1.2).	50–100 mi from CGS	Construction and operations would occur through license term.
McNary-John Day Transmission Line	BPA is proposing to build a new 79-mi 500 kilovolt (kV) transmission line. The transmission line would begin at the McNary Substation, near the McNary Dam in Oregon, and run along the Columbia River in Benton, Yakima, Klickitat Counties, Washington, and then cross the Columbia River and terminate at the John Day Substation, near the John Day Dam in Oregon. The new transmission line would be collocated with existing BPA transmission lines.	Ranges from 36 to over 50 mi from CGS	Construction is expected to begin in 2009 (BPA, 2010).
Vantage-Pomona Heights Transmission Line Project	Pacific Power is proposing to build and operate a new 230 kV electric transmission line that would cross Federal lands managed by the Bureau of Land Management (BLM) and the U.S. Army-Yakima Training Center (YTC). The transmission line would begin at the Pomona Heights substation, located near the southwest corner of the YTC, run eastward, and terminate at the Vantage substation near the Wanapum Dam on the Columbia River. As of December 2011, Pacific Power was considering several route alternatives (BLM, 2011).	Ranges from 25 mi to over 50 mi from CGS	Construction would likely occur from 2012–2013 with an in-service date expected in 2013 (Pacific Power, 2011).
Other energy projects	Other energy projects include maintenance and upgrades to, or construction and operation of, transmission lines (such as the 17-mi 500 kV line and	Throughout region	Operational

Project name	Summary of project	Location	Status
	10-mi 230 kV transmission lines from the Ashe substation to the BPA), biofuel facilities, and natural gas terminals, pipelines, and storage projects, as described in DOE (2009a).		
	Other projects		
Hanford Reach National Monument & Saddle Mountain National Wildlife Refuge	The Hanford Reach National Monument covers an area of 196,000 acres on the Hanford Site. The area includes a biologically diverse landscape, native shrub and grassland steppe that is considered an endangered ecosystem by U.S. Department of Interior, and a variety of cultural resources. Recreational opportunities include hiking, boating, fishing, hunting, and wildlife viewing (USFWS, 2010).	3–25 mi from CGS	Continued and increased opportunities for recreation and conservation of natural and cultural resources; development is unlikely in this area (USFWS, 2008).
Yakima River Basin Integrated Water Resource Management	The Yakima River Basin Integrated Water Resource Management Plan would result in a variety of actions to improve water supply and fish habitat, including the addition of fish passage at existing reservoirs, new or expanded storage reservoirs, groundwater storage, fish habitat enhancements on the mainstem Yakima River and its tributaries, enhanced water conservation, and market-based reallocation of water resources (WSDOE, 2009).	Throughout the Yakima drainage basin	The final EIS for the preliminary plan was published in June 2009 (WSDOE, 2009). On March 9, 2011, the Yakima River Basin Water Enhancement Project Working Group voted to support the final element of the Proposed Integrated Water Resource Management Plan. As of May 2011, the implementation committee is prioritizing projects and developing an environmental impact statement based on the refined plan (WSDOE, 2011).
Moses Lake Siphon	Installation of the second barrels of the Weber Branch Siphon and the Weber Coulee Siphon (Reclamation 2010)—Construction of the siphons is needed to transport additional waters of the Columbia Basin Project via the existing East Low Canal.	11 mi east of Moses Lake; 25 mi northwest from CGS	Construction began in April 2010.
Umatilla Army Depot	Closure of the Umatilla Army Depot is associated with the loss of 884 regional jobs (512 direct and 372 indirect) (BRAC, 2005).	43 mi south of CGS	Umatilla Army Depot was listed for closure in 2005.
Fort Lewis & Yakima Training Center (YTC)	Increase the number of soldiers stationed at Fort Lewis and YTC by approximately 5,700 soldiers and 8,260 family members—To accommodate growth, new construction would occur and could include new or expanded barracks, maneuver and live fire training grounds, motor pools, classrooms, and administrative facilities (Army, 2009).	7 mi northeast of the city of Yakima; 55 mi west of CGS	Construction activities would occur through 2015.
Expansion of academic facilities	Washington State University Tri-Cities campus would be expanded and a Kadlec Medical Center and Columbia Basin Community College new health	8–20 mi south of CGS	Construction would be completed by 2020.

Project name	Summary of project	Location	Status
	science building would be constructed.		
Mining	Primary resources extracted include sand, gravel, and basalt. The Washington State Surface Mine Reclamation Act states that surface mines more than 3 acres in size or with a highwall that is higher than 30 feet and steeper than 45 degrees must be reclaimed (WDNR, 2010a).	Throughout region (WDNR, 2010 b)	Operational—future expansion and new mines are expected to provide construction materials.
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; and water and wastewater treatment and distribution facilities and associated pipelines as described in local land-use planning documents (Benton County, 2007) and in Appendix R of DOE (2009a)—As a result of increased urbanization, the cities of Richland, Pasco, and Kennewick (Tri-Cities) are expected to withdraw up to 178 cubic feet per second per year from the Columbia River for municipal, industrial, and commercial uses (Surface Water Application No. S4-30976). The American Recovery and Reinvestment Act (2009) is funding several infrastructure modernization projects, including reconstruction of runways, facility improvements within school districts, and highway expansion and construction projects within the area (Recovery, 2009).	Throughout region	Construction would occur in the future, as described in state and local land-use planning documents (Benton County, 2007).

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NRC FORM 335 (12-2010) NRCMD 3.7 **U.S. NUCLEAR REGULATORY COMMISSION** **BIBLIOGRAPHIC DATA SHEET** *(See instructions on the reverse)*	1. REPORT NUMBER **(Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.)** NUREG-1437, Suplement 47, Vol. 2
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11. ABSTRACT (200 words or less)

This final supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted by Energy Northwest to renew the operating license for Columbia Generating Station (CGS) for an additional 20 years.

The final SEIS includes the NRC staff's analysis that evaluates the environmental impacts of the proposed action and alternatives to the proposed action. Alternatives considered include replacement power from new natural gas-fired combined-cycle generation; new nuclear generation; a combination alternative that includes some natural gas-fired capacity, energy conservation, a hydropower component, and a wind-power component; and not renewing the license (the no-action alternative).

The U.S. Nuclear Regulatory Commission's (NRC) recommendation is that the adverse environmental impacts of license renewal for CGS are not great enough to deny the option of license renewal for energy-planning decisionmakers. This recommendation is based on: (1) the analysis and findings in NUREG-1437, Volumes 1 and 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants"; (2) the environmental report submitted by Energy Northwest; (3) consultation with Federal, State, and local agencies; (4) the NRC's environmental review; and (5) consideration of public comments received during the scoping process and draft SEIS comment period.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)	
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Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Columbia Generating Station

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