

**PROJECT-SPECIFIC CATEGORICAL EXCLUSION FOR THE TESTING,
INSTALLATION, AND OPERATION OF A GROUND SOURCE HEAT
PUMP SYSTEM, PACIFIC NORTHWEST NATIONAL LABORATORY,
RICHLAND, WASHINGTON**

Proposed Action:

Pacific Northwest National Laboratory (PNNL) proposes to install at least one groundwater well to test the viability of wells to support a ground source heat pump system. If well testing is successful, a ground source heat pump system will be installed and operated to supply heat to a complex of buildings at the PNNL-Richland Campus in Benton County, Washington.

Location of Action:

The test well(s) will be located at the northeast corner of Battelle Boulevard and Stevens Drive at the PNNL-Richland Campus in Benton County, Washington, as shown in Figure 1. If the test well(s) is successful and the project moves forward with a ground source heat pump system, the system will supply heat to a complex of buildings on the PNNL-Richland Campus, including the Physical Sciences Laboratory (PSL), Mathematics Building (MATH), Research Operations Building (ROB), Engineering Development Laboratory (EDL), Auditorium, and potentially Life Sciences Laboratory 2 (LSL2). The entire project area, including the test well location and the notional system location, has been previously disturbed or developed such that its functioning ecological processes have been and remain significantly altered by human activity.

Description of the Proposed Action:

The proposed action includes both installing and testing at least one groundwater well (test well) and the potential installation and operation of a ground source heat pump system. At least one test well is required to determine if the well(s) can produce the required flow, duration, and temperature required to implement the ground source heat pump system. The test well(s) would be a groundwater well installed in the northeast corner of the intersection of Battelle Boulevard and Stevens Drive (Figure 1). If testing demonstrates the well is viable, the successful test well will remain in place and be used as part of the overall system. Design of the overall system will not be completed until viability testing is completed. Figure 1 shows the notional locations of the wells supporting the ground source heat pump system.

If testing demonstrates a test well is viable, approximately 3 to 4 withdrawal wells and 3 to 4 injection wells are anticipated to be needed for the system. A series of withdrawal wells would be installed along the western edge of Stevens Drive (Figure 1). The injection wells would be located to the east of the withdrawal wells, potentially in the lawn and parking area to the east of LSL2 or in the field south of Battelle Boulevard (Figure 1). The withdrawal and injection wells would be placed an appropriate distance apart such that the injected water could not be pulled back into the withdrawal side of the system. The desired extraction rate for this system is approximately 3750 gallons per minute, with a matching injection rate.

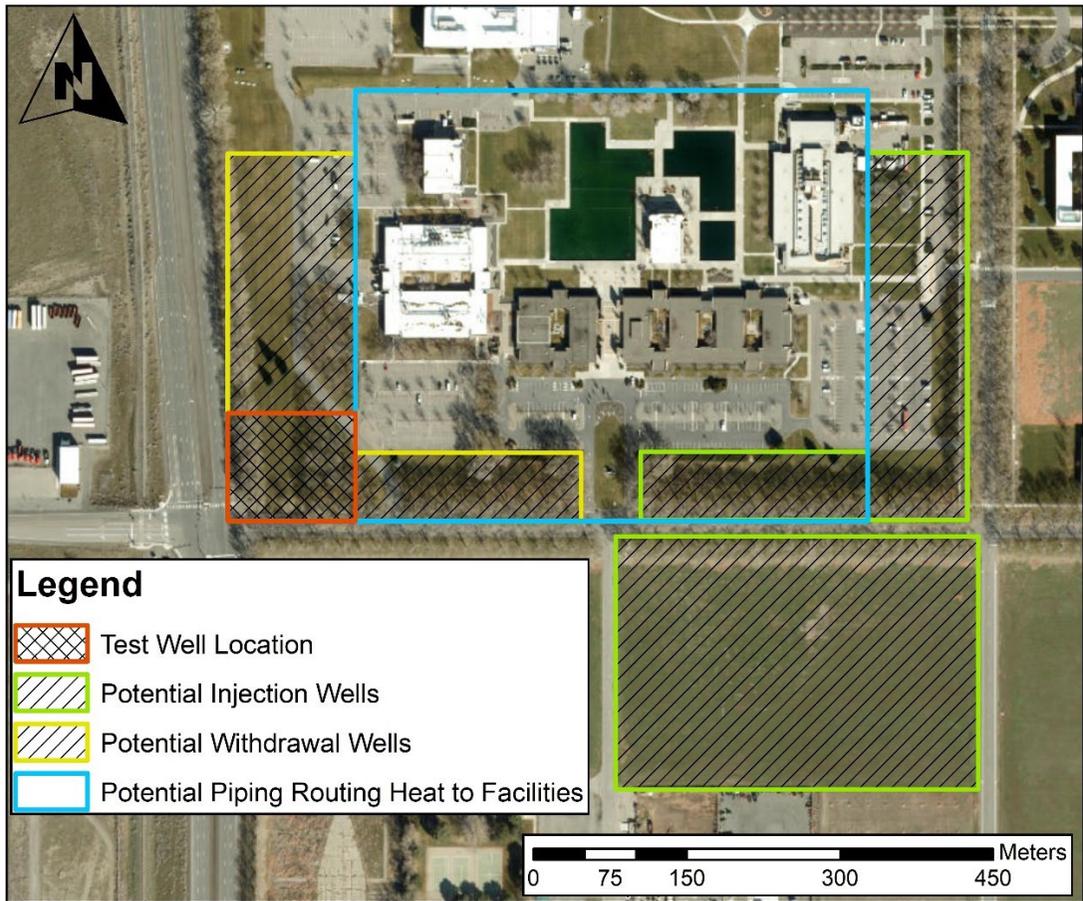


Figure 1. The Project Area.



Figure 2. An Existing Withdrawal Well at BSF.

New underground piping, requiring minor building modifications and excavation, would be installed as follows:

- From the withdrawal wells to the ROB mechanical room,
- in existing utility tunnels to connect the system between the ROB mechanical room, MATH, EDL, and PSL buildings,
- between the ROB mechanical room and the Auditorium and LSL2 buildings, and
- from the ROB mechanical room to the injection wells.

Test and system well construction is expected to require a 100' x 100' and up to 1' deep disturbance area to support the drill rig and laydown area at each well location. The wells may be drilled approximately 200' to 300' deep with a diameter up to 2' to access an aquifer that can provide at least 1,000 gallons per minute of production. The final surface signature of the wells is expected to resemble the withdrawal/injection wells currently operating at the Biological and Computational Sciences Facilities (BSF/CSF), as shown in Figure 2.

If a test well is viable, operation of the system is anticipated to occur annually during the heating season (approximately September – April). During this time, the system will provide groundwater to the ROB mechanical room. The groundwater will travel through a non-contact heat exchanger, where it is expected to elevate temperatures in the heating system 9-10°F. Physical separation between the groundwater and heating system will prevent cross-contamination. After groundwater passes through the heat exchanger, the temperature of the water will be approximately 9-10°F cooler. After passing the heat exchanger the groundwater will be piped from the ROB mechanical room to the injection wells and into the same aquifer from which it was withdrawn. The ground source heat pump system will be designed such that it is closed loop from the point of withdrawal back to injection in the aquifer, resulting in non-consumptive use of the groundwater.

If a test well is not viable, all test wells will be decommissioned in accordance with WAC 173-160 well standards and the ground source heat pump system will not be installed.

Actual withdrawal and injection locations may change from those depicted in Figure 1 based on final design by a qualified hydrogeologist. If locations are changed in a way that results in additional environmental impacts, additional National Environmental Policy Act (NEPA) analysis is required.

The proposed action will meet all the following criteria:

1. Major associated activities (such as drilling and discharge) will be regulated.
2. Appropriate leakage and containment control measures (including for cross-contamination between aquifers) will be in place.
3. There will be no potential to cause significant changes in sub-surface temperature.

4. The proposed action will be located in a previously disturbed or developed area.
5. Applicable requirements (such as local land use and zoning requirements) in the proposed action area will be followed.
6. Appropriate control technologies and best management practices will be implemented.

The proposed action also includes reasonably foreseeable actions necessary for implementation such as excavation, equipment and material staging, waste management, equipment maintenance, award of contracts, and landscaping disturbed areas. These activities would be managed in accordance to, and in compliance with, DOE orders, as well as federal, state, and local regulations and guidelines.

Biological and Cultural Resources:

Biological and cultural resource reviews have been conducted for the proposed action to evaluate potential impacts to environmental resources. The biological resource review found the proposed action would have no significant impacts to sensitive resources. The cultural resource review found test well installation is subject to the provisions of the Memorandum of Agreement for the Richland Campus Future Development.

The biological resource review identified plant and animal species listed as threatened or endangered at the state level; candidate, threatened, and endangered species and critical habitat listed under the federal Endangered Species Act (ESA; 16 U.S.C. 1531-1544); essential fish habitat (EFH) as defined by the Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. 1801 *et seq.*); and avian species protected under the Migratory Bird Treaty Act (16 U.S.C. 703-712). The biological resource review includes an evaluation of the protected species with the potential to occur in the project area, along with an analysis of potential impacts to Columbia River biota from operation of the proposed ground source heat pump system.

Conclusions in the biological resource review were based on modeling performed for the BSF/CSF ground source heat pump by Yabusaki et al. (2019) and on a technical position analyzing the applicability of Yabusaki et al. (2019) to the proposed action (Rockhold and Johnson 2023). Modeling of the BSF/CSF system concluded that the thermal impact of heated groundwater entering the Columbia River would only be detectable in winter, and the groundwater would be less than 2°F warmer than river water (Yabusaki et al. 2019). The proposed ground source heat pump system would inject cooled water, as opposed to warmed water from the BSF/CSF system, and the difference in temperature from ambient of injected water is expected to be less than the BSF/CSF injected water. Therefore, no detrimental temperature impacts to the Columbia River are expected from the proposed ground source heat pump system (Rockhold and Johnson 2023). Additionally, diurnal variation in river water level would be expected to create river water incursions and groundwater excursions, indicating that river temperatures strongly influence groundwater temperatures next to the river interface, minimizing the impacts of a thermal plume (Yabusaki et al. 2019). Given this information, no effects to aquatic biota are anticipated from operation of the notional ground source heat pumps.

The biological resource review found that the proposed action would not affect ESA-listed species, other protected species, priority habitats, EFH, or other biological resources of concern. Migratory birds may occur in the project area but given the scope of the proposed action and requirements in

the biological resource review, adverse effects to migratory birds are not expected.

Biological resource review requirements will be followed to assure there are no adverse impacts to sensitive species and resources. The biological resource review will be updated on an annual basis until installation is completed and the system is operational. If an update to the biological resource review finds that resources may be adversely impacted, the use of this categorical exclusion (CX) would be reevaluated. Potential options could be, but are not limited to, changing the proposed activity location, the development of mitigation measures to render the impact(s) not significant, or the performance of additional NEPA analysis and review.

The cultural resource review was conducted to comply with the National Historic Preservation Act (54 U.S.C. 306108). Only test well installation, viability testing, and potential decommissioning were reviewed in this iteration of the cultural resource review. The review resulted in a determination that the proposed project is a component of the undertaking as defined by Mendez et al. (2018) in *Cultural Resources Review for the Pacific Northwest National Laboratory (PNNL) Richland Campus Future Development, Richland, Benton County, WA (2016-PNSO-003)*. The review resulted in a finding of *Adverse Effect* as defined in 36 CFR 800.5. A Memorandum of Agreement (MOA) was developed to address construction and expansion activities occurring on the PNNL-Richland Campus. Provisions of the MOA will be applied to the project to resolve adverse effects to historic properties.

The lack of final design until viability testing is completed precludes a thorough and accurate evaluate of potential impacts to cultural resources from the ground source heat pump system. If viability testing is successful, upon receipt of system design a subsequent cultural resource review will be performed to determine if the ground source heat pump system will have an adverse effect on cultural resources. No project actions apart from test well installation, viability testing, and potential decommissioning are permitted to occur until the subsequent cultural resource review is completed. If the final cultural resource review finds that resources may be adversely impacted, the use of this CX would be reevaluated. Potential options could be, but are not limited to, changing the proposed activity location, the development of mitigation measures to render the impact(s) not significant, or the performance of additional NEPA analysis and review.

Categorical Exclusions to be Applied:

As the proposed action is to install a ground source heat pump system, the following CX, as listed in the DOE NEPA implementing procedures, 10 CFR 1021, would apply:

B5.19 *Ground Source Heat Pumps*

The installation, modification, operation, and removal of commercially available small-scale ground source heat pumps to support operations in single facilities (such as a school or community center) or contiguous facilities (such as an office complex) (1) Only where (a) major associated activities (such as drilling and discharge) are regulated, and (b) appropriate leakage and contaminant control measures would be in place (including for cross-contamination between aquifers); (2) that would not have the potential to cause significant changes in subsurface temperature; and (3) would be located within a previously disturbed or developed area. Covered actions would be in accordance with applicable requirements (such as local land use and zoning requirements) in the proposed project area and would incorporate appropriate control technologies and best management practices.

Eligibility Criteria:

The proposed activity meets the eligibility criteria of 10 CFR 1021.41 O(b) because the proposed action does not have any extraordinary circumstances that might affect the significance of the environmental effects, is not connected to other actions with potentially significant impacts [40 CFR 1508.25(a)(1)], is not related to other actions with individually insignificant but cumulatively significant impacts [40 CFR 1508.27(b)(7)], and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during environmental impact statement preparation.

The "Integral Elements" of 10 CFR 1021 are satisfied as discussed below:

INTEGRAL ELEMENTS, 10 CFR 1021, SUBPART D, Appendix B (1)-(5)	
<i>Would the Proposed Action</i>	Evaluation
Threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health?	The proposed action would not threaten a violation of regulations, DOE orders, or Executive Orders. The test well(s) and potential subsequent wells will be installed in accordance with WAC 173-160.
Require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities?	No waste management facilities would be constructed under this CX. Any generated waste would be managed in accordance with applicable regulations in existing facilities. Waste disposal pathways would be identified prior to generating waste and waste generation would be minimized.

Disturb hazardous substances, pollutants, or contaminants that preexist in the environment such that there would be uncontrolled or unpermitted releases?	No preexisting hazardous substances, pollutants, or contaminants would be disturbed in a manner that results in uncontrolled or unpermitted releases.
<p>Have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited, to:</p> <ul style="list-style-type: none"> protected historic/archaeological resources, protected biological resources and habitat, jurisdictional wetlands, 100-year floodplains, Federal- or state-designated parks and wildlife refuges, wilderness areas, wild and scenic rivers, national monuments, marine sanctuaries, national natural landmarks, and scenic areas. 	<p>No environmentally sensitive resources would be adversely affected by the proposed action. Refer to the Biological and Cultural Resources section for details regarding the completion of cultural and biological resource reviews.</p> <p>The proposed action would not cause significant impacts to floodplains, wetlands regulated under the Clean Water Act, or other specially designated areas. Per 10 CFR 1022 there are no base or critical floodplains present in the project area and there are no wetlands present in the project area per the U.S. Fish and Wildlife Service National Wetlands Inventory.</p>
Involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species?	The proposed action does not involve the use of genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species.

Summary of Environmental Impacts:

The following table summarizes environmental impacts considered when preparing this CX determination.

Environmental Impacts Considered when Preparing this CX Determination	
<i>Would the Proposed Action</i>	Evaluation
Result in more than minimal air impacts?	There may be temporary and localized dust and fumes from construction equipment during test well and system installation. These would be minimized as necessary, using water applications or other emission controls, and would be compliant with applicable permits, local, state, and federal regulations, DOE orders, and PNNL guidelines.
Increase offsite radiation dose measurably?	The proposed action would not increase offsite radiation dose.
Require a radiological work permit?	The proposed action would not require a radiological work permit.

Discharge any liquids to the environment?	The test well(s) will require surface discharge of water that will be located and contained on DOE property. Groundwater utilized as part of the ground source heat pump system would be injected into the same aquifer it was withdrawn from and the system will be non-consumptive. There may be minor quantities of liquid effluents associated with well construction which will be managed in accordance with applicable regulations and best management practices.
Require a Spill Prevention, Control, and Countermeasures plan?	The proposed action is not expected to require a formal Spill Prevention, Control, and Countermeasures plan. Standard best management practices would be implemented to prevent and control accidental releases of fluids or erosion from project work.
Involve hazardous, radioactive, polychlorinated biphenyl, or asbestos waste?	The proposed action will not involve hazardous, radioactive, polychlorinated biphenyl, or asbestos waste.
Use carcinogens, hazardous, or toxic chemicals/materials?	The proposed action may involve the use of carcinogens, hazardous and/or toxic chemicals and materials. For example, refueling of equipment may be required on site and best management practices would be followed to prevent accidental release of liquids. Project inventories would be maintained at the lowest practicable levels, and chemical wastes would be recycled, neutralized, or regenerated if possible. Product substitution (use of less toxic chemicals in place of more toxic chemicals) would be considered when reasonable.
Cause more than a minor or temporary increase in noise level?	Well drilling will result in short-term, intermittent increases in noise. Noise would be temporary and limited to daytime hours. Required PPE will be incorporated into the project safety analysis for worker protection from noise levels.
Create light/glare, or other aesthetic impacts?	The proposed action will not create light, glare, or other aesthetic impacts.
Require an excavation permit (e.g., for test pits, wells, utility installation)?	The proposed action will require an excavation permit under the PNNL <i>Excavation Work Environment</i> work control.
Disturb an undeveloped area?	The location of the proposed action is within land that has been changed such that its functioning ecological processes have been and remain altered by human activity. The proposed action will not disturb an undeveloped area.

Result in more than minimal impacts on transportation and public services?	The proposed action will not have more than minimal impacts on transportation and public services.
Disproportionately impact low-income or minority populations?	The proposed action will not disproportionately impact low income or minority populations.
Require environmental or other permits from federal, state, or local agencies?	Federal, state, and/or local environmental permits will be required for the proposed action. If a test well is viable, a non-consumptive Water Right Permit will be obtained through WA Ecology for operation of the ground source heat pump system. All permits will be acquired prior to construction and activities will abide by all applicable permit requirements.

Compliance Action:

I have determined that the proposed action satisfies the DOE NEPA eligibility criteria and integral elements, does not pose extraordinary circumstances, and meets the requirements for the CX referenced above. Therefore, using the authority delegated to me by DOE Policy 451.1, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.

Signature: _____

Tom McDermott
PNSO NEPA Compliance Officer

cc: ES Norris, PNNL