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

November 2, 2015

Carolyn C. Haass
Vice President
Northwest Medical Isotopes, LLC
8815 Northwest 9th Street, Suite 256
Corvallis, OR 97330

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE ENVIRONMENTAL REVIEW OF THE NORTHWEST MEDICAL ISOTOPES, LLC CONSTRUCTION PERMIT APPLICATION

Dear Ms. Haass:

On November 7, 2014, Northwest Medical Isotopes, LLC (NWMI) filed with the Nuclear Regulatory Commission (NRC) pursuant to Section 103 of the Atomic Energy Act of 1954, as amended, and Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), a portion of an application for a construction permit application for a medical radioisotope production facility in Columbia, Missouri. By letter dated February 5, 2015, NWMI withdrew and resubmitted this portion of their construction permit application to include a discussion of connected actions in their environmental report (ER) in response to a letter from the NRC (ADAMS Accession No. ML14349A501). The U.S. Nuclear Regulatory Commission (NRC) is reviewing the information contained in the application and has identified areas where additional information is needed to complete the environmental review. Enclosure 1 lists environmental requests for additional information (RAIs).

In accordance with 10 CFR Section 50.30(b), NWMI must execute its response in a signed original document under oath or affirmation. NWMI's response must be submitted in accordance with 10 CFR 50.4, "Written communications." Information included in this response that NWMI considers sensitive or proprietary must be marked in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." NRC staff requests that NWMI provide a response to the enclosed RAIs within 30 calendar days of this letter. Following receipt of the additional information, NRC staff will continue its evaluation of NWMI's construction permit application.

If you have any questions, please contact me by telephone at 301-415-2719 or by e-mail at Nancy.Martinez@nrc.gov.

Sincerely,

/RA/

Nancy Martinez, Environmental Project Manager
Environmental Review and Guidance Branch
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-609

Enclosure:
Requests for Additional Information

cc w/encl: Distribution

If you have any questions, please contact me by telephone at 301-415-2719 or by e-mail at Nancy.Martinez@nrc.gov.

Sincerely,
/RA/

Nancy Martinez, Environmental Project Manager
Environmental Review and Guidance Branch
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-609

Enclosure:
Requests for Additional Information

cc w/encl: Distribution

DISTRIBUTION: See next Page

ADAMS Accession No: ML15288A102 *concurred via email

OFFICE	LA:DLR	PM:RERB:DLR	BC:RERB:DLR	PM:RERB:DLR
NAME	IBetts*	NMartinez	DWrona	NMartinez
DATE	10/27/15	10/30/15	10/30/15	11/2/15

OFFICIAL RECORD COPY

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE ENVIRONMENTAL REVIEW OF THE NORTHWEST MEDICAL ISOTOPES, LLC CONSTRUCTION PERMIT APPLICATION

DISTRIBUTION

E-mail:

Public	AAdams, NRR	DTiktinsky, NMSS
RTR r/f	SLynch, NRR	RJohnson, NMSS
RidsNrrDpr	DBarass, NSIR	ASapountzis, NSIR
RidsNrrDprPrta	LTran, NRR	LHarris, NSIR
RidsNrrDprPrtb	MYoung, OGC	DWrona, NRR
RidsAcrsAcnw_MailCTR	NMartinez, NRR	MBalazik, NRR
RidsOgcMailCenter	MMoser, NRR	

Hard Copy:

Darrell Liles, CHP, PE
Senior Health Physicist
ARCADIS-SENES
8310 South Valley Highway Suite 135
Englewood, Colorado, 80112

Nicholas F. Fowler
Chief Executive Officer
Northwest Medical Isotopes, LLC
8815 Northwest 9th Street, Suite 256
Corvallis, OR 97330

NORTHWEST MEDICAL ISOTOPES, LLC RADIOISOTOPE PRODUCTION FACILITY
ENVIRONMENTAL REQUESTS FOR ADDITIONAL INFORMATION

The following questions are based on a review of Chapter 19 of Northwest Medical Isotopes, LLC's (NWMI's) environmental report (ER) (ADAMS Accession Nos. ML15210A123, ML15210A128, ML15210A129, and ML15210A131) using Final Interim Staff Guidance (ISG) augmenting NUREG-1537, Parts 1 and 2. In accordance with Title 10 of the *Code of Federal Regulation* (CFR) 51.41, provide the following information.

AIR QUALITY (AIR)

AIR-1

The ISG augmenting NUREG-1537, Part 1, Section 19.4.2, "Air Quality and Noise," states that the ER should provide estimates of on-site and off-site vehicle and other emissions resulting from construction, operations, and decommissioning, including fugitive dust.

A.) Clarify if Table 19-58 of the ER presents emission factors or emissions for off-road construction equipment. If Table 19-58 does present emissions for off-road construction equipment, verify the emissions presented for particulate matter less than 2.5 microns.

B.) Section 19.4.2.1.2.5 of the ER states: "Emissions data shown in Table 19-63 provide an estimate of vehicle emissions. Calculations used to obtain the estimates are based on an average workforce of 25-50 vehicles/day using a specific vehicle ratio (60 percent light-duty autos, 30 percent light-duty gas trucks, and 10 percent light-duty diesel trucks) and a round trip of 40 mi/day..." However, Table 19-6 lists that during operation the average workforce and peak workforce will be 98. Explain why 25-50 vehicles/day were assumed during the operation phase to estimate workforce vehicle emissions.

C.) Section 19.4.2.1.2.5 of the ER states "During the operations phase, vehicular air emissions would result from the commuting workforce and from routine deliveries to and from the proposed RPF." Table 19-63 of the ER provides an estimate of vehicle emissions during operations. Clarify if Table 19-63 emissions account for both commuting workforce and from routine deliveries to/from the radioisotope production facility (RPF).

D.) Table 19-56 of the ER identifies 100 for workforce travel during the construction phase. However, Table 19-6 identifies a peak workforce of 82 during construction. Clarify why 100 workforce travel was used in Table 19-56.

E.) Table 19-59 of the ER considered fugitive dust, windblown dust, and emissions from off-road construction equipment from construction presented in Tables 19-55 and 19-58. However, the total amount presented in Table 19-59 does not equate to the sum from Tables 19-55 and 19-58. Clarify the differences in these values.

F.) Table 19-61 and Table 19-62 of the ER present total annual and hourly emissions from the four natural gas boilers. Hourly and annual emissions, however, from these two tables do not match. Clarify and provide the correct annual and hourly total emissions from the gas-fired boilers.

G.) Section 19.4.2.1.1 of the ER identifies batch plant operations as a source of fugitive dust. Clarify if a batch plant will be onsite and if emissions from batch plant operations are accounted for in Section 19.4.2.1.1 of the ER.

AIR-2

The ISG augmenting NUREG-1537, Part 1, Section 19.4.2, "Air Quality and Noise" states that the ER should provide a description of gaseous effluents (i.e., type, quantity, and origin), a description of gaseous effluent control systems, and detailed descriptions of the models and assumptions used to determine normalized concentration.

A.) Section 19.2.3.1.2 of the ER states "The off gas containing the fission product gases goes through a series of cleanup columns. The nitrogen oxides (NO_X) is removed by a reflux condenser and several NO_X absorbers, the fission product gases (noble and iodine) are captured on absorbers, and the remaining gas is filtered and discharged into the process ventilation header." Table 19-86 of the ER states "The RPF would emit minor emissions of NOx and CO_2 along with levels of radionuclides below 10 CFR 20 levels." Furthermore, Section 19.4.2.1.2.3 of the ER, states: "Gaseous effluents resulting from the production process are based on a 50-week/year operating schedule. There are no emissions of CO, Pb, O_3, or particulate matter from the process exhaust system." However, Section 19.4.2.1.2.3 does not discuss NO_X, SO_2, or CO_2 emissions or quantify the amount of NO_X, SO_2, or CO_2 emitted resulting from the RPF production process. Clarify if NO_X, SO_2, or CO_2 would be emitted during the production process. If so, provide NO_X, SO_2, and CO_2 emissions resulting from the production process and include supporting calculations.

B.) Section 19.4.2.2.4 of the ER states that emission-specific strategies would be developed and implemented to ensure compliance with NAAQS and NESHAP standards. However, the ER does not quantify the hazardous air pollutants emitted. Identify sources of hazardous air pollutants (HAPs), quantify HAP emissions from these sources during construction, operation, and decommissioning, and provide supporting calculations.

C.) Provide the following ER references for docketing:

1. EDF-3124-0011, 2014, Greenhouse Gas Emissions, Rev. 0, Portage, Inc., Idaho Falls, Idaho, June 26, 2014.
2. EDF-3124-0008, 2014, Emissions from Natural Gas Boiler Operation, Rev. 0, Portage, Inc., Idaho Falls, Idaho, June 26, 2014.
3. EDF-3124-0012, 2015, Emission Modeling for Process and HVAC Boilers Using AERSCREEN, Rev. 1, Portage, Inc., Idaho Falls, Idaho, February 4, 2015.
4. EDF-3124-0013, 2014, On-Road Emissions for Vehicles During Operation, Rev. 0, Portage, Inc., Idaho Falls, Idaho, June 26, 2014.

AIR-3

The ISG augmenting NUREG-1537, Part 1, Section 19.1.2, "Regulatory Provisions, Permits, and Required Consultations" and 10 CFR 51.45(d) state that an applicant should list and summarize the status of all applicable Federal, State, local, and other regulatory requirements, permits, and consultations that would be required for the proposed facility to be constructed and operated. Table 19-4 in the ER identifies that construction and operating air permits from the Missouri Department of Natural Resources (MDNR) are not required. Has NWMI contacted MDNR regarding the determination that air emission sources will be exempt from permitting requirements and has MDNR confirmed that air permits will not be required? If so, provide documents (e.g., letters) of such communication. Otherwise, indicate the applicant's plans and associated timeframe.

ALTERNATIVES (ALT)

ALT-1

The ISG augmenting NUREG-1537, Part 1, Section 19.1.1, "Purpose and Need for the Proposed Action" states that the ER should describe how the proposed action would satisfy global, national, or regional projected demands for the radioisotope products to be produced through implementation of the proposed action. Section 19.5.1 of the ER states that "[t]he current demand for ^{99m}Tc in the U.S. requires a weekly supply of approximately 6,000 six-day Ci

of ^{99}Mo, approximately 50 percent of the annual U.S. demand." This seems contradictory. Is 6,000 six-day Ci of ^{99}Mo the current demand or 50% of the demand?

ALT-2
10 CFR 51.45(b)(3) and the ISG augmenting NUREG-1537, Part 1, Section 19.5 "Alternatives" state that ER should summarize the history and process used to formulate the reasonable alternatives.

A.) Make available for docketing the *Alternative Site Selection* presentation given at the site audit.
B.) Section 19.5.2.2 of the ER identifies available space as a screening criterion and states that all sites have the minimum amount of space required for the production facility, but differences in available space could impact the complexity of facility design. Discuss the space limitations at the University of Missouri Research Reactor (MURR), Oregon State University TRIGA reactor (OSTR), and McClellan Business Park alternative sites.

ALT-3
The ISG augmenting NUREG-1537, Part 1, Section 19.5 "Alternatives," states that for each reasonable alternative site, a description should be provided In the ER. Provide the following figures pertaining to the MURR alternative site:

A.) Radioisotope Production Facility site boundary at the MURR alternative site (similar to what was provided for the Discovery Ridge Site in Figure 19-6 of the ER).
B.) 8-kilometer (5 mile) radius figure from the center of the facility at the MURR alternative site (similar to what was provided for the Discovery Ridge Site in Figure 19-5 of the ER).

CONCLUSIONS (CON)

CON-1
10 CFR 51.45(e) and the ISG augmenting NUREG-1537, Part 1, Section 19.6, "Conclusions" state that the ER should include a discussion on the unavoidable adverse environmental impacts of the proposed action. Section 19.6.1 states that "[i]f the site is returned to its current state, there would be no unavoidable adverse environmental impacts associated with the proposed action." Yet, Sections 19.6.1.1 and 19.6.1.2 determines SMALL unavoidable impacts to construction and operation. Unavoidable impacts are, by definition, not avoided simply through decommissioning. Unavoidable adverse impacts are predicted adverse environmental impacts that cannot be avoided and that have no practical means of further mitigation. Clarify how there can be "no unavoidable adverse environmental impacts" as stated in the header Section 19.6.1 of the ER and yet there are such impacts, albeit small ones, as discussed in Subsections 19.6.1.1 and 19.6.1.2 of the ER. Further, reconcile the statement in Section 19.6.1 with the statements in Section 19.6.2.1 and 19.6.2.2 that "[s]ome small adverse environmental impacts could remain after all practical measures to avoid or mitigate them are taken."

CONNECTED ACTIONS (CONN)

In determining the scope of its environmental review for the proposed action, the NRC staff, consistent with 10 CFR 51.14(b), uses the definitions in 40 CFR 1508.25 in implementing Section 102(2) of the National Environmental Policy Act. Section 1508.25, "Scope" states that actions are connected if they:

- automatically trigger other actions which may require environmental impact statements;

- cannot or will not proceed unless other actions are taken previously or simultaneously; or
- are interdependent parts of a larger action and depend on the larger action for their justification.

Radioisotope production by NWMI's proposed facility depends on targets being transferred to and from, and irradiated in, one or more research reactors. Therefore, irradiation at research reactors are connected actions to the proposed action.

Section 19.2.1 of the ER identifies two research reactors that will be part of the irradiation network and states a third research reactor is being considered and that an analysis for a third research reactor is currently underway. In support of analyzing the site-specific environmental impacts associated with the connected actions, the NRC requests the following information regarding the connected actions.

CONN-1

Describe a hypothetical third research reactor that is representative of the research reactors NWMI is considering. Include the following environmental parameters:

A.) A description of necessary or anticipated modifications at the reactor to support target irradiation. Identify:
   1.) If modifications would be internal or external to the existing structures and if there would be any associated ground-disturbing activities (quantify acreage affected)
   2.) Additional workforce needed to support modifications
   3.) Depth of excavation expected to be required for new/modified facilities and utility connections
   4.) Duration of activities to complete modifications and to commission the modified facilities and equipment
   5.) Any additional noise, traffic, or air emissions from facility modification activities

B.) Land-use classification of the third reactor

C.) Additional workforce needed to support operation activities for irradiating targets

D.) Identify if target handling and irradiation will result in changes in the types or increases in the non-radiological effluent releases and waste streams at the reactor. Provide sources, types, and approximate quantities of non-radiological effluents or waste and discuss non-radiological waste management impacts of target handling and irradiation.

E.) Additional water use to complete modifications and to support operation activities for irradiating targets (as compared to existing operations)

F.) Discuss the storage and treatment of non-radioactive material from target handling and irradiation at the reactor.

G.) Discuss human health impacts due to target handling and irradiation. Specifically, address the following:
   1.) Provide a list of reporting requirements for non-radioactive waste streams to the Environmental Protection Agency (EPA) applicable state agencies.
   2.) Provide a copy of or discuss the procedure that workers would use for identifying industrial hazards prior to performance of jobs.
   3.) Provide a copy of or discuss the anticipated emergency response plan.
   4.) Provide a copy of or discuss the anticipated recycling and reuse plan.

H.) Distance travelled of targets to and from the reactor.

I.) Identify if target handling and irradiation will result in changes in the types or increases in the radiological effluent releases and waste streams at the reactor. Provide sources, types, and approximate quantities of radiological effluents or waste and discuss radiological waste management impacts of target handling and irradiation. Discuss any expected radiological impacts to the workers at those facilities due to those expected changes. Discuss any expected radiological impacts from transportation due to the shipment to and from the reactor.

CONN-2
In support of analyzing the site-specific environmental impacts associated with the connected actions, identify if target handling and irradiation will result in changes in the types or increases in the non-radiological effluent releases and waste streams at the two identified research reactors (MURR and OSTR). Provide sources, types, and approximate quantities of non-radiological effluents or waste and discuss non-radiological waste management impacts of target handling and irradiation at MURR and OSTR.

CONN-3
In support of analyzing the site-specific environmental impacts associated with the connected action of irradiation services, discuss the storage and treatment of non-radioactive material from target handling and irradiation at MURR and OSTR.

CONN-4
Discuss human health impacts due to the connected actions of target handling and irradiation at MURR and OSTR. Specifically, for MURR and OSTR, address the following:

A.) Provide a list of reporting requirements for non-radioactive waste streams to EPA applicable state agencies.
B.) Provide a copy of the procedure that workers would use for identifying industrial hazards prior to performance of jobs.
C.) Provide a copy of the emergency response plan for each reactor.
D.) Provide a copy of the recycling and reuse plan for each reactor.

CONN-5
In support of analyzing of the environmental impacts associated with the connected actions, identify if target handling and irradiation will result in changes in the types or increases in the radiological effluent releases and waste streams at the two identified reactors (MURR and OSTR). Provide sources, types, and approximate quantities of radiological effluents or waste and discuss radiological waste management impacts of target handling and irradiation at the two identified reactors. Discuss any expected radiological impacts to the workers at those facilities due to those expected changes. Discuss any expected radiological impacts from transportation due to the shipment to and from the two identified reactors.

CONN-6
Section 19.4.13 of the ER identifies facility modifications at the two identified reactors (MURR and OSTR) needed to support the handling and irradiation of targets. Provide the following information regarding facility modifications and handling and irradiation of targets:

A.) Additional workforce needed to support modifications
B.) Additional workforce needed to support operation activities for irradiating targets

C.) Duration of activities to complete modifications and to commission the modified facilities and equipment
D.) Depth of excavation expected to be required for new/modified facilities and utility connections
E.) Additional water use to complete modifications and to support operation activities for irradiating targets (as compared to existing operations)
F.) Any additional noise, traffic, or air emissions from facility modification activities
G.) Would modifications be internal or external to the existing structures? If external modifications are necessary, would there be any associated ground-disturbing activities? If so, quantify the acreage and identify the nature of the areas that may be impacted.

CUMULATIVE IMPACTS (CI)

CI-1
The ISG augmenting NUREG-1537, Part 1, Section 19.4.13, "Cumulative Effects" states that the ER should identify other actions that could contribute to cumulative impacts. Section 19.4.14 of the ER addresses the cumulative effects of constructing, operating and decommissioning the RPF in the context of other actions within the region of interest, and Table 19-6 provides a listing of projects that were considered by the applicant in the determining potential cumulative impacts. The text indicates that these projects were identified using the *City of Columbia FY 2013 CIP Planning Document* (City of Columbia 2013f), as well as other sources for which no citation is provided.

A.) Identify any additional state, county, and regional documents that were reviewed (other than the cited *City of Columbia FY2013 CIP Planning Document*) to develop Table 19-86. Provide associated URLs for this reference information and specifically identify for which of the listed projects each source provides supporting information.
B.) Provide the name, description, location, and status of any additional past, present or reasonably-foreseeable projects or actions at or in the vicinity of the proposed RPF that have been identified since the applicant's ER was prepared.

ECOLOGY (ECO)

ECO-1
The ISG augmenting NUREG-1537, Part 1, Section 19.3.5, "Ecological Resources" states that the applicant should describe the ecological resources potentially affected by construction, operation, and/or decommissioning.

Describe any site investigations that examined vegetation (grasses, shrubs, and trees) and wildlife (mammals, reptiles and amphibians, and birds) on or near the site, including transient wildlife that may only use the site as a temporary resting or foraging ground, or wildlife that only uses the site seasonally. In addition, describe any site investigations that focused on invasive species.

ECO-2
The ISG augmenting NUREG-1537, Part 1, Section 19.3.5, "Ecological Resources" states that the applicant should provide a description of the types of vegetative communities found within the potentially affected area. Section 19.3.5.7.1 of the ER states that "representative plant

species include little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), winter bentgrass (*Agrostis hyemalis*), and Atlantic camas (*Camassia scilloides*) (Nigh and Schroeder, 2002; Faber-Lagendoen, 2001)." Provide the technical basis for why NWMI assumes these plants occur onsite. Describe the percent cover of the most common vegetative species on site

ECO-3
The ISG augmenting NUREG-1537, Part 1, Section 19.3.5, "Ecological Resources," states that the applicant should provide a description of the types of vegetative communities found within the potentially affected area.

Section 19.3.5.7.1 of the ER states that "potential native plant species that may occur within the proposed site include those associated with tall grass hardpan prairie (Nigh and Schroeder, 2002)." Nigh and Schroeder (2002) describe numerous native species. Describe which native species occur on site and provide a summary of how NMWI determined which native species occur on site, such as onsite ecological surveys.

ECO-4
The ISG augmenting NUREG-1537, Part 1, Section 19.3.5, "Ecological Resources," states that the applicant should provide a description of the types of vegetative communities, especially any delineated wetlands or potential wetland habitat found within the potentially affected area.

Figure 19-39 of the ER shows the locations for wetlands near the proposed RPF site. The large size of the symbol for the proposed RFP makes it difficult to confirm the location of any wetland onsite or near the site. Confirm whether any wetlands are located on the proposed site and describe the distance from the proposed site to the nearest wetland. Describe wetland and wildlife species that are likely to occur in nearby wetlands.

ECO-5
The ISG augmenting NUREG-1537, Part 1, Section 19.3.5, "Ecological Resources" states that the applicant should describe aquatic communities within potentially affected waterbodies.

Describe the aquatic species, such as fish and invertebrates that are likely to occur within the stormwater management ponds, Gans Creek, and nearby streams.

ECO-6
The ISG augmenting NUREG-1537, Part 1, Section 19.5.2, "Reasonable Alternatives" states that the applicant should describe the major direct, indirect, and cumulative impacts for alternatives to the proposed action.

Describe the most common vegetative species (grasses, shrubs, and trees), wildlife species (mammals, reptiles and amphibians, and birds), and aquatic species (fish and macroinvertebrates) at each alternative site.

GEOLOGIC ENVIRONMENT (GEO)

GEO-1
The ISG augmenting NUREG-1537, Part 1, Section 19.3.3, "Geologic Environment," states that the applicant should identify the geological, seismological, and geotechnical characteristics of the site and surrounding area. ISG to NUREG-1537, Part 1, Section 19.3.4, "Water Resources," further states that the applicant should describe site-specific and regional data on the physical

and hydrological characteristics of surface water and groundwater, etc. Additional information is required with respect to the following:

A.) Provide clarification of the information presented in Section 19.3.3, including 19.3.3.8, and 19.3.4.3, of the ER with respect to the greater Discovery Ridge site development. Specifically, provide a description of the scope and timing of proposed site-specific geotechnical and hydrological studies to be performed of the RFP site (Lot 15) and of any adjoining areas that may be used for laydown or site access. Include studies such as proposed baseline preoperational groundwater and surface water quality monitoring (including sampling parameters) as well as studies to address such potential issues as soils with high-shrink swell potential, karst features, and confirmation of the depth to perched groundwater or water-table conditions.

B.) As part of the site-specific characterization studies referenced in (a) above, describe the number, spacing, diameter and proposed depth, and installation method of any groundwater monitoring wells to be installed, such as to verify and monitor depth to groundwater. Specify whether the wells, if any, would be retained for operational phase groundwater monitoring and/or leak detection.

C.) Provide the following references as cited in the ER for docketing:

1.) Terracon, 2011a, Phase I Environmental Site Assessment Discovery Ridge Lots 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18, Terracon Consultants, Inc., prepared for University of Missouri and Trabue, Hansen & Hinshaw, Inc., Terracon Project No. 09117701, March 23, 2011 (cited in ER Section 19.3.4.3.1).

2.) Terracon, 2011b, Preliminary Geotechnical Engineering Report Discovery Ridge– Certified Site Program Lots 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18, Terracon Consultants, Inc., prepared for University of Missouri and Trabue, Hansen & Hinshaw, Inc., Terracon Project No. 09105094.1, February 11, 2011 (cited in ER Section 19.3.3.8.1).

GEO-2

The ISG augmenting NUREG-1537, Part 1, Section 19.4.3, “Geologic Environment,” states, in part, that the applicant should provide the following information in the ER: Depth of excavation for below-grade portions of facilities and for such activities as trenching for utilities and piping, roadway construction, etc.

Section 19.2.3 of the ER indicates that the depth of the processing hot cell below grade, without footers, is 4.6 m (15 ft). Section 19.4.3.1 of the ER states that the maximum depth of excavation is anticipated to be 15.5 ft. below ground surface, presumably for the hot-cells, waste storage areas, and transfer tunnel as referenced in the ER. Confirm that this excavation depth is still bounded by the facility design and include relevant information on the thickness and material of construction of the outer walls and basement floor of the below ground portions of the RPF in support of your response.

HISTORIC AND CULTURAL RESOURCES (HC)

HC-1

The ISG augmenting NUREG-1537, Part 1, Section 19.4.6, “Historic and Cultural Resources” states that the ER should discuss the process to be followed upon the discovery of human remains at the proposed site, and describe mitigation measures such as practices and procedures that could reduce or minimize adverse impacts.

Identify whether the applicant has prepared a Cultural Resource Management Plan, and/or any procedures that would be followed in the event that human remains or other items of historic or

cultural value are inadvertently discovered during construction, operation, and decommissioning of the facility.

HC-2
The ISG augmenting NUREG-1537, Part 1, Section 19.4.6, "Historic and Cultural Resources" states that the ER should discuss impacts to historic and cultural resources during construction, operation, or decommissioning resulting from land use and visual changes.

Provide information on whether the proposed RPF would be visible from any surrounding National Register of Historic Places (NHRP) –listed or –eligible historic properties.

HC-3
The ISG augmenting NUREG-1537, Part 1, Section 19.4.6, "Historic and Cultural Resources" states that the ER should document consultations with the State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO) concerning the impact of the proposed action on historic properties and other cultural resources, and any conclusions resulting from the consultations.

Section 19.3.6.8 of the ER indicates that the applicant initiated consultation with the Missouri SHPO and six Federally-recognized tribes in 2013, and indicates in Section 19.4.6 that the Missouri SHPO has reviewed and concurred with the findings of the Phase I archaeological survey. Provide copies of any letters or communications, to and from the Missouri SHPO, Federally-recognized Indian tribes that may have ancestral or historical ties to the project area, or local historical societies that have occurred subsequent to those discussed in the ER.

HUMAN HEALTH (HH)

Human Health, Non-radiological (HH-NR)
HH-NR-1
The ISG augmenting NUREG-1537, Part 1, Section 19.1.2, "Regulatory Provisions, Permits, and Requires Consultations," states that applicable federal, state, local, and other regulatory requirements should be summarized. Provide a list of reporting requirements for non-radioactive waste streams to EPA and MDNR as discussed in Section 19.3.8.3 of the ER.

HH-NR-2
The ISG augmenting NUREG-1537, Part 1, Section 19.4.10, "Human Health" states that the ER should provide an assessment of the physical occupational hazards. Provide a copy of the plant procedure that workers would use for identifying industrial hazards prior to performance of jobs.

HH-NR-3
The ISG augmenting NUREG-1537, Part 1, Section 19.4.9, "Waste Management" states that the ER should provide a description of the proposed waste management systems designed to collect, store, and process waste. Provide a copy of the recycling and reuse plan discussed in Section 19.4.8.1.2.4 of the ER.

Human Health, Radiological (HH-R)
HH-R-1

The ISG augmenting NUREG-1537, Part 1, Section 19.3.8, "Human Health" states that the ER should provide effluent release points and expected radioactive effluent releases and exposures from construction, operational, and decommissioning activities. Baseline radiation levels for the general area are discussed in 19.3.8 of the ER, and consist of reports from reactors like MURR and Callaway Plant, Unit 1. Since it is stated in 19.4.8.2 of the ER that there is possibility that the RPF will release gaseous and liquid radionuclides into the environment, current radiation levels are important to quantify. Clarify if any baseline monitoring will be performed at the RPF, and also how effluent releases will be monitored/mitigated during construction, operations, and decommissioning.

HH-R-2
The ISG augmenting NUREG-1537, Part 1, Section 19.3.8, "Human Health," states that the ER should provide a description of the facility's radiological programs and systems. Provide a description of the program(s) for radiological worker protection and monitoring necessary to comply with 10 CFR Part 20.

LAND USE (LAN)

LAN-1
The ISG augmenting NUREG-1537, Part 1, Section 19.3.1, "Land Use and Visual Resources," states that the applicant should describe existing on site land use conditions and land cover.

Table 19-15 of the ER describes U.S. Geological Survey (USGS) land use categories for the 8 km (5-mi) region of influence surrounding the proposed RPF. Describe the current land uses on site as defined by USGS.

LAN-2
The ISG augmenting NUREG-1537, Part 1, Section 19.3.1, "Land Use and Visual Resources" states that the applicant should asses the rating of the aesthetic and scenic quality of the site in accordance with the U.S. Bureau of Land Management Visual Resource Management System.

Section 19.3.1.2.3 of the ER states that the site has an L sensitivity rating, as an area with low scenic values resulting from a low sensitivity to changes in visual quality by the type of users in the area, a low amount of use by viewers, low public interest in changes to the visual quality of the site, and a lack of special natural and wilderness areas. Provide the technical justification for this rating.

LAN-3
The ISG augmenting NUREG-1537, Part 1, Section 19.4.1, "Land Use and Visual Resources" states that the applicant should provide a description of any on- and offsite land-use changes caused by the proposed action, including the number of acres and location of each land use type that would be changed on a temporary and permanent basis during construction, operation, and decommissioning.

Section 19.4.1.1.1 of the ER states that "construction staging activities could also occur along Discovery Drive bordering the lot and the adjacent Discovery Ridge Lot 14. Staging activities would be temporary and would cease after construction of the facility." Describe the exact

locations and approximate acreage of any offsite stages areas that would be used during construction.

LAN-4
The ISG augmenting NUREG-1537, Part 1, Section 19.4.1, "Land Use and Visual Resources" states that the applicant should provide a description of mitigation measures that would reduce or minimize adverse impacts.

Section 19.4.1.1.1 of the ER states that "after the facility is built, landscaping would mitigate disturbances caused during construction on the lot, both exterior of the perimeter fence and from the perimeter fence to the perimeter of the building." Provide a description of landscaping activities NWMI intends to complete. For example, would open areas be covered in grasses, shrubs, or ornamental flowers. Would any native species be used for landscaping? If known, provide the approximate percentage of space that would be landscaped vs. developed.

LAN-5
The ISG augmenting NUREG-1537, Part 1, Section 19.5.2, "Reasonable Alternatives," states that the applicant should describe the major direct, indirect, and cumulative impacts for alternatives to the proposed action.

Describe the current zoning classification at each alternative site.

NOISE (NOI)

NOI-1
The ISG augmenting NUREG-1537, Part 1, Section 19.4.2, "Air Quality and Noise" states that the ER should provide the potential impacts to sensitive receptors. Section 19.4.2.3.1 of the ER states that the impacts from noise during construction are SMALL. However Table 19-90 of the ER state that the noise impacts from construction at the Discovery ridge site would be MODERATE. Clarify the noise construction impact level and reconcile the differences concluded regarding the impact level.

NOI-2
The ISG augmenting NUREG-1537, Part 1, Section, 19.3.2, "Air Quality and Noise" states that the ER should provide a description of any current or past noise studies and analyses conducted at the proposed site or within an audible range of the site. Section 19.3.2.3.1 of the ER states that "[b]ased on the most recent peak 1-hr traffic count summary from the Missouri Department of Transportation, the expected noise levels at the proposed RPF site resulting from traffic on U.S. Highway 63 range from 54 to 58 [A-weighted decibel] dBA (MoDOT, 2009)." The source sited, MoDOT 2009, identifies the peak 1-hr traffic count, however, it does not provide information on noise levels. Provide the basis for the stated 54 to 58 dBA and/or how that noise level was obtained.

NOI-3
The ISG augmenting NUREG-1537, Part 1, Section 19.4.2, "Air Quality and Noise" states that the ER should provide predicted noise levels using the dBA-weighted scale and major sources of noise, including all models, assumptions, and input data. Section 19.4.2.3.1 states that "[t]raffic associated with the construction workforce commuting to and from the facility site also generates noise. As previously discussed, the baseline noise conditions for traffic include airports, railways, and highways. The increase in noise relative to baseline conditions is most noticeable during periods of high activity onsite and during shift changes in the morning and late

afternoon." However, predicted noise levels from the additional workforce and deliveries and offsite shipments was not provided in the ER. Provide predicted increase in noise levels resulting from the additional commuting workforce and deliveries and offsite shipments during construction, operations, and decommissioning along U.S. Highway 63 and Discovery Drive in the vicinity of the proposed RPF site.

PROPOSED ACTION (PA)

PA-1
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the application should describe the proposed action and provide a detailed description of the proposed action and the general progression of the project including, in part, pre-operational and operational activities.

A. Section 19.2 of the ER discusses the activities and schedule of the pre-operation phase. Clarify if the impacts of the pre-operational phase were considered within the construction phase or the operations phase impacts described in Section 19.4 of the ER.
B. Section 19.2.1 of the ER states the nominal operational processing capacity of the RPF would be one batch per week (up to 12 targets per batch) for up to 52 weeks, and approximately 30 targets from the OSTR or a third university reactor for eight weeks per year per reactor. The discussion further states that the assumed bounding scenario would be a total of 68 batches of irradiated LEU targets processed at the RPF annually. For the bounding scenario, clarify:

    1.) The estimated number of targets per batch, batches per week, and batches per year that would be separately processed from the OSTR and the third reactor, respectively.

    2.) The estimated annual number of targets to be fabricated, irradiated, and processed at the RPF.

PA-2
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the application should provide a schedule showing the major phases of the proposed action.

Section 19.2.1.1 of the ER states that the start date of site preparation/construction would be the first quarter of 2016 and an end date of construction of first quarter 2017, which would result in a maximum construction phase of 15 months. However, Section 19.4.2.1.1.4. of the ER references an estimated construction period spanning 17 months. Clarify the construction duration phase and/or the difference in construction duration presented in Section 19.2.1.1 and Section 19.4.2.1.1.4 of the ER.

PA-3
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the application should estimate the total amount of land that would be temporarily affected by construction activities and permanently affected by operational activities.

Section 19.2.1.2 of the ER states that 100% of the 3.0 hectare (7.4 acre) site would be permanently affected. Differentiate between the total estimated amount of land that would be temporarily affected by construction activities (e.g., land clearing, material and equipment lay-down areas) versus the amount that would be permanently affected by operational activities (e.g., building and support facility footprints, paved vehicle access and parking areas).

PA-4
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the application should estimate the average number of truck deliveries and shipments of waste material offsite per day, week, or month during each of the major phases of the proposed action.

Section 19.2.1.3, Table 19-6 of the ER lists shipments by project phase to include delivery trucks and offsite radioactive materials and waste shipments. Section 19.2.8.2.2, Table 19-14 of the ER presents a different set of shipment information. Clarify the relationship of the values presented in Tables 19-6 and 19-14, specifically:

A.) Whether the estimated delivery trucks listed in Table 19-6 during operation account for fresh LEU and irradiated target shipments identified in Table 19-14 of the ER, and
B.) Whether the estimated offsite shipments identified in Table 19-6 during operation account for the unirradiated targets, ^{99}Mo product, spent LEU, and radioactive waste shipments during operation identified in Table 19-14 of the ER.

PA-5
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the application should estimate the amount of materials, such as fuel oil, gasoline, construction and process materials required, as well as water consumption and treatment.

Section 19.2.2.3 of the ER indicates that the proposed RPF site would be connected to local power, sewer, and water infrastructure. Provide estimated annual sanitary sewer, electrical power, municipal water, and natural gas requirements required to support each phase of the project.

PA-6
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the application should describe heating and cooling dissipation systems.

Section 19.2.5.2 of the ER indicates that the RPF would use three electric boilers. Clarify how these boilers relate to the four natural gas boilers discussed in Section 19.4.2.1.2.4.

PURPOSE AND NEED (PN)

PN-1
The ISG augmenting NUREG-1537, Part 1, Section 19.1.2, "Regulatory Provisions, Permits, and Required Consultations," and 10 CFR 51.45(d) state that an applicant should list and summarize the status of all applicable Federal, State, local, and other regulatory requirements, permits, and consultations that would be required for the proposed facility to be constructed and operated.

A.) In Section 19.2 of the environmental report, NWMI summarized the status of all applicable Federal, state, local, and other regulatory requirements, permits, and consultations that would be required. For the permits identified in Table 19-4 of the environmental report, provide a timeline or status update for when NWMI expects to apply for and receive the permits. If relevant, provide a specific regulatory or other milestone on which a given permit may be dependent upon.
B.) In accordance with Section 401 of the Federal Water Pollution Control Act (i.e., Clean Water Act (CWA)) (33 U.S.C. 1251 et seq.), a Federal agency cannot issue a permit or license for any activity that may result in a discharge to navigable waters of the United

States until the state or tribe where the discharge would originate has granted or waived certification that the potential discharge will comply with applicable water quality standards. CWA Section 401(a)(1) specifies that the applicant for the Federal license or permit is responsible for providing the Federal licensing or permitting agency the certification or a waiver from the state in which the discharge originates. As appropriate, the state could also provide the applicant with documentation that no separate 401 certification is required. Section 401 requirements are cited under Section 19.1.2 of the ER and in Table 19-4, and Section 19.1.2.5.1.2 of the ER further states that "the construction, operation, and decommissioning of the RPF is not anticipated to need a Federal Section 404 permit or Section 401 certification…." Clarify whether the State of Missouri will require a separate CWA Section 401 certification for NRC-licensed construction and operation of the RPF. Indicate the applicant's plans, and associated timeframe, for providing the NRC with required CWA Section 401 documentation from the State of Missouri.

PN-2

The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the applicant should provide a description of the operational activities. Clarify if the NWMI facility would produce molybdenum (Mo-99), iodine-131 (I-131) and xenon-133 (Xe-133).

SOCIOECONOMICS (SOC)

SOC-1

The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the ER should provide the projected number of full-time onsite workers during each of the phases of the proposed action including the number of construction worker (average and peak) as well as pre-operations, operations, and post operations workers.

A.) Section 19.4.7.1.2 of the ER indicates "89 (non-management) permanent operations workers needed are available in the ROI." The next sentence states, "About 40 percent (36) of the operations workers and their families are assumed to relocate to reside in the ROI." These statements appear to be in conflict. There is also no discussion about the number of permanent management operations workers. In addition, Table 19-6 of the ER lists an average and peak operation workforce of 98. Clarify these statements and reconcile the differences.

B.) Section 19.4.7.1.3 of the ER states that during peak construction, an estimated 81 workers would be required for decommissioning. However, Table 19-6 of the ER lists a peak workforce of 28. Reconcile the differences in workforce numbers discussed in Section 19.4.7.1.3 and Table 19-6 during decommissioning.

SOC-2

The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the ER should provide estimated amount of materials and equipment requirements including average number of truck deliveries and shipments of waste material offsite per day, week, or month during each of the major phases of the proposed action during construction, pre-operations, operations, and post-operations.

A.) Section 19.4.7.6.1 of the ER states that during peak construction, traffic volume is estimated to be 30 heavy vehicles (dump truck and deliveries) and 82 vehicles (pickup

trucks and cars) daily. However, Table 19-6 of the ER lists 20 delivery trucks (per week) and 1 offsite material waste and shipment per week. Reconcile the differences in traffic volume discussed in Section 19.4.7.6.1 and shipments identified in Table 19-6 during construction.

B.) Section 19.4.7.6.3 of the ER states that there are an estimated 30 heavy vehicles (waste trucks) and 81 vehicles (pickup and cars) traveling to and from the site daily during the decommissioning phase. However, Table 19-6 of the ER lists 20 waste shipments per week and a peak workforce of 15. Reconcile the differences in traffic volume discussed in Section 19.4.7.6.3 and shipments and workforce identified in Table 19-6 during decommissioning.

STORAGE, TREATMENT, AND TRANSPORTATION OF NONRADIOACTIVE MATERIALS (STT)

STT-NR-1
The ISG augmenting NUREG-1537, Part 1, Section 19.4.9, "Waste Management" states that the ER should provide anticipated disposal plans for the waste and a description of waste-minimization plans to reduce or minimize generation of waste. Provide copies of the chemical management plan and product handling plan discussed in Section 19.2.8.1.1 of the ER.

STT-NR-2
The ISG augmenting NUREG-1537, Part 1, Section 19.4.10, "Transportation" states that the ER should identify the treatment and packaging for radioactive and non-radioactive streams.

A.) Clarify whether Section 19.2.8.1.2 applies to the treatment and temporary storage of non-radioactive wastes. The preamble sentence of the section refers only to radioactive and mixed wastes.
B.) Discuss the processes intended to manage transportation of non-radioactive materials and wastes.

STT-NR-3
The ISG augmenting NUREG-1537, Part 1, Section 19.4.10, "Transportation" states that the ER should provide estimated transportation distance from the originating site to the projected destination of non-radioactive waste. Section 19.4.10.1.6 of the ER states that a non-radioactive waste recycling drop-off point is located approximately 4 miles from the RFP. Clarify that statement. Will NWMI be transporting non-radioactive recyclables to that drop off point or will the waste broker pick up the recyclables at the RFP?

WASTE MANAGEMENT (WM)

Waste Management, Non-Radiological (WM-NR)

WM-NR-1
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the ER should provide a description of all (i.e., nonradioactive, radioactive, mixed, and hazardous waste materials) proposed or current waste systems, including quantities, composition, and frequency of waste generation.

A.) Provide the chemical composition of the waste streams listed in Tables 19-12 and 19-13 of the ER.
B.) Provide the anticipated mass (in a unit applicable to solid material) of the waste streams listed in Table 19-13 of the ER.

WM-NR-2
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the ER should identify treatment and packaging procedures for radioactive and nonradioactive wastes and radioisotope products; transportation packaging systems to be used for waste; and estimated transportation distance to which radioactive and nonradioactive waste would most likely be sent. Provide a list of anticipated waste disposal companies and disposal sites for the waste streams, including construction wastes, listed in Section 19.2.7 of the ER.

WM-NR-3
The ISG augmenting NUREG-1537, Part 1, Section 19.4.9, "Waste Management" states that the ER should provide a description of the sources, types, and approximate quantities of solid, hazardous, and mixed wastes expected from the proposed action. Provide a list of non-radioactive waste streams, their chemical composition, and their anticipated mass.

WM-NR-4
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that the ER should identify the type of hazardous materials associated with the facility. Clarify whether the radioisotope production facility will be a large or small quantity hazardous waste generator under the Resource Conservation and Recovery Act (RCRA).

Waste Management, Radiological (WM-R)

WM-R-1
The ISG augmenting NUREG-1537, Part 1, Section 19.4.9, "Waste Management" states that the ER should provide information with respect to waste management as a result of construction, operation, and decommissioning activities. Part of the information necessary to properly determine the environmental impacts of the proposed action is the type and class of radioactive wastes generated at the facility. Table 19-14 of the ER lists the types of radioactive materials and wastes generated by or required for use at the RPF. For the radioactive wastes generated and shipped to Waste Control Specialist (WCS), clarify what those wastes are and what class of radioactive waste (i.e., Class A, Class B, Class C, Greater Than Class C (GTCC)) that will be produced, treated, stored, and shipped.

WM-R-2

The ISG augmenting NUREG-1537, Part 1, Section 19.4.9, "Waste Management" states that the ER should provide information with respect to waste management as a result of construction, operation, and decommissioning activities. Part of the information necessary to properly determine the environmental impacts of the proposed action is the amount of storage a facility has to handle the radioactive wastes generated at the facility. Clarify how long radioactive waste must be stored on site for decay before shipping, and if sufficient storage space is available for all anticipated radioactive wastes and radioactive materials necessary for operation.

WATER RESOURCES (WAT)

WAT-1
The ISG augmenting NUREG-1537, Part 1, Section 19.2, "Proposed Action" states that relevant to water consumption and treatment, the applicant should provide a narrative description and water-use diagram for the reactor and processing facility showing flow rates to and from the

various water systems. Further, the ISG to NUREG-1537, Part 1, Section 19.3.4, “Water Resources” states that the applicant should estimate the amount of water that would be obtained from a public water supply system.

Additional information and clarification is required with respect to the following:

A.) Section 19.2.4.1 and Table 19-11 of the ER provide a narrative description and tabular summary, respectively, of the projected water demands, and Section 19.2.7.1 summarizes liquid waste streams associated with operation of the proposed RPF. Provide a supporting process water balance (water use diagram) for the facility that bounds the estimated volume of makeup water required and which shows flow rates to and from the various water systems, water system interconnections and interdependence, points of consumption, and source and discharge locations. Specifically identify RPF process, cooling, steam production, fire protection, potable and sanitary, floor and equipment washdown, and any other specific water uses and identify consumptive losses.

B.) ER Table 19-11, which reports total annual water consumption for the RPF, implies that all facility water use is “demineralized water” with separate columns included for “wash water.” Raw potable water usage does not appear to be accounted for and, except for the activity “faculty support,” there appears to be no provision to meet the potable and sanitary water needs of the 98 facility staff. Address and clarify these apparent discrepancies.

C.) As cited in Table 19-11, reconcile the cited average daily use values (539 + 366 gal) with the value of 1,286 gal/day given in Section 19.6.3.1.2 of the ER.