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VIA OVERNIGHT MAIL

May 4, 2011

Mr. Keith McConnell
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville MD 20852

Dr. Tom McLaughlin
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville MD 20852

RE: License No. SUA-1139, Highland Reclamation Project

Dear Mr. McConnell and Dr. McLaughlin:

Thank you for meeting with us on March 22, 2011, and for speaking further with representatives of Exxon Mobil Environmental Services (EMES) on April 7, 2011, to discuss the forthcoming Alternate Concentration Limit (ACL) License Amendment Application for the ExxonMobil Highland Mill Site.

At our March 22, 2011 meeting, the United States Nuclear Regulatory Commission (NRC) staff recommended that ExxonMobil Environmental Services (EMES) respond to Mr. McConnell's January 14, 2010 letter entitled: *Response to Notice of Intent to Submit a License Amendment for the ExxonMobil Highland Reclamation Project, License SUA-1139.* Please excuse our confusion and delay in replying to the January 14, 2010 letter. The letter lists items to be included in the aforementioned ACL License Amendment Application, but did not specifically request that we address those items prior to submitting our application for that reason, we did not provide a written response prior to meeting with you in March of this year.

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This letter provides a general response to each of the issues raised in the January 2010 letter and in the March 2011 meeting with references to more complete data and a more thorough analyses of these items in our ACL License Amendment Application. NRC Staff should review the ACL License Amendment Application for a complete understanding of the data and explanations that are only generally discussed in this letter. ExxonMobil's intent is to submit the ACL Amendment Application under separate cover within the next few days.

The January 2010 letter asked ExxonMobil to make sure that its license amendment application includes:

- A discussion of the past commitments made to the Wyoming Department of Environmental Quality (WDEQ) about the disposition of the Pit Lake area and their impacts, if any, on the proposal.
- A description of all models used to predict constituent concentrations seeping from the mill tailings, and any issues that could bear on the validity of those models.
- A discussion of how the license amendment will comply with, as necessary, the stability requirements established in 10 CFR Part 40 Appendix A and the several factors listed in Criterion 5B6(a-b) of Appendix A that must be considered regarding the approval of ACL.
- A demonstration that the re-defined long-term surveillance and monitoring boundary (LSTB) will not result in the site requiring active maintenance.

At the March 22, 2011 meeting, NRC Staff indicated that, in addition to the items listed in the January 14, 2010 letter, there are other specific items to be addressed in the ACL License Amendment Application including:

- A discussion of previous proposals for a fertilization program to treat waters the Highland Pit Lake;
- Concern about the accuracy of uranium isotopic data presented as part of ExxonMobil's slide presentation and the applicability of the use of uranium isotopic data at the Highland site; and
- Data for evaluating the current groundwater potentiometric surface.

In addition, as a follow-up to the March 22, 2011 meeting, NRC Staff sent a list of excerpts from various documents regarding the Highland Pit Lake and its history. During a follow-up call on April 7, 2011, NRC Staff indicated that it was important that EMES consider the history as

described in the excerpts. The January 2010 letter, NRC Staff's comments during our March 2011 meeting and the documents forwarded to us after that meeting seemed to focus on several key issues that are of concern to the NRC staff, which ExxonMobil has attempted to address by issue rather than by document or by date. The key issues identified are 1) the disposition of the Highland Pit Lake including previous proposals to WDEQ, 2) seepage of 11e.(2) from the tailings impoundment and predictions of constituent transport, and 3) proposed changes to the long-term surveillance boundary. The specific and key issues/concerns are addressed below. Please note the Highland site has been managed by several Exxon and ExxonMobil subsidiaries. For simplicity, premerger companies are generally referred to as Exxon (unless reference to specific entities is required for clarification), and post-merger entities are referred to ExxonMobil or EMES.

Pit Lake Disposition. Early plans for surface mining at the Highland site recognized that the backfilling technique proposed by Exxon would result in one or two areas being left open and that these areas would fill with water to form Pit Lakes[1]. At that time, as per the initial mine plan, it was anticipated that the ore-grade material would be completely mined and removed from the final open pits[2] and it was predicted that the water in the Pit Lake(s) would be of the same quality as the regional groundwater[1] and would not contain radioactive material. In the initial mine planning, as described in the January 1972 Supplement to Applicant's Environmental Report Submitted by Humble Oil and Refining Company (Humble Oil) to the Atomic Energy Commission (AEC[3]), it was also anticipated that the remaining pit(s) after mining would have steep high walls that would be sloped to a 2:1 slope to allow for re-vegetation. It was also expected than mine plans would change over the life of the mining operations[1] based on site-specific data and analyses.

The March 1973 Final Environmental Statement (FES) prepared by the AEC[3] concluded that a source materials license should be issued to Exxon subject to certain license conditions. The license conditions defined in the FES provided for an environmental monitoring plan, the control of wastes and effluent, and reclamation and restoration plans. In addition to these conditions, the FES, provided a description of the potential benefits of the Pit Lake(s) for providing a source of fresh water to livestock and wildlife in a semi-arid region and improving the recreational value of the area. These documents were prepared early in the history of the site and before mining and milling had taken place.

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1 Legacy ADAMS 9706100451
2 Legacy ADAMS 9706100455
3 ADAMS ML102730143

Previous proposals and/or commitments made to WDEQ regarding the disposition of the Pit Lake have focused on:

1. Reclamation of the Pit Lake area including the sloping and re-vegetation of the pit walls;
2. Development of the Pit Lake for recreational uses including a possible fishery; and
3. The possible implementation of a Pit Lake treatment program.

There are several key factors that have affected the proposals or commitments made to WDEQ and the Wyoming Land Quality Division (WLQD) with respect to the disposition of the Highland Pit Lake.

1. The initial estimates of seepage from the tailings impoundment described in the FES, based on the state of the science at the time, significantly underestimated the amount of tailings seepage that would actually move to the Pit Lake and backfilled pits during milling operations[4,5,6].
2. Plans for re-grading the high walls around the Pit Lake changed over time as new information became available. Initial mine plans anticipated sloping 100% of the Pit Lake high walls to a slope of 2:1[1]. Subsequent investigations and modeling conducted by Exxon and its consultants indicated that sloping of 100% of the Pit Lake high walls would negatively impact the quality of water in the Pit Lake. These results were presented in May 1984 to WLQD[7]. Subsequently plans for regrading Pit Lake high walls, which were based on a slope stability study, were amended to include regrading 50% of the walls to a 3:1 slope as specified in the 1985 Reclamation Plan[8].
3. The collection of water quality data from the groundwater and surface water monitoring program over the past nineteen (19) years has shown that the Pit Lake water quality is not of the same quality as the regional groundwater. These data indicate that radiological and non-radiological components of 11e.(2) byproduct material have seeped and will continue to seep from ExxonMobil's reclaimed uranium mill tailings impoundment to the Highland Pit Lake[4,5,9,10].

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4 ADAMS ML102730142
5 ADAMS ML102800234
6 See ACL License Amendment Application Sections 1.2.2.7 and 2.2.1.1
7 ADAMS ML102860099
8 ADAMS ML102860100
9 ADAMS ML103370298
10 See ACL License Amendment Application Sections 2.1.2, 2.2 and Attachment 2

4. As late as April 1998, Exxon was conducting studies regarding the suitability of a fishery in the Pit Lake[11]. In fact, Exxon's two attempts to stock the Pit Lake were unsuccessful because there is insufficient habitat (i.e. food) to support a fishery[12]. Moreover, as Exxon gathered more information, it became apparent that a fishery would not be appropriate due to lack of habitat, and accordingly, on September 28, 2000, ExxonMobil advised WDEQ that the potential use of the Lake for recreation and as a fishery was unlikely[13]. WDEQ concurred that a fishery was unlikely[14].
5. ExxonMobil indicated that it questioned the benefits of attempting corrective action of the Pit Lake waters given the long-term technical impracticability, the high cost, and the fact that the Wyoming Class III water quality standards did not take into account site specific factors of the Highland site.
6. Many of the proposals and/or commitments in question were made prior to NRC's 2000 "concurrent jurisdiction" decision in which the Commission determined that the Atomic Energy Act of 1954 (hereinafter the "AEA"), as amended by the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 confers exclusive, preemptive federal jurisdiction over all components (radiological and non-radiological) of 11e.(2) byproduct material at the Highland site, including its Pit Lake[15].

In summary, several proposals regarding the disposition of the Highland Pit Lake were made early in the life of the site some of which were made before mining and milling was initiated. During mining and milling, seepage from the mill tailings impoundment did not behave as expected. We are now faced with a different set of factual circumstances. ExxonMobil has gathered additional data and now know how the mill tailings impoundment seepage has impacted the Pit Lake, which was not known or knowable in the early years of the Highland Mine and Mill Site. We now know that it would not possible to create a fishery in the Highland Pit Lake due to insufficient habitat to support this usage. All of the initial proposals to WDEQ were made before NRC concluded that it has exclusive federal preemptive jurisdiction over 11e.(2) byproduct material[13]. The changed facts and exclusive federal preemptive jurisdiction of NRC over 11e.(2) byproduct material render the prior proposals and/or commitments moot. ExxonMobil's forthcoming ACL License Amendment Application is the appropriate next step given the existing site conditions and regulatory environment for progress toward final site closure.

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11 ADAMS ML110840279
12 See ACL License Amendment Application Section 2.3 and Attachment 3
13 WDEQ TFN 3 2/234
14 WDEQ Technical Comments Pit Lake Modeling Results – Highlands Reservoir December 2000, and others at WDEQ TFN 3 2/234
15 CVR-SECY-99-027 (2000)

Predictive Models. As requested, a description of the hydrologic and geochemical models is included in the ACL License Amendment Application (Appendix A). The models used in past reports and studies at the site are contrasted with the current models and the assumptions and uncertainties are also described in the Application. A brief summary follows below with reference to the list of historical document excerpts.

The initial model predictions presented in the FES predicted seepage from the tailings impoundment to initially be about 80 gpm and diminish to 1 to 10 gpm within the first two to three years because of the sealing effect of the tailings. These early estimates of potential seepage from the tailing impoundment were based on limited data and a one-dimensional analytical estimate of potential maximum flows. The early estimates substantially underestimated the volume of seepage from the tailings impoundment.

It was also predicted prior to mining that radiological and non-radiological constituents in the tailings seepage would not migrate a significant distance from the impoundment because of the expected attenuative capacity of most soils to remove contaminants[3].

In February 1982, Exxon prepared a Uranium Tailings Impoundment Seepage Study[4] for the Highland Site predicting that the tailings impoundment would seep to the Southeastern Drainage and to the west to the mined out areas, but that there would be attenuation of the hazardous solutes. In the model results presented in the 1982 report, the attenuation of hazardous 11e.(2) byproduct constituents was based on a laboratory program that consisted of batch tests. There was some concern over the ability of the study to predict what might happen over the long-term. In fact, in May 1982 Dr. Roy Williams, Williams-Robinette & Associates, Inc. commented to NRC[16] that he disagreed with this study. He expected the seepage to move more rapidly than the model predicted and said that chloride should be used as a tracer for the seepage plume. Chloride is now used as a tracer for the 11e.(2) byproduct material seepage at the site. In June 1982, WDEQ expressed some concern to NRC that the solutes seeping from the tailings impoundment might not attenuate as predicted by the study[17].

A fundamental difference between the current geochemical conceptual site model (CSM) and the Pit Lake model, both described in the ACL License Amendment Application[10], and the previous models[4,9] is the conclusion in recent modeling that the 11e.(2) byproduct constituents radium, selenium and uranium were transported to and are entrained in the Pit Lake[18]. All previous

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16 ADAMS ML102800233
17 ADAMS ML102800235
18 See ACL License Amendment Application Sections 1.3.2, 2.1.2, Appendix A, and Attachment 2

models, because they included the retardation factors (e.g. relative velocity) developed by Exxon in 1982[4] predicted that these constituents would not reach the Pit Lake[9,19]. However, once the Pit Lake began to form and water quality data became available, it was recognized that the lake contained concentrations of radium, selenium and uranium at levels above the regional groundwater[9,20] and that a source of these constituents was required to calibrate the models. Because the retardation factors used essentially eliminated the tailings as a source in the early models, it was postulated that the weathering of the residual ore in the Ore Body Sandstones (OBSS) was the source of these constituents in the Pit Lake[9,19]. It now appears very likely that the early models utilized by Exxon and AEC over predicted the attenuation of the tailings solutes and that the concerns expressed by WDEQ[12] that "if the models underpredicted solute transport there would be a good chance solutes will be discharged into the pit" were valid.

As discussed in the current ACL License Amendment Application, change in the development of the current CSM and model is supported by historical data collected at the Highland Site, other Uranium Mill Tailings Radiation Control Act sites, and a significant body of scientific literature generated over the past 15 years.

Compliance with 10 CFR 40 Appendix A. ExxonMobil's ACL License Amendment Application complies with NRC requirements at 10 CFR 40 Appendix A and the factors listed in Criterion 5B6(a-b). ExxonMobil's application contains data and analyses that provide NRC Staff with the information necessary to conduct a detailed technical and environmental review of an ACL application; as well as a proposed "alternative" pursuant to the Preamble of Appendix A for the Pit Lake.

Briefly, the stability requirements in 10 CFR 40 Appendix A govern the long-term stability of the tailings materials. The tailings impoundment was closed in accordance with the reclamation plan. The closure was approved by NRC and there are no outstanding stability requirements for the tailings impoundment within the license.

In addition, long-term geotechnical studies have been conducted on the area surrounding the Pit Lake, and those areas that were deemed less stable were sloped to 3:1 angle[19], and continued studies have demonstrated the geotechnical stability of the Pit Lake slopes and highwalls[13]. Regardless, nothing associated with stability in the Pit Lake area will impact the stability of the reclaimed uranium mill tailings impoundment; indeed, the Pit Lake represents a self-maintaining

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19 ADAMS ML102810234
20 ADAMS ML103090358

(i.e., passive) control mechanism for tailings seepage to the west of the reclaimed uranium mill tailings impoundment.

The ACL License Amendment Application proposes ACLs pursuant to Criterion 5B5 and 5B6 and an "alternative" for the Pit Lake. The Application also proposes site-specific limits that are as low as reasonably achievable, after considering practicable corrective actions, and that are protective of human health and safety, and the environment. The application presents the potential adverse affects on groundwater quality, considering the physical and chemical characteristics of the tailings seepage and the potential for migration, the hydrogeological characteristics of the facility and the surrounding land, the quantity of groundwater and direction of groundwater flow, the proximity and withdrawal rates of groundwater users, the current and future uses of groundwater in the area, the existing quality of groundwater, the potential for health risks and damage caused by exposure to waste constituents, and the persistence and permanence of the potential adverse effects. The application also addresses the potential adverse effects on hydraulically-connected surface water quality, considering the volume and physical and chemical characteristics of the waste, the hydrogeological characteristics of the facility and surrounding land, the quantity and quality of groundwater, and the direction of groundwater flow, the patterns of rainfall in the region, the proximity of the site to surface waters, the current and future potential uses of surface waters in the area, the existing quality of surface water, the potential for health risks and damage caused by exposures to waste constituents, and the permanence of the potential adverse effects. These are the elements that are required to be considered under Appendix A, Criterion 5B6(a-b).

Redefined site boundary and active maintenance. In May 1991, Exxon submitted a request to reduce the size of the restricted area[21] due to groundwater compliance and radioactive material survey's around the tailings impoundment that indicated that the soils contained Ra-226 levels well within the limits provided in 10 CFR Part 40, Appendix A Criterion 6. In July 1991, NRC approved Exxon's request with respect to the contaminated soils[22]. NRC found that the groundwater data were insufficient to support the findings regarding groundwater compliance. The NRC stated, "the reduction in the restricted area will not affect the groundwater compliance program since compliance must be achieved even in the unlikelihood that a contamination plume would migrate beyond any present or proposed restricted area boundary". The current ACL License Amendment Application provides the NRC with an update on migration of the contaminant plume and proposes expansion of the previously proposed LTSB.

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21 ADAMS ML103060254
22 ADAMS ML103060255

The ACL License Amendment Application assesses a range of practicable alternative corrective actions[23] to comply with the requirements of 10 CFR Part 40, Appendix A, Criterion 5B(4) and 5B(6)[24,25]. Expansion of the LTSB as currently proposed would provide for the protection of human health and the environment without requiring active maintenance except for periodic repair and replacement of fencing around the Pit Lake.

Specific Information Requests

Previous Proposals to Treat the Pit Lake with Fertilizer. As you pointed out during our March 2011 meeting, proposals were made regarding the addition of fertilizer to the Pit Lake.

The Pit Lake fertilization program was initially proposed in the 1998[26]. The proposal was to add the macronutrients nitrogen and phosphorus to the Pit Lake to promote algal growth and Pit Lake eutrophication. Increasing the algae growth rate in the epilimnion would increase the concentration of suspended solids in the water column and the rate of sedimentation, which in theory could enhance the removal of selenium, radium and uranium. A proposal for the first year of Pit Lake remediation was subsequently submitted to the WDEQ, WLQD in March, 1999 (Proposal – Reservoir Fertilization for Water Treatment of the Highland Reservoir).

In July 1999 management of the Highland Reclamation Project was transferred from Exxon Coal and Minerals Company (ECMC) to Exxon Company, USA (EUSA) due to the loss of the ECMC veteran project manager and the fertilization program was placed on hold during management transition.

In 2000, ExxonMobil Environmental Remediation (ExxonMobil; formerly EUSA) submitted the results of additional modeling that was conducted to predict the effects of various corrective actions on the long-term water quality of the Pit Lake. In those modeling studies, one of the scenarios evaluated was the treatment of the reservoir by addition of an organic carbon source and fertilizer. In a letter to WDEQ dated September 28, 2000 ExxonMobil indicated that it questioned the benefits of such a corrective action approach given the technical challenges of implementation, the relatively high costs, and the fact that the Wyoming Class III water quality standards did not take into account site specific factors of the Highland site.

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23 ACL License Amendment Application Section 3.2 and Appendix E

24 Nuclear Regulatory Commission (NRC). 1996. Staff Technical Position Alternate Concentration Limits for Title II Uranium Mills. January.

25 Nuclear Regulatory Commission (NRC). 2000. NMSS Decommissioning Standard Review Plan. NUREG 1727, Appendix D. September.

26 Shepherd Miller, Inc. (SMI). 1998. "Hydrologic and Chemical Evolution of the Highland Reservoir, Converse County, Wyoming" December 1998.

While the proposed addition of fertilizer to the Highland Pit Lake was not conducted, pilot-scale studies were conducted to evaluate the addition of macronutrients at the DJX Uranium Pit Lake in Saskatchewan, Canada[27]. These studies indicated that addition of fertilizer (potassium phosphate) could enhance algal growth and the removal of uranium from the water column, but that surface water concentrations of radium-226 and selenium showed no relationship to phosphate loading. These studies suggest that the effectiveness of adding fertilizer to the Highland Pit Lake to improve water quality is highly uncertain. In addition, a recently completed ecological risk assessment for the Highland Pit Lake, which is included with the ACL License Amendment Application (Attachment 3), showed that the euphotic zone (i.e. lake surface to depth of sunlight penetration) is very limited in the Highland Pit Lake with sunlight penetrating to a maximum of about 6.5 ft (2 m) as measured by Secchi disk visibility. Low light penetration in the Pit Lake is expected to limit primary productivity and algal growth and provides additional uncertainty regarding the potential effectiveness of fertilization as a remedial strategy.

The proposal to add fertilizer was made prior to the pilot-scale studies and prior to the recent ecological risk study which indicates that the risk to biological receptors is limited due to lack of habitat, and minimal primary and secondary productivity[28]. Moreover, this proposal was made prior to the discovery that the Lake contains 11e.(2) byproduct material, which removes the Pit Lake from the regulatory oversight of WDEQ and places it under the auspices of the NRC.

We have included and assessed a range of practicable alternative corrective actions in the ACL Amendment Application[24] to comply with the requirements of 10 CFR Part 40, Appendix A, Criterion 5B(4) and 5B(6)[24,25]. Corrective action alternatives considered for the Southeast Drainage and the Highland Pit Lake include both active and passive methods as well as in-situ and ex-situ treatment technologies. Pit Lake fertilization is not included in the evaluation, although addition of an organic carbon source and fertilizer is evaluated.

Uranium Concentrations and Activity Ratios Graph. At the March 22 meeting, NRC Staff indicated that we had not provided sufficient information to allow you to calculate the uranium concentrations in the uranium activity ratio graph that was part of the slide presentation. The graph and the data used to produce it are attached to this letter for your review. ExxonMobil provides additional detail and a thorough discussion of the Uranium Concentrations and Activity Ratios Graph in its ACL License Amendment Application[10].

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27 Dessouki, T.C.E., Hudson, J.J., Neal, B.R., Bogard, M.J., 2005. The effects of phosphorus additions on the sedimentation of contaminants in a uranium mine pit-lake. Wat. Res., 39: 3055-3061.

28 ACL License Amendment Application, Section 2.3 and Attachment 3.

Uranium Isotope Activity Ratio. At the March 22 meeting, NRC Staff asked about ExxonMobil's interpretations of the uranium isotope activity ratios, and you then provided several technical journal articles that describe the use of uranium $^{234}U/^{238}U$ isotopic activity ratio (AR) values to identify groundwater sources. The articles were distributed to the members of our ACL team and were subsequently reviewed with respect to our current understanding of uranium isotope chemistry and application of uranium AR values as indicators of tailings impacted waters at the Highland Site.

Our team of geochemists has reviewed over 25 additional technical articles related to the behavior of uranium isotopes and the use of uranium AR values to identify uranium sources and extent of groundwater mixing at locations throughout the world. The literature review indicates that uranium AR values can be utilized to distinguish groundwaters of specific origin, provided that isotopic distinction exists between the various waters. Uranium isotopic distinction is produced when certain physical and/or geochemical mechanisms operate to produce isotopic "fractionation" in receiving waters. A number of various factors have been identified which can cause uranium fractionation, or otherwise control observed uranium AR ratios in groundwater, the most notable including: (1) lithology and mineralogy of the geologic deposit, (2) rate and extent of chemical weathering, (3) groundwater residence times, and (4) oxidation-reduction conditions in groundwater. The supplemental articles provided by NRC are consistent with ExxonMobil's use of uranium AR values as indicators of tailings impacted waters at the Highland Site. A detailed discussion of the AR ratios and applicability to the waters at the Highland site is included in the ACL Amendment Application[10].

Current Potentiometric Surface Map. During the March 22 meeting, you requested a current potentiometric surface map. The current potentiometric surface map, including the supporting data and interpretations, is included in the ACL License Amendment Application[29].

Conclusion

This letter has provided a response to numerous concerns that were identified and expressed by the NRC staff regarding the history of the Highland Mine and Mill Site and the submission of the new ACL License Amendment Application. The concerns expressed by NRC staff have primarily focused on the evolving plans of Pit Lake disposition, assessment of 11e.(2) byproduct fate and transport away from the mill tailings impoundment, and changes to the LTSB. As described above, there is an extensive history for the Highland Site encompassing almost forty

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29 ACL License Amendment Application Section 1.2.2.7 and Figure 1-23

years from the initial pre-mining plans and proposals to the present. In this span of almost 40 years an extensive amount of data has been collected and analyzed, the tools used for modeling hydrogeological and geochemical processes have become much better, our general understanding of these processes is greatly advanced, and the regulatory environment has changed.

Recent modeling, which incorporates the latest site data and the current scientific understanding of hydrogeochemical processes consequential to chemical fate and transport indicates that hazardous 11e.(2) byproduct constituents (e.g. Ra, Se, and U) have seeped from the tailings impoundment into the Southeast Drainage and the Highland Pit Lake. Consequently, there is a need to reevaluate the adequacy of the current POC wells and approved ACLs, and the previously proposed LTSB. In addition, the Commission's 2000 "concurrent jurisdiction" decision that determined that the Atomic Energy Act of 1954, as amended by UMTRCA of 1978 confers exclusive, preemptive federal jurisdiction over all aspects (radiological and non-radiological) of 11e.(2) byproduct material changed the regulatory environment which govern the long-term land use of the site.

The ACL License Amendment Application that ExxonMobil is submitting in the next few days contains additional data and analyses that support the current request for license amendment.

If you have any questions or would like further information, please feel free to contact me.

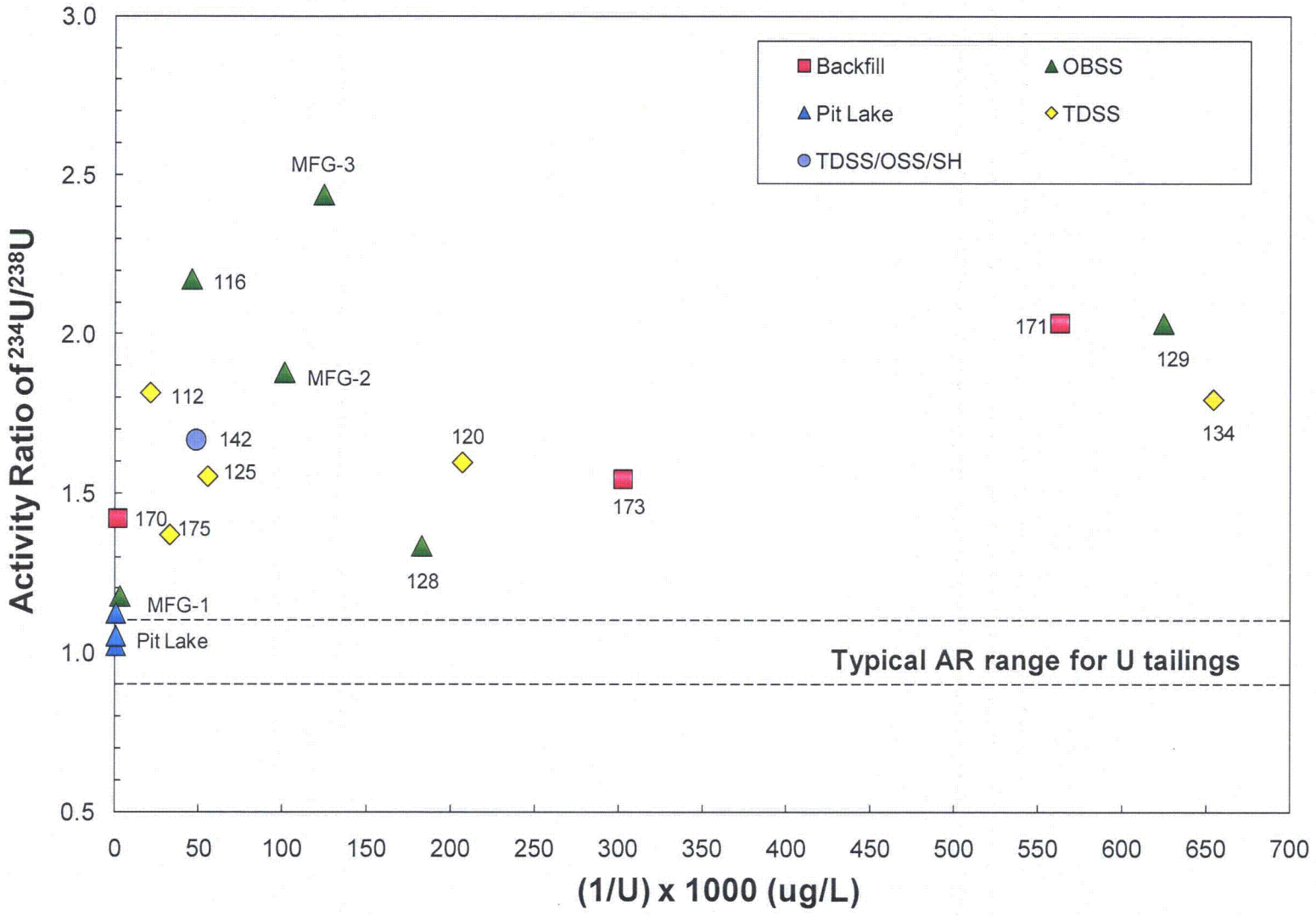
Sincerely,

Mahesh Vidyasagar
Project Manager
ExxonMobil Environmental Services Company

CC: Keith McConnell, NRC
Paul Michalak, NRC
Steve Ingle, WDEQ
Anthony Thompson, Thompson and Pugsley, PLLC
Rebecca Bilodeau, AES, Inc.
Bruce Wielinga, AMEC, Inc.
NRC Document Control Desk
Mark. A. Zuschek

December 2009 Uranium Data used for preparation of AR vs. Concentration graph

Sample ID	Sample Type	U (ug/L)	^{234}U (pCi/L)	^{234}U Precision	^{238}U (pCi/L)	^{238}U Precision	^{234}U/^{238}U
167	Pit Lake	3043	1030	160	1010	160	1.02
168	Pit Lake	3087	1060	170	1010	160	1.05
169	Pit Lake	3145	1110	170	990	160	1.12
170	Backfill	609	240	38	169	27	1.42
171	Backfill	1.78	0.81	0.15	0.398	0.084	2.04
173	Backfill	3.30	1.7	0.3	1.1	0.3	1.55
116	OBSS	21.8	10.1	1.7	4.65	0.77	2.17
128	OBSS	5.47	2.11	0.36	1.58	0.28	1.34
129	OBSS	1.60	0.72	0.14	0.354	0.076	2.03
MFG1	OBSS	347	126	20	107	17	1.18
MFG-2	OBSS	9.87	4.36	0.72	2.32	0.39	1.88
MFG-3	OBSS	8.04	3.85	0.63	1.58	0.27	2.44
112	TDSS	47.5	20.5	3.3	11.3	1.9	1.81
120	TDSS	4.83	2.01	0.34	1.26	0.22	1.60
125	TDSS	18.1	7.4	1.2	4.77	0.78	1.55
134	TDSS	1.53	0.66	0.13	0.368	0.08	1.79
172	TDSS	0.412	0.215	0.053	0.059	0.025	3.64
175	TDSS	30.6	11.9	2	8.7	1.5	1.37
182	TDSS	ND	<0.3	0.2	<0.05	0.1	------
142	TDSS/OSS/SH	20.7	8.7	1.4	5.22	0.86	1.67


Backfill
OBSS
Pit Lake
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TDSS/OSS/SH
Activity Ratio of 234U/238U
(1/U) x 1000 (ug/L)
Typical AR range for U tailings
MFG-3
116
MFG-2
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175
MFG-1
Pit Lake
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