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LOST CREEK ISR, LLC

April 21, ~~2015~~ 2016

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: 2015 ALARA Audit and Public Dose Calculation
Lost Creek ISR Project License SUA-1598, Docket 040-09068, TAC J00717

Dear Mr. Saxton,

Please find, enclosed with this letter, the signed 2015 Annual ALARA Audit, and the public dose calculations for 2015.

Sincerely,

Chris Pedersen
Radiation Safety Officer

Cc: NRC Deputy Director, Division of Decommissioning, Uranium Recovery and Waste Programs
Theresa Horne, Ur-Energy, Littleton
Mr. John Saxton, NRC (via email)

NMSS01

Lost Creek ISR

2015 Annual ALARA Audit

1.0 Executive Summary

As required by NRC Regulatory Guide 8.31, dated May 2002 entitled "Information Relevant to Ensuring That Occupational Radiation Exposure At Uranium Facilities Will Be As Low As Is Reasonably Achievable (ALARA)", Section 2.3.3 "Radiation Protection and ALARA Program Audit" the annual ALARA audit was performed at the Lost Creek ISR Project (LC-ISR) during the period October 10 to November 15, 2015 by Bill Kearney, Radiation Protection Specialist.

The on-site audit took place on November 5, 2015. The on-site audit team included Bill Kearney, John Cash (VP Regulatory Affairs), Kurt Brown (Mine Manager), Jay Pry (Plant Foreman), Jay Douthit (Wellfield Operations Superintendent) and Mike Gaither (Manager EHS and Regulatory Affairs). Chris Pedersen (RSO) and Krista Amunson (HPT) assisted with the audit but were not official members of the audit team.

In accordance with Section 2.3.3 of NRC Regulatory Guide 8.31 the following areas of the Radiation Protection Program were reviewed and the results are summarized in this report:

- Employee exposure records
- Bioassay results
- Inspection log entries, daily and weekly inspections, and monthly summary reports
- Documented training program activities
- Radiation safety meeting reports
- Radiological survey and sampling data
- Reports on overexposure of workers submitted to applicable agencies
- Operating procedures that were reviewed during the past year

Additionally, this audit also covered the following recommendations from the previous 2014 ALARA audit report:

- Assess any trends in the radiological monitoring and survey data used to determine employee exposures.
- Assess any trends in personnel exposure of yellowcake/uranium workers to radioactive materials especially as exposures relate to elevated bioassays.
- Assess the radiologic environmental monitoring program and determine if there are any trends in the data.

- Review wellfield operations data as it relates to NRC License No. SUA-1598.

In accordance with NRC guidance, the report on the annual radiation protection and ALARA audit should specifically discuss the following:

- Trends in personnel exposures for identifiable categories of workers and types of operational activities.
- Whether equipment used for exposure control is being properly used, maintained, and inspected.
- Recommendations on ways to further reduce personnel exposures from uranium and its daughters.

2.0 Lost Creek ISR Project ALARA Activities

This ALARA Audit covers the period October 1, 2014 thru September 30, 2015. Bill Kearney, Radiation Protection Specialist, conducted the full audit. The on-site ALARA Audit Team was comprised of John Cash (VP Regulatory Affairs, Kurt Brown (Mine Manager), Jay Pry (Plant Foreman), Jay Douthit (Wellfield Operations Superintendent) and Mike Gaither (Manager EHS and Regulatory Affairs). Chris Petersen (RSO) and Krista Amunson (HPT) assisted with the audit but were not official members of the audit team.

At the time of the on-site audit (November 4 and 5), the workforce at LC-ISR totaled 56 personnel with 15 workers assigned to the Plant, 20 workers assigned to the wellfield (operations and construction) and 21 office workers (geologists, management, environmental, safety and radiation protection staff). Bill Kearney reviewed NRC license documents, site radiological monitoring data (both health physics and environmental monitoring site data) and numerous Standard Operating Procedures. In summary, the following relevant documents were reviewed:

- NRC License No. SUA-1598
- NRC License Application Technical Report (emphasis on Section 5- "Operational Organization, Management, Programs and Training")
- Applicable NRC Regulatory Guides including, but not limited to nos. 4.14, 8.15, 8.22, 8.25, 8.29, 8.30, and 8.31
- 10 CFR Part 20
- Monthly Radiation Safety Summary Reports
- Miscellaneous site records and reports generated by the Radiation Safety staff
- NRC Inspection Report 040-09068/15-001 dated September 11, 2015

In addition to the review of the above documents, the site RSO and HPT were consulted and they provided details concerning their working knowledge of the Radiation Protection Program and the various files and databases containing the data and records supporting the program.

3.0 Review of Radiation Program Data

3.1 Employee Exposure Records

A detailed review of the employee exposure records was completed. The review of the records concentrated on the period October 1, 2014 thru June 30, 2015. In accordance with NRC requirements, employee exposure records are summarized by tracking the Total Effective Dose Equivalent (TEDE) for select employees. Accordingly, the TEDE records for employees at the LC-ISR are comprised of the internal Committed Effective Dose Equivalent (CEDE) from exposure to particulate uranium and radon daughters (radon) and the Effective Dose Equivalent (EDE) to external gamma radiation.

The Deep Dose Equivalent (DDE) is determined for gamma radiation exposure from Optically Stimulated Luminescence (OSL) personnel dosimeter badges that are exchanged every three months. The badges are supplied by Landauer Corporation.

The CEDE for uranium and radon is determined from air sampling data obtained from area sampling and breathing zone (BZ) monitoring. The BZ monitoring is used to estimate exposures to uranium during Radiation Work Permit (RWP) activities. BZ monitoring is also routinely used to estimate exposures to uranium for personnel that work in the Dryer Room (Dryer Operators and maintenance workers). Actual occupancy times and credit for respiratory protection are used to estimate these doses. Additionally, on an infrequent basis, the internal dose to uranium is estimated from the uranium bioassay results.

Records for the period Q3 2014 thru Q2 2015 were reviewed as the Q3 2015 records were not complete at the time of the audit due to the processing of the Q3 2015 OSL badges by the supplier. A review of the records show that the TEDE was estimated for approximately 72 personnel.

A review for the TEDE records show that personnel that do not routinely work at the Plant Restricted Area are summarized in 3 groups (Office Workers, Chemlab, and Wellfield Construction (not Wellfield Operators). Over the year period, wellfield workers received an estimated dose less than 30 mrem. The Office

Workers received a dose between 120 and 180 mrem. The workers in the Chemlab received a dose of 275 mrem; the bulk of that dose came from the abnormally high radon concentration in Q4 2014 (127 mrem).

The work groups that are expected to, and do, show some level of estimated exposure (TEDE) to radiation at the LC-ISR Project (i.e. yellowcake/uranium workers) include maintenance workers that work in the Plant, Plant Operators and Dryer Operators, and to a lesser extent, the radiation protection staff (RSO and RST). On an infrequent basis Plant Operators may assist with drying operations and some of the Plant Operators had been Dryer Operators for part of the period, prior to being reassigned as Plant Operators. A summary of the TEDE for these work groups for the period Q3 2014 thru Q2 2015 follow:

Maintenance Workers TEDE:

Range- 249 to 325 mrem

Mean- 293 mrem (5.9% ALI)

Plant Operators TEDE:

Range- 341 to 395 mrem

Mean- 362 mrem (7.2% ALI)

Dryer Operators TEDE:

Range- 341 to 540 mrem

Mean- 444 mrem (8.9% ALI)

RSO and RST TEDE:

Range- 177 to 265 mrem

Mean- 201 mrem (4.0% ALI)

The review of the TEDE records and the conservative data presented above for these work groups show low exposures to radiation.

3.2 Uranium Bioassay Results

A detailed review of the uranium bioassay program and records was completed. The bioassay program is contained in SOP HP-009 "Bioassay Monitoring." The review of the records concentrated on the period October 1, 2014 through September 30, 2015.

Uranium bioassay samples are obtained from workers representing all the work groups at the LC-ISR Project. Urinalysis for U-nat comprises the bioassay method. Bioassay samples are obtained on a routine basis from most workers at the LC-ISR Project. Bioassay samples are obtained more frequently from Plant and Dryer Operators who by the nature of the work directly handle yellowcake and/or uranium contaminated materials. In general, Dryer Operators and Plant Operators provide bioassay samples on a weekly basis when they return to work for their next shift. Maintenance personnel assigned to the Plant typically provide samples on a weekly basis. Bioassay samples are also required for non-routine work activities (typically associated with Radiation Work Permits) where significant exposure to uranium may occur and respiratory protection may be required.

The main purpose for the bioassay program is to ensure that workers are not realizing an intake of uranium (typically by inhalation or ingestion) from activities not known to the LC-ISR management and the Radiation Protection staff. The bioassay program is also an integral part of the Respiratory Protection Program and is used to ensure that workers are properly utilizing respirators. This includes ensuring that the respirators utilized are of the correct style, contain the correct types of filters, and afford the appropriate protection factor.

The review of the bioassay records showed that the laboratory results were available within 20 days of specimen collection. It was verified with the RSO that the current contract laboratory (IML Sheridan, WY) provides very quick turnaround of the required uranium analyses and notifies the RSO or RST immediately (within the same day the analyses are completed) via phone and email of the detection of any positive results (including spikes). Notification is typically received at the LC-ISR Project within 3-4 business days of receipt of the samples by the lab.

The results for bioassay samples collected from October 1, 2014 through September 30, 2015 were reviewed. It was observed that 332 bioassay results were analyzed, not including quality control samples. It was determined that there were only 5 detectable results during the period and they were all less than 6.5 ug/L (detection limit is 5.0 ug/L). This shows a significant improvement compared to the last report when there were 37 detectable bioassay results during the previous period of review.

There were no documented investigations by the RSO required during this period as there were no bioassay results greater than 15 ug/L. This shows a significant improvement compared to the last report when there were seven (7) bioassay results during the previous period of review that required investigation by the RSO. Discussions with the RSO showed that the following actions and ALARA practices assisted in substantially reducing the number of positive bioassays:

- Additional training for Plant and Dryer Operators on personal hygiene and the obtaining of urine samples
- Additional training on respiratory protection and cleaning of respirators
- Changes to personnel that may have resulted in better personal hygiene practices
- Use of powered air-purifying respirators (PAPR) during maintenance activities where high levels of uranium particulates is presumed

The in house QA/QC blank and spike bioassay samples for the period October 1, 2014 through September 30, 2015 were also reviewed in detail (approximately 47 samples). It was determined that blank and spike samples were included as required by SOP HP-009 "Bioassay Monitoring". The review showed that the contract lab results were in close agreement with the spiked concentrations (typically within 5 % of the known concentration) and no concerns were noted with the contract lab results.

3.3 Daily and Weekly Inspections

A detailed review of the Daily and Weekly Radiation Safety Inspections reports completed from Q4 2014 through Q3 2015 was conducted as part of the on-site audit by John Cash and Kurt Brown. It was observed that SOP HP-003 and Form HP-003A "Radiation Safety/ALARA Inspections" which is used to document both the daily and weekly inspections had been revised as a result of recommendations from last year's audit. The form still covers the entire week, but it has been revised to include specific wellfield inspection items. It also contains a separate sheet that contains numbered "Plant Inspection Items" in order that there is adequate space to expand upon specific inspection items.

The review of the records showed that the required inspections had been completed as required to assist in promoting the ALARA concept. The review also showed that the RSO and Plant Foreman had documented their review of the inspections in the required timeframes.

3.4 Documented Training Program Activities

Records documenting Radiation Protection Training, DOT Training and General Safety Training were reviewed by Mike Gaither as part of the on-site audit. It was observed that the records were better organized compared to the previous audit and more detail has been included to document the topics covered. The Radiation Protection Training includes the use of a detailed Power Point slideshow presented by the RSO and a quiz to demonstrate that trainees understand the key concepts. In summary, it was determined

that Radiation Protection Training was presented to approximately 10 new employees, 3 rehires and 20 contractor employees in 2015. Records showed that Annual Radiation Protection Refresher training for workers at Lost Creek was provided on June 23 and 29, 2015.

A review of the training records for the RSO (Chris Pedersen) and the HPT (Krista Amunson) showed that they both last attended "Radiation RSO Refresher" training on November 14, 2014 and June 8, 2015, respectively. They both attended DOT training for shipping radioactive materials on September 23 and 24, 2015. Relative to radiation training, the following recommendations are included:

- Ensure that training is documented on an appropriate form or memo.
- Add additional training spreadsheet(s) for radiation program-specific training (e.g. respirator training/medical clearance/fit test matrix) to better track training fulfilment and scheduling. Currently the radiation training is tracked on the safety training-specific matrix.

3.5 Radiation Safety Meeting Reports

The RSO completes a Monthly Radiation Safety/ ALARA report that is forwarded to LC-ISR and corporate management. The report summarizes the results of the daily and weekly inspections, radiation surveys and monitoring, radiation safety training, Radiation Work Permits (RWPs) completed, estimated exposures for the month. The report also summarizes any compliance concerns and the need for corrective actions and it includes the quarterly TEDE estimates for employee exposures. A review of the monthly reports from Q3 2014 through Q3 2015 show them to be very detailed and they include the information required by NRC regulatory guidance. The RSO is completing the reports in a timely manner.

3.6 Radiological Survey and Sampling Data

This audit focused on the radiological survey and sampling data used to support the ALARA program at the Plant (Restricted Area) as it relates to the protection of personnel from exposure to uranium and its daughters, including the determination of the TEDE. In accordance with a recommendation in the previous ALARA Audit, the radiological survey and sampling data used to support the environmental monitoring program were reviewed in detail. The following radiological survey and monitoring data for the radiation protection program were reviewed; uranium and radon daughter monitoring

(sampling) data, gamma (OSL) personnel monitoring, "clean" area contamination surveys, personnel contamination survey data and surveying (screening) of materials for unrestricted release.

Uranium Monitoring Data

In accordance with SOP HP-008 "Indoor Airborne Rad Sampling" it was verified that airborne uranium is routinely sampled at four locations in the Plant using high volume pumps (30 LPM) and particulate filters. The period Q4 2014 through Q3 2015 was reviewed. The required monthly "area" monitoring for airborne uranium was completed at the Yellowcake Slurry Area, Filter Presses, and Yellowcake Drum Storage Area. As expected, the results for these areas showed that airborne uranium concentrations are very low (0 to 3% DAC). Therefore, the potential exposure of workers in the Plant to airborne uranium is very minimal under normal operating conditions. This also shows that work practices and ventilation systems are effective in minimizing airborne uranium concerns.

The Dryer Room was monitored on the required monthly basis for "area" airborne uranium. This room is maintained as an "Airborne Radioactivity Area" under normal operating conditions. Therefore, workers are not permitted to enter the Dryer Room without the required respiratory protection (fullface negative pressure respirator or fullface PAPR). The monthly monitoring is typically conducted when drying and packaging operations are not occurring. When work activities are not occurring the levels of uranium particulates in the room are typically 1-10% DAC. Although the air monitoring data shows it may not always be required, LC-ISR maintains the Dryer Room as an "Airborne Radioactivity Area" as a conservative administrative control to keep the potential exposure of workers to uranium ALARA. Given these conditions the following is recommended:

- Because the Dryer Room is maintained as an "Airborne Radioactivity Area", workers utilize BZ monitoring to determine airborne uranium particulate concentrations to determine exposure to uranium. Therefore, it is recommended that the monthly area monitoring for uranium be discontinued.

Radon Monitoring Data

In accordance with SOP HP-005 "Indoor Radon Monitoring, Sampling and Mitigation" it was verified that radon daughter concentrations (radon) are routinely monitored at locations in the Plant, Office area and header houses. Radon daughter concentrations are determined using the Modified Kusnetz method. It was observed that the frequency of radon monitoring completed during the last year varied but it was done at least monthly at required locations. A review of the radon monitoring data shows that levels are very low and less than those typically observed at other operating ISR facilities. The very low levels of radon are attributed to the fresh air ventilation system used at the Plant, the tank

ventilation systems, and the relatively closed nature of resin transfer and processing activities. Currently, IX resin is transferred within the Plant between vessels and there is no transfer of resin from trucks.

In summary, a review of the monitoring data shows that radon concentrations in the Plant (except the Dryer Room) and header houses are typically only 1-5% DAC. The Dryer Room typically contains radon concentrations near 10-13% DAC. This higher concentration at the Dryer Room is attributed to the fact that the Dryer Room has negative ventilation which may be causing the buildup of radon daughters due to a lack of significant fresh air exchanges. Additionally, the radon daughter monitoring results may on occasion be impacted by uranium particulates captured on the filter. This would result in calculated radon daughters concentrations being elevated compared to actual concentrations. It should be noted that the Dryer Room is posted as an "Airborne Radioactivity Area" due to the potential for elevated particulate uranium concentrations. Therefore, workers are also routinely protected from any radon daughters present in Dryer Room.

A review of the 2015 radon monitoring data for the Office areas shows that mean radon concentrations are approximately 5% DAC. These concentrations are slightly greater than those observed for the Plant. During late 2014 there were some changes made to the CPP ventilation system that resulted in an apparent improvement (lessening) of radon in the Office areas.

Radon monitoring is augmented with radon continuous air monitors (CAM) that assist in immediately identifying (via alarms) the presence of radon daughters. These monitors can also digitally log radon concentrations to permit further data analysis. These are used at the LC-ISR to investigate activities that could cause the release of radon as well as a warning device in case an unanticipated source of radon develops. Because these monitors have stringent calibration requirements and they are not approved by the NRC they are not used for dose determinations. Details for how the CAMs are used are not covered in any SOP. Because the CAMs are an important component of the radon monitoring and detection program at the Plant, SOP HP-005 should be updated to include a description of how the CAMs are utilized and maintained. Alternatively, a new SOP dedicated to the CAMs could be developed.

The following recommendations are included:

- Routine radon monitoring should be maintained at a monthly frequency.

- The monthly radon monitoring results for the Office should be more closely tracked to assess if changes to the CPP ventilation system have been effective in reducing radon levels in the Office.

- The use and operation of the radon CAMs should be included in SOP HP-005, or a new SOP that just addresses the use of the radon CAM should be developed.

Gamma Dosimetry Data

The gamma dosimetry data was reviewed. In accordance with SOP HP-002 "Personnel External Radiation Dosimetry," OSL personnel dosimeter badges are currently used to monitor gamma radiation exposure. The badges are supplied by Landauer Corporation and they are exchanged every three months.

Since the start of operations in Q3 2013, through Q2 2015 all personnel that work at the Lost Creek ISR project CPP, wellfield operators and representative employees from other work groups have been required to wear OSL badges. This included personnel from the Casper office (management staff, EHS personnel, geologists) that are at the facility on a limited basis (typically only once or twice per week). The employees who do not routinely work in the CPP do not have any significant gamma exposure in the workplace and, in accordance with NRC regulations and guidance documents, are not required to be monitored. In accordance with recommendations included in the 2014 ALARA Audit, the RSO reduced the number of personnel in the dosimetry badge program to those employees working in the CPP. This includes the radiation protection staff, CPP and Dryer Operators and CPP Maintenance workers.

Records for the Q3 and Q4 2014 and Q1 and Q2 2015 were reviewed as the Q3 2015 records were not complete at the time of the audit due to the processing of the Q3 2015 OSL badges by the supplier.

The Deep Dose Equivalent (DDE) data for this period was reviewed in respect to the various work groups that the personnel are assigned to. The only work groups that showed any DDE are as follows:

Maintenance Workers DDE:

Range- 3 to 65 mrem

Mean- 38 mrem (<1% ALI)

Plant Operators DDE (estimated, based on less than full time duties):

Range- 39 to 142 mrem

Mean- 83 mrem (<2% ALI)

Dryer Operators DDE (estimated, based on less than full time duties):

Range- 56 to 152 mrem

Mean- 116 mrem (<3% ALI)

Wellfield Operators DDE:

Range- 11 to 36 mrem

Mean- 25 mrem (<1% ALI)

Radiation Protection Staff DDE:

Range- 20 to 23 mrem

Mean- 22 mrem (<1% ALI)

The highest estimated full year DDE dose (152 mrem for a Dryer Operator) was approximately 3% of the ALI. This low exposure to gamma radiation is comparable to the previous year.

Gamma Survey Data

Gamma radiation surveys are currently completed on a monthly basis to measure gamma radiation levels at various locations in the Plant, Office area and wellfield header houses. This is primarily done to ensure that tanks, IX vessels or other equipment in the Plant do not become a significant gamma radiation source that could require posting as a "Radiation Area" (greater than 5 mR/hr) and ensure that ALARA principles are adhered to in order that workers do not receive unacceptable levels of gamma radiation. Although SOP HP-006 "Gamma Surveys" specifies a minimum frequency of semi-annual monitoring, the radiation protection staff at the LC-ISR has been completing this monitoring on a monthly basis since the start of production operations. It is recommended that the monthly gamma survey frequency be continued, in part, to help ensure that any unknown sources of significant gamma radiation do not develop.

The monthly gamma survey data for the Plant and Office area for Q4 2014 thru Q3 2015 was reviewed. The review showed that gamma levels in the Plant are low and in the range expected for a newer ISR IX Plant facility. In summary, tanks, IX columns and other equipment had relatively low gamma radiation levels of approximately 100 to 1,000 uR/hr. No survey data exceeded or approached the level requiring posting as a "Radiation Area." Areas that are routinely occupied by workers (Control Room, main floor areas (i.e. not between tanks)) exhibit lower gamma levels. A review of the monthly gamma survey data for the Office area showed that gamma levels are at background except for a slight elevation at several of the offices located adjacent to the Plant. Accordingly, actual employee exposures to gamma radiation, as evidenced by the OSL personnel dosimetry data, remain low.

Personnel Contamination Surveys

Personnel contamination surveys (scanning) are conducted at three locations at the Plant (Main Survey Station in the foyer, the East Door and the North Door). The surveys are conducted for

alpha/beta activity with a Ludlum Model 2360 meter equipped with a 43-93 probe. The RST periodically sets the acceptable limit for the alpha/beta activity based on the meter efficiency for alpha and for beta and background beta activity. Records of the surveys were observed at the survey stations.

A spot check of the personnel contamination survey records completed in Q4 2014 thru Q3 2015 was conducted as part of the on-site audit by John Cash and Kurt Brown. The review showed the records to be complete. Because the acceptable release limits are set each week, it was difficult to confirm that the activity numbers recorded on the survey record (form) met the applicable release limit. Therefore, the following recommendation is included:

- SOP HP-007 "Personnel Surveys" should be revised to reflect that the RSO or RST will include the calculated release limit on the survey forms. As an alternative the RSO should consider modifying the SOP and form such that individuals that survey do not need to record the actual result (dpm's) but just note via a "check" that the survey results met (or failed) the applicable limit(s).

3.7 Reports on Over Exposure of Workers

There were no instances of over-exposure of any worker to radioactive materials. Therefore, no reports of this nature were reviewed.

3.8 Annual Review of Standard Operating Procedures (SOPs)

Section 5.2.1 "Environmental, Health and Safety Management System (EHSMS)" of the NRC Technical Report (TR) requires that "SOPs related to handling, processing, storing, or transporting radioactive materials and all health physics related SOPs will be annually reviewed by the RSO". As part of the previous 2014 ALARA Audit many standard operating procedures (SOPs) related to radiation protection were reviewed. Additional review and subsequent revisions were completed during the period Q4 2014 thru Q1 2015. In order to ensure that the RSO completed this required review on an annual basis, and it is adequately documented, the following recommendation is included:

- The RSO should document their required annual review of the required SOPs in a memo format that specifies the date(s) of the review and summarizes the extent of the review and any significant changes to the SOPs.
- The above should be done for calendar year 2015 prior to December 31, 2015.

4.0 Review of the Radiologic Environmental Monitoring Program

The 2014 ALARA Audit included a recommendation for the 2015 audit to "assess the radiological environmental monitoring program and determine if there are any trends in the data". This was completed as part of this audit for the radiological particulate air monitoring data, passive radon and gamma monitoring data, and the soil monitoring data routinely monitored at the five high volume (Hi-Vol) air monitoring stations (HV-1 thru HV-5).

4.1 Radiological Particulate Air Monitoring Data

A comprehensive review of the eight (8) years of radiological particulate air monitoring data obtained from the five high volume (Hi-Vol) air monitoring stations was completed to assess the potential impacts of the operations on the environment and assess if any changes to the current monitoring program were warranted. The comprehensive review included the development of spreadsheets to calculate statistics, such as mean and maximum concentrations, for uranium (U-nat), thorium-230, radium-226 and lead-210. This effort also included the development of graphs for each monitoring station that show the concentrations of uranium, thorium-230, radium-226 and lead-210 versus time, from the first quarter 2008 (Q1 2008) through the second quarter 2015 (Q2 2015). The graphs permitted an assessment of the monitoring data to ascertain if any trends in the data are evident. In summary, the comprehensive review of the radiological particulate air monitoring data showed the following:

1. The monitoring data for the two monitoring stations that are basically upwind from operations and therefore monitor background levels of the radiological particulates (Stations HV-3 and HV-5) do not show any significant trends in the parameters monitored. The mean concentrations of uranium, thorium-230, and radium-226 at both stations were consistently less than 1% of the Effluent Concertation Limit (ECL). The mean concentrations of lead-210 were consistently less than 2.5% of the ECL at both stations. Also, the monitoring data obtained at both stations is very comparable to each other.
2. The monitoring data for Station HV-2 which is just downwind (approximately 50 feet) from the CPP does show a slight increase in uranium concentrations since start of uranium production and processing began in the third quarter of 2013. It was determined that the mean concentration of uranium during operations increased from less than 1% of the ECL prior to operations, to approximately 5% of the ECL since the start of operations in August 2013. This is not unexpected as the monitoring station is located very close to and downwind to the CPP. The concentrations of thorium-230, and radium-226 remained at background (less than 1% of the ECL). The mean concentrations of lead-210 were also at background levels, consistently less than 2.5% of the ECL.
3. The monitoring data for Station HV-1 (which is located approximately 17 miles north east of the CPP and was intended to monitor the nearest residence at Baroil) does not show any significant trends in the parameters monitored. The mean concentrations of uranium, thorium-230, and radium-226 were consistently less than 1% of the Effluent Concertation Limit (ECL). The mean concentrations of lead-210 were consistently less

than 2.5% of the ECL. Also, this monitoring data is very comparable to the background stations (Stations HV-3 and HV-5). In summary, the monitoring data from this station shows that there are no impacts from the uranium mining and processing operations.

4. The monitoring data for Station HV-4 (which is located at the license area boundary approximately 2.5 miles east and downwind of the CPP) does not show any significant trends in the parameters monitored. The mean concentrations of uranium, thorium-230, and radium-226 were consistently less than 1% of the Effluent Concertation Limit (ECL). The mean concentrations of lead-210 were consistently less than 3% of the ECL. Also, this monitoring data is very comparable to the background stations (Stations HV-3 and HV-5). In summary, the monitoring data form this station shows that there are no impacts from the uranium mining and processing operations.

Based on the comprehensive review of the radiological particulate air monitoring data, as discussed above, the following recommendations are included:

- Consideration should be given to discontinuing the radiological particulate air monitoring at Station HV-1 located approximated 17 miles north east of the CPP at Baroil as the monitoring data shows the site continues to monitor background conditions and there are no measurable impacts from the operations. Such a revision to the monitoring program would be consistent with NRC Regulatory Guide 4.14 "Radiological Effluent and Environmental Monitoring at Uranium Mills" that recommends a monitoring station to measure potential impacts form a conventional uranium mill to the nearest residence or occupiable structure within 10 kilometers (6.2 miles) of the of the conventional uranium mill. Given that the ISR operation does not contain a conventional uranium mill and utilizes a vacuum dryer and is considerably more than 6.2 miles from Baroil, it is inconceivable that any impacts from the operations could be effectively monitored at this location.
- Consideration should be given to discontinuing the radiological particulate air monitoring at Station HV-5 as this station is upwind of the CPP, monitors background and is duplicative with Station HV-3.

4.2 Passive Radon Monitoring Data

A comprehensive review of the seven (7) years of passive radon monitoring data located at the five high volume (Hi-Vol) air monitoring stations was completed to assess the potential impacts of the operations on the environment and assess if any changes to the current monitoring program were warranted. The comprehensive review included the development of spreadsheets to calculate statistics, such as mean and maximum levels of radon (pCi/L) as determined from the radon cups that are exchanged on a quarterly basis. This effort also included the development of graphs for each monitoring station that show the concentrations of radon versus

time, from the first quarter 2008 (Q1 2008) through the second quarter 2015 (Q2 2015). The graphs permitted an assessment of the monitoring data to ascertain if any trends in the data are evident. In summary, the comprehensive review of the radon monitoring data showed the following:

1. The radon data that pertains to Stations HV-2, HV-3, HV-4 and HV-5 (PR-5, PR-2, PR-10 and PR-3, respectively) all track very close and represent background conditions with a mean radon concentration of approximately 0.9 to 1.3 pCi/L. There is no discernable impact from the operations. In fact, when the levels of radon monitored under operating conditions are compared to levels measured during the pre-operational period, the radon levels actually show a slight decrease at most stations, including Station HV-2 which is located adjacent to the CPP.
2. The radon data that pertains to Stations HV-3 (PR-2) and HV-5 (PR-3) which are both upwind from the CPP and monitor background conditions compare favorably and there is no discernable impact from the operations.
3. The radon data that pertains to Station HV-1(PR-1) located a Baroil actually shows lower concentrations of radon than the other four stations under both pre-operational and operating conditions. This could be attributed to the fact that the other four stations are located closer to uranium deposits. Additionally, the concentration of radon during the operational conditions is less than during the pre-operational background conditions. In summary, due to the distance that Station HV-1 is from the operations it is not expected that impacts from radon generated by the operations would be detectable at this location and the monitoring data represents background conditions and the inherent variability associated with natural radon monitoring data.

Based on the comprehensive review of the radon monitoring data, the following recommendation is included:

- Consistent with the recommendations to discontinue monitoring of the radiological air particulate monitoring at Stations HV-1 (PR-1) and HV-5 (PR-3) it is recommended that the passive radon monitoring also be discontinued at these stations.

4.3 Passive Gamma Monitoring Data

A comprehensive review of the seven (7) years of passive gamma radiation monitoring data located at the five high volume (Hi-Vol) air monitoring stations (PR-1thru PR-5) and additional monitoring sites located distant from the CPP (PR-4, PR-6, PR-7, PR-8, PR-9, PR-11 and PR-12) was completed to assess the potential impacts of the operations on the environment and assess if any changes to the current monitoring program were warranted. The comprehensive review included the development of spreadsheets to calculate statistics, such as mean and maximum levels of gamma radiation (mrem per quarter) obtained from the OSL dosimeters that are exchanged on a quarterly basis. This effort also included the development of graphs for each

monitoring station that show the levels of gamma radiation versus time, from the first quarter 2008 (Q1 2008) through the second quarter 2015 (Q2 2015). The graphs permitted an assessment of the monitoring data to ascertain if any trends in the data are evident. In summary, the comprehensive review of the gamma radiation monitoring data showed the following:

1. The gamma radiation data that pertains to Stations HV-1, HV-2, HV-5 and HV-3 (PR-1, PR-5, PR-3 and PR-2, respectively) all track very close and represent background conditions with a mean gross gamma radiation of approximately 58 mrem/quarter. There is no discernable impact from the operations.
2. The gamma radiation data that pertains to Station HV-5 (PR-3) that is located upwind from the CPP and tracks background conditions shows that the data is very comparable to the other upwind background monitoring Station HV-3.
3. The gamma radiation data that pertains to Station HV-4 (PR-10) also tracks background conditions as it is located distant from the CPP. It does consistently have higher gross gamma radiation of approximately 70 mrem/quarter. There is no discernable impact from the operations. It is possible that this higher background gamma results from nearby natural uranium deposits.
4. The gamma radiation data that pertains to Station HV-2 (PR-2) which is located adjacent to the east side of the CPP may show some minor impacts from operations. A review of the data and the graph show that the gross gamma radiation appears to have increased slightly from pre-operational background conditions from approximate 58 to 63 mrem/quarter. This apparent minor increase is not unexpected as the monitoring site is directly adjacent to the CPP. It should be noted that this apparent slight increase is still less than the background conditions measured at Station HV-4.
5. The gamma radiation data that pertains to Stations PR-4, PR-6, PR-7, PR-8, PR-9, PR-11 and PR-12 which are located distant from the CPP all track very close and represent background conditions with a mean gross gamma radiation of approximately 57 mrem/quarter for the period of record. There is no discernable impact from the operations. Additionally, it was determined that the mean gross gamma radiation of approximately 57 mrem/quarter for the period of record is basically indiscernible from the mean gross gamma radiation of approximately 58 mrem/quarter for the four Stations HV-1, HV-2, HV-5 and HV-3 (PR-1, PR-5, PR-3 and PR-2, respectively). This supports that the gamma radiation monitoring at all locations monitors background conditions.

Based on the comprehensive review of the gamma radiation monitoring data, the following recommendation is included:

- Consistent with the recommendations to discontinue monitoring of the radiological air particulate monitoring at Stations HV-1(PR-1) and HV-5 (PR-3) it is recommended that the passive gamma monitoring also be discontinued at these stations.
- It is recommended that the passive gamma monitoring also be discontinued at Stations PR-4, PR-6, PR-7, PR-8, PR-9, PR-11 and PR-12 which are located distant from the CPP

as they continue to only monitor background conditions and there is no reason to expect that they will generate any useful information in the future.

4.4 Soil Monitoring Data

A comprehensive review of the three (3) years of radiologic soil monitoring data obtained from the five high volume (Hi-Vol) air monitoring stations (HV-1 thru HV-5) was completed to assess the potential impacts of the operations on the environment and assess if any changes to the current monitoring program were warranted. The radiologic soil data is obtained on an annual basis. The comprehensive review included the development of spreadsheets to calculate statistics, such as mean and maximum concentrations, for uranium (U-nat), thorium-230, radium-226 and lead-210. This effort also included the development of graphs for each monitoring station that show the concentrations of uranium, thorium-230, radium-226 and lead-210 versus time, for 2010 (Background), 2014, and 2015. The graphs permitted an assessment of the monitoring data to ascertain if any trends in the data are evident. In summary, the comprehensive review of the radiological particulate air monitoring data showed the following:

1. The soil radiological soil data for all five stations show no significant trends from background conditions or impacts from the operations. The observed variability at such low concentrations of all parameters fall within the expected range of values due to natural variability, as well as variability associated with sampling and analytical procedures.
2. Accordingly, the analysis shows the following mean concentrations or activity for each parameter at all the stations combined:

U-nat	2.18 mg/kg
Th-230	0.67 pCi/g
Ra-226	1.54 pCi/g
Pb-210	0.80 pCi/g

3. The soil radiological soil data Station HV-1 (which is located approximately 17 miles north east of the CPP and was intended to monitor the nearest residence at Baroil) does not show any significant trends in the parameters monitored. Also, this monitoring data is very comparable to the background stations (Stations HV-3 and HV-5). In summary, as expected due to its distance from the operations, the data continues to show background conditions and no impacts from the uranium mining and processing operations.
4. The soil radiological soil data for all parameters at Station HV-5 (located upwind from the CPP and tracks background conditions) shows that the data is very comparable to the other upwind background monitoring Station HV-3.
5. The soil radiological data at Station HV-4 also tracks background conditions as it is located distant from the CPP. This station does show slightly higher soil uranium

concentrations for background and monitoring conducted during operations. It is possible that this higher background results from nearby natural uranium deposits or just the natural variability in soil uranium levels.

6. The soil radiological data for Station HV-2 that is adjacent to the CPP shows no discernable impacts from operations.

Based on the comprehensive review of the soil radiological monitoring data, the following recommendation is included:

- Consistent with the recommendations to discontinue the radiological air particulate monitoring at Stations HV-1 and HV-5 it is recommended that the annual radiological soil monitoring also be discontinued at these stations.

5.0 Trends in Personnel Exposures

Section 3.1 "Employee Exposure Records" reviews and discusses the exposure of personnel at the LC-ISR Project to radioactive materials (uranium, radon daughters and gamma radiation) including the estimates of the TEDE determinations. As discussed in Section 3.2 "Uranium Bioassay Results" there was significant reduction in the number of positive bioassays from the previous report period. This reduction mostly involved Dryer Operators. Therefore, the exposure of Dryer Operators to uranium and the corresponding dose from the internal exposure to uranium was substantially reduced.

In summary, there were no other significant trends in personnel exposure and the conservative estimates of personnel exposures show that they have been maintained at less than 11% of the ALI. The following is recommended:

- Efforts to minimize the occurrence of positive bioassays from current, and any new, Dryer Operators should continue.

6.0 Equipment Used for Exposure Control

The equipment used at the LC-ISR Plant to control the exposure of workers to radioactive materials (radon daughters and particulate uranium) includes the following:

- A ducted forced air ventilation system that filters incoming air of dust is used in combination with wall vents and fans, and passive ventilation as necessary, to assist in ensuring sufficient air exchanges in the building to prevent the buildup of radon daughters.

- Point source ventilation that directly vents tanks, IX columns and the resin shaker deck via exhaust pipes and fans to the outside. This ventilation is primarily intended to vent radon daughters and chemical fumes outside the Plant.
- The Dryer Room contains a HEPA filter system that discharges filtered air from the Dryer Room to the Precipitation area of the Plant. This system maintains negative pressure in the Dryer Room to assist in ensuring that uranium particulates remain in the Dryer Room. This is especially important during yellowcake packaging activities when airborne uranium concentration in the Dryer Room can increase.
- In addition to passive ventilation via doors, header houses are equipped with fans that are continuously operated to minimize the buildup of radon daughters.
- Floor sumps and pumps are located in the Plant to assist with the cleanup of any spilled fluids and/or yellowcake.

During the November 5 on-site audit of the Plant it was observed that varying combinations of the above ventilation systems were operating to prevent the accumulation of radon daughters. Due to increased radon levels observed in late 2014 modifications were made to the operation of the Plant forced air ventilation system to maintain lower levels of radon. Based on a review of the radon daughter data collected in 2015 it appears that the modifications were successful in reducing radon. The following recommendations is included:

- The RSO should ensure that radon levels at the Plant remain at acceptably low levels and continue to meet ALARA.

It was also observed that the floor sumps and pumps located in the Plant to assist with the cleanup of any spilled fluids and/or yellowcake were operating and were being used on a routine basis.

During the November 5 on-site audit it was observed that the wall fans at all header houses entered were operating as intended to prevent the buildup of radon daughters within these buildings.

7.0 Review of NRC Inspections

There was one NRC inspection conducted during the period. It took place on January 27-29, 2015. Three NRC personnel conducted the inspection. As described in the NRC Inspection Report 040-09068/15-001 dated September 11, 2015 there was one Level IV Violation issued for the lack of issuance of Radiation Work Permits (RWPs) in two instances. Additionally, there was a non-cited violation for failure of workers to follow SOP instructions in an incident involving pressurized drums of yellowcake.

The RSO submitted the required "Reply to the Notice of Violation" on October 20, 2015. A review of this submittal found it to be timely and complete. At the time of this ALARA Audit the NRC had not provided the licensee with any response concerning the acceptability of the submittal.

8.0 On-Site Audit

The on-site audit took place on November 5, 2015. The on-site audit team included Bill Kearney, John Cash (VP Regulatory Affairs), Kurt Brown (Mine Manager), Jay Pry (Plant Foreman), Mike Gaither (Manager EHS and Regulatory Affairs) and Jay Douthit (Wellfield Operations Superintendent). Chris Pedersen (RSO) and Krista Amunson (HPT) assisted with the audit but were not official members of the audit team. The team conducted "walk-thru" audits of the Plant and of the wellfield. A summary of the walk-thru audits and review of the records follow.

8.1 Plant Walk-Thru Audit

On November 5,2015 the audit team conducted a walk-thru audit of the Plant. At the time of the audit routine operations activities were occurring at the Plant including the transfer of resin from IX columns for elution and the precipitation of yellowcake. The Dryer was not operating during the walk-thru audit. In general, the Plant was orderly and clean, and the minimal amounts of visible yellowcake at the various process areas were acceptable. It was observed that the Dryer Room, which is routinely posted as an "Airborne Radioactivity Area," had recently been washed down to assist in minimizing the potential for airborne uranium. It was also observed that respirators were properly stored in plastic bags and the plastic containers. The following items were noted, especially as related to recommendations from the previous audit:

- A heavier plastic curtain has been installed on the Dryer Room side of the wall hatch where the drums pass through on the roller deck in order that the ventilation system in the Dryer Room can be more effective and yellowcake dust can be better contained in the room during an upset condition.
- It was observed and discussed that the HEPA filter system for the Dryer Room is typically only operated when yellowcake packaging operations are being conducted.
- A review of the respirator log sheets which are used to record the Dryer Operator BZ monitoring were complete.
- It was observed that appropriate trash cans were in place and they were labelled properly.

- Signs reading "Entering Restricted Area" had been installed adjacent to the overhead door at the Yellowcake Warehouse and the IC/PC vault door on the west side of the Plant and between the two overhead doors on the north side of the Plant.
- Tarps had been installed along the wall behind the east filter press to prevent wash down fluids from seeping into maintenance portion of the Plant.
- A dedicated area for 11e2 Byproduct Material has been defined with metal fencing at the maintenance portion of the Plant.
- It was discussed that "smoke tests" had been completed in the Dryer Room to assess the effectiveness of the current room ventilation system. This led to some changes.

Part of the Plant walk-thru audit was to review plant operations equipment and electronic monitoring activities as they relate to commitments in NRC License No. SUA-1598. The results of this activity are included in Section 9.

8.2 Wellfield Walk-Thru Audit

On November 5 the audit team conducted a walk-thru audit of the operating wellfield Mine Unit 1. At the time of the audit routine operations activities were occurring at Header Houses 1-1 through 1-11. Jay Douthit (Wellfield Operations Superintendent) accompanied the team. The header houses were in good order and no leaks were observed. It was noted that trash cans were properly labeled for their use for non-contaminated or contaminated trash/waste. No concerns were identified.

Part of the wellfield walk-thru audit was to review wellfield operations equipment and electronic monitoring activities as they relate to commitments in NRC License No. SUA-1598. The results of this activity are included in Section 9.

8.3 Review of Radiation Work Permits (RWP's)

During the on-site audit of November 5, 2015 Bill Kearney reviewed the Radiation Work Permits (RWP's) for 2015 (January through September) for completeness and agreement with SOP HP-001 "Radiation Work Permits". It was observed that the number of RWP's completed to date in 2015 (total of 72 with an average of 8 per month) had significantly increased over the number issued in 2014. This increase is attributed to a better understandings by radiation protection staff as well as operations personnel of the factors requiring the need to issue RWPs. Additionally, HP-001 was revised in February 2015 to include more guidance concerning when RWP's may be required. In accordance with recommendations from the 2014 ALARA Audit, the RWP form HP-001A was also revised at that time to include additional requirements, including the dose assessment for the

particular activities covered by the RWP. It was determined that an adequate numbering system had been instituted.

As would be expected the majority of the RWPs were issued for activities in the CPP including non-routine work on the yellowcake dryers, baghouses, filter presses and tanks/IX columns. RWPs for activities outside the CPP were predominantly associated with the deep disposal wells and evaporation ponds.

The following recommendations were discussed with the RSO and RST:

- Copies of the bioassays reports should be included with the RWP in order that all data supporting the RWP is in one place.
- Need to ensure that a bioassay is required if the uranium air monitoring results exceed 100% DAC even if a respirator is used.
- In the case of a long duration RWP and/or an RWP where considerable potential exists for exposure to uranium the RSO needs periodically check on the work activities to ensure that conditions have not changed, workers are following directions and wearing the proper PPE, BZ samples are being adequately taken, etc.

8.4 Review of Yellowcake Shipment Records

Mike Gaither reviewed the records for the 19 shipments of yellowcake that occurred since the last review. It was determined that all survey records were documented and all records were complete.

8.5 Review of 11e.2 Byproduct Shipment Records

Mike Gaither reviewed the records for the 3 shipments of 11e.2 Byproduct shipments that occurred since the last review. All shipments went to the NRC licensed Shirley Basin 11e.2 Byproduct Disposal Facility located approximately 130 miles from the LC-ISR. It was determined that all survey records were documented and all records were complete.

8.6 Review of Calibration Records for Radiation Detection and Survey Instruments

Mike Gaither reviewed the calibration records for all radiation detection and survey instruments. In general, these instruments require an annual calibration completed offsite by the manufacturer or lab facility specializing in this type of service. The records were observed to be complete and in good order. Due to the number of instruments and the varying required calibration dates, the following recommendation is included:

- An electronic calendar or other suitable method should be used to assist in tracking current and required instrument calibration dates in order that the instruments are sent offsite for calibration in a timely manner and equipment calibrations do not unexpectedly expire.
- To ensure that "out of calibration" instruments are not inadvertently used, the RSO should start "tagging out" such instruments with appropriate tags and store them in a designated location to minimize their potential use when "out of calibration".

8.7 Review of Respirator User Medical Evaluations, Fit Test Results and Training Records

The records required for workers that are required to utilize respiratory protection were reviewed in detail by Bill Kearney. It was determined that the training documentation, respirator fit test records and the respirator medical review and approvals were complete. Where required, the forms were signed by both the trainer and trainee.

9.0 Plant and Wellfield Operations Equipment and Electronic Monitoring Activities

In accordance with a recommendation in the previous ALARA Audit, the Plant and wellfield operations equipment and electronic monitoring activities were reviewed to assess if they met commitments in NRC License No. SUA-1598 and the NRC Technical Report. This was accomplished as part of the on-site audit on November 5, 2015. Most of the equipment and electronic monitoring activities required by the NRC license are related to chemical systems, production and injection pipeline/well monitoring systems and leak detection systems that can invoke an alarm or cause an automated shutdown of equipment if specific conditions are identified. In summary, although it appears that the requirements and intent of the various commitments are being met, there are several ambiguities written into sections of the Technical Report that should be addressed. Therefore, the following recommendations are included.

- Consideration should be given to installing an "emergency stop" for the chemical area of the Plant. It could be located at the entrance of the chemical area from the south side of the Plant (interior).
- Consideration should be given to installing a leak detection device in the pipeline vault in the Plant that alarms in the case of a leak at this location.
- Assess if oxygen sensors are included in all header houses.
- Determine if flow algorithms on the main computer system are sufficient to effectively monitor pipeline flows to and from the wellfield, detect leaks and alarm.

- Determine if it is necessary to be able to start production and injection wells from the PLC and Plant.
- Complete a detailed review of the Technical Report and use the SERP process to alleviate ambiguities in the Technical Report and more accurately describe the as-built systems and their operation.

10.0 Recommendations to Further Reduce Personnel Exposure to Uranium and Daughters

As discussed in Section 3.2 "Uranium Bioassay Results" there was a significant reduction in the number of positive bioassays from the previous report period. This reduction mostly involved Dryer Operators. Therefore, the exposure of Dryer Operators to uranium and the corresponding dose from the internal exposure to uranium was substantially reduced. Efforts to minimize the occurrence of positive bioassays from current, and any new, Dryer Operators should continue.

Radon daughter monitoring should be continued on a monthly basis and the data should be routinely assessed to ensure that the Plant ventilation system is operating in an effective manner.

11.0 Recommendations for Next Annual ALARA Audit

The following recommendations are included for the next ALARA Audit (expected for completion near the fourth quarter 2016):

- Assess any trends in the radiological monitoring and survey data used to determine employee exposures.
- Assess any trends in personnel exposure of yellowcake/uranium workers to radioactive materials especially as exposures relate to elevated bioassays.
- Assess the database program currently being developed to track employee exposure data.

Signatures:

Bill Kearney _____ Date 11/23/15
Radiation Protection Specialist

John Cash _____ Date 12/3/15

VP Regulatory Affairs

Kurt Brown _____ Date 12/3/15
Mine Manager

Jay Pry _note: Jay Pry not employed when report finalized_____ Date _____
Plant Foreman

Mike Gaither _____ Date 12/3/2015
Manager EHS and Regulatory Affairs

Jay Douthit _____ Date 12.3-2015
Wellfield Operations Superintendent

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LOST CREEK ISR, LLC

MEMO

Date: April 15, 2016

To: File

From: Chris Pedersen

Subject: 2015 Public Dose

The greatest dose to a member of the public is either to a UPS driver or to a contractor working in the plant. There have not been any ranchers, campers, hunters, or other member of the public spending any significant amount of time near the plant during 2014. The only members of the public that would have received a significant dose are those that were on site for business purposes, and all visitors to the facility are required to sign in and sign out.

Of the several UPS drivers that deliver to Lost Creek they collectively spend less than 173 hours on site throughout the year. The UPS driver dose calculation is based on the environmental results, without background subtracted, at the monitoring station immediately downwind of the plant (Passive Radiation monitor 5/ High Volume air sampling station 2); this sampling location was calculated using the MILDOS program before operations and is the most likely spot for the greatest concentration. This sampling location will provide the radon concentration and the airborne particulate uranium concentration for the UPS driver. The gamma exposure rate at the warehouse and front office, where the UPS driver will deliver packages, measures between 20 and 30 uR/hr and is considered background. The calculation results can be seen in Table 1 below.

Table 1: UPS Diver Dose Calculation

	Concentration (uCi/ml)	DAC	175 hr Dose (mrem)
Unat	1.40E-14	4.67E-05	0.02
Rn with Daughters	1.80E-09	6.00E-02	26
		Total Dose	**26**

The other member of the public likely to receive the greatest dose is a contractor working in the plant. If a contractor is likely to work in the plant for more than a week, is working with radioactive material, or is likely to receive greater than 100 mrem of dose then they will be trained as a radiation worker. Examples of workers not trained as radiation workers would be contractors hired to work on the air compressors or heat exchangers in the plant shop area; the contamination levels and external exposure rates in this area are very low, and significant doses are unlikely. These projects typically occur in less than 3 days (24 hours). Monthly sampling results will be used for radon daughter and airborne uranium dose calculations. A conservative approximation of 0.3 mR/hr will be used for the external dose calculation. Most areas in the plant a meter away from a tank are less than 0.3 mR/hr. See Table 2 for dose calculation results of contractors inside the plant considered members of the public. The Table 2 results show the results based on the average concentrations in the plant for 2015 and the results for the highest measurements collected during routine sampling.

Table 2: Inside Plant Member of the Public Contractor

	Concentration	DAC	40 hr Dose (mrem)
Average Unat (uCi/mL)	3.05E-12	0.01	1
Average Rn Daughters (mWL)	17	0.05	3
Gamma Dose Rate 0.3mrem/hr			7.2
		Total Dose	**11**
Max Unat (uCi/mL)	2.82E-11	0.09	6
Max Rn Daughters (mWL)	117	0.36	21.6
Gamma Dose Rate 0.3mrem/hr			7.2
		Total Dose	**34**