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Sent VIA Federal Express

July 13, 2012

Mr. Rusty Lundberg
Director of the Utah Division of Radiation Control
Utah Department of Environmental Quality
195 North 1950 West
P.O. Box 144820
Salt Lake City, UT 84114-4820

Re: Transmittal of revised Renewal Application State of Utah Groundwater Quality Discharge Permit UGW370004 White Mesa Uranium Mill

Dear Mr. Lundberg:

In September 2009 Denison submitted a Renewal Application, State of Utah Groundwater Quality Discharge Permit UGW370004 for the White Mesa Uranium Mill. DRC requested in e-mail correspondence dated March 22, 2012 that Denison submit an updated version of the September 1, 2009 renewal application. In response to the DRC request, Denison is submitting this updated version of the September 1, 2009 Renewal Application.

Pursuant to DRC e-mail correspondence dated May 15, 2012, the revised Renewal Application is due to DRC on Monday July 16, 2012. Two hardcopies and 2 word searchable CDs have been sent via overnight carrier as required.

If you should have any questions regarding this report please contact me.

Yours very truly,

DENISON MINES (USA) CORP.
Jo Ann Tischler
Director, Compliance and Permitting

cc: David C. Frydenlund
Harold R. Roberts
David E. Turk
Katherine A. Weinel

WHITE MESA URANIUM MILL

RENEWAL APPLICATION

STATE OF UTAH GROUND WATER DISCHARGE PERMIT No. UGW370004

July 2012

DENISON MINES

Denison Mines (USA) Corp.
1050 17th Street, Suite 950
Denver, CO 80265

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1.0 INTRODUCTION

1.1 Background

Denison Mines (USA) Corp. ("Denison")[1] operates the White Mesa Uranium Mill (the "Mill"), located approximately six miles south of Blanding, Utah, under State of Utah Ground Water Discharge Permit No. UGW 370004 (the "Permit"). The Permit was originally issued by the Co-Executive Secretary of the Utah Water Quality Board on March 8, 2005, for 5 years, expiring on March 8, 2010, and was up for timely renewal in accordance with Utah Administrative Code ("UAC") R317-6-6.7. A renewal application was submitted September 1, 2009. At the request of the Director of the Utah Division of Radiation Control, Denison is submitting this updated version of the September 1, 2009 renewal application.

Prior to July 1, 2012, the Director of the Utah Division of Radiation Control ("Director") was referred to as the Executive Secretary of the Utah Radiation Control and Board Co-Executive Secretary of the Utah Water Quality Board. Documents referenced in this Application, published prior to that date, refer to the Director, by one or both of these previous titles.

In accordance with R317-6-6.7, this is an updated application (the "Application") to the Director for renewal of the Permit for another 5-years under R313-6-6.7. In this Application, Denison is not proposing any modifications to the terms and conditions of the Permit.

The Mill is also subject to State of Utah Radioactive Materials License No. UT 1900479 (the "Mill License"), which was issued on March 31, 1997[2] for 10-years and is currently in the process of timely renewal under R313-22-36[3], and State of Utah Air Quality Approval Order DAQE-AN0112050018-11 (the "Air Approval Order") which was re-issued on March 2, 2011 and is not up for renewal at this time. While the Mill License is referred to in this Application from time to time in order to allow the Director to better understand Mill operations and compliance with applicable regulatory requirements, this is not an application for renewal of the Mill License or Air Approval Order.

1.2 Applicable Standards for Review and Approval of this Application

In accordance with discussions between Denison management and State of Utah Division of Radiation Control ("DRC") staff on March 12, 2009, this Application includes the information required under R313-6-6.3.

[1] Prior to December 16, 2006, Denison was named "International Uranium (USA) Corporation."

[2] The Mill License was originally issued by the United States Nuclear Regulatory Commission ("NRC") as a source material license under 10 CFR Part 40 on March 31, 1980. It was renewed by NRC in 1987 and again in 1997. After the State of Utah became an Agreement State for uranium mills in August 2004, the Mill License was re-issued by the Executive Secretary as a State of Utah Radioactive materials license on February 16, 2005, but the remaining term of the Mill License did not change.

[3] A Mill License renewal application was submitted to the Executive Secretary on February 28, 2007, pursuant to R313-22-36.

In accordance with R313-6-6.4C, the Director may issue (or renew) a ground water discharge permit for an existing facility, such as the Mill, provided:

a) The applicant demonstrates that the applicable class total dissolved solids ("TDS") limits, ground water quality standards and protection levels will be met;
b) The monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;
c) The applicant utilizes treatment and discharge minimization technology commensurate with plant process design capability and similar or equivalent to that utilized by facilities that produce similar products or services with similar production process technology; and
d) There is no current or anticipated impairment of present and future beneficial uses of the ground water.

Since this is an application for renewal of the existing Permit, this Application will focus on any changes to currently permitted activities since the original date of issuance of the Permit, and on demonstrating how existing facilities continue to meet applicable regulatory criteria.

Although Denison is not proposing any significant changes to the original Permit, this Application has nevertheless been performed under the direction, and bears the seal, of a professional engineer qualified to practice engineering before the public in the state of Utah and professionally registered as required under the Professional Engineers and Professional Land Surveyors Licensing Act rules (UAC 156-22).

1.3 Background Groundwater Reports and Re-opening of Permit

In the December 1, 2004 Statement of Basis (the "2004 Statement of Basis") prepared by DRC in connection with the original issuance of the Permit, three monitoring wells (MW-14, MW-15, and MW-17) located downgradient of the Mill's tailings cells were found to have long-term increasing concentration trends for total uranium. These three wells and downgradient well MW-3, had total uranium concentrations above the Utah Ground Water Quality Standard ("GWQS"), found in UAC R317-6-2 (see the 2004 Statement of Basis, pp. 6-7). These findings were of concern to the DRC because they appeared to indicate that the tailings cells had possibly discharged wastewater into the underlying shallow aquifer.

To resolve this concern, the Director required Denison to evaluate groundwater quality data from the thirteen existing wells on site, and submit a Background Ground Water Quality Report for Director approval. The existing wells are those wells which were installed prior to the issuance of the original GWDP on March 8, 2005 and include: MW-1, MW-2, MW-3, MW-5, MW-11, MW-12, MW-14, MW-15, MW-17, MW-18, MW-19, MW-26 (formerly called TW4-15 and installed as part of the chloroform corrective action order), and MW-32 (formerly called TW4-17 and installed as part of the chloroform corrective action order). It is important to note that MW-4 was installed prior to the issuance of the original permit; however, MW-4 is monitored under the chloroform program and was not included in the Existing Background Report. GWCLs have not been established for this well, and MW-4 is not a POC well under the GWDP. One of the purposes of that report was to provide a critical evaluation of historic groundwater quality data from the facility, and determine representative background quality conditions and reliable groundwater compliance limits ("GWCLs") for the Permit.

As required, Denison submitted the following reports:

- *Revised Background Groundwater Quality Report: Existing Wells For Denison Mines (USA) Corp.'s White Mesa Mill Site, San Juan County, Utah*, October 2007, prepared by INTERA, Inc. (the "Existing Well Background Report"); and

- *Revised Addendum: -- Evaluation of Available Pre-Operational and Regional Background Data, Background Groundwater Quality Report: Existing Wells For Denison Mines (USA) Corp.'s White Mesa Mill Site, San Juan County, Utah*, November 16, 2007, prepared by INTERA, Inc. (the "Regional Background Report").

The Existing Well Background Report and the Regional Background Report included a detailed quality assurance evaluation of all existing groundwater quality data collected prior to the date of issuance for the thirteen exiting wells, in accordance with criteria established by DRC and United States Environmental Protection Agency ("EPA") guidance. This resulted in a data base suitable for statistical and other analyses. Based on an analysis of this updated data base, the Existing Well Background Report and Regional Background Report concluded that there have been no impacts to groundwater from Mill activities, based on a number of factors, including the following:

- There are a number of exceedances of GWQSs in upgradient and far downgradient wells at the site, which cannot be considered to have been impacted by Mill operations to date. Exceedances of GWQSs in monitoring wells nearer to the site itself are therefore consistent with natural background in the area.

- There are numerous cases of both increasing and decreasing trends in constituents in upgradient, far downgradient, and Mill site wells, which provide evidence that there are natural forces at work that are impacting groundwater quality across the entire site.

- In almost all cases where there are increasing trends in constituents in wells at the site, there are increasing trends in those constituents in upgradient wells. Furthermore, in no case is there any evidence in the wells in question of increasing trends in chloride, which is very mobile and a good indicator of potential tailings cell leakage at the site.

See Section 2.11.2 below for a more detailed discussion of the Existing Well Background Report and Regional Background Report and their conclusions.

The Permit also required nine new monitoring wells to be installed around tailings Cells 1 and 2, followed by groundwater sampling and analysis, and later submittal of another Background Ground Water Quality Report to determine reliable background conditions and groundwater compliance limits for the new wells. The new wells are those wells which were installed after the issuance of the original GWDP on March 8, 2005 and include: MW-3A, MW-23, MW-24, MW-25, MW-27, MW-28, MW-29, MW-30, and MW-31. In response to this requirement, Denison installed the nine new wells, and submitted to the Director a *Revised Addendum: -- Background Groundwater Quality Report: New Wells For Denison Mines (USA) Corp.'s White Mesa Mill*

Site, San Juan County, Utah, April 30, 2008, prepared by INTERA, Inc. (the "New Well Background Report"), and together with the Existing Well Background Report and the Regional Background Report, are referred to as the "Background Reports").

The New Well Background Report concluded that the sampling results for the new wells confirm that the groundwater at the Mill site and in the region is highly variable naturally and has not been impacted by Mill operations and that varying concentrations of constituents at the site are consistent with natural background variation in the area. See Section 2.11.2 below for a more detailed discussion of the New Well Background Report and its conclusions.

During the course of discussions with Denison staff, and further DRC review, DRC decided to supplement the analysis provided in the Background Reports by commissioning the University of Utah to perform a geochemical and isotopic groundwater study at White Mesa. This resulted in the University of Utah completing a study entitled *Summary of work completed, data results, interpretations and recommendations for the July 2007 Sampling Event at the Denison Mines, USA, White Mesa Uranium Mill Near Blanding Utah*, May 2008, prepared by T. Grant Hurst and D. Kip Solomon, Department of Geophysics, University of Utah (the "University of Utah Study"). The purpose of the University of Utah Study was to determine if the increasing and elevated trace metal concentrations (such as uranium) found in the monitoring wells at the Mill were due to potential leakage from the on-site tailings cells. To investigate this potential problem, the study examined groundwater flow, chemical composition, noble gas and isotopic composition, and age of the on-site groundwater. Similar evaluations were also made on samples of the tailings wastewater and nearby surface water stored in the northern wildlife ponds at the facility. Fieldwork for the University of Utah Study was conducted July 17 - 26 of 2007. The conclusions in the University of Utah Study supported Denison's conclusions in the Background Reports

As stated above, DUSA prepared Background Reports that evaluated all historic data for the thirteen existing wells and nine new wells for the purposes of establishing background groundwater quality at the site and developing GWCLs under the GWDP. Prior to review and acceptance of the conclusions in these Background Reports, the GWCLs were set on an interim basis in the GWDP. The interim limits were established as fractions of the state GWQSs for drinking water, depending on the quality of water in each monitoring well at the site.

The January 20, 2010 GWDP established GWCLs that reflect background groundwater quality for the thirteen existing wells and the nine new wells based primarily on the conclusions and analysis in the Background Reports. It should be noted, however, that, because the GWCLs have been set at the mean plus second standard deviation, or the equivalent, un-impacted groundwater would normally be expected to exceed the GWCLs approximately 2.5% of the time. Therefore, exceedances are expected in approximately 2.5% of all sample results, and do not necessarily represent impacts to groundwater from Mill operations.

In addition to the thirteen existing wells and the nine new wells there are an additional 7 monitoring wells at the site which are included in the routine groundwater monitoring program . Those 7 wells are: MW-20, MW-22, MW-33, MW-34, MW-35, MW-36, and MW-37.

The GWDP dated January 20, 2010 required the completion of eight consecutive quarters of groundwater sampling and analysis of MW-20 and MW-22, and later submittal of another Background Report to determine if wells MW-20 and MW-22 should be added as point of compliance (POC) monitoring wells. Data from MW-20 and MW-22 were analyzed in the pre-operational and regional background addendum (INTERA 2007a); however there was not a complete data set at the time. Although wells MW-20 and MW-22 were installed in 1994, they were not sampled regularly until the second quarter of 2008. The eighth full round of sampling was completed during the first quarter of 2010, and Denison submitted to the Director the *Background Groundwater Quality Report for Wells MW-20 and MW-22 for Denison Mines (USA) Corp.'s White Mesa Mill Site, San Juan County, Utah,* June 1, 2010, prepared by INTERA, Inc. (the "MW-20 and MW-22 Background Report"). DRC classified MW-20 and MW-22 as general monitoring wells, and no GWCLs have been calculated. MW-20 and MW-22 are sampled semiannually.

The GWDP dated June 17, 2012, Part I.H.6 required the installation of three hydraulically downgradient wells adjacent to Tailings Cell 4B (MW-33, MW-34, and MW-35) prior to placement of any potential tailings and wastewater in Cell 4B. The purpose of these monitoring wells was to provide early detection of tailings cell contamination of shallow groundwater from Tailings Cell 4B. Denison installed MW-33, MW-34, and MW-35 as required. Of these three wells installed near tailings Cell 4B, only MW-35 was hydraulically acceptable, with five feet or more of saturated thickness. MW-35 has been sampled quarterly since fourth quarter 2010 to collect eight consecutive quarters of data for the completion of the Background Report and calculation of GWCLs. MW-33 and MW-34 had insufficient water for sampling, with saturated thicknesses less than five feet. MW-33 is completely dry, and no samples or depth to measurements are collected from this well. Quarterly depth to water is measured in MW-34, but no sampling or analysis is required.

Part I.H.4 of the February 15, 2011 GWDP required the installation of two wells hydraulically downgradient of Tailings Cell 4B as replacements for MW-33 and MW-34. Denison installed MW-36 and MW-37 as required. MW-36 and MW-37 have been sampled quarterly since third quarter 2011 to collect eight consecutive quarters of data for the completion of the Background Report and calculation of GWCLs.

1.4 Documents Referenced in This Application

The following documents are referenced in this Application and are a part of this Application:

a) The following Permits, Licenses, Statement of Basis, Plans and Related Reports:

  (i) State of Utah Ground Water Discharge Permit No. UGW370004 (the "Permit") dated July 14, 2011;

  (ii) State of Utah Radioactive Materials License No. UT 1900479 (the "Mill License");

  (iii) *Statement of Basis For a Uranium Milling Facility at White Mesa, South of Blanding, Utah, Owned and Operated by International Uranium (USA)*

Corporation, December 1, 2004, prepared by the State of Utah Division of Radiation Control (the "2004 Statement of Basis");

(iv) *Reclamation Plan White Mesa Mill Blanding, Utah, Source Material License No. SUA-1358 Docket No. 40-8681 Revision 4.0*, November 2009 (the "Reclamation Plan"); and

(v) *UMETCO Minerals Corporation: White Mesa Mill Drainage Report for Submittal to NRC*, January 1990;

b) The following Background Groundwater Quality Reports and Related Studies:

(i) *Revised Background Groundwater Quality Report: Existing Wells For Denison Mines (USA) Corp.'s White Mesa Mill Site, San Juan County, Utah*, October 2007, prepared by INTERA, Inc. (the "Existing Well Background Report");

(ii) *Revised Addendum: -- Evaluation of Available Pre-Operational and Regional Background Data, Background Groundwater Quality Report: Existing Wells For Denison Mines (USA) Corp.'s White Mesa Mill Site, San Juan County, Utah*, November 16, 2007, prepared by INTERA, Inc. (the "Regional Background Report");

(iii) *Revised Addendum: -- Background Groundwater Quality Report: New Wells For Denison Mines (USA) Corp.'s White Mesa Mill Site, San Juan County, Utah,* April 30, 2008, prepared by INTERA, Inc. (the "New Well Background Report" and together with the Existing Well Background Report and the Regional Background Report, the "Background Reports"); and

(iv) *Summary of work completed, data results, interpretations and recommendations for the July 2007 Sampling Event at the Denison Mines, USA, White Mesa Uranium Mill Near Blanding Utah*, May 2008, prepared by T. Grant Hurst and D. Kip Solomon, Department of Geophysics, University of Utah (the "University of Utah Study");

(v) *Background Groundwater Quality Report for Wells MW-20 and MW-22 for Denison Mines (USA) Corp.'s White Mesa Mill Site, San Juan County, Utah,* June 1, 2010, prepared by INTERA, Inc. (the "MW-20 and MW-22 Background Report")

c) The following environmental reports and analyses:

(i) *Environmental Report, White Mesa Uranium Project San Juan County, Utah*, January 30, 1978, prepared by Dames & Moore (the "1978 ER"); and

(ii) *Final Environmental Statement related to operation of White Mesa Uranium Project Energy Fuels Nuclear, Inc.*, May 1979, Docket No. 40-8681, prepared by the United States Nuclear Regulatory Commission (the "FES");

d) The following engineering, geological and hydrogeological reports:

(i) *Umetco Groundwater Study, White Mesa Facilities, Blanding, Utah*, 1993, prepared by Umetco Minerals Corporation and Peel Environmental Services;

(ii) *Hydrogeological Evaluation of White Mesa Uranium Mill*, July 1994, prepared by Titan Environmental Corporation (the "1994 Titan Report");

(iii) *Evaluation of Potential for Tailings Cell Discharge – White Mesa Mill*, November 23, 1998, prepared by Knight-Piesold LLC;

(iv) Update to report *Investigation of Elevated chloroform concentrations in Perched Groundwater at the White Mesa Uranium Mill Near Blanding, Utah*, 2001, prepared by Hydro Geo Chem, Inc.;

(v) *Hydraulic Testing at the White Mesa Uranium Mill Near Blanding, Utah During July 2002*, August 22, 2002, prepared by Hydro Geo Chem, Inc.;

(vi) Letter Report dated August 29, 2002, prepared by Hydro Geo Chem, Inc.;

(vii) *Perched Monitoring Well Installation and Testing at the White Mesa Uranium Mill April Through June 2005*, August 3, 2005, prepared by Hydro Geo Chem, Inc.;

(viii) *Site Hydrogeology and Estimation of Groundwater Travel Times In The Perched Zone White Mesa Uranium Mill Site Near Blanding, Utah*, August 27, 2009, prepared by Hydro Geo Chem, Inc.;

(ix) Site *Hydrogeology and Estimation of Groundwater Travel Times in the Perched Zone White Mesa Uranium Mill Site Near Blanding, Utah*, May 8, 2012, prepared by Hydro Geo Chem, Inc.;

(x) *Hydrogeology of the Perched Groundwater Zone and Associated Seeps and Springs Near the White Mesa Uranium Mill Site, Blanding Utah*, November 12, 2010, prepared by Hydro Geo Chem, Inc.; and

(xi) *Hydrogeology of the Perched Groundwater Zone and Associated Seeps and Springs Near the White Mesa Uranium Mill Site, Blanding Utah*, January 12, 2012, prepared by Hydro Geo Chem, Inc.

e) The following plans and specifications relating to construction and operation of the Mill's tailings cells:

(i) *Engineers Report: Tailings Management System, White Mesa Uranium Project Blanding, Utah*, June 1979, prepared by D'Appolonia Consulting Engineers, Inc.;

(ii) *Engineer's Report: Second Phase Design – Cell 3 Tailings Management System, White Mesa Uranium Project Blanding, Utah*, May 1981, prepared by D'Appolonia Consulting Engineers, Inc.;

(iii) *Construction Report: Initial Phase – Tailings Management System, White Mesa Uranium Project Blanding, Utah*, February 1982, prepared by D'Appolonia Consulting Engineers, Inc.;

(iv) *Construction Report: Second Phase Tailings Management System, White Mesa Uranium Project*, March 1983, prepared by Energy Fuels Nuclear, Inc.;

(v) *Cell 4 Design, White Mesa Project Blanding, Utah*, April 10, 1989, prepared by Umetco Minerals Corporation;

(vi) *Construction Report: Tailings Cell 4A, White Mesa Uranium Mill – Tailings Management System*, August 2000, prepared by Denison (then named International Uranium (USA) Corporation);

(vii) *Cell 4A Lining System Design Report For The White Mesa Mill Blanding, Utah*, January 2006, prepared by GeoSyntec Consultants;

(viii) *Cell 4A Construction Quality Assurance Report, White Mesa Mill Blanding, Utah*, July 2008, prepared by Geosyntec consultants (disk only);

(ix) *Cell 4B Design Report, White Mesa Mill, Blanding, Utah*, December 8, 2007, prepared by Geosyntec Consultants; and

(x) *Cell 4B Construction Quality Assurance Report, Volumes 1-3*, November 2010, prepared by Geosyntec Consultants.

f) The following documents relating to the chloroform investigation at the site:

(i) *Preliminary Corrective Action Plan, White Mesa Mill Near Blanding, Utah*, August 20, 2007, prepared by Hydro Geo Chem, Inc.; and

(ii) *Preliminary Contamination Investigation Report, White Mesa Mill Near Blanding, Utah*, November 20, 2007, prepared by Hydro Geo Chem, Inc.

g) The following documents relating to the nitrate and pH/Out of Compliance investigations at the site:

(i) *White Mesa Mill State of Utah Groundwater Discharge Permit UGW370004 Plan* *and Time Schedule Under part I.G.4 (d) for Violations of Part I.G.2 for Constituents in the First, Second, Third and Fourth Quarters of 2010 and First Quarter 2011*, June 13, 2011;

(ii) *White Mesa Mill State of Utah Groundwater Discharge Permit UGW370004 Plan and Time Schedule Under part I.G.4 (d) for Violations of Part I.G.2 for Constituents in the Second Quarter of 2011*, September 7, 2011;

(iii) *Plan and Time Schedule for Assessment of pH Under Groundwater Discharge Permit UGW370004,* April 13, 2012 prepared by Hydro Geo Chem, Inc;

(iv) *Stipulated Consent Agreement Docket No. UGW12-03 between Denison Mines (USA) Corp. and the Director of the Division of Radiation Control*, July 12, 2012.

(v) *Revised Tolling Agreement, Revision 3, between DUSA and the Director,* Revision 2, dated August 21, 2011.

(vi) *Revised Phase 1 (A through C) Work Plan and Schedule for Phase 1 A – C Investigation,* May 11, 2011, prepared by INTERA, Inc;

(vii) *Revised Phase 2 through 5 Work Plan and Schedule,* June 3, 2011, prepared by INTERA, Inc;

(viii) *Revised Phase 2 QAP and Work Plan, Revision 2.0,* July 12, 2011; and

(ix) *Nitrate Corrective Action Plan,* May 7, 2012, prepared by Hydro Geo Chem, Inc;.

2.0 INFORMATION PROVIDED IN SUPPORT OF THE APPLICATION

2.1 Name and Address of Applicant and Owner (R317-6-6.3.A)

The Applicant is Denison Mines (USA) Corp. ("Denison"). Denison is the current holder of the Permit. The Mill is owned by Denison's affiliate, Denison White Mesa LLC ("DWM").

The address for both Denison and DWM is:

1050 17th St. Suite 950
Denver, CO 80265
Telephone: 303-628-7798
Fax: 303-389-4130

Contacts at Denison, all located at the foregoing office:

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2.2 Legal Location of the Facility (R317-6-6.3B)

The Mill is regionally located in central San Juan County, Utah, approximately 6 miles (9.5 km) south of the city of Blanding. The Mill can be reached by taking a private road for approximately 0.5 miles west of Utah State Highway 191. See Figure 1.

Within San Juan County, the Mill is located on fee land and mill site claims, covering approximately 5,415 acres, encompassing all or part of Sections 21, 22, 27, 28, 29, 32, and 33 of T37S, R22E, and Sections 4, 5, 6, 8, 9, and 16 of T38S, R22E, Salt Lake Base and Meridian. See Figure 2.

All operations authorized by the Mill License are conducted within the confines of the existing site boundary. The milling facility currently occupies approximately 50 acres, and the tailings disposal cells encompass another 250 acres. See Figure 2.

2.3 Name and Type of Facility (R317-6-6.3.C)

The name of the facility is the White Mesa Uranium Mill. The facility is a uranium milling and tailings disposal facility, which operates under a Radioactive Materials License issued by the Director of the Utah Division of Radiation Control under UAC R313-24. In addition to uranium in the form of U_3O_8, the Mill also produces vanadium, in the form of vanadium pentoxide (V_2O_5), ammonia metavanadate (AMV) and vanadium pregnant liquor (VPL), from certain conventional ores and has produced other metals from certain alternate feed materials. Alternate feed materials are uranium bearing materials other than conventionally mined ores.

Construction of the Mill was completed and first operations commenced in May 1980. The Mill does not have a set operating life, and can operate indefinitely, subject to available tailings capacity and license and permit renewals. The conceptual and permitted total capacity is for the quantity of Mill tailings produced from a 15-year operating period at a rate of 2,000 tons per day, operating 340 days per year. Since it commenced operations in 1980, the Mill has operated on a campaign basis, processing conventional ores and alternate feed materials as they become available and as economic conditions warrant.

2.4 A Plat Map Showing All Water Wells, Including The Status And Use Of Each Well, Drinking Water Source Protection Zones, Topography, Springs, Water Bodies, Drainages, And Man-Made Structures Within A One-Mile Radius Of The Discharge. (R317-6-6.3.D)

There are five deep wells within a one mile radius of the Mill, two of which supply the Mill facility. There are no Drinking Water Source Protection Zones or ordinances within this radius.

Routine groundwater monitoring wells have been established for monitoring under the Permit. These monitoring wells are depicted on Figure 4 and have been plotted on San Juan County, Utah plat maps in Appendix A to this Application. The depth and purpose of each of these wells is as shown in Table 2.4-1.

See Section 2.9.1.3 below for a detailed description of the Mill's groundwater monitoring program.

The surface topography within this one mile zone is relatively flat, and man-made structures are limited to the Mill facilities. See Sections 2.5.4 and 2.5.7 below for a more detailed discussion on local topography and land use.

The Mill area has several dry drainages, and the only nearby natural water bodies within one mile are Westwater Creek, Corral Creek and Cottonwood Creek. In addition to these are Ruin Spring and several other springs and seeps located within a 1.5 mile radius of the Mill. See Sections 2.5.3 and 2.13 below for discussions relating to seeps and springs in the vicinity of the site and to surface water and drainages, respectively.

2.5 Geologic, Hydrologic, and Agricultural Description of the Geographic Area (R317-6-6.3.E)

2.5.1 Groundwater Characteristics

This Section is excerpted from the Report entitled: *Site Hydrogeology and Estimation of Groundwater Travel Times In The Perched Zone White Mesa Uranium Mill Site Near Blanding, Utah,* July 10, 2012, prepared by Hydro Geo Chem, Inc. ("HGC") (the "2012 HGC Report" referred to as HGC, 2012b), a copy of which accompanies this Application.

2.5.1.1 Geologic Setting

The Mill is located within the Blanding Basin of the Colorado Plateau physiographic province. Typical of large portions of the Colorado Plateau province, the rocks underlying the site are relatively undeformed. The average elevation of the site is approximately 5,600 ft (1,707 m) above mean sea level (amsl).

The site is underlain by unconsolidated alluvium and indurated sedimentary rocks consisting primarily of sandstone and shale. The indurated rocks are relatively flat lying with dips generally less than 3°. The alluvial materials consist mostly of aeolian silts and fine-grained aeolian sands with a thickness varying from negligible to as much as 25 to 30 feet across the site. In some portions of the site the alluvium is underlain by a few feet to as much as 30 feet of Mancos Shale. In other areas, the Mancos Shale is absent. The alluvium and Mancos (where present) are underlain by the Dakota Sandstone and Burro Canyon Formation, which are sandstones having a combined total thickness ranging from approximately 55 to 140 feet (17 to 43 m). Beneath the Burro Canyon Formation lies the Morrison Formation, consisting, in descending order, of the

Brushy Basin Member, the Westwater Canyon Member, the Recapture Member, and the Salt Wash Member. The Brushy Basin and Recapture Members of the Morrison Formation, classified as shales, are very fine-grained and have a very low permeability. The Brushy Basin Member is primarily composed of bentonitic mudstone, siltstone, and claystone. The Westwater Canyon and Salt Wash Members are primarily sandstones but are expected to have a low average vertical permeability due to the presence of interbedded shales. See Figure 3 for a generalized stratigraphic column for the region.

Beneath the Morrison Formation lies the Summerville Formation, an argillaceous sandstone with interbedded shales, and the Entrada Sandstone. Beneath the Entrada lies the Navajo Sandstone. The Navajo and Entrada Sandstones constitute the primary aquifer in the area of the site. The Entrada and Navajo Sandstones are separated from the Burro Canyon Formation by approximately 1,000 to 1,100 feet (305 to 355 m) of materials having a low average vertical permeability. Groundwater within this system is under artesian pressure in the vicinity of the site, is of generally good quality, and is used as a secondary source of water at the site.

2.5.1.2 Hydrogeologic Setting

The site is located within a region that has a dry to arid continental climate, with average annual precipitation of approximately 13.3 inches, and an average annual lake evaporation rate of approximately 47.6 inches. Recharge to the principal aquifers (such as the Navajo/Entrada) occurs primarily along the mountain fronts (for example, the Henry, Abajo, and La Sal Mountains), and along the flanks of folds such as Comb Ridge Monocline.

Although the water quality and productivity of the Navajo/Entrada aquifer are generally good, the depth of the aquifer (approximately 1,200 feet below land surface [ft bls]) makes access difficult. The Navajo/Entrada aquifer is capable of yielding significant quantities of water to wells (hundreds of gallons per minute [gpm]). Water in on-site wells completed within the Navajo/Entrada rises approximately 800 feet above the base of the overlying Summerville Formation.

The shallowest groundwater beneath the site consists of perched water hosted primarily by the Burro Canyon Formation. Perched water is used on a limited basis to the north (upgradient) of the site because it is much shallower and more easily accessible than the deep Navajo/Entrada aquifer.

2.5.1.3 Perched Zone Hydrogeology

Perched groundwater originates mainly from precipitation and local recharge sources such as unlined reservoirs (Kirby, 2008) and is supported within the Burro Canyon Formation by the underlying, fine-grained Brushy Basin Member. Perched groundwater at the site has a generally low quality due to high total dissolved solids (TDS) in the range of approximately 1,100 to 7,900 milligrams per liter (mg/L). Generally poor quality is one reason that perched water is used primarily for stock watering and irrigation in areas upgradient (north) of the site. Figure 4 is a contour map showing the approximate elevation of the contact of the Burro Canyon Formation with the Brushy Basin Member, which essentially forms the base of the perched water zone at the site. Based on Figure 4, the Burro Canyon Formation/Brushy Basin Member contact generally dips to the south/southwest beneath the site.

Figure 5 is a perched groundwater elevation contour map for the first quarter, 2012. Based on the contoured water levels, groundwater within the perched zone flows generally south to southwest beneath the site. Beneath the tailings cells, perched groundwater flow is generally to the southwest.

Perched groundwater discharges from outcrops of the Burro Canyon Formation in seeps and springs along Westwater Creek Canyon and Cottonwood Canyon (to the west-southwest of the millsite and tailings cells) and along Corral Canyon (to the east and northeast of the millsite and tailings cells). Known discharge points include all seeps and springs shown in Figure 5 except Cottonwood Seep.

As discussed in HGC (2012b), Cottonwood Seep is located more than 1,500 feet west of White Mesa in an area where the Dakota Sandstone and Burro Canyon Formation (which hosts the perched water system) are absent due to erosion, and at an elevation approximately 230 feet below the base of the perched zone defined by the contact between the Burro Canyon Formation and the underlying Brushy Basin Member. Cottonwood Seep occurs near the contact between the slope-forming Brushy Basin Member and the underlying Westwater Canyon (sandstone) Member.

Contact elevations shown in Figure 4 are based on perched monitoring well drilling and geophysical logs and surveyed land surface elevations, and the surveyed elevations of Westwater Seep and Ruin Spring. The elevations of Westwater Seep and Ruin Spring are included because they occur at the contact between the Burro Canyon Formation and the underlying Brushy Basin Member (HGC, 2012a).

Groundwater elevations shown in Figure 5 include the surveyed elevations of all seeps and springs except Cottonwood Seep. As discussed above, no evidence exists to connect Cottonwood Seep to the perched water system. Although Cottonwood Seep may potentially receive some contribution from perched water, its occurrence near the contact between the Brushy Basin Member and the underlying Westwater Canyon Member indicates that its elevation is not representative of the perched water system.

The permeabilities of the Dakota Sandstone and Burro Canyon Formation at the site are generally low. No significant joints or fractures within the Dakota Sandstone or Burro Canyon Formation have been documented in any wells or borings installed across the site (Knight Piésold, 1998). Any fractures observed in cores collected from site borings are typically cemented, showing no open space.

Porosities and water contents of the Dakota Sandstone have been measured in samples collected during installation of former well MW-16 and well MW-17 (Figure 5). MW-16 was located immediately downgradient of tailings Cell 3 and MW-17 is located south of tailings Cell 4A at a location primarily cross-gradient with respect to perched water flow. Porosities of the Dakota Sandstone range from 13.4% to 26%, averaging 20%, and water saturations range from 3.7% to 27.2%, averaging 13.5%. The average volumetric water content is approximately 3%. The hydraulic conductivity of the Dakota Sandstone based on packer tests in borings installed at the site prior to 1994 ranges from 2.71 x 10^{-6} centimeters per second (cm/s) to 9.12 x 10^{-4} cm/s, with a geometric average of 3.89 x 10^{-5} cm/s (TITAN, 1994).

The average porosity of the Burro Canyon Formation is similar to that of the Dakota Sandstone. Based on samples collected from the Burro Canyon Formation at former well MW-16 porosity ranges from 2% to 29.1%, averaging 18.3%, and water saturations of unsaturated materials range from 0.6% to 77.2%, averaging 23.4% (TITAN, 1994).

Extensive hydrogeologic characterization of the saturated Burro Canyon Formation has occurred through hydraulic testing of perched monitoring wells and borings at the site. Hydraulic testing of MW-series wells located upgradient, cross-gradient, downgradient, and within the millsite and tailings cell complex, TW4-series wells located cross-gradient to upgradient of the millsite and tailings cells, TWN-series wells located primarily upgradient of the millsite and tailings cells, and DR-series piezometers indicate that the hydraulic conductivity of the perched zone ranges from approximately 3 x 10^{-8} to 0.01 cm/s.

Hydraulic testing of wells MW-1, MW-3, MW-5, MW-17, MW-18, MW-19, MW-20, MW-22, MW-23, MW-25, MW-27, MW-28, MW-29, MW-30, MW-31, MW-32, MW-35, MW-36, and MW-37 (Figure 5), located upgradient, cross-gradient, downgradient, and within the area of the tailings cell complex at the site, yielded hydraulic conductivities ranging from approximately 2 x 10^{-7} cm/s to 1 x 10^{-3} cm/s (HGC, 2002; HGC, 2005; HGC, 2010b; and HGC, 2011a) Hydraulic testing of MW-11 and MW-14 (located within and immediately downgradient of the tailings cell complex) yielded hydraulic conductivities of approximately 1 x 10^{-3} cm/s and 7 x 10^{-4} cm/s, respectively.

DR-series piezometers were installed in May, 2011 to investigate perched zone conditions southwest (downgradient) of the tailings cells (Figure 5). Hydraulic testing of DR-5, DR-8, DR-9, DR-10, DR-11, DR-13, DR-14, DR-17, DR-19, DR-20, DR-21, DR-23, and DR-24 (Figure 5) yielded hydraulic conductivity estimates (based on the KGS slug test analysis of automatically logged data) ranging from approximately 3 x 10^{-8} cm/s to 4 x 10^{-4} cm/s with a geometric average of approximately 1 x 10^{-5} cm/s.

27 temporary perched zone chloroform monitoring wells (TW4-series wells in Figure 5), and 19 temporary perched zone nitrate monitoring wells (TWN-series wells in Figure 5) have been installed to investigate elevated nitrate concentrations detected initially in MW-4 and some of the TW4-series wells. TW4-series wells are located northeast (upgradient) to east (cross-gradient) of the tailings cells and TWN-series wells extend to the northeast (upgradient) of the millsite and tailings cells.

Hydraulic testing of the TWN-series wells yielded hydraulic conductivities ranging from approximately 4 x 10^{-7} cm/s to 0.01 cm/s with a geometric average of approximately 5 x 10^{-5} cm/s (HGC, 2009). Testing of TW4-20, TW4-21, and TW4-22 (HGC, 2005) and TW4-23, TW4-24, and TW4-25 (HGC, 2007b) yielded hydraulic conductivities ranging from approximately 4 x 10^{-5} to approximately 2 x 10^{-4} cm/s. Testing of TW4-4 yielded a hydraulic conductivity of approximately 1.7 x 10^{-3} cm/s, and testing of TW4-6, TW4-26, and TW4-27 (located downgradient of TW4-4) yielded hydraulic conductivities ranging from approximately 7 x 10^{-7} cm/s to 2 x 10^{-5} cm/s (HGC, 2010a and HGC, 2011b). Analysis of the drawdown data collected during a long-term pumping test conducted at MW-4, TW4-19, and MW-26 using TW4-series wells as observation wells yielded hydraulic conductivity estimates ranging from approximately 4 x 10^{-5} cm/s to 1 x 10^{-3} cm/s (HGC, 2004).

Some of the coarser-grained and conglomeratic materials encountered within the perched zone during installation of the TW4-series wells are believed to be partly continuous with or at least associated with a relatively thin, relatively continuous zone of higher permeability (International Uranium [USA] Corporation [IUSA] and HGC, 2001). The higher permeability zone defined by wells completed in the zone is generally located east to northeast of the tailings cells at the site, and is hydraulically cross-gradient to upgradient of the tailings cells with respect to perched groundwater flow.

Based on analyses of pumping tests at MW-4 and drilling logs from nearby temporary wells, the hydraulic conductivity of this relatively thin coarser-grained zone was estimated to be as high as 2.5 x 10^{-3} cm/s. Relatively high conductivities measured at MW-11, located on the southeastern margin of the downgradient edge of tailings Cell 3, and at MW-14, located on the downgradient edge of tailings Cell 4A, of 1.4 x 10^{-3} cm/s and 7.5 x 10^{-4} cm/s, respectively (UMETCO, 1993), may indicate that this zone extends beneath the southeastern portion of the tailings cell complex. However, based on hydraulic tests, this zone of higher permeability does not appear to exist within the saturated zone downgradient (south-southwest) of the tailings cells nor to the south of TW4-4. The apparent absence of the zone south of TW4-4 and south-southwest of the tailings cells suggests that it "pinches out" (HGC, 2007a).

The apparent pinching out of this zone is consistent with hydraulic tests at temporary wells TW4-6, TW4-26 and TW4-27 (located downgradient of TW4-4), and tests at DR-series piezometers (located downgradient of the tailings cell complex). As discussed above, the hydraulic conductivities of TW4-6, TW4-26 and TW4-27 ranged from approximately 7 x 10^{-7} to 2 x 10^{-5} cm/s, approximately two to three orders of magnitude lower than the conductivity at TW4-4 (approximately 2 x 10^{-3} cm/s). The hydraulic conductivities of the DR-series piezometers (based on analysis of automatically logged slug test data using the KGS solution) ranged from approximately 3 x 10^{-8} to 4 x 10^{-4} cm/s, (one to five orders of magnitude lower than at MW-11) with a geometric average of approximately 1 x 10^{-5} cm/s (two orders of magnitude lower than at MW-11). The effect of this transition from higher to lower permeability is to reduce the rate of perched water movement south of TW4-4 and south-southwest of tailings Cell 4A.

The extensive hydraulic testing of perched zone wells at the site indicates that perched zone permeabilities are generally low with the exception of the apparently isolated zone of higher permeability associated with the chloroform plume east to northeast (cross-gradient to upgradient) of the tailings cells. The geometric average hydraulic conductivity (approximately 1 x 10^{-5} cm/s) of the DR-series piezometers which cover an area nearly half the size of the total monitored area at White Mesa (excluding MW-22), is nearly identical to the geometric average hydraulic conductivity of 1.01 x 10^{-5} cm/s reported by TITAN (1994), and is within the range of 5 to 10 feet per year (ft/yr) [approximately 5 x 10^{-6} cm/s to 1 x 10^{-5} cm/s] reported by Dames and Moore (1978) for the (saturated) perched zone during the initial site investigation.

Because of the generally low permeability of the perched zone beneath the site, well yields are typically low (less than 0.5 gpm), although sustainable yields of as much as 4 gpm (for example, at TW4-19, shown in Figure 5) are possible in wells intercepting the relatively large saturated thicknesses within the higher permeability zone located east to northeast (cross-gradient to upgradient) of the tailings cells at the site. Sufficient productivity can generally be obtained only in areas where the saturated thickness is greater, which is one reason that the perched zone has been used on a limited basis as a water supply to the north (upgradient) of the site.

2.5.1.4 Perched Groundwater Flow

Perched groundwater flow at the site has historically been to the south/southwest. Figure 5 groundwater elevations indicate that beneath and south of the tailings cells, in the west central portion of the site, perched water flow is south-southwest to southwest. Flow on the western margin of White Mesa is generally south, approximately parallel to the mesa rim (where the Burro Canyon Formation [and perched zone] is terminated by erosion). On the eastern side of the site perched water flow is also generally southerly. Near the wildlife ponds, flow direction ranges locally from westerly (west of the ponds) to easterly (east of the ponds) resulting in a generally north-south perched water divide along a line connecting the ponds. Cones of depression result from pumping of wells MW-4, TW4-4, TW4-19, TW4-20, and MW-26. These wells are pumped to reduce chloroform mass in the perched zone east and northeast of the tailings cells.

In general, perched groundwater elevations have not changed significantly at most of the site monitoring wells since installation, except in the vicinity of the wildlife ponds and the pumping wells. For example, relatively large increases in water levels occurred between 1994 and 2002 at MW-4 and MW-19, located in the east and northeast portions of the site, as discussed in HGC (2007a). These water level increases in the northeastern and eastern portions of the site are the result of seepage from wildlife ponds located near piezometers PIEZ-1 through PIEZ-5 shown in Figure 5, which were installed in 2001 for the purpose of investigating these changes. The mounding associated with the wildlife ponds and the general increase in water levels in the northeastern portion of the site have resulted in a local steepening of groundwater gradients over portions of the site. Conversely, pumping of wells MW-4, TW4-4, TW4-19, TW4-20, and MW-26 has depressed the perched water table locally and reduced average hydraulic gradients to the south and southwest of these wells.

As discussed above, perched water discharges in springs and seeps along Westwater Creek Canyon and Cottonwood Canyon to the west-southwest of the site, and along Corral Canyon to the east of the site. The known discharge points located directly downgradient of the tailings cells are Westwater Seep and Ruin Spring. These features are located more than 2,000 feet west-southwest and more than 9,000 feet south-southwest of the tailings cells at the site as shown in Figure 5.

DR-8, located approximately 4,000 feet southwest of the tailings cells, is located near the mesa rim above Cottonwood Seep along a line between the tailings cells and Cottonwood Seep. Although there is no evidence to connect Cottonwood Seep to the perched water system, under hypothetical conditions that Cottonwood Seep receives some contribution from perched water, perched water passing beneath the tailings cells would presumably pass by DR-8 before continuing on an unidentified potential pathway toward Cottonwood Seep.

Figure 6 shows perched water pathlines southwest of the tailings cells based on first quarter, 2012 perched water level data. Paths 1 and 3 represent the shortest pathlines to discharge points Westwater Seep and Ruin Spring, respectively. Path 2 is the shortest pathline to DR-8, located near the edge of the mesa above Cottonwood Seep. A potential pathline is drawn from DR-8 to Cottonwood Seep. Westwater Seep is downgradient of tailings Cell 1 and the western portions of Cells 2, 3, and 4B. DR-8 is downgradient of tailings Cells 2, 3 and 4B. Ruin Spring is downgradient of Cell 4A, and the eastern portions of Cells 2, 3, and 4B.

2.5.1.5 Perched Zone Hydrogeology Beneath And Downgradient Of The Tailings Cells

The perched zone hydrogeology southwest (downgradient) of the tailings cells is similar to other areas of the site except that the saturated thicknesses are generally smaller, portions of the perched zone are dry, and hydraulic gradients and hydraulic conductivities are relatively low. The combination of shallow hydraulic gradients, relatively low permeabilities, and small saturated thicknesses, results in rates of perched water movement that are among the lowest on-site.

In the immediate vicinity of the tailings cells, perched water was encountered at depths of approximately 51 to 115 ft below the top of casing ("btoc") as of the first quarter of 2012 (Figure 7). Beneath tailings Cell 3, depths to water ranged from approximately 68 feet in the eastern portion of the cell, to approximately 115 ft btoc at the southwest margin of the cell. Assuming an average depth of the base of tailings Cell 3 of 25 feet below grade, this corresponds to perched water depths of approximately 43 to 90 feet below the base of the cell, and an average depth of approximately 67 feet beneath the base of the cell.

Beneath tailings Cell 4B, depths to water ranged from approximately 106 ft btoc in the northeastern portion of the cell (at MW-5), to approximately 112 ft btoc at the southwest margin of the cell (at MW-35). Assuming an average depth of the base of tailings Cell 4B of 25 feet below grade, this corresponds to perched water depths of approximately 81 to 87 feet below the base of the cell, and an average depth of approximately 84 feet beneath the base of the cell.

The saturated thickness of the perched zone in the immediate vicinity of the tailings cells as of the first quarter of 2012 ranges from approximately 83 feet to negligible (Figure 8). Beneath tailings Cell 3, the saturated thickness varies from approximately 59 feet in the eastern portion of the cell to approximately 7 feet in the western portion of the cell. Beneath tailings Cell 4B, the saturated thickness varies from approximately 21 feet in the southeastern portion of the cell to negligible in the southwestern portion of the cell, where a dry zone, defined by MW-33 and former (historically dry) well MW-16, is present.

Saturated thicknesses in the southwest area of the site are affected by a ridge-like high in the Burro Canyon Formation/Brushy Basin Member contact. The influence of this paleoridge is discussed in HGC (2012a). As shown in Figures 5 and 8 dry conditions or low saturated thickness conditions are associated with this paleoridge.

South-southwest of the tailings cells, the saturated thickness ranges from negligible at MW-21 (historically dry) to approximately 25 feet at DR-9. Small saturated thicknesses (less than 3 feet) near DR-6, DR-7, and DR-9 (west and southwest of Cell 4B) result from this paleoridge. The average saturated thickness based on measurements at MW-37, DR-13, MW-3, MW-20, and DR-21, which lay close to a line between the southeast portion of tailings Cell 4B and Ruin Spring, is approximately 8 feet. The average saturated thickness based on measurements at MW-35, DR-7, and DR-6, which are the points closest to a line between the southeast portion of tailings Cell 3 and Westwater Seep, is approximately 5 feet.

Site-wide, perched zone hydraulic gradients as of the first quarter of 2012 range from a maximum of approximately 0.07 feet per foot (ft/ft) east of tailings Cell 2 to approximately 0.001 ft/ft in the northeastern portion of the site (between TWN-15 and MW-1). Hydraulic gradients in the southwest portion of the site are typically close to 0.01 ft/ft, but the gradient is less than 0.005 ft/ft west/southwest of tailings Cell 4B, between Cell 4B and DR-8. The hydraulic gradient between the west dike of tailings Cell 3 and Westwater Seep is approximately 0.0122 ft/ft, and between the south dike of tailings Cell 4B and Ruin Spring, approximately 0.0118 ft/ft

2.5.2 Groundwater Quality

2.5.2.1 Entrada/Navajo Aquifer

The Entrada and Navajo Sandstones are prolific aquifers beneath and in the vicinity of the site. Water wells at the site are screened in both of these units, and therefore, for the purposes of this discussion, they will be treated as a single aquifer. Water in the Entrada/Navajo Aquifer is under artesian pressure, rising 800 to 900 ft above the top of the Entrada's contact with the overlying Summervillle Formation; static water levels are 390 to 500 ft below ground surface.

Within the region, this aquifer is capable of yielding domestic quality water at rates of 150 to 225 gpm, and for that reason, it serves as a secondary source of water for the Mill. Additionally, two domestic water supply wells drawing from the Entrada/Navajo Aquifer are located 4.5 miles southeast of the Mill site on the Ute Mountain Ute Reservation. Although the water quality and productivity of the Navajo/Entrada aquifer are generally good, the depth of the aquifer (>1,000 ft bls) makes access difficult.

Table 2.5.2.1-1 is a tabulation of groundwater quality of the Navajo Sandstone aquifer as reported in the FES and subsequent sampling. TDS ranges from 244 to 1,110 mg/liter in three samples taken over a period from January 27, 1977, to May 4, 1977. High iron (0.057 mg/liter) concentrations are found in the Navajo Sandstone. Because the Navajo Sandstone aquifer is isolated from the perched groundwater zone by approximately 1,000 to 1,100 ft of materials having a low average vertical permeability, sampling of the Navajo Sandstone is not required under the Mill's previous NRC Point of Compliance monitoring program or under the Permit. However, samples were taken at two other deep aquifer wells (#2 and #5) on site (See Figure 9 for the locations of these wells), on June 1, 1999 and June 8, 1999, respectively, and the results are included in Table 2.5.2.1-1.

2.5.2.2 Perched Groundwater Zone

Perched groundwater in the Dakota/Burro Canyon Formation is used on a limited basis to the north (upgradient) of the site because it is more easily accessible. The quality of the Burro Canyon perched water beneath and downgradient from the site is poor and extremely variable.

The concentrations of TDS measured in water sampled from upgradient and downgradient wells range between approximately 600 and 5,300 mg/1. Sulfate concentrations measured in three upgradient wells varied between 670 and 1,740 mg/l (1994 Titan Report). The perched groundwater therefore is used primarily for stock watering and irrigation. The saturated thickness of the perched water zone generally increases to the north of the site. See the Section 2.11.2 below for a more detailed discussion of background ground water quality in the perched aquifer.

2.5.3 Springs and Seeps

As discussed in Section 2.5.1.4, perched groundwater at the Mill site discharges in springs and seeps along Westwater Creek Canyon and Cottonwood Canyon to the west-southwest of the site, and along Corral Canyon to the east of the site, where the Burro Canyon Formation outcrops. Water samples have been collected and analyzed from springs and seeps in the Mill vicinity as part of the baseline field investigations reported in the 1978 ER (See Table 2.6-6 in the 1978 ER).

During the period 2003-2004, Denison implemented a sampling program for seeps and springs in the vicinity of the Mill which had been sampled in 1978, prior to the Mill's construction. Four locations were designated for sampling, which are shown on Figure 9. These are Ruin Spring (G3R), Cottonwood Seep (G4R), west of Westwater Creek (G5R) and Corral Canyon (G1R). During the 2-year study period only two of the four locations were able to be sampled, Ruin Spring and Cottonwood Canyon. The other two locations, Corral Creek and the location west of Westwater Creek were not flowing (seeping), and samples could not be collected. With regard to the Cottonwood seep, while water was present, the volume was not sufficient to complete all determinations, and only organic analyses were conducted. The results of the organic analysis did not detect any detectable organics.

Samples at Ruin Spring were analyzed for major ions, physical properties, metals, radionuclides, volatile and semi-volatile organic compounds, herbicides and pesticides, and synthetic organic compounds. With the exception of one chloromethane detection, all organic determinations were at less than detectable concentrations. The detection of chloromethane is not uncommon in groundwater and can be due to natural sources. In fact, chloromethane has been observed by Denison at detectable concentrations in field blank samples during routine groundwater sampling events. The results of sampling for the other parameters tested are shown in Table 2.5.3-1. The results of the 2003/2004 sampling did not indicate the presence of mill derived groundwater constituents and are representative of background conditions.

As required by Part I.E.6 of the Permit, the Mill has implemented a *Sampling Plan for Seeps and Springs*. Per Part I.E.6 of the Permit, sampling of seeps and springs in required annually. A copy of the approved Sampling Plan for Seeps and Springs Revision 0, dated March 17, 2009, is included as Appendix B to this Application. Denison submitted Revision 1.0 on June 10, 2011. Revision 1.0 is currently undergoing review by the Director. See Section 2.12.2 below for a more detailed description of the Plan. The first sampling under the Plan was completed in August, 2009. A summary of sampling results from the 2009, 2010, and 2011 sampling events, performed under the approved *Sampling Plan for Seeps and Springs*, is provided in Table 2.5.3-2 through Table 2.5.3-5.

2.5.4 Topography

The Mill site is located on a gently sloping mesa that, from the air, appears similar to a peninsula, as it is surrounded by steep canyons and washes and is connected to the Abajo Mountains to the north by a narrow neck of land. On the mesa, the topography is relatively flat, sloping at less than one (1) percent to the south and nearly horizontal from east to west. See also Figure 6.

2.5.5 Soils

The majority (99%) of the soil at the Mill site consists of the Blanding soil series (1978 ER, Section 2.10.1.1). The remaining 1% of the site is in the Mellenthin soil series. Because the Mellenthin soil occurs only on the eastern-central edge of the site (1978 ER, Plate 2.10-1), the FES (Section 2.8) concluded that it should not be affected by Mill construction and operation.

The Mill and associated tailings cells are located on Blanding silt loam, a deep soil formed from wind-blown deposits of fine sands and silts. Although soil textures are predominantly silt loam, silty-clay-loam textures are found at some point in most profiles (See Appendix C to this Application – *Results of Soil Analysis at Mill Site*). This soil generally has a 4 to 5 inch reddish-brown, silt-loam A horizon and a reddish-brown, silt-loam to silty-clay-loam B horizon. The B horizon extends downward about 12 to 16 inches where the soil then becomes calcareous silt-loam or silty-clay-loam, signifying the C horizon. The C horizon and the underlying parent material are also reddish-brown in color.

The A and B horizon both are non-calcareous with an average pH of about 8.0, whereas the C horizon is calcareous with an average pH of about 8.5. Subsoil sodium levels range up to 12% in some areas, which is close to the upper limit of acceptability for use in reclamation work (1978 ER, Sect. 2.10.1.1). Other elements, such as boron and selenium, are well below potentially hazardous levels. Potassium and phosphorus values are high in this soil (1978 ER, Table 2.10-2) and are generally adequate for plant growth. Nitrogen, however, is low (1978 ER, Sect. 2.10.1.1) and may have to be provided for successful revegetation during final reclamation.

With well-drained soils, relatively flat topography (see Section 2.5.4), and limited annual precipitation (see Section 2.5.1.2), the site generally has a low potential for water erosion. However, the flows resulting from thunderstorm activity are nearly instantaneous and, without the Mill's design controls, could result in substantial erosion. When these soils are barren, they are considered to have a high potential for wind erosion. Although the soil is suitable for crops, the low percentage of available moisture (6 to 9%) is a limiting factor for plant growth; therefore, light irrigation may be required to establish native vegetation during reclamation.

2.5.6 Bedrock

Subsurface conditions at the Mill site area were investigated as part of the 1978 ER by drilling, sampling, and logging a total of 28 borings which ranged in depth from 6.5 to 132.4 ft. Of these borings, 23 were augured to bedrock to enable soil sampling and estimation of the thickness of the soil cover. The remaining 5 borings were drilled through bedrock to below the perched water table, with continuous in situ permeability testing where possible and selective coring in bedrock. The soils encountered in the borings were classified, and a complete log for each boring was maintained. See Appendix A of Appendix H of the 1978 ER.

Borings in the footprint of the existing tailings cells reported calcareous, red-brown sands and silts from the surface to a depth of 15 ft, averaging over 7 ft. Borings in the general area of the Mill site and the tailings cells reported calcareous, red-brown sands and silts from the surface to a depth of 14 ft, averaging over 9 ft. Downgradient of the tailings cells, calcareous sands and silts extend to a depth of 17 ft of the surface. The calcareous silts and sands of the near-surface soils grade to weathered claystones or weathered sandstones, inter-layered with weathered claystone and iron staining. At depth, the weathered claystone or weathered clayey sandstone grade into sandstone with inter-layered bands of claystone, gravel, and conglomerate. Some conglomerates are cemented with calcareous matrix.

2.5.7 Agricultural and Land Use Description of the Area

Approximately 65.8% of San Juan County is federally owned land administered by the U.S. Bureau of Land Management, the National Park Service, and the U.S. Forest Service. Primary land uses include livestock grazing, wildlife range, recreation, and exploration for minerals, oil, and gas. Approximately 22% of the county is Native American land owned either by the Navajo Nation or the Ute Mountain Ute Tribe. The area within 5 miles of the Mill site is predominantly range land owned by residents of Blanding. The Mill site itself, including tailings cells, encompasses approximately 300 acres.

A more detailed discussion of land use at the Mill site, in surrounding areas, and in southeastern Utah, is presented in the FES (Section 2.5). Results of archeological studies conducted at the site and in the surrounding areas as part of the 1978 ER are also documented in the FES (Section 2.5.2.3).

2.5.8 Well Logs

Well/boring logs for wells MW-1, MW-2, MW-3, MW-4 (not a compliance well under the Permit), MW-5, MW-11, MW-12, MW-14, MW-15, MW-16 (not a compliance well under the Permit and abandoned during the construction of Tailings Cell 4B), MW-17, MW-18, and MW-19, are included as Appendix A to the 1994 Titan Report. A copy of the 1994 Titan Report was previously submitted under separate cover.

Lithologic and core logs for wells MW-3A, MW-23, MW-24, MW-25, MW-27, MW-28, MW-29, MW-30 and MW-31 are included as Appendix A to the Report: *Perched Monitoring Well Installation and Testing at the White Mesa Uranium Mill April Through June 2005*, August 3, 2005, prepared by Hydro Geo Chem, Inc. A copy of that Report was previously submitted under separate cover.

Lithologic and core logs for well MW-26 (previously named TW4-15) and well MW-32 (previously named TW4-17) are included as Appendix A to the *Letter Report dated August 29, 2002, prepared by Hydro Geo Chem, Inc.* and addressed to Harold Roberts.

Lithologic and core logs for well MW-33, MW-34 and well MW-35 are included as Appendix A to the *Installation and Hydraulic Testing of Perched Monitoring Wells MW-33, MW-34, and*

MW-35 at the White Mesa Uranium Mill Near Blanding Utah, prepared by Hydro Geo Chem, Inc. October 11, 2010. A copy of that Report was previously submitted under separate cover.

Lithologic and core logs for well MW-36 and well MW-37 are included as Appendix A to the *Installation and Hydraulic Testing of Perched Monitoring Wells MW-36 and MW-37 at the White Mesa Uranium Mill Near Blanding Utah, prepared by Hydro Geo Chem, Inc. June 28, 2011.* A copy of that Report was previously submitted under separate cover.

2.6 The Type, Source, and Chemical, Physical, Radiological, and Toxic Characteristics of the Effluent or Leachate to be Discharged (R317-6-6.3.F)

The Mill is designed not to discharge to groundwater or surface waters. Instead, the Mill utilizes tailings and evaporation Cells for disposal of Mill effluents as indicated below:

- Cell 1: -dedicated to evaporation of Mill waste solutions;
- Cell 2: -contains Mill tailings, has an interim cover and is closed to future tailings disposal;
- Cell 3: -contains Mill tailings and is in the final stages of filling;
- Cell 4A: -receives Mill tailings and is used for evaporation of Mill solutions; and
- Cell 4B: -receives Mill tailings and is used for evaporation of Mill solutions.

See Sections 2.7.2 through 2.7.4 below for a more detailed discussion of the Mill's tailings cells.

The projected chemical and radiological characteristics of tailings solutions were assessed by Energy Fuels Nuclear, Inc., a predecessor operator of the Mill, and NRC in 1979 and 1980, respectively. In addition, early samples were assessed by D'Appolonia Engineering as the Mill started operations to further evaluate and project the character of the solutions. Samples of tailings after the Mill was fully operational were collected by NRC (1987), Denison/UDEQ (2003), Denison (2007), Denison (2008) and Denison (2009). Samples collected in 2003 were obtained under the oversight of DRC personnel. The Samples collected in 2007 and 2008 were obtained by Denison on a voluntary basis as the then proposed *Tailings and Slimes Drain Sampling Plan* (the "Tailings Sampling Plan") had not been approved by the Director at that time. The 2009 samples were collected on August 6, 2009 under the approved Tailings Sampling Plan. Subsequent annual sampling has been performed in August 2010 and 2011 under the approved Tailings Sampling Plan. As of this writing, Denison has submitted Revision 2.0 of the Tailings Sampling Plan, which is currently undergoing review by the Director.

The chemical and radiological characteristics of the solutions held in the tailings cells, based on the sample results described above, are provided in the tables included in Appendix D, which list the concentration of parameters measured in accordance with the Permit.

There is no active discharge from the tailings Cells; therefore, an estimation of the flow rate (gpd) is not applicable in this instance. However, when operating at full capacity, the Mill discharges approximately 2000 tons per day of dry tailings and approximately 600 gpm of tailings solutions to the Mill's tailings cells.

2.7 Information Which Shows that the Discharge can be Controlled and Will Not Migrate Into or Adversely Affect the Quality of any Other Waters of the State (R317-6-6.3.G)

2.7.1 General

The Mill has been designed as a facility that does not discharge to groundwater or surface water. All tailings and other Mill wastes are disposed of permanently into the Mill's tailings system. Excess waters are disposed of in the tailings cells, where they are subject to evaporation, or re-processed through the Mill circuit. See Section 2.6.

The Mill was also designed and constructed to prevent runon or runoff of storm water by a) diverting runoff from precipitation on the Mill site to the tailings cells; and b) diverting runoff from surrounding areas away from the Mill site.

The Permit therefore does not authorize any discharges to groundwater or surface water, but is intended to protect against potential inadvertent or unintentional discharges, such as through potential failure of the Mill's tailings system.

The Mill's tailings system is currently comprised of four tailings cells (Cells 2, 3 4A, and 4B) and one evaporation pond (Cell 1). Diagrams showing the Mill facility layout, including the existing tailings cells are included as Figures 10 and 11 to this Application. In addition, the Mill has a lined catchment basin, used for temporary storage of Mill process upset fluids, known as "Roberts Pond". Roberts Pond is about 0.40 acres in size, and found approximately 180 feet west of the Mill building and about 200 feet east of the northeast corner of Cell 1.

The following sections describe the primary Discharge Minimization Technology ("DMT") and Best Available Technology ("BAT") features of the Mill, which demonstrate that the wastes and tailings at the Mill can be controlled so that they do not migrate into or adversely affect the quality of any waters of the State, including groundwater and surface water.

2.7.2 Cells 1, 2 and 3

2.7.2.1 Design and Construction of Cells 1, 2 and 3

Tailings Cells 1, 2 and 3 were each constructed more than 25 years ago. Construction of Cell 2 was completed on May 3, 1980, construction of Cell 1 was completed on June 29, 1981, and construction of Cell 3 was completed on September 15, 1982.

Each of Cells 1, 2 and 3 are constructed below grade. Each has a single 30 ml PVC flexible membrane liner ("FML") constructed of solvent welded seams on a prepared sub-base. A protective soil cover layer was constructed immediately over the FML with a thickness of 12-inches on the cell floor and 18-inches on the interior sideslope. Immediately below the FML, each Cell has a nominal 6-inch thick layer of crushed sandstone that was prepared and rolled smooth as an FML sub-base layer. Beneath this underlay, native sandstone and other foundation materials were graded to drain to a single low point near the upstream toe of the south cross-valley dike. Inside this layer, is an east-west oriented pipe to gather fluids at the upstream toe of the cross-valley dike. The crushed sandstone layer draining to the pipe at the upstream toe of the dike of the cell was intended to be a leak detection system for each cell. However, because the design of these leak detection systems does not meet current BAT standards, they are not recognized as leak detection systems in the Permit.

Each of Cells 2 and 3 also has a slimes drain collection system immediately above the FML, comprised of a nominal 12-inch thick protective blanket layer of soil or comparable material, on top of which is a network of PVC perforated pipe laterals on a grid spacing interval of about 50-feet. These pipe laterals gravity drain to a perforated PVC collector pipe which also drains toward the south dike and is accessed from the ground surface via a non-perforated access pipe. At cell closure, leachate head inside the pipe network will be removed via a submersible pump installed inside the access pipe

See Part I.D.1 of the Permit for a more detailed description of the design of Cells 1, 2 and 3.

After review of the existing design and construction and consultation with the State of Utah Division of Water Quality, the Director determined, in connection with the issuance of the Permit in 2005, that the DMT required under the groundwater quality protection rules (UAC R317-6-6.4(c)(3)) for Cells 1, 2 and 3 that pre-dated those rules will be defined by the current or existing disposal cell construction, with a few modifications that were included in the Permit (see page 25 of the 2004 Statement of Basis). These modifications focus on changes in monitoring requirements, and on improvements to facility closure. The goal of these improvements is to ensure that potential wastewater losses are minimized and local groundwater quality is protected. These modifications are described in Sections 2.7.2.2, 2.7.2.3 and 2.7.2.4 below.

2.7.2.2 Improved Groundwater Monitoring

Improvements were made to the Mill's groundwater monitoring network at the time of issuance of the Permit, to meet the following goals:

a) Early Detection

Three monitoring wells (MW-24, MW-27 and MW-28) were added immediately adjacent to Cell 1, in order to detect a potential release as early as practicable.

b) Discrete Monitoring

In order to individually monitor each tailings cell and to be able to pinpoint the source of any potential groundwater contamination that may be detected, the Permit required the addition of three monitoring wells (MW-29, MW-30 and MW-31) between Cells 2 and 3, in addition to the addition of wells MW-24, MW-27 and MW-28 immediately adjacent to Cell 1.

The addition of monitoring wells MW-24, MW-27, MW-28, MW-29, MW-30 and MW-31, together with the existing monitoring wells at the site provides a comprehensive monitoring network to determine any potential leakage from Cells 1, 2 and 3. See Figure 4 for a map showing the locations of the existing compliance monitoring wells for the site.

2.7.2.3 Operational Changes and Improved Operations Monitoring

The Permit also required changes to disposal cell operation in order to increase efforts to minimize potential seepage losses, and thereby improve protection of local groundwater quality. Examples of these changes are:

c) Maximum Waste and Wastewater Pool Elevation

Part I.D.3 of the Permit requires that Denison continue to ensure that impounded wastes and wastewaters for all of the Mill's tailings Cells and Roberts Pond are held within an FML.

d) Slimes Drain Maximum Allowable Head

Part I.D.3(b) of the Permit requires that the Mill provide constant pumping efforts to minimize the accumulation of leachates over the FML in Cell 2, and upon commencement of dewatering activities, in Cell 3, and thereby minimize potential FML leakage to the foundation and groundwater. See the discussion in Section 2.15.2.2 below.

2.7.2.4 Evaluation of Tailings Cell Cover System Design

Denison submitted an *Infiltration and Contaminant Transport Modeling ("ICTM") Report, White Mesa Mill Site, Blanding, Utah*, prepared by MWH Americas, Inc., to the Director for review in November, 2007, in order to fulfill the requirements of Part I.H.11 of the Permit. That report has been reviewed by the Director, and comments were provided to Denison. Denison addressed those comments and prepared a revised version of the report submitted to the Director for review in March 2010. As of 2011, the Director had not provided comments on the revised version of the ICTM report. In 2011, Denison agreed to fund the Director's use of a consulting firm to review and comment on the revised ICTM Report. Denison received a first round of interrogatory comments from the Director in March 2012. Denison provided a partial response to the first round of comments in June 2012. The need for additional sampling, resulting from the first round of interrogatory comments, required that a portion of the responses be delayed for submittal after the receipt of additional data. The remainder of the responses to the first round of interrogatories will be submitted on August 15, 2012.

See Section 2.19 below for a more detailed discussion of post-closure requirements for the Mill.

2.7.3 Cell 4A

Construction of Cell 4A was completed on or about November 1989. Cell 4A was used for a short period of time after its construction for the disposal of raffinates from the Mill's vanadium circuit. No tailings waste or wastewater had been disposed of in Cell 4A since the early 1990s. This lack of waste disposal, and exposure of the FML to the elements, caused Cell 4A to fall into disrepair over the years.

Although the original design of Cell 4A was an improvement over the design of Cells 1, 2 and 3 (it had a one-foot thick clay liner under a 40 ml high density polyethylene ("HDPE") FML, with a more elaborate leak detection system), it was constructed in 1989 and did not meet today's BAT standards.

Cell 4A was re-lined in 2007-2008 and was re-authorized for use in November 2008. With the reconstruction of Cell 4A, BAT was required, as mandated by Part I.D.4 of the Permit and as stipulated by the Utah Ground Water Quality Regulations at UAC R317-6-6.4(A). With BAT for Cell 4A, there are also new performance standards that require daily leak detection system monitoring, weekly wastewater level monitoring, and slimes drain recovery head monitoring. The BAT monitoring results are required to be reported and summarized in the Routine DMT and BAT Performance Standard Monitoring Reports. See Section 2.15.3 below for a more detailed discussion relating to the BAT performance standards and monitoring requirements for Cell 4A.

Tailings Cell 4A Design and Construction was approved by the Director as meeting BAT requirements. The major design elements are set out in Part I.D.5 of the Permit and consist of the following:

e) Dikes – consisting of existing earthen embankments of compacted soil, constructed by a previous Mill operator between 1989-1990, and composed of four dikes, each including a 15-foot wide road at the top (minimum). On the north, east, and south margins these dikes have slopes of 3H to 1V. The west dike has a slope of 2H to 1V. Width of these dikes varies. Each has a minimum crest width of at least 15 feet to support an access road. Base width also varies from 89-feet on the east dike (with no exterior embankment), to 211-feet at the west dike.

f) Foundation – including existing subgrade soils over bedrock materials. Foundation preparation included excavation and removal of contaminated soils, compaction of imported soils to a maximum dry density of 90%. The floor of Cell 4A has an average slope of 1% that grades from the northeast to the southwest corners.

g) Tailings Capacity – the floor and inside slopes of Cell 4A encompass about 40 acres and have a maximum capacity of about 1.6 million cubic yards of tailings material storage (as measured below the required 3-foot freeboard).

h) Liner and Leak Detection Systems – including the following layers, in descending order:
    (i) Primary FML – consisting of an impermeable 60 mil HDPE membrane that extends across both the entire cell floor and the inside side-slopes, and is anchored in a trench at the top of the dikes on all four sides. The primary FML is in direct physical contact with the tailings material over most of the Cell 4A floor area. In other locations, the primary FML is in contact with the slimes drain collection system (discussed below).
    (ii) Leak Detection System – includes a permeable HDPE geonet fabric that extends across the entire area under the primary FML in Cell 4A, and drains to a leak detection sump in the southwest corner. Access to the leak detection sump is via an 18-inch inside diameter (ID) HDPE pipe placed down the inside slope, located between the primary and secondary FML liners. At its base this pipe is surrounded with a gravel filter set in the leak detection sump, having dimensions of 10 feet by 10 feet by 2 feet deep. In turn, the gravel filter layer is enclosed in

an envelope of geotextile fabric. The purpose of both the gravel and geotextile fabric is to serve as a filter.

(iii) Secondary FML – consisting of an impermeable 60-mil HDPE membrane found immediately below the leak detection geonet. This FML also extends across the entire Cell 4A floor, up the inside side-slopes and is also anchored in a trench at the top of all four dikes.

(iv) Geosynthetic Clay Liner – consisting of a manufactured geosynthetic clay liner (GCL) composed of 0.2-inch of low permeability bentonite clay centered and stitched between two layers of geotextile.

i) Slimes Drain Collection System – including a two-part system of strip drains and perforated collection pipes both installed immediately above the primary FML, as follows:

(i) Horizontal Strip Drain System – is installed in a herringbone pattern across the floor of Cell 4A that drains to a "backbone" of perforated collection pipes. These strip drains are made of a prefabricated two-part geo-composite drain material (solid polymer drainage strip) core surrounded by an envelope of non-woven geotextile filter fabric. The strip drains are placed immediately over the primary FML on 50-foot centers, where they conduct fluids downgradient in a southwesterly direction to a physical and hydraulic connection to the perforated slimes drain collection pipe. A series of continuous sand bags, filled with filter sand cover the strip drains. The sand bags are composed of a woven polyester fabric filled with well graded filter sand to protect the drainage system from plugging.

(ii) Horizontal Slimes Drain Collection Pipe System – includes a "backbone" piping system of 4-inch ID Schedule 40 perforated PVC slimes drain collection (SDC) pipe found at the downgradient end of the strip drain lines. This pipe is in turn overlain by a berm of gravel that runs the entire diagonal length of the cell, surrounded by a geotextile fabric cushion in immediate contact with the primary FML. In turn, the gravel is overlain by a layer of non-woven geotextile to serve as an additional filter material. This perforated collection pipe serves as the "backbone" to the slimes drain system and runs from the far northeast corner downhill to the far southwest corner of Cell 4A where it joins the slimes drain access pipe.

(iii) Slimes Drain Access Pipe – consisting of an 18-inch ID Schedule 40 PVC pipe placed down the inside slope of Cell 4A at the southwest corner, above the primary FML. Said pipe then merges with another horizontal pipe of equivalent diameter and material, where it is enveloped by gravel and woven geotextile that serves as a cushion to protect the primary FML. A reducer connects the horizontal 18-inch pipe with the 4-inch SDC pipe. At some future time, a pump will be set in this 18-inch pipe and used to remove tailings wastewaters for purposes of de-watering the tailings cell.

j) North Dike Splash Pads – three 20-foot wide splash pads have been constructed on the north dike to protect the primary FML from abrasion and scouring by tailings slurry. These pads consist of an extra layer of 60 mil HDPE membrane that has been installed in the anchor trench and placed down the inside slope of Cell 4A, from the top of the dike, under the inlet pipe, and down the inside slope to a point 5-feet beyond the toe of the slope.

k) Emergency Spillway – a concrete lined spillway has been constructed near the southwestern corner of the west dike to allow emergency runoff from Cell 4A to Cell 4B. At this time, all stormwater runoff and tailings wastewaters not retained in Cells 2, 3, and 4A will be managed and contained in Cell 4B, including the Probable Maximum Precipitation and flood event.

l) BAT Performance Standards for Tailings Cell 4A – Denison shall operate and maintain Tailings Cell 4A so as to prevent release of wastewater to groundwater and the environment in accordance with an Operations and Maintenance Plan, as currently approved by the Director, pursuant to Part I.H.19. At a minimum these performance standards shall include:
   (i) Maximum Allowable Daily Head – on the secondary FML,
   (ii) Maximum Allowable Daily Leak Detection System Flow Rate
   (iii) Slimes Drain Monthly and Annual Average Recovery Head Criteria – to be applied after the Mill initiates pumping conditions in the slimes drain layer,
   (iv) Maximum Daily Wastewater Level – to ensure compliance with the minimum freeboard requirements for Cell 4A, and prevent discharge of wastewaters via overtopping.

See Part I.D.5 of the Permit for a more detailed discussion of the design of Cell 4A. A copy of the Mill's *Cell 4A BAT Monitoring, Operations and Maintenance Plan* is attached as Appendix E to this Application.

2.7.4 Cell 4B

Construction of Cell 4B was completed in November 2011.

Tailings Cell 4B Design and Construction was approved by the Director as meeting BAT requirements. The major design elements are set out in Part I.D.12 of the Permit and consist of the following:

a) Dikes – consisting of newly constructed dikes on the south and west side of the cell, each including a 20-foot wide road at the top (minimum). The exterior slopes of the southern and western dikes have slopes of 3H to 1V. The interior dikes have slopes of 2H to 1V. Limited portions of the Cell 4B interior sidelopes in the northwest corner and southeast corner of the cell (where the slimes drain and leak detection sump are located) have a slope of 3H to 1V. Width of these dikes varies. The base width of the southern dike varies from approximately 92 feet at the western end to approximately 190 feet at the eastern end of the dike, with no exterior embankment present on any other side of the cell.

b) Foundation – including existing subgrade soils over bedrock materials. Foundation preparation included excavation and removal of contaminated soils, compaction of imported soils to a maximum dry density of 90%. The floor of Cell 4B has an average slope of 1% that grades from the northwest to the southeast corner.

c) Tailings Capacity – the floor and inside slopes of Cell 4B encompass about 40 acres and the cell has a maximum capacity 1.9 million cubic yards of tailings material storage (as measured below the required 3-foot freeboard).

d) Liner and Leak Detection Systems – including the following layers, in descending order:

   (i) Primary FML – consisting of an impermeable 60 mil HDPE membrane that extends across both the entire cell floor and the inside side-slopes, and is anchored in a trench at the top of the dikes on all four sides. The primary FML is in direct physical contact with the tailings material over most of the Cell 4B floor area. In other locations, the primary FML is in contact with the slimes drain collection system (discussed below).

   (ii) Leak Detection System – includes a permeable HDPE geonet fabric that extends across the entire area under the primary FML in Cell 4B, and drains to a leak detection sump in the southeast corner. Access to the leak detection sump is via an 18-inch inside diameter (ID) HDPE pipe placed down the inside slope, located between the primary and secondary FML liners. At its base this pipe is surrounded with a gravel filter set in the leak detection sump, having dimensions of 15 feet by 10 feet by 2 feet deep. In turn, the gravel filter layer is enclosed in an envelope of geotextile fabric. The purpose of both the gravel and geotextile fabric is to serve as a filter.

   (iii) Secondary FML – consisting of an impermeable 60-mil HDPE membrane found immediately below the leak detection geonet. This FML also extends across the entire Cell 4B floor, up the inside side-slopes and is also anchored in a trench at the top of all four dikes.

   (iv) Geosynthetic Clay Liner – consisting of a manufactured geosynthetic clay liner (GCL) composed of 0.2-inch of low permeability bentonite clay centered and stitched between two layers of geotextile.

e) Slimes Drain Collection System – including a two-part system of strip drains and perforated collection pipes both installed immediately above the primary FML, as follows:

   (i) Horizontal Strip Drain System – is installed in a herringbone pattern across the floor of Cell 4B that drains to a "backbone" of perforated collection pipes. These strip drains are made of a prefabricated two-part geo-composite drain material (solid polymer drainage strip) core surrounded by an envelope of non-woven geotextile filter fabric. The strip drains are placed immediately over the primary FML on 50-foot centers, where they conduct fluids downgradient in a southeasterly direction to a physical and hydraulic connection to the perforated slimes drain collection pipe. A series of continuous sand bags, filled with filter sand cover the strip drains. The sand bags are composed of a woven polyester fabric filled with well graded filter sand to protect the drainage system from plugging.

   (ii) Horizontal Slimes Drain Collection Pipe System – includes a "backbone" piping system of 4-inch ID Schedule 40 perforated PVC slimes drain collection (SDC) pipe found at the downgradient end of the strip drain lines. This pipe is in turn overlain by a berm of gravel that runs the entire diagonal length of the cell, surrounded by a geotextile fabric cushion in immediate contact with the primary

FML. In turn, the gravel is overlain by a layer of non-woven geotextile to serve as an additional filter material. This perforated collection pipe serves as the "backbone" to the slimes drain system and runs from the far northeast corner downhill to the far southeast corner of Cell 4A where it joins the slimes drain access pipe.

(iii) Slimes Drain Access Pipe – consisting of an 18-inch ID Schedule 40 PVC pipe placed down the inside slope of Cell 4B at the southeast corner, above the primary FML. Said pipe then merges with another horizontal pipe of equivalent diameter and material, where it is enveloped by gravel and woven geotextile that serves as a cushion to protect the primary FML. A reducer connects the horizontal 18-inch pipe with the 4-inch SDC pipe. At some future time, a pump will be set in this 18-inch pipe and used to remove tailings wastewaters for purposes of de-watering the tailings cell.

f) North and East Dike Splash Pads – nine 20-foot wide splash pads have been constructed on the north and east dikes to protect the primary FML from abrasion and scouring by tailings slurry. These pads consist of an extra layer of 60 mil HDPE membrane that has been installed in the anchor trench and placed down the inside slope of Cell 4B, from the top of the dike, under the inlet pipe, and down the inside slope to a point 5-feet beyond the toe of the slope.

g) Emergency Spillway – a concrete lined spillway has been constructed near the southeastern corner of the east dike to allow emergency runoff from Cell 4A into Cell 4B. This spillway is limited to a 6-inch reinforced concrete slab, with a welded wire fabric installed within its midsection, set directly atop a cushion geotextile placed directly over the primary FML in a 4-foot deep trapezoidal channel. A 100-foot wide, 60-mil HDPE membrane splash pad is installed beneath the emergency spillway. No other spillway or overflow structure will be constructed at Cell 4Bunless and until the construction of Cells 5A and 5B. At this time, all stormwater runoff and tailings wastewaters not retained in Cells 2, 3, and 4A will be managed and contained in Cell 4B, including the Probable Maximum Precipitation and flood event.

h) BAT Performance Standards for Tailings Cell 4B – Denison shall operate and maintain Tailings Cell 4B so as to prevent release of wastewater to groundwater and the environment in accordance with the currently-approved Cell 4B BAT, Monitoring, Operations and Maintenance Plan. At a minimum these performance standards shall include:

(i) Maximum Allowable Daily Head – on the secondary FML,
(ii) Maximum Allowable Daily Leak Detection System Flow Rate
(iii) Slimes Drain Monthly and Annual Average Recovery Head Criteria – to be applied after the Mill initiates pumping conditions in the slimes drain layer,
(iv) Maximum Daily Wastewater Level – to ensure compliance with the minimum freeboard requirements for Cell 4B, and prevent discharge of wastewaters via overtopping.

See Part I.D.12 of the Permit for a more detailed discussion of the design of Cell 4B. A copy of the Mill's *Cell 4A and 4B BAT Monitoring, Operations and Maintenance Plan* is attached as Appendix E to this Application.

2.7.5 Future Additional Tailings Cells

Future additional tailings cells at the Mill will require Director approval prior to construction and operation. All future tailings cells at the Mill will be required to satisfy BAT standards at the time of construction.

2.7.6 Roberts Pond

Roberts Pond receives periodic floor drainage and other wastewaters from Mill process upsets, is frequently empty, and was re-lined with a new FML in May, 2002.
In order to minimize any potential seepage release from Roberts Pond, the Director has determined that an appropriate DMT operations standard would be two-fold, as required by Part I.D.3(e) of the Permit:

(i) A stipulation that the Mill maintain a minimal wastewater head in this pond based on a 2-foot freeboard limit and a 1-foot additional operating limit; and
(ii) At the time of Mill site closure, Denison will excavate and remove the liner, berms, and all contaminated subsoils in compliance with an approved final reclamation plan under the Mill License.

2.7.7 Other Facilities and Protections

2.7.7.1 Feedstock Storage

In order to constrain and minimize potential generation of contaminated stormwater or leachates, Part I.D.11 of the Permit requires the Mill to continue its existing practice of limiting open air storage of feedstock materials to the historical storage area found along the eastern margin of the Mill site (as defined by the survey coordinates found in Permit Table 4); and one of the following three practices: 1) Store feedstock materials in water-tight contains, or 2) Place feedstock containers in water-tight overpack containers, or 3) place feedstock containers on a hardened surface that conforms to the requirements spelled out in the permit part I.D.11d) 1 through 5.

2.7.7.2 Mill Site Reagent Storage

In order to prevent potential reagent tank spills or leaks that could release contaminants to site soils or groundwater, and to provide proper spill prevention and control, Part I.D.3(g) of the Permit requires the Mill to demonstrate that it has adequate provisions for spill response, cleanup, and reporting for reagent storage facilities, and to include these in a Stormwater Best Management Practices Plan. Contents of this plan are stipulated in Part I.D.8 of the Permit, and submittal and approval of the plan is required under Part I.H.17 of the Permit. For existing facilities at the Mill, secondary containment is required, although such containment may be earthen lined. For new facilities constructed at the Mill, or reconstruction of existing facilities, Part I.D.3(e) requires the higher standard of secondary containment that would prevent contact of any potential spill with the ground surface.

A copy of the Mill's *Stormwater Best Management Practices Plan*, Revision 1.3: June 12, 2008 is attached as Appendix F to this Application.

2.7.7.3 New Construction

Part I.D.4 of the Permit ensures that all construction, modification, or operation of waste or wastewater disposal, treatment, or storage facilities requires submittal of engineering plans and specifications and prior Director approval. In these plans and specifications, the Mill is required to demonstrate how BAT requirements of the Groundwater Quality Protection Rules have been met. After Director Approval, a construction permit may be issued, and the Permit modified.

2.7.7.4 Other

The *White Mesa Mill Tailings Management System and Discharge Minimization Technology (DMT) Monitoring Plan,* 2/12 Revision: Denison-11.5 (the "DMT Plan"), a copy of which is attached as Appendix G to this Application, is designed as a systematic program for constant surveillance and documentation of the integrity of the tailings system including monitoring the leak detection systems. The Plan requires daily, weekly, quarterly, monthly and annual inspections and evaluations and monthly reporting to Mill management. See Section 2.15.2 below for a more detailed discussion of the requirements of the DMT Plan.

2.7.8 Surface Waters

The Mill has been designed as a facility that does not discharge to surface waters. All tailings and other Mill wastes are disposed of permanently into the Mill's tailings system. Further, as mentioned above, the Mill was designed and constructed to prevent runon or runoff of storm water by a) diverting runoff from precipitation on the Mill site to the tailings cells; and b) diverting runoff from surrounding areas away from the Mill site. As a result, there is no pathway for liquid effluents from Mill operations to impact surface waters.

Under the Mill License, the Mill is required to periodically sample local surface waters to determine if Mill activities may have impacted those waters. The primary pathway would be from air particulate from Mill operations that may have landed on or near surface waters, or that may have accumulated in drainage areas that could feed into surface waters. Sampling results since inception of Mill operations show no trends or other impacts of Mill operations on local surface waters. See the Mill's *Semi-Annual Effluent Report for the period July1 to December 31, 2011*, a copy of which has previously been provided to the Director.

2.7.9 Alternate Concentration Limits

The Mill does not discharge to groundwater or surface water, nor is it designed to do so. Therefore, no alternate concentration limits are currently applicable to the site.

2.8 For Areas Where the Groundwater Has Not Been Classified by the Board, Information of the Quality of the Receiving Ground Water (R317-6-6.3.H)

Groundwater classification was assigned by the Director in the Permit on a well-by-well basis after review of groundwater quality characteristics for the perched aquifer at the Mill site. A well-by-well approach was selected by the Director in order to acknowledge the spatial variability of groundwater quality at the Mill, and afford the most protection to those portions of the perched aquifer that exhibited the highest quality groundwater. These groundwater classifications are set out in Part I.A and Table 1 of the Permit.

The primary element used by the Director in determining the groundwater classification of each monitoring well at the site, is the TDS content of the groundwater, as outlined in UAC 317-6-3. Groundwater quality data collected by the Mill show the shallow aquifer at the Mill has a highly variable TDS content, with TDS averages ranging from about 1100 to over 7900 mg/L. Another key element in determination of groundwater class is the presence of naturally occurring contaminants in concentrations that exceed their respective GWQS. In such cases, the Director has cause to downgrade aquifer classification from Class II to Class III (see UAC R317-6-3.6). Using all available TDS data and background data, for 24 of the POC and general monitoring wells the Director determined that 4 of those wells exhibit Class II drinking water quality groundwater. The remaining 20 wells exhibited Class III or limited use groundwater at the site. The Director determined that MW-35 will be classified as having Class II drinking water quality groundwater until sufficient background data have been collected and the applicable Background Report is submitted. Wells MW-36 and MW-37 have not been classified at this time.

2.8.1 Existing Wells at the Time of Original Permit Issuance

The Director required Denison to evaluate groundwater quality data from the thirteen existing wells on site, and submit a Background Ground Water Quality Report for Director approval. One of the purposes of that report was to provide a critical evaluation of historic groundwater quality data from the facility, and determine representative background quality conditions and reliable GWCLs for the Permit.

DUSA prepared the Existing Well Background Report that evaluated all historic data for the thirteen existing wells for the purposes of establishing background groundwater quality at the site and developing groundwater compliance limits GWCLs under the GWDP. Prior to review and acceptance of the conclusions in the Existing Well Background Report, the GWCLs were set on an interim basis in the GWDP. The interim limits were established as fractions of the state GWQSs for drinking water, depending on the quality of water in each monitoring well at the site.

The January 20, 2010 GWDP established GWCLs that reflect background groundwater quality for the thirteen existing wells, based primarily on the analysis performed in the Existing Wellls Background Report. It should be noted, however, that, because the GWCLs have been set at the mean plus second standard deviation, or the equivalent, un-impacted groundwater would normally be expected to exceed the GWCLs approximately 2.5% of the time. Therefore, exceedances are expected in approximately 2.5% of all sample results, and do not necessarily represent impacts to groundwater from Mill operations.

2.8.2 New Wells Installed After the Date of Original Issuance of the Permit

Because the Permit called for installation of nine new monitoring wells around the tailings cells, background groundwater quality had to be determined for those monitoring points. To this end, the Permit required the Mill to collect at least eight quarters of groundwater quality data, and submit the New Well Background Report for Director approval to establish background groundwater quality for those wells.

DUSA prepared the New Well Background Report that evaluated all historic data for the nine new wells for the purposes of establishing background groundwater quality at the site and developing groundwater compliance limits GWCLs under the GWDP. Prior to review and acceptance of the conclusions in the New Well Background Report, the GWCLs were set on an interim basis in the GWDP. The interim limits were established as fractions of the state GWQSs for drinking water, depending on the quality of water in each monitoring well at the site.

The January 20, 2010 GWDP established GWCLs that reflect background groundwater quality for the nine new wells based primarily on the analysis performed in the New Well background Report. It should be noted, however, that, because the GWCLs have been set at the mean plus second standard deviation, or the equivalent, un-impacted groundwater would normally be expected to exceed the GWCLs approximately 2.5% of the time. Therefore, exceedances are expected in approximately 2.5% of all sample results, and do not necessarily represent impacts to groundwater from Mill operations.

2.9 Sampling and Analysis Monitoring Plan (R317-6-6.3.I)

The groundwater monitoring plan is set out in the Permit. All groundwater monitoring at the site is in the perched aquifer. The following sections summarize the key components of the Mill's sampling and analysis plan.

2.9.1 Ground Water Monitoring to Determine Ground Water Flow Direction and Gradient, Background Quality at the Site, and the Quality of Ground Water at the Compliance Monitoring Point

2.9.1.1 Groundwater Monitoring at the Mill Prior to Issuance of the Permit

At the time of renewal of the Mill license by NRC in March, 1997 and up until issuance of the Permit in March 2005, the Mill implemented a groundwater detection monitoring program to ensure compliance to 10 CFR Part 40, Appendix A, in accordance with the provisions of then Mill License condition 11.3A. The detection monitoring program was in accordance with the report entitled, *Points of Compliance, White Mesa Uranium Mill,* prepared by Titan Environmental Corporation, submitted by letter to the NRC dated October 5, 1994. Under that program, the Mill sampled monitoring wells MW-5, MW-11, MW-12, MW-14, MW-15 and MW-17, on a quarterly basis. Samples were analyzed for chloride, potassium, nickel and uranium, and the results of such sampling were included in the Mill's Semi-Annual Effluent Monitoring Reports that were filed with the NRC up until August 2004 and with the DRC subsequent thereto.

Between 1979 and 1997, the Mill monitored up to 20 constituents in up to 13 wells. That program was changed to the Points of Compliance Program in 1997 because NRC had concluded that:

- The Mill and tailings system had produced no impacts to the perched zone or deep aquifer; and

- The most dependable indicators of water quality and potential cell failure were considered to be chloride, nickel, potassium and natural uranium.

2.9.1.2 Issuance of the Permit

On March 8, 2005, the Director issued the Permit, which includes a groundwater monitoring program that superseded and replaced the groundwater monitoring requirements set out in Mill License Condition 11.3A. Condition 11.3A has since been removed from the Mill License. Groundwater monitoring under the Permit commenced in March 2005, the results of which are included in the Mill's Quarterly Groundwater Monitoring Reports that are filed with the Director.

On September 1, 2009, Denison filed a Groundwater Discharge Permit Renewal Application. This document is an amendment and update of the Renewal Application, which is being submitted at the request of the Director. The Permit remains in timely renewal status awaiting completion of review of the Renewal Application by the Director.

2.9.1.3 Current Ground Water Monitoring Program at the Mill Under the Permit

The current groundwater monitoring program at the Mill under the Permit, which is used to determine ground water flow direction and gradient, and quality of the ground water at the compliance monitoring points, consists of monitoring at 25 point of compliance monitoring wells: MW-1, MW-2, MW-3, MW-3A, MW-5, MW-11, MW-12, MW-14, MW-15, MW-17, MW-18, MW-19, MW-23, MW-24, MW-25, MW-26, MW-27, MW-28, MW-29, MW-30, MW-31, MW-32, MW-35, MW-36, and MW-37. The locations of these wells are indicated on Figure 4. Depth to water is measured quarterly in MW-34, but due to limited water is not sampled for POC compliance. MW-33 is completely dry and is not sampled for POC compliance.

Part I.E.1.(d) of the Permit requires that each point of compliance well must be sampled for the constituents listed in Table 2.9.1.3-1.

Further, Part I.E.1.(d)1) of the Permit, requires that, in addition to pH, the following field parameters must also be monitored:

- Depth to groundwater
- Temperature
- Specific conductance,

and that, in addition to chloride and sulfate, the following general organics must also be monitored:

- Carbonate, bicarbonate, sodium, potassium, magnesium, calcium, and total anions and cations.

Sample frequency depends on the speed of ground water flow in the vicinity of each well. Parts I.E.1 (b) and (c) provide that quarterly monitoring is required for all wells where local groundwater average linear velocity has been found by the Director to be equal to or greater than

10 feet/year, and semi-annual monitoring is required where the local groundwater average linear velocity has been found by the Director to be less than 10 feet/year.

Based on these criteria, quarterly monitoring is required at MW-11, MW-14, MW-25, MW-26 and MW-30, and MW-31, and semi-annual monitoring is required at MW-1, MW-2, MW-3, MW-3A, MW-5, MW-12, MW-15, MW-17, MW-18, MW-19, MW-23, MW-24, MW-27, MW-28, MW-29 and MW-32.

Wells MW-35, MW-36 and MW-37 are also currently being sampled quarterly, to collect eight consecutive quarters of background data, to enable the Director to establish groundwater compliance levels for those wells and to determine their frequency of sampling

Prior to the February 15 2011 revision of the GWDP, Denison collected quarterly groundwater samples from MW-20 and MW-22 for development of background values and potential GWCLs. Part I.E.1.c).3) in the currently approved July 2011 revision of the GWDP now requires that MW-20 and MW-22 be monitored on a semi-annual basis as "General Monitoring Wells," but not subject to GWCLs.

2.9.1.4 Groundwater Flow Direction and Gradient

Part I.E.3 of the Permit requires that, on a quarterly basis and at the same frequency as groundwater monitoring required by Part I.E.1 and described in Section 2.9.1.3 above, the Mill shall measure depth to groundwater in the following wells and/or piezometers:

i) The point of compliance wells identified in Table 2 of the Permit, as described in Section 2.9.1.3 above;
j) Piezometers: P-1, P-2, P-3, P-4 and P-5;
k) Existing monitoring wells: MW-20, MW-22, and MW-34;
l) Contaminant investigation wells: any well required by the Director as a part of a contaminant investigation or groundwater corrective action (at this time this includes all chloroform and nitrate investigation wells); and
m) Any other wells or piezometers required by the Director.

While it is not a requirement of the GWDP, Denison also measures depth to water in the DR piezometers which were installed during the Southwest Hydrogeologic Investigation. As a result of these measurements, the Mill prepares groundwater isocontour maps each quarter that show the groundwater flow direction and gradient. The isocontour map for the first quarter of 2012 is attached as Figure 5.

2.9.1.5 Background Quality at the Site

A significant amount of historic groundwater quality data had been collected by Denison and previous operators of the Mill for many wells at the facility. In some cases these data extend back more than 30 years to September 1979. A brief summary of some of the various studies that had been performed prior to the original issuance of the Permit is set out in Section 2.0 of the Regional Background Report.

However, at the time of original issuance of the Permit, the Director had not yet completed an evaluation of the historic data, particularly with regard to data quality, and quality assurance issues. Such an examination needed to include such things as justification of any zero concentration values reported, adequacy of minimum detection limits provided (particularly with respect to the corresponding GWQS), adequacy of laboratory and analytical methods used, consistency of laboratory units or reporting, internal consistency between specific and composite types of analysis (e.g., major ions and TDS), identification and justification of concentration outliers, and implications of concentration trends (both temporal and spatial).

As discussed in Section 2.11.2 below, the Director also noted several groundwater quality issues that needed to be resolved prior to a determination of background groundwater quality at the site. These were: 1) a number of constituents exceeded their respective GWQS (including nitrate in one well and manganese, selenium and uranium each in several wells); 2) long term trends in uranium in downgradient wells MW-14, MW-15 and MW-17; and 3) a spatial high of uranium in those three downgradient wells. See pages 5-8 of the 2004 Statement of Basis for a more detailed discussion of these points.

As a result of the foregoing, the Director required that the Background Reports be prepared to address and resolve these issues.

Further, because background groundwater quality at the Mill site had not yet been approved at the time of original Permit issuance, the Director was not able to determine if any contaminant is naturally occurring and therefore detectable or undetectable for purpose of selecting GWCLs in each well. Consequently, the Director initially assigned GWCLs as if they were "undetectable" (i.e., assuming that all natural background concentrations were less than a fraction of the respective GWQS).

As discussed in Section 1.3 above and 2.11.2 below, Denison submitted the Background Reports to the Director. Both the Existing Well Background Report and the New Well Background Report provided GWCLs for all of the constituents in the existing wells and new wells, respectively, based on a statistical intra-well approach. The Director has approved the Background Reports.

The January 20, 2010 GWDP established GWCLs that reflect background groundwater quality for the thirteen existing wells and the nine new wells based primarily on the analysis performed in the Background Reports. It should be noted, however, that, because the GWCLs have been set at the mean plus second standard deviation, or the equivalent, un-impacted groundwater would normally be expected to exceed the GWCLs approximately 2.5% of the time. Therefore, exceedances are expected in approximately 2.5% of all sample results, and do not necessarily represent impacts to groundwater from Mill operations.

2.9.1.6 Quality of Ground Water at the Compliance Monitoring Point

There are over 30 years of data for some constituents in some wells at the site, but not for all constituents in any wells. However, with the exception of tin, which was added as a monitoring constituent in 2007, all currently required monitoring constituents have been sampled in all wells that were in existence on the date of the original issuance of the Permit commencing with the first quarter of 2005. Further, all constituents in all new compliance monitoring wells have been sampled upon installation of those wells, commencing either in the second or third quarters of 2005.

All of the analytical results from this sampling are reported quarterly in Groundwater Monitoring Reports, which are filed with the Director pursuant to Part I.F.1 of the Permit.

2.9.2 Installation, Use and Maintenance of Monitoring Devices

Compliance monitoring at the Mill site is accomplished in three ways: the compliance well monitoring program; monitoring the leak detection system in Cells 4A and 4B; and various DMT monitoring requirements. Each of these are discussed below.

2.9.2.1 Compliance Well Monitoring

Compliance for tailings Cells 1, 2 and 3 and the remainder of the Mill site, other than Cells 4A and 4B, is accomplished by quarterly or semi-annual sampling of the network of compliance monitoring wells at the site. See Figure 4 for a map that shows the compliance monitoring well locations, and Section 2.9.1.3 for a description of the monitoring program.

2.9.2.2 Leak Detection System in Cell 4A

With the reconstruction of Cell 4A, BAT was required, as mandated in Part I.D.4 of the Permit and as stipulated by UAC R317-6-6.4(a). Because tailings Cells 1, 2 and 3 were constructed more than 25 years ago, and after review of the existing design and construction, the Director determined that DMT rather than BAT is required for Cells 1, 2 and 3 (see the discussion in Section 2.7.2 above).

BAT for Cell 4A included the construction of a modern leak detection system. See Section 2.7.3 above for a description of the key design elements of Cell 4A, including its leak detection system. With BAT for Cell 4A, there are new performance standards in the Permit that require daily leak detection system monitoring, weekly wastewater level monitoring, and slimes drain recovery head monitoring. The BAT monitoring results are required to be reported and summarized in the Routine DMT and BAT Performance Standard Monitoring Reports. See Section 2.15.3 below for a more detailed discussion of the BAT monitoring requirements for Cell 4A.

Because Cell 4A has a modern leak detection system that meets BAT standards and is monitored daily, the leak detection system in Cell 4A can be considered to be a point of compliance monitoring device.

2.9.2.3 Leak Detection System in Cell 4B

BAT was required for Cell 4B, as mandated in Part I.D.4 of the Permit and as stipulated by UAC R317-6-6.4(a).

See Section 2.7.4 above for a description of the key design elements of Cell 4B, including its leak detection system. Performance standards for Cell 4B in the Permit require daily leak detection system monitoring, weekly wastewater level monitoring, and slimes drain recovery head monitoring. The BAT monitoring results are required to be reported and summarized in the Routine DMT and BAT Performance Standard Monitoring Reports. See Section 2.15.4 below for a more detailed discussion of the BAT monitoring requirements for Cell 4B.

Because Cell 4B has a modern leak detection system that meets BAT standards and is monitored daily, the leak detection system in Cell 4B can be considered to be a point of compliance monitoring device.

2.9.2.4 Other DMT Monitoring Requirements

In addition to the foregoing, the additional DMT performance standard monitoring discussed in detail in Section 2.15 below is required to be performed under the Permit

2.9.3 Description of the Compliance Monitoring Area Defined by the Compliance Monitoring Points

The compliance monitoring area at the site is the area covered by the groundwater compliance monitoring wells. Figure 4 shows the most current locations of the compliance groundwater monitoring wells at the site.

At the time of original Permit issuance, the Director reviewed the then recent water table contour maps of the perched aquifer. Those maps identified a significant western component to groundwater flow at the Mill site, which the Director concluded appeared to be the result of wildlife pond seepage and groundwater mounding (see page 23 of the 2004 Statement of Basis). As a consequence, new groundwater monitoring wells were required, particularly along the western margin of the tailings cells, in addition to the monitoring wells already in existence at that time. The Director also concluded that new wells were also needed for DMT purposes and to provide discrete monitoring of each tailings cell. This resulted in the addition of the following compliance monitoring wells to the then existing monitoring well network: MW-23, MW-24, MW-25, MW-26 (which was then existing chloroform investigation well TW4-15), MW-27, MW-28, MW-29, MW-30, MW-31 MW-32 (which was then existing chloroform investigation well TW4-17), MW-35, MW-36, and MW-37. As previously stated MW-33, and MW-34 were installed but are not currently sampled due to limited water and saturated thickness. MW-20 and MW-22 are not POC wells but are general monitoring wells and are sampled semiannually for information purposes only.

Based on groundwater flow direction and velocity, the compliance monitoring network, with the foregoing additional new wells, was considered to be adequate for compliance monitoring in the perched aquifer at the site.

Further, as mentioned in Section 2.9.2.2 and 2.9.2.3 above, the leak detection systems in Cell 4A and 4B can also be considered to be compliance monitoring areas for these cells.

2.9.4 Monitoring of the Vadose Zone

Monitoring is not performed in the vadose zone at the site, and there are no current intentions to perform any future monitoring in the vadose zone at the site.

2.9.5 Measures to Prevent Ground Water Contamination After the Cessation of Operation, Including Post-Operational Monitoring

2.9.5.1 Measures to Prevent Ground Water Contamination After the Cessation of Operation

Please see Section 2.19 below for a detailed discussion of the measures to prevent ground water contamination after the cessation of operations.

2.9.5.2 Post-Operational Monitoring

Groundwater monitoring will continue during the post-operational phase through final closure until the Permit is terminated. Denison understands that the final closure will take place and the Permit will be terminated upon termination of the Mill License and transfer of the reclaimed tailings cells to the United States Department of Energy pursuant to U.S.C. 2113. See Section 2.19.1.1 below.

2.9.6 Monitoring Well Construction and Ground Water Sampling Which Conform Where Applicable to Specified Guidance

2.9.6.1 Monitoring Well Construction

a) New Wells

All new compliance monitoring wells installed after the original issuance of the Permit were installed in accordance with the requirements of Part I.E.4 of the Permit. Part I.E.4 requires that all new groundwater monitoring wells installed at the facility shall comply with the following design and construction criteria:

a) Located as close as practical to the contamination source, tailings cell, or other potential origin of groundwater pollution;
b) Screened and completed in the shallow aquifer;
c) Designed and constructed in compliance with UAC R317-6-6.3(I)(6), including the EPA RCRA Ground Water Monitoring Technical Enforcement Guidance Document, 1986, OSWER-9950.1 (the "EPA RCRA TEGD"); and
d) Aquifer tested to determine local hydraulic properties, including but not limited to hydraulic conductivity.

As-built reports for all new groundwater monitoring wells were submitted to the Director for his approval, in accordance with Part I.F.6 of the Permit. Part I.F.6 requires those reports to include the following information:

a) Geologic logs that detail all soil and rock lithologies and physical properties of all subsurface materials encountered during drilling. Said logs were prepared by a Professional Geologist licensed by the State of Utah or otherwise approved beforehand by the Director ;

b) A well completion diagram that details all physical attributes of the well construction, including:

   1) Total depth and diameters of boring;
   2) Depth, type, diameter, and physical properties of well casing and screen, including well screen slot size;
   3) Depth intervals, type and physical properties of annular filterpack and seal materials used;
   4) Design, type, diameter, and construction of protective surface casing; and
   5) Survey coordinates prepared by a State of Utah licensed engineer or land surveyor, including horizontal coordinates and elevation of water level measuring point, as measured to the nearest 0.01 foot; and

c) Aquifer permeability data, including field data, data analysis, and interpretation of slug test, aquifer pump test or other hydraulic analysis to determine local aquifer hydraulic conductivity in each well.

Between April and June 2005, Denison installed wells MW-23, MW-24, MW-25, MW-27, MW-28, MW-29, MW-30, and MW-31. On August 23, 2005, Denison submitted a *Perched Monitoring Well Installation and Testing at the White Mesa Uranium Mill April through June 2005* Report, prepared by Hydro Geo Chem, Inc., that documented how these wells had been installed in accordance with requirements of the Permit. A copy of that Report was previously submitted under separate cover.

Between August 30 and September 2, 2010, Denison installed wells MW-33, MW-34, and MW-35. On October 11, 2010, Denison submitted *Installation and Hydraulic Testing of Perched Monitoring Wells MW-33, MW-34, and MW-35 at the White Mesa Uranium Mill Near Blanding Utah, prepared by Hydro Geo Chem, Inc.* that documented how these wells had been installed in accordance with requirements of the Permit. A copy of that Report was previously submitted under separate cover. During the week of April 25, 2011, Denison installed wells MW-36, and MW-37. On June 28, 2011, Denison submitted *Installation and Hydraulic Testing of Perched Monitoring Wells MW-36, and MW-37 at the White Mesa Uranium Mill Near Blanding Utah, prepared by Hydro Geo Chem, Inc.* that documented how these wells had been installed in accordance with requirements of the Permit. A copy of that Report was previously submitted under separate cover.

b) Existing Wells

The Existing Wells, MW-1, MW-2, MW-5, MW-11, MW-12, MW-14, MW-15, MW-17, MW-18, MW-19, MW-26 and MW-32 as well as wells MW-16, MW-20 and MW-22, which are not compliance monitoring wells, and piezometers P-1, P-2, P-3, P-4 and P-5, were all constructed and installed prior to original issuance of the Permit. Some of those wells date back to 1979.

During several site visits and four split groundwater sampling events between May 1999 and the date of original issuance of the Permit, and a review of available as built information, DRC staff noted the need for remedial construction, maintenance, or repair at several of these wells, including:

(i) 16 of the existing monitoring wells failed to produce clear groundwater in conformance with the EPA RCRA TEGD, apparently due to incomplete well development. Consequently, the Permit required that MW-5, MW-11, MW-18, MW-19, MW-26, TW4-16, and MW-32 be developed to ensure that groundwater clarity conforms to the EPA RCRA TEGD to the extent reasonably achievable;

(ii) The Permit required the Mill to install protective steel surface casings to protect the exposed PVC well and piezometer casings for piezometers P-1, P-2, P-3, P-4, and P-5 and wells MW-26 and MW-32; and

(iii) Several problems were observed with the construction of MW-3, including:

A. A review of the MW-3 well as-built diagram showed that no geologic log was provided at the time of well installation. Consequently, the Director was not able to ascertain if the screened interval was adequately located across the base of the shallow aquifer;

B. MW-3 was constructed without any filter media or sand pack across the screened interval;

C. An excessively long casing sump (a 9 or 10 foot long non-perforated section of well casing), was constructed at the bottom of the well; and

D. The well screen appeared to be poorly positioned, based on the low productivity of the well, and there is no geologic log to verify proper positioning.

As a result, the Permit, required Denison to verify the depth to the upper contact of the Brushy Basin Member of the Morrison Formation in the immediate vicinity of well MW-3. The Permit also required that, in the event that the Director determined the well screen has been inadequately constructed, the Mill shall retrofit, reconstruct, or replace monitoring well MW-3.

The Mill developed the wells as required and installed the protective casings required. The Director concluded that Denison had fulfilled the requirements and sent Denison a Closeout Letter on August 5, 2008.

With respect to the concerns raised about MW-3, the Mill installed MW-3A approximately 10 feet southeast of MW-3, in order to verify the depth to the upper contact of the Brushy Basin Member of the Morrison Formation (the "UCBM"). After installation, the Director reviewed the geologic log for MW-3 and the as-built reports for both MW-3 and MW-3A and concluded that the well screen for MW-3A is 2.5 feet below the UCBM and the well screen for MW-3 is 4.5 feet above the UCBM. Therefore MW-3 is a partially penetrating well; whereas MW-3A is fully penetrating. The Director concluded that semiannual sampling must continue in both wells until sufficient data is available and the DRC can make a conclusion regarding the effects of partial well penetration and screen length. As a result, the GWDP was modified to require that MW-3A be completed with a permanent surface well completion according to EPA RCRA TEGD. Both MW-3 and MW-3A are currently sampled semiannually.

Denison completed MW-3A as required, and on August 5, 2008 the DRC sent Denison a Closeout Letter.

Subsequent to original Permit issuance, on January 6, 2006, DRC staff performed an inspection of the compliance groundwater monitoring wells at the Mill. During the inspection, well MW-5 was found to have a broken PVC surface casing. The repair of MW-5 was added to the Permit compliance schedule to require the Mill to repair the broken PVC casing to meet the requirements of the Permit.

The Permit required Denison to submit an As-Built report for the repairs of monitoring well MW-5 on or before May 1, 2008. Denison submitted the required report, and on August 5, 2008 the DRC sent Denison a Closeout Letter.

The groundwater monitoring program at the Mill has historically had numerous wells with elevated turbidity, turbidity levels which could not stabilize to within 10% Relative Percent Difference (10% RPD) or both. Identification of equipment problems and improvements to field sampling practices did not result in improvements to measured turbidities. Ongoing turbidity issues were the result of monitoring requirements which were most likely ill-suited to the site geology. It is suspected that many wells at the Mill might not be capable of attaining a turbidity of 5 NTU due to the natural conditions in the formation hosting the perched monitoring wells (the Burro Canyon Formation and Dakota Sandstone). Clay interbeds occur in both the Burro Canyon Formation and Dakota Sandstone, and friable materials occur within the Burro Canyon Formation. Saturated clays and friable materials will likely continue to be mobilized using standard purging techniques currently in use for the sampling program at the Mill. Mobilized kaolinite (a cementing material within the formation) is expected to be an additional continuing source of turbidity in perched wells. Denison discussed the turbidity issues with DRC, and, despite the fact that the available evidence demonstrated that turbidity issues are caused by the formation, Denison agreed to complete a redevelopment program for the appropriate wells at the Mill in a "good-faith" effort. Surging, bailing, and overpumping were determined to be the preferred well development techniques. The rationale for using surging and bailing followed by overpumping is consistent with U.S. Environmental Protection Agency (EPA) guidance and guidance provided in other technical papers and publications.

Select, nonpumping, chloroform, nitrate and groundwater POC, wells were redeveloped during the period from fall 2010 to spring 2011 by surging and bailing followed by overpumping.

The results of the redevelopment are provided in the Report entitled:*Redevelopment of Existing Perched Monitoring Wells White Mesa Uranium Mill, Near Blanding Utah, prepared by Hydro Geo Chem, Inc. September 30, 2011* (the "Redevelopment Report"). The Redevelopment Report provides a qualitative description of turbidity behavior before and after redevelopment and provides a number of conclusions and recommendations. A copy of the Redevelopment Report was previously submitted under separate cover. The Redevelopment Report is currently under review by the Director.

As described above, all existing wells have been reviewed by the Director, and repairs, modifications, retrofits, etc. have been made as required to conform those wells to the requirements of Part I.E.4 of the Permit, to the extent reasonably practicable.

2.9.6.2 Ground Water Sampling

Ground water sampling is performed in accordance with the requirements of Part I.E.5 of the Permit, which requires that all monitoring shall be conducted in conformance with the following procedures:

a) Grab samples shall be taken of the groundwater, only after adequate removal or purging of standing water within the well casing has been performed;
b) All sampling shall be conducted to ensure collection of representative samples, and reliability and validity of groundwater monitoring data. All groundwater sampling shall be conducted in accordance with the currently approved Groundwater Monitoring Quality Assurance Plan;
c) All analyses shall be performed by a laboratory certified by the State of Utah to perform the tests required;
d) If any monitor well is damaged or is otherwise rendered inadequate for its intended purpose, Denison shall notify the Director in writing within five days of the discovery; and
e) Immediately prior to each monitoring event, Denison shall calibrate all field monitoring equipment in accordance with the respective manufacturer's procedures and guidelines. Denison shall make and preserve on-site written records of such equipment calibration in accordance with Part II.G and H of the Permit. Said records shall identify the manufacturer's and model number of each piece of field equipment used and calibration.

In accordance with the requirements of Part I.E.1(a) of the Permit, all groundwater sampling at the Mill is performed in accordance with the *White Mesa Uranium Mill Ground Water Monitoring Quality Assurance Plan (QAP)* (the "QAP"), which has been approved by the Director. The QAP complies with UAC R317-6-6.3(I) and (L) and by reference incorporates the relevant requirements of the *Handbook of Suggested Practices for Design and Installation of Ground-Water Monitoring Wells* (EPA/600/4-89/034, March 1991), *ASTM Standards on Ground Water and Vadose Investigations* (1996), *Practical Guide for Ground Water Sampling* EPA/600/2-85/104, (November 1985) and *RCRA Ground Water Monitoring Technical Enforcement Guidance Document* (1986), unless otherwise specified or approved by the Director, by virtue of his approving the QAP. A copy of the current version of the QAP, Date: 6-06-12 Revision 7.2, is included as Appendix H.

2.9.7 Description and Justification of Parameters to be Monitored

The groundwater parameters to be monitored are described in Table 2.9.1.3-1. The process of selecting the groundwater quality monitoring parameters for the original Permit included examination of several technical factors. Each of these is discussed in detail in Section 4 on pages 9-19 of the 2004 Statement of Basis, and include the following:

a) The number and types of contaminants that might occur in feedstock materials processed at the Mill;
b) Mill process reagents as a source of contaminants;
c) Source term abundance in the Mill's tailings cell solutions, based on limited historic wastewater quality sampling and analysis that had been done at the Mill's tailings cells; and
d) A consideration of contaminant mobility in a groundwater environment, based on site specific K_d information where available and lowest K_d values in the literature where site specific K_d information is not available.

Please see Section 4, pages 9-19, of the 2004 Statement of Basis for a more detailed discussion of the description and justification of parameters to be monitored.

One additional parameter, tin, was added to the list of groundwater monitoring constituents in 2007. Tin was not originally a required groundwater monitoring parameter in the Permit, and was omitted from the original Permit due to non-detectable concentrations reported by Denison in three tailings leachate samples (2004 Statement of Basis, Table 5). With the addition of the alternate feed material from Fansteel Inc., tin was expected to experience an estimated increase in the tailings inventory from 9 to 248 tons. The Director concluded that, with an estimated K_d of 2.5 to 5, tin is not as mobile in the groundwater environment as other metals; however, with the high acid conditions in the tailings wastewater, tin could stay in solution and not partition on aquifer materials. As a result, tin was added as a monitoring constituent to Table 2 of the Permit.

2.9.8 Quality Assurance and Control Provisions for Monitoring Data

Part I.E.1(d) of the Permit sets out some special conditions for groundwater monitoring. Under those conditions, the Mill must ensure that all groundwater monitoring conducted and reported complies with the following:

a) Depth to groundwater measurements shall always be made to the nearest 0.01 foot;
b) All groundwater quality analyses reported shall have a minimum detection limit or reporting limit that is less than its respective GWCL concentration defined in Table 2 of the Permit; and
c) all gross alpha analysis reported with an activity equal to or greater than the GWCL shall have a counting variance that is equal to or less than 20% of the reported activity concentration. An error term may be greater than 20% of the reported activity concentration when the sum of the activity concentration and error term is less than or equal to the GWCL.

As mentioned in Section 2.9.6.2 above, Part I.E.1(a) of the Permit requires that all groundwater sampling shall be conducted in accordance with the currently approved QAP. The detailed quality assurance and control provisions for monitoring data are set out in the QAP, a copy of which is attached as Appendix H to this Application.

2.10 Plans and Specifications Relating to Construction, Modification, and Operation of Discharge Systems (R317-6-6.3.J)

As discussed in Section 2.7.1 above, the Mill has been designed as a facility that does not discharge to groundwater or surface water. All tailings and other wastes associated with Mill operations are designed to be permanently disposed of in the Mill's tailings cells. The Mill's tailings cells can therefore be considered the Mill's discharge system in that they permanently dispose of discharges from the Mill's process circuits and all other Mill tailings and wastes.

The following plans and specifications and as built reports relating to tailings Cells 1, 2, 3, 4A and 4B are referenced in this Application and were previously submitted on the dates noted below under separate cover:

a. *Engineers Report: Tailings Management System, White Mesa Uranium Project Blanding, Utah*, June 1979, prepared by D'Appolonia Consulting Engineers, Inc.;
b. *Engineer's Report: Second Phase Design – Cell 3 Tailings Management System, White Mesa Uranium Project Blanding, Utah*, May 1981, prepared by D'Appolonia Consulting Engineers, Inc.;
c. *Construction Report: Initial Phase – Tailings Management System, White Mesa Uranium Project Blanding, Utah*, February 1982, prepared by D'Appolonia Consulting Engineers, Inc.;
d. *Construction Report: Second Phase Tailings Management System, White Mesa Uranium Project*, March 1983, prepared by Energy Fuels Nuclear, Inc.;
e. *Cell 4 Design, White Mesa Project Blanding, Utah*, April 10, 1989, prepared by Umetco Minerals Corporation;
f. *Construction Report: Tailings Cell 4A, White Mesa Uranium Mill – Tailings Management System*, August 2000, prepared by Denison (then named International Uranium (USA) Corporation);
g. *Cell 4A Lining System Design Report For The White Mesa Mill Blanding, Utah*, January 2006, prepared by GeoSyntec Consultants; and
h. *Cell 4A Construction Quality Assurance Report, White Mesa Mill Blanding, Utah*, July 2008 prepared by Geosyntec consultants (disk only).
i. *Cell 4B Design Report, White Mesa Mill, Blanding, Utah*, December 8, 2007, prepared by Geosyntec Consultants
j. *Cell 4B Construction Quality Assurance Report, Volumes 1-3*, November 2010, prepared by Geosyntec Consultants

2.11 Description of the Ground Water Most Likely to be Affected by the Discharge (R317-6-6.3.K)

2.11.1 General

The ground water most likely to be affected by a potential discharge from Mill activities is the perched aquifer.

The deep confined aquifer under White Mesa is found in the Entrada and underlying Navajo Sandstones, is hydraulically isolated from the perched aquifer, and is therefore extremely unlikely to be affected by any such potential discharges. The top of the Entrada Sandstone at the site is found at a depth of approximately 1,200 feet below land surface (see the discussion in Sections 2.5.1.1 and 2.5.1.2 above). This deep aquifer is hydraulically isolated from the shallow perched aquifer by at last two shale members of the Morrison Formation, including the Brushy

Basin (approximately 295 feet thick) and the Recapture (approximately 120 feet thick) Members. Other formations are also found between the perched and deep confined aquifers, that also include many layers of thin shale interbeds that contribute to hydraulic isolation of these two groundwater systems, including: the Morrison Formation Westwater canyon (approximately 60 feet thick), and Salt Wash (approximately 105 feet thick) Members, and the Summerville Formation (approximately 100 feet thick). Artesion groundwater conditions found in the deep Entrada/Navajo Sandstone aquifer also reinforce this concept of hydraulic isolation from the shallow perched system. See the discussion on page 2 of the 2004 Statement of Basis.

2.11.2 Background Ground Water Quality in the Perched Aquifer

This Section describes the groundwater quality in the perched aquifer. See Sections 2.5.1.3, 2.5.1.4 and 2.5.1.5 above for a more detailed description of the perched aquifer itself, the depth to ground water, the saturated thickness, flow direction, porosity, hydraulic conductivity and flow system characteristics of the perched aquifer.

As mentioned in Section 2.9.1.5 above, a significant amount of historic groundwater quality data had been collected by Denison and previous operators of the Mill for many wells at the facility. However, at the time of original issuance of the Permit, the Director had not yet completed an evaluation of the historic data, particularly with regard to data quality, and quality assurance issues. The Director also noted several groundwater quality issues that needed to be resolved prior to a determination of background groundwater quality at the site, such as a number of constituents that exceeded their respective GWQS and long term trends in uranium in downgradient wells MW-14, MW-15 and MW-17, and a spatial high of uranium in those three downgradient wells.

As a result of the foregoing, the Director required that the Existing Well Background Report be prepared to address and resolve these issues. DUSA prepared the Existing Well Background Report that evaluated all historic data for the thirteen existing wells for the purposes of establishing background groundwater quality at the site and developing groundwater compliance limits GWCLs under the GWDP. Prior to review and acceptance of the conclusions in the Existing Well Background Report, the GWCLs were set on an interim basis in the GWDP. The interim limits were established as fractions of the state GWQSs for drinking water, depending on the quality of water in each monitoring well at the site.

The January 20, 2010 GWDP established GWCLs that reflect background groundwater quality for the thirteen existing wells based primarily on the analysis performed in the Existing Well background Report. It should be noted, however, that, because the GWCLs have been set at the mean plus second standard deviation, or the equivalent, un-impacted groundwater would normally be expected to exceed the GWCLs approximately 2.5% of the time. Therefore, exceedances are expected in approximately 2.5% of all sample results, and do not necessarily represent impacts to groundwater from Mill operations.

As required by the Permit, the Existing Well Background Report addressed all available historic data, which includes pre-operational and operational data, for the compliance monitoring wells under the Permit that were in existence at the date of issuance of the Permit. The Regional Background Report focuses on all pre-operational site data and all available regional data to develop the best available set of background data that could not conceivably have been influenced by Mill operations. The New Well Background Report, which was required by the Permit, analyzed the data collected from the new wells, which were installed in 2005, to determine background concentrations for constituents listed in the Permit for each new well.

The purpose of the Existing Well Background Report and the New Well Background Report was to satisfy several objectives: first, in the case of the Existing Well Background Report, to perform a quality assurance evaluation and data validation of the existing and historical on-site groundwater quality data in accordance with the requirements of the Permit, and to develop a database consisting of historical groundwater monitoring data for "existing" wells and constituents.

Second, in the case of the New Well Background Report, to compile a database consisting of monitoring results for new wells, which were collected subsequent to issuance of the Permit, in accordance with the Mill's QAP data quality objectives.

Third, to perform a statistical, temporal and spatial evaluation of the existing well and new well data bases to determine if there have been any impacts to groundwater from Mill activities. Since the Mill is an existing facility that has been in operation since 1980, such an analysis of historic groundwater monitoring data was required in order to ensure that the monitoring results to be used to determine background groundwater quality at the site and GWCLs have not been impacted by Mill activities.

Finally, since the analysis demonstrates that groundwater has not been impacted by Mill activities, to develop a GWCL for each constituent in each well.

The Regional Background Report was prepared as a supplement to the Existing Well Background Report to provide further support to the conclusion that Mill activities have not impacted groundwater.

In evaluating the historic data for the existing wells, INTERA used the following approach:

- If historic data for a constituent in a well do not demonstrate a statistically significant upward trend, then the proposed GWCL for that constituent is accepted as representative of background, regardless of whether or not the proposed GWCL exceeds the GWQS for that constituent. This is because the monitoring results for the constituent can be considered to have been consistently representative since commencement of Mill activities or installation of the well; and
- If historic data for a constituent in a monitoring well represent a statistically significant upward trend or downward trend in the case of pH, then the data is further evaluated to determine whether the trend is the result of natural causes or Mill activities. If it is concluded that the trend results from natural causes, then the GWCL proposed in the Existing Well Background Report will be appropriate.

After applying the foregoing approach, INTERA concluded that, other than some detected chloroform and related organic contamination at the Mill site, which is the subject of a separate investigation and remedial action, and that is the result of pre-Mill activities, and some elevated nitrate concentrations in certain wells which were considered to be associated with the chloroform plume, there have been no impacts to groundwater from Mill activities (See Section 2.16.1 below relating to the chloroform contamination and Section 2.16.2 relating to the nitrate contamination).

In reaching this conclusion, INTERA noted that, even though there are a number of increasing trends in various constituents at the site, none of the trends are caused by Mill activities, for the following reasons:

- Chloride is unquestionably the best indicator parameter, and there are no significant trends in chloride in any of the wells;
- There are no noteworthy correlations between chloride and uranium in wells with increasing trends in uranium, other than in upgradient wells MW-19 and MW-18, which INTERA concluded are not related to any potential tailings seepage. INTERA noted that it is inconceivable to have an increasing trend in any other parameter caused by seepage from the Mill tailings without a corresponding increase in chloride;
- There are significant increasing trends upgradient in MW-1, MW-18 or MW-19 in uranium, sulfate, TDS iron, selenium, thallium, ammonia and fluoride and far downgradient in MW-3 in uranium and selenium, sulfate, TDS and pH (decreasing trend). INTERA concluded that this provides very strong evidence that natural forces at the site are causing increasing trends in these constituents (decreasing in pH) in other wells and supports the conclusion that natural forces are also causing increasing trends in other constituents as well; and
- On a review of the spatial distribution of constituents, it is quite apparent that the constituents of concern are dispersed across the site and not located in any systematic manner that would suggest a tailings plume.

INTERA concluded that, after extensive analysis of the data, and given the conclusion that there have been no impacts to groundwater from Mill activities, the GWCLs set out in Table 16 of the Existing Well Background Report are appropriate, and are indicative of background ground water quality. INTERA did advise, however, that proposed GWCLs for all the trending constituents should be re-evaluated upon Permit renewal to determine if they are still appropriate at the time of renewal. See Table 16 of the Existing Well Background Report for INTERA's calculation of background ground water quality as represented by the proposed GWCLs. See Section 6.0 of the Existing Well Background Report for a discussion of the statistical manner used to calculate each proposed GWCL.

In evaluating the new well data, INTERA used the same approach in the New Well Background Report that was used in the Existing Well Background Report for existing well data. In addition, INTERA compared the groundwater monitoring results for the new wells to the results for the existing wells analyzed in the Existing Well Background Report and to the pre-operational and regional results analyzed in the Regional Background Report. This was particularly important for the new wells because there is no historic data for any constituents in those wells that goes back to commencement of Mill operations. A long-term trend in a constituent may not be evident from the available data for the new wells. By comparing the means for the constituents in the new wells to the results for the existing wells and regional background data, INTERA was able to determine if the concentrations of any constituents in the new wells are consistent with background at the site.

INTERA concluded that after applying the foregoing approach, there have been no impacts to groundwater in the new monitoring wells from Mill activities. INTERA concluded that the groundwater monitoring results for the new wells are consistent with the results for the existing wells analyzed in the Existing Well Background Report and for the pre-operational and regional wells, seeps and springs analyzed in the Regional Background Report. INTERA noted that there were some detections of chloroform and related organic contamination and degradation products and nitrate and nitrite in the new wells, which are now the subject of two separate investigations (see Sections 2.16.1 and 2.16.2), but that such contamination was the result of pre-Mill activities.

As a result, given its conclusion that there have been no impacts to groundwater from Mill activities, INTERA concluded that the calculated GWCLs for new wells set out in Table 10 of the New Well Background Report are appropriate, and are indicative of background ground water quality. Again, INTERA noted that GWCLs for trending constituents should be re-evaluated upon Permit renewal to determine if they are still appropriate at the time of renewal. See Table 10 of the New Well Background Report for INTERA's calculation of background ground water quality as represented by the proposed GWCLs. See Section 2.2 of the New Well Background Report for a discussion of the statistical manner used to calculate each proposed GWCL.

As a result of the foregoing, the Director required that the New Well Background Report be prepared to address and resolve these issues. DUSA prepared the New Well Background Report that evaluated all historic data for the nine new wells for the purposes of establishing background groundwater quality at the site and developing GWCLs under the GWDP. Prior to review and acceptance of the conclusions in the New Well Background Report, the GWCLs were set on an interim basis in the GWDP. The interim limits were established as fractions of the state GWQSs for drinking water, depending on the quality of water in each monitoring well at the site.

The University of Utah Study confirmed INTERA's conclusions in the Background Reports that groundwater at the site has not been impacted by Mill operations (see the discussion in Section 1.3 above).

The January 20, 2010 GWDP established GWCLs that reflect background groundwater quality for the nine new wells based primarily on the analysis performed during the New Well Background Report. It should be noted, however, that, because the GWCLs have been set at the mean plus second standard deviation, or the equivalent, un-impacted groundwater would normally be expected to exceed the GWCLs approximately 2.5% of the time. Therefore, exceedances are expected in approximately 2.5% of all sample results, and do not necessarily represent impacts to groundwater from Mill operations.

Part I.G.2 of the Permit provides that out-of-compliance status exists when the concentration of a pollutant in two consecutive samples from a compliance monitoring point exceeds a GWCL in Table 2 of the Permit. Per the requirements of Part I.G.4(c) of the Permit, Denison is required to prepare and submit written plans and time schedules, for Director approval, to fully comply with the requirements of Part I.G.4(c) of the Permit relating to any such out-of-compliance situation, including, but not limited to:

(i) submittal of a written assessment of the source(s);

(ii) submittal of a written evaluation of the extent and potential dispersion of said groundwater contamination; and

(iii) submittal of a written evaluation of any and all potential remedial actions to restore and maintain ground water quality at the facility, for the point of compliance wells and contaminants in question, to ensure that: 1) shallow groundwater quality at the facility will be restored and 2) the contaminant concentrations in said point of compliance wells will be returned to and maintained in compliance with their respective GWCLs.

Two plans and time schedules have been submitted to address consecutive exceedances which have been noted in wells since the establishment of the GWCLs in the January 20, 2010 GWDP. The Plans and time schedules are the Initial Plan and Schedule and the Q2 2011 Plan and Schedule to address analytes other than pH in out-of-compliance status. Those plans were submitted June 13, and September 7, 2011, respectively. Those plans will be implemented concurrent with the pH investigation described below and described in the pH plan and Time schedule submitted to the Director on April 13, 2012. The plans were previously submitted under separate cover.

On July 12, 2012, Denison and the Director entered into a Stipulated Consent Agreement relating to the implementation of these plans and schedules.

Given the varied background groundwater quality at the site, previously identified rising trends in some wells and other factors, it cannot be assumed that consecutive exceedances of a constituent in a monitoring well means that contamination has been introduced to groundwater in that well. The exceedances may very well be the result of background influences. The approach in these Plans therefore is to first determine if the recent exceedances are the result of background influences. If they are determined to be the result of background influences, then no remedial actions are required. If, however, they are determined to not be the result of natural background influences, then further analyses will be required.

Based on the information available at this time, Denison believes that the exceedances observed are the result of natural influences and reflect the need to adjust some of the GWCLs for the site.

During the completion of the 4th Quarter 2010 Quarterly Groundwater Monitoring Report, Denison noted eleven perched groundwater monitoring wells with pH measurements below the GWCLs. These wells are located upgradient, cross-gradient, and downgradient of the Mill and tailings cells. Investigation into the eleven pH GWCLs in question indicated that the GWCLs for groundwater pH in all wells established in the January 20, 2010 GWDP were erroneously based on historic laboratory results instead of field measurements as contemplated by Table 2 of the GWDP. Denison notified DRC that the existing GWCLs for groundwater pH were incorrectly based on laboratory results rather than field measurements and proposed to submit revised descriptive statistics for field pH to be used as revised pH GWCLs by the end of the second quarter 2011.

Denison received approval from DRC to proceed with the revision of the pH GWCLs based on field measurements. The data processing and statistical assessments necessary to revise the GWCLs based on historic field pH data were completed. The data processing and statistical assessments completed were based on the DRC-approved methods in the logic flow diagram included as Figure 17 of the New Well Background Report. Following the statistical evaluation of pH data, Denison compared the Mill's groundwater pH data from the 2nd Quarter of 2011, including accelerated sampling results through June 2011, and noted that all of the June 2011 groundwater results, and many of the other results from the 2nd Quarter, were already outside the revised GWCLs to be proposed based on the logic flow diagram.

It was noted that the historical trend of decreasing pH, which was addressed in the Background Study Reports, appeared to be present in nearly all wells throughout the Mill site area, including upgradient, downgradient, and cross-gradient wells in the groundwater monitoring program. As of June 2011, all groundwater monitoring wells demonstrated a downward trend in the field pH data over time.

Denison notified DRC that the 2nd Quarter 2011 data exceeded the recalculated GWCLs. Denison advised DRC that, as a result of these findings, Denison did not believe it was appropriate to continue with its efforts to reset the GWCLs for pH based on field pH data, as originally planned, but instead it appeared that it would be more appropriate to undertake a study to determine whether the decreasing trends in pH are due to natural influences and, if so, to determine a more appropriate way to determine GWCLs.

Denison and DRC have agreed on further investigations to be completed, as well as the steps and milestone dates to be incorporated into a pH Plan. The investigation into the decreasing site-wide pH trends is documented in the *Plan to Investigate pH Exceedances in Perched Groundwater Monitoring Wells White Mesa Uranium Mill Blanding, Utah, Prepared by Hydro Geo Chem, Inc,* April 13, 2012 (the "pH Plan"). The pH Plan describes the pH investigation to pursuant to the July 12, 2012a Stipulated Consent Agreement referred to above. The pH Plan was previously submitted under separate cover.

The primary conclusion from the activities conducted to date is that the historical trend of decreasing pH, which was addressed in the Background Reports, appears to be present in nearly all wells throughout the Mill site area, including upgradient, downgradient, and crossgradient wells in the groundwater monitoring program, and there seems to be no abatement of the trend. The wide-spread nature of the decrease in pH in upgradient, downgradient and crossgradient wells, suggests that the pH decrease results from a natural phenomenon unrelated to Mill operations.

In an effort to determine if these trends may have resulted in whole or in part, from increasing water levels attributed to the Wildlife ponds at the Mill, Denison has committed to stop recharging the two most northern of these ponds, commencing in March 2012.

2.11.3 Quality of Ground Water at the Compliance Monitoring Point

All of the analytical results from groundwater sampling are reported quarterly in Groundwater Monitoring Reports, which are filed with the Director pursuant to Part I.F.1 of the Permit.

2.12 Compliance Sampling Plan (R317-6-6.3.L)

The Mill's plan for sampling groundwater compliance monitoring points is discussed in detail in Section 2.9.1.3 above, and the plan for sampling the leak detection systems in Cells 4A and 4B is discussed in Section 2.15.3 below. This Section 2.12 will address other sampling required under the Permit. As the Mill is designed not to discharge to ground water, there are no flow monitoring requirements in the Permit.

2.12.1 Tailings Cell Wastewater Quality Sampling Plan

Part I.E.10 of the Permit requires that, on an annual basis, Denison must collect wastewater quality samples from each wastewater source at each tailings cell at the facility, including surface impounded wastewaters, and slimes drain wastewaters. All such sampling must be conducted in August of each calendar year in compliance with an approved plan. The Tailings SAP (dated November 21, 2008) was approved by the Director on March 3, 2009. A copy of the approved *Tailings and Slimes Drain Sampling Program*, Revision 0, November 20, 2008 is attached as Appendix H to this Application. As of this writing, Denison has submitted Revision 2.1, which is undergoing review by the Director.

The purpose of the Tailings SAP is to characterize the source term quality of all tailings cell wastewaters, including impounded wastewaters or process waters in the tailings cells, and wastewater or leachates collected by internal slimes drains. The Revision 0,Tailings SAP requires:

- Collection of samples from the pond area of each active cell and the slimes drain of each cell that has commenced de-watering activities;
- Samples of tailings and slimes drain material will be analyzed at an offsite contract laboratory and subjected to the analytical parameters included in Table 2 of the Permit and general inorganics listed in Part I.E.1(d)(2)(ii) of the Permit, as well as semi-volatile organic compounds;
- A detailed description of all sampling methods and sample preservation techniques to be employed;
- The procedures utilized to conduct these analyses will be standard analytical methods utilized for groundwater sampling and as shown in Section 8.2 of the QAP;
- The contracted laboratory will be certified by the State of Utah in accordance with UAC R317-6-6.12A; and
- 30-day advance notice of each annual sampling event must be given, to allow the Director to collect split samples of all tailings cell wastewater sources.

The tailings and slimes drain sampling events will be subject to the currently approved QAP, unless otherwise specifically modified by the Tailings SAP to meet the specific needs of this type of sampling. The QAP has been approved by the Director and satisfies the most appropriate requirements of the following references, unless otherwise specified by the Director through his approval of the Tailings SAP:

- *Standard Methods for the Examination of Water and Wastewater, twentieth edition*, 1998; Library of Congress catalogue number: ISBN: 0-87553-235-7;
- *E.P.A. Methods for Chemical Analysis of Water and Wastes*, 1983; Stock Number EPA-600/4-79-020;
- *Techniques of Water Resource Investigations of the U.S. Geological Survey*, (1998); Book 9;
- Monitoring requirements in 40 CFR parts 141 and 142, 2000 ed., Primary Drinking Water Regulations and 40 CFR parts 264 and 270, 2000 ed.; and
- *National Handbook of Recommended Methods for Water-Data Acquisition*, GSA-GS edition; Book 85 AD-2777, U.S. Government Printing Office Stock Number 024-001-03489-1.

The currently approved Tailings SAP is attached to this Application. As previously stated, Denison has submitted Revision 2.1, which is undergoing review by the Director.

2.12.2 White Mesa Seeps and Springs Sampling Plan

The initial Permit required Denison to submit a plan for groundwater sampling and analysis of all seeps and springs ("SSSP") found downgradient or lateral gradient from the tailings cells for Director review and approval. The Director approved the plan on on March 17, 2009. A copy of the *Sampling Plan for Seeps and Springs in the Vicinity of the White Mesa Uranium Mill*, Revision: 0, March 17, 2009, is attached as Appendix B to this Application. As of this writing, Denison has submitted Revision 1.0, which is undergoing review by the Director.

Under the SSSP, seeps and springs sampling will be conducted on an annual basis between May 1 and July 15 of each year, to the extent sufficient water is available for sampling, at six identified seeps and springs near the Mill. The sampling locations were selected to correspond with those seeps and springs sampled for the initial Mill site characterization performed in the 1978 ER, plus additional sites located by Denison, the United States Bureau of Land Management and Ute Mountain Ute Indian Tribe representatives.

Samples will be analyzed for all ground water monitoring parameters found in Table 2 of the Permit. The laboratory procedures utilized to conduct the analyses of parameters listed in Table 2 will be those utilized for groundwater sampling and as shown in Section 8.2 of the QAP. In addition to these laboratory parameters, the pH, temperature and conductivity of each sample will be measured and recorded in the field. Laboratories selected by Denison to perform analyses of seeps and springs samples will be required to be certified by the State of Utah in accordance with UAC R317-6-6.12.A.

The seeps and springs sampling events will be subject to the currently approved QAP, unless otherwise specifically modified by the SSSP to meet the specific needs of this type of sampling. The QAP has been approved by the Director and satisfies the most appropriate requirements of the references listed in Section 2.12.1 above, unless otherwise specified by the Director through his approval of the SSSP.

Please, see the attached copy of the SSSP for further details.

2.12.3 Monitoring of Deep Wells

Due to the fact that the deep confined aquifer at the site is hydraulically isolated from the shallow perched aquifer (see the discussion in Section 2.11.1 above) no monitoring of the deep aquifer is required under the Permit.

2.13 Description of the Flooding Potential of the Discharge Site (R317-6-6.3.M)

2.13.1 Surface Water Characteristics

As discussed above, the Mill site is located on White Mesa, a gently sloping (1% SSW) plateau that is physically defined by the adjacent drainages which have cut deeply into regional sandstone formations. There is a small drainage area of approximately 62 acres (25 ha) above the site that could yield surface runoff to the site. Runoff from the mesa is conveyed by the general surface topography to either Westwater Creek, Corral Creek, or to the south into an unnamed branch of Cottonwood Wash. Local porous soil conditions, topography and low average annual rainfall of 13.3 inches (reported as 11.8 by Dames and Moore in historic reports) cause these streams to be intermittently active, responding to spring snowmelt and local rainstorms (particularly thunderstorms). Surface runoff from approximately 624 acres of the Mill drains westward and is collected by Westwater Creek, and runoff from another 384 acres drains east into Corral Creek. The remaining 4,500 acres of the southern and southwestern portions of the site drain indirectly into Cottonwood Wash (1978 ER, p. 2-143). The site and vicinity drainages carry water only on an intermittent basis. The major drainages in the vicinity of the Mill are depicted in Figure 12 and tabulated in Table 2.13.1-1. Total runoff from the mesa (total yield per watershed area) is estimated to be less than 0.5 inch annually (1978 ER, p. 2-143).

There are no perennial surface waters on or in the vicinity of the Mill site. This is due to the gentle slope of the mesa on which the site is located, the low average annual rainfall of 13.3 (reported as 11.8 by Dames and Moore in historic reports) inches per year at Blanding, local soil characteristics and the porous nature of local stream channels. Prior to construction, three small ephemeral catch basins were present on the site to the northwest and northeast of the Mill site.

Corral Creek is an intermittent tributary to Recapture Creek. The drainage area of that portion of Corral Creek above and including drainage from the eastern portion of the site is about 5 square miles. Westwater Creek is also an intermittent tributary of Cottonwood Wash. The Westwater Creek drainage basin covers nearly 27 square miles at its confluence with Cottonwood Wash 1.5 miles west of the Mill site. Both Recapture Creek and Cottonwood Wash are similarly intermittently active, although they carry water more often and for longer periods of time due to their larger watershed areas. They both drain to the south and are tributaries of the San Juan River. The confluences of Recapture Creek and Cottonwood Wash with the San Juan River are approximately 18 miles south of the Mill site. The San Juan River, a major tributary for the upper Colorado River, has a drainage of 23,000 square miles measured at the USGS gauge to the west of Bluff, Utah (1978 ER, p. 2-130).

Storm runoff in these streams is characterized by a rapid rise in flow rates, followed by rapid recession primarily due to the small storage capacity of the surface soils in the area. For example, on August 1, 1968, a flow of 20,500 cubic feet per second was recorded in Cottonwood Wash near Blanding. The average flow for that day, however, was only 4,340 cfs. By August 4, the flow had returned to 16 cfs (1978 ER, p. 2-135). Monthly streamflow summaries as updated from Figure 2.4 of the FES are presented in Figure 13 for Cottonwood Wash, Recapture Creek and Spring Creek. Flow data are not available for the two smaller water courses closest to the Mill site, Corral Creek and Westwater Creek, because these streams carry water infrequently and only in response to local heavy rainfall and snowmelt, which occurs primarily in the months of April, August, and October. Flow typically ceases in Corral Creek and Westwater Creek within 6 to 48 hours after precipitation or snowmelt ends.

2.13.2 Flood Protection Measures

As mentioned above, the Mill was designed and constructed to prevent runon or runoff of storm water by a) diverting runoff from precipitation on the Mill site to the tailings cells; and b) diverting runoff from surrounding areas away from the Mill site via three drainage ditches that have been constructed north (upslope) of the Mill facility.

See the *UMETCO Minerals Corporation: White Mesa Mill Drainage Report for Submittal to NRC*, January 1990, a copy of which accompanies this Application, for a more detailed description of the flooding potential of the site, including the 6-hour probable maximum precipitation (which is more conservative than the 100-year flood plain), and applicable flood protection measures.

In addition to the foregoing designed control features, the facility has developed a *Stormwater Best Management Practices Control Plan* which includes a description of the site drainage features and the best management practices employed to ensure appropriate control and routing of stormwater. A copy of the Mill's *Stormwater Best Management Practices Plan* is included as Appendix F to this Application.

2.14 Contingency Plan (R317-6-6.3.N)

As required by Part I.H.15 of the Permit, the Mill currently has a *Contingency Plan* for regaining and maintaining compliance with the Permit limits and for re-establishing best available technology as defined in the Permit. A copy of the most current approved version of the Mill's *Contingency Plan* is included as Appendix J to this Application.

2.15 Methods and Procedures for Inspections of the Facility Operations and for Detecting Failure of the System (R317-6-6.3.O)

Part I.D. of the Permit sets out a number of DMT and BAT standards that must be followed. Part I.E. of the Permit sets out the Ground Water Compliance and Technology Performance Monitoring requirements, to ensure that the DMT and BAT standards are met. These provisions of the Permit, along with the DMT Plan, *Cell 4A BAT Monitoring Operations and Maintenance Plan* and other plans and programs developed pursuant to these Parts, set out the methods and procedures for inspections of the facility operations and for detecting failure of the system.

In addition to the programs discussed above, the following additional DMT and BAT performance standards and associated monitoring are required under Parts I.D and I.E. of the Permit

2.15.1 Existing Tailings Cell Operation

Part I.D.2 of the Permit provides that authorized operation and maximum disposal capacity in each of the existing tailings Cells, 1, 2 and 3 shall not exceed the levels authorized by the Mill License and that under no circumstances shall the freeboard be less than three feet, as measured from the top of the FML. Part I.E.7(a) of the Permit requires that the wastewater pool elevations in Cells 1 and 3 must be monitored weekly to ensure compliance with the maximum wastewater elevation criteria mandated by Condition 10.3 of the Mill License.

Part I.D.2 further provides that any modifications by Denison to any approved engineering design parameter at these existing tailings cells requires prior Director approval, modification of the Permit and issuance of a construction permit.

2.15.2 Existing Facility DMT Performance Standards

Part I.D.3 of the Permit requires Denison to operate and maintain certain Mill site facilities and the existing tailings disposal cells to minimize the potential for wastewater release to groundwater and the environment, including, but not limited to the following additional DMT measures:

2.15.2.1 DMT Monitoring Wells at Cells 1, 2 and 3

Parts I.D.3 (a) and (d) require that at all times Denison must operate and maintain Cells 1, 2 and 3 to prevent groundwater quality conditions in any nearby monitoring wells from exceeding the GWCLs in Table 2 of the Permit. This is monitored for detecting failure of the system through the ground water compliance monitoring program described in detail in Section 2.9.1.3 above.

2.15.2.2 Slimes Drain Monitoring

Part I.D.3(b)(1) of the Permit requires that Denison must at all times maintain the average wastewater head in the slimes drain access pipe to be as low as reasonably achievable (ALARA) in each tailings disposal cell, in accordance with the approved DMT Plan. Compliance will be achieved when the average annual wastewater recovery elevation in the slimes drain access pipe, determined pursuant to the currently approved DMT Plan meets the conditions in Equation 1 specified in Part I.D.3(b)(3) of the Permit.

Part I.E.7(b) of the Permit requires that Denison must monitor and record quarterly the depth to wastewater in the slimes drain access pipes as described in the currently approved DMT Plan at Cell 2, and upon commencement of de-watering activities, at Cell 3, in order to ensure compliance with Part I.D.3(b)(3) of the Permit.

2.15.2.3 Maximum Tailings Waste Solids Elevation

Part I.D.3(c) of the Permit requires that upon closure of any tailings cell, Denison must ensure that the maximum elevation of the tailings waste solids does not exceed the top of the FML liner.

2.15.2.4 Wastewater Elevation in Roberts Pond

Part I.D.3(e) of the Permit requires that Roberts Pond be operated so as to provide a minimum 2-foot freeboard at all times, and that under no circumstances will the water level in the pond exceed an elevation of 5,624 feet above mean sea level. Part I.D.3(e) also provides that in the event the wastewater elevation exceeds this maximum level, Denison must remove the excess wastewater and place it into containment in Cell 1 within 72 hours of discovery.

Part I.E.7(c) of the Permit requires that the wastewater level in Roberts Pond must be monitored and recorded weekly, in accordance with the currently approved DMT Plan, to determine compliance with the DMT operations standard in Part I.D.3(e) of the Permit;

2.15.2.5 Inspection of Feedstock Storage Area

Part I.D.3(f) of the Permit requires that open-air or bulk storage of all feedstock materials at the Mill facility awaiting Mill processing must be limited to the eastern portion of the Mill site (the "ore pad") described by the coordinates set out in that Part of the Permit, and that storage of feedstock materials at the facility outside of this defined area, must meet the requirements of Part I.D.11 of the Permit. Part I.D.11 requires that Denison must store and manage feedstock materials outside the defined ore storage pad in accordance with an approved Feedstock Management Plan. On June 20, 2008, Denison submitted a *White Mesa Mill Containerized Alternate Feedstock Material Storage Procedure* for Director review and approval. A copy of that procedure is included as Appendix K to this Application. The Director is currently reviewing that procedure.

Part I.E.7(d) of the Permit requires that Denison inspect the feedstock storage areas weekly to:

a) Confirm that the bulk feedstock materials are maintained within approved feedstock storage defined by Table 4; and
b) Verify that all alternate feedstock materials located outside the feedstock storage area defined in Table 4 are stored in accordance with the requirements found in Part I.D.11.

Part I.E.7(d) further provides that Denison must implement the Feedstock Material Storage Procedure immediately upon Director approval.

The Mill's Standard Operating Procedure under the Mill License for inspection of the Mill's ore pad is contained in Section 3.3 of the DMT Plan, a copy of which is attached as Appendix G to this Application.

2.15.2.6 Monitor and Maintain Inventory of Chemicals

Part I.D.3(g) of the Permit requires that for all chemical reagents stored at existing storage facilities and held for use in the milling process, Denison must provide secondary containment to capture and contain all volumes of reagent(s) that might be released at any individual storage area. Response to spills, cleanup thereof, and required reporting must comply with the provisions of an approved Emergency Response Plan as found in an approved Stormwater Best Management Practices Plan, stipulated by Parts I.D.10 and I.D.3(g)of the Permit. Part I.D.3(g) further provides that for any new construction of reagent storage facilities, such secondary containment and control must prevent any contact of the spilled or otherwise released reagent or product with the ground surface.

Part I.E.9 of the Permit requires that Denison must monitor and maintain a current inventory of all chemicals used at the facility at rates equal to or greater than 100 kg/yr. This inventory must be maintained on-site, and must include:

- (i) Identification of chemicals used in the milling process and the on-site laboratory; and
- (ii) Determination of volume and mass of each raw chemical currently held in storage at the facility.

A copy of the Mill's chemical Inventory is attached as Appendix L to this Application.

A copy of the Mill's *Stormwater Best Management Practices Plan*, Revision 1.4; October 2011 is attached as Appendix F to this Application.

2.15.3 BAT Performance Standards for Cell 4A

2.15.3.1 BAT Operations and Maintenance Plan

Part I.D.6 provides that Denison must operate and maintain Cell 4A so as to prevent release of wastewater to groundwater and the environment in accordance with a BAT Operations and Maintenance Plan, as approved by the Director, pursuant to Part I.H.19 of the Permit, and that at a minimum such plan must include the following performance standards:

- a) The fluid head in the leak detection system shall not exceed 1 foot above the lowest point in the lower membrane liner;
- b) The leak detection system maximum allowable daily leak rate shall not exceed 24,160 gallons/day;
- c) After Denison initiates pumping conditions in the slimes drain layer in Cell 4A, Denison will provide continuous declining fluid heads in the slimes drain layer, in a manner equivalent to the requirements found in Part I.D.3(b) for Cells 2 and 3; and
- d) Under no circumstances shall the freeboard be less than 3-feet in Cell 4A, as measured from the top of the FML.

The BAT Operations and Maintenance Plan required under Part I.H.19 was submitted on September 16, 2008 and approved by the Director on September 17, 2008. A copy of the most currently-approved *BAT Operations and Maintenance Plan* Revision 2.3 dated July 2011, is included as Appendix E to this Application.

2.15.3.2 Implementation of Monitoring Requirements Under the BAT Operations and Maintenance Plan

Part I.E.8 of the Permit provides that, after Director approval of the Tailings Cell 4A Operations and Maintenance Plan, required by Part I.H.19 of the Permit, Denison must immediately implement all monitoring and recordkeeping requirements contained in the plan. At a minimum, such BAT monitoring shall include:

a) Weekly Leak Detection System (LDS) Monitoring - including:

(i) Denison must provide continuous operation of the leak detection system pumping and monitoring equipment, including, but not limited to, the submersible pump, pump controller, head monitoring, and flow meter equipment approved by the Director. Failure of any pumping or monitoring equipment not repaired and made fully operational within 24-hours of discovery shall constitute failure of BAT and a violation of the Permit;

(ii) Denison must measure the fluid head above the lowest point on the secondary FML by the use of procedures and equipment approved by the Director. Under no circumstance shall fluid head in the leak detection system sump exceed a 1-foot level above the lowest point in the lower FML on the cell floor. For purposes of compliance monitoring this 1-foot distance shall equate to 2.28 feet above the leak detection system transducer;

(iii) Denison must measure the volume of all fluids pumped from the leak detection system. Under no circumstances shall the average daily leak detection system flow volume exceed 24,160 gallons/day; and

(iv) Denison must operate and maintain wastewater levels to provide a 3-foot Minimum of vertical freeboard in tailings Cell 4A. Such measurements must be made to the nearest 0.1 foot.

b) Slimes Drain Recovery Head Monitoring

Immediately after the Mill initiates pumping conditions in the Cell 4A slimes drain system, monthly recovery head tests and fluid level measurements will be made in accordance with the requirements of Parts I.D.3 and I.E.7(b) of the Permit and any plan approved by the Director.

2.15.4 BAT Performance Standards for Cell 4B

2.15.4.1 BAT Operations and Maintenance Plan

Part I.D.13 provides that Denison must operate and maintain Cell 4B so as to prevent release of wastewater to groundwater and the environment in accordance with a BAT Operations and

Maintenance Plan, as approved by the Director, pursuant to Part I.H.19 of the Permit, and that at a minimum such plan must include the following performance standards:

e) The fluid head in the leak detection system shall not exceed 1 foot above the lowest point in the lower membrane liner;
f) The leak detection system maximum allowable daily leak rate shall not exceed 26,145 gallons/day;
g) After Denison initiates pumping conditions in the slimes drain layer in Cell 4B, Denison will provide continuous declining fluid heads in the slimes drain layer, in a manner equivalent to the requirements found in Part I.D.3(b) for Cells 2, 3 and 4A; and
h) Under no circumstances shall the freeboard be less than 3-feet in Cell 4B, as measured from the top of the FML.

As mentioned above, the BAT Operations and Maintenance Plan was submitted on September 16, 2008 and approved by the Director on September 17, 2008. A copy of the most currently-approved *BAT Operations and Maintenance Plan,* Revision 2.3 dated July 2011, is included as Appendix E to this Application.

2.15.4.2 Implementation of Monitoring Requirements Under the BAT Operations and Maintenance Plan

Part I.E.12 of the Permit provides that Denison must implement all monitoring and recordkeeping requirements contained in the Tailings Cell 4B BAT Operations and Maintenance Plan. At a minimum, such BAT monitoring includes:

c) Weekly Leak Detection System (LDS) Monitoring - including:

(i) Denison must provide continuous operation of the leak detection system pumping and monitoring equipment, including, but not limited to, the submersible pump, pump controller, head monitoring, and flow meter equipment approved by the Director. Failure of any pumping or monitoring equipment not repaired and made fully operational within 24-hours of discovery shall constitute failure of BAT and a violation of the Permit;

(ii) Denison must measure the fluid head above the lowest point on the secondary FML by the use of procedures and equipment approved by the Director. Under no circumstance shall fluid head in the leak detection system sump exceed a 1-foot level above the lowest point in the lower FML on the cell floor. For purposes of compliance monitoring this 1-foot distance shall equate to 2.25 feet above the leak detection system transducer;

(iii) Denison must measure the volume of all fluids pumped from the leak detection system. Under no circumstances shall the average daily leak detection system flow volume exceed 26,145 gallons/day; and

(iv) Denison must operate and maintain wastewater levels to provide a 3-foot Minimum of vertical freeboard in tailings Cell 4B. Such measurements must be made to the nearest 0.1 foot.

d) Slimes Drain Recovery Head Monitoring

Immediately after the Mill initiates pumping conditions in the Cell 4B slimes drain system, monthly recovery head tests and fluid level measurements will be made in accordance with the requirements of Parts I.D.3 and I.E.7(b) of the Permit and any plan approved by the Director.

2.15.4.3 Implementation of Monitoring Requirements Under the BAT Operations and Maintenance Plan

Part I.E.12 of the Permit provides that, after Director approval of the Tailings Cell 4B Operations and Maintenance Plan, Denison must immediately implement all monitoring and recordkeeping requirements contained in the plan. At a minimum, such BAT monitoring shall include:

e) Weekly Leak Detection System (LDS) Monitoring - including:

(i) Denison must provide continuous operation of the leak detection system pumping and monitoring equipment, including, but not limited to, the submersible pump, pump controller, head monitoring, and flow meter equipment approved by the Director. Failure of any pumping or monitoring equipment not repaired and made fully operational within 24-hours of discovery shall constitute failure of BAT and a violation of the Permit;

(ii) Denison must measure the fluid head above the lowest point on the secondary FML by the use of procedures and equipment approved by the Director. Under no circumstance shall fluid head in the leak detection system sump exceed a 1-foot level above the lowest point in the lower FML on the cell floor. For purposes of compliance monitoring this 1-foot distance shall equate to 2.25 feet above the leak detection system transducer;

(iii) Denison must measure the volume of all fluids pumped from the leak detection system. Under no circumstances shall the average daily leak detection system flow volume exceed 26,145 gallons/day; and

(iv) Denison must operate and maintain wastewater levels to provide a 3-foot Minimum of vertical freeboard in tailings Cell 4B. Such measurements must be made to the nearest 0.1 foot.

f) Slimes Drain Recovery Head Monitoring

Immediately after the Mill initiates pumping conditions in the Cell 4B slimes drain system, monthly recovery head tests and fluid level measurements will be made in accordance with the requirements of Parts I.D.3 and I.E.7(b) of the Permit and any plan approved by the Director.

2.15.5 Stormwater Management and Spill Control Requirements

Part I.D.10 of the Permit requires that Denison will manage all contact and non-contact stormwater and control contaminant spills at the facility in accordance with an approved stormwater best management practices plan. Such plan must include the following minimum provisions:

a) Protect groundwater quality or other waters of the state by design, construction, and/or active operational measures that meet the requirements of the Ground Water Quality Protection Regulations found in UAC R317-6-6.3(G) and R317-6-6.4(C);
b) Prevent, control and contain spills of stored reagents or other chemicals at the Mill site;
c) Cleanup spills of stored reagents or other chemicals at the Mill site immediately upon discovery; and
d) Report reagent spills or other releases at the Mill site to the Director in accordance with UAC 19-5-114.

The Mill's *Stormwater Best Management Practices Plan* dated June 12, 2008, was approved by the Director on July 1, 2008. A copy of the most recently approved Mill's *Stormwater Best Management Practices Plan* Revision dated 1.4 October 2011, is included as Appendix F to this Application.

2.15.6 Tailings and Slimes Drain Sampling

Part I.E.10 of the Permit requires that on an annual basis, Denison must collect wastewater quality samples from each wastewater source at each tailings cell at the facility, including surface impounded wastewaters, the leak detection systems (if present) and slimes drain wastewaters. All such sampling must be conducted in August of each calendar year in compliance with the approved Tailings Cell Tailings Sampling Plan.

See Section 2.12.1 above for a more detailed description of this program.

The Mill's *Tailings and Slimes Drain Sampling Program* was approved by the Director. The most recently approved version is included as Appendix I to this Application. As of this writing, Denison has submitted Revision 2.1, which is undergoing review by the Director.

2.15.7 Additional Monitoring and Inspections Required Under the Mill License

Under the Mill License daily, weekly, and monthly inspection reporting and monitoring are required by NRC Regulatory Guide 8.31, *Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Recovery Facilities will be As Low As is Reasonable Achievable*, Revision 1, May 2002 ("Reg Guide 8.31"), by Section 2.3 of the Mill's ALARA Program and by the Mill's *Environmental Protection Manual ("EPM")*, over and above the inspections described above that are required under the Permit.

Denison recently submitted for Director approval, a revised DMT Plan and Tailings Management System Procedure (Section 3.1 of the EPM) to separate the RML DMT requirements from the GWDP DMT requirements, into two separate documents. As of this writing, both of these plans are undergoing review by the Director.

2.15.7.1 Daily Inspections

Three types of daily inspections are performed at the Mill under the Mill License:

a) Radiation Staff Inspections

Paragraph 2.3.1 of Reg. Guide 8.31 provides that the Mill's Radiation Safety Officer ("RSO") or designated health physics technician should conduct a daily walk-through (visual) inspection of all work and storage areas of the Mill to ensure proper implementation of good radiation safety procedures, including good housekeeping that would minimize unnecessary contamination. These inspections are required by Section 2.3.1 of the Mill's ALARA Program, and are documented and on file in the Mill's Radiation Protection Office.

b) Operating Foreman Inspections

30 CFR Section 56.18002 of the Mine Safety and Health Administration regulations requires that a competent person designated by the operator must examine each working place at least once each shift for conditions which may adversely affect safety or health. These daily inspections are documented and on file in the Mill's Radiation Protection Office.

c) Daily Tailings Inspection

Section 3.1 of the Mill's EPM requires that during Mill operation, the Shift Foreman, or other person with the training specified in paragraph 2.4 of the Tailings Management Procedure, designated by the RSO, will perform an inspection of the tailings line and tailings area at least once per shift, paying close attention for potential leaks and to the discharges from the pipelines. Observations by the Inspector are recorded on the appropriate line on the Mill's Daily Inspection Data form.

2.15.7.2 Weekly Inspections

Three types of weekly inspections are performed at the Mill under the Mill License:

a) Weekly Inspection of the Mill Forms

Paragraph 2.3.1 of Reg. Guide 8.31 provides that the RSO and the Mill foreman should, and Section 2.3.2 of the Mill's ALARA Program provides that the RSO and Mill foreman, or their respective designees, shall conduct a weekly inspection of all Mill areas to observe general radiation control practices and review required changes in procedures and equipment. Particular attention is to be focused on areas where potential exposures to personnel might exist and in areas of operation or locations where contamination is evident.

b) Weekly Ore Storage Pad Inspection Forms

Paragraph 3.3 of the DMT Plan and Part I.E.7.(d of the Permit requires that weekly feedstock storage area inspections will be performed by the Radiation Safety Department, to confirm that the bulk feedstock materials are stored and maintained within the defined area of the ore pad and that all alternate feed materials located outside the defined ore pad area are maintained in accordance with the requirements of the Permit. The results of these inspections are recorded on the Mill's Ore Storage/Sample Plant Weekly Inspection Report.

c) Weekly Tailings and DMT Inspection

Section 3.1 of the EPM requires that weekly inspections of the tailings area and DMT requirements be performed by the radiation safety department.

2.15.7.3 Monthly Reports

Two types of monthly reports are prepared by Mill staff:

a) Monthly Radiation Safety Reports

At least monthly, the RSO reviews the results of daily and weekly inspections, including a review of all monitoring and exposure data for the month and provides to the Mill Manager a monthly report containing a written summary of the month's significant worker protection activities (Section 2.3.4 of the ALARA Program).

b) *Monthly Tailings Inspection Reports*

Section 3.1 of the EPM, requires that a Monthly Inspection Data form be completed for the monthly tailings inspection. This inspection is typically performed in the fourth week of each month and is in lieu of the weekly tailings inspection for that week.

Mill staff also prepares a monthly summary of all daily, weekly, monthly and quarterly tailings inspections.

2.15.7.4 Quarterly Tailings Inspections

Section 3.1 of the EPM requires that the RSO or his designee perform a quarterly tailings inspection.

2.15.7.5 Annual Evaluations

The following annual evaluations are performed under the Mill License, as set out in Section 3.1 of the EPM.

a) Annual Technical Evaluation

An annual technical evaluation of the tailings management system must be performed by a registered professional engineer (PE), who has experience and training in the area of geotechnical aspects of retention structures. The technical evaluation includes an on-site inspection of the tailings management system and a thorough review of all tailings records for the past year. The Technical Evaluation also includes a review and summary of the annual movement monitor survey (see Section (b) below).

All tailings cells and corresponding dikes are inspected for signs of erosion, subsidence, shrinkage, and seepage. The drainage ditches are inspected to evaluate surface water control structures.

In the event tailings capacity evaluations were performed for the receipt of alternate feed material during the year, the capacity evaluation forms and associated calculation sheets will be reviewed to ensure that the maximum tailings capacity estimate is accurate. The amount of tailings added to the system since the last evaluation will also be calculated to determine the estimated capacity at the time of the evaluation.

As discussed above, tailings inspection records consist of daily, weekly, monthly, and quarterly tailings inspections. These inspection records are evaluated to determine if any freeboard limits are being approached. Records will also be reviewed to summarize observations of potential concern. The evaluation also involves discussion with the Environmental and/or Radiation Technician and the RSO regarding activities around the tailings area for the past year. During the annual inspection, photographs of the tailings area are taken. The training of individuals is also reviewed as a part of the Annual Technical Evaluation.

The registered engineer obtains copies of selected tailings inspections, along with the monthly and quarterly summaries of observations of concern and the corrective actions taken. These copies are then included in the *Annual Technical Evaluation Report.*

The *Annual Technical Evaluation Report* must be submitted by September 1st of every year to the Directing Dam Safety Engineer, State of Utah, Natural Resources.

b) Annual Movement Monitor Survey

A movement monitor survey is conducted by a licensed surveyor annually during the second quarter of each year. The movement monitor survey consists of surveying monitors along dikes 3-S, 4A-W, and 4A-S to detect any possible settlement or movement of the dikes. The data generated from this survey is reviewed and incorporated into the *Annual Technical Evaluation Report* of the tailings management system.

c) Annual Leak Detection Fluid Samples

Annually, the leak detection system fluids in Cells 1, 2, 3, 4A and 4B will be sampled when present as described in the Tailings Sampling Plan in Section 2.12.1.

2.16 Corrective Action Plan or Identification of Other Response Measures to be Taken to Remedy any Violation of Applicable Ground Water Quality Standards (R317-6-6.3.P)

There are two circumstances where applicable groundwater standards have been exceeded at the site that are not associated with natural background: chloroform contamination, and nitrate contamination. As discussed below, none of these circumstances appear to be related to discharges from milling activities. See Section 2.11.2 for a discussion of the current investigation into exceedances of GWCLs for certain constituents and decreasing pH trends at the site, which Denison believes are associated with natural background.

2.16.1 Chloroform Investigation

In May, 1999, excess chloroform concentrations were discovered in monitoring well MW-4, in the shallow perched aquifer along the eastern margin of the Mill site. Because these concentrations were above the GWQS for chloroform, the Executive Secretary of the Utah Water Quality Board initiated enforcement action against the Mill on August 23, 1999 through the issuance of a Groundwater Corrective Action Order (UDEQ Docket No. UGO-20-01), which required completion of: 1) a contaminant investigation report to define and bound the contaminant plume, and 2) a groundwater corrective action plan to clean it up. Repeated groundwater sampling by both the Mill and DRC have confirmed the presence of chloroform in concentrations that exceed the GWQS along the eastern margin of the site in wells that are upgradient or cross gradient from the tailings cells. Other VOC contaminants and nitrate and nitrite have also been detected in these samples. After installation of 27 new monitoring wells at the site, groundwater studies appear to have defined the boundaries of the chloroform plume.

Based on the location of the plume and characterization studies completed to date, the contamination appears to have resulted from the operation of temporary laboratory facilities that were located at the site prior to and during construction of the Mill facility, and septic drainfields that were used for laboratory and sanitary wastes prior to construction of the Mill's tailings cells. Interim measures have been instituted in order to contain the contamination and to pump contaminated groundwater into the Mill's tailings cells. To that end, the Mill has equipped 5 of the wells (MW-4, TW4-4, MW-26 (previously named TW4-15), TW4-19 and TW4-20) with pumps to recover water impacted by chloroform and to dispose of such water in the Mill's tailings cells.

In the 2004 Statement of Basis, DRC noted on page 3 that, while the contaminant investigation and groundwater remediation plan are not yet complete, the DRC believes that additional time is available to resolve these requirements based on the following factors: 1) hydraulic isolation found between the shallow perched aquifer in which the contamination has been detected and the deep confined aquifers which are a source of drinking water in the area, 2) the large horizontal distance and the long groundwater travel times between the existing groundwater contamination on site and the seeps and springs where the shallow aquifer discharges at the edge of White Mesa, and 3) lack of human exposure for these shallow aquifer contaminants along this travel path.

Denison submitted a *Preliminary Corrective Action Plan, White Mesa Mill Near Blanding, Utah*, August 20, 2007, prepared by Hydro Geo Chem, Inc., on August 21, 2007, and a *Preliminary Contamination Investigation Report, White Mesa Mill Near Blanding, Utah*, November 20, 2007, prepared by Hydro Geo Chem, Inc., on December 21, 2007. Those documents are currently under review by the Director.

The objectives of the proposed Corrective Action Plan include the following:

a) Minimize or prevent further downgradient migration of the chloroform plume by a combination of pumping and reliance on natural attenuation;
b) Prevent chloroform concentrations exceeding the action level from migrating south or southwest of the tailings cells;
c) Monitor to track changes in concentrations within the plume and to establish whether the plume boundaries are expanding, contracting, or stable;
d) Provide contingency plans to address potential continued expansion of the plume and the need for additional monitoring and/or pumping points; and
e) Ultimately reduce chloroform concentrations at all monitoring locations to the action level or below.

To achieve these objectives, the proposed Corrective Action Plan proposes a phased approach. The first phase consists of a combination of "active" and "passive" strategies. The active strategy consists of removing chloroform mass as rapidly as practical by pumping areas that have (on a relative basis) both high chloroform concentrations, and high productivity. Continued monitoring within and outside the plume is considered part of the active strategy. The passive strategy consists of relying on natural attenuation processes to remove chloroform mass and reduce concentrations. Reductions in concentrations would be achieved by physical processes such as volatilization, hydrodynamic dispersion, and abiotic degradation, and through natural biological degradation of chloroform. These are essentially the same processes that have been relied upon in the interim action.

Natural attenuation is expected to reduce chloroform concentrations within the entire plume. However, within upgradient portions of the plume that occur in higher permeability materials, that are amenable to pumping, direct mass removal via pumping will be the primary means to reduce concentrations. In downgradient portions of the plume where permeabilities are low, chloroform migration rates are low, and mass removal by pumping is not practical because achievable pumping rates would be very low, natural attenuation will be the primary means to reduce concentrations.

The second phase relies on natural attenuation (without pumping) to reduce chloroform concentrations at all monitoring locations to action levels, once concentrations during Phase 1 are judged to be sufficiently low that Phase 2 will be effective.

As part of the active strategy in the first phase of the Corrective Action Plan, Denison has operated a chloroform capture system, referred to as the "Long-term Pump Test" continuously since January 31, 2010. The purpose of the test is to serve as an interim action that will remove a significant amount of chloroform-contaminated water while gathering additional data on hydraulic properties in the area of investigation. Chloroform-contaminated water is captured by pumping six wells located within the identified chloroform plume, and transferred via an above-ground piping network to Tailings Cell 1 for disposal.

Effectiveness of the first phase of the Corrective Action is evaluated and documented in quarterly reports to the Director. Denison estimates that, to date, 597 lbs. of chloroform have been extracted through the capture system.

2.16.2 Nitrate Investigation

During review of the New Well Background Report and other reports, a Nitrate contaminant plume was identified by DRC staff in five monitoring wells in the Mill site area, including wells: MW-30, MW-31, TW4-22, TW4-24, and TW4-25. TW4-25 is located upgradient of the Mill's tailings cells. Elevated concentrations of chloride also appear to be associated with the nitrate plume.

On September 30, 2008, the Director issued a request for a voluntary plan and schedule for Denison to investigate and remediate this Nitrate contamination. On November 19, 2008 Denison submitted a plan and schedule prepared by INTERA, Inc., which identified a number of potential sources for the contamination, including several potential historic and offsite sources. On January 27, 2009, the Director and Denison signed a Stipulated Consent Agreement ("SCA") by which Denison agreed to conduct an investigation of the Nitrate contamination, determine the sources of pollution, and submit a report by January 4, 2010.

Denison submitted a Contaminant Investigation Report ("CIR") on December 30, 2009. On October 5, 2010 the Director issued a Notice of Additional Required Action ("NARA") letter that notified Denison of the Director's determination that the 2009 CIR was incomplete.

On December 20, 2010 Denison and the Director entered into Revision 0 of a Tolling Agreement allowing a tolling period until April 30, 2011 in order to provide time for Denison to prepare a Plan and Schedule for Director review addressing additional investigations to resolve open issues identified in the October 5, 2010 NARA, and to execute a revised SCA.

Denison submitted a Plan and Schedule on February 14, 2011 and a revised Plan and Schedule on February 18, 2011. the Director provided his comments on the revised Plan and Schedule on March 21, 2011. In an April 20, 2011 meeting, Denison and the Director agreed that the Plan and Schedule to conduct additional nitrate investigations would be composed of four to five phases of study, including geoprobe drilling and soil sampling/analysis to investigate natural nitrate salt reservoir sources in the vadose zone beyond the Mill site, potential Mill sources, and other potential sources; groundwater sampling and analysis of existing monitoring wells for non-isotopic analytes; deep bedrock core sampling/analysis of possible natural nitrate reservoir and potential nitrate source locations; stable isotopic sampling/analysis of groundwater in existing monitoring wells; and stable isotopic sampling/analysis of soil/core samples, if needed.

On April 28, 2011, Denison and the Director entered into Revision 1 of the Tolling Agreement to extend the Tolling Period through June 30, 2011 and adopt the agreements made on April 20, 2011. Under the Tolling Agreement Revision 1, Denison agreed to submit a Revised Phase 1 (A through C) Work Plan on or before May 6, 2011 and a Revised Phase 2 through 5 Work Plan and Schedule on or before June 3, 2011.

Denison submitted a May 6, 2011 Revised Phase 1 Work Plan and Schedule for the Phase 1 A - C investigation for Director review. Denison conducted field and laboratory work for the Phase 1 A-C study in May and June, 2011.

Denison submitted a Revised Phase 2 through 5 Work Plan and Schedule for Director review on June 3, 2011. The Director provided comments on this document on June 23, 2011 and advised Denison that in order to revise the 2009 SCA to incorporate needed deliverables and timelines, the Phase 2 through 5 Work Plan would need to be expanded to the same level of detail as was provided for Phase 1 in Attachment 1 of the Revision 1 Tolling Agreement.

On June 30, 2011, Denison and the Director entered into Revision 2 of the Tolling Agreement extending the Tolling Period to August 31, 2011, to facilitate the revision of the Phase 2 through 5 Work Plan to provide the required level of detail to construct a replacement SCA. Denison submitted a separate July 1, 2011 detailed Revision 0 of the Work Plan and Quality Assurance Plan ("QAP") for the Phase 2 investigation. The Director provided comments on this document on July 7, 2011. Denison provided a July 12, 2011 Revision 1.0 to the Phase 2 QAP and Work Plan, which DRC conditionally approved in a letter dated July 18, 2011. On August 1 and 2, 2011 Denison submitted by email preliminary laboratory results for the Phase 1 A-C study to the Director.

On August 4, 2011, Denison provided a Revision 1.0 to the Phase 2 - 5 Work Plan for Director review. The Director provided comments on the Phase 2-5 Work Plan, Revision 1.0 and the August 1, 2011 preliminary laboratory results on August 11, 2011. Denison submitted Revision 2.0 of the Phase 2-5 Work Plan for Director review on August 11, 2011.

On August 25, 2011, the Director determined that based on review of the Revision 2.0 Phase 2-5 Work Plan, a finalized Plan and Schedule that meets the satisfaction of the Director, and which would allow the preparation of a replacement SCA, was not possible at that time; and that the development of a replacement SCA for continued contaminant investigation activities was not supported.

At a meeting on August 29, 2011, Denison and DRC agreed that:

1. After more than two years of investigation it has been determined that there are site conditions that make it difficult to determine the source(s) of the contamination at the White Mesa site;
2. As a result, resources will be better spent in developing a CAP in accordance with UAC R317-6-6.15(D), rather than continuing with further investigations as to the source(s) of the contamination.

In discussions during October 2011, Denison and the Director acknowledged that it has not been possible to date to determine the source(s), cause(s), attribution, magnitudes of contribution, and proportion(s) of the local nitrate and chloride in groundwater, and thereby cannot eliminate Mill activities as a potential cause, either in full or in part, of the contamination. As a result, Denison and the Director agreed that resources will be better spent in developing a Corrective Action Plan in accordance with UAC R317-6-6.15(D), rather than continuing with further investigations.

On October 3, 2011 Denison and the Director entered into a revised Stipulated Consent Agreement which required Denison to submit a Corrective Action Plan for Director review which includes at least the following three phases of activity:

Phase I – to determine the physical extent of soil contamination observed at the Ammonium Sulfate Crystal Tanks, and provide a control measure consisting of either removal of the areal extent of contamination down to bedrock, or a Plan and Schedule for covering the areal extent of contamination with at least 6 inches of concrete, followed by removal action during or before site closure.

Phase II – to include near term active remediation of the nitrate contamination by pumping contaminated water into the Mill's tailings cells for disposal. This phase is to include development, implementation, operation, and monitoring for a pumping well network to contain and hydraulically control the nitrate plume; monitoring of chloride concentrations; and any required increases to the Mill's surety for activities in this Phase.

Phase III – if necessary, to include a comprehensive long-term solution for the nitrate contamination at the Mill Site. This Phase is to be determined after public participation and Director approval, and may include continuation of Phase I and II activities alone or in combination with any of the following: monitored natural attenuation, additional remediation and monitoring, determination of additional hydrogeologic characterization, contaminant travel times, points of exposure to public or wildlife, risk analysis, cost/benefit analysis, and possible development and petetion of the Board for alternate Corrective action concentration limits.

Denison submitted a Draft Corrective Action Plan on November 30, 2011. The Director provided comments on the Draft Corrective Action Plan on January 19, 2012. Denison provided Revision 1.0 of the Corrective Action Plan on February 27, 2012, and received comments from the Director on March 19, 2012. Pursuant to the revised SCA, Denison provided Revision 2.0 to the Director on May 7, 2012.

The Director prepared a draft Stipulation and Consent Order and a Statement of Basis on July 5, 2012. The Statement of Basis and the Revised CAP will undergo a public review and comment period beginning July 18, 2012. Following the Director's final approval of Corrective Action Plan, Denison will initiate corrective actions consistent with the schedule provided in the Stipulation and Consent Order.

2.17 Other Information Required by the Director (R317-6-6.3.Q)

2.17.1 Chemical Inventory Report

Part I.H.1 of the Permit requires that Denison complete a historical review and conduct an inventory of all chemical compounds or reagents stored, used, or currently in use at the facility. including the types of chemicals and the total volumes present, and historically used, as data is available. Denison submitted a chemical inventory report on June 7, 2005, and submitted additional related information on November 17, 2006.

Part I.H.1 requires that at the time of Permit renewal, the Permittee shall submit an updated inventory report. Part I.E.9 requires that the inventory address chemicals used in the milling process and the on-site laboratory. The updated inventory report is provided in Appendix L of this Application.

2.17.2 Southwest Hydrogeological Investigation

Part I.H.6 of the Permit required that Denison perform a detailed Southwest Hydrogeologic Investigation to define, demonstrate and characterize: 1) the hydraulic connection and local groundwater flow directions between the area near Tailings Cell 4B, and the westerm margin of White Mesa, and 2) the full physical extent of the unsaturated area between former well MW-16, MW-33 and the western margin of White Mesa.

During 2011, Denison installed 18 piezometers to demonstrate the geologic and physical extent of the apparent unsaturated structural high between Tailings Cell 4B and the western margin of White Mesa, and to demonstrate the location and direction of groundwater flow paths between Tailings Cell 4B and Westwater and Cottonwood Seeps and Ruin Spring. Consistent with Part I.H.6.c) of the Permit, Denison submitted an investigation report, the *Hydrogeology of the Perched Groundwater Zone in the Area Southwest of the Tailings Cells, White Mesa Uranium Mill Site* (the "Southwest Hydrogeology Report"), prepared by Hydrogeochem, on January 12, 2012. The Director provided comments in a conference call during May 2012, and in a letter dated May 30, 2012. In an additional conference call following Denison's receipt of the May 30 letter, Denison and the Director agreed that Denison would respond to the letter by preparing a revision to the Southwest Hydrogeology Report by August 3, 2012.

No other information has been specifically required by the Director to be included in this Application at this time. Denison will provide additional information as requested by the Director

2.18 This Application Performed Under the Direction of a Professional Engineer (R317-6-6.3.R)

This Application has been performed under the direction, and bears the seal, of Harold R. Roberts, Executive Vice President, US Operations of Denison. Mr. Roberts is a Registered Professional Engineer in the State of Utah, No. 165838.

2.19 Closure and Post Closure Management Plan Demonstrating Measures to Prevent Ground Water Contamination During the Closure and Post Closure Phases of Operation (R17-6-6.3.S)

2.19.1 Regulatory Requirements for Uranium Mills

2.19.1.1 Long Term Custodian

One unique feature of the regulatory scheme for uranium mill tailings is that Section 83 of the Atomic Energy Act of 1954, as amended by the Uranium Mill Tailings Radiation Control Act of 1978 ("UMTRCA") (the Atomic Energy Act of 1954 as so amended is referred to herein as the "AEA")[4] requires that, prior to license termination, title to uranium mill tailings (11e.(2) byproduct material) must be transferred to the United States Department of Energy ("DOE") or the State in which the activity occurred, if the State so elects, for custody and long term care. 10 CFR 40.28 provides a general license to DOE or the State for that purpose.

[4] *See* 42 U.S.C. 2113.

2.19.1.2 Responsibility For And Manner Of Clean Up

UMTRCA amended the AEA to require that all Title II facilities (i.e., active mills) will comply with the decontamination, decommissioning, and reclamation standards prescribed by the Commission[5] and to require that such facilities post reclamation bonds or surety[6].

Responsibility for reclamation rests with the licensee. 10 CFR Part 40 Appendix A Criterion 6A requires the adoption of a Director-approved reclamation plan for the site, Criterion 9 requires that financial surety must be established to fund the cost of reclamation in accordance with such plan, and Criterion 10 requires that each licensee include in its financial surety an amount equivalent to $250,000 (1978 dollars) to cover the costs of long-term surveillance by the long-term government custodian (DOE). Criteria 6, 9 and 10 have been incorporated by reference into the Utah rules by UAC R313-24-4.

2.19.1.3 Surface

The reclamation plan adopted by the Mill at the outset, as required by 10 CFR Part 40, Appendix A, Criterion 9, must address the decontamination and decommissioning of the Mill and Mill site and reclamation of any tailings or waste disposal areas.

As is the case for most uranium mills, the Mill's reclamation plan must require that upon closure, all mill buildings, unsalvageable equipment, contaminated soils (impacted by Mill operations within the Mill site itself as well as surrounding areas that may be impacted by windblown radioactive dusts from milling operations) etc. must be deposited in the tailings cells and the tailings cells capped in place.

Appendix A, Criterion 6(6) sets the standard for determining when all impacted areas, other than the tailings impoundments have been adequately cleaned up. Criterion 6(6) provides that byproduct material containing concentrations of radionuclides other than radium in soil, and surface activity on remaining structures, must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the benchmark standard of 5pCi/g concentration of radium in the surface 15 cm (6 in) and 15 pCi/g concentration of radium in the subsurface, and must be at levels which are ALARA. If more than one residual radionuclide is present, the sum of the ratios for each radionuclide present will not exceed "1" (unity). Further details on the NRC's approach to evaluating reclamation plans and release criteria for uranium mill sites, including the manner of modeling the release standard set out in Criterion 6(6), are contained in NUREG-1620, Rev 1, *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978*, Final Report, June 2003 ("NUREG-1620").

2.19.1.4 Groundwater

Each uranium mill is required to have a groundwater monitoring program. In the case of the

[5] *See* 42 U.S.C. 2113.
[6] *See* 42 U.S.C. 2201.

Mill, the Permit implements the applicable requirements of UAC R317-6. If there is groundwater contamination after cessation of operations, the requirements of UAC R317-6.15 must be satisfied.

2.19.1.5 License Termination

Section 83.7 of the AEA[7] provides that material and land transferred to the long term custodian must be transferred without cost to the long-term custodian other than administrative and legal costs incurred in carrying out such transfer.

In order to cover the costs of long-term surveillance, Criterion 10 requires that a minimum charge of $250,000 (1978 dollars) must be paid by each mill operator to the general treasury of the United States or to an appropriate State agency prior to the termination of a uranium mill license.

In most cases if there is a groundwater contamination problem, the problem must be remediated prior to license termination, or an alternate corrective action concentration limit under R317-6-6.15.G must be obtained, thereby resolving the problem. In some circumstances DOE may agree to take some additional actions after it takes title to the site, such as additional monitoring, if not onerous and provided adequate funding is provided.

Upon the Director being satisfied that all regulatory requirements have been met and the site is reclaimed in a manner that satisfies all applicable standards, the Mill's license will be terminated upon transfer of the tailings to DOE. 10 CFR 40.28 provides a general license in favor of the long-term custodian for custody of and long-term care of the tailings impoundments and any surrounding lands transferred to it. [8] The surrounding areas not transferred to DOE would generally be free-released.

2.19.2 Current Reclamation Plan

The Mill's *Reclamation Plan*, Revision 4.0, was approved by DRC under the Mill License in January 2011. The *Reclamation Plan* sets out the requirements to be met by Denison for the final reclamation and closure of the Mill facility, including the tailings cells and all impacted surrounding areas, in accordance with the requirements of 10 CFR Part 40, Appendix A (which have since been incorporated by reference into UAC R313-24). A copy of the Mill's *Reclamation Plan*, Revision 4.0 was previously submitted to the Director and is on file at the DRC.

Denison submitted Revision 5.0 of the Reclamation Plan in September 2011. Denison is in the process of responding to the one round of interrogatories received to date. Submission of responses to all first round interrogatory questions will be completed by August 15, 2012

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[7] *See* 42 U.S.C. 2113.

[8] In circumstances where the facility has a groundwater contamination plume, additional lands may be acquired by the licensee in order to bound the plume. In these circumstances these additional lands would be transferred along with the capped tailings impoundments, to DOE.

2.19.3 Provisions Included in the Permit Relating to the Mill's Reclamation Plan

The Mill License is currently in timely renewal. As part of the Mill License Renewal, DRC is re-examining the Mill's *Reclamation Plan* for content and adequacy. At the time of original issuance of the Permit the Director had not completed his review of the Mill's *Reclamation Plan*. As a result, new requirements were added to the Permit to ensure that the final reclamation design approved by the Director on his re-examination of the *Reclamation Plan* will provide adequate performance criteria to protect local groundwater quality.

To this end, three requirements were included in Part I.D.8 of the Permit to ensure that the cover system for each tailings cell will be designed and constructed to:

a) Minimize the infiltration of water into the radon barrier and underlying tailings waste;
b) Prevent the accumulation of leachates within the tailings that might create a bathtub effect and thereby spill over the maximum elevation of the FML inside any disposal cell; thereby causing a release of contaminants to the environment; and
c) Protect groundwater quality at the compliance monitoring wells by ensuring that contaminant concentrations there do not exceed their respective GWQS or GWCL defined in Part I.C.1 and Table 2 of the Permit.

To provide consistency with the performance criteria stipulated by the Director at other 11e.(2) disposal operations, a 200-year minimum performance period was required for all three of these criteria.

In addition, Part I.D.9 was included in the Permit, which provides that upon commencement of decommissioning, Denison will reclaim the Mill site and all related facilities, stabilize the tailings cells, and construct a cover system over the tailings cells in compliance with all engineering design and specifications in an approved reclamation plan. Part I.D.7 also provides that the Director reserves the right to require modifications to the Mill's *Reclamation Plan* for purposes of compliance with the Utah Ground Water Quality Protection Regulations, including but not limited to containment and control of contaminants, or discharges, or potential discharges to waters of the State.

Finally, Part I.D.9 was added to the Permit to provide the Director an opportunity to ensure that:

a) The post-closure performance requirements for the tailings cell cover system in Part I.D.8 is fully and adequately integrated into the Mill's *Reclamation Plan*. Part I.H.2 was also added to the Permit to require Denison to complete an infiltration and contaminant transport model of the final tailings cell cover system to demonstrate the long-term ability of the cover to protect nearby groundwater quality. As a part of this cover system performance modeling required by Part I.H.2, the Director will determine if changes to the cover system are needed to ensure compliance with the Part I.D.8 performance criteria;
b) All other facility demolition and decommissioning activities outlined in the *Reclamation Plan* will be done in a manner adequate to protect local groundwater quality. Issues or concerns to be considered and resolved include:

(i) Identification, isolation, and authorized disposal of any un-used chemical reagents held in storage at the Mill site at the time of closure;

(ii) Demolition, excavation, removal, and authorized disposal of all contaminated man-made structures, including, but not limited to: buildings, pipes, power lines, tanks, access roads, drain fields, leach fields, fly-ash disposal ponds, feedstock storage areas, Mill site wastewater storage ponds, solid waste disposal landfills, and all related appurtenances; and

(iii) Excavation, removal, and authorized disposal of all contaminated soils found anywhere outside of the tailings cells at the facility.

Through this process, the Director will be able to ensure that DMT has been adequately established for both the final tailings cell cover system and reclamation of the facility.

Denison submitted an *Infiltration and Contaminant Transport Modeling Report, White Mesa Mill Site, Blanding, Utah*, November 2007, prepared by MWH Americas, Inc., in November, 2007. Denison submitted a revised *Infiltration and Contaminant Transport Modeling Report, White Mesa Mill Site, Blanding, Utah*, March 2012 in response to DRC comments. The March 2012 report is currently being reviewed in conjunction with the Reclamation Plan, Revision 5.0.

2.19.4 Post-Operational Monitoring

Monitoring will continue under the Permit after cessation of operations, during reclamation and after reclamation has been completed until such time as the Mill License and Permit are terminated and the reclaimed tailings impoundments are transferred to the Department of Energy for perpetual care and maintenance.

3.0 CONCLUSIONS

This Application describes the key monitoring and DMT performance standard requirements and other protections contained in the Permit.

Denison believes that with this Application, the accompanying Background Reports and other documentation, the Director has been provided sufficient information to determine that:

f) Denison has demonstrated that the applicable class TDS limits, ground water quality standards and protection levels will be met;

g) The monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;

h) Denison utilizes treatment and discharge minimization technology at the Mill commensurate with plant process design capability and similar or equivalent to that utilized by facilities that produce similar products or services with similar production process technology; and

i) There is no current or anticipated impairment of present and future beneficial uses of the ground water.

Denison would be pleased to provide any further information required by the Director.

4.0 SIGNATURE AND CERTIFICATIONS

This Application is dated July 13, 2012 and is being submitted by Denison Mines (USA) Corp.

Denison Mines (USA) Corp.

By:

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David C. Frydenlund
Vice President, Regulatory Affairs and General Counsel

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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David C. Frydenlund
Vice President, Regulatory Affairs and General Counsel

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER

I hereby certify that the foregoing Application has been prepared under my direction, that I have reviewed this Application, that I am familiar with the Mill facilities, and attest that this Application has been prepared in accordance with good engineering practices.

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Harold R. Roberts
Registered Professional Engineer
State of Utah No. 165838

(seal)

REGISTERED PROFESSIONAL ENGINEER
No. 165838
HAROLD R. ROBERTS
STATE OF UTAH

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