6.0 RECLAMATION PLAN

The objective of the Reclamation Plan is to return the subsurface and surface of the Nichols Ranch ISR Project area to conditions compatible with the pre-mining uses. All groundwater that is affected by the Nichols Ranch ISR Project will be restored to a condition of use equal to or exceeding that which existed prior to project construction.

6.1 GROUNDWATER RESTORATION

Groundwater restoration is an important part of an ISR operation. The time it takes to restore the groundwater is primarily linked to the capacity of the deep waste disposal well. If the capacity of a deep waste disposal well is such that the time involved for groundwater restoration is unacceptable, then measures such as installing another deep disposal well will be implemented to decrease the restoration time.

Uranerz will return the groundwater quality of the production areas to the restoration standards that are specified in NUREG-1569. The criteria to be used are as follows:

(a) Primary Restoration Standards—The primary goal of a restoration program is to return the water quality within the exploited production zone and any affected aquifers to pre-operational (baseline) water quality conditions. Recognizing that *in situ* recovery operations fundamentally alter groundwater geochemistry, restoration activities are not likely to return groundwater quality to exact water quality that existed at every location prior to *in situ* recovery operations. Still, as a primary restoration goal, Uranerz will attempt to return the concentrations of the monitored water quality indicator constituents to within the baseline range of statistical variability for each constituent.

(b) Secondary Restoration Standards—*In situ* recovery operations may cause permanent changes in water quality within the exploited production zone, because the *in situ* recovery extraction process relies on changing the chemistry in the production zone to remove the uranium. If baseline conditions cannot be met, then Uranerz will return the water quality to its pre-operational Wyoming class of use (e.g., drinking water, livestock, agricultural, or limited use) as a secondary restoration standard. Uranerz's principal goal of its restoration program will be to return the water to baseline, as long as it is technically and economically feasible, and that secondary standards will not be applied so long as restoration continues to result in significant improvement in groundwater quality. Uranerz first attempt will be to return groundwater quality to primary restoration standards before reverting to secondary restoration standards such as Wyoming class of use.

In the event secondary restoration standards will be used, it is acceptable to establish secondary restoration standards on a constituent-by constituent basis, with the numerical limits established to ensure state or EPA primary or secondary drinking water standards will not be exceeded in any potential source of drinking water. For radionuclides not included in the drinking water standards, it is acceptable to determine, on a constituent-by-constituent basis, secondary standards from the concentrations for unrestricted release to the public in water, from Table 2 of 10 CFR Part 20, Appendix B.

(c) If a constituent cannot technically or economically be restored to its secondary standard within the exploited production zone, Uranerz will demonstrate that leaving the constituent at the higher concentration would not be a threat to public health and safety or the environment or produce an unacceptable degradation to the water use of adjacent groundwater resources. This situation may arise with respect to general water quality parameters such as the total dissolved solids, sulfate, chloride, iron, and others which do not typically present a health risk. However, not all the major constituents have a primary or secondary drinking water standard (e.g., bicarbonate, carbonate, calcium, magnesium, and potassium). Consequently, groundwater restoration may achieve the secondary standard for total dissolved solids, but may not achieve a secondary standard for individual major ions that contribute to total dissolved solids. If such a situation occurred, Uranerz will show that leaving the individual constituent at a concentration higher than secondary standard would not be a threat to public health and safety nor the environment, or produce an unacceptable degradation to the water use of adjacent groundwater resources.

Such proposed alternatives must be evaluated on a case-by-case basis as a license amendment request only after restoration to the primary or secondary standard is shown not to be technically or economically achievable. This approach is consistent with the as low as is reasonably achievable philosophy that is used broadly within NRC.

Additionally, Uranerz Energy Corporation will inform the NRC when a transition from production to restoration has occurred in a Production Unit and will adhere to the timeliness in decommissioning regulations of 10 CFR Part 40.42.

6.1.1 Water Quality Criteria

The primary goal of the groundwater restoration efforts will be to return the groundwater quality of the mined ore zone, on a production area average, to the pre-mining baseline water quality condition that has been defined by the baseline water quality sampling program. During the groundwater restoration, all parameters on an average basis will be returned to baseline or as close to average baseline values as is reasonably achievable. If the average baseline values of some of the parameters are unachievable using the best practical technology (BPT), Uranerz Energy Corporation will then use a secondary goal of returning the groundwater to the Wyoming Department of Environmental Quality-Water Quality Division class of use designation. This will return the groundwater to a quality consistent with the use of the water prior to the ISR extraction.

The use categories of the groundwater are those established by the Wyoming Department of Environmental Quality-Water Quality Division. Pre-mining baseline water quality data, groundwater use category, available technology, and economics will be criteria used in attaining the final level of water quality during restoration.

6.1.2 Restoration Criteria

Groundwater restoration criteria in a production area will be based on the baseline water quality data collected for each production area. The baseline water quality data will include data collected from wells completed in the ore zone (i.e. MP-wells) and perimeter monitoring ring wells. Baseline water quality parameters from the MP-Wells will be used, on a parameter-by-parameter basis, to monitor and evaluate restoration activities in returning the affected groundwater back to pre-mining quality as reasonably as possible.

Specific restoration values will be established prior to mining in each production area by computing specific restoration values for specific parameters. The restoration values will be the mean plus two standard deviations of the pre-mining water quality for each parameter listed in Table 5-1. These restoration target values (RTVs) will not change unless the operational monitoring program indicates that baseline water quality has changed in a production area because of accelerated movement of groundwater, and that such change justifies re-determination of the baseline water quality. If this were to occur, re-sampling of monitor wells would be conducted along with the Wyoming Department of Environmental Quality (WDEQ) and NRC reviewing and approving the change to restoration values.

The success of the restoration will be determined after the completion of the stability monitoring period (see Section 6.1.4). If no significant increasing trends in restoration values are identified, restoration will be deemed complete. A summary report requesting approval will be submitted along with the appropriate water quality data to the regulatory agencies. When approval is received from the regulatory agencies, final decommissioning of the wellfield will commence.

6.1.3 Groundwater Restoration Methods

For in situ recovery (ISR) operations, a common commercial groundwater restoration program consists of two stages, the restoration stage and the stability monitoring stage. The restoration stage typically consists of three phases such as groundwater sweep, groundwater transfer, and groundwater treatment. These techniques represent the BPT that has been used in the successful restoration of groundwater at numerous Wyoming ISR operations and Pilot Plants including the Bison Basin ISR operation located in the Great Divide Basin of Wyoming, the COGEMA Christensen Ranch and Irigaray ISR operations, Smith Ranch/Highlands ISR operation, Collins Draw R&D Facility, Ruth R&D Facility, and the Reno Creek R&D Facility, all located in the

Powder River Basin in Wyoming within 35 miles of the Nichols Ranch ISR Project. The formations that are found in the Nichols Ranch ISR Project are very similar to those found in the other operations that have had successful groundwater restoration, therefore Uranerz believes that successful groundwater restoration will be accomplished using the same techniques that have been previously employed. Additionally, the Reno Creek R&D Facility was able to demonstrate the successful groundwater restoration of an unconfined aquifer with their Pattern 2 operation using the same techniques that will be used by Uranerz Energy Corporation. Summaries of the Reno Creek Project groundwater restoration can be found in Section 6.1.3.5 and Addendum 6C.

The stability monitoring stage includes a six- month or longer time period in which the groundwater is monitored for successful restoration by monitoring the restoration targets for consistency.

The three phases used in groundwater restoration are designed to efficiently and effectively restore the groundwater so that groundwater loss is kept to a minimum and restoration equipment is optimized. Monitoring of the quality of groundwater will occur in selected wells as needed during restoration to determine the efficiency of the operations and to determine if additional or alternate techniques are necessary. Online production wells will be sampled for certain parameters, such as uranium and conductivity, to determine restoration progress on a pattern-by-pattern basis.

The sequence of the restoration methods used will be determined based on operating conditions and waste water system capacity. Depending on the progress of restoration, it is possible that not all phases of the restoration stage will be utilized. Uranerz Energy Corporation will determine the need for certain restoration steps based on the progress of restoration and the monitoring of restoration values.

During groundwater restoration, a reductant may be added to lower the oxidation potential of the ore zone. Either a sulfide or sulfite compound may be added to the injection stream in concentrations sufficient to reduce the mobilized species. The use of reductants is beneficial because several of the metals typically found in the ore zone groundwater become solubilized during the recovery process. These metals can then form stable insoluble compounds that are usually in form of sulfides. Dissolved metal compounds that are precipitated by such reductants include those of molybdenum, selenium, uranium, and vanadium.

Once restoration activities have returned the average concentration of restoration parameters to acceptable levels, the WDEQ and NRC will be contacted for agreement that restoration has been achieved in the production area. After this, the stability monitoring stage will begin. This phase of restoration consists of monitoring the water quality in the restored production area for at least six months after the successful completion of the restoration stage. When the stability monitoring stage is completed, Uranerz Energy Corporation will make a request to the WDEQ and NRC that the production area be deemed restored.

6.1.3.1 Groundwater Transfer

During the groundwater transfer phase, water may be transferred between a production area beginning restoration operations and a production area beginning mining operations. Also, a groundwater transfer may occur within the same production area, if one section of the production area is in a more advanced state of restoration than another.

Pre-mining baseline quality water from the production area beginning mining may be pumped and injected into the production area in restoration. The higher TDS (total dissolved solids) water from the production area in restoration will be recovered and injected into the production area beginning mining. The direct transfer of water will act to lower the TDS in the production area being restored by displacing affected groundwater with pre-mining baseline quality water.

The goal of the groundwater transfer is to blend the water in the two production areas until they become similar in conductivity. The water recovered from the restoration production area may be passed through ion exchange (IX) columns and/or filtered during this phase if suspended solids are sufficient in concentration to present a problem with blocking the injection well screens.

For the groundwater transfer to occur between production areas, a newly constructed production area must be ready to begin mining. Because of this condition, a groundwater transfer can occur at any time during the restoration process, if needed. If a production area is not available to accept transferred water, then groundwater sweep will be used as the first phase of restoration.

The advantage of using the groundwater transfer technique is that it reduces the amount of water that must ultimately be sent to the deep disposal well during restoration activities.

6.1.3.2 Groundwater Sweep

During the groundwater sweep stage, the groundwater from a production area beginning restoration is pumped from the production area to the processing plant though all production wells without any re-injection. By doing this, native groundwater is drawn into the production area to flush contaminants from the mining zone thus "sweeping" the mining aquifer. The cleaner baseline water has lower ion concentrations that act to strip off the cation that have attached to the clays during mining. The water produced during groundwater sweep is usually then sent to the processing plant for treatment and removal of any uranium that could be in the production area water. Radium 226 and dissolved solids are also removed. After the treatment, the swept water is disposed of in an approved manner such as injection into a deep disposal well.

The rate of groundwater sweep will be dependent upon the capacity of the deep disposal wells and the ability of the production area to sustain the rate of withdrawal. A hydraulic barrier may be employed during this stage if there is an adjacent operation production area to prevent drawing groundwater from the operational production area to the production area undergoing restoration.

6.1.3.3 Groundwater Treatment

Either following or in conjunction with the groundwater sweep, water will be pumped from the mining zone to treatment equipment at the surface. Ion exchange (IX) and reverse osmosis (RO) treatment equipment will then be utilized during this phase of restoration.

Groundwater recovered from the restoration production area may be passed through the IX system prior to RO. The groundwater will either be sent to waste disposal system or it will be re-injected into the production area. The IX columns exchange the majority of the contained soluble uranium for chloride or sulfate. Additionally, prior to or following IX treatment, the groundwater may be passed through a de-carbonation unit to remove residual carbon dioxide that remains in the groundwater after mining.

At any time during treatment, an amount of reductant sufficient to reduce any oxidized minerals may be metered into the restoration production area injection stream. The concentration and amount of reductant injected into the restoration production area is determined by how the ore zone groundwater reacts with the reductant. The goal of reductant addition is to decrease the concentrations of oxidation-reduction sensitive elements through reduction of these elements.

All or some portion of the restoration recovery water can be sent to the RO unit. The use of an RO unit 1) reduces the total dissolved solids in the groundwater being restored, 2) reduces the quantity of water that must be removed from the aquifer to achieve restoration limits, 3) concentrates the dissolved contaminates in a smaller volume of brine to facilitate waste disposal, and 4) enhances the exchange of ions from the formation due to the large difference in ion concentration. The RO passes a high percentage of the water through the membranes, leaving 60 to 90 percent of the dissolved salts in the brine water or concentrate. The clean water, called permeate, will be either re-injected, or stored for use in the mining process, or sent to the waste water disposal well. The permeate may also be de-carbonated prior to re-injection into the wellfield. The brine water that is rejected contains the majority of the dissolved salts in the affected groundwater and is sent to the disposal system. Make-up water, which may come from either water produced from a production area that is in a more advanced state of restoration, or water being exchanged with a new production area, water being pumped from a different aquifer, or the purge of an operating production area, or a combination of these sources, may be added prior to the RO or production area injection stream to control the amount of "bleed" in the restoration area.

If needed, the reductant added to the injection stream during this stage will scavenge any oxygen and reduce the oxidation-reduction potential of the aquifer. During mining operations, certain trace elements are oxidized. By adding the reductant, the oxidation-reduction potential of the aquifer is lowered thereby decreasing the solubility of these elements. Regardless of the reductant used, a comprehensive safety plan will be developed and implemented prior to using any reductant that will address such issues as reductant use, proper PPE to be worn around the reductant, and the location of the reductant versus other chemicals in and around the plant.

If necessary, sodium hydroxide may be used during the groundwater treatment phase to return the groundwater to baseline pH levels. This will assist in immobilizing certain parameters such as trace metals.

The number of pore volumes treated and re-injected during the groundwater treatment phase will depend on the efficiency of returning the production area back to pre-mining baseline water quality conditions. This relies on the efficiency of the RO in removing contaminates from the restoration production area groundwater and the success of the reductant, if used, in lowering the uranium and trace element concentrations.

6.1.3.4 Restoration Monitoring

During restoration, lixiviant injection is discontinued while improving the quality of the groundwater back to restoration standards. Because of this, the possibility of an excursion is greatly reduced. The monitor ring wells (MR-Wells), overlying aquifer wells (MO-Wells), and underling aquifer wells (MU-Wells) sampling frequencies will be changed from once every two weeks to once every 60 days during restoration. The wells are analyzed for the excursion parameters chloride, total alkalinity and conductivity. Water levels are also obtained at these wells prior to sampling.

In the event that unforeseen conditions (such as snowstorms, flooding, and equipment malfunction) occur, the WDEQ will be contacted if any of the wells cannot be monitored within 65 days of the last sampling event.

The production area will be monitored no differently with the addition of any reductants than it would normally be with the standard restoration techniques. During restoration, the production area will be monitored (MP-Wells) on a frequent basis that will provide Uranerz Energy Corporation with adequate information to address the success of the restoration, the effectiveness and efficiency of the restoration techniques being used, and any further restoration that may or may not be needed in areas of the production areas. Samples collected will be analyzed for all of the parameters found in Table 5-1 at the beginning of restoration and then all or some of the parameters as restoration continues.

The sampling frequencies that will be used during restoration for monitoring of excursions are adequate since no known preferential flow paths have been defined at either of the Nichols Ranch or Hank Units. Therefore, a uniform monitoring ring was selected to best detect an excursion. The natural groundwater flow rates for the two sites in the ore sands are estimated to be 12 and 22 ft/year. During restoration these groundwater movement rates should be reduced near the monitoring ring wells. The slow groundwater movement rates warrant the monitoring of the wells every 60 days. If the groundwater moves at 22 ft/year the actual movement for 60 days is only 3.6 ft.

Figures 3-8A and Figures 3-8B of Chapter 3.0 of the Technical Report demonstrate the proposed location of all monitoring wells (ie. MP-wells, MR-Wells, MO and MU Wells).

6.1.3.5 Effectiveness of Groundwater Restoration Techniques

The monitor wells that were used to establish the baseline water quality in a production area ore zone (i.e. MP-Wells) will be the same wells that will be used to monitor groundwater quality during restoration.

The groundwater restoration methods described in this application have been successfully used at other ISR operations in the Wyoming, including the Great Divide and Powder River Basins, Nebraska, and Texas. By using the techniques presented in this application the operations that have used the proposed restoration techniques have obtained regulatory approval for groundwater restoration. As mentioned in Section 6.1.3, several of the successful operation have been located very near the Nichols Ranch ISR Project and have used the proposed restoration techniques in similar formations with very similar operational techniques. The following information details the success of three ISR operations that have used the proposed restoration techniques and are located within the Powder River Basin.

Smith Ranch/Highland Uranium Project

The Smith Ranch/Highland Uranium Project currently operated by Cameco Resources, Inc [formally Power Resources, Inc (PRI)] had two R&D and commercial wellfields approved as restored by both the NRC and WDEQ. In 2004 the A-Wellfield was approved by both agencies as restored after commercial operation to applicable regulatory standards. Not all of the parameters were returned to baseline conditions, but the groundwater quality was consistent with the pre-mining class of use. In 1987, the NRC confirmed the restoration of the Q-Sand Project. Although one well exhibited uranium and nitrate levels above the restoration target values, the wellfield water quality averages, as a whole, were below the target values.

Christensen Ranch/Irigaray Uranium Project

The Irigaray/Christensen Ranch Uranium Project operated by COGEMA Mining, Inc. has received both WDEQ and NRC approval for groundwater restoration for Wellfield 1 through 9 at Irigaray following commercial operation of the wellfields and groundwater restoration. When restoration of the wellfields was completed, 27 of the 29 constituents were restored to the restoration target values. Only bicarbonate and manganese did not meet the restoration target value, but the two constituents did meet the pre-mining class of use criteria. Based on this, the WDEQ determined that the groundwater had been returned to its pre-mining class of use and that restoration was complete.

In 2006, the NRC agreed with the DEQ determination that restoration was complete and that Wellfields 1 through 9 had been restored in accordance with the applicable regulatory requirements.

Reno Creek Project

The Reno Creek Project was an R&D ISR project operated by Rocky Mountain Energy Corporation (RME) located approximately less than 20 mi to the East of the Nichols Ranch ISR Project. In October of 1980, a sodium carbonate/bicarbonate lixiviant was used to extract uranium from two wellfields, Pattern 1 and Pattern 2. Both patterns were located in the typical sandstone formations found in the Powder River Basin, but Pattern 1 was located in a confined portion of the mining aquifer while Pattern 2 was located in an unconfined portion of the mining aquifer. The water level in Pattern 2 was approximately 8 feet below the top of the aquifer.

After 10 weeks of lixiviant injection, recovery operations were halted and groundwater restoration began. The techniques used during groundwater restoration included pumping and circulating the wellfields back through the ion exchange (IX) process. This process continued for a one month period of time and was then followed by a groundwater sweep. At the close of the groundwater restoration program, all groundwater constituents, except uranium, were restored to levels below or within baseline ranges. Uranium was reduced to less than 5 parts per million which is below the standard for drinking water in Wyoming. After restoration and stabilization data were thoroughly evaluated by the WDEQ and NRC, both agencies concluded that the goal of restoring the groundwater to pre-mining baseline conditions was achieved for all parameters except uranium, but the uranium met the pre-mining class of use standards. Thus the groundwater was restored and that the restoration was suitable, for both Pattern 1 and the unconfined Pattern 2, to support commercial ISR operations.

Three reports titled, "Reno Creek ISL Hydrology," "Reno Creek Project, Demonstrated Restoration Report," and "Hydrologic Analysis of the Reno Creek – Pattern 2 Property For In Situ Uranium Recovery" are attached in Addendum 6C for further information on the Reno Creek Project and the restoration on the unconfined Pattern 2.

6.1.3.6 Environmental Effects of Groundwater Restoration

The restoration of groundwater at ISR operations and at other ISR operations in the Powder River Basin has proven successful by utilizing the techniques discussed in the application. Uranerz Energy Corporation expects that groundwater restoration at the Nichols Ranch ISR Project will also be successful at both the Nichols Ranch and Hank Units by utilizing the proven techniques that have been discussed. As with any groundwater restoration, the purpose of the restoration is to restore the groundwater back to the restoration target values so that adjacent groundwater is protected outside the EPA/WDEQ exempted production area. If during groundwater restoration, a constituent cannot technically or economically be restored to its restoration target value within the production area, the NRC and WDEQ will require Uranerz Energy Corporation to demonstrate that leaving the constituent at a higher concentration will not be a threat to public health and safety, to the environment, or produce any unacceptable impact to the use of adjacent groundwater resources. With the proven application of the best practicable technology for groundwater restoration and the in place regulatory requirements of the WDEQ and NRC, Uranerz Energy Corporation believes that there is no adverse impact on the water quality of groundwater outside the production area.

The proposed restoration techniques do consume groundwater. During the restoration process, water will be consumed by the groundwater sweep. This amount, based on one pore volume could be as much as twenty million plus gallons of water. Also during restoration, approximately 20 to 25% of the groundwater treatment flow through the reverse osmosis (RO) units is disposed of as brine that is sent to the deep disposal well. This consumption of water is an unavoidable consequence of groundwater restoration, but will not have any different affect on surrounding groundwater used outside of the production zone other than those impacts that have been discussed in Chapter 2.0, Section 2.7 and Chapter 7.0, Section 7.2.3.

6.1.4 Restoration Stability Monitoring Stage

Once a production area has been designated as restored by the Wyoming Department of Environmental Quality, a six month stability period begins to ensure that the restoration goal of returning the production area groundwater to baseline water quality or pre-mining class of use category is maintained. The following restoration stability monitoring program will be in place during the stability period:

1. The monitor ring wells are sampled once every two months and analyzed for the UCL (upper control limits) parameters: chloride, total alkalinity and conductivity; and
2. At the beginning, middle, and end of the stability period, the production wells will be sampled and analyzed for the parameters in Table 5-1.

In the event that unforeseen conditions (such as snowstorms, flooding, and equipment malfunction) occur, the WDEQ will be contacted if any of the monitor or production wells cannot be monitored within 65 days of the last sampling event.

The six month stability monitoring period is specified in WDEQ-LQD Guideline 4. The criteria to establish restoration stability will be based on wellfield averages for water quality. A determination of aquifer stability should be made upon the "trends" in the data; i.e., a stable aquifer should not exhibit rapid upward or downward trends or be oscillating back and forth over a wide range of values. The data is evaluated against baseline quality and variability to determine if the restoration goal is met and if the water is restored at a minimum to within the class of use.

6.1.5 Well Abandonment

When the groundwater has been adequately restored and determined stable by the regulatory agencies, surface reclamation and well abandonment will begin. All production, injection, monitor wells, and drill holes will be abandoned in accordance with WS-35-11-404 and Chapter VIII of the Wyoming Department of Environmental Quality-Land Quality Rules and Regulations to prevent adverse impacts to groundwater quality or quantity, and to ensure the safety of people, livestock, wildlife, and machinery in the area.

Wells will be abandoned using the following procedure:

1. All pumps and piping will be removed from wells, when practicable.
2. All wells are plugged from total depth to within 5 ft of the collar with a well abandonment plugging gel formulated for well abandonment and mixed in the

recommended proportion of 10 to 20 lbs per barrel of water, to yield an abandonment fluid with a 10 minute gel strength of at least 20 lbs/100 sq ft and a filtrate volume not to exceed 13.5 cc.

3. The casing is cut off at least two feet below the ground surface. Abandonment fluid is used to fill the void to the top of the cut-off casing.
4. Cement or a plastic plug will be placed at the top of the abandoned well casing. The area is backfilled, smoothed, leveled, and reseeded to blend with the natural terrain.

Any deviation from the above procedure will be approved in advanced by the NRC and WDEQ.

6.2 SURFACE RECLAMATION AND DECOMMISSIONING

6.2.1 Introduction

At the completion of mining of the Nichols Ranch ISR Project, all lands disturbed by the mining project will be restored to their pre-mining land use of livestock grazing and wildlife habitat. Any buildings or structures will be decontaminated to regulatory standards, and either demolished and trucked to a disposal facility or turned over to the landowner if desired. Baseline soils, vegetation, and radiological data will be used as guide in evaluating the final reclamation. A final decommissioning plan will be sent to the NRC for review and approval at least 12 months prior to the planned decommissioning of a wellfield or project area.

6.2.2 Surface Disturbance

Because of the nature of ISR mining, minimal surface disturbance will be associated with the Nichols Ranch ISR Project. Surface disturbance will consist of construction activities associated with the construction of the central processing plant (CPP), satellite plants, and wellfields including well drilling, pipeline installations, and road construction. Disturbances associated with the wellfield impact a relatively small area and have short-term impacts.

Surface disturbances associated with the construction of the central processing plant, satellite plants, and wellfield header houses will be for the life of those activities. Topsoil will be stripped from these areas prior to the construction of the facilities. Disturbances associated with the wellfield drilling and pipeline installation are limited and reclaimed as soon as possible after completion of these items. Access roads to and from the wellfield are also limited with minimum surface disturbance.

6.2.3 Topsoil Handling and Replacement

Topsoil will be salvaged from any building sites, permanent storage areas, main access roads, and chemical storage areas prior to construction in accordance with Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD) requirements. To accomplish this, typical earth moving equipment such as rubber tired scrapers and front end loaders will be utilized. Topsoil salvage operations for the wellfield will be limited to the removal of topsoil at header house locations. Wellfield access roads topsoil removal will be in accordance with the landowner's road construction practices. These practices are outlined in the letter attached in Addendum 6A. All together, an estimated 100 acres of topsoil will be salvaged, stockpiled, and reapplied during the life of the Nichols Ranch ISR Project.

Topsoil that is salvaged during construction activities will be stored in designated topsoil stockpiles. These stockpiles will be located so as to minimize topsoil losses from wind erosion. Topsoil stockpiles will also not be located in any drainage channels or other locations that could lead to a loss of material. Berms will be constructed around the base of the stockpiles along with the seeding of the stockpiles with a mixture of Western Wheatgrass and Thickspike Wheatgrass at a seeding rate of seven pounds pure live seed per acre per wheatgrass species to reduce the risk of sediment runoff. Additionally, all topsoil stockpiles will be identified with highly visible signs labeled "Topsoil" in accordance with WDEQ-LQD requirements.

During excavations of mud pits associated with well construction, exploration drilling, and delineation drilling activities, topsoil is separated from the subsoil with a backhoe. The topsoil is first removed and then placed at a separate location. The subsoil is then removed and deposited next to the mud pit. When the use of the mud pit is complete (usually within 30 days of initial excavation), the subsoil is then redeposited in the mud pit followed by the replacing of the topsoil. Pipeline ditch construction will follow a similar path with the topsoil stored separately from the subsoil with the topsoil deposited on the subsoil after the pipeline ditch has been backfilled. These methods of topsoil salvaging have proven to be adequate as demonstrated by the successful revegetation and reclamation at prior and existing ISR operations.

6.2.4 Vegetation Reclamation Practices

All revegetation practices will be conducted in accordance with the WDEQ-LQD regulations and the methods outlined in the mining permit. Topsoil stockpiles, along with as many as practical disturbed areas of the wellfield, will be seeded with vegetation throughout the mining operation to reduce wind and water erosion. Final revegetation of the mine area will consist of seeding the area with one final reclamation seed mix. Table 6-1 shows the seed mixture that will be used for reclamation. This mixture was developed through discussions with the landowner and approved by the WDEQ-LQD. A seeding rate of 15 pounds of pure live seed per acre will be used when using a rangeland drill. On areas where it is not practicable to use a drill, the seed will be broadcast at a rate of 30 pounds pure live seed per acre.

The success of the final revegetation will be determined by measuring the revegetation in meeting prior mining land use conditions and reclamation success standards as compared to the "Extended Reference Area" outlined in WDEQ-LQD Guideline No. 2. The Extended Reference Area allows for a statistical comparison of the reclaimed area with an adjacent undisturbed area of the same or nearly the same vegetation type. The area that the Extended Reference Area has to encompass needs to be at least one half the size of the reclaimed area that is being assessed or at least no smaller than 25 acres in size.

In choosing the Extended Reference Area, the WDEQ-LQD will be consulted. This will ensure that the Extended Reference Area adequately represents the reclaimed area being assessed. The success of the final revegetation and final bond release will be determined by the WDEQ-LQD.

Table 6-1 Uranerz Reclamation Seed Mixture.

Species	Percent of Mix	Pounds PLS/acre
Western Wheatgrass	28	4.2
Revenue Slender Wheatgrass	28	4.2
Bozoisky Russian Wildrye	19	2.85
Greenleaf Pubescent	9	1.35
Gulf Annual Ryegrass	6	0.9
Yellow Blossom Sweet Clover	5	0.75
Ladak 65 Alfalfa	5	0.75
Total	100	15

6.2.5 Road Reclamation

6.2.5.1 Access Roads

Two access roads will be built to connect both the Nichols Ranch central processing plant (CPP) and the Hank satellite plant with the existing ranch roads. The length of the Nichols Ranch CPP road is approximately 0.20 mi in length. The Hank satellite plant road will also be approximately 0.20 mi in length. If the landowner desires, the roads will be left in place when operations are complete. If not, the roads will be reclaimed. Even if the roads are left in place, third party reclamation costs will be included in the reclamation bond estimate.

If the access roads are to be reclaimed, the first step will be to pick up and remove the scoria/gravel on the road surface. Once the scoria/gravel has been removed the roadbed will be disced or ripped. Next, the topsoil stored in the ditch will be re-applied on the road surface. Finally, the road surface will be mulched and seeded with the permanent seed mixture.

6.2.5.2 Wellfield Access Roads

The wellfield access roads will allow vehicular traffic to move from the plants to the wellfields and from one wellfield to another wellfield. The construction design for the wellfield access roads is present in Addendum 6A. At the time of decommissioning, the landowner will decide which wellfield access roads will remain and which roads will be reclaimed.

If wellfield access roads are to be reclaimed, the first step in reclaiming the wellfield access roads will be to pick up and remove the scoria/gravel so that the roadbed is back to the approximate original grade. Next, the roadbed will be either disced or ripped. The disturbed area will then be mulched and seeded with the permanent seed mixture.

6.2.6 Site Decontamination and Decommissioning

A pre-remediation radiological survey will identify areas of the site that need to be cleaned up to comply with respective or applicable limits. Prior to commencement of reclamation, Uranerz will make available the results of the pre-remediation radiological survey that documents the post-operational condition of the site. The pre-remediation radiological survey will include lands (soils), and structures and equipment.

6.2.6.1 Reclaiming Disturbed Lands

Following the successful conclusion of the aquifer restoration stability period in a particular production area, the wellfield piping, well heads and associated equipment will be removed and, if serviceable, taken to a new production area for continued service. Wellfield equipment that is no longer usable will be gamma surveyed and placed in either a contaminated or non-contaminated bone yard located near the central processing plant for subsequent removal from the site. If the final production area is being reclaimed, the nonsalvageable contaminated piping, well heads, and associated equipment will be trucked from the site to an approved NRC disposal facility.

Uranerz will provide a plan for reclamation of land (soil plan) to the NRC for review and approval at least 12 months before the planned commencement of reclamation of a well field or licensed area. The plan will include a description of the areas to be reclaimed, a description of planned reclamation activities, a description of methods to be used to ensure protection of workers and the environment against radiation hazards, a description of the planned final radiation survey including cleanup criteria for soil, and a respective cost estimate.

The cleanup criteria for radium in soils will be as provided in 10 CFR Part 40, Appendix A, Criterion 6(6).

The cleanup criteria for Th-230 in soil will be that concentration, when combined with the residual concentration of Ra-226 (i.e., contribution from thorium transformation plus residual radium), will result in the radium concentration that would be present in 1,000 years satisfying the radium cleanup standard.

The cleanup criteria for uranium in soil will be derived from the radium benchmark dose approach of 10 CFR Part 40, Appendix A, Criterion 6(6).

6.2.6.2 Removing and Disposing of Structures and Equipment

After groundwater restoration is complete in the final production area, decommissioning of the Nichols Ranch Unit central processing plant site and the Hank Unit satellite plant will commence. (The Nichols Ranch plant may continue to be used after completion of mining to process materials from other satellites.) All process equipment associated with the plants will be dismantled and either sold to another NRC licensed facility or decontaminated to satisfy the surface contamination levels of "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material." Any material that cannot be decontaminated to an acceptable level will be disposed of at an approved NRC facility. After decontamination, materials that will not be reused or that do not have any resale value, like building foundations, will be removed and disposed of at an off-site facility.

Uranerz will provide a plan for decommissioning structures and equipment (plan) to the NRC for review and approval at least 12 months before the planned commencement of decommissioning of such structures and equipment. The plan will include a description of structures and equipment to be decommissioned, a description of planned decommissioning activities, a description of methods to be used to ensure protection of workers and the environment against radiation hazards, a description of the planned final radiation survey, and a respective cost estimate.

Nonradioactive hazardous wastes will be segregated and disposed of at a hazardous waste disposal facility. Non-radiological uncontaminated wastes will be disposed of as ordinary solid waste at a municipal solid waste facility. Closure of the site will otherwise be completed in conformance with 10 CFR Part 40, Appendix A, Criterion 6 (7).

6.2.7 Final Contouring

Because of the nature of solution mining, very little, if any, construction activities will take place which will require any major contouring during reclamation. Any surface disturbances that do occur will be contoured to blend in with the natural terrain. The Nichols Ranch Unit plant site and Hank Unit satellite plant site will be contoured to blend in with the natural terrain after all buildings have been removed; topsoil replacement and reseeding of the area will then take place. No final contour map has been included since no significant changes in the topography will result from the proposed mining operation.

6.2.8 Financial Assurance

Uranerz Energy Corporation will maintain surety instruments to cover the costs of reclamation for the Nichols Ranch ISR Project. The surety instruments will cover the costs of groundwater restoration, decommissioning, dismantling, and disposal of all facilities including buildings and the wellfield, and the reclamation and revegetation of all affected mining areas. Additionally, the NRC and WDEQ-LQD require an updated Annual Surety Estimate Revision to be submitted each year to adjust the surety instrument amount to reflect existing operations and those planned for construction or operation in the following year. Uranerz Energy Corporation will revise any surety instrument amount to reflect any changes to the Annual Surety Estimate Revision after its review and approval by the NRC and WDEQ-LQD. Uranerz Energy Corporation will also 1) automatically extend the existing surety amount for one year if the NRC has not approved a proposed revision at least 30 days prior to the expiration date for the existing surety, 2) revise the surety arrangement within 3 months of NRC approval of a revised closure (decommissioning) plan, if estimated costs exceed the amount of the existing financial surety, 3) update the surety to cover any planned expansion or operational change not included in the annual surety update at least 90 days prior to beginning associated construction, and 4) provide NRC a copy of the State's surety review.

Once the WDEQ-LQD, NRC, and Uranerz Energy Corporation have agreed to the estimated reclamation and restoration costs, a reclamation performance bond, irrevocable letter of credit, or other acceptable surety instrument will be submitted to the WDEQ-LQD with a copy to the NRC.

Addendum 6B contains the calculations and estimate of the proposed surety bond for the first year of operation for the Nichols Ranch ISR Project. The surety estimate is based on the first year of operation consisting of the construction of the Nichols Ranch central processing plant and the start up of the first production area at the Nichols Ranch Unit. The construction of the Hank satellite plant and the first Hank production area are also included in the surety estimate. Although the first Hank production area will be put in place, it is not anticipated to be operational in the first year thus the surety bond will not include a cost estimate for restoring the groundwater at the Hank Unit.

Groundwater restoration costs for the Nichols Ranch Unit are based on the treatment of one pore volume of groundwater sweep and 6 pore volumes of treatment using reverse osmosis. The calculation for pore volume is as follows:

> Pore Volume = (Affected Ore Zone Area) x (Average Well Completed Thickness) x (Flare Factor) x (Porosity).

The number of pore volumes needed to restore a production area can vary from operation to operation or from wellfield to wellfield. As seen by COGEMA, who is located just a few miles to the north-northwest of the Nichols Ranch ISR Project and who has operated in very similar formations and conditions as the Nichols Ranch ISR Project; the number of pore volumes needed to restore Wellfieds 1-9, that were fully operational on a commercial scale, has varied from 9.5 to 18.4 with an average of 14.6. Other Wyoming ISR operations such as the commercial Bison Basin ISR uranium project needed just six pore volumes to achieve restoration; while the Reno Creek R&D uranium project successfully restored the groundwater without RO by using ten pore volumes in both confined and unconfined settings. Based on these operations and the restoration techniques that will be used by Uranerz Energy Corporation, the number of pore volumes that Uranerz estimates that will be needed to restore the partial operating Production Area 1 in the first year of operation at the Nichols Ranch Unit has been modified to seven pore volumes, one pore volume groundwater sweep and six pore volumes circulated through an RO unit.

Along with researching the number of pore volumes used at other commercial and R&D operations, the flare factor for a typical ISR operation can be anywhere from 1.3 as seen and approved for the HRI Churchrock ISR operations in New Mexico; to 1.5 to 1.7 as modeled using MODFLOW and MODPATH by PRI's Smith Ranch wellfields. COGEMA's Irigaray/Christensen Ranch sites have used an overall flare factor of 1.44. Knowing that flare factor can be influenced by such things as well completion, but also taking into account the flare factors that have been used at operating commercial ISR operations that are adjacent to the Nichols Ranch ISR Project and operate in very similar sandstone formations and deposits, Uranerz will be using a flare factor of 1.45 for the surety estimates attached in Addendum 6B.

Porosity values used in the surety estimate are based on total porosity of the Nichols Ranch and Hank Units. Although, in places, a porosity of 0.05 is used in the application, this porosity is used in only discussion about effective porosity. The effective porosity values for the A and F Sands of 0.05 was used for calculation of groundwater velocity. A total porosity is more appropriate for the restoration pore volumes than for the effective porosity. The effective porosity for groundwater velocity estimates was conservatively estimated from the lithologic materials at the two sites. A smaller effective porosity results in a conservatively higher groundwater velocity. The porosity value in the surety estimate has been revised to 0.3 for consistency.