3.0 DESCRIPTION OF THE FACILITIES

The Nichols Ranch In Situ Recovery (ISR) Project is divided into two units, the Nichols Ranch Unit and the Hank Unit. The Nichols Ranch Unit encompasses approximately 1,120 acres of land, and the Hank Unit area encompasses approximately 2,250 acres of land. The project units will contain all of the proposed operations. The major surface facilities include the central processing plant, satellite plant, wellfields, and deep disposal wells. The injection and production proposed wellfield and disturbance area for Nichols Ranch Unit will contain approximately 113 acres, and Hank Unit will contain approximately 155 acres. The deep disposal wells will be designed for at least 100 gallons per minute (GPM) flow rate each and have a maximum injection pressure less than the fracture pressure of the formation.

3.1 IN SITU RECOVERY PROCESS AND EQUIPMENT

Uranerz plans to mine the Nichols Ranch Unit (Township 43N, Range 76 West, Sections 7, 8, 17, 18, and 20) and Hank Unit (Township 44N, Range 75 West, Sections 30 and 31; Township 43N, Range 75 West, Sections 5, 6, 7 and 8) ore zones using the in situ recovery (ISR) extraction method. This is the same method that is used by Power Resources Inc. (PRI) at the Smith-Highland mine in the southern Powder River Basin and is the same method used by COGEMA (AREVA) at the nearby Christensen Ranch Site.

The ore zones at the Nichols Ranch Unit and the Hank Unit will be divided into individual production areas where injection and recovery wells will be installed. As typical with the above mentioned commercial operations, the wells will be arranged in 4-spot, 5-spot or 7-spot patterns. In some situations, a line-drive pattern or staggered line-drive pattern may be employed. Horizontal and vertical excursion monitor wells will be installed at each wellfield as dictated by geologic and hydro-geologic parameters, and as approved by the Wyoming Department of Environmental Quality - Land Quality Division and the United States Nuclear Regulatory Commission. The facilities will be constructed according to acceptable engineering practices.

3.2 SITE FACILITIES LAYOUT

The Nichols Ranch Unit will consist of a complete processing plant including auxiliary facilities such as office, change room, laboratory, maintenance and deep disposal well. The processing plant will have the capability of concentrating the wellfield recovery solution obtained from wells installed in the Nichols Ranch Unit ore zone. Figure 3-1 (see map pocket) is a site facility diagram of the Nichols Ranch Unit. This figure shows the location of the major surface facilities.

In addition, the Nichols Ranch Unit processing facility will have excess installed capacity to process uranium loaded resin or yellowcake slurry from the Hank Unit Satellite plant. The accumulated uranium values from both ore zones will then be processed into a dry yellowcake concentrate, packaged in approved 55 gallon steel drums, and trucked off site for conveyance to the licensed uranium conversion facility of choice. At the Hank Unit there will be a plant building, maintenance building, and deep disposal well. A site facility diagram showing the major surface buildings for the Hank Unit is presented in Figure 3-2 (see map pocket).

The central processing plant at the Nichols Ranch Unit and the satellite plant at the Hank Unit will each have a concrete foundation. The concrete foundation will have concrete curbed side walls. The height of the concrete sides will be such that the curbed foundation will contain the volume of the largest tank located at that Unit. Any of the spills located within the curbed foundation areas will be considered contained spills. The Unit's foundation will be sloped toward multiple sump pumps. If the sump pump is in a production area, the fluid may be pumped back into the process circuit. However, all sump pumps will also be routed to the waste tanks to be pumped down the deep disposal well.

3.2.1 Nichols Ranch Unit – Central Processing Plant

At the Nichols Ranch Unit processing facility, most of the process equipment will be housed in an approximate 150 x 250 ft metal building with eave heights less than 50 ft. The major process equipment is shown in Figure 3-3 (see map pocket), with some of the bulk chemical storage tanks located outside of the process building. The major equipment inside the process building will be the ion exchange circuit, the lixiviant make-up circuit, the elution/precipitation circuit, and the yellowcake drying facility. During restoration, the water treatment system for aquifer restoration will also be located in the process building.

The yellowcake drying and drumming facilities will be located at one end of the process building. Due to the height of the dust abatement equipment, the building's eave height is approximately 40 ft at this end. A yellowcake storage area will be located adjacent to the yellowcake drying and packaging area. This will be an enclosed, heated area approximately 60 x 60 ft. By storing the drummed yellowcake within an enclosed area, employee safety will be improved (no snow or ice to work around) and the packaged product will be secured under locked conditions.

An office building, now planned to be approximately 150 x 60 ft, will be located adjacent to the process building. The office will be near the process building to allow use of a centralized lunch room and restroom facilities. In addition to office spaces for professional staff; a central security monitoring room, computer server room and the on-site laboratory will be located in the office building.

A second auxiliary building (maintenance building) will house the vehicle, electrical, and rotating equipment maintenance area, as well as provide an area for additional office spaces for field and operating personnel. The first aid area may be located in the maintenance building.

3.2.2 Hank Unit – Satellite Facility

The Hank Unit satellite facility will consist of an ion exchange circuit and lixiviant make-up circuit, bleed treatment and disposal well. Most of the process equipment will be housed in an approximate 80 x 160 ft metal building with eave heights less than 40 ft. The process equipment layout is shown in Figure 3-4 (see map pocket) with some of the bulk chemical storage tanks located outside of the process building. Carbon dioxide will be added to the lixiviant as the fluid exits the Hank Unit satellite facility and returns to the header houses where oxygen and/or sodium bicarbonate could be added prior to injection into the wellfield.

3.2.3 Process Description

3.2.3.1 Uranium Recovery

The proposed uranium in situ recovery (ISR) process has been successfully tested at the Ruth R & D project and at a commercial scale at other uranium ISR extraction properties in Wyoming including the nearby Christensen Ranch Mine. This process, involving the dissolution of the water soluble uranium compound from the mineralized host rock at neutral pH ranges, consists of two steps. First, the uranium is oxidized from the tetravalent to the hexavalent state with an oxidant such as oxygen or hydrogen peroxide. Second, a chemical compound such as a baking soda ($NaHCO_3$) is used to complex the uranium in the solution if needed. The uranium rich solution (typically 20 mg/l to 250 mg/l, but may be higher or lower) is transferred from the production wells to the processing facility nearby for uranium concentration with ion exchange resin. Figure 3-5 (see map pocket) shows a general flow process schematic.

3.2.3.2 Lixiviant Composition

The lixiviant for the in situ uranium recovery process is a dilute carbonate/ bicarbonate aqueous solution that is fortified with an oxidizing agent. During the injection of lixiviant, oxygen or hydrogen peroxide will be added to oxidize the uranium underground. A small amount of chlorine or sodium hypochlorite, approximately 3 mg/l as chlorine, may be added to the injection solution to prevent bacterial plugging of the injection wells. Carbon dioxide is provided to lower the pH to about neutral. Additionally, carbon dioxide dissolved in water provides another source of the carbonate/ bicarbonate ions. Finally, sodium carbonate/ bicarbonate may be used to adjust the carbonate/ bicarbonate concentration.

The barren solution that leaves the uranium ion exchange system will be refortified with chemicals prior to the re-injection into the ore zone aquifer. The process continues until the economics become unfavorable.

3.2.3.3 Process Plant Circuits

The proposed Nichols Ranch Unit processing plant will have three major solution circuits: 1) the recovery/ extraction circuit, 2) the elution circuit, and typically 3) a yellowcake slurry production circuit. The system is designed to recycle and reuse most of the solutions inside each circuit. A small bleed will be taken from each circuit to prevent buildup of undesirable ions. This bleed solution will be routed to the deep disposal well.

The recovery/extraction circuit includes the flow of lixiviant from the wellfield to the sand filters, or directly to the ion exchange columns and back to the wellfield. The uranium, that is liberated underground, is extracted in the ion exchange system of the process plant. The bleed from the circuit is permanently removed from the lixiviant flow to create a "cone of depression" in the wellfield's static water level and ensure that the lixiviant is contained by the inward movement of groundwater within the designated recovery area. The bleed is disposed of by means of injection into Class I – Non Hazardous approved deep disposal wells. The volume of the concentrated bleed is approximately 0.5% to 1.5% of the circulating lixiviant flow for the Nichols Ranch Unit and 2.5% to 3.5% for the Hank Unit.

The Nichols Ranch Unit elution circuit is designed to release the uranium from the loaded ion exchange resin by applying an aqueous solution of salt and sodium carbonate or sodium bicarbonate to the loaded ion exchange resin. The uranium concentration in the eluate will be built up at a controlled concentration range of between 20 to 40 grams per liter. This uranium rich eluate is ready for the de-carbonation process that occurs in the uranium precipitation circuit.

The yellowcake production circuit starts when the eluate is treated with acid to destroy the carbonate portion of the dissolved uranium complex. In addition to adding the acid slowly, a common defoamer may be used to reduce the foaming activity. The precipitation reagents, hydrogen peroxide and sodium hydroxide, or ammonia are added to the eluate to precipitate uranium yellowcake. The yellowcake slurry is then filtered, washed, dried, and drummed.

A bleed from the elution and the yellowcake precipitation circuits is used to control the concentration of undesirable ions such as sulfates. The chemical strength is refortified during each cycle.

3.2.4 Chemical Reactions

3.2.4.1 Underground Recovery

Oxidation of tetravalent uranium is achieved by using oxygen or hydrogen peroxide. For economic reasons, oxygen is widely used in commercial applications. Uranerz will use oxygen as the primary oxidant; however, hydrogen peroxide may be used if needed to increase the oxidation potential in the lixiviant.

The end product of the carbonate/bicarbonate complexing process can be identified as uranyl-dicarbonate, $[UO_2(CO_3)_2]^{2-}$ (UDC), at neutral pH ranges and as uranyl-tricabonate, $[UO_2(CO_3)_3]^{4-}$ (UTC), at more alkaline pH ranges.

The chemical reactions for the alkaline recovery process are listed as follows:

Oxidation: $UO_2 + ½ O_2 = UO_3$

$UO_2 + H_2O_2 = UO_3 + H_2O$

Complexing: $UO_3 + 2HCO_3- = [UO_2(CO_3)_2]^{2-} + H_2O$

$UO_3 + 2HCO_3- + CO_3- = [UO_2(CO_3)_3]^{4-} + H_2O$

3.2.4.2 Ion Exchange

A strong base resin will be used for the ion exchange of either the uranyl-dicarbonate complex, $[UO_2(CO_3)_2]^{2-}$ (UDC), or the uranyl-tricarbonate complex, $[UO_2(CO_3)_3]^{4-}$ (UTC), in the process plant.

The chemical reactions are listed as follows:

$$[UO_2(CO_3)_2]^{2-} + R^{2+} = R[UO_2(CO_3)_2]$$
$$[UO_2(CO_3)_3]^{4-} + 2R^{2+} = R_2[UO_2(CO_3)_3]$$

R denotes the active site on the ion exchange resin.

The barren lixiviant will be reconstituted to the proper bicarbonate strength if needed prior to wellfield injection. Sesqui-carbonate, soda ash, and/or carbon dioxide will be used, if needed, to maintain proper sodium bicarbonate strength. Carbon dioxide may also be used to adjust the pH.

3.2.4.3 Elution Process and Resin Handling

The resin is ready for elution when it is fully loaded with uranium. The elution process reverses the loading reactions for the ion exchange resin and strips the uranium from the resin. The eluant will be an aqueous solution containing salt and sodium carbonate and/or sodium bicarbonate.

The chemical reactions are listed as follows:

$$R\,[UO_2(CO_3)_2] = [UO_2(CO_3)_2]^{2-} + R^{2+}$$
$$R_2[UO_2(CO_3)_3] = [UO_2(CO_3)_3]^{4-} + 2R^{2+}$$

The elution circuit at the Nichols Ranch Unit facility will be designed to also accept and elute uranium loaded resin from other satellite operations. A DOT approved trailer will be used to transport the resin to and from satellite facilities. The resin will be hydraulically removed from the trailer and screened to remove formation sand and other debris. Once screened, the resin will flow by gravity into a dedicated elution vessel where the resin will be contacted with eluant.

3.2.4.4 Yellowcake Production

Yellowcake will be produced from the rich eluates that are processed at the Nichols Ranch Unit. The eluate from the elution circuit will be de-carbonated by lowering the pH below 2 with acid. The yellowcake product will be precipitated with hydrogen peroxide and a base such as sodium hydroxide or ammonia.

De-carbonation:

$$[UO_2(CO_3)_2]^{2-} + 4H^+ = UO_2^{2+} + 2CO_2 + 2H_2O$$
$$[UO_2(CO_3)_3]^{4-} + 6H^+ = UO_2^{2+} + 3CO_2 + 3H_2O$$

Precipitation:

$$UO_2^{2+} + H_2O_2 + 4H_2O = UO_4{\cdot}4H_2O + 2H^+$$

The precipitated yellowcake slurry will be transferred to a filter where excess liquid will be removed. Following a fresh water wash step that will flush the dissolved chlorides, the resulting product cake will be transferred to the yellowcake dryer which further reduces the moisture content, yielding the final dried free flowing product.

The yellowcake dryer will operate under a vacuum. The use of vacuum conditions lowers the temperature at which the yellowcake solids are dried (typically 165 F to 190 F). At these temperatures, water soluble uranium oxides and other compounds are not formed. In addition, the vacuum draws solids and water vapor toward the system's interior preventing unwanted dust releases. This type of dryer is the same design that has been successfully used by Power Resources Inc. (PRI) at the Smith-Highland mine in the southern Powder River Basin.

3.2.5 Flow and Material Balance

The ion exchange system for the Nichols Ranch Unit is designed to accommodate flow rates up to 3,500 GPM. In order to contain the lixiviant within the designated wellfield recovery area, a small portion of the barren solution is withdrawn from the ion exchange circuit. The amount of bleed is estimated to be in the average range of 1% of the overall flow rate or equivalent to about 35 GPM.

The ion exchange system for the Hank Unit is designed for flow rates up to 2,500 GPM. The average bleed rate for Hank Unit is estimated to be 3% or equivalent to about 75 GPM. The bleed rate estimates are discussed in detail in Section 3.4.8 of this Chapter.

The bleed solution is to be used to rinse and clean-up freshly eluted resin, make-up fresh eluant in the elution circuit, back wash sand filters, and wash yellowcake if necessary. A flow and material balance for the two Units are presented nominally in Figure 3-6 (see map pocket). The flow shown is an example capacity for the facilities and does not represent any design or regulatory limits. A water balance is shown in Figure 3-7 (see map pocket).

3.2.6 Sources of Plant Liquid Effluents and Disposal Methods

Liquid effluents are expected to be generated from well development water, pumping test water, process bleed, process solutions, wash-down water, and restoration water. The water generated during well development and pumping tests is expected to satisfy WDEQ-WDQ Class IV (Livestock) standards at a minimum and has minimal potential radiological impact on soils or surface water. No alternate handling or disposal method is required allowing water to be pumped onto the ground.

The process bleed and wash down water will be transferred to a deep disposal well. This deep disposal well will be equivalent in design and depth to existing deep disposal wells at similar *in* *situ* uranium recovery sites. This deep disposal well will be permitted through the WDEQ and operated according to permit requirements.

The restoration water will be treated by reverse osmosis or other purification technology. The treated restoration water will be re-injected into the process with the restoration water bleed transferred to the deep disposal well.

Uranerz plans to use two Class I – Non Hazardous or Class V deep disposal wells. One of the deep disposal wells (DDW) will be located at the Nichols Ranch Unit and one will be located at the Hank Unit. Uranerz will likely permit two DDW for each unit, but will initially only install one at each Unit. The DDWs will be permitted through the Wyoming Department of Environmental Quality – Water Quality Division, which has primacy from the EPA. Uranerz is expecting a 100 GPM flow into each of the DDW. As required, the disposal wells will be completed in approved formations. A typical deep disposal well design is depicted in Figure 3-8 (see map pocket). The exact locations will depend on field placement.

For the Nichols Ranch Unit there are three types of liquid effluent that will constitute the bleed that can be up to 35 GPM: 1) the wellfield bleed, 2) the elution circuit bleed, and 3) the general plant waste (resin wash, filter backwash, etc). A small quantity of water, about 1 to 2 GPM, may be introduced from a permitted water well for plant wash down and yellowcake wash.

Surge capacity is an important factor in maintaining balance within the main processing plant and the satellite plant. The Nichols Ranch main processing facility has four large tanks with a capacity of over 17,000 gallons each. At a fill rate of 42 GPM, the surge capacity has approximately 24-hours. The Hank Ranch satellite facility has six large tanks with a capacity of over 17,000 gallons each. At a fill rate of 77 GPM, the surge capacity has approximately 22-hours. The waste tanks are shown on Figure 3-3A Nichols Ranch Unit Process Flow Diagram Details (see map pocket) and Figure 3-4A Hank Unit Process Flow Diagram Details (see map pocket).

Uranerz has three possible solutions to manage surge capacity. One option would be to rent large capacity bladder tanks with secondary confinement. A second option would be to haul the solution over to the other site (Nichols to Hank or Hank to Nichols), and a third option would be to reduce production to minimize the waste tank fill rate, thus minimizing the volume of solution needed to be sent down the deep disposal well.

Nichols Ranch Unit 1% Bleed

Production Only

Deep Disposal Well (DDW) Flow	+100	GPM
Production Flow to DDW	(-)40	GPM
Other	(-)1-2	GPM
Remaining Balance	+58	GPM

Production and Restoration

Deep Disposal Well (DDW) Flow	+100	GPM
Production Flow to DDW	(-)40	GPM
Restoration Flow to DDW	(-)57	GPM
Other	(-)1-2	GPM
Remaining Balance	+1	GPM

Restoration Only

Deep Disposal Well (DDW) Flow	+100	GPM
Restoration Flow to DDW	(-)90	GPM
Other	(-)1-2	GPM
Remaining Balance	+8	GPM

Hank Unit 3% Bleed

Production Only

Deep Disposal Well (DDW) Flow	+100	GPM
Production Flow to DDW	(-)75	GPM
Other	(-)1-2	GPM
Remaining Balance	+23	GPM

Production and Restoration

Deep Disposal Well (DDW) Flow	+100 GPM
Production Flow to DDW	(-)75 GPM
Restoration Flow to DDW	(-)22 GPM
Other	(-)1-2 GPM
Remaining Balance	+1 GPM

Restoration Only

Deep Disposal Well (DDW) Flow	+100 GPM
Restoration Flow to DDW	(-)90 GPM
Other	(-)1-2 GPM
Remaining Balance	+8 GPM

For the restoration operation, reverse osmosis or other purification technologies will be used to treat the recovery solution from the spent production areas. The groundwater restoration plan is discussed in detail in Chapter 6.0. For a typical restoration schedule, the anticipated liquid effluent flow rates are:

Pore Volume	Gross Water Withdrawn	Net Water Consumption
1st	50 GPM	50 GPM
2nd to 5th	200 GPM	50 GPM
6th	50 GPM	50 GPM

The average annual net water consumption from the ore zone aquifer during restoration activities is anticipated to be approximately 50 GPM.

3.2.7 Airborne Effluents and Solid Wastes

The potential effluents that will need to be controlled for the Nichols Ranch ISR Project include radon, radioactive particulates in air, and radionuclides in liquid streams. The effluent control for gaseous and airborn particulates and liquid and solid wastes are discussed in detail in

Chapter 4.0. For solid waste Uranerz will obtain an agreement with a licensed and approved 11e.(2) by product disposal facility. Uranerz will notify the NRC in writing within 7 days if the agreement expires or is terminated, and Uranerz will submit a new agreement for NRC approval within 90 days of the expiration of the termination. Uranerz plans to have readily available the most current safety equipment and personal protective equipment at the Nichols Ranch Unit and the Hank Unit.

The locations for potential sources for radiological emissions in the CPP are the IX columns, the elution circuit area, the precipitation circuit, rotary vacuum dryer room, and yellowcake storage area. In the IX column, elution, and precipitation area, radon could be present. In order to prevent radon build up, building ventilation systems and tank vents will be used. The dryer room and yellowcake storage area could have the potential for radiological airborne particulates if the yellowcake is released. To protect against the airborne release of air particulates, a rotary vacuum dryer will be used along with ventilation and dust collection equipment such as baghouses will be employed. Each of these areas will be monitored as described in Chapter 5.0, Section 5.7.2. Figures 5-2a and 5-2b show the areas where monitoring will take place.

The Hank satellite location may have the potential of radon in the IX column area. Building ventilation and tank vents will be used to preventive/mitigate any potential release of radon in this area.

Chemicals used in the processing of uranium will be stored and located in areas where they should not have any effect on radiological emissions. The effects of potential accident scenarios such as a plant fire are discussed in detail in Chapter 7.0.

3.3 CHEMICAL STORAGE FACILITIES

Uranerz plans to use chemicals to extract uranium, process waste water, and restore groundwater. The Nichols Ranch Unit and the Hank Unit will store chemicals that are both hazardous and non hazardous. The different types of chemicals will be stored in separate locations. Any bulk hazardous materials that could impact the radiological safety of the facility will be isolated and stored in accordance with regulatory agency requirements. Chemicals that are considered nonhazardous and will not affect radiological safety can be stored inside the main buildings. A list of possible chemicals to be used at the facilities include: hydrochloric acid, hydrogen peroxide, sodium chloride, sodium hydroxide, sodium hypochlorite, ammonia, oxygen, carbon dioxide, sodium carbonate, and sodium bicarbonate. Material Safety Data Sheets (MSDS) for each of the chemicals will be reviewed for facility safety and for radiological effects and the sheets will be located at the Nichols Ranch Unit and the Hank Unit.

3.3.1 Process Related Chemicals

Chemicals that are considered hazardous and have the potential to effect radiological safety are ammonia (pH adjustment), hydrogen peroxide (uranium precipitation and oxidant in lixiviant), and hydrochloric acid (pH adjustment). These chemicals will be located outside of the main processing building. They will be separated from inside the process area until their addition point. The outside storage location may have a concrete curbed secondary containment basin for the tanks.

Oxygen (oxidant in lixiviant), sodium hydroxide (pH adjustment), sodium hypochlorite, carbon dioxide (carbonate complexing), sodium carbonate/bicarbonate (carbonate complexing and resin regeneration), and sodium chloride (resin regeneration) are the other bulk chemicals used for processing the uranium. The carbon dioxide is typically stored outside and is added to the lixiviant before the flow leaves the ion exchange facilities. Oxygen can also be stored centrally so that it can be added to the injection stream in each header house or if necessary the oxygen can be added down hole with individual spargers. The sodium hydroxide, sodium carbonate/bicarbonate, and sodium chloride will be stored inside the main processing plant near the point of addition.

Chemicals that could be located at the Nichols Ranch Unit include: hydrochloric acid, hydrogen peroxide, sodium chloride, sodium hydroxide, sodium hypochlorite, ammonia, oxygen, carbon dioxide, sodium carbonate, and sodium bicarbonate. Chemicals that could be located at the Hank Unit include: oxygen, sodium bicarbonate and carbon dioxide. During groundwater restoration activities, hydrochloric acid may be located at the Hank Unit. The hydrochloric acid will be located in a secondary containment basin. Sodium carbonate and/or sodium bicarbonate could be located at the Hank Unit for leaching. Figures 3-1 and 3-2 (see map pocket) show the storage locations of chemicals for the Nichols Ranch Unit and the Hank Unit, respectively.

Standards for transporting, handling, storing, and managing hazardous chemicals have been developed by regulatory agencies. In reviewing the on site chemicals, anhydrous ammonia is likely to be the most hazardous chemical with the greatest impact to chemical safety. Uranerz may use sodium hydroxide or ammonia. If ammonia is used, the ammonia system at the Nichols Ranch Unit will be reviewed and follow accepted Environmental Protection Agency (EPA) regulations for on site quantities. To prevent unintentional releases of hazardous chemicals and limit potential impacts to the public and environment, the Risk Management Program (RMP) regulations require facilities to comply with certain actions. The actions include accidental release modeling, documentation of safety information, hazard reviews, operating procedures, safety training, and emergency response preparedness. Uranerz will comply with the RMP regulations if on site quantities of anhydrous ammonia require such actions.

3.3.2 Nonprocess Related Chemicals

Chemicals that are nonprocess related materials are stored at the Nichols Ranch Unit and the Hank Unit. The materials include gasoline, diesel and propane. Since these materials are considered flammable and/or combustible, the bulk quantities are stored outside of the main buildings. The storage tanks are located above ground and within secondary containment basins in compliance with local code.

3.4 WELLFIELDS

3.4.1 Ore Zone

The ore zones for the Nichols Ranch Unit are 300-700 ft below the surface and occur in two long narrow trends meeting at the nose. The nose is the northwest corner of the ore zone where the two narrow trends meet to form the tip of the geochemical front. The Hank Unit's ore zones are approximately 200-600 ft below the surface. The depths of the two units depend on the topography, the changes in the levels of the formation and the stratigraphic horizon. The host sand for the Nichols Ranch Unit is designated as the A Sand and the Hank Unit host sand is designated as the F Sand. The average grade of the two units is above 0.1%, the average thickness is above seven feet, and the combined areal distribution is near 100 acres.

3.4.2 Wellfield Areas

Wellfields are designated areas above the ore zone that are sized to reach the desired production goals. The ore zone is the geological sandstone unit where the leaching solutions are injected and recovered in an in situ recovery wellfield and it is bounded between impermeable aquatards. Production areas are the individual areas that will be mined in the wellfield. The injection and recovery wells are completed in the ore zone intervals of the production sand. Horizontal monitor wells are located in a ring around the wellfields. The screened intervals for the excursion monitor wells are across the entire production zone. Vertical monitor wells for overlaying and underlying aquifers are installed accordingly for one monitor well for every 4 acres of wellfield area. The distance between the monitor wells in the same aquifer shall not exceed 1,000 ft, and all monitor wells are installed within the production area unit. The final locations of the horizontal and vertical monitor wells will be submitted in the Production Area Pump Test Document as described in Section 5.7.8. This is because the actual locations might need to be changed because of topography, access, etc. Figure 3-8A Nichols Ranch Unit Proposed Monitor Well Locations, shows the proposed monitor well locations for the Nichols Ranch Unit, and

Figure 3-8B Hank Unit Proposed Monitor Well Locations, shows the proposed monitor well locations for the Hank Unit.

3.4.3 Wellfield Injection and Recovery Patterns

The patterns for the injection and recovery wells follow the conventional 5-spot pattern. Depending on the ore zone shape, 7-spot or line drive patterns may be used. A typical 5-spot pattern is shown in Figure 3-9 (see map pocket) and contains 4 injection wells and 1 recovery well. The dimensions of the pattern vary depending on the ore zone, but the injection wells will likely be between 50 and 150 ft apart. In order to effectively recover the uranium and also to complete the groundwater restoration, the wells will be completed so that they can be used as either injection or recovery wells. The leaching solution will be injected into the injection wells, and the solution will be recovered through the recovery wells. To create a cone of depression in the wellfield, a greater volume of water is recovered than injected. The excess water or wellfield bleed will be disposed of in a Class I deep disposal well. With the cone of depression being created, the natural groundwater movement from the surrounding areas is toward the wellfield providing an additional control of the leaching solution.

Wellfield bleed is defined as the difference between the amount of solution injected and produced. The bleed rate is anticipated to average 1% of the total production rate for the Nichols Ranch Unit and up to 3% for the Hank Unit. Over- production can be adjusted to guarantee the horizontal ore zone monitor wells are influenced by the cone of depression from the wellfield bleed.

Depending on the oxidation requirement of the formation, the injection wells may be equipped with down-hole oxygen spargers with oxygen being metered through individual rotometers so that each well can be controlled as to the amount of oxygen concentration it receives, or a header house oxygen manifold distributor will be installed.

The Nichols Ranch Unit and Hank Unit wellfields will have header houses that contain manifolds with valves, piping, and instrumentation for injection and recovery wells. The header houses will contain the electrical closures, flow metering, possible oxygen rotometers, and/or final injection filtration. Each header house will contain up to 60 well accommodations. There are two possible designs for a typical header house, and they are shown in Figures 3-9A-Header House Details (see map pocket) and 3-9B Header House Details Ground Level (see map pocket), and the details of the piping and instrumentation for the header house is shown in Figure 3-9C Header House Piping and Instrumentation (see map pocket).

The header houses will be metal buildings. There are two possible designs for the buildings and foundations. Depending on the terrain and logistics in the wellfield, one of the two designs will be used. Design A will have the metal building set on top of a concrete foundation. The concrete foundation will have grating, which will allow access to the subfloor containing valves and hose runs. The maximum dimensions for the header houses will be up to 40 by 20 ft with a 6-inch concrete pad floor. The floor will slope to a sump with an automatic level control pump. The sump will pipe to the recovery line and will include check valves. Design B will have the metal building set on a bermed pad. The inside of the building will be designed so that the main connection, valves a hose behind one of two walls that run the length of the header house. The walls will be 3- to 4 ft from the building edges, and thus allow for maintenance and operators to conduct their inspections and work on the ground level, and not in the subfloor area.

There are two separate solution trunk lines connecting the header houses. One of the trunk lines will take the recovery solutions from the header houses back to the processing plants, and the other trunk line will take injection fluid from the plants out to the header houses for injection into the wellfields. The actual number of header houses will depend on field placement of wells.

At each header house the individual injection and recovery flow and pressure readings will be monitored. Individual well flow readings will be recorded on a shift basis, and the overall wellfield flowrates will be balanced at least once per day. Alternately, flow and totallizer data will be transferred to the main or satellite plant and checked automatically. The recovery and injection trunk lines will have electronic pressure gauges and the information will be monitored from the Unit's control room. The control system will have high and low alarms for pressure and flow. If the pressure and/or flow is out of range the alarms will alert personnel to make adjustments, and certain ranges will signal automatic shutoffs or shutdowns.

High density polyethylene (HDPE), Polyvinyl chloride (PVC), and/or stainless steel piping are used in the wellfield. The piping would be designed for an operating pressure of 150 psig. However, the equipment will be operated at pressures less than or equal to the designed piping and other equipment ratings. If higher operating pressures are needed, the overall system would be evaluated and materials of construction with appropriate pressure ratings would be used.

Some of the lines from the ion exchanges facilities, header houses, and individual well lines may be buried to prevent freezing. Other ISR sites in Wyoming have successfully buried pipelines to protect them from freezing. Such as, COGEMA, Christensen Ranch and CAMECO's Smith Ranch Highlands operation.

3.4.4 Wellfield Operations – Production Areas

To plan production, develop extraction schedules, establish baseline data, comply with monitoring requirements and complete restoration, the Nichols Ranch Unit will be divided into two production areas. The Nichols Ranch Unit (NR) contains the central processing plant with two production areas, NR Production Area #1 and NR Production Area #2. As the productivity or head grade of some patterns for the NR Production Area #1 decrease below the economic limit, replacement patterns for the NR Production Area #2 will be placed into operation in order to maintain the desired flow rate and head grade to the processing plant. Eventually, all the patterns in NR Production Area #1 will reach their economic limit and all production flow in that area will cease. At that time, all production flow will be coming from NR Production Area #2, and restoration activities will commence at NR Production Area #1. Figure 3-10 (see map pocket) shows the two Production Areas for Nichols Ranch. A characteristic flow rate for each of the two Nichols Ranch Unit Production Areas will range from 1,000-3,500 GPM.

The Hank Unit is a remote satellite facility with two production areas, Hank Production Area #1 and Hank Production Area #2. The Hank Production Areas will follow a similar developmental, production, and restoration schedule as outlined in the above section for the Nichols Ranch Production Areas. The two Hank Production Areas are shown in Figure 3-11 (see map pocket). A characteristic flow rate for each of the Hank Unit Production Areas will range from 1,000-2,500 GPM.

A Gantt chart showing Nichols Ranch and Hank Production Areas is shown in Figure 3-12A (see map pocket). The chart shows the proposed plan for production, groundwater restoration, and decommissioning of each production area. However, the plan is subject to change due to extraction schedules, variations with production area recoveries, production plant issues, economic conditions, etc. The exact annual extraction schedules will be updated in the Annual report to the WDEQ. The proposed plan incorporates an adequate water balance calculations so that the deep disposal well can process the proposed production and restoration efforts at any given time.

After each production area is completed, aquifer restoration will begin as soon as practical. If a completed production area is near a unit that is currently being mined, a portion of the first production area's restoration may be delayed to limit interference with the current extraction production area. The exact production area size and location may change based on the final delineation results of the ore zone and the actual production performance of the particular ore zone.

3.4.5 Well Completion

Pilot holes for monitor, production, and injection wells are drilled through the target completion interval with a small rotary drilling unit using native mud and a small amount of commercial drilling fluid additive for viscosity control. The hole is logged, reamed, casing set, and cemented to isolate the completion interval from all other aquifers. The cement will be placed by pumping it down the casing and forcing it out the bottom of the casing and back up the casing drill-hole annulus. The drill holes will be large enough in diameter for adequate sealing and, at any given depth, at least three inches greater in nominal diameter than the diameter of the outer casing at that depth.

Typical well completion schematics for production wells (recovery and injection wells), and monitor wells are shown on Figures 3-13 (see map pocket) and 3-14 (see map pocket), respectively. The well casing will be fiberglass, PVC, or HDPE. The fiberglass casing has a standard joint length of 30 ft and is rated for at least 950 pounds per square inch operating pressure. PVC well casing is typically 4- to 6 inches in diameter and SDR·17 to SDR·26 (or equivalent). The PVC casing joints normally have a length of approximately 20 ft each. When PVC casing is used, each joint is connected by a water tight o-ring seal.

Casing centralizers, located approximately every 40 ft along the casing, are normally placed around the casing to ensure it is centered in the drill hole. Effective sealing materials shall consist of neat cement slurry and/or sand-cement grout meeting Wyoming State requirements described in Section 6.0, Chapter 11.0 of the LQD Non Coal Rules and Regulations unless a variance is obtained from the LQD Administrator. The purpose of the cement is to stabilize and strengthen the casing and plug the annulus of the hole to prevent vertical migration of solutions. If needed, the upper portion of the annulus will be cemented from the surface to stabilize the wellhead. This procedure is called "topping off". Tremie pipes can be used to top off a well.

After the well is cemented and the cement has set, the well is under reamed in the mineralized zone and completed either as an open hole or it is fitted with a screen assembly (slotted liner), which may have a sand filter pack installed between the screen and the under reamed formation. The well may then be air lifted for 30 minutes or more to remove any remaining drilling mud and/or cuttings. A submersible pump or small trailer mounted air compressor may be run in the well for final cleanup and/or sampling.

3.4.6 Well Casing Integrity

After an injection or recovery well has been completed, and before it is made operational, a Mechanical Integrity Test (MIT) of the well casing is conducted. For the integrity test, the bottom of the casing adjacent to or below the confining layer above the production zone is sealed with a plug, down hole packer, or other suitable device. The top of the casing is then sealed in a similar manner or with a sealed cap, and a pressure gauge is installed to monitor the pressure inside the casing. The pressure in the sealed casing is then increased to 125% of the maximum operating wellhead casing pressure. A well is considered satisfactory if a pressure drop of less than 10% occurs over a 60-min period. A second procedure that uses a 5% pressure drop over a 30 min period may also be used.

If there are obvious leaks, or the pressure drops by more than 10% during the 60-min period, or equivalent period, the seals and fittings will be reset and/or checked and another test is conducted. If the pressure drops less than 10% the well casing is considered to have demonstrated acceptable mechanical integrity.

The results of the MITs conducted during a quarter are documented on a quarterly bases to include the well designation, date of the test, method by which the MIT was completed, verification of whether the MIT was or was not established, test duration, beginning and ending pressures, and the signature of the individual responsible for conducting the test. Results of the MITs are maintained on site and are available for inspection by NRC and WDEQ personnel. In accordance with regulatory requirements the results of MITs are reported to the WDEQ on a quarterly basis for those wells that were tested. In accordance with WDEQ and EPA requirements, MITs are repeated once every five (5) years for all wells used for injection of lixiviant, or injection of fluids for restoration operations.

If a well casing does not meet the MIT criteria, the well will be placed out of service and the casing may be repaired and the well re-tested or abandoned. If a repaired well passes the MIT, it will be employed in its intended service. If an acceptable test cannot be obtained after repairs, the well will be plugged and abandoned. The WDEQ-LQD Administration will be notified in the quarterly report of wells that fail the MIT. In the quarterly report the following is required: the identification of the failed well, a description of the method of plugging or repair, a status of the corrective actions on defective wells, the results of well plugging or repair, statements that the wells were plugged according to the approved permit and that the volume of material used for plugging equals the volume of material placed in the well.

During wellfield operations, injection pressure at the injection well heads will not exceed 90% of the mechanical integrity test pressure. Injection wells will not be used for injection purposes if they do not demonstrate mechanical integrity. Additionally, a MIT will be conducted on any well to be used for injection purposes after any well repair where a down hole drill bit or under reaming tool is used. Any injection well with evidence of suspected subsurface damage will require a new MIT prior to the well being returned to service.

3.4.7 Monitoring of Wellfield Flow and Pressure

Injection well and recovery well flow rates and pressures are monitored in order that injection and recovery can be balanced for each pattern and the entire production area. Recovery flow rates will always be greater than injection rates. This flow information is also needed for assessing operational conditions and mineral royalties. The volume of fluid for each recovery and injection well is determined by monitoring individual flow meters in each production areas header houses. Recovery well volumes are determined on a daily basis. More details on the instrumentation are given in Section 3.5 of this Chapter.

3.4.8 Monitor Well Ring Gradient Reversal

An analytical simulation of the gradient reversal was conducted with the use of the Theis well flow equation, and a program by Walton (1989), which is called "WELFLO". This program sums the drawdowns from numerous stresses over a grid. The critical location for the gradient reversal at Nichols Ranch Unit is to the northwest in the downgradient direction. The wellfield orientation extends in this direction and therefore, the drawdowns for the northwestern portion of the wellfield were calculated to evaluate the gradient reversal. Figure 3-15 (see map pocket) shows the location of 73 recovery wells in the northwestern end of the number one wellfield. Additional stresses were lumped together and placed at 15 locations over the remainder with the wellfield, which extends an additional length of 4,800 ft to the southeast of these 73 stresses. This accounts for the entire stress from the wellfield with distribution of the stresses over the area. The bleed rate was applied to each of the recovery wells to simulate the net withdrawal of water from the A Sand aquifer.

An average transmissivity of 350 gal/day/ft and a storage coefficient of 1.8E-4 were used to simulate the drawdowns resulting from the bleed of the Nichols Ranch Unit Production Areas. A stress of 0.155 GPM was applied to each of the 73 recovery wells shown in the northern portion of the production area. The lumped bleed rates for the remaining 15 stresses varied from 0.93 to 2.48 GPM for a total bleed of 23.7 GPM from the additional stresses. The simulation period was one year to allow definition of the gradient reversals after a significant period of operation. The cumulative drawdown was calculated at each of the nodes. The differences between the 100 ft node drawdowns to the northwest (groundwater gradient direction) are shown on Figure 3-15 (see map pocket).

This simulated bleed rate was 1% of the overall flow and the distance between adjacent nodes on the diagonal is 141 ft. In the northwest direction, a simulated head difference between adjacent nodes that is greater that 0.47 ft indicates gradient reversal toward the wellfield. The northwest corner of the model grid is approximately 1,100 ft from the northwest edge of the wellfield, and the simulated head difference between adjacent nodes in the northwest corner of the model grid is much greater than 0.47 ft. Hence, the operation of the Nichols Ranch Unit Production Areas at a bleed of 1% will result in gradient reversal to the wellfield at a distance much greater than 1,100 ft from the northwest edge of the wellfield. A horizontal monitoring ring that is located 500 ft from the perimeter of the Nichols Ranch Unit Production Areas is within the zone of gradient reversal and will be adequate for detection of potential excursions from the Production Areas. These monitoring wells will also be spaced 500 ft from each other.

The magnitude of this simulated gradient reversal shows that the maintenance of a reversal zone in the confined aquifer at the Nichols Ranch Unit is readily achievable, and adjustments in local wellfield balance can be used to quickly induce reversal in the event of excursions.

The groundwater gradient at the Hank Unit site is 0.005 ft/ft to the west. Seventy one wells in the southern end of the Hank Unit Production Area #1 were used to simulate the composite drawdown response for the Hank Units at a rate of 0.426 GPM per well. Aquifer properties used in the simulation were a transmissivity of 400 gal/day/ft and a specific yield of 0.05. A simulation period of 365 days was also used for the Hank Unit Production Areas. The Hank Unit Production Areas are planned for a 2,500 GPM production rate and a 3% bleed was used in this simulation. This resulted in a stress at the seventy one recovery wells of 0.426 GPM. An additional nine stresses were used to simulate the remaining 105 wells in the northern portion of the wellfield with varying stresses from 3.41 to 7.24 GPM for a total additional stress of 44.74 GPM for the northern wells. The total stress rate was 75 GPM.

Figure 3-16 (see map pocket) shows the results of the gradient reversal for the Hank Unit. The head change between the 100 ft nodes is shown on this figure to the left of the 71 recovery stresses. An additional drawdown of 0.5 ft is needed to create gradient reversal toward the wellfield. Horizontal monitoring ring distance for this unconfined aquifer will be adequate at a distance of 500 ft from the wellfield perimeter with a 3% bleed rate for the Hank Unit. A spacing of 500 ft between the monitoring ring wells is also proposed for the Hank Unit.

An additional simulation was conducted on the gradient reversals for the Hank Unit. The second simulation was the same as presented above except that the net extraction from the nine southern recovery wells in the production area were increased by a total of 5 GPM, which increases the overall wellfield bleed from 3% to 3.2%. The individual bleed rate for these nine wells was 0.982 GPM instead of the 0.462 GPM used in the first Hank Unit simulation. This small localized increase in the bleed rate caused the reversal to increase by greater than 60% at a distance of 500 ft from the production area. The second simulation shows that small local adjustments in the bleed rate can be used to expand the local zone of reversal and prevent or retrieve an excursion in a particular area for the Hank Unit.

The Hank Unit simulations show that an adequate gradient will be maintained with a 3% bleed rate for the Hank Unit. The unconfined aquifer setting at the Hank Unit causes the drawdowns to exist closer to the wellfield. With the bleed rate increased to 3% the gradient reversal is extended out to 400-500 ft. The total magnitude of the drawdowns for the Hank Unit will not be as large as those at the Nichols Unit because the unconfined aquifer yields more water with smaller drawdowns.

This analysis provides the impacts that in situ recovery operations might have on surrounding groundwater. The surface pathways that might transport extraction solutions off site include the Cottonwood Drainage and the Tex Draw for the Nichols Ranch Unit and the Dry Willow and Willow Creek Drainage for the Hank Unit. The expected post-extraction impacts on geochemical properties and water quality are discussed in the Restoration section of Chapter 6.0. The flood and flood velocities are provided in Appendix D6-1.

3.5 EQUIPMENT, INSTRUMENTATION, AND CONTROL

The plant equipment at the proposed facilities will consist of standard design, construction, and materials for uranium in situ recovery extraction. Uranerz plans to install automated devices within the plant circuits to assist the operators with their coverage and reduce the number of operators required for successful coverage. Most of the automated devices will be pre-programmed to control operating parameters and the process information will be recorded. The automated systems will include alarms and shutoffs to prevent overflow and overpressure situations and provide centralized monitoring of the process variables.

The central processing plant, satellite plant, production circuits, wellfields, header houses, lines from the wellfield to the plant, and the deep disposal well will have instrumentation. The control system will have continuous monitoring, and alarms that are set when operating parameters are outside of the specified operating ranges. The alarms signal the operators to proceed with corrective actions until the parameter is back within specific ranges. Extreme tank levels or pressures will activate automatic shutdown of equipment for that area. The header houses, pipelines, and deep disposal wells are the sources of greatest risk for large spills and will have high and low pressure, and flow alarms for automatic shutdown of related equipment.

The total plant flow, total waste flow leaving the plant, and tank levels will be monitored. There will also be a low vacuum alarm for the dryer that will indicate either corrective action or automatic shut down. Manufacture's recommendations for the operating and maintenance of the dryer will be followed and recorded according to 10 CFR Part 40, Appendix A, Criterion 8. The critical systems will be equipped with back up systems that are automatically activated in a power failure or operating failure. The wellfield flows and pressures may be continually recorded, but at a minimum once a day recordings. The pressures will be kept under casing and formation rupture pressures.

The Uranerz Standard Operating Procedures (SOP) will address alarm responses, automatic shutdowns, and start up after automatic shutdowns. The SOP at both the Nichols Ranch Unit and Hank Unit facilities are designed to minimize the risks of uncontrolled releases of leaching fluids, chemicals, and plant fluids, and provide the maximum safety and protection to the environment and personnel.

In the event that a significant spill occurs in the wellfield or process plants, measures will be taken to safely and quickly contain the spill and mitigate the impacts of any released material. Proper notification of plant and corporate management will be made along with properly contacting the NRC and State if applicable.

Spills are likely to occur from leaking pipelines and fittings. If a pipeline leak or spill occurs in the plants, the spill or leak will be contained within the building with all spilled material collected in the plant sump. This material will either be pumped backed into the process or sent to the deep disposal well.

Significant wellfield spills will be contained as soon as possible. The area of the spill will be surveyed to identify any contaminated areas and then cleaned up and removed for disposal according to NRC and State regulations.

The recovery and injection trunk lines will have electronic pressure gauges and the information will be monitored from the Unit's control room. The control system will have high and low alarms for pressure and flow. If the pressure and/or flow is out of range the alarms will alert personnel to make adjustments, and certain high or low readings will signal automatic shutoffs or shutdowns. The high and low flow alarms should be very effective in detecting significant piping failures. At each header house the individual injection and recovery flow and pressure readings will be monitored. Individual well flow readings will be recorded on a shift basis, and the overall wellfield flowrates will be balanced at least once per day. Alternately, flow and totallizer data will be transferred to the main or satellite plant and checked automatically. If any process vessels or tanks that contain or have contained radioactive materials have to be entered for any reason such as cleaning, inspection, or repairs, a radiation work permit (RWP) will be issued detailing the requirements for special air sampling, protective equipment, and increased exposure surveillance.

To notify operating personnel of potential issues with process and wellfield operations, instrumentation such as flow meters and pressure indicators will be used. If any process condition falls out of the normal operating range, audible and visual alarms will sound notifying employees of potential plant problems. The alarm notification will aid in reducing the severity of any potential spills that might occur.

Uranerz has consulted with existing ISR mining operations and with system engineers who provide these types of control systems. Based upon this review process, Uranerz believes one option for a control system could be the Allen-Bradley (AB) Programmable Logic Controllers. The AB Controllers could provide control and shutdown interlocks for the Nichols Ranch Unit and Hank Unit. This equipment is currently in service at existing mines in the same geographical area. This platform is designed for use in mining and industrial applications.

Uranerz could also use fiber optic technology within the main process facility, satellite facility, header houses, and production areas to provide the maximum communications speed available. This technology can allow Uranerz to deal with power failures or flow interruptions in the most efficient manner.

This equipment will be specifically designed to be customized to the Nichols Ranch ISR Project and to optimize process control/shutdown control in the event an anomaly occurs. Application software is developed based upon the final process design. During development of the application software a Process Safety Hazard Analysis (PSHA) will be performed by engineering and operations personnel. During this analysis personnel will identify and define parameters for normal and emergency operation. Final outcomes of the PSHA will be operational descriptions and a Cause and Effect chart that will detail actions to be taken based upon operational events or upsets. This chart will be used in the development of interlocks and the creation of system shutdowns.

Upon completion of the application software the control system will be tested under controlled conditions at the supplier's facility. During the Factory Acceptance Test the control system will be fully tested to confirm it meets the intent of the design parameters and shutdown requirements developed during the PSHA and defined in the Cause and Effect chart.

As with the control system platform, Uranerz will investigate and select the most current technology for our instrumentation and field end devices. These end devices will be selected based upon process requirements developed during final process engineering. All instrumentation will be selected based upon intended service. Confirmation of metallurgy, pressure ratings, etc. will be confirmed during the PSHA.

3.6 SPILLS AND EXCURSIONS

The proper handling of spills and excursions is extremely important to Uranerz. Uranerz commits to the proper handling and reporting of spills and excursions.

3.6.1 Excursion Reporting

Uranerz Energy Corporation will verbally report to the WDEQ/LQD within 24 hours of becoming aware of noncompliance occurrences which may endanger public health or the environment; including monitoring or other information which indicates contaminates endangered an Underground Source of Water (USW), and/or noncompliances with a permit or malfunction of the injection system which caused fluid migration into or between USWs or unauthorized zones. Uranerz will also provide a written report within 7 days of becoming aware of the noncompliance occurrence.

Uranerz will notify the WDEQ/LQD within 24 hours of a second or third confirmation of a noncompliance occurrence in a regularly scheduled sample. The second sample will be conducted within 24 hours upon receipt of the results of the first sample. When the first and second samples agree, a noncompliance occurrence is confirmed. However, if the first and second samples conflict, a third sample will be obtained within 48 hours of the results of the second sample. The excursion will be considered a noncompliance occurrence if the re-samples are not completed within 30 days. Uranerz will also submit a written report within 7 days of the confirmation.

An excursion is controlled when it can be demonstrated that recovery fluid in unauthorized areas is declining. If the excursion is controlled, but the fluid has not been recovered, Uranerz will submit within 90 days of the excursion, a plan and compliance schedule. Monthly reports will be submitted to the WDEQ/LQD until the excursion is over. As part of a WDEQ/LQD requirement, a map will be generated of areas outside process pads affected by significant spills of process fluids for the respective report year, along with depiction of areas affected by previous years' significant spills. The maps will be included in the Uranerz Annual Report to the WDEQ/LQD and to the NRC.

Along with the state regulatory reporting requirements, Uranerz will verbally notify the NRC within 48 hours of becoming aware of a noncompliance occurrence reportable to the WDEQ/LQD.

Within 30 days of becoming aware of the noncompliance occurrence, Uranerz will also submit a written report in compliance with NRC license conditions.

3.6.2 Maintenance, Spill Prevention and Spill Reporting

In the event that a significant spill occurs in the wellfield or process plants, measures will be taken to safely and quickly contain the spill and mitigate the impacts of any released material. Proper notification of plant and corporate management will be made along with properly contacting the NRC and WDEQ/LQD.

Administrative and engineering controls will be established to limit both surface and subsurface releases to the environment and to mitigate the effects should a release occur. These controls, including response actions, will be implemented by operating procedures. Releases such as vessel failure, piping failure, etc.; and subsurface releases such as well excursion or piping failure.

Liquid effluents are expected to be generated from well development water, pumping test water, process bleed, process solutions, wash down water, and restoration water. The water generated during well development and pumping tests is expected to satisfy WDEQ/WQD Class III (Livestock) standards at a minimum and has minimal potential radiological impact on soils or surface water. No alternate handling or disposal method is required allowing water to be pumped onto the ground.

The process bleed and wash down water will be transferred to a deep disposal well. This deep disposal well will be equivalent in design and depth to existing deep disposal wells at similar ISR uranium recovery sites. This deep disposal well will be permitted through the WDEQ and operated according to permit requirements.

The restoration water will be treated by reverse osmosis or other purification technology. The treated restoration water will be re-injected into the production area undergoing restoration with the restoration water bleed transferred to the deep disposal well.

3.6.3 Flow Alarms for Leak Detection

The Uranerz Standard Operating Procedures (SOP) will address alarm responses, automatic shutdowns, and start up after automatic shutdowns. The SOPs at both the Nichols Ranch Unit and Hank Unit facilities will be designed to minimize the risks of uncontrolled releases of recovery fluids, chemicals, and plant fluids, and provide the maximum safety and protection to the environment and personnel. Activation of the flow alarms prompts corrective actions which inherently include inspection for leaks and spills.

At each header house the individual injection and recovery flow and pressure readings can be monitored. Individual well flow readings will be recorded on a shift basis, and the overall wellfield flowrates will be balanced at least once per day. Alternately, flow and totallizer data will be transferred to the main or satellite plant and checked automatically. The recovery and injection trunk lines will have electronic pressure gauges and the information will be monitored from the Unit's control room. The control system will have high and low alarms for pressure and flow. If the pressure and/or flow is out of range the alarms will alert personnel to make adjustments, and certain ranges will signal automatic shutoffs or shutdowns.

3.6.4 Inspections for Wellfields and Header Houses

In the Uranerz NRC Technical Report, Section 5.3 "Management Audit and Inspection Program" discusses inspections for operating wellfields and header houses. An Environmental Safety & Health staff representative or designate will conduct a daily walk through inspection of the process and storage areas, operating wellfields, and header houses. The inspection will provide for a visual survey of proper implementation of procedures, housekeeping, and contamination control.

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**"FIGURE 3-3A,
PROCESS FLOW DIAGRAM
NICHOLS RANCH UNIT."**

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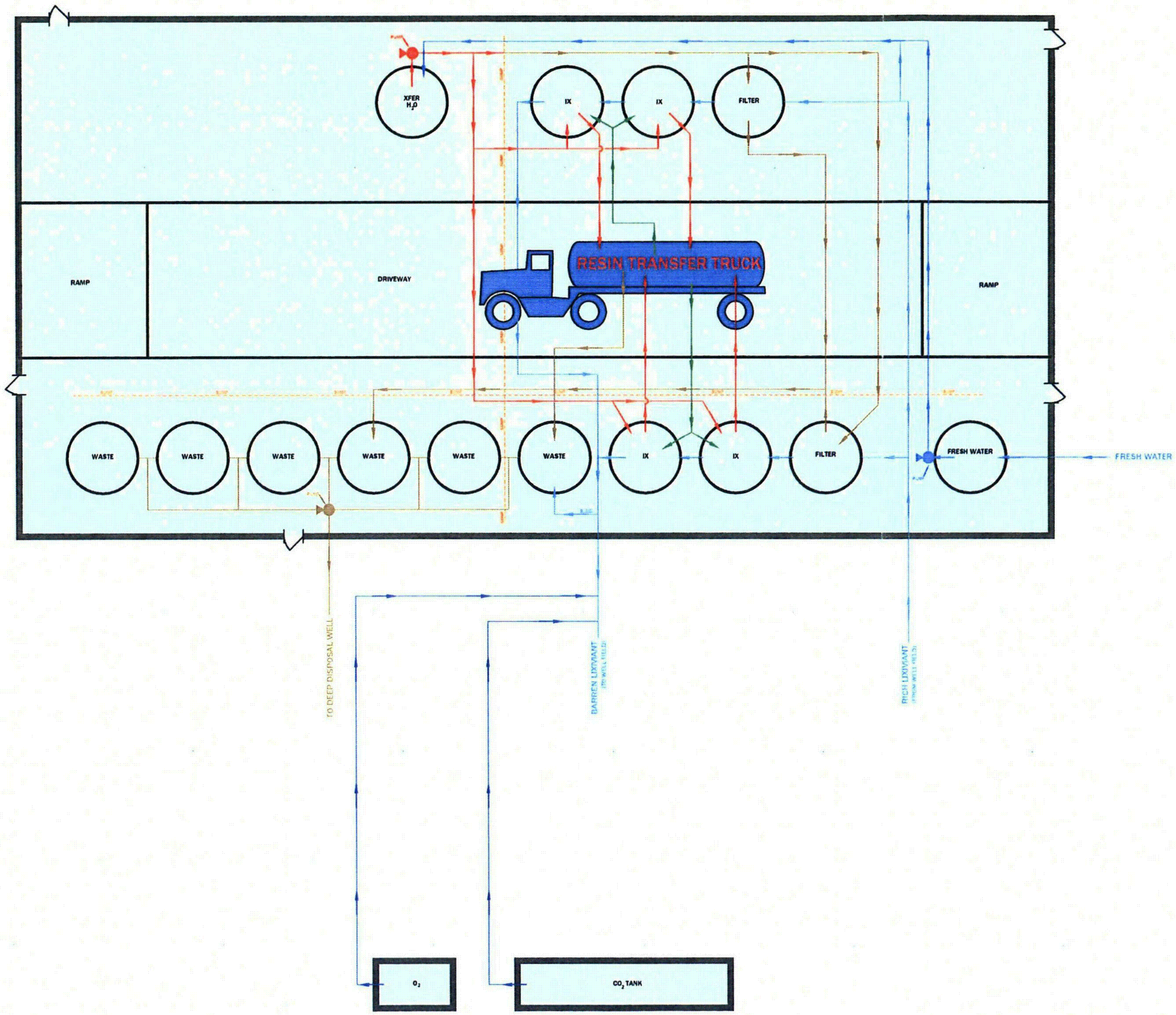
BY SEARCHING USING THE**

D-01



LEGEND

- FRESH WATER
- LOADED RESIN
- WASTE WATER
- LIXIVIANT
- SUMP
- CHEMICAL
- TRANSFER WATER

SCALE: 1"=20'

0 20' 40'

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FIGURE 3-4A

PROPOSED HANK SATELLITE PLANT FLOW DIAGRAM DETAILS

By: S.M.F.	Date: 2/22/2008
Contour Interval:	Revision Date:
Scale: 1"=20'	Dwg: HANK FLOW DIAGRAM

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**"FIGURE 3-8A,
NICHOLS RANCH UNIT
PROPOSED MONITOR WELL LOCTIONS."**

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"FIGURE 3-8B, HANK UNIT PROPOSED MONITOR WELL LOCATIONS"

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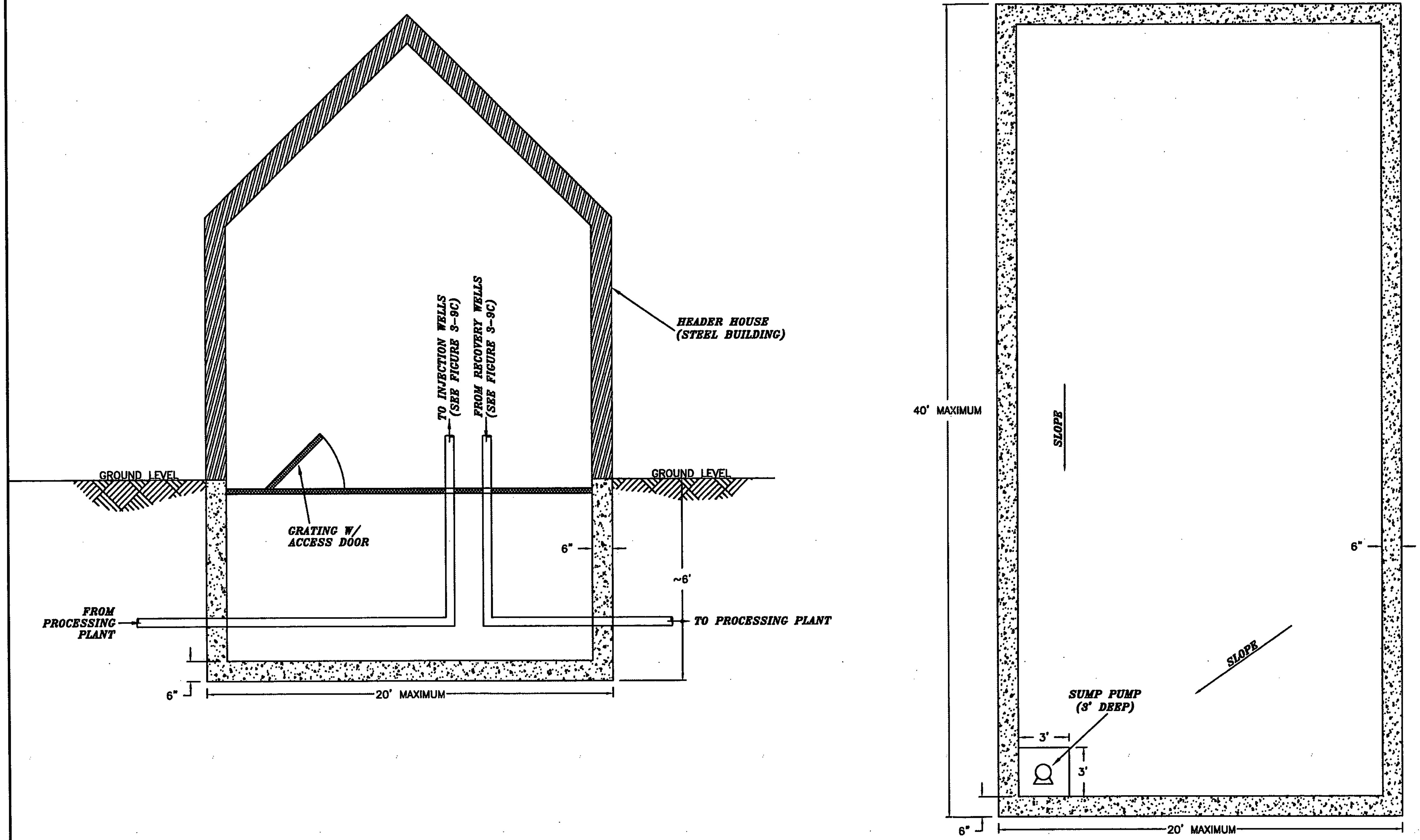

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FIGURE 3-9A
HEADER HOUSE DETAILS

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Datum: N/A	Revision Date: 10/21/2008
Scale: NOT TO SCALE	Contour Interval: N/A

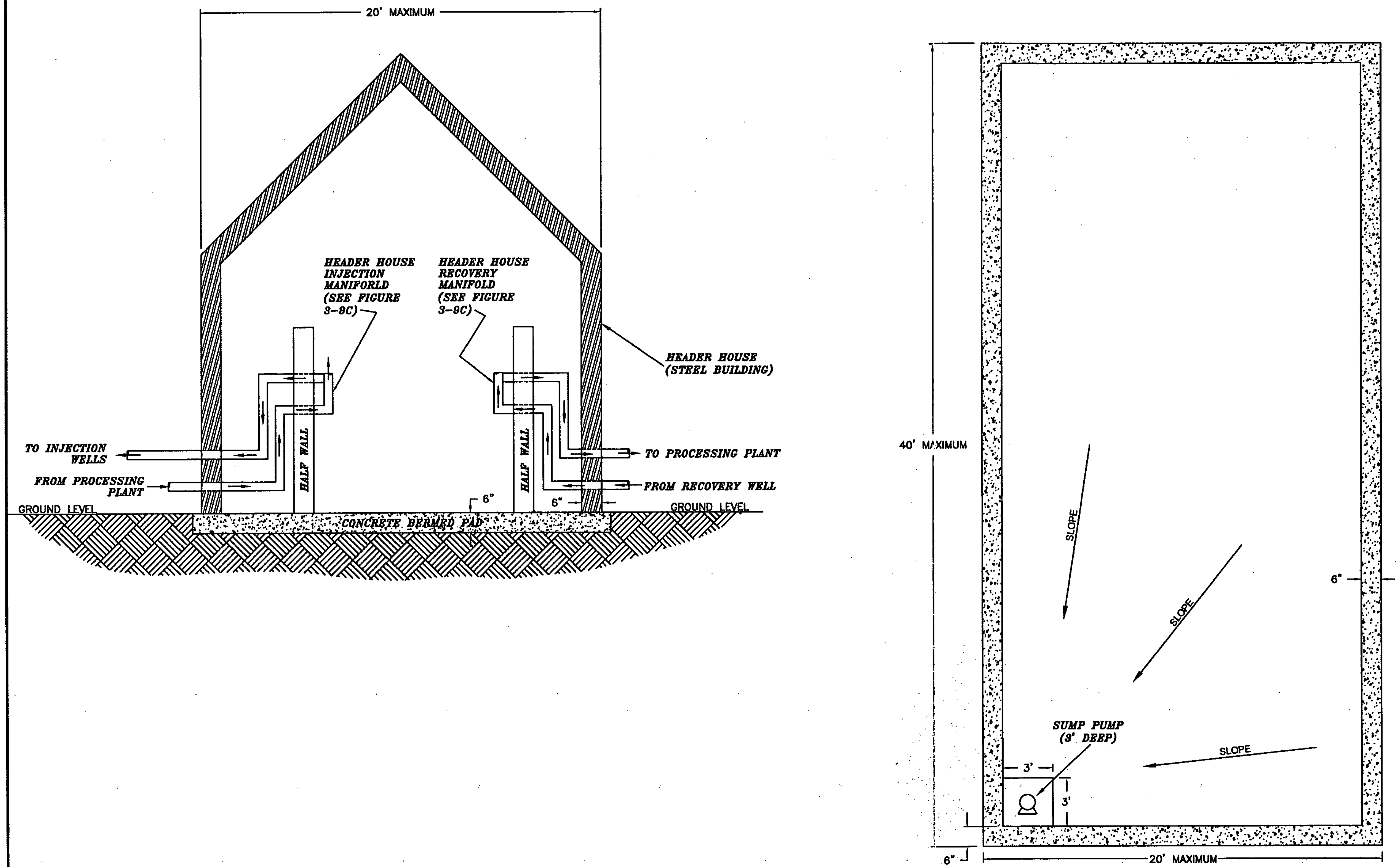

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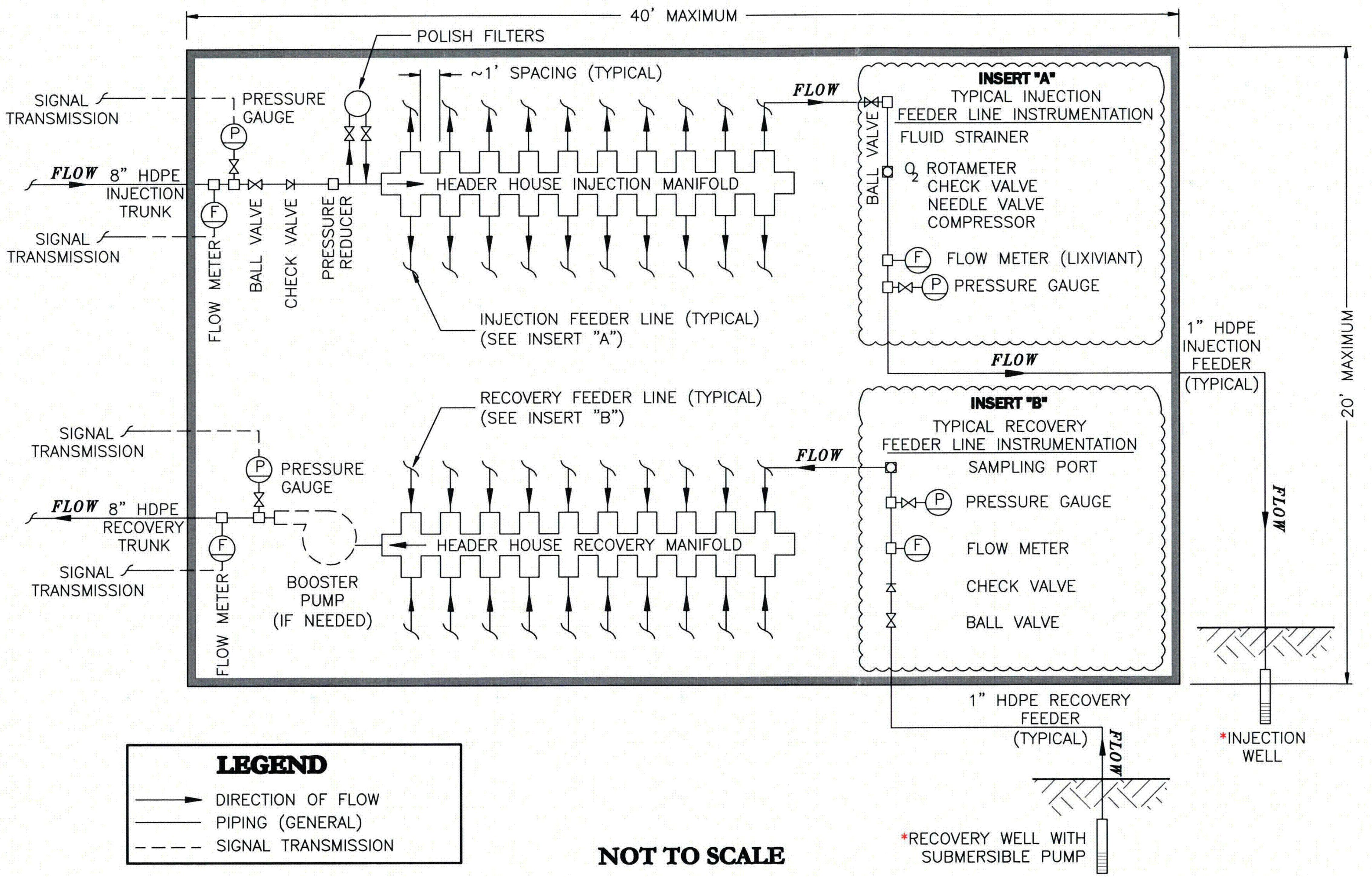
FIGURE 3-9B
HEADER HOUSE DETAILS
GROUND LEVEL

By: J.F.P. / S.M.F.	Date: 2/22/2008
Datum: N/A	Revision Date: 10/21/2008
Scale: NOT TO SCALE	Contour Interval: N/A



NOT TO SCALE

*NOTE: MAY CONTAIN UP TO 30 INJECTION & 30 RECOVERY ACCOMMODATIONS FOR WELLS.

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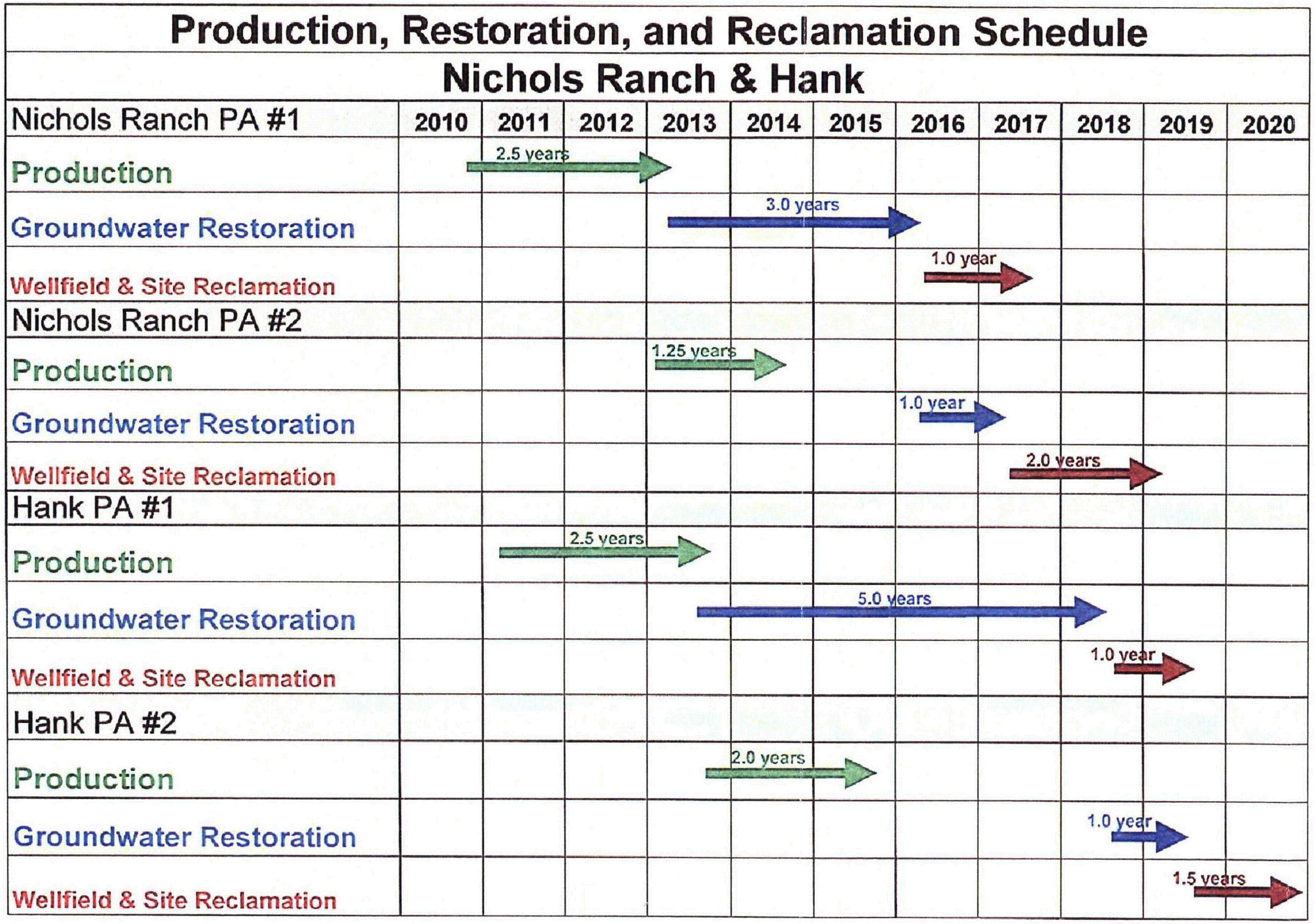
FIGURE 3-9C
HEADER HOUSE PIPING AND INSTRUMENTATION

By: J.F.P. / S.M.F.	Date: 2/22/2008
Datum: N/A	Revision Date: 10/21/2008
Scale: NOT TO SCALE	Contour Interval: N/A



Note: Nichols Ranch Unit is divided into two production areas: Nichols Ranch Production Area #1 and Nichols Ranch Production Area #2. Hank Unit is divided into 2 production areas: Hank Production Area #1 and Hank Production Area #2. This is a projected estimate for Production, Restoration and Reclamation. The actual schedule will depend on permit approval timing, construction efficiency, actual production results and actual restoration of the ground water.

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FIGURE 3-12

PRODUCTION, RESTORATION & RECLAMATION SCHEDULE

By: S.M.F.	Date: OCT. 17, 2007
Datum: N/A	Revision Date: 10-22-2008
Scale: N/A	Contour Interval: N/A

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"FIGURE 3-15, RESULTS OF STIMULATION OF GRADIENT REVERSAL FOR NICHOLS RANCH UNIT."

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THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

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"FIGURE 3-16, RESULTS OF STIMULATION OF GRADIENT REVERSAL FOR HANK UNIT."

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