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NATURAL SODA

2010 Mine Plan
Volume 4, Section 8.0
Reclamation Plan

Prepared for:

Natural Soda, Inc.

Piceance Creek Basin

Rio Blanco County, Colorado

Prepared by:

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SECTION 8.0 RECLAMATION PLAN

8.1. Introduction

The development of the Natural Soda, Inc. reclamation plan involved an integrated effort among engineering and environmental disciplines, and is based on the extensive reclamation experience of Natural Soda's employees and other resource development companies in the area. This reclamation plan has also been prepared in consultation with the Bureau of Land Management White River Field Office (BLM WRFO), Colorado Division of Reclamation, Mining and Safety (CDRMS), and the Colorado Division of Wildlife (CDOW).

Two types of reclamation are associated with the current mining operations: 1) those associated with the on-going reclamation of areas disturbed by construction and well field operations; and 2) those associated with cessation of mining operations on the sodium lease. Details and plans associated with each of these two types are addressed in the following sections, and include discussions on grading, topsoil handling, surface preparation, seeding procedures, and monitoring procedures.

8.2. Post-Mining Land Use

The proposed post-mining land use is designed to be consistent with the current land use. The current land use is primarily limited to livestock grazing and wildlife habitat with its associated hunting activities. The proposed post-mining land use likewise will be livestock grazing and wildlife habitat. The reclamation plan has been designed so that post-mining land use goals are met. This is achieved by ensuring that a permanent vegetation cover is established which meets or exceeds the BLM WRFO success criteria.

8.3. General Reclamation Goals and Procedures

A diverse, effective, and permanent vegetation cover will be established at the project site on all lands disturbed by mining operations. Plant species selected for revegetation will be self-renewing and capable of withstanding the climatic and soil conditions found in the project area. Additionally, reclamation will be carried out in a manner that encourages the prompt establishment of vegetative cover and its return of productive capabilities. All reclaimed areas will be fenced with three or four-strand barbed wire fence conforming to BLM Type D fence specifications, until bond release.

The BLM WRFO Reclamation Coordinator will be notified via email or by phone 24 hours prior to beginning any BLM approved construction-related activities, regardless of size that result in disturbance of surface soils.

8.4. Site-Specific Reclamation Procedures

Site-specific reclamation procedures are identified in this section for the two types of reclamation activities that will occur on the project area. These two types include 1) the reclamation activities that will follow construction and those routine disturbances associated with the well field operations, and 2) those reclamation activities that will be associated with the cessation of mining operations. Many of the specific, routine reclamation procedures associated with each of these two types of activities are identical and will be discussed in tandem. Some the activities that will be associated with final decommissioning of the mining operations are different from those routine reclamation activities and will be discussed separately in Section 8.4.3.

8.4.1. Construction and Well Field Reclamation

In May of 1990, Natural Soda started site clearance and "dirt work" for the process area of mine facilities. Approximately 33.5 acres were cleared and disturbed. Activity associated with construction of water supply and monitoring wells caused

disturbance of 6.3 acres. A production pipeline from wells 90-5 and 88-1, and a water supply pipeline from 90-1 to the plant facilities, disturbed 1.1 acres. Total historical “as-built” disturbed acreage associated with plant construction, wells and pipelines was 40.9 acres.

Areas associated with 1990 activities, such as natural gas pipeline ROW (12 acres) and new access road ROW (30 acres), were also disturbed. A telephone ROW was approved in 1990, and the telephone line was installed within County Road 83 ROW and access road ROW causing no additional disturbed acreage. Table 8-1 lists disturbed acreage for the 1990 Natural Soda project.

In addition to those areas that were disturbed by construction activities in 1990, it was anticipated that approximately 3.5 acres/year will be disturbed in association with the well field operations. A total of approximately 250 acres was predicted to be disturbed over the 40-50 year project.

Between 1990 and 2009, disturbed acreage at any given time did not exceed 72 acres, due to ongoing reclamation efforts.

In 2009, Natural Soda reported the total disturbed acreage at 53.6 acres (Figure 8-1), including 16.2 acres for the Process Area and 37.4 acres for the Well Field (Table 8-2).

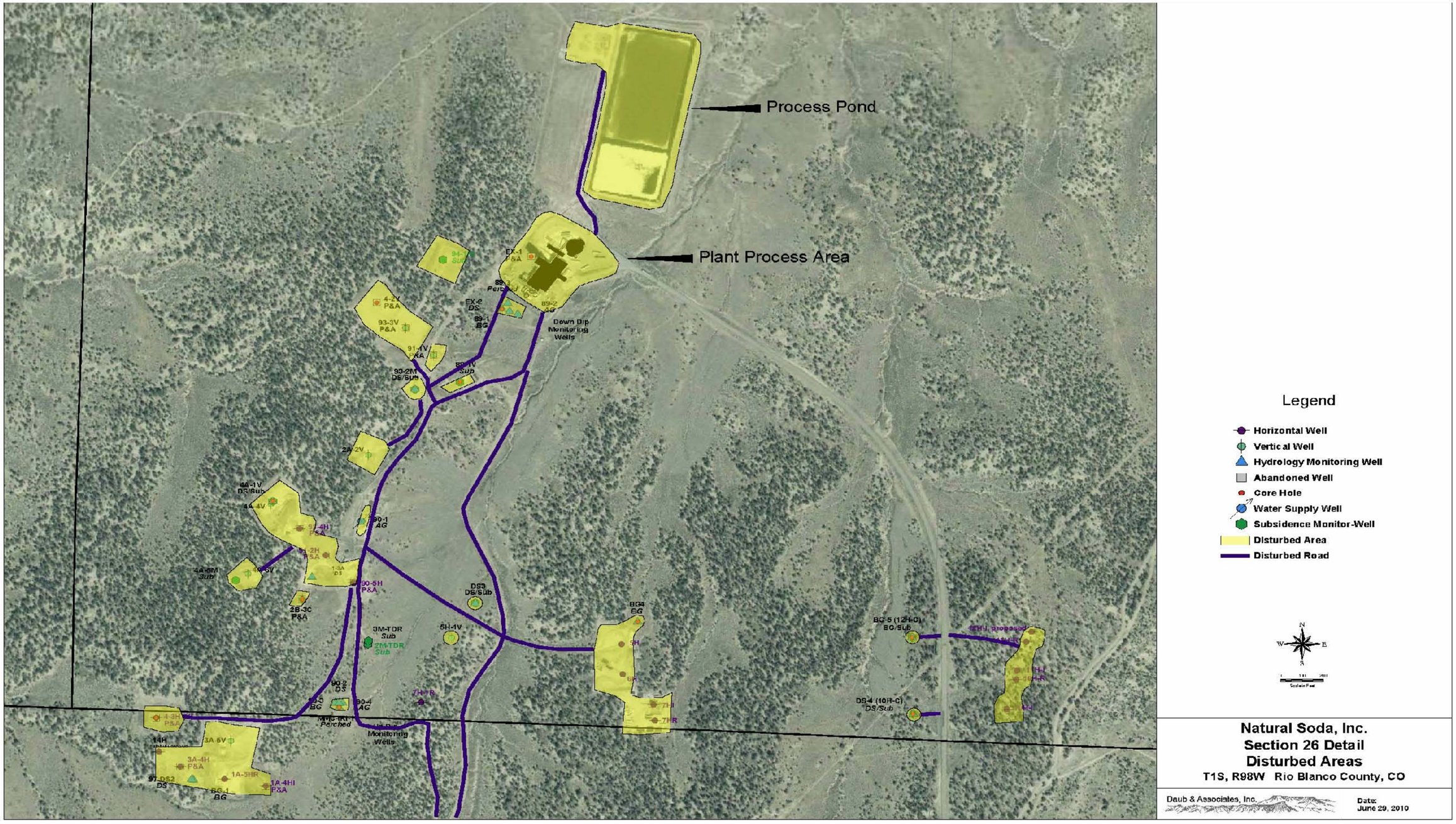

Figure 8-1. Section 26 Detail Disturbed Areas

The well field surface disturbances are required in order to provide areas for drilling rigs to operate, areas for production pipelines, and roads for well access. Also, areas are disturbed in order to provide pollution control measures for drilling operations, e.g. retention ponds. After a mining cavity is depleted, the wells are abandoned and the production pipeline is relocated. Disturbed areas are then reclaimed. Reclamation activities consist of grading the disturbed areas so that the configuration is consistent with the surrounding topography, topsoiling disturbed areas, preparing the seedbed, and revegetating the area. The specific procedures that are conducted during this process are described in the following sections.

TABLE 8-1
1990 DISTURBED ACREAGE

	Acres
Process Area	
Process facilites	5.30
Pond area	11.80
Topsoil embankment	4.00
Cut/fill areas	12.40
	33.50
Mine Field Areas	
Production well 88-1/temporary offices	1.40
Water Well 90-1 and topsoil	1.40
Production Well 90-5	2.20
Monitoring wells at EX-2 site (Down gradient in-field)	0.80
Monitoring wells at MMC-IRI-1 site (Up gradient)	0.20
Monitoring wells at Maxi-pad (Down gradient)	0.30
Water supply pipeline	0.80
Product Transport pipeline	0.30
Total Mine Site Disturbance	**40.90**
Associated Areas/ROW's	
Abandoned access road	1.50
Natural gas pipeline ROW	12.00
New access road ROW	30.00
Total Associated Area/ROW Disturbance	**43.50**

Table 8-1. 1990 disturbed acreage for the Natural Soda, Inc. project.

Table 8-2
2009 TOTAL DISTURBED ACRES

Process Area:	**Acres:**
Process Ponds & Facilities	10
Plant Process Area	6.2
Well Field:	
Well Pads	18.7
Roads and Compacted Areas	18.7
Total Facility Disturbance:	**53.6**

Table 8-2. 2009 disturbed acreage for the Natural Soda, Inc. project.

8.4.2. Regulatory Compliance

Topsoil Handling Procedures

The WRFO Reclamation Coordinator will be notified via email or by phone 24 hours prior to beginning any BLM approved construction-related activities, regardless of size, that result in disturbance of surface soils. Handling of topsoil during mining operations involves several different activities. These activities include the removal of vegetation, topsoil stripping, stockpiling, and replacement of the topsoil onto the areas to be ultimately reclaimed. Prior to construction or any mining activities, the vegetation in the area must be cleared, and the soil grubbed to a depth of one foot. If less than one foot of soil is present, the entire soil present should be grubbed. The topsoil will then be removed to the extent possible according to the recommendations identified in Section 3.8, Soils. Suitable soil materials will be scraped from all the areas to be disturbed and stockpiled.

Surfaces of topsoil stockpiles will be stabilized and protected from wind and water erosion by seeding as soon as possible, i.e. spring or fall. The total seeding rate will be 12 to 15 lbs of pure live seed (PLS) per acre for a drilled rate, and 24 to 30 lbs per acre for a broadcasted rate. An established grass and forb cover will be adequate to protect topsoil stockpiles from erosion until the soil is needed for reclamation. In cases when topsoil handling sequencing does not allow stabilization by vegetation methods, topsoil stockpiles may be stabilized by application of a chemical dust suppressant. Topsoil suitability rating and approximate soil volumes available for reclamation are presented in Section 3.8, Soils. Topsoil will be spread as evenly as possible over the graded surfaces.

Where feasible, topsoil will be removed from areas that are being stripped and will be directly applied to well sites or other disturbed areas, rather than stockpiling the material. Limitations that will influence the use of this technique include such factors as the haul distance and sequencing of reclamation. The potential benefits of this reclamation technique are well documented and include maintained topsoil fertility and preserved seed source. Reclamation is often more successful when topsoil is directly applied than when the topsoil is stockpiled.

After mining activities are completed and the area is graded, the topsoil will be taken from the stockpiles and spread as evenly as practicable over the disturbed area. This area will then be prepared for seeding.

During the 1990 Natural Soda project, all available topsoil was stripped and stockpiled in topsoil embankments for future reclamation of disturbed lands. From the 33.5 acres disturbed at the process area, 29.5 acres were stripped of topsoil (33.5 acres less topsoil stockpile area of 4.0 acres). A total of 42,107 cu. yds. of topsoil was stockpiled. Approximately 10.6 inches of topsoil was available to cover the process area for reclamation.

Grading

In preparation for reclamation, all disturbed areas will be graded to slopes consistent with the surrounding area. Grading will also be done in a manner so as to control erosion and siltation of the affected and unaffected lands. Erosion control measures such as contour furrowing, installing water bars, etc., will be used where necessary to ensure that slope and soil erosion are kept to a minimum. Surface drainage patterns will be re-established to pre-mining conditions.

In certain areas, production wells will be located where slopes are greater than 3:1. In these cases special precautions will be taken to minimize erosion, both during and after operation of these portions of the well field. Water bars and ditches will be used during operation to minimize potential adverse erosion impacts. Reclamation of these areas will incorporate water bars and contour furrowing to aid in erosion control.

Surface Preparation

Where necessary, heavily compacted surfaces will be ripped prior to receiving a topsoil cover from the topsoil stockpiles. Surface tillage and seedbed preparation will consist of a light or shallow tillage operation using a combination of disk harrow and spike-tooth harrow. The final tillage treatment will be performed by a shallow chisel plow on a level contour, or by using an imprinter or rangeland pitter, where necessary, depending upon soil conditions. The purpose is to leave an uneven, erosion-resistant surface which will aid water infiltration and enhance germination and establishment of seeded and planted species. Any existing vegetation piles will be removed.

Seeding Procedure

The seed mix application rates and seeding techniques are based on reclamation experience in the area, as well as on consideration of local environmental conditions

of soil, slopes, elevation, and precipitation. Use of this seed mixture will result in a rapidly established, diverse, and effective vegetative cover capable of self-regeneration. The seed mixture is shown in Table 8-3. For short-term stockpiles or other areas, an interim seed mixture will be utilized (Table 8-4).

TABLE 8-3

RECLAMATION SEED SPECIES LIST

Species	Variety	Pounds Pure Live Seed/Acre
Grasses		
Thickspike wheatgrass	Critana	0.5
Streambank wheatgrass	Sodar	0.5
Western wheatgrass	Arriba	1.0
Pubescent wheatgrass	Luna	0.5
Basin wildrye	Magnar	0.5
Russian wildrye	Vinall	0.5
Green needlegrass	Common or Lodorm	2.0
Forbs		
Lewis flax	Appar	0.2
Cicer milkvetch	Monarch*	0.5
Alfalfa	50% Ladak*	0.75
	50% Nomad*	0.75
Scarlet globemallow	VNS or common	0.2
Palmer's penstemon	Cedar	0.2
Shrubs		
Fourwing saltbush	Rincon (dewinged)	1.5
Winterfat	VNS or common	0.5
Antelope bitterbrush	VNS or common	1.0
* preinoculated	**Total**	**11.1**

Table 8-3. Reclamation seed species list.

TABLE 8-4

INTERIM SEED SPECIES LIST

Species	Variety	Pounds Pure Live Seed/Acre
Grasses		
Pubescent wheatgrass	Luna	4
Thickspike wheatgrass	Critana	2
Forb		
Alfalfa	Ladak*	2
*preinoculated		

Table 8-4. Interim seed species list for reclamation.

The availability of seed will determine the ultimate seed mixture and variety of seed used. If a variety of seed is not available, additional seed from one of the seeds listed in Table 8-3 will be substituted so that the final seeding rate is 12 to 15 lbs pure live seed (PLS) per acre.

Topsoil stockpiles or other areas which require short-term vegetative stabilization, normally less than three years, will be seeded with this seed mixture. Seeding will be conducted as soon as possible (spring or fall) following disturbance to enhance viability of stockpiled topsoil, to increase the stabilization of the disturbed area, and to reduce potential erosion problems.

Although seeding can occur on the site nearly any time between snowmelt and ground freezing, the optimum time for seeding is during the fall. Accordingly, the seed mixture will be seeded between the time the first killing frost occurs usually sometime in September and when the ground freezes usually sometime in November. The scheduling of revegetation in this manner will allow the seeds to germinate and become established early in the spring when soil moisture is optimum. However, it may be necessary to seed at other times in some instances to either establish a ground cover to prevent soil erosion or to re-seed an area in the event of failed seedling establishment. In these events, seeding may occur during the spring (April-May).

The seed mixture will be placed by either a drill seeder or by broadcast seeding. The use of a drill seeder necessitates having slopes less than 3:1 (33 percent). Drill rows will be 20 to 25 centimeters apart. If the seed is broadcast, the amount of seed indicated will be doubled.

Following seeding, straw or native pasture hay will be applied as a mulch at a rate of approximately 2 tons per acres. If hydromulch is used, the rate will be ¾ - 1 ton per acre. Straw or hay mulch will be mechanically crimped using a straight running disc on 10-inch centers. Normally, irrigation will not be required to establish a good stand of vegetation, provided that seeding occurs at appropriate timing. Any prohibited noxious weeds that may appear in the reclaimed area will be controlled, as necessary, by chemical and/or mechanical means.

Topsoil stockpile, pipelines and disturbed areas were seeded between October and November, 1990. Areas seeded included the following:

		Acres:
a.)	**Process area soil stockpile**	**4.0**
b.)	**Production well 90-5 and water well 90-1 soil stockpiles**	**0.6**
c.)	**Monitoring well pad at MMC-IRI-1**	**0.2**
d.)	**Water supply pipeline**	**0.1**
e.)	**Abandoned access road**	**1.5**
f.)	**Natural gas pipeline (total disturbance)**	**6.0**
g.)	**New access road (total available)**	**10.0**
	Total:	**22.4**

The approved (BLM/Colorado Division of Reclamation, Mining and Safety) seed mixture was broadcast at a rate (24 lbs/acre) that was double the drilled rate per the mine plan. Pure live seed was the basis for the calculation of seed rate. Table 8-3 lists the species that were seeded.

Limited overseeding occurred around the pipeline in the project area in 2009. Seeding will occur as necessary as the project progresses.

Fertilizer

The use of a sufficient topsoil material that is high in organic matter and contains the naturally occurring microorganism populations and necessary trace elements required for revegetation is more important than the application of fertilizers. However, soils that are stored for even relatively short periods of time lose their fertility and may need to be amended with fertilizers. Soil fertility in the project area appears to be adequate for reclamation purposes.

Generally, fertilizer application with precipitation of less than 12 inches per year yields very poor results. Furthermore, application of nitrogen fertilizer with inadequate spring moisture may have a depressing effect on grasses.

In the project area, an application of 800 lbs/acre of 5-10-5 fertilizer is expected to produce positive results. This fertilizer rate is typically used for cultivation of dry land wheat. Fertilizer will only be utilized after the third growing season and the determination that desired plant species are established and fertilizer is necessary to meet ROD vegetative production or species mixture goals.

8.4.3. Well Field and Plant Decommissioning

Production and monitoring wells associated with the well field will be plugged and capped in accordance with procedures described herein and permit stipulations. Since only the lower portion of the well casings will be cemented in place during operations, the casings can be cut off at the top of the cement column and reused in

other wells. Following removal of the casing, the wells will be filled with cement and other acceptable plugging materials from the bottom of the hole to the surface per Section 6.6.7 Well Abandonment.

At the completion of commercial mining operations, all surface facilities will be dismantled. Areas previously occupied by these facilities, and any remaining areas associated with the well field, will be reclaimed and revegetated according to procedures described in this section.

Surface facilities include the process plant building, product storage and load-out facility, roads, parking lots, pipelines, power lines, retention ponds, and the evaporation pond. These facilities will be dismantled and either salvaged or removed for disposal. Concrete foundations and road pavement will be broken up and buried on-site at least three feet below final grade. Salts remaining in the evaporation pond will be removed from the pond and disposed of either in a mined-out cavity or at an approved off-site disposal location. The evaporation pond liner will be removed and disposed of at an approved off-site landfill. The natural gas and water pipelines will be disconnected and purged; they will be left in place because these areas will have already been reclaimed and revegetated.

8.5. Reclamation Schedule

Following the cessation of mining activities, the removal of surface facilities will require approximately six months. Revegetation of the project area will be completed within about seven months of mine shut-down; seeding will occur according to the procedures described in Section 8.4.2. Monitoring activities associated with ground water quality (monitoring wells) will continue for 3 years after mine operations cease. The monitoring of revegetation success will continue until bond release.

The schedule outlining the tasks which will be accomplished and their sequencing is shown on Table 8-5. Reclamation techniques to be used during final abandonment will be identical to those discussed previously (Section 8.4.1).

8.6. Reclamation Monitoring

The State of Colorado and BLM requires reclaimed lands to be revegetated in a manner that establishes a diverse, effective, and long-lasting vegetation cover that is equal or nearly so to the natural vegetation of the surrounding areas. The vegetative cover should be as defined by the range/ecological site description or by the seed mix applied. It should also be self sustaining and of a density sufficient enough to control erosion and non-native weed encroachment. In order to ensure that this requirement is fulfilled, monitoring will be required to assess the success of revegetation efforts.

The monitoring program will evaluate the success of any reclamation effort and will provide recognition of any problem areas. Vegetation transects will be sampled each year at the peak of the growing season. Initially (years 1-2), cover and production are sampled. In year 2 or 3, depending on growth rate, the amount of vegetative cover, production, and plant composition will be determined as a minimum.

TABLE 8-5

SCHEDULE AND SEQUENCE OF TASKS TO BE ACCOMPLISHED

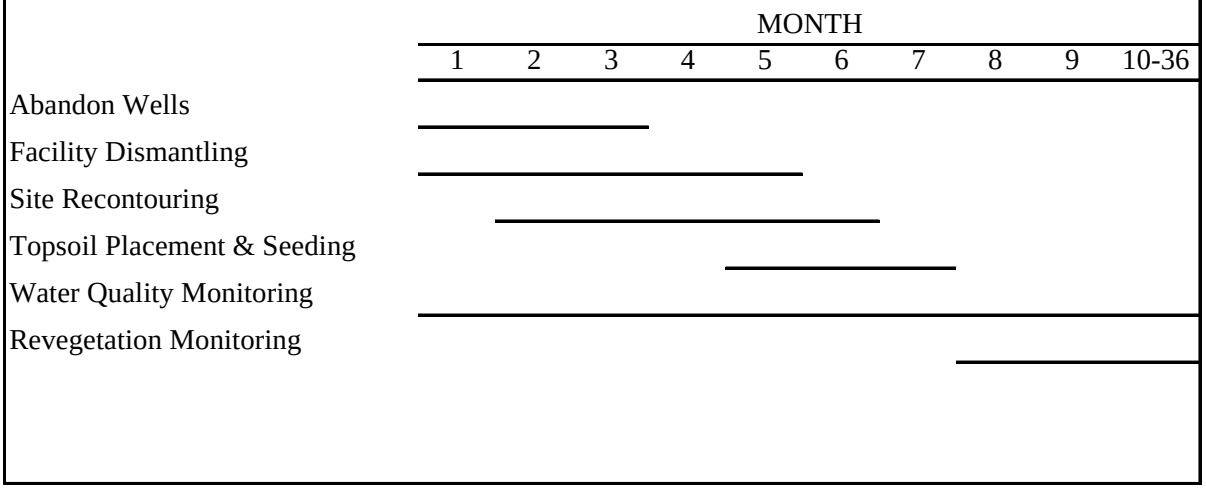

Table 8-5. Schedule and sequence of reclamation tasks to be accomplished in 2010 and beyond.

Additional reclamation monitoring information is included in the Comprehensive Monitoring Plan (submitted under separate cover). Following sampling, appropriate mitigation measures will be identified, and any problems will be rectified. Additionally, the monitoring program will be implemented by qualified personnel with both practical field experience and knowledge of reclamation practices. Monitoring will continue until bond release.

In the event that seeding is unsuccessful, potential causes for the failure will be evaluated. The soils may be tested for toxic, sodic, pH, or other conditions that may prohibit successful revegetation. Depending upon the results of this testing, the soils may be removed, covered with more suitable material, or amended to provide a more favorable growth medium.

8.7. Surface and Ground Water Protection

A number of proposed mine activities during the construction and operational phases could adversely impact surface and ground water without adequate protection measures. The following sections present measures which are deemed to be sufficient in protecting the existing hydrologic systems.

8.7.1. Surface Water

During the construction phase, surface disturbance including cuts, fills, and grading could increase the potential for sedimentation in nearby streams. Presently, no perennial streams occur within the mine area. Streams which drain through the mine area are intermittent and usually have less than 2 square miles of drainage area above the project site. Sedimentation pond and runoff diversion ditches will be placed at strategic locations to minimize runoff and sediment contributions from construction areas.

Each production/ injection well will have a retention pond during drilling to contain all drill cutting liquids. Saline cuttings/liquids greater than 5,000 µmhos/cm will be removed and placed in process ponds near the plant site.

The proposed mine plan requires two ponds (evaporation/process) for use in the nahcolite extraction process. These ponds are approximately 10 acres in size with a dual liner system that incorporates a drain blanket and leakage detection system. Any water which breaches the top liner would flow by gravity between the liners to a leakage collection ditch and sump. Leak detection equipment in the collection sump will signal that a breach of the liner has occurred. Remedial action will then take place. Provisions will be made to allow one pond to be drained to the other so that repairs can be conducted.

There is concern that a rupture of the well field pipeline could cause poor quality water to enter surface drainages. An auxiliary 4-inch diameter pipeline is incorporated into the system design which permits draining of the well field pipeline to the evaporation ponds. This will minimize spills of contaminated water in the event of a pipeline rupture, or when the main well field pipeline is relocated or repaired.

The pregnant liquor tank, barren liquor tank and crystallizers are built over a bermed concrete pad such that any spills will be contained and directed to the evaporation ponds. The areas around the discharge end of the dryer and product

handling/loadout area are equipped with berms or drainage structures so that all contaminated material can be directed to the evaporation ponds. Consequently, contamination to surface water will be minimal.

8.7.2. Ground Water

The three major concerns involving possible effects to ground water systems includes those associated with subsidence, the production wells, and the evaporation and retention ponds and sewage leach field. The possible impacts to ground water as a result of subsidence were discussed in Sections 6.9.3 and 6.9.4. The impacts were believed to be minimal and localized.

There is concern that the production wells could cause water quality degradation to the existing ground water system. In order to prevent communication between the mine zone and the overlying USDW aquifers, the proposed plan is to cement the well casing from near the mine zone from the shoe upward for a minimum of 250 feet and a best management practice attempt to circulate the cement to surface. This approach is intended to prevent communication between the mine zone and the overlying aquifers. In addition, the solution mining fluid will be pumped in and out of the well casing in production pipe, balancing mining cavity pressure with the Dissolution Surface.

A monitoring program is proposed as an additional part of the mine plan (see Volume 6). The monitor wells are located adjacent to the production wells in order to monitor water quality and fluid pressure changes. If any leakage from the solution mining zone is detected, remedial action could be taken.

As previously described, the evaporation/process retention ponds are lined ponds. The ponds, which contain high TDS water, have a dual liner system that incorporates a drain blanket with a leakage detection system. Consequently, no impacts to ground water quality from the evaporation/process ponds are expected.

The proposed plan is to withdraw water from the A-groove Aquifer at an average rate of approximately 105 gpm (169 acre-feet/yr) in order to produce 125,000 tons of sodium bicarbonate per year. As production increases to 250,000 tons per year, it is anticipated that 190 gpm from the A-groove Aquifer will be required. The 90-1 water supply well location is between initial production wells, located in the SW ¼ of Section 26 on Sodium Lease Tract C-0118327.

8.8. Contingency Plans

Correction procedures for unsuccessful reclamation are necessary in the event that revegetation attempts fail. The environmental monitoring programs for vegetation and wildlife will be used to evaluate the effectiveness of revegetation, and of the impact of mining and reclamation on the wildlife populations. These programs have been described in Section 3.10 (Wildlife) and Section 8.6 (Reclamation Monitoring).

BLM requirements also state that contingency plans be included in the reclamation plan to protect the environment and human welfare from such catastrophes as flooding, fires, massive slope failures, or explosions resulting from mining operations. Flooding is extremely unlikely to occur at the project site, because the proposed mining plan involves solution mining. No slopes of any significance are present on the project site, so massive slope failure does not apply. Prevention of fires and explosions resulting from mining operations is addressed in Section 7.0 (Mine Plan).