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NATURAL SODA

**2013 Plan of Development**  
Oil Shale Research, Development and Demonstration (RD&D)  
Tract COC 74299

Prepared for:

**Natural Soda Holdings, Inc.**  
Piceance Creek Basin  
Rio Blanco County, Colorado

Prepared by:

**Daub & Associates, Inc.**  
Grand Junction, Colorado

Daub & Associates, Inc. compiled this document under the direction of Natural Soda, Inc. The information contained herein was supplied in part or in whole by Natural Soda, Inc., Daub & Associates, Inc., Stress Engineering Services, Inc., Process Engineering Associates, LLC, Rusty Roberts and Dr. Martin Gorbaty.

# Table of Contents

TABLE OF FIGURES.....	V
LIST OF TABLES.....	VI
LIST OF APPENDICES.....	VII
LIST OF ACRONYMS.....	VIII
PURPOSE.....	1
EXECUTIVE SUMMARY.....	1
9(A) SUBMISSION STATEMENT.....	2
9(B) GENERAL INFORMATION, GEOLOGY, LOCATION, AND METHODS.....	2
9(b)(1) Operator Name and Contact Information.....	2
Federal Lease Serial Numbers:.....	2
Surface and Mineral Ownership:.....	3
9(b)(2) General Description of Geologic Conditions and Mineral Resources, With Appropriate Maps, Within the Area Where Mining Is To Be Conducted.....	3
Geologic Structure.....	3
General Stratigraphy.....	7
Overburden Cross-Section.....	9
Estimated Geologic Tops and Markers.....	9
Detailed Stratigraphy.....	9
Hydrostratigraphy.....	15
Geological Formations to be Developed.....	15
9(b)(3) Suitable Map or Aerial Photograph Showing the Topography, the Area Covered by the Lease(s), the Name and Location of Major Topographic and Cultural Features and the Plan for Drainage Away From the Affected Area.....	16
9(b)(4) Proposed Methods of Operating, Including a Description of the Surface or Underground Mining Methods, the Proposed Roads, the Size and Location of Structures and Facilities to Be Built, Mining Sequence, Production Rate, Estimated Recovery Factors, Stripping Ratios (if applicable) and Number of Acres in the Federal Lease(s) or Permit(s) to Be Affected.....	16
9(C) STATEMENT OF PROPOSED METHOD OF DEVELOPMENT FOR IN SITU OPERATIONS <b>(CONFIDENTIAL)</b> .....	16
9(c)(1) Description of the In Situ Methodology <b>(CONFIDENTIAL)</b> .....	16
Phase 1: Pre-Conversion Nahcolite Solution Mining <b>(CONFIDENTIAL)</b> .....	18
Phase 2: Shale Oil Liquefaction <b>(CONFIDENTIAL)</b> .....	20
Phase 3: Extraction of shale oil and other products <b>(CONFIDENTIAL)</b> .....	23
9(c)(2) Equipment for Development and Extraction <b>(CONFIDENTIAL)</b> .....	24
9(c)(3) Proposed Access Roads <b>(CONFIDENTIAL)</b> .....	26
9(c)(4) Size, Location, and Schematics of All Structures and Facilities to Be Built <b>(CONFIDENTIAL)</b> ... Well Pads.....	26
Ponds.....	26
Power Lines.....	26
Pits.....	28
Monitor Wells.....	28
Storage Tanks.....	28
Surface Structures/Facilities.....	28
Stack Parameters and Air Emissions.....	30

9(c)(5)	Development Sequence and Schedule (CONFIDENTIAL)	30
	Dates of Construction	30
	Dates of Operation	30
9(c)(6)	Acreage in the Federal Lease to Be Affected (CONFIDENTIAL)	31
9(c)(7)	Typical Schematics of All Drilled Well Types Including Those Used for Heating, Freezing, Disposal or Production Activities Detailing All Casing and Completion Design Including Materials Used in All Cementing Operations (CONFIDENTIAL)	31
9(c)(8)	Description of Methods and Means to Protect and Monitor Aquifers (CONFIDENTIAL)	32
	Groundwater Protection Plan	34
	Perched Aquifer	35
	A-Groove Aquifer	35
	B-Groove Aquifer	35
	Dissolution Surface Aquifer	35
<b>9(D)</b>	<b>RESOURCE ANALYSES, PROCEDURES, MAPS, CROSS SECTIONS, AND IN SITU DEVELOPMENT SEQUENCE</b>	<b>36</b>
9(d)(1)	Estimate of Quantity and Quality of the Mineral Resources	36
	Oil Shale	36
	Nahcolite	36
	Dawsonite	36
	Estimated Production Rate	36
	Estimated Resource Recovery Factors	37
9(d)(2)	Explanation of How the Resource Will Be Recovered With a Minimum of Waste. If a Portion of the Deposit Is Not Recovered or Is to Be Rendered Unrecoverable by the Operation, the Lessee Must Submit Appropriate Justification to the Authorized Officer for Approval	37
9(d)(3)	Maps and Cross Sections	37
	9(d)(3)(i) Federal lease boundaries and serial numbers	37
	9(d)(3)(ii) Surface ownership and boundaries	37
	9(d)(3)(iii) Locations of existing and abandoned mines and existing oil and gas wells	39
	9(d)(3)(iv) Structure cross sections	42
	9(d)(3)(v) Location of shafts or mining entries, strip pits, waste dumps, retort facilities, and surface facilities	42
	9(d)(3)(vi) In situ development sequence and timeframe	42
9(d)(4)	Environmental Aspects Associated With the Proposed Project	42
	9(d)(4)(i) Water quantity estimates	42
	An estimate of the quantity of water to be used and where the water will be obtained	42
	An estimate of the quantity of water to be produced and treated	43
	An estimate of the quantity of potential pollutants that may enter any receiving waters (surface water and groundwater)	43
	9(d)(4)(ii) Design for the necessary impoundment, treatment, or control of all produced water, runoff water, and drainage from workings	44
	Spill Prevention, Control and Countermeasures Plan	44
	Stormwater Management Plan	44
	9(d)(4)(iii) Description of the measures to be taken to prevent or control fire, soil erosion, subsidence, pollution of surface and groundwater, pollution of air, damage to fish or wildlife or other natural resources, and hazards to public health and safety	45
	Fire Prevention and Control	45
	Soil Erosion	45
	Subsidence	45
	Pollution of Surface Water	46
	Pollution of Groundwater	46
	Pollution of Air	46

Damage to Fish or Wildlife or other Natural Resources.....	46
Hazards to Public Health and Safety .....	47
Type of Materials Produced.....	47
Containment/Disposal.....	47
<b>9(d)(4)(iv) Description of the proposed source or sources of energy for the operations, and any measures to reduce or to mitigate energy requirements, to use renewable energy requirements, to use renewable energy, or to reduce emissions of greenhouse gases .....</b>	<b>48</b>
<b>9(d)(4)(v) Description of transportation facilities or rights of way necessary to provide energy to operation .....</b>	<b>48</b>
Electrical Power .....	48
Natural Gas.....	48
Water .....	48
Communications.....	48
<b>9(d)(5) Detailed Reclamation Plan and Schedule .....</b>	<b>49</b>
<b>Site-Specific Reclamation Procedures .....</b>	<b>49</b>
<b>Ensure Compliance with Established Requirements.....</b>	<b>50</b>
<b>9(d)(5)(i) Proposed methods of preparation and fertilizing the soil prior to replanting.....</b>	<b>50</b>
Grading.....	50
Surface Preparation .....	50
Topsoil Handling Procedures.....	51
Fertilizer .....	51
<b>9(d)(5)(ii) Types and mixtures of shrubs, trees or tree seedlings, grasses, or legumes to be planted .....</b>	<b>52</b>
<b>9(d)(5)(iii) Types and methods of planting, including the amount of grasses or legumes to be planted per acre, or the number and spacing of trees or tree seedlings, or combinations of grasses and trees .....</b>	<b>53</b>
Seeding Procedure .....	53
Reclamation Monitoring.....	54
Reclamation Schedule.....	54
Contingency Plans.....	54
<b>9(d)(6) Method of Abandonment Operations.....</b>	<b>54</b>
<b>Protection of the unmined recoverable reserves and other resources, including the method proposed to fill in, fence, or close all surface openings which are a hazard to people or animals. Description of the method and materials used to plug all abandoned development/production wells. ....</b>	<b>55</b>
<b>A description of the method and materials used to plug all abandoned development/production wells .....</b>	<b>56</b>
<b>9(d)(7) Additional Information .....</b>	<b>56</b>
<b>9(E) OCCUPANCY AND USE OF EXISTING STRUCTURES OR FACILITIES.....</b>	<b>56</b>
<b>9(F) APPROVAL CONDITIONED ON REASONABLE MODIFICATION OF THE PLAN....</b>	<b>56</b>
<b>9(G) POST APPROVAL PLAN CHANGES.....</b>	<b>56</b>
<b>9(H) OPERATIONAL COMPLIANCE WITH SECTIONS OF 43 CFR PART 3160.....</b>	<b>56</b>
<b>9(I) UNDERSTANDING THAT NO ACTIVITIES WITHOUT APPROVED POD .....</b>	<b>57</b>
<b>9(J) UNDERSTANDING OF WATER DIVERSION ON FEDERAL LANDS .....</b>	<b>57</b>
<b>REFERENCES CITED .....</b>	<b>58</b>

## Table of Figures

Figure 1	General Location Map NSHI RD&D Lease Area .....	4
Figure 2	Topographic Map - NSHI 160-Acre RD&D Lease Area .....	5
Figure 3	Structure Contour Map – Top of the R-2 Zone in the Vicinity of the NSHI RD&D Lease Area .....	6
Figure 4	Stratigraphic, Lithologic, and Hydrostratigraphic Column - NSHI RD&D Lease Area.....	8
Figure 5	Cross-Section - Vicinity of the NSHI 160-Acre RD&D Lease Area .....	11
Figure 6	Extent of the Saline Zone - Piceance Creek Basin .....	12
Figure 7	Extent Upper and Lower Salts - Vicinity of the NSHI RD&D Lease Area and the Dudley Bluffs Graben .....	14
Figure 8	Aerial Map - Lease with Topographic, Cultural, and Drainage Features (CONFIDENTIAL).....	17
Figure 9	OSR Well Completion Using a Nitrogen Gas Cap - Solution Mining Phase (CONFIDENTIAL).....	19
Figure 10	OSR Well Completion Using a Nitrogen Gas Cap – Shale Oil Liquefaction Phase (CONFIDENTIAL).....	21
Figure 11	Drilling and Completion Design Configuration using a Dual String Packer (CONFIDENTIAL).....	22
Figure 12	OSR Utility Map with Disturbed Areas (CONFIDENTIAL) .....	27
Figure 13	Generalized OSR Project Surface Facilities Layout (CONFIDENTIAL).....	29
Figure 14	Completion Diagram - DS-6 Monitor Well.....	33
Figure 15	NSHI Lease Area Boundaries and Surface Ownership .....	38

## List of Tables

Table 1 Stratigraphic and Hydrostratigraphic Tops Prognosis - OSR Well .....	10
Table 2 NSHI RD&D Equipment List (CONFIDENTIAL) .....	24
Table 3 Proposed Downhole Equipment (CONFIDENTIAL) .....	25
Table 4 RD&D Schedule of Operations (CONFIDENTIAL) .....	31
Table 5 Analyte List for NSHI's Quarterly Water Sampling Program .....	34
Table 6 Oil and Gas Wells Within and Surrounding NSHI's Oil Shale Leases.....	41
Table 7 Existing Rights-of-Way Within NSHI Lease Tracts (EA after BLM, 2012).....	49
Table 8 Grasses and Forbs Used in Interim and Final Reclamation.....	52
Table 9 Shrubs Used in Final Reclamation.....	53

## **List of Appendices**

**Appendix A – Process Flow Diagrams and Block Flow Diagrams  
(CONFIDENTIAL)**

**Appendix B – Technical Data (CONFIDENTIAL)**

**Appendix C – Spill Prevention, Control and Countermeasures Plan  
Provided by Natural Soda, Inc.**

**Appendix D – Stormwater Management Plan**

**Appendix E – Emergency Response Plan**

**Appendix F – NSHI Safety Manual  
Provided by Natural Soda, Inc.**

## List of Acronyms

APEN	Air Pollution Emission Notice
BFD	Block Flow Diagram
BLM	Bureau of Land Management
BMP	Best Management Practices
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
DRMS	Division of Reclamation, Mining and Safety
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
MAIP	maximum allowable injection pressure
MSDS	Material Safety Data Sheet
NSHI	Natural Soda Holdings, Inc.
NSI	Natural Soda, Inc.
OSR	oil shale reactor
PFD	Process Flow Diagram
POD	Plan of Development
PLS	pure live seed
PRL	Preference Right of Lease
RD&D	Research, Development and Demonstration
SPCC	Spill Prevention, Control and Countermeasures
SWMP	Stormwater Management Plan
TDS	total dissolved solids
UIC	Underground Injection Control
UL	Underwriters Laboratories
USDW	Underground Source of Drinking Water
USGS	United States Geological Survey
VIT	vacuum insulated tubing
Williams	Williams Production RMT

## PURPOSE

This Plan of Development (POD) presents a development plan for the Research, Development, and Demonstration (RD&D) Lease issued to Natural Soda Holdings, Inc. (NSHI) and allows for the permitting, constructing, and operating an in situ pilot oil shale reactor test on Oil Shale RD&D Lease COC74299.

## EXECUTIVE SUMMARY

NSHI, in conjunction with its wholly owned subsidiary Natural Soda, Inc. (NSI), has successfully operated a nahcolite (sodium bicarbonate) mining operation in the Piceance Creek Basin in northwestern Colorado since 1991. NSI's solution mining technique is a proven method for economically extracting nahcolite with minimal environmental impact. NSHI's strategy is to incorporate NSI's expertise in solution mining with a new and innovative in situ method for extracting kerogen from oil shale to commercially develop oil shale resources within the 160-acre RD&D Lease area. Following the issuance of NSHI's oil shale RD&D Lease by the Bureau of Land Management (BLM), NSHI developed this POD, which discusses details of implementing NSHI's oil shale research project.

The NSHI RD&D Lease area consists of 160 acres and is situated between the Stake Springs and Ryan Gulch drainages, encompassing Lots 1, 2, 3, and 4 in the N ½ of the N ½ of Section 35, T1S, R98W, 6th Principal Meridian, Rio Blanco County, Colorado. Meeker, Colorado, lies approximately 41 miles to the northeast. Surface elevation on the lease ranges from approximately 6,650 to 6,770 feet. The topography is characterized by shallow alluvial valleys and broad soil-covered ridges and mesas. Pinyon, juniper, and sagebrush are the dominant vegetative cover.

NSHI's process for extracting kerogen from the oil shale within portions of the Green River Formation involves [REDACTED]

[REDACTED] of the Saline Zone. [REDACTED]  
[REDACTED]. This interval will then be heated using a [REDACTED]

[REDACTED]

[REDACTED] At this time, [REDACTED] is also being considered [REDACTED] as a backup method. Another alternative heating approach NSHI is considering is [REDACTED] This process was derived from research conducted [REDACTED]

[REDACTED]  
[REDACTED]

[REDACTED] on samples of oil shale from the Piceance Creek Basin to guide process development. The research includes similar work undertaken since 2010 on core samples (of the 12H-C well) from NSI's ongoing sodium solution mining operations.

## **9(a) SUBMISSION STATEMENT**

This POD describes the proposed exploration, prospecting, testing, and development or mining operations to be conducted. Exploration, mining plans, and in situ development plans, which are incorporated into this POD, are consistent with the requirements of the lease for protecting non-mineral resources and for reclaiming the surface of the lands affected by the operations authorized by Federal RD&D Lease COC74299. The authorized officer will consult with any other agency involved and will promptly approve the plans or indicate what additional information is necessary to conform to the provisions of the established requirements.

## **9(b) GENERAL INFORMATION, GEOLOGY, LOCATION, AND METHODS**

### **9(b)(1) Operator Name and Contact Information**

Natural Soda Holdings, Inc.  
3200 Rio Blanco County Road 31  
Rifle, Colorado 81650  
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#### Responsible Party:

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Cell: (970) 355-4590  
Email: [warnekeb@naturalsoda.com](mailto:warnekeb@naturalsoda.com)

#### Additional Contact:

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Email: [bradbunnnett@mac.com](mailto:bradbunnnett@mac.com)

#### Local Contact:

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Grand Junction, CO 81507-4101  
Office: (970) 254-1224  
Cell: (970) 216-1010  
Email: [gjdaub@daubandassociates.com](mailto:gjdaub@daubandassociates.com)

#### ***Federal Lease Serial Numbers:***

NSHI's oil shale RD&D Lease (COC74299) is encumbered by Federal oil and gas leases COC60735 and COC62052, committed to ExxonMobil/Williams Production RMT (Williams/WPX) Ryan Gulch Oil and Gas Exploratory Unit COC68239X.

### ***Surface and Mineral Ownership:***

The United States Federal Government owns and manages both the surface and mineral rights to the NSHI 160-acre RD&D Lease area. This land is managed by the BLM. All existing right of ways on the tract are also administered by the BLM.

### **9(b)(2) General Description of Geologic Conditions and Mineral Resources, With Appropriate Maps, Within the Area Where Mining Is To Be Conducted**

The NSHI 160-acre RD&D Lease area is located in the north-central portion of the Piceance Creek Basin, near the depositional center and center of saline mineral deposits within the Eocene Green River Formation (Figure 1). The Piceance Creek Basin contains the largest concentration of oil shale reserves in the world and has been the subject of numerous major oil shale research and development projects over the past 75 years.

#### ***Geologic Structure***

Structurally, the north-central Piceance Creek Basin consists of a series of northwest-southeast trending anticlines and synclines, which are superimposed on the overall basinal setting. None of these structures cross the RD&D Lease area. Bedding on the lease area is flat-lying to gently dipping to the northeast between 1.0 and 2.5 degrees.

The Dudley Bluffs Graben is a southeast to northwest trending fault system originating at the Piceance Creek Dome about 10 miles southeast of NSHI's RD&D Lease area. As the Dudley Bluffs Graben approaches the lease area, it loses surficial definition and intensity (Figure 2). It is doubtful that this feature will have a significant impact to oil shale operations on the RD&D Lease area.

The RD&D Lease area is located near the depositional center of the basin, and it contains some of the thickest and richest oil shale deposits in the entire basin. The initial oil shale reactor (OSR) interval to be developed is [REDACTED]

[REDACTED] Figure 3 is a structure contour map of the top of the R-2 Zone in the vicinity of the NSHI 160-acre RD&D Lease area. The lithologic units and features contained within each stratigraphic zone can be easily correlated from one part of the basin to another. This is especially true over short lateral distances. Because of the proximity of the NSI plant and associated sodium bicarbonate production wells, NSHI has good stratigraphic control over the stratigraphic tops of the Parachute Creek Member in the vicinity of the 160-acre RD&D Lease area.

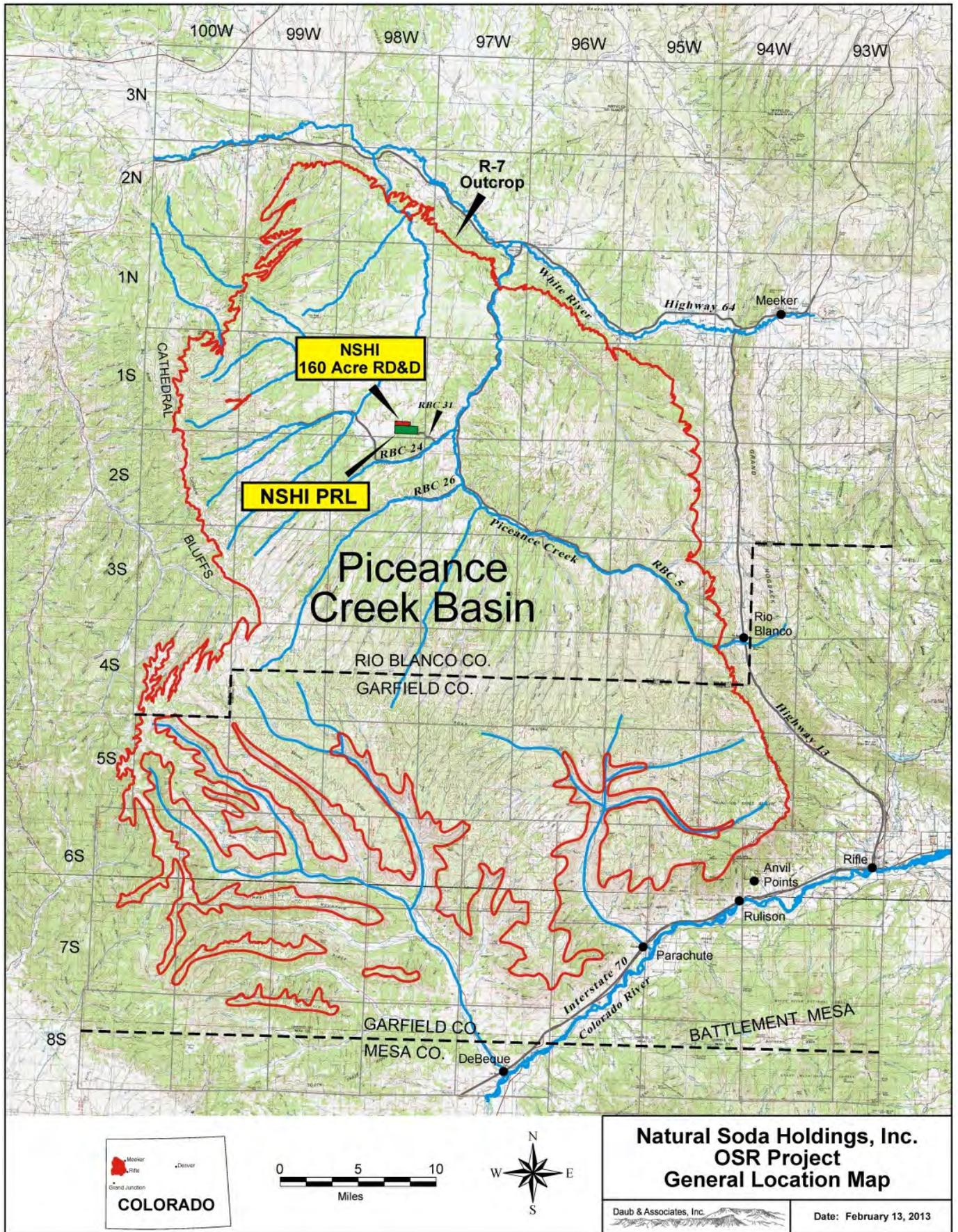


Figure 1 General Location Map NSHI RD&D Lease Area

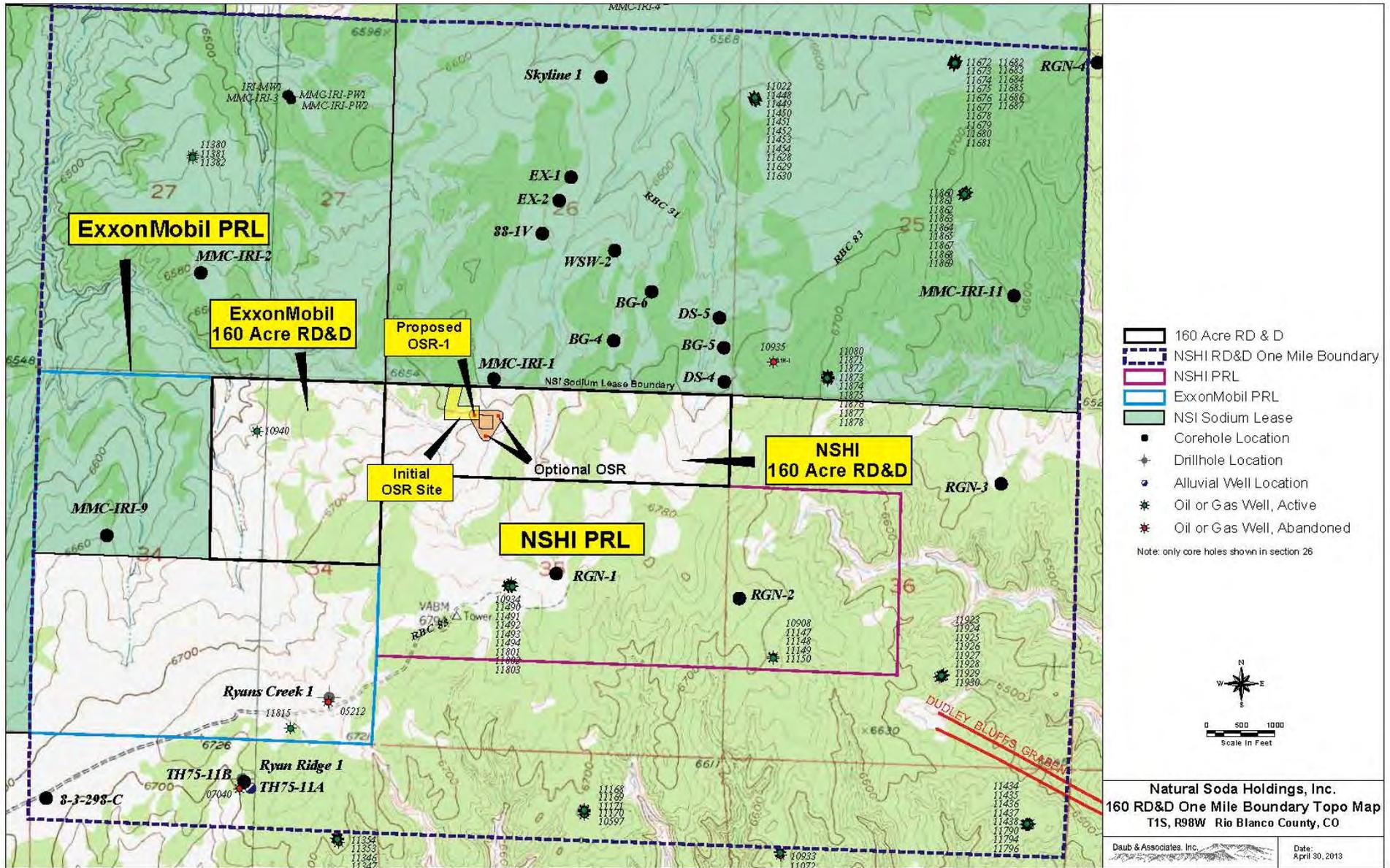


Figure 2 Topographic Map - NSHI 160-Acre RD&D Lease Area

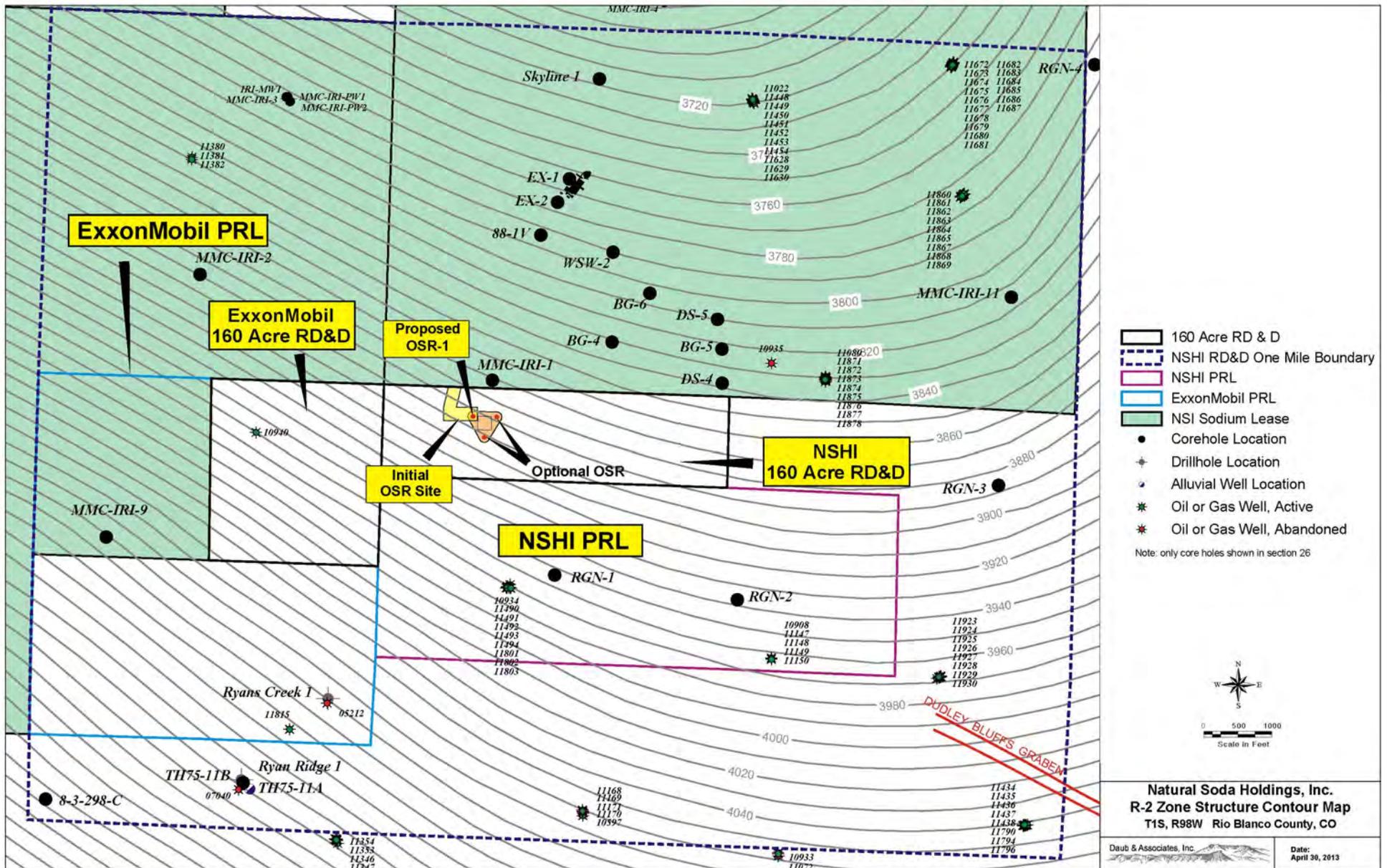


Figure 3 Structure Contour Map – Top of the R-2 Zone in the Vicinity of the NSHI RD&D Lease Area

## **General Stratigraphy**

The Uinta Formation dominates surface outcrops on the lease area. The Uinta Formation consists predominantly of fluvial sandstones, with occasional interbedded siltstones and marlstones. The Uinta Formation has an average thickness of approximately 1,200 feet in the lease area. Included in this sequence are three tongues of the Green River Formation. The Uinta Formation rests conformably on the R-8 Zone of the Parachute Creek Member of the Green River Formation.

The Green River Formation, a thick lacustrine unit deposited in ancient Lake Uinta, contains important oil shale and saline mineral deposits in the Piceance Creek Basin. In the lease area, the Green River Formation is more than 2,500 feet thick and is overlain by the Uinta Formation (Eocene) and underlain by the Wasatch and Fort Union Formations (Eocene-Paleocene). The Parachute Creek Member of the Green River Formation is the principal resource interval for both oil shale and saline minerals. It averages about 1,700 feet thick in the lease area and consists primarily of oil shale, marlstone, leached oil shale, and saline oil shale (Figure 4).

The Parachute Creek Member of the Green River Formation consists of 13 zones that are differentiated by average oil shale grade. They have been divided into two categories: rich and lean. There are seven thick, rich oil shale zones (R-8, R-7, R-6, R-5, R-4, R-3, and R-2 Zones) separated by six thinner, leaner oil shale zones (A-Groove, B-Groove, L-5, L-4, L-3, and L-2 Zones). Average oil shale grade varies substantially between rich zones (on average 20 to 30 gallons per ton and up to 80 gallons per ton) and lean zones (on average 10 to 15 gallons per ton), as well as within the individual rich and lean zones.

Thin volcanic ash (tuff) deposits are common in the uppermost five zones of the Parachute Creek Member. Saline minerals in saline oil shale include nahcolite ( $\text{NaHCO}_3$ ), dawsonite [ $\text{NaAl}(\text{CO}_3)(\text{OH})_2$ ] and halite ( $\text{NaCl}$ ). In the area of the NSHI 160-acre Lease area, saline oil shale is located in the lower part of the Parachute Creek Member in the R-2, L-2, R-3, L-3, R-4, L-4, R-5, and in part L-5 stratigraphic zones. This interval, known as the Saline Zone, ranges in thickness from approximately 950 to 1,000 feet in the lease area. Oil shale resources for the Saline Zone under the lease are approximately 300 million barrels (Johnson et al., 2009). At the current time, NSHI is targeting only the oil shales within the Saline Zone for potential commercial oil shale production.

The Saline Zone is overlain by a 400 to 600-foot-thick sequence of oil shale known as the Leached Zone. This interval, which generally includes part of the L-5 Zone; all of the R-6 Zone, B-Groove, R-7 Zone, A-Groove; and part of the R-8 Zone, once contained numerous horizons of stratiform nahcolite, halite, and nonstratified nahcolite (in oil shale). Circulating groundwater in the geologic past dissolved the saline minerals and produced numerous dissolution vugs, cavities, breccia, and rubble, as well as the subsidence features within the Leached Zone. The Leached Zone is characterized by thin oil shale horizons containing numerous dissolution features interbedded with massive oil shales containing joints and partings.

Lithologies above the Saline Zone contain numerous fractures. Most are associated with the Leached Zone and were produced by a combination of local and regional tectonism along with the imprint of the dissolution of saline minerals. Lithologies in the Saline Zone have far fewer fractures relative to the rest of the Parachute Creek Member and Uinta Formation. Most open fractures in the Saline Zone have been healed by secondary precipitation of saline minerals, mainly white crystalline nahcolite. Some fractures in the L-3 and L-2 Zones have infillings of organic matter.

# Stratigraphic, Lithologic, and Hydrostratigraphic Intervals of Uinta and Upper Green River Formations

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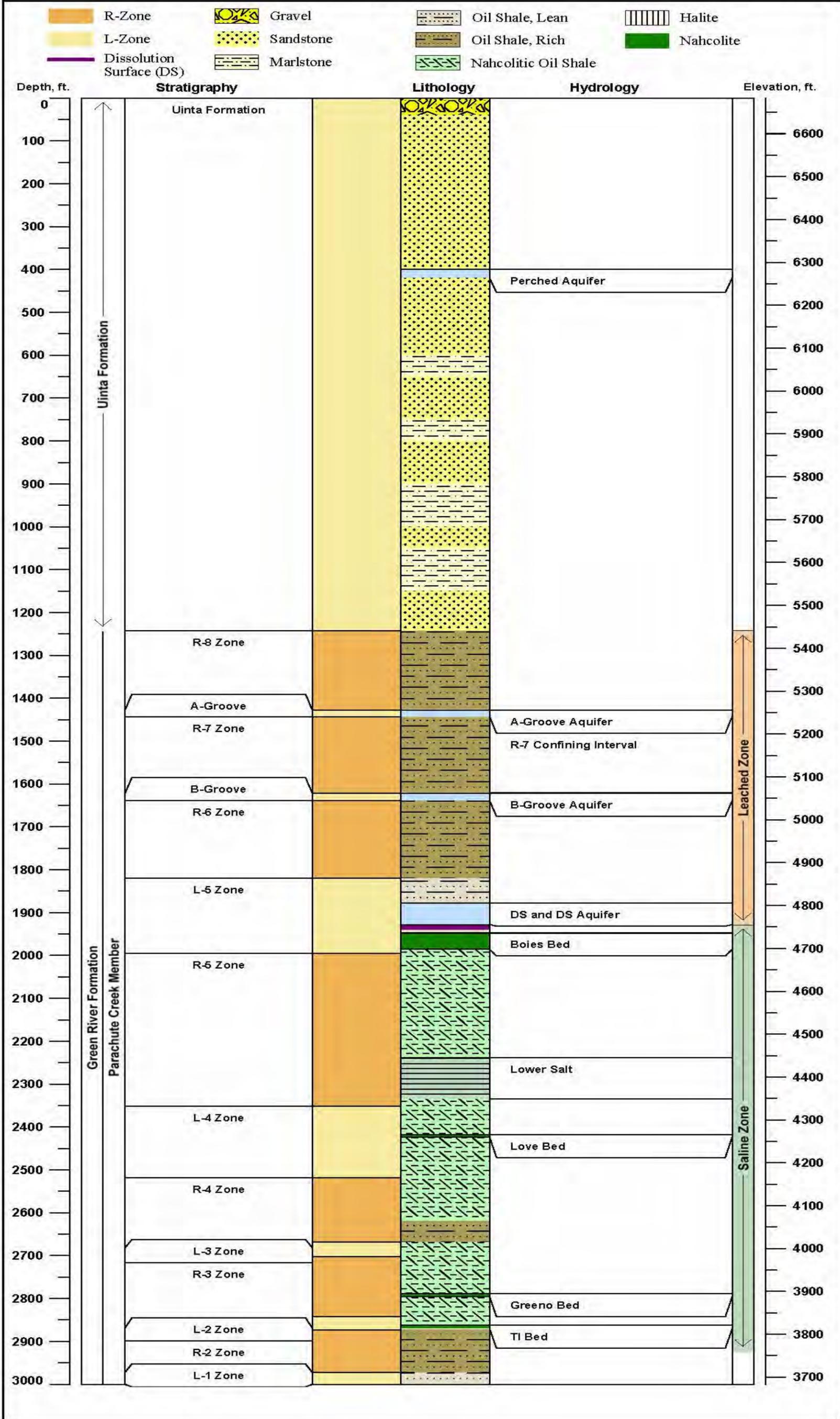


Figure 4 Stratigraphic, Lithologic, and Hydrostratigraphic Column - NSHI RD&D Lease Area

The Garden Gulch Member of the Green River Formation underlies the Saline Zone, and it consists of dry clay-rich oil shales and claystones. In the vicinity of the lease area, the Garden Gulch Member is approximately [REDACTED]

In summary, the NSHI 160-acre RD&D Lease area has the following geological characteristics:

- A uniform and predictable stratigraphic framework within the Uinta Formation and Parachute Creek Member of the Green River Formation
- Abundant resources of oil shale, nahcolite, and dawsonite. Numerous mappable nahcolite beds exist in the Saline Zone
- A structure characterized by a broad, shallow basin, with fractures and dissolution features common in rocks above the Saline Zone
- A gentle surface topography conducive to continual development of the property
- A dry, confining interval above the proposed area of development (within the Saline Zone) that is highly competent and devoid of water
- A dry, clay-rich confining interval below the proposed area of development (Garden Gulch Member) that is highly competent and devoid of water

### ***Overburden Cross-Section***

The Piceance Creek Basin in the vicinity of NSHI's RD&D Lease area contains some of the thicker overburden deposits of the Uinta Formation overlying the Parachute Creek Member of the Green River Formation. The Uinta Formation overburden on the lease area is anticipated to be approximately 1,200 feet thick. Figure 5 provides a cross-section in the vicinity of the lease area.

### ***Estimated Geologic Tops and Markers***

Table 1 displays the estimated tops of the stratigraphic zones and nahcolite marker beds based upon an average ground level elevation of 6,710 feet above mean sea level.

The top of the Saline Zone is expected to coincide with the Dissolution Surface at a depth of approximately 1,883 feet. The T1 nahcolite bed is anticipated to be present between the depths of 2,815 and 2,824 feet. The top of the R-2 Zone is expected to be at a depth of approximately 2,824 feet. The OSR interval is expected to be between the depths [REDACTED]

### ***Detailed Stratigraphy***

The upper contact of the Saline Zone is marked by a Dissolution Surface (Figure 5), which represents the lowermost penetration of circulating groundwater into the Parachute Creek Member. Near NSHI's RD&D Lease area, the Saline Zone reaches its maximum thickness, where the Dissolution Surface is positioned stratigraphically about 110 feet above the contact between the L-5 and R-5 oil shale zones. Laterally from this location, the Dissolution Surface progressively penetrates deeper into the Parachute Creek Member, reducing the Saline Zone in thickness until it becomes nonexistent. The present-day extent of the Saline Zone (Figure 6) is a result of natural subsurface dissolution processes operating since the Eocene Epoch.

Natural Soda Holdings, Inc.  
160 Acre RD&D Program  
**Stratigraphic and Hydrostratigraphic  
Prognosis Tops**

Well Number: OSR-1  
Section: 35  
Township: 1S  
Range: 98W  
GL Elev, ft: 6710

Date: 8/1/2013

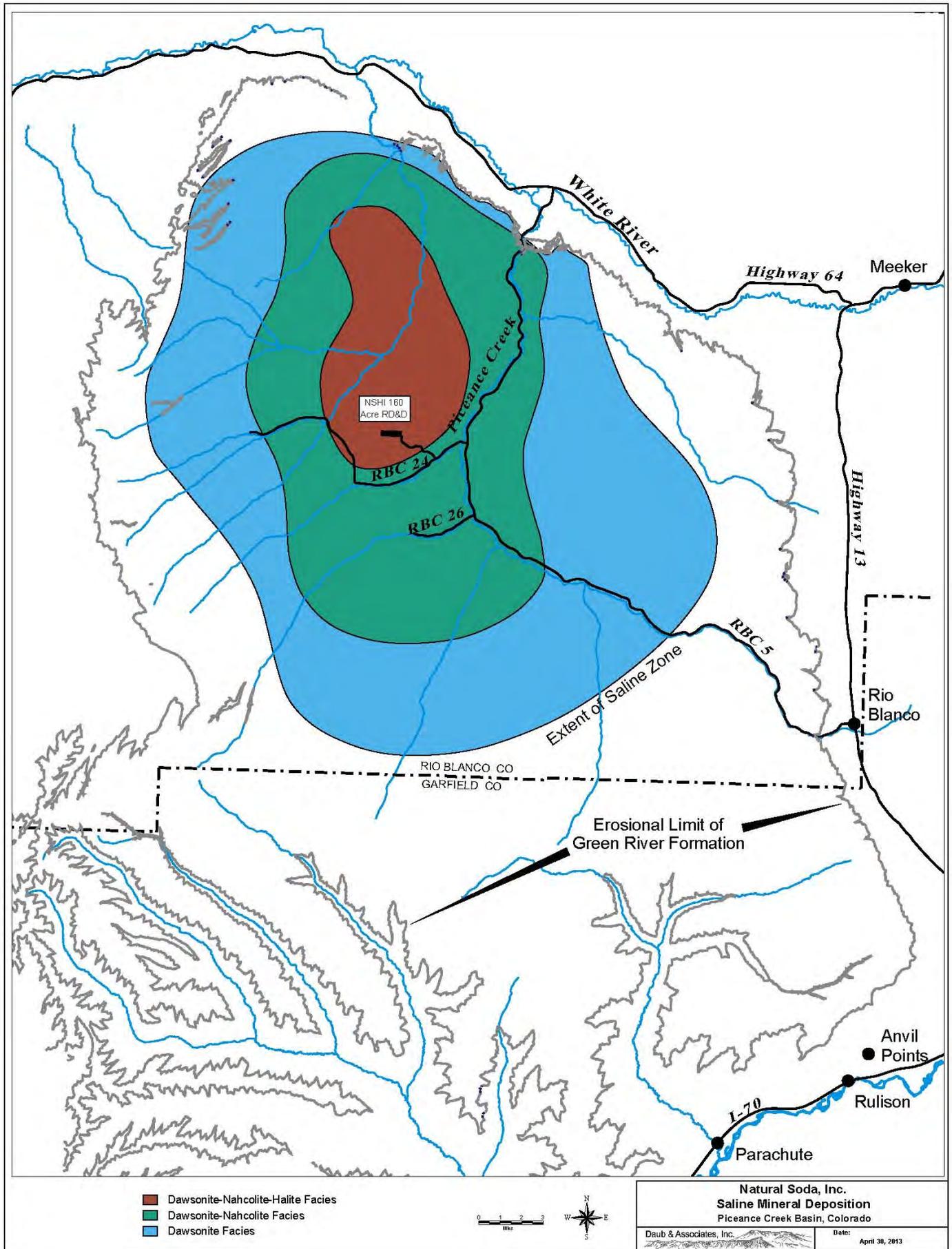
Stratigraphic Intercept		Prog Depth, ft	Prog Elevation, ft	Hydro-stratigraphic Intercept	Prog Top Depth, ft	Prog Bottom, Depth, ft	
Green River Tongue		566.5	6143.5	Perched Aquifer	397.0	417.0	
Uinta Formation		nd		A-Groove Aquifer	1373.5	1410.1	
Transition Zone		nd		B-Groove Aquifer	1564.4	1604.5	
Green River Formation	Parachute Creek Member	R-8 Zone	1217.5	5492.5	DS Aquifer	1833.1	1883.1
		A-Groove	1383.5	5326.5			
		R-7 Zone (Mahogany Zone)	1400.1	5309.9			
		B-Groove	1574.4	5135.6			
		R-6 Zone	1594.5	5115.5			
		L-5 Zone	1775.3	4934.7			
		R-5 Zone	1940.3	4769.7			
		L-4 Zone	2298.7	4411.3			
		R-4 Zone	2459.6	4250.4			
		L-3 Zone	2617.1	4092.9			
		R-3 Zone	2641.5	4068.5			
		L-2 Zone	2796.8	3913.2			
		R-2 Zone	2824.2	3885.8			
		Garden Gulch	L-1 Zone (Blue Marker)	2923.2	3786.8		
	R-1 Zone		2964.5	3745.5			
L-0 Zone	nd		nd				
R-0 Zone (Orange Marker)	nd		nd				

Saline Mineral Interval	Prog Top Depth, ft	Prog Bottom, Depth, ft	Prog Top Elevation, ft	Prog Bottom, Elevation, ft	Prog Thickness, ft
First Water	nd	na	nd	na	na
Top Mahogany Bed	1446.3	na	5263.7		na
Dissolution Surface	1883.1	na	4826.9		na
First Nahcolite	nd	nd	nd		nd
Partially Leached Interval	nd	nd	nd		nd
Saline Zone Interval	1883.1	2871.4	4826.9	3838.6	988.3
L5-E Bed - Nahcolitic	1883.1	1886.1	4826.9	4823.9	3.0
L5-E Bed - Halitic	na	na	na	na	na
L-5 B&C Bed	1886.1	1906.9	4823.9	4803.1	20.8
Upper Boies Bed - Nahcolitic	1906.9	1929.9	4803.1	4780.1	23.0
Upper Boies Bed - Halitic	na	na	na	na	na
Oil Shale Marker Bed	1929.9	1933.8	4780.1	4776.2	3.9
Lower Boies Bed - Nahcolitic	1933.8	1938.4	4776.2	4771.6	4.6
Lower Boies Bed - Halitic	na	na	na	na	na
Lower Salt	2206.3	2284.1	4503.7	4425.9	77.8
Love Nahcolite Bed	2359.3	2366.7	4350.7	4343.3	7.4
Greeno Nahcolite Bed	2742.7	2750.7	3967.3	3959.3	8.0
TI Nahcolite Bed	2815.6	2824.2	3894.4	3885.8	8.6

Table 1 Stratigraphic and Hydrostratigraphic Tops Prognosis - OSR Well



**Figure 5 Cross-Section - Vicinity of the NSHI 160-Acre RD&D Lease Area**



**Figure 6 Extent of the Saline Zone - Piceance Creek Basin**

Above the Dissolution Surface, rocks of the Parachute Creek Member are generally disturbed. The intensity of disruption is proportional to the former abundance of saline minerals in the oil shale host rock. High concentrations of saline minerals are now represented by dissolution features, rubble, and collapse breccia. Natural dissolution of the saline minerals has also produced subsidence in overlying oil shales, thus, creating numerous joints and partings. A more intense interval of dissolution disturbance in the Parachute Creek Member occurs between the R-7 (Mahogany Zone) and the R-5 Zone. Where the Saline Zone is thick, the Leached Zone (the interval between the Dissolution Surface and the uppermost vug or dissolution feature) has a minimum thickness of about 600 feet. As the Dissolution Surface penetrates further into the section, the Leached Zone becomes proportionally thicker. Evidence for leaching of saline minerals is also present above the Mahogany Zone. The lower Mahogany Zone, A-Groove, and parts of the R-8 Zone all have dissolution features (Daub et al., 1985; Trudell et al., 1970, 1974).

Because the Dissolution Surface represents the deepest extent of groundwater penetration, rocks in the Saline Zone below the Dissolution Surface are dry, generally very competent, and largely devoid of fractures. Significant quantities of nahcolite are present below the Dissolution Surface in the form of nodules and aggregates, thin interbeds, thick beds, and intervals of disseminated (non-stratiform) nahcolite.

The most important bedded (stratiform) nahcolite horizons in descending order are the Boies Bed, a 30- to 32-foot-thick seam of crystalline nahcolite in the lower L-5 Zone; the Love Bed, an interbedded series of microcrystalline nahcolite seams and oil shale beds (6 to 7 feet thick) in the L-4 Zone; the Greeno Bed, a 7- to 8-foot-thick horizon in the R-3 Zone consisting of densely disseminated nahcolite crystals in an oil shale matrix; and the T1 Bed, a 7- to 8-foot-thick nahcolite bed in the L-2 Zone that closely resembles the Greeno Bed in texture, composition, and thickness. Typically, the average nahcolite content in these high-grade beds exceeds 65 weight percent. These units are easily identifiable and are, therefore, considered good marker beds.

Dawsonite generally becomes common within the R-5 Zone and is present in the stratigraphic units below the R-5 Zone. Minor amounts of free oil and methane are anticipated to be encountered in the Saline Zone lithologic units, though not in enough quantity so as to be commercially developed. However, any methane or natural gas encountered in the subsurface, either by way of degassing or via the subsurface heating process, [REDACTED]

Halite in the Saline Zone is not found below the R-5 oil shale zone. It is primarily concentrated in two major horizons: one at the base of the L-5 Zone, called the Upper Salt (containing the Boies Bed), and the second within the R-5 oil shale zone, the Lower Salt. Other horizons of halite occur between the two massive salts, but they are subordinate in thickness. Within the Upper and Lower Salts, halite is typically interbedded with thin horizons of nahcolitic oil shale, nahcolite, and halitic nahcolite.

Although halite is present in the Boies Bed on the NSI leases immediately to the north of the NSHI 160-acre RD&D Lease area, the lateral extent of this halite facies in the Boies Bed is not expected to encompass any part of the lease area. Halite is also present in the Lower Salt as part of an approximately 100-foot-thick nahcolitic halite interval within the R-5 Zone, and it acts as an excellent confining interval (Figure 7).

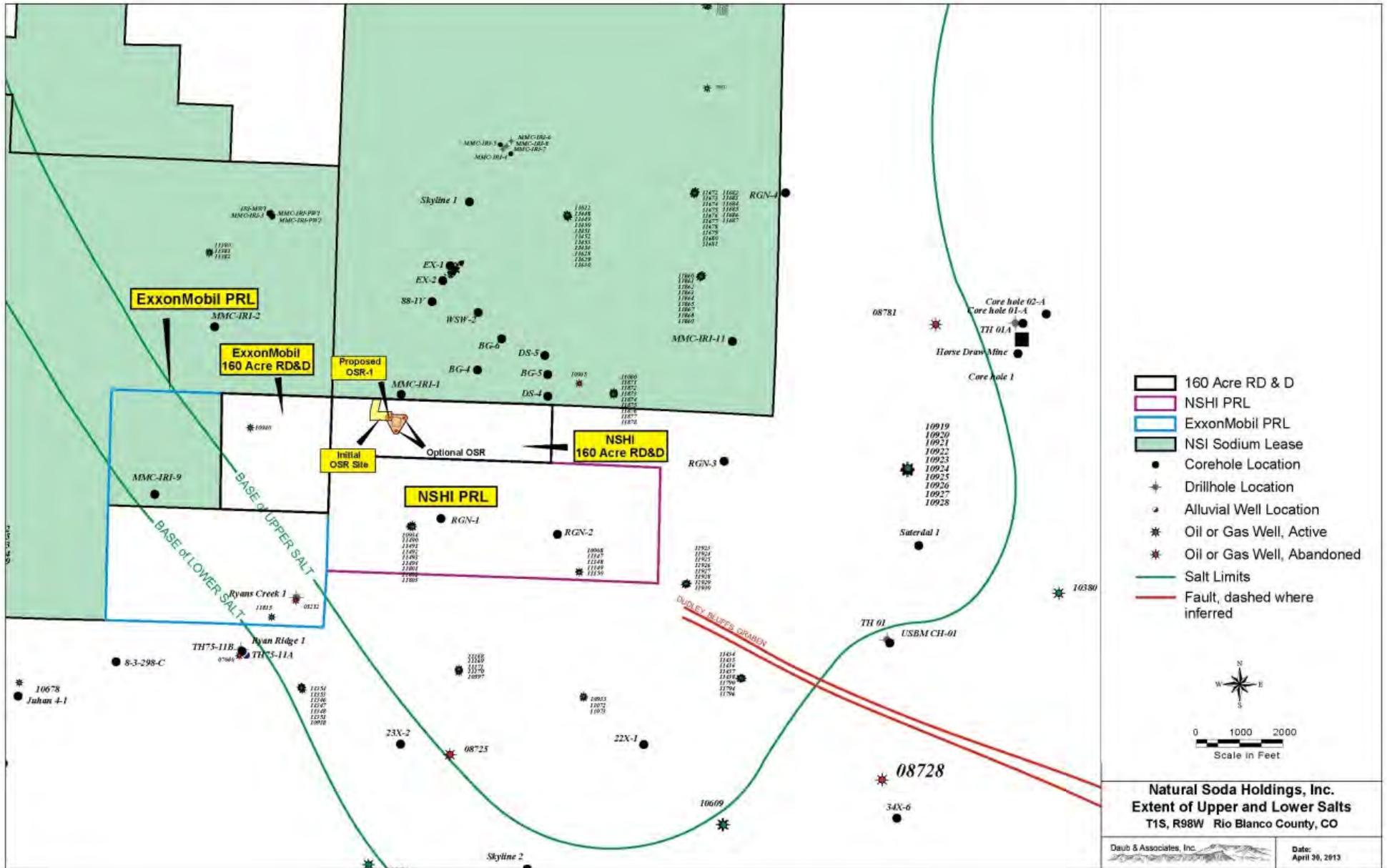


Figure 7 Extent Upper and Lower Salts - Vicinity of the NSHI RD&D Lease Area and the Dudley Bluffs Graben

The NSHI's research project intends to initially produce approximately 100 barrels of oil

### ***Hydrostratigraphy***

Groundwater is expected to be encountered in the Perched (where it exists), A-Groove, B-Groove, and Dissolution Surface Aquifers at the depths listed in Table 1. However, because the initial OSR interval is between the depths of [REDACTED] no groundwater is anticipated to be encountered near or within the production zone. It is unlikely that existing groundwater would be adversely affected by development operations. Approximately 942 feet of dry, confining interval exists between the top of the initial OSR and the lowermost groundwater occurrence, which is the Dissolution Surface Aquifer which is not an Underground Source of Drinking Water (USDW). NSHI may elect to research the effect of varied OSR intervals within the same well. In the case of stacked OSR intervals, the uppermost interval would be located below the base of the Lower Salt (2,284 feet below ground surface). The halitic/nahcolitic Lower Salt is approximately 100 feet thick and a very effective aquiclude. Should OSR intervals be placed near the base of the Lower Salt, approximately 462 feet of dry, competent formation would exist between the top of the OSR and the base of the USDW-exempt Dissolution Surface Aquifer. Approximately 740 feet of formation would exist between the OSR and the base of the B-Groove Aquifer. In addition, to preclude any contamination, OSR wells will be cased and cemented from near the top of the reactor interval to ground level. The initial OSR interval will be the lowermost interval explored. The base of the Parachute Creek Member is approximately 50 feet below the bottom of the OSR (and deepest planned exploration). This formation is dry and competent. The Garden Gulch Member of the Green River Formation underlies the Parachute Creek Member and the Saline Zone. The Garden Gulch Member consists of dry clay-rich oil shales and claystones. In the vicinity of the lease area, the [REDACTED]

### ***Geological Formations to be Developed***

The R-2 Zone characteristically consists of moderately rich to rich oil shale with occasional aggregates, nodules, and interbeds of nahcolite in the upper half of the R-2 Zone. The base of the Saline Zone in the vicinity of the lease area is found at a depth of approximately 2,870 feet, and it is located near the middle of the R-2 Zone. The initial reactor interval for the NSHI research project will be between the depths of [REDACTED] the Saline Zone (Figure 5). The top of the initial reactor interval is [REDACTED]

Based upon analytical data from the MMC-IRI-1 well, located adjacent to the NSHI 160-acre RD&D Lease area, the R-2 Zone reactor interval in the lease area is expected to average approximately 30 gallons of oil per ton of oil shale. Nahcolite in the reactor interval is anticipated to average 17 percent by weight, and dawsonite is expected to average 4 percent by weight.

Because the initial reactor interval is near the base of the Saline Zone, there will be a competent overlying confining interval of more than [REDACTED] of solid rock between the initial OSR and the lowermost aquifer known as the Dissolution Surface Aquifer, which is not a USDW. Subsidence or groundwater contamination resulting from the solution mining and oil recovery activities is not anticipated.

**9(b)(3) Suitable Map or Aerial Photograph Showing the Topography, the Area Covered by the Lease(s), the Name and Location of Major Topographic and Cultural Features and the Plan for Drainage Away From the Affected Area**

Please refer to (Figure 8) on the following page of this document.

**9(b)(4) Proposed Methods of Operating, Including a Description of the Surface or Underground Mining Methods, the Proposed Roads, the Size and Location of Structures and Facilities to Be Built, Mining Sequence, Production Rate, Estimated Recovery Factors, Stripping Ratios (if applicable) and Number of Acres in the Federal Lease(s) or Permit(s) to Be Affected**

NSHI's OSR will be an in situ operation; it will not be a surface or underground mining operation. Refer to Section 9(c) for details concerning NSHI's proposed method of development.

**9(c) STATEMENT OF PROPOSED METHOD OF DEVELOPMENT FOR IN SITU OPERATIONS  
(CONFIDENTIAL)**

**9(c)(1) Description of the In Situ Methodology (CONFIDENTIAL)**

NSHI proposes an situ process for converting kerogen from oil shale contained within portions of the Green River Formation into shale oil and extracting it to the surface. This process involves Nahcolite dissolution and removal followed by heating the formation to temperatures [REDACTED]. This heating technique uses a closed loop, high temperature, heat transfer system to break the chemical bonds of kerogen in oil shale to convert it into shale oil. NSHI also retains the option of using a [REDACTED] as conditions warrant. A summary description of the proposed [REDACTED] process follows.

NSHI intends to drill and complete an in situ Oil Shale Reactor (OSR) production well or wells to test the effectiveness of their [REDACTED] conversion technology on a small scale. An approximate [REDACTED] [REDACTED] is proposed for the initial test at a depth interval of approximately [REDACTED] feet within the R-2 rich oil shale zone (Figure 5). It is intended to produce approximately 100 barrels of shale oil. Following the initial test, additional reactor intervals higher up in the Saline Zone (and below the base of the Lower Salt) may be selected within the OSR well for subsequent testing. In the event of mechanical difficulties with the initial well or a determination to extend the research project, an offset replacement OSR well or wells may be drilled. A maximum of [REDACTED] vertical feet of rock in each well could be converted. The total vertical interval may be spread out among a maximum of three OSR wells.

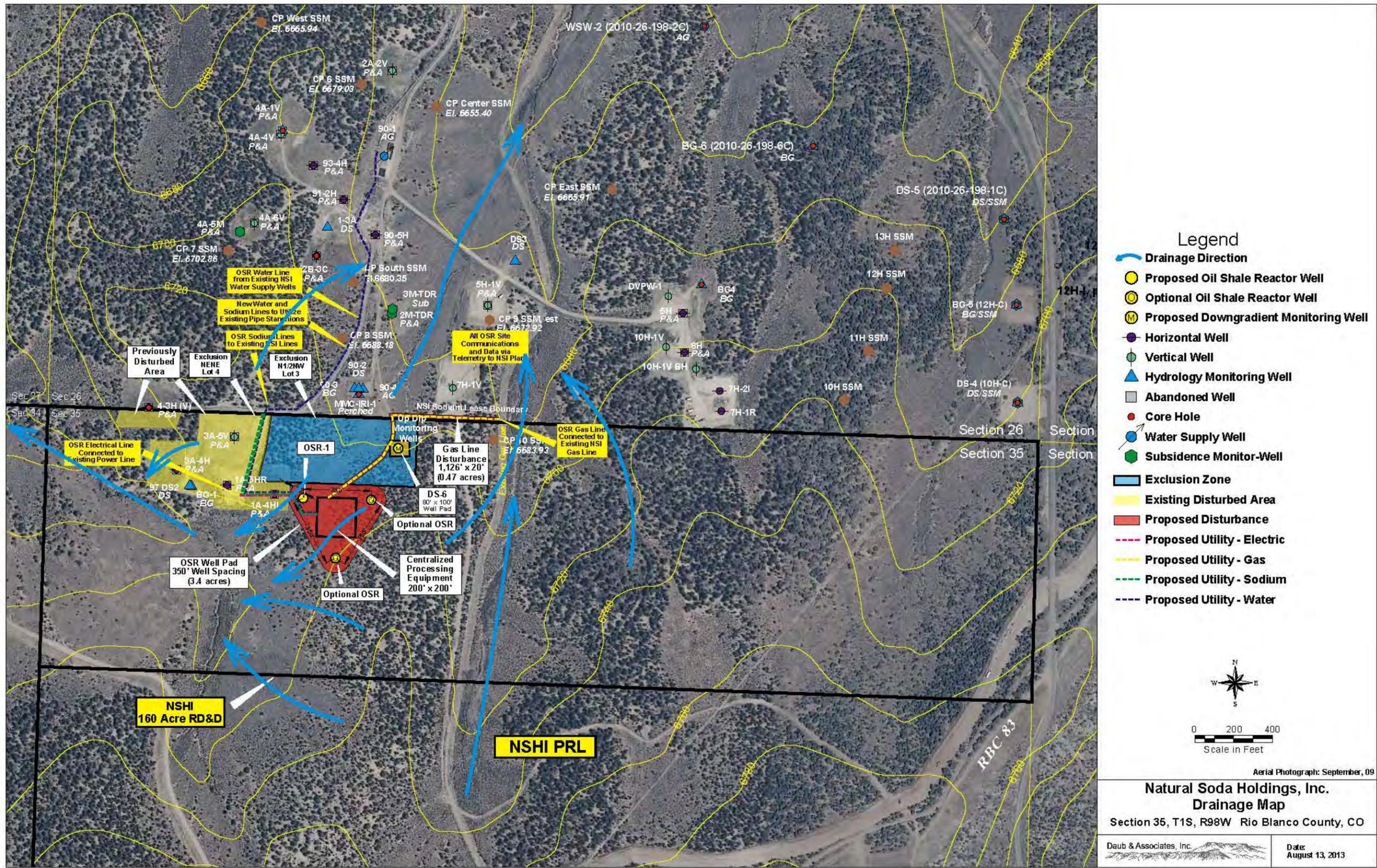


Figure 8 Aerial Map - Lease with Topographic, Cultural, and Drainage Features (CONFIDENTIAL)

This approach would use a best management practice by testing multiple intervals in a single production hole. The in situ heating and recovery would occur at a depth substantially below fresh water aquifer zones of the Green River Formation and within an interval that is isolated from and does not contain groundwater. Approximately 1,220 feet to a minimum of 740 feet of formation will separate the base of the B-Groove Aquifer—the deepest aquifer likely to contain water suitable for domestic, stock, or agricultural purposes—from the top of any potential OSR stacked intervals. Approximately 942 feet to a minimum of 462 feet of dry, competent confining interval will separate the base of the Dissolution Surface Aquifer [with total dissolved solids (TDS) levels in the 25,000 to 100,000 milligram per liter range] from the top of any potential test intervals for the proposed OSR RD&D effort.

The base of the Parachute Creek Member is approximately [REDACTED] below the bottom of the OSR and deepest planned exploration. This formation is dry and competent. The Garden Gulch Member of the Green River Formation underlies the Parachute Creek Member and the Saline Zone. The Garden Gulch Member consists of dry clay-rich oil shales and claystones. In the vicinity of the lease area, the Garden Gulch Member is approximately [REDACTED] feet thick.

The feasibility test is divided into three parts and is summarized below.

### **Phase 1: Pre-Conversion Nahcolite Solution Mining (CONFIDENTIAL)**

The first phase in the in situ development of shale oil will involve conventional vertical well technology to solution mine nahcolite within a select interval of the Saline Zone. Solution mining nahcolite will enhance porosity and form an in situ reactor interval within and near the base of the Saline Zone, hundreds of feet below the Dissolution Surface.

Phase 1 would entail the following:

1. Drilling a conventional vertical wellbore to access the [REDACTED] and comprising [REDACTED]
2. Solution mining the nahcolite within the selected interval of the Saline Zone (R-2 Zone) to form an in situ reactor interval for conversion of the oil shale kerogen into shale oil.
  - 2.1. Heated brine [barren liquor at approximately [REDACTED] degrees Celsius ([REDACTED] degrees Fahrenheit)] produced by NSI's existing sodium bicarbonate production facility would be piped and injected into the reactor interval via the production well injection tube to dissolve the nahcolite to form the OSR in the leached interval, which would act as the kerogen conversion reactor chamber. The sodium bicarbonate-enriched brine produced by dissolution of the nahcolite would be recovered via the recovery tube and would be treated in the existing NSI sodium bicarbonate production facility.
3. Following nahcolite extraction from the reactor zone, [REDACTED] The zone would then be dewatered in preparation for kerogen conversion. A pump and screen would be lowered into the leached interval, and all liquids would be pumped to the surface for recovery/disposal.
4. Design and construction of surface RD&D processing and recovery facilities would begin during Phase 1 and would continue during Phases 2 and 3, as appropriate.

Figure 9 presents a diagram of a potential well completion technique using a nitrogen gas cap for solution mining operations.

**Well: OSR-1, solution mode**  
**Well Type: Oil Shale Reactor**  
**Section: 35**  
**Township: 1S**  
**Range: 98W**

**Hole Type: Production Well**  
**Elevation: 6710, estimated**  
 Top of Conductor Casing, ft.  
**Date: 7/15/2013**  
 stratigraphy from prog

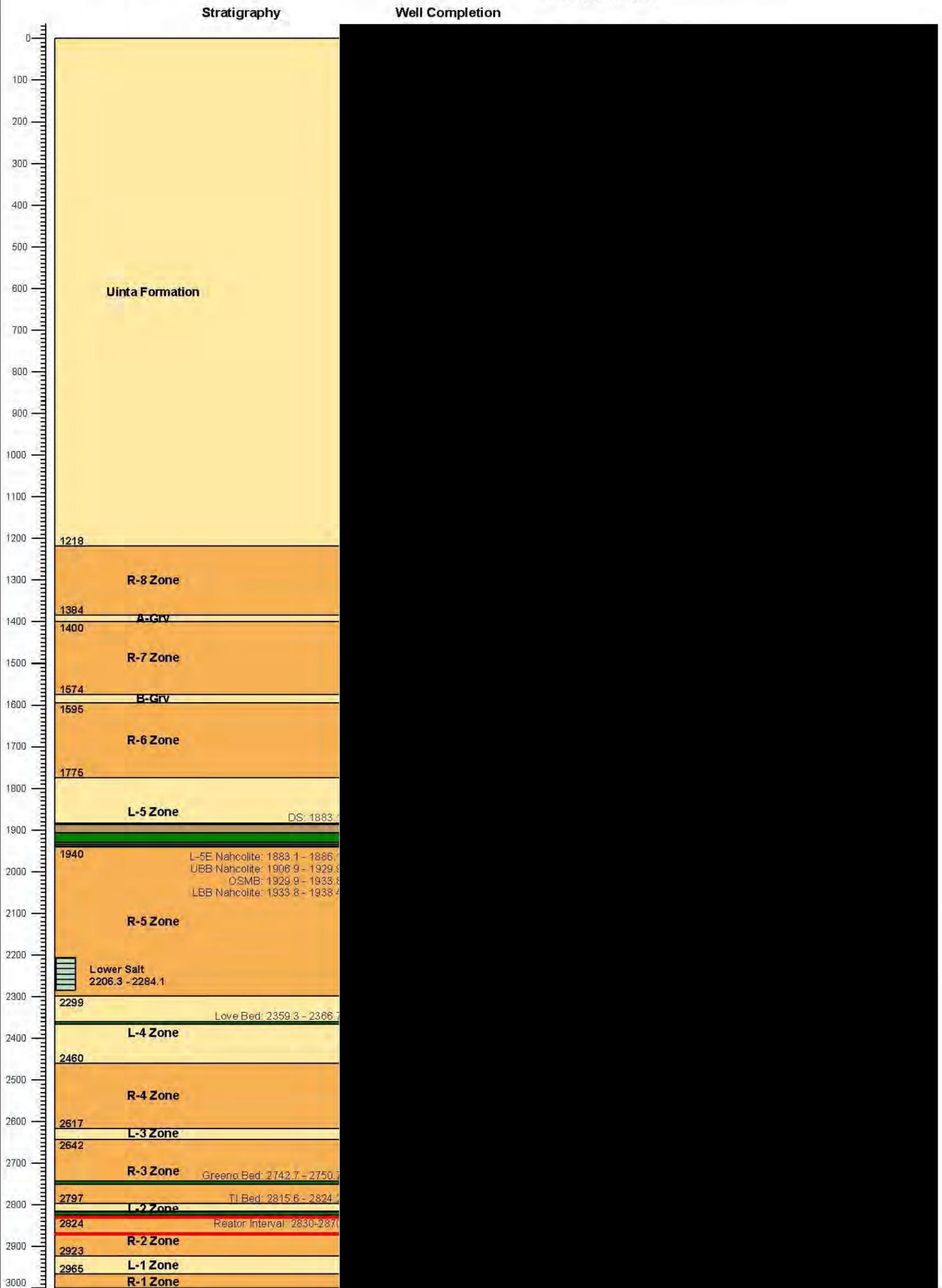


Figure 9 OSR Well Completion Using a Nitrogen Gas Cap - Solution Mining Phase (CONFIDENTIAL)

**Phase 2: Shale Oil Liquefaction (CONFIDENTIAL)**

The OSR well will use a conventional completion technique (Figure 10 and Figure 11), which will comply with appropriate U.S. Environmental Protection Agency (EPA) Underground Injection Control (UIC) regulations. The kerogen within the oil shale would be liquefied into shale oil within the solution-mined, leached reactor interval by heating the OSR interval.

1. The completed wellbore would accommodate a closed loop, heat exchange system capable of bringing the reactor up to the temperature required for kerogen conversion.  
[REDACTED]
2. The well design would enable downhole temperatures within the OSR interval to reach [REDACTED] degrees Celsius ([REDACTED] degrees Fahrenheit) to convert the kerogen into liquids.
3. [REDACTED] As the liquefaction progresses, more kerogen will be released from the reactor walls. The reaction continues until the cavity becomes too big for the temperature to be maintained. At that point, the temperature in the reaction chamber decreases and the conversion reaction slows and stops.

The well head will be equipped with a pressure control system to maintain pressure as high as possible without exceeding the formation fracture pressure. [REDACTED] is being considered to isolate the higher temperatures and pressures in the wellbore. Annular isolation will also be performed with a [REDACTED]

[REDACTED] Figure 10 shows annular isolation [REDACTED] Figure 11 presents a well drilling and completion design configuration using the dual string packer.

The proposed heat transfer medium is T [REDACTED] will be circulated through a closed loop system at a flow rate of approximately [REDACTED] gallons per minute.

As part of RD&D, NSHI may choose to investigate the feasibility of alternative methods to heat the OSR interval(s). These methods include, but are not limited to: [REDACTED]

**Well: OSR-1, heating mode**  
**Well Type: Oil Shale Reactor**  
**Section: 35**  
**Township: 1S**  
**Range: 98W**

**Hole Type: Production Well**  
**Elevation: 6710, estimated**  
 Top of Conductor Casing, ft.  
**Date: 7/15/2013**  
 stratigraphy from prog

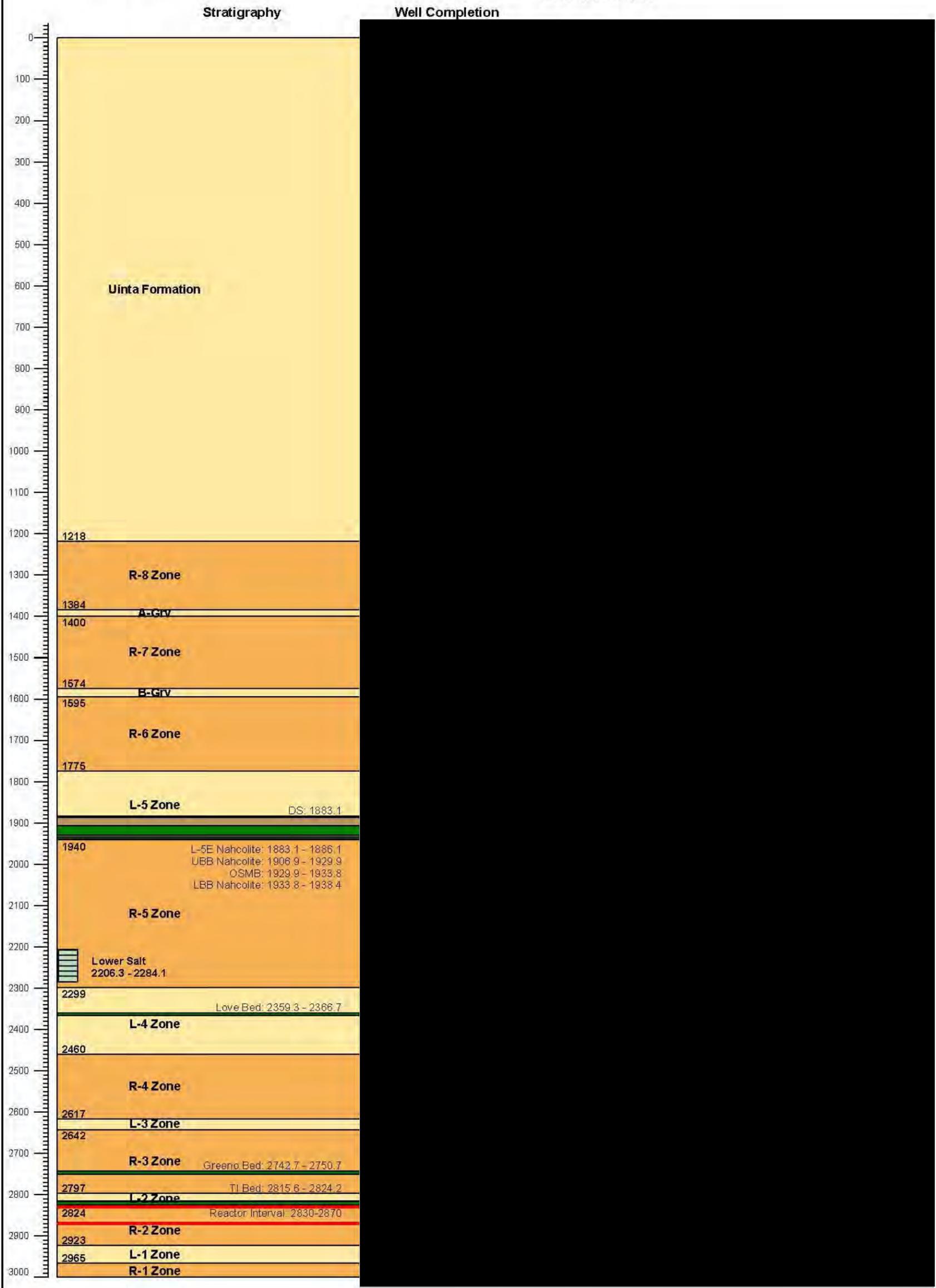


Figure 10 OSR Well Completion Using a Nitrogen Gas Cap – Shale Oil Liquefaction Phase (CONFIDENTIAL)

HOT OIL RECIRCULATION SIDE

PRODUCTION / INJECTION SIDE

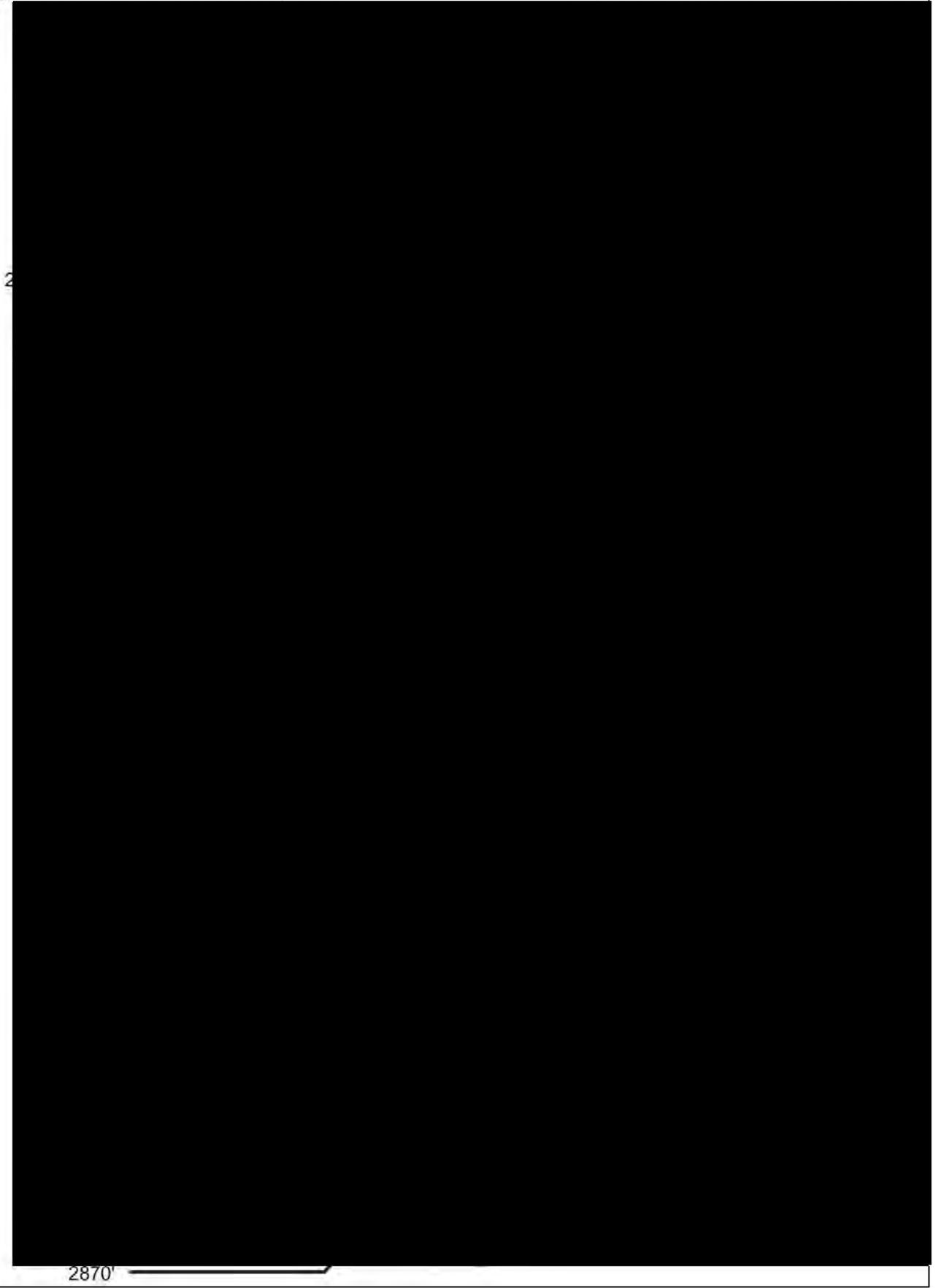


Figure 11 Drilling and Completion Design Configuration using a Dual String Packer (CONFIDENTIAL)

### **Phase 3: Extraction of shale oil and other products (CONFIDENTIAL)**

The third and final phase of the shale oil development will involve extracting the shale oil and additional products of the conversion process.

1. The generated gas and liquid hydrocarbon phases and other by-products would be removed from the reactor chamber through either [REDACTED]

[REDACTED] On a commercial scale, process off-gases could be sent to a waste heat boiler for thermal efficiency and/or cogeneration to support nahcolite and oil shale production. Subsequent sections of this POD discuss specific details about constructing the above ground processing site and equipment.

2. Production of shale oil and natural gas would be sustained until approximately 100 barrels of shale oil are produced from a specific reactor interval. Process off-gases from Phase 2 will be scrubbed and/or combusted and then vented. Upon completion of testing in the initial well, additional production wells may be constructed on the RD&D Lease area, subject to BLM approval, for continued testing and expansion of the technology before commercial production.

It is anticipated that the liquefaction reaction will generate liquids with a wide boiling range, so it is envisaged that hydrocarbons will be in the gas and liquid phases within the reactor. To collect the higher boiling point liquids, [REDACTED] may be used to solubilize the heavy end liquids and provide an extraction medium. [REDACTED] g parameters will be modified as part of the ongoing RD&D effort to increase efficiency and to optimize the product mix.

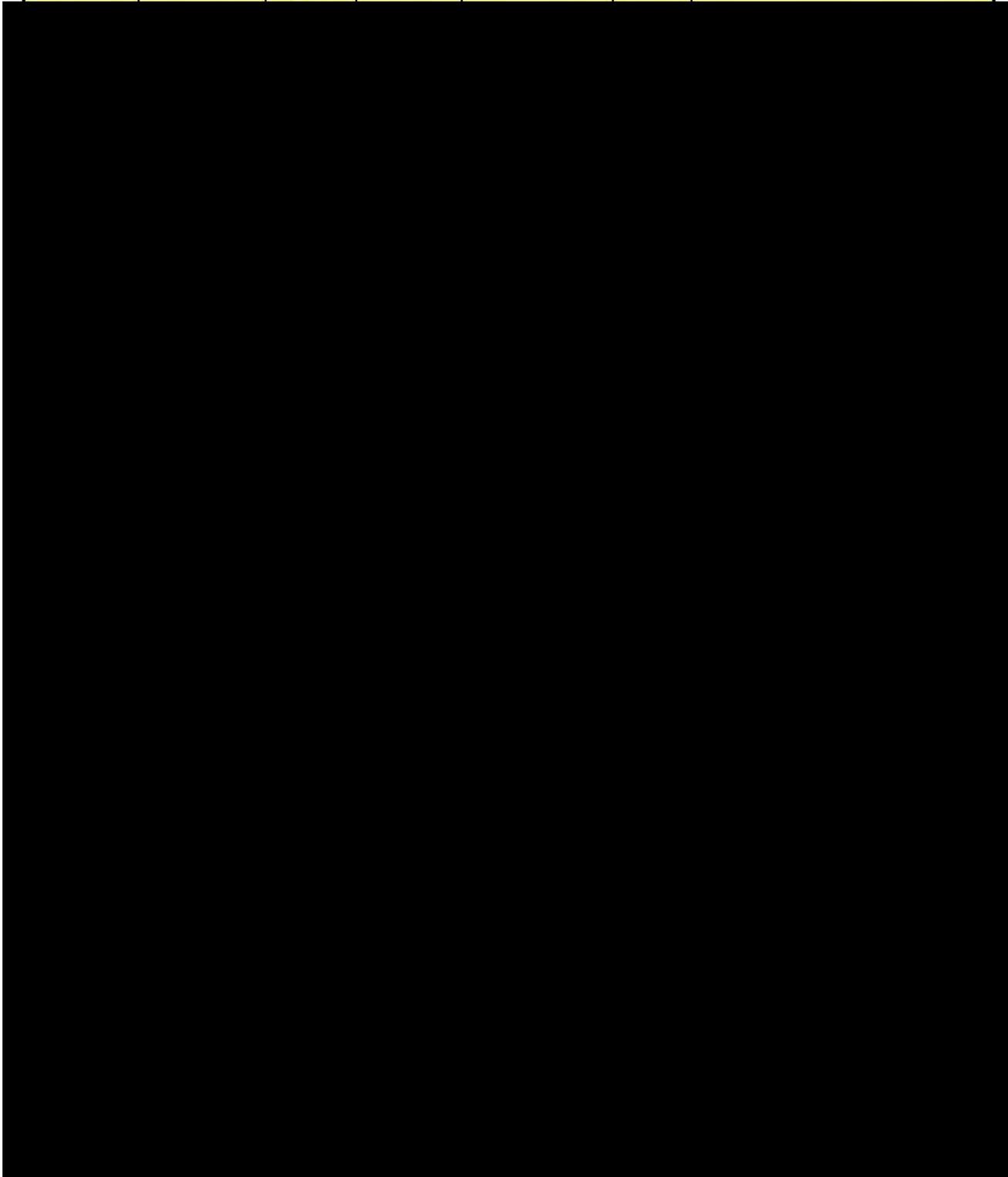
On a commercial scale, the reaction will be limited by the ability to increase the heat input into the reactor to maintain the reaction temperature as the volume of the reactor increases. As such, the reaction will be self-limiting, and there will be an economic life for each OSR well.

At least 10 barrels of product oil will be isolated under [REDACTED] in drums and shipped to a petroleum analysis laboratory where its components and overall market value will be determined. Analyses on the oil will include viscosity analysis; trace element analysis; and various spectroscopic techniques, including infrared, nuclear magnetic resonance, and mass spectrometry. The crude shale oil will be distilled into conventional fractions and the amounts of each fraction noted. Elemental analysis and several spectroscopic techniques will be used to characterize all of the fractions obtained by distillation. Research and motor octane blending numbers will be determined for the naphtha fractions, and cetane numbers will be determined for the distillate fractions. Gas oils and vacuum gas oils will be tested for their performance in simulated catalytic cracking, and the vacuum bottoms will be tested for their performance in coking operations. Several fractions will be tested for their performance in hydrotreating operations, and the hydrotreated products will be evaluated as blending stocks for gasoline, diesel, and jet fuels. These and other tests will allow for evaluating the product oil.

**9(c)(2) Equipment for Development and Extraction (CONFIDENTIAL)**

Table 2 and Table 3 identify the equipment involved in developing and constructing the OSR well.

Equipment Name	Mechanical Requirements					Remarks
	Capacity / Amount	Pressure & Temperature Rating	Materials of Construction	Estimated Overall Dimensions	Estimated Power	



**Table 2 NSHI RD&D Equipment List (CONFIDENTIAL)**



### **9(c)(3) Proposed Access Roads (CONFIDENTIAL)**

Access to NSHI's OSR pad and facilities will be from existing roads on NSHI and NSI leases to minimize surface disturbance and continue the use of best management practices. Two roads are proposed for initial research and development operations. The access road from the north and west will be on previously disturbed land. The access road from the north and east will involve constructing a 20-foot-wide by 445-foot-long road that will disturb approximately 0.20 acres (Figure 12). Additional roads may be constructed in the future, coincident with project expansion.

### **9(c)(4) Size, Location, and Schematics of All Structures and Facilities to Be Built (CONFIDENTIAL)**

NSHI has delineated approximately 4 acres within the 160-acre RD&D Lease area for various aspects of the surface operations (Figure 12). To the west of the initial project area is a previously disturbed area which is under partial reclamation. A portion of this reclamation area contains a utility corridor and will be used without incurring additional project surface disturbance. Other surface disturbances are expected to include an access road and natural gas line, a well pad sized to accommodate the processing equipment and up to three wells, a single mud pit, and a monitoring well pad. The monitoring well pad and portions of the access road and natural gas pipeline corridor are located within a BLM-identified exclusion zone. The BLM was contacted regarding the location of the surface facilities within the exclusion zone and has approved the locations, which are indicated on Figure 12.

#### ***Well Pads***

The main pad configuration (OSR well pad) is intended to accommodate a centralized process equipment area (measuring 200 by 200 feet) and up to three OSR wells (Figure 12). This pad area is anticipated to be roughly triangular shaped, and current plans would result in a disturbance of approximately 3.4 acres if all of the OSR wells are eventually drilled. Contingent upon the success of the initial OSR operation, an additional 3 to 4 acres may be considered for additional testing. Total disturbance is anticipated to be less than 10 acres. NSHI intends to drill the initial OSR-1 well near the west portion of the OSR well pad. One or both of the optional OSR locations may be used if it is determined that the OSR-1 location is unsuitable or if the OSR-1 location is successful and it is determined to continue the project. Access to the well pad would be via a short spur road extending from the northeastern corner of the triangular pad to an existing road. A list of Applicant-Committed Design Features, intended to protect the natural and human environment, are included in subsequent sections of this POD.

#### ***Ponds***

Because of the proximity of the NSI ponds, no new ponds will be constructed. The NSI process or waste ponds may be used for the disposal of any saline waste waters, when and if necessary.

#### ***Power Lines***

Existing power lines on the lease area will not be affected by the initial research and development operations. However, NSI's existing power lines will need to be extended approximately 200 feet to bring power to the OSR well area (Figure 12).

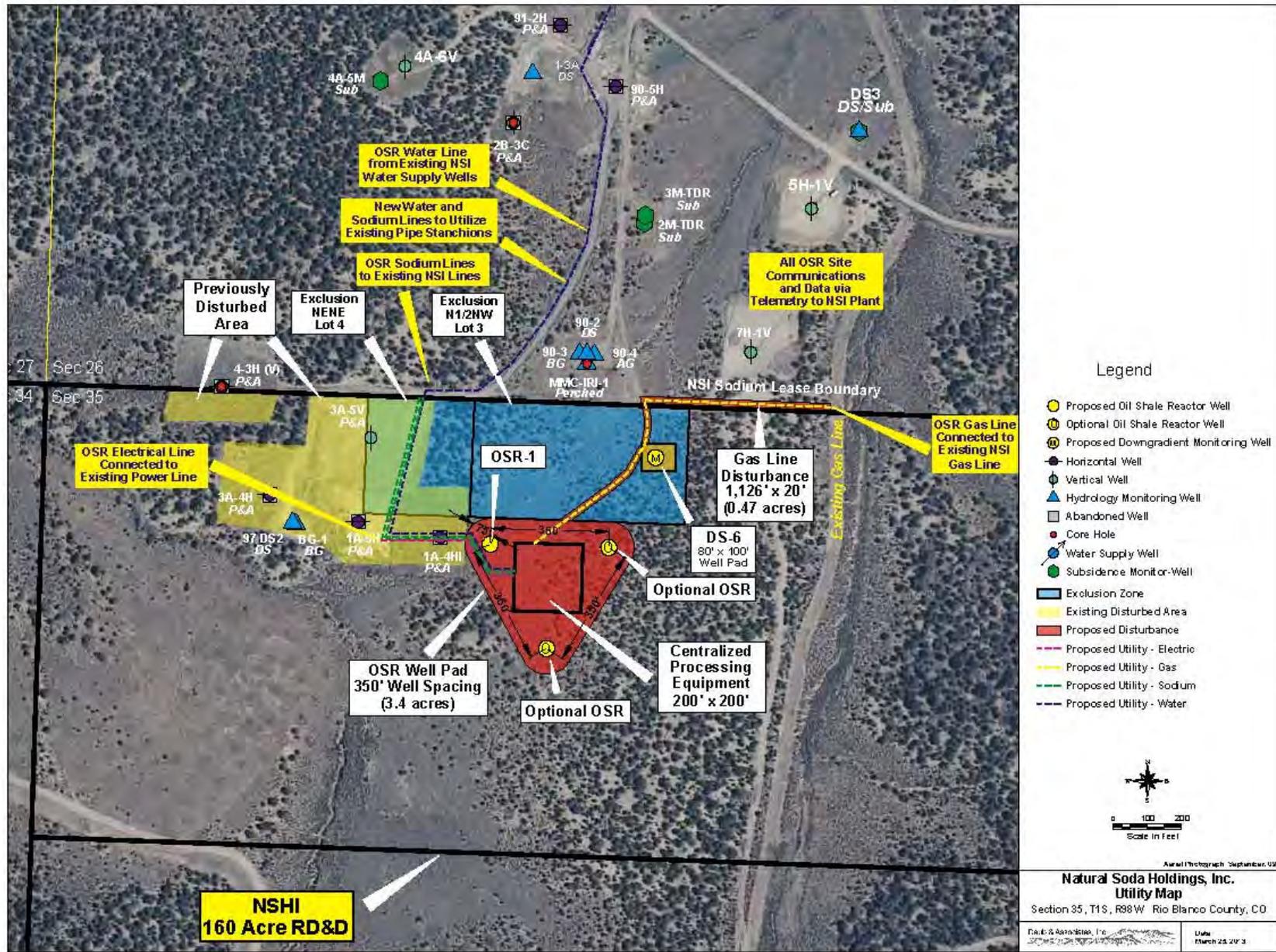


Figure 12 OSR Utility Map with Disturbed Areas (CONFIDENTIAL)

### ***Pits***

A single mud pit will be dug and used to contain the drilling mud while drilling the OSR well. The mud pit will have the following approximate dimensions: 12 feet wide, 60 feet long and 10 feet deep. Upon completing the drilling activities, the drilling fluid will be removed and disposed of at an appropriate disposal facility, and the pit will be filled in, recontoured, and reclaimed.

### ***Monitor Wells***

Six monitoring wells will be employed to monitor groundwater conditions near the OSR facility. Existing NSI upgradient and downgradient monitoring wells will be used to monitor groundwater conditions at the OSR site. The existing upgradient monitoring wells will be the BG-1 to monitor the B-Groove Aquifer and the 97 DS-2 to monitor the Dissolution Surface Aquifer. The existing downgradient monitoring wells to be used will be the MMC-IRI-1 to monitor the Perched Aquifer, 90-4 to monitor the A-Groove Aquifer, and the 90-3 to monitor the B-Groove Aquifer. Existing historical baseline groundwater data are already available for these wells. One new monitoring well, the DS-6, will be installed as a downgradient monitor well of the Dissolution Surface Aquifer. This well will be located approximately 550 feet to the east-northeast and downgradient of the OSR site. Additional details concerning this new monitor well are located in Section 9(c)(7) of this POD.

### ***Storage Tanks***

A single temporary storage tank will be brought to the pad to store water required for the drilling of the OSR well. This storage tank will be removed after the well has been drilled and completed. Storage tanks are not anticipated to be needed for the nahcolite solution mining phase. Storage tanks required for the kerogen conversion phase are indicated on the equipment list (Table 2).

### ***Surface Structures/Facilities***

Above ground shale oil storage tanks and support systems will be constructed, tested, and labelled in accordance with Underwriters Laboratories (UL) specifications for above ground storage of flammable and combustible liquids, UL-142. Skid-mounted or other portable structures will be used where appropriate. The tanks will be equipped with the option to be blanketed with an inert gas, such as nitrogen or carbon dioxide. Tanks will be installed on-site in conjunction with appropriate secondary containment (vertical dikes or other such similar and approved containment systems) to prevent spills, contain possible leaks, and protect the environment. Best management practices will be employed to ensure all surface facilities are safe, secure, and operate properly and to minimize adverse impacts to the environment.

Surface facilities shall be designed, built, monitored, and operated in accordance with industry best practice to ensure the surrounding environment is protected in accordance with the BLM and EPA regulations and applicable mining, environmental, and other laws related to above ground storage tanks for petroleum and chemical products. The use of skid-mounted facilities is anticipated for much of the RD&D operations. (Figure 13) depicts a conceptualized diagram of the NSHI surface facilities layout.

**(CONFIDENTIAL)**



Figure 13 Generalized OSR Project Surface Facilities Layout (CONFIDENTIAL)

### **Stack Parameters and Air Emissions**

During the Phase 1 sodium solution mining operations, a closed loop system will be used and air emissions will be minor. NSHI's [REDACTED] air emissions are also anticipated to be very minor given the limited scope of the system. In situ and preheating requirements and equipment are currently under development. [REDACTED]

[REDACTED] Emissions from the boiler will include nitrogen oxide and carbon monoxide, with lesser amounts of particulates, volatile organic compounds, and sulfur oxide also being produced. The initial fuel source for the proposed boiler is anticipated to be natural gas; however, as the kerogen conversion process begins to produce recoverable hydrocarbons, NSHI would like to replace the natural gas with these produced fuels. If the boiler system is fired with produced gas or oil, NSHI will appropriately scrub these waste streams before use to ensure that emissions are below acceptable levels.

### **9(c)(5) Development Sequence and Schedule (CONFIDENTIAL)**

#### ***Dates of Construction***

Approval of the Environmental Assessment and NSHI's Plan of Operations occurred in late 2012. NSHI anticipates BLM approval of this POD in late 2013. It is anticipated that additional Federal, State, and local permits will be approved in 2014. The DS-6 monitor well may be drilled as early as 2014. Contingent upon a timely permitting process, remaining facilities should be up and running no later than 2016. Surface facilities will be constructed and/or delivered to the site after the OSR well has been completed.

#### ***Dates of Operation***

Stage 3 of the production operations (Table 4) is anticipated to begin approximately 3 months after the completing the initial OSR production hole, dependent upon timely permitting activities. Stage 6 is expected to continue until sufficient quantities of shale oil are produced to demonstrate the success of the kerogen conversion technology and the economic feasibility of the process. Table 4 contains additional schedule details, which are benchmarked to permit approvals.

Stage	Description	Estimated Time
1	Drill, complete, and monitor for 6 months the DS-6 monitor well	Months 1-8
2	Drill and complete the initial OSR RD&D production well (concurrent with Stage 1)	Months 7-8
3	Develop a reactor chamber by the dissolution of nahcolite from the initial production well	Years 1-2
4	Design and construct surface RD&D processing facilities (concurrent with Stage 3)	
5	Install heating elements and recovery infrastructure	Years 2-3
6	Operate RD&D facilities and kerogen conversion	Years 3-5
7	Expand, modify, and replicate process	Years 4-9
8	Plug, abandon, and reclaim deactivated wells and infrastructures	Years 10-15
9	Continued groundwater monitoring following end of production	Years 16-19

**Table 4 RD&D Schedule of Operations (CONFIDENTIAL)**

The first six stages listed above apply to the material contained within this POD. The seventh stage, expand and replicate, is expected to use the same basic technology and methodology as the OSR outlined in this POD. Appropriate modifications to the methodology and/or technology will be made before and during the expansion and replication stage.

**9(c)(6) Acreage in the Federal Lease to Be Affected (CONFIDENTIAL)**

Initially, the total anticipated disturbance of the surface for the entire research project is approximately 4 acres, including the drilling and completion of the OSR and monitoring wells and the subsequent heating and oil extraction. Contingent upon the success of the initial OSR operation, an additional 3 to 4 acres may be considered for additional testing. Total disturbance is anticipated to be less than 10 acres. A portion of this acreage has already been disturbed by past well pad construction from NSI's nahcolite solution mining operation and is in a partial reclamation phase.

**9(c)(7) Typical Schematics of All Drilled Well Types Including Those Used for Heating, Freezing, Disposal or Production Activities Detailing All Casing and Completion Design Including Materials Used in All Cementing Operations (CONFIDENTIAL)**

NSHI's RD&D effort will involve a single well type with three different modes of operation: Phase 1, a solution mining mode for the dissolution of nahcolite (previously presented as Figure 9), and Phases 2 and 3, an oil shale reactor mode for the conversion of kerogen to shale oil and the extraction of the shale oil (previously presented as Figure 11).

Figure 14 presents a diagram of the proposed Dissolution Surface Aquifer monitor well (DS-6). NSHI will not be constructing freeze or disposal wells. Supporting technical data are supplied in APPENDIX B.

### **9(c)(8) Description of Methods and Means to Protect and Monitor Aquifers (CONFIDENTIAL)**

NSHI is committed to protecting all identified USDWs in the area of the RD&D Lease area, which include the Perched, A-Groove, and B-Groove Aquifers. The Dissolution Surface Aquifer in this area overlies the Saline Zone and, therefore, contains fluids that are higher in TDS. The Dissolution Surface Aquifer is not considered a USDW. The Wasatch Formation underlies the Green River Formation. While some distal locations of the Wasatch Formation contain aquifers, in the area of NSHI's project, the Wasatch occurs rather deep in the stratigraphic section; therefore, the extent, quality, or even the existence of any potential aquifers is poorly understood. Additionally, in the area of NSHI's RD&D Lease area, approximately 50 feet of dry, competent Parachute Creek Member and 400 to 500 feet of dry, competent, clay-rich Garden Gulch Member of the Green River Formation forms an effective seal below the deepest planned OSR interval.

NSHI's initial OSR interval will be approximately [REDACTED] than the Boies Bed, which NSI successfully mines. NSI has more than 20 years of experience solution mining nahcolite from the Boies Bed, located near and below the Dissolution Surface, with minimal effects to the stratigraphic or hydrostratigraphic units. The production interval is located deep within the Saline Zone. The Saline Zone is primarily a nahcolitic oil shale seal, which contains no aquifers and is effective at excluding groundwater. More than [REDACTED] of the Saline Zone is in place between the top of the initial OSR interval and the Dissolution Surface Aquifer. NSHI will specify aquifer isolation for all cementing operations to control annular vertical fluid flow. The OSR well and new monitor well are specified to have annular cement to surface. Pressure and temperature testing will be conducted as required to ensure the mechanical integrity of casing. Contamination of the groundwater aquifer systems is not anticipated. The aquifer systems will be sampled quarterly using currently existing upgradient and downgradient NSI monitoring wells and the monitoring well to be constructed by NSHI. Table 5 lists analytes that will be monitored. Appropriate corrective action will take place if a problem is identified. Figure 5 indicates the spatial relationships between the OSR interval and aquifers.

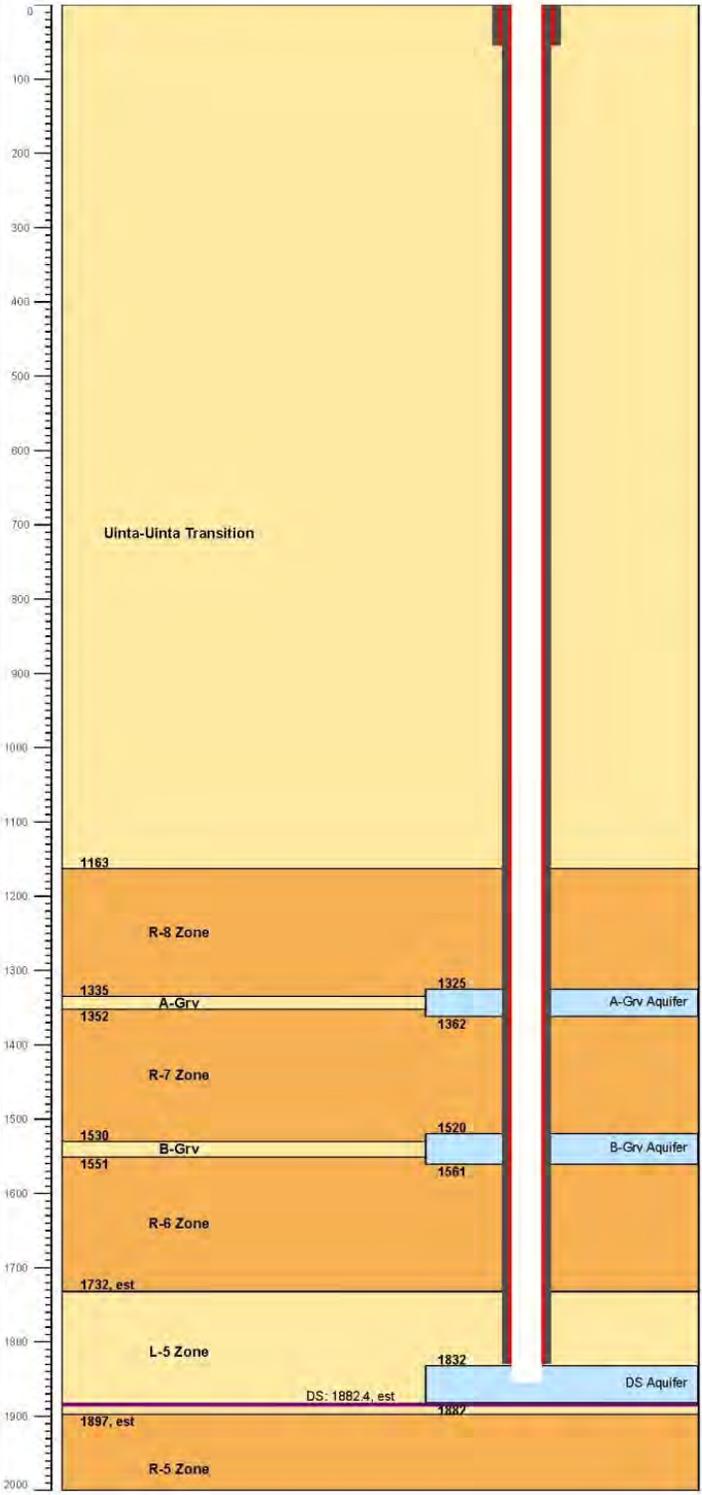
**Natural Soda, Inc.**  
**Drilling and Well Completion Diagram**



Well: DS-6, proposed  
 Section: 35  
 Township: 1S  
 Range: 98W  
 Latitude: TBD  
 Longitude: TBD  
 Total Depth, ft: 1854.0, proposed

Well Type: DS Aquifer Monitoring Well  
 Hole Type: Rotary Hole  
 Ground Elevation, ft: 6700, estimated  
 WL Measurement Elevation, ft: TBD  
 Diagram Date: 4/30/2013  
 stratigraphy and hydrostratigraphy from BG-1

- Cement
- Hole Plug and/or Cement
- Bentonite Plug / Seal
- Sand Plug / Sand Pack
- Bridge Plug
- Pump
- Transducer



0-54.0: conductor drill hole, 8.750" dia. (est)  
 0-54.0: conductor casing, 7.000" OD

**DRILLING and COMPLETION PROGNOSIS**  
 54.0-1829.0: intermediate drill hole, 6.250" dia.  
 0-1829.0: intermediate casing, 4.500" OD  
 0-1829.0: intermediate casing cement  
 1829.0-1854.0: drillout, 3.875" dia.

**Figure 14 Completion Diagram - DS-6 Monitor Well**

## Groundwater Protection Plan

Appropriate high-grade specialty alloy, casing grades, and thicknesses will be used for the OSR intermediate casing. Groundwater contamination will be prevented by cementing the OSR production casing string from the bottom of the intermediate casing string(s) (located within the Saline Zone, below the Dissolution Surface) to the surface. Additionally, more than [REDACTED] feet of groundwater-free Saline Zone above the initial reactor interval will ensure that the production activities will not affect any aquifers underlying the NSHI 160-acre RD&D Lease area. If additional reactor intervals higher up in the Saline Zone are used for subsequent testing, a minimum of [REDACTED] feet of groundwater-free Saline Zone (including the confining Lower Salt Zone) will separate the Dissolution Surface Aquifer and any OSR intervals. The downgradient monitoring well to be drilled (DS-6) will be cased and cemented to the surface. This will result in isolating the aquifers and preventing aquifer cross-mixing or comingling. This monitoring well, in conjunction with the existing NSI monitoring wells, to be used for NSHI OSR monitoring purposes and will provide both upgradient and downgradient groundwater monitoring. All wells will have cement bond logs run in them to verify that a quality cement bond exists between the aquifer systems. Remedial cement jobs will be conducted on wells as necessary. The aquifers will be isolated by competent annular cement seals.

Should groundwater contamination from the NSHI OSR production activities be noted in the monitoring wells, production will be halted and appropriate remediation measures taken. Remediation measures may include secondary cement jobs, cement squeeze jobs, casing liners, casing replacement, or plugging and abandonment.

Analyte List		
Field Measurements:		
pH	Conductivity	Temperature
Major Analytes:		
TDS	Alkalinity	Sodium
Silica	pH	Chloride
Potassium	Bicarbonate	Magnesium
Fluoride	Conductivity	Carbonate
Calcium	Sulfate	Boron
Strontium	Hardness	VOCs
BTEX		
Minor Analytes:		
Arsenic	Aluminum	Cadmium
COD	Manganese	Selenium
Barium	SAR in water	Chromium
Nickel	Copper	Lead
Ammonia	Molybdenum	Mercury
Vanadium	Cation-Anion Balance	Beryllium
Bromide	Zinc	Lithium
Iron	Total Phosphorus	Nitrate as N
Nitrate/Nitrite as N	Nitrogen, total	Kjeldahl Nitrogen
Nitrate as N		

Table 5 Analyte List for NSHI's Quarterly Water Sampling Program

### ***Perched Aquifer***

The Perched Aquifer is locally present in the lease area because of the presence of the Thirteenmile Creek tongue of the Green River Formation within the more permeable sandstones of the Uinta Formation. The Thirteenmile Creek tongue consists of more impermeable oil shale units, and groundwater is encountered in the Uinta Formation sandstones that immediately overlie the Thirteenmile Creek tongue. This aquifer is up to 20 feet thick, and it is encountered at a depth of approximately 530 feet on the lease area. In addition to the above-mentioned protection measures, the base of the Perched Aquifer is nearly [REDACTED] to a minimum of [REDACTED] feet above any anticipated OSR intervals. The downgradient monitoring well for the Perched Aquifer will be the MMC-IRI-1.

### ***A-Groove Aquifer***

The A-Groove Aquifer consists of fractured lean oil shale and marlstone of the Parachute Creek Member of the Green River Formation located immediately above the Mahogany Zone. The permeability of the aquifer is due to primary matrix porosity and secondary fracture porosity. The A-Groove Aquifer is encountered at approximately 1,375 feet below ground surface on the lease area. It is generally between 15 and 35 feet thick. In addition to the above-mentioned protection measures, the base of the A-Groove Aquifer is approximately [REDACTED] above any anticipated OSR intervals. The downgradient monitoring well for the A-Groove Aquifer will be the 90-4.

### ***B-Groove Aquifer***

The B-Groove Aquifer consists of lean fractured oil shale and marlstone of the Parachute Creek Member underlying the Mahogany Zone. The B-Groove Aquifer occurs approximately 1,565 feet below ground surface in the area of the NSHI RD&D Lease area. It is generally between 20 and 40 feet thick. In addition to the above-mentioned protection measures, the base of the B-Groove Aquifer is approximately [REDACTED] above any anticipated OSR intervals. The downgradient monitoring well for the B-Groove Aquifer will be the 90-3. The BG-1 will serve as an upgradient monitoring well.

### ***Dissolution Surface Aquifer***

The Dissolution Surface Aquifer is present approximately 50 to 70 feet immediately above the top of the Saline Zone. In the vicinity of the NSHI RD&D Lease area, the Dissolution Surface Aquifer is found in the lean, fractured, brecciated, and rubblized oil shales and marlstones of the upper L-5 stratigraphic zone. Because of the proximity of the Dissolution Surface, solution features such as vugs, voids, and pits are common characteristics of the matrix material. The Dissolution Surface Aquifer occurs approximately 1,875 feet below the ground surface in the area of the NSHI RD&D Lease area. In addition to the above-mentioned protection measures, the base of the Dissolution Surface Aquifer is approximately [REDACTED] to a minimum of 462 feet above any anticipated OSR intervals. The downgradient monitoring well for the Dissolution Surface Aquifer will be the DS-6 (to be constructed). The 97 DS-2 will serve as an upgradient monitoring well.

## **9(d) RESOURCE ANALYSES, PROCEDURES, MAPS, CROSS SECTIONS, AND IN SITU DEVELOPMENT SEQUENCE**

### **9(d)(1) Estimate of Quantity and Quality of the Mineral Resources**

In the immediate area of the NSHI OSR well, analytical data of core samples are available from the MMC-IRI-1 core hole, which is located approximately 500 feet north of the OSR. Analysis of core samples from the Saline Zone in MMC-IRI-1 indicated average concentrations of 22.2 gallons of oil per ton, 35.4 percent by weight nahcolite and 5.3 percent by weight dawsonite. Nahcolite in the 40-foot reactor interval is anticipated to average 17 percent by weight (Figure 5).

#### ***Oil Shale***

The United States Geological Survey (USGS) completed an assessment of the in-place oil shale resources of the Piceance Creek Basin in 2009 (Johnson et al., 2009). According to this assessment, Township 1 South, Range 98 West contains approximately 45,790.89 million barrels of oil in the Saline Zone (between the L-5 and R-2 Zones). Compensating for geographic setting of the lease area within Township 1 South, Range 98 West, the Saline Zone within the NSHI 160-acre RD&D Lease area is estimated to contain approximately 304.02 million barrels of oil. This is equivalent to 1.9 million barrels of oil per acre.

#### ***Nahcolite***

The USGS completed an assessment of the in-place nahcolite resources of the Piceance Creek Basin in 2009 (Brownfield et al., 2009). According to this assessment, Township 1 South, Range 98 West contains approximately 12.9 billion short tons of nahcolite in the Saline Zone. Compensating for geographic setting of the lease area within Township 1 South, Range 98 West, the Saline Zone within the NSHI 160-acre RD&D Lease area is estimated to contain approximately 89.8 million short tons of nahcolite.

#### ***Dawsonite***

Beard et al. (1974) compiled an estimate of in-place dawsonite resources in the Piceance Creek Basin. According to this assessment, the lease area falls within a region where dawsonite concentrations are approximately 120 million tons per square mile. It is, thus, determined that there are approximately 30 million tons of dawsonite underlying the NSHI 160-acre RD&D Lease area.

#### ***Estimated Production Rate***

The NSHI POD specifies a 40-foot-thick reactor interval to be initially leached of saline minerals to generate porosity and permeability for enhanced shale oil recovery during the kerogen conversion process. NSHI's primary shale oil and gas production process will be induced by the liquefaction of kerogen through a closed loop hot oil circulation system at elevated temperature. Production of shale oil and gas is to be sustained until approximately 100 barrels of shale oil have been produced from a particular reactor interval. An estimate of oil production rate during the sustained production period is given by the following equation:

$$\text{Oil production rate} = (\text{oil shale grade}) \times (\text{recovery efficiency of shale oil}) \times (\text{affected volume}) \\ \times (\text{percentage of affected volume recoverable}) \times (\text{conversion rate}) \times (\text{conversion efficiency}) \times (\text{recovery efficiency of pump})$$

At this time, laboratory experiments are being conducted to help define some of these variables. The RD&D project is designed to determine rates of production and resource recovery factors that will ultimately lead to an economic oil shale recovery process.

### ***Estimated Resource Recovery Factors***

Small scale batch laboratory tests performed at Monash University have shown that oil shale kerogen can be converted into useful liquid products under the conditions outlined in this POD. Yield data from these experiments indicate that about 62 to 72 percent of the kerogen in the oil shale can be converted to liquid products. One goal of the RD&D project is to meet or exceed these levels. At this time, laboratory experiments are designed to define some of the parameters needed to determine recovery factors and rates of production.

### **9(d)(2) Explanation of How the Resource Will Be Recovered With a Minimum of Waste. If a Portion of the Deposit Is Not Recovered or Is to Be Rendered Unrecoverable by the Operation, the Lessee Must Submit Appropriate Justification to the Authorized Officer for Approval**

During the RD&D efforts, it is unclear whether resources will be recovered with a minimum of waste, which is one of the reasons for conducting RD&D operations. The oil shale resource will ultimately be recovered with a minimum of waste by gathering data, through these RD&D efforts, which will allow for a better understanding and appropriate modifications of processes.

NSHI's initial RD&D efforts are modest in scope. As operations progress and data are gathered, lessons learned will be applied to ongoing and future operations. Expectations for the applications of gathered data and lessons learned include: (1) fine tuning all parameters relating to the oil shale conversion process and (2) determining optimal horizontal and vertical spacing for the operations of OSRs on a future, commercial scale. At this time, it is anticipated that any unrecovered resource will be left in place to provide support to the formation as required by regulatory agencies.

### **9(d)(3) Maps and Cross Sections**

#### ***9(d)(3)(i) Federal lease boundaries and serial numbers***

Figure 15 indicates NSHI's oil shale lease boundaries. Figure 15 also shows ExxonMobil's adjacent oil shale lease to the west and the sodium leases of NSI, NSHI, and Shell (generally located to the north and west of NSHI's oil shale lease). Oil, gas, grazing, and other potential leases are not indicated.

#### ***9(d)(3)(ii) Surface ownership and boundaries***

The BLM and Shell are surface land owners in the area of NSHI's oil shale lease. The BLM is the surface land owner of NSHI's oil shale lease area. The BLM is also the surface land owner of the adjacent land surrounding NSHI's oil shale lease (Figure 15).

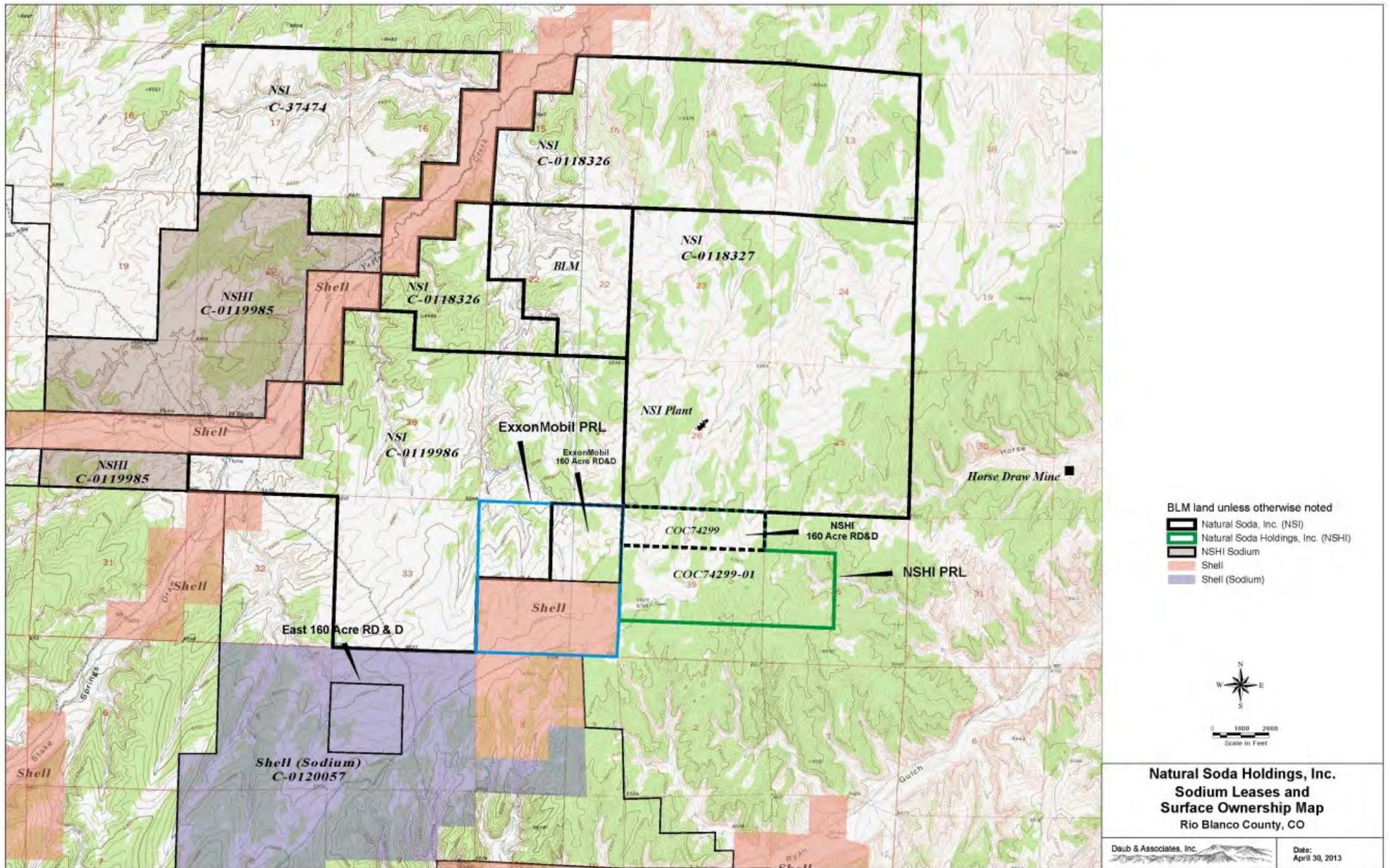


Figure 15 NSHI Lease Area Boundaries and Surface Ownership

**9(d)(3)(iii) Locations of existing and abandoned mines and existing oil and gas wells**

There are no known existing or abandoned surface or subsurface mines on NSHI's 160-acre RD&D Lease area or within 1 mile of the lease area boundaries. The surface shaft of the shut-in Horse Draw mine is located approximately 1.7 miles east-northeast of NSHI's oil shale lease area. A search of the Colorado Oil and Gas Conservation Commission database indicated no oil or gas facilities in Section 26. A total of 113 oil and/or gas wells were identified within the sections containing the NSHI lease area or within the immediate surrounding sections. Table 6 identifies the status of these wells, including drilling (DG), producing (PR), shut-in (SI), dry and abandoned (DA), plugged and abandoned (PA), abandoned location (AL), or location (X). Cells are shaded by Sec #.

API #	Well Name	Company	Status <sup>a</sup>	Twp	Rng	Sec	Latitude	Longitude	Elev. (feet AMSL)
05-103-08781	FEDERAL 30-4	Caerus Washco	AL	1S	97W	30	39.933060997	108.319966987	6310.0
05-103-10919	FREEDOM 197-31A10	XTO Energy	SI	1S	97W	31	39.923731000	108.321962000	6526.0
05-103-10920	FREEDOM 197-31A8	XTO Energy	SI	1S	97W	31	39.923810000	108.321960000	6525.0
05-103-10921	FREEDOM 197-31A3	XTO Energy	SI	1S	97W	31	39.923836000	108.321870000	6526.0
05-103-10922	FREEDOM 197-31A9	XTO Energy	SI	1S	97W	31	39.923772000	108.321964000	6526.0
05-103-10923	FREEDOM 197-31A7	XTO Energy	DG	1S	97W	31	39.923850000	108.321960000	6524.0
05-103-10924	FREEDOM 197-31A6	XTO Energy	SI	1S	97W	31	39.923890000	108.321960000	6523.0
05-103-10925	FREEDOM 197-31A5	XTO Energy	SI	1S	97W	31	39.923750000	108.321870000	6527.0
05-103-10926	FREEDOM 197-31A4	XTO Energy	SI	1S	97W	31	39.923795000	108.321870000	6526.0
05-103-10927	FREEDOM 197-31A2	XTO Energy	SI	1S	97W	31	39.923877000	108.321879000	6526.0
05-103-10928	FREEDOM 197-31A1	XTO Energy	SI	1S	97W	31	39.923920000	108.321880000	
05-103-11022	FEDERAL RGU 11-25-198	Williams	SI	1S	98W	25	39.939121005	108.350513998	6608.0
05-103-11080	FEDERAL RGU 14-25-198	Williams	PR	1S	98W	25	39.928059005	108.346293987	6684.0
05-103-11448	FEDERAL RGU 411-25-198	Williams	PR	1S	98W	25	39.939200003	108.350545986	6607.0
05-103-11449	FEDERAL RGU 341-26-198	Williams	PR	1S	98W	25	39.939231006	108.350593988	6607.0
05-103-11450	FEDERAL RGU 342-26-198	Williams	PR	1S	98W	25	39.939133012	108.350555997	6607.0
05-103-11451	FEDERAL RGU 541-26-198	Williams	PR	1S	98W	25	39.939191992	108.350580013	6607.0
05-103-11452	FEDERAL RGU 414-24-1	Williams	PR	1S	98W	25	39.939257015	108.350572988	6607.0
05-103-11453	FEDERAL RGU 312-25-198	Williams	PR	1S	98W	25	39.939081000	108.350498000	6607.0
05-103-11454	FEDERAL RGU 544-23-198	Williams	PR	1S	98W	25	39.939271010	108.350609004	6607.0
05-103-11628	FEDERAL RGU 41-26-198	Williams	PR	1S	98W	25	39.939250996	108.350601995	6608.0
05-103-11629	FEDERAL RGU 511-25-198	Williams	PR	1S	98W	25	39.939160000	108.350530000	6608.0
05-103-11630	FEDERAL RGU 311-25-198	Williams	PR	1S	98W	25	39.939239000	108.350560000	6608.0
05-103-11672	FEDERAL RGU 334-24-198	Williams	PR	1S	98W	25	39.940997000	108.340106000	6640.0
05-103-11673	FEDERAL RGU 541-25-198	Williams	PR	1S	98W	25	39.940857000	108.340160000	6641.0
05-103-11674	FEDERAL RGU 434-24-198	Williams	PR	1S	98W	25	39.940980000	108.340118000	6640.0
05-103-11675	FEDERAL RGU 524-24-198	Williams	PR	1S	98W	25	39.940888000	108.340179000	6641.0
05-103-11676	FEDERAL RGU 421-25-198	Williams	PR	1S	98W	25	39.940814000	108.340229000	6641.0
05-103-11677	FEDERAL RGU 424-24-198	Williams	PR	1S	98W	25	39.940906000	108.340167000	6641.0
05-103-11678	FEDERAL RGU 31-25-198	Williams	PR	1S	98W	25	39.940924000	108.340155000	6641.0
05-103-11679	FEDERAL RGU 344-24-198	Williams	PR	1S	98W	25	39.940985000	108.340074000	6641.0
05-103-11680	FEDERAL RGU 321-25-198	Williams	PR	1S	98W	25	39.940833000	108.340216000	6641.0
05-103-11681	FEDERAL RGU 444-24-198	Williams	PR	1S	98W	25	39.940967000	108.340086000	6640.0

Updated:  
2/5/13

API #	Well Name	Company	Status <sup>a</sup>	Twp	Rng	Sec	Latitude	Longitude	Elev. (feet AMSL)
05-103-11682	FEDERAL RGU 41-25-198	Williams	PR	1S	98W	25	39.940930000	108.340111000	6640.0
05-103-11683	FEDERAL RGU 431-25-198	Williams	PR	1S	98W	25	39.940802000	108.340197000	6641.0
05-103-11684	FEDERAL RGU 21-25-198	Williams	PR	1S	98W	25	39.940870000	108.340191000	6641.0
05-103-11685	FEDERAL RGU 441-25-198	Williams	PR	1S	98W	25	39.940875000	108.340147000	6641.0
05-103-11686	FEDERAL RGU 331-25-198	Williams	PR	1S	98W	25	39.940821000	108.340184000	6640.0
05-103-11687	FEDERAL RGU 341-25-198	Williams	PR	1S	98W	25	39.940894000	108.340135000	6641.0
05-103-11860	FEDERAL RGU 442-25-198	Williams	PR	1S	98W	25	39.935632000	108.339372000	6670.0
05-103-11861	FEDERAL RGU 332-25-198	Williams	PR	1S	98W	25	39.935677000	108.339350000	6670.0
05-103-11862	FEDERAL RGU 22-25-198	Williams	PR	1S	98W	25	39.935653000	108.339393000	6672.0
05-103-11863	FEDERAL RGU 422-25-198	Williams	PR	1S	98W	25	39.935605000	108.339477000	6670.0
05-103-11864	FEDERAL RGU 42-25-198	Williams	PR	1S	98W	25	39.935681000	108.339286000	6670.0
05-103-11865	FEDERAL RGU 531-25-198	Williams	PR	1S	98W	25	39.935702000	108.339308000	6670.0
05-103-11867	FEDERAL RGU 532-25-198	Williams	PR	1S	98W	25	39.935570000	108.339479000	6670.0
05-103-11868	FEDERAL RGU 23-25-198	Williams	PR	1S	98W	25	39.935558000	108.339500000	6670.0
05-103-11869	FEDERAL RGU 43-25-198	Williams	PR	1S	98W	25	39.935607000	108.339415000	6670.0
05-103-11871	FEDERAL RGU 314-25-198	Williams	DG	1S	98W	25	39.928098000	108.346289000	6684.0
05-103-11872	FEDERAL RGU 413-25-198	Williams	DG	1S	98W	25	39.928139000	108.346284000	6684.0
05-103-11873	FEDERAL RGU 521-36-198	Williams	DG	1S	98W	25	39.927932000	108.346270000	6684.0
05-103-11874	FEDERAL RGU 321-36-198	Williams	DG	1S	98W	25	39.927973000	108.346266000	6684.0
05-103-11875	FEDERAL RGU 423-25-198	Williams	DG	1S	98W	25	39.928096000	108.346253000	6684.0
05-103-11876	FEDERAL RGU 24-25-198	Williams	DG	1S	98W	25	39.928055000	108.346257000	6684.0
05-103-11877	FEDERAL RGU 424-25-198	Williams	PR	1S	98W	25	39.928014000	108.346261000	6684.0
05-103-11878	FEDERAL RGU 11-36-198	Williams	PR	1S	98W	25	39.928017000	108.346298000	6684.0
05-103-11380	FEDERAL RGU 432-27-198	Williams	PR	1S	98W	27	39.936125995	108.379917016	6560.0
05-103-11381	FEDERAL RGU 32-27-198	Williams	PR	1S	98W	27	39.936168000	108.379914000	6560.0
05-103-11382	FEDERAL RGU 33-27-198	Williams	PR	1S	98W	27	39.936085000	108.379920000	6560.0
05-103-05212	Ryans Creek 1	Ohio Oil	DA	1S	98W	34	39.914310988	108.371888996	6732.0
05-103-10940	FEDERAL RGU 31-34-198	Williams	PR	1S	98W	34	39.925136000	108.376079989	6622.0
05-103-11815	RG FEDERAL 4D-34D	Puckett Land Co	PR	1S	98W	34	39.913203000	108.373816000	6744.0
05-103-10934	FEDERAL RGU 23-35-198	Williams	PR	1S	98W	35	39.919332006	108.362492987	6780.0
05-103-11490	FEDERAL RGU 322-35-198	Williams	PR	1S	98W	35	39.919263991	108.362627006	6778.0
05-103-11491	FEDERAL RGU 412-35-198	Williams	PR	1S	98W	35	39.919229011	108.362653006	6778.0
05-103-11492	FEDERAL RGU 522-35-198	Williams	PR	1S	98W	35	39.919227991	108.362545985	6778.0
05-103-11493	FEDERAL RGU 532-35-198	Williams	PR	1S	98W	35	39.919227989	108.362493012	6778.0
05-103-11494	FEDERAL RGU 13-35-198	Williams	PR	1S	98W	35	39.919201000	108.362680000	6778.0
05-103-11801	FEDERAL RGU 523-35-198	Williams	PR	1S	98W	35	39.919200000	108.362492000	6778.0
05-103-11802	FEDERAL RGU 413-35-198	Williams	PR	1S	98W	35	39.919201000	108.362627000	6778.0
05-103-11803	FEDERAL RGU 33-35-198	Williams	PR	1S	98W	35	39.919201000	108.362440000	6778.0
05-103-10908	FEDERAL RGU 13-36-198	Williams	PR	1S	98W	36	39.916717000	108.348652001	6680.0
05-103-11147	FEDERAL RGU 43-35-198	Williams	PR	1S	98W	36	39.916737999	108.348646992	6679.0
05-103-11148	FEDERAL RGU #44-35-198	Williams	PR	1S	98W	36	39.916615004	108.348646996	6679.0
05-103-11149	FEDERAL RGU #343-35-198	Williams	PR	1S	98W	36	39.916696991	108.348646993	6679.0
05-103-11150	FEDERAL RGU #344-35-198	Williams	PR	1S	98W	36	39.916656011	108.348646995	6679.0
05-103-11923	FEDERAL RGU 434-36-198	Williams	DG	1S	98W	36	39.916094000	108.339926000	6579.0
05-103-11924	FEDERAL RGU 344-36-198	Williams	DG	1S	98W	36	39.916162000	108.339761000	6579.0
05-103-11925	FEDERAL RGU 543-36-198	Williams	DG	1S	98W	36	39.916181000	108.339713000	6579.0
05-103-11926	FEDERAL RGU 433-36-198	Williams	DG	1S	98W	36	39.916181000	108.339713000	6579.0
05-103-11927	FEDERAL RGU 343-36-198	Williams	DG	1S	98W	36	39.916205000	108.339730000	6579.0
05-103-11928	FEDERAL RGU 544-36-198	Williams	DG	1S	98W	36	39.916142000	108.339808000	6579.0

Updated:  
2/5/13

API #	Well Name	Company	Status <sup>a</sup>	Twp	Rng	Sec	Latitude	Longitude	Elev. (feet AMSL)
05-103-11929	FEDERAL RGU 34-36-198	Williams	DG	1S	98W	36	39.916133000	108.339832000	6579.0
05-103-11930	FEDERAL RGU 33-36-198	Williams	DG	1S	98W	36	39.916167000	108.339825000	6579.0
05-103-10609	FEDERAL RGU 44-1-298	Williams	PR	2S	98W	1	39.901000994	108.336162013	6282.0
05-103-11025	FEDERAL RGU 43-1-298	Williams	PR	2S	98W	1	39.901003000	108.336188000	6282.0
05-103-11026	FEDERAL RGU 32-1-298	Williams	PR	2S	98W	1	39.901005000	108.336215000	6282.0
05-103-11027	FEDERAL RGU 343-1-298	Williams	PR	2S	98W	1	39.900998000	108.336108000	6282.0
05-103-11072	FEDERAL RGU 12-1-298	Williams	PR	2S	98W	1	39.908853000	108.347962000	6625.0
05-103-11073	FEDERAL RGU 22-1-298	Williams	PR	2S	98W	1	39.908812000	108.347960000	6625.0
05-103-11434	FEDERAL RGU 441-1-298	Williams	PR	2S	98W	1	39.910274000	108.335080000	6574.0
05-103-11435	FEDERAL RGU 342-1-298	Williams	PR	2S	98W	1	39.910282000	108.335028000	6574.0
05-103-11436	FEDERAL RGU 542-1-298	Williams	PR	2S	98W	1	39.910290000	108.334976000	6574.0
05-103-11437	FEDERAL RGU 432-1-298	Williams	DG	2S	98W	1	39.910260000	108.335159000	6574.0
05-103-11438	FEDERAL RGU 411-1-298	Williams	PR	2S	98W	1	39.910300000	108.334924000	6574.0
05-103-11790	FEDERAL RGU 331-1-298	Williams	PR	2S	98W	1	39.910287000	108.335165000	6576.0
05-103-11794	FEDERAL RGU 531-1-298	Williams	PR	2S	98W	1	39.910269000	108.335106000	6576.0
05-103-11796	FEDERAL RGU 41-1-298	Williams	DG	2S	98W	1	39.910301000	108.335088000	6576.0
05-103-08725	FEDERAL C-012396 298-2 #1	Rio Blanco Nat.Gas	AL	2S	98W	2	39.904871013	108.358798007	6652.0
05-103-10597	FEDERAL RGU 31-2-298	Williams	PR	2S	98W	2	39.910100991	108.358277991	6696.0
05-103-11168	FEDERAL RGU 341-2-298	Williams	PR	2S	98W	2	39.910322998	108.358307009	6690.0
05-103-11169	FEDERAL RGU 441-2-298	Williams	PR	2S	98W	2	39.910281989	108.358295983	6690.0
05-103-11170	RYAN GULCH UNIT 442-2-298	Williams	XX	2S	98W	2	39.910202003	108.358273981	6690.0
05-103-11171	FEDERAL RGU 42-2-298	Williams	PR	2S	98W	2	39.910241996	108.358285000	6690.0
05-103-07040	Ryan Ridge 1	Humble	PA	2S	98W	3	39.910701013	108.376388994	6691.0
05-103-10938	FEDERAL RGU 42-3-298	Williams	PR	2S	98W	3	39.908659009	108.371094002	6701.0
05-103-11346	FEDERAL RGU 311-3-298	Williams	PR	2S	98W	3	39.908838000	108.371159000	6698.0
05-103-11347	FEDERAL RGU 511-3-298	Williams	PR	2S	98W	3	39.908798000	108.371141000	6698.0
05-103-11348	FEDERAL RGU 32-3-298	Williams	PR	2S	98W	3	39.908791000	108.371176000	6698.0
05-103-11351	FEDERAL RGU 442-3-298	Williams	PR	2S	98W	3	39.908778000	108.371134000	6698.0
05-103-11352	FEDERAL RGU 431-3-298	Williams	PR	2S	98W	3	39.908802000	108.371226000	6698.0
05-103-11353	FEDERAL RGU 341-3-298	Williams	PR	2S	98W	3	39.908841000	108.371241000	6698.0
05-103-11354	FEDERAL RGU 31-3-298	Williams	PR	2S	98W	3	39.908822000	108.371233000	6698.0

a.

- a. AL = abandon location; SI = shut in; DG = drilling; PR = producing; DA = dry and abandoned; PA = plugged and abandoned; xx = location.

**Table 6 Oil and Gas Wells Within and Surrounding NSHI's Oil Shale Leases**

**9(d)(3)(iv) Structure cross sections**

A typical structure cross section is presented in Figure 5.

**9(d)(3)(v) Location of shafts or mining entries, strip pits, waste dumps, retort facilities, and surface facilities**

No shafts or mining entries, strip pits, waste dumps, retort facilities, or surface facilities are located on NSHI's oil shale lease area.

**9(d)(3)(vi) In situ development sequence and timeframe**

NSHI's plan to produce shale oil using an in situ kerogen conversion process will involve multiple stages. For a description of the in situ methodology, refer to Section 9(c)(1) of this POD. NSHI seeks to start the RD&D project as early as 2014 but not later than 2016.

With the addition of required monitoring and reclamation activities, a typical in situ development sequence with appropriate timeframes is presented in Table 4.

**9(d)(4) Environmental Aspects Associated With the Proposed Project**

**9(d)(4)(i) Water quantity estimates**

***An estimate of the quantity of water to be used and where the water will be obtained***

The majority of water to be used will be during the drilling of the OSR well and monitor well. NSHI's RD&D project anticipates using less than 100 barrels per day for 15 to 30 days of drilling and approximately 10 barrels per day after operations begin. This water usage is expected to total less than 1 acre foot per year.

NSI owns and controls significant absolute and conditional water rights in northwest Colorado, which are sufficient to solution mine nahcolite on the NSI sodium lease and develop the OSR project on the NSHI 160-acre RD&D Lease area.

NSI, a wholly owned subsidiary of NSHI, is the owner of several direct flow and storage water rights that divert out of the White River, Piceance Creek, Yellow Creek, and well water rights that divert water from aquifers tributary to the surface streams. The water rights are part of an integrated system of a water supply for various uses associated with NSI's sodium leases and other natural resource development.

Under Colorado law, the withdrawal of water through a water production well or wells requires replacing depletions to stream systems caused by the withdrawal of the water from the aquifer. In compliance with Colorado law, NSI or its predecessors obtained and has operated a judicially approved plan for augmentation to replace the stream depletions associated with water well production. Pursuant to a decree entered by the District Court in and for Water Division No. 5 in Case No. 88CW420 on August 13, 1991, the District Court approved a plan for augmentation for the sodium mining operations and other natural resource development operations. The plan for augmentation provides for constructing such wells as are required by NSI for the mining operations and for replacing depletions associated with such well operation. The water produced pursuant to constructing and operating the groundwater wells will provide water supplies for the RD&D Lease area operations.

NSI owns several water rights that are useable for replacing stream depletions associated with operating the water production wells. Included within the water rights are several senior ditch water rights. The significance of the senior status is that under Colorado law, the right to withdraw water from the surface streams is based on seniority. As a result, a senior water right is entitled to divert water before a junior water right.

NSI's current sodium bicarbonate production is in excess of 100,000 short tons per year, which has required a water supply of approximately 115 acre feet of water per year. The withdrawal of the water supply requires the replacement of water depletions to stream systems, and the replacement obligation is currently less than 2.5 acre feet of water per year. The historical calculated maximum annual replacement of depletions associated with past pumping of the water well is approximately 7 acre feet over the next approximately 250 years.

The senior ditch water rights owned by NSI are among the most senior water rights in the Piceance Creek Basin. The water rights produce approximately 270 acre feet of fully consumable water each year, which will allow for water well pumping and supply of approximately 3,100 acre feet of water per year. In addition, NSI owns other water rights that divert out of the White River that are anticipated to produce in excess of 79,000 acre feet of fully consumable water per year. The water rights owned by NSI will provide adequate water for the RD&D Lease area operations, and no further approvals will be required from the Colorado District Courts.

The NSI WSW-2, 90-1, and future water supply wells will be the source of water for the OSR project. These wells will be used to supply the water for the drilling, nahcolite solution mining, and shale oil production operations.

***An estimate of the quantity of water to be produced and treated***

The NSHI production process is in situ and, for much of the process, a closed-loop system; therefore, the amount and type of by-products and associated environmental impacts are limited. As a best management practice, most of the circulation water used in the conversion process will be recycled. Spent circulation water will be removed from the OSR, as necessary, and stored in an on-site waste water tank before disposition. This unrecyclable waste water from the conversion process is expected to be limited to less than 10 barrels per day. As a best management practice, NSHI will create a slurry comprised of the solids that were brought to surface as a by-product of the kerogen conversion process and the spent circulation water. This slurry will then be pumped into an exhausted OSR interval. Should this process prove unfeasible, the solid and liquid waste by-products will be removed and disposed of at an appropriate off-site solid waste and/or liquid disposal facility by a contracted waste disposal company in a timely manner.

***An estimate of the quantity of potential pollutants that may enter any receiving waters (surface water and groundwater)***

Any waste water that meets the qualifications of NSI's existing process evaporation/storage pond may be transferred to this lined pond. The OSR interval is located approximately 950 feet below the Dissolution Surface within dry, nahcolitic oil shale. No pollutants from the conversion process are anticipated to affect either surface water or groundwater. Prognosis data in the area indicate that approximately 400 to 600 feet of competent, dry, clay-rich oil shale are in place between the bottom of the OSR and the top of the Wasatch Formation. Potential pollutants are not anticipated to migrate through the competent, clay-rich oil shale and enter any potential aquifer systems below the OSR.

**9(d)(4)(ii) Design for the necessary impoundment, treatment, or control of all produced water, runoff water, and drainage from workings**

***Spill Prevention, Control and Countermeasures Plan***

All storage tanks and roll-off bins located on-site will have secondary containments. These secondary containments will be checked daily for possible pollutants. Accumulated precipitation within the secondary containments will be removed as necessary.

In the event of a leak from a storage tank to a secondary containment, the material in the leaky storage tank will be immediately and completely removed from the tank, and the storage tank will be repaired as soon as possible. The removed material will either be transferred to another on-site storage tank or transported to an appropriate off-site disposal facility. Material contained within the secondary containments will also be disposed of in a like manner.

Any spill to the ground surface will be immediately remediated using NSI's in-place guidelines for spill remediation. A spill will indefinitely shut down drilling or production operations until it has been appropriately remediated. Notifications of a spill will be sent to the appropriate local, State, and Federal regulatory agencies. NSHI's Spill Prevention, Control and Countermeasures (SPCC) Plan is attached as APPENDIX C.

***Stormwater Management Plan***

The initial RD&D phase will use NSI's water management facilities for water storage and evaporation. NSHI does not anticipate significant environmental impacts for water, air, and/or the land. NSHI has developed a Stormwater Management Plan (SWMP) that conforms to the requirements established by the Colorado Department of Public Health and Environment (CDPHE) for compliance with Colorado's General Permit for Stormwater Discharges Associated with Construction Activities. The complete SWMP may be found as APPENDIX D.

The plan includes a site description and detailed site map. All erosion and sediment control best management practices that will be employed at the site are described, including structural site management practices, interim and permanent stabilization practices and materials handling procedures. Best management practices for controlling sediment sources are given greater emphasis than those designed to handle sediments after release.

NSHI will submit the required Stormwater Construction Permit Application to CDPHE at least 10 days before the anticipated start of construction.

Implementation of the SWMP will commence when construction is initiated. The construction process will be carefully monitored, and any needed changes to the SWMP will be identified, incorporated into a revised plan, and fully implemented.

After construction has been completed and final stabilization of the site has been achieved, NSHI will provide CDPHE with a stormwater permit inactivation notice.

Stormwater-produced fluid on the NSHI site will be collected into appropriate catchments. Stormwater collected within NSHI surface equipment containment will be promptly removed to NSI's 7-acre waste water evaporation pond.

**9(d)(4)(iii) Description of the measures to be taken to prevent or control fire, soil erosion, subsidence, pollution of surface and groundwater, pollution of air, damage to fish or wildlife or other natural resources, and hazards to public health and safety**

***Fire Prevention and Control***

Fire extinguishers will be conveniently located throughout the OSR site for accessibility and rapid attack on a fire. Clear access to fire extinguishers will be maintained. Portable, dry chemical extinguishers with A, B, and C ratings will be used and work for most types of fire. At a minimum, these fire extinguishers will be checked annually for condition and charge. Water extinguishment works well for most solid flammable fuels, such as structure fires and for cooling structures during brush fires, but it should not be used on an electrical fire. A water truck from NSI's nearby plant will be made available. Halon extinguishers will be available, as required, in instrumentation and electrical areas. Extra fire extinguishers located in the NSI plant will be brought to the NSHI lease area during drilling and production operations. Additionally, the close proximity of the NSI plant and attendant resources will be available to enhance NSHI firefighting capabilities.

Fire prevention for the NSHI lease area will consist of controlling the supply of flammable and combustible materials as well as any possible sources of ignition. The dry terrain on the lease area is a potential source of combustion, and caution will be used in extinguishing smoking materials in the area. Designated smoking areas will be established and equipped with appropriate disposal containers. Produced shale oil, motor oil, flammable liquids, and grease will be kept in appropriate containers provided for them. The containers will be labeled as to their contents. NSHI generated an Emergency Response Plan to address a variety of situations. Additional fire prevention and control information and protocol may be found in NSHI's Emergency Response Plan, provided in APPENDIX E.

***Soil Erosion***

Soil erosion control practices that will be implemented on the NSHI RD&D Lease area are contained within NSHI's SWMP, found in APPENDIX D.

***Subsidence***

Surface subsidence monuments and subsidence monitoring wells in the area of NSI's Boies Bed mining operations have not indicated any subsidence of the ground surface or any significant subsurface subsidence in more than 20 years of operation. NSHI's RD&D initial OSR interval will affect a much smaller area and will be approximately 950 feet deeper than NSI's Boies Bed, solution mined, nahcolite production cavities. Approximately 15 percent of the material in the OSR interval will be removed. A matrix of the remaining 85 percent will occupy the OSR interval, and subsurface subsidence is not anticipated. No surficial or subsurface subsidence is anticipated; as such, NSHI will not need to monitor subsidence for its limited RD&D production operations.

### ***Pollution of Surface Water***

No perennial surface water has been identified on or adjacent to the NSHI 160-acre RD&D Lease area; therefore, there is no nearby surface water to contaminate. During the construction phase, surface disturbance, including cuts, fills, and grading, could increase the potential for sedimentation in nearby ephemeral drainages. Streams that drain through the lease area are intermittent and usually have less than two square miles of drainage area above the project site. A sedimentation pond and runoff diversion ditches will be placed at strategic locations to minimize runoff and sediment contributions from construction areas pursuant to the construction phase SWMP.

### ***Pollution of Groundwater***

Contamination of the groundwater aquifer systems is not anticipated as any production intervals will be located and encased deep within the Saline Zone. Existing upgradient and downgradient NSI monitoring wells and the proximal DS-6 downgradient monitoring well (to be constructed by NSHI) will monitor the aquifer systems quarterly. Appropriate corrective action will take place if a problem is identified.

Saline liquids produced by the drilling operations with conductivity values greater than 5,000 micromhos per centimeter will be removed and placed in the existing NSI lined evaporation/process ponds near the NSI plant site. The ponds, which contain high TDS water, have a dual liner system that incorporates a drain blanket with a leakage detection system. Consequently, impacts to groundwater quality from the evaporation/process ponds are not expected.

### ***Pollution of Air***

Air pollution from NSHI's limited RD&D production processes is expected to be minimal and below regulatory compliance levels. No permanent RD&D facilities are currently planned to be constructed on the NSHI RD&D Lease area because the nature of the project is relatively small scale. NSHI intends to monitor air emissions to gather data for use in planning commercial operations and future air pollution emission permitting. After the equipment that will be used on-site has been fully specified, NSHI will determine whether an Air Pollution Emission Notice (APEN) must be prepared and submitted to the CDPHE Air Pollution Control Division. This will involve evaluating the planned NSHI process and operations, identifying relevant regulated air pollutants, determining whether the sources are subject to Maximum Achievable Control Technology Requirements, identifying exempt sources, calculating uncontrolled actual emissions, and determining whether an APEN is required. If so, the APEN will be prepared and submitted to CDPHE. Should future facilities be constructed on the NSHI lease area, permits will be filed and APENs submitted to the CDPHE in accordance with existing regulations.

### ***Damage to Fish or Wildlife or other Natural Resources***

The BLM-commissioned Environmental Assessment (EA) No. DOI-BLM-C0-110-2011-0177-EA comprehensively investigated all manner of potential impacts to fish, wildlife, and other natural resources. It mandated specific mitigations to eliminate or minimize any potential impacts to fish, wildlife, or other natural resources. NSHI will conform to the mitigations that are stipulated in the EA and/or NSHI's lease document. Additionally, NSHI's OSR well and other facilities are to be located near or on a portion of the NSHI RD&D Lease area that has been disturbed by previous NSI drilling activities. Therefore, creating additional disturbed areas will be minimized.

The lack of perennial surface waters indicates that potential damage to fish populations will be nonexistent. The small footprint (less than 10 acres) of the OSR site on or near previously disturbed land will ensure that potential disturbance or damage to wildlife populations and other natural resources will be minimal.

Subsurface activities of the initial production operations will result in an approximately 40- to 50-foot tall by 20-foot diameter zone of porous and permeable, retorted and spent oil shale matrix. The influence of this zone will be restricted to the proximal unretorted oil shale, and it is not expected to exhibit detrimental effects either vertically or horizontally at significant distance from the well.

### ***Hazards to Public Health and Safety***

Given the minor scope of the project and its location in a sparsely populated region of Colorado, the activities to be conducted during the drilling and production of the pilot hole and monitoring wells will not substantially nor detrimentally affect public health and safety.

NSHI employees, NSI employees, and contractors working on the project will be required to follow NSHI's Safety Manual. Copies of NSHI's Emergency Response Plan and Safety Manual are included as APPENDIX E and APPENDIX F respectively to this POD.

Cleanup activities will be ongoing during all aspects of the site preparation, well drilling, and site operations. All construction and drilling-related debris will be removed and disposed of at an approved off-site disposal area. All household and other approved trash will be collected in on-site animal-proof containers and periodically hauled to NSI's nearby garbage bay, which is emptied every month with the trash taken to a county landfill. The NSI garbage bay is emptied by Waste Management, operating out of Meeker, Colorado.

### ***Type of Materials Produced***

During the production phase, wastes may be produced in the form of spent oil shale and waste water from the production well. The water will be analyzed for potential contaminants (by-products). The spent oil shale is not considered to be hazardous. Waste water and solids may be disposed of in situ or at an acceptable off-site disposal facility depending upon composition and analysis.

### ***Containment/Disposal***

Waste water resulting from the breakdown of the oil shale will be recaptured and recirculated as a best management practice to minimize the water use and reduce the amount of wastes produced by the research operation. Any waste water that cannot be recaptured and recirculated or returned to a spent reactor interval will be trucked off-site for disposal at an appropriate disposal facility by a contracted fluid disposal company. Off gases will be captured and directed through an on-site scrubber. The captured wastes from the scrubber will be contained in a 1,000-gallon waste tank.

The in situ process will leave the spent oil shale within the confined oil shale reactor interval. Any process tailings from the above ground processing may be slurried and put back into the OSR before associated wells are plugged and abandoned in compliance with all regulatory requirements.

**9(d)(4)(iv) Description of the proposed source or sources of energy for the operations, and any measures to reduce or to mitigate energy requirements, to use renewable energy requirements, to use renewable energy, or to reduce emissions of greenhouse gases**

Electric and natural gas needs for NSHI's RD&D project will be met through existing commercial utility suppliers. The small scale nature of NSHI's RD&D effort will preclude the use of extensive measures to reduce or mitigate energy requirements. Upon successfully completing the RD&D project and before commencing a commercial phase, NSHI will evaluate available measures to reduce or mitigate energy requirements, including the use of renewable energy and/or other methods to reduce emissions of greenhouse gases. Measures to reduce or mitigate energy requirements and emissions of greenhouse gasses will be implemented as appropriate.

**9(d)(4)(v) Description of transportation facilities or rights of way necessary to provide energy to operation**

***Electrical Power***

The existing electrical power line that cuts across the western portion of the 160-acre RD&D Lease area will provide electrical power to the OSR facility. Approximately 200 feet of new power lines will be required to bring power to the OSR well location.

***Natural Gas***

The NSI natural gas pipeline supplying the existing sodium bicarbonate production facility bisects the lease area and will provide natural gas to the NSHI OSR site.

***Water***

Proposed water and sodium solution lines supplying the OSR facility will originate from existing NSI operations. Water used during drilling operations of the OSR will be trucked or piped to the site from the existing NSI 90-1 and/or WSW-2 water wells.

***Communications***

A telemetry data collection system will provide communications and data medium between the OSR on-site work trailer and the NSI production plant. Table 7 indicates BLM-recognized right of ways within NSHI's lease areas. Figure 12 indicates various utility feeds that supply the NSHI RD&D Lease area.

Serial Number	Type	Grantee	Length (miles)	Width (feet)
COC 040613	O&G Facilities	Natural Soda Inc.	2	50
COC 050047	Power Line	White River Electric	7.4	25
COC 050065	Telephone Line	Qwest Corp.	2.2	10
COC 053195	Roads	Rio Blanco County	3.2	100
COC 057625	Roads	Natural Soda Inc.	0.1	150
COC 067991	O&G Pipelines	Bargath LLC	69	30
COC 069548	O&G Pipelines	Enterprise Products	33.7	Varies
COC 073180	Water Pipelines	Williams Production	10.3	15
COC 073830	Roads	Rio Blanco County	0.8	Varies

**Table 7 Existing Rights-of-Way Within NSHI Lease Tracts (EA after BLM, 2012)**

### **9(d)(5) Detailed Reclamation Plan and Schedule**

NSHI will engage in interim reclamation efforts in and around the RD&D Lease area, as appropriate, and in accordance with BLM guidelines and area-specific recommendations. Final reclamation of disturbed RD&D areas, which are not expected to transition into a commercial phase, will occur at the completion of the RD&D project.

A diverse, effective, and permanent vegetative cover will be established at the project site on all lands disturbed by production 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 a three- or four-strand barbed wire fence conforming to BLM Type D fence specifications until bond release.

The BLM White River Field Office reclamation coordinator will be notified via email or by phone 24 hours before beginning any BLM-approved construction-related activities, regardless of size, that result in disturbance of surface soils.

#### **Site-Specific Reclamation Procedures**

Site-specific reclamation procedures will be followed for the interim and final reclamation activities that will occur on RD&D Lease area. Interim reclamation activities will follow construction and those routine disturbances associated with the well field operations. Final reclamation activities will be associated with the cessation of production 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 of the activities that will be associated with final decommissioning of the production operations are different from routine reclamation activities and will be discussed separately.

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 production operations. Flooding is extremely unlikely to occur at the project site because the production plan involves solution mining and chemical conversion of oil shale. No slopes of any significance are present on the project site, so massive slope failure does not apply. Preventing of fires and explosions resulting from production operations is addressed in Section 9(d)(4)(iii) of this POD.

### ***Ensure Compliance with Established Requirements***

The bonding of disturbed lands (financial assurance) will ensure compliance with established requirements. Successful reclamation of the well site and access road will be considered completed when (1) reclamation has been performed according to BLM and Colorado Division of Reclamation, Mining and Safety requirements, and the total cover of live perennial vegetation, excluding noxious weeds, provides sufficient soil erosion control as determined by botanical study and the regulatory agencies through a visual appraisal, (2) disturbances resulting from flow line installations are reclaimed to the extent that they are reasonably capable of supporting the pre-disturbance land use, (3) a Sundry Notice has been submitted describing the final reclamation procedures and any mitigation measures associated with final reclamation, and (4) a final reclamation inspection has been completed by the BLM and/or Colorado Division of Reclamation, Mining and Safety and there are no outstanding BLM and/or Colorado Division of Reclamation, Mining and Safety compliance issues.

### ***9(d)(5)(i) Proposed methods of preparation and fertilizing the soil prior to replanting***

#### ***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 to control erosion and siltation of the affected and unaffected lands. Best management practices for erosion control measures, such as contour furrowing and installing water bars, 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-production conditions.

In certain areas, future production wells may 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***

Heavily compacted surfaces will be ripped before receiving a topsoil cover. Surface tillage and seedbed preparation will consist of a light or shallow tillage operation using a combination of disk harrow and spike-tooth harrow. Depending on soil conditions and when necessary, the final tillage treatment will be performed by a shallow chisel plow on a level contour or by using an imprinter or rangeland pitter. This treatment will 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.

## ***Topsoil Handling Procedures***

The White River Filed Office reclamation coordinator will be notified via email or by phone 24 hours before beginning any BLM-approved construction-related activities, regardless of size, that result in disturbance of surface soils. Handling of topsoil during production operations involves several different activities. These activities include removing vegetation, topsoil stripping, stockpiling, and replacing topsoil onto the areas to be ultimately reclaimed. Before construction or any production activities, the vegetation in the area must be cleared and the soil grubbed to a depth of 1 foot. If less than 1 foot of soil is present, the entire soil present should be grubbed. The topsoil will then be removed to the extent possible.

Suitable topsoil materials will be removed from areas that are being stripped and will be directly applied to well sites or other disturbed areas undergoing interim reclamation. 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.

Excess salvaged topsoil will be placed in shallow stockpiles adjacent to construction zones and operational facilities for future reclamation. Surfaces of topsoil stockpiles will be stabilized and protected from wind and water erosion by seeding as soon as possible in the spring or fall. The total seeding rate will be 12 to 15 pounds of pure live seed (PLS) per acre for a drilled rate, and 24 to 30 pounds 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 where the topsoil handling sequencing does not allow stabilization by vegetation methods, topsoil stockpiles may be stabilized by applying a chemical dust suppressant. Topsoil will be spread as evenly as possible over the graded surfaces.

After production 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, restoring pre-construction contours and drainage patterns. This area will then be prepared for seeding.

### ***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 applying 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.

Generally, applying fertilizer with precipitation of less than 12 inches per year yields very poor results. Furthermore, applying nitrogen fertilizer with inadequate spring moisture may have a depressing effect on grasses. If deemed necessary in the project area, an application of 800 pounds per 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 used if deemed necessary and after the third growing season.

**9(d)(5)(ii) Types and mixtures of shrubs, trees or tree seedlings, grasses, or legumes to be planted**

Seed mix application rates, seed types, and seeding techniques are based on BLM White River Field Office Surface Reclamation Protocol (BLM, 2011) and reclamation experience in the area. Local environmental conditions of soils, slopes, elevation, and precipitation have also been considered. The best management practices to be employed during reclamation will include surface roughening, seeding, and erosion control blankets. The proposed seed mixes for reclamation activities are shown in Table 8 and Table 9. The use of native, weed-free seed mixes will result in a rapidly established, diverse, and effective vegetative cover capable of self-regeneration.

The seed mix presented in (Table 8) will be used for both interim and final reclamation. The composition of Phase 1 interim reclamation seed mix may be different from those used during Phase 2 interim and final reclamation. Because of the short-term nature of Phase 1 interim reclamation, the BLM does not generally require the use of forb seed; therefore, only grass seed will be used in Phase 1. Areas that require short-term or interim vegetative stabilization will be seeded with the appropriate seed mix as soon as possible following disturbance (spring or fall, September 1–March 15). This will enhance viability of topsoil berms and shallow stockpiles. It will also increase the stabilization of the disturbed area and reduce potential erosion problems.

The White River Field Office Surface Reclamation Protocol recommends seeding bluebunch wheatgrass on rolling loam and pinyon juniper sites, both of which are characteristic of NSHI's RD&D Lease area. However, reclamation experience in this area has proven bluebunch wheatgrass is not very common and can be hard to establish. Therefore, thickspike wheatgrass has been substituted for bluebunch wheatgrass. Additionally, needle and thread seed can be difficult to obtain; therefore, green needlegrass (a species doing very well on nearby reclaimed well pads) may be substituted for it. The availability of seed will determine the ultimate seed mixture and variety of seed used.

Cultivar	Species	Scientific Name	Application Rate (PLS/acre)
<b>Grasses</b>			
Rosanna	Western Wheatgrass	<i>Pascopyrum smithii</i>	4
Critana	Thickspike Wheatgrass	<i>Elymus lanceolatus ssp. Lanceolatus</i>	3
Rimrock	Indian Ricegrass	<i>Achnatherum hymenoides</i>	3
	Needle and Thread Grass	<i>Hesperostipacomata ssp. comata</i>	2.5
<b>Forbs</b>			
Maple Grove	Lewis Flax	<i>Linum lewisii</i>	1
	Scarlet Globemallow	<i>Sphaeralcea coccinea</i>	0.5
<b>Alternates</b>			
Timp	Northern Sweetvetch	<i>Hedysarum boreale</i>	3
Lodorm	Green Needlegrass	<i>Nassella viridula</i>	2.5

**Table 8 Grasses and Forbs Used in Interim and Final Reclamation**

Shrub species shown in Table 9 will be added for final reclamation. Based on reclamation results from nearby well pads, it is anticipated that sagebrush will eventually re-establish from nearby native stands. Therefore, it has not been included in the seed mix. However, if necessary, Wyoming Big Sagebrush (*Artemisia tridentata* var. *wyomingensis*) at 0.25 to 0.5 PLS/acre will be added to the seed mix.

Species	Variety	Scientific Name	Application Rate (PLS/acre)
<b>Shrubs</b>			
Four-wing Saltbush	Rincon (dewinged)	<i>Atriplex canescens</i>	1.5
Winterfat		<i>Krascheninnikovia lanata</i>	0.5
Antelope Bitterbrush		<i>Purshia tridentata</i>	1.0

**Table 9 Shrubs Used in Final Reclamation**

Seed mixes as detailed in Table 8 and Table 9 were designed to average 50 seeds per square foot with the assumption that there would not be a substantial viable seed bank remaining in topsoil piles that had been stored for greater than 6 months. At the discretion of the BLM, it may be appropriate to reduce the seeding rates (adjusted to 20 to 30 seeds per square foot) in circumstances where a substantial viable seed bank persists in the topsoil.

**9(d)(5)(iii) Types and methods of planting, including the amount of grasses or legumes to be planted per acre, or the number and spacing of trees or tree seedlings, or combinations of grasses and trees**

**Seeding Procedure**

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. This scheduling of revegetation 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 reseed an area in the event of failed seedling establishment. In these events, seeding may occur during the spring (April to 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. Table 8 and Table 9 indicate seed application rates.

Following seeding, straw or native pasture hay will be applied as mulch at a rate of approximately 2 tons per acre. If hydromulch is used, the rate will be ¾ to 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 if seeding occurs with appropriate timing. Any prohibited noxious weeds that may appear in the reclaimed area will be controlled, as necessary, by chemical and/or mechanical means. Noxious weed control will be performed by a certified pesticide applicator 1 to 2 times annually (during the growing season).

Seeding will occur as necessary and as the project progresses.

### ***Reclamation Monitoring***

The State of Colorado and BLM require 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. To ensure that this requirement is fulfilled, monitoring will be required to assess the success of revegetation efforts.

### ***Reclamation Schedule***

After production activities cease, the removal of surface facilities will require approximately 6 months and take place between the spring and fall seasons. Revegetation of the project area will be completed during the first fall following production shut-down; seeding will occur according to the procedures described above. Monitoring activities associated with groundwater quality (monitoring wells) will continue for 3 years after production operations cease. The monitoring of revegetation success will continue until bond release.

The monitoring program will evaluate the success of any reclamation effort and will recognize any problem areas. Vegetation transects will be sampled each year at the peak of the growing season. Initially (years 1 to 2), cover and production will be 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.

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.

### ***Contingency Plans***

Correction procedures for unsuccessful reclamation are necessary in the event that revegetation attempts fail. The currently established NSI environmental monitoring programs for vegetation and wildlife will be used to evaluate the effectiveness of revegetation and the impact, if any, of mining and reclamation on wildlife populations.

## **9(d)(6) Method of Abandonment Operations**

Production and monitoring wells associated with the well field will be plugged and abandoned in accordance with procedures described herein and lease stipulations. At the completion of RD&D, pilot, and/or commercial production 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.

***Protection of the unmined recoverable reserves and other resources, including the method proposed to fill in, fence, or close all surface openings which are a hazard to people or animals. Description of the method and materials used to plug all abandoned development/production wells.***

The limited nature of NSHI's RD&D project will serve to protect unmined, recoverable reserves and other resources. Additionally, NSHI's in situ OSR methodology proposes to recover two of the principal mineral resources in the Piceance Creek Basin—shale oil and nahcolite—resulting in less potential resource waste than the recovery of a single resource. The in situ recovery of nahcolite and shale oil resources from discrete intervals, which appear to contain little in the way of economic or additional resources, serves to protect other resources located above or below NSHI's OSR interval.

A portion of the reclamation strategy embodies a concept that is very common with salt dome use. Used production intervals associated with shale oil production may be used to return insoluble material (primarily clays) back to the subsurface where they originated. At the end of oil production, all remaining insoluble material will be slurried and re-injected into the spent OSR interval. As there is a net removal of material during the formation of the leached interval in the form of nahcolite and kerogen, the proportion of insoluble material is projected to be quite small. The insoluble material are likely to be restricted to clays, which have minimal commercial value; however, because they originated from the leached interval they are non-polluting. When there is no additional use for an OSR interval, any recovered argillaceous- or carbonaceous-type material may be reintroduced into the spent interval. Additionally, residual brine will be left in the OSR interval and will help to stabilize and support it.

Before plugging and abandoning an OSR production well, the production and injection tubing strings set inside the intermediate casing(s) will be removed from the wellbore. Bridge plugs may be set near the top of the OSR interval.

Wells will be plugged and abandoned in compliance with all regulatory requirements. Any core holes will be plugged and abandoned or converted to monitoring wells per BLM specifications. NSHI's monitor well may be maintained to provide additional groundwater monitoring for the NSI sodium operations.

Any surface facilities present when production operations cease will be dismantled and either salvaged or removed for disposal. Concrete foundations and road pavement with no further use will be broken up and buried on-site at least 3 feet below final grade. Buried utilities, such as natural gas pipelines, will be disconnected and purged; they will be left in place because these areas will have already been revegetated. Any pits will be closed according to applicable regulations, recontoured to match native surrounding, and revegetated.

Surface infrastructure (such as buildings, tanks, foundations, and associated structures) that cannot be used by NSI's sodium bicarbonate facility will be removed from the site and the site recontoured and revegetated. It is estimated that the cost for final reclamation and abandonment would be approximately \$5,400 per acre based on bonding for the NSI facilities.

***A description of the method and materials used to plug all abandoned development/production wells***

NSHI plans to cement the well to surface after borehole preparation is complete. The following plugs are anticipated: (1) a cast iron bridge plug will be placed at the base of the production casing, and the interval from the top of the cast iron bridge plug to the Dissolution Surface will be cemented, (2) cement the entire Dissolution Surface Aquifer interval plus 50 feet above, (3) the entire B-Groove Aquifer interval must be plugged, and the plug must extend 50 feet above and below the aquifer, (4) the entire A-Groove Aquifer interval must be plugged, and the plug must extend 50 feet above and below the aquifer, and (5) the final plug must extend from the surface to 165 feet below ground level. The intervals between the cement plugs will be filled with a bentonite-based plugging mud and/or cement. Other cement plugs or revised plugging procedures may be required based on cement bond log analyses and casing recovery results. Any remaining casing will be cut off and removed to a depth of 2 feet below grade. An appropriate surface location marker will be installed at grade. The well abandonment will conform to all applicable regulatory requirements.

**9(d)(7) Additional Information**

**9(e) OCCUPANCY AND USE OF EXISTING STRUCTURES OR FACILITIES**

Occupancy and use of existing structures and facilities will be authorized by the approval of this POD.

**9(f) APPROVAL CONDITIONED ON REASONABLE MODIFICATION OF THE PLAN**

The authorized officer may condition the approval on reasonable modifications of the plan to ensure protection of the environment, health and safety, and maximum efficient recovery.

**9(g) POST APPROVAL PLAN CHANGES**

After plan approval, the Lessee must obtain the written approval of the authorized officer for any change in the plan approved under subsection 9(a).

**9(h) OPERATIONAL COMPLIANCE WITH SECTIONS OF 43 CFR PART 3160**

The Lessee may be required, as part of plan approval, to conduct operations in compliance with applicable sections of 43 Code of Federal Regulations (CFR) Part 3160, Onshore Oil and Gas Orders, 43 CFR Subpart 3931, and 43 CFR 3590, which will be identified in the plan approval document.

**9(i) UNDERSTANDING THAT NO ACTIVITIES WITHOUT APPROVED POD**

The Lessee shall not commence or continue any exploration, extraction, or other surface-disturbing activity without an approved POD, and shall conduct all surface-disturbing activities in compliance with such approved POD.

**9(j) UNDERSTANDING OF WATER DIVERSION ON FEDERAL LANDS**

Establishing a point of water diversion on Federal lands shall be subject to the approval of the Federal land manager.

## REFERENCES CITED

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- Daub, G.J., L.K. Weston, and E.C. Rosar, 1985, "Detailed Lithologic, Rock Quality and Hydrologic Data from Four Drill Holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado," *Colorado Sch. Mines 18th Oil Shale Symposium Proceedings*, pp. 21-46.
- Johnson, R.C., T.J. Mercier, M.E. Brownfield, M.P. Pantea, and J.G. Self, 2009, "Assessment of In-place Oil Shale Resources of the Green River Formation, Piceance Basin, Western Colorado," U.S. Geological Survey Fact Sheet 2009–3012, 6 p.
- Trudell, L.G., T.N. Beard, and J.W. Smith, 1970, *Green River Formation Lithology and Oil-shale Correlations in the Piceance Creek Basin, Colorado*, U.S. Bureau Mines Rept. Inv. 7357, 226 p.
- Trudell, L.G., T.N. Beard, and J.W. Smith, 1974, *Stratigraphic Framework of Green River Formation Oil Shales in the Piceance Creek Basin, Colorado*, Rocky Mtn. Assoc. Geologists Guidebook, pp. 6569.

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NATURAL SODA

**APPENDIX A**  
**Process Flow Diagrams and Block**  
**Flow Diagrams**  
**(CONFIDENTIAL)**

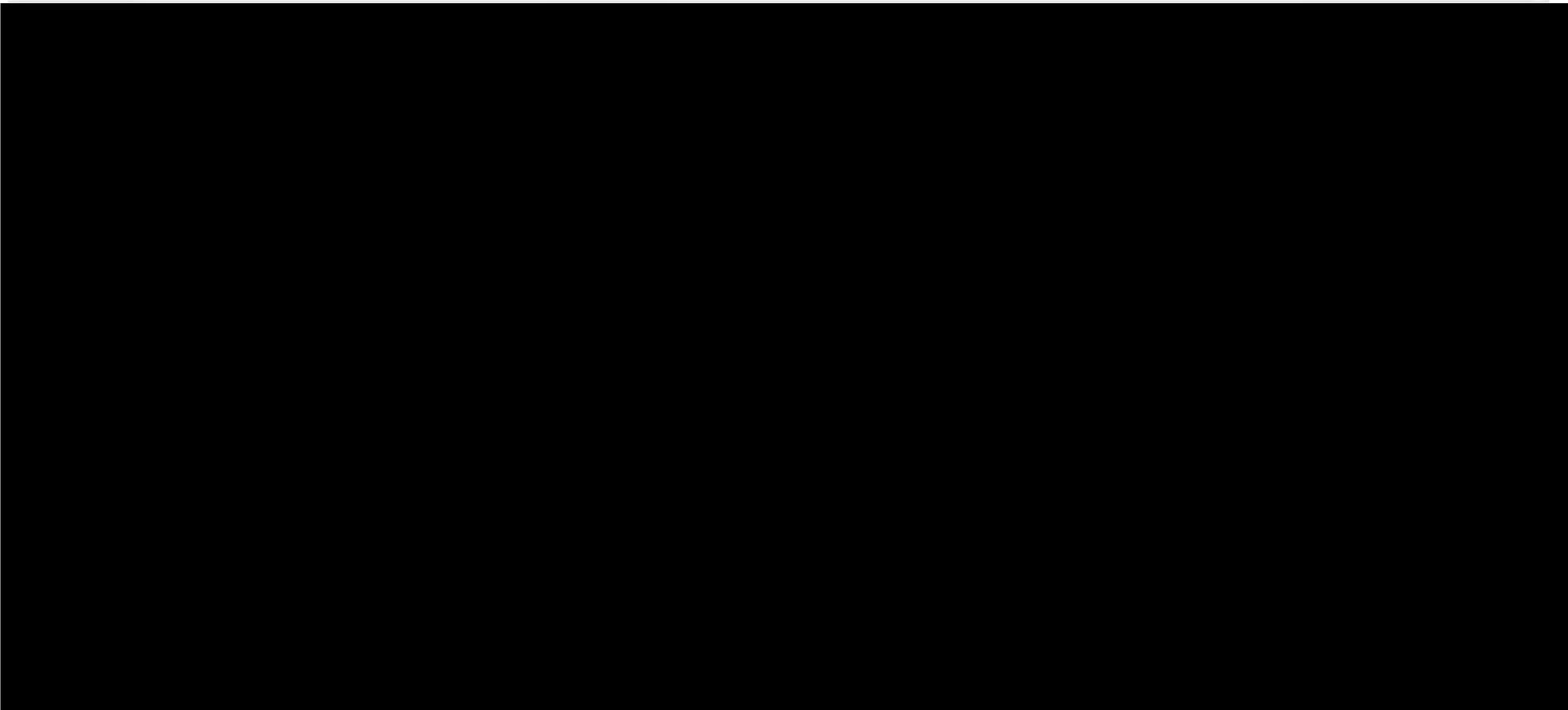
**2013 Plan of Development**  
Oil Shale Research, Development and Demonstration (RD&D)  
Tract COC 74299

Prepared for:  
**Natural Soda Holdings, Inc.**  
Piceance Creek Basin  
Rio Blanco County, Colorado

Prepared by:  
**Daub & Associates, Inc.**  
Grand Junction, Colorado



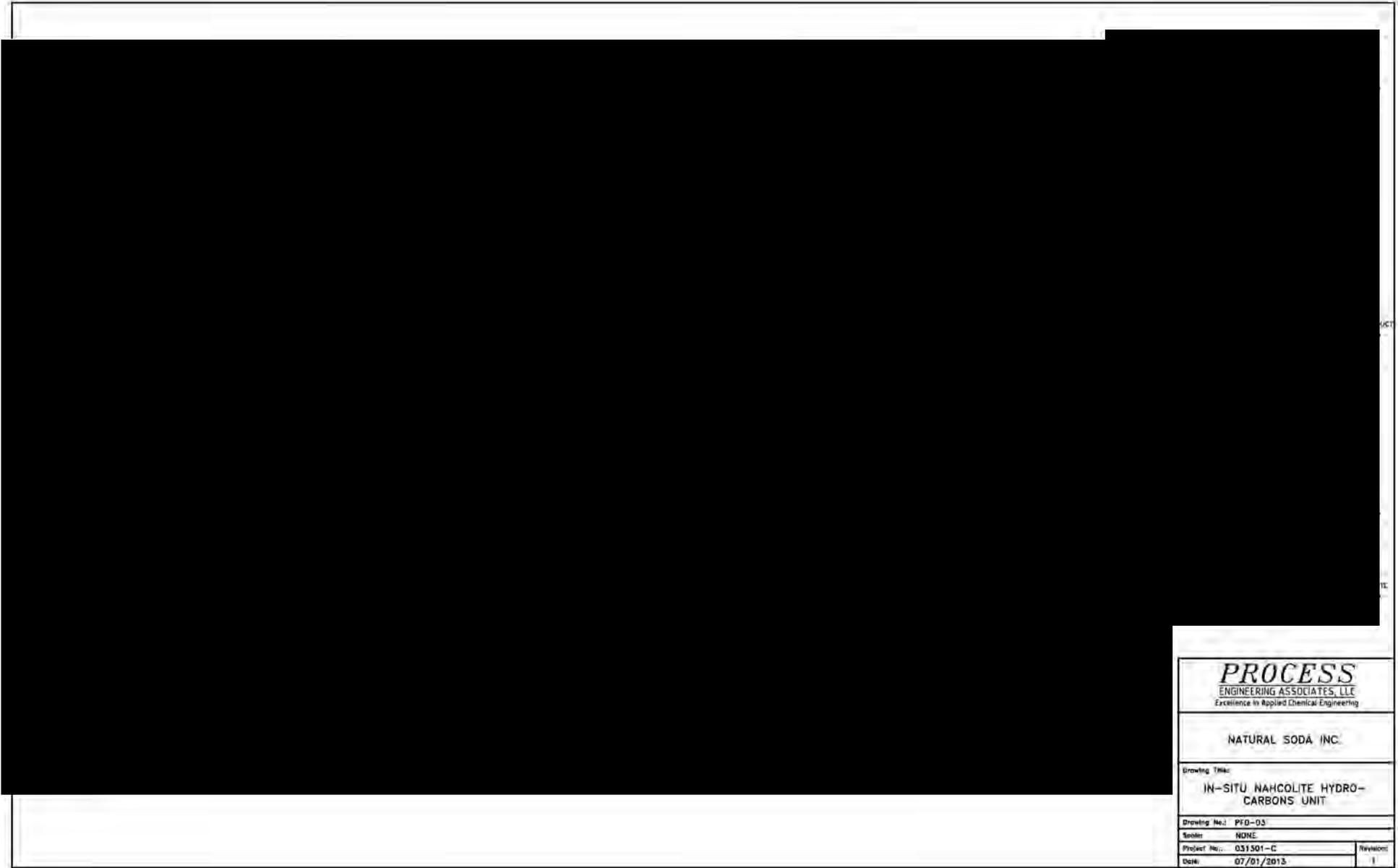
Drawing Title:	
IN-SITU NAHCOLITE HYDRO-CARBONS UNIT	
Drawing No.: PFD-01	
Scale: NONE	
Project No.: 031501-C	Revision:
Date: 07/01/2013	1



**NOTES:**

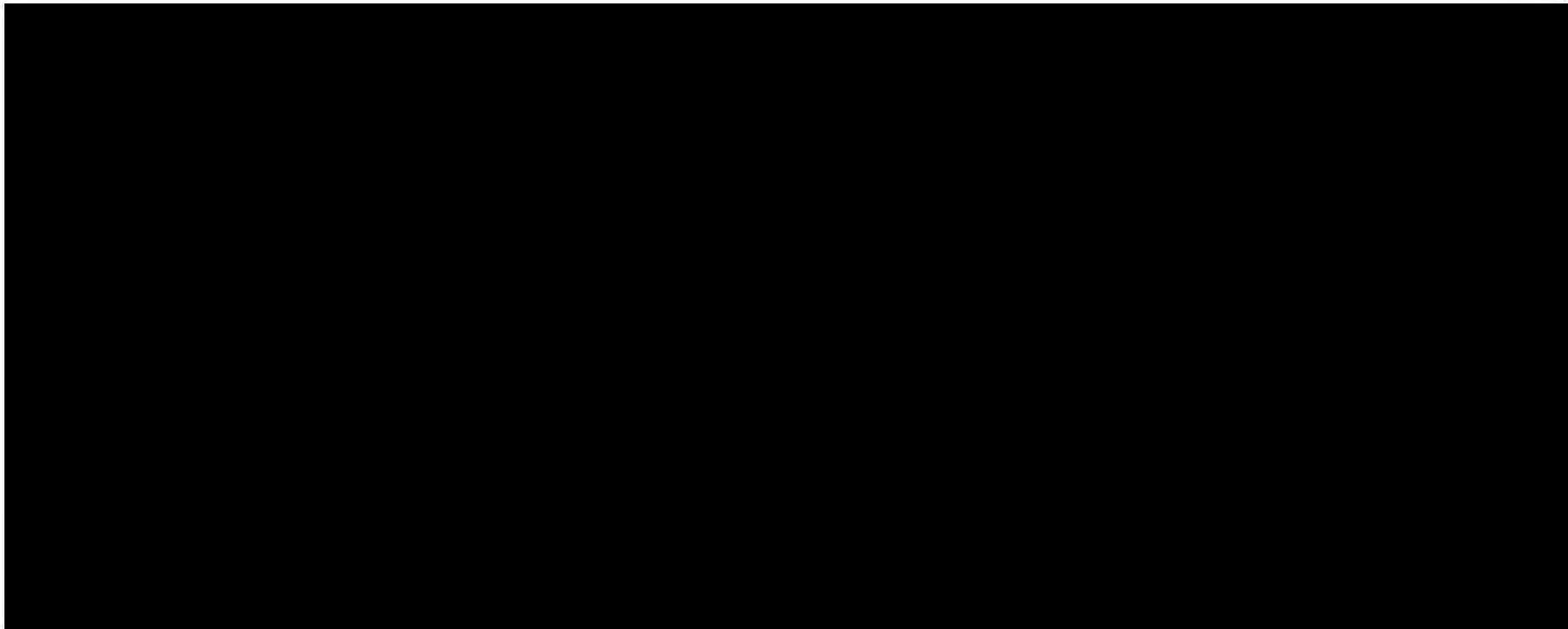
1. NAHCOLITE SOLUTION REQUIRED FOR PHASE 1 OPERATION ONLY.
2. WELL WATER REQUIRED FOR OIL SHALE REACTOR (OSR) IN-SITU REACTION WHEN USING CARBON MONOXIDE.
3. STREAM 4B IS SHALE CRUDE OIL THAT REMAINS LIQUID AND WILL HAVE TO BE PUMPED OUT OF THE OSR.

<b>PROCESS</b> ENGINEERING ASSOCIATES, LLC <small>Excellence in Applied Chemical Engineering</small>	
<b>NATURAL SODA INC.</b>	
Drawing Title: <b>IN-SITU NAHCOLITE HYDRO-CARBONS UNIT</b>	
Drawing No.: EYD-02	
Scale: NONE	
Project No.: 031301-C	Revised:
Date: 07/07/2015	1



<b>PROCESS</b> ENGINEERING ASSOCIATES, L.L.C. <small>Excellence In Applied Chemical Engineering</small>	
NATURAL SODA, INC.	
Drawing Title: IN-SITU NAHCOLITE HYDRO-CARBONS UNIT	
Drawing No.: PFD-03	
Speller: NONE	
Project No.: 031501-C	Revision:
Date: 07/01/2013	1





**PROCESS**  
ENGINEERING & CONSTRUCTION, INC.

Natural Soda, Inc.  
Topside Hydrocarbon Processing Plant - Phase 2 Offshore Rebuild  
Block Flow Diagram, Page 1, Rev. A  
JPT 06/13/13



Natural Gas

**PROCESS**  
CONSTRUCTION PROJECTS

Natural Soda, Inc.  
Topic: Hydrochloric Process & Plant - Phase 2 Oilfield Re-entry  
Block Flow Diagram, Page 2, Rev. A  
JPT 05/13/13

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NATURAL SODA

**APPENDIX B**  
**Technical Data**  
**(CONFIDENTIAL)**

**2013 Plan of Development**  
Oil Shale Research, Development and Demonstration (RD&D)  
Tract COC 74299

Prepared for:  
**Natural Soda Holdings, Inc.**  
Piceance Creek Basin  
Rio Blanco County, Colorado

Prepared by:  
**Daub & Associates, Inc.**  
Grand Junction, Colorado

## **Temperatures of Heating Technology (CONFIDENTIAL)**

The reactor interval will be used to first solution mine nahcolite at temperature of [REDACTED] [REDACTED] ) to create a prescribed void space in the oil shale and pre-heat the OSR. [REDACTED] will then be circulated through a closed loop system to the downhole heat exchanger and downhole temperatures will be generated in the range of approximately [REDACTED] degrees Fahrenheit). If necessary, [REDACTED]

[REDACTED] Optionally, [REDACTED]

## **Circulation Medium to Heat Oil Shale (CONFIDENTIAL)**

[REDACTED] will be installed in the initial [REDACTED]

[REDACTED] will be isolated through [REDACTED]  
Alternatively, additional studies may indicate [REDACTED]

[REDACTED] attached to monitor the reactor interval and sections above the reactor interval. The open hole reactor interval will have an adequate pressure control regulator at the surface well head.

## **Type and Weight of Mud/Drilling Fluids (CONFIDENTIAL)**

The OSR and monitoring wells will be drilled using a combination of [REDACTED] [REDACTED]. This medium has provided for the successful drilling of the numerous wells on the NSI sodium leases and is expected to be satisfactory the wells on the NSHI 160-acre RD&D Lease area. [REDACTED]

[REDACTED] Circulation will be normal, and any lost circulation zones will be remedied by flushing the hole with lost circulation material in the form of sawdust, shredded paper, walnut hulls, Diamond Seal, or similar materials. Additional strategies to remediate lost circulation may include spotting cement plugs in lost circulation zones. It is anticipated that less than 100 barrels of water will be used daily during the drilling operations. The water to be used in drilling operations will be taken from one of NSI's water supply wells, the WSW-2 and/or the 90-1, or from water wells to be constructed in the future.

## Cement (CONFIDENTIAL)

It is anticipated that the OSR well will use [REDACTED]

[REDACTED] Cement will be circulated to the surface in both casing strings. The monitoring wells will use Portland Type I/II cement with 2 percent calcium chloride on both the conductor and intermediate casing strings. Cement will be circulated to the surface on all monitoring well holes. Specific cement formulations will be designed before the need, allowing for the most current research data to be used and ensuring the most appropriate cement product for the expected conditions.

## Fracturing Methods (CONFIDENTIAL)

NSHI will not employ any fracturing methods or proppants in the OSR well drilling or production operations. However, minor fracturing within the OSR as a result of thermal expansion of the oil shale during the heating of the formation is expected.

## Expected Bottom Hole Pressures (CONFIDENTIAL)

For a well design that includes cemented casing from the surface to near the top of the OSR interval [REDACTED]

[REDACTED] The formation fracture pressure at that depth is given by the equation:

$$FP = FG \times (\text{depth to top of reactor interval}) \quad (1)$$

where

FP = fracture pressure  
FG = fracture gradient

A conservative formation fracture pressure at [REDACTED] therefore, equal to [REDACTED] x [REDACTED]. Downhole pressures of less than [REDACTED] are not expected to fracture the formation at bottom hole depths.

The hydrostatic pressure component of the wellbore and reactor fluids is given by the equation:

$$HP = D \times FW \times 0.052 \quad (2)$$

where

HP = hydrostatic pressure (in psi)  
D = depth (in feet)  
FW = fluid weight (in ppg)  
0.052 = unit conversion factor.

Drilling mud is anticipated to be among the heavier fluids with a weight of between 9.0 and 9.5 ppg. The hydrostatic pressure of heavier drilling mud at the top of the anticipated OSR interval will be approximately:

[REDACTED]

The maximum allowable injection pressure of an injected fluid is limited by the equation:

$$\text{MAIP} = (\text{formation fracture pressure at the top of the reactor interval}) - (\text{hydrostatic pressure}) \quad (3)$$

where

MAIP = maximum allowable injection pressure.

or by the similar equation:

$$\text{MAIP} = [\text{FG} - (0.433 \times \text{SG})] \times (\text{depth to top of reactor interval}) \quad (4)$$

where

FG = fracture gradient

SG = specific gravity

A fluid with the weight of drilling mud could be injected at a pressure of up to or less than [REDACTED] without fracturing the formation [REDACTED] in a well containing cemented casing from the surface to the top of the OSR interval. Fluids weighing less (i.e., water or solvents) may be injected at correspondingly higher pressures.

The injection of gases into a dry hole is limited by the formation fracture pressure of [REDACTED]. Gases added to a reactor containing injected fluids are limited to a maximum pressure of [REDACTED] if allowed to displace any fluids (i.e., opening the system to allow fluid displacement). In a closed system containing injected fluids, gas injection would be limited by the maximum allowable injection pressure. Expected downhole pressures, expressed as the total of hydrostatic pressure (if any) and injection pressure, will be less than [REDACTED] to avoid pressure-induced formation fracturing.

### **Pressure Control Equipment (CONFIDENTIAL)**

Automatic and manual pressure control valves, gauges, and monitoring and recording equipment will be installed to ensure control and compliance of the OSR pressures.

Though minor pressure variations are anticipated, these variations are not expected to be considerably above normal bottom hole pressures and at no time expected to be above the formation fracture pressure.

### **Disposal, Injection, and Production (CONFIDENTIAL)**

No disposal wells are planned. Initially, for Phase 1, a single OSR well will be constructed, which will act as both an injection well (for the leaching phase) and the production well (for the recovery of shale oil during the production phase).

## Casing Specifications (CONFIDENTIAL)

Two well casing scenarios are being considered:

1. The OSR well may use 22-inch carbon steel conductor casing to a depth of approximately 50 to 150 feet and 16-inch permanent (intermediate) casing with 5 ½-inch vacuum insulated tubulars. These tubulars will be fabricated of a specialty alloy to meet the temperature, pressure, and strength criteria for the system. Thermal insulating cement may be used in the annulus of the 16-inch casing.
2. The OSR well may use 18 5/8-inch carbon steel conductor casing to a depth of approximately 50 to 150 feet and two 7-inch permanent (intermediate) casings and 4 ½-inch tubulars. Tubulars may consist of something similar to a nickel-iron-chromium alloy to an austenitic nickel based alloy and will meet all temperature, pressure, and strength criteria. Thermal insulating cement may be used in the annulus of the 7-inch casings.

## Well Life (CONFIDENTIAL)

The OSR well is expected to produce shale oil from [REDACTED] within the Saline Zone. After the appropriate amount of shale oil has been produced at a particular reactor interval, the [REDACTED] and production material may be removed from the hole and a new reactor interval will be identified, leached, and produced from an area higher up in the stratigraphic section. The old or spent well will be plugged and abandoned following production from the multiple intervals in the Saline Zone or at a time when the well is deemed uneconomic.



NATURAL SODA

**APPENDIX C**  
**Spill Prevention, Control and  
Countermeasures**

**2013 Plan of Development**  
Oil Shale Research, Development and Demonstration (RD&D)  
Tract COC 74299

Prepared by:  
**Natural Soda, Inc.**  
Piceance Creek Basin  
Rio Blanco County, Colorado

	Document Title	NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

# **Spill Prevention, Control and Countermeasures (SPCC) PLAN part 1 of 3**

**NATURAL SODA HOLDINGS, INC.  
(NSHI)**

**Completed by: MICHAEL CLARK  
Completed Date: 08/06/2013**

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Spill Prevention, Control and Countermeasure (SPCC) Plan

### I. General SPCC Plan Requirements.

#### **I.A. General Company Policy.**

##### *I.A.1. Purpose.*

The purpose of this program is to inform interested persons, including employees, that our facility, the Natural Soda Holdings, Inc. (NSHI), Oil Shale Reactor (OSR), located at 3200 County Road 31, Rifle, CO, 81650, complies with EPA requirements for preparing, implementing, and maintaining a Spill Prevention Control and Countermeasure (SPCC) Plan under the Oil Pollution Prevention regulations, Title 40 Code of Federal Regulations (CFR) Part 112, by providing a written plan that describes the equipment, manpower, procedures, and adequate countermeasures for preventing and controlling oil discharges.

The evolution of hydrocarbon fluids from the OSR **will not be similar** to conventional oil and gas operations. This is an operation designed to demonstrate a process only, and not provide continuous production. Hydrocarbon fluids in the OSR will accumulate slowly as an underground heating process slowly converts in-situ solid organic matter to fluid hydrocarbons. Evolved hydrocarbon fluids will then be pumped from the underground OSR to surface facilities on a non-continuous as-needed basis. The entire operation is expected to produce on the order of 5,000 gallons, total, of fluid hydrocarbon.

##### *I.A.2. Applicability (§112.1(b) and §112.1(d)(2)).*

This plan will apply to our facility because:

- We will have a non-transportation related facility engaged in pilot plant research, development and demonstration of extraction of shale oil from oil shale ;
- Due to our facility location, our facility could be reasonably be expected to discharge oil in quantities that may be harmful, as described in 40 CFR 110, into or upon the navigable waters of the

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

- U.S. or adjoining shorelines; and
- Our facility will have an aggregate aboveground storage capacity greater than 1,320 gallons.

*I.A.3. Responsibilities and Plan Location (§112.3(e)).*

NSHI, the facility owner and operator, is responsible for this plan and for making sure that the plan is available to the EPA Regional Administrator for onsite review during normal working hours. Copies of the written plan will be located in Office of Business Support and Sustainability Manager, Michael Clark, at 3200 County Road 31, Rifle CO, who is available by calling 970-878-3674, extension

25. NSHI is responsible for developing and maintaining the plan.

The facility owner name, address, and telephone is as follows:

NSHI, 3200 County Road 31, Rifle, CO, 970-878-3674, attention Michael Clark

The facility operator name, address, and telephone is as follows:

NSHI, 3200 County Road 31, Rifle, CO, 81560, 970-878-3674, attention Michael Clark

Facility contacts include the following:

Contact	SPCC Plan Role	Title:	Telephone number:	Address:
<b>Michael Clark</b>	<b>Emergency Response Coordinator-ERC</b>	<b>Business Support and Sustainability Mgr</b>	<b>970-878-3674, x25</b>	<b>3200 County Road 31, Rifle, CO 81652</b>
<b>Robert Warneke</b>	<b>ERC Backup #1</b>	<b>V.P. Operations</b>	<b>970-878-3674, x14</b>	<b>3200 County Road 31, Rifle, CO 81652</b>
<b>Eric Simms</b>	<b>ERC Backup #2</b>	<b>Technical Manager</b>	<b>970-878-3674, x13</b>	<b>3200 County Road 31, Rifle, CO 81652</b>
<b>Carl Meyer</b>	<b>ERC Backup #3</b>	<b>Production Supervisor</b>	<b>970-878-3674, x37</b>	<b>3200 County Road 31, Rifle, CO 81652</b>

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

*I.A.4. Plan Certification (§§112.3(d) and 112.5(c)).*

The undersigned Registered Professional Engineer is familiar with the requirements of 40 CFR 112 and has visited and examined the facility, or has supervised examination of the facility by appropriately qualified personnel. The undersigned Registered Professional Engineer attests that:

- This SPCC Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and the requirements of 40 CFR 112;
- Procedures for required inspections and testing have been established;
- This plan is adequate for the facility;

This certification in no way relieves the owner or operator of the facility of his/her duty to prepare and fully implement this SPCC Plan in accordance with the requirements of 40 CFR 112. This plan is valid only to the extent that the facility owner or operator maintains, tests, and inspects equipment, containment, and other devices as prescribed in this plan.

Signature:

Professional engineer registration number:

Name: Edward R. White, P.E.

Title: Project

Engineer

Company: CTL-Thompson, Inc.

Date:

Professional engineer's seal (provide seal here):

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

*I.A.5. Plan Review, Evaluation, and Verification (§112.5).*

The facility The owner and operator will amend this SPCC Plan in accordance with Section 112.7 and other applicable Sections of Part 112, when there is a change in the facility design, construction, operation, or maintenance that materially affects its potential for a discharge. The amendment will be prepared within six months of the change. Examples of changes that may require amendment to the Plan include, but are not limited to:

- Commissioning or decommissioning containers;
- Replacement, reconstruction, or movement of containers;
- Reconstruction, replacement, or installation of piping systems;
- Construction or demolition that might alter secondary containment structures;
- Changes of product or service; or
- Revision of standard operation or maintenance procedures at the facility.

Amendments to the plan made to address changes of this nature are referred to as "technical amendments," and must be certified by a professional engineer. "Non- technical amendments" can be done (and must be documented) by the facility owner and operator. Non-technical amendments include the following:

- Change in the name or contact information (i.e., telephone numbers) of individuals responsible for the implementation of this plan; or
- Change in the name or contact information of spill response or cleanup contractors.

The facility will make the needed revisions to the SPCC Plan as soon as possible, but no later than six months after the change occurs. The plan will be implemented as soon as possible following any technical amendment, but no later than six months from the date of the amendment. NSHI is responsible for initiating and coordinating revisions to the SPCC Plan.

NSHI will review this Plan at least every five years from the date the facility becomes subject to 40 CFR 112 and five years from the date of

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

the last review. Amendments will be prepared within six months of the review. As described above any technical amendments to our SPCC Plan are certified by a professional engineer. See section I.A.4. for certification

Both the scheduled reviews and technical and non-technical amendments described above will be recorded and found in the Appendices to this plan. This record will be completed even if no amendment is made to the plan as a result of the review.

*I.A.6. Worker Attendance (§112.3(e)).*

Our facility will normally be attended by workers at least four hours per day. Therefore, a complete copy of the plan will be maintained at the facility. See section I.A.3.

*I.A.7. Plan Suggestions.*

We encourage any suggestions that our employees, plan reviewers, professional engineers, EPA, or state agencies have for improving our written SPCC Plan, as we are committed to developing and maintaining an effective plan. We strive for clear understanding, environmentally-minded behavior, and involvement in the plan from every level of the company.

*I.A.8. Management Approval (§112.7).*

We are committed to the prevention of discharges of oil to navigable waters and the environment and to maintaining the highest standards for spill prevention, control, and countermeasure through the implementation and regular review and amendment to this plan. This plan has the full approval of management at a level of authority to commit the necessary resources to fully implement it.

The authorized facility representative below is our designated person accountable for oil spill prevention at the facility and has the authority to commit the necessary resources to implement this plan.

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Authorized Facility Representative: Robert Warneke

Title: Vice President Operations

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

*I.A.9. Not Yet Operational Facilities, Procedures, Methods, and Equipment (§112.7).*

If this SPCC Plan calls for additional facilities, procedures, methods, or equipment not yet fully operational, we discuss these items, as necessary, in separate paragraphs throughout this SPCC Plan and explain separately the details of installation and operational start-up. This facility has not yet been constructed at this time. Equipment, methods and procedures discussed herein are representative of current plans. If there are technical changes to current plans prior to construction, this plan will be subject to review, amendment and recertification prior to construction. This plan will be amended and recertified within 6 months of completion of facility construction and commencement of operations.

**I.B. Discussion of Facility's Conformance with 40 CFR 112.7 (§§112.7, 112.8(a), 112.9(a), 112.10(a), 112.11(a), and 112.12(a)).**

NSHI's OSR will conform with applicable SPCC regulations by fully developing and implementing this Spill Prevention Control and Countermeasures Plan.

**I.C. Facility Location and Layout/Diagram (§112.7(a)(3)).**

NSHI proposes to demonstrate proprietary non-traditional oil-and-gas industry technology suitable for economic production of liquid hydrocarbons from oil shale.

The proposed operation will be an oil shale research, development and demonstration project that has been permitted as such by the US Bureau of Land Management. The well in which the OSR is to be located will be first drilled by a contractor, following the same practices currently used to drill

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

nacholite (baking soda) production wells, and operated by solution mining processes for the production of nacholite by adjacent facilities operated by Natural Soda company under BLM sodium lease no. C-0118326. After sufficient nacholite is withdrawn, solution mining apparatus will be withdrawn from the well and replaced with OSR equipment. Because of the nature of the nacholite drilling process, it is not anticipated that the drilling operation will be subject to the requirements of 40 CFR 112.10.

The attached "Utility Map" illustrates the project's ground plan. A natural gas line is proposed to tap into the existing gas main line [REDACTED] Oil storage facilities pertinent to this SPCC Plan are located within the area denoted as "OSR Well Pad". Centralized processing equipment is located within the OSR Well Pad.

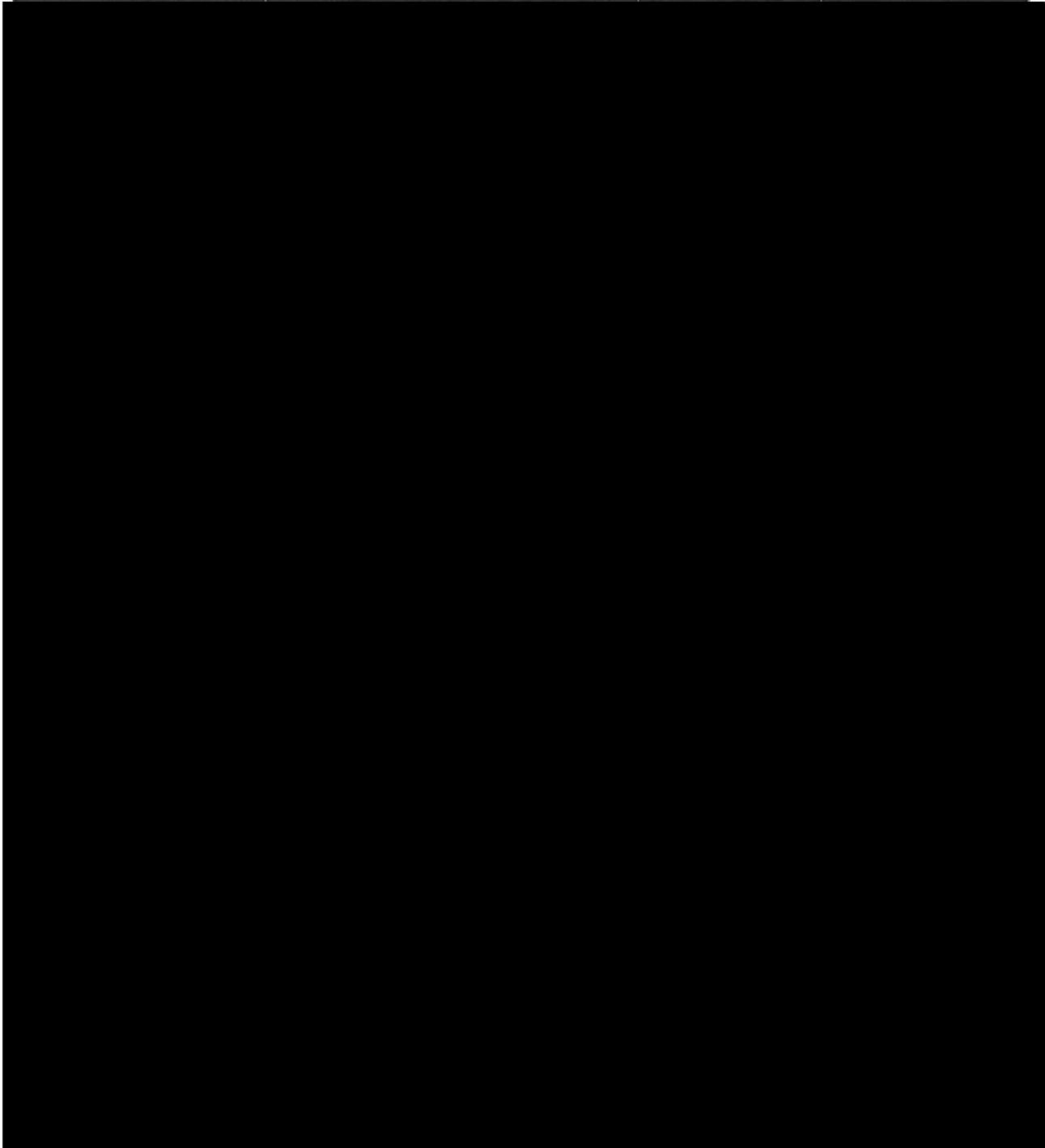
The "Surface Facilities Layout" illustrates arrangement of the processing equipment. Hydrocarbons evolved from the OSR (Oil Shale Reactor) Well will be separated from co-produced gas and water and transferred through suitable pipe to a 5,000 gallon oil storage tank. Produced water will be transferred to a 1,000 gallon waste tank through suitable above-ground pipe. Stage 1 produced water and liquid hydrocarbons evolved from the gas scrubber will be transferred to a 10,000 gallon scrubber tank. Produced water from the scrubber tank will be transferred to the produced-water tank. All three tanks will be protected by secondary containment. Secondary containment will consist of low-permeability materials and have capacity to hold the volume of the largest tank plus sufficient freeboard for precipitation.

The table below includes a complete list of all oil storage containers with capacity of 55 U.S. gallons or more, unless otherwise exempt from Part 112.

		Document Title		NSHI SPCCP--Part 1			
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

The type of oil in each container and its storage capacity is listed in the table below:

Container type and age:	Type of oil stored and storage capacity:	Description of discharge	Container location:
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		Document Title						NSHI SPCCP--Part 1			
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released				
Document Owner		Clark, Michael									

Our discharge prevention measures including procedures for routine handling of products (loading, unloading, and facility transfers, etc.) are as follows:

Oil handling at the facility involves the loading, unloading, and transfer of oil in quantities and container sizes that range from less than 55 gallons up to several thousand gallons. Procedures are developed for oil handling operations that are designed to prevent releases.

### Fluid Transfer Associated with Facility Processing

- Fluid movement from the wellhead to points down the process stream is to be driven by a down-hole pump. Fluids will consist of a mixture of gas, hydrocarbons and produced water.
- Fluid transfer from the wellhead to downstream processes will not be continuous.
- Down-stream processes include separation of gas, water and hydrocarbon phases, storage of water and hydrocarbon phases, and transfer of water and hydrocarbon phases away from the facility.
- Should transfer lines fail, flow will be discontinued by shutting off the down hole pump, minimizing the amount of fluids not contained within lines and minimizing potential spill of fluids.
- Fluid transfer and associated processes are protected entirely by secondary containment from the wellhead to final discharge of water and hydrocarbons into tank trucks for transport off site. Secondary containment is sized to accommodate loss from the largest vessel plus sufficient free-board to allow for potential precipitation.

### Drum and Tote Handling

- Only approved drums (tight head with bung caps installed or open top with properly secured lids and rings) or properly sealed totes are to be used [REDACTED]

		Document Title		NSHI SPCCP--Part 1			
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

- Oil drums and totes containing liquid will be stored only in designated areas equipped with necessary secondary containment.
- Container caps and lids will be secured in place during transport of containers within the facility. All containers will be properly labeled.
- Dispensing activities will occur only within secondary containment of the systems being serviced.
- Transfer lines will be securely connected and inspected against leaks and damage before, during, and after transfer operations.
- Spill containment equipment and materials (such as absorbent pads, containment booms, etc.) will be maintained in close proximity to oil containment vessels.
- Damaged (corroded, cracked, non-sealing, etc.) drums or totes will not be used.
- All spills are to be contained, reported, and immediately cleaned up.
- Out-of-service drums and totes will be emptied and stored within secondary containment until properly retrieved and removed by supplier for recycle.

## Bulk Loading and Unloading

NSHI operations involving bulk loading and unloading primarily include transfer of fluids to and from the [REDACTED] and transfer of produced hydrocarbons to an offsite distillation plant, and transfer of produced waters to an evaporative pond associated with adjacent Natural Soda operations. Following are guidelines for bulk oil transfer operations.

- All loading and unloading operations will be conducted within the same secondary containment system used for facility containers and

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

processing equipment.

- NSHI personnel must be present during all loading and unloading operations.
- Tank truck operators must remain with their respective vehicles at all times when transfer hoses are connected.
- Transfer line connections will be checked prior to beginning transfer operations.
- The wheels of tank trucks will be chocked to prevent runaway.
- Transfer hoses will be emptied of their contents prior to disconnection.
- Connection points on tanks will be checked prior to departure from the site.
- Facility piping connection points for bulk loading / unloading will be capped or blank flanged and locked when not in service.
- Appropriate spill containment equipment and materials (e.g. pads, absorbent booms, etc.) shall be maintained at all times adjacent to bulk transfer location. No bulk transfer activities will be conducted in the absence of a sufficient quantity of appropriate spill containment equipment and materials.
- All spills are to be contained, reported, and immediately cleaned up.

#### **I.D. Discharge Response Procedures and Notifications (§§112.4 and 112.7(a)(3)(iv)-(vi), and (a)(4).**

Discharges would typically be discovered during the inspections conducted at the facility in accordance with this plan. However, should a discharge to navigable waters or adjoining shorelines be discovered,

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

facility personnel must take immediate actions.

Countermeasures for discharge discovery, response, and cleanup (both the facility's capability and those that might be required of a contractor) include:

- Employee discovering an incident assesses immediate safety risks.
- Employee immediately secures the area, including preventing others from entering a harmful situation and, if no imminent safety concerns, shutting down mechanical source of discharge.
- Employee immediately reports incident to the ERC. If the ERC is not immediately available, employee notifies Natural Soda supervision in accord with the call-down list on Appendix A.
- The ERC, or supervisor backup will conduct hazard assessment to evaluate safety risks.
- The ERC, or backup, and immediately available management team will determine, through hazard assessment, whether containment and cleanup measures can be performed safely by appropriately trained facility personnel.
- If safe and appropriate to proceed, site personnel will immediately begin containment using available materials (including spill kits, bulk sorbents, soils, etc.) and cleanup.
- If the spill cannot be contained by facility personnel due to safety concerns or spill magnitude, Clean Harbors will be requested to respond for containment and cleanup on an emergency basis.
- Local fire, rescue, and hazardous materials crews (911 call) will be contacted to provide emergency support for all spills where the hazard assessment indicates fire or life safety concerns.
- ERC will determine if external notification to Federal, State or local authorities is required; and make internal notifications to company management.

The immediate priority for all incident response is the protection of workers. A hazard analysis will be performed, which takes into account the type of incident, the characteristics of the material released, the location of the release relative to potential receptors (including environmental receptors) and the magnitude of the release. The goal of all incident response is to clean up any adverse discharge of oil to the environment so that no significant deleterious effects are left behind.

Following incident response and associated with hazard analysis, root-cause investigation will be conducted to determine the mechanism of release and

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

to determine corrective actions necessary to prevent recurrence.

The ERC will perform the full release assessment, hazard analysis and root-cause investigation.

The general response procedures include

- Stopping the release;
- Containing released materials;
- Cleanup of released materials; and
- Decontamination of the incident area.

The type of personal protective equipment (PPE), response equipment, cleanup procedures, and decontamination procedures will vary depending upon the specific nature of the release and will be specified by either the supervisors or ERC. Free oil recovered from secondary containment structures may be placed in the Used Oil containers for future recycling. Absorbent material (i.e., oil dry, pigs, socks, etc.) will be recovered using a non-sparking shovel and placed in an appropriate Department of Transportation (DOT) approved shipping container for disposal by a licensed waste hauler, Clean Harbors.

Certain incidents may necessitate the need for sustained actions. Examples of this include cleanup and repair following a major oil release to the environment. In such cases, NSHI may retain outside parties, such as Clean Harbors, as needed to conduct or assist in performing the sustained response actions. The ERC will be responsible for initiating sustained actions, when appropriate. In addition, the ERC will also be responsible for ensuring that any recovered oil material is disposed in accordance with all applicable regulations.

Termination of release response actions will be the responsibility of the management team. Follow-up actions typically include: post-action review of the incident, critique of the response actions, review of the SPCC plan, and preparation of follow-up report(s), e.g. to agencies. The ERC will initiate appropriate follow-up actions.

Per 40 CFR 112.4, whenever there is a discharge of more than 1,000 U.S. gallons of oil in a single discharge, or more than two discharges each

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

of more than 42 U.S. gallons of oil occurring within any twelve month period, that reach navigable waters of the United States, or otherwise harmful as described in 40 CFR 110, the ERC will submit the appropriate report to the EPA Regional Administrator within 60 days from the time of discharge.

If an oil discharge results in contamination of a navigable waterway of the US, the ERC will provide immediate notification to local, state, and federal authorities.

Our methods of disposal of recovered materials are:

- Accumulation of cleanup materials (e.g. absorbent pads and booms) and contaminated media (soils, etc.) in containers legally compliant for shipping; engaging hazardous waste contractor; Clean Harbors, to remove and properly dispose of accumulated cleanup materials and contaminated media.
- As necessary for disposal, samples of contaminated materials and media may be collected and submitted to a qualified laboratory to be analyzed for hazardous waste characteristics.

A list of important contacts, in the event of a discharge are provided in Appendix A, Release Response Procedure.

Our procedures and information for reporting a discharge are listed below:

In the event of an unauthorized discharge of oil or oil-containing fluids, personnel operating the facility will--if it is safe to do so--attempt to stop the discharge by closing appropriate valves, pipes, hoses by mechanical controls available. All oil-containing vessels and flow lines are located within secondary containment. Spills should therefore be contained. Spills within secondary containment must be locally contained as much as possible to facilitate cleanup.

- Personnel responding to a spill will record the following:

		Document Title		NSHI SPCCP--Part 1			
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

- Date and Time of discharge
- Type of material discharged
- Location and source within the facility of discharge
- Estimate of total quantity discharged
- Description of all affected media
- Cause of discharge
- Any damages or injuries caused by the discharge
- Actions used to stop the discharge
- Actions used to remove and mitigate the effects of the discharge
- Whether an evacuation may be needed
- Names of individuals and organizations contacted

Appendix B provides criteria for reporting information and incident record.

### **I.E. Emergency Procedures (§112.7(a)(5)).**

Our procedures to use when a discharge occurs include the following:

Appendix A illustrates appropriate release response procedures, including contact information of appropriate personnel.

Appendix B is the form to be used for on-scene recording of release-reporting information.

### **I.F. Fault Analysis (§112.7(b)).**

We have considered the most likely failure scenarios and summarized in Appendix C: Release Scenarios.

Appendix C considers the equipment, failure type, discharge rate, total potential discharge quantity, direction of flow from potential release, and potential down-flow effects.

		Document Title		NSHI SPCCP--Part 1			
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**I.G. Secondary Containment, Diversionary Structures, and/or Alternative (§§112.7(a)(3)(iii), 112.7(c), 112.7(k)).**

*1.G.1. Secondary Containment, Diversionary Structures, and/or Alternative (§112.7(a)(3)(iii) and (c)).*

Our facility is configured to minimize the likelihood of a discharge reaching navigable waters. The following measures are provided:

Secondary containment will be constructed of walls sufficiently impervious to contain oil and be of sufficient capacity to contain the volume of the largest container plus freeboard to account for precipitation.

The entire operation, from OSR wellhead to hydrocarbon storage vessel and produced-water storage vessel, including all flow lines and flow-through equipment, drums and totes, will be located within secondary containment.

Calculations for secondary containment capacity, considering volume and footprint requirements, are presented in Appendix H.

Spill kits equipped with materials sufficient to contain most spills are located appropriately within the facility. Though all oil-containing equipment is to be located within secondary containment, spills will be isolated and cleaned up.

Because we will install containment into which all oil-bearing equipment will be located, we are not required to have an oil spill contingency plan nor a written commitment of manpower, equipment, and materials to control and remove discharged oil. Refer to Section I.G. for more information about our preventive measures.

**I.H. Facility Inspections, Tests, and Records**

The Business Support and Sustainability Manager, Technical Manager, or competent designee is responsible for conducting facility inspections and tests and maintaining inspection records (signed by the appropriate

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

supervisor or inspector) with the SPCC Plan for a period of three years.

## **I.I Personnel, Training, and Spill Prevention Procedures (§112.7(f)).**

All oil- handling personnel in: the operation and maintenance of equipment to prevent discharges of oil will receive initial and refresher training on discharge procedures protocols, general facility operations, and the contents of the facility SPCC Plan. The Business Support and Sustainability Manager is responsible for providing all oil-handling personnel with a copy of NSHI's SPCC Plan, obtaining written acknowledgement that oil-handling personnel understand, will abide by and will be accountable to the SPCC Plan.

Oil-handling personnel who deliver and take away bulk quantities of oil will complete and oil-handling checklist with each transaction.

Appendix D includes the bulk-petroleum handling checklist.

In addition, we are committed to providing proper and regular instruction of oil- handling personnel in applicable pollution control laws, rules, and regulations. Applicable pollution control laws, rules and regulations pertinent to tasks involving oil-handling personnel are embodied in NSHI's SPCC Plan. Oil-handling personnel sign an acknowledgement of understanding of NSHI's SPCC Plan.

The Business Support and Sustainability Manager is responsible for ensuring that oil-handling employees are properly instructed.

The Business Support and Sustainability Manager is designated and accountable for overseeing discharge prevention activities

The Business Support and Sustainability Manager is responsible for reporting on the progress of discharge prevention activities to facility management.

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

The Business Support and Sustainability Manager is responsible for conducting discharge prevention briefings at least once a year for oil-handling personnel to ensure adequate understanding of the facility SPCC Plan. Such briefings highlight and describe any known discharges or failures, malfunctioning components, and any recently developed precautionary measures.

### **I.J. Facility Security (Excluding Oil Production Facilities) (§112.7(g)).**

The facility will be an oil-production facility, but we intend to meet requirements of 112.7(g) regardless. To prevent unauthorized access to oil handling, processing, and storage areas, our facility has established several security measures.

- Any unauthorized visitation to the facilities is prohibited.
- Appropriate fencing will be installed on the facility perimeter to inhibit access
- Signage will be installed on approach to the facilities and on perimeter fencing that warns against trespass.
- Any personnel not directly involved with the operation of the facility must sign in at the Natural Soda plant office prior to access and must be accompanied by personnel involved with operation of the facility.

We employ the following procedures to secure master flow and drain valves:

- Master flow and drain valves that may expose vessels to adverse discharge are provided with locking mechanisms.
- Keys to the locking mechanisms are controlled in a lockbox in the facility office.
- Access to the lock box will be restricted to authorized personnel

We employ the following procedures to prevent unauthorized access to starter controls on oil pumps:

Document Title		NSHI SPCCP--Part 1					
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

- Start controls on pumps are accessed only by personnel authorized to operate the facility.
- Only personnel authorized to operate the facility are allowed access to the facility

The following are the procedures to secure out-of-service and loading/unloading connections of oil pipelines:

- The facility is to be newly constructed. Out-of-service connections to oil pipelines is not within the scope of this new facility.
- All connections to piping that pose a risk of adverse discharge will be installed with locking mechanisms to prevent discharge. Keys to those locking mechanisms will be controlled in a lock box in the facility office.

We maintain sufficient security lighting that is appropriate for preventing acts of vandalism and assisting in the discovery of oil discharges.

Lighting is to be maintained sufficient to illuminate all grounds within the perimeter fencing as well as all areas within the vessel installation sites and containment structures.

### **I.K. Facility Tank Car and Tank Truck Loading/Unloading (Excluding Offshore Facilities) (§112.7(h)).**

Tank truck loading and unloading will occur within the secondary containment structure.

Appendix D includes checklist items to help ensure bulk loading and unloading precautions are taken.

### **I.L. Brittle Fracture Evaluation Requirements (§112.7(i)).**

If a field-constructed aboveground container undergoes a repair, alteration, reconstruction, or a change in service that might affect the risk of a

		Document Title		NSHI SPCCP--Part 1			
Doc #	E 261-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

discharge or failure due to brittle fracture or other catastrophe, or the container has discharged oil or failed due to brittle fracture failure or other catastrophe, the project engineer will evaluate the container for risk of discharge or failure due to brittle fracture or other catastrophe, and as necessary, take appropriate action.

**I.M. Conformance with General Federal and State Requirements for SPCC Plans (§112.7(a)(1) and (j)).**

The State of Colorado and Rio Blanco County do not have additional SPCC Plan requirements.

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

# SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN (SPCCP) part 2 of 3

**NATURAL SODA HOLDINGS INC**

**Completed by: MICHAEL  
CLARK Completed Date:  
08/09/2013**

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## **II. Requirements for Petroleum and Non-Petroleum Oils, Except Animal and Vegetable Oils (40 CFR 112 Subpart B).**

### **II.A. Requirements for Onshore Facility Drainage (Excluding Production Facilities) (§112.8).**

Our facility is not an onshore, non-production facility; therefore, we are not required to comply with Section 112.8.

### **II.B Requirements for Onshore Production Facilities (Excluding Drilling or Workover Facilities) (§112.9).**

#### *II.B.1 Conformance with Specific Requirements (§112.9(a)).*

NSHI's OSR facility operates in conformance with all applicable regulations that are designed to reduce the risk of adverse discharge, as described in this SPCCP.

#### *II.B.2 Oil Production Facility Drainage (§112.9(b)).*

Drains of secondary containment structures are closed and sealed at all times, except when draining containment systems as described below. Locking mechanisms are installed on secondary containment drains. Keys to locking mechanisms are controlled in a key box in the facility office accessible only by authorized oil-handling personnel.

Rainwater may accumulate in secondary containment structures. Uncontaminated rainwater may be released from containment drains directly to ground, if the quantity of water and rate of release does not cause adverse impact to the grounds or adversely affect safety of other activities. When accumulated precipitation will be released to the ground, the team member performing the drainage will first inspect the accumulated water for sheens or other evidence of oil contamination and will only release the precipitation after verifying no oil contamination is

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

present.

The Precipitation Drainage Form, in Appendix F, will be used to document inspection for accumulated oil prior to releasing accumulated precipitation from the secondary containment structure to the ground.

If the quantity of after uncontaminated rainwater is too large for release direct to ground, then that water is to be transferred by vacuum truck for discharge into the nearby Natural Soda evaporation pond.

Any accumulated oil on the rainwater will be eliminated by removal or in-situ decomposition, depending on size and scope of accumulation. Removal will consist of entrapment within absorbent materials in the form of booms, pads or granular media. Used absorbent material will be placed in containers suitable for shipping. Containers of used absorbent materials will be collected and properly disposed by contractor, Clean Harbors. Alternatively, accumulated oil may be decomposed in place by application of commercially available products that utilize hydrocarbon-consuming microbes. In-situ decomposition practices will be monitored for effectiveness, and if not effective, accumulated oil will be removed with absorbent materials.

Roadways accessing the OSR will be monitored by observation of personnel attending the operation for spills. Vehicle operators servicing the OSR will be required to report any spill along roadways. Spills along roadways will be cleaned up by removal of contaminated soils and road base, placing in containers suitable for transport and contracting with Clean Harbors for proper disposition. Spills too large for cleanup by NSHI personnel will be contacted for cleanup with Clean Harbors.

In general, all areas of NSHI operation are subject to informal inspections on a daily basis by personnel operating the facility. Accumulation of oil from any small discharge is reported to the Business Support and Sustainability Manager or the V.P. of Operations within 24 hours and plans made for timely cleaned up.

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Documented inspections are performed monthly and annually as prescribed by the inspection forms adopted from the Steel Tank Institute SP001 Standard for Inspection of Aboveground Storage Tanks by personnel operating the facility. Inspection documents are verified and maintained by the Business Support and Sustainability Manager.

Appendices E1 through E4 include inspection criteria and provides record of monthly and annual inspections. Records are maintained for at least 3 years.

### *II.B.3 Oil Production Facility Bulk Storage Containers (§112.9(c)).*

#### *II.B.3.i. Bulk Storage Container Material (§112.9(c)(1)).*

At our facility, the material and construction of bulk containers will be compatible with the material stored in them and the conditions of storage. Specifically, our bulk containers that store oil are constructed of various corrosion-preventative materials depending on the nature and application of the container (see Appendix E1). Construction materials include carbon steel, stainless steel and polytetrafluoroethylene-lined carbon steel and are designated on specification sheets for each container.

#### *II.B.3.ii. Secondary Containment for Bulk Storage Containers (§112.9(c)(2)).*

We use construct secondary containment to hold all hydrocarbon-containing apparatus: vessels, pipes, flow-through equipment, drums and totes. Secondary containment will also provide for spill control for bulk loading and unloading by allowing mobile equipment access to and location within the secondary containment structure while loading and unloading.

The secondary containment structure will be built on the slope of the

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

OSR area and consist of a U-shaped earthen berm configuration open to the upslope side. The down-slope end berm will be of sufficient height, with the side berms merging from a zero-height at the open end to the height of the down-slope end berm, to contain at least the volume of the largest tank plus sufficient free-board to contain precipitation from a 10-year storm event. Determination of volume of the secondary containment structure are presented in Appendix H. Material used to construct the berm will be sufficiently impervious so as to retain material spilled from the largest vessel until cleanup can be effected.

The secondary containment structure, vessels within and associated components are subject to documented monthly and annual inspections that are intended to identify degradation of components and prevent system failures. Corrective actions are determined and suitable repairs are made if component or system degradation is identified

### II.B.3.iii. Inspections, Tests, and Records (§112.9(c)(3)).

At our facility, bulk storage containers that contain oil are visually inspected informally on a daily basis, and formally monthly and annually by a competent, qualified individual for condition and need for maintenance.

Appendices E1-E4 include criteria for container inspections and provides record of those inspections.

### III.B.3.iv. Bulk Storage Container Overflow Prevention (§112.9(c)(4)).

Bulk storage tank installations will be engineered or updated in accordance with good engineering practice to prevent discharges. All vessels pertinent to the operation, including bulk storage vessels, are outlined in SPCC Plan Part 1, section I.C.--Facility Location and Layout.

As appropriate to the specific container, each container will be engineered to capacity adequate to prevent overflow or other unintended discharge.

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Additionally, depending on the nature of the container, spill prevention measures will include:

- overflow equalization lines between containers
- vacuum protection adequate to prevent container collapse
- high-level sensors that generate and transmit an alarm signal to controlling computer system, which will shut the system down upon high-level alarm.
- Outflow from the OSR well driven by a 50 gpm down-hole pump, from which flow and rate will drive downstream processes and flow-through vessels. Shutdown of this pump will shut down process between the wellhead and the storage tanks.
- Outflow from the OSR well on an as-needed basis, engaging the down-hole pump only often enough to evacuate the chamber in which liquid hydrocarbons slowly accumulate. The down-hole pump will be manually turned on and off by a facility operator; it is not automatically engaged.
- Offloading of bulk storage to mobile equipment for transport off site accomplished only while the bulk transfer operation is attended by a competent operator.
- Loading of oil-storing equipment, e.g. the heat-transfer system, accomplished by a competent operator.

The engineering design is still in progress for vessel configurations, and the exact prevention measures to be used for each vessel has not been determined at this time. This SPCC will be amended and re-certified after final vessel design is completed.

### II.B.3.v. Flow-Through Process Vessels (§112.9(c)(5)).

We have chosen not to implement the alternate requirements for flow-through process vessels as described at §112.9(c)(5). Therefore, we provide sized secondary containment as required in §112.9(c)(2) and (c)(3). See section II.B.3.ii. to II.B.3.iii. for more information. All flow-through equipment will be located within the secondary containment

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

structure.

### II.B.3.vi. Produced Water Containers (§112.9(c)(6)).

All produced-water vessels will be located within the secondary containment structure.

### *II.B.4. Facility Transfer Operations for an Oil Production Facility (§112.9 (d)).*

#### II.B.4.i. Inspection of Aboveground Valves and Piping (§112.9(d)(1)).

All aboveground valves and piping associated with transfer operations are subject to undocumented daily inspections by personnel operating the facility as well as documented inspections on a monthly basis and each time bulk transfer operations are performed. Bulk transfer operators are responsible for completing a checklist for criteria prior to, during, and after transfer.

Appendix D includes checklist criteria for bulk transfers and provides record of inspection.

#### II.B.4.ii. Inspection of Saltwater Disposal Facilities (§112.9(d)(2)).

Components of the saltwater (oil field brine) disposal facilities are inspected after a sudden change in atmospheric temperature and monthly by field operation personnel as described in section I.H. This includes the pumps and motors for working condition and leaks, hoses, valves, flowlines, and the saltwater injection wellhead.

#### II.B.4.iii. Flowlines/Intra-Facility Gathering Lines (§112.9(d)(3) and (d)(4)).

All flowlines and intra-facility gathering lines will be located entirely within the secondary containment structure.

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Flowlines and intra-facility gathering lines, associated valves, vessels, and equipment will be compatible with the type of production fluids; their corrosive potential, volume, and pressure; and other conditions expected in the operational environment.

Formal monthly and annual inspections will monitor flowlines and gathering lines for signs; such as leaks and loose couplings; of potential failure. Formal monthly and annual inspections document checklist

Facility personnel will visually monitor the operations daily. Personnel will monitor temperature, pressure, and flow rates of components to ensure the system functions within expected parameters. Operation outside of expected parameters indicate possible system upset which would be cause for system shutdown to prevent failure and unwanted discharge. Facility personnel will provide informal visual inspect of flow lines and gathering lines daily for leaks and loose couplings during normal operations.

Upon selection of suppliers and manufacturers for flow line systems, a complete flow line maintenance program will be developed based on manufacturer specifications and operating recommendations. The flow line maintenance program will include corrective actions based on the findings of the regular monthly inspection program, as well as regularly scheduled replacement of components as recommended by the manufacturer. In addition, automated control systems connected to flowlines will be tested periodically in accordance with manufacturer recommendations.

## **II.C. Requirements for Onshore Oil Drilling and Workover Facilities (§112.10).**

Our facility does not have any onshore oil drilling or workover facilities; therefore, we are not required to comply with Section 112.10.

The OSR will utilize the well hole and down-hole cavity that is developed

	Document Title	NSHI SPCCP--Part 2					
Doc #	E 262-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

from withdrawal of nacholite by the adjacent Natural Soda solution mining operation.

## **II.D Requirements for Offshore Oil Drilling, Production, or Workover Facilities (§112.11).**

Our facility does is not an offshore oil drilling, production, or workover facility; therefore, we are not required to meet the requirements of Section 112.11.

	Document Title	NSHI SPCCP--Part 3					
Doc #	E 263-P	Revision Date	08/10/2013	Revision	1	Status	Released
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# SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN (SPCCP) part 3 of 3

**NATURAL SODA HOLDINGS, INC**

**Completed by: MICHAEL CLARK**  
**Completed Date: 08/07/2013**

	Document Title	NSHI SPCCP--Part 3					
Doc #	E 263-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

### **III. Requirements for Animal Fats, Oils, Greases; Fish and Marine Mammal Oils; and Vegetable Oils.**

Our facility does not handle animal fats and oils and greases; fish and marine mammal oils; or vegetable oils including oils from seeds, nuts, fruits, or kernels, applicable to Sections 112.12; therefore, we are not required to comply with Sections 112.12.

### **IV. Appendices.**

We have attached the following documents to this plan to help ensure better understanding of our written plan:

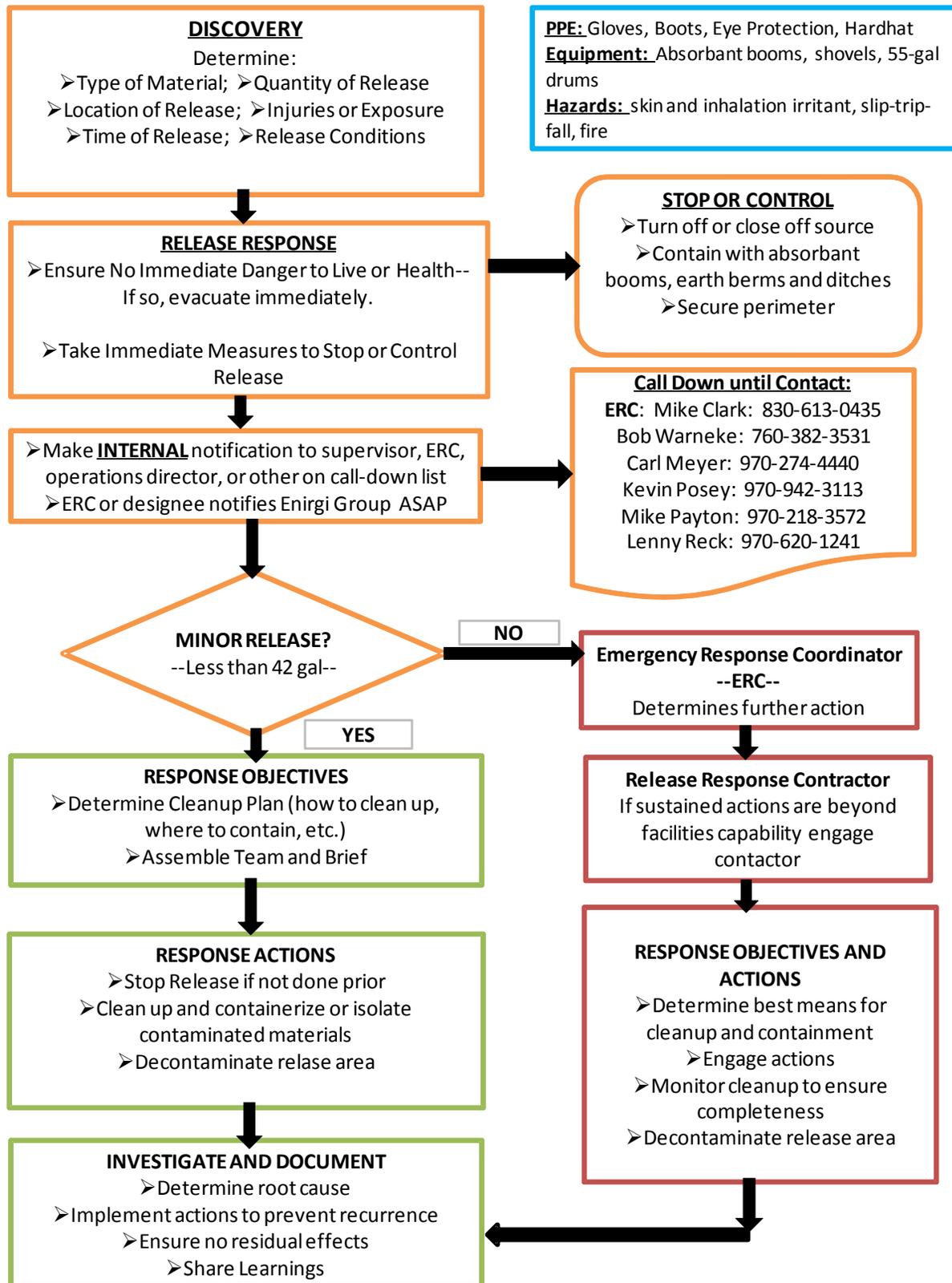
- A -- Release Response Procedure and call-down information
- B -- Release Reporting Information and record
- C -- Release Scenarios
- D -- Bulk Handling Checklist
- E1 -- STI SP001 AST Record
- E2 -- STI SP001 Monthly Inspection Checklist
- E3 -- STI SP001 Annual Inspection Checklist
- E4 -- STI SP001 Portable Container Monthly Inspection Checklist
- F -- Drainage Inspection Form
- G -- Substantial Harm Determination
- H -- Calculations for Secondary Containment Capacity
- I -- Review and Amendment Log

### **Attachments**

- Attachment 1: Utility Map
- Attachment 2: Preliminary Surface Facilities Layout
- Attachment 3: NSHI Drainage Map

Document Title		NSHI SPCCP--Appendix A--Release Response Procedure					
Doc #	E 260 A-P	Revision Date	08/10/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Appendix A: RELEASE RESPONSE PROCEDURE



		Document Title						NSHI SPCCP Appendix B--Release Reporting Information							
Doc #		E 260 B-R		Revision Date		08/09/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

## RELEASE REPORTING INFORMATION

<b>Date and time of discharge</b>	
<b>Material discharged</b>	
<b>Source of discharge</b>	
<b>Estimate of quantity</b>	
<b>Cause of discharge</b>	
<b>Effects of the discharge</b>	
<b>Damages or Injuries</b>	
<b>Actions to stop discharge</b>	
<b>Actions to remove effects</b>	
<b>Evacuation needed?</b>	
<b>Contacts made</b>	
<b>(outside contact, other than first responders, must be made by management)</b>	

\*\*\*\*\*

Reported by: \_\_\_\_\_ Date/Time of Report: \_\_\_\_\_

Reported to: \_\_\_\_\_



		Document Title						NSHI SPCCP--Appendix D--Bulk Handling Checklist					
Doc #	E 260 D-R	Revision Date	08/09/2013	Revision	1	Status	Released						
Document Owner				Clark, Michael									

## Bulk Petroleum Products Vendor Delivery Checklist

Invoice #: \_\_\_\_\_ Vendor Name: \_\_\_\_\_

P. O. #: \_\_\_\_\_ Driver Name: \_\_\_\_\_ Signature\*: \_\_\_\_\_

\*By signing this form the Driver is acknowledging that he/she will comply with best-practice spill control protocols and guidelines on the Vendor Disclosure Notice.

Date: \_\_\_\_\_ Check In Time: \_\_\_\_\_ a.m./p.m. Check Out Time: \_\_\_\_\_ a.m./p.m.

Substance Delivering: \_\_\_\_\_ Delivery Location: \_\_\_\_\_

- Checked area for recently spilled oil or fuel before, during, and after the transfer operations.
- Checked transfer line connections prior to beginning transfer operations.
- Checked liquid level in each tank prior to beginning transfer operations.
- Ensured the brakes of the tank truck are set and the wheels are blocked to avoid movement.
- Attached grounding equipment.
- Ensure spill containment equipment is present.
- Checked secondary containment structure is sealed.

Indicate which of the following methods were used to prevent tank overfill (check ALL that apply):

- High level shut-off to prevent further filling of the tank.
- High level alarm or signal to warn of rising liquid level in tank (e.g., audible siren).
- Continuous manual tank gauging.
  
- Ensured the transfer hoses are empty prior to disconnection.
- Sealed all facility piping connection points with cap or blank/flanged.
- Checked connection points on the tanker truck prior to departure from site.

Did a release occur? \_\_\_\_\_ \*\*

**IF A RELEASE OCCURS, NOTIFY NHSI PERSONNEL IMMEDIATELY.**

\_\_\_\_\_

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		Document Title						NSHI SPCCP--Appendix E1--STI-SP001 AST Record					
Doc #	E 260 E1-R	Revision Date	08/09/2013	Revision	1	Status	Released						
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## Appendix E1: STI SP001 AST Record

OWNER INFORMATION	FACILITY INFORMATION	INSTALLER INFORMATION
Name	Name	Name
Number and Street	Number and Street	Number and Street
City, State, Zip Code	City, State, Zip Code	City, State, Zip Code

<b>TANK ID</b> _____	
<b>SPECIFICATION:</b>	
Design:	UL _____ SWRI _____ Horizontal Vertical Rectangular API _____ Other _____ Unknown
Manufacturer:	Contents: _____ Construction Date: _____ Last Repair/Reconstruction Date: _____
Dimensions:	Capacity: _____ Last Change of Service Date: _____
Construction:	Bare Steel      Cathodically Protected (Check one: A. Galvanic or B. Impressed Current) Date Installed: _____ Coated Steel      Concrete      Plastic/Fiberglass      Other Double-Bottom      Double-Wall      Lined Date Installed: _____
Containment:	Earthen Dike      Steel Dike      Concrete      Synthetic Liner      Other _____
CRDM:	Date Installed: _____ Type: _____
Release Prevention Barrier:	Date Installed: _____ Type: _____

	Document Title	NSHI SPCCP--Appendix E1--STI-SP001 AST Record					
Doc #	E 260 E1-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

<b>TANK ID</b> _____							
<b>SPECIFICATION:</b>							
Design:	UL _____	SWRI _____	Horizontal	Vertical	Rectangular		
	API _____	Other _____		Unknown			
Manufacturer:	Contents:		Construction Date:		Last Repair/Reconstruction Date:		
Dimensions:	Capacity:		Last Change of Service Date:				
Construction:	Bare Steel	Cathodically Protected (Check one: A. Galvanic or B. Impressed Current)			Date Installed: _____		
	Coated Steel	Concrete	Plastic/Fiberglass	Other			
	Double-Bottom	Double-Wall	Lined Date Installed: _____				
Containment:	Earthen Dike	Steel Dike	Concrete	Synthetic Liner	Other _____		
CRDM:	Date Installed:		Type:				
Release Prevention Barrier:	Date Installed: _____		Type: _____				

<b>TANK ID</b> _____							
<b>SPECIFICATION:</b>							
Design:	UL _____	SWRI _____	Horizontal	Vertical	Rectangular		
	API _____	Other _____		Unknown			
Manufacturer:	Contents:		Construction Date:		Last Repair/Reconstruction Date:		
Dimensions:	Capacity:		Last Change of Service Date:				
Construction:	Bare Steel	Cathodically Protected (Check one: A. Galvanic or B. Impressed Current)			Date Installed: _____		
	Coated Steel	Concrete	Plastic/Fiberglass	Other			
	Double-Bottom	Double-Wall	Lined Date Installed: _____				
Containment:	Earthen Dike	Steel Dike	Concrete	Synthetic Liner	Other _____		
CRDM:	Date Installed:		Type:				
Release Prevention Barrier:	Date Installed: _____		Type: _____				

	Document Title	NSHI SPCCP--Appendix E1--STI-SP001 AST Record					
Doc #	E 260 E1-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

<b>TANK ID</b> _____							
<b>SPECIFICATION:</b>							
Design:	UL _____	SWRI _____	Horizontal	Vertical	Rectangular		
	API _____	Other _____		Unknown			
Manufacturer:	Contents:		Construction Date:		Last Repair/Reconstruction Date:		
Dimensions:	Capacity:		Last Change of Service Date:				
Construction:	Bare Steel	Cathodically Protected (Check one: A. Galvanic or B. Impressed Current)			Date Installed: _____		
	Coated Steel	Concrete	Plastic/Fiberglass	Other			
	Double-Bottom	Double-Wall	Lined Date Installed: _____				
Containment:	Earthen Dike	Steel Dike	Concrete	Synthetic Liner	Other _____		
CRDM:	Date Installed:		Type:				
Release Prevention Barrier:	Date Installed: _____		Type: _____				

<b>TANK ID</b> _____							
<b>SPECIFICATION:</b>							
Design:	UL _____	SWRI _____	Horizontal	Vertical	Rectangular		
	API _____	Other _____		Unknown			
Manufacturer:	Contents:		Construction Date:		Last Repair/Reconstruction Date:		
Dimensions:	Capacity:		Last Change of Service Date:				
Construction:	Bare Steel	Cathodically Protected (Check one: A. Galvanic or B. Impressed Current)			Date Installed: _____		
	Coated Steel	Concrete	Plastic/Fiberglass	Other			
	Double-Bottom	Double-Wall	Lined Date Installed: _____				
Containment:	Earthen Dike	Steel Dike	Concrete	Synthetic Liner	Other _____		
CRDM:	Date Installed:		Type:				
Release Prevention Barrier:	Date Installed: _____		Type: _____				

	Document Title	NSHI SPCCP--Appendix E1--STI-SP001 AST Record					
Doc #	E 260 E1-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

<b>TANK ID</b> _____							
<b>SPECIFICATION:</b>							
Design:	UL _____	SWRI _____	Horizontal	Vertical	Rectangular		
	API _____	Other _____		Unknown			
Manufacturer:	Contents:		Construction Date:		Last Repair/Reconstruction Date:		
Dimensions:	Capacity:		Last Change of Service Date:				
Construction:	Bare Steel	Cathodically Protected (Check one: A. Galvanic or B. Impressed Current)			Date Installed: _____		
	Coated Steel	Concrete	Plastic/Fiberglass	Other			
	Double-Bottom	Double-Wall	Lined Date Installed: _____				
Containment:	Earthen Dike	Steel Dike	Concrete	Synthetic Liner	Other _____		
CRDM:	Date Installed:		Type:				
Release Prevention Barrier:	Date Installed: _____		Type: _____				

<b>TANK ID</b> _____							
<b>SPECIFICATION:</b>							
Design:	UL _____	SWRI _____	Horizontal	Vertical	Rectangular		
	API _____	Other _____		Unknown			
Manufacturer:	Contents:		Construction Date:		Last Repair/Reconstruction Date:		
Dimensions:	Capacity:		Last Change of Service Date:				
Construction:	Bare Steel	Cathodically Protected (Check one: A. Galvanic or B. Impressed Current)			Date Installed: _____		
	Coated Steel	Concrete	Plastic/Fiberglass	Other			
	Double-Bottom	Double-Wall	Lined Date Installed: _____				
Containment:	Earthen Dike	Steel Dike	Concrete	Synthetic Liner	Other _____		
CRDM:	Date Installed:		Type:				
Release Prevention Barrier:	Date Installed: _____		Type: _____				

		Document Title						NSHI SPCCP--Appendix E2--STI-SP001 Monthly Inspection Checklist							
Doc #		E 260 E2-R		Revision Date		08/09/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

## Appendix E2: STI SP001 Monthly Inspection Checklist

### General Inspection Information:

Inspection Date: _____	Retain Until Date: _____ (36 months from inspection date)
Prior Inspection Date: _____	Inspector Name: _____
Tanks Inspected (ID #'s): _____	

### Inspection Guidance:

- For equipment not included in this Standard, follow the manufacturer recommended inspection/testing schedules and procedures.
- The periodic AST Inspection is intended for monitoring the external AST condition and its containment structure. This visual inspection does not require a Certified Inspector. It shall be performed by an owner's inspector who is familiar with the site and can identify changes and developing problems.
- Upon discovery of water in the primary tank, secondary containment area, interstice, or spill container, remove promptly or take other corrective action. Before discharge to the environment, inspect the liquid for regulated products or other contaminants and disposed of it properly.
- (\*) designates an item in a non-conformance status. This indicates that action is required to address a problem.
- Non-conforming items important to tank or containment integrity require evaluation by an engineer experienced in AST design, a Certified Inspector, or a tank manufacturer who will determine the corrective action. Note the non-conformance and corresponding corrective action in the comment section.
- Retain the completed checklists for 36 months.
- **In the event of severe weather (snow, ice, wind storms) or maintenance (such as painting) that could affect the operation of critical components (normal and emergency vents, valves), an inspection of these components is required as soon as the equipment is safely accessible after the event.**

Item	Task	Status	Comments
<b>1.0 Tank Containment</b>			
1.1 Containment structure	Check for water, debris, cracks or fire hazard	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
1.2 Primary tank	Check for water	<input type="checkbox"/> Yes* <input type="checkbox"/> No	
1.3 Containment drain valves	Operable and in a closed position	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
1.4 Pathways and entry	Clear and gates/doors operable	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
<b>2.0 Leak Detection</b>			
2.1 Tank	Visible signs of leakage	<input type="checkbox"/> Yes* <input type="checkbox"/> No	

	Document Title	NSHI SPCCP--Appendix E2--STI-SP001 Monthly Inspection Checklist					
Doc #	E 260 E2-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Item	Task	Status	Comments
2.2 Secondary Containment	Visible signs of leakage from tank into secondary containment	<input type="checkbox"/> Yes* <input type="checkbox"/> No	
2.3 Surrounding soil	Visible signs of leakage	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
2.4 Interstice	Visible signs of leakage	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
<b>3.0 Tank Equipment</b>			
3.1 Valves	a. Check for leaks.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
	b. Tank drain valves must be kept locked.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
3.2 Spill containment boxes on fill pipe	a. Inspect for debris, residue, and water in the box and remove.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
	b. Drain valves must be operable and closed.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
3.3 Liquid level equipment	a. Both visual and mechanical devices must be inspected for physical damage.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	b. Check that the device is easily readable	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
3.4 Overfill equipment	a. If equipped with a "test" button, activate the audible horn or light to confirm operation. This could be battery powered. Replace the battery if needed	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	b. If overfill valve is equipped with a mechanical test mechanism, actuate the mechanism to confirm operation.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	



		Document Title						NSHI SPCCP--Appendix E3--STI-SP001 Annual Inspection Checklist					
Doc #	E 260 E3-R	Revision Date	08/09/2013	Revision	1	Status	Released						
Document Owner		Clark, Michael											

## **Appendix E3: STI SP001 Annual Inspection Checklist**

### **General Inspection Information:**

Inspection Date: _____	Retain Until Date: _____ (36 months from inspection date)
Prior Inspection Date: _____	Inspector Name: _____
Tanks Inspected (ID #'s): _____	

### **Inspection Guidance:**

- For equipment not included in this Standard, follow the manufacturer recommended inspection/testing schedules and procedures.
- The periodic AST Inspection is intended for monitoring the external AST condition and its containment structure. This visual inspection does not require a Certified Inspector. It shall be performed by an owner's inspector who is familiar with the site and can identify changes and developing problems.
- Remove promptly upon discovery standing water or liquid in the primary tank, secondary containment area, interstice, or spill container. Before discharge to the environment, inspect the liquid for regulated products or other contaminants and disposed of it properly.
- In order to comply with EPA SPCC (Spill Prevention, Control and Countermeasure) rules, a facility must regularly test liquid level sensing devices to ensure proper operation (40 CFR 112.8(c)(8)(v)).
- (\*) designates an item in a non-conformance status. This indicates that action is required to address a problem.
- Non-conforming items important to tank or containment integrity require evaluation by an engineer experienced in AST design, a Certified Inspector, or a tank manufacturer who will determine the corrective action. Note the non-conformance and corresponding corrective action in the comment section.
- Retain the completed checklists for 36 months.
- Complete this checklist on an annual basis supplemental to the owner monthly-performed inspection checklists.
- **Note: If a change has occurred to the tank system or containment that may affect the SPCC plan, the condition should be evaluated against the current plan requirement by a Professional Engineer knowledgeable in SPCC development and implementation.**

Item	Task	Status	Comments
<b>1.0 Tank Containment</b>			
1.1 Containment structure	Check for: <ul style="list-style-type: none"> <li>• Holes or cracks in containment wall or floor</li> <li>• Washout</li> <li>• Liner degradation</li> <li>• Corrosion</li> <li>• Leakage</li> <li>• Paint failure</li> <li>• Tank settling</li> </ul>	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	

		Document Title						NSHI SPCCP--Appendix E3--STI-SP001 Annual Inspection Checklist							
Doc #		E 260 E3-R		Revision Date		08/09/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

Item	Task	Status	Comments
<b>2.0 Tank Foundation and Supports</b>			
2.1 Foundation	Settlement or foundation washout?	<input type="checkbox"/> Yes* <input type="checkbox"/> No	
2.2 Concrete pad or ring wall	Cracking or spalling?	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
2.3 Supports	Check for corrosion, paint failure, etc.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
2.4 Water drainage	Water drains away from tank?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
2.5 Tank grounding	Strap secured and in good condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
<b>3.0 Cathodic Protection</b>			
3.1 Galvanic cathodic protection system	Confirm system is functional, includes the wire connections for galvanic systems	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
3.2 Impressed current system	a. Inspect the operational components (power switch, meters, and alarms).	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	b. Record hour meter, ammeter and voltmeter readings.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
<b>4.0 Tank Shell, Heads, Roof</b>			
4.1 Coating	Check for coating failure	<input type="checkbox"/> Yes* <input type="checkbox"/> No	
4.2 Steel condition	Check for: <ul style="list-style-type: none"> <li>• Dents</li> <li>• Buckling</li> <li>• Bulging</li> <li>• Corrosion</li> <li>• Cracking</li> </ul>	<input type="checkbox"/> Yes* <input type="checkbox"/> No	
4.3 Roof slope	Check for low points and standing water	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	

		Document Title						NSHI SPCCP--Appendix E3--STI-SP001 Annual Inspection Checklist							
Doc #		E 260 E3-R		Revision Date		08/09/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

Item	Task	Status	Comments
<b>5.0 Tank Equipment</b>			
5.1 Vents	Verify that components are moving freely and vent passageways are not obstructed for: <ul style="list-style-type: none"> <li>• Emergency vent covers</li> <li>• Pressure/vacuum vent poppets</li> <li>• Other moving vent components</li> </ul>	<input type="checkbox"/> Yes* <input type="checkbox"/> No	
5.2 Valves	Check the condition of all valves for leaks, corrosion and damage.	<input type="checkbox"/> Yes* <input type="checkbox"/> No	
5.2.1 Anti-siphon, check and gate valves	Cycle the valve open and closed and check for proper operation.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.2.2 Pressure regulator valve	Check for proper operation. (Note that there may be small, 1/4 inch drain plugs in the bottom of the valve that are not visible by looking from above only)	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.2.3 Expansion relief valve	Check that the valve is in the proper orientation. (Note that fuel must be discharged back to the tank via a separate pipe or tubing.)	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.2.4 Solenoid valves	Cycle power to valve to check operation. (Electrical solenoids can be verified by listening to the plunger opening and closing. If no audible	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	

		Document Title						NSHI SPCCP--Appendix E3--STI-SP001 Annual Inspection Checklist					
Doc #	E 260 E3-R	Revision Date	08/09/2013	Revision	1	Status	Released						
Document Owner		Clark, Michael											

Item	Task	Status	Comments
	confirmation, the valve should be inspected for the presence and operation of the plunger.)		
5.2.5 Fire and shear valves	a. Manually cycle the valve to ensure components are moving freely and that the valve handle or lever has clearance to allow valve to close completely.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	b. Valves must not be wired in open position.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	c. Make sure fusible element is in place and correctly positioned.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	d. Be sure test ports are sealed with plug after testing is complete and no temporary test fixture or component remains connected to valve.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.3 Interstitial leak detection equipment	Check condition of equipment, including: <ul style="list-style-type: none"> <li>The window is clean and clear in sight leak gauges.</li> <li>The wire connections of electronic gauges for tightness and corrosion</li> <li>Activate the test button, if applicable.</li> </ul>	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	

		Document Title						NSHI SPCCP--Appendix E3--STI-SP001 Annual Inspection Checklist					
Doc #	E 260 E3-R	Revision Date	08/09/2013	Revision	1	Status	Released						
Document Owner		Clark, Michael											

Item	Task	Status	Comments
5.4 Spill containment boxes on fill pipe	a. If corrosion, damage, or wear has compromised the ability of the unit to perform spill containment functions, replace the unit.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
	b. Inspect the connections to the AST for tightness, as well as the bolts, nuts, washers for condition and replace if necessary.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
	c. Drain valves must be operable and closed	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
5.5 Strainer	a. Check that the strainer is clean and in good condition.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.5 Strainer	b. Access strainer basket and check cap and gasket seal as well as bolts.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.6 Filter	a. Check that the filter is in good condition and is within the manufacturer's expected service life. Replace, if necessary.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	b. Check for leaks and decreased fuel flow	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.7 Flame arrestors	Follow manufacturer's instructions. Check for corrosion and blockage of air passages.	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	

	Document Title	<b>NSHI SPCCP--Appendix E3--STI-SP001 Annual Inspection Checklist</b>					
Doc #	E 260 E3-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Item	Task	Status	Comments
5.8 Leak detector for submersible pump systems	Test according to manufacturer's instructions and authority having jurisdiction (AHJ). Verify leak detectors are suited and properly installed for aboveground use.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.9 Liquid level equipment	a. Has equipment been tested to ensure proper operation?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	b. Does equipment operate as required?	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	c. Follow manufacturer's instructions	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
5.10 Overfill equipment	a. Follow manufacturer's instructions and regulatory requirements for inspection and functionality verification.	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
	b. Confirm device is suited for above ground use by the manufacturer	<input type="checkbox"/> Yes <input type="checkbox"/> No* <input type="checkbox"/> N/A	
<b>6.0 Insulated Tanks</b>			
6.1 Insulation	Check condition of insulation for: <ul style="list-style-type: none"> <li>• Missing sections</li> <li>• Areas of moisture</li> <li>• Mold</li> <li>• Damage</li> </ul>	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	
6.2 Insulation cover or jacket	Check for damage that will allow water intrusion	<input type="checkbox"/> Yes* <input type="checkbox"/> No <input type="checkbox"/> N/A	



	Document Title	<b>NSHI SPCCP--Appendix E4--STI-SP001 Portable Container Monthly Inspection Checklist</b>					
Doc #	E 260 E4-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Appendix E4: STI SP001 Portable Container Monthly Inspection Checklist

### General Inspection Information:

Inspection Date: _____	Retain Until Date: _____ (36 months from inspection date)
Prior Inspection Date: _____	Inspector Name: _____
Containers Inspected (ID #'s): _____	

### Inspection Guidance:

- For equipment not included in this Standard, follow the manufacturer recommended inspection/testing schedules and procedures.
- The periodic AST Inspection is intended for monitoring the external AST condition and its containment structure. This visual inspection does not require a Certified Inspector. It shall be performed by an owner's inspector who is familiar with the site and can identify changes and developing problems.
- (\*) designates an item in a non-conformance status. This indicates that action is required to address a problem.
- Non-conforming items important to tank or containment integrity require evaluation by an engineer experienced in AST design, a Certified Inspector, or a tank manufacturer who will determine the corrective action. Note the non-conformance and corresponding corrective action in the comment section.
- Retain the completed checklists for 36 months.

Item	Area: _____	Area: _____	Area: _____	Area: _____
<b>1.0 AST Containment/Storage Area</b>				
1.1 ASTs within designated storage area?	<input type="checkbox"/> Yes <input type="checkbox"/> No*			
1.2 Debris, spills, or other fire hazards in containment or storage area?	<input type="checkbox"/> Yes* <input type="checkbox"/> No			
1.3 Water in outdoor secondary containment?	<input type="checkbox"/> Yes* <input type="checkbox"/> No			
1.4 Drain valves operable and in a closed position?	<input type="checkbox"/> Yes <input type="checkbox"/> No*	<input type="checkbox"/> Yes* <input type="checkbox"/> No	<input type="checkbox"/> Yes* <input type="checkbox"/> No	<input type="checkbox"/> Yes* <input type="checkbox"/> No
1.5 Egress pathways clear and gates/doors operable?	<input type="checkbox"/> Yes <input type="checkbox"/> No*	<input type="checkbox"/> Yes* <input type="checkbox"/> No	<input type="checkbox"/> Yes* <input type="checkbox"/> No	<input type="checkbox"/> Yes* <input type="checkbox"/> No



	Document Title	NSHI SPCCP--Appendix F--Drainage Release Form					
Doc #	E 260 F-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Appendix F: Record of Secondary Containment Drainage

This record must be completed when rainwater is pumped or discharged from secondary containment **to the ground**.

Date	Time	Oil Present (Y or N)	Quantity Removed (gal)	Comments (weather, activity, etc.)	Signature

		Document Title						NSHI SPCCP--Appendix G--Substantial Harm Determination--008053.docx					
Doc #	E 260 G-R	Revision Date	08/09/2013	Revision	1	Status	Released						
Document Owner		Clark, Michael											

## Appendix G: Substantial Harm Determination

Facility Name: \_\_\_\_\_

Facility Address: \_\_\_\_\_

1. Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

Yes  No

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground storage tank area?

Yes  No

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in 40 CFR part 112 Appendix C, Attachment C-III or a comparable formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments?

Yes  No

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in 40 CFR part 112 Appendix C, Attachment C-III or a comparable formula) such that a discharge from the facility would shut down a public drinking water intake?

Yes  No

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

Yes  No

### Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Name: \_\_\_\_\_ Title: \_\_\_\_\_

\_\_\_\_\_  
Date: \_\_\_\_\_

Signature

		Document Title						NSHI SPCCP--Appendix H--Secondary Containment Structure Volume Determination					
Doc #	E 260 H-Rf	Revision Date	08/14/2013	Revision	2	Status	Released						
Document Owner		Clark, Michael											

## Appendix H: Secondary Containment Structure Volume Determination

The Secondary Containment structure is designed to enclose all operating equipment, including all flow and gathering pipes, storage tanks, and process flow-through equipment. The structure is also designed to provide storage for totes and barrels of oils and operating fluids. The structure will also fully accommodate bulk loading and unloading.



### Calculation of Natural Soda, Inc. OSR Secondary Containment Sump Volume

#### Basis:

1. Outside dimensions of Secondary Containment are 100 feet wide by 100 feet long (reference sketch titled "Secondary Containment Layout," Rev. A, 08/10/13).
2. Requirement for sump volume is that it must be sufficiently large to contain the volume of the largest vessel inside the containment PLUS the rainfall from a 10 year, 24 hour rainfall event. The rainfall from a 25 year, 24 hour rainfall event for the site location is 2.2 inches (reference information provided by Natural Soda, Inc. in email dated 08/05/13).
3. For the purposes of this calculation, the largest vessel expected inside this containment is assumed to be a 6500 gallon tanker trailer. This is larger than the maximum process vessel size of 5000 gallons (reference the Preliminary Equipment List, Rev. 2 for V-005 Hydrocarbon Storage Tank dimensions giving 5000 gallons volume for this vessel).

#### Calculations:

1. Sump volume required:

$$(100 \text{ feet}) \times (100 \text{ feet}) \times (2.2/12 \text{ feet}) \times (7.481 \text{ gallons/cubic foot}) = 13,715 \text{ gallons for precipitation}$$

$$(13,715 \text{ gallons for precipitation}) + (6,500 \text{ gallons for vessel volume}) = 20,215 \text{ gallons minimum sump volume}$$

2. Actual sump volume as shown in Secondary Containment Layout:

$$(92 \text{ feet}) \times (16 \text{ feet}) \times (2.5 \text{ feet}) \times (7.481 \text{ gallons/cubic foot}) = 27,530 \text{ gallons actual sump volume}$$

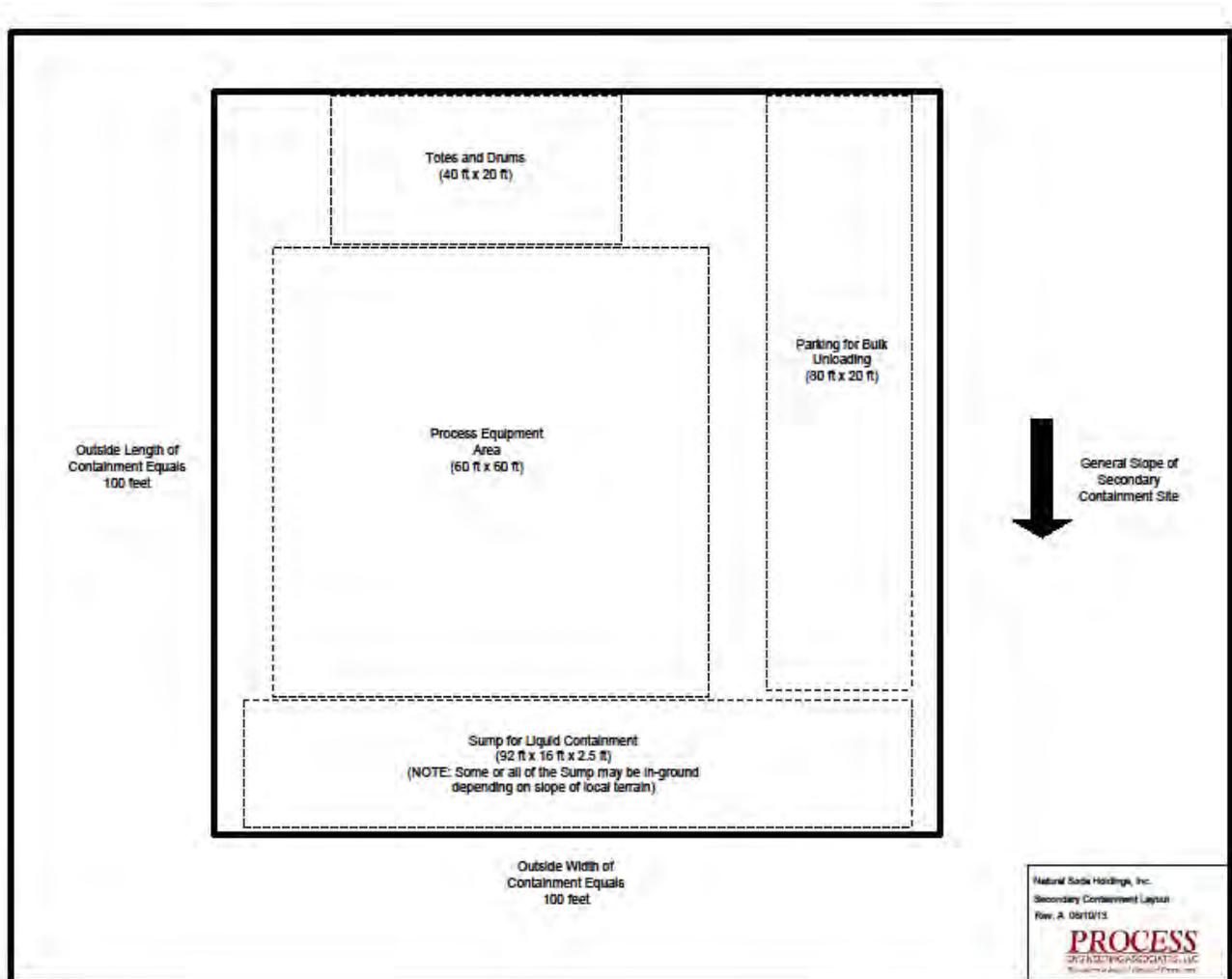
#### Conclusion:

The sump dimensions shown on the Secondary Containment Layout meet the volume requirement.

		Document Title						NSHI SPCCP--Appendix H--Secondary Containment Structure Volume Determination							
Doc #		E 260 H-Rf		Revision Date		08/14/2013		Revision		2		Status		Released	
Document Owner				Clark, Michael											

**Secondary Containment Structure**

- Sump designed to contain spill from largest mobile vessel (bulk loading truck, 6500 gal) which will also contain largest fixed vessel (5,000 gal oil storage).
- Process Equipment Area is located upslope from Sump
- Totes and Drum storage located upslope from Sump
- Bulk Loading and Unloading is located upslope from Sump
- Upslope end of structure has no berm, allowing access to operations by mobile equipment
- Sides of structure will be of sufficient height to provide diversion of potential spill to Sump
- Sides of structure will be of earthen materials sufficient to contain spill until cleanup
- Down-slope end of structure will be of earthen materials sufficient to contain spill until cleanup



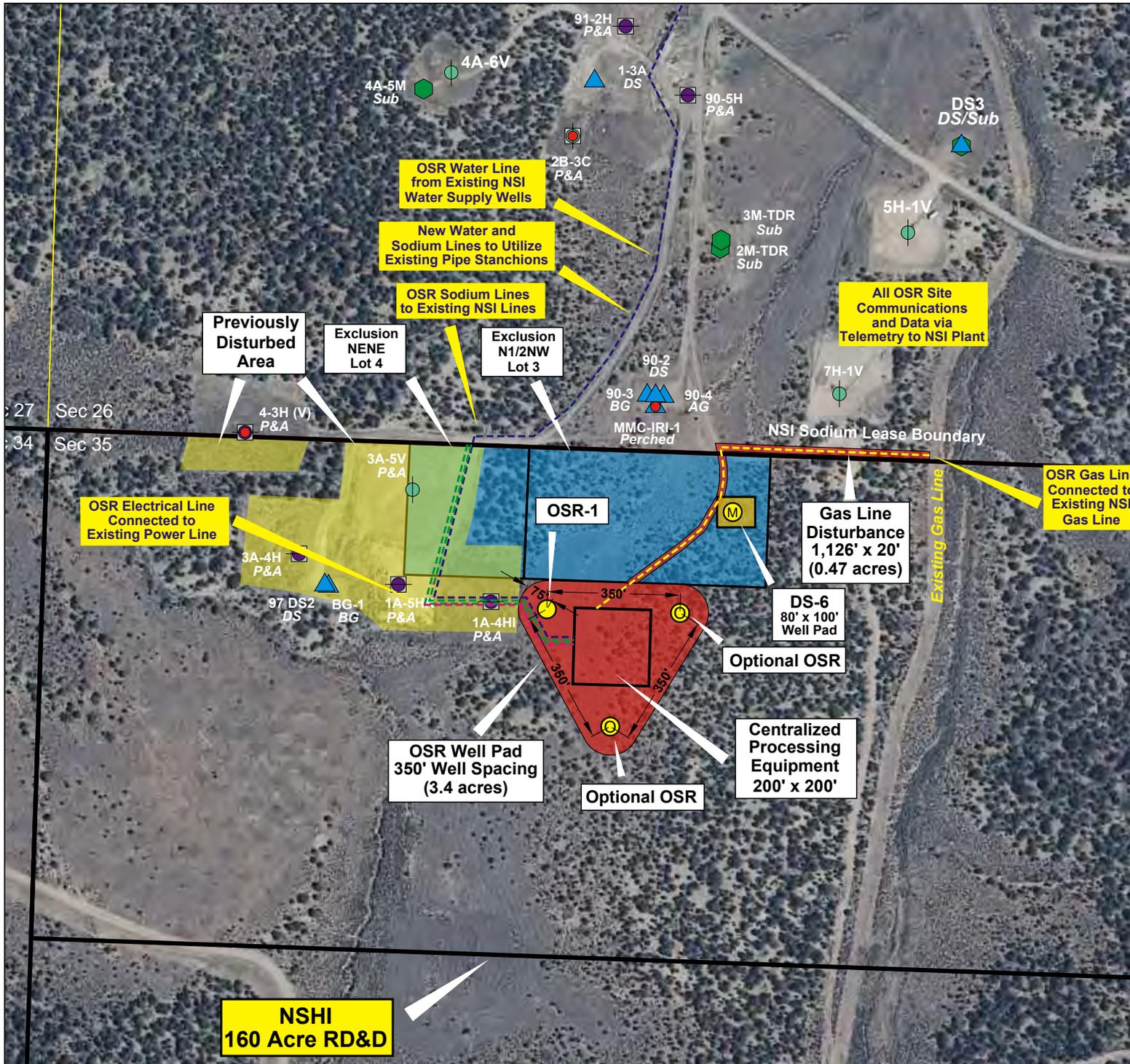
	Document Title	NSHI SPCCP--Appendix I--Review and Amendment Log					
Doc #	E 260 I-R	Revision Date	08/09/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Appendix I: SPCCP REVIEW AND AMENDMENT LOG

As mandated by 40 CFR 112.5, amendments to the NSHI SPCCP will occur “when there is a change in facility design, construction, operation, or maintenance that materially affects its potential for a discharge.” In addition, a complete review of the NSHI SPCCP will occur at least once every five years. Review and revision of the SPCCP will be completed by the Business Support and Sustainability Manager.

Any modifications deemed necessary to the SPCC plan will be implemented within six months of the review. Technical amendments to the SPCC plan (i.e., storage equipment modifications, procedural or operational changes, etc.) will necessitate recertification by a licensed Professional Engineer. Documentation of reviews completed, amendments made and Professional Engineer recertification shall be recorded in the following log:

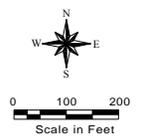
Date	Reviewer Name and Title	Changes (if any)	Actions needed (if any)	PE Cert./Date or n/a



**NSHI  
160 Acre RD&D**

**Legend**

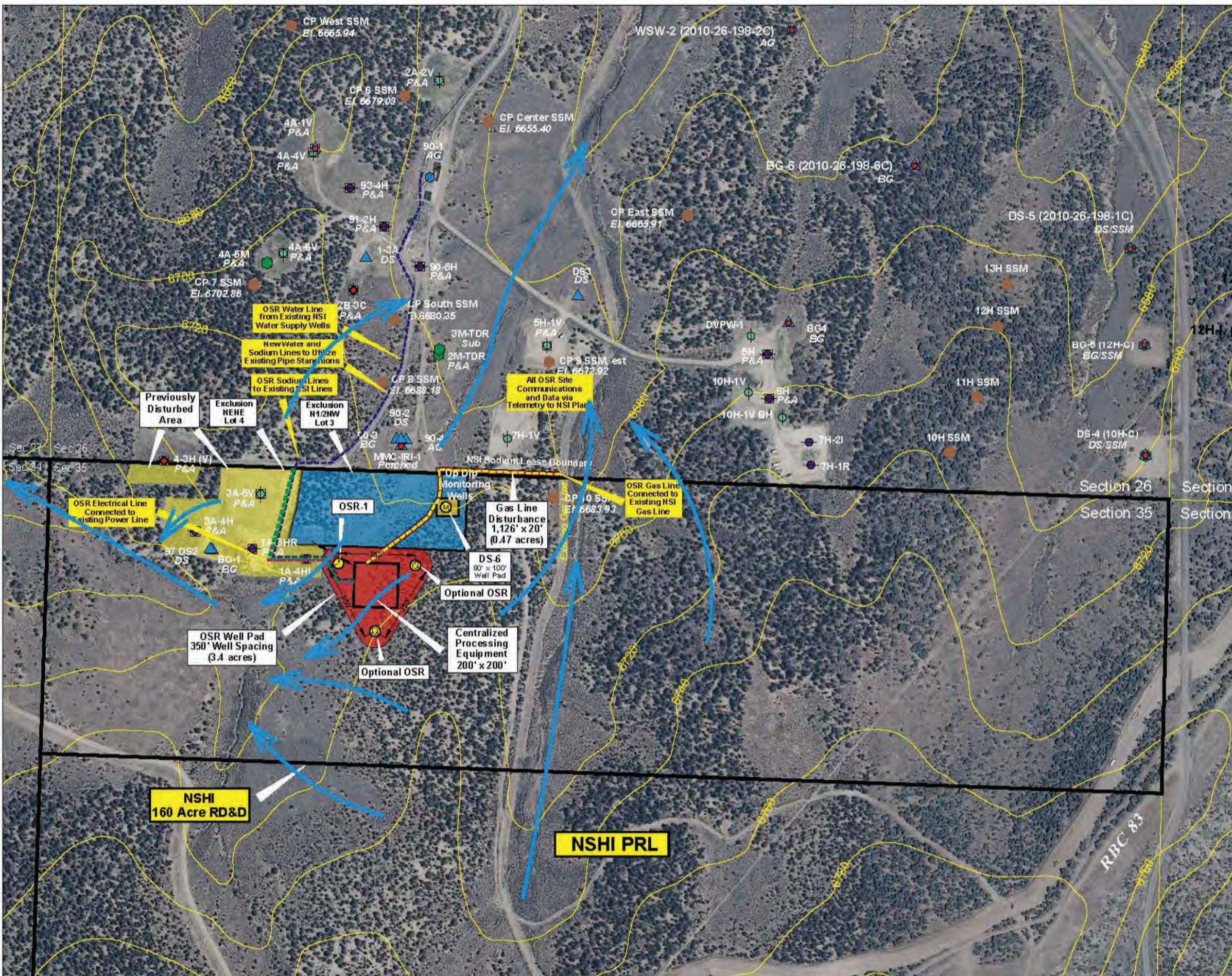
- Proposed Oil Shale Reactor Well
- Optional Oil Shale Reactor Well
- Proposed Downgradient Monitoring Well
- Horizontal Well
- Vertical Well
- Hydrology Monitoring Well
- Abandoned Well
- Core Hole
- Water Supply Well
- Subsidence Monitor-Well
- Exclusion Zone
- Existing Disturbed Area
- Proposed Disturbance
- Proposed Utility - Electric
- Proposed Utility - Gas
- Proposed Utility - Sodium
- Proposed Utility - Water



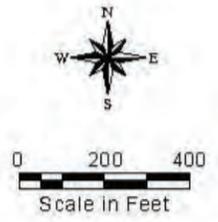
Aerial Photograph: September, 09

**Natural Soda Holdings, Inc.**  
**Utility Map**  
 Section 35, T1S, R98W Rio Blanco County, CO

Daub & Associates, Inc.  Date: March 25, 2013



- ### Legend
- Drainage Direction
  - Proposed Oil Shale Reactor Well
  - Optional Oil Shale Reactor Well
  - Proposed Downgradient Monitoring Well
  - Horizontal Well
  - Vertical Well
  - Hydrology Monitoring Well
  - Abandoned Well
  - Core Hole
  - Water Supply Well
  - Subsidence Monitor-Well
  - Exclusion Zone
  - Existing Disturbed Area
  - Proposed Disturbance
  - Proposed Utility - Electric
  - Proposed Utility - Gas
  - Proposed Utility - Sodium
  - Proposed Utility - Water



Aerial Photograph: September, 09

**Natural Soda Holdings, Inc.**  
**Drainage Map**  
 Section 35, T1S, R98W Rio Blanco County, CO

Daub & Associates, Inc. Date: August 13, 2013

DAUB & ASSOCIATES, INC.



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NATURAL SODA

# APPENDIX D

## Stormwater Management Plan

### 2013 Plan of Development

Oil Shale Research, Development and Demonstration (RD&D)  
Tract COC 74299

Prepared for:

**Natural Soda Holdings, Inc.**

Piceance Creek Basin  
Rio Blanco County, Colorado

Prepared by:

**Daub & Associates, Inc.**

Grand Junction, Colorado

# Table of Contents

---

<b>1.0 SITE DESCRIPTION</b> .....	<b>D-1</b>
<b>2.0 SITE MAPS</b> .....	<b>D-3</b>
<b>3.0 STORMWATER MANAGEMENT CONTROLS</b> .....	<b>D-6</b>
3.1 SWMP ADMINISTRATOR .....	D-6
3.2 SITE SPECIFIC IDENTIFICATION OF POLLUTANT SOURCES AND BEST MANAGEMENT PRACTICES (BMPs) .....	D-6
3.2.1 Wells/Well Pads.....	D-6
3.2.2 Pipeline .....	D-8
3.2.3 Access Roads.....	D-8
3.3 IDENTIFICATION OF DISCHARGES OTHER THAN STORMWATER.....	D-9
3.4 STORMWATER DEWATERING .....	D-9
3.5 SAMPLING INFORMATION .....	D-9
3.6 PREVENTATIVE MAINTENANCE.....	D-9
3.7 GOOD HOUSEKEEPING.....	D-10
3.8 SPILL PREVENTION AND RESPONSE PROCEDURES .....	D-10
3.9 EMPLOYEE TRAINING .....	D-11
3.10 FUEL AND FLUIDS HANDLING PROCEDURES .....	D-11
<b>4.0 FINAL STABILIZATION AND LONG TERM STORMWATER MANAGEMENT</b> .....	<b>D-12</b>
<b>5.0 COMPREHENSIVE INSPECTIONS</b> .....	<b>D-16</b>
<b>6.0 REFERENCES</b> .....	<b>D-16</b>

## List of Figures

---

Figure 1 General Location Map – NSHI RD&D Lease.....	D-2
Figure 2 OSR Utility Map with Disturbed Areas.....	D-4
Figure 3 Aerial Map - Lease with Topographic, Cultural, and Drainage Features .....	D-5

## List of Tables

---

Table 1 Grasses and Forbs Used in Interim and Final Reclamation .....	D-14
Table 2 Shrubs Used in Final Reclamation .....	D-14

## 1.0 SITE DESCRIPTION

The proposed project is an oil shale Research, Development, and Demonstration (RD&D) project that will be implemented under BLM Lease COC74299 issued in 2012. The project operator and leaseholder is Natural Soda Holdings, Inc. (NSHI). This stormwater management plan (SWMP) is being prepared to comply with the requirements of the Colorado Department of Public Health and Environment (CDPHE) relating to potential water quality impacts that may result from construction activities. This SWMP addresses all potential stormwater impacts from construction activities related to NSHI's RD&D project. Potential pollutant sources for NSHI's RD&D project can be differentiated into one category, based upon the location of the activities. The corresponding Best Management Practice (BMP) for a potential pollutant source and a schedule for the implementation of the BMP will be addressed with the identification of the pollutant source. This SWMP has been prepared as a Field Permit Certification because all drilling pads and associated access roads will be in the same lease area and will be developed during the same time frame.

Natural Soda Holdings, Inc. in conjunction with its wholly owned subsidiary Natural Soda, Inc. (NSI), has successfully operated a nahcolite (sodium bicarbonate) mining operation in the Piceance Creek Basin in northwestern Colorado since 1991 (Figure 1). NSI's solution mining technique is a proven method for economically extracting nahcolite with minimal environmental impact. NSHI's strategy is to incorporate NSI's expertise in solution mining with a new and innovative in-situ method for extracting kerogen from oil shale to commercially develop oil shale resources within the 160 acre RD&D lease area.

The project area topography is characterized by shallow alluvial valleys and broad soil-covered ridges and mesas. Pinyon, juniper and sagebrush are the dominant vegetative cover. In summary, the NSHI 160 acre RD&D Lease has the following geological characteristics:

- A uniform and predictable stratigraphic framework within the Uinta Formation and Parachute Creek Member of the Green River Formation.
- Abundant resources of oil shale, nahcolite and dawsonite. Numerous mappable nahcolite beds exist in the Saline Zone.
- A structure characterized by a broad, shallow basin, with fractures and dissolution features common in rocks above the Saline Zone.
- A gentle surface topography conducive to continual development of the property.
- A dry, confining interval above the proposed area of development (within the Saline Zone) that is highly competent and devoid of water.
- A dry, clay-rich confining interval below the proposed area of development (Garden Gulch Member) that is highly competent and devoid of water.

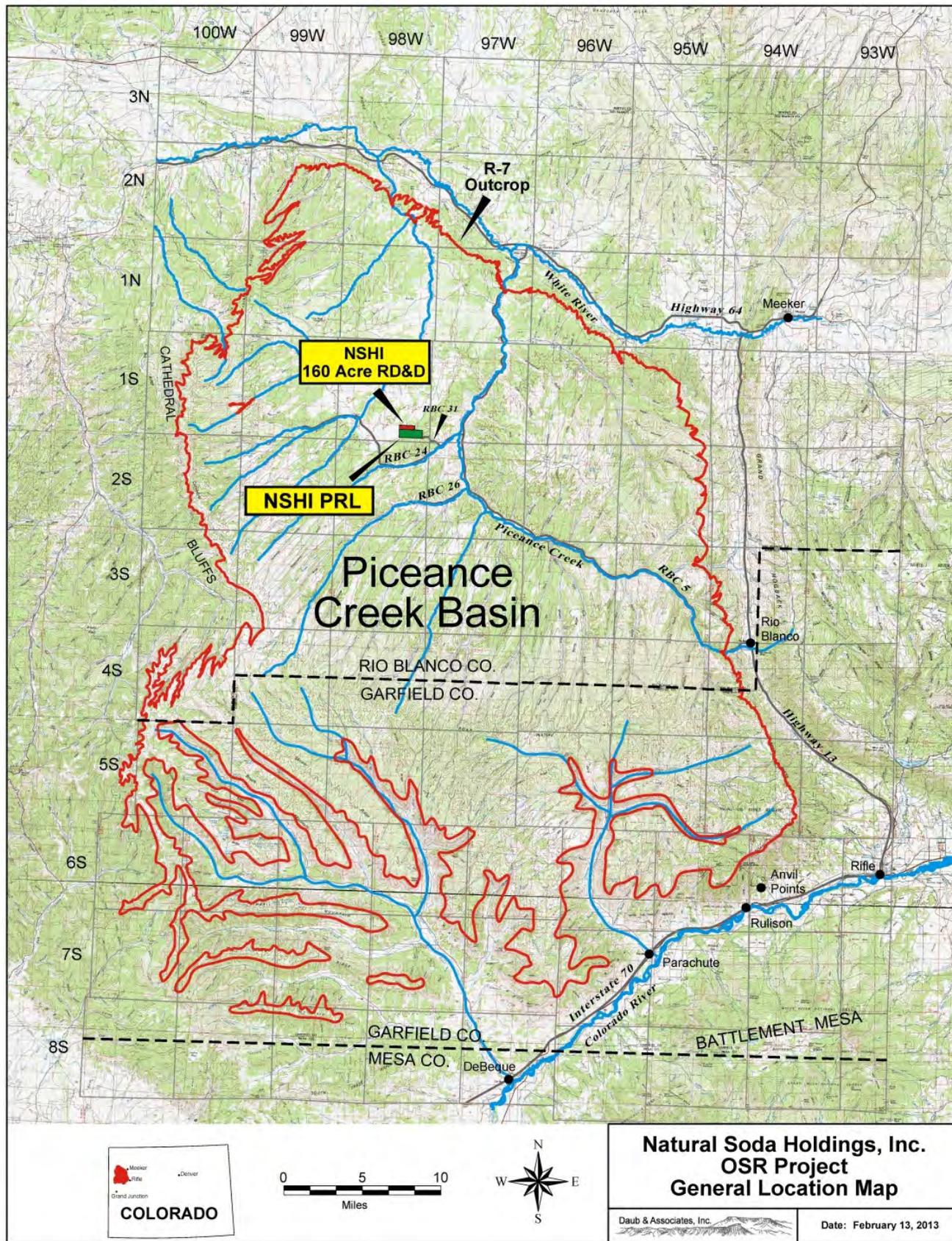


Figure 1 General Location Map – NSHI RD&D Lease

NSHI has delineated a 4.0-acre parcel within the 160 acre RD&D proposed lease area (Figure 2). The western side of the initial project area consists of a previously disturbed area which is under partial reclamation. The portion of the reclamation area located within the initial project area would be used to site a utility corridor without incurring additional project surface disturbance. Other surface disturbances are expected to include an access road, a well pad sized to accommodate the processing equipment and up to three wells, a well pad sized for a single groundwater monitoring well, a single mud pit, and a natural gas supply pipeline to provide gas to power the OSR heater.

Due to the proximity of the Natural Soda, Inc. process or waste ponds, no new ponds will be constructed. The NSI ponds may be utilized for the disposal of any saline waste waters, when and if necessary. The process/waste ponds are not within the NSHI RD&D lease boundary and are monitored under NSI's existing SWMP.

## **2.0 SITE MAPS**

The NSHI RD&D Lease area consists of 160 acres and is situated between the Stake Springs and Ryan Gulch drainages, encompassing Lots 1, 2, 3, and 4 in the N ½ of the N ½ of Section 35, T1S, R98W, 6th Principal Meridian, Rio Blanco County, Colorado (Figure 3). Meeker, Colorado, lies approximately 41 miles to the northeast. Surface elevation on the lease ranges from approximately 6,650 to 6,770 feet.

The NSHI RD&D lease tract is located between Ryan Gulch (an ephemeral stream) and Yellow Creek (a perennial stream) in the White River basin. Yellow Creek flows northward about 18 miles before discharging into the White River. Ryan Gulch projects northeastward about 3 ½ miles before joining Piceance Creek. From its confluence with Ryan Gulch, Piceance Creek flows northward about 14 miles before discharging into the White River. The White River is a tributary to the Green River in Utah which is a tributary to the Colorado River. The NSHI site is located approximately 2 1/2 mile southeast of Yellow Creek, approximately 2 1/2 miles north of Ryan Gulch, and approximately 4 miles west of Piceance Creek.

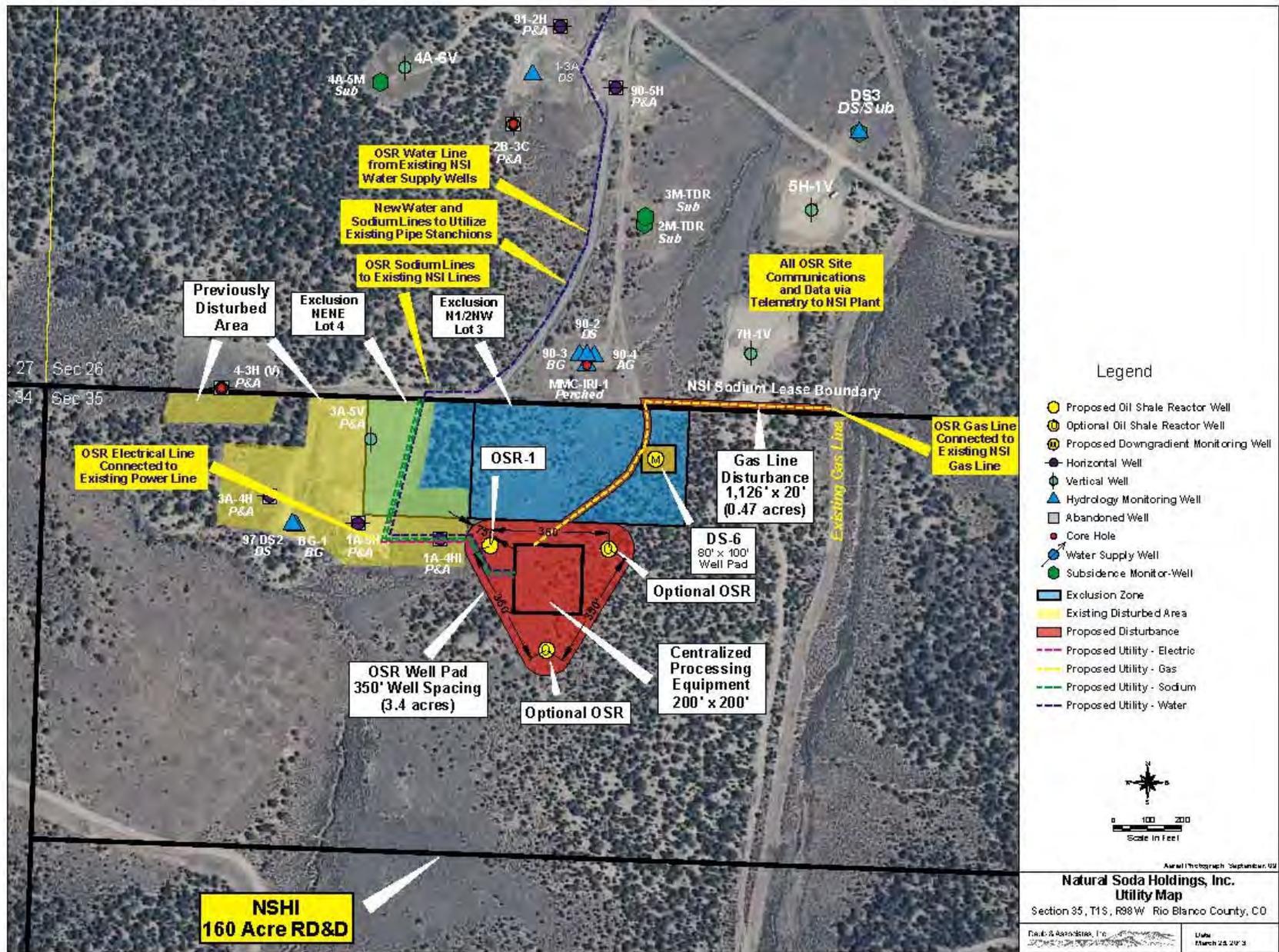


Figure 2 OSR Utility Map with Disturbed Areas

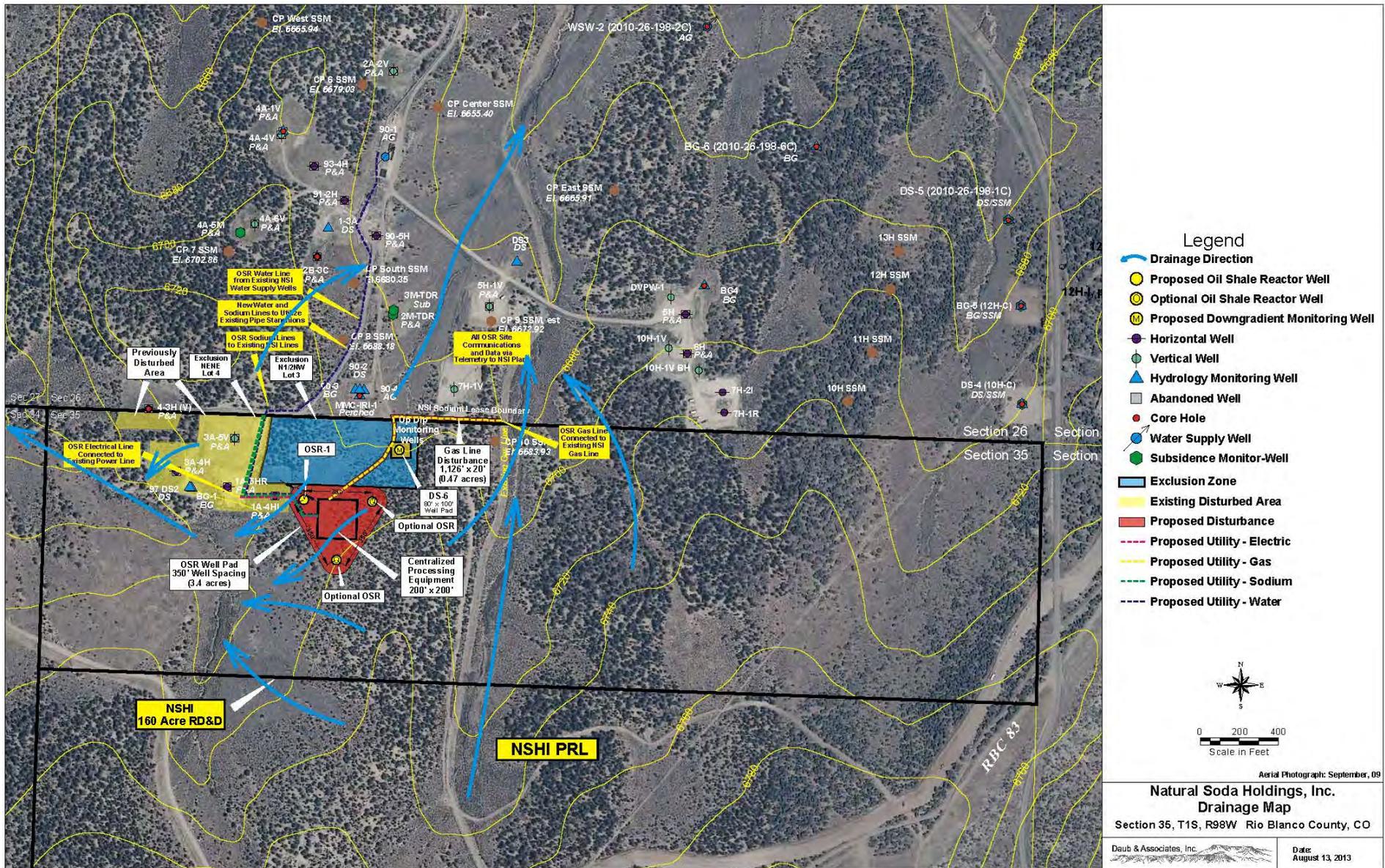


Figure 3 Aerial Map - Lease with Topographic, Cultural, and Drainage Features

## **3.0 STORMWATER MANAGEMENT CONTROLS**

### **3.1 SWMP Administrator**

As of June 2013, the operator's site representative and SWMP Administrator for this project is:

Michael Clark, Business Support and Sustainability Manager  
Natural Soda Holdings, Inc.  
3200 County Rd. 31  
Rifle, Co 81650  
Tel: (970) 878-3674  
Cel: (830-613-0435  
clarkm@NaturalSoda.com

The SWMP Administrator is the point of contact for all SWMP-related matters. The SWMP Administrator is also responsible for conducting bi-annual inspections of structural control measures and monthly inspections of the potential pollution areas on the NSHI Lease. The SWMP Administrator will correct insufficient or damaged existing structural control measures and will implement necessary additional structural control measures and best management practices (BMPs).

### **3.2 Site Specific Identification of Pollutant Sources and Best Management Practices (BMPs)**

#### **3.2.1 Wells/Well Pads**

The main pad configuration (OSR Well Pad) is intended to accommodate a centralized process equipment area (200 feet by 200 feet) and up to three OSR wells (Figure 2). This pad area is anticipated to be roughly triangular shaped and current plans would result in a disturbance to approximately 3.4 acres if all of the OSR wells are eventually drilled. Contingent upon the success of the initial OSR operation, an additional 3 to 4 acres may be considered for additional testing. Total disturbance is anticipated to be less than 10 acres. It is intended to drill the initial OSR-1 well near the west portion of the OSR Well Pad. One or both of the optional OSR locations may be utilized if it is determined that the OSR-1 location is unsuitable or if the OSR-1 location is successful and it is determined to continue the project.

One new monitoring well, the DS-6, will be installed as a downgradient monitor well of the Dissolution Surface Aquifer. This well will be located approximately 550 feet to the east-northeast and downgradient of the OSR. This pad area is anticipated to be rectangular shaped (80 feet by 100 feet) and current plans would result in a disturbance of approximately 0.47 acres.

Active injection and recovery wells are linked to the plant via a carbon steel pipeline connected to the wellhead. There is a potential for barren and pregnant liquor leaks at these wellheads from valve and/or pipe failure. Subsidence and groundwater monitoring wells offer no appreciable potential for contamination. Active well pads have the potential to contribute fine sediment pollution in runoff. Wells that have been abandoned have been filled to the surface with cement and have been labeled as plugged and abandoned on the well head. Abandoned well pads within the NSHI RD&D Lease area have been reclaimed by grading and reseeding and undergo annual monitoring to ensure that the reseeding efforts have proven successful. Therefore, there are no potential pollutants to stormwater discharge associated with the plugged and abandoned wells or reclaimed well pads.

Due to the influx of machinery and contractor personnel involved with the construction of a new well pad and the drilling of a new well, potential pollutants to stormwater discharge are also increased during this stage of well and pad development. These pollutants include fuel leaks or spills from the heavy equipment and drilling rig, spent drilling mud, groundwater elevated in TDS, and human sewage from porta-johns.

Best management practices employed during the drilling stage of well and pad development include the following. Prior to use on NSHI Lease land, any heavy equipment or drilling rigs are inspected for fluid leaks or cracks in fluid containments. Should any leaks or cracks be detected, these are to be corrected prior to use on NSHI property. During pad construction and drilling activities, drip trays and plastic sheeting will be placed under all equipment, and equipment is to be inspected daily for leaks. Should leaks be detected while on NSHI property, drip pans and absorbents are to be used to collect additional leaked fluids and the machinery is to cease all work until the leak has been fixed. The ground affected by a leak or spill will be manually cleaned up by absorption of fluids and removal of contaminated soil using absorbent material and mechanical removal, and disposed of in an appropriate container. Absorbents will be used, as necessary, to assist in the cleanup of a leak or spill. All constructed pads will have silt fences installed around the perimeter of the pad to contain all fluids and eroded particulates during the duration that the pad is active. Drilling mud will be kept in on-site dug mud pits, and will be removed and disposed of by way of a vacuum truck when the pit becomes full and at the cessation of drilling activities. Should salt or bicarbonate-saturated drilling mud be used (>5,000 ppm TDS), the mud pit will be lined so as to contain the fluids capable of contaminating surface waters, soil, or vegetation. This lined pit will also be able to contain any Dissolution Surface Aquifer fluid that may be encountered during drilling operations. During all well pad construction and drilling activities, a porta-potty will be present on-site for use by any individuals working on the well or pad. Sewage contained within the porta-potty will be removed by way of a vacuum truck weekly and at the conclusion of the drilling operations.

Once a well has been completed and is active in the long-term as an injection/recovery or monitoring well, the well and pad have very few potential pollutant sources. The OSR well pad will be interim reclaimed by recontouring, distributing topsoil, and reseeding as much as possible to still allow access to the wellhead. Active injection/recovery well pads will have a pit for spill containment. Wellhead integrity is to be inspected on a monthly basis as part of the monthly water level/water quality sampling program. Wellhead integrity issues will be immediately remediated and the faulty wellhead will be repaired appropriately. Spills resulting from a ruptured wellhead will be directed toward the pit to contain the fluid. This fluid will be removed by vacuum truck and disposed of at an appropriate facility. Any remaining fluid will be allowed to dry, and then the contaminated soil will be removed and disposed of appropriately. In order to keep monitoring wells clean and protected, plastic porta-potty covers are currently installed over the monitoring wells and are to continue to be used for subsequent completed monitoring wells. As noted above, silt fences or berms will exist around the perimeter of the well pad as long as it is in existence to prevent erosion.

Well field operators are responsible for inspecting the active injection and production wells, well pad, and associated pipeline once per 12-hour shift. These inspections are documented daily, and the log book detailing the inspections is stored in the NSI processing plant.

### **3.2.2 Pipeline**

NSI's pipeline carries barren and pregnant liquor to and from the well field to the processing plant. Due to the proximity of this pipeline to the proposed OSR location, NSHI proposes to build an OSR sodium line to the existing NSI pipeline. The OSR sodium line will extend approximately 600 ft. to the NSHI RD&D lease boundary and has the potential to have pollutants contributing to stormwater discharge outside the OSR well pad area (Figure 2). Pregnant liquor, though non-hazardous, can negatively affect the quality of surface waters (none of which exist on the NSI sodium lease or the NSHI RD&D lease) with the addition of the high TDS, sodium, and chloride water. In addition, inactive sections of pipeline contain built-up bicarbonate scale within them. If the integrity of the pipeline is compromised, stormwater can incorporate this scale into stormwater discharge.

In order to prevent potential leaks of pregnant liquor from the pipeline, the entire pipeline trace will be walked and examined monthly to identify any existing leaks or potential cracks or breaches of the pipeline. If a leak is discovered, the pipeline is to be shut down until after the problem can be remedied. If the spill is large enough, trenches will be dug in the vicinity of the spill to contain as much of the spill as possible. Inactive sections of pipeline are to be walked and inspected annually. Sections that are compromised and have scale exposed to stormwater are to be removed and either disposed of or amended for future use. As noted in Section 4.1.1 above, operators are required to inspect the pipeline in the vicinity of an active injection or recovery well pad once per 12-hour shift.

### **3.2.3 Access Roads**

Access to NSHI's OSR pad and facilities will be from existing roads on NSHI and NSI leases to minimize surface disturbance and continue the use of best management practices. Two roads are proposed for initial research and development operations. The access road from the north and west will be on previously disturbed land. The access road from the north and east will involve construction of a 20-foot-wide by 445-foot-long road that will disturb approximately 0.20 acres (Figure 2). Additional roads may be constructed in the future, coincident with project expansion.

The only hazardous materials that could potentially be present and negatively affect stormwater discharge would be leaked fuels/fluids from either the heavy equipment used to initially construct the access road, or from vehicles that currently use the access roads to get to and from the existing well pads.

Heavy equipment used to construct access roads are maintained regularly to prevent fluid leaks. The access roads will be inspected for leaks immediately after access road construction and monthly for those roads that are actively used. Access roads that are infrequently used will be inspected every six months. Identified leaks or spills will be absorbed as necessary with absorbents and removed via shovel for cleanup purposes.

In order to mitigate erosion of the access roads and to provide runoff control, all access roads will be crowned and ditched along the trace of the roads. Periodic inspection of the roads will determine erosional extent and effectiveness of the crowning and ditching. Other BMPs, such as straw bales or berms, will be implemented as necessary to limit erosion.

### **3.3 Identification of Discharges Other Than Stormwater**

In the event that an illicit discharge is discovered, immediate corrective measures will be taken. This will include identifying the point source of the illicit discharge and ending the flow at the point source as soon as possible. Because the stormwater drainage ditches are containments and do not flow anywhere, an illicit discharge will be cleaned up in the same manner as for a leak or spill, as described in Section 3.8. Absorbents will be used, as necessary, and the CDPHE will be notified of the illicit discharge upon cleanup of the discharge.

### **3.4 Stormwater Dewatering**

Stormwater Dewatering is not anticipated within the NSHI RD&D Lease area.

### **3.5 Sampling Information**

NSHI has no historical stormwater discharge sampling data. For the purposes of stormwater discharge monitoring, NSI is a designated Sand and Gravel production operation and is not required to do so. No future stormwater discharge data is anticipated to be collected.

### **3.6 Preventative Maintenance**

For the identification of machinery, equipment, and areas that are to be inspected and the schedule for such inspections and maintenance, please see the descriptions of the BMPs for each site-specific area in Section 2.2. A record of all inspections, whether weekly or semi-annually, whether in relation to the processing plant or well field, will be contained within a log book that is to be kept and maintained in the NSI processing plant with the SWMP Administrator. This record will include the date of inspection, the site or equipment inspected, a description of the facility/equipment, any problems noted, and a description of any remedial actions taken. Additionally, the log book will also include a spreadsheet detailing the need for spare/replacement parts for NSI and NSHI operations, including, but not limited to, piping, liner, fencing, machinery, and mechanical equipment. The date, description, and quantity of these materials ordered will be recorded in the log book.

### **3.7 Good Housekeeping**

NSI currently employs a number of good housekeeping practices: garbage and waste materials are contained within a large dumpster outside of the processing plant which has a functional lid and is emptied on a weekly basis; all chemicals and fuels are stored in the same room, are properly labeled, and the associated Material Safety Data Sheets (MSDS) are easily accessible; walkways, driveways, and access roads are kept free of trash, debris, and other obstructions; the interior of the processing plant is swept weekly; and storage containers and drums are stored away from direct traffic routes.

The following are additional good housekeeping practices that are employed by NSI: the exterior of the processing plant, specifically beneath the conveyor belt between the plant and the silo, are swept weekly to eliminate as much sodium bicarbonate dust exposed to the atmosphere as possible; all chemical substances present within the plant are listed in a spreadsheet and will be updated as necessary; a dumpster or trash container will be present on all well pads during drilling operations. These good housekeeping practices will continue for NSHI's RD&D operations.

### **3.8 Spill Prevention and Response Procedures**

On the NSHI Lease, there are 2 immediate locations where liquid spills are possible: along the trace of the pipeline running to and from the NSI plant and OSR well pad and on an active well pad during drilling and injection/recovery activities. In general, topography around the NSHI RD&D Lease area is gently sloping to the northeast. As such, any barren or pregnant liquor spills from the pipelines would flow in this direction, though flow would be limited and would find localized depressions, likely in the form of the ditches associated with the access roads that are adjacent to and parallel the pipeline trace. Fuel, oil, or drilling mud spills occurring on an active well pad would be contained within the pad, as the pad is to be graded and bermed.

In the event of a spill, the following procedures are to be followed:

- 1) Call/notify the NSHI SWMP Administrator. Depending upon the Administrator's location, the person who notified the Administrator about the spill may be tasked with cleanup activities. The Administrator should be the individual with adequate knowledge to personally clean up spills or direct individuals as to how the spill should be cleaned up. The Administrator will also determine if regulatory agency notification is required.
- 2) Attempt to contain the spill in the appropriate discharge outfall. This may require using a shovel to provide a direct pathway to the outfall or additional materials to be used as obstructions to deflect the spill in the direction of the outfall. Shovels are located in the maintenance shop of the NSI processing plant.
- 3) If the spill is barren or pregnant liquor, the liquid simply needs to be directed to the nearest outfall. If the spill is fuel, oil, drilling mud, or any other chemical, appropriate absorbent material should be used to soak up as much of the free liquid as possible. Absorbents can be found in the maintenance shop of the NSI processing plant.
- 4) After the spill has been sufficiently contained and absorbed, a description of the spill is to be written down and recorded in the SWMP log book. Details should include the date, weather conditions, nature of the spill material, cause of the spill, estimated quantity of the spill, duration of the spill, and how the spill was contained/remediated.

- 5) If absorbent material was used to clean up the spill, the material is to be shoveled up and disposed of in an appropriate trash container or drum for subsequent disposal to an appropriate off-site facility. Absorbents and drums can be found in the maintenance shop of the processing plant. The ground is to be shoveled until clean soil is encountered. In no instances is the absorbent material to be disposed of or washed into a drainage or sewage system.
- 6) If the spill is deemed to potentially enter or threaten surface or ground waters, the CDPHE needs to be notified immediately. The 24-hour environmental emergency spill reporting line is 1-(877)-518-5608.
- 7) Make preparations for a company meeting regarding the nature of the spill and measures to be taken to prevent a future spill. This is to take place within 2 days of the incident, if possible.

A sign containing spill procedure and contact information can be found in the maintenance shop of NSI's processing facility. All new employees are to be trained on the spill prevention and procedure plan and to be shown the locations of spill cleanup material and contact information. The new employees are also to become acquainted with the spill documentation paperwork.

### **3.9 Employee Training**

The NSHI SWMP Administrator will be responsible for conducting yearly refresher training on the SWMP for all NSHI employees. Training will consist of an explanation of the goals of the SWMP, currently employed best management and good housekeeping practices, the nature of inspections, and a discussion of incidents/measures taken during the last year and the goal/focus for the forthcoming year. New employees will be required to read through the entire SWMP and go over the major components of the SWMP with the SWMP Administrator to ensure understanding and compliance with the goals of the SWMP.

### **3.10 Fuel and Fluids Handling Procedures**

In accordance with BLM lease requirements, an SPCC Plan (APPENDIX C) has been prepared for this project. Even though limited quantities of fuel and petroleum products will be stored on site, these smaller quantities of petroleum products, such as gasoline, diesel, hydraulic fluid, and lubrication oils and grease, could still pose a threat to water quality if not stored and handled properly. To ensure adequate protection of water quality, the following spill prevention and response procedures will be followed to address the potential for leakage or spilling of fuels and fluids:

- All fuels and fluids will be properly stored in appropriately marked above ground storage tanks, 55-gallon drums, or five-gallon buckets on wooden pallets within a secondary containment areas to facilitate inspection. The fuels and fluids storage areas will be surrounded by a berm and the area within the berm will be sized to contain any potential leakage or spills that could occur from the storage containers.
- All containers will be kept sealed and inspected to ensure that the lids and valves are properly closed and secured. Any leaking containers will be repaired or replaced immediately.
- Any leakage or spills will be cleaned up immediately by removing all contaminated soil and placing it in approved containers for transport to approved disposal facilities.

- To facilitate cleanups, a spill kit with materials for cleaning up spills (absorbent pads, shovels, drums for contaminated soil, etc.) will be kept on site, in the immediate vicinity of the fuel storage area.
- Operations staff will be trained in proper fueling and fluids handling procedures and appropriate spill prevention and emergency response procedures.
- Any release or spill of fluids, including exploration and production waste exceeding 5 barrels (210 gallons), including spills that are fully captured within secondary containment areas will be reported immediately to the SWMP Administrator, and shall be reported in writing to the BLM White River Field Office and to the COGCC on a COGCC Spill/Release Report Form 19 within 10 days from the date the spill is discovered.
- Any release or spill that exceeds 20 barrels (840 gallons) of exploration and production liquids/waste shall be reported to the COGCC within 24 hours from when the spill/release is discovered.
- All spills or releases, regardless of quantity, that impact or threaten to impact any waters of the state, residence or occupied structure, livestock or public byway, shall be verbally reported to the COGCC as soon as practical after discovery (COGCC Rule 906). If the spill reaches, or is likely to reach waters of the state (including surface water, groundwater, and dry gullies or storm sewers leading to surface waters) it must also be reported to the Colorado Department of Public Health and Environment (CDPHE).
- There will be no storage of hazardous materials, chemicals, fuels and lubricating oils, or concrete coating activities, and no refueling activities within 200 feet of any water body or wetland.

#### **4.0 FINAL STABILIZATION AND LONG TERM STORMWATER MANAGEMENT**

Production and monitoring wells associated with the well field will be plugged and abandoned in accordance with procedures described herein and lease stipulations. At the completion of RD&D, pilot, and/or commercial production 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.

When there is no additional use for an OSR interval, any recovered argillaceous- or carbonaceous-type material may be reintroduced into the spent interval. Additionally, residual brine will be left in the OSR interval and will help to stabilize and support it. Wells will be plugged and abandoned in compliance with all regulatory requirements. Any core holes will be plugged and abandoned or converted to monitoring wells per BLM specifications. NSHI's monitor well may be maintained to provide additional groundwater monitoring for the NSI sodium operations.

Before plugging and abandoning an OSR production well, the production and injection tubing strings set inside the two 7.0-inch casing strings will be removed from the wellbore. Bridge plugs may be set near the top of the OSR interval.

Site-specific reclamation procedures are identified in this section for the two types of reclamation activities that will occur on RD&D Lease area: (1) activities that will follow construction and those routine disturbances associated with the well field operations (interim reclamation) and (2) activities that will be associated with the cessation of production operations (final reclamation). 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 of the activities that will be associated with final decommissioning of the production operations are different from those routine reclamation activities and will be discussed separately.

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 production operations. Flooding is extremely unlikely to occur at the project site because the production plan involves solution mining and kerogen conversion of oil shale. No slopes of any significance are present on the project site, so massive slope failure does not apply.

Any surface facilities present when production operations cease will be dismantled and either salvaged or removed for disposal. Concrete foundations and road pavement with no further use will be broken up and buried on-site at least 3 feet below final grade. Buried utilities, such as natural gas pipelines, will be disconnected and purged; they will be left in place because these areas will have already been revegetated. Any pits will be closed according to applicable regulations, recontoured to match native surrounding, and revegetated.

Surface infrastructure (such as buildings, tanks, foundations, and associated structures) that cannot be used by NSI's sodium bicarbonate facility will be removed from the site and the site recontoured and revegetated according to BLM White River Field Office Surface Reclamation Protocol.

### **Types and mixtures of shrubs, trees or tree seedlings, grasses, or legumes to be planted**

Seed mix application rates, seed types and seeding techniques are based on BLM White River Field Office Surface Reclamation Protocol (BLM, 2011) and reclamation experience in the area. Local environmental conditions of soils, slopes, elevation, and precipitation have also been considered. The best management practices to be employed during reclamation would include surface roughening, seeding, and erosion control blankets. The proposed seed mixes for reclamation activities are shown in Table 1 and Table 2. The use of native, weed-free seed mixes will result in a rapidly established, diverse, and effective vegetative cover capable of self-regeneration.

The seed mix presented in Table 1 will be used for both interim and final reclamation. The composition of Phase 1 interim reclamation seed mix may be different from those used during Phase 2 interim and final reclamation. Because of the short-term nature of Phase 1 interim reclamation, the BLM does not generally require the use of forb seed; therefore, only grass seed will be used in Phase 1. Areas that require short-term or interim vegetative stabilization will be seeded with the appropriate seed mix as soon as possible following disturbance (spring or fall, September 1–March 15). This will enhance viability of topsoil berms and shallow stockpiles. It will also increase the stabilization of the disturbed area and reduce potential erosion problems.

The White River Field Office Surface Reclamation Protocol recommends seeding bluebunch wheatgrass on rolling loam and pinyon juniper sites, both of which are characteristic of NSHI's RD&D Lease area. However, reclamation experience in this area has proven bluebunch wheatgrass is not very common and can be hard to establish. Therefore, thickspike wheatgrass has been substituted for bluebunch wheatgrass. Additionally, needle and thread seed can be difficult to obtain; therefore, green needlegrass (a species doing very well on nearby reclaimed well pads) may be substituted for it. The availability of seed will determine the ultimate seed mixture and variety of seed used.

Cultivar	Species	Scientific Name	Application Rate (PLS/acre)
<b>Grasses</b>			
Rosanna	Western Wheatgrass	<i>Pascopyrum smithii</i>	4
Critana	Thickspike Wheatgrass	<i>Elymus lanceolatus ssp. Lanceolatus</i>	3
Rimrock	Indian Ricegrass	<i>Achnatherum hymenoides</i>	3
	Needle and Thread Grass	<i>Hesperostipacomata ssp. comata</i>	2.5
<b>Forbs</b>			
Maple Grove	Lewis Flax	<i>Linum lewisii</i>	1
	Scarlet Globemallow	<i>Sphaeralcea coccinea</i>	0.5
<b>Alternates*</b>			
Timp	Northern Sweetvetch	<i>Hedysarum boreale</i>	3
Lodorm	Green Needlegrass	<i>Nassella viridula</i>	2.5

**Table 1 Grasses and Forbs Used in Interim and Final Reclamation**

Shrub species shown in Table 2 will be added for final reclamation. Based on reclamation results from nearby well pads, it is anticipated that sagebrush will eventually re-establish from nearby native stands. Therefore, it has not been included in the seed mix. However, if necessary, Wyoming Big Sagebrush (*Artemisia tridentata* var. *wyomingensis*) at 0.25 to 0.5 PLS/ac will be added to the seed mix.

Species	Variety	Scientific Name	Application Rate (PLS/acre)
<b>Shrubs</b>			
Four-wing Saltbush	Rincon (dewinged)	<i>Atriplex canescens</i>	1.5
Winterfat		<i>Krascheninnikovia lanata</i>	0.5
Antelope Bitterbrush		<i>Purshia tridentata</i>	1.0

**Table 2 Shrubs Used in Final Reclamation**

Seed mixes detailed in Table 1 and Table 2 were designed to average 50 seeds per square foot with the assumption that there would not be a substantial viable seed bank remaining in topsoil piles that had been stored for greater than 6 months. At the discretion of the BLM, it may be appropriate to reduce the seeding rates (adjusted to 20 to 30 seeds per square foot) in circumstances where a substantial viable seed bank persists in the topsoil.

## **Seeding Procedure**

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. This scheduling of revegetation 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 reseed an area in the event of failed seedling establishment. In these events, seeding may occur during the spring (April to 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. Table 1 and Table 2 indicate seed application rates.

Following seeding, straw or native pasture hay will be applied as mulch at a rate of approximately 2 tons per acre. If hydromulch is used, the rate will be  $\frac{3}{4}$  to 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 if seeding occurs with appropriate timing. Any prohibited noxious weeds that may appear in the reclaimed area will be controlled, as necessary, by chemical and/or mechanical means. Noxious weed control will be performed by a certified pesticide applicator 1 to 2 times annually (during the growing season).

Seeding will occur as necessary as the project progresses.

## **Reclamation Monitoring**

The State of Colorado and BLM require 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. To ensure that this requirement is fulfilled, monitoring will be required to assess the success of revegetation efforts.

## **Reclamation Schedule**

After production activities cease, the removal of surface facilities will require approximately 6 months and take place between the spring and fall seasons. Revegetation of the project area will be completed during the first fall following production shut-down; seeding will occur according to the procedures described above. Monitoring activities associated with groundwater quality (monitoring wells) will continue for 3 years after production operations cease. The monitoring of revegetation success will continue until bond release.

The monitoring program will evaluate the success of any reclamation effort and will recognize any problem areas. Vegetation transects will be sampled each year at the peak of the growing season. Initially (years 1 to 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.

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.

### **Contingency Plans**

Correction procedures for unsuccessful reclamation are necessary in the event that revegetation attempts fail. The currently established NSI environmental monitoring programs for vegetation and wildlife will be used to evaluate the effectiveness of revegetation, and of the impact, if any, of mining and reclamation on wildlife populations.

## **5.0 COMPREHENSIVE INSPECTIONS**

The SWMP Administrator or a specific NSHI employee designated by the SWMP Administrator is responsible for a comprehensive, though periodic inspection of RD&D Lease area. This will consist of monthly inspections of the well pads, pipeline, and frequently traveled access roads. Access roads that are not frequently traveled will be inspected every six months. The inspections will document and record the status of in-place structural control measures and BMPs, as well as identify any supplementary and/or corrective work needed to address additional stormwater discharge concerns or remediate insufficient or faulty in-place structural control measures. Equipment needed to address spill concerns will also be evaluated for quantity and adequacy.

Twice a year, the SWMP Administrator will write a comprehensive inspection report detailing the findings of the monthly inspections, including a description of any corrective actions made to existing structural control measures and the implementation of any new structural control measures. This document will also describe the results of the illicit discharge investigation and any remedial actions taken. The comprehensive inspection reports will be kept on site for a minimum period of three years.

## **6.0 REFERENCES**

BLM (Bureau of Land Management), 2011, April, White River Field Office Surface Reclamation Protocol, from <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/reclamation/examples.Par.28461.File.dat/WRFOSurfaceReclProtocol.pdf>

BLM (Bureau of Land Management), 2012, *Environmental Assessment for the Colorado Oil Shale Research, Development, and Demonstration (RD&D) Lease Tracts Project*, DOI-BLM-CO-110-2011-0177-EA, from [http://www.blm.gov/pgdata/etc/medialib/blm/co/field\\_offices/white\\_river\\_field/oil\\_shale/Round\\_2\\_-\\_POO\\_and\\_Map.Par.73287.File.dat/doiblmco\\_11020110177\\_ea\\_final.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/co/field_offices/white_river_field/oil_shale/Round_2_-_POO_and_Map.Par.73287.File.dat/doiblmco_11020110177_ea_final.pdf)

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NATURAL SODA

# APPENDIX E

## Emergency Response Plan

### 2013 Plan of Development

Oil Shale Research, Development and Demonstration (RD&D)  
Tract COC 74299

Prepared for:

**Natural Soda Holdings, Inc.**

Piceance Creek Basin  
Rio Blanco County, Colorado

Prepared by:

**Daub & Associates, Inc.**

Grand Junction, Colorado

**DATE PREPARED: 7/11/2013**



NATURAL SODA

**EMERGENCY PERSONNEL NAMES  
AND PHONE NUMBERS**

**DESIGNATED RESPONSIBLE OFFICIAL:**

Name: Bob Warneke      Phone: (970) 355-4590

**EMERGENCY COORDINATOR:**

Name: Mike Clark      Phone: (830) 613-0435

**OTHER EMERGENCY CONTACTS:**

Name: Eric Simms      Phone: (970) 379-9821

Name: Carl Meyer      Phone: (970) 274-4440

Name: Kevin Posey      Phone: (970) 261-3847

Date: 7/11/2013

# EVACUATION ROUTES

- Evacuation route maps have been posted in each work area. The following information is marked on evacuation maps:
  - Primary exit
  - Secondary exit
  - Location of fire extinguishers
  - First Aid Supplies
  - Safety shower and eye wash station
- Site personnel should know location of all exits.

# NSHI EMERGENCY PHONE NUMBERS

<b><u>Rio Blanco County Sheriff's Office</u></b>		911 or (970) 878-9620
<b><u>First Responders (Shell)</u></b>	(Patty Merriam)	(970) 675-6307
	(Amy @ reception)	(970) 675-6301
<b><u>Hospital</u></b>	Meeker, CO	(970) 878-5047
	Piceance Creek Clinic	(970) 878-3601 (Wed. only)
	Rifle	(970) 625-1510
<b><u>Ambulance</u></b>		911
	Meeker, CO	(970) 878-5047
	St. Mary's Air Life Emergency Center	(970) 244-2551
	<b>**See below for directions</b>	
<b><u>Wildfire:</u></b>	Report to Craig BLM	(970) 826-5037
<b><u>Fire Department (Structure Fires):</u></b>		911
	Meeker, CO	(970) 878-9620
<b><u>Poison Control</u></b>		(800) 332-3073
<b><u>Colorado State Patrol</u></b>		(970) 824-6501
<b><u>Gas Company: Questar</u></b>		
	Neil Wilken	(435) 781-4057
	Martin Anderson	(801) 324-2017
	Mike Madlena-office	(801) 321-1448
	Mike Madlena-cell	(801) 573-5445
<b><u>White River Electric (Power outage)</u></b>		(970) 878-5041
<b><u>Phone Repair</u></b>		(800) 954-1211
<b><u>Road and Weather Conditions:</u></b>		(970) 573-1311
	Meeker, CO	(970) 878-9620
	Grand Junction, CO	(970) 245-8800
<b><u>County Road Maintenance</u></b>		(970) 878-9590
<b><u>BLM – Meeker, CO</u></b>		(970) 878-3800
<b><u>OSHA – Denver, CO</u></b>		(303) 844-3061
<b><u>Vice President of Operations(Bob Warneke)</u></b>		(970) 355-4590

**\*\* Latitude 39 Degrees 55' 34"; Longitude 108 Degrees 21' 53"**  
**Location: T1S R 98W Section 35,**  
**Approximately 25 air miles west, southwest of Meeker (40 highway miles)**

**St. Mary's**

**Air Life**

**MEDICAL TRANSPORT**

Toll Free Numbers

Colorado **(800) 332-4923**

All other States **(800) 525-4224**

### **FLIGHT OPERATIONS**

Medical Transport

Helicopter Landing Guide

- Select site, minimum 100 X 100 feet with unobstructed approach and departure corridors
- Pick up loose articles that may blow into rotors such as plastic tarps, sheet metal, lose clothes, rags.
- Remove obstructions over 6 inches tall at his point of intended landing. Or select another site.
- Alternate landing site at Shell Admin Bldg. (if appropriate): east-northeast of junction between Rio Blanco County Rd 24 and Rio Blanco County Rd 83 (Yellow Creek Jeep Trail).
- Order of preference landing pads:
 

Grass	Best
Asphalt	
Concrete	
/ Gravel	
Apply water to /	Slick rock
These surfaces: \	Dirt, packed
\	Loose soil
\ Sand	Worst

- Wind Direction: Say "WIND IS FROM . . . "or if calm but has been blowing say "Wind was last from. . . but is now calm". If wind is not calm give approximate wind speed. No radio: Stand at the edge of the landing site with your back to the wind, arms extended toward the site and in the same direction the wind is blowing.
- At night: Park a vehicle with lights shining across the intended landing site, and shining into the wind. Notify the pilot that you have done this. He will land into the wind whenever possible and in front of the vehicle with the lights giving wind direction and illuminating the landing site.

- Communicate: if you have a radio on-site, give the frequency to the hospital on the initial call. The frequency is normally not printed on the outside of the radio, and may require writing it down on a piece of paper and taping it to the radio prior to an emergency situation. It may be under the battery cover, and should be a number such as 155.34 or 155.340 Hz (5 or 6 digits).
- If you have a radio telephone, call the mobile operator and have her call the hospital and give assistance in communications.
- Drill Rigs: Give legal description of drill site  
Latitude: 39° 55'                      Longitude: 108° 21'  
Township: T 1 S                      Range: R 98 W  
Section: 35 Radio Frequencies: \_\_\_\_\_
  - Also give normal directions, i.e.: 10 miles west of Colorado/Utah border, in a canyon just north of Winter Ridge.
  - Lower Geronimo line.
  - Make heliport at the edge of drill pad so helicopter can approach and depart into the wind, and not have to climb out over guy lines, pipe stanchions, trailer houses, TV antennas or other obstacles.
  - Advise pilot of any wires or obstructions, especially at night!

# EMERGENCY REPORTING AND EVACUATION PROCEDURES

- MEDICAL
- FIRE
- SEVERE WEATHER
- BOMB THREAT/HOSTAGE SITUATION/TERRORIST ATTACK
- CHEMICAL SPILL
- EXTENDED POWER LOSS
- WILDLIFE PROTECTION MEASURES
- SPILL REPORTING

# FIRE EMERGENCY

**The first concern during a fire is the safety of the employees. If a fire should start in or near your immediate area, you have two options, if you are able to extinguish the fire do so immediately, or immediately evacuate area and initiate a fire response team.**

*When fire is discovered:*

- Activate nearest fire alarm
- Notify the local Fire Department by calling (970) 878-9620 or 911

*Fight the fire ONLY if:*

- The Fire Department has been notified.
- The fire is small and not spreading to other areas.
- Escaping the area is possible by backing up to the nearest exit.
- The fire extinguisher is in working condition and personnel are trained to use it.

*Upon being notified about the fire emergency, occupants must:*

- Leave the building using the designated evacuation paths.
- All employees are to meet at the fire hydrant in front of the building.
- Remain outside until the senior employee announces that it is safe to reenter.

*Designated Official, Emergency Coordinator or supervisors must (senior official):*

- Disconnect utilities and equipment unless doing so jeopardizes his/her safety.
- Coordinate an orderly evacuation of personnel.
- Perform an accurate head count of personnel reporting to the designated muster area.
- Determine a rescue method to locate missing personnel.
- Provide the Fire Department personnel with the necessary information about the facility.
- Perform assessment and coordinate weather forecast office emergency closing procedures.

Date: 7/11/2013

# FIRE PREVENTION

Fire prevention consists of controlling the supply of flammable and combustible materials as well as any possible sources of ignition.

1. The dry terrain surrounding the project is a source of combustion and extra caution must be exerted extinguishing smoking materials at the plant and in route. Always be certain your cigarette butt, match or pipe ash is out. Take the time to grind them underfoot or throw them in butt cans.
2. Oil, flammable liquids and grease shall be in containers provided for them. The containers must be labeled as to their contents.
3. Fire extinguishers will be conveniently located in the on-site work trailers and at the NSI the plant, office building and remote work areas. These are provided for instant use. Do not pile or store materials in such a manner that they interfere with access to an extinguisher. Portable, ABC dry chemical extinguishes work for most types of fire. This is the most common extinguisher throughout the plant site. Halon extinguishes are supplied in control room and electrical control panels areas for electrical fires. Surrounding the NSI plant are fire hydrants. Water extinguishment works well for most solid flammable fuel, for structure fires, and for cooling structures during brush fires, but should not be used on an electrical fire.
4. If you discharge a fire extinguisher or find one that is not charged, label it so it can be replaced in the correct location, and then take it to the nearby NSI warehouse for a replacement.

# MEDICAL EMERGENCY

- Call medical emergency phone number (911):  
Provide the following information:
  - a. Nature of medical emergency,
  - b. Location of the emergency (address, building, room number)
  - c. Your name and phone number from which you are calling.
- Do not move victim unless absolutely necessary.
- Call personnel trained in CPR and First Aid to provide the required assistance prior to the arrival of the professional medical help:
- If personnel trained in First Aid are not available, as a minimum, attempt to provide the following assistance:
  - Stop the bleeding with firm pressure on the wounds  
(note: avoid contact with blood or other bodily fluids).
  - Clear the air passages using the Heimlich Maneuver in case of choking.
- In case of rendering assistance to personnel exposed to hazardous materials, consult the Material Safety Data Sheet (MSDS) and wear the appropriate personal protective equipment. Attempt first aid ONLY if trained and qualified.

Date: 7/11/2013

# EXTENDED POWER LOSS

In the event of extended power loss to a facility certain precautionary measures should be taken depending on the geographical location and environment of the facility:

- Unnecessary electrical equipment and appliances should be turned off and unplugged in the event that power restoration would surge causing damage to electronics and effecting sensitive equipment.
- Facilities with freezing temperatures should turn off and drain the following lines in the event of a long term power loss.
  - Fire sprinkler system
  - Standpipes
  - Potable water lines
  - Toilets
- Add propylene-glycol to drains to prevent traps from freezing
- Equipment that contains fluids that may freeze due to long term exposure to freezing temperatures should be moved to heated areas, drained of liquids or provided with auxiliary heat sources.

## Upon Restoration of heat and power:

- Electronic equipment should be brought up to ambient temperatures before energizing to prevent condensate from forming on circuitry.
- Fire and potable water piping should be checked for leaks from freeze damage after the heat has been restored to the facility and water turned back on.

# CHEMICAL SPILL

The following are the locations of:

**Spill Containment and Security Equipment:** For small spills use absorbent rags and litter, for large spills neutralize with baking soda and contact Clean Harbors at **1-800-645-8265 or 911 for immediate emergency.**

**Personal Protective Equipment (PPE):** All employees will have required PPE.

**MSDS:** Located in the on-site work trailers as well as the File Cabinet outside of the Natural Soda plant's cafeteria

*When a Large Chemical Spill has occurred:*

- Immediately notify the designated official and Emergency Coordinator.
- Contain the spill with available equipment (e.g., pads, booms, absorbent powder, etc.).
- Secure the area and alert other site personnel.
- Do not attempt to clean the spill unless trained to do so.
- Attend to injured personnel and call the medical emergency number, if required.
- Call a local spill cleanup company or the Fire Department (if arrangement has been made) to perform a large or hazardous chemical spill cleanup.
- Evacuate building structures as necessary

*When a Small Chemical Spill has occurred:*

- Notify the Emergency Coordinator and/or supervisor (select one).
- If toxic fumes are present, secure the area (with caution tapes or cones) to prevent other personnel from entering.
- Deal with the spill in accordance with the instructions described in the MSDS.
- Small spills must be handled in a safe manner, while wearing the proper PPE.
- Review the general spill cleanup procedures.

Date: 7/11/2013

# TELEPHONE BOMB THREAT CHECKLIST

INSTRUCTIONS: BE CALM, BE COURTEOUS. LISTEN. DO NOT INTERRUPT THE CALLER. RECORD THE FOLLOWIING INFORMATION:

YOUR NAME: \_\_\_\_\_ TIME: \_\_\_\_\_ DATE: \_\_\_\_\_  
 CALLER'S IDENTITY SEX: Male \_\_\_\_\_ Female \_\_\_\_\_ Adult \_\_\_\_\_ Juvenile \_\_\_\_\_ APPROXIMATE AGE: \_\_\_\_\_  
 ORIGIN OF CALL: Local \_\_\_\_\_ Long Distance \_\_\_\_\_ Telephone Booth \_\_\_\_\_

VOICE CHARACTERISTICS	SPEECH	LANGUAGE
<input type="checkbox"/> Loud	<input type="checkbox"/> Fast	<input type="checkbox"/> Excellent
<input type="checkbox"/> Soft	<input type="checkbox"/> Slow	<input type="checkbox"/> Good
<input type="checkbox"/> High Pitch	<input type="checkbox"/> Distinct	<input type="checkbox"/> Fair
<input type="checkbox"/> Deep	<input type="checkbox"/> Distorted	<input type="checkbox"/> Poor
<input type="checkbox"/> Raspy	<input type="checkbox"/> Stutter	<input type="checkbox"/> Foul
<input type="checkbox"/> Pleasant	<input type="checkbox"/> Nasal	_____
<input type="checkbox"/> Intoxicated	<input type="checkbox"/> Slurred	Other
Other	Other	
ACCENT	MANNER	BACKGROUND NOISES
<input type="checkbox"/> Local	<input type="checkbox"/> Calm	<input type="checkbox"/> Factory
<input type="checkbox"/> Not Local	<input type="checkbox"/> Angry	<input type="checkbox"/> Trains
<input type="checkbox"/> Foreign	<input type="checkbox"/> Rational	<input type="checkbox"/> Machines
<input type="checkbox"/> Region	<input type="checkbox"/> Irrational	<input type="checkbox"/> Animals
<input type="checkbox"/> Race	<input type="checkbox"/> Coherent	<input type="checkbox"/> Music
	<input type="checkbox"/> Incoherent	<input type="checkbox"/> Quiet
	<input type="checkbox"/> Deliberate	<input type="checkbox"/> Office
	<input type="checkbox"/> Emotional	<input type="checkbox"/> Voices
	<input type="checkbox"/> Laughing	<input type="checkbox"/> Machines
		<input type="checkbox"/> Airplanes
		<input type="checkbox"/> Street
		<input type="checkbox"/> Party
		<input type="checkbox"/> Traffic
		<input type="checkbox"/> Atmosphere

## BOMB FACTS

**PRETEND DIFFICULTY HEARING - KEEP CALLER TALKING - IF CALLER SEEMS AGREEABLE TO FURTHER CONVERSATION, ASK QUESTIONS LIKE:**

- When will it go off? Certain Hour \_\_\_\_\_, Time Remaining: \_\_\_\_\_
- Where is it located? Building: \_\_\_\_\_. Area: \_\_\_\_\_
- What kind of bomb? \_\_\_\_\_
- What kind of package? \_\_\_\_\_, What color? \_\_\_\_\_
- How do you know so much about the bomb? \_\_\_\_\_
- What is your name and address? \_\_\_\_\_
- If building is occupied, inform caller that detonation could cause injury or death.
- Activate malicious call trace: Hang up phone and do not answer another line. Choose same line and dial \*57 (if your phone system has this capability). Listen for the confirmation announcement and hang up.
- Did the caller appear familiar with plant or building (by his/her description of the bomb location)? Write out the message in its entirety and any other comments on a separate sheet of paper and attach to this checklist.
- Notify your supervisor immediately.

# SEVERE WEATHER AND NATURAL DISASTERS

## ***Tornado:***

- When a warning is issued by sirens or other means, seek inside shelter. Consider the following:
  - Small interior rooms on the lowest floor and without windows,
  - Hallways on the lowest floor away from doors and windows, and
  - Rooms constructed with reinforced concrete, brick, or block with no windows.
- Stay away from outside walls and windows.
- Use arms to protect head and neck.
- Remain sheltered until the tornado threat is announced to be over.

## ***Earthquake:***

- Stay calm and await instructions from the Emergency Coordinator or the designated official.
- Keep away from overhead fixtures, windows, filing cabinets, and electrical power.
- Assist people with disabilities in finding a safe place.
- Evacuate as instructed by the Emergency Coordinator and/or the designated official.

## ***Blizzard:***

### *If indoors:*

- Stay calm and await instructions from the Emergency Coordinator or the designated official.
- Stay indoors!
- If there is no heat:
  - Close off unneeded rooms or areas.
  - Stuff towels or rags in cracks under doors.
  - Cover windows at night.
- Eat and drink. Food provides the body with energy and heat. Fluids prevent dehydration.
- Wear layers of loose-fitting, light-weight, warm clothing, if available.

### *If outdoors:*

- Find a dry shelter. Cover all exposed parts of the body.
- If shelter is not available:
  - Prepare a lean-to, wind break, or snow cave for protection from the wind.
  - Build a fire for heat and to attract attention. Place rocks around the fire to absorb and reflect heat.
  - Do not eat snow. It will lower your body temperature. Melt it first.

*If stranded in a car or truck:*

- Stay in the vehicle!
- Run the motor about ten minutes each hour. Open the windows a little for fresh air to avoid carbon monoxide poisoning. Make sure the exhaust pipe is not blocked.
- Make yourself visible to rescuers.
  - Turn on the dome light at night when running the engine.
  - Tie a colored cloth to your antenna or door.
  - Raise the hood after the snow stops falling.
- Exercise to keep blood circulating and to keep warm.

# CRITICAL OPERATIONS

During some emergency situations, it will be necessary for some specially assigned personnel to remain at the work areas to perform critical operations.

Assignments:

Work Area	Name Job Title	Description of Assignment
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

- Personnel involved in critical operations may remain on the site upon the permission of the site designated official or Emergency Coordinator.
- In case emergency situation will not permit any of the personnel to remain at the facility, the designated official or other assigned personnel shall notify the appropriate offices to initiate backups. This information can be obtained from the Emergency Evacuation Procedures included in the Safety Manual.

The following offices should be contacted:

Name/Location:\_\_\_\_\_

Telephone Number:\_\_\_\_\_

Name/Location:\_\_\_\_\_

Telephone Number:\_\_\_\_\_

Name/Location:\_\_\_\_\_

Telephone Number:\_\_\_\_\_



# Spill Reporting

NSHI shall notify the Colorado Division of Reclamation, Mining and Safety (DRMS) of a spill of any toxic or hazardous substance, including spills of petroleum products, that occurs within the mined land permit area or area encompassed by a Notice of Intent and which would be required to be reported to the Division of the Colorado Department of Public Health and the Environment, the National Response Center, the Colorado Hard Rock/Metal Mining Rule 3 Emergency Planning Commission, any local Emergency Planning Commission, local Emergency Planning Committee, or the State Oil Inspector.

NSHI shall:

- (1) within 24 hours of the time the spill is reported to any other agency(ies) with jurisdiction over the spill, notify any DRMS Minerals Program Field Office or the Minerals Program Denver Office, Division of Reclamation, Mining and Safety, via phone, facsimile, or email;
- (2) include in the notice any relevant information known at the time contact is made with the Office that would assist the Office in assessing spill seriousness, such as:
  - (a) operation name, DRMS permit number and name of person reporting the spill,
  - (b) telephone number of a responsible company official for the Office staff to use as a contact,
  - (c) date and time of spill,
  - (d) type of material spilled (CAS number if applicable, from the material safety data sheet (MSDS) form),
  - (e) estimate of the amount spilled, whether any material has left the permit area, and where the spilled material went, and (f) initial measures taken to contain and clean up spill.
- (3) copy the Office on any correspondence and/or written reports provided to other agencies. Supplement those reports if necessary to include the information outlined in Rule 3.1.13(2).



NATURAL SODA

**APPENDIX F**  
**NSHI Safety Manual**

**2013 Plan of Development**  
Oil Shale Research, Development and Demonstration (RD&D)  
Tract COC 74299

Prepared by:  
**Natural Soda, Inc.**  
Piceance Creek Basin  
Rio Blanco County, Colorado

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

# Natural Soda

# SAFETY MANUAL



	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**TABLE OF CONTENTS**  
**NATURAL SODA**  
**SAFETY POLICY MANUAL**

Effective Date 2/01/2010

	<u>Page No.</u>
SAFETY POLICY .....	1
PROMOTING SAFETY .....	1
THE SAFETY ADMINISTRATION OF NATUAL SODA .....	2
MAINTENANCE OF SAFE WORKING CONDITIONS .....	3
SAFETY RESPONSIBILITY OF MANAGEMENT .....	4
SAFETY RESPONSIBILITY OF EMPLOYEES .....	5
GENERAL SAFETY REGULATIONS .....	6
PERSONAL PROTECTIVE EQUIPMENT .....	7
HOUSEKEEPING/FOOD GRADE REQUIREMENTS .....	8
FIRE PREVENTION AND EMERGENCY PROCEDURES FOR FIRES .....	9
PERSONAL INJURY ACCIDENTS.....	11
EMERGENCY GUIDELINES .....	14
Follow-up of Injured Employee Procedures .....	14
Accident Analysis and Record Keeping.....	15
Employee Safety Contacts .....	15
Job Observation.....	16
ACCIDENT CONTROL PROCEDURES .....	16
Accident Investigation.....	16
VEHICLE OPERATION .....	17
VEHICLE ACCIDENTS, "NEAR MISS" AND REPORTING PROCEDURES .....	18
HAZARD COMMUNICATION .....	18

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

HAZARDS IN JOB PERFORMANCE .....19

HEALTH STANDARDS .....21

Air Quality .....21

Noise Exposure .....22

ELECTRICAL HAZARDS AND PRECAUTIONS .....22

LOCKOUT PROCEDURE .....24

MAINTENANCE AND MECHANICAL SHOP PRACTICES .....27

CUTTING AND WELDING PIPE PROCEDURE .....27

Purpose .....27

Policy.....28

Procedure.....28

Responsibility For Work Area .....29

Issuance Rules .....30

Emergency Procedures .....31

Questionable Hazards.....31

HAZARDOUS ENTRY - CONFINED SPACE ENTRY .....31

LINE BREAKING .....36

PLANT ATMOSPHERE .....37

GASES .....38

Purpose and Scope .....39

Procedure.....39

Confined Space Name .....40

NS Qualified Confined Space Personnel .....41

PRODUCT STORAGE DOME ENTRY PROCEDURE .....43

Purpose and Scope .....43

Procedure.....43

HAZARD COMMUNICATION COMPLIANCE PROGRAM.....45

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Employee Training and Information .....45

Informing Subcontractors and Other Contractors Onsite.....49

Material Safety Data Sheet.....50

Natural Soda Potential Hazard Categories for .....51

Common Chemical Products.....51

BLOOD BORNE PATHOGENS.....52

Purpose and Scope .....52

Procedure.....52

Attachments.....52

PROTOCOL FOR INFECTION CONTROL .....53

Purpose and Scope .....53

General Hazards .....53

Infection Control .....53

    Infectious, contagious, communicable disease .....53

    Exposure Control by Engineering and Work Practice .....54

    Infectious Waste.....54

POST EXPOSURE EVALUATION AND FOLLOW-UP.....55

    Exposure Incident.....55

    HBV Vaccine .....55

Training Records .....56

DEFINITIONS - PROTOCOL FOR INFECTION CONTROL.....56

FIRSTSAVE AUTOMATED EXTERNAL DEFIBRILLATOR POLICY AND PROCEDURES .....59

Purpose and Scope .....59

First Save Description .....59

Operator Training Requirements.....60

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Safety Precautions .....60

Operating Instructions .....61

Post Rescue Process .....62

HBV VACCINE MANDATORY DECLINATION STATEMENT .....63

## **SAFETY POLICY**

The management of Natural Soda does not consider any phase of operations or administration of a greater importance than the health and safety of its employees. Natural Soda believes in the dignity and importance of the individual employee and it is our responsibility to provide a safe and healthful working environment.

Accident prevention and efficient production go hand-in-hand. Safety must always be uppermost in the minds of all Natural Soda employees. NS has a safety incentive program designed to promote safety awareness and reward all individual efforts in maintaining Natural Soda as a safe, productive mining and processing operation. This safety incentive program will appropriately recognize and reward safe practices. The design of the Safety Program ensures compliance with federal and state regulations.

---

Manufacturing Director



**PROMOTING SAFETY**

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Safety must always be uppermost in the minds of all Natural Soda employees. To accomplish this, prominent safety displays will be maintained at key locations. A billboard-type sign located in the lunchroom records the consecutive number of days worked since the last lost time accident. Also recorded on the sign will be the number of days worked without a disabling injury.

Safety slogans will be displayed in the lunch room and control room. Periodic safety messages will be distributed to all employees.

Natural Soda will have a safety incentive program designed to promote safety awareness and reward individual efforts in maintaining Natural Soda as a safe, productive mining and processing operation. This safety incentive program will appropriately recognize and reward safe practices.

Safety handbooks will be distributed to and reviewed with each Natural Soda employee.

**THE SAFETY ADMINISTRATION OF NATURAL SODA  
NAHCOLITE PROJECT  
RIO BLANCO COUNTY, COLORADO**

The health and safety of all employees is Natural Soda's, as well as each employee's, responsibility. Natural Soda's goal is the safe production of sodium bicarbonate; safety is an integral part of every job. Safety will not be subordinated to demands for production, cost savings, product quality, schedules, convenience or expediency.

**Every employee has the responsibility to perform their job in a safe manner, to ensure their own safety and the safety of their co-workers.**

It is Company policy to maintain safe working conditions. Work places shall be free of recognized safety hazards. Natural Soda will comply fully with all state and federal laws and regulations pertaining with the safety and health of its employees. All employees will receive necessary training in safe procedures and safety regulations.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Employees will be held accountable for the safe performance of their duties, and will be measured on their accomplishments in controlling accidents and losses. Disregard for safety will be regarded as a cause for termination.

The goal of Natural Soda is an accident free workplace.

Natural Soda recognizes its responsibility to manage activities in a manner that assures a safe and healthy operation. The Company will continue in its endeavors to develop better methods to attain the safe and health environment.

### **MAINTENANCE OF SAFE WORKING CONDITIONS**

The Company will continually strive to meet or exceed with all state and federal health and safety regulations and guidelines.

Surveys and inspections as defined in the federal and state health regulations will be conducted. Safety inspections will be a cooperative effort of employees and management. The objective of safety inspections is to identify unsafe conditions or acts which might pose a threat to employees or violate government regulations. A written report of the inspection will be submitted to all employees. A follow-up inspection will be conducted to assure that violations and/or unsafe conditions are eliminated. A report of the follow-up will be distributed to the general manager and safety.

Safety meetings will be held monthly for all personnel. Safety meetings will be conducted during, before or after the working shift. The Safety Department will provide assistance in conducting meaningful meetings.

**Employees are encouraged to make suggestions so that unsafe conditions can be identified and corrected.**

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## **SAFETY RESPONSIBILITY OF MANAGEMENT**

Each employee is personally responsible for his own safety, the safety of co-workers, and the safe operations of equipment.

Natural Soda management must ensure that employees are educated in safe job performance and are supervised with the safe production of bicarb as the primary objective.

Natural Soda's management is accountable for acceptable standards of safety performance. Natural Soda's level of management has the following responsibilities:

1. Accepting assigned responsibility for safety.
2. Instruction of each employee (including new or transferred employees) in safety rules, and correct job procedures and practices applicable to his assigned job.
3. Observing employees frequently to monitor compliance with job instructions and safe work procedures and safety rules; and promptly pointing out any unsafe practices, taking corrective action as necessary.
4. Making frequent contacts to discuss safety with individual employees.
5. Maintaining facilities and equipment in safe condition and in compliance with OSHA standards and other applicable federal and state regulations.
6. Conducting and/or participating in safety meetings.
7. Instructing employees on housekeeping standards and following up to assure that standards are meant and maintained.
8. Requiring use of personal protective equipment.
9. Maintain & update knowledge of federal and state regulations and being certified or qualified as required by job assignment.

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

10. Notifying appropriate personnel of serious accidents involving injuries and/or property damage.
11. Investigating all accidents resulting in injury or property damage and "near-miss" accidents having injury or property damage potential; and, after obtaining the facts and determining the cause taking or recommending effective action to prevent recurrence.
12. Preparing and submitting the Supervisor's Accident Report form immediately following the incident.
13. Determining training needs of employees, conducting on-the-job training when practical or appropriate, and advising Safety/Training personnel of identified training needs or problems for which guidance or staff assistance may be required.
14. Conducting daily safety inspections of active work areas.
15. Being alert to unsafe acts and conditions of contractors and sub-contractors and reporting these to the appropriate people.

**SAFETY RESPONSIBILITY OF EMPLOYEES**

Every effort will be made to make safety information readily accessible to all Company employees. Each employee will be provided with an assigned copy of this Safety Program. The information contained in the program is an accumulation of all general rules and regulations, as well as descriptions of common hazards with the recommended precautions. Every employee shall study this manual, especially those sections related to his/her job. Everyone will be expected to have knowledge of the information in this book.

**UNDERSTANDING THE INFORMATION CONTAINED IN THIS HANDBOOK IS THE RESPONSIBILITY OF ALL EMPLOYEES AND WILL NOT BE ACCEPTABLE AS AN EXCUSE FOR VIOLATION OF THE RULES, REGULATIONS, AND PROCEDURES OUTLINED HEREIN.**

Each employee shall:

1. Be responsible for his/her own personal safety.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

2. Learn and be aware of the hazards of the job
3. Comply with all rules and regulations.
4. Promote the overall safety effort by demonstrating a good safety attitude and forming safe work habits.
5. Assist in establishing safety rules and regulations.
6. Report any hazardous conditions to his supervisor.
7. Report all accidents and near misses.
8. Report all injuries.

### **GENERAL SAFETY REGULATIONS**

The rules and regulations herein shall apply to all personnel on site. In addition, all Company employees shall submit to a physical to include a drug & alcohol screen if requested. Drug and alcohol testing may be conducted at any time deemed necessary by NSI management.

#### Rules of Conduct:

1. Alcoholic beverages and/or narcotics will not be allowed on site. Prescription drugs are acceptable providing they do not impair the employee's ability to perform his job safely.
2. No firearms or knives, other than pocketknives, will be allowed on site.
3. Employees will not engage in horseplay, practical jokes, fighting, running or other activities that could cause injury or property damage.
4. All caution signs and danger signals shall be obeyed. Observe and obey "No Smoking" and "Restricted Area" signs, speed limits, flashing lights, sirens, etc.
5. The destruction of, or tampering with, safety devices, signs, signals, first aid supplies, and/or needless discharging of fire extinguishers will not be permitted.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

6. No one shall operate the controls of any machine unless authorized to do so; the employee's supervisor will give authorization.
7. Compressed air should be used carefully and in small quantities to "dust" clothes or persons. Directing compressed air on a person could create an embolism (air bubble) in a blood vessel.

### **PERSONAL PROTECTIVE EQUIPMENT**

It is the responsibility of each Company employee to wear and use all required personal protective equipment in order to ensure personal safety and health. At a minimum, a safety hat, safety shoes and eye protection (safety glasses or goggles) must be worn at all times by employees in operating areas. Office buildings, parking lots, and other approved areas are not considered operating areas. Ear protection is to be worn when the employee is exposed to high noise levels. These areas will be posted.

Natural Soda will provide hard hats, non-prescription safety glasses, goggles, ear protection, face shields, and dust masks or respirators. Natural soda will reimburse the employee \$175.00/year for the purchase of prescription safety glasses. This allowance shall not be used for the purchase of contact lenses nor are contact lenses allowed at any time in the operating areas of nahcolite solution plant. Safety glasses with side shields will be utilized when employee is grinding or producing air borne particulate material.

An additional allowance of \$200.00/year shall be made by the Company toward the purchase of steel-toed shoes. An employee will be reimbursed, up to \$200 year, for the purchase of safety toed shoes with the presentation of a receipt for safety shoes to a safety administrator or representative. For additional information on this allowance program, contact your supervisor.

Various other safety devices and apparel may be required, depending on the nature of the work being done. Ask your supervisor to ascertain which safety devices and/or apparel is necessary to the job you are doing. For example, special gloves or boots may be necessary in or around the high temperature liquids at the operating plant. Special face shields and laboratory jackets may be required when working with some chemicals. If you are in doubt as to the

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

need for special personal protective apparel, contact your supervisor.

Suitable personal clothing shall be worn to work at all times. Long pants and short sleeved shirts are suitable. Absolutely no sleeveless shirts, cut-off shirts or short pants will be allowed in the operating areas of the plant. Medic-alert necklaces or bracelets shall be allowed in the operating area of the nahcolite solution plant as well as wristwatches and rings. To avoid injury by jewelry becoming entangled in moving parts, employees working on or around machinery shall remove all other jewelry during working hours. Long hair and beards may also need containment during working hours to avoid getting caught in machinery. Your supervisor shall determine when this extra precaution needs to be taken.

An additional requirement when working around the food grade process and exposure to pregnant liquor, wet crystals or dry product is the use of hairnets.

### **HOUSEKEEPING/FOOD GRADE REQUIREMENTS**

A clean and orderly work area is conducive to a safe working environment. Good housekeeping lessens the possibility of an accident and promotes more efficient job performance. **Employees are responsible for the appearance of their work area.**

1. Hand tools will be kept clean and in good working condition.
2. All cable and hoses will be located in such a manner that they do not pose a tripping hazard.
3. Nails protruding from lumber must be bent over or removed.
4. Beverage cans, bottles, and food wrappers shall be disposed of in appropriate waste receptacles.
5. If any kind of leak or spill occurs, clean it up at once. Various liquids can be very slippery. Extra precaution must be made to clean liquid spills from walk surfaces to prevent injuries caused by slipping. Any spilled flammable material, diesel or oil for example, must be cleaned up immediately and every precaution taken to avoid igniting the material.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

6. If repairs are necessary to avoid future leaks of solutions or flammable materials, report it to your supervisor at once.
7. All drainage must be kept clean and free from obstruction to eliminate the accumulation of solutions on plant site floor.
8. A job will not be considered finished until all tools and debris have been removed, stacked, stored, or disposed of properly.
9. Use hairnets when employee is exposed to food grade product which is under a vacuum, (above the centrifuge and in packaging when super sacking food grade product).
10. Eliminate roof leaks, which may contaminate food grade products.
11. Use food grade oil and lubricants for all machinery associated with food grade production.
12. Accumulation of bicarb dust should be removed to avoid contamination of food grade product.
13. All portions of food grade production should be enclosed, i.e. crystallizers, screens, centrifuge, screw conveyors, etc.
14. Two master sanitation schedules are maintained one in the control room and the other in packaging in their log book for routine housekeeping activity.

## **FIRE PREVENTION AND EMERGENCY PROCEDURES** **FOR FIRES**

Although the product at Natural Soda's nahcolite solution plant is not a flammable hazard, fire remains a serious consideration for all employees. Fire prevention consists of controlling the supply of flammable and combustible materials as well as any possible sources of ignition.

1. The dry terrain surrounding the nahcolite plant is a definite source of combustion and extra caution must be exerted extinguishing smoking

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

materials at the plant and in route. Always be certain your cigarette butt, match or pipe ash is out. Take the time to grind them underfoot or throw them in butt cans.

2. Oil, flammable liquids and grease shall be in containers provided for them. The containers must be labeled as to their contents.
3. Fire extinguishers are conveniently located throughout the plant, office building and remote work areas. These are provided for instant use. Do not pile or store materials in such a manner that they interfere with access to an extinguisher. Portable, ABC dry chemical extinguishes work for most types of fire. This is the most common extinguisher throughout the plant site. Halon extinguishes are supplied in control room and electrical control panels areas for electrical fires. Surrounding the plant are fire hydrants. Water extinguishment works well for most solid flammable fuel, for structure fires, and for cooling structures during brush fires, but should not be used on an electrical fire.
4. If you discharge a fire extinguisher or find one that is not charged, label it so it can be replaced in the correct location, and then take it to the warehouse for a replacement.

The first concern during a fire is the safety of the employees. If a fire should start in or near your immediate area, you have two options, depending on the size of a fire:

1. If, in your judgment, you can extinguish the fire, do so immediately.
2. If the fire is large enough that you don't feel you can safely extinguish it, or if you make an attempt but are unable to control the fire, leave the area and initiate a fire response team from Meeker immediately. Give them your name, the location of the fire, and the type of fire. The phone located in the Control Room can be used 24 hours per day for reporting emergencies. If necessary, locate and evacuate all other crewmembers from potentially dangerous situations.
3. A hazardous respiratory environment is present during fires. In certain

 Document Title		SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

areas of the plant, i.e. lab, hazardous products of combustion and chemicals should be evaluated for evacuation and fire suppression.

## PERSONAL INJURY ACCIDENTS

Move a seriously injured individual only if he is in imminent danger of further injury. Move the injured person carefully and only out of the danger zone. Call for additional medical assistance as soon as possible. Give the exact location of the accident, the type of accident, the seriousness of the accident, and your name. Return to the victim until more qualified medical personnel arrives. Notify your supervisor and the Control Room at the first opportunity and they will handle necessary reporting and notification.

**YOU MUST BE FAMILIAR WITH EMERGENCY PROCEDURES FOR A SERIOUS INJURY. KNOW HOW TO REACT SO THE INJURED PERSON CAN GET EMERGENCY TREATMENT AS SOON AS POSSIBLE. A LIFE MAY DEPEND ON YOU....**

Our emergency ambulance services are:

**Meeker Volunteer Ambulance**                      911 or 878-5047

**Rifle Volunteer Ambulance Rifle line**                      911

You must realize that the response time to the NS Project area is:

Rifle - 1hour    Meeker - 45 minutes

Our emergency flight service is:

**St. Mary's Air Life**    1-800-332-4923

Their response to our project is    29 minutes

Our physician advisors are    Grand River Medical Center  
501 Airport Road  
Rifle, CO 81650  
303/625-1100

Meeker, Rifle and St. Mary's have limited emergency response capabilities and must travel a great distance to our site. DO NOT CALL them for minor

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

injuries that can be transported in a company vehicle.

In case of a minor on-the-job injury, do not fail to notify your supervisor as soon as possible, but no more than four days after the injury. If the supervisor is not notified, the company cannot accept liability. If the injury does require professional attention, the supervisor will issue an authorization for medical treatment order that will accompany the injured person to Rifle Medical Associates or to the Emergency Room at the Rifle hospital. The injured employee who has been attended to by a physician must obtain a doctor's release. Unless the injured employee submits the release to his supervisor, he will not be allowed to resume work status. If employee is released for limited duty, supervisor must evaluate limitations and determine if limitations are compatible with job duties

First aid materials are available in the control and lunchrooms. These materials should be used as needed by employees. These should not be confused with medical supply boxes labeled "For E.M.T. Use Only" These are for the emergency treatment of serious injuries and are to be used only by qualified personnel.

# Air Life

MEDICAL TRANSPORT

Colorado 1-800-332-4923

All other States 1-800-525-4224

FLIGHT OPERATIONS

Medical transport

Page **12** of **71**

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Helicopter Landing Guide

- Select site, minimum 100X100 feet with unobstructed approach and departure corridors
- Pick up loose articles that may blow into rotors such as plastic tarps, sheet metal, lose clothes, rags.
- Remove obstructions over 6 inches tall at his point of intended landing. Or select another site.
- Order of preference landing pads:
 

Grass	Best
Asphalt	
Concrete	

/	Gravel	
Apply water to /	Slick rock	
These surfaces: \	Dirt, packed	
	\	Loose soil
	\	Sand
		Worst

- Wind Direction: Say “WIND IS FROM . . . “or if calm but has been blowing say “Wind was last from. . . but is now calm”. If wind is not calm give approximate wind speed.  
No radio: Stand at the edge of the landing site with your back to the wind, arms extended toward the site and in the same direction the wind is blowing.
- At night: Park a vehicle with lights shining across the intended landing site, and shining into the wind. Notify the pilot that you have done this. He will land into the wind whenever possible and in front of the vehicle with the lights giving wind direction and illuminating the landing site.
- Communicate: if you have a radio on site, give the frequency to the hospital on the initial call. The frequency is normally not printed on the outside of the radio, and may require writing it down on a piece of paper and taping it to the radio prior to an emergency situation. It may be under the battery cover, and should be a number such as 155.34 or 155.340 Hz (5 or 6 digits).
- If you have a radio telephone, call the mobile operator and have her call the hospital and give assistance in communications.
- Drill Rigs: Give legal description of drill site – (fill it in now)  
 Latitude: 39° 56'                      Longitude: 108° 19'  
 Township: T 1 S                      Range: R 98 W  
 Section: 26                      Radio Frequency: \_\_\_\_\_

Also give normal directions, i.e.: 10 miles west of Colorado/Utah border, in a canyon just north of Winter Ridge.

Lower geronimo line.

Make heliport at the edge of drill pad so helicopter can approach and depart into the wind, and not have to climb out over guy lines, pipe stanchions, trailer houses, TV antennas or other obstacles.

Advise pilot of any wires or obstructions, especially at night!

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

First aid training is recommended at the time of hire. Refresher training will be given as part of routine safety meetings. E.M.T. training is offered through local training institutions periodically. Employees are encouraged to take the more advanced training in emergency first aid. Supervisor approval should be obtained for reimbursement and paid time-off.

### **EMERGENCY GUIDELINES**

1. All employees will receive first aid training so that in an accident situation they are equipped with the knowledge and skill necessary to render first aid.
2. It is the intent of this safety policy document to provide a workable plan to ensure that medical treatment can be obtained at the earliest possible time.
3. Appropriate medical and first-aid supplies and equipment are provided by the company and maintained at well-marked locations.
4. Emergency telephone numbers are posted in control room.
5. Emergency notification procedures are posted at key locations.
6. Methods of responding to emergency situations are covered with each employee during safety training.
7. All emergency plans and procedures are reviewed periodically.
8. All job-related injuries will be seen and treated by Rifle Medical Associates or a physician at an Emergency Room.

### **Follow-up of Injured Employee Procedures**

#### A. Disabling Injury

1. Accompany the employee to seek medical treatment. Make sure a doctor at Rifle Medical Associates or at a Hospital Emergency Room sees the employee.

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

2. Express concern - determine extent of injury - obtain information pertinent to the accident.
3. Supervisor should notify family if warranted.
4. Revisit the employee periodically - telephone if necessary.
5. Upon return to work your Supervisor and Human Resources must receive a medical release from the attending physician. Review accident, stress need to prevent recurrence, review corrective action taken or to be taken.

#### B. Minor Injuries or Near Miss Accidents

1. Promptly review and discuss the incident - the cause and remedial action.
2. Emphasize that most accidents have serious injury potential.
3. View every minor injury and near miss accident as a warning that something went wrong. Identify the cause, and then take corrective action immediately.
4. In the case of an industrial injury that renders the employee incapable of performing his regular duties, he may be eligible for light duty.

### **Accident Analysis and Record Keeping**

Safety/Training will properly maintain up-to-date safety and training files on each employee. The safety and training file will document each employee's history and training received as a Natural Soda employee. Injury and property damage records will also be kept by safety/training. These records will be reviewed and analyzed frequently to diagnose trends and to identify areas that need attention.

### **Employee Safety Contacts**

All supervisory personnel shall discuss safety with individual employees at every appropriate opportunity. It is every supervisor's responsibility to

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

demonstrate Natural Soda's interest in and concern for employee's safety.

When an accident occurs, it should be reviewed and discussed with individual employees or in small groups. This discussion should identify cause, outline corrective action taken, or to be taken, and emphasize prevention.

Every employee is to understand that safe work performance is required, that violations of safety rules and procedures will not be tolerated and that disregard of safety rules can be the basis for disciplinary action including discharge.

**Job Observation**

As part of each employee's performance appraisal, the supervisor will identify any unsafe actions or unsafe work practices. A written assessment of the job observation will be recorded on the employee's performance appraisal form.

**ACCIDENT CONTROL PROCEDURES**

Adherence to the following procedures can reduce and/or eliminate unsafe practices, accidents, injuries and property damage.

**Accident Investigation**

Accidents, injuries (even those which may seem minor), and property damage; will require prompt and thorough investigation. The immediate supervisor performs this investigation as soon as possible after the occurrence and determines the cause factors of the accident. All accidents must be reported on the shift they occur. As soon as the necessary information has been collected and a determination of cause is made, effective corrective action must be implemented to prevent recurrence.

To speed the process of corrective action, the Supervisor's Accident Investigation Report form must be completed during the next shift in which the supervisor is on site. A photocopy will then be delivered to Safety. Safety uses the information from this report to complete insurance, state, and federal reports. Safety and operations management will investigate all accidents.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## VEHICLE OPERATION

Any person operating a propane, diesel or gasoline vehicle on site will adhere to all rules and regulations pertaining to vehicle operation. Natural Soda personnel who drive off site in Natural Soda vehicles must be familiar with the company regulations pertaining to this operation as well. These regulations are as follows:

1. You must have a valid driver's license.
2. You must obey all state and local traffic laws.
3. Only authorized or company personnel are to operate vehicles.
4. You must make a safety and maintenance check prior to operation of any vehicle or any piece of machinery. This will consist of checking the gas, oil, lights, tires; body damage, jack, spare tire, and making sure the windows are clean.
5. Use the equipment checklist when applicable.
6. No one shall ride in the back of a pickup.
7. Seat belts shall be worn at all times.
8. The driver is responsible for the safety of all his passengers.
9. The "open range" policy is in existence on Piceance Creek and on all county roads including the access road to project. Always drive with care and obey posted warnings.

Parking of personal vehicles is in designated areas only. The use of personal vehicles for company business must be approved by your supervisor prior to actual use.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## VEHICLE ACCIDENTS, "NEAR MISS" AND REPORTING PROCEDURES

All accidents involving any damage to vehicle or other property, no matter how slight, must be immediately reported to your supervisor. An investigation of the accident must be completed. If there is personal injury involved, a First Report of injury must be attached to the Accident Report.

Off-site accidents in company vehicles are to be investigated by the local law enforcement agency (state law requires all accidents be reported immediately), and reported to your supervisor.

A "Near Miss" is a before-the-fact report. It reports an unsafe condition before an accident occurs. The condition can then be corrected and a future accident avoided. A "Near Miss" can also be based on an event or occurrence that could have resulted in an accident. "Near Miss" reporting involves the use of the standard accident forms. Anytime you witness an incident or condition with the potential to cause substantial property damage or personal injury, it should be reported in a "Near Miss" format. The Accident Report form should be filled out as if the potential accident had occurred. The report should then be clearly marked "Near Miss".

### HAZARD COMMUNICATION

Hazard Communication and "Right-to-Know" legislation ensures that all employees at the NS nahcolite solution plant have available information concerning possible chemical hazards that may be encountered. Material Safety Data Sheets (MSDS) are specifically written to identify the levels of hazard, fire protection and first aid treatment for each chemical in use at the nahcolite solution plant.

MSDS information is kept in three-ring binders in the lunchroom. Posters with additional information on Hazard Communication are also posted in the lunchroom and laboratory. All employees are encouraged to review this information regularly and are expected to know proper procedures for a chemical emergency.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Hazardous chemicals are located throughout the plant. Most of the hazardous chemicals are located in the lab and in the plant area near the electrical control center. Hazardous material cabinets in the plant and shop contain paints and solvents. A steel connex, located behind the plant on the north side is being utilized as a storage shed which contains oils, lubricants, and other hazardous products as well as the waste oil. The cleaning products are located in the storage room between the bathrooms. The bicarb crystal enhancement chemical is located in the plant area near the water softener and the defoamer is located in plant near the dryers. Gasoline and diesel fuel tanks are located behind the plant on the north side.

Hazardous chemical handling procedures are noted on MSDS sheets and should be reviewed for proper product usage.

### **HAZARDS IN JOB PERFORMANCE**

Lifting and carrying materials many times may lead to over exertion, strain, pinching and crushing of parts of the body. When possible, use mechanical devices to lift heavy materials. Get help if you feel material is too heavy or unsafe to move alone and always use proper lifting and carrying techniques. Be certain of your footing, don't place your feet too far apart. Bend your knees and keep your back straight. Hold the load close to your body, and then **LIFT WITH YOUR LEGS, NOT YOUR BACK**. When two or more persons are carrying a long object, carry the object on the same side of both bodies. Set the ends down at the same time. Do not carry the object with the hands on the ends where they risk being pinched or crushed. Wear gloves when handling rough or sharp materials that could injure your hands.

Proper tool use consists primarily of using the proper tool in the prescribed manner. Carefully maintain all tools and equipment. Always wear safety glasses or other appropriate eye protection when using tools. When using a wrench, adjust it to fit the work, pulling the handle toward you. If you must push the wrench away from your body, take a secure stance and hold in case the wrench should slip. Power tools should be examined carefully before use. Check for exposed electrical connection and wiring. The third wire ground prong must be on all power tools. **DO NOT USE IF DEFECTIVE**. All

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

portable power tools must be equipped with a finger pressure control switch. Locks on switches are prohibited. The power tool will cease operating when dropped or when the pressure on the switch is released. Guards on all hand held power tools must never be removed.

Compressed gas cylinders shall be treated as if they are full. Do not transport cylinders with gauges on. Make certain valve caps are on. Oxygen cylinders must be stored 20 feet from all fuel or gas cylinders and gasoline and diesel tanks.

Acetylene tank gauge pressure must not exceed safe limits. All gauges and regulators must be kept free of oil and grease. Cylinders should be stored in an upright position, chained or tied to prevent them from tipping or falling and should always be transported in a carrier. **DO NOT EXPOSE CYLINDERS NEAR EXCESSIVE HEAT SOURCES.**

One of the best methods to prevent falls of persons is good housekeeping. It keeps the area free of stumbling and tripping hazards. However, this section will deal with some specific falling dangers:

1. Ladders must be used when there is work at elevated height. **DO NOT USE BOXES, CHAIRS OR MAKESHIFT STAGING.** Select the right ladder for the job. Do not use one that is too long or too short. Do not splice ladders together, or use a ladder that is damaged or appears unsafe for any reason. Do not use metal ladders near electrical circuits or power lines. Set a portable ladder on even, solid footing. Place it at an angle of about 75° with the floor or ground and never work above the third rung from the top of a portable ladder. **DO NOT STAND ON THE TOP OF A STEPLADDER.** Portable ladders are to have suitable bases and must be placed securely when used. Permanent ladders must be secured at both ends. There must be back guards for ladders over 20' high. **ALWAYS FACE THE LADDER WHEN CLIMBING UP OR DOWN AND HOLD ON OR GRIP WITH BOTH HANDS.** Carry tools in a sack over the shoulder so both hands are free to grip the ladder.
2. Stairways and walkways should be kept clear of all debris, loose

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

materials and ice. Maintain good illumination over all stairways and walkways. **DO NOT RUN ON STAIRWAYS.** Keep all floor openings or manholes covered or guarded. Any travel way more than 30° from the horizontal will be provided with handrails and all elevated walkways will be equipped with a proper handrail, mid-rail and toe-board. Report any broken railing to your supervisor immediately.

Mobile equipment shall **ALWAYS** be operated under power. At no time shall it be coasted. When not in use, all equipment must be left with hydraulically operated fixtures lowered to their lowest position or blocked; parking brake set, and switches shut off. Loaders must not be left idling for long periods of time. Cabs of mobile equipment must be kept free of extraneous materials. Operator will not permit persons to ride on or work from the bucket of the loader. Do not travel with the bucket in high position. The bucket must not be raised if there is any danger of contacting electric wires or other equipment. Do not raise the bucket on steeply inclined surfaces. No one shall work under the bucket, unless the bucket is properly blocked. Bucket must not be overloaded while tramming or loading.

Propane may be used as a primary heat system at remote locations. No smoking, open flames or other ignition sources are permitted near the propane tanks. High temperature liquids and lines under pressure could cause hazards at the Natural Soda nahcolite solution plant. Hot liquors, and water solutions will be up to 250° F and many lines will be pressurized. Take extra precautions around the hot liquid to avoid burns and use additional care in cleaning solution spills. Hot liquid can seep in through leather boot seams and cause serious burns before the boot can be removed.

Cool, sterile liquids should be utilized to treat hot liquor, or water exposure.

## **HEALTH STANDARDS**

### **Air Quality**

Natural Soda will endeavor to maintain an atmosphere of the highest quality in all working areas. It will be Natural Soda's policy to maintain employee exposure to airborne contaminants within limits not to exceed the threshold

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

limit values adopted by the American Conference of Governmental Industrial Hygienists and the Occupational Safety and Health Administration.

**Noise Exposure**

Natural Soda has conducted noise level surveys to ensure that employees are not exposed to noise levels in excess of the OSHA permissible Noise Exposures under regulations 1910.95 of CFR Title 29.

The following are the noise levels and exposure periods established by OSHA:

<u>Duration per Day, Hours</u>	<u>Sound Level dbA Slow Response</u>
12	87
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 Or less	115

Therefore, based on noise survey, most areas of the plant have 3-4 hour limits for noise exposure. But around boiler house, the bag house rotary valve, and air compressor the exposure limit is 15 - 30 minutes. Hearing protection, both ear plugs and radio muffs are available for protection of hearing loss. If there is any question of noise exposure use hearing protection equipment and/or contact safety representative. As other health exposures evolve, they will be evaluated as recommended by the National Institute of Occupational Health and Safety. The program as stated will comply with all federal and state laws. As the laws change they will be implemented. If necessary an employee and area exposures information logs will be maintained.

**ELECTRICAL HAZARDS AND PRECAUTIONS**

Following are types of potential electrical accidents that result in employee injuries:

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

1. Arcs resulting in burns.
2. Electrically generated heat resulting in burns or scalds.
3. Electrocutation or shock.
4. Property damage resulting from fire.

The following electrical procedures and precautions will reduce the possibility of injury by electricity:

1. Electrical repairs must be done by an electrician or by someone under his direct supervision.
2. All electrical lines must be regarded as live until they are tested and it is established that they are dead.
3. Electrical switches will be locked out before any electrical work is done. **NO ONE SHALL REMOVE ANOTHER PERSON'S LOCK, (see Lock Out procedures.)**
4. Metallic watchbands shall not be worn while doing electrical work.
5. Grounding reduces the possibility of electrical shock. All equipment shall be equipped with proper and effective grounds.
6. If disconnecting a circuit for any reason, disconnect the ground wire last. **NEVER DISCONNECT THE GROUND WHILE EQUIPMENT IS ENERGIZED.**
7. Any metallic box containing energized parts must be grounded.
8. **REPORT ANY DISCONNECTED OR BROKEN GROUNDS TO YOUR SUPERVISOR IMMEDIATELY.**
9. Electrical installations shall have suitable warning signs and grounds. All transformer stations shall be enclosed and all electrical panels and switch boxes shall be labeled to show what they control.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

10. Areas containing major electrical installations shall be entered only by authorized persons.
11. Power cables shall not be in contact with water. Where crossing is unavoidable, suitable insulation shall be provided.
12. Trailing cables and extension lines shall not be driven over. Do not expose cables or lines to sharp objects that might pierce the insulation and do not stand on a cable or cord.

**NATURAL SODA**  
**LOCKOUT PROCEDURE**

**Approval:** \_\_\_\_\_  
Plant Manager

**Date:** \_\_\_\_\_

**Approval:** \_\_\_\_\_  
Safety Manager

When a piece of equipment or machinery is to be inspected, cleaned or repaired, that piece of equipment must be immobilized prior to commencing work on the equipment. The following procedure will be followed:

1. Each employee or crew will use locks and/or lockout tags for this lockout procedure. Tags will be used to identify who installed the lockout device and the reason for the lockout.
2. The locks are to be used to lockout electrical switch gear at the circuit breaker, power center, or disconnect, and to tag with the lockout tags or other safety lock out devices, hot liquor valves, steam valves, water valves, chemical valves, etc.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

3. If more than one individual or crew is working on the same piece of equipment at the same time, each employee or crew is to have his/her own lock on the lockout device. If someone has locked out the equipment, do not assume this provides for your personal protection. The primary responsibility belongs to each individual. If the primary device will not accommodate each individual's lock, multiple locking devices are to be used and are available from lockout supply box in control room.
4. When multiple locking devices are required, the shank of the multiple devices must immobilize the equipment and must not merely be attached to the shank of another lock.
5. Before work commences, the employee will make certain that the equipment is immobilized by attempting to start the machine or equipment after it has been locked out and while everyone is in the clear.
6. All other necessary precautions such as opening or closing valves, draining lines and tanks, and tagging and locking valves, installing blind flanges etc., will be preformed prior to starting the job.
7. If any employee has any doubt as to the lockout locations, lockout procedures, job procedures or any other questions pertaining to the job assignment, ask your co-worker, supervisor, or safety coordinator for assistance and clarification.
8. During the work assignment, if the equipment must be operational, the following precautions must be taken:
  - a. Make certain the area is clear.
  - b. Advise fellow workers of procedure.
  - c. All locks or tags removed.
  - d. Before returning to work on the equipment, replace lockouts. Check to make sure everyone is clear, and then retests the equipment to insure that it is immobilized.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

9. All work performed on the equipment will be accomplished in a safe and prescribed manner.
10. Before leaving the job at shift end or upon completing the job, the employee will remove his lock. If lockout requirement is not completed at shift change, a lockout tag will be utilized temporarily between shift changes and until new shift personnel replace the tag with a lock. This should be done as soon as possible. A lockout device that is utilized for more than one shift, shall be noted in operator's log book and discussed with new shift crews. When the employee has completed working on the equipment, the employee will notify the operating crew responsible for the equipment that the equipment has been released. This will be done only after all guards have been replaced and no hazardous operating or working conditions are left. The employee will clean up maintenance debris and materials.
11. If the individual who put the lock or tag on the equipment is not available, the lock will NOT be removed until complete check of the equipment has been made by the operating crew on the new shift. This crew will determine if the equipment is safe to operate.
12. In the event that standard lockout switches are not available to immobilize mobile equipment, fuses shall be pulled, terminals disconnected, or other standard safety procedures applicable to the individual piece of equipment shall be followed. Then tag the particular device with a DO NOT OPERATE sign and sign it. On standard ignition systems, keys will be removed and tagged. If in doubt, check with the operating crew in charge of the equipment.
13. This is a "General Lockout" procedure and does not encompass all special tasks that require safety lockout. There are specific lockout procedures for those tasks that are unique and do not fall under the "General Lockout" procedure. Check with you supervisor should you have any questions about special tasks requiring lockout. On standard ignition systems, keys will be removed/ tagged.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## **MAINTENANCE AND MECHANICAL SHOP PRACTICES**

Equipment brought into the shop for repairs or maintenance will be tagged, "DO NOT OPERATE" until all service of the equipment is complete. All equipment must be properly blocked up with good blocks, carefully aligned, before anyone works underneath. Make sure all personnel are in the clear before starting an engine. Block the wheel on all equipment in the shop area for repairs. No cleaning, repairs or adjustments shall be made on any machinery while in motion. Rough edges and burrs on iron and steelwork must be ground off before they leave the shop. Do not use fuel oil, cutting compounds or solvent to clean hands.

1. When work is performed on mobile equipment in the maintenance shop, no one will be allowed in the cab of the vehicles or equipment, unless their work involves the cab area and operator assistance is specifically requested by repair personnel.
  
2. A tag shall be placed on the access steps or inside the cab of the unit reading; "DANGER - DO NOT START - EQUIPMENT LOCKED OUT".
  
3. When equipment is under repair or being serviced in the field, the operator will not be allowed to remain in the cab of the unit. Before returning to the cab, the operator will determine, by asking and looking, that the work is complete and all employees are in the clear. All warning signals will be given by the operator before starting and moving the unit.
  
4. All employees assigned to work while exposed to moving components of stationary equipment shall comply fully with the requirements of the lockout and tagging procedures.

## **CUTTING AND WELDING PIPE PROCEDURE**

### **Purpose**

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

The purpose of this procedure is to protect employees from injuries and equipment from damage. Compliance with this procedure is mandatory.

**Policy**

1. Pre-job planning is required in any designated "Flammable" or "No Smoking" area and/or in any tank, vessel, sewer, or similar enclosed space; or on pipelines where flammable liquids or flammable materials are handled or utilized. Hot work permits must be utilized and posted.
2. The pre-job planning will be initiated by a NS supervisor at the scene of the job; by the supervisor for the specific work area. The planning must be completed for work prior to the commencement of any cutting or welding.
3. The person responsible for planning the job will be the operating supervisor or his designee.

**Procedure**

1. The supervisor will initiate the pre-job planning for a particular job, giving a description of the work to be done including any hazards involved and protective equipment to be worn or used. The supervisor must be familiar with the job to give proper safety instructions. The supervisor will fill out a hot work permit and document the pre-job planning in the daily shift report.
2. The authorized supervisor will:
  - a. Brief the maintenance personnel on the safety requirements.
  - b. Review the scope of the job with maintenance.
  - c. Determine potential safety hazards in the area relative to type of products in the unit, surrounding areas and make proper preparation to insure job safety.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

- d. Proceed to the site and make a thorough inspection. All precautions will be observed during welding activity. All lines and vessels will be cleared properly. Fire watch procedures will be initiated. A trained person will check the atmosphere for flammable vapors. If the job entails tank entry, hazardous entry evaluation must be performed and all line and valves properly locked and tagged. If applicable, the line breaking regulations should be reviewed.
- e. During pre-job planning the supervisor must insure that all the rules are satisfactorily complied with and the appropriate precautions reviewed. The employee will review the job with supervisor and the work will commence.
- f. Upon completion, the maintenance personnel will remove any lockout devices and the site will be inspected within a half-hour after the work is completed.

**Responsibility For Work Area**

1. It is the responsibility of supervision to see that no work is started in a building, area, or unit before the proper planning has been completed.
2. Employees must not start any job until the pre-job planning is properly completed.
3. Pre-job planning and review must be performed for each job in an area or different shifts.
4. Review of pre-job planning and documentation should identify individuals, who will be involved with the job.
5. Remove anything that could burn from the area, including below or cover anything that can't be moved with fireproof material.
6. Make sure area has adequate ventilation.
7. The operating supervisor is responsible for seeing that conditions remain safe while work is in progress and that work proceeds in accordance with

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

any special instructions identified in planning the job.

8. Responsibility for proper conduct of work rests with the supervisor who is responsible for the prevention of accidents to the best of his knowledge and skill.

**Issuance Rules**

1. No work shall commence until the operating supervisor has inspected the area; he must personally inspect the area and be satisfied that conditions are and will remain safe while the work is being carried out.
2. Where gas tests are necessary, the policy on gas testing will be strictly enforced. The person inspecting for gas will be a trained Natural Soda employee. Confined space entry permits will be utilized as required.
3. Pre-job planning will evaluate safety equipment, protective clothing requirements, asphyxiation, fire and explosion potential.
4. The responsibility for determining whether a combustible gas test is necessary rests with the supervisor of the work. He will make the necessary arrangements for gas testing. The supervisor in each case should witness the test if a gas test is required.
5. The supervisor will post a fire-watch in the immediate area during all jobs that involve flammable materials. Flammable materials must be covered or water wetted for a minimum of 50' from cutting and welding work.
6. The supervisor will assign a fire-watch to periodically check the work area for an additional 3 hours after work completion. If the work area is washed down, the need for periodic fire check is precluded.
7. A Firewatcher is an employee, who stands at a job site in a potentially hazardous area, watching for and preventing a fire from starting or spreading.
8. Equipment that could serve as an ignition source such as a disc-grinder or an arcing-electrical switch requires pre-job planning.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

9. Fire extinguishers hanging in the area are not considered fire watch extinguishes. They are for emergencies only.

**Emergency Procedures**

In case of fire, initiate the fire emergency procedure. If reporting to Meeker Volunteer Fire Department or BLM is necessary, give your name, the fire location and severity. Also indicate if anyone is injured and if so, how serious to facilitate proper emergency procedures.

**Questionable Hazards**

Whenever there is any question as to a hazardous exposure and the person doing the work takes exception to the decision of the supervisor, the matter will be referred to the person in the next higher authority for a decision. The safety representative can also be consulted.

**HAZARDOUS ENTRY - CONFINED SPACE ENTRY**

1. The immediate supervisor of a crew must do a hazard evaluation before work is started in any confined area. Examples of confined spaces include: manholes, stacks, pipes, process and storage tanks, tank cars, pits, sumps, hoppers, bins, abandoned areas, and other similar hazardous locations.
2. Before entry is made into a confined space, a hazardous entry evaluation shall be performed and noted in logbook.
3. Atmosphere within the confined space shall be tested to determine that the air is breathable and contains sufficient oxygen. Employees shall not be permitted to work without approved air supplied personal protective equipment where the oxygen content of the air is less than 19.5% by volume. Employees will be trained to use the oxygen analyzer and combustible meter.
4. Prior to entry into a confined space, a plan of action must be prepared

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		NATURAL SODA – CONFINED SPACE ENTRY PERMIT					

LOCATION: _____	DEPARTMENT: _____
	DATE: _____
CONFINED SPACE TO BE ENTERED: _____	
PERMIT EXPIRATION DATE: _____	TIME: _____
DESCRIPTION OF WORK TO BE PERFORMED: _____	

which provides a means of rescue from the confined space in the event of an emergency.

5. Each employee entering a confined space shall use a safety belt, equipped with a lifeline, if breathable atmosphere is questionable.
6. Prior to entry into the confined space, emergency equipment such as lifelines, safety horn, and other devices appropriate to the situation must be ready and immediately available.
7. At least one person must be immediately available outside the confined space to provide assistance if necessary.
8. Whenever employees are required to enter into confined spaces containing power drive equipment or into "pinch point" areas of mobile equipment, they will insure there is no possibility of inadvertent movement or accidental starting of the equipment (see lockout procedures).
9. Additional evaluation may be required (i.e. - lockout, welding and cutting, etc.) before entering a confined space, make sure they have all been evaluated properly before work commences. The hot work permit shall be utilized to help ensure safety.

**NATURE OF HAZARDS IN CONFINED SPACE: (check)**

- \_\_\_\_\_ Oxygen deficiency (less than 19.5%)
- \_\_\_\_\_ Flammable gases or vapors (greater than 10% of the lower flammable limit, or greater than 23.5% oxygen)
- \_\_\_\_\_ Toxic gases or vapors (greater than the permissible)

**EQUIPMENT REQUIRED FOR ENTRY AND WORK: (check)**

- \_\_\_\_\_ Lifeline and safety harness
- \_\_\_\_\_ Protective clothing
- \_\_\_\_\_ Fire extinguishers
- \_\_\_\_\_ Emergency escape retrieval

		Document Title		SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released		
Document Owner		Clark, Michael							

- |                                     |   |
|-------------------------------------|---|
| _____ equipment                     | _____   |
| _____ exposure limit)               | _____ Respiratory protection (specify):                             |
| _____ Mechanical hazards            | _____ Communication aid (specify):                                  |
| _____ Electrical hazards            | _____ Rescue equipment (specify):                                   |
| _____ Materials harmful to the skin | _____ Protective equipment (specify):                               |
| _____ Engulfment                    | _____ Ventilation required (specify):                               |
| _____ Configuration hazard          | _____ Other (specify):  |
| _____ Other:                        | _____ Attach hot work permit for welding, cutting or other hot work |
|                                     | _____ Employees informed of specific confined space hazards         |
|                                     | _____ Entry work procedures reviewed with each employee             |
|                                     | _____ Ventilation to provide fresh air                              |

**PREPARATION: (check)**

- \_\_\_ Isolated, disconnected, or blinded, valves closed, locked, and tagged
- \_\_\_ Electrical switches locked, tagged, and tested
- \_\_\_ Rotating parts blocked
- \_\_\_ Belt/coupling removed
- \_\_\_ Cleaned, drained, washed, purged
- \_\_\_ Secure area, document in notes section, tape and tag openings into confined space
- \_\_\_ Atmospheric tests are in compliance
- \_\_\_ Continuous monitoring for \_\_\_\_\_  
SUBSTANCE
- \_\_\_ Personal \_\_\_\_\_
- \_\_\_ Area \_\_\_\_\_
- \_\_\_ Duration of Work \_\_\_\_\_
- \_\_\_ Other \_\_\_\_\_

**ELECTRICAL EQUIPMENT/TOOLS:**

- \_\_\_\_\_ Low voltage
- \_\_\_\_\_ Ground-fault current interrupters
- \_\_\_\_\_ Approved for hazardous locations
- \_\_\_\_\_ Lighting (explosion proof)

\_\_\_ Rescue squad available (notify Security)  
 The rescue squad only has to be available for entry into confined spaces that pose an engulfment hazard, configuration hazard, or where dilution ventilation will not control and atmospheric hazard.

TEST	Allowable Limits	If Required	Result	Result	Result	Result	Result	Result
			AM	AM	AM	AM	AM	AM
			PM	PM	PM	PM	PM	PM
Oxygen-min.	19.50%							
Oxygen-max	23.50%							
Flammability	10%LEL							
H <sub>2</sub> S	10ppm							
Cl <sub>x</sub>	.5 ppm							
NH <sub>3</sub>	25 ppm							
CO	50 ppm							
CO <sub>2</sub>	5000 ppm							
Heat	°F/°C							
Other								

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Name of employee conducting atmospheric monitoring: \_\_\_\_\_

Instrument(s) used: \_\_\_\_\_

NOTES: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

AUTHORIZED NS ATTENDANTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

AUTHORIZED NS ENTRANT: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**AUTHORIZATION:**

I certify that all required precautions have been taken and the necessary equipment is provided for safe entry and work in the confined space.

**ENTRY SUPERVISOR OR HIS DESIGNEE ISSUING CLEARANCE:**

PRINT NAME: \_\_\_\_\_  
 SIGN NAME: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

**ENTRY CAN ONLY BE AUTHORIZED BY THE FACILITY MANAGER OR HIS DESIGNEE**

FACILITY MANAGER: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

The contract representative's signature indicates they have reviewed the precautions and will provide the necessaut equipment to provide for safe entry and work in the confined space. Contract employes are only allowed entrance into the confined space after receiving proper instructions from the contracting organization and signing in on their contractor entry form.

CONTRACT REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 CONTRACT COMPANY: \_\_\_\_\_  
 CONTRACT REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 CONTRACT COMPANY: \_\_\_\_\_  
 CONTRACT REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 CONTRACT COMPANY: \_\_\_\_\_

**FINAL RELEASE BACK TO OPERATIONS:**

CONTRACT REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 CONTRACT REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

CONTRACT REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

ENTRY SUPERVISOR OR HIS DESIGNEE COMPLETEING CLEARANCE:

PRINT NAME: \_\_\_\_\_  
SIGN NAME: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

PERMIT REVIEWED BY FACILITY MANAGER:

FACILITY  
MANAGER: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## **LINE BREAKING**

The purpose of the Line Breaking Procedure is to protect employees engaged in work that requires line separation or replacement.

### **Line Breaking Procedure**

1. Each employee assigned a task requiring line breaking will be advised of the associated safety and/or health hazard.
2. All necessary evaluation will be completed by the production supervisor prior to commencement of the work.
3. Prior to work, the operator must ensure that lines are empty and purged of all contaminants. All feed lines will be secured by locking and tagging the valves or blinding the lines.
4. If the substance normally circulated in the line is of a toxic nature (gases or vapors), then one of the following precautions will be taken to protect the employee (s):
  - a. An air-monitoring device will be operated during work activity.
  - b. Adequate flow-through ventilation will be provided to eliminate toxic concentrations of gas or vapors. Periodic monitoring will be made to insure air quality.
5. Consideration will be given to whether protective clothing is required during line breaking to protect against contact with substances irritating to or absorbed by the skin.
6. An adequate supply of water shall be provided when there is a possibility of contact with an irritant or hazardous material.
7. Production operators will secure the area by tag warning tape. This will include areas below the breaking point to prevent accidental spilling on persons at a lower level.
8. Adequate and substantial scaffolding shall be provided with adequate

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

escape routes.

9. Cutting and welding pre-job panning will be performed, when required, prior to the start of the job (refer to Cutting & Welding Section.)
10. All pump and motor starters shall be locked out prior to the beginning of the job. All heat tracing tape and steam tracing lines associated with the line to be broken shall be shut off, locked and tagged.

### PLANT ATMOSPHERE

**Carbon Dioxide** (CO<sub>2</sub>) can be evolved from the liquid or solid state of sodium bicarbonate. If enough carbon dioxide is evolved, it can displace oxygen creating a hazardous environment. This could take place in the crystallizers or in the storage building. Oxygen monitoring will be required in and around these areas as the depletion of oxygen monitoring can cause serious damage to the respiratory tract and death. At high temperatures this evolution takes place rapidly and by the time a victim may notice the effects of oxygen deficiency, permanent physical damage, even death, may be inevitable. Immediately take a victim to fresh air. Oxygen has to be administered very carefully and with a physician's assistance.

Ventilation disbursts bad air and maintains a constant supply of fresh air throughout the plant and storage building. No change may be made to the ventilation or exhaust systems without consulting the plant management.

Hazards to the lungs are not always easy to detect. Some of the most common hazards are the lack of oxygen and the presence of harmful dust, fogs, smokes, mists, fumes, gases, vapors, or sprays including substances that may cause cancer, lung impairment, and diseases or death. Respirators prevent the entry of harmful substances into the lungs during breathing. If a respirator is required for certain work in the plant where engineering controls cannot adequately prevent atmospheric contamination, your supervisor will be responsible for supplying and fitting the proper respirator for the job. You are responsible for wearing the respirator and complying with the program.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## GASES

There are two (2) gases that may be encountered during operations at the nahcolite solution plant or in the event of a fire.

Carbon Monoxide	CO
Hydrogen Sulfide	H <sub>2</sub> S

It is important that all employees know how to identify the presence of these gasses and the precautions to be taken with each.

Hydrogen Sulfide is a flammable, highly toxic gas. H<sub>2</sub>S can burn in the air and explode upon ignition when mixed in a certain concentration with the air. Because H<sub>2</sub>S is heavier than air, it will travel near the ground for considerable distances. It could reach a source of ignition and flash back.

H<sub>2</sub>S smells like rotten eggs at first, but it rapidly deadens the senses of smell and causes the eyes and throat to sting. If an employee has reason to believe H<sub>2</sub>S is present, evacuate the area immediately and notify the supervisor. Exposure to higher concentrations of H<sub>2</sub>S will cause the victim to lose sense of reasoning and balance. Respiratory paralysis sets in after a few minutes. In an even higher concentration, H<sub>2</sub>S causes the victim to become unconscious instantly. Permanent brain damage or death could result unless the victim is promptly rescued and removed to fresh air. **ANY PERSON OVERCOME BY H<sub>2</sub>S MUST HAVE ARTIFICIAL RESUSCITATION IMMEDIATELY UPON REACHING FRESH AIR.**

To rescue a victim apparently overcome by H<sub>2</sub>S a person with a life live will use a gas monitor devise to enter the area and remove the victim, if hazardous levels of gas are detected, additional ventilation will be utilized prior to entry. Carbon Monoxide would be present in the event of fire. It is colorless, odorless and tasteless. Like Hydrogen Sulfide, Carbon Monoxide is highly toxic. It is classified as a chemical asphyxiate. CO combines with the red blood cells in place of oxygen.

As a result, the blood no longer delivers oxygen to the body. Exposure to very small concentrations of CO over a period of time results in a headache, the

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

severity of which varies according to the amount of CO in the atmosphere. At an increased concentration, an individual will experience a severe headache, weakness, dizziness, nausea and vomiting, dim vision and collapse. In high concentrations there is coma with intermittent convulsions, depressed heart action and respiration, and possible death. **THE TIME OF EXPOSURE TO CARBON MONOXIDE IS AN IMPORTANT FACTOR.** The longer the exposure, the more severe are the effects. Exposure to 0.5% CO by volume for one hour will cause respiratory failure and death.

To affect the rescue of someone apparently overcome by CO, a life line and gas monitor will be utilized to enter the area and remove the victim. If hazardous levels of gas are detected additional ventilation will be utilized prior to entry. Monitoring of oxygen, hydrogen sulfide and explosive gases will be done on a regular basis at the nahcolite solution plant.

**NATURAL SODA**  
**SAFETY STANDARD CONFINED SPACE ENTRY LIST**

**Purpose and Scope**

The attached confined space list identifies all of the current confined spaces at the Natural Soda Nahcolite Facility.

**Procedure**

The attached confined space list must be reviewed prior to any confined space entry to determine ventilation and atmospheric testing requirements. Each confined space entry must have an outside attendant.

**Confined Space List**

Qualified Confined Space Personnel and Designed List

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Approved by

 Document Title		SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Natural Soda

Confined Space Name	Ventilation	Atmospheric Test		Outside Attendant
		Yes	No	
Raw Water Tank		X		X
Wash Water Tank		X		X
Pregnant Liquor Tank	X	X		X
Process Water Tank	X	X		X
Barron Liquor Tank	X	X		X
#1-#4 Crystallizers	X	X		X
Flash Dryer Fire Box	X	X		X
Water Softener Tanks	X	X		X
Cyclone			X	X
Bag house			X	X
Coarse Bin			X	X
Fines Bin			X	X
Bagging Hoppers			X	X
Cooling Tower			X	X
Storm Water Drain		X		X
Boilers		X		X
Air Separator	X	X		X
S-101 Bin	X	X		X
S-102 Bin	X	X		X
S-103 Bin	X	X		X
S-104 Bin	X	X		X
S-105 Bin	X	X		X
Load Out Dust Collector			X	X
Product Storage Dome*			X	X

 Document Title		SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**NS Qualified Confined Space Personnel**

Name	Entrant	Attendant	Entry Supervisor
Asselin, Jeff	X	X	
Blazon, Donald	X	X	
Bryant, Joe	X	X	
Clark, Michael	X	X	X
Cudo, Gayla		X	
Denney, Deric	X	X	
Denney, Thomas	X	X	
Eichman, John	X	X	
Evans, Ronald	X	X	
Gilstrap, Nancy		X	
Kilduff, Howard	X	X	
Kilduff, JAK	X	X	
Kurth, Dennis	X	X	
Kurth, Eric	X	X	
Kurth, Jed	X	X	
Kurth, Troy	X	X	
Lees, Paul	X	X	
Loar, Thadius	X	X	
May, Shiloh	X	X	
McFarland, Tim	X	X	
McGruder, Rhawnie		X	
Mee, Aaron	X	X	
Merriam, Gary	X	X	
Meyer, Carl	X	X	X
Meyer, T.J.	X	X	
Murray, David	X	X	
Otto, Jason	X	X	
Payton, Mike	X	X	
Pfister, Raymond	X	X	
Posey, Kevin	X	X	X
Pritchard, Dean	X	X	
Randall, Donald	X	X	
Reck, Jamie		X	
Reck, Leonard	X	X	X
Ruder, Tyson	X	X	

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Shoup, Richard	X	X	
Simms, Eric	X	X	X
Stewart, Dave	X	X	
Strope, Gary	X	X	
Taylor, Jere	X	X	
Warneke, Bob	X	X	X

**Lead operators are also qualified to be Entry Supervisors.**

The following Natural Soda personnel are authorized to sign the confined space form:

Michael Clark  
 Carl Meyer  
 Kevin Posey  
 Leonard Reck  
 Eric Simms  
 Bob Warneke

		Document Title						SAFETY MANUAL							
Doc #		S-100-M		Revision Date		06/07/2013		Revision		1		Status		Released	
Document Owner				Clark, Michael											

**NATURAL SODA SAFETY STANDARD**  
**PRODUCT STORAGE DOME ENTRY PROCEDURE**

**Purpose and Scope**

The purpose of this entry procedure is to protect all Natural Soda employees from the moving conveyor on the floor of the dome and of the possibility of engulfment by sodium bicarb while performing work inside the dome. This procedure will not pertain to the overhead walkway at the top of the dome. The procedure will be divided into two parts, allowing foot traffic into the product storage dome and allowing the loader into the product storage dome. This procedure must be followed at all times.

**Procedure**

- 1.0 Allowing foot traffic into the product storage dome.
  - 1.1 Before foot traffic entry into the product storage dome can be authorized the ground floor conveyor must be properly locked out. The inside of the dome must be checked to be sure that there are no large piles of product that could slough off and engulf an entrant. If there are large piles of product, the loader operator must be contacted and those piles knocked down by the loader before entry can take place. Once this is accomplished the entrant must notify another worker, in the immediate area that he/she is entering the product storage dome and what length of time they expect to be in that area. All visitors and contractors, who may be involved in entry into the product storage dome, must have permission from the management of Natural Soda to enter. At least one entrant must carry a radio when entering.
  - 1.2 After the work is complete the entrant (Natural Soda employee or visitor/contractor) must notify the additional worker that they have exited the dome. The ground floor conveyor can then be unlocked.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## 2.0 Allowing the front end loader in the product storage dome.

- 2.1 The loader operator can operate the loader inside the storage bin after he/she has notified another worker in the area that they are entering the product storage dome and what length of time they expect to be inside. The loader operator must carry a radio inside the dome. At no time should the loader operator leave the cab of the loader until after they have exited the dome. If the loader breaks down or there is an emergency, the loader operator must notify an additional worker in the area to watch him/her, from outside the large door at the front of the dome, as he/she leaves the dome.
- 2.2 The loader operator must routinely knock down any walls over 10 feet in height that are not supported and have accumulated inside the product storage dome. This will be accomplished at the discretion of the loader operator and the supervisor in the area. The purpose of this routine is to reduce the possibility of engulfment for any foot traffic as well as for those operating the loader.
- 2.3 Additionally the dome must be posted with a sign stating:  
**AUTHORIZED PERSONNEL ONLY**, the employees of Natural Soda or the visitors and contractors authorized by Natural Soda management are allowed to enter the product storage dome.

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Approved

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**NATURAL SODA SAFETY STANDARD**  
**HAZARD COMMUNICATION COMPLIANCE PROGRAM**

The hazard communication compliance program is established to provide for the safety of all Natural Soda employees, while also meeting all government requirements, which will include container labeling and other forms of warning, material safety data sheets (MSDS) and employee training.

The following written hazard communication compliance program has been established for Natural Soda nahcolite solution plant. The written program will be available for review by any interested employee.

Prior to starting work, each new employee of Natural Soda will attend a health and safety orientation. After attending the training class, each new employee will sign the hazardous communication training certification to verify that they attended the training, received our written materials, and understood this company's policies on hazard communication.

Prior to a new chemical hazard being introduced into any section of the nahcolite solution plant, each employee of the affected area will be given information as outlined in this written compliance program.

**Employee Training and Information**

The following information will be covered with each new employee during his/her safety and health orientation:

1. An overview of the hazard communication requirements.

The hazard communication standard (HazCom) is intended to ensure that both employers and employees are aware of potential hazards associated with chemicals in their workplace.

2. A review of the chemicals present.

We use a variety of products. Many of these products contain one or more hazardous chemicals. Most of the products we use can be grouped by their basic function or use. We will discuss which

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

products fit into each group and will identify the associated hazards and how to detect and control them through engineering or administrative controls, as well as through the use of personal protective equipment. A list of the chemicals potentially found on our project is found in MSDS file next to the lunchroom.

3. The location, availability and contents of our written hazard communication program and MSDS.
  - a. The written plan is available in every safety manual distributed to new employees, as well as in the safety department files.
  - b. Updates will be distributed periodically. These should be placed in each employee's policy notebook.
4. How to detect the release of hazardous chemicals in the work area.
5. See individual MSDS, the safety coordinator or area supervisor for detail.
6. Physical and health hazards of the chemicals by using good work practices; personal protective equipment, etc.
7. See individual MSDS, the safety coordinator or area supervisor for details.
8. How to lessen or prevent exposure to hazardous chemicals by using good work practices; personal protective equipment, etc.
  - a. The new employee safety and health orientation will cover areas pertaining to necessary protection for chemical handling. Additional information may be obtained on MSDS or from area foremen and the safety coordinator.
  - b. Periodically, employees will be required to perform hazardous non-routine tasks. Prior to starting work on such projects, each affected employee will be given information by their supervisor about hazardous chemicals to which they may be exposed during such activities.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

9. This information will include:

- a. Specific chemical hazards.
- b. Protective/safety measures the employees can take.
- c. Measures the company has taken to lessen the hazards including ventilation, respirators, presence of another employee, and emergency procedures.

10. Emergency and first aid procedures.

- a. See individual MSDS, first aid posters placed throughout the nahcolite solution plant or the safety department for information on procedures for certain chemical hazards.
- b. Attendance at regularly scheduled first aid training and emergency procedure training is required of all employees.

11. How to read labels and MSDSs to obtain hazard information.

- a. The safety coordinator, or other responsible person, will verify that all containers received for use will:
  1. Be clearly marked as to the contents of the container.
  2. Note the appropriate hazard warning.
  3. List the name and address of the manufacturer.
- b. The safety coordinator, or other responsible person, will assure that all secondary containers are labeled with either an extra copy of the original manufacturer's label or with the "central stores" general labels which have a block for identity and blocks for the hazard warning.
- c. Our employee training program has been developed on the basis of groups or types of hazardous chemicals used and the common hazards associated with the group or type of chemicals. For specific hazard information on individual substances, the Material Safety Data Sheets (MSDS) must be reviewed.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

12. The training will cover the following:
  1. An overview of the hazard communication requirements.
  2. A review of the chemicals present.
  3. The location, availability and contents of our written hazard communication program and MSDSs.
  4. How to detect the release or presence of hazardous chemicals in the work area.
  5. Identify physical and health hazards of the chemicals found at Natural Soda.
  6. How to lessen or prevent exposure to hazardous chemicals by using good work practices, personal protective equipment, etc.
  7. Emergency and first aid procedures.
  8. How to read labels and MSDSs to obtain hazard information.
  9. The location of our MSDSs.
  
13. You should read product labels before working with a hazardous substance. Each label will have the identity of the hazardous chemical and a hazard warning. Original container labels will also have the name and address of the manufacturer.
  1. The label should serve as a reminder of the information we are presenting in this training session and of the information found in more detail on the MSDS.
  2. It is essential that you read the hazard warning and use the chemical as prescribed by the label. If you have any questions about a specific label, ask your supervisor or refer to the MSDSs.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

14. Material Safety Data Sheets provide a great deal of information about the chemicals we use. The chemical manufacturers are responsible for providing us with MSDSs sheets. MSDSs, for chemicals potentially found on our plant site, are available in the lunchroom and in the safety office.
15. The location of our MSDSs.
  - a. The safety coordinator will be responsible for obtaining and maintaining the data sheet system for the Natural Soda nahcolite solution plant.
  - b. All incoming data sheets will be reviewed for new and significant health/safety information. This information will be passed on to those employees affected by the information.
  - c. A copy of MSDS for all hazardous chemicals to which employees in the plant may be exposed will be kept in the lunchroom.

### **Informing Subcontractors and Other Contractors Onsite**

It is the responsibility of the project engineer and/or safety coordinator to provide subcontractors and other contractors on site with the following information:

1. Identify and location of hazardous chemicals to which they may be exposed while on the plant site.
2. Precautions their employees may take to lessen the possibility of exposure by usage of appropriate protective measures.
3. Where Material Safety Data Sheets (MSDS) are located.
4. An explanation of the labeling system used by this company on the plant site.



	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

### Natural Soda Potential Hazard Categories for

Substance	Physical Hazards			Health Hazards		
	Flammable Combustible	Compressed Gas	Systemic Poison	Irritant Dust	Corrosive	
Acetylene	X	X				
Acetone	X		X	X		
Alcohol solvents	X		X			
Carbon Dioxide	X	X	X			
Carbon Monoxide	X	X	X			
Cleaners	X			X		
Compressed Air	X			X		
Diesel Fuel	X		X	X		
Epoxy Resin	X		X	X		X
Freon	X	X	X			
Gasoline	X		X	X		
Glues	X		X			
Hydrochloric Acid						X
Lime						X
LP Gas	X	X				
Lubricants	X					
Mastics/Adhesives	X		X	X		
Paint	X		X	X		
Paint Stripper	X		X	X		
Pipe Joint Compound	X		X	X		
Portland Cement				X		
Propane	X	X				
Sulfuric Acid						X
Turpentine	X		X			
Waterproofing			X	X		
Water Treatments						X
Welding Rods			X			

### Common Chemical Products

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**NATURAL SODA SAFETY STANDARD**  
**BLOOD BORNE PATHOGENS**

**Purpose and Scope**

To explain the risks of exposure to human blood and body fluids as well as the protective procedures and precautions that must be followed by workers in health care, emergency response and other jobs with risk potential. Although Natural Soda employees are "undesigned" first aid providers, this plan provides a standard in case an employee should be exposed to a potentially infectious material.

**Procedure**

The procedures and requirements included in the Blood borne Pathogens Standard should be understood when responding to an emergency on or off the job. Documentation included in this standard will identify infection control and how it is to be handled on and off the work place.

**Attachments**

Protocol for Infection Control NS-IC-2  
 Definitions for Infection Control  
 HBV Mandatory Declination Statement

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Approved by

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## **NATURAL SODA SAFETY STANDARD PROTOCOL FOR INFECTION CONTROL**

### **Purpose and Scope**

The purpose of this standard includes information and precautions that should be understood concerning the risk of exposure to human blood and body fluids. It identifies the protective procedures and precautions that must be followed by workers in emergency response and other jobs with risk potential.

### **General Hazards**

Blood borne pathogens are microorganisms such as human immunodeficiency virus (HIV) or Hepatitis B (HBV) in blood or other body fluids that can cause disease in people. HIV and HBV are serious and every effort should be made to prevent risky exposure to human blood or other body fluids.

### **Infection Control**

Directive for Health Care Providers Standards 1-3 were implemented in 1990; Standard 4 was added in 1992.

1. US Department of Health and Human Services
2. Inland Counties Emergency Medical Agency, BLS-ALS Guideline for Infection Control.
3. American Heart Association of American Red Cross Association Guidelines for CPR Instructor and Providers.
4. Blood-borne Pathogen Standard, 1992.

### **Infectious, contagious, communicable disease**

Communicable diseases are transmitted as a result of direct contact with blood by ingestion or injection. Indirect contact with contaminated objects such as dressings and clothing can be a factor in transmitting disease. Droplets from coughing, sneezing, etc. could be instrumental in transmitting diseases.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**Exposure Control by Engineering and Work Practice**

Washing is the best overall protective measure. Hands and body parts must be washed immediately and thoroughly with soap and water, if contaminated. If there is no hand washing facility available than antiseptic hand cleaner are to be used. If mucous membranes are contaminated you should flush with water immediately or as soon as possible.

Personal protective equipment such as gloves must be worn by all providers when a chance of contamination is predictable. The infection control response kit containing gloves, face masks, gowns, goggles, antimicrobial wipes, disposal bags and closures is located in the control room. Masks, eye protection or face shields are to be worn whenever splash, spay splatter, or droplets can be anticipated. All procedures involving blood should be done in a manner to minimize splash, spray, splatter, and generation of droplets.

Oxygen equipment and airway ventilation devices are available for use when the need for resuscitation is predictable. CPR masks must be used by health care provider (HCP) when resuscitation methods are being performed. All equipment which comes in contact with blood or OPIM must be cleaned, disinfected, or deposed of after each use. You must decontaminate all equipment prior to service or use. Protective covering must be kept over all equipment and replaced after use. All equipment must be decontaminated with soap and water, a 10% bleach soak, an alcohol rinse and air drying.

**Infectious Waste**

Containers for disposing of infectious waste should be puncture resistant and leak proof. All containers must be labeled as to what it contains. If the container should be punctured, place it within a second container.

All contaminated dressings must be bagged or boxed. The size of the dressing will determine which container to use. All contaminated laundry will be bagged and placed in labeled bags. Appropriate PPE must be worn when handling contaminated laundry and all bags are to be handled at a minimum.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

Decontamination of the work surface must be done on exposure. The work site must be cleaned and sanitized following the incident. Mechanical means should be used to pick up all sharps or glassware.

Warning labels must be on all containers which contain waste.

## **POST EXPOSURE EVALUATION AND FOLLOW-UP**

### **Exposure Incident**

The employee reports to employer per NS Injury Management Procedure.

It is the employer's responsibility to direct the employee to a HCP and send a copy of this standard, the employee's job description and an incident report. The employer should give the source of the individual's identity and HBV/HIV status if known. If the employer knows the employee's relevant medical information is should be included with the information. When the employer receives the opinion of HCP, the written opinion will be supplied to the employee.

The HCP must evaluate the incident and arrange testing for the employee. Per the privacy law the HPC must notify the employee of the results of the testing. The HPC must provide counseling and post exposure prophylaxis.

The health care provider is to send the employer a written opinion documenting that the employee was informed of test results and was notified of any follow-up. He reports whether HBV vaccine was indicated and received. Follow up will be per US Public Health Guidelines.

### **HBV Vaccine**

HBV vaccine will be offered as soon as possible to unvaccinated providers with an incident exposure. This vaccine will be provided at a reasonable time and place and at no cost, including booster doses. All employees who decline must sign a statement of declination. The vaccination can, however, be requested by the employee at a later date.

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**Recordkeeping**

Medical records containing the name, social security number, and a copy of vaccination status, copy of results of exam, tests, and follow-up are to be kept separate and confidential, and maintained during employment and for the following thirty years. This information is to be kept at the HCP’s except for the employer’s copy of written opinion.

**Training Records**

All dates, contents, or summary will be kept with name and qualification of persons conducting training. Accurate records will be kept of names and job titles of all persons attending training secessions.

There will be an annual review to reflect new tasks and procedures. During training all employees will have access to a copy of regulatory text. There will be a general explanation of epidemiology and symptoms of blood borne disease and how it is transmitted. Each will be informed where they can obtain a copy of this plan. Recognizable tasks and other activities that involve exposure will be explained as will methods to prevent or reduce exposure. PPE type, use, location, removal, handling, decontamination, disposal will be reviewed. All employees will be made aware of vaccine status and the proper action to take in case of emergencies. Each will be made aware of the proper way to report exposure incidents. All information on past exposure evaluation, follow up and labels will be demonstrated.

**DEFINITIONS - PROTOCOL FOR INFECTION CONTROL**

**BLOOD:** Human blood, human blood component, and products made from human blood.

**BLOODBORNE PATHOGENS:** Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

**CONTAMINATED:** The presence or the reasonably anticipated presence of blood, or other potentially infectious materials found on a surface or in or on an item.

**CONTAMINATED LAUNDRY:** Laundry which has been soiled with blood or other potentially infectious materials on a surface or may contains sharps.

**CONTAMINATED SHARPS:** Any contaminated object that can penetrate the skin; including, but not limited to needles, scalpels, broken glass, or any sharp item.

**DECONTAMINATION:** Use of physical o chemical means to remove, inactivate, or destroy blood borne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

**ENGINEERING CONTROLS:** Controls (e.g., sharps disposal containers, self-sheathing needles) that isolate or remove the blood borne pathogen hazard from the workplace.

**EXPOSURE INCIDENT:** A specific eye, mouth, other mucous membrane, non- intact skin, accidental contact with blood, or other potentially infectious materials that results from the performance of an employee’s duties.

**HAND WASHING FACILITIES:** A facility providing an adequate supply of running potable water, soap, and single-use towels or hot air-drying machines.

**HBV:** Hepatitis B Virus

**HIV:** Human Immunodeficiency Virus

**LICENSED HEALTH CARE PROFESSIONA:** A person whose legally permitted scope of practice allows him or her to independently perform the activities required under vaccinations and post-exposure evaluation and follow-up.

**OCCUPATIONAL EXPOSURE:** Reasonably anticipated skin, eye, mucous membrane, or accidental contact with blood, or other potentially

		Document Title		SAFETY MANUAL			
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

infectious materials that may result from the performance of an employee's duties.

**OTHER POTENTIALLY INFECTIOUS MATERIALS:**

1. Human body fluids, including semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, or any other body fluid that is visibly contaminated with blood, such as saliva or vomits, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids, such as emergency response.
2. Any unfixed issue or organ (other than intact skin) from a human (living or dead).

**PARENTERAL:** Piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts and abrasions.

**PERSONAL PROTECTIVE EQUIPMENT:** Specialized clothing or equipment, worn or used by an employee for protection against a hazard, which does not permit blood or OPIM to pass through or reach work or street clothes, undergarments, skin, eyes, mouth, or mucous membranes under normal conditions of use and for the duration of time in which equipment will be used. General work clothes (e.g., uniforms, pants, shirts, or blouses), not intended to function as protection against a hazard, are not considered to be personal protective equipment.

**REGULATED WASTE:** Liquid or semi-liquid blood or other potentially infectious materials, contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed, items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling, contaminated sharps, and pathological and microbiological wastes containing blood or other potentially infectious materials, including **medical waste**.

**SOURCE INDIVIDUAL:** Any person, living or dead, whose blood or other

 Document Title		SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

potentially infectious materials may be a source of occupational exposure to the employee.

**STERILIZE:** Use of a physical or chemical procedure to destroy all microbial life, including highly resistant bacteria endospores.

**UNIVERSAL PRECAUTIONS:** An approach to infection control in which all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other blood borne pathogens.

**WORK PRACTICE CONTROLS:** Controls that reduce the likelihood of exposure by altering the manner in which a task is performed, such as prohibiting recapping of needles by a two-handed technique.

**NATURAL SODA SAFETY STANDARD**  
**FIRSTSAVE AUTOMATED EXTERNAL DEFIBRILLATOR**  
**POLICY AND PROCEDURES**

**Purpose and Scope**

The purpose of this standard includes information and precautions that should be understood in operating the First Save automated external defibrillator. It identifies the operator training requirements, safety precautions, operating instructions, and the post rescue process.

**First Save Description**

The First Save (unit) is a self-testing battery-operated automated external defibrillator (AED). After applying the Forestage’s electrodes to the patient’s chest, the First Save automatically analyzes the patients Electrocardiogram (ECG). The First Save advises you to deliver a defibrillation shock upon analyzing one of the following shock able cardiac rhythms:

- Ventricular fibrillation – when peak to peak amplitude is greater than a systole threshold (0.15 mV nominal) and cardiac rhythm rate of at least 180 bpm (beats per minute): or
- Ventricular tachycardia – cardiac rhythm rate is at least 180 bpm.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

- Supraventricular tachycardia – cardiac rhythm rate is at least 180 bpm.

The First Save uses one button for all operations. It also guides you through the rescue using a combination of voice prompts, audible alerts, and visible indicators.

Annual checks of the lithium battery, electrodes, and general operation of the First Save are recommended.

### **Operator Training Requirements**

Natural Soda Inc. employees authorized to operate the First Save automated external defibrillator must have all of the following minimum training and experience.

- Current CPR Certification
- Current First Aid Certification
- Defibrillation training (one hour of instruction, video and “hands on” experience by certified CPR instructor or First Save AED trained NS employee

### **Safety Precautions**

The following is a list of First Save safety alerts to be applied while using the First Save automated external defibrillator:

- *Fire and Explosion Hazard:* Exercise caution when operating the First Save close to flammable gases.
- *Shock Hazard:* Do not touch the patient or metal objects in contact with the patient.
- *Possible Radio Frequency (RF) susceptibility:* Do not operate wireless radiotelephones within 1 meter of First Save.
- *Possible Interference with Implanted Pacemaker:* Do not place electrodes directly over an implanted pacemaker.

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## **Operating Instructions**

1. Call local emergency center.
2. Assess the patient: must be unconscious, no breathing and no pulse.
3. Turn the First Save ON by opening lid.
4. Place Electrodes by following diagram
5. Follow voice prompts of the First Save unit.
6. If the First Save detects a shockable cardiac rhythm, the voice prompt will say, “*Charging*” and First Save prepares to deliver a defibrillation shock.
7. If the First Save does not detect a shockable rhythm, the voice prompt will say, “*Check pulse. If no pulse, give CPR*”
8. When the FirstSave is ready to deliver a defibrillation shock, you will:
  - See the word “Rescue” flashing above the button and
  - Hear the charged tone and
  - Hear the voice prompt say, “*Stand, Clear. Press flashing button to rescue.*”
  - Push the “Rescue” button to deliver the first defibrillation shock.
9. After the FirstSave delivers the first defibrillation shock, FirstSave analyzes the cardiac rhythm of the patient again. IF the FirstSave

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

determines that a shockable rhythm still exists, it will charge, and then issue another voice prompt instructing you to deliver another defibrillation shock. Push the “Rescue” button to deliver the second defibrillation shock. The analyze/charge/defibrillation process will continue a maximum of three consecutive times.

10. If at any time the patient has a non-shockable cardiac rhythm, the voice prompt will say, “*Check pulse. If no pulse, give CPR.*” Perform CPR if there is no pulse. After the third defibrillation shock is delivered, the voice prompt will say, “*Check Pulse, IF no pulse, give CPR.*”

### **Post Rescue Process**

After transferring the patient to Advanced Life Support personnel, do the following to prepare the First Save for the next rescue:

1. Notify your safety manager for removal of stored rescue data, as well as, ordering of new electrodes and batteries, as needed.
2. Connect a new pair of electrodes (one spare set will be maintained on site) to the FirstSave, check expiration date for validity and place expiration date sticker on outside of First Save.
3. Verify that the “Replace” indicator is not lit. If it is, replace the battery.
4. Close the lid and verify that the “Status” indicator on the First Save handle is GREEN.
5. Replace in pre-selected secure spot for next usage.



	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## **RECEIPT OF THE EMPLOYEE SAFETY MANUAL**

*This is to acknowledge that I have received a copy of the Natural Soda Safety Manual and/or updates and understand that it sets forth the terms and conditions of my employment as well as the duties, responsibilities and obligations of my employment with the organization where safety is concerned. I understand and agree that it is my responsibility to read the Safety Manual and to abide by the rules, policies, and standards set forth in the Safety Manual.*

*I understand that the regulations in this Safety Manual are my responsibility to follow not only for my well being but also the well being of my fellow employees.*

*If I have questions regarding the content or interpretation of this manual, I will bring them to the attention of my direct supervisor or the safety manager.*

Employee Name: \_\_\_\_\_ Date: \_\_\_\_\_

Employee  
Signature: \_\_\_\_\_

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

	Document Title	SAFETY MANUAL					
Doc #	S-100-M	Revision Date	06/07/2013	Revision	1	Status	Released
Document Owner		Clark, Michael					

## Revision History

### 8/29/12

- Added "Revision History" page
- Updated "Cutting and Welding Pipe Procedure", Issuance Rules section, to include 3 hours of fire check, recommended by Marsh Risk Consulting Underwriting Report of 7/20/12: "The supervisor will assign a fire-watch to periodically check the work area for an additional 3 hours after work completion. If the work area is washed down, the need for periodic fire check is precluded.