U.S. Department of the Interior
Bureau of Land Management

Environmental Assessment
UT-020-2006-002
August 2012

Intrepid Potash Mine and Reclamation Plan
(Modification)

43 CFR 3590 Mine Plan

Western Great Salt Lake Desert
Tooele County, UT

Applicant: Intrepid Potash – Wendover, LLC
2½ Mile East Frontage Road
Wendover, UT 84083

UTU-087809-087818

Salt Lake Field Office
2370 South 2300 West
Salt Lake City, UT 84119
Phone: (801) 977-4300
Fax: (801) 977-4397
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1.0 PURPOSE AND NEED

1.1 Introduction

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental consequences of the Intrepid Potash Mine and Reclamation Plan Modification (Plan) as proposed by Intrepid Potash-Wendover, LLC (Intrepid). The EA is a site-specific analysis of potential impacts that could result with the implementation of a proposed action or alternatives to the proposed action. The EA assists the BLM in project planning and ensuring compliance with the National Environmental Policy Act (NEPA) and in making a determination as to whether any significant impacts could result from the analyzed actions. Significance is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of Finding of No Significant Impact (FONSI). If the decision maker determines that this project has significant impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record may be signed for the EA approving the selected alternative, whether the proposed action or another alternative.


1.2 Background

Potash extraction operations began in the early 1900's in Tooele County near Wendover Utah under the authority of the 1872 Mining Law. Although the Mineral Leasing Act of 1920 proclaimed that potassium and similar minerals such as sodium and magnesium were no longer locatable under the Mining Law, several thousand acres of mining claims were grandfathered and in 1929, patented into private ownership.

In 1936, Bonneville Ltd. was the first company to successfully produce potash by solar evaporation (Gwynn, p. 1-3, 1996). In April 1962 Bonneville Ltd. applied for ten potassium leases adjacent to their operations near Wendover, Utah. Ten Federal Potassium (potash) leases covering 24,699.83 acres were issued to Bonneville Ltd. on January 1, 1963 under the authority of the Mineral Leasing Act of 1920. These ten leases were assigned to Standard Magnesium (and Chemical) Corporation on May 1, 1963. The leases were then assigned to Kaiser Aluminum and Chemical Corporation (Kaiser) on April 1, 1964. On July 1, 1988 the BLM approved the assignment of these leases to Reilly Tar and Chemical Corporation. On December 1, 2004 the leases were assigned to Intrepid Wendover Potash LLC (See Map 1).
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Intrepid Wendover Potash LLC
with
Federal & State Leases and ROW's

Map 1

Legend

Intrepid Wendover Private Lands

Federal Leases

SITLA Potash Leases

Fringe Acreage App.

U.S. 0876712

U.S. 0876713

U.S. 0876714

U.S. 0876715

U.S. 0876716

U.S. 0876717

U.S. 0876718

ROW's

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Mining Plan

In February 1963, Kaiser submitted a map to the United States Geological Survey (USGS\(^1\)) showing the collection ditches on the north (of Highway 40\(^2\)) Federal leases. On March 3, 1965, Kaiser requested permission from the USGS to start pumping water from the collection ditches north of Highway 40 into the potash mining operation. This (1965) map also showed ditches planned on the South leases on the section lines that run east and west (some of these ditches were never constructed). In 1975 the BLM approved an update to Kaiser’s Mine Plan that allowed the company to move the primary evaporation pond 4 – PP4 from private property onto public leased land and create primary pond 5 – PP5. In 2004 Intrepid purchased the mining operation. In 2005, BLM and the Utah Division of Oil, Gas and Mining requested Intrepid submit a mining plan modification (Plan).

This final Plan was submitted to BLM in 2009. Modifications to this plan may be required in the future as new data are acquired or as operational and/or plant processes are revised over time.

1.3 Purpose and Need for the Proposed Action

Intrepid has submitted the Plan with the intent of complying with the requirements specified in the Code of Federal Regulations (CFR) Title 43, Part 3590 Solid Minerals (Other than Coal) Exploration and Mining Operations. One of the provisions of this regulation requires the operator to achieve Ultimate Maximum Recovery (UMR) (43 CFR 3590.0-5h). In addition, Intrepid must comply with other regulations in 43 CFR 3500 which require the company to pay royalties on the portion of the final product that was extracted from Federal lands. The current plan was approved for the previous operator, Reilly Industries, in 1998 and does not address the changes that have occurred in the operation since 1998, or the proposed changes that Intrepid is planning in order to keep up with current technologies and more efficient production. Also, the BLM needs an update of all aspects of Intrepid’s operation including surety calculations and a reclamation plan.

1.4 Conformance with BLM Land Use Plan(s)

The 1990 Pony Express Resource Management Plan (RMP) provides direction for the management of mining related activities on BLM administered lands in Tooele County. The proposed action and alternative would conform to the general guidelines of the RMP, as amended, under Minerals Program Decision 4, page 28 of the Record of Decision.

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1 The function for administering the MLA and the federal mineral leases was moved from the USGS to the Minerals Management Service (now called Office of Natural Resources Revenue) in 1982 and then in 1983 to the BLM.

2 (Old) Highway 40 is located approximately 1/4 mile south of the present Interstate 80. At the present time this portion of highway 40 is not maintained.

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This Decision states: “Applications to remove other types of leasable minerals, such as phosphate, tar sands, and oil shale, will continue to proceed on a case-by-case basis. Stipulations to protect important surface values will be required based on review of each proposal. Coal exploration and development, if any, would be regulated under 43 CFR 3400”.

The Plan is also consistent with the following RMP decisions: Soil/Water/Air Decision 1 (evaluate), Decision 2 (protect water rights), Decision 4 (erosion), Decision 7 (air); Wildlife Decision 2 (T&E/SSP) & Decision 4 (protect habitat values); Recreation Decision 1 (manage as SRMA) & Decision 2 (OHV use); VRM Decision 1 (manage classes); Cultural Resources Decision 1 (evaluate); and Areas of critical Environmental concern (ACEC) Decision 1 (designation).

1.5 Relationship to Statutes, Regulations, or Other Plans

The following activity plans and documents also direct the Salt Lake Field Office’s (SLFO) management in this EA: Solid Minerals Exploration and Mining Operations at 43 CFR § 3590, Recreation Area Management Plan Bonneville Salt Flats (USDI – BLM 1985), and Mine and Reclamation Plan (Shaw 2008).

The proposed action is consistent with Tooele County’s General Plan (1995) to the maximum extent possible. Land use regulations under the jurisdiction of Tooele County and are published in the Tooele County Land Use Ordinance. The site is zoned multiple use with a minimum lot size of 40 acres (MU-40). Multiple use zoning districts are generally open and undeveloped land where human habitation would be generally limited. The land is encouraged to be used for mining among other activities such as recreation and grazing.

1.6 Identification of Issues

This project was posted on the Utah BLM Environmental Notification Bulletin Board (ENBB) and the SLFO public lobby on 9/30/2005. A BLM interdisciplinary team also reviewed the proposal; Appendix A contains the Interdisciplinary Analysis Record Checklist (ID Checklist). Based on internal and external input, the issues analyzed throughout this EA include:

Hydrology/Groundwater: Ground Water Hydrology: Increasing the amount of water pumped from the alluvial fan aquifer to accommodate the salt laydown project may be depleting the aquifer and increasing the flow from the shallow brine aquifer to the alluvial aquifer.

Area of Critical Environmental Concern (ACEC)/Cultural Values/Recreation: Removing mineral from the shallow brine aquifer north of I-80 may be causing the salt layer to thin and retract. Intrepid’s voluntary continuation of the salt laydown project may not be sufficient to prevent diminishment to the Bonneville Salt Flats (BSF) from drawing off the brine from adjacent areas. Such diminishment would degrade the unique
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geology and historical relevance of the site and would disrupt the recreational opportunities that have been part of the BSF for over 80 years.

1.7 Issues not carried forward for detailed analysis

Socioeconomics: Comments received during scoping for the proposed action indicate concern that the salt flats might not continue to be suitable for recreational use, especially timed speed trial events. Additionally if the salt flats can’t continue to support recreational uses, the surrounding communities might be negatively impacted economically. The BLM does not have any data to support this assertion since the salt flats seems to be remaining stable. Based on the analysis in Chapters 3 and 4 of this document, the salt-based surface should continue to serve recreational purposes and associated spending by recreationists within the planning area.

Approval or denial of the proposed action should not have an impact on employment at the Intrepid Wendover site or the unemployment rate in the impact area. The percent of employment by Intrepid constitutes less than .1% of the total employment in both Elko County, Nevada, and Tooele County, Utah, the two counties in which virtually all Intrepid employees reside. The principle industry in the Wendover area is the casino businesses in West Wendover, Nevada.

2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Alternative A- Proposed Action- Approve Plan as proposed

The BLM is responding to Intrepid’s submission of an updated Plan and is required to approve the Plan (with conditions of approval as necessary). The specific new proposed actions in the Plan modification are to:

- Approve moving the primary evaporation pond back to private land using Primary Pond 6-PP6 and off Public Land which utilized PP5 (See Map 2).
  - In 2001 Reilly Tar and Chemical moved their primary production pond from Federal leases PP5 to private lands PP6. This was necessary because the walls of the pond on the federal lease could not hold the brine due to the amount of salt that had been deposited on the pond floor. The 1975 EA estimated that the PP5 life would be approximately 20 years.

- Approve a new ditch network on the South Federal leases.
  - Now that PP6 is the primary evaporation pond, Intrepid seeks to recover the brine that has leaked from the PP5 and place it into production. Intrepid would have to construct a new set of ditches to rehydrate the salt and move the brine into production.

- Approve Fringe Acreage lease application (UTU-85926) for 1,272 acres on the Wendover Bombing Range. The lease would be for administrative purposes only. There would not be any surface disturbance in connection with the lease.
  - Regulations at 43 CFR 3594.5 state that there shall not be any collection ditches within 500 feet of the mine plan boundary unless approved by the authorized officer. There are several ditches that are currently within 500 feet of the boundary. Adding acreage through a fringe acreage lease would bring Intrepid into compliance with the regulation. There would be no surface disturbance allowed on these leases and the BLM would require a bonus payment for the leases prior to them being issued. The leases would be issued non-competitively if the bonus payment meets or exceeds the fair market value established by the BLM.

- Approve the continuation of the salt laydown project of pumping sodium chloride onto the salt flats as part of the Plan.
  - In 1998 Reilly Tar and Chemical (predecessors to Intrepid Wendover) started an experimental salt laydown program to see if the salt crust thickness could be improved. Intrepid Wendover has continued this program and has included it on a voluntary basis into this plan to be approved under the mining plan.
  - Because of the voluntary basis of the salt laydown project in the proposed action, it attempts to achieve a mass balance of the amount of sodium chloride ions removed from the leases north of I-80. It also allows removal of the excess sodium chloride from the North and South Ripening ponds on private land which increases the capacity of the ponds and allows Intrepid the ability to continue processing potash without
constructing new ponds. This excess sodium chloride salt is then pumped back onto the salt flats in a liquid brine solution. The Plan calls for a mass-balance (salt) to be calculated which would allow the BLM to show which lands the production is coming from. To accomplish this goal additional brine monitoring sites would be installed to determine the amount of salt being removed from the federal leases. They would monitor brine solution flow at the number 2 booster pump and three additional locations, one site to monitor the South Federal leases, one to monitor the private lands the third monitoring station is at the PP-6.

- Approve detailing the reclamation procedures and bonding requirements on Federal and non-Federal lands.
  - The Federal leases have always required reclamation. The reclamation plan details the reclamation on both federal and non-federal lands. The reclamation activities include the requirements for filling ditches, removing berms, facility removal, resurveying public lands, and plugging wells.
  - Consistent with section 2 of the Mining and Mineral Policy Act of 1970 and section 102(a), (8), and (12) of the Federal Land Policy and Management Act (FLPMA), it is the policy of the Department of the Interior to encourage the development of Federal mineral resources and reclamation of disturbed lands.
2.2 Alternative B- Proposed Action with Mitigation

This alternative is similar to the proposed action except the salt replenishment (salt laydown program) would be a mitigation requirement instead of a voluntary action. Intrepid would be required to return the same amount of sodium chloride salt (NaCl) to the Bonneville Salt Flats north of I-80 as was removed from leases north of I-80 during mining based on a three year rolling sum.

The mining plan (Intrepid, 2008, Dwg. 5.6) shows that Intrepid Wendover would install an ultrasonic flow meter with a data collection device at the number 2 booster pump collection point. This is the location where the pumped brine exits the federal leases north of I-80. The meter would measure the total volume of brine and the plan calls for a sample port to analyze the chemical component of the brine, both pieces of data are required to calculate the total tonnage of all salts removed via ditch collection system. A similar meter would measure volume and the chemical composition of the brine returned to the salt flats. Intrepid would report to the BLM on an annual basis the salt tonnages removed from north of I-80 and deposited on the BSF via the salt laydown system.

The evaluation period would be on a three calendar year basis and would use the following calculation where SL= Salt Laydown, SB= Salt in the brine from the leases north of I-80 and the three years are Y1, Y2 and Y3:

\[
\frac{(Y1SL + Y2SL + Y3SL)}{(Y1SB + Y2SB + Y3SB)} = 0 \text{ or } 1.0 \text{ or greater}
\]

The company will be required to submit to the BLM the basis for this annual evaluation 60 days after the salt laydown project is completed or would normally be completed for the year.

Monitoring and Adaptive Management

By the end of 2018, Intrepid will arrange for a third party contractor with oversight from BLM to repeat the BLM's 2003 salt-crust thickness study on the BSF. If data indicates that the salt volume is decreasing and it can be shown that it is the result of the mining company, the BLM may revise the terms and conditions when the lease is readjusted in 2023.

If the equation isn't met then 43 CFR 3598.4(b) states that a Notice of Noncompliance (NNC) “shall specify how the operator/lessee has failed to comply with established requirements, and shall specify the action which shall be taken to correct the noncompliance and the time limits within which such action shall be taken”. The cure period will be specified in the NNC and should be flexible to meet the specific situation.

2.3 Alternative C- No Action
Under this alternative, the Plan would not be approved. Intrepid would continue to operate under the 1975 Plan and the salt laydown would continue to be a voluntary action.

2.4 Alternatives Considered, but Eliminated from Further Analysis

Another alternative considered was to, during the winter months, flood PP6 with brackish water, and pump the resulting brine to the BSF. This alternative was eliminated because Intrepid had tried this method and found that it resulted in a substantial economic loss. When brine from the borrow ditch (see Section 4.4.2 of Intrepid’s mine Plan) was mixed with the brine created by dissolving the deposited salt, the resulting mixture was high enough in potash content to have resulted in the loss of several million dollars were it to have been pumped onto the BSF without first harvesting the potash.

Another alternative considered was the BLM has looked into several different types of material handling scenarios (trucking, conveyors, scrapers etc.) for moving salt onto the salt flats. From 1997 to 2002 there was 6.2 million tons of salt moved from the Intrepid Property to the Bonneville Salt Flats through pumping. In contrast it would take 155,000 trucks (at 40 tons per truck) to haul that amount of salt. This does not include the ripping that would be necessary and the loading. Each operation would take a different piece of equipment. The salt would have to be dumped or windrowed and then spread out using another piece of equipment. It would then be subject to wind erosion. There would be more personnel required and more pollutants than the dissolution process.
3.0 AFFECTED ENVIRONMENT

3.1 Introduction
This chapter presents the potentially affected existing environment (i.e., the physical, biological, social, and economic values and resources) of the impact area as identified in the Interdisciplinary Team Checklist found in Appendix A and presented in Chapter 1 of this assessment. This chapter provides the baseline for comparison of impacts or consequences described in Chapter 4. Information from the Plan is incorporated by reference as required. Disclosure is subject to proprietary and confidentiality requirements.

3.2 General Setting
The analysis area is located in the westernmost part of Tooele County, Utah on the Bonneville Salt Flats (BSF) as illustrated in Map 1. The BSF is located in the western part of the Great Salt Lake Desert in northwest Utah. The Great Salt Lake Desert extends east of the potash mine for 46 miles to the Cedar Mountains, south for approximately 65 miles and north for 60 miles. The plant facilities and offices are located approximately 3 miles east of Wendover, Utah on old U.S. Highway 40. The site is located approximately 3 miles east of the Nevada border and is primarily located south of Interstate Highway 80 (I-80) although portions of the site are located north of I-80.

Geologic Setting

The Bonneville Salt Flats are located in western Utah within the Great Salt Lake Desert subdivision of the Basin and Range physiographic province. The province extends 500 miles from the east flank of the Sierra Nevada Mountain, California to the west flank of the Wasatch Mountains, Utah. The Basin and Range Province is defined by north-south trending mountains that alternate with intervening basins and occurred as a result of tectonic extension of the crust. The basins are commonly filled with lake sediments and erosional material from the surrounding mountains. This sequence of mountain-range building and basin formation started between 17 and 23 million years ago and has continued to the present time in some areas (Lines, 1979, p. 23). The Silver Island Mountains are the first mountain range west of the Bonneville Salt Flats and form the highest topographic feature in the area (Ford, 1988).

Potash Production

The water in the Wendover area contains a high volume of salts, including sodium chloride or table salt (NaCl), potassium chloride (KCl) or potash, and magnesium chloride (MgCl₂). This salt laden water is referred to as brine, which is contained interstitially in the surface and subsurface mud layers of this basin as ground water. This ground water is referred to generally as the shallow brine aquifer.
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To harvest the salts in the brine from the shallow brine aquifer, ditches are dug below the water table which allows the brine to collect into a ditch system. Some brine is collected from the basin fill aquifer which is much deeper and is pumped into the collection ditches. The ditches transport the brine to a series of ponds that use solar evaporation to reduce the amount of water in the solution. As the water decreases in volume by evaporation, the major salts in the solution reach saturation and precipitate out of solution, sodium chloride (NaCl) is the first salt to precipitate out in ripening pond 6 (PP6). The brine is then moved to a second series of ponds where the brine is allowed to sit to allow for additional evaporation. The brine is again moved and eventually the second salt to reach saturation, potassium chloride, falls out of solution in the harvest ponds. At this point the potassium chloride still has some sodium chloride associated with it and is called sylvinite. Once the sylvinite dries, it is sent to the mill for further processing to remove the sodium chloride which leaves the potassium chloride for shipment to market. The remaining brine contains some potassium and magnesium and it is moved to the carnalite (KMgCl_3·6H_2O) pond where carnalite is precipitated out of solution. This pond is flooded periodically and the brine is returned to recover the potassium. Magnesium chloride is the only salt to remain in solution because it is hygroscopic and cannot be turned into a solid form without industrial processing; therefore it is left in solution and sold in liquid form.

Salt Crust and Salt Laydown

The salt crust surface area and volume from the Bonneville Salt Flats (BSF) has been a concern to speed enthusiasts since the early 1960’s. The potash extraction operation has been identified by the public and the land management agencies as a potential cause of perceived salt crust depletion. While there is a perceived depletion, the study by White and Terrazas (2006, p.1) concluded there was no difference between the 1988 and 2003 measurements. On page 29 the report continues “…despite brine withdrawal for mineral production, neither short nor long-term measurable changes in salt crust thickness could be documented…” Sodium chloride on the salt flats is dissolved by rain and due to a lack of evaporation in the cooler months it mixes with the Shallow Brine aquifer and forms a pond on the surface of the salt crust. White and Terrazas (2006, p. 26) continued that, as the brine is removed from collection ditches, the amount of sodium chloride north of the interstate in the Shallow Brine aquifer is decreased by a certain amount. The sodium chloride balance in the Shallow Brine aquifer is most likely maintained by dissolution of the salt crust. If not maintained in a mass balance this reduction due to extraction of sodium chloride in the brine would most likely start to eventually deplete the salt crust volume.

From 1998 through 2003, Reilly Industries participated in an effort to supplement the natural deposition of salt minerals to the BSF north of I-80. Approximately 1.5 million tons per year of salt were targeted to be re-saturated from former Pond 4 North and a high concentrated salt solution was pumped onto the salt crust/flat surface north of the mining facility for the 5-year test period. During the 5-year program, approximately 6.2 million
tons of salt were deposited north of I-80. Intrepid has continued to pump brine north of I-80 from 2003 to the present.

The ecology of the salt crust is not well understood, given the amount of salt put back onto the salt flats, an increase in the salt crust thickness would have been expected; however the salt crust did not respond as anticipated. To date all studies conducted have not been successful at describing the relationship between the salt removed and replaced on the salt flats. Nor is there an explanation as to the ultimate fate of the sodium chloride salt returned to the salt flats. Factors such as geochemical interactions, climatic conditions, road construction, increased recreation or other factors could have a significant role in the hydrology of the salt flats and have not been studied comprehensively enough yet to make any definitive conclusions.

At the present time Intrepid Wendover is utilizing the salt from the North and South Ripening ponds in order to provide salt for the salt laydown project, most all of the salt in Pond 4 North has been removed. Intrepid is in the process of placing Pond 4 North as part of Primary Pond 6. This pond would then become part of the salt laydown and would be utilized to help supplement the amount of salt that would be available in the future for the salt laydown aspect of the plan.

The salt laydown project is beneficial to Intrepid’s operation. Sodium Chloride is a byproduct of potash production. Prior to the salt laydown project the salt accumulated in the ripening ponds, the laydown project allows Intrepid to rehydrate the byproduct and return it to the salt flats, thereby increasing the life of the ripening ponds.

3.3 Resources/Issues Brought Forward for Analysis

3.3.1 Resource 1: Ground Water Hydrology

Depositional Environment

The Great Salt Lake Desert is dominated by extensive playas and mud flats composed of Pleistocene and Holocene lake sediments. The playa and lake sediments consist mainly of salt crust, clay strata with interbedded fine-grained gypsum-crystal strata, organic material and thin-bedded oolitic-sand strata. The oolitic sand is made up of calcite-coated brine shrimp fecal pellets and sand-sized ovoids composed of concentric layers of calcite or aragonite minerals. The salt crust and surrounding playa of the Bonneville Salt Flats were formed by the precipitation of bedded halite (NaCl) and gypsum (CaSO₄·2H₂O) minerals (Lines, 1979; Turk et al, 1973). These sediments contained brackish to saline ground water and are the remnants of Pleistocene fresh-water Lake Bonneville and its subsequent multiple evaporation episodes (Nolan, 1927). Lake Bonneville occupied the western half of Utah from 32,000 to 14,000 years before present and covered an estimated 20,000 square miles. The basin fill that underlies the Bonneville Salt Flats is about 5,000 feet deep (Lines, 1979, p. 27). Driller logs from test wells have enabled geologists to describe the layers of the basin to a depth of about 3,000
feet below the surface. These deposits are mainly composed of clay and gypsum with some conglomerate (Bingham, 1980, p.231).

Hydrogeology

The Bonneville Salt Flats is included within a playa that occupies the topographic low in the Great Salt Lake Desert and consequently is the lowest point and discharge site for regional ground-water flow. Three aquifers affect the Bonneville Salt Flats:

1. A Shallow-Brine (Upper) aquifer (defined by Lines, 1979, p. 65, and Turk, 1973, p. 8, Mason and Kipp, 1998, p.1) occupies pore spaces in the upper 15-25 feet of surface which are remnants of Lake Bonneville sediments and is the primary source of the minerals being processed at Intrepid Potash Wendover LLC (Mason and Kipp, 1998, p. 22). Brine concentrations range from 65,000 to 325,000 mg/L total dissolved solids (TDS) (Mason and Kipp, 1998, p. 45). Because the salt crust occupies the lowest point in the playa, it is both bathed by the shallow-brine aquifer and serves (along with the surrounding playa) as its point of natural discharge. Rather than being a single massive layer of salt, the salt crust is actually composed of three (3) halite (table salt) and two (2) gypsum strata (White and Terrazas, 2006, p. 3).

2. A Basin-Fill (Deep Brine) aquifer (defined by Lines, 1979, p. 57) ranges from 20 to 30 feet below the ground surface to 840 feet deep contained within a thick conglomerate unit which overlies Tertiary-age volcanic rocks. Although the Deep Brine aquifer chemistry is similar (percentages) to the Shallow-Brine aquifer, the TDS concentrations are considerably lower by a factor of 2.5 times.

3. An Alluvial Fan aquifer is contained along the south-eastern flank of the Silver Island Mountains. Sediments hosting the aquifer include sand and gravel that gradually become mixed with silt and clay-sized particles as the fans extend into the surficial lake sediments (Mason and Kipp, 1998, p. 39). This aquifer contains fresher water as opposed to the other two aquifers but the water is considered to be brackish and ranges from 6,200 to 8,000+ mg/L TDS (Mason and Kipp, 1998, p. 49).

See Appendix B for more detailed information on the properties and chemistry of the three aquifers.

3.3.2 Resource 2: ACEC/Cultural Values/Recreation

Management of the land encompassing the BSF has a complex history involving a variety of state and federal agencies and private organizations. Management has involved a variety of resource activities including potash leases, patent issuance, military uses, and recreational activities involving timed speed events and filming.

In 1985, the portion of the BSF north of I-80 was designated as an ACEC. As per the RMP, management objectives include: (a) preserve the unique visual, historic and
geological resources, (b) minimize and manage mineral uses and other surface disturbing activities to avoid resource damage, (c) coordinate management of the BSF ACEC and (d) recognize and manage racing and filming activities on the salt flats. As such, three criteria were established to preserve the BSF due to their importance for national and international communities. The criteria include land speed racing, unique vistas and a unique geographic area.

Approximately 5,350 acres of the Intrepid leases are located within the ACEC, along with approximately four miles of brine collection ditches. The majority of Intrepid's operation, including all the ponds and processing facilities, is located south of I-80. The Salduro Loop, an abandoned brine collection ditch that runs along the edge of private land north of I-80, the western edge of the loop which parallels the southern section of the straight track, is north of I-80, but the ditch was abandoned in April 1966. With the abandonment of the Salduro Loop, the only brine drainage ditches within two miles of the normally used speed courses on the Bonneville Salt Flats are the aforementioned four miles of brine ditches within the ACEC.

At the same time the ACEC was established, it was also designated a Special Recreation Management Area (SRMA). Recreational activities include a variety of motorized speed record timing events, model rocketry and archery competitions, and running events. The Bonneville Salt Flats have long attracted drivers from throughout the world and have become the site of numerous land speed records. Their attraction to this area is due to the hard, flat surface that is continually renewed by nature each year.

The potential for setting land speed or endurance records at Bonneville was first recognized in 1896 by W.D. Rishel, who was scouting a bicycle race course from New York to San Francisco. Rishel returned and convinced daredevil Teddy Tezlaff to attempt an automobile speed record on the flats. Tezlaff drove his Blitzen Benz 141.73 mph to set an unofficial record in 1914.

Further attempts to promote automobile racing on the Salt Flats failed until the 1930s when Ab Jenkins, a Utah native driving a Studebaker dubbed the Mormon Meteor, began setting endurance speed records at Bonneville. Jenkins was later instrumental in promoting land speed record setting and luring British racing legend Sir Malcolm Campbell to the Salt Flats in 1935.

By 1949, the salt on the Bonneville Salt Flats was the standard course for world land speed records. On this natural straightaway, the 300, 400, 500, and 600 mile-per-hour land speed barriers were broken. The world famous Bonneville Speed Week has been held annually each August at BSF since 1949. Annual visitation to BSF for land speed record setting and other recreational events is approximately 100,000 people. From 2000-2010 Special Recreation Permit Fees collected by the BLM for events held at the site average $28,000 per year.
The Bonneville Salt Flats have also become an internationally important backdrop for commercial filming and photography. The stark white plain and dramatic, rocky backdrop of the Silver Island Mountains have made BSF a much sought after venue for professional and amateur film projects. Although other large salt flat playas exist in several parts of the world, most of these are located in very remote, undeveloped locations that are difficult to access. BSF is unique and important for the international filming community because it is easily accessible via the Salt Lake International Airport and Interstate 80. BSF is conveniently located within a 1.5 hour drive from Salt Lake City and only 5 miles from the town of Wendover where hotel accommodations, restaurants, and many other services can be found. As a result, several major motion pictures and numerous car or fashion commercials have been filmed or shot at BSF including Wind, Independence Day, World’s Fastest Indian, and Pirates of the Caribbean 3. Filming at BSF is actively promoted by the Utah Film Commission and helps supports a locally significant filming industry. During an average year, BLM may process up to 30 or more film permits at BSF. Filming fees collected at BSF since 2005 average $15,000 per year.

During the winter and spring months each year, natural recharge into the shallow brine aquifer causes the water table to rise above ground level at the Bonneville Salt Flats. Precipitation mixes with the brine, decreasing the concentration and dissolving part of the salt crust. As the temperatures rise in late spring and early summer, the standing water evaporates, re-precipitating the salt back onto the crust and the water table lowers, allowing the crust to solidify. Speed events are normally held in late summer after the crust has hardened.

The land speed community relies on a stable, hardened crust of salt that can withstand the weight and passage of thousands of high performance, high speed vehicles and their associated support teams throughout the course of a season that may host up to 5 major events from August to October. In order to achieve desired speeds and maintain safe conditions on the course, the upper layer of salt crust must be dry, hard, and as thick as possible.

The BLM, the potash mining company (Reilly Industries), and the racing community (represented by Save the Salt [STS]) developed a project to mitigate the perceived depletion of the salt crust through a cooperative salt laydown project (White, 2002, p. 435; White, 2004, p. 243). Sometime during the non-production months, the mining company rehydrates the ripening ponds containing post-production sodium chloride and pumps the salt laden water back onto the salt flats. The salt laydown project began its delivery of salt water to the Salt Flats in November 1997 and is currently continued on a voluntary basis by Intrepid Potash, Wendover (Reilly’s successor).

The Bonneville Salt Flats Race Track was also listed in the National Register of Historic Places in 1975.
4.0 ENVIRONMENTAL IMPACTS

4.1 Introduction
This section will discuss the impacts on the environment as they relate to the alternatives and the actions in the Plan.

4.2 General Analysis Assumptions and Guidelines
Analysis assumptions:

1. Mining will continue as provided in the mining plan.
2. Current climatic and hydrological relationships would remain the same.

4.3 Direct and Indirect Impacts
Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. See the following Table 4.3.0 for a summary of impacts of this action.

Table 4.3.0 Resource Impact Table Summary

<table>
<thead>
<tr>
<th>Resource: Hydrology</th>
<th>Primary Pond Relocation</th>
<th>New Ditch Locations</th>
<th>Fringe Acreage Lease</th>
<th>Salt Lay Down</th>
<th>Reclamation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt. A Proposed Action</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow Brine aquifer</td>
<td>Positive Impact</td>
<td>Positive and Negative Impact</td>
<td>No New Impact</td>
<td>Potential Negative Impact</td>
<td>Positive Impact</td>
</tr>
<tr>
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<td>No New Impact</td>
<td>No New Impact</td>
<td>Positive Impact</td>
<td>Positive Impact</td>
</tr>
<tr>
<td>Alluvial Fill aquifer</td>
<td>No New Impact</td>
<td>No New Impact</td>
<td>No New Impact</td>
<td>Negative Impact</td>
<td>Positive Impact</td>
</tr>
<tr>
<td>Alt. B Proposed Action with Mitigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow Brine aquifer</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
<td>Positive Impact</td>
<td>Same As Proposed Action</td>
</tr>
<tr>
<td>Basin Fill aquifer</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
<td>Same as proposed Action</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
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<tr>
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<td>Same As Proposed Action</td>
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<tr>
<td>Alt. C No Action</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
<td>Same As Proposed Action</td>
</tr>
</tbody>
</table>
4.3.1 Resource 1: Ground Water Hydrology

4.3.1.1 Alternative A Proposed Action

**Shallow Brine aquifer**

*Primary Pond Relocation:* Moving the pond from the federal leases back to private leases would have a positive impact on the aquifers, sodium chloride left in pond 5 would be allowed to be reclaimed and returned to the shallow brine aquifer and therefore potentially recharging the salt flats. The PP6 would have leakage and that would recharge that portion of the Shallow Brine aquifer.

*New ditch location on South Leases:* The impact on the shallow brine aquifer is the mineral resource would be extracted until it becomes unprofitable to do so. The new ditch configuration allows for the ability for production accounting on the south leases.

*Fringe Acreage Lease:* The fringe acreage lease would have no further impacts than it currently has because there would be no surface disturbance allowed.

*Salt Laydown:* The water component of the shallow brine aquifer is thought to be recharged from direct precipitation and the minerals recharged from relatively slower processes, as brine is drawn off by potash extraction operation, the mineral concentration of the aquifer is slowly decreasing by the amount of production each year. Therefore by supplementing the mineral recharge only “as site conditions dictate (Intrepid, 2008, p. 94) the proposed action could eventually reduce the concentration of minerals in the shallow brine aquifer north of I-80. This could result in the leaching of more salt from the salt crust into the aquifer and reducing the size and thickness of the crust.

*Reclamation:* Reclamation would stop brine and mineral production in the reclaimed area thus returning the aquifer or portion of the aquifer back to natural processes. It is unknown whether or not the aquifer would be affected by the fill material that is placed into the ditches.

**Basin Fill aquifer**

*Primary Pond Relocation:* There would be no new impact on the Basin Fill aquifer because the relocation action is a surface disturbance issue and not a Basin Fill aquifer issue.

*New ditch location on South Leases:* There would be no new impact on the Basin Fill aquifer because the ditches do not intercept the Basin Fill aquifer.

*Fringe Acreage Lease:* There would be no new impact by issuing these leases. There will be no wells drilled into the Basin Fill aquifer from these leases.

*Salt Laydown:* The Basin Fill aquifer may contribute some of the salt that is necessary to run the salt laydown project but the amount of brine removed from this aquifer is very small and the impact on the aquifer is unknown.
4.0 ENVIRONMENTAL IMPACTS

*Reclamation:* The well(s) that are drilled into the Basin Fill aquifer would be plugged and abandoned and the pump removed, thus returning this aquifer back to a natural condition.

**Alluvial Fan aquifer**

*Primary Pond Relocation:* This would have no new impact on the Alluvial Fan aquifer because this pond is for production purposes.

*New ditch location on South Leases:* This would have no new impact on the aquifer.

*Fringe Acreage Lease:* This would have no new impact on the Alluvial Fan aquifer.

*Salt Laydown:* The Alluvial Fan aquifer would continue to be pumped at the rate of approximately 1.2 billion gallons per year (Intrepid, 2008, p.72) the permit issued by the Utah Division of Water Rights allows Intrepid to pump 8.6 billion gallons per year. Based upon earliest data (Turk, 1969, p.77) and the information submitted by Intrepid Wendover in the mining plan in 2008, indicates there has been an increase in salinity in the Alluvial Fill aquifer from 8,200 ppm TDS to over 18,000 ppm (Intrepid, 2008, p. 8). Individual wells have not been tracked but, these figures are based on the average of all the wells. The effect of this pumping shows the Alluvial Fan aquifer is interconnected with the Shallow Brine aquifer and the pumping of the Alluvial Fan aquifer is drawing some of the brine from the Shallow Brine aquifer. As the Alluvial Fan aquifer becomes more saline, the company would have an increasingly difficult time using this water for the intended purpose. Even at the original values reported by Turk, (8,200 – 18,000 ppm) the aquifer is unfit for human consumption. The EPA (2010) has non mandatory secondary drinking water standards of 500 mg/L (parts per million) for human consumption and 3,000 ppm for livestock.

Based on this information there appears to be an environmental impact on the Alluvial Fan aquifer but there is no human (wildlife, livestock, and plant) use for this brackish water so there is no effect on the human environment. Once pumping stops then the direction of flow from the aquifer would be returned toward the center of the basin and the aquifer may recover to some degree. There are no plans to change the system.

*Reclamation:* The wells that are drilled into the Alluvial Fan aquifer would be plugged and abandoned and the pumps removed. This would return the aquifer back to its original hydrological condition and would reverse the apparent flow from the Shallow Brine aquifer.
4.0 ENVIRONMENTAL IMPACTS

4.3.1.2 Alternative B-Proposed Action with Mitigation

**Shallow Brine aquifer**

*Primary Pond Relocation:* The impacts would be the same as described in the Proposed Action.

*New ditch location on South Leases:* The impacts would be the same as described in the Proposed Action.

*Fringe Acreage Lease:* The impacts would be the same as described in the Proposed Action.

*Salt Laydown:* This would ensure that the mass-ion balance would be maintained for the salt flats and there should be no depletion of salt. If the lessee does not comply with the mitigation, 43 CFR 3598.4 requires that a notice of non-compliance (NNC) be written. The NNC must state the reason for issuance and specify the action to take in order to comply with the notice. Depending upon the amount of material that is deficient and the fact that the laydown is only run during the winter months, it may take as long as two years for the company to come back into compliance. If the company encounters problems such as Acts of God, there may be reasons to allow the company to put less salt back than is taken off, but is thought that this can still be accomplished using a 3 year rolling sum.

*Reclamation:* The impacts would be the same as described in the Proposed Action.

**Basin Fill aquifer**

*Primary Pond Relocation:* The impacts would be the same as described in the Proposed Action.

*New ditch location on South Leases:* The impacts would be the same as described in the Proposed Action.

*Fringe Acreage Lease:* The impacts would be the same as described in the Proposed Action.

*Salt Laydown:* The impacts would be the same as described in the Proposed Action.

*Reclamation:* The impacts would be the same as described in the Proposed Action.

**Alluvial Fan aquifer**

*Primary Pond Relocation:* The impacts would be the same as described in the Proposed Action.

*New ditch location on South Leases:* The impacts would be the same as described in the Proposed Action.

*Fringe Acreage Lease:* The impacts would be the same as the Proposed Action.
4.0 ENVIRONMENTAL IMPACTS

Salt Laydown: There would be an impact on the Alluvial Fan aquifer which apparently has been reversed due to the pumping to supply brackish water for the salt laydown project and facility needs.

Reclamation: The impacts would be the same as described in the Proposed Action.

4.3.1.3 Alternative C-No Action

Shallow Brine aquifer

Primary Pond Relocation: The impacts would be the same as described in the Proposed Action.

New ditch location on South Leases: These ditches would not be dug and there would be no production accounting for the material coming of the leases due to the fact that the ditch configuration would not change. The salts would still be extracted but it would take a longer time period.

Fringe Acreage Lease: The fringe acreage lease would not be issued and the company would then be in Non-Compliance and other corrective action would have to be taken.

Salt Laydown: The impacts would be the same as described in the Proposed Action except for the fact that there would be no production monitoring approved and a material balance would not be calculated and the company would not be required to continue if they for business reasons decide it is not in their interest to do so.

Reclamation: There would be no reclamation plan approved and a reclamation bond could not be imposed because there is no plan to make the appropriate calculation from. This would not be in accordance with the regulations and there would have to be a new reclamation plan submitted for approval.

Basin Fill aquifer

Primary Pond Relocation: The impacts would be the same as described in the Proposed Action.

New ditch location on South Leases: The impacts would be the same as described in the Proposed Action.

Fringe Acreage Lease: The impacts would be the same as described in the Proposed Action.

Salt Laydown: The impacts would be the same as described in the Proposed Action.

Reclamation: There would be no reclamation plan approved and the Basin Fill aquifer wells would not be reclaimed. This would be a negative impact.

Alluvial Fill aquifer

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4.0 ENVIRONMENTAL IMPACTS

*Primary Pond Relocation:* The impacts would be the same as described in the Proposed Action.

*New ditch location on South Leases:* These ditches would not be dug and there would be no production accounting for the material coming of the leases due to the fact that the ditch configuration would not change.

*Fringe Acreage Lease:* The fringe acreage lease would not be issued and the company would then be in Non-Compliance and other corrective action would have to be taken.

*Salt Laydown:* The impacts would be the same as the Proposed Action except for the fact that there would be no production monitoring approved and a material balance would not be calculated.

*Reclamation:* There would be no reclamation plan approved and a reclamation bond could not be imposed because there is no plan to make the appropriate calculation from. This would not be in accordance with the regulations and there would have to be a new reclamation plan submitted for approval. However, as previously explained, the salt laydown project offers benefits to Intrepid’s operation that would result in a probable continuation by the company. If the salt laydown project continues then there would be no effect on the human environment.

4.3.2 Resource 2: ACEC/Cultural Values/Recreation

4.3.2.1 Alternative A-Proposed Action

*Primary Pond Relocation:* There would be no new impacts to the ACEC and Recreation resources because the primary ponds are not location in these areas.

*New Ditch Location on South Leases:* There would be no new impacts because the new ditches are not located in the ACEC or Recreation areas.

*Fringe Acreage Lease:* There would be no new impacts because they are located on the Wendover Bombing Range.


1. The salt laydown project demonstrated that sodium chloride salt in brine removed from the Salt Flats for mineral extraction can be replenished.
2. 6.2 million tons of sodium chloride as human-made enriched brine was pumped back onto the Bonneville Salt Flats from 1 November through at least 30 April for five consecutive years.

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3. During the same time period an estimated 4.2 million tons were removed by the production of ditches leaving 2 million tons that went directly to the shallow brine aquifer.
4. Geochemical modeling (TEQUIL) showed that within the 28-square-mile laydown area (Bingham, 1991, p. 435), the shallow brine aquifer has the capacity to accept 17 to 25-million tons of NaCl; this tonnage is about three to four times the 6.2-million tons of salt delivered to the Bonneville Salt Flats during the first five years of the laydown project.
5. Consequently, the ability of the shallow-brine aquifer to assimilate additional salt suggests that most of the 6.2 million tons of laydown-delivered salt resides in the shallow-brine aquifer.
6. The predicted +2 inches of thickness addition to the salt crust (Bingham, 1991, p. 435) as a result of the laydown project was not observed at any of the multi-year monitoring locations upon conclusion of the five-year experiment.
7. The addition of laydown brine to the shallow-brine aquifer neither changes its brine chemistry, nor the existing salt-crust.
8. Based on geochemical modeling (TEQUIL) anhydrite and halite were the only minerals predicted to precipitate from two different simulated mixing ratios of laydown brine and shallow-aquifer brine in an open system such as Bonneville Salt Flats. This ensures that any small amounts of KCl do not precipitate out of the solution on to the Salt Flats.
9. During the laydown project, the removed shallow aquifer brine from mineral production was believed to be mostly replaced by Laydown brine that approached halite saturation and minimized salt-crust dissolution.
10. Consequently the laydown brine helped minimize salt-crust dissolution while maintaining the mass balance of total dissolved salts in the shallow-brine aquifer.

By the end of 2005 White and Terrazas (2006, p.3) estimated that over 7 million tons of sodium-chloride salt was delivered to the Bonneville Salt Flats portion of the shallow-brine aquifer during the period 1997 through 2005.

White and Terrazas, 2006 page 26 concluded that “If brine from the shallow brine aquifer is removed from the Salt Flats north of I-80 through the federal-lease-collection ditch, then the total ion mass north of the interstate is decreased by some finite amount that would need to be replaced to maintain the ion mass balance. Consequently, if this withdrawal were to continue for decades without replenishment, one could reasonably conclude that the salt-crust mass north of I-80 could eventually be affected and show some level of impact.”

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9 The 850,000 tons per year production number coming from the collection ditches that was used by White (2006, p.24) was calculated by Mason and Kipp (1998, p.2). They stated “Simulation results indicate a net loss of solute of about 850,000 tons.” This simulation result (output of the model) was based on the input provided by Brooks, 1988. Brooks stated “the amount of salt estimated to have been lost from the salt crust in the 28-year period, 1960-88 is more than 55 million tons. This estimate is based on the change in volume of the salt crust for the 28-year period (S. Brooks, Bureau of Land Management, written commun., 1988) and the average dry density (Mason & Kipp, 1998, p.54).”
Given the results of White and Terrazas (2006), the salt laydown project should have a positive impact towards the goal of maintaining an ion mass balance in the shallow brine aquifer. However, whether this translates into perceived gains in salt crust conditions beneficial to both land speed racing and filming cannot be definitively concluded given the current data available and scientific understanding related to salt crust variability. The best science available does not provide data or conclusions that support public perceptions that the salt crust at Bonneville has been negatively impacted by potash mineral extraction.

Reclamation: Reclamation would not affect the ACEC since there are no mining features within the ACEC.

4.3.2.2 Alternative B Proposed Action with Mitigation

Primary Pond Relocation: The impacts would be the same as the Proposed Action.

New Ditch Location on South Leases: The impacts would be the same as the Proposed Action

Fringe Acreage Lease: The impacts would be the same as the Proposed Action

Salt Laydown: The effect of the salt laydown project on the resource would be the same as under the proposed action. The only difference is that Intrepid would be obligated to conduct the salt laydown project.

Reclamation: Reclamation would not affect the ACEC since there are no mining features within the ACEC.

4.3.2.3 Alternative C: No Action

Primary Pond Relocation: There is no recreation in the area of PP5 nor is it in the ACEC, therefore there would be no new impacts.

New ditch location on South Leases: There are no new impacts because there is no recreation in this area and it is not within the ACEC.

Fringe Acreage Lease: There are no new impacts because there is no recreation in this area and it is not within the ACEC.

Salt Laydown: The impacts would be the same as the Proposed Action in that if the salt laydown is accomplished on a more intermittent basis, then it might result, over some undetermined amount of time, in a decrease in the mass ion balance in the Shallow Brine aquifer which could potentially impact the salt crust (White and Terrazas, 2006.).

Reclamation: Reclamation would not affect the ACEC since there are no mining features within the ACEC.
4.4 Cumulative Impact Analysis

Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, or reasonably foreseeable actions regardless of what agency or person undertakes such other actions.

4.4.1 Resource 1: Ground Water Hydrology

4.4.1.1 Cumulative Impact Area (CIA)

The CIA for Ground Water Hydrology would be the areas where the aquifers reside.

4.4.1.2 Past and Present Actions

There are no known past or present actions other than the Intrepid operation that would affect the aquifers.

4.4.1.3 Reasonably Foreseeable Actions

The only reasonably foreseeable actions that may affect the aquifers are short or long term climatic conditions.

4.4.1.4 Cumulative Impact Analysis

Drought years may decrease the recharge rate of the aquifers, and wet years increase it. Climatic changes could lead to an increase or decrease of the average level of precipitation, leading to increased or decreased recharge rate.

4.4.2 Resource 2: ACEC/Cultural Values/Recreation

4.4.2.1 Cumulative Impact Area (CIA)

The CIA for these resources is same as for Ground Water Hydrology.

4.4.2.2 Past and Present Actions

Past and present actions such as the, highways and the railroad have affected the BSF. These construction activities have indirectly affected the historic and scenic values and recreation uses of the salt flats.

4.4.2.3 Reasonably Foreseeable Actions

The only reasonably foreseeable actions that may affect the aquifers are short or long term climatic conditions.

4.4.2.4 Cumulative Impact Analysis

Both the railroad and I-80 bisect the BSF, and only the area to the north has been left intact and available for recreation purposes.

Years where there is high precipitation can preclude recreation. The high water year of 1983 precluded most recreational activities on the SRMA for a year.
5.0 CONSULTATION AND COORDINATION

5.1 Introduction

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. The ID Team Checklist provides the rationale for issues that were considered but not analyzed further. The issues were identified through the public and agency involvement process described in sections 5.2 and 5.3 below.

5.2 Persons, Groups, and Agencies Consulted:

Table 5.2.1

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose &amp; Authorities for Consultation or Coordination</th>
<th>Findings &amp; Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utah State Historic Preservation Office</td>
<td>Consultation for Undertakings as required by the National Historic Preservation Act (16 USC 470).</td>
<td>Project design has excluded these cultural properties from areas to be treated. A finding of &quot;No Historic Properties Effected&quot; under NHPA will be forwarded to the SHPO under the notification clause during the next quarterly Protocol submission.</td>
</tr>
<tr>
<td>Paiute, Ute, Western Shoshone, Northwestern Shoshone, Skull Valley Band of Goshutes and Confederated Band of Goshute Reservation</td>
<td>Consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1996) and NHPA (16 USC 470).</td>
<td>Notification letters were sent to the Tribes. No responses were received.</td>
</tr>
</tbody>
</table>

5.3 Summary of Public Participation

This project was posted on the ENBB and the SLFO public lobby on 9/30/2005. Since that time, the BLM has received input from the public as well as held meetings with interested parties about the Plan proposal.

A public open house meeting attended by less than five members of the public was held September 14, 2011. A 60-day public review and comment period for the EA and unsigned FONSI ended November 7, 2011. BLM received numerous e-mailed, faxed and mailed “form letter” type comments as well as postcards during the comment period. BLM also received many comments that were not form letters.

5.3.1 Modifications Based Public Comment and Internal Review

The public comment period and internal review identified necessary corrections or clarifications to this EA. These modifications include:

1. Corrections to grammar, sentence structure, and formatting were made throughout the EA. In general, these changes were made without further clarification. Examples include: changes in font size, changes in verb tense and style or insertion of footnotes. Redundant paragraphs or words were deleted. An August 2012 date was inserted on the cover page to distinguish from the September 2011 version of the EA.
5.0 CONSULTATION AND COORDINATION

2. Sections 1.3, 1.7, 2.1, 2.2, 2.3, 2.4, 3.2: Sections were updated based on public comment and internal review.

3. Section 3.3.2: Added more history about the recreation use of the BSF. Updated text based on public comment and internal review.

4. Section 4.3.1: Change text in reclamation section.

5. Section 4.3.2: Added clarification to salt laydown sections. Updated reclamation sections with correct information.

6. Section 5.0: Table 5.4.1 was updated to include a more accurate list of preparers.

7. Appendix B: Clarification was added to the Shallow-Brine (Upper) Aquifer Properties.

8. Appendix C: A comment and response table was inserted.

5.3.2 Response to Public Comment

The BLM received many comments from the public during the comment period. The majority of these comments were in support of selecting Alternative B, saving the salt and about the Bonneville Salt Flats in general. BLM responded to three public comment letters, these comments and BLM responses are summarized in Appendix C. Section 5.3.1 Modifications Based on Public Comments and Internal Review identifies changes to this EA that were made as a result of public comments. The comments focused on the management of the Bonneville Salt Flats, continuation of salt laydown on the BSF and minor inaccuracies in the EA.

The BLM acknowledges the support and concerns expressed by the public regarding the BSF and recreation use of that area. Information within the comments that is background or general in nature was reviewed; however, responses to or clarifications made to the EA from these items are not necessary. Likewise, expressions of position or opinion are acknowledged but do not cause a change in the analysis. As identified in the NEPA Handbook (H-1790-1, section 6.9.2.2 comment response), BLM looked for modifications to the alternatives and the analysis as well as factual corrections while reviewing public comments.

5.4 List of Preparers

Table 5.4.1 List of Preparers

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Responsible for the Following Section(s) of this Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larry Garahana</td>
<td>Geologist</td>
<td>Project Lead, geology, administration</td>
</tr>
<tr>
<td>Cindy Ledbetter</td>
<td>Environmental Specialist</td>
<td>NEPA</td>
</tr>
<tr>
<td>Peter Ainsworth</td>
<td>Archaeologist</td>
<td>Cultural, Native American Consultation (previous Cultural Lead)</td>
</tr>
<tr>
<td>Mike Sheehan</td>
<td>Archaeologist</td>
<td>Current Cultural Lead</td>
</tr>
<tr>
<td>Mike Nelson</td>
<td>AFM, Nonrenewable</td>
<td>Lands, Review</td>
</tr>
<tr>
<td>Roxanne Tea</td>
<td>Outdoor Recreation Planner</td>
<td>Recreation, ACEC</td>
</tr>
<tr>
<td>Heidi Hadley</td>
<td>Hydrologist</td>
<td>Plan Review, hydrology</td>
</tr>
<tr>
<td>Stan Perkes</td>
<td>Mining Engineer</td>
<td>Plan Review</td>
</tr>
</tbody>
</table>

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6.0 REFERENCES, GLOSSARY AND ACRONYMS

6.1 References Cited


Intrepid Potash Wendover, 2008, Mine and Reclamation Plan, Intrepid Potash-Wendover LLC Potash Mine, Prepared by Shaw Environmental Inc, Salmon, ID., located that the Utah State Office, Bureau of Land Management, Salt Lake City, Utah


Save the Salt webpage http://www.saltflats.com/save%20the%20salt.html 5/19/2011


USDI-BLM 1985 Recreation Area Management Plan (RAMP) for the Bonneville Salt Flats.


Appendix A - Interdisciplinary Team Analysis Checklist

INTERDISCIPLINARY TEAM ANALYSIS RECORD CHECKLIST

Project Title:  Intrepid Potash Mine and Reclamation Plan
NEPA Log Number:  UT-020-2006-002
File/Serial Number:  UTU-087809 through UTU-087818
Project Leader:  Larry Garahan

Determination of Staff:

<table>
<thead>
<tr>
<th>Determination</th>
<th>Resource</th>
<th>Rationale for Determination</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 1</td>
<td>Air Quality</td>
<td>Present to determine NEPA impact, the project must be reviewed by NEPA. This is a significant issue.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>P 1</td>
<td>Areas of Critical Environmental Concern</td>
<td>Areas of Concern may impact site conditions in the San Juan, San Rafael, or Manti Laughlin Area.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N 7</td>
<td>Cultural Resources</td>
<td>Cultural resources may be impacted and the project must be evaluated to avoid their destruction.</td>
<td>Peter Annibale</td>
<td>7/30/06</td>
</tr>
<tr>
<td>M 1</td>
<td>Environmental Justice</td>
<td>Environmental justice would not be compromised.</td>
<td>S. C. Healy</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N P</td>
<td>Fossil Wastes (Prime or Unique)</td>
<td>The proposed action is not located within units designated as fossil combustible.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N I</td>
<td>Floodplains</td>
<td>The proposed action may be located within units designated as floodplain. The proposed action must not impact floodplains.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N I</td>
<td>Invasive, Non-native Species</td>
<td>Salt Flats area and flato support little vegetation.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N I</td>
<td>Native American Religious Concerns</td>
<td>Cultural resources are significant. Cultural resources have been identified.</td>
<td>Peter Annibale</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N P</td>
<td>Threatened, Endangered or Candidate Plant Species</td>
<td>Little vegetation in this area.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N P</td>
<td>Threatened, Endangered or Candidate Animal Species</td>
<td>Little vegetation in this area.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>N P</td>
<td>Wastes (hazardous or solid)</td>
<td>No hazardous materials present.</td>
<td>F. L. Decker</td>
<td>7/30/06</td>
</tr>
<tr>
<td>P E</td>
<td>Water Bodies (drinking/ground)</td>
<td>May impact existing ground water conditions through several different mechanisms.</td>
<td>R. A. Healy</td>
<td>7/30/06</td>
</tr>
</tbody>
</table>

NP = not present in the area impacted by the proposed or alternative actions
N = present, but not sufficient to a degree that detailed analysis is required
P = present with potential for significant impact analyzed in detail in the EA, or identified in a DNA as requiring further analysis
HC = (DNA only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section C of the DNA form.
<table>
<thead>
<tr>
<th>Resource</th>
<th>Rationale for Determination</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetlands/Wetland Zones</td>
<td>The proposed action is located in self-fact which are lands without potential for riparian habitat</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Wild and Scenic Rivers</td>
<td>Not present.</td>
<td>Melvin</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Wilderness</td>
<td>Not present.</td>
<td>Melvin</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Range and Health Standards and Guidelines</td>
<td>The proposed action would be on an undeveloped section and would not have impacted the range and health on the landscape.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Livestock Grazing</td>
<td>Proposed action is located outside a grazing plan.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Woodland/Forestry</td>
<td>There is no need to speak of in this case.</td>
<td>Melvin</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Vegetation including Special Status Plant Species other than PWS candidate or Listed species</td>
<td>There is little vegetation in this area. No impacts is minimal.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Fish and wildlife including Special Status Species other than PWS candidates</td>
<td>No fish present. Acknowledged additional value to any available.</td>
<td>Melvin</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Soils</td>
<td>Although soil movement would take place from proposed action, it is not anticipated that action would result from the proposed action.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Recreation</td>
<td>Soil conditions @ GSF are critical to special recreation permit which is held each year.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Visual Resources</td>
<td>Proposed action would not increase impact to visual resources already present due to existing activities.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Geology/Mineral Resources/energy production</td>
<td>PM2 and PM10 are the reason the proposed action is being implemented, without detailed analysis is not required.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Paleontology</td>
<td>No known significant paleo resources in project area.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
<tr>
<td>Lands / Access</td>
<td>Proposed action will not require new lands acquisition.</td>
<td>Allen</td>
<td>7/1/06</td>
</tr>
</tbody>
</table>

NP = not present in the area impacted by the proposed or alternative actions
NI = not present, but not assessed in a format that detailed analysis is required
PI = present with potential for significant impact analyzed in detail in the EA or identified in a DNIA as requiring further analysis
NC = (DNIA only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section C of the DNIA form.
<table>
<thead>
<tr>
<th>Determination</th>
<th>Resource</th>
<th>Rationales for Determination</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>Parks / Plan Management</td>
<td>Low fire hazard area. Follow standard fire prevention steps in any location where vegetation exists.</td>
<td>[Signature]</td>
<td>7/24/06</td>
</tr>
<tr>
<td>N1</td>
<td>Socio-Economics</td>
<td>Land use plans and regulations would not change.</td>
<td>[Signature]</td>
<td>7/10/06</td>
</tr>
<tr>
<td>NP</td>
<td>Wild Horses and Burros</td>
<td>There are no wild horses present in the area</td>
<td>[Signature]</td>
<td>7/26/06</td>
</tr>
<tr>
<td>NP</td>
<td>Wilderness Characteristics</td>
<td>Not identified for project area.</td>
<td>[Signature]</td>
<td>7/26/06</td>
</tr>
</tbody>
</table>

**FINAL REVIEW:**

<table>
<thead>
<tr>
<th>Reviewer Title</th>
<th>Signature</th>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Coordinator</td>
<td>[Signature]</td>
<td>7/26</td>
<td></td>
</tr>
<tr>
<td>Authorized Officer</td>
<td>[Signature]</td>
<td>8/26/12</td>
<td></td>
</tr>
</tbody>
</table>

NP = not present in the area impacted by the proposed or alternative actions
N1 = present, but not affected to a degree that detailed analysis is required
P1 = present with potential for significant impact analyzed in detail in the EA; or identified in a DNA as requiring further analysis
NC = (DNA only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section C of the DNA form.
Appendix B-
Bonneville Salt Flats Aquifers

Shallow-Brine (Upper) Aquifer Properties:

The Shallow-Brine Aquifer that discharges to the Bonneville Salt Flats and surrounding playa has an aerial extent of at least 975 square miles (White and Terrazas, 2006, p.12). The interbedded sediments in this aquifer assist in the horizontal transport of brines within the aquifer. Specifically, vertical fractures in the lake-sediment clays; gypsum-crystal and oolitic-sand strata provide permeable pathways for lateral and some vertical transport of the brine (Jones and others, 2009; Mason and Kipp, 1998; Turk 1969, p. iii). The transmissivity or amount of flow through an area of the aquifer ranges from 100 feet squared per day (ft²/day) or [13.4 gal per day per ft (gpd/ft)] to 13,000 ft²/day [1738 gpd/ft] near the center of the salt crust (Turk, 1973, p.9). Lines reported water flow ranging from 490 ft²/day [65 gpd/ft ] - 8100 ft²/day [1082 gpd/ft ](Lines, 1979, p.67).5

The clay sediments in the shallow brine aquifer are vertically fractured having a maximum width of about 1 inch and a maximum depth of about 25 feet (Lines, 1979, p. 65). These fractures are an additional path for brines to flow horizontally in the clay sediments. Water flow through the fractures ranged from 30 to 140 ft²/day, [4 gpd/ft-18 gpd/ft] (Mason and Kipp, 1998, p.23). These fractures are evident along the sides of the production ditches at the Intrepid mining operation. Through scientific tests this aquifer has the properties of being full to partially full of brine (Turk, 1969, p. 115). Mason states that the confining properties are more prevalent where there is salt crust and more fractures (Mason and Kipp, 1998, p. 24).

Shallow-Brine (Upper) Aquifer Chemistry:
Intrepid’s Wendover operation is currently mining products of sodium chloride (NaCl), potassium chloride (KCl), silvinit (NaKCl2) and magnesium chloride (Mg Cl2). The chemical elements that make up these mineral compounds are contained in the brine as ions that reside in the shallow brine aquifer. For example, when the mineral halite (sodium chloride compound which is commonly called table salt), dissolves in water the mineral compound disassociates to form sodium ions or (Na+) and chloride ions (Cl-). When the water of the brine evaporates, the mineral compound (i.e. sodium chloride) forms as it precipitates based on a number of factors, mainly concentration and temperature. Brines from the shallow-brine aquifer result primarily as remnants from multiple evaporation episodes of Lake Bonneville. Major sources for ions comprising the

4 Transmissibility—The transmissibility of a rock is its capacity to transmit water under pressure. The coefficient of transmissibility is the field coefficient of permeability multiplied by the saturated thickness, in feet, of the aquifer; replaced by the term “transmissivity.” To convert a value of transmissivity to a value for coefficient of transmissibility, multiply by 7.48", (McNellis, 1973).

5 (Note the flow in Ft²/ft is derived from Ft³/day per ft of aquifer. By combining terms this equals Ft²/day).
solid and liquid phases of the salt crust and shallow-brine aquifer have been identified as 1) leaching of magnesium, potassium, and sodium from brines entrained in clay-bearing Lake Bonneville sediments, 2) dissolution of geologically older halite and gypsum (evaporate) deposits in the Lake Bonneville basin, and 3) weathering of chloride, bicarbonate, and sulfide-bearing rocks within the Lake Bonneville drainage basin (White and Terrazas, 2006, p.22). Lines (1979, p. 72) states that concentration or density of the brine (weight per unit volume) generally increases from the edges of the playa toward the salt crust. The brine rate of flow increases in this same direction. Table 3.1 lists the chemical composition that makes up the Shallow Brine Aquifer.

| Table 3.1 Shallow-Brine Aquifer Typical Chemical Composition (from Intrepid, 2008, Table 3.3). |
|-----------------------------------------------|-----------------------------------------------|
| Analyte Ions                             | Concentration Range, mg/L | Average, mg/L |
| Calcium (Ca⁺⁺)                             | 970-2,700                   | 1,558          |
| Magnesium (Mg⁺⁺)                           | 61-5,900                    | 3,816          |
| Potassium (K⁺⁺)                            | 170 -10,000                 | 6,733          |
| Sodium (Na⁺⁺)                              | 61,000-130,000              | 92,862         |
| Bicarbonate (HCO₃⁻)                        | 73-750                      | 195            |
| Chloride (Cl⁻)                             | 78,000-210,000              | 151,655        |
| Sulfate (SO₄²⁻)                            | 2,400-6,800                 | 5,514          |
| Total dissolved solids (TDS)               | 140,000 -340,000            | 279,793        |

Shallow-Brine (Upper Brine) Aquifer Recharge and discharge: There are a number of ways that the shallow brine aquifer may be recharged including direct meteoric precipitation and horizontal subsurface inflow. Lines (1979, p.84) stated that the recharge during his study was from direct precipitation. Mason and Kipp (1998 p. 30) state horizontal subsurface inflow contributes very little to the shallow brine aquifer. They continue that other possible recharge sources are subsurface inflows from the alluvial fan aquifer and surface runoff from the Silver Island Mountains. Although, based on gradient information, they determined that these are minor contributors.

Basin Fill (Deep Brine) aquifer. There was insufficient data to conclude whether or not there was upward leakage of the deep brine aquifer. Mason and Kipp (1998, p. 44) state that the thick sequence and low permeability of the lacustrine sediment in the upper part of the deep brine aquifer probably prohibits leakage from the upper brine aquifer even though the driving force is downward.

There are two ways which there is discharge from the Shallow-Brine Aquifer. Direct evaporation at the playa surface (Mason and Kipp, 1998, p.1) is one and the pumping of approximately 5 billion gallons annually (Intrepid, 2008, p.72) from the shallow brine aquifer in to brine collection ditches is the other. The brine collection (production) ditches are located in the Shallow-Brine Aquifer. Intrepid Wendover pumps brine from the Shallow-Brine throughout the entire 87,000+ acres controlled by the mining operation. The Utah Division of Water Rights has appropriated the use of over 26
billion gallons per year (Intrepid, 2008, p. 72). There is an increase in dissolved-solids concentration toward the center of the playas and this reflects the natural direction of brine movement toward the natural discharge areas which are the salt crusts. Due to placement of the brine collection ditches in the shallow brine aquifer and the pumping of the alluvial fan aquifer by Intrepid Wendover, the natural direction of the flow of the brines in the aquifers have been reversed (Lines, 1979, p. 90-91). Lines (1979, p. 91) reported that by extracting brines from the carbonate muds, the percentages of potassium and magnesium have decreased in some areas while the concentrations of sodium and chloride have been maintained by re-solution of the salt crust.

**Basin-Fill Aquifer Properties:**

The Basin-Fill aquifer consists mainly of conglomerate that overlies volcanic rocks that are about 65 million years old (Lines, 1979, p. 57). From 48 to 63 feet deep the aquifer has no fractures or highly permeable layers (Mason and Kipp, 1989, p 43). The water flow through this aquifer is reported to be from 2,000 ft²/day [267 (gpd/ft)] – 8,000 ft²/day [1069 gpd/ft](Mason and Kipp, 1998, p.43). Scientific measurements that have been taken show that this is a confined aquifer. (A confined aquifer is bounded by layers that retard the movement of water in and out of the aquifer. An unconfined aquifer is bounded by layers that are pervious). These numbers are significantly lower than those of the Shallow Brine aquifer.

**Basin-Fill Aquifer Chemistry:**

The following is a list of the ions that occur in the Basin-Fill aquifer. Each ion, with its electronic charge, is shown along with the concentration range, and the unit of measurement.

| Table 3.2 Basin-Fill (Deep Brine) Aquifer Chemistry (from Turk, 1969, p.97) |
|-----------------------------------|-----------------|-----------------|
| **Analyte** | **Concentration Range, mg/L** | **Average, mg/L** |
| Calcium (Ca⁺) | 1,500-1,600 | 1,550 |
| Magnesium (Mg²⁺) | 1,400 | 1,400 |
| Potassium (K⁺) | 1,800-2,000 | 1,900 |
| Sodium (Na⁺) | 41,400-46,000 | 43,700 |
| Bicarbonate (HCO₃⁻) | Not Analyzed | Not Analyzed |
| Chloride (Cl⁻) | 70,000-72,000 | 71,000 |
| Sulfate (SO₄²⁻) | 6,000-6,200 | 6,100 |
| Total dissolved solids (TDS) | Not Analyzed | Not Analyzed |

**Basin-Fill Aquifer Recharge and Discharge:**

Mason and Kipp (1998, p. 44) stated that the recharge to the aquifer was most likely from the alluvial fan aquifers. Turk (1969, p. 95) suggests that aquifer may be fed by a fault which borders the salt flats on the west side.
The movement and discharge mechanism of the Basin-Fill aquifer is based on studies conducted by Mason and Kipp (1989, p. 44), they synopsized that the ground water flow in this aquifer was from the North to the South and calculations showed the driving force for the groundwater was down even though the Salt Flats is a discharge point for the Great Salt Lake desert and there should be upward movement. This discharge mechanism appears to be inconclusive. Intrepid Wendover also pumps out of this aquifer which provides another mechanism for discharge.

**Alluvial Fan Aquifer Properties:**

There are several places where the alluvial fan aquifer exists along the East Flank of the Silver Island Mountains. It was created by material deposited by stream flows exiting the canyon that occur along the mountain front. Alluvial fans are mainly composed of poorly sorted pebbles, conglomerates, sand and silts that underlie (Turk, 1969, p.43) and are interbedded with the lake sediments of the Bonneville Salt Flats (Lines, 1979, p.55). Turk (1969, p. 43) stated that the alluvial fans originated prior to Lake Bonneville.

The amount of water that flows through the alluvial fan aquifer per unit area ranges from 185,000 - 475,000 gpd/ft indicating a leaky aquifer (Turk, 1969, p.70, 72)) based on long term pumping tests. A leaky aquifer has the characteristics of a confined aquifer but the layers are semi-pervious and some water can penetrate the layers.

At the present time Intrepid Wendover has 7 wells that can produce approximately 6500 gallons per minute (3.5 billion gallons per year) of make-up-water (Intrepid, 2008, p. 33) for use in their process, but the annual usage is around 1.2 billion gallons per year (Intrepid, 2008, p.72). The Utah Division of Water Rights has placed an appropriation limit of 8.6 billion gallons of make-up-water per year. (Intrepid, 2008, p.72). There has been an increased demand on the alluvial fan aquifer due to the salt laydown project. Data taken from the salt laydown flow meter in 2005, 2006 and 2009 (located on the discharge side of the system) indicates that there was an average of 255 million gallons pumped out on to the Salt Flats. This number represents the output of the pump for the salt laydown project and not the amount of brine removed from the alluvial-fill aquifer. Because of ditch loss, the input number would be larger than the output number of 255 million gallons. The 255 million gallons represents an increase of over 21% in the annual pumping amount.

**Alluvial Fan Aquifer Chemistry:**

The chemistry of the aquifers indicates that the water is not fresh but contains moderately high levels of ions. In this case, the TDS Turk (1969, p. 77) in 5 samples ranged from 6,800 to 8,200 milligrams per liter (mg/L). Gorrell (1958), defined brackish water that has a range from 1,000-10,000 ppm, NaCl and from 10,000-100,000 parts per million, (ppm TDS) as salty. Milligrams per liter and parts per million are equivalent for water that weighs 1 kilogram per liter, but as the density of the solution increases the difference between ppm and mg/L can change (Brownlow, 1979, p. 134-135).
Table 3.3 Brackish Well Field (alluvial fan aquifer) Groundwater Quality (from Intrepid, 2008, Table 3.8).

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration Range, mg/L</th>
<th>Average, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (Ca(^{++}))</td>
<td>130-670</td>
<td>362</td>
</tr>
<tr>
<td>Magnesium (Mg(^{++}))</td>
<td>110-460</td>
<td>262</td>
</tr>
<tr>
<td>Potassium (K(^{+}))</td>
<td>160-650</td>
<td>332</td>
</tr>
<tr>
<td>Sodium (Na(^{+}))</td>
<td>2,700-14,000</td>
<td>6,800</td>
</tr>
<tr>
<td>Bicarbonate (HCO(_3^{-}))</td>
<td>130-160</td>
<td>138</td>
</tr>
<tr>
<td>Chloride (Cl(^{-}))</td>
<td>3,400-19,000</td>
<td>6,417</td>
</tr>
<tr>
<td>Sulfate (SO(_4^{2-}))</td>
<td>290-1,400</td>
<td>717</td>
</tr>
<tr>
<td>Total dissolved solids (TDS)</td>
<td>5,300 - 41,000</td>
<td>18,433</td>
</tr>
</tbody>
</table>

Alluvial Fan Aquifer Recharge and Discharge:

Recharge to the alluvial fan aquifers comes from the following sources as described by Turk, (1969, p. 73)
1. Rainfall
2. Leakage of brine from the shallow brine aquifer
3. Subsurface fault-line springs along the mountain front

Discharge is only through pumping, loss to the basin fill aquifer or shallow brine aquifer. There are no springs or seeps that emanate from this aquifer.
## Appendix C-
Comment and Response Table

<table>
<thead>
<tr>
<th>Comment #</th>
<th>Commenter</th>
<th>Comment/Response</th>
<th>Integration Status (EA addition/correction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G. Long</td>
<td>Under 1.7, Issues not carried forward for detailed analysis, I was disappointed to see that Socioeconomics was included in this category. Response: The EA was prepared in conjunction with the approval of Intrepid’s mine plan and as Mr. Long stated in part in his comment letter, “I agree that approval or denial of the Intrepid Mining Plan would have little or no impact on employment in the overall impact area”. That was why socioeconomics were not carried forward.</td>
<td>No EA change required.</td>
</tr>
<tr>
<td>2</td>
<td>G. Long</td>
<td>What is needed is a comprehensive monitoring program that looks at the thickness and aerial extent of the salt, chemical makeup of the salt, salt density, salt surface conditions, and anything else you can think of that is pertinent to maintaining a viable salt surface. Response: Between the BLM and Intrepid, there has always been some form of monitoring of the extent, chemistry, density and conditions of the salt and the salt crust, and BLM and others are working to better understand the complex groundwater system in that region. As for “anything else you can think of that is pertinent to maintaining a viable salt surface”, a study on what the possible affects are of thousands of vehicles and people on the BSF every year and what they are doing to the salt crust could be conducted. This would be a different study.</td>
<td>No EA change required.</td>
</tr>
<tr>
<td>3</td>
<td>Save the Salt Coalition 1.3</td>
<td>The same mining regulation (43 CFR Part 3590, Solid Minerals (other than coal) Exploration and Mining Operations) that encourages maximum recovery also establishes protective limits and that should be noted in the EA. Response: The EA has been updated to reference Ultimate maximum recovery with the CFR.</td>
<td>Added text to Section 1.3.</td>
</tr>
<tr>
<td>4</td>
<td>Save the Salt Coalition 1.4a</td>
<td>The Coalition contends that the BLM has failed in its requirements to manage the BSF as an ACEC by allowing the degradation to take place over decades. Response: The BLM has a multifaceted responsibility to manage for prior existing mineral leases in addition to other activities on the BSF.</td>
<td>No EA change required.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>5</td>
<td>Save the Salt Coalition 1.4b</td>
<td>The Coalition contends that BLM has failed for decades to keep the SHPO informed of the degradation at the BSF as a consequence of mining operations or sought a letter of project consent from the SHPO. <strong>Response:</strong> Because it has never been determined that the conditions of the BSF are attributed to the mining operations, the BLM did not believe it needed to inform the SHPO of anything.</td>
<td>No EA change required.</td>
</tr>
<tr>
<td>6</td>
<td>Save the Salt Coalition 1.6 Hydrology/ Groundwater</td>
<td>The Coalition states the alluvial fan aquifer is higher that the shallow brine aquifer and the water content is not 22% salt brine. <strong>Response:</strong> Section 1.6 of the EA does not address the salinity of the alluvial fan aquifer. Please see Appendix B for additional information on the alluvial fan aquifer recharge and discharge.</td>
<td>No EA change required.</td>
</tr>
<tr>
<td>7</td>
<td>Save the Salt Coalition 1.6 ACEC</td>
<td>For five decades the BM has allowed the BSF to deteriorate and has not required the mine owners before Reilly and Intrepid to implement replenishment programs. <strong>Response:</strong> While there has been perceived depletion by the public for years, a study conducted by White (BLM) and Terrazas (2006 p.1), concluded there was no difference in the crust thickness between the 1988 and 2003 measurements, see page 12 of EA.</td>
<td>Typographical error changed from 1998 to 1988.</td>
</tr>
<tr>
<td>8</td>
<td>Save the Salt Coalition 1.7</td>
<td>“The EA asserts that “the salt flats seems to be remaining stable”. What science is this based on? The racing community does not share this conclusion and believes scientific measurements document a drastic reduction in salt depth, quality and hardness”. <strong>Response:</strong> 3.2 Salt Crust and Salt Laydown. The study conducted by White and Terrazas (2006 p.1) concluded there was no change in thickness between the 1988 and 2003 measurements On page 29 the report continues “...despite brine withdrawal for mineral production, neither short nor long-term measurable changes in salt crust thickness could be documented...”</td>
<td>Actual statement from study was inserted in Section 3.2.</td>
</tr>
<tr>
<td>9</td>
<td>Save the Salt Coalition 2.1 Evaporation Pond</td>
<td>Salt in PP5 should be a candidate eventually spreading on the BSF. <strong>Response:</strong> 4.3.1.1 Shallow Brine Aquifer, Primary Pond Relocation: This paragraph states the salt in PP5 would be reclaimed and returned to the BSF and eventually to the shallow brine aquifer.</td>
<td>No EA change required.</td>
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<td>10</td>
<td>Save the Salt Coalition 2.1 Salt Laydown</td>
<td>The Coalition seeks “interested party” status so as to monitor and assist in implementation of the Salt Laydown plan. Response: The BLM encourages the Coalition to seek salt laydown results directly from the Company.</td>
<td>Language added in Section 2.2.</td>
</tr>
<tr>
<td>11</td>
<td>Save the Salt Coalition 2.1 Reclamation</td>
<td>The Coalition is wondering if 2.1 Alternative A: Proposed Action-Approved Plan Proposed, bullet 5 is the entire reclamation plan. Response: No, there is an entire section in the Mine Plan that deals with reclamation of the facilities, ditches and ponds.</td>
<td>EA changed to state reclamation plan.</td>
</tr>
<tr>
<td>12</td>
<td>Save the Salt Coalition 2.2</td>
<td>The Coalition would like Intrepid to repeat the 2003 salt-crust thickness study on the BSF in 2016 if not sooner. They would also like to see language that states if data indicates the salt crust is decreasing, steps would be done in the interim and not wait until lease renewals in 2023. Response: Comment noted.</td>
<td>No EA change required.</td>
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<td>13</td>
<td>Save the Salt Coalition 2.2</td>
<td>The Coalition recommends changes to the second paragraph of 2.2. Response: Paragraph was updated for clarification.</td>
<td>Updated second paragraph of Section 2.2.</td>
</tr>
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<td>14</td>
<td>Save the Salt Coalition 2.2</td>
<td>The Coalition suggests that the final paragraph of 2.2 be reworded. Response: Changes have been made to this paragraph for clarification. The BLM considers the salt crust as the entire stratigraphy and therefore will not change from volume to crust.</td>
<td>Updated paragraph of EA.</td>
</tr>
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<td>15</td>
<td>Save the Salt Coalition 2.4</td>
<td>The Coalition believes that there are alternatives beyond pumping that should be considered to replenish lost salt. Response: Updated Section 2.4 of the EA to include other alternatives considered.</td>
<td>Added text to Section 2.4</td>
</tr>
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<td>16</td>
<td>Save the Salt Coalition 2.4</td>
<td>The Coalition would like to require an annual meeting with the BLM, mining company and user community. Response: The BLM does not object to an annual meeting; however this will not be required in the mine plan approval.</td>
<td>No EA change required.</td>
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| 17        | Save the Salt Coalition 2.4 | The Coalition would like a longer time period of implementing salt laydown.  
Response: Comment noted. | No EA change required. |
| 18        | Save the Salt Coalition 3.2 | It would be useful to provide context on the salt depth and not focus on the consistency of the 1998-2003 measurements.  
Response: Context has been established by the White and Terrazas 2006 report. | No EA change required. |
| 19        | Save the Salt Coalition 3.3.2 | The Coalition is unaware of the SHPO or Advisory Council on Historic Preservation ever having reviewed and approving  
Response: The cultural review associated with this undertaking, which resulted in a finding of “No Historic Properties Effected”, was forwarded to SHPO as part of a quarterly “Protocol” submission. | No EA change required. |
| 20        | Save the Salt Coalition 4.3.1.1 | The Coalition notes speculation with use of “return the aquifer…. Back to its original condition”.  
Response: The paragraph was updated to reflect comments. | Section 4.3.1 updated. |
| 21        | Save the Salt Coalition 4.3.1.2 | The Coalition believes there is a lack of specificity with respect to the laydown project.  
Response: Intrepid has stated in its plan that they will install monitoring devices to give an accurate account of the mass-ion balance in order to return the same amount of salt removed from the north side of I-80. | No EA change required |
| 22        | Save the Salt Coalition 4.3.2 | While the Coalition believes that the proposed action under Alternative B will stabilize the BSFs from any further deterioration, they think the BLM needs to pursue supplemental replenishment activities to bring it back to its glory days.  
Response: This comment is outside the scope of this EA. | No EA change required. |
| 23        | Save the Salt Coalition 4.3.2 | The Coalition states that ACEC reclamation would be “spurious”.  
Response: The BLM corrected the appropriate sections of the EA to reflect correct reclamation plans. | Section 4.3.2 updated. |
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<td>24</td>
<td>Save the Salt Coalition 4.3.2.3</td>
<td>The Coalition states confusion with “No Action” and the salt laydown project. Response: No Action means that the operation would continue as it is currently as well proposed with voluntary salt laydown.</td>
<td>No EA change required.</td>
</tr>
<tr>
<td>25</td>
<td>Save the Salt Coalition 4.4.1.2/4.4.1.3/4.4.2.2/4.4.2.3</td>
<td>The Coalition contends that the only other significant activity that could be directly associated with the degradation of the BSF is mining. Response: See comment number 8.</td>
<td>No EA change required.</td>
</tr>
<tr>
<td>26</td>
<td>Save the Salt Coalition 5.2</td>
<td>The Coalition wants SHPO to seek advice from the Advisory Council on Historic Preservation and other interested parties. Response: As a consulting party, the Coalition can certainly make that request of SHPO with regard to the ACHP. The BLM has consulted with other interested parties, in this case STS (Consulting Party Meeting held on 03 August 2012).</td>
<td>No EA change required.</td>
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<td>27</td>
<td>Intrepid. Pg 6, Section 2.1</td>
<td>The EA has Intrepid as the owner of Wendover Potash in 2001, when in fact it was Reilly Chemical. Response: Error noted and change made in the EA.</td>
<td>EA changed to reflect correct facility owner.</td>
</tr>
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<td>28</td>
<td>Intrepid</td>
<td>Intrepid would urge BLM to make clear that, for the measurement calculation presented for measuring the salt laydown, the result must be either 0 or 1.0 or greater (i.e., no number between 0 and 1), because any number divided by zero is zero and the equation would not be satisfied in the event no salt is harvested from the federal leases in the measurement period regardless of the amount of salt laydown in the same period. Response: The EA was updated to make it clear that the calculation number can also be 0.</td>
<td>Section 2.2 updated.</td>
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<td>29</td>
<td>Intrepid 4.3.1.2</td>
<td>Intrepid is concerned that there is no discussion of a “cure period” in the event of noncompliance or of the impact of Act of God. They believe they should be addressed in Section 2.2 of the EA. Response: Comment noted, see section 2.2 for changes.</td>
<td>Section 2.2 updated.</td>
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<td>30</td>
<td>Intrepid</td>
<td>Intrepid has its biggest concern with the last sentence in Section 2.2 which states: “if the data indicates that the salt volume is decreasing, terms and conditions would be devised to add to the Federal leases when they are renewed in 2023.” We believe that with certain statements in the EA the</td>
<td>Section 2.2 changed.</td>
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<td>BLM cannot determine with any level of scientific certainty that if the salt crust has decreased in a particular time interval that it must and can only be because of Intrepid's mining operations. Imposing additional terms and conditions on Intrepid under these circumstances would be arbitrary and capricious and therefore, subject to successful legal challenges.</td>
<td>Section 2.2 of the EA has been updated.</td>
</tr>
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<td>Intrepid</td>
<td>In Section 3.0 (page 15(now page 16, second paragraph)) we would suggest insertion of the word “natural” before the word “recharge” in the first sentence in the third full paragraph to remove the possibility of any incorrect implication that Intrepid is causing the water table to rise.</td>
<td>Section 3.0 updated.</td>
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<td>31</td>
<td>Intrepid</td>
<td>Response: BLM added the word “natural” in Section 3.0.</td>
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Finding of No Significant Impact
Environmental Assessment
UT-020-2006-002

August 2012
Intrepid Potash Mine and Reclamation Plan
(Modification)
UTU-087809-087818

Location: Western Great Salt Lake Desert
Tooele County, UT

Applicant/Address: Intrepid Potash – Wendover, LLC
2 1/2 Mile East Frontage Road
Wendover, UT 84083

U.S. Department of the Interior
Bureau of Land Management
Salt Lake Field Office
2370 South 2300 West
Salt Lake City, Utah 84119
Phone: (801) 977-4300
FAX: (801) 977-4397
FINDING OF NO SIGNIFICANT IMPACT
ENVIRONMENTAL ASSESSMENT
UT-020-2006-002
Intrepid Potash Mine and Reclamation Plan
(Modification)
UTU-087809-087818

Based upon a review of Environmental Assessment (EA) number UT-020-2006-002 and the supporting documents, I have determined that the Intrepid Potash Mine and Reclamation Plan (Modification) with conditions of approval is not a major federal action and will not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27 and do not exceed those effects described in the Pony Express Resource Management Plan (1990). Therefore, an environmental impact statement is not required. The selected alternative, (Alternative B) and the following specific factors were considered in making the determination.

Given the results of White and Terrazas (2006), the salt laydown project should have a positive impact towards the goal of maintaining an ion mass balance in the shallow brine aquifer. However, whether this translates into perceived gains in salt crust conditions beneficial to both land speed racing and filming cannot be definitively concluded given the current data available and scientific understanding related to salt crust variability. The best science available, a comparison of 1988 and 2003 (White and Terrazas, 2006), does not provide data or conclusions that support public perceptions that the salt crust at the Bonneville Salt Flats has decreased.

Other resources analyzed were determined to be not present in the project area or not impacted by the plan.

Based upon these findings, an Environmental Impact Statement is not required.

Authorized Officer

Date

August 8, 2012
United States Department of the Interior
Bureau of Land Management

DECISION RECORD
ENVIRONMENTAL ASSESSMENT
UT-020-2006-002

August 2012
Intrepid Potash Mine and Reclamation Plan
(Modification)
UTU-087809-087818

Location: Western Great Salt Lake Desert
Tooele County, UT

Applicant/Address: Intrepid Potash – Wendover, LLC
2½ Mile East Frontage Road
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U.S. Department of the Interior
Bureau of Land Management
Salt Lake Field Office
2370 South 2300 West
Salt Lake City, Utah 84119
Phone: (801) 977-4300
FAX: (801) 977-4397
It is my decision to approve the Intrepid Potash Mine and Reclamation Plan (Modification) dated May 2008 with the following conditions:

1. Three Year Mass Balance. The operator/lessee shall be required to conduct salt laydown as per the mining plan dated May 2008 with the exception that mass-ion balance of the sodium chloride ions that are removed from the lands north of Interstate 80 via booster pump #2 will equal or exceed the sodium chloride ions placed onto the salt flats using the following evaluation criteria. The evaluation period would be on a three calendar year basis and would use the following calculation where SL= Salt Laydown, SB= Salt in the brine from the leases north of I-80 and the three years are Y1, Y2 and Y3:

\[
\frac{(Y1SL + Y2SL + Y3SL)}{(Y1SB + Y2SB + Y3SB)} = 0 \text{ or } 1.0 \text{ or greater}
\]

The company will be required to submit to the BLM the basis for this annual evaluation 60 days after the salt laydown project is completed or would normally be completed for the year.

2. 2018 Salt Study. The operator/lessee shall arrange for a third party contractor with oversight from BLM to repeat the BLM’s 2003 salt-crust thickness study on the BSF by the end of 2018. If data indicates that the salt volume is decreasing and it can be shown that it is the result of the mining company, the BLM may revise the terms and conditions when the lease is readjusted in 2023.

3. Fringe Acreage Lease. No Surface Occupancy. These lands are on property under the jurisdiction of the Department of Defense, Hill Air Force Base and may contain unexploded ordinance. The lessee shall not enter the lands subject to this lease without the express written consent of Base Civil Engineer, 75 CEG/CL to arrange access. All requests and responses shall be furnished to the BLM prior to accessing the property. No mining, trenching, processing or exploration is authorized on this lease. This lease is issued to conform with 43 CFR 3594.5(c).

I accept the use of primary evaporation pond 6, and approve the decommissioning of pond 5, the new ditch network on the South Federal Leases and the Fringe Acreage lease application. I also approve the continuation and monitoring of the salt laydown project using an ultrasonic flow meter with a data collection device and the reclamation procedures and bonding requirements on Federal and non-Federal lands.
The approvals authorized under this decision are described in more detail in the selected alternative, Alternative B- Proposed Action with Mitigation in Environmental Assessment (EA) UT-020-2006-002. This approval is contingent upon strict compliance with the specifics of Alternative B (also referred to as the selected alternative) as outlined in the EA and the Intrepid Potash Mine and Reclamation Plan (Modification).

**PLAN CONFORMANCE AND CONSISTENCY:**

The proposed action and alternatives have been reviewed and found to be in conformance with one or more of the following BLM Land Use Plans and the associated decision(s):

Land Use Plan Name: Pony Express RMP Date Approved/Amended: January 12, 1990

The selected alternative is in conformance with the LUP, even though it is not specifically provided for, because it is clearly consistent with the following LUP decision:

The 1990 Pony Express Resource Management Plan (RMP) provides direction for the management of mining related activities on BLM administered lands in Tooele County. The proposed action and alternative would conform to the general guidelines of the RMP, as amended, under Minerals Program Decision 4, page 28 of the Record of Decision.

This Decision states: “Applications to remove other types of leasable minerals, such as phosphate, tar sands, and oil shale, will continue to proceed on a case-by-case basis. Stipulations to protect important surface values will be required based on review of each proposal. Coal exploration and development, if any, would be regulated under 43 CFR 3400”.

The plan modification is also consistent with the following RMP decisions: Soil/Water/Air Decision 1 (evaluate), Decision 2 (protect water rights), Decision 4 (erosion), Decision 7 (air); Wildlife Decision 2 (T&E/SSP) & Decision 4 (protect habitat values); Recreation Decision 1 (manage as SRMA) & Decision 2 (OHV use); VRM Decision 1 (manage classes); Cultural Resources Decision 1 (evaluate); and Areas of Critical Environmental concern (ACEC) Decision 1 (designation).

**Alternatives Considered:**

The Proposed Action, Alternative B and No Action alternatives were considered and analyzed. The Proposed Action and No Action alternatives would keep the salt laydown project as a voluntary action and not a requirement which would not ensure that the mass-ion balance would be maintained.

If the No Action Alternative was implemented the impacts for the primary pond relocation would be the same as described in the proposed action, the new ditch location on the south leases would not be dug, the fringe acreage lease would not be issued, there would be no production monitoring for material balance and there would be no reclamation plan approved and a reclamation bond could not be imposed because there is no plan to make the calculations from.

**Rationale for Decision:**

Selection of Alternative B is the most scientifically sound alternative and satisfies most concerns of the parties interested in the Bonneville Salt Flats area.

This decision complies with the Mineral Leasing Act of 1920 as revised and the 1990 Pony Express Resource Management Plan.
Approval:

My signature on and approval of this Decision Record authorizes the Intrepid Potash Mine and Reclamation Plan (Modification).

In accordance with 43 CFR 3501.20, this authorization is effective the first day of the month after this Decision is signed.

Protest/Appeal Language:

The decision may be appealed to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR Part 4. Within 30 days of this decision, a notice of appeal must be filed in the office of the authorized officer at the Bureau of Land Management, BLM, Salt Lake Field Office, 2370 South 2300 West, Salt Lake City, Utah 84119. If a statement of reasons for the appeal is not included with the notice, it must be filed with the Interior Board of Land Appeals, Office of Hearings and Appeals, U.S. Department of the Interior, 801 North Quincy St., Suite 300, Arlington, VA 22203 within 30 days after the notice of appeal is filed with the authorized officer.

A copy of the notice of appeal, any statement of reasons and all pertinent documents must be served on the IBLA at the same time it is filed with the authorized officer. In addition, a copy of all such documents must be served on each adverse party named in the decision from which the appeal is taken and on the Office of the Solicitor, U.S. Department of the Interior, Intermountain Region, 125 South State Street, Ste. 6201, Salt Lake City, Utah 84138-1180, not later than 15 days after filing the notice of appeal with the Authorized Officer.

If you wish to file a petition for stay pursuant to 43 CFR Part 4.21(b), the petition for stay should accompany your notice of appeal and shall show sufficient justification based on the following standards:

1. The relative harm to the parties if the stay is granted or denied;
2. The likelihood of the appellant’s success on the merits;
3. The likelihood of irreparable harm to the appellant or resources if the stay is not granted; and,
4. Whether the public interest favors granting the stay.

If a petition for stay is submitted with the notice of appeal, a copy of that petition also must be served on the authorized officer and with the IBLA and each party named in the decision from which the appeal is taken.

Authorized Officer

Date