REPORT ON THE POTASH POTENTIAL
of the
GREEN RIVER POTASH PROJECT AREA

Grand County, Utah

Approximate Geographic Limits:

578 000E – 606 000E
4 264 000N – 4 291 000N
(Datum: NAD83, Zone 12N)

A technical report in compliance with National Instrument 43-101

Prepared For:

American Potash LLC

By:


August 15, 2009
# 2.0 Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>SUMMARY</td>
</tr>
<tr>
<td>4.0</td>
<td>INTRODUCTION</td>
</tr>
<tr>
<td>5.0</td>
<td>RELIANCE ON OTHER EXPERTS</td>
</tr>
<tr>
<td>6.0</td>
<td>PROPERTY DESCRIPTION AND LOCATION</td>
</tr>
<tr>
<td>7.0</td>
<td>ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY</td>
</tr>
<tr>
<td>8.0</td>
<td>HISTORY</td>
</tr>
<tr>
<td>9.0</td>
<td>GEOLOGICAL SETTING</td>
</tr>
<tr>
<td>9.1</td>
<td>Regional Geology</td>
</tr>
<tr>
<td>9.2</td>
<td>Local Geology</td>
</tr>
<tr>
<td>10.0</td>
<td>DEPOSIT TYPES</td>
</tr>
<tr>
<td>10.1</td>
<td>History of Potash</td>
</tr>
<tr>
<td>10.2</td>
<td>Genesis</td>
</tr>
<tr>
<td>10.3</td>
<td>Extraction</td>
</tr>
<tr>
<td>11.0</td>
<td>MINERALIZATION</td>
</tr>
<tr>
<td>12.0</td>
<td>EXPLORATION</td>
</tr>
<tr>
<td>13.0</td>
<td>DRILLING</td>
</tr>
<tr>
<td>13.1</td>
<td>Well Log Interpretation Theory</td>
</tr>
<tr>
<td>13.2</td>
<td>Review of Select Well Logs in the Permit Application Area</td>
</tr>
<tr>
<td>14.0</td>
<td>SAMPLING METHOD AND APPROACH</td>
</tr>
<tr>
<td>15.0</td>
<td>SAMPLE PREPARATION, ANALYSES AND SECURITY</td>
</tr>
<tr>
<td>16.0</td>
<td>DATA VERIFICATION</td>
</tr>
<tr>
<td>17.0</td>
<td>ADJACENT PROPERTIES</td>
</tr>
<tr>
<td>18.0</td>
<td>MINERAL PROCESSING AND METALLURGICAL TESTING</td>
</tr>
<tr>
<td>19.0</td>
<td>MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES</td>
</tr>
<tr>
<td>20.0</td>
<td>OTHER RELEVANT DATA AND INFORMATION</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>21.0 INTERPRETATION AND CONCLUSIONS</td>
<td>25</td>
</tr>
<tr>
<td>22.0 RECOMMENDATIONS</td>
<td>26</td>
</tr>
<tr>
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<td>28</td>
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</table>
American Potash LLC
Potash Potential of the Green River Potash Project Area, Utah
August, 2009

2.1 TABLES

Table No.  Page
1 Potash Prospecting Permit Applications following pg 3
2 Densities of common rock forming minerals in evaporite sequences 16
3 Potash intervals defined in Cane Creek Federal 7-1 (API 43019-31363) 17

2.2 FIGURES

Figure No.  Following Page
1 Location Map 3
1b Bureau of Land Management Designated Routes (Map 2-11-C) 4
2 Potash Prospecting Permit Applications 4
3 Structural Elements of the Paradox Basin Area 7
4 Stratigraphy of the Paradox Basin Area 8
5 Geology of the Northwest Part of the Paradox Basin 10
6 Elevation of the Top of the Paradox Formation Salt 10
7 Elevation of the Top of Cycle 13 Halite and Depth (feet) Below Surface 11
8 Isopach Thickness (Feet) of Evaporite Cycle 13 11
9 Isopach Thickness (Feet) of Evaporite Cycle 13 Halite Horizon 11
10 Isopach Thickness (Feet) of Evaporite Cycle 13 Potash Horizon 11
12 Oil and Gas Wells 14
13 Cane Creek Federal 7-1 Well, Cycle 13 Evaporite Geology and Gamma-Ray Log 15
14 McRae Federal 1 Well, Gamma-Ray and Neutron Logs 20
15 Federal 1-26 Well, Gamma Ray – Resistivity Log, Cycle 5 20
16 Federal 1-26 Well, Gamma Ray – Resistivity Log, Cycle 13 21
17 Federal 1-26 Well, Gamma Ray – Neutron Log, Cycle 13 21
18 Possible Evaporation Pond Sites and Identified Environmental Concerns 23

2.3 PHOTOS

Photo No.  Page
1 Cane Creek Federal 7-1 monument. 17
2 View to west of Bartlett and Jug Rock Flats. Potential evaporation pond “A” 24
3 View to west of valley north of Tenmile Wash. Potential evaporation pond “C” 24
4 View southeast of Intrepid Potash’s north evaporation pond 24
3.0 SUMMARY

The Green River Potash project consists of 31 potash prospecting permit applications totalling 25,593.03 hectares (63,241.5 acres US), located near Moab in southeast Utah. It is within the limits of the Paradox Basin, a southeast trending geological feature with dimensions of roughly 160km by 50km. This sedimentary basin has been the focus of oil, gas exploration since the mid 1950s, and has supported potash extraction from the Cane Creek mine since 1964.

The Paradox Basin was formed during Pennsylvanian age subsidence and over the span of approximately 4 million years was filled with 1500-1800m (5000-6000 feet) of cyclical evaporite sequences. An ice age on Pangaea during this time was characterized by rapid cyclic warming and cooling periods. Continental ice sheets expanded and contracted, causing fluctuations in sea level. The Paradox basin had limited access to the open ocean. In periods of rising sea levels (marine transgression) anhydrite, dolomite and shale were deposited. During periods of low sea level (marine regression) the basin water became hypersaline due to evaporation, causing precipitation of salt and potash. Over 29 evaporite sequences accumulated in the Paradox Basin. All terminated with the deposition of halite, and 17 of these contain sylvite and other potash minerals.

Most of the Paradox evaporite sequences are thickest in the northeast where the basin was deepest along the foot of the Uncompahgre uplift. The accumulation of evaporite Cycle 13, however, was thickest in the shallower northwest edge of the basin, presumably along some local structural depression. The Green River potash project area is centred on the postulated thickest part of the Cycle 13 accumulation.

Logs and reports for several oil and gas exploration wells drilled on the subject permit applications were reviewed for indications of potash. It appears that in the property area cycles 5, 13 and 18 contain significant concentrations of potash. The Cycle 5 potash horizon is currently being solution mined by Intrepid Potash at the Cane Creek mine. In the Green River property area it ranges from 3.7 – 5.5m (12-18') in thickness and based on gamma ray logs grades very approximately between 15 and 25% K₂O.

Cycle 13 has three distinct consecutive potash-bearing horizons with a cumulative thickness of 44 to 55m (143-180') which is thickening to the northwest. This Cycle 13 potash sequence can be traced across at least 14km of the permit applications and is very probably continuous throughout. The upper potash-bearing horizon ranges in thickness from 48' in the southeast to 70' in the northwest, and grades an estimated 4-7% K₂O. The middle Cycle 13 potash horizon ranges from 4 to 4.6m (13-15') thick with an apparent consistent grade of approximately 15% K₂O. The lower potash member ranges in thickness from 21.9 to 27.4m (72-90') but is very low grade, with an estimated K₂O content of only 1-2%.

Cycle 18 potash was identified in only one of the holes studied in detail. It is 2.4m (8') thick and grades approximately 30% K₂O.
Although Cycle 13 has significant widths of potash-bearing salt, it is probable that only the middle higher-grade 4-5m thick horizon has the potential of supporting a viable solution mining operation. The Cycle 5 potash horizon has similar widths but apparently considerably higher grades and shallower depths, and it may be a more attractive exploration target.

Land tenure is a concern. None of the Green River project prospecting permits have been granted to date. The “Known Potash Lease Area” (KPLA) boundaries are currently under review, with no schedule for completion. Potash is known to underlie much of the Paradox Basin, and these KPLA boundaries could be enlarged substantially. Any of the current subject potash prospecting permit applications which fall within the newly defined KPLA boundary will be rejected. It is uncertain how many, or in fact if any of these permits will be granted.

4.0 INTRODUCTION

This technical review of the Green River Potash project, Utah, was prepared for American Potash LLP. It has been undertaken to assess the potential of the potash prospecting permit applications (which make up the property) to contain viable potash deposits exploitable by solution mining. The project area covers part of the Paradox Basin, which was filled by a generally well understood series of cyclical evaporite sequences. There have been over 29 evaporite cycles identified with associated halite beds, most of which appear to be continuous and correlateable across hundreds of kilometres. At least 17 of these evaporite cycles are known to contain potash.

Most of the data available for the subject property area were collected during the exploration for hydrocarbons, and evidence for the occurrence of potash is generally indirect in the form of geophysical logs from oil and gas wells. Well log data and reports are available on line through the Utah Division of Oil, Gas and Mining website. Drill hole locations are available through the Utah State Geographic Information Database (SGID). The geology and potash potential of the property area have been discussed in numerous public domain reports and scientific papers. Information used in this technical report was obtained on line, from the Natural Resources Map and Bookstore in Salt Lake City, and from private book vendors.

The author visited the subject property on August 6th and August 7th, 2009. The target potash horizons do not outcrop and the permit applications do not have any associated monuments. The purpose of the trip was to assess road access and potential cultural and environmental conflicts, and to confirm the location of several abandoned well sites with indications of significant potash in the Cycle 13 evaporite.
5.0 RELIANCE ON OTHER EXPERTS

The concept of the Cycle 13 evaporite horizon as a potentially viable solution mining potash target was presented in 1976 by Robert Hite in the USGS Open-File Report 76-755. In this report he used well log data to determine the thickness of the potash-bearing horizon associated with the Cycle 13 halite bed, and produced an isopach map outlining the interpreted thickest part of that horizon. That map was the basis for the location of the subject potash prospecting permit applications.

Robert Hite worked as a geologist for the USGS between 1956 and 1989, and during most of that time focused on the geology of potash in marine evaporites. In 1975 he received the Special Achievement award of the U.S. Department of the Interior, and in 1987 the Meritorious Award for the advancement of the understanding of the geology of potash and marine evaporite basins.

The author has reviewed the data that Hite (1976) used in his interpretation of the Cycle 13 potash horizon, and can confirm that geophysical logs appear to indicate the presence of potash in the defined intervals based on lithology (halite) and associated anomalous gamma radiation. The author is not, however, an experienced well log analyst, and must ultimately rely on the expertise of Mr. Hite and his conclusions.

6.0 PROPERTY DESCRIPTION AND LOCATION

The Green River Potash project is located in Grand County, Southeast Utah. It is centred at approximately 593 000E, 4 278 000N (NAD 83, Zone 12N); 50km (31 miles) north of the confluence of the Green and Colorado Rivers, 43km (27 miles) south-southeast of the town of Green River, and 33km (21 miles) west-northwest of the town of Moab (Figure 1). It is located on land administered by the Bureau of Land Management (BLM).

The project area is defined by 31 potash prospecting permit applications totalling 25,593.03 hectares, or 63,241.5 acres US (Table 1, Figure 3). All applications listed in Table 1 are on file with the BLM. The applicant name on each of the case recordations is Sweetwater River Resources LLC, and their status is listed as "pending."

These applications have been on file for over a year, and to date no potash prospecting permits have been granted. Potash exploration and mining rights are obtained on federal BLM-administered land in different ways depending on the status of the land (43 CFR Part 3500, et al.):

1. If land has no known viable potash deposits, the rights to explore for potash are granted with “potash exploration permits” which have to be applied for by defining the desired area using a section (or part of), township and range designation. The location of section boundaries is well known, and no physical monument
### Potash Prospecting Permit Applications
#### Green River Potash Project, Utah

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marking the application limits is placed on the ground. Prospecting permits are only valid for 2 years from the date of granting, but in the case of potassium (potash), the BLM can extend the permits for an additional 2 years. Permits are maintained by paying a rent of $0.25 per acre for the first year, and then $0.50 per acre per year for the remainder of the life of the permit. Holders of prospecting permits can apply for a “Preference Right Lease” any time within the term of the permit, or with 60 days after the permit expires. Leases are typically valid for 20 years. To maintain a lease the holder must pay a minimum annual royalty of 5% of the gross value of output of potash, or $3 per acre, whichever is greater.

2. Land with known potash occurrences is defined as “Know Potash Lease Area”, or KPLA. To obtain potash rights within a KPLA, one must make a “Competitive Lease Application.” An applicant will be given the potash rights if they offer the highest bonus bid which meets or exceeds fair market value. Potash exploration rights within the defined KPLA boundaries can be obtained prior to competitive leasing by applying for an “exploration licence”, but a licence does not give the holder any subsequent preference or right to a lease. The bidding process must still be followed.

The two KPLA boundaries in Grand County are currently under review by the BLM (old “Seven Mile” and “Cane Creek” KPLA boundaries shown in Figure 2) and until such time that these boundaries are re-defined by law, no potash prospecting permits will be granted. Any prospecting permit applications that fall within the newly-defined KPLA boundaries will be rejected and the applicant will be given no preference in any subsequent bidding process. Timing to redefine the KPLA boundaries is uncertain.

Sweetwater River Resources LLC has entered an option agreement with American Potash LLC; a Nevada limited liability corporation owned 50% by each of Magna Resources Ltd. and Confederation Minerals Ltd., to sell potash exploration rights for land in Utah and Arizona. In addition to the potash prospecting permit applications for BLM land in Utah (as detailed in Table 1), American Potash will be acquiring:

- 3921.4 hectares (9690 acres US) of Arizona State Lands and BLM lands in the southwest part of the Holbrook Basin.
- 1295.0 hectares (3200 acres US) of Arizona State Lands in Apache County.
- 679.9 hectares (1680 acres US) of BLM land in Navajo County, Arizona.

The Green River Potash project in Utah is considered to be the “Principal Property” of the land package. Funds from equity financing will be used to conduct exploratory drilling on the Green River property, and hence this report is only discussing the Utah part of the total land holdings.

A news release by Magna dated June 3, 2009 outlines the terms of the agreement:

“The option agreement entitles American Potash to acquire a 100% interest in the Permits, subject to a 2% royalty to the Optionors (Sweetwater) which may be bought back
American Potash LLC

Green River Potash Project, Utah

Bureau of Land Management

Designated Routes (Map 2-11-C)

G. Allen, August, 2009

NAD 83, Zone 12N
American Potash LLC

Green River Potash Project, Utah

Potash Prospecting Permit Applications

G. Allen, August, 2009

NAD 83, Zone 12N

Figure 2
for $2,000,000(US). The option may be exercised by Magna and Confederation each paying a total of $135,000(US) and each issuing in aggregate 1,000,000 shares to the Optionors, as follows: $35,000(US) on signing of the option agreement; 100,000 shares upon grant of the Permits representing not less than 25,000 acres; $25,000(US) cash and 300,000 shares on or before the first, second and third anniversaries of the grant of the Permits; and a final $25,000(US) cash on or before the fourth anniversary.”

“With the exception of certain permits already issued in Arizona, all references to the Utah and Arizona exploration permits are references only to permits that are yet to be issued pursuant to existing applications submitted by the Optionors. There is no assurance that exploration permits will be issued or that all those issued will be contiguous. In addition to royalties payable to the Optionors, the Utah prospect will be subject to federal royalties (minimum 5% of gross value of output) and the Arizona prospect will be subject to federal or state royalties.”

No environmental liabilities from previous industrial activities are known to exist on the property.

Prior to conducting any exploration drilling on BLM land in Utah an exploration notice must be filed which outlines details of the proposed program. No surface disturbance may be made prior to receipt of an approval notice from the BLM. An exploration notice has not been filed to date.

**7.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY**

The Green River project area lies roughly 18km (11 miles) south of east-west interstate 70, and 11km (7 miles) west of the paved highway 191 which connects I-70 to the town of Moab (Figure 1). Numerous well maintained roads cross the property between highway 191 and the east rim of the Green River canyon. A maze of 4x4 roads and dirt tracks as shown in the State Geographic Information Database (SGID), presumably for the most part originally for seismic surveys and oil and gas exploration well-site access, provide BLM-designated road entry to every permit application (Figures 1b and 2).

Subject permit applications are located in relatively flat terrain on the east side of the Green River. It consists of broad stepped mesas with low rolling hills generally ranging in elevation between 1370 and 1670m (4500-5500’), but cut down below 1200m (4000’) in southwest-draining creek gullies and along the Green River canyon. Topography is such that evaporation ponds for extracting potash and salt from solution would be easily constructed. The adjacent Green River would be able to supply ample water for a solution mining operation. A power line is located along highway 191 approximately 10km (6 miles) east of the applications.
The climate is arid to semi arid, with an average annual rainfall of 20-28cm (8-11”). Through the year, the average daily high temperature ranges between 5-37°C (42-98°F), and the average daily low temperature between -8 - 17°C (18-63°F). The area receives approximately 300 days of sunshine annually. At Intrepid Potash’s nearby Cane Creek mine, pumping of water into the mine and subsequently into the evaporation ponds is only conducted for 7 months per year, presumably due to lowered evaporation rates in the ponds during the winter.

The Bureau of Land Management (BLM) controls the surface rights to the prospecting permit applications. Potash prospecting rights have not been applied for on the interspersed Utah State trust sections.

The BLM released a Proposed Resource Management Plan for this area in August of 2008. This document defines wildlife habitat areas, vegetation zones, designated routes, permitted land use, restricted use areas, etc.

Vegetation consists of sparse sage and black brush, clumps of native grasses, and sporadic pinion and juniper. BLM Moab Map 3-15 shows the property area to be covered with ‘desert scrub’ (largely within the canyons) and ‘grassland.’

The land supports typical desert fauna including mule deer, pronghorn, coyote, rabbit, foxes, rodents and reptiles. The Mexican spotted owl is classified as a state threatened species. It has potential foraging, breeding and nesting habitat throughout the property area (BLM Moab, 2008, Map 2-18). The burrowing owl is a species of special concern. It also has habitat within the permit applications (BLM Moab, 2008, Map 2-22). Other potentially sensitive species with habitat in the property include desert bighorn sheep and the golden eagle (BLM Moab, 2008, Maps 2-19 and 2-26-C). Endangered fish in the Green River include the Colorado pikeminnow, humpback chub, bonytail chub, and the razorback sucker (BLM Moab, 2008, Map 2-17).

The subject property area has been divided into 4 grazing allotments (BLM Moab Map 2-4-C). The southwest draining Mineral Canyon, Hell Roaring Canyon, and Spring Canyon (Figure 2) are desert bighorn sheep lambing and rutting areas, and are closed to grazing. Some barbed wire fences cross the land, and cattle guards have been established where roads cross these fences. A few corrals have been built. Water is scarce, but there are some springs and wind-powered well pumps in the area. No livestock was noted during the property examination and it is unclear how suitable the land is for ranching or how intensely it is used.

A few of the historic wells drilled in the project area have environmental profiles in their files. No archaeological sites were noted. No Wilderness Study Areas occur in the project area. Any commercial operation would have no visual impact on nearby parks. This area is, however, used for recreational off road vehicle travel and is crossed by several “jeep safari” routes.
The town of Moab (population approx. 5500), located within a half hour’s drive of the east side of the property, is the county seat of Grand County. It has an experienced work force and a well established infrastructure to support exploration activities. There is also a BLM field office located in Moab. For additional support contractors and consulting services, Denver is located 560km (350 miles) to the east with a driving time of approximately 5.5 hours.

8.0 HISTORY

Historic commercial activities in the project area have largely been limited to the exploration for oil and gas. Since the mid 1950s a total of 21 wells have been drilled on the current pending applications, and 70 within a distance of 5km of the outside limits of the permit application block. These wells appear to have been largely targeting hydrocarbons in clastic horizons in cycles 4, 12 and 21 of the Paradox Formation, and the Mississippian Leadville carbonate underlying the Paradox Formation. The most productive hydrocarbon reservoirs in this region are hosted in vertically fractured shale of the Cane Creek horizon, within cycle 21 of the Paradox Formation. It appears that no wells on the subject applications were drilled specifically for potash exploration, although it was noted in a few holes. There has been no previous potash production from the subject property.

Hite (1976) reviewed drill logs that penetrated the Cycle 13 potash horizon in what is now the subject permit application area, and estimated an average width of 18m (60’) with a conservative grade of 15% K₂O. He calculated a potential contained resource of 4.74 billion tonnes of potash ore, which translates to a contained 711 million metric tonnes of K₂O. These numbers are based on the imprecise and indirect evidence of gamma-ray and neutron density logs from a few widely-spaced holes, and in no way conform to a mineral resource under the definitions of NI43-101.

9.0 GEOLOGICAL SETTING

9.1 REGIONAL GEOLOGY

The Green River project potash prospecting permit applications are underlain by a Palaeozoic to Mesozoic sedimentary sequence ranging from Jurassic to Cambrian, and presumably by a granitic Precambrian basement. They are located within the surface projection of the Paradox Basin; a mid Pennsylvanian cyclical evaporite sequence which partially infilled a subsiding northwest – southeast trending basin roughly 160km long by 50km wide in southeastern Utah and southwestern Colorado (Figure 3). The Paradox basin is defined by the lateral extent of Pennsylvanian age evaporites. It has been the focus of exploration for, and the production of, oil, gas and potash.

It is postulated that the Paradox Basin subsidence occurred between 309.4 – 305.5 Ma during mid Pennsylvanian Desmoinesian age (Trudgill et al., 2009). The basin was
After Raup et al., 1992, Nuccio et al., 1996, and Trudgill et al., 2009

Approximate lateral extent of potash within evaporite sequences (Raup et al., 1992)
Subsurface salt diapirs or "walls." (Trudgill et al., 2009)

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Structural Elements of the Paradox Basin Area
surrounded by paleo-highlands as defined by areas with missing Paradox Formation stratigraphy, including the Emory uplift (San Rafael "swell") in the northwest, the Uncompahgre Uplift to the northeast, the San Luis Highlands (San Juan Dome) to the east, the Nacimiento Uplift to the southeast, the Zuni and Defiance Uplifts, and the Circle Cliffs on the southwest. The basin was deepest in the northeast along the flank of the Uncompahgre Uplift, and shallowed to platform carbonates to the southwest. The Uncompahgre Uplift is a partially buried up-thrust block of Precambrian granitic and is part of a series of basement uplifts known as the Ancestral Rocky Mountains (ARM). They formed during the Late Mississippian to Permian Ouachita-Marathon orogeny. This intraplate orogeny is thought to have been caused by the collision and suturing of the North American and South American-African continents during the formation of Pangaea (Brown, 2002).

The Paradox basin is bound on the northeast by the Uncompahgre Uplift and the northwest-trending Uncompahgre thrust fault; a moderately steep reverse fault separating Precambrian granitic rocks in the northeast from Palaeozoic and Mesozoic strata to the southwest. It is likely that the Paradox Basin is tectonically related to the Uncompahgre Uplift, although the exact mechanism of formation has not had consensus. From drilling data (No. 1 McCormick Federal “C”) it is known that the Uncompahgre thrust has had at least 14000 feet (4268m) of vertical offset, uplifted on the northeast side. The floor of the Paradox Basin has also had tectonic deformation. In seismic sections presented in Trudgill et al., 2009, Mississippian sediments in the floor of the basin are seen to have normal fault offsets in what appears to be tensional deformation causing the formation of a stepped graben.

Sedimentation within the Paradox Basin occurred within a 2 to 5 million year period largely coincident with Pennsylvanian basin subsidence. The stratigraphy of the basin is relatively well understood from the many oil, gas and potash exploration wells that have been drilled over the last half century. The basin is largely filled with the Pennsylvanian Hermosa Group, and the Permian Cutler Group (Figure 4). The Hermosa Group has been divided into three formations. From earliest to latest these are the Pinkerton Trail Formation, Paradox Formation, and the Honaker Trail Formation.

The basal **Pinkerton Trail Formation** consists of a sequence of interbedded marine carbonate rocks and black shale. It marks the re-introduction of a marine environment following Mississippian regression (Brown, 2002). The formation is quite thin, ranging up to 60m in thickness.

The bulk of the Paradox Basin infill is part of the **Paradox Formation**. It is a substantial sequence of repeated evaporite deposition cycles, totalling over 3350m (11,000 feet) in thickness in the deepest, northeastern part of the basin. This interval may have been thickened by diapiric anticlines, and it is thought that the original maximum accumulated thickness of the Paradox Formation was in the order of 1500 – 1800m (5000 to 6000 feet; Raup et al., 1992). There are 29 documented evaporite cycles in the Paradox Basin, numbered from 1 at the top, to 29 at the base. Each cycle typically consists from
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Stratigraphy of the Paradox Basin Area

G. Allen, August, 2009
bottom to top of anhydrite, silty dolomite, shale, silty dolomite, anhydrite, and halite +/- sylvite (Figure 11).

Cyclical sea level fluctuations in Pennsylvanian time are well documented world-wide. It is thought that the formation of the super continent Pangaea during this time caused a prolonged period of glaciation, but with cyclical warming and cooling intervals. This cyclical build-up and melting of the ice sheets caused corresponding glacio-eustatic fluctuations in sea level ranging up to 120m. During the Pennsylvanian Epoch, the Paradox Basin was thought to have had restricted access to the open ocean through 3 shallow channels or “sags” (Trudgill et al., 2009). During times of low water the basin must have been largely cut off from the open ocean, and evaporation caused salinities in the water to range from penesaline to hypersaline. The deposition of the Paradox evaporite sequences were controlled by salinity combined with the mechanical action of marine transgression.

At the beginning of a typical cycle, rising sea level would cause marine transgression and the flooding of the basin with fresh sea water. Halite deposited at the end of the previous cycle would be partially dissolved causing a sharp solution disconformity. With the influx of new materials, calcium and sulphur would be available for the precipitation and deposition of anhydrite. As salinities decrease to a point that allowed algal growth, dolomite mixed with clastic sediment (probably from current and wave action) were deposited. The final phase of marine transgression is marked by the deposition of black shale. As global glacial conditions changed and the sea level dropped, basin conditions changed to a state of marine regression. Still water with rising salinities caused the deposition sequence to occur in reverse, with dolomite (but with less silt) being overlain by anhydrite. Eventually salinity in the basin would reach hypersaline levels. Dense brines would sink to the deepest parts of the basin and when saline levels exceed 375 parts per thousand, precipitation of halite +/- sylvite and carnallite would occur. Sylvite and carnallite (potash) are known to occur in 17 out of the 29 evaporite cycles (Raup et al., 1992). These minerals are generally located at the top of the salt beds, and were deposited during periods of extreme brine salinity.

Sedimentation rates have been used to calculate an estimation of the duration of the evaporite cycles. The slowest to accumulate would be the dolomite, precipitating at the rate of as little as 0.2mm per year. Halite would have the most rapid deposition rate at up to 5cm per year. Cycle 6 has the thickest halite layer at up to 100m, which would take approximately 2000 years to form. Complete evaporite cycle durations are estimated to be between 100,000 to 500,000 years. Sedimentation rates exceed known typical basin subsidence rates, and hence it is thought that the Paradox Basin existed prior to the first deposition of salt, and that these early depositions occurred in sub aqueous conditions within the deepest part of the basin. Late evaporite accumulations likely occurred in an increasingly shallow marine environment. In the sample log from Cane Creek Federal 7-1 (API 43019-31363), the clastic interval below the Cycle 13 halite horizon is described as argillaceous coal, suggesting very shallow conditions.
Rocks in the northeast part of the basin have been folded into a series of parallel, northwest-trending anticlines and synclines which have been the targets of petroleum exploration. Loading from sedimentary rocks of the overlying Honaker Formation and Cutler Group were responsible for salt diapirism that continued into the Jurassic Period. These salt diapirs are most common in the northeast part of the basin closest to the Uncompahgre Uplift. Salt has flowed from the synclines into the adjacent anticlines. Northwest-southeast trending normal fault movement, probably related to on-going subsidence of the basin, have fractured the Paradox Formation and overlying sediments and provided conduits for the upward movement of salt. These fault-related, planar, near vertical salt intrusions are known as “salt walls” (Figure 3). Salt horizons in the southwest part of the basin (in the subject property area) are conformable and structurally uncomplicated.

The Honaker Trail Formation overlies the last salt cycle. It consists of arkosic sandstones (probably derived from the Uncompahgre Uplift), marine and terrigenous delta shale, and up to 900m (3000 feet) of limestone.

9.2 LOCAL GEOLOGY
The subject potash prospecting permit applications cover a flat-lying Mesozoic and Palaeozoic sedimentary sequence ranging in age from Cambrian to Jurassic (Figure 4, Northern Paradox Basin and Book Cliffs section). Exposures on surface belong to the Jurassic Summerville and Entrada Formations, the underlying Jurassic Glen Canyon Group, and the Triassic Chinle and Ankareh Formations (Figure 5). These rocks consist predominantly of terrigenous sandstone, and lacustrian and shallow marine deposits.

The exploration target on the subject potash prospecting permit applications is potash in the Paradox Formation evaporites, and specifically the Cycle 13 evaporite which occurs at roughly the mid point of the sequence. The top of the Paradox Formation salt sequence is located roughly 1200 – 1500m (4000-5000’) below surface. The formation has been folded about the NNW trending Big Flat anticline (a projection of the Cane Creek anticline to the SE) in the south part of the permit application area, but appears to be relatively uniformly gently dipping (1-2°) to the north or north-northeast in the north part (Figure 6). There is no evidence of faulting in the permit area.

Several of the evaporite sequences also contain potash, which are mentioned in some of the well reports on file. For example, stratigraphic intervals described in Cane Creek Federal 7-1 (API 43019-31363, Figure 10), include defined intervals of potash in 12 of the 19 evaporite sequences intersected. Potash was noted in evaporite cycles 4, 5 (target horizon in the Cane Creek solution mine located approximately 18km or 11 miles southeast of the south end of the permit applications), 6, 7, 9, 13, 14, 16, 18, 19, 20, and 21. Some of these intervals will be discussed in more detail in Sections 11.0 and 13.0.
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Green River Potash Project, Utah
Geology of the Northwest Part of the Paradox Basin

G. Allen, August, 2009
American Potash LLC
Green River Potash Project, Utah

Elevation of Top of Paradox Formation Salt

G. Allen, August, 2009

Elevation data from Utah Oil and Gas; http://oilgas.ogm.utah.gov/Data_Center/LiveData_Search
Typically, the thickest accumulation of potash in any evaporite cycle is located in the deeper northeast part of the basin. Hite (1976) points out, however, that the Cycle 13 potash horizon is an exception, and that the thickest accumulation is located along the shallower northwest part of the southwest flank of the basin (Figure 3), presumably within a locally formed structural depression. The estimated depth below surface to the top of the Cycle 13 evaporite (and theoretically the potash horizon within the salt bed) ranges between 1600 to 2134m (5250' to 7000'). As with the top of the Paradox Formation in general, the Cycle 13 evaporite sequence appears to have been folded along the Big Flat anticline in the south part of the permit application area, but then dips uniformly gently at 2-3° to the north-northeast in the north part (Figure 7).

The Cycle 13 evaporite sequence is typical of other sequences in the basin, consisting of (although not in all locations) anhydrite at the base and progressing gradationally upwards into silty dolomite, black shale, dolomite, anhydrite and finally halite and potash. Trudgill et al. (2009) produced isopach maps of all the evaporite sequences in the basin based on sample descriptions and well log data from oil / gas wells in the Utah Division of Oil, Gas and Mining website. The Cycle 13 sequence is generally a minimum of 30m (100') thick underlying most of the subject potash prospecting permit applications, and the majority of these applications cover the thickest part of the sequence which ranges up to 62m (205') in total accumulation (Figure 8). Hite (1976) constructed an isopach map of just the halite thickness of Cycle 13, showing a total accumulated thickness of over 60m or 200' (Figure 9). The two studies are somewhat contradictory on this point. Hite further refined his study restricted to just the thickness of the potash horizon within the halite, and shows a total accumulation of over 18m (60'). Much of the thickest part of the Cycle 13 potash accumulation is covered by the subject potash prospecting permit applications (Figure 10).

10.0 DEPOSIT TYPES

10.1 HISTORY OF POTASH

The term potash is derived from the term “potasch”, a Dutch word for wood ash (Canadian Encyclopaedia). Historically, hard wood was burned and potassium carbonate (K₂CO₃) subsequently leached from the ash in large iron pots. It was used predominantly as a fertilizer. Wood ash as a source of potassium was replaced by potash from mineral salts in the late 19th century.

Modern usage of the word potash has come to mean a wide range of water-soluble potassium compounds and potassium-bearing minerals, but within the potash production industry it is generally accepted to be a contraction of the term “muriate of potash”, or KCl. Sylvite (also KCl) is the most common potash mineral. Commercial potash output is measured in tonnes of K₂O. One tonne of sylvite contains the equivalent of 0.63 tonnes of K₂O.
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Elevation of Top of Cycle 13 Halite and Depth (feet) Below Surface

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NAD 83, Zone 12N

Figure 7
American Potash LLC

Green River Potash Project, Utah

Isopach Thickness (Feet) of Evaporite Cycle 13

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Figure 8
potash prospecting permit applications

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Isopach Thickness (Feet) of Evaporite Cycle 13 Halite Horizon

G. Allen, August, 2009

NAD 83, Zone 12N
Green River Potash Project, Utah
Isopach Thickness (Feet) of Evaporite Cycle 13 Potash Horizon

G. Allen, August, 2009
Roughly 95% of the world’s potash production is used to make fertilizers.

10.2 GENESIS
The Paradox Formation potash-bearing evaporites are relatively typical of restricted marine basin evaporite sequences that have developed worldwide through a wide range in geologic time. Other examples of this type of deposit in North America occur within the Devonian Prairie Evaporite Formation of Saskatchewan (and peripherally Alberta, Manitoba, North Dakota and Montana; Hardy et al., 2008), the Permian Supai Formation within the Holbrook Basin of Arizona (Butrenchuk, 2009), and the Permian Ochoa Series within Delaware Basin of New Mexico and Texas (Grace et al., 2008).

Deposition of these evaporites occurred within restricted marine basins that developed increased salinity through evaporation. Dense brines would have sunk to the deepest parts of the basin and salt precipitates would have been deposited with the most soluble minerals located in the centre, and less soluble minerals located concentrically outwards (Williams-Stroud, 1994). The precipitation sequence from increasingly saline sea water is alkaline carbonate minerals (calcite and dolomite), and subsequently calcium sulphates (anhydrite), halite, magnesium sulphates (kieserite), and finally potassium chloride (sylvite - potash) and magnesium chloride (carnallite). This order matches the depositional sequence observed in the many evaporite sequences with the Paradox Basin.

The ratio of sodium to potassium in sea water is roughly 27:1 and hence the quantity of halite (NaCl) deposited is substantially greater than sylvite (KCl). The potash zone is typically located at the top of the halite deposit because the potassium minerals are precipitated from the most saline brines at the end of the evaporite cycle, being deposited after sodium has been largely depleted. Carnallite (KCl.MgCl2.6H2O) would be among the last minerals to be deposited due to increased concentrations of magnesium in the brine.

Typical potash ore consists of a mix of sylvite and halite, and is termed sylvinite. Sylvinite typically contains insoluble impurities such as clay, anhydrite, and dolomite. Other contaminants include magnesium-bearing minerals such as carnallite and kieserite (MgSO4.7H2O). Concentrations greater than 0.25% Mg can affect solubility and recovery of the sylvite. A “carnallite assay” value is typically expressed as the calculated MgCl2 content, which is 3.91 times the Mg content. The actual amount of the mineral carnallite present (if it is the only Mg-bearing mineral) is 11.42 times the Mg content (Hardy et al., 2008). Hence, carnallite concentrations greater than 2.9% within the potash can be a serious detriment to the economic viability of a deposit.

10.3 EXTRACTION
Potash deposits can either be mined by conventional methods, or by solution injection. The world’s first solution potash mine was put into production by Kalium Chemicals Ltd. near Regina, Saskatchewan, in 1964. The depth to the potash horizon was 1585m
(5200’), roughly the same depth below surface as the Cycle 13 evaporite target on the subject property. If an economic potash resource was to be developed in the Green River Potash Project area, it would likely be solution mined. Intrepid Potash Inc. is solution mining potash from the Cycle 5 evaporite horizon roughly 18km (11 miles) to the southeast of the subject property, and using solar evaporators to recover the sylvinitite.

11.0 MINERALIZATION

The occurrence of potash with the Paradox Basin was discovered through oil and gas exploration wells. It may have been identified in sample cuttings (although no references to physically observed potash have been found in the sample logs or reports), but typically it is identified by down-hole radiation logs (Gamma-ray). Naturally occurring potassium contains roughly 0.01% of K-40; a radioactive isotope (Nelson, 2007). Halite is not radioactive (Figure 11), and hence, radioactive zones within the salt are assumed to be related to potash.

Of course potash is also known to occur within the sequence because sylvinitite is currently being solution mined from Cycle 5 at Intrepid Potash’s nearby Cane Creek mine (Section 17.0).

Most of the drilling in the basin was targeting petroleum, and the majority of core samples were taken in potential hydrocarbon reservoirs. Some potash intervals were cored in the vicinity of the Cane Creek mine, but to date, no reference to coring of potash has been found for the subject property area. Potash thicknesses (Figure 10) have been estimated from the Gamma-ray logs. Grades and mineralogy are not known. Hite (1976) comments that the dominant potash mineral in Cycle 13 appears to be sylvite, but that carnallite may also be present. Evidence for the presence of carnallite is based on interpretation of the neutron logs, which can identify hydrated minerals. He also points out, however, that due to the highly soluble nature of the sylvite, the drill holes could have been enlarged by the dissolving of the potash, and that the out-of-gauge holes could give a neutron log response similar to one caused by bound water in minerals such as carnallite.

A total of 17 or 18 of the 29 salt horizons within the Paradox evaporite sequence are thought to contain potash. The Cane Creek Federal 7-1 well (API 43019-31363) is located within the subject permit applications on section 7, Township 25S, Range 19E (Figure 10). Records from the hole have well defined intervals of potash in 12 of the 19 evaporite cycles intersected, including Cycle 13. It will be discussed further in Section 13.2.

Hite (1976) notes that the maximum thickness of potash in Cycle 13 known at the time the paper was written was 30m (100’), intersected in McRae Federal No. 1 (Figure 10). This 30m contains several apparently barren intervals, which if removed leave an
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Green River Potash Project, Utah
Typical Gamma Ray - Neutron Density Signatures Through Paradox Evaporite Cycle, and Postulated Environment of Deposition

G. Allen, August, 2009

Figure 11
aggregate total of 22.9m (75’) of potash. This well is located in section 10, Township 25S, Range 18E, and is within the current Green River potash prospecting permit applications.

No direct data on the mineralogy of the Cycle 13 (or any) potash horizon within the subject property area have been located. Coring of the sequence will be needed to determine the exact nature of the contained potash mineralization.

12.0 EXPLORATION

No physical exploration work has been conducted on the property by the issuer or by the vendor.

13.0 DRILLING

The Paradox Basin has been the focus of hydrocarbon exploration since the early 1950s. Hydrocarbon targets include clastic horizons in the Paradox Formation and the underlying Mississippian Leadville dolomite. No holes on the subject property area were drilled specifically for the exploration of potash.

A total of 21 wells have been drilled on the current pending applications, and 70 within a distance of 5km of the outside limits of the permit application block (Figure 12). Locations of these wells are documented in Utah State Geographic Information Database (SGID). Holes were drilled vertical with conventional rotary equipment, and were typically 13 ¾” diameter at surface (cased with 10 ¾” pipe) and reduced in stages to 7 7/8” (cased with 5 ½” pipe) at depth.

13.1 WELL LOG INTERPRETATION THEORY

Kenneth et al. (2008) summarize the well log response of common evaporite minerals as follows:

**Halite** - uniformly low gamma-ray response similar to anhydrite, and oversized hole (owing to high solubility) on calliper logs, moderate to low neutron response, moderate density and sonic log response, and high resistivity.

**Anhydrite** - low response on gamma-ray logs, normal bore-hole diameter on calliper logs, high count on neutron logs, high velocity on sonic log, and high density log response.

**Sylvite** - identified by high gamma-ray response, an enlarged bore-hole diameter on calliper logs, relatively low density and low neutron response.
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Potash Prospecting Permit Applications

Figure 12

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Green River Potash Project, Utah
Oil and Gas Wells

G. Allen, August, 2009

NAD 83, Zone 12N
**Gamma-ray Log**

The gamma-ray (GR) log measures naturally emitted gamma radiation down the hole. There are essentially only three natural elemental isotope sources of gamma radiation: uranium, thorium, and potassium. These elements are typically more abundant in shale than in other sedimentary rocks, and hence the GR log can be used to identify shale horizons, as well as to estimate the mud or fine-grained clastic content of sandstones and carbonates.

An example of this is shown in Figure 11, where a well penetrates a complete evaporite cycle. The gamma ray log on the left has a low response within the Cycle 4 halite. The overlying anhydrite is also non radioactive. Radiation increases in the silty dolomite, peaks in the shale, and drops down again in the overlying silty dolomite. The overlying anhydrite is slightly radioactive, presumably due to a small mud or silt content. The final halite bed of Cycle 3 is also not radioactive.

Halite (NaCl) is not radioactive, but potash minerals such as sylvite (KCl) and carnallite (KCl.MgCl₂.6H₂O) both contain potassium and do emit gamma radiation. When used in conjunction with a lithology log, or a neutron density log (to determine lithology), the GR log can be used to identify potash horizons within the salt beds. An example of potash being interpreted from a gamma-ray log from well ‘Cane Creek Federal 7-1’ is shown in Figure 13, and will be discussed in Section 13.2.

**Neutron Log**

The neutron log measures porosity indirectly by detecting the hydrogen content of the rock. Hydrogen is generally found in water or hydrocarbons within the pore spaces. The tool has a neutron source. If emitted neutrons traveling through the rock strike larger more dense atoms they are reflected and scattered with little energy lost in each collision. If a neutron strikes a hydrogen atom, which is roughly the same mass as the neutron, there is a significant energy transfer from the neutron to the hydrogen. This energy is transmitted from the hydrogen atom in the form of gamma radiation. The neutron tool can either measure reflected neutrons, or emitted gamma-rays. Low neutron reflectance or high gamma radiation is an indication of hydrogen either in pore fluids (and hence higher porosity) or as a molecular component of the minerals in the rock (such as carnallite).

Neutron log data can be presented in units of rock density, porosity, or API units. Neutron densities can be used to make assumptions regarding lithology. Mineral densities are listed in Table 2.
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Green River Potash Project, Utah
Cane Creek Federal 7-1 Well
Cycle 13 Evaporite
Geology and Gamma-Ray Log

G. Allen, August, 2009

Figure 13

Log source: Utah Division of Oil, Gas and Mining Website
Table 2. Densities of common rock forming minerals in evaporite sequences

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Formula</th>
<th>Density (g/cc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td></td>
<td>2.1 - 2.8</td>
</tr>
<tr>
<td>Halite</td>
<td>NaCl</td>
<td>2.04</td>
</tr>
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In Figure 11 the neutron data have been converted to an approximation of the true rock density in grams per cubic centimetre, and are labelled ‘Neutron Density.’ Lithologies are easily differentiated by distinct density differences. Halite and anhydrite beds have densities close to their true theoretical densities as shown in Table 3. Pure dolomite has a theoretical density of 2.88 g/cc but in silty dolomite is showing a density of 2.6 g/cc. The lower value is presumably due to mixing of the dolomite with lower density clay and quartz. The shale unit has a sporadic density which averages roughly 2.3 g/cc, a reasonable density for a mixture of clays, quartz, and feldspar.

13.2 REVIEW OF SELECT WELL LOGS IN THE PERMIT APPLICATION AREA

Some well files and logs for the holes drilled in the subject property area are available on line at the Utah Division of Oil, Gas and Mining website. The log suites are not consistent for each well, but include sample logs with lithology descriptions, and gamma-ray, neutron density, neutron, resistivity, and sonic logs. In some cases the electric logs can be used to identify evaporite sequences, and specifically, salt and potash horizons within them.

**Cane Creek Federal 7-1 (API 43019-31363)**

Of all the holes reviewed within the applications area, the Cane Creek Federal 7-1 well (also referred to in the well file as the Kane Springs Federal 7-1) has the most clearly defined intervals of potash. It is located in the east-central part of the application area (Figures 10 and 12, Photo 1). Potash intervals were determined using the gamma ray curves from induction logs in concert with the geology log (pp. 167-172 of the well file report), and presented in Table 3.
**Photo 1.** Cane Creek Federal 7-1 monument. Collar location as measured with a hand-held GPS in the field is approximately 45m NE of the location in the Utah State Geographical Information Database (SGID).

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**Table 3.** Potash intervals defined in Cane Creek Federal 7-1 (API 43019-31363)
The lithology log of the intervals listed in Table 3 only note halite. No sylvite was identified, so these potash intervals are strictly interpreted from the geophysical logs. In some cases it was also found that the lithology log noted shale beds within the defined potash intervals, so their exact limits are somewhat suspect. This apparent inconsistency may be due in part to a discrepancy between the driller’s depth (and hence the sample log) and the geophysical log.

Geology and gamma ray logs of this interval are presented in Figure 13. The entire Cycle 13 evaporite is 57m (187’) thick at this location. It is composed of shale and minor anhydrite at the base, with a thick overlying horizon of salt. The top of the salt has low gamma radiation typical of pure halite. Between 6992’ - 7040’, and 7048’ – 7063’ the gamma radiation is highly anomalous. These intervals have been logged as salt, and for the GR log to show such radioactivity, there must be potash present. In the upper interval between 6992’ and 7040’ the radiation is erratic with peaks to 150API between intervals with low or background radiation. The geology log indicates that this interval consists of halite with traces of shale and anhydrite, but the radioactivity suggests that it may be predominantly a mix of salt and potash, or sylvinitite. The second potash interval has a consistently higher gamma radiation count and is likely more pure sylvite. Nelson (2007) shows that K$_2$O grades can be roughly estimated by the amount of gamma radiation given off. A gamma-ray reading of 10 API indicates a rough K$_2$O grade of 1%, or approximately 1.6% sylvite. The upper potash interval between 6992’ and 7040’ (48 feet, 14.6m) is averaging roughly 60-70 API, which would convert to 6-7% K$_2$O, or 10% sylvite. The lower interval between 7048’ and 7063’ (15 feet, 4.6m) appears to average approximately 150API, which could convert to 15% K$_2$O or roughly 24% sylvite. Below this horizon between 7063 and 7135 feet (72 feet, 22m) is a thick bed of halite with weak gamma radiation possibly grading 2-3% potash.

According to the intervals in Table 3, the Cycle 13 evaporite sequence occurs between 6982 and 7122 feet, and is 140 feet (42.7m thick). From a review of the gamma ray and geology log, it actually appears to have a total significant potash thickness of 21.6m (71’). The Cane Creek Federal 7-1 well is located in an area that Hite estimated to have a Cycle 13 potash thickness of roughly 15m or 50’ (Figure 10). This hole was drilled in 1992, well after Hite created his Cycle 13 thickness isopach, and it appears that he may have been conservative in his estimation of isopach thicknesses.

A review of the other potash intervals in this hole is summarized below:

- **Cycle 4, 5439-5476 feet:** very low level gamma ray anomaly suggesting only traces of potash
- **Cycle 5, 5560-5612 feet:** between 5555 and 5573 feet there is a highly radioactive zone in halite. Gamma ray readings in this 18 foot (5.5m) interval range up to over 300 API, perhaps averaging 150-200 API. This intensity of radiation suggests a K$_2$O grade in the range of 15-20%. Between 5573 and 5612
feet, a very low level gamma ray anomaly suggests the presence of 1-2% potash.

- Cycle 6b, 5892-6037 feet: this predominantly halite and minor anhydrite interval has two zones of low level gamma radiation between 5905 to 5960 feet and 5988 to 6050 feet. Radiation levels of 40 API in the first interval and 50 API in the second interval suggest potash grades of 4-5%.
- Cycle 7, 6182-6239 feet: very low level gamma radiation anomaly suggests only traces of potash.
- Cycle 9, 6432-6462 feet: a narrow interval between 6420 and 6423 has a radiation peak of roughly 130 API (possible grade 13% K₂O), and a low level gamma radiation anomaly between 6445 and 6460 feet suggesting a potash grade of 1-2% K₂O.
- Cycle 14, 7160-7176 feet: very low level gamma radiation anomaly suggests only traces of potash.
- Cycle 16, 7350-7430 feet: a low level gamma radiation anomaly of roughly 30API suggests a K₂O content of 2-3%. There is also a narrow gamma spike between 7472 and 7475 feet with up to 150 API in halite, which may be a bed of higher grade sylvite.
- Cycle 18, 7556-7606 feet: this zone of halite has a low level radiation anomaly, with a contained very prominent 8’ radioactive interval between 7572 and 7580 feet. This bed has radiation levels above 300 API, suggesting K₂O grades in excess of 30%.
- Cycle 19, 7778-7930 feet: on the geology log much of this interval is in Cycle 18 clastic / shale, so there appears to be an error in the upper limit of this potash interval. However, between 7838 and 7930 (92’) cycle 19 halite is weakly radioactive with an average reading of 15API, or roughly 1.5% K₂O. Within this zone there is one prominent 7’ radioactive peak of 125API between 7860 and 7867 feet.

Although traces to low levels of potash occur in numerous intervals, only Cycles 5, 13, and 18 appear to have significant potash horizons at this well location. In summary these are:

- Cycle 5 – approximately 18 feet (5.5m) possibly grading 15-20% K₂O
- Cycle 13 – approximately 48 feet (14.6m) possibly grading 6-7% K₂O
- Cycle 13 – approximately 15 feet (4.6m) possibly grading 15% K₂O
- Cycle 18 – approximately 8 feet (2.4m) possibly grading in excess of 30% K₂O

**McRae Federal 1 (API 43019-10715)**

According to Hite (1976), this well intersected the thickest interval of cycle 13 potash in the basin known at that time (Figures 10 and 12). The cycle 13 interpreted potash-bearing interval was approximately 30m (100 feet) thick, roughly 8m (25 feet) of which...
appeared to be barren. No depths of formations were given, and it was not explained how this interval was identified.

Very little lithologic information was given in the well file or the logs, apart from noting that the top of the Paradox Formation salt was intersected at 4618 feet (1407.6m). Well logs available included a Gamma-ray and Neutron log, and resistivity / SP and calliper logs, but only the Gamma ray – Neutron log went deep enough to penetrate the Cycle 13 potash.

The top of the Paradox salt (cycle number uncertain) is clearly identifiable on the Gamma-ray – Neutron log, with low gamma ray emission and high neutron readings (Figure 14). It is not clear what the neutron log is showing, but it is presumed that if the top of the Paradox is pure salt (as seems likely from the low Gamma-ray readings), that where the neutron plot is to the right it corresponds to a low rock density (as shown in the halite intervals in Figure 11). There are many coincident gamma-ray highs and neutron lows (higher density rock?), which probably correspond to shale intervals. It seems reasonable for this log, therefore, that potash intervals would have corresponding high gamma-ray readings and coincident high neutron readings (curve to right). Three such intervals were identified:

- 5225’ – 5250’ 25’ 7.6m
- 7035’ – 7050’ 15’ 4.6m
- 7290’ – 7305’ 15’ 4.6m

It is not known within which cycles these intervals occur, but they could conceivably be cycles 5, 13, and 18, as identified in well Cane Creek Federal 7-1.

From the data reviewed it is unclear how Hite (1976) interpreted a 100 foot thickness of potash in Cycle 13 in this hole. It is probable that he had a more complete data set than is currently available.

**Federal 1-26 (API 43019-30688)**

This hole is located close to the centre of the thickest part of the of the Cycle 13 potash as postulated by Hite (Figure 10). It was drilled in 1981, well after he constructed his Cycle 13 potash isopach. Available well logs include gamma ray, resistivity and neutron density.

Potash-bearing intervals will have coincident high gamma radiation, high resistivity, and low rock density. Four such zones were located in the logs. The top of the Paradox Formation salt is distinct at 4767 feet (1453m). Evaporite / salt cycles have been noted on the resistivity log, with Cycle 2 being the top salt penetrated. Cycle 5 potash shows the expected geophysical characteristics with a zone of apparent higher grade between 5372 and 5384 feet, with a width of 12 feet or 3.7m (Figure 15). Gamma ray intensity in this interval is approximately 250 API, or roughly 25% K₂O. This interval is underlain by
Gamma-Ray and Neutron Logs

American Potash LLC
Green River Potash Project, Utah
McRae Federal 1 Well
Gamma-Ray and Neutron Logs

Figure 14

Log source: Utah Division of Oil, Gas and Mining Website
American Potash LLC
Green River Potash Project, Utah
Federal 1-26 Well
Gamma Ray - Resistivity Log
Cycle 5

G. Allen, August, 2009

Figure 15

Log source: Utah Division of Oil, Gas and Mining Website
an apparent zone of low grade potash between 5384 and 5420 feet (width: 36 feet, 11m) with a gamma ray count of approximately 15 API, or roughly 1-2% potash.

Cycle 6 contains an apparent 110 foot (33.5m) zone of low-grade potash between 5570 and 5680 feet. Gamma radiation is 15-20 API in this interval, which translates to roughly 1-2% K₂O.

Cycle 13 has two possible horizons of potash. Between 6400 and 6470 feet (70 feet, 21.3m) the zone is characterized by sporadic anomalous gamma radiation with partially coincident high resistivity, and moderate to low densities (Figures 16 and 17). The gamma ray / density pairs are less convincing than the gamma ray / resistivity pairs, and it is possible that there is interbedded shale and potash in this interval. Gamma radiation intensity in this interval is sporadic, perhaps averaging 45 API, indicating a potential potash grade of 4-5% (less if there is interbedded shale). A second relatively narrow zone of apparently higher-grade potash occurs between 6477 and 6490 feet. This interval is 13 feet or 4m thick, and has an average gamma ray count of approximately 150 API with a possible grade of 15% K₂O. Below this layer, between 6490 and 6580 feet, is an interval of halite with weakly anomalous gamma radiation. This interval is 90 feet thick, has an average radiation level of approximately 15 API, and a potential grade of 1-2% K₂O. This sequence of potential potash-bearing evaporite is very similar to the Cycle 13 sequence seen 14 km to the southeast in the Cane Creek Federal 7-1 well between 6992 and 7135 feet (Figure 13). In Cane Creek Federal 7-1 the upper two intervals (including a thin bed of barren salt) have a total width of 71’ or 21.6m. In Federal 1-26 this same interval has a width of 90 feet or 27m. This thickening supports Hite’s interpretation of the Cycle 13 basin morphology.

Cycle 16 in well Federal 1-26 has a narrow interval of weakly radioactive salt between 6818 and 6835 feet. Radiation intensity is approximately 15 API, or equivalent to 1-2% K₂O.

In summary, well Federal 1-26 appears to have significant potash horizons in the following evaporite cycles:

- Cycle 5 – approximately 3.7m (12 feet) possibly grading 25% K₂O
- Cycle 13 – approximately 21.3m (70 feet) possibly grading 4-5% K₂O
- Cycle 13 – approximately 4m (13 feet) possibly grading 15% K₂O

### 14.0 SAMPLING METHOD AND APPROACH

No samples of potash are known to have been collected for analysis from the subject property.
Gamma Ray

American Potash LLC
Green River Potash Project, Utah
Federal 1-26 Well
Gamma Ray - Neutron Log
Cycle 13

G. Allen, August, 2009
15.0 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

There have been no known sample preparations or analyses.

16.0 DATA VERIFICATION

Data verification has been limited to the review of available well logs to confirm the presence of salt with associated anomalous high gamma radiation which could indicate the presence of potash. In some cases the intervals with potash noted in published papers and in well logs did in fact have coincident salt and gamma-ray anomalies. In many cases, however, this could not be confirmed due to lack of legible or appropriate drill logs, or the lack of interval data to define a specific horizon to assess. The verification process of data from a few wells is detailed in Section 13.

17.0 ADJACENT PROPERTIES

Intrepid Potash Inc. is successfully operating the Cane Creek solution potash mine approximately 14km (8 miles) southwest of the Green River project area. The operation was started by Texas Gulf in 1964 as a conventional room and pillar potash mine in the Cycle 5 potash horizon, approximately 400m (1300’) stratigraphically above the Cycle 13 potash target. The mine had many problems and was difficult to operate. It contained methane, it was hot, the hangingwall to the ore was incompetent due to lithology and faulting, and folding made the ore difficult to follow (Garrett, 1995). After developing over 560km of underground workings the mine was intentionally flooded in 1970 and subsequently operated as a solution mine.

A brine withdrawal pipe was placed at the lowest point in the mine and a series of 12 drill holes were drilled into various parts of the mine. Water from the nearby Colorado River was (is?) pumped into the mine at an average rate of 2000 gpm for approximately 7 months out of the year. Flow rates were adjusted to maintain a saturated brine withdrawal. It is estimated that the water residence time in the mine is between 300 and 350 days. The saturated brine, or ‘liquor’, was (and is) pumped to solar evaporation ponds to crystallize both salt and potash. The ponds are 0.76m deep. Evaporation rates are in the order of 1m per year. Material from the ponds is sent to a floatation plant for separating and refining both the salt and the sylvite. Current output of the plant is between 600 and 900 tonnes (700 and 1000 tons) of potash per day (Intrepid Potash website).

Intrepid Potash Inc. purchased the Cane Creek Mine from Texas Gulf in 2000. Since that time they have also been exploring the Cycle 9 potash horizon, approximately 240m (800’) below Cycle 5, to assess the possibility of solution mining that as well.
18.0 MINERAL PROCESSING AND METALLURGICAL TESTING

No mineral processing or metallurgical tests have been conducted.

19.0 MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES

No mineral resource or mineral reserve estimates have been made for any mineralized body within the Potash Prospecting Permit applications that constitute the Green River Potash Project.

20.0 OTHER RELEVANT DATA AND INFORMATION

Solution potash mining requires that the potash is somehow precipitated from the solution. At the nearby Cane Creek mine this process involves solar evaporation ponds, and it is presumed that any mining operation on the Green River property would employ a similar process. Three potential potash and salt evaporation pond areas have been identified and designated A through C (Figure 18). They were picked for their topographic characteristics, size, visual impact, and environmental suitability.

The BLM has designated the Mineral Canyon, Hell Roaring Canyon, Spring Canyon, and Tenmile Wash and a few other corridors as zones of “no surface occupancy.” This is because these areas are migration corridors, and lambing and rutting habitat for the desert bighorn sheep. There are also a few known golden eagle nesting sites in the canyons. Tenmile wash has been designated an “area of critical environmental concern” (ACEC). The potential leach ponds are located outside of these environmentally sensitive areas.

There is abundant relatively flat land in the project area, but areas A through C are exceptionally shallow basins or gently dipping broad valleys (Photos 2 and 3).
Possible Evaporation Pond Sites and Identified Environmental Concerns

American Potash LLC
Green River Potash Project, Utah

G. Allen, August, 2009


Figure 18

NAD 83, Zone 12N. Contour interval 500 feet
Collectively the Intrepid Potash evaporation ponds total 177 hectares or 437.4 acres US (Photo 4).

These ponds are able to supply a processing plant that produces in the order of 900 tonnes (1000 tons) of potash per day. Assuming that saline concentrations and evaporation rates would be similar at a new facility on the Green River property, 180-200 hectares (450-500 acres US) of evaporation ponds would be needed to produce
1000 tonnes of potash per day. Areas of the selected potential evaporation pond sites are:

- **Area A (Jug Rock and Bartlett Flats)**: 463 hectares (1144 Acres US)
- **Area B (north of Spring Canyon)**: 160 hectares (396 Acres US)
- **Area C (north of Tenmile Wash)**: 619 hectares (1529 Acres US)

Areas A and C appear to have ample space to provide an amount of product at least equivalent to Intrepid’s Cane Creek operation.

The author is not aware of any other relevant data or information, the omission of which will make this report incomplete or misleading.

### 21.0 INTERPRETATION AND CONCLUSIONS

The purpose of this report was to confirm that the Green River property is a valid potash exploration target. That has been amply demonstrated. The subject prospecting permit applications cover at least nine potash-bearing evaporite cycles within the Paradox Basin. From the limited number of wells reviewed it appears that the most significant and most continuous potash members are located within cycles 5, 13 and 18.

**Cycle 5** is the evaporite horizon currently being exploited in Intrepid Potash’s solution mine to the southeast. In the holes studied in the subject applications area this horizon ranges from 3.7-5.5m (12 to 18 feet) thick with very approximate grades estimated from the gamma ray logs of 15-25% K₂O.

Potash in the Cycle 13 salt is dispersed over a much thicker interval. Three distinct potash-bearing intervals within the Cycle 13 salts have been tentatively traced across the subject property for approximately 14km, with overall bed thickness increasing to the northwest as was postulated by Hite in 1976. The upper interval appears to consist of potash interbedded with halite (sylvinite), and possibly some shale. It ranges from 14.6m (48 feet) with possible grades of 6-7% K₂O in the southeast, to 21.3m (70 feet) with possible grades of 4-5% K₂O in the northwest. The middle Cycle 13 potash horizon is the most discrete mineralization and appears to have the highest grades. Well logs from the property studied to date indicate that it ranges from 4.6m (15 feet) thick in the southeast to 4m (13 feet) in the northwest, and apparently maintains a consistent grade of roughly 15% K₂O. A horizon of salt with traces of potash underlying this interval ranges in thickness from 22m (72 feet) in the southeast to 27.4m (90 feet) in the northwest.

**Cycle 18** potash was identified in only one hole to date, where it was 2.4m (8 feet) thick and may be grading in excess of 30% K₂O.
The middle Cycle 13 potash horizon appears to have similar widths to the Cycle 5 and Cycle 18 potash horizons, but with lower grade. Economic viability of solution extraction of potash is beyond the scope of this study, but the 2-5m thick higher-grade potash beds in Cycles 5, 13 and 18 certainly appear to be the most attractive exploration targets. Hite (1976) indicated that the Cycle 13 potash horizon had a potential to be greater than 100 feet (30m) thick in the Green River property area. Potash-bearing salt is almost certainly present in these thicknesses, but such a thick target with grades similar to those in viable operations elsewhere has not been observed to date, and may be unrealistic for this area. The Cycle 5 potash horizon has similar widths to the Cycle 13 middle potash horizon but with apparently considerably higher grades and shallower depths, and it may be a more attractive exploration target in the property area.

The viability of potash extraction in this area using solution mining and solar evaporation has been clearly demonstrated by Intrepid Potash. There is ample room on the Green River property to construct evaporation ponds of sufficient size. Ultimately, however, viability will depend on the grade of material being extracted. The grades presented in this report are highly speculative and serve only as an indication of relative potential of the various potash horizons intersected. Drill core through each potash bed will be needed to properly evaluate grade and mineralogy.

There are environmental concerns associated with any development planned in the area. The permit applications area is habitat to both State-threatened species (Mexican spotted owl) and species of special concern (burrowing owl). Desert bighorn rutting and lambing habitat (predominantly in the gullies and canyons) are currently protected by a no surface occupancy status, but these areas would be avoided for evaporation pond sites. An environmental impact study will be required prior to any development.

Land tenure is also a concern. None of the Green River prospecting permits have been granted to date. The “Known Potash Lease Area” (KPLA) boundaries are currently under review, with no schedule for completion. Potash is known to underlie much of the Paradox Basin, and these KPLA boundaries could be enlarged substantially. Any of the current subject potash prospecting permit applications which fall within the newly defined KPLA boundary will be rejected. It is uncertain how many, or in fact if any of these permits will be granted.

22.0 RECOMMENDATIONS

Conclusions presented in this report regarding grades and thicknesses of potash-bearing horizons have been drawn from a brief study of a few well logs from the subject property. Interpretations made were based on a very rudimentary knowledge of well logs, and it would be of value to have an experienced log analyst review and evaluate all holes in the property vicinity (perhaps within 5km of the property boundary).
Objectives of such a study would be to identify the best potash horizons in the sequence, to determine potash grades as best as possible, and to correlate these horizons between holes so that drill targets with optimal grade and thickness can be picked.

Once a well log study has been completed, it would also be advisable to have a qualified person review the data to assess viability of solution potash mining given the indicated grades, widths, depths, and location.

No samples of potash from the property are known to have been collected. Grade and mineralogy of the potash are crucial to making a proper evaluation of the potential. It is recommended that two holes be drilled to core through the three best potash horizons in Cycles 5, 13 and 18. This would require that the holes be drilled to depths of approximately 2450m (8000’), for a total of 4900m (16000’). The estimated cumulative length of coring to test the three target horizons in each hole is estimated to be 80m, or 160m (525’) in two holes. Drilling would not necessarily be contingent on a favourable assessment of viability since potash grades used in that study would be based on indirect geophysical measurements and therefore unsubstantiated.

A rough budget for the proposed exploration program is presented below.

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|                  | **Approximate Total** | $1,180,500 |

27
23.0 REFERENCES


Intrepid Potash Inc. website discussion of the Cane Creek solution mine.
http://www.intrepidpotash.com/loc/moab.html

Magna Resources Ltd. news release, June 3, 2009. Magna Resources Ltd. announces joint venture with Confederation Minerals Ltd. and option of US potash prospects.


http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1SEC916357


http://www.ut.blm.gov/LandRecords/mtps_his_ut.cfm


Utah Division of Oil, Gas and Mining Website. Source for well logs.
http://oilgas.ogm.utah.gov/Data_Center/LiveData_Search/logs.htm


24.0 DATE AND SIGNATURE PAGE

This report titled “Report on the Potash Potential of the Green River Potash Project Area, Grand County, Utah” was prepared under NI43-101 guidelines. No active exploration program is being conducted on the subject property and no new data is being generated. The effective and signature dates are the same.

Respectfully submitted,

____________________________


Signed in Duncan, British Columbia on August 15, 2009.
I, GORDON J. ALLEN, P. GEO, DO HEREBY CERTIFY THAT:

1. I am a consulting geologist with a home office at:

   2479 Jackson Valley Road,
   Duncan, British Columbia, V9L 6B2


3. I am a graduate from the University of British Columbia with a Bachelor of Science, Honours Geology degree (1975).

4. I am a member in good standing of the Association of Professional Engineers and Geoscientists of the Province of British Columbia (19692).

5. I have worked as a geologist for a total of thirty-four years since my graduation from university and that for twenty-three of those years I have held professional status. Relevant experience pertaining to potash exploration includes assessment of potash potential of Subsurface Mineral Permit Application KP441, in Saskatchewan, for Raytec Metals Corp.


7. I am responsible for the preparation of all sections of this Technical Report, and have reviewed historical data to confirm previous assessment of potash potential in the project area.

8. I am independent of the issuer as defined in section 1.4 of National Instrument 43-101.

9. I have not had prior involvement with the property that is the subject of this Technical Report.

10. I have read the National Instrument 43-101 and Form 43-101F1, and this Technical Report has been prepared in compliance with that instrument and form.
9. I am not aware of any material fact or material change with respect to the subject matter of this Technical Report that has not been disclosed, the omission of which would make the Technical Report misleading.

Dated this 15th Day of August, 2009

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Gordon J. Allen, P. Geo