

DRAFT STATEMENT OF BASIS

BERRY PETROLEUM COMPANY

Area UIC Permit UT22195-00000: The Brundage Canyon Oil Field Located within The Uintah and Ouray Indian Reservation, Utah

Contact: Bruce Suchomel
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This Statement of Basis gives the derivation of site-specific Underground Injection Control (UIC) Permit conditions and the reasons for them. Referenced sections and conditions correspond to sections and conditions in the Permit.

EPA UIC permits regulate the injection of fluids into underground injection wells to prevent endangerment to Underground Sources of Drinking Water (USDWs). EPA UIC permit conditions are based upon the authorities set forth in regulatory provisions at 40 CFR parts 144 and 146, and are intended to prevent movement of contaminants into USDWs. Issuance of this permit does not convey property rights of any sort or any exclusive privilege, nor authorize injury to persons or property or invasion of other rights, or any infringement of other Federal, State or local laws or regulations. Under 40 CFR part 144 subpart D, certain conditions apply to all UIC Permits and may be incorporated either expressly or by reference. General Permit conditions for which the content is mandatory and not subject to site-specific differences (40 CFR parts 144, 146 and 147) are not discussed in this document.

EPA administers the Class II UIC program throughout Indian country in Utah, including the Uintah and Ouray Indian Reservation. Regulations specific to injection wells located in Indian country in Utah are found at 40 CFR part 147 subpart TT. This Permit will expire upon EPA authorization of primary enforcement responsibility (primacy) for applicable portions of the UIC Program to the Ute Indian Tribe unless the Tribe chooses to adopt and administer this Permit as a Tribal Permit.

Part 1. General Information and Description of Project

Permittee:

Berry Petroleum Company
1999 Broadway, Suite 3700
Denver, CO 80202

Facility:

The Brundage Canyon Oil Field located within the
Uintah and Ouray Indian Reservation, Utah

Berry Petroleum Company (Berry or “the Permittee”) submitted an application to EPA Region 8’s UIC Program in October, 2010, for an Area UIC Permit to construct and operate Class II-R (enhanced recovery) injection wells on the Brundage Canyon Oil Field located within the Uintah and Ouray Indian Reservation henceforth referred to as the Authorized Permit Area and further described as: T5S, R4W Sections 5, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 30, 31, 32, 33, and 34; T5S, R5W Sections 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, and 36, Duchesne County, Utah. The following areas are excluded from the area permit as they are not in Indian country:

Township 5 S, Range 4 W:

Section 10, S $\frac{1}{2}$ of SW $\frac{1}{4}$, NW $\frac{1}{4}$ of SW $\frac{1}{4}$, SW $\frac{1}{4}$ of SE $\frac{1}{4}$.

Township 5 S, Range 5 W:

Section 12, E $\frac{1}{2}$ of SE $\frac{1}{4}$

Section 16, NW $\frac{1}{4}$

Section 33, E $\frac{1}{2}$ of SE $\frac{1}{4}$

Section 34, S $\frac{1}{2}$ of NW $\frac{1}{4}$, NE $\frac{1}{4}$ of NW $\frac{1}{4}$, NW $\frac{1}{4}$ of NE $\frac{1}{4}$, NW $\frac{1}{4}$ of SW $\frac{1}{4}$.

This area permit would authorize the continued operation of 14 existing injection wells within the Authorized Permit Area and authorize further conversion of oil-gas production wells to Class II-R (enhanced recovery) water injection wells in accordance with the conditions of this permit. This permit does not limit the number of Class II-R injection wells within the Authorized Permit Area and may include approximately 500 injection wells at full field development.

The Brundage Canyon Field is located in the Uinta Basin of eastern Utah and occupies an area of approximately 40 square miles. In 2003, Berry acquired a significant amount of acreage in the Uinta Basin, which includes the Ashley Forest area, targeting the Green River formation that produces both light oil and natural gas. Berry acquired the Brundage Canyon leasehold in Duchesne County

in Northeastern Utah, which consists of approximately 51,000 acres on federal, tribal, and private leases. They have working interests in approximately 57,000 acres and exploratory rights in approximately 61,230 acres in the Lake Canyon project, which is located immediately west of the Brundage Canyon producing properties.

In 2010 Berry drilled 60 wells, which included 36 wells in Brundage Canyon, 20 wells in Ashley Forest and four wells in Lake Canyon. They also participated in four non-operated Lake Canyon wells. The Lake Canyon drilling program identified a new pay interval in the Upper Wasatch that was commingled with the Green River formation, yielding encouraging results. Berry continues to monitor the progress of the initial water flood pilot in Brundage Canyon, which was implemented in the fourth quarter of 2009, and began injection on the second Brundage Canyon water flood pilot in the fourth quarter of 2010. Average daily production was approximately 5,350 BOE/D in 2010 compared to 4,930 BOE/D in 2009.

LOCATION AND GEOLOGIC SETTING

Brundage Canyon Field is located in T5S-R4 & 5W, Duchesne County, Utah, and is situated about six miles south of the town of Duchesne (Fig.1 and 2). Antelope Creek Field lies immediately to the east of Brundage Canyon and the smaller Lake Canyon Field lies to the west. The majority of Brundage Canyon is located within the Uintah and Ouray Indian Reservation.

Brundage Canyon is situated on the southwestern flank of the Uinta Basin that is characterized by a gentle regional northeasterly dip of approximately four degrees. The Uinta Basin is both a structural and topographic trough covering over 9,000 square miles. The basin, which formed in Late Cretaceous time, is asymmetrical with a steep northern flank bounded by the Uinta Mountains and a gently dipping southern flank. The San Rafael Swell structural high bounds the southwestern flank of the basin and the Wasatch Plateau forms the western boundary. Brundage Canyon is situated between the Duchesne Fault Zone located about three miles to the north and an extension of the Garmesa Fault System approximately eight miles to the south. Photo-geologic mapping of surface geologic units in the Brundage Canyon area indicates the presence of only minor anticlinal structures and associated synclines trending to the north-northeast in the central part of the field, but there is no evidence of these features at depth.

Listed in descending stratigraphic order, the geologic units that produce oil and gas in Brundage Canyon Field and their typical overall thicknesses are:

Garden Gulch member of the Green River Formation (~750 ft)

Douglas Creek member of the Green River Formation (~650 ft)

Castle Peak member of the Green River Formation (~400 ft)
Uteland Butte member of the Green River Formation (~200 ft)
Colton member of the Wasatch Formation (~2100 ft)

A stratigraphic column showing the relationship of these units is presented in Figure 3.

The above units were deposited in alluvial and open- to marginal-lacustrine settings along the southern shore of ancestral Lake Uinta. This southern shoreline experienced large transgressive-regressive shifts due to tectonic and climatic conditions affecting water levels in the lake (Fouch et al., 1992; Morgan et al., 2003). Episodic water level shifts resulted in cyclic depositional patterns well recognized in outcrop and subsurface wireline well logs. These cyclic depositional patterns resulted in a number of stacked deltaic sequences that include distributary channels, distributary mouth bars, and nearshore bars hosting sandstones that are the primary reservoirs in Brundage Canyon. Individual oil-bearing sandstones are typically on the order of 10 ft thick. A secondary reservoir target is the Uteland Butte Limestone, which is comprised of thin limestone and dolostone beds deposited in an open- lacustrine setting.

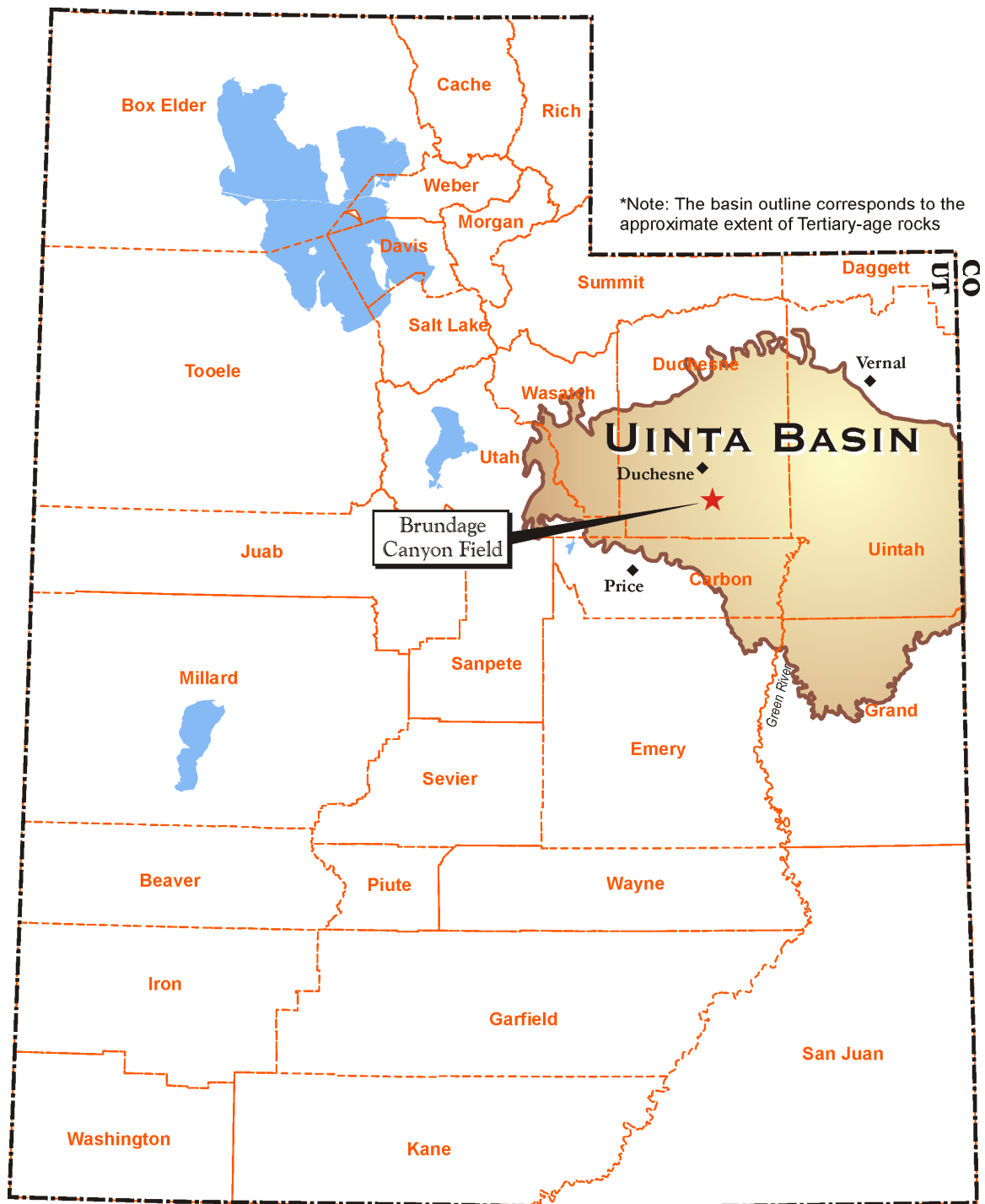


Figure1. Regional Uinta Basin index map showing the location of Brundage Canyon Field in southern Duchesne County, Utah

A USGS study of the petroleum systems within the Uinta Basin concluded that the Black Shale facies of the lower Green River Formation was the most likely source rock for oil and gas found within Green River reservoirs (Lillis et al., 2003). The Black Shale facies in Brundage Canyon is approximately 300 ft thick and is described as organic-rich, black shale with some thin interbeds of sandstone and siltstone. The Black Shale facies occurs between the Castle Peak and Douglas Creek geologic units (Fig. 3).

The geologic structure of the Brundage Canyon Field consists of a stratigraphic trap with up dip pinchouts of sandstone bodies deposited in distributary channels and nearshore environments trapping most of the oil. Distinct gas/oil/water contacts are not readily identifiable although in some parts of the field the sandstones encountered are wet even though porosity and permeability appear to be of reservoir quality. This phenomenon is most likely related to the discontinuous nature of the sandstones.

Reservoirs in the field are normal to slightly under-pressured. Original reservoir pressure in the lower Green River Formation at Brundage Canyon was estimated to be approximately 2,000 psi. with a bubble point of 1,170 psi.

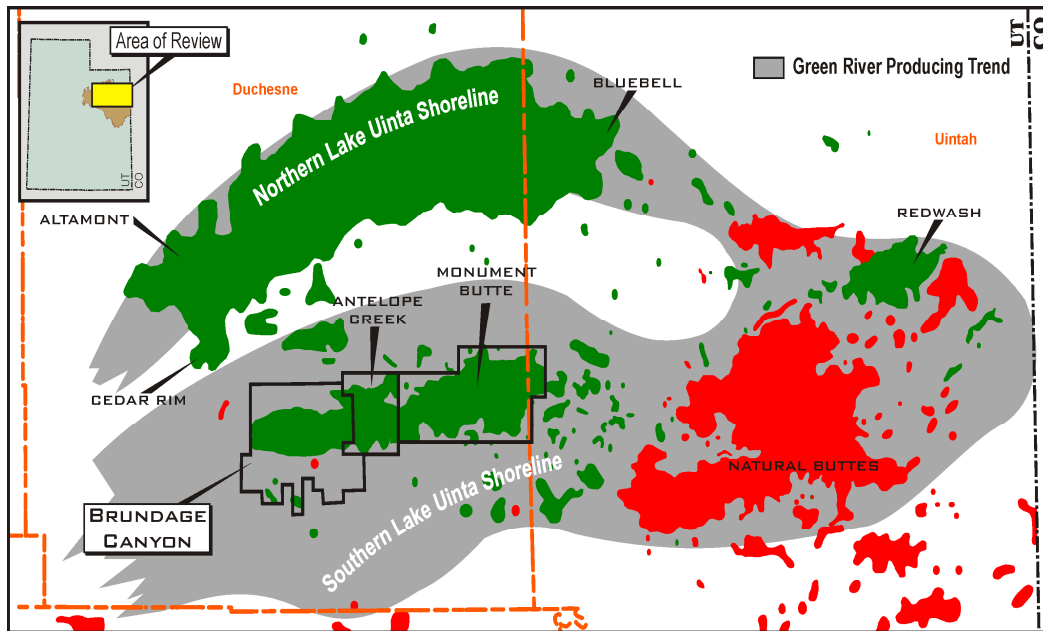


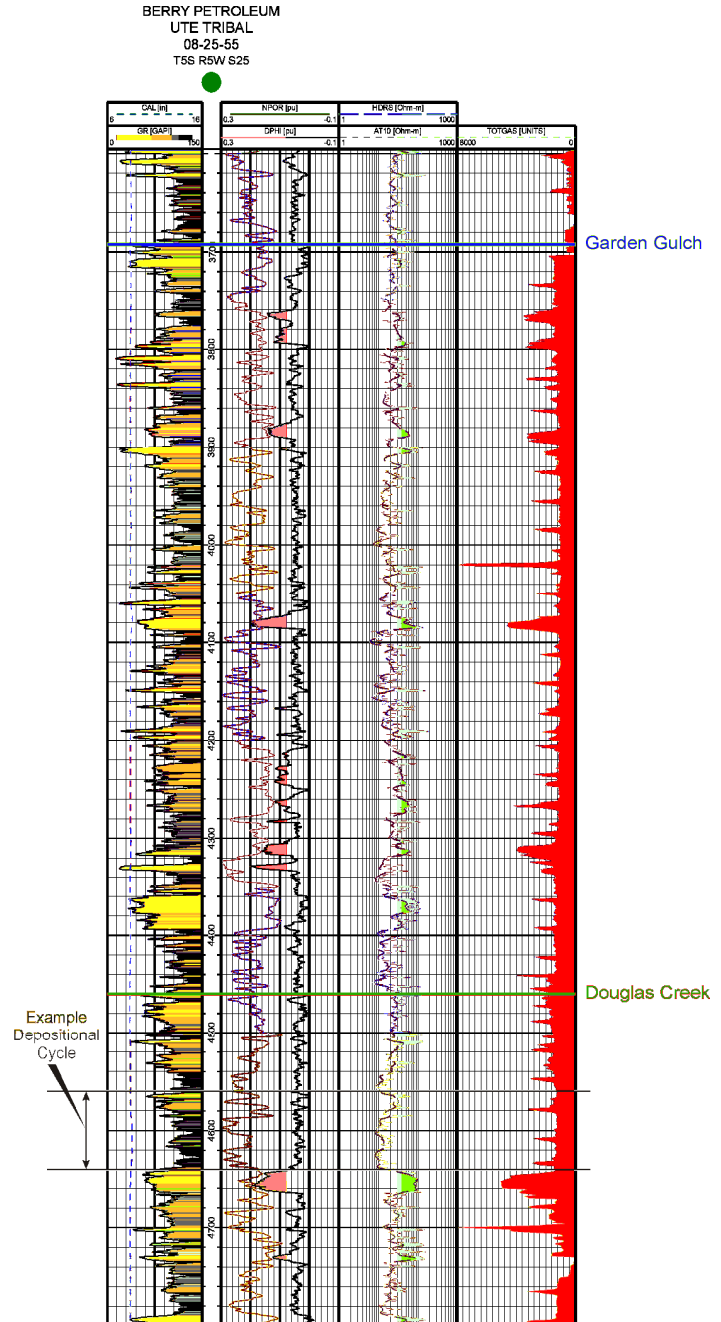
Figure2. Ancestral Lake Uinta northern and southern shoreline trends with the location of Brundage Canyon Field and adjacent fields along the southern trend.

AGE	EPOCH	FORMATION	MEMBER	GEOLOGIC UNIT
TERTIARY	EOCENE	UINTA		Undifferentiated
		GREEN RIVER	UPPER GREEN RIVER	Undifferentiated
				Mahogany Shale
			MIDDLE GREEN RIVER	Garden Gulch (750 ft)
				Douglas Creek (650 ft)
				Black Shale
			LOWER GREEN RIVER	Castle Peak (400 ft)
				Uteland Butte (200 ft)
	PALEOCENE	WASATCH	COLTON	

Figure3. Generalized stratigraphic column of the Tertiary section and approximate overall thicknesses of producing horizons in Brundage Canyon Field.

STRATIGRAPHY OF THE PRODUCING INTERVALS

Understanding the depositional environments and stratigraphy of producing units in Brundage Canyon is important in field development. Wells encountering the greatest number of stacked reservoir sandstones typically have the highest Estimated Ultimate Recoveries (EURs). The depositional environment for the Green River reservoir units is best described as a system of interfingering fluvial, marginal-lacustrine, and open-lacustrine sediments deposited along the southern shore of ancestral Lake Uinta. This broad, gently sloping shoreline experienced numerous transgressive-regressive episodes as lake levels changed over time resulting in complex deltaic settings. This type of depositional system includes sporadic, lenticular sandstones that do not correlate from well to well. However, there are cyclic depositional patterns, readily recognized in outcrop and in the subsurface using wireline well logs. An individual cycle typically ranges in thickness from 50 to 100 ft. Previous detailed studies by others have recognized as many as 18 cycles in the middle member of the Green River Formation (Morgan et al., 2003). A



type log for Brundage Canyon shows tops for the producing geologic units. An example of a depositional cycle within the Douglas Creek geologic unit is also shown on the type log.

Colton Formation

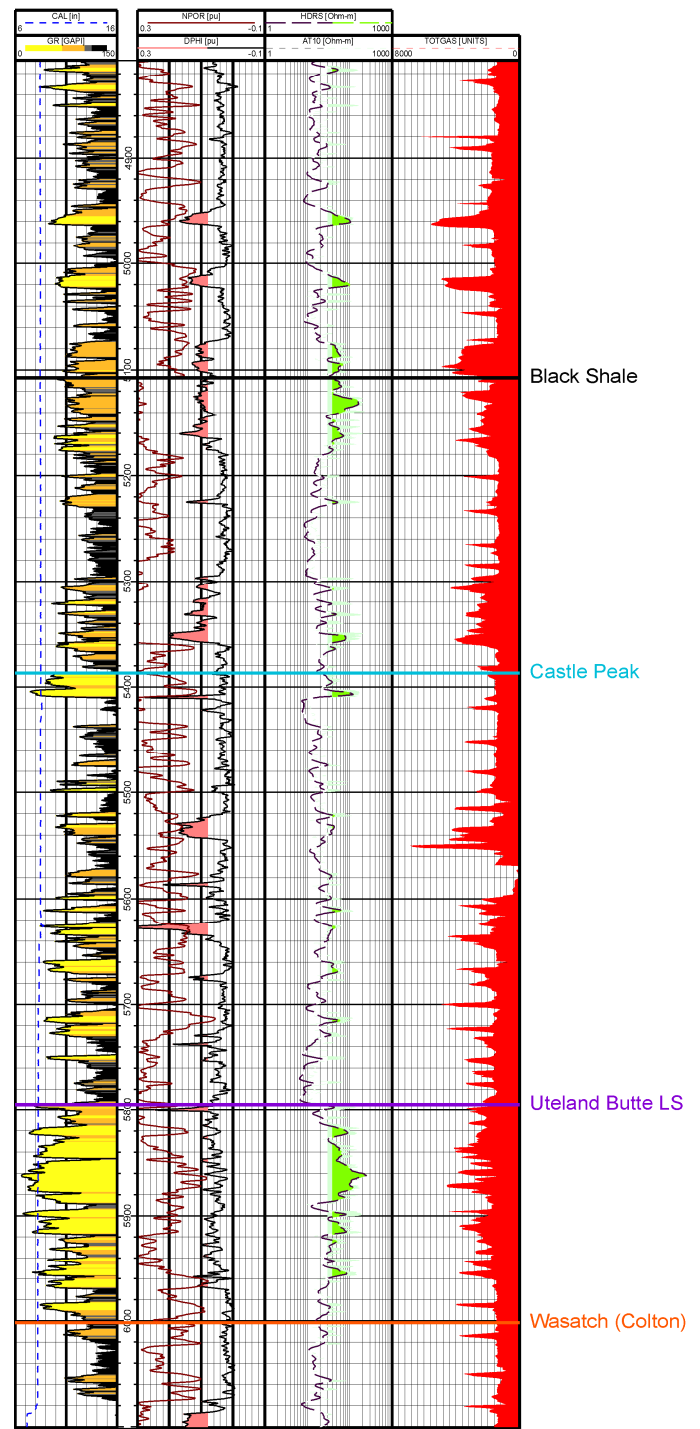
The Colton Formation was deposited as an alluvial sequence consisting of shales, mudstones, channel sandstones, and thin argillaceous limestones. Often characterized by red, yellow, or brown, fine- to medium-grained sandstones, it is easily distinguished in drill cuttings from the overlying Green River Formation which consists of lacustrine, light- to dark-gray sandstones, mudstones and limestones.

The fluvial sandstones of the Colton Formation have been completed in a few wells in and around Brundage Canyon. Production tests from these low permeability and porosity sandy units have indicated minor oil and gas contributions to overall well performance.

Uteland Butte

The Uteland Butte unit was deposited during a period of significant lake expansion dominated by the formation of open-lacustrine carbonates with little siliciclastic source material. The rapid rise in lake level most likely caused fluvial clastic sediments to be deposited some distance upstream of the shoreline. Regional tectonics may also have played a role in the lack of fluvial sediment load entering the lake. Deposition of the Uteland Butte unit marked the first significant lake level rise after the Colton Formation was deposited. The Uteland Butte is comprised of limestone, dolostone, and calcareous siltstone with occasional thin beds of sandstone. The limestones are described as ostracodal grain-supported packstone and grainstone (Morgan et al., 2003) with some intervals of skeletal wackestone. Although

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stromatolites and algal mounds have been reported to be present and productive in a few fields along the southern flank of the basin (e.g., Osmond, 2000), to date, no such deposits have been identified in Brundage Canyon Field.

Typical wire-line log responses through the Uteland Butte show low matrix porosities of less than 8% and gamma-ray readings of 30 API units or lower in “clean” carbonate layers. Resistivities range from approximately 10 ohm-m in argillaceous intervals to over 1000 ohm-m in some carbonate layers. The microcrystalline nature of the carbonates, coupled with low matrix permeability, makes this reservoir unit a secondary target in Brundage Canyon.

Castle Peak

The Castle Peak unit was deposited during a period of rapid changes in lake level resulting in isolated, parallel distributary channel development during lowstands followed by encasement in lacustrine carbonates during rapid rises in lake levels. Sandstones within the Castle Peak generally occur as isolated channel deposits, and vertical stacking is less common than in the overlying Douglas Creek (Morgan et al., 2003). Typical sandstones within the Castle Peak are described as highly compacted, medium-grained, poorly to moderately sorted, angular to rounded, lithic arkose or feldspathic litharenites with quartz and feldspar cementation.

Douglas Creek

Deposition of the Douglas Creek unit occurred during a lowstand of ancestral Lake Uinta with active delta building taking place on a gently sloping shoreline. Even minor changes in lake level produced pronounced shifts of the shoreline resulting in a number of depositional cycles that include sandstones within distributary channels and distributary mouth bars. Amalgamation and stacking of potential reservoir sandstones was prevalent during this time period. Typical sandstones are described as very fine- to fine-grained, moderately to well sorted, and angular to subrounded. Post depositional diagenesis greatly affected porosity by various stages of both calcite cementation and dissolution.

Wireline log response for the cored interval shows density porosity ranging from 8 to 10% and resistivities ranging from 40 to 100 ohm-m. Gamma-ray response ranges from 50 to 70 API units. Calculated water saturations range from 39 to 54%.

Garden Gulch

The Garden Gulch unit was deposited during a period of maximum areal extent of ancestral Lake Uinta. This geologic unit is comprised of interbedded sandstone, siltstone, shale and local limestones. The target Garden Gulch reservoir rock in

Brundage Canyon Field includes individual sandstones ranging in thickness from 5 to 20 ft.

The amount of sand present during Garden Gulch deposition was limited compared to earlier time periods. Sandstones were deposited in distributary channels and nearshore bars during lowstands in the lake. The Mahogany oil shale was deposited in an open-lacustrine setting during a highstand in the lake at the end of this period.

Downhole cores have not been collected for Garden Gulch reservoir rocks in Brundage Canyon. However, the reservoir parameters of porosity, permeability and saturations are thought to be similar to underlying Douglas Creek sandstones. Wireline log porosity readings show averages of 8 to 10% for productive sandstones.

DEVELOPMENT HISTORY

Brundage Canyon was discovered by Diamond Shamrock with the Ute Tribal #1-13 well in the SW SE of Section 13, T5S, R4W in 1966. The well was completed in the lower Garden Gulch and Douglas Creek units of the lower Green River Formation. The well had an initial production of 160 BOPD, 10 MCFD and 10 BWPD. The well produced continuously from inception until 1986. Sporadic production occurred from 1986 until 2002 followed by continuous production through to the present. Cumulative production for the well is 72 MBO, 105 MMCF and 4500 BW.

Following the field discovery in 1966, virtually no activity took place until 1983. Between 1983 and 1988, 34 wells were drilled by Lomax Exploration, Ironwood Exploration and Gavilan Petroleum. The field went through another slow activity period between 1988 and 1996, with only eight wells being drilled by Zinke and Trumbo. In 1996, Barrett Resources bought most of the producing wells in Brundage Canyon and began a significant development effort. Seventy-eight wells were drilled under Barrett's (and subsequently Williams Production) tenure as operator from 1996 to mid-2003. Barrett extended the well completions into the Castle Peak and Uteland Butte units and extended field development west into T5W. Annual oil and gas production increased over that 7 year period from 142 MBO to 438 MBO, and 311 MMCF to 1.6 BCF.

Berry Petroleum bought Brundage Canyon from Williams Production in August 2003 and immediately started an aggressive 2-rig drilling program. Since August of 2003, Berry has drilled 300 wells in Brundage Canyon and extended the field limits south into the Ashley National Forest and west toward Indian Canyon. Annual field production has climbed from 606 MBO and 2.4 BCF in 2003 to 1.8MMBO and 12.3 BCF through 2007. In addition to Berry Petroleum, FIML

Natural Resources is actively developing several lease positions in Brundage Canyon.

A typical EUR for a modern Brundage Canyon well is 40 MBO and 200 MMCF, or 73 thousand barrels of oil equivalent (MBOE). Completion generally includes zones in the Douglas Creek, Castle Peak and Uteland Butte units of the lower Green River Formation. Monument Butte and Antelope Creek fields to the east of Brundage Canyon are both under successful secondary recovery programs utilizing injected water to improve reservoir pressure in the producing zones. Berry Petroleum is presently conducting two water flood pilots that would include the Douglas Creek, Castle Peak, and Uteland Butte units. If successful, the recovery factors could be as high as 15 to 20% of OOIP, significantly improving project economics and ultimate field performance.

Part 2. Permit Considerations (40 CFR 146.24)

BRUNDAGE CANYON FIELD HYDROGEOLOGIC OVERVIEW

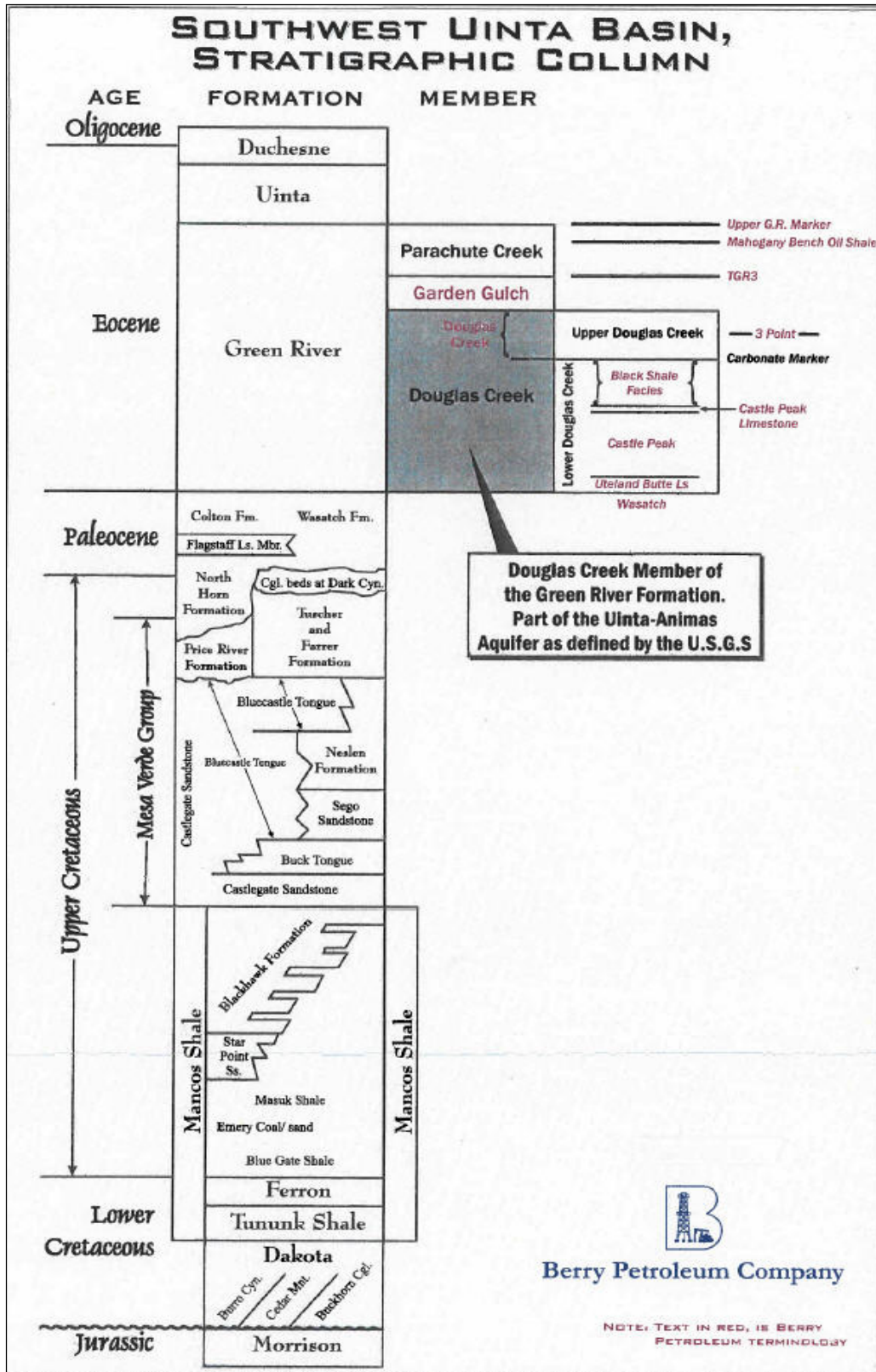
The US Geological Survey has classified the uppermost bedrock in the southern part of the Uinta Basin as the Uinta-Animas Aquifer. This aquifer is comprised of water-yielding sandstones, conglomerates, and siltstones of the Duchesne River and Uinta Formations, the Renegade Tongue of the Wasatch Formation and the Douglas Creek Member of the Green River Formation (USGS, 1995). On a regional basis, the geologically youngest Duchesne River Formation consists of permeable sandstones and conglomerates of fluvial origin. The underlying Uinta Formation is comprised of permeable, fine to coarse-grained sandstone with interbedded siltstone and mudstone. The Douglas Creek Member of the Green River Formation and Renegade Tongue of the Wasatch are described as containing thick bedded sandstone and siltstone of fluvial origin deposited along the southern and eastern margins of the basin. The relationship of the geologic formations making up the Uinta-Animas aquifer is illustrated in Figure 1. The USGS reports that the thickness of the Duchesne and Uinta Formation portion of the aquifer ranges from 0 feet along the southern margin of the Uinta Basin to more than 9,000 feet in the north-central part of the basin while the Douglas Creek Member and Wasatch Tongue achieve a thickness of only 500 feet (USGS 1995). Water-yielding units within the Uinta-Animas Aquifer are typically interbedded with claystone, shale, marlstone and limestone that act as aquitards on a local scale (e.g., underlying Brundage Canyon Field) while thicker shale, claystone and marlstone units can be consistently mapped across large areas of the basin and are considered to be regional aquitards.

The Duchesne River Formation and the Renegade Tongue of the Wasatch are not present in Brundage Canyon, and the Uinta Formation is exposed at the ground

surface. Therefore, of most importance is the portion of the Uinta-Animas aquifer found in the Douglas Creek Member of the Green River Formation.

In the Douglas Creek Member sandstone beds that would technically be part of the Uinta-Animas aquifer are the same zones (reservoirs) which are hydraulically fractured when a well is first completed to enhance the flow of oil and gas to the wellbore. Natural permeability for the sandstones is typically less than 1 millidarcy and porosity values average about 10 to 12%. The low permeability nature of these sandstones is further demonstrated by higher initial flush production of hydrocarbons immediately after fracture stimulation declining within a few months to average daily rates for a typical well of approximately 5 to 10 BOPD, 50 to 75 MCFGD and 2 to 5 BWPD. The sandstone reservoirs within the Douglas Creek Member were deposited in a complex fluvial –deltaic – lacustrine setting and are very heterogeneous and discontinuous. It is not unusual to find that the sandstones do not correlate between wells drilled adjacent to each other in 40- acre offset locations. Because of this heterogeneous and discontinuous nature, groundwater movement oftentimes follows a tortuous pathway (Utah NR, 1987).

Groundwater in the vicinity of Brundage Canyon field is expected to flow from areas of higher ground elevation along the southern margin of the basin north-northeasterly toward areas of discharge along the Strawberry and Duchesne rivers. TDS of groundwater usually increases with depth within the basin as groundwater flows down gradient away from recharge areas along the margin of the basin and comes in contact with and dissolves mineral deposits found along the flow path. Total Dissolved Solids (TDS) values for water produced during recovery of oil and gas are variable vertically and aerially in Brundage Canyon. As shown on the Base of Moderately Saline Groundwater map Figure 2. (i.e. groundwater with TDS values less than 10,000 mg/l), elevation of the base is higher in the eastern part of Brundage Canyon and slopes west to northwest into a low in the central part of 5S 5W.



Proposed Injection Zone

An *injection zone* is a geological formation, group of formations, or part of a formation that receives fluids through a well. The proposed injection zone for Area UIC Permit UT22195-00000 is from the lower part of the Garden Gulch member starting at the TGR3 Marker (top of injection zone), through the Douglas Creek, Black Shale, Castle Peak, and Uteland Butte members of the Green River Formation, to the top of the Wasatch Formation (bottom of injection zone). The approximate depth of the injection zone begins between 2,900 and 3,800 feet, and continues downward to between 5,300 and 6,100 feet. The Injection Zone is located between the depths of 3,517 and 5,872 feet in the Ute Tribal 8-27D-55 Type Gamma Log for the Brundage Canyon Field.

Confining Zones

A *confining zone* is a geological formation, part of a formation, or a group of formations that limits fluid movement above the injection zone. The designated Local Confining Zone, the confining layer that is used and referenced throughout this permit and SOB, begins approximately 150 feet above the TGR3 Top at the GR Marker 1 and continues down to the TGR3 Top, and is found between the depths of 3,370 feet to 3,517 feet in the Ute Tribal 8-27D-55 Type Gamma Log for the Brundage Canyon Field. The designated Regional Confining Zone is found approximately 900 to 1,000 feet above the TGR3 Top in the Mahogany Shale layer and is at the depths of 2,414 feet to 2,517 feet in the Ute Tribal 8-27D-55 Type Gamma Log. This geologic interval is known to be continuous across the permit area and serves as a common barrier to vertical fluid movement for all wells. Limiting fluid movement below the injection zone is another confining zone known as the Wasatch Formation. This formation typically begins at the base of the lowermost portion of the injection zone, immediately below the Uteland Butte Member, at depths approximately between 5,300 and 6,100 feet. Laterally continuous shale zones, identified in the application and shown on regional geologic cross sections supplied with the application, will act as regional and local aquitards preventing vertical migration of injected fluid out of the exempted portion of the aquitard.

Underground Sources of Drinking Water (USDWs)

Aquifers or the portions thereof which are being or could in the future be used as a source of drinking water are considered to be USDWs.

Utah Geological Survey Special Study 144, *the base of moderately saline water in the Uinta Basin, Utah* by Lewis Howells, M.S. Longson, and G.L. Hunt, has been utilized by the BLM, Utah DOGM and EPA as a primary source of information regarding USDWs in the Uinta Basin. This 1987 publication estimated the lowermost occurrence of drinking water underground and is based on the assumption that the salinity of groundwater increases with depth. According to

Utah Geological Survey Special Study 144, the base of moderately saline water occurs between 1,900 and 5,900 feet above sea level, which corresponds to depths between 0 (at the surface) to a depth of roughly 4,000 feet in the western part of the Brundage Canyon Field. In some cases the USDW depth specified in Utah Geological Survey Special Study 144 extends deep enough to reach the injection zone for this area permit, and is addressed in the following paragraph regarding aquifer exemptions.

Exempted Aquifers (40 CFR §§ 144.7 and 146.4)

Class II wells may not inject fluid containing any contaminants into a USDW. Therefore, if the receiving injection zone is a USDW, permittees need to apply for, and EPA needs to approve, an aquifer exemption in order to be allowed to inject. In this case, the permittee has requested an area aquifer exemption.

Because analyses of 353 individual well water samples from the injection zone have shown a TDS less than 10,000 mg/l, an area-wide aquifer exemption of the injection zone is proposed in conjunction with this area UIC permit. The permittee is seeking an area aquifer exemption under the criteria at 40 CFR section 146.4. The basis for this aquifer exemption can be found at 40 CFR section 146.4(a)&(b)(1). The Permittee has demonstrated that the injection zone does not currently serve as a source of drinking water and that it cannot now and will not in the future serve as a source of drinking water because it is mineral, hydrocarbon, or geothermal energy producing, and can be demonstrated by a permit applicant as part of a permit for a Class II operation to contain minerals or hydrocarbons that, considering their quantity and location, are expected to be commercially producible.

The proposed interval to be exempted in conjunction with Area UIC Permit UT22195-00000 is the Green River Formation from the TGR3 Top in the Garden Gulch member to the top of the Wasatch Formation within the permit area defined as T5S, R4W Sections 5, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 30, 31, 32, 33, and 34; T5S, R5W Sections 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, and 36 (S.L.B. & M.), Duchesne County, Utah. The following areas are excluded from the area permit as they are not in Indian country, but will be included within the aquifer exemption due to the area being encompassed by the ¼ mile area of review buffer:

Township 5 S, Range 4 W:

Section 10, S ½ of SW ¼, NW ¼ of SW ¼, SW ¼ of SE ¼.

Township 5 S, Range 5 W:

Section 12, E ½ of SE ¼

Section 16, NW ¼

Section 33, E ½ of SE ¼

Section 34, S ½ of NW ¼, NE ¼ of NW ¼, NW ¼ of NE ¼, NW ¼ of SW ¼.

Part 3. Considerations Under Federal Law (40 CFR, Part 144.4)

The Bureau of Land Management's role on Indian Trust Lands and Allotments has been to accept the NEPA that was prepared by the Bureau of Indian Affairs for Applications for Permits to Drill (APDs), and to review the APDs down hole program. To document that the BLM accepted the BIA's NEPA for the APD, BLM prepares a one page Decision Record/Finding of No Significant Impact.

The BIA documented its evaluation of impacts to the environment of its oil-gas field development for the Authorized Permit Area in the Berry Petroleum Brundage Canyon Oil and Gas Field Infill Drilling Program Environmental Assessment. The EA was prepared in May 2006 by the Petros Environmental Group, Inc., for the BIA.

As part of its permit decision regarding injection wells, EPA considered and has determined that its permit decision is in compliance with the following federal laws:

Wild and Scenic Rivers Act

There are no designated Wild and Scenic rivers or tributaries of any such rivers within the Berry Brundage Canyon Area Permit or within the ¼ mile radius Area of Review for Area UIC Permit UT22195-00000. In addition, no water resources project will be authorized by this permit. Accordingly, the Wild and Scenic Rivers Act is not applicable to this action.

National Historic Preservation Act (NHPA)

The EPA is undergoing consultations with the BIA, the BLM, the Utah State Historic Preservation Office, the Ute Indian Tribe of the Uintah and Ouray Reservation, and the National Advisory Council on Historic Preservation concerning the appropriate resolution of potential effects on historic properties. The EPA understands and expects that in general, before construction of infrastructure within the Authorized Permit Area occurs, the BIA (or, potentially, another federal agency) will have undertaken NHPA section 106 consultation concerning the impacts of that construction, in connection with its land management authorities. After construction activities covered by these NHPA reviews, there will be no additional land disturbance related to conversion of wells under the EPA's area permit. Because the other federal agency's NHPA consultation process will include an analysis of effects from building water pipelines, access roads, and well pads, and will be completed before any activity authorized by the EPA's area permit commences, the EPA is in the draft phase of

a programmatic agreement with the BIA, the BLM, the Ute Indian Tribe of the Uintah and Ouray Reservation, and the Utah SHPO. This agreement reflects that the BIA's NHPA reviews will be the mechanism for identifying and addressing any adverse effects on historic properties from construction of this infrastructure and any subsequent conversion to injection under this area permit. The ACHP advised that it did not need to participate in the programmatic agreement.

Where there is no federal surface or mineral interest in a parcel, it is possible that the prior federal agency's compliance may not cover some construction activities. As noted above in part 1, this area permit only covers those wells for which the NHPA section 106 compliance process has been completed as of the time a request for authorization to construct is submitted. Wells for which the NHPA section 106 compliance process has not been completed will need to be covered under another permit, or the EPA will conduct the compliance process prior to authorizing to construct.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act (ESA), 16 U.S.C. 1536 (a)(2), requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of federally-listed endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. ESA implementing regulations at 50 C.F.R. part 402 requires consultation with the US Fish and Wildlife Service (FWS) where the action "may affect and is likely to adversely affect" listed species or their critical habitat.

On March 5, 2013 the USFWS rendered a Biological Opinion stating the proposed project may affect and is likely to adversely affect the following four Colorado River fishes: The Bonytail, Colorado Pikeminnow, Humpback Chub, and Razorback Sucker. Some of the water to be injected for enhanced recovery operations will be taken from two water supply wells which may ultimately affect the Green River. An important item to note is that the one flowing stream, an unnamed Green River tributary, in Brundage Canyon does not support these fish. (Referenced within Berry's Biological Assessment that preceded the USFWS Biological Opinion.) Adverse affects to the endangered Colorado River fish are, however, mitigated by the Recovery and Implementation Program (RIP). Berry has also paid a depletion fee to the National Fish and Wildlife Foundation in 2006, and according to the Biological Opinion will pay another depletion fee at the time of this UIC permitting action going final. Other federally listed species considered and evaluated within the Biological Assessment were the Greater Sagegrouse, Mexican Spotted Owl, Western Yellow-billed Cuckoo, Black-footed Ferret, Canada Lynx, Barneby Ridgeway, Graham's Beartongue, Pariette

Cactus, and the Shrubby Reedmustard. The project is determined to have “no effect” on each of these species, with the Biological Opinion concurring.

In accordance with U.S. Fish and Wildlife Service Biological Opinion 6-UT-06-F-018, Berry Petroleum has provided payment of the required production project depletion fee in the amount of \$2,583.85 to the National Fish and Wildlife Foundation. Berry is required to pay the UIC project depletion fee of \$20,240.18 (\$20,669.09 if paid after September 30, 2013). The USFWS office that issued the Biological Opinion is located at:

U.S. Fish and Wildlife Service, Utah Field Office
2369 West Orton Circle, Suite 50
West Valley City, UT 84119

Berry will use fresh water from two water supply wells located within Brundage Canyon. No water will be taken directly from the Green River, however, the depletion fee will cover any water depletion from the area that may ultimately affect the Green River.

Coastal Zone Management Act

EPA has determined that the issuance of Area UIC Permit UT22195-00000 would not affect land or water in any coastal zone.

Fish and Wildlife Coordination Act

The EPA is coordinating with the BIA, BLM, and the Uintah and Ouray Tribal Business Committee regarding the results of the Biological Opinion.

Executive Order 12898

On February 11, 1994, the President issued Executive Order 12898, entitled “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.” The area of review for this permit extends one-quarter mile beyond the permit area, where the pressures in the injection zone may cause the migration of the injection fluid. The EPA identified one permanent dwelling within the boundaries of the area of review on private lands in T5S R4W Section 5 (SW/NE quadrant). The EPA determined that the activity authorized by this Permit decision will not reduce the quantity of water provided for this dwelling, as injection activity takes place well below the aquifer used for drinking water. Further, the nearest town is six miles away and outside the boundaries of the area of review. Nevertheless, the EPA determined that the activity authorized by this Permit decision will use existing oil-gas well infrastructure, service roads, well pads and pipeline rights-of-way, and no increase in truck traffic is expected to result in the town of Duchesne (six miles from Brundage Canyon).

Thus, the EPA has determined that this permit action will not have disproportionately high and adverse human health or environmental effects on either the private dwelling within the area of review or the town of Duchesne. The public notice for this permit decision will solicit input during the public comment period from the Uinta Basin community.

Part 4. Cumulative Effects Analysis (40 CFR, Part 144.33(c)(3))

The cumulative effects considered for this decision include only those effects which may impact USDWs. The cumulative effects to surface due to continued oil field development including road construction, oil-gas well drilling and associated emissions, dust and noise are considered independently for this permit by the BIA as part of its analyses under the National Environmental Protection Act (NEPA) and are beyond the scope of EPA's permit decision regarding injection wells. The reader is referred to the EA referenced in Part 3, Paragraph 1 of this document for information on the cumulative effects to surface of continued field development in the Brundage Canyon Field.

EPA has considered the cumulative effects of drilling and operation of additional injection wells and determined that the cumulative effects of this Permit action are acceptable to the Director. The following items are a summary of EPA's cumulative effects considerations:

Groundwater Quality

This permit sets requirements to protect USDWs from contamination from the proposed injection activity. The established geologic confining units, well construction requirements, and injection pressure, well testing and plugging and abandonment requirements are designed to prevent fluid movement into USDWs. Based on these requirements and direct knowledge obtained by previous regulation of injection activities within the permit area, EPA has determined that the proposed underground injection will have no cumulative impact on any USDWs located beyond the injection zone.

Pressure Effects

EPA has considered the cumulative effects resulting from an expected increase in reservoir pressure with time due to both continued injection into 14 existing injection wells and the addition of injection wells to this area permit in the future. For Class II wells, EPA limits the injection pressure of wells to a threshold pressure below which existing fractures in a geologic confining zone will not be opened or extended in the subsurface, to prevent any significant fluid movement through potential pathways in the protective confining zone. These threshold pressures are obtained from both injection well and production well test data from wells within the permit area.

EPA consulted with the Utah Division of Water Rights to confirm that three domestic water wells exist within the Authorized Permit Area and all are shallow (160 feet), except for one plugged and abandoned well that is 1,500 feet deep. The other locations identified are water rights with the majority, if not all of these rights, expected to supply water to cattle. Based on regional geology, which includes many impermeable shale units, the designated protective confining zone, depth of the injection zone for this permit action, and history of regulating injection activities in the field, EPA determined that there will be no effect on these shallow drinking water aquifers as a result of the changing pressure regime within the oil producing reservoir over time. The aquifers being used as a drinking water resource are hydraulically isolated from waters of the injection zone and oil-gas well cementing requirements and injection pressure limitations are set to prevent hydraulic communication between the injection zone and shallower aquifers from occurring.

In general, maintenance of existing reservoir pressure and some increase in pressure with time is expected as part of an enhanced oil recovery project because this increase in pressure can help mobilize additional oil within the subsurface. As part of any enhanced recovery injection, reservoir fluid production via adjacent production wells serves to balance pressure induced by fluid injection into the reservoir. EPA is requiring the Permittee to submit reservoir pressure data prior to receiving authorization to place an additional well on injection. In the event that reservoir pressure is found to pose a risk to USDWs as a cumulative effect of injection under this permit, Berry will take measures to reduce the reservoir pressure to acceptable levels.

EPA has considered the possibility that pressure increases caused by the Permittee's injection wells may exert pressure effects on production wells or mineral rights owned by an entity that is not the permit applicant. In case of such an occurrence, EPA considers this to be a correlative rights issue and therefore beyond the scope and authority of EPA's area UIC permit decision.

Part 5. Description of Permitting Approach

Currently, EPA regulates injection wells within the Authorized Permit Area under individual injection well permits. Following this permit decision, a single, consolidated area permit would apply to all enhanced recovery water injection wells operated by the Permittee within the Authorized Permit Area and would authorize the future conversion of oil-gas production wells to water injection wells. This permit does not authorize the drilling of wells for the purpose of injection.

Review of this permit decision included an evaluation of all existing oil-gas wells (499 wells) both inside, and within a ¼-mile exterior radius of, the Authorized Permit Area. To keep up with the future drilling of oil-gas production wells, Part 3 of this Permit requires that the Permittee submit to EPA quarterly information about production well drilling activities and data from newly drilled production wells. This data will be reviewed by EPA and recorded in the List of Wells (LW) for Area UIC Permit UT22195-00000, which is described in Part 5 of the Permit.

The LW serves as a communication and record keeping tool that records EPA determinations on oil-gas wells, construction and injection authorization dates and well testing requirements for injection wells within the Authorized Permit Area. Under Area UIC Permit UT22195-00000, EPA communications and authorizations to The Permittee will be primarily electronic (email) and authorization dates will be recorded in the LW for easy reference by the Permittee.

Part 4 of this Permit describes how injection wells will be individually authorized by EPA as they are requested by the Permittee and this process is summarized here:

1. In order to convert a production well to injection, the Permittee must first obtain an authorization to construct the injection well from EPA. The Permittee must submit a letter requesting the injection well(s), EPA application form(s) and all information listed under Part 4, Section 1 of the Permit that EPA will review prior to authorizing the conversion of a oil-gas production well to an injection well.
2. EPA will review the submitted materials and check the information for accuracy against oil-gas well information previously recorded by EPA in the LW. For any oil-gas wells located near the requested injection well(s) that have not been previously evaluated by EPA as part of the permit review process or as part of quarterly submittals of oil-gas production well information, EPA will conduct an evaluation of the well construction and cement and record this determination in the LW. Once EPA has determined that the request to convert the oil-gas production well to an injection well is in accordance with permit conditions, EPA will record a construction authorization date in the LW and notify the Permittee via written correspondence.
3. Once EPA has authorized conversion of an oil-gas well to an injection well, the Permittee has 90 calendar days to construct the injection well before the authorization expires. Once the packer and tubing are set, the Permittee will notify the EPA by submitting the materials required in Part 4, Section 2 of the

Permit within 30 calendar days.

4. Once EPA receives the materials required under Part 4, Section 2 of the Permit, EPA will review the materials to ensure the injection well was constructed in accordance with permit conditions. Upon a determination that the Permittee is in compliance with permit conditions, the EPA will authorize the commencement of injection into the well by recording an injection authorization date in the LW and notifying the Permittee by written correspondence.
5. Upon receiving authorization to inject, the Permittee has 90 calendar days to place the well on injection and must submit materials required under Part 4, Section 3 to EPA within 30 calendar days of placing that well on injection.
6. If the LW indicates that a temperature log or radioactive tracer survey is required for the injection well, these must be submitted within 180 calendars days of commencement of injection. Once all initial testing data is reviewed and approved by EPA, EPA will notify the Permittee via written correspondence and the Permittee may continue to operate the injection well according to the terms and conditions of Area UIC Permit UT22195-00000.

Part 6. Permit Conditions for Area UIC Permit UT22195-00000

Well Construction (40 CFR 146.22 and Part 7 of the Permit)

Injection well construction requirements are stipulated in Part 7 of Area UIC Permit UT22195-00000 and under the Safe Drinking Water Act. EPA does not regulate the construction or drilling of production wells and therefore has no regulatory authority to impose requirements on the construction of these wells at the time they are drilled. However, the area UIC permit does require that surface casing of newly converted injection wells meet certain requirements and, in anticipation of future conversion of production wells to injection, the Permittee is advised to consider injection well construction requirements during the drilling and completion of production wells. EPA does not allow the operation of any injection well that allows the movement of fluid into or between USDWs because this is prohibited in 40 CFR, Part 144.12.

Surface casing for injection wells converted from existing production wells in the Brundage Canyon Field is typically 8-5/8" diameter pipe set in a 12-1/4" hole and is usually cemented to surface. Surface casing in most of these wells varies, as they were approved under production well regulations by the BLM. On a case-by-case basis the well surface casing will be evaluated to determine that it corresponds to the depth of the lowermost occurrence of moderately saline water according to Utah Geological Survey Special Study 144 referenced in the above

section on Underground Sources of Drinking Water. In consideration of future use as an injection well, surface casing on newly drilled production wells must be set to at least 50 feet below the lowermost USDW. Long string casing, often referred to as "production" casing, is typically 5-1/2" diameter pipe in a 7-7/8" hole, drilled to a depth of approximately 5,500 feet below surface. Long string casing is typically perforated between the depths of 3,500 feet and 5,000 feet.

Injection tubing is required to be installed from a packer up to the surface inside the long string well casing. The packer will be set above the uppermost perforation. The tubing and packer are designed to prevent injected fluid from coming in contact with the outermost well casing.

The Tubing-Casing Annulus (TCA) allows the casing, tubing and packer to be pressure-tested periodically for mechanical integrity and will allow the detection of any leaks in the casing, tubing or packer. The TCA of all injection wells will be filled with fresh water treated with a corrosion inhibitor or other fluid approved by the Director.

The Permittee is required to install and maintain wellhead equipment that allows for monitoring pressures and provides access for sampling the injected fluid. Required equipment may include but is not limited to: 1) shut-off valves located at the wellhead on the injection tubing and on the TCA; 2) a flow meter that measures the cumulative volume of injected fluid; 3) fittings or pressure gauges attached to the injection tubing and the TCA for monitoring the injection and TCA pressures; and 4) a tap on the injection line, isolated by shut-off valves, for sampling the injected fluid. All sampling and measurement taken for monitoring is required to be representative of the monitored activity.

Part 7. Area of Review Requirements (40 CFR 144.55 and Part 12 of the Permit)

This permit requires that all oil-gas wells within a 1/4-mile radius of an injection well have top of cement behind the outermost casing string above the designated confining zone. This requirement ensures that no fluid is moved upward into USDWs through vertical channels adjacent to the wellbore of nearby wells. The Permittee may obtain information about the top of cement in any well by checking the List of Wells for Area UIC Permit UT22195-00000. For any new well not yet listed in the List of Wells with an EPA determination, it is incumbent upon the Permittee to provide cementing records in accordance with this Permit.

Well Operation Requirements (40 CFR 146.23 and Part 10 of the Permit)

Approved Injection Fluid

The approved injection fluid is limited to Class II injection well fluids as defined at 40 CFR §144.6(b). Injection of any fluid for the purpose of disposal is prohibited. Prohibited fluids include unused fracturing fluids or acids, gas plant cooling tower cleaning wastes, service wastes, and vacuum truck and drum rinsate from trucks and drums transporting or containing non-exempt waste.

Injection Pressure Limitation (Part 11 of the Permit)

Injection pressure, measured at the wellhead, shall not exceed a calculated Maximum Allowable Injection Pressure (MAIP) to assure that the pressure used during injection does not initiate new fractures or propagate existing fractures in the confining zone. The Permittee will submit to EPA the MAIP for each well based on the calculation discussed in part 11 of the permit.

Previously established Maximum Allowable Injection Pressures (MAIP) for wells under existing Federal UIC Permits in the Brundage Canyon Field shall transfer to UIC Permit UT22195-00000 and will be incorporated as enforceable conditions of this Permit. For requested changes to these previously established MAIPs and for all other wells covered under this permit, the Permittee will be required to calculate the MAIP, measured in units of “pounds per square inch” (psi), based on the following equation:

$$\text{MAIP} = [\text{FG} - (0.433)(\text{SG})] * \text{Depth}$$

“Depth” is the depth in feet from the Kelly Bushing (usually eight feet above the surface) to the top of the injection zone.

The FG is a measure of how the pressure required to fracture rock in the earth changes with depth. It is usually measured in units of "pounds per square inch per foot" (psi/ft) and varies with the type of rock and the stress history of the rock. This means, for example, that for a FG of 0.8 psi/ft at a depth of 100 ft, a pressure of 80 psi would be required to fracture the rock, while at a depth of 500 ft, the required pressure would be 400 psi; at 1000 ft, 800 psi. The FG (fracture gradient) has already been determined and approved for each well, and is shown within Book 2, well data, of Berry's permit application. The original FG was calculated by the Permittee performing hydraulic fracture stimulation for each production well. Each respective well FG value from Book 2 shall be used to determine the MAIP of existing wells.

While FGs are not expected to vary considerably from existing well data, it is possible that geologic changes can lead to a FG change. If the Permittee performs

a Step Rate Test and finds that the FG value should be changed based on this information, it must submit this data to the EPA. The Director will review the information, and if the Director approves the new FG derived from the Step Rate Test, then that value will be plugged into the MAIP formula above, with a new MAIP derived.

The SG (specific gravity) is 1.015 throughout T5S-R4-5W and shall be used unless the Director determines otherwise. Specific gravity is defined as the ratio of the density of the material of interest (such as oilfield brine) to the density of fresh water.

Acknowledgement of the MAIP will be sent to Berry via a Record of Well Construction and Authorization to Inject.

Injection Volume Limitation

There is no limit on the volume of approved Class II fluids that may be injected. While an aquifer exemption is proposed with this area permit because this is an enhanced oil recovery operation involving the production of oil and water as well as water injection, injected water is expected to remain within the exempted permit area.

Part 8. Mechanical Integrity (40 CFR 146.8 and Part 8 of the Permit)

Part 8 of this Permit describes all requirements for establishing mechanical integrity of injection wells. An injection well has mechanical integrity if:

1. there is no significant leak in the casing, tubing or packer (Part I); and
2. there is no significant fluid movement into a USDW through vertical channels adjacent to the well bore (Part II).

This Permit prohibits injection into any well that lacks mechanical integrity. A demonstration of mechanical integrity includes both internal (Part I) and external (Part II) mechanical integrity as defined above. The methods and frequency of these demonstrations are dependent upon well-specific conditions and/or EPA's determination regarding the construction of each oil-gas well within the permit area as recorded in the LW.

Part 9. Monitoring, Recordkeeping and Reporting Requirements (Part 15 of the Permit)

Injection Well Monitoring Program

At least once a year the permittee must analyze a sample of the injected fluid for

Total Dissolved Solids (TDS), specific conductivity, pH and specific gravity. This analysis shall be reported to EPA annually as part of the Annual Report to the Director. Any time a new source of injected fluid is added, a fluid analysis shall be made of the new source.

Instantaneous injection pressure, injection flow rate, cumulative fluid volume and Tubing-Casing Annulus (TCA) pressures must be observed on a weekly basis. A recording, at least once every 30 days, must be made of the injection pressure, annulus pressure, monthly injection flow rate and cumulative fluid volume. This information is required to be reported annually as part of the Annual Report to the Director.

Part 10. Plugging and Abandonment Requirements (40 CFR 146.10 and Part 17 of the Permit)

Prior to abandonment, injection wells shall be plugged with cement in a manner which isolates the injection zone and prevents the movement of fluids into or between underground sources of drinking water and in accordance with 40 CFR §146.10 and other applicable Federal, State or local laws or regulations.

The plugging and abandonment plan required in Part 17 of this Permit accomplishes several objectives, all intended to prevent fluid movement into or between USDWs. It isolates the injection zone, both inside and outside the long string casing, preventing fluid from moving into shallower formations through the well bore. It isolates the Trona-Birds Nest aquifer, a known water-bearing zone with USDWs, and the Mahogany Bench oil shale resource in accordance with BLM recommendations and requirements. A default plug at the Uinta-Green River Formation contact is required because these formations are known to contain USDWs in some places. If long string casing is not cemented to surface, the Permittee is required to emplace cement behind long string casing from at least 50 feet below the base of surface casing or from at least 50 feet below the base of the lowermost USDW, back to surface. Finally, a minimum 50-foot plug is required inside the long string casing at the surface to prevent the entry of surface water runoff into the well bore.

Part 11. Financial Responsibility (40 CFR 144.52 and Part 23 of the Permit)

The Permittee is required to maintain financial responsibility and resources to close, plug and abandon the underground injection operation in the manner prescribed by the Director in Part 23 of the Permit.

At the time of permit issuance, the estimated cost for plugging and abandonment of injection wells within the authorized permit area is considered by EPA to be

\$59,400 per well. On June 9, 2009, EPA Region 8 approved the Permittee's demonstration of financial responsibility in the amount of \$1,000,000, which consisted of a Surety Bond and Standby Trust Agreement. EPA Region 8 has evaluated the Schedule A list of wells submitted by the Permittee and determined that all currently injecting, EPA-regulated injection wells (14) are included on the Schedule. The permittee estimates that up to 300 production wells may be converted to water injection within the next several years. The estimated cost of plugging all wells listed on Schedule A is \$831,600, which is less than the total amount of the Permittee's financial responsibility demonstration.

In the event that the Permittee seeks to convert production wells to injection that are not listed on the most recently approved Schedule A list of wells, the Director will require an updated approval of the Permittee's demonstration of financial responsibility. The director may, from time to time, require the permittee to submit an estimate of the resources needed to plug and abandon the injection wells governed under this permit and, if necessary, revise its demonstration of financial responsibility.