NI 43-101 TECHNICAL REPORT ON THE POLYHALITE RESOURCES AND UPDATED PRELIMINARY ECONOMIC ASSESSMENT OF THE OCHOA PROJECT
Lea County, Southeast New Mexico

Prepared for

ICPOTASHCORP

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NMOCD CASE NO.15262
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Fulfer/Driftwood Oil
EXHIBIT NO. 5

TABLE 25-7 WATER RIGHTS HELD BY POTASH COMPANIES IN THE CARLSBAD AREA.

Owner	Well Number	Diversion Right (ac-ft/yr)	Basin
HB Potash LLC	CP 00645	1,451	Capitan
	CP 00648	1,451	Capitan
	L 01880	3,953	Lea County
	Total	**6,855**	
Intrepid Mining NM LLC	L 02724	2,410	Lea County
	L 04247 A	1,400	Lea County
	SP 00302	4,640	Surface Permit
	SP 01942	10,868	Surface Permit
	SP 02045	18,100	Surface Permit
	Total	**37,418**	
Mississippi Potash, Inc.	L 01613	1,410	Lea County
	L 02347	3,220	Lea County
	L 02680	3,500	Lea County
	Total	**8,130**	
Mosaic Potash Carlsbad Inc.	CP 00378	1,371	Capitan
	CP 00379	484	Capitan
	L 01695	786	Lea County
	C 00110	4,152	Carlsbad
	Total	**6,793**	
Potash Company (NSL) a Corp.	SD 01094	382	Surface Declaration
	Total	**382**	
Western Ag-Minerals Co.	CP 00788	1,000	Capitan
	C 02111	47	Carlsbad
	L 03616	2,257	Lea County
	Total	**3,304**	

The geology, hydrogeology, and water availability of the ICP lease holdings area are discussed in more detail below.

25.9.1 General Geology of the ICP Lease Holdings Area

The area of interest consists of almost 12,000 feet of Permian age deposits. Older Permian deposits, the Wolfcampian and Leonardian Series, consist of approximately 4,000 feet of mostly fine-grained sandstones, siltstones, shales and various types of limestone deposited before the Capitan reef was built and the Delaware Basin formed (Figure 25-17). The Delaware Basin

deposits of Permian age in southeastern New Mexico are divided into the Guadalupian and the Ochoan Series. The Guadalupian Series consists primarily of sandstones that make up the Delaware Mountain Group (Bjorklund and Motts, 1959). The Ochoa Series is composed of, oldest to youngest, the Castile Formation, Salado Formation, Rustler Formation, and Dewey Lake redbeds (Bachman, 1983). The Castile Formation is composed primarily of anhydrite and halite and rests unconformably on the upper member of the Bell Canyon Formation, the last sequence of the Delaware Mountain Group (Bjorklund and Motts, 1959). The Salado Formation consists primarily of cyclic anhydrite, halite, and clay sedimentation and interfingers laterally with the underlying Castile Formation (Bjorklund and Motts, 1959). Near the Capitan Reef escarpment, a thin clay layer is present at the contact between the upper Salado Formation and the overlying Rustler Formation which creates a local barrier to downward water movement (Bjorklund and Motts, 1959; Bachman, 1983). The Rustler Formation is composed of anhydrite, halite, and two carbonate beds (Bjorklund and Motts, 1959). The Dewey Lake redbeds conformably overlie the Rustler Formation and consist of red siltstone, sandstone and shale (Bjorklund and Motts, 1959). The Dewey Lake redbeds are the youngest of the Ochoan Series.

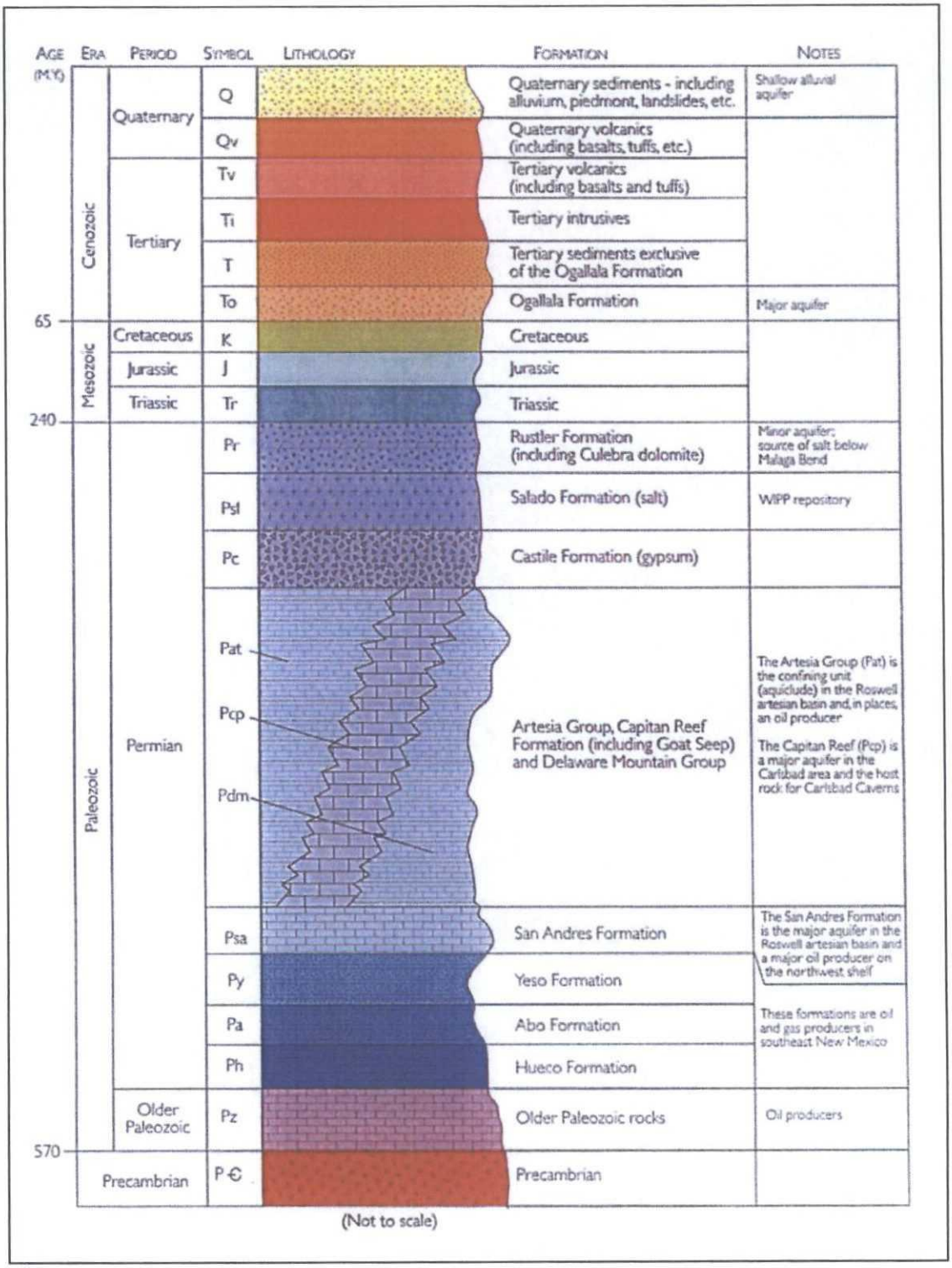

FIGURE 25-17 GENERALIZED STRATIGRAPHIC COLUMN FOR SOUTHEASTERN NEW MEXICO

(From Johnson et al., 2003)

25.9.2 Hydrostratigraphic Units

The Delaware Basin Permian sediments contain aquifer units with low permeabilities, poor-quality water, and low well yields (Uliana, 2001). Aquifer yields in the Permian shelf facies are highly dependent on fracture and karst porosity (Uliana, 2001). The Capitan aquifer exhibits higher permeability and yields than either the Permian basin or shelf facies. While the Capitan aquifer produces large quantities of water, water quality throughout the reef is highly variable (Uliana, 2001). The geologic units around the Capitan Reef complex are less permeable and have lower conductivity and so act as barriers to significant horizontal groundwater movement to or from the Capitan Aquifer (Leedshill-Herkenhoff Inc. et al., 2000).

There are a number of potential site specific target hydrostratigraphic units for both fresh and brackish water development, each of which is discussed below, in order of depth below ground surface.

25.9.2.1 Alluvium (surface to 700 ft bgs)

Quaternary alluvial deposits exist throughout Lea County, though the saturated thickness of the alluvium is only sufficient in a few places to provide a significant water source (Leedshill-Herkenhoff Inc. et al., 2000 [Lea County Regional Water Plan]). Most of the wells accessing the Alluvial Aquifer in the Capitan Basin are completed near Monument Draw on the Mescalero Ridge, and less are located on the Querecho Plains and the northeast San Simon Swale (Leedshill-Herkenhoff Inc. et al., 2000). The amount and characteristics of water in storage in the Alluvial Aquifer is difficult to estimate because the aquifer is not continuous and in most areas the extent of saturated alluvium is quite small (Leedshill-Herkenhoff Inc. et al., 2000).

The Dewey Lake Formation consists of clastic red beds that unconformably overlie the Rustler Formation and are considered part of the Ochoan Series (Summers, 1972). The Dewey Lake beds are presumed to have very low permeability and would yield very little water, if any, though very little data are available about the hydraulic properties of the beds (Summers, 1972).

25.9.2.2 Santa Rosa Sandstone of the Dockum Group (150 to 2,000 ft bgs)

The Triassic Dockum Group has thick areas of sediments and is estimated to have large amounts of stored groundwater, however low permeability appears to have limited well completion in the

Santa Rosa Aquifer (Leedshill-Herkenhoff Inc. et al., 2000; Summers, 1972). The Santa Rosa Aquifer is the principal aquifer of the Dockum Group and has well yields that average 25 to 30 gpm in southern Lea County (Summers, 1972). Depth to water in the Santa Rosa Aquifer ranges from 120 to 700 ft (Leedshill-Herkenhoff Inc. et al., 2000).

25.9.2.3 Rustler Formation (1,200 to 1,600 feet below ground surface [ft bgs])

This is the target formation for the Ochoa Project. The Rustler Formation contains aquifers east of the Pecos River with variable yields and water quality (Bjorklund and Motts, 1959). Well yields are quite variable, and have been reported from 7 to 4,400 gpm throughout the formation south of the ICP lease holdings in Texas. Aquifer permeability is believed to be locally enhanced by carbonate and evaporite dissolution (Boghici and Van Broekhoven, 2001). Water from the Rustler contains relatively large amounts of sulfate and chloride (Bjorklund and Motts, 1959). Discharge from the aquifer is from pumping wells and flow into the overlying Edwards-Trinity aquifer in Texas (Boghici and Van Broekhoven, 2001). The Rustler is also the source of saline water discharging to the Pecos River in the vicinity of Malaga Bend.

25.9.2.4 Salado Formation (1,600 to 2,700 ft bgs)

The Salado Formation is not water bearing (Bjorklund and Motts, 1959) and is the host formation for the WIPP site. A red silt and clay layer at the contact of the Salado and the overlying Rustler Formation acts as a barrier to the vertical movement of water (Bjorklund and Motts, 1959; Bachman, 1983).

25.9.2.5 Castile Formation (2,700 to 4,200 ft bgs)

The Castile Formation does not contain any appreciable amount of groundwater and acts as a barrier to the movement of water from the Capitan Limestone into the Castile Formation. Only in areas of outcrop does the Castile Formation contain water, typically in small caverns (Bjorklund and Motts, 1959). Water found in the Castile Formation is highly mineralized, including high sulfate, and has been used for stock wells west of Carlsbad, near the Guadalupe Mountains (Bjorklund and Motts, 1959), but not generally as a significant source of fresh water for uses other than stock watering.

25.9.2.6 Capitan Aquifer (2,000 to 4,000 ft bgs)

The Capitan Aquifer is composed of the Capitan Formation, parts of the Goat Sheep Formation, and the Carlsbad Formation (Uliana, 2001; Hiss, 1980). The high permeability of the Capitan Aquifer is due to solution channels (Bjorklund and Motts, 1959; Uliana, 2001). In the vicinity of Carlsbad, the Capitan Aquifer produces potable water but the water quality decreases to the south and east of the Pecos River (Uliana, 2001; Leedshill-Herkenhoff, Inc. et al., 2000; Hiss, 1975). Average hydraulic conductivity of the Capitan Aquifer east of the Pecos is approximately 5 feet per day (Leedshill-Herkenhoff, Inc. et al., 2000). Within Lea County, the aquifer ranges from 800 to 2,200 feet thick and is approximately 12 miles wide near the Eddy and Lea County boundary and 6 miles wide near Jal, New Mexico (Leedshill-Herkenhoff, Inc. et al., 2000). Groundwater flow in the Capitan Aquifer in the area of interest flows southeast and south, following the preferential path of the reef facies (Uliana, 2001; Hiss, 1980). According to Bjorklund and Motts (1959), the Delaware Mountain Group formation underlying the reef acts as a barrier to downward movement of the groundwater in the Capitan Aquifer. The basin deposits along the inner arc of the reef also create a barrier to groundwater movement, however groundwater interaction does occur with the outer arc deposits, particularly the Tansil and Yates Formations (Bjorklund and Motts, 1959; Barroll et al., 2004). According to Hiss (1975), a constriction in the reef aquifer near the boundary between Lea County and Eddy County reduces transmissivity of the Capitan aquifer. Hydraulic heads east of the county line have dramatically declined in response to large withdrawals while hydraulic heads west of the county line remain relatively stable (Barroll et al., 2004).

Based on long-term monitoring in Lea County, water-level drops as great as 160 feet from 1967 through 1975 were observed. Withdrawal of water from adjacent Guadalupian-age formations that are in hydraulic connection with the Capitan aquifer is also thought to have contributed to water-level declines in the Capitan aquifer (Leedshill-Herkenhoff, Inc. et al., 2000).

25.9.2.7 Delaware Mountain Group (4,200 to 8,000 ft bgs)

Little or no fresh groundwater has been found in the Delaware Mountain Group in the vicinity of Carlsbad, though some wells have drilled to beds containing saline water and others to beds containing petroleum and gas (Bjorklund and Motts, 1959). The Delaware Mountain group

appears to act as the lower confining beds of the reef aquifer as well as constraining lateral flow on the basin side of reef facies (Bjorklund and Motts, 1959).

25.9.2.8 Victorio Peak/Bone Spring Limestone (8,000 to 11,000 ft bgs)

The Permian Leonardian Series Victorio Peak and Bone Spring Limestone has not been characterized for aquifer characteristics in the vicinity of the area of interest. The Diablo Plateau Aquifer systems consist of interconnected solution cavities in the Victorio Peak and Bone Spring Formations west of the Guadalupe Mountains (Ashworth, 2001). Groundwater of the Diablo Plateau Aquifer is generally poor quality with TDS ranging from approximately 1,000 to more than 6,500 milligrams per liter (mg/L) (Ashworth, 2001). This unit is a productive aquifer elsewhere, but has not been studied at this location due to its depth.

25.9.3 Fresh Water Availability

As discussed above, sources of fresh water available for processing operations include purchasing water from the City of Carlsbad's Double Eagle Water System (DEWS), purchasing and transferring freshwater water rights, or applying for a new appropriation from the Capitan Administrative Basin.

The City of Carlsbad's DEWS draws water from the Ogallala aquifer northeast of Carlsbad, and serves, in addition to other areas, the Department of Energy's Waste Isolation Pilot Plant (WIPP). The WIPP is located approximately 10 miles northwest of the western boundary of the ICP lease holdings. The section of pipeline that serves the WIPP is 24 inches in diameter, and has an estimated capacity of 6,000 gpm, according to the City of Carlsbad. The pipeline terminates at the WIPP site, but could be extended. The City of Carlsbad may be willing to upgrade or add to the existing pipeline to serve new users. In addition, there may be excess capacity in the pipeline for wheeling (transfer of water between water users) purchased irrigation water from the Lea County Basin or elsewhere via the DEWS facilities. In addition, due to the ICP lease holdings' proximity to the New Mexico-Texas border, it may be economical to purchase water for the Ochoa Project from an out-of-state provider.

Options for purchase of water rights include purchases from the Carlsbad, Capitan, or Lea County Administrative Basins. Since portions of the ICP lease holdings are within the Capitan

Administrative Basin (Capitan Basin) and Carlsbad Administrative Basin (Carlsbad Basin), it is likely that water rights purchased in either basin could be physically transferred to a well or wells within the ICP lease holdings area. Purchase and transfer of water rights would trigger the New Mexico Office of the State Engineer (NM OSE) administrative process for change of place of use, and possibly change of purpose (if non-industrial water rights were purchased). This process includes public notification and a hearing before the NM OSE before the transfer can be approved. Irrigation water rights may also be available for sale in the Lea County Basin to the north. Accessing this water may involve transfer via pipeline, again possibly via the existing DEWS pipeline.

New appropriations may be allowed in the Capitan Basin in areas other than the vicinity of the Pecos River, near the towns of Eunice and Jal, or within the Capitan aquifer. Potential aquifers for new appropriations within the Capitan Basin include the Rustler, the Santa Rosa Sandstone of the Dockum Group, the Dewey Lake Formation, and the alluvium (also called Quaternary Bolson in some areas). While water is available within the Capitan Basin in areas outside of the Capitan aquifer, the water availability in these areas is not expected to be high.

25.9.4 Brackish Water Availability

The most promising target zone for brackish groundwater in the vicinity of the ICP lease holdings is the Capitan Reef aquifer. According to NM OSE guidance (72-12-25 NMSA) brackish groundwater is defined as water in aquifers whose top is below 2,500 ft bgs with greater than 1,000 parts per million (ppm) total dissolved solids (TDS). This water is available for development without a water right from NM OSE for oil and gas exploration and production, prospecting, mining, road construction, agriculture, generation of electricity, industrial, or geothermal uses.

Pursuant to NMSA 1978 72-12-26 and 27, the NM OSE requires that a Notice of Intent (NOI) be filed when proposing to develop brackish groundwater. The NOI requirements include:

- Description of the target aquifer and overlying confining strata;
- Development of geologic cross-sections of the target aquifer and overlying confining strata;
- Definition of lateral extent of the target aquifer and overlying confining strata;

- Determination of TDS of groundwater from the target aquifer; and
- Proof of hydraulic separation of the target aquifer from shallower freshwater aquifer systems and surface water.

While it is clear that there are portions of the Capitan aquifer where the top of the aquifer is below 2,500 ft bgs and the TDS exceeds 1,000 ppm, the high transmissivity and extent of hydraulic connectivity within the Capitan aquifer makes development of brackish groundwater challenging. This is because the NM OSE requires that any aquifer developed for brackish groundwater be demonstrated to be hydraulically separated from any other freshwater aquifer. In general this is not true for the Capitan aquifer. Thus while brackish groundwater availability is high, successfully accessing it within the context of NM OSE guidance may be problematic.

25.9.5 Conclusions

Water is available for the Ochoa Project from a number of different sources. Options for supplying the Ochoa Project with water include purchasing from the City of Carlsbad's DEWS or others, purchasing and transferring water rights, applying for a new appropriation from the Capitan Administrative Basin, or developing deep brackish groundwater (for which a water right is not required).

Of these options, the most promising appear to be purchasing water from the City of Carlsbad or others (potentially outside of New Mexico) or purchasing and transferring water rights within the Carlsbad or Capitan Administrative Basins. Opportunities for new appropriations appear limited, although they are not out of the question. Similarly, while brackish groundwater is abundant in the Capitan aquifer, the degree of hydraulic connectivity between it and shallower freshwater resources makes brackish groundwater development subject to extensive analyses and potential legal challenges.

For the purpose of this PEA, Gustavson assumed brackish water could be utilized for the process plant. Gustavson included the cost for a reverse osmosis plant to produce fresh water from the brackish water.