GRAND JUNCTION
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GEOTECHNICAL ENGINEERS - GEOLOGISTS

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WPX Energy Rocky Mountain LLC
c/o D&J Gardner Excavating
134 Gardner Ln.
Parachute, CO 81635

Re: 1.5-Million Gal. Above-Ground Tank; Ryan Gulch Area; Piceance Basin, CO

Gentlemen:

At the request of Mr. Joe Lobato, Facilities Engineer, WPX Energy Rocky Mountain LLC, personnel of Grand Junction Lincoln DeVore, Inc. made site observations of 5 site locations which have or will have a 1.5-million gallon capacity, above-ground tank, for long-term containment purposes. The purpose of these on-site observations was to assess the general conditions of the site regarding short-term and long-term subgrade soil load bearing capacities, site grading as related to potential adverse moisture penetration into the subgrade soils and minor slope stability issues as the above-ground tanks are placed partially, or entirely, upon man-made fills and are adjacent to steep slopes away from the tank locations. As part of this initial site evaluation of each tank location, no subsurface exploration borings or test pits were accomplished. Following are our findings and recommendations.

The production sites have been final graded to be rather flat. The production site drainage does not typically direct water across the entire site and into a well defined water retention area. In the vicinity of the tank site, several small areas of storm water appear to have puddled and then evaporated. No deep soaking of the soils is typically apparent.

The above ground tanks are manufactured by Big Holding Systems, Ltd. The project product is Model BH-1500. The tanks are a flexible liner supported with a 12-foot high segmented steel external panel wall. The tanks have a capacity in excess of 1.5-million gallons and have a diameter of approximately 148 feet. The tanks have a floating cover.

The entire tank system is underlain by a secondary containment system which includes a leak detection liner. The liner extends approximately 10 feet beyond the tank perimeter and completely covers an approximate 2-1/2 foot high earth berm which completes the leak detection system. The outer edge of the leak detection liner, after covering the leak detecting berm, is approximately 15-17 feet away from the exterior tank edge.

From the Big Holding Systems data sheets for the Model BH-1500, the tank is designed to hold a "dirty water-type fluid" (unit weight 68.67 pcf), and the 12-foot high tank is assumed to contain a total fluid pressure at the base of 824 psf. Taking the 824 psf manufacture design value and adding 100 psf for slight site modification to include a thin gravel pad and other materials results in an earth contact pressure for this large circular pad of 925 psf, plus or minus. This 925 psf value has been used for our analysis of the site conditions as related to estimated bearing capacities of the native and fill soils.

For purposes of visual site assessment, we have assumed a minimum soil bearing capacity of 2,000 psf as adequate

to support the 12'-high BH-1500 tank without requiring additional site investigation. The 925 psf value has also been used for our preliminary analysis of slope stability conditions in those instances where the tanks have been placed near higher (up to 25 feet) slopes which are rather steep (1 vertical : 1 horizontal). For purposes of visual site assessment, we have used a minimum fill slope toe-to-tank edge distance of 1:2.7 (vertical:horizontal) to be adequate for these gravelly, occasionally rocky, clayey fill soils which are not saturated; and the fill toe areas and side slopes are not subject to significant erosion.

The following production locations were observed by Edward M. Morris, P.E. of Grand Junction Lincoln DeVore on June 12, 2012. The locations and tank conditions are as follows:

- Site 1 RG 12-14-298 BH-1500 Tank on site with leak detection
- Site 2 RGU 13-24-198 No tank on site
- Site 3 RGU 13-36-198 BH-1500 Tank on site with leak detection
- Site 4 RGU 31-24-198 BH-1500 Tank on site with leak detection
- Site 5 RGU 31-25-198 No tank on site

Site No. 1 -- RG 12-14-298: The site contains a BH-1500 above-ground tank and leak detection liner w/berm in the west, southwest corner of the production pad. Based upon our site observations and aerial photographs, it appears the northern 1/3 to1/2 of the tank is on thin man-made fill. Our observations indicate the fill is less than 4-feet thick beneath the tank area. The fill in the area of the tank is composed of a lean clay (CL, under the Unified Classification System) containing many gravel to coarse gravel (mostly less than 12-inch maximum size). The gravels are a orange to almost red tint siltstone, mudstone and occasional sandstone materials which were originally in the near surface, oxidized zone of the Evacuation Creek Member of the Green River Formation, Paleocene Age. The fill and native soils have been reworked by the grading operation on the site and subsequent truck traffic during construction and development of the producing wells.

The production site is surrounded by either shallow cut banks or a recently improved 3-4 foot-high earthen berm. The nearby berm to the northwest of the existing tank is on a fill surface which appears to be 5-7 feet high.

In areas where storm water has collected and puddled, our observation and probing indicates that the reworked native soils and the fill soils have not experienced significant softening or excessive water saturation. The fill soils on this site appear to have a dry to slightly moist bearing capacity in excess of 4,000 psf considering widely spread loads (matte-type bearing) such as this tank feature. If these soils are saturated for extended periods, some softening may occur which would reduce the allowable bearing capacity to 2,500 psf in some small areas. Significant softening of large areas are not anticipated. The site bearing capacity appears to be adequate.

The critical slope toe-to-tank edge slope is flatter than 1:4 (vertical:horizontal), indicating slope stability of the fill slopes immediately adjacent to this above-ground tank is not a concern.

Site grading around the tank is quite flat, and it is recommended that minor ponding of any surface run-off waters be minimized by minor surface grading away from the west side of this tank both to the north, northeast and to the south, southeast. Such grading need be no more than 0.5%.

Site No. 2 -- RGU 13-24-198: The site does not contain BH-1500 above-ground tank at the time of our observation. Based upon diagrams provided by the client, we understand a BH-1500 above-ground tank and leak

site observations and aerial photographs, it appears the northwest 2/3 of the tank will be on thin to moderately thick man-made fill. Our observations indicate the fill may be as much as 15-feet thick beneath the northwest portion of the tank area. The fill in the area of the tank is composed of a gravelly, rocky lean clay (CL, under the Unified Classification System) with most of the gravels and rock fragments observed to be less than 12-inch maximum size. The gravels are a buff to light brown siltstone, mudstone and occasional sandstone materials of the Evacuation Creek Member of the Green River Formation, Paleocene Age. The fill and native soils have been reworked by the grading operation on the site and subsequent truck traffic during construction and development of the producing wells.

The production site is surrounded by either shallow cut banks or a recently improved 3-4 foot-high earthen berm. The nearby berm to the northwest of the existing tank is on a fill surface which appears to be 12-17 feet high.

The fill soils on this site appear to have a dry to slightly moist bearing capacity in excess of 4,000 psf considering widely spread loads (matte-type bearing) such as this tank feature. In areas where storm water has collected and puddled, our observation and probing indicates that the reworked native soils and the fill soils have not experienced significant softening or excessive water saturation. If these soils are saturated for extended periods, some softening may occur which would reduce the allowable bearing capacity to 2,500 psf in some small areas. Significant softening of large areas are not anticipated. The site bearing capacity appears to be adequate.

The critical slope toe-to-tank edge slope is right at 1:2.7 (vertical:horizontal), indicating slope stability of the fill slopes immediately adjacent to this above-ground tank should not be a concern if site grading on the north, northwest and west sides of the tank are improved to prevent surface water ponding.

Site grading around the tank area is quite flat, and it is recommended that minor ponding of any surface run-off waters be minimized by minor surface grading away from the tank be improved. Such grading need be no more than 0.5%.

Site No. 3 -- RGU 13-36-198: The site contains a BH-1500 above-ground tank and leak detection liner W/berm in the south corner of the production pad. Based upon our site observations and previous aerial photographs, it appears the eastern 1/2 of the tank is on thin man-made fill. Our observations indicate the fill is up to 8-feet thick beneath the tank area. The fill in the area of the tank is composed of a gravelly, rocky lean clay (CL, under the Unified Classification System) with most of the gravels and rock fragments observed to be less than 12-inch maximum size. The gravels are a buff to light brown siltstone, mudstone with some orange to almost red tint siltstone, mudstone and occasional sandstone materials which were originally in the near surface, oxidized zone of the Evacuation Creek Member of the Green River Formation, Paleocene Age. The fill and native soils have been reworked by the grading operation on the site and subsequent truck traffic during construction and development of the producing wells.

The production site is surrounded by either shallow cut banks or a recently improved 3-4 foot-high earthen berm. The nearby berm to the south, southeast and east of the existing tank is on a fill surface which appears to be up to 11 feet high on the south side and increasing to 16 feet high on the east side.

In areas where storm water has collected and puddled, our observation and probing indicates that the reworked native soils and the fill soils have not experienced significant softening or excessive water saturation. The fill soils on this site appear to have a dry to slightly moist bearing capacity in excess of 3,000 psf considering widely spread loads (matte-type bearing) such as this tank feature. If these soils are saturated for extended periods, some

softening may occur which would reduce the allowable bearing capacity to 2,000 psf in some small areas. Significant softening of large areas are not anticipated. The site bearing capacity appears to be adequate assuming the site grading is maintained.

The slope toe-to-tank edge slope is flatter than 1:4 (vertical:horizontal), indicating slope stability of the fill slopes immediately adjacent to this above-ground tank is not a concern.

Site grading around the tank is quite flat but surface drainage appears to be in-place, moving surface waters toward the north. Some minor improvement of the surface grading may be appropriate if areas of ponding water are noted in the vicinity of the tank. Such grading need be no more than 0.5%.

Site No. 4 -- RGU 31-24-198: The site contains a BH-1500 above-ground tank and leak detection liner W/berm in the northwest corner of the production pad. Based upon our site observations and previous aerial photographs, it appears the entire tank is on man-made fill. Our observations indicate the fill is less than 4-feet thick in the southeast tank area, increasing to possibly 15-feet thick in the northwest tank area. The fill in the area of the tank is composed of a gravelly, rocky lean clay (CL, under the Unified Classification System) with most of the gravels and rock fragments observed to be less than 12-inch maximum size. The gravels are a buff to light brown siltstone, mudstone and occasional sandstone materials of the Evacuation Creek Member of the Green River Formation, Paleocene Age. The fill and native soils have been reworked by the grading operation on the site and subsequent truck traffic during construction and development of the producing wells.

The production site is surrounded by a recently improved 3-4 foot-high earthen berm. The nearby berm to the northwest of the existing tank is on a fill surface which appears to be 16-26 feet high.

In areas where storm water has collected and puddled, our observation and probing indicates that the reworked native soils and the fill soils have not experienced significant softening or excessive water saturation. The fill soils on this site appear to have a dry to slightly moist bearing capacity in excess of 4,000 psf considering widely spread loads (matte-type bearing) such as this tank feature. If these soils are saturated for extended periods, some softening may occur which would reduce the allowable bearing capacity to 2,500 psf in some small areas. Significant softening of large areas are not anticipated. The site bearing capacity appears to be adequate assuming the site grading is slightly improved on the northwest side.

The critical slope toe-to-tank edge slope is right at 1:2.7 (vertical:horizontal), indicating slope stability of the fill slopes immediately adjacent to this above-ground tank should not be a concern if site grading on the north, northwest and west sides of the tank are improved to prevent surface water ponding.

Site grading around the tank is quite flat, and it is recommended that minor ponding of any surface run-off waters be minimized by minor surface grading away from the north, northwest and west sides of the tank. Such grading need be no more than 0.5%.

Site No. 5 -- RGU 31-25-198: The site does not contain BH-1500 above-ground tank at the time of our observation. Based upon our site observations and previous aerial photographs, it appears the entire tank area is on man-made fill. Our observations indicate the fill is less than 4-feet thick in the southeast tank area, increasing to possibly 15-feet thick in the northwest tank area. The fill in the area of the tank is composed of a gravelly, rocky lean clay (CL, under the Unified Classification System) with most of the gravels and rock fragments observed to

be less than 12-inch maximum size. The gravels are a buff to light brown siltstone, mudstone and occasional sandstone materials of the Evacuation Creek Member of the Green River Formation, Paleocene Age.. The fill and native soils have been reworked by the grading operation on the site and subsequent truck traffic during construction and development of the producing wells.

The production site is surrounded by a recently improved 3-4 foot-high earthen berm. The nearby berm to the northwest of the existing tank is on a fill surface which appears to be 12-22 feet high.

The fill soils on this site appear to have a dry to slightly moist bearing capacity in excess of 4,000 psf considering widely spread loads (matte-type bearing) such as this tank feature. In areas where storm water has collected and puddled, our observation and probing indicates that the reworked native soils and the fill soils have not experienced significant softening or excessive water saturation. If these soils are saturated for extended periods, some softening may occur which would reduce the allowable bearing capacity to 2,000 psf in some small areas. Significant softening of large areas are not anticipated. The site bearing capacity appears to be adequate assuming the site grading is slightly improved on the northwest side.

The critical slope toe-to-tank edge slope is right at 1:3.5 (vertical:horizontal), indicating slope stability of the fill slopes immediately adjacent to this above-ground tank should not be a concern if site grading on the north, northwest and west sides of the tank are improved to prevent surface water ponding.

Site grading around the tank area is quite flat, and it is recommended that minor ponding of any surface run-off waters be minimized by minor surface grading away from the tank be improved. Such grading need be no more than 0.5%.

It is believed that all pertinent points have been addressed. If any further questions arise regarding this project, or if we can be of any further assistance, please do not hesitate to contact this office at any time.

Respectfully submitted,

GRAND JUNCTION
LINCOLN DeVORE, INC.

COLORADO LICENSED
EDWARD M. MORRIS
30590
6-15-2012
PROFESSIONAL ENGINEER

by: Edward M. Morris, P.E.
Principal Engineer

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