

Rule 908.b Supplementary Narrative

**LINN Operating Inc.
O-29 Centralized E&P Waste
Management Facility**

OA Project No. 014-1565

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**COGCC FORM 28
CENTRALIZED E&P WASTE MANAGEMENT FACILITY
SUPPLEMENTAL INFORMATION**

O-29 WATER IMPOUNDMENT FACILITY

**LINN OPERATING, INC.
OPERATOR NUMBER 10516
LOCATION ID 335836
FACILITY ID 290544**

SWSE Section 29, T5S, R96W, 6th PM, Garfield County, Colorado

According to the 100 Series rules of the Colorado Oil and Gas Conservation Commission (COGCC), a **CENTRALIZED E&P WASTE MANAGEMENT FACILITY** shall mean a facility, other than a commercial disposal facility regulated by the Colorado Department of Public Health and Environment, that (1) is either used exclusively by one owner or operator or used by more than one operator under an operating agreement; and (2) is operated for a period greater than three (3) years; and (3) receives for collection, treatment, temporary storage, and/or disposal of produced water, drilling fluids, completion fluids, and any other exempt E&P wastes that are generated from two or more production units or areas or from a set of commonly owned or operated leases.

This supplement to the COGCC Form 28 for LINN Operating, Inc.'s (LINN) proposed O-29 Water Impoundment Facility (O-29) provides additional information required by COGCC Rules 704 and 908. This information is provided by reference to the applicable sections of Rules 704 and 908. LINN has obtained the appropriate Garfield County Land Use Permits for this facility. The recorded approved Land Use Permit is included with this submittal. The Centralized E&P Waste Management Facility is identified as the O-29 Water Impoundment Facility. This facility is located on the Roan Plateau off of Garden Gulch Road, northwest of Parachute, Colorado.

LINN is proposing to operate a permanent water storage impoundment and disposal facility with associated infrastructure on its existing O-29 pad site to eliminate the need for water treatment and storage in multiple locations. The produced water originates from a number of facilities that are included in LINN's natural gas development activities. A complete list of the contributing water sources and their associated COGCC API numbers (in accordance with COGCC regulation 908.b(6)a) is included in the Waste Profile section accompanying this submittal. This facility would decrease the risk of a produced water release from other pits, decrease the risk of exposure to wildlife populations, and would decrease overall truck traffic associated with water hauling on local roadways.

The perimeter of the impoundment is fenced and netted in order to restrict wildlife and livestock access according to criteria identified by the Colorado Parks and Wildlife Division (CPW) and the COGCC. In February 2014, Berry received CPW permission and COGCC approval to remove the bird netting during the winter provided that the pit is frozen over and that the portions of the pit that are not frozen continue to be netted. The netting must be reinstalled when the pit thaws or by April 1, whichever is earliest. During these periods, LINN is to report any wildlife entrapment

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to CPW and reinstall the nets immediately. A copy of the Form 4 and CPW approval is included with this submittal.

The impoundment was constructed with a triple HDPE synthetic liner (two 60 mil and one 24 mil) and a leak detection system. No permanent sanitation facilities were required to accommodate operation of the facility. If necessary, human generated wastes are accommodated by portable toilets placed near the boundary of the proposed facility. Potable water will not be required for the proposed facility. The facility is accessible to LINN personnel and is accessed primarily during normal working hours from approximately 7:30 am to 6:00 pm Monday through Friday. During construction and operation of the facility, soil erosion was controlled via the implementation of best management practices (BMPs) included in LINN's Stormwater Management Plan (SWMP).

The pad and BMPs have been designed to maintain fluids on-site, using containment berms down-gradient from the production pit and surrounding the tank battery. Both the tank battery and pit are constructed using a triple liner to prevent infiltration should a spill occur. Linn's Stormwater Management Plan and Spill Prevention and Control Countermeasures (SPCC) Plan are attached and ensure that the site is inspected frequently to maintain compliance.

LINN has obtained Air Quality permits for the facility which include the impacts associated with the injection well. The air quality permits will be provided upon request.

Historic Timeline of Use of the Pit Facility

The original Form 15 was approved on May 10, 2007, for Berry Petroleum Company (Berry) for a Production Special Purpose Frac Pit. On May 2, 2011, a new Form 15 was submitted to update the use of the pit along with the actual location and name. It also included the details for a dual liner system.

Records of COGCC indicate that the pit has been maintained in a satisfactory fashion. Any deficiencies noted were immediately rectified and no follow-up inspections were required.

The pit was originally constructed with a 60 mil primary liner and a 24 mil secondary liner. In 2012, Linn (Berry) installed a second 60 mil HDPE liner on top of the original liner stack.

On January 6, 2014, Berry reported a release caused by a leak in the six-inch line that runs from the can valve to the O-29 pit. Within 4 hours, the line was shutdown, blown clear, and surface water cleaned up. A temporary ground liner was installed on the O-29 pad to stockpile soil for remediation. The contaminated soil was land farmed on site until it passes COGCC Table 910-1 standards. The entire line was replaced with higher quality material. The line was pressured tested and chemically treated where needed. A copy of the Form 19 Spill/Release Report is included with this submittal.

On September 18, 2014, COGCC approved a Water Reuse Plan between LINN and WPX for the sharing of water for beneficial reuse up to 50,000 bbls. A copy of the Form 4 is included with this submittal.

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On January 14, 2015, COGCC approved a change of operator from Berry to LINN, effective June 1, 2014.

Rule 908.a. Applicability

The proposed facility is a non-commercial, centralized E&P waste management facility for the storage, recycling, and disposal of E&P waste and will serve LINN exclusively. As part of the local land use approval process in Garfield County, LINN has secured authorization from Marathon Oil Company, PGR Partners, LLC, and Wapiti Energy, LLC for the permitting, construction, and operation of the facility. Copies of these authorizations are included in this submittal.

Rule 908.b. Permit Requirements

Rule 908.b.(1) Contact Information

This facility is operated by LINN. The information required by this rule is as follows:

Operator Name: LINN Operating, LLC.
Address: 1999 Broadway, Suite 3700, Denver, CO 80202
Phone: (303) 999-4245
Contact Person: Bryan Burns

Rule 908.b.(2) Surface Owner

The surface ownership includes LINN Operating, Inc., Marathon Oil Company, Wapiti Oil and Gas and PGR Partners. LINN is the owner and operator of this facility. The information required by this rule is as follows:

Surface Owner: Berry Petroleum Inc.
Local Address: 1999 Broadway, Suite 3700, Denver, CO 80202
Phone: (303) 999-4245
Contact Person: Bryan Burns

Surface Owner: Marathon Oil Company
Local Address: 743 Horizon Court, Grand Junction, CO 81506
Phone: (970) 244-5735
Contact Person:

Surface Owner: Wapiti Oil and Gas
Address: 800 Gessner, Suite 700, Houston, TX 77024
Phone: (713) 365-8500
Contact Person: Robert W. Kirkland

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Surface Owner: PGR Partners

Address: 800 Gessner, Suite 700, Houston, TX 77024

Phone: (713) 365-8500

Contact Person: Robert W. Kirkland

Rule 908.b.(3) Legal Description

A parcel of land situated in the SW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 29, Township 5 South, Range 96 West of the 6th Principle Meridian., Garfield County, Colorado

Garfield County Parcel Number: 2135-321-00-009

Rule 908.b.(4) Figures, Maps, Precipitation and Evaporation Rates

Topographic maps of the location and a report detailing the geology and hydrology of the site have been included in this submittal. The average annual precipitation in the area of the facility is approximately 16 inches (Colorado Climate Center records for Altenbern Ranch station (station number 50214). The average annual evaporation rate in the area of the facility is approximately 40 inches (National Weather Service Evaporation Map of the United States). Additional details are provided in this submittal. Typical adjacent land uses consist of natural gas development, ranching, agricultural practices and hunting activities.

Rule 908.b.(5) Centralized Facility Siting Requirements

Rule 908.b.(5).A Site Plan

The site plan included in this submittal identifies all of the features of the facility, including fencing, access road improvements and drainage structures. Construction and drainage details are also provided in the grading plans and drainage plans. Drainage details have been prepared by a licensed professional engineer and are in accordance with COGCC requirements for surface flows. The entire plan set, signed and sealed by a licensed professional engineer or licensed surveyor, is provided in this submittal.

Rule 908.b.(5).B Scaled Drawings

The distances at the surface to the nearest section lines are approximately 243 feet from the south section line and approximately 2207 feet from the east section line. A survey plat is available with the Site Plan drawings.

Rule 908.b.(5).C Access Control

Public access to the site is controlled by a security station located on Garden Gulch Road near Garfield County Road 215 (Parachute Creek Road). Garden Gulch Road is a private road built and maintained by the natural gas industry to provide access to the top of the plateau. This road is for the exclusive use of the natural gas industry and associated vehicle traffic. All vehicles using this road must stop at the security gate. All unauthorized public and private traffic is prohibited. An Access Road Map is available in the Figures section of this application.

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The impoundment is fenced so that access by the public, wildlife or domestic animals is prohibited. An 8 foot wildlife fence, including wood posts and mesh wire animal barrier, is used to restrict access. Per Garfield County Resolution 2013-13, the pond is fenced and netted based on recommendations from the Colorado Division of Parks and Wildlife (CPW) identified during the local land use permit consultation process.

Rule 908.b.(5).D. Fire Lane & Buffer

A fire lane and buffer zone do not exist within the fence surrounding the impoundment. The impoundment and fence were previously constructed and operated as a Form 15 water impoundment which does not call for a buffer zone and fire lane. Linn is requesting a variance to Rule 908.b.(5).D. A 10 foot buffer zone and a 10 foot fire lane is available by utilizing area both inside and outside the impoundment fence. Grand Valley Fire Protection District is aware of the site layout and has written a letter in support of the variance. Additionally, in an emergency the fence can be taken down to provide access to the impoundment. A copy of the variance request is included in this submittal.

Rule 908.b.(5).E. Surface Water Diversion Structures

The grading and drainage plans are included in this application demonstrating compliance with COGCC rules intended to accommodate stormwater run-on and run-off. A representation of the Garfield County floodplain designations is included in Figure F-1. As noted on this map, the area surrounding this facility is an area where no floodplain or floodway has been identified. Flooding along Little Creek occurs occasionally. The O-29 facility is located above the high water level of the creek.

LINN's SWMP and permit are available in this submittal. The site has been designed for a storm event greater than stated in Rule 908.b.(5).E and is consistent with the Garfield County approved design criteria referenced within the report. In addition, the full drainage details are included in this submittal.

Rule 908.b.(6). Waste Profile

The information provided in the waste management profile is as follows:

- A mass-flow balance for this facility representing maximum anticipated monthly volumes for receipt and disposal of materials.
- A process flow diagram illustrating the anticipated sources of wastes, delivery for remediation and potential disposal requirements.
- The data set reflecting sampling and analysis of representative waste.

This waste profile information is available in the Waste Profile section of this submittal. This section also provides pipeline maps for the transport of produced water to the injection well facility. Initial separation of produced water and condensate will occur on well pads prior to piping to the O-29 Water Impoundment Facility. Water will not be treated at the facility. Occasionally transport

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to/from the site will be by truck for reuse or off-site disposal when the injection well is not in operation.

Rule 908.b.(7). Facility Design and Engineering

The site plan for the facility and the grading plan and drainage report provide details of the facility design and engineering. Also included is a process-flow diagram and process description. The facility has been designed by a professional engineer with features to prevent runoff from impacting the localized surface water features. LINN's operational policies and emergency management procedures for this facility are designed to minimize risk to the environment and accommodate rapid response in the event of any accident.

Rule 908.b.(7).A. Geological Data

A comprehensive report from the Natural Resources Conservation Service (NRCS) is provided in this submittal and a report on geological hazards is provided. Figure S-1 provides the soils map for this project. A generalized geologic map of the area is provided in Figure G-1.

According to information prepared by the NRCS, the soil in the location of this proposed water treatment facility has been mapped as Parachute-Irigul-Rhone association, (56) as seen in Figure S-1.

The 29-17 injection well facility location is underlain by soils of the Northwater-Adel complex, 5 to 50 percent slopes, Parachute-Irigul complex, 5 to 30 percent slopes, and Parachute-Irigul-Rhone association, 25 to 50 percent slopes. The Northwater-Adel complex soil is described as deep, well drained loam, channery loam, and extremely channery loam that extend to depths of about 60 inches. The Parachute-Irigul complex and Parachute-Irigul-Rhone association soils are described as well drained, shallow (17 to 29 inches) loam, channery loam and extremely channery loam. These soils all have an erosion factor Kw of 0.20, which generally means that the water erosion potential is low to moderate.

The Northwater-Adel complex, Parachute-Irigul complex, and Parachute-Irigul-Rhone association are rated as very limited for this purpose. The primary limitations identified by the NRCS for shallow excavations are based on the shallow depth to hard bedrock, steep slopes, and the potential for cut banks to cave. The existing lined water storage pit is located on a well pad that was constructed several years ago and appears to be stable.

Rule 908.b(7). B. Hydrologic Data

The site is located on a point between the north and south fork drainages of Little Creek. Willow Creek is located to the north, and Bear Run is located further north. Light Gulch is located to the northeast. House Log Gulch is located to the south, and Circle Dot Gulch is located further south within a two mile radius of the site. Surface water flow is directed to the northeast and these surface waters drain to the North Fork of Parachute Creek approximately three miles to the northeast. Figure SW-1 – Surface Water Map shows the site relative to surface water features

within two miles of the site. There are no surface waters subject to COGCC Rule 317B located in the vicinity of the proposed project.

Shallow groundwater does not appear to be present in the vicinity of the site based on a review of information from the Colorado Division of Water Resources (DWR) for permitted water wells in the area. Several monitoring holes permitted by Encana Oil and Gas are shown to the north of the site. The total depths of these wells are listed at between 24 feet and 34 feet below ground surface (bgs), but static water levels were not listed for these wells and the indication in the boring logs is that these wells were dry. The surface elevations of these wells range from 5,895 feet to 6,180 feet amsl. The permitted water wells within one mile of the site are shown on Figure PW-1 – Permitted Water Wells.

Marathon Oil Company has several monitoring holes permitted in Section 32, with total depths that range from 191 feet to 239 feet bgs. The static water levels in these wells are listed at between 171 feet and 233 feet bgs. The elevations of these wells range from 8,333 feet to 8,364 feet. Bargath LLC has three canceled well permits for wells located just outside the one mile radius to the southeast. The depths of these wells were reported at between 14 feet and 20.5 feet bgs, and static water levels reported at between 4.5 feet and 11 feet bgs. Elevations of these wells range from 5,378 feet and 5,389 feet.

Flash floods are a potential issue during intense summer thunderstorms that slowly move over the Roan Plateau, or if snowmelt were to occur rapidly. The site is located at an elevation of 7,919 feet which is in an upland area well above area drainages that would be prone to flooding. There is much greater chance of flooding along the Little Creek, Light Gulch, or other streams that flow to the northeast toward the North Fork of Parachute Creek.

An assessment of potential impacts to wetlands and waters of the United States (US) according to the Army Corps of Engineers (ACOE) discussed in the Wildlife and Vegetative Survey determined that no jurisdictional wetlands or drainages would be affected by the project. That report is included in this submittal. An area map showing wetland and riparian locations is provided as Figure HG-1.

The entire proposed facility has been designed with features that significantly reduce the potential for the facility to impact nearby surface and ground water. LINN does not anticipate impacts to nearby surface and ground water from the facility. Potential impacts are addressed via adherence to the COGCC approved design criteria for an ongoing assessment of impacts and safe operation of the facility.

Shallow groundwater is expected to follow topography and flow to the northeast. A potentiometric surface map cannot be created since there are no monitoring wells in the immediate vicinity of the site. Since groundwater in the bedrock is fracture controlled, it is also likely that the water levels would be influenced by the presence of fractures and impermeable layers and would be expected to discharge at locations where these layers crop out in the sides of the canyons. Many such springs are known to occur in the area along the main drainages.

The Uinta-Animas aquifer in the Piceance Basin consists of silty sandstone, siltstone, and marlstone, which is largely impermeable, but in some parts of the aquifer much of the intergranular space within these rocks was filled by sodium and calcium bicarbonate cements. Fractures and dissolution of carbonate minerals produces substantial secondary permeability.

The Parachute Creek member has been divided into three zones based on lithology, hydrology, and geophysical characteristics. These zones include 1) the upper aquifer, 2) the Mahogany zone, and 3) the lower aquifer. The upper and lower aquifers are separated by the Mahogany zone as a confining unit that contains more kerogen and is less permeable than the surrounding aquifers. However, the Mahogany zone is locally fractured and permits some communication between the two aquifer systems. The vertical hydraulic conductivity of the Mahogany zone has been estimated to be as much as 0.37 feet per day (ft/day). The lower aquifer is underlain by a high resistivity zone of brine water near the center of the basin.

The Garden Gulch member, Douglas Creek member, and Anvil Points member of the Green River Formation and the underlying Wasatch Formation form a thick confining unit, thousands of feet thick, and that separates the Uinta-Animas aquifer from the underlying Mesaverde aquifer.

LINN proposes to continue sampling surface water location LC-1 on Little Creek twice per year to monitor water quality for the Little Creek alluvial groundwater down gradient of the injection well facility and pipeline crossing. In addition, a reconnaissance of the creek between the Garden Gulch Road and Light Gulch was conducted to identify additional groundwater springs. Any additional springs found along that reach of Little Creek will also be sampled. Sampling of the two deep sourced springs in Little Creek is not proposed unless a release from the injection well facility occurs and investigation is justified.

LINN will install up to three (3) monitoring wells, one (1) up-gradient and two (2) down-gradient from the facility. These wells have been tested twice a year. The monitoring and testing schedule of these wells was at the same time as the testing of springs located along Little Creek as outlined in the Groundwater Monitoring Plan included in this submittal. Copies of all test results are provided to the COGCC within three (3) months of collecting the samples. Results of the monitoring program will also be included in LINN's annual 900 Series facility report to the Director.

Rule 908.b.(7).C. Engineering Data

The pond has been constructed with three synthetic liners that cover the bottom and interior sides of the pit with the edges secured with at least a 24-inch deep anchor trench around the pit perimeter. The primary HDPE synthetic liner is 60 mil thick. The secondary HDPE synthetic liner is 24 mil thick. The additional HDPE synthetic liner is 60 mil thick and was installed in 2012 on top of the original liner stack.

The trench is designed to secure and prevent slippage or destruction of the liner materials. Field seams were installed and tested in accordance with manufacturer specifications and good engineering practices. Test results are maintained at LINN's office and will be provided to the Director upon request.

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The synthetic material is impervious, has high puncture and tear strength, has adequate elongation, and is resistant to deterioration by ultraviolet light, weathering, hydrocarbons, aqueous acids, alkali, fungi, or other substances in the produced water used for the facility.

The impoundment was constructed, installed, and maintained in accordance with the manufacturer's specification. The impoundment was designed with good engineering practices. A leak detection system was installed to monitor for any leaks. Details regarding specific operational activities associated with the leak detection system are included in the Operating Plan document accompanying this submittal.

Construction drawings demonstrating the design components of the facility, depth of cut, dimensions, grades, structures and access road are included in this submittal.

Rule 908.b.(8).Operating Plan

The site will be unmanned but remotely monitored via a SCADA system. All personnel on location will have radio and cellular telephone capabilities to reach other LINN employees in the event of an emergency. In order to ensure a safe and timely response to emergency situations, LINN can provide the appropriate authorities with detailed maps, detailed directions, and GPS coordinates to facilitate timely response. Roads are well maintained and snow-plowed in the winter to facilitate vehicle access. Detailed Standard Operating Procedures (also referred to as the Operating Plan in this submittal) are provided. A general Emergency Response Plan and area wide Emergency Response Plan for facilities of this type are provided in this submittal. LINN's Operating Plan will be implemented and utilized in tandem with the Emergency Response Plan in order to accommodate typical operation of the facility and to address upset conditions including leak detection.

A copy of LINN's Stormwater Management Plan (SWMP) and Permit are included in this submittal. Final details of the specific stormwater best management practices (BMPs) was included in the SWMP as part of the regular inspection schedule. Diverted water is addressed in the Drainage Plan and via adherence to the SWMP. Updates to the plan, as recorded, are provided to the COGCC with a Form 4, Sundry Notice.

Rule 908.b.(9).A. Ground Water Monitoring

There are no domestic water wells within one mile of the site boundary according to the Colorado Division of Water Resources on-line resources. A map demonstrating water wells in the general area is provided in Figure PW-1 of this application.

Rule 908.b.(9).B. Site-specific Monitoring Wells

LINN will install up to three monitoring wells, one up-gradient and two down-gradient from the facility. These wells are tested twice a year. The monitoring and testing schedule of these wells was at the same time as the testing of springs located along Little Creek as outlined in the Groundwater Monitoring Plan included in this submittal. Copies of all test results are provided to

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the COGCC within three months of collecting the samples. Results of the monitoring program will also be included in LINN's annual 900 Series facility report to the Director.

Rule 908.b.(10). Surface Water Monitoring

The sampling program consists of obtaining baseline data of the all proximal water sources prior to any construction activity and then periodic sampling as the activity progresses through the construction and operational phases. The targeted sampling schedule for each location is as follows:

- Prior to construction
- After construction/prior to filling pond with for injection well storage
- Twice annually thereafter

Test points for water sampling relative to this site have been established and are identified on the Sampling Locations Map accompanying this submittal.

Rule 908.b.(11). Contingency Plan

The O-29 Water Impoundment Facility Operating Plan, Standard Operating Procedures and Emergency Response Plan address all elements required by the COGCC contingency planning and are included in this application.

Rule 908.c. Permit Approval

No response required.

Rule 908.d. Financial Assurance

An estimate of the cost for proper reclamation, closure and abandonment of the proposed facility is provided. Upon approval of the proposed facility and prior to commencing construction of the facility, LINN will provide the required financial assurance to the COGCC.

Rule 908.e. Facility Modifications

Throughout the life of the facility, LINN will submit proposed modifications to the facility design, operating plan, permit data, or permit conditions to the Director for prior approval.

Rule 908.f. Annual Permit Review

To facilitate the annual review of this facility by the COGCC, LINN will submit an annual report summarizing operations, including the types and volumes of waste actually handled at the facility and the results of all spring and monitoring well samples.

Rule 908.g. Closure

A preliminary plan for reclamation and closure of the facility, as well as the estimated cost to close and reclaim the facility is provided. Upon approval of the proposed facility and prior to

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commencing construction of the facility, LINN will provide the required financial assurance to the COGCC.

Rule 908.h. Local Permitting

LINN has received a Garfield County land use permit. A copy of the recorded resolution is included in this submittal. This encompasses all requirements for local government zoning and construction.

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