

**Objective Criteria Review Memo Koda Exploration LLC, WHP Misty 2-7 Pad
Form 2A Document # 402149379**

This summary explains how COGCC staff conducted its technical review of the Koda Exploration LLC (Koda), WHP Misty 2-7 well pad, Form 2A Document Number 402149379, within the context of SB 19-181 and for the required Objective Criteria. This proposed new Location is for one well and associated pump jack and gas or diesel motor, two drilling pits (one freshwater and one water-based bentonitic mud reserve pit). In the event this wildcat/exploratory oil and gas well produces, Koda will install temporary equipment including two oil tanks, two water tanks, a separator, and a flare. This Location meets the following Objective Criteria:

(Criteria #5.c) The proposed Location lies within a Sensitive Area for water resources (within an area of potential shallow groundwater and proximity to surface water).

COGCC staff met with the Director to discuss the Objective Criteria for the Form 2A with the proposed best management practices (BMPs). The following sections provide details regarding the valuation of each criterion.

Criteria 5.c: Oil and Gas Locations within a Sensitive Area for water resources.

Site Specific Description of Applicability of Criteria 5.c: Koda proposes to drill the WHP Misty 2-7 well on a 400 foot by 400 foot pad Location in the northwest quarter of the northeast quarter of Section 7, T17S, R54W, Lincoln County, Colorado at an elevation of 4,766 feet. Koda also proposes to construct two drilling pits - one lined for freshwater storage, and an unlined reserve pit for water-based bentonitic drilling fluids and cuttings.

The Location is in a sensitive area due to proximity to an ephemeral or intermittent surface water drainage located approximately 255 feet to the north, another approximately 1,015 feet south, and has the potential for shallow groundwater. The offsite area north-northwest of the pad lies on a 10 percent to 12 percent slope and the well pad is at 16 feet higher elevation above the drainage. Groundwater depth is estimated at 18 feet below ground surface (bgs) based, in part, on Division of Water Resources (DWR) records for permitted water well #35537, plotted in Section 2, T17S, R55W, near a drainage approximately two miles west, at approximately 4,980 feet in elevation.

The closest water well (DWR #279321) is in Section 7, T17S, R54W, approximately 2,965 feet southwest of the Location at 4,820 feet in elevation. This well has a total depth of 41 feet bgs; however, a static water level is not reported. The topographic map shows springs at higher elevation (4,920 feet), west of the Location, between DWR water well #35537, and the Location. Bedrock is the Pierre Shale Formation which is impermeable and forms the base of the major bedrock aquifers in the Denver-Julesburg basin.

Due to the proximity to the unnamed ephemeral or intermittent tributary drainage approximately 255 feet north of the Location and another approximately 1,015 feet south, shown on the attached Hydrology Map, COGCC staff requested additional information. Koda agreed to reduce the pad dimensions to 400 feet by 400 feet and move the Location 75 feet further away from the drainage to the north. The drainage flows northeast, then turns southeast, where it is joined by a network of ephemeral or intermittent drainages from the south that coalesce into a discontinuous intermittent channel that terminates approximately one mile east of the Location at approximately 4,600 feet in elevation. Adobe Creek is the nearest named surface water feature, located approximately three miles east-southeast of the Location at an elevation of 4,570 feet. Adobe Creek receives surface water during heavy precipitation resulting in high surface water flow or groundwater recharge from these drainages. Adobe Creek flows to the southeast.

Springs feed networks of east trending unnamed ephemeral or intermittent drainages located over three-quarters of a mile west, northeast, and southwest of the location at an approximate elevation of 4,920 feet. The presence of springs a mile and a quarter north of the Location, also suggest a connection between topography, bedrock depth and outcrop, shallow groundwater, and groundwater discharge to intermittent surface water drainages in the vicinity of the Location.

Site Specific Measures to Address Criteria 5.c: Koda agreed to reduce the pad footprint to move it away from the drainage to the north. The proposed wellhead location remains the same. Koda proposes to construct two drilling pits - one lined for freshwater storage, and an unlined reserve pit for water-based bentonitic drilling fluids and cuttings. Koda provided a BMP stating that if shallow groundwater is encountered during construction of the reserve pit, Koda will notify COGCC that a liner will be installed or will halt pit construction and notify COGCC that a closed-loop system will be used instead of the lined reserve pit. To strengthen the BMP, the COGCC added a condition of approval (COA) that if shallow groundwater is encountered during pit construction, Koda will be required to line the reserve pit or halt construction and convert to a closed-loop system consisting of aboveground tanks. Additionally, the COGCC added COA prohibiting oil disposal in the pit(s) and requiring immediate skimming of oil if any is detected in the pit(s), impervious lined containment for vessels and liquid containers, and stormwater controls to prevent off-site sediment migration and erosion.

Koda provided BMPs on the Form 2A for protection of shallow groundwater and surface water at the Location. Stormwater controls will be constructed around the perimeter of the site prior to construction and will be installed and maintained in a manner consistent with good engineering practices to prevent off-site migration of sediment or contamination in runoff. The stormwater controls will remain in place until the pad reaches final reclamation. Reduction of the well pad dimensions reduces the disturbance area and the sediment source. Stormwater BMPs will include earthen berms, erosion control blankets, straw bale barriers, straw wattles, check dams, culvert and culvert inlet/outlet protection, silt fence, surface roughening, and surface ripping. Inspections will be conducted every 14-days during the construction period and after precipitation events capable of causing erosion.

The BMPs include lined secondary containment for temporary production facilities consisting of fold-up walls or liners draped over earthen berms for all tanks, treaters, and separators. Operator will conduct daily inspections of production equipment to check for leaks and spill response while temporary facilities are in use. Stormwater BMPs to prevent runoff to the intermittent drainage will be installed around the cross-gradient and downgradient sides of the Location to prevent off-site migration of sediment into surface water features.

Summary:

The Location meets Objective Criteria 5.c due to the Location being located within 255 feet of an ephemeral or intermittent drainage. The drainage flows to the northeast and east where it is eventually joined by other ephemeral or intermittent drainages such as one located approximately 1,015 feet to the south. Adobe Creek is the nearest named surface water and ultimately receives surface water and groundwater recharge in the area. There is a potential for shallow groundwater based on a reported groundwater depth of 18 feet bgs in an area water well, and the total depth of 41 feet bgs reported for a water well located within Section 7. Springs shown on the topographic map in the area suggest shallow groundwater is in communication with intermittent surface water drainages.

Koda proposes to use an unlined reserve pit for water based bentonitic mud and cuttings. Koda provided a BMP for lining the pit if shallow groundwater is encountered during pit construction, the COGCC requires Koda to line the reserve pit or halt construction and convert to a closed-loop system consisting of aboveground tanks. Additionally, the COGCC added a COA prohibiting oil disposal in the pit(s) and a COA requiring immediate skimming of oil if any is detected in the pits.

Director Determination: Based on the Objective Criteria review. The Director has determined that this permit application meets the standard for protection of public health, safety, welfare, the environment and wildlife resources set by SB 19-181.