Susquehanna Gas Company

Alternatives Analysis

Proposed Surface Water Withdrawal Example Project

Note: This is a sample report and project; to be used for example purposes only.

Prepared By: (Project Sponsor)
Date:

ALTERNATIVES ANALYSIS FOR SUSQUEHANNA GAS COMPANY

Susquehanna Gas Company (SGC) has prepared the following Alternatives Analysis as part of its application, per 18 CFR § 806.14(b)(1)(v): *For new projects and major modifications to increase a withdrawal, the application shall include an alternatives analysis for a withdrawal proposed in settings with a drainage area of 50 miles square or less, or in a waterway with exceptional water quality.* SGC has filed a surface water withdrawal application for a water extraction operation to support its unconventional natural gas development project. The proposed project is located in Middle Paxton Township, Dauphin County, Pennsylvania. Prior to submission, SGC participated in a pre-application meeting with Susquehanna River Basin Commission (SRBC) staff to discuss the project, including this Alternatives Analysis. SRBC staff provided general details about water availability at or near the project location, which SGC used in its application and this analysis.

Description of Project

SGC is a petroleum and natural gas exploration and production company with existing lease holdings located throughout Cold Mountain in Middle Paxton Township, Dauphin County, Pennsylvania. The proposed project is located on a 25-acre undeveloped parcel within an existing lease holding that is located along both Cold Creek and Mill Run. Mill Run drains 5 miles downstream to its confluence with the Susquehanna River, near Harrisburg, Pennsylvania. To support its nearby unconventional natural gas development projects, SGC proposes to construct a 300,000 gallons per day (gpd) (at 208 gallons per minute [gpm]) surface water withdrawal in Mill Run with direct piping to a 5 million gallon (MG) freshwater storage impoundment located on the same parcel. The contributing drainage area to the proposed withdrawal location on Mill Run is 49 square miles (mi^2), which is the reason this Alternatives Analysis has been prepared and submitted to SRBC.

SGC's surface water application proposes a withdrawal from Mill Run as opposed to the smaller Cold Creek tributary (~9 mi^2 drainage area and Exceptional Value [EV] water quality), which is also along its property, because Mill Run is comparatively a larger waterbody with larger flows available more often during the year and is not classified as exceptional water quality. The withdrawal would be located approximately 100 feet below the confluence of Cold Creek and Mill Run, and transported to a pump house via a buried 6-inch waterline and then stored in the 5 MG freshwater storage impoundment. SGC has looked at the technical and economic feasibility of the project, as well as its effect on water resources under the SRBC's *Guidelines for Preparing an Alternatives Analysis* (Policy No. 2017-01).

Analysis of Technical and Economic Feasibility and Water Resources

The withdrawal location is at [insert coordinates] on Mill Run, is accessible, and can accommodate installation of the submerged suction strainer needed to withdraw the requested volume of water. A 600-foot buried waterline from the pump house to this proposed intake location is required. A newly constructed, 5 MG freshwater storage impoundment would be used to store water for drilling operations. It is not expected that permitting for the land

disturbance or stream encroachment would be an issue on Mill Run considering its Cold Water Fishery (CWF) stream designation.

The project is economically feasible, given that SGC already controls the lease holding for the parcel of land at the withdrawal location. SGC has already planned for the construction costs for the 5 MG freshwater storage impoundment and associated water transfer infrastructure (~$2.5 million), and for the purchase and installation of a large submerged suction strainer in the stream to accommodate the withdrawal rate ($2,500). Estimated cost for the waterline purchase and installation from the pump house to the intake location is $9,000.

The proposed withdrawal location on Mill Run has a 49 mi^2 contributing drainage area Aquatic Resource Class (ARC) 2 and is classified as a CWF at this location. It should be noted that at a 49 mi^2 drainage area, this withdrawal location is 1 mi^2 less than the next higher class of ARC 3 streams, which range from ≥50 mi^2 and <200 mi^2 and are characterized as "small rivers." Mill Run does not host wild trout in this section of the watercourse and is listed as impaired for aquatic life use by an unknown source of sedimentation. Mill Run can support SGC's water needs with its larger and more sustainable flows. Discussions with SRBC staff indicated that passby flows for this location would occur less often than for the project's upstream Alternative 1 location on the smaller Cold Creek because the watershed is larger and not EV.

OTHER ALTERNATIVES CONSIDERED

Alternative 1 – Upstream Withdrawal Location on Cold Creek

SGC assessed its first alternative as a proposed withdrawal on Cold Creek, located approximately 1,000 feet upstream of its confluence with Mill Run.

Analysis of Technical and Economic Feasibility and Water Resources

The alternative withdrawal location would be at [insert coordinates] on Cold Creek, is accessible, and can accommodate installation of the submerged suction strainer needed to withdraw the requested volume of water. A 1,200-foot buried waterline from the pump house to the Cold Creek intake location is required. A newly constructed, 5 MG freshwater storage impoundment would be used to store water for drilling operations. It is expected that permitting for the land disturbance or stream encroachment could be an issue on Cold Creek considering its EV stream designation.

The estimated costs for this alternative are the same as the proposed project, other than the cost of the longer waterline purchase and installation, which is approximately $18,000.

Cold Creek is classified as an EV stream, with a Class B naturally reproducing wild trout population to its confluence with Mill Run. The contributing drainage area to Cold Creek at the point of this alternative withdrawal is 9 mi^2 and is within a headwaters ARC 1.

While SGC believes that it could withdraw up to 300,000 gpd from Cold Creek for its unconventional natural gas development, the withdrawal would be subject to a passby due to being an ARC 1, and that passby would likely be elevated because of the stream's EV water quality classification. Thus, water will be far less available than at the Mill Run proposed site. Because the withdrawal from Mill Run provides more water across the year, is lesser water quality, and is technically and economically feasible, SGC determines that Alternative 1 does not pose a more reasonable alternative than its proposed project for its surface water withdrawal.

Alternative 2 – Downstream Withdrawal Location

SGC assessed its second alternative as a proposed withdrawal on Mill Run, located approximately 1 mile downstream of its property boundary on the stream. This alternative became nonviable upon SGC's review of county tax records. The Commonwealth of Pennsylvania owns the 3,000-acre Mill Run State Park adjacent to SGC's parcel. Mill Run State Park extends the length of Mill Run from SGC's parcel to its confluence with the Susquehanna River. SGC has chosen to avoid any projects that would potentially disrupt the surface and recreational uses on state-owned lands.

Alternative 3 – Use of Abandoned Mine Drainage Waters

SGC assessed its third alternative as a proposed withdrawal from Red Run, a stream impaired by abandoned mine drainage (AMD) located in the headwaters of the Mill Run watershed. This withdrawal would utilize AMD-impaired waters for SGC drilling operations.

Analysis of Technical and Economic Feasibility and Water Resources

To obtain the AMD-impaired waters from Red Run (insert coordinates), SGC would need to construct a 4-mile waterline to the withdrawal point on Red Run in the headwaters of the watershed. This design includes direct collection of the impaired water and construction of a booster pump, adjacent to the collection point. SGC would not be able to utilize its planned 5 MG freshwater storage impoundment, and would instead need to construct a similarly sized storage impoundment that meets state-required criteria for the storage of impaired/reuse waters.

The project costs are significantly higher due to the infrastructure needs for this option. Estimated construction costs for the 4-mile waterline and booster bump are approximately $1.5 million. Estimated construction costs for the 5 MG reuse impoundment are four to five times higher than that of the proposed freshwater storage impoundment in the proposed project (~$10-$12.5 million). SGC would also need to secure a permanent easement with annual access lease rights with the landowner on which the proposed withdrawal would be located. This estimated cost is $10,000 for the easement and a lease payment of $3,000 annually. SGC believes the costs for this alternative would require an outlay of $14 million plus recurring annual costs of $3,000/year.

Use of AMD water in lieu of freshwater for operational needs would represent the beneficial use of impaired waters and conserve freshwater. This water likely would be available

for SGC's use and likely would not be subject to a passby requirement due to its impaired status. Because this alternative would greatly add to the cost of SGC's project, and SGC believes adequate water can be withdrawn from its proposed project location without harm to the water resources of the Susquehanna River Basin, this alternative was rejected.

Extent of Investigation and Rationale for the Proposed Project

SGC examined the technical, economic, and water resources aspects of the proposed withdrawal at the proposed project location, of moving the withdrawal to both an upstream and a downstream location, and of the use of water from an AMD-impaired stream. As there is no public water supply service available at SGC's location, these are the only potentially feasible alternatives considered.

After a pre-application meeting with SRBC, SGC selected the Mill Run site as its proposed project (the preferred alternative). The Mill Run site is a more sustainable water supply due to its larger drainage area, larger flows, and lesser water quality than Cold Creek. It also avoids stricter passby flow requirements that would likely be required for the Cold Creek withdrawal location. The proposed project is within the project's budget while Alternative 3, the use of AMD-impaired waters from Red Run, far exceeds the project's budget and has been rejected.