Appendix 1,
Exhibit 7

Assessment of the Currently Proposed Post-Mining Water Level in NHCS Quarry Pit

August 22, 2017

Prepared by:

Michael J. Byle, P.E., D.GE, F.ASCE
Tetra Tech, Inc.
One Oxford Valley, Suite 200
Langhorne, PA 19047

and

Ira D. Sasowsky, PhD., P.G.
Sasowsky Earth Science Consultants, Ltd
379 Bittersweet Rd.
Akron, OH 44333

Contents

Assessment of the Currently Proposed Post-Mining Water Level in the NHCS Quarry Pit

Executive Summary

The currently proposed final post-mining water level in the quarry pit operated by New Hope Crushed Stone & Lime Company (NHCS) is set at +98' MSL. In early 2017, Solebury School asked us to (A) evaluate the currently proposed +98' MSL level relative to the sinkhole risk at the School, and (B) determine whether another post-mining water level might be feasible that would better improve conditions at Solebury School. We have prepared this report to summarize our findings.[1] For the following reasons, we have determined that the final post-mining water level should be raised.

1. A higher water level will further raise groundwater levels in the surrounding region, including under Solebury School's campus. This is likely to bring groundwater levels above the top of bedrock across most of Solebury School's campus, which will further reduce the likelihood of collapse sinkholes by stabilizing the area underlying Solebury School and limiting the downward migration of regolith.

2. Higher groundwater levels will reduce the head differential and velocity of groundwater travelling downgradient. This, too, will reduce the likelihood of future collapse sinkholes by curtailing the migration of regolith.

3. Building the outlet structure and channel connecting the quarry pit to the existing downstream reach of Primrose Creek at a water level of +98' MSL would require very extensive earthwork, and would result in a stream segment that differs dramatically from the original streambed.

4. By contrast, building the outlet structure and channel that will be required to attain a higher water level will be far less complicated and work-intensive, and will result in a stream segment and surrounding groundwater levels that much more closely resemble natural conditions and the original streambed.

Indeed, we were unable to identify any benefit to or justification for artificially depressing the water level at +98' MSL. Thus, the final post-mining pool water level should be raised, ideally to +106' MSL.

[1] This report assumes the reader possesses a level of background knowledge regarding the features and history of this site (including the substance of the appeal that resulted in the Environmental Hearing Board's Adjudication of July 31, 2014) and applicable geologic terms.

Background

Solebury School has been suffering from collapse sinkholes for several decades. Scientific studies have shown, and the Pennsylvania Environmental Hearing Board (EHB) has found, that these collapse sinkholes are caused by unnatural depression of the groundwater table resulting from the extensive dewatering of NHCS's adjacent quarry. The EHB has ruled that the collapse sinkholes will continue unabated until dewatering ends, the quarry pit is allowed to fill with water, and groundwater is restored. The Pennsylvania Department of Environmental Protection (PADEP) has ordered that steps be taken to achieve those objectives.

Primrose Creek is an eastward flowing tributary of the Delaware River that begins several miles to the east of the Solebury School campus and the quarry. The Creek runs across Solebury School's campus, and then terminates in a swallet just east of the quarry pit. The original Primrose Creek channel on NHCS's property was mined through, and flow to the downstream reach of Primrose Creek now resumes at the point where NHCS discharges the water it pumps from the quarry pit. Historically, Primrose Creek was a perennial (or gaining) stream, meaning that it received most of its flow from groundwater that intersected the base of the streambed. As a result of NHCS's extensive dewatering, however, groundwater no longer provides baseflow to the Creek upstream of NHCS—including the segment that crosses the Solebury School campus—resulting in frequent low- or no-flow conditions except in response to storms.

When mining ceases, the quarry pit will fill, forming a lake and rejoining the upstream (eastern) and downstream (western) reaches of Primrose Creek.

Final Post-Mining Water Level in the Quarry Pit

The planned post-closure water level in the quarry pit is currently set at +98' MSL, which appears to have been the plan since at least 1997. This elevation first appears in a conceptual reclamation plan and letter from Uday Patankar of Philip Services to Michael Hill at PADEP. Despite a comprehensive review of the universe of documents we have been able to locate and examine, we have not found an explanation, or even formulated any plausible hypothesis, as to why the final water level was set at +98' MSL. For the reasons explained below, we conclude that the post-mining water level in the quarry pit should be raised.

Mapping in NHCS's most recent quarterly NPDES report (1st Quarter 2017) indicates that the quarry pit is completely enclosed within the 108' land surface contour. This has been confirmed by a recent (2017) aerial survey conducted by Tetra Tech on behalf of Solebury School. This means that if the quarry was allowed to fill to its natural capacity, it would begin to overflow the rim of the quarry at elevation +108' MSL, which is the lowest point on the rim and a full ten feet above the currently planned post-mining water level. The quarry pit thus has considerable capacity beyond +98' MSL. Although the quarry pit technically has the capacity to fill to +108' MSL, it is advisable to allow sufficient freeboard between the quarry rim and the post-mining

water level to accommodate precipitation or increased flow from the upstream reach of Primrose Creek in order to prevent flooding and to direct flow toward Primrose Creek. We therefore recommend a target final water level of approximately +106' MSL.[2]

Impact on Groundwater Level

In order to reduce the likelihood of future collapse sinkholes to the maximum extent possible, the groundwater level must be restored as closely as possible to pre-mining levels. This is true for two overlapping reasons.

First, as the groundwater rises, the portion of bedrock above the groundwater table is reduced, minimizing both the likelihood that existing voids in the karst limestone will collapse and the potential for new voids to form due to the downward migration (or settling) of regolith currently embedded in the karst features. Raising the groundwater table above the top of bedrock ("top of rock") and into the overburden layer will therefore substantially curtail the formation of collapse sinkholes. Moreover, because the overburden is less permeable than the bedrock in this area, once the groundwater table reaches the overburden, the velocity of groundwater traveling downgradient will decrease, which in turn yields the dual benefit of further raising the groundwater table and increasing the stability of the underlying soil and rock. In short, the higher the groundwater, the better.[3]

A groundwater map prepared by NHCS as part of its 1st Quarter 2017 NPDES monitoring report shows that the groundwater table underlying the campus has a gradient of approximately 0.5% (i.e., a drop of 6 inches for every 100 feet) beneath Primrose Creek. Based on our extensive knowledge of geology and groundwater dynamics and our understanding of the conditions underlying Solebury School and the surrounding region, we conclude that the gradient will most likely remain constant (at close to 0.5%) regardless of the final water level in the quarry pit. Using this gradient, we are able to predict the likely approximate groundwater levels across Solebury School's campus. Accordingly, with a final water elevation of +98' MSL, groundwater levels are likely to range from approximately +98' MSL on the east side of campus to approximately +112' MSL on the west side of campus. The implications of this are discussed in the following paragraphs.

Borings conducted on the Solebury School Campus indicate that the top of rock, although highly varied and irregular, has an average top-of-rock elevation of about 117' MSL. Thus, with a final pool water level of +98' MSL, groundwater will remain below the top of rock across most, if not

---

[2] There is historic precedent for this elevation, as the original Primrose Creek streambed also crossed the middle of the quarry property at approximately +106' MSL.

[3] Relatedly, it is worth noting that higher groundwater levels increase the likelihood that baseflow will return to the upstream reach of Primrose creek, resulting in higher quality habitat.

all, of the campus—although it is possible that the groundwater could cover the top of rock in certain places at certain times. However, with a final pool water level of +106' MSL, groundwater levels are likely to range from approximately +106' MSL on the east side of campus to approximately +120' MSL on the west side of campus. In this scenario, the groundwater would be positioned above bedrock across a majority of the campus—a vast improvement over the current situation and considerably better than the outcome with a +98' MSL water level in the quarry pit.

Additionally, raising the final post-mining water level will further reduce the head differential and velocity of the groundwater, which in turn will reduce the subsurface erosion of regolith and help stabilize the soil and rock underlying the campus. Here, too, it is beneficial for the groundwater to be allowed to rise as high as possible. Thus, allowing the water in the quarry pit to rise beyond +98' MSL to +106' MSL will make an appreciable difference.

Engineering Considerations

The water being pumped from the quarry pit currently accounts for most, if not all, of the flow in the downstream reach of Primrose Creek. Because it is critical to maintain these flows once the quarry is allowed to fill, the design and construction of an outfall structure and a channel connecting the quarry to the downstream reach (collectively referred to as the "outfall conveyance") is a critical component of the pre-closing process.

According to its latest reclamation plan, dated April 12, 2016 and revised on June 6, 2016, NHCS intends to construct a linear channel to convey water from an outfall point at the eastern rim of the quarry pit to a point approximately 380 feet to the east, near where the pumped water is currently discharged at elevation 98' (see Figure 1). There is no indicated grading of the proposed channel, but it appears that it would be nearly flat since the discharge point is at about elevation 98', which is the same elevation as the planned quarry pool level. This plan presents several significant problems and challenges.

First, both the outfall and end point of the channel that NHCS has proposed appear to be located at about the same elevation (+98' MSL). Because there is little or no gradient within the channel, it is unclear how the channel will facilitate the flow volume required to keep the downstream reach viable. Surprisingly, none of NHCS's reclamation plans or other related documents we reviewed address this issue, nor do they include any details regarding channel itself (e.g., width and depth, erosion protection, etc.) or the outfall mechanism that will convey water from the pit into the channel. Although there are, in theory, ways in which a channel may be engineered in order to convey significant quantities of water from one point to a similar elevation (e.g., by increasing its depth and width), any such effort will require extensive earthmoving, and the end result will be significantly different from the original streambed.

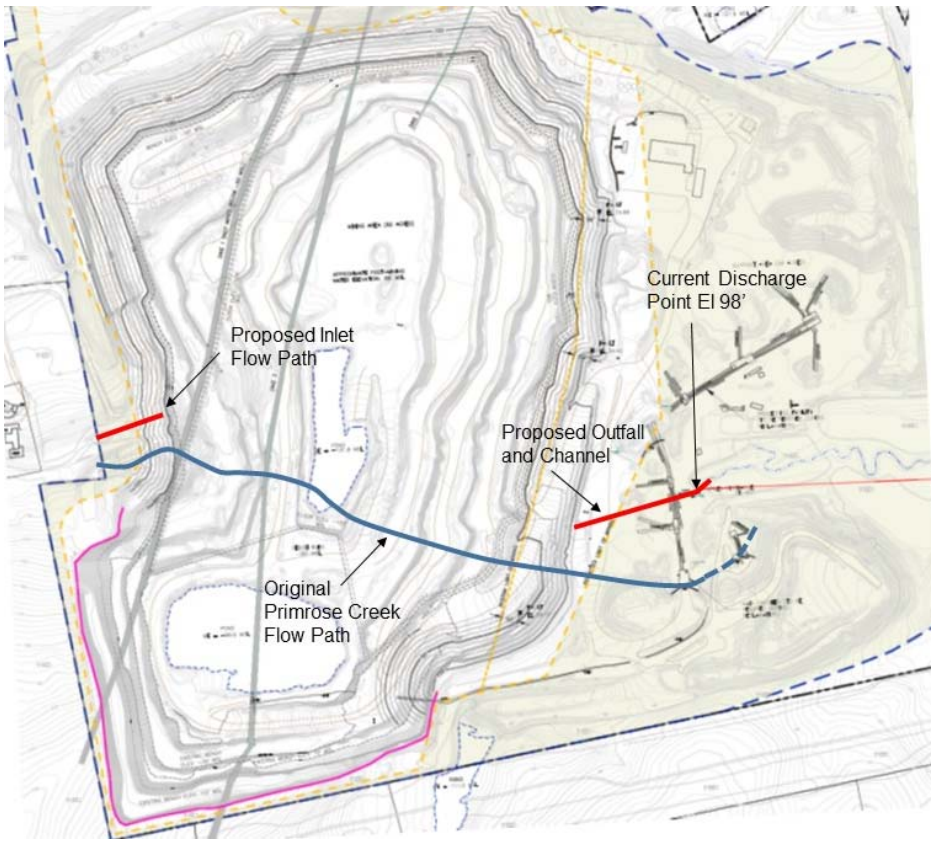

Figure 1: *Comparison of original Primrose Creek flow path and NHCS proposed flow paths into and out of the quarry pit. [Proposed flow path from ERG, NHCS Bonding and Reclamation Map 4/12/2016, Previous Primrose Creek from NHCS Mining Plan April 1974]*

Further complicating NHCS's current plan is the fact that the path of the proposed channel is not yet flat. As shown in Figure 1, the current rim of the eastern quarry wall in the location of NHCS's proposed outfall is at approximately +108' MSL—a full ten feet above the proposed outfall and final water level. The ground slopes down from the rim, reaching the proposed discharge point at +98' MSL approximately 380 feet to the east. Thus, under the current plan, not only will the final water level be artificially suppressed at +98' MSL—well below the current capacity of the quarry pit—but significant earthwork must be undertaken to achieve an unnecessary and counterproductive end. Specifically, a 10-foot deep notch must be cut into the eastern rim in order to accommodate an outfall at +98' MSL, and the remainder of the 380-foot channel will need to be graded in order to create the flat channel NHCS has proposed. This, too, will result in a highly-engineered channel that is dramatically different from the original streambed. Once again, we have not seen any details regarding how NHCS plans to accomplish this task.

By contrast, if the water level is allowed to rise to +106' MSL, gravity will convey water from the outfall to the designated discharge point via a channel with a natural gradient. Such a channel

will require far less work to construct,[4] and will be more stable over time. Moreover, this channel will much more closely resemble natural conditions and the grade, size, and elevation of the original streambed. A cross section comparing this level with that currently proposed by NHCS is presented in Figure 2.

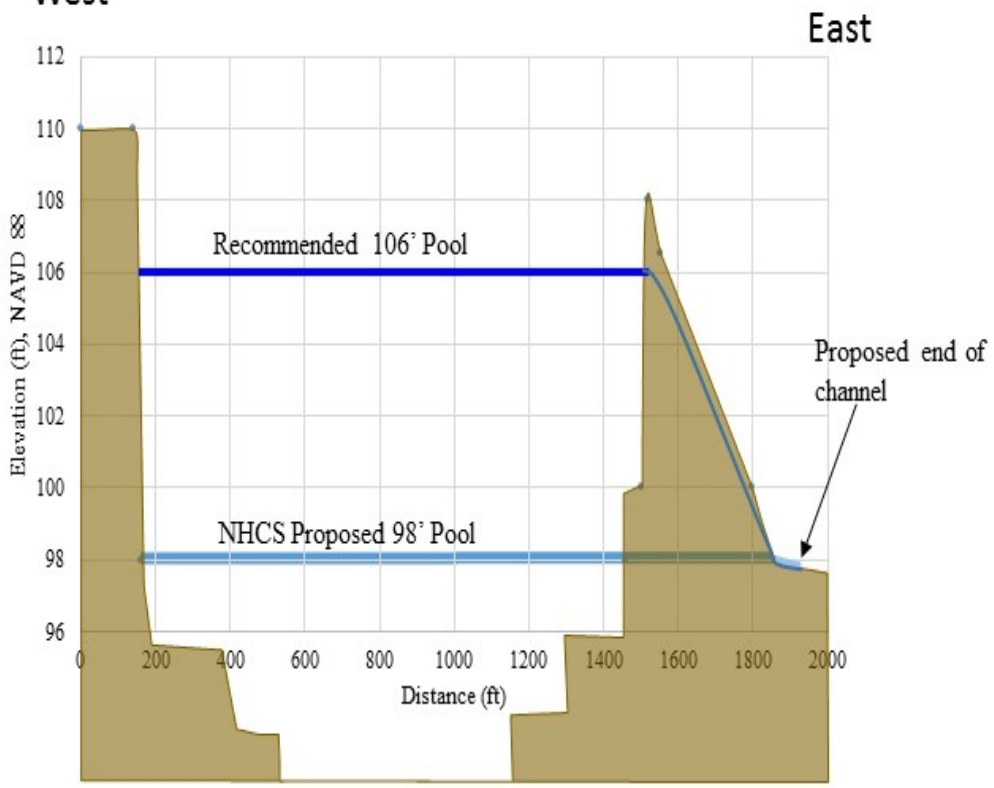

Figure 2 – *Comparison of Profile with Pool level at Elevation 106' to NHCS Proposed Pool and Discharge at Elevation 98'. [Source: NHCS Bonding and Reclamation Map 4/12/2016, Vertical Exaggeration: 10:1]*

Raising the pool will also increase the capacity of the discharge (outflow) channel, allowing it to function better in times of high runoff. In the worst case, if the channel were blocked, the pit would overtop and flow down the gentle slope that is present on the east side of the pit. Flow velocity would be so low that erosion would not be a significant concern.

[4] Although the specific design of the outfall conveyance is beyond the scope of this report, according to initial calculations, with the outfall at +106' MSL, a channel that is 5 feet wide and 1.5 feet deep will provide continuous flow to the downstream reach of Primrose Creek. Such a channel assumes a 1-2% gradient, which is consistent with the historic gradient in this section of Primrose Creek. Moreover, such a channel would safely pass the calculated 100-year storm discharge.

From an engineering perspective and based on the information available to us, we conclude that setting the final water level at +98 MSL is highly impractical. There is no apparent reason to prevent the water from rising to approximately +106' MSL, which will allow a vastly less complicated and more effective outfall structure, and a channel that will more closely resemble natural conditions and the original streambed.

Conclusion

The final post-mining water level can and should be set at an elevation higher than +98' MSL, ideally at a target elevation near +106' MSL. There is no reason to artificially suppress the water level at +98' MSL. Allowing the water to rise above that point will further restore groundwater and therefore further reduce the likelihood of collapse sinkholes. Moreover, a higher water elevation will require far less work, and will result in a channel that much more closely resembles natural conditions and the original streambed.

References

ERG (2016) NHCS Bonding and Reclamation Map 4/12/2016

Skelly and Loy (1974) New Hope Crushed Stone & Lime Company, Mining Plan, April, 1974

ERG (2005) Hydrologic Investigation Report, New Hope Crushed Stone, August, 2005

ERG (2017) NPDES 1st Quarter 2017 Monitoring Report, NHCS, April 28, 2017.