GILMORE & ASSOCIATES, INC.
ENGINEERING & CONSULTING SERVICES

August 5, 2020

Michael Kutney, P.G.
Chief, Permits & Technical Section
Department of Environmental Protection
Pottsville District Mining Office
5 West Laurel Boulevard | Pottsville, PA 17901

Re: Buzzi Unicem USA, Stockertown Quarry
Groundwater Tracer Study Work Plan

Mr. Kutney:

While I am in the process of preparing a more formal report of the recently-completed hydrologic tracer study conducted at Buzzi's Stockertown Quarry on July 7-8, 2020, as part of our more comprehensive hydrogeologic evaluations which support the pending quarry deepening request, I wanted to provide a preliminary summary of the findings from this recent field effort. As you know, the study was conducted pursuant to a work plan developed with input from PADEP, PENNDOT, PAF&BC and the PAGS .

In correspondence dated December 5, 2018, PADEP requested that Buzzi include a tracer study as one component of the investigations being pursued to support quarry deepening pursuant to Buzzi's Large Non-Coal Surface Mine Permit No. 7473SM2. The suggestion at that time was that the tracer study might further all interested parties' understanding of water loss through in-stream sinkholes within the Bushkill corridor in the vicinity of S.R. 33.

The completed tracer study, as defined in the February 27, 2020 work plan, included the introduction of chemically-detectable optical dyes into both the Bushkill and Schoeneck Creeks, followed by visual monitoring and collection of samples for laboratory analyses. At the time of the study in July 2020, the Schoeneck Creek was not flowing so that specific test has not yet been conducted. The test in the Bushkill was successfully completed pursuant to the plan, as described briefly in the remainder of this letter report. The test in the Schoeneck Creek cannot be conducted until there is sustained flow in that naturally intermittent stream.

Hydrologic Tracer Study – Bushkill Creek

The Bushkill Creek test involved two distinct dye tracers introduced respectively into two in-stream swallow holes at upstream and downstream locations in the reach of stream between SR 33 and SR 2017. In addition, representatives of PENNDOT requested that Buzzi also introduce tracer into two of the monitoring wells (SW-439 and SW-379) installed on the west side of the bridge abutments of S.R. 33 along the south bank of Bushkill Creek. On the morning of July 7, 2020, with representatives of PADEP and PENNDOT present, Buzzi introduced the optical dyes

- Rhodamine – introduced into two PENNDOT wells west of the south abutment of SR 33 and into one swallow hole on the north bank of Bushkill Creek approximately 500 feet downstream of SR 33;

- Fluorecein – introduced into a stream-bank sinkhole on the north bank of the stream approximately 100 feet west of the former SR 2017 bridge.

To facilitate dye introduction, Buzzi decreased the quarry discharge approximately one hour prior to the initiation of the test. That resulted in a decrease of stream stage by approximately 1.0 to 1.5 ft, providing for easier access to both stream-bank swallow holes, thereby ensuring that all dye was introduced to the subsurface with no loss downstream. Both dyes were introduced simultaneously while the stream stage was decreased. Upon successful introduction of the dyes, Buzzi resumed quarry discharge at the normal rate and the stream stage rebounded to its pre-introduction level within approximately 20 minutes.

After the successful introduction of the two dyes, representatives of PADEP and PENNDOT left the site. Monitoring crews were deployed to the quarry and downstream in Bushkill Creek where both observations and sampling were conducted pursuant to the schedule in the February 27, 2020 work plan.

Hydrologic Tracer Study Results

The tracer study was successful in that tracer was detected[1], and added to our overall understanding of groundwater movement within the Bushkill corridor, which will be presented in the full report to PADEP, which we expect to complete in September, 2020. At the time of this preliminary report, tracer was detected only in two upwelling points in the West Quarry Inflow Zone (WQIZ) and was not observed at any other monitoring location in either the quarry or in Bushkill Creek. The laboratory data from other monitoring points are currently being received and might reveal that dye was detected at some other location. It also should be noted that arrival of the dye in the WQIZ, and its subsequent discharge via the quarry's normal pumping activities, made continued testing in the Bushkill Creek untenable, since we would no longer be in position to differentiate in the downstream sampling points dye introduced directly into the sinkholes from dye which was subsequently discharged into the Bushkill with the normal quarry outflow.

The preliminary outcome (tracer detected in the WQIZ), was "Potential Outcome No. 1" in the February 27, 2020 work plan. The outcome, if confirmed with laboratory data, also would be consistent with conclusions suggested by various past investigations which acknowledged that some percentage of WQIZ inflow water could derive from Bushkill Creek stream flow losses[2]. Because the test included collection of samples for laboratory analyses, we will explore the possibility of using test data to calculate the mass of dye present in the WQIZ, from which we may be able to determine the percentage of inflow which derives from Bushkill Creek. It also should be noted that, relevant to deepening, the outcome of the tracer study does not alter our understanding of the expected and predicted hydrogeologic impacts of deepening. That issue had been discussed with the PADEP and PENNDOT in a December 12, 2019 meeting at your office in Pottsville, PA. At that time, we had provided data from several phases of investigation in the planned deepening zone in which the confined groundwater which provides continuous inflow into the WQIZ is not present below the planned east pit deepening zone within the planned deepening interval (to 0 ft msl).

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[1] In many tracer studies, tracer is never observed or chemically detected and the tests are, consequently, inconclusive.
[2] EarthTech, 2002; H2H, 2008, 2009; ELM, 2011 Sections 2.0, 4.1.2, 4.3, 4.4, 5.0; ERG, 2015 and 2018

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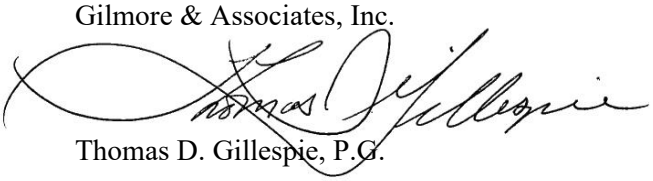
By having satisfied the PADEP requirement to conduct a hydrologic tracer study, Buzzi is now in the process of preparing a request to deepen a portion of the east pit of the quarry, as provided for in the approved mining permit. That request will be presented in the form of an Updated Groundwater Report, as required in Special Conditions No. 21 of the permit, which will include a more detailed report of the tracer study.

Sincerely,
Gilmore & Associates, Inc.



Thomas D. Gillespie, P.G.

c: Michele Maranzana, Buzzi Unicem USA
Dan Nuguent, Buzzi Unicem USA
Timothy Bergere, Armstrong Teasdale