2 February 2012

Bernards Township Planning Board
277 South Maple Avenue
Basking Ridge, NJ 07920

Re: Millington Quarry, Inc.
Millington Quarry Reclamation Plan
Tax Map Sheet #s 34, 39 & 45
Bernards Township (Millington)
Somerset County, New Jersey
Princeton Hydro Project No. 0391.011

Dear Members of the Planning Board:

Princeton Hydro, LLC (Princeton Hydro) submits the following report pertaining to the management of the lake proposed as part of the Millington Quarry Reclamation Plan (hereinafter referred to as the "Plan"). The following documents, along with testimony provided by the Millington Quarry Inc.'s (MQI) consultants, were reviewed and are largely the basis for our comments, conclusions and recommendations:

- Plans titled "2011 Reclamation Plan for Millington Quarry", 6 sheets, prepared by Page Engineering Consultants, dated 13 October 2011.
- Report titled "Lake Management Plan for 2011 Millington Quarry Reclamation", prepared by Omni Environmental, LLC, dated 13 October 2011
- Report titled "Environmental Impact Statement for 2011 Millington Quarry Reclamation", prepared by Omni Environmental, LLC, dated October 13, 2011.
- Plan titled "Vegetative Planning Areas, Millington Quarry", Sheet L-1, prepared by Landscape plan developed by Davies Associates, Inc., dated 13 October 2011.
- HydroCAD simulation output files, prepared by Page Engineering
- Letter report on updated hydrologic assessment of Millington Quarry lake prepared by Leggette, Brashears, & Graham, Inc., dated 24 January 2008
- Letter report on hydrology and filling of Millington Quarry lake prepared by Leggette, Brashears, & Graham, Inc., dated 12 November 2003;
- Report titled "Environmental Impact Statement for 2008 Millington Quarry License Renewal Tilcon New York, Inc.", prepared by Page Engineering Consultants, dated January 2008;
- Report titled "Report Geotechnical Engineering Consultation, Proposed Millington Quarry Reclamation", prepared by Melick-Tully and Associates, PC, dated October 13, 2011.
- Test pit logs, TP-1 through TP-43, dated September 20 through September 22, 2011, prepared by Melick- Tully and Associated, PC.
- Letter prepared by Continental Placer Inc., addressed to Mr. Tom Carton of Millington Quarry, Inc., dated November 11, 2008.

It is emphasized that to date specific information requested by me of the applicant, both verbally and in writing, has yet to be supplied. Specifically information/data pertaining to the existing NJPDES permit and associated pumping rates, the recharge characteristics of the bioretention basin soil media, and the permeability of the rock at the upper rim of the quarry have yet to be

supplied. As such, this report may need to be revised or amended in some capacity pursuant to the receipt of said data and information. Additionally, since not all of the testimony pertaining to the lake has yet to be provided by the applicant's consultants (e.g. testimony of Davies Associates Landscape Architects, LLC, hereinafter referred to as Davies) we reserve the right to provide further comment or prepare a subsequent report. Finally, while this report focuses on the lake and the reclamation plan's proposed stormwater management measures there may be some of the report's comments may overlap issues more specifically pertaining to geotechnical, engineering or environmental risk related matters. These overlaps occur only as needed with respect to our analysis of the lake and the proposed stormwater management measures.

1. Stormwater Management:

MQI has proposed the use of four (4) bioretention basins to manage runoff over the course of the quarry's reclamation. Details of these basins appear in the Omni Environmental Lake Management Plan (13 October 2011), Slides 11, 12, and 22 (provided as part of the 22 November 2011 testimony), and on the landscape plan (Sheet L-1) prepared by Davies (dated 13 October 2011). It should be noted that these basins are referred to as settling basins in the Davies Associates and Page Engineering documents, as water quality forebays in the Omni Environmental reports and testimony slides, and as bioretention basins in the verbal testimony provided by the applicant's consultants and then on page 8 of the Omni Environmental Lake report. Given that the NJDEP has developed a specification for bioretention basins (Chapter 9.1 of the NJ Stormwater Best Management Practices Manual, 2010), we highly recommend that for the sake of consistency that all MQI references of these structures use the bioretention basin terminology.

As per the Omni Environmental report, the bioretention basins will collect runoff generated from the southern portion of the quarry (referred to as the Upland Meadow Area). These structures are intended to control sediment and nutrient loading to the lake during its filling and thereafter, once the lake attains full pool elevation (WSE 220 ±). The applicant's consultants (Omni Environmental and Page Engineering Consultants) have testified that these same bioretention basins will also provide stormwater management for the projected residential end use of the reclaimed quarry. As noted above, the use of the basins to manage the post-developed site is also stated in the Omni Environmental lake report.

Princeton Hydro was provided with routing data developed by Page Engineering in the form of TR-20, HydroCAD analyses. These analyses were conducted for the water quality storm (1.25"/24-hours) as well as for the Type III, 24-hour 2, 10 and 100-year storms (relative rainfall values of 3.3", 5.0" and 8.2"). These analyses assumed a post-development scenario where the contributing watershed would have 40% impervious cover. This can be considered a very conservative assumption; that is an over-estimation of actual site conditions for the site under either the reclaimed or developed state. An individual analysis was conducted for each designated storm event, for each of the sub-watersheds or catchment areas encompassed by the Upland Meadow Area. Thus, as is appropriate, the entire Upland Meadow Area was divided into a number of catchments and runoff data (peak flow and volume) were computed for each catchment data for each storm event. These data were then used to compute inflow and volume data for each of the four bioretention basins.

The analyses clearly show that the bioretention basins have adequate capacity to manage the volume of runoff generated during each of the designated storm events. The data also show that the peak flow discharged from the basins, following the collection, storage and release of the runoff, occurs with an appropriate level of mitigation. That is, the rate of flow leaving the basins is adequately controlled. Thus, in keeping with Township and NJDEP stormwater management requirements, the basins provide ample peak flow management for each of the designated storm events.

Discharge from the basins to the lake occurs via a rip-rap lined outfall channel. The channel is adequately sized and the rip-rap is of appropriate dimension for the projected flows. Thus we do not envision any scour or erosion problems resulting from the discharge of the collected runoff to the lake.

Appendix A of the Omni Environmental Lake report includes a table (Riparian/Settling Basin) prepared by Davies. That table lists a number of different species of trees, shrubs, forbs and grasses. As provided in the report it is not possible to discern which plants or grasses will specifically be used to vegetate those bioretention basins. We strongly recommend that an individual specification be developed for the bioretention basin. Additionally, the landscape plan Sheet L-1) prepared by Davies (dated 13 October 2011) while identifying the basins does not include a planting specification for these structures. Sheet L-1should be modified accordingly.

In keeping with the functional attributes of a bioretention basin, testimony provided by the MQI consultants regarding these structures made note that the basins will attenuate nutrients, settle out sediments and provide some degree of recharge or infiltration capacity. If they are in fact designed to function in this capacity a specification is needed for the soil mix that will be used in the construction of the basins. The specification should be consistent with that provided in Chapter 9.1 of the NJ Stormwater Best Management Practices Manual. Additionally, Slide 12 (Water Quality Forebay Profile) should be corrected or an additional slide prepared. The current illustration only shows a rip-rap surface on the bottom of the basin. While this may be appropriate while the basins are being used as sedimentation basins during the stabilization stage of the site (i.e. while the meadow becomes established), it is inconsistent with their subsequent use as water quality forebays or bioretention basins. We strongly recommend that a second profile be prepared illustrating the bioretention soil layer and this profile added to the Omni Environmental lake report and the plan set prepared by Page Engineering.

The Omni Environmental lake report clearly states that no stormwater management provisions are being provided for the 16 acre MOA area given that it is “stable”. We strongly recommend that at a minimum a bioretention swale be constructed at the toe of this slope at the 225 elevation. This would provide a means of controlling and treating runoff from this area into the lake. Even if not developed in any capacity, this area will still be a source of nutrient and sediment loading to the lake. We thus strongly recommend that stormwater management measure in the form of a simple bioretention swale be provided by the applicant for the long-term management of this area’s runoff.

The applicant’s engineer is assuming that is will be possible to effectively direct runoff to the four basins by means of sheet flow, even thought the flow paths exceed 800 linear feet. The NRCS has established a maximum stable flow path 100 before sheet flow develops into concentrated

flow, even for a gently sloping meadow condition. We feel that it would be far better to use a series of vegetated swales to convey the runoff to the basins.

Finally, maintenance specification and schedule is needed for the basins. There must be some means in place to ensure that they are properly constructed, the specified plant cover becomes fully established, and the basins are maintained so that they can consistently meet their proposed pollutant removal and stormwater management functions.

2. Lake Water Quality Monitoring Plan

The Omni Environmental lake report includes a proposed long-term water quality monitoring plan. This is detailed in Appendix C "Quality Assurance Sampling Plan". While we agree with the details of the plan as they apply to the number of samples, sampling depths and sampled parameters (including a number of metals and two forms of phosphorus) we do not agree with the sampling frequency. The applicant is proposing that sampling be conducted once every three years. This is insufficient especially given the lake's projected eutrophic to hypereutrophic condition (see Page 29 of the Omni Environmental lake report).

In order for an adequate database to be developed and maintained for the purpose of both forecasting lake water quality problems and implementing appropriate corrective actions, it is imperative that the lake be sampled at least four (4) times annually. The sampling events should be scheduled to coincide with key periods relative to the lake's annual cycle of productivity (algae and aquatic plant growth). We recommend, based on our extensive lake management and restoration experience, the lake be sampled at a minimum in May, July, August and mid-October. This would provide the Township and MQI with data at the on-set of the growing season, during the middle of the growing season (when algae and aquatic weed problems peak) and around the time when the lake should experience fall destratification and turn over.

We also strongly recommend that because algae blooms will likely be the lake's biggest problem, that the sampling program include the collection and analysis of phytoplankton samples.

Under conditions of anoxia we can expect various metals to be liberated from the sediments into the overlying water. This happens on a routine basis in lakes and reservoirs that stratify and have a hypolimnion (deep water layer) that become depleted of dissolved oxygen. While most of the released metals present more of a nuisance problem from the standpoint of taste, odor or color, arsenic solubilization can be a significant environmental issue, particularly if the arsenic becomes assimilated and entrained in lake's phytoplankton and subsequently transferred through the lake's food chain. The September data shows the lake does stratify, the hypolimnion becomes anoxic and arsenic is released into the water column (Appendix C of Omni Environmental lake report). Princeton Hydro will defer to ELM regarding the significance of the measured release and any related long-term environmental risk issues.

3. Lake Maintenance Plan

As emphasized in the e-mail correspondence received by me on 24 January 2012 from Mr. James Cosgrove of Omni Environmental, MQI has no plans to prepare or submit a Lake Maintenance Plan. As noted in said email, the applicant "expect[s] the lake water quality to be among the best

in the State of NJ". Mr. Cosgrove goes on to state that "if quality is found to deviate from the NJ State Surface Water Quality Standards, appropriate actions will be taken at that time".

Failure to have a maintenance plan in place for the lake is very short-sighted. The Trophic State Index data (see Page 29 of the Omni Environmental lake report) shows the lake in its existing state is classified as eutrophic to hypereutrophic. The data collected by AquaLink during the 27 September 2011 sampling event shows the lake to have depleted (<5.0 mg/L) concentrations of dissolved oxygen at depths greater than 3 meters and elevated concentrations of total phosphorus (0.27 mg/l) and dissolved orthophosphate (0.021 mg/L) at a depth of 3 meters.

Lakes, such as the MQI lake, that are deep, thermally stratified and have a prolonged hydraulic retention time, are prone to algae blooms. We have documented such blooms occurring in numerous lakes throughout New Jersey even when the lake's total phosphorus (TP) concentrations are well below the State's TP standard. Additionally, most of the parameters used to evaluate the trophic state or overall water quality of lakes are not included in the State's Water Quality Standards. This includes Secchi disk transparency, soluble reactive phosphorus, and dissolved orthophosphate. As such, limiting any type of lake maintenance action to an exceedance of the State's Surface Water Quality Standards is not appropriate. It is far better, with respect to maintaining the ecological health and aesthetics of the lake, to proactively implement maintenance measures, using a properly developed, robust lake quality database to trigger the need for such maintenance.

At a minimum MQI needs to be prepared to implement algae control measures and potentially be prepared to install and operate some type of aeration system as part of the lake's long-term maintenance and management. Such maintenance activities were discussed with MQI in the review of earlier reclamation plans, and were contained in documents and correspondence prepared by MQI's consultants.

4. Lake Hydrology

Ample data has been provided concerning how the lake will fill over time, including the sources of water. The reports issued by Page Engineering, Omni Environmental and Leggette, Brashears and Graham, Inc. (LBG) set the lake's permanent pool elevation at 220 ±. The applicant has stated that the maintenance of the lake at that level will be a function of evaporation and water losses that occur via seepage through the upper rim of the quarry. As stated in testimony and in the consultant's reports the lake will not be equipped with any form of outlet control structure. Presently water levels in the existing lake are controlled by discharge that directs flow into the Passaic River. This discharge is regulated via a NJPDES permit. Although we have requested the NJPDES permit discharge records, those have yet to be received by Princeton Hydro.

To date we have not been supplied with any definitive data pertaining to the permeability of the rock within the quarry's bedrock. Neither the 2003 nor the 2008 LBG reports actually quantifies the lake's rate of discharge through the rock. The 2003 report references ground water elevation depths measured in MQI supply well and the surface water elevations of the Passaic River and Long Hill Brook to justify the projected permanent pool height of 220±. Neither LBG report provides actual data supporting the contention that the lake's pool height will be self regulating without the use of some form of control structure. As such, until we are provided with hydrogeologic data to illustrate the ability of the rock to transmit groundwater we cannot agree

with the applicant's position that the lake's level will be maintained at or near the projected permanent pool elevation without the use of some form of outlet control structure.

5. Placement and Use of Rip-Rap Within Lake

In the lake report, MQI's consultant Omni Environmental proposes the placement of rip-rap over the entire bottom of the lake. This will necessitate the importation of approximately 190,000 yds^3 of material. We find no plausible environmental, ecological or limnological reason for doing so and are strongly opposed to this design element of the lake plan. While the placement of rip-rap and stone along the lake's immediate edge has some benefit, this can be limited to the final 25' of lake shoreline. Additionally, as was detailed by Princeton Hydro in our review of earlier (2003 and 200) reclamation plans, the creation of randomly placed deeper water (5-10') fish habitat can be accomplished with the boulders and rock already present on the site.

Within the lake report, and as part of the testimony provided by MQI's consultants, the stated purpose of the rip-rap is as follows:

- Nutrient and sediment removal
- Stability of the lake edge
- Fish habitat
- Goose control

None of these are viable reasons to support the importation of the approximately 190,000 yds^3 of rip-rap.

First, in terms of nutrient and sediment control, this will be accomplished by the construction of the bioretention basins, the planting of the Upland Meadow and further stabilization of the MOA area. Rip-rap has no nutrient removal capability. With respect to sediment control, again MQI has stated in the supporting reports and plans that the bioretention basins will initially be utilized as sediment settling BMPs. In combination with this, MQI would be far better served installing silt fencing at the toe of disturbed areas, seeding and vegetatively stabilizing exposed areas or areas slated for regrading, and in general implementing the standard erosion and sediment control practices required buy the Morris County Soil Conservation District. It also needs to be emphasized that during the initial stages of the lake's filling, those portions of the quarry that will be flooded already largely consist of exposed bedrock. Placement of rip-rap over these areas (essentially covering rock with more rock) provides no stability or erosion control value. Even in the intermediate areas of the lake that will be filled later on, MQI could easily remove extraneous non-compacted soils elsewhere on the site; which is in keeping with their overall grading and site preparation plans for the entire quarry.

Second, with respect to shoreline stability, we agree that at the final stage of the lake's filling the use of rip-rap to create a 25' wide perimeter has some value. Typically we would not advocate such a uniform, stone lined lake edge. However, for the MQI lake this approach is acceptable. Additionally, in keeping with Princeton Hydro's recommendations of earlier reclamation plans, the applicant will be creating a vegetated riparian buffer area adjacent to the lake. This is reflected in the Davies Vegetation Planning Areas plan (Sheet L-1, dated 13 October 2011), which is also included and referenced in Omni Environmental's lake report. The vegetated riparian buffer in itself will greatly add to the overall stability of the lake's edge, and if done

correctly could effectively negate, or significantly reduce, the need for rip-rap along the entirely of the lake's edge.

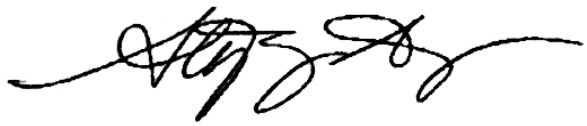
Third, the rip-rap can provide some fish habitat, but the value and utility of this habitat is largely limited to the upper reaches of the lake; specifically what would be termed the lake's littoral zone. This is the area of the lake that has the greatest fishery potential with respect to spawning, nursery and foraging activity. The MQI data shows that even under existing conditions those portions of the lake deeper than 3-4 meters (approximately 10-13 feet) either do not have enough dissolved oxygen, or are devoid of dissolved oxygen (anoxic). These deeper reaches of the lake therefore do not have any fish habitat value. Thus, covering the entire lake bottom with rip-rap serves no practical purpose from the position of creating fish habitat. During the earlier stages of the lake's filling there will be no or very few fish in the lake. As such, proposing the introduction of the rip-rap to create fish habitat during the filling process again is not supported from the position of it having a benefit to the lake's fishery.

The final reason provided for the placement of rip-rap is to control the use of the lake by Canada geese. The lake report states that the geese prefer not to walk on the rip-rap and thus lining the edge of the lake with rip-rap will deter goose passage to and from the lake. While we can in part accept this reason, the use of rip-rap for goose control purposes has limited value. References citing the use of rip-rap in this capacity discuss the creation of a steep, high (2-3') embankment using large boulder sized material. These same references also caution that the creation of such a steeply sided rip-rap edge could result in the creation of nesting habitat for other problematic water fowl. At most, the only practical use of the rip-rap in this capacity would be directly along the lake's shore; not at significant depths below the water's surface. As illustrated in the accompanying photo, the creation of a rip-rap edge does not guarantee goose control. This photo shows a pond where rip-rap has been placed to correct and control slope erosion caused by goose traffic and foraging.

The use of the riparian buffer plantings, again if conducted properly, will create a far more effective and sustainable means of controlling the use of the lake by Canada geese than will the use of rip-rap. As such, the importation and placement of fill as proposed by MQI as part of the lake's long-term management serves no viable purpose with respect to goose control or management.

This concludes our report on the reports, materials, plans and testimony thus far provided by MQI concerning the development of the lake. As previously noted, given that we have not as of yet been provided with all of the data needed to complete our environmental review of this application. We therefore reserve the right to provide additional comment on any of the above or other issues that may arise with the submission of subsequent reports or testimony. I will be prepared to provide testimony concerning this report at a later date.

Sincerely,



Stephen J. Souza, Ph.D.
President, Princeton Hydro, LLC

cc: For Distribution