



June 30, 2020

City of Wheeling  
1500 Chapline St., Room 305  
Wheeling, WV 26003

Attention: Mr. Thomas Connelly, AICP  
[tconnelly@wheelingwv.gov](mailto:tconnelly@wheelingwv.gov)

Reference: **Geotechnical Evaluation**  
**GC&P Development Planning Commission Application Review**  
Wheeling, West Virginia  
S&ME Project No. 1195-20-002

Dear Mr. Connelly:

S&ME, Inc. (S&ME) is pleased to submit the results of our geotechnical evaluation for the GC&P Development Planning Commission Application Review in Wheeling, West Virginia. The purpose of this geotechnical evaluation is to review available data submitted as part of the Planning Commission application for GC&P Development and provide you with guidance on geotechnical engineering related items. We conducted this evaluation in general accordance with our Revised Proposal No. 11-2000131, dated May 12, 2020, which was authorized by the City of Wheeling on May 14, 2020. This report presents our understanding of the project, site reconnaissance findings, document review comments, and additional geotechnical considerations.

S&ME appreciates the opportunity to be of service to you on this project. We look forward to helping you through project completion. If you have any questions, please call.

Sincerely,

**S&ME, Inc.**

Handwritten signature of Benjamin C. Dusina in blue ink.

Benjamin C. Dusina, PE  
Senior Engineer

Handwritten signature of Richard T. Wilson in purple ink.

Richard T. Wilson, PG  
Senior Geologist

Handwritten signature of Ghassan H. Suwaid in black ink.

Ghassan H. Suwaid, P.E., PMP, DBIA  
Transportation Program Manager

Attachments: Site Photographs



## ◆ Introduction

S&ME is pleased to submit the results of our geotechnical evaluation completed for the GC&P Development Planning Commission Application Review in Wheeling, West Virginia. The purpose of this geotechnical evaluation is to review available data submitted as part of the Planning Commission application for GC&P Development and provide you with guidance on geotechnical engineering related items. This report presents our understanding of the project, site reconnaissance findings, document review comments, and additional geotechnical considerations.

## ◆ Site and Project Description

We understand the majority of the subject property is located east of WV-88 (Bethany Pike) and north of US-40 (National Road) in Edgewood, West Virginia and is currently zoned as R-1A (Residential, Single-family – Low Density) by the City of Wheeling. Based on our discussion with you, we understand that GC&P Development has submitted an Application for Creation of Special Area Plan & Comprehensive Plan Amendment to develop the property into a mixed-use development that would include commercial, residential, office, and educational/institutional uses.

The existing site extends up from the surrounding site to a ridgetop near the center of the site. The surficial conditions ranged from sparsely vegetated to heavily wooded. Relief from the ridgetop (approximate El. 1150) to the housing development to the south (approximate El. 750) is approximately 400 feet. We understand that the mixed-use development subgrade level is planned around El. 950.

## ◆ Field Reconnaissance

Mr. Richard T. Wilson, PG with S&ME performed a site reconnaissance on May 20, 2020. Mr. Wilson observed significant amounts of colluvium present at critical locations such as Pad A, Pad B, and the multiple entrance roads. Mr. Wilson also observed the presence of stained (orange) water seeping from the colluvium behind the 3C church. The presence of what could be acid mine drainage (AMD) may indicate the abandoned coal mine in the Pittsburg coal seam buried by the colluvium is introducing water into the colluvium. The water would tend to destabilize the soil slope. We are unable to provide an opinion regarding the quantity of the water present in the abandoned mine.

## ◆ Document Review

S&ME completed the review of the following documents: Preliminary Geotechnical Report: Larson Design Group (LGD) (Exhibit 11a), The Thrasher Group (TTG) Geotechnical Summary (Exhibit 11), Public Email Correspondence Set 6, Batch 8, pages 159-161, Stormwater Management Plan (Map Nos. 60 and 61). We also used the following maps to get oriented with the site and plan: Map Nos. 6, 29, 29a, 29b, 29c, 30, 31, 32, 40, 58, 80, and 81a. Some of the geotechnical reports are labeled as preliminary reports, and while they offer general guidance are insufficient for the final design of this development site. The assumptions, guidelines and general recommendations need to be investigated, confirmed, or modified based on specific site data acquired prior to the start of any on-site construction. Based on our review of the previously mentioned documents, we provide the following comments:



## Exhibit 11a – Geotechnical Report – Larson Design Group

- ◆ **We recommend an exploration program in this lithologic interval be developed and executed.** These soil samples and rock cores are specifically to analyze the soil and rock materials present, perform an engineering analysis to aid in cut slope design recommendations of the entrance roads to the site. The geology between the planned final rough grade of the site estimated elev. 940 ft. to 950 ft. and near the beginning of entrance roadway estimated elevation 720 ft. is described in general terms in Exhibit 11a. However, no roadway profiles, cross sections or site-specific geotechnical data is included in any of the documents to support design recommendations for the access road to the development site. Exhibit 11a does mention the presence of acid mine drainage (AMD), therefore, selected cores will be analyzed for acid-base accountability study to assess acid runoff potential from the roadway cuts. If acidic rock is present develop a plan to mitigate the AMD.
- ◆ **We recommend a thorough geotechnical engineering exploration and testing program that include additional geotechnical borings.** Three rock cores (B-1, B-2, B-3) and the stratigraphic profile developed from the core logs are provided in the report. They cover the lithologic interval from the highest point on the proposed development site to the rough final grade. While this information is sufficient in the design of a coal extraction plan it lacks critical information for the geotechnical engineering design of rock cut slopes, design of waste areas, undercuts and embankments in the proposed development. Additionally, the geotechnical scope should laboratory strength testing of the soil and rock and slake durability index testing (SDI) to ascertain the shales long term durability. **Acid-Base Accountability is recommended on the rock cores to assess if special treatment of the excavated rock will be required when placed in the excess material storage sites.**
- ◆ **We would recommend a geotechnical study be performed prior to the construction of any permanent embankments or cut slopes.** The site plan and profile proposed in the report indicates a permanent highwall at the back of the development from the proposed rough final grade to the groundline. Also, noted in the report are embankments proposed in other areas downslope of the rough final grade. In our opinion, the information provided within the documents is insufficient to design and construct stable rock cut slopes and fill embankments. This should include an exploration plan with multiple rock cores spaced at a maximum of 500-foot intervals where highwalls are to remain after site excavation is completed and are to be used in the design of specific cut slopes. Each proposed embankment should have borings and slope stability analyses performed. The benefit of this approach is construction of these permanent cuts and embankments could be incorporated in the initial design providing for a more cost effective and stable final design.
- ◆ The 0.5H:1V overall cut slope highwall, and 2H:1V embankment slope recommendations in the LDG report for the approach road, final highwall, and sidehill fills in this geology is optimistic at this level of preliminary design in the absence of more specific geotechnical information. Based on our experience and at this level of available information, we would recommend for estimation purposes (quantities, right of way, etc.), utilizing 1.25:1 overall cut slope and a 2.5:1 embankment slope. Once more detailed information is obtained and analyzed these slopes can be refined, if necessary.
- ◆ Installation of water wells was recommended by LDG to evaluate the AMD within the Pittsburgh coal seam. Have the water wells been installed?
- ◆ Existing sediment ponds were present during the LDG site reconnaissance. Who maintains these ponds?



- ◆ Evidence of instability (e.g., sloughing of surficial material and bowed trees) features were observed and included as Photographs 2, 3, and 12. Additionally, LDG noted the presence of colluvium soils and the Monongahela and Conemaugh Groups. Constructing embankments on existing slopes consisting of colluvium and/or the Monongahela/Conemaugh Groups should be done only after a geotechnical evaluation has been performed with specific geotechnical borings, laboratory testing, and slope stability analyses. Colluvium slopes and the Monongahela and Conemaugh Groups are known to be unstable if not properly evaluated and dealt with during construction.
- ◆ Mine subsidence of the Pittsburgh coal seam could affect the planned development and should be further evaluated

### **Exhibit 11 – Geotechnical Summary – Thrasher**

- ◆ TTG report indicates that excavated material will be exported from the site. Have waste areas been designated and designed? The waste area design and drawings should be made available to the City of Wheeling for review.
- ◆ TTG does not offer an opinion on the stability of the planned rock cut highwall, or the planned embankment fills. TTG does not address the risk related to mine subsidence.
- ◆ Deep overburden encountered below El. 950 in test pits. Slope stability analyses of embankment slopes should be performed.
- ◆ **Additional geotechnical explorations, laboratory testing, and engineering analyses should be performed to address these items.**

### **Public Emails – Correspondence Set 6, Batch 8, Pages 159-161**

- ◆ We concur with Mr. Sandin E. Phillipson, Ph.D. that further geotechnical exploration and evaluation be performed to assess the slope stability of the southern facing slope. We also recommend additional geotechnical borings, laboratory testing, and slope stability analyses be performed for embankment slopes shown on Map Nos. 29, 29a and 29b.
- ◆ We concur with Mr. Sandin E. Phillipson, Ph.D. that the stability of the proposed cut slope should be evaluated with additional geotechnical explorations, laboratory testing, and engineering analyses.
- ◆ We concur with Mr. Sandin E. Phillipson, Ph.D. a risk exists for subsidence of the Pittsburgh coal seam and further investigation of the abandoned mine should be performed to properly assess the risk.

### **Map Nos. 60, 61, 80 & 80a – Stormwater management plan, Stormwater – pre/post-construction drainage area management plan, and Existing & Proposed Hydrology**

- ◆ These drawings generally show the existing and planned development but do not show the intermediate stormwater plans during site development. Controlling stormwater during site development is a critical measure to protect the surrounding properties and environment.
- ◆ Map Nos. 80 and 80a show the general configuration of the ridgeline before and after development. The ridgeline moves from the center of the site to the south. How is the stormwater going to be controlled prior to the site being excavated to El. 950 and the final stormwater retention/detention ponds installed?



## ◆ Geotechnical Considerations

The review of the data provided in the exhibits and our field observations emphasize this development is missing critical geotechnical information for an adequate design of this development. In our opinion the following need to be addressed as part of the design submittal:

- ◆ Additional geotechnical exploration, testing and analyses are required for final design of cut slopes for the development.
- ◆ There is a large amount of colluvial deposits present within the area of influence on the proposed roadways, Pad "A" and Pad "B". We recommend these colluvial areas, and others if identified, that are impacted by the development and its associated activities be evaluated and specific design recommendations developed to ensure the long-term stability of the slopes.
- ◆ Embankment fills slopes are shown to be constructed over existing slopes. No geotechnical evaluation has been performed in these areas. Additionally, no benching configuration is shown between the planned embankment and existing slopes. We recommend geotechnical explorations and evaluation be performed for the planned embankment areas to address their long-term stability and the plans should include details for embankment benching where new fill is placed against existing fill
- ◆ Investigate the abandoned coal mine in the Pittsburgh coal seam to evaluate the risk of potential subsidence under the development.
- ◆ Performing core borings through the middle of the ridgetop can overestimate the engineering properties of bedrock that will be located within the cut areas near the edge of the ridgetop. Bedrock near the edges of the ridgetop will experience greater amount of weathering than the bedrock found in the middle of the ridgetop.
- ◆ Further geotechnical exploration and analyses should include the design of cut slopes, impact of colluvium on the stability of the site and, the potential impoundment of water in the underground mine works Specific recommendations addressing each of these areas should be provided.
- ◆ In reviewing the documents, the earthwork balance indicated roughly 240,000 cubic yards of material will be used as refill onsite and the site will generate 8.9 million of excess excavation. This will result in the developer needing storage areas for the 8.9 million cubic yards of excavated materials (i.e. waste areas). These excess material storage sites (waste areas) were not identified within the documents reviewed. Furthermore, designs for these waste areas were not discussed in the reports. We recommend plans and design calculations be provided to the City of Wheeling for review. These documents need to include environmental documents of existing conditions at the waste area site(s), stormwater management, and geotechnical design of the waste area site(s).
- ◆ Material being excavated at the development (above approximately elev. 950 ft.) needs to be tested for the potential to generate acidic water. An Acid-Base Accounting should be performed to quantify the risk and serve as a basis for mitigation.
- ◆ The geotechnical testing of the rock core obtained for cut slope design should include 2-cycle Slake Durability Index (SDI) testing on each lithology at 5-foot intervals for the shales and siltstones. SDI information is critical in assessing the long-term stability of rock cut slope designs (both back slope angle and bench locations).
- ◆ Considering the excavation of the development and roadway will likely be done with explosives the potential for damage to structures surrounding the development is possible from the blasting. S&ME



recommends that the City of Wheeling require the contractor perform a pre-blast survey of all structures, retaining walls, and roadways that could be affected by the blasting operation.

- ◆ The City of Wheeling should require that the contractor furnish seismographs to monitor the actual peak particle velocity generated by each blast so a comparison can be made against a specified maximum peak particle velocity.



## **Attachments**



		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
<b>1</b>	<b>Location / Orientation</b>	Overview of site
	<b>Remarks</b>	Site mostly vegetated

		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
<b>2</b>	<b>Location / Orientation</b>	Overview of the site
	<b>Remarks</b>	Site partially vegetated



		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
<b>3</b>	<b>Location / Orientation</b>	Overview of site
	<b>Remarks</b>	Site partially vegetated

		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
<b>4</b>	<b>Location / Orientation</b>	Behind 3C Church, near Station 20 of Profile C
	<b>Remarks</b>	Acidic mine drainage



		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
5	<b>Location / Orientation</b>	Base of hill near station 30 of Profile C
	<b>Remarks</b>	Colluvial deposits present

		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
6	<b>Location / Orientation</b>	Behind Greenhouse off Waddles Run
	<b>Remarks</b>	Proposed revegetated slope with colluvial deposits



		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
7	<b>Location / Orientation</b>	Slope adjacent to Bethany Pike
	<b>Remarks</b>	Colluvial soil present

		Date: 5/20/2020  Photographer: Richard T. Wilson, PG
8	<b>Location / Orientation</b>	Entrance Roadway from Bethany Pike
	<b>Remarks</b>	Colluvial soils present



<b>9</b>	<b>Location / Orientation</b>	Entrance Road from Bethany Pike	
	<b>Remarks</b>	Showing colluvial slopes	

  

	Date: 5/20/2020  Photographer: Richard T. Wilson, PG
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