Hanover

Engineering Associates Inc

June 30, 2015

Mr. Jack Cahalan, Manager
Lower Saucon Township
3700 Old Philadelphia Pike
Bethlehem, PA 18015

RE: Investigation of Undermined Area of
Riverside Drive at PennDOT Repair Location
Hanover Project LS90-7

Dear Mr. Cahalan:

In accordance with direction received from Lower Saucon Township, I have completed an investigation of the above-referenced section of Riverside Drive, in the area known locally as the Narrows, in Lower Saucon Township. The field portion of this investigation was conducted on June 25, 2015 and was combined with the usual monthly landfill inspection on that day. I have the following to report.

The area where the roadbed of Riverside Drive is undermined is situated approximately three hundred feet (300') to the east of the high tension electric line crossing, and is depicted on the attached topographic plan as "Area of Undermining" (see Attachment 1). This area is near a high point in the roadway, and does not contain any stormwater conveyance structures. As shown on the plan, this area is directly downslope of the landfill, but does not correspond with any channels or ravines on the slope above it that would carry runoff from the landfill to this area. Such channels are clearly depicted on the plan hundreds of feet to the east and west of this location. But the topography on the slope above this location is "raised", which would serve to shed water away from this location rather than directing it to this location.

The conditions around this area were observed and photographed (see Attachment 2 for photographs). As can be seen, the undermining has created a small hole in the pavement surface, approximately one by two feet (1' x 2') in size, which opens to the bank below. The southern side of Riverside Drive in this area is bordered by a near-vertical wall of competent bedrock. A very small amount of soil and rock debris on the road surface was observed, approximately twenty-five feet (25') east of, and upslope of, the undermining.

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ROUTING
- ☒ Council
- ☒ Manager
- ☐ Asst. Mgr.
- ☐ Zoning
- ☐ Finance
- ☐ Police
- ☐ P. Works
- ☐ P/C
- ☐ P & R
- ☐ EAC
- ☐ Engineer
- ☐ Solicitor
- ☐ Planner
- ☒ Landfill
- ☐ EMC
- ☒ Other

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PennDot Freeman Boscola Simmons

The northern side of Riverside Drive in this area is bordered by a steep bank that drops down to the adjacent Norfolk Southern Railroad right-of-way. This bank was observed from the railroad bed. An outcrop of dolomite bedrock was observed at the face of the bank in this area. A distinct fracture zone in this bedrock was observed directly under the undermined area of the road bed. This fracture zone consisted of thinly-bedded, shaly dolomite which was highly weathered and eroded and contained a large amount of soil in the fractures. By comparison, the bedrock on either side of this fracture zone was thickly-bedded, competent, and only slightly weathered. A concrete wall was built along the road bed, spanning the fracture zone and anchoring to the competent bedrock on either side of it.

Based on all of the above, it is my professional opinion that the undermining of the roadway is due to a soft fracture zone in the underlying bedrock, which is being eroded by stormwater runoff

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coming from the immediate area of the undermining. It is my further opinion that no concentrated runoff of stormwater from the landfill facility is reaching this area to cause or worsen this situation.

Please be advised that, while traveling along Riverside Drive to conduct the above investigation, I encountered another condition that I must bring to your attention. Just inside the entrance to the Narrows, approximately five hundred feet (500') west of the high tension electric line, a large amount of sediment and rock were observed to be washed out onto Riverside Drive. This area is depicted on the attached topographic plan as "Area of Washout" (see Attachment 1). The conditions around this area were observed and photographed (see Attachment 3). At this location, a prominent eroded channel was observed in the bank on the south side of Riverside Drive and extending southward up the slope. The washout of material continued across Riverside Drive, down the northern bank of the roadway, and onto the railroad right-of-way. Evidence indicated that sediment had washed across both sets of railroad tracks (sediment was visible on the rail bed between the ties). This washout is located approximately one hundred feet (100') west of the "Speed Limit 25" sign, and is the same location referenced by Mr. Ronald Young of PennDOT in his e-mail dated June 25, 2015 (see Attachment 4).

In the area of the speed limit sign, there are hazard markers along the southern edge of the roadway and a sump filled with sediment in the roadside ditch. Opposite this to the north, there is a sump in the ditch along the railroad tracks. Finally, there is the outlet of a twenty-four inch (24") square concrete culvert on the north bank of the railroad bed, above the Lehigh River. This evidence seems to indicate the presence of inlets along Riverside Drive and along the railroad bed, which are filled and clogged with sediment. I suggest that, while PennDOT and Norfolk Southern are collaborating on the repair of the undermined area (as indicated in Mr. Young's e-mail), they should also conduct work to find, clear and reopen these inlets.

Following the investigation described above, I conducted my regular monthly inspection of the landfill facility. As part of this, I conducted an inspection of the north slope road. I observed a large amount of recent erosion along the entrance to this road, continuing along the western leg of the road. I observed a concrete "sluice" along the north side of the road which physical evidence indicates served to direct stormwater runoff northward, toward a natural swale that was observed in the field and which is depicted on the topographic plan. This swale starts at the northern property line of the facility, and proceeds down the slope (northward) across the neighboring properties. The area of the washout along Riverside Drive is directly down slope of this swale. Based on the above, I conclude that a large amount of the stormwater runoff that caused the washout on Riverside Drive originated from the northwest portion of the landfill facility, an area which does not have detention basins to control and slow the rate of runoff.

If you have any comments or questions, please do not hesitate to call me immediately.

Respectfully,

HANOVER ENGINEERING ASSOCIATES, INC.

Christopher A. Taylor, PG

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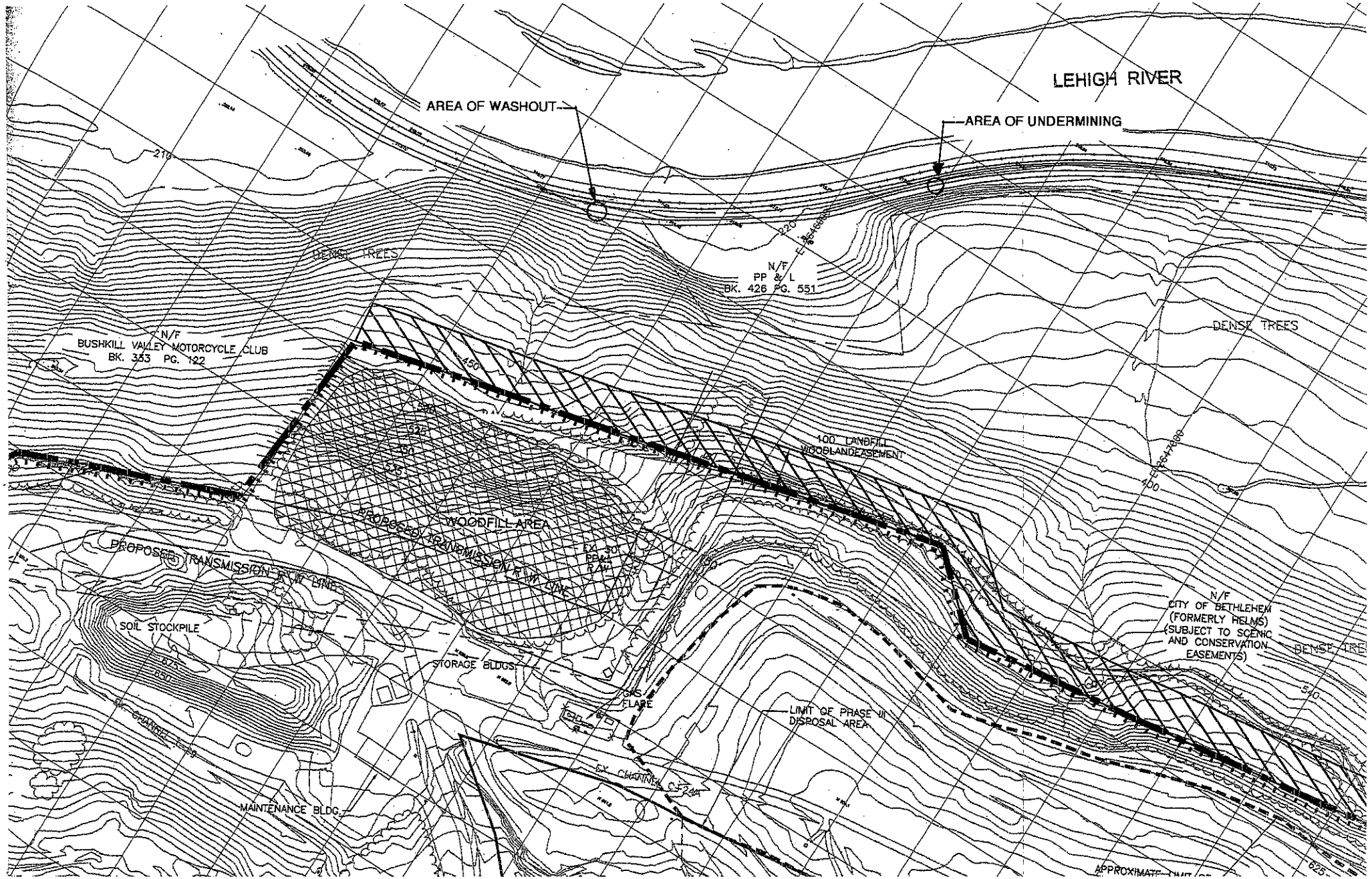
Enclosure(s)

ATTACHMENT 1

TOPOGRAPHIC PLAN


LEHIGH RIVER
AREA OF WASHOUT
AREA OF UNDERMINING
DENSE TREES
N/F
PP & L
BK. 426 PG. 551
N/F
BUSHKILL VALLEY MOTORCYCLE CLUB
BK. 353 PG. 122
100' LANDFILL
WOODLAND EASEMENT
PROPOSED WOODFILL AREA
PROPOSED TRANSMISSION R/W LINE
SOIL STOCKPILE
STORAGE BLDGS.
GAS FLARE
LIMIT OF PHASE III
DISPOSAL AREA
MAINTENANCE BLDG.
N/F
CITY OF BETHLEHEM
(FORMERLY HELMS)
(SUBJECT TO SCENIC
AND CONSERVATION
EASEMENTS)
APPROXIMATE

ATTACHMENT 2

SITE PHOTOGRAPHS OF AREA OF UNDERMINING

2-1. Overall view of Riverside Drive in the area of undermining, showing hole in road surface (foreground) and small amount of outwash onto roadway (background).

2-2. Close-up of hole in road surface, showing that it extends to daylight below.

2-3. Close-up of small amount of outwash onto road surface just upslope of area of undermining.

2-4. View of northern bank of roadway at undermined area. Note outcrops of competent dolomite bedrock on either side of undermining and concrete wall anchored to competent bedrock and spanning fracture zone of weathered bedrock.

2-5. Close-up of outcrop of competent bedrock on east side of fracture zone.

2-6. Close-up of outcrop of competent bedrock on west side of fracture zone.

2-7. Close-up of fracture zone in bedrock and undermining of concrete wall constructed to span it. Note thin-bedded and highly weathered nature of the bedrock in the fracture zone.

2-8. Close-up of soil and soft rock material eroded from the fracture zone and lying on the railroad bed at the base of the roadway bank.

ATTACHMENT 3

SITE PHOTOGRAPHS OF AREA OF WASHOUT

3-1. Overall view of Riverside Drive in the area of washout. Note relation of area to speed limit sign and hazard markers next to speed limit sign.

3-2. Looking south from Riverside Drive at the washout location, showing the eroded channel on the slope heading southward.

3-3. Looking south from the railroad bed across Riverside Drive at the washout location, showing soil and rock material deposited on the north bank of the roadway.

3-4. Looking north across the railroad bed at the washout location, showing soil and rock material deposited across both sets of tracks. Note large pile of soil and rock pushed up by machinery on the far (north) side of the rail bed.

3-5. Looking east along juncture of railroad bed and road bank at outwash location, showing soil and rock material deposited.

3-6. Looking south across Riverside Drive at location of hazard markers that may mark a culvert or inlet along the south side of the roadway.

3-7. Close-up of "sump" in ditch along rail bed at bottom of roadway bank. This is opposite the location of the hazard markers on Riverside Drive and may indicate the presence of a culvert or inlet at this location.

3-8. On the IESI landfill property, looking north along entrance to north slope road, showing erosion channel in road bed cause by stormwater runoff.

3-9. Close-up of erosion channel on north slope road on IESI property.

3-10. Looking east along western leg of north slope road, showing rock material deposited by stormwater runoff.

3-11. Looking west along western leg of north slope road, showing beginning of concrete "sluice" which directs stormwater runoff to the north toward a natural swale on the north slope.

3-12. Close-up of end of concrete sluice and beginning of natural swale on the north slope.

3-13. Showing second location where stormwater leaves north slope road and runs northward toward natural swale.

3-14. View downhill of the concrete "sluice", showing soil and rock material eroded by stormwater runoff coming from north slope road.

3-15. View downhill of second runoff location, showing soil and rock material eroded by stormwater runoff coming from north slope road.

3-16. Looking north across IESI property line showing natural swale running northward toward Riverside Drive. Stormwater runoff from the north slope road concentrates at this location.

ATTACHMENT 4

E-MAIL FROM PENNDOT

Zimbra **ctaylor@hanovereng.com**

Riverside Drive "Narrows" update

From : Diane Palik <AdminAsst@lowersaucontownship.org> Thu, Jun 25, 2015 02:44 PM

Subject : Riverside Drive "Narrows" update 1 attachment

To : Jack Cahalan <manager@lowersaucontownship.org>, David Willard <stixny@aol.com>, David Willard <DWillard@lowersaucontownship.org>, Glenn Kern <GKern@lowersaucontownship.org>, Glenn KernForward <glennckern@gmail.com>, Priscilla deLeon <deLeon.Priscilla@gmail.com>, Priscilla deLeon (E-mail) <pmdeleon@aol.com>, Priscilla deLeon <pdeleon@lowersaucontownship.org>, Ron Horiszny <RHoriszny@lowersaucontownship.org>, Ron Forward <rwhoriszny@hotmail.com>, Tom Maxfield (E-mail) <kmax@enter.net>, Tom Maxfield <TMaxfield@lowersaucontownship.org>, aschleyer@iesi.com, Chris Garges <zoning@lowersaucontownship.org>, Chris Taylor <ctaylor@hanovereng.com>, Donna Louder <dlouder2013@gmail.com>, Haz Hijazi (thehijazis@hotmail.com) <thehijazis@hotmail.com>, Jake Schray <jschray@hanovereng.com>, Jim Birdsall (E-mail) <jbirdsall@hanovereng.com>, Lauressa McNemar <lmcnemarpe@verizon.net>, Rich Sichler <rsichler@msn.com>

Cc : Leslie Huhn <asstmgr@lowersaucontownship.org>

From: Young, Ronald (PENNDOT) [mailto:RONYOUNG@pa.gov]
Sent: Thursday, June 25, 2015 1:28 PM
To: Priscilla deLeon; Priscilla DeLeon (deLeon.Priscilla@gmail.com); Rep. Robert Freeman (rfreeman@pahouse.net)
Cc: Jack Cahalan; Krause, Jill; Rebert, Michael W; Brown, Sean A; Vanscavish, Rodney; Campanaro, Shawn; Hubbard, Jack W; Ken Luybli; (KDERR@pasenate.com)
Subject: Riverside Drive "Narrows" update

All,

A site meeting was conducted yesterday at State Route 2014/Riverside Drive (AKA Narrows) to discuss plans to excavate the roadway to see what is underneath to be able to come up with options for repairs.

Attendees included staff from PennDOT and Norfolk Southern Rail Road.

The PennDOT maintenance staff anticipates performing preliminary excavation work on or around July 7th. All work will be done during railroad track outage windows, 2 hours in AM and 4 hours in PM. The

Norfolk Southern Rail Road will assisting the PennDOT Northampton County Maintenance forces.

First they will attempt to break-up the concrete wall and then drop the wall down to the bottom of the slope. Norfolk Southern, with the use of their log picker machine, will pick up the pieces of the concrete wall and move them to another location.

PennDOT maintenance will then peel back the roadway and excavate down to see what is underneath, and use that information to determine what possible fixes can be done to restore the roadway.

While at the site, they noticed a hole has opened up in the roadway surface in this location, most likely due to the recent rain events (see attached photo).

Norfolk Southern is being very cooperative and willing to assist in any way possible.

On a side note, yesterday they noticed another large washout onto the roadway (same location as when Ivan hit). A large amount of sediment, rock, etc. washed onto the roadway from the uphill side of the mountain. The roadway surface is also slightly buckled.

Regards,

Ronald J. Young, Jr., M.P.A. | District Press Officer
PA Department of Transportation
Engineering District 5
1002 Hamilton Street | Allentown PA 18101
Phone: 610.871.4555 | Fax: 610.871.4126
ronyoung@.pa.gov | www.dot.state.pa.us
District 5 Website

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