



**EARTH
ENGINEERING
INCORPORATED**
Geotechnical Engineers & Geologists

June 3, 2015
EEI Proposal No. BB-14292

Mr. Guy Wolfington
O'Neill Properties Group
2701 Renaissance Blvd., 4th Floor
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**Re: Malin Road Development
Malvern, Pennsylvania**

Dear Mr. Wolfington:

As requested, Earth Engineering Incorporated (EEI) has reviewed the available geologic information provided from the investigations conducted as part of the former Bishop Tube Site, located on Malin Road in Malvern. This information was reviewed to determine if the project site is underlain by karst geology. The karst geology issue is relevant to the stormwater management of the proposed development.

Review of the information provided indicates that the former Bishop Tube Site is underlain by calcareous schist/phyllitic calcareous schist bedrock. EEI was provided with copies of the installation logs for wells installed by Baker Environmental in the first quarter of 2003. Wells MW25 through MW28 all indicate that the underlying bedrock consist of the calcareous schist/phyllitic calcareous schist bedrock. MW28 was installed north of the property boundary, behind the Taylor Rental store located on Lancaster Avenue. In MW28 the schist was encountered at a depth of 25 feet and continued to the well termination depth of 252 feet.

Based on the subsurface information provided, EEI concludes that, the site is underlain by calcareous schist/phyllitic calcareous schist bedrock. Consequently, the site is not underlain by limestone or karst geology. The stormwater management system can be designed accordingly. Earth Engineering Incorporated trusts this information is responsive to your request. If you have any questions or require additional information, please call.

Sincerely,
EARTH ENGINEERING INCORPORATED

Patrick M. McNamara, P.E.
Director – Geotechnical Investigations

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MONITORING WELL CONSTRUCTION RECORD

PROJECT: **BISHOP TUBE SITE**

PROJECT NO.: 101128 Task 03009

WELL NAME: **MW25**

COORDINATES: NORTHING: 10353.84

EASTING: 10235.52

ELEVATION: SURFACE: 384.40

Rig: Air Rotary

| Borehole Size | Start Date | End Date | Progress (ft) | Remarks |
|------------------------------|------------|-----------|-----------------|---|
| 6-inch Diameter HSA Drilling | 12/9/2003 | 12/9/2002 | Drill 0'-16' | FLUTE [®] NAPL Liner deployed on 12/09/2002. |
| 6-inch | 1/30/2003 | 2/5/2003 | Drill 0'-282' | Set 6-inch temporary casing 0'-7' on 02/05/2003. |
| 15-inch | 2/19/2003 | 2/20/2003 | Drill 0'-24.5' | Set and grouted 12-inch casing on 02/20/2003. |
| 12-inch | 2/21/2003 | 2/21/2003 | Drill 25'-100' | Set and grouted 8-inch casing on 02/21/2003. |
| 8-inch Reaming | 2/24/2003 | 2/24/2003 | Drill 100'-282' | Ream 6-inch diameter hole to 8-inch diameter. |
| Well Construction | 2/25/2003 | 2/26/2003 | - | Well construction began 02/25/2003. |
| Gauge Static Water Levels | 3/21/2003 | 3/21/2003 | - | A (19.37'), B (19.37'), C (19.39') |

Remarks:

MW25 is a multi screened monitoring well with three separate screened intervals (A, B, & C). The well is located along the north side of Building #8 . PID background 0 meter units. Well completed at surface using a 3-foot stick-up of 8-inch diameter steel casing.

WELL INFORMATION

| Construction Details | | | Elevations | Diameter (in.) | Top Depth (Ft.) | Bottom Depth (Ft.) |
|-------------------------------------|---|--|--------------------------|----------------|-----------------|--------------------|
| Portland Cement Grout - 1' to 25.5' | | Steel Casing | 384.40 Ground Surface | 12 | 0 | 25.5 |
| Portland Cement Grout - 1' to 100' | | Steel Casing | 387.09 Stick-up | 8 | +3 | 100 |
| Bentonite Seal - 6'-102' | A | Well Casing --Schedule 40 PVC | 386.73 | 2 | +3 | 106 |
| # 2 Morie Sand - 102'-120' | | Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | Top of PVC | | 106 | 116 |
| Bentonite Seal - 120'-205' | B | Well Casing --Schedule 40 PVC | 386.71 | 2 | +3 | 212 |
| # 2 Morie Sand - 205'-224' | | Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | Top of PVC | | 212 | 222 |
| Bentonite Seal - 224'-265' | C | Well Casing --Schedule 40 PVC | 386.74 | 2 | +3 | 272 |
| # 2 Morie Sand - 265'-282' | | Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | Top of PVC | | 272 | 282 |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | Lab Sample ID No. | PID meter units | Visual Description | Well Installation Detail | Elevation (Ft.) |
|-------------|-------------------|---------------------|-------------------|-----------------|--|--------------------------|-----------------|
| | | | | | | | 384.40 |
| 1 | | | | | 0-2' - Limestone gravel and soil. | | 1 |
| 2 | | | | | 2'-18' - Clayey silt, brown (10 YR 4/3), moist, firm; rock/gravel fragments (2-5 mm). 0 units | | 2 |
| 3 | | | | 3 | | | |
| 4 | | | | 4 | | | |
| 5 | | | | 5 | | | |
| 6 | | | | 6 | | | |
| 7 | | | | 7 | | | |
| 8 | | | | 8 | | | |
| 9 | | | | 9 | | | |
| 10 | | | | 10 | | | |
| | | | | | Match to Sheet 2 | | |

DRILLING CO.: Uni-Tech Drilling Company, Inc.

BAKER REP.: David Fekete and Peter Farrand

DRILLER: Jim Evans

WELL NO.: MW25

SHEET 1 OF 15

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **BISHOP TUBE SITE**

PROJECT NO.: 101128 Task 03009

WELL NAME:

MW26

COORDINATES: NORTHING: 10421.76

EASTING:

10552.45

ELEVATION: SURFACE: 383.00

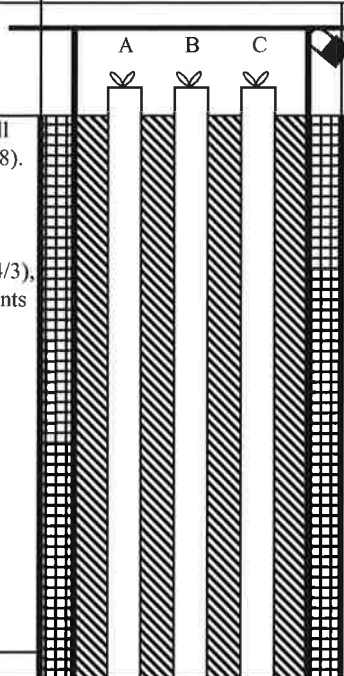
| Rig: Air Rotary | | | | |
|---------------------------|------------|-----------|----------------|---|
| Borehole Size | Start Date | End Date | Progress (ft) | Remarks |
| 6-inch | 1/8/2003 | 1/9/2003 | Drill 31'-250' | Set 6-inch temporary casing 0'-31' on 01/08/2003. |
| 15-inch | 1/6/2003 | 1/7/2003 | Drill 0'-31' | Set and grouted 12-inch casing on 01/08/2003. |
| 12-inch | 1/14/2003 | 1/14/2003 | Drill 31'-85' | Set and grouted 8-inch casing on 01/14/2003. |
| 8-inch Reaming | 1/15/2003 | 1/15/2003 | Drill 85'-250' | Ream 6-inch diameter hole to 8-inch diameter. |
| Well Construction | 1/17/2003 | 3/3/2003 | - | Well construction began 01/17/2003. Difficulty breaking bridge at 111'-118'. |
| Gauge Static Water Levels | 3/21/2003 | 3/21/2003 | - | A (17.68'), B (17.55'), C (16.56') |

Remarks:

MW26 is a multi screened monitoring well with three separate screened intervals (A, B, & C). The well is located along at the northeast corner of Building #8 . PID background 0 meter units. Well completed at surface using a 3-foot stick-up of 8-inch diameter steel casing.

WELL INFORMATION

| Construction Details | | | Elevations | Diameter (in.) | Top Depth (Ft.) | Bottom Depth (Ft.) |
|--|---|---|--------------------------|----------------|-----------------|--------------------|
| Portland Cement Grout - 1' to 31.5' | | Steel Casing | 383.00 Ground Surface | 12 | 0 | 31.5 |
| Portland Cement Grout - 1' to 85' | | Steel Casing | 386.18 Stick-up | 8 | +3 | 85 |
| Bentonite Seal - 0'-88' # 2 Morie Sand - 88'-111' | A | Well Casing --Schedule 40 PVC Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | 385.94 Top of PVC | 2 | +3 90 | 90 100 |
| Bentonite/Grout Seal - 111'-174' # 2 Morie Sand - 174'-198' | B | Well Casing --Schedule 40 PVC Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | 385.95 Top of PVC | 2 | +3 176 | 176 186 |
| Bentonite Seal - 198'-219' # 2 Morie Sand - 219'-235' | C | Well Casing --Schedule 40 PVC Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | 385.94 Top of PVC | 2 | +3 222 | 222 232 |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | Lab Sample ID No. | PID meter units | Visual Description | Well Installation Detail | Elevation (Ft.) |
|-------------|-------------------|---------------------|-------------------|-----------------|---|---|-----------------|
| | | | | | | | 383.00 |
| | | | | | 8" Diameter Steel Casing Stickup at Surface |  | |
| 1 | | | | | 0'-3' - Limestone gravel and soil (fill from the construction of Building #8). | | 1 |
| 2 | | | | | | | 2 |
| 3 | | | | | 3'-10' - Clayey silt, brown (10 YR 4/3), moist, firm; rock and gravel fragments (2-5 mm). | | 3 |
| 4 | | | | | | | 4 |
| 5 | | | | 0 units | | | 5 |
| 6 | | | | | | | 6 |
| 7 | | | | | | | 7 |
| 8 | | | | | | | 8 |
| 9 | | | | | | | 9 |
| 10 | | | | | Match to Sheet 2 | | 10 |

DRILLING CO.: Uni-Tech Drilling Company, Inc.

BAKER REP.: David Fekete and Peter Farrand

DRILLER: Jim Evans

WELL NO.: MW26

SHEET 1 OF 14

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **BISHOP TUBE SITE**

PROJECT NO.: 101128 Task 03009

WELL NAME:

MW27

COORDINATES: NORTHING: 10156.31

EASTING:

10459.53

ELEVATION: SURFACE: 398.80

| Rig: Air Rotary | | | | |
|------------------------------|------------|------------|----------------|---|
| Borehole Size | Start Date | End Date | Progress (ft) | Remarks |
| 6-inch Diameter HSA Drilling | 12/9/2002 | 12/9/2002 | Drill 0'-39' | FLUTE [®] NAPL Liner deployed on 12/09/2002. |
| 6-inch | 12/10/2002 | 12/12/2002 | Drill 0'-242' | Set 6-inch temporary casing 0'-44' on 12/10/2002. |
| 15-inch | 12/17/2002 | 12/18/2002 | Drill 0'-50' | Set and grouted 12-inch casing on 12/18/2002. |
| 12-inch | 12/19/2002 | 12/19/2002 | Drill 50'-70' | Set and grouted 8-inch casing on 12/19/2002. |
| 8-inch Reaming | 12/26/2002 | 1/2/2003 | Drill 70'-242' | Ream 6-inch diameter hole to 8-inch diameter. |
| Well Construction | 1/3/2003 | 2/21/2003 | - | Well construction began 1/3/2003. |
| Gauge Static Water Levels | 3/21/2003 | 3/21/2003 | - | A (16.36'), B (23.13'), C (16.21') |

Remarks:

MW27 is a multi screened monitoring well with three separate screened intervals (A, B, & C). The well is located in the drum storage area. PID background 0 meter units. Well completed at surface using a 2.5-foot stick-up of 8-inch diameter steel casing.

WELL INFORMATION

| Construction Details | | | Elevations | Diameter (in.) | Top Depth (Ft.) | Bottom Depth (Ft.) |
|-----------------------------------|---|--|--------------------------|----------------|-----------------|--------------------|
| Portland Cement Grout - 1' to 50' | | Steel Casing | 398.80 Ground Surface | 12 | 0 | 50 |
| Portland Cement Grout - 1' to 70' | | Steel Casing | 401.17 Stick-up | 8 | +2.5 | 70 |
| Bentonite Seal - 1' to 85' | A | Well Casing --Schedule 40 PVC | 400.94 | 2 | +2.5 | 87 |
| # 2 Morie Sand - 85' to 100' | | Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | Top of PVC | | 87 | 97 |
| Bentonite Seal - 100' to 173' | B | Well Casing --Schedule 40 PVC | 400.83 | 2 | +2.5 | 177 |
| # 2 Morie Sand - 173' to 190' | | Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | Top of PVC | | 177 | 187 |
| Bentonite Seal -190' to 226' | C | Well Casing --Schedule 40 PVC | 400.73 | 2 | +2.5 | 232 |
| # 2 Morie Sand - 226' to 242' | | Well Screen --20-Slot, Sch. 5 Stainless (Type 304) | Top of PVC | | 232 | 242 |

| Depth (Ft.) | Sample Type & No. | Sample Rec. (Ft.,%) | Lab Sample ID No. | PID meter units | Visual Description | Well Installation Detail | Elevation (Ft.) |
|------------------|-------------------|---------------------|-------------------|-----------------|--|--------------------------|-----------------|
| | | | | | | | 398.80 |
| | | | | | 8" Diameter Steel Casing Stickup at Surface | | |
| 1 | | | | | 0'-15' - Clayey silt, yellowish brown (10 YR, 5/6), moist; trace rock fragments. | | 1 |
| 2 | | | | 2 | | | |
| 3 | | | | 3 | | | |
| 4 | | | | 4 | | | |
| 5 | | | | 5 | | | |
| 6 | | | | 6 | | | |
| 7 | | | | 7 | | | |
| 8 | | | | 8 | | | |
| 9 | | | | 9 | | | |
| 10 | | | | 10 | | | |
| Match to Sheet 2 | | | | | | | |

DRILLING CO.: Uni-Tech Drilling Company, Inc.

DRILLER: Jim Evans

BAKER REP.: David Fekete and Peter Farrand

WELL NO.: MW27

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