APPENDIX M

WATER WELL ASSESSMENT

(Main body of the study report and figures)

Moody and Associates, Inc.
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Groundwater and Environmental Professionals - Since 1891

Sent via email

January 28, 2016

Mr. Steve Halmi
Deiss & Halmi Engineering, Inc.
105 Meadville Street
Edinboro, PA 16412

RE: ITC Lake Erie Connector, LLC Project
Residential Water Well Risk Abatement
Recommendation

Mr. Halmi,

ITC Lake Erie Connector LLC ("ITC") engaged Moody and Associates, Inc. ("Moody") to conduct a pre-construction risk assessment to privately owned potable water sources in the vicinity of the underground electric transmission line to be installed as part of the Lake Erie Connector Project ("Project"). This letter report provides a summary of the results of our investigations and our recommendations with respect to techniques to avoid, reduce or mitigate potential impacts to residential well sources.

Letters were sent to 67 property owners having water wells along the proposed ITC Lake Erie Connector, LLC ("ITC") cable route in Springfield, Conneaut, and Girard Township, Erie County, Pennsylvania. The letters requested access for Moody and Associates, Inc. ("Moody") to perform quality and quantity evaluations on the water wells. Moody has received responses from and completed water quality, quantity, and risk assessments of 21 water sources located adjacent to the proposed ITC cable route. Additionally, Moody evaluated local conditions and borehole logs provided to Moody by ITC to establish whether risk of impact may exist due to the proposed construction activities.

To establish pre-construction water supply yield and a general water quality baseline, data was gathered for those private water supply sources who provided access. This data included basic information about the source, such as type (i.e. well or otherwise), location, depth, diameter, pump

depth setting, and static water level. Water quality samples were collected for field analysis of pH, conductivity, oxidation-reduction potential, dissolved oxygen, temperature, and turbidity. The samples were also analyzed by a PADEP certified laboratory for alkalinity, chloride, conductivity, hardness, pH, sulfate, total dissolved solids, total suspended solids, coliform bacteria, E. coli bacteria, calcium, iron, magnesium, manganese, potassium, sodium, ethane, and methane. A 30-minute drawdown flow test was also conducted for each source to determine the source yield and recovery. The water quality data was offered to be shared with the property owner at no charge to the property owner. Individual assessments and the data generated during the site visits are included in ATTACHMENT A.

Water sources located within close proximity to the route, and those located in the apparent down-gradient groundwater flow direction may have the potential to be impacted from construction activities. A total of 9 out of the 21 sources sampled were deemed to be at moderate risk of impact. The remaining water sources were deemed to be at low risk of impact. Moody recommends that construction techniques be employed in order to avoid, reduce or mitigate the risk of impact to residential water supply wells adjacent to the proposed cable route.

Topographic relief and gradient are minimal, which reduces the overall risk of interception and re-direction of groundwater otherwise destined for a residential water well. However, the water table is relatively high in some areas. Risk involved with construction activities in those areas includes introduction of turbidity to the water source and interruption of water flow to the well. While turbidity is generally a temporary disruption, interruption of groundwater flow gradient is potentially a more long-term concern. FIGURE 1 illustrates the recorded water levels measured in the wells surveyed by Moody. Properties having wells with a recorded water level greater than or equal to 10 feet below ground surface ("bgs") are shown in green, and wells having a recorded water level less than 10 feet bgs are shown in blue. The wells having recorded water levels less than 10 feet bgs are highlighted because they may be more likely to be impacted by interruptions in shallow groundwater flow.

The duct bank design will result in an impermeable barrier from ground surface to approximately 5.5 feet bgs along the proposed ITC cable route. The risk of potential interruption in groundwater flow would occur in areas where the proposed cable trench and impermeable duct bank are constructed in areas where the following conditions exist:

- Permeable sediments exist in the shallow subsurface that is penetrated by the duct bank, and less permeable subsurface sediments then occur immediately below the permeable zone at less than 10 feet bgs.
- The water table is relatively shallow and encountered during excavation.

ITC provided data from 43 borings installed along the proposed ITC cable route. The boring logs are included in ATTACHMENT B. Each borehole description was analyzed to assess whether the installation of the cable duct bank might impact the groundwater flow to water wells in the area.

The conditions that were considered included:

- A low permeability interval immediately below the duct bank, based on bore hole log data
- Water wells located downgradient of the ITC line
- A groundwater elevation high enough to be impacted by the impermeable duct bank or low-permeability interval.

Based on bore hole log data, low permeability intervals were identified by the occurrence of clay in the soil descriptions above 20 feet bgs. Descriptions that only included "trace of clay" were not identified as low permeability. Groundwater flow was assumed to follow the general ground slope in the area and in the direction of hydrologic features. Mitigative recommendations based on individual borehole locations are as follows:

- BH-01, BH-05, BH-06, BH-07, BH-08, BH-19, BH-21, BH-22, BH-23, BH-24, BH-25, BH-26, BH-27, BH-30, BH-31, BH-32, BH-34, BH-35, BH-36, BH-37, and BH-40 all had no low permeability intervals. Mitigative procedures are unnecessary at these locations.
- AC-01 has a low permeability interval from 1.5-7.5 feet bgs. AC-01 is not located along the proposed route of the line and mitigative procedures are unnecessary.
- AC-02 has a low permeability interval from 1.5-15.0 feet bgs. AC-02 is not located along the proposed route of the line and mitigative procedures are unnecessary.
- BH-02 has a low permeability interval from 1.5-5.0 feet bgs. The duct bank will be deeper than this interval. Mitigative procedures are unnecessary.
- BH-03 has a low permeability interval from 10.0-20.0 feet bgs which will not be immediately below the duct bank. Mitigative procedures are unnecessary.
- BH-04 has a low permeability interval from 4.0-7.5 feet bgs. There are water wells downgradient of this section of line and the recorded water levels (RWL) in these wells is high enough to be impacted by the low permeability interval. If groundwater is encountered during trench construction, mitigative procedures should be taken along this section of line, illustrated on PLATE 1.
- BH-09 has a low permeability interval from 1.5-5.0 feet bgs and from 7.0-10.0 feet bgs. The permeable interval from 5.0-7.0 feet bgs makes mitigative procedures unnecessary.
- BH-10 has a low permeability interval from 1.5-5.0 feet bgs, from 7.0-10.0 feet bgs, and from 12.0-20.0 feet bgs. The permeable interval from 5.0-7.0 feet bgs makes mitigative procedures unnecessary.
- BH-11 has a low permeability interval from 7.0-15.0 feet bgs. The permeable interval from 0.0-7.0 feet bgs makes mitigative procedures unnecessary.
- BH-12 has a low permeability interval from 4.0-7.5 feet bgs and 11.5-16.5 feet bgs. There are water wells downgradient of this section of line and the RWL in these

wells is high enough to be impacted by the low permeability interval. If groundwater is encountered during trench construction, mitigative procedures should be taken along this section of line, illustrated on PLATE 1.

- BH-13 has a low permeability interval from 1.5-5.0 feet bgs, 7.5-10.0 feet bgs and 11.5-16.5 feet bgs. The permeable interval from 5.0-7.5 feet bgs makes mitigative procedures unnecessary.
- BH-14 has a low permeability interval from 11.5-20.0 feet bgs which will not be immediately below the duct bank. Mitigative procedures are unnecessary.
- BH-15 has a low permeability interval from 2.0-20.0 feet bgs. There are water wells downgradient of this section of line and the SWL in these wells is high enough to be impacted by the low permeability interval. If groundwater is encountered during trench construction, mitigative procedures should be taken along this section of line, illustrated on PLATE 1.
- BH-16 has a low permeability interval from 4.5-10.0 feet bgs. There are water wells downgradient of this section of line but the SWL of these wells is unknown at this time. If groundwater is encountered during trench construction, mitigative procedures should be taken along this section of line, illustrated on PLATE 1.
- BH-17 has a low permeability interval from 6.5-10.0 feet bgs. The permeable interval from 0.0-6.5 feet bgs makes mitigative procedures unnecessary.
- BH-18 has a low permeability interval from 4.5-10.0 feet bgs. There are now water wells downgradient of this section of line. Mitigative procedures are unnecessary.
- BH-20 has a low permeability interval from 1.5-10.0 feet bgs. There are water wells downgradient of this section of line and the SWL in these wells is high enough to be impacted by the low permeability interval. If groundwater is encountered during trench construction, mitigative procedures should be taken along this section of line, illustrated on PLATE 1.
- BH-28 has a low permeability interval from 0.5-5.0 feet bgs. The duct bank will be deeper than this interval. Mitigative procedures are unnecessary.
- BH-29 has a low permeability interval from 0.5-5.0 feet bgs. The duct bank will be deeper than this interval. Mitigative procedures are unnecessary.
- BH-33 has a low permeability interval from 1.5-4.5 feet bgs. The duct bank will be deeper than this interval. Mitigative procedures are unnecessary.
- BH-38 has a low permeability interval from 9.0-18.0 feet bgs which will not be immediately below the duct bank. Mitigative procedures are unnecessary.
- BH-39 has a low permeability interval from 0.7-4.5 feet bgs. The duct bank will be deeper than this interval. Mitigative procedures are unnecessary.
- BH-41 has a low permeability interval from 4.5-7.5 feet bgs. There are water wells downgradient of this section of line but the SWL of these wells is unknown at this time. If groundwater is encountered during trench construction, mitigative procedures should be taken along this section of line, illustrated on PLATE 1.

Moody recommends that in order to minimize risk of impact, mitigative techniques may need to be employed in the construction of the cable trench. Sections of the line in which the impermeable barrier may affect local water wells are illustrated on PLATE 1. Mitigation should be considered along those intervals, and especially when shallow groundwater is encountered during the construction of the trench. Channels oriented perpendicular to the direction of the trench should be incorporated into the trench bottom along intervals of concern. The channels should be not less than one foot wide and one foot deeper than the prevailing depth of the trench, and should be backfilled with a permeable material that will permit groundwater flow beneath the line. Additionally, the channels should be constructed at intervals not greater than ten feet along the length of the section of concern. In addition, Moody recommends that dewatering activities are kept at the minimum level necessary to facilitate construction activities. Excessive dewatering of the trench may lead to alteration of the preexisting groundwater flow gradient and reduced yield in adjacent water wells.

The analysis and recommendations contained in this letter report are based specifically on the data provided by ITC and collected to date by Moody during pre-construction well surveys. Please contact us if you have any questions regarding this assessment or the information contained herein.

Respectfully Submitted,

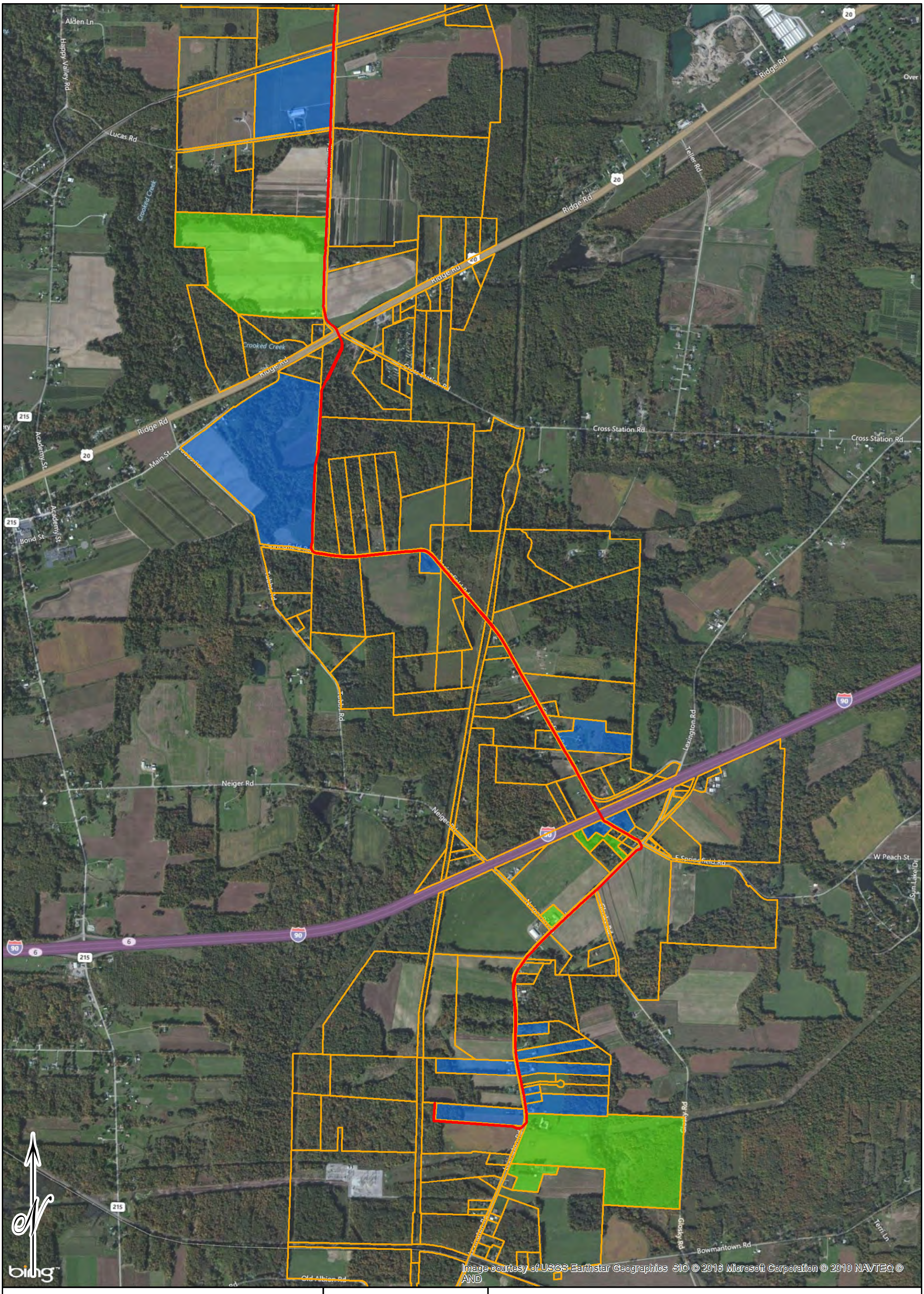
Paul J. Martin
Moody and Associates, Inc.

Cc: Tim Weston
Mark Miller

Attachments

FIGURE 1

INITIAL RECORDED WATER LEVELS



LEGEND

- Cable Route 5-8-2015
- Tax Parcel Boundary

Recorded Water Level

- <10'
- ≥10'

Scale: 1 in = 1,500 ft

0 750 1,500

Feet

Prepared for:
Deiss & Halmi Engineering, Inc

Map Reference:
This exhibit is based on the Bing Maps Hybrid - © 2010 Microsoft Corporation and its data suppliers

RECORDED WATER LEVEL MAP

ITC Lake Erie Connector Site
Springfield, Conneaut and Girard Townships
Erie County, Pennsylvania

Project #: 15-268-MM

Drawn by:	Checked by:	Date:	Revision:
AMH	PJM	1/27/2016	0

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PLATE 1

RECOMMENDED MITIGATION INTERVAL MAP

PLATE 1
RECOMMENDED
MITIGATION INTERVAL MAP

ITC Lake Erie Connector Site
Springfield, Conneaut and Girard Townships
Erie County, Pennsylvania

Prepared for:
Deiss & Halmi Engineering, Inc

LEGEND

- Borehole Location
- Evaluated Water Source Location
- Assumed Water Source Location
- Cable Route 5-8-2015
- Recommended Mitigation Interval
- Tax Parcel Boundary

Map Reference:

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Scale: 1 in = 1,000 ft

0 500 1,000
Feet

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Project #: 15-268-MM

Drawn by:	Checked by:	Date:	Sheet #:
AMH	PJM	1/28/2016	1