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October 25, 2018
GZA File No. 03.0033554.60

Mr. Neal Personeus
Rhode Island Department of Environmental Management (RIDEM)
Office of Water Resources
235 Promenade
Providence, Rhode Island 02908

OCT 25 2018

Re: RIPDES Construction General Permit Application
WQC File 16-171 & RIPDES File No. RIR101477
Response to RIDEM Request for Additional Information dated September 5, 2018
Proposed Liquefaction Facility Project
642 Allens Avenue/121 Terminal Road
Providence, Rhode Island

Dear Mr. Personeus:

GZA GeoEnvironmental, Inc. (GZA) has prepared this letter on behalf of National Grid LNG, LLC (NGLNG) in response to the Rhode Island Department of Environmental Management (RIDEM) Office of Water Resource's Stormwater Engineering comments and request for additional information related to the construction of the proposed liquefaction facility (the "Project") at 642 Allens Avenue/121 Terminal Road in Providence, Rhode Island (the "Site"). RIDEM requested clarification of certain items in NGLNG's July 20, 2018 submittal package, which are addressed below.

1. **Ensure that any need to address nitrogen impacts using the "Stormwater Compensation Method" meets the requirements identified in Appendix H.3: Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters "Stormwater Compensation Method" dated March 21, 2014.**

Response:

The water quality volume (WQV) requirement was calculated using the method outlined in Section 3.3.3 of the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM). A porosity value of 0.33 was used to account for storage within the filter media and the stone underdrain area was excluded. Using the information provided in Comment 4 (below), and a 1.2-inch rainfall design storm (results in 1 inch of runoff after accounting for an initial abstraction of 0.2 inches), the required WQV is 4,427 cubic feet. This results in the need for a treatment system that must hold 3,329 cubic feet, which represents 75% of the WQV. The static storage volume of the sand filter and sediment forebay for the Project is 6,158 cubic feet. This represents 185% of the requirement noted in Section 5.5.4 of the RISDISM.

The filter drains to the Providence River, which is an impaired water body for total nitrogen, dissolved oxygen, and fecal coliform. To address this impairment, the Stormwater Compensation Method (SCM) was used. Specifically, for total nitrogen, this method requires that 100% of any new or increased impervious area is treated PLUS compensation of 1.5:1. With this requirement, the sand filter would need to capture and treat 2.5 inches of runoff (1 inch plus 1.5:1 compensation or 10,424 cubic feet). The 1-year storm event is defined in the RISDISM as 2.7 inches of rainfall over a 24-hour period. Assuming an initial abstraction of 0.2 inches, the 1-year storm event is expected to produce 2.5 inches of runoff. Using the information provided in Comment 4 (below), 10,424 cubic

feet will need to be captured and treated. Based on our dynamic hydraulic modeling using HydroCAD software, the proposed stormwater treatment system (sand filter preceded by a sediment forebay) will capture and treat 12,614 cubic feet of runoff during the 2.7-inch storm event. In other words, the system can capture and treat approximately 21% more runoff than that required by the SCM. We believe the intent of the requirement is being met – the entire WQV plus the additional compensation is being fully treated prior to discharge into the Providence River.

As discussed during our September 14, 2018 meeting, sand filters by design, represent dynamic treatment methods for stormwater. From a review of the literature concerning sand filters and treatment, there is nothing that relates static storage to more effective water quality treatment. Stormwater is exfiltrating from the sand filter at the same time that the filter fills; thus, the stormwater is being effectively treated by the sand filter concurrently with the storm event.

Based on the above, it is GZA's professional opinion that the 75% of WQV temporary storage requirement under RISDISM standard 5.5.4 has been effectively met, and the 100% plus compensation of 1.5:1 capture and treat requirement of the SCM has also been met.

2. **Demonstrate that the post-project pollutant loads for both bacteria and for nitrogen will not be increased by the proposed project.**

Response:

As discussed during the September 14, 2018 meeting, the stormwater compensation method will be used in lieu of a pollutant loading analysis.

3. **Please provide the back-up ground cover information used in the existing and the proposed conditions hydrologic analysis. Please ensure that the proposed design will clearly demonstrate that the associated proposed conditions impervious area that needs to be treated per the "Stormwater Compensation Method" will actually be delivered to the proposed water quality treatment practice (sand filter and forebay).**

Response:

The tables below provide pre-development and post-development drainage areas and surface cover types by drainage area. Note, under pre-development conditions all drainage areas were assumed to be 100% stone ground cover.

Table 1: Pre-Development Ground Cover

Drainage Area	Total Area (acres)	C
DA-1	0.49	85
DA-2	0.63	85
DA-3	0.48	85
DA-4	0.25	85
DA-5	0.38	85
DA-6	0.34	85
DA-7	0.18	85
DA-8	0.09	85
Total	2.84	85

Table 2: Post Development Ground Cover

Drainage Area	Concrete/Asphalt (acres)	Stone (acres)	Total Area (acres)	C
DA-1	0.34	0.42	0.76	90
DA-2	0.04	0.02	0.06	91
DA-3	0.07	0.00	0.07	94
DA-4	0.06	0.05	0.11	90
DA-5	0.03	0.05	0.08	89
DA-6	0.10	0.03	0.13	92
DA-7	0.05	0.10	0.15	88
DA-8	0.13	0.12	0.25	92
DA-9	0.14	0.16	0.30	89
DA-10	0.04	0.11	0.15	88
DA-11	0.10	0.19	0.29	88
DA-12	0.00	0.29	0.29	85
DA-13	0.11	0.06	0.17	91
Total	1.21	1.6	2.81	89

Under the proposed conditions, drainage areas 1 through 11 drain to the proposed treatment system. The total area that drains to the treatment system is approximately 2.35 acres.

4. **At this point, this reviewer has some remaining uncertainties regarding the amount of area requiring water quality treatment. Based on the information submitted it appears that the treatment areas appear to be approximately accurate. However, it would be helpful to have additional information to ensure more accuracy in the review. Therefore, please indicated the following areas:**
    - **In order to adequately evaluate the required amount of water quality treatment and which impervious areas will require water quality treatment, please address the following items. For all areas of impervious cover on the proposed condition sub-watershed map drainage area map, please label each area of impervious cover as being in one of the following categories:**
        - **Pre-existing impervious areas that will not be altered in any way from the pre-project condition. These areas do not require any treatment.**
        - **Areas of pre-existing pavement that have been simply overlain with new pavement, as opposed to have been subject to a full-depth reconstruction. These areas will not require any treatment.**
        - **Areas of pavement or pre-existing building area that will be subject to full depth. Fifty percent of these areas will require treatment**
        - **Pre-existing pervious areas that will be converted to new impervious cover. These areas will need to be treated in accordance with the "Compensation Method". Given that no infiltration is proposed, the treatment of 250% of this area needs to be treated to meet nitrogen standards. Otherwise a pollutant loading analysis is needed.**
        - **Any pre-existing pervious areas to remain as pervious areas. No treatment is required for this area.**

Response:

The attached Figure 1 depicts the areas identified above. Additionally, the figure also depicts pre-existing impervious areas that will be converted into pervious areas. The total areas for each of the items identified above are listed below.

- *Pre-existing impervious areas that will not be altered in any way from the pre-project condition. These areas do not require any treatment: 23,935 square feet.*
- *Areas of pre-existing pavement that have been simply overlain with new pavement (as opposed to having been subject to a full-depth reconstruction) and incidental paved areas. These areas will not require any treatment: 3,218 square feet.*
- *Areas of pavement or pre-existing building area that will be subject to full depth. Fifty percent of these areas will require treatment: 10,286 square feet (treat 429 cubic feet).*
- *Pre-existing pervious areas that will be converted to new impervious cover. These areas will need to be treated in accordance with the "Compensation Method". Given that no infiltration is proposed, the treatment of 250% of this area needs to be treated to meet nitrogen standards: 47,970 square feet (treat 3,998 cubic feet plus 5,997 cubic feet).*
- *Any pre-existing pervious areas to remain as pervious areas. No treatment is required for this area: 75,185 square feet.*
- *Pre-existing impervious areas to be converted to pervious areas. No treatment required: 12,414 square feet.*

In addition to the above comments, RIDEM requested during the September 14, 2018 meeting, that GZA address the stormwater treatment system effectiveness during periods of spring/moon tides, per public comments provided by Eugenia Marks. For reference, Eugenia Marks comments are provided below in **bold**.

The plans indicated that the outflow pipe from the proposed stormwater mitigation is 6.5 feet above mean high water, listed as 2.12 NAVD88.

1. **Mean is an average and thus the effective drainage of the outflow in any high tide, any spring/moon high tide, or any sea-level rise projections is not indicated.**
2. **List projected sea-level rise peak tides, including apogee conditions.**
3. **Comment on the effectiveness of the storm water drainage system during the above extreme scenarios.**

Response:

The invert elevation of the discharge pipe is 4.80 feet (NAVD88). Mean High Water (MHW) is at elevation 2.12 feet (NAVD88), Mean High High Water (MHHW) is at elevation 2.37 feet (NAVD88). The table below indicates the highest tides (assumed to be spring/moon tide) over a 1-year period as reported by the National Oceanic and Atmospheric Administration for the Providence Area (Station 8454000). Based on guidance provided by the Coastal Resources Management Program the "Red Book", the anticipated sea level rise over the design life of the liquefaction facility is 1.5 feet. As indicated in the table below, the highest tides with sea level rise are above the invert elevation of the discharge pipe. However, in our hydraulic analysis we modeled the system assuming a worst-case scenario of the discharge pipe being completely submerged by flood waters (elevation 7.0 NAVD88). Based on our analysis, the treatment system will function properly during spring/moon tides, accounting for the sea level rise currently anticipated within the "Red Book".

Month/Year	Highest Tide Elev. ft. (NAVD88)	Highest tide with sea level rise (NAVD88)
July 2017	4.178	5.678
August 2017	3.759	5.259
September 2017	3.578	5.078
October 2017	4.47	5.97
November 2017	4.625	6.125
December 2017	4.244	5.744
January 2018	4.201	5.701
February 2018	3.309	4.809
March 2018	5.117	6.617
April 2018	4.008	5.508
May 2018	3.401	4.901
June 2018	3.765	5.265
July 2018	3.736	5.236

This letter is subject to GZA's limitations in **Appendix A**. We trust that this letter and attached supporting documentation will address RIDEM's comments. If you have any questions or need any additional information, please contact Igor Runge at igor.runge@gza.com or 401-421-4140.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Sara Haupt, P.E.
Assistant Project Manager

Igor Runge, Ph.D., P.H.
Consultant/Reviewer

Margaret Kilpatrick, P.E.
Associate Principal

Todd R. Greene, P.E.
Associate Principal

cc: Mr. William Howard, National Grid
Mr. Anthony LaRusso, National Grid
Mr. Nicholas Pisani, RIDEM OWR

Appendices: Appendix A – Limitations
Figure 1 – Pre-and Post-Development Ground Cover

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APPENDIX A

LIMITATIONS

LIMITATIONS

1. This response to comments letter has been prepared on behalf of and for the exclusive use of National Grid LNG, LLC (NGLNG), solely for use in documenting the work completed as described herein at the 121 Terminal Road / 642 Allens Avenue Former MGP ("Site") under the applicable provisions of the State of Rhode Island Department of Environmental Management Office of Water Resources Water Quality Regulations. This letter and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party, nor used by any other party in whole or in part, without the prior written consent of GZA GeoEnvironmental, Inc.(GZA) or NGLNG.

2. GZA's work was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area, and GZA observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. GZA's findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion concerning the significance of the limited data gathered during the course of the study. No other warranty, express or implied is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during the work described herein.

3. The observations described in this letter were made under the conditions stated therein. The conclusions presented in the report were based upon services performed and observations made by GZA.

4. In the event that NGLNG or others authorized to use this letter obtain information on environmental or hazardous waste issues at the Site not contained in this letter, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this letter.

5. The conclusions and recommendations contained in this letter are based in part upon the data obtained from environmental samples obtained from relatively widely spread subsurface explorations. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this letter.

6. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the boring logs.

7. In the event this work included the collection of water level data, these readings have been made in the test pits, borings and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

8. The conclusions contained in this letter are based in part upon various types of chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the letter. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed by GZA and the conclusions and recommendations presented herein modified accordingly.

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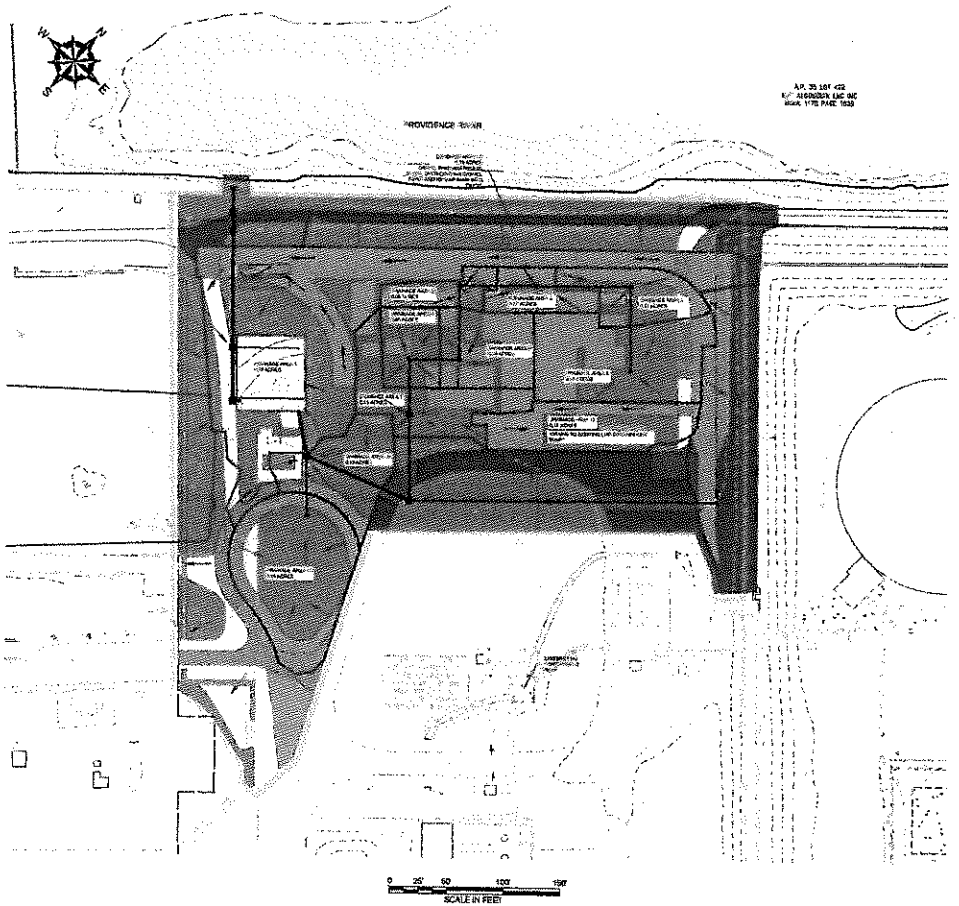
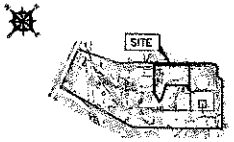
FIGURE





KEY PLAN:
SCALE: 1"=800'

LEGEND:

- EXISTING BUILDING
- EXISTING CONTOUR (MAJOR 5 FOOT INTERVAL)
- EXISTING CONTOUR (MINOR 1 FOOT INTERVAL)
- PROPERTY LINES
- INTERIOR PROPERTY LINE
- DRAINAGE AREA
- SHEET FLOW DIRECTION
- PROPOSED 48" RECTANGULAR DRAINAGE STRUCTURE
- PROPOSED 60" ROUND DRAINAGE STRUCTURE
- PROPOSED 30" ROUND DRAINAGE STRUCTURE
- LIQUEFACTION WORK AREA
- FLOW PATH

- PRE-EXISTING IMPERVIOUS TO REMAIN UNALTERED IMPERVIOUS (NO TREATMENT REQUIRED)
- PRE-EXISTING PAVEMENT TO RECEIVE NEW PAVEMENT AND INCIDENTAL PAVED AREAS (NO TREATMENT REQUIRED)
- PRE-EXISTING PAVEMENT / BUILDING FOUNDATIONS TO BE RESULT (50% TREATMENT REQUIRED)
- PRE-EXISTING PERVIOUS TO BE CONVERTED TO NEW IMPERVIOUS (100% TREATMENT REQUIRED)
- PRE-EXISTING PERVIOUS TO REMAIN PERVIOUS (NO TREATMENT REQUIRED)
- PRE-EXISTING IMPERVIOUS TO BE CONVERTED TO PERVIOUS (NO TREATMENT REQUIRED)

GENERAL NOTES:

1) BASE MAP DEVELOPED FROM THE FOLLOWING:
   - ELECTRONIC CAD FILE "ACAD-7257PL.DWG" PROVIDED BY VANASSE HANGEN BRUSTLIN (VHB) ENTITLED "EXISTING CONDITIONS PLAN," PROJECT TITLE "NATIONAL GRID LNG TERMINAL ROAD LNG FACILITY" DATED MARCH 10, 2014, ORIGINAL SCALE 1" = 50', DRAWING NO. SV-1 THROUGH SV-3 AND AERIAL MAPPING BY VHB TRANSPORTATION AND INFRASTRUCTURE DATED JANUARY 15, 2014 PREPARED FOR NATIONAL GRID LAND SURVEYING DEPARTMENT, WALTHAM, MASSACHUSETTS AND CAD FILE NO. 6803023.092-1.DWG. PLANS PROVIDED BY NATIONAL GRID.
   - DESCRIPTIONS PROVIDED IN THE CITY OF PROVIDENCE DEED BOOK (BK) 470 PAGES 224 - 229, BK 561 PAGES 326 - 328, BK 1111 PAGES 752 -756 AND BK 2249 PAGES 219 - 322.
   - ELECTRONIC CAD FILE14-153_SU1_REV2.DWG, TITLED "TOPOGRAPHIC SURVEY PLAN, PORTION OF A.P. 56 LOT 5" DATED OCTOBER 27, 2014 AND PROVIDED BY NATIONAL GRID.
   - ELECTRONIC CAD FILE 9153_COG.DWG, TITLED "EXISTING CONDITIONS PLAN" PREPARED BY PROCESS PIPELINE SERVICES, DATED DECEMBER 18, 2014 AND PROVIDED BY NATIONAL GRID.
   - ELECTRONIC CAD FILES PROVIDED BY KIEWIT
     1. "ACAD-102761-CIV_SITE.DWG"
     2. "2007EXP_102761-CIV_SURFACING.DWG"
     3. "102761_MEC_STR_BASE.DWG"
     4. "102761-SURVEY_SITE.DWG"
     5. "A2007EXP_102761-CIV_STORM.DWG"
     6. "ACAD-102761-CIV_SURFACING.DWG"
     7. "ACAD-102761-PROP-CONT.DWG"
     8. "POST DEVELOPMENT DRAINAGE MAP.DWG"
     9. "PRE-DEVELOPMENT DRAINAGE MAP.DWG"
   - PDFS OF THE FOLLOWING DRAWINGS PROVIDED BY NATIONAL GRID
     1. "CATCH BASINS AND SANITARY SEWER SYSTEM" PREPARED BY PROVIDENCE GAS COMPANY, DATED SEPTEMBER 25, 1981.
     2. "PLAN SHOWING UNDERGROUND UTILITIES LNG FACILITY" DATED OCTOBER 8, 1963, "SUBSURFACE UTILITY ENGINEERING" PREPARED BY BAYSTATE SUBSURFACE INVESTIGATION, INC., DATED MAY 17, 2005.
2) HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY VHB.
3) VERTICAL DATUM IS BASED ON NAVD 1988 FROM BASE MAPPING PROVIDED BY VHB.
4) SELECT PRESENTED SITE UTILITIES WERE TAKEN FROM HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND HAVE BEEN ALIGNED AND ADJUSTED FOR THE "BEST FIT" AND THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED. UTILITIES ARE SHOWN FOR REFERENCE ONLY. OTHER LOCATIONS MAY EXIST.
5) ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS BETWEEN 2011 AND 2013.
6) PARCEL DATA PROVIDED BY THE CITY OF PROVIDENCE PLANNING AND DEVELOPMENT DEPARTMENT. PARCELS OF REAL ESTATE ASSESSED AS OF DECEMBER 31, 2012. GIS DATA ARE FOR PLANNING PURPOSES ONLY. THESE DATA DO NOT REPRESENT A LEGALLY RECORDED PLAN, DEED, SURVEY OR ENGINEERING SCHEMATIC AND ARE NOT INTENDED TO BE USED AS SUCH.
7) SITE BOUNDARIES ARE APPROXIMATE.
8) ln VALUES CALCULATED UTILIZING SITE SPECIFIC INFORMATION GENERATED USING HYDROCAD. NC = NOT CALCULATED. AS DRAINAGE AREA IS NOT PART OF SYSTEM.
9) CONVEYANCE TO THE STORMWATER TREATMENT SYSTEM (SAND FILTER AND SEDIMENT FOREBAY) WAS DESIGNED BY KIEWIT POWER CONSTRUCTORS OF HOUSTON, TEXAS. KIEWIT'S CONVEYANCE SYSTEM IS DEPICTED ON THE FOLLOWING DRAWINGS FOR NATIONAL GRID AND PROVIDED TO GZA.
   - 102761-S-00-0000-CIV-SK-6010, SHEET 1 OF 3 TITLED, "FIELDS POINT LIQUEFACTION PROJECT STORM PLAN AND PROFILE - LINE 100"
   - 102761-S-00-0000-CIV-SK-6011, SHEET 2 OF 3 TITLED, "FIELDS POINT LIQUEFACTION PROJECT STORM PLAN AND PROFILE - LINES 200 & 300"
   - 102761-S-00-0000-CIV-SK-6012, SHEET 3 OF 3 TITLED, "FIELDS POINT LIQUEFACTION PROJECT STORM PLAN AND PROFILE - LINE 400"

FOR PERMITTING ONLY

NATIONAL GRID
LIQUEFACTION PLANT
642 ALLENS AVENUE PROVIDENCE, RHODE ISLAND

PRE AND POST DEVELOPMENT GROUND COVER

PREPARED BY:	GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com
PREPARED FOR:	nationalgrid
DESIGN MGR: MJS	REVIEWED BY: SAM
DESIGNED BY: SAM	DRAWN BY: LMT
CHECKED BY: MI	SCALE: AS NOTED
DATE: SEPTEMBER 2015	PROJECT NO. 33554.60
REVISION NO. 0	FIGURE 1
	SHEET NO. 1 OF 1