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NORTH KENT 1

Construction Vibration Monitoring Report

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REPORT

Executive Summary

This report summarizes the results of vibration monitoring carried out for the North Kent 1 project (NK1) completed as part of Section H1 of the Renewable Energy Approval (REA) document issued by the Ontario Ministry of the Environment and Climate Change (MOECC). The construction vibration monitoring program documented in this report was based on the results of a test pile driving and vibration monitoring program (Phase 1) completed in accordance with a work plan prepared by Golder Associates Ltd. (Golder) dated March 3, 2017, subsequently approved by MOECC on March 6, 2017. A report summarizing the test pile driving and vibration monitoring program results was finalized and issued on June 16, 2017. Subsequent vibration monitoring field work for the full construction phase of this project (Phase 2) was carried out in accordance with a vibration monitoring program prepared by Golder dated June 2, 2017 and subsequently approved by MOECC and issued by Golder on June 9, 2017.

The intent of the work was to evaluate the surface and subsurface magnitudes, propagation and attenuation characteristics of ground vibrations associated with driving of piles for the foundations of 34 wind turbines. This report focuses on:

- peak vibration amplitudes near the pile driving source;
- patterns of vibration attenuation in soil and rock as compared to published methods of vibration attenuation prediction or analysis;
- magnitudes of vibrations at distant domestic water wells; and
- comparison of the site-specific data to published and regulatory vibration monitoring thresholds.

Vibrations of various magnitudes emanating from multiple sources were detected by monitoring instruments at the turbine construction sites and at nearby domestic water wells.

For this project, a total of 625 steel pipe piles were driven into the ground to support the wind turbine foundations. This total number of piles included 13 that were driven to replace others that were damaged or otherwise judged unsuitable. During pile driving, some of the piles were hammered again after they had achieved their design resistance criteria. These “restrike” events were used as a means to test pile resistance after a period of time. Dynamic testing events were also carried out on a number of piles. Well monitoring data for periods of time during which piles were not being driven were also analyzed to evaluate background conditions, specific vibration sources other than pile driving, and vibrations induced by operating well pumps.

The resulting data has permitted an evaluation of distance-vibration attenuation behaviour for this project. The data demonstrate that the character of vibrations at monitored water wells, as measured by the sensitive instrumentation, were not of concern as compared to those induced by common day-to-day activities. As compared to typical vibration magnitudes associated with other causes or published acceptable vibration thresholds for different activities and conditions, and as compared to background day-to-day activities near the well locations, vibrations at the residential well locations were below regulatory thresholds for human perception and other published thresholds related to residential uses. Where turbine construction was sufficiently close that pile-induced vibrations could be discerned within the well monitoring data, the vibration magnitudes were significantly less than vibrations induced by nearby road traffic and the water well pumps, sometimes being smaller by a factor of 10 to 100. It is our opinion that the pile driving did not expose any of the monitored groundwater wells to vibrations in excess of those that the wells commonly experience otherwise. Further, given the distance and vibration magnitude attenuation patterns confirmed by the measurement data, it is our opinion that vibrations induced by pile driving were of magnitudes that would have been of no consequence at other wells in the project area.

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1.0 INTRODUCTION

This report summarizes the results of vibration monitoring carried out for the North Kent 1 project (NK1) completed as part of Section H1 of the Renewable Energy Approval (REA) document issued by the Ontario Ministry of the Environment and Climate Change (MOECC). The construction vibration monitoring program documented in this report was based on the results of a test pile driving and vibration monitoring program (Phase 1) completed in accordance with a work plan prepared by Golder Associates Ltd. (Golder) dated March 3, 2017, subsequently approved by MOECC on March 6, 2017. A report summarizing the test pile driving and vibration monitoring program results was finalized and issued on June 16, 2017 and, except where relevant data is presented, is not discussed further within this report. Vibration monitoring field work for the construction phase of this project (Phase 2) was carried out in accordance with a vibration monitoring program prepared by Golder dated June 2, 2017 and subsequently approved by MOECC and issued by Golder in June 9, 2017.

The intent of the work was to evaluate the surface and subsurface magnitudes, propagation and attenuation characteristics of ground vibrations associated with driving of piles for the foundations of 34 wind turbines. This report focuses on:

- measured vibration amplitudes on the turbine construction sites, near the pile driving source;
- vibrations amplitudes at the ground surface and in the subsurface soil and rock at known distances from the pile driving sources;
- magnitudes of vibrations at domestic water wells;
- patterns of vibration attenuation in soil and rock as compared to published methods of vibration attenuation prediction or analysis; and
- a comparison of these vibrations to regulatory and published thresholds.

This report summarizes:

- a description of the sources of vibrations;
- the subsurface conditions at the NK1 turbine sites;
- vibration monitoring systems and locations;
- field activity observations at the turbine and water well sites during pile driving;
- a summary of the vibration monitoring data gathered during pile driving and at other key times; and
- interpretations of the data.

Where applicable, this report also references “Information to be Submitted for Approval of Stationary Sources of Sound (NPC-233)” and the two relevant references cited in NPC-233 “Procedures (NPC-103)” and “Impulse Vibration in Residential Buildings, (NPC-207)” as published by MOECC. The MOECC NPC-233, NPC-103 and NPC-207 documents have been referenced for guidance related to background information and data provided in vibration monitoring reports and the thresholds for human perception of vibrations as a means for comparison purposes.

This report should be read in conjunction with the attached document “Important Information and Limitations of This Report”, which comprises an integral component hereof. The reader’s attention is specifically drawn to this material, as it is essential for proper use and interpretation of the information presented and discussed herein.

2.0 PROJECT SUMMARY

A total of 34 turbine foundations have been constructed as part of the NK1 project. These turbine foundations have been constructed within a rural farming area generally between Wallaceburg and Chatham, Ontario, bound by Bear Line on the west, Centre Side Road on the east, Oldfield Line on the north and Darrell Line and Pine Line on the south. The project area is illustrated on Figure 1. In general, the topography surrounding the turbine sites is relatively flat, with a topographic relief generally less than about 2 m. Buildings in the vicinity, considered potential receptors under NPC-233, consist of rural residences and farm buildings, typical of southwestern Ontario. In general, the nearest residences are more than 550 m from the turbine sites; however, this report does not provide specific off-set distances to all potential residential structures. For the purposes of monitoring, the turbines were grouped into geographic clusters within which vibration monitoring was to be undertaken at two domestic water wells. These turbine clusters and the associated water wells are also illustrated on Figure 1 and listed in Table 1, below. Figures T3 through T73 (provided after Figures 1 through 5, following the report text) illustrate individual turbine sites and the associated domestic water wells where vibration monitoring was completed. These figures have been numbered to reflect the turbine identification number.

Table 1: Summary of Turbine and Water Well Clusters

Turbine	Well	Well
Turbine Cluster 1		
T12	5 (9559 Pioneer Line)	6 (24123 Prince Albert Road)
T35		
T36		
Turbine Cluster 2		
T6	7 (25117 Prince Albert Road)	8 (9241 Countryview Line)
T7		
T31		
T38		
Turbine Cluster 3		
T28	9 (9557 Countryview Line)	10 (9709 Cedar Hedge Line)
T30		
T32		

Turbine	Well	Well
Turbine Cluster 4		
T3	11 (9596 Union Line)	12 (9468 Union Line)
T4		
T20		
T21		
T43		
T45		
T46		
Turbine Cluster 5		
T5	3 (8522 Bush line)	4 (26347 St Clair Road)
T33		
T34		
T52		
Turbine Cluster 6		
T14	13 (8771 Union Line)	14 (8904 Union Line)
T15		
T19		
T23		
T26		
T27		
T44		
T49		
T51		
Turbine Cluster 7		
T39	1A (25226 Baldoon Road)	A (25321 St. Clair Road)
T41		
T42		
T73		

2.1 Subsurface Conditions

Subsurface conditions at each turbine site were explored, tested and summarized by AMEC (2016). In general, the subsurface conditions consist of:

- Topsoil is commonly encountered near the surface and, in many areas, represents tilled and worked farmlands.
- In some areas, below the topsoil, deposits of sand and silt exist ranging in total thickness between nil and 8.2 m with an average thickness of 1.7 m, based on the boreholes completed for this project (AMEC 2016).

- Below the sand and silt, where present, the majority of the soils consist of a regionally extensive deposit of very soft to firm silty clay, ranging in thickness at the planned turbine sites from about 10 to 20 m with an average thickness of 13.2 m (AMEC 2016).
- At various turbine sites, sand and gravel soils with varying proportions of silt and clay, either representing ice-contact outwash or basal glacial till soils, were commonly found between the overlying thick silty clay deposits and the underlying bedrock. These soils represent the local aquifer and are as much as 10.4 m thick with an average thickness of about 2.2 m (AMEC 2016).
- Fine-grained shale bedrock of the Kettle Point Formation was encountered beneath the glacial till at all turbine sites in boreholes completed by AMEC (2016), during pile driving and during foundation anchor drilling.
- Natural gases were encountered during pile driving and drilling at turbine sites T7, T36, T73 and T44, during exploratory drilling at turbine sites T11, T16, T20, T27, T38, T41, T72 and T73 as noted in the AMEC (2016) report and was observed by Golder discharging from the outside tap at Well 11. Natural gas was also identified during drilling of domestic water wells as noted in MOECC water well records for or near Wells 5, 7, 8 and 12.

2.2 Foundation Design

Since the shallow ground conditions are not suitable to support the turbines on spread foundations, deep foundations were required. Each of the turbines will be supported by a circular mass concrete foundation and steel pipe piles driven into the ground to the top of bedrock. An approximately 2.7 m deep excavation, as measured from the surrounding ground surface, was completed prior to pile driving (see cover photograph) to bury the mass concrete foundation and utilize the overlying re-compacted soil as part of the resistance to uplift and overturning forces on the foundation. The initial foundation design planned to consist of as many as 24 to 26 driven steel pipe piles per turbine.

Two of the turbine sites, numbers T42 and T5, were selected for installation of a single foundation test pile at each site to refine the design of turbine foundations for the NK1 project. Work at the T42 test pile site was completed first and included driving and partially extracting a single pile along with a surface, subsurface and domestic water well vibration monitoring program (as discussed in the June, 2017 Golder report). The general location, site layout and subsurface instrumentation for the Turbine T42 area are illustrated on Figures T42 and T42A. Work at the T5 test pile site included driving and partially extracting a single test pile along with surface and domestic water well vibration monitoring at the locations illustrated on Figure T5. Test pile driving was undertaken between March 29 and 31, 2017 at the T42 site and on May 3 and 4, 2017 at the T5 site. The test pile program consisted of driving one pile from the ground surface at each of sites T42 and T5 where the pile was driven to the depth of pile refusal to penetration to measure resistance to downward loads. The test piles were selected to be consistent with the expected foundation piles and were about 410 millimetre (mm) outside diameter, driven with a closed-end and filled with structural concrete after driving. The closed-end was formed with an approximately 430 mm diameter, 50 to 60 mm thick plate welded to the tip of the pile. A closed-end pile design was selected based on geotechnical resistance performance whereby a larger structural end-bearing area is created by the closed end as opposed to the relatively thin, circumferential steel pipe cross section. Driving the piles with a closed-end was also advantageous for inhibiting soft soil materials from entering the pile and for permitting the entire pipe internal volume to be filled with structural concrete, producing a more rigid, heavier pile foundation system. The test piles were partially extracted to test uplift resistance and these results are provided by Exp (2017a). The test piles, therefore, do not form a structural part of the T5 and T42 foundations and have been abandoned within the foundation footprints.

Based on the results of test pile uplift resistance measurements, the foundations were redesigned to utilize a total of 18 driven pipe piles with integral rock anchors to provide uplift resistance. To permit both driving of closed-end piles and subsequent drilling for the rock anchors, the ends of the pipe piles were designed to be plugged with cement grout rather than being capped by steel plates as previously used for the test pile program. Half of the piles were designed to be driven at an angle of 5 degrees from vertical, outward away from the foundation, to provide additional resistance to overturning and sliding forces. After contacting the top of rock, the grout plugs and soils within the steel pile were removed using a 355 mm diameter drilling bit. Once the plug and soils were removed from within the steel pile, an approximately 229 mm diameter hole was drilled into the rock, into which a steel reinforcing bar was to be grouted as an anchor to uplift. The piles were then designed to be filled with concrete to the surface.

2.3 Pile Driving Hammer

With respect to the information required by NPC-233, the pile driving that forms the source of the vibrations was completed using a Berminghammer B-32 diesel hammer with a rated energy of 110 kJ with an operational hammer rate of 35 to 56 blows per minute, with the exception of one pile at T12 driven with a Berminghammer B-21 diesel hammer. This second hammer was judged to be ineffective for further use at this site. Specifications for the Berminghammer B-21 and B-32 diesel hammers are provided in Appendix A. The pile driving hammers and piles were suspended on a mobile crane mounted on a tracked/crawler carrier. Pile driving occurred during daytime and normal construction operational hours.

3.0 MONITORING EQUIPMENT, LOCATIONS AND METHODS

Vibration monitoring during driving of piles for the turbine foundations was completed between June 21 and November 8, 2017 in accordance with the work program approved by MOECC issued by Golder on June 9, 2017. For the purposes of vibration monitoring, the turbine sites were grouped into seven clusters as illustrated on Figure 1, based on geographic proximity, as the primary consideration, a need to develop a variety of turbine-to-well distances, construction sequence and permission from well owners. Monitoring of vibrations at the turbine construction sites was conducted full-time during active pile driving. Vibrations were also monitored at two domestic water wells within each of the turbine clusters. Figure 1 illustrates the clusters and Table 1 summarizes the corresponding wells that were monitored in each of the clusters. The centre of each turbine location was mapped using data provided to Golder and, based on the foundation design drawings, Golder mapped each pile for the turbines to allow determination of pile-specific distances to monitoring points (geophones and domestic water wells).

3.1 Vibration Monitoring at Turbine Sites

Ground surface vibrations were monitored at each turbine site on a full-time basis when piles were being actively hammered. Vibration monitoring was not completed during activities such as excavation, concrete placement or drilling activities. Conventional ground surface construction vibration seismographs were used for this purpose and consisted of geophone systems, as previously used during the test pile monitoring program, located close to the piles. Because of the foundation excavation slopes, site safety considerations and for protection of the monitoring systems from construction equipment, the geophones were typically located between 6 and 10 m radial distance away from the closest foundation pile. Therefore, the geophones were at a higher elevation than the bottom of the 2.7 m deep excavation completed for pile driving and foundation construction. The geophone sensors were coupled to the ground at the base of a shallow excavation, completed to remove surficial topsoil and loose materials, and the threaded coupling pins at the base of the geophone were firmly forced into the ground. The geophone was also covered with a plastic bag to protect it from rainfall and a sandbag was placed over the geophone to further ensure ground coupling. The geophones remained in a stationary position as the foundation piles were driven (i.e., the monitoring devices remained unchanged as the piles were driven around the circumference of the foundation). As a result, individual pile to geophone distances ranged from 6.1 to 28.6 m. Geophone locations and instrument serial numbers are illustrated on the turbine site plan Figures T3 through T73. Monitoring instruments consisted of Instantel Minimate Pro 3 and Pro 4 systems (see Appendix B). All systems were programmed to continuously record vibration histograms at two second intervals as well as a low “trigger” threshold for capturing vibration waveforms. Due to limitations related to data storage capacity, when the Pro 3 system was utilized, two instruments were installed so that while data was being downloaded from one, the other would continue to record data. This redundancy was not necessary for the more advanced Pro 4 system; however, dual geophone systems were implemented in many cases based on instrument availability and the number of turbine sites where pile driving was in progress. At least one geophone was operating at all times. Calibration records for these instruments are included in Appendix B and calibrations were completed in accordance with the manufacturer’s recommended schedule.

During all active pile driving, Golder personnel were on-site full-time and recorded pile depths, numbers of hammer blows, character of pile hammer performance, all hammering start and stop times as well as general notes on other activities such as splicing and welding. Pile driving times were recorded using the National Research Council of Canada official time (through cellular phone internet connection), to document time consistently throughout the vibration monitoring field work.

3.2 Vibration Monitoring at Domestic Water Wells

As noted above, two domestic water wells were monitored for vibrations when pile driving within each of the turbine clusters. A total of 14 water wells were monitored for the seven turbine clusters, since some of the well owners that initially participated in the test pile monitoring program subsequently declined to continue. A summary of conditions at each monitored water well, including photographs of each casing and the surroundings, is provided in Appendix C along with records obtained from the MOECC Water Well Information System database for the specific monitored well or for wells mapped in the near vicinity of the monitored wells. The MOECC water well records are provided as background information related to well casing sizes, construction dates, depths and ground conditions at each well.

Domestic water well casings for each turbine cluster were monitored with PCB 393A03 uniaxial accelerometers matching those used during the test pile monitoring program (see Appendix B). Three accelerometers were used for each casing to capture vibrations in three orthogonal directions (noted as vertical, longitudinal and transverse). As pile driving was carried out at the different turbine sites, the longitudinal monitoring direction was reoriented to be aligned toward the nearest turbine pile driving activities to the extent that physical conditions permitted (e.g., when pumps, casing attachments or other obstructions did not prohibit variable accelerometer orientation). Figures T3 through T73 illustrate the azimuths (based on magnetic north) that were used for accelerometer orientation.

For each monitored casing, the three accelerometers were rigidly mounted (threaded bolts) to a pre-fabricated block specifically manufactured for the purpose of using accelerometers to capture directional movements. The mounting blocks were rigidly attached to a stainless steel channel section fabricated at the University of Western Ontario machine shop specifically to allow adaptation to the range of circular well casings expected in the field, avoid altering or damaging the privately-owned well casing and to permit daily or weekly moving of the accelerometers to other wells. Two steel band clamps were used to temporarily attach the accelerometer system to the well casings. Each band clamp was secured using a torque of 81.3 Newton-metres (60 pound-feet) on the worm screw, producing more than two tonnes of radial force clamping the accelerometers to the well casings (see Appendix D for torque and band tension relationship). Examples of the accelerometer installations are illustrated in the photographs included in Appendix C. Field verification of accelerometer calibration was completed with a portable controlled vibration source before and after each time the accelerometers were installed on well casings and verification records are included in Appendix B.

Data from the well casing accelerometers was captured continuously during pile driving using either Crystal Instruments Spider 20 or Rion DA-21 four-channel data loggers. The Spider 20 sampled acceleration data at a rate of 1,280 Hz and the Rion DA-21 sampled at a rate of 256 Hz. The data loggers were pre-programmed and tested to capture data in electronic files of 10 minute durations to minimize the potential for data loss if the data loggers were damaged or otherwise interrupted. Since the wells were in multiple outdoor settings, the data loggers were battery powered except in some instances where the wells were sufficiently close to a power source and permission from the owner was granted to use the household electric current. In some cases, due to environmental conditions during the summer months and long operating durations, the batteries for these data loggers overheated, causing excessive and unexpected battery drain from time to time. Once this difficulty was identified, the data loggers were contained within coolers chilled with ice. Electronic files from each data logger were downloaded and stored on a daily basis on Golder computers and network servers.

During water well casing vibration monitoring, Golder personnel were stationed near the data loggers to record other activities on and near the well property. These individuals turned the equipment on and off as directed by Golder coordinating staff, periodically checked battery and recording status of the data loggers (balancing the need to minimize walking near the instrument with checking needs) and, to the extent practicable, observed on-site vehicle and pedestrian traffic, traffic on the nearby roads and other nearby activities that might influence ground vibrations. These individuals recorded observations marking the time of the observation. Recording of observation times at the wells was of less accuracy than at the pile driving site because of the time needed to write individual notes about a wide variety of observations. When possible and practical, vehicle types associated with road traffic were recorded; however, passing of every vehicle could not be recorded, particularly for busy roads such as St. Clair Road, Countryview Line, Prince Albert Road and Union Line.

3.3 Subsurface Vibration Monitoring at Turbine T42

Data from accelerometers previously installed within the bedrock at the turbine T42 site (see Golder 2017) was captured during pile driving using a Crystal Instruments Spider 80Xi 24 channel data logger that sampled acceleration data at a rate of 1,280 Hz. As with the well monitoring, the data logger was pre-programmed and tested to capture data in electronic files of 10 minute durations to minimize the potential for data loss if the data loggers were damaged or otherwise interrupted. A small, lightweight (98 cc) gasoline-powered portable generator, located about 10 m away from the nearest subsurface instrumentation location, was used to provide electric current to the data logger.

4.0 FIELD OBSERVATIONS DURING MONITORING

4.1 Monitoring at Turbine Sites

Commonly, the piles penetrated the first few metres of ground under their own weight, with nominal pile driving effort required (e.g., less than 5 hammer blows per metre of penetration) until the underlying glacial till and/or rock was encountered. In many cases, the pile driving resistance in the upper soil layers was insufficient to engage the firing mechanism in the diesel hammer. Upon reaching the glacial till, the pile hammer fully engaged and fired for the remainder of driving. Typically, the piles were marked at 0.25 m increments prior to driving to allow gaging of pile depth. While Golder personnel observed pile driving full-time, the focus of the observations was on counting hammer blows to judge penetration rate, time keeping and hammer performance related to energy delivered to the piles. Detailed records of final penetration depth and pile testing were prepared by others. However, pile driving conditions were clearly different and representative of “hard” driving conditions on glacial till or bedrock when the number of pile hammer blows required to drive the pile more than 0.25 m increased above approximately 10 and the hammer started firing.

At some turbine locations, particularly T3, T34, T45, T46 and T73, the piles had to have additional lengths spliced on the piles and the piles were driven deeper than initially planned. During pile driving, the crews observed and reported to Golder personnel that the grout plug was displaced up into the steel pile, indicating that the plug did not remain fully in place and that the driving energy delivered to the ground ahead of the pile was likely less than when the steel end cap was used during the test pile program. In 13 cases, piles were damaged and were replaced by new piles driven at distances of 0.5 to 1 m toward the turbine centre as measured from the original pile locations.

In some instances, construction equipment operated or travelled in close proximity to the vibration monitoring geophones. These instances and the times during which such conditions occurred were noted by Golder personnel.

4.2 Monitoring at Domestic Water Wells

Activities at and near the domestic well monitoring sites, well pump conditions and their operation and other observations made during vibration monitoring are summarized below:

- **Well 3:** Activities at the Well 3 property included crop harvesting, movement of farm vehicles and loading of haul trucks in relatively close proximity to Well 3. This well was located in a gravel driveway and farm equipment storage area.

- **Well 4:** Prior to September 6, 2017, Well 4 had not included a pump while Golder personnel were on site. On September 6, 2017 a well pump was connected, operated and adjusted and the owner made frequent return visits to the well shed. The pump was mounted in close proximity (less than about 1 m) to the well casing (see Appendix C). On September 5 and 6, 2017, passenger vehicles entered and left the Well 4 property, passing and parking close to the well shed. Crop harvesting was also carried out as close as about 25 m from the well casing.
- **Well 6:** The pump for Well 6 is mounted in close proximity to the well casing (see Appendix C). Approximately 1 minute after driving of Pile 1 for turbine T12 concluded, a loaded tractor-trailer dump truck drove by on the road near Well 6 causing sufficient vibration to be noticed by the Golder well attendant. At the same time, the resident was hammering in a nearby shed. During well monitoring, mechanical systems associated with the farm silos were observed to be operating from time to time. Farm equipment and crop transport trucks entered and left the site within approximately 105 m of the well. A small bridge used for farm equipment to cross a local open drain is located within 60 m of the well.
- **Well 9:** A piston pump for Well 9 is located within the barn adjacent to the Well 9 casing location, a total distance (inside and outside) of about 3 to 4 m. During pile driving for turbines T28 and T32, on August 11, 2017, other work was occurring near Well 9. This work included construction of the electric power collection system along the access road leading to the T32 site and included movement of heavy equipment, excavator operations, dump truck traffic, discharge of stone from delivery vehicles and other activities. This surface construction work was as close as 100 m from Well 9. Additionally, Well 9 is approximately 74 m from Countryview Line that experiences significant traffic. Traffic included loaded construction equipment, buses, fuel tanker trucks and other vehicles. Golder conducted a separate monitoring event at this well on September 8, 2017, to observe the influence of the pump on well casing vibrations in the absence of pile driving and the resulting character of the pump-induced vibration data.
- **Well 10:** The pump for Well 10 is mounted in close proximity to the casing and was audible during operation (see photographs in Appendix C).
- **Well 11:** Vibrations of the casing at Well 11 were measured during water quality sampling on August 17, 2017 in the absence of pile driving at any location to observe the influence of the pump on well casing vibrations in the absence of pile driving and the resulting character of the pump-induced vibration data. The pump is located within the residence and approximately 40 m from the well.
- **Well 12:** Well 12 was clearly audible when it was operating. The pump for Well 12 is a mechanical lift pump mounted directly on top of the well casing. Golder personnel recorded the specific times of pump operations on a number of occasions to identify the influence of the pump on well casing vibrations and the resulting character of the pump-induced vibration data.
- **Well 13:** Well 13 is located in an area near the barns and is subject to on-site farm equipment movements in the vicinity. The pump for this well was mounted in close proximity to the well casing and was clearly audible when it was operating. Golder personnel recorded the specific times of pump operations on a number of occasions to identify the influence of the pump on well casing vibrations and the resulting character of the pump-induced vibration data.

- **Well 14:** Well 14 is located approximately 13 m from the centreline of Union Line and within 2 m of the driveway. This well also includes use of wagon wheels leaned against the well casing as a decorative feature.

The monitored wells were located on properties that abutted and opened onto local roads as summarized in the table below. In general, the local paved roads in the area were originally constructed in the 1960s and 1970s using unreinforced Portland cement concrete with wooden expansion joints at approximately 18.3 m intervals placed on approximately 150 mm of cement-treated base. Since then, the roads have been resurfaced at various times with 70 to 80 mm of asphaltic concrete pavement. The Portland cement concrete pavement has typically developed transverse cracks that allows water into the road base that then promotes degradation of both the pavement and base over repeated freeze-thaw cycles and traffic loads. While the surface asphaltic pavement results in a smooth surface for a period of time, reflection of the transverse cracks through the surface results in many of the roads in the project area having low condition ratings based on the Ministry of Transportation Ontario SP024 Manual for Condition Rating of Pavements. In some areas, crack sealing compounds have resulted in an additional ridge of at the transverse crack, making ride quality worse. This poor road condition and the transverse cracks and filling materials produce noticeable and repeated bumps in the road that likely serve as a mechanism underlying traffic-induced vibrations.

Table 2: Summary of Roads at Monitored Domestic Wells

Well No.	Address	Distance to Road Centreline (m)	Road Surface
1	25209 Baldoon Road	37	Gravel surfaced
1A	25226 Baldoon Road	65	Gravel surfaced
A	25321 St. Clair Road	35	Asphaltic surface, transverse cracking clearly evident at 10 to 15 m intervals
2	25345 Baldoon Road	51	Gravel surfaced
3	8522 Bush Line	101	Gravel surfaced
4	26457 St. Clair Road	81	Asphaltic surface, transverse cracking clearly evident at 5 to 10 m intervals
5	9559 Pioneer Line	195	Suspected former “tar and chip” surface treatments, longitudinal ruts
6	24123 Prince Albert Road	55	Asphaltic surface, surface treatment more recent and transverse cracking less pronounced than other area roads
7	25117 Prince Albert Road	54	Asphaltic surface, transverse cracking clearly evident at 10 to 15 m intervals
8	9241 Countryview Line	56	Asphaltic surface, transverse cracking clearly evident at 5 to 10 m intervals
9	9557 Countryview Line	80	Asphaltic surface, transverse cracking clearly evident at 5 to 10 m intervals
10	9709 Cedar Hedge Line	61	Gravel surfaced
11	9596 Union Line	89	Asphaltic surface, transverse cracking clearly evident at 5 to 10 m intervals with closer crack spacing in some areas

Well No.	Address	Distance to Road Centreline (m)	Road Surface
12	9468 Union Line	84	Asphaltic surface, transverse cracking clearly evident at 5 to 10 m intervals with closer crack spacing in some areas
13	8771 Union Line	67	Asphaltic surface, transverse cracking clearly evident at 5 to 15 m intervals
14	8904 Union Line	13	Asphaltic surface, transverse cracking clearly evident at 5 to 10 m intervals

4.3 Subsurface Vibration Monitoring at T42 Site

As noted above, subsurface vibration monitoring equipment installed within the bedrock as part of the test pile program was used to measure vibrations generated during construction pile driving at the T42 site. Initial data collection determined that the high resolution uniaxial accelerometers were functioning appropriately. During initial on-site measurements, however, it was not clearly identifiable whether the triaxial instruments within the bedrock were also functioning though all systems were connected and powered during pile driving. Later review and comparison of the data from both instrument types determined that only some channels of the triaxial accelerometers were functioning and included signal noise below about 10Hz. While monitoring the subsurface accelerometers, electrical power supplies associated with the on-site generator were inconsistent as a result of a ground-fault interrupter switch triggering because of heavy rain and wet site conditions. In total, subsurface data from driving half of the piles was captured by all in-rock instruments.

5.0 VIBRATION MONITORING DATA

5.1 Data Evaluation Methods

Consistent with the test pile vibration monitoring program (Golder 2017), geophone vibration velocity data gathered by the Instantel Minimates was processed using Blastware software[1]. Full waveform and long-duration monitoring time-velocity histograms were used to identify peak vibrations during driving of each pile. The combination of time, velocity and pile driving location permitted evaluation of distance-dependent vibration magnitude attenuation for each turbine site.

As described in the test pile vibration monitoring program report (Golder 2017), data generated by accelerometers required separate processing for the following reasons:

- high-precision, low-noise accelerometers were chosen for much of the monitoring since, for the physical size, frequency and amplitude ranges necessary for this work, available accelerometers were more sensitive than most geophone systems;
- background vibrations and other vibration noise (e.g., generated by nearby road traffic, other equipment operating at the ground surface, environmental influences, etc.) and system electronic noise (e.g., voltage

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[1] Blastware, (2015). Blastware, Release 10.74, Xmark Corporation for Instantel, Kenata, Ontario.

variability of power generators, signals outside of rated frequency ranges, etc.) must be considered apart from the primary frequency source (pile driving) to arrive at appropriate measurements of related particle velocities;

- pile driving using an impact hammer produces discrete, transient, or discontinuous, complex waveforms (i.e., not continuous, repeating sinusoidal waves); and
- acceleration data must be mathematically integrated to obtain corresponding velocity data.

Acceleration time histories for each instrument were used to relate specific activities identified by time of occurrence to instrument responses. Accelerometer data was subsequently analysed using the MATLAB[2] Version 2017A and 2017B software along with the Signal Processing Toolbox. Consistent with the data evaluation process implemented for the test pile vibration monitoring program (Golder 2017), a Fast-Fourier Transform (FFT) algorithm was used to convert consecutive one second intervals of acceleration data from the time domain into the frequency domain with the FFT data subsequently integrated to velocity. The values of each peak within the velocity spectrum for each consecutive one second interval of data (i.e., comprising 256 or 1,280 specific sampled measurements of acceleration) were chosen using the “findpeaks” function in MATLAB. This approach limited the potential influence of various filtering algorithms and signal power suppression that might otherwise be used to address FFT spectra noise and leakage while at the same time addressing the FFT results that appear in the low frequency range below 5 to 10 Hz. During the test pile vibration monitoring program, verification of Parseval’s theorem was also completed to ensure that the recorded energy in the time domain was the same as the energy in the frequency domain for this data evaluation methodology. A semi-automated process was implemented whereby the 10 minute files of multi-channel data from the data loggers were evaluated for key periods of time during which the piles were being driven on the glacial till and/or rock and the driving energy was therefore at its greatest. Additional 10 minute files were also evaluated for specific events such as when pile driving was not occurring and during well pumping. Analysis of each 10 minute file produced 600 individual FFT results from which peak vibration velocity was obtained. In addition, when pile driving induced vibrations could be specifically identified within the acceleration time history data, these time periods were also examined to separate the influences of pile driving from other transient vibration sources.

Appendix E includes examples of 10 minute acceleration time history periods from various well casing accelerometers and the subsurface accelerometers at the T42 site. These examples are organized in Appendix E sequentially by turbine number, well number and pile number. The data time histories illustrate accelerometer responses to pile driving actions and examples of other identifiable transient sources of vibrations such as pump operations for Wells 5 (mechanical interference), 6, 10, 12 and 13 as well as the effects of vehicles passing the wells on the nearby roads, particularly at Well 14. Turbine T14 and Well 14 represent the closest pile to well monitoring distances and, therefore, more examples are shown for this particular case. Further, in this case, the well also represented the closest well to road distance and observations of traffic conditions were the most readily identifiable on a consistent basis because of this proximity. Additional examples for turbines T5, T31, T32, T35 and T44 are also provided. These additional examples illustrate the relatively consistent character of the vibrations induced by pile driving as compared to pump operations and other transient sources (most commonly induced by traffic on adjacent roads or on the site), though the magnitudes of the vibrations differ. Examples of vibrations

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[2] MATLAB 2017a (2017). MATLAB, 1 Apple Hill Drive, Natick, MA 01760-2098; https://www.mathworks.com/products/matlab.html

measured in the bedrock at the T42 site are also provided in Appendix E. Within the overall set of 10 minute data file image examples, several excerpts for significantly shorter time scales are also included to illustrate the character of vibration waveforms associated with the pile driving. In all examples, the data file images are scaled according to the number of time-based samples obtained by the data logger (i.e., either 1,280 Hz or 256 Hz). Therefore, the horizontal time scales of the 10 minute long data images are shown with maxima of $8x10^5$ samples and $16x10^4$ samples, respectively. The figures included in Appendix E also include elapsed time scales and start of data file times for ease of reference and comparison to the data reports included in Appendix F. All 10 minute data file image examples use the same vertical scale of $1x10^{-3}$g for comparison purposes (where $g = 9.81\ m/s^2$), except for those at the T42 site since the vibration magnitudes were greater and not necessarily suited to this scale.

During monitoring, data was produced by uniaxial and some channels of the triaxial accelerometers installed in the rock at the turbine T42 site used as part of the test pile vibration monitoring. Upon detailed inspection and comparison of the data from these two instrument types, the peak acceleration magnitudes captured by the triaxial and uniaxial accelerometers was comparable; however, the triaxial data included significant signal noise below 10 Hz, causing artefacts when processing using the fast Fourier transform methods described above. Therefore, velocity values derived from the fast Fourier transform for the triaxial instruments that appeared below 10 Hz were not utilized. Examples of acceleration time histories, illustrating both full time histories where pile strikes were recorded as well as sequences of individual pile strikes at a smaller time scale are presented in Appendix E.

5.2 Data Summary

Vibration data for each turbine site and each of the two monitored wells in the associated turbine clusters are presented in Appendix F. These data reports also include specific notes related to observations made at both the turbine and well sites at the time of monitoring as related to construction activities, possible sources of vibration at the well sites, water well pump issues and the like.

On the monitoring data reports, three times are reported for each driven pile. The column heading “Start” refers to the time of day when the pile hammering commenced on the indicated pile. The column heading “Rock/Till” indicates the time at which hard driving started, as evidenced by the rate of pile depth change as compared to the numbers of hammer strikes on the pile and hammer performance (e.g., times when hammer was firing). The column heading “End” indicates the time of day at which active pile hammering ceased for the identified pile. While the total pile driving duration can be determined by the difference between the “Start” and “End” times, the duration of active pile hammering was frequently interrupted by pile splicing, welding, equipment repair, decision-making required for pile termination depths, pile testing and daily labour breaks. Many of these start and stop instances are identified on the data reports included in Appendix F. Other site activities, such as crane movements, welding, equipment start-up and other work occurring prior to start of active pile hammering were not recorded except in specific instances when the turbine site geophones were inadvertently influenced by other equipment operating too closely.

Pile driving for this project included:

- Driving a total of 625 piles for the 34 turbine foundations, where 13 of these were replacements for piles that were damaged during driving;

- 154 events during which the piles were hammered again to either evaluate whether suitable resistance to compression loads and contact with bedrock had been achieved or to advance the piles deeper to achieve contact with the top of rock;
- The duration of active hammering on the piles, when in contact with glacial till or bedrock, typically ranged from less than one to 10 minutes per pile, with an average of about 6 minutes per pile, and the longest durations, were associated with splicing and driving piles deeper through the glacial till soils.

The ground surface vibration monitoring data summarized in Appendix F represents the peak values of the vertical, longitudinal and transverse geophone measurements made at any time when driving the pile on the glacial till or rock. As noted above, since the piles were driven from the base of an excavation, driving of the piles through the upper-most soils required little effort (many penetrated by their self-weight) and the peak ground surface vibrations occurred when driving the pile on the glacial till or rock. Where the table entries on the data reports in Appendix F are left blank, the geophone instrument was not in use; for example when changing batteries or downloading data. At least one geophone was operating at all times. Peak ground surface vibrations measured at the turbine sites are illustrated on Figure 2 as compared to the geophone distance from each of the driven piles. These data clearly illustrate attenuation of vibration magnitudes with increased distance from the piles.

Well casing vibration monitoring is also summarized on the data reports included in Appendix F as relevant to active hammering on each pile for each turbine. These data represent the peak values of all vibration velocities measured in vertical, longitudinal and transverse directions that occurred for the period of time analyzed, regardless of the source of the vibrations.

Well casing monitoring identified several wells for which the vibrations induced by the pumps dominated the instrument readings when the pumps. Other activities were also identified that dominated the measured vibrations (e.g., road traffic, work on well pump, etc.). Relevant notes regarding various pumps, their operation and other identifiable influences on vibration measurements are described below:

- **Well 3:** Activities at the Well 3 property included crop harvesting, movement of farm vehicles and loading of haul trucks in relatively close proximity to Well 3.
- **Well 4:** Peak well casing vibration velocities for Well 4 of nearly 5 mm/s were recorded on September 6, 2017 when a well pump was connected, operated and adjusted and the owner made frequent return visits to the well shed. Crop harvesting was also carried out as close as about 25 m from the well casing.
- **Well 5:** Data from monitoring Well 5 exhibited intermittent vibration characteristics similar to pump operations (i.e., constant, relatively high frequency vibrations). These vibrations were independent of pile driving times and were not consistent with traffic-induced transient vibrations. It is suspected that the pump for this well may have been located within the adjacent garage/shed, the plumbing between the pump and casing may be relatively rigid and coupled to the casing or a separate piece of machinery may have been operating from time to time within the garage/shed.
- **Well 6:** The pump for Well 6 is mounted in close proximity to the well casing (see Appendix C). Peak particle velocities of as much as 0.8 mm/s were obtained from monitoring data collected at Well 6 on July 13, 2017 when the well pump was operating during a time period without pile driving. The influences of the pump were readily discernable in the monitoring data. Approximately 1 minute after driving of Pile 1 for turbine T12 concluded, a loaded tractor-trailer dump truck drove by on the road near Well 6 and, at the same time, the

resident was hammering in a nearby shed. Vibrations associated with the loaded dump truck were also perceptible by our well monitoring staff and registered at about 2.8 mm/s.

- **Well 9:** A piston pump for Well 9 is located within the barn adjacent to the Well 9 casing location, a total distance (inside and outside) of about 3 to 4 m. During pile driving for turbines T28 and T32, on August 11 and 14, 2017, other work was occurring near Well 9. This work included construction of the electric power collection systems along the access road leading to the T32 site and included movement of heavy equipment, excavator operations, dump truck traffic, discharge of stone from delivery vehicles and other activities. This surface construction work was as close as 100 m to Well 9. Additionally, Well 9 is approximately 74 m from Countryview Line that experiences significant traffic. Traffic included loaded construction equipment, buses, fuel tanker trucks and other vehicles. Golder conducted a separate monitoring event at this well on September 8, 2017 to measure the influence of the pump on well casing vibrations in the absence of pile driving. Peak measured casing vibrations during this test were about 1.2 mm/s. Measurements at Well 9 on dates other than August 11 and 14, 2017 are consistent with expectations based on local traffic volumes and the potential influence of the adjacent piston pump.

- **Well 10:** Well 10 exhibited peak vibrations of about 1.25 mm/s during pump operation. The influence of pump operations were clearly discernable in the vibration monitoring data. The proximity of the pump and well casing are illustrated in the photographs provided in Appendix C.

- **Well 11:** Vibrations of the casing at Well 11 were measured during water quality sampling on August 17, 2017 in the absence of pile driving at any location. When the pump was operating, a peak vibration magnitude of 0.016 mm/s was measured at this well. The pump is located within the residence and approximately 40 m from the well.

- **Well 12:** During pile driving, Well 12 operated on a number of clearly definable occasions. Peak vibration measurements of pump-induced well casing vibrations were as much as 2.4 mm/s. The pump for Well 12 is a mechanical pump mounted directly on top of the well casing as illustrated in the photographs provided in Appendix C.

- **Well 13:** Well 13 is located approximately 87 m from the centreline of Union Line which is subjected to local truck traffic. Review of the data indicates that well pumping and non-pile driving transient sources influenced the results at this location. Vibrations induced by the Well 13 pump were as much as 0.75 mm/s.

- **Well 14:** Well 14 is located approximately 13 m from the centreline of Union Line which is subjected to local truck traffic. Peak vibration velocities measured at Well 14 of 0.613 mm/s and 0.675 mm/s were associated with a vehicle turning in the driveway and a tractor-trailer transport truck passing the well in the road lane closest to the well, respectively.

When well pumps were operating during pile driving time periods, the well casing vibrations caused by the pumps were one or more orders of magnitude greater than those generated by all other sources. Appendix E includes multiple examples of the effects of pump-induced vibrations on the accelerometer data. The data reports included in Appendix F include a “no pump” column that provides peak vibration data exclusive of these pump influences. Figure 3 summarizes pump-induced well casing vibrations measured for this project.

6.0 DATA INTERPRETATION

Figure 2, summarizing the vibrations measured at the turbine sites, clearly indicates patterns of vibration attenuation with increased distance from pile driving. Vibrations measured at the turbine site were the largest magnitudes measured during the course of the vibration monitoring program. While the ground responses at the individual turbine sites were of different magnitudes, the patterns of attenuation were similar. The magnitudes of measured turbine site vibrations were less than those anticipated based on the test pile program and use of the CALTRANS (2004) model for predictive vibration magnitude estimation. The reduced vibration responses are the result of the piles being driven from the base of a 2.7 m deep excavation that removed most of the surficial sand, silt and stiff clay from the sites. Penetration of the piles through the upper materials was accomplished with less resistance as compared to the test pile monitoring program and, in many cases, the piles penetrated several metres under their own self-weight. Peak vibration velocities at the turbine sites were less than 14 mm/s. While the vibration velocities exceeded the thresholds for human perception identified by NPC-207-2 and NPC-207-3 at the turbine sites, these thresholds are applicable to the reception sites which, in this case, are at significant distances from the construction (pile driving) location.

Figure 3 summarizes the influence of water well pumps on well casing vibrations. With the exception of vibrations caused by individuals installing, adjusting or otherwise working on the pumps and well casings, the pumps were the largest sources of well casing vibrations measured during the course of this monitoring program. Variability in the measurements is likely reflective of different pump types (e.g., mechanical lift versus jet pumps), water supply demands on the pumps, differing pump ages and mechanical conditions, and mechanical and plumbing connections among other variables.

As illustrated on multiple examples of acceleration time histories included in Appendix E, vibrations associated with transient traffic sources can be readily identified. Transient vibrations induced by vehicles passing by and farm vehicles operating on the domestic water well sites were the largest source of well casing vibrations when the influences of pump-induced vibrations are eliminated. Figure 4 compares well casing vibrations to the distance of the well casing from the nearby roads. While variability exists in the data, associated with the local road conditions, vehicle sizes, axle numbers, weights and speeds, there is a trend of decreased influence of traffic as compared to distance from the road, consistent with expected ground vibration attenuation patterns.

Bedrock vibrations induced by pile driving were measured at the turbine T42 site. In general, the magnitude of the rock vibrations was less than those measured during the test pile program for two principal reasons. First, during the test pile program, the pile driving hammer energy was selected to be as large as possible for the equipment and there was little concern for damaging the top of the pile. The test pile was hammered for a relatively long duration at the high energy. Second, the test pile included a thick welded steel end cap on the pile whereas the production piles used a grout plug to reduce the ingress of soil into the pipe pile when driving. While the grout plug successfully limited the ingress of soft clay soils into the pipe, the plug frequently became dislodged and displaced upward into the pile when driving through denser soils near the top of bedrock. The net result of the plug materials and behaviour was that the energy delivered to the rock during production pile driving was less than during the test pile program. Variability in the data is expected to be the result of natural variability in ground conditions, energy delivered to the pile and vibration wave form patterns as compared to the relative spatial positioning of the measuring instruments and pile tip locations.

Measured pile-driving vibration magnitudes at the well casings were significantly smaller than those identified at the turbine site where measurements in the bedrock were made, consistent with known vibration distance attenuation characteristics. The measured vibration magnitudes were less than those anticipated based on the test pile program and the CALTRANS (2004) model for predictive vibration magnitude estimation. Variability in these values reflect the variability in the levels of energy delivered to the rock at the pile driving site (as discussed above) and attenuation of low-energy vibrations at the pile sites to below detectable magnitudes at the wells (given the separation distances). The peak vibration velocities at domestic water well casings that were directly attributable to pile driving were less than 0.04 mm/s at turbine T32 and, elsewhere, were less than 0.030 mm/s at the closest well to pile distances. These measured velocities are:

- one or more orders of magnitude less than vibrations induced by typical pump operations where the pumps are connected in relatively close proximity to the wells;
- less than vibrations induced by local road traffic;
- less than the thresholds identified under NPC-207-2 and NPC-207-3 for human perception (see Table 3);
- less than published steady-state vibrations threshold of perception (0.15 – 0.5 mm/s, see Table 4)
- less than the ISO thresholds for human perception of steady state vibrations greater than about 8 Hz (0.1 mm/s); and
- comparable to or less than published values for “quiet background” conditions (see Table 4).

Table 3: Vibration Limits for Human Perception as Defined in Tables NPC-207-2 and NPC-207-3

Applicable Clause	Observation Period	Limit on the Average Peak Vibration Velocity (mm/s)	
		Daytime	Nighttime
Vibration Limits for Frequent Impulses			
4(4)(b)	≤20 minutes	0.3	0.3
4(4)(c)(i)	20 < period ≤ 60 minutes	0.6	0.3
4(4)(c)(ii)	60 < period ≤ 120 minutes	1.0	0.3
Vibration Limits for Infrequent Impulses			
4(4)(c)(iii)	120 minutes	10.0	0.3

Table 4: Examples of the effects, thresholds or conditions associated with small magnitude ground vibrations[3]

PPV (mm/s)	Effect or Condition
2 – 30	Pile driving in soft ground at 1 to 3 m from hammer using vibratory and impact hammers
23	Close-proximity nail driving in residential structure
2.5 – 12	Equates to normal daily family activity within residential structure
3 – 9	Vibration limits for pumps ranging from 10 hp to 3000 hp

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[3] See references at conclusion of report text for cited vibration magnitudes, their causes and other thresholds.

PPV (mm/s)	Effect or Condition
7.6	Equivalent to jumping on floor of residential structure
6	Transient vibrations distinctly perceptible
5	Steady-state vibrations annoying
2.5	Truck traffic on bumpy road at 16 m
2.3	Large bulldozer at 7.6 m
1	Steady-state vibrations readily perceptible
1	Transient vibrations barely perceptible
0.8	Steady-state threshold for workshop
0.8	Equivalent to walking on floor of residential structure
0.8	Small bulldozer at 7.6 m
0.76	Vehicle traffic at 16 m
0.15 – 0.5	Steady-state vibrations threshold of perception
0.4	Steady-state threshold for office
0.3	Steady-state vibrations slightly perceptible
0.2	Steady-state threshold for residence
0.1	Steady-state threshold for hospital operating room
0.025	Quiet background

7.0 CONCLUSIONS

Vibration monitoring was completed during construction of pile foundations for 34 turbines within the NK1 project area at the sites of the pile driving and at 14 domestic water wells. Ground surface vibration data was collected at multiple distances from each pile at the turbine sites. Vibrations of steel well casings used for domestic water supply wells were also measured at various distances from the pile driving. Vibrations of various magnitudes and sources were detected by all monitoring instruments. The resulting data has permitted an evaluation of distance-vibration attenuation behaviour for the project area site and vibrations at residential well locations. As compared to typical vibration magnitudes associated with well pumps, nearby road traffic, farm and passenger vehicle travel on the well sites and published acceptable vibration thresholds for different activities and conditions, vibrations at the residential well locations associated with pile driving were below regulatory values for human perception of transient vibrations, below published thresholds related to residential uses and below magnitudes for other common activities at the domestic water well sites. It is our opinion that pile driving did not expose distant groundwater wells (e.g., more than 550 m) to vibrations in excess of those that the wells commonly experience otherwise and were inconsequential for the wells.

GOLDER ASSOCIATES LTD.

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

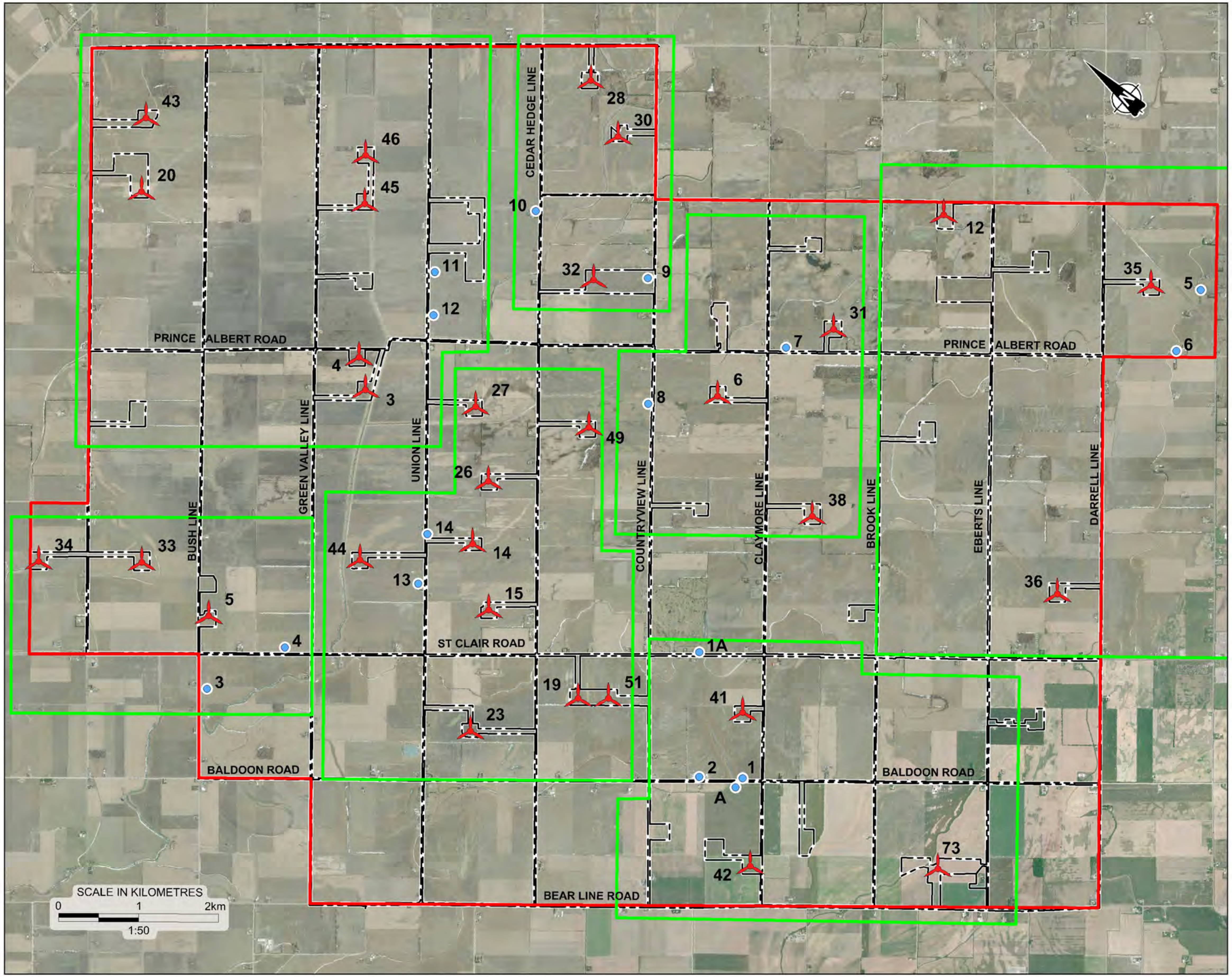
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client’s expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

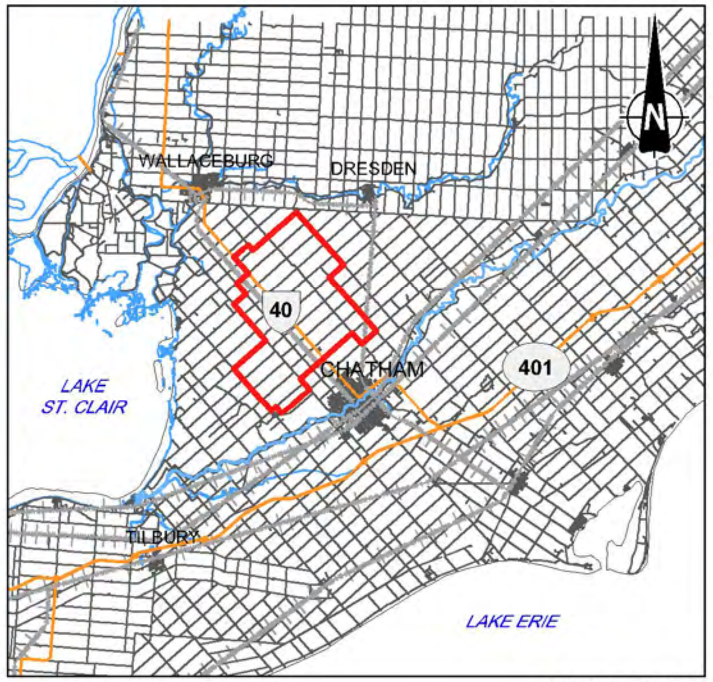
Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder’s report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder’s report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder’s report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder’s report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder’s responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.





KEY PLAN

LEGEND

● MONITORED WATER WELL

TURBINE

🟩 MONITORING CLUSTER BOUNDARY

🟥 PROJECT STUDY AREA BOUNDARY

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF NOVEMBER 30 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

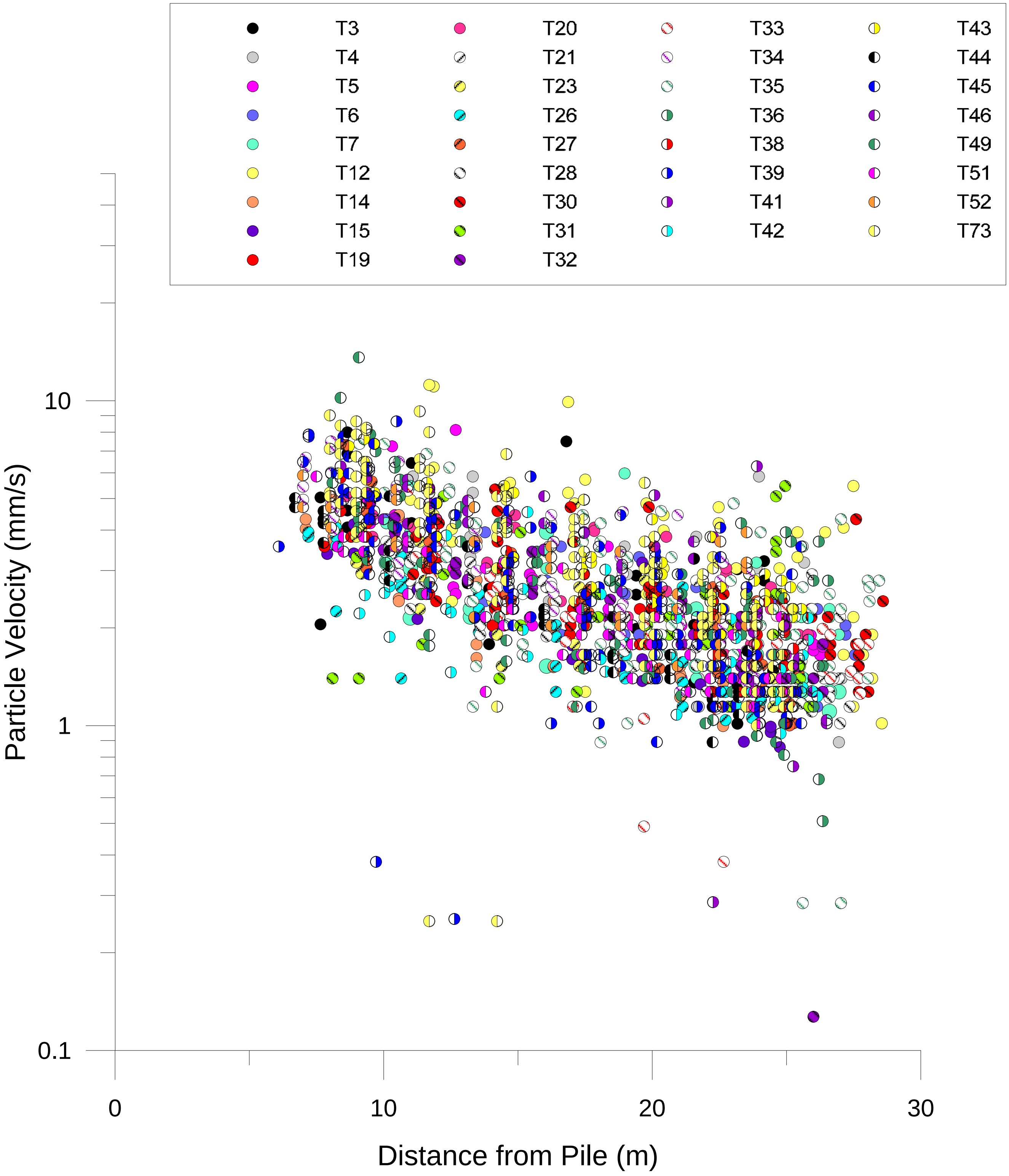
LOCATION PLAN

Golder Associates

PROJECT No.	1668031	FILE No. 1668031-2000-R02001	
		SCALE AS SHOWN	REV.
CADD	DCH	Nov 30/17	
CHECK	SSB		

FIGURE 1

Drawing file: 1668031-2000-R02001.dwg Nov 30, 2017 - 4:05pm



Notes:
1. This figure must be read with accompanying report.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

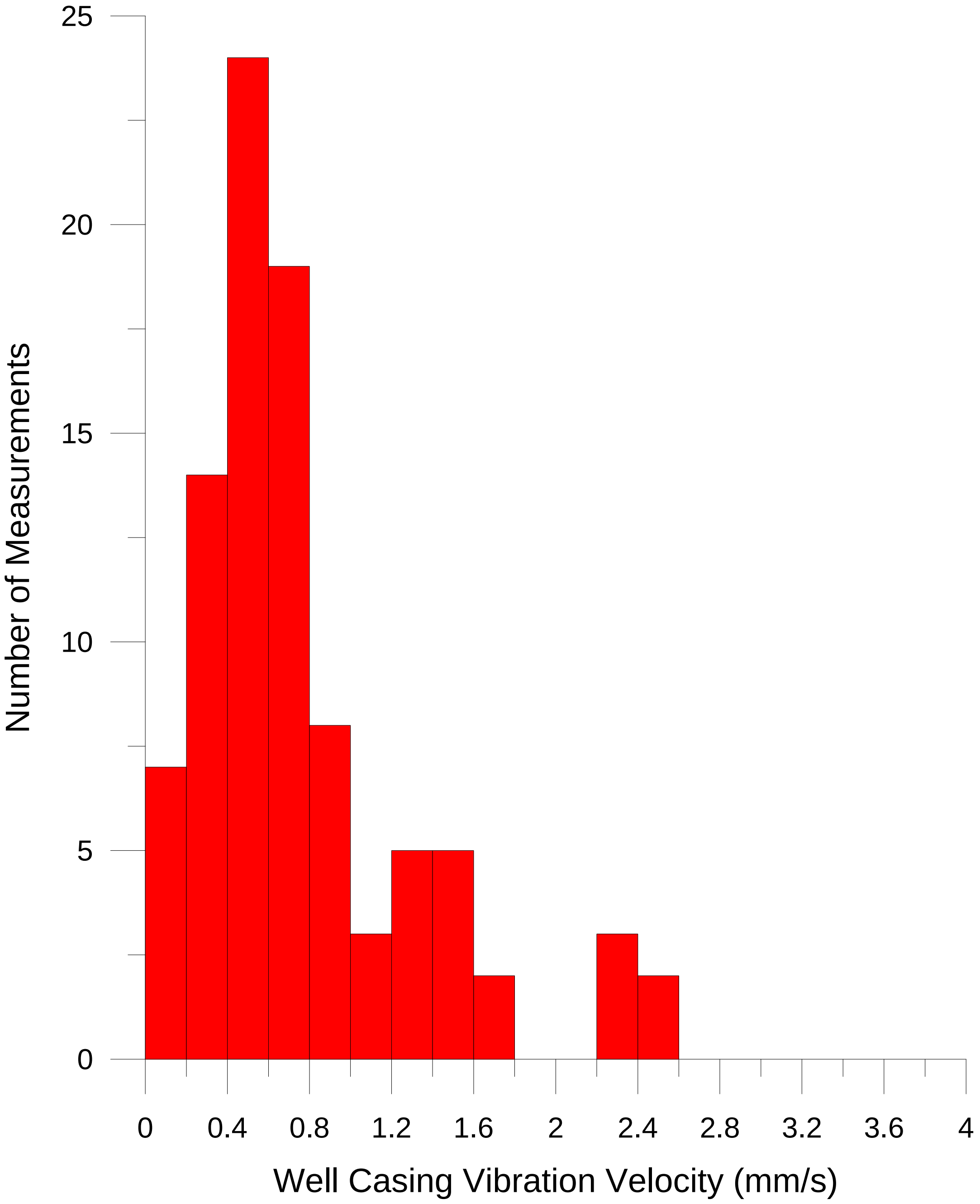
TITLE

VIBRATION MONITORING DATA SUMMARY
TURBINE SITES

Golder Associates

PROJECT No.	1668031-2000	**FILE No.**	1668031-2000-R02002	
		SCALE	AS SHOWN	**REV.** 0
DRAWN	SJB	DEC 2017		
CHECK	SJB		**FIGURE 2**	

N:\active\2016\3 Proj\1668031 Pattern_North Kent Vib Monit_Chatham-Kent\3-Drafting\Grapher Plots\R02\1668031-2000-R02002.grf



Notes:
1. This figure must be read with accompanying report.
2. Well casing vibrations exclude influences of manual installation and adjustment of pump at Well 4 and nearby construction for utilities.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

VIBRATION MONITORING DATA SUMMARY WATER WELL PUMP INFLUENCES

Golder Associates

PROJECT No.	1668031-2000	**FILE No.**	1668031-2000-R02	
		SCALE	AS SHOWN	**REV.** 0
DRAWN	SJB	DEC 2017		
CHECK	SJB		**FIGURE 3**	

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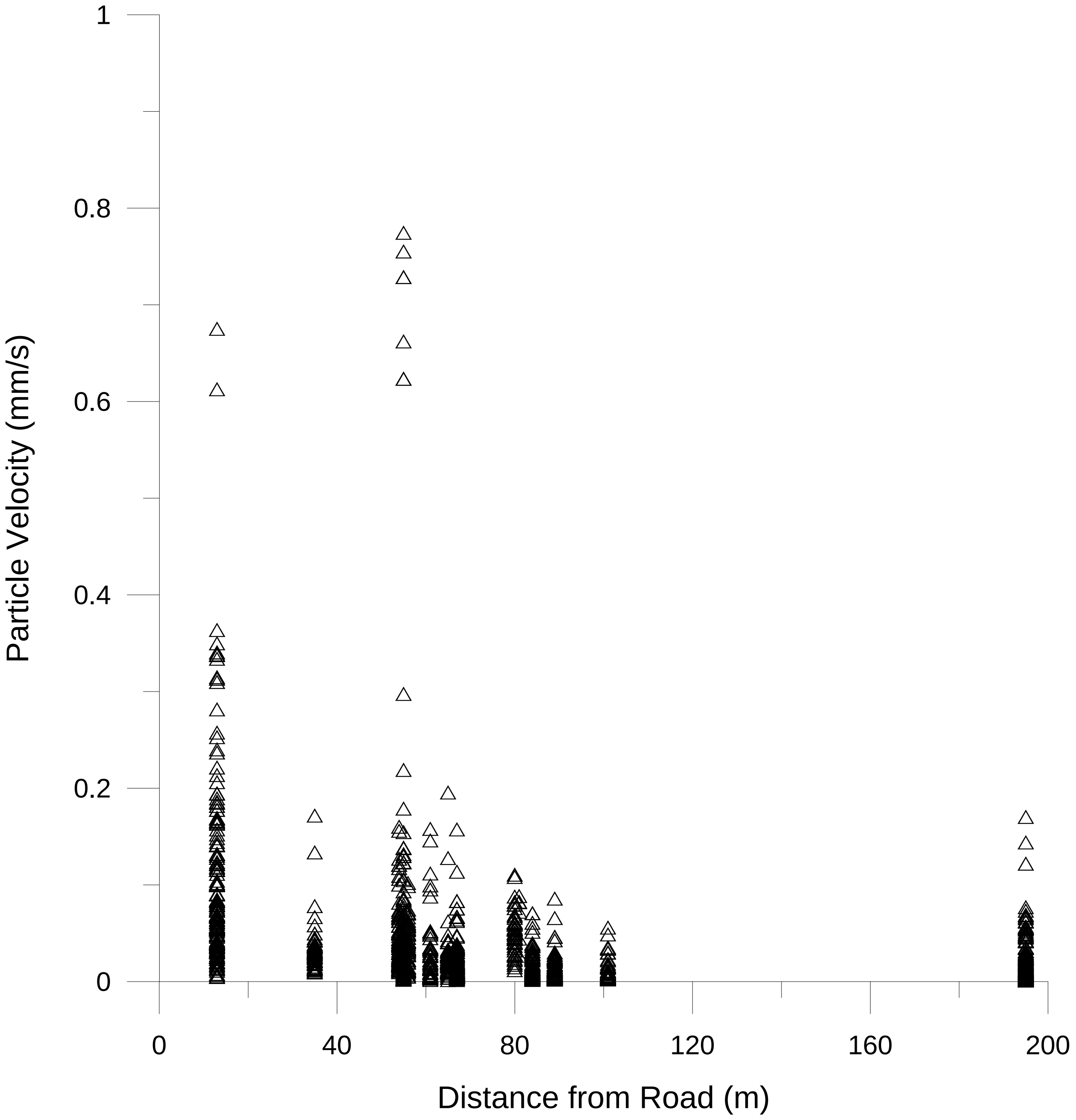

Notes:
1. This figure must be read with accompanying report.
2. Well casing vibrations exclude influences of pumps, manual installation and adjustment of pump at Well 4 and nearby construction for utilities.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

VIBRATION MONITORING DATA SUMMARY
SITE AND TRAFFIC INFLUENCES

Golder Associates

PROJECT No.	1668031-2000	**FILE No.**	1668031-2000-R02004	
		SCALE	AS SHOWN	**REV.** 0
DRAWN	SJB	DEC 2017		
CHECK	SJB		**FIGURE 4**	

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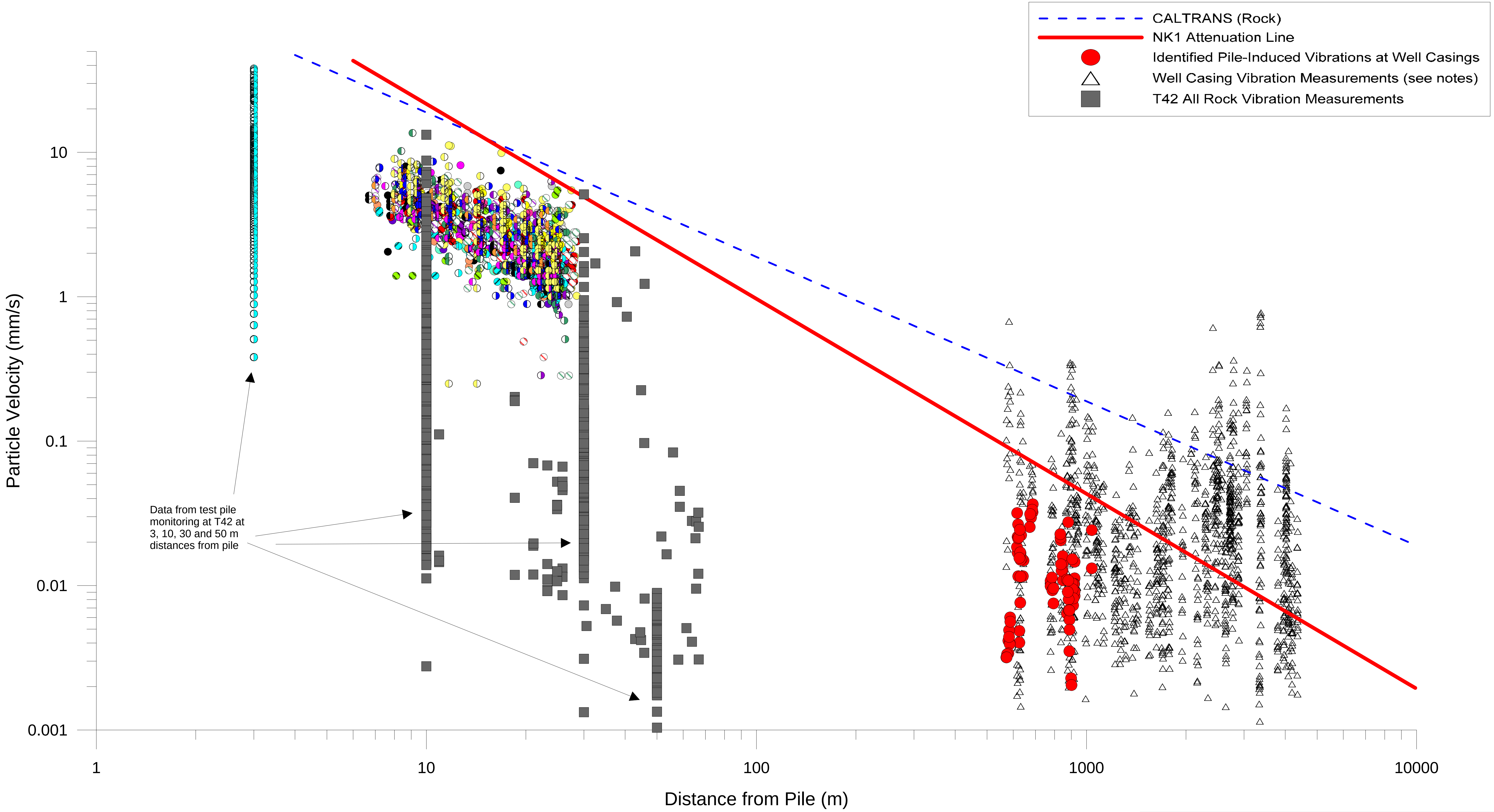

Notes:
1. This figure must be read with accompanying report.
2. Well casing vibration measurements include influences of traffic and excludes influences of pumps, manual installation and adjustment of pump at Well 4 and nearby utility construction.
3. See Figure 2 Legend for turbine site monitoring data locations.
4. Data shown for T42 at fixed 3, 10, 30 and 50 m distances from piles are from the test pile monitoring program where surface and subsurface vibration monitoring was conducted at fixed distances from the single test pile.

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
VIBRATION ATTENUATION CHARACTERISTICS

Golder Associates

PROJECT No.	1668031-2000		**FILE No.**	1668031-2000-R02005
			SCALE AS SHOWN	**REV.** 0
DRAWN	SJB	DEC 2017	**FIGURE 5**	
CHECK	SJB			

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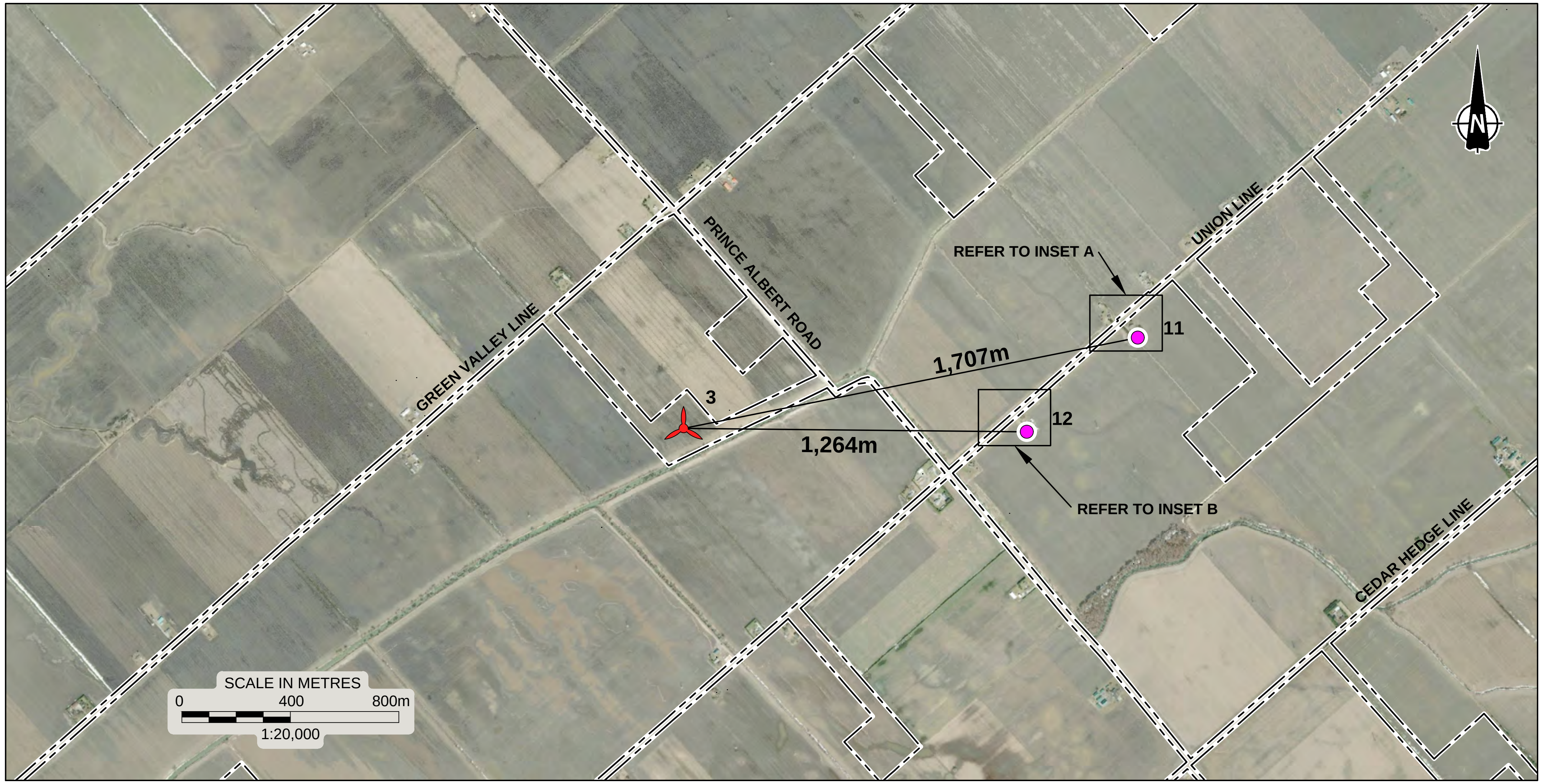
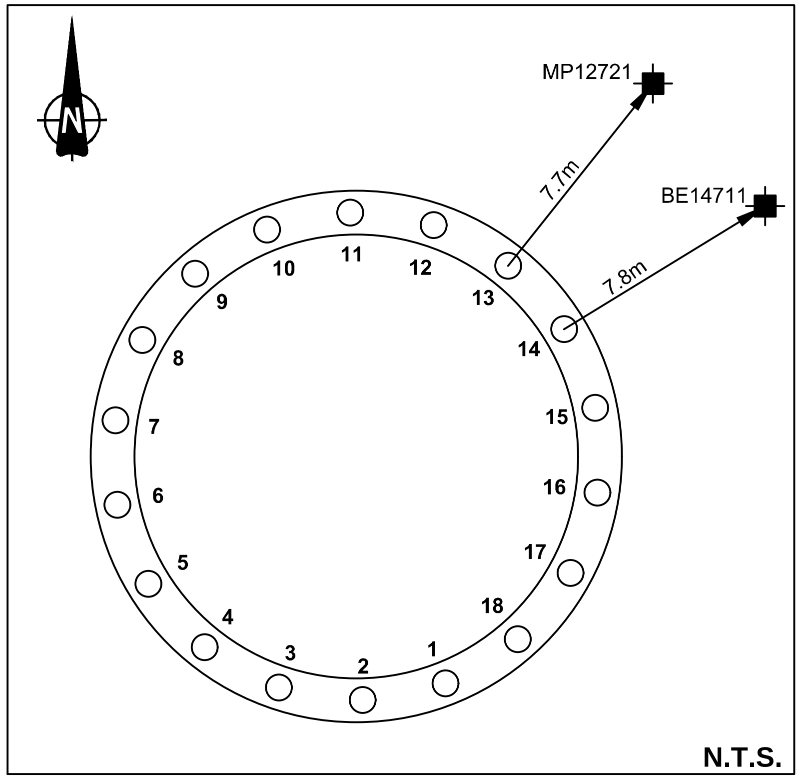


SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✦	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GEOGRAPHIC NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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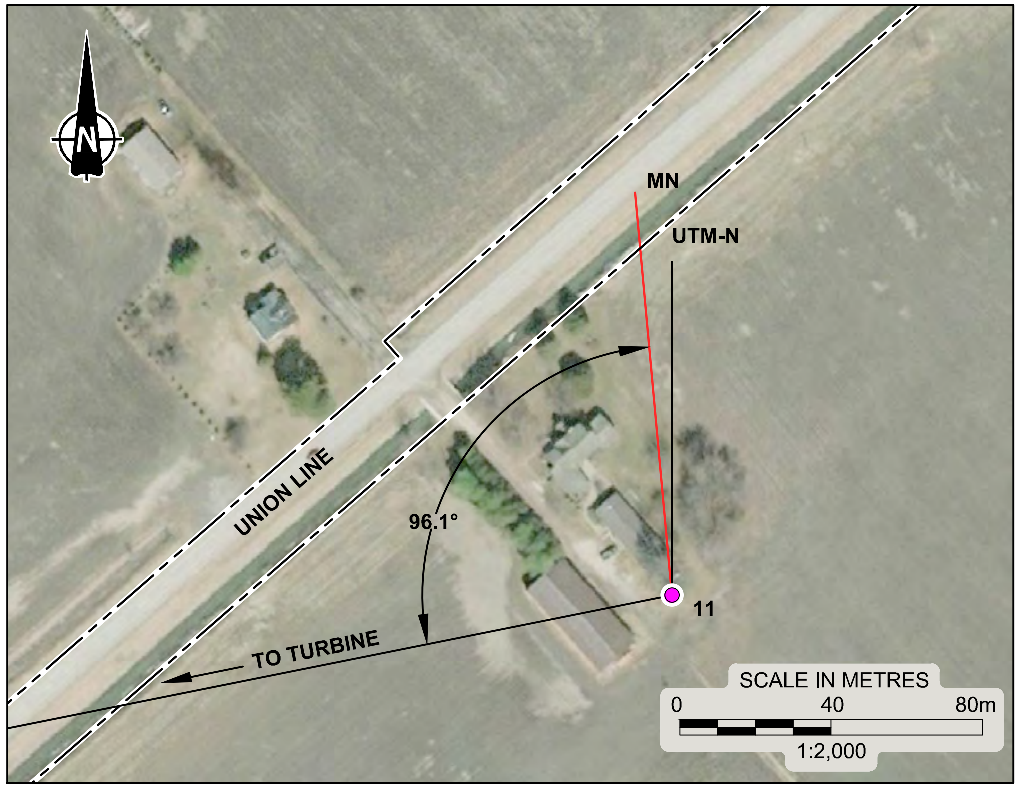
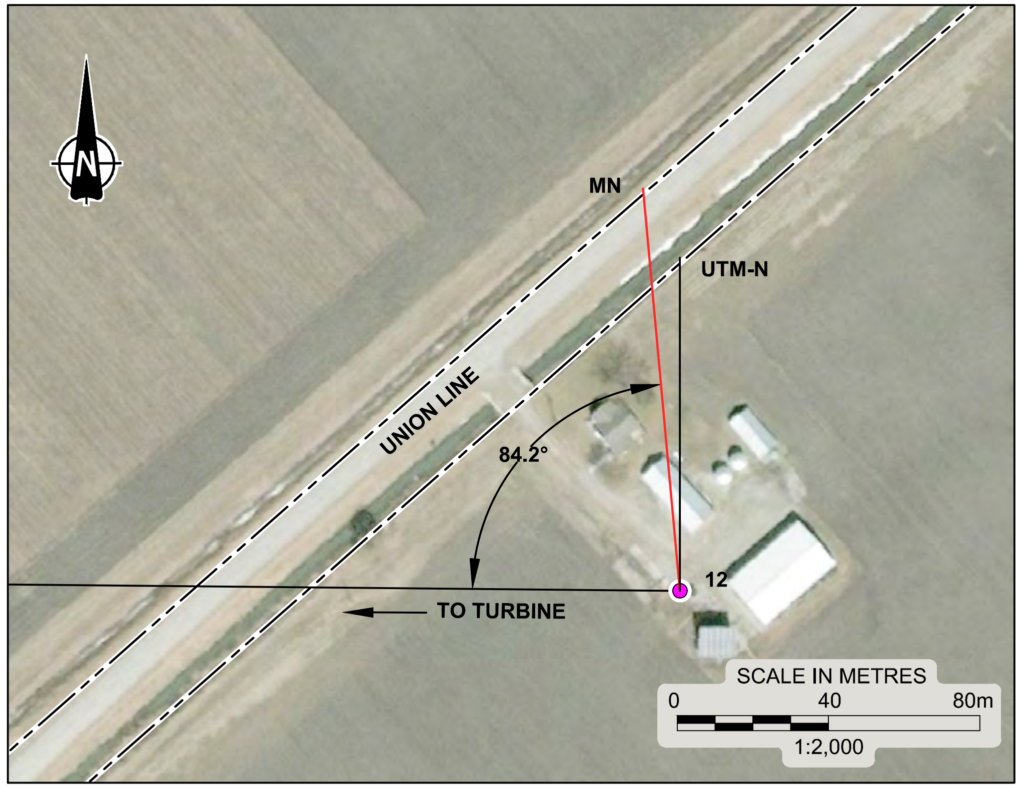
ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #11)



INSET B (WELL #12)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

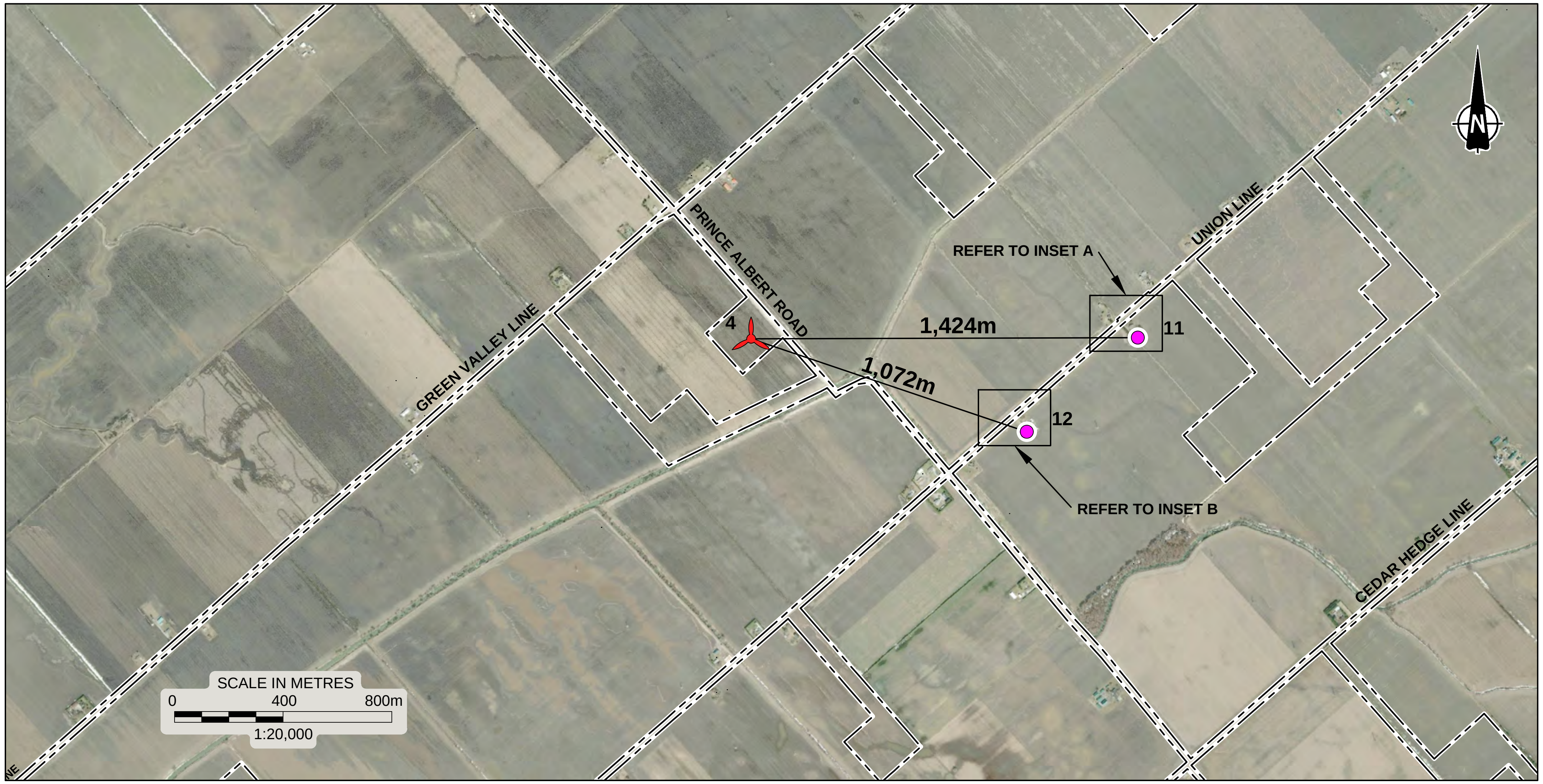
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T3

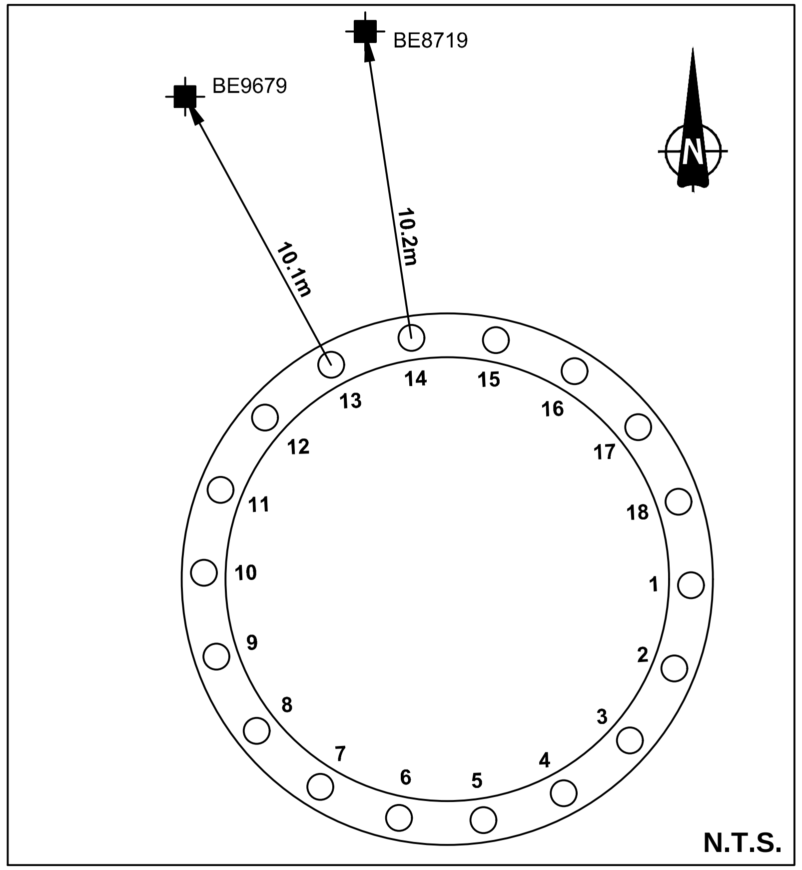
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T03
			SCALE AS SHOWN REV.
CADD	DCH/ZJB	Dec 7/17	
CHECK	SJB		FIGURE T3

Drawing file: 1668031–2000–R02T03.dwg Dec 07, 2017 – 10:31am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✱	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GEOGRAPHIC NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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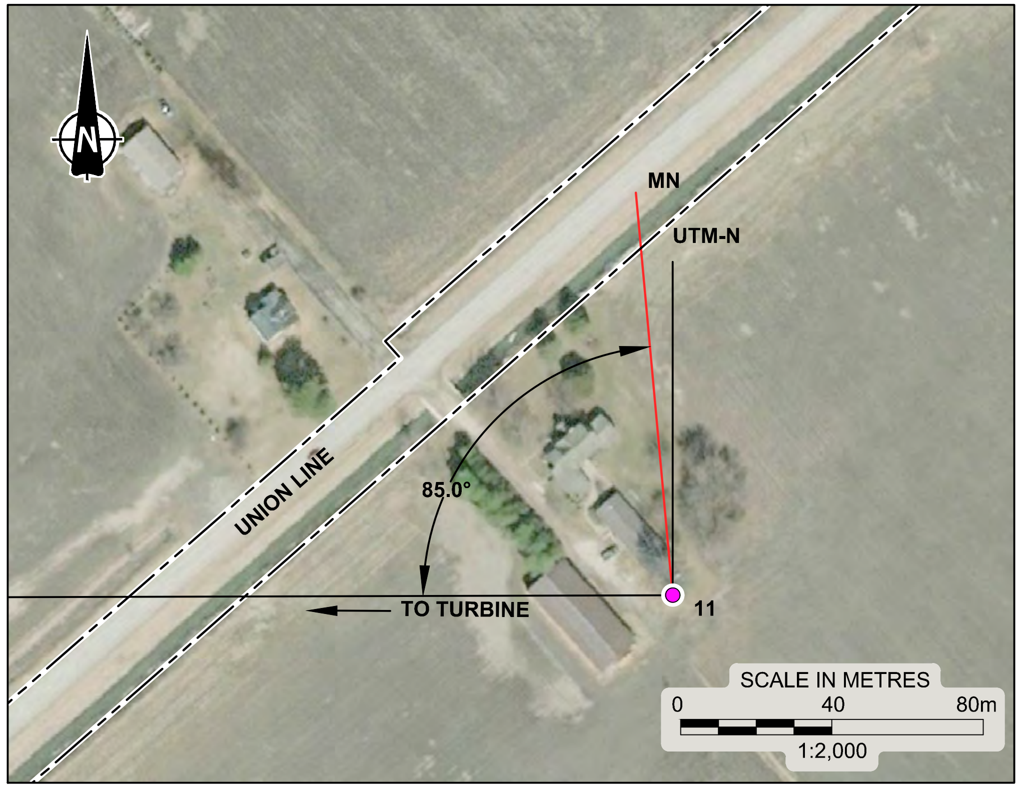
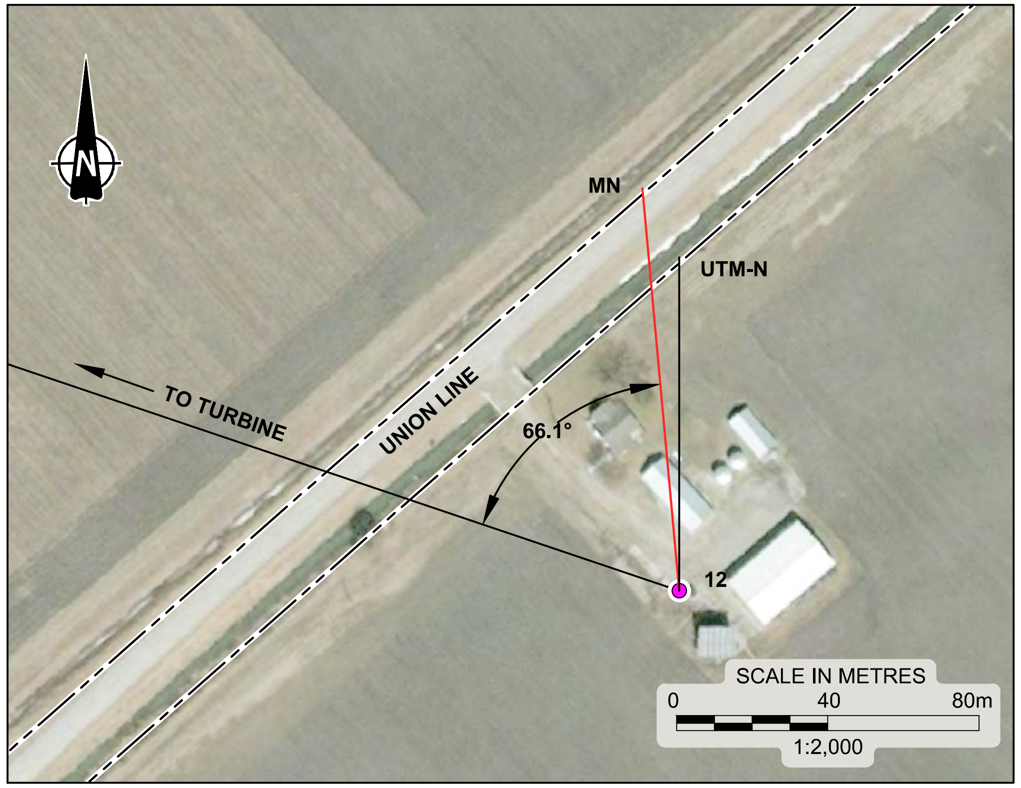


INSET A (WELL #11)



INSET B (WELL #12)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

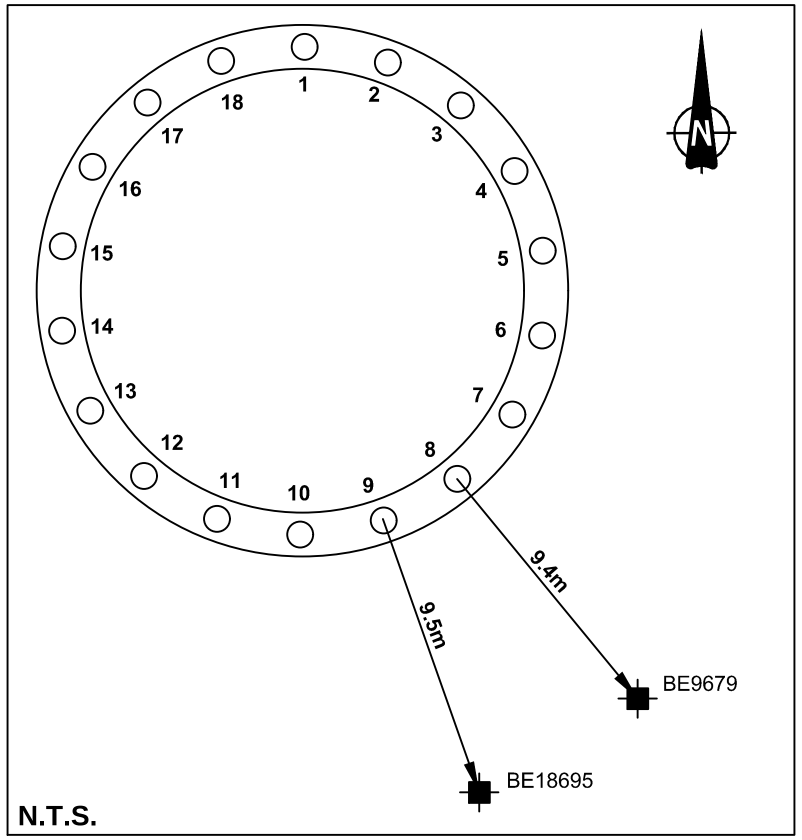
TURBINE PILES AND WATER WELL LOCATION PLAN, T4

Golder Associates

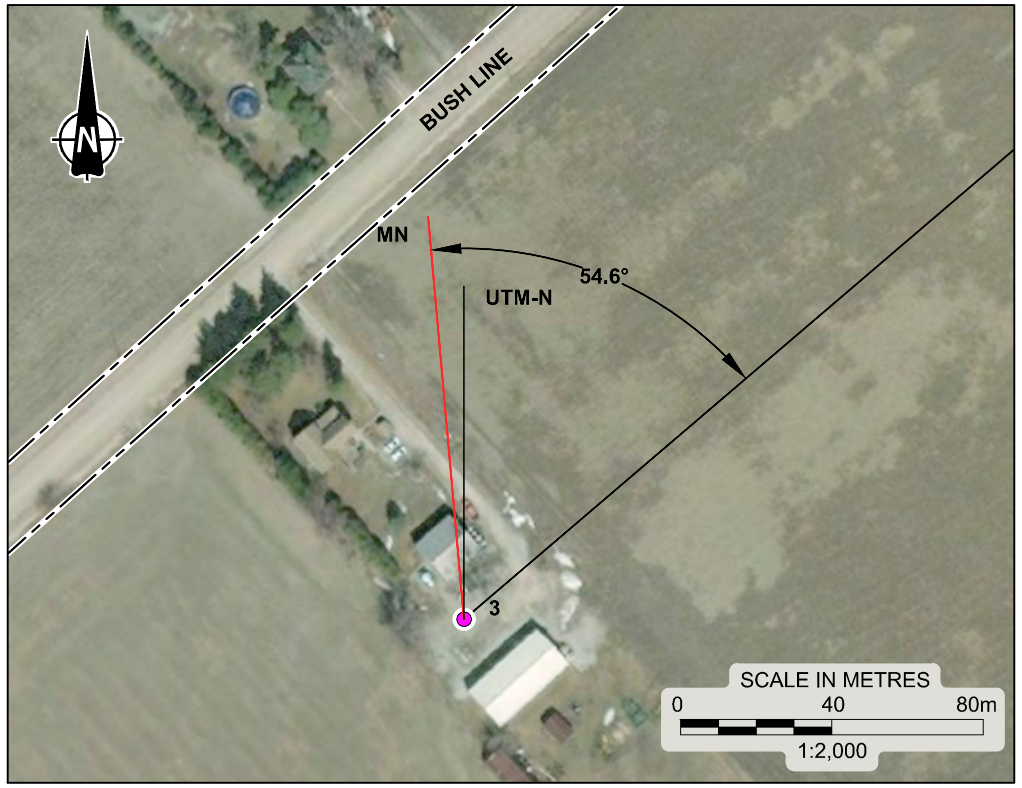
PROJECT No.		1668031	FILE No.1668031–2000–R02T04
			SCALE AS SHOWN REV.
CADD	DCH/ZJB	Dec 7/17	
CHECK	SJB		**FIGURE T4**

Drawing file: 1668031–2000–R02T04.dwg Dec 07, 2017 – 10:50am

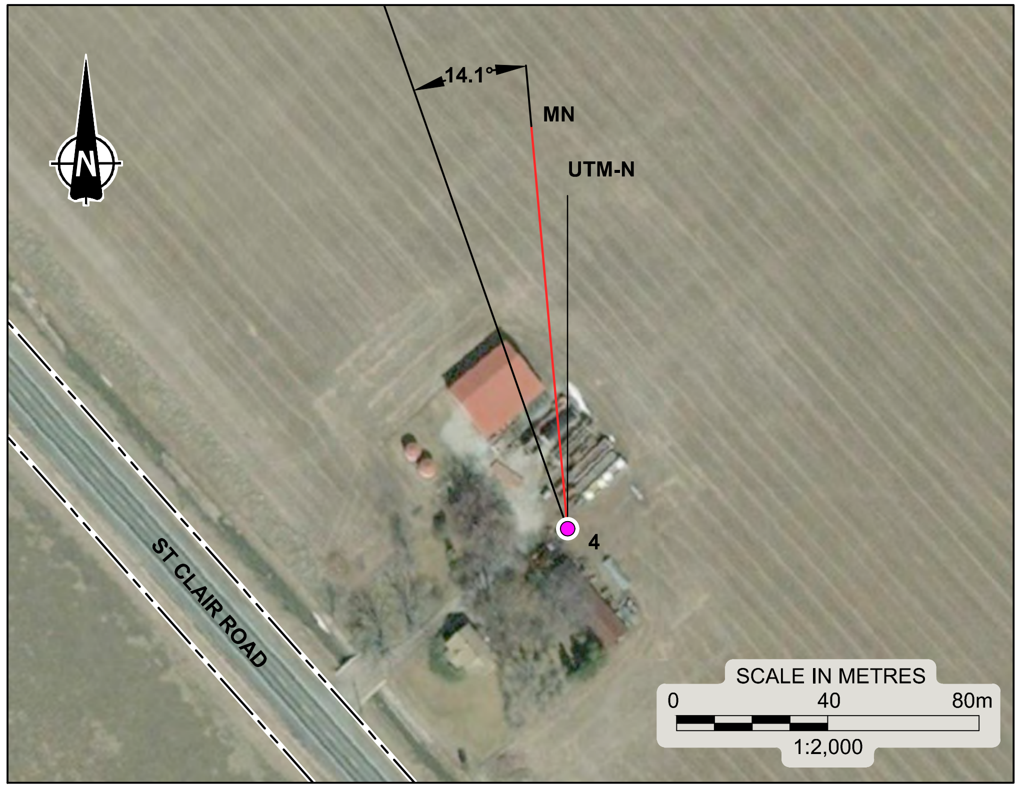
SITE PLAN



TURBINE PILE LAYOUT



INSET A (WELL #3)



INSET B (WELL #4)

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

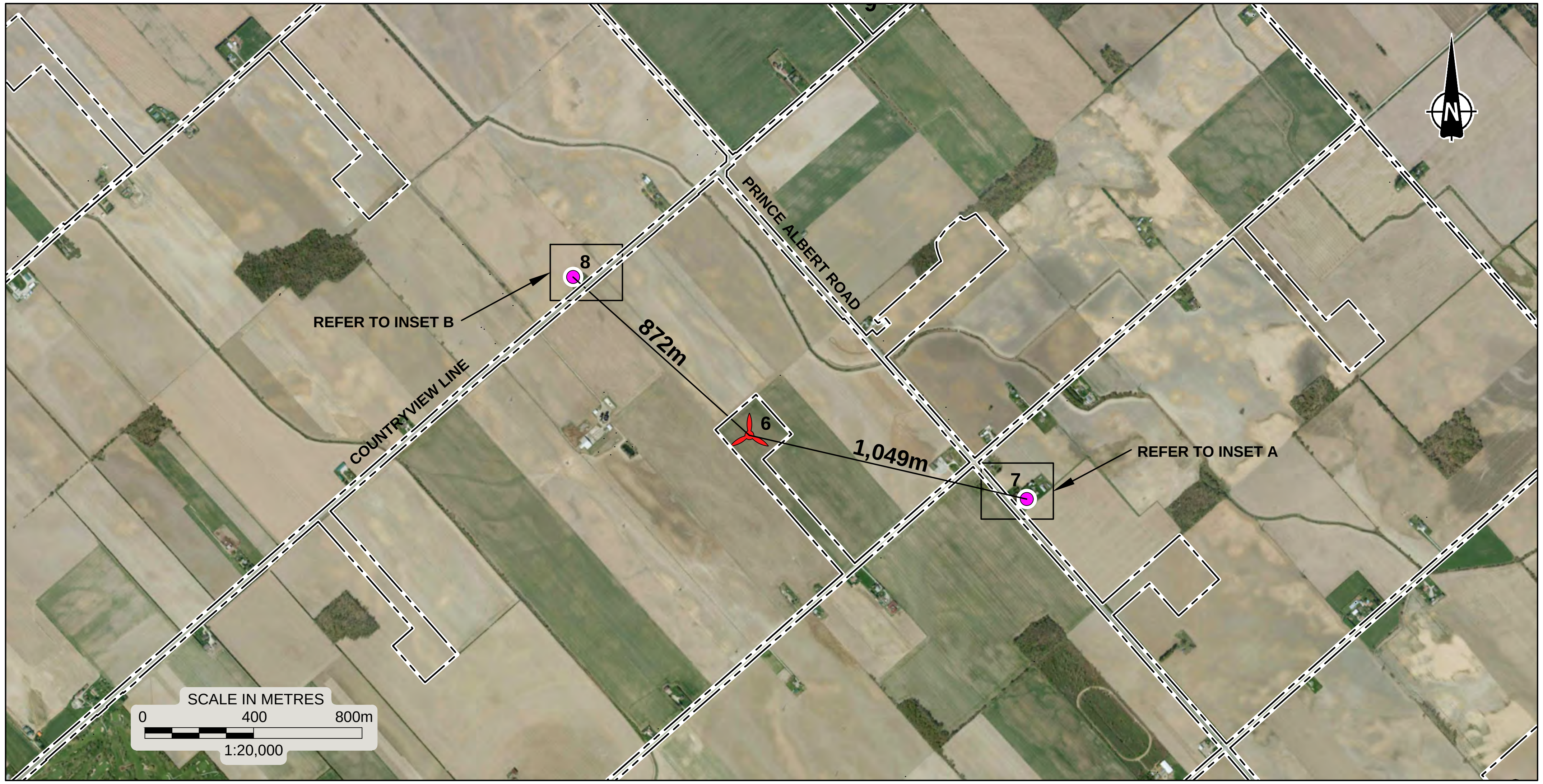
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T5

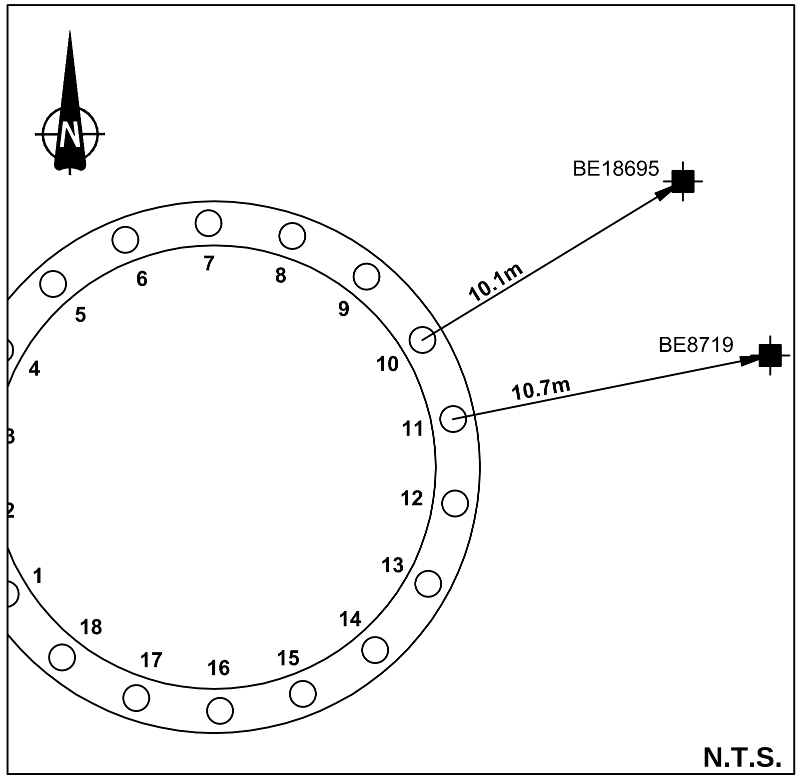
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T05
			SCALE AS SHOWN / REV.
CADD	DCH	Dec 7/17	
CHECK	SSB		FIGURE T5

Drawing file: 1668031–2000–R02T05.dwg Dec 07, 2017 – 10:52am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✱	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GEOGRAPHIC NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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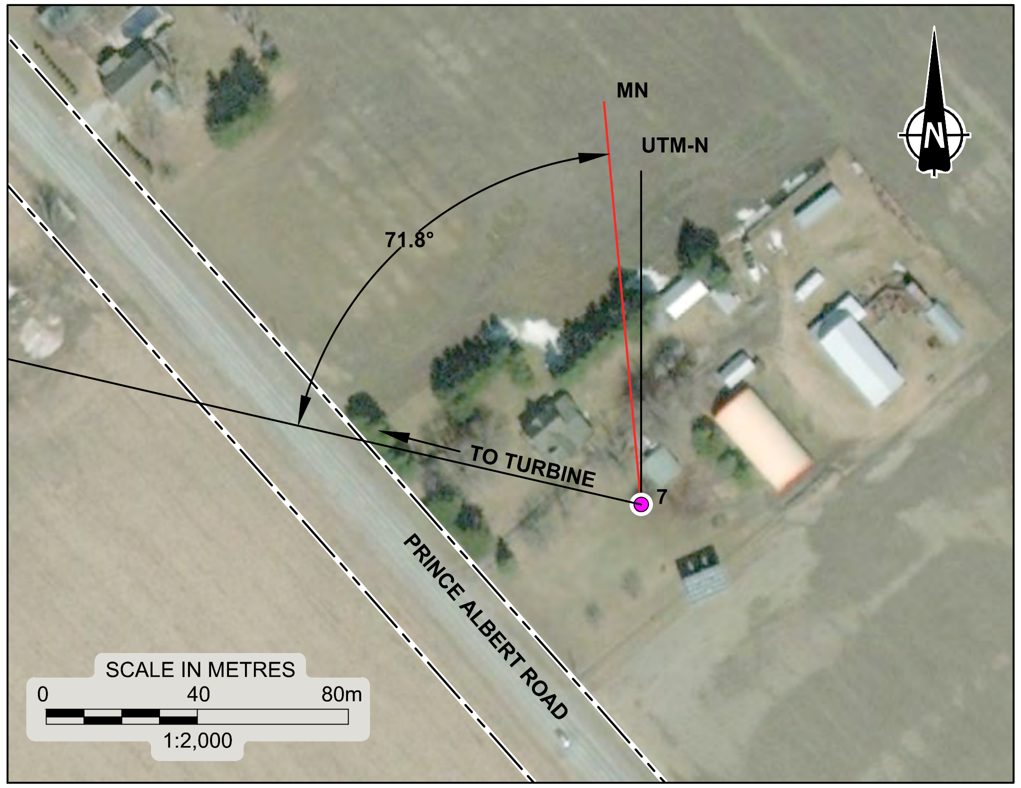
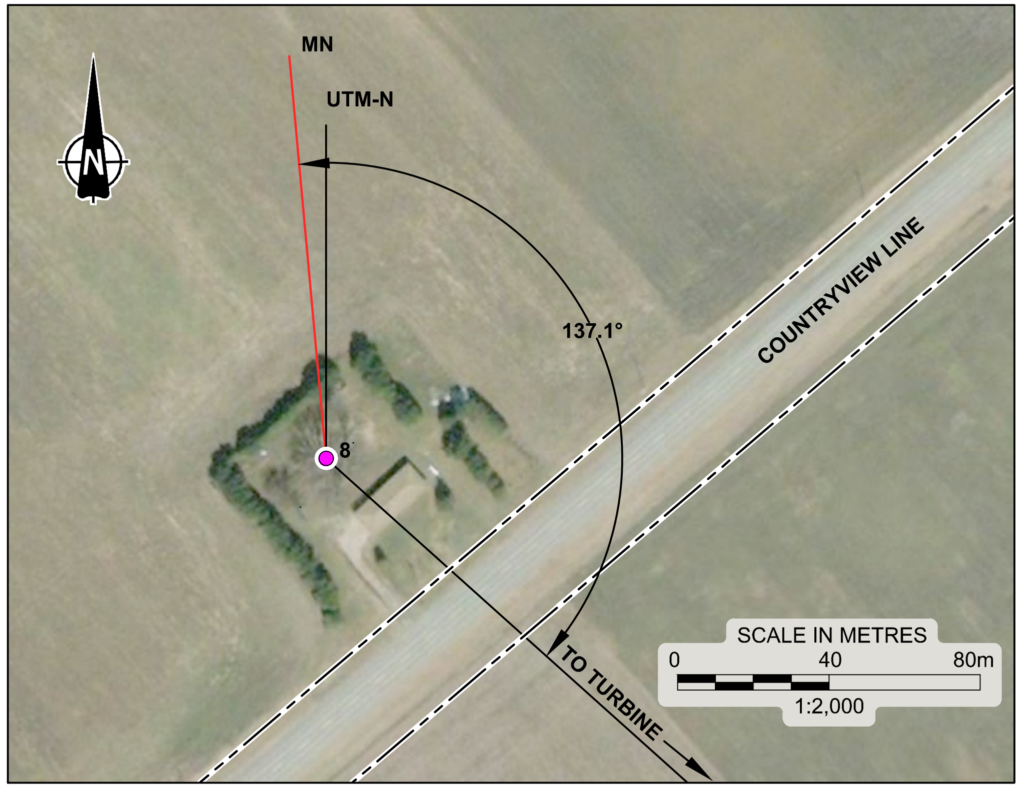


INSET A (WELL #7)



INSET B (WELL #8)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

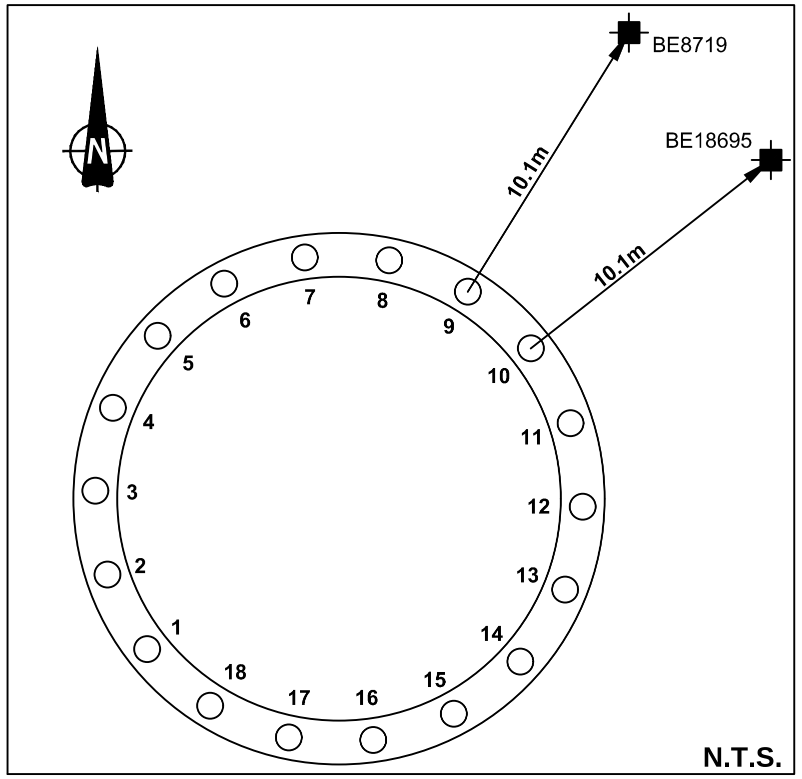
TURBINE PILES AND WATER WELL LOCATION PLAN, T6

Golder Associates

PROJECT No.		1668031	FILE No.1668031-2000-R02T06	
			SCALE AS SHOWN	REV.
CADD	DCH/ZJB	Dec 7/17	FIGURE T6	
CHECK	SJB			

Drawing file: 1668031-2000-R02T06.dwg Dec 07, 2017 - 10:53am

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GEOGRAPHIC NORTH

REFERENCE

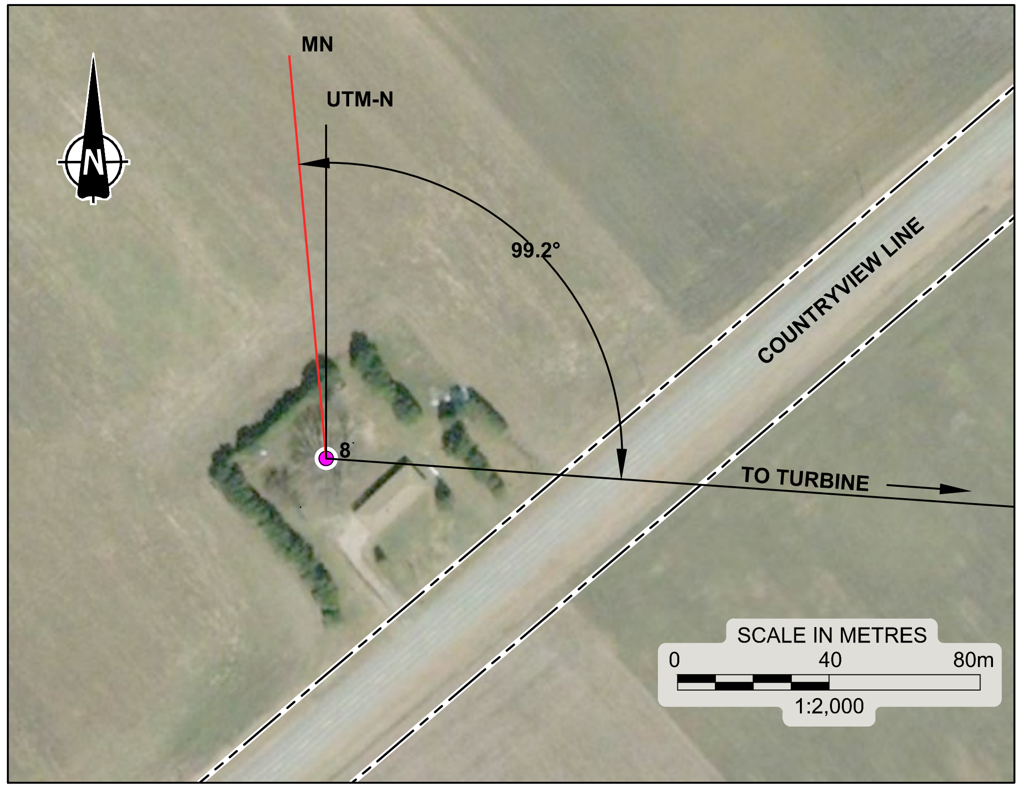
DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

INSET A (WELL #7)



INSET B (WELL #8)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE PILES AND WATER WELL
LOCATION PLAN, T7

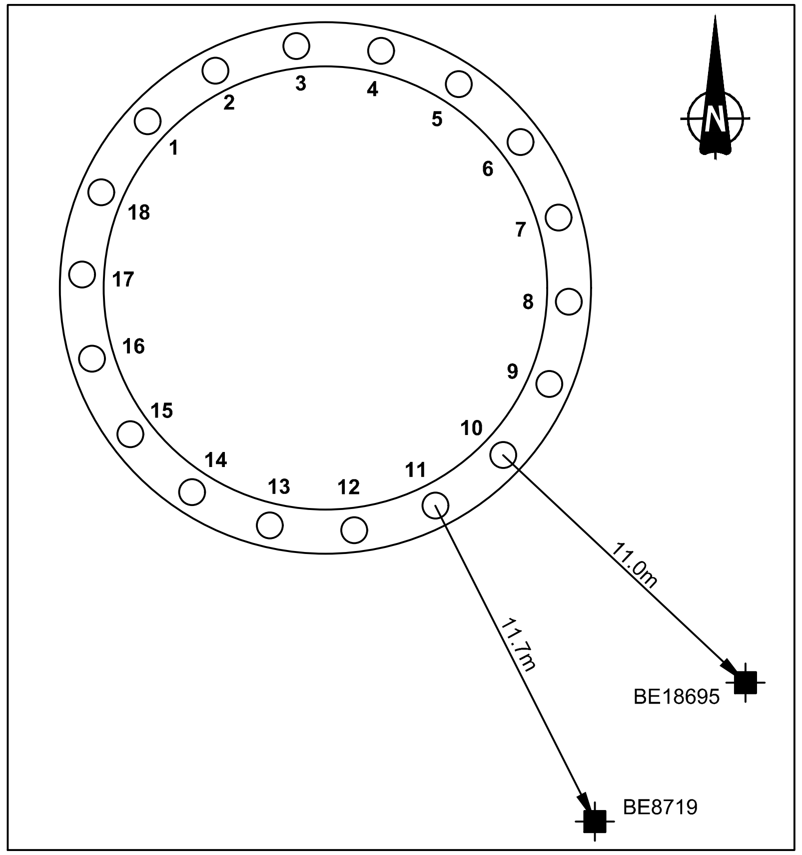
Golder Associates

PROJECT No. 1668031
FILE No.1668031–2000–R02T07
SCALE AS SHOWN
REV.
CADD DCH/ZJB Dec 7/17
CHECK SJB

FIGURE T7

Drawing file: 1668031–2000–R02T07.dwg Dec 07, 2017 – 10:55am

SITE PLAN



TURBINE PILE LAYOUT N.T.S.

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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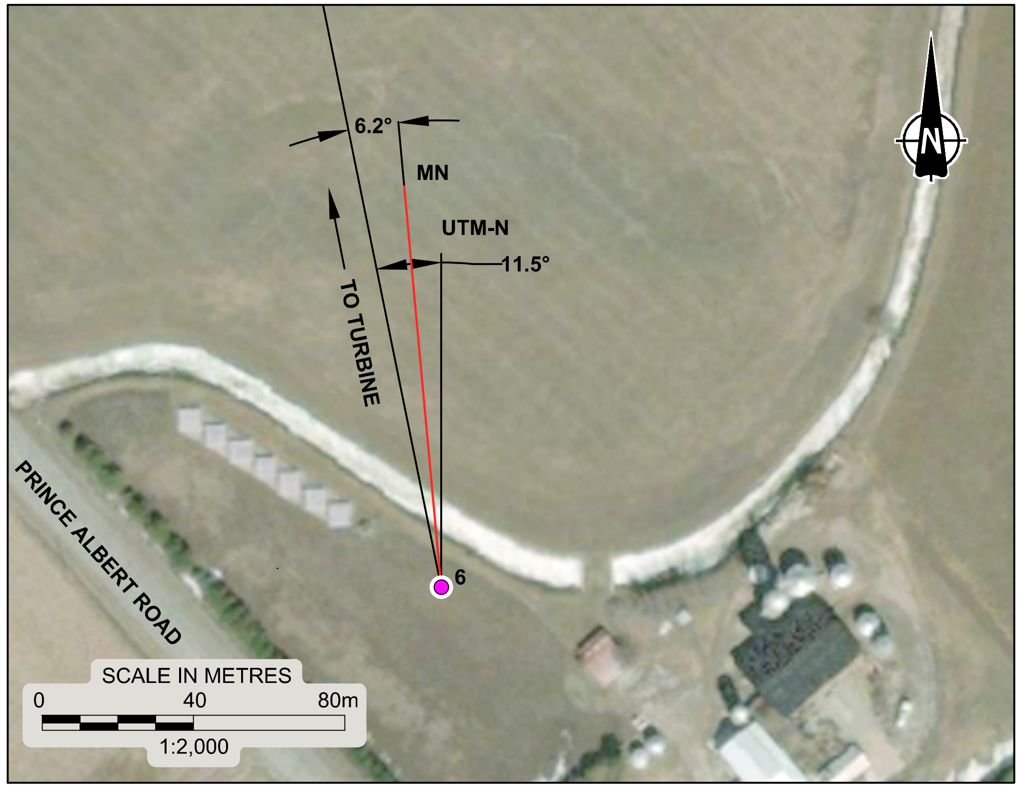
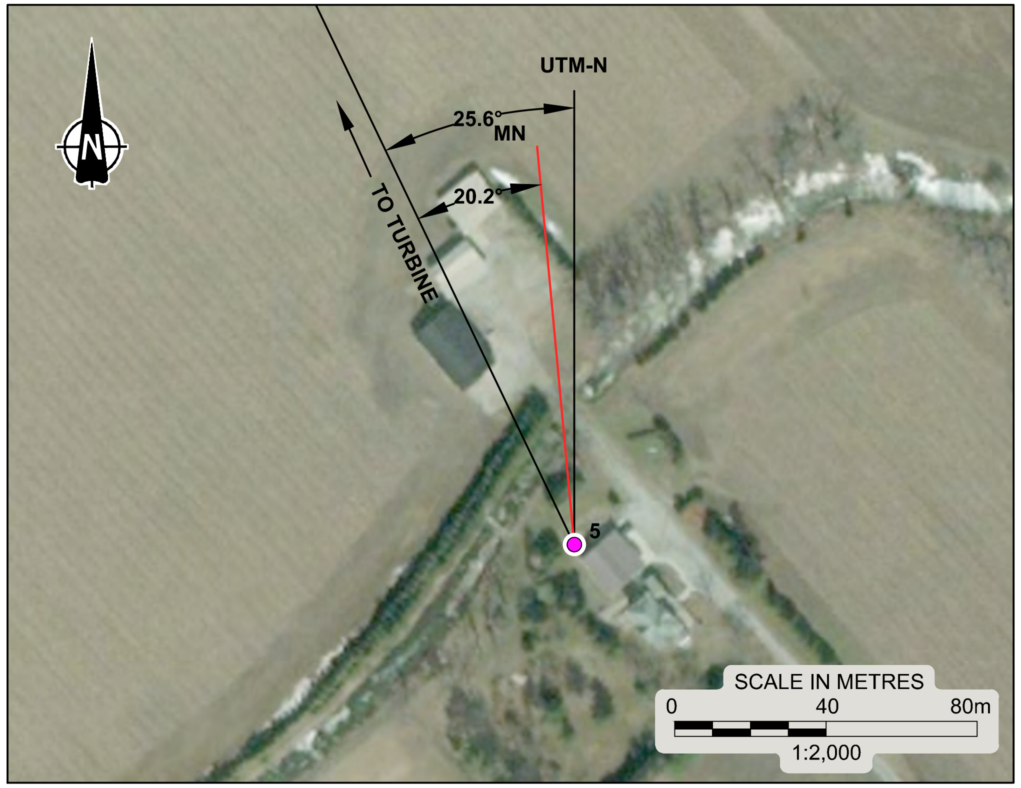
BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #6)



INSET B (WELL #5)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T12

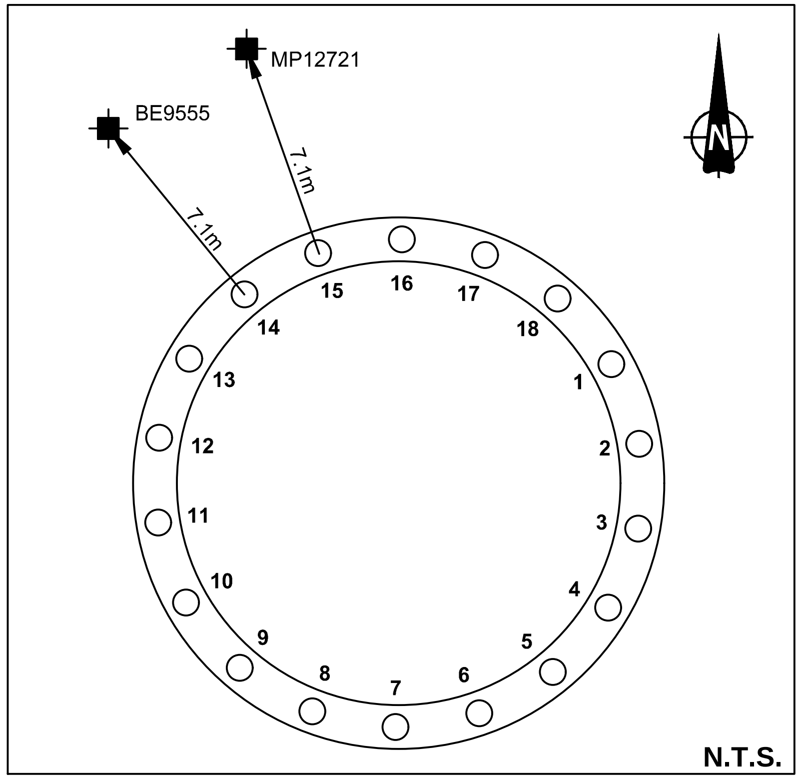
Golder Associates

PROJECT No.		1668031	FILE No. 1668031–2000–R02T12
			SCALE AS SHOWN REV.
CADD	DCH/ZJB	Dec 7/17	
CHECK	SJB		

FIGURE T12

Drawing file: 1668031–2000–R02T12.dwg Dec 07, 2017 – 10:54am

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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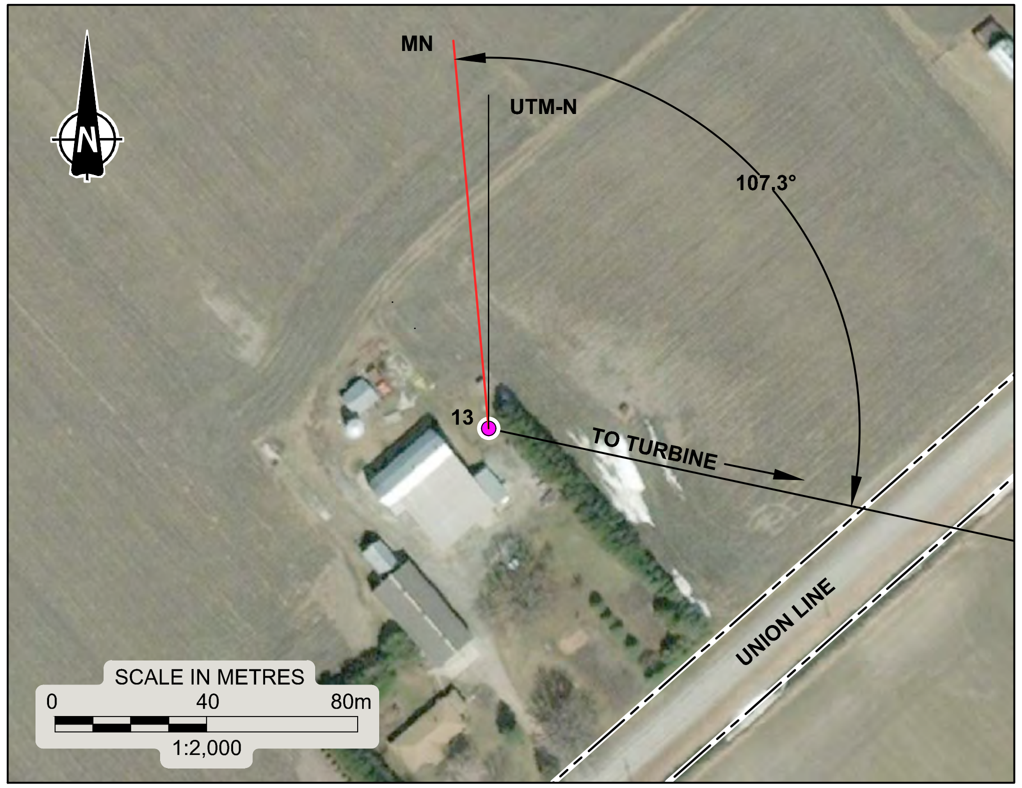
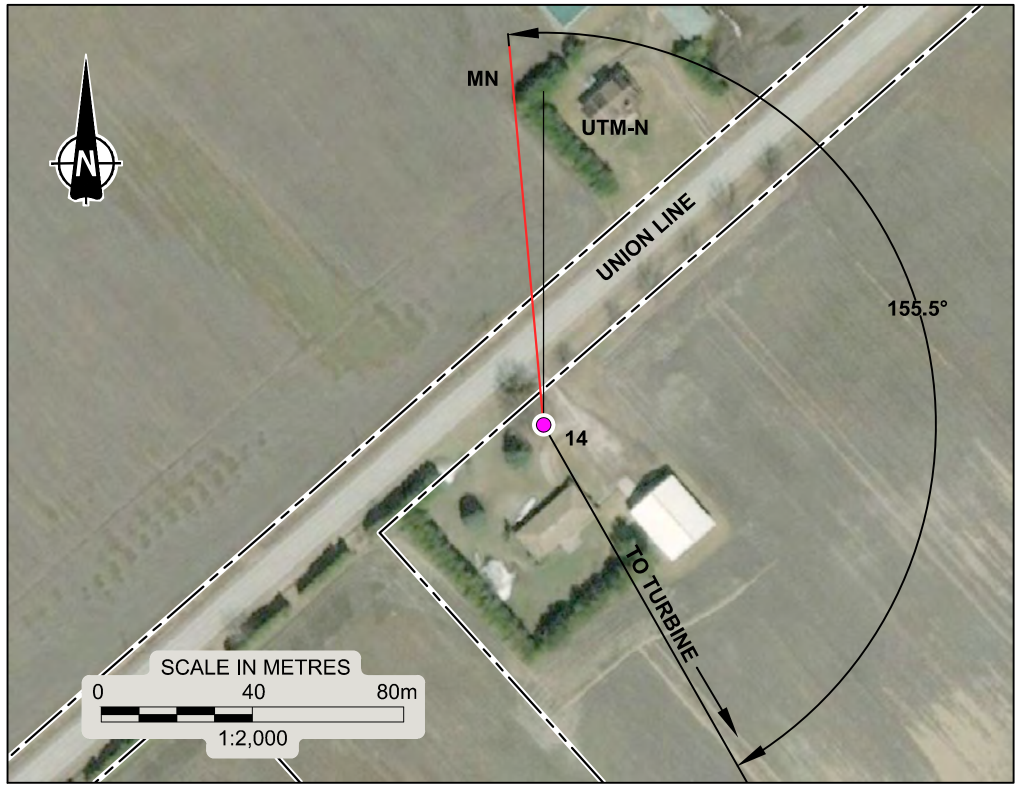
BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #13)



INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T14

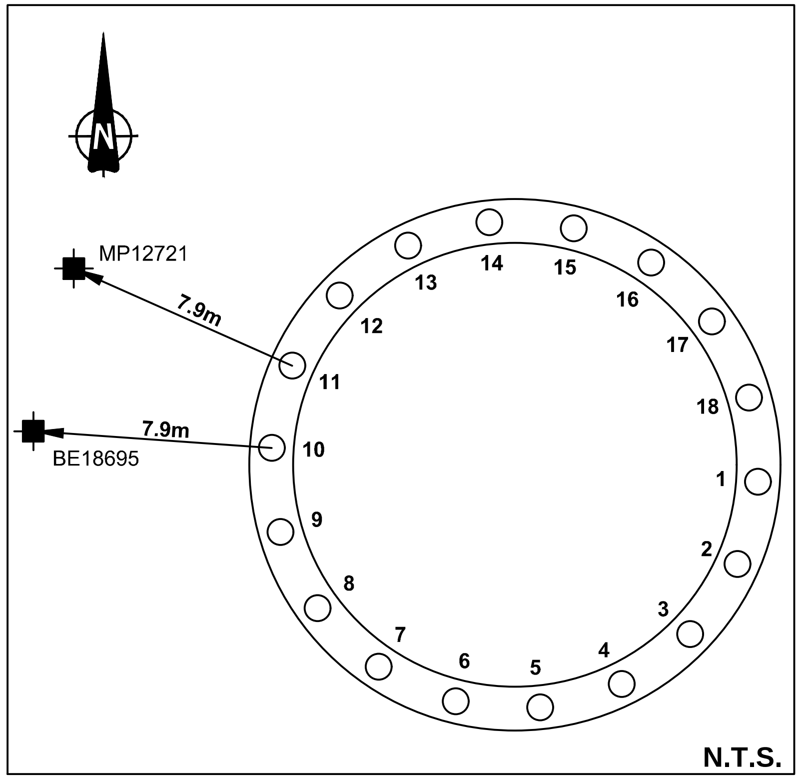
Golder Associates

PROJECT No. 1668031
FILE No.1668031–2000–R02T14
SCALE AS SHOWN
REV.
CADD DCH/ZJB Dec 7/17
CHECK SJB

FIGURE T14

Drawing file: 1668031–2000–R02T14.dwg Dec 07, 2017 – 1:55pm

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

⊞	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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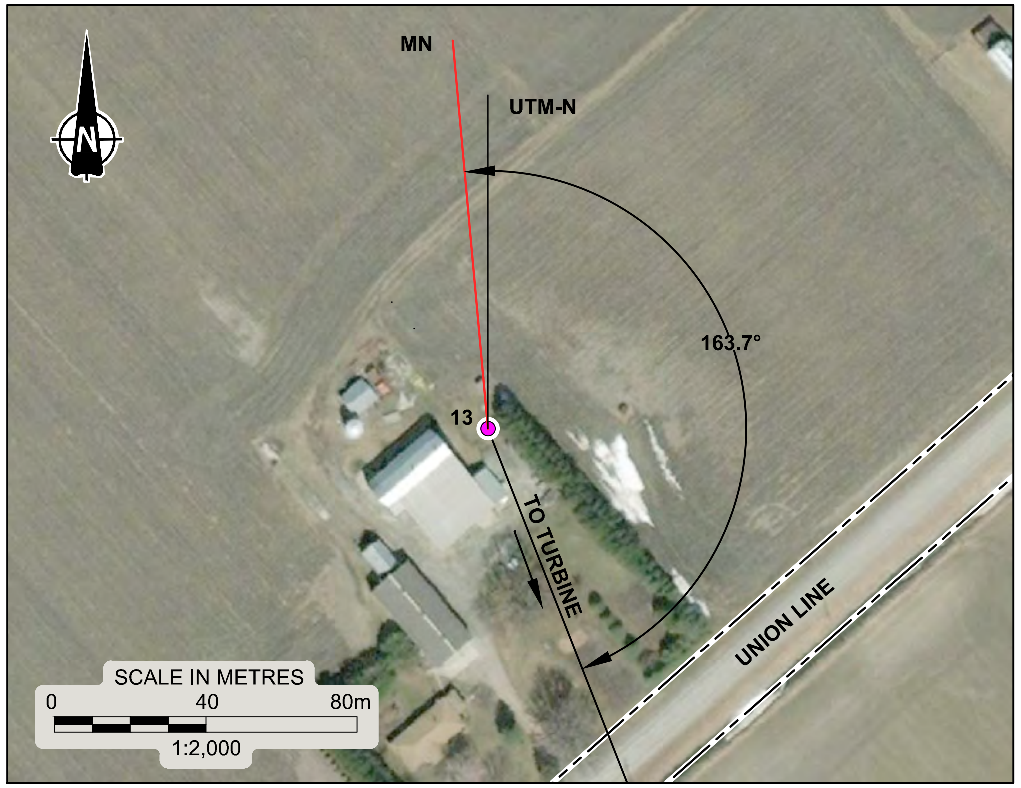
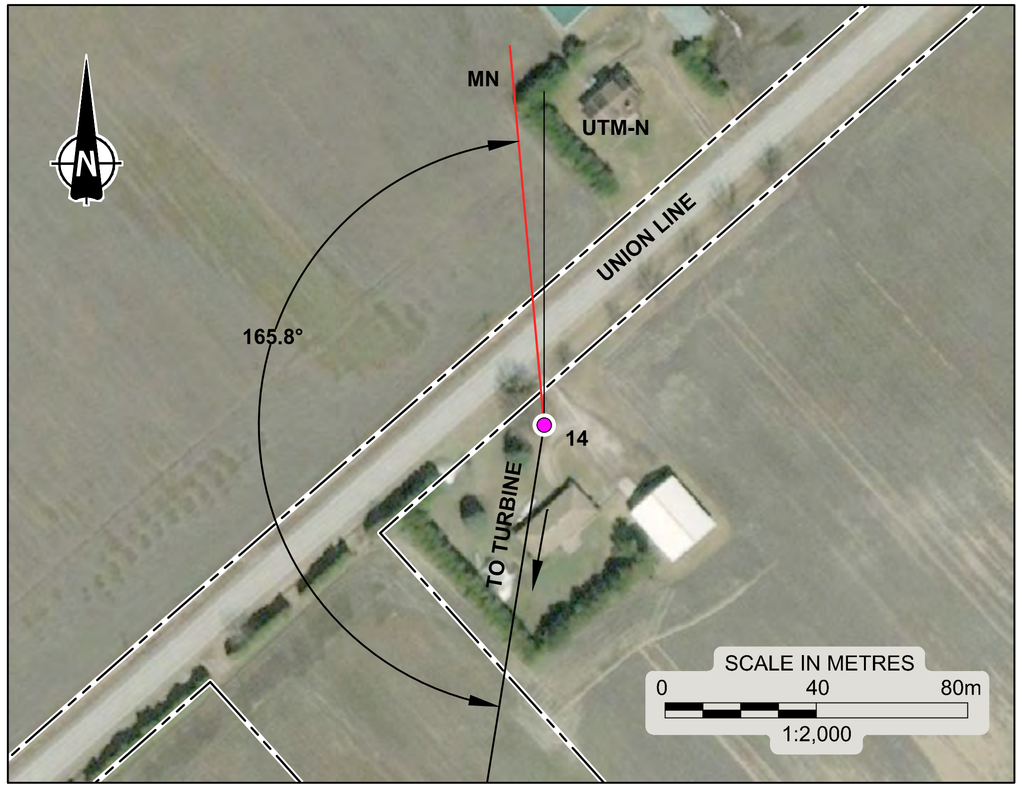
BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #13)



INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

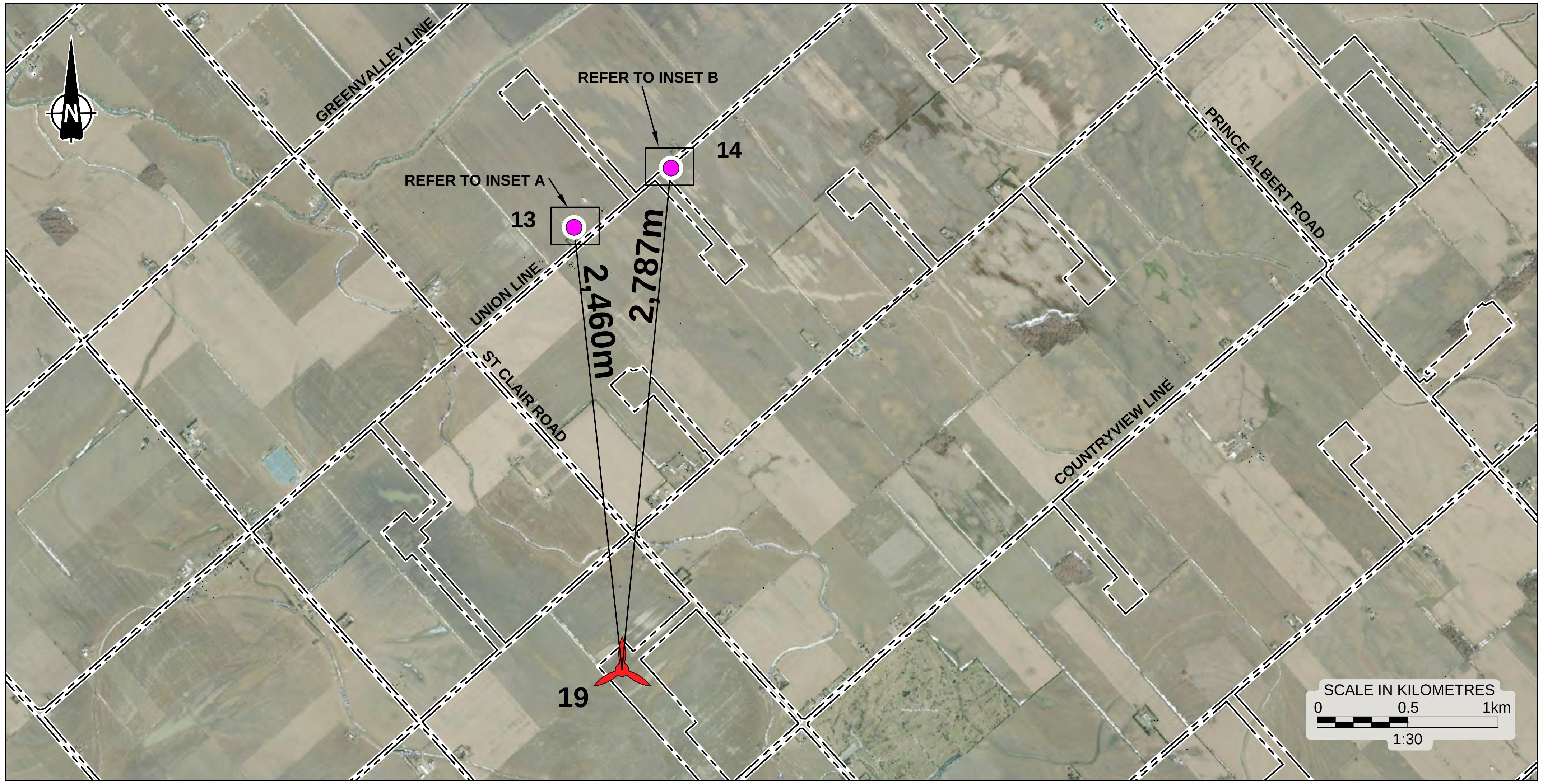
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T15

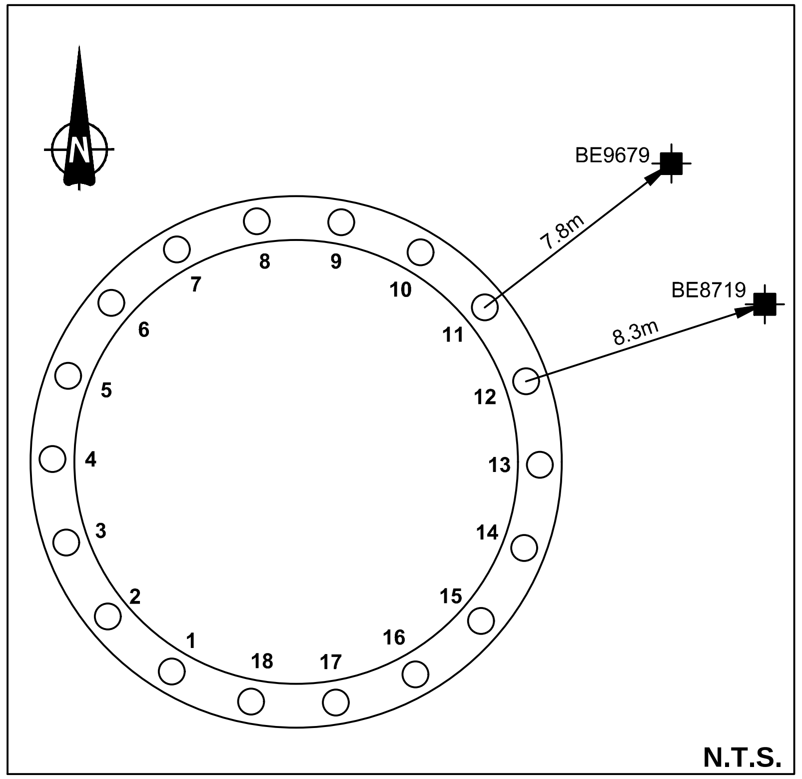
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T15	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17	**FIGURE T15**	
CHECK	SJB			

Drawing file: 1668031–2000–R02T15.dwg Dec 07, 2017 – 1:55pm



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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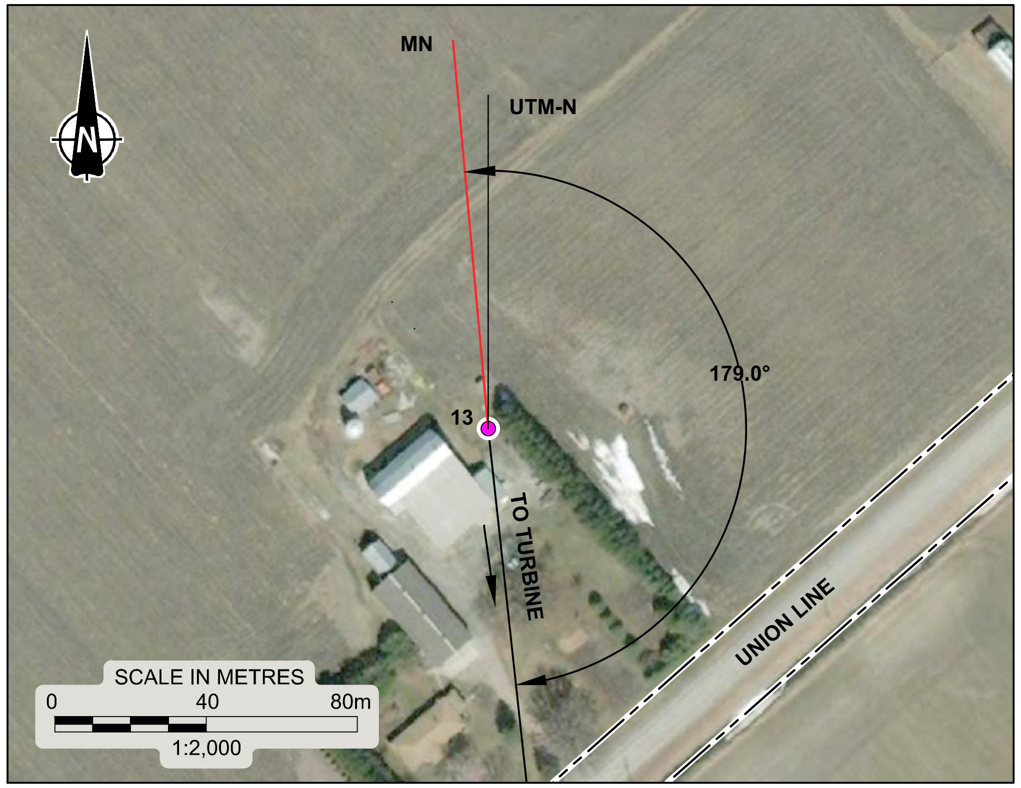
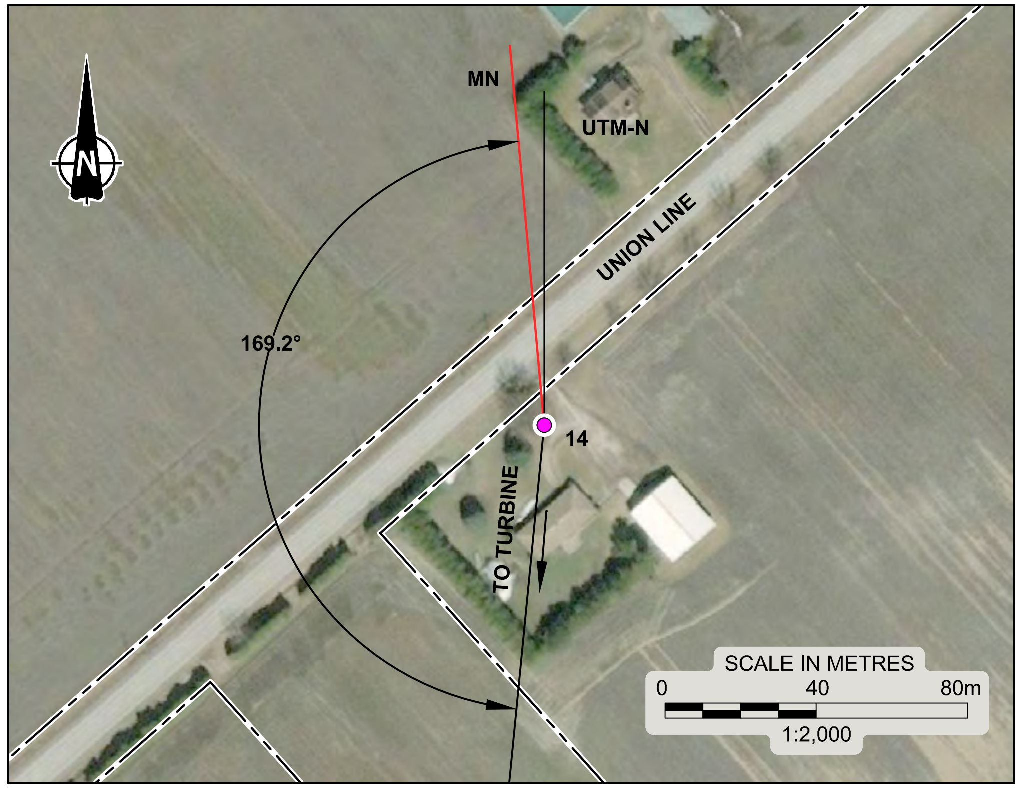
BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #13)



INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

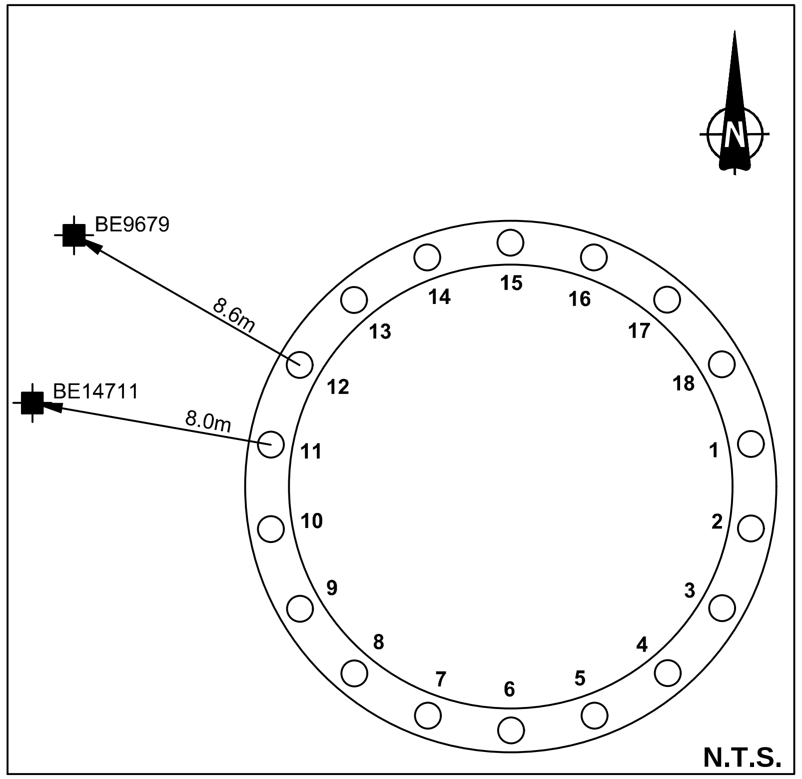
TURBINE PILES AND WATER WELL LOCATION PLAN, T19

Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T19
			SCALE AS SHOWN · REV.
CADD	DCH	Dec 7/17	**FIGURE T19**
CHECK	SJB		

Drawing file: 1668031–2000–R02T19.dwg Dec 07, 2017 – 1:57pm

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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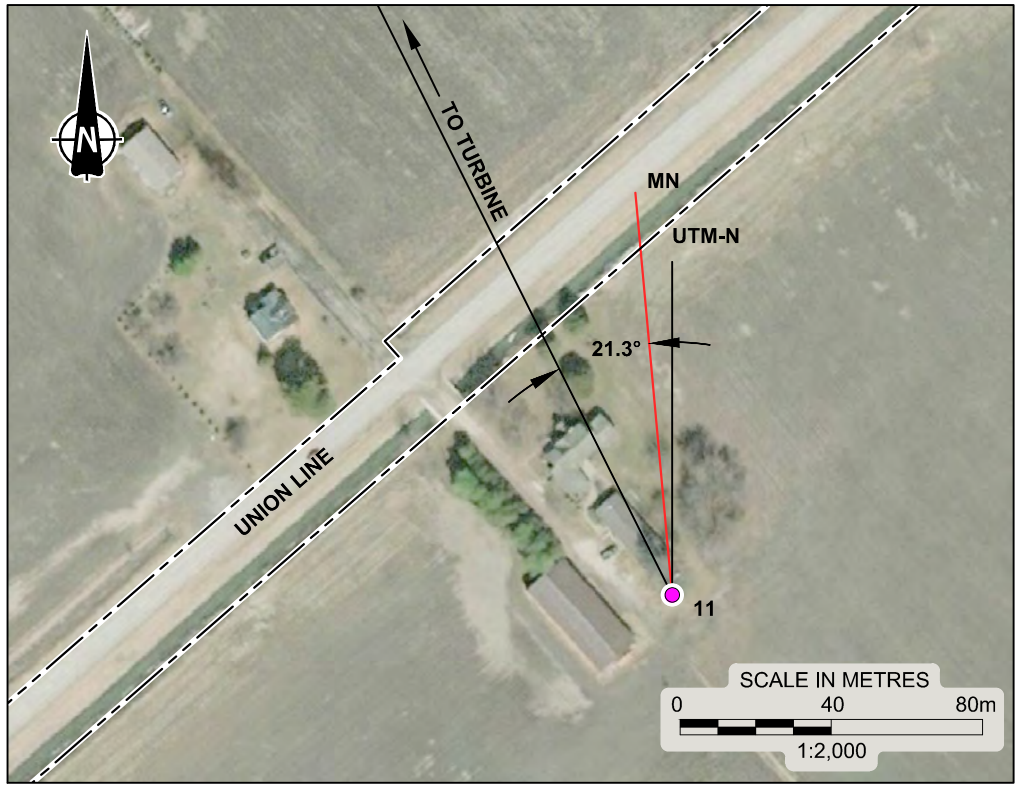
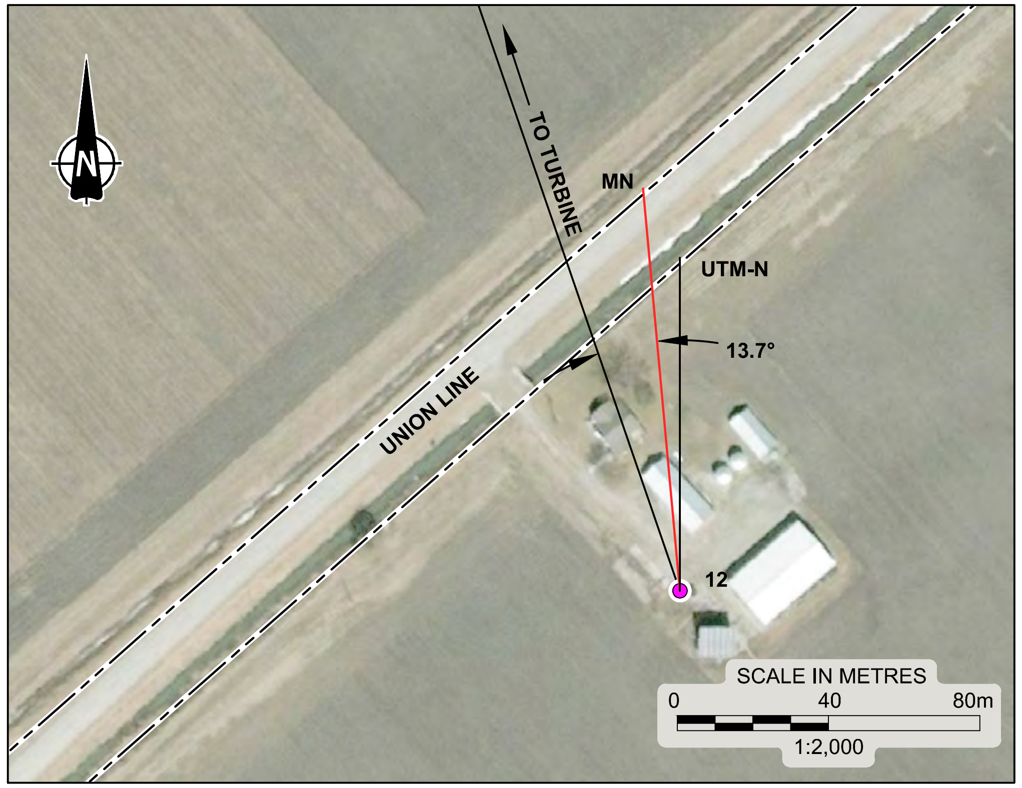
BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #11)



INSET B (WELL #12)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

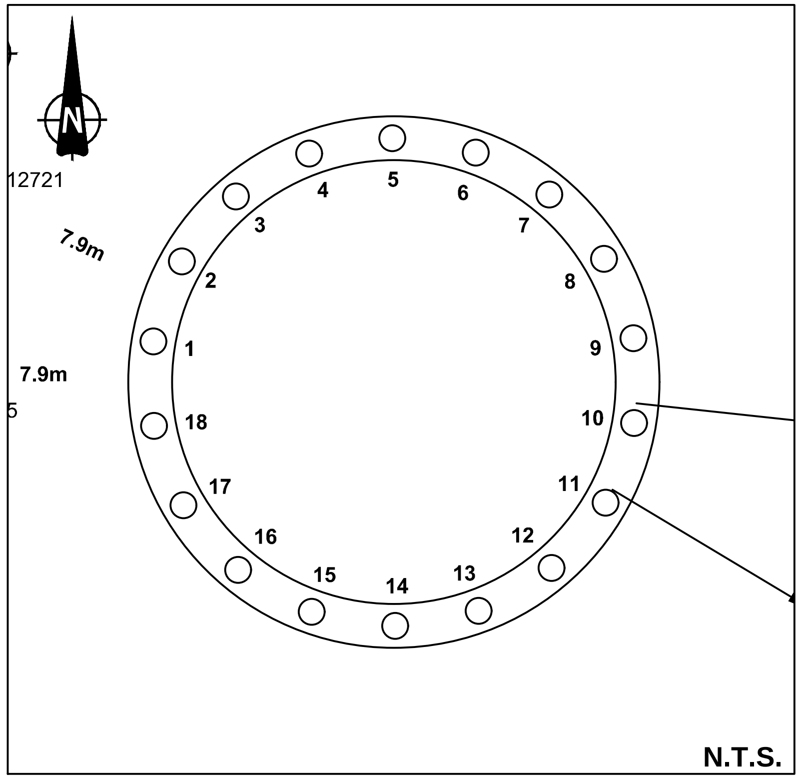
TURBINE PILES AND WATER WELL LOCATION PLAN, T20

Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T20	
			SCALE AS SHOWN	REV.
CADD	DCH/ZJB	Dec 7/17	**FIGURE T20**	
CHECK	SJS			

Drawing file: 1668031–2000–R02T20.dwg Dec 07, 2017 – 11:05am

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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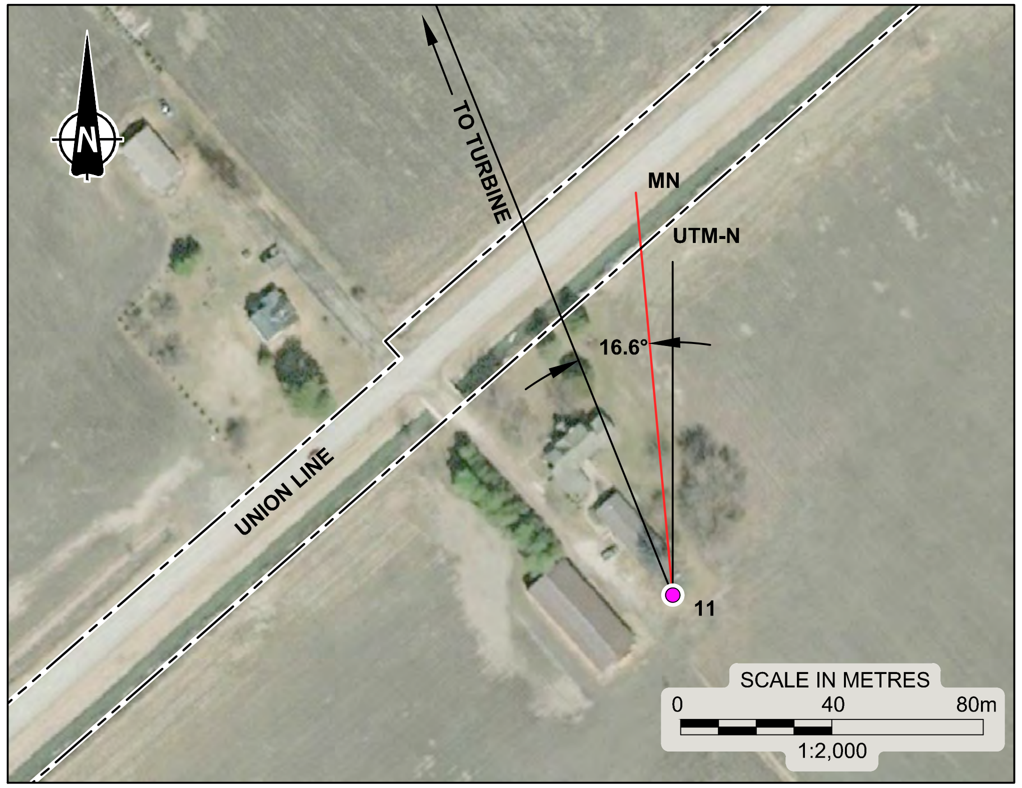
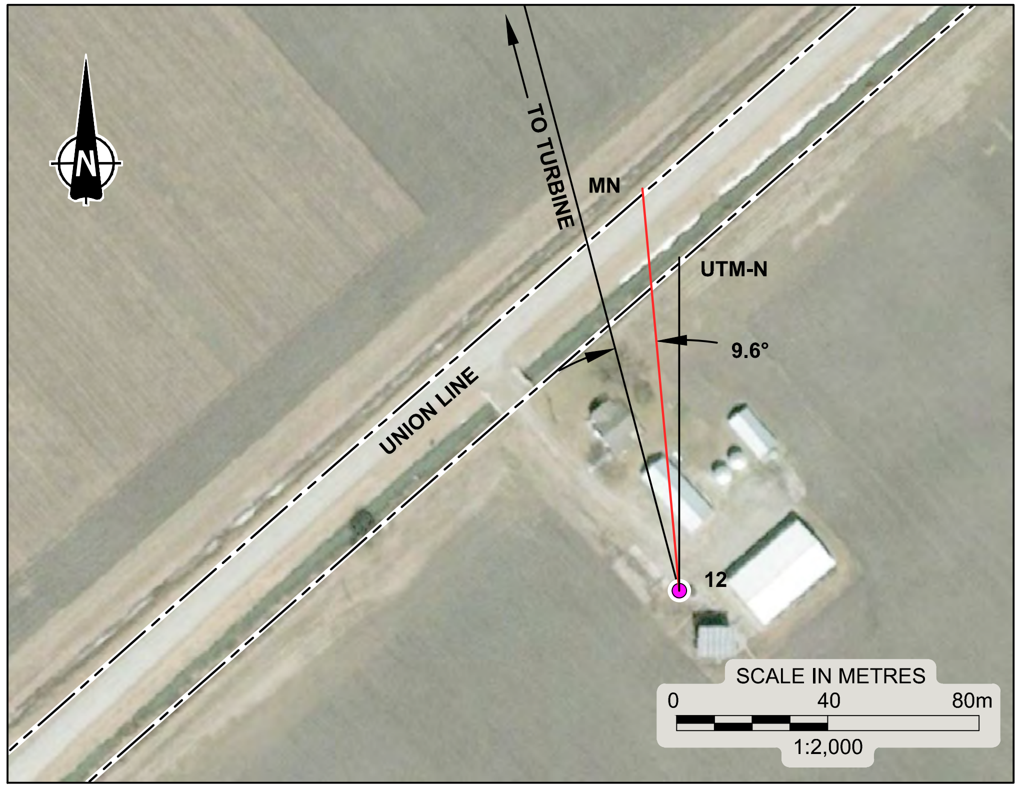


INSET A (WELL #11)



INSET B (WELL #12)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T21

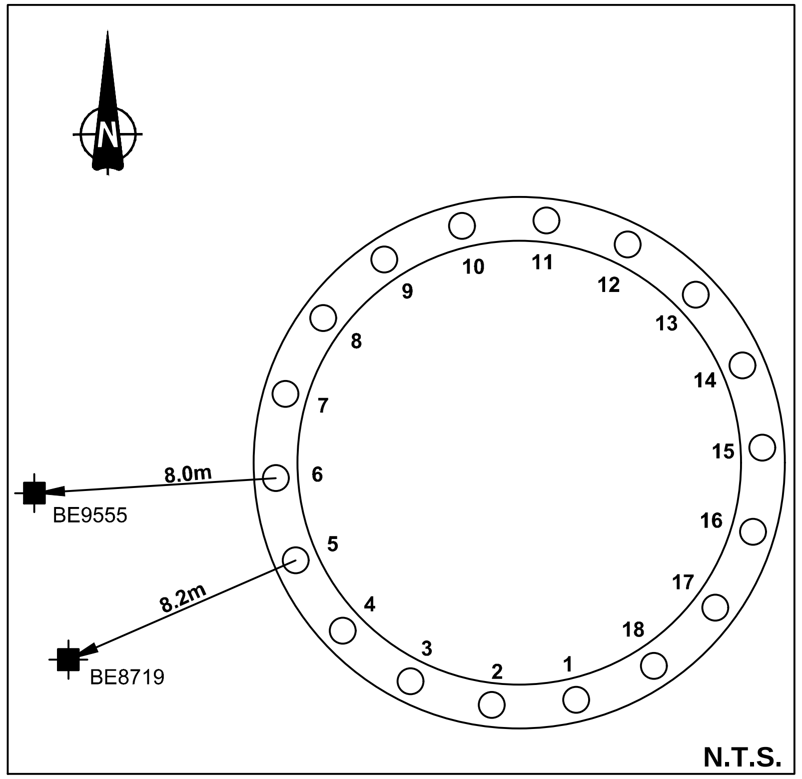
Golder Associates

PROJECT No. 1668031
FILE No. 1668031–2000–R02T21
SCALE AS SHOWN
REV.
CADD DCH/ZJB Dec 7/17
CHECK SJS

FIGURE T21

Drawing file: 1668031–2000–R02T21.dwg Dec 07, 2017 – 11:07am

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

✚	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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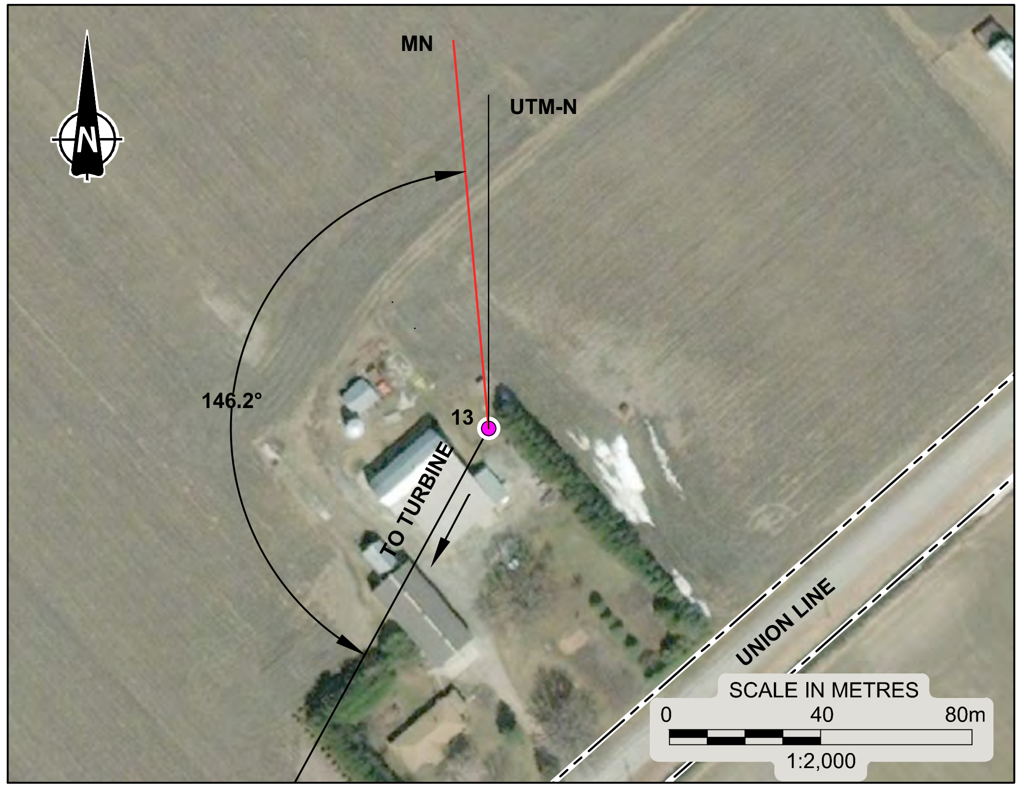
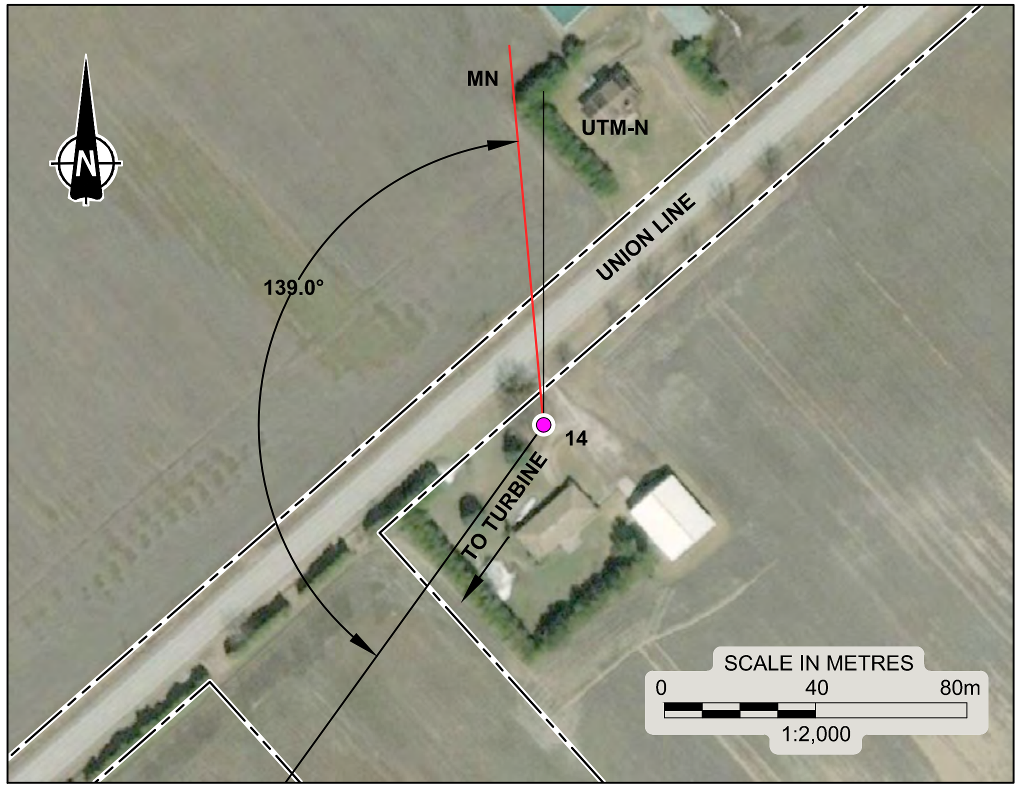
ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #13)



INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

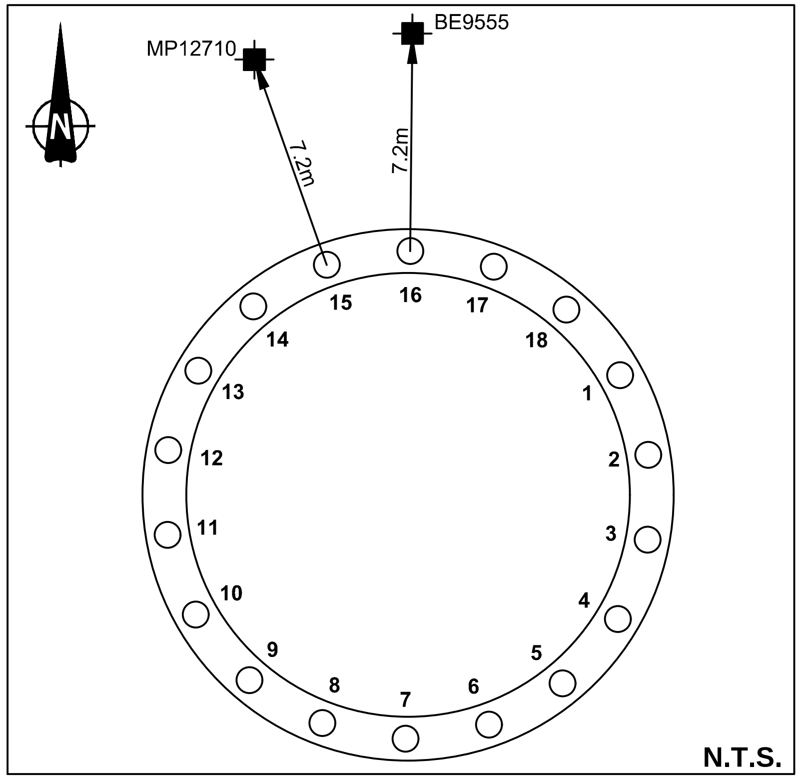
TURBINE PILES AND WATER WELL LOCATION PLAN, T23

Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T23	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17	FIGURE T23	
CHECK	SSB			

Drawing file: 1668031–2000–R02T23.dwg Dec 07, 2017 – 11:10am

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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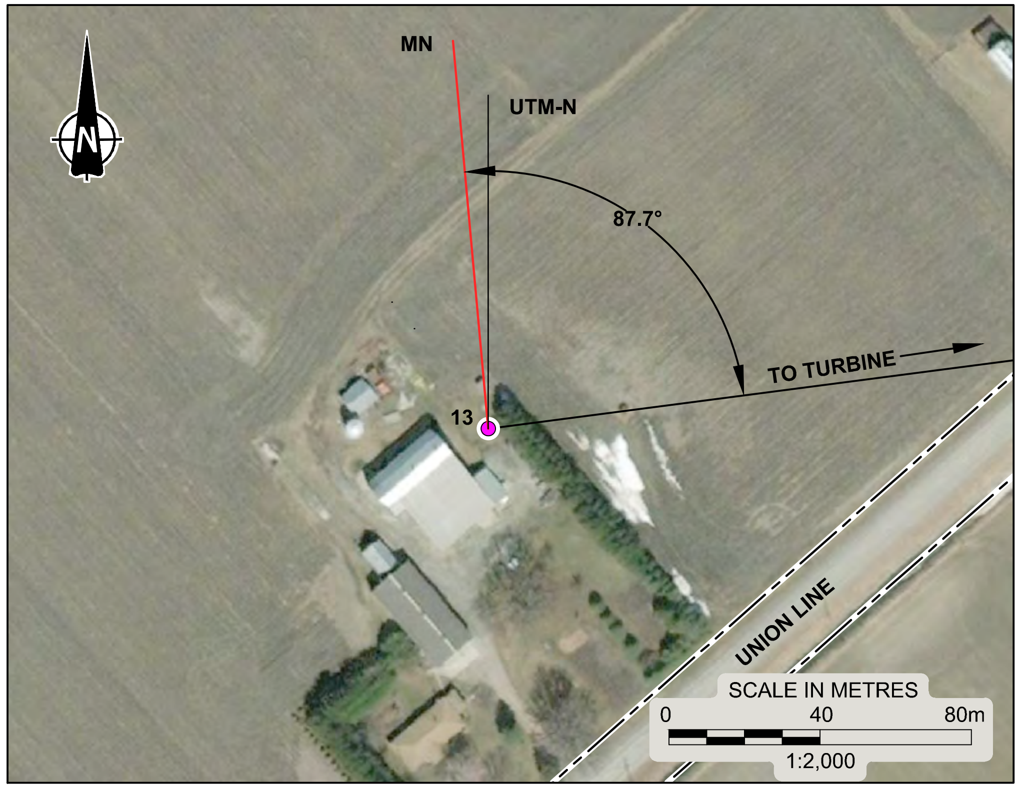
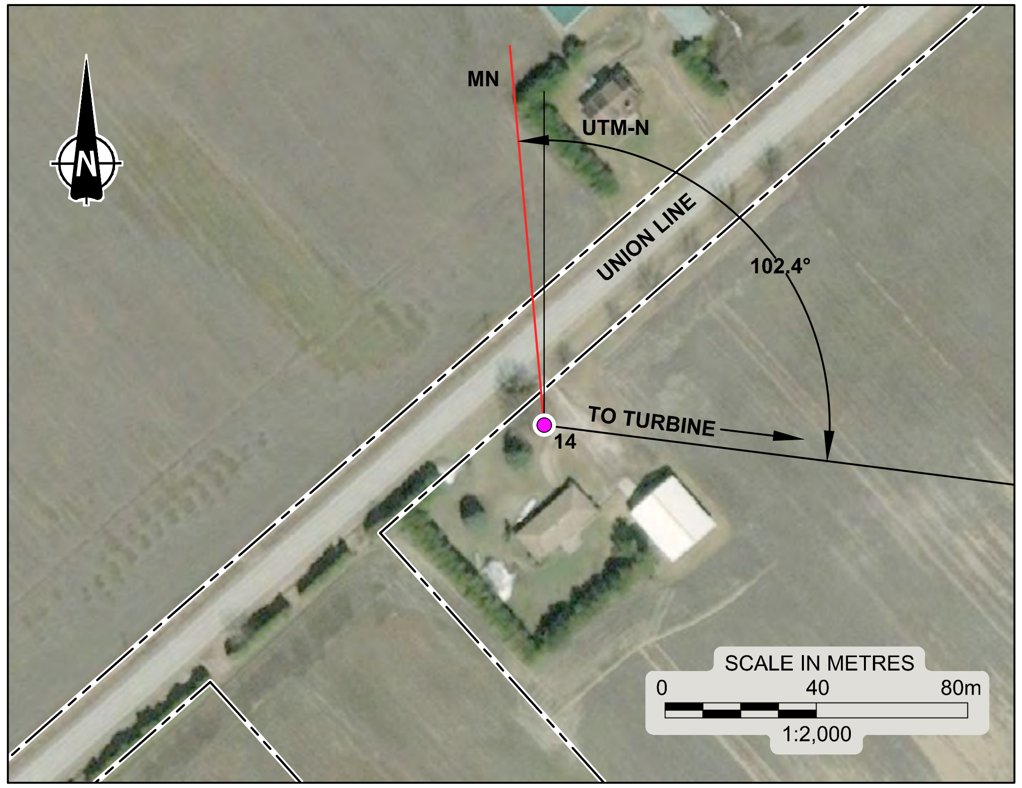


INSET A (WELL #13)



INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T26

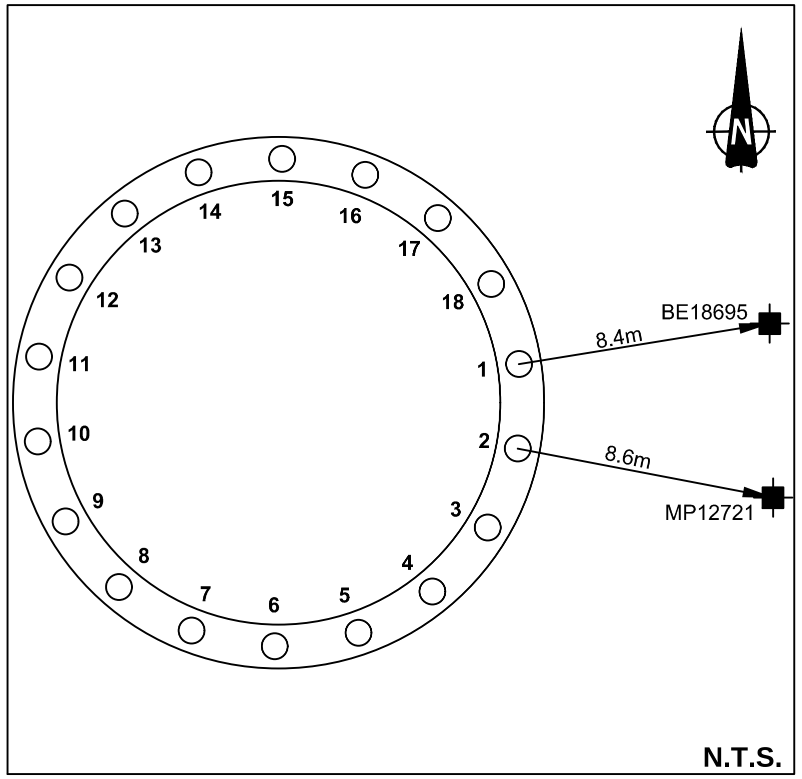
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T26
			SCALE AS SHOWN / REV.
CADD	DH/ZB/LK	Dec 7/17	
CHECK	SSB		

FIGURE T26

Drawing file: 1668031–2000–R02T26.dwg Dec 07, 2017 – 11:12am

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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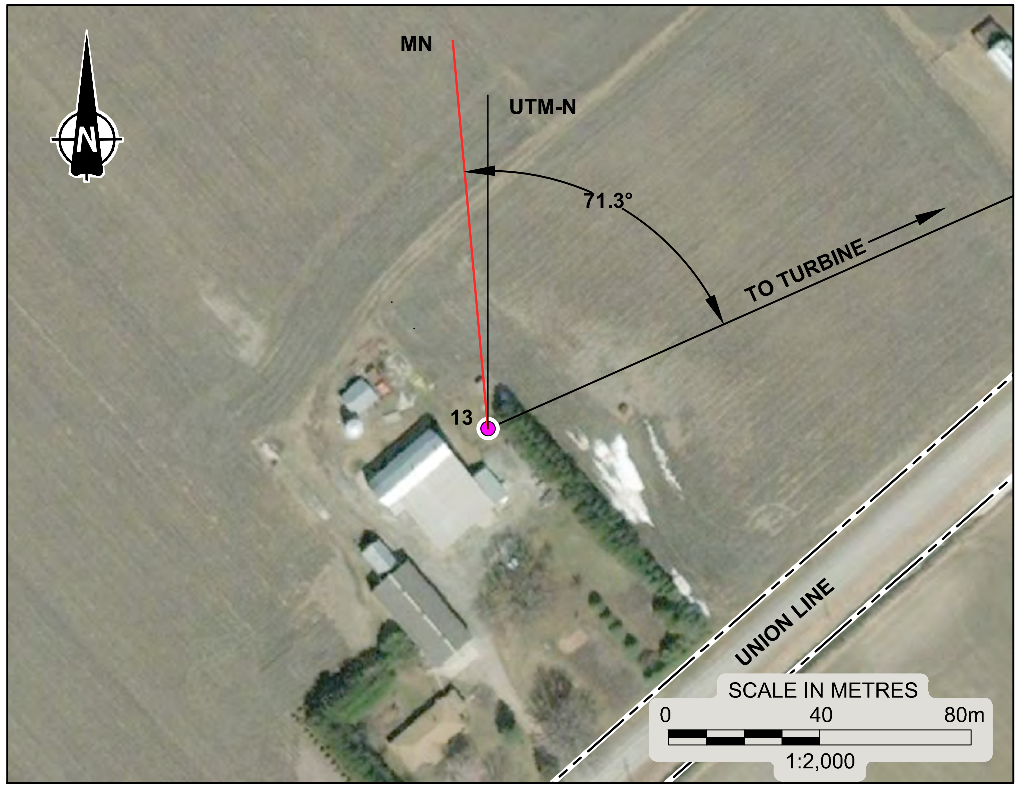
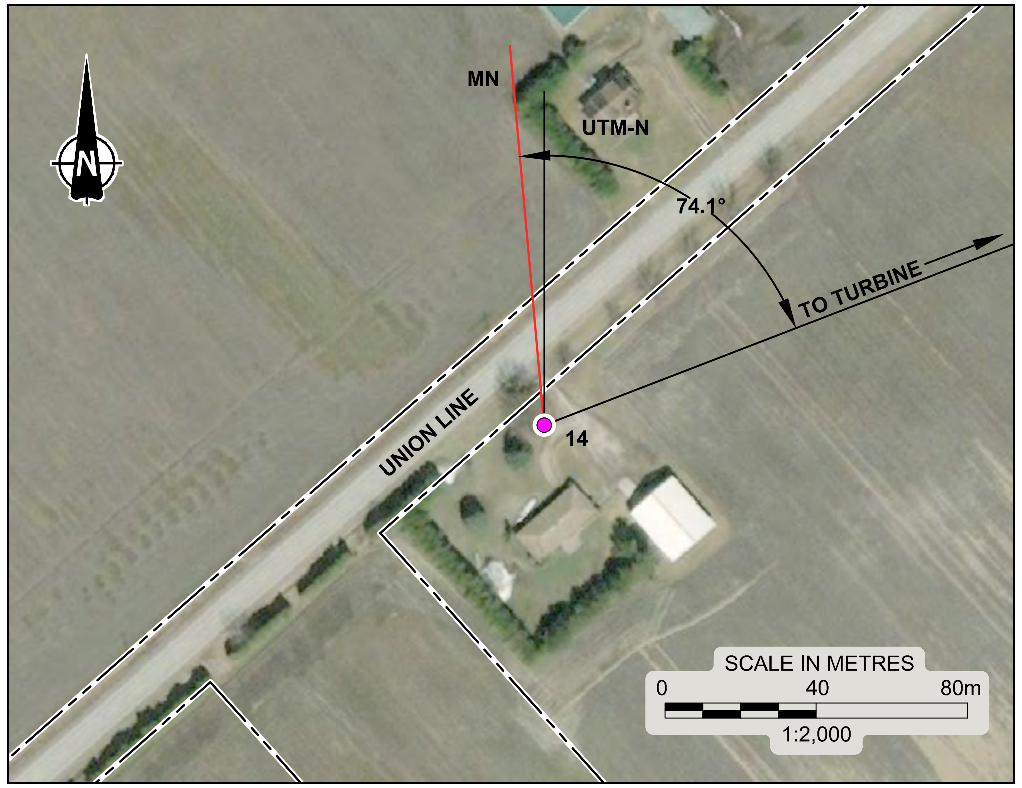


INSET A (WELL #13)



INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

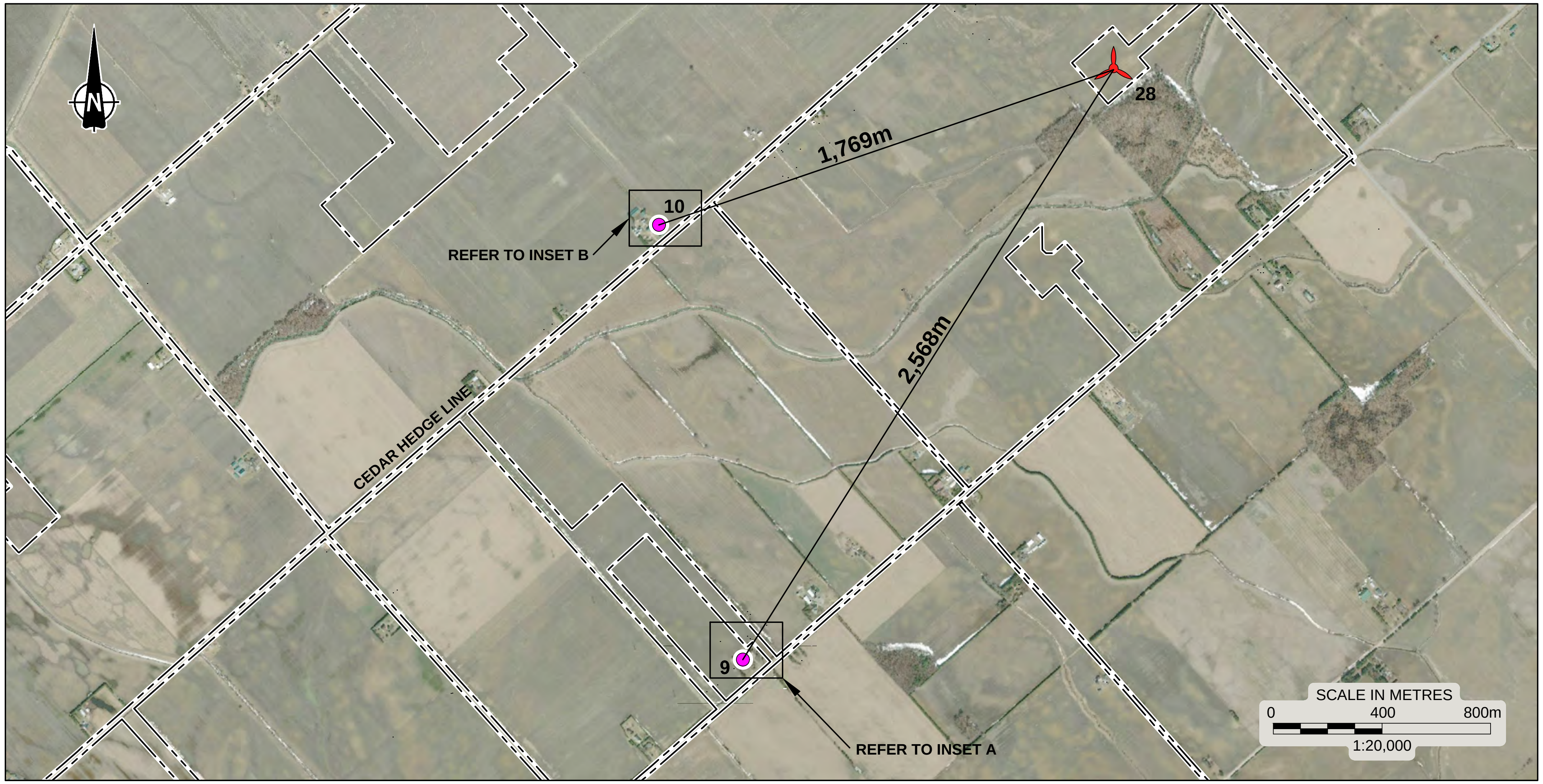
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T27

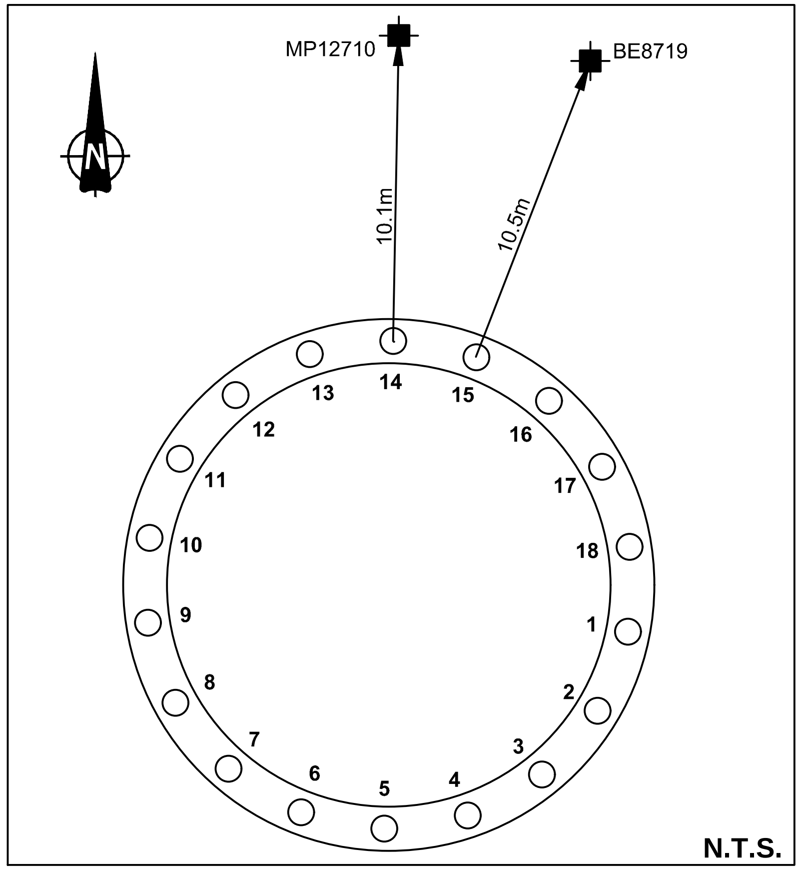
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T27	
			SCALE AS SHOWN	REV.
CADD	DH/ZB/LK	Dec 7/17	FIGURE T27	
CHECK	SSB			

Drawing file: 1668031–2000–R02T27.dwg Dec 07, 2017 – 11:14am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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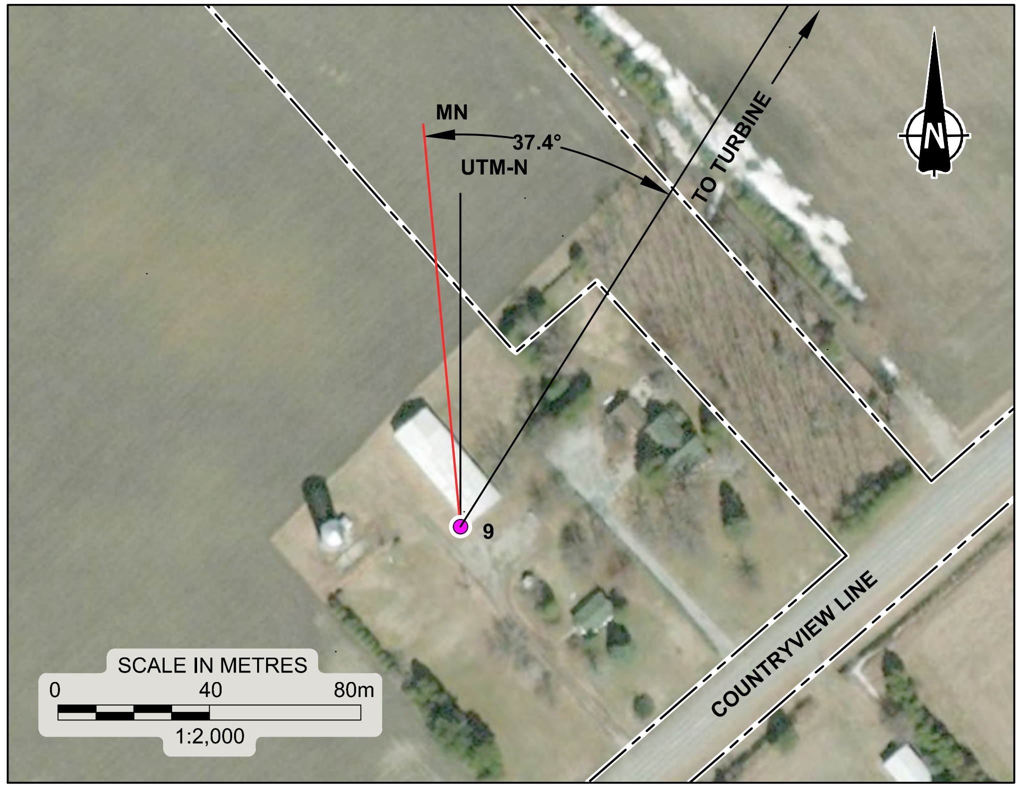
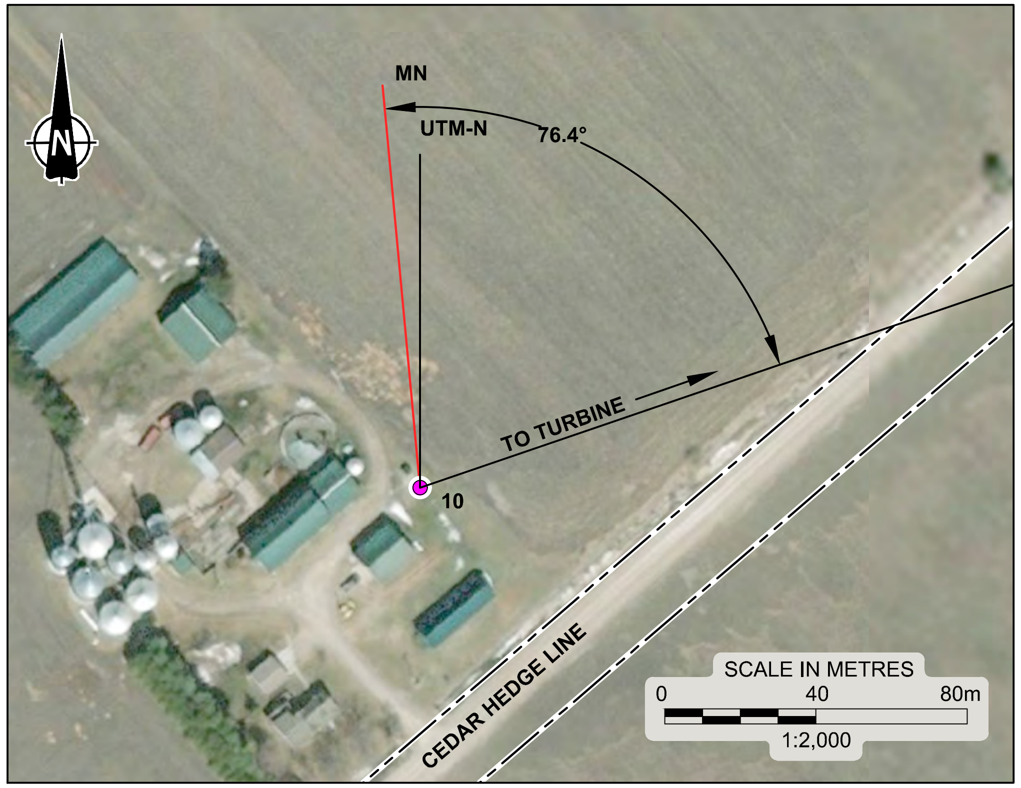


INSET A (WELL #9)



INSET B (WELL #10)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

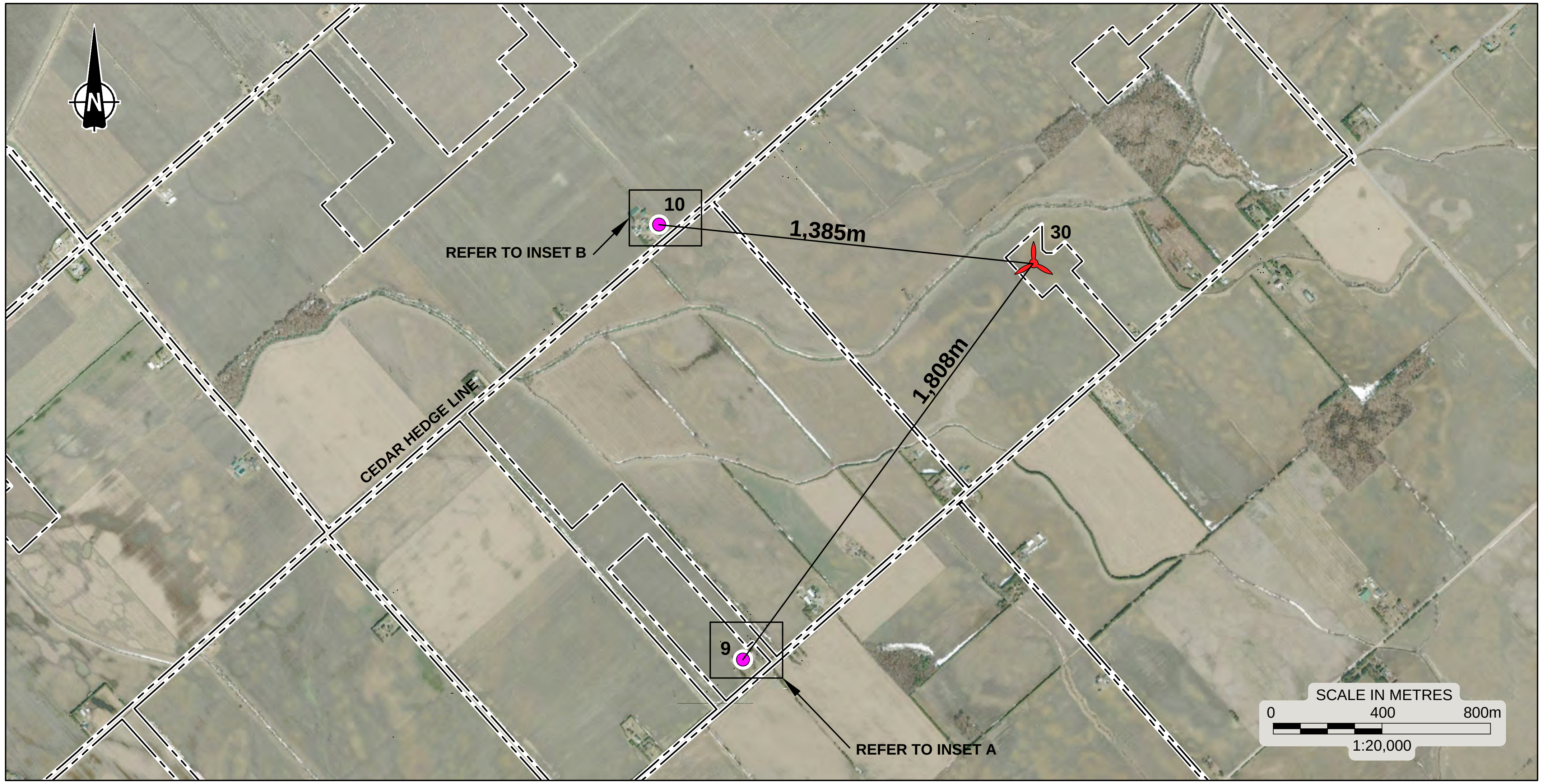
TURBINE PILES AND WATER WELL LOCATION PLAN, T28

Golder Associates

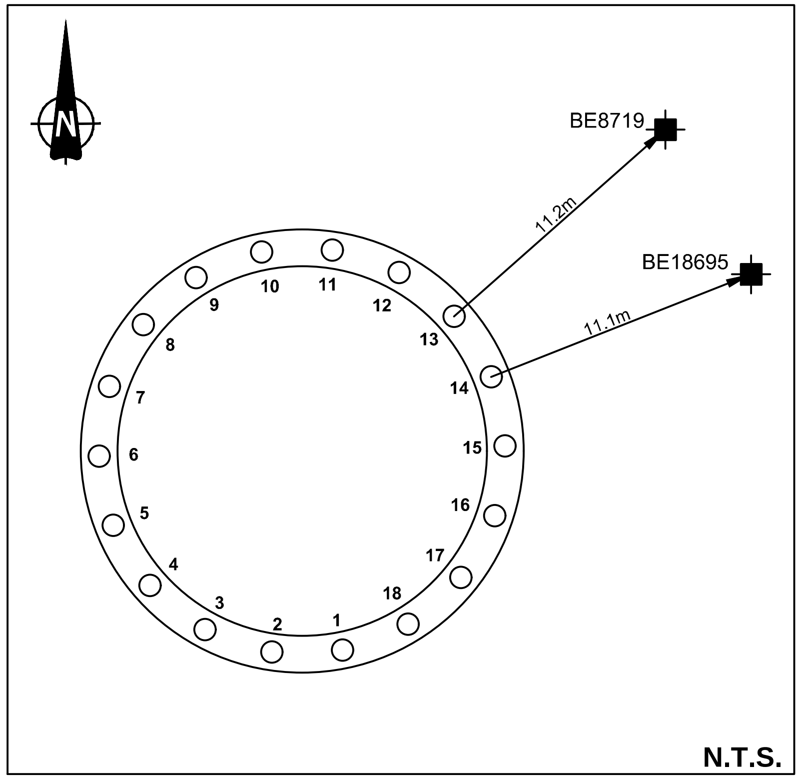
PROJECT No.	1668031	FILE No. 1668031-2000-R02T28	
		SCALE AS SHOWN	REV.
CADD	DH/ZB/LK	Dec 7/17	
CHECK	SJS		

FIGURE T28

Drawing file: 1668031-2000-R02T28.dwg Dec 07, 2017 - 11:15am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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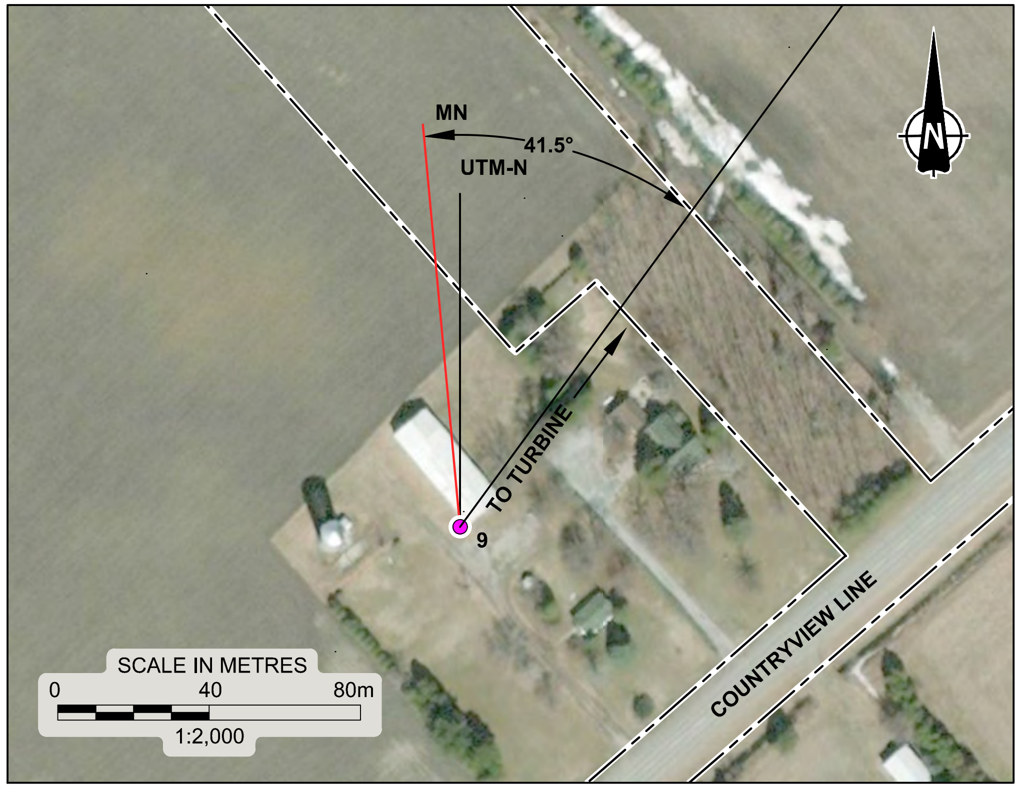
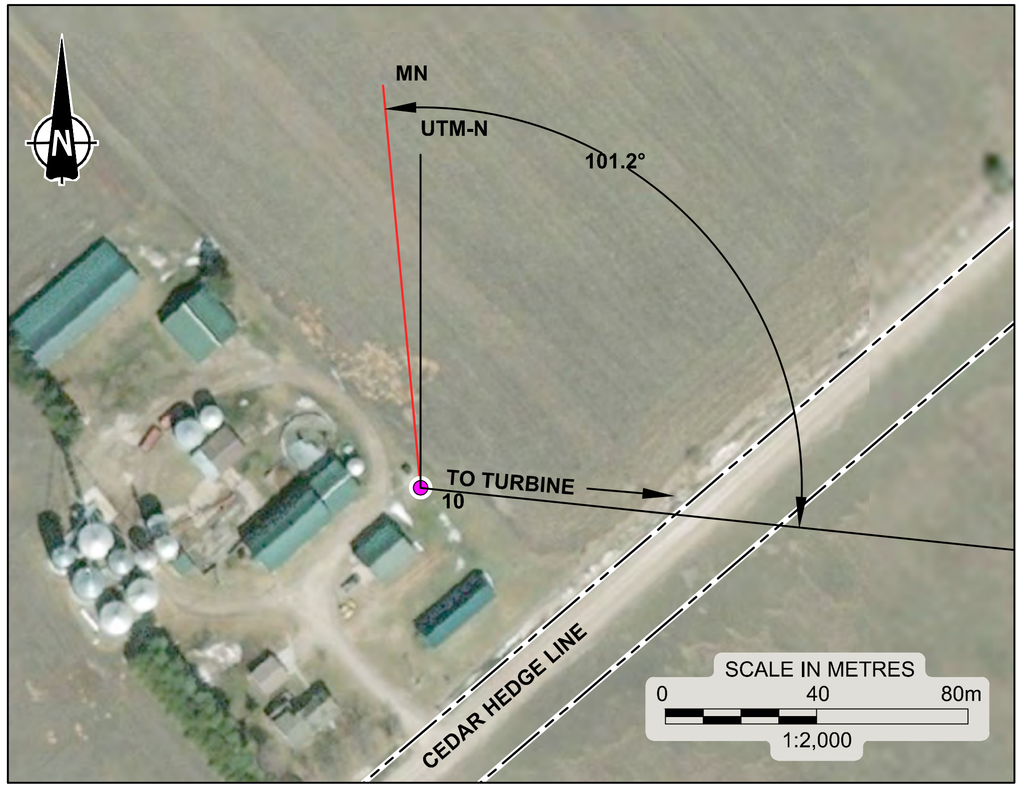


INSET A (WELL #9)



INSET B (WELL #10)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

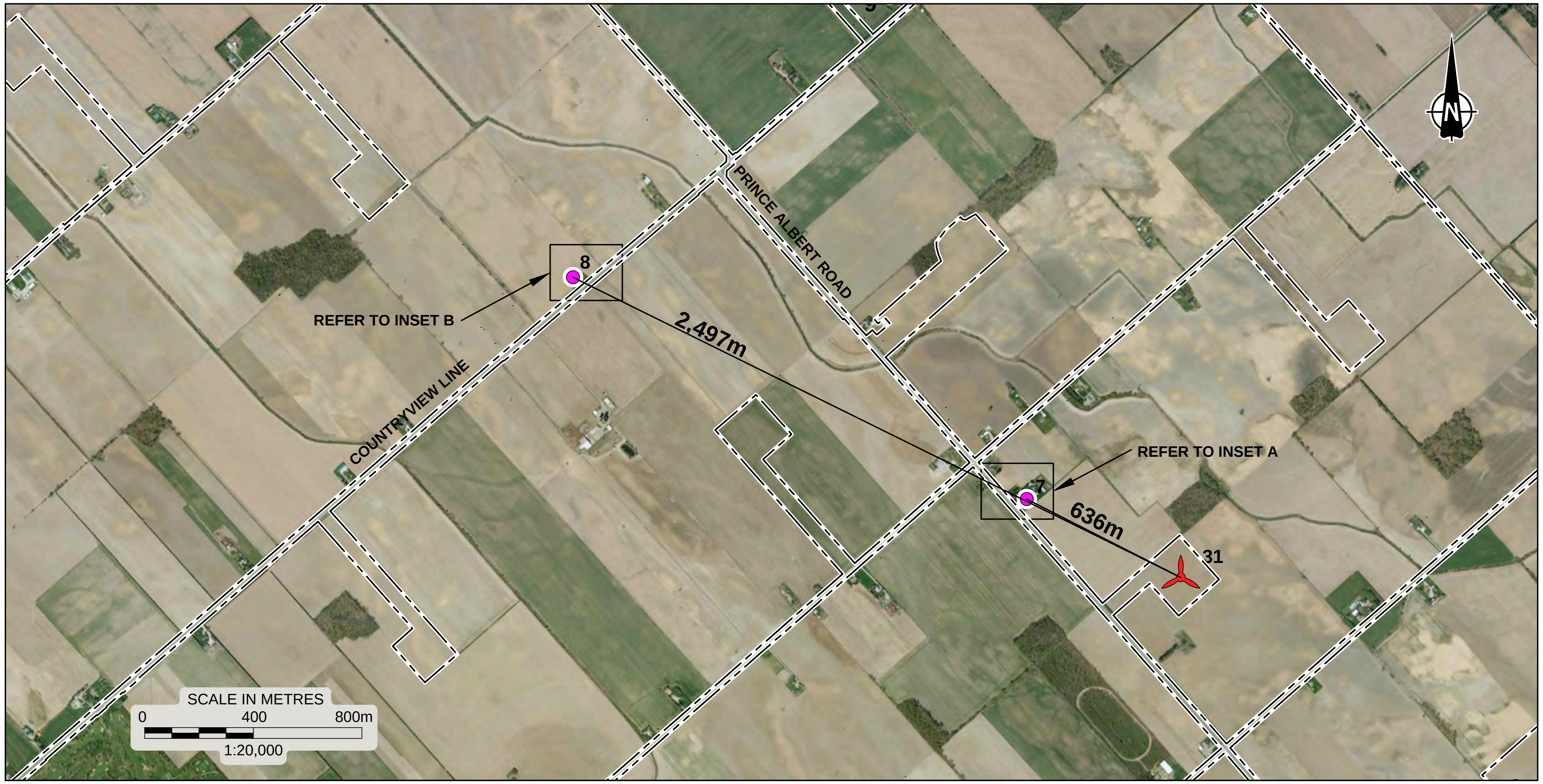
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T30

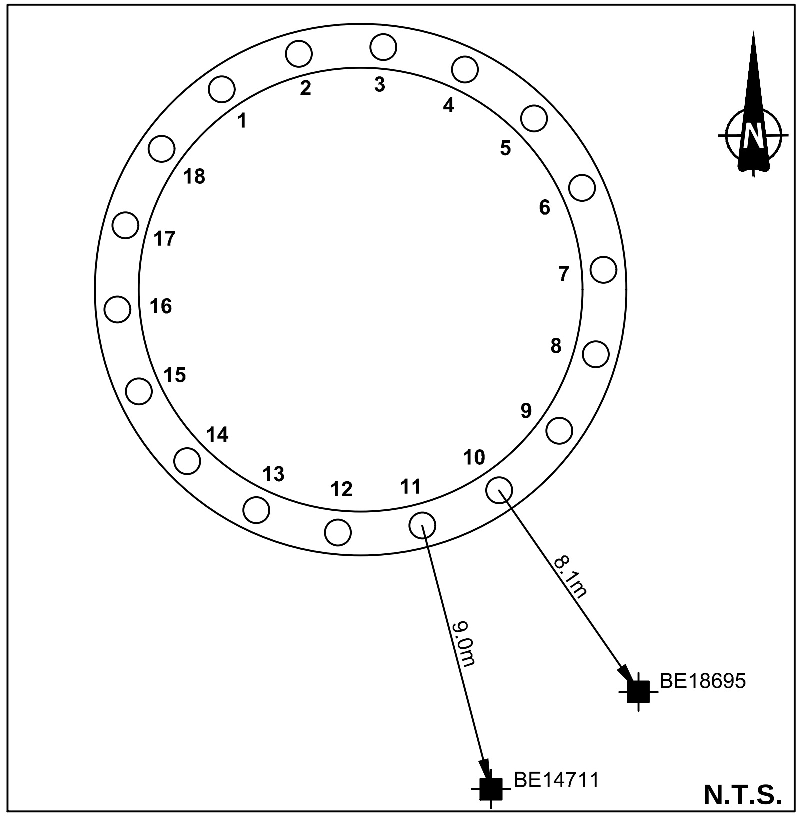
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T30
			SCALE AS SHOWN REV.
CADD	DH/ZB/LK	Dec 7/17	
CHECK	SJB		**FIGURE T30**

Drawing file: 1668031–2000–R02T30.dwg Dec 07, 2017 – 11:16am



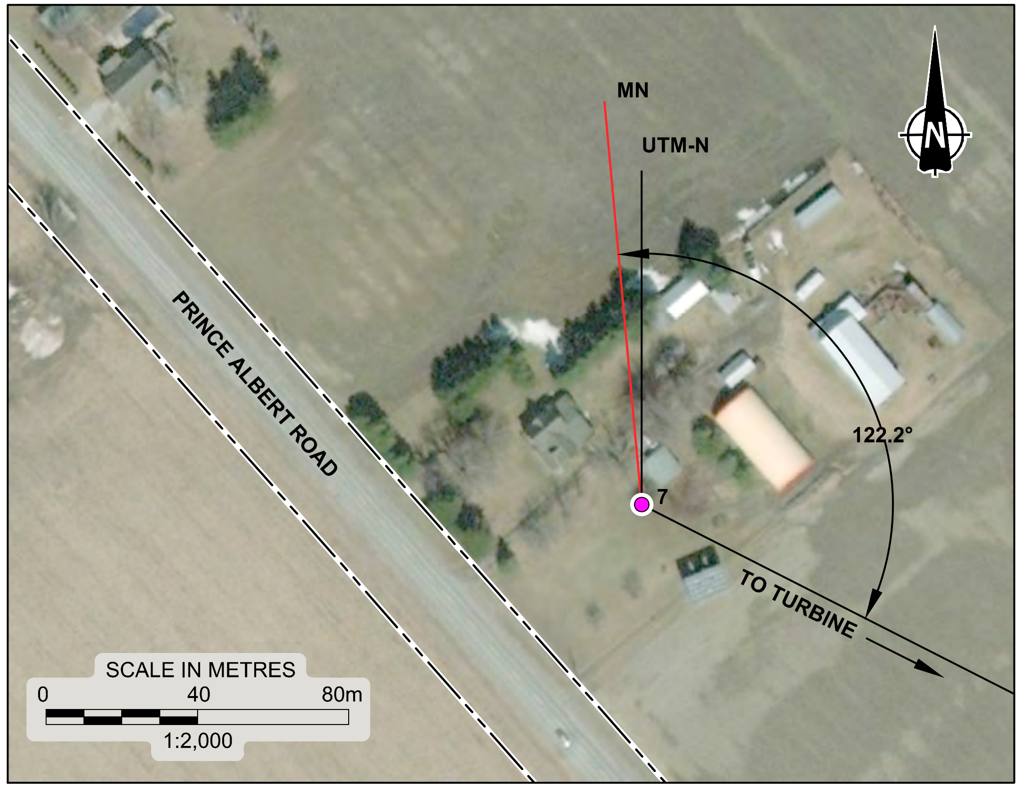
SITE PLAN



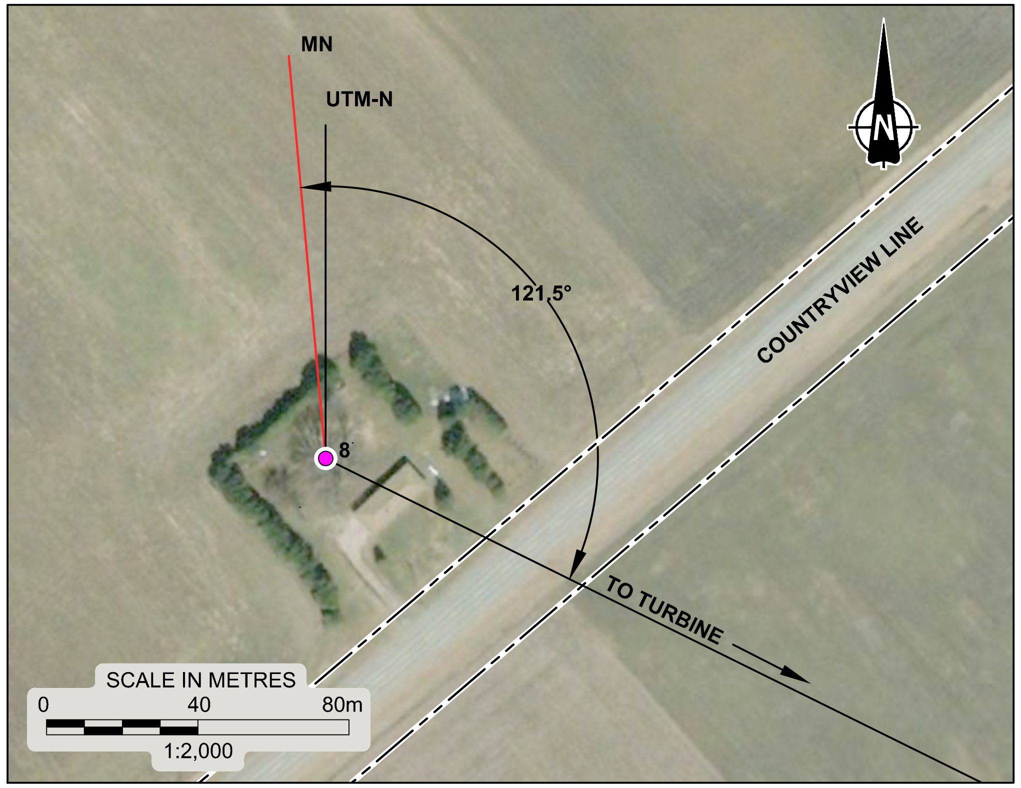
TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✣	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH



INSET A (WELL #7)



INSET B (WELL #8)

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

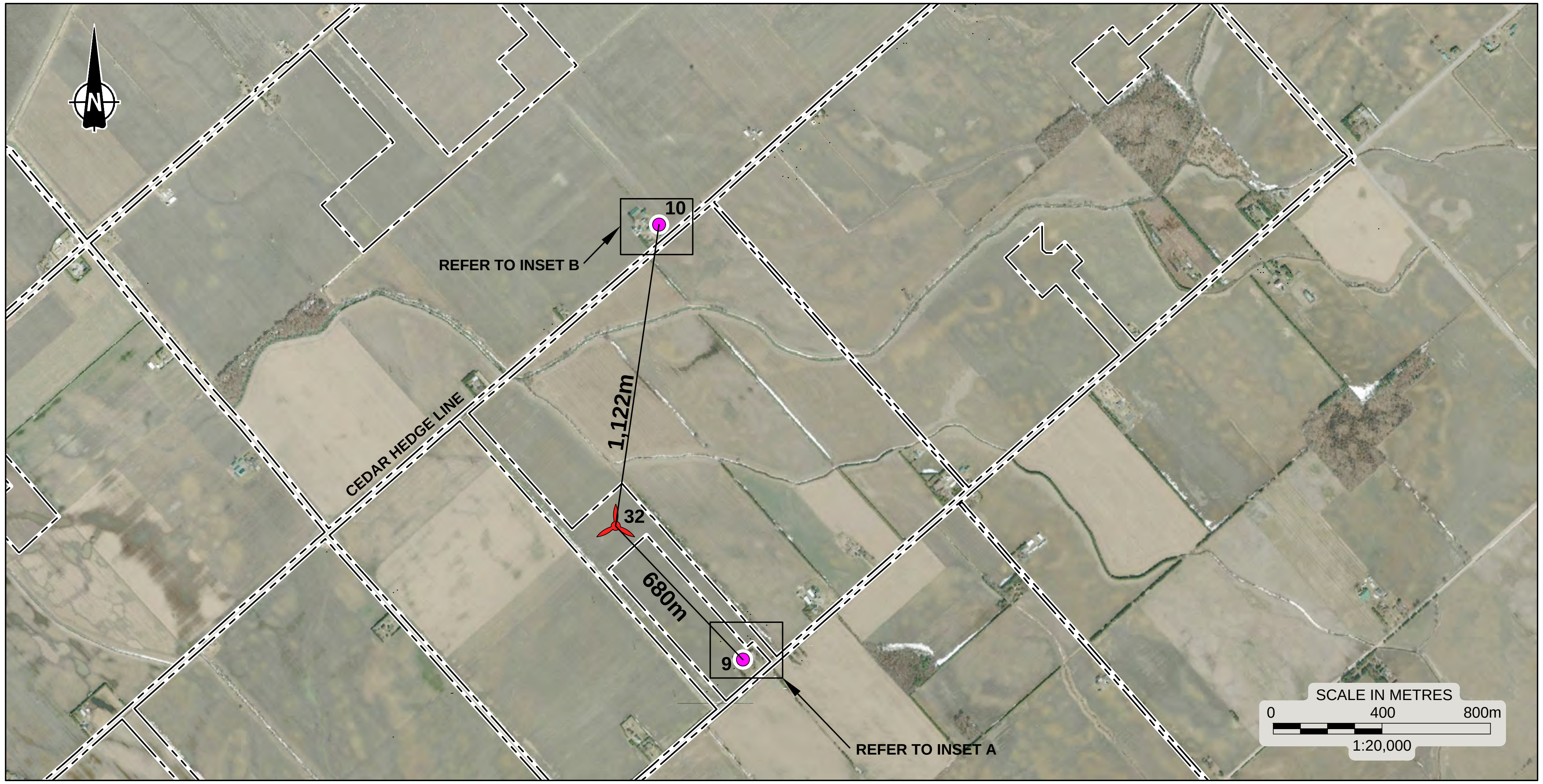
TITLE

TURBINE PILES AND WATER WELL
LOCATION PLAN, T31

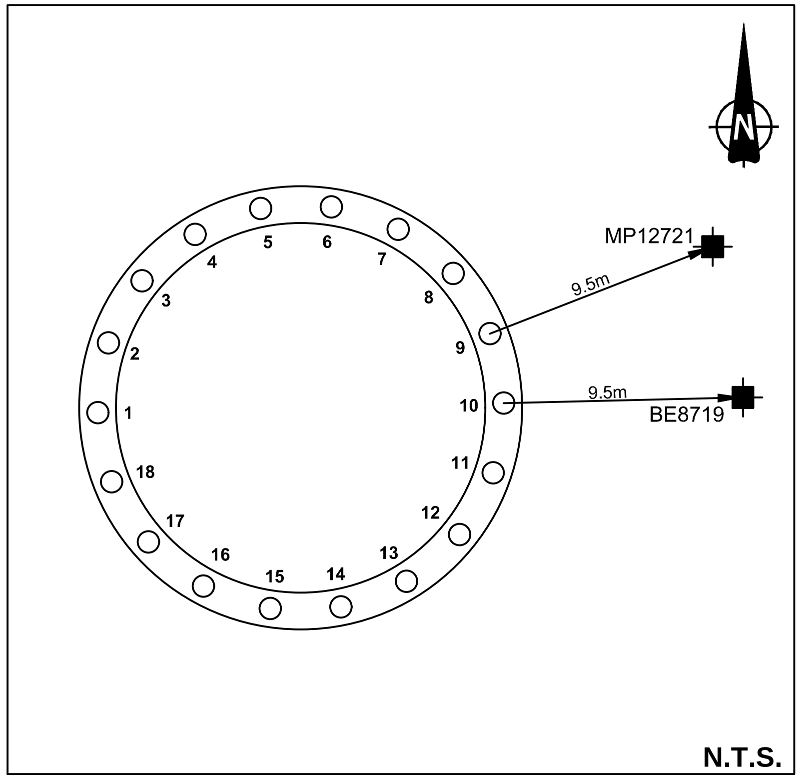
Golder Associates

PROJECT No.		1668031	FILE No. 1668031–2000–R02T31	
			SCALE AS SHOWN	REV.
CADD	DH/ZB/LK	Dec 7/17	**FIGURE T31**	
CHECK	SJB			

Drawing file: 1668031–2000–R02T31.dwg Dec 07, 2017 – 11:17am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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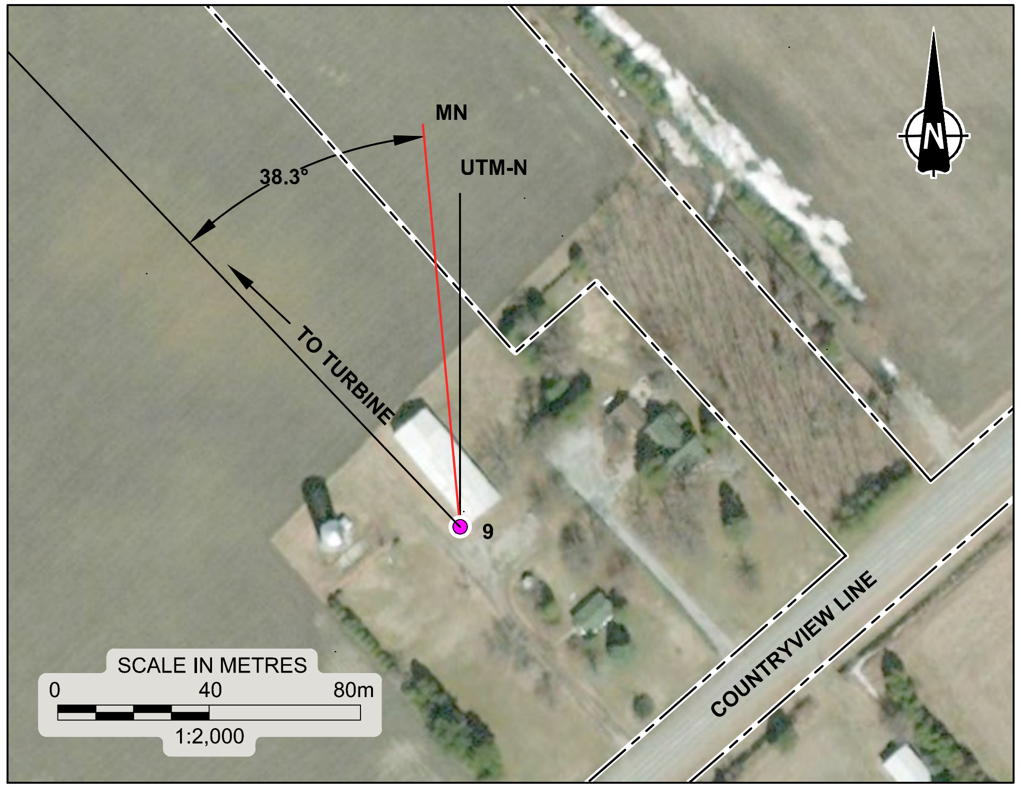
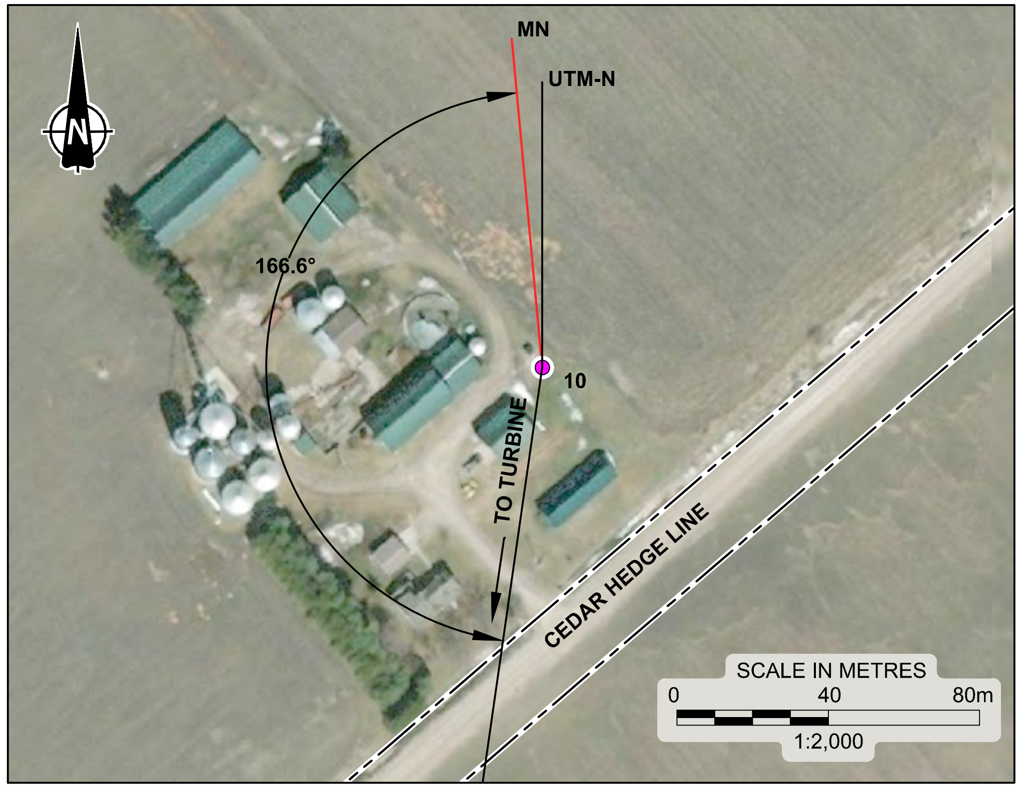


INSET A (WELL #9)



INSET B (WELL #10)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

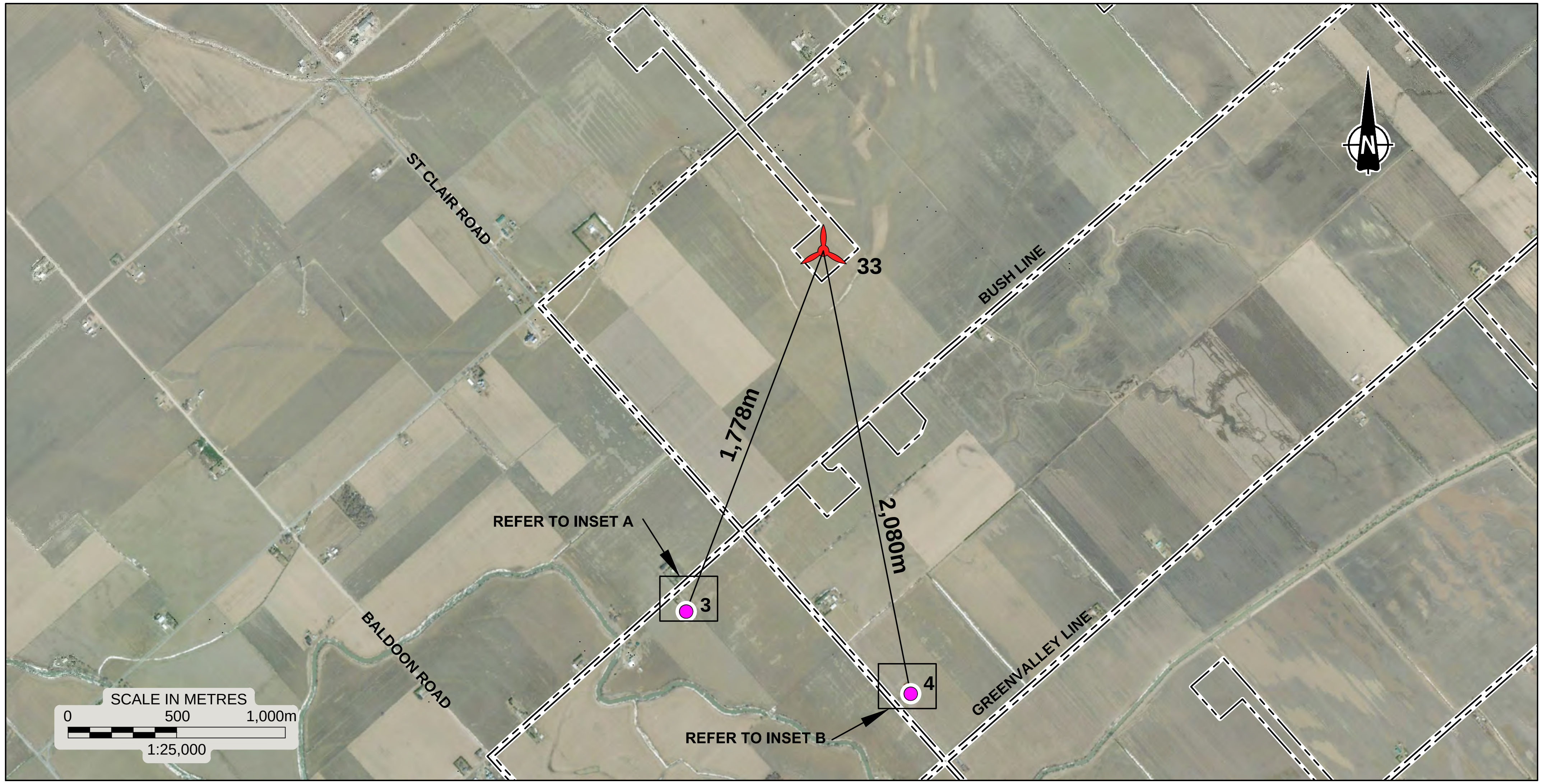
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T32

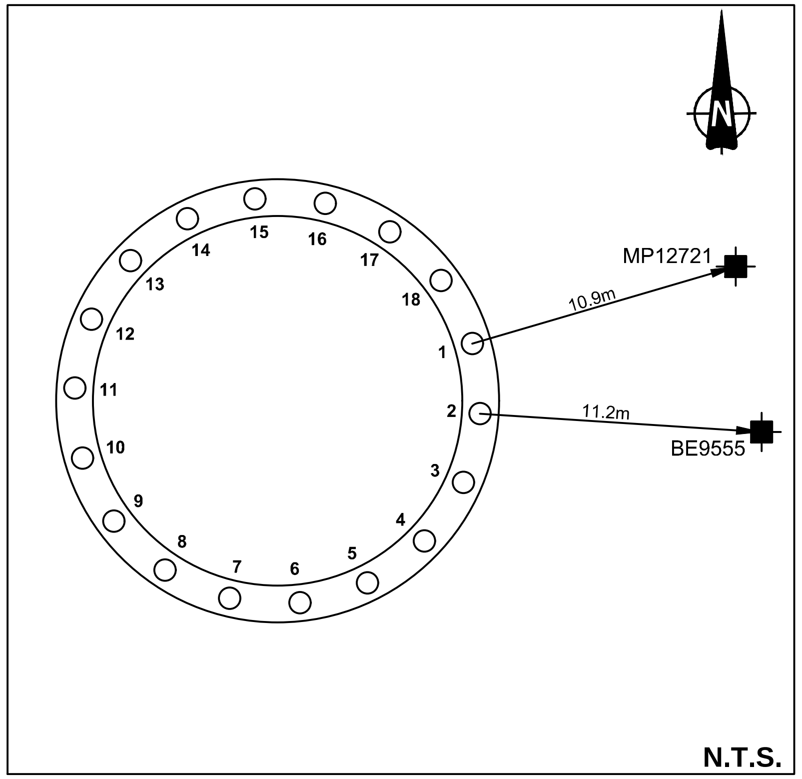
Golder Associates

PROJECT No.		1668031	FILE No.1668031-2000-R02T32
			SCALE AS SHOWN REV.
CADD	DH/ZB/LK	Dec 7/17	FIGURE T32
CHECK	SJB		

Drawing file: 1668031-2000-R02T32.dwg Dec 07, 2017 - 11:18am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✱	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

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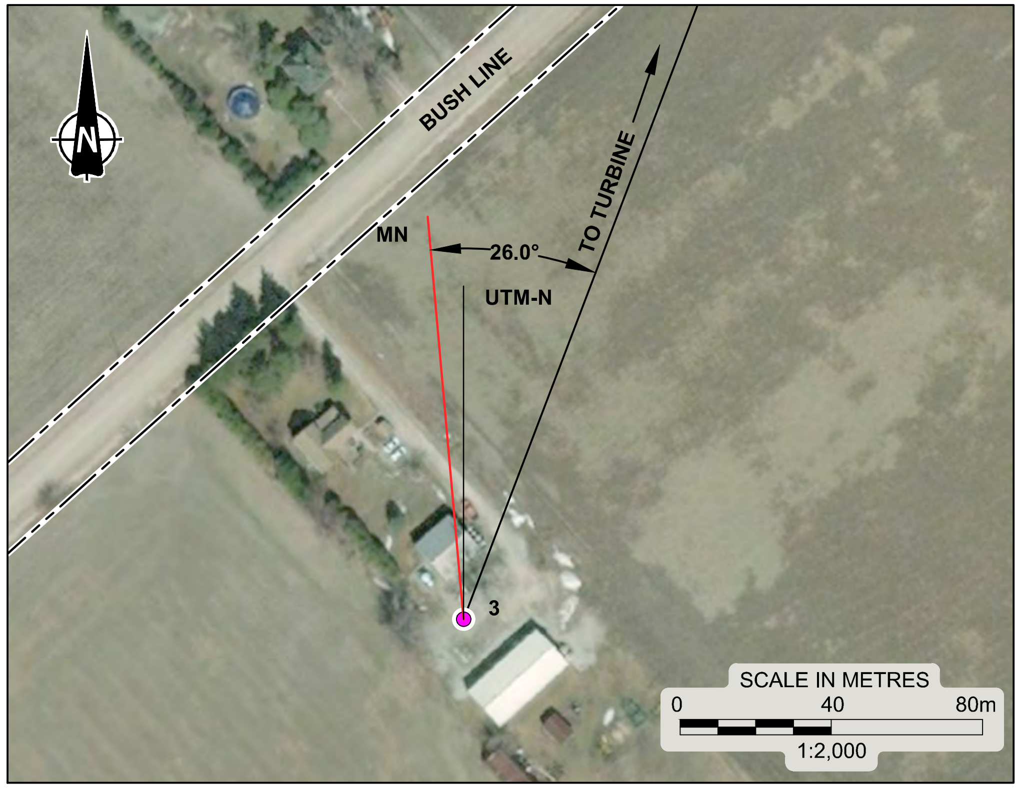
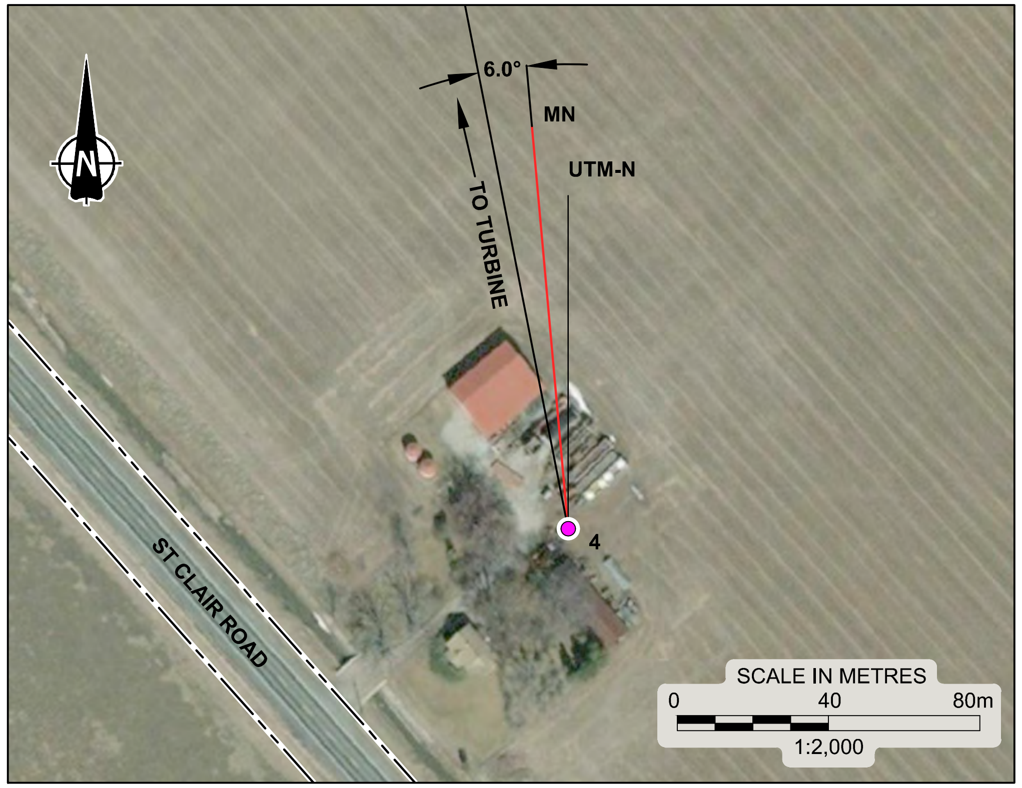


INSET A (WELL #3)



INSET B (WELL #4)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

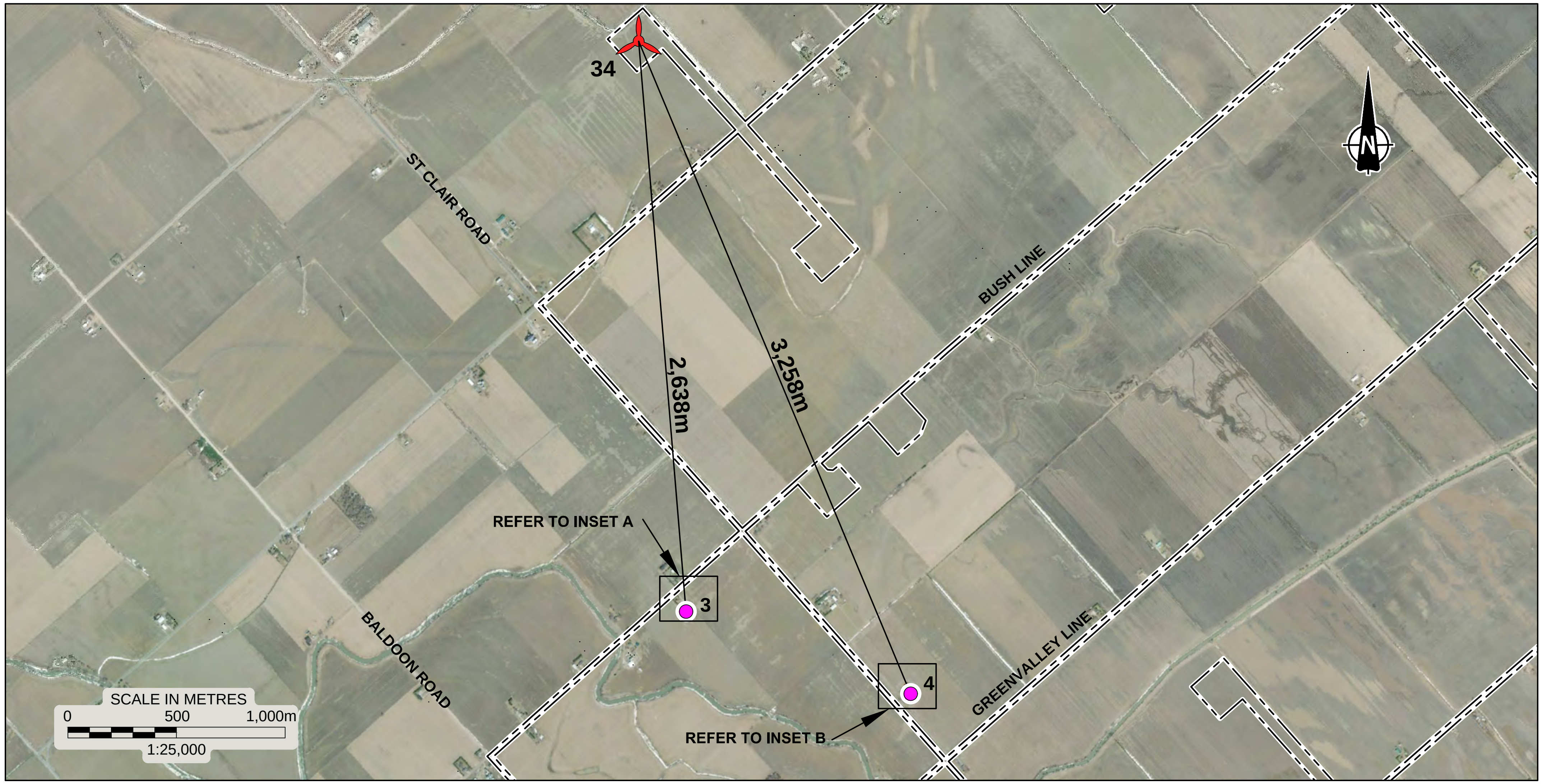
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T33

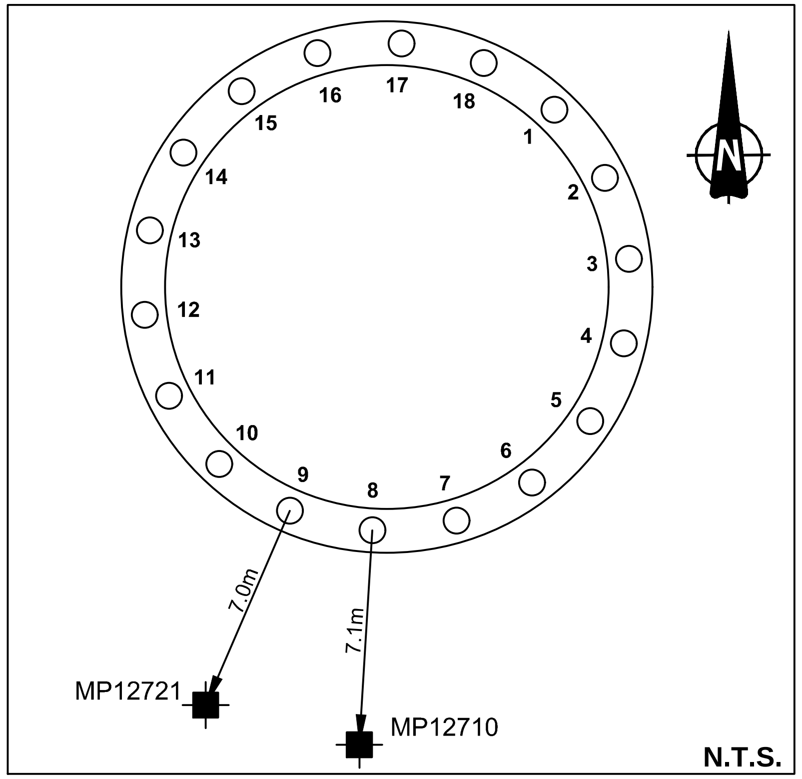
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T33
			SCALE AS SHOWN / REV.
CADD	DH/ZB/LK	Dec 7/17	
CHECK	SSB		FIGURE T33

Drawing file: 1668031–2000–R02T33.dwg Dec 07, 2017 – 11:19am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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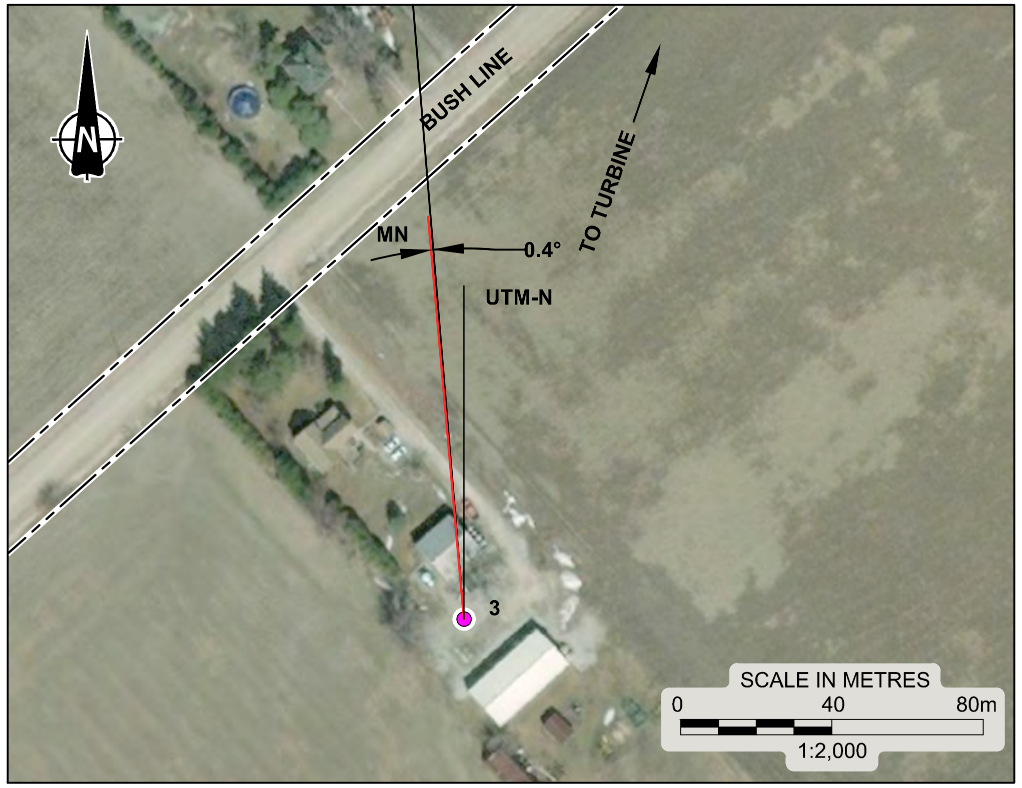
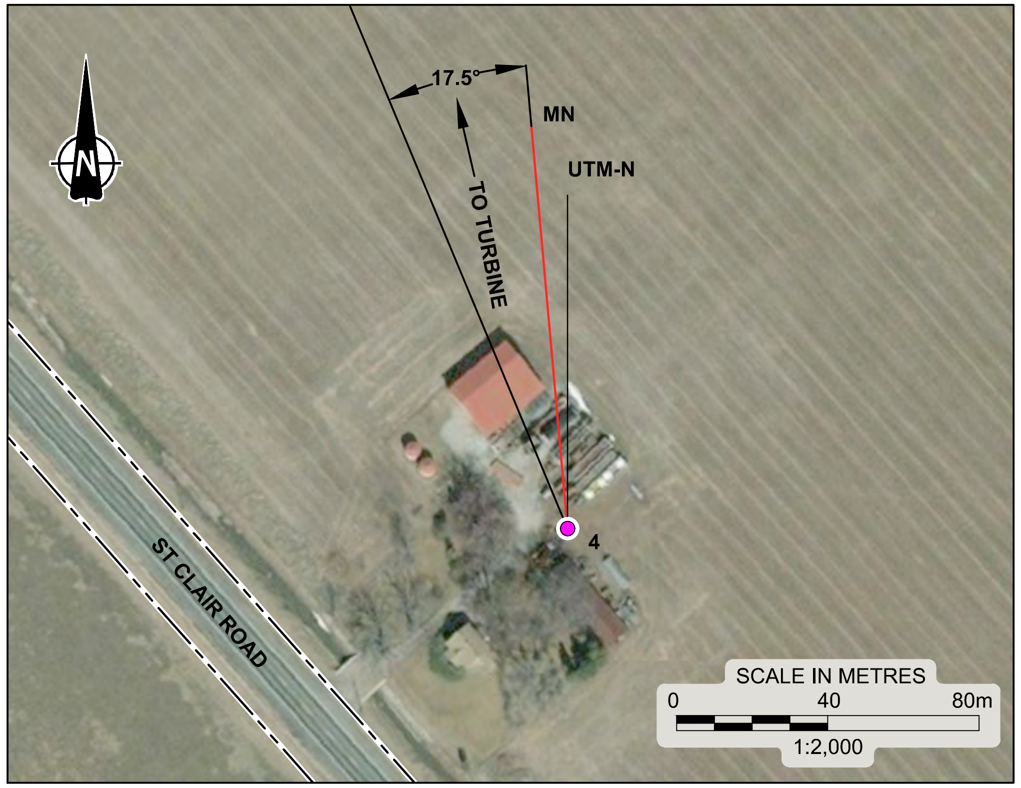


INSET A (WELL #3)



INSET B (WELL #4)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

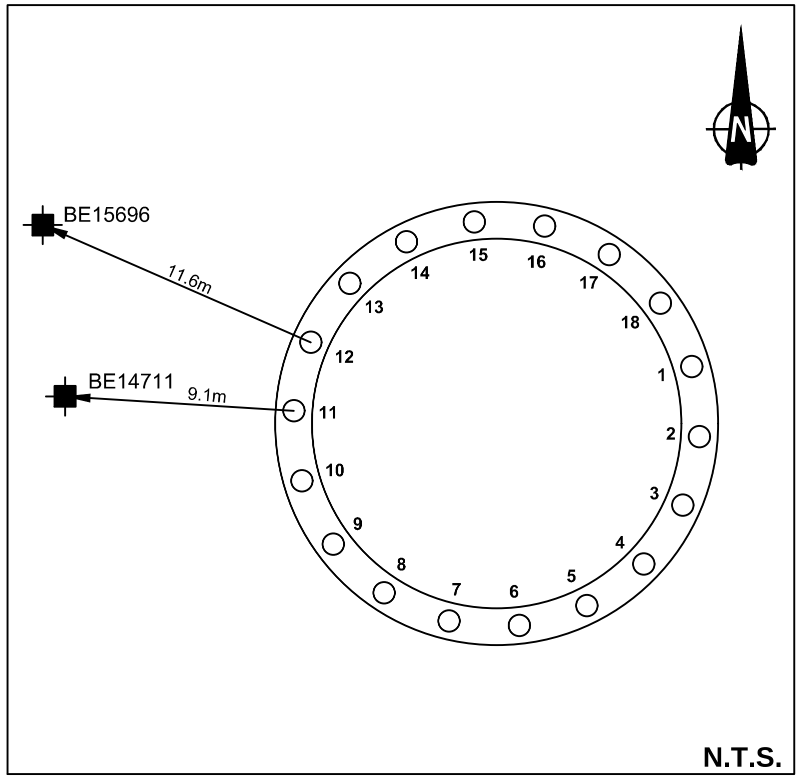
TURBINE PILES AND WATER WELL LOCATION PLAN, T34

Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T34	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17	FIGURE T34	
CHECK	SSB			

Drawing file: 1668031–2000–R02T34.dwg   Dec 07, 2017 – 11:20am

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

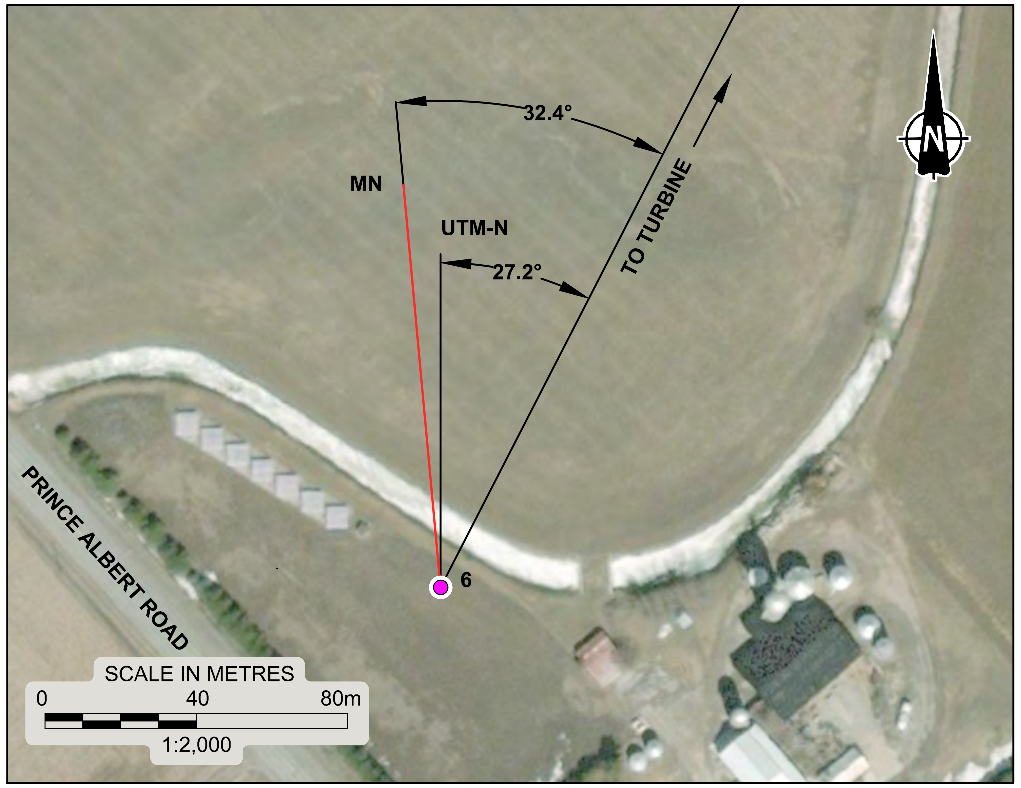
DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO;
BING IMAGERY (IMAGE DATE UNKNOWN) AS OF NOVEMBER 30 - 2017;
AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190,
DWG No. S002.

NOTES

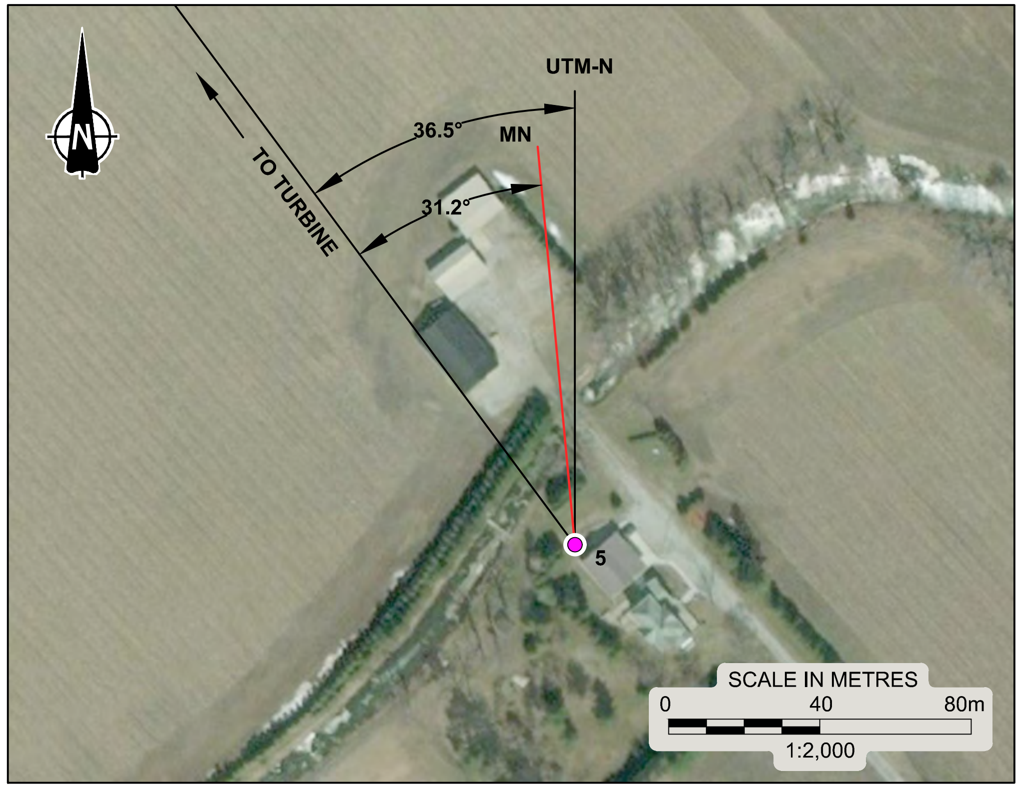
THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #6)



INSET B (WELL #5)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

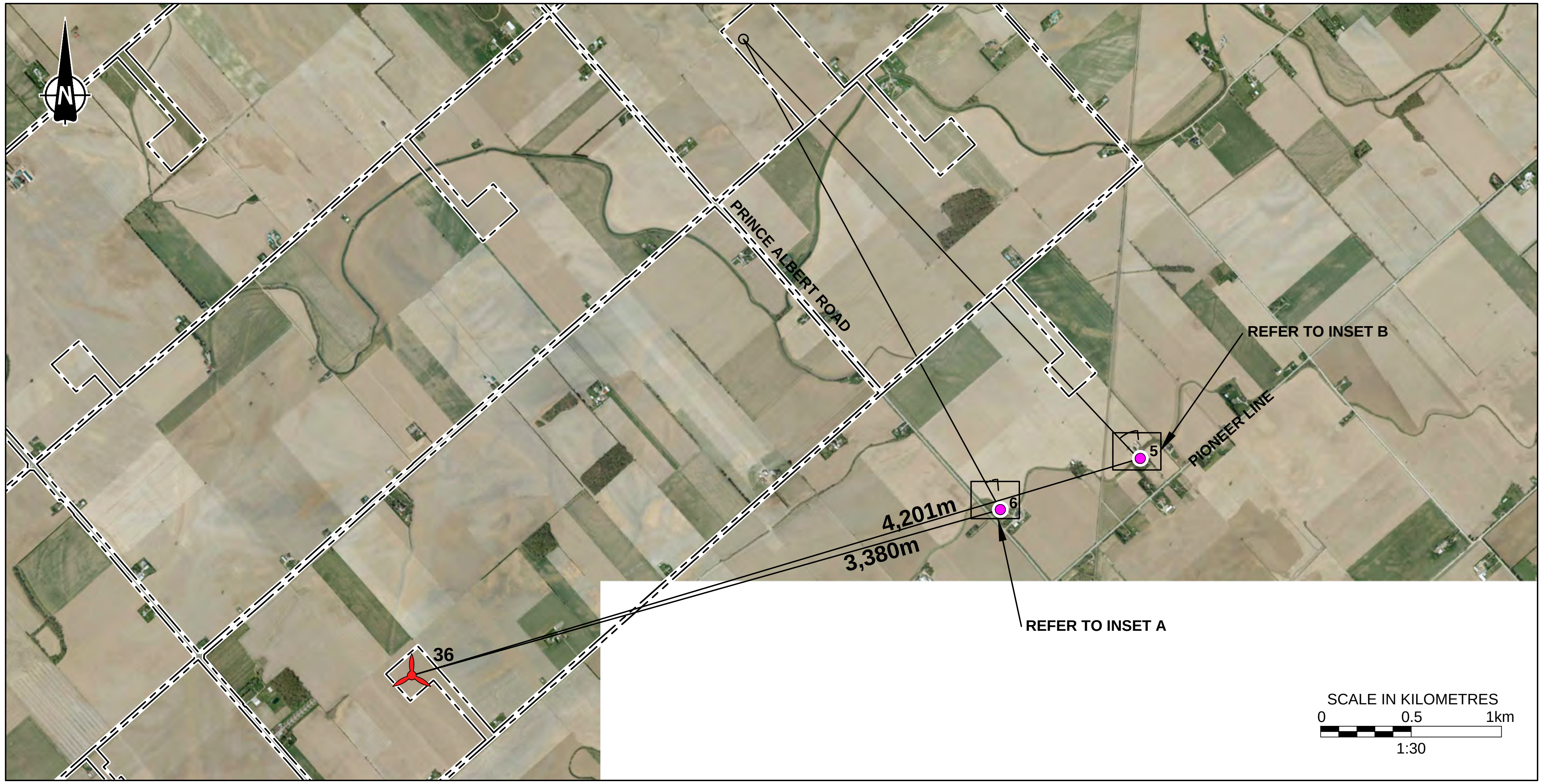
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T35

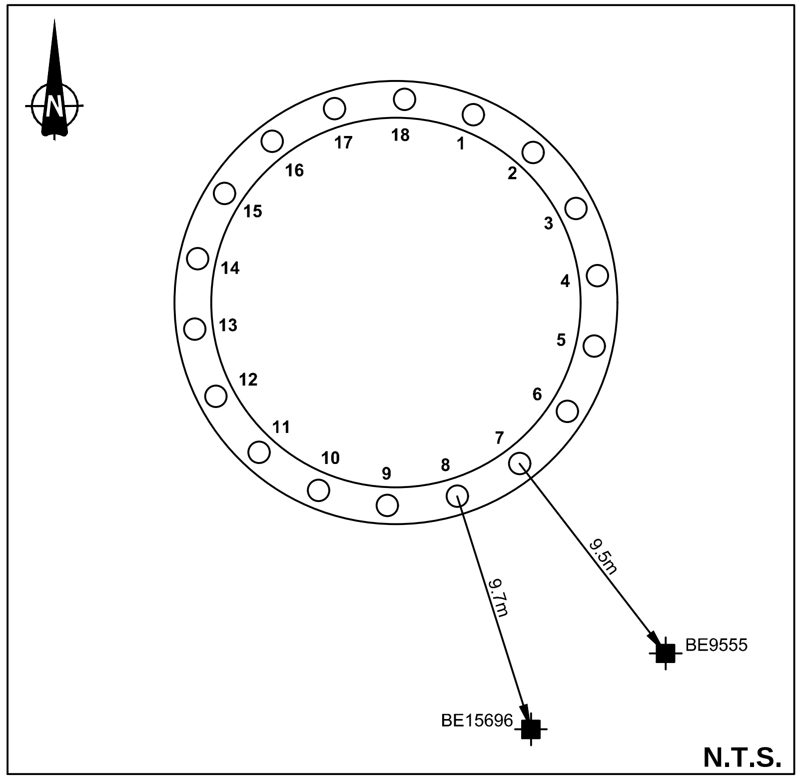
PROJECT No.		1668031	FILE No.1668031–2000–R02T35	
			SCALE AS SHOWN	REV.
CADD	DH/ZB/LK	Dec 7/17	FIGURE T35	
CHECK	SJB			

Golder Associates

Drawing file: 1668031–2000–R02T35.dwg   Dec 07, 2017 – 11:21am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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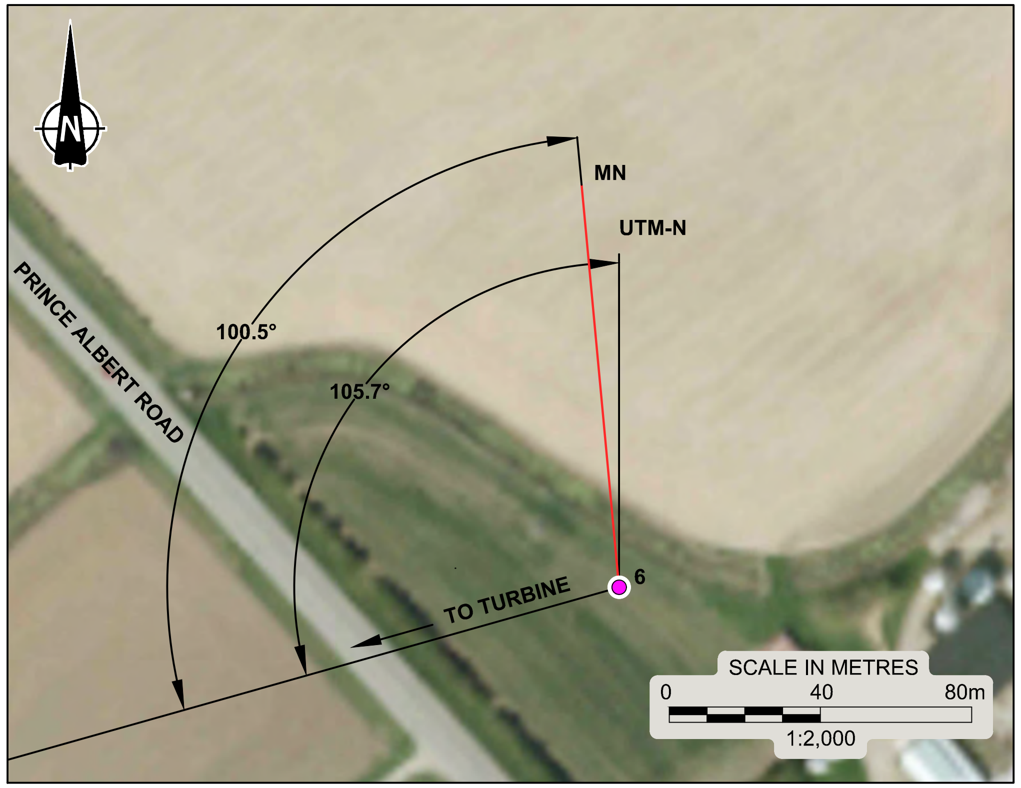
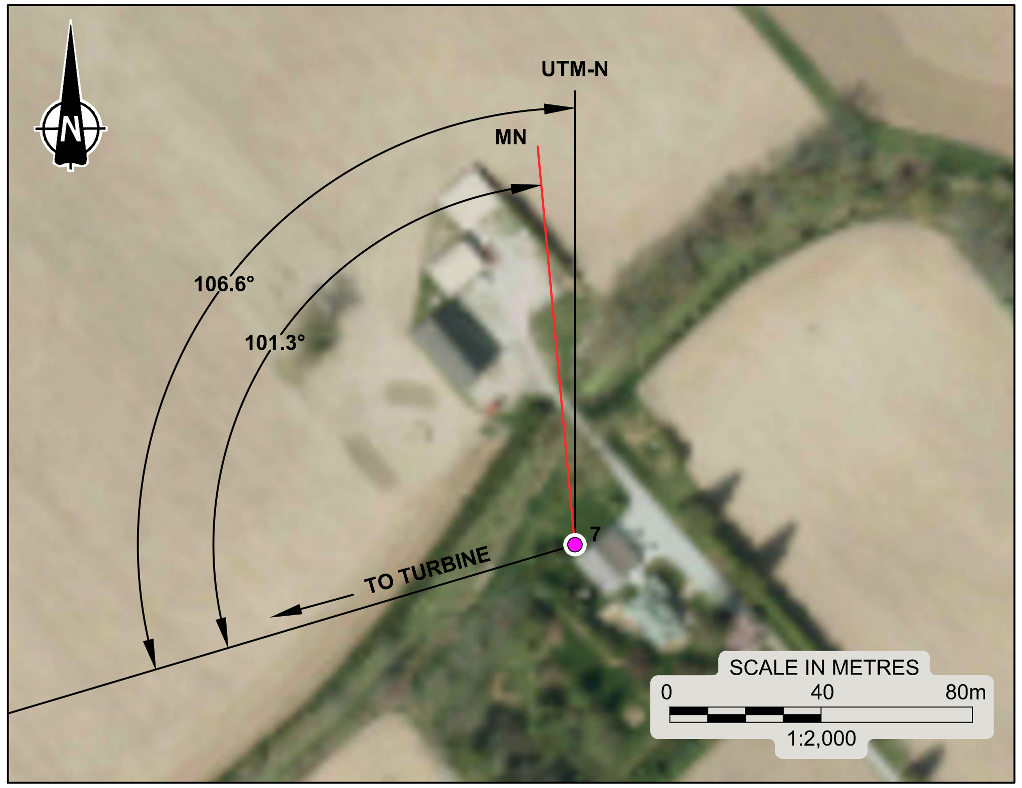
ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #6)



INSET B (WELL #5)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

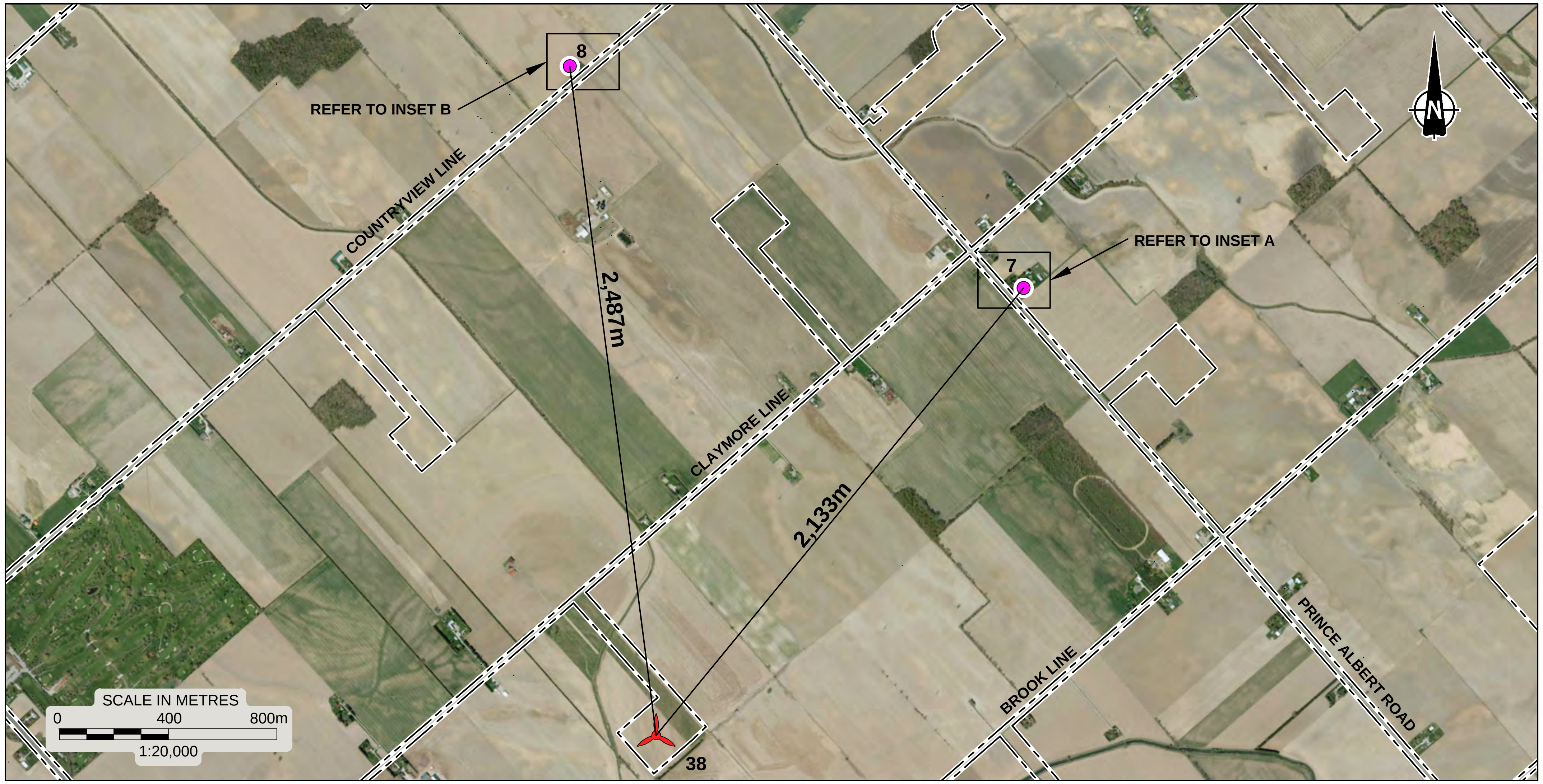
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T36

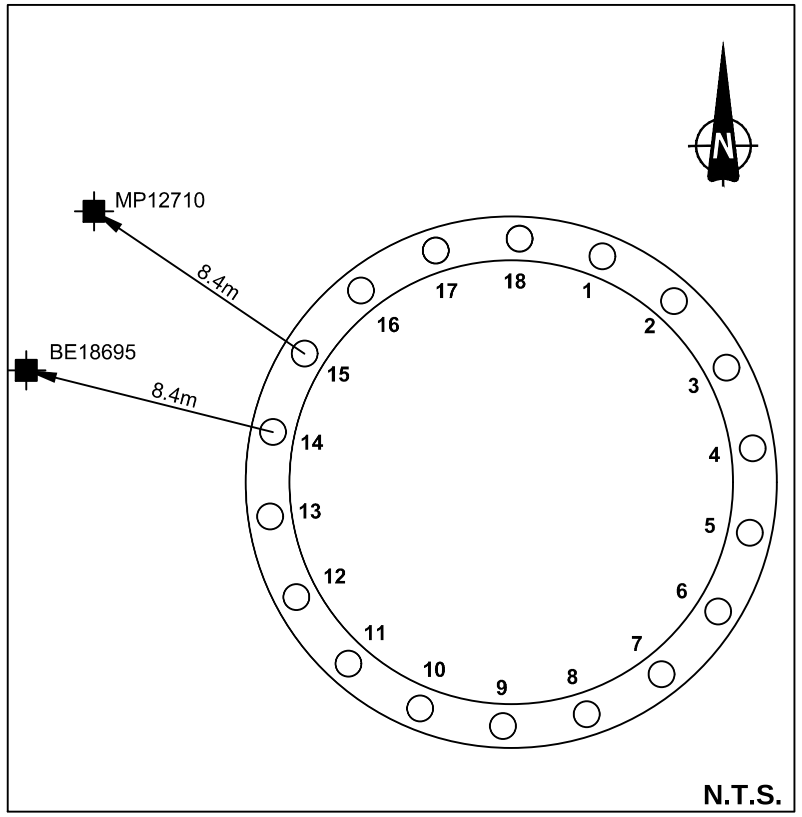
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T36	
			SCALE AS SHOWN	REV.
CADD	DH/ZB/LK	Dec 7/17	FIGURE T36	
CHECK	SSB			

Drawing file: 1668031–2000–R02T36.dwg Dec 07, 2017 – 1:43pm



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✱	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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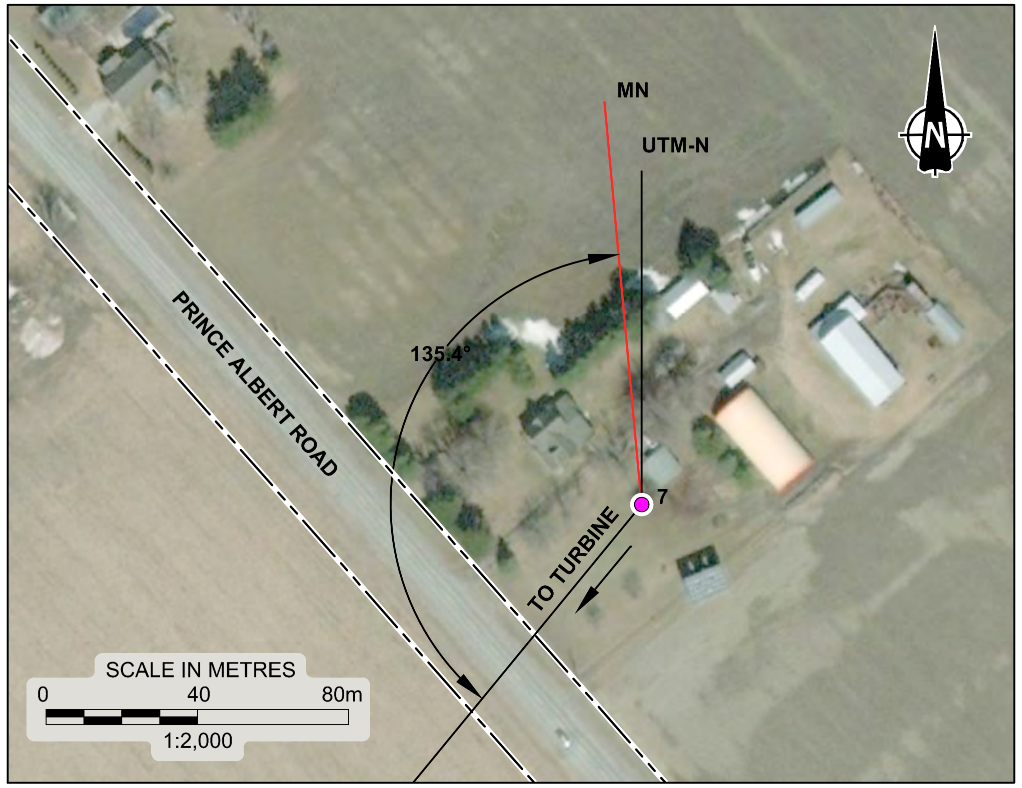
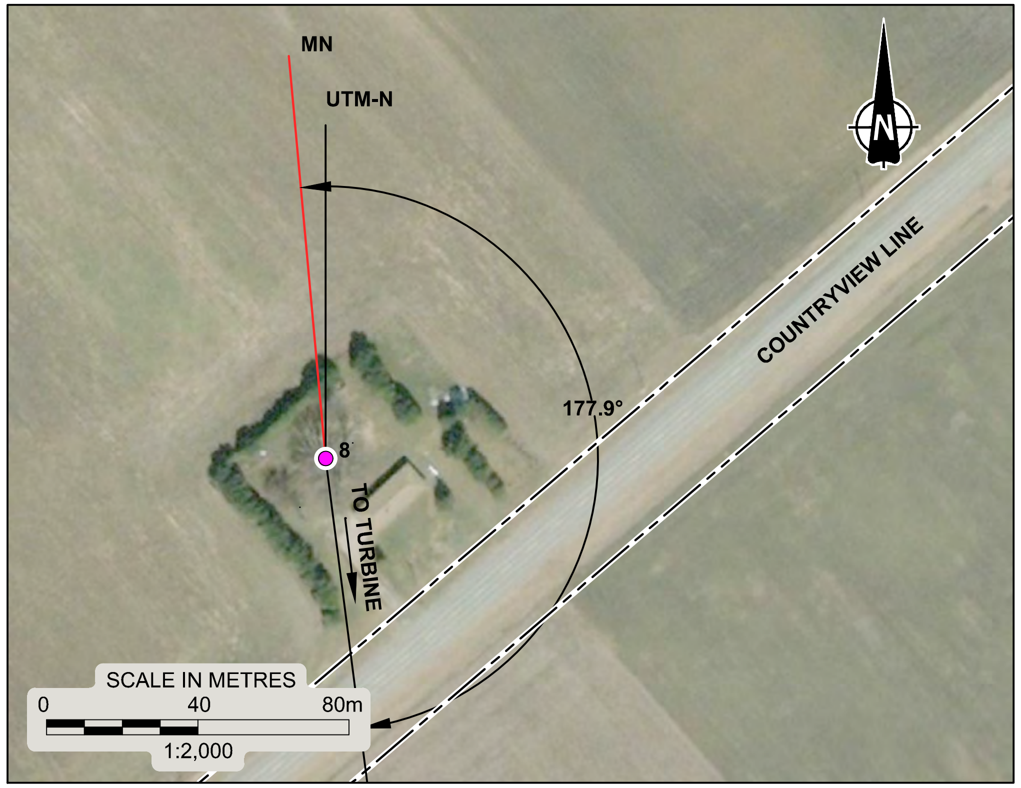
ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #7)



INSET B (WELL #8)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

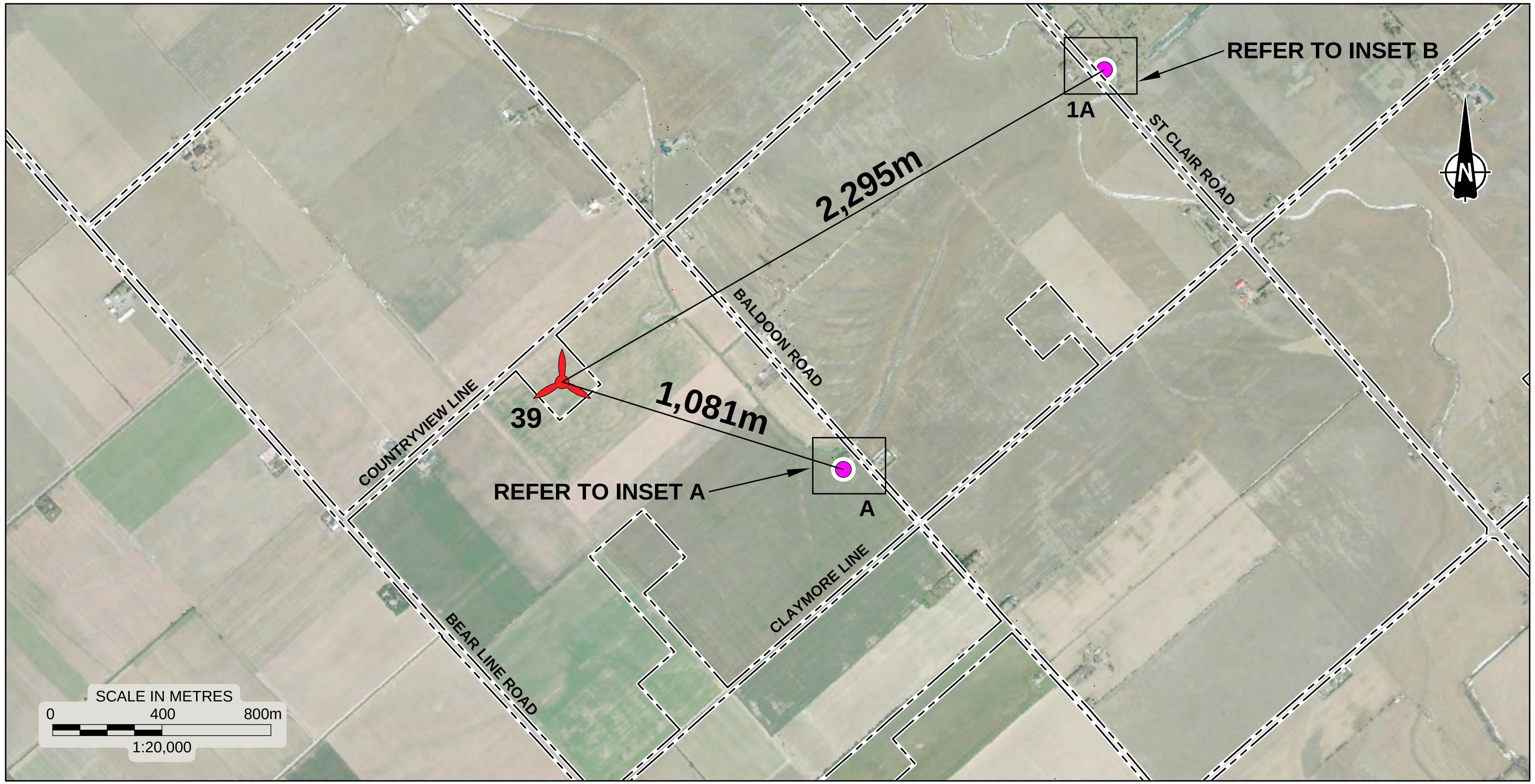
TURBINE PILES AND WATER WELL LOCATION PLAN, T38

Golder Associates

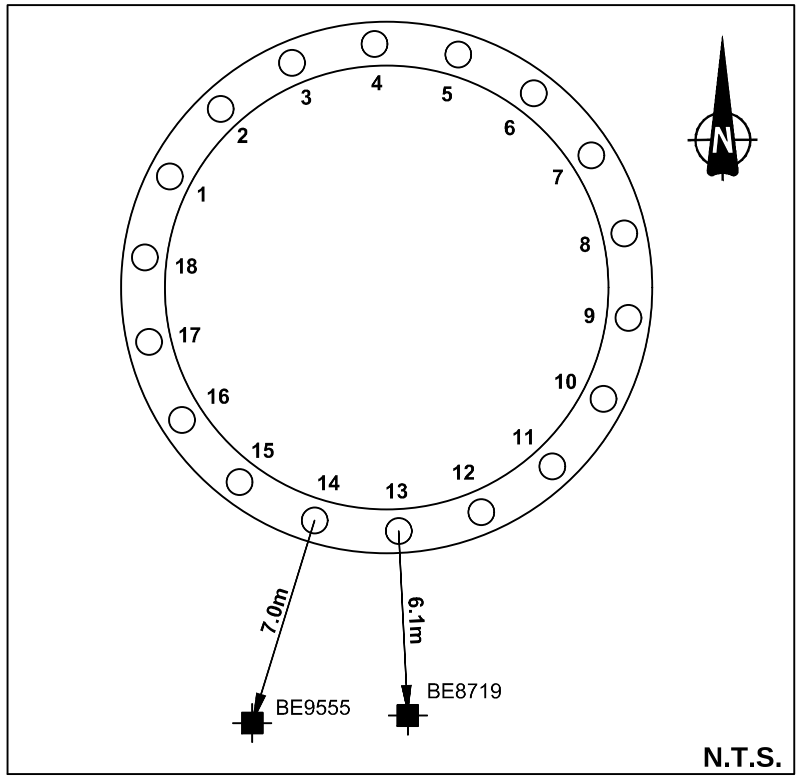
PROJECT No. 1668031
FILE No.1668031–2000–R02T38
SCALE AS SHOWN
REV.
CADD DCH Dec 7/17
CHECK SS

FIGURE T38

Drawing file: 1668031–2000–R02T38.dwg Dec 07, 2017 – 11:23am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✢	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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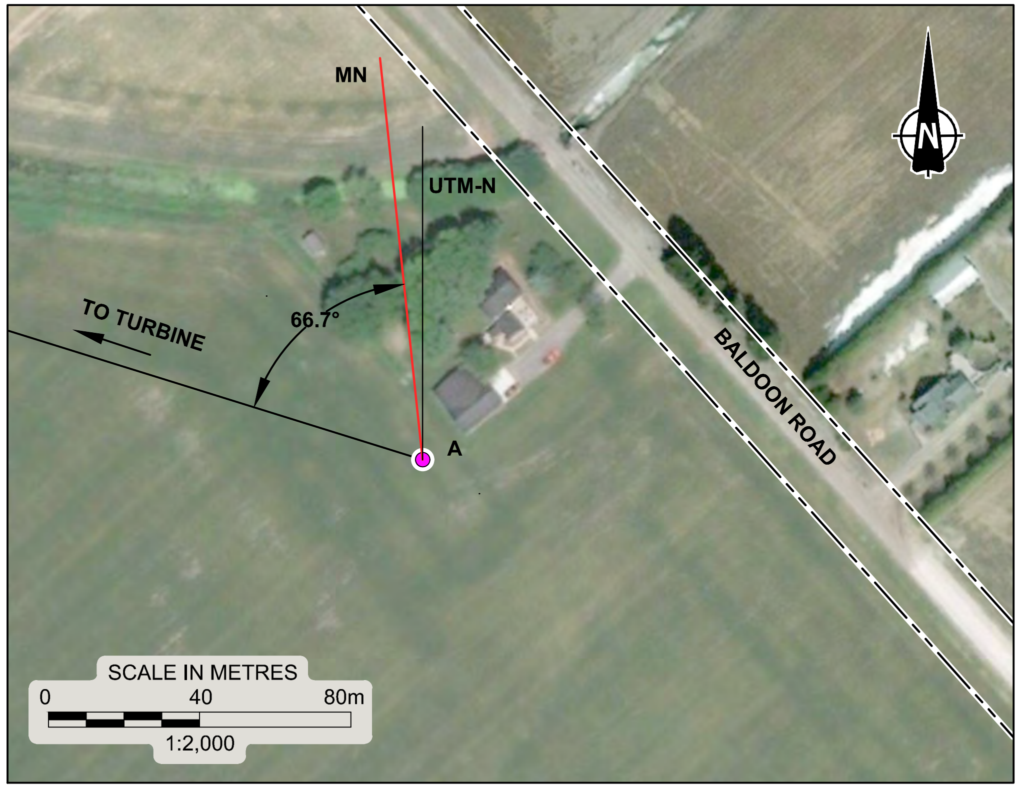
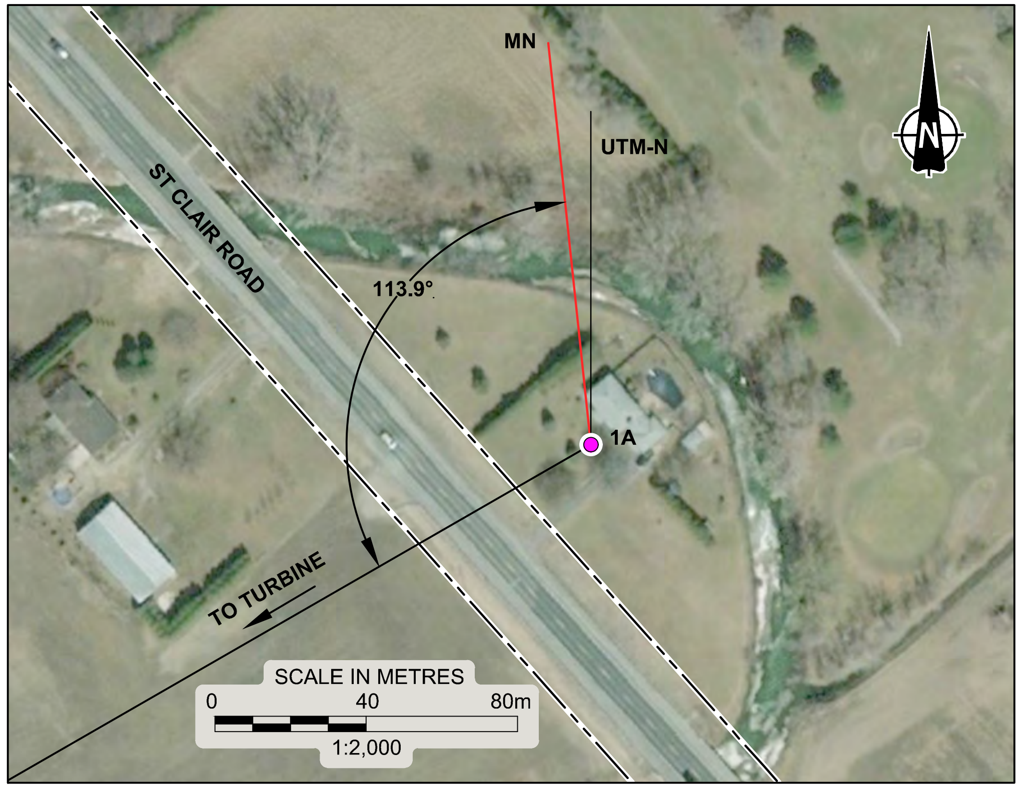
BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL A)



INSET B (WELL 1A)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

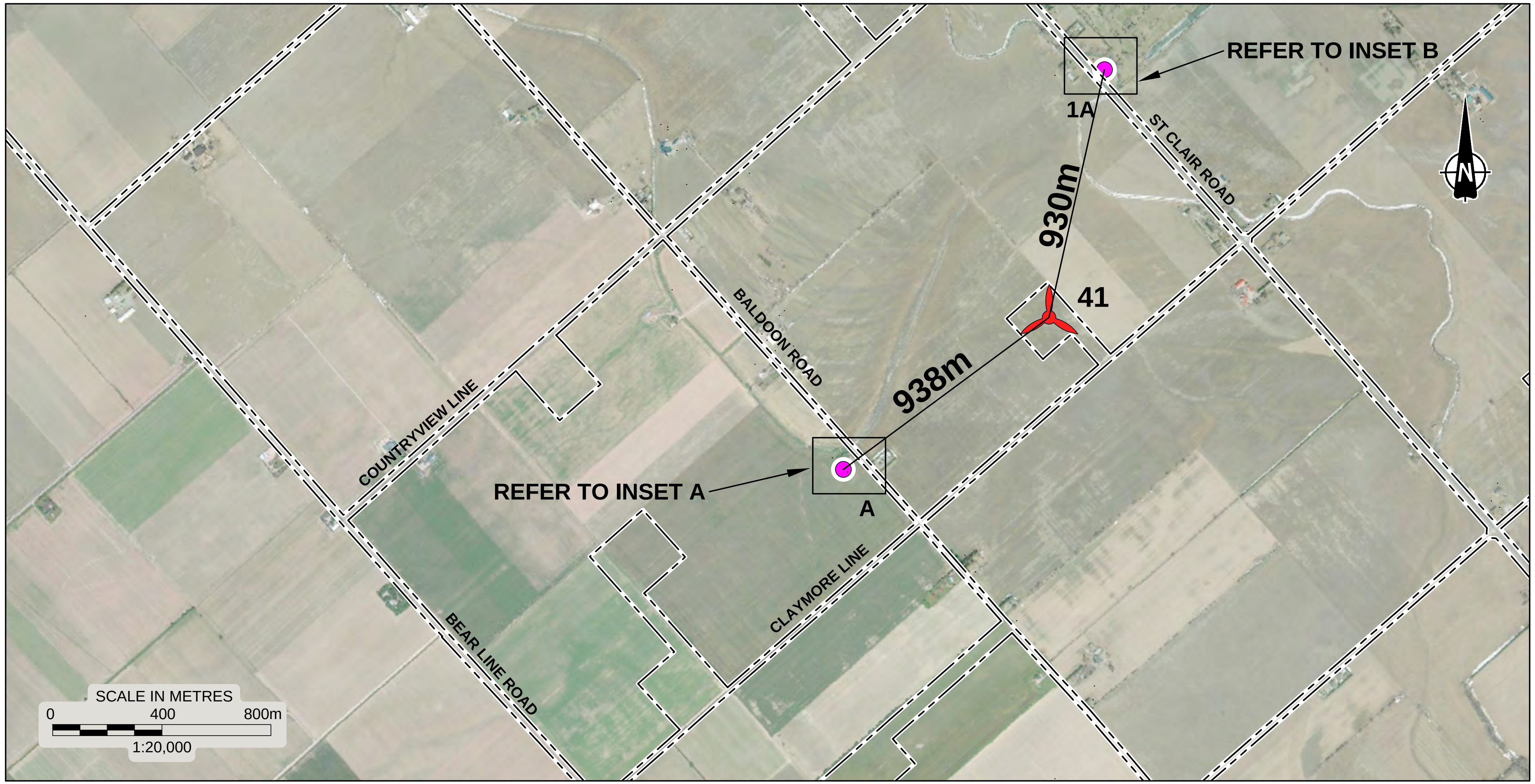
TITLE

WATER WELL MONITORING LOCATION PLAN, T39

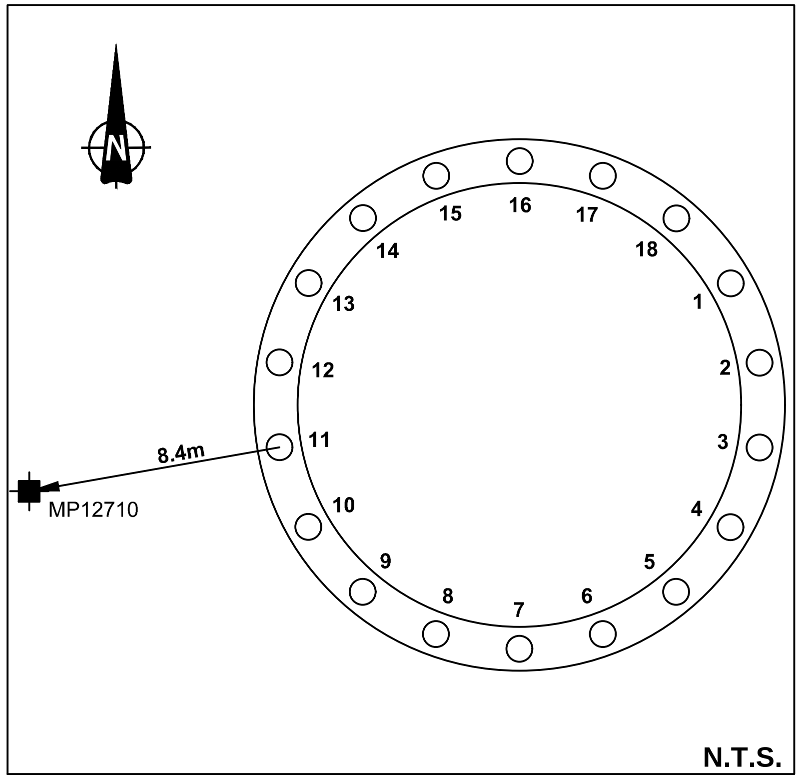
Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T39	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17	**FIGURE T39**	
CHECK	SJB			

Drawing file: 1668031–2000–R02T39.dwg Dec 07, 2017 – 11:24am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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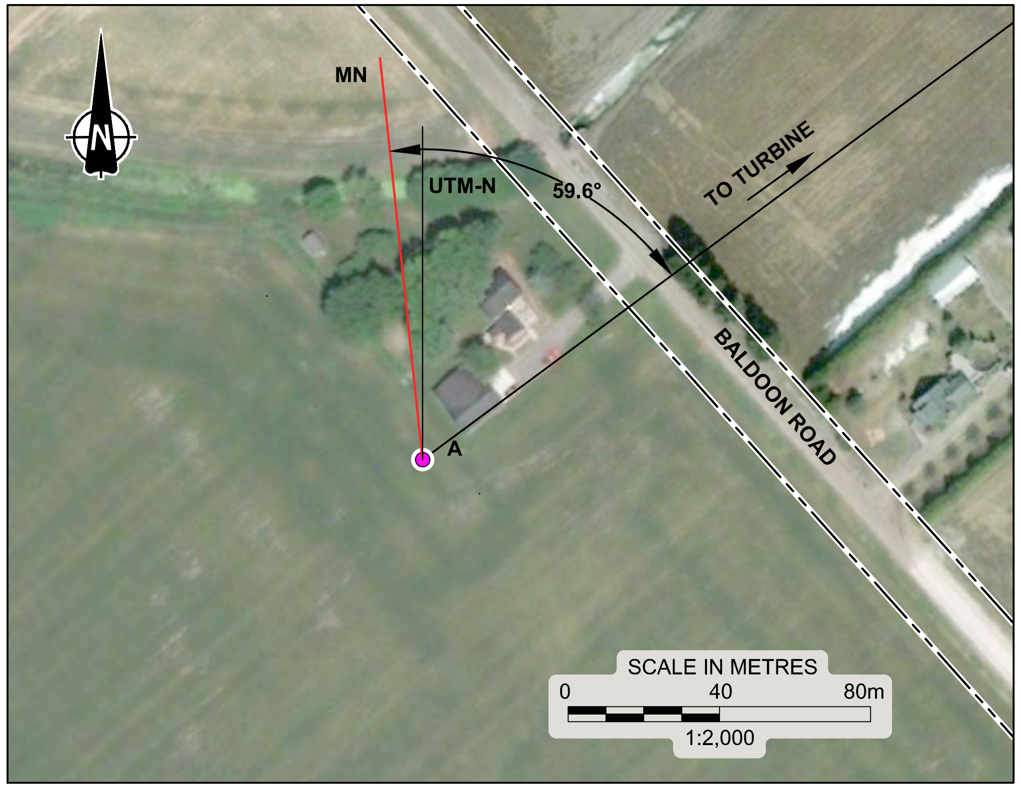
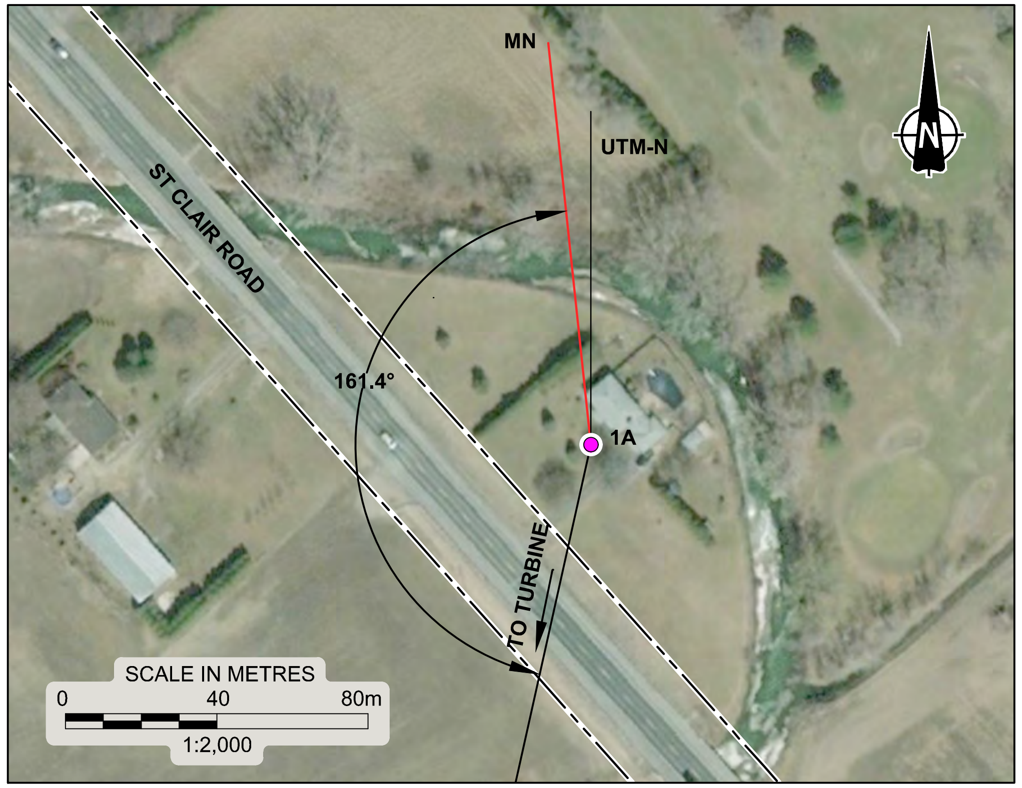


INSET A (WELL A)



INSET B (WELL 1A)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

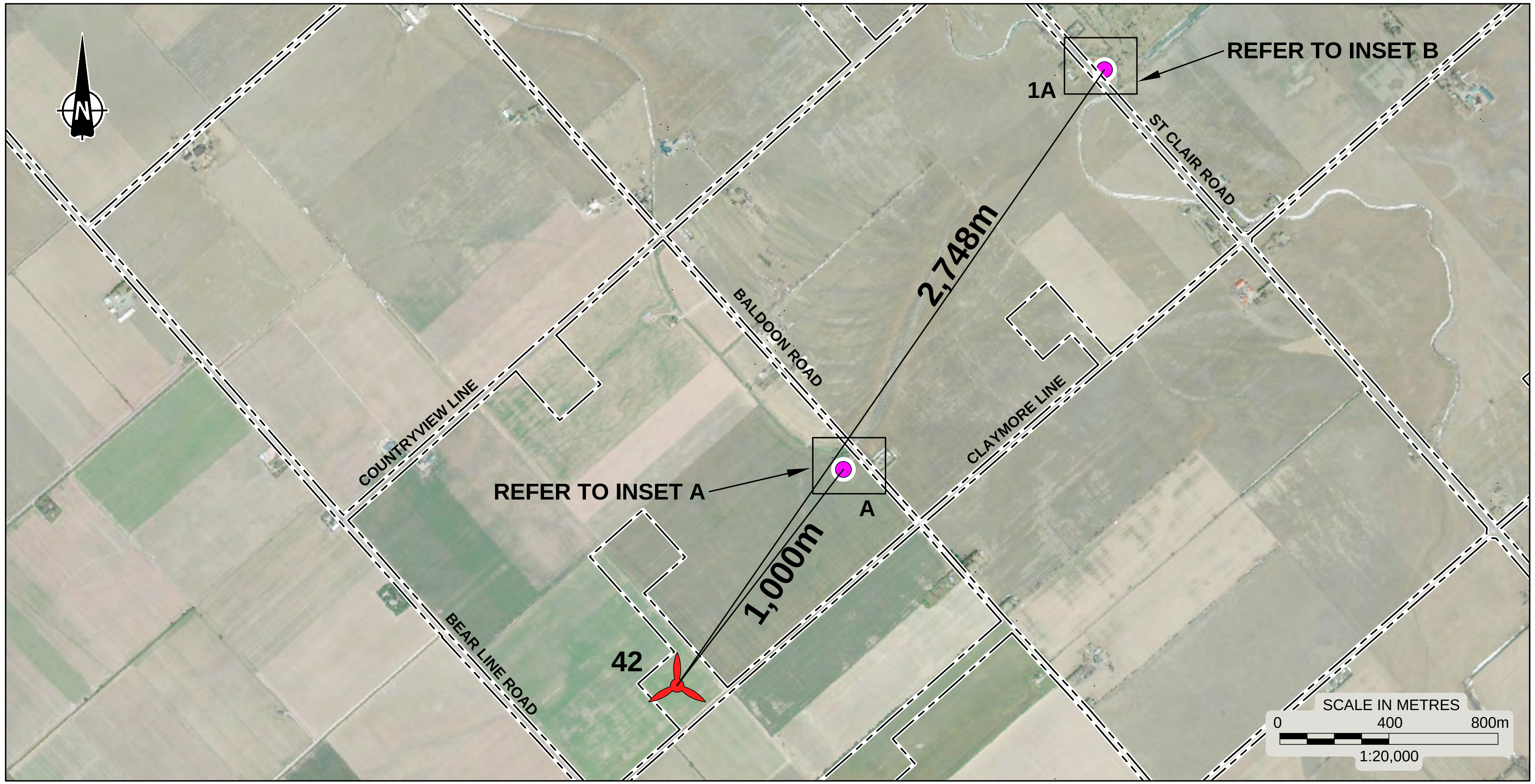
TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T41

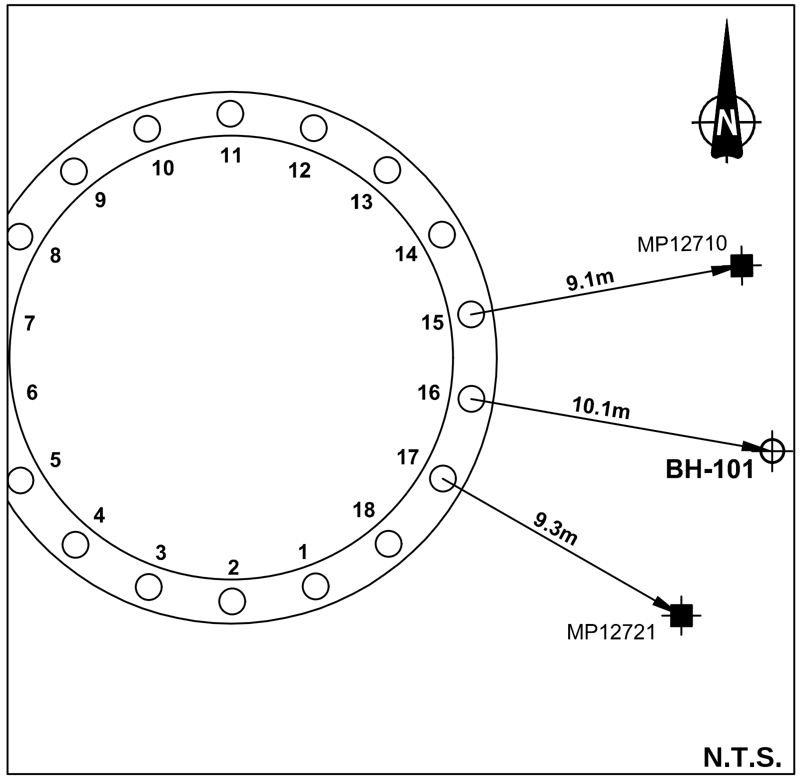
Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02T41	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17	**FIGURE T41**	
CHECK	SJB			

Drawing file: 1668031-2000-R02T41.dwg Dec 07, 2017 - 11:25am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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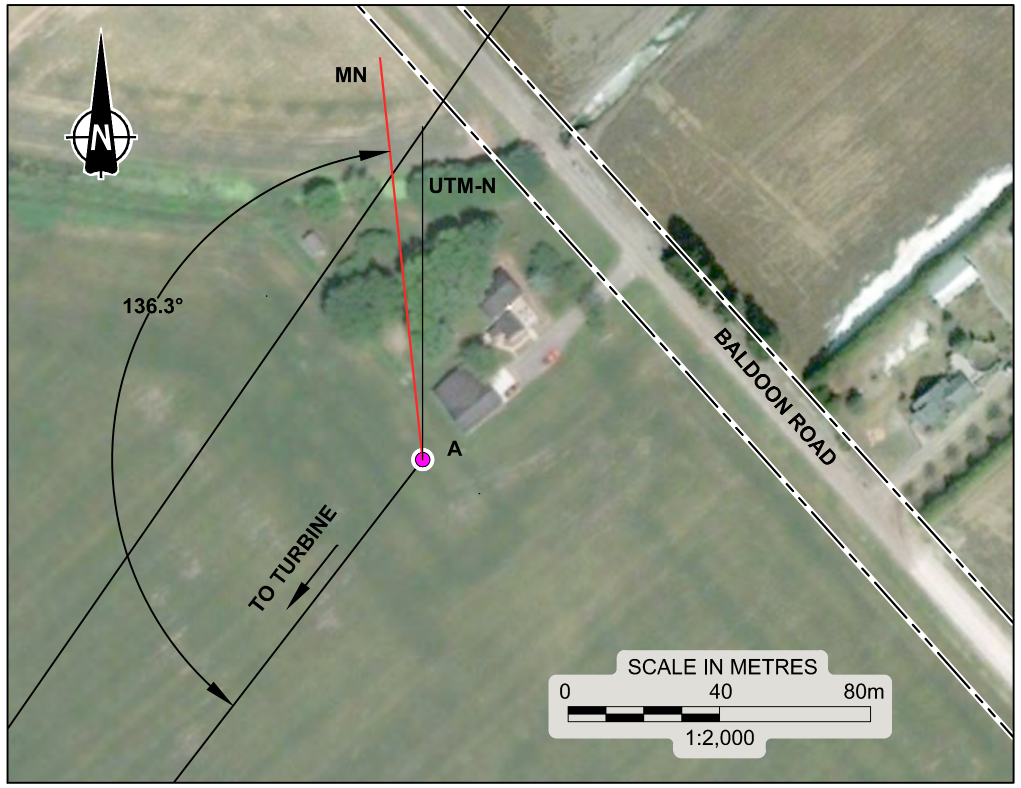
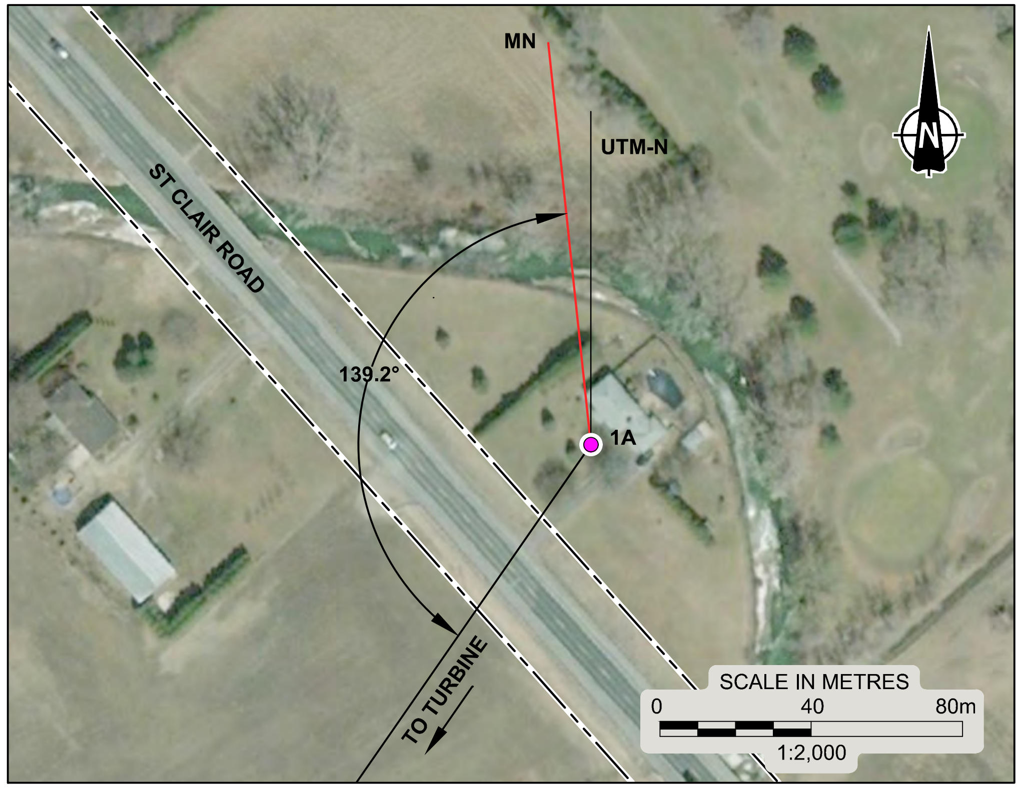


INSET A (WELL A)



INSET B (WELL 1A)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

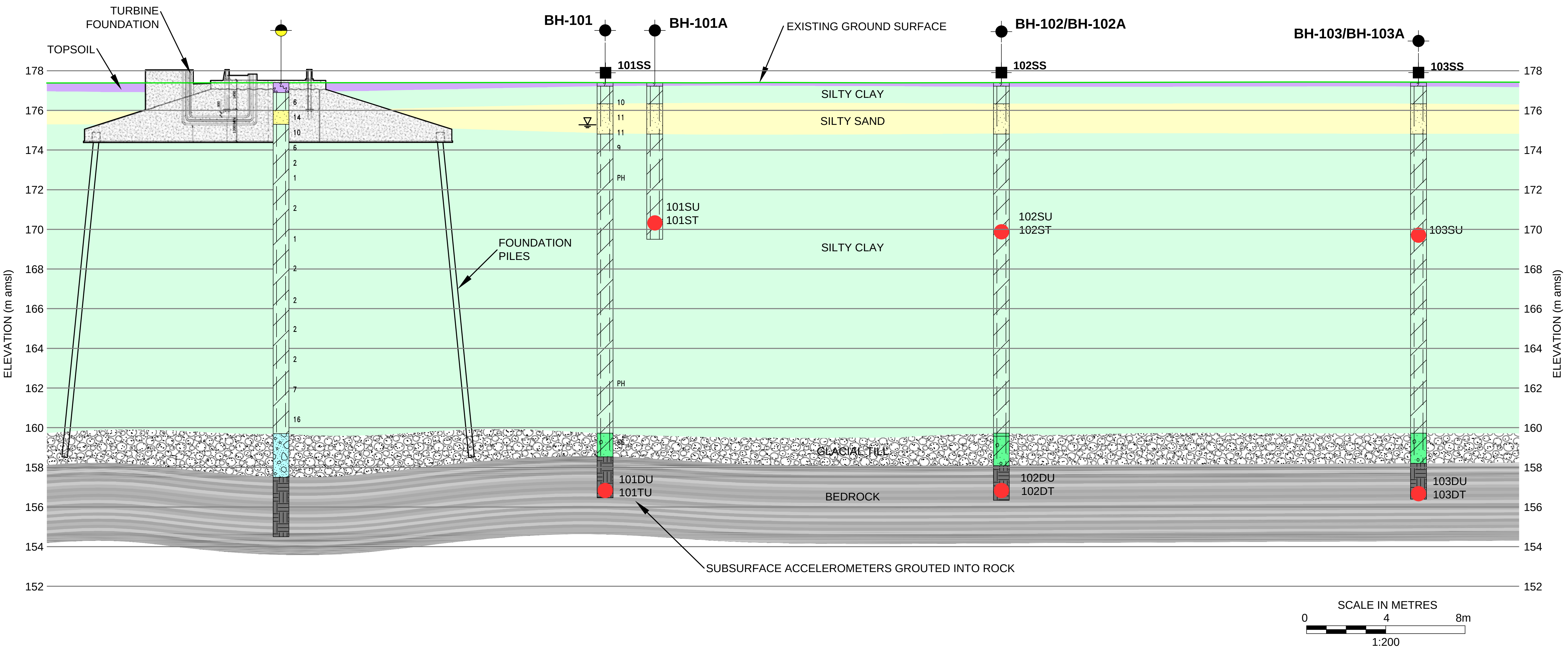
TITLE

TURBINE PILES AND WATER WELLLOCATION PLAN, T42

Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T42	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17	**FIGURE T42**	
CHECK	SJB			

Drawing file: 1668031–2000–R02T42.dwg Dec 07, 2017 – 11:38am



LEGEND

● BOREHOLE

■ SURFACE VIBRATION SENSOR

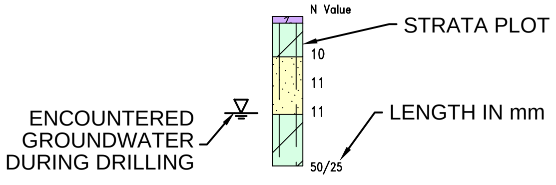
● SUBSURFCE VIBRATION SENSOR

● BOREHOLE (AMEC)

SIMPLIFIED STRATIGRAPHY

▨ TOPSOIL	▨ SILTY CLAY
▨ SAND	▨ SILTY CLAY TILL
▨ SILTY SAND	▨ SILTY SAND & GRAVEL
▨ SAND & GRAVEL	▨ BEDROCK

INSTALLATION DETAILS



FOR DETAILS REFER TO RECORD OF BOREHOLES

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO;
"FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002; AND
AutoCAD FILE "T42.dwg", RES-GROUP, RECEIVED MARCH 14 - 2017.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

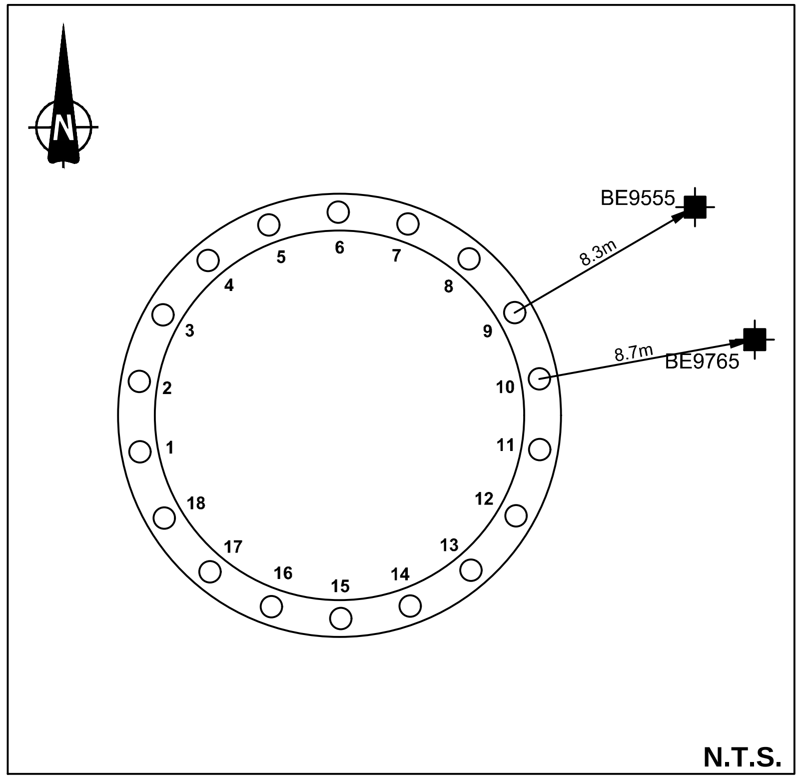
TURBINE PILE AND SUBSURFACE
MONITORING SYSTEMS, T42

Golder Associates

PROJECT No.		1668031	FILE No. 1668031–2000–R02T42A
			SCALE AS SHOWN REV.
CADD	DCH	Dec 7/17	FIGURE T42A
CHECK	SJB		

Drawing file: 1668031–2000–R02T42A.dwg Dec 07, 2017 – 1:51pm

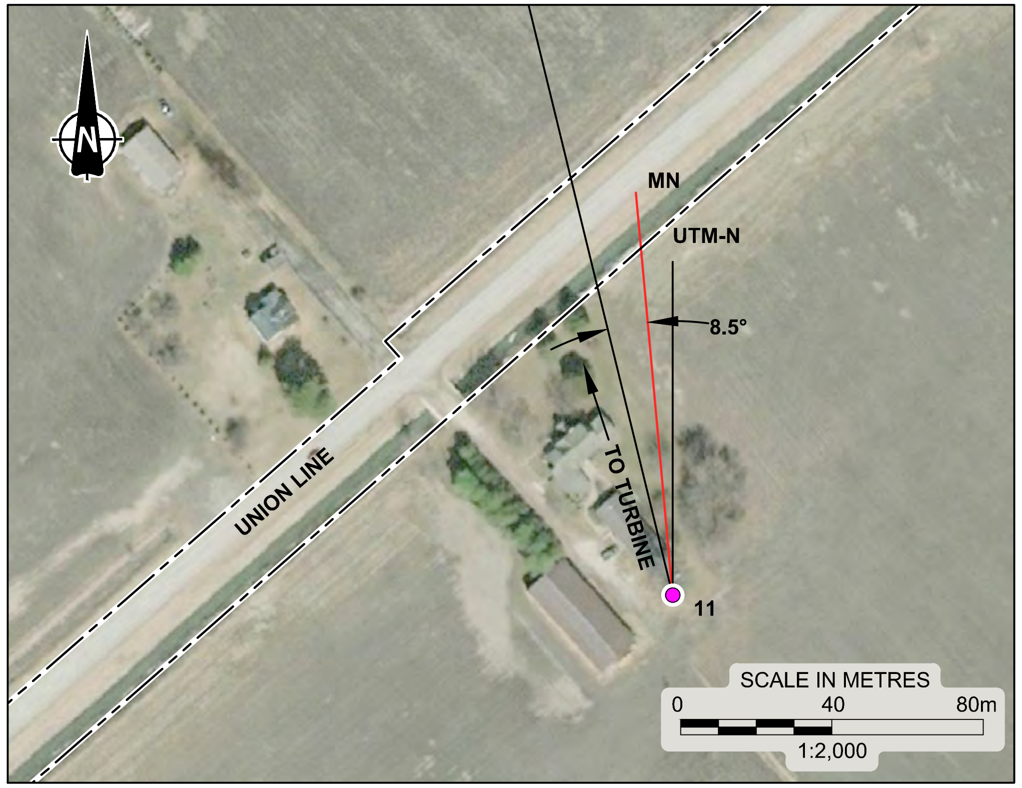
SITE PLAN



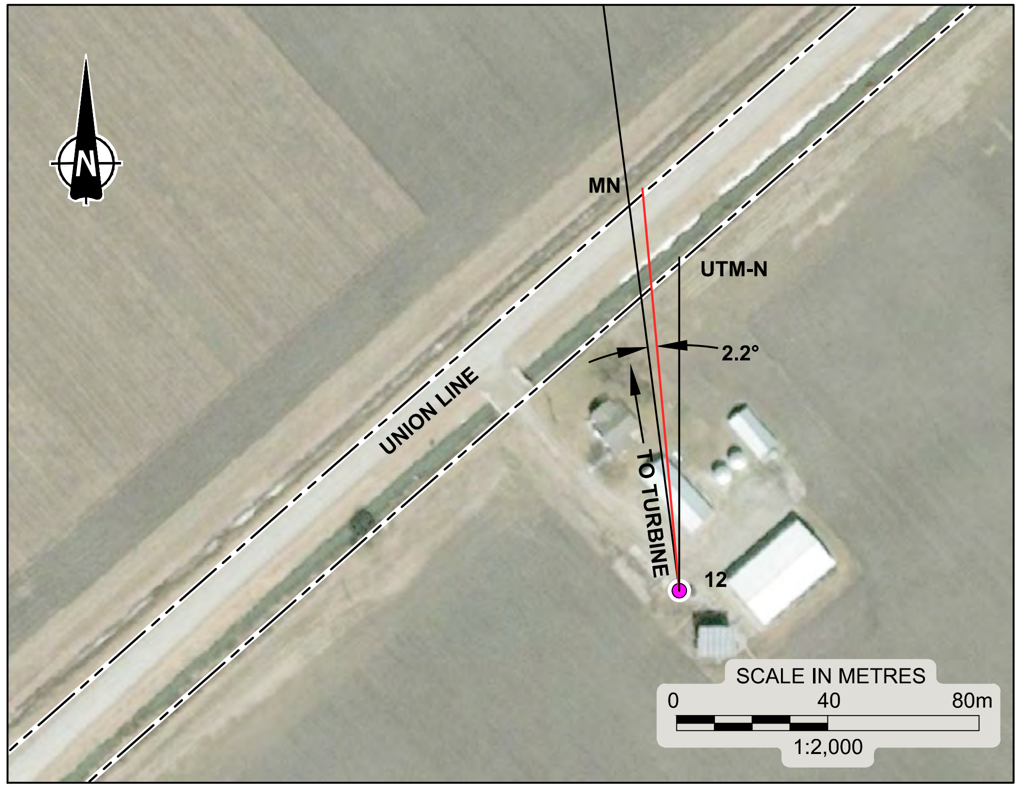
TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH



INSET A (WELL #11)



INSET B (WELL #12)

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

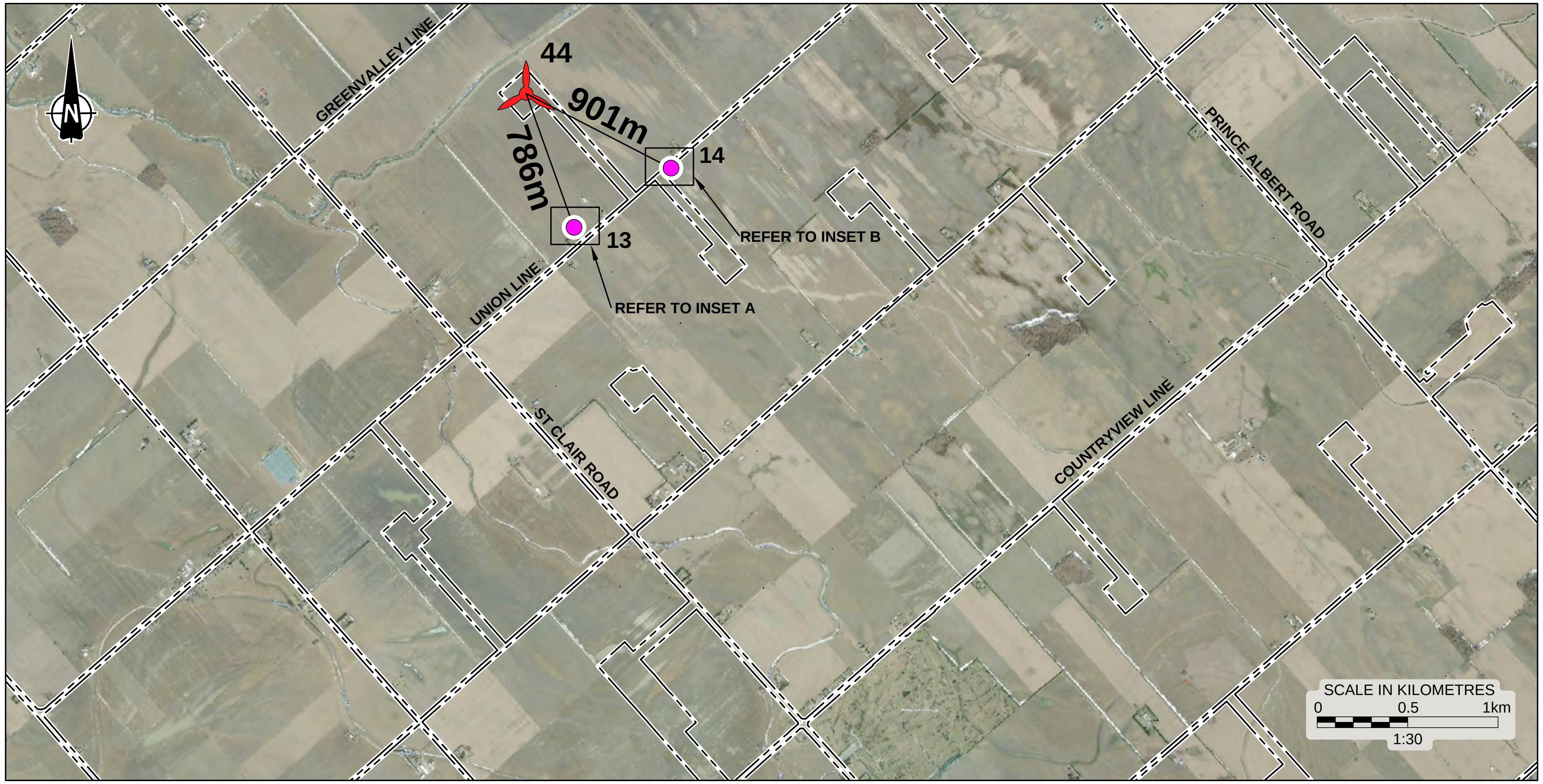
**TURBINE PILES AND WATER WELL
LOCATION PLAN, T43**

Golder Associates

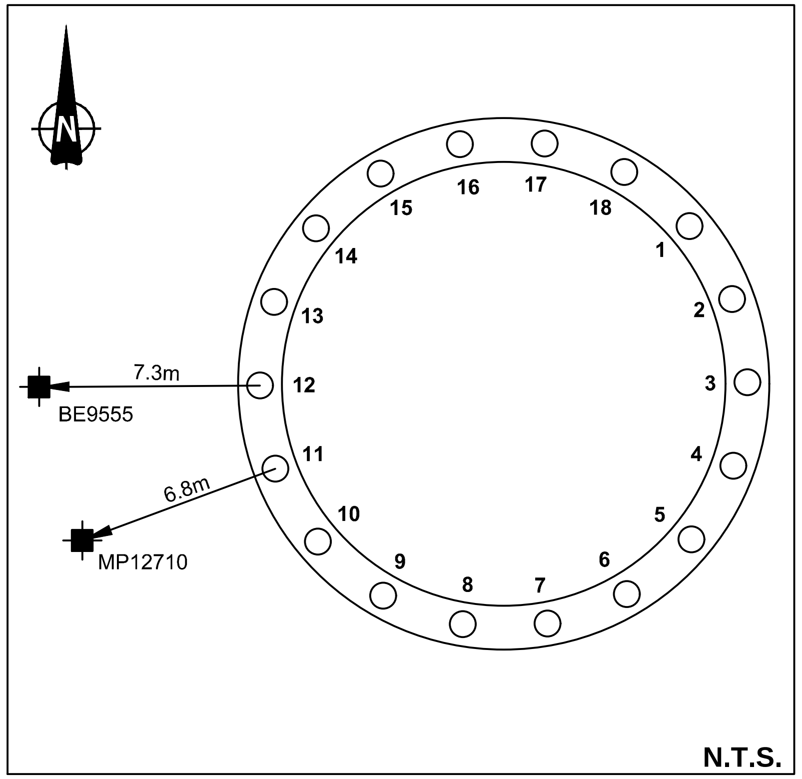
PROJECT No. 1668031
FILE No.1668031–2000–R02T43
SCALE AS SHOWN
REV.
CADD DH/ZB/LK Dec 7/17
CHECK SSB

FIGURE T43

Drawing file: 1668031–2000–R02T43.dwg Dec 07, 2017 – 11:57am



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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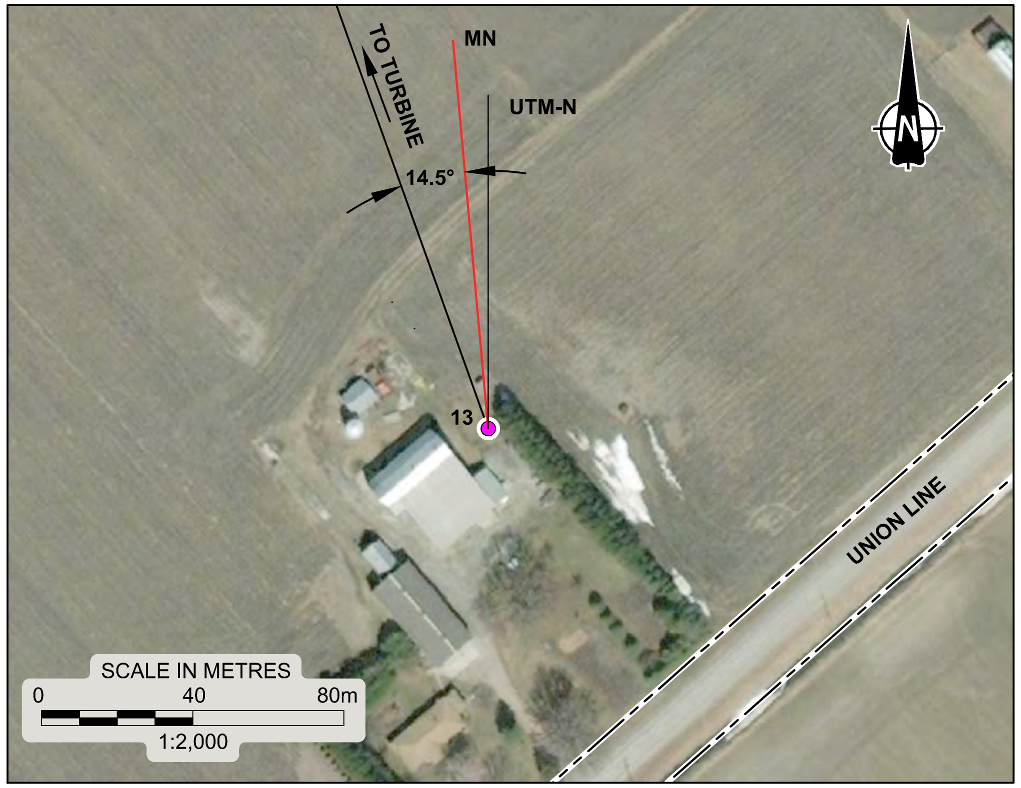
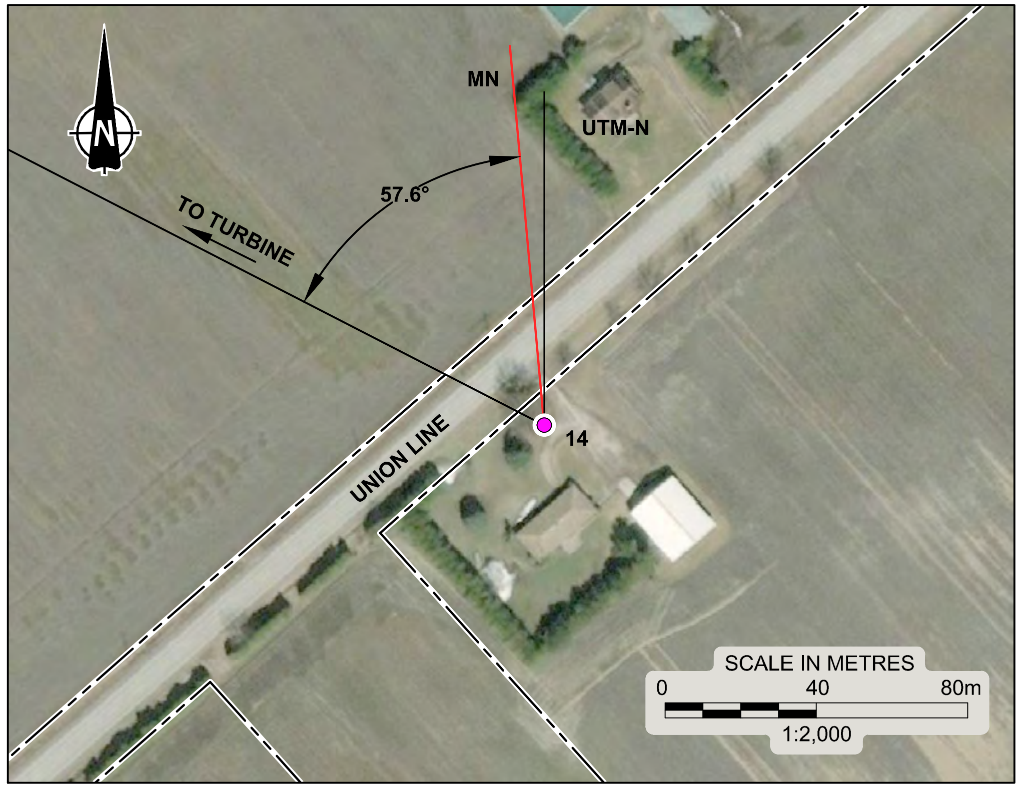


INSET A (WELL #13)



INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

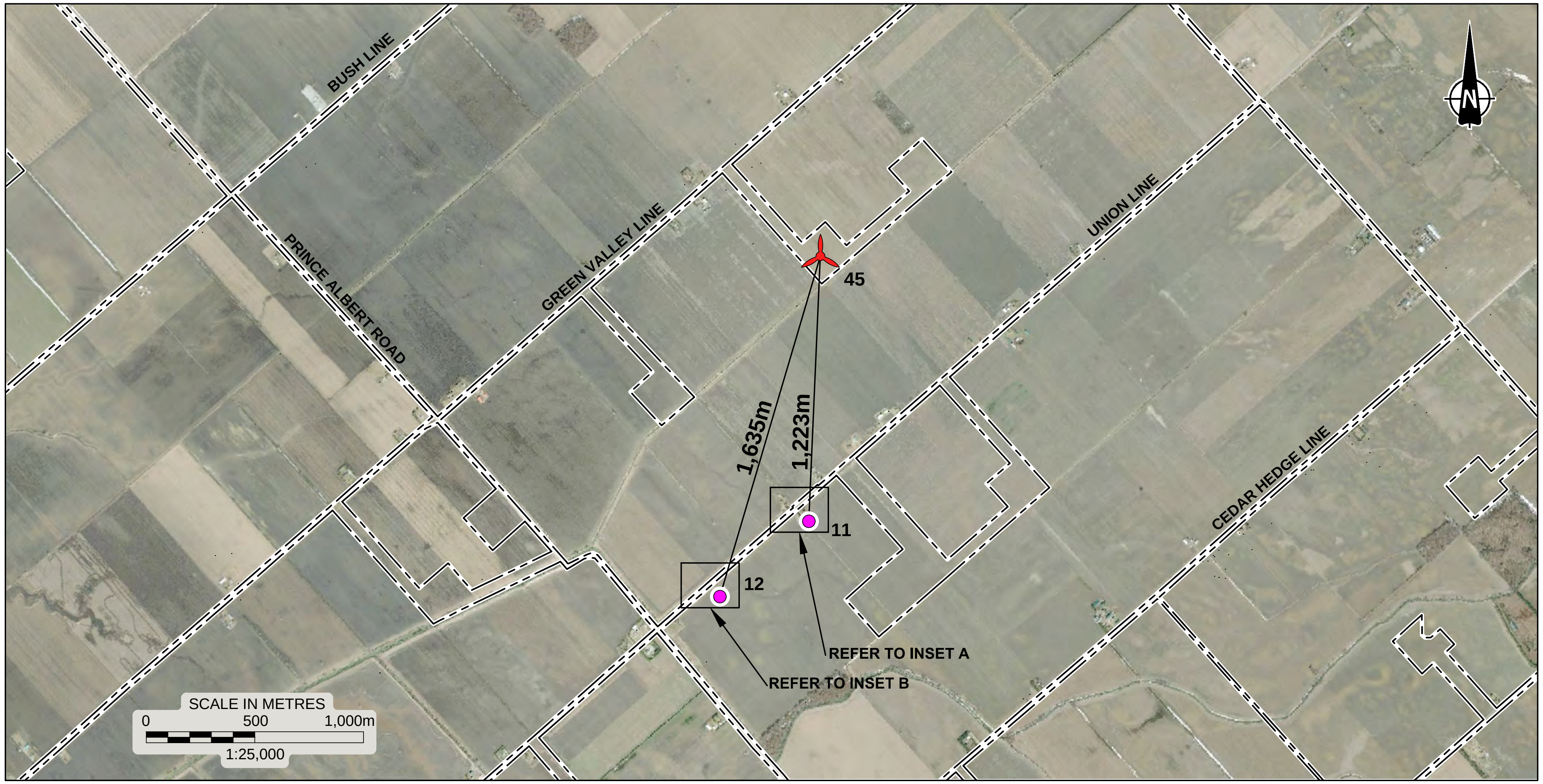
TURBINE PILES AND WATER WELL LOCATION PLAN, T44

Golder Associates

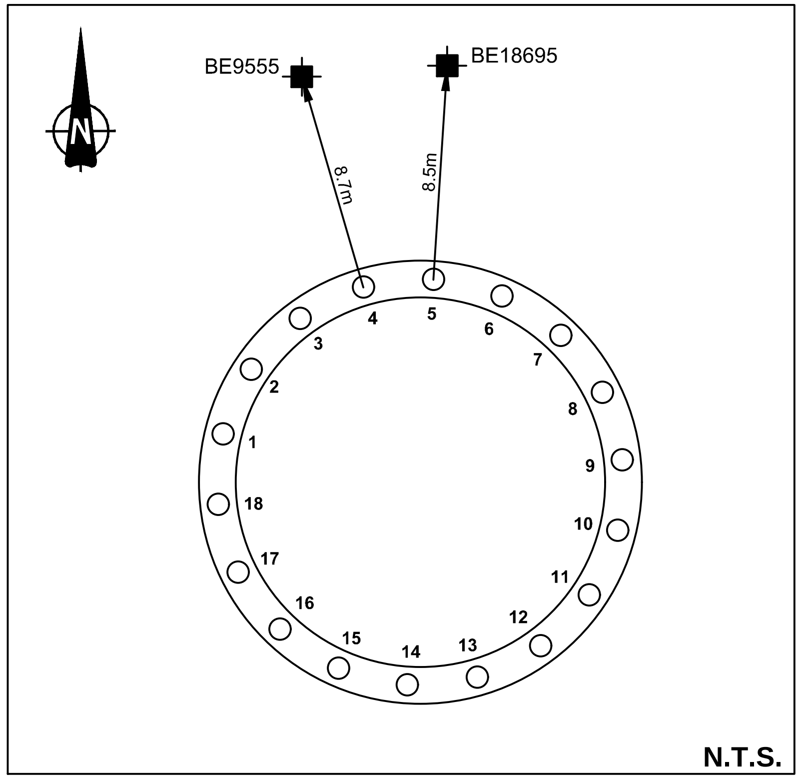
PROJECT No. 1668031
FILE No.1668031–2000–R02T44
SCALE AS SHOWN
REV.
CADD DCH/LMK Dec 7/17
CHECK SJB

FIGURE T44

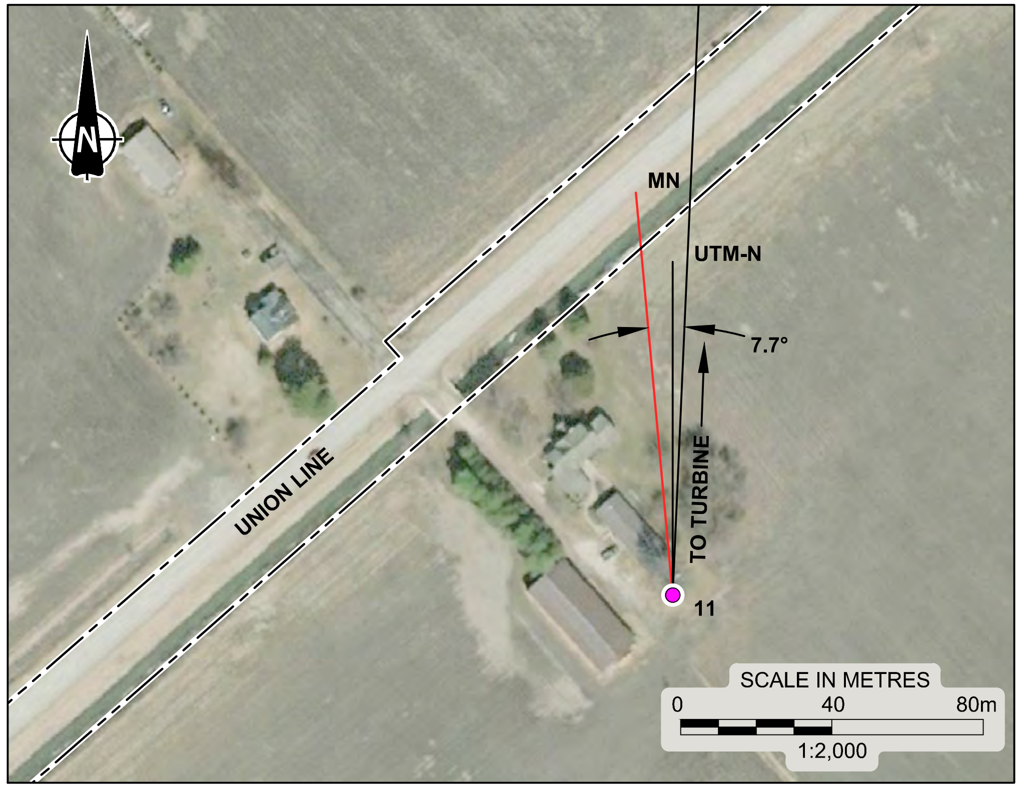
Drawing file: 1668031–2000–R02T44.dwg Dec 07, 2017 – 1:24pm



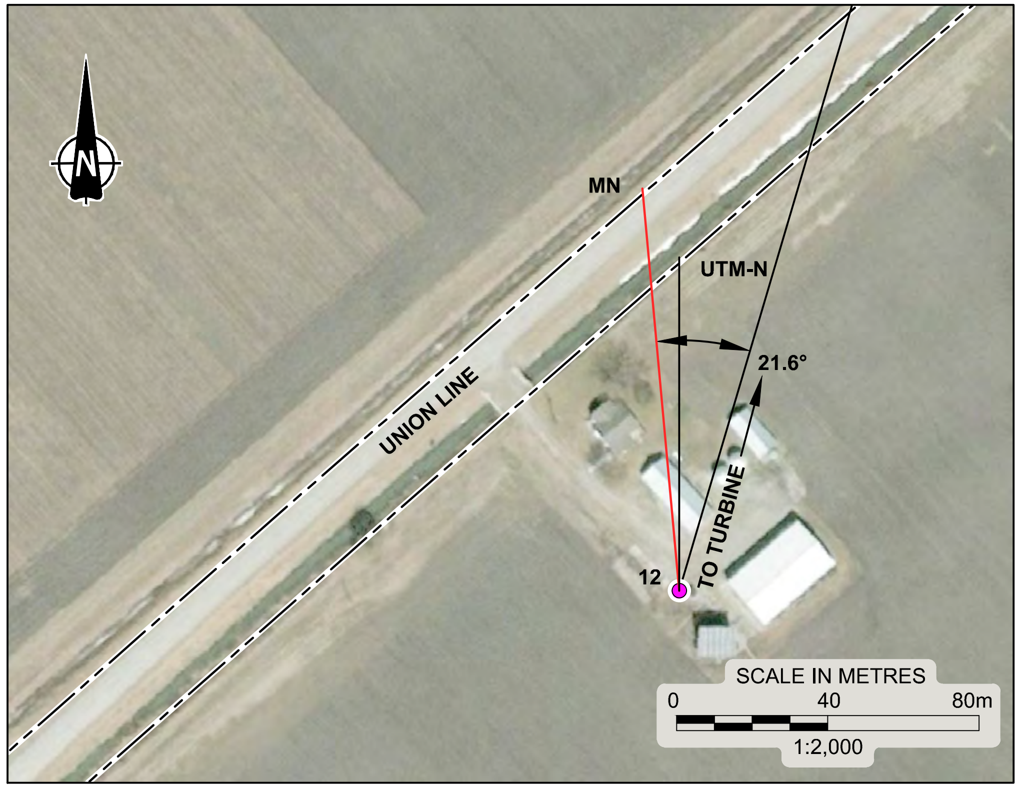
SITE PLAN



TURBINE PILE LAYOUT



INSET A (WELL #11)



INSET B (WELL #12)

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✤	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

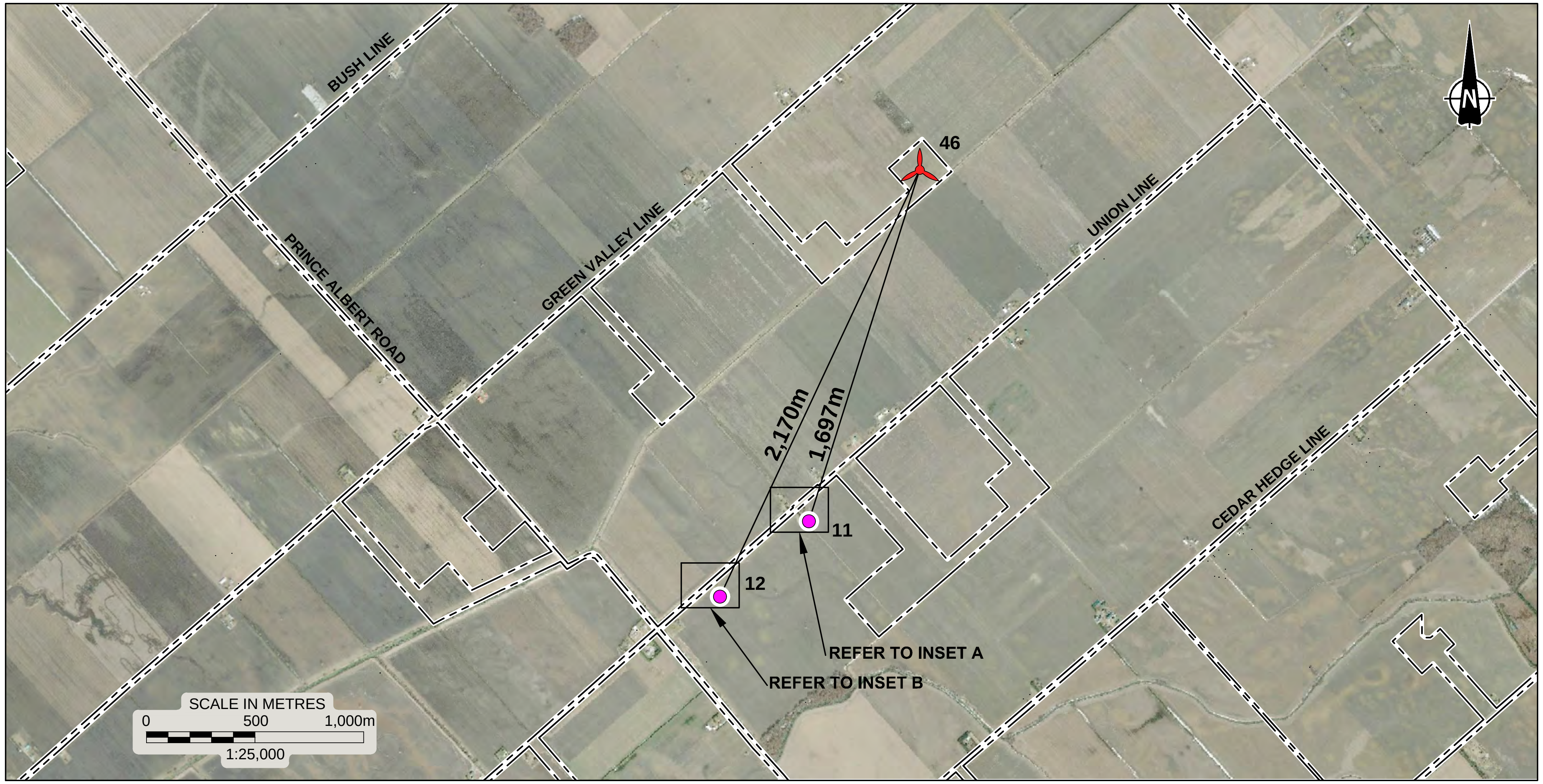
TURBINE PILES AND WATER WELL
LOCATION PLAN, T45

Golder Associates

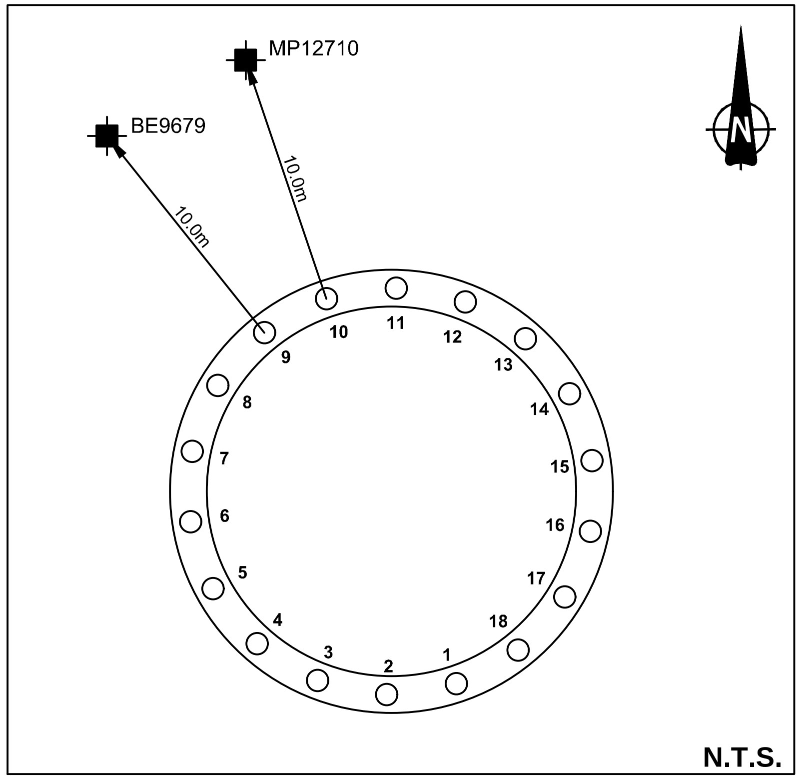
PROJECT No. 1668031
FILE No.1668031–2000–R02T45
SCALE AS SHOWN
REV.
CADD DH/ZB/LK Dec 7/17
CHECK SJB

FIGURE T45

Drawing file: 1668031–2000–R02T45.dwg Dec 07, 2017 – 1:25pm



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON 2010 AERIAL IMAGERY PROVIDED BY THE MUNICIPALITY OF CHATHAM-KENT, INCLUDES MATERIAL c 2015 OF THE QUEEN'S PRINTER FOR ONTARIO; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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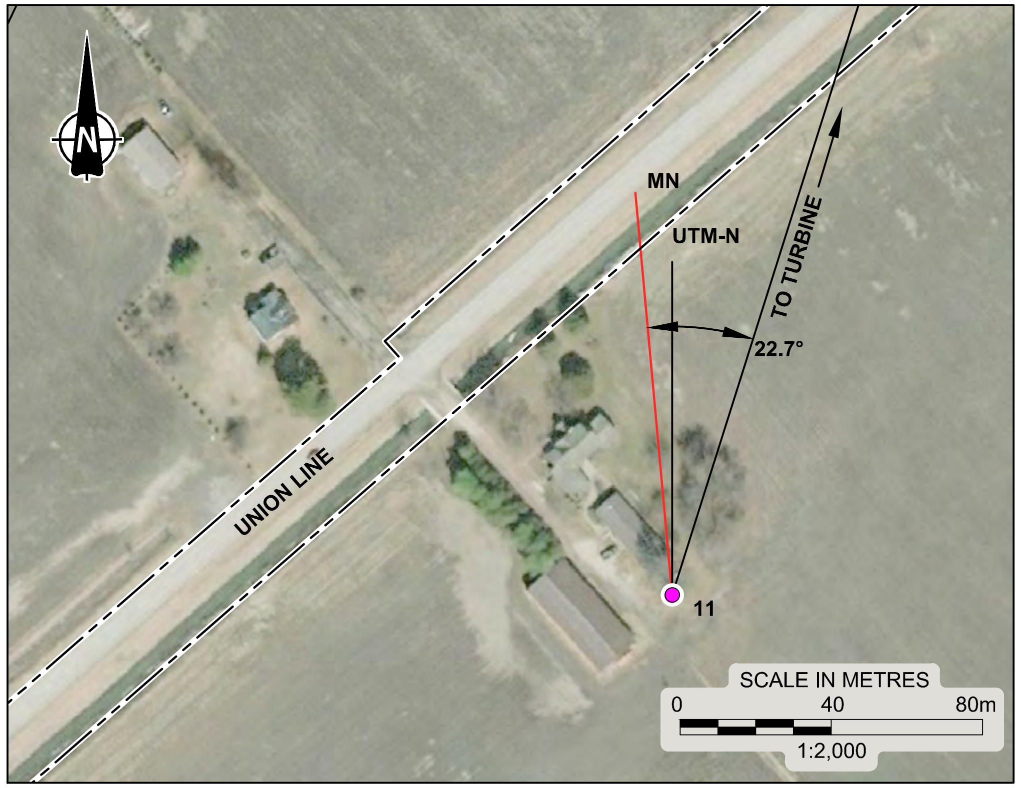
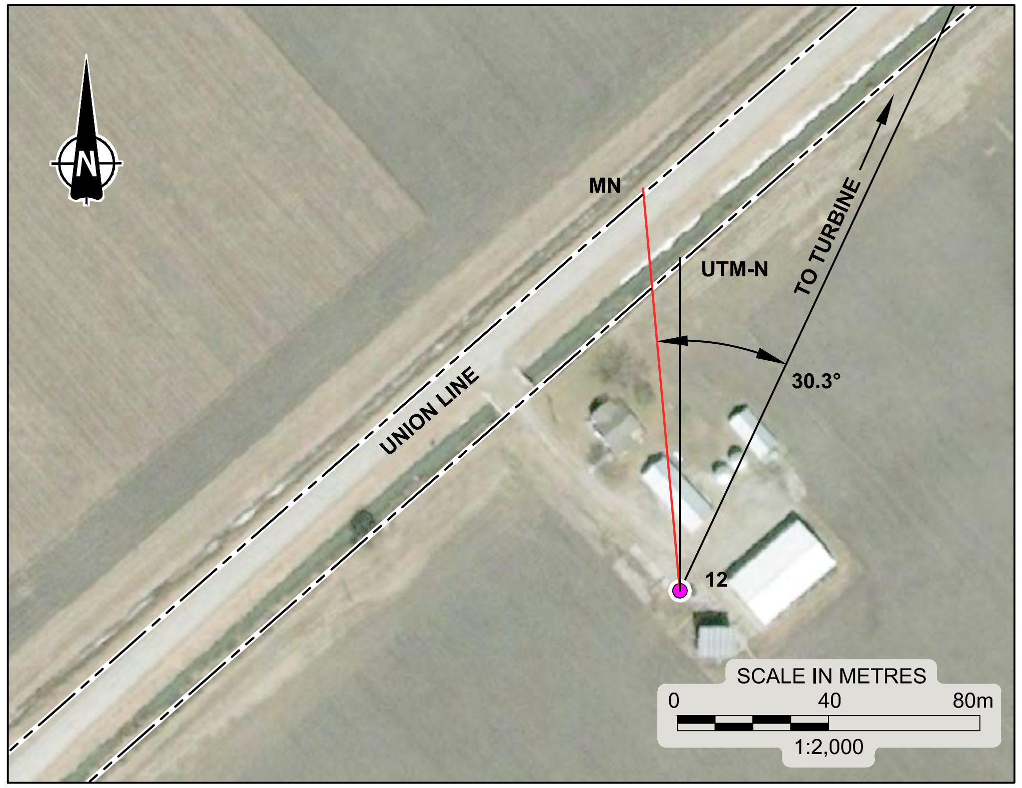


INSET A (WELL #11)



INSET B (WELL #12)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE PILES AND WATER WELL LOCATION PLAN, T46

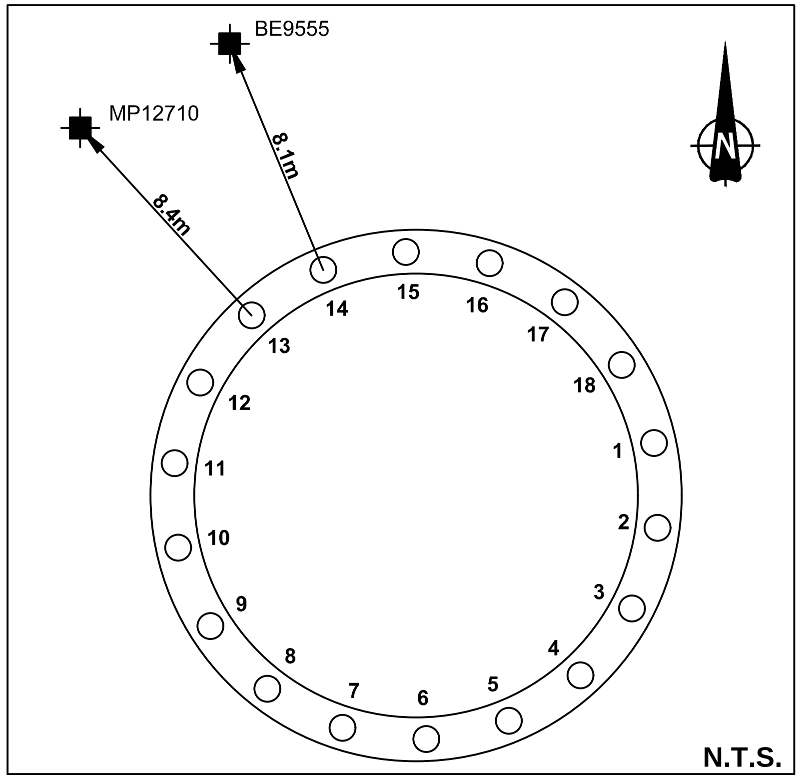
Golder Associates

PROJECT No.	1668031	FILE No. 1668031-2000-R02T46	
		SCALE AS SHOWN	REV.
CADD	DH/ZB/LK	Dec 7/17	
CHECK			

FIGURE T46

Drawing file: 1668031-2000-R02T46.dwg   Dec 07, 2017 - 1:26pm

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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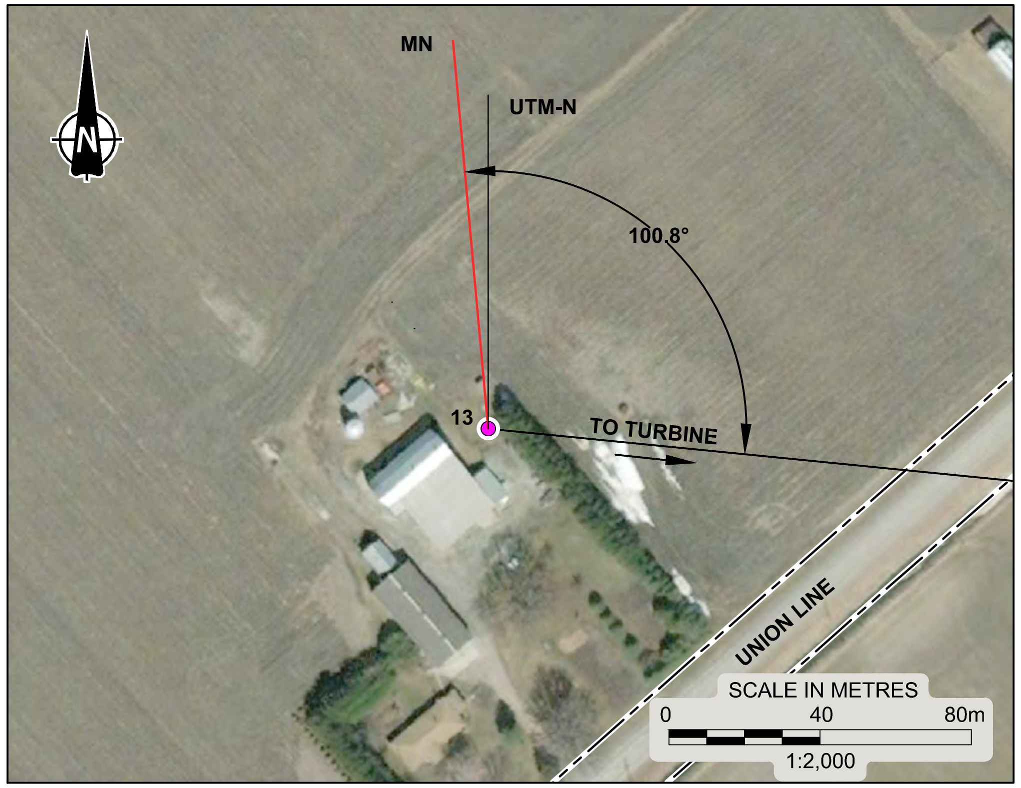
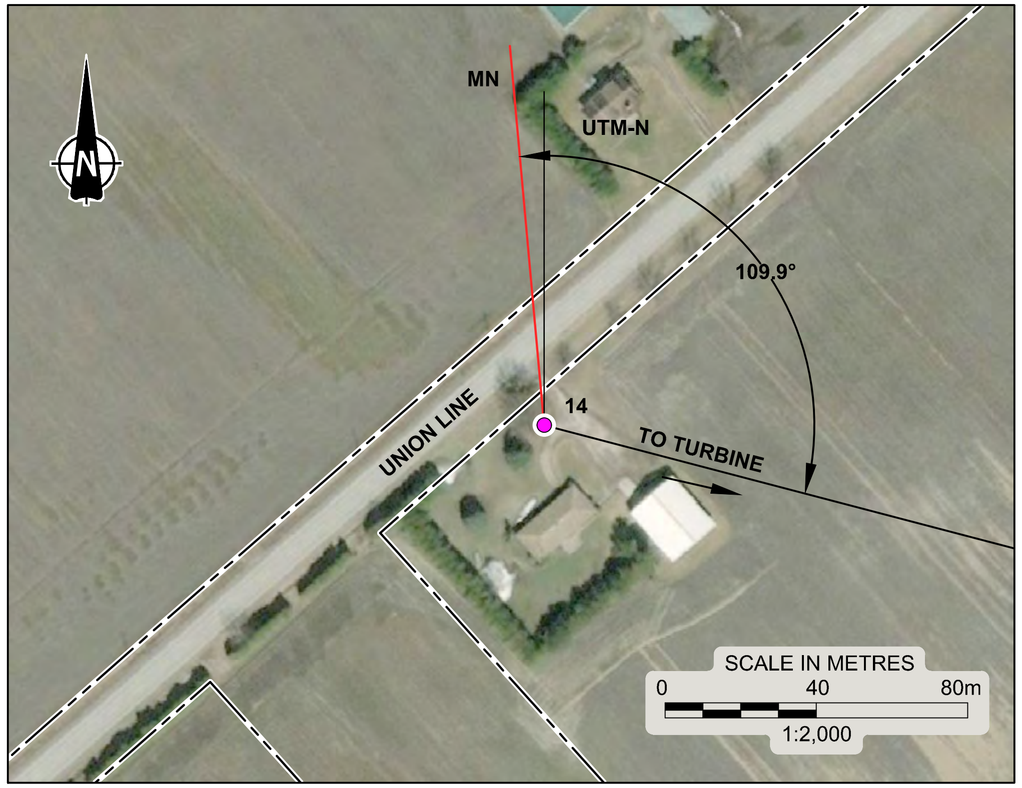


INSET A (WELL #13)



INSET B (WELL #14)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE PILES AND WATER WELL LOCATION PLAN, T49

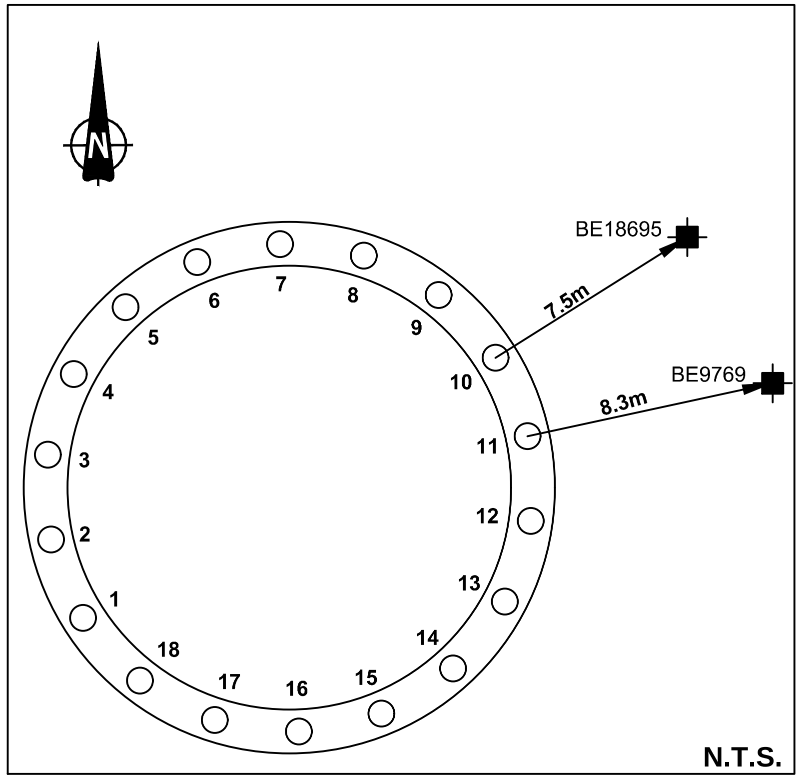
PROJECT No.	1668031	FILE No.	1668031–2000–R02T49
		SCALE	AS SHOWN
CADD	DCH	Dec 7/17	REV.
CHECK	SJB		

Golder Associates

FIGURE T49

Drawing file: 1668031–2000–R02T49.dwg Dec 07, 2017 – 1:27pm

SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
⅄	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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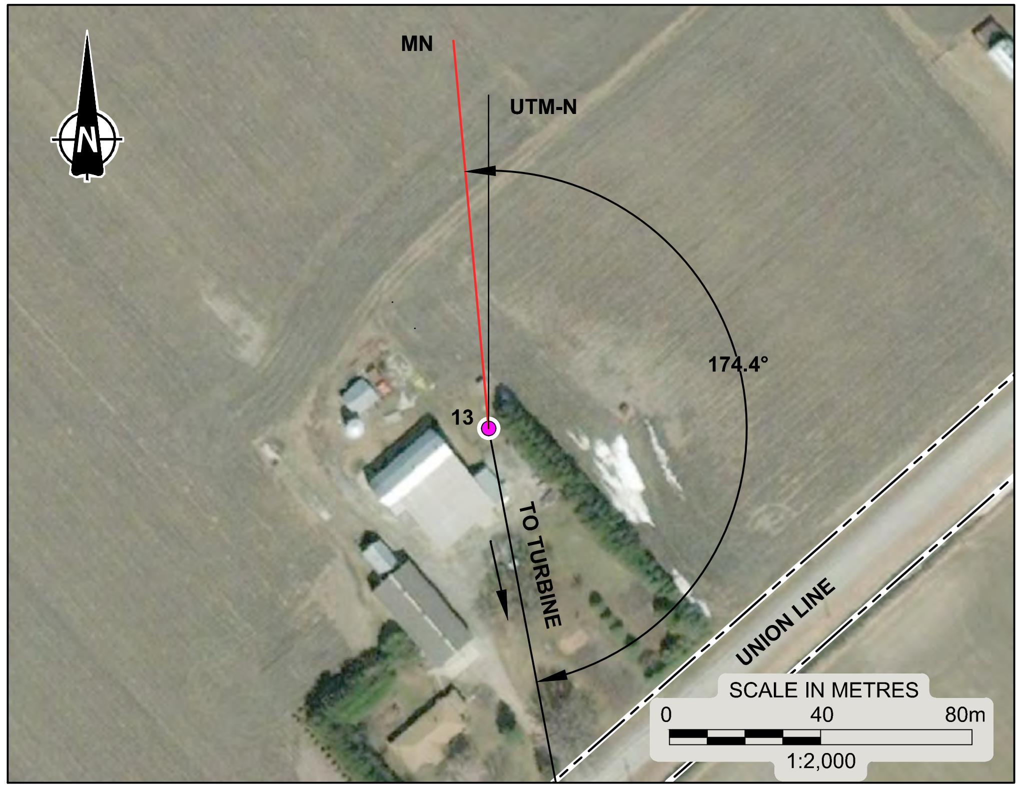
ALL LOCATIONS ARE APPROXIMATE.



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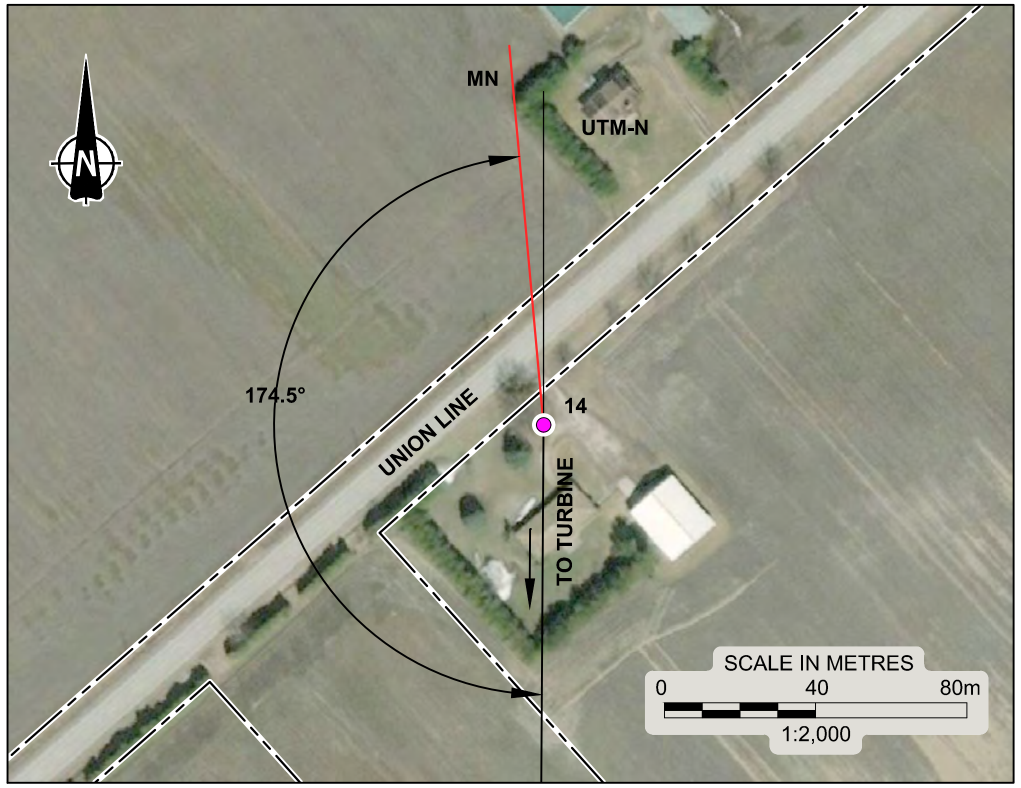


INSET B (WELL #14)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

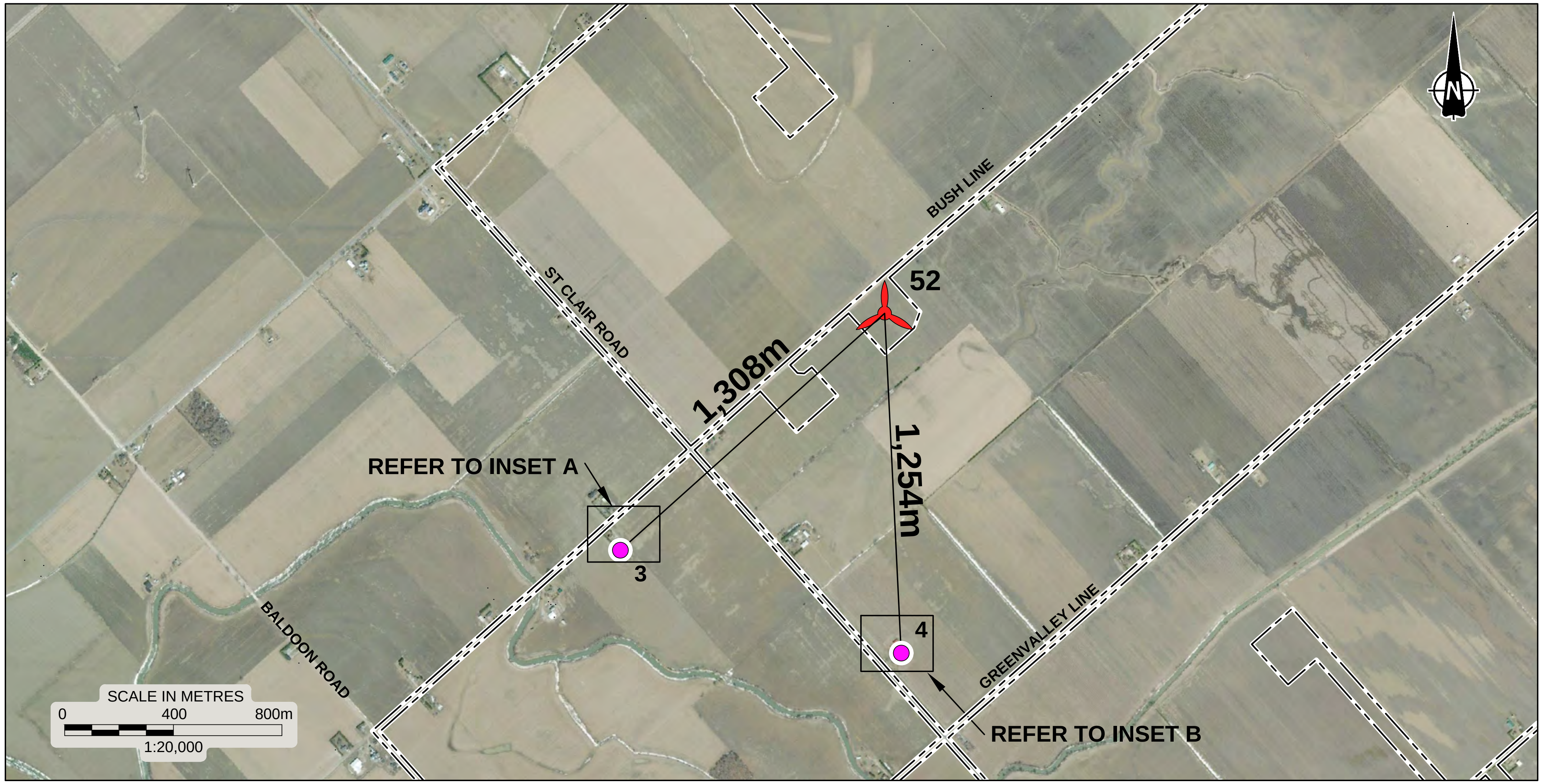
TURBINE PILES AND WATER WELL LOCATION PLAN, T51

Golder Associates

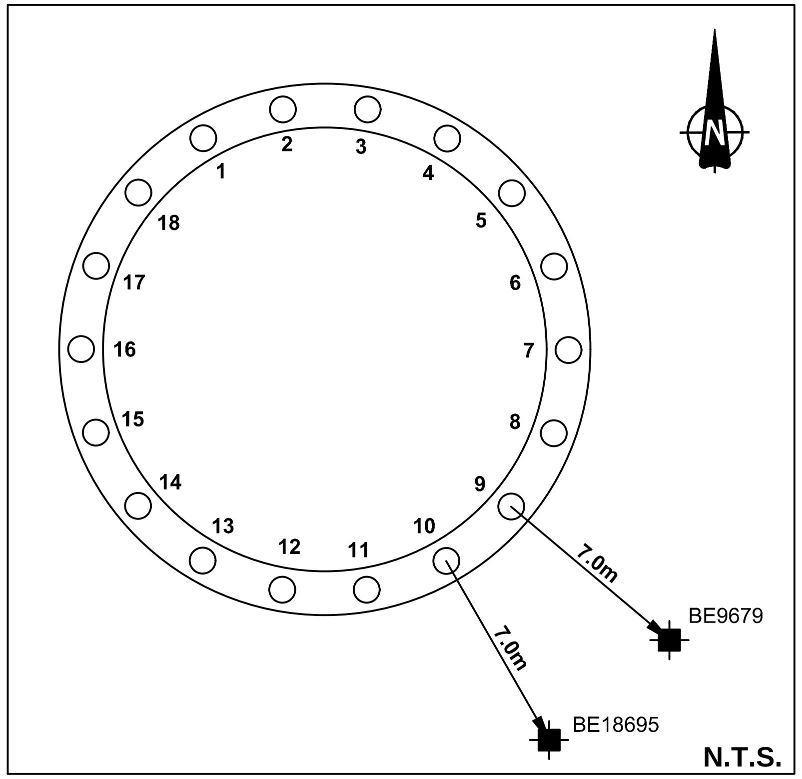
PROJECT No. 1668031			FILE No. 1668031-2000-R02T51
			SCALE AS SHOWN REV.
CADD	DCH	Dec 7/17	
CHECK	SJB		

FIGURE T51

Drawing file: 1668031-2000-R02T51.dwg Dec 07, 2017 - 1:30pm



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

✚	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✇	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

NOTES

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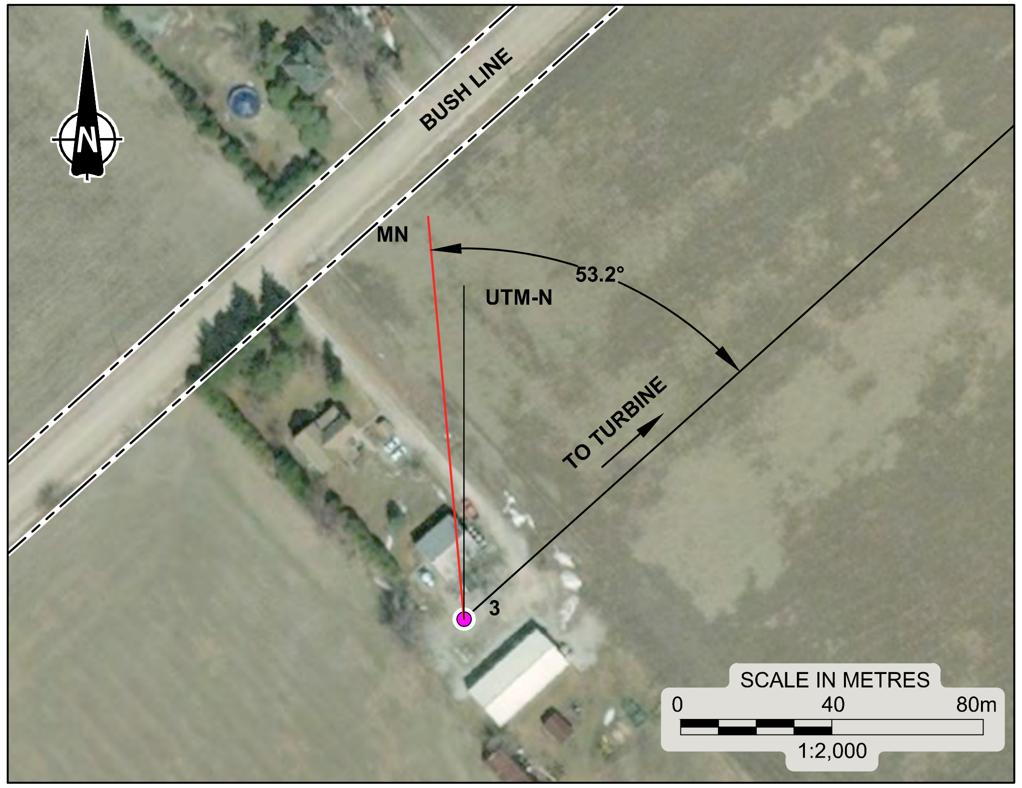
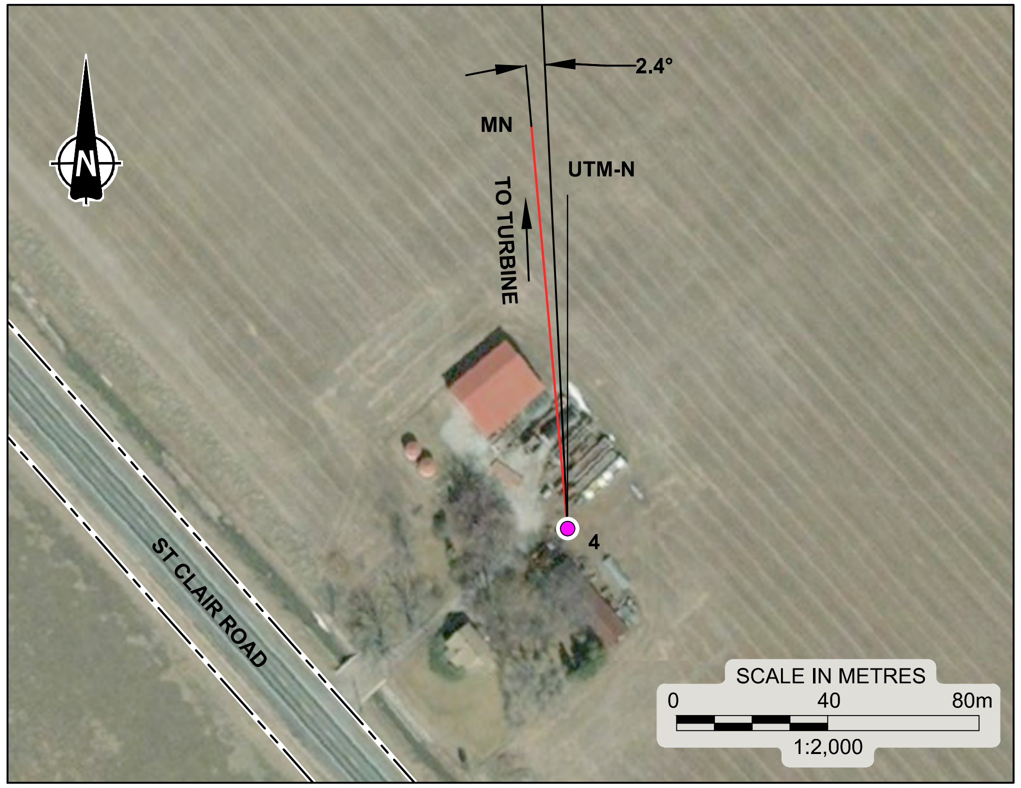
ALL LOCATIONS ARE APPROXIMATE.



INSET A (WELL #3)



INSET B (WELL #4)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

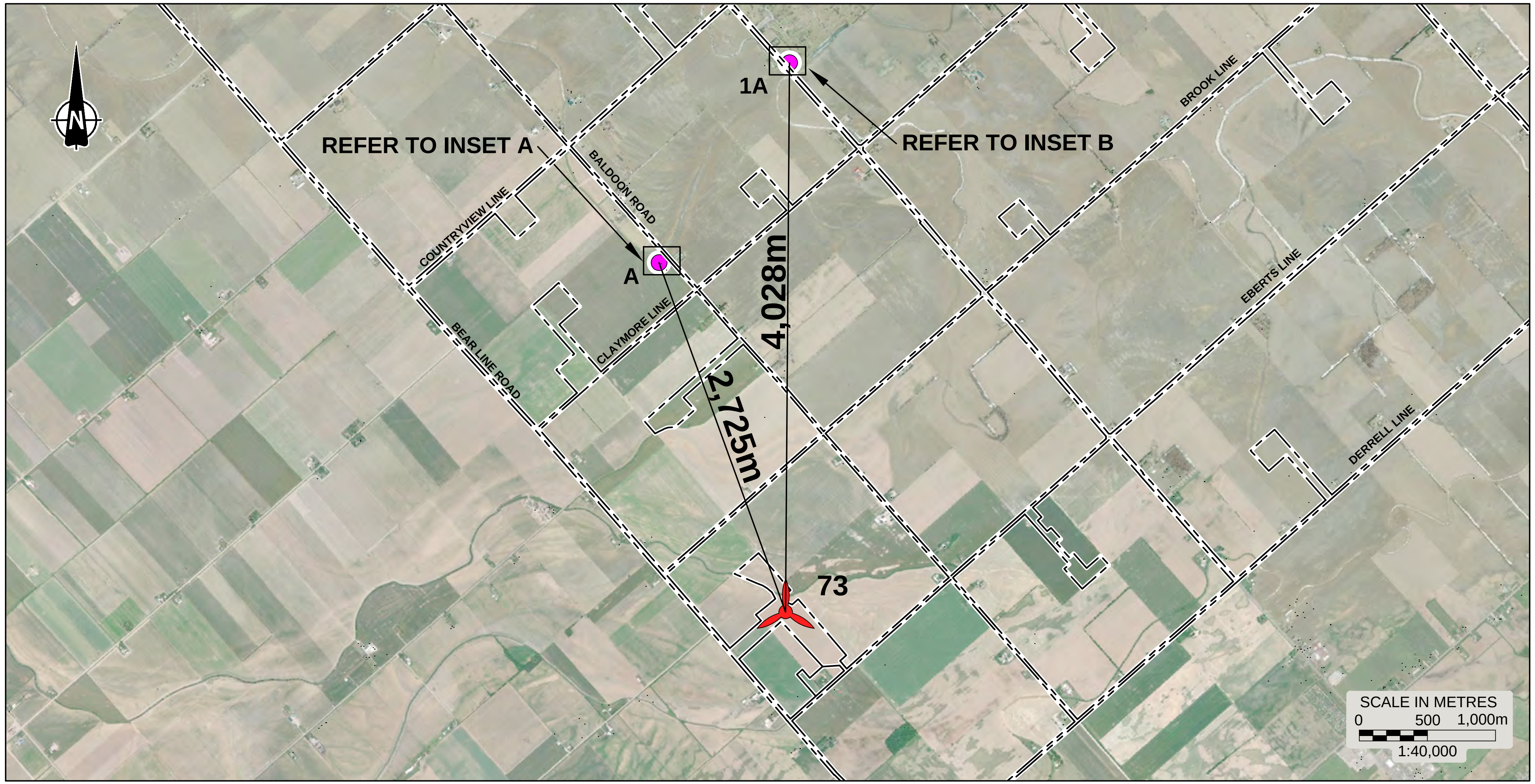
TURBINE PILES AND WATER WELLLOCATION PLAN, T52

Golder Associates

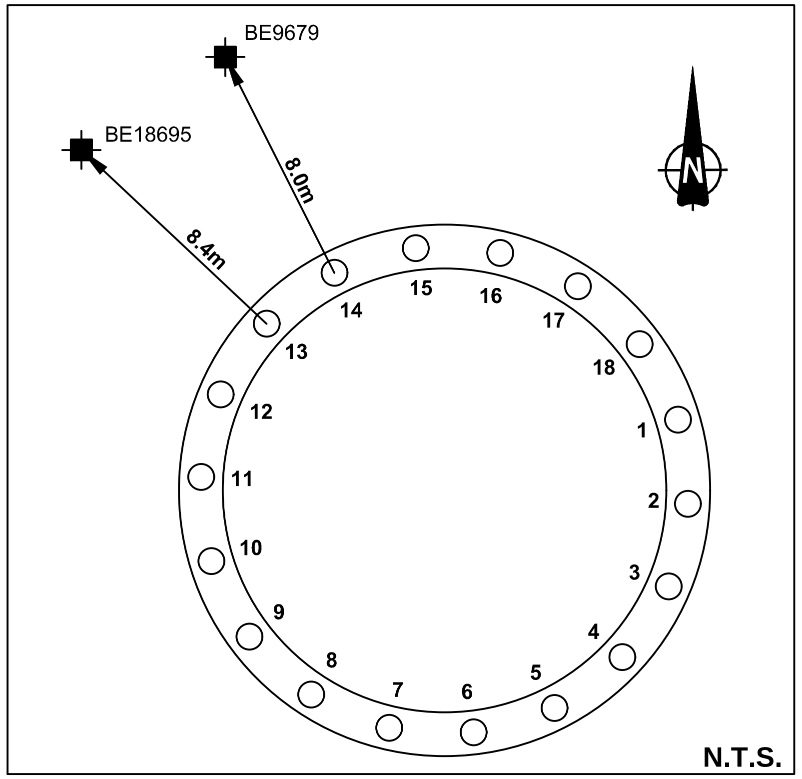
PROJECT No.		1668031	FILE No.1668031–2000–R02T52	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17		
CHECK	SSB			

FIGURE T52

Drawing file: 1668031–2000–R02T52.dwg Dec 07, 2017 – 1:32pm



SITE PLAN



TURBINE PILE LAYOUT

LEGEND

■	INSTANTEL MINIMATE GEOPHONE
●	WATER WELL
✱	TURBINE
MN	MAGNETIC NORTH
UTM-N	UNIVERSAL TRANSVERSE MERCATOR GRID NORTH

REFERENCE

DRAWING BASED ON BING IMAGERY (IMAGE DATE UNKNOWN) AS OF OCTOBER 16 - 2017; AND "FOUNDATION PLAN", ENTUITIVE, PROJECT No. C017-0190, DWG No. S002.

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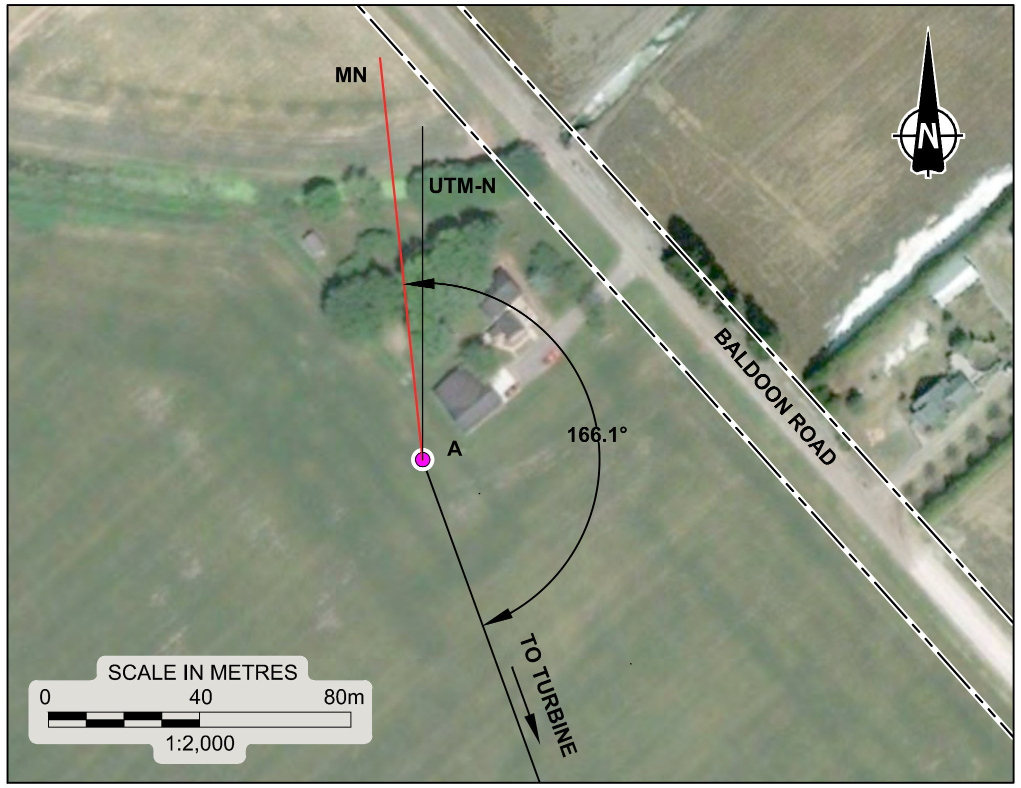
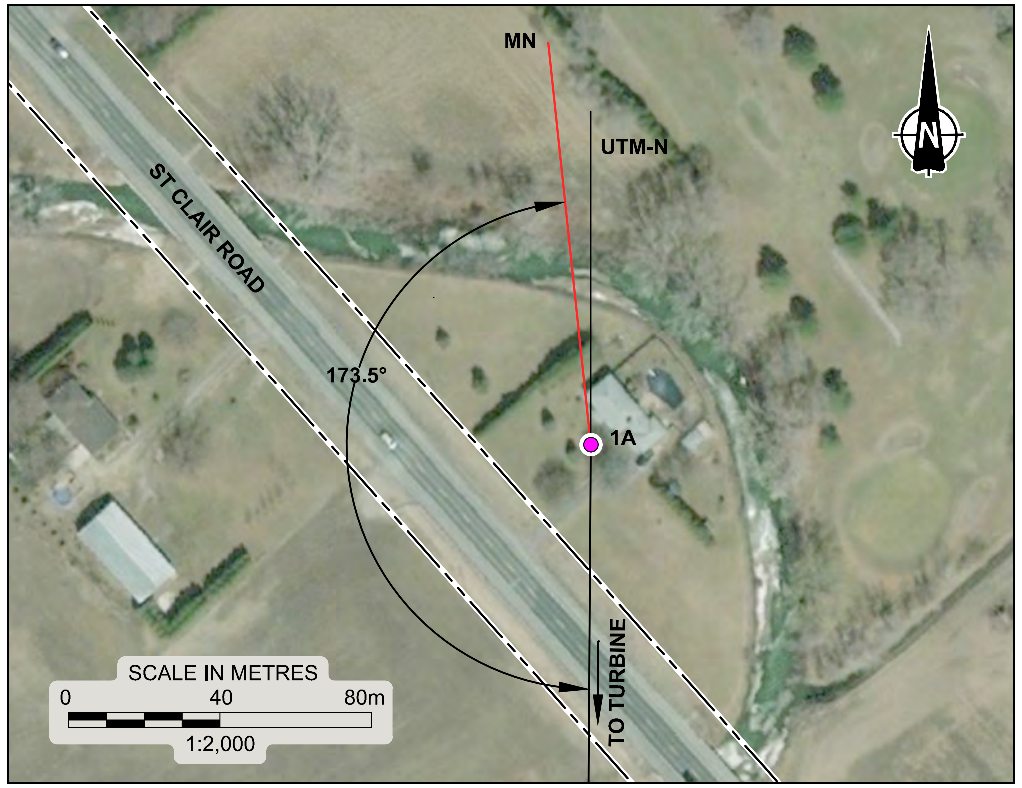


INSET A (WELL A)



INSET B (WELL 1A)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE PILES AND WATER WELL
LOCATION PLAN, T73

Golder Associates

PROJECT No.		1668031	FILE No.1668031–2000–R02T73	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 7/17	**FIGURE T73**	
CHECK	SSB			

Drawing file: 1668031–2000–R02T73.dwg Dec 07, 2017 – 1:33pm

APPENDIX A

Pile Driving Hammer Specifications

BERMINGHAMMER
FOUNDATION EQUIPMENT

Model B-21

Clean Series 2004

Features

- ☐ Remote Throttle – infinitely controlable energy
- ☐ Clean Combustion- Low Emissions
- ☐ Fuel injection
- ☐ Easy Start in soft driving
- ☐ Available with hydraulic trip
- ☐ Free-standing operation
- ☐ Specialty driving adapters
- ☐ Optional Kinetic Energy Monitor
- ☐ Optional Energy Control System (patented)
- ☐ Environmentally friendly (no-drip operation, bio-fuels and oils)

Operational Specifications

Ram mass:	4,630 lbs (2 100 kg)
Rated Energy:	53,200 ft▪lbs (72 kJ)
Stroke at Rated Energy:	11.5 ft (3.5 m) 35 blows per minute
Maximum Physical Stroke:	13.1 ft (4.0 m)
Range of Operation:	4.5-11.5 ft (1.4-3.5 m) 56-35 blows per minute
Kinetic Energy at Rated Stroke:	32,010 ft-lbs (43.4 kJ)
Hammer Weight – bare hammer:	9,300 lbs (4 220 kg)
Weight with Typical USA-Style Box Lead Guides:	9,800 lbs (4 450 kg) 26 in (660 mm) guides
Typical Direct-Drive Housing:	1,850 lbs (840 kg) 21 in (530 mm) opening
Total Typical Operating Weight:	11,650 lbs (5 280 kg) (with guides, trip, and drive housing)
Fuel Tank Capacity:	12.0 US Gal. (45 L)
Oil Tank Capacity:	4.0 US Gal. (15 L)
Overall Length:	17.5 ft (5.3 m)
Length including Direct-Drive Housing:	19.8 ft (6.0 m)
Minimum Box Lead size:	21 in (533 mm)

English Units

B-21	4,630 lb Piston		
BPM	Stroke (ft)	Potential Energy (ft▪lb)	Velocity (ft/s)
35	11.8	54,630	22.5
36	11.2	51,860	22.0
37	10.6	49,080	21.5
38	10.0	46,300	21.0
39	9.5	43,990	20.5
40	9.1	42,130	20.0
41	8.6	39,820	19.5
42	8.2	37,970	19.0
43	7.8	36,110	18.5
44	7.5	34,730	18.0
45	7.2	33,340	17.5
46	6.9	31,950	17.0
47	6.6	30,560	16.5
48	6.3	29,170	16.0
49	6.0	27,780	15.5
50	5.8	26,850	15.0
51	5.6	25,930	14.6
52	5.4	25,000	14.2
53	5.2	24,080	13.8
54	5.0	23,150	13.4
55	4.8	22,220	13.0
56	4.6	21,300	12.6

SI Units

B-21	2 100 kg Piston		
BPM	Stroke (m)	Potential Energy (kJ)	Velocity (m/s)
35	3.60	74.2	6.9
36	3.41	70.2	6.7
37	3.23	66.5	6.6
38	3.05	62.8	6.4
39	2.90	59.7	6.3
40	2.77	57.1	6.1
41	2.62	54.0	5.9
42	2.50	51.5	5.8
43	2.38	49.0	5.6
44	2.29	47.2	5.5
45	2.20	45.3	5.3
46	2.10	43.3	5.2
47	2.01	41.4	5.0
48	1.92	39.6	4.9
49	1.83	37.7	4.7
50	1.77	36.5	4.6
51	1.71	35.2	4.5
52	1.65	34.0	4.3
53	1.59	32.8	4.2
54	1.52	31.3	4.1
55	1.46	30.1	4.0
56	1.40	28.8	3.8

🟨	Stroke height is a function of soil resistance and may not be attainable in certain driving conditions.
⬜	Standard Operating Range.

Berminghammer
FOUNDATION EQUIPMENT

Model B-32

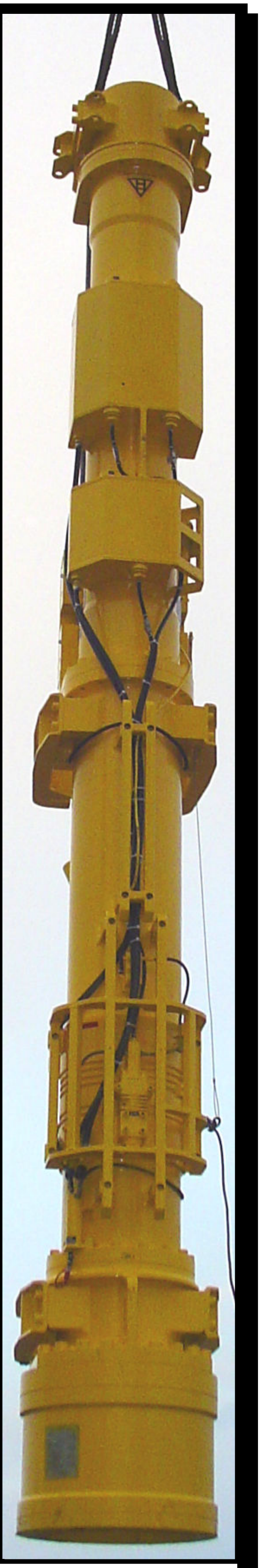
Clean Series 2005

Features

- ☐ Remote Throttle – infinitely controlable energy
- ☐ Clean Combustion- Low Emissions
- ☐ Fuel injection
- ☐ Easy Start in soft driving
- ☐ Available with hydraulic trip
- ☐ Free-standing operation
- ☐ Specialty driving adapters
- ☐ Optional Kinetic Energy Monitor
- ☐ Optional Energy Control System (patented)
- ☐ Environmentally friendly (no-drip operation, bio-fuels and oils)

Operational Specifications

Ram mass:	**7,050 lbs (3 200 kg)**
Rated Energy:	**81,080 ft▪lbs (110 kJ)**
Stroke at Rated Energy:	11.5 ft (3.5 m) 35 blows per minute
Maximum Physical Stroke:	13.0 ft (4.0 m)
Range of Operation:	4.5-11.5 ft (1.4-3.5 m) 56-35 blows per minute
Kinetic Energy at Rated Stroke:	50,040 ft-lbs (67.8 kJ)
Hammer Weight – bare hammer:	14,110 lbs (6 400 kg)
Weight with Typical USA-Style Box Lead Guides:	14,570 lbs (6 610 kg) 26 in (660 mm) guides
Typical Direct-Drive Housing:	1,850 lbs (840 kg) 21 in (530 mm) opening
Total Typical Operating Weight:	16,420 lbs (7 450 kg) (with guides, trip, and drive housing)
Fuel Tank Capacity:	19.0 US Gal. (72 L)
Oil Tank Capacity:	6.5 US Gal. (25 L)
Overall Length:	20.1 ft (6.1 m)
Length including Direct-Drive Housing:	21.7 ft (6.6 m)
Minimum Box Lead size:	26 in (660 mm)



BERMINGHAM
FOUNDATION SOLUTIONS
SINCE 1897

Wellington Street Marine Terminal, Hamilton, ON, Canada L8L 4Z9
Phone 1.905.528.0425 ▪ Fax 1.905.528.6187 ▪ Toll Free (Canada & USA 1.800.668.9432)
www.berminghammer.com

English Units

B-32		7,050 lb Piston	
BPM	Stroke (ft)	Potential Energy (ft▪lb)	Velocity (ft/s)
35	11.8	83,190	22.5
36	11.2	78,960	22.0
37	10.6	74,730	21.5
38	10.0	70,500	21.0
39	9.5	66,980	20.5
40	9.1	64,160	20.0
41	8.6	60,630	19.5
42	8.2	57,810	19.0
43	7.8	54,990	18.5
44	7.5	52,880	18.0
45	7.2	50,760	17.5
46	6.9	48,650	17.0
47	6.6	46,530	16.5
48	6.3	44,420	16.0
49	6.0	42,300	15.5
50	5.8	40,890	15.0
51	5.6	39,480	14.6
52	5.4	38,070	14.2
53	5.2	36,660	13.8
54	5.0	35,250	13.4
55	4.8	33,840	13.0
56	4.6	32,430	12.6

SI Units

B-32		3 200 kg Piston	
BPM	Stroke (m)	Potential Energy (kJ)	Velocity (m/s)
35	3.60	113	6.9
36	3.41	107	6.7
37	3.23	101	6.6
38	3.05	95.7	6.4
39	2.90	91.0	6.3
40	2.77	87.0	6.1
41	2.62	82.2	5.9
42	2.50	78.5	5.8
43	2.38	74.7	5.6
44	2.29	71.9	5.5
45	2.20	69.1	5.3
46	2.10	65.9	5.2
47	2.01	63.1	5.0
48	1.92	60.3	4.9
49	1.83	57.4	4.7
50	1.77	55.6	4.6
51	1.71	53.7	4.5
52	1.65	51.8	4.3
53	1.59	49.9	4.2
54	1.52	47.7	4.1
55	1.46	45.8	4.0
56	1.40	43.9	3.8

🟨 Stroke height is a function of soil resistance and may not be attainable in certain driving conditions.
⬜ Standard Operating Range.

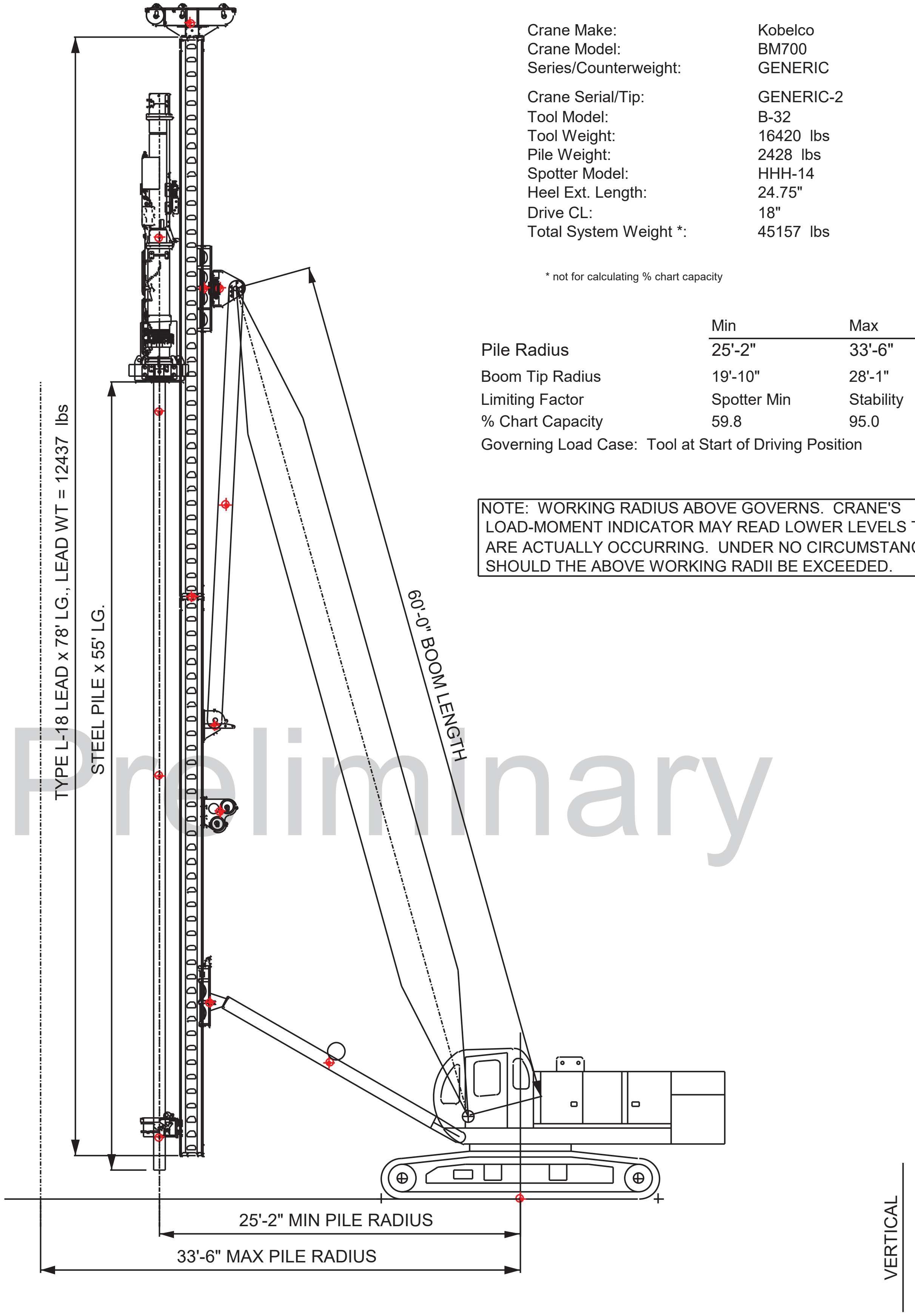
Crane Make:	Kobelco
Crane Model:	BM700
Series/Counterweight:	GENERIC
Crane Serial/Tip:	GENERIC-2
Tool Model:	B-32
Tool Weight:	16420 lbs
Pile Weight:	2428 lbs
Spotter Model:	HHH-14
Heel Ext. Length:	24.75"
Drive CL:	18"
Total System Weight *:	45157 lbs

* not for calculating % chart capacity

	Min	Max
Pile Radius	25'-2"	33'-6"
Boom Tip Radius	19'-10"	28'-1"
Limiting Factor	Spotter Min	Stability
% Chart Capacity	59.8	95.0

Governing Load Case: Tool at Start of Driving Position

NOTE: WORKING RADIUS ABOVE GOVERNS. CRANE'S LOAD-MOMENT INDICATOR MAY READ LOWER LEVELS THAN ARE ACTUALLY OCCURRING. UNDER NO CIRCUMSTANCES SHOULD THE ABOVE WORKING RADII BE EXCEEDED.



BERMINGHAM
FOUNDATION SOLUTIONS
SINCE 1897

Customer Name: BCL

Description: B32 ON BM700

Date:	Dwg. No.:	Orientation:	Rev.:
02 Feb 2017	SK-A17-002-1	1A	A

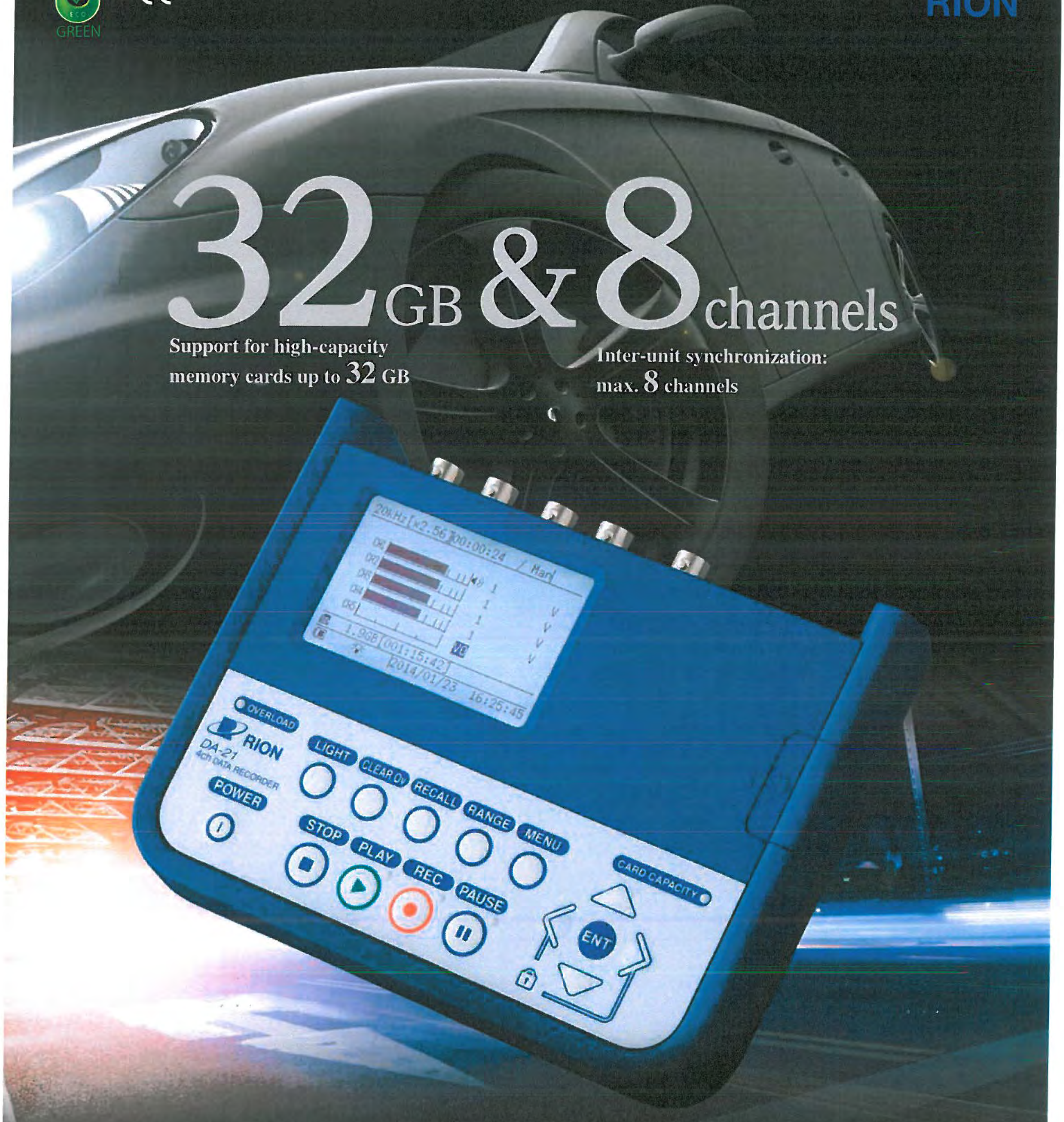
APPENDIX B

Monitoring Instrument Specifications and Calibrations

32GB & 8channels

Support for high-capacity
memory cards up to 32 GB

Inter-unit synchronization:
max. 8 channels



4 channel Data Recorder

DA-21

The 4 channel Data Recorder DA-21 is capable of recording acoustic / vibration waveforms and various electrical signals in the field.
Recorded data are saved in WAVE format on SD cards and can be imported into a computer for waveform analysis and other processing tasks.

4 channel Data Recorder

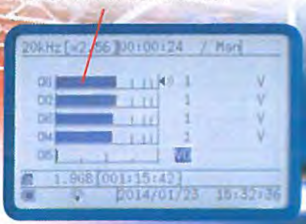
DA-21 CE

Playback of recorded data supported

Silent operation without any moving parts. Able to operate also in difficult environments subject to vibration and humidity.

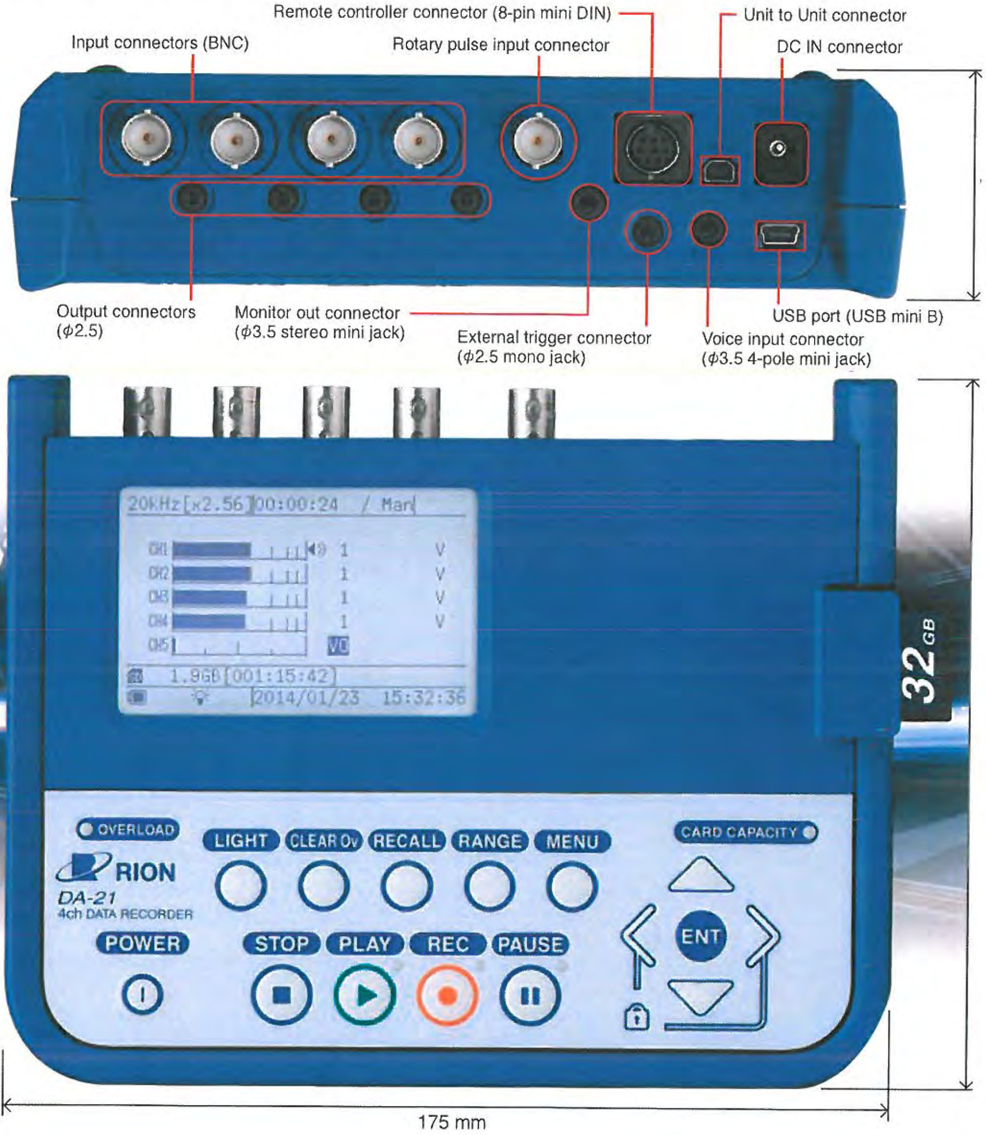
Voice memo recording function

Bar graph provides visual level indication



Measurement screen

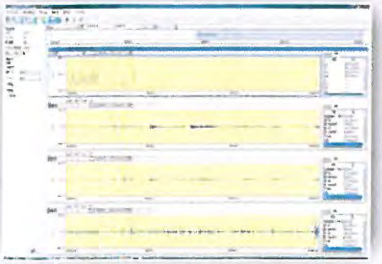
Menu screen



Software DA-21 data can be displayed and analyzed in various software packages

Viewer Software

AS-70 Viewer **Supplied**



4 channel display screen example

Reads WAVE format files produced by the DA-21 and enables functions such as waveform display, level display, file output (WAVE format/CSV format), and playback. Display of inter-unit synchronization data is also supported.

Specifications

Graph	Display types	Amplitude waveform, level waveform
	Frequency weighting characteristics	Z, A, C, G, C to A, vertical vibration characteristics, horizontal vibration characteristics
	Time weighting characteristics	10 ms, F (Fast), 630 ms, S (Slow), 10 s
Statistical processing	Amplitude waveform	Maximum value, minimum value average value, variance, effective value
	Level waveform	L_{eq} / L_E / L_{max} / L_{min} / L_N (5 types)

Waveform Analysis Software

AS-70 **Option**

Waveform analysis screen example

Adds octa
and FFT a

Specification

Waveform analysis
Frequency w characterist
FFT analysis
Time weighting
Octave band analysis

Operating environment requirements **Viewer software AS-70 Viewer / Waveform Analysis Software AS-70** ■ CPU : Intel Core i5 2 GHz or faster ■ RAM : 2 GB or more, 4 GB recommended ■ HDD : 20 GB or m
Waveform analysis software CAT-WAVE ■ CPU : Intel Core i5/i7 1.4 GHz or more (Core2 Duo 2 GHz or more) ■ RAM : 2 GB or more ■ HDD : 60 GB or more (free spa

| Improvements compared to predecessor model DA-20 |

Support for high-capacity SD cards (max. 32 GB)

Quantization
24 bit also supported

Use as USB storage supported
(recognized as removable disk)

Additional rotary signal input
(dedicated connector)

Inter-unit synchronization (max. 8 channels)

Separate input and playback output connectors

Time trigger function added

Battery Life

Using four IEC R6 (size AA) alkaline batteries

Approx. **8 hours***1

*1 20 kHz, 4ch, CCLD OFF

Using Battery Pack BP-21A with four IEC R20 (size D) alkaline batteries

Approx. **30 hours***2

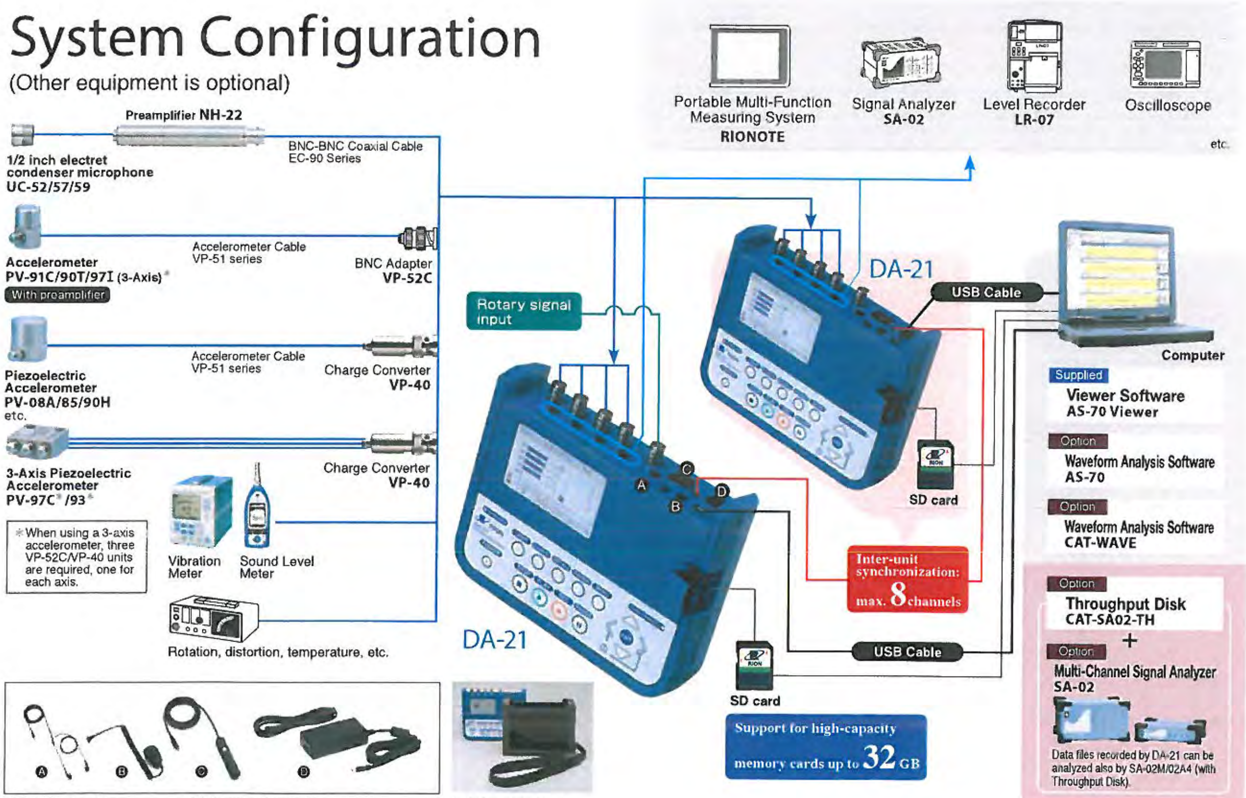
*2 Depending on recording settings

45 mm

System Configuration

(Other equipment is optional)

140 mm



Ⓐ Monitor earphone
Ⓑ Voice memo microphone
Ⓒ Remote Controller
Ⓓ AC Adapter

Soft Carrying Case

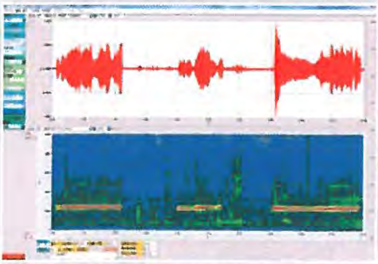
e band, 1/3 octave band,
nalysis functions to AS-70Viewer

s

Processing functions	Maximum value, minimum value, average value, effective value, distribution, differentiation and integration, HPF, LPF
eighting cs	Z, A, C, G, C to A, vertical vibration characteristics, horizontal vibration characteristics
Number of analysis points	32 to 65 536 points
Data view	Power spectrum, power spectrum density, spectrogram
characteristics	10 ms, F (Fast), 630 ms, S (Slow), 10 s
Applicable standards	JIS C 1514 (IEC 61260) Class 1
Analysis frequencies	octave bands 0.5 Hz to 16 kHz, 1/3 octave bands 0.4 Hz to 20 kHz

Waveform Analysis Software
CAT-WAVE Option

[This software is a product of Catec Inc.]



Spectrum map screen example

Reads WAVE format files produced by the DA-21 and enables functions such as octave band analysis, 1/3 octave band analysis, and FFT analysis. Inter-channel processing functions such as cross spectrum and transfer function, as well as 1/12 octave band analysis are also possible. (Tracking analysis can be added as an option.)

Specifications

Waveform	Display	Scaled time axis, Differential and integral calculus available
FFT analysis	Sampling points	64 to 32 768 points
	Display function	Power spectrum, Cross spectrum, Transfer function, Coherence, Power spectrum map, Differential and integral calculus for spectrum area
Octave band analysis	Applicable standard	JIS C 1514 (IEC 61260) Class 1
	Frequency range	Octave band 0.5 Hz to 8 kHz (15 bands), 1/3 octave band 0.4 Hz to 10 kHz (45 bands), 1/12 octave band 0.36 Hz to 11 kHz (180 bands)
Time weighting characteristics		1 ms, 10 ms, 35 ms, F (Fast), 630 ms, S (Slow), 10 s
Frequency weighting characteristics		FLAT, A, C

ore (free space), 100 GB or more recommended ■ DISPLAY : XGA (1024×768) or higher ■ OS : Microsoft Windows 7 Professional 32 bit/64 bit, 8.1 Pro 32 bit/64 bit, 10 Pro 32 bit/64 bit
e) ■ DISPLAY : SXGA (1280×1024) or higher ■ OS : Microsoft Windows 7 Professional 32 bit / 64 bit, 8.1 Pro 64 bit

Specifications 4 channel Data Recorder DA-21

Input Section	Input connectors			
		Signal input		4 channels (BNC)
		Rotation speed (rotary pulse)		1 channel (BNC)
		Voice memo input		1 channel (voice memo microphone 3.5 mm. 4-pole mini jack)
		External trigger input		1 (ϕ2.5 mm. stereo mini jack)
		Remote control		For optional remote controller, 8-pin mini DIN
		USB port		Mini B
		Input range		±0.01 V, 0.03 V, 0.1 V, 0.3 V, 1 V, 3 V, 10 V
		Input impedance		100 kΩ or more
		Max. input voltage		±13 V
		Overload		+2.0 dB ±1.0 dB at range full-scale
		Input coupling		AC/DC (AC coupling (primary) –3.0 dB ±1.0 dB at 0.315 Hz)
		CCLD (Constant Current Line Drive)		2 mA, 24 V
		Filters (digital)		High-pass OFF, 5 Hz (–3 dB ±1.0 dB) (–12 dB / oct) / Low-pass OFF, 200 Hz, 1 kHz, 2 kHz (–3 dB ±1.0 dB) (–12 dB / oct)
		Frequency response		
			DC coupling	DC to 1 Hz: ±1.0 dB 1 Hz to 12.5 kHz: ±0.5 dB 12.5 kHz to 20 kHz: ±1.0 dB
			AC coupling	1 Hz: ±1.0 dB 1 Hz to 12.5 kHz: ±0.5 dB 12.5 kHz to 20 kHz: ±1.0 dB
		Inter-channel phase difference		Max. 1 deg. (with AC coupling, HPF OFF, same frequency range, 20 kHz range)
		S/N ratio		80 dB or more (input voltage range: 10, 3, 1, 0.3 V; within frequency band; including overload)
		Distortion		Max. 0.1 % (within frequency band)
		Voice memo function		2 operation modes A: Recording in stand by state B: Revolution speed channel is always used as voice memo during recording Revolution speed function is disabled while using voice memo function ※Marker function becomes also active during recording
		Rotary pulse		Input impedance 100 kΩ or more
			Input voltage range	0 to 10 V, open collector
			Threshold level	Approx. 2.5 V
			Counting method	Periodic measurement
			Revolution measurement range	200 to 600 000 rpm (1 pulse / rotation)
Output Section	Output Connectors			
		Playback output		4 (ϕ2.5, separate from signal input), for playback of recorded signal, output impedance 600 Ω
			Frequency response	DC to 1 Hz: ±1.0 dB, 1 Hz to 12.5 kHz: ±0.5 dB, 12.5 kHz to 20 kHz: ±1.0 dB
			Output voltage	±3.16 V at range full-scale
			Max. output voltage	±4.0 V
			Inter-channel phase difference	Max.1 deg. (within frequency range)
		Monitor output		1 channel (ϕ3.5 stereo mini jack), Output impedance 100 Ω
			During recording	Analog signal for 1 selected channel
			During playback	Playback output of any selected channel (including voice memo)
			Output voltage	±3.16 V at range full-scale
			Max. output voltage	±5.5 V
		Playback output selection		Output from playback output and monitor output
Recorder Section	Recording media			SD card (Use only RION supplied cards for assured operation.) Max. capacity 32 GB File system (FAT16/FAT32)
	AD converter			Quantization: 24 bit, Bit length 16 bit/24 bit selectable from menu
	File format			WAVE (16 bit/24 bit, linear, non-compressed)
	Frequency range			100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, 20 kHz
	Sampling frequency			Frequency range x 2.4 / 2.56
	Max. recording time			Approx. 23 hours (20 kHz, sampling frequency x2.4, 4 channels, 32 GB card)
	Pre-recording			Data captured since 0 s, 1 s, or 5 s before recording key was pressed, or triggered

Trigger Section	Trigger source	External: Open-collector trigger External, External Gate (Comparator output of Sound Level Meter NL-62, NL-52, NL-42 supported) Internal: Level trigger (Waveform) 0.1 % to 0.9 %, 1 % to 99 % of range full-scale, linear peak Time trigger: Repeated recording at preset intervals between specified start time and end time possible		
	Trigger mode	Free, single, repeat (file division for repeat)		
	Pre-trigger	0 s, 1 s, 5 s (prior to trigger time)		
Calibration	Conversion	Linear (EU), Log (dB) Selectable for each channel		
Display Section	LCD	256 x 160 dots (Monochromatic LCD, with backlight)		
	Display items	Setting screen, recording screen, level bars, level history		
	LEDs	Overload indication, SD card low space warning, status indication (record, playback, trigger standby, etc.)		
Saving settings		Five sets of settings can be saved in internal memory, startup files on SD card		
USB	Mass storage class	Recognized as removable disk		
Power Supply Section	Power requirements	Batteries or dedicated AC adapter (NC-98C), cigarette lighter adapter (CC-82)		
	Batteries	Four IEC R6 (size AA) batteries (alkaline or nickel-hydride rechargeable batteries)		
	External DC	5 to 20 V, current consumption 190 mA (6 V) (Frequency range 100 Hz, CCLD OFF, backlight OFF, monitor output OFF)		
	Battery life (using alkaline batteries in cont. operation at 23 °C, back light off,typical value for 32 GB card)	Alkaline batteries	20 kHz, 4 channels,	CCLD ON: approx. 4.5 hours CCLD OFF: approx. 8 hours
			20 kHz, 1 channel,	CCLD ON: approx. 7.5 hours CCLD OFF: approx. 10 hours
		Nickel-hydride batteries (capacity 2 450 mAh)	20 kHz, 4 channels,	CCLD ON: approx. 7 hours CCLD OFF: approx. 10 hours
			20 kHz, 1 channel,	CCLD ON: approx. 11 hours CCLD OFF: approx. 12 hours
Inter-unit synchronization function		Synchronized operation of two units allows simultaneous waveform level recording in up to 8 channels		
Dimensions and Weight		Approx. 140 (H) x 175 (W) x 45 (D) mm, approx. 450 g (excl. batteries)		
Ambient conditions for operation		-10 °C to +50 °C, 10 % to 90 % RH (no condensation)		
Supplied Accessories		IEC R6 (size AA) alkaline battery x 4, AS-70Viewer x 1		

Option

Product		Designation
Waveform analysis software		AS-70
Waveform analysis software		CAT-WAVE
Charge Converter		VP-40
Memory card※1 (SD card)	2 GB	MC-20SD2
	32 GB	MC-32SD3
AC adapter		NC-98C
Battery pack		BP-21A
Cigarette lighter adapter		CC-82
4-channel data recorder remote controller		DA-20RC1
Voice memo microphone		MH-34B4B
Monitor earphone		ATH-C320
Soft Carrying Case (with shoulder strap)		DA-20007
BNC-BNC coaxial cable		EC-90 series (2 m and up)
BNC-BNC cable		NC-39A
BNC-mini plug Cable		CC-24
Comparator output cable (for NL-42/52)※2		CC-42C
Inter-unit sync cable		CC-43
USB A-Mini B Cable		—

※1 Use only RION supplied cards for assured operation.

※2 When used with the DA-21, BNC-mini plug Cable CC-24 and Joint connector VP-54C are required.

Maximum recording times on memory card (SD card) [Approximate]

32 GB SD card Sampling frequency: x2.56 (2.4 also supported), Quantization: 16 bit

		Frequency range (Hz)					
		100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
Number of channels	1	17066 h 40 m	3413 h 20 m	1706 h 40 m	341 h 20 m	170 h 40 m	85 h 20 m
	2	8533 h 20 m	1706 h 40 m	853 h 20 m	170 h 40 m	85 h 20 m	42 h 40 m
	3	5688 h 32 m	1137 h 36 m	568 h 48 m	113 h 36 m	56 h 48 m	28 h 24 m
	4	4266 h 40 m	853 h 20 m	426 h 40 m	85 h 20 m	42 h 40 m	21 h 20 m

2 GB SD card Sampling frequency: x2.56 (2.4 also supported), Quantization: 16 bit

		Frequency range (Hz)					
		100 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz
Number of channels	1	1066 h 40 m	213 h 20 m	106 h 40 m	21 h 20 m	10 h 40 m	5 h 20 m
	2	533 h 20 m	106 h 40 m	53 h 20 m	10 h 40 m	5 h 20 m	2 h 40 m
	3	355 h 32 m	71 h 06 m	35 h 33 m	7 h 06 m	3 h 33 m	1 h 46 m
	4	266 h 40 m	53 h 20 m	26 h 40 m	5 h 20 m	2 h 40 m	1 h 20 m

※Varies slightly depending on number of data files ※Maximum recording time for one file is approx. 1000 hours. ※Use only RION supplied cards for assured operation.

JCSS 0197

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1405-4 1706.P.D

	Spider-80X	Spider-80Xi
		
Total Channels Per System	8 to 512	8 to 512
Input Mode	AC, DC, IEPE (ICP®), optional charge	AC, DC, IEPE (ICP®)
Charge Amplifier Solution	Internal charge can be installed at the factory Can use external amplifier	Use external charge amplifier
Main Application	Vibration control, dynamic testing, remote monitoring 8 to 512 channels	Portable dynamic signal data acquisition and real-time processing with relatively large channels. Some applications may require battery power
Strain Gage	Can install strain gage front-end in the same chassis	N/A
Modularity	Front-end is shielded with its own chassis hence swappable on site	Board modules are installed at factory and are not swappable
Weight of 8 Channel Front-end	2 kg	N/A
Dimension of 8 Channel Front-end	240 x 35 x 310 mm (w x h x l)	N/A
Weight of a 32 Channel System	23 kg for 32 channels 25 kg for 40 channels	8 kg
Dimension of a 32 Channel System	343 x 310 x 407 mm (w x h x l)	194 x 259 x 298 mm (w x h x l)
Weight of a 64 Channel System	36.5 kg	10.4 kg
Dimension of a 64 Channel System	470 x 310 x 407 mm (w x h x l)	274 x 259 x 298 mm (w x h x l)
Power of a 64 Channel System	AC powered, 100W	AC powered, 90W
Power of a 32 Channel System	N/A	DC powered, 50W
Battery Power	N/A	Available (with Spider-Battery)

Dynamic Signal Analyzers
Vibration Test Controllers
EDM Modal
Machine Condition Monitoring Devices & Systems
Software Modules - Engineering Data Management
Premier Technology Service Agreement

THE SPIDER-20 WIRELESS DYNAMIC SIGNAL ANALYZER AND DATA RECORDER

(Wireless Analysis Anywhere)

Spider-20 is a compact yet powerful dynamic signal analyzer and digital data recorder. It provides four 24-bit precise high-fidelity input channels, and a unique software-selectable tachometer-input/signal-source output channel (all using conventional BNC connectors). Each input is individually programmable to accept AC or DC voltage or output from an IEPE (ICP) sensor with built-in electronics.

Spider-20 is a diminutive 5.3 x 4.3 x 1 inch tool weighing only 18 ounces. It has only three push-button controls and five LED status indicators. This little powerhouse can run over 6 hours on its internal rechargeable battery which can be replaced in field with a backup battery. It can also record data on its built-in 4GB flash memory at the simple push of a button.

Spider-20 communicates with the world through its built-in Wi-Fi interface. Use your iPad to setup and view or record time histories as well as perform spectrum analysis or measure Frequency Response and Coherence functions. Link the Spider-20 to your laptop or tablet running Windows and enjoy the full repertoire of functionality provided by our EDM (Engineering Data Management) software including 1/nth Octave acoustic functions, Order Tracking for rotating machinery, Shock Response Spectra for drop testing, or Digital Filtering for special purpose analysis.

A secondary version, Spider-20E, replaces Wi-Fi with a wired Ethernet connection. The device has the same form factor as the standard wireless version.

Transfer measured data to truly massive storage space using the EDM Cloud server. EDM can be used to program your Spider-20 to perform a custom measurement or measurement sequence at the touch of its START button, making it an unintimidating and user-friendly tool. No computer, tablet or phone is required; just use your thumb and your Spider-20 operating in Black Box mode. Use our flexible Automated Schedule and Limiting software to turn this Spider into an intelligent unattended monitor capable of responding to data conditions or networked instructions, notifying you of significant conditions via e-mail.

ANALYSIS FEATURES:

- **Frequency Response Function (FRF)**
- **Octave Analysis and Sound Level Meters (SLM)**
- **Time Waveform Recording**
- **Automated Schedule and Limiting Test**
- **Real-Time Digital Filters**
- **Shock Response Spectrum (SRS) Analysis**
- **Order Tracking Analysis**
- **Sine Reduction**
- **Spider-20 Remote Timer On/Off with Black Box Mode**

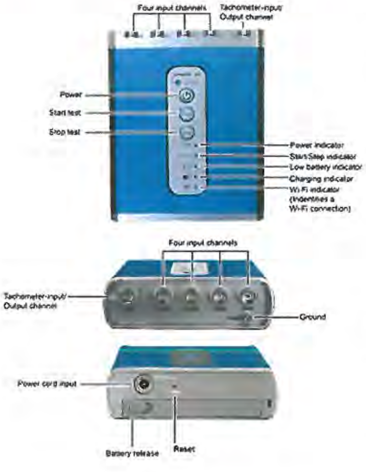
PRODUCT SPECIFICATIONS

Analog Input Channels
Input Channels: 4
Coupling: AC, DC, IEPE (ICP®)
Input Range: ±0.1V, ±1V, ±10V
Input Dynamic Range: 100 dBFS
Sampling Rate: 0.48 Hz to 102.4 kHz, with 54 stages
Maximum Useful Bandwidth: 46.08 kHz

Tachometer Input Channel
Tachometer Input Channel: 1
Connector Type: isolated BNC (shared with the Analog Output)
Configuration: Tachometer or Output function selected by software
Shaft RPM Range: 3/N – 300,000/N RPM

Analog Output Channel
Output Channels: 1
Output Range: ± 10 Volts

DC Power Input
Connector Type: 5.5mm Jack connector (on rear panel)
Voltage: 15 VDC (±10%)



Spider-20 Wireless (standard)

Spider-20E with Ethernet connection

Indicating LEDs
Power, Start/Stop, Battery, Wi-Fi and Charging

Network Communication
Type: Built-in Wi-Fi router
Compliance: IEEE 802.11a/b/g/n; dual-channel; 2.4 & 5 GHz band 802

Power Specifications
Power Supply: interchangeable battery with DC charger inter-face
Battery Hours: 6 hours or longer in full operation
Power Consumption: less than 6W

Environmental Specifications
Enclosure 135mm x 109mm x 32.5mm
Weight: 0.56kg
On-Board Flash Memory: 4GB

DOWNLOAD MORE INFORMATION:

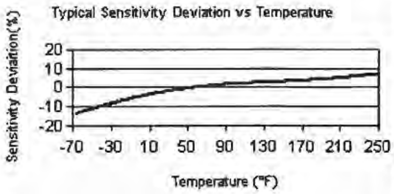
- Dynamic Signal Analysis and Data Acquisition Brochure

Search

f in G+

Model Number 393A03	# SEISMIC ICP® ACCELEROMETER	Revision: H ECN #: 29751

Performance	**ENGLISH**	**SI**	
Sensitivity(± 5 %)	1000 mV/g	102 mV/(m/s^2)	
Measurement Range	± 5 g pk	± 49 m/s^2 pk	
Frequency Range(± 5 %)	0.5 to 2000 Hz	0.5 to 2000 Hz	
Frequency Range(± 10 %)	0.3 to 4000 Hz	0.3 to 4000 Hz	
Frequency Range(± 3 dB)	0.2 to 6000 Hz	0.2 to 6000 Hz	
Resonant Frequency	≥ 10 kHz	≥ 10 kHz	
Broadband Resolution(1 to 10,000 Hz)	0.00001 g rms	0.0001 m/s^2 rms	[1]
Non-Linearity	≤ 1 %	≤ 1 %	[2]
Transverse Sensitivity	≤ 7 %	≤ 7 %	
Environmental			
Overload Limit(Shock)	± 5000 g pk	± 49,050 m/s^2 pk	
Temperature Range	-65 to +250 °F	-54 to +121 °C	
Temperature Response	See Graph	See Graph	
Base Strain Sensitivity	≤ 0.0005 g/µε	≤ 0.005 (m/s^2)/µε	[1]
Electrical			
Excitation Voltage	18 to 30 VDC	18 to 30 VDC	
Constant Current Excitation	2 to 20 mA	2 to 20 mA	
Output Impedance	<250 ohm	<250 ohm	
Output Bias Voltage	8 to 12 VDC	8 to 12 VDC	
Discharge Time Constant	1 to 3 sec	1 to 3 sec	
Settling Time	<15 sec	<15 sec	
Spectral Noise(1 Hz)	2 µg/√Hz	20 (µm/sec^2)/√Hz	[1]
Spectral Noise(10 Hz)	0.5 µg/√Hz	5 (µm/sec^2)/√Hz	[1]
Spectral Noise(100 Hz)	0.2 µg/√Hz	2 (µm/sec^2)/√Hz	[1]
Spectral Noise(1 kHz)	0.1 µg/√Hz	1 (µm/sec^2)/√Hz	[1]
Electrical Isolation(Case)	≥ 10^8 ohm	≥ 10^8 ohm	
Physical			
Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Stainless Steel	Stainless Steel	
Sealing	Hermetic	Hermetic	
Size (Hex x Height)	1 3/16 in x 2 3/16 in	30.2 mm x 55.6 mm	
Weight	7.4 oz	210 gm	[1]
Electrical Connector	2-Pin MIL-C-5015	2-Pin MIL-C-5015	
Electrical Connection Position	Top	Top	
Mounting Thread	1/4-28 Female	1/4-28 Female	
Mounting Torque	2 to 5 ft-lb	3 to 7 N-m	



[3]

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

T - TEDS Capable of Digital Memory and Communication Compliant with IEEE P1451.4

Output Bias Voltage	8.5 to 12.5 VDC	8.5 to 12.5 VDC

NOTES:

[1] Typical.
[2] Zero-based, least-squares, straight line method.
[3] See PCB Declaration of Conformance PS023 for details.

SUPPLIED ACCESSORIES:

Model 081B20 Mounting Stud, with shoulder (1/4-28 to 1/4-28) (1)
Model 085A31 Protective Thermal Jacket (1)
Model ACS-1 NIST traceable frequency response (10 Hz to upper 5% point). (1)
Model ACS-4 Single axis, low frequency phase and amplitude response cal from 0.5 to 10 Hz (1)
Model M081B20 Mounting Stud 1/4-28 to M6 X 0.75 (1)

Entered:	Engineer:	Sales: WDC	Approved: EB	Spec Number:
Date: 12-2-08	Date: 11-24-08	Date: 11-24-08	Date: 12-1-08	393-1030-80

All specifications are at room temperature unless otherwise specified.
In the interest of constant product improvement, we reserve the right to change specifications without notice.

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VIBRATION DIVISION
3425 Walden Avenue, Depew, NY 14043

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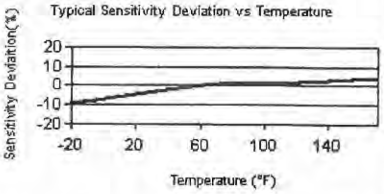
Fax: 716-685-3886
E-Mail: vibration@pcb.com

Model Number		
356B18	**TRIAXIAL ICP® ACCELEROMETER**	Revision: G ECN #: 26468

Performance	**ENGLISH**	**SI**	
Sensitivity(± 10 %)	1000 mV/g	102 mV/(m/s²)	
Measurement Range	± 5 g pk	± 49 m/s² pk	
Frequency Range(± 5 %)	0.5 to 3000 Hz	0.5 to 3000 Hz	
Frequency Range(± 10 %)	0.3 to 5000 Hz	0.3 to 5000 Hz	
Resonant Frequency	≥ 20 kHz	≥ 20 kHz	
Phase Response(± 5 °)(at 70°F [21°C])	2 to 2000 Hz	2 to 2000 Hz	
Broadband Resolution(1 to 10,000 Hz)	0.00005 g rms	0.0005 m/s² rms	[1]
Non-Linearity	≤ 1 %	≤ 1 %	[2]
Transverse Sensitivity	≤ 5 %	≤ 5 %	
Environmental			
Overload Limit(Shock)	± 5000 g pk	± 5000 g pk	
Temperature Range(Operating)	-20 to +170 °F	-29 to +77 °C	
Temperature Response	See Graph	See Graph	
Base Strain Sensitivity	0.0007 g/µε	0.007 (m/s²)/µε	[1]
Electrical			
Excitation Voltage	20 to 30 VDC	20 to 30 VDC	
Constant Current Excitation	2 to 20 mA	2 to 20 mA	
Output Impedance	≤ 600 ohm	≤ 600 ohm	
Output Bias Voltage	8 to 12 VDC	8 to 12 VDC	
Discharge Time Constant	0.8 to 3.0 sec	0.8 to 3.0 sec	
Settling Time(within 10% of bias)	<12 sec	<12 sec	
Spectral Noise(1 Hz)	11.4 µg/√Hz	112 (µm/s²)/√Hz	[1]
Spectral Noise(10 Hz)	4.0 µg/√Hz	39 (µm/s²)/√Hz	[1]
Spectral Noise(100 Hz)	1.2 µg/√Hz	12 (µm/s²)/√Hz	[1]
Spectral Noise(1 kHz)	0.4 µg/√Hz	4.4 (µm/s²)/√Hz	[1]
Physical			
Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Anodized Aluminum	Anodized Aluminum	
Sealing	Epoxy	Epoxy	
Size (Height x Length x Width)	0.80 in x 1.03 in x 0.80 in	20.3 mm x 26.1 mm x 20.3 mm	
Weight	0.88 oz	25 gm	[1]
Electrical Connector	1/4-28 4-Pin	1/4-28 4-Pin	
Electrical Connection Position	Side	Side	
Mounting Thread	10-32 Female	10-32 Female	



CE [3]

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

A - Adhesive Mount

Mounting Thread	None - Adhesive Mount Only	None - Adhesive Mount Only

Supplied Accessory : Model 080A109 Petro Wax (1)
Supplied Accessory : Model 080A90 Quick Bonding Gel (1)

J - Ground Isolated

Electrical Isolation(Base)	$>10^8$ ohm	$>10^8$ ohm
Size - Height x Length x Width	0.85 in x 1.03 in x 0.85 in	21.6 mm x 26.1 mm x 21.6 mm

T - TEDS Capable of Digital Memory and Communication Compliant with IEEE P1451.4
TLA - TEDS LMS International - Free Format
TLB - TEDS LMS International - Automotive Format
TLC - TEDS LMS International - Aeronautical Format
TLD - TEDS Capable of Digital Memory and Communication Compliant with IEEE 1451.4

Output Bias Voltage	8.5 to 13 VDC	8.5 to 13 VDC

NOTES:

[1] Typical.
[2] Zero-based, least-squares, straight line method.
[3] See PCB Declaration of Conformance PS023 for details.

SUPPLIED ACCESSORIES:

Model 080A109 Petro Wax (1)
Model 080A68 Adhesive mounting base (for Models 356B07 and 356B08) (1)
Model 081B05 Mounting Stud (10-32 to 10-32) (1)
Model ACS-1T NIST traceable triaxial amplitude response, 10 Hz to upper 5% frequency. (1)
Model M081B05 Mounting Stud 10-32 to M6 X 0.75 (1)

Entered: BLS	Engineer:	Sales: RGL	Approved:	Spec Number:
Date: 5-16-07	Date: 5/16/07	Date: 5/16/07	Date: 5/16/07	11615

All specifications are at room temperature unless otherwise specified.
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VIBRATION DIVISION
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Fax: 716-685-3886
E-Mail: vibration@pcb.com

Model 731A
Ultra-quiet, ultra low frequency, seismic accelerometer

Dynamic

Sensitivity, ±10%, 25°C	10 V/g
Acceleration range	0.5 g peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	0.10 - 300 Hz
±3 dB	0.05 - 450 Hz
Resonance frequency	750 Hz
Transverse sensitivity, max.	1% of axial
Temperature response:	
−10°C	−12%
+65°C	+5%

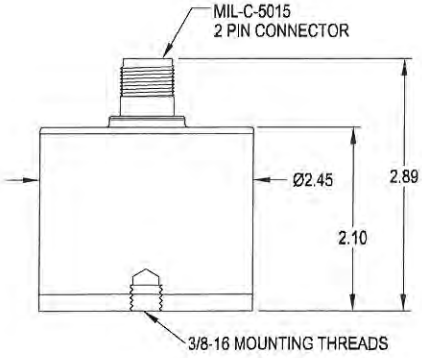
Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	0.5 μg
Spectral	2 Hz	0.03 μg/√Hz
	10 Hz	0.01 μg/√Hz
	100 Hz	0.004 μg/√Hz
Output impedance, max		100Ω
Bias output voltage		9 VDC
Grounding		case isolated

Features
- Ultra high sensitivity
- Ultra low-noise electronics for clear signals at sub micro-g levels
- Low frequency capable
- Low pass filtered to eliminate high frequencies
- Reverse wiring protection

Environmental

Temperature range	−10 to 65°C
Vibration limit	10 g peak
Shock limit	fragile
Electromagnetic sensitivity @ 60 Hz	20 μg/gauss
Sealing	hermetic
Base strain sensitivity	0.0001 g/μstrain



Physical

Sensing element design	PZT ceramic / flexure
Weight	775 grams
Case material	316L stainless steel
Mounting	3/8 - 16 tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J9 / J9T2A

Connector pin	Function
Shell	ground
A	power/ signal
B	common

Note: Special handling required due to sensitivity, wooden protective case included

Accessories supplied: SF7 mounting stud; calibration data (level 3)

Options: Power unit/amplifier P31

Wilcoxon Research Inc
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MEGGiTT
smart engineering for
extreme environments

98078 Rev.C.6 03/10

Minimate Pro4™

Instantel

Advanced Vibration, Overpressure and Sound Monitor

4 – Channel data acquisition for the following range of Applications:

- Blast-monitoring for compliance
- Remote monitoring - Auto Call Home™
- Near-field blast analysis
- Sound monitoring
- Pile driving
- Construction activity
- Demolition activity
- Structural monitoring
- Underwater monitoring
- Heavy transportation

The **Instantel® Minimate Pro4** vibration, overpressure and sound monitors are built on the success of the **Minimate® Series III** monitoring systems.

The **Minimate Pro4** offers 64MBs of memory, improved ruggedness, including a metal case and connectors, and water resistance.

For reliable compliance monitoring, connect an ISEE or DIN Triaxial Geophone and an ISEE Linear Microphone or optional Sound Microphone.

Versatile

Each compliance sensors calibration date, serial number, and sample rate specification are determined by the Sensor Check feature of the unit and stored in the setup file. The sensor type, calibration date and serial number are also recorded on the Event Report.

For those challenging monitoring applications, such as tunneling, the **Minimate Pro4** monitoring unit includes EMI shielding and built-in noise and anti-aliasing filters; both the sensor and auxiliary channels are isolated.

With the optional **Instantel Blastware® Advanced Module**, perform VDV monitoring, Signature Hole Analysis and real time display of Histogram data.

Intelligent

View Peak Vibration and Zero Crossing Frequencies immediately after each Event occurs. Toggle between Peak Vibration and Peak Overpressure with a simple push of a button. Data highlights, including Operator, Trigger, Duration, and Maximum Vibration and Overpressure, are also available for review, right on the monitors display.

Remote Monitoring

For remote installations, the **Instantel Auto Call Home** feature will automatically transfer event files from field to office as they are recorded using a variety of wireless modems. From there, the **Blastware Mail** feature of the **Instantel Blastware** software automatically distributes files or summary information to multiple e-mail addresses.

Vision™

Auto Call Home integrates with **Vision**, Instantel's Cloud-based event data hosting application (optional). With **Vision,** you can store monitoring data securely in the Cloud and deliver the information your stakeholders need—anytime, anywhere, instantly. Vision also lets you:

- View, sort, filter and print event data to identify trends before they become issues.
- Map your site—using technology from Google, you can place your monitoring units on a street or satellite map.
- Upload photos for a record of the latest progress.

Easy to use

Even with all of these features, the **Minimate Pro4** system is still easy for anyone to use. A high-contrast LCD and ten-key tactile keypad drives simple menu operations, while graphic icons indicate battery and memory levels at a glance.

Key Features

- Dedicated function keys and intuitive menu-driven operation enable quick and easy setup.
- Sample rates from 512 to 65,536 S/s per channel, independent of record times.
- Continuous monitoring means zero dead time between events, even while the unit is processing.
- **Instantel Histogram Combo™** mode allows capturing thousands of full waveform records while simultaneously recording in histogram mode.
- The **Auto Call Home** feature automates remote monitoring applications.
- Non-volatile memory with standard 8,000-plus event storage capacity.
- Records full waveform events over two hours long.
- Match any channel with a variety of sensors; geophones, accelerometers, hydrophones and a dedicated microphone channel.
- Optional Sound Microphone available for sound monitoring. Combine an ISEE or DIN Triaxial Geophone with the Sound Microphone to monitor two types of event data.

Minimate Pro4™

General Specifications

Minimate Pro4 Channels	Channels 1-3, ISEE or DIN Triaxial Geophone, and Channel 4, ISEE Linear or Sound Level Microphone
Geophone	
Range	Up to 254 mm/s (10 in/s)
Response Standard	ISEE Seismograph Specification or DIN 45669-1
Resolution	0.00788 mm/s (0.00031 in/s)
Frequency Range (ISEE / DIN)	2 to 250 Hz, within zero to -3 dB of an ideal flat response / 1 to 315 Hz or 1 to 80 Hz
Accuracy (ISEE / DIN)	+/- 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz / DIN 45669-1 standard
Transducer Density	2.13 g/cc (133 lbs/ft^3)
Maximum Cable Length (ISEE / DIN)	75 m (250 ft) / 1,000 m (3,280 ft)

Microphone (Sold separately)	**ISEE Linear Microphone**	**Sound Level Microphone**
Weighting Scales	ISEE Linear Microphone	A-Weight or C-Weight
Response Standard	ISEE Seismograph Specification (2011)	Fast (125s) or Slow (1s)
Range	2 to 500 Pa (0.00029 to 0.0725 psi [88 to 148 dB])	30 to 140 dB A or C
Resolution	0.0156 Pa (2.2662x10^{-6} psi)	0.05 dB (Display limit 0.1dB)
Frequency Response	2 to 250 Hz between -3 dB roll off points	Up to 20 kHz
Accuracy	+/- 10% or +/- 1dB, whichever is larger, between 4 and 125 Hz	IEC 61672 Class 1
Maximum Cable Length	75 m (250 ft)	75 m (250 ft)

Optional Advanced Sensors Contact Instantel for more information	High Pressure Microphone, High Frequency Geophone, Uniaxial and Triaxial Accelerometer, and Hydrophone

Waveform Recording

Record Modes	Waveform, Waveform Manual
Seismic Trigger	0.13 to 254 mm/s (0.005 to 10 in/s)
Linear Acoustic Trigger	2.0 to 500 Pa (0.0029 to 0.0725 psi)
Sample Rate	512, 1,024, 2,048, 4,096, 8,192, 16,384, 32,768, 65,536 S/s per channel (independent of record time)
Record Stop Mode	Fixed record time, **Instantel AutoRecord™** record stop mode
Record Time	1-9,000 seconds (1-30 seconds, then 30-second increments up to 150 minutes) plus a 0.25 seconds pre-trigger
AutoRecord Time	Event is recorded until activity remains below trigger level for duration of auto window, or until available memory is filled.
Cycle Time	Recording uninterrupted by event processing, monitoring, or communication - no dead time below 65 KHz.
Minimate Pro4 Storage Capacity	64 MBs. Optional 240 MBs.
Full Waveform Events	8,000-plus 1-second events at 1,024 S/s sample rate

Histogram Recording

Record Modes	Histogram and **Instantel Histogram Combo** (monitor captures triggered waveforms while recording in Histogram mode)
Recording Interval	1 to 30 seconds at 1 second intervals, and 30 seconds to 60 minutes at 30 second intervals
Histogram Storage Capacity	800,000 intervals. Examples: 18.5 days at 2 second intervals, or 555 days at 1 minute
Histogram Combo Storage Capacity	Example: 30 days of Histogram recording at 1 minute intervals, and over 7,500 1 second waveform events

Physical Specifications

Dimensions	25.4(l) x 11.75(w) x 10.80(h) cm (10.00 x 4.63 x 4.25 in); length dimension includes connectors and dust caps
Unit Weight	2.27 kg (5 lbs)
Battery	10 days
User Interface	10 domed tactile with separate keys for common functions
Display	7-line x 32-character, high-contrast, multi-color backlit LCD
PC Interface	Ethernet® cable, supplied, for PC to unit connection (Auto Call Home is not supported over Ethernet), or RS-232 with an optional USB adapter
Auxillary Inputs and Outputs	External Trigger and Remote Alarm
Environmental	
LCD Operating Temperature	-20 to 45 °C (-4 to 113 °F)
Electronics Operating Temperature	-40 to 45 °C (-40 to 113 °F)
Water Resistance	IP67 – submerse to 30 cm (1 ft.) for 24 hours
Remote Communications	Instantel approved serial communication modems Automatically transfers events when they occur through the **Instantel Auto Call Home** feature Monitor start/stop timer
Additional Features	(Optional) **Vision** provides you and your stakeholders with secure, encrypted, Cloud-based access to the data they need, providing instant sharing for time-sensitive projects.
Electrical Standards	CE Class B

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Instantel

StanleyBlack&Decker

The World's Most Trusted Monitors — Vibration · Noise · Air Overpressure

Standard Geophone

Measures ground motion in three orthogonal directions. The sensor includes three ground spikes for soft surfaces or can be bolted to hard surfaces.

PART NUMBER	714A9701
RESPONSE STANDARD	ISEE SPECIFICATION 2000 EDITION
FREQUENCY RANGE	2 TO 250 Hz
VELOCITY RANGE	UP TO 10 in/s (254 mm/s)
RESOLUTION	0.000625in/s (0.0159mm/s)
SENSOR DENSITY	133 lbs/ft^3 (2.13 g/cc)
CABLE LENGTH	6 ft (2 m)
MAXIMUM CABLE LENGTH	250 ft (75 m)
REQUIRED SOFTWARE	BLASTWARE COMPLIANCE

DIN Geophone

Measures ground motion in three orthogonal directions. The sensor includes three ground spikes for soft surfaces or can be bolted to hard surfaces.

PART NUMBER	718A3301
RESPONSE STANDARD	DIN 45669-1 CLASS 1
FREQUENCY RANGE	1 TO 315 Hz
VELOCITY RANGE	UP TO 10 In/s (254 mm/s)
RESOLUTION	0.000625in/s (0.0159mm/s)
SENSOR DENSITY	133 lbs/ft^3 (2.13 g/cc)
CABLE LENGTH	6 ft (2 m)
MAXIMUM CABLE LENGTH	3250 ft (1000 m)
REQUIRED SOFTWARE	BLASTWARE COMPLIANCE

Triaxial High Frequency Geophone

Measure high frequency, high amplitude vibrations in three orthogonal directions. Designed for near field monitoring of blasting activities.

Not available for Minimate Blaster.

PART NUMBER	714A9101
FREQUENCY RANGE	30 TO 1000 Hz
VELOCITY RANGE	UP TO 100in/s (2540mm/s)
RESOLUTION	0.05in/s (1.27mm/s)
SENSOR DENSITY	145 lbs/ft^3 (2.33 g/cc)
CABLE LENGTH	100 ft (30 m)
MAXIMUM CABLE LENGTH	3250 ft (1000 m)
REQUIRED SOFTWARE	BLASTWARE ADVANCED

Calibration Certificate

Part Number: 716A0403
Description: MINIMATE PLUS W/EXT. GEO
Serial Number: BE9555
Calibration Date: February 22, 2017
Calibration Equipment: 718A1501

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: ____________________
Vipulan Mathi

Instantel

Calibration Certificate

Part Number: 714A9701
Description: TRIAXIAL GEOPHONE (ISEE)
Serial Number: BG12428
Calibration Date: February 22, 2017
Calibration Equipment: 714J7401

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Calibrated By: ______________________
Vipulan Mathi

Instantel

Calibration Certificate

Part Number: 714A9701
Description: TRIAXIAL GEOPHONE (ISEE)
Serial Number: BG9326
Calibration Date: February 22, 2017
Calibration Equipment: 714J7401

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Calibrated By: __________________
Li Pan

Instantel

Calibration Certificate

Part Number: 716A0403
Description: MINIMATE PLUS W/EXT. GEO
Serial Number: BE15696
Calibration Date: February 22, 2017
Calibration Equipment: 718A1501

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Calibrated By: ____________________
Li Pan

Instantel

Calibration Certificate

Part Number:	716A0403
Description:	MINIMATE PLUS W/EXT. GEO
Serial Number:	BE18695
Calibration Date:	February 22, 2017
Calibration Equipment:	718A1501

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Calibrated By: ____________________
Andrew Stockwell

Instantel

Calibration Certificate

Part Number:	714A9701
Description:	TRIAXIAL GEOPHONE (ISEE)
Serial Number:	BG17714
Calibration Date:	February 22, 2017
Calibration Equipment:	714J7401

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Calibrated By: ______________________
Andrew Stockwell

Instantel

Calibration Certificate

Part Number: 716A0403
Description: MINIMATE PLUS W/EXT. GEO
Serial Number: BE14711
Calibration Date: March 13, 2017
Calibration Equipment: 718A1501

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Calibrated By:

Tuyen Bui

Instantel

Calibration Certificate

Part Number: 716A0403
Description: MINIMATE PLUS W/EXT. GEO
Serial Number: BE9678
Calibration Date: March 13, 2017
Calibration Equipment: 718A1501

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Calibrated By: ______________________
Li Pan

Instantel

Calibration Certificate

Part Number: 720A2301
Description: MINIMATE PRO 4
Serial Number: MP12721
Calibration Date: March 27, 2017
Calibration Equipment: KEITHLEY S/N 1125403

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

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Calibrated By: Pan Li

Li Pan

Instantel

Calibration Certificate

Part Number:	720A2301
Description:	MINIMATE PRO 4
Serial Number:	MP12710
Calibration Date:	March 28, 2017
Calibration Equipment:	KEITHLEY S/N 1125403

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

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Calibrated By: ______________________

Andrew Stockwell

Instantel

Calibration Certificate

Part Number:	716A0403
Description:	MINIMATE PLUS W/EXT. GEO
Serial Number:	BE9679
Calibration Date:	June 26, 2017
Calibration Equipment:	718A1501

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

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Calibrated By: ______________________

Xiaochuan He

Instantel

71408901 Rev 01

Calibration Certificate

Part Number: 716A0403
Description: MINIMATE PLUS W/EXT. GEO
Serial Number: BE8720
Calibration Date: March 13, 2017
Calibration Equipment: 718A1501

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Calibrated By:

Tuyen Bui

Instantel

Calibration Certificate

Part Number: 716A0403
Description: MINIMATE PLUS W/EXT. GEO
Serial Number: BE8719
Calibration Date: March 13, 2017
Calibration Equipment: 718A1501

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Calibrated By:

Tuyen Bui

Instantel®

Calibration Certificate

Part Number:	714A9701
Description:	TRIAXIAL GEOPHONE (ISEE)
Serial Number:	BG13492
Calibration Date:	March 13, 2017
Calibration Equipment:	714J7401

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

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Calibrated By:

Tuyen Bui

Instantel

Calibration Certificate

Part Number: 714A9701
Description: TRIAXIAL GEOPHONE (ISEE)
Serial Number: BG7709
Calibration Date: March 13, 2017
Calibration Equipment: 714J7401

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Calibrated By: ____________________
Li Pan

Instantel

Calibration Certificate

Part Number:	720A2001
Description:	ISEE TRIAXIAL GEOPHONE
Serial Number:	SE12723
Calibration Date:	March 28, 2017
Calibration Equipment:	714J7401

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Calibrated By: ____________________

Andrew Stockwell

Instantel

Calibration Certificate

Part Number:	720A2001
Description:	ISEE TRIAXIAL GEOPHONE
Serial Number:	SE12724
Calibration Date:	March 27, 2017
Calibration Equipment:	714J7401

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

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Calibrated By: ______________________

Li Pan

Instantel®

Calibration Certificate

Part Number: 714A0301
Description: STANDARD TRANSDUCER BM III
Serial Number: BG5527
Calibration Date: June 26, 2017
Calibration Equipment: 714J7402

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By:
Xiaochuan He

Instantel

71408901 Rev 01

Calibration Certificate

Part Number: 714A9701
Description: TRIAXIAL GEOPHONE (ISEE)
Serial Number: BG18657
Calibration Date: March 13, 2017
Calibration Equipment: 714J7401

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By:

Tuyen Bui

Instantel

Calibration Certificate

Part Number:	714A9701
Description:	TRIAXIAL GEOPHONE (ISEE)
Serial Number:	BG16603
Calibration Date:	March 13, 2017
Calibration Equipment:	714J7401

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By:

Tuyen Bui

Instantel

Inspection Certificate

INSPECTOR

M. Hidaka

We hereby certify that this product has been tested and calibrated at our factory according to RION specifications and that the product satisfies all relevant requirements.

RION CO., LTD.
3-20-41 Higashimotomachi, Kokubunji,
Tokyo 185-8533,
Japan

Sound and Vibration Measuring Instrument Section Product information and software downloads can be found on our web-site:
http://svmeas.rion.co.jp/
Please check it out.

№C14070200

~Certificate of Calibration~

Manufacturer: The Modal Shop
Model Number: 9100D
Serial Number: 737
Description: Portable Vibration Calibrator
Test Procedure: PRD-P278
Calibration Tech: BTH
Customer: TMS Rental

Calibration Date: 15-Nov-16
Calibration Due:
Temperature: 69.9 °F
21.1 °C
Humidity: 29.7 %

As found: In Tolerance
As left: In Tolerance

Internal Reference 10.18 **mV/g**
Sensitivity @ 100 Hz: 1.04 **mV/m/s^2**
(Measured at Monitor Reference Out BNC)

Reference Equipment:

Manufacturer	Description	Model Number	Serial Number	Due Date
PCB	Standard Sensor	353B02	126967	8/24/2017
PCB	Signal Cond.	442A102	299	8/23/2017
HP	DMM	34401A	US36061937	3/1/2017

	Standard Sensor		Unit Under Test		% difference
Frequency Hz	Measured Acceleration Level g pk	m/s^2	Displayed Acceleration Level g pk	m/s^2	Displayed / Measured
7	0.40	3.92	0.40	3.92	-0.01%
10	0.81	7.97	0.81	7.94	-0.36%
30	1.00	9.82	1.00	9.81	-0.18%
50	1.00	9.83	1.00	9.81	-0.21%
80	1.00	9.81	1.00	9.81	-0.08%
100	1.00	9.81	1.00	9.81	-0.04%
160	1.00	9.81	1.00	9.81	0.01%
300	1.00	9.78	1.00	9.81	0.23%
500	1.00	9.80	1.00	9.81	0.07%
1000	1.00	9.81	1.00	9.81	-0.05%
2000	1.00	9.80	1.00	9.81	0.11%
3000	1.00	9.82	1.00	9.81	-0.14%
4000	1.00	9.83	1.00	9.81	-0.26%
5000	1.00	9.83	1.00	9.81	-0.20%
6000	1.00	9.83	1.00	9.81	-0.26%
8000	1.00	9.79	1.00	9.81	0.19%
9000	1.01	9.86	1.00	9.81	-0.54%
10000	1.00	9.86	1.00	9.81	-0.49%

Notes:

1. This document certifies that the above meets published specifications.
2. The equipment referenced above has been calibrated using standards traceable to NIST (Project Number 822/271196) and PTB (Project Number 5399). Evidence of traceability is on file at The Modal Shop.
3. The results documented in this certificate relate only to the items tested or calibrated.
4. This certificate may not be reproduced, except in full, without the written consent of The Modal Shop, Inc.
5. Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 7<10 Hz; ±4.0%, 10<30 Hz; ± 3.0%, 30<100 Hz; ± 1.5%, 100 Hz; ± 1.5%, 100<2000 Hz; ± 1.5%, 2000-10,000 Hz; ± 4.0%.

ACCREDITED
Calibration Lab
Certificate Number 2649-01

THE MODAL SHOP INC.
A PCB GROUP CO.

The Modal Shop Inc.
3149 East Kemper Road
Cincinnati, Ohio 45241
+1-513-351-9919
www.modalshop.com

PRD-F256 revH 7/29/2016

Calibration ID: 11/15/16 13:55

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	45425
Manufacturer:	PCB
ID Number:	57375
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	1,018	mV/g
Phase @ 100 Hz:	-0.79	deg.
Test Level:	1.00	g

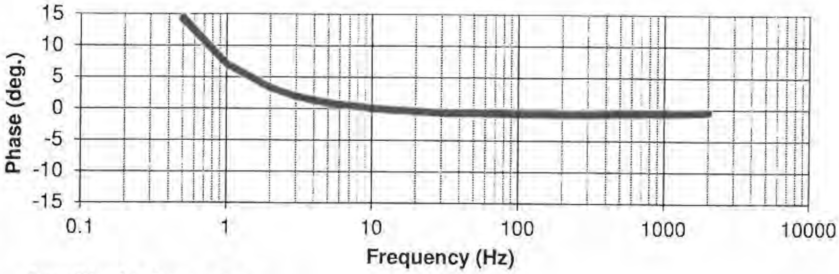
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

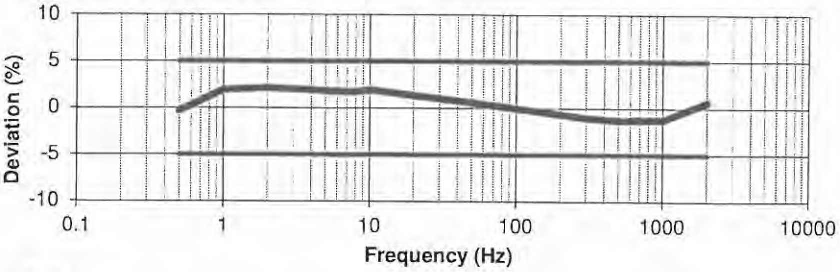
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-0.2915	14.3374
1	1.9348	7.0367
2	2.1489	3.3279
3	2.0076	1.9670
4	1.9400	1.2892
5	1.8285	0.9055
6.3	1.7641	0.5977
7	1.7406	0.4726
8	1.7297	0.3241
10	1.9534	0.0352
30	1.0067	-0.6202
50	0.5890	-0.6551
100	0.0000	-0.7926
300	-1.0348	-0.8246
500	-1.2988	-0.7250
1000	-1.2402	-0.6726
2000	0.6648	-0.4698

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.

This certificate may not be reproduced except in full, without written permision.

Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21

This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0

Calibration traceable to NIST (project number 822/271196).

Back-to-Back Comparison Calibration per ISO 16063-21

Procedures Used: PRD-P220, PRD-P214

Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	78 (26)	°F (°C)
Humidity:	33	%

Cal Date: 12-Apr-17
Due Date:

Approval Information

Technician: Ed Devlin
Approval:

ACCREDITED
2649.01

Cal ID: 32908 Calibration Lab

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	45222
Manufacturer:	PCB
ID Number:	57377
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 10 Hz:	1,008	mV/g
Phase @ 10 Hz:	0.03	deg.
Test Level:	1.00	g
Output Bias Level:	11.1	VDC

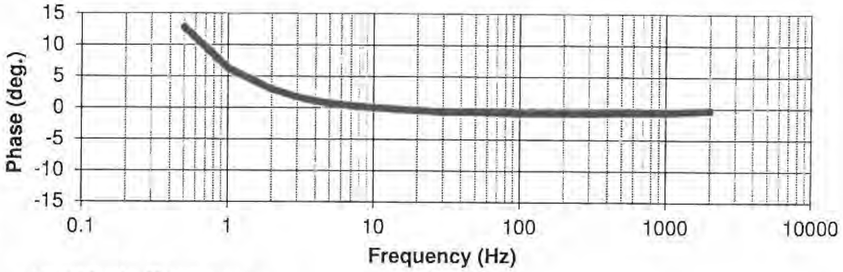
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

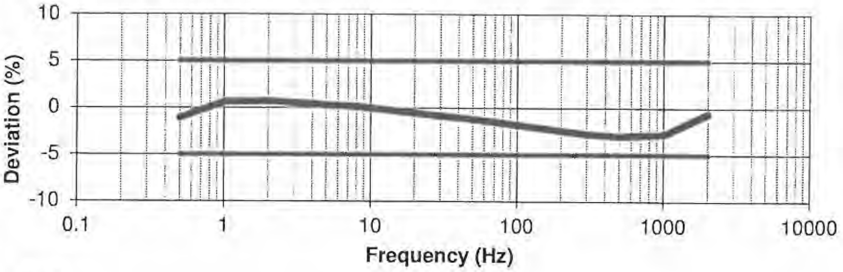
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-1.1135	12.8169
1	0.6316	6.2437
2	0.7043	2.9073
3	0.5200	1.6752
4	0.4246	1.0607
5	0.2988	0.7223
6.3	0.2181	0.4402
7	0.1874	0.3299
8	0.1677	0.1897
10	0.0000	0.0290
30	-0.8181	-0.6411
50	-1.2135	-0.6711
100	-1.7880	-0.7841
300	-2.7910	-0.7894
500	-3.0108	-0.6941
1000	-2.8024	-0.5980
2000	-0.5789	-0.3170

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
This certificate may not be reproduced except in full, without written permision.
Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	74 (23)	°F (°C)
Humidity:	44	%

Unit Condition

As Found:	In Tolerance
As Left:	In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 1-May-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

ACCREDITED
2649.01

Cal ID: 33051 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
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~Calibration Certificate~

Sensor Information

Model Number:	393A03
Serial Number:	45215
Manufacturer:	PCB
ID Number:	57379
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 10 Hz:	998.5	mV/g
Phase @ 10 Hz:	-0.09	deg.
Test Level:	1.00	g
Output Bias Level:	11.1	VDC

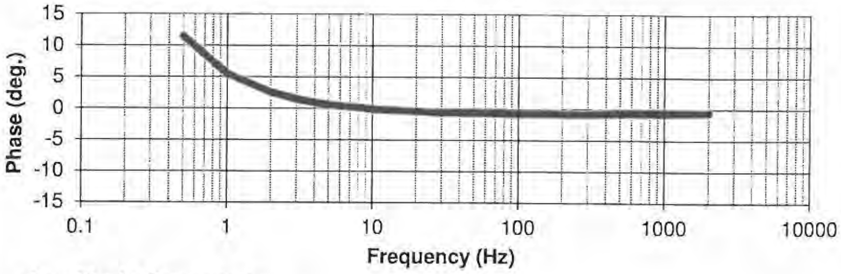
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

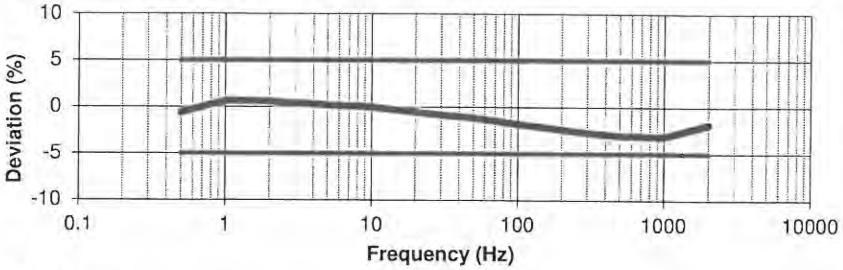
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-0.6098	11.4590
1	0.6453	5.4998
2	0.5800	2.5505
3	0.3932	1.4523
4	0.3126	0.9052
5	0.1979	0.5990
6.3	0.1280	0.3524
7	0.1046	0.2527
8	0.0931	0.1335
10	0.0000	-0.0883
30	-0.8297	-0.6485
50	-1.1549	-0.7093
100	-1.7910	-0.7903
300	-2.7340	-0.8262
500	-3.0301	-0.7639
1000	-3.1325	-0.7363
2000	-1.8563	-0.5469

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
This certificate may not be reproduced except in full, without written permision.
Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	73 (23)	°F (°C)
Humidity:	45	%

Unit Condition

As Found:	In Tolerance
As Left:	In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date:	1-May-17
Due Date:	

Approval Information

Technician:	Adam Magee
Approval:	Adam Mage

ACCREDITED
2649.01

Cal ID: 33048 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	44845
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 10 Hz:	1,020	mV/g
Phase @ 10 Hz:	0.10	deg.
Test Level:	1.00	g
Output Bias Level:	10.9	VDC

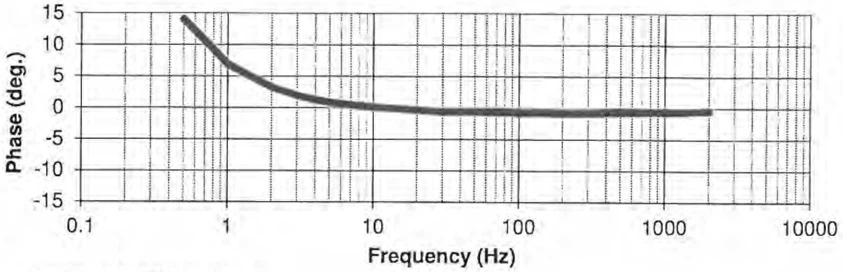
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

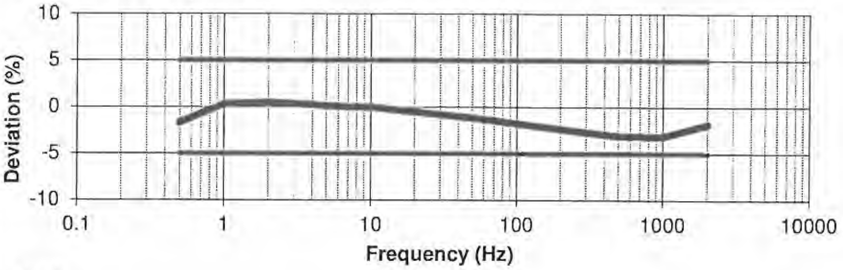
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-1.6633	14.0828
1	0.3320	6.9124
2	0.5019	3.2741
3	0.3457	1.9269
4	0.2598	1.2567
5	0.1370	0.8809
6.3	0.0631	0.5768
7	0.0373	0.4531
8	0.0206	0.2999
10	0.0000	0.0988
30	-0.8043	-0.5776
50	-1.1777	-0.6396
100	-1.7727	-0.7828
300	-2.7257	-0.8487
500	-3.1080	-0.7200
1000	-3.1394	-0.6401
2000	-1.8636	-0.4417

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.

This certificate may not be reproduced except in full, without written permision.

Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21

This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0

Calibration traceable to NIST (project number 822/271196).

Back-to-Back Comparison Calibration per ISO 16063-21

Procedures Used: PRD-P220, PRD-P214

Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	73 (23)	°F (°C)
Humidity:	45	%

Cal Date: 1-May-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

A2LA
ACCREDITED
2649.01
Calibration Lab

Cal ID: 33049

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	44846
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 10 Hz:	1,017	mV/g
Phase @ 10 Hz:	-0.10	deg.
Test Level:	1.00	g

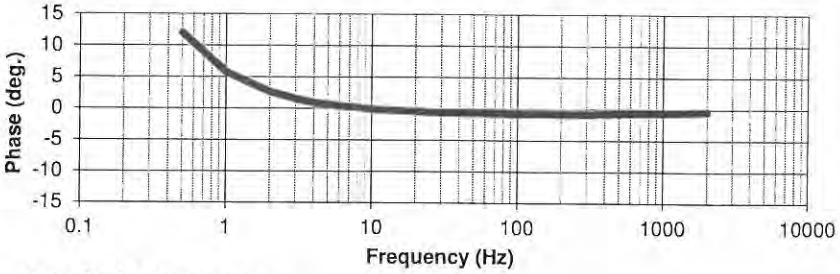
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

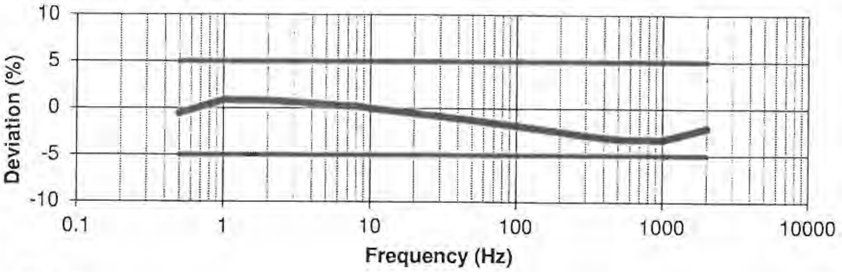
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-0.5587	12.0484
1	0.8912	5.7700
2	0.8196	2.6535
3	0.6069	1.4987
4	0.5040	0.9244
5	0.3717	0.6057
6.3	0.2843	0.3512
7	0.2564	0.2460
8	0.2369	0.1216
10	0.0000	-0.1049
30	-0.8271	-0.6569
50	-1.2656	-0.6832
100	-1.8599	-0.8089
300	-2.8676	-0.8467
500	-3.2330	-0.7538
1000	-3.2950	-0.6500
2000	-2.0466	-0.3827

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.

This certificate may not be reproduced except in full, without written permision.

Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21

This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0

Calibration traceable to NIST (project number 822/271196).

Back-to-Back Comparison Calibration per ISO 16063-21

Procedures Used: PRD-P220, PRD-P214

Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	74 (23)	°F (°C)
Humidity:	23	%

Cal Date: 1-May-17
Due Date:

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Approval Information

Technician: Adam Magee
Approval:

ACCREDITED
2649.01

Cal ID: 33050 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number: 393A03
Serial Number: 9929
Manufacturer: PCB
ID Number:
Description: ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz: 964.6 mV/g
Phase @ 100 Hz: -1.10 deg.
Test Level: 1.00 g

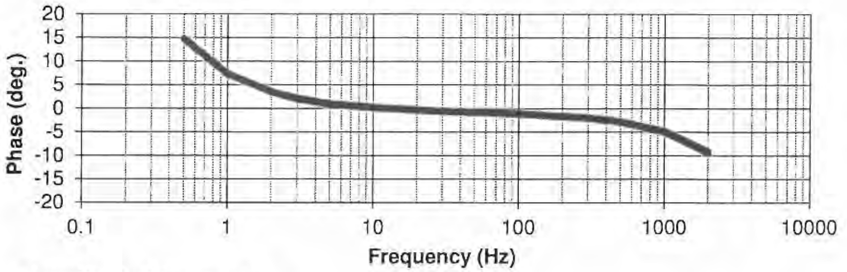
Transducer Specifications

Amp. Range: ± 5 g
Resolution: 0.00001 g
Resonant Freq: ≥ 10000 Hz
Temp. Range: -54 to 121 °C
-65 to 250 °F
Axis: Uni-Axial

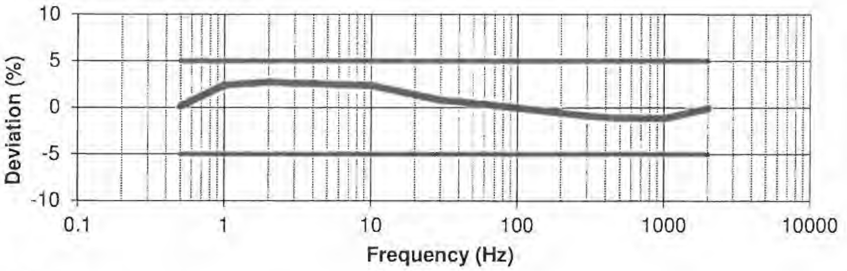
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	0.1460	14.8407
1	2.4466	7.2979
2	2.7250	3.4906
3	2.6339	2.0978
4	2.5998	1.3952
5	2.5111	0.9938
10	2.4028	0.1639
30	0.8193	-0.6213
50	0.4846	-0.7569
100	0.0000	-1.1029
300	-0.8579	-1.9983
500	-1.1467	-2.7925
1000	-1.1617	-4.9268
2000	-0.0736	-9.2554

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
This certificate may not be reproduced except in full, without written permision.
Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature: 73 (23) °F (°C)
Humidity: 47 %

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 13-Jun-17
Due Date:

Approval Information

Technician: Ed Devlin
Approval:

ACCREDITED
2649.01

Cal ID: 33430 Calibration Lab

THE MODAL SHOP INC.
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~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	9744
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	968.3	mV/g
Phase @ 100 Hz:	-1.09	deg.
Test Level:	1.00	g

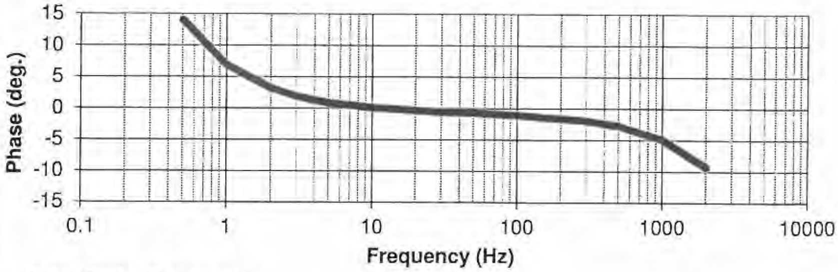
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

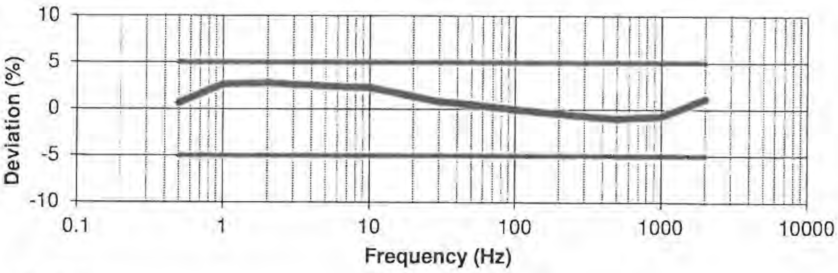
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	0.6634	14.0687
1	2.6507	6.8486
2	2.7916	3.2376
3	2.6457	1.9107
4	2.5715	1.2502
5	2.4521	0.8785
10	2.3113	0.0987
30	0.8088	-0.5930
50	0.4883	-0.7343
100	0.0000	-1.0851
300	-0.7330	-1.9680
500	-0.9550	-2.7506
1000	-0.7384	-4.9059
2000	1.1390	-9.2614

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.

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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21

This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0

Calibration traceable to NIST (project number 822/271196).

Back-to-Back Comparison Calibration per ISO 16063-21

Procedures Used: PRD-P220, PRD-P214

Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	72 (22)	°F (°C)
Humidity:	48	%

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 13-Jun-17
Due Date:

Approval Information

Technician: Ed Devlin
Approval:

A2LA ACCREDITED
2649.01

Cal ID: 33429 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	9740
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	968.9	mV/g
Phase @ 100 Hz:	-1.06	deg.
Test Level:	1.00	g

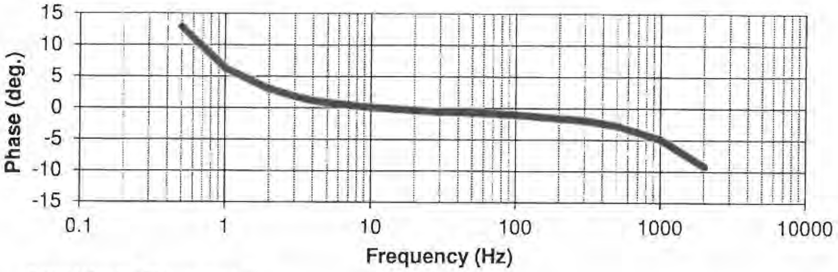
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	℃
	-65 to 250	℉
Axis:	Uni-Axial	

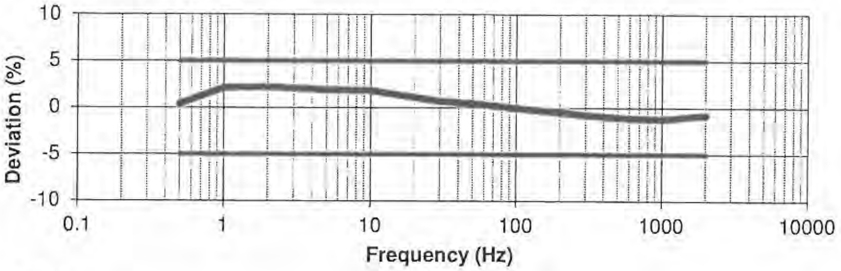
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	0.4368	12.8537
1	2.1215	6.3121
2	2.1920	2.9905
3	2.0591	1.7704
4	2.0083	1.1539
5	1.9173	0.8060
10	1.8332	0.0919
30	0.7163	-0.5813
50	0.4383	-0.7298
100	0.0000	-1.0599
300	-0.7844	-1.9749
500	-1.0657	-2.7788
1000	-1.2420	-4.9366
2000	-0.7733	-9.1197

Phase Response



Amplitude Response



Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Notes

Results relate only to the items calibrated.

This certificate may not be reproduced except in full, without written permision.

Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21

This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0

Calibration traceable to NIST (project number 822/271196).

Back-to-Back Comparison Calibration per ISO 16063-21

Procedures Used: PRD-P220, PRD-P214

Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Lab Conditions

Temperature:	72 (22)	℉ (℃)
Humidity:	49	%

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 13-Jun-17
Due Date:

Approval Information

Technician: Ed Devlin
Approval:

ACCREDITED
2649.01

Cal ID: 33427 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number: 393A03
Serial Number: 9741
Manufacturer: PCB
ID Number:
Description: ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	1,003	mV/g
Phase @ 100 Hz:	-1.13	deg.
Test Level:	0.10	g
Output Bias Level:	11.2	VDC

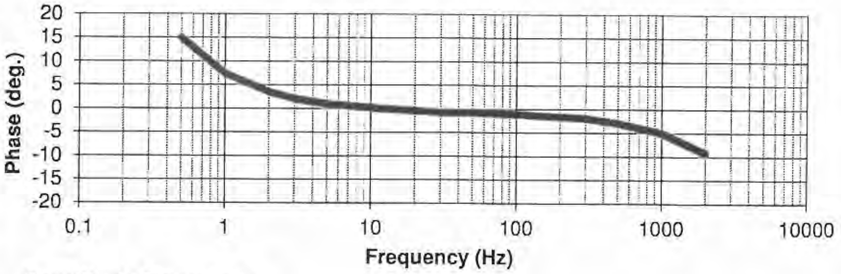
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	℃
	-65 to 250	℉
Axis:	Uni-Axial	

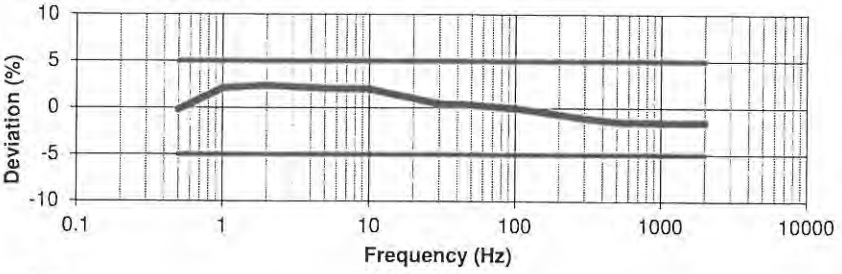
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-0.2182	14.9713
1	2.0967	7.3479
2	2.3685	3.5216
3	2.2294	2.1083
4	2.1618	1.4108
5	2.0589	1.0114
10	2.0020	0.2004
30	0.4310	-0.7074
50	0.3327	-0.7549
100	0.0000	-1.1345
300	-1.1128	-1.9284
500	-1.4478	-2.9267
1000	-1.5752	-4.9688
2000	-1.5316	-9.2195

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
This certificate may not be reproduced except in full, without written permision.
Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature: 71 (21) ℉ (℃)
Humidity: 41 %

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 8-Jun-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

ACCREDITED
2649.01

Cal ID: 33369 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number: 393A03
Serial Number: 9956
Manufacturer: PCB
ID Number:
Description: ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	973.9	mV/g
Phase @ 100 Hz:	-1.16	deg.
Test Level:	0.10	g
Output Bias Level:	10.6	VDC

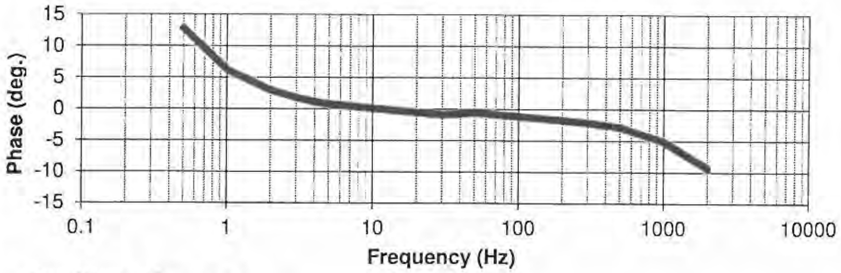
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

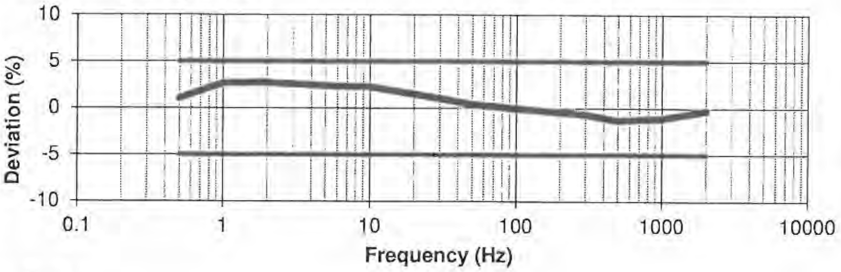
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	1.0523	12.8074
1	2.7045	6.2058
2	2.7462	2.9357
3	2.5800	1.7174
4	2.4945	1.1215
5	2.3803	0.7830
10	2.2643	0.1062
30	1.0484	-0.9311
50	0.3738	-0.6138
100	0.0000	-1.1559
300	-0.6779	-2.1485
500	-1.2938	-2.8624
1000	-1.1044	-5.1224
2000	-0.2883	-9.3312

Phase Response



Amplitude Response



Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Notes

Results relate only to the items calibrated.

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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21

This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0

Calibration traceable to NIST (project number 822/271196).

Back-to-Back Comparison Calibration per ISO 16063-21

Procedures Used: PRD-P220, PRD-P214

Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Lab Conditions

Temperature: 73 (23) °F (°C)
Humidity: 42 %

Cal Date: 8-Jun-17
Due Date:

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Approval Information

Technician: Adam Magee
Approval: Adam L Magee

A2LA ACCREDITED
2649.01

Cal ID: 33370 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	9934
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	966.7	mV/g
Phase @ 100 Hz:	-1.12	deg.
Test Level:	0.10	g
Output Bias Level:	10.8	VDC

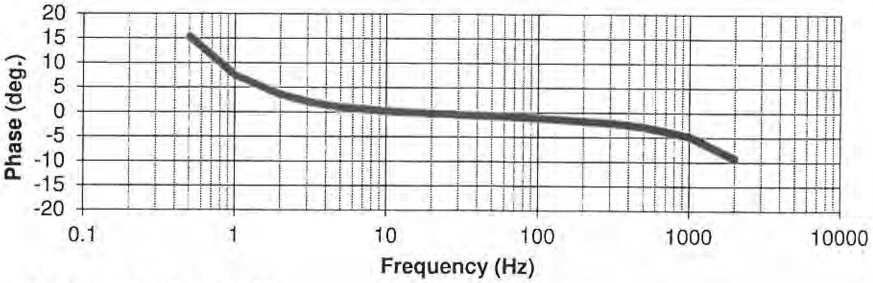
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

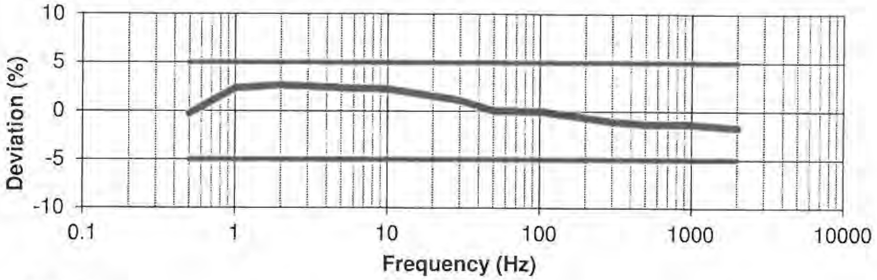
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-0.2641	15.3261
1	2.3445	7.5114
2	2.6732	3.5901
3	2.5402	2.1568
4	2.4832	1.4287
5	2.3831	1.0220
10	2.2781	0.1887
30	1.1267	-0.4813
50	0.0256	-0.7413
100	0.0000	-1.1228
300	-1.0557	-2.1061
500	-1.3206	-2.8762
1000	-1.3140	-4.7608
2000	-1.6992	-9.3112

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	72 (22)	°F (°C)
Humidity:	40	%

Cal Date: 8-Jun-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

ACCREDITED
2649.01

Cal ID: 33368 Calibration Lab

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

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~Calibration Certificate~

Sensor Information
Model Number: 393A03
Serial Number: 9932
Manufacturer: PCB
ID Number:
Description: ICP® Accelerometer

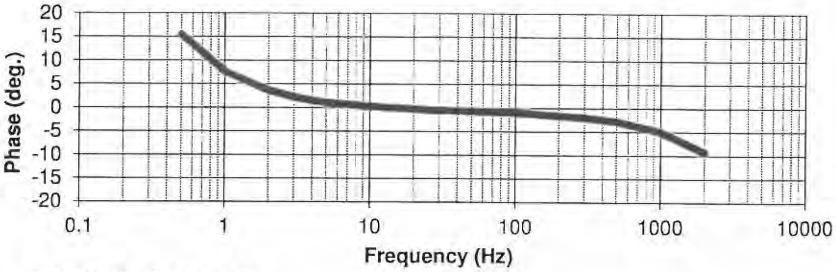
Calibration Data
Sensitivity @ 100 Hz: 971.6 mV/g
Phase @ 100 Hz: -1.00 deg.
Test Level: 1.00 g

Transducer Specifications
Amp. Range: ± 5 g
Resolution: 0.00001 g
Resonant Freq: ≥ 10000 Hz
Temp. Range: -54 to 121 °C
-65 to 250 °F
Axis: Uni-Axial

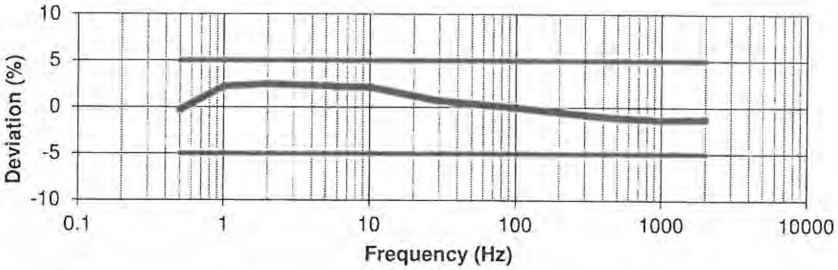
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-0.3003	15.4549
1	2.2097	7.6314
2	2.5087	3.6612
3	2.4025	2.2123
4	2.3422	1.4869
5	2.2335	1.0771
10	2.1481	0.2189
30	0.6961	-0.5386
50	0.3659	-0.6898
100	0.0000	-0.9978
300	-0.8132	-1.9821
500	-1.1429	-2.8049
1000	-1.3473	-4.9752
2000	-1.2666	-9.3066

Phase Response



Amplitude Response



Notes
Results relate only to the items calibrated.
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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer
TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions
Temperature: 72 (22) °F (°C)
Humidity: 48 %

Unit Condition
As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 13-Jun-17
Due Date:

Approval Information
Technician: Ed Devlin
Approval:

ACCREDITED
2649.01
Cal ID: 33428 Calibration Lab

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Sensor Information

Model Number:	393A03
Serial Number:	9742
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	970.5	mV/g
Phase @ 100 Hz:	-1.03	deg.
Test Level:	0.10	g
Output Bias Level:	10.7	VDC

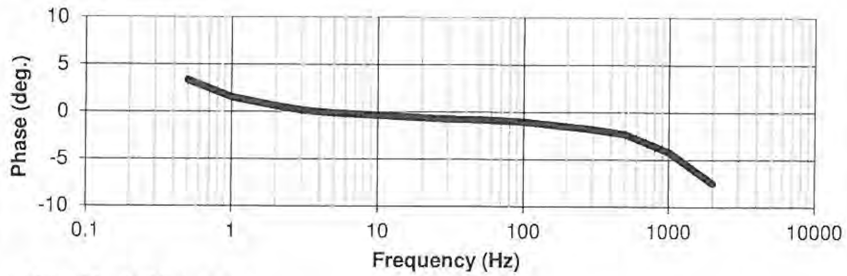
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

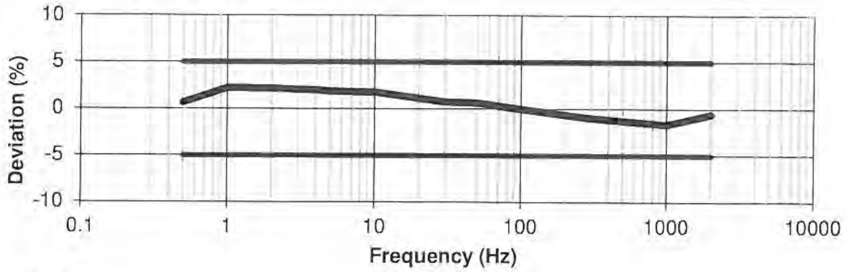
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	0.6431	3.3454
1	2.2072	1.5210
2	2.1783	0.5994
3	2.0416	0.1690
4	1.9965	-0.0405
5	1.8783	-0.1430
10	1.7895	-0.3660
30	0.7412	-0.7635
50	0.6287	-0.8197
100	0.0000	-1.0307
300	-1.0111	-1.7955
500	-1.3015	-2.3203
1000	-1.6534	-4.1751
2000	-0.5625	-7.4702

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	73 (23)	°F (°C)
Humidity:	40	%

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	5/26/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	5/26/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 8-Jun-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

ACCREDITED
2649.01

Cal ID: 33365 Calibration Lab

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Sensor Information

Model Number: 393A03
Serial Number: 9958
Manufacturer: PCB
ID Number:
Description: ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	969.9	mV/g
Phase @ 100 Hz:	-1.06	deg.
Test Level:	0.10	g
Output Bias Level:	10.9	VDC

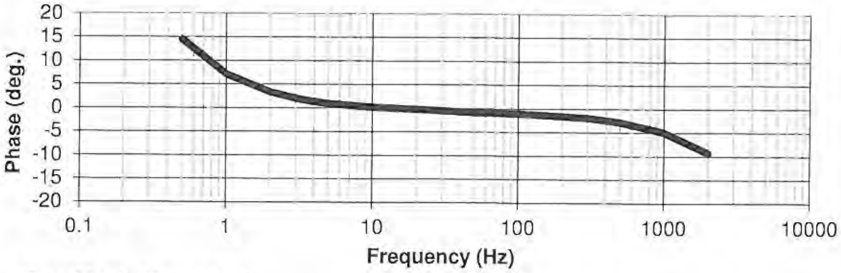
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

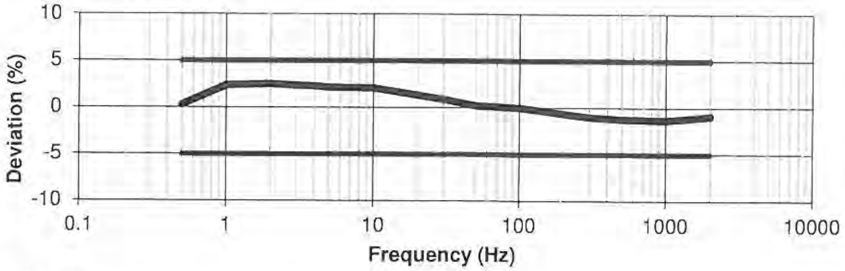
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	0.2945	14.5395
1	2.3522	7.1235
2	2.4935	3.4015
3	2.3452	2.0355
4	2.2601	1.3675
5	2.1439	0.9807
10	2.0645	0.1914
30	0.8666	-0.4803
50	0.2008	-0.9481
100	0.0000	-1.0618
300	-1.0181	-1.9102
500	-1.2434	-2.7940
1000	-1.3185	-4.9419
2000	-0.9006	-9.2688

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature: 71 (22) °F (°C)
Humidity: 48 %

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 18-May-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

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2649.01

Cal ID: 33228 Calibration Lab

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Sensor Information

Model Number:	393A03
Serial Number:	9931
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	971.4	mV/g
Phase @ 100 Hz:	-1.23	deg.
Test Level:	0.10	g
Output Bias Level:	11.1	VDC

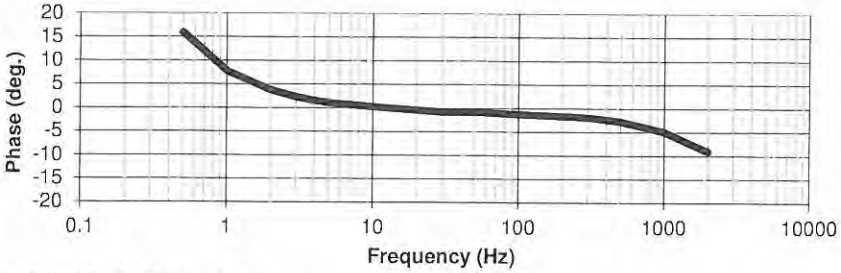
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

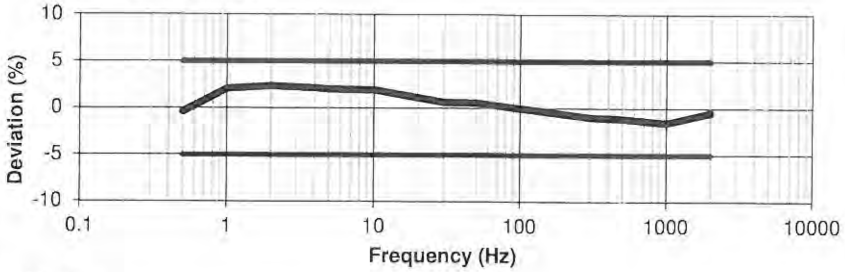
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	-0.3968	15.9428
1	2.0763	7.8250
2	2.3447	3.7473
3	2.2094	2.2686
4	2.1276	1.5404
5	2.0203	1.1236
10	1.9314	0.2602
30	0.6188	-0.8614
50	0.5474	-0.8662
100	0.0000	-1.2252
300	-0.9754	-1.9329
500	-1.1332	-2.7322
1000	-1.5468	-4.9339
2000	-0.4797	-9.0570

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	71 (22)	°F (°C)
Humidity:	48	%

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 18-May-17
Due Date:

Approval Information

Technician: Adam Magee
Approval: Adam L Magee

ACCREDITED
2649.01

Cal ID: 33227 Calibration Lab

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~Calibration Certificate~

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Sensor Information

Model Number: 393A03
Serial Number: 9936
Manufacturer: PCB
ID Number:
Description: ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	982.3	mV/g
Phase @ 100 Hz:	-1.02	deg.
Test Level:	0.10	g
Output Bias Level:	11.1	VDC

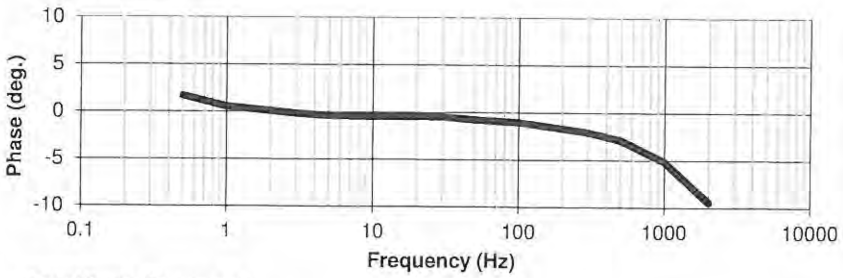
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

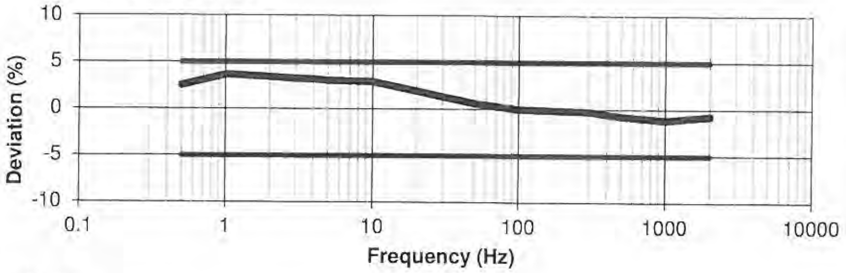
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	2.5389	1.6758
1	3.6505	0.5532
2	3.4411	0.0852
3	3.2377	-0.1819
4	3.1548	-0.3136
5	3.0307	-0.3705
10	2.8949	-0.4878
30	1.3206	-0.5077
50	0.5744	-0.7887
100	0.0000	-1.0174
300	-0.2601	-2.0952
500	-0.7458	-2.8948
1000	-1.1788	-5.1268
2000	-0.7210	-9.4229

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature: 72 (22) °F (°C)
Humidity: 39 %

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 22-May-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

ACCREDITED
2649.01

Cal ID: 33257 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

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Sensor Information

Model Number:	393A03
Serial Number:	9941
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	955.2	mV/g
Phase @ 100 Hz:	-1.09	deg.
Test Level:	0.10	g
Output Bias Level:	10.3	VDC

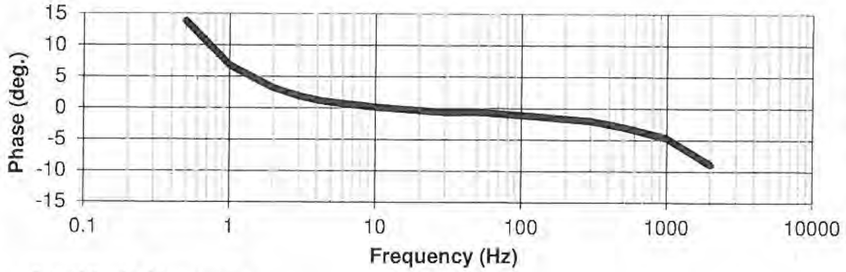
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	℃
	-65 to 250	℉
Axis:	Uni-Axial	

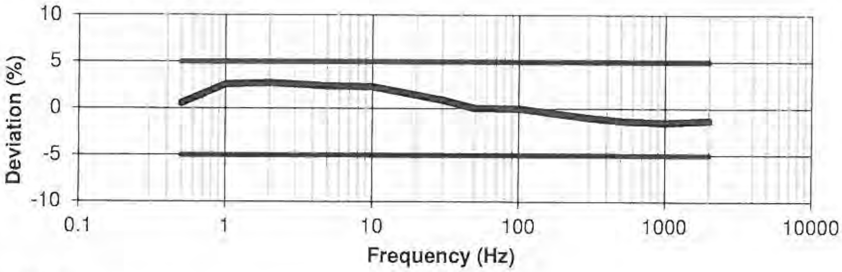
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	0.5687	13.8241
1	2.5855	6.7341
2	2.7435	3.2068
3	2.5906	1.9133
4	2.5132	1.2637
5	2.4008	0.9081
10	2.2934	0.1541
30	0.9069	-0.6844
50	0.0359	-0.6179
100	0.0000	-1.0917
300	-0.9995	-2.0280
500	-1.3254	-2.9475
1000	-1.5044	-4.7261
2000	-1.2844	-8.9008

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
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Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	71 (22)	℉ (℃)
Humidity:	41	%

Cal Date: 22-May-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

A2LA ACCREDITED
2649.01

Cal ID: 33253 Calibration Lab

THE MODAL SHOP INC.
A PCB GROUP CO.

~Calibration Certificate~

3149 East Kemper Rd.
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Ph : 513-351-9919
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www.modalshop.com

Sensor Information

Model Number:	393A03
Serial Number:	9957
Manufacturer:	PCB
ID Number:	
Description:	ICP® Accelerometer

Calibration Data

Sensitivity @ 100 Hz:	957.5	mV/g
Phase @ 100 Hz:	-1.18	deg.
Test Level:	0.10	g
Output Bias Level:	10.7	VDC

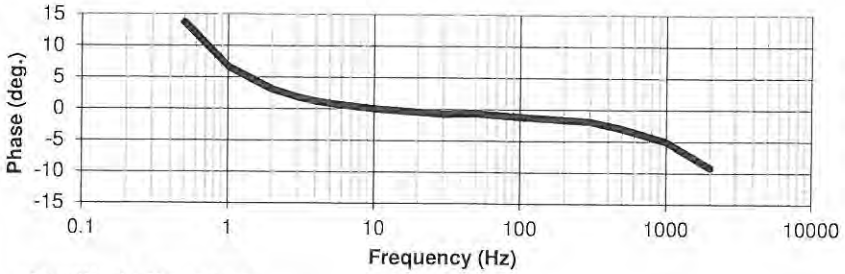
Transducer Specifications

Amp. Range:	± 5	g
Resolution:	0.00001	g
Resonant Freq:	≥ 10000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

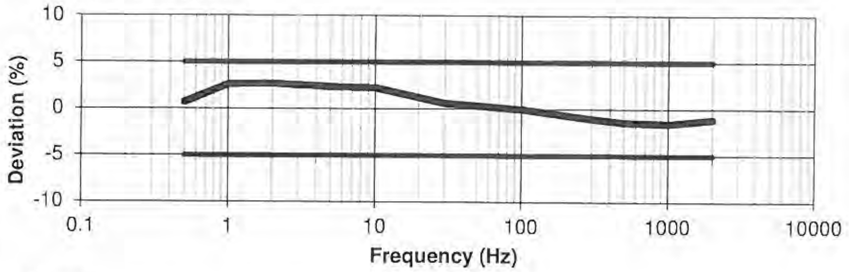
Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
0.5	0.6918	13.7296
1	2.6230	6.6705
2	2.7088	3.1478
3	2.5444	1.8604
4	2.4548	1.2172
5	2.3392	0.8531
10	2.2335	0.0403
30	0.5835	-0.7742
50	0.3314	-0.7177
100	0.0000	-1.1805
300	-1.0606	-1.9296
500	-1.4240	-2.9820
1000	-1.5611	-5.0476
2000	-1.1331	-9.1479

Phase Response



Amplitude Response



Notes

Results relate only to the items calibrated.
This certificate may not be reproduced except in full, without written permision.
Method: Back-to-Back Comparison Calibration per ISO 16063 Part 21
This calibration was performed with TMS 9155 Calibration Workstation 1 version 6.0.0
Calibration traceable to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO 16063-21
Procedures Used: PRD-P220, PRD-P214
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-1 Hz; 1.10%; >1-10 Hz; ± 0.80%, 11-99 Hz; ±1.20%, 100 Hz; ± 0.75%, 101-920 Hz; ± 1.00%, 921-5000 Hz; ± 1.40%, 5001-10,000 Hz; ± 1.90%, 10,001-15,000 Hz; ± 2.20%, 15,001-20,000 Hz; ± 2.8%.

Customer

TMS Rental
3149 E. Kemper Rd
Cincinnati, OH 45241

User Notes

Lab Conditions

Temperature:	71 (22)	°F (°C)
Humidity:	48	%

Unit Condition

As Found: In Tolerance
As Left: In Tolerance

Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	19A1EE8	8/18/2017
Ref Std Conditioner	NI	PCI-6251	136F2A3	10/25/2017
Reference Std	PCB	080A200	110553	2/13/2018
Air Bearing Shaker	PCB	396C11	603	n/a
Ref Std Conditioner	PCB	442A102	305	2/13/2018
SUT Signal Conditioner	PCB	443B101	373	11/7/2017
Power Amplifier	TMS	2100E21-C	50002	n/a
Reference Std	TMS	2129E025	111	10/25/2017
Long Stroke Shaker	TMS	2129E025-779	111	n/a

Cal Date: 18-May-17
Due Date:

Approval Information

Technician: Adam Magee
Approval:

ACCREDITED
2649.01

Cal ID: 33226 Calibration Lab

CRYSTAL
INSTRUMENTS

Crystal Instruments Corporation | 2370 Owen Street | Santa Clara, CA 95054 | Phone: (408) 986-8880 | Fax: (408) 834-7818 | www.crystalinstruments.com

CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-6423264

CALIBRATION CONDITIONS
Calibration Date: 06/06/2017
Due Date: 06/06/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version1.0)

INSTRUMENT/ID

Model: Spider-80Xi
Description: Vibration Control System

Serial No: 6423264

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3578018	FLUKE	8845A	08/19/2016	08/19/2017	2-Z50CK-2-1

TECHNICIAN: ____________ **QC:** ____________

CRYSTAL
INSTRUMENTS

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CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-6423424

CALIBRATION CONDITIONS
Calibration Date: 06/06/2017
Due Date: 06/06/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version1.0)

INSTRUMENT/ID

Model: Spider-80Xi **Serial No: 6423424**
Description: Vibration Control System

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3578018	FLUKE	8845A	08/19/2016	08/19/2017	2-Z50CK-2-1

TECHNICIAN: __________ **QC:** Liang Xi Zo

CRYSTAL
INSTRUMENTS

Crystal Instruments Corporation | 2370 Owen Street | Santa Clara, CA 95054 | Phone: (408) 986-8880 | Fax: (408) 834-7818 | www.crystalinstruments.com

CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-6423456

CALIBRATION CONDITIONS
Calibration Date: 06/06/2017
Due Date: 06/06/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version1.0)

INSTRUMENT/ID

Model: Spider-80Xi **Serial No: 6423456**
Description: Vibration Control System

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3578018	FLUKE	8845A	08/19/2016	08/19/2017	2-Z50CK-2-1

TECHNICIAN:_________ **QC:**____________

CRYSTAL
INSTRUMENTS

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CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-6423712

CALIBRATION CONDITIONS

Calibration Date: 06/06/2017
Due Date: 06/06/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version1.0)

INSTRUMENT/ID

Model: Spider-80Xi **Serial No: 6423712**
Description: Vibration Control System

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3578018	FLUKE	8845A	08/19/2016	08/19/2017	2-Z50CK-2-1

TECHNICIAN: ____________ **QC:** Liang Xi Zou ____________

CRYSTAL
INSTRUMENTS

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CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-5464128

CALIBRATION CONDITIONS

Calibration Date: 07/05/2017
Due Date: 07/05/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version 1.0)

INSTRUMENT/ID

Model: Spider-20 **Serial No: 5464128**
Description: Dynamic Signal Analyzer

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3177003	FLUKE	8845A	01/06/2017	01/06/2018	1-A9N4I-20-1

TECHNICIAN:

QC:

CRYSTAL
INSTRUMENTS

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CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-5462944

CALIBRATION CONDITIONS

Calibration Date: 4/6/2017
Due Date: 4/6/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30% RH
Cal Procedure: CI User's Manual (Version 1.0)

INSTRUMENT/ID

Model: Spider-20
Description: Dynamic Signal Analyzer

Serial No: 5462944

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3578018	FLUKE	8845A	08/19/2016	08/19/2017	2-Z50CK-2-1

TECHNICIAN:

QC:

CRYSTAL
INSTRUMENTS

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CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-5461792

CALIBRATION CONDITIONS

Calibration Date: 3/27/2017
Due Date: 3/27/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version1.0)

INSTRUMENT/ID

Model: Spider-20
Description: Dynamic Signal Analyzer
Serial No: 5461792

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3578018	FLUKE	8845A	08/19/2016	08/19/2017	2-Z50CK-2-1

TECHNICIAN: ____________

QC: Liang X. Zou ____________

CRYSTAL
INSTRUMENTS

Crystal Instruments Corporation | 2370 Owen Street | Santa Clara, CA 95054 | Phone: (408) 986-8880 | Fax: (408) 834-7818 | www.crystalinstruments.com

CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-5463520

CALIBRATION CONDITIONS

Calibration Date: 04/25/2017
Due Date: 04/25/2018
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version1.0)

INSTRUMENT/ID

Model: Spider-20 **Serial No: 5463520**
Description: Vibration Controller

This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

Standard Utilized

Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
1565012	FLUKE	8808A	05/25/2016	05/25/2017	TME-40037

TECHNICIAN: ____________

QC: ____________

CRYSTAL
INSTRUMENTS

Crystal Instruments Corporation | 2370 Owen Street | Santa Clara, CA 95054 | Phone: (408) 986-8880 | Fax: (408) 834-7818 | www.crystalinstruments.com

CERTIFICATE OF CALIBRATION

Certificate No. #: Rental-5460992

CALIBRATION CONDITIONS

Calibration Date: 11/01/2016
Due Date: 11/01/2017
Calibration Cycle: 12 Mo.
Temperature: 23 ± 5°C
Relative Humidity: 50 ± 30%RH
Cal Procedure: CI User's Manual (Version 1.0)

INSTRUMENT/ID

Model: Spider-20
Description: Dynamic Signal Analyzer

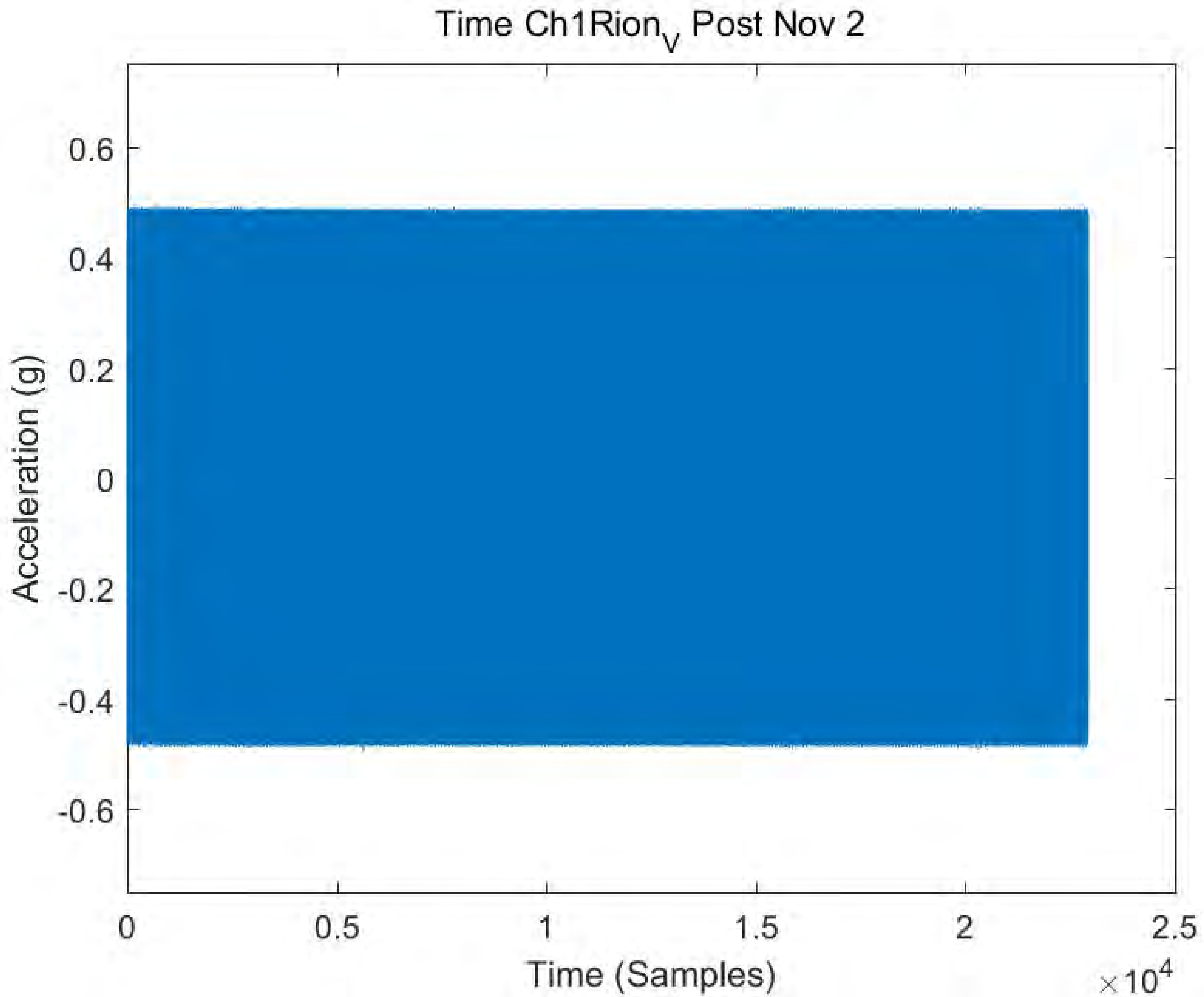
Serial No: 5460992

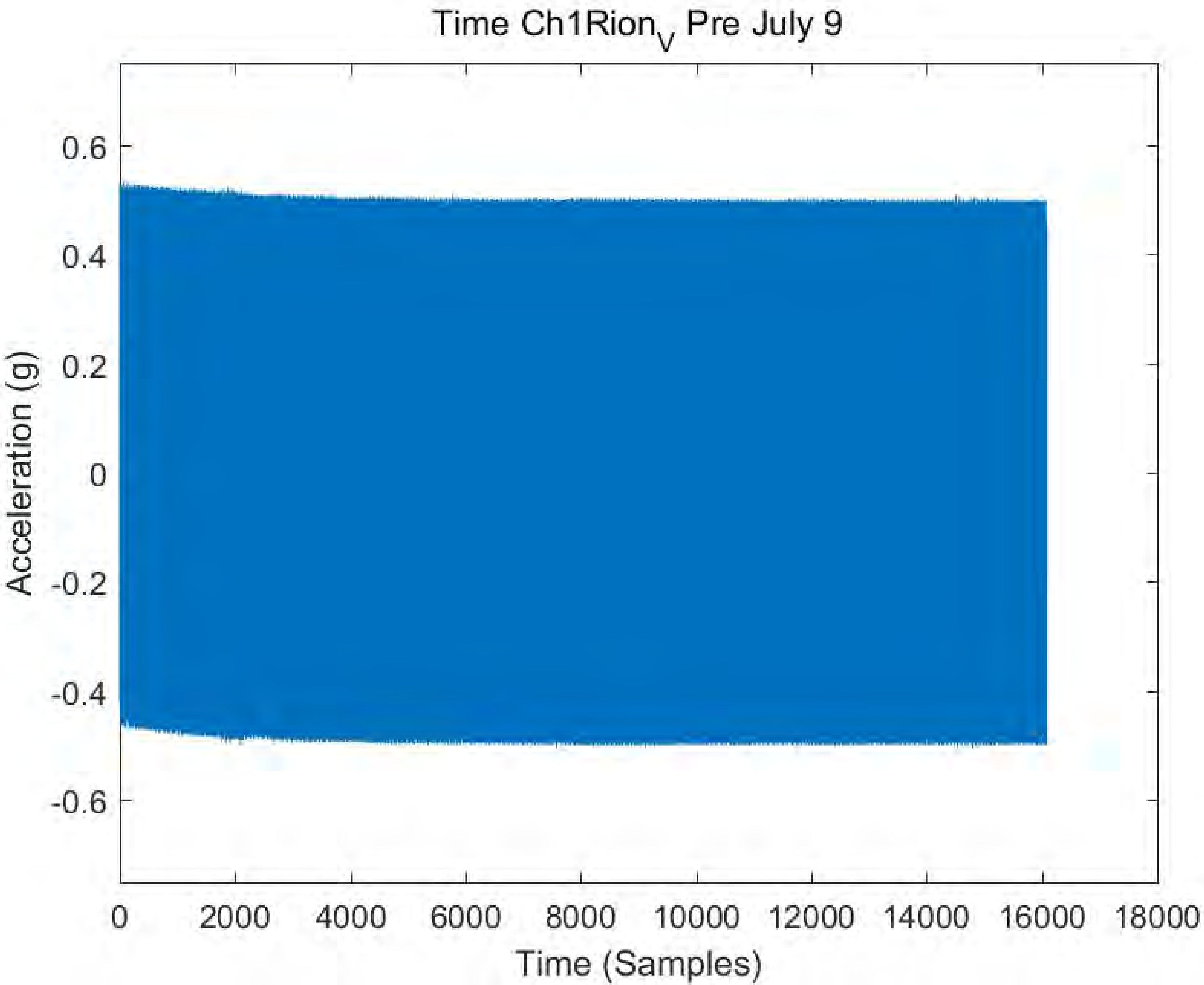
This certifies that the above instrument was calibrated in compliance with the quality system registered to ISO 9001:2008 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to NIST, natural physical constants, consensus standards or derived by ratio type calibrations. Expanded uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2sigma), no sampling plan or other process was used for this calibration, the results reported herein apply only to the item described above.

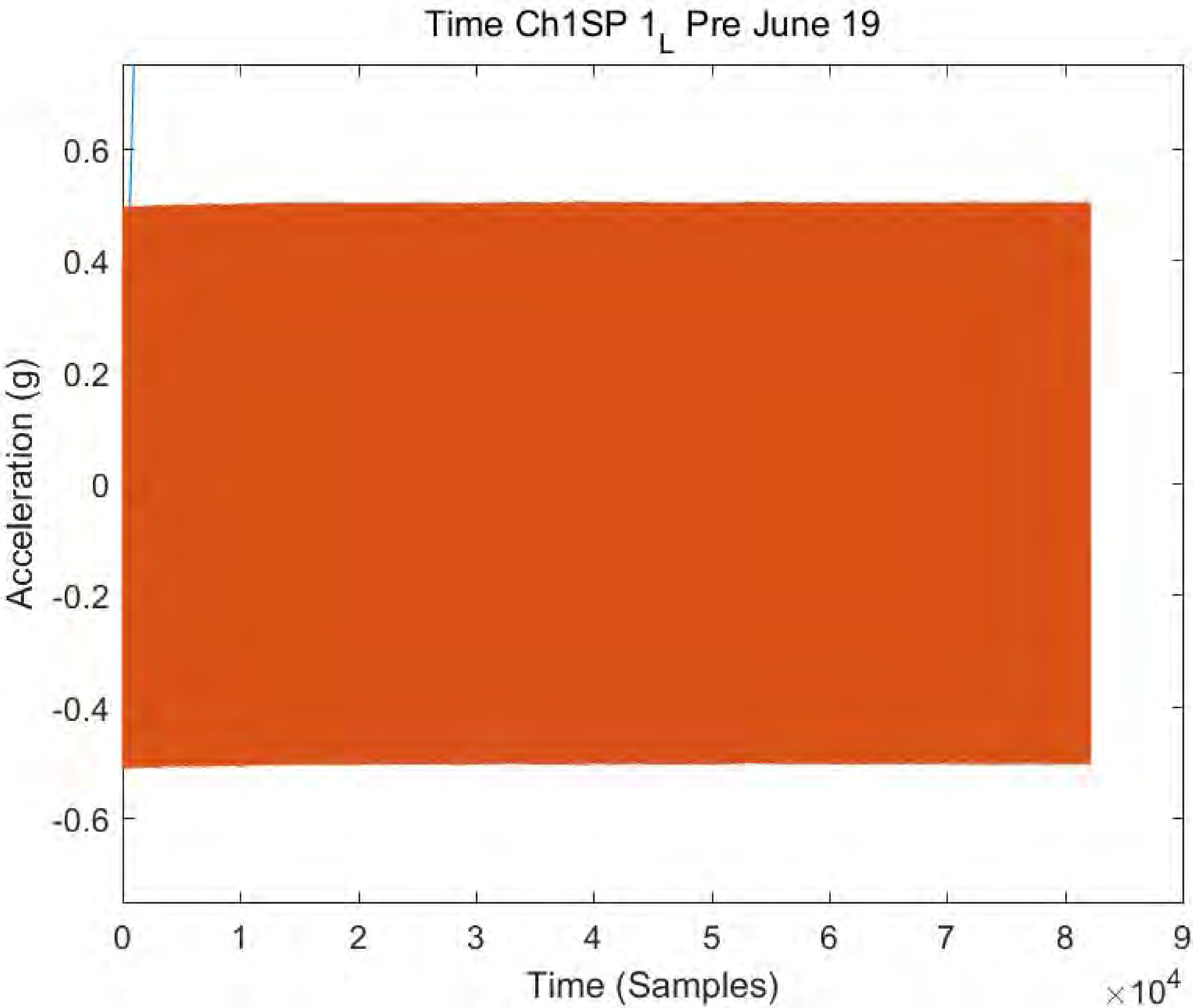
Standard Utilized

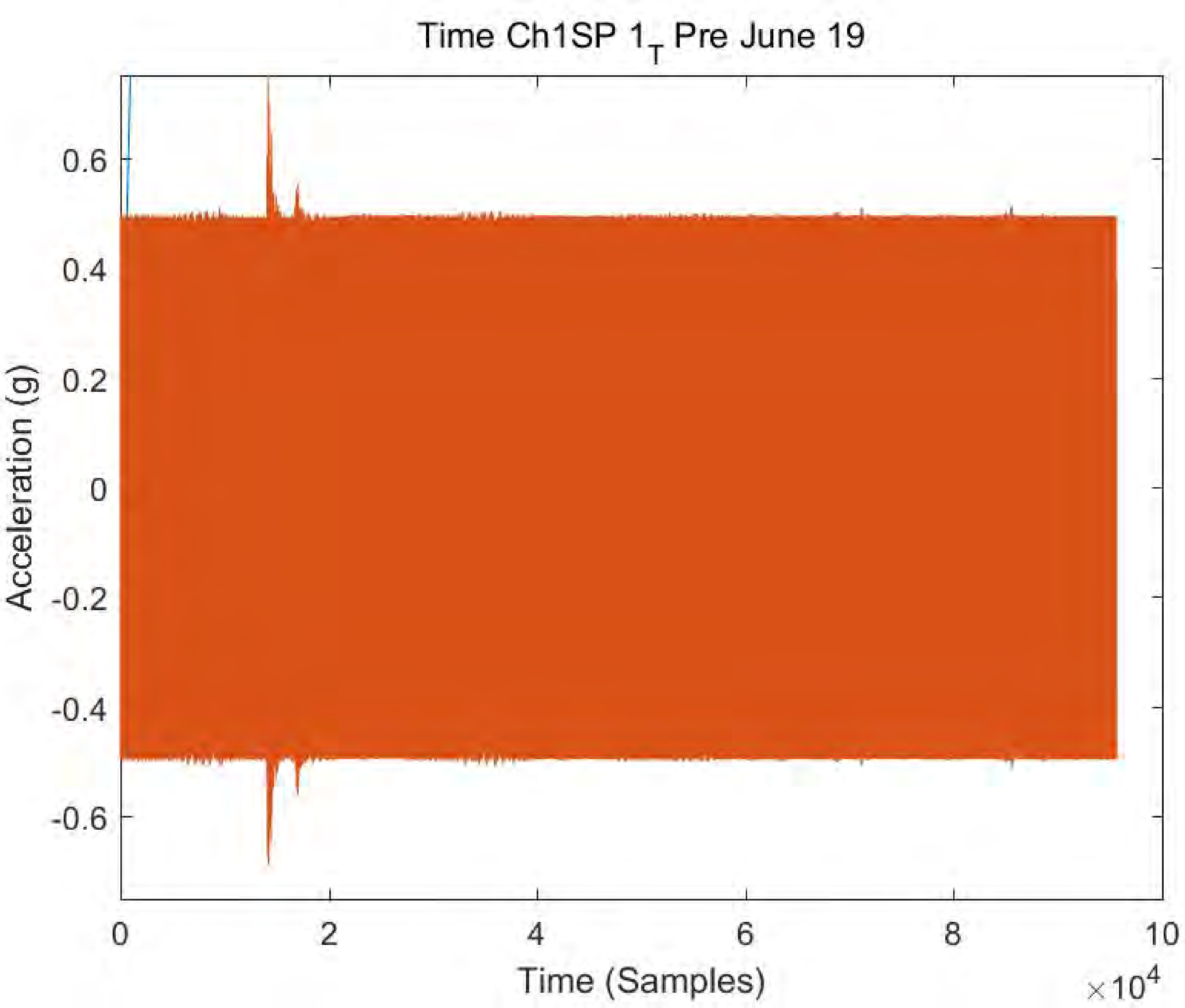
Serial Number	Manufacturer	Model No.	Calib.Date	Due Date	Traceability Cert.No.
3578018	FLUKE	8845A	08/19/2016	08/19/2017	2-Z50CK-2-1

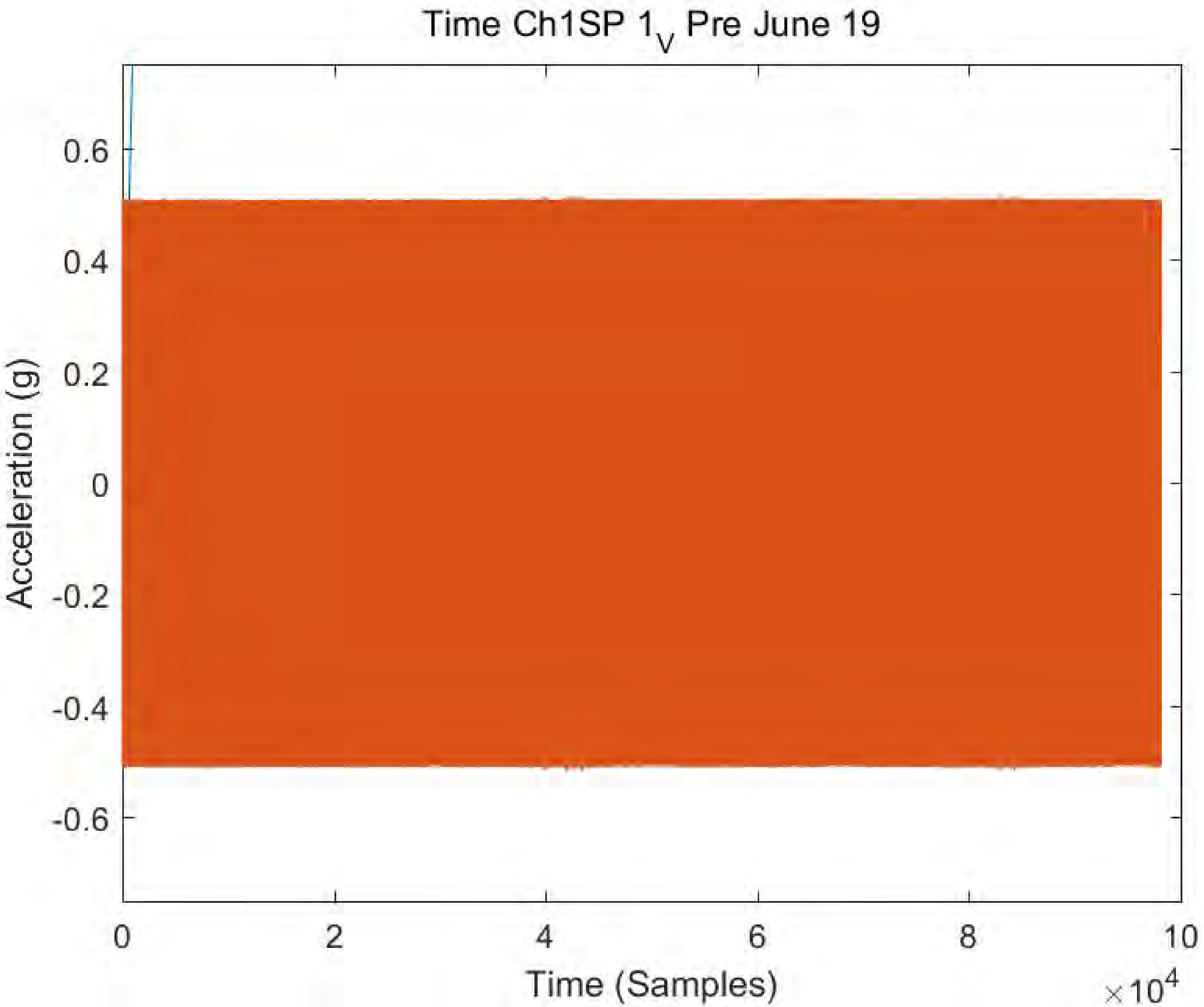
TECHNICIAN:__________ **QC:**__________

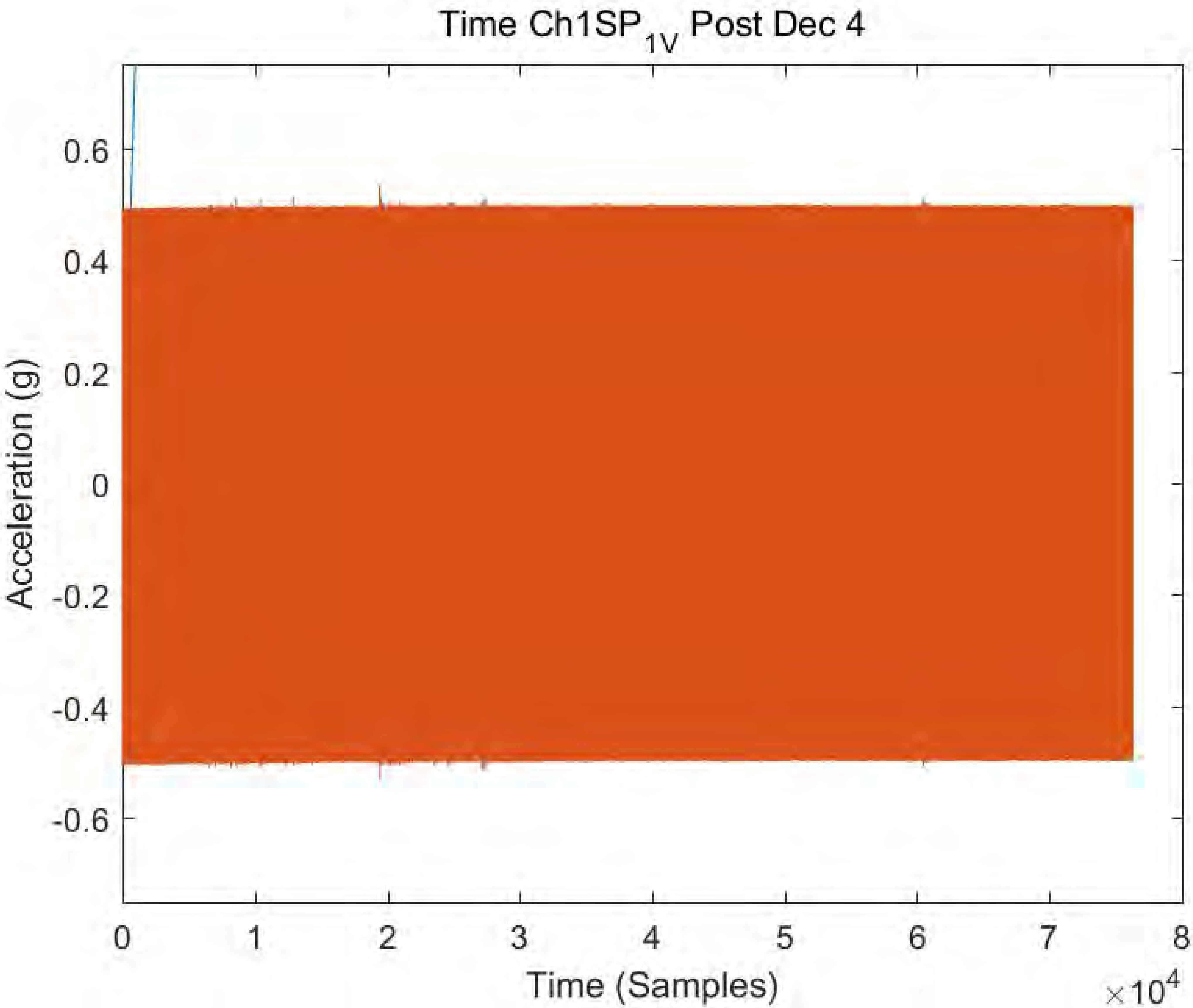

Time Ch1Rion$_V$ Post Nov 2
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
0.5
1
1.5
2
2.5
Time (Samples)
$\times 10^4$

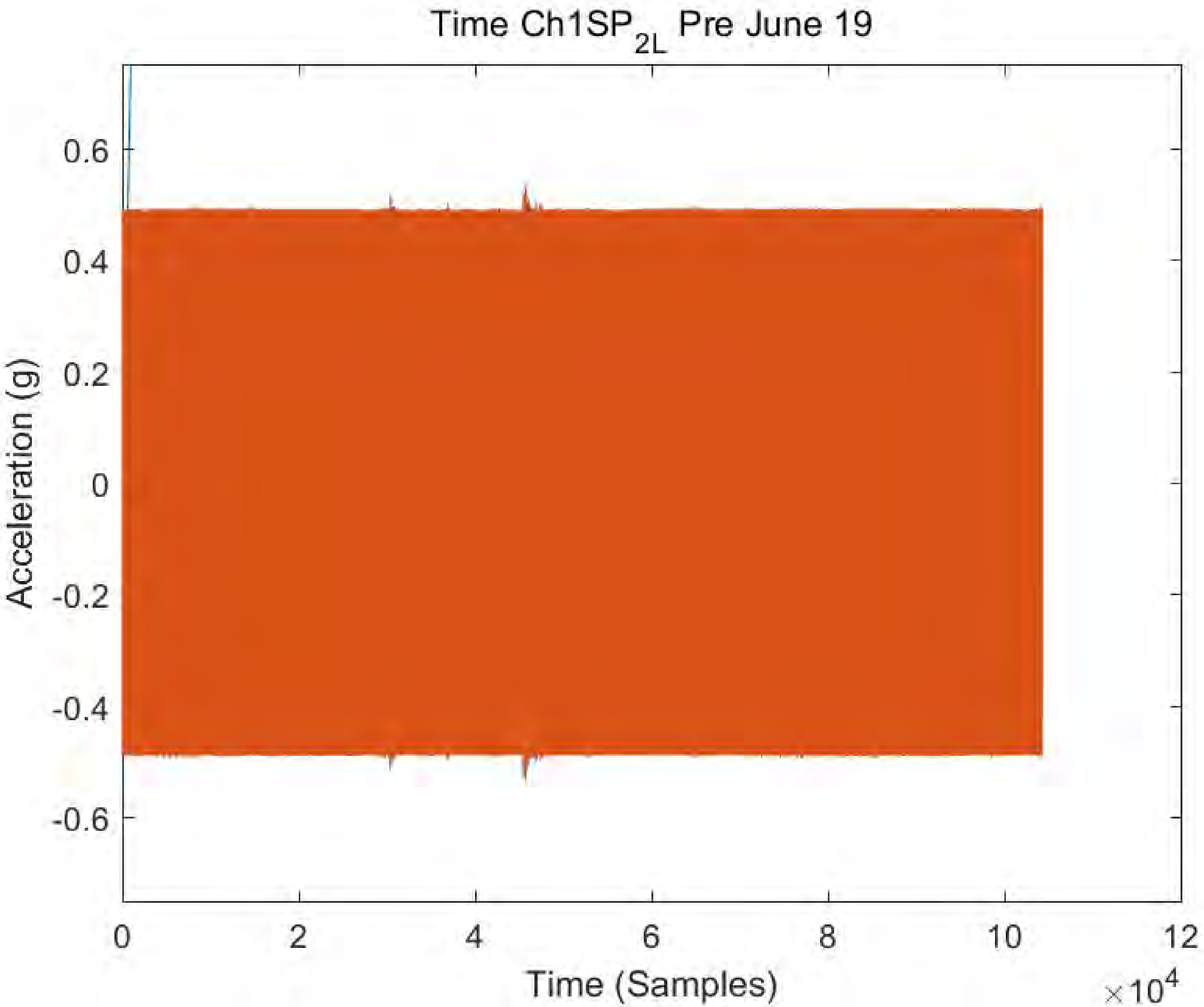

Time Ch1Rion$_V$ Pre July 9
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Time (Samples)

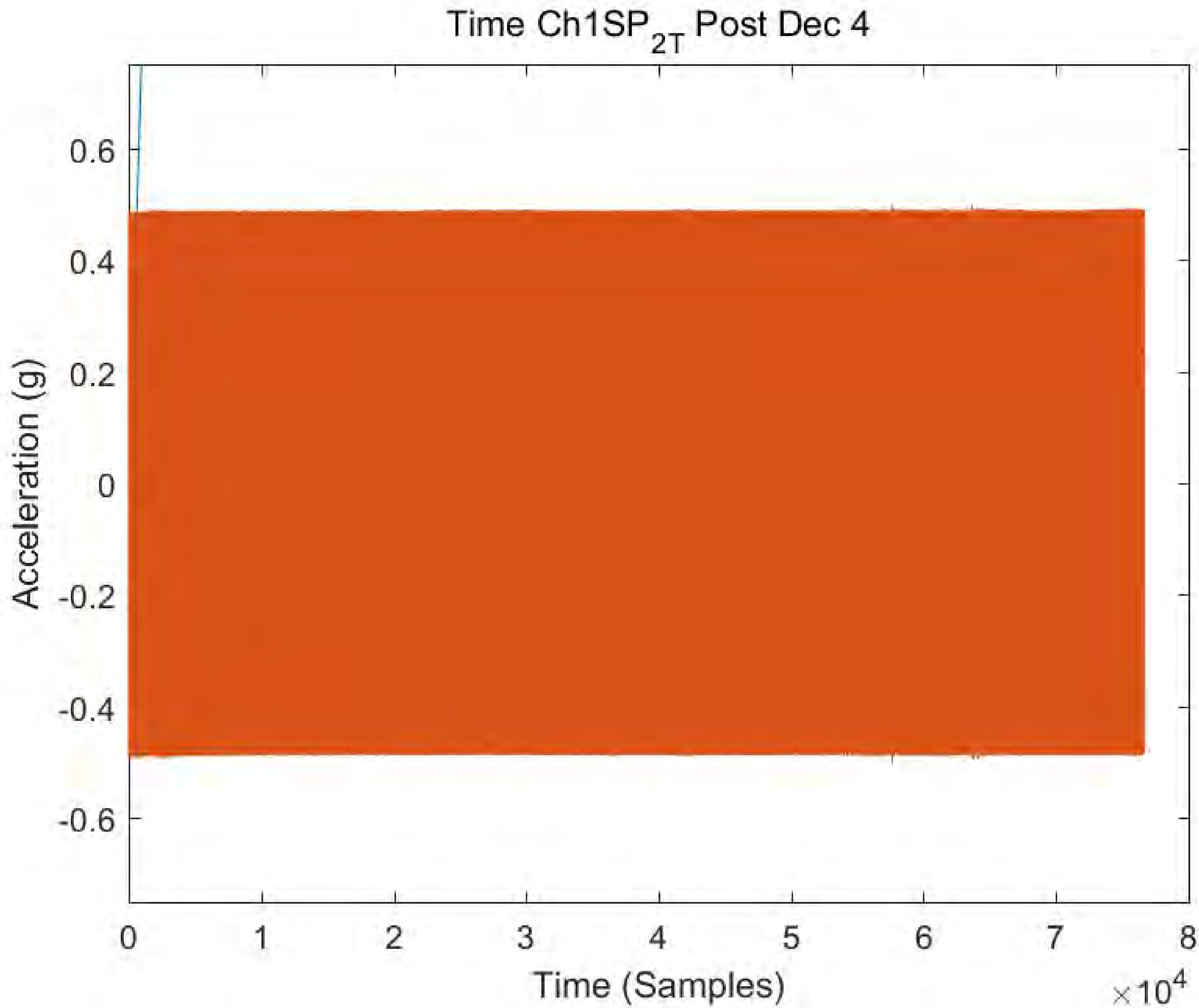

Time Ch1SP 1$_L$ Pre June 19
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Time (Samples)
0
1
2
3
4
5
6
7
8
9
×10^4

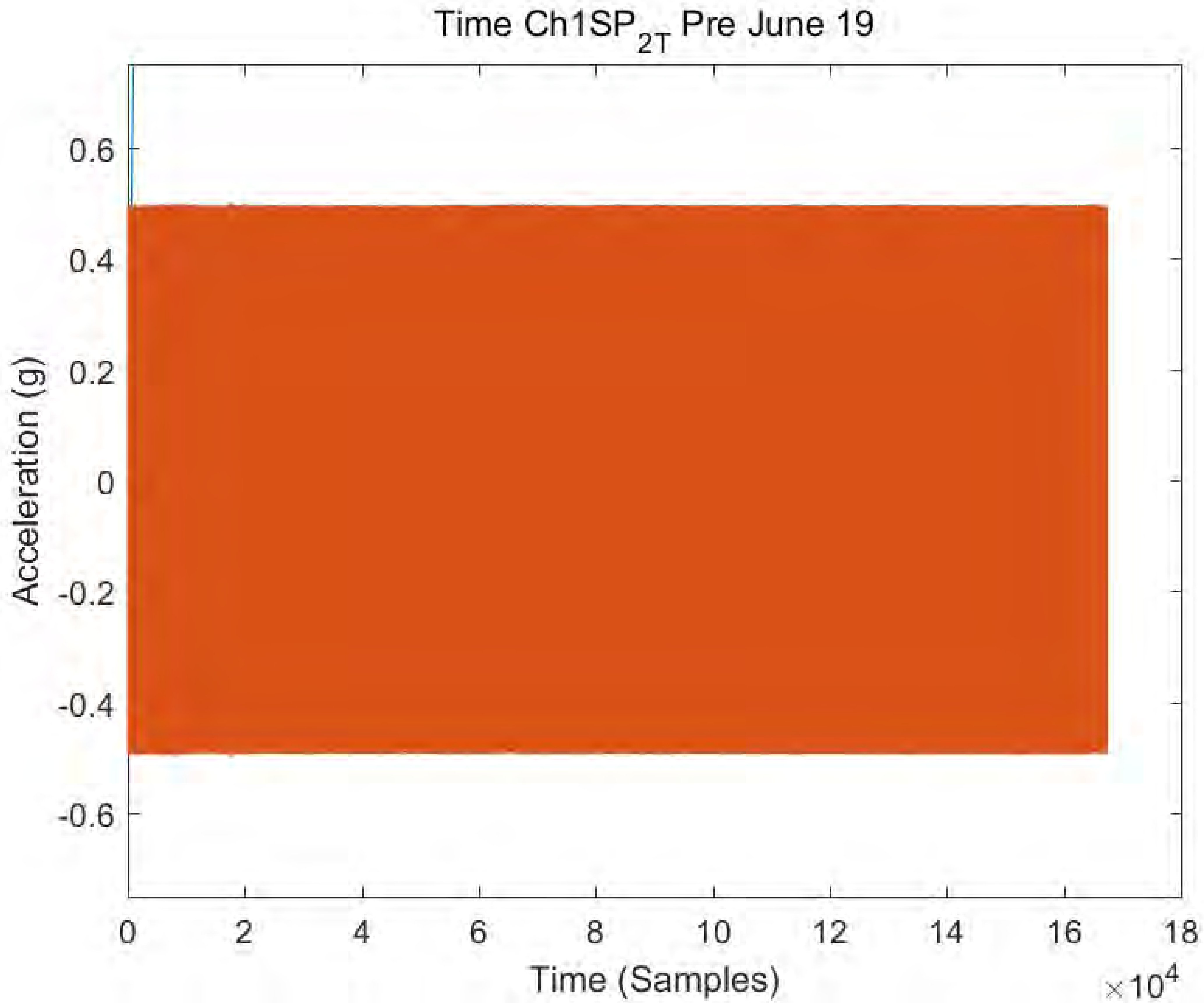

Time Ch1SP 1_T Pre June 19
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
Time (Samples)
$\times 10^4$

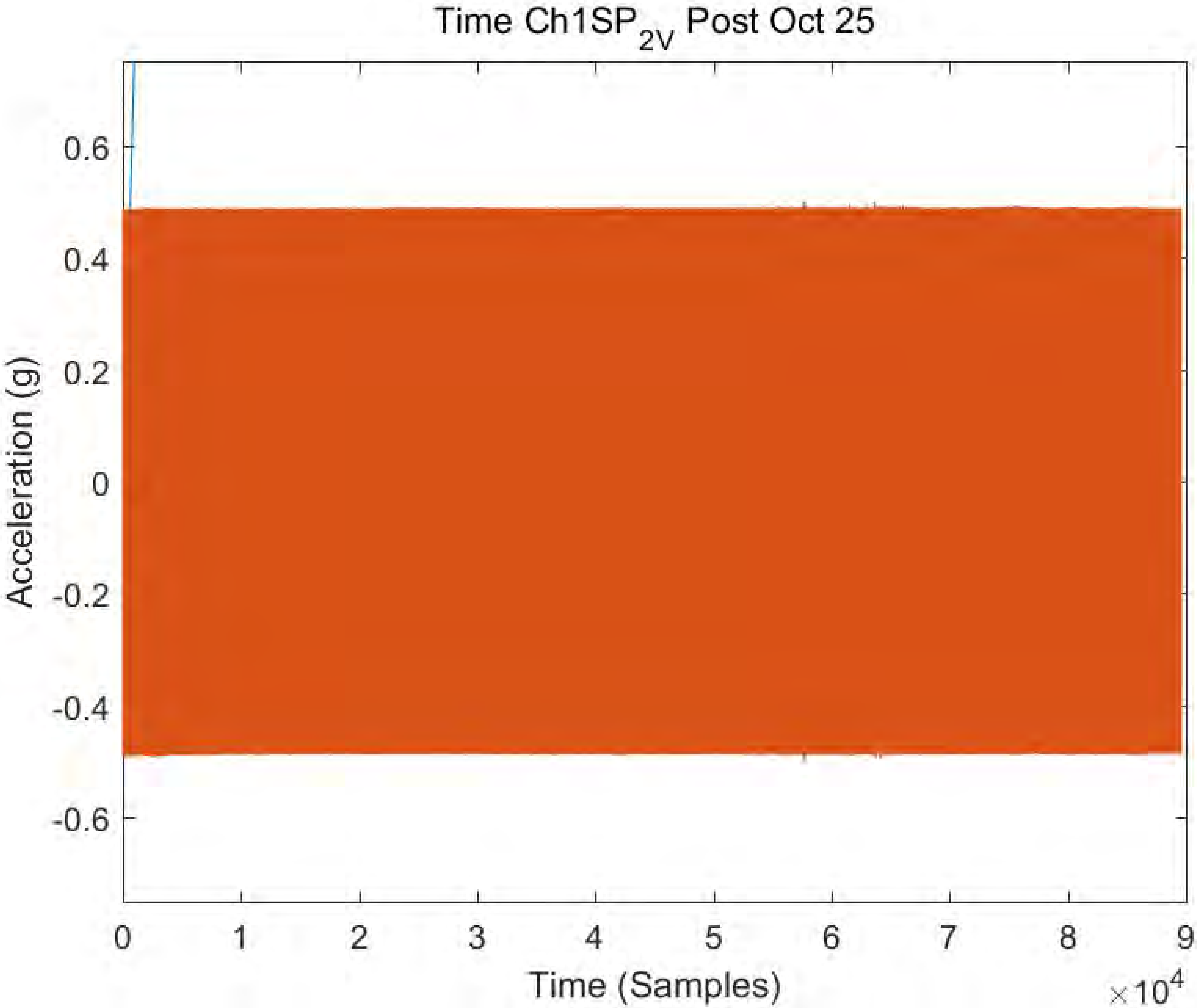

Time Ch1SP 1_V Pre June 19
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
Time (Samples)
$\times 10^4$

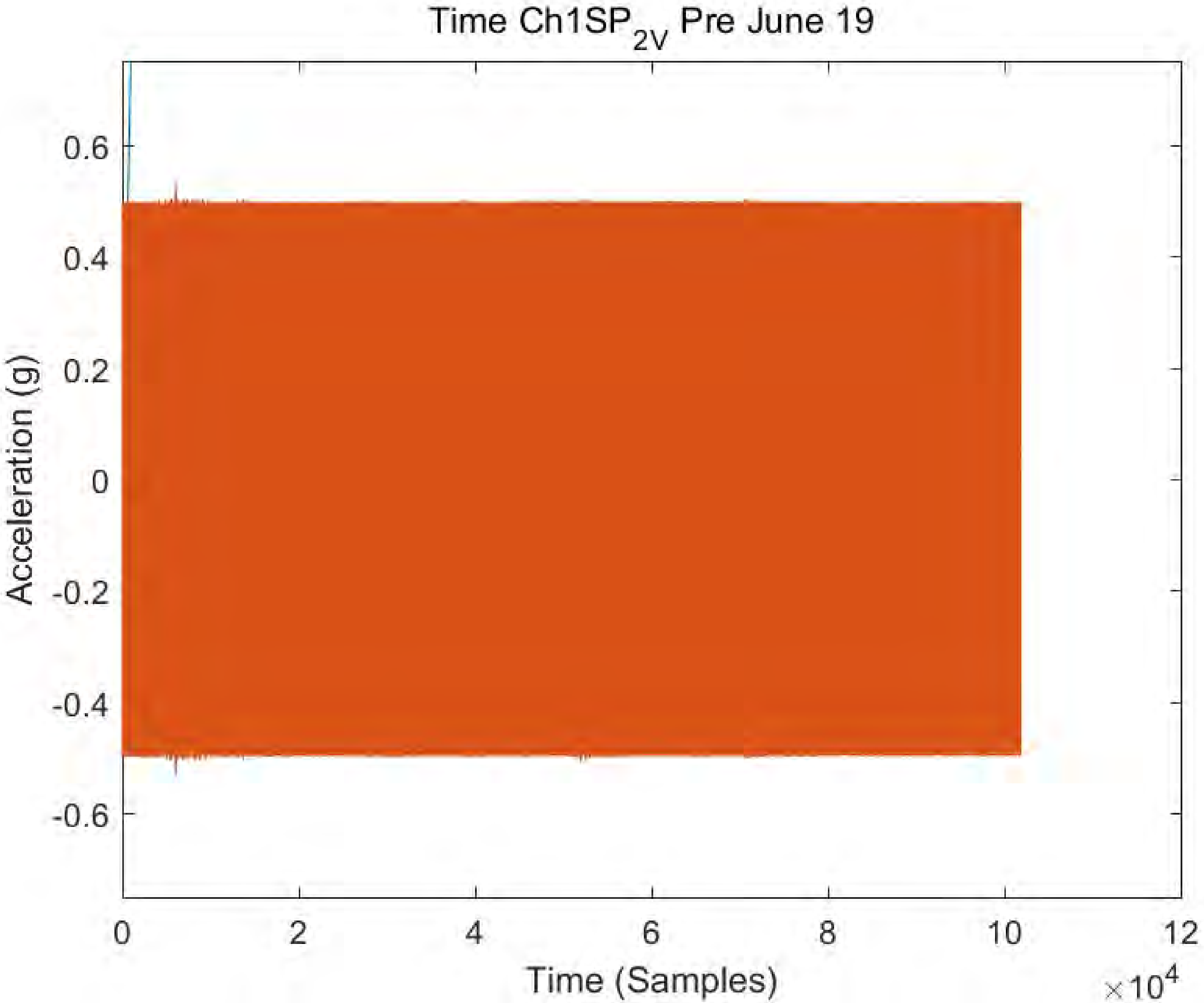

Time Ch1SP$_{1V}$ Post Dec 4
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
$\times 10^4$

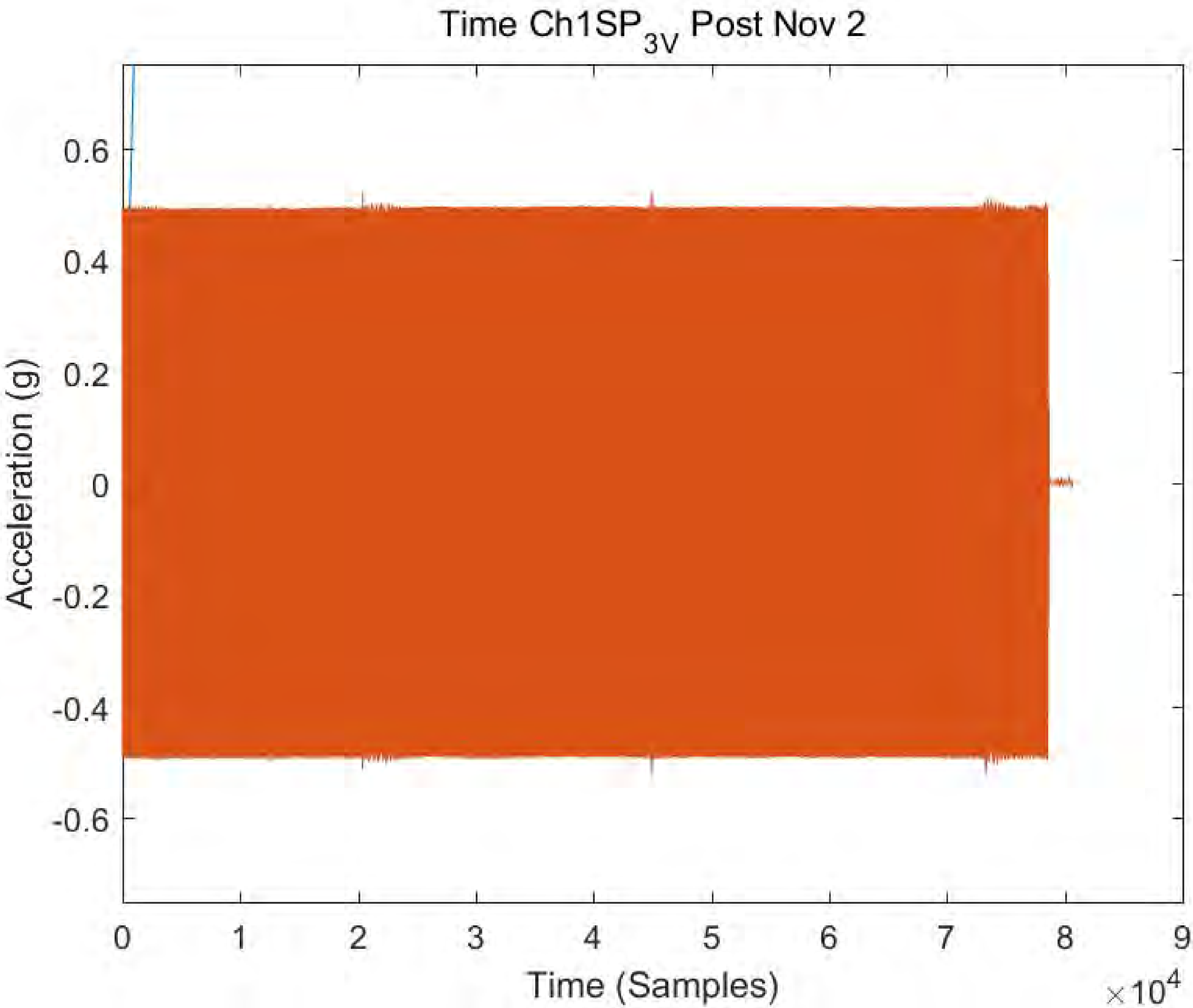

Time Ch1SP$_{2L}$ Pre June 19
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
12
Time (Samples)
×10^4

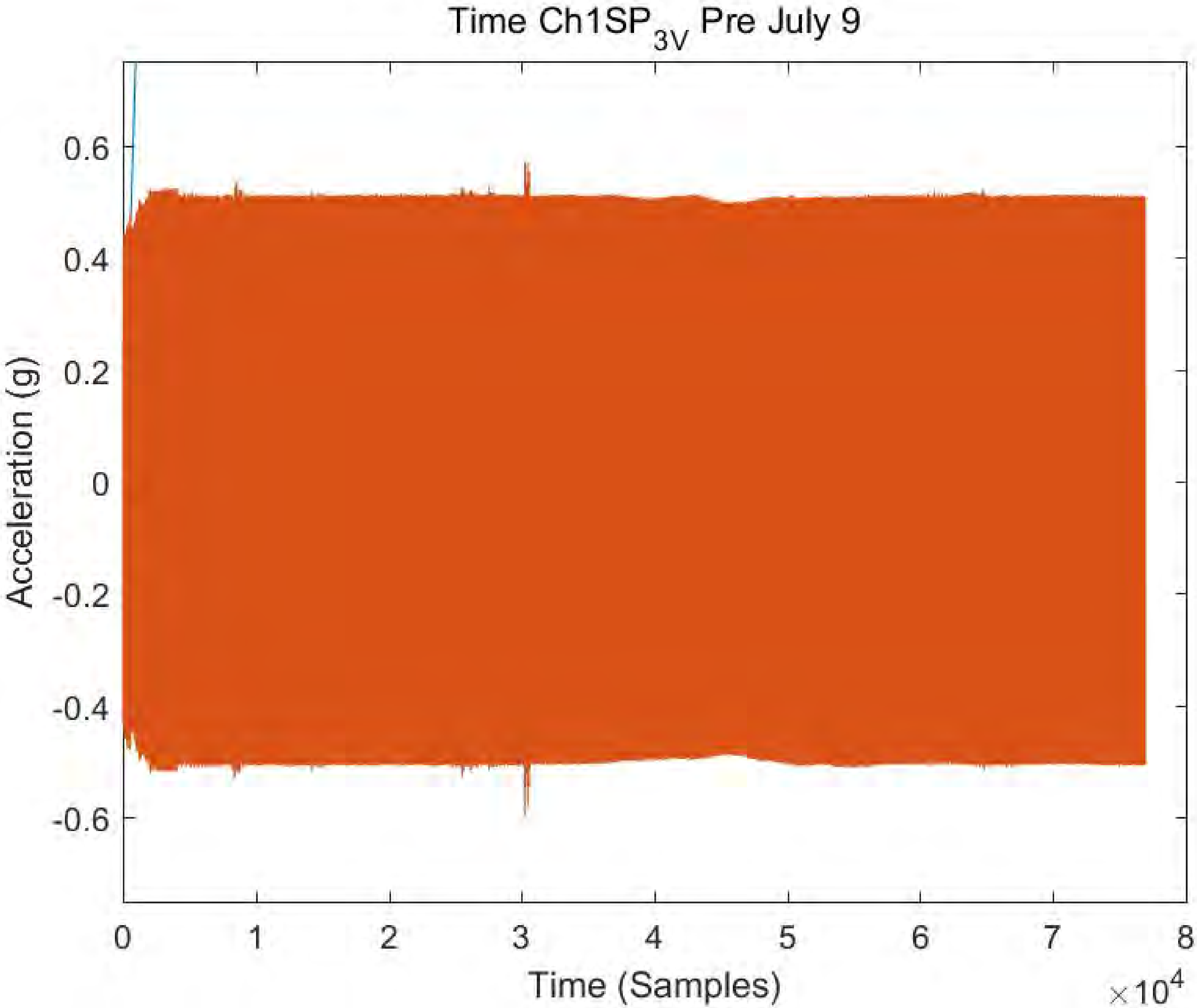

Time Ch1SP$_{2T}$ Post Dec 4
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
×10^4

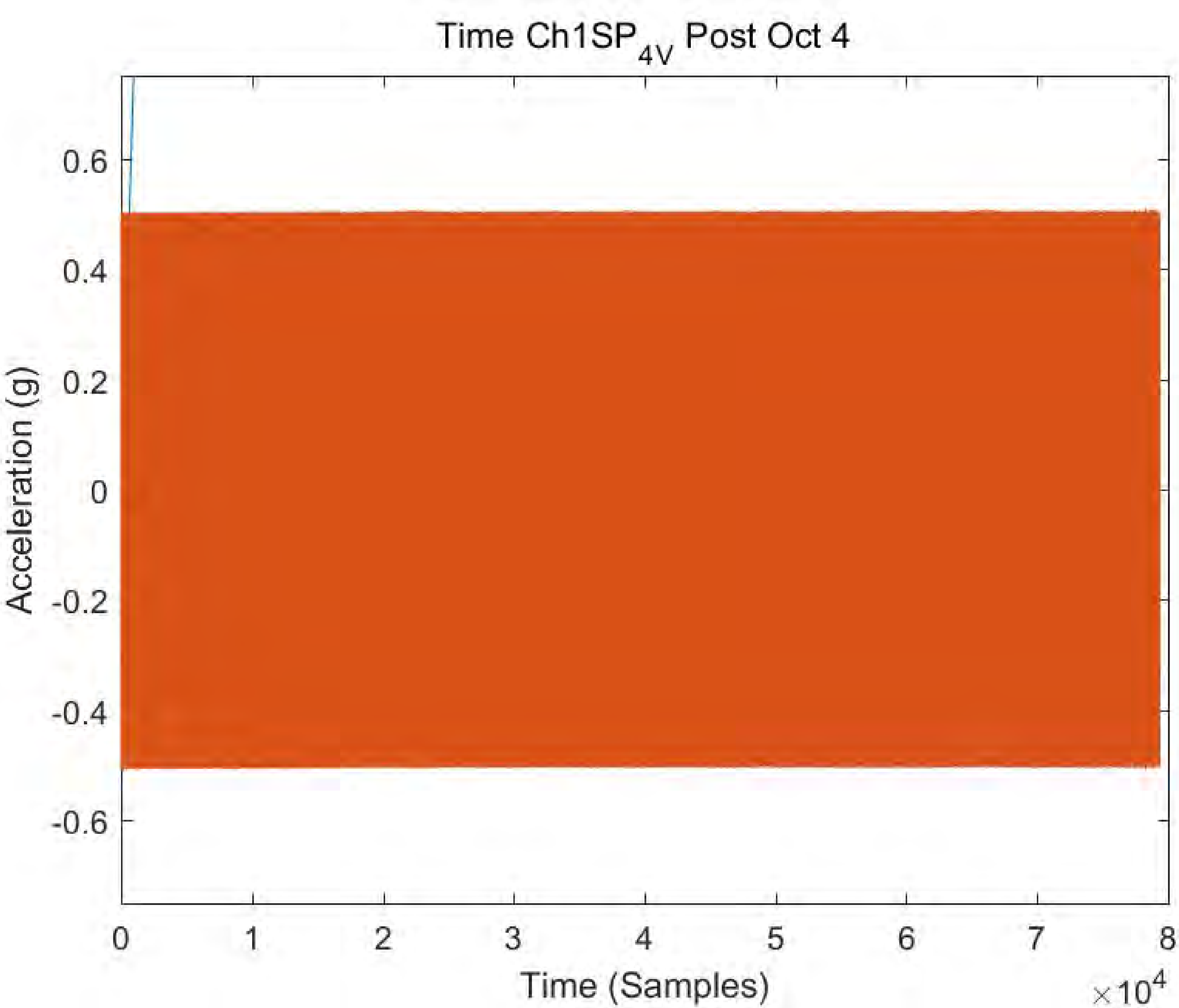

Time Ch1SP$_{2T}$ Pre June 19
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
12
14
16
18
Time (Samples)
×10^4

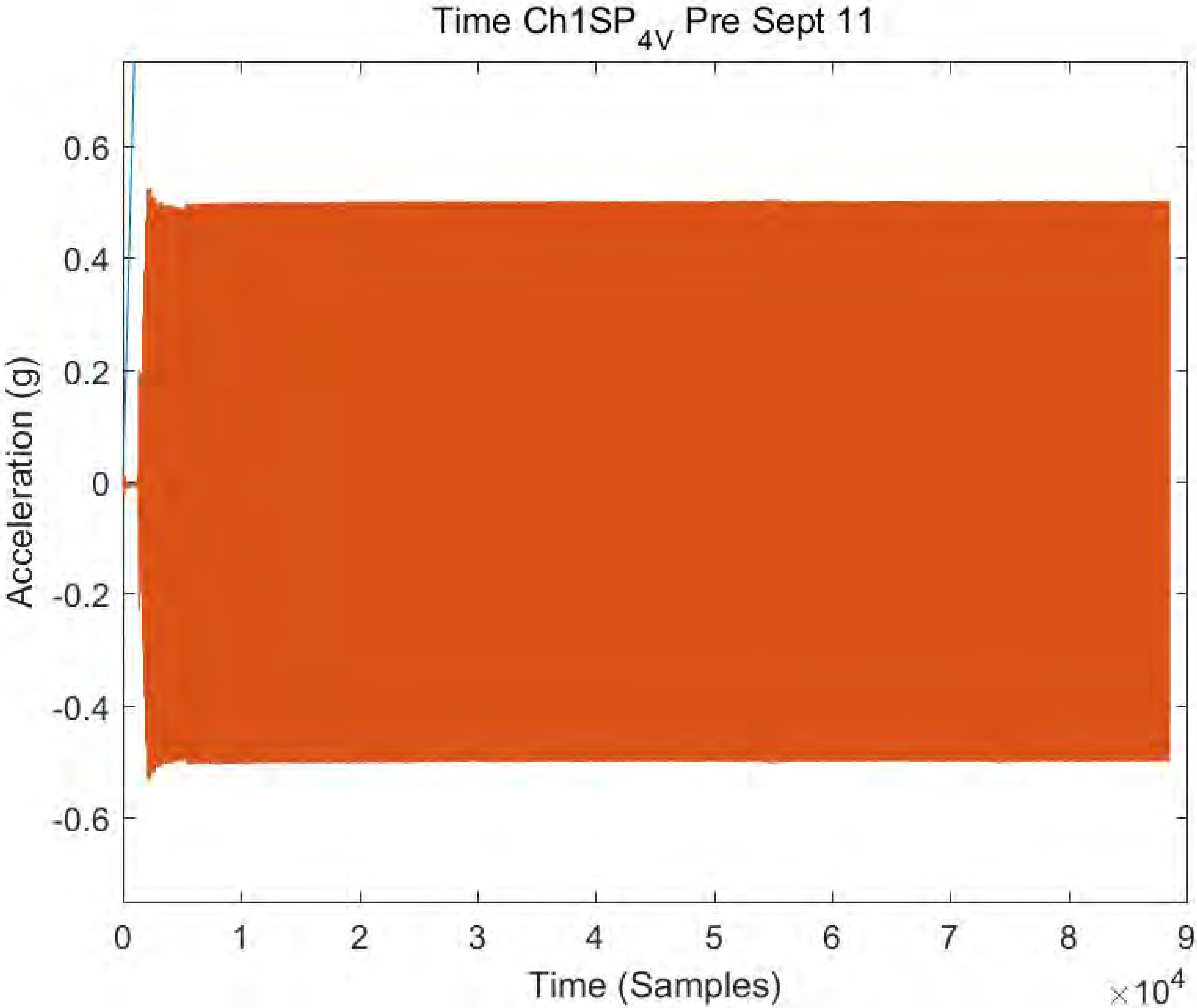

Time Ch1SP$_{2V}$ Post Oct 25
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
×10^4

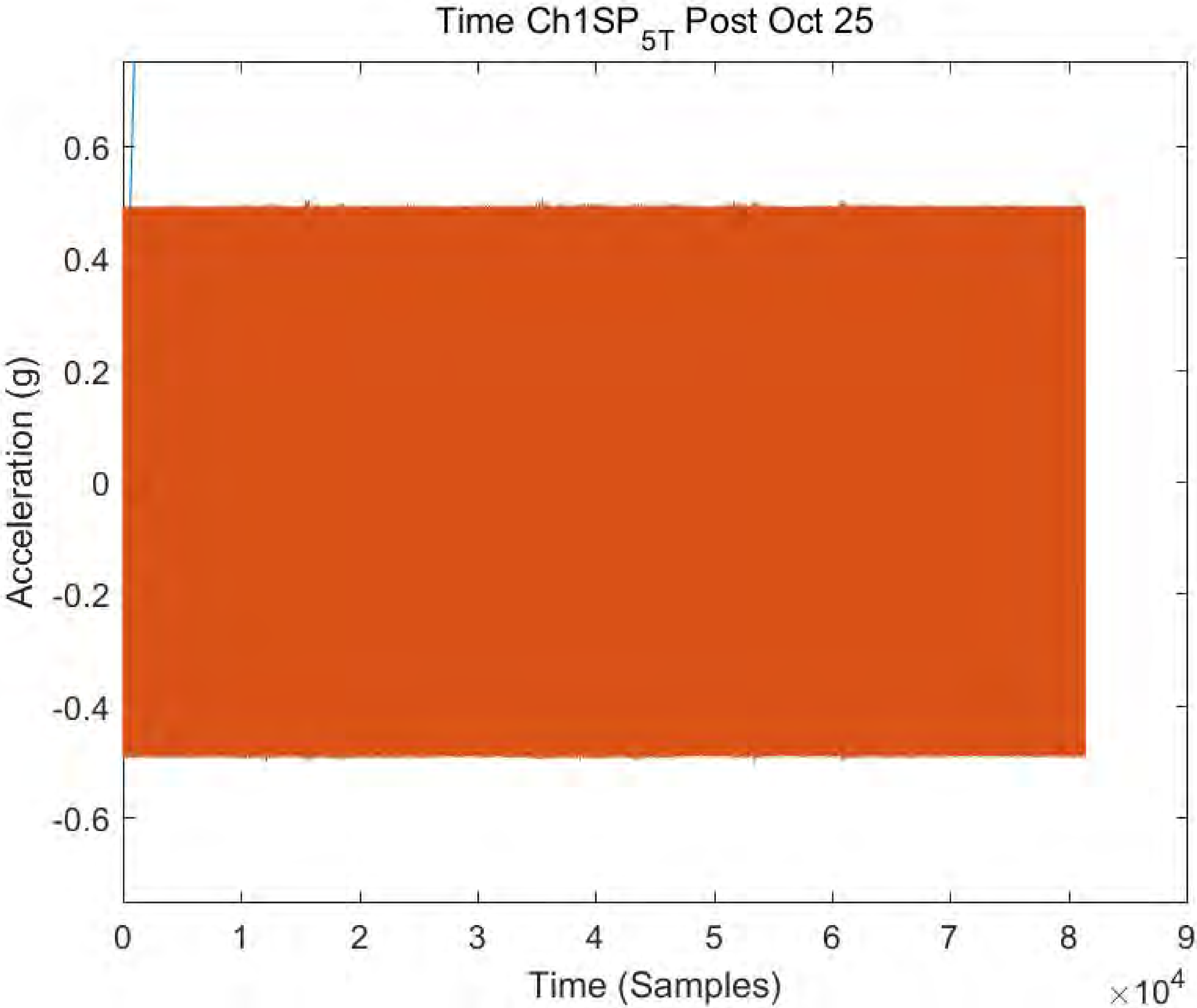

Time Ch1SP$_{2V}$ Pre June 19
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
12
Time (Samples)
×10^4

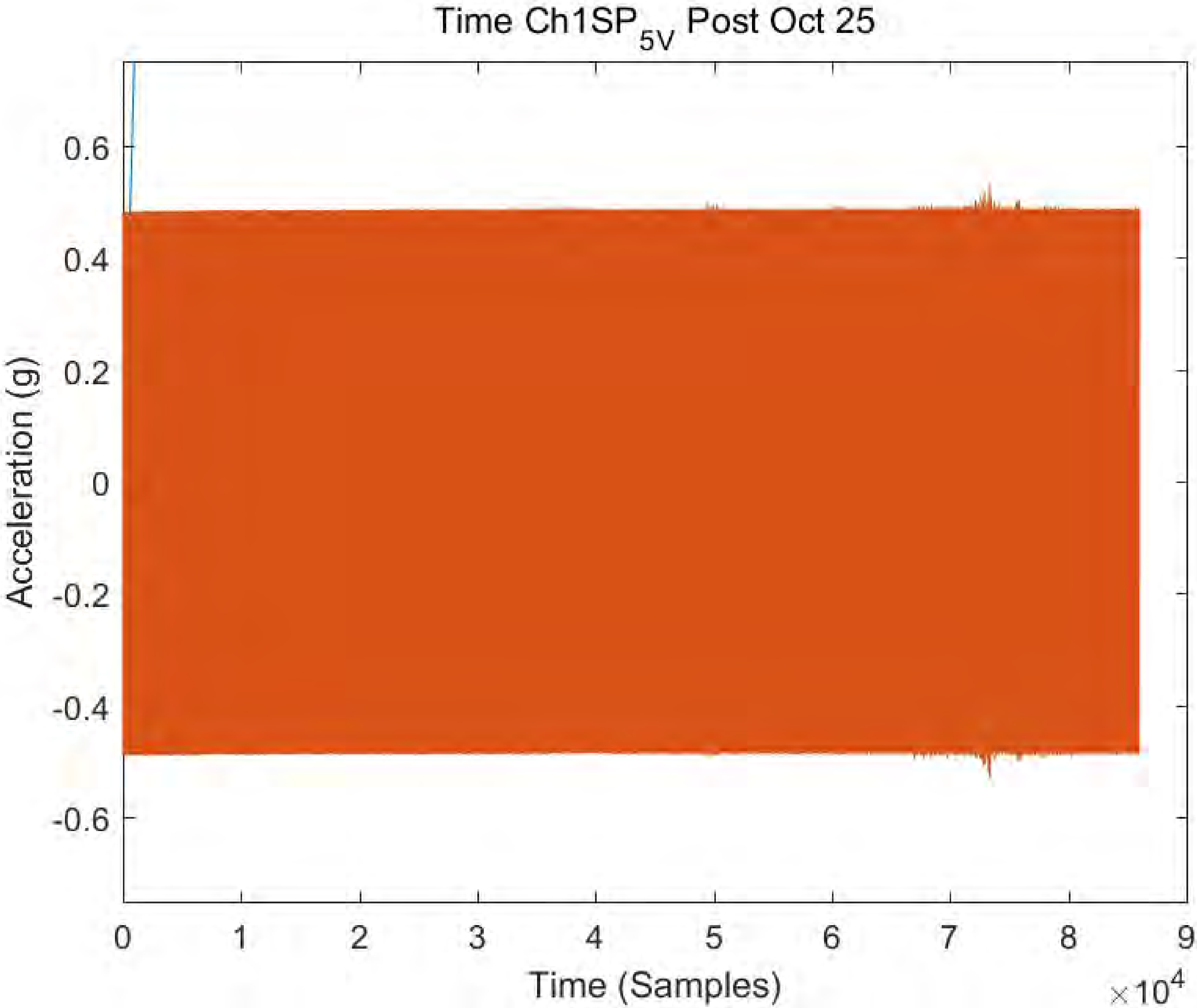

Time Ch1SP$_{3V}$ Post Nov 2
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
×10^4

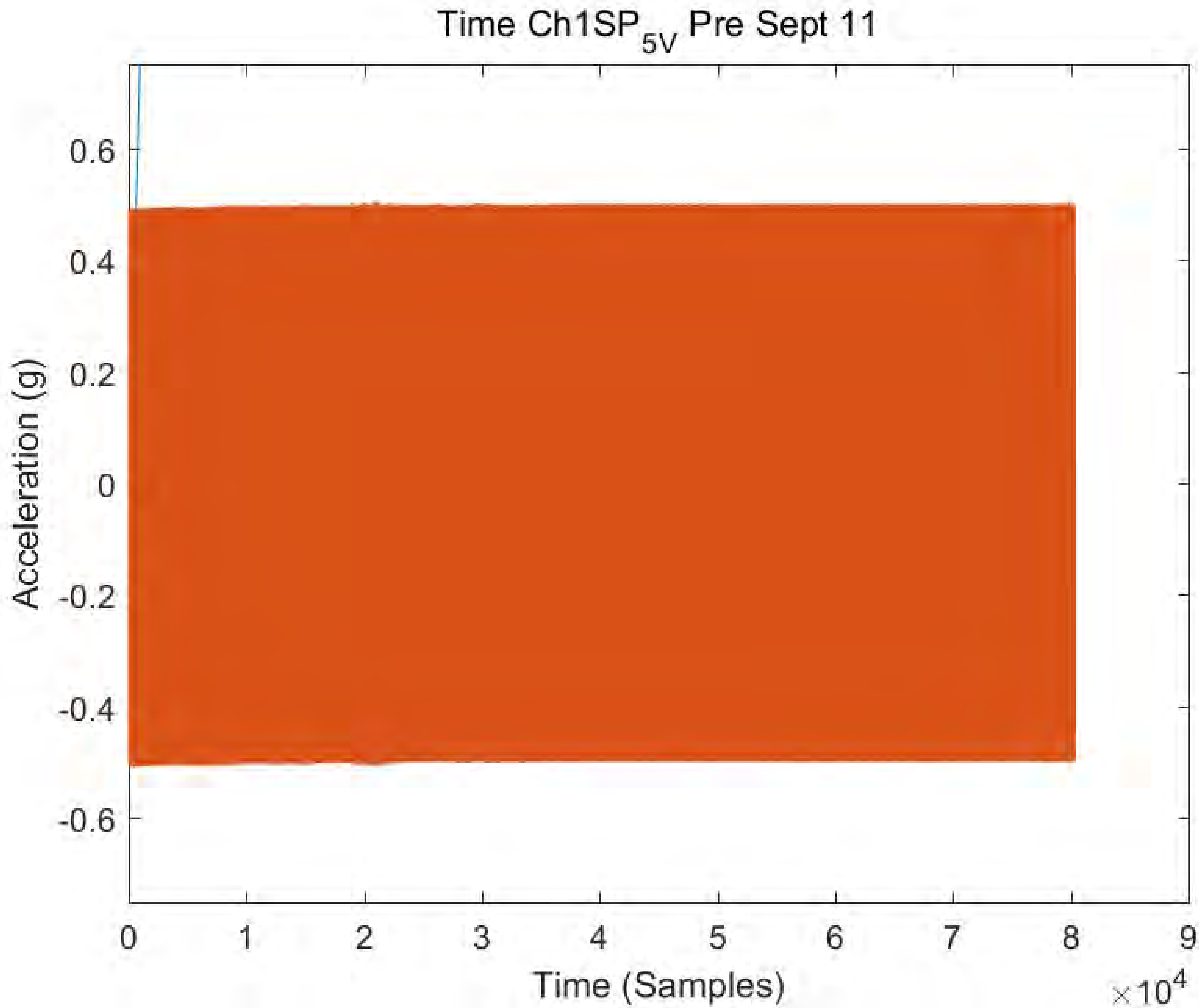

Time Ch1SP$_{3V}$ Pre July 9
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Acceleration (g)
0
1
2
3
4
5
6
7
8
Time (Samples)
$\times 10^4$

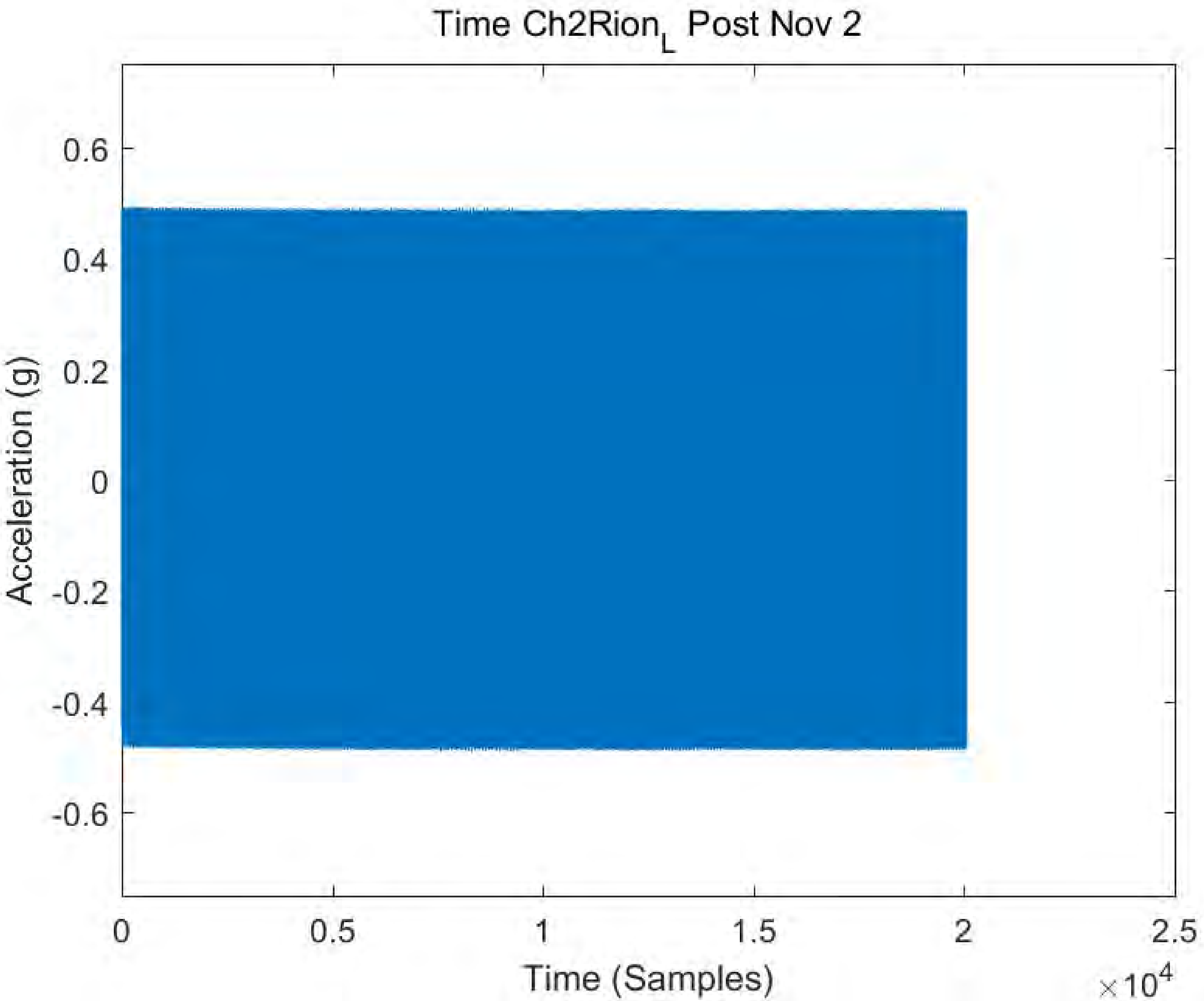

Time Ch1SP$_{4V}$ Post Oct 4
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
×10^4

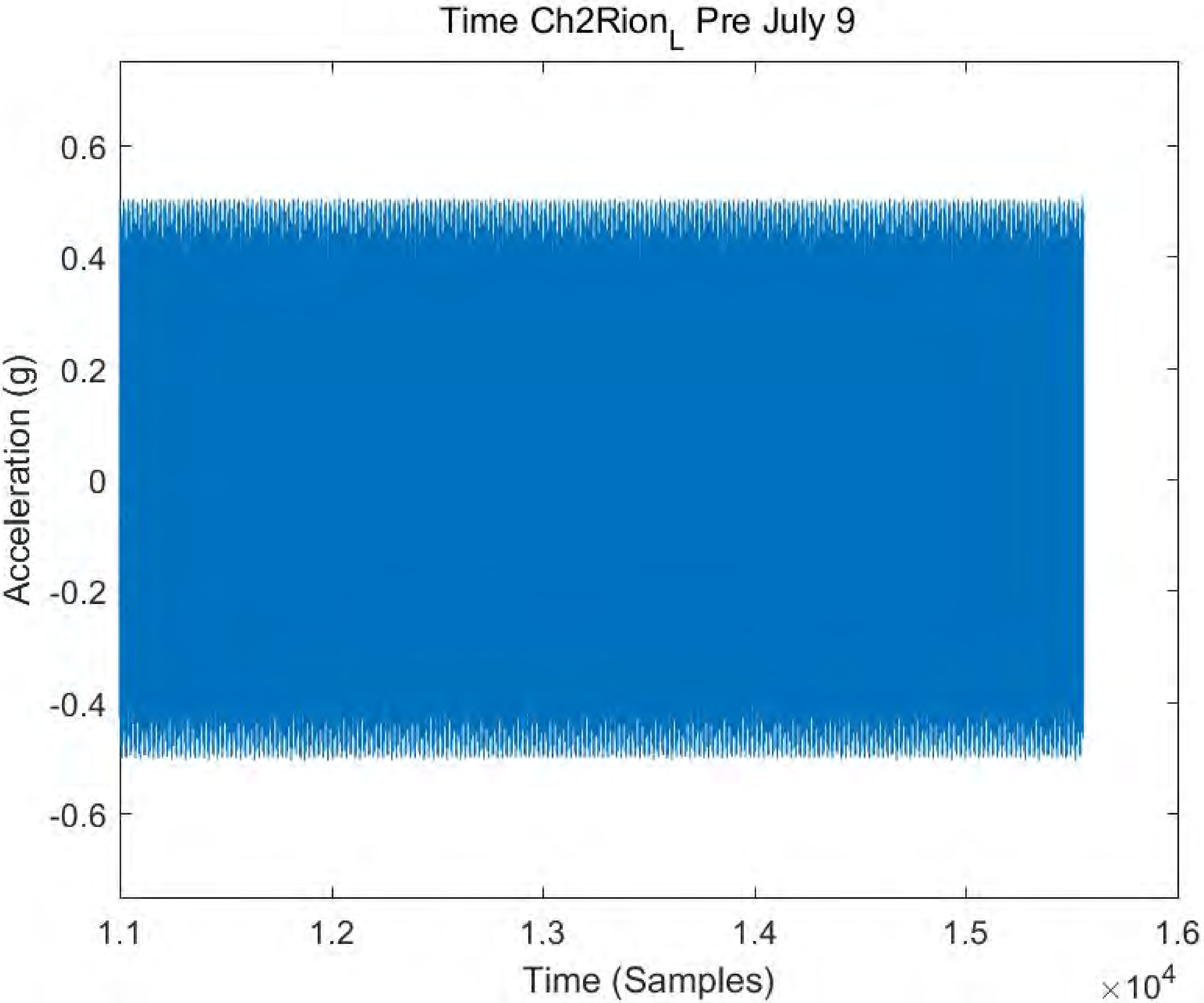

Time Ch1SP$_{4V}$ Pre Sept 11
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
$\times 10^4$

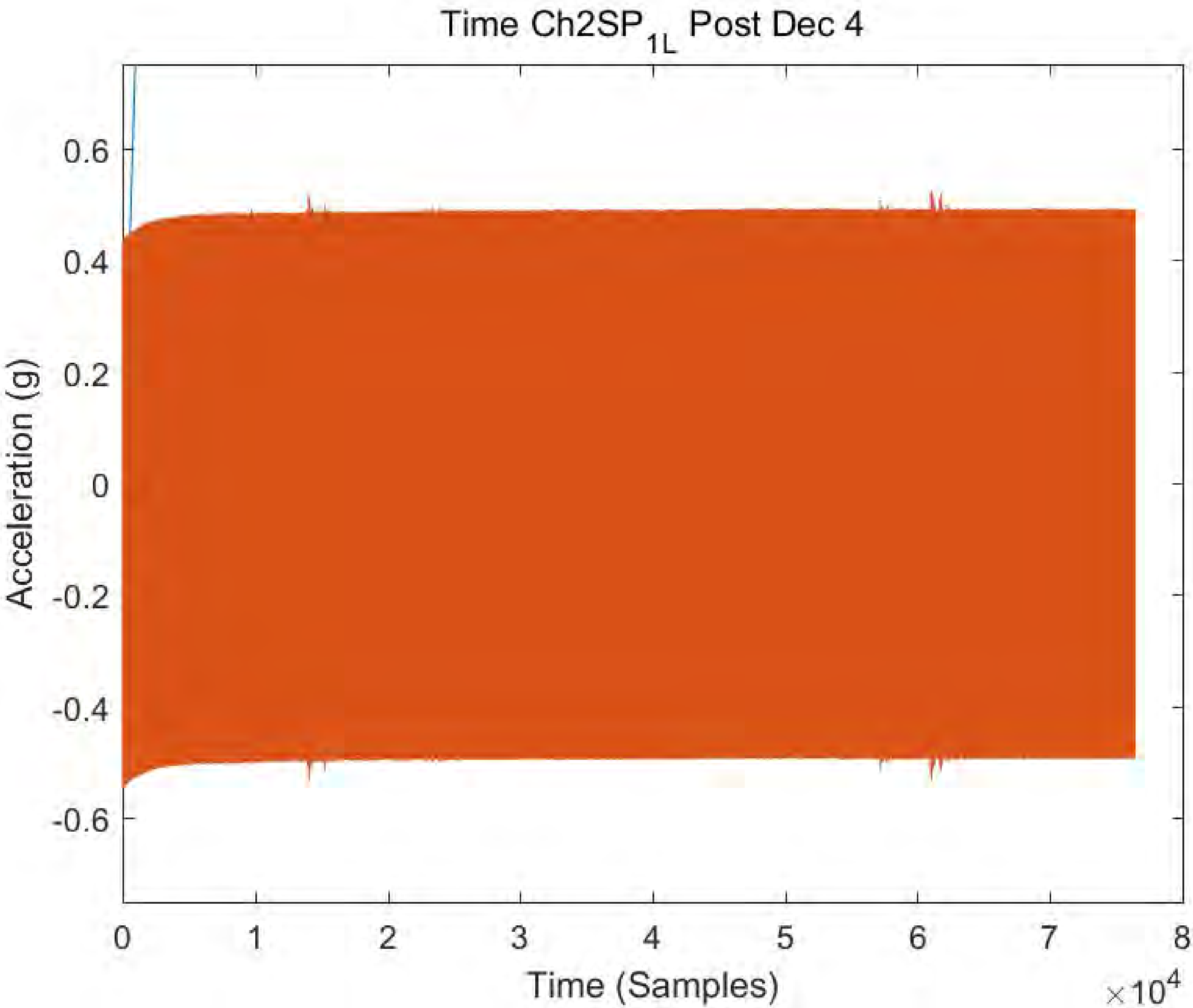

Time Ch1SP$_{5T}$ Post Oct 25
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
$\times10^4$

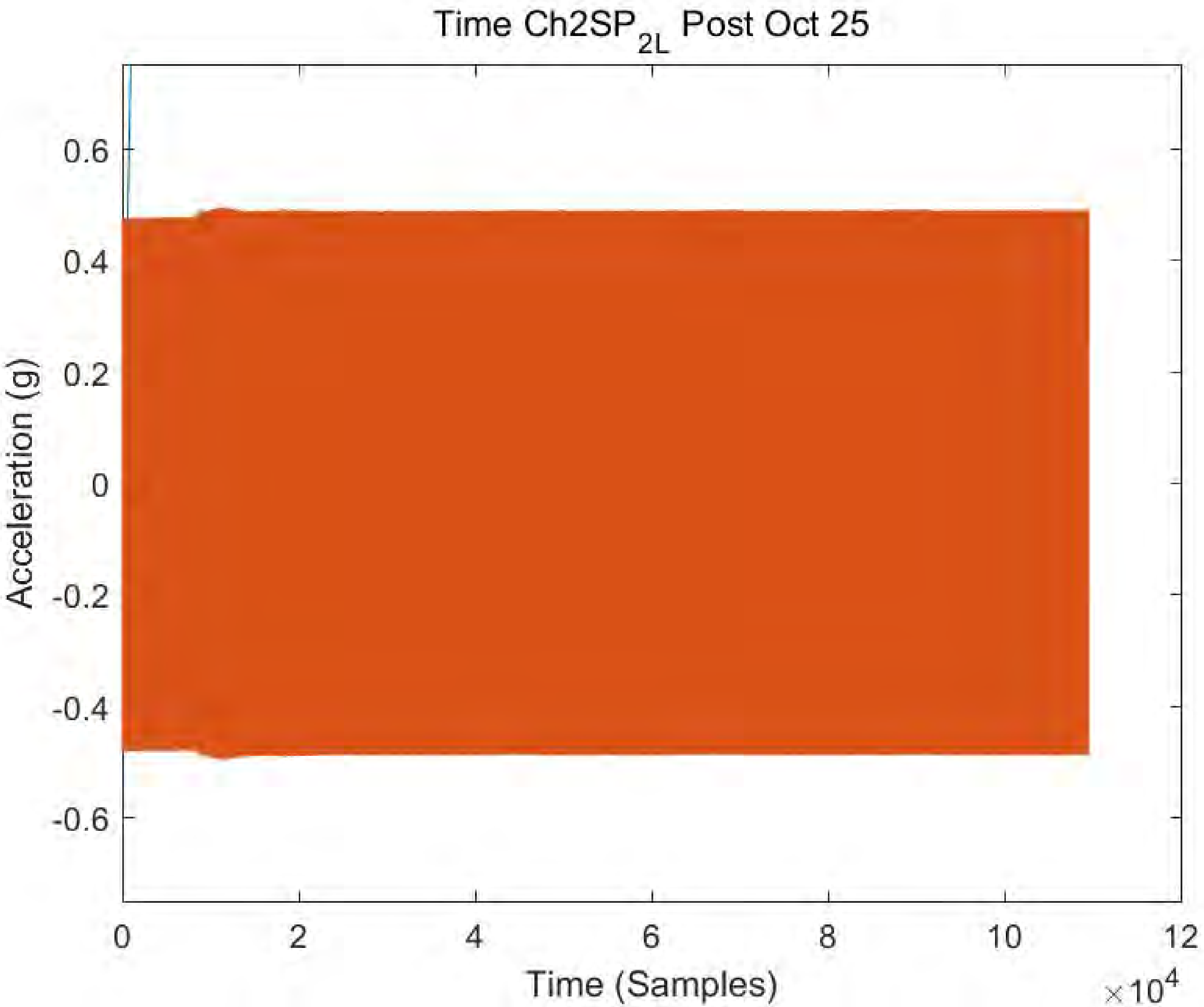

Time Ch1SP$_{5V}$ Post Oct 25
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
$\times 10^4$

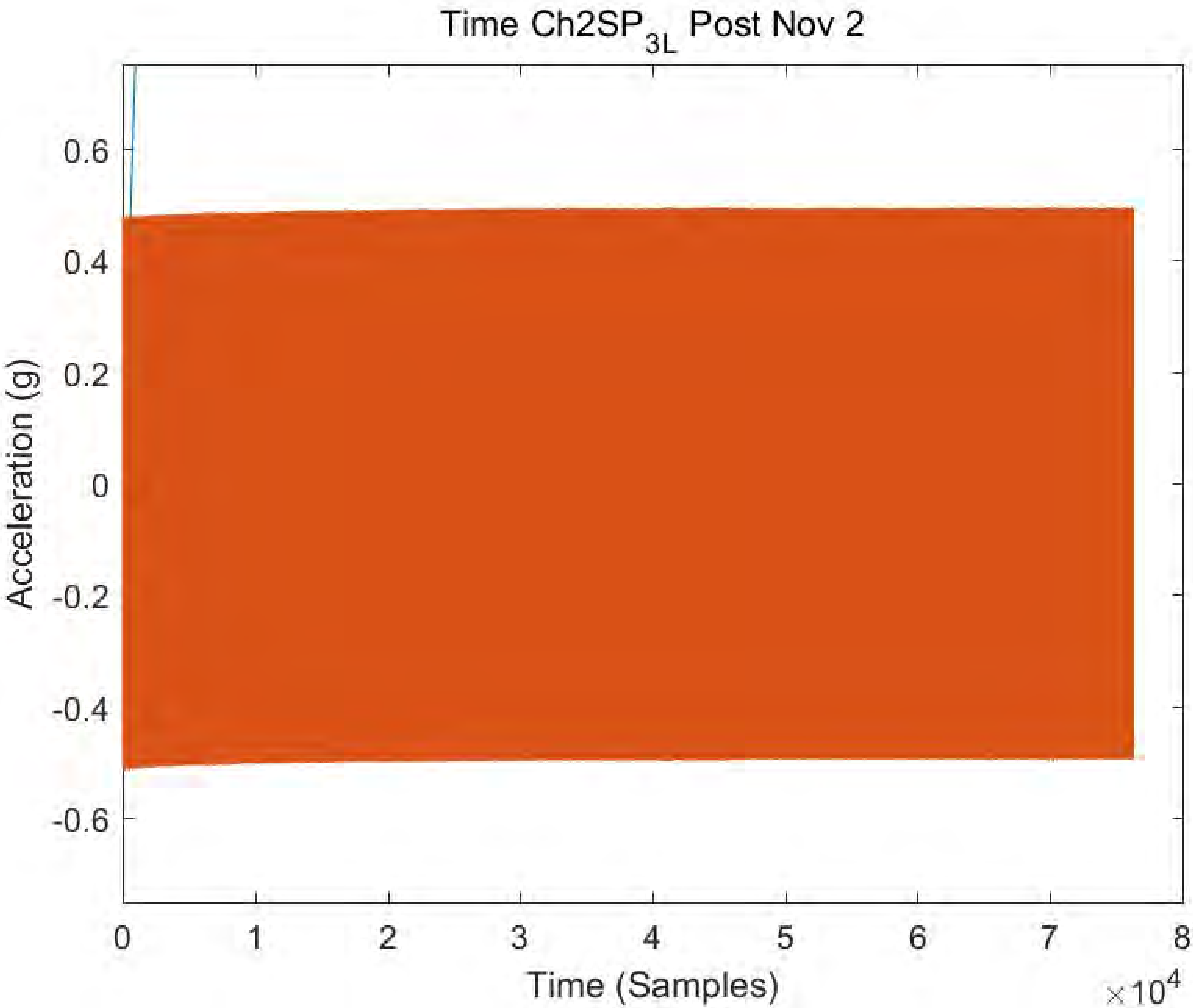

Time Ch1SP$_{5V}$ Pre Sept 11
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
×10^4

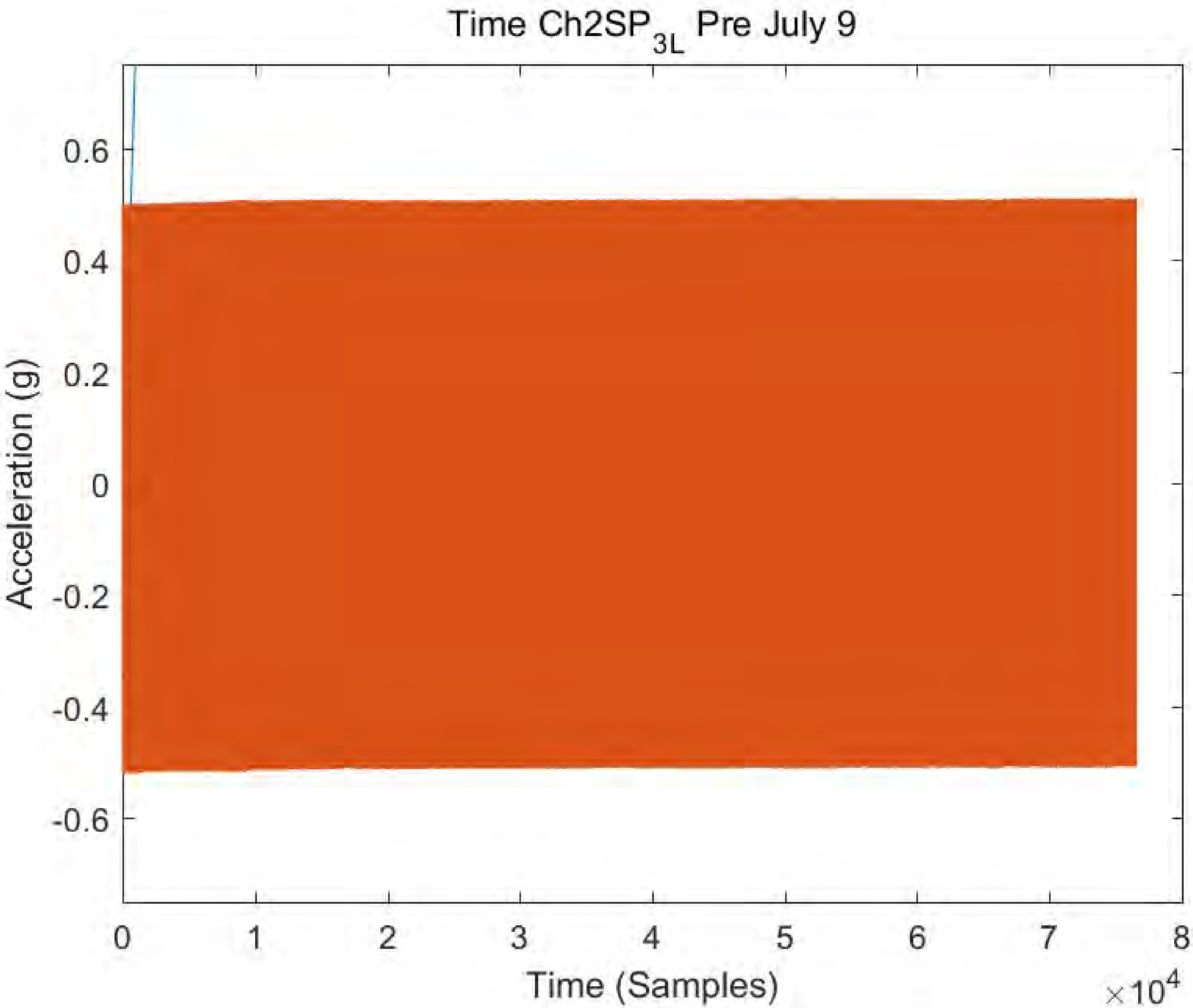

Time Ch2Rion$_L$ Post Nov 2
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
0.5
1
1.5
2
2.5
Time (Samples)
×10^4


Time Ch2Rion$_L$ Pre July 9
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Time (Samples)
1.1
1.2
1.3
1.4
1.5
1.6
$\times 10^4$

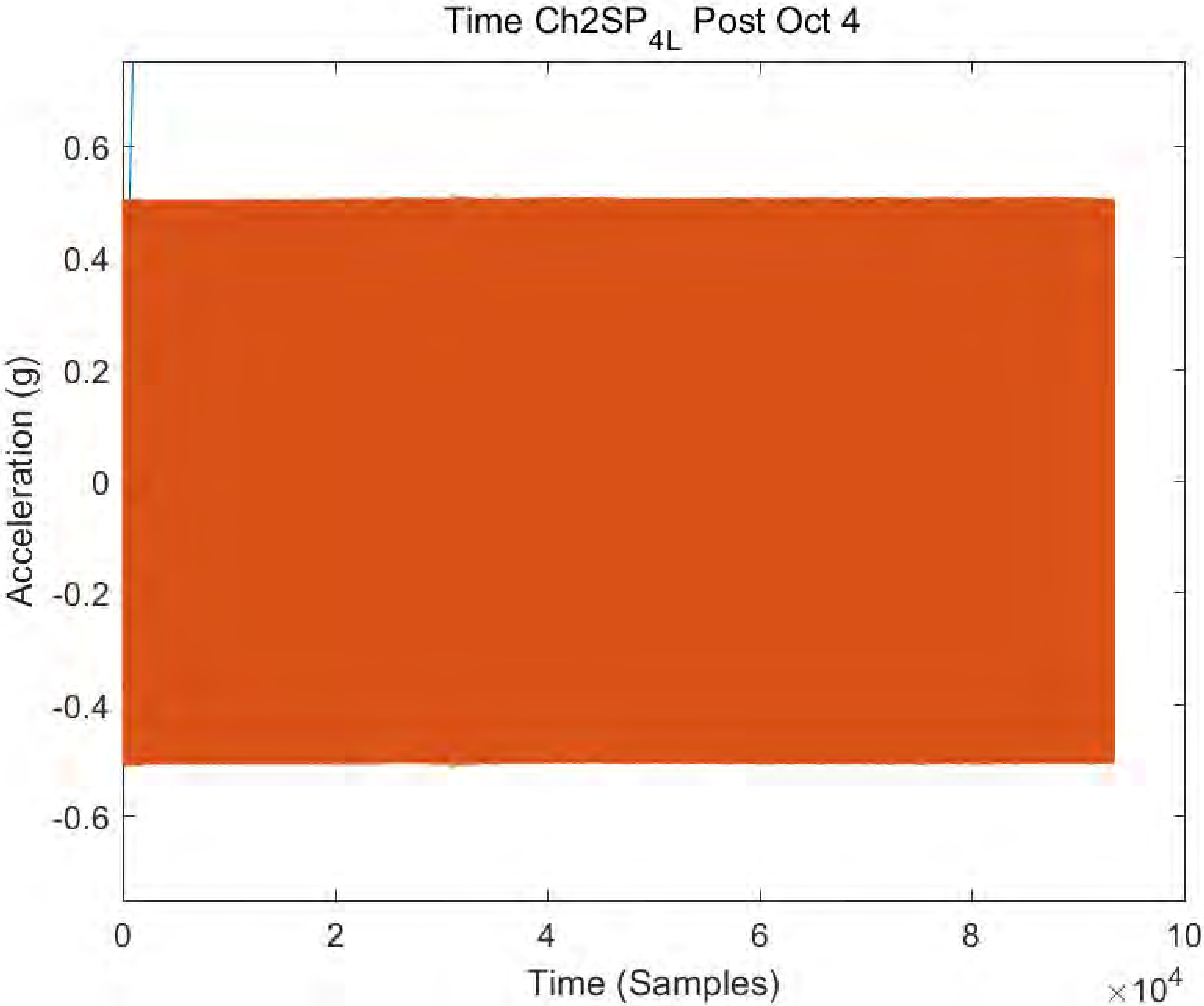

Time Ch2SP$_{1L}$ Post Dec 4
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
$\times 10^4$

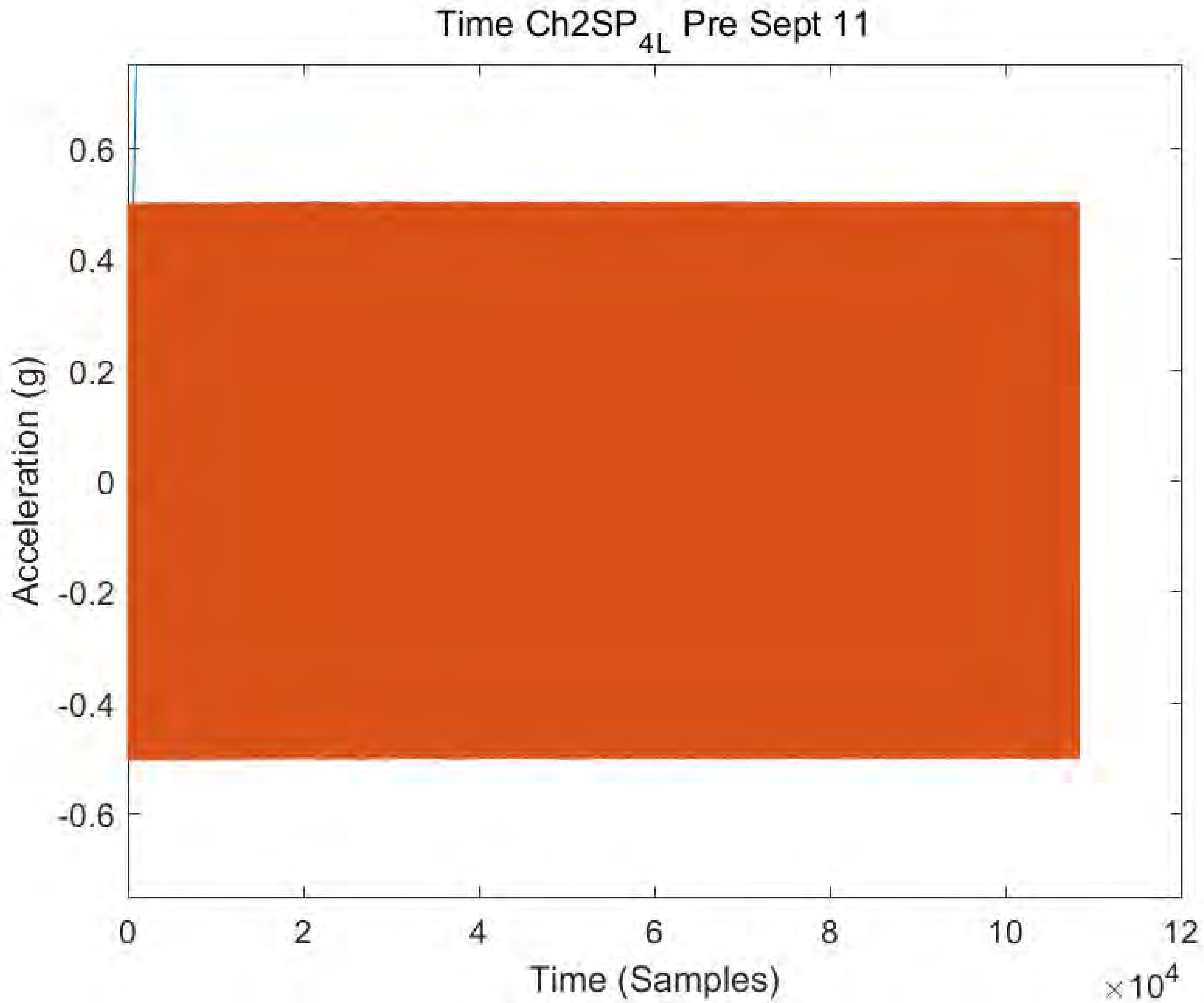

Time Ch2SP$_{2L}$ Post Oct 25
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
12
Time (Samples)
×10^4

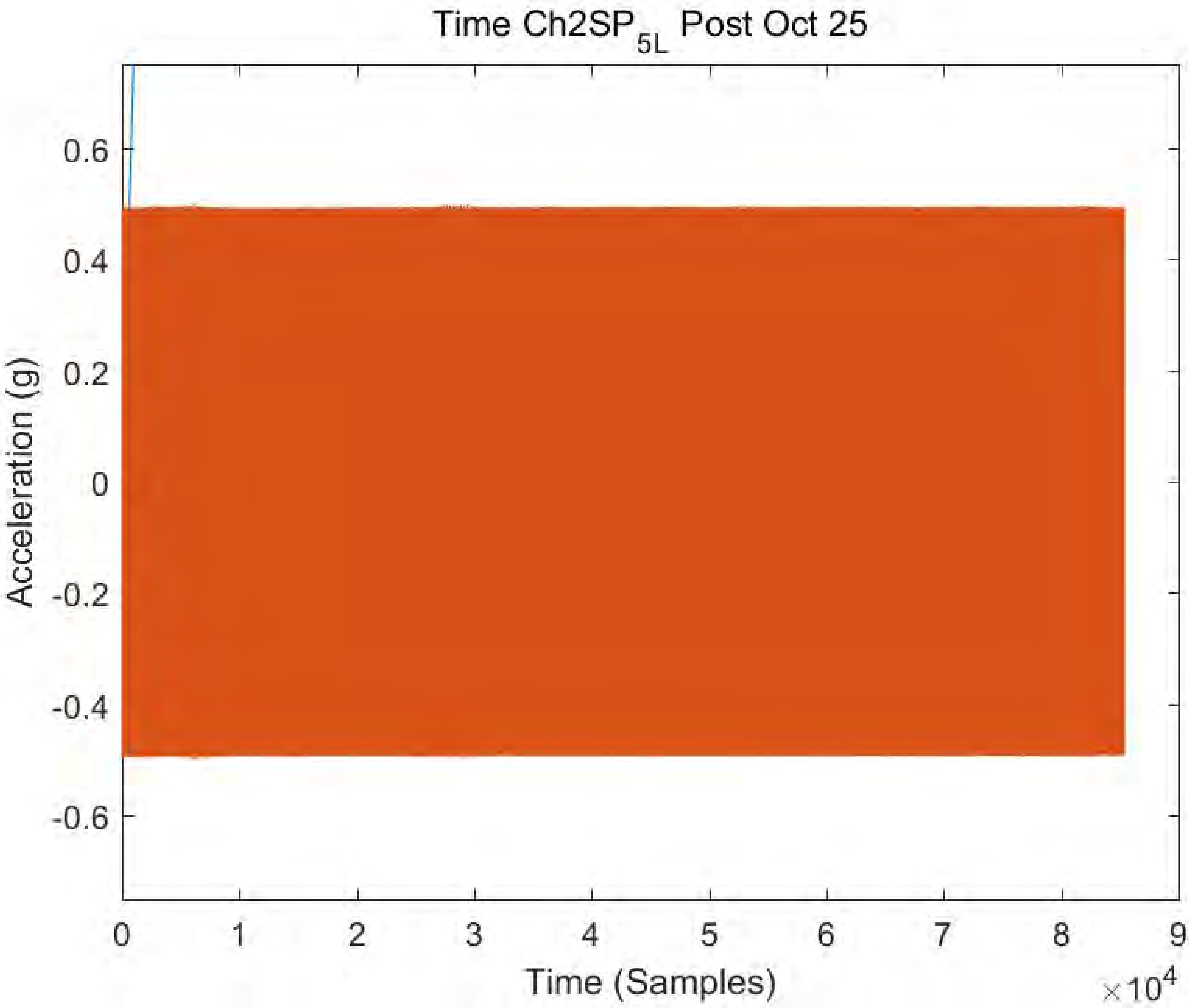

Time Ch2SP$_{3L}$ Post Nov 2
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
×10^4

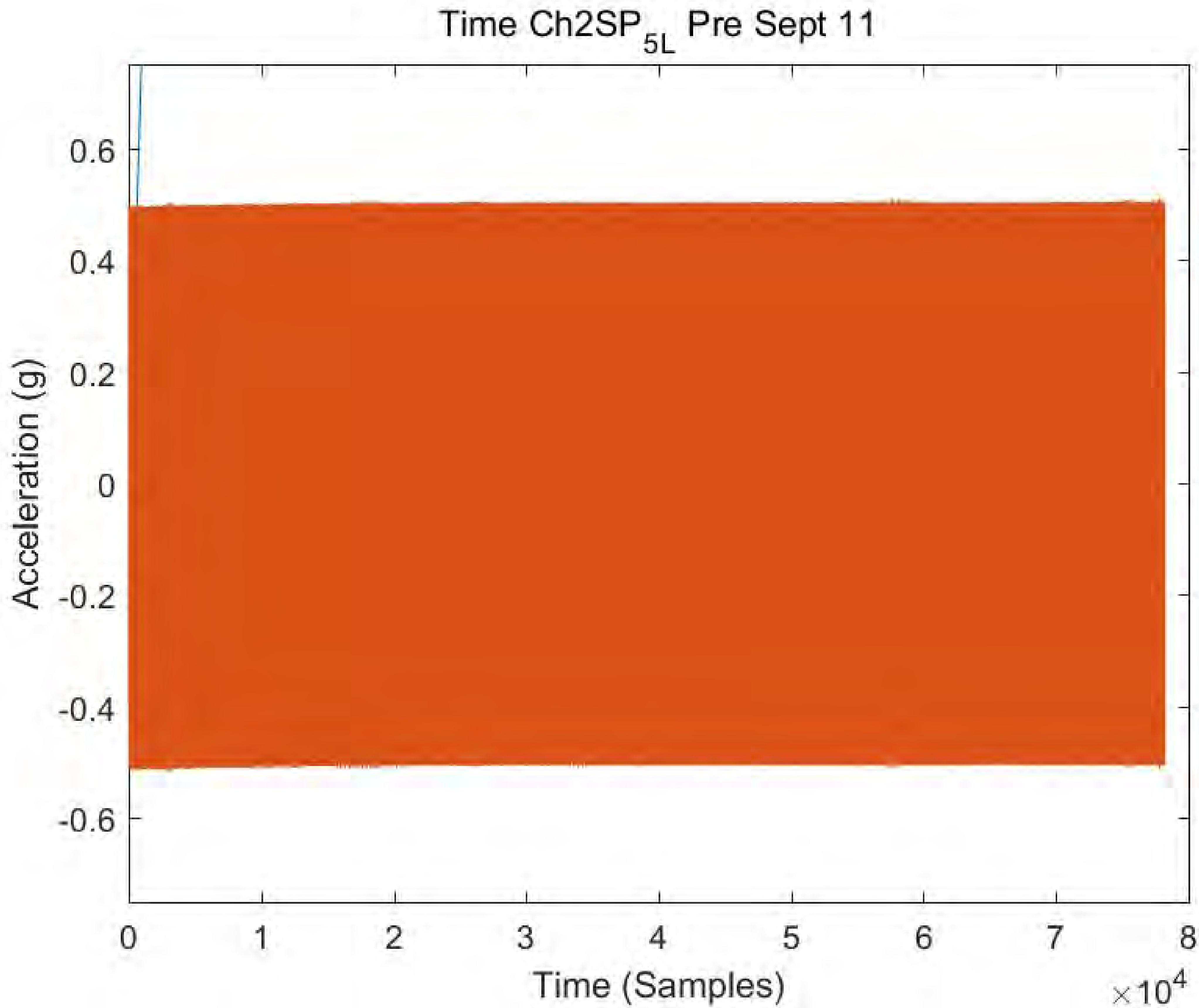


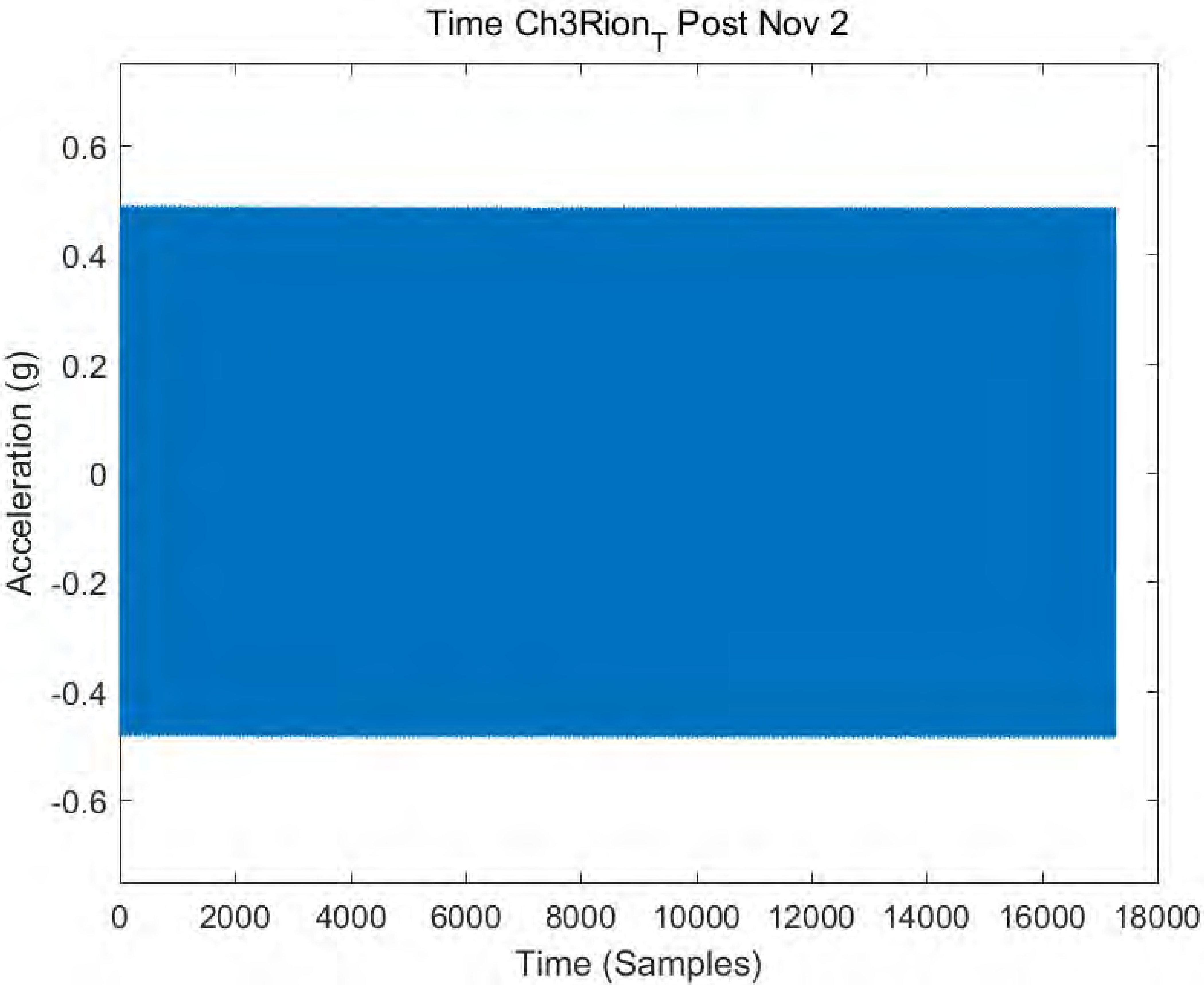
Time Ch2SP$_{3L}$ Pre July 9
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Time (Samples)
0
1
2
3
4
5
6
7
8
×10^4


Time Ch2SP$_{4L}$ Post Oct 4
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
Time (Samples)
×10^{4}

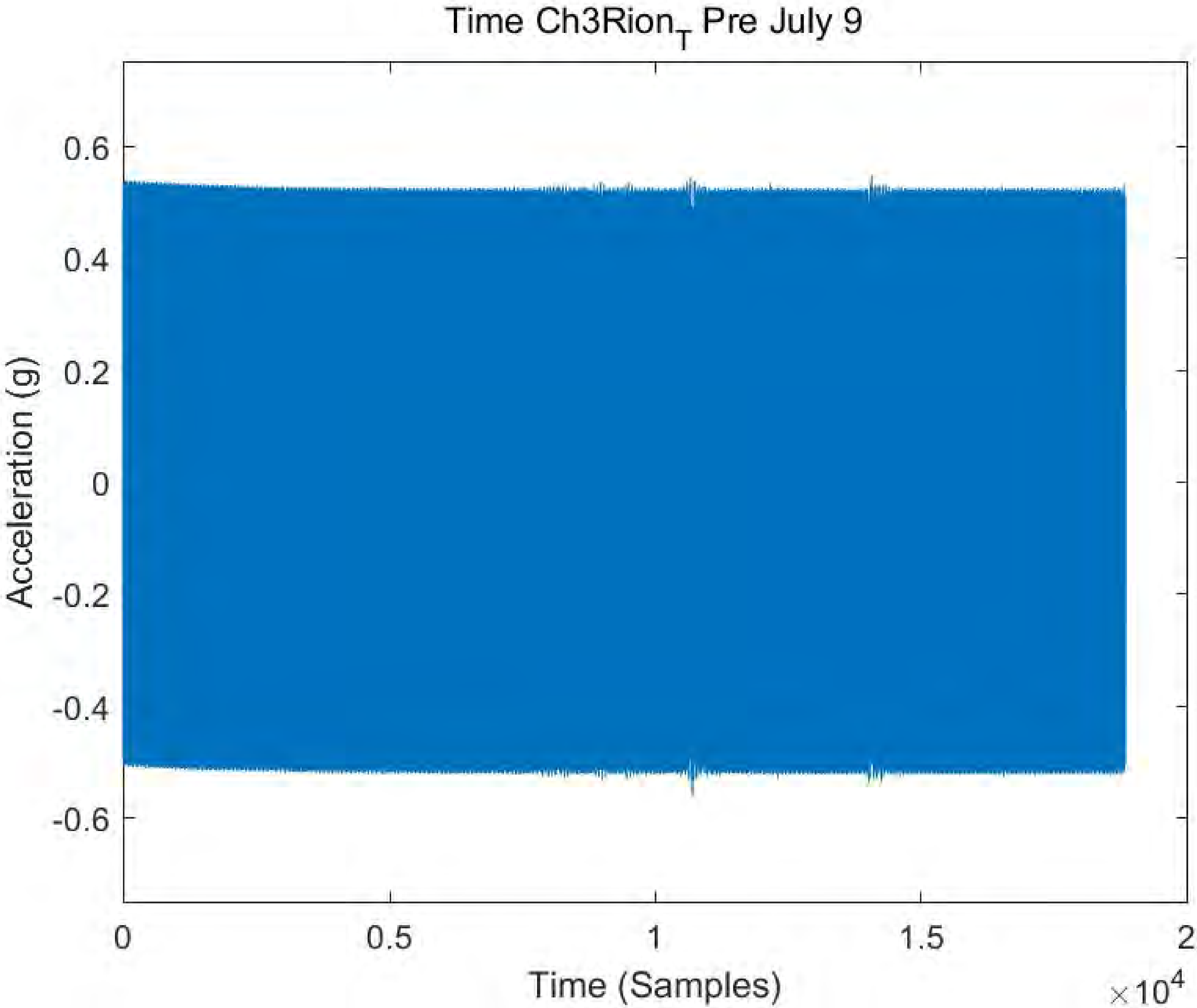

Time Ch2SP$_{4L}$ Pre Sept 11
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
12
Time (Samples)
×10^4

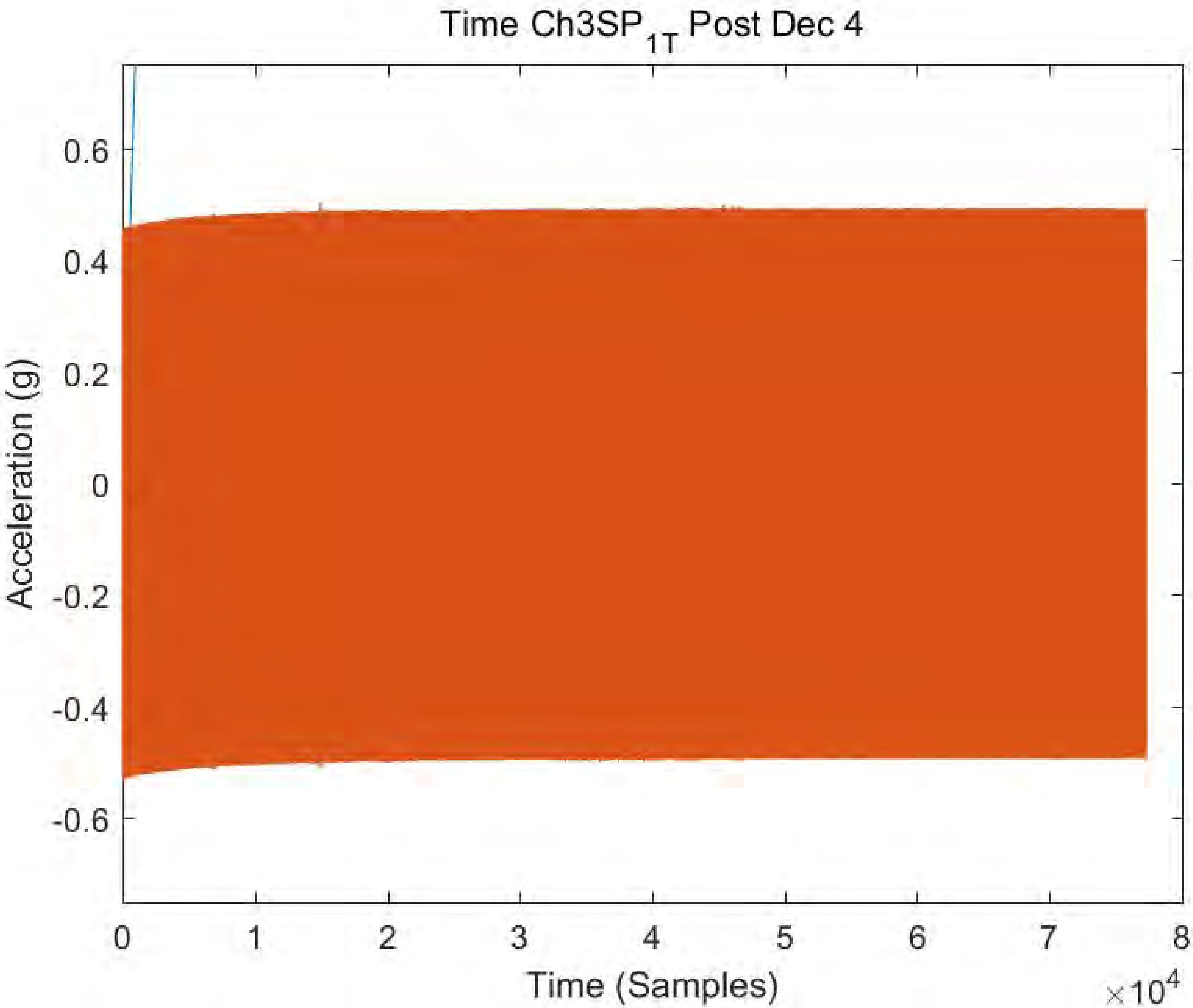

Time Ch2SP$_{5L}$ Post Oct 25
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
×10^4


Time Ch2SP$_{5L}$ Pre Sept 11
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
×10^4

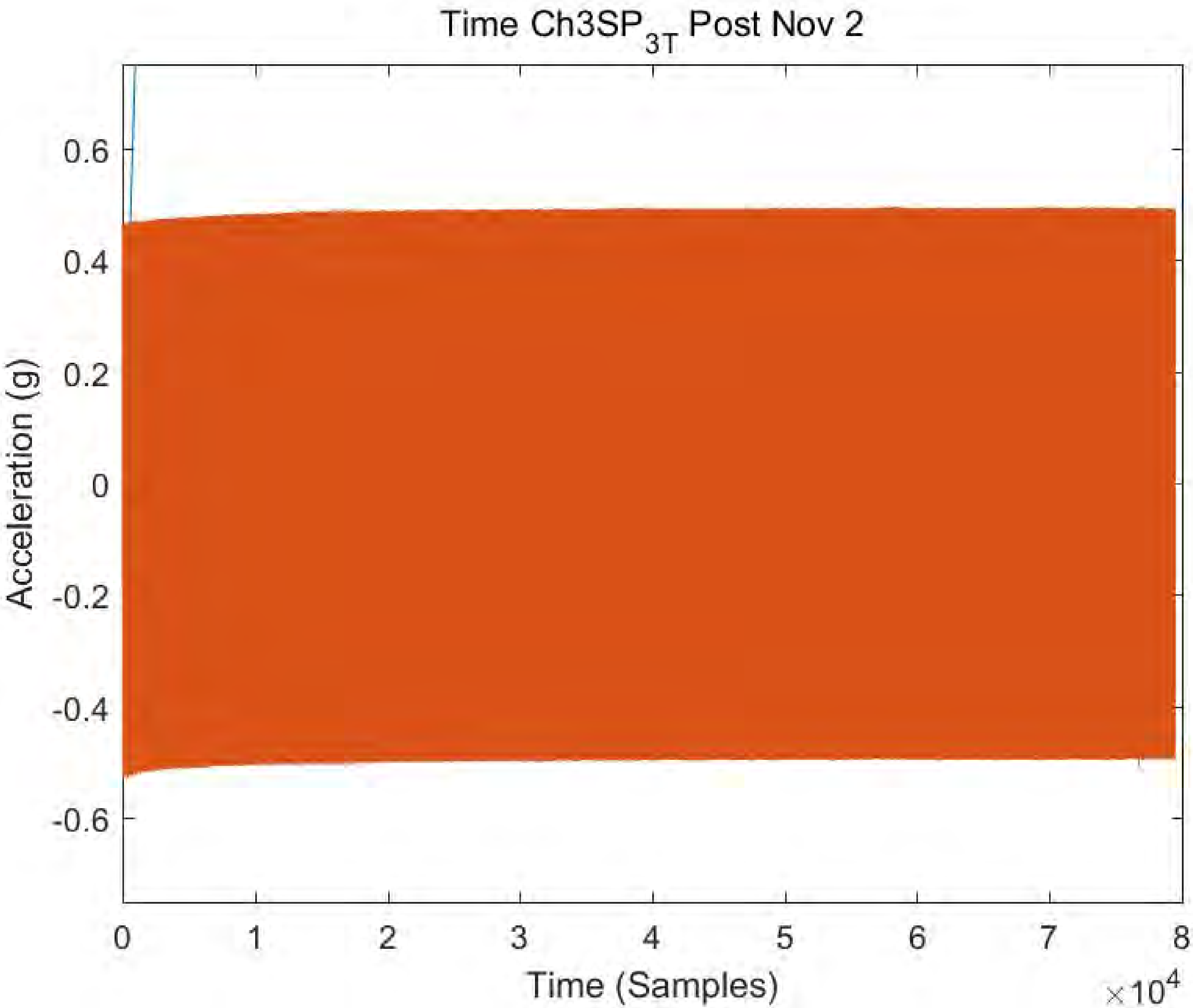


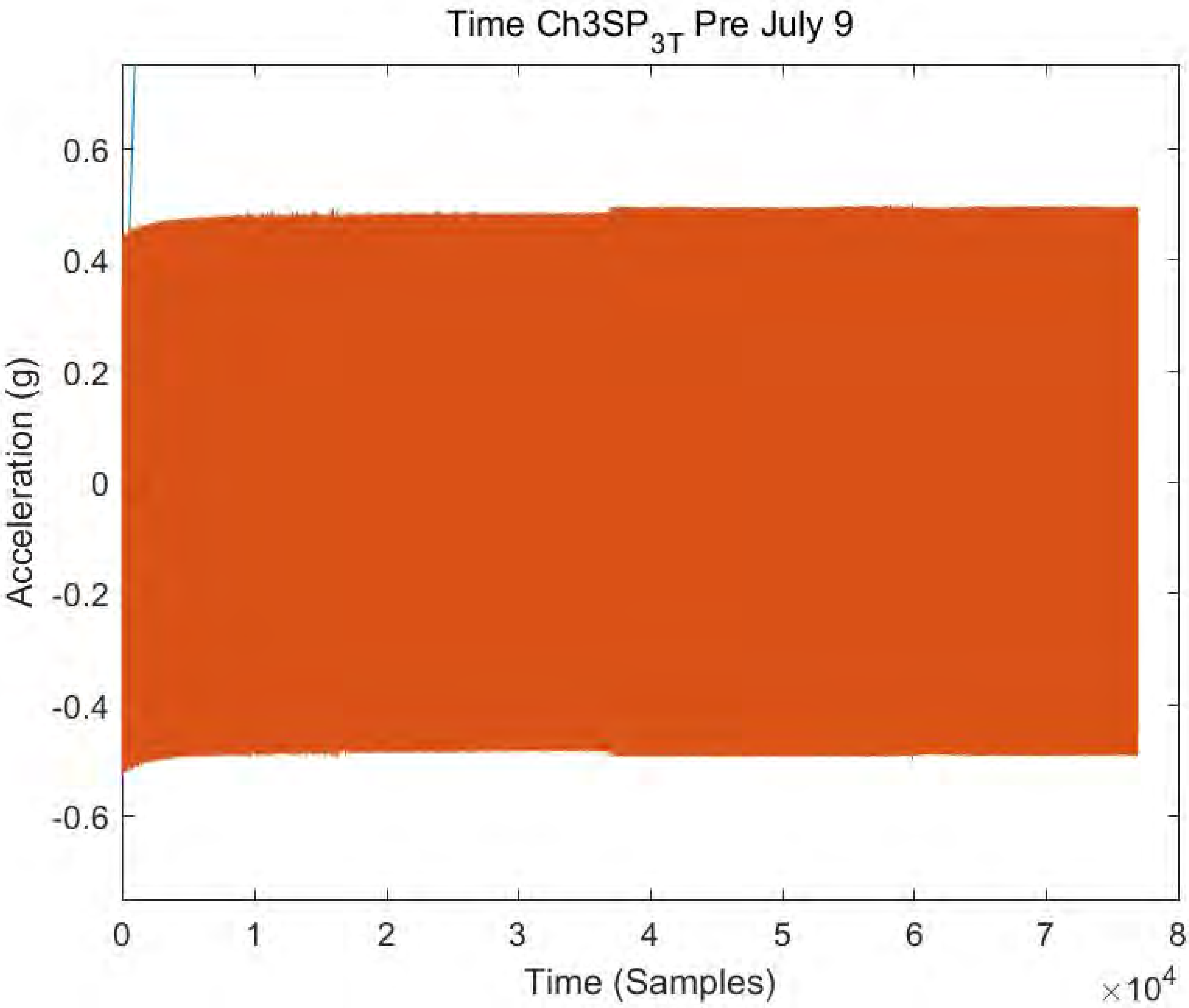
Time Ch3Rion$_T$ Post Nov 2
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Acceleration (g)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Time (Samples)

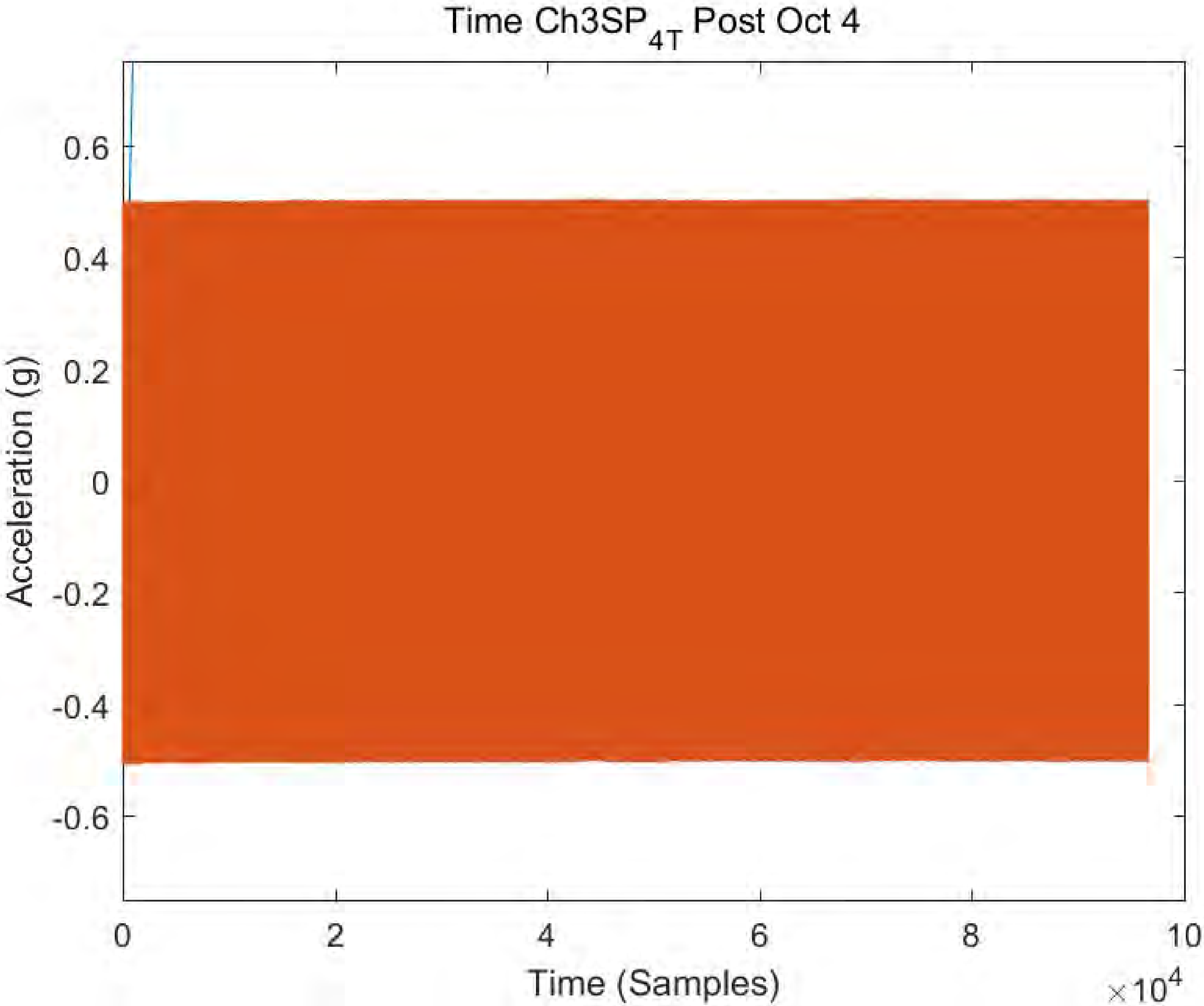

Time Ch3Rion$_T$ Pre July 9
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
0.5
1
1.5
2
Time (Samples)
×10^4

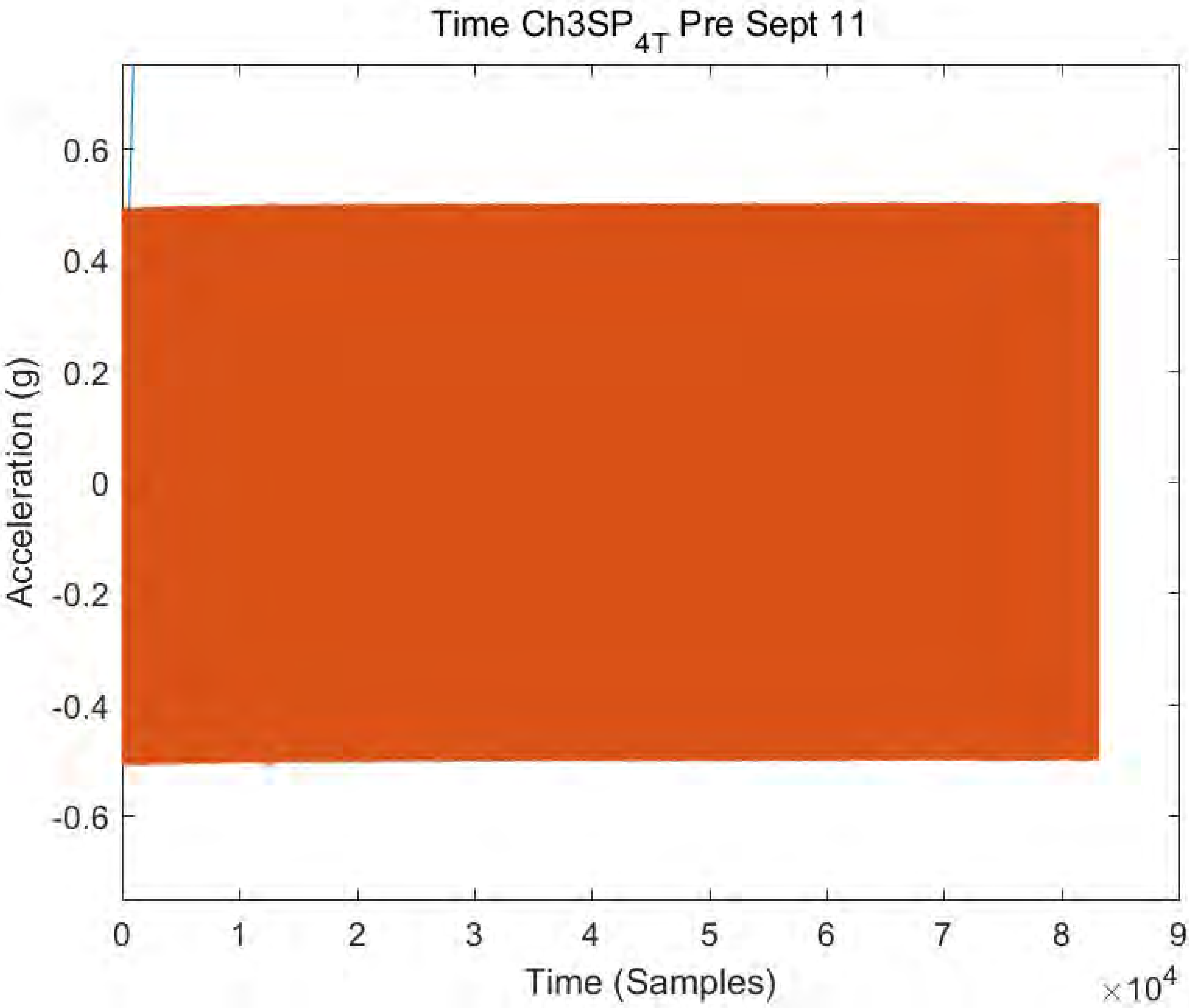


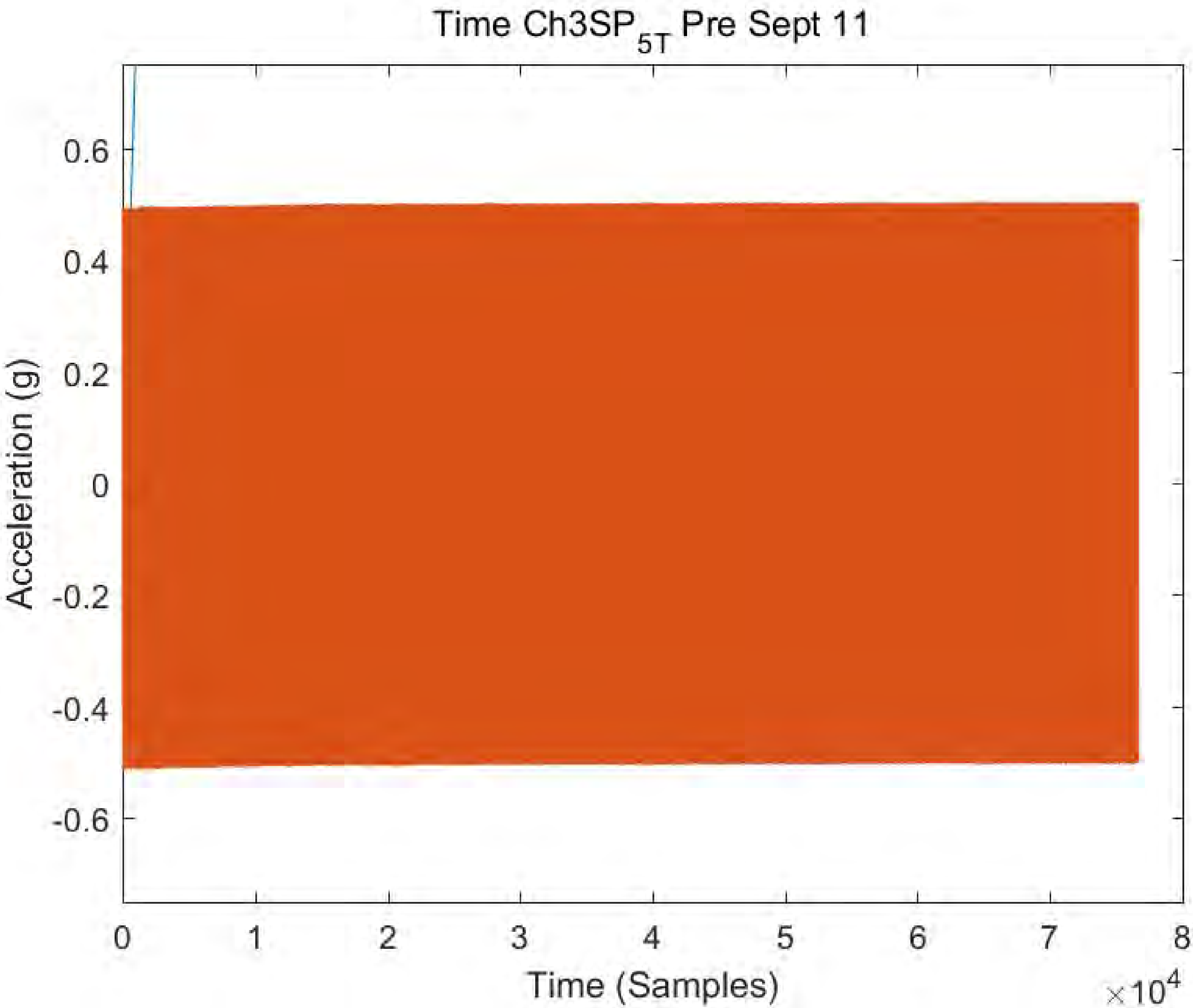
Time Ch3SP$_{1T}$ Post Dec 4
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
$\times 10^4$


Time Ch3SP$_{3T}$ Post Nov 2
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
×10^{4}


Time Ch3SP$_{3T}$ Pre July 9
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Acceleration (g)
0
1
2
3
4
5
6
7
8
Time (Samples)
×10^4


Time Ch3SP$_{4T}$ Post Oct 4
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
2
4
6
8
10
Time (Samples)
×10^4


Time Ch3SP$_{4T}$ Pre Sept 11
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
9
Time (Samples)
$\times 10^4$



Time Ch3SP$_{5T}$ Pre Sept 11
Acceleration (g)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0
1
2
3
4
5
6
7
8
Time (Samples)
×10^4

APPENDIX C

Summaries of Monitored Water Wells and Relevant MOECC Water Well Records

Table 1: Summary of Domestic Water Wells

Well Number, Address	Available Well Details & Photographs
Well 1 (Cluster 7) 25209 Baldoon Road	**Drilled Depth:** 37.5 m **Depth to Static Water Level:** N/A **Casing Depth, Diameter:** N/A m, ≈150 mm **Casing to Pump Distance:** N/A **Casing to Road Distance:** 37 m **Pump Type:** N/A **MOECC Well Record Number:** N/A **Other:** Close to south side of house, depth extended to 37.5 m and serviced 25 years ago. Nearby well records: 3302378 (1965) drilled 0.3 m into shale below 19.5 m, intake at 8.5 m, static water level at 4.6 m, pumped for 5 hours at 15.2 l/m, unable to clear water, abandoned; 3302379 (1965) drilled 0.6 m into shale below 19.5 m, intake at 10 m, static water level at 4.6 m, recommended pumping rate of 15.2 l/m, 102 mm casing installed to 18.2 m.

Well 1. Top photograph illustrates checking of accelerometers prior to mounting on well casing. Bottom photograph illustrates conditions near well casing.

Well Number, Address	Available Well Details & Photographs
Well 1A (Cluster 7) 25226 Baldoon Road	**Drilled Depth:** 20.1 m **Depth to Static Water Level:** 4.6 m **Casing Depth, Diameter:** 18.3 m, ≈102 mm **Casing to Pump Distance:** N/A m **Casing to Road Distance:** 65 m **Pump Type:** N/A **MOECC Well Record Number:** 3302379 (1965) **Other:** 3302378 (1965) drilled 0.3 m into shale below 19.5 m, 0.3 m of loose shale and gravel over rock, 102 mm diameter casing installed, depth to static water 4.6 m, well pumped at 15.2 l/m for 5 hours, unable to clear water (cloudy), well abandoned.

Well 1A. Photographs showing well covered with pail for protection of accelerometers. Left photograph looking north, center photograph looking south and right photograph showing accelerometers mounted on casing.

Well Number, Address	Available Well Details & Photographs
Well A (Cluster 7) 25321 St. Clair Road	**Drilled Depth:** 20.4 m, bedrock at 20.1 m **Depth to Static Water Level:** 2.1 m **Casing Depth, Diameter:** 20.4, ≈ 102 mm **Casing to Pump Distance:** N/A **Casing to Road Distance:** 35 m **Pump Type:** Vacuum, intake at 6.1 m depth **MOECC Well Record Number:** 3301106 (1966) **Other:** Water pumped at 12.6 l/m for 1 hour to drawdown of 6.1 m, recommended pumping rate of 9.5 l/m

Well A. Photographs showing well covered for protection of accelerometers. Top photograph looking west, bottom photograph looking south.

Well Number, Address	Available Well Details & Photographs
Well 2 (Cluster 7) 25345 Baldoon Road	**Drilled Depth:** 21.3 m, bedrock at 18.9 m **Depth to Static Water Level:** 3.87 m **Casing Depth, Diameter:** 18.9, ≈112 mm **Casing to Pump Distance:** N/A **Casing to Road Distance:** 50.5 m **Pump Type:** Vacuum, intake at 7 m depth **MOECC Well Record Number:** 3305921 (1974)/A1392245 (2013) **Other:** Recommended pumping rate of 22.8 l/m, well casing and new cap installed in 2013; six well attempts were made on this property in 1974 before encountering water including 3305919 (1974), 3305920 (1974), 3305922 (1974), 3305923 (1974), 3305924 (1974), and 3305925 (1974) all of which were dry and abandoned

Well 2. Vented well cap showing accelerometer mounted during Phase 1 test pile vibration monitoring test program.

Well Number, Address	Available Well Details & Photographs
Well 3 (Cluster 5) 8522 Bush Line	**Drilled Depth:** 18.7 m **Depth to Static Water Level:** 3.87 m **Casing Depth, Diameter:** N/A, ≈150 mm **Casing to Pump Distance:** Not available **Casing to Road Distance:** 101 m **Pump Type:** Vacuum, intake at 7 m depth **MOECC Well Record Number:** N/A **Other:** Well records from nearby property 7204772 (2013), 7204774 (2013), 7204775 (2013) indicated all dry wells, drilled to >3 m into shale

Well 3. Accelerometers mounted to well casing (left). Pressure tank (yellow) shown behind well casing. Well casing cap fitted with vent. Right and bottom photographs illustrate conditions near well casing and bottom photo illustrates existing band clamp with wires running between vented cap and casing.

Well Number, Address	Available Well Details & Photographs
Well 4 (Cluster 5) 26457 St. Clair Road	**Drilled Depth:** N/A **Depth to Static Water Level:** N/A **Casing Depth, Diameter:** N/A, ≈102 mm **Casing to Pump Distance:** <1 m **Casing to Road Distance:** 81 m **Pump Type:** One-line jet pump (vacuum) **MOECC Well Record Number:** N/A **Other:** Well and pump enclosed within small well house, located northeast of residence, pump not connected until September 6, 2017. Nearby well record: 302440 (1967) 102 mm diameter casing to 18.3 m, sand and gravel at 17.7 m, static water level at 3.7 m well intake at 13.7 m and recommended pumping rate of 12.5 litres/min

Well 4. Accelerometers mounted to well casing (left) with pump installed on September 6, 2017 also shown. Pressure tank shown to right of well casing. Photographs below illustrate well house and site conditions near well.

Well Number, Address	Available Well Details & Photographs
Well 5 (Cluster 1) 9559 Pioneer Line	**Drilled Depth:** 23.8 m **Depth to Static Water Level:** 4.8 m **Casing Depth, Diameter:** 22.9 m, ≈137 mm **Casing to Pump Distance:** N/A m **Casing to Road Distance:** 195 m **Pump Type:** N/A, Intake at 22.9 m **MOECC Well Record Number:** 7105314/A063189 (2008) **Other:** Casing set at top of rock, recommended pumping rate of 19 litres per minute based on drawdown test. Other wells between residence and road: 3306422 (1976) drilled 0.3 m into shale below 22.3 m, recommended pumping rate of 19 l/m, 102 mm casing; 3306421 (1976) drilled to 22.9 m, dry, abandoned. Gas noted in well record 7105314.

Well 5. Accelerometers mounted to well casing (bottom right). Photographs below and left illustrate site conditions near well.

Well Number, Address	Available Well Details & Photographs
Well 6 (Cluster 1) 24123 Prince Albert Road	**Drilled Depth:** 20.5 m **Depth to Static Water Level:** 4.2 m **Casing Depth, Diameter:** 20.5 m, ≈102 mm **Casing to Pump Distance:** <1 m **Casing to Road Distance:** 55 m **Pump Type:** Two-line jet pump **MOECC Well Record Number:** 3300979 (1967) **Other:** Pump and well located in well house, near solar panels about 140 m from residence. Pumping rate of 9.5 litres per minute. Additional well on site, 3300980 (1967) drilled to 1.2 m into "soft black shale" below 23.1 m, casing set 0.3 m into top of rock, at 21.9 m well dry and abandoned.

Well 6. Photograph at left illustrates well casing, pump and pressure tank. Bottom photograph illustrates well house and nearby conditions.

Well Number, Address	Available Well Details & Photographs
Well 7 (Cluster 2) 25117 Prince Albert Road	**Drilled Depth:** 17.5 m **Depth to Static Water Level:** 3.2 m **Casing Depth, Diameter:** 16.5 m, ≈162 mm **Casing to Pump Distance:** N/A **Casing to Road Distance:** 54 m **Pump Type:** N/A, intake at 9.14 m **MOECC Well Record Number:** 3309885 (2003) **Other:** Drilled 1.2 m into shale below 16.2 m, screen installed into rock with packer above in casing. Gas noted in well records 3309885 and 3301107.

Well 7. Photograph at right illustrates well casing with accelerometers mounted to casing and bag for rain cover. Well casing located between home (lower left) and garage (upper right corner, right photograph).

Well Number, Address	Available Well Details & Photographs
Well 8 (Cluster 2) 9241 Countryview Line	**Drilled Depth:** 16.8 m **Depth to Static Water Level:** 1.9 m **Casing Depth, Diameter:** 15.8 m, 140 mm **Casing to Pump Distance:** N/A m **Casing to Road Distance:** 56 m **Pump Type:** N/A, intake at well bottom **MOECC Well Record Number:** 7186693**/**A099114 (2012) **Other:** Well includes sand pack from top of rock at 14.6 m to bottom of well around stainless steel screen, gas encountered at 15.2 m, cloudy water at end of pumping test, recommended pumping rate 3.8 l/m, existing well at site abandoned at time of drilling new well. Gas noted in well record 7186693.

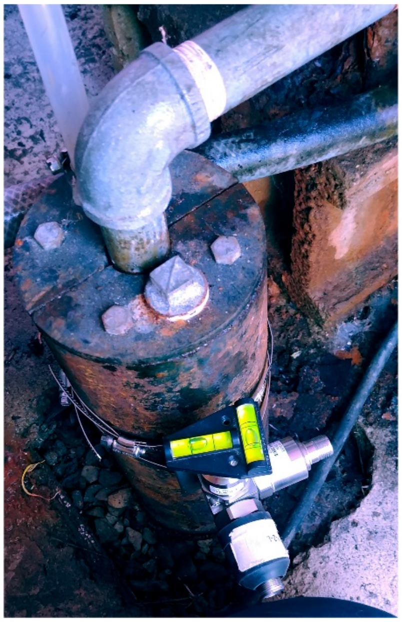
Well 8. Photograph at right illustrates well with accelerometers mounted to casing. Photograph below illustrates conditions near well.

Well Number, Address	Available Well Details & Photographs
Well 9 (Cluster 3) 9557 Countryview Line	**Drilled Depth:** ≈14.3 m **Depth to Static Water Level:** 4.6 m **Casing Depth, Diameter:** ≈13.7 m, ≈102/153 mm **Casing to Pump Distance:** ≈3 m **Casing to Road Distance:** 80 m **Pump Type:** N/A **MOECC Well Record Number:** 3310350 (2012) **Other:** 3310350 (2012) indicates correct location, appears to be a new top casing over old well; 330133 (1967) drilled 0.6 m into shale below 14.3, 102 mm diameter casing set to 13.7 m in sand and gravel, red brass screen for bottom 1 m, recommended pumping rate of 11.4 l/m; 3304611 (1968) drilled 0.3 m into shale below 14.9 m, 102 mm diameter, intake at 9 m, static level at 4.6 m, 19 l/m; 3304642 (1969) dry, abandoned; 3304643 (1969) dry, abandoned; 3304644 (1969) drilled 0.6 m into shale, dry, abandoned; 3304653 (1969) drilled 0.6 m into shale, unable clear cloudy water after 2 days of pumping, abandoned; 3304654 (1969) drilled 0.6 m into shale, unable clear cloudy water after 6 days of pumping, abandoned

Well 9. Photograph at right illustrates well casing with accelerometers mounted to casing. Conditions near well casing illustrated in photographs below where barn, within which pump was located near well casing, and driveway leading to barn.

Well Number, Address	Available Well Details & Photographs
Well 10 (Cluster 3) 9709 Cedar Hedge Line	**Drilled Depth:** N/A **Depth to Static Water Level:** N/A **Casing Depth, Diameter:** N/A, ≈102 mm **Casing to Pump Distance:** N/A **Casing to Road Distance:** 61 m **Pump Type:** One-line jet pump (vacuum) **MOECC Well Record Number:** N/A **Other:** Nearby well records: 3304612 (1968) drilled 0.6 m into shale below 13.7 m, dry, abandoned; 3304613 (1968) drilled 0.3 into shale at 14 m, static water level at 3 m, pumped for 2 weeks at 4 15.2 l/m, water cloudy and "unable to control sand", casing pulled and well abandoned; 3304614 (1968) drilled 0.3 m into shale at 14.3 m, 102 mm casing installed to 12.2 m, intake at 10 m, pumped for 3 days at 15.2 l/m, water "cloudy at times"; 3301136 (1963) drilled 2.6 m into shale below 13.6 m, installed 102 mm diameter casing, other pumping details unknown.

Well 10. Photograph at upper left illustrates proximity of well casing, pump and tank. Accelerometers mounted to casing shown below. Conditions near well casing illustrated in lower left photograph.



Well Number, Address	Available Well Details & Photographs
Well 11 (Cluster 4) 9596 Union Line	**Drilled Depth:** N/A m **Depth to Static Water Level:** N/A m **Casing Depth:** N/A, ≈150 mm **Casing to Pump Distance:** N/A m **Casing to Road Distance:** 89 m **Pump Type:** N/A **MOECC Well Record Number:** N/A **Other:** Nearby well records: 3301279 (1959) drilled 0.3 m into gravel below 14.9 m, 102 mm diameter casing to 19.9 m, gas, recommended pumping 2 l/mm, static level 4.6 m.

Well 11. Accelerometers mounted to casing shown lower right. Conditions near well casing illustrated in photographs at left.

Well Number, Address	Available Well Details & Photographs
Well 12 (Cluster 4) 9468 Union Line	**Drilled Depth:** N/A **Depth to Static Water Level:** N/A **Casing Depth, Diameter:** N/A m, ≈150 mm **Casing to Pump Distance:** 0 m **Casing to Road Distance:** 84 m **Pump Type:** Mechanical lift pump **MOECC Well Record Number:** N/A **Other:** Nearby well records: 3301223 (1947) drilled 1.5 m into shale below 13.4 m, static water level at 3.7 m; 7163633/A099070 (2011) drilled 2.7 m into shale below 13.4 m, 140 mm casing to 13.7 m, screen and sand pack installed, recommended pumping rate 38 l/m with intake at 16.2 m; 716345/264876 (2011) drilled to 15.8 m, 1.5 m screen, decommissioned well originally drilled in 2003 because well "turned dirty". Gas noted in records 7163633 7163645.

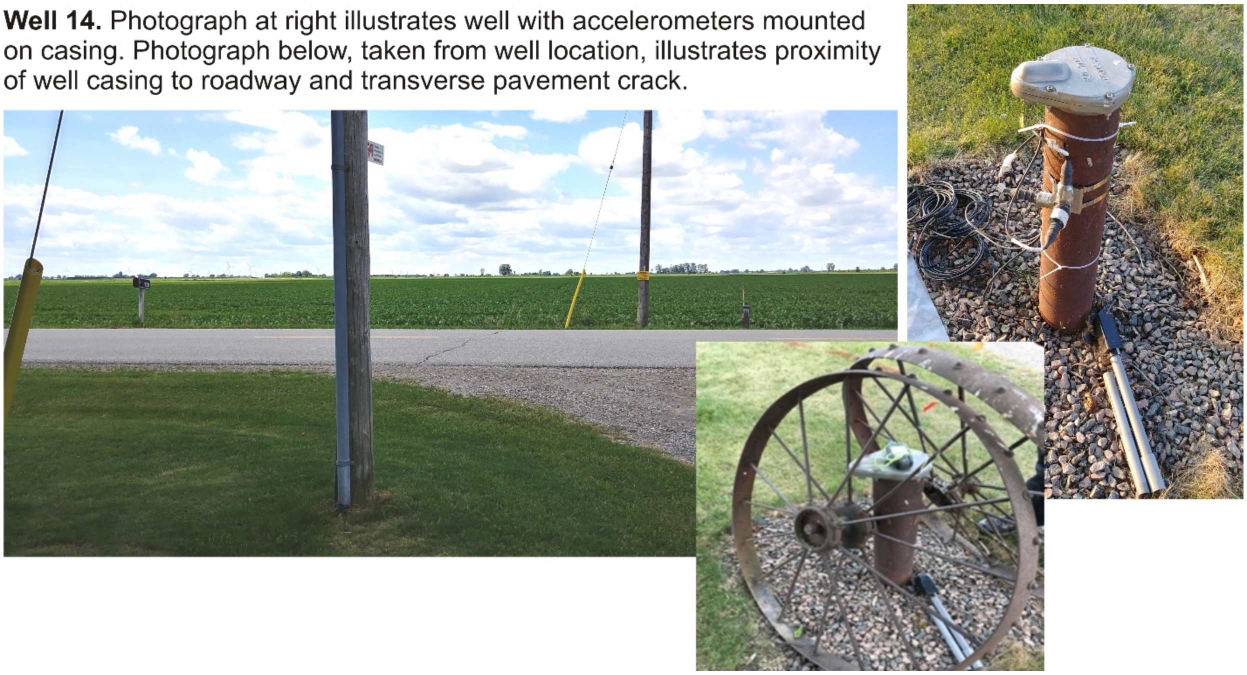
Well 12. Photograph at top right illustrates well casing with pump mounted on top of casing. Lower right photograph shows accelerometers mounted on casing. Conditions near well casing illustrated in photographs below.

Well Number, Address	Available Well Details & Photographs
Well 13 (Cluster 6) 8771 Union Line	**Drilled Depth:** 15.8 m **Depth to Static Water Level:** 2.1 m **Casing Depth, Diameter:** 13.7 m, ≈136 mm **Casing to Pump Distance:** <1 m **Casing to Road Distance:** 67 m **Pump Type:** Two-line jet pump **MOECC Well Record Number:** 3308468 (1989) **Other:** Recommended pumping rate 2 to 3 l/m. 3308469 (1989) dry, abandoned.

Well 13. Photograph at right illustrates well casing with pump mounted immediately adjacent to pump. Photographs at left illustrate conditions near well casing.

Well Number, Address	Available Well Details & Photographs
Well 14 (Cluster 6) 8904 Union Line	**Drilled Depth:** N/A m **Depth to Static Water Level:** N/A m **Casing Depth, Diameter:** N/A m, ≈150 mm **Casing to Pump Distance:** N/A m **Casing to Road Distance:** 13 m **Pump Type:** Jet **MOECC Well Record Number:** N/A **Other:** Nearby well records: 7216293 (2013) abandonment of 50 mm diameter 14 m deep well; 7216295 (2013) abandonment of 73 mm diameter 17 m deep well in pump house; 7216292/A139346 (2013) drilled 4.7 m into shale below 14.2 m, 137 mm diameter casing to 14.2 m, recommended pump rate 2 l/m, water with "slight haze".

Well 14. Photograph at right illustrates well with accelerometers mounted on casing. Photograph below, taken from well location, illustrates proximity of well casing to roadway and transverse pavement crack.



Well A. MOECC Record 3301106

F

33 № 1106
FEB. 2 1967
ONTARIO WATER RESOURCES COMMISSION

.UTM 17 Z 3 9 5 1 4 0 E
5 R 4 7 0 3 3 1 9
Elev. 4 R 0 5 9 0

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 2 3 County or District KENT

Township, ~~Village, Town or City~~ Chatham

Con. Eight Lot One

Date completed 23rd (day) September month 1966 year)

[redacted]dress R. R. #1, Dover Centre

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 67'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 4"

Pumping Test

Static level 7'

Test-pumping rate 200 gal. per hour G.P.M.

Pumping level 20'

Duration of test pumping 1 hour

Water clear or cloudy at end of test clear

Recommended pumping rate 150 gal. per hr. G.P.M.

with pump setting of 20 feet below ground surface

Well Log			Water Record	
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Red Sand	One	Fifteen		Fresh
Soft blue clay	Fifteen	Sixty-five		
Hard Pan	Sixty-five	Sixty-six		
Black Shale	Sixty-six	Sixty-seven	67	

For what purpose(s) is the water to be used? Domestic Use

Is well on upland, in valley, or on hillside? Level

Drilling or Boring Firm Orval L'Ecuyer

Address 57 Joseph St., Chatham, Ontario

Licence Number 2168

Name of Driller or Borer Orval L'Ecuyer

Address 57 Joseph St., Chatham, Ontario

Date September 23rd, 1966

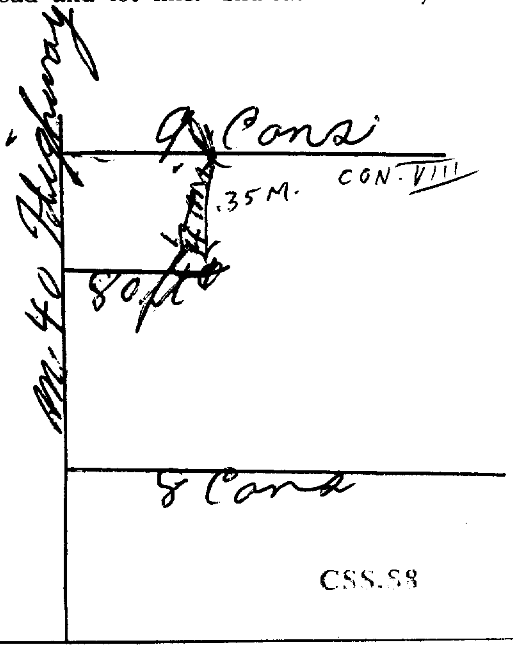
Orval L'Ecuyer
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

O W R C COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

Well 1. Nearby MOECC Record 3302378

33 № 2378

BRW Lot 16

UTM 17 Z 394280 E

5 R 4701760 N

Lot 16

Elev. 4 R 0590

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 23

County or District KENT

Township, Village, Town or City DOVER

Con. ~~8~~ BDW Lot 16

Date completed 18 (day) Sept (month) 65 (year)

[redacted]dress R.R. II 2, Bear Line

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 64'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 4"

Pumping Test

Static level 15

Test-pumping rate 4 G.P.M.

Pumping level 22'

Duration of test pumping 5 hrs

Water clear or cloudy at end of test abandoned unable to clear

Recommended pumping rate 4 G.P.M.

with pump setting of 28' feet below ground surface

Well Log

			Water Record	
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2	63	Fresh
Yellow clay	2	12		
Blue clay	12	63		
Loose Shale + gravel	63	64		
Black Shale	64	65		

For what purpose(s) is the water to be used? D + S

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Same as below

Address

Licence Number 1824

Name of Driller or Borer R W Simpson

Address Dresden Ont RR #2

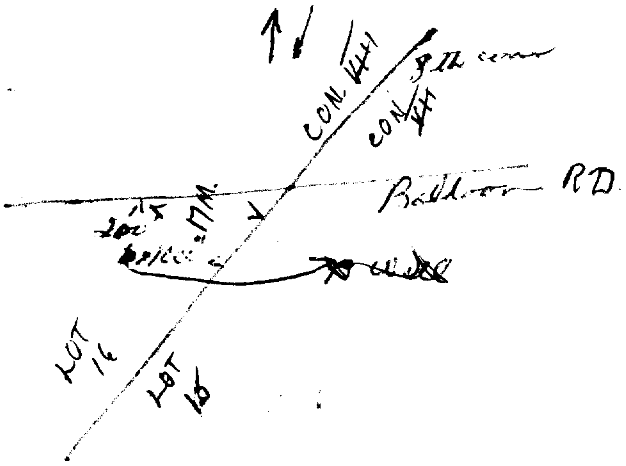
Date Sept 8/65

R W Simpson

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

O W R C COPY

Well 1. Nearby MOECC Record 3302379

BRW
Lot 16

33 № 2379

394240

UTM 17 Z 8 E

15 R 4701805 N

Con 8 Lot 16

Elev. 14 R 65910

Basin 23

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City DOVER

Con. 8 BDW. Lot 16 Date completed 20 (day) Sept month 65 year)

[redacted] dress R. R. # 2, Bear Line

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 60'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 4"

Pumping Test

Static level 15'

Test-pumping rate 4 G.P.M.

Pumping level 22'

Duration of test pumping 7 hrs

Water clear or cloudy at end of test clear

Recommended pumping rate 4 G.P.M.

with pump setting of 30' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2	63	fresh
yellow clay	2	12		
Blue clay	12	63		
Loose shale + gravel	63	64		
Black shale	64	66		

For what purpose(s) is the water to be used? D+S

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Same as below

Address

Licence Number 1824

Name of Driller or Borer R W Simpson

Address RR # 2 Dresden

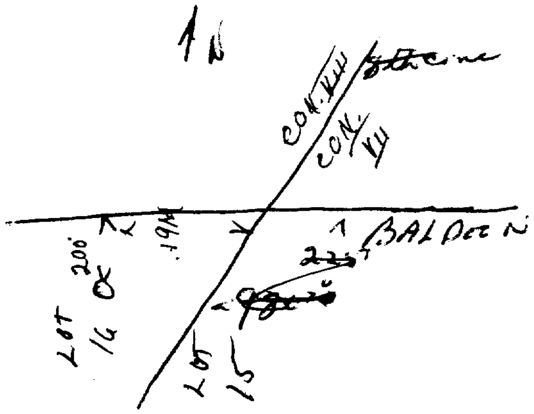
Date Sept 20/65

R W Simpson

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

Well 1A. MOECC
Record 3302378

BRW
Lot 16

33 Nº ~~2378~~

UTM 17 Z ~~85~~ 394280 E

15 R ~~Con 8~~ Lot 14 4701760 N

Elev. 14 R 0590

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 23 County or District KENT

Township, Village, Town or City DOVER

Con. ~~8~~ BDW Lot 16

Date completed 18 (day) Sept (month) 65 (year)

[redacted]

dress R. R. # 2, Bear Line

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 64'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 4"

Pumping Test

Static level 15

Test-pumping rate 4 G.P.M.

Pumping level 22'

Duration of test pumping 5 hrs

Water clear or cloudy at end of test abandoned unable to clear

Recommended pumping rate 4 G.P.M.

with pump setting of 28' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
top soil	0	2	63	Fresh
Yellow clay	2	12		
Blue clay	12	63		
Loose Shale + gravel	63	64		
Black Shale	64	65		

For what purpose(s) is the water to be used? D + S

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm below

Address Same as

Licence Number 1824

Name of Driller or Borer R W Simpson

Address Dresden Ont RR # 2

Date Sept 18/65

R W Simpson

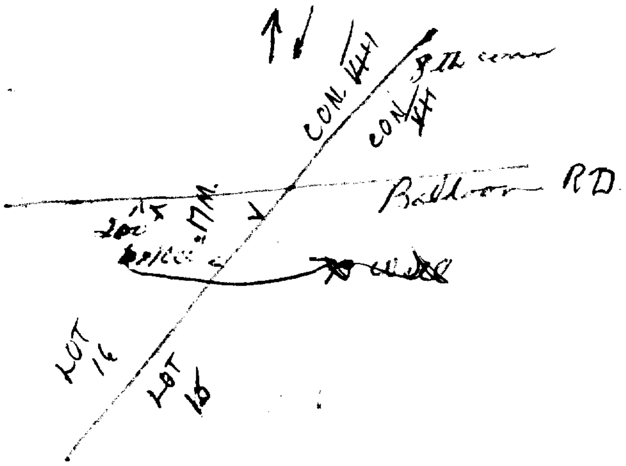
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Well 1A. MOECC Record 3302379

BRW Lot 16

Con 8 Lot 16

UTM 17 Z 8 E 394240

15 R 16 N 4701805

Elev. K R 0 5 9 0

Basin 2 3 0

33 № 2379

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT

Township, Village, Town or City DOVER

Con. 8 BDW. Lot 16

Date completed 20 (day) Sept (month) 65 (year)

[redacted]

dress R.R. #2, Bear Line

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 60'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 4"

Pumping Test

Static level 15'

Test-pumping rate 4 G.P.M.

Pumping level 22'

Duration of test pumping 7 hrs

Water clear or cloudy at end of test clear

Recommended pumping rate 4 G.P.M.

with pump setting of 30' feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2	63	fresh
yellow clay	2	12		
Blue clay	12	63		
Loose shale + gravel	63	64		
Black Shale	64	66		

For what purpose(s) is the water to be used? D+S

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Same as below

Address

Licence Number 1324

Name of Driller or Borer R.W. Simpson

Address R.R. 2 Dresden

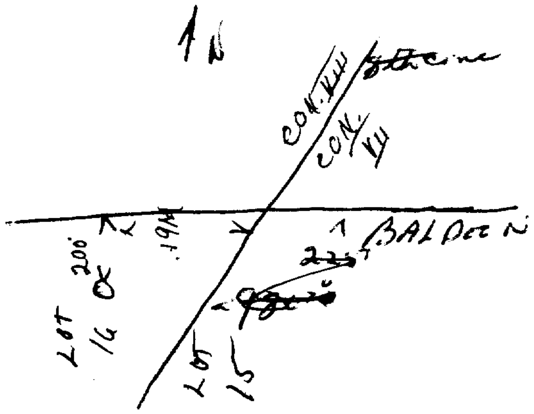
Date Sept 20/65

R.W. Simpson

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

Well 2. MOECC Record 3305919

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3305919 | MUNICIP. 33003 | CON. BR E

COUNTY OR DISTRICT: KENT
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: DOVER
CON., BLOCK, TRACT, SURVEY, ETC.: 8 B.Rd. E
LOT: 017

[redacted]

-1 Dover Centre

DATE COMPLETED: DAY 15 MO. ~~Mar~~ 03 YR. 74

RC | ELEVATION | RC | BASIN CODE

21 3305919 17 394008 4702397 4 588 4 23 AUG 07, 1975 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
yellow	clay.			0	4'
sand				4'	15'
grey	clay.			15'	59'
black	shale			59'	80'
grey	shale			80'	84'

31 0004505 0015128 0059205 0080817 0084217

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
04	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.205	0	59
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☑ OPEN HOLE		59	84
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)
DIAMETER INCHES
LENGTH FEET
MATERIAL AND TYPE
DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

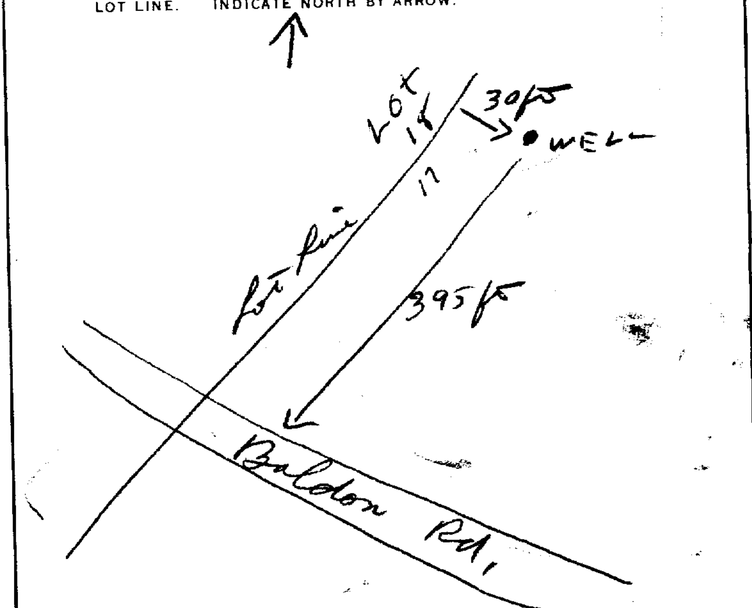
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	84	clay.

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER
PUMPING RATE: GPM.
DURATION OF PUMPING: HOURS MINS.
STATIC LEVEL: FEET
WATER LEVEL END OF PUMPING: FEET
WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY
15 MINUTES: FEET | 30 MINUTES: FEET | 45 MINUTES: FEET | 60 MINUTES: FEET
IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: FEET
RECOMMENDED PUMPING RATE: GPM
GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☑ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED
Casing Pulled

WATER USE

1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Don Wade
LICENCE NUMBER: 5406
ADDRESS: RR-5 Tilbury Ont
NAME OF DRILLER OR BORER: same
LICENCE NUMBER: 5406
SIGNATURE OF CONTRACTOR: Don Wade
SUBMISSION DATE: DAY 15 MO. Mar YR. 74

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 5406
DATE RECEIVED: 260374
DATE OF INSPECTION: 21/1/75
INSPECTOR: 7
REMARKS:
CSS.S8
P 7
WI

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT COPY

Well 2. MOECC Record 3305920

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

3305920

MUNICIP. 33003

CON. BR E

COUNTY OR DISTRICT [redacted]

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: DOVER

CON., BLOCK, TRACT, SURVEY, ETC.: 8 B. Rd. E

LOT: 017

DATE COMPLETED: DAY 19 MO. 03 YR. 74

RC. ELEVATION RC. BASIN CODE

3305920 17 393975 4702250 4 588 4 23 AUG 07, 1975 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
yellow	clay.			0	4'
sand				4'	15"
grey	"			15'	58'
black	shale			58'	~~78~~ 78'
grey	shale			78'	80'

31 0004505 0015128 0058205 0078817 0080217

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
04	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	205	0	58
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ ~~OPEN HOLE~~		~~58~~	~~78~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)

DIAMETER INCHES

LENGTH FEET

MATERIAL AND TYPE

DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0000	0080'	clay.

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE GPM.

DURATION OF PUMPING HOURS MINS.

STATIC LEVEL FEET

WATER LEVEL END OF PUMPING FEET

WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

15 MINUTES FEET · 30 MINUTES FEET · 45 MINUTES FEET · 60 MINUTES FEET

IF FLOWING, GIVE RATE GPM.

PUMP INTAKE SET AT FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING FEET

RECOMMENDED PUMPING RATE GPM.

GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☒ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED Casing Pulled.

WATER USE

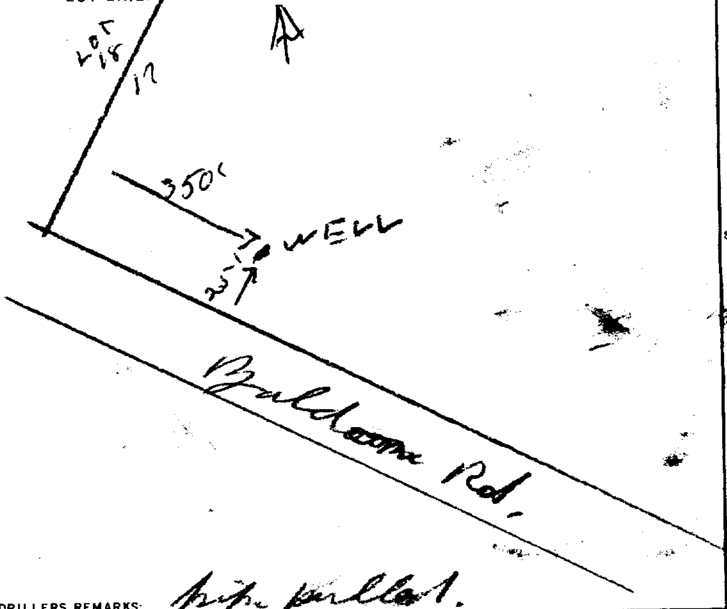
1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: pipe pulled.

CONTRACTOR

NAME OF WELL CONTRACTOR: Don Frade — LICENCE NUMBER: 5406

ADDRESS: RR-5 Ivrbury Ont

NAME OF DRILLER OR BORER: same — LICENCE NUMBER: 5406

SIGNATURE OF CONTRACTOR: Don Frade

SUBMISSION DATE: DAY 19 MO. Mar YR. 74

OFFICE USE ONLY

DATA SOURCE: 1

CONTRACTOR: 5406

DATE RECEIVED: 2603 74

DATE OF INSPECTION: 21/4/75

INSPECTOR

REMARKS: CSS.S8

P 7

WI

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT COPY

Well 2. MOECC Record 3305921

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

Ontario

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3305921 | MUNICIP. 33003 | CON. BR E

COUNTY OR DISTRICT: KENT
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: DOVER
CON., BLOCK, TRACT, SURVEY, ETC.: 8 B. Rd E
LOT 017

[redacted] -1 Dover centre

DATE COMPLETED: DAY 22 MO. ~~Aug~~ 08 YR. 74

			RC.	ELEVATION	RC.	BASIN CODE		
3305921 17	394042	4702267	4	588	4	23	AUG 07, 1975	90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
yellow	clay			0	4'
	sand			4'	12'
sand	"			12'	59'
grey hard	pan			59'	62'
black	shale			62'	70'

31 | 0004506 | 0012 28 | 0059205 | 0062 14 | 0070817

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
062	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
04	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ ~~OPEN HOLE~~	205	0 ~~62~~ ~~62~~	0062 ~~70~~
04	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0070
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)
DIAMETER INCHES
LENGTH FEET
MATERIAL AND TYPE
DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

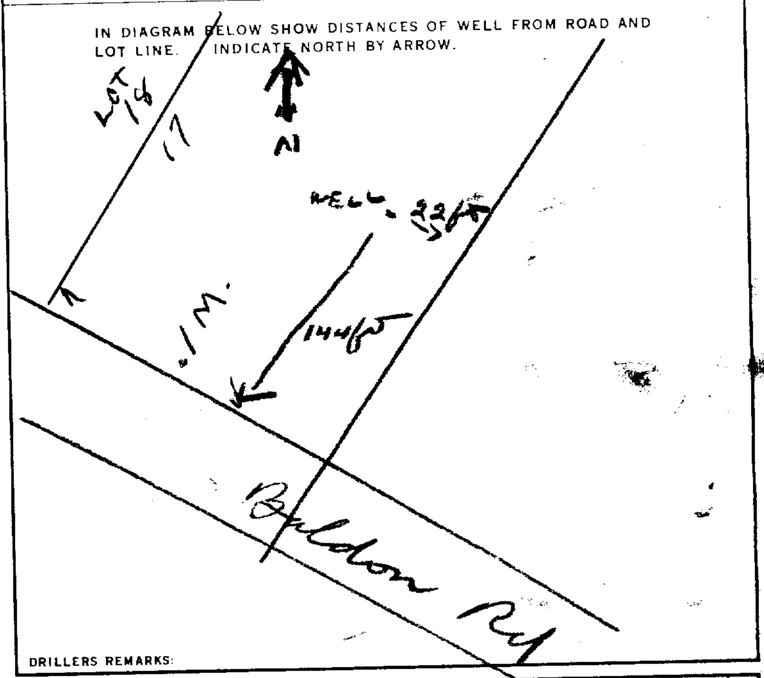
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 0010 GPM
DURATION OF PUMPING: 03 HOURS 00 MINS
STATIC LEVEL: 023 FEET
WATER LEVEL END OF PUMPING: 030 FEET
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY
15 MINUTES: FEET | 30 MINUTES: FEET | 45 MINUTES: FEET | 60 MINUTES: 030 FEET
IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 050 FEET
RECOMMENDED PUMPING RATE: 0006 GPM
0.01.4 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE

01

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Don Glrade
LICENCE NUMBER: 5406
ADDRESS: RR-5 McKay Ont
NAME OF DRILLER OR BORER: same
LICENCE NUMBER: 5406
SIGNATURE OF CONTRACTOR: Don Glrade
SUBMISSION DATE: DAY 22 MO. Mar YR. 74

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 5406
DATE RECEIVED: 260374
DATE OF INSPECTION: 21/1/75
INSPECTOR: R
REMARKS: CSS.S
P 2
WI 2

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT COPY

Well 2. MOECC Record 3305922

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

ONTARIO

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3305922 | MUNICIP. 33003 | CON. BR E

COUNTY OR ~~DISTRICT~~ [redacted]

TOWNSHIP, BOROUGH, CITY, TOWN, ~~VILLAGE~~: DOVER

CON., BLOCK, TRACT, SURVEY, ETC.: 8 B Rd. E

LOT: 017

1 Dover centre

DATE COMPLETED: DAY 15 MO. ~~Feb.~~ YR. 74

RC. ELEVATION RC. BASIN CODE II III IV

21 3305922 17 393939 4702343 4 588 4 23 AUG 07, 1975 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
dark	clay.			0	2'
~~black~~	~~sand~~			~~2~~	
yellow	clay.			2'	4'
quick	sand			4'	12'
gray	clay			12'	60'
black	shale			60'	78'
grey	shale			78'	81'

31 | 000205 | 0004505 | 0012 07 | 0060205 | 007817 | 008117

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
04"	~~1 ☒ STEEL~~ 2 ☐ GALVANIZED 3 ☐ CONCRETE ~~4 ☒ OPEN HOLE~~	.25	~~0'~~ ~~60'~~	~~60'~~ ~~81'~~
17-18	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	81	clay
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE: GPM.

DURATION OF PUMPING: HOURS MINS.

STATIC LEVEL: 12 FEET

WATER LEVEL END OF PUMPING: Too FEET

WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

15 MINUTES: slow FEET | 30 MINUTES: to FEET | 45 MINUTES: test FEET | 60 MINUTES: FEET

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP

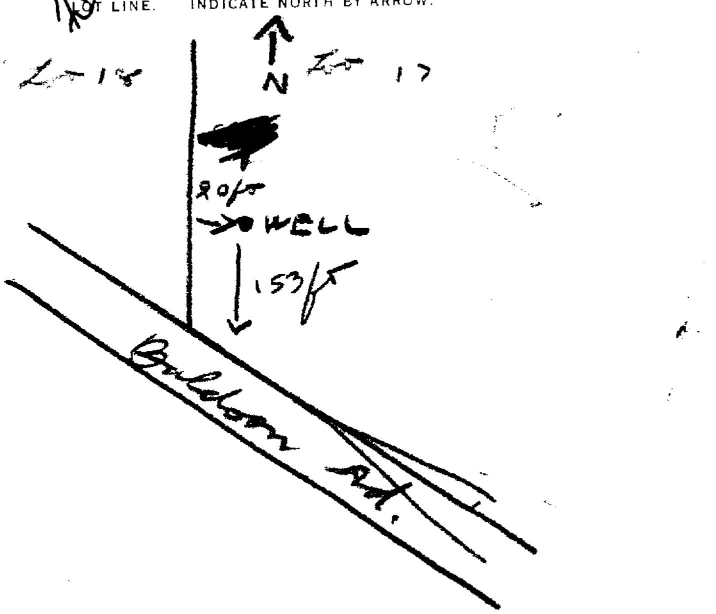
RECOMMENDED PUMP SETTING: FEET

RECOMMENDED PUMPING RATE: GPM.

GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☒ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

Casing pulled.

WATER USE

1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Don. Gleadle
LICENCE NUMBER: 5406
ADDRESS: R.R. 5 Tilbury Ont
NAME OF DRILLER OR BORER: same
LICENCE NUMBER: 5406
SIGNATURE OF CONTRACTOR: Donald Gleadle
SUBMISSION DATE: DAY 15 MO. Feb. YR. 74

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 5406
DATE RECEIVED: 2603 74
DATE OF INSPECTION: 21, 1, 75
INSPECTOR: 2
REMARKS:
CSS.S8
P 2
WI

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT COPY

Well 2. MOECC Record 3305923

3 rd

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 3305923 MUNICIP. 33003 CON. BR E

COUNTY OR DISTRICT KENT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE DOVER	CON., BLOCK, TRACT, SURVEY, ETC. 8 B. Rd. E	LOT 017

[redacted] -1 Dover Centre

DATE COMPLETED DAY 27 MO. 02 YR. 74

RC. ELEVATION RC. BASIN CODE

21 3305923 17 393944 4702288 4 588 4 23 AUG 07, 1975 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
dark	clay.			0	2'
yellow	"			2'	4'
sand				4'	12'
grey	"			12'	57'
hard	pan			57'	60'
black	shale			60'	80'
grey	shale			80'	85'

31 0002 05 ~~0004~~ 5 05 0012 28 ~~0057~~ 0060 05 0060 14 0080 17 1

32 0085 217

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
04	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	~~205~~	~~0~~	~~60~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ ~~OPEN HOLE~~		~~60~~	~~85~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)

DIAMETER INCHES

LENGTH FEET

MATERIAL AND TYPE

DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0000	0085	clay.

71 PUMPING TEST

PUMPING TEST METHOD 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE GPM.

DURATION OF PUMPING HOURS MINS

STATIC LEVEL FEET

WATER LEVEL END OF PUMPING FEET

WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

15 MINUTES FEET | 30 MINUTES FEET | 45 MINUTES FEET | 60 MINUTES FEET

IF FLOWING, GIVE RATE GPM

PUMP INTAKE SET AT FEET

WATER AT END OF TEST 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☐ DEEP

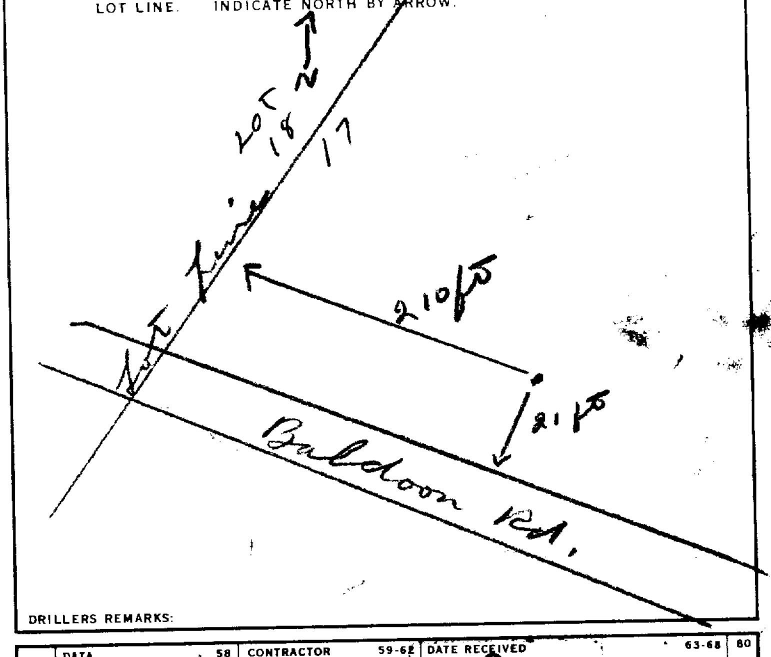
RECOMMENDED PUMP SETTING FEET

RECOMMENDED PUMPING RATE GPM

GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☒ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

Casing Pulled.

WATER USE

1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR Don Wade

LICENCE NUMBER 5406

ADDRESS RR-5 W'burg Ont

NAME OF DRILLER OR BORER same

LICENCE NUMBER 5406

SIGNATURE OF CONTRACTOR Don Wade

SUBMISSION DATE DAY 27 MO. Feb. YR. 74

OFFICE USE ONLY

DATA SOURCE 1

CONTRACTOR 5406

DATE RECEIVED 28 03 74

DATE OF INSPECTION 21/1/75

INSPECTOR

REMARKS:

CSS.S8

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Well 2. MOECC Record 3305924

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MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3305924 | MUNICIP. 33003 | CON. BR E

COUNTY OR ~~DISTRICT~~: Kent

TOWNSHIP, BOROUGH, ~~CITY~~, TOWN, VILLAGE: Dover

CON., BLOCK, ~~TRACT, SURVEY~~, ETC.: 8 B.Rd. E

LOT 25-27: 017

[redacted]

1 Dover Centre

DATE COMPLETED 48-53: DAY 30 MO. Feb. YR. 74

RC. | ELEVATION | RC. | BASIN CODE

21 3305924 17 393926 4702311 4 588 4 23 AUG 07, 1975 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
dark	clay.			0'	1'
yellow				1'	4'
sand				4'	12'
blue	clay.			12'	58'
hard	pan			58'	60'
black	shale			60'	78'
grey	shale			78'	90'

31 0001 05 0004505 0012 28 0058305 0060 14 0078817 ✓

32 0080217

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 ☐ FRESH 3 ☐ SULPHUR 14 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 19 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 24 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 29 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 34 80 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
10-11 6¼	1 ☒ STEEL 12 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE	.205	0 60'	13-16 60 90'
17-18	1 ☐ STEEL 19 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	1 ☐ STEEL 26 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 31-33	DIAMETER 34-38 INCHES	LENGTH 39-40 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN 41-44 FEET	80

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13 0	14-17 8	clay.
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE 11-14: GPM

DURATION OF PUMPING: 15-16 HOURS 17-18 MINS

STATIC LEVEL 19-21	WATER LEVEL END OF PUMPING 22-24	25 WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY: 15 MINUTES 26-28	30 MINUTES 29-31	45 MINUTES 32-34	60 MINUTES 35-37
FEET	FEET	FEET	FEET	FEET	FEET

IF FLOWING GIVE RATE 38-41: GPM.

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST 42: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP

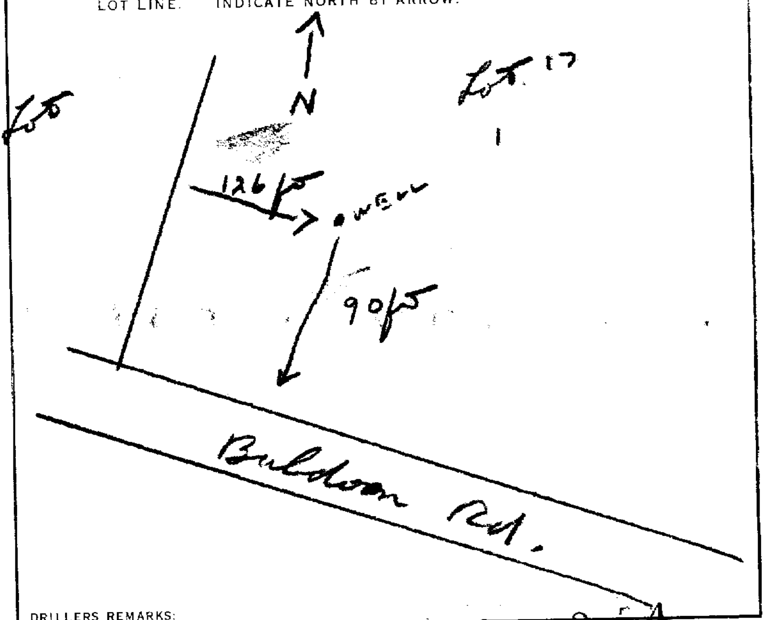
RECOMMENDED PUMP SETTING 43-45: FEET

RECOMMENDED PUMPING RATE 46-49: GPM

50-53 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

54
1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☒ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

Casing Pulled

WATER USE

55-56
1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

57
1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Don Glade

LICENCE NUMBER: 5406

ADDRESS: RR 5 [illegible] Ont

NAME OF DRILLER OR BORER: same

LICENCE NUMBER: 5406

SIGNATURE OF CONTRACTOR: Don Glade

SUBMISSION DATE: DAY 22 MO. ~~Mar~~ YR. 74

OFFICE USE ONLY

DATA SOURCE 58: 1

CONTRACTOR 59-62: 5406

DATE RECEIVED 63-68: 2603 74

80

DATE OF INSPECTION: 21/1/75

INSPECTOR:

REMARKS:

CSS.S8

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FORM 7 07-091

MINISTRY OF THE ENVIRONMENT COPY

Well 2. MOECC Record 3305925

Ontario

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

3305925

MUNICIP. 33003 CON. BR E

COUNTY OR DISTRICT: KENT
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: DOVER
CON., BLOCK, TRACT, SURVEY, ETC.: 8 B Rd E
LOT: 017

[redacted]

~~24 Tilbury Ont~~ DOVER CENTRE

DATE COMPLETED: DAY 06 MO. ~~Mar~~ 03 YR. 74

RC. ELEVATION RC. BASIN CODE

21 3305925 17 393989 4702379 4 588 4 23 AUG 07, 1975 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
dark	clay,			0	1'
yellow	"			1'	4'
sand				4'	12'
grey	"			12'	55'
hard	pan			55'	57'
black	shale			57'	75'

31 0001 05 | 0004 05 05 | 0012 28 | 0055 205 | 0057 14 | 0075 817

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
—	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
04	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.205	0	0057
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE ~~4 ☒ OPEN HOLE~~		~~57~~	~~75~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
000	0075'	clay.

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER
PUMPING RATE: GPM.
DURATION OF PUMPING: HOURS MINS.
STATIC LEVEL: — FEET
WATER LEVEL END OF PUMPING: FEET
WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY
15 MINUTES: FEET 30 MINUTES: FEET 45 MINUTES: FEET 60 MINUTES: FEET
IF FLOWING, GIVE RATE: GPM.
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: FEET
RECOMMENDED PUMPING RATE: GPM
GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☒ ABANDONED, INSUFFICIENT SUPPLY
6 ☒ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED
~~Casing Pulled~~

WATER USE

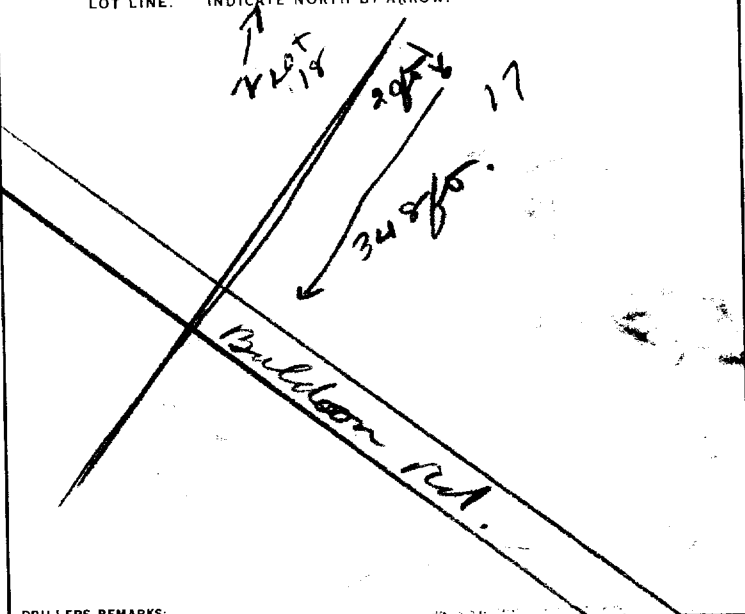
1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: Don Wade
LICENCE NUMBER: 5406
ADDRESS: Milroy Ont. RR. 5
NAME OF DRILLER OR BORER: same
LICENCE NUMBER: 5406
SIGNATURE OF CONTRACTOR: Don Wade
SUBMISSION DATE: DAY 6 MO. Mar YR. 74

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 5406
DATE RECEIVED: 26 03 74
DATE OF INSPECTION: 21/ 1/ 75
INSPECTOR:
REMARKS:
P 2
SS S8
WI

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT COPY

Well 2. MOECC Record 7209457

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)*
A1392 245

Regulation 903 Ontario Water Resources Act

Page ______ of ______

Measurements recorded in: ☐ Metric ☑ Imperial

[redacted]

Address of Well Location (Street Number/Name) 25345 BALDOON RD.	Township DOVER	Lot 17	Concession BDE
County/District/Municipality KENT	City/Town/Village	Province **Ontario**	Postal Code
UTM Coordinates Zone Easting Northing NAD 8 3 | 17 | 394037 | 4702456	Municipal Plan and Sublot Number	Other	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(m/ft)* From	To
	WELL CASING WAS EXTENDED AND A PITLESS				
	ADAPTER INSTALLED. ALSO VERMON PROOF CAP				
	TOTAL DEPTH OF WELL 63 Ft FROM LAND SURFACE				

Annular Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
-6	6½'	BENTONITE	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*
If pumping discontinued, give reason:
Pump intake set at *(m/ft)*
Pumping rate *(l/min / GPM)*
Duration of pumping ____ hrs + ____ min
Final water level end of pumping *(m/ft)*
If flowing give rate *(l/min / GPM)*
Recommended pump depth *(m/ft)*
Recommended pump rate *(l/min / GPM)*
Well production *(l/min / GPM)*
Disinfected? ☐ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level	10'		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☐ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

UNKNOWN

Well Use

☐ Public
☒ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify*
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To
5''	STEEL	.188	+3	5½
4''	STEEL	?	5½	?

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☑ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Water Details

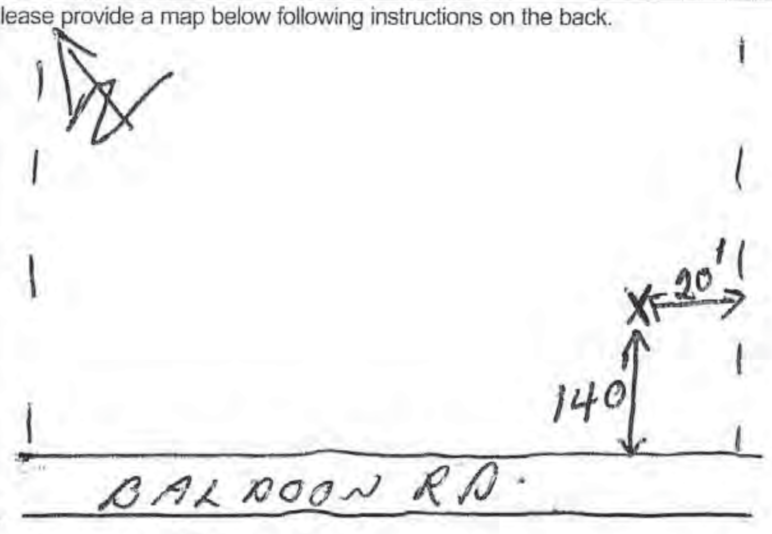
Water found at Depth ? *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☑ Untested ☐ Other, *specify*
Water found at Depth *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth *(m/ft)* From	To	Diameter *(cm/in)*

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: RUMBLE WATERWELLS
Well Contractor's Licence No.: 4642
Business Address (Street Number/Name): RR#5
Municipality: BLENHEIM
Province: ONT.
Postal Code: N0P1A0
Business E-mail Address:
Bus.Telephone No. *(inc. area code)*: 5196768203
Name of Well Technician (Last Name, First Name): RUMBLE GARNET.
Well Technician's Licence No.: 0066
Signature of Technician and/or Contractor:
Date Submitted: Y Y Y Y M M D D

Well owner's information package delivered ☐ Yes ☒ No
Date Package Delivered: Y Y Y Y M M D D
Date Work Completed: 20131007

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Audit No. Z 170083
OCT 15 2013
Received

0506E (2007/12)

Ministry's Copy

Well 3. Nearby MOECC
Record 7204772

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)*
N/A

Regulation 903 Ontario Water Resources Act

Page ______ of ______

Measurements recorded in: ☐ Metric ☒ Imperial

[redacted]

Address of Well Location (Street Number/Name) 8460 BUSHLINE	Township DOVER	Lot 30	Concession BRE
County/District/Municipality KENT.	City/Town/Village	Province **Ontario**	Postal Code
UTM Coordinates NAD 8 3 Zone 17 Easting 390509 Northing 4707578	Municipal Plan and Sublot Number	Other	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(m/ft)* From	To
GRAY	STONE-GRAVEL		LOOSE	0	1
BROWN	CLAY	SAND	PACKED	1	10
GREY	CLAY		DENSE	10	62
GREY	GRAVEL	CLAY SILT	CEMENTED	62	63
BLACK	SHALE		HARD	63	75
	DRY HOLE - CASING PULLED				

Annular Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
75	57	Peastone	
57	15	Bentonite Grout	
15	0	Drill Cuttings	

Method of Construction

☒ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☒ Other, *specify* AGRICULTURE
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☒ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Water Details

ater found at Depth ____ *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
ater found at Depth ____ *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
ater found at Depth ____ *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth *(m/ft)* From	To	Diameter *(cm/in)*

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

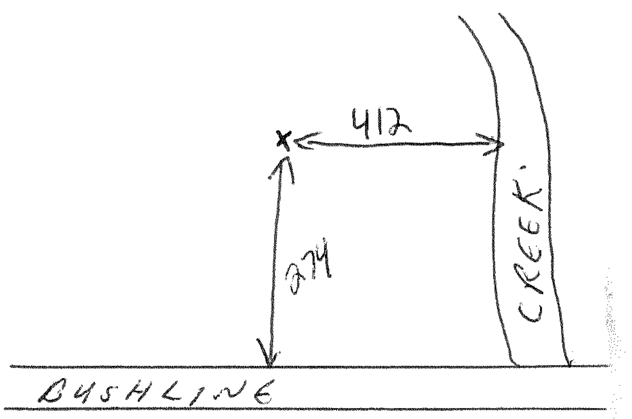
Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

usiness Name of Well Contractor RUMBLEWATER WELLS	Well Contractor's Licence No. 4 6 4 2
usiness Address (Street Number/Name) RR# 5	Municipality BLENHEIM

rovince: ONT.
Postal Code: N0P1A0
Business E-mail Address: ______
us.Telephone No. *(inc. area code)*: 5196768203
Name of Well Technician (Last Name, First Name): GARNET RUMBLE
ell Technician's Licence No.: 0 0 6 6
Signature of Technician and/or Contractor:
Date Submitted: Y Y Y Y M M D D

Well owner's information package delivered ☐ Yes ☒ No
Date Package Delivered: Y Y Y Y M M D D
Date Work Completed: 20130603

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Audit No. Z 170072
Received JUL 16 2013

506E (2007/12)

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Well 3. Nearby MOECC Record 7204774

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)* N/A

Regulation 903 Ontario Water Resources Act

Page ______ of ______

Measurements recorded in: ☐ Metric ☒ Imperial

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
8460 BUSH LINE	DOVER	30	BRE.

County/District/Municipality	City/Town/Village	Province	Postal Code
KENT.		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	390491	4707578		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(m/ft)* From	To
GREY	GRAVEL	STONE-BRICK.		0	1
BROWN	CLAY		PACKED.	1	11
GREY	CLAY.		DENSE	11	61
GREY	GRAVEL	CLAY-SILT.	CEMENTED	61	63
BLACK	SHALE		HARD	63	75
	DRY HOLE - CASING PULLED				

Annular Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
75	56	Pea stone	
56	14	Bentonite grout	
14	0	Drill cuttings	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping
___ hrs + ___ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected?
☐ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☒ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify* AGRICULTURE
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☒ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth ___ *(m/ft)* Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

Water found at Depth ___ *(m/ft)* Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

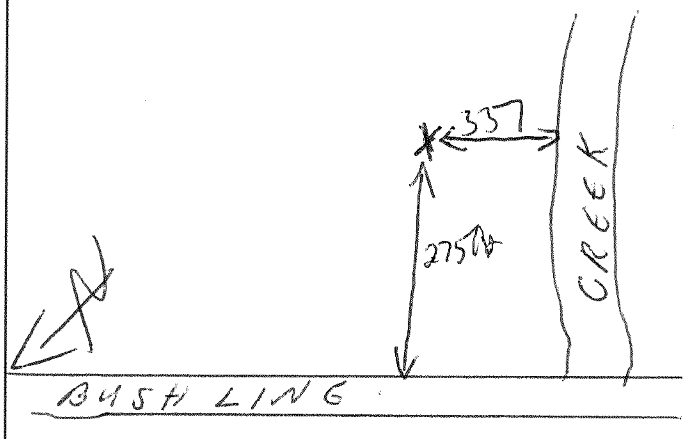
Water found at Depth ___ *(m/ft)* Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

Hole Diameter

Depth *(m/ft)* From	To	Diameter *(cm/in)*

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: RUMBLE WATERWELLS

Well Contractor's Licence No.: 4642

Business Address (Street Number/Name): RR# 5

Municipality: BLENHEIM

Province: ONT.

Postal Code: N0P1A0

Business E-mail Address:

Bus.Telephone No. *(inc. area code)*: 5196768203

Name of Well Technician (Last Name, First Name): GARNET RUMBLE

Well Technician's Licence No.: 0066

Signature of Technician and/or Contractor:

Date Submitted: Y Y Y Y M M D D

Well owner's information package delivered
☐ Yes
☒ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 20130530

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Audit No. Z170069

Received JUL 16 2013

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Ontario Ministry of the Environment

Well 3. Nearby MOECC Record 7204775

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*
N/A

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
8460 BUSH LINE	DOVER	30	BRE

County/District/Municipality	City/Town/Village	Province	Postal Code
KENT.		**Ontario**	

UTM Coordinates NAD 83	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
	17	390483	4707588		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(m/ft)* From	To
BROWN	CLAY		PACKED	0	9½
GREY	CLAY.		DENSE	9½	60
GREY	GRAVEL	CLAY-SILT.	CEMENTED.	60	63
BLACK	SHALE		HARD.	63	80
	DRY HOLE - CASING PULLED.				

Annual Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
80	58	Pea Stone.	
58	10	Bentonite groat	
10	0	Drill cuttings	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify
If pumping discontinued, give reason:
Pump intake set at *(m/ft)*
Pumping rate *(l/min / GPM)*
Duration of pumping ____ hrs + ____ min
Final water level end of pumping *(m/ft)*
If flowing give rate *(l/min / GPM)*
Recommended pump depth *(m/ft)*
Recommended pump rate *(l/min / GPM)*
Well production *(l/min / GPM)*
Disinfected? ☐ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☒ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, specify
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☒ Other, specify AGRICULTURE
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☒ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Water Details

Water found at Depth ____ *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth ____ *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth ____ *(m/ft)* ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth *(m/ft)* From	To	Diameter *(cm/in)*

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
RUMBLE WATER WELLS	4642

Business Address (Street Number/Name)	Municipality
RR#5	BLENHEIM

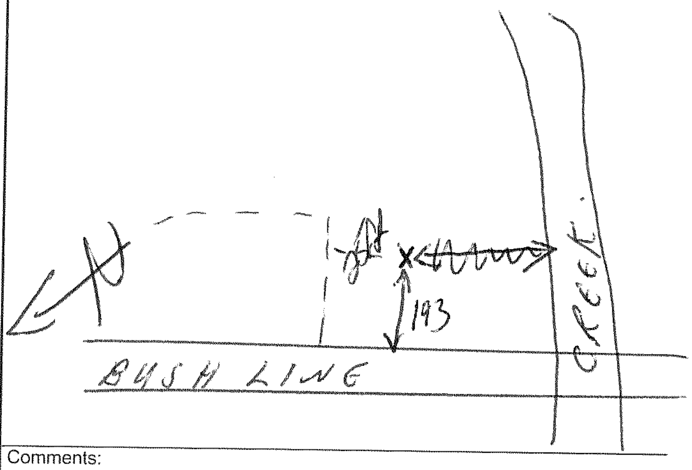
Province	Postal Code	Business E-mail Address
ONT.	N0P1A0	

Bus.Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
5196768203	RUMBLE GARNET.

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
0066		YYYYMMDD

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well owner's information package delivered	Date Package Delivered
☐ Yes ☒ No	YYYYMMDD
	Date Work Completed 20130605

Ministry Use Only
Audit No. Z 170071
Received JUL 16 2013

0506E (2007/12)

Ministry's Copy

Well 4. Nearby MOECC Record 3302440

7

33 № 2440

UTM 17 Z 392030 E

5 ~~R~~ 4706690 N

74

Elev. 4 R 0583

Basin 23 Kent

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Kent Township, Village, Town or City Dover

Con. XI Lot 24 Date completed 1 (day) July (month) 1967 (year)

[redacted]ress RR#5 Dresden

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 60 ft

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 4"

Pumping Test

Static level 12 ft

Test-pumping rate 200 gph G.~~P.M.~~

Pumping level 30 ft

Duration of test pumping 3 hour

Water clear or cloudy at end of test Clear

Recommended pumping rate 200 G.P.~~M.~~H

with pump setting of 45' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Red sand	2	12	60 ft	Fresh
Soft Clay	12	55		
Hard Pan	55	58		
Sand & gravel	58	60		

For what purpose(s) is the water to be used? Farm

Is well on upland, in valley, or on hillside? L

Drilling or Boring Firm Orval Lecuyer

Address 236 Grand E

Licence Number 2516

Name of Driller or Borer Orval Lecuyer

Address 236 Grand E.

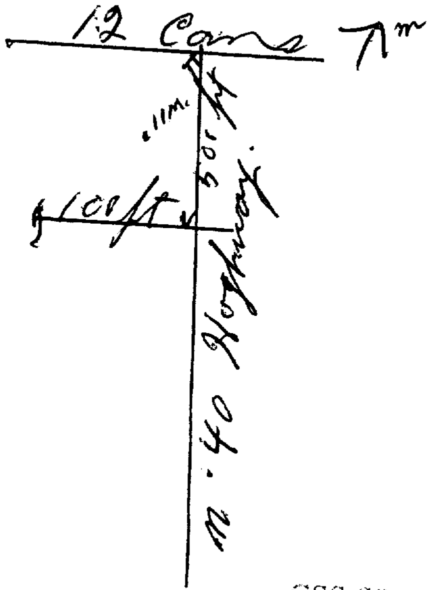
Date Sept. 22/67

Orval Lecuyer

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

Form 7 15M-60-4138

OWRC COPY

Well 5. MOECC Record 3306421

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3306421 | MUNICIP. 33002 | CON. CON | 04

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
KENT	CHATHAM	4	008

DATE COMPLETED 48-53 DAY 15 MO. 06 YR. 76

[redacted]

…G 0/500 | RC. 5 | ELEVATION 0595 | RC. 5 | BASIN CODE 23 | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Topsoil			0	1
Yellow	clay			1	12
Blue	clay			12	60
	Hardpan			60	75
Black	Shale			75	

31 | 0001 02 | 0012505 | 0060305 | 0075 1H | 0075817

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
Dry Hole	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE		Casing	
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE		Pulled	
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD 1 ☐ PUMP 2 ☐ BAILER | PUMPING RATE GPM | DURATION OF PUMPING HOURS MINS

STATIC LEVEL FEET | WATER LEVEL END OF PUMPING FEET | WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY: 15 MINUTES FEET | 30 MINUTES FEET | 45 MINUTES FEET | 60 MINUTES FEET

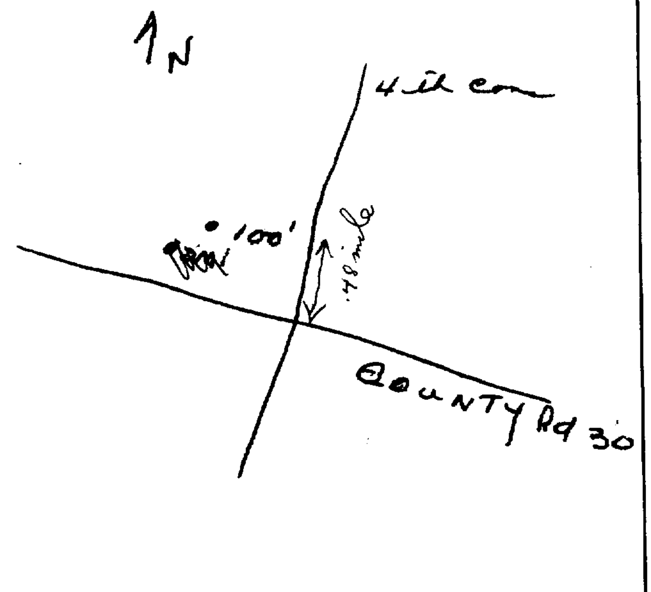
IF FLOWING, GIVE RATE GPM | PUMP INTAKE SET AT FEET | WATER AT END OF TEST 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING FEET | RECOMMENDED PUMPING RATE GPM

GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 0201

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 5

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☒ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE

1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING 1

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: R W Simpson | LICENCE NUMBER: 4708

ADDRESS: RR#2 Dresden

NAME OF DRILLER OR BORER: R W Simpson | LICENCE NUMBER: 4708

SIGNATURE OF CONTRACTOR: R W Simpson | SUBMISSION DATE DAY ___ MO. ___ YR. ___

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 4708 | DATE RECEIVED: 130876

DATE OF INSPECTION: 19/11/76 | INSPECTOR:

REMARKS: OK

P

WI J.C

FORM 7 MOE 07-091

MINISTRY OF THE ENVIRONMENT COPY

Well 5. MOECC Record 3306422

Ontario

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3306422 | MUNICIP. 33002 | CON. CON 04

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
KENT	CHATHAM	CONC 4	8 008

[redacted]

DATE COMPLETED 48-53 DAY 15 MO. 06 YR. 76

…ING 70 1550 | RC 5 | ELEVATION 0595 | RC 5 | BASIN CODE 23 | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	Topsoil			0	1
Yellow	clay			1	12
Blue	clay			12	72
	gravel			72	73
Black	Shale			73	74

31 | 0001 02 | 0012505 | 0072305 | 0073 11 | 0074817

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0072	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
04"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.205	0	0073
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

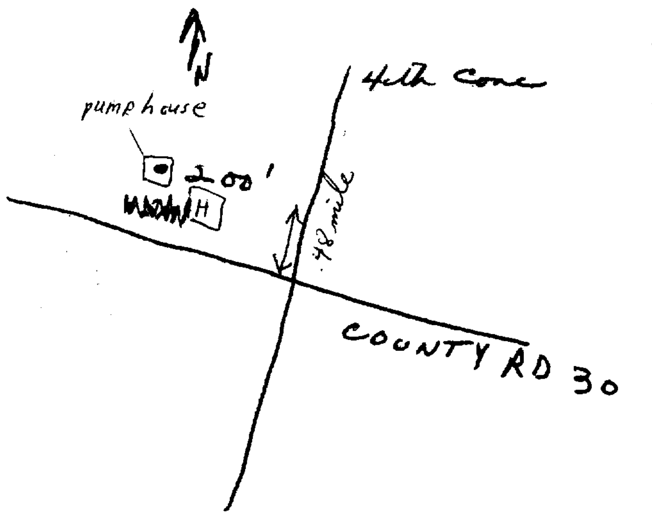
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER
PUMPING RATE: 0005 GPM.
DURATION OF PUMPING: 01 HOURS 00 MINS.
STATIC LEVEL: FEET
WATER LEVEL END OF PUMPING: FEET
WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY — 15 MINUTES FEET; 30 MINUTES FEET; 45 MINUTES FEET; 60 MINUTES FEET
IF FLOWING, GIVE RATE: GPM.
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: FEET
RECOMMENDED PUMPING RATE: GPM.
GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 0201

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 1
1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☒ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 01
1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING 1
1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: R.W. SIMPSON
LICENCE NUMBER: 4708
ADDRESS: RR 2 Dresden
NAME OF DRILLER OR BORER:
LICENCE NUMBER:
SIGNATURE OF CONTRACTOR:
SUBMISSION DATE: DAY MO. YR.

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 4708
DATE RECEIVED: 130876
DATE OF INSPECTION: 19/11/76
INSPECTOR:
REMARKS: OK screen sent
P ~~8~~ 10
WI 1.0.

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 MOE 07-091

Well 5. MOECC Record 7105314

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*
A 063 189
A 063189

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
9559 PIONEER LINE	CHATHAM	8	4

County/District/Municipality	City/Town/Village	Province	Postal Code
– KENT	CHATHAM	Ontario	N7M 5J7

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	17	402719	4701828		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/[✓ ft]) From	Depth To
BROWN	CLAY			0	10 FT.
GRAY	CLAY			10	14
GRAY	CLAY	SAND		14	25
GRAY	CLAY			25	63
GRAY	CLAY	SAND		63	68
BLACK	STONES	GRAVEL – SAND		68	75
BLACK	SHALE			75	78

WARRANTY VOID
WHEN NOT HOOKED UP
BY #719329 ONTARIO LTD.

Annular Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
0	75	FT. VOLCLAY GROUT	

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason: —

Pump intake set at (m/[✓ ft]) 70 FT.

Pumping rate *(l/min / [✓ GPM])* 5 GPM

Duration of pumping 6 hrs + ____ min

Final water level end of pumping (m/[✓ ft]) 41 FT.

If flowing give rate *(l/min / GPM)* —

Recommended pump depth (m/[✓ ft]) 70 FT

Recommended pump rate *(l/min / [✓ GPM])* 5 GPM

Well production *(l/min / GPM)* 5 GPM.

Disinfected? ☒ Yes ☐ No

Draw Down Time *(min)*	Draw Down Water Level (m/[✓ ft])	Recovery Time *(min)*	Recovery Water Level *(m/ft)*
Static Level	15.8'		41 FT
1	19.6	1	40.8
2	21.8	2	37.6
3	23.6	3	34.9
4	25.05	4	32.5
5	26.2	5	30.5
10	29.75	10	24.2
15	31.8	15	21.3
20	33.2	20	19.6
25	34.3	25	18.5
30	35.3	30	17.8
40	37.0	40	16.9
50	37.4	50	16.3
60	38.1	60	15.9

Method of Construction

☐ Cable Tool
☒ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☒ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify*
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To
5"	STEEL	.188	+2	75
5"	OPEN HOLE		75	77

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Water Details

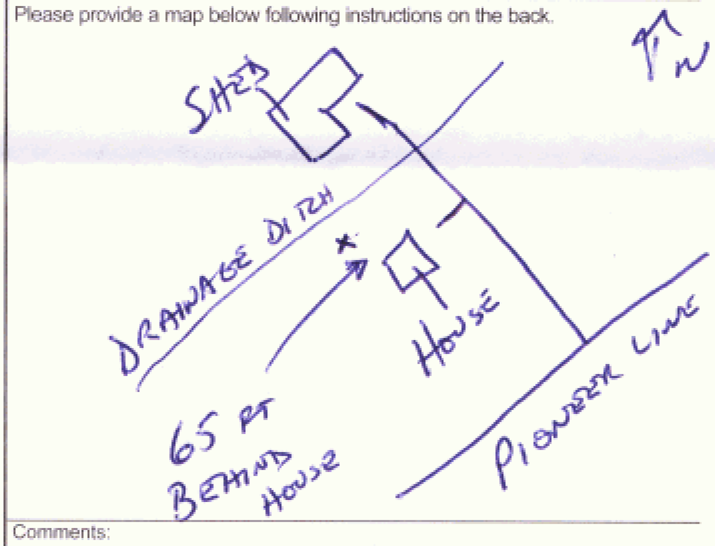
Water found at Depth 76 (m/[✓ ft]) Kind of Water: ☒ Fresh ☐ Untested ☒ Gas ☐ Other, *specify*
Water found at Depth ____ *(m/ft)* Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*
Water found at Depth ____ *(m/ft)* Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/[✓ ft]) From	To	Diameter (cm/[✓ in])
0	75	10"
75	77	5"

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
LASKEY'S SERVICES	3366

Business Address (Street Number/Name)	Municipality
12 MAITLAND TERRACE	STRATHROY

Province	Postal Code	Business E-mail Address
ONTARIO	N7G 1L1	

Bus.Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
5192450590	LASKEY MARK

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T 3 1 7		20080403

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered 20080403

Date Work Completed 20080403

Ministry Use Only
Audit No. Z 92620
Received MAY 20 2008

0506E (12/2007)

Ministry's Copy

Well 6. MOECC Record 3300979

7

UTM 3 17 Z 4 0 1 9 7 0 E

5 R 4 7 0 1 3 5 5 N

Elev. 5 R 0 5 9 3

Basin 2 3

33 № 979

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Kent

Township, Village, Town or City Chatham

Con. IV Lot 7

Date completed 21 (day) Sept. (month) 1967 (year)

[redacted]dress R.R. # 4 Chatham

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 67'

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 4"

Pumping Test

Static level 14'

Test-pumping rate 180 G.P.~~M~~H

Pumping level 28'

Duration of test pumping 24 hrs.

Water clear or cloudy at end of test clear

Recommended pumping rate 180 G.P.~~M~~H

with pump setting of .... feet below ground surface

Well Log

			Water Record	
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Brown ~~topsoil~~ clay	0	12		
soft blue clay	12	66		
gravel	66	67	66-67	fresh

For what purpose(s) is the water to be used? D. & S.

Is well on [✓ upland], in valley, or on hillside?

Drilling or Boring Firm O. Lécuyer

Address 236 Grand E. Chatham

Licence Number 2511

Name of Driller or Borer

Address same

Date Sept. 22/67

Orval Lecuyer

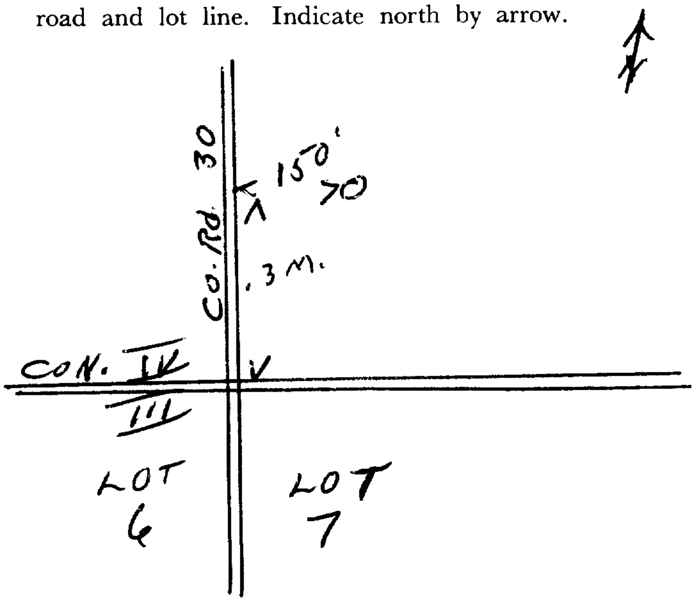
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



USS.S8

Well 6. MOECC Record 3300980

7

WATER RESOURCES
33 DIVISION No. 980
SEP 28 1967
ONTARIO WATER RESOURCES COMMISSION

WELL #1

UTM |1|7| Z |4|0|2|0|7|5| E

|5| R |4|7|0|1|3|5|0| N

Elev. |5| R |0|5|9|3|

Basin |2|3|

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City Chatham

Con. 4 Lot 7 Date completed 21 (day) AUG (month) 1967 (year)

[redacted] Address RR# 4 Chatham

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 73

Type of screen ✓

Length of screen ✓

Depth to top of screen ✓

Diameter of finished hole 4" Casing Pulled

Pumping Test

Static level —

Test-pumping rate DRY ✓ G.P.M.

Pumping level —

Duration of test pumping —

Water clear or cloudy at end of test WELL

Recommended pumping rate — G.P.M.

with pump setting of — feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
clay	0	4	DRY	WELL
sand	4	18		
soft clay	18	64		
clay (with pebbles)	64	70		
clay gravel little shale	70	72		
soft black shale	72	76		

For what purpose(s) is the water to be used? abandoned Domestic

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Doug Lecuyer

Address ~~30~~ 62 Lorne Ave Chatham, Ont.

Licence Number 2386

Name of Driller or Borer Douglas Lecuyer

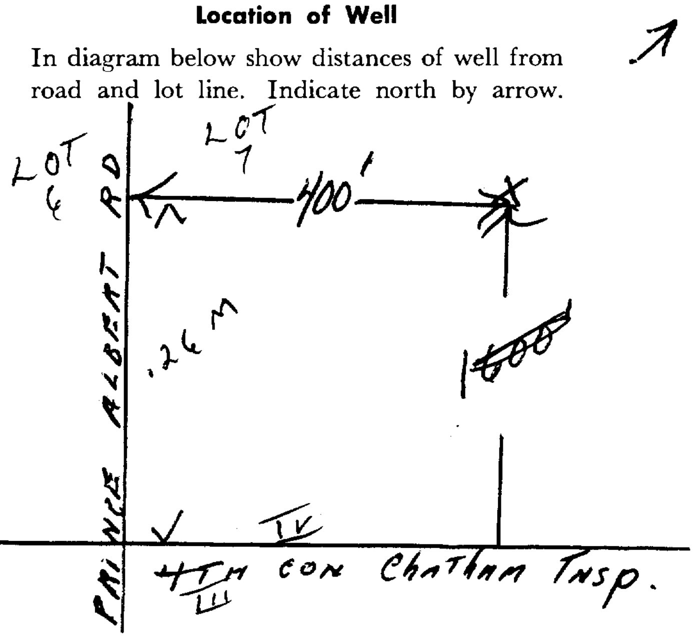
Address 62 Lorne Ave

Date Aug /67

Douglas Lecuyer
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

CSS.S8

Well 7. MOECC Record 3309885

Ontario **Ministry of Environment and Energy**

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 3309885

Municipality 33002 Con. CON 07

County or District [redacted]	Township/Borough/City/Town/Village CHATHAM	Con., block, tract, survey, etc. CON 7 · Lot 7
	Address of Well Location RR# 7 Dresden.	Date completed 18 day 5 month 003 year

21 Zone · Easting · Northing · RC · Elevation · RC · Basin Code · ii · iii · iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	To
Brown	Top soil		loose	0	2
Brown	loome		loose	2	6
Brown	Clay		dence	6	10
Grey	Clay		dence - loose	10	51
Black	Gravel	shale stones	cemented	51	53
Black	Shale		shattered	53	54½
Black	Shale		~~Sh~~ Hard	54½	57
Caution GAS 53′-54′					

← 3 →

31 3′ Riser | Packer

32

41 WATER RECORD

Water found at - feet	Kind of water
54′	1 ☒ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	To
6	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+2	54
4	SCREEN 4 ☐ Open hole 5 ☐ Plastic		51	57
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.) 100	Diameter 4″ inches	Length 3 feet
Material and type SS V Slot	Depth at top of screen 51 feet	packer

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
15	0	Holeplug

71 PUMPING TEST

Pumping test method 1 ☒ Pump 2 ☐ Bailer

Pumping rate 8 GPM

Duration of pumping ……… Hours ……… Mins

Static level 10-6″ feet

Water level end of pumping 13′ feet

Water levels during 1 ☐ Pumping 2 ☑ Recovery

15 minutes	30 minutes	45 minutes	60 minutes
10-6″ feet	feet	feet	feet

If flowing give rate GPM

Pump intake set at 30′ feet

Water at end of test ☒ Clear ☐ Cloudy

Recommended pump type ☒ Shallow ☐ Deep

Recommended pump setting 30′ feet

Recommended pump rate 8 GPM

FINAL STATUS OF WELL

- 1 ☒ Water supply
- 2 ☐ Observation well
- 3 ☐ Test hole
- 4 ☐ Recharge well
- 5 ☐ Abandoned, insufficient supply
- 6 ☐ Abandoned, poor quality
- 7 ☐ Abandoned (Other)
- 8 ☐ Dewatering
- 9 ☐ Unfinished
- 10 ☐ Replacement well

WATER USE

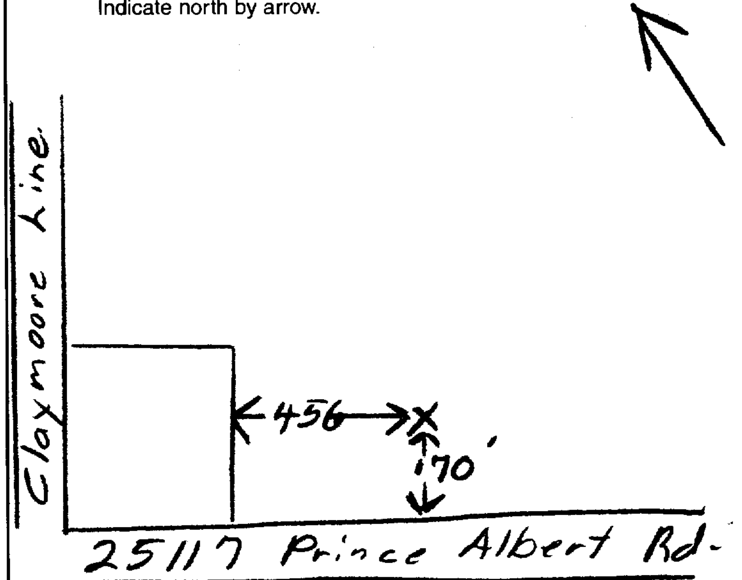
- 1 ☐ Domestic
- 2 ☐ Stock
- 3 ☐ Irrigation
- 4 ☐ Industrial
- 5 ☐ Commercial
- 6 ☐ Municipal
- 7 ☐ Public supply
- 8 ☐ Cooling & air conditioning
- 9 ☐ Not use
- 10 ☒ Other FARM

METHOD OF CONSTRUCTION

- 1 ☒ Cable tool
- 2 ☐ Rotary (conventional)
- 3 ☐ Rotary (reverse)
- 4 ☐ Rotary (air)
- 5 ☐ Air percussion
- 6 ☐ Boring
- 7 ☐ Diamond
- 8 ☐ Jetting
- 9 ☐ Driving
- 10 ☐ Digging
- 11 ☐ Other

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



255669

Name of Well Contractor: Rumble Water wells

Well Contractor's Licence No.: 4642

Address: RR#5 Blenheim Ont.

Name of Well Technician: John Rumble

Well Technician's Licence No.: T-0065

Signature of Technician/Contractor

Submission date day mo yr

MINISTRY USE ONLY

Data source · Contractor 4642 · Date received JUL 02 2003

Date of inspection · Inspector

Remarks

2 - MINISTRY OF ENVIRONMENT AND ENERGY COPY

0506 (06/02) Front Form 9

Well 7. Nearby MOECC Record 3301107

UTM 1 7 Z 3 9 8 4 4 0 E
9 R 4 7 0 5 3 4 5 N
Elev. 9 R 0 5 9 0
Basin 2 3

ONTARIO

33 № 1107

RECEIVED
APR 10 1952
GEOLOGICAL BRANCH
DEPARTMENT of MINES

The Well Drillers Act
Department of Mines, Province of Ontario

Water Well Record

County or Territorial District..Kent.......... Township, ~~Village, Town or City~~..Chatham..........

[redacted]

...own or City)..........

..Chatham..........

(excluding pump)..58..........
(day) (month) (year)

Pipe and Casing Record	Pumping Test
Casing diameter(s)..3"........	Date..—........
Length(s) of casing(s)..57'........	Static level..—........
Type of screen..—........	Pumping level..Not enough water........
Length of screen..—........	Pumping rate..dry hole........
Distance from top of screen to ground level..—........	Duration of test........
Is well a gravel-wall type?..yes........	Distance from cylinder or bowls to ground level........

Water Record

Kind (fresh or mineral)..fresh..........
Quality (hard, soft, contains iron, sulphur, etc.)..........
Appearance (clear, cloudy, coloured)..cloudy..........
For what purpose(s) is the water to be used?..........
....
How far is well from possible source of contamination?..........
What is the source of contamination?..........
Enclose a copy of any mineral analysis that has been made of water..........

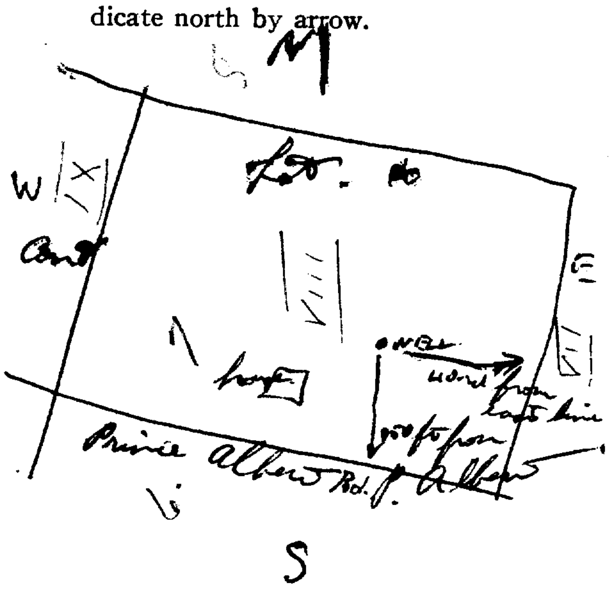
Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
57		

Well Log

Overburden and Bedrock Record	From	To
dark clay	0 ft.	2 ft.
quick sand	2'	8'
grey clay	8'	56'
gravel shell	56'	57
B. shale	57'	71'
hit a little water & gas		
at 57 feet.		

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Situation: Is well on upland, in valley, or on hillside?..upland..........
Drilling Firm..J Wades..........
Address..R.R.5 Tilbury..........
Name of Driller..Donald Wade.......... Address..R.R. 5 Tilbury..........
Date..March 20 1952.......... Licence Number..239..........
..Donald Wade..........
Signature of Licensee

FORM 5

CSS.S3

Well 7. Nearby MOECC Record 3301109

UTM 1 7 Z 3 9 8 4 5 0 E

9 R 4 7 0 5 3 0 0 N

Elev. 9 R 0 5 9 0

Conc- VIII

Basin 2 3

Lot - 7

RECEIVED
FEB 17 1953
GEOLOGICAL BRANCH
DEPARTMENT of MINES

33 Nº 1109

ONTARIO

The Well Drillers Act

Department of Mines, Province of Ontario

Water Well Record

[redacted] ~~Village, Town or City~~ Chatham Twp

own or City)

Bear Line

Date Completed 9 (day) Apr. (month) 1952 (year) Cost of Well (excluding pump) $47.25

Pipe and Casing Record

Casing diameter(s) 3

Length(s) of casing(s) 52

Type of screen

Length of screen

Distance from top of screen to ground level

Is well a gravel-wall type?

Pumping Test

Date

Static level Dry hole

Pumping level

Pumping rate

Duration of test

Distance from cylinder or bowls to ground level

Water Record

Kind (fresh or mineral)

Quality (hard, soft, contains iron, sulphur, etc.)

Appearance (clear, cloudy, coloured)

For what purpose(s) is the water to be used?

How far is well from possible source of contamination?

What is the source of contamination?

Enclose a copy of any mineral analysis that has been made of water

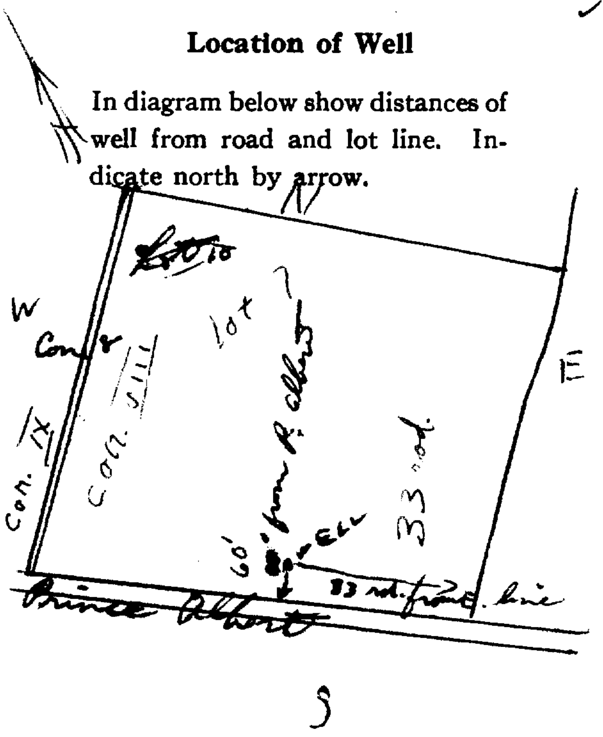
Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises

Well Log

Overburden and Bedrock Record	From	To
dark Clay	0 ft.	2 ft.
sand &	2'	7'
clay	7'	52'
Bt. Shale.	52'	63'

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Situation: Is well on upland, in valley, or on hillside? upland.

Drilling Firm D. W. Wade

Address R.R. 5 Wallaceburg.

Name of Driller Donald W. Wade Address R.R.#5 W'burg

Date Apr. 9 1952 Licence Number 239

Donald W. Wade
Signature of Licensee

Form 5

Well 8. MOECC Record 7186693

Ontario Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Below)

A 099114

ord

Regulation 903 Ontario Water Resources Act

Page ______ of ______

Measurements recorded in: ☐ Metric ☒ Imperial

[redacted]

Address of Well Location (Street Number/Name) 9241 COUNTRY VIEW LINE	Township CHATHAM		Lot 5	Concession 9
County/District/Municipality KENT	City/Town/Village DRESDEN		Province Ontario	Postal Code N0P1M0
UTM Coordinates NAD 83 Zone 17 Easting 397073 Northing 4706034	Municipal Plan and Sublot Number		Other CELL 519 436 1559	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BROWN	LOAM			0	2
BROWN	LOAM	SAND		2	6
GRAY	CLAY		SILTY	6	12
GRAY	CLAY		SOFT	12	48
BLACK	SHALE		BROKEN	48	50
BLACK	SHALE		FIRM	50	55

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	48	VOLCLAY GROUT	
48	55	SILICA SAND	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* CLOUD

If pumping discontinued, give reason: —

Pump intake set at (m/ft) BOTTOM

Pumping rate (l/min / GPM) 1 (ONE)

Duration of pumping 6 hrs + ______ min

Final water level end of pumping (m/ft) 17.2 FT

If flowing give rate (l/min / GPM) —

Recommended pump depth (m/ft) BOTTOM

Recommended pump rate (l/min / GPM) ONE

Well production (l/min / GPM) ONE

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	6.1 FT.		17.5
1	7.8	1	16.3
2	8.3	2	15.7
3	8.8	3	15.2
4	9.2	4	14.7
5	9.6	5	14.3
10	11.1	10	13
15	12.2	15	12.3
20	13	20	11.8
25	13.8	25	11.4
30	14.4	30	11.1
40	15.4	40	10.7
50	16.4	50	10.3
60	17.2	60	9.9

Method of Construction

☐ Cable Tool
☒ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify* ______
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☒ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify* ______
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
5 1/8	STEEL	.188	+2	49
4 1/8	STEEL	.188	52	55

Status of Well

☐ Water Supply
☒ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify* ______
☐ Other, *specify* ______

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5	STAINLESS	18	49	52

Water Details

Water found at Depth 50 (m/ft) ☒ Gas | Kind of Water: ☒ Fresh ☐ Untested ☐ Other, *specify* PIN GAS

Water found at Depth ______ (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify* ______

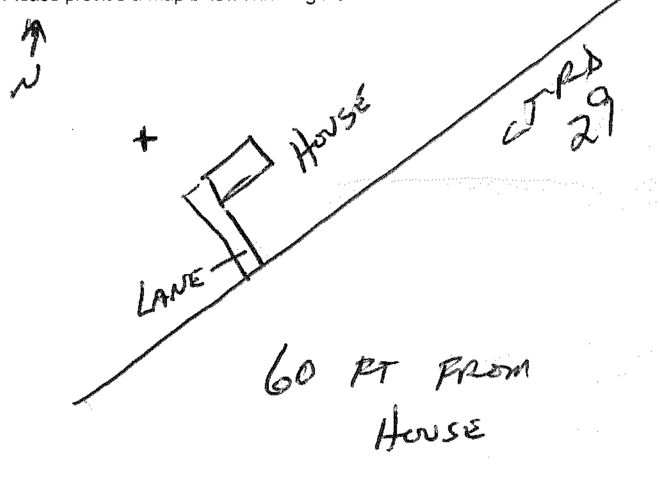
Water found at Depth ______ (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify* ______

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	55	10

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor LASKEY'S SERVICES		Well Contractor's Licence No. 3366
Business Address (Street Number/Name) 12 MAITLAND TERRACE		Municipality STRATHROY
Province ONT.	Postal Code N7G1L1	Business E-mail Address
Bus.Telephone No. *(inc. area code)* 5192450590	Name of Well Technician (Last Name, First Name) LASKEY MARK	
Well Technician's Licence No. T317	Signature of Technician and/or Contractor	Date Submitted 2012 08 02

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered 2012 06 DD

Date Work Completed 2012 07 25

Ministry Use Only

Audit No. Z152478

Received SEP 06 2012

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Ministry's Copy

Well 8. MOECC Record 7186694

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Page ______ of ______

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* N/A

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
9241 COUNTRY VIEW LINE	CHATHAM	5	9

County/District/Municipality	City/Town/Village	Province	Postal Code
– KENT	DRESDEN	Ontario	N0P1M0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	397087	4706051		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(m/ft)* From	To
		?			
		0			
		NO RECORD			
	*	DECOMMISSION *			
					49

Annular Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
		BENTONITE	
0	49	HOLE PLUG	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* ______

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ______ hrs + ______ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level	6 FT		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☐ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify*
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To
5	STEEL	.219	+2	49

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☒ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

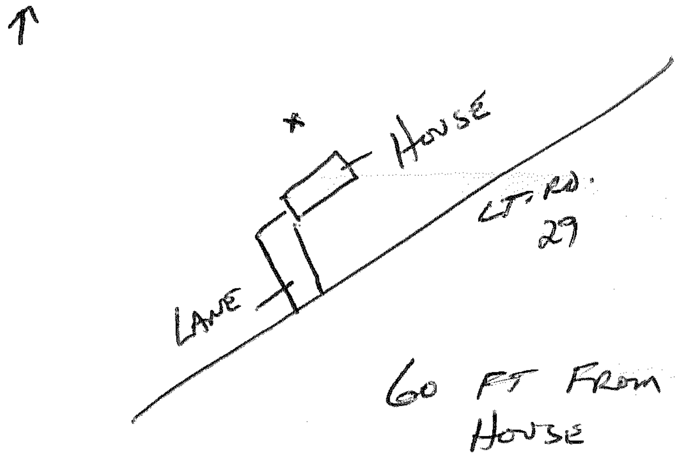
Water found at Depth *(m/ft)* ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth *(m/ft)* ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth *(m/ft)* ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth *(m/ft)* From	To	Diameter *(cm/in)*

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: LASKEY'S SERVICES	Well Contractor's Licence No.: 3366
Business Address (Street Number/Name): 12 MAITLAND TERR.	Municipality: STRATHROY
Province: ONT.	Postal Code: N7G1L1
Business E-mail Address:	
Bus.Telephone No. *(inc. area code)*: 5192450590	Name of Well Technician (Last Name, First Name): LASKEY MARK
Well Technician's Licence No.: T3117	Signature of Technician and/or Contractor:
Date Submitted: 20120802	

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered: 201206

Date Work Completed: 20120725

Ministry Use Only

Audit No. Z152480

SEP 06 2012

Received

0506E (2007/12)

Ministry's Copy

Well 9. MOECC Record 3301133

33 No. 1133 7
1967
ONTARIO WATER RESOURCES COMMISSION

UTM | 17 | 2 | 3 9 8 1 0 0 | E
| 5 | R | 4 7 0 6 7 5 5 | N
Elev. | 5 | R | 0 5 8 1 |
Basin | 2 | 3 |

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, ~~Village, Town or~~ City CHATHAM

Con. 9 IX Lot ~~12~~ 8 Date completed 12 (day) 9 month 64 year)

[redacted]

Address RR #2 Chatham

Casing and Screen Record

Inside diameter of casing 4"
Total length of casing 47' 2 ft above ground
Type of screen RED BRASS .025
Length of screen 3 ft
Depth to top of screen 44' 1 foot up in casing
Diameter of finished hole 4"

Pumping Test

Static level 30
Test-pumping rate 3 G.P.M.
Pumping level 34
Duration of test pumping 4 hrs.
Water clear or cloudy at end of test CLEAR
Recommended pumping rate 3 G.P.M.
with pump setting of 40 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
TOP SOIL	0	1	45	FRESH
CLAY	1	45		
SAND & GRAVEL	45	47		
~~HARD PAN~~				

For what purpose(s) is the water to be used? D

Is well on upland, in valley, or on hillside? Upland

Drilling or Boring Firm **DONALD C. SIMPSON**
WATER WELLS AND PUMPS
DRESDEN - ONTARIO

Address

Licence Number 2142

Name of Driller or Borer **DONALD C. SIMPSON**
WATER WELLS AND PUMPS

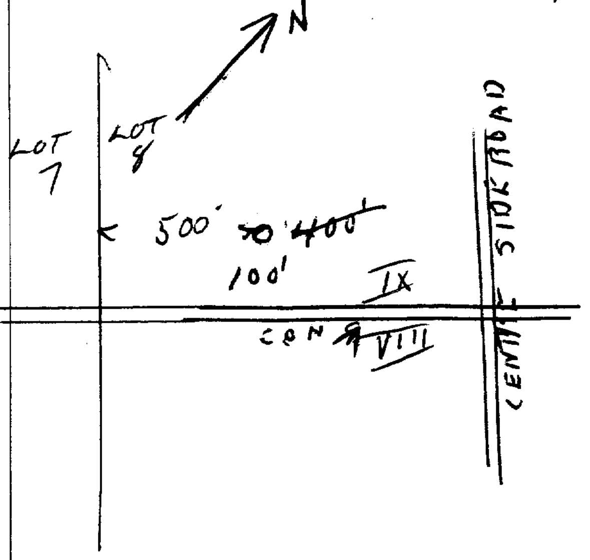
Address DRESDEN - ONTARIO

Date Sept 12/64

Donald C Simpson
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

UTM 17 Z 398150 Con IX

5 R 4706940 CODED

Elev. 5 R 0583

Basin 23

3304611

DIVISION OF WATER RESOURCES
NOV 22 1968
ONTARIO WATER RESOURCES COMMISSION

Well 9. MOECC Record 3304611

7

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City CHATHAM

Con. 9 Lot 8 Date completed 15 (day) NOV month 68 year)

[redacted] dress RR#6 DRESDEN

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 49'

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 4"

Pumping Test

Static level 15'

Test-pumping rate 5 G.P.M.

Pumping level 16'

Duration of test pumping 8 hrs

Water clear or cloudy at end of test clear

Recommended pumping rate 5 G.P.M.

with pump setting of 30' feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Topsoil	0	2	47	Fresh
yellow	2	6		
Blue clay	6	47		
Gravel & loose shale	47	48		
Black Shale	48	49		

For what purpose(s) is the water to be used? D & S

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Ron Simpson
R.R. #2 Dresden

Address

Licence Number 3029

Name of Driller or Borer RW Simpson

Address RR#2 Dresden

Date Nov 15/68

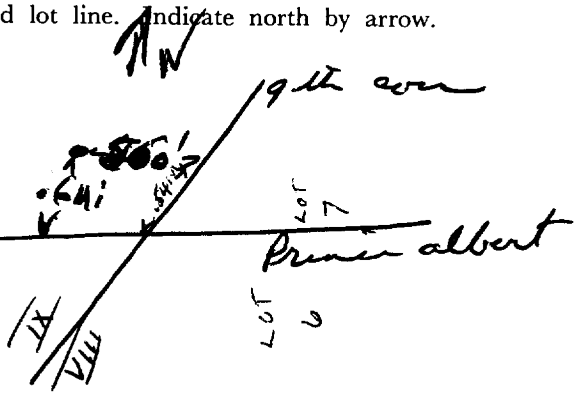
RW Simpson
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

JM 117 Z 397550

5 R 47081000 CODED

ev. 5 R 0583

in 23

Con X Lot 8

Well 9. MOECC Record 3304613

3304613

DIVISION OF WATER RESOURCES
NOV 22 1968
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City CHATHAM

Con. 10 Lot 8 Date completed 5 (day) MAY month 68 year)

[redacted]ess RR#6 DRESDEN

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing

Type of screen Casing Pulled

Length of screen

Depth to top of screen

Diameter of finished hole —

Pumping Test

Static level 10'

Test-pumping rate 4 G.P.M.

Pumping level 20'

Duration of test pumping 2 hrs

Water clear or cloudy at end of test cloudy

Recommended pumping rate unable to G.P.M.

with pump setting of control sand feet below ground surface

Well Log / Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2	44	Fresh
Yellow clay	2	7		
Blue clay	7	44		
Muddy Sand	44	46		
Black shale	46	47		

For what purpose(s) is the water to be used? Abandoned

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm R W Simpson

Address RR#2 Dresden

Licence Number 3029

Name of Driller or Borer R W Simpson

Address RR#2 Dresden

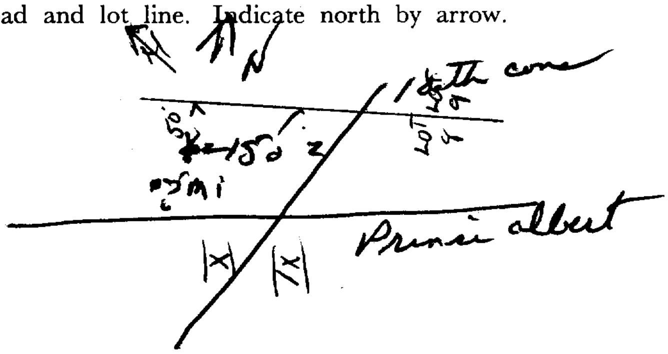
Date May 5/68

R W Simpson

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

CSS.S8

Well 9. MOECC Record 3304642

UTM 17 Z 3·98·2000
5 R 4706840
Elev. 5 R 0583
Basin 23
SB

Con. IX
Lot 8
CODED

3304642

DI WATER RESOURCES
FEB 27 1969
ONTARIO WATER RESOURCES COMMISSION

7

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City CHATHAM

Con. 9 Lot 8 Date completed 28 (day) Oct. (month) 68 (year)

[redacted] dress RR#6 Dresden

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing pulled ✓

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole

Pumping Test

Static level

Test-pumping rate Dry Hole ✓ G.P.M.

Pumping level

Duration of test pumping

Water clear or cloudy at end of test

Recommended pumping rate G.P.M.

with pump setting of feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2		
Yellow Clay	2	4		
Blue clay	4	45		
Black Shale	45		—	—

For what purpose(s) is the water to be used? Dry hole

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm R W Simpson

Address

Licence Number 3027

Name of Driller or Borer R W Simpson

Address RR#2 Dresden

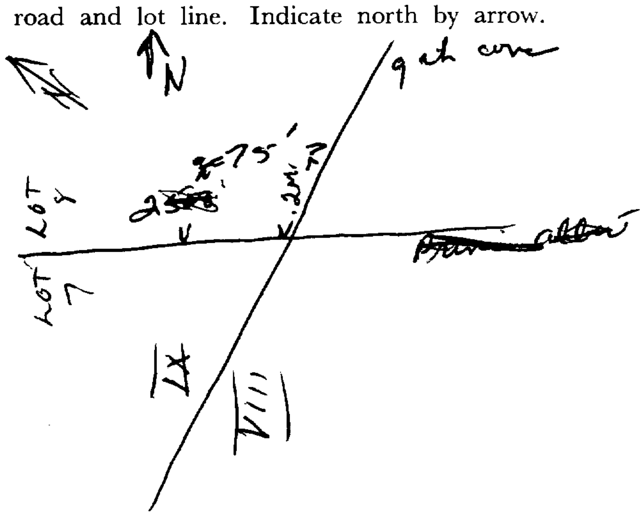
Date Oct 28/68

R W Simpson

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

Well 9. MOECC Record 3304643

UTM 17 z 398140 Con IX

5 R 4706788 Lot 8

CODED

Elev. 5 R 10582

Basin 23

3304643

3 9

DIVISION OF WATER RESOURCES FEB 27 1969 ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

SD

County or District KENT Township, Village, Town or City CHATHAM

Con. 9 Lot 8 Date completed 12 Sept 68 (day month year)

[redacted]ddress RR#6 Chatham

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 45' pulled

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole ~~4"~~ Casing Pulled.

Pumping Test

Static level

Test-pumping rate Dry Hole G.P.M.

Pumping level

Duration of test pumping

Water clear or cloudy at end of test

Recommended pumping rate G.P.M.

with pump setting of feet below ground surface

Well Log			Water Record	
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2		
yellow clay	2	4		
Blue clay	4	45		
Black shale	45	48	—	—

For what purpose(s) is the water to be used? Dry

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm R W Simpson

Address

Licence Number 3029

Name of Driller or Borer R W Simpson

Address RR#2 Dresden

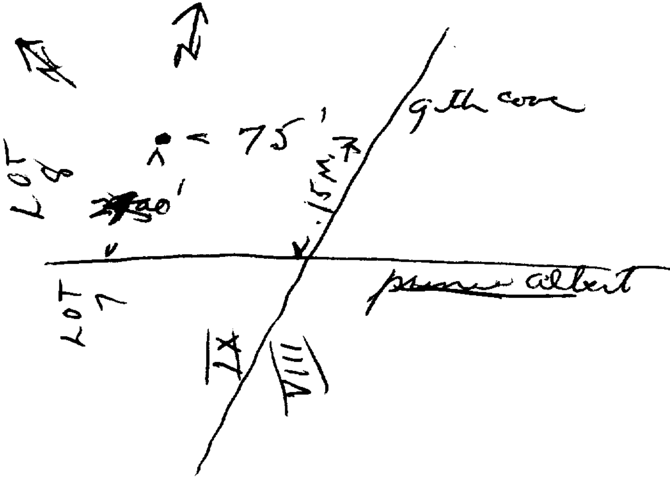
Date Oct 28/68

R W Simpson

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7

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Well 9. MOECC Record 3304644

UTM 17 Z 398330 Con IX
5R 4706920 CODED
Elev. 5R 0583
Basin 23

DIVISION
WATER RESOURCES
3304644
FEB 27 1969
ONTARIO WATER
RESOURCES COMMISSION

7

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City CHATHAM

Con. 9 Lot 8 Date completed 28 (day) Oct (month) 68 (year)

[redacted] ddress RR# 6 Dresden

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 45'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole Casing Pulled

Pumping Test

Static level Dry

Test-pumping rate G.P.M.

Pumping level

Duration of test pumping

Water clear or cloudy at end of test

Recommended pumping rate G.P.M.

with pump setting of feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2		
yellow clay	2	4		
Blue clay	4	45		
Black shale	45	47	—	—

For what purpose(s) is the water to be used? Dry

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm R W Simpson

Address

Licence Number 3029

Name of Driller or Borer R W Simpson

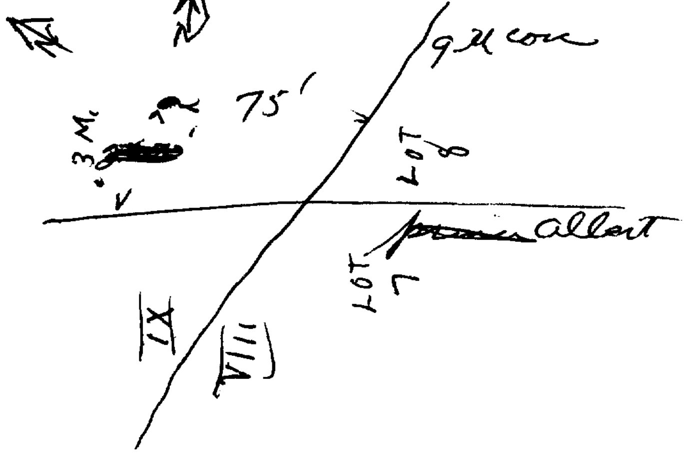
Address RR# 2 Dresden

Date Oct 28/68

R W Simpson
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7
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CSS.58

Well 9. MOECC Record 3304653

JTM 17 398260 - Conc IX
21 R 4706950
Elev. 5 R 0583
Basin 23

CODED

3304653
3 9

RESOURCES
FEB 27 1969
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

SD
County or District KENT Township, Village, Town or City CHATHAM
Con. 9 Lot 8 Date completed 7 (day) May (month) 68 (year)
[redacted]ldress RR # 6 Dresden

Casing and Screen Record

Inside diameter of casing 4"
Total length of casing 46' pulled
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole Casing Pulled

Pumping Test

Static level 15'
Test-pumping rate ~~0~~ 3 G.P.M.
Pumping level ~~15~~ 30'
Duration of test pumping 2 days
Water clear or cloudy at end of test cloudy
Recommended pumping rate unable to clean G.P.M.
with pump setting of — feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top Soil	0	2		
yellow clay	2	6	45	Fresh
Blue clay	6	45		
Fine Sand & Silt	45	46		
Black Shale	46	48		

For what purpose(s) is the water to be used? Abandoned

Is well on upland, in valley, or on hillside? upland
Drilling or Boring Firm R W Simpson

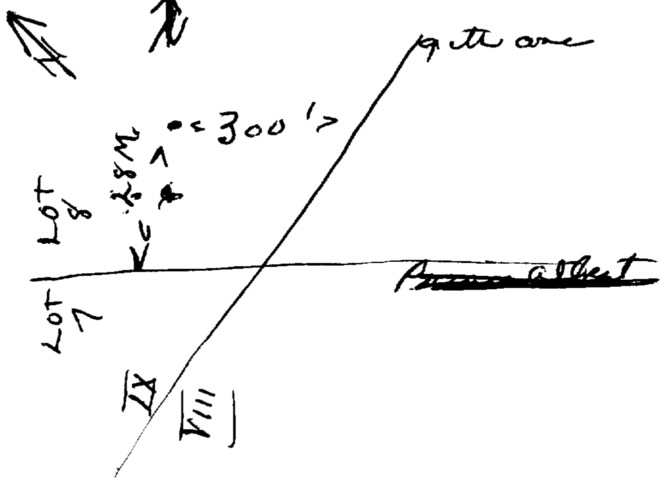
Address /

Licence Number 3029
Name of Driller or Borer R W Simpson
Address RR # 2 Dresden
Date May 7/68
R W Simpson
(Signature of Licensed Drilling or Boring Contractor)

Form 7
OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Well 9. MOECC Record 3304654

71

UTM 17 3 9 8 2 5 0 Conc IX
5 R 4 7 0 6 9 6 0 Lot 8
Elev. 5 R 0 5 8 3
Basin 2 3

CODED

5B

3304654

DIVISION OF WATER RESOURCES
FEB 27 1969
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City CHATHAM

Con. 9 Lot 7 Date completed 8 (day) May (month) 68 (year)

[redacted] Address RR#6 Dresden

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 45' pulled

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 4" Casing Pulled

Pumping Test

Static level 15'

Test-pumping rate 3 G.P.M.

Pumping level 30'

Duration of test pumping 6 days

Water clear or cloudy at end of test cloudy

Recommended pumping rate unable G.P.M.

with pump setting of to clear feet below ground surface

Well Log / Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2	45	fresh
Yellow sand	2	6		
Blue clay	6	45		
Fine Sand & Silt	45	46		
Black Shale	46			

For what purpose(s) is the water to be used? Abandoned.

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm R W Simpson

Address

Licence Number 3029

Name of Driller or Borer R W Simpson

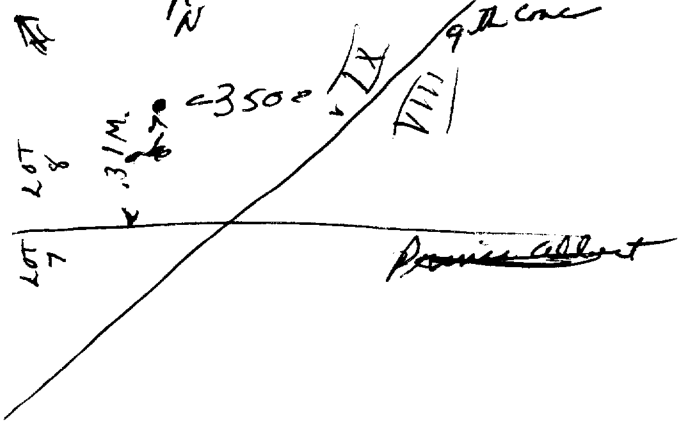
Address RR#2 Dresden

Date May 8/68

R W Simpson
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7
OWRC COPY

CSS.58

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)

N A

Well 9. MOECC Record 3310350

Regulati

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN CON LOT

[redacted]

Address of Well Location (County/District/Municipality): 9557 CountryVew line

Town: Chatham

Lot: 8

Concession: 11

RR#/Street Number/Name: 9557 Country view line.

City/Town/Village: Chatham

Site/Compartment/Block/Tract etc.:

GPS Reading: NAD 83 Zone 17 Easting 398242 Northing 4707099

Unit Make/Model: Garmin

Mode of Operation: Etrex ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify ______

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres

Water Record

Water found at ___ Metres	Kind of Water
☐ m ☐ Gas ☐ Other:	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals
☐ m ☐ Gas ☐ Other:	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals
☐ m ☐ Gas ☐ Other:	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify ______

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
15.24	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.47	-.52m	+.9
8.84	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	?	?	?
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ______hrs + ______ min	2		2	
Final water level end of pumping ______metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ______metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

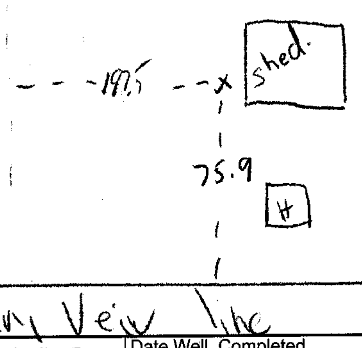
Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
1.82	.3	Hole Plug	

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. **Z 52924**

Date Well Completed: YYYY 2006 MM 10 DD 17

Was the well owner's information package delivered? ☐ Yes ☑ No

Date Delivered: YYYY ___ MM ___ DD ___

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: Rumble Water Wells

Well Contractor's Licence No.: 4642

Business Address (street name, number, city etc.): RR5 Blenheim On

Name of Well Technician (last name, first name): Garnet Rumble.

Well Technician's Licence No.: T-0066

Signature of Technician/Contractor: X

Date Submitted: YYYY ___ MM ___ DD ___

Ministry Use Only

Data Source:

Contractor: **4642**

Date Received: YYYY MM DD OCT 27 2006

Date of Inspection: YYYY ___ MM ___ DD ___

Remarks:

Well Record Number:

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐

Cette formule est disponible en français

Well 10. Nearby MOECC Record 3301136

3

UTM | 1 | 7 | Z | 3 | 9 | 8 | 1 | 7 | 5 | E

| 5 | R | 4 | 7 | 0 | 8 | 6 | 0 | 0 | N

Con 5

Elev. | 5 | R | 0 | 5 | 9 | 0 |

Lot 10

Basin | 2 | 3 |

The Ontario Water Resources Commission Act

WATER WELL RECORD

33 No 1136

GROUND WATER BRANCH

JUL 16 1963

ONTARIO WATER RESOURCES COMMISSION

County or District KENT Township, ~~Village, Town or City~~ CHATHAM

Con. IX Lot #10 Date completed 11 (day) APRIL month 63 year)

[redacted]ress DRESDEN RR#6

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole

Pumping Test

Static level

Test-pumping rate G.P.M.

Pumping level

Duration of test pumping

Water clear or cloudy at end of test

Recommended pumping rate G.P.M.

with pump setting of feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.
TOP	0	2
RED CLAY	2	5
GREY "	5	44½
BL. SHALE	44½	53

Water Record

Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)

For what purpose(s) is the water to be used? [illegible]

Is well on upland, in valley, or on hillside?

Drilling or Boring Firm Donald C Simpson

Address Dresden RR# 5

Licence Number 794

Name of Driller or Borer

Address Same as above

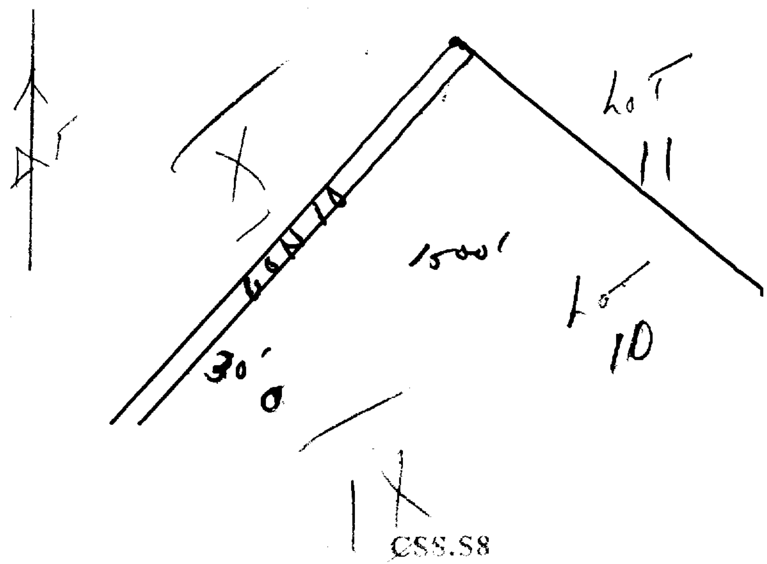
Date July 13/63

Donald C Simpson

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

Form 7 15M-60-4138

OWRC COPY

Well 10. Nearby MOECC Record 3304612

UTM 17 Z 3975730
5 R 4708110
Elev. 5 R 0583
Basin 23

CONT
CODED

3304612

DIVISION WATER RESOURCES
NOV 22 1968
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT
Township, Village, Town or City CHATHAM
Con. 10
Lot 8
Date completed 4 (day) MAY (month) 68 (year)

[redacted]ess RR 6 DRESDEN

Casing and Screen Record

Inside diameter of casing 4"
Total length of casing Casing Pulled.
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole —

Pumping Test

Static level
Test-pumping rate Dry Hole G.P.M.
Pumping level
Duration of test pumping
Water clear or cloudy at end of test
Recommended pumping rate G.P.M.
with pump setting of feet below ground surface

Well Log

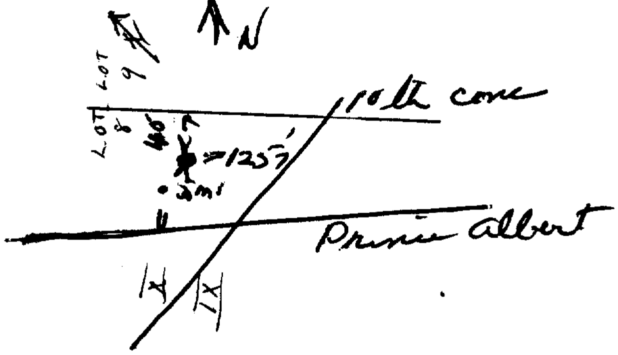
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0	2		
Yellow clay	2	7		
Blue clay	7	44		
Muddy sand	44	45		
Black shale	45	47	—	—

For what purpose(s) is the water to be used? Dry

Is well on upland, in valley, or on hillside?
Drilling or Boring Firm R W Simpson
Address RR 2 Dresden
Licence Number 3029
Name of Driller or Borer R W Simpson
Address RR 2 Dresden
Date May 5/68
R W Simpson
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

CSS.S8

Well 10. Nearby MOECC Record 3304614

UTM 1|7 Z 3|9|7|5|0|0 Cont

5 R 4|7|0|8|0|9|0 CODED

Elev. 5 R 0|5|8|3

Basin 2|3

3304614

NOV 22 1968
ONTARIO WATER RESOURCES COMMISSION

7

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District KENT Township, Village, Town or City CHATHAM

Con. 10 Lot 8 Date completed 2 (day) JUNE (month) 68 (year)

[redacted] ess RR#6 DRESDEN

Casing and Screen Record		Pumping Test	
Inside diameter of casing	4"	Static level	10'
Total length of casing	44'	Test-pumping rate	4 G.P.M.
Type of screen	—	Pumping level	18'
Length of screen	—	Duration of test pumping	3 days
Depth to top of screen	—	Water clear or cloudy at end of test	Cloudy at Times
Diameter of finished hole	4"	Recommended pumping rate	4 G.P.M.
		with pump setting of	30' feet below ground surface

Well Log			Water Record	
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Topsoil	0	2	46	fresh
Yellow clay	2	7		
Blue clay	7	46		
Sand & gravel	46	47		
Black Shale	47	48		

For what purpose(s) is the water to be used? D. S.

Is well on upland, in valley, or on hillside?

Drilling or Boring Firm R W Simpson
R.R. 2 Dresden

Address

Licence Number 3029

Name of Driller or Borer R W Simpson

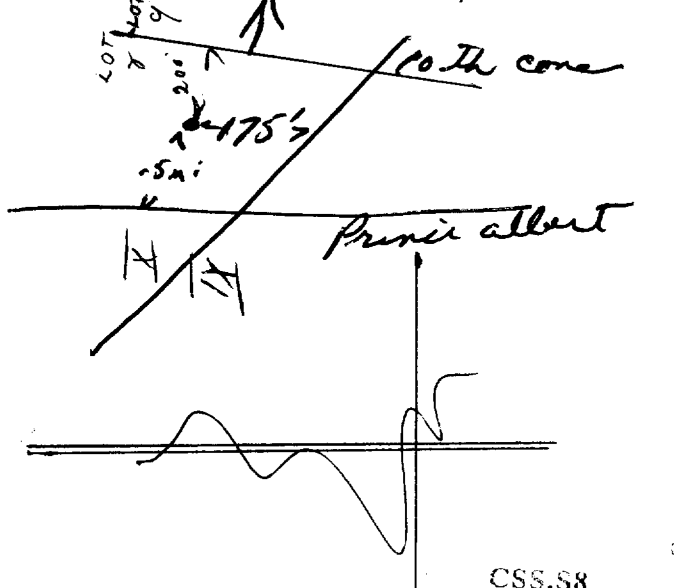
Address RR# 2 Dresden

Date June 2/68

R W Simpson
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

Form 7 15M-60-4138

OWRC COPY

Well 11. Nearby MOECC Record 3301279

UTM |17|Z |3|9|6|8|8|0|E

|5|R |4|7|0|9|4|1|5|N

Elev. |50|R ~~0445~~910|

Basin |2439 7| 9 |

ONTARIO

GROUND WATER BRANCH No. 33 1279

FEB 10 1959

ONTARIO WATER RESOURCES COMMISSION

X

The Water-well Drillers Act, 1954

Department of Mines

Water-Well Record

County or Territorial District KENT Township, Village, Town or City Chatham Twp

[redacted] Village, Town or City)

Address R.R. 5 DRESDEN

(day) (month) (year)

Pipe and Casing Record	**Pumping Test**
Casing diameter(s) 4	Static level 15 feet
Length(s) 49	Pumping rate 1/2 gal pe min
Type of screen —	Pumping level 25 feet
Length of screen —	Duration of test 1 ½ hours

Well Log **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
TOP SOIL	1	3	49	34	fresh
BLUE CLAY	3	49			
gravel at	49	50			
	gas at 49				

lum

For what purpose(s) is the water to be used? Domestic and stock

Is water clear or cloudy? ~~cloudy~~ clear

Is well on upland, in valley, or on hillside? flat

Drilling firm John C Smith

Address

Name of Driller John C Smith

Address R R 3 Dresden

Licence Number 980

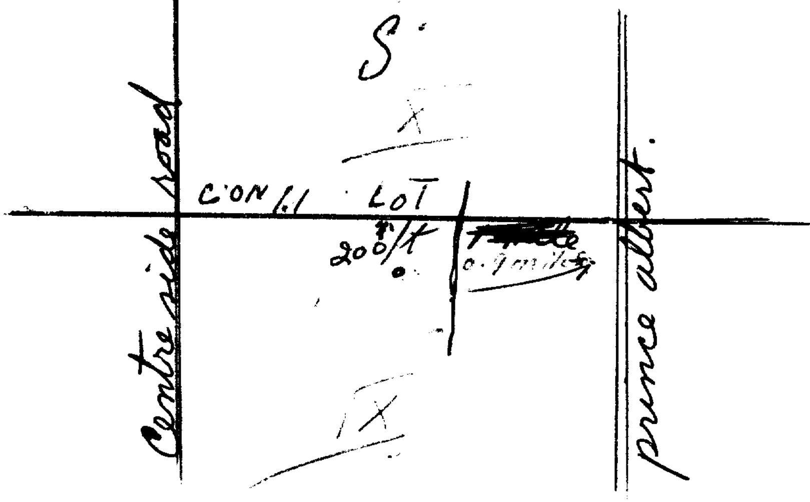
I certify that the foregoing statements of fact are true.

Date Aug 26 John C Smith

Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

CSS.S8

Well 12. MOECC Record 3301223

Form No. 2 1M-Jan. 1947-(A360D)

14

33 Nº 1223

UTM 1 7 Z 3 9 6 0 4 0 E

9 R 4 7 0 ~~8~~ 2 6 0 N

Elev. 9 R 0 ~~5~~8 8

Basin 23

ONTARIO

The Well Drillers Act

Department of Mines, Province of Ontario

RECEIVED
FEB 10 1948
GEOLOGICAL BRANCH
DEPARTMENT OF MINES

Water Well Record

[redacted]

Con 10 Lot 12 Pt. Lot

Acres

luding pump)

Pipe and Casing Record

Casing diameter(s) 4"

Length(s) of casing(s) 42 ft

Length of screen

Type of screen

Type of pump

Capacity of pump

Depth of pump setting

Pumping Test

Date aug 1947

Developed Capacity 125 gals per hour

Duration of Test 1 hour bailing

Pumping Rate

Drawdown

Static level of completed well 12 ft

Is well a gravel-wall type? yes

Water Record

Kind (fresh or mineral) Fresh

Quality (hard, soft, contains iron, sulphur etc.) Soft

Appearance (clear, cloudy, coloured) Clear

For what purpose(s) is the water to be used? D

How far is well from possible source of contamination?

What is source of contamination?

Enclose a copy of any mineral analysis that has been made of water

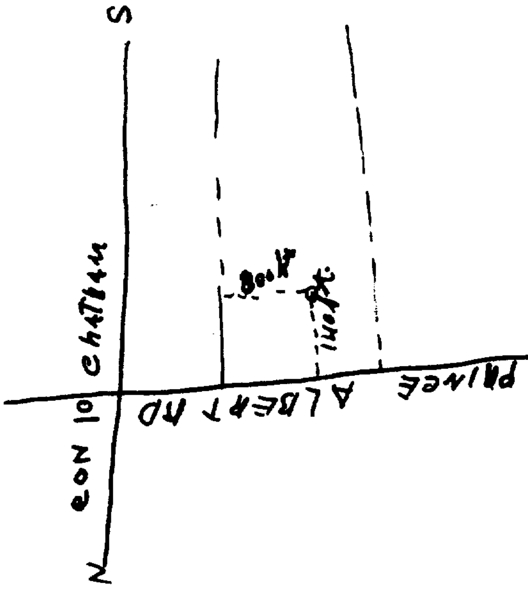
Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
42 ft	Fresh	32 ft

Well Log

Drift and Bedrock Record	From 0 ft.	To ft.
Clay	0	42
Gravel	42	44
Black Shale	44	49

Location of Well

In diagram below show distances of well from road and **lot** line



Situation: Is well on upland, in valley, or on hillside? Flat Land

Drilling Firm Edwin McGaffey

Address Bothwell Ont

Recorded by Edwin McGaffey

Address Bothwell

Date Oct 28 1947.

Licence Number 125

CSS.S8

Well 12. MOECC Record 7163633

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)*

A 099070

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ______ of ______

[redacted]

Address of Well Location (Street Number/Name) 9385 UNION LINE	Township CHATHAM	Lot 6	Concession ELEVEN
County/District/Municipality KENT	City/Town/Village DRESDEN	Province Ontario	Postal Code N0P 1M0
UTM Coordinates NAD 83 · Zone 17 · Easting 395733 · Northing 4708628	Municipal Plan and Sublot Number	Other	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/[✓ ft]) From	To
	CLAY			0	7
GRAY	SILT	SAND		7	9
GRAY	CLAY			9	44
BLACK	SAND	BROKEN SHALE	LOOSE	44	52
BLACK	SHALE		FIRM	52	54
	*	SAND PACKED	*		

Annular Space

Depth Set at (m/[✓ ft]) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	45	VOLCLAY GROUT	
45	54	SILICA SAND	

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason: —

Pump intake set at (m/[✓ ft]) BOTTOM

Pumping rate (l/min / [✓ GPM]) 10

Duration of pumping 20 hrs + ____ min

Final water level end of pumping (m/[✓ ft]) 9.4

If flowing give rate (l/min / GPM) —

Recommended pump depth (m/[✓ ft]) 53

Recommended pump rate (l/min / [✓ GPM]) 10

Well production (l/min / GPM) LOTS

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/[✓ ft])	Recovery Time (min)	Water Level (m/ft)
Static Level	9.0		9.5
1	9.5	1	9.0
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60	9.5	60	9.0

Method of Construction

☐ Cable Tool
☒ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, specify
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☒ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, specify
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/[✓ in])	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/[✓ in])	Depth (m/ft) From	To
5 1/8	STEEL	.188	+2	48
4"8	STEEL	.188	51	54

Construction Record - Screen

Outside Diameter (cm/[✓ in])	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/[✓ ft]) From	To
5	STAINLESS	18	48	51

Status of Well

☐ Water Supply
☒ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

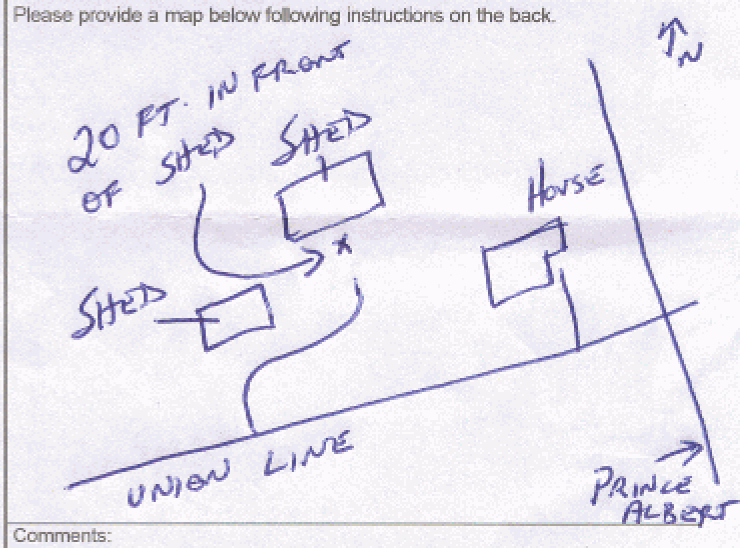
Water found at Depth 45 (m/[✓ ft]) ☒ Gas (RIN) · Kind of Water: ☒ Fresh ☐ Untested ☐ Other, specify
Water found at Depth (m/ft) ☐ Gas · Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth (m/ft) ☐ Gas · Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/[✓ ft]) From	To	Diameter (cm/[✓ in])
0	54	10

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: LASKEY'S SERVICES
Well Contractor's Licence No.: 3366
Business Address (Street Number/Name): 12 MAITLAND TERRACE
Municipality: STRATHROY
Province: ONTARIO
Postal Code: N7G 1L1
Business E-mail Address:
Bus.Telephone No. *(inc. area code)*: 5192450590
Name of Well Technician (Last Name, First Name): IRWIN CHRIS
Well Technician's Licence No.: 3467
Signature of Technician and/or Contractor:
Date Submitted: 2011 05 18

Well owner's information package delivered ☒ Yes ☐ No
Date Package Delivered: 2011 04 02
Date Work Completed: 2011 05 02

Ministry Use Only
Audit No. Z113723
Received MAY 30 2011

0506E (2007/12) © Queen's Printer for Ontario, 2007

Ministry's Copy

Well 12. MOECC Record 7163645

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*
N/A

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
9385 UNION LINE RR 5	CHATHAM	6	ELEVEN

County/District/Municipality	City/Town/Village	Province	Postal Code
KENT	DRESDEN	Ontario	N0P1M0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	395733	4708628		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
DECOMMISSION		OF WELL RECORD	# 264876		
	DRILLED	SEPT. 12 2003			

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	44	HOLEPLUG	
44	52	SILICA SAND	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping
____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected?
☐ Yes ☐ No

N/A

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	9		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☐ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify* DECOMMISSION
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5 ⅝	STEEL	.188	+2	45
4 ⅝	STEEL	.188	50	52

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5	STAINLESS	18	45	50

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☒ Abandoned, other, *specify* TURNED DIRTY
☐ Other, *specify*

Water Details

Water found at Depth 44 (m/ft) ☒ Gas — Kind of Water: ☒ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth ____ (m/ft) ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth ____ (m/ft) ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

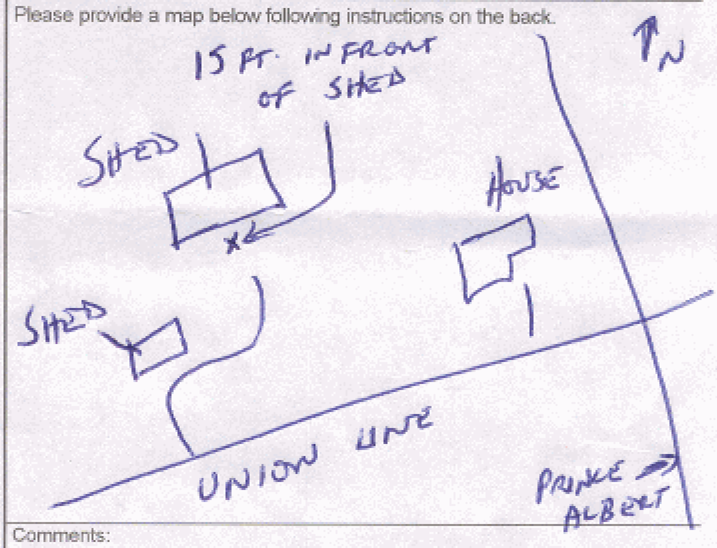
Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Well Contractor and Well Technician Information

Business Name of Well Contractor: LASKEY'S SERVICES
Well Contractor's Licence No.: 3366
Business Address (Street Number/Name): 12 MAITLAND TERRACE
Municipality: STRATHROY
Province: ONTARIO
Postal Code: N7G1L1
Business E-mail Address:
Bus.Telephone No. *(inc. area code)*: 5192450590
Name of Well Technician (Last Name, First Name): IRWIN CHRIS
Well Technician's Licence No.: 3467
Signature of Technician and/or Contractor:
Date Submitted: 2011 05 18

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well owner's information package delivered
☒ Yes
☐ No

Date Package Delivered: 2011 04 02
Date Work Completed: 2011 05 02

Ministry Use Only
Audit No. Z113724
Received MAY 30 2011

0506E (2007/12) Ministry's Copy

Well 13. MOECC Record 3308468

Ministry of the Environment
Ontario

The Ontario Water Res

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 3308468 MUNICIP 33002 CON. CON 11

COUNTY OR DISTRICT: Kent
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Chatham
CON, BLOCK, TRACT, SURVEY, ETC: 11
LOT 25-27: 2

[redacted]

R# 5 ~~Chatham~~ Dresden
DATE COMPLETED 48-53: DAY 22 MO 8 YR 89

06449 RC ELEVATION 590 RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Top Soil			0	2
Br	Clay			2	12
Gr	Clay			12	45
Br	Shale			45	52

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13: 45	14: 1 ☑ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
15-18	19: 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
20-23	24: 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
25-28	29: 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
30-33	34 80: 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
10-11: 5"	12: 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	13-16: 45
17-18	19: 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			20-23
24-25	26: 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 31-33
DIAMETER 34-38 INCHES
LENGTH 39-40 FEET
MATERIAL AND TYPE
DEPTH TO TOP OF SCREEN 41-44 FEET 30

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10: air 1 ☑ PUMP 2 ☐ BAILER
PUMPING RATE 11-14: 3/4 GPM
DURATION OF PUMPING 15-16 HOURS 17-18 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
19-21: 7 FEET	22-24: 38 FEET	26-28: 36 FEET	29-31: 38 FEET	32-34: 38 FEET	35-37: 38 FEET

25 WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE 38-41 GPM
PUMP INTAKE SET AT FEET
WATER AT END OF TEST 42: 1 ☐ CLEAR 2 ☑ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP
RECOMMENDED PUMP SETTING 43-45 FEET
RECOMMENDED PUMPING RATE 46-49: 1/2 To 3/4 GPM
50-53

FINAL STATUS OF WELL

54
1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED
9 ☐ DEWATERING

WATER USE

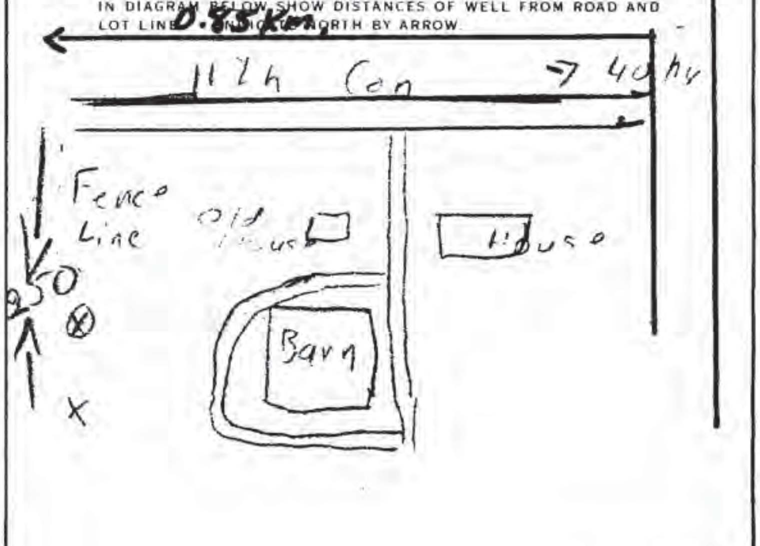
55-56
1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF CONSTRUCTION

57
1 ☑ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING
☐ DIGGING
☐ OTHER

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



28363

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR: Dunlop Drilling
WELL CONTRACTOR'S LICENCE NUMBER: 1842
ADDRESS: RR#2 Tupperville
NAME OF WELL TECHNICIAN: Richard Dunlop
WELL TECHNICIAN'S LICENCE NUMBER: T0192
SIGNATURE OF TECHNICIAN/CONTRACTOR: Richard Dunlop
SUBMISSION DATE: DAY 8 MO. 9 YR 89

OFFICE USE ONLY

DATA SOURCE 58
CONTRACTOR 59-62: 1842
DATE RECEIVED 63-68: SEP 11 1989
80
DATE OF INSPECTION
INSPECTOR
REMARKS
CSS.S8

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Well 13. MOECC Record 3308469

Ministry of the Environment
Ontario

The Ontario Water Re

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 3308469 | MUNICIP 33002 | CON. CON 11

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON, BLOCK, TRACT, SURVEY, ETC	LOT 25-27
Kent	Chatham	11	2

[redacted] RR# 5 Dresden

DATE COMPLETED 48-53 DAY 17 MO 8 YR 89

06442 | RC | ELEVATION 590 | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	Top Soil			0	2
Br	Clay			2	15
Gr	Clay			15	45
Br	Shale			45	72

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 ☐ FRESH 3 ☐ SULPHUR 14 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
15-18	1 ☐ FRESH 3 ☐ SULPHUR 19 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
20-23	1 ☐ FRESH 3 ☐ SULPHUR 24 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
25-28	1 ☐ FRESH 3 ☐ SULPHUR 29 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS
30-33	1 ☐ FRESH 3 ☐ SULPHUR 34 80 2 ☐ SALTY 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
10-11	1 ☐ STEEL 12 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			13-16
17-18	1 ☐ STEEL 19 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			20-23
24-25	1 ☐ STEEL 26 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 31-33	DIAMETER 34-38 INCHES	LENGTH 39-40 FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN 41-44 FEET	80

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13 72	14-17 0	cuttings + clay
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE 11-14 GPM

DURATION OF PUMPING 15-16 HOURS 17-18 MINS

STATIC LEVEL 19-21 FEET

WATER LEVEL END OF PUMPING 22-24 FEET

25 WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

15 MINUTES 26-28 FEET | 30 MINUTES 29-31 FEET | 45 MINUTES 32-34 FEET | 60 MINUTES 35-37 FEET

IF FLOWING, GIVE RATE 38-41 GPM

PUMP INTAKE SET AT FEET

WATER AT END OF TEST 42: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING 43-45 FEET

RECOMMENDED PUMPING RATE 46-49 GPM

50-53

FINAL STATUS OF WELL

54
- 1 ☐ WATER SUPPLY
- 2 ☐ OBSERVATION WELL
- 3 ☐ TEST HOLE
- 4 ☐ RECHARGE WELL
- 5 ☑ ABANDONED, INSUFFICIENT SUPPLY
- 6 ☐ ABANDONED POOR QUALITY
- 7 ☐ UNFINISHED
- 9 ☐ DEWATERING

WATER USE

55-56
- 1 ☐ DOMESTIC
- 2 ☐ STOCK
- 3 ☐ IRRIGATION
- 4 ☐ INDUSTRIAL
- ☐ OTHER
- 5 ☐ COMMERCIAL
- 6 ☐ MUNICIPAL
- 7 ☐ PUBLIC SUPPLY
- 8 ☐ COOLING OR AIR CONDITIONING
- 9 ☑ NOT USED

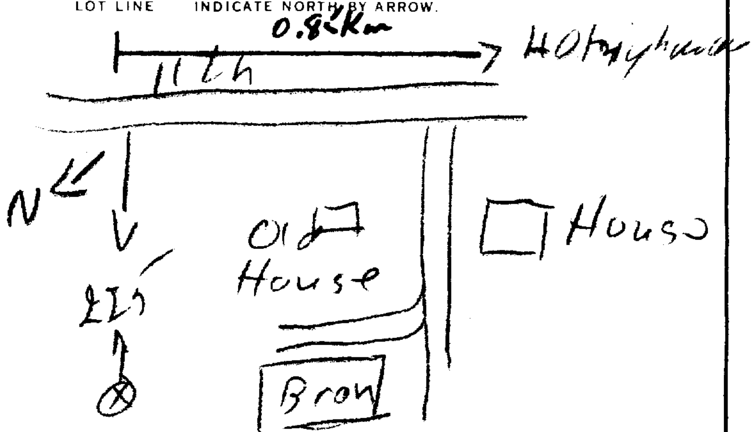
METHOD OF CONSTRUCTION

57
- 1 ☑ CABLE TOOL
- 2 ☐ ROTARY (CONVENTIONAL)
- 3 ☐ ROTARY (REVERSE)
- 4 ☐ ROTARY (AIR)
- 5 ☐ AIR PERCUSSION
- 6 ☐ BORING
- 7 ☐ DIAMOND
- 8 ☐ JETTING
- 9 ☐ DRIVING
- ☐ DIGGING
- ☐ OTHER

LOCATION OF WELL

Bhe.

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



28365

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR: Dunlop Drilling

WELL CONTRACTOR'S LICENCE NUMBER: 1892

ADDRESS: RR#9 Tupperville

NAME OF WELL TECHNICIAN: Richard Dunlop

WELL TECHNICIAN'S LICENCE NUMBER: T0 192

SIGNATURE OF TECHNICIAN/CONTRACTOR: Richard Dunlop

SUBMISSION DATE DAY 8 MO. 9 YR 89

OFFICE USE ONLY

DATA SOURCE 58 | CONTRACTOR 59-62 1842 | DATE RECEIVED 63-68 SEP 11 1989 | 80

DATE OF INSPECTION | INSPECTOR

REMARKS

CSS.S8

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Well 14. Nearby MOECC Record 7216292

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A139346

Well Record

Regulation 903 Ontario Water Resources Act

Page of

[redacted]

Address of Well Location (Street Number/Name): 8811 Union rd.

Township: Dover

Lot: 2

Concession: 11

County/District/Municipality: Chatham Kent

City/Town/Village: Dresden

Province: **Ontario**

Postal Code: N0P 1M0

UTM Coordinates NAD 8 3 Zone 17 Easting 393643 Northing 4706778

Municipal Plan and Sublot Number:

Other:

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Topsoil			0	1
brown	Clay			1	46
Black	Sand	silt		46	46'6"
Black	Shale		Hard.	46'6"	62

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	Bentonite Grout	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☒ Other, *specify* slight haze

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*: 42 ft

Pumping rate *(l/min / GPM)*: .25 gpm us

Duration of pumping: 2 hrs + 0 min

Final water level end of pumping *(m/ft)*: 14 ft

If flowing give rate *(l/min / GPM)*:

Recommended pump depth *(m/ft)*: 42 ft

Recommended pump rate *(l/min / GPM)*: .25 gpm us

Well production *(l/min / GPM)*:

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	9		
1	9'3"	1	13'9"
2	9'6"	2	13'6"
3	9'9"	3	13'3"
4	10	4	13
5	10'3"	5	12'9'
10	10'9"	10	13'7
15	11'2"	15	12'9"
20	11'7"	20	12'1"
25	11'10"	25	11'5"
30	12	30	10'10"
40	12'9"	40	10'2"
50	13'6"	50	9'7"
60	14'	60	9'2"

Method of Construction

☒ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☒ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify*
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5"	Steel	.188	+2	46'6"
5	open hole		46'6"	62

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Water Details

Water found at Depth 46-47 (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☒ Untested ☐ Other, *specify*

Water found at Depth (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

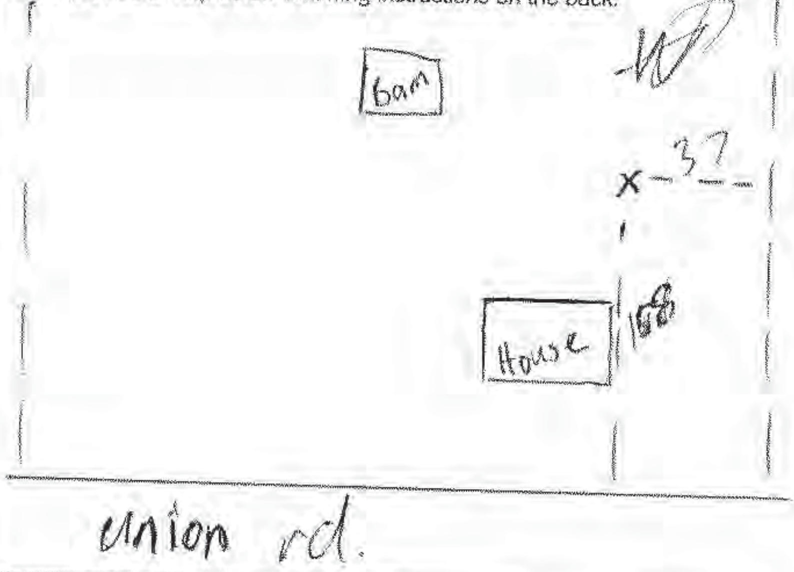
Water found at Depth (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	20	8"
20	62	5

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Rumble Water Wells

Well Contractor's Licence No.: 4642

Business Address (Street Number/Name): 12R 5 Blenheim

Municipality: Chatham Kent

Province: ON

Postal Code: N0P 1M0

Business E-mail Address:

Bus. Telephone No. *(inc. area code)*: 5196768203

Name of Well Technician (Last Name, First Name): Garnet Rumble

Well Technician's Licence No.: 2544

Signature of Technician and/or Contractor:

Date Submitted: Y Y Y Y M M D D

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 20131122

Date Work Completed: 20131122

Ministry Use Only

Audit No. Z 170080

FEB 14 2014

0506E (2007/12)

Ministry's Copy

Well 14. Nearby MOECC Record 7216293

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* N/A

Well Record

Regulation 903 Ontario Water Resources Act

Page of

[redacted]

Address of Well Location (Street Number/Name): 8811 Union rd.	Township: Dover	Lot: 2	Concession: 11
County/District/Municipality: Chatham Kent.	City/Town/Village: Dresden	Province: Ontario	Postal Code: N0P 1M0
UTM Coordinates NAD 8 3, Zone: 17, Easting: 393643, Northing: 4706778	Municipal Plan and Sublot Number	Other	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Peastone			46	47
	Bentonite grout			47	-6'6"
	Bentonite pad.			6'6"	6'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)

Method of Construction

☐ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify*
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
2"	Steel	?	-6-6"	?

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☒ Abandoned, other, *specify* not used.
☐ Other, *specify*

Water Details

Water found at Depth (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft) ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

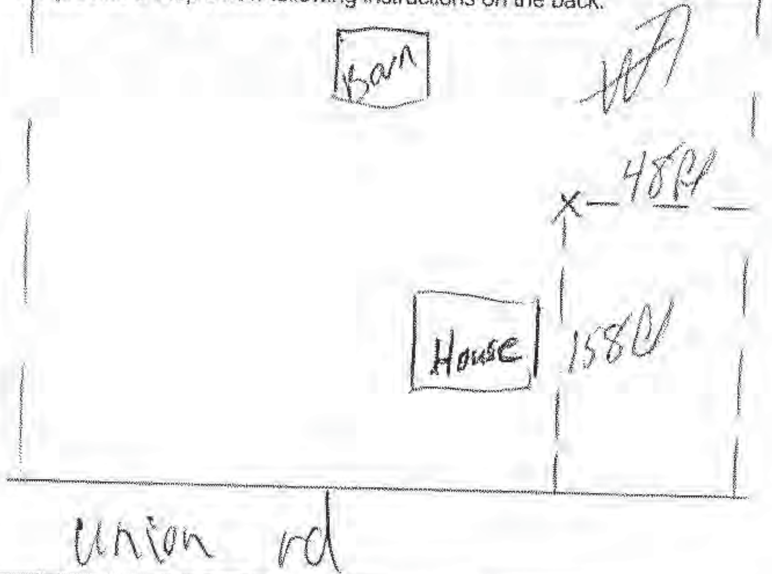
Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*
If pumping discontinued, give reason:
Pump intake set at *(m/ft)*
Pumping rate *(l/min / GPM)*
Duration of pumping hrs + min
Final water level end of pumping *(m/ft)*
If flowing give rate *(l/min / GPM)*
Recommended pump depth *(m/ft)*
Recommended pump rate *(l/min / GPM)*
Well production *(l/min / GPM)*
Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Rumble Water Wells
Well Contractor's Licence No.: 4642
Business Address (Street Number/Name): RR5 Blenheim
Municipality: Chatham Kent
Province: ON
Postal Code: N0P 1A0
Business E-mail Address:
Bus. Telephone No. (inc. area code): 5196768205
Name of Well Technician (Last Name, First Name): Garret Rumble
Well Technician's Licence No.: 3 5 4 4
Signature of Technician and/or Contractor:
Date Submitted: Y Y Y Y M M D D

Well owner's information package delivered ☐ Yes ☒ No
Date Package Delivered: Y Y Y Y M M D D
Date Work Completed: 2013 11 22

Ministry Use Only
Audit No. Z170082
FEB 14 2014

0506E (2007/12)

Ministry's Copy

Well 14. Nearby MOECC Record 7216295

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* N/A

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name): 8811 union rd.
Township: Dover
Lot: 2
Concession: 11
County/District/Municipality: Chatham Kent
City/Town/Village: Dresden
Province: **Ontario**
Postal Code: N0P 1M0
UTM Coordinates: NAD 83 Zone 17 Easting 393643 Northing 4706778
Municipal Plan and Sublot Number:
Other:

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(m/ft)* From	To
	Peastone.			44	56
	Bentonite grout			0	44

Pump house still in use

Annular Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*

Method of Construction

☐ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify*
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To
3"	steel	?	0	?

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☒ Abandoned, other, *specify* not used.
☐ Other, *specify*

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*
If pumping discontinued, give reason:
Pump intake set at *(m/ft)*
Pumping rate *(l/min / GPM)*
Duration of pumping ____ hrs + ____ min
Final water level end of pumping *(m/ft)*
If flowing give rate *(l/min / GPM)*
Recommended pump depth *(m/ft)*
Recommended pump rate *(l/min / GPM)*
Well production *(l/min / GPM)*
Disinfected? ☒ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Water Details

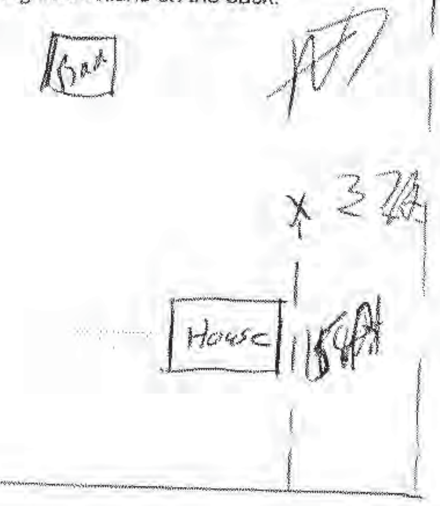
Water found at Depth ____ *(m/ft)* ☐ Gas Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth ____ *(m/ft)* ☐ Gas Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth ____ *(m/ft)* ☐ Gas Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth *(m/ft)* From	To	Diameter *(cm/in)*

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor: Rumble Water Wells
Well Contractor's Licence No.: 4642
Business Address (Street Number/Name): RR 5 Blenheim
Municipality: Chatham Kent
Province: On
Postal Code: N0P 1A0
Business E-mail Address: —
Bus. Telephone No. *(inc. area code)*: 5196768003
Name of Well Technician (Last Name, First Name): Garnet Rumble
Well Technician's Licence No.: 3544
Signature of Technician and/or Contractor:
Date Submitted: Y Y Y Y M M D D

Comments:

Well owner's information package delivered ☐ Yes ☒ No
Date Package Delivered: Y Y Y Y M M D D
Date Work Completed: 2013 11 22

Ministry Use Only
Audit No. Z170081
Received FEB 14 2014

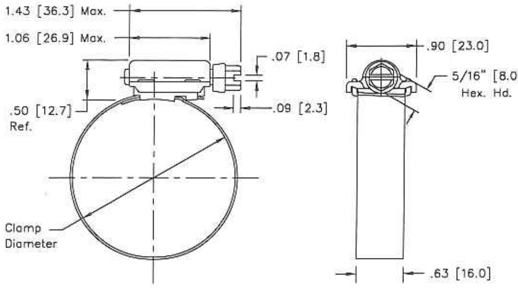
0506E (2007/12)

Ministry's Copy

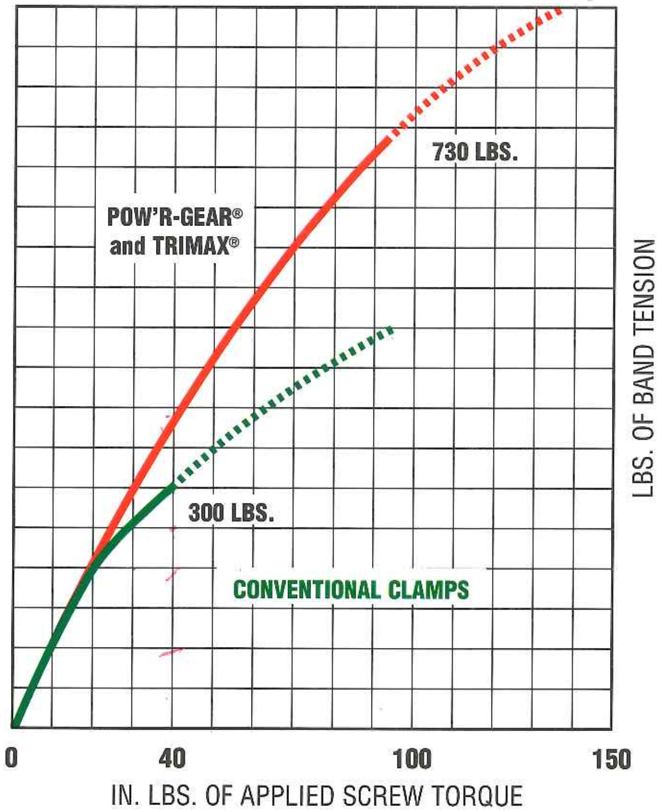
APPENDIX D

Band Clamp Torque Chart

POW'R-GEAR® and TRIMAX® clamps deliver over 800 lbs. of band tension at 150 in.-lbs. of screw torque. That's more than twice the band tension of conventional clamps.



Measurements in illustrations are in inches [millimeters]



EXTENDED RANGE		CLAMPING RANGE					
SAE Sizes	Ideal Part No.	Min. Dia. (in.)	Max. Dia. (in.)	Min. Dia. (mm)	Max. Dia. (mm)	Hose I.D. Min. (in.)	Hose I.D. Max. (in.)
	6X						
262	6X200	1 1/4	2 5/8	32	66	1 1/4	2
412	6X300	2	4 1/8	51	104	2	3 1/2
612	6X400	4	6 1/8	102	155	4	5 1/2
912	6X500	6	9 1/8	153	231	6	8 1/2
1012	6X600	7	10 1/8	178	257	7	9 1/2

HIGH PERFORMANCE CLAMP									CLAMPING RANGE					
SAE Sizes	Ideal Part No.	Tridon Part No.	Ideal Part No.	Tridon Part No.	Ideal Part No.	Tridon Part No.	Ideal Part No.	Tridon Part No.	Min. Dia. (in.)	Max. Dia. (in.)	Min. Dia. (mm)	Max. Dia. (mm)	Hose I.D. Min. (in.)	Hose I.D. Max. (in.)
	60	850	6P	N/A	6L	843	6M	N/A						
175	60175	850-175	6P175	–	6L175	843-175	6M175	–	1	1 3/4	25	45	7/8	1 1/8
212	60200	850-200	6P200	–	6L200	843-200	6M200	–	1 1/4	2 1/8	32	54	1	1 1/2
262	60250	850-250	6P250	–	6L250	843-250	6M250	–	1 3/4	2 5/8	45	66	1 1/2	2
312	60300	850-300	6P300	–	6L300	843-300	6M300	–	2 1/4	3 1/8	57	79	2	2 1/2
362	60350	850-350	6P350	–	6L350	843-350	6M350	–	2 3/4	3 5/8	70	92	2 1/2	3
412	60400	850-400	6P400	–	6L400	843-400	6M400	–	3 1/4	4 1/8	83	105	3	3 1/2
462	60450	850-450	6P450	–	6L450	843-450	6M450	–	3 3/4	4 5/8	95	117	3 1/2	4
512	60500	850-500	6P500	–	6L500	843-500	6M500	–	4 1/4	5 1/8	108	130	4	4 1/2
562	60550	850-550	6P550	–	6L550	843-550	6M550	–	4 3/4	5 5/8	121	143	4 1/2	5
612	60600	850-600	6P600	–	6L600	843-600	6M600	–	5 1/4	6 1/8	133	155	5	5 1/2
662	60650	850-650	6P650	–	6L650	843-650	6M650	–	5 3/4	6 5/8	146	168	5 1/2	6
712	60700	850-700	6P700	–	6L700	843-700	6M700	–	6 1/4	7 1/8	159	181	6	6 1/2
762	60750	850-750	6P750	–	6L750	843-750	6M750	–	6 3/4	7 5/8	172	193	6 1/2	7
812	60800	850-800	6P800	–	6L800	843-800	6M800	–	7 1/4	8 1/8	184	206	7	7 1/2
862	60850	850-850	6P850	–	6L850	843-850	6M850	–	7 3/4	8 5/8	197	219	7 1/2	8
912	60900	850-900	6P900	–	6L900	843-900	6M900	–	8 1/4	9 1/8	210	232	8	8 1/2

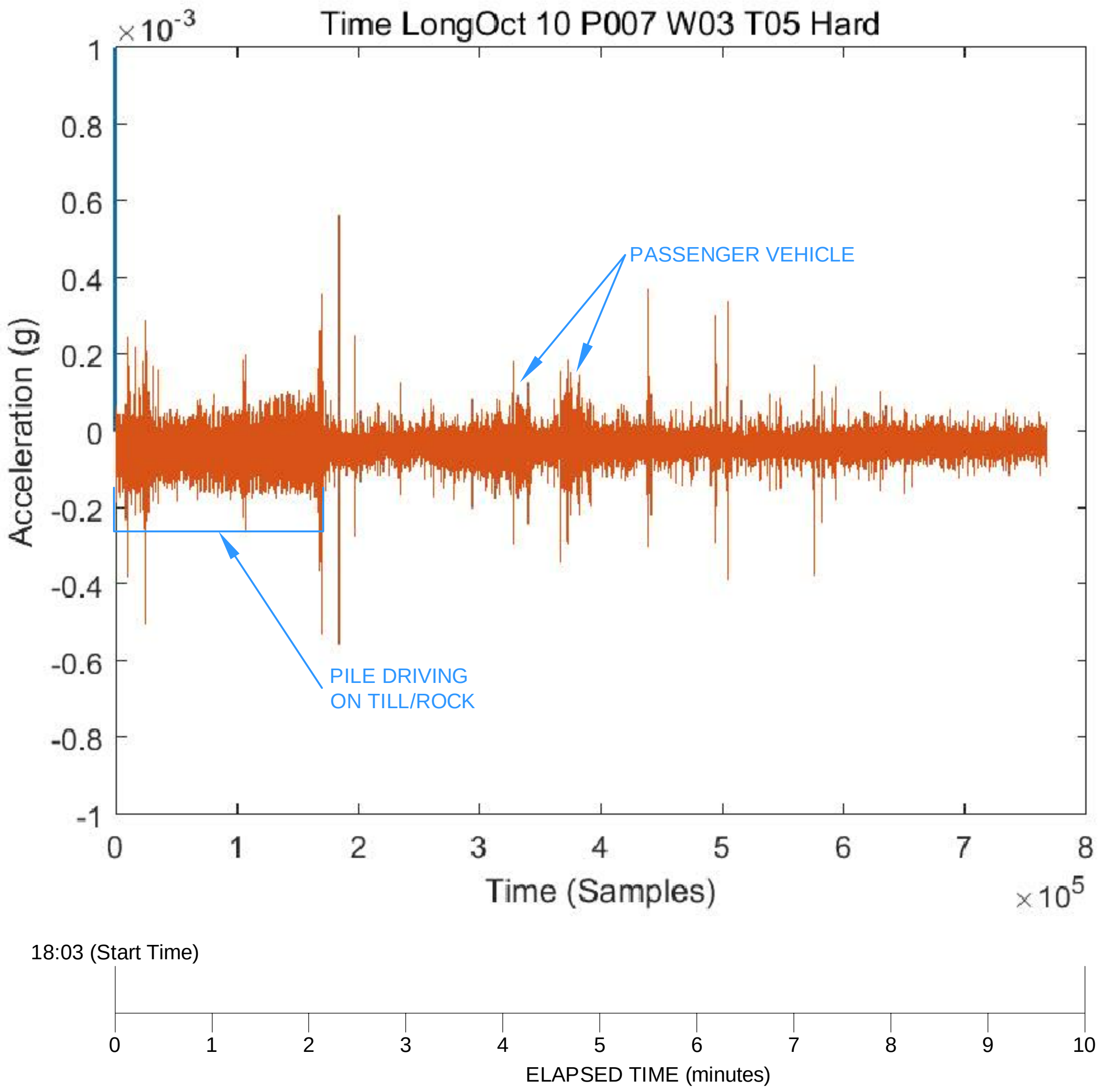
Additional sizes available - Contact Ideal for information.

N/A - Not Available

We recommend a minimum of all 300 grade stainless steel clamps for marine applications. For applications directly over galvanized steel, we recommend an intermediate layer of non-conductive material such as vinyl electrical tape.

APPENDIX E

Example Acceleration Time History Figures



Drawing file: 1668031-2000-R02ET05W03.dwg Dec 01, 2017 - 1:30pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

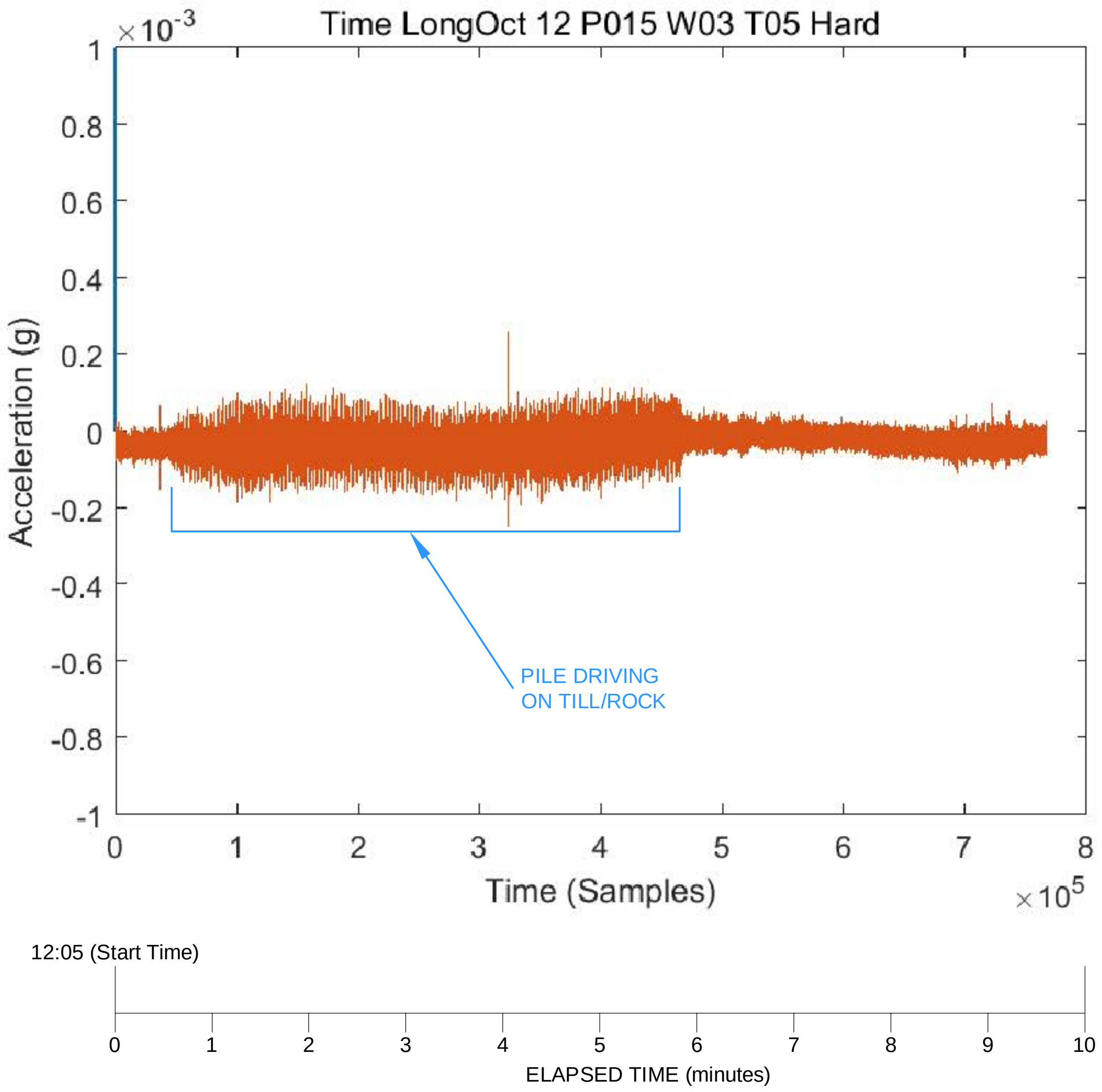
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T5, WELL 3, PILE 7
(OCTOBER 10, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET05W03
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK

E-T05W03P07



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

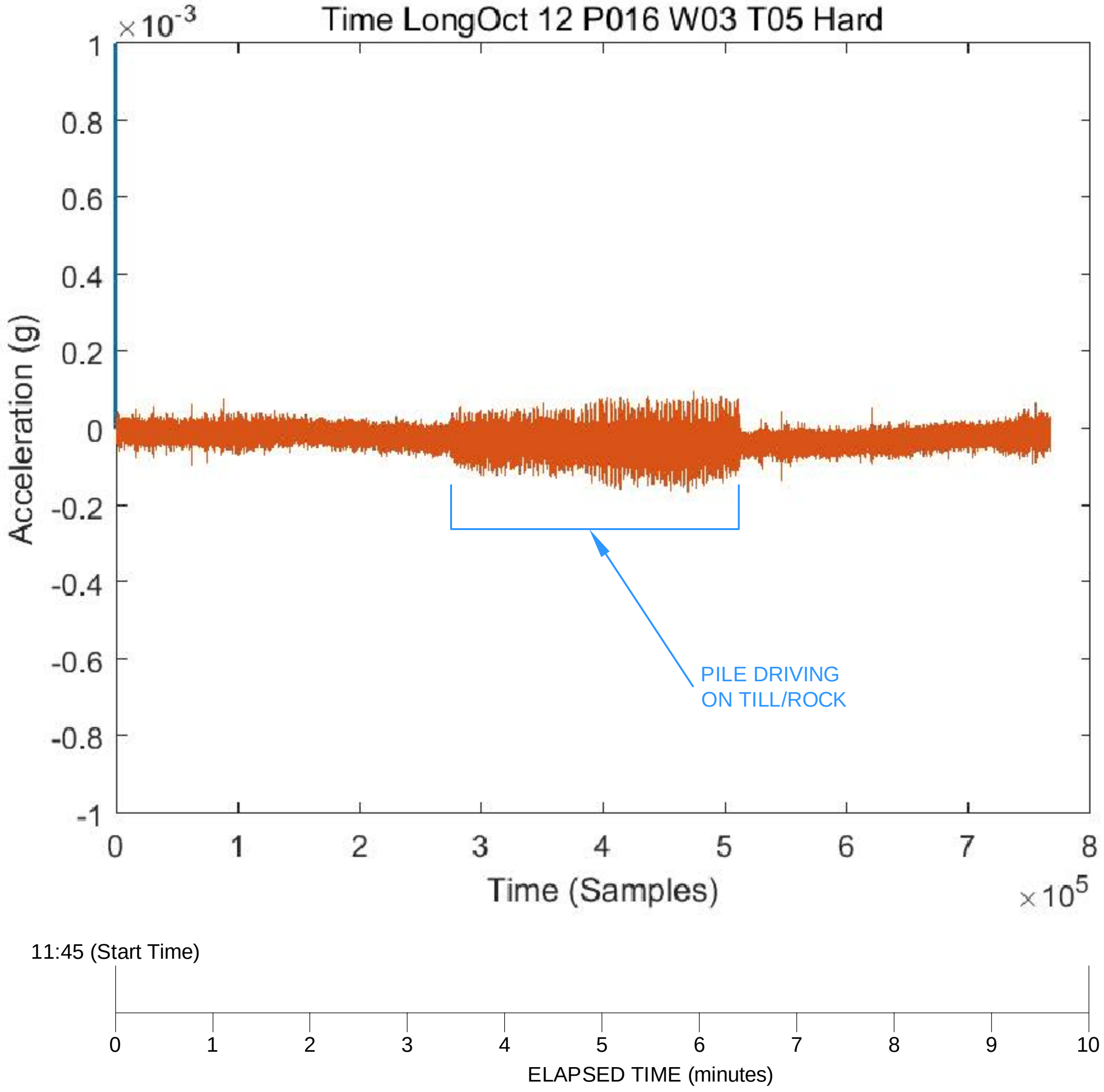
TITLE

TURBINE T5, WELL 3, PILE 15
(OCTOBER 12, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET05W03
			SCALE AS SHOWN REV.
CADD	DCH	Dec 1/17	
CHECK			**E-T05W03P15**

Drawing file: 1668031-2000-R02ET05W03.dwg Dec 01, 2017 - 1:29pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T5, WELL 3, PILE 16
(OCTOBER 12, 2017)

Golder Associates

PROJECT No.		1668031
CADD	DCH	Dec 1/17
CHECK	SSB	

FILE No. 1668031-2000-R02ET05W03

SCALE AS SHOWN | REV.

E-T05W03P16

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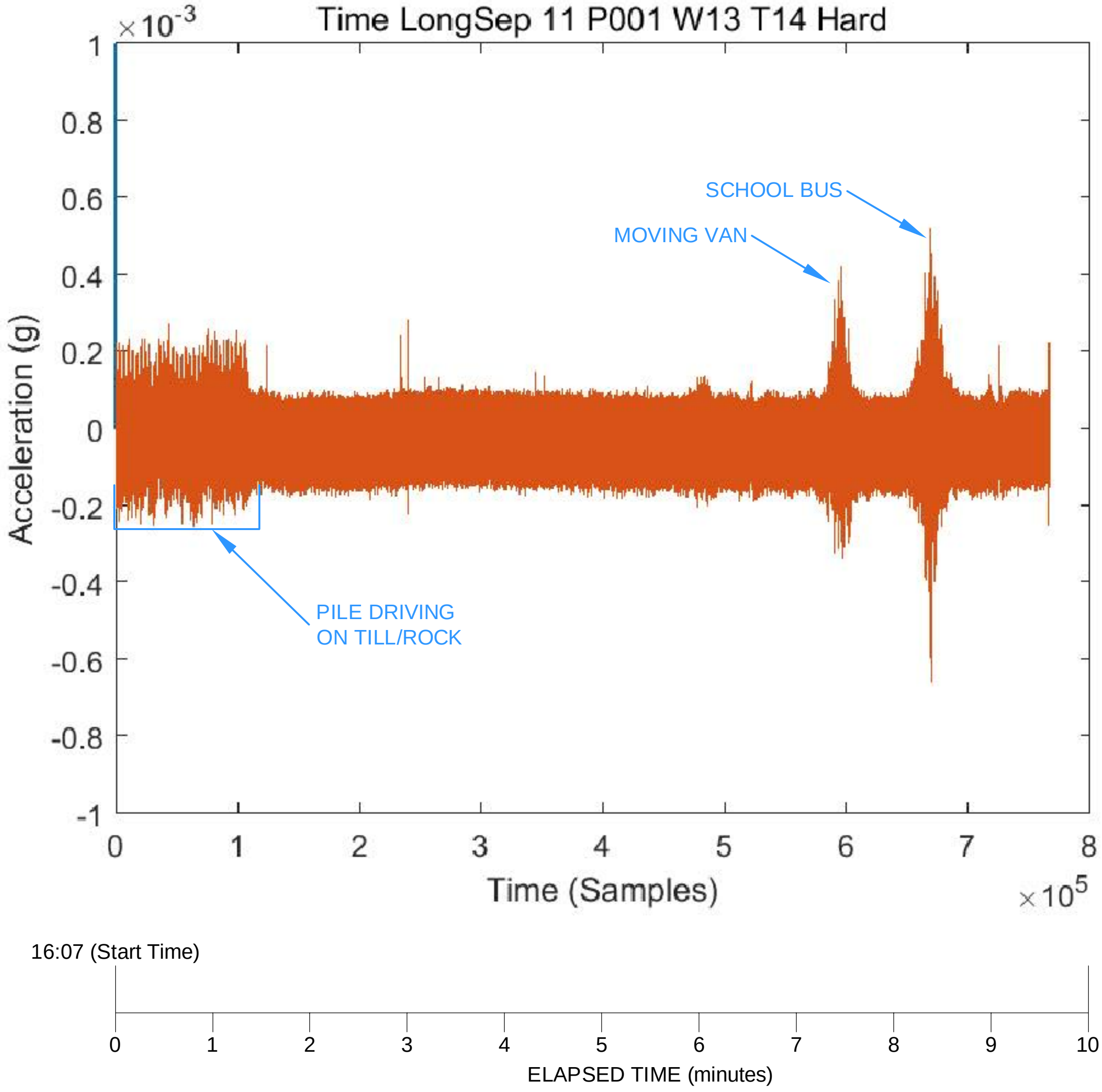

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

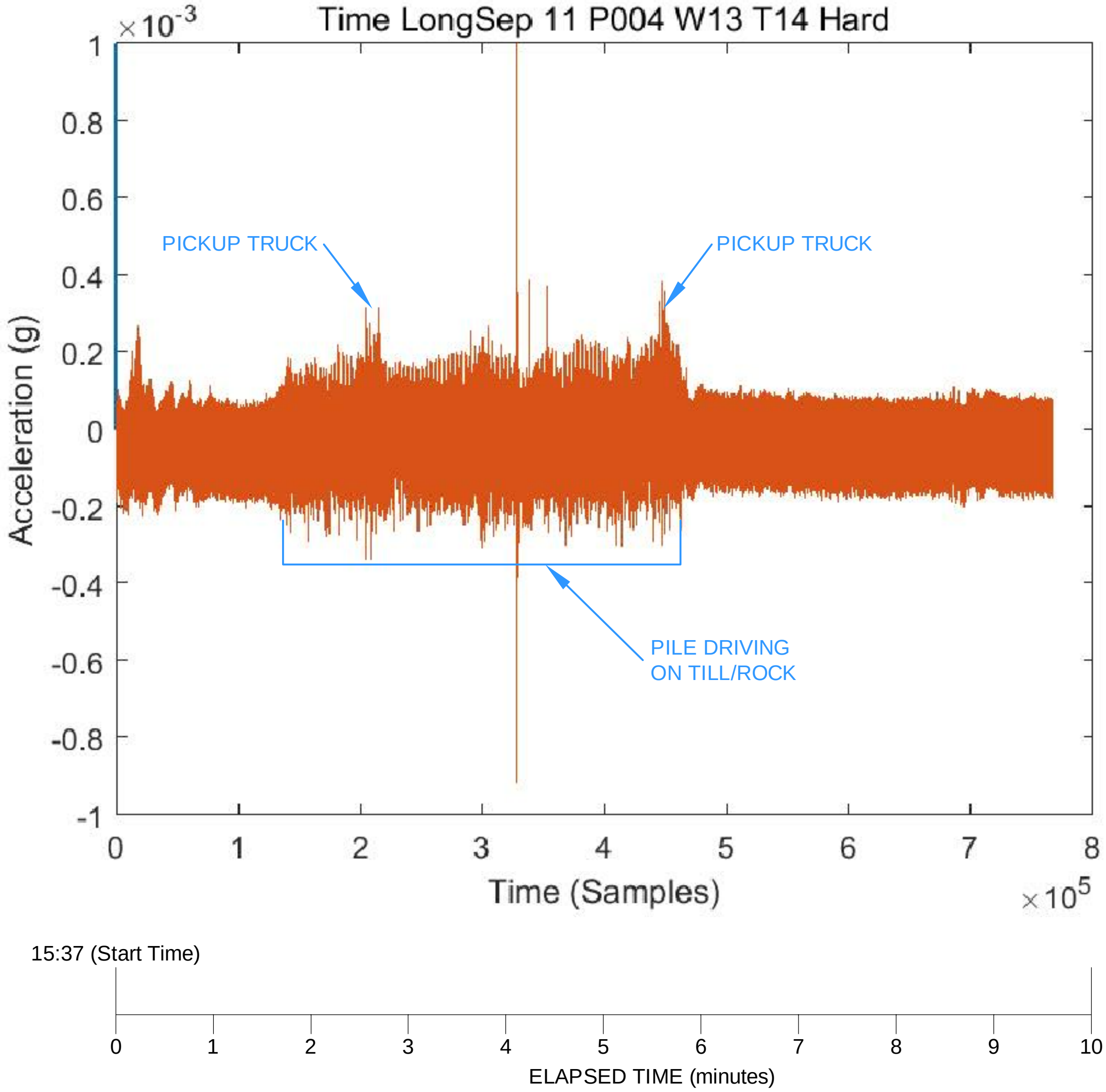
NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T14, WELL 13, PILE 1
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET14W13
			SCALE AS SHOWN REV.
CADD	DCH	Dec 1/17	
CHECK			**E-T14W13P01**



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T14, WELL 13, PILE 4
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET14W13
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SSB

E-T14W13P04

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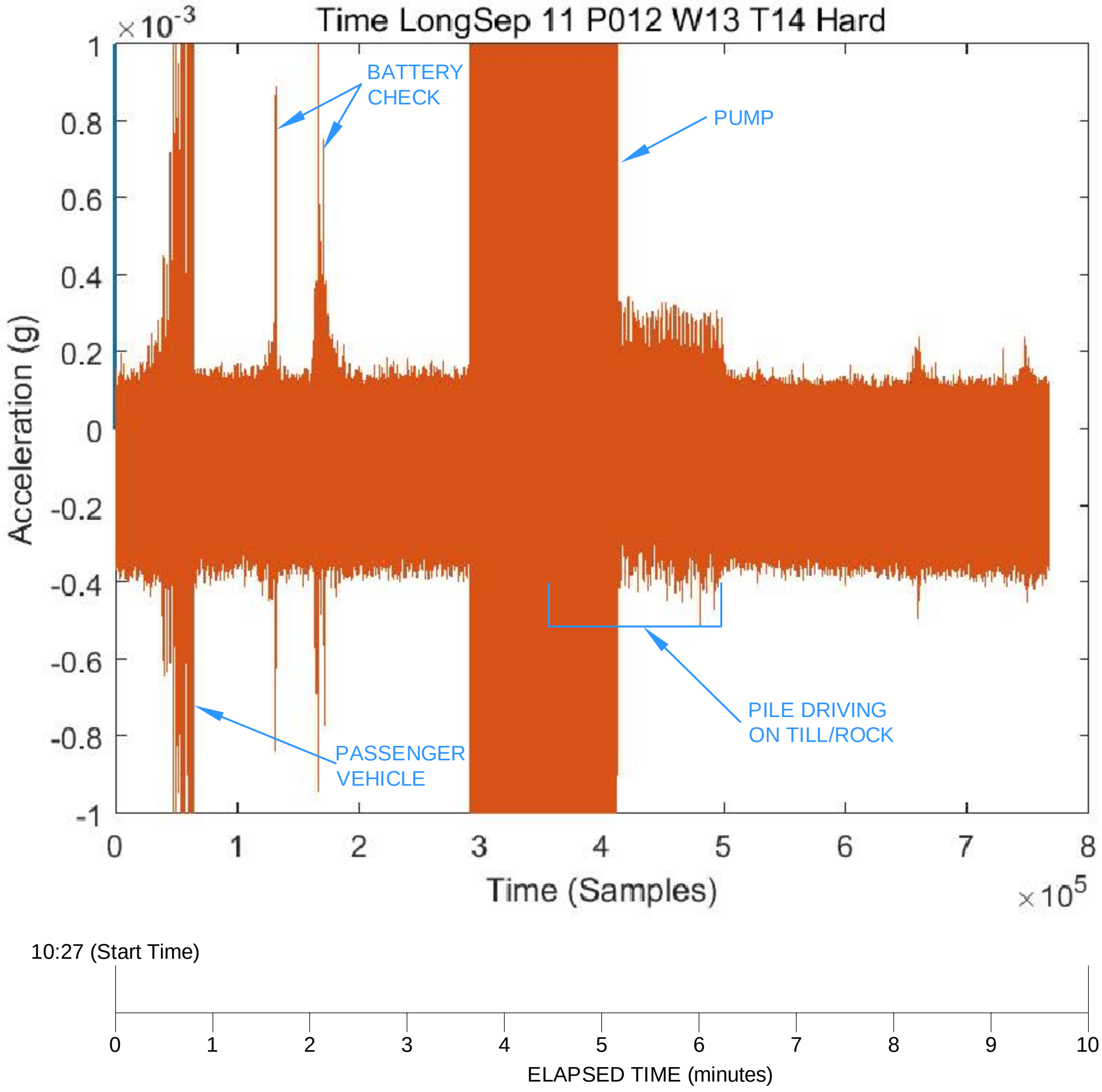

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NOTES

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IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T14, WELL 13, PILE 12
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.	1668031	FILE No.	1668031-2000-R02ET14W13
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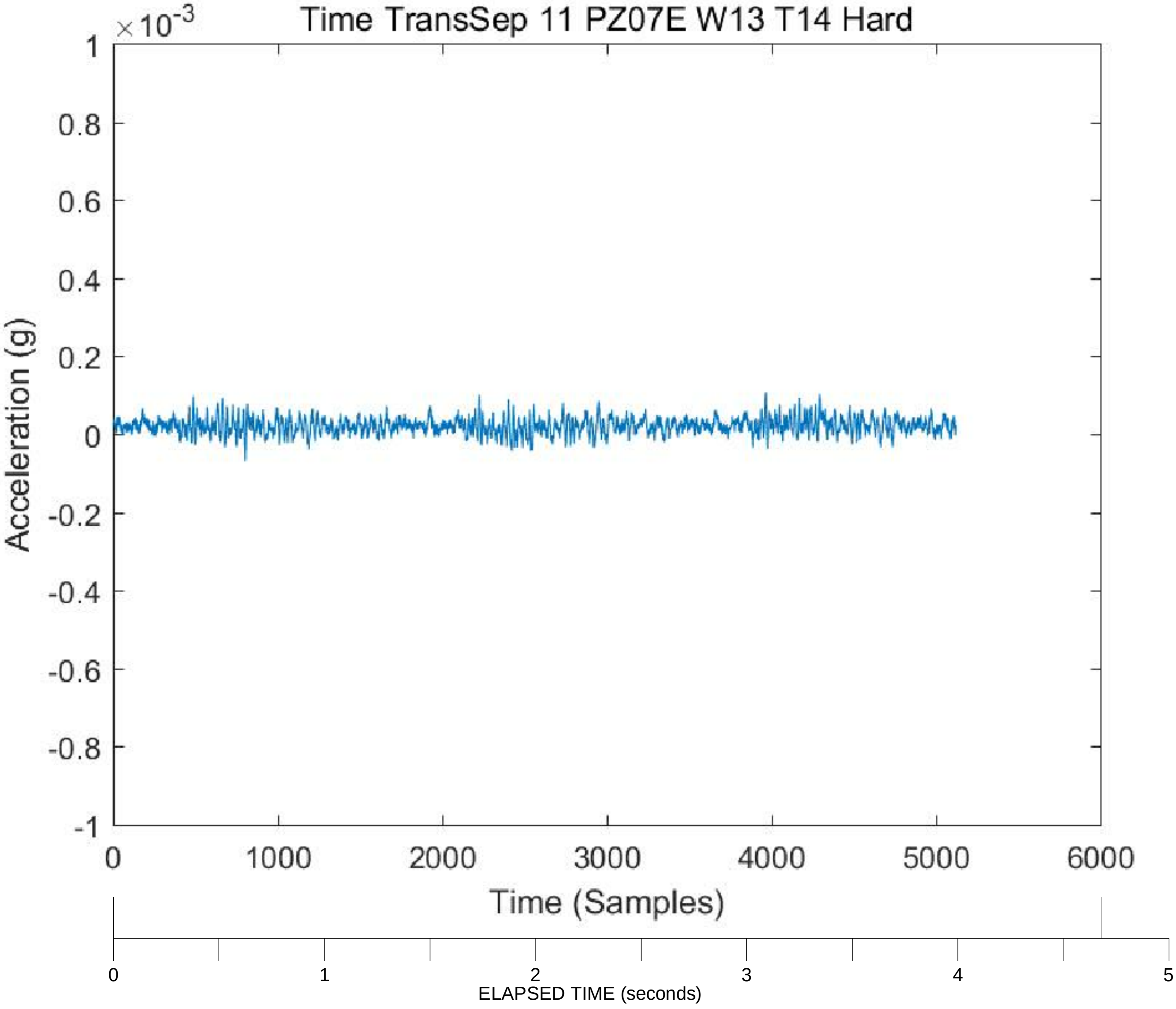
CADD	DCH	Dec 1/17	REV.
CHECK	SSB		**E-T14W13P12**



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE Z07E
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031–2000–R02ET14W13
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SSB

E-T14W13PZ07E

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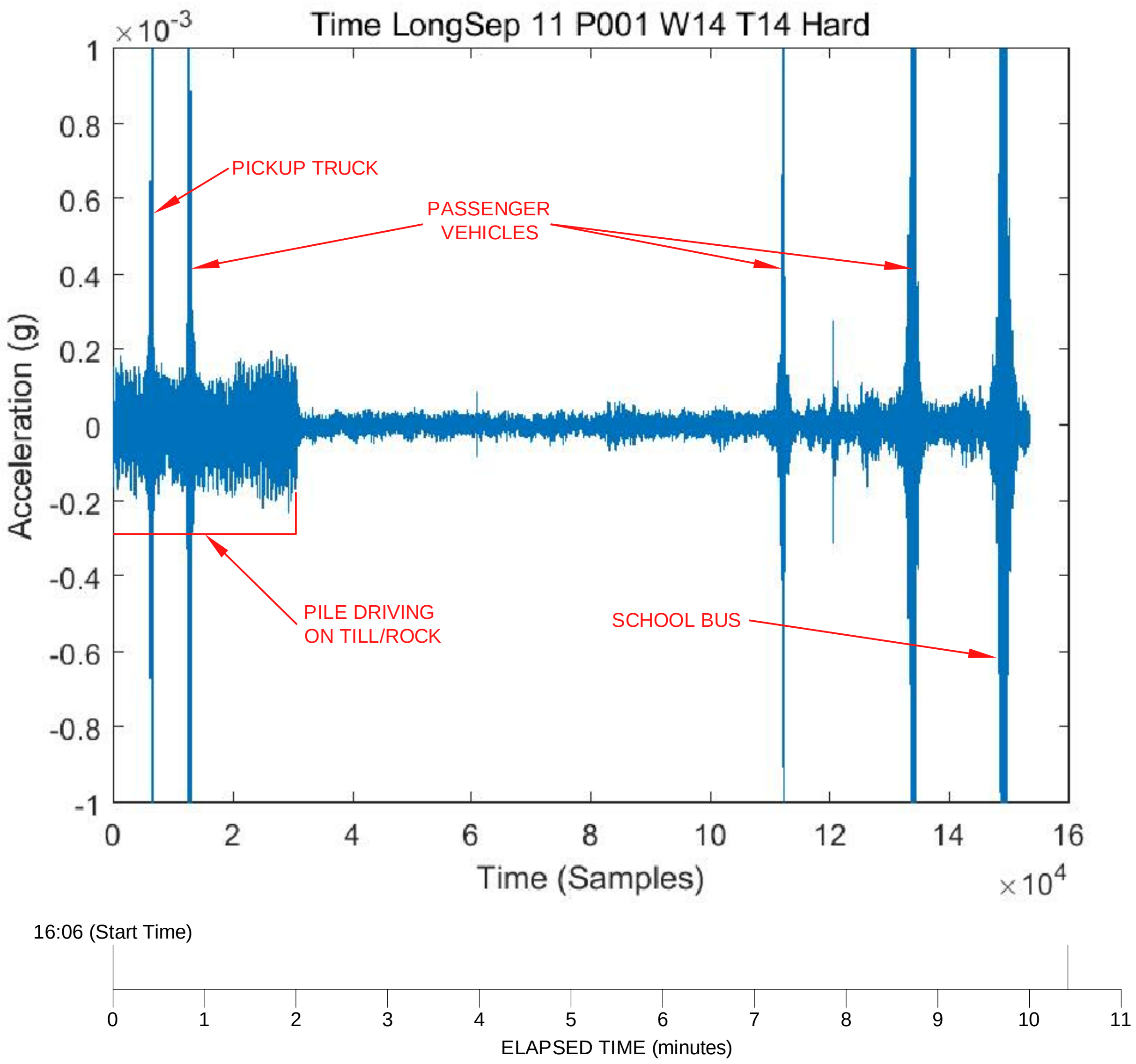

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T14, WELL 14, PILE 1
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET14W14	
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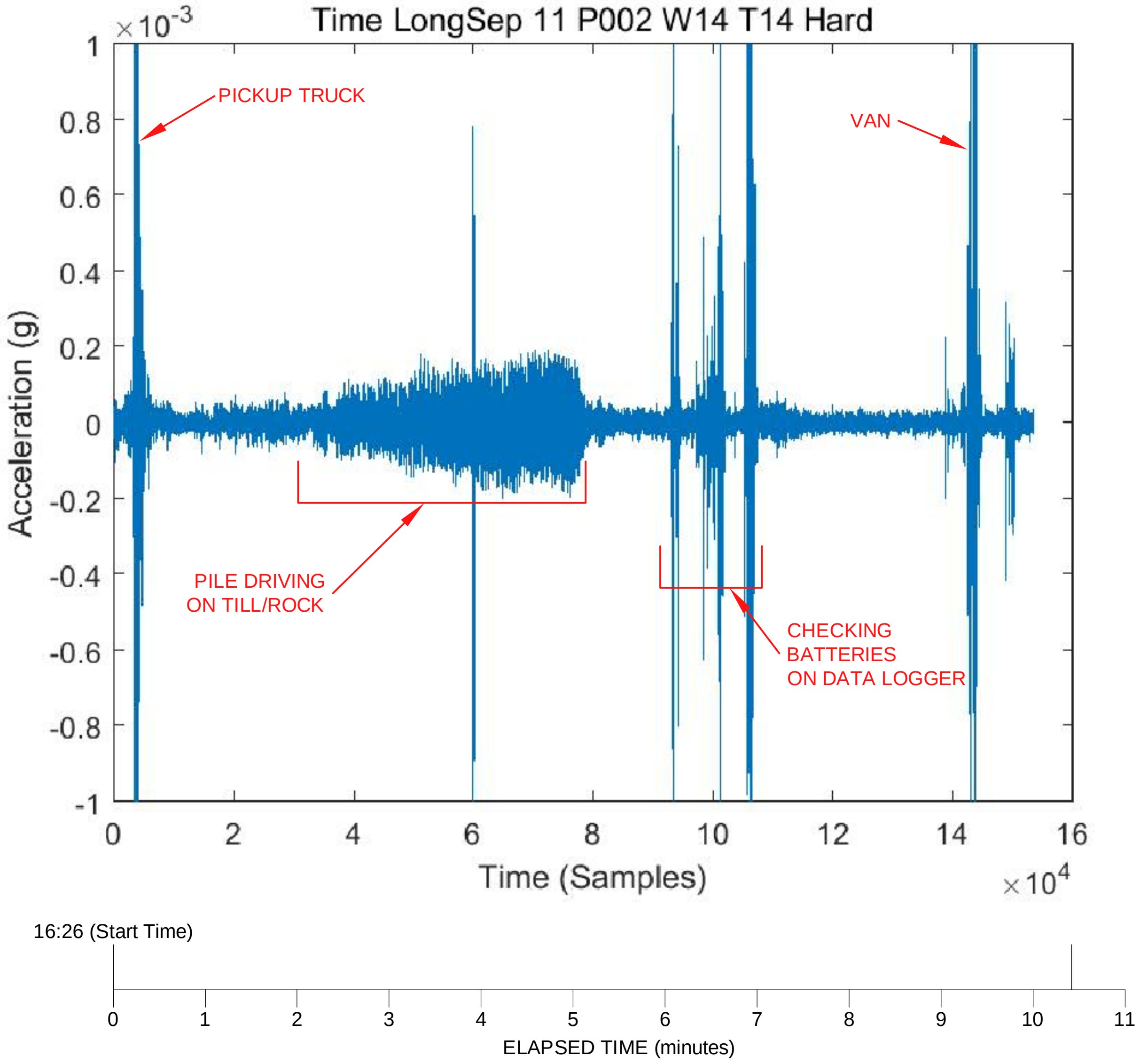
CADD	DCH	Nov 30/17	**E-T14W14P01**	
CHECK	SSB			



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE 2
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.	1668031	FILE No.	1668031-2000-R02ET14W14
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		REV.	
CADD	DCH	Nov 30/17	
CHECK			**E-T14W14P02**

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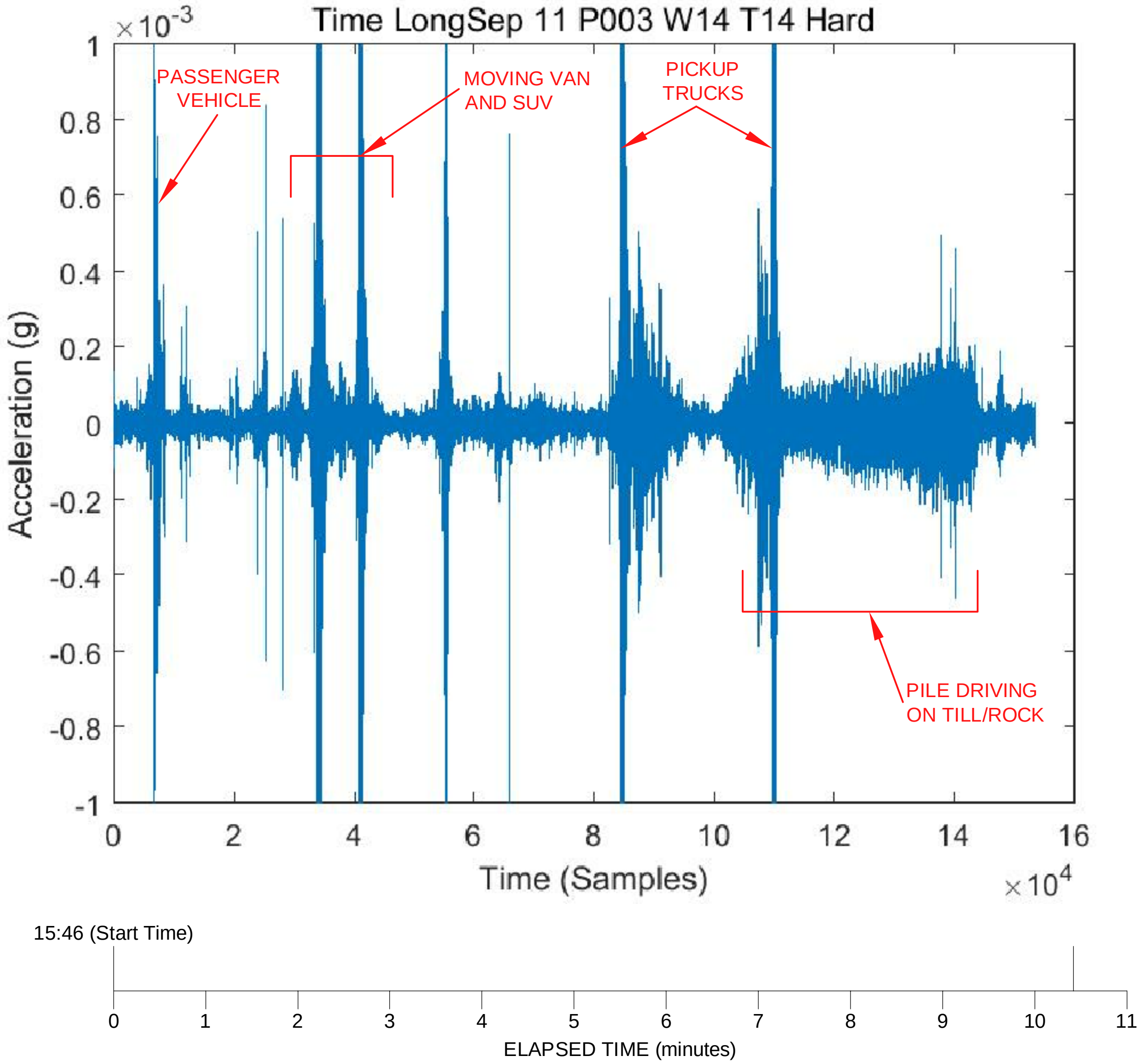

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE 3
(SEPTEMBER 11, 2017)

Golder Associates	PROJECT No.		1668031	FILE No. 1668031-2000-R02ET14W14
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	CADD	DCH	Nov 30/17	
	CHECK	SSB		**E-T14W14P03**

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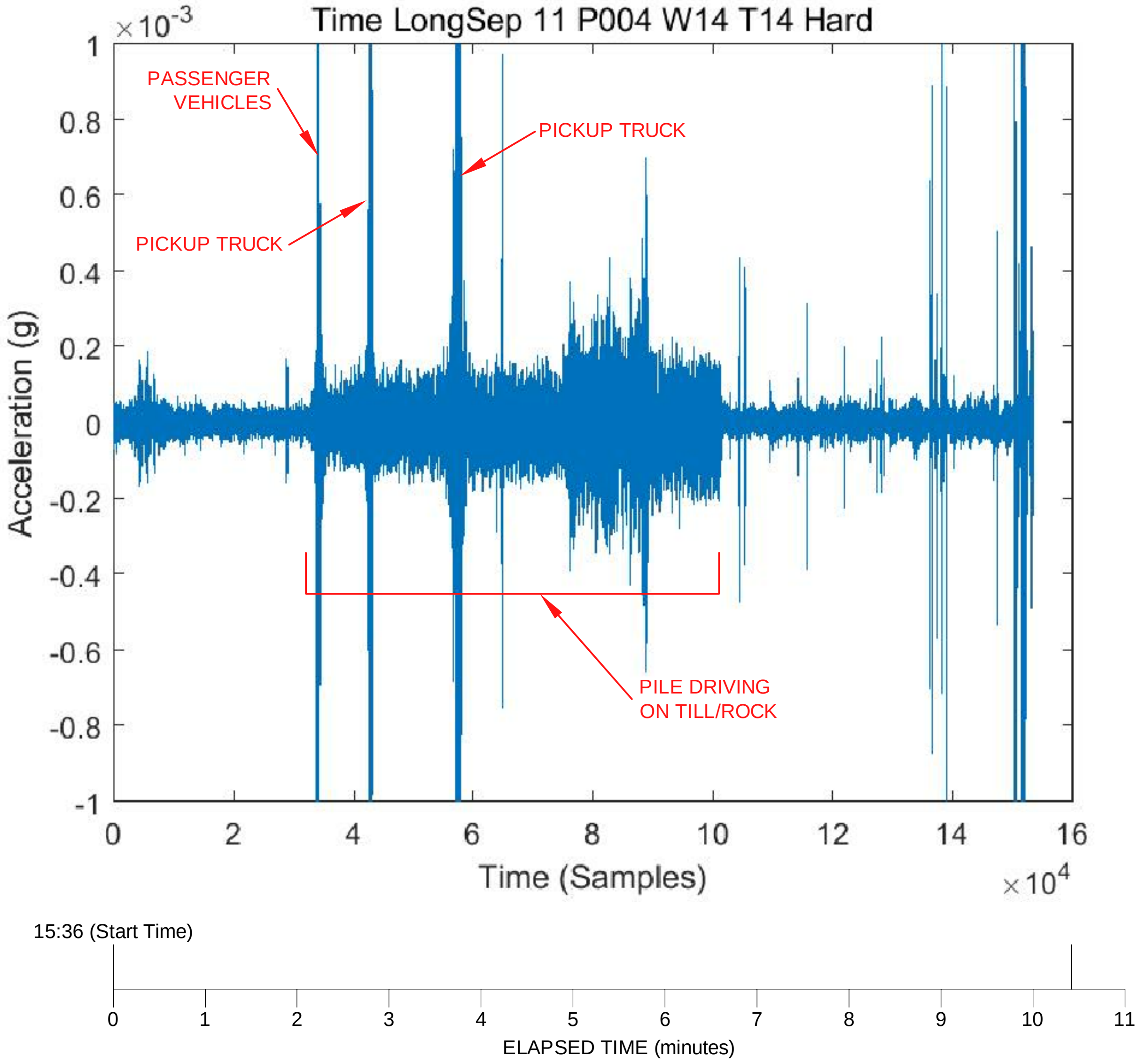

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE 4
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.	1668031	FILE No.	1668031-2000-R02ET14W14
		SCALE	AS SHOWN
		REV.	
CADD	DCH	Nov 30/17	
CHECK			

E-T14W14P04

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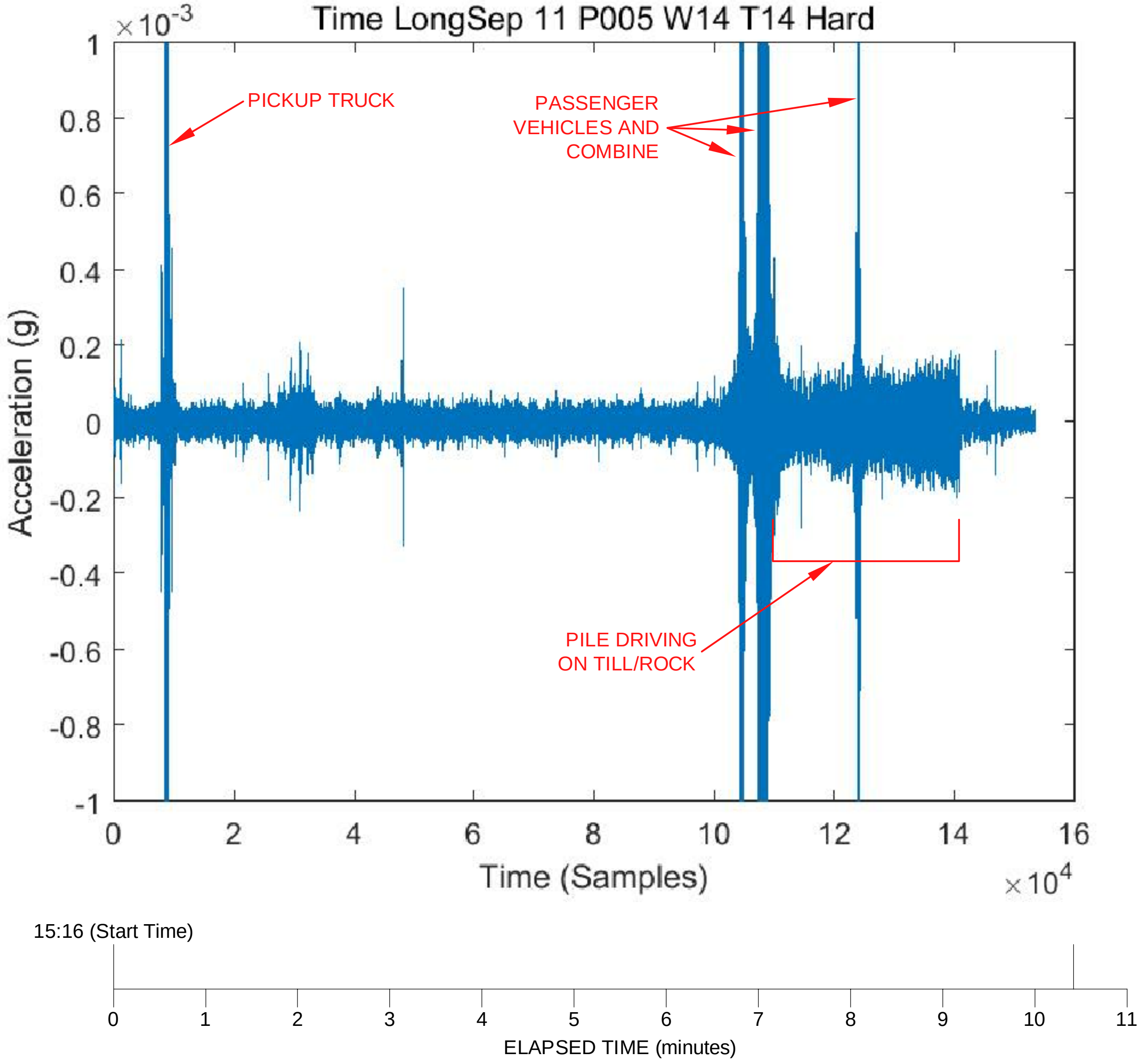


Drawing file: 1668031-2000-R02ET14W14.dwg Dec 04, 2017 - 4:44pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

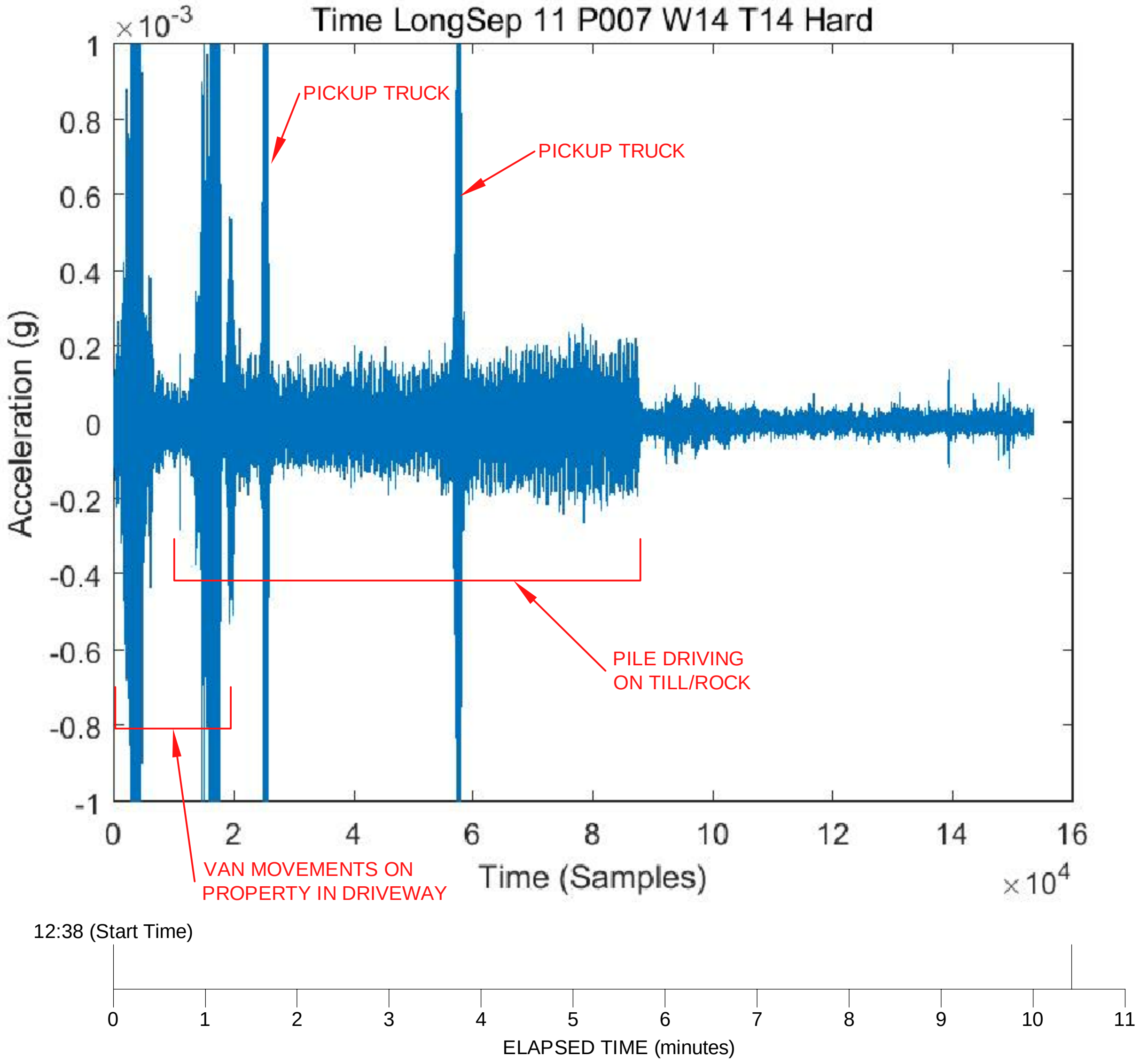
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE 5
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET14W14
SCALE AS SHOWN
REV.
CADD DCH Nov 30/17
CHECK SSB

E-T14W14P05



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

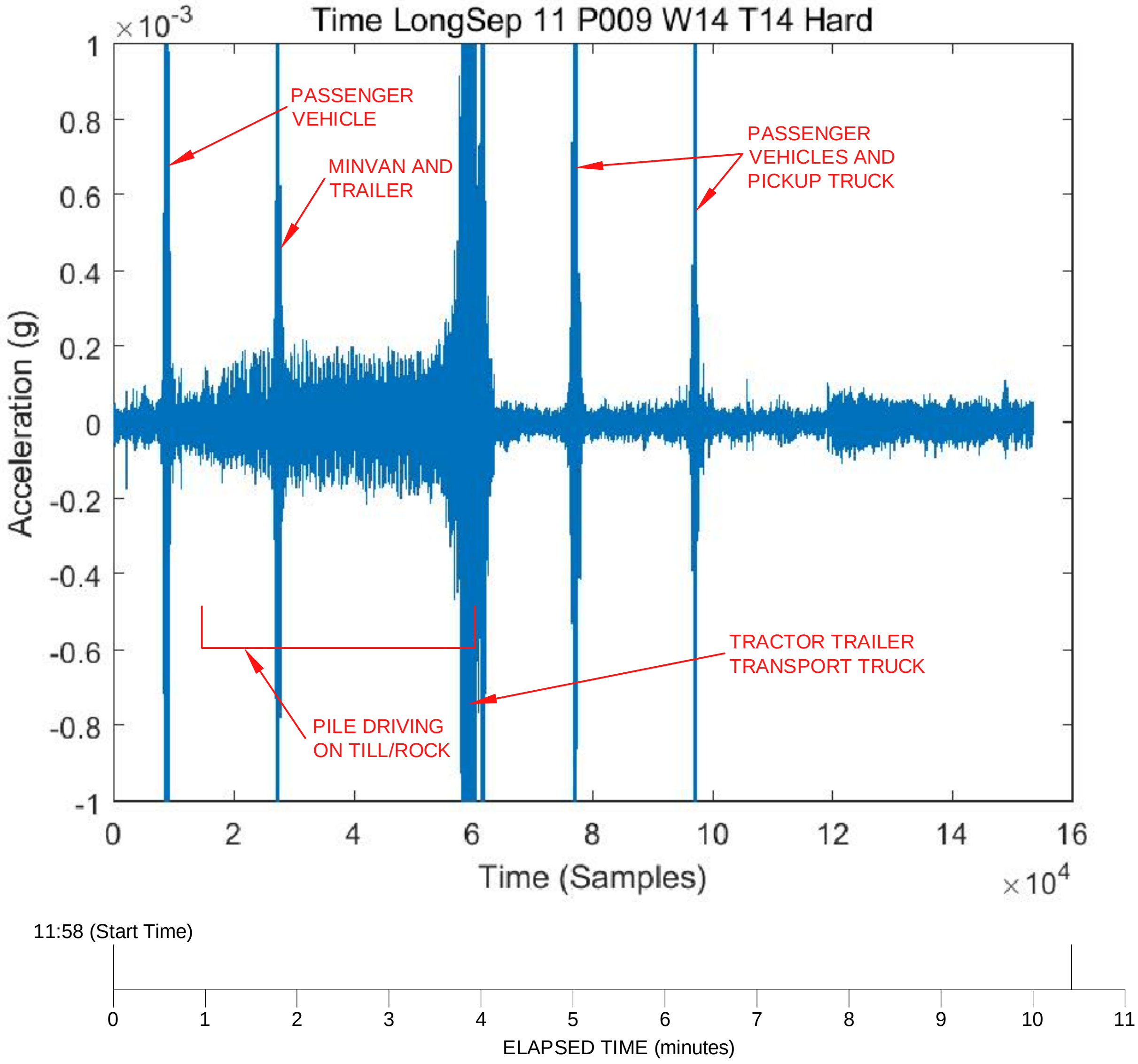
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE 7
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.	1668031	FILE No.	1668031-2000-R02ET14W14	
		SCALE	AS SHOWN	REV.
CADD	DCH	Nov 30/17		
CHECK	SSJS		**E-T14W14P07**	

Drawing file: 1668031-2000-R02ET14W14.dwg Nov 30, 2017 - 4:44pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

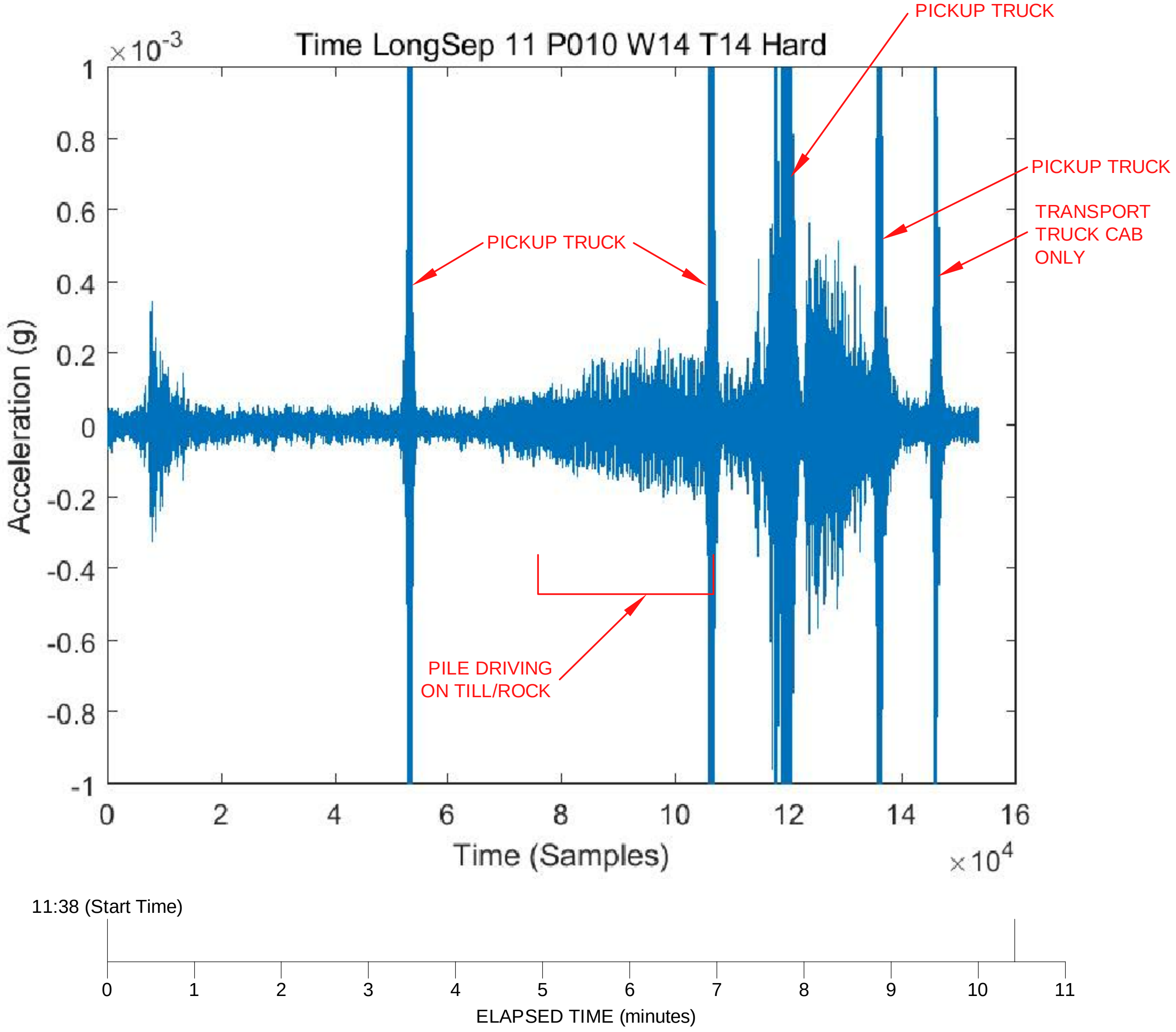
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE 9
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.		1668031	FILE No.	1668031-2000-R02ET14W14
			SCALE	AS SHOWN REV.
CADD	DCH	Nov 30/17		
CHECK	SSJS			**E-T14W14P09**

Drawing file: 1668031-2000-R02ET14W14.dwg Nov 30, 2017 - 4:35pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

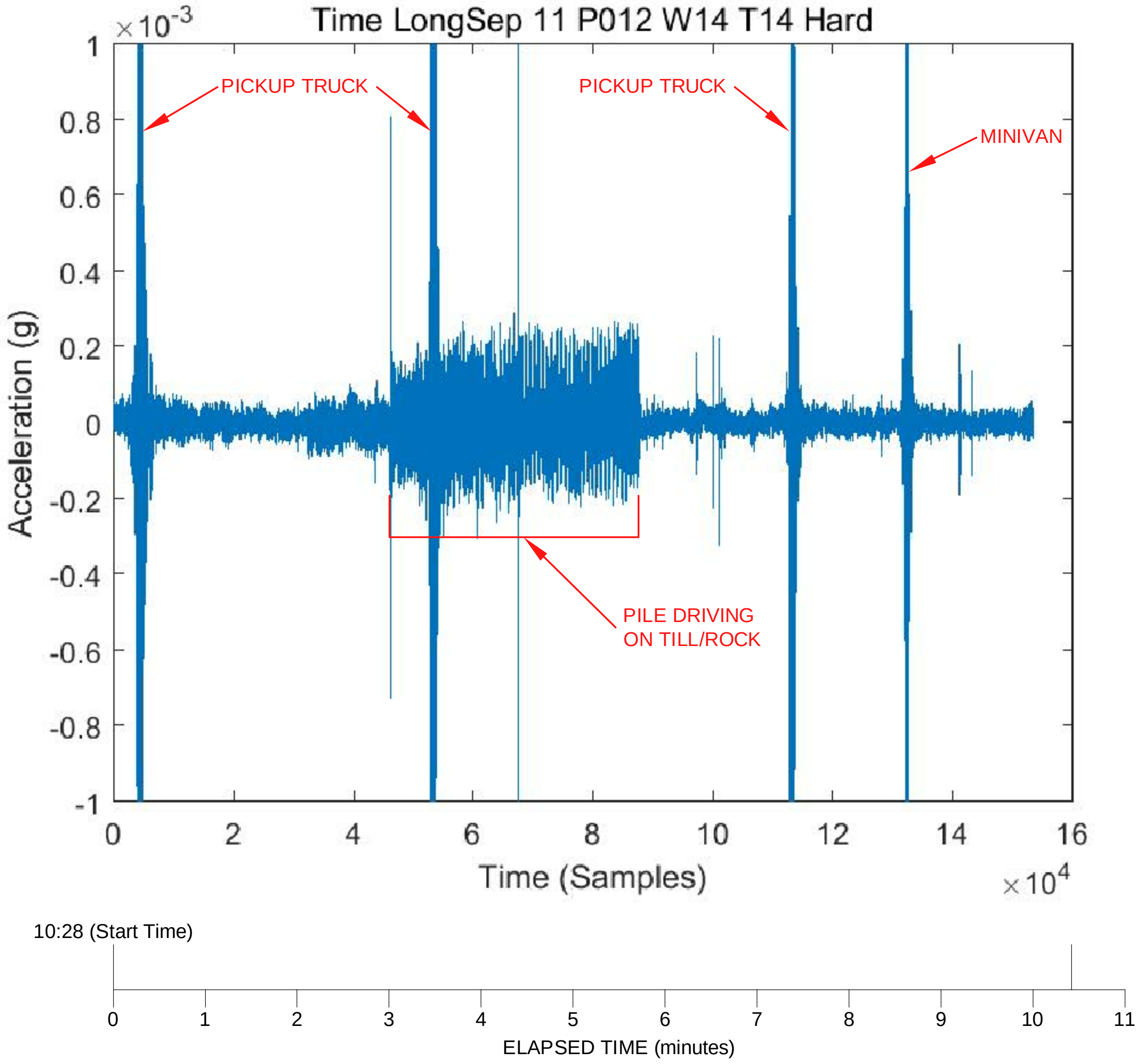
TITLE
TURBINE T14, WELL 14, PILE 10
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET14W14
SCALE AS SHOWN
REV.
CADD DCH Nov 30/17
CHECK

E-T14W14P10

Drawing file: 1668031-2000-R02ET14W14.dwg Nov 30, 2017 - 4:35pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T14, WELL 14, PILE 12
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET14W14	
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CADD	DCH	Nov 30/17		
CHECK			**E-T14W14P12**	

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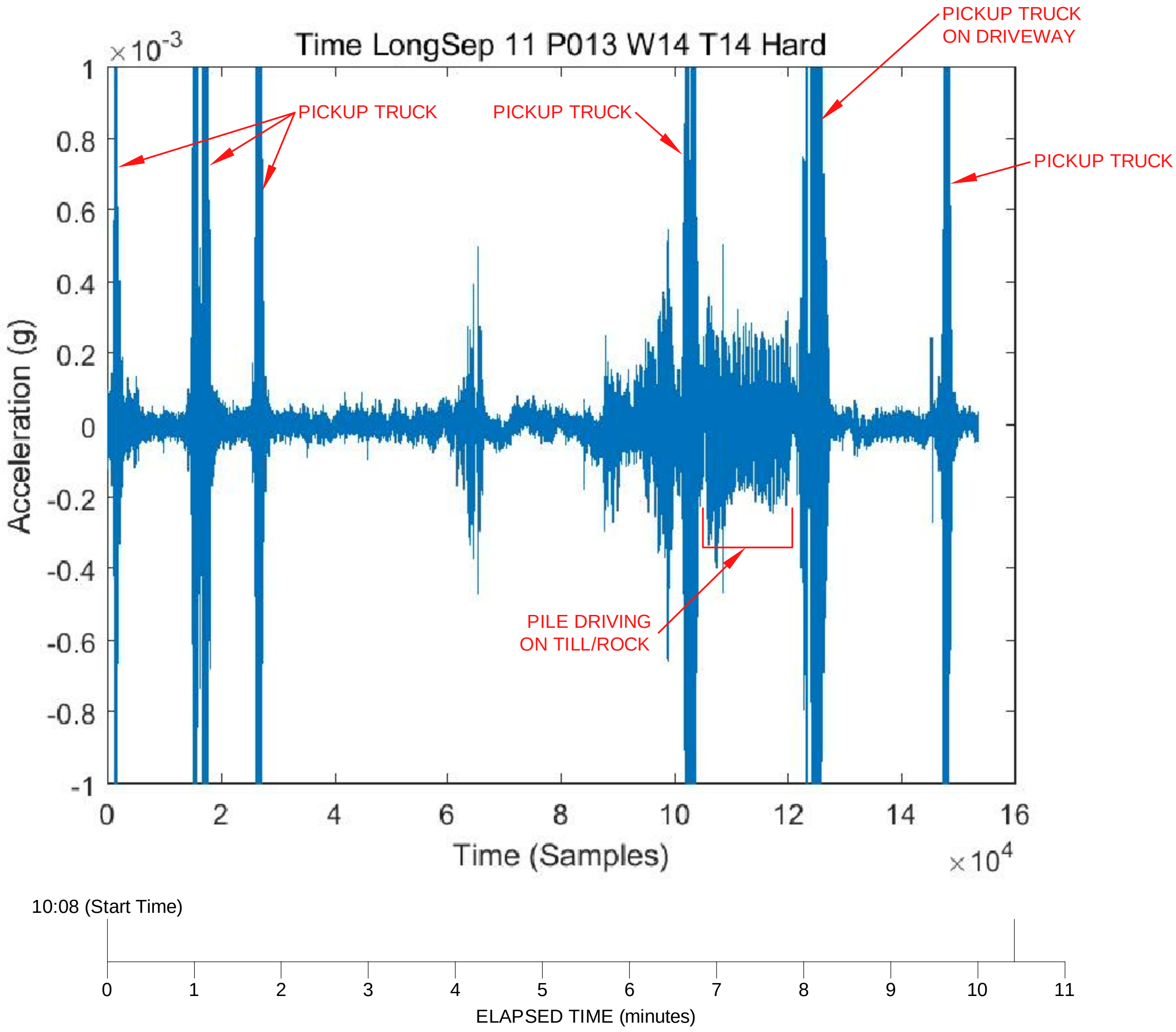

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE 13
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031–2000–R02ET14W14
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CADD	DCH	Nov 30/17	
CHECK	SJS		**E-T14W14P13**

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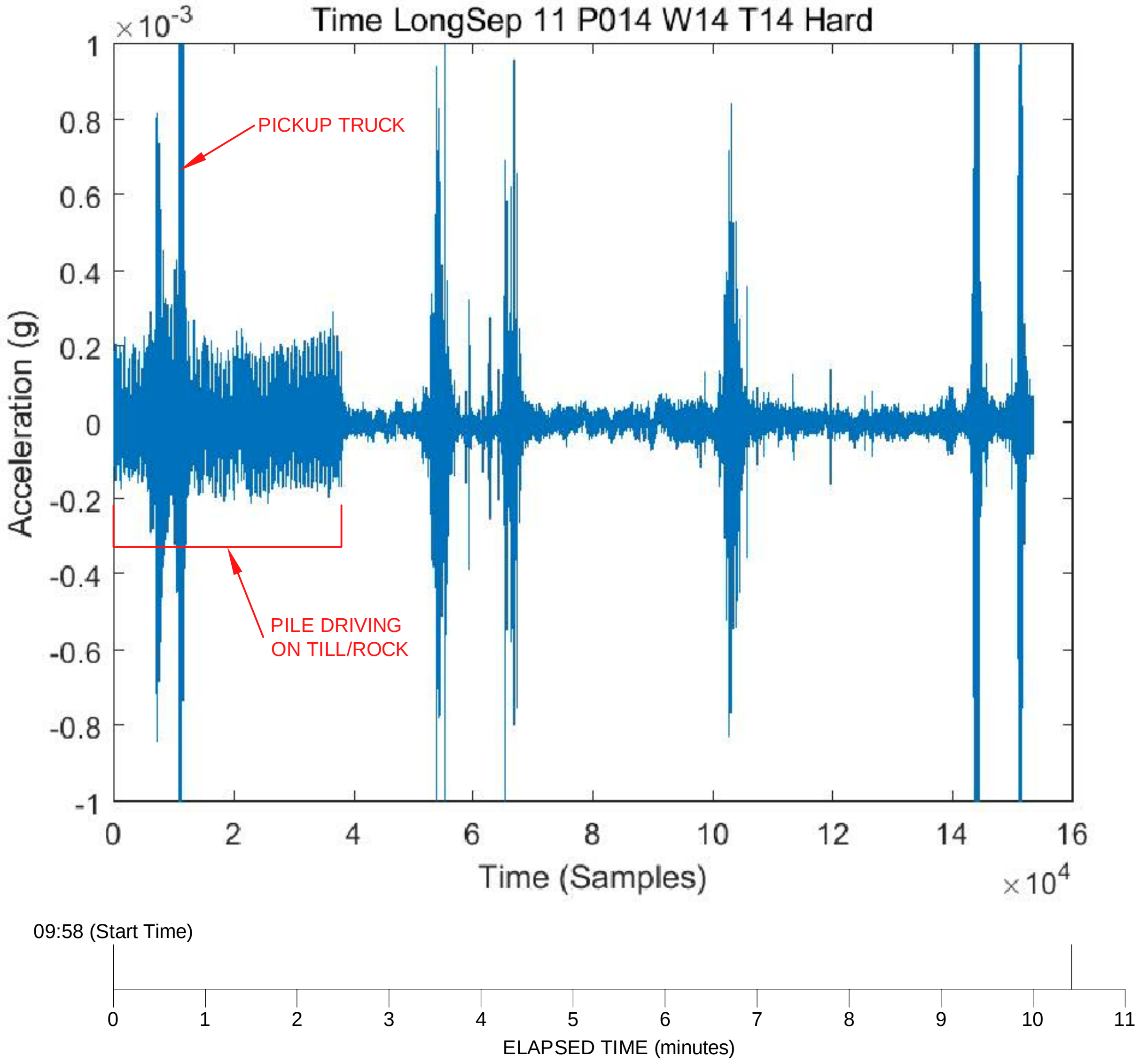

Drawing file: 1668031-2000-R02ET14W14.dwg Nov 30, 2017 - 4:34pm

NOTES

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IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

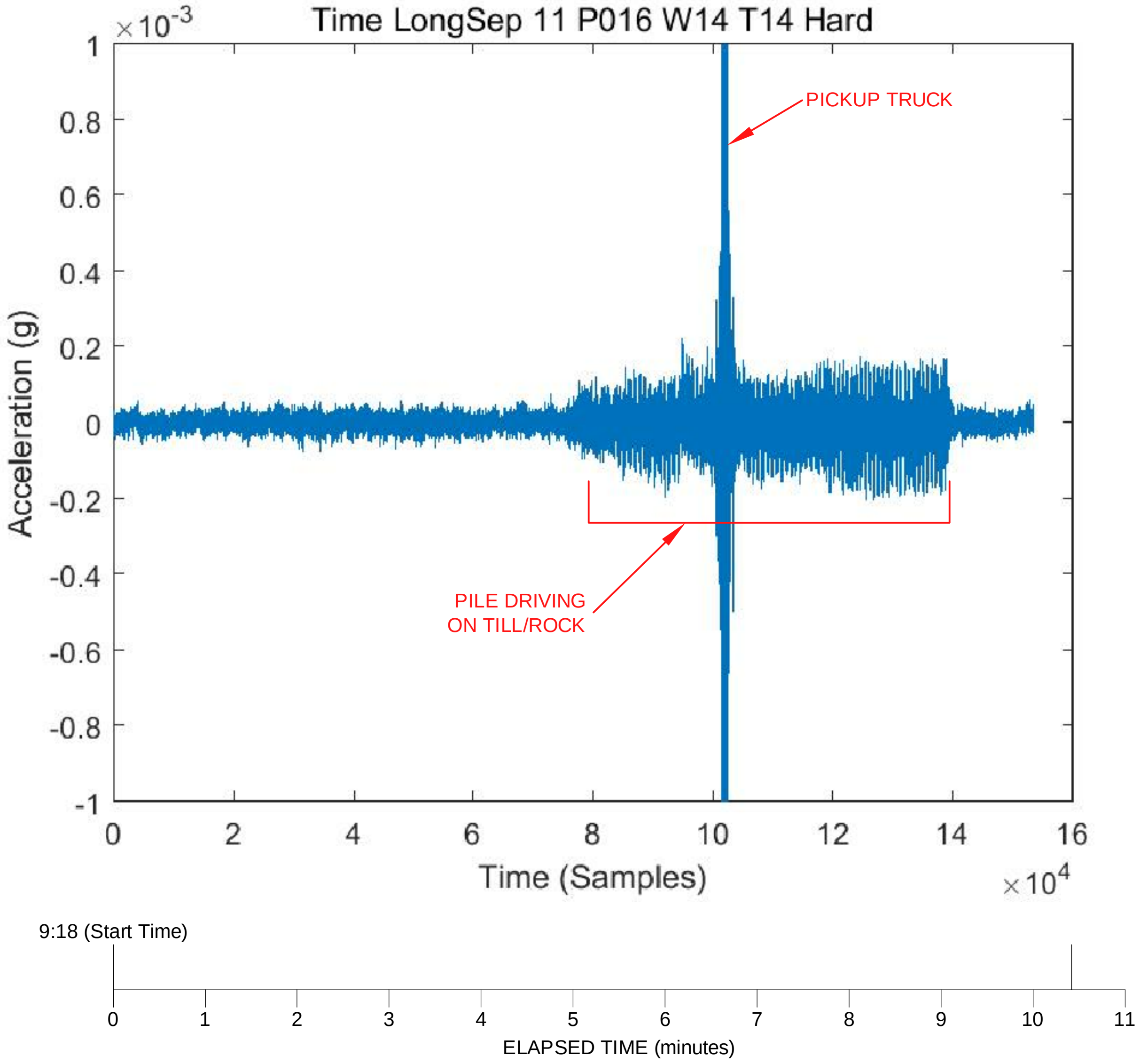
NORTH KENT 1
VIBRATION MONITORING

TITLE

**TURBINE T14, WELL 14, PILE 14
(SEPTEMBER 11, 2017)**

Golder Associates

PROJECT No.	1668031		FILE No.	1668031-2000-R02ET14W14
			SCALE	AS SHOWN REV.
CADD	DCH	Nov 30/17		
CHECK	SSB			**E-T14W14P14**



PICKUP TRUCK

PILE DRIVING
ON TILL/ROCK

9:18 (Start Time)

ELAPSED TIME (minutes)

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

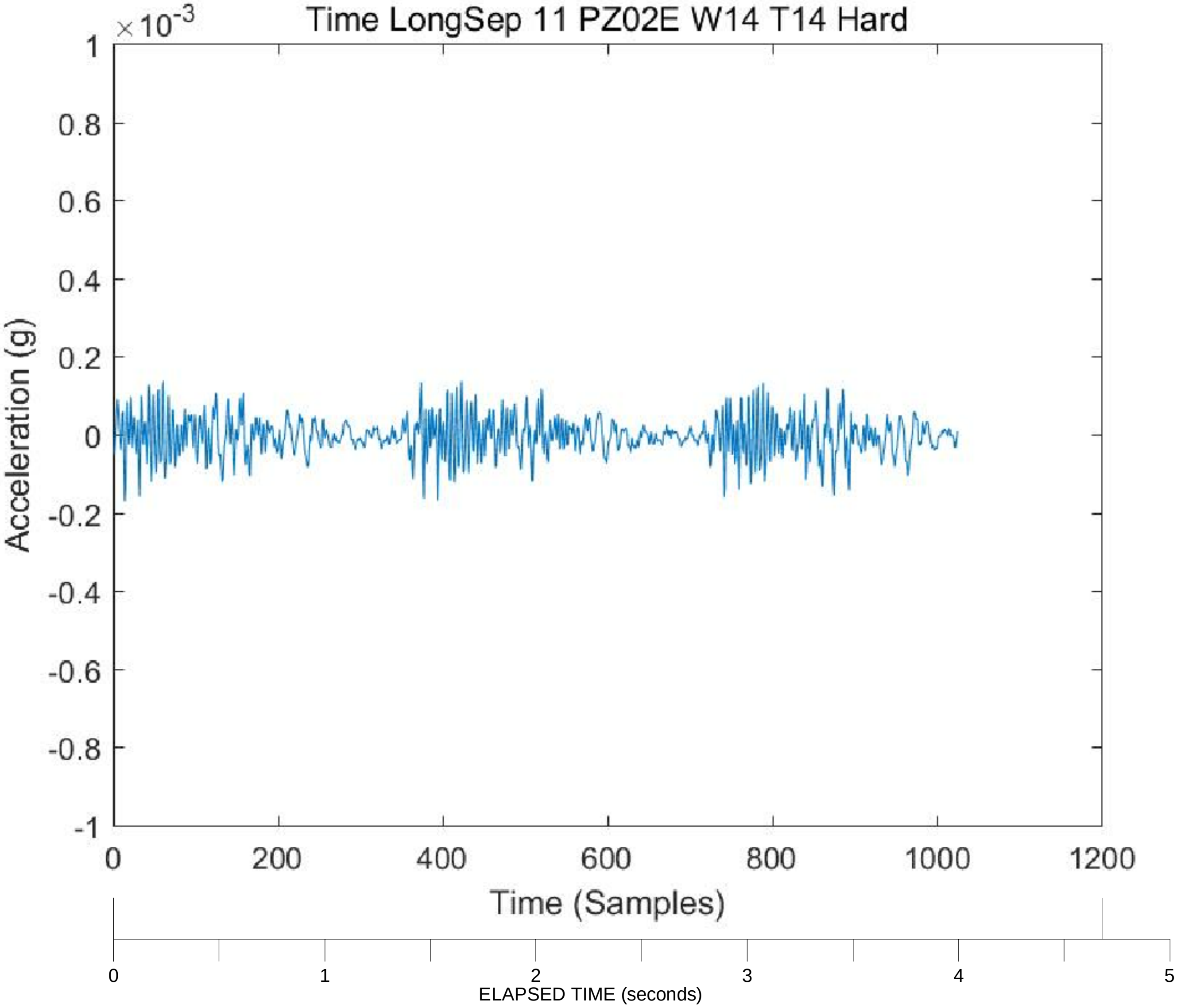
TITLE
TURBINE T14, WELL 14, PILE 16
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET14W14
SCALE AS SHOWN
REV.
CADD DCH Nov 30/17
CHECK SJS

E-T14W14P16

Drawing file: 1668031-2000-R02ET14W14.dwg Nov 30, 2017 - 4:34pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

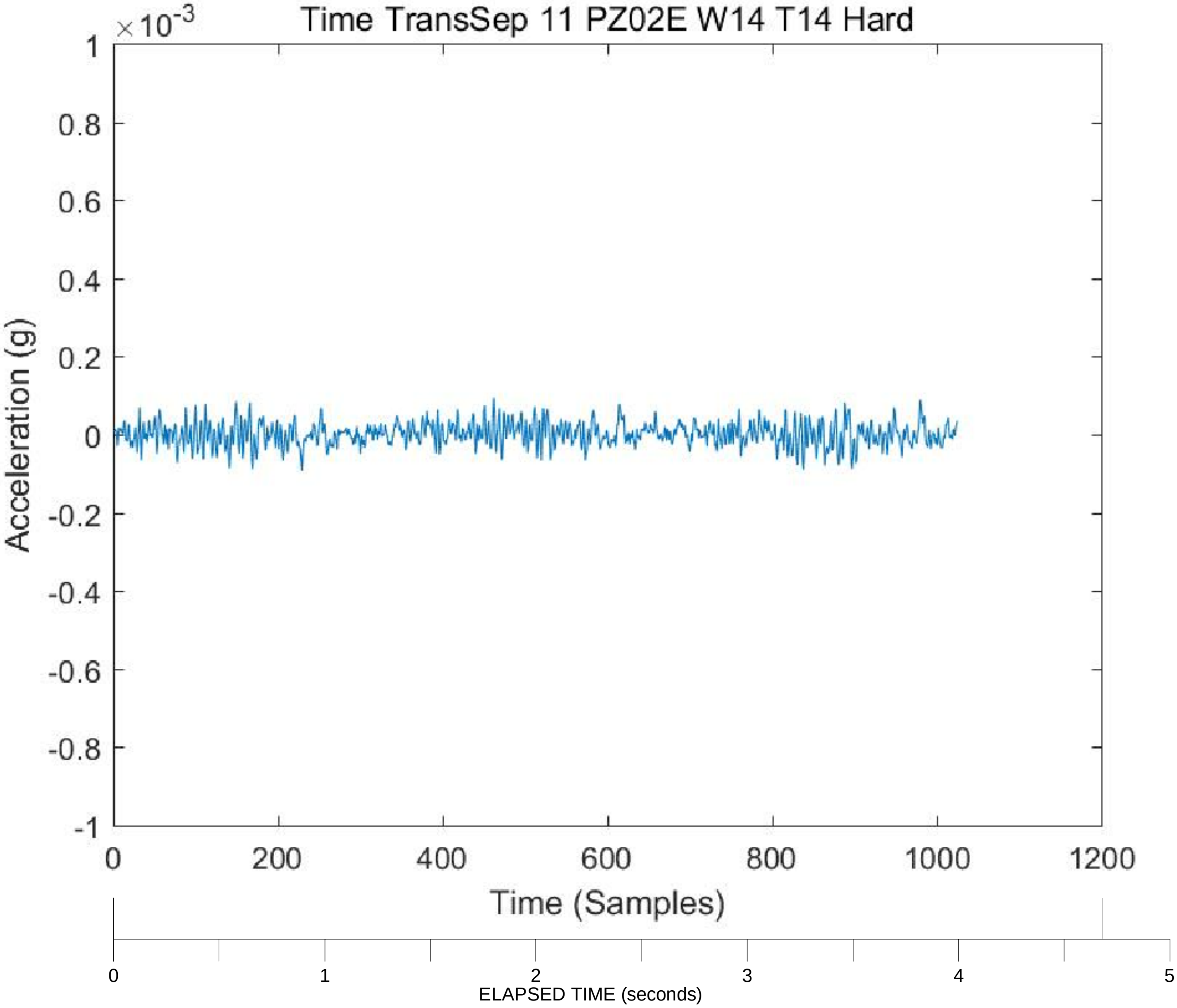
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T14, WELL 14, PILE Z02E
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031–2000–R02ET14W14
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SJB
E-T14W14PZ02E

Drawing file: 1668031–2000–R02ET14W14.dwg Dec 01, 2017 – 3:59pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

PROJECT

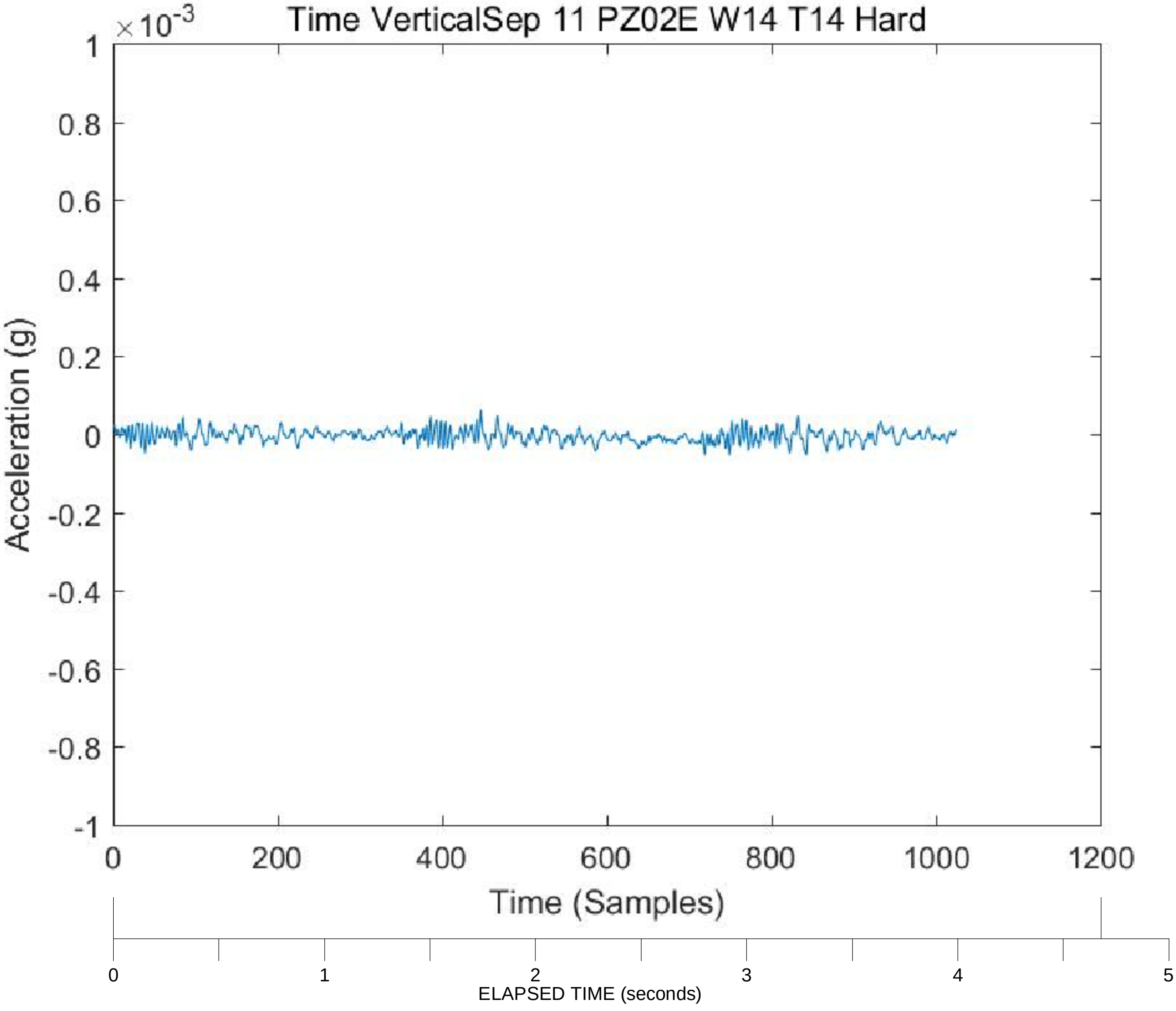
NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T14, WELL 14, PILE Z02E
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.	1668031	FILE No1668031-2000-R02ET14W14_T	
		SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17	
CHECK	SJB		E-T14W14PZ02E



Drawing file: 1668031-2000-R02ET14W14_V.dwg Dec 01, 2017 - 3:55pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

PROJECT

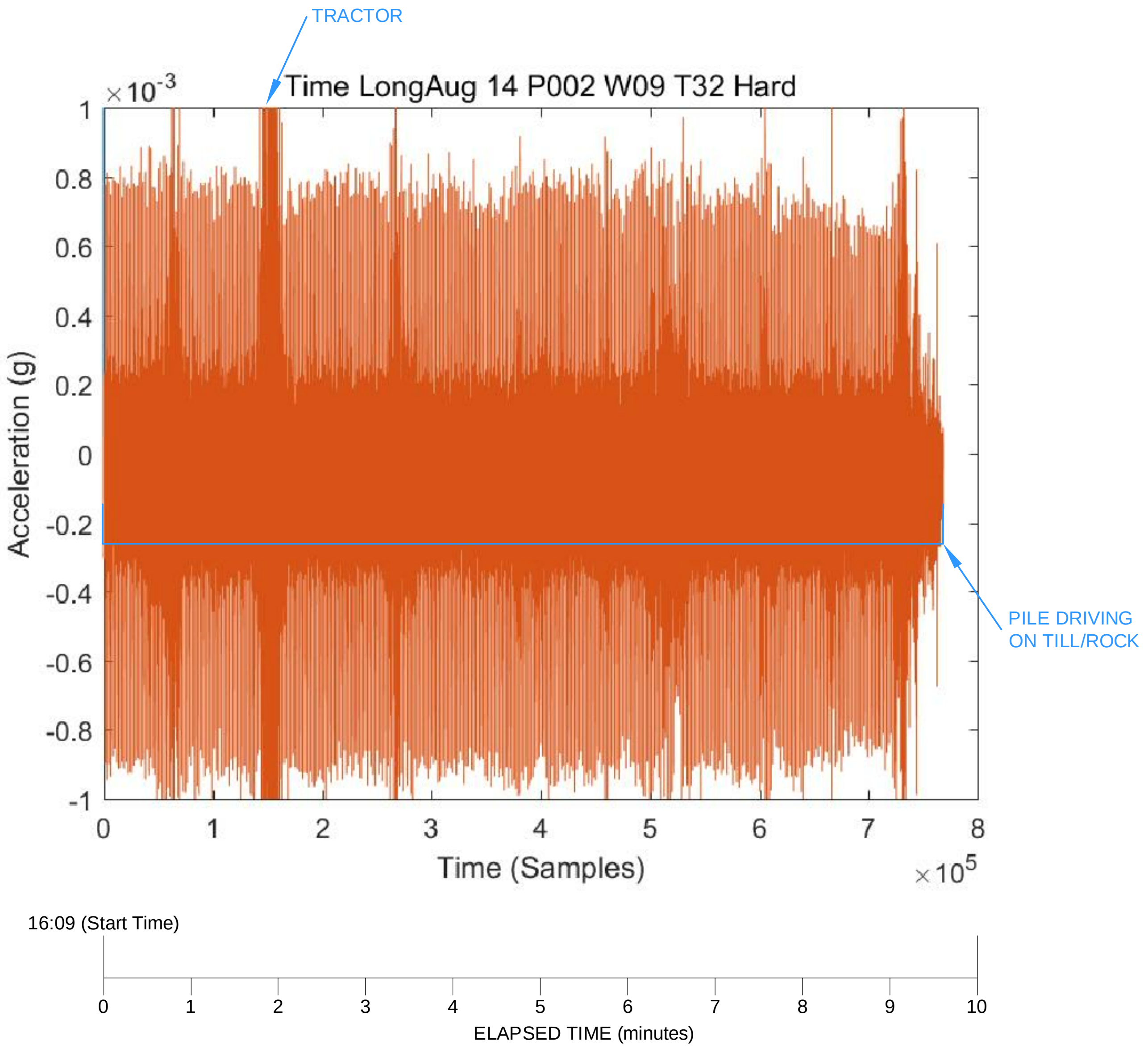
NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T14, WELL 14, PILE Z02E
(SEPTEMBER 11, 2017)

Golder Associates

PROJECT No.	1668031	FILE No.	1668031-2000-R02ET14W14_V
		SCALE	AS SHOWN
		REV.	
CADD	DCH	Dec 1/17	
CHECK	SSB		E-T14W14PZ02E



Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 1:33pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

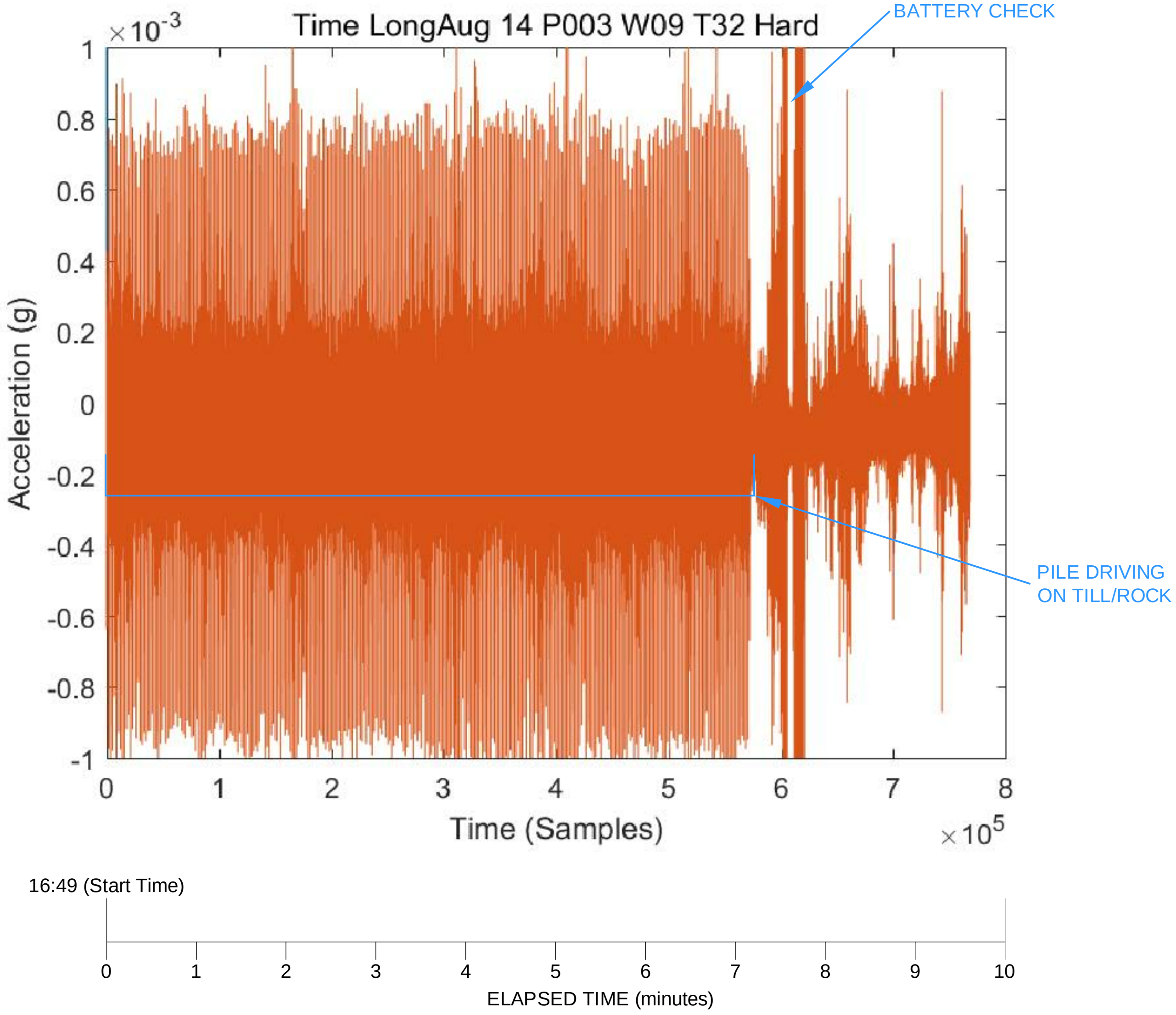
a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T32, WELL 9, PILE 2
(AUGUST 14, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET32W09	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17	**E-T32W09P02**	
CHECK				



Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 1:32pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

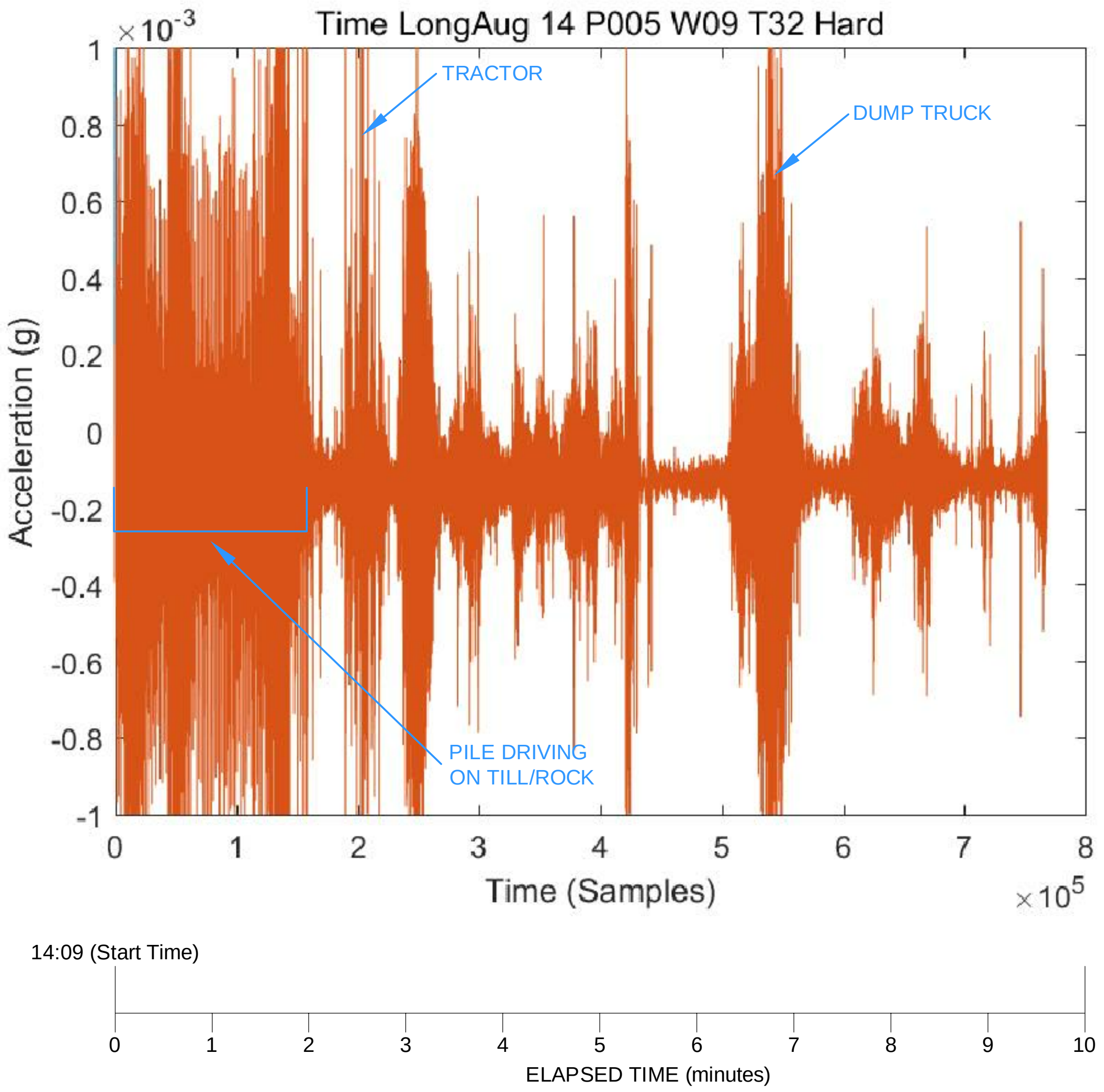
a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T32, WELL 9, PILE 3
(AUGUST 14, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET32W09	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17	**E-T32W09P03**	
CHECK	SSB			



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

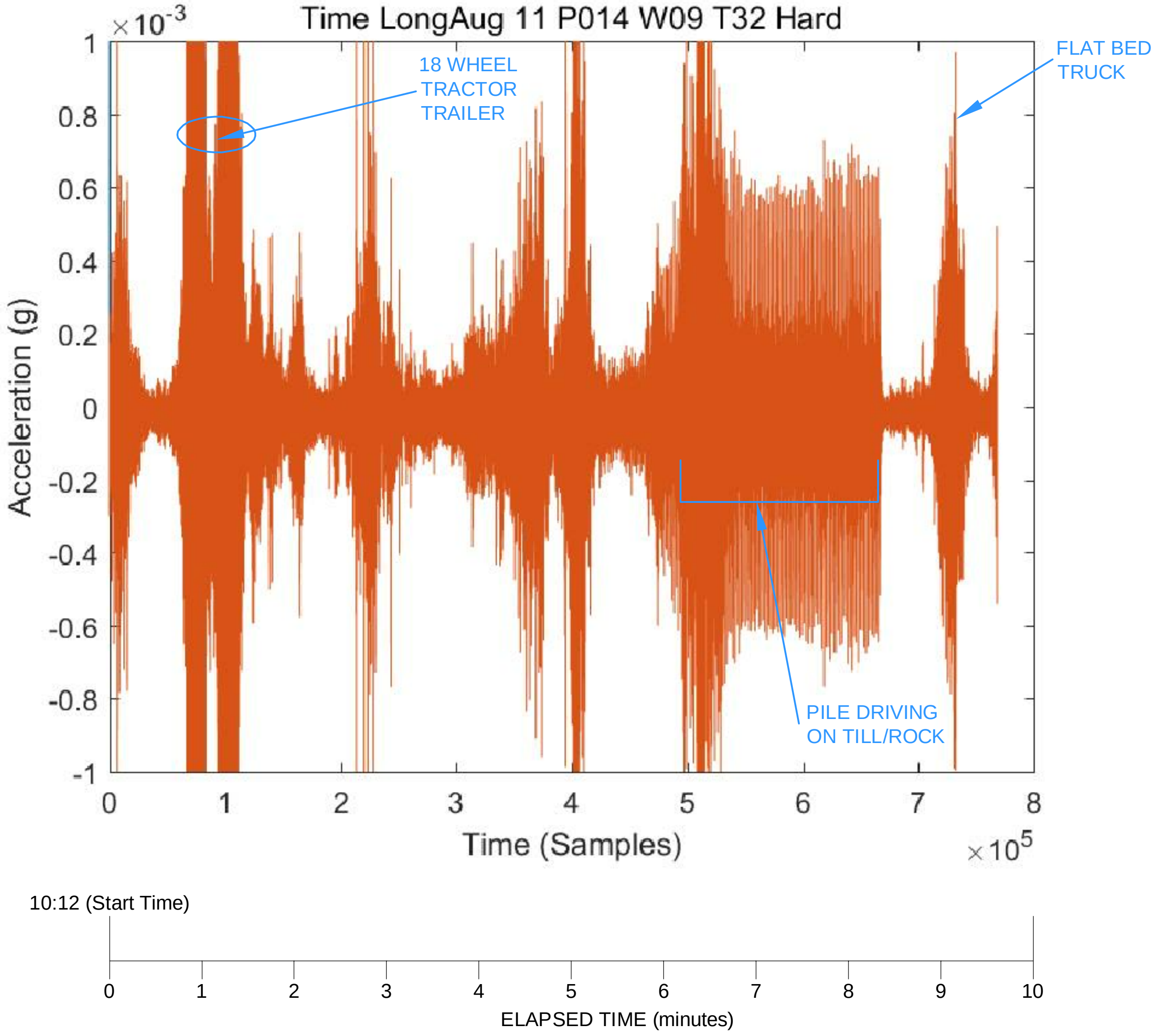
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T32, WELL 9, PILE 5
(AUGUST 14, 2017)

Golder Associates

PROJECT No.	1668031	FILE No. 1668031–2000–R02ET32W09	
		SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17	**E-T32W09P05**
CHECK	SSB		

Drawing file: 1668031–2000–R02ET32W09.dwg Dec 01, 2017 – 1:32pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

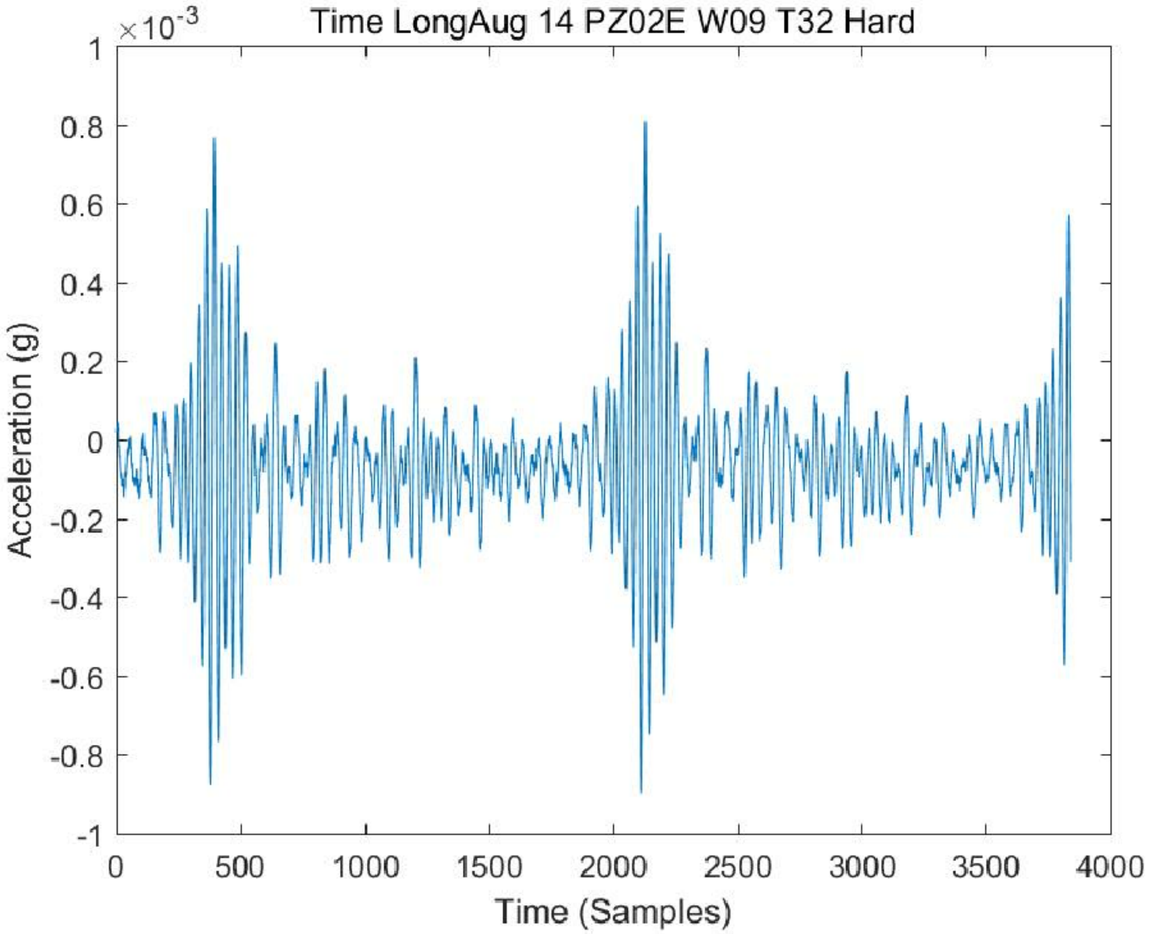
PROJECT
NORTH KENT 1
VIBRATION MONITORING

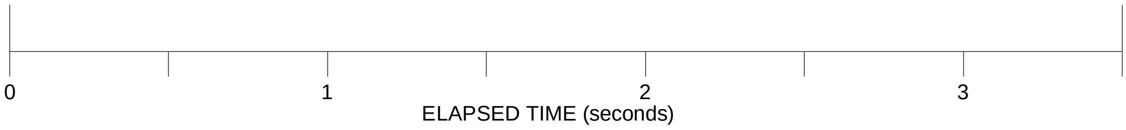
TITLE
TURBINE T32, WELL 9, PILE 14
(AUGUST 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET32W09
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SJS
E-T32W09P14

Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 1:32pm





NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

PROJECT
NORTH KENT 1
VIBRATION MONITORING

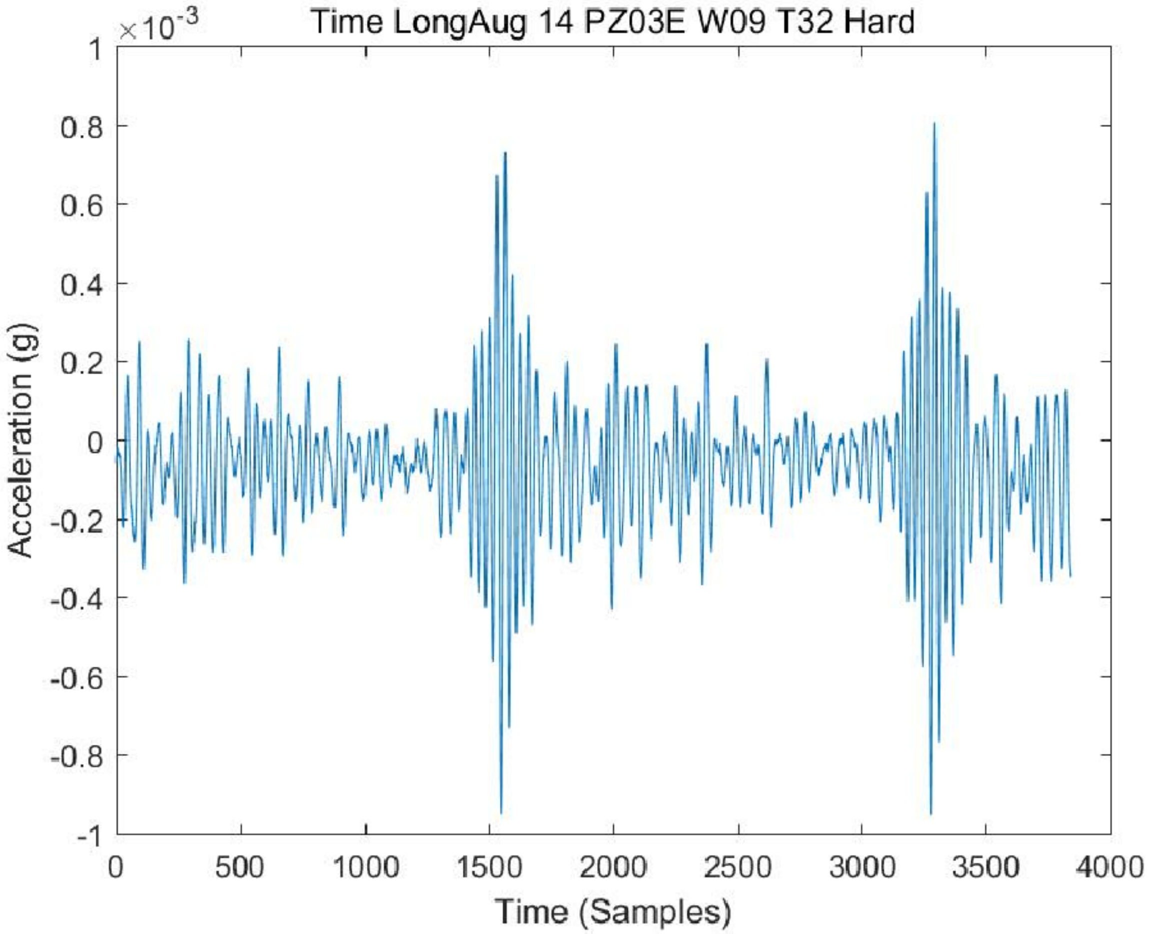
TITLE
TURBINE T32, WELL 9, PILE Z02E
(AUGUST 14, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET32W09
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SSB

E-T32W09PZ02E

Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 3:59pm



ELAPSED TIME (seconds)

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

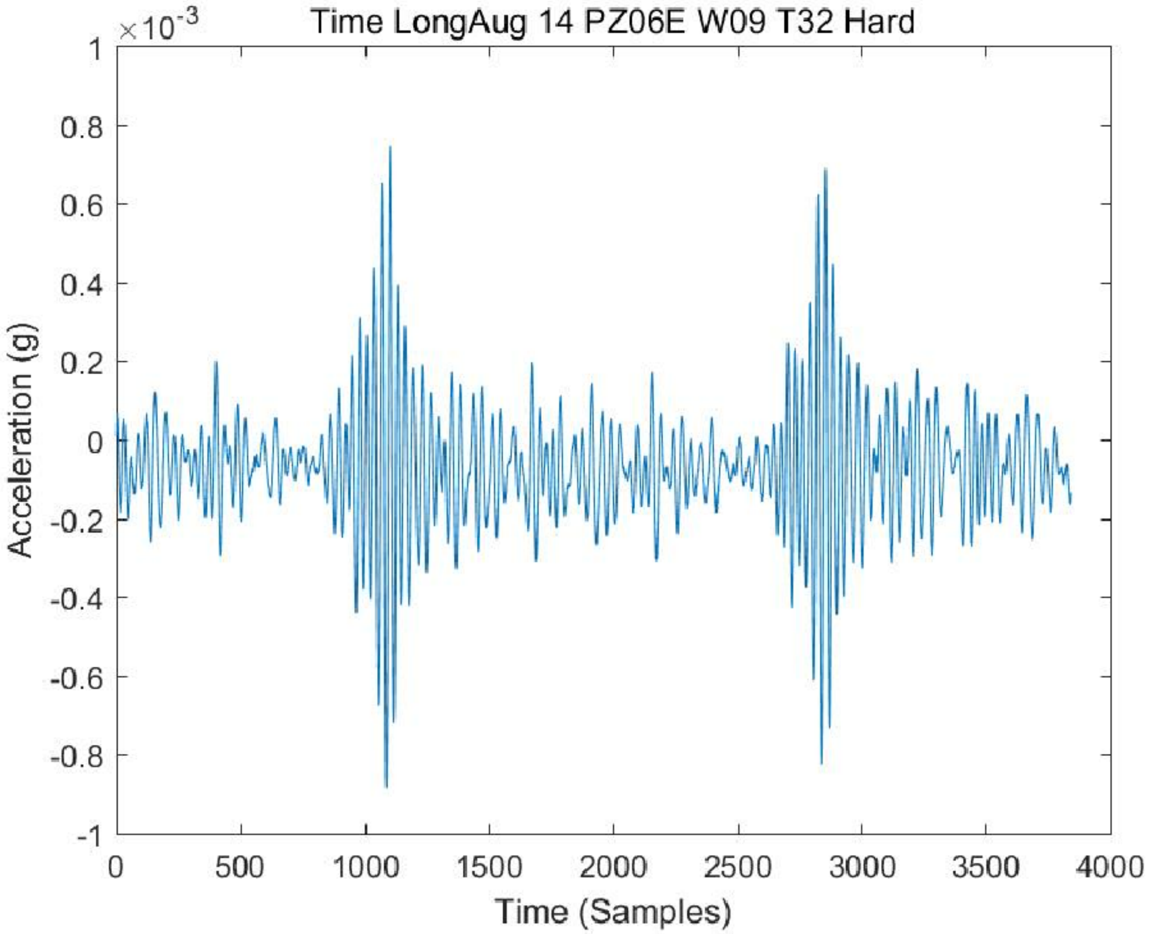
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T32, WELL 9, PILE Z03E
(AUGUST 14, 2017)

PROJECT No.		1668031	FILE No. 1668031–2000–R02ET32W09
			SCALE AS SHOWN REV.
CADD	DCH	Dec 1/17	
CHECK	SSB		**E-T32W09PZ03E**

Golder Associates

Drawing file: 1668031–2000–R02ET32W09.dwg Dec 01, 2017 – 3:58pm



ELAPSED TIME (seconds)

Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 3:58pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

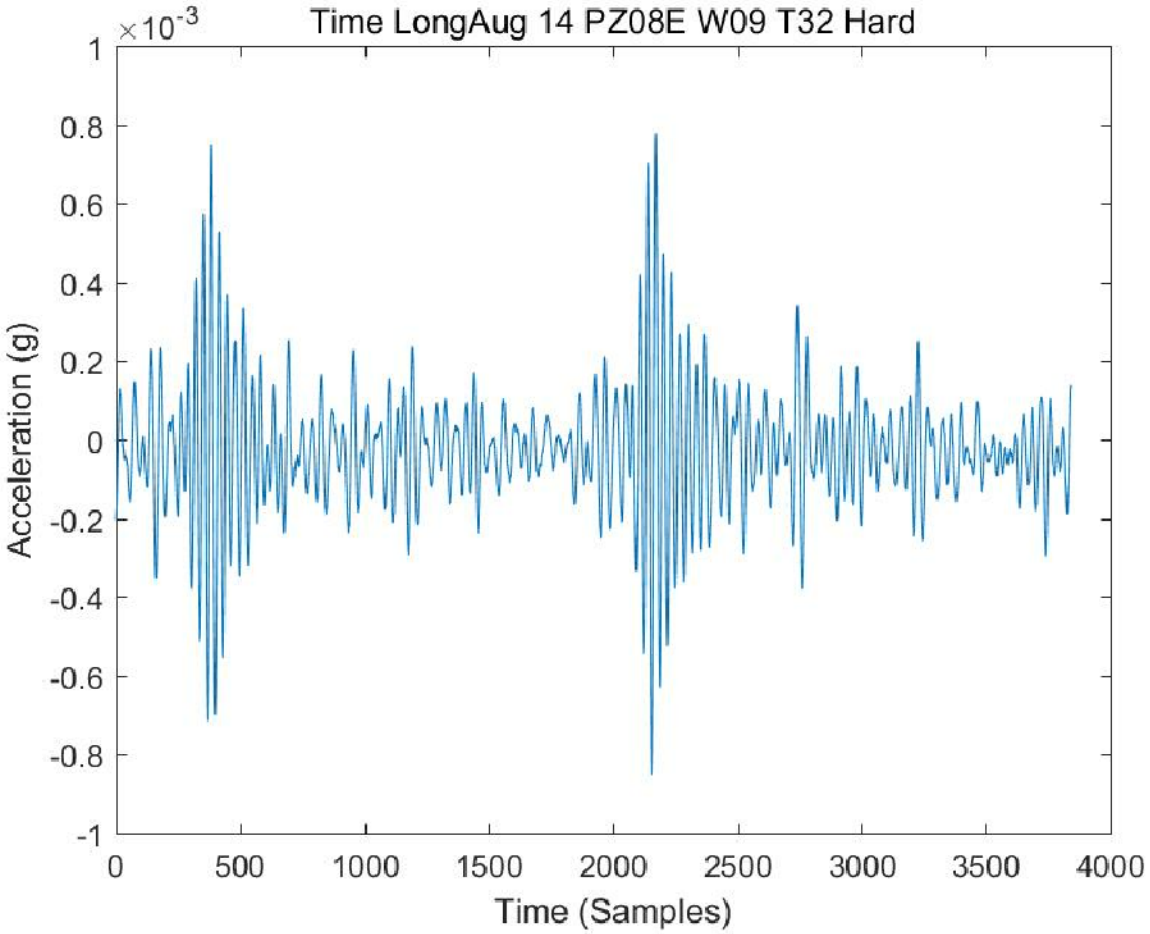
a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

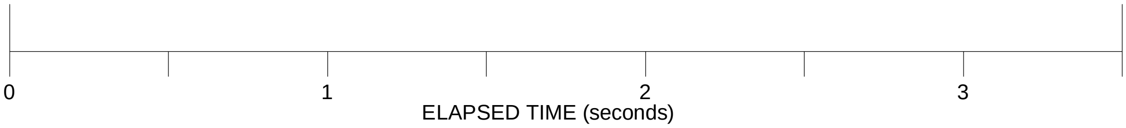
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T32, WELL 9, PILE Z06E
(AUGUST 14, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET32W09	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17		
CHECK	SSB		**E-T32W09PZ06E**	





NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

PROJECT

NORTH KENT 1
VIBRATION MONITORING

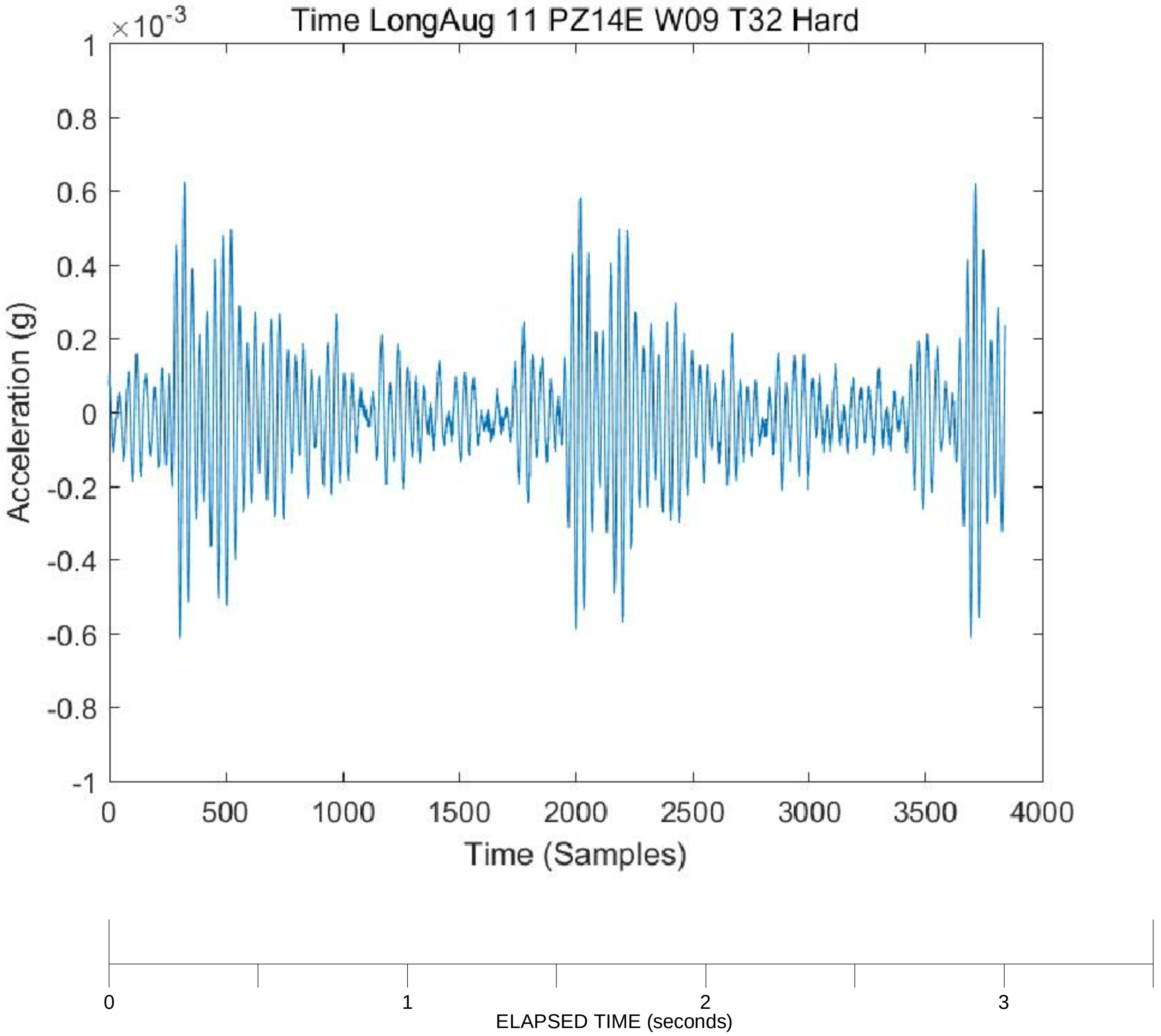
TITLE

TURBINE T32, WELL 9, PILE Z08E
(AUGUST 14, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET32W09
			SCALE AS SHOWN REV.
CADD	DCH	Dec 1/17	
CHECK	SSB		**E-T32W09PZ08E**

Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 3:58pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

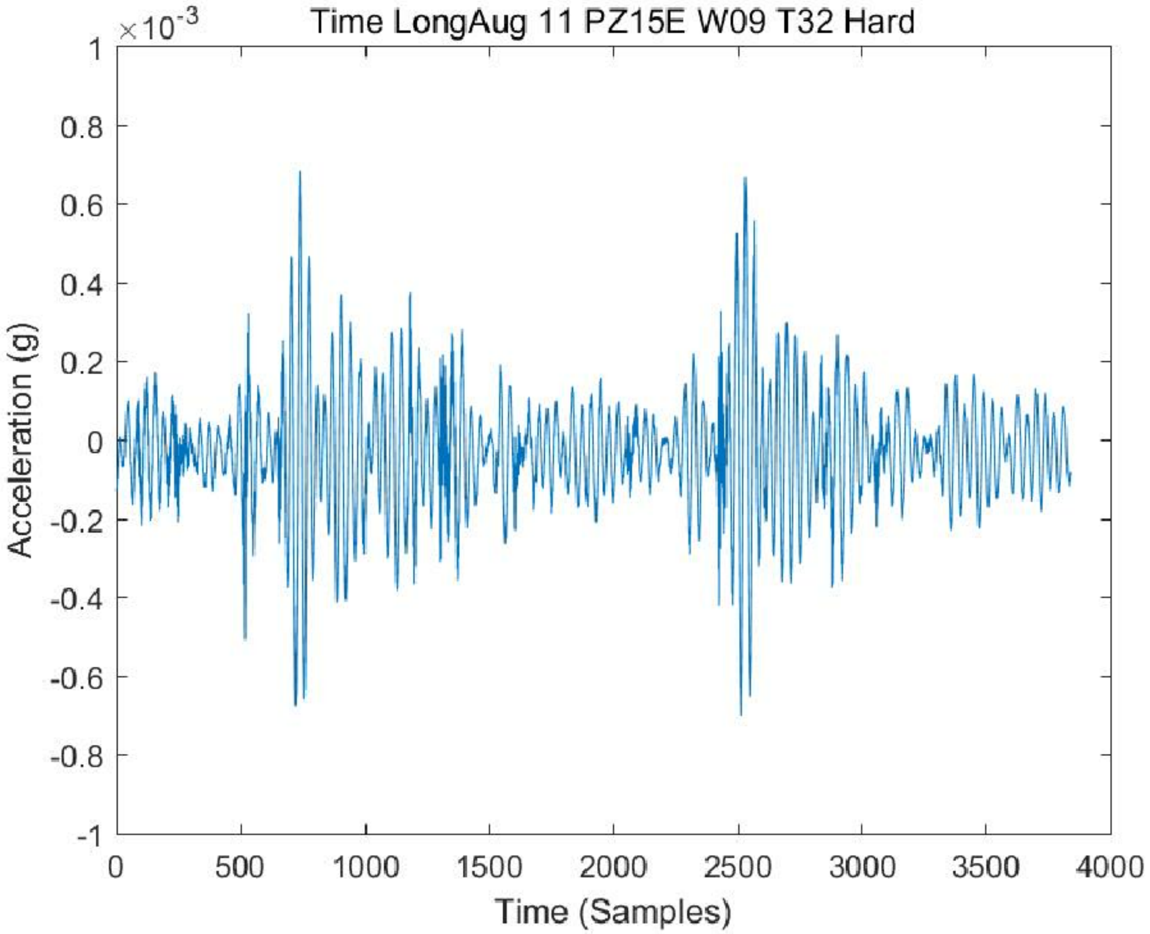
TURBINE T32, WELL 9, PILE Z14E
(AUGUST 11, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET32W09
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK

E-T32W09PZ14E

Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 3:57pm



ELAPSED TIME (seconds)

Drawing file: 1668031-2000-R02ET32W09.dwg Dec 01, 2017 - 3:58pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

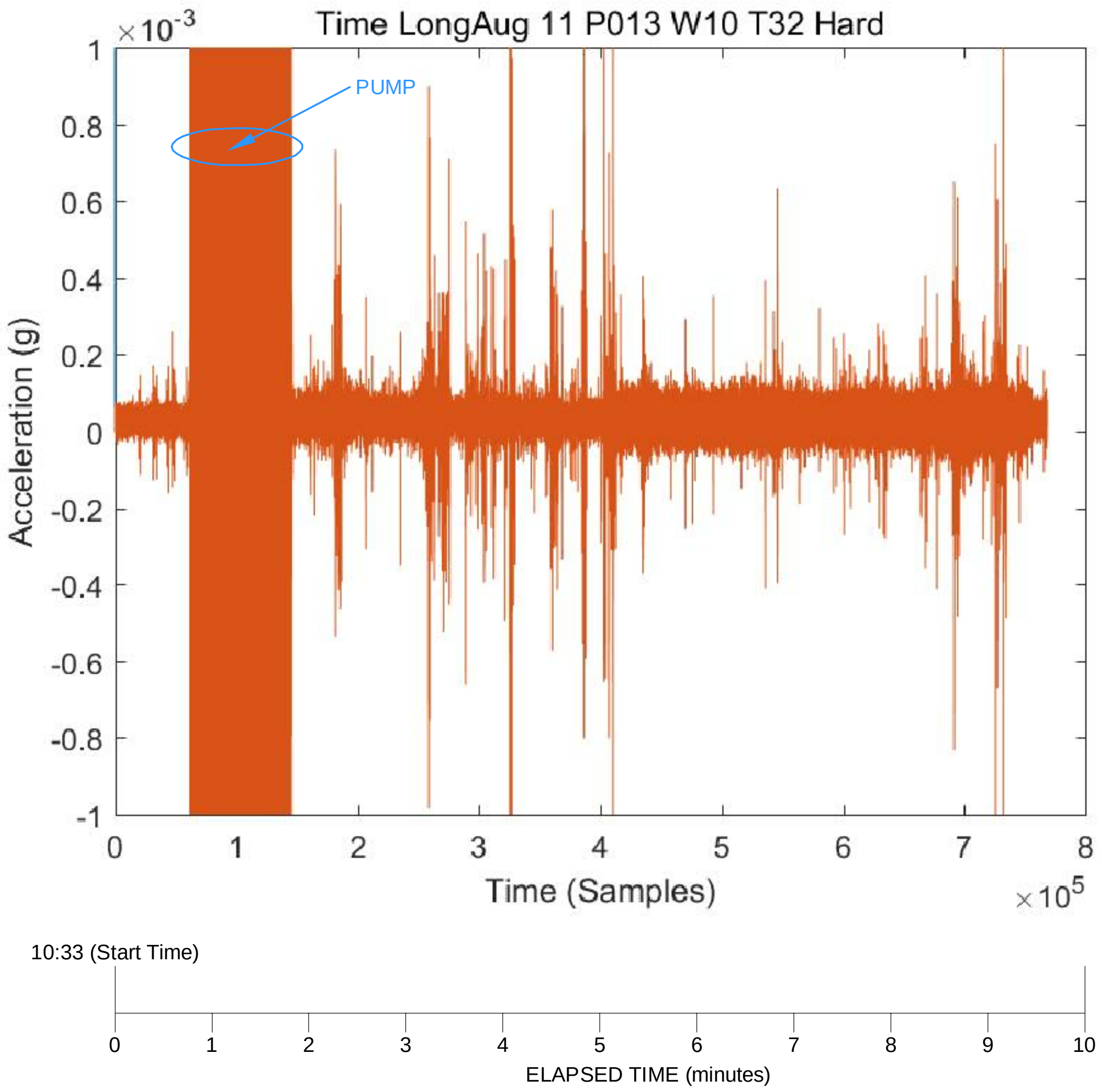
a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)
g) Z refers to zoomed scale
h) E refers to example

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T32, WELL 9, PILE Z15E
(AUGUST 11, 2017)

Golder Associates

PROJECT No.	1668031	FILE No.	1668031-2000-R02ET32W09
		SCALE	AS SHOWN · REV.
CADD	DCH	Dec 1/17	
CHECK			**E-T32W09PZ15E**



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

Drawing file: 1668031-2000-R02ET32W10.dwg Dec 01, 2017 - 1:33pm

PROJECT
NORTH KENT 1
VIBRATION MONITORING

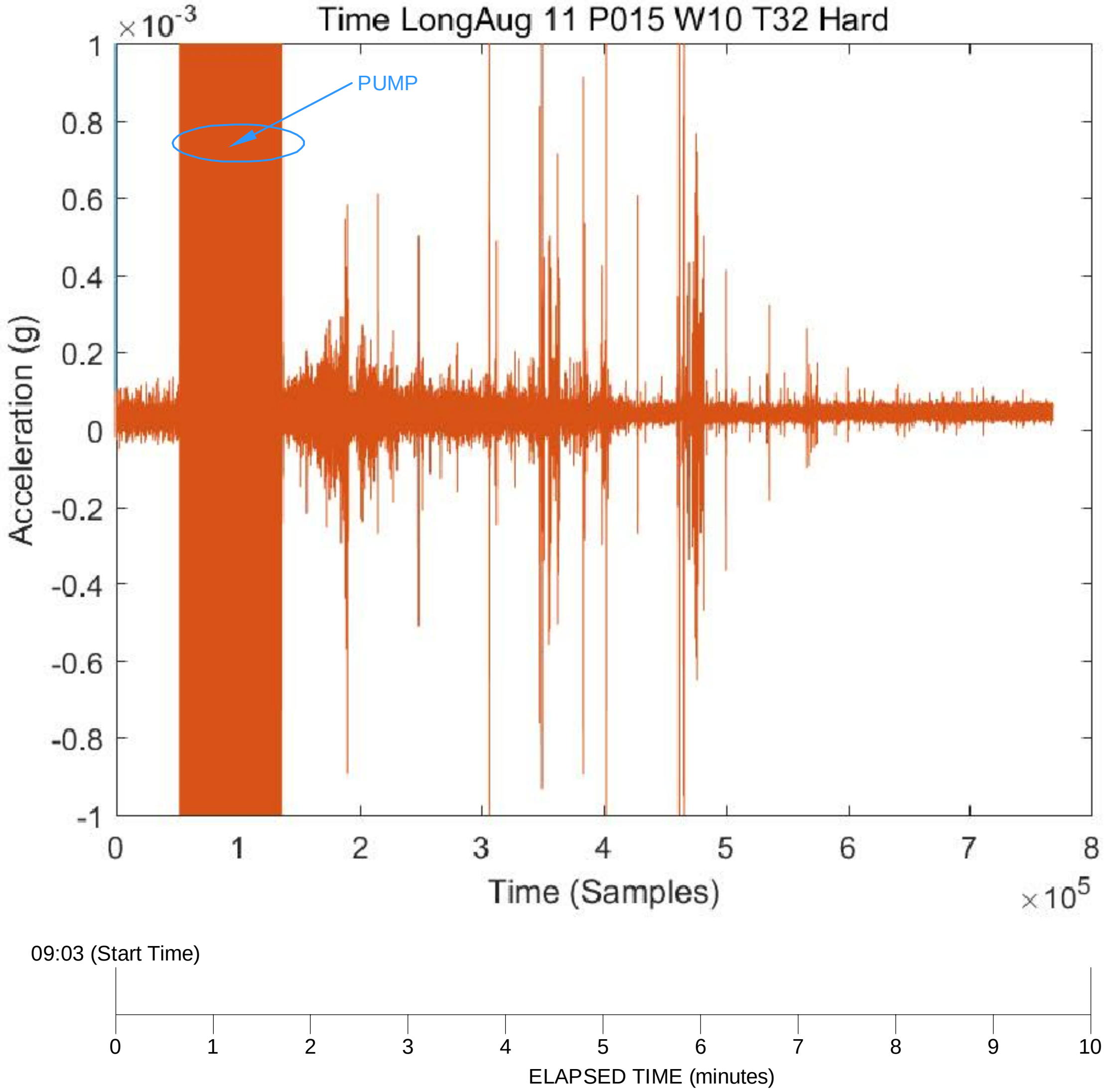
TITLE
TURBINE T32, WELL 10, PILE 13
(AUGUST 11, 2017)

Golder Associates

PROJECT No.		1668031
CADD	DCH	Dec 1/17
CHECK	SS/JS	

FILE No. 1668031-2000-R02ET32W10
SCALE AS SHOWN
REV.

E-T32W10P13



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

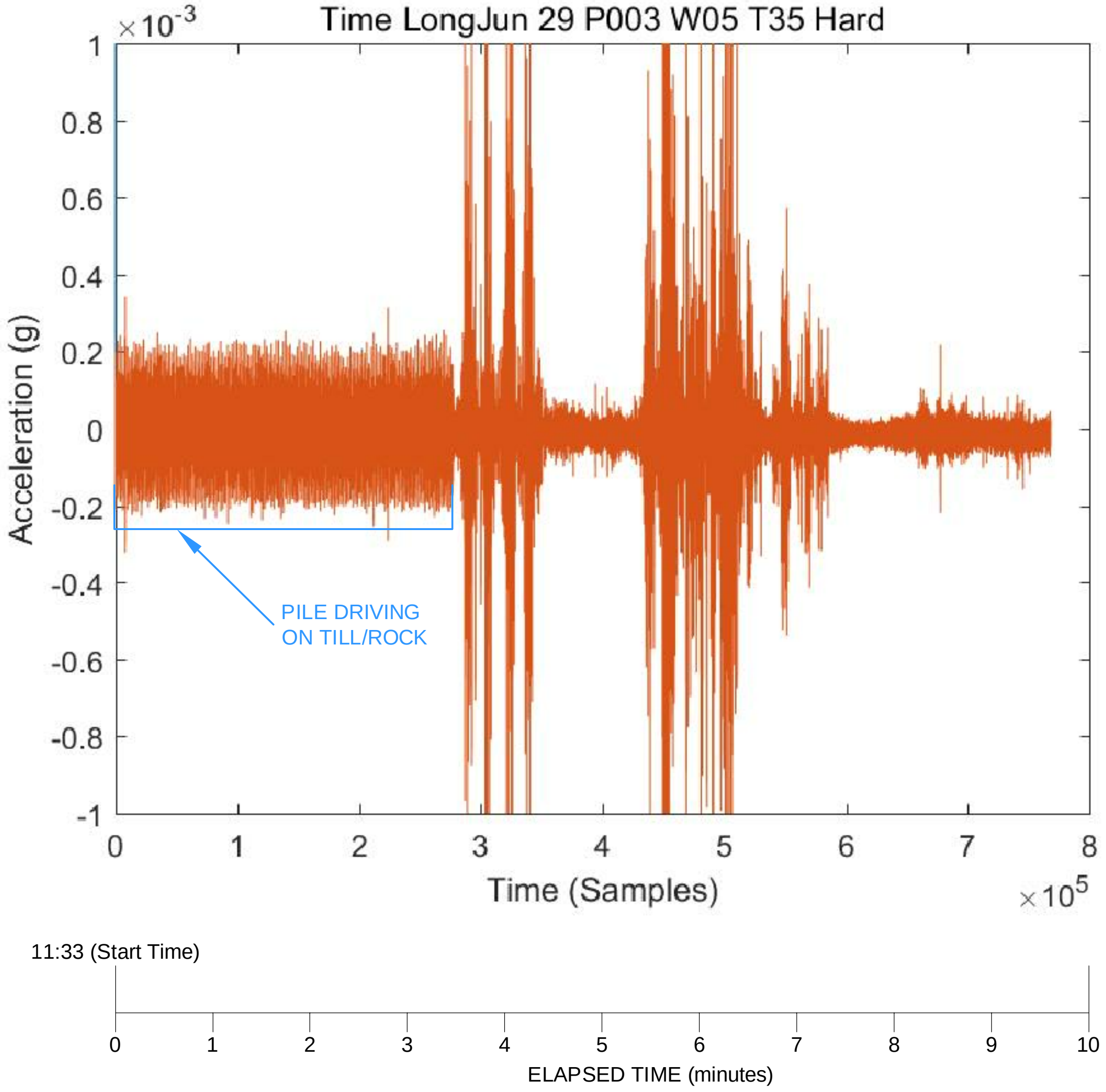
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T32, WELL 10, PILE 15
(AUGUST 11, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET32W10	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17		
CHECK	SSB		**E-T32W10P15**	

Drawing file: 1668031-2000-R02ET32W10.dwg Dec 01, 2017 - 1:33pm



Drawing file: 1668031-2000-R02ET35W05.dwg Dec 01, 2017 - 2:24pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

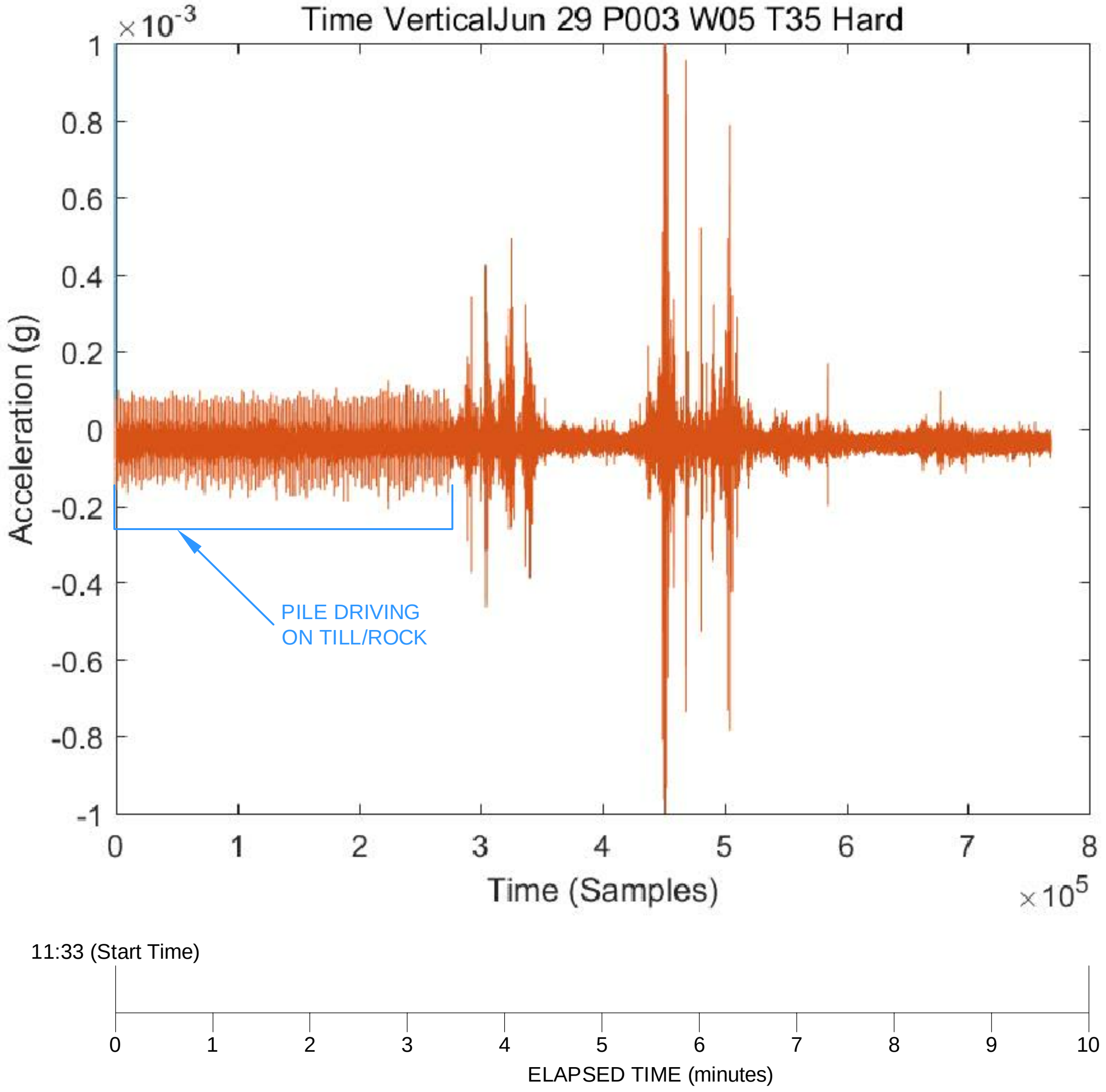
a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T35, WELL 5, PILE 3
(JUNE 29, 2017)

Golder Associates

PROJECT No.	1668031	FILE No. 1668031-2000-R02ET35W05	
		SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17	
CHECK	SSB		**E-T35W05P03**



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

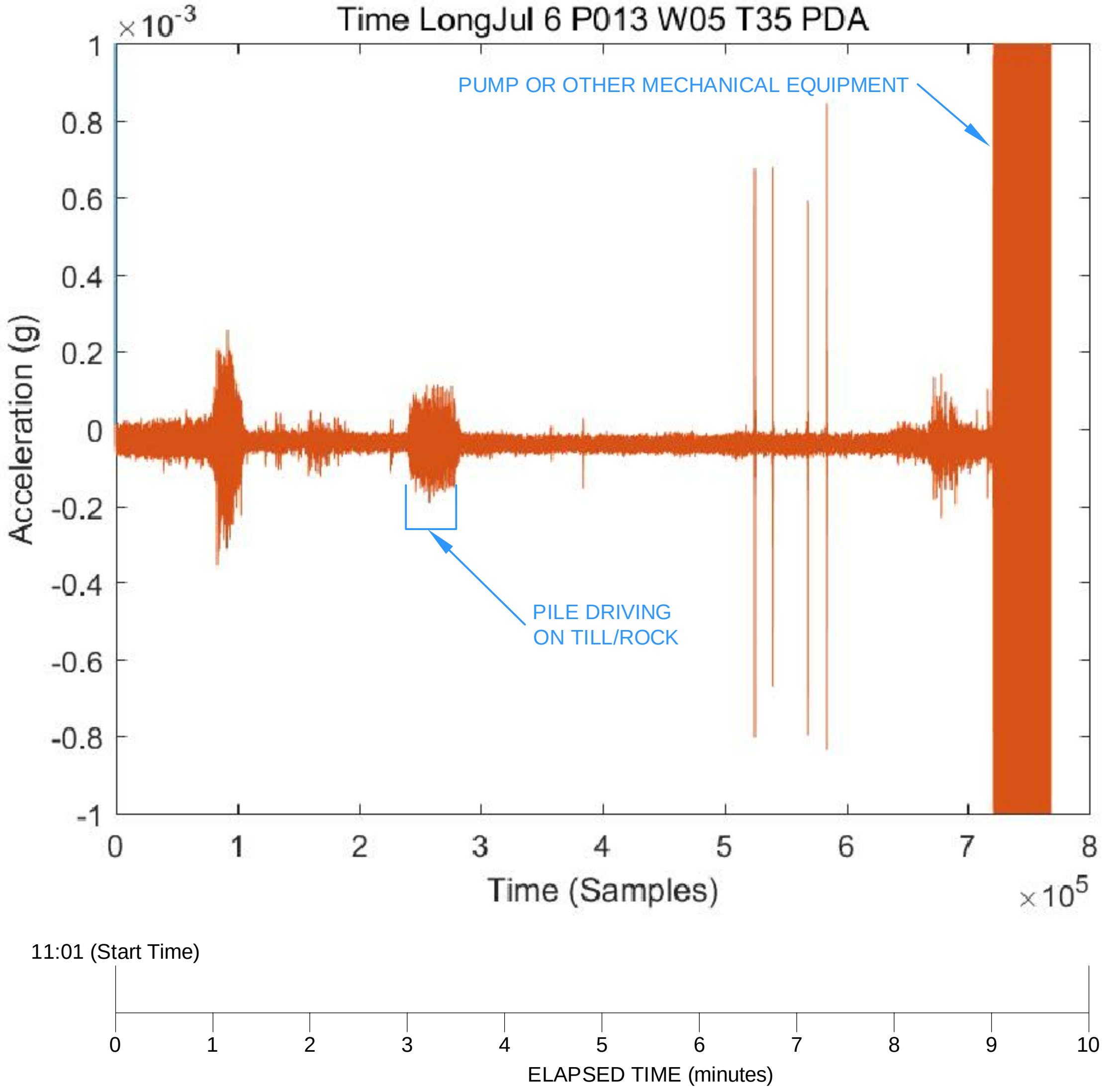
TURBINE T35, WELL 5, PILE 3
(JUNE 29, 2017)

Golder Associates

PROJECT No.	1668031	FILE No.	1668031-2000-R02ET35W05_V
		SCALE	AS SHOWN
		REV.	
CADD	DCH	Dec 1/17	
CHECK	SJS		

E-T35W05P03

Drawing file: 1668031-2000-R02ET35W05_V.dwg Dec 01, 2017 - 1:51pm



Drawing file: 1668031-2000-R02ET35W05.dwg Dec 01, 2017 - 2:24pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

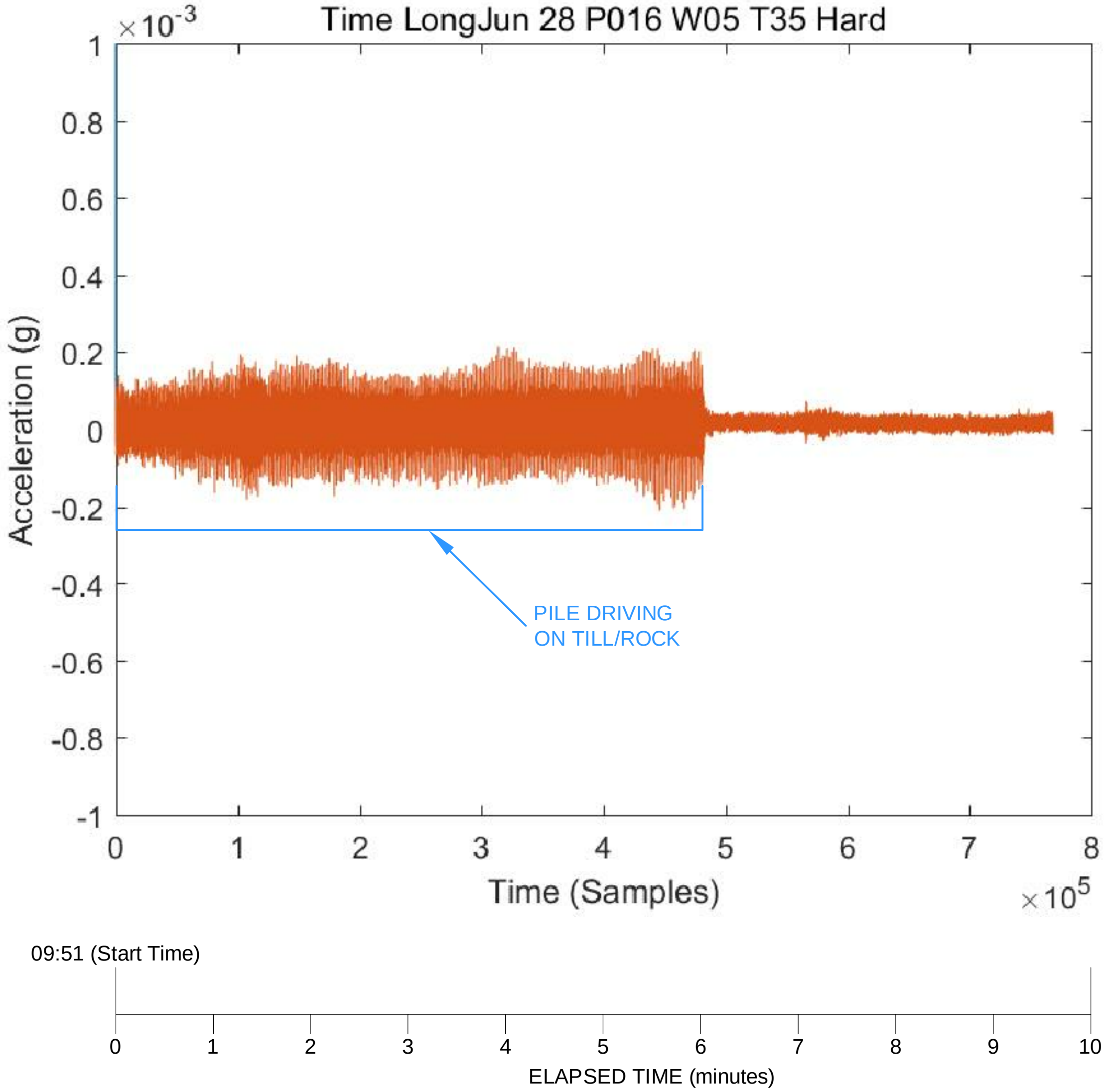
NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T35, WELL 5, PILE 13
(JULY 6, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031-2000-R02ET35W05	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17	**E-T35W05P13**	
CHECK	SSB			



Drawing file: 1668031-2000-R02ET35W05.dwg Dec 01, 2017 - 3:45pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

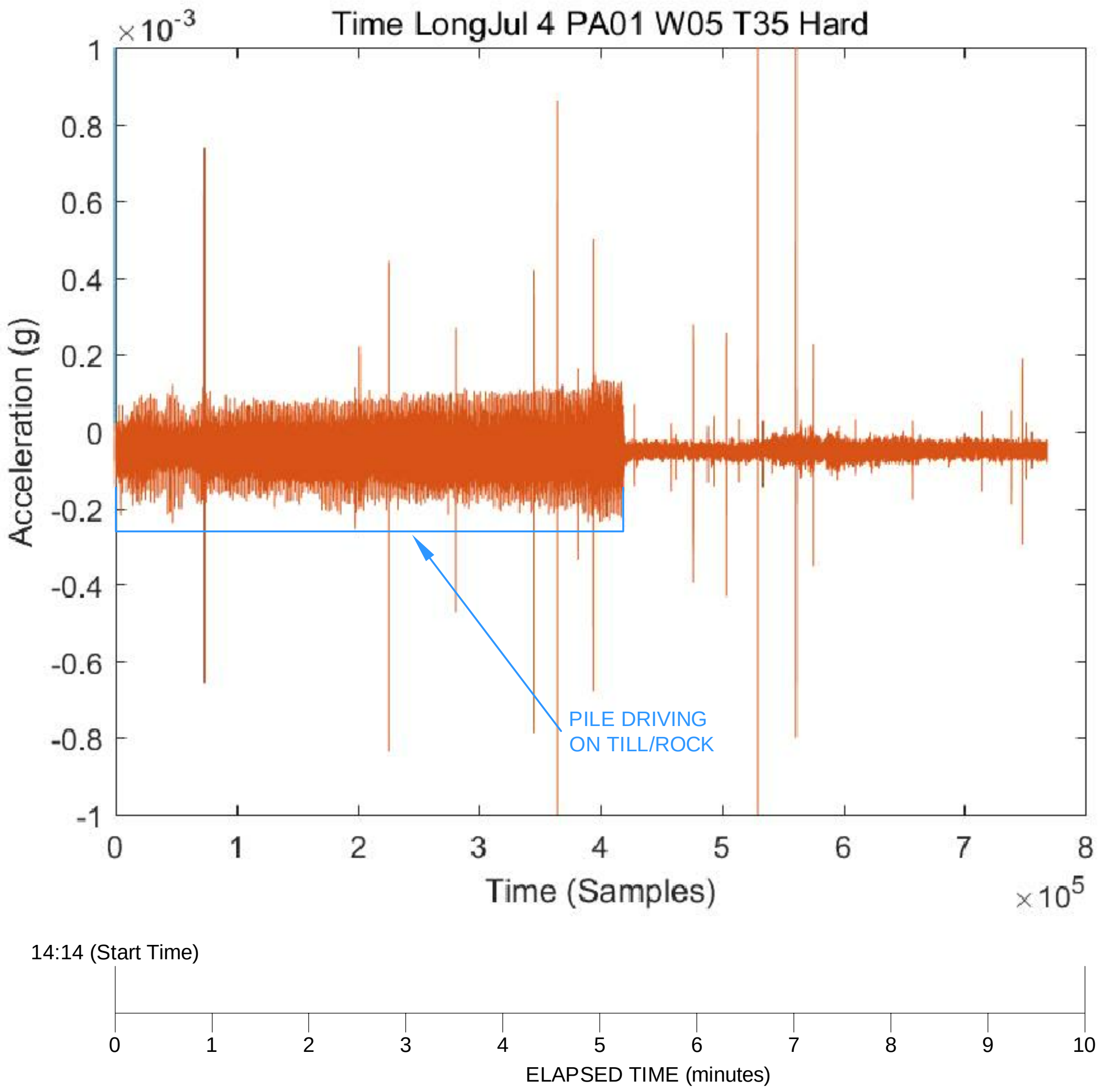
TITLE

TURBINE T35, WELL 5, PILE 16
(JUNE 28, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET35W05
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK

E-T35W05P16



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

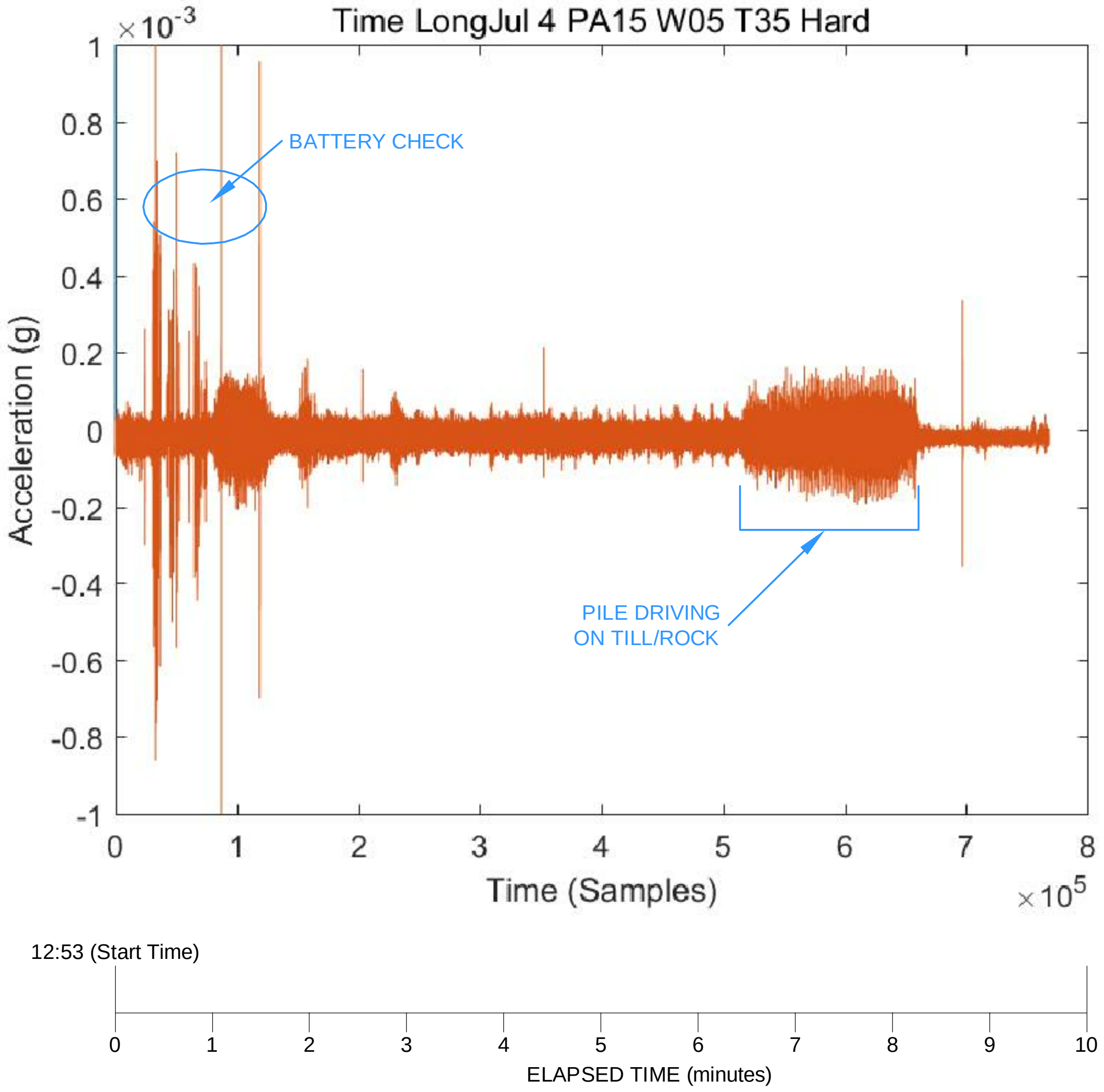
TITLE
TURBINE T35, WELL 5, PILE A01
(JULY 4, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET35W05
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK

E-T35W05PA01

Drawing file: 1668031-2000-R02ET35W05.dwg Dec 01, 2017 - 2:23pm



Drawing file: 1668031–2000–R02ET35W05.dwg Dec 01, 2017 – 2:25pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

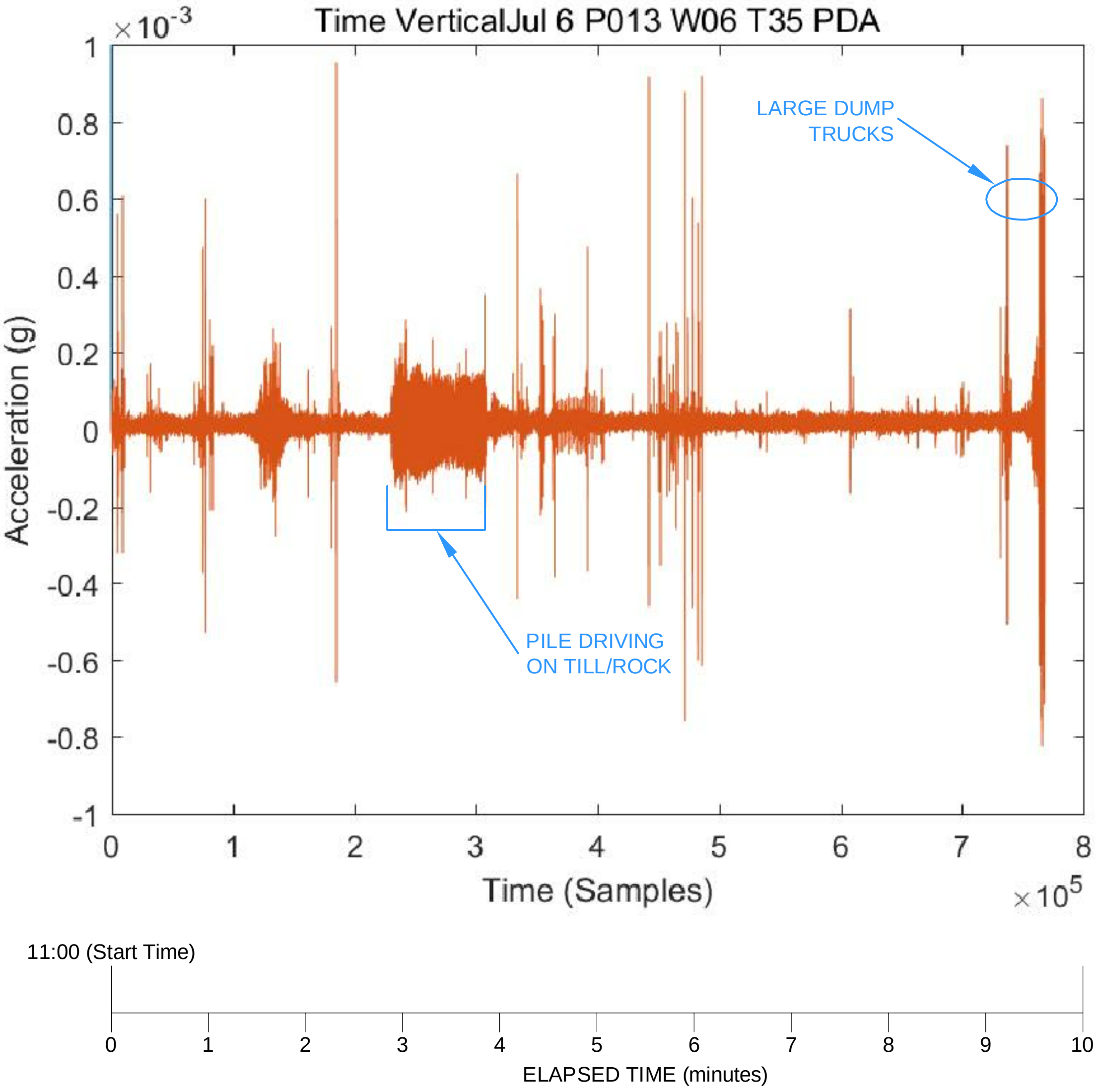
NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T35, WELL 5, PILE A15
(JULY 6, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031–2000–R02ET35W05	
			SCALE AS SHOWN	REV.
CADD	DCH	Dec 1/17	**E-T35W05PA15**	
CHECK	SJB			



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT
NORTH KENT 1
VIBRATION MONITORING

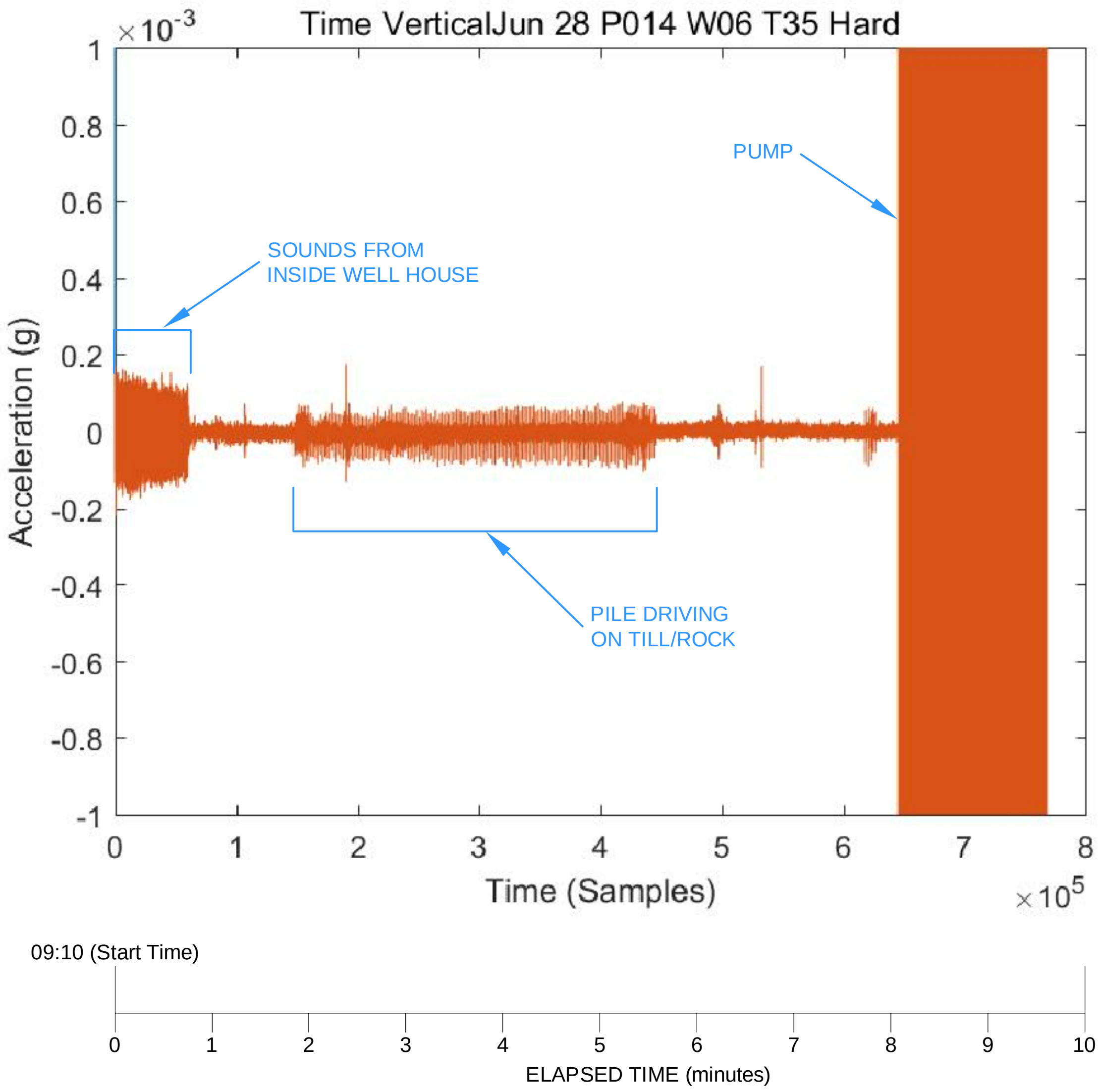
TITLE
TURBINE T35, WELL 6, PILE 13
(JULY 6, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET35W06
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SJS

E-T35W06P13

Drawing file: 1668031-2000-R02ET35W06.dwg Dec 01, 2017 - 2:25pm



Drawing file: 1668031-2000-R02ET35W06.dwg Dec 01, 2017 - 2:26pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

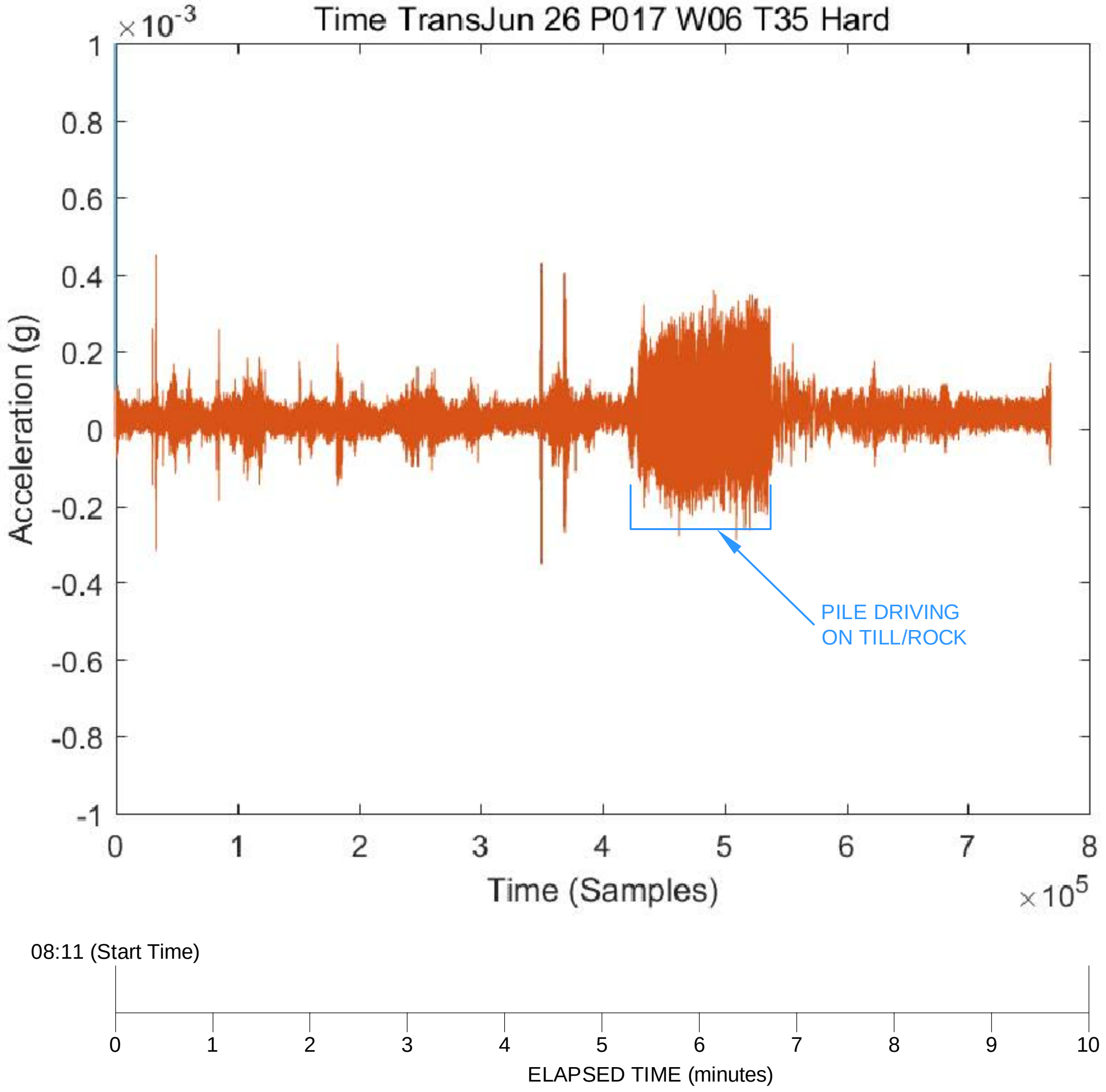
TITLE

TURBINE T35, WELL 6, PILE 14
(JUNE 28, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET35W06
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SSB

E-T35W06P14



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

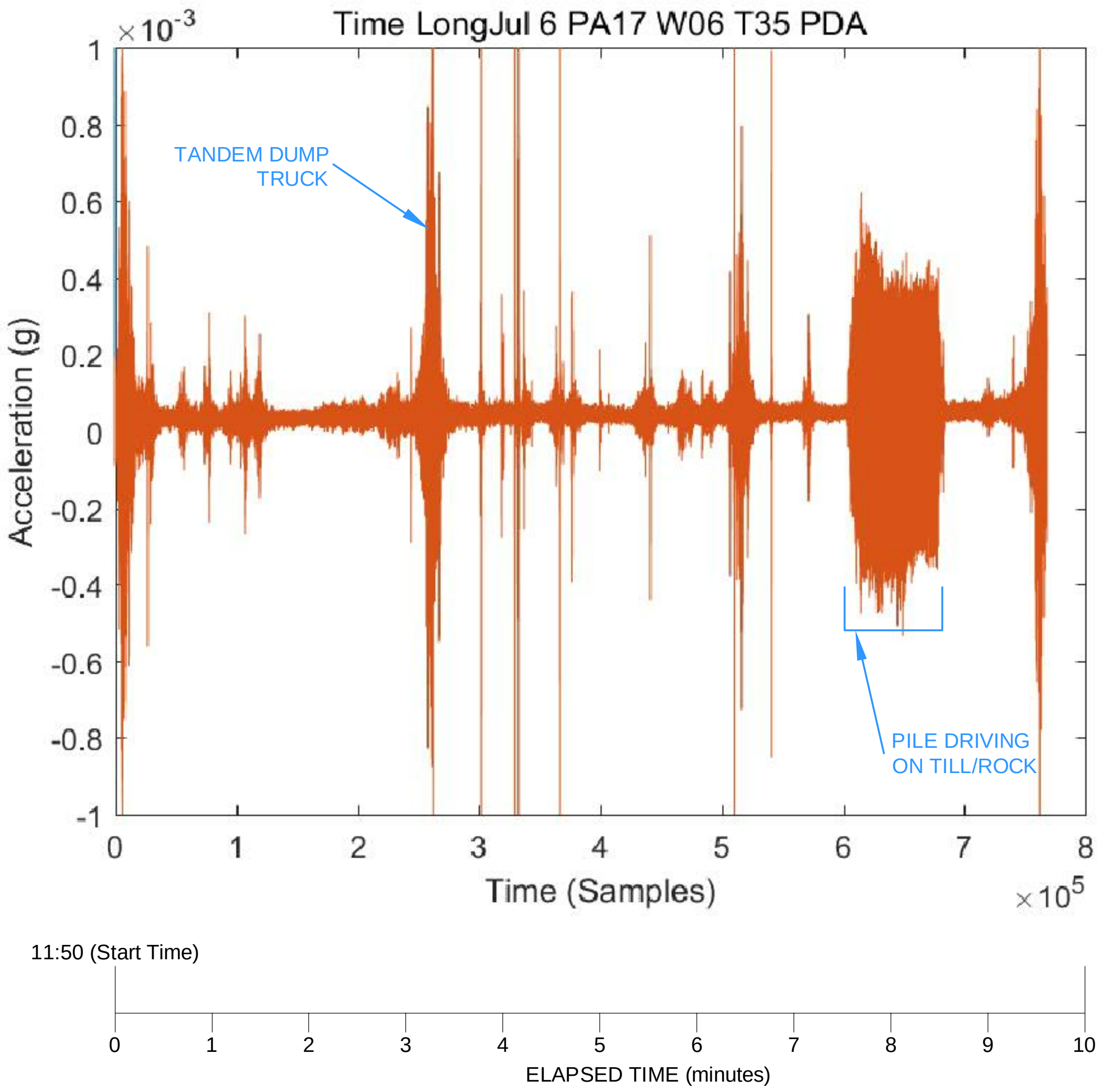
PROJECT
NORTH KENT 1
VIBRATION MONITORING

TITLE
TURBINE T35, WELL 6, PILE 17
(JUNE 26, 2017)

Golder Associates

PROJECT No.		1668031	FILE No. 1668031–2000–R02ET35W06
			SCALE AS SHOWN REV.
CADD	DCH	Dec 1/17	
CHECK	SSB		**E-T35W06P17**

Drawing file: 1668031–2000–R02ET35W06.dwg Dec 01, 2017 – 2:26pm



Drawing file: 1668031-2000-R02ET35W06.dwg Dec 01, 2017 - 3:46pm

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Long, Tran, Vert - direction of measurement;
c) Date;
d) Pile Number;
e) Well Number; and
f) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

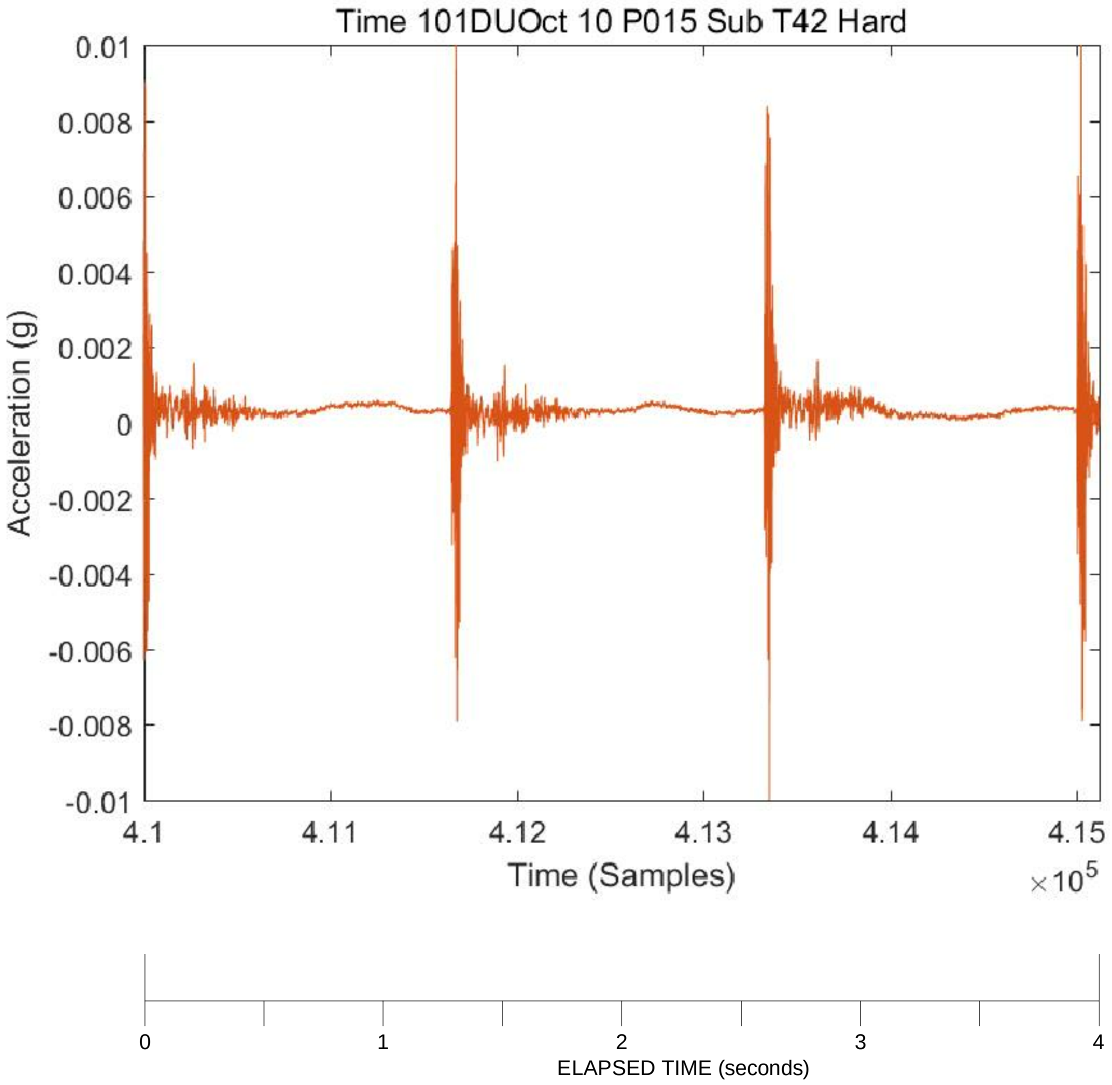
TITLE

TURBINE T35, WELL 6, PILE A17
(JULY 6, 2017)

Golder Associates

PROJECT No. 1668031
FILE No. 1668031-2000-R02ET35W06
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SSB

E-T35W06PA17



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Date;
c) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

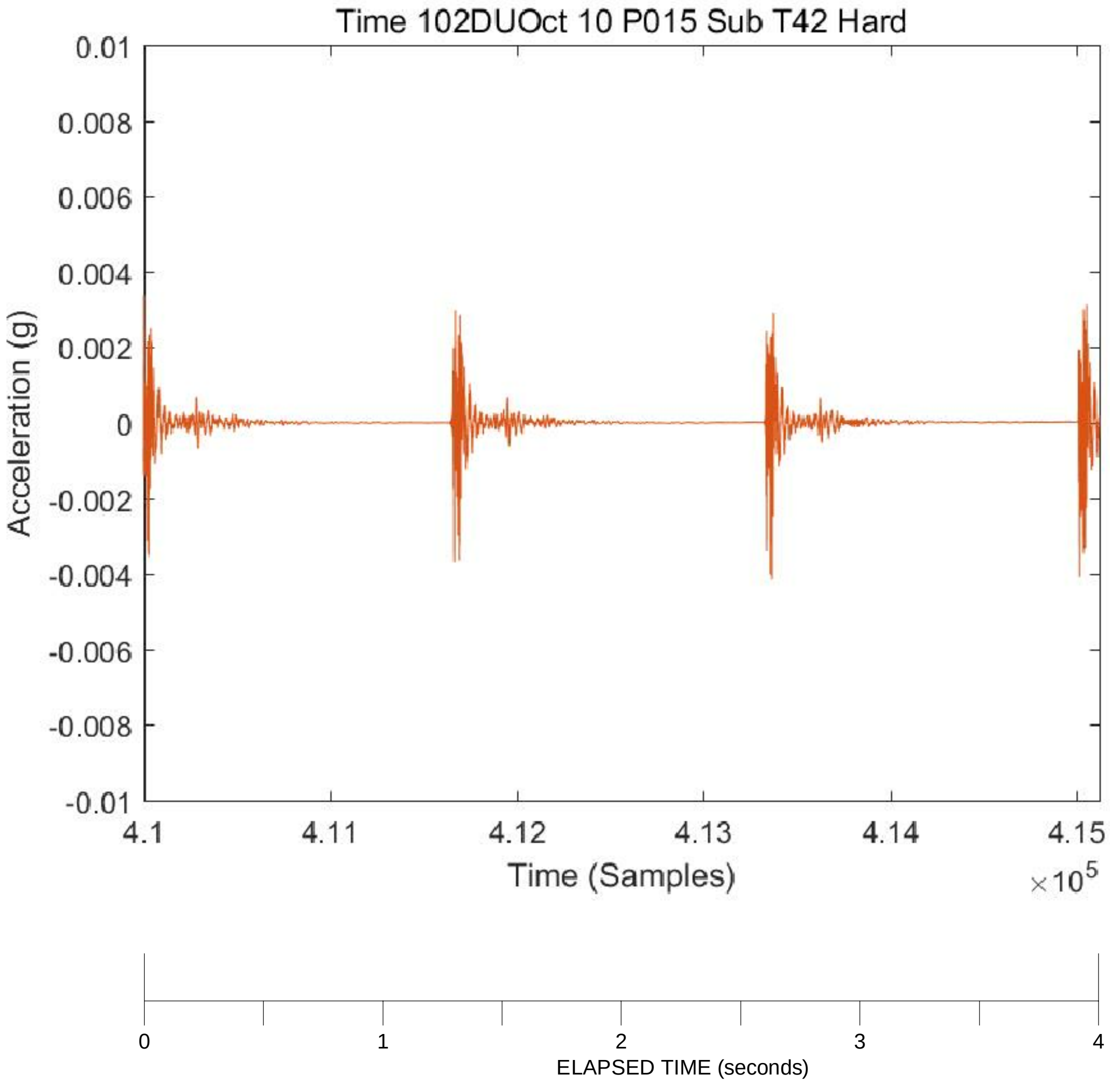
TURBINE T42
BEDROCK ACCELEROMETER 101DU

Golder Associates

PROJECT No. 1668031
FILE N668031–2000–R02ET42BA101DU
SCALE AS SHOWN
REV.
CADD DCH Dec 1/17
CHECK SSB

E-T42BA101DU

Drawing file: 1668031–2000–R02ET42BA101DU.dwg Dec 01, 2017 – 4:39pm



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

IMAGE SCALE AND MAXIMUM TIME SCALE VALUE BASED ON DATA LOGGER SAMPLING RATE. REFER TO TEXT.

DATA IMAGE TITLE INDICATES:

a) Time- time history of acceleration measurements;
b) Date;
c) Pile Driving Condition (refer to text)

PROJECT

NORTH KENT 1
VIBRATION MONITORING

TITLE

TURBINE T42
BEDROCK ACCELEROMETER 102DU

Golder Associates

PROJECT No.		1668031	FILE No.1668031-2000-R02ET42BA102DU
			SCALE AS SHOWN REV.
CADD	DCH	Dec 1/17	
CHECK	SJB		**E-T42BA101DU**

Drawing file: 1668031-2000-R02ET42BA102DU.dwg Dec 01, 2017 - 4:40pm

APPENDIX F

Vibration Monitoring Data Reports

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T3

		Vibration Measurements at Turbine Site						Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**MP12721**	**BE14711**	**MP12721**	**BE14711**	**Well 11**	**Well 12**	**No Pump[e]**
1	8/23/2017 10:01	8/23/2017 10:10	8/23/2017 10:11	21.6	19.5	1.36	1.78	NA[e]	0.021	
2	8/23/2017 11:29	8/23/2017 11:35	8/23/2017 12:35	23.2	21.7	3.03	3.05	0.011	0.003	
3	8/23/2017 11:46	8/23/2017 11:56	8/23/2017 12:41	24.2	23.3	3.21	2.75	0.024	0.013	
4	8/23/2017 12:12	8/23/2017 12:19	8/23/2017 12:21	24.5	24.3	1.47	1.78	0.014	0.010	
5	8/23/2017 9:43	8/23/2017 9:49	8/23/2017 9:52	24.2	24.7	2.80	2.54	NA[e]	0.010	
6	8/23/2017 9:28	8/23/2017 9:35	8/23/2017 9:35	23.2	24.3	1.01	2.03	NA[e]	0.004	
7	8/22/2017 12:16	8/22/2017 12:22	8/22/2017 12:57	21.6	23.3	3.26	3.81	0.015	0.016	
8	8/22/2017 18:43	8/22/2017 18:49	8/22/2017 18:54	19.4	21.7	1.99	3.94	0.013	0.004	
9	8/22/2017 16:52	8/22/2017 16:58	8/22/2017 17:00	16.8	19.5	1.89		0.018	0.011	
10	8/22/2017 18:19	8/22/2017 18:27	8/22/2017 18:32	13.9	16.9	2.64	2.41	0.014	0.008	
11	8/22/2017 16:34	8/22/2017 16:40	8/22/2017 16:45	11.0	14.1	3.67	3.56	0.022	0.025	
12	8/22/2017 17:48	8/22/2017 17:57	8/22/2017 18:08	8.7	11.2	7.99	8.26	0.011	0.003	
13	8/22/2017 16:08	8/22/2017 16:16	8/22/2017 16:18	7.7	8.8	5.04	4.83	0.007	0.029	
14	8/22/2017 17:29	8/22/2017 17:38	8/22/2017 17:39	8.7	7.8	4.60	4.70	0.012	0.013	
15	8/22/2017 14:27	8/22/2017 14:33	8/22/2017 15:41	11.0	8.8	6.43	4.95	0.066	0.008	
16	8/22/2017 17:13	8/22/2017 17:20	8/22/2017 17:20	13.9	11.2	1.78		0.026	0.005	
17	8/22/2017 13:14	8/22/2017 13:22	8/22/2017 15:48	16.8	14.1	7.49	5.21	0.046	0.008	
18	8/23/2017 11:05	8/23/2017 11:12	8/23/2017 11:16	19.4	16.9	2.53	2.41	0.018	0.014	
Restrikes and Continued Pile Driving										
7C	8/23/2017 18:27	8/23/2017 18:27	8/23/2017 18:31	21.6	23.3	2.04	1.40	0.023	1.354	0.022
8C	8/23/2017 8:14	8/23/2017 8:14	8/23/2017 8:14	19.4	21.7	2.89	2.54	0.010	0.004	
11C	8/23/2017 8:18	8/23/2017 8:18	8/23/2017 8:18	11.0	14.1	4.20	3.18	0.009	2.405	0.006
12C	8/23/2017 8:22	8/23/2017 8:22	8/23/2017 8:22	8.7	11.2	6.87	4.83	0.009	2.405	0.006
13C	8/23/2017 8:25	8/23/2017 8:26	8/23/2017 8:26	7.7	8.8	2.05	4.70	0.009	0.007	
14C	8/23/2017 8:28	8/23/2017 8:28	8/23/2017 8:28	8.7	7.8	4.08	3.94	0.007	0.007	
16C	8/23/2017 8:31	8/23/2017 8:31	8/23/2017 8:32	13.9	11.2		3.05	0.007	0.007	
17C	8/23/2017 8:34	8/23/2017 8:34	8/23/2017 8:34	16.8	14.1		2.92	0.007	0.007	
6	8/23/2017 12:14	8/23/2017 12:15	8/23/2017 12:15	23.2	24.3	1.33	1.78	0.025	0.023	
Replacement Piles										
7A	9/6/2017 12:05	9/6/2017 12:14	9/6/2017 12:19	22.6	24.3	1.99		0.033	0.005	

Well Information

Well No.: 11
Municipal Address: 9596 Union Line
Distance from Turbine Centre: 1,707 m

Well No.: 12
Municipal Address: 9468 Union Line
Distance from Turbine Centre: 1,264 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Continued pile driving on subsequent days are marked "C". Replacement piles are marked "A". Vibration measurements were undertaken on August 17, 2017 at Wells 11 and 12 during water quality sampling events in the absence of pile driving within the cluster. Both pumps turned on and operated during the sampling events. Peak vibration measurements for Well 11 were 0.016 mm/s and this pump was located within the residence approximately 40 m from the well. Peak vibration measurements for Well 12 were 0.896 mm/s and this pump was mounted on the well casing. During pile driving on August 23, 2017, the peak vibration measurement of the Well 12 casing was 2.4 mm/s for clearly definable periods during which the pump was operating. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Data not available for Piles 1, 5 and 6 at Well 11 on August 23, 2017 due to battery failure in monitoring equipment. Battery was subsequently replaced. Driving/restriking of some piles occured in relatively rapid succession and, therefore, in some cases the vibration measurement data for the 10 minute periods of analysis are applicable to multiple piles. Where total driving duration between till/rock start and end times noted above is not representative, actual driving duration for each pile is shown in parentheses following the pile number in minutes and seconds: 2(6:42), 3(5:13), 7(8:45), 12(7:08), 15(1:20), 17(1:42). Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: **T4**

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9679**	**BE8719**	**BE9679**	**BE8719**	**Well 11**	**Well 12**	**No Pump[e]**
1	8/25/2017 8:00	8/25/2017 8:08	8/25/2017 8:09	23.9	21.7	1.52	1.14	0.004	0.006	
2	8/25/2017 8:30	8/25/2017 9:15	8/25/2017 9:16	25.6	24.0	1.40	1.40	0.006	2.335	0.008
3	8/25/2017 9:03	8/25/2017 9:09	8/25/2017 9:10	26.6	25.7	1.40	1.40	0.007	2.335	0.008
4	8/25/2017 8:47	8/25/2017 8:56	8/25/2017 8:57	27.0	26.7	0.89	1.40	0.005	0.011	
5	8/25/2017 8:15	8/25/2017 8:22	8/25/2017 8:23	26.6	27.1	1.40	1.40	0.028	0.018	
6	8/24/2017 13:01	8/24/2017 13:10	8/24/2017 13:11	25.6	26.7	1.40	1.40	0.011	0.056	
7	8/24/2017 9:56	8/24/2017 10:04	8/24/2017 10:51	23.9	25.7	3.05	3.18	0.018	1.511	0.024
8	8/24/2017 13:19	8/24/2017 15:13	8/24/2017 15:14	21.6	24.0	3.81	5.84	0.024	1.777	0.014
9	8/24/2017 10:56	8/24/2017 11:04	8/24/2017 11:04	19.0	21.7	1.78	1.40	0.006	0.004	
10	8/24/2017 13:35	8/24/2017 13:45	8/24/2017 13:45	16.1	19.1	2.67	2.54	0.006	0.018	
11	8/24/2017 11:10	8/24/2017 11:18	8/24/2017 11:18	13.2	16.2	3.30	2.41	0.013	0.026	
12	8/24/2017 13:52	8/24/2017 15:09	8/24/2017 15:10	11.0	13.3	3.81	5.84	0.024	1.777	0.014
13	8/24/2017 11:23	8/24/2017 11:32	8/24/2017 11:33	10.1	11.1	4.32	3.68	0.009	0.009	
14	8/24/2017 14:07	8/24/2017 14:17	8/24/2017 14:17	11.0	10.2	3.30	3.56	0.007	0.006	
15	8/24/2017 11:38	8/24/2017 15:03	8/24/2017 15:04	13.2	11.1	3.81	5.84	0.009	1.374	0.028
16	8/24/2017 14:24	8/24/2017 14:33	8/24/2017 15:01	16.1	13.3	3.43	5.21	0.009	1.374	0.028
17	8/24/2017 12:46	8/24/2017 14:55	8/24/2017 14:56	19.0	16.2	3.56	3.56	0.030	1.374	0.028
18	8/24/2017 14:40	8/24/2017 14:52	8/24/2017 14:52	21.6	19.1	2.29	2.92	0.030	0.029	

Well Information

Well No.: 11
Municipal Address: 9596 Union Line
Distance from Turbine Centre: 1,424 m

Well No.: 12
Municipal Address: 9468 Union Line
Distance from Turbine Centre: 1,072 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Vibration measurements were undertaken on August 17, 2017 at Wells 11 and 12 during water quality sampling events in the absence of pile driving within the cluster. Both pumps turned on and operated during the sampling events. Peak vibration measurements for Well 11 were 0.016 mm/s and this pump was located within the residence approximately 40 m from the well. Peak vibration measurements for Well 12 were 0.896 mm/s and this pump was mounted on the well casing. During pile driving on August 24, 2017, the peak vibration measurement of the Well 12 casing was 1.777 mm/s for clearly definable periods during which the pump was operating. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Note that driving of some piles was paused while the tip was in the upper soil deposits and subsequently driven to the glacial till/rock later in the day. In these instances, the hard driving conditions for different piles occured in relatively rapid succession and, therefore, the vibration measurement data for the 10 minute periods of analysis are applicable to multiple piles. Where total driving duration between till/rock start and end times noted above is not representative, actual driving duration is shown for each pile in parentheses following the pile number in minutes and seconds: 2(7:33), 7(1:32), 8(0:53), 12(1:10), 15(1:15), 16(1:02), 17(1:31). Total driving durations derived from start and end times noted above include labour breaks, equipment work, splicing, welding and other standby time.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T5

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	Start[a]	Rock/Till	End[a]	BE9679	BE18695	BE9679	BE18695	Well 3	Well 4	No Pump[e]
1	8/28/2017 13:59	8/28/2017 14:21	8/28/2017 14:47	24.9	26.0	2.16	1.70	0.002	0.045	
2	10/10/2017 16:20	10/10/2017 16:29	10/10/2017 16:31	23.2	25.0	2.03	2.03	0.004	NA[e]	
3	10/10/2017 16:40	10/10/2017 16:48	10/10/2017 16:51	21.0	23.3	2.16	2.16	0.016	NA[e]	
4	10/10/2017 17:02	10/10/2017 17:07	10/10/2017 17:11	18.3	21.1	3.56	2.03	0.014	NA[e]	
5	10/10/2017 17:19	10/10/2017 17:25	10/10/2017 17:29	15.4	18.4	2.92	2.14	0.006	NA[e]	
6	10/10/2017 17:37	10/10/2017 17:42	10/10/2017 17:43	12.6	15.5	3.05	2.84	0.006	NA[e]	
7	10/10/2017 17:53	10/10/2017 18:01	10/10/2017 18:06	10.3	12.7	7.24	8.13	0.003	NA[e]	
8	10/10/2017 18:15	10/10/2017 18:21	10/10/2017 18:23	9.4	10.4	4.95	4.45	0.014	NA[e]	
9	10/12/2017 7:53	10/12/2017 8:01	10/12/2017 8:05	10.3	9.5	3.68	4.19	0.003	NA[e]	
10	10/12/2017 8:13	10/12/2017 8:24	10/12/2017 8:26	12.6	10.4	2.67	3.56	0.005	NA[e]	
11	10/12/2017 8:36	10/12/2017 8:43	10/12/2017 8:45	15.4	12.7	2.14	2.54	0.017	NA[e]	
12	10/12/2017 8:58	10/12/2017 9:06	10/12/2017 9:07	18.3	15.5	2.16	2.03	0.008	NA[e]	
13	10/12/2017 10:40	10/12/2017 10:47	10/12/2017 10:48	21.0	18.4	2.16	2.14	0.003	NA[e]	
14	10/12/2017 11:22	10/12/2017 11:28	10/12/2017 11:30	23.2	21.1	1.65	1.40	0.019	NA[e]	
15	10/12/2017 12:00	10/12/2017 12:06	10/12/2017 12:12	24.9	23.3	1.65	1.40	0.003	NA[e]	
16	10/12/2017 11:42	10/12/2017 11:49	10/12/2017 11:52	25.9	25.0	1.90	1.65	0.004	NA[e]	
17	10/12/2017 9:33	10/12/2017 9:42	10/12/2017 9:43	26.3	26.0	1.65	1.78	0.005	NA[e]	
18	8/28/2017 15:56	8/28/2017 16:20	8/28/2017 16:25	25.9	26.4	2.29	1.75	0.006	0.027	

Well Information

Well No.: 3
Municipal Address: 8522 Bush Line
Distance from Turbine Centre: 911 m

Well No.: 4
Municipal Address: 26347 St Clair Road
Distance from Turbine Centre: 1,030 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Monitoring of Well 4 was not permitted after September 10, 2017. For reference in comparison to the vibration velocities noted above, St. Clair Road traffic passing at 78 m from Well 4 on September 5, 2017, was observed to include large tractor-trailers, concrete mixers and dump trucks at a rate of about 1 heavy vehicle every 1.5 to 2 minutes. Passenger vehicle movements on the Well 4 property passed and were parked near the well throughout the afternoon on September 5, 2017. On September 6, 2017, heavy vehicle traffic on St. Clair Road and near Well 4 was similar to September 5, 2017. Combine harvesting was on-going as close as 25 to 30 m from Well 4, during much of the day on September 6, 2017. On this same day, various individuals were at and in the well shed, connecting, operating and adjusting a well pump. Well 4 pump was cycled on and off on September 6, 2017, operating for periods of 1 to more than 7 minutes. When individuals were working on the pump and well, well casing vibrations were as much as 4.987 mm/s. At other times, Well 4 casing vibrations ranged from about 0.07 to about 0.62 mm/s with an average of about 0.18 mm/s, reflective of the vehicle and foot traffic on site near the well, harvesting equipment and traffic on the nearby St. Clair road. During this same measurement time on September 5 and 6, 2017, the nearest pile driving was more than 2 km distant and vibration measurements did not identify any evidence of pile driving influences. Geophone data shown in columns above on August 28, 2017 were obtained using instruments with serial numbers BE8719 and MP12721 at the respective positions occupied by BE9679 and BE18695 as listed above.

During the October, 2017 period for which data is presented above, Union Gas was constructing a pipeline about 400 m northwest of Well 4 and within about 100 to 180 m of 26457 St. Clair Road.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T6

Vibration Measurements at Turbine Site								Vibration Measurements at Wells	
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]	
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**BE8719**	**BE18695**	**BE8719**	**Well 7**	**Well 8**
1	7/31/2017 11:25	7/31/2017 11:28	7/31/2017 11:32	27.0	27.2	1.27	1.91	0.068	0.049
2	7/31/2017 12:20	7/31/2017 12:26	7/31/2017 12:28	26.6	27.6	1.27	1.65	0.044	0.032
3	7/31/2017 12:37	7/31/2017 12:41	7/31/2017 12:46	25.6	27.2	1.40	2.03	0.018	0.028
4	7/31/2017 13:35	7/31/2017 13:40	7/31/2017 13:46	23.9	26.1	1.65	2.29	0.066	0.011
5	7/31/2017 13:18	7/31/2017 13:23	7/31/2017 13:28	21.6	24.5	1.91	2.43	0.017	0.010
6	7/31/2017 12:59	7/31/2017 13:05	7/31/2017 13:07	19.0	22.2	1.91	2.54	0.012	0.033
7	7/31/2017 7:33	7/31/2017 7:37	7/31/2017 7:42	16.1	19.5	2.67	3.30	0.050	0.050
8	7/31/2017 7:53	7/31/2017 7:56	7/31/2017 8:03	13.2	16.6	2.92	3.56	0.127	0.070
9	7/31/2017 8:14	7/31/2017 8:18	7/31/2017 8:22	11.0	13.8	3.94	3.94	0.051	0.015
10	7/31/2017 8:31	7/31/2017 8:37	7/31/2017 8:41	10.1	11.6	4.32	2.79	0.025	0.058
11	7/31/2017 8:48	7/31/2017 8:51	7/31/2017 8:53	11.0	10.7	3.05	2.67	0.035	0.012
12	7/31/2017 9:02	7/31/2017 9:07	7/31/2017 9:12	13.2	11.6	3.18	2.54	0.058	0.023
13	7/31/2017 9:21	7/31/2017 9:25	7/31/2017 9:33	16.1	13.8	2.79	2.41	0.118	0.005
14	7/31/2017 9:42	7/31/2017 9:47	7/31/2017 9:50	19.0	16.6	2.54	1.91	0.082	0.007
15	7/31/2017 10:21	7/31/2017 10:24	7/31/2017 10:29	21.6	19.5	2.67	1.91	0.039	0.032
16	7/31/2017 10:36	7/31/2017 10:40	7/31/2017 10:43	23.9	22.2	2.16	1.52	0.010	0.014
17	7/31/2017 10:51	7/31/2017 10:54	7/31/2017 10:58	25.6	24.5	2.16	1.65	0.040	0.057
18	7/31/2017 11:09	7/31/2017 11:13	7/31/2017 11:17	26.6	26.1	1.78	1.14	0.024	0.071

Well Information

Well No.: 7
Municipal Address: 25117 Prince Albert Road
Distance from Turbine Centre: 1,049 m

Well No.: 8
Municipal Address: 9241 Countryview Line
Distance from Turbine Centre: 872 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Well monitoring undertaken during periods of time on these same days when pile driving was not occuring measured peak particle velocities of as much as 0.37 mm/s (Well 7). Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T7

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells	
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]	
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**BE8719**	**BE18695**	**BE8719**	**Well 7**	**Well 8**
1	7/27/2017 17:57	7/27/2017 18:03	7/27/2017 18:04	26.6	27.0	2.29	1.27	0.030	0.011
2	7/27/2017 18:31	7/27/2017 18:36	7/27/2017 18:36	25.6	26.6		1.11	0.063	0.013
3	7/28/2017 8:11	7/28/2017 8:16	7/28/2017 8:16	23.9	25.6	1.14	1.27	0.019	0.022
4	7/28/2017 8:37	7/28/2017 8:43	7/28/2017 8:44	21.6	23.9	1.40	1.65	0.035	0.045
5	7/27/2017 18:11	7/27/2017 18:17	7/27/2017 18:18	19.0	21.6		1.52	0.017	0.012
6	7/27/2017 15:27	7/27/2017 15:32	7/27/2017 15:33	16.1	19.0	3.43	1.78	0.019	0.028
7	7/27/2017 15:10	7/27/2017 15:15	7/27/2017 15:16	13.2	16.1	2.29	1.52	0.026	0.028
8	7/27/2017 14:30	7/27/2017 14:36	7/27/2017 14:37	11.0	13.2	3.94	2.16	0.017	0.027
9	7/27/2017 14:10	7/27/2017 14:16	7/27/2017 14:18	10.1	11.0	4.19	2.14	0.011	0.031
10	7/27/2017 13:55	7/27/2017 14:00	7/27/2017 14:01	11.0	10.1	5.46	3.18	0.030	0.012
11	7/27/2017 13:42	7/27/2017 13:46	7/27/2017 13:47	13.2	11.0	3.18	3.05	0.025	0.042
12	7/27/2017 13:09	7/27/2017 13:13	7/27/2017 13:23	16.1	13.2	3.05	2.29	0.019	0.035
13	7/27/2017 12:21	7/27/2017 12:34	7/27/2017 12:53	19.0	16.1	5.97	3.94	0.030	0.049
14	7/27/2017 15:42	7/27/2017 15:51	7/27/2017 15:54	21.6	19.0		1.65	0.026	0.039
15	7/27/2017 16:06	7/27/2017 16:12	7/27/2017 16:13	23.9	21.6	3.18	2.29	0.032	0.021
16	7/27/2017 16:34	7/27/2017 16:44	7/27/2017 16:45	25.6	23.9	2.16	1.40	0.010	0.066
17	7/27/2017 16:55	7/27/2017 17:01	7/27/2017 17:02	26.6	25.6	2.16	1.40	0.069	0.030
18	7/27/2017 17:17	7/27/2017 17:25	7/27/2017 17:26	27.0	26.6	1.91	1.27	0.027	0.060

Well Information

Well No.: 7
Municipal Address: 25117 Prince Albert Road
Distance from Turbine Centre: 1,354 m

Well No.: 8
Municipal Address: 9241 Countryview Line
Distance from Turbine Centre: 2,883 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Well monitoring undertaken during periods of time on these same days when pile driving was not occuring measured peak particle velocities of as much as 0.073 mm/s. Total driving duration between till/rock start and end times noted above for Pile 13 is not representative and actual driving duration was 00:1:45 due to pauses in actual hammering. Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T12

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**BE8719**	**BE18695**	**BE8719**	**Well 5**	**Well 6**	**No Pump[e]**
1	7/5/2017 12:33	7/5/2017 12:46	7/5/2017 12:47	27.9	28.2	1.65	1.40	0.008	0.044	See Notes
2	7/5/2017 15:47	7/5/2017 16:01	7/5/2017 16:01	27.5	28.6	1.14	1.02	0.001	0.106	
3	7/6/2017 8:08	7/6/2017 8:19	7/6/2017 8:20	26.4	28.2	1.78	1.91	0.010	0.775	
4	7/6/2017 7:47	7/6/2017 7:58	7/6/2017 7:59	24.7	27.1	1.14	1.65	0.002	0.048	
5	7/5/2017 12:57	7/5/2017 13:26	7/5/2017 13:27	22.5	25.4	4.19	3.30	0.002	0.729	
6	7/5/2017 14:11	7/5/2017 14:22	7/5/2017 14:23	19.8	23.1	3.05	3.05	0.002	0.298	
7	7/4/2017 14:48	7/4/2017 14:57	7/4/2017 14:58	16.9	20.4	5.21	3.99	0.002	0.026	
8	7/5/2017 11:38	7/5/2017 11:49	7/5/2017 11:50	14.1	17.5	2.54	1.27	0.008	0.030	
9	7/4/2017 9:26	7/4/2017 9:58	7/4/2017 10:00	11.9	14.7	6.22	5.21	0.011	0.246	0.014
10	7/5/2017 11:11	7/5/2017 11:25	7/5/2017 11:26	11.0	12.5	4.95	3.68	0.002	0.047	0.014
11	6/30/2017 12:03	6/30/2017 13:47	6/30/2017 13:54	11.9	11.7	11.05	11.18	0.004	0.755	
12	7/4/2017 15:15	7/4/2017 15:25	7/4/2017 15:25	14.1	12.5	2.03	2.41	0.002	0.179	
13	7/4/2017 11:22	7/4/2017 11:33	7/4/2017 11:34	16.9	14.7	9.91	5.59	0.002	0.066	
14	7/4/2017 15:47	7/4/2017 15:58	7/4/2017 15:58	19.8	17.5	2.54	2.03	0.069	0.037	
15	7/4/2017 11:55	7/4/2017 12:06	7/4/2017 12:07	22.5	20.4	4.70	4.45	0.003	0.023	
16	7/4/2017 16:35	7/4/2017 16:47	7/4/2017 16:47	24.7	23.1	2.54	3.05	0.004	0.155	
17	7/4/2017 13:01	7/4/2017 13:14	7/4/2017 13:20	26.4	25.4	3.94	3.94	0.007	0.085	
18	7/4/2017 15:08	7/4/2017 15:27	7/4/2017 15:28	27.5	27.1	5.46	4.06	0.002	0.729	
Restrikes										
7	7/5/2017 8:42	7/5/2017 8:42	7/5/2017 8:42	16.9	20.4	0.13	0.13	0.007	0.647	0.027
9	7/5/2017 8:47	7/5/2017 8:47	7/5/2017 8:48	11.9	14.7	2.92	0.13	0.007	0.634	0.027
11	7/5/2017 8:51	7/5/2017 8:51	7/5/2017 8:52	11.9	11.7	4.45	2.79	0.007	0.634	0.032
12	7/5/2017 8:57	7/5/2017 8:57	7/5/2017 8:58	14.1	12.5	2.41	4.03	0.003	0.624	
13	7/5/2017 9:02	7/5/2017 9:02	7/5/2017 9:03	16.9	14.7	2.92	5.59	0.008	0.662	
14	7/5/2017 9:09	7/5/2017 9:09	7/5/2017 9:10	19.8	17.5	4.83	5.72	0.008	0.624	
15	7/5/2017 9:13	7/5/2017 9:13	7/5/2017 9:14	22.5	20.4	3.18	3.05	0.003	0.546	0.057
16	7/5/2017 9:17	7/5/2017 9:17	7/5/2017 9:19	24.7	23.1	3.05	2.03	0.002	0.546	0.057
17	7/5/2017 9:22	7/5/2017 9:22	7/5/2017 9:23	27.5	27.1	2.16	0.13	0.002	0.546	0.057

Well Information

Well No.: 5
Municipal Address: 9559 Pioneer Line
Distance from Turbine Centre: 3,346 m

Well No.: 6
Municipal Address: 24123 Prince Albert Road
Distance from Turbine Centre: 3,368 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". On July 5, 2017, approximately 1 minute after pile driving stopped for Pile 1, the well monitoring personnel at Well 6 observed a loaded tractor/trailer dump truck drive by the well at 54 m distance and ground vibrations were sensed. At this time, the resident was also hammering on equipment within a nearby (120 m) shed during which it sounded as though a heavy sledge was being used with multiple recoil/hammer falls after each main strike. Vibrations associated with these activities (not separable) registered as 2.8 mm/s, consistent with the perception of vibrations by the well monitoring personnel. Monitoring of deliberate pump operation at Well 6 on July 13, 2017, during a period when no pile driving was occuring, measured peak particle velocities of 0.08 to 0.8 mm/s. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 6 are shown in the "no pump" column. Driving/restriking of some piles occured in relatively rapid succession and, therefore, in some cases the vibration measurement data for the 10 minute periods of analysis are applicable to multiple piles. Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. The total driving duration for Pile 11 on June 30, 2017 was unusually long since a smaller driving hammer (Berminghammer B-21) was used for this pile. The total duration of driving on till/rock was 7 minutes for this pile.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T14

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9555**	**MP12721**	**BE9555**	**MP12721**	**Well 13**	**Well 14**	**No Pump[e]**
1	9/11/2017 16:01	9/11/2017 16:06	9/11/2017 16:09	18.9	16.3	1.78	1.93	0.020	0.206	
2	9/11/2017 16:24	9/11/2017 16:29	9/11/2017 16:32	21.0	18.9	1.52	1.79	0.010	0.056	
3	9/11/2017 15:48	9/11/2017 15:54	9/11/2017 15:56	22.6	21.0	1.14	1.43	0.017	0.132	
4	9/11/2017 15:33	9/11/2017 15:39	9/11/2017 15:43	23.6	22.6	1.27	1.36	0.012	0.190	
5	9/11/2017 15:19	9/11/2017 15:24	9/11/2017 15:26	24.0	23.6	1.14	1.15	0.006	0.064	
6	9/11/2017 15:04	9/11/2017 15:10	9/11/2017 15:13	23.6	24.0	1.14	1.58	0.005	0.221	
7	9/11/2017 12:33	9/11/2017 12:39	9/11/2017 12:44	22.6	23.6	1.27	1.43	0.007	0.083	
8	9/11/2017 12:17	9/11/2017 12:25	9/11/2017 12:27	21.0	22.6	1.40	1.00	0.005	0.338	
9	9/11/2017 11:53	9/11/2017 11:59	9/11/2017 12:02	18.9	21.0	1.65	1.22	0.114	0.675	
10	9/11/2017 11:36	9/11/2017 11:43	9/11/2017 11:45	16.3	18.9	1.52	1.46	0.013	0.240	
11	9/11/2017 11:20	9/11/2017 11:25	9/11/2017 11:28	13.5	16.3	1.78	1.51	0.013	0.168	
12	9/11/2017 10:24	9/11/2017 10:30	9/11/2017 10:34	10.6	13.5	2.41	1.62	0.428	0.077	0.011
13	9/11/2017 10:07	9/11/2017 10:14	9/11/2017 10:16	8.1	10.6	3.68	2.46	0.543	0.141	0.008
14	9/11/2017 9:50	9/11/2017 9:56	9/11/2017 10:01	7.1	8.1	4.32	3.82	0.021	0.102	
15	9/11/2017 9:34	9/11/2017 9:39	9/11/2017 9:42	8.1	7.1	4.95	4.04	0.004	0.014	
16	9/11/2017 9:17	9/11/2017 9:24	9/11/2017 9:28	10.6	8.1	4.45	4.11	0.318	0.021	0.007
17	9/11/2017 8:57	9/11/2017 9:03	9/11/2017 9:05	13.5	10.6	3.68	4.38	0.026	0.070	
18	9/11/2017 8:39	9/11/2017 8:47	9/11/2017 8:49	16.3	13.5	2.41	2.80	0.007	0.018	

Well Information

Well No.: 13
Municipal Address: 8771 Union Line
Distance from Turbine Centre: 841 m

Well No.: 14
Municipal Address: 8904 Union Line
Distance from Turbine Centre: 580 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. The peak particle velocity of 0.675 mm/s during driving of Pile 9 was associated with a tractor-trailer truck driving northeast along Union Line (i.e., in lane closest to well).

Data for two 10-minute time periods on September 11, 2017 during which no pile driving occurred were evaluated with start times of 10:47 and 14:27 for Well 13 and 10:48 and 14:36 for Well 14. During these periods, the peak well casing vibration velocity was 0.079 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 13 from data obtained on September 14, 2017, at 11:24 and 16:38 and September 15, 2017 at 08:29. The peak particle velocity of the Well 13 casing during these periods was 0.099 mm/s. On September 19 and 21, 2017 during water sampling events when the pump was operating, the peak particle velocity of the Well 13 casing was 0.655 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 14 from data obtained on September 14, 2017, at 11:33 and 12:53 and September 15, 2017 at 08:35. The peak particle velocity of the Well 14 casing during these periods was 0.160 mm/s. On September 19, 2017 during a water sampling event when the pump was operating, the peak particle velocity of the Well 14 casing was 0.019 mm/s. Well 13 pump vibrations dominated data for periods of 1 to 5 minutes. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T15

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**MP12721**	**BE18695**	**MP12721**	**Well 13**	**Well 14**	**No Pump[e]**
1	10/2/2017 15:02	10/2/2017 15:11	10/2/2017 15:12	24.8	24.4		0.95	0.213	0.091	0.017
2	10/2/2017 16:07	10/2/2017 16:21	10/2/2017 16:22	24.4	24.8		0.86	0.036	0.048	
3	10/2/2017 15:42	10/2/2017 15:50	10/2/2017 15:52	23.4	24.4		0.99	0.541	0.282	0.031
4	10/2/2017 15:25	10/2/2017 15:34	10/2/2017 15:35	21.8	23.4		1.43	0.003	0.037	
5	9/29/2017 11:31	9/29/2017 12:52	9/29/2017 13:03	19.6	21.8	3.18	2.06	0.004	0.195	
6	10/2/2017 10:32	10/2/2017 10:45	10/2/2017 10:46	17.0	19.6		1.37	0.010	0.054	
7	10/2/2017 10:10	10/2/2017 10:19	10/2/2017 10:20	14.1	17.0		1.77	0.258	0.079	0.013
8	10/2/2017 9:39	10/2/2017 9:52	10/2/2017 9:53	11.3	14.1		2.33	0.544	0.075	0.005
9	10/2/2017 9:11	10/2/2017 9:25	10/2/2017 9:26	8.9	11.3		2.13	0.014	0.037	
10	10/2/2017 8:44	10/2/2017 8:57	10/2/2017 8:59	7.9	8.9		3.39	0.549	0.182	0.076
11	10/2/2017 8:12	10/2/2017 8:26	10/2/2017 8:27	8.9	7.9		3.37	0.016	0.141	
12	10/2/2017 7:41	10/2/2017 7:54	10/2/2017 7:55	11.3	8.9		4.16	0.009	0.091	
13	9/29/2017 13:43	9/29/2017 14:07	9/29/2017 14:37	14.1	11.3	2.03	2.62	0.033	0.091	
14	10/2/2017 11:08	10/2/2017 11:19	10/2/2017 11:21	17.0	14.1		1.92	0.384	0.039	0.067
15	10/2/2017 11:41	10/2/2017 11:50	10/2/2017 11:55	19.6	17.0		1.60	0.063	0.341	
16	10/2/2017 12:59	10/2/2017 13:21	10/2/2017 13:22	21.8	19.6		1.60	0.035	0.073	
17	10/2/2017 13:34	10/2/2017 13:43	10/2/2017 13:46	23.4	21.8		1.34	0.048	0.315	
18	10/2/2017 14:23	10/2/2017 14:33	10/2/2017 14:34	24.4	23.4		0.89	0.031	0.132	

Well Information

Well No.: 13
Municipal Address: 8771 Union Line
Distance from Turbine Centre: 940 m

Well No.: 14
Municipal Address: 8904 Union Line
Distance from Turbine Centre: 1,218 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Driving of Pile 13 on till/rock included multiple stops and restarts between 14:37 and 15:07 pm with a total of 26 intermittent hammer blows during this period.

Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. Well 14 vibration monitoring data was dominated by vibrations induced by local passing traffic including tractor-trailer transport trucks, combines, buses, and tractors passing the site on the road and vehicles entering and leaving driveway. Peak Well 14 casing vibrations of 0.341 mm/s associated with Pile 15 directly related to road traffic passing well outside of times when pile driving on till/rock. Similar traffic influences were identifiable for Well 14 during 10 minute data intervals analysed for Piles 1, 3, 5, 10, 11, 17 and 18. Well 13 pump vibrations were clearly discernable in data and confirmed by audible pump noise. Peak Well 13 casing vibrations induced by the pump were about 0.55 mm/s during 10 minute data analysis intervals associated with Piles 1, 3, 7, 8 and 14. Well 13 pump vibrations dominated data for periods of 1 to 5 minutes. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T19

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9679**	**BE8719**	**BE9679**	**BE8719**	**Well 13**	**Well 14**	**No Pump[e]**
1	10/4/2017 16:23	10/4/2017 16:28	10/4/2017 16:31	24.3	23.8	2.40	1.52	0.023	0.364	
2	10/5/2017 8:20	10/5/2017 8:25	10/5/2017 8:28	24.7	24.8	1.27	1.14	0.522	0.313	0.018
3	10/5/2017 8:38	10/5/2017 8:43	10/5/2017 8:47	24.3	25.2	1.40	1.27	0.006	0.058	
4	10/5/2017 10:40	10/5/2017 10:44	10/5/2017 10:46	23.3	24.8	1.27	1.14	0.005	0.186	
5	10/5/2017 9:41	10/5/2017 9:46	10/5/2017 9:49	21.7	23.8	2.03	1.52	0.424	0.056	0.034
6	10/5/2017 9:21	10/5/2017 9:26	10/5/2017 9:29	19.5	22.2	1.78	1.27	0.010	0.157	
7	10/4/2017 16:01	10/4/2017 16:08	10/4/2017 16:09	16.9	20.0	1.91	1.78	0.010	0.115	
8	10/5/2017 9:02	10/5/2017 9:07	10/5/2017 9:08	14.1	17.4	2.03	1.52	0.026	0.041	
9	10/4/2017 14:21	10/4/2017 14:26	10/4/2017 14:27	11.2	14.5	3.30	2.03	0.064	0.142	
10	10/4/2017 14:05	10/4/2017 14:11	10/4/2017 14:12	8.8	11.6	3.81	3.05	0.007	0.130	
11	10/4/2017 13:46	10/4/2017 13:52	10/4/2017 13:54	7.8	9.3	3.56	3.18	0.015	0.253	
12	10/4/2017 13:24	10/4/2017 13:32	10/4/2017 13:34	8.8	8.3	3.81	3.94	0.039	0.128	
13	10/4/2017 12:56	10/4/2017 13:01	10/4/2017 13:02	11.2	9.3	3.30	3.30	0.026	NA[e]	
14	10/4/2017 12:35	10/4/2017 12:42	10/4/2017 12:46	14.1	11.6	2.67	3.43	0.035	NA[e]	
15	10/4/2017 11:31	10/4/2017 11:37	10/4/2017 11:40	16.9	14.5	2.16	2.54	0.035	0.121	
16	10/4/2017 11:11	10/4/2017 11:18	10/4/2017 11:20	19.5	17.4	2.29	2.41	0.028	0.100	
17	10/4/2017 10:51	10/4/2017 10:58	10/4/2017 11:00	21.7	20.0	1.91	2.29	0.008	0.116	
18	10/5/2017 7:59	10/5/2017 8:04	10/5/2017 8:07	23.3	22.2	1.27	1.27	0.349	0.043	0.014

Well Information

Well No.: 13
Municipal Address: 8771 Union Line
Distance from Turbine Centre: 2,460 m

Well No.: 14
Municipal Address: 8904 Union Line
Distance from Turbine Centre: 2,787 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. Well 14 vibration monitoring data was dominated by vibrations induced by local passing traffic including tractor-trailer transport trucks, combines, buses, and tractors passing the site on the road and vehicles entering and leaving driveway. The peak measured Well 14 vibrations of 0.364 mm/s noted above was attributable to vehicles passing on the road. The peak vibrations measured at Well 14 of 0.61 mm/s were associated with a vehicle turning in the driveway (9/27/2017). Data for Piles 13 and 14 for Well 14 not available due to battery failure in monitoring equipment. The battery was subsequently replaced.

Well 13 pump vibrations were clearly discernable in data and confirmed by audible pump noise. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

T20 Issue Date: 12/5/2017

Turbine Location: T20

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
				Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]				
	Pile Driving Times and Dates							Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE14711**	**BE9769**	**BE14711**	**BE9769**	**Well 11**	**Well 12**	**No Pump[e]**
1	8/30/2017 15:30	8/30/2017 15:33	8/30/2017 15:54	23.7	24.4	1.78	2.67	0.016	NA[e]	
2	8/30/2017 18:17	8/30/2017 18:21	8/30/2017 18:29	24.0	25.5	1.27	1.91	0.005	0.008	
3	8/30/2017 18:33	8/30/2017 18:38	8/30/2017 18:45	23.7	25.8	1.65	1.91	0.003	0.004	
4	8/30/2017 17:55	8/30/2017 17:59	8/30/2017 18:10	22.7	25.5	1.27	1.52	0.004	0.005	
5	8/30/2017 17:38	8/30/2017 17:37	8/30/2017 17:49	21.2	24.4	1.78	2.29	0.004	0.855	0.022
6	8/30/2017 17:14	8/30/2017 17:19	8/30/2017 17:31	19.1	22.8	2.16	2.92	0.004	NA[e]	
7	8/30/2017 16:54	8/30/2017 16:56	8/30/2017 17:09	16.6	20.5	2.41	2.59	0.003	NA[e]	
8	8/30/2017 16:19	8/30/2017 16:24	8/30/2017 16:53	13.9	17.8	3.18	4.07	0.046	NA[e]	
9	8/30/2017 16:01	8/30/2017 16:05	8/30/2017 16:12	11.1	14.9	4.06	4.45	0.005	NA[e]	
10	8/30/2017 11:34	8/30/2017 11:38	8/30/2017 11:50	8.9	12.0		4.83	0.005	0.016	
11	8/30/2017 10:26	8/30/2017 10:29	8/30/2017 10:40	8.0	9.6		3.81	0.018	0.013	
12	8/30/2017 9:58	8/30/2017 10:02	8/30/2017 10:16	8.9	8.6		5.08	0.011	0.014	
13	8/30/2017 9:49	8/30/2017 9:44	8/30/2017 9:50	11.1	9.6		4.45	0.010	0.014	
14	8/30/2017 12:02	8/30/2017 12:04	8/30/2017 12:22	13.9	12.0		4.32	0.028	0.008	
15	8/30/2017 12:36	8/30/2017 12:39	8/30/2017 12:54	16.6	14.9		4.06	0.023	0.006	
16	8/30/2017 13:01	8/30/2017 13:05	8/30/2017 13:20	19.1	17.8		3.97	0.004	0.004	
17	8/30/2017 14:26	8/30/2017 14:29	8/30/2017 14:41	21.2	20.5	1.78	3.81	0.004	0.006	
18	8/30/2017 14:52	8/30/2017 14:56	8/30/2017 15:24	22.7	22.8	1.65	3.05	0.003	0.025	
Restrikes										
13	8/30/2017 13:23	8/30/2017 13:23	8/30/2017 13:35	11.1		0.00		0.008	0.008	

Well Information

Well No.: 11
Municipal Address: 9596 Union Line
Distance from Turbine Centre: 3,800 m

Well No.: 12
Municipal Address: 9468 Union Line
Distance from Turbine Centre: 3,962 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Vibration measurements were undertaken on August 17, 2017 at Wells 11 and 12 during water quality sampling events in the absence of pile driving within the cluster. Both pumps turned on and operated during the sampling events. Peak vibration measurements for Well 11 were 0.016 mm/s and this pump was located within the residence approximately 40 m from the well. Peak vibration measurements for Well 12 were 0.896 mm/s and the pump was mounted on the well casing. During pile driving on August 23, 2017, the maximum vibration measurement of the Well 12 casing was 2.4 mm/s for clearly definable periods during which the pump was operating. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Data not available for Piles 1, 6, 7, 8 and 9 at Well 12 on August 30, 2017 due to battery failure in monitoring equipment. Battery was subsequently replaced. Total driving duration between till/rock start and end times noted above for Pile 1 is not representative and actual driving duration was 00:7:40 due to pauses in actual hammering. Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T21

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9555**	**BE14711**	**BE9555**	**BE14711**	**Well 11**	**Well 12**	**No Pump[e]**
1	8/29/2017 12:01	8/29/2017 12:04	8/29/2017 12:14	25.6	23.7	1.78	2.16	NA[e]	0.008	
2	8/29/2017 1:27	8/29/2017 1:30	8/29/2017 1:39	26.6	25.4	1.27	1.40	0.003	0.006	
3	8/29/2017 1:44	8/29/2017 1:47	8/29/2017 1:54	27.0	26.4	1.40	1.40	0.009	0.006	
4	8/29/2017 11:20	8/29/2017 11:23	8/29/2017 11:32	26.6	26.8	1.78	1.40	0.003	0.013	
5	8/29/2017 11:05	8/29/2017 11:08	8/29/2017 11:13	25.6	26.4	1.78	1.52	NA[e]	0.013	
6	8/29/2017 8:48	8/29/2017 8:51	8/29/2017 8:59	23.9	25.4		1.27	NA[e]	0.026	
7	8/29/2017 8:28	8/29/2017 8:33	8/29/2017 8:40	21.6	23.7		1.52	NA[e]	0.005	
8	8/29/2017 8:07	8/29/2017 8:11	8/29/2017 8:19	19.0	21.5		1.78	NA[e]	0.003	
9	8/29/2017 7:51	8/29/2017 7:54	8/29/2017 7:59	16.1	18.8		2.79	0.004	0.004	
10	8/28/2017 16:40	8/28/2017 16:44	8/28/2017 16:53	13.2	15.9	2.41		0.015	0.071	
11	8/28/2017 16:11	8/28/2017 16:14	8/28/2017 16:27	11.0	13.0	2.79		0.007	1.551	0.039
12	8/28/2017 15:51	8/28/2017 15:58	8/28/2017 16:05	10.1	10.8	3.68		0.005	0.007	
13	8/28/2017 14:27	8/28/2017 14:30	8/28/2017 14:37	11.0	9.9	3.30		0.003	0.005	
14	8/28/2017 14:10	8/28/2017 14:13	8/28/2017 14:21	13.2	10.8	3.18		0.006	0.005	
15	8/28/2017 13:45	8/28/2017 13:48	8/28/2017 13:58	16.1	13.0	2.67		0.008	0.013	
16	8/28/2017 13:21	8/28/2017 13:24	8/28/2017 13:37	19.0	15.9	2.16	2.79	0.006	0.011	
17	8/28/2017 13:01	8/28/2017 13:05	8/28/2017 13:13	21.6	18.8	2.79	2.29	0.011	0.010	
18	8/29/2017 11:44	8/29/2017 11:47	8/29/2017 11:54	23.9	21.5	1.65	1.78	NA[e]	0.031	

Well Information

Well No.: 11
Municipal Address: 9596 Union Line
Distance from Turbine Centre: 3,960 m

Well No.: 12
Municipal Address: 9468 Union Line
Distance from Turbine Centre: 4,161 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Vibration measurements were undertaken on August 17, 2017 at Wells 11 and 12 during water quality sampling events in the absence of pile driving within the cluster. Both pumps turned on and operated during the sampling events. Peak vibration measurement for Well 11 was 0.016 mm/s and this pump was located within the residence approximately 40 m from the well. Peak vibration measurement for Well 12 was 0.896 mm/s and the pump was mounted on the well casing. During pile driving on August 23, 2017, the peak vibration measurement of the Well 12 casing was 2.4 mm/s for clearly definable periods during which the pump was operating. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Data not available for Piles 1, 5, 6, 7, 8 and 18 at Well 11 on August 29, 2017 due to battery failure in monitoring equipment. Battery was subsequently replaced. Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T23

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Maximum Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE8719**	**BE9555**	**BE8719**	**BE9555**	**Well 13**	**Well 14**	**No Pump[e]**
1	10/2/2017 8:19	10/2/2017 8:27	10/2/2017 8:32	17.3	19.7	2.67	2.79	0.016	0.169	
2	10/2/2017 8:42	10/2/2017 8:50	10/2/2017 8:57	14.4	17.1	5.33	4.83	0.549	0.182	0.076
3	10/2/2017 9:09	10/2/2017 9:13	10/2/2017 9:16	11.5	14.2	3.30	3.02	0.019	0.049	
4	10/2/2017 9:25	10/2/2017 9:31	10/2/2017 9:35	9.2	11.3	2.94	3.68	0.018	0.048	
5	10/2/2017 9:45	10/2/2017 9:51	10/2/2017 9:54	8.2	9.0	4.19	3.81	0.581	0.075	0.004
6	10/2/2017 10:02	10/2/2017 10:09	10/2/2017 10:11	9.2	8.0	4.06	4.19	0.024	0.334	
7	10/2/2017 11:21	10/2/2017 11:29	10/2/2017 11:30	11.5	9.0	2.79	3.18	0.003	0.033	
8	10/2/2017 11:45	10/2/2017 11:50	10/2/2017 11:51	14.4	11.3	1.52	2.29	0.302	0.341	0.008
9	10/2/2017 11:59	10/2/2017 12:05	10/2/2017 12:08	17.3	14.2	1.52	1.91	0.007	0.054	
10	10/2/2017 12:36	10/2/2017 12:42	10/2/2017 12:46	19.9	17.1	1.91	1.78	0.007	0.054	
11	10/2/2017 12:53	10/2/2017 12:59	10/2/2017 13:03	22.1	19.7	2.03	1.78	0.004	0.195	
12	10/2/2017 13:13	10/2/2017 13:18	10/2/2017 13:22	23.7	21.9	2.16	2.03	0.035	0.073	
13	10/2/2017 13:30	10/2/2017 13:36	10/2/2017 13:40	24.7	23.5	1.27	1.68	0.008	0.178	
14	10/2/2017 13:52	10/2/2017 13:59	10/2/2017 14:00	25.1	24.5	1.27	1.40	0.472	0.152	0.019
15	10/2/2017 14:06	10/2/2017 14:18	10/2/2017 14:19	24.7	24.9	1.40	1.27	0.751	0.067	0.012
16	10/2/2017 15:21	10/2/2017 15:25	10/2/2017 15:26	23.7	24.5	1.52	1.14	0.020	0.119	
17	10/2/2017 14:54	10/2/2017 15:03	10/2/2017 15:09	22.1	23.5	1.91	1.40	0.213	0.091	0.017
18	10/2/2017 14:29	10/2/2017 14:36	10/2/2017 14:41	19.9	21.9	2.54	2.16	0.031	0.132	

Well Information

Well No.: 13
Municipal Address: 8771 Union Line
Distance from Turbine Centre: 1,954 m

Well No.: 14
Municipal Address: 8904 Union Line
Distance from Turbine Centre: 2,518 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Driving of Pile 3 on till/rock paused for 2:00 between times noted above.

Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. Well 14 vibration monitoring data was dominated by vibrations induced by local passing traffic including tractor-trailer transport trucks, combines, buses, and tractors passing the site on the road and vehicles entering and leaving driveway. The passing of Well 14 by 9 trucks, busses and passenger vehicles was clearly identified in vibration data on 10/2/2017 between 8:31 and 8:41 resulting in a peak vibration velocity of about 0.17 mm/s during this time interval. The peak measured Well 14 vibrations of 0.334 mm/s associated with vehicle entering driveway immediately adjacent to well (10:05 on 10/2/2017).

Well 13 pump vibrations were clearly discernable in data and confirmed by audible pump noise. Peak Well 13 casing vibrations induced by the pump were about 0.75 mm/s during 10 minute data analysis intervals associated with Piles 2, 5, 8, 14, 15 and 17. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T26

Vibration Measurements at Turbine Site								Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	Start[a]	Rock/Till	End[a]	MP12710	BE9555	MP12710	BE9555	Well 13	Well 14	No Pump[e]
1	9/15/2017 11:13	9/15/2017 11:17	9/15/2017 11:24	16.4	13.5	2.04	2.29	0.010	0.039	
2	9/15/2017 11:50	9/15/2017 11:55	9/15/2017 12:02	19.0	16.4	1.80	1.52	0.006	0.057	
3	9/15/2017 11:32	9/15/2017 11:36	9/15/2017 11:37	21.1	19.0	1.57	1.40	0.006	0.144	
4	9/15/2017 10:31	9/15/2017 10:40	9/15/2017 10:43	22.7	21.1	1.48	2.67	0.013	0.024	
5	9/15/2017 9:05	9/15/2017 9:10	9/15/2017 9:12	23.7	22.7	1.50	1.27	0.423	0.068	0.007
6	9/15/2017 8:44	9/15/2017 8:49	9/15/2017 8:50	24.1	23.7	1.20	1.27	0.005	0.036	
7	9/15/2017 8:06	9/15/2017 8:11	9/15/2017 8:14	23.7	24.1	1.06	1.52	0.009	0.118	
8	9/15/2017 7:46	9/15/2017 7:54	9/15/2017 7:55	22.7	23.7	1.04	1.27	0.028	0.148	
9	9/14/2017 18:24	9/14/2017 18:30	9/14/2017 18:34	21.1	22.7	1.36	1.27	0.005	0.058	
10	9/14/2017 18:05	9/14/2017 18:09	9/14/2017 18:11	19.0	21.1	1.44	1.14	0.592	0.104	0.010
11	9/14/2017 17:44	9/14/2017 17:48	9/14/2017 17:52	16.4	19.0	1.88	1.65	0.003	0.062	
12	9/14/2017 17:30	9/14/2017 17:34	9/14/2017 17:35	13.5	16.4	1.94	1.27	0.006	0.054	
13	9/14/2017 17:11	9/14/2017 17:18	9/14/2017 17:27	10.7	13.5	2.81	2.54	0.005	0.080	
14	9/14/2017 16:13	9/14/2017 16:19	9/14/2017 16:22	8.2	10.7	2.25	2.67	0.083	0.069	
15	9/14/2017 15:46	9/14/2017 15:53	9/14/2017 16:00	7.2	8.2	3.82	3.81	0.007	0.018	
16	9/14/2017 15:19	9/14/2017 15:26	9/14/2017 15:31	8.2	7.2	3.57	3.94	0.010	0.030	
17	9/14/2017 14:53	9/14/2017 15:05	9/14/2017 15:06	10.7	8.2	3.31	4.06	0.005	0.024	
18	9/15/2017 10:53	9/15/2017 11:02	9/15/2017 11:03	13.5	10.7	2.16	1.40	0.003	0.036	

Well Information

Well No.:	13	**Well No.:**	14
Municipal Address:	8771 Union Line	Municipal Address:	8904 Union Line
Distance from Turbine Centre:	1,552 m	Distance from Turbine Centre:	1,011 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Peak particle velocities of about 4 to 7 mm/s on September 14, 2017 as measured by geophone on-site were triggered by other equipment travelling in close proximity to the geophones. Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. A peak well casing velocity of 0.675 mm/s during driving of Pile 9 at T14 on September 11, 2017 was associated with a tractor-trailer truck driving northeast along Union Line (i.e., in lane closest to well).

Data for two 10-minute time periods on September 11, 2017 during which no pile driving occurred were evaluated with start times of 10:47 and 14:27 for Well 13 and 10:48 and 14:36 for Well 14. During these periods, the peak well casing vibration velocity was 0.079 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 13 from data obtained on September 14, 2017, at 11:24 and 16:38 and September 15, 2017 at 08:29. The peak particle velocity of the Well 13 casing during these periods was 0.099 mm/s. On September 19 and 21, 2017 during water sampling events when the pump was operating, the peak particle velocity of the Well 13 casing was 0.655 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 14 from data obtained on September 14, 2017, at 11:33 and 12:53 and September 15, 2017 at 08:35. The peak particle velocity of the Well 14 casing during these periods was 0.160 mm/s. On September 19, 2017 during a water sampling event when the pump was operating, the peak particle velocity of the Well 14 casing was 0.019 mm/s. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

Golder Associates Ltd.

T27 Issue Date: 12/5/2017

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T27

Vibration Measurements at Turbine Site								Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**MP12721**	**BE18695**	**MP12721**	**Well 13**	**Well 14**	**No Pump[e]**
1	9/15/2017 10:12	9/15/2017 10:15	9/15/2017 10:16	8.4	9.6	0.02		0.687	0.068	0.018
2	9/15/2017 10:04	9/15/2017 10:07	9/15/2017 10:08	9.4	8.6	4.57	7.31	0.710	0.090	0.008
3	9/15/2017 9:52	9/15/2017 9:55	9/15/2017 9:58	11.7	9.6	3.68	5.64	0.009	0.046	
4	9/15/2017 9:42	9/15/2017 9:46	9/15/2017 9:47	14.6	11.9	2.92	3.89	0.012	0.100	
5	9/15/2017 9:32	9/15/2017 9:35	9/15/2017 9:37	17.5	14.7	2.41	2.44	0.744	0.116	0.016
6	9/15/2017 9:22	9/15/2017 9:25	9/15/2017 9:27	20.1	17.6	3.56	2.62	0.699	0.042	0.024
7	9/15/2017 9:08	9/15/2017 9:10	9/15/2017 9:16	22.3	20.3	2.67	2.55	0.423	0.068	0.007
8	9/15/2017 8:54	9/15/2017 8:58	9/15/2017 9:02	23.9	22.5	2.41	2.01	0.010	0.005	
9	9/15/2017 8:41	9/15/2017 8:46	9/15/2017 8:48	24.9	24.1	1.65	1.54	0.006	0.011	
10	9/15/2017 11:20	9/15/2017 11:23	9/15/2017 11:24	25.3	25.1	1.02	1.00	0.010	0.008	
11	9/15/2017 11:28	9/15/2017 11:32	9/15/2017 11:33	24.9	25.5	1.27	1.44	0.006	0.007	
12	9/15/2017 11:37	9/15/2017 11:41	9/15/2017 11:45	23.9	25.1	1.40	1.17	0.483	0.048	0.007
13	9/15/2017 11:50	9/15/2017 11:53	9/15/2017 11:57	22.3	24.1	1.14	1.36	0.554	0.032	0.033
14	9/15/2017 12:02	9/15/2017 12:04	9/15/2017 12:06	20.1	22.5	1.65	1.45	0.006	0.030	
15	9/15/2017 12:11	9/15/2017 12:13	9/15/2017 12:16	17.5	20.3	1.65	1.50	0.009	0.026	
16	9/15/2017 12:34	9/15/2017 12:36	9/15/2017 12:39	14.6	17.6	2.54	2.22	0.010	0.026	
17	9/15/2017 12:22	9/15/2017 12:24	9/15/2017 12:28	11.7	14.7	3.18	3.40	0.002	0.005	
18	9/15/2017 11:08	9/15/2017 11:11	9/15/2017 11:13	9.4	11.9	3.05	4.06	0.010	0.015	

Well Information

Well No.: 13
Municipal Address: 8771 Union Line
Distance from Turbine Centre: 2,326 m

Well No.: 14
Municipal Address: 8904 Union Line
Distance from Turbine Centre: 1,705 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. A peak well casing velocity of 0.675 mm/s measured during driving of Pile 9 at T14 was associated with a tractor-trailer truck driving northeast along Union Line (i.e., in lane closest to well).

Data for two 10-minute time periods on September 11, 2017 during which no pile driving occurred were evaluated with start times of 10:47 and 14:27 for Well 13 and 10:48 and 14:36 for Well 14. During these periods, the peak well casing vibration velocity was 0.079 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 13 from data obtained on September 14, 2017, at 11:24 and 16:38 and September 15, 2017 at 08:29. The peak particle velocity of the Well 13 casing during these periods was 0.099 mm/s. On September 19 and 21, 2017 during water sampling events when the pump was operating, the peak particle velocity of the Well 13 casing was 0.655 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 14 from data obtained on September 14, 2017, at 11:33 and 12:53 and September 15, 2017 at 08:35. The peak particle velocity of the Well 14 casing during these periods was 0.160 mm/s. On September 19, 2017 during a water sampling event when the pump was operating, the peak particle velocity of the Well 14 casing was 0.019 mm/s. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

T28 Issue Date: 12/5/2017

Turbine Location: T28

Vibration Measurements at Turbine Site								Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**MP12710**	**BE8719**	**MP12710**	**BE8719**	**Well 9**	**Well 10**	**No Pump[e]**
1	8/15/2017 14:33	8/15/2017 14:41	8/15/2017 14:43	21.6	19.3	1.53	1.52	0.061	0.020	
2	8/15/2017 14:53	8/15/2017 15:04	8/15/2017 15:06	23.9	22.0	1.40	1.27	0.019	0.036	
3	8/15/2017 15:31	8/15/2017 15:42	8/15/2017 15:44	25.6	24.3	1.17	1.27	0.111	0.805	0.019
4	8/15/2017 13:23	8/15/2017 13:37	8/15/2017 13:39	26.6	26.0		2.92	0.022	0.804	0.100
5	8/15/2017 12:10	8/15/2017 12:22	8/15/2017 12:24	27.0	27.0		2.16	0.108	0.158	
6	8/15/2017 11:46	8/15/2017 11:59	8/15/2017 12:00	26.6	27.4	1.22	1.14	0.012	0.095	
7	8/15/2017 9:56	8/15/2017 10:08	8/15/2017 10:11	25.6	27.0	1.58	1.02	0.027	0.052	
8	8/15/2017 9:16	8/15/2017 9:34	8/15/2017 9:36	23.9	26.0	1.51	1.11	0.040	0.009	
9	8/15/2017 8:51	8/15/2017 9:03	8/15/2017 9:04	21.6	24.3	1.74	1.27	0.046	0.015	
10	8/15/2017 8:18	8/15/2017 8:33	8/15/2017 8:35	19.0	22.0	1.70	1.27	NA[e]	0.750	0.026
11	8/15/2017 7:45	8/15/2017 7:58	8/15/2017 8:02	16.1	19.3	1.88	1.52	NA[e]	0.007	
12	8/11/2017 13:27	8/11/2017 14:45	8/11/2017 14:46	13.2	16.4	2.92	2.41	0.812	0.014	
13	8/11/2017 12:36	8/11/2017 12:48	8/11/2017 12:50	11.0	13.6	2.29	1.91	0.054	0.006	
14	8/11/2017 12:13	8/11/2017 12:25	8/11/2017 12:27	10.1	11.4	2.92	2.67	0.055	0.112	
15	8/11/2017 11:19	8/11/2017 11:28	8/11/2017 11:30	11.0	10.5	3.18	3.18	0.244	0.015	
16	8/11/2017 11:48	8/11/2017 12:02	8/11/2017 12:03	13.2	11.4	2.41	2.54	0.183	0.007	
17	8/11/2017 10:22	8/11/2017 11:06	8/11/2017 11:07	16.1	13.6	2.03	2.03	0.686	0.034	
18	8/15/2017 13:56	8/15/2017 14:09	8/15/2017 14:10	19.0	16.4	3.14		0.015	0.705	0.052
Restrikes										
2	8/16/2017 8:19	8/16/2017 8:19	8/16/2017 8:23	23.9	22.0	2.23		0.017	0.029	

Well Information

Well No.:	9	**Well No.:**	10
Municipal Address:	9557 Countryview Line	Municipal Address:	9709 Cedar Hedge Line
Distance from Turbine Centre:	2,568 m	Distance from Turbine Centre:	1,769 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Data for Well 9 was not available for August 15, 2017 during driving of piles 10 and 11 while awaiting site security changes implemented following an incident at the Well 9 property the evening of August 14, 2017. Highlighted values for Well 9 on August 11 and 14, 2017 are higher than and inconsistent with other measurements during pile driving at the T28 site. On August 11 and 14, 2017, electric power collection system construction and other activities were underway between Countryview Line and T32, located as close as about 100 m from Well 9. These activities included: hammering, movements of large construction equipment (e.g., loaders, dump trucks, excavators, "stone throwers"), and equipment travelled on access road site without construction mats, equipment operating along the T32 access road resulted in "pounding" sounds as noted by well monitoring personnel. The Well 9 area is also subject to heavy passing traffic on Countryview Line (74 m from well) including: fuel trucks, loaded dump trucks, large transport trucks, a bus, and cranes/boom trucks among other vehicles. Further analysis of Well 9 vibration data was undertaken for 10 minute periods on August 11, 2017 during which pile driving was not occuring between 08:32:00 and 08:42:00, 09:12:00 and 09:22:00, 11:22:00 and 11:32:00, and 13:48:00 and 13:58:00. During these periods the maximum velocities (regardless of direction) of the Well 9 casing ranged from 0.011 to 1.2 mm/s. Data shown for Well 9 during driving of Piles 12, 15, 16 and 17 (highlighted) are considered unrepresentative of pile driving and associated with other vibration sources. The piston pump for Well 9 is within the barn approximately 4 to 5 m from the well location. When the Well 9 pump was deliberately operated on September 8, 2017, in the absence of pile driving, well casing velocities were up to 0.04 mm/s. When the pump for Well 10 was operating, well casing vibrations of as much as 1.25 mm/s were measured. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 10 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T30

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells Particle Velocity (mm/s)[c, d]		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]				
Pile No.:	Start[a]	Rock/Till	End[a]	BE8719	BE18695	BE8719	BE18695	Well 9	Well 10	No Pump[e]
1	8/4/2017 14:24	8/4/2017 14:42	8/4/2017 15:01	24.9	27.6	2.14	4.32	0.054	0.815	0.014
1A	8/9/2017 9:30	8/9/2017 9:51	8/9/2017 9:58	25.9	28.6	2.16	2.41	0.080	0.935	0.027
2	8/8/2017 8:42	8/8/2017 8:52	8/8/2017 9:03	26.6	28.0	1.65	1.91	0.061	0.049	
3	8/8/2017 9:17	8/8/2017 9:25	8/8/2017 9:35	27.7	27.6	1.52	1.78	0.041	0.883	0.009
4	8/8/2017 7:49	8/8/2017 8:02	8/8/2017 8:10	28.1	26.5	1.27	1.52	0.035	1.251	0.036
5	8/4/2017 16:24	8/4/2017 16:32	8/4/2017 16:40	27.7	24.8	1.65	2.25	0.061	0.007	
6	8/4/2017 15:57	8/4/2017 16:03	8/4/2017 16:11	26.6	22.6	1.78	1.91	0.059	0.003	
7	8/4/2017 15:24	8/4/2017 15:34	8/4/2017 15:39	24.9	19.9	1.52	1.78	0.082	0.028	
8	8/4/2017 10:57	8/4/2017 11:03	8/4/2017 11:06	22.7	17.0	2.29	2.03	0.032	0.540	0.033
9	8/3/2017 13:33	8/3/2017 13:38	8/3/2017 13:46	20.0	14.1	2.29	2.29	0.076	0.088	
10	8/3/2017 13:07	8/3/2017 13:16	8/3/2017 13:20	17.1	12.0	2.29	2.41	0.088	0.014	
11	8/3/2017 11:46	8/3/2017 11:52	8/3/2017 11:56	14.2	11.1	3.68	2.92	0.029	0.007	
12	8/3/2017 11:25	8/3/2017 11:29	8/3/2017 11:34	12.1	12.0	3.30	3.30	0.066	0.005	
13	8/3/2017 10:44	8/3/2017 10:53	8/3/2017 10:59	11.2	14.1	3.81	5.33	0.059	0.876	0.005
14	8/3/2017 14:04	8/3/2017 14:11	8/3/2017 14:19	12.1	17.0	4.19	4.70	0.061	0.023	
15	8/3/2017 14:34	8/3/2017 14:47	8/3/2017 14:50	14.2	19.9	3.05	2.67	0.032	0.005	
16	8/4/2017 8:50	8/4/2017 8:55	8/4/2017 9:08	17.1	22.6	3.68	2.67	0.048	0.032	
17	8/4/2017 9:32	8/4/2017 9:38	8/4/2017 9:43	20.0	24.8	2.54	2.41	0.051	0.002	
18	8/4/2017 10:17	8/4/2017 10:33	8/4/2017 10:36	22.7	26.5	2.54	2.16	0.024	0.004	
Restrikes and Continued Pile Driving										
15C	8/4/2017 8:15	8/4/2017 8:15	8/4/2017 8:21	14.2	19.9	4.57	4.70	0.044	0.022	
1	8/8/2017 15:19	8/8/2017 15:19	8/8/2017 15:25	24.9	27.6	1.40	1.78	0.080	0.006	
5	8/8/2017 8:15	8/8/2017 8:15	8/8/2017 8:20	27.7	24.8	1.27	1.65	0.056	1.016	0.006
6	8/8/2017 9:40	8/8/2017 9:40	8/8/2017 9:41	26.6	22.6	1.40	1.65	0.041	1.116	0.146

Well Information

Well No.: 9
Municipal Address: 9557 Countryview Line
Distance from Turbine Centre: 1,808 m

Well No.: 10
Municipal Address: 9709 Cedar Hedge Line
Distance from Turbine Centre: 1,385 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Piles noted with "A" represent piles installed to replace similarly-numbered piles. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes" (where applicable). Piles noted with "C" were those that were started on one day and continued on a separate day; therefore, additional well monitoring data is presented for the time periods during which piling continued on till/rock. When the pump for Well 10 was operating, well casing vibrations of as much as 1.25 mm/s were measured. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 10 are shown in the "no pump" column. Total driving duration between till/rock start and end times noted above for Pile 1 is not representative and actual driving duration was 00:11:50 due to pauses in actual hammering.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T31

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells	
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]	
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**BE14711**	**BE18695**	**BE14711**	**Well 7**	**Well 8**
1	7/17/2017 13:18	7/17/2017 13:24	7/17/2017 13:26	8.1	25.5	1.40	1.40	0.042	0.028
2	7/17/2017 14:46	7/17/2017 14:52	7/17/2017 14:54	9.1	25.9	1.40	1.14	0.038	0.034
3	7/18/2017 7:39	7/18/2017 7:47	7/18/2017 7:49	11.4	25.5	1.78	1.52	0.016	0.075
4	7/18/2017 8:03	7/18/2017 8:10	7/18/2017 8:13	14.3	24.5	1.40	1.27	0.023	0.005
5	7/17/2017 12:56	7/17/2017 13:01	7/17/2017 13:05	17.2	22.8	1.27	1.14	0.020	0.071
6	7/17/2017 11:49	7/17/2017 11:53	7/17/2017 11:54	19.8	20.6	1.40	1.91	0.100	0.099
7	7/17/2017 11:25	7/17/2017 11:30	7/17/2017 11:35	22.0	18.0	1.78	2.16	0.014	0.028
8	7/17/2017 10:25	7/17/2017 10:31	7/17/2017 10:36	23.6	15.1	2.03	2.03	0.044	0.028
9	7/17/2017 8:03	7/17/2017 8:09	7/17/2017 8:30	24.6	12.2	2.54	2.92	0.011	0.041
10	NA[e]	NA[e]	NA[e]	25.0	9.9	NA[e]	NA[e]	NA[e]	NA[e]
11	7/14/2017 16:18	7/14/2017 16:25	7/14/2017 16:28	24.6	9.0	3.68	3.30	0.041	NA[e]
12	7/13/2017 15:38	7/13/2017 15:44	7/13/2017 15:45	23.6	9.9	0.13	0.13	0.037	0.034
13	7/13/2017 16:12	7/13/2017 16:26	7/13/2017 16:30	24.6	12.2	5.08	5.08	0.012	0.015
14	7/14/2017 8:22	7/14/2017 8:47	7/14/2017 8:48	25.0	15.1	5.46	3.94	0.072	0.023
15	7/13/2017 16:56	7/13/2017 17:06	7/13/2017 17:08	24.6	18.0	3.43	2.54	0.156	0.020
16	7/14/2017 11:18	7/14/2017 11:23	7/14/2017 11:29	23.6	20.6	2.92	2.16	0.044	0.034
17	7/14/2017 11:40	7/14/2017 11:48	7/14/2017 11:51	22.0	22.8	2.54	2.03	0.074	0.075
18	7/14/2017 12:10	7/14/2017 12:16	7/14/2017 12:21	19.8	24.5	2.03	1.91	0.050	0.041

Well Information

Well No.: 7
Municipal Address: 25117 Prince Albert Road
Distance from Turbine Centre: 636 m

Well No.: 8
Municipal Address: 9241 Countryview Line
Distance from Turbine Centre: 2,497 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: On July 14, 2017 at about 14:00, Golder was informed that piling operations at T31 were concluded. At 15:45 instruments were therefore turned off at Well 8 in preparation for removal for the day. Piling resumed at approximately 16:15. As a result, data was not captured for Wells 7 and 8 when driving Pile 10 and Well 8 when driving Pile 11. Well monitoring undertaken during periods of time when pile driving was not occuring measured maximum particle velocities of as much as 0.37 mm/s at Well 7. Total driving duration between till/rock start and end times noted above for Pile 9 is not representative and actual driving duration was 00:04:00 due to pauses in actual hammering. Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

Golder Associates Ltd.

T32 Issue Date: 12/5/2017

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: **T32**

		Vibration Measurements at Turbine Site						Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	Start[a]	Rock/Till	End[a]	MP12721	BE8719	MP12721	BE8719	Well 9	Well 10	No Pump[e]
1	8/11/2017 14:41	8/11/2017 14:43	8/11/2017 15:01	25.0	26.0	0.127	0.127	0.069	0.020	
2	8/14/2017 15:43	8/14/2017 15:46	8/14/2017 16:19	23.3	25.0	2.16	1.397	0.050	0.013	
3	8/14/2017 16:25	8/14/2017 16:28	8/14/2017 16:57	21.1	23.3	2.42	2.032	0.045	0.045	
4	8/14/2017 14:51	8/14/2017 14:55	8/14/2017 15:21	18.4	21.1	2.443	2.286	0.046	0.697	0.017
5	8/14/2017 13:52	8/14/2017 13:55	8/14/2017 14:11	15.5	18.4	2.656		0.059	0.035	
6	8/14/2017 13:12	8/14/2017 13:15	8/14/2017 13:33	12.7	15.5	2.932		0.055	0.009	
7	8/14/2017 11:40	8/14/2017 11:42	8/14/2017 12:18	10.4	12.7	3.925	3.175	0.062	0.049	
8	8/14/2017 11:20	8/14/2017 11:23	8/14/2017 11:33	9.5	10.4	4.296	4.064	0.050	0.880	0.014
9	8/14/2017 7:47	8/14/2017 7:50	8/14/2017 7:54	10.4	9.5	4.359	4.826	0.041	0.733	0.006
10	8/14/2017 10:59	8/14/2017 11:04	8/14/2017 11:12	12.7	10.4	3.121	4.064	0.028	0.010	
11	8/11/2017 10:53	8/11/2017 10:56	8/11/2017 11:00	15.5	12.7	3.429	3.175	1.090	0.049	
12	8/11/2017 10:42	8/11/2017 10:44	8/11/2017 10:47	18.4	15.5	2.159	2.54	0.871	0.014	
13	8/11/2017 10:28	8/11/2017 10:30	8/11/2017 10:34	21.1	18.4	2.413	1.905	1.346	0.738	0.005
14	8/11/2017 10:14	8/11/2017 10:19	8/11/2017 10:21	23.3	21.1	1.524	1.778	0.068	0.051	
15	8/11/2017 9:00	8/11/2017 9:03	8/11/2017 9:07	25.0	23.3	1.397	1.524	0.037	0.764	0.004
16	8/11/2017 11:07	8/11/2017 11:10	8/11/2017 11:14	26.0	25.0	1.397	1.016	0.229	0.034	
17	8/11/2017 13:12	8/11/2017 13:14	8/11/2017 13:19	26.4	26.0	1.778	1.27	0.230	0.684	0.009
18	8/11/2017 13:26	8/11/2017 13:28	8/11/2017 13:42	26.0	26.4	1.397	1.27	0.135	0.713	0.004

Well Information

Well No.: 9
Municipal Address: 9557 Countryview Line
Distance from Turbine Centre: 680 m

Well No.: 10
Municipal Address: 9709 Cedar Hedge Line
Distance from Turbine Centre: 1,122 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Highlighted values for Well 9 on August 11 and 14, 2017 are higher than and inconsistent with other measurements during pile driving at the T32 site. On August 11 and 14, 2017, electric power collection system construction and other activities were underway between Countryview Line and T32, located as close as about 100 m from the well. These activities included: hammering, movements of large construction equipment (e.g., loaders, dump trucks, excavators, aggregate delivery equipment), and equipment travelled on site access road without construction mats, equipment operating on the T32 access road resulted in "pounding" sounds as noted by well monitoring personnel. Well 9 area is subject to heavy passing traffic on Countryview Line (74 m from well) including: fuel trucks, loaded dump trucks, large transport trucks, a bus, and cranes/boom trucks among other vehicles. Further analysis of Well 9 vibration data was undertaken for 10 minute periods on August 11, 2017 during which pile driving was not occuring between 08:32:00 and 08:42:00, 09:12:00 and 09:22:00, 11:22:00 and 11:32:00, and 13:48:00 and 13:58:00. During these periods, the peak velocities (regardless of direction) of the Well 9 casing ranged from 0.011 to 1.2 mm/s. Data shown for Well 9 during driving of Piles 11, 12, 13, 16, 17 and 18 (highlighted) are considered unrepresentative of pile driving and associated with other vibration sources. The piston pump for Well 9 is within the barn approximately 4 to 5 m from the well location. When the pump for Well 10 was operating, well casing vibrations of as much as 1.25 mm/s were measured. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 10 are shown in the "no pump" column. Instrument BE18695 used in lieu of MP12721 on August 11, 2017.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T33

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	Start[a]	Rock/Till	End[a]	MP12721	BE69555	MP12721	BE69555	Well 3	Well 4	No Pump[e]
1	9/5/2017 13:10	9/5/2017 13:16	9/5/2017 13:25	10.9	12.1	5.3	3.7	0.015	0.118	
2	9/5/2017 13:46	9/5/2017 13:55	9/5/2017 14:03	11.8	11.2	2.8	3.3	0.011	0.138	
3	9/5/2017 14:11	9/5/2017 14:20	9/5/2017 14:27	14.0	12.1	2.9	3.4	0.056	0.174	
4	9/5/2017 14:38	9/5/2017 14:46	9/5/2017 14:54	16.8	14.2	2.2	2.7	0.035	0.082	
5	9/5/2017 15:05	9/5/2017 15:13	9/5/2017 15:18	19.7	17.1	2.1	2.2	0.049	0.137	
6	9/5/2017 15:34	9/5/2017 15:44	9/5/2017 15:48	22.4	20.0	2.2	1.9	0.009	0.072	
7	9/5/2017 17:02	9/5/2017 17:10	9/5/2017 17:10	24.6	22.7	2.2	2.3	0.030	0.298	
8	9/5/2017 17:32	9/5/2017 17:41	9/5/2017 17:49	26.3	24.9	2.0	2.3	0.036	0.131	
9	9/5/2017 18:14	9/5/2017 18:21	9/5/2017 18:28	27.4	26.6	1.4	1.4	0.034	0.083	
10	9/6/2017 9:30	9/6/2017 9:47	9/6/2017 9:53	27.8	27.7	1.3	1.4	0.004	0.243	
11	9/6/2017 10:09	9/6/2017 10:25	9/6/2017 10:35	27.4	28.1	1.5	1.8	0.004	0.089	
12	9/6/2017 12:03	9/6/2017 12:16	9/6/2017 12:26	26.3	27.7	1.5	1.8	0.005	0.179	
13	9/6/2017 12:58	9/6/2017 13:08	9/6/2017 13:16	24.6	26.6	1.8	1.9	0.003	0.162	
14	9/6/2017 13:33	9/6/2017 13:43	9/6/2017 13:58	22.4	24.9	1.9	2.0	0.004	0.161	
15	9/6/2017 14:37	9/6/2017 14:45	9/6/2017 14:54	19.7	22.7	0.5	0.4	0.005	4.987	
16	9/6/2017 16:01	9/6/2017 16:08	9/6/2017 16:20	16.8	20.0	1.8	1.8	0.006	0.277	
17	9/6/2017 15:29	9/6/2017 15:35	9/6/2017 15:45	14.0	17.1	2.5	2.2	0.003	0.175	
18	9/6/2017 14:13	9/6/2017 14:24	9/6/2017 14:36	11.8	14.2	4.1	2.2	0.004	0.622	
Restrikes										
6	9/6/2017 18:15	9/6/2017 18:15	9/6/2017 18:23	22.4	20.0	1.1	1.4	0.009	4.858	
5	9/6/2017 17:02	9/6/2017 17:02	9/6/2017 17:03	19.7	17.1	1.1	1.1	0.023	0.129	

Well Information

Well No.: 3
Municipal Address: 8522 Bush Line
Distance from Turbine Centre: 1,778 m

Well No.: 4
Municipal Address: 26347 St. Clair Road
Distance from Turbine Centre: 2,080 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". During vibration monitoring on September 5, 2017, a forklift operated close to the geophone between 16:00:00 and 16:30:00 and triggered a maximum peak particle velocity of 6.2 mm/s. Value shown above excludes the peak measurement triggered by the forklift. On September 5, 2017, tractors, harvest haul trucks and other equipment travelled through Well 3 property frequently from 12:48 to 15:55 and occasionally thereafter until 16:50. On September 5, 2017, St. Clair Road traffic passing at 78 m from Well 4 was observed to include large tractor-trailers, concrete mixers and dump trucks at a rate of about 1 heavy vehicle every 1.5 to 2 minutes. Passenger vehicle movements on the Well 4 property passed and were parked near the well at 12:10, 14:40, 14:47, 15:06, 15:17, 15:42, 16:16, 16:35 and 19:02. On September 6, 2017, heavy vehicle traffic near Well 4 was similar to September 5, 2017. Combine harvesting was on-going as close as 25 to 30 m from Well 4, starting at 8:53 and continuing to after 14:30 on September 6, 2017. Passenger vehicle traffic on September 6, 2017 adjacent to Well 4 on the property was noted at 7:41, 10:40 - 10:45, 10:56 - 11:04, 11:46 - 11:52, 12:57 - 12:59, 13:22, 14:31, 14:36, 16:35, 16:42, 16:49, and 18:34. Various individuals were at and in the well shed at 16:35 to 16:54. Prior to September 6, 2017 observations by Golder personnel indicated that a pump was not connected at Well 4. During the afternoon of September 6, 2017 a pump was connected and operational. From 17:02 to 17:18 the newly connected Well 4 pump was cycled on and off, operating for periods of 1 to more than 7 minutes. The owner was physically working on Well 4 after 17:18 and returning to well shed frequently. All data highlighted above is considered to have been significantly influenced by near-well activities, particularly work directly related to the Well 4 pump and shed.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T34

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells	
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]	
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**MP12710**	**MP12721**	**MP12710**	**MP12721**	**Well 3**	**Well 4**
1	10/16/2017 16:02	10/17/2017 12:01	10/17/2017 12:14	22.6	23.5	2.70	1.70	0.019	NA[e]
2	10/16/2017 15:53	10/18/2017 10:37	10/18/2017 10:48	21.0	22.5	1.91	1.85	0.049	NA[e]
3	10/16/2017 15:44	10/17/2017 13:24	10/17/2017 13:32	18.9	20.9	2.37	2.32	0.008	NA[e]
4	10/16/2017 15:34	10/17/2017 14:48	10/17/2017 14:54	16.3	18.8	2.56	1.78	0.014	NA[e]
5	10/16/2017 15:27	10/17/2017 15:40	10/17/2017 15:49	13.5	16.2	3.00	2.74	0.015	NA[e]
6	10/16/2017 15:17	10/18/2017 12:22	10/18/2017 12:32	10.6	13.4	2.92	3.52	0.005	NA[e]
7	10/16/2017 14:58	10/18/2017 9:27	10/18/2017 9:36	8.1	10.5	3.99	3.59	0.010	NA[e]
8	10/16/2017 15:07	10/17/2017 11:29	10/17/2017 11:41	7.1	8.0	6.67	4.82	0.007	NA[e]
9	10/17/2017 8:35	10/18/2017 14:28	10/18/2017 14:36	8.1	7.0	4.64	5.43	0.020	NA[e]
10	10/17/2017 8:45	10/18/2017 16:06	10/18/2017 16:15	10.6	8.0	3.56	6.01	0.010	NA[e]
11	10/17/2017 9:15	10/19/2017 7:51	10/19/2017 8:16	13.5	10.5	3.56	5.16	0.009	NA[e]
12	10/17/2017 9:29	10/19/2017 8:59	10/19/2017 9:06	16.3	13.4	2.25	4.01	0.009	NA[e]
13	10/17/2017 16:39	10/17/2017 16:45	10/17/2017 16:51	18.9	16.2	2.93	2.67	0.017	NA[e]
14	10/18/2017 15:18	10/19/2017 11:16	10/19/2017 11:24	21.0	18.8	2.08	2.22	0.008	NA[e]
15	10/18/2017 15:08	10/19/2017 12:22	10/19/2017 12:38	22.6	20.9	1.57	2.00	0.005	NA[e]
16	10/18/2017 15:00	10/19/2017 13:14	10/19/2017 13:25	23.6	22.5	1.50	1.80	0.005	NA[e]
17	10/18/2017 14:48	10/18/2017 14:52	10/18/2017 14:53	24.0	23.5	1.45	1.36	0.023	NA[e]
18	10/16/2017 16:12	10/18/2017 14:56	10/18/2017 15:04	23.6	23.9	1.40	1.36	0.020	NA[e]
Restrikes and Continued Pile Driving									
17C	10/19/2017 16:26	10/19/2017 16:26	10/19/2017 16:36	23.6	23.9	2.12	2.31	0.009	NA[e]
13C	10/31/2017 16:26	10/31/2017 16:35	10/31/2017 16:48	18.9	16.2	4.54	4.19	0.018	NA[e]
4C	10/31/2017 10:31	10/31/2017 10:31	10/31/2017 11:17	16.3	18.8	3.68	3.30	0.007	NA[e]
5C	10/31/2017 11:21	10/31/2017 11:21	10/31/2017 11:38	13.5	16.2	3.99	4.45	0.009	NA[e]
6C	10/31/2017 11:41	10/31/2017 11:41	10/31/2017 12:09	10.6	13.4	3.18	4.06	0.006	NA[e]
7C	10/31/2017 14:30	10/31/2017 14:30	10/31/2017 14:48	8.1	10.5	4.35	5.46	0.006	NA[e]
8C	10/31/2017 14:51	10/31/2017 14:51	10/31/2017 15:21	7.1	8.0	6.27	7.49	0.024	NA[e]
18C	11/1/2017 13:44	11/1/2017 13:44	11/1/2017 13:52	23.6	23.9	1.90	2.16	0.010	NA[e]
17C	11/1/2017 13:53	11/1/2017 13:53	11/1/2017 14:02	24.0	23.5	2.39	2.03	0.003	NA[e]
12C	11/1/2017 8:15	11/1/2017 8:15	11/1/2017 8:40	16.3	13.4	3.67	3.56	0.014	NA[e]
10C	11/1/2017 10:48	11/1/2017 10:48	11/1/2017 11:27	10.6	8.0	6.50	4.06	0.007	NA[e]
9C	11/1/2017 12:03	11/1/2017 12:03	11/1/2017 12:38	8.1	7.0	7.20	4.95	0.010	NA[e]
1C	11/1/2017 13:35	11/1/2017 13:35	11/1/2017 13:42	22.6	23.5	2.04	2.67	0.006	NA[e]
3C	11/1/2017 16:20	11/1/2017 16:20	11/1/2017 16:41	18.9	20.9	3.34	4.45	0.010	NA[e]
14C	11/2/2017 10:50	11/2/2017 10:53	11/2/2017 11:24	21.0	18.8	2.27	2.29	0.005	NA[e]
1C	11/2/2017 9:11	11/2/2017 9:11	11/2/2017 9:16	22.6	23.5	1.92	2.54	0.005	NA[e]
2C	11/2/2017 8:30	11/2/2017 8:30	11/2/2017 9:07	21.0	22.5	2.06	2.79	0.001	NA[e]
15C	11/2/2017 12:25	11/2/2017 12:25	11/2/2017 13:32	22.6	20.9	3.18	2.29	0.003	NA[e]
16C	11/2/2017 10:43	11/2/2017 10:43	11/2/2017 13:49	23.6	22.5	2.93	3.30	0.004	NA[e]
17C	11/2/2017 9:41	11/2/2017 9:41	11/2/2017 10:07	24.0	23.5	1.78	1.65	0.003	NA[e]
18C	11/2/2017 9:19	11/2/2017 9:19	11/2/2017 9:39	23.6	23.9	1.37	1.40	0.017	NA[e]
14C	11/8/2017 8:12	11/8/2017 8:12	11/8/2017 8:26	21.0	18.8	1.27	1.91	0.026	NA[e]

Well Information

Well No.: 3

Municipal Address: 25117 Prince Albert Road

Distance from Turbine Centre: 2,638 m

Well No.: 4

Municipal Address: 9241 Countryview Line

Distance from Turbine Centre: 3,258 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

NORTH KENT 1
Vibration Monitoring Data Report

Monitoring Notes: After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Piles that were spliced that were then driven deeper are indicated "C" for continuation of pile depth. Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Pile driving was stopped and restarted on multiple days to address splicing and final pile depth requirements. Respective stop/restart times for individual piles were as shown in parentheses following pile number: 1 (10/16 at 16:06; 10/17 at 12:01); 2 (10/16 at 15:58; 10/18 at 10:36:10); 3 (10/16 at 15:48:15; 10/17 at 13:23); 4 (10/16 at 15:39; 10/17 at 14:46:00), 5 (10/16 at 15:30; 10/17 at 15:39), 6 (10/16 at 15:21, 10/18 at 12:21), 7 (10/16 15:01:50 on 10/16, 10/18 at 9:26), 8 (10/16 at 15:11, 10/17 at 11:28), 9 (10/17 at 8:40, 10/18 at 14:27), 10 (10/17 at 8:52, 10/18 at 16:05), 11 (10/17 at 9:19, 10/19 at 7:50), 12 (10/17 at 9:34, 10/19 at 8:59), 16 (10/18 at 15:04, 10/19 at 13:14), 18 (10/16 at 16:21, 10/18 at 14:50), 14C (11/8 at 8:21, 11/8 at 8:26) 15C (11/2 at 12:34, 11/2 at 13:30). Prior to the continued pile driving as shown for the second and third driving times (where applicable for each pile), the depth of the continued advancement was predrilled. Therefore, two intervals of vibration analyses are summarized above where the first instance is consistent with the hardest driving prior to predrilling and the second instance reflects the hard driving at the final depth of the pile once the pile achieved depths that had not been predrilled. Well 4 was unavailable for monitoring after September 10, 2017. Geophone serial numbers BE18695 and BE9555 used on November 8, 2017 in lieu of MP12710 and MP12721, respectively.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

T35 Issue Date: 12/5/2017

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T35

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE14711**	**BE15696**	**BE14711**	**BE15696**	**Well 5**	**Well 6**	**No Pump[e]**
1	6/21/2017 9:16	6/21/2017 9:31	6/21/2017 9:58	25.6	27.0	3.56	4.32	0.005	0.011	
1A	7/4/2017 14:09	7/4/2017 14:15	7/4/2017 14:20	26.6	28.0	2.54	2.79	0.011	0.085	
2	6/28/2017 11:40	6/28/2017 11:50	6/28/2017 11:56	26.0	28.1	2.29	2.67	0.004	0.002	
3	6/29/2017 11:15	6/29/2017 11:26	6/29/2017 11:37	25.6	28.5	2.67	2.79	0.004	0.080	0.009
4	6/29/2017 11:45	6/29/2017 12:28	6/29/2017 12:35	24.6	28.1	2.29	2.41	0.002	0.003	
5	6/29/2017 10:36	6/29/2017 10:53	6/29/2017 10:59	22.9	27.0	2.79	2.29	0.003	0.008	
6	6/29/2017 9:49	6/29/2017 10:09	6/29/2017 10:19	20.7	25.3	2.03	1.91	0.002	0.017	
7	6/28/2017 16:45	6/28/2017 16:55	6/28/2017 16:59	18.1	23.0	1.78	1.65	0.002	0.006	
8	6/28/2017 16:19	6/28/2017 16:28	6/28/2017 16:36	15.2	20.3	1.78	1.91	0.004	0.008	
9	6/29/2017 15:55	6/29/2017 16:03	6/29/2017 16:09	12.3	17.4	0.13	0.25	0.003	0.011	
10	6/28/2017 15:23	6/28/2017 15:35	6/28/2017 15:43	10.0	14.6	5.21	4.06	0.002	0.010	
11	6/28/2017 14:34	6/28/2017 14:52	6/28/2017 14:56	9.1	12.4	7.37	5.33	0.002	0.081	0.011
12	6/28/2017 14:04	6/28/2017 14:19	6/28/2017 14:23	10.0	11.6	7.37	6.86	0.003	0.016	
13	6/26/2017 16:52	6/26/2017 17:15	6/26/2017 17:22	12.3	12.4	3.43	6.22	0.004	0.093	0.015
13A	6/30/2017 10:53	6/30/2017 11:24	6/30/2017 11:36	13.3	13.4	4.19	4.19	0.001	0.093	0.015
14	6/28/2017 8:34	6/28/2017 8:59	6/28/2017 9:16	15.2	14.6	2.54	2.67	0.005	0.110	0.023
15	6/26/2017 16:03	6/26/2017 16:26	6/26/2017 16:28	18.1	17.4	3.68	4.45	0.002	0.009	
15A	7/4/2017 12:54	7/4/2017 13:00	7/4/2017 13:21	19.1	18.4	3.18	2.79	0.008	0.130	
16	6/28/2017 9:32	6/28/2017 9:52	6/28/2017 9:57	20.7	20.3	3.30	4.57	0.002	0.004	
17	6/26/2017 7:45	6/26/2017 8:19	6/26/2017 8:20	18.1	23.0	4.19	4.83	0.012	0.002	
17A	7/4/2017 13:39	7/4/2017 13:45	7/4/2017 13:51	19.1	24.0	3.30	3.94	0.004	0.105	
18	6/28/2017 10:40	6/28/2017 10:55	6/28/2017 11:25	20.7	25.3	2.41	2.16	0.004	0.015	
Restrikes										
1	6/26/2017 7:39	6/26/2017 7:39	6/26/2017 7:40	25.6	27.0	0.28	0.28	0.007	0.007	
17	6/28/2017 12:54	6/28/2017 12:54	6/28/2017 13:14	18.1	23.0	0.89	1.65	0.004	0.014	
10	6/29/2017 13:31	6/29/2017 13:31	6/29/2017 13:32	10.0	14.6	3.43	3.04	0.006	0.004	
13	6/29/2017 13:37	6/29/2017 13:37	6/29/2017 13:42	13.3	13.4	1.14	1.52	0.004	0.002	
14	6/29/2017 13:47	6/29/2017 13:47	6/29/2017 13:50	15.2	14.6	1.65	2.05	0.006	0.003	
16	6/29/2017 13:54	6/29/2017 13:54	6/29/2017 13:56	20.7	20.3	1.65	1.65	0.005	0.003	
15	6/29/2017 14:20	6/29/2017 14:20	6/29/2017 14:25	18.1	17.4	3.43	3.68	0.008	0.011	
PDA										
13A	7/6/2017 10:06	7/6/2017 10:06	7/6/2017 10:15	13.3	13.4	2.413	2.667	0.005	0.138	
13	7/6/2017 11:05	7/6/2017 11:05	7/6/2017 11:23	12.3	12.4	3.302	5.207	0.006	0.219	
15A	7/6/2017 11:39	7/6/2017 11:39	7/6/2017 11:40	19.1	18.4	1.524	2.032	0.009	0.130	
17A	7/6/2017 11:55	7/6/2017 11:55	7/6/2017 11:56	19.1	24.0	1.016	2.032	0.010	0.061	
1A	7/6/2017 12:18	7/6/2017 12:18	7/6/2017 12:18	26.6	28.0	1.524	1.397	0.011	0.084	

Well Information

Well No.:	5	**Well No.:**	6
Municipal Address:	9559 Pioneer Line	Municipal Address:	24123 Prince Albert Road
Distance from Turbine Centre:	623 m	Distance from Turbine Centre:	880 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

NORTH KENT 1
Vibration Monitoring Data Report

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Tractor was observed operating frequently near Well 6. Water pump was observed cycling on and off during pile driving operations and remaining on for periods of 2 to 4 minutes. When pump was operating, casing at Well 6 exhibited particle velocities in the range of 0.08 to 0.12 mm/s and dominated analysis of data. Pile restrike events were of short duration with the following total number of hammer blows shown in parentheses: Pile 1 (20), Pile 10 (5 to 7), 13 (205), 14 (140), 16 (51), 15 (214). Pile 17 experienced 446 hammer blows over a period of 9 minutes. Piles noted with PDA indicate restrike events during which pile dynamics analyzer monitoring was completed. Piles noted with "A" represent piles installed to replace similarly-numbered piles. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Monitoring of deliberate pump operation at Well 6 on July 13, 2017, during a period when no pile driving was occuring, measured peak well casing velocities of 0.08 to 0.8 mm/s. Where total driving duration between till/rock start and end times noted above is not representative, actual driving duration for each pile is shown in parentheses following the pile number in minutes and seconds: 13A(10:00), 15A(6:24), 17 restrike (14:00), 13PDA(6:20). Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 6 are shown in the "no pump" column. Farm and silo equipment operating on July 4 and 6, 2017 on well property.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T36

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE15696**	**BE9555**	**BE15696**	**BE9555**	**Well 5**	**Well 6**	**No Pump[e]**
1	7/26/2017 10:33	7/26/2017 10:38	7/26/2017 10:48	23.3	25.2	4.19	3.68	0.005	0.086	
2	7/26/2017 18:16	7/26/2017 18:21	7/26/2017 18:28	21.1	23.5	2.92	2.54	0.003	0.016	
3	7/26/2017 19:24	7/26/2017 19:28	7/26/2017 19:42	18.4	21.3	1.68	1.27	0.002	0.005	
4	7/26/2017 18:37	7/26/2017 19:07	7/26/2017 19:19	15.5	18.6	2.79	1.78	0.002	0.027	
5	7/26/2017 17:59	7/26/2017 18:04	7/26/2017 18:10	12.7	15.7	4.19	3.43	0.012	0.016	
6	7/26/2017 17:30	7/26/2017 17:34	7/26/2017 17:44	10.4	12.9	6.22	4.70	0.004	0.032	
7	7/26/2017 17:10	7/26/2017 17:13	7/26/2017 17:23	9.5	10.6	7.87	5.72	0.010	0.044	
8	7/26/2017 16:41	7/26/2017 16:45	7/26/2017 16:56	10.4	9.7	6.48	6.99	0.007	0.038	
9	7/26/2017 16:19	7/26/2017 16:23	7/26/2017 16:33	12.7	10.6	4.45	5.08	0.004	0.010	
10	7/26/2017 15:48	7/26/2017 15:51	7/26/2017 16:03	15.5	12.9	3.18	3.68	0.005	0.070	
11	7/26/2017 15:12	7/26/2017 15:15	7/26/2017 15:23	18.4	15.7	2.79	3.18	0.004	0.045	
12	7/26/2017 14:32	7/26/2017 14:45	7/26/2017 14:57	21.1	18.6	2.54	2.67	0.005	0.048	
13	7/26/2017 14:15	7/26/2017 14:21	7/26/2017 14:28	23.3	21.3	1.91	2.29	0.014	0.018	
14	7/26/2017 13:58	7/26/2017 14:03	7/26/2017 14:08	25.0	23.5	1.91	2.41	0.009	0.031	
15	7/26/2017 13:16	7/26/2017 13:20	7/26/2017 13:32	26.0	25.2	1.14	1.40	0.005	0.111	0.029
16	7/26/2017 12:48	7/26/2017 12:53	7/26/2017 13:05	26.4	26.2	1.52	1.52	0.011	0.038	
17	7/26/2017 11:41	7/26/2017 11:47	7/26/2017 11:56	26.0	26.6	2.79	2.79	0.005	0.021	
18	7/26/2017 11:08	7/26/2017 11:12	7/26/2017 11:22	25.0	26.2	3.94	3.68	0.006	0.068	
Restrikes										
16	7/27/2017 7:36	7/27/2017 7:36	7/27/2017 7:37	26.4	26.2	0.51	0.68	0.003	0.437	0.028

Well Information

Well No.: 5
Municipal Address: 9559 Pioneer Line
Distance from Turbine Centre: 4,201 m

Well No.: 6
Municipal Address: 24123 Prince Albert Road
Distance from Turbine Centre: 3,380 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. A single restrike event occured on July 27, 2017 with a total of 24 hammer blows on Pile 16 during a period of approximately 65 seconds. Water pump at Well 6 was observed cycling on and off during pile driving operations and remaining on for periods of 2 to 4 minutes. When pump was operating during pile driving, casing at Well 6 exhibited particle velocities of up to 0.44 mm/s and pump operation dominated data. Monitoring of deliberate pump operation at Well 6 on July 13, 2017, during a period when no pile driving was occuring, measured peak velocities of 0.08 to 0.8 mm/s. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 6 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) Data shown is for Well 6 exclusive of influence of pump, see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T38

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells	
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]	
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**MP12710**	**BE18695**	**MP12710**	**Well 7**	**Well 8**
1	10/23/2017 9:35	10/23/2017 11:05	10/23/2017 11:08	20.1	17.5	2.54	2.93	0.058	0.055
2	10/23/2017 11:24	10/23/2017 11:31	10/23/2017 11:34	22.3	20.1	1.65	2.29	0.022	0.049
3	10/24/2017 8:51	10/24/2017 8:57	10/24/2017 9:06	23.9	22.3	1.91	2.41	0.067	0.049
4	10/24/2017 9:16	10/24/2017 9:24	10/24/2017 9:28	24.9	23.9	1.02	1.63	0.037	0.050
5	10/24/2017 8:34	10/24/2017 8:40	10/24/2017 8:44	25.3	24.9	1.27	1.94	0.109	0.072
6	10/24/2017 8:16	10/24/2017 8:20	10/24/2017 8:25	24.9	25.3	1.52	1.73	0.121	0.045
7	10/24/2017 7:51	10/24/2017 8:02	10/24/2017 8:05	23.9	24.9	1.78	1.97	0.051	0.102
8	10/23/2017 16:21	10/23/2017 16:26	10/23/2017 16:31	22.3	23.9	1.27	1.28	0.063	0.057
9	10/23/2017 15:53	10/23/2017 15:58	10/23/2017 16:09	20.1	22.3	2.67	2.21	0.053	0.058
10	10/23/2017 15:32	10/23/2017 15:38	10/23/2017 15:44	17.5	20.1	2.03	2.46	0.021	0.061
11	10/23/2017 14:57	10/23/2017 15:02	10/23/2017 15:20	14.6	17.5	2.41	2.54	0.013	0.042
12	10/23/2017 14:34	10/23/2017 14:40	10/23/2017 14:48	11.7	14.6	2.54	3.44	0.029	0.054
13	10/23/2017 14:15	10/23/2017 14:19	10/23/2017 14:22	9.4	11.7	3.81	4.17	0.106	0.053
14	10/23/2017 13:28	10/23/2017 13:33	10/23/2017 13:40	8.4	9.4	4.57	5.01	0.017	0.037
15	10/23/2017 13:01	10/23/2017 13:08	10/23/2017 13:13	9.4	8.4	4.19	5.79	0.047	0.032
16	10/23/2017 12:34	10/23/2017 12:40	10/23/2017 12:47	11.7	9.4	3.05	4.84	0.053	0.063
17	10/23/2017 12:13	10/23/2017 12:18	10/23/2017 12:22	14.6	11.7	2.29	3.22	0.160	0.041
18	10/23/2017 11:49	10/23/2017 11:55	10/23/2017 12:00	17.5	14.6	2.16	4.30	0.121	0.042

Well Information

Well No.: 7
Municipal Address: 25117 Prince Albert Road
Distance from Turbine Centre: 2,133 m

Well No.: 8
Municipal Address: 9241 Countryview Line
Distance from Turbine Centre: 2,487 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Driving of Pile 1 paused between 9:36:16 and 11:00:52 to repair problem with hammer. Driving of Pile 11 paused between 15:03:30 and 15:09:01. Well 8 is located in high traffic area, approximately 56 m from centreline of Countryview Line, with relatively steady passenger car and light truck traffic with tractor-trailer transport trucks and heavy farm equipment passing the house approximately 10 to 20 per hour. Prince Albert Road near Well 7 experienced about half the traffic flow as compared to Well 8. Pump location was unknown at Well 8, but could be heard when listening at the well casing.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T39

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	Start[a]	Rock/Till	End[a]	BE9555	BE8719	BE9555	BE8719	Well 1A	Well A	No Pump[e]
1	10/16/2017 7:49	10/16/2017 8:16	10/16/2017 8:28	20.1	18.8	3.30	2.79	0.021	0.014	
2	10/16/2017 8:51	10/16/2017 9:16	10/16/2017 9:20	21.7	20.9	2.16	1.91	0.011	0.029	
3	10/16/2017 9:36	10/16/2017 9:54	10/16/2017 10:13	22.6	22.5	2.29	1.91	0.020	0.027	
4	10/16/2017 11:59	10/16/2017 12:11	10/16/2017 12:19	23.0	23.5	1.40	1.65	0.016	0.025	
5	10/16/2017 11:44	10/16/2017 11:28	10/16/2017 11:40	22.6	23.9	1.14	1.65	0.019	0.018	
6	10/16/2017 10:39	10/16/2017 10:51	10/16/2017 11:05	21.7	23.5	2.03	2.67	0.010	0.020	
7	10/13/2017 13:52	10/13/2017 14:37	10/13/2017 14:41	20.1	22.5	3.43	4.06	0.021	NA[e]	
8	10/13/2017 13:02	10/13/2017 13:17	10/13/2017 13:36	18.0	20.9	2.67	2.92	0.020	0.043	
9	10/13/2017 11:31	10/13/2017 11:46	10/13/2017 11:50	15.5	18.8	5.84	4.45	0.020	0.030	
10	10/12/2017 16:59	10/12/2017 17:13	10/12/2017 17:15	12.6	16.2			0.028	0.019	
11	10/12/2017 16:16	10/12/2017 16:31	10/12/2017 16:43	9.7	13.4			0.020	0.045	
12	10/12/2017 15:40	10/12/2017 15:56	10/12/2017 15:58	7.2	10.5			0.041	0.032	
13	10/12/2017 14:55	10/12/2017 15:17	10/12/2017 15:20	6.1	8.0			0.032	0.029	
14	10/13/2017 7:54	10/13/2017 8:12	10/13/2017 8:19	7.2	7.0	7.75	6.48	0.012	0.013	
15	10/13/2017 8:43	10/13/2017 9:02	10/13/2017 9:07	9.7	8.0	5.08	5.97	0.048	0.032	
16	10/13/2017 9:35	10/13/2017 9:57	10/13/2017 10:01	12.6	10.5	4.45	4.06	0.016	0.027	
17	10/13/2017 10:18	10/13/2017 10:31	10/13/2017 10:37	15.5	13.4	4.06	3.56	0.011	0.013	
18	10/13/2017 15:07	10/13/2017 15:23	10/13/2017 15:35	18.0	16.2	3.56	4.06	0.019	0.010	
Restrikes										
1	10/16/2017 14:12	10/16/2017 14:12	10/16/2017 14:14	20.1	18.8	1.40	1.52	0.010	0.025	
2	10/16/2017 9:25	10/16/2017 9:25	10/16/2017 9:25	21.7	20.9	1.78	1.91	0.027	0.021	
3	10/16/2017 13:25	10/16/2017 13:25	10/16/2017 13:35	22.6	22.5	1.14	1.40	0.033	0.037	
4	10/16/2017 13:40	10/16/2017 13:40	10/16/2017 13:46	23.0	23.5	1.14	1.40	0.013	0.037	
6	10/16/2017 13:52	10/16/2017 13:52	10/16/2017 13:53	21.7	23.5	1.14	1.65	0.043	0.037	
7	10/16/2017 13:57	10/16/2017 13:57	10/16/2017 13:59	20.1	22.5	1.40	1.52	0.043	0.067	
8	10/16/2017 14:05	10/16/2017 14:05	10/16/2017 14:06	18.0	20.9	1.65	1.78	0.017	0.022	
12	10/16/2017 14:39	10/16/2017 14:39	10/16/2017 14:48	7.2	10.5	7.87	8.64	0.026	0.032	
17	10/16/2017 14:19	10/16/2017 14:19	10/16/2017 14:20	15.5	13.4	2.16	2.14	0.010	0.025	
18	10/16/2017 14:33	10/16/2017 14:33	10/16/2017 14:34	18.0	16.2	1.02	1.02	0.010	0.078	

Well Information

Well No.: 1A
Municipal Address: 25226 Baldoon Road
Distance from Turbine Centre: 2,295 m

Well No.: A
Municipal Address: 25321 St. Clair Road
Distance from Turbine Centre: 1,081 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Well 1A located 65 m from Baldoon Road and Well A located 35 m from St. Clair Road. Vibration velocities noted above for both wells reflect maximum values induced by transient sources other than pile driving. Data at both wells was dominated by influence of locally heavy traffic on both roads and on St. Clair Road in particular. Tractor-trailer transport trucks typically passed Well A every 1 to 3 minutes corresponding to peak vibration velocities. Data not available for Well A during driving of Pile 7 due to battery failure. Battery subsequently replaced. Data unavailable for turbine site on October 12, 2017.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T41

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**MP12710**	**NA[e]**	**MP12710**	**NA[e]**	**Well 1A**	**Well A**	**No Pump[e]**
1	10/3/2017 7:39	10/3/2017 7:48	10/3/2017 7:51	24.9		2.13		0.027	0.014	
2	10/2/2017 8:06	10/2/2017 8:11	10/2/2017 8:16	25.3		0.75		0.024	0.038	
3	10/3/2017 15:54	10/3/2017 15:58	10/3/2017 16:00	24.9		2.02		0.023	0.029	
4	10/2/2017 9:54	10/2/2017 9:58	10/2/2017 10:05	23.9		6.28		0.019	0.036	
5	10/2/2017 8:26	10/2/2017 8:31	10/2/2017 8:34	22.3		0.29		0.022	0.042	
6	10/2/2017 10:20	10/2/2017 10:30	10/2/2017 10:35	20.1		3.56		0.028	0.010	
7	10/2/2017 10:00	10/2/2017 10:05	10/2/2017 10:10	17.5		3.94		0.031	0.036	
8	10/2/2017 11:13	10/2/2017 11:22	10/2/2017 11:25	14.6		4.26		0.032	0.050	
9	10/2/2017 11:43	10/2/2017 11:49	10/2/2017 11:54	11.7		4.82		0.026	0.039	
10	10/2/2017 12:04	10/2/2017 12:11	10/2/2017 12:20	9.4		5.18		0.029	0.026	
11	10/2/2017 12:33	10/2/2017 12:47	10/2/2017 12:50	8.4		6.28		0.016	NA[e]	
12	10/2/2017 14:18	10/2/2017 14:24	10/2/2017 14:29	9.4		5.80		0.021	0.134	
13	10/2/2017 15:00	10/2/2017 15:06	10/2/2017 15:13	11.7		5.38		0.028	0.031	
14	10/2/2017 15:27	10/2/2017 15:38	10/2/2017 15:38	14.6		2.97		0.010	0.021	
15	10/2/2017 15:49	10/2/2017 15:52	10/2/2017 15:52	17.5		3.92		0.041	0.172	
16	10/2/2017 16:15	10/2/2017 16:20	10/2/2017 16:27	20.1		5.12		0.041	0.016	
17	10/2/2017 16:42	10/2/2017 16:47	10/2/2017 16:53	22.3		3.80		0.063	0.058	
18	10/2/2017 16:59	10/2/2017 17:05	10/2/2017 17:09	23.9		2.23		0.024	0.031	
Restrikes										
8	10/2/2017 11:29	10/2/2017 11:29	10/2/2017 11:29	14.6				0.020	0.050	
8	10/3/2017 10:17	10/3/2017 10:18	10/3/2017 10:19	14.6				0.196	0.035	

Well Information

Well No.: 1A
Municipal Address: 25226 Baldoon Road
Distance from Turbine Centre: 930 m

Well No.: A
Municipal Address: 25321 St. Clair Road
Distance from Turbine Centre: 938 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Second geophone unavailable on October 2 and 3, 2017.

Well 1A located 65 m from Baldoon Road and Well A located 35 m from St. Clair Road. Vibration velocities noted above for both wells reflect maximum values induced by transient sources other than pile driving. Data at both wells was dominated by influence of locally heavy traffic on both roads and on St. Clair Road in particular. Tractor-trailer transport trucks typically passed Well A every 1 to 3 minutes corresponding to maximum vibration velocities. Data not available for Well A during driving of Pile 11 due to battery failure. Battery subsequently replaced.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

Golder Associates Ltd.

Issue Date: 12/5/2017

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T42

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**MP12721**	**MP12710**	**MP12721**	**MP12710**	**Well 1A**	**Well A**	**No Pump[e]**
1	10/12/2017 11:00	10/12/2017 11:06	10/12/2017 11:09	18.1	12.5	1.60	1.46	0.017	0.032	
2	10/12/2017 11:52	10/12/2017 11:59	10/12/2017 12:06	20.7	15.4	1.62	1.63	0.010	0.034	
3	10/12/2017 15:36	10/12/2017 15:41	10/12/2017 15:46	22.9	18.3	1.57	1.47	0.008	0.030	
4	10/12/2017 15:55	10/12/2017 16:01	10/12/2017 16:06	24.6	20.9	1.20	1.08	0.006	0.010	
5	10/12/2017 15:11	10/12/2017 15:20	10/12/2017 15:27	25.6	23.1	1.31	1.16	0.012	0.039	
6	10/12/2017 14:48	10/12/2017 14:56	10/12/2017 15:01	26.0	24.8	1.28	0.95	0.027	0.022	
7	10/12/2017 14:16	10/12/2017 14:23	10/12/2017 14:31	25.6	25.8	1.65	1.84	0.006	0.036	
8	10/12/2017 13:47	10/12/2017 13:52	10/12/2017 13:58	24.6	26.2	1.27	1.23	0.021	0.026	
9	10/12/2017 13:18	10/12/2017 13:23	10/12/2017 13:34	22.9	25.8	2.13	2.14	0.018	0.018	
10	10/12/2017 12:21	10/12/2017 12:29	10/12/2017 12:37	20.7	24.8	2.28	1.49	0.128	0.023	
11	10/12/2017 9:46	10/12/2017 9:53	10/12/2017 9:56	18.1	23.1	2.54	1.86	0.002	0.043	
12	10/12/2017 8:53	10/12/2017 9:01	10/12/2017 9:05	15.2	20.9	1.97	2.14	0.004	NA[e]	
13	10/12/2017 8:29	10/12/2017 8:36	10/12/2017 8:38	12.3	18.3	2.29	3.02	0.029	0.029	
14	10/12/2017 8:10	10/12/2017 8:18	10/12/2017 8:20	10.0	15.4	2.56	4.54	0.016	0.029	
15	10/10/2017 16:34	10/10/2017 16:43	10/10/2017 16:45	9.1	12.5	2.22	2.23	NA[e]	NA[e]	
16	10/12/2017 7:45	10/12/2017 7:54	10/12/2017 7:58	10.0	10.2	2.84	2.68	0.031	0.014	
17	10/12/2017 10:08	10/12/2017 10:15	10/12/2017 10:17	12.3	9.3	3.85	2.52	0.004	0.012	
18	10/12/2017 10:30	10/12/2017 10:36	10/12/2017 10:42	15.2	10.2	2.63	1.88	0.016	NA[e]	

Well Information

Well No.: 1A
Municipal Address: 25226 Baldoon Road
Distance from Turbine Centre: 2748 m

Well No.: A
Municipal Address: 25321 St. Clair Road
Distance from Turbine Centre: 999 m

ISO 2631-2 particle velocity threshold for human perception is 0.1 mm/s between approximately 8 to 100 Hz

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time.

Well 1A located 65 m from Baldoon Road and Well A located 35 m from St. Clair Road. Vibration velocities noted above for both wells reflect maximum values induced by transient sources other than pile driving. Data at both wells dominated by influence of locally heavy traffic on both roads and on St. Clair Road in particular. Tractor-trailer transport trucks typically passed Well A every 1 to 3 minutes corresponding to maximum vibration velocities. Data not available for Well A during driving of Pile 12 due to battery failure. Battery was subsequently replaced. Data not available for Wells 1A and A during driving of Pile 15 as a result of insufficient advance notice time to operate the well monitoring equipment for the one pile driven on October 10, 2017.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T43

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9555**	**BE9765**	**BE9555**	**BE9765**	**Well 11**	**Well 12**	**No Pump[e]**
1	8/18/2017 12:35	8/18/2017 12:45	8/18/2017 12:52	24.8	25.6	2.79	2.29	0.006	0.008	
2	8/18/2017 13:01	8/18/2017 13:12	8/18/2017 13:20	23.8	25.2	2.79	2.29	0.006	0.007	
3	8/21/2017 8:28	8/21/2017 8:38	8/21/2017 8:48	22.2	24.2	2.51	2.92	0.010	0.007	
4	8/21/2017 12:47	8/21/2017 12:59	8/21/2017 13:10	20.0	22.6	2.45	2.67	0.007	0.006	
5	8/21/2017 9:03	8/21/2017 9:16	8/21/2017 9:23	17.4	20.4	3.30	2.92	0.006	1.468	0.009
6	8/21/2017 7:56	8/21/2017 8:08	8/21/2017 8:17	14.5	17.7	3.22	3.18	0.024	0.024	
7	8/18/2017 14:32	8/18/2017 14:43	8/18/2017 14:50	11.6	14.8	5.59	3.30	0.006	0.006	
8	8/18/2017 13:37	8/18/2017 13:49	8/18/2017 13:57	9.3	12.0	6.48	4.83	0.007	0.005	
9	8/15/2017 15:09	8/15/2017 15:18	8/15/2017 15:27	8.3	9.6	5.97	7.37	0.086	0.005	
10	8/15/2017 13:21	8/15/2017 13:28	8/15/2017 13:37	9.3	8.7	7.62	7.24	0.004	0.002	
11	8/15/2017 12:22	8/15/2017 12:34	8/15/2017 12:35	11.6	9.6	5.33	5.21	0.002	0.006	
12	8/15/2017 11:58	8/15/2017 12:10	8/15/2017 12:13	14.5	12.0	5.46	3.81	0.018	0.018	
13	8/15/2017 9:19	8/15/2017 9:42	8/15/2017 11:40	17.4	14.8	3.05	5.21	0.003	0.002	
14	8/15/2017 15:46	8/15/2017 15:57	8/15/2017 16:10	20.0	17.7	4.32	3.30	0.006	0.013	
15	8/18/2017 9:17	8/18/2017 9:23	8/18/2017 9:31	22.2	20.4	3.81	3.18	0.005	0.009	
16	8/18/2017 9:43	8/18/2017 9:50	8/18/2017 9:59	23.8	22.6	1.78	1.91	0.012	0.009	
17	8/18/2017 10:10	8/18/2017 10:17	8/18/2017 10:28	24.8	24.2	2.54	2.54	0.004	0.018	
18	8/18/2017 11:45	8/18/2017 12:02	8/18/2017 12:21	25.2	25.2	2.67	2.16	0.008	0.004	
Restrikes										
14	8/21/2017 10:43	8/21/2017 10:43	8/21/2017 10:43	20.0	17.7	2.39	2.67	0.012	0.010	
16(1)	8/21/2017 10:30	8/21/2017 10:30	8/21/2017 10:30	23.8	22.6	2.35	2.29	0.011	0.010	
16(2)	8/21/2017 11:52	8/21/2017 11:52	8/21/2017 11:54	22.2	24.2	2.40	2.41	0.005	0.029	

Well Information

Well No.: 11
Municipal Address: 9596 Union Line
Distance from Turbine Centre: 4,092 m

Well No.: 12
Municipal Address: 9468 Union Line
Distance from Turbine Centre: 4,359 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Vibration measurements were undertaken on August 17, 2017 at Wells 11 and 12 during water quality sampling events in the absence of pile driving within the cluster. Both pumps turned on and operated during the sampling events. Peak vibration measurements for Well 11 were 0.016 mm/s and this pump was located within the residence approximately 40 m from the well. Peak vibration measurements for Well 12 were 0.896 mm/s and the pump was mounted on the well casing. During pile driving for turbine T3, on August 23, 2017, the peak vibration measurement of the Well 12 casing was 2.4 mm/s for clearly definable periods during which the pump was operating. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Driving/restriking of some piles occured in relatively rapid succession and, therefore, the vibration measurement data for the 10 minute periods of analysis are applicable to multiple piles. Driving of pile 13 was started and stopped on multiple occasions because of problems with fuel pump resulting in a total of approximately 88 minutes of standby between driving intervals for a total driving time on till/rock of 14:45 (minutes:seconds). Pile 18 total driving time on till/rock was 8:46 (minutes:seconds) due to intermittant stops and starts.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

Golder Associates Ltd.

T44 Issue Date: 12/5/2017

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T44

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**MP12710**	**BE9555**	**MP12710**	**BE9555**	**Well 13**	**Well 14**	**No Pump[e]**
1	9/18/2017 13:38	9/18/2017 13:43	9/18/2017 13:44	23.2	22.8	1.08	1.27	0.033	0.237	
2	9/18/2017 13:54	9/18/2017 14:01	9/18/2017 14:02	23.6	23.8	1.70	1.40	0.005	0.049	
3	9/21/2017 14:39	9/21/2017 14:46	9/21/2017 14:47	23.2	24.2	1.22	1.27	0.641	0.026	0.010
4	9/21/2017 14:19	9/21/2017 14:25	9/21/2017 14:26	22.2	23.8	1.14	0.89	0.011	0.338	
5	9/18/2017 14:25	9/18/2017 14:29	9/18/2017 14:31	20.7	22.8	1.48	1.40	0.005	0.350	
6	9/18/2017 14:11	9/18/2017 14:16	9/18/2017 14:17	18.5	21.2	1.61	2.16	0.006	0.034	
7	9/18/2017 9:10	9/18/2017 9:18	9/18/2017 9:20	16.0	19.1	2.19	2.29	0.015	0.056	
8	9/18/2017 9:32	9/18/2017 9:37	9/18/2017 9:40	13.1	16.5	3.56	2.79	0.488	0.041	0.006
9	9/18/2017 9:46	9/18/2017 9:52	9/18/2017 9:54	10.2	13.6	3.45	2.79	0.034	0.100	
10	9/18/2017 10:05	9/18/2017 10:10	9/18/2017 10:11	7.8	10.7	4.32	4.19	0.007	0.021	
11	9/18/2017 10:20	9/18/2017 10:24	9/18/2017 10:27	6.7	8.3	5.01	4.70	0.005	0.167	
12	9/18/2017 10:37	9/18/2017 10:42	9/18/2017 10:45	7.8	7.3	3.65	4.57	0.018	0.085	
13	9/18/2017 11:31	9/18/2017 11:36	9/18/2017 11:39	10.2	8.3	3.09	5.08	0.015	0.075	
14	9/18/2017 11:46	9/18/2017 11:53	9/18/2017 11:55	13.1	10.7	2.74	3.56	0.018	0.214	
15	9/18/2017 12:02	9/18/2017 12:08	9/18/2017 12:10	16.0	13.6	2.04	2.16	0.006	0.017	
16	9/18/2017 12:25	9/18/2017 12:30	9/18/2017 12:34	18.5	16.5	1.46	1.65	0.020	0.194	
17	9/18/2017 12:58	9/18/2017 13:03	9/18/2017 13:06	20.7	19.1	1.48	1.65	0.009	0.055	
18	9/18/2017 13:14	9/18/2017 13:19	9/18/2017 13:23	22.2	21.2	1.21	1.91	0.380	0.102	0.011

Well Information

Well No.:	13	**Well No.:**	14
Municipal Address:	8771 Union Line	Municipal Address:	8904 Union Line
Distance from Turbine Centre:	786 m	Distance from Turbine Centre:	901 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Truck drove very close to geophone at turbine site at 9:39:25 on September 18, 2017. Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements.

Data for two 10-minute time periods on September 11, 2017 during which no pile driving occurred were evaluated with start times of 10:47 and 14:27 for Well 13 and 10:48 and 14:36 for Well 14. During these periods, the peak well casing vibration velocity was 0.079 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 13 from data obtained on September 14, 2017, at 11:24 and 16:38 and September 15, 2017 at 08:29. The peak particle velocity of the Well 13 casing during these periods was 0.099 mm/s. On September 19 and 21, 2017 during water sampling events when the pump was operating, the peak particle velocity of the Well 13 casing was 0.655 mm/s. Three 10-minute vibration monitoring periods during which pile driving was not occurring were analyzed for Well 14 from data obtained on September 14, 2017, at 11:33 and 12:53 and September 15, 2017 at 08:35. The peak velocity of the Well 14 casing during these periods was 0.160 mm/s. On September 19, 2017 during a water sampling event when the pump was operating, the peak velocity of the Well 14 casing was 0.019 mm/s. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

Golder Associates Ltd.

T45 Issue Date: 12/5/2017

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T45

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9555**	**BE18695**	**BE9555**	**BE18695**	**Well 11**	**Well 12**	**No Pump[e]**
1	8/23/2017 11:47	8/23/2017 11:53	8/23/2017 12:18	14.8	17.5	3.30	2.54	0.025	0.010	
2	8/23/2017 14:20	8/23/2017 14:27	8/23/2017 14:41	12.0	14.7	3.81	2.79	0.024	NA[e]	
3	8/23/2017 15:10	8/23/2017 15:17	8/23/2017 15:27	9.6	11.8	5.08	4.06	0.017	0.005	
4	8/23/2017 16:49	8/23/2017 16:55	8/23/2017 17:05	8.7	9.5	6.73	5.08	0.008	1.148	0.018
5	8/23/2017 17:22	8/23/2017 17:30	8/23/2017 17:44	9.6	8.5	7.37	7.75	0.011	0.007	
6	8/23/2017 10:50	8/23/2017 11:00	8/23/2017 11:16	12.0	9.5	4.32	6.22	0.018	0.016	
7	8/24/2017 8:30	8/24/2017 8:38	8/24/2017 8:47	14.8	11.8	2.41	3.30	0.014	0.014	
8	8/24/2017 9:05	8/24/2017 9:14	8/24/2017 9:21	17.7	14.7	2.16	2.92	0.021	0.040	
9	8/24/2017 9:36	8/24/2017 9:44	8/24/2017 10:48	20.4	17.5	2.29	1.65	0.018	1.511	0.024
10	8/23/2017 12:49	8/23/2017 12:58	8/23/2017 13:15	22.6	20.2	3.30	2.92	0.009	0.005	
11	8/24/2017 13:32	8/24/2017 13:42	8/24/2017 13:48	24.2	22.4	1.40	1.78	0.004	0.018	
12	8/24/2017 15:06	8/24/2017 15:15	8/24/2017 15:23	25.2	24.0	1.14	1.27	0.007	0.008	
13	8/24/2017 15:35	8/24/2017 15:44	8/24/2017 15:53	25.6	25.0	3.56	1.02	0.026	0.034	
14	8/24/2017 16:05	8/24/2017 16:14	8/24/2017 16:22	25.2	25.4	2.92	1.27	0.012	0.061	
15	8/24/2017 16:40	8/24/2017 16:46	8/24/2017 16:55	24.2	25.0	1.40	1.02	0.015	0.007	
16	8/24/2017 17:11	8/24/2017 17:18	8/24/2017 17:24	22.6	24.0	1.65	1.14	0.012	0.004	
17	8/24/2017 17:33	8/24/2017 17:39	8/24/2017 17:45	20.4	22.4	1.78	1.52	0.006	0.009	
18	8/24/2017 17:57	8/24/2017 18:08	8/24/2017 18:12	17.7	20.2	2.16	1.91	0.005	0.006	
Restrikes										
6	8/23/2017 13:28	8/23/2017 13:28	8/23/2017 13:29	12.0	9.5	3.05	2.92	0.043	0.017	
1	8/23/2017 13:13	8/23/2017 13:13	8/23/2017 13:13	14.8	17.5	2.29	2.03	0.009	0.005	
15	8/25/2017 7:45	8/25/2017 7:45	8/25/2017 7:47	24.2	25.0	1.27	1.02	0.015	0.032	
16	8/25/2017 9:11	8/25/2017 9:11	8/25/2017 9:13	22.6	24.0	1.27	1.10	0.007	2.335	0.008
17	8/25/2017 9:03	8/25/2017 9:03	8/25/2017 9:06	20.4	22.4	2.41	1.14	0.007	0.019	
18	8/25/2017 8:51	8/25/2017 8:51	8/25/2017 8:55	17.7	20.2	1.52	1.65	0.011	0.011	
1	8/25/2017 11:44	8/25/2017 11:44	8/25/2017 11:45	14.8	17.5	2.54	2.16	0.013	0.037	
12	8/25/2017 9:22	8/25/2017 9:22	8/25/2017 9:25	25.2	24.0	1.14	1.02	0.024	0.010	
18	8/25/2017 9:16	8/25/2017 9:16	8/25/2017 9:18	17.7	20.2	1.14	0.89	0.011	0.011	
4	8/25/2017 8:43	8/25/2017 8:43	8/25/2017 8:45	8.7	9.5	5.97	3.43	0.013	0.007	
5	8/25/2017 8:36	8/25/2017 8:36	8/25/2017 8:37	9.6	8.5	3.68	5.33	0.013	0.013	
7	8/25/2017 8:30	8/25/2017 8:30	8/25/2017 8:32	14.8	11.8	2.03	2.67	0.006	0.028	
8	8/25/2017 8:25	8/25/2017 8:25	8/25/2017 8:26	17.7	14.7	2.41	3.18	0.006	0.018	
10	8/25/2017 9:28	8/25/2017 9:28	8/25/2017 10:19	22.6	20.2	1.65	1.40	0.021	0.011	
13	8/25/2017 7:53	8/25/2017 7:54	8/25/2017 7:59	25.6	25.0	1.27	1.02	0.013	0.007	
9	8/25/2017 8:09	8/25/2017 8:09	8/25/2017 8:19	20.4	17.5	2.67	2.54	0.028	0.010	
11	8/25/2017 8:03	8/25/2017 8:03	8/25/2017 8:05	24.2	22.4	1.27	1.14	0.008	0.024	
Continued Pile Driving										
13C	8/30/2017 11:06	8/30/2017 11:06	8/30/2017 11:07	25.6	25.0	1.02	1.06	0.006	0.012	
2C	8/30/2017 10:06	8/30/2017 10:06	8/30/2017 10:06	12.0	14.7	4.83	4.58	0.005	0.018	
3C	8/30/2017 10:09	8/30/2017 10:09	8/30/2017 10:10	9.6	11.8	4.57	2.67	0.005	0.018	
4C	8/30/2017 10:14	8/30/2017 10:14	8/30/2017 10:16	8.7	9.5	5.21	4.32	0.011	0.014	
5C	8/30/2017 10:19	8/30/2017 10:19	8/30/2017 10:20	9.6	8.5	4.32	4.95	0.011	0.014	
6C	8/30/2017 10:23	8/30/2017 10:23	8/30/2017 10:25	12.0	9.5	3.56	6.10	0.013	0.016	
7C	8/30/2017 10:27	8/30/2017 10:27	8/30/2017 10:29	14.8	11.8	3.18	4.32	0.013	0.016	
8C	8/30/2017 10:32	8/30/2017 10:32	8/30/2017 10:34	17.7	14.7	1.65	2.67	0.013	0.013	
10C	8/30/2017 10:40	8/30/2017 10:40	8/30/2017 11:00	22.6	20.2	1.91	1.78	0.003	0.018	
Replacement Piles										
6A	9/12/2017 7:51	9/12/2017 7:59	9/12/2017 9:41	13.0	10.5	3.30	4.70	0.014	0.007	
10A	9/12/2017 8:29	9/12/2017 8:36	9/12/2017 9:37	23.6	21.2	2.54	1.78	0.015	0.003	
13A	9/12/2017 9:07	9/12/2017 9:13	9/12/2017 9:29	26.6	26.0	1.65	1.52	0.015	0.011	

NORTH KENT 1
Vibration Monitoring Data Report

Well Information

Well No.:	11	**Well No.:**	12
Municipal Address:	9596 Union Line	Municipal Address:	9468 Union Line
Distance from Turbine Centre:	1,223 m	Distance from Turbine Centre:	1,635 m

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Piles were spliced and driven deeper and these are noted with "C" for continued pile driving. Piles that were replaced entirely are noted with "A", above. Vibration measurements were undertaken on August 17, 2017 at Wells 11 and 12 during water quality sampling events in the absence of pile driving within the cluster. Both pumps turned on and operated during the sampling events. The peak vibration measurement for Well 11 was 0.016 mm/s and this pump was located within the residence approximately 40 m from the well. The peak vibration measurement for Well 12 was 0.896 mm/s and the pump was mounted on the well casing. The peak vibration measurement of the Well 12 casing during all monitoring completed to the date of report issue was about 2.4 mm/s for clearly definable periods during which the pump was operating. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Driving/restriking of some piles occured in relatively rapid succession and, therefore, the vibration measurement data for the 10 minute periods of analysis are applicable to multiple piles. Data for Well 12 during driving of Pile 2 on August 23, 2017 was not captured when data logger battery failed and was then replaced. Total driving time on till/rock for Pile 9 was interrupted by repairs to the pile driving hammer and the actual driving duration on till/rock was 8:00 (minutes:seconds) for this pile. Total driving time on till/rock for restrike of Pile 10 was interrupted by damage to the pile top, splicing and welding and total driving duration on till/rock was 5:48 (minutes:seconds). Driving time on till/rock for driving of Pile 6A was interrupted from 8:07:35 to 8:10:35 and from 8:12:45 to 9:40:28. Driving time on till/rock for driving of Pile 10A was interrupted from 8:49:30 to 9:37:05. Driving time on till/rock for driving of Pile 13A was interrupted from 9:18:45 to 9:26:30. Instrument BE8719 was used on August 30, 2017 in lieu of BE18695.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

T46 Issue Date: 12/5/2017

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T46

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9679**	**MP12710**	**BE9679**	**MP12710**	**Well 11**	**Well 12**	**No Pump[e]**
1	8/29/2017 8:38	8/29/2017 8:44	8/29/2017 9:10	26.5	26.9	1.02	1.19	NA[e]	0.002	
2	8/29/2017 9:24	8/29/2017 9:33	8/29/2017 9:49	25.5	26.5	1.14	1.81	NA[e]	0.003	
3	8/29/2017 10:14	8/29/2017 10:19	8/29/2017 10:30	23.8	25.5	1.02	1.31	NA[e]	0.037	
4	8/29/2017 12:41	8/29/2017 12:52	8/29/2017 13:01	21.5	23.8		1.94	0.004	0.010	
5	8/29/2017 12:00	8/29/2017 12:09	8/29/2017 12:28	18.9	21.5		1.91	NA[e]	0.003	
6	8/29/2017 11:02	8/29/2017 11:11	8/29/2017 11:25	16.0	18.9		2.59	NA[e]	0.006	
7	8/28/2017 16:35	8/28/2017 16:47	8/28/2017 16:53	13.1	16.0	4.19	3.47	0.015	0.071	
8	8/28/2017 16:02	8/28/2017 16:12	8/28/2017 16:20	10.9	13.1	4.57	4.93	0.007	1.551	0.039
9	8/28/2017 13:25	8/28/2017 13:34	8/28/2017 13:36	10.0	10.9	3.81	3.54	0.006	0.011	
10	8/28/2017 12:44	8/28/2017 12:56	8/28/2017 12:59	10.9	10.0	4.32	3.48	0.006	0.008	
11	8/28/2017 11:25	8/28/2017 11:34	8/28/2017 11:41	13.1	10.9	5.72	4.19	NA[e]	0.011	
12	8/28/2017 10:07	8/28/2017 10:17	8/28/2017 10:20	16.0	13.1	2.79	2.81	0.003	0.009	
13	8/28/2017 9:33	8/28/2017 9:43	8/28/2017 9:49	18.9	16.0	5.08	3.48	0.021	0.015	
14	8/28/2017 9:00	8/28/2017 9:12	8/28/2017 9:16	21.5	18.9	3.05	3.13	0.003	0.003	
15	8/28/2017 8:30	8/28/2017 8:44	8/28/2017 8:47	23.8	21.5	3.68	3.26	0.004	0.004	
16	8/28/2017 13:53	8/28/2017 14:03	8/28/2017 14:07	25.5	23.8	1.52	1.52	0.002	0.006	
17	8/28/2017 14:27	8/28/2017 14:38	8/28/2017 14:48	26.5	25.5	1.52	1.61	0.017	0.004	
18	8/29/2017 7:53	8/29/2017 8:01	8/29/2017 8:05	26.9	26.5	1.02	1.04	NA[e]	0.002	
Restrikes										
9	8/29/2017 13:14	8/29/2017 13:14	8/29/2017 13:16	10.0	10.9		5.43	0.005	0.006	
8	8/29/2017 13:25	8/29/2017 13:25	8/29/2017 13:26	10.9	13.1		4.22	0.003	0.052	
16	8/29/2017 13:36	8/29/2017 13:36	8/29/2017 13:38	25.5	23.8		1.37	0.003	0.006	

Well Information

Well No.:	11	**Well No.:**	12
Municipal Address:		Municipal Address:	
Distance from Turbine Centre:	1,697 m	Distance from Turbine Centre:	2,170 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Total duration for pile driving on rock/till based on times noted above is not representative for Piles 1 and 5 where the actual duration for driving on till/rock was (minutes:seconds): 1(11:30) and 5(18:32) . Peak vibrations for Well 12 were 1.55 mm/s for August 29, 2017. The pump was mounted on the well casing. During pile driving on August 23, 2017, the peak vibration measurement of the Well 12 casing was 2.4 mm/s for clearly definable periods during which the pump was operating. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 12 are shown in the "no pump" column. Data not available for Piles 1, 2, 3, 5, 6, 11 and 18 at Well 11 on August 28 and 29, 2017 due to several separate battery failures in monitoring equipment. Batteries were subsequently replaced.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T49

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start**[a]	**Rock/Till**	**End**[a]	**MP12710**	**BE9555**	**MP12710**	**BE9555**	**Well 13**	**Well 14**	**No Pump**[e]
1	9/28/2017 10:36	9/28/2017 10:41	9/28/2017 10:41	22.3	19.8	1.04	1.40	0.028	0.013	
2	9/28/2017 10:48	9/28/2017 10:53	9/28/2017 10:53	23.9	22.0	0.93	1.02	0.083	0.020	
3	9/28/2017 11:15	9/28/2017 11:18	9/28/2017 11:19	24.9	23.6	2.47	2.29	0.036	0.040	
4	9/28/2017 11:02	9/28/2017 11:06	9/28/2017 11:07	25.3	24.6	1.53	1.65	0.028	0.028	
5	9/28/2017 9:51	9/28/2017 9:58	9/28/2017 9:59	24.9	25.0	0.81	1.02	0.031	0.069	
6	9/28/2017 9:18	9/28/2017 9:23	9/28/2017 9:26	23.9	24.6	0.93	0.89	0.311	0.025	0.011
7	9/28/2017 9:04	9/28/2017 9:09	9/28/2017 9:10	22.3	23.6	1.90	2.16	0.022	0.030	
8	9/28/2017 7:47	9/28/2017 7:53	9/28/2017 8:06	20.1	22.0	2.85	2.67	0.016	0.068	
9	9/27/2017 13:30	9/27/2017 13:49	9/27/2017 13:50	17.5	19.8	1.50	1.52	0.008	0.081	
10	9/27/2017 14:02	9/27/2017 14:08	9/27/2017 14:09	14.6	17.2	1.83	1.65	0.037	0.163	
11	9/27/2017 14:17	9/27/2017 14:21	9/27/2017 14:24	11.7	14.3	2.76	2.16	0.015	0.122	
12	9/27/2017 15:08	9/27/2017 15:13	9/27/2017 15:14	9.4	11.4	3.30	3.18	0.038	0.313	
13	9/27/2017 15:23	9/27/2017 15:27	9/27/2017 15:37	8.4	9.1	10.21	13.59	0.015	0.052	
14	9/27/2017 15:49	9/27/2017 15:54	9/27/2017 16:01	9.4	8.1	3.32	5.59	0.157	0.613	
15	9/27/2017 16:19	9/27/2017 16:23	9/27/2017 16:23	11.7	9.1	1.90	4.32	0.019	0.111	
16	9/27/2017 17:23	9/27/2017 17:30	9/27/2017 17:35	14.6	11.4	1.58	2.54	0.007	0.057	
17	9/27/2017 17:44	9/27/2017 17:48	9/27/2017 17:54	17.5	14.3	2.28	4.19	0.010	0.068	
18	9/28/2017 9:36	9/28/2017 9:42	9/28/2017 9:42	20.1	17.2	1.46	1.14	0.370	0.031	0.004
Restrikes										
15	9/28/2017 11:58	9/28/2017 11:58	9/28/2017 11:58	11.7	9.1	1.76	4.06	0.009	0.031	
Replacements										
8A	9/29/2017 13:18	9/29/2017 13:23	9/29/2017 13:24	21.1	23.0	1.24	1.27	0.046	0.057	
13A	9/29/2017 13:04	9/29/2017 13:08	9/29/2017 13:08	9.4	10.1	3.23	3.18	0.011	0.040	
14A	9/29/2017 12:47	9/29/2017 12:53	9/29/2017 12:54	10.4	9.1	4.11	4.70	0.016	0.054	

Well Information

Well No.:	13	**Well No.:**	14
Municipal Address:	8771 Union Line	Municipal Address:	8904 Union Line
Distance from Turbine Centre:	2892 m	Distance from Turbine Centre:	2421 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

NORTH KENT 1
Vibration Monitoring Data Report

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Piles that were replaced are noted with "A", above. Driving of Piles 8, 9 and 17 on till/rock paused from 7:59:10 to 8:03:05, 13:36:10 to 1:50:40 and 17:49:41 to 17:52:50, respectively.

Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. Vibrations of as much as 0.08 mm/s of the Well 13 casing were directly identified as being associated with passing truck traffic. Well 14 vibration monitoring data was dominated by vibrations induced by local passing traffic including: tractor-trailer transport trucks, combines, tractors pulling hopper wagons, and vehicles entering and leaving driveway. The peak measured Well 14 vibrations of 0.61 mm/s associated with vehicle turning in driveway immediately adjacent to well (15:57 on 9/27/2017) and passage of large trucks on the road (16:04 to 16:07 on 9/27/2017).

Well 13 pump vibrations were clearly discernable in data prior to start of pile driving on till/rock for Pile 6. Pump operations was confirmed by audible pump noise and associated with water sampling at this well. Peak Well 13 casing vibrations induced by the pump were 0.31 mm/s for this instance. Well 13 pump operations were clearly discernable in data evaluated for Pile 18, pump operations were confirmed by audible pump noises, and peak Well 13 casing vibrations of 0.37 mm/s were measured during this interval. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T51

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**BE9769**	**BE18695**	**BE9769**	**Well 13**	**Well 14**	**No Pump[e]**
1	10/3/2017 10:23	10/3/2017 10:29	10/3/2017 10:33	24.4	24.8	1.40	1.40	0.459	0.040	0.009
2	10/3/2017 12:16	10/3/2017 12:23	10/3/2017 12:24	24.0	25.2	1.02	1.27	0.333	0.166	0.007
3	10/3/2017 12:39	10/3/2017 12:44	10/3/2017 12:45	23.0	24.8	1.91	2.16	0.306	0.083	0.067
4	10/3/2017 12:57	10/3/2017 13:03	10/3/2017 13:06	21.4	23.8	1.27	1.14	0.018	0.165	
5	10/3/2017 11:27	10/3/2017 11:32	10/3/2017 11:33	19.3	22.2	1.40	1.27	0.016	0.079	
6	10/3/2017 8:58	10/3/2017 9:04	10/3/2017 9:05	16.7	20.0	1.65	1.78	0.737	0.185	0.012
7	10/3/2017 8:10	10/3/2017 8:19	10/3/2017 8:24	13.8	17.4	2.16	2.14	0.542	0.084	0.018
8	10/3/2017 7:46	10/3/2017 7:54	10/3/2017 7:56	10.9	14.5	2.54	2.03	0.026	0.124	
9	10/2/2017 12:30	10/2/2017 12:40	10/2/2017 12:42	8.5	11.6	3.43	3.43	0.010	0.048	
10	10/2/2017 13:02	10/2/2017 13:09	10/2/2017 13:12	7.5	9.3	5.84	3.81	0.008	0.195	
11	10/2/2017 13:28	10/2/2017 13:35	10/2/2017 13:35	8.5	8.3	3.81	3.56	0.008	0.178	
12	10/2/2017 14:02	10/2/2017 14:09	10/2/2017 14:11	10.9	9.3	3.68	3.43	0.747	0.054	0.006
13	10/2/2017 14:25	10/2/2017 14:31	10/2/2017 14:33	13.8	11.6	3.05	2.54	0.014	0.132	
14	10/2/2017 14:45	10/2/2017 14:51	10/2/2017 14:55	16.7	14.5	3.05	3.18	0.008	0.258	
15	10/2/2017 15:08	10/2/2017 15:16	10/2/2017 15:27	19.3	17.4	1.78	1.65	0.020	0.037	
16	10/2/2017 16:26	10/2/2017 16:35	10/2/2017 16:37	21.4	20.0	1.65	1.52	0.020	0.038	
17	10/3/2017 9:29	10/3/2017 9:36	10/3/2017 9:37	23.0	22.2	1.40	1.40	0.008	0.070	
18	10/3/2017 9:58	10/3/2017 10:06	10/3/2017 10:08	24.0	23.8	1.27	1.27	0.514	0.062	0.011
Restrikes										
7	10/3/2017 11:39	10/3/2017 11:39	10/3/2017 11:40	13.8	17.4	1.27	1.91	0.320	0.079	0.005
15	10/3/2017 13:14	10/3/2017 13:35	10/3/2017 13:38	19.3	17.4	2.03	2.29	0.067	0.310	
Replacements										
7A	10/3/2017 15:48	10/3/2017 15:55	10/3/2017 15:56	14.8	18.4	2.29	1.91	0.008	0.060	
15A	10/3/2017 15:00	10/3/2017 15:09	10/3/2017 15:11	20.3	18.4	2.16	2.29	0.017	0.065	

Well Information

Well No.: 13
Municipal Address: 8771 Union Line
Distance from Turbine Centre: 2776 m

Well No.: 14
Municipal Address: 8904 Union Line
Distance from Turbine Centre: 3056 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Piles noted with "A" represent piles installed to replace similarly-numbered piles. After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Driving of Pile 15 paused 15:19 to 15:20 and 15:22:10 to 15:27:30.

Wells 13 and 14 are located approximately 87 m and 13 m from the centre line of Union Line, respectively. Evaluation of acceleration time histories concluded that other transient vibrations occurring before, during and after pile driving times dominated all measurements. Well 14 vibration monitoring data was dominated by vibrations induced by local passing traffic including tractor-trailer transport trucks, combines, buses, and tractors passing the site on the road and vehicles entering and leaving driveway. The peak measured Well 14 vibrations of 0.258 and 0.310 mm/s noted above were directly attributable to vehicles passing on the road including slow passage of a tractor, and passing of a bus, passenger cars, light trucks and tractor-trailer transport trucks. The peak vibrations measured at Well 14 of 0.61 mm/s were associated with a vehicle turning in the driveway (9/27/2017).

Well 13 pump vibrations were clearly discernable in data and confirmed by audible pump noise. Peak Well 13 casing vibrations induced by the pump were about 0.75 mm/s during monitoring of this well. Peak well casing vibrations exclusive of pump influences identified within the same monitoring period at Well 13 are shown in the "no pump" column.

NORTH KENT 1
Vibration Monitoring Data Report

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T52

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE9679**	**BE18695**	**BE9679**	**BE18695**	**Well 3**	**Well 4**	**No Pump[e]**
1	10/16/2017 10:44	10/16/2017 10:50	10/16/2017 10:52	23.5	23.5	3.05	3.18	0.008	NA[e]	
2	10/16/2017 11:44	10/16/2017 12:00	10/16/2017 12:02	22.5	23.9	1.65	1.52	0.006	NA[e]	
3	10/16/2017 11:23	10/16/2017 11:29	10/16/2017 11:32	20.9	23.5	1.52	2.03	0.022	NA[e]	
4	10/16/2017 11:00	10/16/2017 11:10	10/16/2017 11:13	18.8	22.5	2.16	1.78	0.003	NA[e]	
5	10/13/2017 12:22	10/13/2017 12:32	10/13/2017 12:35	16.2	20.9	3.05	2.29	0.005	NA[e]	
6	10/13/2017 12:00	10/13/2017 12:11	10/13/2017 12:13	13.4	18.8	3.68	3.43	0.003	NA[e]	
7	10/13/2017 11:37	10/13/2017 11:45	10/13/2017 11:45	10.5	16.2	3.68	3.30	0.030	NA[e]	
8	10/13/2017 10:59	10/13/2017 11:13	10/13/2017 11:16	8.0	13.4	4.06	4.70	0.011	NA[e]	
9	10/13/2017 9:53	10/13/2017 11:25	10/13/2017 11:28	7.0	10.5	5.89	4.95	0.006	NA[e]	
10	10/13/2017 9:35	10/13/2017 11:18	10/13/2017 11:21	8.0	7.0	5.08	4.70	0.011	NA[e]	
11	10/13/2017 9:16	10/13/2017 9:21	10/13/2017 9:25	10.5	8.0	5.33	4.70	0.009	NA[e]	
12	10/13/2017 8:53	10/13/2017 9:02	10/13/2017 9:05	13.4	10.5	4.70	3.56	0.015	NA[e]	
13	10/13/2017 14:14	10/13/2017 14:24	10/13/2017 14:26	16.2	13.4	3.56	2.16	0.010	NA[e]	
14	10/16/2017 7:59	10/16/2017 8:08	10/16/2017 8:10	18.8	16.2	2.03	2.03	0.008	NA[e]	
15	10/13/2017 12:48	10/13/2017 12:57	10/13/2017 12:59	20.9	18.8	2.54	2.03	0.005	NA[e]	
16	10/13/2017 13:10	10/13/2017 13:24	10/13/2017 13:24	22.5	20.9	2.14	1.52	0.004	NA[e]	
17	10/16/2017 8:22	10/16/2017 8:32	10/16/2017 8:33	23.5	22.5	3.94	3.68	0.011	NA[e]	
18	10/16/2017 8:43	10/16/2017 8:49	10/16/2017 8:51	23.9	23.5	2.03	1.52	0.004	NA[e]	

Well Information

Well No.: 3
Municipal Address: 8522 Bush Line
Distance from Turbine Centre: 1,308 m

Well No.: 4
Municipal Address: 26347 St Clair Road
Distance from Turbine Centre: 1,254 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Driving of Pile 9 was paused between 10:01 and 11:23 to complete welding on the pile. Driving of Pile 10 was paused between 9:44 and 11:18 to complete welding on the pile.

Monitoring of Well 4 was not permitted after September 10, 2017. For reference in comparison to the vibration velocities noted above, St. Clair Road traffic passing at 78 m from Well 4 on September 5, 2017, was observed to include large tractor-trailers, concrete mixers and dump trucks at a rate of about 1 heavy vehicle every 1.5 to 2 minutes. Passenger vehicle movements on the Well 4 property passed and were parked near the well throughout the afternoon on September 5, 2017. On September 6, 2017, heavy vehicle traffic on St. Clair Road and near Well 4 was similar to September 5, 2017. Combine harvesting was on-going as close as 25 to 30 m from Well 4, during much of the day on September 6, 2017. On this same day, various individuals were at and in the well shed, connecting, operating and adjusting a well pump. Well 4 pump was cycled on and off on September 6, 2017, operating for periods of 1 to more than 7 minutes. When individuals were working on the pump and well, well casing vibrations were as much as 4.987 mm/s. At other times, Well 4 casing vibrations ranged from about 0.07 to about 0.62 mm/s with an average of about 0.18 mm/s, reflective of the vehicle and foot traffic on site near the well, harvesting equipment and traffic on the nearby St. Clair road. During this same measurement time on September 5 and 6, 2017, the nearest pile driving was more than 2 km distant and vibration measurements did not identify any evidence of pile driving influences.

During the period for which data is presented above, Union Gas was constructing a pipeline about 400 m northwest of Well 4 and within about 100 to 180 m of 26457 St. Clair Road.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

NORTH KENT 1
Vibration Monitoring Data Report

Turbine Location: T73

	Vibration Measurements at Turbine Site							Vibration Measurements at Wells		
	Pile Driving Times and Dates			Geophone Distance (m)		Peak Particle Velocity (mm/s)[b]		Particle Velocity (mm/s)[c, d]		
Pile No.:	**Start[a]**	**Rock/Till**	**End[a]**	**BE18695**	**BE9679**	**BE18695**	**BE9679**	**Well 1A**	**Well A**	**No Pump[e]**
1	10/23/2017 16:22	10/23/2017 16:28	10/23/2017 16:37	22.3	19.72	3.30	3.68	0.069	0.132	
2	10/24/2017 8:00	10/24/2017 8:10	10/24/2017 8:21	23.9	21.89	2.29	2.79	0.021	0.028	
3	10/24/2017 8:30	10/24/2017 8:36	10/24/2017 8:50	24.9	23.51	2.03	2.54	0.030	0.055	
4	10/23/2017 15:27	10/23/2017 15:32	10/23/2017 15:40	25.3	24.51	2.29	2.29	0.067	0.025	
5	10/23/2017 14:29	10/23/2017 14:30	10/23/2017 14:37	24.9	24.85	2.03	1.65	0.046	0.047	
6	10/23/2017 13:32	10/23/2017 13:36	10/23/2017 13:46	23.9	24.51	2.16	1.91	0.054	0.041	
7	10/23/2017 13:04	10/23/2017 13:07	10/23/2017 13:15	22.3	23.51	2.54	2.16	0.056	0.035	
8	10/23/2017 12:37	10/23/2017 12:43	10/23/2017 12:52	20.1	21.89	3.05	2.92	0.047	0.094	
9	10/20/2017 12:00	10/20/2017 12:15	10/20/2017 12:37	17.5	19.72	4.95	5.59	0.013	0.060	
10	10/23/2017 8:10	10/23/2017 8:17	10/23/2017 8:22	14.6	17.11	4.19	4.06	0.021	0.039	
11	10/20/2017 13:54	10/20/2017 14:01	10/20/2017 14:11	11.7	14.23	5.33	5.08	0.023	0.046	
12	10/20/2017 14:34	10/20/2017 14:39	10/20/2017 14:52	9.4	11.35	6.48	6.60	0.035	0.025	
13	10/23/2017 8:32	10/23/2017 8:46	10/23/2017 8:58	8.4	8.98	7.37	7.87	0.019	0.038	
14	10/23/2017 9:44	10/23/2017 9:47	10/23/2017 10:00	9.4	8.00	8.13	9.02	0.025	0.029	
15	10/20/2017 13:21	10/20/2017 13:27	10/20/2017 13:39	11.7	8.98	8.00	8.64	0.023	0.046	
16	10/23/2017 10:49	10/23/2017 10:55	10/23/2017 11:10	14.6	11.35	6.85	9.27	0.043	0.033	
17	10/23/2017 11:47	10/23/2017 11:50	10/23/2017 12:04	17.5	14.23	1.65	1.14	0.042	0.040	
18	10/23/2017 15:55	10/23/2017 16:00	10/23/2017 16:11	20.1	17.11	3.81	3.81	0.073	0.139	
Restrikes and Continued Pile Driving										
11	10/23/2017 10:30	10/23/2017 10:30	10/23/2017 10:31	11.7	14.2	0.25	0.25	0.032	0.021	
1	10/23/2017 13:02	10/23/2017 13:02	10/23/2017 13:06	22.3	19.7	2.29	2.03	0.122	0.065	
18	10/24/2017 12:56	10/24/2017 12:56	10/24/2017 13:00	20.1	17.1	2.79	2.92	0.077	0.077	
17	10/24/2017 12:47	10/24/2017 12:47	10/24/2017 12:54	17.5	14.2	4.32	3.81	0.144	0.038	
16	10/24/2017 12:42	10/24/2017 12:42	10/24/2017 12:45	14.6	11.3	3.94	5.46	0.055	0.038	
15	10/24/2017 12:36	10/24/2017 12:36	10/24/2017 12:40	11.7	9.0	4.70	5.21	0.055	0.032	
14	10/24/2017 12:30	10/24/2017 12:30	10/24/2017 12:34	9.4	8.0	5.72	7.11	0.062	0.030	
13	10/24/2017 11:46	10/24/2017 11:46	10/24/2017 11:50	8.4	9.0	4.83	5.84	0.066	0.080	
12	10/24/2017 11:40	10/24/2017 11:40	10/24/2017 11:44	9.4	11.3	5.21	6.22	0.042	0.038	
10	10/24/2017 10:22	10/24/2017 10:22	10/24/2017 10:23	14.6	17.1	4.06	3.68	0.052	0.022	
8	10/24/2017 9:35	10/24/2017 9:35	10/24/2017 9:37	20.1	21.9	1.91	2.16	0.048	0.124	
7	10/24/2017 9:29	10/24/2017 9:29	10/24/2017 9:31	22.3	23.5	1.52	1.52	0.028	0.124	
6	10/24/2017 9:23	10/24/2017 9:23	10/24/2017 9:25	23.9	24.5	1.00	1.52	0.030	0.048	
5	10/24/2017 9:13	10/24/2017 9:13	10/24/2017 9:17	24.9	24.9	1.27	1.27	0.030	0.022	
4	10/24/2017 8:56	10/24/2017 8:56	10/24/2017 9:00	25.3	24.5	1.27	1.65	0.027	0.018	
12C	10/26/2017 15:51	10/26/2017 15:51	10/26/2017 16:05	9.4	11.3	8.26	5.46	0.024	0.049	
13C	10/26/2017 16:15	10/26/2017 16:15	10/26/2017 16:39	8.4	9.0	6.86	4.83	0.028	0.045	
5C	10/27/2017 8:07	10/27/2017 8:07	10/27/2017 8:16	24.9	24.9	1.65	1.27	0.035	0.035	
6C	10/27/2017 8:23	10/27/2017 8:23	10/27/2017 8:33	23.9	24.5	2.03	1.27	0.035	0.029	
7C	10/27/2017 8:35	10/27/2017 8:35	10/27/2017 8:44	22.3	23.5	2.41	1.52	0.012	0.030	
8C	10/27/2017 10:12	10/27/2017 10:12	10/27/2017 10:22	20.1	21.9	2.92	2.03	0.031	0.043	
14C	10/27/2017 11:02	10/27/2017 11:02	10/27/2017 11:39	9.4	8.0	6.22	5.21	0.035	0.029	
15C	10/27/2017 11:56	10/27/2017 11:56	10/27/2017 12:11	11.7	9.0	5.21	3.94	0.032	0.024	
1C	10/27/2017 13:12	10/27/2017 13:12	10/27/2017 13:22	22.3	19.7	3.05	1.52	0.036	0.036	
17C	10/27/2017 13:25	10/27/2017 13:25	10/27/2017 13:27	17.5	14.2	4.95	2.41	0.042	0.019	
16C	10/27/2017 13:31	10/27/2017 13:31	10/27/2017 13:45	14.6	11.3	4.95	4.19	0.047	0.028	
10C	10/27/2017 13:50	10/27/2017 13:50	10/27/2017 14:17	14.6	17.1	5.08	4.32	0.014	0.029	
18C	10/27/2017 14:46	10/27/2017 14:46	10/27/2017 14:56	20.1	17.1	3.18	2.41	0.031	0.021	
11C	10/27/2017 14:59	10/27/2017 14:59	10/27/2017 15:19	11.7	14.2	6.10	4.06	0.063	0.024	
9C	10/27/2017 15:21	10/27/2017 15:21	10/27/2017 15:27	17.5	19.7	2.92	2.16	0.043	0.024	
3C	10/27/2017 15:31	10/27/2017 15:31	10/27/2017 15:34	24.9	23.5	1.27	1.14	0.050	0.019	
4C	10/27/2017 7:56	10/27/2017 7:56	10/27/2017 8:05	25.3	24.5	1.52	1.27	0.007	0.033	
3C	10/30/2017 8:31	10/30/2017 8:31	10/30/2017 8:33	24.9	23.5	1.14	1.27	0.057	0.027	
5C	11/1/2017 13:13	11/1/2017 13:13	11/1/2017 13:16	24.9	24.9	1.14	1.27	0.029	0.042	
6C	11/1/2017 12:52	11/1/2017 12:52	11/1/2017 12:57	23.9	24.5	1.27	1.27	0.016	0.032	

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Vibration Monitoring Data Report

7C	11/1/2017 11:19	11/1/2017 11:19	11/1/2017 11:23	22.3	23.5	1.52	1.40	0.013	0.051
8C	11/1/2017 11:11	11/1/2017 11:11	11/1/2017 11:16	20.1	21.9	1.65	1.52	0.013	0.051
10C	11/1/2017 10:55	11/1/2017 10:55	11/1/2017 10:59	14.6	17.1	3.18	2.92	0.008	0.034
11C	11/1/2017 10:30	11/1/2017 10:30	11/1/2017 10:34	11.7	14.2	4.57	3.05	0.006	0.041
12C	11/1/2017 10:43	11/1/2017 10:43	11/1/2017 10:50	9.4	11.3	6.10	4.83	0.003	0.042
13C	11/1/2017 10:37	11/1/2017 10:37	11/1/2017 10:40	8.4	9.0	8.38	6.73	0.007	0.024
14C	11/1/2017 15:16	11/1/2017 15:16	11/1/2017 15:21	9.4	8.0	6.22	5.08	0.015	0.024
15C	11/1/2017 15:24	11/1/2017 15:24	11/1/2017 15:28	11.7	9.0	4.67	4.57	0.016	0.019
16C	11/1/2017 15:08	11/1/2017 15:08	11/1/2017 15:13	14.6	11.3	2.79	3.94	0.056	0.032
17C	11/1/2017 14:57	11/1/2017 14:57	11/1/2017 15:04	17.5	14.2	3.43	3.05	0.026	0.123
18C	11/1/2017 14:44	11/1/2017 14:44	11/1/2017 14:49	20.1	17.1	2.16	3.30	0.012	0.039
4C	11/1/2017 12:58	11/1/2017 12:58	11/1/2017 13:03	25.3	24.5	1.14	1.27	0.016	0.050
1C	11/1/2017 14:38	11/1/2017 14:38	11/1/2017 14:41	22.3	19.7	2.16	3.05	0.018	0.027
2C	11/1/2017 13:06	11/1/2017 13:06	11/1/2017 13:11	23.9	21.9	1.52	1.91	0.170	0.021

Well Information

Well No.:	1A	**Well No.:**	A
Municipal Address:	25226 Baldoon Road	Municipal Address:	25321 St. Clair Road
Distance from Turbine Centre:	2,725 m	Distance from Turbine Centre:	4,028 m

This data report must be read with "Construction Vibration Monitoring Report, North Kent 1," prepared by Golder Associates Ltd., dated December, 2017.

Monitoring Notes: After installation, selected piles were struck again with the hammer to demonstrate resistance performance and these are noted as "restrikes". Piles that were spliced that were then driven deeper are indicated "C" for continuation of pile depth after splicing. Total pile driving durations derived from start and end times noted above includes labour breaks, equipment work, splicing, welding and other standby time. Multiple intervals of vibration analyses are summarized above where the first instance is consistent with the hardest driving prior to predrilling and the subsequent instances reflect hard driving at the depths of the pile once the pile was spliced and driving restarted. Multiple instances of splicing and driving were required for some piles to penetrate the glacial till and reach the top of rock. Vibration monitoring systems at turbine site switched as follows: BE18695 replaced with BE9555 October 23 through November 1; BE9769 replaced with BE9769 on October 23.

Well 1A located 65 m from Baldoon Road and Well A located 35 m from St. Clair Road. Vibration velocities noted above for both wells reflect peak values induced by transient sources other than pile driving. Data at both wells dominated by influence of locally heavy traffic on both roads and on St. Clair Road in particular. Tractor-trailer transport trucks typically passed Well A every 1 to 3 minutes corresponding to peak vibration velocities.

Footnotes: a) start and end of pile driving are start and stop times for active hammering; b) values shown are peak values regardless of direction; c) well casing vibrations associated with multiple sources, see report text; d) values shown are based on fast Fourier transform analyses of consecutive 1 second intervals for a total period of 10 minutes during pile driving on till/rock (600 seconds) and represent the largest of the 1 second interval peak velocity values during these periods regardless of measurement direction; e) see monitoring notes above.

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