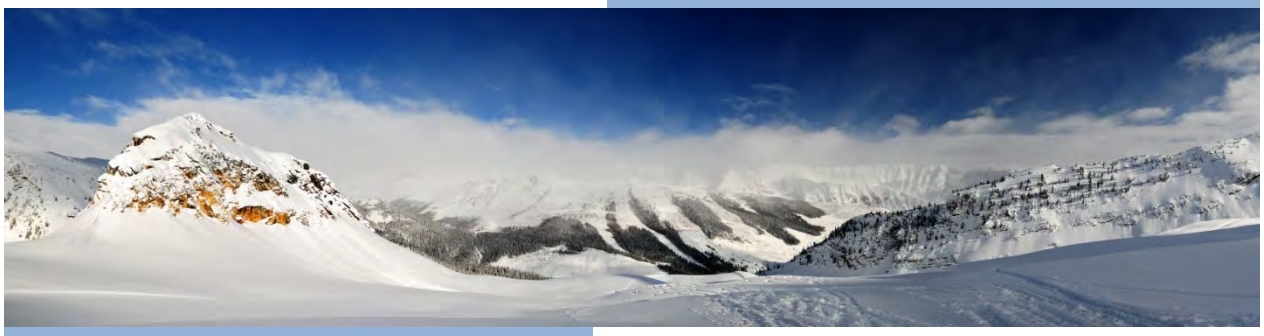
Whitewater
Hydrogeology Ltd.



2020 ADAPTIVE MANAGEMENT PLAN COMPLIANCE MONITORING REPORT

KEPPEL QUARRY

Prepared for:

Harold Sutherland CONSTRUCTION

A Walker Company

Date: August 2021

Whitewater Hydrogeology Ltd
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August 26, 2021

Harold Sutherland Construction
323545 East Linton Road, R.R #2
Kemble, Ontario, Canada N0H 1S0

Attention: Mr. Dave Munro

Re: Keppel Quarry: 2020 Adaptive Management Plan Compliance Monitoring Report

Dear Sir:

Whitewater Hydrogeology Ltd. (Whitewater) is pleased to present the 2020 Adaptive Management Plan (AMP) Compliance Monitoring Report. Based on the monitoring data, Whitewater concludes that extraction did not cause any negative impacts on groundwater resources in 2019.

Based on the findings of the monitoring data collected to date, a revised groundwater and surface water monitoring program is recommended. In response, a revised AMP will be prepared under a separate cover for agency approval and includes a detailed description of the recommended impact assessment methodologies. Until approval is granted, the existing monitoring program shall continue.

If you have any questions, please do not hes

Regards,

Tecia White, M.Sc., P.Geo (licence 0701)
Senoir Hydrogeologist / President
Whitewater Hydrogeology Ltd.

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1.0 INTRODUCTION

Harold Sutherland Construction Ltd. (HSCL), a Walker Company, owns and operates the Keppel Quarry located on Part Lot 28, Concession 10, in the Township of Georgian Bluffs, Grey County (Figure 1). The Keppel Quarry operates under two Aggregate Resources Act (ARA) licenses:

1. License Number 4881 (Original License: East Quarry)
2. License Number 609501 (New License: West Quarry)

Through the ARA licensing process and Ontario Municipal Board proceedings for the New West Quarry, there were extensive technical studies completed to establish baseline data and to assess the potential for adverse impacts to the natural environment because of the quarry operations. This information was used to develop an Adaptive Management Plan (AMP), which includes monitoring, mitigation, and contingency measures that will be relied upon to prevent, minimize, or, if necessary, mitigate environmental impacts. The AMP is a condition of the East Quarry license and approved ARA Site Plans.

1.1 Keppel Quarry: Extraction/Operations Plan

A detailed description of the extraction plan is provided on page 3 of the Site Plans (Bradshaw, May 2012). The sequence of operations describes the extraction from the four areas of the quarry (Area 1A, Area 1B, Area 2, and Area 3). Area 1A was a small expansion of the East Quarry and has been fully extracted to a depth of approximately 234 masl. In 2020, operations (blasting) occurred in Area 1B of the West Quarry. Aggregate was extracted to an elevation of roughly 238 masl (lift one of two).

1.2 Keppel Quarry: Water Management Plan

To maintain dry operating conditions, the East Quarry relies on a water management plan. An Ontario Water Resources Act Section 34 Permit to Take Water (PTTW, No.: 4028-8RCKTY) and Section 54 Environmental Compliance Approval (ECA, Number 3515-8M4PWM) have been issued to allow for the management of groundwater and surface water entering the East Quarry. The PTTW permits the pumping of 2,160,000 L/day at an instantaneous rate of 3,000 L/min for 12 hours a day.

On August 29, 2017, the Ministry of the Environment, Conservation, and Parks (MECP) issued ECA No.:1624-ANJQ4P, which permitted the modifications to the existing sewage works for the collection, transmission, treatment, and disposal of the groundwater and surface water collected in the West Quarry footprint. On June 14, 2018, the MECP issued PTTW No.: 5843-AZ4QLJ, which permits the pumping of the West Quarry at a maximum rate of 6,000 L/min to the sewage works regulated under ECA No.:1624-ANJQ4P.

Condition 4.5 of PTTW No.: 5843-AZ4QLJ stated that HSCL was to provide a final trigger mechanism that meets the Ministry's approval before the water taking commences. This PTTW was amended on April 27, 2021 to provide HSCL additional time to meet this requirement. The final trigger mechanism shall be provided by December 31, 2021. These revised trigger values will reflect updated baseline values in an attempt to avoid false trigger exceedances

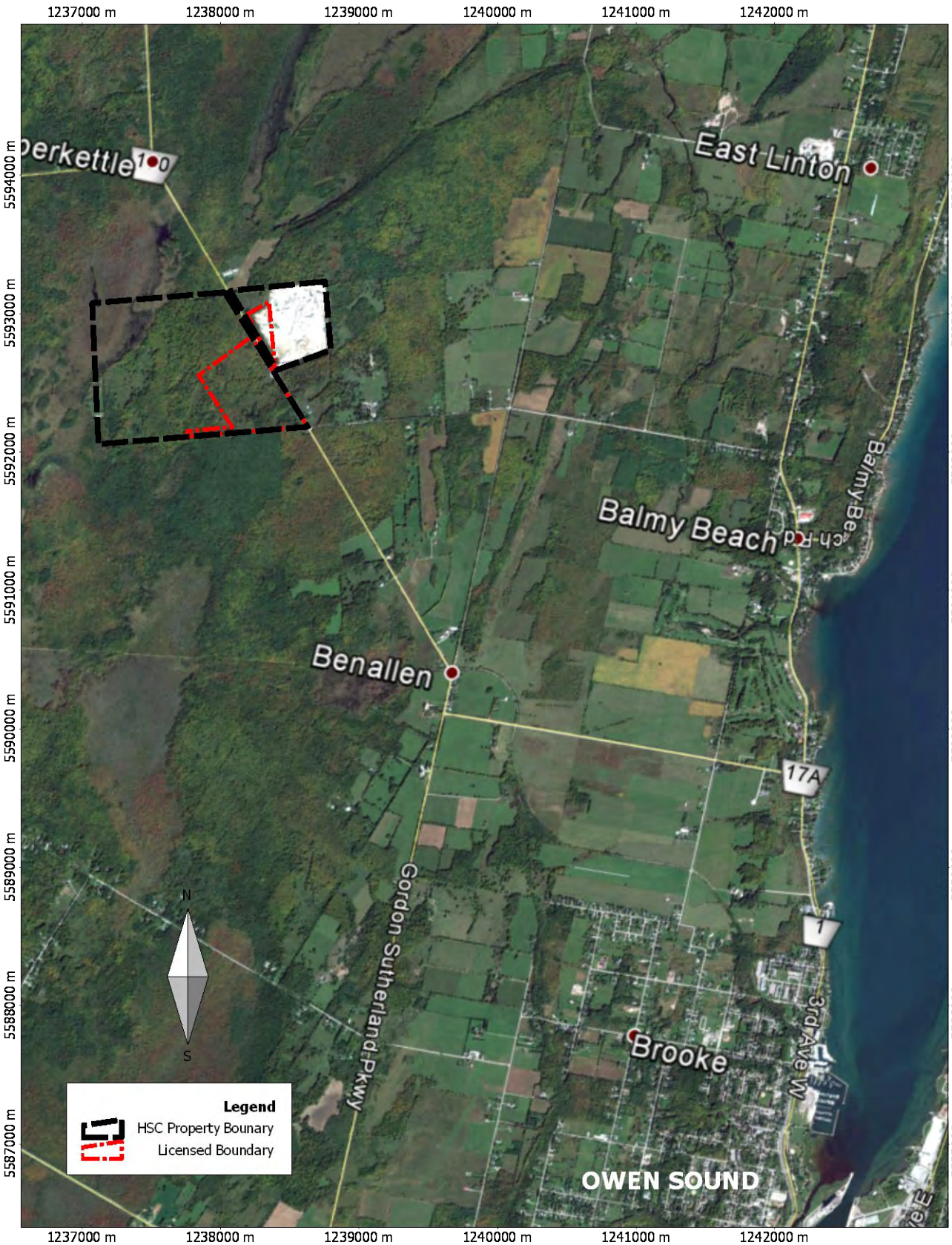


FIGURE 1: SITE LOCATION MAP

2.0 GROUNDWATER AND SURFACE WATER MONITORING RESULTS

The monitoring program outlined in the AMP is intended to minimize potential impacts on water resources, ecological features and monitor the effects of blasting to ensure that proposed mitigation measures are sufficient. There are three components to the monitoring program:

- Water Resources Monitoring (including Private Well Monitoring) (Main Report and Appendix A);
- Ecological Monitoring (Appendix B); and
- Blast Monitoring (Appendix C).

The Water Resources Monitoring Program is designed to track the performance of the West Quarry and the potential impacts on water resources. The Water Resources Monitoring Program tracks changes in each of the following environmental receptors:

- The bedrock groundwater flow system;
- The Shouldice Wetland; and
- The Glen Management Area.

The annual reporting for the West Quarry involves the data compilation, presentation, and evaluation of the performance monitoring data, including the trend analysis. The annual AMP monitoring reports are to be stand-alone documents that provide the reviewers/agencies with interpretations of the data collected and make recommendations to modify the monitoring programs and/or the ARA Site Plan.

The comprehensive monitoring program required under the AMP has resulted in an extensive database of water level and water quality data. Therefore, to ensure that the report provides a clear and concise interpretation of the 2020 monitoring activities relative to the historical and background data, the data is provided in graphical format only. Data in raw format (in the form of extensive tables) have not been included in the report but will be made available upon request.

The AMP for the Keppel Quarry currently relies on seasonal site-specific trigger water level elevations at selected sentry monitoring wells and surface water monitoring stations. These seasonal triggers are set for four quarterly periods (highlighted in Figure 2):

- Winter: December 21st to March 21st
- Spring: March 21st to June 21st
- Summer: June 21st to September 21st
- Fall: Sept 21st to Dec 21st

Ontario experiences significant seasonal climatic variability and season creep, which needs to be taken into consideration during the hydrogeological impact assessment for the Keppel Quarry. An approach to assessing how changes in climate (both temperature and precipitation) affect the hydrogeological response in groundwater and surface water regimes coupled with potential impacts from the aggregate operation is required. As a result, an assessment of the local climatic conditions has been included. Additional information on the trigger conditions is provided in Section 2.3.1.

2.1 Climatic Conditions

A key component of the groundwater and surface water assessment is understanding the climatic conditions over the monitoring period. Figure 2 plots the precipitation data collected from the Wiarton Airport Environment Canada (EC) Weather Station (located approximately 15.5 km from the site) between 2010 and 2020. In order to provide an understanding of variability, the climatic normal for the station (average monthly data between 1981 and 2010). Variability outside of the normal conditions will have a strong influence on the seasonal groundwater and surface water levels, and trends, which will impact the hydrogeological assessment. Therefore, to ensure that the database is complete, the local precipitation data that has been relied upon

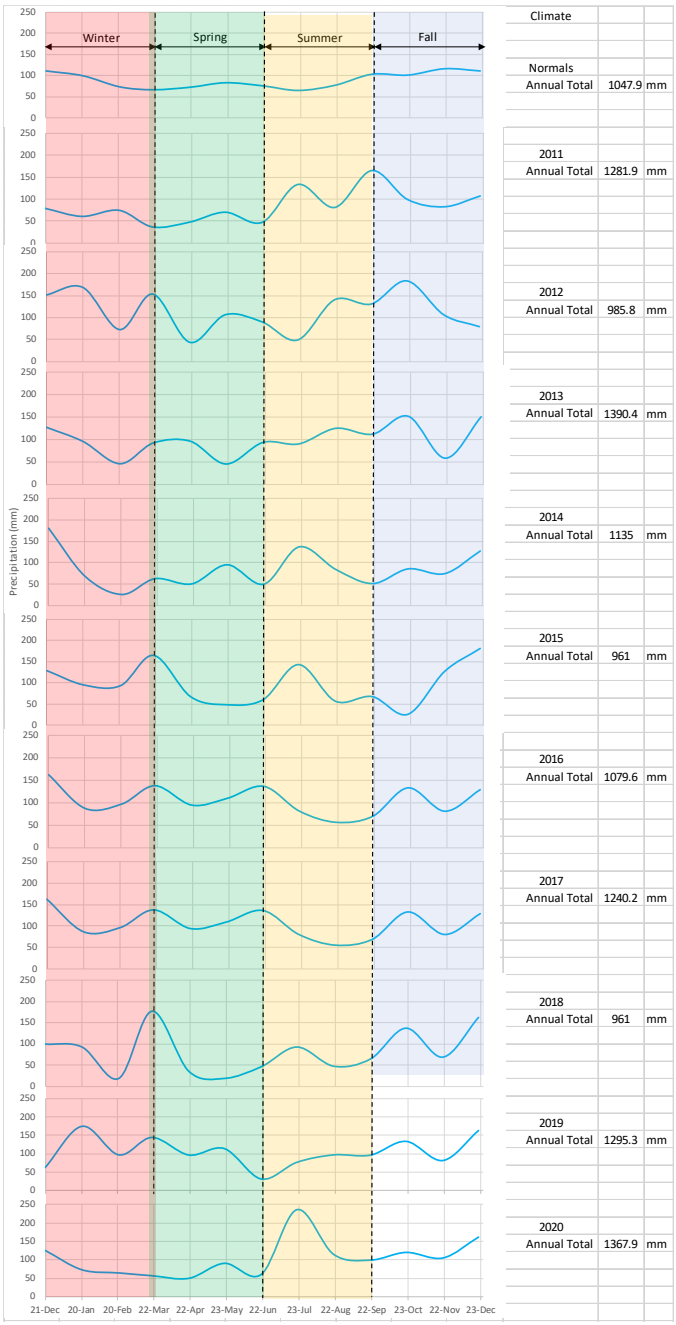


FIGURE 2: SEASONAL PRECIPITATION TRENDS

2.2 New Keppel Quarry Activities

2.2.1 Pumping Records

Quarry dewatering in 2020 continued from the East Quarry under PTTW No.: 4028-8RCKTY. The pump that is used for dewatering the East Quarry is rated at 3,000 L/min and enables the quarry to be dewatered at the maximum permitted rate. In 2020, 234,332 m^3 of water was pumped over 132 days (Figure 3). The maximum daily taking was reported to be 2,150 m^3. HSCL remains in compliance with PTTW No.: 4028-8RCKTY.

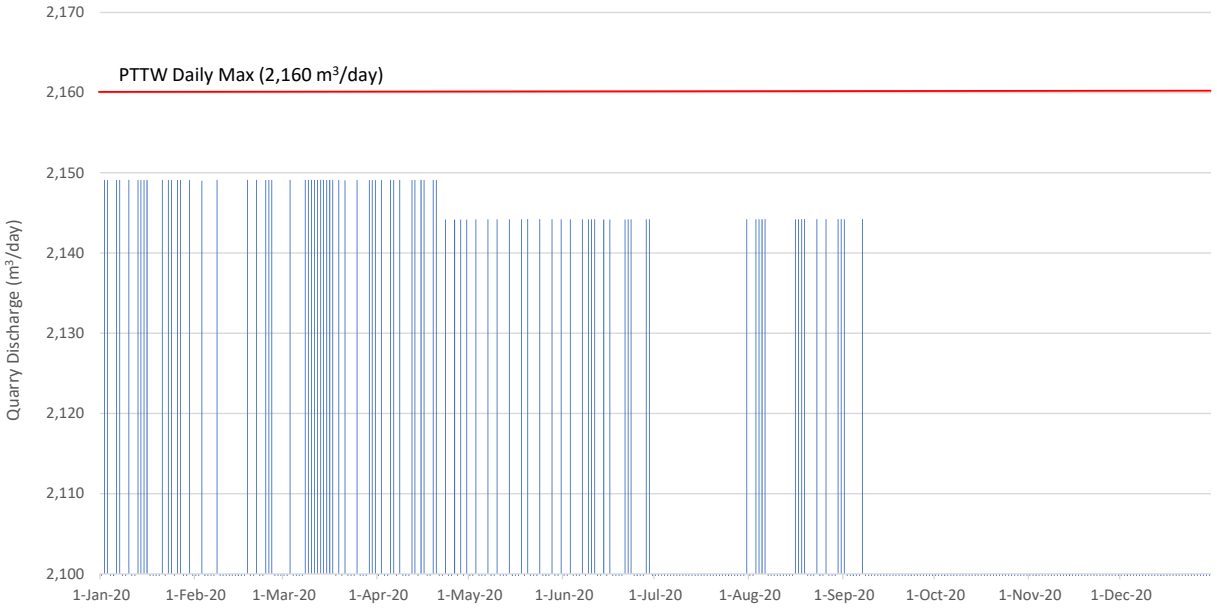
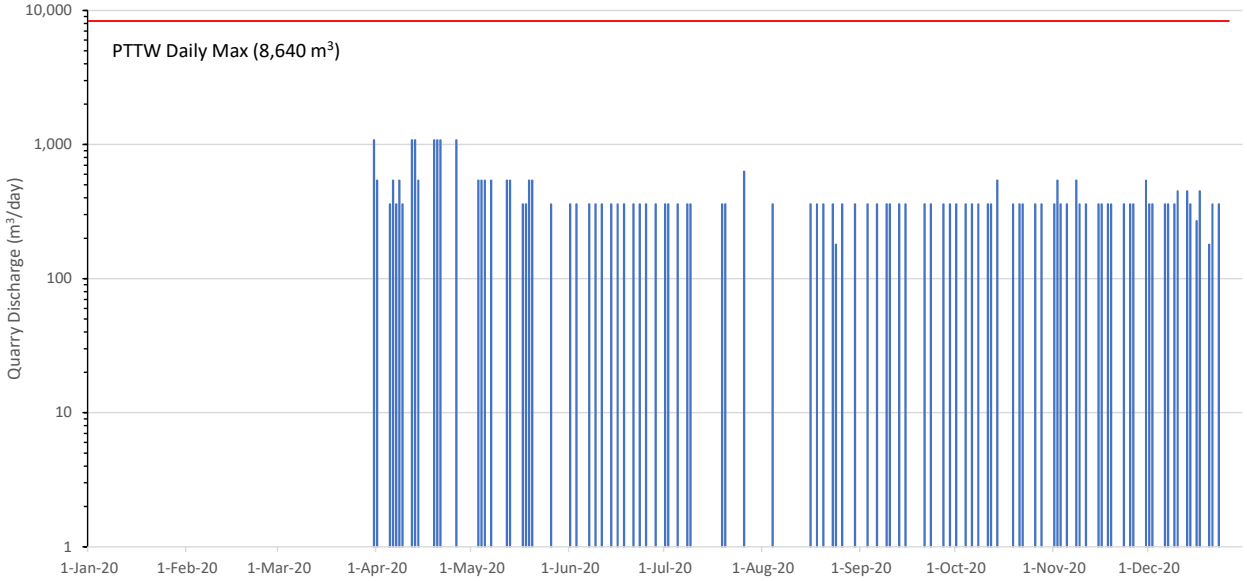


FIGURE 3: 2020 DAILY PUMPING VOLUMES (PTTW NO.: 4028-8RCKTY)

Similarly, under PTTW No.: 5843-AZ4QLJ, dewatering occurred on 103 days in 2020 and totaled 45,090 m^3 from the West Quarry (Figure 3). The maximum daily taking was reported to be 1080 m^3. HSCL remains in compliance with PTTW No.: 5843-AZ4QLJ.



2.2.2 Water Bearing Fractures

The AMP requires visual inspections along the active quarry face after each blast for water-bearing fractures. The intent is to ensure that the quarry does not interfere with potential epi-karst pathways that might otherwise deliver water to surface water features such as springs found in the Shouldice Wetland. Visual inspections were made by HSCL staff after each blast in 2020.

There were 18 blasts in total, which took place on:

- April 17, 2020
- May 4, 2020
- June 5, 2020
- June 16, 2020
- June 30, 2020
- July 9, 2020
- July 31, 2020
- Aug 14, 2020
- Aug 26, 2020

- Sept 4, 2020
- Sept 15, 2020
- Sept 25, 2020
- Oct 13, 2020
- Oct 23, 2020
- Oct 30, 2020
- Nov 10, 2020
- Nov 24, 2020
- Nov 27, 2020

No concerns related to water (i.e., high flows observed in new and/or existing fractures) were reported after any of the blasts.

2.3 Groundwater Monitoring

The bedrock groundwater system includes three distinct components:

1. Epi-karst.
2. Shallow bedrock.
3. Deeper bedrock.

The groundwater elevation monitoring program, which has been designed to characterize all three groundwater flow zones over time, has been divided into two areas: the groundwater monitoring locations within the predicted area of influence (Groundwater Monitoring Wells); and the groundwater monitoring of locations outside the predicted area of influence (Sentry Groundwater Monitoring Wells). The water monitoring network is shown in Figure 4.

2.3.1 Changes to the Groundwater Monitoring Program

Several changes to the groundwater monitoring program have occurred over the years. Specifically, several wells have been destroyed because of the on-going extraction of aggregate. These wells include:

- OW34
- OW35
- OW36
- OW40
- OW65d

In 2020, several manual water levels were not obtained. Water levels were not measured in January due to severe weather conditions, or access issues due to the operations. In the spring (March/April), access roads and trails to some wells were being used by a logging company and could not be used by HSCL employees due to safety concerns around their equipment.

2.3.2 Groundwater Elevations

Monthly groundwater levels are collected at 46 monitoring well locations (Figure 4). Nested groundwater wells (multi-level) are found at 30 of the 46 monitoring locations. Water level data collected from multi-level groundwater wells allow for the assessment of the horizontal flow direction within the bedrock aquifer systems as well as the vertical movement of groundwater over time.

The epi-karst (designated by the letter 'k') is discontinuous across the site but where present is contained within the upper 5 m. Shallow wells (designated by the letter 's') extend five to 10 metres below ground surface (mbgs), while deep wells (designated by the letter 'd') are between 10 and 22 mbgs. Deep wells are screened at an elevation close to the current quarry floor elevation (234 masl), while shallow screens are placed about halfway between the natural grade and the finished quarry floor elevation.

Monthly water levels are measured at the following groundwater monitoring wells:

- OW3d
- OW4d[1]
- OW7s and OW7d[1]
- OW10s and OW10d
- OW14s and OW14d[1]
- OW15s and OW15d
- OW24d[2]
- OW25s[2] and OW25d[2]
- OW26d[2]
- OW27s[2] and OW27d[2]
- OW28s and OW28d
- OW29s and OW29d
- OW30s and OW30d[1]
- OW31s and OW31d
- OW32s and OW32d
- OW37d
- OW38d
- OW39d[1]
- OW41s and OW41d
- OW42s[1] and OW42d[1]
- OW43s and OW43d
- OW44s and OW44d
- OW46k, OW46s, and OW46d
- OW48d
- OW49d[3]
- OW50d[3]
- OW52d[3]
- OW53d
- OW58s[2] and OW58d[2]
- OW59s[2] and OW59d[2]
- OW60s[2] and OW60d[2]
- OW62k, OW62s, and OW62d
- OW63s[1] and OW63d[1]
- OW64s[1] and OW64d[1]
- OW65s[1] and OW65d[1]
- OW72s (OW11 replacement)

Note:

1. Monitoring wells that have reported a drawdown / decreasing water level trend resulting from quarry operations.
2. Monitoring wells that were installed to monitor groundwater levels under the Shouldice Wetland.
3. Monitoring wells that were installed to monitor groundwater levels under the Glen Management Area.

Groundwater levels have been monitored in the shallow and deep bedrock since 2003. It wasn't until 2009 that routine monthly water level monitoring was completed and captured the true seasonal fluctuations. Water level hydrographs (with trend lines) have been generated for the period between 2009 and 2020 (Appendix A-1a). The hydrographs have a constant vertical scale that spans between 234 masl (base of the quarry floor) and 250 masl, which allows for a comparison between the water level elevations, seasonal fluctuations, and trends.

Water levels across the site remain within the historical seasonal ranges, except for the observed drawdown trends measured at monitoring wells located near the extracted quarry faces. These wells include:

- OW4d
- OW7d
- OW14d
- OW30d
- OW39d
- OW42s and OW42d
- OW63s and OW63d
- OW64s and OW64d
- OW65 and OW65d

Bedrock groundwater levels between the Keppel Quarry and the Glen Management Area are measured at OW49, OW50, OW51, and OW52. Monitoring results indicate that water levels remain within background conditions.

Water level monitoring that is completed to assess the potential impacts to the Shouldice Wetland is completed for the overburden sediments (test pits and mini-piezometers) as well as within the groundwater beneath the wetland. Hydrographs for the water levels in the vicinity of the Shouldice Wetland are presented in Appendix A-1b. Water levels remain within background ranges.

In order to confirm that there have been no changes to the water levels in the vicinity of the Shouldice Wetland, a more detailed assessment was completed. This assessment incorporated the findings of the vertical gradient and area of influenced evaluations and are presented in Section 2.3.4.

2.3.1 Sentry Groundwater Monitoring Wells

Nine (9) of the 46 monitoring locations have been equipped with automatic dataloggers to supplement the manual groundwater monitoring. These wells are located outside the predicted zone of influence from the quarry operations and are therefore referred to as sentry well locations. As a contingency measure, the AMP identifies trigger values for the sentry wells that, if exceeded, will trigger action by HSCL so that mitigation can occur before any negative effects to the natural environment can occur.

For each of the sentry wells, there are three standard categories of trigger values (green, yellow, and red). Each trigger value is accompanied by a set of actions that are implemented if these values are exceeded. Data loggers were not installed until the spring of 2017. The assessment has been completed based on spot measurements, and extrapolation between these data points on the hydrograph is interpretative (as a result of the erroneous barometric data in 2019).

Green trigger values were set at 15 cm above observed seasonal lows (spring, summer, autumn, and winter) reported from the monthly water level data collected between 2009 and 2014 for each of the Sentry Wells. Exceedance of a green trigger value indicates no significant negative impacts have been observed, and water levels are still within the normal historical range. This will trigger a Green Action as an early response action (i.e., increase monitoring frequency and investigate). Yellow trigger values are equal to observed seasonal lows for each location. Exceedance of a yellow trigger value indicates water levels are slightly below seasonal lows, but no significant negative impacts have been observed. This is used to trigger a Yellow Action or a precautionary mitigation measure. Red trigger values were set at 15 cm below observed seasonal lows. Exceedance of a red trigger value is used to trigger Red Actions or immediate responses if the yellow actions fail to correct or reverse the impact.

Monthly and continuous water levels (collected via datalogger) are measured at the following sentry groundwater monitoring well locations:

- OW8s and OW8d
- OW9s and OW9d
- OW12s and OW12d
- OW13s and OW13d
- OW33s and OW33d
- OW45d
- OW47s and OW47d
- OW51d
- OW71k, OW71s, and OW71d[1]

Note:

1. Monitoring wells were installed to monitor groundwater levels under the Shouldice Wetland.

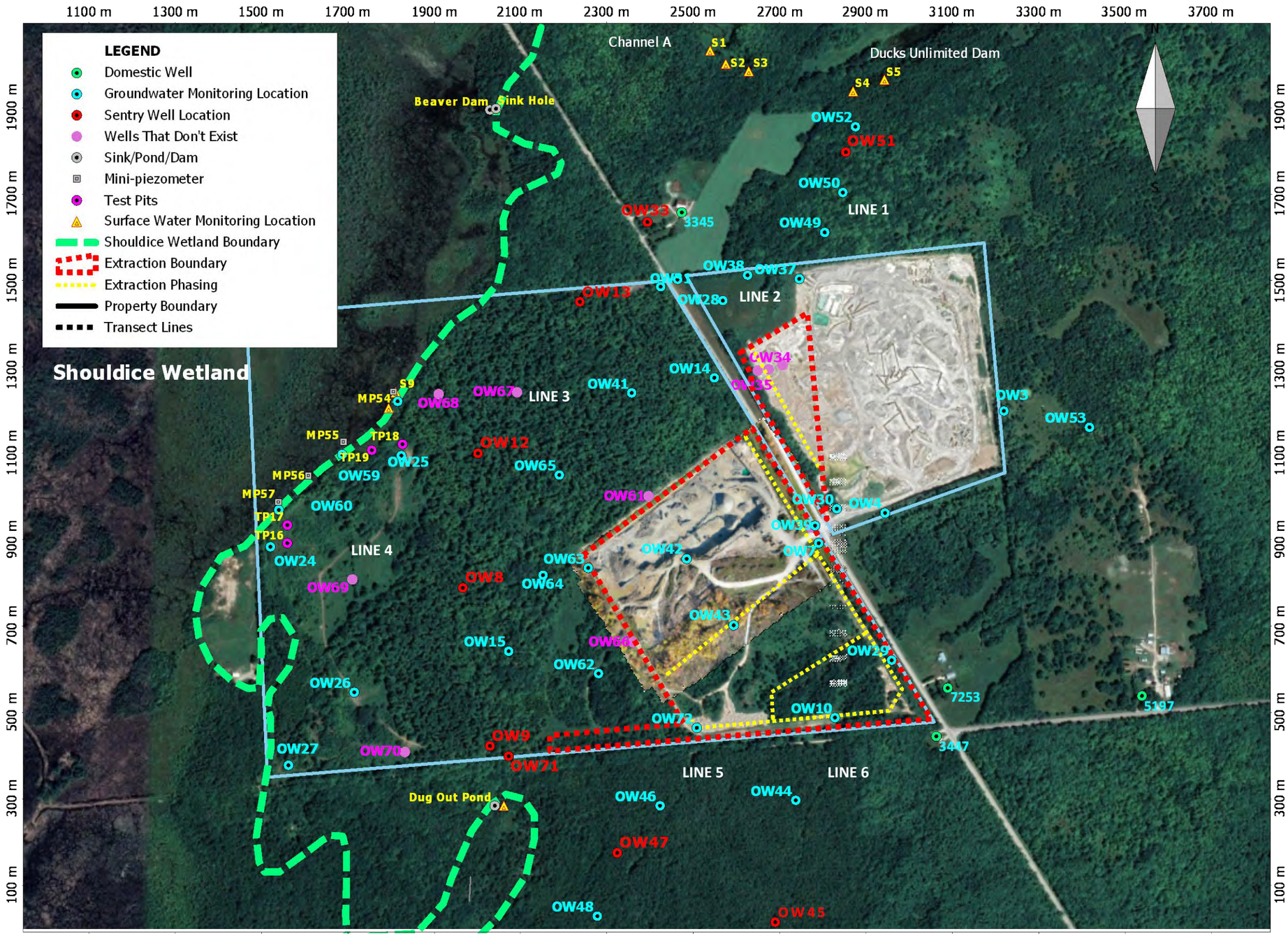


FIGURE 4: MONITORING LOCATION MAP

Water level hydrographs (in comparison to the associated trigger values) have been generated for the period between 2015 and 2020 (Appendix A-1c). A review of the data indicates that generally, water levels remain within historical levels. A comparison to the seasonal trigger levels has been completed with the understanding that there is climatic variability (Appendix A-1c). Overall, 26 yellow and 32 red false positive triggers have been exceeded since 2015. In order to analyze the data for monotonic trends that may be related to the quarry operation, the Seasonal Kendall test (SK test) has been applied to the sentry well data.

2.3.2 Seasonal Kendall Tests

The Seasonal Kendall test (SK test) is a nonparametric test that analyzes data for monotonic trends in seasonal data. Developed by Hirsch, Smith, and Slack (for the U.S. Geological Survey) in the 1980s, it is the most popular trend test in environmental studies. "Monotonic" means a consistent upwards or downwards trend. "Seasonal" means that data is collected for periods where trends can are upwards or downwards.

Variables other than time usually influence the behavior of water water levels. These covariates are usually natural phenomena such as precipitation, temperature, or streamflow. By removing the variation caused by these explanatory variables, the noise may be reduced and a trend revealed. Correction for hydrologic and meteorologic variability is essential in both parametric and nonparametric trend tests to determine if the statistically significant trends are due to processes and transport changes such as land use changes, or to artifacts of system variability (Helsel, D.R., D.K. Mueller, and J.R. Slack. 2005).

Changes between seasons are a major source of variation in water level data. The Seasonal Mann-Kendall Test, which considers the seasonality of the data series, requires a "season" to be defined in advance. Seasons should be just long enough so that some data are available for most of the seasons in most years of monitoring. If data are collected or aggregated on a monthly frequency seasons should be defined representing each of the 12 months. This means that for monthly data with seasonality of 12 months, one will not try to find a trend in the overall series, but a trend from one of January to another, and from one February and another, and so on. The Seasonal Mann-Kendall test is established on the basis that the trend is cyclically varying in relation to the seasons of the year. It is used to analyse time series data for the possible existence of an upward or downward trend, at a significance level, while accounting for the effect of seasonality.

If a decreasing trend is determined by the results of the Seasonal Mann-Kendall Test, the trend will be analyzed using a Theil-Sen slope. The Theil-Sen test is also nonparametric and provides a more robust slope estimate than the least-squares method because outliers or extreme values in the time series affect it less. Therefore, this test provides an estimate of the true slope of an existing trend (as change per year). If the trend is decreasing, the date at which the water level is predicted to drop below a threshold value is calculated. If the trend is not decreasing, the test will conclude that the slope is not statistically decreasing. The slope of the trend line is used to make a conclusion on future groundwater conditions. The results are provided in Table 1. A positive Sen's Slope value indicates an increasing trend, while a negative value indicates a downward trend.

TABLE 1: SEN'S SLOPE VALUES

Sentry Well	Sen's Slope	Sentry Well	Sen's Slope
OW8s	**-0.002**	OW33d	0.166
OW8d	0.008	**OW45**	**-0.039**
OW9s	0.02	OW47s	0.015
OW12s	0.023	OW47d	0.014
OW12d	0.086	OW51	0.031
OW13s	0.013	OW71k	0.013
OW13d	0.032	OW71s	0.011
OW33s	0.067	OW71d	0.01

Sen's slope has identified two minor decreasing trends (OW8s and OW45). The values represent the magnitude of change in water levels over each month. Based on the dataset available, the water level decrease has been calculated to be 0.002 m/month at OW8s and 0.039 m/month at OW45. The on-going groundwater monitoring data will be assessed to see if these trends continue as extraction proceeds.

2.3.3 Overburden Water Levels and Groundwater Recharge

Four test pits with standpipes have been installed in the overburden within 100 m of the Shouldice Wetland boundary. These test pits (TP16, TP17, TP18, and TP19) are monitored to assess water level conditions in the overburden aquifer, which are believed to be a potential source of groundwater recharge for the wetland springs. Water levels in the overburden remain within historical ranges (Appendix A-1d).

2.3.4 Groundwater Flow

Vertical Hydraulic Gradients

The vertical movement of groundwater in the overburden sediments and the bedrock aquifer can be determined by measuring the hydraulic head difference between the units by installing a mini-piezometer (MP). A mini-piezometer is a portable drive probe that provides a comparison between the stage of a surface water body and the hydraulic head beneath the surface water body at the depth to which the screen at the end of the probe is driven. Because the MP is driven manually into the sediments, obtaining a good seal between the MP and the sediments is difficult, and data should be interpreted with caution.

At the Keppel Quarry, groundwater levels in the overburden are monitored at four mini-piezometers (MP54, MP55, MP56, MP57), which are constructed in the ponded water of the Shouldice Wetland and are monitored monthly during unfrozen conditions (Appendix A1-e). These overburden water levels were used to estimate the vertical direction of groundwater flow beneath the wetland when wet. In 2020, the wetland was dry most of the year. As a result, the vertical hydraulic gradients could not be calculated during these periods. The 2020 hydraulic gradients remained within historical ranges.

Groundwater vertical hydraulic gradients were also calculated using observation wells installed in the bedrock underlying the Shouldice Wetland, including observation well nests OW58, OW59, OW60, and OW71. The calculated gradient values for the observation wells ranged between -0.01 to 0.06 m/m in 2020. The average vertical gradient for the karst bedrock to the shallow bedrock at OW71 was slightly upward (0.06 m/m), while the average vertical gradient for the shallow bedrock to deep bedrock at OW71 was neutral. These gradients were consistent with historical data at these locations. This information, coupled with the gradients calculated from the mini-piezometers, indicates that the groundwater vertical hydraulic gradients in the Shouldice Wetland or the bedrock underneath the wetland were not affected by extraction in 2020.

TABLE 2: VERTICAL HYDRAULIC GRADIENTS BENEATH THE SHOULDICE WETLAND

Date	Overburden				Bedrock				
	MP54	MP55	MP56	MP57	OW58	OW59	OW60	OW71 S&K	OW71 S&D
29-Apr-20	dry	dry	-0.02	-0.02	0.03	0.03	0.00	0.05	0.00
13-May-20	dry	dry	-0.02	-0.04	0.03	0.03	0.00	0.05	0.01
15-Jun-20	0.43	0.30	-0.03	0.00	0.03	0.03	0.00	0.08	0.00
21-Jul-20	0.00	dry	dry	dry	0.04	0.02	0.00	0.05	0.01
21-Aug-20	0.00	-0.01	-0.03	-0.01	0.03	0.01	-0.02	0.09	0.01
15-Sep-20	dry	0.00	-0.06	0.00	0.03	0.02	0.00	0.06	-0.01
08-Oct-20	dry	0.01	-0.06	0.01	0.02	0.02	-0.01	0.06	-0.01
15-Nov-20	dry	-0.02	-0.07	-0.02	0.02	0.02	-0.01	0.03	0.00
AVERAGE	0.15	0.05	-0.04	-0.01	0.03	0.02	-0.01	0.06	0.00

Horizontal Groundwater Flow.

The shallow and deep groundwater flow maps have been prepared based on water levels collected on September 15, 2020. The potentiometric surface for the shallow bedrock aquifer is presented in Figure 5. The influence of the extraction has become evident in the shallow groundwater elevation data. As discussed in Section 2.3.2, a 2 m drawdown was reported at OW42, which is immediately adjacent to the quarry extraction face. The data is showing the early stages of a cone of influence developing in the shallow aquifer system. Groundwater flow under natural conditions flowed directly west toward the Shouldice Wetland. As anticipated, local changes in the groundwater flow have resulted from the extraction and dewatering, and a portion of the shallow groundwater now flows toward the West Quarry footprint.

The potentiometric surface for the deep bedrock aquifer is presented in Figure 6. The deep groundwater flows from a high of approximately 245-246 masl in the central portion of the West Quarry. Groundwater flows radially from this groundwater mound towards the Shouldice Wetland in the west and toward the East Quarry. The extraction of Area 1B appears to have had only a minor no influence on the deep groundwater flow pattern. The extraction in the East Quarry has resulted in an area of influence that extends between 300-500 m from the quarry face.

2.3.1 Groundwater Area of Influence Assessment

The zone of influence within the bedrock aquifer has been defined by mapping the water table contours based on the seasonal low water levels (Section 2.3.4). To supplement this plan view delineation of the zone of influence and to track the changes within this area over time, distance-water level plots have been generated (Appendix A2).

Figure 4 and Figure A2-1 shows the transect lines used to generate the distance – water level plots. Transect Line 1 shows an inflection point at OW50 for most of the year. In June, this inflection point moved to OW51 and in July it moved passed OW52. On average, the area of influence that has resulted from the extraction of aggregate at the Keppel Quarry extends between 200 and 350 m in a northerly direction.

Transect Lines 2, 3, and 4 all run from the east towards the Shouldice Wetland in the west. Transect Line 2 is within the area of influence, and no inflection point is noted. Transect Line 3 could not be intreprated in 2020 due to the lack of water level data obtained from OW41. Transect 4 show that the inflection point is generally at OW63 (570 m). However, it did extend to OW8 in November 2020. Transect Lines 5 and 6 runs from the quarry face south. Inflection points are noted at distances of 380 m (OW43) and 495 m (at OW10).

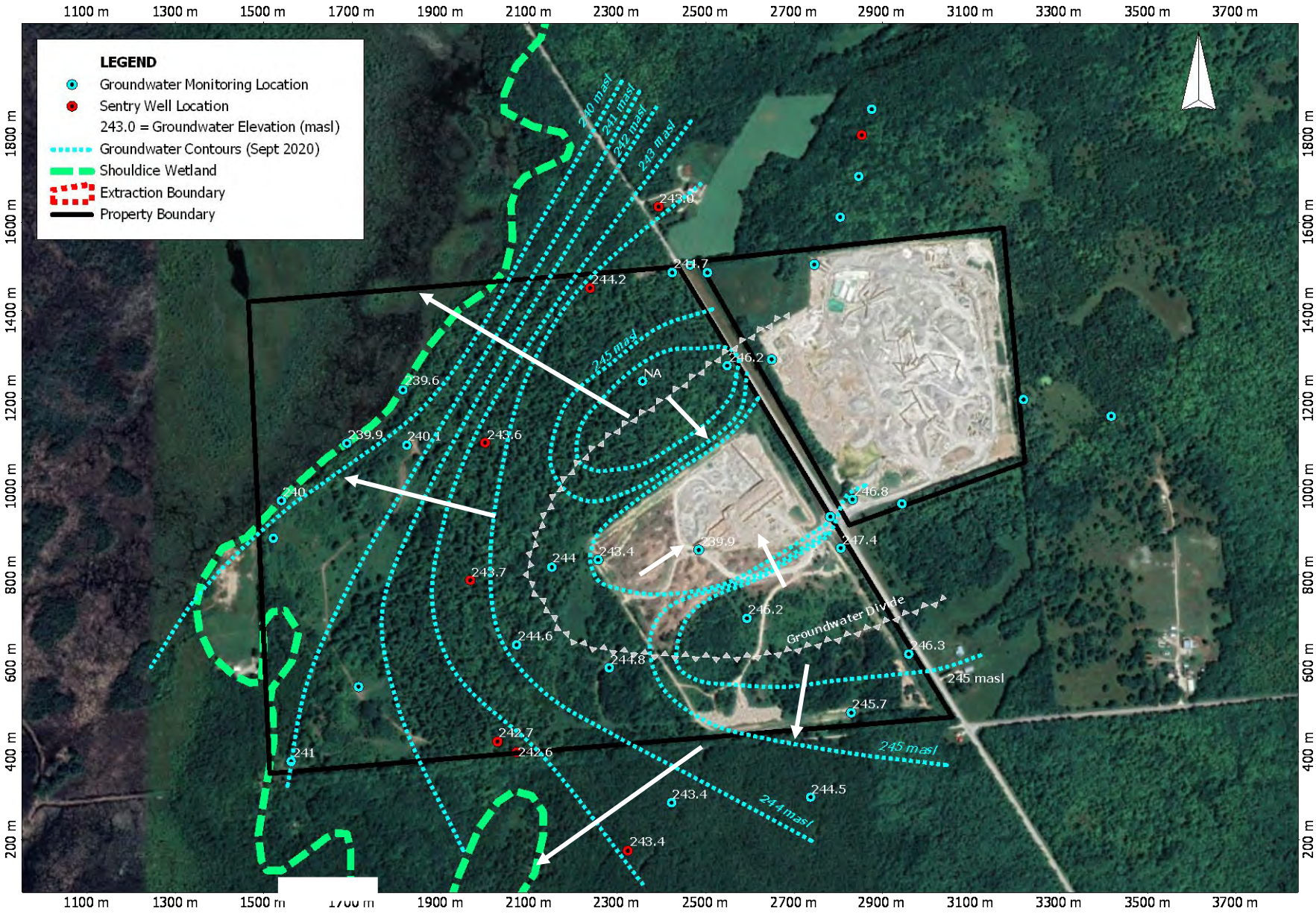


FIGURE 5: GROUNDWATER FLOW PATTERN – SHALLOW AQUIFER

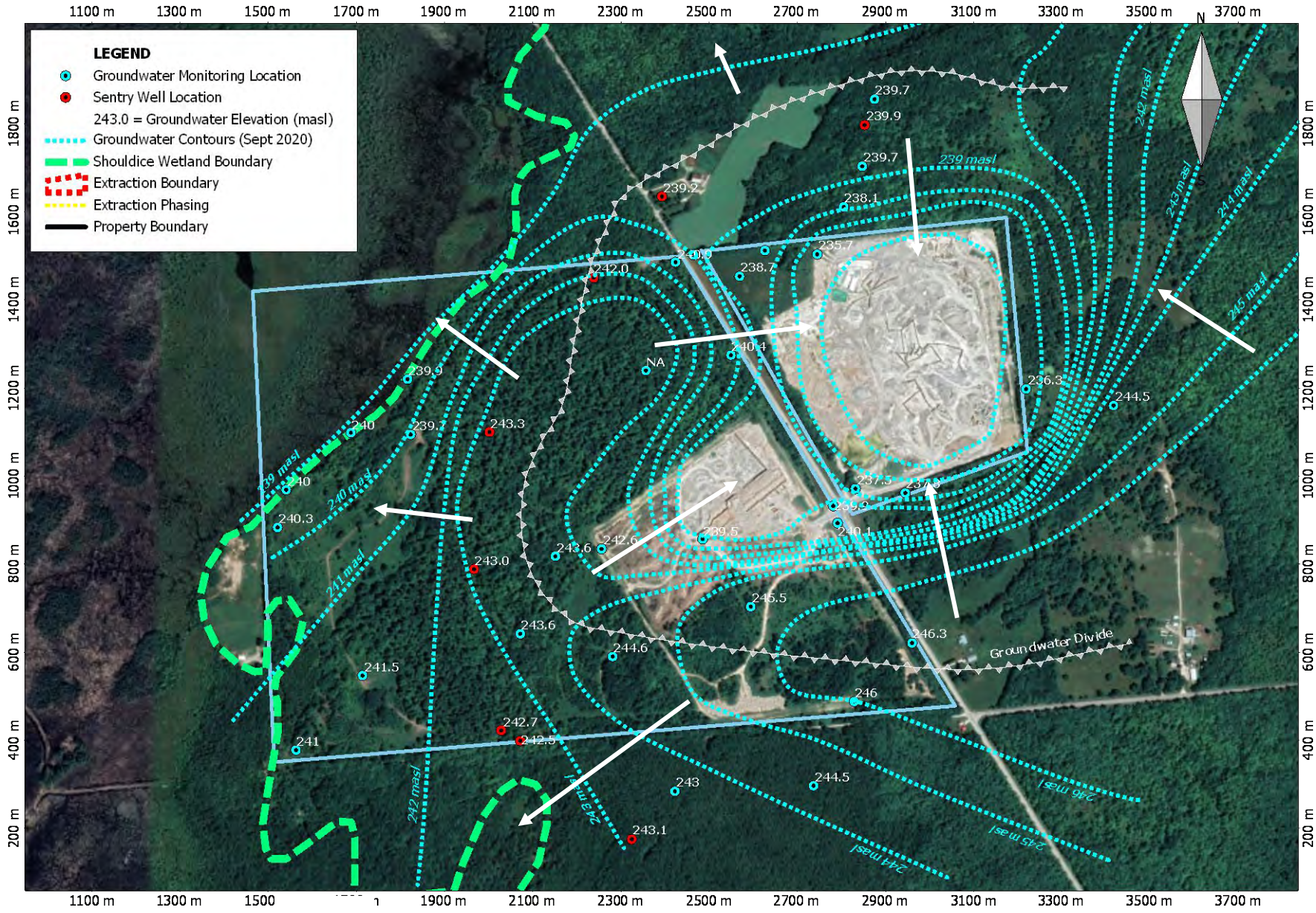


FIGURE 6: GROUNDWATER FLOW PATTERN - DEEP AQUIFER

2.4 Domestic Water Well Monitoring

A Private Domestic Water Well Monitoring Program has been developed to monitor water supplies of residents within one kilometer of the Keppel Quarry (Figure 4). Private wells have been separated into two categories:

1. Category A wells – includes those wells within or just outside the predicted zone of influence for the deep bedrock aquifer when the Keppel Quarry is at its full extent. These wells include:
    - well no. 3345 (the Ritchie well);
    - well no. 3447 (owned by HSCL);
    - well no. 5197 (the Ruthven well); and
    - well no. 7253 (the Cramp well)
2. Category B wells - includes those wells within 1 km of the Keppel Quarry license boundaries but outside the predicted zone of influence. Category B Private Wells include:
    - well no. PW1 (the Jenks well);
    - well no. PW2 (the Thompson well); and
    - well no. PW3 (the Porter well).

2.4.1 Category "A" Domestic Water Wells

1. Private well no. 3345 (the Ritchie well)

As stated in the 2015 and 2016 AMP Compliance Assessment Report (MTE, 2016, and 2017), the resident declined to be a part of the monitoring program. This remains unchanged, and therefore no water level data was collected at this location in 2020.

2. Private well no. 3447 (owned by HSCL)

Access to the well is limited as it is in a locked shed occupied by the tenant's scrap material and garbage. HSCL has requested the shed be cleaned up for safer access. Water levels cannot be collected until access to the well has been re-established.

3. Private Well No. 7253 (the Cramp well)

The Cramp well is a drilled well constructed in a well pit with a suction pump. As a result, the monitoring had to be completed with a vented cable to surface from the datalogger. In 2020, this vented cable that had been installed in the Cramp was damaged and the water level data has not been retrieved. The Cramp well is currently being replaced by Sutherland as per the conditions stipulated in the AMP and the site's PTTW. Monitoring of the new well will commence by the end of October 2021.

4. Private Well No. 5197 (the Ruthven well)

Water levels in Private Well No. 5197 were measured using a data logger. Water levels were like historical values fluctuating around 248 masl on average. At least 4.75 m of water column remained in this well while extraction occurred in 2020, which is like previous years. This information indicates that the water supply has not been affected by extraction.

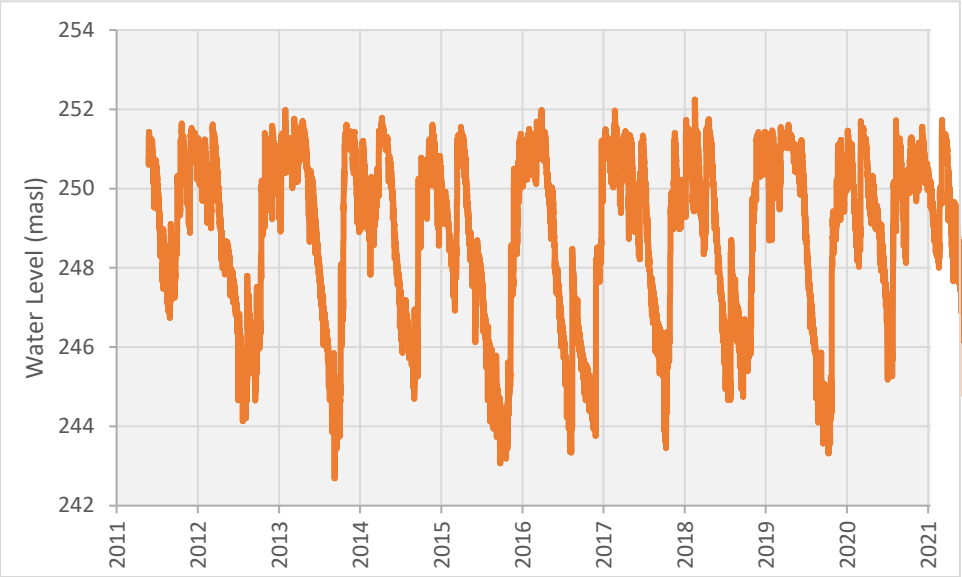


FIGURE 7: RUTHVEN WELL WATER LEVELS

2.4.2 Category "B" Domestic Water Wells

Water levels are to be measured manually from each of the participating Category B private wells on a seasonal basis (3 times per year). PW1, PW2, and PW3 fluctuated seasonally in 2020, with the highest water levels being measured in the spring, the lowest water level in the summer, and then a small amount of recharge in the fall. Water levels measured at the Category B wells in 2020 were comparable to previous years.

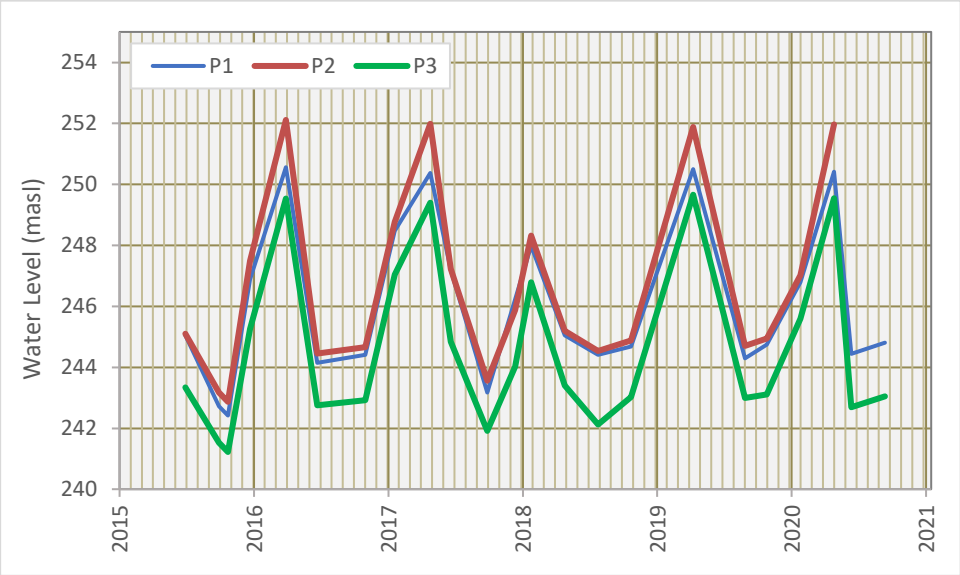


FIGURE 8: CATEGORY B - DOMESTIC WELL WATER LEVELS

2.4.3 Domestic Water Well Interference Complaints

There were no well interference complaints received by HSCL from any of the private wells in 2020

2.5 Surface Water Monitoring

2.5.1 Shouldice Wetland

The Shouldice Wetland is a Provincially Significant Wetland (PSW). The wetland has been identified as an environmental receptor due to its ecological importance and its unique hydraulic and hydrogeologic characteristics. Key indicators used to monitor the Shouldice Wetland include:

- Bedrock Groundwater levels (refer to Section 2.3.2);
- Groundwater recharge (refer to Section 2.3.3);
- Groundwater vertical hydraulic gradients using mini-piezometers (refer to Section 2.3.3);
- Springs (s8, s9, and s13) and the dugout pond;
- Shouldice Wetland culverts; and
- Beaver dam and sinkhole.

As discussed in Sections 2.3, the groundwater conditions indicate that the vertical hydraulic gradients between the Shouldice Wetland and both the overburden and bedrock aquifers were not affected by extraction in 2020. To supplement this information and provide multi-lines of evidence to effectively assess the impacts of aggregate extraction from the Keppel Quarry on the wetland, the following surface water program was conducted in 2020 to comply with the requirements of the AMP:

A. Continuous and monthly surface water levels, conductivity and temperature measurements (datalogger) at Spring s8, s13 and dugout pond (SG1 and outflow) to characterize the hydroperiod, trends, and to determine the water source (groundwater or surface water);
B. Monthly surface water levels and flows at Spring s9;
C. Flow conditions at the Shouldice Wetland culverts to confirm the length of hydroperiod and trends; and
D. Monthly surface water flows measurements at the beaver dam sinkhole to characterize the hydroperiod and trends. Continuous water level, temperature, and conductivity monitoring to determine the water source (groundwater or surface water).

A: Surface Water Stations s8 and s13 and the Dugout Pond

Spring s8 is located along the edge of the Shouldice Wetland, approximately 850m west of Area 1a. Spring s13 is located approximately one kilometer southwest of Area 1A and adjacent to the dugout pond (SG1). The spring locations are identified in Figure 4. The monthly monitoring data are provided in Table 3. Continuous water level and temperature data are presented in Figure 9.

TABLE 3: SURFACE WATER FIELD MEASUREMENTS

Date	Surface Water Springs						Dug Pond				
	s8			s13			SG1		Pond Outflow		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow	Conductivity	Temperature	Conductivity	Temperature	Flow
	µS	°C	L/s	µS	°C	L/s	µS	°C	µS	°C	L/s
31-Jan-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
28-Feb-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30-Mar-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30-Apr-20	520	5.2	F	661	5.9	F	700	6.4	677	6.9	F
13-May-20	440	6.8	F	710	8.2	F	750	9.9	700	10.2	F
19-Jun-20	460	14	NF	510	9.1	NF	580	12.1	D	D	D
23-Jul-20	511	18.4	NF	772	13.1	NF	946	14.9	D	D	D
20-Aug-20	510	12.1	F	560	12.1	NF	590	13.5	N/A	N/A	N/A
17-Sep-20	550	13.6	NF	520	12.9	NF	710	13.5	N/A	N/A	N/A
08-Oct-20	520	10.8	F	500	10.7	NF	550	11	N/A	N/A	N/A
18-Nov-20	NF	NF	NF	NF	NF	NF	NF	NF	N/A	N/A	N/A
10-Dec-20	NF	NF	NF	NF	NF	NF	NF	NF	N/A	N/A	N/A
Notes:	F = Flowing			NA = Frozen/No Data							
	NF = No Apparent Flow			ND = No Data							
	D = Dry										

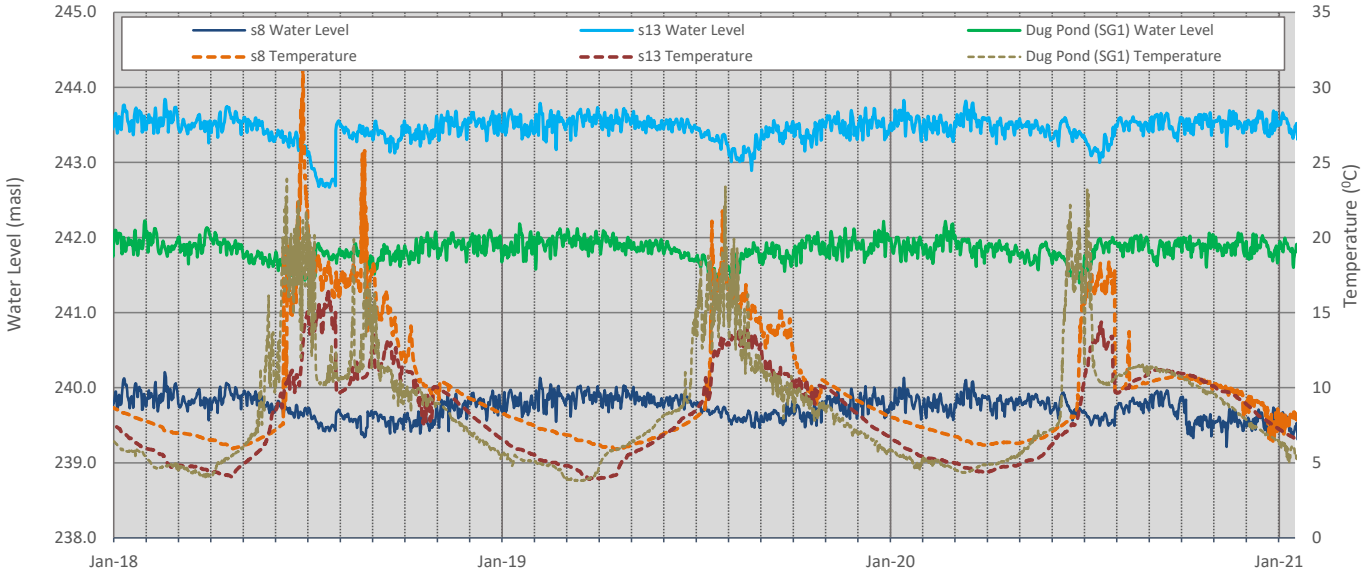


FIGURE 9: S8 AND S13 WATER LEVELS AND TEMPERATURE

The surface water monitoring in 2020 shows that there was flow at s8 periodically (in the months of April, May, August and October. At s13, the flow was only reported during the spring freshet in April and May. Water levels measured in 2020 at s8 and s13 were comparable to historical values. Flow out of the Pond was reported in the spring (April and May). Monitoring results indicate that extraction has not caused any not measurable influence on the surface water regime at these locations.

Historical conductivity values ranged from 440 µS to 623 µS at spring s8, 26 µS to 1,102 µS at spring s13 and 662 µS to 1228 µS at the dugout pond. The 2020 values are comparable to historical data collected at these locations.

B: Surface Water Station s9

Spring s9 is either dry, ponded, or frozen, and no flow was observed in 2020.

C: Shouldice Wetland culverts

There are several culverts (Culverts 4 through 7) that allow water to cross under a snowmobile trail constructed at the end of Gun Club Road, which through the Shouldice Wetland (Figure 2). Monthly monitoring of surface water flows (observed as 'flowing,' 'no apparent flow,' 'dry' 'frozen or blocked), conductivity, and water temperature is collected to assist in evaluating the hydro-period of the Shouldice Wetland. The monitoring results from 2020 are summarized in Table 4.

Culver 4 only flowed during the month of October in 2020. The remaining stations were frozen in November, December, January, and February 2020. Over the course of the summer, flow ceased for at least once month at all locations with the exception of Culver 6, which remained flowing during unfrozen conditions.

The conductivity values collected in 2020 at the culverts ranged from 300 to 620 at the culverts. These values are comparable to historical data collected at these locations. Water temperature values collected in 2020 at the culverts ranged from 4.6 to 26°C. Historically, temperatures have risen as high as 30°C.

TABLE 4: CULVERT FIELD MEASUREMENTS

Location	Parameter	Unit	Monitoring Results									
			31-Mar-20	30-Apr-20	12-May-20	16-Jun-20	21-Jul-20	20-Aug-20	17-Sep-20	08-Oct-20	19-Nov-20	10-Dec-20
Culvert 4	Conductivity	mS	512	662	460	620	D	D	590	560	NA	NA
	Temperature	°C	5.5	9.9	15.8	16.5	D	D	16.3	10.9	NA	NA
	Flow	L/s	NF	NF	NF	NF	D	D	NF	F	NA	NA
Culvert 5	Conductivity	mS	437	534	390	430	650	470	450	430	NA	NA
	Temperature	°C	4.5	8.2	11.6	20.7	26	20.7	17.5	11	NA	NA
	Flow	L/s	F	F	F	F	NF	F	F	F	NA	NA
Culvert 5a	Conductivity	mS	406	571	330	340	450	350	340	330	NA	NA
	Temperature	°C	5	8.6	9.7	21.2	24.4	23.6	16.1	11	NA	NA
	Flow	L/s	NF	F	F	F	NF	NF	F	F	NA	NA
Culvert 6	Conductivity	mS	457	449	320	340	380	300	350	310	NA	NA
	Temperature	°C	4.6	7.6	9.7	19.1	23.5	20.7	17.1	10.9	NA	NA
	Flow	L/s	F	F	F	F	F	F	F	F	NA	NA
Culvert 6a	Conductivity	mS	499	484	330	410	370	310	300	310	NA	NA
	Temperature	°C	4.8	8.7	12	20.1	22.6	20.4	15.7	11.1	NA	NA
	Flow	L/s	NF	F	F	F	NF	F	F	F	NA	NA
Culvert 7	Conductivity	mS	399	416	340	320	D	290	460	410	NA	NA
	Temperature	°C	4.7	8.5	11.7	18.9	D	20.2	17.3	11.2	NA	NA
	Flow	L/s	F	F	F	F	D	NF	NF	F	NA	NA
Notes:	F = Flowing		D = Dry									
	NF = No Apparent Flow		NA = Frozen or Blocked									

D: Beaver Dam and Sinkhole

The beaver dam and sinkhole are located approximately 850 m north of the Keppel Quarry (Figure 4) in the Shouldice Wetland. The beaver dam maintains surface water levels in the north portion of the Shouldice Wetland, which would otherwise recharge the shallow groundwater regime by the sinkhole located at the edge of the wetland. During high water levels, surface water drains over the dam and recharges the bedrock along a prominent joint in the limestone bedrock. This sinkhole is a discrete karst feature that is connected to springs s1-s3 in the Glen Management Area.

Monthly monitoring of surface water flows (observed as 'flowing,' 'no apparent flow,' 'dry,' 'frozen'), conductivity, and water temperature is collected to assist in evaluating the hydro-period of the Shouldice Wetland. The monitoring results from 2019 are summarized in Table 5.

TABLE 5: BEAVER DAM AND SINK HOLE FIELD MEASUREMENTS

Date	Beaver Dam					
	Sinkhole			Dam		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow
	µS	°C	L/s	µS	°C	L/s
31-Jan-20	NA	NA	NA	NA	NA	NA
28-Feb-20	NA	NA	NA	NA	NA	NA
27-Mar-20	497	6	F	512	5	F
30-Apr-20	607	7	F	695	8	F
12-May-20	510	13	F	670	14	F
17-Jun-20	D	D	D	390	27	F
23-Jul-20	370	14	NF	390	13	NF
20-Aug-20	N/A	N/A	D	250	13	F
18-Sep-20	N/A	N/A	D	250	13	F
08-Oct-20	400	10.3	NF	310	12	F
18-Nov-20	450	4.1	NF	400	5	F
10-Dec-20	435	1.8	F	426.2	0.5	F
Notes:	F = Flowing		NA = Frozen/No Data			
	NF = No Apparent Flow		ND = No Data			
	D = Dry					

Based on the flow data collected at the beaver dam, water was observed flowing through and into the cove all year except for dry periods in July. Flow observations at the sinkhole are made at the eastern extent of the cove, and flow ended in June with minor flow occurring again during the month of December. Even though flows at the sinkhole ended in June, the hydroperiod for the sinkhole is tied to the flow through the beaver dam because the bedrock joint extends through the entire cove and water sinks along its entire length (Cowell, 2008).

Conductivity values collected in 2020 at the dam and sinkhole ranged from 250 and 695 us/cm and 370 µs/cm to 607 µs/cm, respectively. The conductivity ranges fall within the historical conductivity values for these locations. Water temperature values collected in 2020 at the beaver dam and sinkhole range from 0.5 to 27.1°C and 1.8 and 14.0°C, respectively. These values are comparable to historical data collected at these locations.

Summary

The monitoring results indicate that there has been no measurable impact on the Shouldice Wetland. This is supported by the findings presented in the Ecological Monitoring Report & Analysis to Baseline Data (AWS, 2021 – refer to Appendix B).

The groundwater and surface water monitoring shall continue as extraction in Phase 1B and 2 proceed. The continued monitoring will provide the information required to assess the potential impact of extraction on the wetland's form and function. This assessment is needed to allow for the holding provision on Area 3 to be lifted by the MNRF and MECP to allow for the extraction of this area.

If the monitoring results indicate a potential impact, an infiltration pond is to be constructed to augment flow to spring s13 and the Dugout Pond. If required, then the infiltration pond shall be constructed in the headwater recharge area for spring s13. As presented, the monitoring data collected in 2020 did not trigger the construction of the infiltration pond.

2.5.2 Glen Management Area

The north portion of the Glen Management Area located approximately 500 m north of the Area 1a is monitored as part of the AMP. The key indicators that are used to monitor this feature include:

- Bedrock Groundwater Levels at OW49-OW52 (refer to Section 2.3.2);
- Beaver Dam and Sink Hole (refer to Section 2.5.1);
- Glen Management Area Springs (s1, s2, and s3);
- Mud Creek (Channel A and Channel B);
- Glen Management Area Springs (s4a-c, s5);
- Ducks Unlimited Dam; and
- Ephemeral Pond.

As discussed in Sections 2.3.2, the groundwater conditions near the Glen Management Area have continued to fluctuate within the historical ranges. To support this conclusion and to provide multiple lines of evidence to effectively assess the impacts of aggregate extraction from the Keppel Quarry on the Glen Management Area, monthly surface water flows, conductivity and temperature are measured at the groundwater spring (s1, s2, and s3), Mud Creek (Channel A and B), and the Ducks Unlimited Dam (outflow weir).

A: Glen Management Area Springs (s1, s2, and s3)

The field measurements collected at the Glen Management Area springs (s1-s3) are provided in Table 6. The surface water flow data continues to show that the hydro-period for these springs extended from January through to December in 2019. This information is consistent with the historical data.

TABLE 6: GLEN MANAGEMENT SPRINGS FIELD MEASUREMENTS (S1, S2, AND S3)

Date	Surface Water Springs								
	s1			s2			s3		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow
	µS	°C		µS	°C		µS	°C	
29-Jan-20	499	1.9	F	412	2	F	486	1.7	F
26-Feb-20	NA	NA	NA	NA	NA	NA	NA	NA	NA
30-Mar-20	584	4	F	499	4.1	F	512	4.2	F
30-Apr-20	485	6.9	F	501	7	F	544	6.8	F
12-May-20	390	7.8	F	370	8	F	370	8.4	F
17-Jun-20	420	10.6	F	390	11.1	F	400	11	F
23-Jul-20	460	12.5	F	470	13.1	F	460	10.8	F
20-Aug-20	390	13.9	F	380	15.2	F	310	15.4	F
18-Sep-20	420	11.2	F	370	11.9	F	410	12.3	F
09-Oct-20	430	10.5	F	410	10.8	F	440	11	F
18-Nov-20	490	8.6	F	470	8.3	F	460	8.2	F
10-Dec-20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Notes:	F = Flow		D = Dry						
	NF = No Apparent Flow		NA = Frozen/No Data						

Conductivity values collected in 2020 range between 310 µs/cm and 584 µs/c, which is comparable to historical data. Conductivity values in this range indicate that there is a mix of groundwater and surface water flowing from these features (Cowell, 2009). Water temperature values collected in 2020 at the springs range between 1.7°C and 15.4°C. Due to inputs from groundwater at these springs, their temperatures historically have not exceeded 22°C. The water temperatures recorded at these springs in 2020 were comparable to historical data collected at these locations.

B: Mud Creek Channel A and Channel B

The headwaters for Mud Creek include springs s1-s3. There are two channels that flow from these springs into Mud Creek. These are referred to as:

- Channel A, the main channel; and
- Channel B, a secondary channel that flows intermittently.

Field measurements collected in 2020 at Mud Creek (Channel A and B) are found in Table 7.

TABLE 7: MUD CREEK FIELD MEASUREMENTS

Date	Mud Creek					
	Channel A			Channel B		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow
	µS	°C		µS	°C	
29-Jan-20	444	2	F	NA	NA	NA
26-Feb-20	539	3	F	NF	NF	NF
30-Mar-20	492	5	F	NF	NF	NF
30-Apr-20	427	8	F	NF	NF	NF
12-May-20	390	10	F	NF	NF	NF
17-Jun-20	440	16	F	D	D	NF
23-Jul-20	420	11	F	D	D	NF
20-Aug-20	390	14	F	D	D	NF
18-Sep-20	420	13	F	D	D	NF
09-Oct-20	490	10	F	D	D	NF
18-Nov-20	510	8	F	D	D	NF
10-Dec-20	N/A	N/A	NA	NA	NA	NF
Notes:	F = Flow		D = Dry			
	NF = No Apparent Flow		NA = Frozen			

Based on the 2020 flow data collected, the hydroperiod for Channel A extended from December through to January. The existence (and therefore, significance) of Channel B remains unclear. Generally, there is only ponded water in the area of the channel. This information is consistent with historical data, which has Channel B as either ponded or dry throughout the year, whereas Channel A flows almost all year.

Conductivity values ranged from 390 µs/cm to 539 µs/cm for Channel A in 2020. Water temperature in Channel A ranged from 2°C to about 16°C. The conductivity and temperature values all fall within the historical ranges.

C: Glen Management Area Springs (s4a, s4b, s4c, and s5)

The field measurements collected at the Glen Management Area springs (s4a, s4b, s4c, and s5) are provided in Table 8. The surface water flow data continues to show that the hydro-period for these springs generally extended from year-round except for a dry period in July and during frozen conditions. This information is consistent with the historical data.

TABLE 8: GLEN MANAGEMENT SPRINGS FIELD MEASUREMENTS (S4 AND S5)

Date	Surface Water Springs											
	s4a			s4b			s4c			s5		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow
	µS	°C		µS	°C		µS	°C		µS	°C	
29-Jan-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26-Feb-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30-Mar-20	606	4	F	524	5	F	499	4	F	589	4	F
30-Apr-20	597	5	F	607	5	F	517	5	F	D	D	D
12-May-20	510	9	F	450	9	F	430	9	F	D	D	D
17-Jun-20	510	14	F	460	13	F	N/A	N/A	NF	D	D	D
23-Jul-20	D	D	D	D	D	D	D	D	D	D	D	D
20-Aug-20	510	12	F	480	12	F	430	12	F	D	D	D
18-Sep-20	440	10	F	460	10	F	500	12	F	D	D	D
09-Oct-20	500	8	F	510	8	F	550	9	F	D	D	D
18-Nov-20	670	7	F	620	7	F	590	4	F	D	D	D
10-Dec-20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	D	D	D
Notes:	F = Flow		D = Dry									
	NF = No Apparent Flow		NA = Frozen									

D: Ducks Unlimited Dam

The field measurements collected at the Ducks Unlimited Dam outflow weir are provided in Table 9. The surface water flow data continues to show that the hydro-period for these springs extended year-round. This information is consistent with the historical data.

TABLE 9: DUCKS UNLIMITED DAM FIELD MEASUREMENTS

Date	Ducks Unlimited Dam		
	Conductivity	Temperature	Flow
	µS	°C	
29-Jan-20	NA	NA	F
26-Feb-20	NA	NA	F
30-Mar-20	501	4	F
30-Apr-20	442	6	F
12-May-20	370	10	F
17-Jun-20	360	24	F
23-Jul-20	390	15	F
20-Aug-20	370	17	F
18-Sep-20	370	15	F
09-Oct-20	400	9	F
18-Nov-20	530	4	F
10-Dec-20	N/A	N/A	N/A
Notes:	F = Flow		D = Dry
	NF = No Apparent Flow		NA = Frozen

E: Ephemeral Pond

There was an ephemeral pond on Lot 26 Concession 10. This feature is not deemed significant wildlife habitat (AWS, 2007) but this pond is important to amphibian breeding activity (AWS, 2012). As a result, the AMP requires that water levels shall be measured during the amphibian breeding season, which extends from April 1 to June 30. The results from 2020 are provided in Table 10.

TABLE 10: EPHEMERAL POND

Date	Ephemeral Pond water depth	Date	Ephemeral Pond water depth	Date	Ephemeral Pond water depth
03-Apr-20	0.59	01-May-20	0	05-Jun-20	0
10-Apr-20	0.53	08-May-20	0	12-Jun-20	0
17-Apr-20	0.54	15-May-20	0	19-Jun-20	0
24-Apr-20	0.52	22-May-20	0	26-Jun-20	0
		29-May-20	0	26-Jun-20	0

In 2019, a drainage ditch was constructed beyond the quarry's western limit, draining the ephemeral pond feature and significantly impairing its ecological function for amphibian breeding (AWS, 2021). In 2020, spring freshet that collected in the quarry footprint was discharged into the ephemeral pond area during the month of April but was discontinued shortly after. Water level monitorin indicated that the ephemeral pond was dry by May 1, 2020.

The ephermeral pond restortation work shall be undertaken in coordination with AWS during the summer of 2021. The goal of the restoration works is to restore the natural environment and ecolocial functions of the ephermeral pond through: seasonal surface water retention, restoration of soils to promote rooted native hydrophilic plant growth and rehabilitate amphibian breeding habitat/cover (AWS, 2021).

Summary

The monitoring results indicate that there has been no measurable impact on the Glen Management Area. This is supported by the findings presented in the Ecological Monitoring Report & Analysis to Baseline Data (AWS, 2021).

3.0 CONCLUSION

Based on the monitoring data, Whitewater concludes that extraction did not cause any negative impacts on groundwater resources in 2020.

4.0 RECOMMENDATIONS

Subject to approval from MNRF, the AMP shall be updated by December 31, 2021 to include any recommended changes to the groundwater and surface water monitoring program. The recommended changes are outlined in the following sections. These recommended changes along with a revised approach to setting threshold values and methods shall be discussed in the amended AMP.

4.1 Recommended Changes to the Groundwater Monitoring Program

Several wells have been destroyed because of the on-going extraction of aggregate or no longer provide insightful water level data due to their proximity to the quarry face and area of extraction. It is recommended that these well be removed from the monitoring requirements.

- OW3
- OW4
- OW9
- OW30
- OW32
- OW34
- OW35
- OW36
- OW39
- OW40
- OW53

The AMP had proposed additional observation wells which have not yet been constructed. Given the presence of existing observation wells in proximity to their proposed locations, these wells are considered redundant. These observation wells are in a part of the ANSI that is too sensitive for the installation of monitoring points without causing significant disturbance to the Natural Environment (specifically OW67 and OW68). It is recommended that these locations be removed from the AMP.

- OW61
- OW66
- OW67
- OW68
- OW69
- OW70

Bedrock groundwater levels between the Keppel Quarry and the Glen Management Area are measured at OW49, OW50, OW51, and OW52. Monitoring results indicate that water levels remain within background conditions. Consideration to remove these from the groundwater monitoring program is requested, in addition to the above-mentioned wells.

4.2 Domestic Water Well Monitoring

A Private Domestic Water Well Monitoring Program has been developed to monitor water supplies of residents within one kilometer of the Keppel Quarry. Two of the wells are no longer monitored and should be removed from the monitoring requirements. These wells include:

- well no. 3345 (permission is no longer granted); and
- well no. 3447 (well cannot be accessed).

4.3 Surface Water Monitoring

There are several culverts (Culverts 4 through 7) that allow water to cross under a snowmobile trail constructed at the end of Gun Club Road, which through the Shouldice Wetland. Monthly monitoring of surface water flows (observed as 'flowing,' 'no apparent flow,' 'dry' 'frozen or blocked), conductivity, and water temperature is collected to assist in evaluating the hydro-period of the Shouldice Wetland. The monitoring locations are frozen in December, January, February, and March. Furthermore, baseline data indicates that the hydroperiod for these culverts typically ended in July. Therefore, the monthly monitoring of the culverts should be changed to only occur during unfrozen periods (between March and November).

The beaver dam and sinkhole are located approximately 850 m north of the Keppel Quarry in the Shouldice Wetland. The beaver dam maintains surface water levels in the north portion of the Shouldice Wetland which would otherwise recharge the shallow groundwater regime by the sinkhole located at the edge of the wetland. To be consistent with the surface water monitoring of the culverts, the monitoring should only occur between March and November.

5.0 REFERENCES

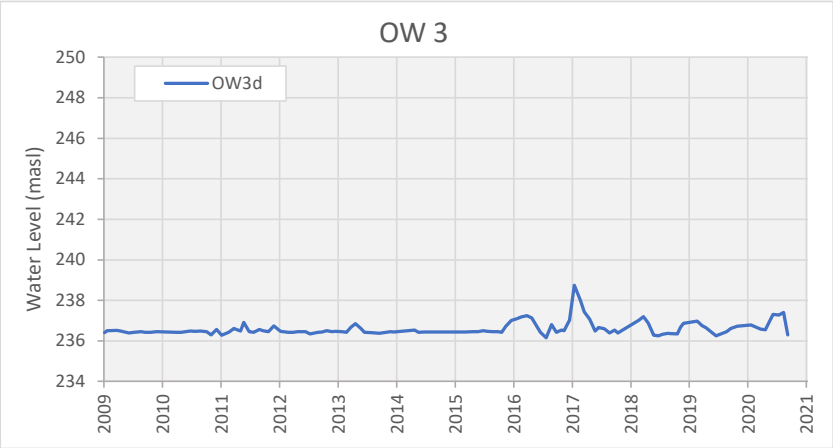
APPENDIX A1

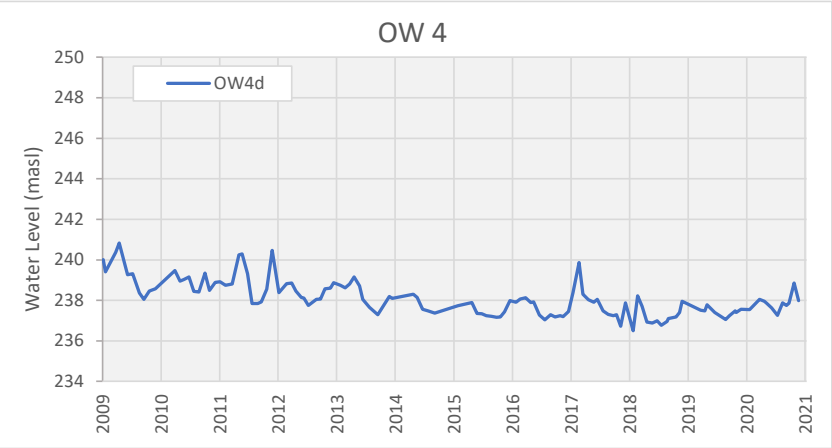
GROUNDWATER HYDROGRAPHS

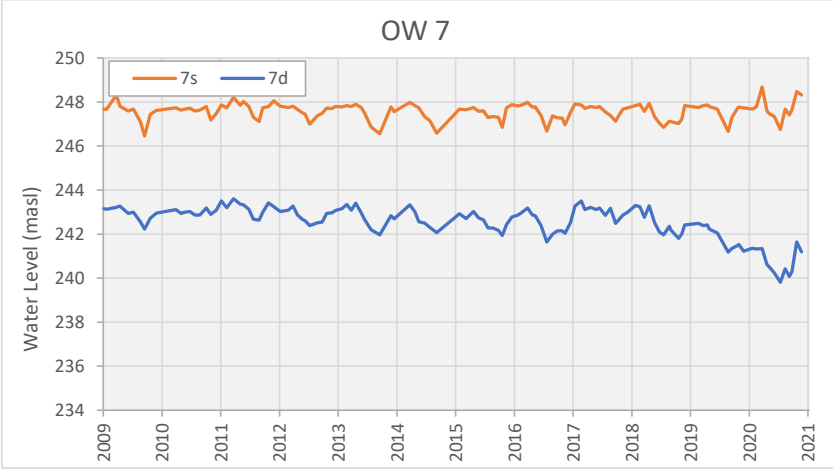
APPENDIX A1-a

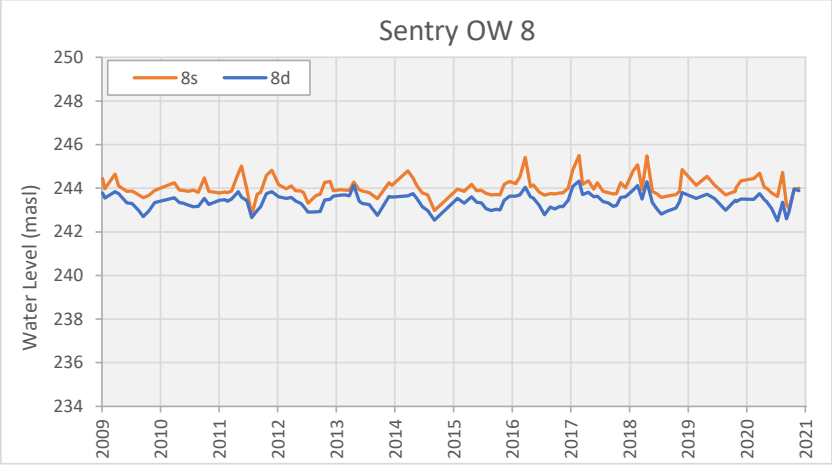
GROUNDWATER MONITORING WELLS

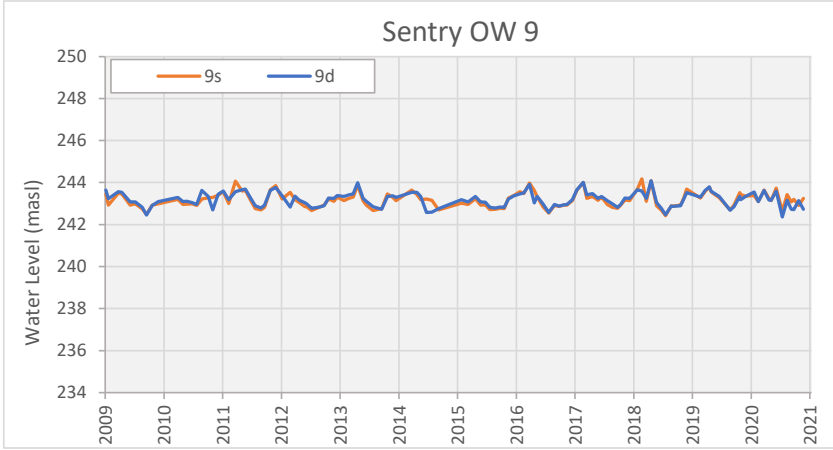
Keppel Quarry: Appendix A-1a
Groundwater Hydrographs

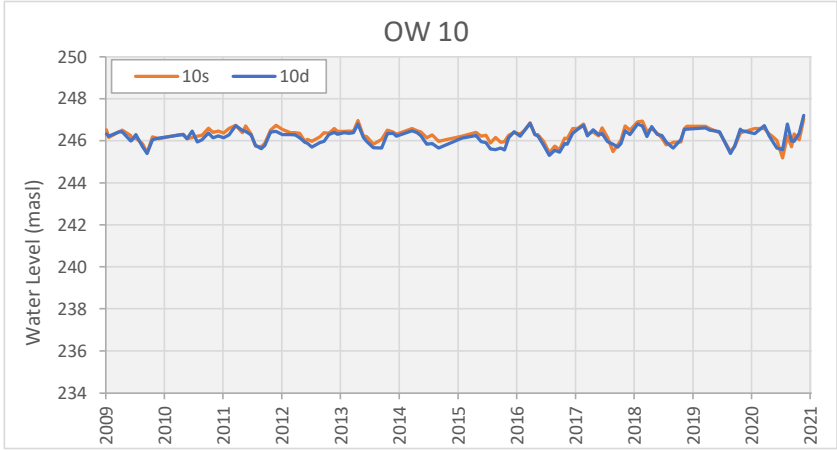




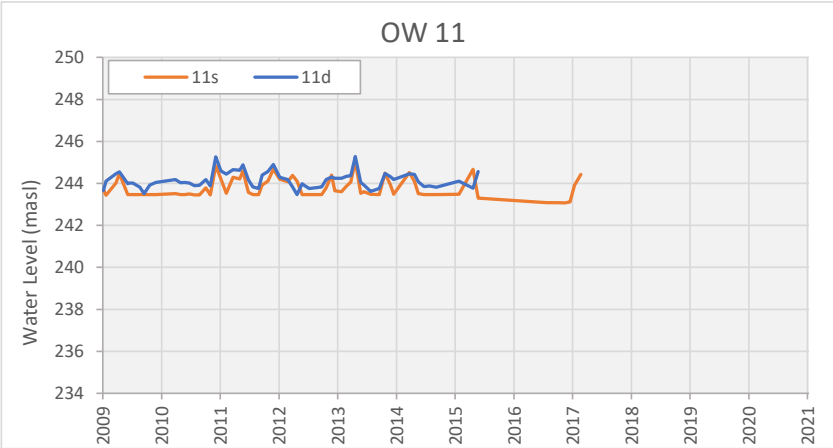


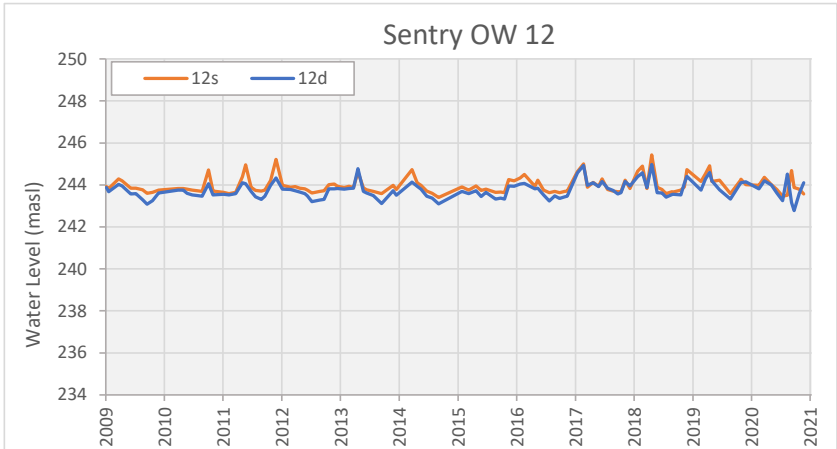


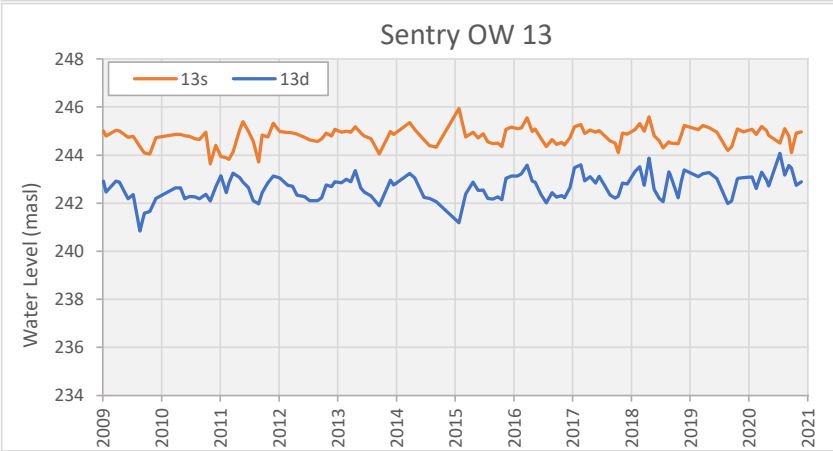


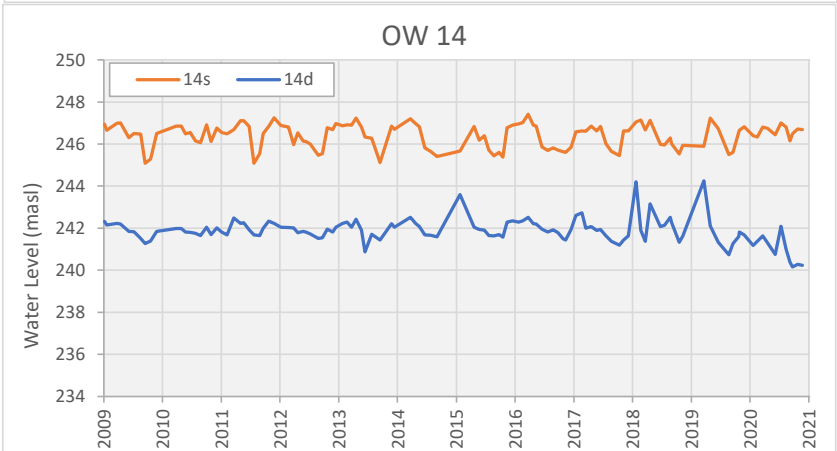


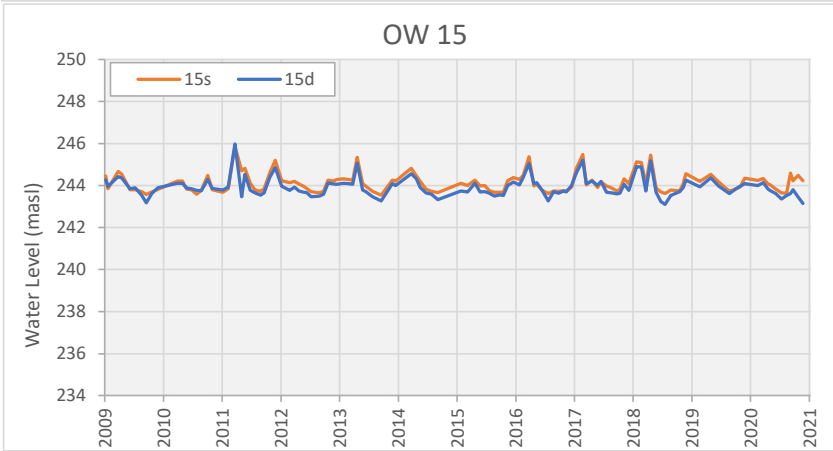
Keppel Quarry: Appendix A-1a
Groundwater Hydrographs

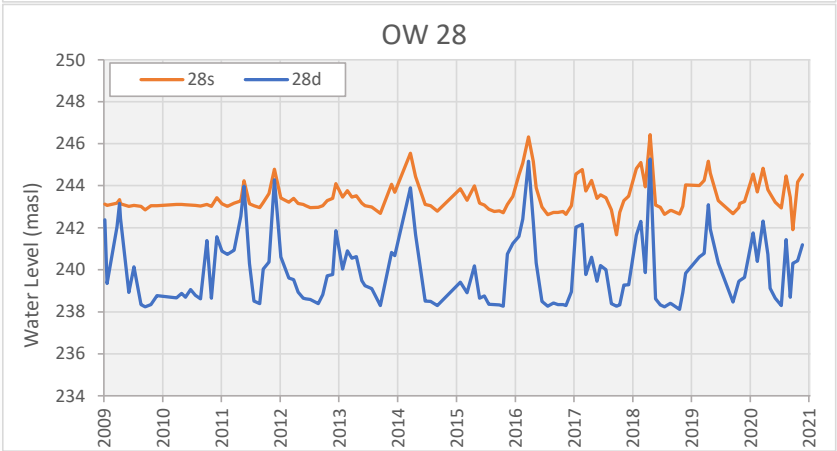




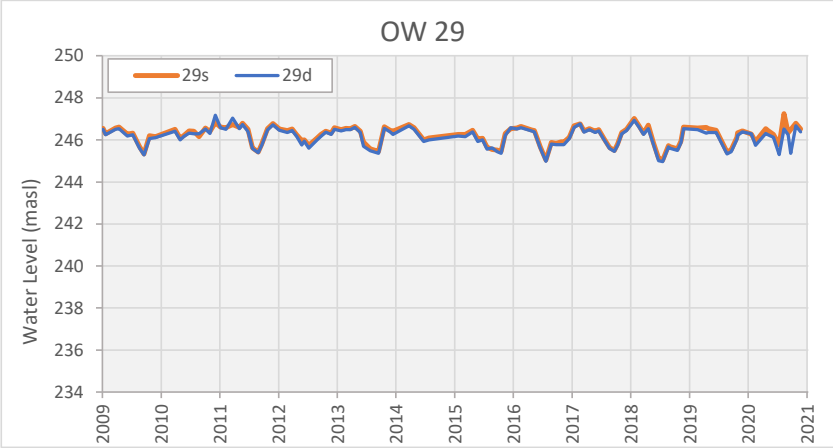


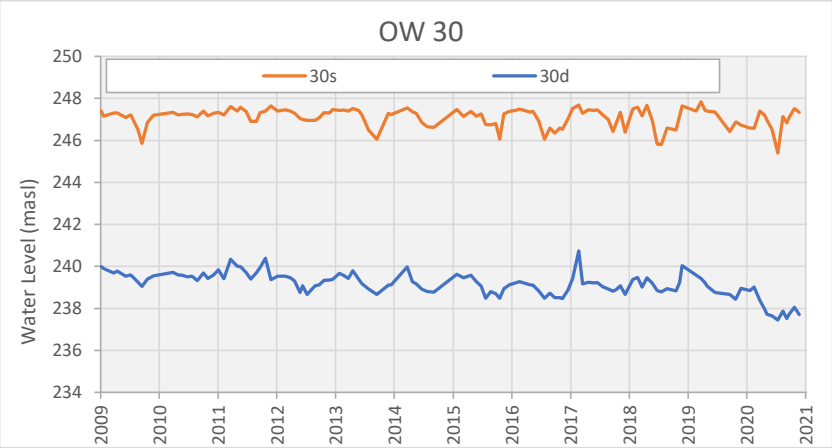


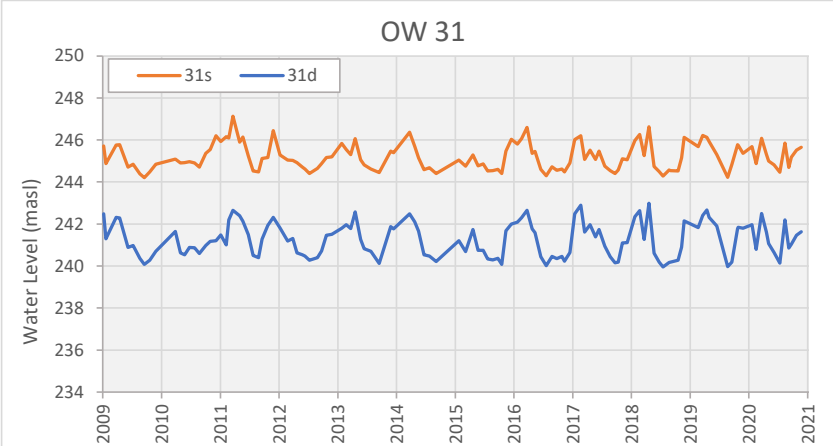


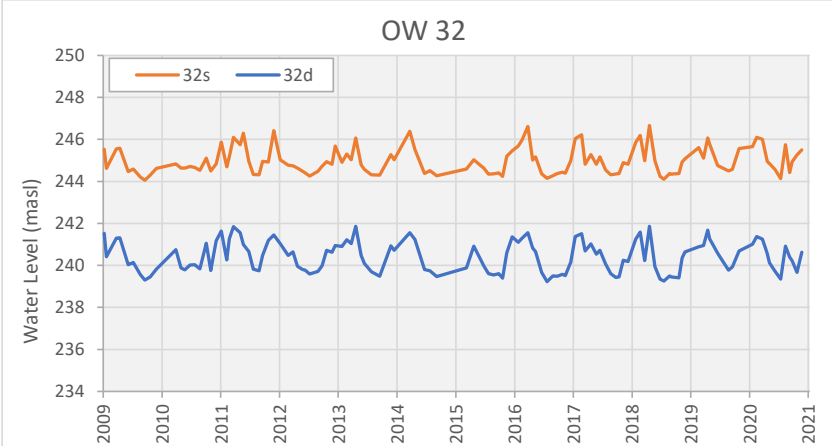


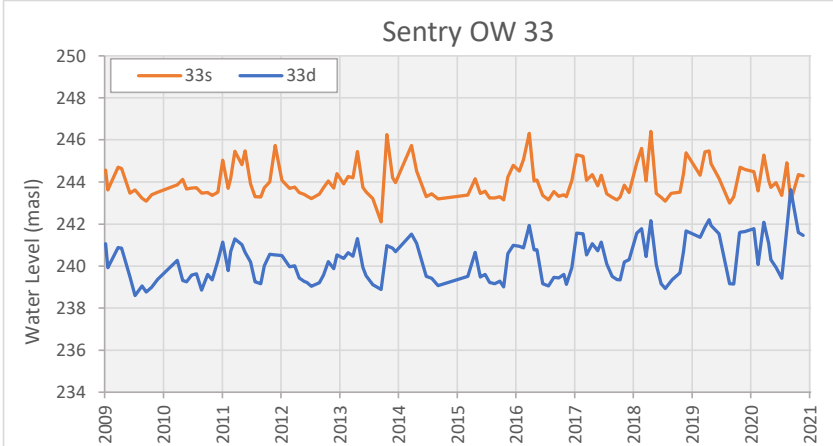
Keppel Quarry: Appendix A-1a
Groundwater Hydrographs

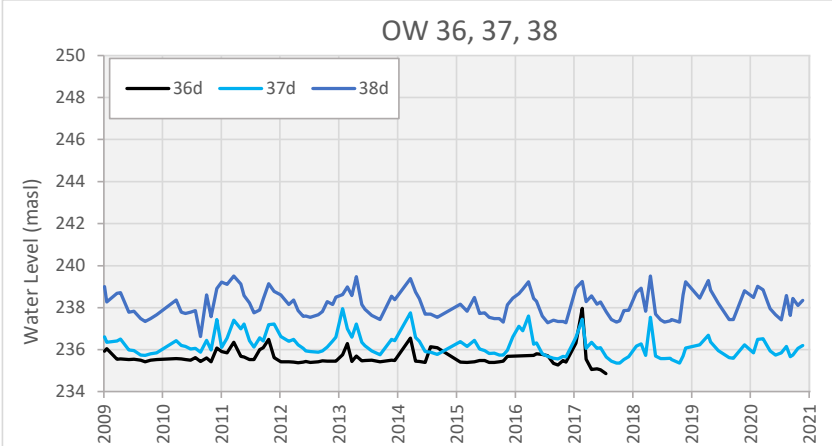




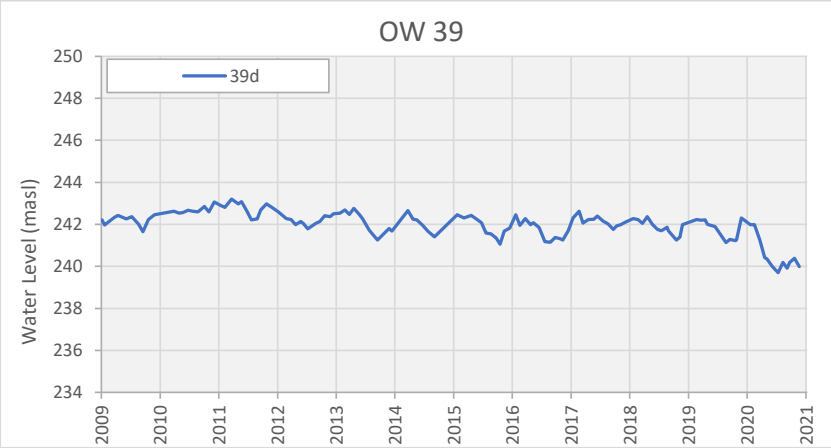


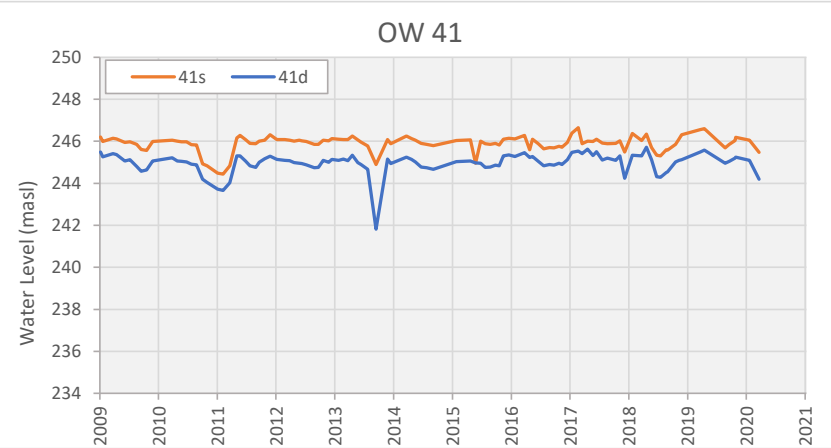


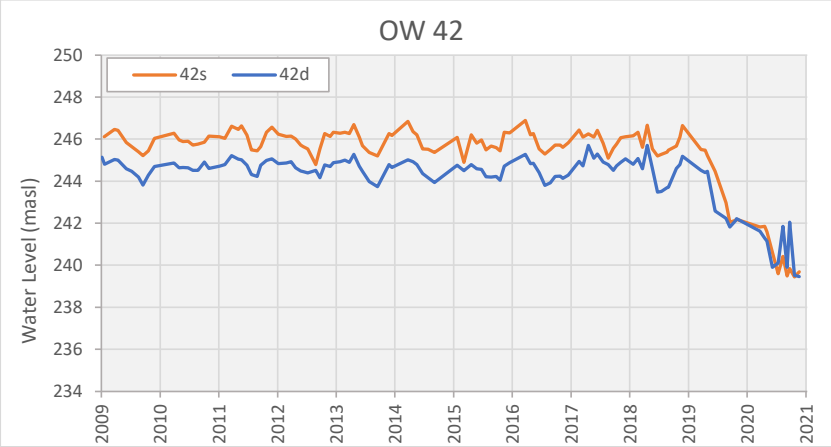


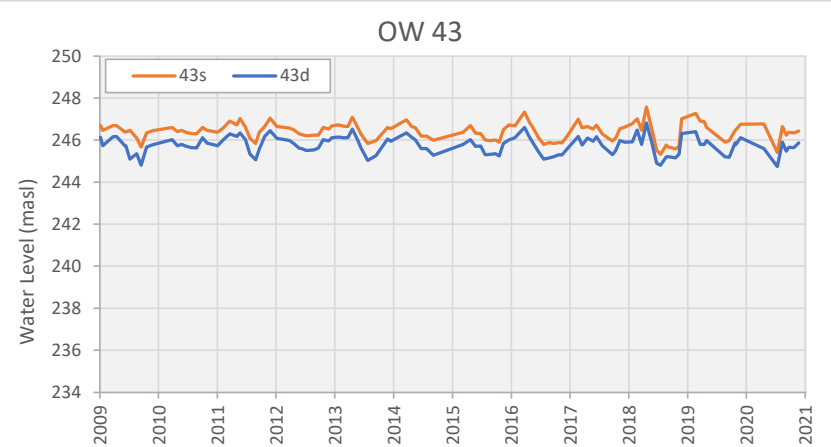


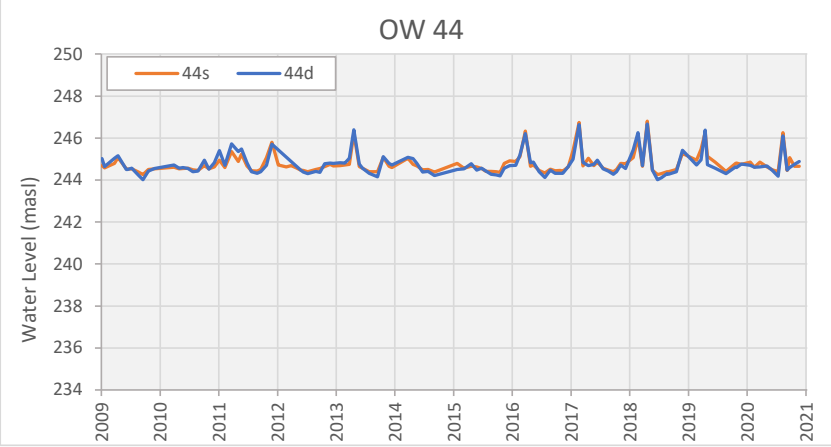
Keppel Quarry: Appendix A-1a
Groundwater Hydrographs

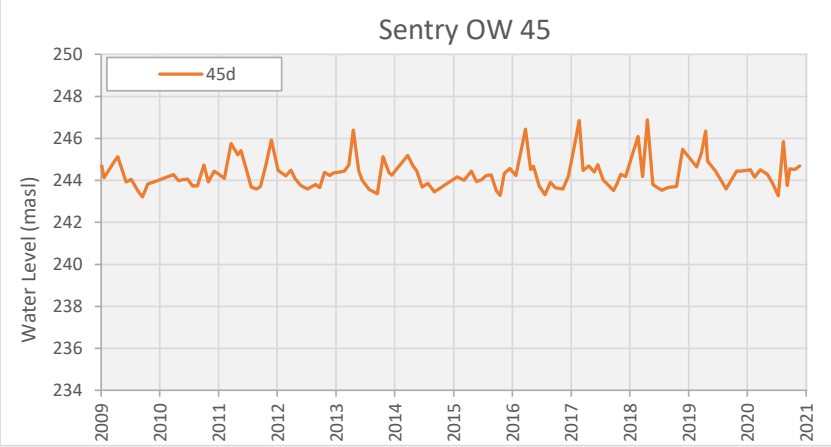




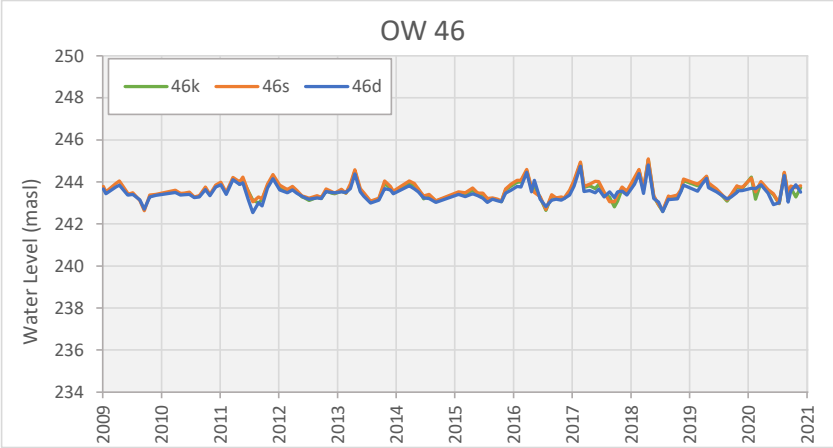


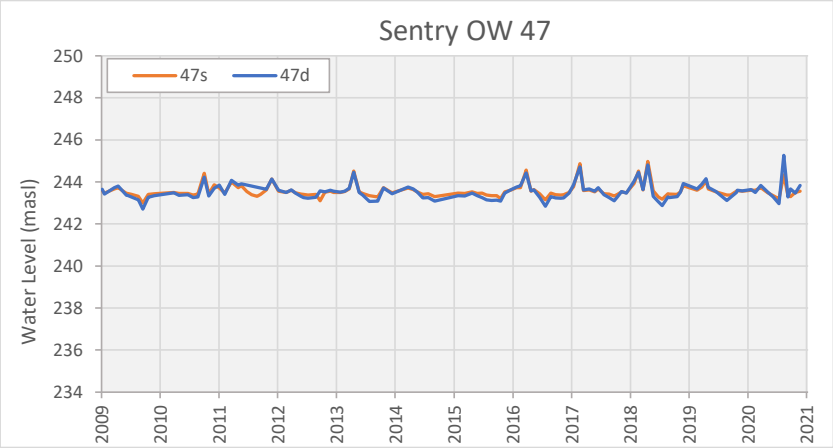


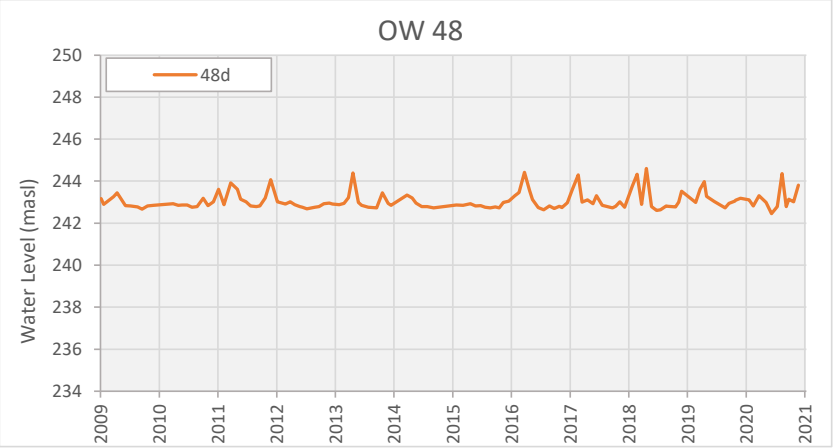


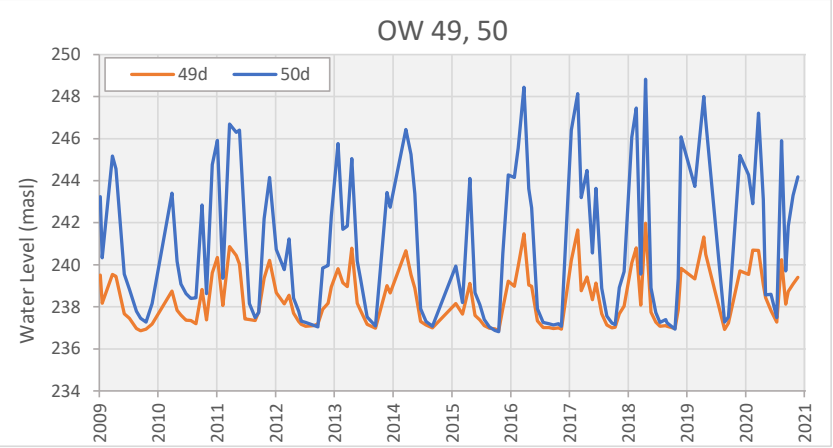


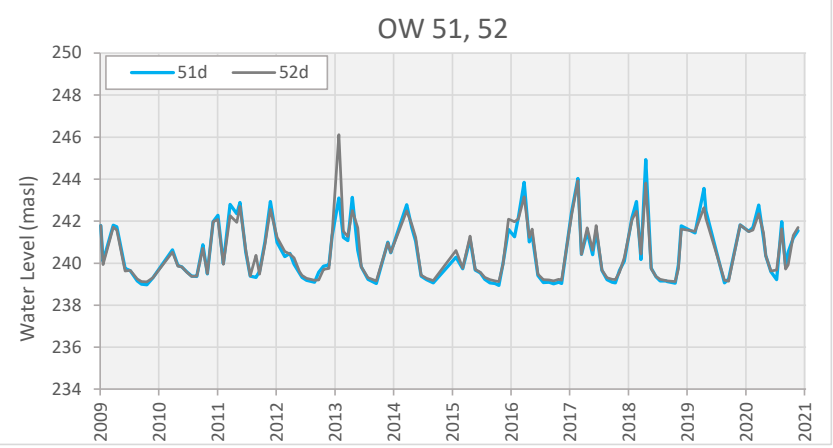
Keppel Quarry: Appendix A-1a
Groundwater Hydrographs

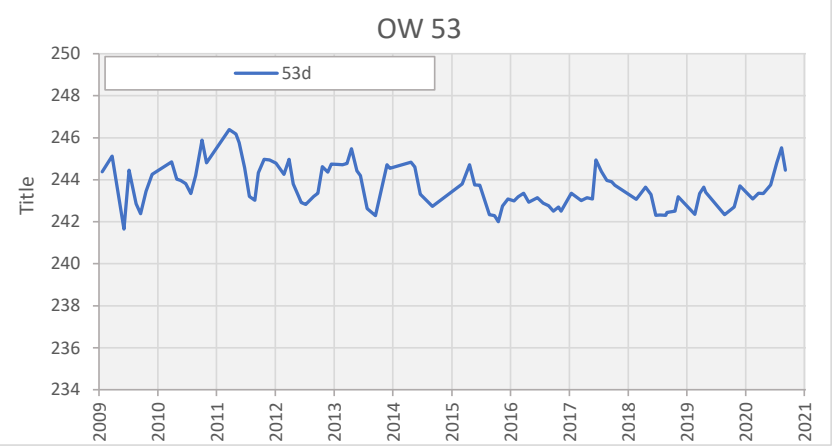




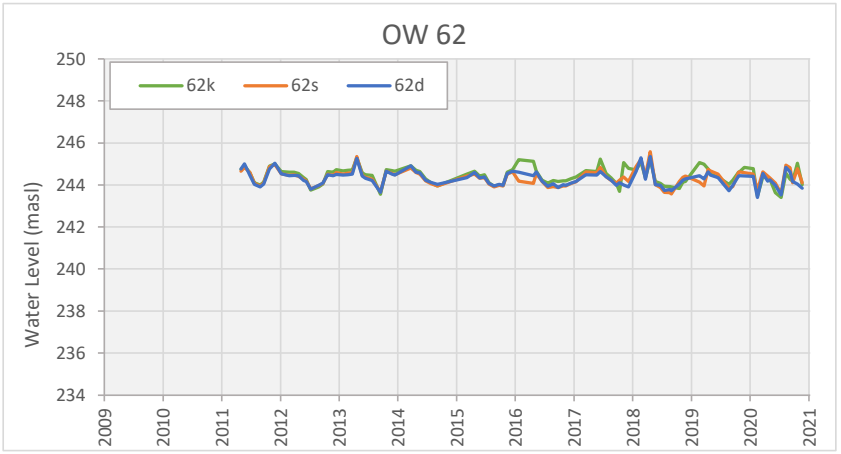


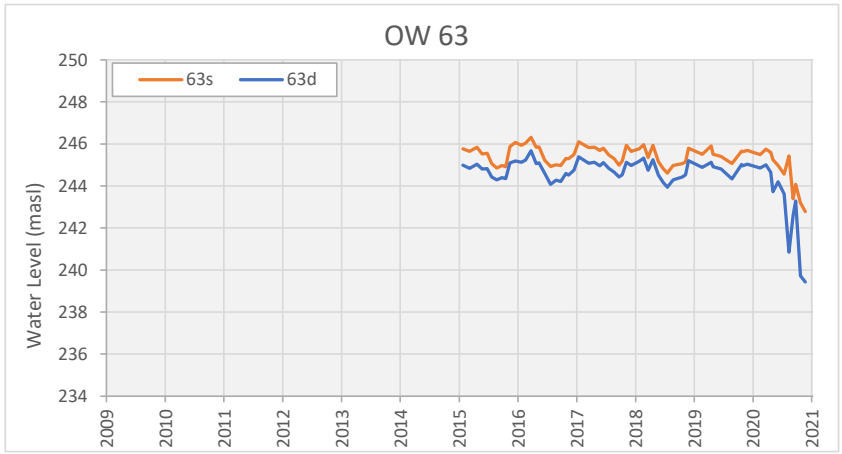


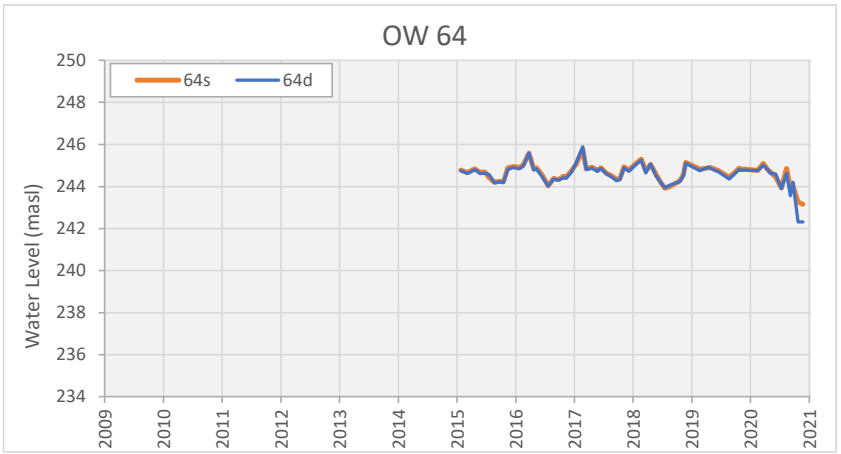


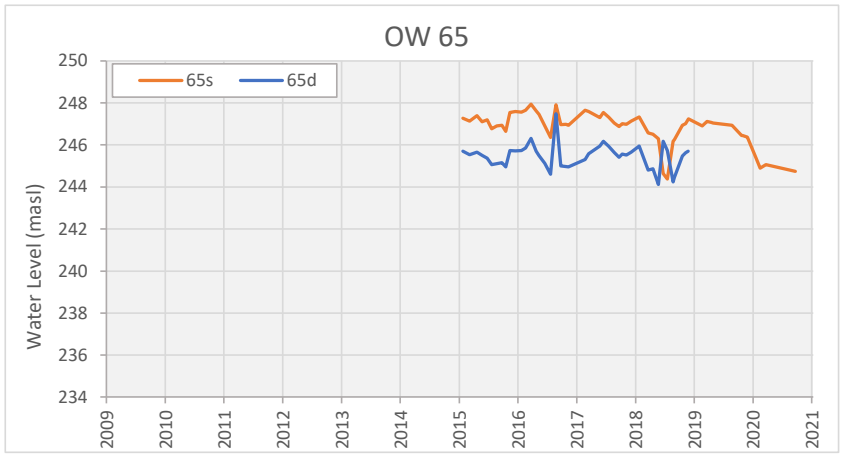


Keppel Quarry: Appendix A-1a
Groundwater Hydrographs





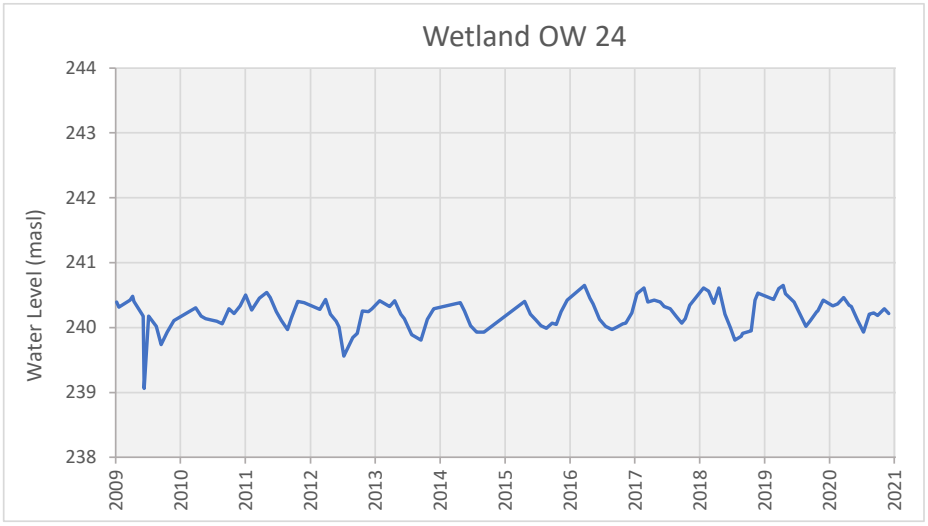


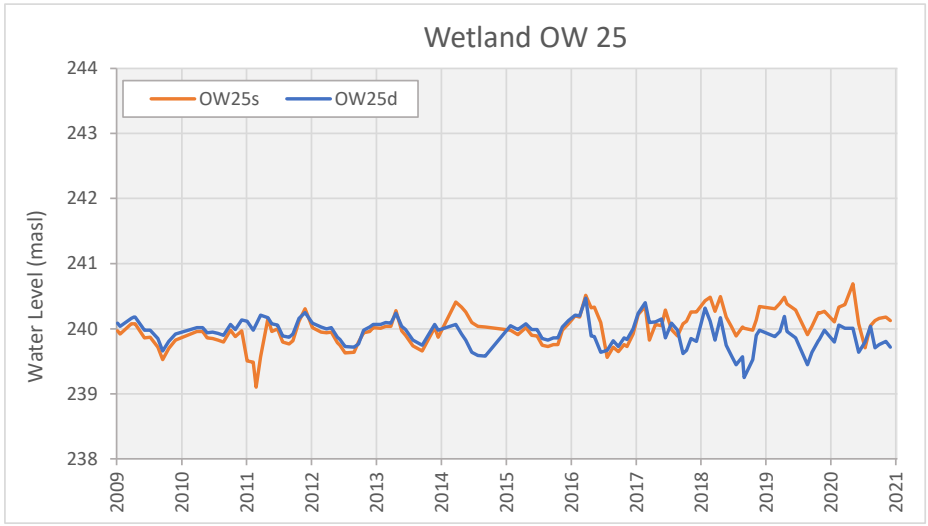


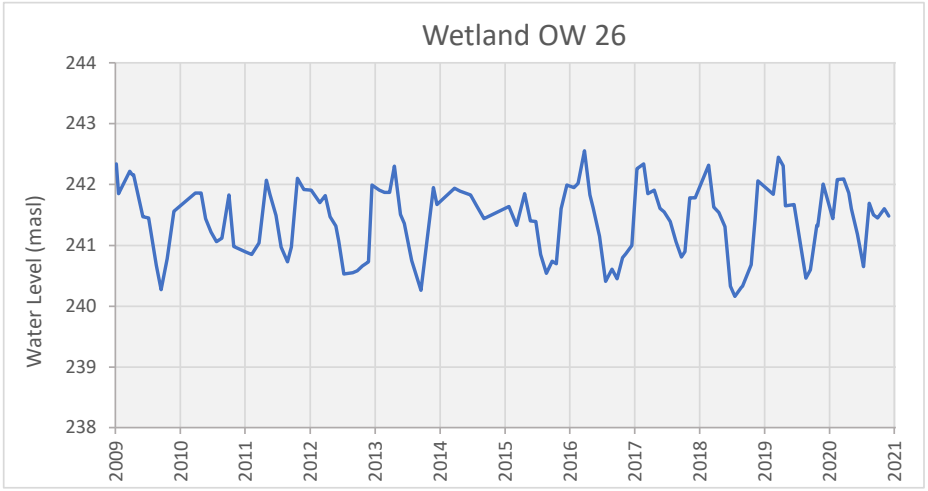
APPENDIX A1-b

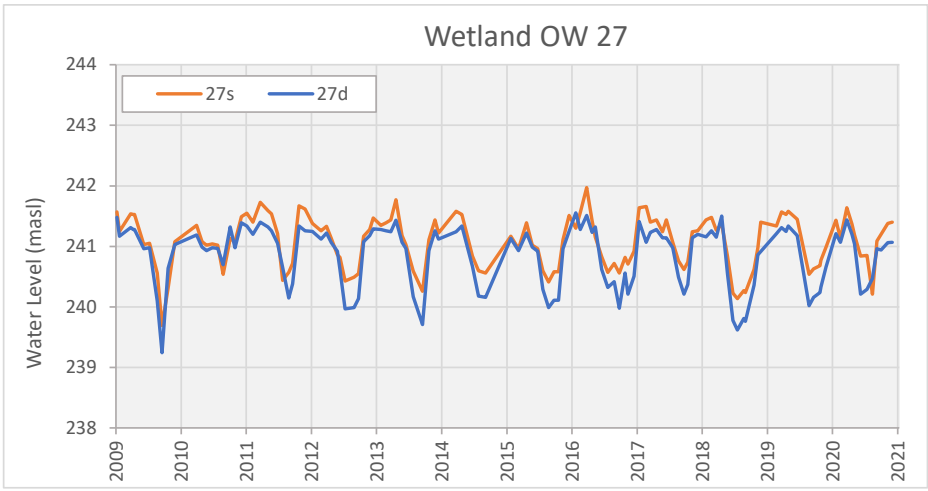
GROUNDWATER MONITORING WELLS: WETLAND AREAS

Keppel Quarry: Appendix A-1b
Groundwater Hydrographs (Wetland Area)

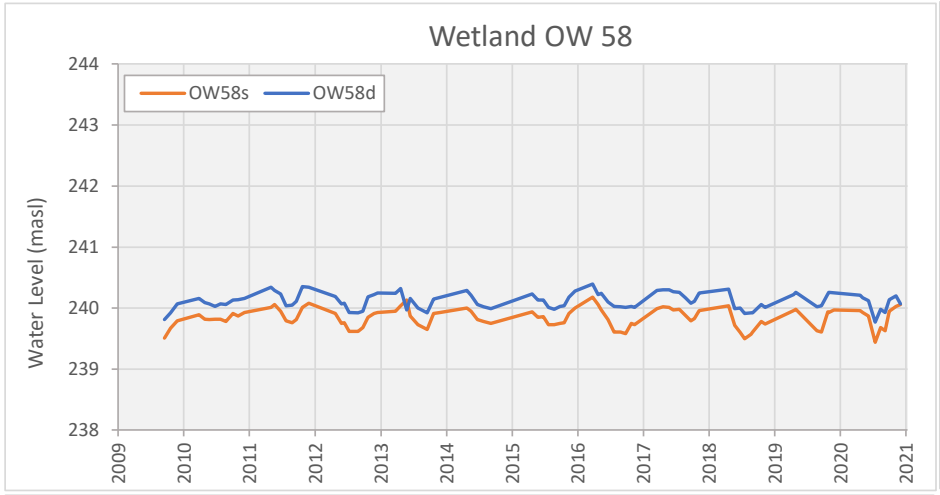


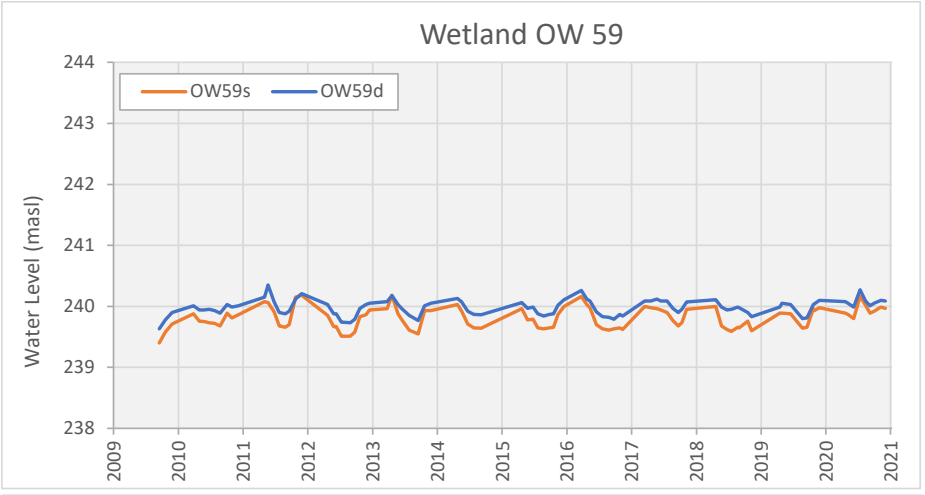


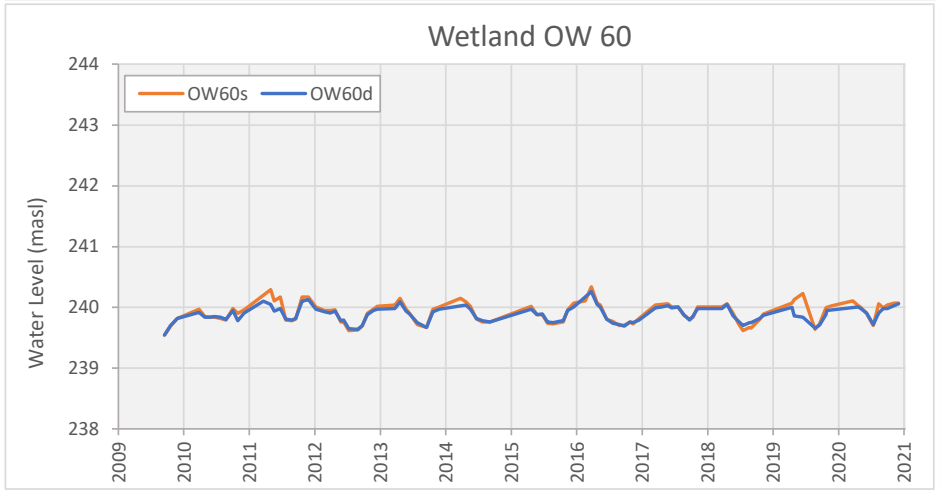


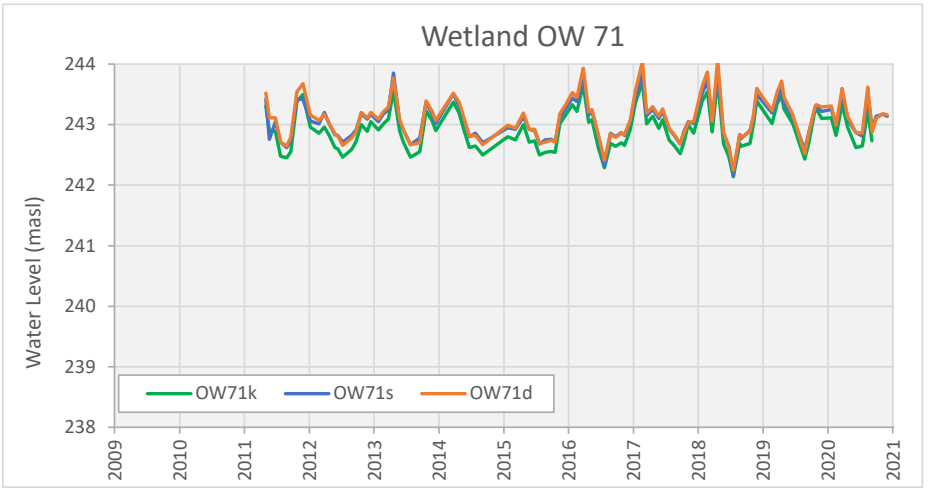


Keppel Quarry: Appendix A-1b
Groundwater Hydrographs (Wetland Area)





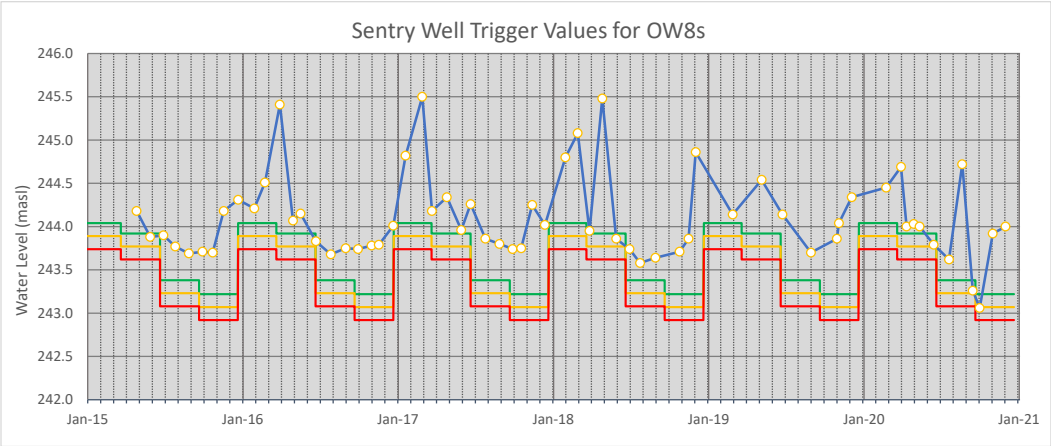


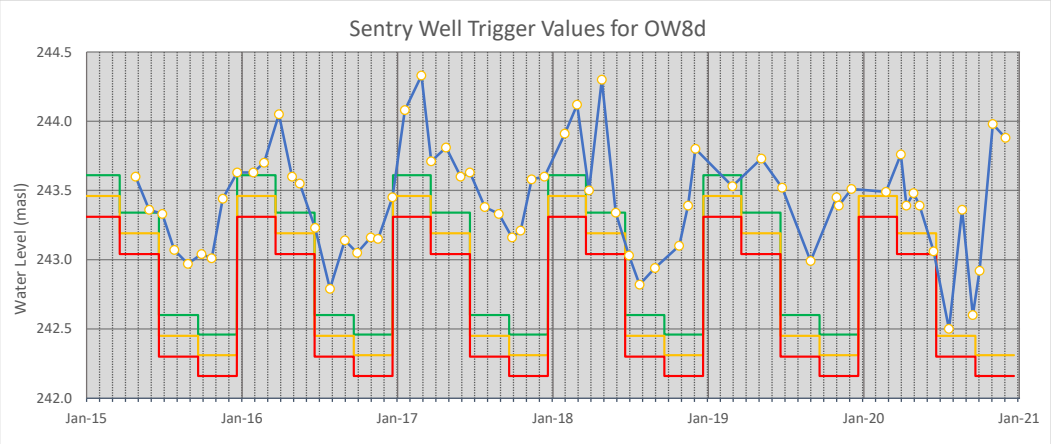


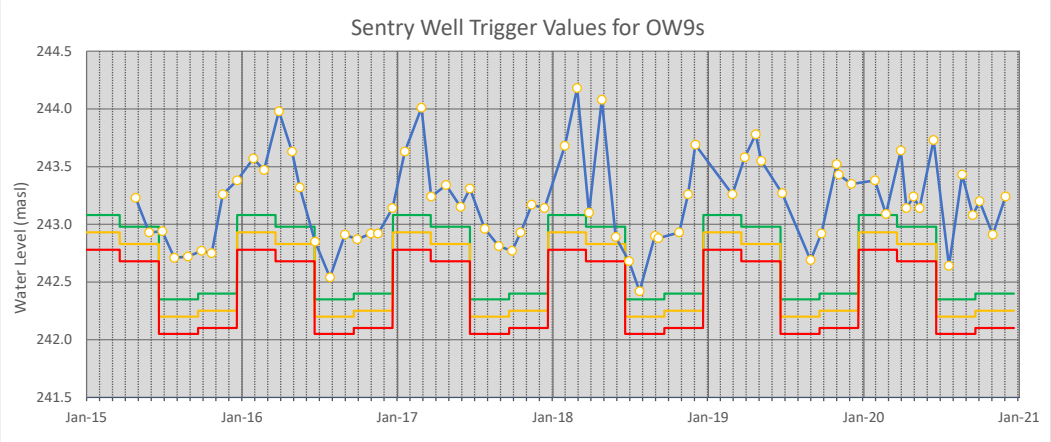
APPENDIX A1-c

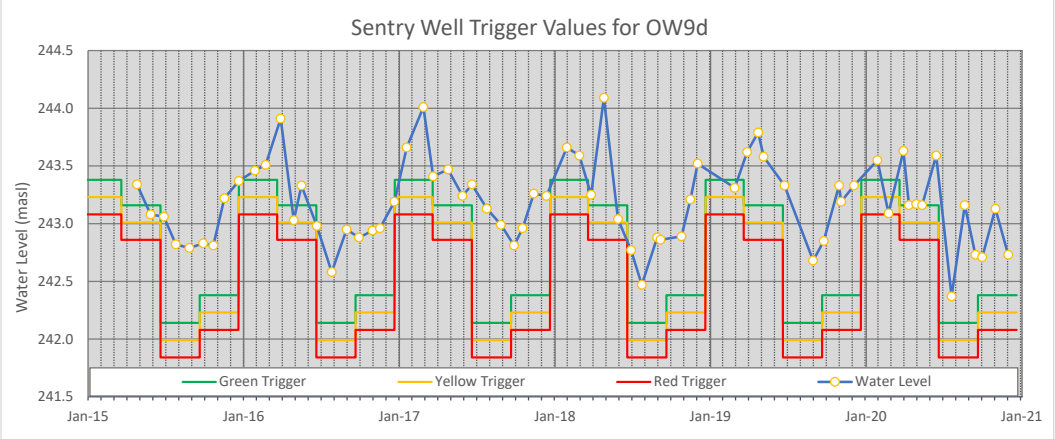
SENTRY MONITORING WELLS

Keppel Quarry: Appendix A-1c
Sentry Well Hydrographs and Trigger Values

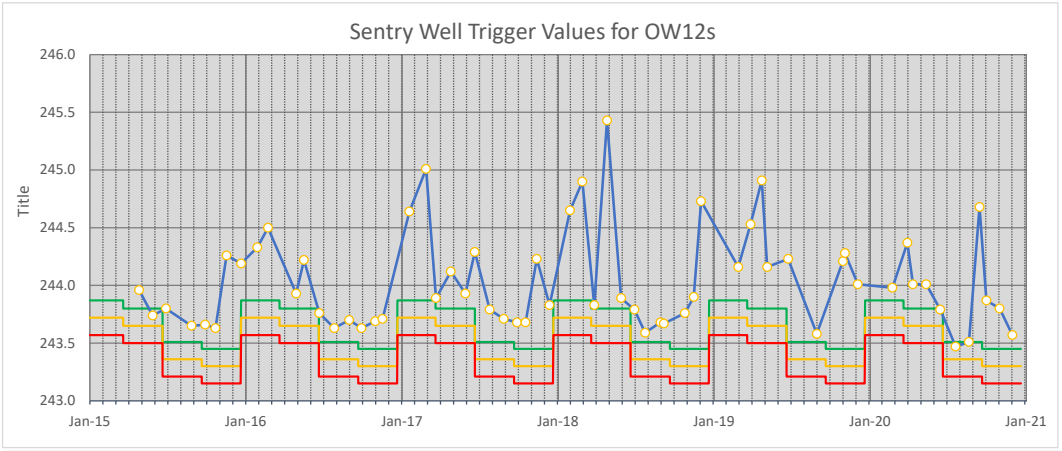


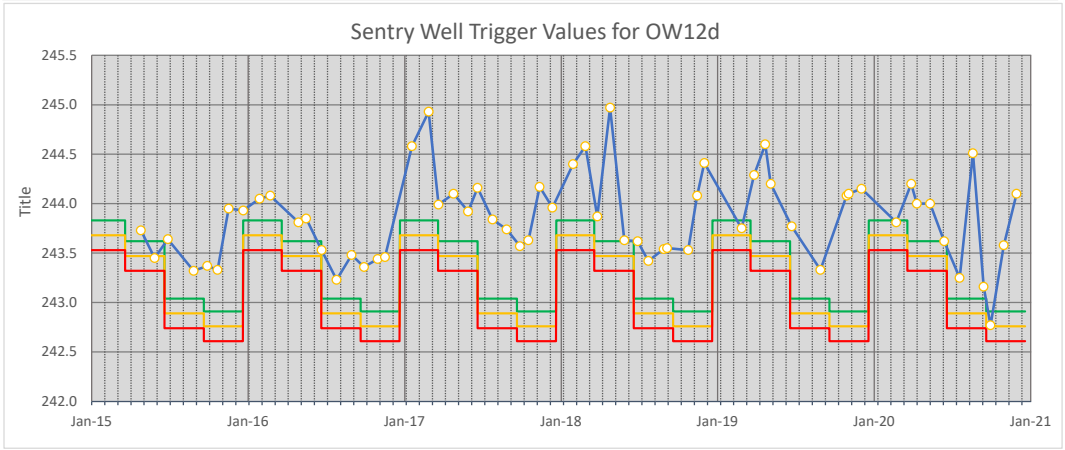


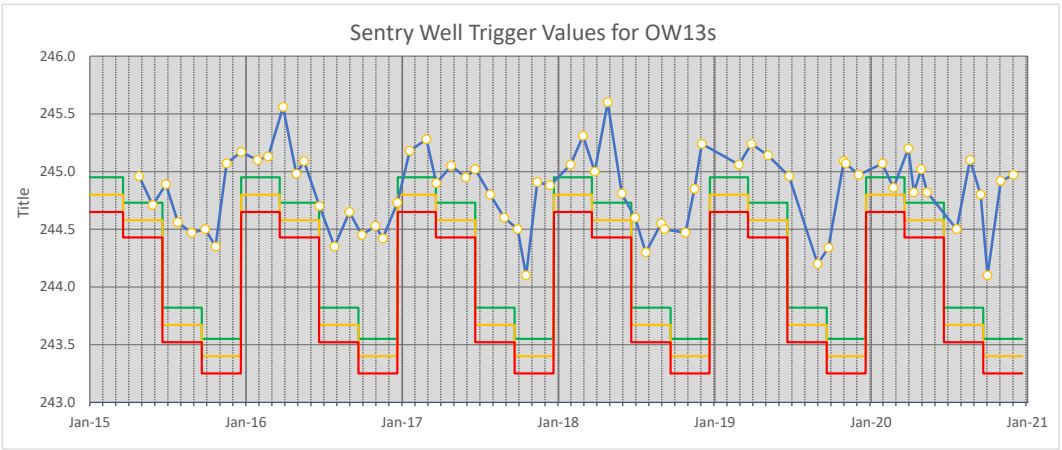


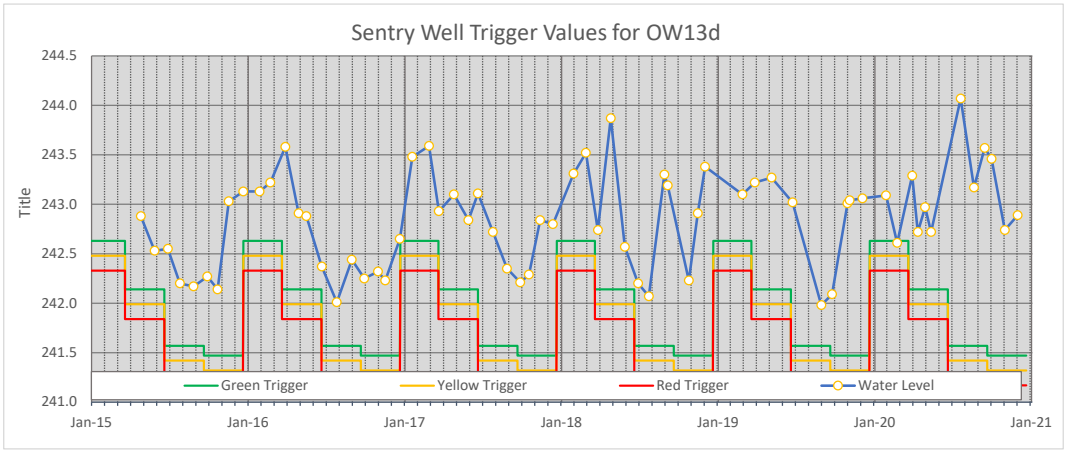


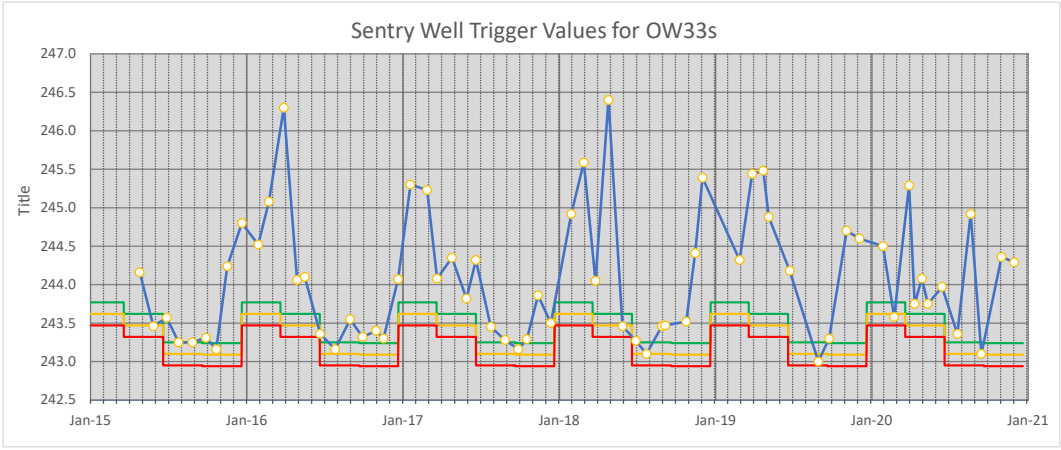
Keppel Quarry: Appendix A-1c
Sentry Well Hydrographs and Trigger Values

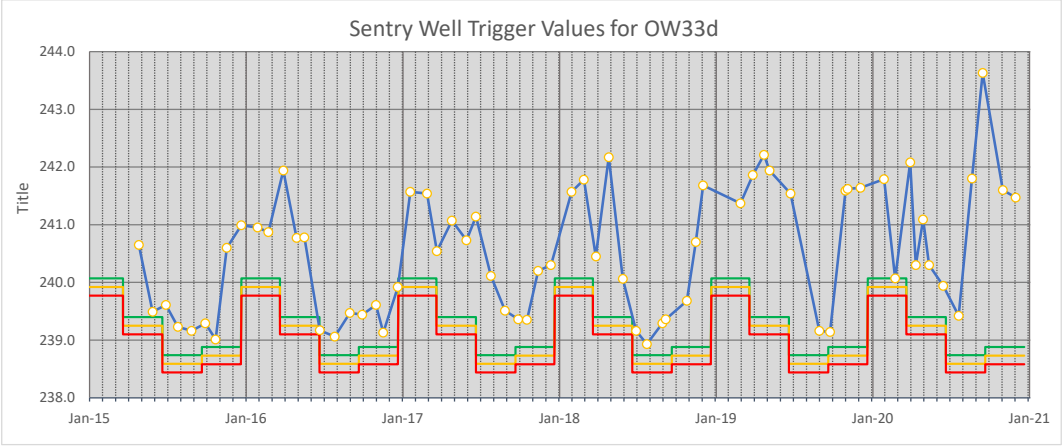


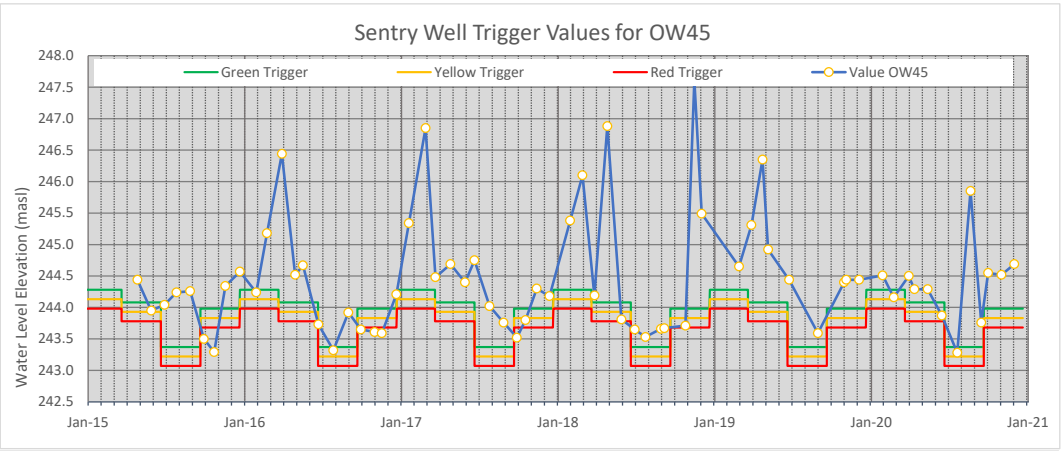


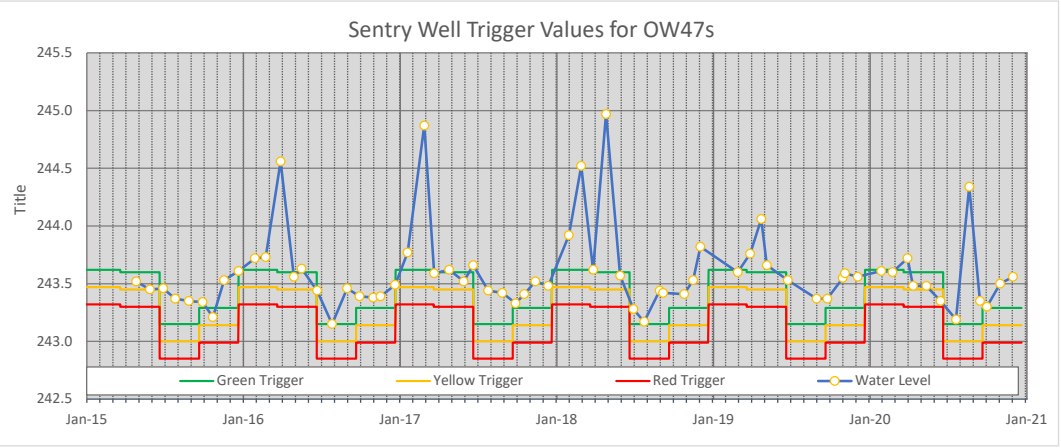


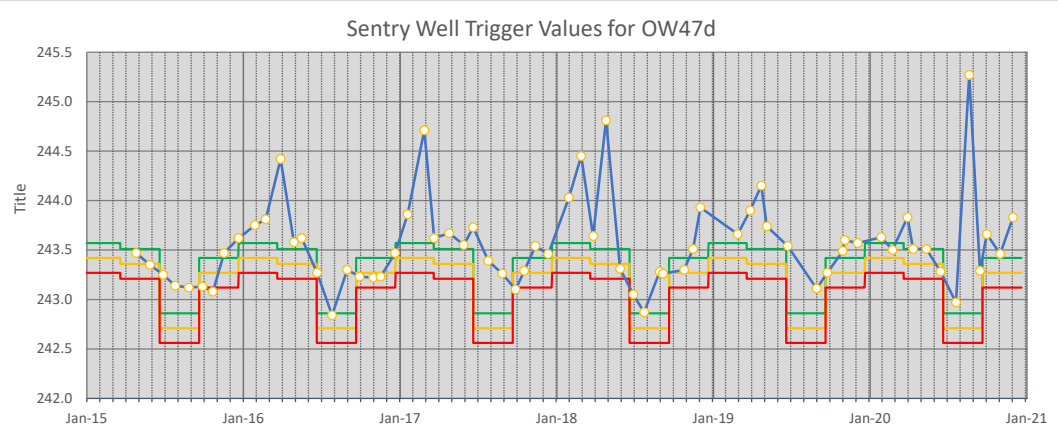



Sentry Well Trigger Values for OW33s
Title
247.0
246.5
246.0
245.5
245.0
244.5
244.0
243.5
243.0
242.5
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW33d
Title
244.0
243.0
242.0
241.0
240.0
239.0
238.0
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW45
Green Trigger
Yellow Trigger
Red Trigger
Value OW45
Water Level Elevation (masl)
248.0
247.5
247.0
246.5
246.0
245.5
245.0
244.5
244.0
243.5
243.0
242.5
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW47s
Title
245.5
245.0
244.5
244.0
243.5
243.0
242.5
Green Trigger
Yellow Trigger
Red Trigger
Water Level
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW47d
Title
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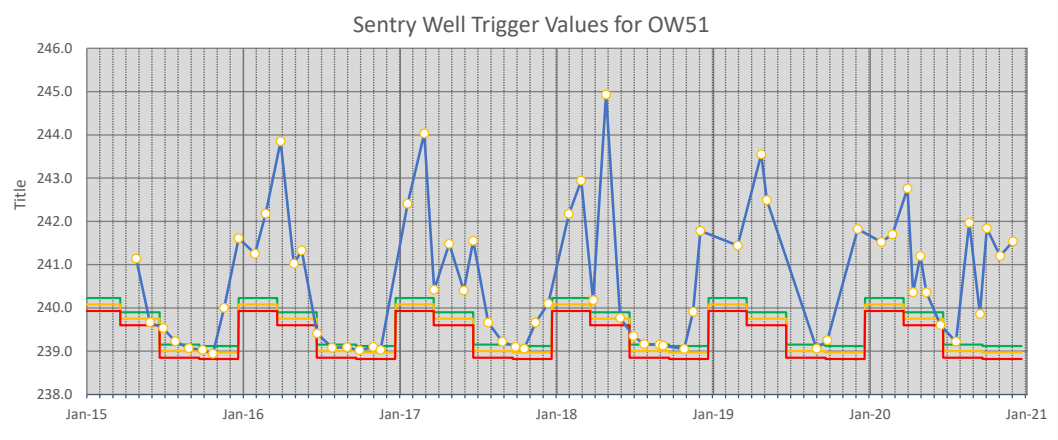
245.0
244.5
244.0
243.5
243.0
242.5
242.0
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW51
Title
246.0
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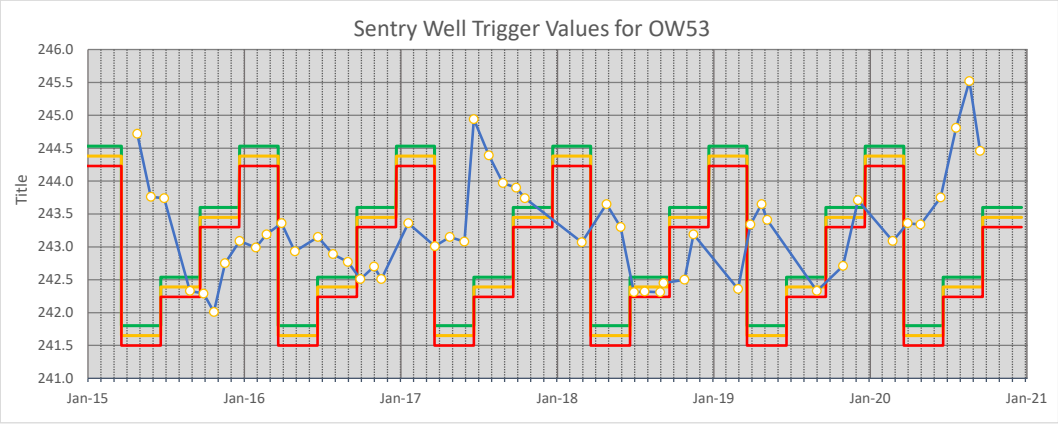
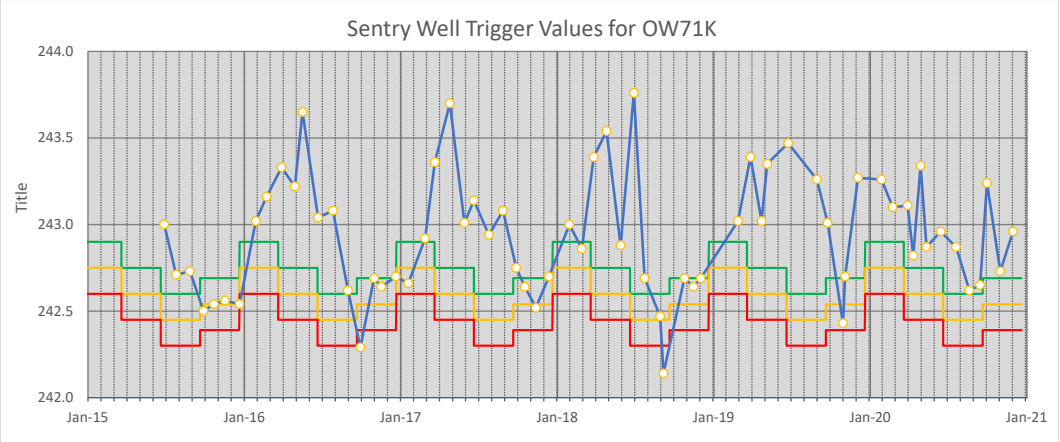
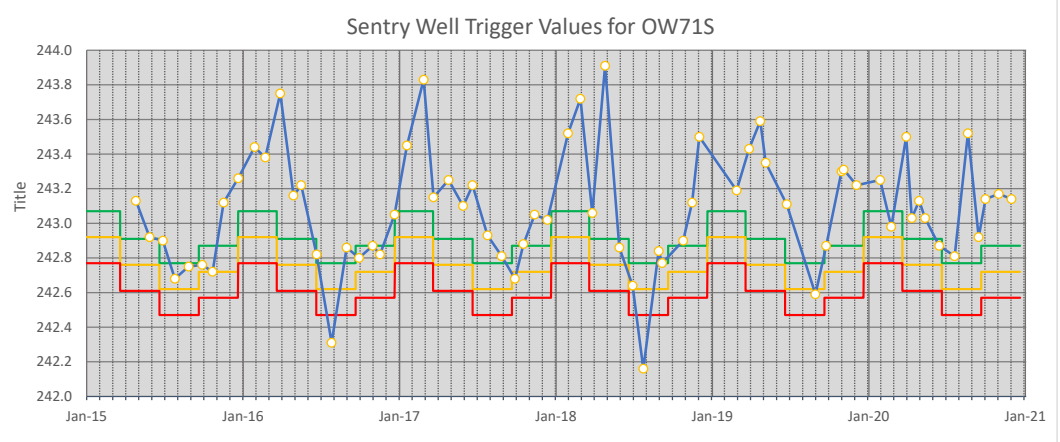
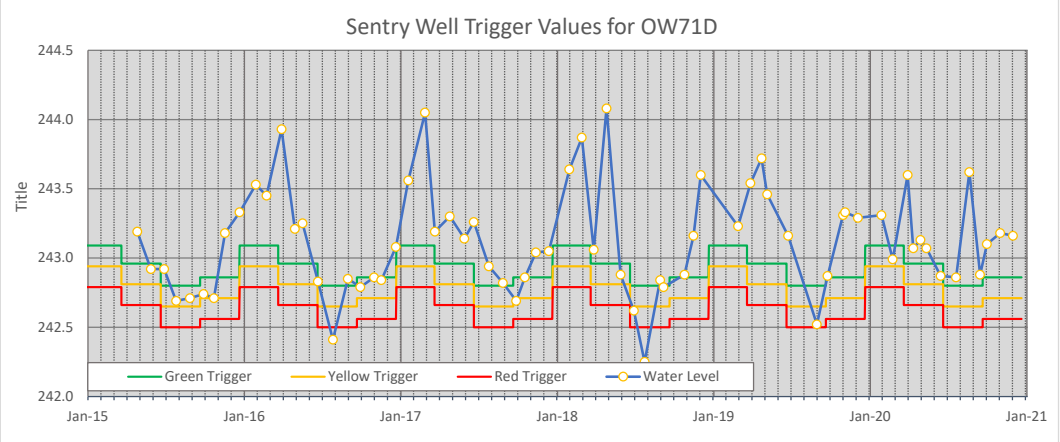
244.0
243.0
242.0
241.0
240.0
239.0
238.0
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW53
Title
246.0
245.5
245.0
244.5
244.0
243.5
243.0
242.5
242.0
241.5
241.0
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW71K
Title
244.0
243.5
243.0
242.5
242.0
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW71S
Title
244.0
243.8
243.6
243.4
243.2
243.0
242.8
242.6
242.4
242.2
242.0
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21


Sentry Well Trigger Values for OW71D
Title
244.5
244.0
243.5
243.0
242.5
242.0
Green Trigger
Yellow Trigger
Red Trigger
Water Level
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21

XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:23:06 / End time: 06/27/2021 at 16:23:06
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$T$1:$T$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW71d	68	0	68	242.250	244.080	243.121	0.375

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW71d):

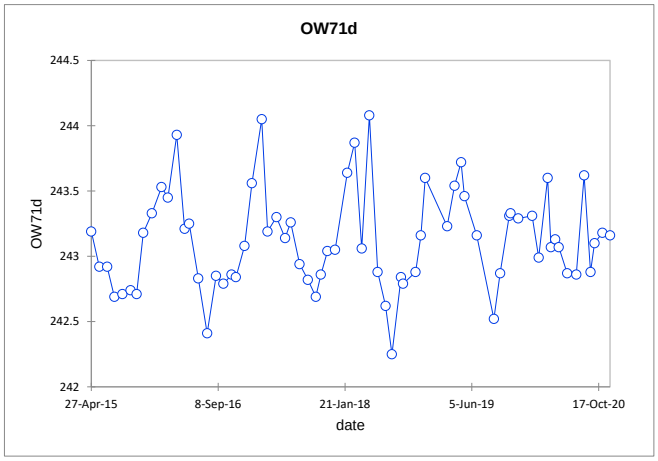
Kendall's tau	0.134
S'	16.000
Var(S')	198.000
p-value (Two-tailed)	0.286
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.01



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:22:26 / End time: 06/27/2021 at 16:22:26
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$S$1:$S$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW71s	68	0	68	242.160	243.910	243.081	0.333

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW71s):

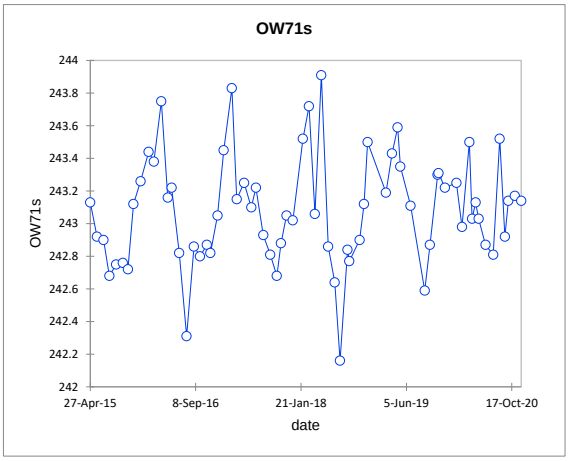
Kendall's ta	0.142
S'	17.000
Var(S')	199.000
p-value (Tv	0.257
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.011



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:21:53 / End time: 06/27/2021 at 16:21:53
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$R$1:$R$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW71k	68	0	68	242.140	243.760	242.937	0.342

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW71k):

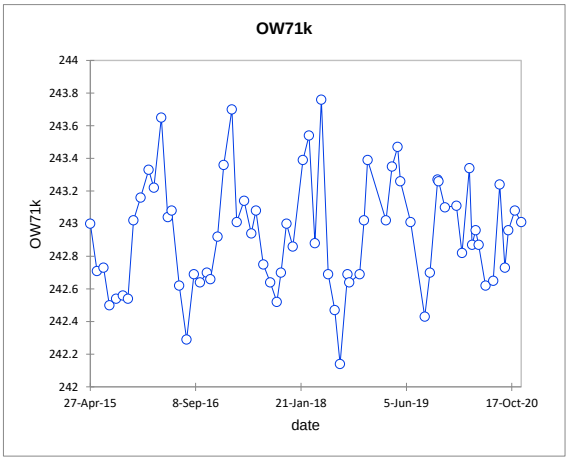
Kendall's ta	0.102
S'	12.000
Var(S')	196.000
p-value (Tv	0.432
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.013



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:16:41 / End time: 06/27/2021 at 16:16:42
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$O$1:$O$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW51	68	5	63	238.940	244.930	240.602	1.500

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW51):

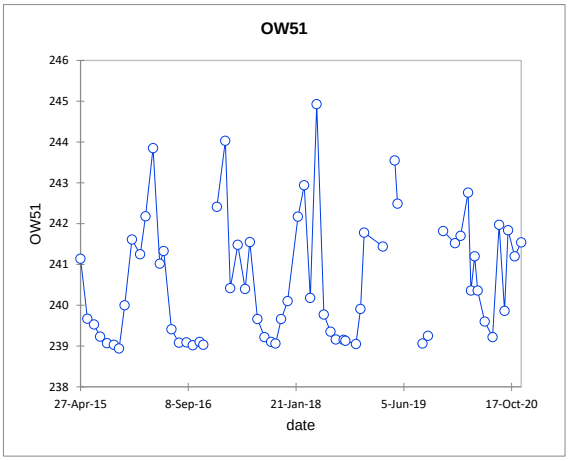
Kendall's ta	0.200
S'	20.000
Var(S')	160.000
p-value (Tv	0.133
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.031



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:15:08 / End time: 06/27/2021 at 16:15:08
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$N$1:$N$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW47d	68	1	67	242.840	245.270	243.549	0.441

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW47d):

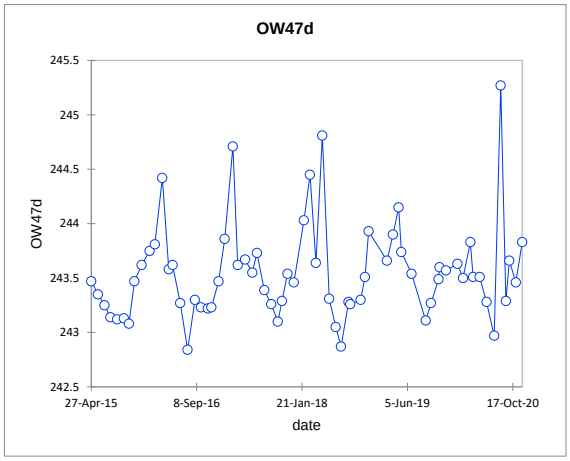
Kendall's ta	0.259
S'	30.000
Var(S')	192.000
p-value (Tv	0.036
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.014



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:13:38 / End time: 06/27/2021 at 16:13:38
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$M$1:$M$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW47s	68	1	67	243.150	244.970	243.591	0.352

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW47s):

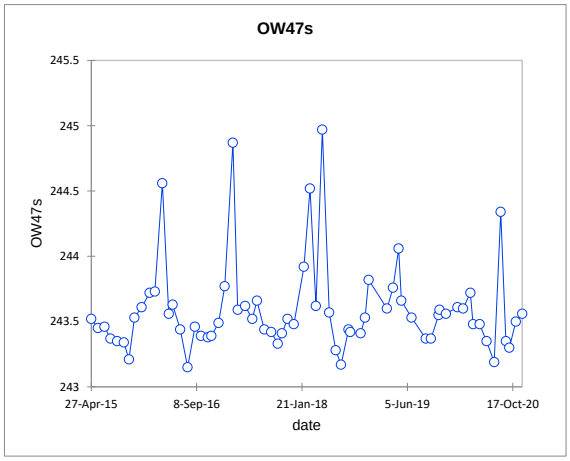
Kendall's ta	0.246
S'	28.000
Var(S')	188.000
p-value (Tv	0.049
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.015



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:11:31 / End time: 06/27/2021 at 16:11:31
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$L$1:$L$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW45	68	2	66	243.280	247.610	244.459	0.914

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW45):

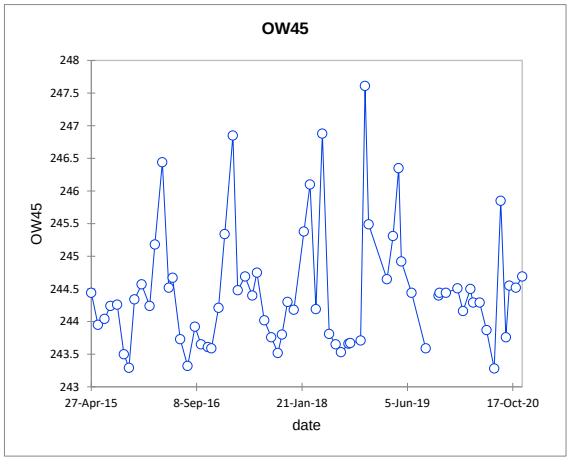
Kendall's ta	0.071
S'	8.000
Var(S')	184.000
p-value (Tv	0.606
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): -0.039



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:08:15 / End time: 06/27/2021 at 16:08:15
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$K$1:$K$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW33d	68	1	67	238.930	243.630	240.522	1.091

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW33d):

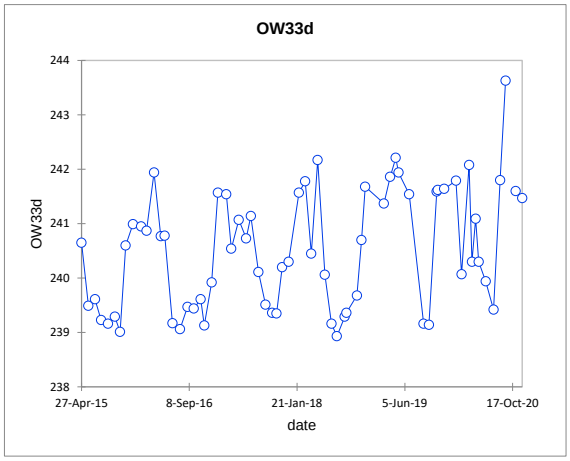
Kendall's ta	0.312
S'	37.000
Var(S')	197.000
p-value (Tv	0.010
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.166



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:06:47 / End time: 06/27/2021 at 16:06:48
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$J$1:$J$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW33s	68	2	66	243.000	246.400	244.075	0.822

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW33s):

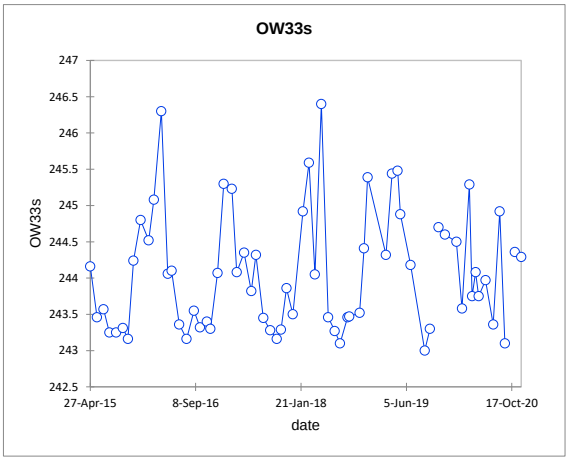
Kendall's ta	0.174
S'	20.000
Var(S')	190.000
p-value (Tv	0.168
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.067



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:06:00 / End time: 06/27/2021 at 16:06:00
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$I$1:$I$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW13d	68	2	66	241.980	244.070	242.841	0.489

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW13d):

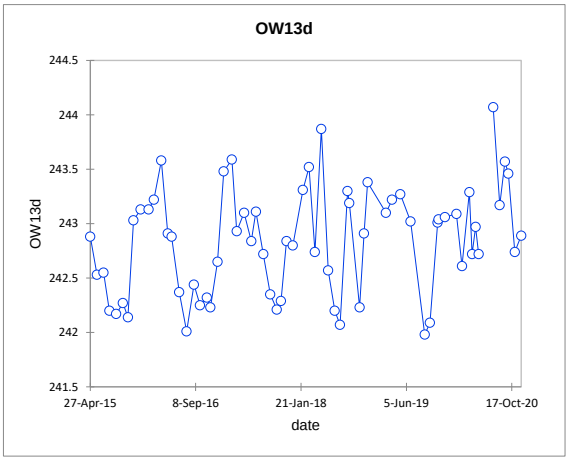
Kendall's ta	0.095
S'	11.000
Var(S')	191.000
p-value (Tv	0.469
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.032



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:05:16 / End time: 06/27/2021 at 16:05:16
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$H$1:$H$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW13s	68	2	66	244.100	245.600	244.835	0.332

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW13s):

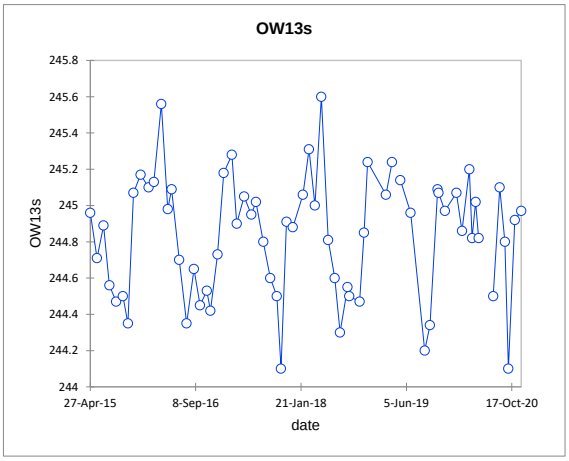
Kendall's ta	0.105
S'	12.000
Var(S')	187.333
p-value (Tv	0.422
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.013



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:04:15 / End time: 06/27/2021 at 16:04:16
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$G$1:$G$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW12d	68	6	62	242.770	244.970	243.846	0.437

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW12d):

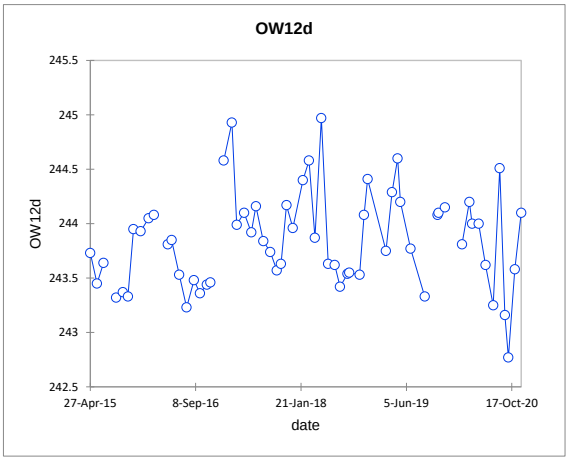
Kendall's ta	0.265
S'	26.000
Var(S')	158.000
p-value (Tv	0.047
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.086



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 16:00:29 / End time: 06/27/2021 at 16:00:29
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$F$1:$F$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW12s	68	6	62	243.470	245.430	244.028	0.420

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW12s):

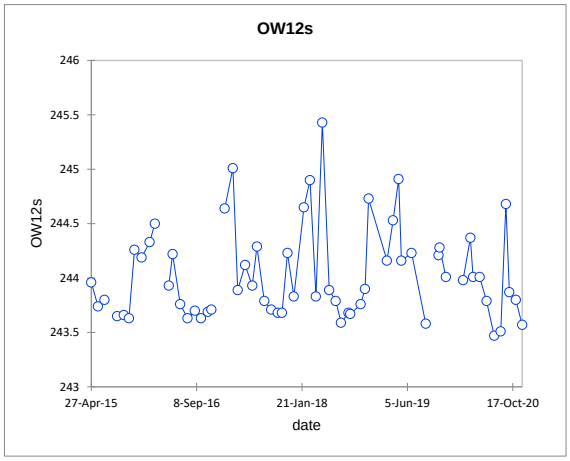
Kendall's ta	0.204
S'	20.000
Var(S')	158.000
p-value (Tv	0.131
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.023



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 15:58:11 / End time: 06/27/2021 at 15:58:12
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$E$1:$E$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW9d	68	0	68	242.370	244.090	243.176	0.359

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW9d):

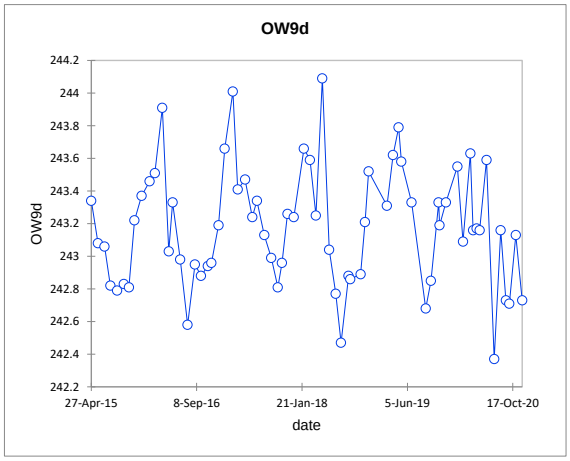
Kendall's ta	0.084
S'	10.000
Var(S')	198.000
p-value (Tv	0.522
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.009



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 15:57:18 / End time: 06/27/2021 at 15:57:19
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$D$1:$D$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW9s	68	0	68	242.420	244.180	243.194	0.384

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW9s):

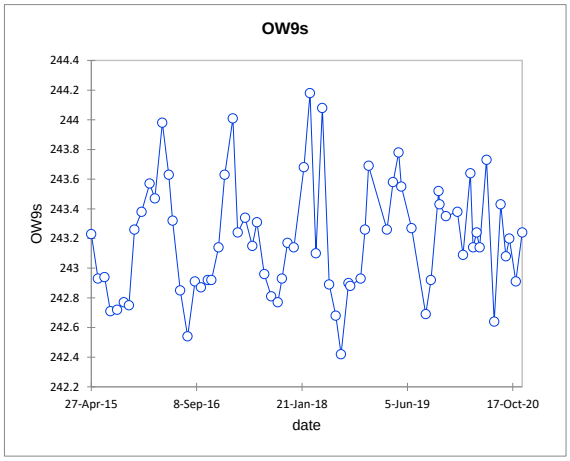
Kendall's ta	0.179
S'	21.000
Var(S')	195.000
p-value (Tv	0.152
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.02



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 15:56:09 / End time: 06/27/2021 at 15:56:09
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$C$1:$C$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW8d	68	5	63	242.500	244.330	243.421	0.385

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW8d):

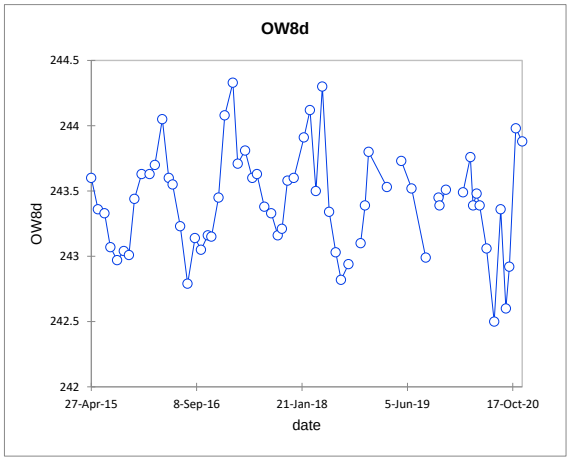
Kendall's ta	0.050
S'	5.000
Var(S')	159.000
p-value (Tv	0.751
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

Sen's slope (Period = 12): 0.008



XLSTAT 2020.5.1.1079 - Mann-Kendall trend tests - Start time: 06/27/2021 at 15:22:22 / End time: 06/27/2021 at 15:22:23
Time series: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$B$1:$B$69 / 68 rows and 1 column
Date data: Workbook = 2020 Kendall Test.xlsx / Sheet = Data Source / Range = 'Data Source'!$A$1:$A$69 / 68 rows and 1 column
Significance level (%): 5
Continuity correction: Yes

Summary statistics:

Variable	Observations	Obs. with missing	Obs. without	Minimum	Maximum	Mean	Std. deviation
OW8s	68	5	63	243.060	245.500	244.089	0.487

Seasonal Mann-Kendall Test / Period = 12 / Serial independence / Two-tailed test (OW8s):

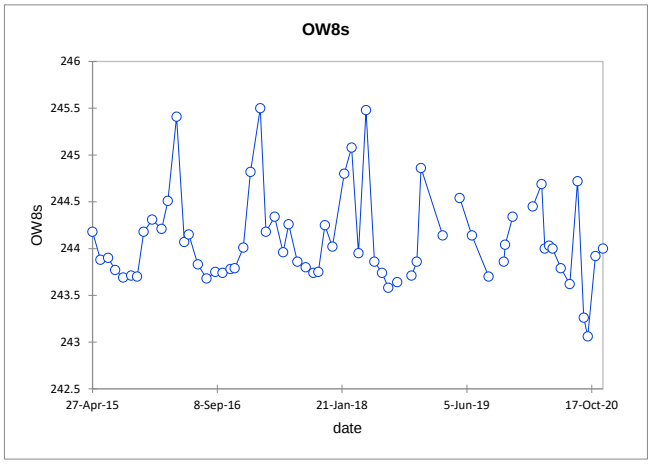
Kendall's tau	0.070
S'	7.000
Var(S')	159.000
p-value (Two-tailed)	0.634
alpha	0.050

An approximation has been used to compute the p-value.

Test interpretation:
H0: There is no trend in the series
Ha: There is a trend in the series
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The continuity correction has been applied.

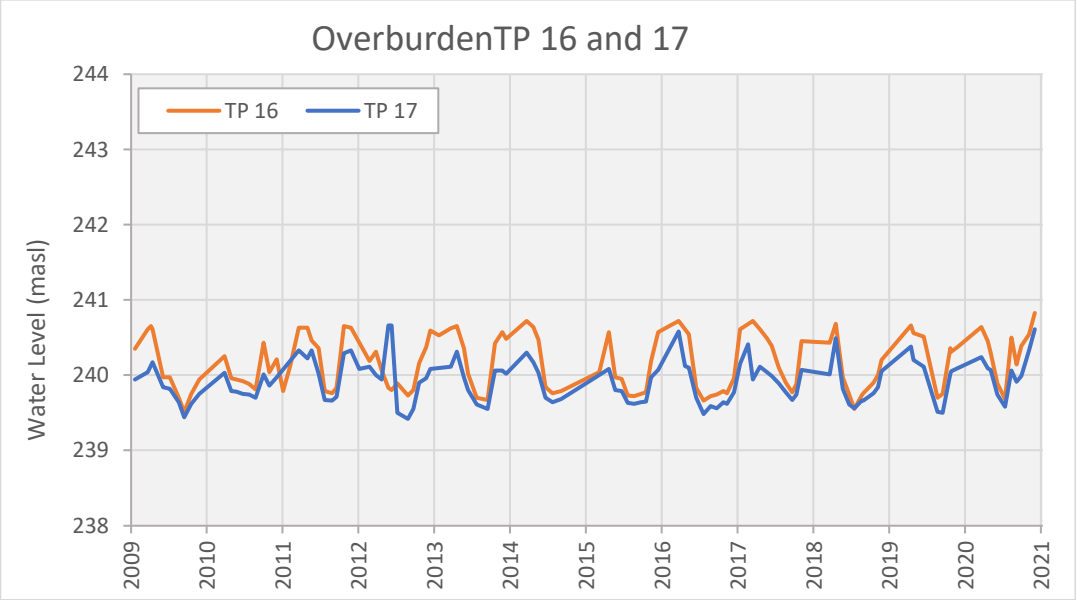
Sen's slope (Period = 12): -0.002

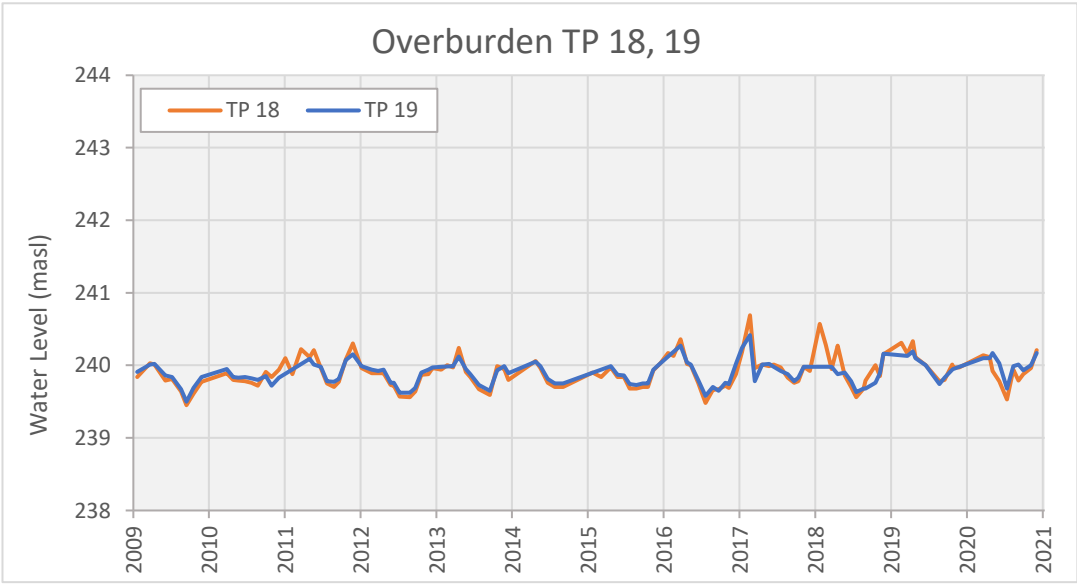


APPENDIX A1-d

OVERBURDEN TEST PITS

Keppel Quarry: Appendix A-1d
Overburden Test Pits

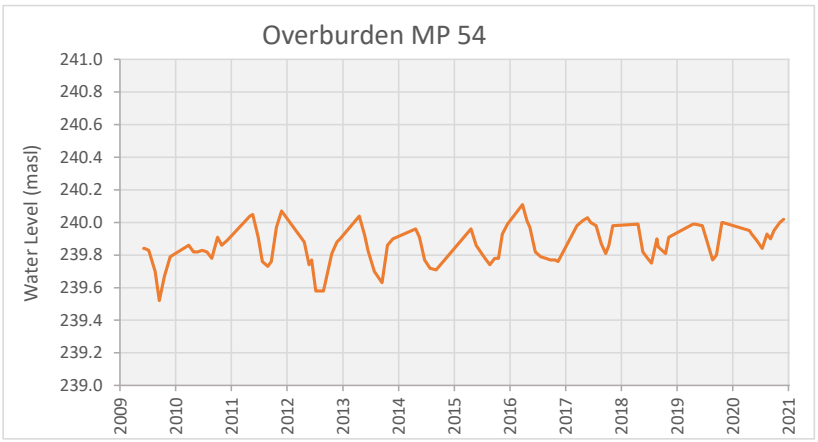


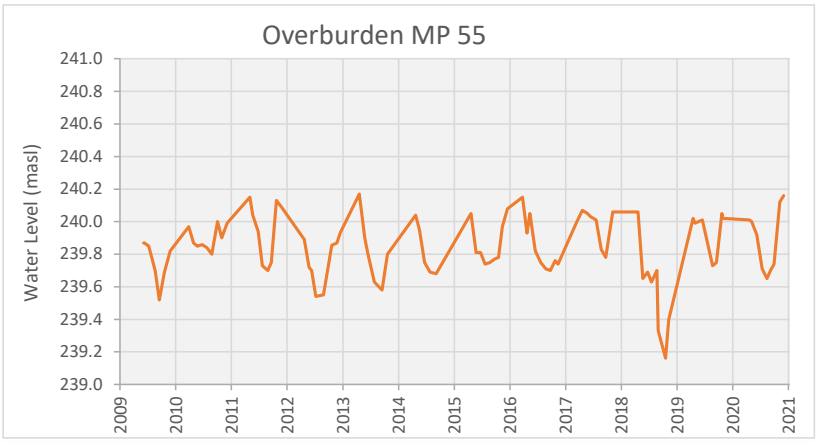


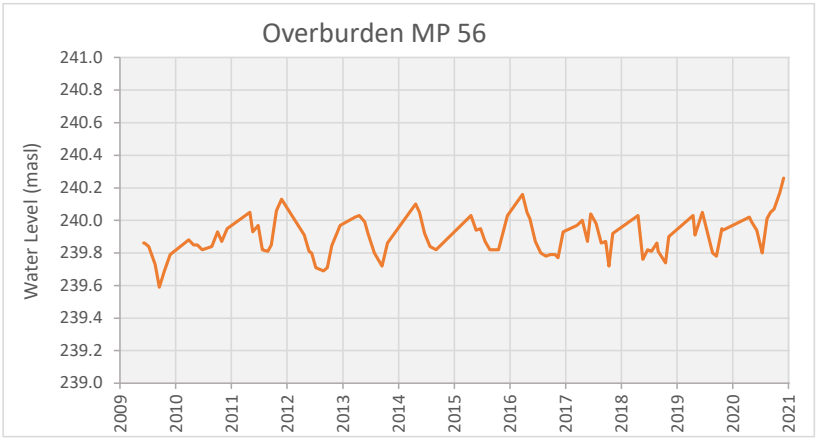
APPENDIX A1-e

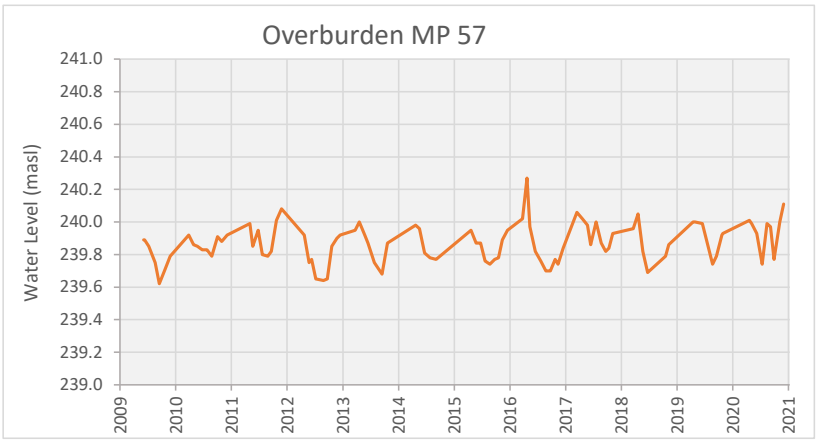
OVERBURDEN MINI-PIEZOMETERS

Keppel Quarry: Appendix A1-e
Groundwater Hydrographs





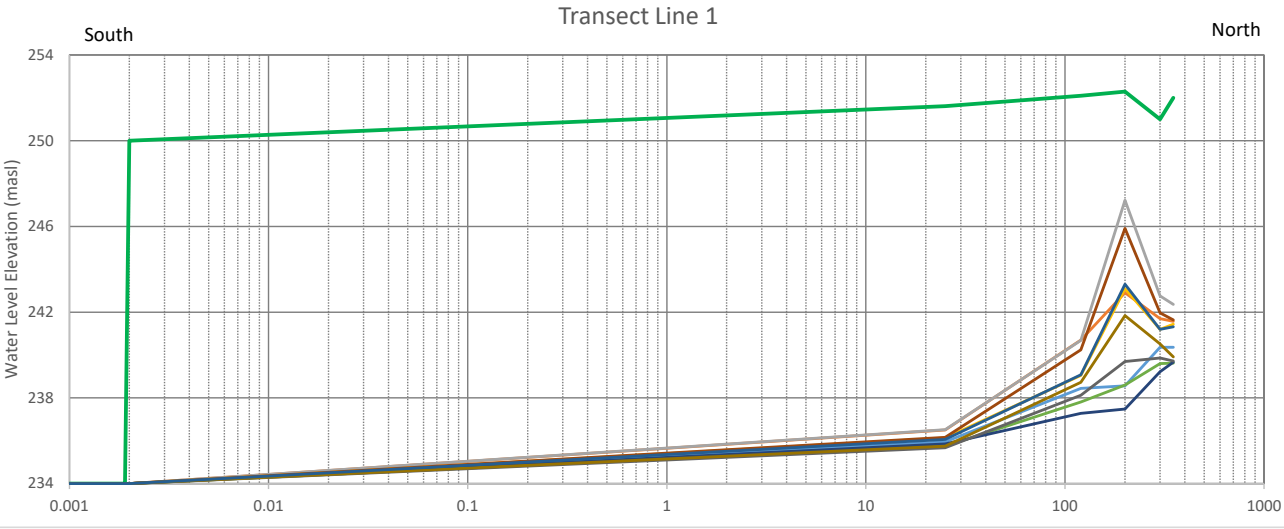


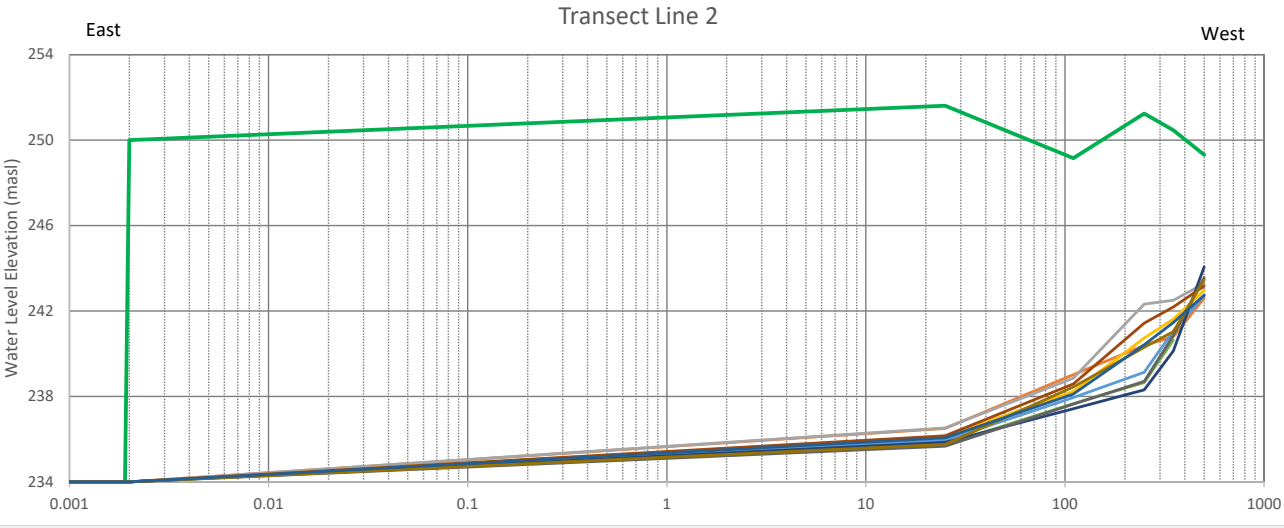


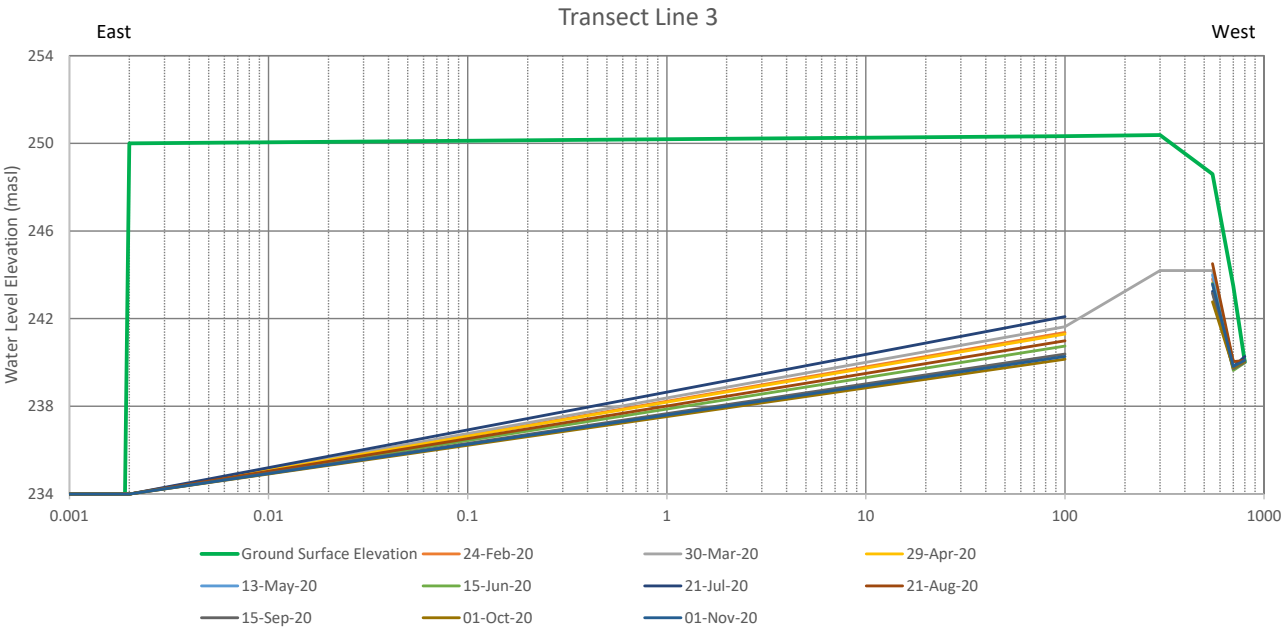
APPENDIX A2

DISTANCE – DRAWDOWN PLOTS

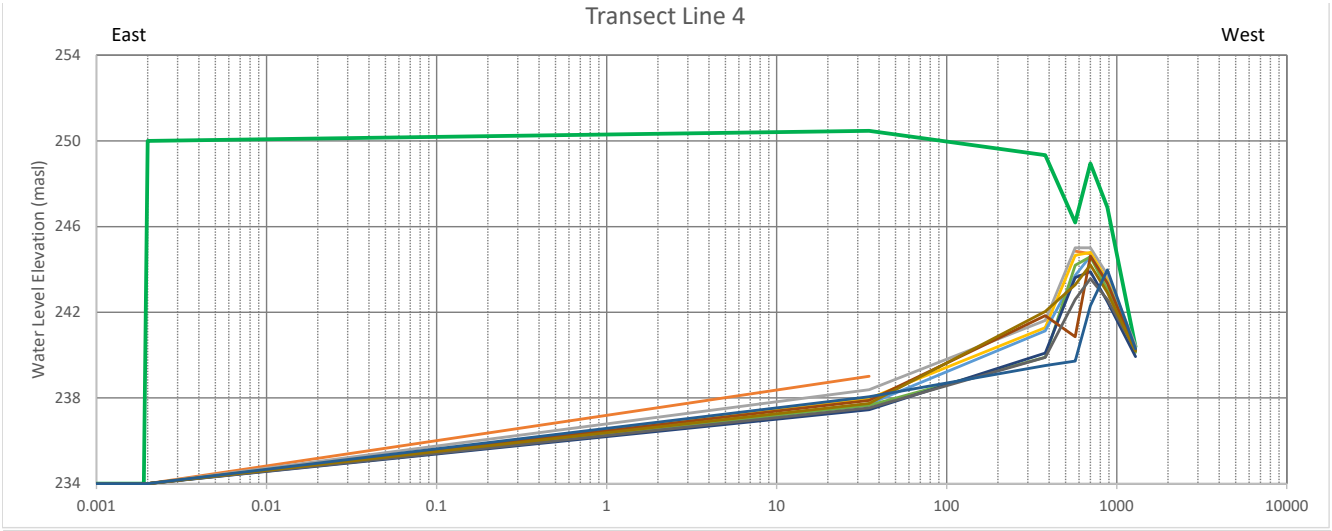
Keppel Quarry: Appendix A2
Distance-Water Level Graphs

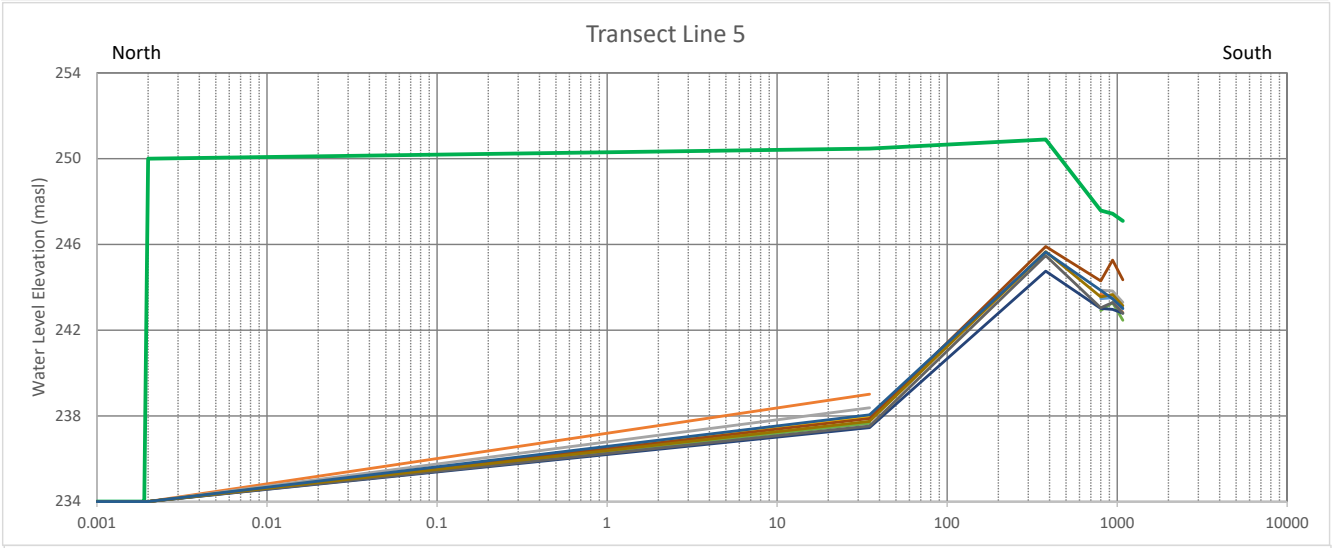


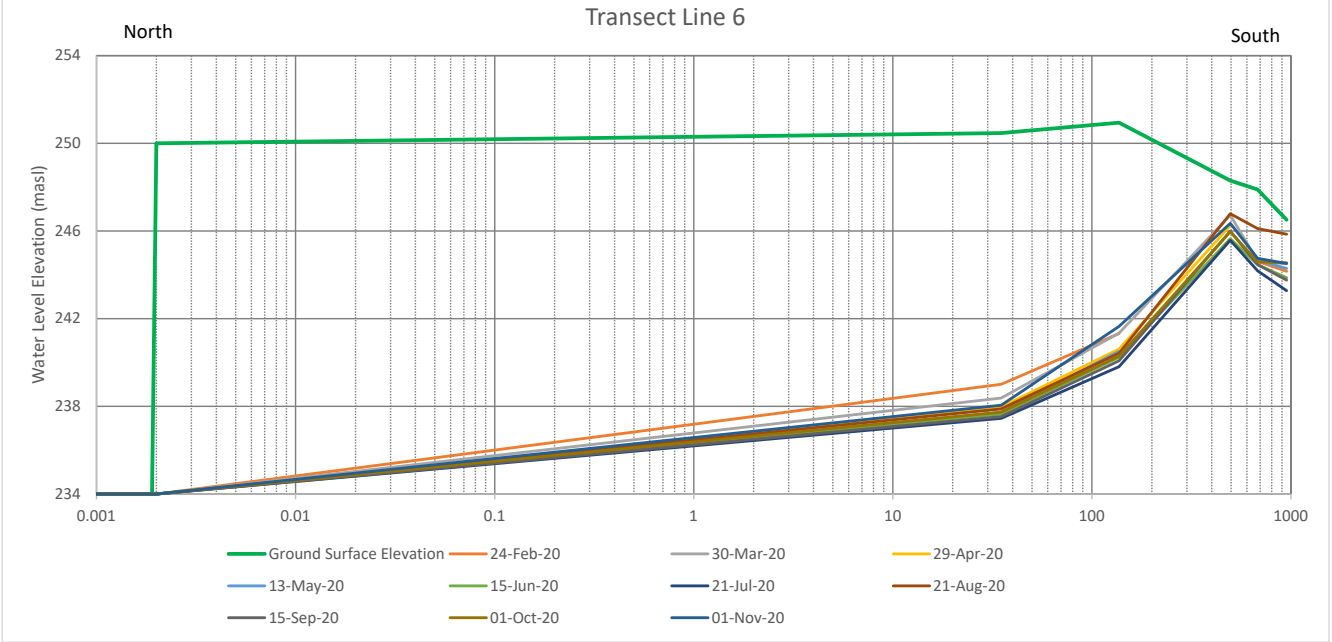




Keppel Quarry: Appendix A2
Distance-Water Level Graphs







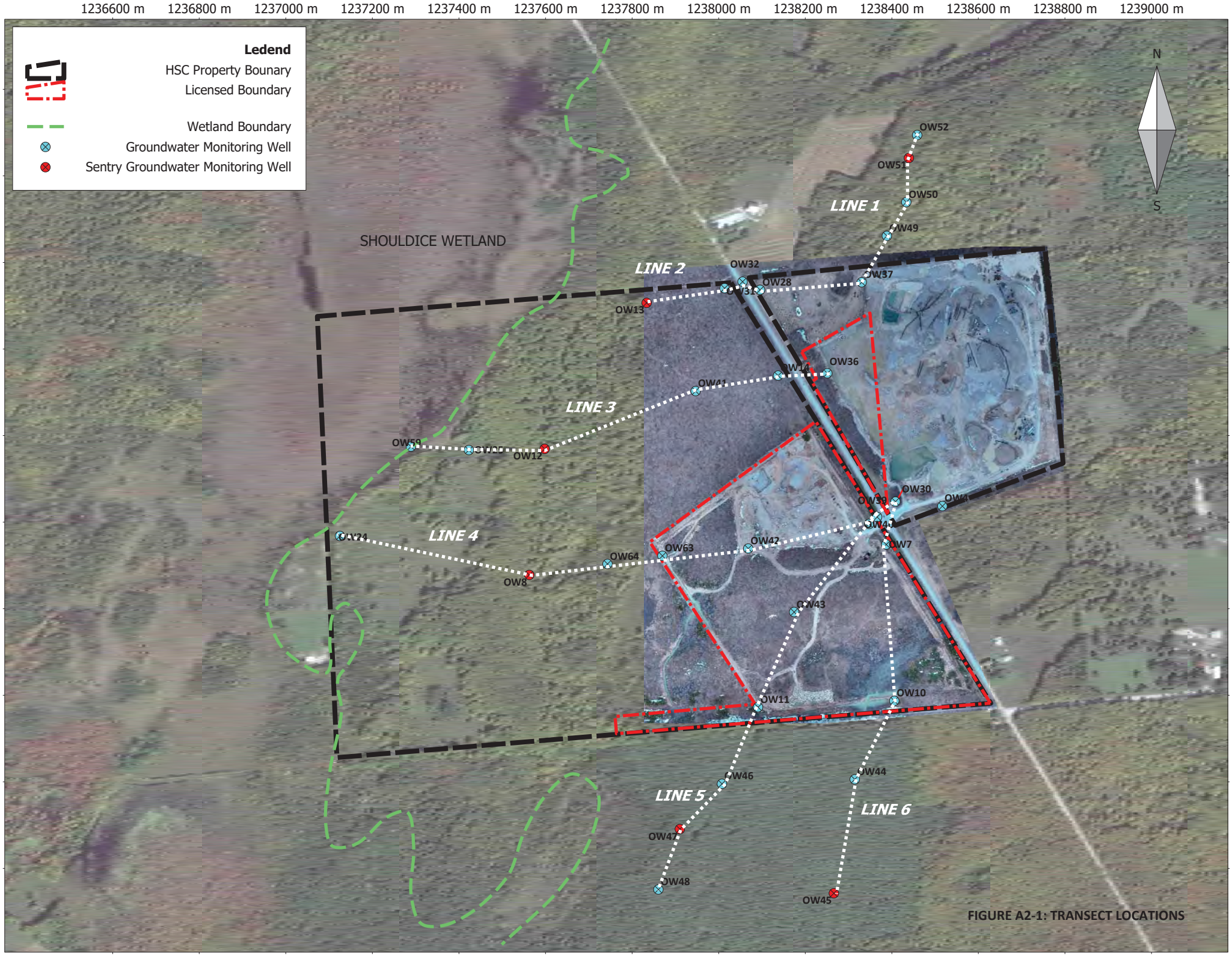


FIGURE A2-1: TRANSECT LOCATIONS

APPENDIX C

ECOLOGICAL MONITORING REPORT: KEPPEL QUARRY

YEAR 6 - 2020

Keppel Quarry: Year 6 (2020) Ecological Monitoring Report & Analysis to Baseline Data

PREPARED FOR

Walker Aggregates

Keppel Quarry

Part Lots 26, 27 & 28, Concession 10
Geographic Township of Keppel
Township of Georgian Bluffs, County of Grey

PREPARED BY

AWS

ENVIRONMENTAL CONSULTING LTD.

Operating as Aquatic and Wildlife Services
R. R. # 1, Shallow Lake, Ontario, N0H 2K0
(519) 372-2303, JOHN MORTON, www.awsenvironmental.ca

March, 2020

Keppel Quarry Operations Year 6 (2020):

Ecological Monitoring Report

1. Introduction

The Keppel Quarry ecological monitoring plan requires Natural Heritage monitoring every three years post the baseline data collection period of years 2015 to 2017 inclusive. This 2020 Ecological Monitoring Report has been undertaken during the Keppel Quarries 6th operational year and providing the first analysis of targeted and current ecological findings in comparison to the baseline data. Plot and site location mapping of the Ecological Monitoring Network is provided under Appendix 1. The approved ecological monitoring approach was designed to be able to provide 'trends through time' data. The comparative analysis could show any unanticipated impacts that may be attributed to the quarry extraction operations, to the surrounding woodlands or wetland features or their identified significant ecological functions, through the full AMP triggering review process.

The ARA licence was issued to HSC Aggregates in early 2015, site clearing and extraction operations commenced that year within Phase 1A area (east of Grey Rd # 17). Site clearing within Phase 1B (west of Grey Rd # 17) and construction of the mitigation berm concluded in the spring of 2016 as per the Operational Plan. Within Phase 1B, above water table extraction operations commenced in the fall of 2017. In the summer of 2019 Harold Sutherland Construction (HSC) corporation was purchased by Walker Industries Inc, including the Keppel Quarry ownership. AWS Environmental Consulting Inc (AWS) commenced the Year 6 ecological monitoring field data collection in late April through to early September, 2020. Site and weather conditions, are provided for each monitoring date were applicable, with survey works following accepted protocol. Year 6 data has been provided under Appendixes 2 to 4 with site photos of 2020 conditions provided under Appendix 5.

At the commencement of the 2020 ecological monitoring activity it was unknown to the current quarry owner or AWS, that the former owner/operator had undertaken extensive timber-logging harvesting operations within much of the surrounding woodlands of Lots 25, 26 and 27, Concession 10 sometime in the winter of 2017/2018- spring 2019. Much of the woodland environment to the north and west of the licensed quarry boundary has incurred selective tree harvesting activity prior to Walker ownership which has impacted the ability to monitor these woodlots over time. In fulfilling its ecological obligations, Walker Aggregates is proposing a new plan to re-establish the ecological baseline monitoring in the affected areas. Further discussion is provided in section 2.i, with a recommended revised tree health monitoring approach and establishment of three new plots outlined under section 6.ii. Additionally during this same time period prior to Walker ownership, a drainage ditch was constructed beyond the quarry's western limit, draining the monitoring plan 'ephemeral pond' feature and significantly impairing its ecological function for amphibian breeding. Further discussion is provided in section 4.ii, with a recommended restoration direction provided under section 6.ii.

2. Terrestrial Monitoring

i. EMA-1; Woodland Tree Health, Regeneration, Diversity Comparative Analysis

Three fixed forest plots (F-1, F-2, F-3) were established in Lot 26 and Lot 27 in 2015, north of the New Keppel Quarry licence limit with base line data collected during the 3-year monitoring period. Plot F-1 was established in close proximity to the Phase 1B north extraction limit to monitor any unpredicted hydrogeological influences which could negatively impact the ANSI woodlands and first showing at this monitoring plot for the 'AMP-monitoring triggering' process. Plot F-2 was located further north, to the potential limit of any groundwater table changes and Plot F-3 was established well beyond any potential hydrogeological influences from the Keppel Quarry, as a 'control' plot. The three woodland plots were established to monitor any vegetation growth differences between Plots F-1 and F-2 in comparison to F-3 which may occur from the quarry operations (water table changes or dust impacts).

In September 2020, AWS accessed the northerly woodlands along the north quarry limit-berm area, to monitoring Plot F-1 and then preceded northerly to plots F-2 and F-3 in sequence. At plot F-1 it was noted that tree felling and harvesting operations activity which had occurred 1-2 years prior (sucker growth observed on tree stumps) had caused site disturbances all around plot F-1, with minor impacts to the plot F-1 itself. Plot F-1 data summary is provided below. These woodland alterations would directly influence tree growth, tree regeneration, groundcover composition etc within the lands directly adjacent to the north quarry limits. As such, the baseline data collection comparison would have limited opportunity to asses if any negative impacts were being incurred on the woodlands from the quarry operations itself. Moving north, on route to monitoring plot F-2 it was noted that tree felling/harvesting operations were increasing but 'patchy', following skidder trails established in the early spring of 2015 (note: the first tree harvesting operation by the former landowner was undertaken within these lands in March-April 2015). Forest plot F-2 was significantly altered from the more recent tree cutting operation, with 54% of the 'tagged' monitoring trees being felled & removed, with several ground cover plots heavily damaged (driven over/crushed or covered with slash).

What data that could be collected from Plots F-1 and F-2 is provided under Appendix 2 and summarized below, with little to no opportunity for comparative assessment purposes. At plot F-3, no data was collected due to significant site alterations (removed tagged trees and slash) and tree harvesting impacts similar but greater than that observed at Plot F-2, making it impractical to further continue with this component of the ecological monitoring plan.

2020 Summary Data and Comparison to baseline averages for Plot F-1 & F-2

A. Plot F-1

- Main Plot (20m x 20m)
  - Upper Canopy Live Tree data with 20 monitoring trees (all still present in 2020)
    - Basal Area: no changes, 18 sq. m/ha
    - Total DBH for the 20 primary monitored trees (growth)
      I. 2015 = 428 cm
      II. 2016 = 428 cm
      III. 2017 = 430 cm
      IV. 2020 = 440 cm
  - Canopy Layer Composition data (regeneration)
    - >10m canopy height: No changes
    - 2-10m canopy height: 10% increase in Sugar Maple & 5% increase in White Ash
    - 0.5 to 2m canopy height: No changes
    - 0 to 0.5m canopy height: No changes
  - Standing dead Tree data
    - No changes.
  - Downed Trees & Woody Debris data
    - Additional two polewood sized limbs from adjacent tree felling operations.
    - 20% increase in branches and 10% increase of smaller woody debris, all attributed to slash from recent tree felling adjacent to the plot.

- Regeneration Plots (2m x 2m), comparative analysis for numbers only
  - NE corner plot
    - Change from 8 seedlings to 9,minor advancement in age/height structure
  - SE corner plot
    - Change from 21 seedlings to 14, primary reduction in White Ash due to cumulative slash pile impacts
  - SW corner plot
    - Change from 15 seedlings to 0, plot destroyed due to tree harvesting skidder activity
  - NW corner plot
    - No change in numbers or diversity, minor advancement in age/height
  - Center plot
    - No change in numbers or diversity, minor advancement in age/height

- Ground Vegetation Composition Plots (1mx1m) comparative analysis
    - NE corner plot
        - No significant changes
    - SE corner plot
        - Reduction in tree seedlings and ground flora due to increase in woody debris slash pile
    - SW corner plot
        - Significant changes and impacts from skidder traffic, plot markers gone
    - NW corner plot
        - No significant changes
    - Center plot
        - No significant changes

B. <u>Plot F-2</u>

- Main Plot (20m x 20m): Significant recent impacts from tree harvesting, much of this plot has been destroyed for monitoring purposes (impacts same as to plot F-3)

    - Upper Canopy Live Tree data, reduction from 28 monitoring trees to 13 left (54% reduction)
        - Basal Area: Significant change, drop from 24 to 12 sq. m/ha
            - Total DBH for 28 primary monitoring trees during the 3-year base line data collection for growth monitoring.
                i. 2015 = 541 cm
                ii. 2016 = 541 cm
                iii. 2017 = 549 cm
                iv. 2020 = 268 cm (reduced to 13 trees left in 2020)
            - Due to recent tree harvesting operations, no comparative tree growth analysis can be made.

    - Canopy Layer Composition data (regeneration)
        - Significant changes to all aspects of Plot due to tree felling/harvesting operations, from upper canopy 60% opening to smashed/killed tree saplings/seedlings and ground cover alterations from skidder trails and slash piles. Making and comparative analysis redundant.

    - Standing dead Tree data
        - None, former standing dead trees removed during tree harvesting operations

    - Downed trees & woody Debris data
        - Natural change is unknown, man-made changes are significant from tree harvesting slash piles and damaged/felled other smaller trees.

- Regeneration Plots (2m x 2m), comparative analysis for numbers only
  - NE corner plot
    - Tree seedling data unknown, entire plot buried under 2m of woody debris slash
  - SE corner plot
    - No significant changes, same tree species and numbers
  - SW corner plot
    - Plot destroyed due to skidder traffic, no tree regeneration left
  - NW corner plot
    - No significant changes, same tree species and numbers
  - Center plot
    - Smaller two saplings same, larger saplings killed/removed from tree felling activity

- Ground Vegetation Composition Plots (1mx1m) comparative analysis
  - NE corner plot
    - Unknown, plot destroyed, buried under 2m of slash
  - SE corner plot
    - No changes
  - SW corner plot
    - Plot destroyed, primarily bare rock/soil now.
  - NW corner plot
    - No significant changes
  - Center plot
    - Impacted from tree harvesting, much of plot now occupied under the cut down center tree plot left on-site.

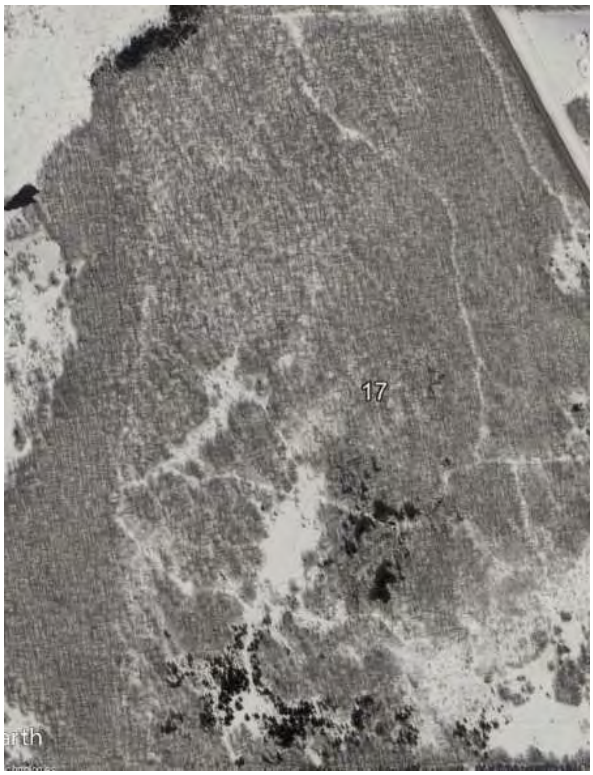
C. <u>Plot F-3</u>

- No data was collected in 2020 due to significant impacts from recent tree harvesting operations, similar to plot F-2, with tagged monitoring trees removed, other trees damaged, slash piles over comer ground plots, skidder traffic throughout plots with topsoil digging (skidder ruts).
- F-3 was established as the 'control' plot', now destroyed for monitoring activity from site alterations/impacts of recent tree harvesting operations.

Due to the second cut tree harvesting operations by the former landowner which occurred sometime around 2018, this aspect of the ecological monitor plan is no longer practical. The three-year baseline data collected can no longer be used as comparative analysis in relation to potential 'quarry' related activities. With the extensive alterations to Plots F-2 and F-3 and alterations to plot F-1 plus immediate adjacent tree felling to plot F-1, continuation of these plots and/or the terrestrial monitoring methodology approach is now impractical. Given the extent of the site alterations throughout the northerly woodland from two recent tree cutting operations, 2014 and again on or about 2018, site

conditions could take 40 plus years to become 'naturalized'. It should be noted at this time that the primary woodland canopy stand itself is still in 'fair to good' condition with pockets of abundant maple sapling regeneration; though the groundcover diversity will be altered for some time (increased sunlight penetration to the forest floor promotes undesirable species while decreasing maple seedling regeneration). The principal of this methodology approach was to monitor any negative woodland impacts/alterations which could be attributed to the quarry operations. With the alterations incurred from the tree harvesting operations and potential on-going alterations (blow-downs, reduced seedling germination) plus anticipated long-term recovery, this original methodology is now impractical anywhere within the northerly property woodlands. That is , we cannot just set up new plots following the same methodology, as the new data and changes associated to tree health/regeneration/diversity will be directly associated with the dominate influence of the woodland recovery from the tree cutting activity, not noticeable or that could be directly associated with any minor changes from the quarry operations. An aerial imagery comparison of the woodland feature with the increased numbers of skidder trails (directly associated with areas of tree removal) from 2014 to 2019 is provided below. A recommended new monitoring approach has been outlined under section 6.ii.

Keppel Quarry Adjacent Woodlands, Same Property Area: Lots 25-27, Concession 10



March 2014 (winter), 8-10 skidder trails evident throughout the woodlands

May 2019 (before leaf-out), dozens of skidder trails evident throughout the woodlands

ii. EMA-2; Woodland Breeding Birds

Eight fixed woodland breeding Bird-Monitoring Points were established within Lot 26 and 27 north of the Keppel Quarry licence lands. Four plots are located along each of the two parallel west-east oriented transect lines within the northerly woodlands with monitoring methodology in accordance to Bird Studies Canada woodland protocols. Though the recent tree harvesting operation significantly impacted the vegetation monitoring plots and terminated that current monitoring aspect, breeding bird monitoring activities can still be carried out and can continue to be used as a 'comparative model for trend-through time' to the baseline data collocated.

Breeding bird point count data collected in 2020 has been provided under Appendix 3 along with a comparative spreadsheet to the 3-year baseline data. Records from the 2020 monitoring shows that the overall breeding bird activity has experienced no significant changes in bird species diversity or numbers due to the recent tree harvesting operation or the Quarry Operations. Woodland bird breeding activity appears to be consistent with that recorded during the 3-year base line data collocation period. One minor change noted is that of woodland birds that are oriented to sparse understory growth vs. dense understory growth, as colour coded on the bird species listing comparative summary sheet. Of the three bird species which prefer sparse understory growth, two were decreasing in numbers during the 2020 monitoring in comparison to the baseline data. While of the noted nine bird species which prefer a dense understory growth, six were increasing in numbers during the 2020 monitoring in comparison to the baseline data. It is anticipated that is a direct result of the recent tree harvesting activity which has 'opened up' the upper canopy allowing greater sunlight penetration to the forest floor which promotes increased groundcover flora growth and density.

3. Wetland Monitoring- Vegetation Monitoring Plots

i. EMA-3; The Glen Wetland

Flora Species Diversity Monitoring Plots S1 & S2

Two fixed 1m x 1m vegetation monitoring plots were established in 2015 immediately down gradient of Seep No. 1 (S1) and Seep No. 2 (S2). These vegetation plots were established to monitor any encroachment of terrestrial vegetation into the perimeter zone of the provincially significant Glen Wetland environment. Any unpredicted groundwater flow pattern alterations to these seep features could reflect input water level changes reflecting in significant vegetation composition changes to the wetland feature.

2020 vegetation composition data for EMA-3 is provided under Appendix 4 and site condition photos provided under Appendix 5. A comparative analysis of 2020 recorded vegetation to that of the 3-year baseline vegetation data is provided below.

Table 1: EMA- 3, Plot No. **S1**

Species	**Year 2015** Emergent/Submergent Percentage Cover	**Year 2016** Emergent /Submergent Percentage Cover	**Year 2017** Emergent/Submergent Percentage Cover	**Year 2020** Emergent/Submergent Percentage Cover
Veronica anagalis-aquatica	75	75	0	20
Nasturtium officinate	24	24	98	78
Typha latifolia	0	0	P	P
Solanum dulcamara	1	1	2	2

Table 2: EMA-3, Plot No. **S2**

Species	**Year 2015** Emergent/ Submergent Percentage Cover	**Year 2016** Emergent/Submergent Percentage Cover	**Year 2017** Emergent/Submergent Percentage Cover	**Year 2020** Emergent/Submergent Percentage Cover
Chrysoplenium americanum	47	47	0	20
Impatiens capensis	25	25	25	20
Leersia oryzoides	15	15	0	3
Epilobium hirsutum	16	16	10	15
Typha latifolia	0	0	0	5
Carex comosa	0	0	5	5
Eupatorium perfoliatum	5	5	P	1
Scutellaria lateriflora	P	P	P	P
Symphyotrchum puniceum	1	1	0	P
Solidago altissima	0	0	P	1
Rumex crispus	1	1	0	0
Scirpus atrovirens	2	2	0	0
Solanum dulcamara	P	P	15	10
Tussilago farfara	26	26	30	20
Clematis virginiana	1	1	0	0
Bare Mud	0	0	10	0

Notes:

1) Red text for species name denotes a Non-Native Species

2) Blue shaded species name box denotes a Wetland Oriented Species

3) Green shaded species name box denotes a Terrestrial Oriented Species

4) No shaded species name box denotes a species which can be found in either Terrestrial or Wetland environments

5) 'P' denotes species is Present but represents <1% coverage of plot area

Analysis of Table 1 shows that the 3-year baseline terrestrial oriented vegetation composition ranged from 1% to 2% of the Plot. Year 2020 terrestrial vegetation composition was consistent with the baseline data. The monitoring data of Plot S1 demonstrates that no significant vegetation composition changes have been recorded within the seep/wetland boundary interface.

Analysis of Table 2 shows that the 3-year baseline terrestrial oriented vegetation composition ranged from 27% to 30% of the Plot. Year 2020 terrestrial vegetation composition was at 20%, slightly lower than the baseline range. This minor & beneficial change is anticipated to be a result of higher input flow volumes (soil having wetter conditions) data. The monitoring data of Plot S2 demonstrates that no encroachment of terrestrial oriented vascular plants is occurring into the seep/wetland boundary interface environment.

ii. EMA-4; Shouldice Wetland - Main Complex

Flora Species Diversity Monitoring Plots S8 & S9

Two fixed 1m x 1m vegetation monitoring plots were established in 2015 immediately down gradient of Seep No. 8 (S8) and Seep No. 9 (S9) situated along the transitional zone of the Shouldice Wetland main wetland complex. These vegetation plots were established to monitor any encroachment of terrestrial vegetation into the perimeter zone of the provincially significant Shouldice Wetland environment which could be associated from unpredicted groundwater input source changes from the surrounding uplands/ quarry area. Any significant terrestrial flora encroachment within the wetland plots could be attributed to unpredicted groundwater flow pattern alterations to these seep features.

Plot location mapping is provided under Appendix 1, with 2020 vegetation composition data for EMA-3 provided under Appendix 4 and site condition photos provided under Appendix 5. A comparative analysis of 2020 recorded vegetation to that of the 3-year baseline vegetation data is provided below.

Flora composition estimations for 2020 are provided under Appendix 4. Over the 3-year monitoring period, no significant measurable difference at any of the Wetland Community monitoring plots was recorded. Surface water levels and seep discharge flows have been fairly consistent at all monitoring sites contributing to a stable wetland flora community.

Table 3: EMA-4, Plot No. **S8**

Species	**Year 2015** Emergent/Submergent Percentage Cover	**Year 2016** Emergent/Submergent Percentage Cover	**Year 2017** Emergent/Submergent Percentage Cover	**Year 2020** Emergent/Submergent Percentage Cover
Leersia oryzoides	18	18	0	25
Typha latifolia	P	p	0	0
Sparganium emersum	5	5	0	0
Gyceria borealis	35	35	8	30
Phalaris arundinacea	2	2	5	5
Ludwigia palustris	4	4	P	5
Mentha arvensis	2	2	0	0
Galium palustris	1	1	P	2
Cicuta bulbifera	P	P	0	0
Scutellaria lateriflora	P	p	0	0
Carex spicata	P	P	0	0
Lysimachia sp. Sterile	6	6	0	0
Poa palustris	P	P	0	0
Ranunculus acris	P	P	0	0
Bare Mud (under water)	40	40	85	33

Table 4: EMA-4, Plot No. **S9**

Species	**Year 2015** Emergent/Submergent Percentage Cover	**Year 2016** Emergent/Submergent Percentage Cover	**Year 2017** Emergent/Submergent Percentage Cover	**Year 2020** Emergent/Submergent Percentage Cover
Ludwigia palustris	45	45	2	25
Carex hystericina	20	20	P	2
Eleocharis palustris	18	18	20	15
Sagittaria latifolia	4	4	1	1
Lysimachia thyrsiflora	6	6	P	P
Sparganium emersum	5	5	0	0
Leersia oryzoides	4	4	0	1
Asclepias incarnata	P	P	P	P
Lycopus americanus	0	0	1	1
Mentha arvensis	P	P	0	0
Typha latifolia	P	P	0	2
Galium palustris	P	P	0	0
Scutellaria lateriflora	P	P	0	0
Cicuta bulbifera	P	P	0	P
Phalaris arundinacea	0	0	0	P
Bare Mud (under water)	0	0	40	50

Notes:

1) Red text for species name denotes a Non-Native Species

2) Blue shaded species name box denotes a Wetland Oriented Species

3) Green shaded species name box denotes a Terrestrial Oriented Species

4) No shaded species name box denotes a species which can be found in either Terrestrial or Wetland environments

5) 'P' denotes species is Present but represents <1% coverage of plot area

Analysis of both Table 3 and 4 shows no Terrestrial oriented vascular plants were recorded during the 3-year baseline data within plots S8 and S9. Vegetation monitoring of 2020 similarly did not record any terrestrial oriented vascular plots in either of these plots. This 2020 monitoring has demonstrated that to-date no adverse vegetation community composition impacts have incurred to the Shouldice Wetland-Main Complex area.

iii. EMA- 6; Shouldice Wetland-Pond & East Park Head Creek Branch

Flora Species Diversity Monitoring Plots S13A to S13D

Table 5: EMA-4, Plot No. **S13-A**

Species	Year 2015 Emergent/Submergent Percentage Cover	Year 2016 Emergent/Submergent Percentage Cover	Year 2017 Emergent/Submergent Percentage Cover	Year 2020 Emergent/Submergent Percentage Cover
Juncus alpinoarticulatus	95	95	35	75
Nusturtium officinale	4	4	25	15
Salix discolor	4	4	20	5
Salix lucida	1	1	3	0
Glyceria borealis	2	2	0	3
Gallium palustris	P	P	0	2
Lemna minor	P	P	0	0
Solanum dulcamara	P	P	1	1
Agrostis gigantea	P	P	P	P
Bare Mud	0	0	5	0

Table 6: EMA-4, Plot No. **S13-B**

Species	**Year 2015** Emergent/Submergent Percentage Cover	**Year 2016** Emergent/Submergent Percentage Cover	**Year 2017** Emergent/Submergent Percentage Cover	**Year 2020** Emergent/Submergent Percentage Cover
Juncus alpinoarticulatus	95	95	95	95
Leersia oryzoides	1	1	0	0
Nusturtium officinale	7	7	1	4
Symphyotrichum puniceum	P	P	0	0
Sium suave	0	0	P	0
Agrostis gigantea	1	1	P	0
Solanum dulcamara	3	3	1	1

Table 7: EMA-4, Plot No. **S13-C**

Species	**Year 2015** Emergent/Submergent Percentage Cover	**Year 2016** Emergent/Submergent Percentage Cover	**Year 2017** Emergent/Submergent Percentage Cover	**Year 2020** Emergent/Submergent Percentage Cover
Impatiens capensis	2	2	0	0
Symphyotrichum puniceum	0	0	2	P
Leersia oryzoides	35	35	P	P
Scirpus atrovirens	10	10	2	2
Ranunculus hispidus	8	8	6	2
Caltha palustris	P	P	23	20
Gallium palustris	P	P	0	0
Sium sauve	P	P	0	0
Nasturtium officinale	0	0	2	P
Agrostis gigantea	45	45	65	75

Table 8: EMA-4, Plot No. **S13-D**

Species	**Year 2015** Emergent/Submergent Percentage Cover	**Year 2016** Emergent/Submergent Percentage Cover	**Year 2017** Emergent/Submergent Percentage Cover	**Year 2020** Emergent/Submergent Percentage Cover
Gallium palustris	P	P	0	0
Scutellaria lateriflora	P	P	0	0
Leersia oryzoides	88	88	0	40
Nasturtium officinale	10	10	5	8
Ranunculus hispidus	3	3	4	2
Ludwigia palustris	1	1	0	0
Sium sauve	1	1	0	0
Glyceria stiata	0	0	88	40
Solanum dulcamara	1	1	0	0
Woody debris	5	5	3	5
Bare Mud (under water)	6	6	0	5

Notes:

1) Red text for species name denotes a Non-Native Species

2) Blue shaded species name box denotes a Wetland Oriented Species

3) Green shaded species name box denotes a Terrestrial Oriented Species

4) No shaded species name box denotes a species which can be found in either Terrestrial or Wetland environments

5) 'P' denotes species is Present but represents <1% coverage of plot area

Monitoring Plots S13A & S13B are situated within the former agricultural man-made pond located immediately below the groundwater discharge spring known as S13. This pond feature represents the headwater area of East Park Head Creek Branch, with historic beaver dam/water level fluctuations at its outlet causing pond water level fluctuations and periodic alga outbreaks. Monitoring Plot S13-C is located within the pond outlet channel, approximately 20m downstream of the beaver dam/pond outlet, while monitoring Plot S13-D is approximately 50m downstream of the beaver dam/pond outlet.

All four monitoring plots over the 3-year baseline data collection period recorded no terrestrial oriented vascular plants. Monitoring in 2020 was consistent with this baseline data, with no terrestrial oriented vascular plants recorded. Fluctuation in species composition over the full study period can be attributed to water level fluctuations, particularly the drier year of 2017 were non-native wetland species have now dramatically increase in numbers at S13-C under these favorable growing conditions.

4. Wetland Monitoring- Amphibian Activity

i. Main Wetland Complex/Body, Plots S8 & S9 Area

Anuran night time calling surveys were completed in the spring season of 2020 for early, mid and late season breeding activity with data collected provided in Table number 9 below.

Table 9: 2020 Anuran Monitoring Survey

Date	Time	Weather	Species	Calling Code/ Numbers
April 27, 2020	2245-2250	6.0C, Wind speed 0-3 km/hr	Spring Peeper	Code 3/ >20
			Wood Frog	Code 1 / 8
May 28, 2020	2330-2335	20.0C, Wind speed 6-11 km/hr	Northern Leopard Frog	Code 2 / 13-15
			Gray Treefrog	Code 1/ 3
June 29, 2020	2300-2305	18.0C, Wind speed 6-11km/hr	Green Frog	Code 2/ 11

Table 10: Comparative Anuran Monitoring Activity, EMA-4

Species	Year 2015	Year 2016	Year 2017	Year 2020
Spring Peeper	No Data	Code 3; for >20	Code 3; for >20	Code 3; for > 20
Northern Leopard Frog	No Data	Code 3; for > 20	Code 3; for > 20	Code 2; for 13-15
Gray Treefrog	No Data	Code 1: for 5	Code 1: for 3	Code 1; for 3
Wood Frog	No Data	Code 1; for 7-8	Code 1: for 5	Code 1; for 8
Green Frog	No Data	Code 2; for 14-16	Code 2; for 9	Code 2; for 11

Note: No anuran calling data was collected in 2015 due to safety concerns with tree harvesting operations at that time.

Table 9 shows that Anuran breeding activity in 2020 is consistent with that to the baseline years of 2016 and 2017. This monitoring has demonstrated that no adverse impact from the Keppel Quarry to amphibian breeding habitat or functions has occurred within the main body of the provincially significant Shouldice Wetland.

ii. EMA- 5; Ephemeral Pond

For safety concern, prior to undertaking the night time monitoring, AWS undertook a site visit during the daylight hours of April 27, 2020 for 'route flagging' to the monitoring location. It was at this time that extensive dredging and channelization of surface waters flows in this area was first noted by AWS. The previous landowner/quarry operator had cut a 1.5m deep by 2m wide x 250m long drainage channel in a southwesterly direction through the woodland environment. This drainage channel (not part of the Operational Plan) commenced from the central area of the Quarry's western limit, bisecting through and draining this ephemeral pond feature while continuing further south and deepening until 'dead-ending' near the south end of Lot 26, Concession 10 (see below air photo imagery). Subsequent to this site alteration finding, an anuran night time calling survey was still completed that evening (see below Table 11), with no anuran calling activity recorded. With the ephemeral pond now drained and no aquatic vegetation present, it was impractical to continue with the mid and late season anuran breeding survey.

Table 11: 2020 Anuran Night-Time Calling Survey

Date	Time	Weather	Species	Calling Code
April 27, 2020	2305-2310	6.0C, Wind speed 0-3 km/hr	0	Code 0

Table 12: Comparative Anuran Monitoring Activity, EMA-5

Species	Year 2015	Year 2016	Year 2017	Year 2020
Spring Peeper	No Data	Code 3; for >20	Code 3; for >20	Code 0
Northern Leopard Frog	No Data	Code 2; for 12-14	Code 3; for >20	Code 0
Gray Treefrog	No Data	Code 0	Code 1; for 2	Code 0

Note: No anuran calling data was collected in 2015 due to safety concerns with tree harvesting operations at that time.

The 2-year baseline monitoring period had demonstrated that anuran breeding activity within this ephemeral pond was fairly consistent and met provincial ecological function criteria for 'significant wildlife habitat' designation for amphibian breeding, prior to the site alterations .

Given this feature had been drained, no surface water depth data was collected in 2020.

In consultation with Walker Industries, they recognize the drainage ditch and site alteration to the ephemeral pond has negatively impacted on the Quarry Ecological Monitoring Plan and the surrounding woodland ecology. As such, restoration works shall be commencing in 2021 with remediation measures provided under section 6 Recommendations.

2020 Google Earth Imagery: Ecological Monitoring site EMA-5 recent alterations

iii. EMA- 6; Shouldice Wetland-Pond S13

Anuran night time calling surveys were completed in the spring season of 2020 for early, mid and late season breeding activity with data collected provided in Table number 13 below.

Table 13: 2020 Anuran Monitoring Survey

Date	Time	Weather	Species	Calling Code
April 27, 2020	2320-2325	6.0C, Wind speed 0-3 km/hr	Spring Peeper	Code 1 /7
			Wood Frog	Code 1/ 3-4
May 28, 2020	2345-2350	20.0C, Wind speed 6-11 km/hr	Northern Leopard Frog	Code 1/ 12-15
			American Toad	Code 1 / 1
June 29, 2020	2315-2320	18.0C, Wind speed 6-11km/hr	Green Frog	Code 1/ 12-15

Table 14. Comparative Anuran Monitoring Activity, EMA-6

Species	Year 2015	Year 2016	Year 2017	Year 2020
Spring Peeper	No Data	Code 1; for 6-7	Code 1; for 7	Code 1; for 5
Northern Leopard Frog	No Data	Code1; for 8-10	Code 1; for 12-15	Code 1; for 15
Gray Treefrog	No Data	Code 0	Code 0	Code 1; for 2
Wood Frog	No Data	Code 1; for 2	Code 1; for 3-4	Code 1; for 2
Green Frog	No Data	Code 1; for 5	Code 1; for 12-15	Code 1; for 8-9
American Toad	No Data	Code 1; for 3	Code 1; for 1	Code 1; for 1

Note: No anuran calling data was collected in 2015 to maintain consistency with the other two Anuran calling activity sites

Table 14 shows that Anuran breeding activity in 2020 is consistent with that to the baseline years of 2016 and 2017. This monitoring has demonstrated that no adverse impact from the Keppel Quarry to amphibian breeding habitat or functions has occurred within this input watercourse area of the provincially significant Shouldice Wetland.

5. Conclusions

EMA-1: Woodlands- Terrestrial Vegetation

- Forest monitoring plots F-1, F-2 and F-3 all destroyed or altered due to recent logging activity by former owner, plots are no longer functional for future data collection or comparative 2020 data analysis.

- Action Item
    - New owner to establishment three new monitoring plots in 2021 and implement new Tree Health protocols and monitoring frequency as per listed under section 6.i.

EMA-2: Woodland- Breeding Birds

- 2020 data findings and comparative analysis to the 3-year baseline data shows no significant alterations or fluctuations to the study area woodland breeding bird numbers or species composition.
- A minor noted change in breeding bird species composition is attributed to the logging effects on increased forest ground cover and lower canopy stem density changes.
- No discernible negative impacts associated with the Keppel Quarry operations on this woodland ecological function.

EMA-3: The Glen Wetland –Vegetation

- 2020 data findings and comparative analysis to the 3-year baseline data shows no significant wetland vegetation (hydrophilic plants) changes or encroachment of terrestrial vegetation at the two monitoring seep plots.

- No discernible negative impacts associated with the Keppel Quarry operations on 'The Glen' wetland environment.

EMA-4: Main Shouldice Wetland- Vegetation

- 2020 data findings and comparative analysis to the 3-year baseline data shows no significant wetland vegetation (hydrophilic plants) changes or encroachment of terrestrial vegetation at the two monitoring seep plots.

- No discernible negative impacts associated with the Keppel Quarry operations on 'The Shouldice Wetland' main body environment.

EMA-4: Main Shouldice Wetland- Amphibian Breeding

- 2020 data findings and comparative analysis to the 2-year baseline data shows no significant changes to anuran calling activity during the active breeding season.

- No discernible negative impacts associated with the Keppel Quarry operations on 'The Shouldice Wetland' main body environment.

EMA-5: Ephemeral Pond-Amphibian Breeding

- Ephemeral pond feature has been recently altered/drained by former owner due to constructed drainage ditch. Loss of ecological functions, with amphibian breeding activity significantly impaired.

- Action Item
    - New owner to implement restoration habitat works and monitoring frequency as listed under section 6.ii

EMA-6: Shouldice Wetland, Pond & East Park Head Creek Area- Vegetation

- 2020 data findings and comparative analysis to the 3-year baseline data shows no significant wetland vegetation (hydrophilic plants) changes or encroachment of terrestrial vegetation at the two 'pond' monitoring sites or the two 'creek' monitoring sites.

- No discernible negative impacts associated with the Keppel Quarry operations on 'The Shouldice Wetland-East Park Head Creek' wetland environment.

EMA-6: Shouldice Wetland, Pond & East Park Head Creek Area- Amphibian Breeding

- 2020 data findings and comparative analysis to the 2-year baseline data shows no significant changes to anuran calling activity during the active breeding season.

- No discernible negative impacts associated with the Keppel Quarry operations on 'The Shouldice Wetland' East Park Head Creek-Pond area environment.

6. Recommendations

i **Terrestrial Forest Vegetation Monitoring** (Replacement to Plots F-1, F-2, F-3)

Tree removal and site alteration impacts incurred within the forest monitoring plots: F-1, F-2 and F-3 from the recent tree harvesting operation have negated baseline data comparisons and long-term monitoring to a point that these plots will need to be abandoned. Additionally, post the extensive selective logging activity throughout the entire subject woodland environment, the natural regeneration response will dramatically change the forest structure and below upper canopy vegetation composition. Thus former component aspects of the ecological forest monitoring methodology for ground cover composition, tree regeneration/sapling growth and woody debris are no longer practical to meet the objective of monitoring any unpredicted woodland alterations that could be linked to the quarry operational practices.

Therefore, a new terrestrial forest vegetation monitoring plan focused on Tree Health focused on the main or upper canopy trees will be required along with the establishment of three new permanent monitoring plots. This new recommended monitoring methodology is consistent with and derived from two key protocol and standards manuals: Monitoring Forest Biodiversity, Health and Dynamics along the Niagara Escarpment-Tree Health component; Environment Canada EMAN Ecosystem Monitoring-Tree Health component. Three forest monitoring plot locations will need to be 'selected' in the field, north or west of the Quarry licence limit of Lots 25, 26 & 27, Concession 10, specifically locating plots within pockets of minimal tree harvesting impacted areas.

Tree Health-Upper Canopy inventory protocol

The monitoring methodology shall follow the recommended procedure outlined below.

- Three new 20m x 20m monitoring plots are to be selected and corner posts marked in the field with Plot GPS-center point coordinates. Plots should be located in natural woodlands within minimal site disturbances or growing influences from adjacent past tree cutting activity.

- Within each plot, all live trees at or greater than 10cm diameter at breast height (dbh) shall be tagged and numbered, with the following parameters recorded:

    i. From Plot Center Point; Basal Area using a wedge prism (overall cross-sectional area of Plot/Stand for total forest biomass and important indicator of forest recovery from impacts and/or maturity of stand).
    ii. Species identification
    iii. Tree diameter at breast height (1.3m above grade) , rounded to 1 decimal place e.g. 12.7cm
    iv. Crown Class (Dominant, Co-Dominate, Intermediate, Suppressed)
    v. Crown Vigour (Healthy, Light to Moderate Decline, Sever Decline)
    vi. Stem Defect Type (Canker, Decay/Fungus, Frost Crack/Scar, Open Wound, Insect or Animal Damage)
    vii. Stem Defect Location (Lower Main Stem, Upper Main Stem, Upper Canopy Branches, Root Collar).
    viii. Additional comments on overall Plot site conditions and forest health.

- Plots shall be established in 2021 with above noted data collected in 2021 and 2022 (Quarry Operational Years 7 & 8).

- Data collection shall be undertaken between July 15th to September 15th with report findings and comparative analysis (when applicable) available within 6 months from the Quarry owner for requested agency review.

- The Full-Ecological Monitoring Plan is on a 3-year rotation, with the next full reporting to be undertaken in 2023 (Quarry Operational Year 9), thus 3-years of consecutive data shall be collected for these three new forest monitoring plots before the subsequent monitoring rotation.

ii **Ephemeral Pond Restoration** (EMA-5 Amphibian Monitoring)

The former landowner/quarry operator constructed a drainage channel circa 2019, beyond the western boundary of the licence limit, to permit drainage of seasonal surface water accumulation within the quarry operational area (snow-melt, rain fall events). This channel commences at a quarry outlet culvert along the central-western perimeter of the quarry, then bisects through the former ephemeral pond feature, and continues on through the woodlands for approximately another 200m further south until 'dead-ending', without intercepting any watercourse or other surface water feature. As such, the lower channel end functions as a long-narrow below grade seasonal surface water retention area, however its construction design & location has drained the ephemeral pond feature and destroyed the amphibian breeding habitat which.

The ephemeral pond restoration works shall be undertaken by Walker Aggregates in coordination with AWS and completed during the dry summer season of 2021. The goal of the restoration works is to restore the natural environment and ecological functions of the ephemeral pond feature through: seasonal surface water retention, restoration of soils to promote rooted native hydrophilic plant growth and rehabilitate amphibian breeding habitat/cover.

Both Ecological monitoring and Hydrology monitoring at EMA-5 shall continue as per the approved monitoring plan protocols in the spring of 2022 with a Full Ecological Monitoring 3-Year rotation scheduled in 2023.

Respectfully Submitted

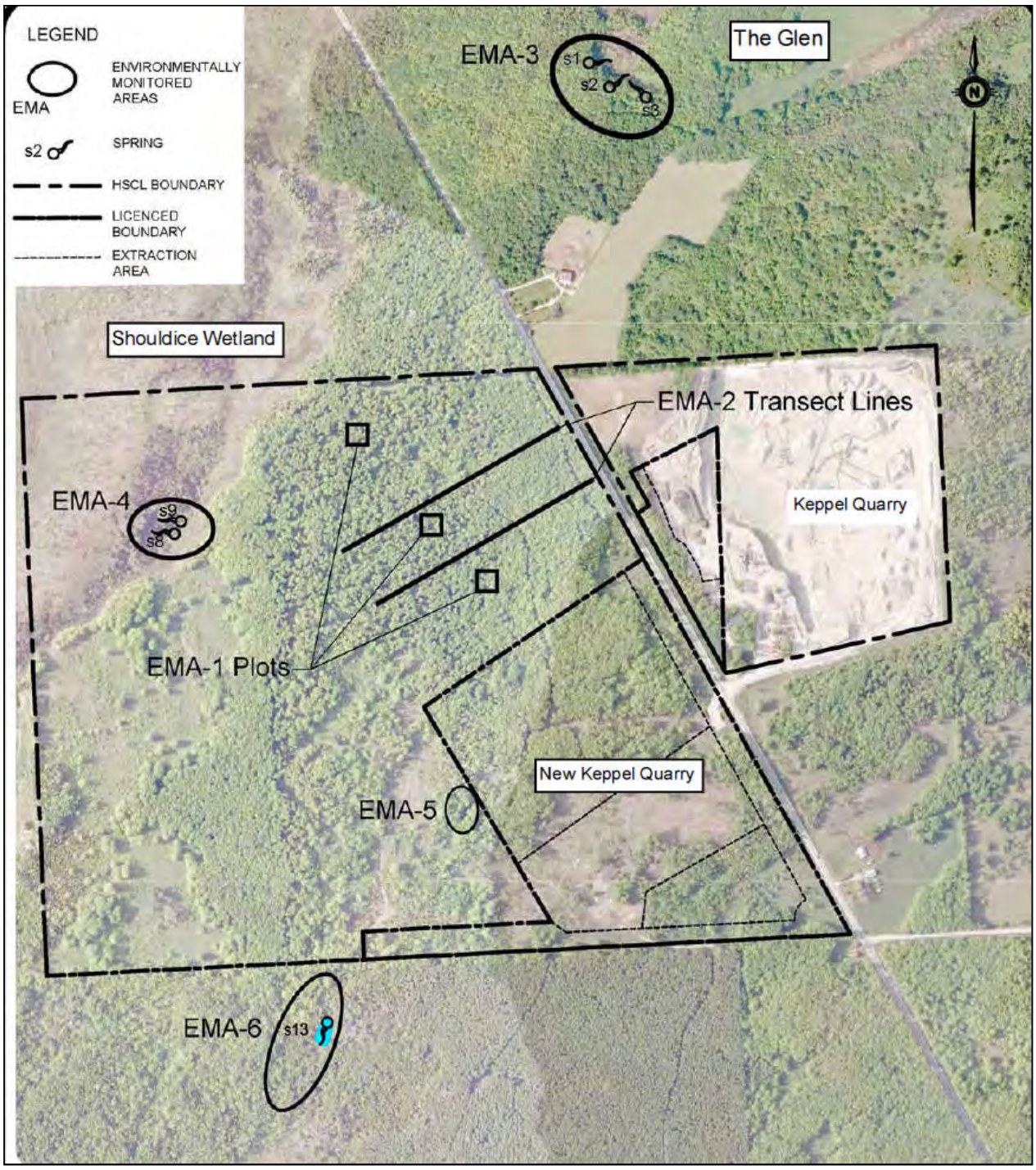
John Morton, President

AWS Environmental Consulting Inc.

APPENDIX 1

- Ecological Monitoring Network: Location Map

ECOLOGICAL MONITORING NETWORK



APPENDIX 2

- EMA-1 Woodland Plot Data

Year 6 (2020) EMA-1 Woodland Vegetation Monitoring Plot Data

Plot No.: **F-1** Date: September 8, 2020

Surveyors: John Morton GPS Center Point : 500134 Easting, 4942528 Northing +/-7m

Main Plot: 20m x 20m

Upper Main Canopy Live Trees (>10cm dbh) Basal Area : 18 sq. m/ha

Tree Number	Species		DBH cm	Crown Class	Crown Vigour Rating	Three Tree Heights
	Common Name	Latin Name				
1	Sugar Maple	*Acer saccharum*	28	1	1	20m
2	Sugar Maple	*Acer saccharum*	24	1	1	
3	Sugar Maple	*Acer saccharum*	16	2	3	
4	Sugar Maple	*Acer saccharum*	18	1	1	
5	Sugar Maple	*Acer saccharum*	32	1	1	21.5m
6	Sugar Maple	*Acer saccharum*	14	2	2	
7	Sugar Maple	*Acer saccharum*	14	2	1	
8	Sugar Maple	*Acer saccharum*	24	1	1	
9	Sugar Maple	*Acer saccharum*	32	1	1	
10	Sugar Maple	*Acer saccharum*	24	1	2	
11	Sugar Maple	*Acer saccharum*	14	3	3	
12	Sugar Maple	*Acer saccharum*	26	1	1	
13	Sugar Maple	*Acer saccharum*	20	1	1	
14	Sugar Maple	*Acer saccharum*	38	1	2	
15	Sugar Maple	*Acer saccharum*	12	2	2	
16	Sugar Maple	*Acer saccharum*	22	1	1	19.5m
17	Sugar Maple	*Acer saccharum*	12	3	2	
18	Sugar Maple	*Acer saccharum*	26	1	1	
19	Sugar Maple	*Acer saccharum*	26	1	1	
20	Sugar Maple	*Acer saccharum*	18	1	1	
		Total dbh =	440		Avg. Ht =	20.3m

Species Composition (regeneration) at various woodland canopy levels

Canopy Ht.	Species Latin Name / Percentage of Canopy Area Occupied in Plot
>10m	*Acer saccarum/92%*
2-10 m	*Ostrya virginiana/15% : Acer scaccarum/20% : Fraxinus americana/ 10%*
0.5 to 2m	*Fraxinus sp. / 10% : Tilia americana/1%*
0 to 0.5m	*Fraxinus sp./ 25% : Clinopodium vulgare / 20%*
	Adiantum pedatum / 10% : Thalictrum dioca / 1%

Standing Dead Trees

	Species (If Determinable)		DBH	Total	
	Common Name	Latin Name	cm	Height m	Decay Class
1	Sugar Maple	*Acer saccharum*	8	12	3
2	Sugar Maple	*Acer saccharum*	8	10	4
3	Sugar Maple	*Acer saccharum*	6	5	5
4	Sugar Maple	*Acer saccharum*	8	10	5
5	Sugar Maple	*Acer saccharum*	4	3	2

Downed Trees & Woody Debris

No.	Logs : > 20cm avg. diameter			Polewood: 10cm to 20cm diameter		
	Length m	Compass Bearing from Main End	Decay Class	Length m	Compass Bearing from Main End	Decay Class
1	3	312 degrees	3	7	270 degrees	1
2	4	250 degrees	2	2	180 degrees	2
3	7	200 degrees	1	3	125 degrees	2
4				4	100 degrees	1
5				3	165 degrees	1

Branches : 4cm to 10cm		Woody Debris : < 4cm	
General Quanity	% Coverage of Plot Area	General Quanity	% Coverage of Plot Area
Minor, Slash	30	Moderate, Slash	30

Year 6 (2020) Monitoring, 2m x 2m Plot : Regeneration Trees

Date: September 8, 2020

Plot : NE

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
Fraxinus sp.	3		1	1	
Acer saccharum	1				
Cornus alternifolia	2		1		

Additional Notes:

Plot : SE

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
Tilia americana	2				
Fraxinus sp.	5	1			
Amelanchier cf. sanguinea			1		
Cornus alternifolia	3				1
Crataegus sp.	1				
Prunus serotina	1				

Additional Notes: Plot partially coved in slash from recent tree harvesting activity

Plot : SW

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
All in grass/sedges/weeds					
no tree seedlings/saplings left					

Additional Notes: Plot destroyed-skidder trail over plot from recent tree harvesting activity

Plot : NW

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
Prunus serotina	1	2			
Fraxinus sp.	3				

Additional Notes:

Plot : Center

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
Fraxinus sp.	4	2	2		
Prunus serotina			1		

Additional Notes:

Year 3 (2017) , 1m x 1m Plot : Ground Vegetation Composition

Date: September 8, 2020

Plot : **NE**

Species Latin Name	Percentage Cover
Thalictrum dioicum	85
Viola blanda	1
Arctium minus	p
Fraxinus sp.	1
Trillium grandiflorum	P
Symphyotrichum lateriflorum	3
Carex arctata	p
Clinopodium vulgare*	1
Carex cf. pedunculata	P
moss	2
Ranunculus abortivus	P
Duff	7

Plot : **SE (plot impacted from slash debris)**

Species Latin Name	Percentage Cover
Duff	60
Woody debris	35
Cornus alternifolia	p
Fraxinus sp.	p
Prunus serotina	p
Amelanchier cf. sanguinea	p
Moss	p
Crataegus sp.	p
Clinopodium vulgare*	p
Tilia americana	p
Carex sp.	p
Agrimonia gyrosepala *	p

Plot : **Plot destroyed-skidder trail**

Species Latin Name	Percentage Cover
moss on a boulder	25
Fraxinus sp.	5
Symphyotrichum lateriflorum	unk
Cornus alternifolia	25
Carex pedunculata	15
Clinopodium vulgare*	unk
Solanum dulcamara*	unk
Tusselago farfara*	unk
Viola labradorica	unk
Centaurea jacea	unk
Sambucus racemosum	unk
Taraxacum officinale*	unk
Epipactis helleborine	unk
Eupatorium perfoliatum	unk
Duff	unk

Plot: **NW**

Species Latin Name	Percentage Cover
Duff	83
Moss	3
Carex pedunculata	4
Cornus alternifolia	2
Prunus serotina	3
Fraxinus sp.	5
Clinopodium vulgare	P

Plot : **Center**

Species Latin Name	Percentage Cover
Duff	30
Adiantum pedatum	50
Fraxinus sp.	7
Prunus serotina	5
Thalictrum dioicum	P
moss	8

Note: ' * ' denotes a Non-Native Species
' P ' represents < 1%

Year 6 (2020) EMA-1 Woodland Vegetation Monitoring Plot Data

Plot No.: **F-2**
Surveyors: John Morton

Date: September 8, 2020
GPS Center Point: 500095 Easting
4942660 Northing +/- 3m

Main Plot: 20m x 20m

Upper Main Canopy Live Trees Basal Area : 12 sq. m/ha

Tree Number	Species		DBH cm	Crown Class	Crown Vigour Rating	Three Tree Heights
	Common Name	Latin Name				
1	White Ash	*Fraxinus americana*	Gone-Harvested			
2	Sugar Maple	*Acer saccarum*	40	1	?-damaged	
3	Sugar Maple	*Acer saccarum*	16	3	2	
4	Sugar Maple	*Acer saccarum*	24	1	1	
5	Sugar Maple	*Acer saccarum*	Gone-Harvested			
6	Sugar Maple	*Acer saccarum*	Gone-Harvested			
7	Sugar Maple	*Acer saccarum*	Gone-Harvested			
8	Sugar Maple	*Acer saccarum*	20	1	1	
9	Sugar Maple	*Acer saccarum*	12	3	2	
10	Sugar Maple	*Acer saccarum*	18	2	2	
11	Sugar Maple	*Acer saccarum*	14	4	1	
12	Sugar Maple	*Acer saccarum*	Gone-Harvested			
13	Sugar Maple	*Acer saccarum*	24	1	1	
14	Sugar Maple	*Acer saccarum*	Gone-Harvested			
15	Sugar Maple	*Acer saccarum*	22	1	1	
16	Sugar Maple	*Acer saccarum*	18	1	1	
17	Sugar Maple	*Acer saccarum*	Gone-Harvested			
18	Sugar Maple	*Acer saccarum*	Gone-Harvested			
19	Sugar Maple	*Acer saccarum*	Gone-Harvested			
20	Sugar Maple	*Acer saccarum*	20	1	2	
21	Sugar Maple	*Acer saccarum*	26	1	1	
22	Sugar Maple	*Acer saccarum*	Gone-Harvested			
23	Sugar Maple	*Acer saccarum*	Gone-Harvested			
24	Balsam Poplar	*Populus balsamifera*	Gone-Harvested			
25	Sugar Maple	*Acer saccarum*	Gone-Harvested			
26	Sugar Maple	*Acer saccarum*	Gone-Harvested			
27	Sugar Maple	*Acer saccarum*	14	1	2	
28	Sugar Maple	*Acer saccarum*	Gone-Harvested			
					Avg. =	N.A.

Canopy Layer Composition Note : 'P' represents Present or < 1% Coverage

Canopy Ht.	Species Common Name / Percentage of Canopy Area Occupied in Plot
>10m	No Longer applicable, extensive alterations from removed trees and smashed understory growth
2-10 m	
0.5 to 2m	
0 to 0.5m	

Standing Dead Trees

No.	Species (If Determinable)		DBH cm	Total Height m	Decay Class
	Common Name	Latin Name			
0	None retained, removed during tree harvesting opertations				

Downed Trees & Woody Debris

	Logs : > 20cm avg. diameter			Polewood: 10cm to 20cm diameter		
No.	Length m	Compass Bearing from Main End	Decay Class	Length m	Compass Bearing from Main End	Decay Class
No longer applicable, significant alterations from skidders						
with natural woody debris mixed in with abundant slash						

Branches : 4cm to 10cm		Woody Debris : < 4cm	
General Quanity	% Coverage of Plot Area	General Quanity	% Coverage of Plot Area
abundant	20	abundant	35

Year 6 (2020), 2m x 2m Plot : Regeneration Trees

Date: September 8, 2020

Plot : NE (Plot metal rods markers gone, plot limits undistigushable)

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm

Additional Notes: No tree regeneration, previous saplings destroyed under slash

Plot : SE

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
Ostrya virginiana	1				
Fraxinus sp.	2		2		

Additional Notes: No changes from baseline

Plot : SW (Plot metal rods markers gone, plot limits undistigushable)

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm

Additional Notes: No tree regeneration, previous saplings destroyed under slash

Plot : NW

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
Ostrya virginiana					5
Fraxinus sp.	3	2			
Prunus serotina	1				

Additional Notes:

Plot : Center

Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
Prunus serotina					
Cornus alternifolia	1				
Fraxinus sp.	1				

Additional Notes: Larger saplings removed from tree felling of plot center point tree

Year 6 (2020) 1m x 1m Plot : Ground Vegetation Composition

Date: September 8, 2020

Plot : **NE:**

Species Latin Name	Percentage Cover
Unknown, plot buried under 2m of slash	

Plot : **SE**

Species Latin Name	Percentage Cover
Duff	64
Ostrya virginiana	2
moss	1
Fraxinus sp.	12
grass cf. *Schizachne purpurascens*	5
Geranium robertianum	15
Symphyotrichum lateriflorum	3

Plot : **SW**

Species Latin Name	Percentage Cover
Unknown, plot driven over numerous times, within a new skidder trail	

Plot: **NW**

Species Latin Name	Percentage Cover
Duff	20
Ostrya virginiana	53
*Clinopodium vulgare**	25
Maianthemum canadense	P
Fraxinus sp.	1
Symphyotrichum lateriflorum	1
Trillium grandiflorum	P
Carex pensylvanica	P

Plot : **Center**

Species Latin Name	Percentage Cover
duff	Unknown natural numbers as altered from tree harvesting impacts
moss	
Caulophyllum thalictroides	
Prunus serotina	
*Clinopodium vulgare**	
Viola pubscens	
Brachyelytrum eretum	
Maianthemum canadense	
Hepatica acutiloba	
Adiantum pedatum	
Geranium robertianum	
Carex sp.	

Note: ' * ' denotes a Non-Native Species
' P ' represents <1%

Appendix 3

- EMA-2: Woodland Breeding Bird Surveys, Year 2 and Year 3

EMA-2 : Breeding Bird Point Count Data: 2020 First Survey

Weather: Air Temp = 14C, Wind Speed = 3-11 km/hr, No Percip. Date: 2020, June 8

South Transect Line

Plot No. : 1	GPS Co-ordinate:	500145 Easting 4942676 Northing +/- 9m	Start Time:	0715
Species Common Name		Breeding Code	Estimated Number (s)	
Rose-breasted Grosbeak		Po-H	1	
Ovenbird		Po-S	1	
White-breasted Nuthatch		Po-S	1	
American Robin		Po-H	1	
Downy Woodpecker		Po-H	1	
Blue Jay		Po-H	1	

Plot No. : 2	GPS Co-ordinate:	500065 Easting 4942645 Northing +/- 7m	Start Time:	0725
Species Common Name		Breeding Code	Estimated Number (s)	
Rose-breasted Grosbeak		Po-S	1	
Blue Jay		Po-H	1	
Black-capped Chickadee		Po-H	1	
Eastern Wood-pewee		Po-S	1	

Plot No. : 3	GPS Co-ordinate:	499971 Easting 4942610 Northing +/- 6m	Start Time:	0735
Species Common Name		Breeding Code	Estimated Number (s)	
Ruffed Grouse		Po-H	1	
Hairy Woodpecker		Po-H	1	
Red-eyed Vireo		Po-S	1	
American Redstart		Pr	2	

Plot No. : 4	GPS Co-ordinate:	499884 Easting 4942565 Northing +/-7m	Start Time:	0745
Species Common Name		Breeding Code	Estimated Number (s)	
Red-eyed Vireo		Po-H	1	
Ovenbird		Po-S	2	
White-breasted Nuthatch		Po-H	1	
Downy Woodpecker		Po-H	1	
Hairy Woodpecker		Po-H	1	

North Transect Line

Plot No. : 5	GPS Co-ordinate:	500036 Easting 4942798 Northing +/- 9m	Start Time:	0800
Species Common Name		Breeding Code	Estimated Number (s)	
Veery		Po-S	1	
Red-eyed Vireo		Po-H	1	
White-breasted Nuthatch		Po-H	1	
American Redstart		Pr	3	
Downy Woodpecker		Po-H	2	

Plot No. : 6	GPS Co-ordinate:	499961 Easting 4942763 Northing +/- 3m	Start Time:	0810
Species Common Name		Breeding Code	Estimated Number (s)	
Veery		Po-S	1	
White-throated Sparrow		Po-H	1	
American Crow		Po-H	1	
American Redstart		Po-H	1	
Black-capped Chickadee		Pr	2	

Plot No. : 7	GPS Co-ordinate:	499894 Easting 4942722 Northing +/- 9m	Start Time:	0820
Species Common Name		Breeding Code	Estimated Number (s)	
American Redstart		Po-S	2	
American Robin		Po-H	1	
Chesnut-sided Warbler		Po-S	1	
Chipping Sparrow		Po-S	1	
Downy Woodpecker		Po-S	1	
Red-eyed Vireo		Pr	2	

Plot No. : 8	GPS Co-ordinate:	499793 Easting 4942697 Northing +/- 7m	Start Time:	0830
Species Common Name		Breeding Code	Estimated Number (s)	
Blue Jay		Po-H	1	
European Starling		Po-H	1	
White-throated Sparrow		Po-H	1	
Rose-breasted Grosbeak		Po-H	1	
American Redstart		Pr	3	
American Robin		Po-H	1	

EMA-2 : Breeding Bird Point Count Data, 2020 Second Survey

Weather: Air Temp = 18C, Wind Speed = 3-6 km/hr, No Percip. Date: 2020, June 29

South Transect Line

Plot No. : 1 GPS Co-ordinate: 500145 Easting Start Time: 0630
4942676 Northing +/- 9m

Species Common Name	Breeding Code	Estimated Number (s)
American Robin	Conf	2
Downy Woodpecker	Po-H	1
Chipping Sparrow	Po-H	2
Blue Jay	Pr	2

Plot No. : 2 GPS Co-ordinate: 500065 Easting Start Time: 0640
4942645 Northing +/- 7m

Species Common Name	Breeding Code	Estimated Number (s)
American Redstart	Pr	2
Chipping Sparrow	Po-S	1
Veery	Po-S	1
Wild Turkey	Pr	3

Plot No. : 3 GPS Co-ordinate: 499971 Easting Start Time: 0650
4942610 Northing +/- 6m

Species Common Name	Breeding Code	Estimated Number (s)
Downy Woodpecker	Po-H	1
White-breasted Nuthatch	Po-H	1
Red-eyed Vireo	Pr	2
Veery	Pr	2

Plot No. : 4 GPS Co-ordinate: 499884 Easting Start Time: 0700
4942565 Northing +/-7m

Species Common Name	Breeding Code	Estimated Number (s)
Downy Woodpecker	Po-H	1
Hairy Woodpecker	Po-H	1
American Redstart	Pr	2
White-throated Sparrow	Po-H	1

North Transect Line

Plot No. : 5	GPS Co-ordinate:	500036	Easting	Start Time:	0715
		4942798	Northing +/- 9m		

Species Common Name	Breeding Code	Estimated Number (s)
Black-capped Chickadee	Pr	3
Yellow-bellied Sapsucker	Po-H	1
American Robin	Po-S	1
Red-eyed Vireo	Po-S	1
Warbling Vireo	Po-S	1

Plot No. : 6	GPS Co-ordinate:	499961	Easting	Start Time:	0725
		4942763	Northing +/- 3m		

Species Common Name	Breeding Code	Estimated Number (s)
Downy Woodpecker	Po-H	1
Warbling Vireo	Po-S	1
American Redstart	Po-H	1
White-throated Sparrow	Po-H	1
Blue Jay	Po-S	1
Veery	Po-S	1

Plot No. : 7	GPS Co-ordinate:	499894	Easting	Start Time:	0735
		4942722	Northing +/- 9m		

Species Common Name	Breeding Code	Estimated Number (s)
Rose-breasted Grosbeak	Po-S	1
Red-eyed Vireo	Po-S	1
Black-capped Chickadee	Po-H	1
White-breasted Nuthatch	Po-H	1

Plot No. : 8	GPS Co-ordinate:	499793	Easting	Start Time:	0745
		4942697	Northing +/- 7m		

Species Common Name	Breeding Code	Estimated Number (s)
American Robin	Po-H	1
American Goldfinch	Po-H	1
Veery	Po-H	1
American Redstart	Pr	3

Keppel Quarry Ecological Monitoring: Baseline Data-Counted Bird Numbers

Bird Species	Year 1 (2015)			Year 2 (2016)			Year 3 (2017)		
	First Survey	Sec. Survey	Total	First Survey	Sec. Survey	Total	First Survey	Sec. Survey	Total
American Cardinal	1	0	1	0	1	1	1	1	2
American Crow	1	0	1	0	1	1	2	0	2
American Goldfinch	2	0	2	1	1	2	2	0	2
American Redstart	5	4	9	4	3	7	9	2	11
American Robin	5	3	8	3	3	6	5	2	7
Baltimore Oriole	0	1	1	0	1	1	0	0	0
Black-capped Chickadee	3	5	8	6	5	11	4	6	10
Blue Jay	4	4	8	3	2	5	3	2	5
Chestnut-sided Warbler	0	0	0	1	0	1	0	0	0
Chipping Sparrow	3	0	3	1	0	1	4	1	5
Downy Woodpecker	8	8	16	2	4	6	7	6	13
Eastern Wood-pewee (SC)	0	0	0	1	2	3	0	3	3
European Starling	1	0	1	2	0	2	0	1	1
Hairy Woodpecker	2	1	3	1	1	2	1	1	2
White-breasted Nuthatch	4	6	10	5	0	5	4	7	11
Ovenbird	3	3	6	3	1	4	6	4	10
Pileated Woodpecker	0	0	0	1	0	1	0	0	0
Red-eyed Vireo	3	4	7	4	1	5	3	2	5
Rose-breasted Grosbeak	3	5	8	2	7	9	3	5	8
Ruffed Grouse	0	1	1	0	1	1	0	1	1
Veery	0	0	0	1	2	3	0	1	1
Warbling Vireo	0	0	0	0	0	0	0	0	0
White-throated Sparrow	1	0	1	2	0	2	0	1	1
Wild Turkey	0	7	7	0	1	1	0	0	0
Winter Wren	0	1	1	0	0	0	0	0	0
Wood Thrush (SC)	1	1	2	0	0	0	0	1	1
Yellow-bellied Sapsucker	0	0	0	0	0	0	0	0	0
TOTALS	41	50	104	35	27	80	40	44	101
	Year 1 : Diversity/Number of Species = 21			Year 2 : Diversity/Number of Species = 23			Year 3 : Diversity/Number of Species = 20		

Colour denotes species which prefer Sparse Understory growth

Clour denotes species which prefer Second Growth or Shrubby Understory

Extraction Operational Period

Bird Species	3-Year Range of Baseline Numbers	Year 6 (2020) First Survey	Year 6 (2020) Sec. Survey	Year 6 (2020) Total	Comparison to 3-Year Baseline Range
American Cardinal	1 to 2	0	0	0	decreasing
American Crow	1 to 2	1	0	1	consitent
American Goldfinch	2	0	1	1	decreasing
American Redstart	7 to 11	11	6	17	increasing
American Robin	6 to 8	3	4	7	consitent
Baltimore Oriole	0 to 1	0	0	0	consitent
Black-capped Chickadee	8 to 11	3	6	9	consitent
Blue Jay	5 to 8	3	3	6	consitent
Chestnut-sided Warbler	0 to 1	1	0	1	consitent
Chipping Sparrow	1 to 5	1	3	4	consitent
Downy Woodpecker	6 to 16	5	4	9	consitent
Eastern Wood-pewee (SC)	0 to 3	1	0	1	consitent
European Starling	1 to 2	1	0	1	consitent
Hairy Woodpecker	2 to 3	2	1	3	consitent
White-breasted Nuthatch	5 to 11	3	2	5	consitent
Ovenbird	4 to 10	2	0	2	decreasing
Pileated Woodpecker	0 to 1	0	0	0	consitent
Red-eyed Vireo	5 to 7	5	4	9	increasing
Rose-breasted Grosbeak	8 to 9	3	1	4	decreasing
Ruffed Grouse	1	1	0	1	consitent
Veery	0 to 3	2	5	7	increasing
Warbling Vireo	0	0	1	1	increasing
White-throated Sparrow	1 to 2	2	2	4	increasing
Wild Turkey	0 to 7	0	3	3	consitent
Winter Wren	0 to 1	0	0	0	consitent
Wood Thrush (SC)	0 to 2	0	0	0	consitent
Yellow-bellied Sapsucker	0	0	1	1	increasing
TOTALS	80 to 104	50	47	97	consitent
	Composition Range of 20 to 23 Species	Year 6 : Diversity/Number of Species = 22			consistent

Colour denotes species which prefer Sparse Understory growth

Clour denotes species which prefer Second Growth or Shrubby Understory

Appendix 4

- EMA-3, EMA-4 and EMA-6: Wetland Flora Plots

Year 6 (2020) Wetland Flora Monitoring

Vegetation Composition : All Plots are 1m x 1m

Site: EMA-3 ; The Glen Date: August 18, 2020

Plot No.: **S1** (2020-No changes noted from baseline)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
Veronica anagalis-aquatica	20	
* *Solanum dulcamara*	2	
* *Nasturtium officinale*	78	
Typha latifolia	P	
GPS Co-ordinates: 500232 E ; 4943487 N		

Plot No. : **S2** (2020-More cattail growth, water higher & faster flow)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
Chrysosplenium americanum	20	
* *Tussilago farfara*	20	
Impatiens capensis	20	
* *Epilobium hirsutum*	15	
Typha latifolia	5	
Eupatorium perfoliatum	1	
Leersia oryzoides	3	
Carex comosa	5	
* *Rumex crispus*	0	
Clematis virginiana	0	
Symphyotrichum puniceum	P	
* *Solanum dulcamara*	10	
Scutellaria lateriflora	P	
Solidago altissima	1	
GPS Co-ordinates: 500246 E ; 4943458 N		

Site: EMA-4 ; Main Shouldice Wetland

Plot No.: **S8** (2020- no changes noted)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
Gyceria borealis	30	
Leersia oryzoides	15	10
Lysimachia sp. Sterile	0	
Sparganium emersum	0	
Ludwigia palustris	5	
Mentha arvensis	0	
Phalaris arundinacea	5	
Galium palustris	2	
* *Ranunculus acris*	0	
* *Carex spicata*	0	
Poa palustris	0	
Scutellaria lateriflora	0	
Cicuta bulbifera	0	
Typha latifolia	0	
Bare mud	0	33
GPS Co-ordinates: 499521 E ; 4942615 N		

Plot : **S9** (Negligable changes noted)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
Ludwigia palustris	15	10
Carex hystericina	2	
Eleocharis palustris	10	5
Sagittaria latifolia	1	
Lysimachia thyrsiflora	P	
Sparganium emersum	0	
Leersia oryzoides	1	
Asclepias incarnata	P	
Lycopus americanus	1	
Typha latifolia	2	
Galium palustris	0	
Scutellaria lateriflora	0	
Cicuta bulbifera	P	
Phalaris arundinacea	P	
Bare Mud	0	30
GPS Co-ordinates: 499519 E ; 4942628 N		

Site: EMA-6 ; Shouldice Wetland - Pond Area Date: August 18, 2020

Plot No.: **S13-A** (2020- higher pond water levels)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
Juncus alpinoarticulatus	25	50
* *Nasturtium officinale*	15	
Salix discolor	5	
Salix lucida	0	
Glyceria borealis	3	
* *Agrostis gigantea*	P	
* *Solanum dulcamara*	1	
Galium palustris	2	
Lemna minor	0	
GPS Co-ordinates: 499757 E ; 4941755 N		

Plot No. : **S13-B** (2020- higher pond water levels)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
Juncus alpinoarticulatus	35	60
Leersia oryzoides	0	
* *Nasturtium officinale*	4	
* *Agrostis gigantea*	P	
* *Solanum dulcamara*	1	
Symphyotrichum puniceum	0	
GPS Co-ordinates: 499745 E ; 4941742 N		

Plot No.: **S13-C** (2020- significant and dense growth)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
* *Agrostis gigantea*	75	
Leersia oryzoides	P	
Scirpus atrovirens	2	
Ranunculus hispidus	2	
Impatiens capensis	0	
Caltha palustris	20	
Galium palustris	0	
Sium suave	0	
**Nasturtium officinale*	P	
Symphyotrichum puniceum	P	
GPS Co-ordinates: 499732 E ; 4941708 N		

Plot No. : **S13-D** (2020- higher channel water flows)		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
Galium palustris	0	
* *Scutellaria lateriflora*	0	
Leersia oryzoides	40	
* *Nasturtium officinale*	8	
Bare mud	0	5
Woody debris	0	5
Ranunculus hispidus	2	
* *Solanum dulcamara*	0	
Ludwigia palustris	0	
Sium suave	0	
sterile grass cf. *Glyceria striata*	40	
GPS Co-ordinates: 499722 E ; 4941667 N		

Notes: ' * ' denotes, a Non-Native Species
' P ' denotes, Present but < 1% coverage

Wetland Plots: Flora Inventory Listing with Floristc Quality Assessment

(FQA) Scores. Species Listing identified throughout the Monitoring Periods

Latin Name	Common Name	Prov. Status	FQA	
			CC	CW
* *Agrostis gigantea*	Redtop	Exotic	0	0
Asclepias incarnata	Swamp Milkweed	NAR	6	-5
Caltha palustris	Wild Calia	NAR	8	-5
Carex comosa	Bearded Sedge	NAR	5	-5
Carex hystericina	Porcupine Sedge	NAR	5	-5
* *Carex spicata*	Spiked Sedge	Exotic	0	5
Chrysosplenium americanum	American Golden-saxifrage	NAR	8	-5
Cicuta bulbifera	Bulb-bearing Water-hemlock	NAR	5	-5
Clematis virginiana	Virginia Virgins-bower	NAR	3	0
Eleocharis palustris	Creeping Spike-rush	NAR	6	-5
* *Epilobium hirsutum*	Hairy Willowherb	Exotic	0	-4
Eupatorium perfoliatum	Common Bonset	NAR	2	-4
Galium palustris	Marsh Bedstraw	NAR	5	-5
Glyceria borealis	Northern Manna Grass	NAR	8	-5
Glyceria striata	Fowl Mana Grass	NAR	3	-5
Impatiens capensis	Spotted Jewelweed	NAR	4	-3
Juncus alpinoarticulatus	Alpine Rush	NAR	5	-5
Leersia oryzoides	Rice Cutgrass	NAR	3	-5
Lemna minor	Lesser Duckweed	NAR	2	-5
Ludwigia palustris	Marsh Seedbox	NAR	5	-5
Lycopus americanus	Water Horehound	NAR	4	-5
Lysimachia thyrsiflora	Tufted Loosestrife	NAR	4	-3
Mentha arvensis	Field Mint	NAR	3	-3
* *Nasturtium officinale*	Watercress	Exotic	0	-5
Phalaris arundinacea	Reed Canary Grass	NAR	0	-4
Poa palustris	Fowl Bluegrass	NAR	5	-4
* *Ranunculus acris*	Tall Buttercup	Exotic	0	-2
Ranunculus hispidus var. caricetorum	Swamp Buttercup	NAR	5	-5
* *Rumex crispus*	Curly Dock	Exotic	0	-1
Sagittaria latifolia	Broad-leaved Arrowhead	NAR	4	-5
Salix discolor	Pussy Willow	NAR	3	-3
Salix lucida	Shining Willow	NAR	5	-4
Scirpus atrovirens	Dark-green Bulrush	NAR	3	-5
* *Scutellaria lateriflora*	Mad Dog Skullcap	NAR	5	-5
Sium suave	Hemlock Water-parsnip	NAR	4	-5
* *Solanum dulcamara*	Climbing Nightshade	Exotic	0	0
Solidago altissima	Tall Goldenrod	NAR	1	3
Sparganium emersum	Green-fruited Burreed	NAR	5	-5
Symphyotrichum puniceum	Swamp Aster	NAR	6	-5
* *Tussilago farfara*	Colt's-foot	Exotic	0	3
Typha latifolia	Broad-leaved Cattail	NAR	3	-5
Veronica anagalis-aquatica	Water Speedwell	Exotic	0	-5

Ontario Ministry of Natural Resources, 'Floristic Quality Assessment' (**FQA**) Scoring System:
CC = Coefficient of Conservatism, ranked 0 (grows anywhere) to 10 (very specific habitat requirements)
CW = Coefficient Wetness Index, values from -5 (very wet) to 5 (very dry)

NAR = Not At Risk

Appendix 5

- Select Summary Photos of 2020 Monitoring Sites

Photo No. 1: Monitoring Site EMA-5, Ephemeral Pond, **April 2017**

Photo No. 2: Monitoring Site EMA-5, Ephemeral Pond, **May 2020**

Photo No. 3: Monitoring Site EMA-5, Drainage ditch dug through Ephemeral Pond, **May 2020**

Photo No. 4: Drainage ditch further south within woodlands, **May 2020**

Photo No. 5: Monitoring Site EMA-6, Pond, **August 2017**

Photo No. 6: Monitoring Site EMA-6, Pond, **August 2020**

Photo No. 7: Monitoring Site EMA-6, Shouldice Wetland, Seep 8, **August 2017**

Photo No. 8: Monitoring Site EMA-6, Shouldice Wetland, Seep 8, **August 2020**

Photo No. 9: Monitoring Site EMA-3, The Glen, Seep 1, **August 2017**

Photo No. 10: Monitoring Site EMA-3,The Glen, Seep 2, **August 2020**

Photo No. 11: Monitoring Site EMA-1, Woodland Plot F-1,
Corner plot driven over during skidder-tree felling operations, **September 2020**

Photo No. 12: Monitoring Site EMA-1, Woodland Plot F-2,
Corner plot buried under slash, **September 2020**

Photo No. 13: Monitoring Site EMA-1, Woodland Plot F-2,
Center Plot-Tree felled, **September 2020**

Photo No. 14: Monitoring Site EMA-1, Woodland Plot F-2,
Tagged tree number 27 retained, tagged trees 25 & 26 removed, stumps to left, **September 2020**

APPENDIX C

2020 BLASTING REPORT

Whitewater
Hydrogeology Ltd.

80 Chamberlain Cres
Collingwood, ON L9Y 0C8
Phone: 705-888-7064
Email: tecia@white-water.ca

August 26, 2021

Harold Sutherland Construction
323545 East Linton Road, R.R #2
Kemble, Ontario, Canada N0H 1S0

Attention: Mr. Dave Munro

Re: Keppel Quarry: 2020 Blast Reporting

Whitewater Hydrogeology Ltd. (Whitewater) is pleased to present a summary of the 2020 Blasting Monitoring Program, which is a condition of the Aggregate Resource Act license for the Keppel Quarry. The Blasting Monitoring Program was developed to ensure that blasting operations are carried out in a safe and productive manner and to ensure no damage to any buildings, structures or residences surrounding the Keppel Quarry.

Blasts were designed by Austin Powder Ltd. so that the seismic activity (vibrations) and noise induced by blasting operations remain within the guidelines set by the Ministry of the Environment and Climate Change. Austin Powder Ltd. set up the primary monitors and HSCL we set up any additional monitors as required.

The Adaptive Management Plan (AMP) stipulates that all blasts be monitored for vibration and overpressure using digital seismographs. There were eighteen blasts in total. Event Reports showing noise and vibration readings measured in 2020 during each blast are appended and the results are summarized in Table 1.

The recommended limit set by the Ministry of the Environment, Conservation and Parks (MECP) for vibration and overpressure (noise) are:
as follows:

- Vibration - 12.5 mm/sec; and
- Overpressure (Noise) - 128 dB.

Seismograph readings showed that vibrations levels ranged from not registered 3.113 mm/sec. Overpressure readings ranged from to not registered to 126 dB average. All measured vibration levels were below the recommended MECP limit in 2020.

No flyrock was generated beyond the blast area in any of the blasts in 2020.

If you have any questions, please do not hesitate to call anytime.

Regards,

Tecia White M.Sc., P.Geo
Senior Hydrogeologist
Whitewater Hydrogeology Ltd.

PROFESSIONAL GEOSCIENTIST
TECIA WHITE
PRACTISING MEMBER
0701
ONTARIO

TABLE 1: BLAST SUMMARY RESULTS

Receptor	Date	Blast Distance (m)	Overpressure (dB)	Vibration (mm/s)
178841 Grey Rd 17	April 17, 2020	608.99	122	0.607
	May 4, 2020	662.03	115	NR
	June 5, 2020	681.84	122	0.254s
	June 16, 2020	651.97	118	NR
	June 30, 2020	705.61	121	0.311
	July 9, 2020	1,096.67	115	0.333
	July 31, 2020	730.30	116	0.117
	Aug 14, 2020	712.01	117	0.311
	Aug 26, 2020	696.77	119	0.254
	Sept 4, 2020	740.36	122	0.22
	Sept 15, 2020	730.30	126	0.198
	Sept 25, 2020	768.10	120	0.596
	Oct 13, 2020	709.57	120	0.082
	Oct 23, 2020	711.10	122	0.254
	Oct 30, 2020	786.08	118	3.113
	Nov 10, 2020	673.61	116	0.596
	Nov 24, 2020	797.36	118	1.636
	Nov 27, 2020	578.51	121	0.566
283197 Conc Rd 10	April 17, 2020	1,135.68	121	0.813
	May 4, 2020	1,111.00	119	NR
	June 5, 2020	1123.79	118	0.0762
	June 16, 2020	1,164.64	116	NR
	June 30, 2020	1,136.29	NR	NR
	July 9, 2020	2,367.99	NR	NR
	July 31, 2020	1,116.18	NR	NR
	Aug 14, 2020	1,095.45	117	0.596
	Aug 26, 2020	1,190.55	116	1.922
	Sept 4, 2020	1,156.41	117	0.094
	Sept 15, 2020	1,058.88	NR	NR
	Sept 25, 2020	1,229.87	115	0.22
	Oct 13, 2020	1,163.73	116	0.22
	Oct 23, 2020	1,173.78	117	0.22
	Oct 30, 2020	1,140.26	109	2.068
	Nov 10, 2020	1,117.40	NR	NR
	Nov 24, 2020	1,090.88	NR	NR
	Nov 27, 2020	1,074.12	119	0.554
178717 Grey Rd 17	April 17, 2020	697.99	119	1.116
	May 4, 2020	665.68	119	NR
	June 16, 2020	717.19	118	NR
	June 30, 2020	683.36	NR	NR
	July 9, 2020	1,926.03	NR	NR
	July 31, 2020	661.11	NR	NR
	Aug 14, 2020	643.43	116	0.181
	Aug 26, 2020	736.40	115	0.079
	Sept 4, 2020	698.60	118	0.596
	Sept 15, 2020	606.55	119	0.28
	Sept 25, 2020	777.54	119	0.73
	Oct 13, 2020	796.14	116	0.66
	Oct 23, 2020	847.95	120	0.142
	Oct 30, 2020	679.09	NR	NR
	Nov 10, 2020	658.06	NR	NR
	Nov 24, 2020	633.68	113	1.673
	Nov 27, 2020	669.04	122	0.525
178706 Grey Rd 17	June 5, 2020	2,214.00 ft	120	0.004

Notes: NR = Not Registered

2020 BLASTING REPORTS

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-01
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 04/17/2020 15:38
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

ENVIRONMENT

Method Used: U.T.M.
Weather: Clear
Wind From: SE
Temperature: 2 °C
Terrain: Flat
Wind Velocity: 2-5 km/h
Blast U.T.M.: 17N 500096 mE 4942402 mN

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Road #17
Direction/Bearing: 0 °
Structure Type: Dwelling
Distance: 609 m
Structure U.T.M.: 17N 500101 mE 4943011 mN

LAYOUT

		Hole Depth:	6.71-9.14 m	Material Blasted:	Limestone	Total Meters Drilled:	1,282.6 m
No. of Holes:	148	Subdrilling:	0.61 m	Burden:	[See Below]	Water Depth:	max 6.10 m
No. of V.P.† Holes:	144	Face Height:	6.10-8.53 m	Spacing:	[See Below]	Stem Length:	min 1.83 m
No. of Rows:	[See Below]	Drilling Angle:	[See Below]	Back Fill Depth:	0.00 m	Area Type:	[See Below]
Diameter:	[See Below]	Mats Used:	No	Stem Type:	5/8" Clear Stone	Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	171.4 kg	Volume Produced:	11,284.8 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	171.4 kg	Weight Produced:	27,088.1 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.394 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	85.7 kg	Powder Factor 2:	1.003 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	65.79	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	46.52		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	No	No	No	No
FRALICK	CRAIG, A			No	Yes	No	No	No
KOUYOUMJIAN	MACKENZIE, H			No	Yes	No	No	No
O'DONOHOE	LIAM, J			No	No	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

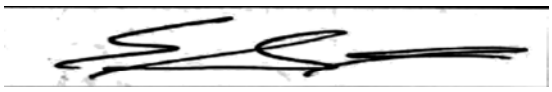
327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-01
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 04/17/2020 15:38
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	176.00	ea	132.00
15001	24' E*STAR Detonator - QM	56.00	ea	0.00
15003	40' E*STAR Detonator - QM	120.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	11,180.00	kg	11,180.00
12981	Mini Stem Plug - 6015	147.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	1.00	ea	0.00
AB013	Labour Charge	6.00	hr	0.00
	Total Weight of Explosives (Include Primers) (kg):			11,312.00

COMMENTS / EXPLANATIONS



Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-01
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 04/17/2020 15:38
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

Pattern: 1

No. of Holes:	119	Hole Depth:	9.14 m	Burden:	3.05 m	Area Type:	Conventional
No. of V.P.† Holes:	119	Diameter:	114.3 mm	Spacing:	3.35 m	Method:	Specified
No. of Rows:	5	Subdrilling:	0.61 m				(H = 8.53 m)
Drilling Angle:	0 °	Face Height:	8.53 m			Total volume for pattern:	10,378.7 m³
† V.P. = Volume Producing						Total weight for pattern:	24,913.0 t

Pattern: 2

No. of Holes:	25	Hole Depth:	6.71 m	Burden:	3.05 m	Area Type:	Sinking Cut/Ditch
No. of V.P.† Holes:	25	Diameter:	101.6 mm	Spacing:	3.05 m	Method:	Specified
No. of Rows:	5	Subdrilling:	0.61 m				(H = 6.10 m)
Drilling Angle:	0 °	Face Height:	6.10 m			Total volume for pattern:	906.1 m³
† V.P. = Volume Producing						Total weight for pattern:	2,175.1 t

Total blast volume: 11,284.8 m³

Total weight produced: 27,088.1 t

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-01 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 04/17/2020 15:38 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type:	Seismic Record	Seismograph Type:	Instantel - Micromate				
Date:	04/17/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.26 mm/s	24.4 Hz
Time:	15:39	Calibration Date:	02/14/20		Vertical:	0.591 mm/s	10.2 Hz
Distance From Blast:	608.99 m	Calibration Signal:	OK		Longitudinal:	0.489 mm/s	25.6 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	122 dB	--- Hz
Location:	Bolted to bedrock at the front of the property.				Vector Sum:	0.607 mm/s	
U.T.M.:	17N 500101 mE 4943011 mN						
Reader and Firm:	Evan Smart, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart, Austin Powder Ltd.						

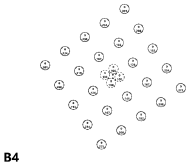
SEISMOGRAPH 2 - 178717 GREY RD #17

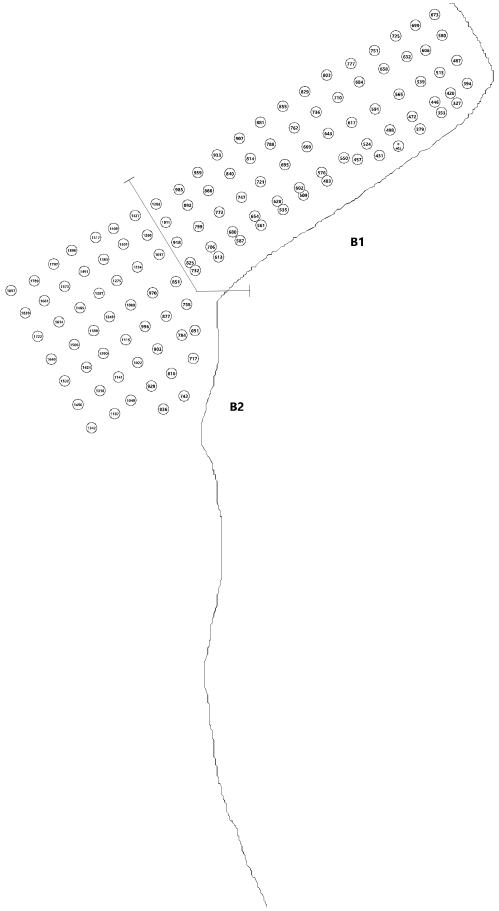
Data Type:	Seismic Record	Seismograph Type:	Instantel - Micromate				
Date:	04/17/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.552 mm/s	25.6 Hz
Time:	15:39	Calibration Date:	02/14/20		Vertical:	0.638 mm/s	20.5 Hz
Distance From Blast:	697.99 m	Calibration Signal:	OK		Longitudinal:	1.111 mm/s	28.4 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	119 dB	--- Hz
Location:	Spiked and buried.				Vector Sum:	1.116 mm/s	
U.T.M.:	17N 500660 mE 4941991 mN						
Reader and Firm:	Evan Smart, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart, Austin Powder Ltd.						

SEISMOGRAPH 3 - 283197 CONC. RD. #10

Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster				
Date:	04/17/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.508 mm/s	24.0 Hz
Time:	15:39	Calibration Date:	01/17/20		Vertical:	0.635 mm/s	0.0 Hz
Distance From Blast:	1,135.68 m	Calibration Signal:	OK		Longitudinal:	0.508 mm/s	8.1 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	121 dB	--- Hz
Location:	Spiked and weight bagged beside the mail box.				Vector Sum:	0.813 mm/s	
U.T.M.:	17N 501117 mE 4941905 mN						
Reader and Firm:	Evan Smart, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart, Austin Powder Ltd.						

Hole Label Mode: Cumulative In-Hole Delays



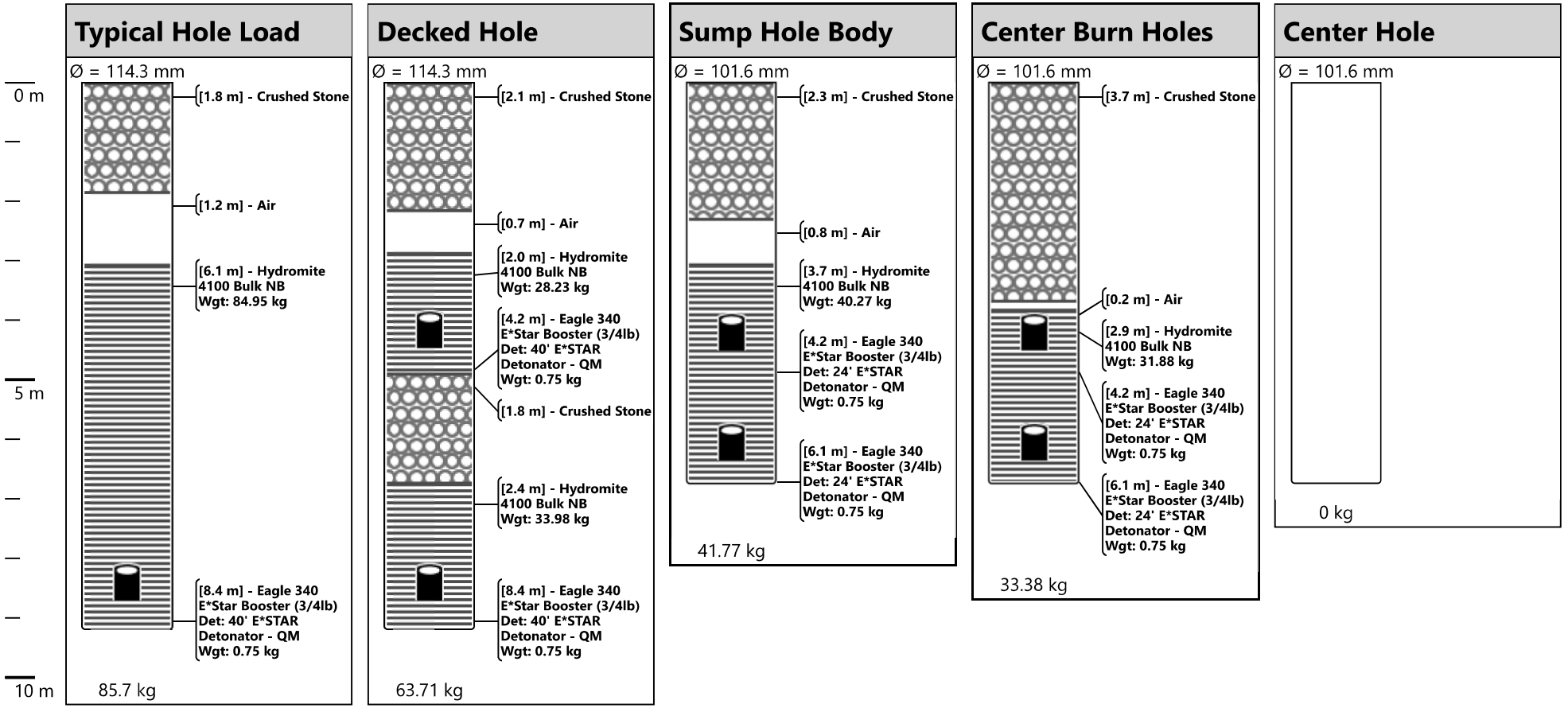


Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay
ZZ71	Decked Hole	0	405	0
ZZ103	Typical Hole Load	0	877	
ZZ89	Typical Hole Load	0	825	
ZZ94	Typical Hole Load	0	1249	
ZZ9	Typical Hole Load	0	985	
ZZ57	Typical Hole Load	0	643	
ZZ76	Typical Hole Load	0	550	
ZZ102	Typical Hole Load	0	996	
ZZ40	Typical Hole Load	0	1573	
ZZ90	Typical Hole Load	0	732	
ZZ97	Typical Hole Load	0	1640	
ZZ46	Typical Hole Load	0	1357	
ZZ56	Typical Hole Load	0	669	
ZZ26	Typical Hole Load	0	684	
ZZ108	Typical Hole Load	0	1022	
ZZ106	Typical Hole Load	0	784	
ZZ82	Typical Hole Load	0	628	
ZZ44	Typical Hole Load	0	1614	
ZZ12	Typical Hole Load	0	907	
ZZ92	Typical Hole Load	0	970	
ZZ77	Typical Hole Load	0	576	
ZZ59	Typical Hole Load	0	591	
ZZ54	Typical Hole Load	0	721	
ZZ43	Typical Hole Load	0	1722	
ZZ87	Typical Hole Load	0	613	
ZZ91	Typical Hole Load	0	851	
ZZ66	Typical Hole Load	0	327	
ZZ113	Typical Hole Load	0	1167	
ZZ20	Typical Hole Load	0	699	
ZZ15	Typical Hole Load	0	829	
ZZ38	Typical Hole Load	0	1383	
ZZ114	Typical Hole Load	0	1048	
ZZ62	Typical Hole Load	0	513	
ZZ79	Typical Hole Load	0	509	
ZZ72	Typical Hole Load	0	498	
ZZ104	Typical Hole Load	0	758	
ZZ39	Typical Hole Load	0	1491	
ZZ32	Typical Hole Load	0	840	
ZZ101	Typical Hole Load	0	1115	
ZZ41	Typical Hole Load	0	1681	
ZZ99	Typical Hole Load	0	1424	
ZZ50	Typical Hole Load	0	918	
ZZ115	Typical Hole Load	0	929	
ZZ36	Typical Hole Load	0	1260	
ZZ75	Typical Hole Load	0	457	
ZZ47	Typical Hole Load	0	1275	

Hole	Load	Surface Delay	Deck 1 Delay
ZZ95	Typical Hole Load	0	1398
ZZ5	Typical Hole Load	0	1517
ZZ53	Typical Hole Load	0	747
ZZ13	Typical Hole Load	0	881
ZZ58	Typical Hole Load	0	617
ZZ98	Typical Hole Load	0	1532
ZZ19	Typical Hole Load	0	725
ZZ52	Typical Hole Load	0	773
ZZ27	Typical Hole Load	0	710
ZZ17	Typical Hole Load	0	777
ZZ10	Typical Hole Load	0	959
ZZ33	Typical Hole Load	0	866
ZZ51	Typical Hole Load	0	799
ZZ22	Typical Hole Load	0	580
ZZ80	Typical Hole Load	0	602
ZZ49	Typical Hole Load	0	1037
ZZ2	Typical Hole Load	0	1789
ZZ67	Typical Hole Load	0	353
ZZ11	Typical Hole Load	0	933
ZZ70	Typical Hole Load	0	379
ZZ112	Typical Hole Load	0	1342
ZZ116	Typical Hole Load	0	810
ZZ14	Typical Hole Load	0	855
ZZ85	Typical Hole Load	0	680
ZZ84	Typical Hole Load	0	654
ZZ18	Typical Hole Load	0	751
ZZ3	Typical Hole Load	0	1707
ZZ34	Typical Hole Load	0	892
ZZ109	Typical Hole Load	0	1141
ZZ25	Typical Hole Load	0	658
ZZ63	Typical Hole Load	0	487
ZZ37	Typical Hole Load	0	1301
ZZ119	Typical Hole Load	0	836
ZZ60	Typical Hole Load	0	565
ZZ7	Typical Hole Load	0	1327
ZZ29	Typical Hole Load	0	762
ZZ78	Typical Hole Load	0	483
ZZ74	Typical Hole Load	0	431
ZZ65	Typical Hole Load	0	420
ZZ83	Typical Hole Load	0	561
ZZ4	Typical Hole Load	0	1599
ZZ31	Typical Hole Load	0	814
ZZ6	Typical Hole Load	0	1409
ZZ105	Typical Hole Load	0	691
ZZ35	Typical Hole Load	0	1011
ZZ117	Typical Hole Load	0	717

Hole	Load	Surface Delay	Deck 1 Delay
ZZ45	Typical Hole Load	0	1465
ZZ61	Typical Hole Load	0	539
ZZ16	Typical Hole Load	0	803
ZZ96	Typical Hole Load	0	1506
ZZ23	Typical Hole Load	0	606
ZZ48	Typical Hole Load	0	1234
ZZ81	Typical Hole Load	0	535
ZZ24	Typical Hole Load	0	632
ZZ28	Typical Hole Load	0	736
ZZ93	Typical Hole Load	0	1089
ZZ118	Typical Hole Load	0	743
ZZ21	Typical Hole Load	0	673
ZZ55	Typical Hole Load	0	695
ZZ86	Typical Hole Load	0	587
ZZ42	Typical Hole Load	0	1830
ZZ69	Typical Hole Load	0	472
ZZ107	Typical Hole Load	0	903
ZZ110	Typical Hole Load	0	1316
ZZ68	Typical Hole Load	0	446
ZZ1	Typical Hole Load	0	1897
ZZ100	Typical Hole Load	0	1290
ZZ88	Typical Hole Load	0	706
ZZ73	Typical Hole Load	0	524
ZZ111	Typical Hole Load	0	1450
ZZ8	Typical Hole Load	0	1286
ZZ64	Typical Hole Load	0	394
ZZ30	Typical Hole Load	0	788
B2	Sump Hole Body	0	301
B3	Sump Hole Body	0	234
B4	Sump Hole Body	0	208
B5	Sump Hole Body	0	234
B6	Sump Hole Body	0	301
C2	Sump Hole Body	0	260
C3	Sump Hole Body	0	219
C4	Sump Hole Body	0	167
C5	Sump Hole Body	0	193
C6	Sump Hole Body	0	260
D2	Sump Hole Body	0	193
D3	Sump Hole Body	0	126
D4	Center Hole	0	
D5	Sump Hole Body	0	126
D6	Sump Hole Body	0	193
E2	Sump Hole Body	0	234
E3	Sump Hole Body	0	167
E4	Sump Hole Body	0	141
E5	Sump Hole Body	0	167

Hole	Load	Surface Delay	Deck 1 Delay
E6	Sump Hole Body	0	234
F2	Sump Hole Body	0	275
F3	Sump Hole Body	0	208
F4	Sump Hole Body	0	182
F5	Sump Hole Body	0	208
F6	Sump Hole Body	0	275
ZZ217	Center Burn Holes	0	100
ZZ218	Center Burn Holes	0	100
ZZ216	Center Burn Holes	0	100
ZZ219	Center Burn Holes	0	100


0 m
5 m
10 m
Typical Hole Load
Ø = 114.3 mm
[1.8 m] - Crushed Stone
[1.2 m] - Air
[6.1 m] - Hydromite 4100 Bulk NB Wgt: 84.95 kg
[8.4 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
85.7 kg
Decked Hole
Ø = 114.3 mm
[2.1 m] - Crushed Stone
[0.7 m] - Air
[2.0 m] - Hydromite 4100 Bulk NB Wgt: 28.23 kg
[4.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
[1.8 m] - Crushed Stone
[2.4 m] - Hydromite 4100 Bulk NB Wgt: 33.98 kg
[8.4 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
63.71 kg
Sump Hole Body
Ø = 101.6 mm
[2.3 m] - Crushed Stone
[0.8 m] - Air
[3.7 m] - Hydromite 4100 Bulk NB Wgt: 40.27 kg
[4.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 24' E*STAR Detonator - QM Wgt: 0.75 kg
[6.1 m] - Eagle 340 E*Star Booster (3/4lb) Det: 24' E*STAR Detonator - QM Wgt: 0.75 kg
41.77 kg
Center Burn Holes
Ø = 101.6 mm
[3.7 m] - Crushed Stone
[0.2 m] - Air
[2.9 m] - Hydromite 4100 Bulk NB Wgt: 31.88 kg
[4.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 24' E*STAR Detonator - QM Wgt: 0.75 kg
[6.1 m] - Eagle 340 E*Star Booster (3/4lb) Det: 24' E*STAR Detonator - QM Wgt: 0.75 kg
33.38 kg
Center Hole
Ø = 101.6 mm
0 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-02
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 05/04/2020 13:31
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Clear
Wind From: WSW
Temperature: 3 °C
Terrain: Hilly
Wind Velocity: - km/h
Blast Lat./Long.: 44° 38' 4.200" N 80° 59' 55.500" W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 0 °
Structure Type: Dwelling
Distance: 660 m
Structure Lat./Long.: 44° 38' 25.580" N 80° 59' 55.233" W

LAYOUT

		Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	1,066.8 m
No. of Holes:	140	Subdrilling:	0.00 m	Burden:	3.05 m	Water Depth:	0.00 m
No. of V.P.† Holes:	140	Face Height:	7.62 m	Spacing:	3.35 m	Stem Length:	min 1.83 m
No. of Rows:	8	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear stone	Method:	Specified (H = 7.01 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	276.2 kg	Volume Produced:	10,029.8 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	276.2 kg	Weight Produced:	25,075.2 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.668 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	69.1 kg	Powder Factor 2:	0.937 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	79.41	Rock Density:	2.500 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	39.70		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
REED	ADAM, G	* ON - N/A		Yes	Yes	Yes	No	Yes
GRENIER	JOHNATHON, R			No	No	No	No	No
KLINGSPOR	DAVID, A			No	Yes	Yes	No	No
KOUYOUMJIAN	MACKENZIE, H			No	No	No	No	No
MCKEEN	DAVIN, R			No	No	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-02
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 05/04/2020 13:31
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	140.00	ea	105.00
15003	40' E*STAR Detonator - QM	140.00	ea	0.00
13271	E*Star Bus Wire - 1250 ft Bag	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	9,290.00	kg	9,290.00
12981	Mini Stem Plug - 6015	140.00	ea	0.00
		Total Weight of Explosives (Include Primers) (kg):		9,395.00

COMMENTS / EXPLANATIONS

General Comments: Imported on 5/6/2020 5:01:51 AM

Adam Reed

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-02 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 05/04/2020 13:31 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY RD. 17

Data Type:	Seismic Record	Seismograph Type:	Instantel-MicroMate				
Date:	05/04/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.889 mm/s	23.0 Hz
Time:	13:31	Calibration Date:	01/17/20		Vertical:	1.778 mm/s	11.0 Hz
Distance From Blast:	662.03 m	Calibration Signal:	OK		Longitudinal:	2.032 mm/s	24.0 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:		Mic. Min. Freq.:	--- Hz		Acoustic:	115 dB	--- Hz
Location:	Bolted to bedrock in front of property.				Vector Sum:	--- mm/s	
Lat./Long.:	44° 38' 25.645" N		80° 59' 55.415" W				
Reader and Firm:	Adam Reed, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Adam Reed Austin Powder						

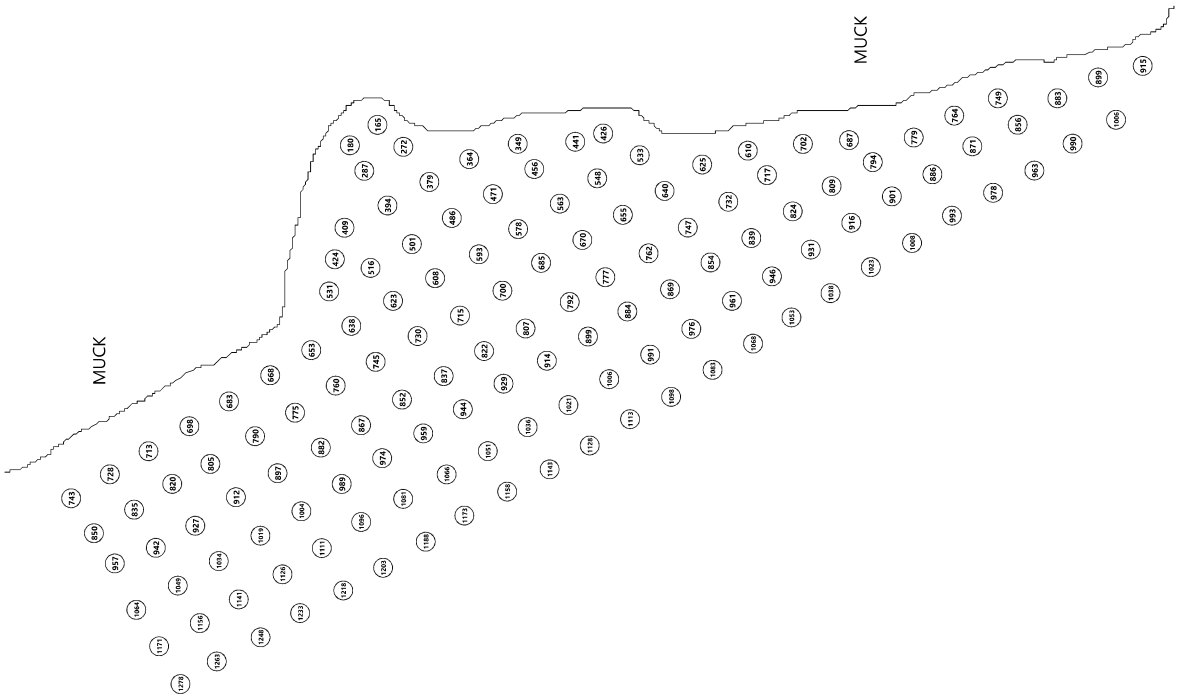
SEISMOGRAPH 2 - 283197 10TH CONC.

Data Type:	Seismic Record	Seismograph Type:	Instatel Minimate				
Date:	05/04/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.079 mm/s	51.0 Hz
Time:	13:31	Calibration Date:	01/17/20		Vertical:	0.063 mm/s	43.0 Hz
Distance From Blast:	1,111.00 m	Calibration Signal:			Longitudinal:	0.063 mm/s	85.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:		Mic. Min. Freq.:	--- Hz		Acoustic:	119 dB	--- Hz
Location:	Behind the mail box.				Vector Sum:	--- mm/s	
Lat./Long.:	44° 37' 49.797" N		80° 59' 9.304" W				
Reader and Firm:	Adam Reed, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Adam Reed Austin Powder						

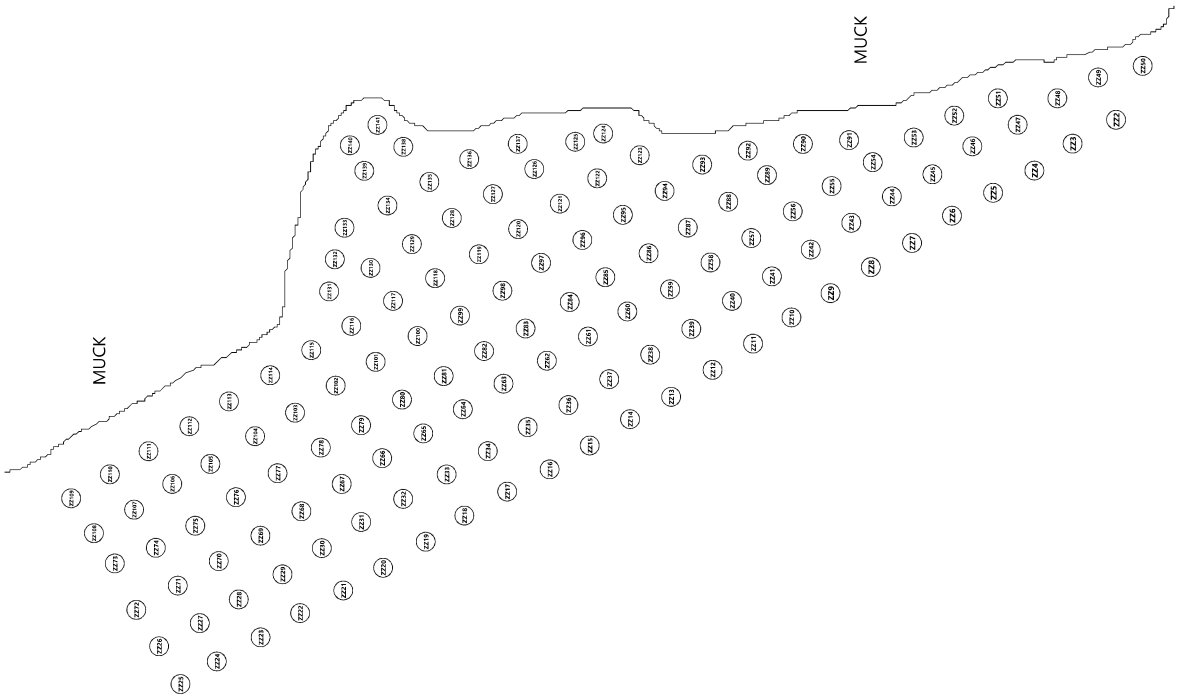
SEISMOGRAPH 3 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	instantel				
Date:	05/04/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.254 mm/s	--- Hz
Time:	13:31	Calibration Date:	01/17/20		Vertical:	0.254 mm/s	--- Hz
Distance From Blast:	665.68 m	Calibration Signal:	OK		Longitudinal:	0.254 mm/s	--- Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:		Mic. Min. Freq.:	--- Hz		Acoustic:	119 dB	--- Hz
Location:					Vector Sum:	--- mm/s	
Lat./Long.:	44° 37' 52.587" N		80° 59' 30.045" W				
Reader and Firm:	Adam Reed, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Adam Reed Austin Powder						

Hole Label Mode: Cumulative In-Hole Delays



Hole Label Mode: Default (A1)

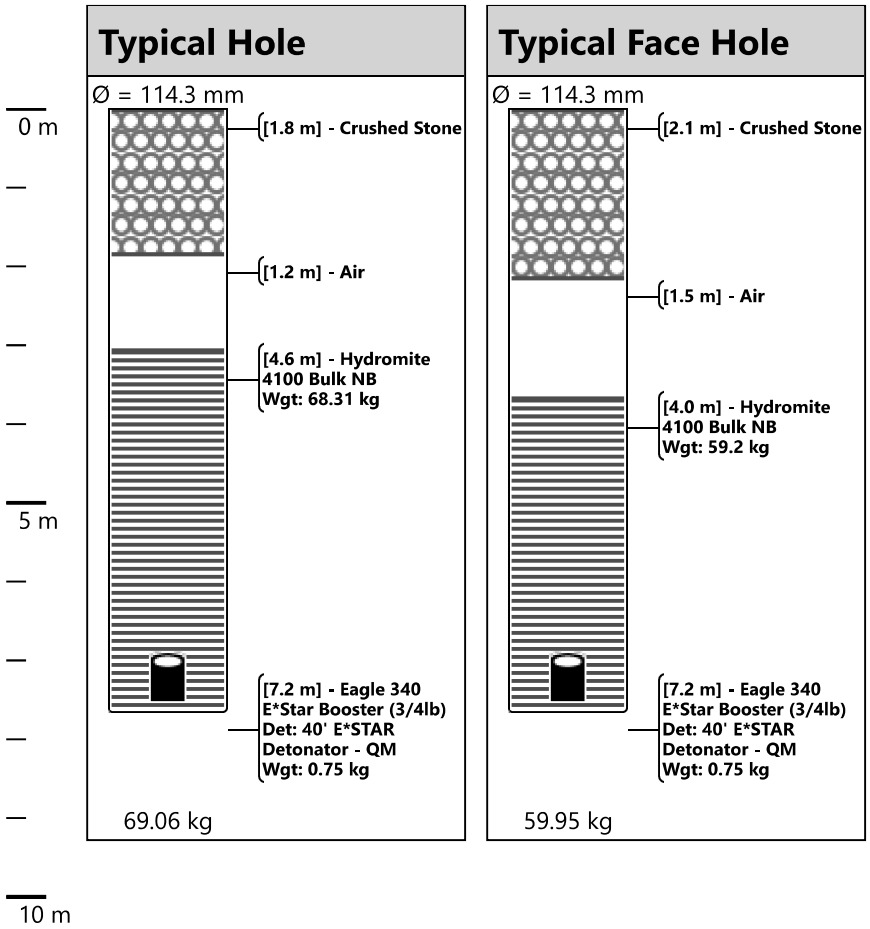


Hole	Load	Surface Delay	Deck 1 Delay
ZZ92	Typical Face Hole	0	610
ZZ122	Typical Hole	0	548
ZZ100	Typical Hole	0	730
ZZ69	Typical Hole	0	1019
ZZ131	Typical Face Hole	0	531
ZZ14	Typical Hole	0	1113
ZZ130	Typical Hole	0	516
ZZ39	Typical Hole	0	976
ZZ104	Typical Hole	0	790
ZZ120	Typical Hole	0	578
ZZ134	Typical Hole	0	394
ZZ20	Typical Hole	0	1203
ZZ68	Typical Hole	0	1004
ZZ21	Typical Hole	0	1218
ZZ66	Typical Hole	0	974
ZZ93	Typical Face Hole	0	625
ZZ126	Typical Hole	0	456
ZZ47	Typical Hole	0	856
ZZ132	Typical Face Hole	0	424
ZZ136	Typical Face Hole	0	364
ZZ133	Typical Face Hole	0	409
ZZ82	Typical Hole	0	822
ZZ53	Typical Face Hole	0	779
ZZ80	Typical Hole	0	852
ZZ25	Typical Hole	0	1278
ZZ129	Typical Hole	0	501
ZZ116	Typical Hole	0	638
ZZ63	Typical Hole	0	929
ZZ72	Typical Hole	0	1064
ZZ38	Typical Hole	0	991
ZZ79	Typical Hole	0	867
ZZ8	Typical Hole	0	1023
ZZ67	Typical Hole	0	989
ZZ50	Typical Face Hole	0	915
ZZ98	Typical Hole	0	700
ZZ119	Typical Hole	0	593
ZZ137	Typical Face Hole	0	349
ZZ71	Typical Hole	0	1049
ZZ101	Typical Hole	0	745
ZZ102	Typical Hole	0	760
ZZ84	Typical Hole	0	792
ZZ88	Typical Hole	0	732
ZZ59	Typical Hole	0	869
ZZ44	Typical Hole	0	901
ZZ125	Typical Face Hole	0	441
ZZ89	Typical Hole	0	717

Hole	Load	Surface Delay	Deck 1 Delay
ZZ12	Typical Hole	0	1083
ZZ73	Typical Hole	0	957
ZZ26	Typical Hole	0	1171
ZZ48	Typical Face Hole	0	883
ZZ54	Typical Hole	0	794
ZZ112	Typical Face Hole	0	698
ZZ33	Typical Hole	0	1066
ZZ19	Typical Hole	0	1188
ZZ3	Typical Hole	0	990
ZZ78	Typical Hole	0	882
ZZ128	Typical Hole	0	486
ZZ7	Typical Hole	0	1008
ZZ96	Typical Hole	0	670
ZZ30	Typical Hole	0	1111
ZZ58	Typical Hole	0	854
ZZ75	Typical Hole	0	927
ZZ94	Typical Hole	0	640
ZZ27	Typical Hole	0	1156
ZZ91	Typical Face Hole	0	687
ZZ65	Typical Hole	0	959
ZZ5	Typical Hole	0	978
ZZ113	Typical Face Hole	0	683
ZZ127	Typical Hole	0	471
ZZ97	Typical Hole	0	685
ZZ51	Typical Face Hole	0	749
ZZ110	Typical Face Hole	0	728
ZZ49	Typical Face Hole	0	899
ZZ114	Typical Face Hole	0	668
ZZ55	Typical Hole	0	809
ZZ86	Typical Hole	0	762
ZZ108	Typical Hole	0	850
ZZ121	Typical Hole	0	563
ZZ40	Typical Hole	0	961
ZZ11	Typical Hole	0	1068
ZZ117	Typical Hole	0	623
ZZ52	Typical Face Hole	0	764
ZZ74	Typical Hole	0	942
ZZ16	Typical Hole	0	1143
ZZ118	Typical Hole	0	608
ZZ61	Typical Hole	0	899
ZZ103	Typical Hole	0	775
ZZ6	Typical Hole	0	993
ZZ43	Typical Hole	0	916
ZZ141	Typical Face Hole	0	165
ZZ34	Typical Hole	0	1051
ZZ10	Typical Hole	0	1053

Hole	Load	Surface Delay	Deck 1 Delay
ZZ24	Typical Hole	0	1263
ZZ109	Typical Face Hole	0	743
ZZ135	Typical Face Hole	0	379
ZZ17	Typical Hole	0	1158
ZZ95	Typical Hole	0	655
ZZ64	Typical Hole	0	944
ZZ36	Typical Hole	0	1021
ZZ62	Typical Hole	0	914
ZZ41	Typical Hole	0	946
ZZ139	Typical Face Hole	0	287
ZZ46	Typical Hole	0	871
ZZ105	Typical Hole	0	805
ZZ28	Typical Hole	0	1141
ZZ83	Typical Hole	0	807
ZZ85	Typical Hole	0	777
ZZ35	Typical Hole	0	1036
ZZ60	Typical Hole	0	884
ZZ32	Typical Hole	0	1081
ZZ15	Typical Hole	0	1128
ZZ13	Typical Hole	0	1098
ZZ29	Typical Hole	0	1126
ZZ42	Typical Hole	0	931
ZZ106	Typical Hole	0	820
ZZ37	Typical Hole	0	1006
ZZ138	Typical Face Hole	0	272
ZZ99	Typical Hole	0	715
ZZ87	Typical Hole	0	747
ZZ56	Typical Hole	0	824
ZZ2	Typical Hole	0	1006
ZZ124	Typical Face Hole	0	426
ZZ107	Typical Hole	0	835
ZZ90	Typical Face Hole	0	702
ZZ22	Typical Hole	0	1233
ZZ76	Typical Hole	0	912
ZZ23	Typical Hole	0	1248
ZZ57	Typical Hole	0	839
ZZ4	Typical Hole	0	963
ZZ45	Typical Hole	0	886
ZZ140	Typical Face Hole	0	180
ZZ111	Typical Face Hole	0	713
ZZ9	Typical Hole	0	1038
ZZ115	Typical Face Hole	0	653
ZZ31	Typical Hole	0	1096
ZZ70	Typical Hole	0	1034
ZZ18	Typical Hole	0	1173
ZZ77	Typical Hole	0	897

Hole	Load	Surface Delay	Deck 1 Delay
ZZ81	Typical Hole	0	837
ZZ123	Typical Face Hole	0	533


Typical Hole
Ø = 114.3 mm
0 m
5 m
10 m
[1.8 m] - Crushed Stone
[1.2 m] - Air
[4.6 m] - Hydromite 4100 Bulk NB Wgt: 68.31 kg
[7.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
69.06 kg
Typical Face Hole
Ø = 114.3 mm
[2.1 m] - Crushed Stone
[1.5 m] - Air
[4.0 m] - Hydromite 4100 Bulk NB Wgt: 59.2 kg
[7.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
59.95 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-04
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 06/05/2020 12:30
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

ENVIRONMENT

Method Used: U.T.M.
Weather: Clear
Wind From: SE
Temperature: 77 °F
Terrain: Flat
Wind Velocity: 3-6 M/h
Blast U.T.M.: 17N 500076 mE 4942330 mN

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 2 °
Structure Type: Dwelling
Distance: 2231 ft
Structure U.T.M.: 17N 500105 mE 4943009 mN

LAYOUT

		Hole Depth:	27.0 ft	Material Blasted:	Limestone	Total Drilling Footage:	2,052.0 ft
No. of Holes:	76	Subdrilling:	5.0 ft	Burden:	10.0 ft	Water Depth:	6.0 ft
No. of V.P.† Holes:	76	Face Height:	22.0 ft	Spacing:	11.0 ft	Stem Length:	min 4.5 ft
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.0 ft	Area Type:	Center Start/ Breakout
Diameter:	4.5 in	Mats Used:	No	Stem Type:	Clear stone	Method:	Specified (H = 22.0 ft)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	898.5 lb	Volume Produced:	6,543.0 yd³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	898.5 lb	Weight Produced:	13,236.5 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	5	Powder Factor 1:	0.993 t/lb
Other Method:		Max. Wt. of Explosive Per Hole:	179.7 lb	Powder Factor 2:	2.038 lb/yd³
Mfg and Model:	DBM1600-2-KC	Max. Allow. Chg. Wt. per 8 ms w/o Seis.:	1,645.4 lb	Rock Density:	2.023 t/yd³
Initiation Settings:		Actual Scaled Distance Factor:	74.43	Scaled Distance Factor Used:	D/W½=55
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	No	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
FRALICK	CRAIG, A			No	Yes	No	No	No
KOUYOUMJIAN	MACKENZIE, H			No	Yes	No	No	No
O'DONOHOE	LIAM, J			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

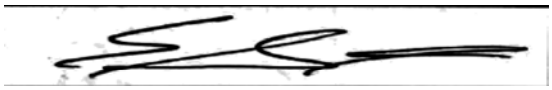
Blast No.: 2020-04
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 06/05/2020 12:30
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (lb)
15106	Eagle 340 E*Star Booster (3/4lb)	79.00 ea	130.63
15003	40' E*STAR Detonator - QM	79.00 ea	0.00
15128	Hydromite 4100 Bulk NB	5,990.00 kg	13,205.69
12981	Mini Stem Plug - 6015	76.00 ea	0.00
		Total Weight of Explosives (Include Primers) (lb):	13,336.32

COMMENTS / EXPLANATIONS

General Comments: Imported on 6/5/2020 5:19:05 PM



Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-04
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 06/05/2020 12:30
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

SEISMOGRAPH 1 - 178706 GREY RD. 17

Data Type: Seismic Record
Seismograph Type: Instantel Mini-Mate II
Date: 06/05/20
Trigger Level: 0.06 in/s 115.00 dB
Transverse: 0.005 in/s 0.0 Hz
Time: 12:30
Calibration Date: 01/17/20
Vertical: 0.005 in/s 8.8 Hz
Distance From Blast: 2,214.00 ft
Calibration Signal:
Longitudinal: 0.005 in/s 16.5 Hz
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Acoustic: 120 dB --- Hz
Location:
Vector Sum: 0.004 in/s
U.T.M.: 17N 500660 mE 4941991 mN
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe, Austin Powder

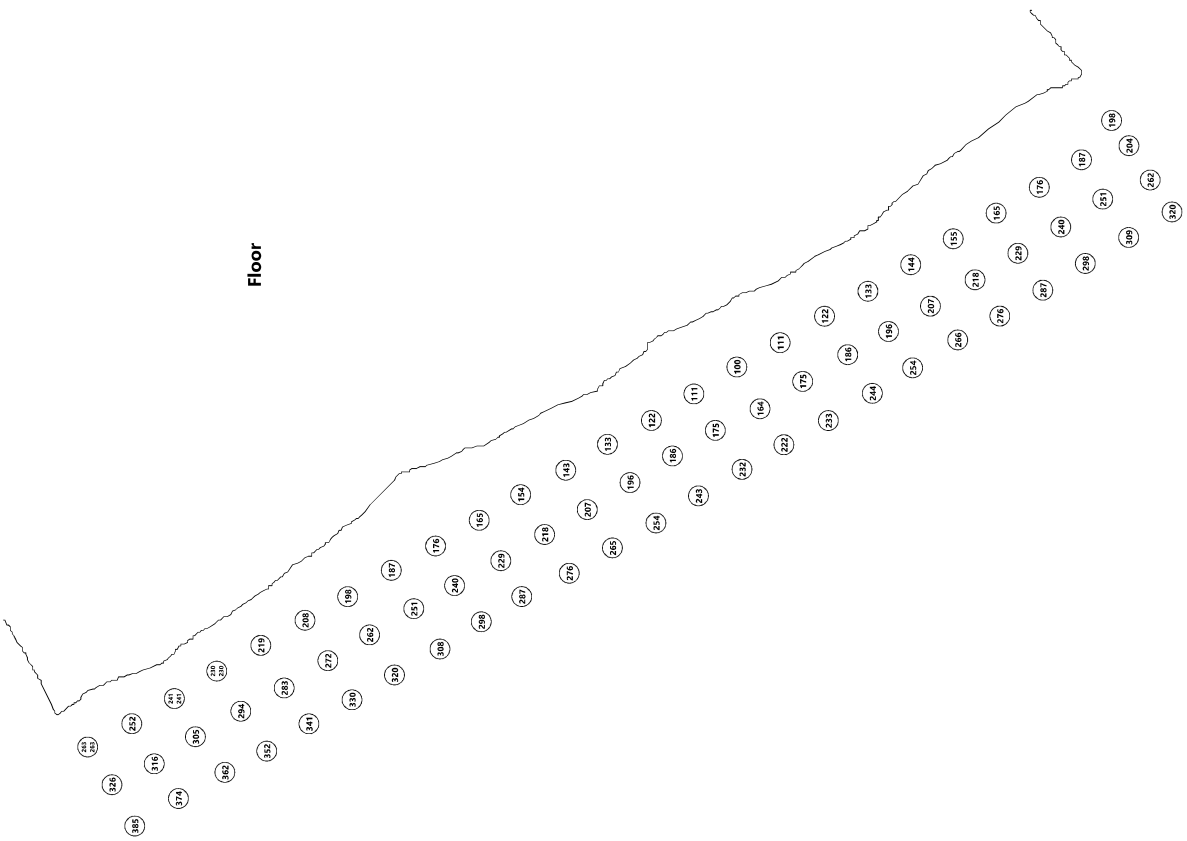
SEISMOGRAPH 2 - 178841 GREY RD. 17

Data Type: Seismic Record
Seismograph Type: Instantel-MicroMate
Date: 06/05/20
Trigger Level: 0.06 in/s 115.00 dB
Transverse: 0.009 in/s 0.0 Hz
Time: 12:30
Calibration Date: 01/17/20
Vertical: 0.009 in/s 0.0 Hz
Distance From Blast: 2,237.00 ft
Calibration Signal: OK
Longitudinal: 0.009 in/s 0.0 Hz
Direction From Blast: N
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Acoustic: 122 dB --- Hz
Location: Bolted to bedrock in front of property.
Vector Sum: 0.01 in/s
U.T.M.: 17N 500101 mE 4943011 mN
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe, Austin Powder

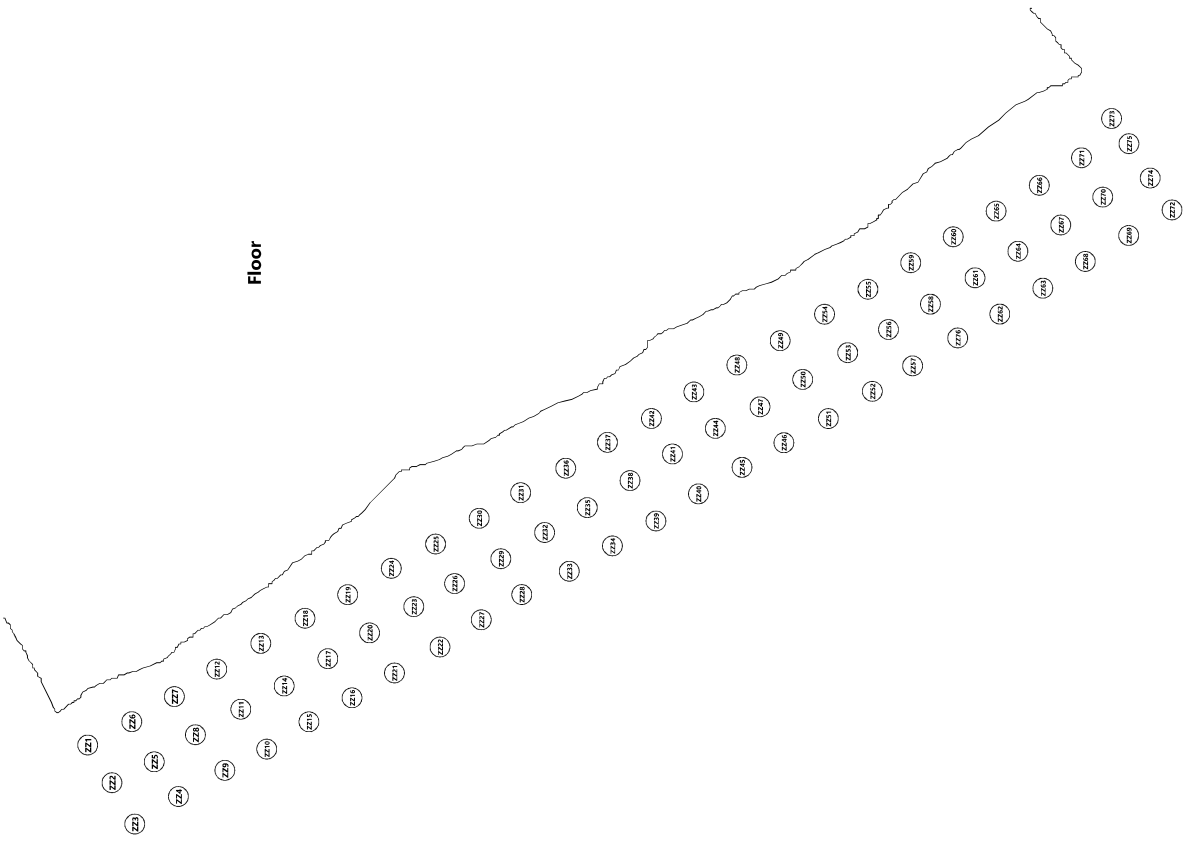
SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type: Seismic Record
Seismograph Type: Instatel Minimate
Date: 06/05/20
Trigger Level: 0.06 in/s 115.00 dB
Transverse: 0.002 in/s 0.0 Hz
Time: 12:30
Calibration Date: 01/17/20
Vertical: 0.002 in/s 0.0 Hz
Distance From Blast: 3,687.00 ft
Calibration Signal:
Longitudinal: 0.002 in/s 0.0 Hz
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Acoustic: 118 dB --- Hz
Location: Behind the mail box.
Vector Sum: 0.003 in/s
U.T.M.: 17N 501117 mE 4941905 mN
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe, Austin Powder

Hole Label Mode: Cumulative In-Hole Delays

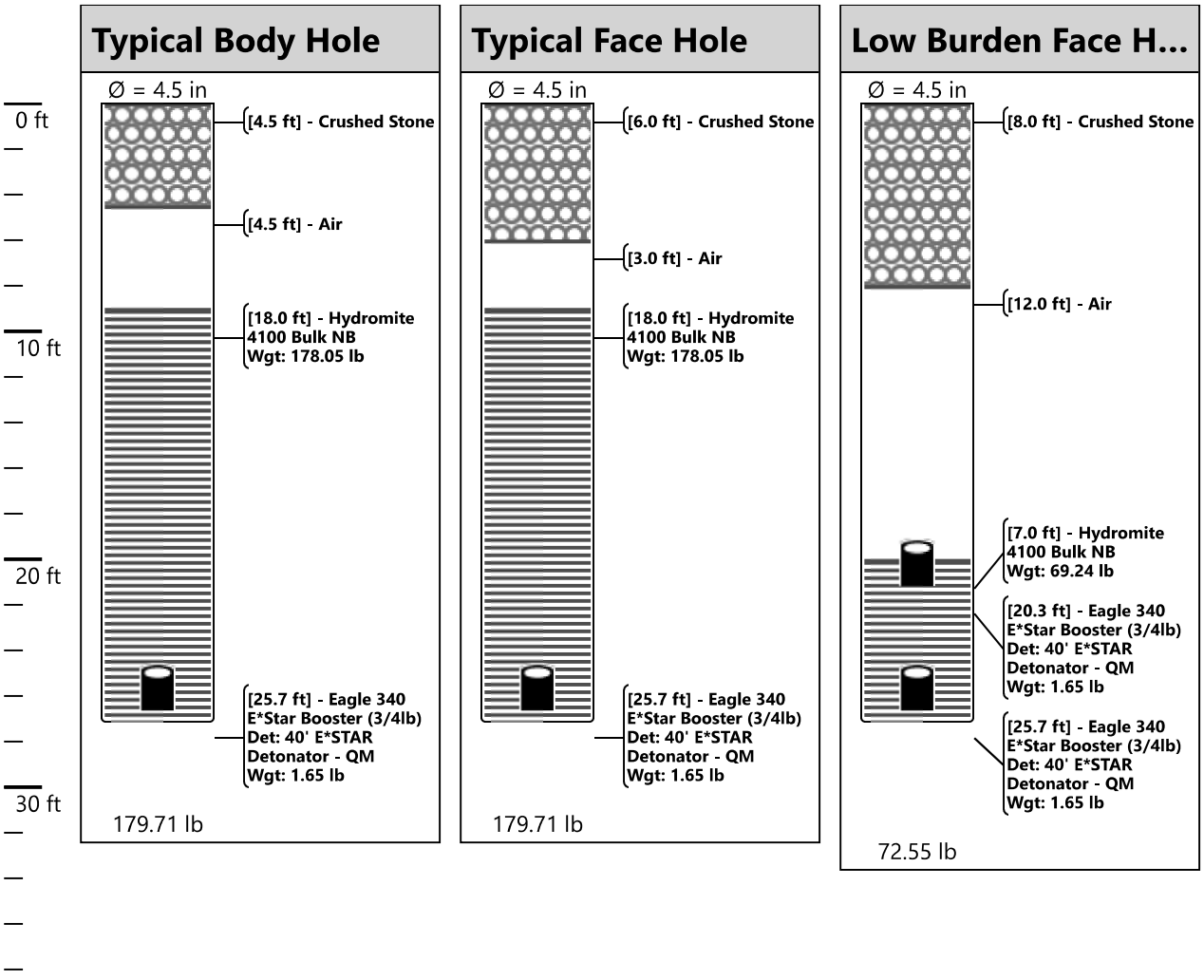


Hole Label Mode: Default (A1)



Hole	Load	Surface Delay	Deck 1 Delay
ZZ23	Typical Body Hole	0	251
ZZ33	Typical Body Hole	0	276
ZZ21	Typical Body Hole	0	320
ZZ22	Typical Body Hole	0	308
ZZ8	Typical Body Hole	0	305
ZZ61	Typical Body Hole	0	218
ZZ59	Typical Face Hole	0	144
ZZ49	Typical Face Hole	0	111
ZZ66	Typical Face Hole	0	176
ZZ18	Typical Face Hole	0	208
ZZ39	Typical Body Hole	0	254
ZZ64	Typical Body Hole	0	229
ZZ42	Typical Face Hole	0	122
ZZ75	Typical Body Hole	0	204
ZZ11	Typical Body Hole	0	294
ZZ53	Typical Body Hole	0	186
ZZ16	Typical Body Hole	0	330
ZZ51	Typical Body Hole	0	233
ZZ30	Typical Face Hole	0	165
ZZ62	Typical Body Hole	0	276
ZZ65	Typical Face Hole	0	165
ZZ2	Typical Body Hole	0	326
ZZ38	Typical Body Hole	0	196
ZZ52	Typical Body Hole	0	244
ZZ54	Typical Face Hole	0	122
ZZ4	Typical Body Hole	0	374
ZZ48	Typical Face Hole	0	100
ZZ27	Typical Body Hole	0	298
ZZ47	Typical Body Hole	0	164
ZZ45	Typical Body Hole	0	232
ZZ20	Typical Body Hole	0	262
ZZ29	Typical Body Hole	0	229
ZZ44	Typical Body Hole	0	175
ZZ34	Typical Body Hole	0	265
ZZ71	Typical Face Hole	0	187
ZZ70	Typical Body Hole	0	251
ZZ25	Typical Face Hole	0	176
ZZ26	Typical Body Hole	0	240
ZZ13	Typical Face Hole	0	219
ZZ46	Typical Body Hole	0	222
ZZ32	Typical Body Hole	0	218
ZZ50	Typical Body Hole	0	175
ZZ5	Typical Body Hole	0	316
ZZ14	Typical Body Hole	0	283
ZZ73	Typical Face Hole	0	198
ZZ57	Typical Body Hole	0	254

Hole	Load	Surface Delay	Deck 1 Delay
ZZ43	Typical Face Hole	0	111
ZZ56	Typical Body Hole	0	196
ZZ41	Typical Body Hole	0	186
ZZ24	Typical Face Hole	0	187
ZZ9	Typical Body Hole	0	362
ZZ12	Low Burden Face Hole	0	230/230
ZZ37	Typical Face Hole	0	133
ZZ69	Typical Body Hole	0	309
ZZ3	Typical Body Hole	0	385
ZZ17	Typical Body Hole	0	272
ZZ15	Typical Body Hole	0	341
ZZ7	Typical Face Hole	0	241/241
ZZ74	Typical Body Hole	0	262
ZZ67	Typical Body Hole	0	240
ZZ28	Typical Body Hole	0	287
ZZ55	Typical Face Hole	0	133
ZZ10	Typical Body Hole	0	352
ZZ72	Typical Body Hole	0	320
ZZ31	Typical Face Hole	0	154
ZZ58	Typical Body Hole	0	207
ZZ76	Typical Body Hole	0	266
ZZ36	Typical Face Hole	0	143
ZZ19	Typical Face Hole	0	198
ZZ1	Low Burden Face Hole	0	263/263
ZZ63	Typical Body Hole	0	287
ZZ60	Typical Face Hole	0	155
ZZ6	Low Burden Face Hole	0	252
ZZ35	Typical Body Hole	0	207
ZZ40	Typical Body Hole	0	243
ZZ68	Typical Body Hole	0	298


0 ft
10 ft
20 ft
30 ft
Typical Body Hole
Ø = 4.5 in
[4.5 ft] - Crushed Stone
[4.5 ft] - Air
[18.0 ft] - Hydromite 4100 Bulk NB Wgt: 178.05 lb
[25.7 ft] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 1.65 lb
179.71 lb
Typical Face Hole
Ø = 4.5 in
[6.0 ft] - Crushed Stone
[3.0 ft] - Air
[18.0 ft] - Hydromite 4100 Bulk NB Wgt: 178.05 lb
[25.7 ft] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 1.65 lb
179.71 lb
Low Burden Face H...
Ø = 4.5 in
[8.0 ft] - Crushed Stone
[12.0 ft] - Air
[7.0 ft] - Hydromite 4100 Bulk NB Wgt: 69.24 lb
[20.3 ft] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 1.65 lb
[25.7 ft] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 1.65 lb
72.55 lb

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-05 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 06/16/2020 13:03 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location:

ENVIRONMENT

Method Used: Lat./Long. | Weather: Clear | Wind From: WSW

Temperature: 22 °C | Terrain: Flat | Wind Velocity: 10-15 km/h

Blast Lat./Long.: 44° 38' 4.600" N 80° 59' 57.900" W

NEAREST PROTECTED STRUCTURE

Compass Point: N

Structure Name: 178841 Grey Rd. 17 | Direction/Bearing: 5 °

Structure Type: Dwelling | Distance: 650 m

Structure Lat./Long.: 44° 38' 25.580" N 80° 59' 55.233" W

LAYOUT

		Hole Depth:	8.53 m	Material Blasted:	Limestone	Total Meters Drilled:	1,126.5 m
No. of Holes:	132	Subdrilling:	1.83 m	Burden:	3.05 m	Water Depth:	4.57 m
No. of V.P.† Holes:	132	Face Height:	6.71 m	Spacing:	3.35 m	Stem Length:	min 1.37 m
No. of Rows:	6	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Center Start/ Breakout
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear stone	Method:	Specified (H = 6.71 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	412.1 kg	Volume Produced:	8,634.3 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	412.1 kg	Weight Produced:	21,586.5 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	5	Powder Factor 1:	2.018 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	82.4 kg	Powder Factor 2:	1.239 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	71.62	Rock Density:	2.500 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	32.03		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No | Misfire Occurred: No | Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
REED	ADAM, G	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
KLINGSPOR	DAVID, A			No	Yes	Yes	No	No
O'DONOHOE	LIAM, J			No	No	No	No	No
WELLS	ZACHARY, N			No	No	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 06/16/2020 13:03

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location:

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	132.00	ea	99.00
15003	40' E*STAR Detonator - QM	132.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	2.00	sp	0.00
15128	Hydromite 4100 Bulk NB	10,600.00	kg	10,600.00
12981	Mini Stem Plug - 6015	132.00	ea	0.00
	Total Weight of Explosives (Include Primers) (kg):			10,699.00

COMMENTS / EXPLANATIONS

General Comments: Imported on 6/17/2020 1:41:51 PM

Adam Reed

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-05 Blast Type: Stone Quarry/Stone Mine - Production Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 06/16/2020 13:03 Pit/Permit: KEPPEL QUARRY / SHOT SERVICE Location:

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	instantel					
Date:	06/16/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	2.032 mm/s	37.0 Hz	
Time:	13:03	Calibration Date:	01/17/20		Vertical:	1.143 mm/s	16.0 Hz	
Distance From Blast:	717.19 m	Calibration Signal:	OK		Longitudinal:	1.778 mm/s	47.0 Hz	
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz					
Readout:		Mic. Min. Freq.:	--- Hz		Acoustic:	122 dB	--- Hz	
Location:					Vector Sum:	--- mm/s		
Lat./Long.:	44° 37' 52.587" N		80° 59' 30.045" W					
Reader and Firm:	Adam Reed, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Adam Reed Austin Powder							

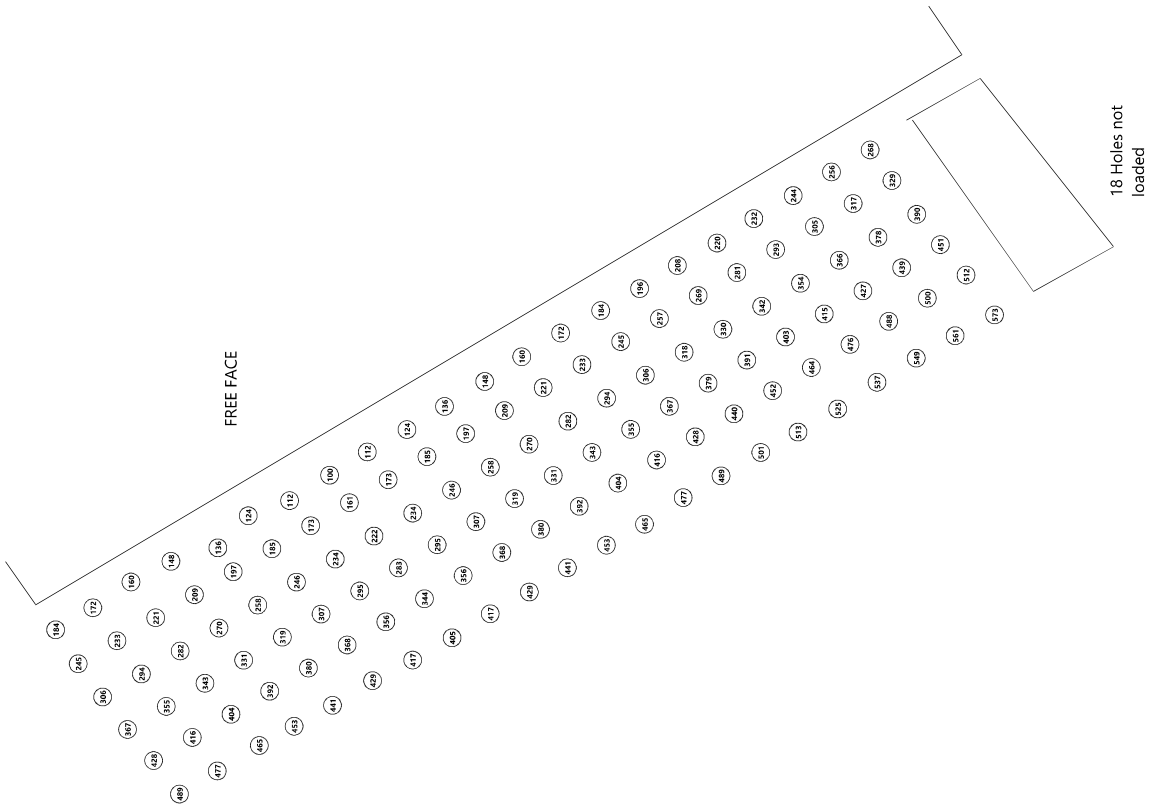
SEISMOGRAPH 2 - 178841 GREY RD. 17

Data Type:	Seismic Record	Seismograph Type:	Instantel					
Date:	06/16/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	--- Hz	
Time:	13:03	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	--- Hz	
Distance From Blast:	651.97 m	Calibration Signal:	OK		Longitudinal:	0.127 mm/s	--- Hz	
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz					
Readout:		Mic. Min. Freq.:	--- Hz		Acoustic:	118 dB	--- Hz	
Location:	Bolted to bedrock in front of property.				Vector Sum:	--- mm/s		
Lat./Long.:	44° 38' 25.645" N		80° 59' 55.415" W					
Reader and Firm:	Adam Reed, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Adam Reed Austin Powder							

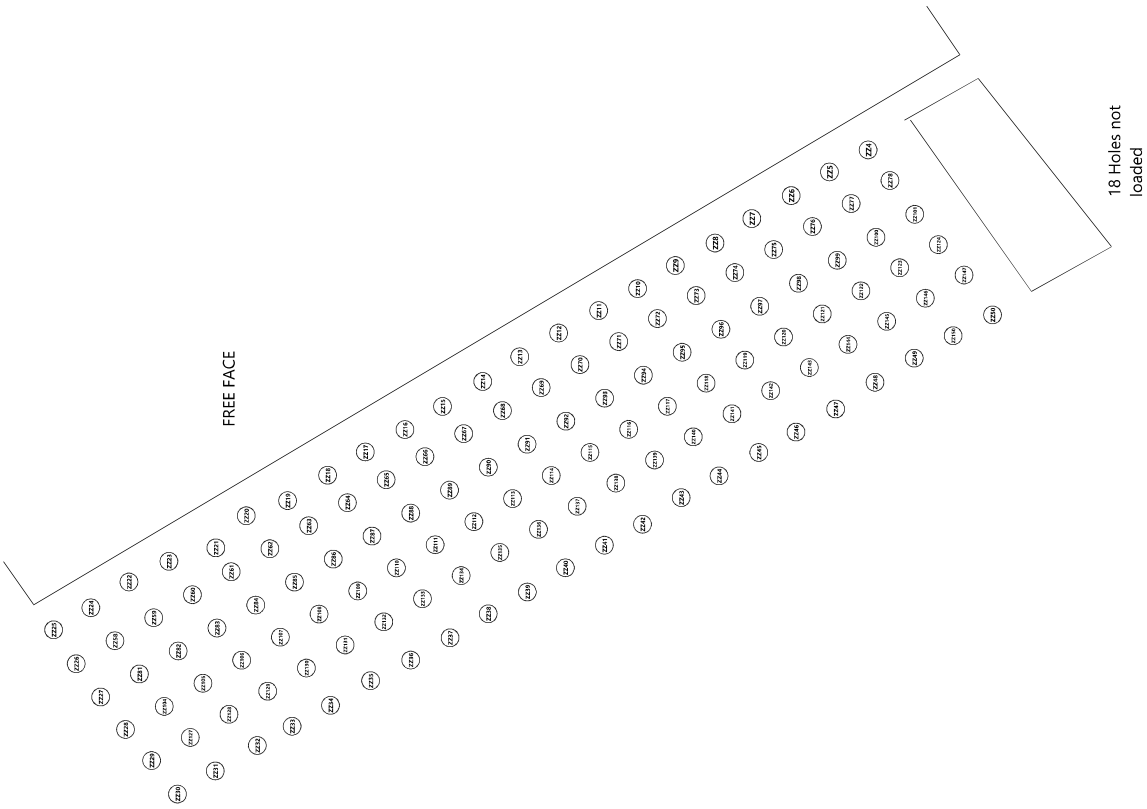
SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type:	Seismic Record	Seismograph Type:	Instatel Minimate					
Date:	06/16/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.825 mm/s	73.0 Hz	
Time:	13:03	Calibration Date:	01/17/20		Vertical:	0.651 mm/s	15.0 Hz	
Distance From Blast:	1,164.64 m	Calibration Signal:			Longitudinal:	1.984 mm/s	64.0 Hz	
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz					
Readout:		Mic. Min. Freq.:	--- Hz		Acoustic:	116 dB	--- Hz	
Location:	Behind the mail box.				Vector Sum:	--- mm/s		
Lat./Long.:	44° 37' 49.797" N		80° 59' 9.304" W					
Reader and Firm:	Adam Reed, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Adam Reed Austin Powder							

Hole Label Mode: Cumulative In-Hole Delays



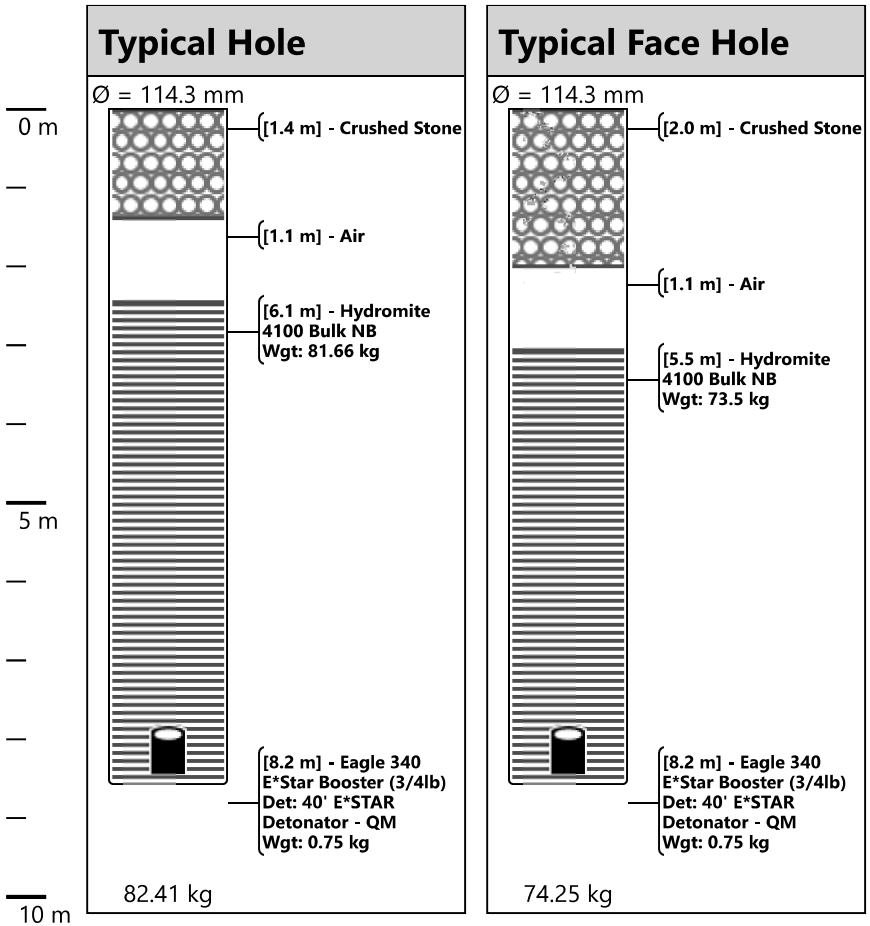
Hole Label Mode: Default (A1)



Hole	Load	Surface Delay	Deck 1 Delay
ZZ9	Typical Face Hole	0	208
ZZ50	Typical Hole	0	573
ZZ96	Typical Hole	0	330
ZZ112	Typical Hole	0	307
ZZ120	Typical Hole	0	403
ZZ127	Typical Hole	0	416
ZZ85	Typical Hole	0	246
ZZ23	Typical Face Hole	0	148
ZZ136	Typical Hole	0	380
ZZ139	Typical Hole	0	416
ZZ31	Typical Hole	0	477
ZZ36	Typical Hole	0	417
ZZ115	Typical Hole	0	343
ZZ123	Typical Hole	0	439
ZZ37	Typical Hole	0	405
ZZ118	Typical Hole	0	379
ZZ34	Typical Hole	0	441
ZZ99	Typical Hole	0	366
ZZ140	Typical Hole	0	428
ZZ122	Typical Hole	0	427
ZZ8	Typical Face Hole	0	220
ZZ101	Typical Hole	0	390
ZZ97	Typical Hole	0	342
ZZ83	Typical Hole	0	270
ZZ20	Typical Face Hole	0	124
ZZ150	Typical Hole	0	561
ZZ41	Typical Hole	0	453
ZZ16	Typical Face Hole	0	124
ZZ6	Typical Face Hole	0	244
ZZ68	Typical Hole	0	209
ZZ108	Typical Hole	0	307
ZZ44	Typical Hole	0	489
ZZ58	Typical Hole	0	233
ZZ131	Typical Hole	0	368
ZZ134	Typical Hole	0	356
ZZ12	Typical Face Hole	0	172
ZZ143	Typical Hole	0	464
ZZ84	Typical Hole	0	258
ZZ5	Typical Face Hole	0	256
ZZ110	Typical Hole	0	283
ZZ72	Typical Hole	0	257
ZZ27	Typical Hole	0	306
ZZ61	Typical Hole	0	197
ZZ146	Typical Hole	0	500
ZZ73	Typical Hole	0	269
ZZ114	Typical Hole	0	331

Hole	Load	Surface Delay	Deck 1 Delay
ZZ87	Typical Hole	0	222
ZZ33	Typical Hole	0	453
ZZ144	Typical Hole	0	476
ZZ137	Typical Hole	0	392
ZZ42	Typical Hole	0	465
ZZ24	Typical Face Hole	0	172
ZZ129	Typical Hole	0	392
ZZ78	Typical Hole	0	329
ZZ75	Typical Hole	0	293
ZZ66	Typical Hole	0	185
ZZ138	Typical Hole	0	404
ZZ91	Typical Hole	0	270
ZZ142	Typical Hole	0	452
ZZ88	Typical Hole	0	234
ZZ133	Typical Hole	0	344
ZZ94	Typical Hole	0	306
ZZ11	Typical Face Hole	0	184
ZZ117	Typical Hole	0	367
ZZ43	Typical Hole	0	477
ZZ26	Typical Hole	0	245
ZZ135	Typical Hole	0	368
ZZ76	Typical Hole	0	305
ZZ21	Typical Face Hole	0	136
ZZ98	Typical Hole	0	354
ZZ141	Typical Hole	0	440
ZZ18	Typical Face Hole	0	100
ZZ4	Typical Face Hole	0	268
ZZ106	Typical Hole	0	331
ZZ45	Typical Hole	0	501
ZZ62	Typical Hole	0	185
ZZ69	Typical Hole	0	221
ZZ95	Typical Hole	0	318
ZZ107	Typical Hole	0	319
ZZ100	Typical Hole	0	378
ZZ65	Typical Hole	0	173
ZZ40	Typical Hole	0	441
ZZ29	Typical Hole	0	428
ZZ39	Typical Hole	0	429
ZZ35	Typical Hole	0	429
ZZ10	Typical Face Hole	0	196
ZZ63	Typical Hole	0	173
ZZ128	Typical Hole	0	404
ZZ59	Typical Hole	0	221
ZZ32	Typical Hole	0	465
ZZ25	Typical Face Hole	0	184
ZZ38	Typical Hole	0	417

Hole	Load	Surface Delay	Deck 1 Delay
ZZ119	Typical Hole	0	391
ZZ46	Typical Hole	0	513
ZZ93	Typical Hole	0	294
ZZ82	Typical Hole	0	282
ZZ124	Typical Hole	0	451
ZZ130	Typical Hole	0	380
ZZ28	Typical Hole	0	367
ZZ49	Typical Hole	0	549
ZZ71	Typical Hole	0	245
ZZ77	Typical Hole	0	317
ZZ7	Typical Face Hole	0	232
ZZ17	Typical Face Hole	0	112
ZZ92	Typical Hole	0	282
ZZ70	Typical Hole	0	233
ZZ147	Typical Hole	0	512
ZZ14	Typical Face Hole	0	148
ZZ81	Typical Hole	0	294
ZZ109	Typical Hole	0	295
ZZ113	Typical Hole	0	319
ZZ74	Typical Hole	0	281
ZZ19	Typical Face Hole	0	112
ZZ15	Typical Face Hole	0	136
ZZ104	Typical Hole	0	355
ZZ13	Typical Face Hole	0	160
ZZ132	Typical Hole	0	356
ZZ48	Typical Hole	0	537
ZZ64	Typical Hole	0	161
ZZ67	Typical Hole	0	197
ZZ116	Typical Hole	0	355
ZZ89	Typical Hole	0	246
ZZ86	Typical Hole	0	234
ZZ30	Typical Hole	0	489
ZZ145	Typical Hole	0	488
ZZ105	Typical Hole	0	343
ZZ121	Typical Hole	0	415
ZZ111	Typical Hole	0	295
ZZ90	Typical Hole	0	258
ZZ60	Typical Hole	0	209
ZZ47	Typical Hole	0	525
ZZ22	Typical Face Hole	0	160


Typical Hole
Ø = 114.3 mm
0 m
5 m
10 m
[1.4 m] - Crushed Stone
[1.1 m] - Air
[6.1 m] - Hydromite
4100 Bulk NB
Wgt: 81.66 kg
[8.2 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
82.41 kg
Typical Face Hole
Ø = 114.3 mm
[2.0 m] - Crushed Stone
[1.1 m] - Air
[5.5 m] - Hydromite
4100 Bulk NB
Wgt: 73.5 kg
[8.2 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
74.25 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-06
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 06/30/2020 13:19
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

ENVIRONMENT

Method Used: U.T.M.
Weather: Clear
Wind From: E
Temperature: 28 °C
Terrain: Flat
Wind Velocity: 3-5 km/h
Blast U.T.M.: 17N 500054 mE 4942307 mN

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Road #17
Direction/Bearing: 4 °
Structure Type: Dwelling
Distance: 706 m
Structure U.T.M.: 17N 500101 mE 4943011 mN

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	847.6 m
No. of Holes:	103	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	3.05 m
No. of V.P.† Holes:	103	Face Height:	7.62 m	Spacing:	3.35 m	Stem Length:	1.83 m
No. of Rows:	5	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Center Start/ Breakout
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	5/8" Clear Stone	Method:	Specified (H = 7.62 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	310.8 kg	Volume Produced:	7,631.4 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	310.8 kg	Weight Produced:	18,318.4 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.294 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	77.7 kg	Powder Factor 2:	1.047 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	80.04	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	40.02		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
O'DONOHOE	LIAM, J			No	Yes	No	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

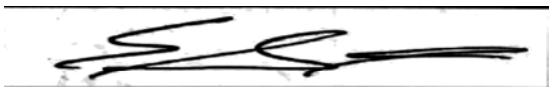
327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-06
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 06/30/2020 13:19
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	104.00	ea	78.00
15003	40' E*STAR Detonator - QM	104.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	7,910.00	kg	7,910.00
12981	Mini Stem Plug - 6015	104.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	1.00	ea	0.00
AB013	Labour Charge	6.00	hr	0.00
	Total Weight of Explosives (Include Primers) (kg):			7,988.00

COMMENTS / EXPLANATIONS



Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-06
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 06/30/2020 13:19
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type: Seismic Record
Seismograph Type: Instantel - Micromate
Date: 06/30/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:19
Calibration Date: 02/14/20
Distance From Blast: 705.61 m
Calibration Signal: OK
Direction From Blast: N
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location: Bolted to bedrock at the front of the property.
U.T.M.: 17N 500101 mE 4943011 mN
Reader and Firm: Evan Smart, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart, Austin Powder Ltd.

Transverse:	0.254 mm/s	0.0 Hz
Vertical:	0.254 mm/s	0.0 Hz
Longitudinal:	0.254 mm/s	0.0 Hz
Acoustic:	121 dB	--- Hz
Vector Sum:	0.311 mm/s	

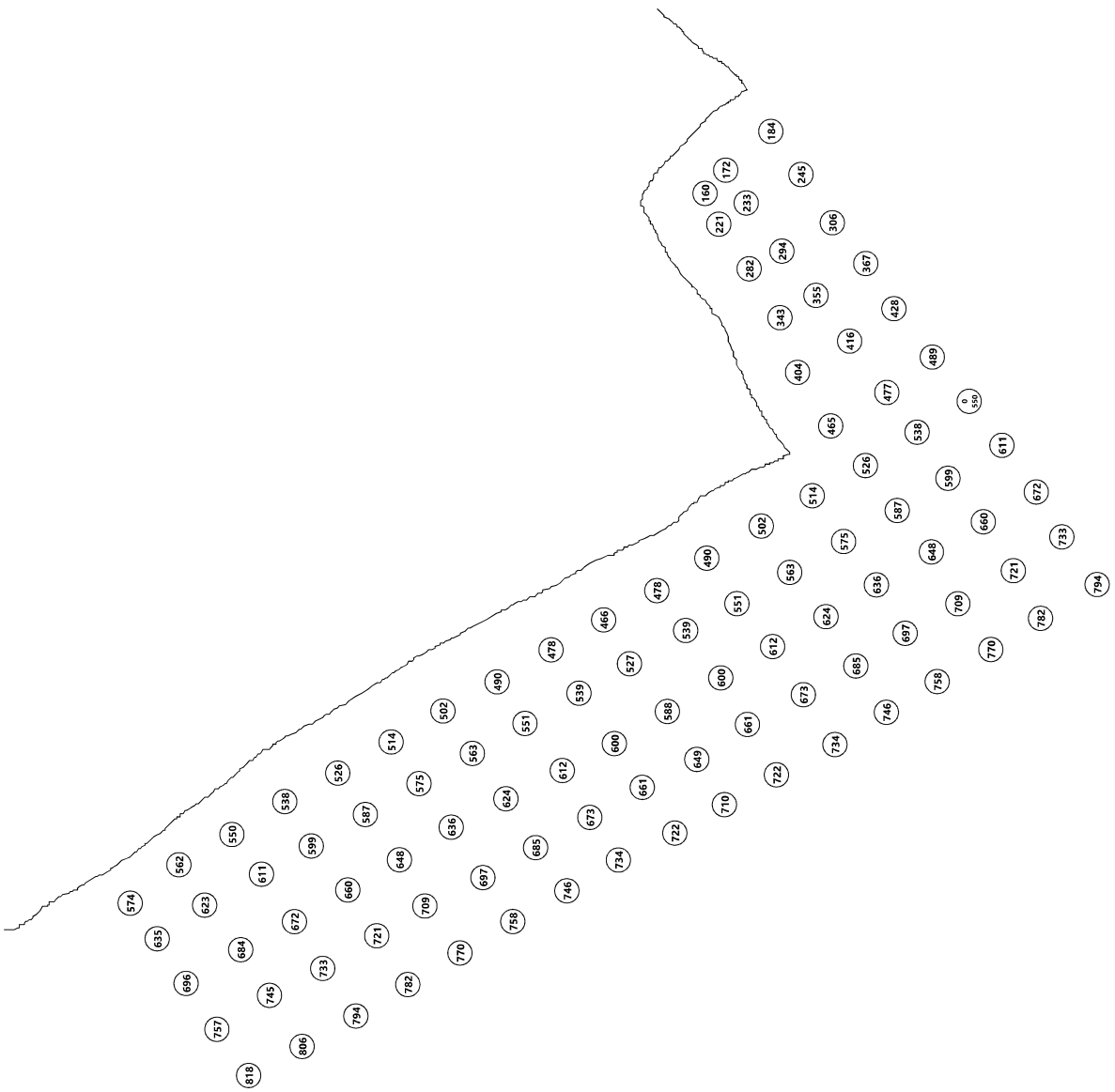
SEISMOGRAPH 2 - 178717 GREY RD #17

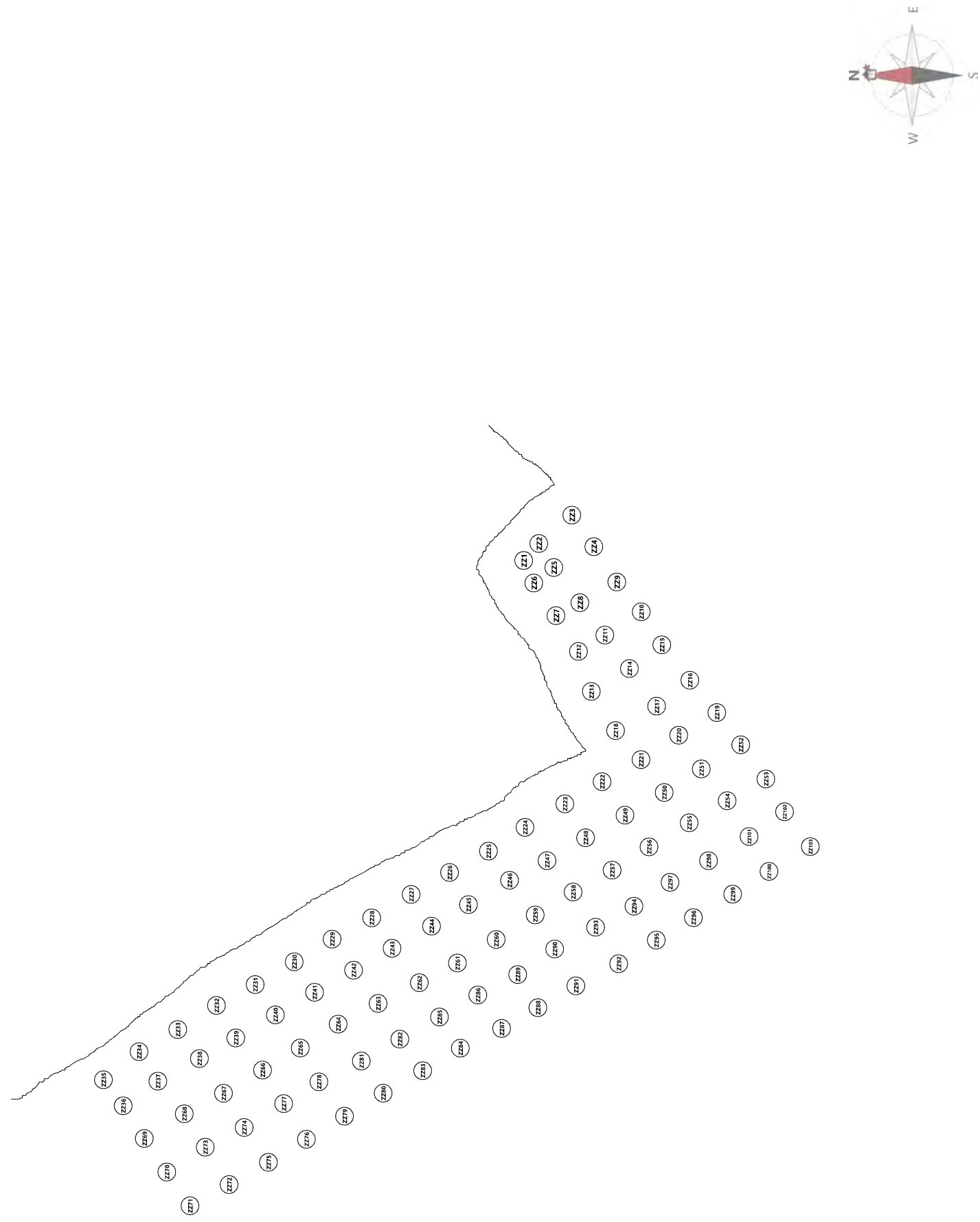
Data Type: No Trigger
Seismograph Type: Instantel - Micromate
Date: 06/30/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:19
Calibration Date: 02/14/20
Distance From Blast: 683.36 m
Calibration Signal: OK
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location: Spiked and buried.
U.T.M.: 17N 500660 mE 4941991 mN
Reader and Firm: Evan Smart, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart, Austin Powder Ltd.

SEISMOGRAPH 3 - 283197 CONC. RD. #10

Data Type: No Trigger
Seismograph Type: Instantel - Minimate Blaster
Date: 06/30/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:19
Calibration Date: 01/17/20
Distance From Blast: 1,136.29 m
Calibration Signal: OK
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location: Spiked and weight bagged beside the mail box.
U.T.M.: 17N 501117 mE 4941905 mN
Reader and Firm: Evan Smart, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart, Austin Powder Ltd.

Hole Label Mode: Cumulative In-Hole Delays

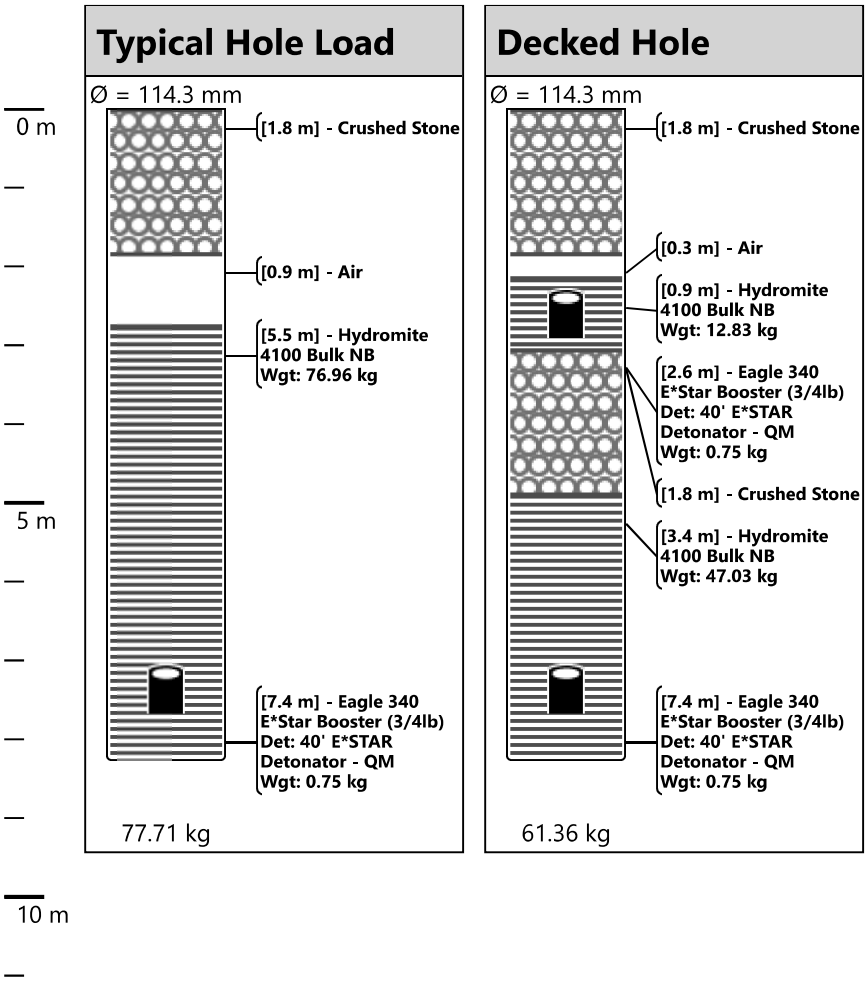



E
N
S
W
Hole Label Mode: Default (A1)

Hole	Load	Surface Delay	Deck 1 Delay
ZZ65	Typical Hole Load	0	648
ZZ73	Typical Hole Load	0	745
ZZ20	Typical Hole Load	0	538
ZZ79	Typical Hole Load	0	770
ZZ49	Typical Hole Load	0	575
ZZ24	Typical Hole Load	0	490
ZZ93	Typical Hole Load	0	673
ZZ90	Typical Hole Load	0	661
ZZ83	Typical Hole Load	0	746
ZZ37	Typical Hole Load	0	623
ZZ29	Typical Hole Load	0	502
ZZ44	Typical Hole Load	0	539
ZZ96	Typical Hole Load	0	758
ZZ52	Typical Hole Load	0	611
ZZ6	Typical Hole Load	0	221
ZZ99	Typical Hole Load	0	770
ZZ38	Typical Hole Load	0	611
ZZ80	Typical Hole Load	0	758
ZZ36	Typical Hole Load	0	635
ZZ59	Typical Hole Load	0	600
ZZ61	Typical Hole Load	0	600
ZZ48	Typical Hole Load	0	563
ZZ69	Typical Hole Load	0	696
ZZ3	Typical Hole Load	0	184
ZZ47	Typical Hole Load	0	551
ZZ77	Typical Hole Load	0	721
ZZ95	Typical Hole Load	0	746
ZZ8	Typical Hole Load	0	294
ZZ70	Typical Hole Load	0	757
ZZ35	Typical Hole Load	0	574
ZZ66	Typical Hole Load	0	660
ZZ39	Typical Hole Load	0	599
ZZ102	Typical Hole Load	0	733
ZZ82	Typical Hole Load	0	685
ZZ67	Typical Hole Load	0	672
ZZ74	Typical Hole Load	0	733
ZZ62	Typical Hole Load	0	612
ZZ43	Typical Hole Load	0	551
ZZ53	Typical Hole Load	0	672
ZZ2	Typical Hole Load	0	172
ZZ72	Typical Hole Load	0	806
ZZ86	Typical Hole Load	0	661
ZZ92	Typical Hole Load	0	734
ZZ57	Typical Hole Load	0	624
ZZ13	Typical Hole Load	0	404
ZZ27	Typical Hole Load	0	478

Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay
ZZ23	Typical Hole Load	0	502	
ZZ54	Typical Hole Load	0	660	
ZZ97	Typical Hole Load	0	697	
ZZ26	Typical Hole Load	0	466	
ZZ60	Typical Hole Load	0	588	
ZZ101	Typical Hole Load	0	721	
ZZ46	Typical Hole Load	0	539	
ZZ41	Typical Hole Load	0	575	
ZZ94	Typical Hole Load	0	685	
ZZ56	Typical Hole Load	0	636	
ZZ28	Typical Hole Load	0	490	
ZZ71	Typical Hole Load	0	818	
ZZ14	Typical Hole Load	0	416	
ZZ19	Decked Hole	0	550	0
ZZ33	Typical Hole Load	0	550	
ZZ91	Typical Hole Load	0	722	
ZZ58	Typical Hole Load	0	612	
ZZ40	Typical Hole Load	0	587	
ZZ42	Typical Hole Load	0	563	
ZZ11	Typical Hole Load	0	355	
ZZ16	Typical Hole Load	0	489	
ZZ64	Typical Hole Load	0	636	
ZZ100	Typical Hole Load	0	782	
ZZ45	Typical Hole Load	0	527	
ZZ51	Typical Hole Load	0	599	
ZZ88	Typical Hole Load	0	710	
ZZ21	Typical Hole Load	0	526	
ZZ85	Typical Hole Load	0	673	
ZZ34	Typical Hole Load	0	562	
ZZ12	Typical Hole Load	0	343	
ZZ89	Typical Hole Load	0	649	
ZZ78	Typical Hole Load	0	709	
ZZ9	Typical Hole Load	0	306	
ZZ31	Typical Hole Load	0	526	
ZZ98	Typical Hole Load	0	709	
ZZ63	Typical Hole Load	0	624	
ZZ25	Typical Hole Load	0	478	
ZZ22	Typical Hole Load	0	514	
ZZ1	Typical Hole Load	0	160	
ZZ103	Typical Hole Load	0	794	
ZZ87	Typical Hole Load	0	722	
ZZ5	Typical Hole Load	0	233	
ZZ84	Typical Hole Load	0	734	
ZZ30	Typical Hole Load	0	514	
ZZ75	Typical Hole Load	0	794	
ZZ7	Typical Hole Load	0	282	

Hole	Load	Surface Delay	Deck 1 Delay
ZZ32	Typical Hole Load	0	538
ZZ4	Typical Hole Load	0	245
ZZ18	Typical Hole Load	0	465
ZZ10	Typical Hole Load	0	367
ZZ68	Typical Hole Load	0	684
ZZ76	Typical Hole Load	0	782
ZZ15	Typical Hole Load	0	428
ZZ50	Typical Hole Load	0	587
ZZ17	Typical Hole Load	0	477
ZZ55	Typical Hole Load	0	648
ZZ81	Typical Hole Load	0	697


Typical Hole Load
Ø = 114.3 mm
[1.8 m] - Crushed Stone
[0.9 m] - Air
[5.5 m] - Hydromite 4100 Bulk NB Wgt: 76.96 kg
[7.4 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
77.71 kg
Decked Hole
Ø = 114.3 mm
[1.8 m] - Crushed Stone
[0.3 m] - Air
[0.9 m] - Hydromite 4100 Bulk NB Wgt: 12.83 kg
[2.6 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
[1.8 m] - Crushed Stone
[3.4 m] - Hydromite 4100 Bulk NB Wgt: 47.03 kg
[7.4 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
61.36 kg
0 m
5 m
10 m

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-07
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 07/09/2020 12:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

ENVIRONMENT

Method Used: U.T.M.
Weather: Clear
Wind From: S
Temperature: 37 °C
Terrain: Flat
Wind Velocity: 3-5 km/h
Blast U.T.M.: 17N 499005 mE 4942976 mN

NEAREST PROTECTED STRUCTURE

Compass Point: E
Structure Name: 178841 Grey Road #17
Direction/Bearing: 88 °
Structure Type: Dwelling
Distance: 1097 m
Structure U.T.M.: 17N 500101 mE 4943011 mN

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	921.7 m
No. of Holes:	112	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	3.05 m
No. of V.P.† Holes:	112	Face Height:	7.62 m	Spacing:	3.35 m	Stem Length:	min 1.37 m
No. of Rows:	3	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Center Start/ Breakout
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	5/8" Clear Stone	Method:	Specified (H = 7.62 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	293.1 kg	Volume Produced:	8,565.3 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	293.1 kg	Weight Produced:	20,560.0 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.484 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	74.2 kg	Powder Factor 2:	0.966 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	127.33	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	64.06		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
KLINGSPOR	DAVID, A			No	Yes	Yes	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

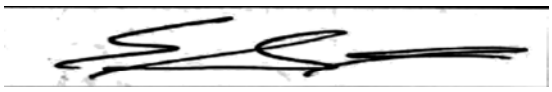
327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-07
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 07/09/2020 12:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	113.00 ea	84.75
15003	40' E*STAR Detonator - QM	113.00 ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00 sp	0.00
15128	Hydromite 4100 Bulk NB	8,120.00 kg	8,120.00
12981	Mini Stem Plug - 6015	113.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	6.00 hr	0.00
	Total Weight of Explosives (Include Primers) (kg):		8,204.75

COMMENTS / EXPLANATIONS



Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-07
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 07/09/2020 12:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type: Seismic Record
Seismograph Type: Instantel - Micromate
Date: 07/09/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 12:58
Calibration Date: 02/14/20
Distance From Blast: 1,096.67 m
Calibration Signal: OK
Direction From Blast: E
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location: Bolted to bedrock at the front of the property.
U.T.M.: 17N 500101 mE 4943011 mN
Reader and Firm: Evan Smart, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart, Austin Powder Ltd.

Transverse:	0.127 mm/s	28.4 Hz
Vertical:	0.26 mm/s	0.0 Hz
Longitudinal:	0.292 mm/s	0.0 Hz
Acoustic:	115 dB	--- Hz
Vector Sum:	0.333 mm/s	

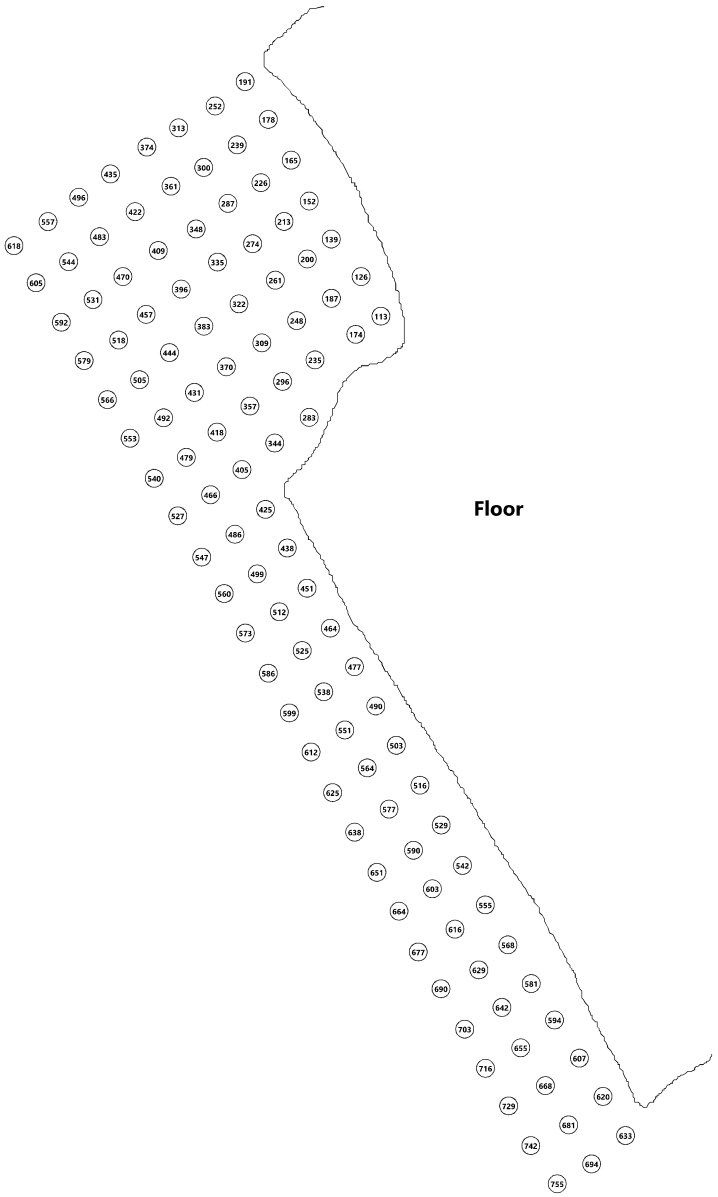
SEISMOGRAPH 2 - 178717 GREY RD #17

Data Type: No Trigger
Seismograph Type: Instantel - Micromate
Date: 07/09/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 12:58
Calibration Date: 02/14/20
Distance From Blast: 1,926.03 m
Calibration Signal: OK
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location: Spiked and buried.
U.T.M.: 17N 500660 mE 4941991 mN
Reader and Firm: Evan Smart, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart, Austin Powder Ltd.

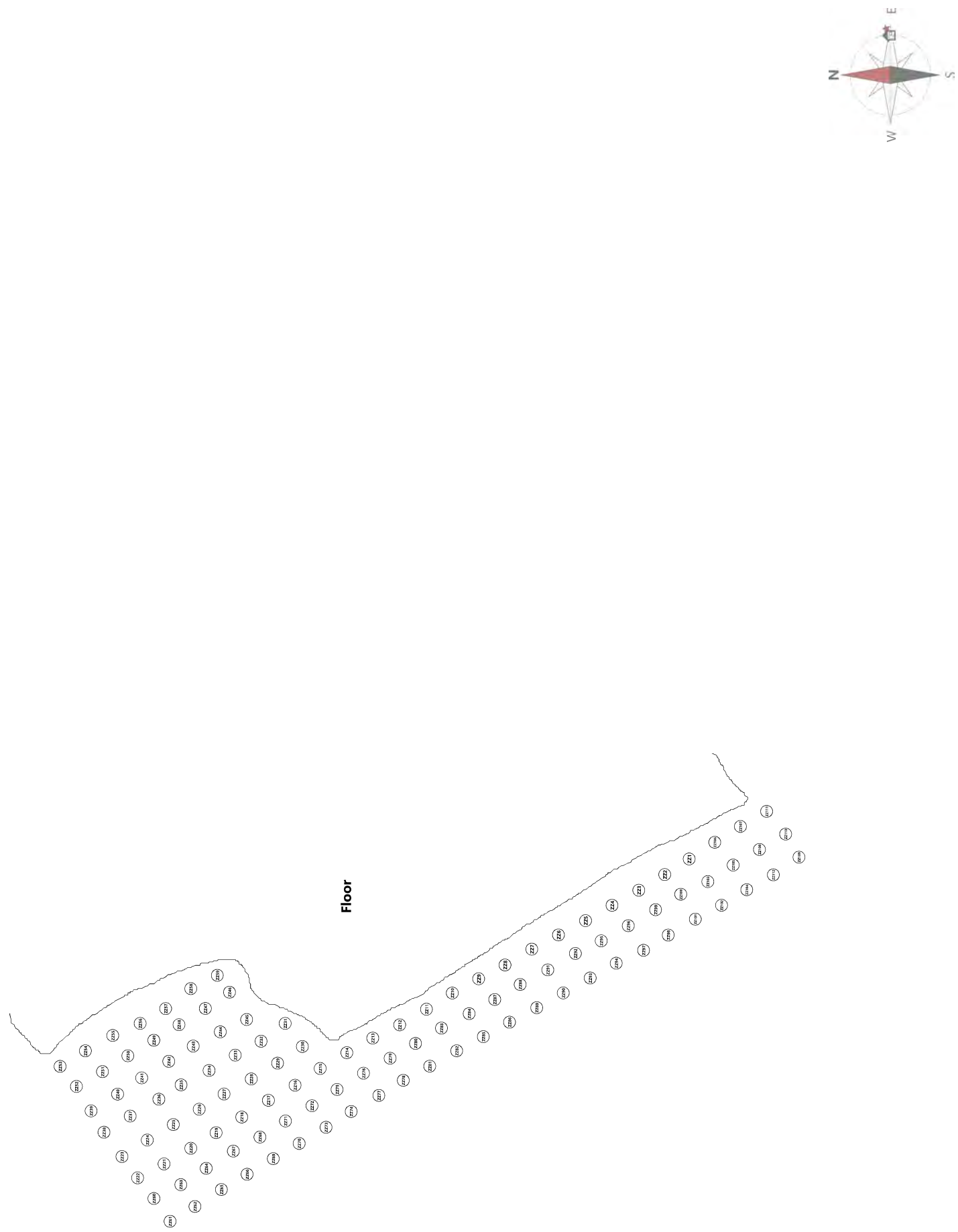
SEISMOGRAPH 3 - 283197 CONC. RD. #10

Data Type: No Trigger
Seismograph Type: Instantel - Minimate Blaster
Date: 07/09/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 12:58
Calibration Date: 01/17/20
Distance From Blast: 2,367.99 m
Calibration Signal: OK
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location: Spiked and weight bagged beside the mail box.
U.T.M.: 17N 501117 mE 4941905 mN
Reader and Firm: Evan Smart, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart, Austin Powder Ltd.

Hole Label Mode: Cumulative In-Hole Delays



Floor

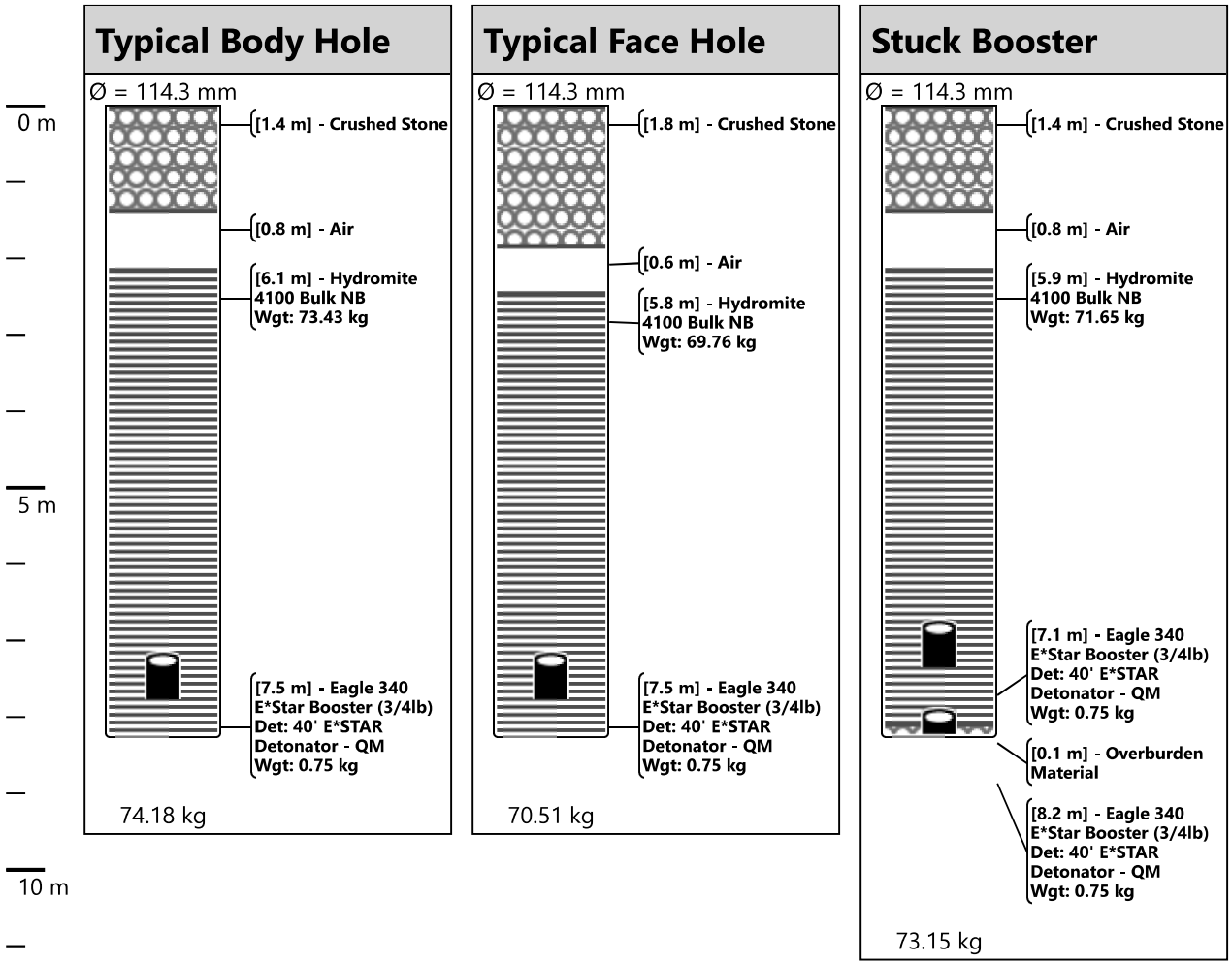


Hole Label Mode: Default (A1)

Hole	Load	Surface Delay	Deck 1 Delay
ZZ53	Typical Face Hole	0	191
ZZ6	Typical Face Hole	0	529
ZZ39	Typical Body Hole	0	313
ZZ61	Typical Body Hole	0	618
ZZ109	Typical Body Hole	0	755
ZZ35	Typical Body Hole	0	335
ZZ111	Typical Face Hole	0	633
ZZ4	Typical Face Hole	0	555
ZZ66	Typical Body Hole	0	579
ZZ95	Typical Body Hole	0	603
ZZ86	Typical Body Hole	0	612
ZZ94	Typical Body Hole	0	664
ZZ59	Typical Face Hole	0	113
ZZ63	Typical Body Hole	0	544
ZZ112	Typical Body Hole	0	742
ZZ8	Typical Face Hole	0	503
ZZ75	Typical Body Hole	0	466
ZZ3	Typical Face Hole	0	568
ZZ76	Typical Body Hole	0	486
ZZ44	Typical Body Hole	0	248
ZZ90	Typical Body Hole	0	638
ZZ15	Typical Body Hole	0	405
ZZ102	Typical Body Hole	0	716
ZZ18	Typical Body Hole	0	444
ZZ45	Typical Face Hole	0	235
ZZ34	Typical Body Hole	0	322
ZZ54	Typical Face Hole	0	178
ZZ68	Typical Body Hole	0	505
ZZ103	Typical Body Hole	0	655
ZZ19	Typical Body Hole	0	457
ZZ87	Typical Body Hole	0	551
ZZ52	Typical Body Hole	0	252
ZZ96	Typical Body Hole	0	616
ZZ70	Typical Body Hole	0	553
ZZ106	Typical Face Hole	0	607
ZZ51	Typical Body Hole	0	239
ZZ13	Typical Face Hole	0	438
ZZ99	Typical Body Hole	0	629
ZZ42	Typical Body Hole	0	274
ZZ37	Typical Body Hole	0	361
ZZ28	Typical Body Hole	0	370
ZZ38	Typical Body Hole	0	374
ZZ27	Typical Body Hole	0	383
ZZ57	Typical Face Hole	0	139
ZZ79	Typical Body Hole	0	499
ZZ10	Typical Face Hole	0	477

Hole	Load	Surface Delay	Deck 1 Delay
ZZ50	Typical Body Hole	0	226
ZZ48	Typical Body Hole	0	200
ZZ105	Typical Body Hole	0	668
ZZ55	Typical Face Hole	0	165
ZZ30	Typical Face Hole	0	344
ZZ49	Typical Body Hole	0	213
ZZ85	Typical Body Hole	0	599
ZZ5	Typical Face Hole	0	542
ZZ31	Typical Face Hole	0	283
ZZ11	Typical Face Hole	0	464
ZZ26	Typical Body Hole	0	396
ZZ84	Typical Body Hole	0	538
ZZ80	Typical Body Hole	0	512
ZZ29	Typical Body Hole	0	357
ZZ73	Typical Body Hole	0	540
ZZ101	Typical Body Hole	0	703
ZZ24	Typical Body Hole	0	422
ZZ43	Typical Body Hole	0	261
ZZ14	Typical Face Hole	0	425
ZZ78	Typical Body Hole	0	560
ZZ97	Typical Body Hole	0	677
ZZ110	Typical Body Hole	0	694
ZZ67	Typical Body Hole	0	518
ZZ60	Typical Body Hole	0	557
ZZ69	Typical Body Hole	0	566
ZZ71	Typical Body Hole	0	492
ZZ62	Typical Body Hole	0	605
ZZ33	Typical Body Hole	0	309
ZZ46	Typical Face Hole	0	174
ZZ72	Typical Body Hole	0	479
ZZ65	Typical Body Hole	0	592
ZZ41	Typical Body Hole	0	287
ZZ108	Typical Body Hole	0	681
ZZ36	Typical Body Hole	0	348
ZZ56	Typical Face Hole	0	152
ZZ23	Typical Body Hole	0	435
ZZ7	Typical Face Hole	0	516
ZZ22	Typical Body Hole	0	496
ZZ89	Typical Body Hole	0	625
ZZ9	Typical Face Hole	0	490
ZZ16	Typical Body Hole	0	418
ZZ64	Typical Body Hole	0	531
ZZ93	Typical Body Hole	0	651
ZZ12	Typical Face Hole	0	451
ZZ92	Stuck Booster	0	590
ZZ104	Typical Body Hole	0	729

Hole	Load	Surface Delay	Deck 1 Delay
ZZ58	Typical Face Hole	0	126
ZZ77	Typical Body Hole	0	547
ZZ74	Typical Body Hole	0	527
ZZ40	Typical Body Hole	0	300
ZZ1	Typical Face Hole	0	594
ZZ88	Typical Body Hole	0	564
ZZ107	Typical Face Hole	0	620
ZZ91	Typical Body Hole	0	577
ZZ20	Typical Body Hole	0	470
ZZ17	Typical Body Hole	0	431
ZZ81	Typical Body Hole	0	573
ZZ82	Typical Body Hole	0	586
ZZ25	Typical Body Hole	0	409
ZZ47	Typical Body Hole	0	187
ZZ32	Typical Body Hole	0	296
ZZ98	Typical Body Hole	0	690
ZZ21	Typical Body Hole	0	483
ZZ2	Typical Face Hole	0	581
ZZ100	Typical Body Hole	0	642
ZZ83	Typical Body Hole	0	525


Typical Body Hole
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[0.8 m] - Air
[6.1 m] - Hydromite 4100 Bulk NB Wgt: 73.43 kg
[7.5 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
74.18 kg
Typical Face Hole
Ø = 114.3 mm
[1.8 m] - Crushed Stone
[0.6 m] - Air
[5.8 m] - Hydromite 4100 Bulk NB Wgt: 69.76 kg
[7.5 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
70.51 kg
Stuck Booster
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[0.8 m] - Air
[5.9 m] - Hydromite 4100 Bulk NB Wgt: 71.65 kg
[7.1 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
[0.1 m] - Overburden Material
[8.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
73.15 kg
0 m
5 m
10 m

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-08
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 07/31/2020 13:39
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

ENVIRONMENT

Method Used: U.T.M.
Weather: Clear
Wind From: WSW
Temperature: 25 °C
Terrain: Flat
Wind Velocity: 5-8 km/h
Blast U.T.M.: 17N 500066 mE 4942281 mN

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 3 °
Structure Type: Dwelling
Distance: 729 m
Structure U.T.M.: 17N 500105 mE 4943009 mN

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	1,028.7 m
No. of Holes:	125	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	1.52 m
No. of V.P.† Holes:	125	Face Height:	7.62 m	Spacing:	3.35 m	Stem Length:	1.37 m
No. of Rows:	5	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Center Start/ Breakout
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 7.62 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	313.1 kg	Volume Produced:	9,344.5 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	313.1 kg	Weight Produced:	22,430.6 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.292 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	79.0 kg	Powder Factor 2:	1.047 kg/m³
Mfg and Model:	DBM1600-2-KC	Scaled Distance Factor (max charge):	81.98	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	41.19		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
SMART	EVAN, C			No	Yes	Yes	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-08
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 07/31/2020 13:39
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	128.00	ea	96.00
15003	40' E*STAR Detonator - QM	128.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	9,690.00	kg	9,690.00
12981	Mini Stem Plug - 6015	125.00	ea	0.00
	Total Weight of Explosives (Include Primers) (kg):			9,786.00

COMMENTS / EXPLANATIONS

General Comments: Imported on 7/31/2020 5:27:42 PM

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-08
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 07/31/2020 13:39
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type: No Trigger
Seismograph Type: Instantel
Date: 07/31/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:39
Calibration Date: 01/17/20
Distance From Blast: 661.11 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location:
U.T.M.: 17N 500660 mE 4941991 mN
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart

SEISMOGRAPH 2 - 178841 GREY RD. 17

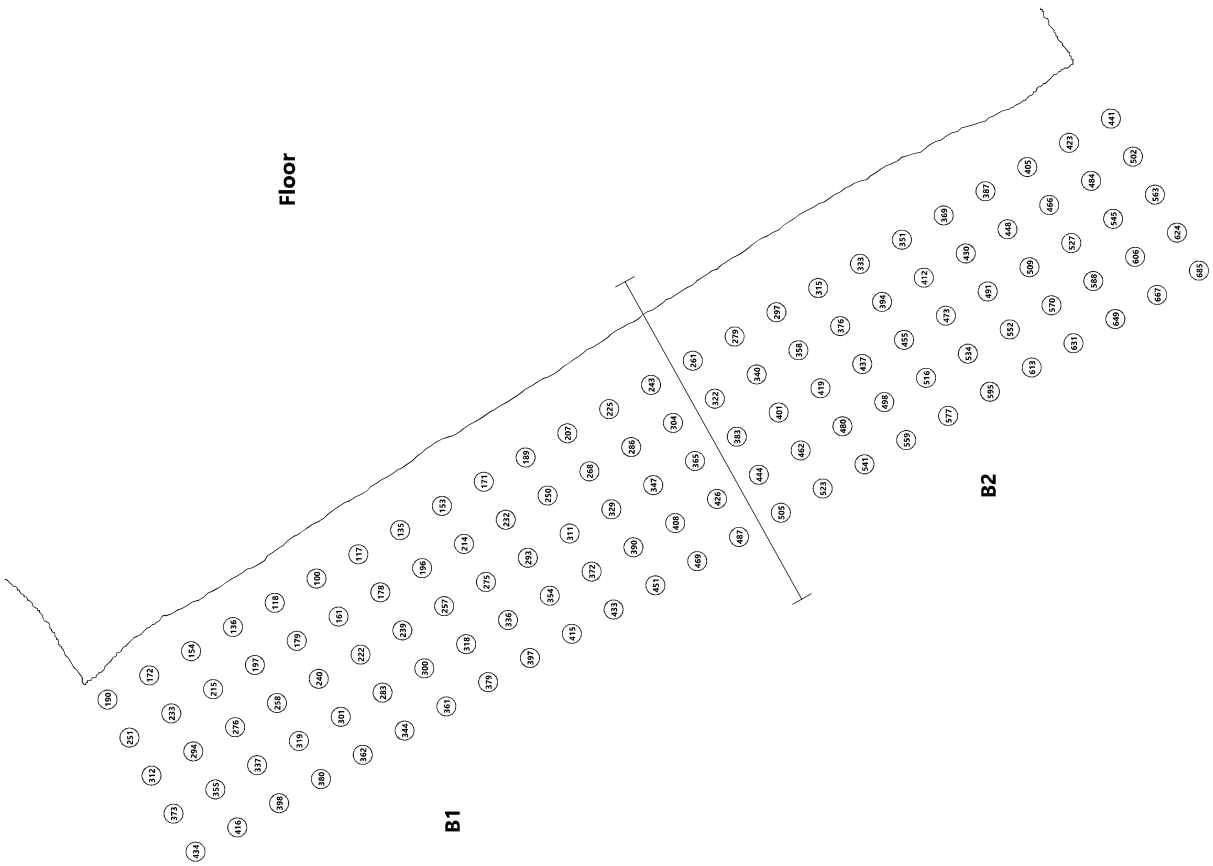
Data Type: Seismic Record
Seismograph Type: Instantel
Date: 07/31/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:39
Calibration Date: 01/17/20
Distance From Blast: 730.30 m
Calibration Signal: ok
Direction From Blast: N
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
U.T.M.: 17N 500101 mE 4943011 mN
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart

Transverse:	0.063 mm/s	57.0 Hz
Vertical:	0.111 mm/s	12.0 Hz
Longitudinal:	0.079 mm/s	39.0 Hz
Acoustic:	116 dB	--- Hz
Vector Sum:	0.117 mm/s	

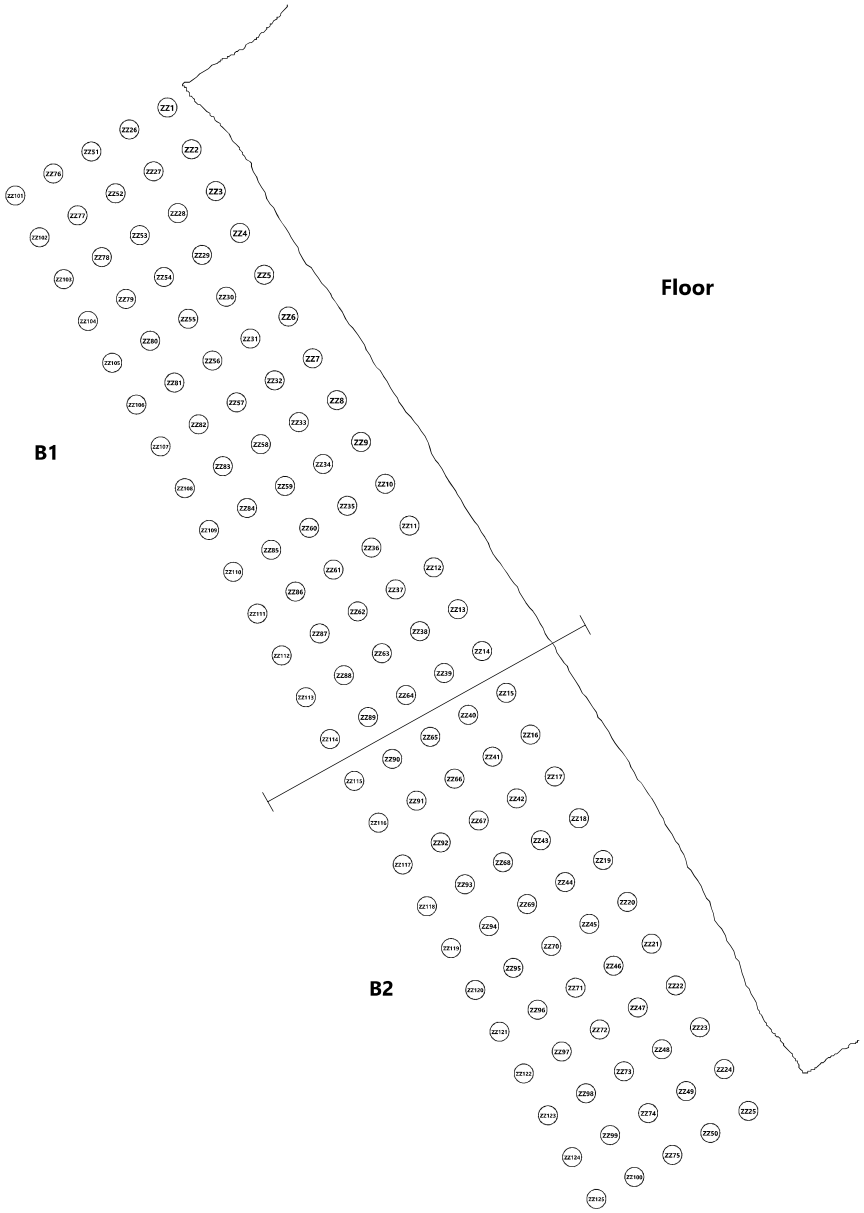
SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type: No Trigger
Seismograph Type: Instantel
Date: 07/31/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:39
Calibration Date: 01/17/20
Distance From Blast: 1,116.18 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location:
U.T.M.: 17N 501117 mE 4941905 mN
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Evan Smart

Hole Label Mode: Cumulative In-Hole Delays



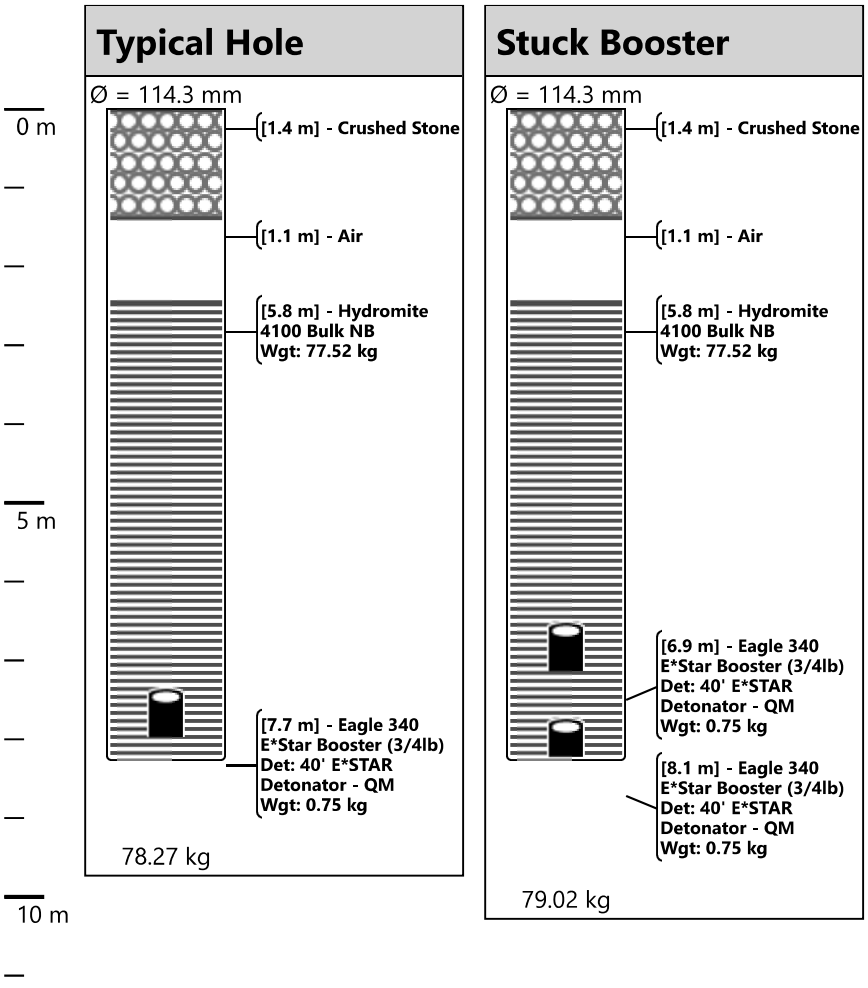
Hole Label Mode: Default (A1)



Hole	Load	Surface Delay	Deck 1 Delay
ZZ15	Typical Hole	0	261
ZZ69	Typical Hole	0	455
ZZ42	Typical Hole	0	358
ZZ61	Typical Hole	0	311
ZZ7	Typical Hole	0	117
ZZ89	Typical Hole	0	426
ZZ118	Typical Hole	0	559
ZZ93	Typical Hole	0	498
ZZ11	Typical Hole	0	189
ZZ111	Typical Hole	0	433
ZZ30	Typical Hole	0	179
ZZ97	Typical Hole	0	570
ZZ116	Typical Hole	0	523
ZZ75	Typical Hole	0	563
ZZ18	Typical Hole	0	315
ZZ68	Typical Hole	0	437
ZZ79	Typical Hole	0	319
ZZ64	Typical Hole	0	365
ZZ32	Typical Hole	0	178
ZZ8	Typical Hole	0	135
ZZ104	Typical Hole	0	380
ZZ58	Typical Hole	0	257
ZZ12	Typical Hole	0	207
ZZ10	Typical Hole	0	171
ZZ85	Typical Hole	0	354
ZZ25	Typical Hole	0	441
ZZ121	Typical Hole	0	613
ZZ20	Typical Hole	0	351
ZZ88	Typical Hole	0	408
ZZ70	Typical Hole	0	473
ZZ55	Typical Hole	0	240
ZZ3	Typical Hole	0	154
ZZ83	Typical Hole	0	318
ZZ114	Typical Hole	0	487
ZZ125	Typical Hole	0	685
ZZ102	Typical Hole	0	416
ZZ124	Typical Hole	0	667
ZZ33	Typical Hole	0	196
ZZ76	Typical Hole	0	373
ZZ110	Typical Hole	0	415
ZZ21	Typical Hole	0	369
ZZ28	Typical Hole	0	215
ZZ94	Typical Hole	0	516
ZZ1	Typical Hole	0	190
ZZ119	Typical Hole	0	577
ZZ23	Typical Hole	0	405

Hole	Load	Surface Delay	Deck 1 Delay
ZZ77	Typical Hole	0	355
ZZ40	Typical Hole	0	322
ZZ56	Stuck Booster	0	222
ZZ63	Typical Hole	0	347
ZZ2	Typical Hole	0	172
ZZ113	Typical Hole	0	469
ZZ39	Typical Hole	0	304
ZZ60	Typical Hole	0	293
ZZ81	Typical Hole	0	283
ZZ9	Typical Hole	0	153
ZZ45	Typical Hole	0	412
ZZ78	Typical Hole	0	337
ZZ38	Typical Hole	0	286
ZZ51	Typical Hole	0	312
ZZ41	Typical Hole	0	340
ZZ80	Typical Hole	0	301
ZZ54	Typical Hole	0	258
ZZ50	Typical Hole	0	502
ZZ86	Typical Hole	0	372
ZZ16	Typical Hole	0	279
ZZ115	Typical Hole	0	505
ZZ14	Typical Hole	0	243
ZZ34	Typical Hole	0	214
ZZ107	Typical Hole	0	361
ZZ108	Typical Hole	0	379
ZZ4	Stuck Booster	0	136
ZZ65	Typical Hole	0	383
ZZ6	Typical Hole	0	100
ZZ22	Typical Hole	0	387
ZZ106	Typical Hole	0	344
ZZ117	Typical Hole	0	541
ZZ36	Typical Hole	0	250
ZZ91	Typical Hole	0	462
ZZ52	Typical Hole	0	294
ZZ57	Typical Hole	0	239
ZZ19	Typical Hole	0	333
ZZ43	Typical Hole	0	376
ZZ48	Typical Hole	0	466
ZZ13	Typical Hole	0	225
ZZ26	Stuck Booster	0	251
ZZ24	Typical Hole	0	423
ZZ66	Typical Hole	0	401
ZZ82	Typical Hole	0	300
ZZ29	Typical Hole	0	197
ZZ67	Typical Hole	0	419
ZZ95	Typical Hole	0	534

Hole	Load	Surface Delay	Deck 1 Delay
ZZ62	Typical Hole	0	329
ZZ92	Typical Hole	0	480
ZZ37	Typical Hole	0	268
ZZ109	Typical Hole	0	397
ZZ46	Typical Hole	0	430
ZZ99	Typical Hole	0	606
ZZ59	Typical Hole	0	275
ZZ100	Typical Hole	0	624
ZZ47	Typical Hole	0	448
ZZ44	Typical Hole	0	394
ZZ53	Typical Hole	0	276
ZZ31	Typical Hole	0	161
ZZ96	Typical Hole	0	552
ZZ105	Typical Hole	0	362
ZZ112	Typical Hole	0	451
ZZ90	Typical Hole	0	444
ZZ49	Typical Hole	0	484
ZZ17	Typical Hole	0	297
ZZ73	Typical Hole	0	527
ZZ74	Typical Hole	0	545
ZZ87	Typical Hole	0	390
ZZ71	Typical Hole	0	491
ZZ101	Typical Hole	0	434
ZZ120	Typical Hole	0	595
ZZ5	Typical Hole	0	118
ZZ98	Typical Hole	0	588
ZZ122	Typical Hole	0	631
ZZ72	Typical Hole	0	509
ZZ27	Typical Hole	0	233
ZZ103	Typical Hole	0	398
ZZ35	Typical Hole	0	232
ZZ123	Typical Hole	0	649
ZZ84	Typical Hole	0	336


Typical Hole
Ø = 114.3 mm
0 m
5 m
10 m
[1.4 m] - Crushed Stone
[1.1 m] - Air
[5.8 m] - Hydromite 4100 Bulk NB Wgt: 77.52 kg
[7.7 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
78.27 kg
Stuck Booster
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[1.1 m] - Air
[5.8 m] - Hydromite 4100 Bulk NB Wgt: 77.52 kg
[6.9 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
[8.1 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
79.02 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-09
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 08/14/2020 13:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

ENVIRONMENT

Method Used: U.T.M.
Weather: Clear
Wind From: WSW
Temperature: 31 °C
Terrain: Flat
Wind Velocity: 5-8 km/h
Blast U.T.M.: 17N 500095 mE 4942299 mN

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 1 °
Structure Type: Dwelling
Distance: 710 m
Structure U.T.M.: 17N 500105 mE 4943009 mN

LAYOUT

		Hole Depth:	3.05-8.53 m	Material Blasted:	Limestone	Total Meters Drilled:	1,086.3 m
No. of Holes:	135	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	max 1.83 m
No. of V.P.† Holes:	135	Face Height:	2.44-7.92 m	Spacing:	3.35 m	Stem Length:	min 2.13 m
No. of Rows:	5	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	63.5 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 7.92 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	271.5 kg	Volume Produced:	10,933.1 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	271.5 kg	Weight Produced:	26,243.9 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	3.122 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	68.6 kg	Powder Factor 2:	0.769 kg/m³
Mfg and Model:	DBM1600-2-KC	Scaled Distance Factor (max charge):	85.74	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	43.10		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BRAGAN	COREY, T			No	Yes	No	No	No
FRALICK	CRAIG, A			No	No	No	No	No
SMART	EVAN, C			No	Yes	Yes	No	No
WELLS	ZACHARY, N			No	Yes	Yes	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-09
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 08/14/2020 13:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	138.00 ea	103.50
15003	40' E*STAR Detonator - QM	138.00 ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00 sp	0.00
15128	Hydromite 4100 Bulk NB	8,300.00 kg	8,300.00
12981	Mini Stem Plug - 6015	138.00 ea	0.00
	Total Weight of Explosives (Include Primers) (kg):		8,403.50

COMMENTS / EXPLANATIONS

General Comments: Imported on 8/14/2020 5:48:35 PM

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-09 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 08/14/2020 13:58 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location: Top Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	08/14/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.048 mm/s	73.0 Hz
Time:	13:58	Calibration Date:	01/17/20		Vertical:	0.143 mm/s	10.0 Hz
Distance From Blast:	643.43 m	Calibration Signal:	ok		Longitudinal:	0.143 mm/s	14.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	116 dB	--- Hz
Location:					Vector Sum:	0.181 mm/s	
U.T.M.:	17N 500660 mE 4941991 mN						
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

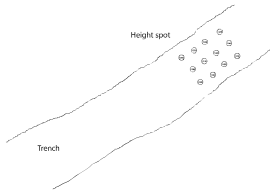
SEISMOGRAPH 2 - 178841 GREY RD. 17

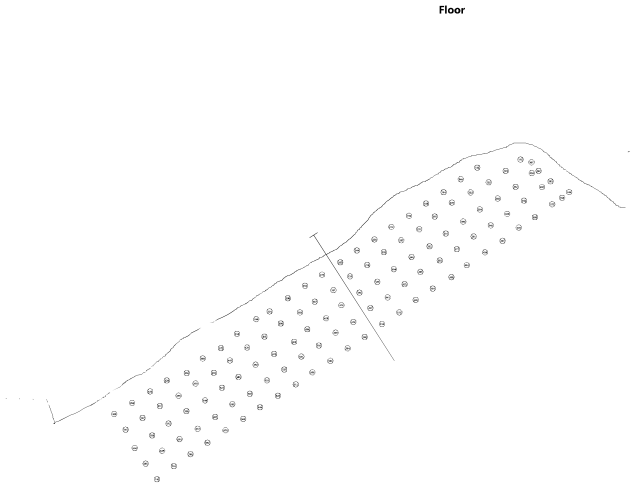
Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	08/14/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	100.0 Hz
Time:	13:58	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	100.0 Hz
Distance From Blast:	712.01 m	Calibration Signal:	ok		Longitudinal:	0.254 mm/s	100.0 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	117 dB	--- Hz
Location:					Vector Sum:	0.311 mm/s	
U.T.M.:	17N 500101 mE 4943011 mN						
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

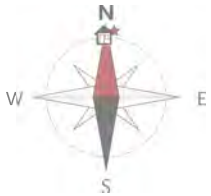
SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	08/14/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.381 mm/s	15.0 Hz
Time:	13:58	Calibration Date:	01/17/20		Vertical:	0.381 mm/s	85.0 Hz
Distance From Blast:	1,095.45 m	Calibration Signal:	ok		Longitudinal:	0.381 mm/s	10.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	117 dB	--- Hz
Location:					Vector Sum:	0.596 mm/s	
U.T.M.:	17N 501117 mE 4941905 mN						
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

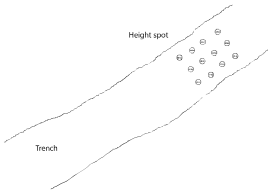
Hole Label Mode: Cumulative In-Hole Delays



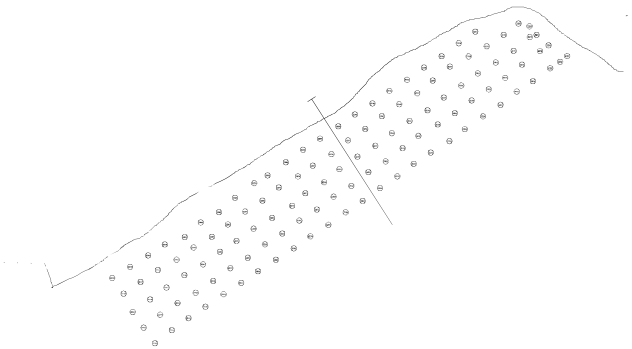


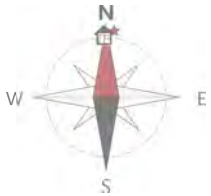


Hole Label Mode: Default (A1)



Floor

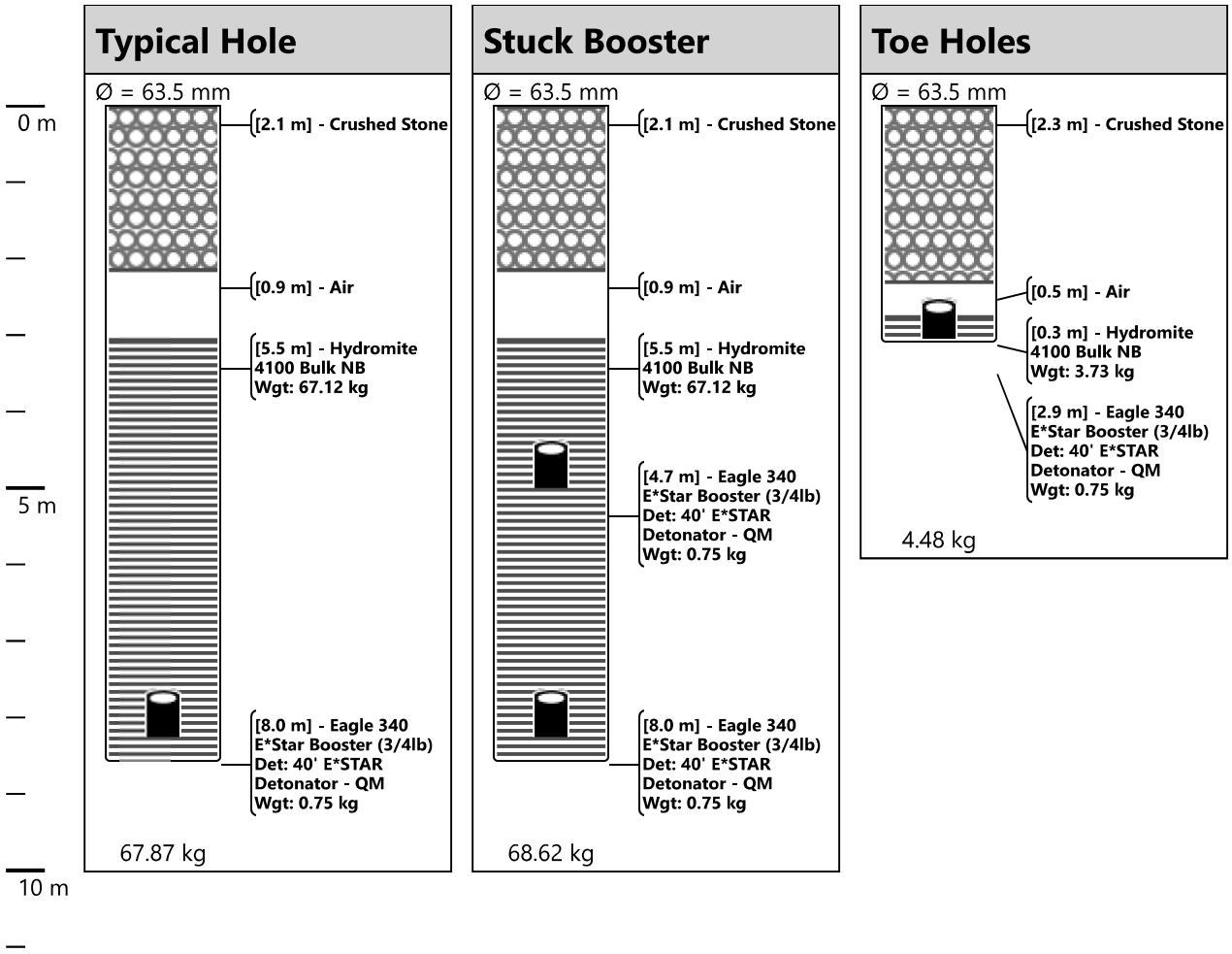




Hole	Load	Surface Delay	Deck 1 Delay
ZZ32	Typical Hole	0	377
ZZ65	Typical Hole	0	489
ZZ99	Typical Hole	0	404
ZZ47	Typical Hole	0	303
ZZ53	Typical Hole	0	516
ZZ108	Typical Hole	0	420
ZZ55	Typical Hole	0	457
ZZ111	Typical Hole	0	572
ZZ60	Typical Hole	0	351
ZZ71	Typical Hole	0	444
ZZ7	Typical Hole	0	236
ZZ69	Typical Hole	0	308
ZZ101	Typical Hole	0	540
ZZ84	Typical Hole	0	628
ZZ4	Typical Hole	0	283
ZZ114	Typical Hole	0	724
ZZ63	Typical Hole	0	548
ZZ80	Typical Hole	0	415
ZZ11	Typical Hole	0	252
ZZ25	Typical Hole	0	361
ZZ20	Typical Hole	0	223
ZZ78	Typical Hole	0	324
ZZ116	Typical Hole	0	588
ZZ43	Typical Hole	0	484
ZZ45	Typical Hole	0	425
ZZ30	Typical Hole	0	255
ZZ125	Toe Holes	0	1460
ZZ26	Typical Hole	0	300
ZZ37	Typical Hole	0	271
ZZ29	Typical Hole	0	180
ZZ115	Typical Hole	0	649
ZZ44	Typical Hole	0	500
ZZ127	Toe Holes	0	1380
ZZ28	Typical Hole	0	164
ZZ106	Typical Hole	0	556
ZZ130	Toe Holes	0	1360
ZZ66	Typical Hole	0	428
ZZ18	Typical Hole	0	132
ZZ98	Typical Hole	0	388
ZZ135	Toe Holes	0	1300
ZZ2	Typical Hole	0	358
ZZ64	Typical Hole	0	564
ZZ117	Typical Hole	0	527
ZZ58	Typical Hole	0	260
ZZ16	Typical Hole	0	268
ZZ104	Typical Hole	0	692

Hole	Load	Surface Delay	Deck 1 Delay
ZZ103	Typical Hole	0	676
ZZ8	Typical Hole	0	161
ZZ131	Toe Holes	0	1340
ZZ87	Typical Hole	0	431
ZZ102	Typical Hole	0	601
ZZ54	Typical Hole	0	532
ZZ92	Typical Hole	0	569
ZZ41	Typical Hole	0	348
ZZ81	Typical Hole	0	476
ZZ132	Toe Holes	0	1320
ZZ109	Typical Hole	0	436
ZZ129	Toe Holes	0	1420
ZZ51	Typical Hole	0	380
ZZ120	Typical Hole	0	543
ZZ128	Toe Holes	0	1400
ZZ24	Typical Hole	0	436
ZZ91	Typical Hole	0	508
ZZ96	Typical Hole	0	524
ZZ6	Typical Hole	0	222
ZZ88	Typical Hole	0	356
ZZ50	Typical Hole	0	319
ZZ86	Typical Hole	0	492
ZZ17	Typical Hole	0	207
ZZ5	Typical Hole	0	297
ZZ90	Stuck Booster	0	447
ZZ82	Typical Hole	0	537
ZZ79	Typical Hole	0	340
ZZ14	Typical Hole	0	404
ZZ15	Typical Hole	0	329
ZZ9	Typical Hole	0	175
ZZ93	Typical Hole	0	644
ZZ89	Stuck Booster	0	372
ZZ3	Typical Hole	0	372
ZZ68	Typical Hole	0	292
ZZ118	Typical Hole	0	452
ZZ56	Typical Hole	0	396
ZZ19	Typical Hole	0	148
ZZ59	Typical Hole	0	276
ZZ97	Typical Hole	0	463
ZZ95	Typical Hole	0	585
ZZ33	Typical Hole	0	452
ZZ23	Typical Hole	0	420
ZZ77	Typical Hole	0	399
ZZ126	Toe Holes	0	1440
ZZ124	Toe Holes	0	1480
ZZ48	Typical Hole	0	228

Hole	Load	Surface Delay	Deck 1 Delay
ZZ83	Typical Hole	0	612
ZZ27	Typical Hole	0	239
ZZ74	Typical Hole	0	596
ZZ100	Typical Hole	0	479
ZZ46	Typical Hole	0	364
ZZ112	Typical Hole	0	633
ZZ113	Typical Hole	0	708
ZZ13	Typical Hole	0	388
ZZ73	Typical Hole	0	580
ZZ107	Typical Hole	0	495
ZZ39	Typical Hole	0	212
ZZ105	Typical Hole	0	617
ZZ57	Typical Hole	0	335
ZZ35	Typical Hole	0	393
ZZ10	Typical Hole	0	191
ZZ31	Typical Hole	0	316
ZZ42	Typical Hole	0	409
ZZ36	Typical Hole	0	332
ZZ122	Typical Hole	0	665
ZZ110	Typical Hole	0	511
ZZ67	Typical Hole	0	367
ZZ70	Typical Hole	0	383
ZZ12	Typical Hole	0	313
ZZ22	Typical Hole	0	345
ZZ40	Typical Hole	0	287
ZZ121	Typical Hole	0	604
ZZ1	Typical Hole	0	344
ZZ49	Typical Hole	0	244
ZZ34	Typical Hole	0	468
ZZ133	Toe Holes	0	1260
ZZ72	Typical Hole	0	505
ZZ75	Typical Hole	0	521
ZZ119	Stuck Booster	0	468
ZZ76	Typical Hole	0	460
ZZ134	Toe Holes	0	1280
ZZ94	Typical Hole	0	660
ZZ21	Typical Hole	0	284
ZZ123	Typical Hole	0	740
ZZ38	Typical Hole	0	196
ZZ62	Typical Hole	0	473
ZZ52	Typical Hole	0	441
ZZ85	Typical Hole	0	553
ZZ61	Typical Hole	0	412


Typical Hole
Ø = 63.5 mm
[2.1 m] - Crushed Stone
[0.9 m] - Air
[5.5 m] - Hydromite 4100 Bulk NB Wgt: 67.12 kg
[8.0 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
67.87 kg
Stuck Booster
Ø = 63.5 mm
[2.1 m] - Crushed Stone
[0.9 m] - Air
[5.5 m] - Hydromite 4100 Bulk NB Wgt: 67.12 kg
[4.7 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
[8.0 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
68.62 kg
Toe Holes
Ø = 63.5 mm
[2.3 m] - Crushed Stone
[0.5 m] - Air
[0.3 m] - Hydromite 4100 Bulk NB Wgt: 3.73 kg
[2.9 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
4.48 kg
0 m
5 m
10 m

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-10
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 08/26/2020 12:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Clear
Wind From: WSW
Temperature: 20 °C
Terrain: Flat
Wind Velocity: 5-8 km/h
Blast Lat./Long.: 44° 38' 3.300" N 80° 59' 59.900" W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 8 °
Structure Type: Dwelling
Distance: 696 m
Structure Lat./Long.: 44° 38' 25.581" N 80° 59' 55.234" W

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	962.9 m
No. of Holes:	117	Subdrilling:	0.30 m	Burden:	3.05 m	Water Depth:	1.83 m
No. of V.P.† Holes:	117	Face Height:	7.92 m	Spacing:	3.35 m	Stem Length:	1.37 m
No. of Rows:	9	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Center Start/ Breakout
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 7.92 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	246.1 kg	Volume Produced:	8,746.5 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	246.1 kg	Weight Produced:	20,995.1 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.188 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	82.0 kg	Powder Factor 2:	1.098 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	76.80	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	44.34		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
FRALICK	CRAIG, A			No	Yes	No	No	No
SMART	EVAN, C			No	No	No	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-10
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 08/26/2020 12:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	117.00	ea	87.75
15003	40' E*STAR Detonator - QM	117.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	9,510.00	kg	9,510.00
12981	Mini Stem Plug - 6015	117.00	ea	0.00
		Total Weight of Explosives (Include Primers) (kg):		9,597.75

COMMENTS / EXPLANATIONS

General Comments: Imported on 8/26/2020 5:06:11 PM

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-10
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 08/26/2020 12:58
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY RD. 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	08/26/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	100.0 Hz
Time:	12:58	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	100.0 Hz
Distance From Blast:	696.77 m	Calibration Signal:	ok		Longitudinal:	0.254 mm/s	100.0 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	119 dB	--- Hz
Location:					Vector Sum:	0.254 mm/s	
Lat./Long.:	44° 38' 25.645" N		80° 59' 55.415" W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

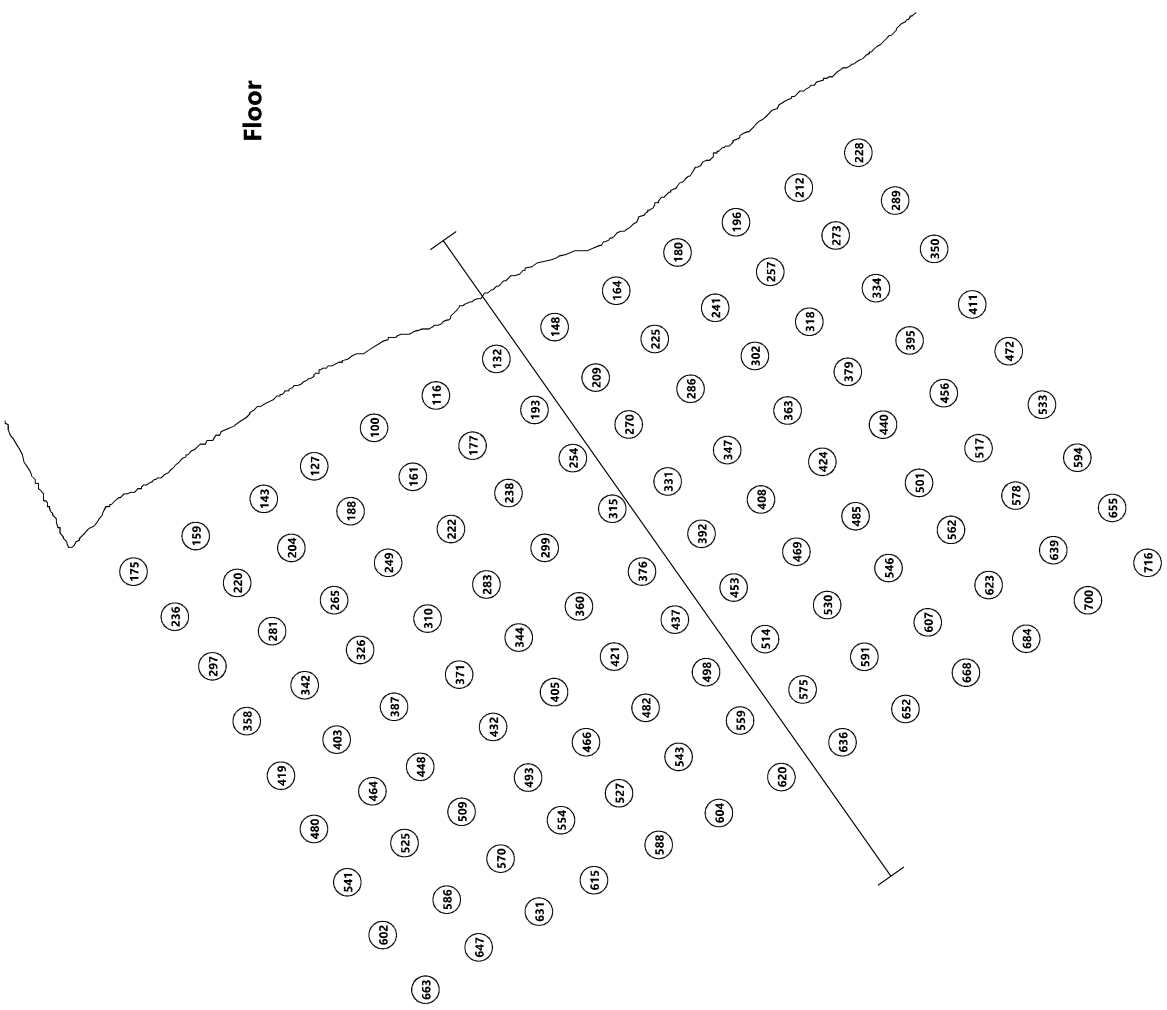
SEISMOGRAPH 2 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	08/26/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.063 mm/s	73.0 Hz
Time:	12:58	Calibration Date:	01/17/20		Vertical:	0.063 mm/s	43.0 Hz
Distance From Blast:	736.40 m	Calibration Signal:	ok		Longitudinal:	0.063 mm/s	85.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	115 dB	--- Hz
Location:					Vector Sum:	0.079 mm/s	
Lat./Long.:	44° 37' 52.587" N		80° 59' 30.045" W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

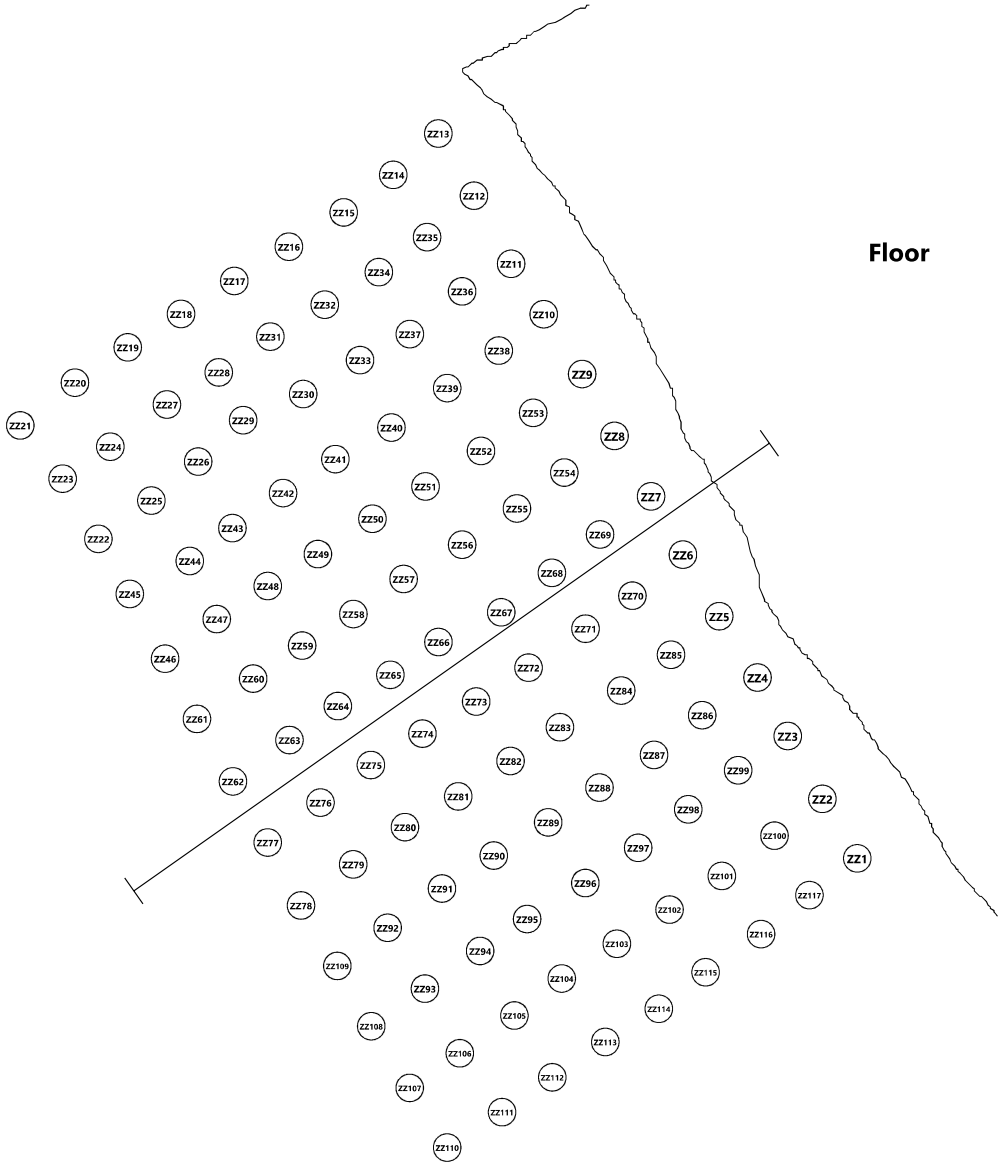
SEISMOGRAPH 3 - 283197 10TH CONC.

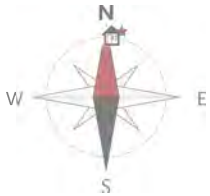
Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	08/26/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	1.143 mm/s	37.0 Hz
Time:	12:58	Calibration Date:	01/17/20		Vertical:	0.635 mm/s	32.0 Hz
Distance From Blast:	1,190.55 m	Calibration Signal:	ok		Longitudinal:	1.905 mm/s	32.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	116 dB	--- Hz
Location:					Vector Sum:	1.922 mm/s	
Lat./Long.:	44° 37' 49.798" N		80° 59' 9.304" W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

Hole Label Mode: Cumulative In-Hole Delays



Hole Label Mode: Default (A1)



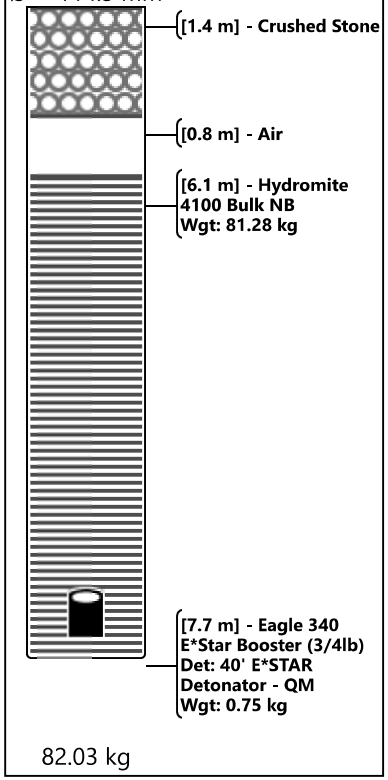


Hole	Load	Surface Delay	Deck 1 Delay
ZZ5	Typical Hole	0	164
ZZ16	Typical Hole	0	358
ZZ98	Typical Hole	0	318
ZZ76	Typical Hole	0	575
ZZ51	Typical Hole	0	283
ZZ103	Typical Hole	0	456
ZZ95	Typical Hole	0	501
ZZ60	Typical Hole	0	543
ZZ29	Typical Hole	0	448
ZZ49	Typical Hole	0	405
ZZ71	Typical Hole	0	270
ZZ47	Typical Hole	0	527
ZZ36	Typical Hole	0	204
ZZ55	Typical Hole	0	238
ZZ44	Typical Hole	0	554
ZZ112	Typical Hole	0	594
ZZ89	Typical Hole	0	424
ZZ74	Typical Hole	0	453
ZZ45	Typical Hole	0	615
ZZ107	Typical Hole	0	700
ZZ113	Typical Hole	0	533
ZZ57	Typical Hole	0	360
ZZ117	Typical Hole	0	289
ZZ24	Typical Hole	0	586
ZZ53	Typical Hole	0	161
ZZ61	Typical Hole	0	604
ZZ33	Typical Hole	0	326
ZZ72	Typical Hole	0	331
ZZ56	Typical Hole	0	299
ZZ58	Typical Hole	0	421
ZZ106	Typical Hole	0	639
ZZ34	Typical Hole	0	281
ZZ18	Typical Hole	0	480
ZZ42	Typical Hole	0	432
ZZ14	Typical Hole	0	236
ZZ79	Typical Hole	0	591
ZZ22	Typical Hole	0	631
ZZ20	Typical Hole	0	602
ZZ2	Typical Hole	0	212
ZZ82	Typical Hole	0	408
ZZ90	Typical Hole	0	485
ZZ99	Typical Hole	0	257
ZZ8	Typical Hole	0	116
ZZ7	Typical Hole	0	132
ZZ77	Typical Hole	0	636
ZZ50	Typical Hole	0	344

Hole	Load	Surface Delay	Deck 1 Delay
ZZ67	Typical Hole	0	315
ZZ84	Typical Hole	0	286
ZZ38	Typical Hole	0	188
ZZ68	Typical Hole	0	254
ZZ48	Typical Hole	0	466
ZZ111	Typical Hole	0	655
ZZ26	Typical Hole	0	509
ZZ31	Typical Hole	0	403
ZZ81	Typical Hole	0	469
ZZ35	Typical Hole	0	220
ZZ104	Typical Hole	0	517
ZZ86	Typical Hole	0	241
ZZ105	Typical Hole	0	578
ZZ17	Typical Hole	0	419
ZZ39	Typical Hole	0	249
ZZ96	Typical Hole	0	440
ZZ94	Typical Hole	0	562
ZZ13	Typical Hole	0	175
ZZ108	Typical Hole	0	684
ZZ101	Typical Hole	0	334
ZZ88	Typical Hole	0	363
ZZ78	Typical Hole	0	652
ZZ25	Typical Hole	0	570
ZZ15	Typical Hole	0	297
ZZ1	Typical Hole	0	228
ZZ52	Typical Hole	0	222
ZZ46	Typical Hole	0	588
ZZ91	Typical Hole	0	546
ZZ80	Typical Hole	0	530
ZZ59	Typical Hole	0	482
ZZ70	Typical Hole	0	209
ZZ102	Typical Hole	0	395
ZZ21	Typical Hole	0	663
ZZ6	Typical Hole	0	148
ZZ27	Typical Hole	0	525
ZZ85	Typical Hole	0	225
ZZ3	Typical Hole	0	196
ZZ69	Typical Hole	0	193
ZZ64	Typical Hole	0	498
ZZ93	Typical Hole	0	623
ZZ75	Typical Hole	0	514
ZZ110	Typical Hole	0	716
ZZ9	Typical Hole	0	100
ZZ54	Typical Hole	0	177
ZZ40	Typical Hole	0	310
ZZ4	Typical Hole	0	180

Hole	Load	Surface Delay	Deck 1 Delay
ZZ66	Typical Hole	0	376
ZZ30	Typical Hole	0	387
ZZ23	Typical Hole	0	647
ZZ115	Typical Hole	0	411
ZZ12	Typical Hole	0	159
ZZ11	Typical Hole	0	143
ZZ73	Typical Hole	0	392
ZZ63	Typical Hole	0	559
ZZ32	Typical Hole	0	342
ZZ37	Typical Hole	0	265
ZZ100	Typical Hole	0	273
ZZ10	Typical Hole	0	127
ZZ92	Typical Hole	0	607
ZZ65	Typical Hole	0	437
ZZ114	Typical Hole	0	472
ZZ62	Typical Hole	0	620
ZZ116	Typical Hole	0	350
ZZ19	Typical Hole	0	541
ZZ83	Typical Hole	0	347
ZZ43	Typical Hole	0	493
ZZ28	Typical Hole	0	464
ZZ87	Typical Hole	0	302
ZZ41	Typical Hole	0	371
ZZ109	Typical Hole	0	668
ZZ97	Typical Hole	0	379

Typical Hole



AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-11
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 09/04/2020 13:49
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Clear
Wind From: WSW
Temperature: 20 °C
Terrain: Flat
Wind Velocity: 10-25 km/h
Blast Lat./Long.: 44° 38' 1.800" N 80° 59' 59.000" W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 6 °
Structure Type: Dwelling
Distance: 739 m
Structure Lat./Long.: 44° 38' 25.581" N 80° 59' 55.234" W

LAYOUT

		Hole Depth:	7.92 m	Material Blasted:	Limestone	Total Meters Drilled:	1,125.3 m
No. of Holes:	142	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	2.44 m
No. of V.P.† Holes:	142	Face Height:	7.32 m	Spacing:	3.35 m	Stem Length:	min 1.37 m
No. of Rows:	7	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 7.32 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	333.5 kg	Volume Produced:	10,615.4 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	333.5 kg	Weight Produced:	25,481.1 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.252 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	89.2 kg	Powder Factor 2:	1.066 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	78.23	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	40.45		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
FRALICK	CRAIG, A			No	Yes	No	No	No
SMART	EVAN, C			No	Yes	No	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-11
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 09/04/2020 13:49
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	142.00	ea	106.50
15003	40' E*STAR Detonator - QM	142.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	2.00	sp	0.00
15128	Hydromite 4100 Bulk NB	11,210.00	kg	11,210.00
12981	Mini Stem Plug - 6015	142.00	ea	0.00
		Total Weight of Explosives (Include Primers) (kg):		11,316.50

COMMENTS / EXPLANATIONS

General Comments: Imported on 9/4/2020 6:03:34 PM

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-11 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 09/04/2020 13:49 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location: Top Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	09/04/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.381 mm/s	1.2 Hz
Time:	13:49	Calibration Date:	01/17/20		Vertical:	0.381 mm/s	8.4 Hz
Distance From Blast:	698.60 m	Calibration Signal:	ok		Longitudinal:	0.381 mm/s	0.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	118 dB	--- Hz
Location:					Vector Sum:	0.596 mm/s	
Lat./Long.:	44° 37' 52.587" N		80° 59' 30.045" W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

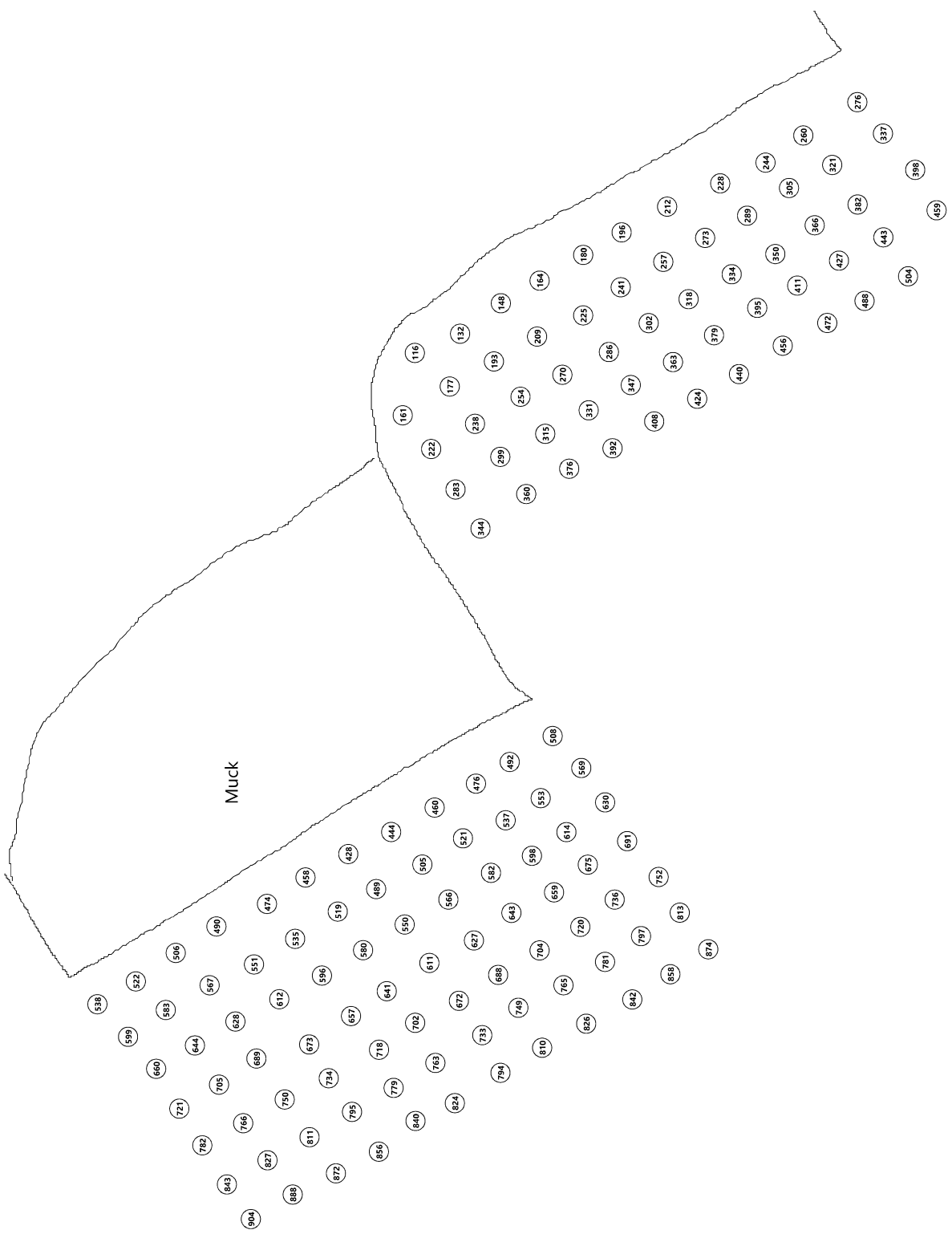
SEISMOGRAPH 2 - 178841 GREY RD. 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	09/04/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	100.0 Hz
Time:	13:49	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	100.0 Hz
Distance From Blast:	740.36 m	Calibration Signal:	ok		Longitudinal:	0.127 mm/s	100.0 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	122 dB	--- Hz
Location:					Vector Sum:	0.22 mm/s	
Lat./Long.:	44° 38' 25.645" N		80° 59' 55.415" W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

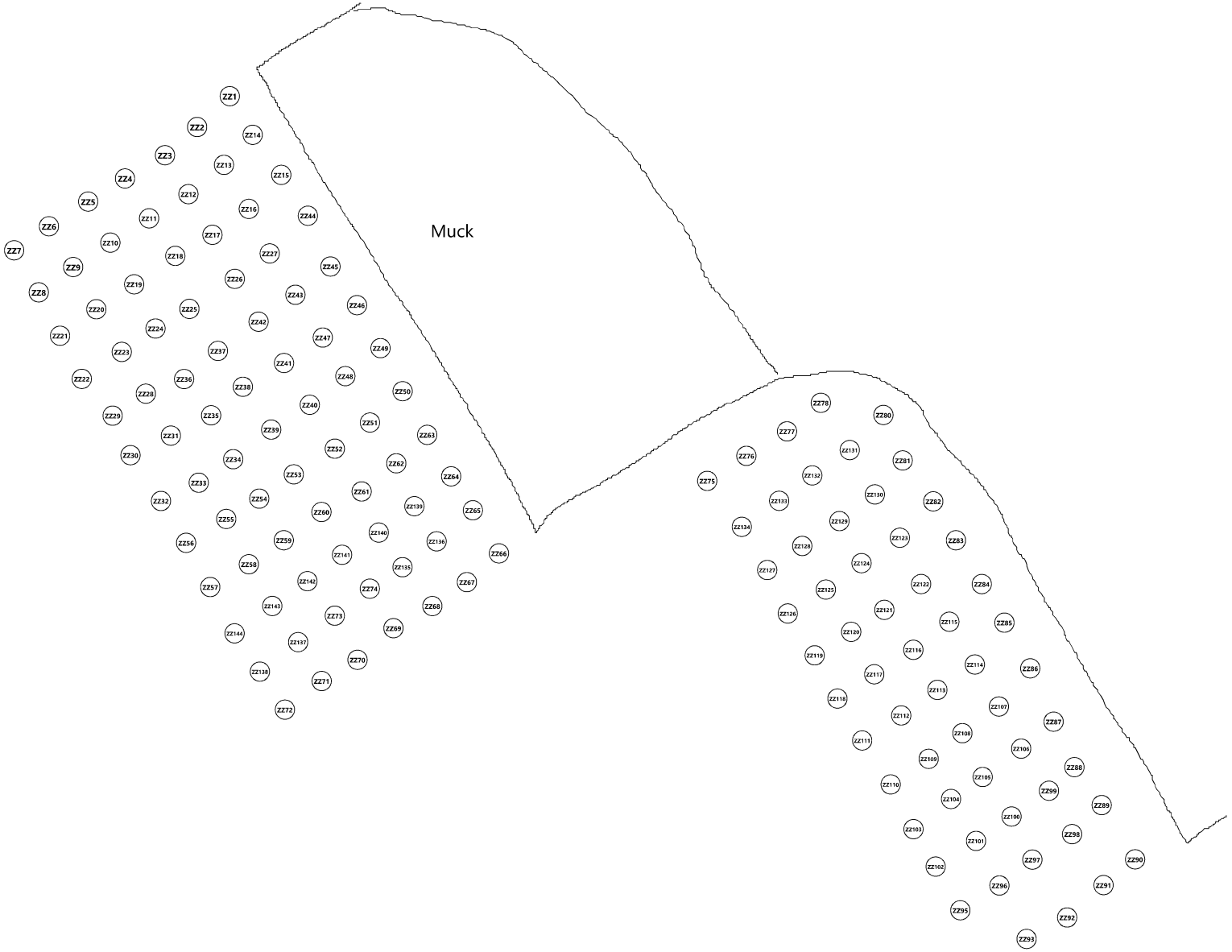
SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	09/04/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.079 mm/s	85.0 Hz
Time:	01:49	Calibration Date:	01/17/20		Vertical:	0.063 mm/s	100.0 Hz
Distance From Blast:	1,156.41 m	Calibration Signal:	ok		Longitudinal:	0.079 mm/s	47.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	117 dB	--- Hz
Location:					Vector Sum:	0.094 mm/s	
Lat./Long.:	44° 37' 49.798" N		80° 59' 9.304" W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

Hole Label Mode: Cumulative In-Hole Delays



Hole Label Mode: Default (A1)

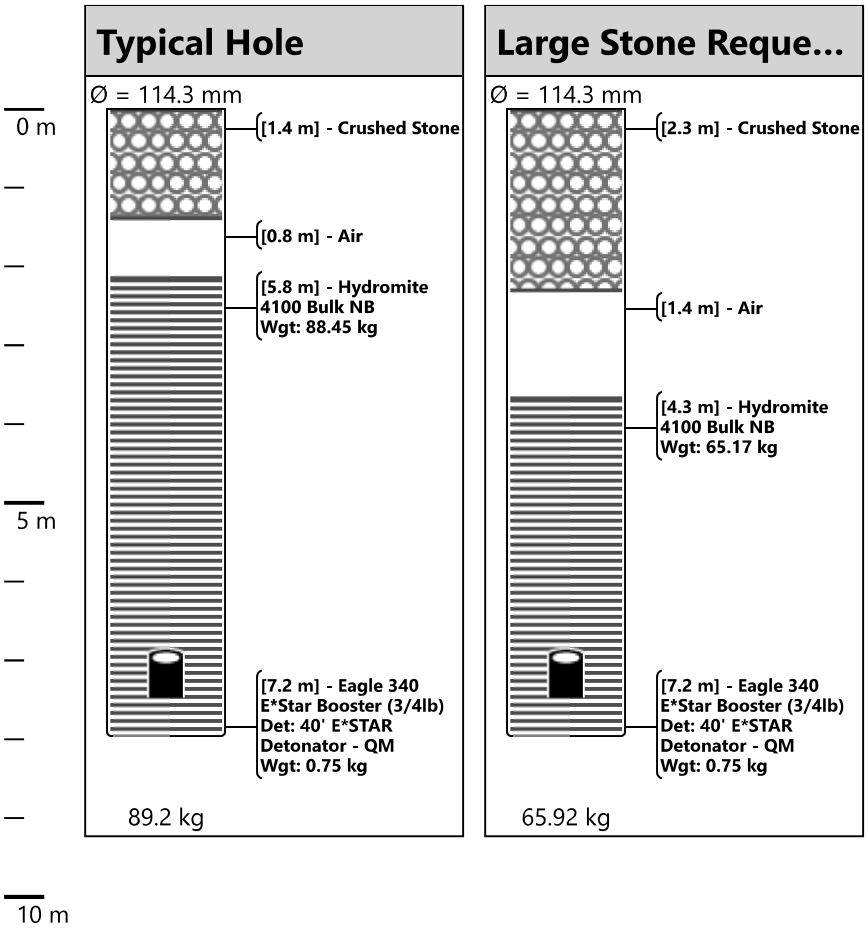


Hole	Load	Surface Delay	Deck 1 Delay
ZZ130	Large Stone Requested	0	193
ZZ54	Typical Hole	0	688
ZZ126	Large Stone Requested	0	392
ZZ2	Typical Hole	0	599
ZZ24	Typical Hole	0	734
ZZ119	Large Stone Requested	0	408
ZZ83	Large Stone Requested	0	164
ZZ57	Typical Hole	0	826
ZZ59	Typical Hole	0	704
ZZ97	Large Stone Requested	0	382
ZZ15	Typical Hole	0	506
ZZ68	Typical Hole	0	630
ZZ75	Large Stone Requested	0	344
ZZ64	Typical Hole	0	476
ZZ35	Typical Hole	0	702
ZZ80	Large Stone Requested	0	116
ZZ47	Typical Hole	0	519
ZZ22	Typical Hole	0	856
ZZ84	Large Stone Requested	0	180
ZZ131	Large Stone Requested	0	177
ZZ33	Typical Hole	0	733
ZZ103	Large Stone Requested	0	472
ZZ141	Typical Hole	0	659
ZZ60	Typical Hole	0	643
ZZ85	Large Stone Requested	0	196
ZZ113	Large Stone Requested	0	318
ZZ58	Typical Hole	0	765
ZZ16	Typical Hole	0	567
ZZ40	Typical Hole	0	550
ZZ62	Typical Hole	0	521
ZZ25	Typical Hole	0	673
ZZ45	Typical Hole	0	474
ZZ140	Typical Hole	0	598
ZZ122	Large Stone Requested	0	225
ZZ105	Large Stone Requested	0	350
ZZ137	Typical Hole	0	797
ZZ27	Typical Hole	0	551
ZZ121	Large Stone Requested	0	286
ZZ88	Large Stone Requested	0	244
ZZ30	Typical Hole	0	824
ZZ21	Typical Hole	0	872
ZZ5	Typical Hole	0	782
ZZ65	Typical Hole	0	492
ZZ81	Large Stone Requested	0	132
ZZ101	Large Stone Requested	0	427
ZZ51	Typical Hole	0	505

Hole	Load	Surface Delay	Deck 1 Delay
ZZ1	Typical Hole	0	538
ZZ49	Typical Hole	0	428
ZZ144	Typical Hole	0	842
ZZ117	Large Stone Requested	0	363
ZZ76	Large Stone Requested	0	283
ZZ8	Typical Hole	0	888
ZZ4	Typical Hole	0	721
ZZ37	Typical Hole	0	657
ZZ112	Large Stone Requested	0	379
ZZ120	Large Stone Requested	0	347
ZZ7	Typical Hole	0	904
ZZ78	Large Stone Requested	0	161
ZZ115	Large Stone Requested	0	241
ZZ53	Typical Hole	0	627
ZZ132	Large Stone Requested	0	238
ZZ108	Large Stone Requested	0	334
ZZ114	Large Stone Requested	0	257
ZZ93	Large Stone Requested	0	459
ZZ135	Typical Hole	0	614
ZZ124	Large Stone Requested	0	270
ZZ96	Large Stone Requested	0	443
ZZ87	Large Stone Requested	0	228
ZZ111	Large Stone Requested	0	440
ZZ74	Typical Hole	0	675
ZZ118	Large Stone Requested	0	424
ZZ133	Large Stone Requested	0	299
ZZ129	Large Stone Requested	0	254
ZZ69	Typical Hole	0	691
ZZ92	Large Stone Requested	0	398
ZZ128	Large Stone Requested	0	315
ZZ134	Large Stone Requested	0	360
ZZ73	Typical Hole	0	736
ZZ71	Typical Hole	0	813
ZZ48	Typical Hole	0	489
ZZ107	Large Stone Requested	0	273
ZZ31	Typical Hole	0	763
ZZ39	Typical Hole	0	611
ZZ36	Typical Hole	0	718
ZZ110	Large Stone Requested	0	456
ZZ142	Typical Hole	0	720
ZZ70	Typical Hole	0	752
ZZ12	Typical Hole	0	644
ZZ44	Typical Hole	0	490
ZZ17	Typical Hole	0	628
ZZ9	Typical Hole	0	827
ZZ82	Large Stone Requested	0	148

Hole	Load	Surface Delay	Deck 1 Delay
ZZ104	Large Stone Requested	0	411
ZZ46	Typical Hole	0	458
ZZ125	Large Stone Requested	0	331
ZZ89	Large Stone Requested	0	260
ZZ56	Typical Hole	0	810
ZZ61	Typical Hole	0	582
ZZ52	Typical Hole	0	566
ZZ77	Large Stone Requested	0	222
ZZ66	Typical Hole	0	508
ZZ6	Typical Hole	0	843
ZZ28	Typical Hole	0	779
ZZ14	Typical Hole	0	522
ZZ10	Typical Hole	0	766
ZZ63	Typical Hole	0	460
ZZ100	Large Stone Requested	0	366
ZZ23	Typical Hole	0	795
ZZ86	Large Stone Requested	0	212
ZZ41	Typical Hole	0	580
ZZ98	Large Stone Requested	0	321
ZZ143	Typical Hole	0	781
ZZ13	Typical Hole	0	583
ZZ109	Large Stone Requested	0	395
ZZ18	Typical Hole	0	689
ZZ55	Typical Hole	0	749
ZZ42	Typical Hole	0	596
ZZ19	Typical Hole	0	750
ZZ50	Typical Hole	0	444
ZZ29	Typical Hole	0	840
ZZ72	Typical Hole	0	874
ZZ102	Large Stone Requested	0	488
ZZ95	Large Stone Requested	0	504
ZZ11	Typical Hole	0	705
ZZ106	Large Stone Requested	0	289
ZZ139	Typical Hole	0	537
ZZ99	Large Stone Requested	0	305
ZZ38	Typical Hole	0	641
ZZ127	Large Stone Requested	0	376
ZZ90	Large Stone Requested	0	276
ZZ123	Large Stone Requested	0	209
ZZ20	Typical Hole	0	811
ZZ116	Large Stone Requested	0	302
ZZ136	Typical Hole	0	553
ZZ43	Typical Hole	0	535
ZZ138	Typical Hole	0	858
ZZ67	Typical Hole	0	569
ZZ3	Typical Hole	0	660

Hole	Load	Surface Delay	Deck 1 Delay
ZZ34	Typical Hole	0	672
ZZ26	Typical Hole	0	612
ZZ91	Large Stone Requested	0	337
ZZ32	Typical Hole	0	794


Typical Hole
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[0.8 m] - Air
[5.8 m] - Hydromite 4100 Bulk NB Wgt: 88.45 kg
[7.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
89.2 kg
Large Stone Reque...
Ø = 114.3 mm
[2.3 m] - Crushed Stone
[1.4 m] - Air
[4.3 m] - Hydromite 4100 Bulk NB Wgt: 65.17 kg
[7.2 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
65.92 kg
0 m
5 m
10 m

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-12
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 09/15/2020 14:55
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Clear
Wind From: WSW
Temperature: 20 °C
Terrain: Flat
Wind Velocity: 10-20 km/h
Blast Lat./Long.: 44° 38' 2.000" N 80° 59' 54.200" W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 358 °
Structure Type: Dwelling
Distance: 728 m
Structure Lat./Long.: 44° 38' 25.581" N 80° 59' 55.234" W

LAYOUT

		Hole Depth:	8.84 m	Material Blasted:	Limestone	Total Meters Drilled:	1,246.3 m
No. of Holes:	141	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	2.13 m
No. of V.P.† Holes:	141	Face Height:	8.23 m	Spacing:	3.35 m	Stem Length:	min 1.37 m
No. of Rows:	5	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 8.23 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	249.0 kg	Volume Produced:	11,858.2 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	249.0 kg	Weight Produced:	28,464.5 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.638 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	89.6 kg	Powder Factor 2:	0.909 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	76.92	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	46.15		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	No	No	No	No
SMART	EVAN, C			No	Yes	Yes	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-12
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 09/15/2020 14:55
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	142.00	ea	106.50
15003	40' E*STAR Detonator - QM	141.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	2.00	sp	0.00
15128	Hydromite 4100 Bulk NB	10,680.00	kg	10,680.00
12981	Mini Stem Plug - 6015	141.00	ea	0.00
	Total Weight of Explosives (Include Primers) (kg):			10,786.50

COMMENTS / EXPLANATIONS

General Comments: 1 Booster went down the Hole Unnattached

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-12
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 09/15/2020 14:55
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	Instantel					
Date:	09/15/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.13 mm/s	100.0 Hz	
Time:	14:55	Calibration Date:	01/17/20		Vertical:	0.25 mm/s	100.0 Hz	
Distance From Blast:	606.55 m	Calibration Signal:	ok		Longitudinal:	0.25 mm/s	100.0 Hz	
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz					
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	119 dB	--- Hz	
Location:					Vector Sum:	0.28 mm/s		
Lat./Long.:	44° 37' 52.587" N		80° 59' 30.045" W					
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Evan Smart							

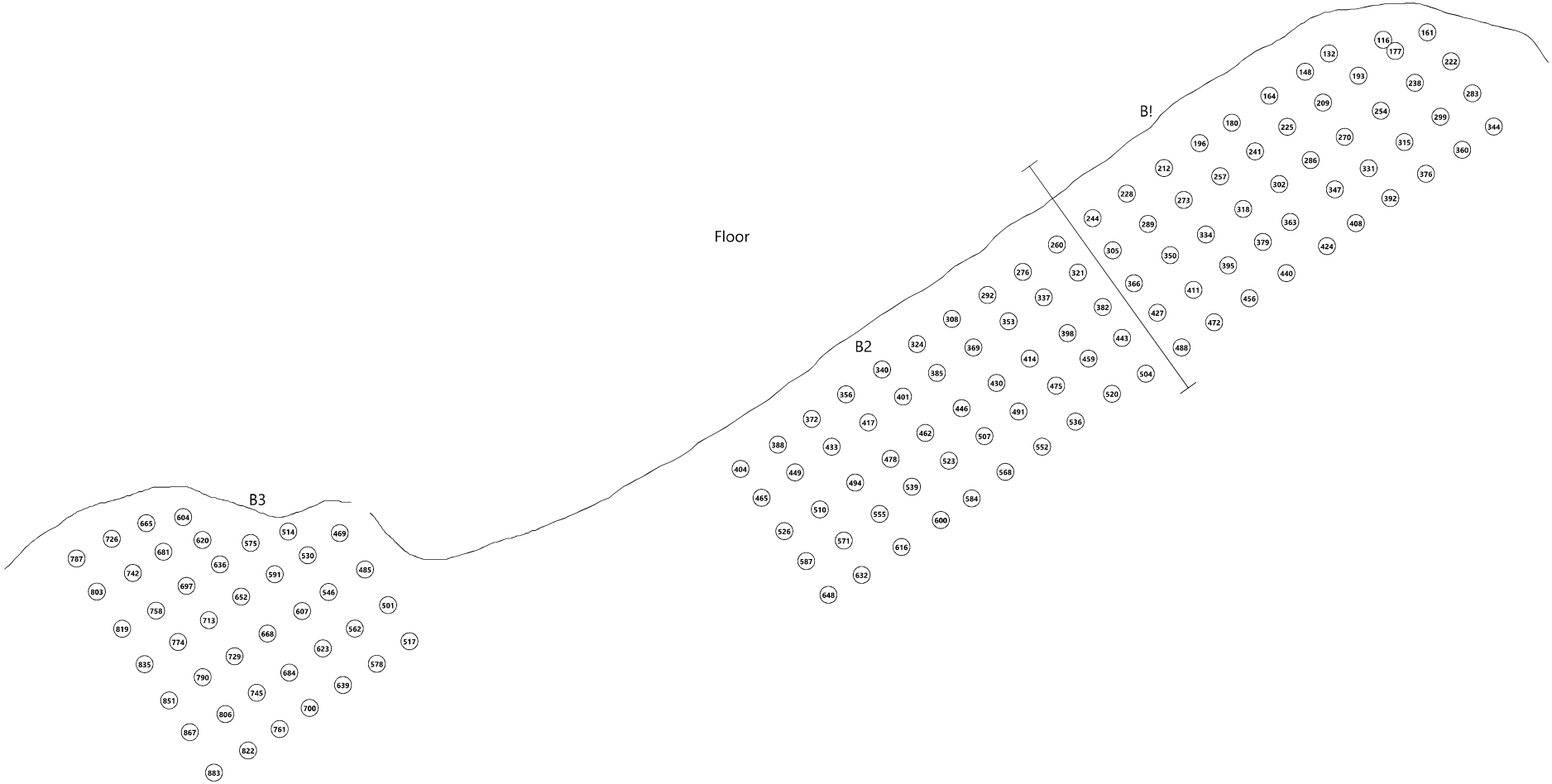
SEISMOGRAPH 2 - 178841 GREY RD. 17

Data Type:	Seismic Record	Seismograph Type:	Instantel					
Date:	09/15/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	36.6 Hz	
Time:	14:55	Calibration Date:	01/17/20		Vertical:	0.166 mm/s	9.3 Hz	
Distance From Blast:	730.30 m	Calibration Signal:	ok		Longitudinal:	0.142 mm/s	12.8 Hz	
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz					
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	126 dB	--- Hz	
Location:					Vector Sum:	0.198 mm/s		
Lat./Long.:	44° 38' 25.645" N		80° 59' 55.415" W					
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Evan Smart							

SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type:	No Trigger	Seismograph Type:	Instantel					
Date:	09/15/20	Trigger Level:	1.50 mm/s	115.00 dB				
Time:	14:55	Calibration Date:	01/17/20					
Distance From Blast:	1,058.88 m	Calibration Signal:	ok					
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz					
Readout:		Mic. Min. Freq.:	--- Hz					
Location:								
Lat./Long.:	44° 37' 49.798" N		80° 59' 9.304" W					
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Evan Smart							

Hole Label Mode: Cumulative In-Hole Delays

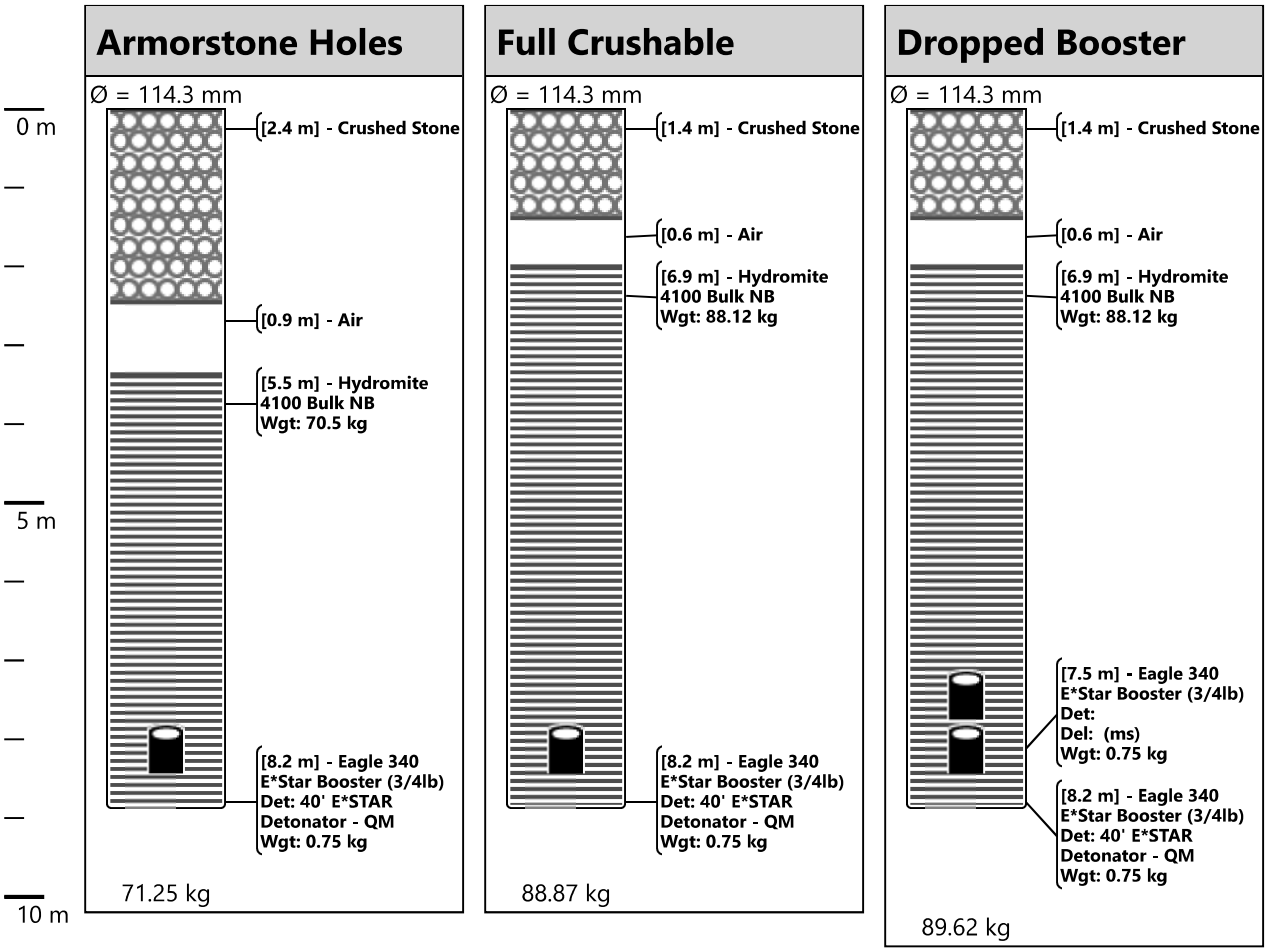


Hole	Load	Surface Delay	Deck 1 Delay
ZZ1	Armorstone Holes	0	404
ZZ2	Armorstone Holes	0	388
ZZ3	Armorstone Holes	0	372
ZZ4	Armorstone Holes	0	356
ZZ5	Armorstone Holes	0	340
ZZ6	Armorstone Holes	0	324
ZZ7	Armorstone Holes	0	308
ZZ8	Armorstone Holes	0	292
ZZ9	Armorstone Holes	0	276
ZZ10	Armorstone Holes	0	260
ZZ11	Armorstone Holes	0	244
ZZ12	Armorstone Holes	0	228
ZZ13	Armorstone Holes	0	212
ZZ14	Armorstone Holes	0	196
ZZ15	Armorstone Holes	0	180
ZZ16	Armorstone Holes	0	164
ZZ17	Armorstone Holes	0	148
ZZ18	Armorstone Holes	0	132
ZZ19	Armorstone Holes	0	116
ZZ20	Armorstone Holes	0	161
ZZ21	Armorstone Holes	0	222
ZZ22	Armorstone Holes	0	283
ZZ23	Armorstone Holes	0	344
ZZ24	Armorstone Holes	0	360
ZZ25	Armorstone Holes	0	299
ZZ26	Armorstone Holes	0	238
ZZ27	Armorstone Holes	0	177
ZZ28	Armorstone Holes	0	193
ZZ29	Armorstone Holes	0	254
ZZ30	Armorstone Holes	0	315
ZZ31	Armorstone Holes	0	376
ZZ32	Armorstone Holes	0	392
ZZ33	Armorstone Holes	0	331
ZZ34	Armorstone Holes	0	270
ZZ35	Armorstone Holes	0	209
ZZ36	Armorstone Holes	0	225
ZZ37	Armorstone Holes	0	286
ZZ38	Armorstone Holes	0	347
ZZ39	Armorstone Holes	0	408
ZZ40	Armorstone Holes	0	424
ZZ41	Armorstone Holes	0	302
ZZ42	Armorstone Holes	0	241
ZZ43	Armorstone Holes	0	257
ZZ44	Armorstone Holes	0	318
ZZ45	Armorstone Holes	0	363
ZZ46	Armorstone Holes	0	379

Hole	Load	Surface Delay	Deck 1 Delay
ZZ47	Armorstone Holes	0	440
ZZ48	Armorstone Holes	0	456
ZZ49	Armorstone Holes	0	395
ZZ50	Armorstone Holes	0	334
ZZ51	Armorstone Holes	0	273
ZZ52	Armorstone Holes	0	289
ZZ53	Armorstone Holes	0	350
ZZ54	Armorstone Holes	0	411
ZZ55	Armorstone Holes	0	472
ZZ56	Armorstone Holes	0	488
ZZ57	Armorstone Holes	0	427
ZZ58	Armorstone Holes	0	366
ZZ59	Armorstone Holes	0	305
ZZ60	Armorstone Holes	0	321
ZZ61	Armorstone Holes	0	382
ZZ62	Armorstone Holes	0	443
ZZ63	Armorstone Holes	0	504
ZZ64	Armorstone Holes	0	520
ZZ65	Armorstone Holes	0	459
ZZ66	Armorstone Holes	0	398
ZZ67	Armorstone Holes	0	337
ZZ68	Armorstone Holes	0	353
ZZ69	Armorstone Holes	0	414
ZZ70	Armorstone Holes	0	475
ZZ71	Armorstone Holes	0	536
ZZ72	Armorstone Holes	0	552
ZZ73	Armorstone Holes	0	491
ZZ74	Armorstone Holes	0	430
ZZ75	Armorstone Holes	0	369
ZZ76	Armorstone Holes	0	385
ZZ77	Armorstone Holes	0	446
ZZ78	Armorstone Holes	0	507
ZZ79	Armorstone Holes	0	568
ZZ80	Armorstone Holes	0	584
ZZ81	Armorstone Holes	0	523
ZZ82	Armorstone Holes	0	462
ZZ83	Armorstone Holes	0	401
ZZ84	Armorstone Holes	0	417
ZZ85	Armorstone Holes	0	478
ZZ86	Armorstone Holes	0	539
ZZ87	Armorstone Holes	0	600
ZZ88	Armorstone Holes	0	616
ZZ89	Armorstone Holes	0	555
ZZ90	Armorstone Holes	0	494
ZZ91	Armorstone Holes	0	433
ZZ92	Armorstone Holes	0	449

Hole	Load	Surface Delay	Deck 1 Delay
ZZ93	Armorstone Holes	0	510
ZZ94	Armorstone Holes	0	571
ZZ95	Armorstone Holes	0	632
ZZ96	Armorstone Holes	0	648
ZZ97	Armorstone Holes	0	587
ZZ98	Armorstone Holes	0	526
ZZ99	Armorstone Holes	0	465
ZZ100	Full Crushable	0	517
ZZ101	Full Crushable	0	501
ZZ102	Full Crushable	0	485
ZZ103	Full Crushable	0	469
ZZ104	Full Crushable	0	514
ZZ105	Full Crushable	0	530
ZZ106	Full Crushable	0	546
ZZ107	Full Crushable	0	562
ZZ108	Full Crushable	0	578
ZZ109	Full Crushable	0	639
ZZ110	Full Crushable	0	623
ZZ111	Full Crushable	0	607
ZZ112	Dropped Booster	0	591
ZZ113	Full Crushable	0	575
ZZ114	Full Crushable	0	604
ZZ115	Full Crushable	0	620
ZZ116	Full Crushable	0	636
ZZ117	Full Crushable	0	652
ZZ118	Full Crushable	0	668
ZZ119	Full Crushable	0	684
ZZ120	Full Crushable	0	700
ZZ121	Full Crushable	0	761
ZZ122	Full Crushable	0	745
ZZ123	Full Crushable	0	729
ZZ124	Full Crushable	0	713
ZZ125	Full Crushable	0	697
ZZ126	Full Crushable	0	681
ZZ127	Full Crushable	0	665
ZZ128	Full Crushable	0	726
ZZ129	Full Crushable	0	742
ZZ130	Full Crushable	0	758
ZZ131	Full Crushable	0	774
ZZ132	Full Crushable	0	790
ZZ133	Full Crushable	0	806
ZZ134	Full Crushable	0	822
ZZ135	Full Crushable	0	883
ZZ136	Full Crushable	0	867
ZZ137	Full Crushable	0	851
ZZ138	Full Crushable	0	835

Hole	Load	Surface Delay	Deck 1 Delay
ZZ139	Full Crushable	0	819
ZZ140	Full Crushable	0	803
ZZ141	Full Crushable	0	787


Armorstone Holes
Ø = 114.3 mm
[2.4 m] - Crushed Stone
[0.9 m] - Air
[5.5 m] - Hydromite
4100 Bulk NB
Wgt: 70.5 kg
[8.2 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
71.25 kg
Full Crushable
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[0.6 m] - Air
[6.9 m] - Hydromite
4100 Bulk NB
Wgt: 88.12 kg
[8.2 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
88.87 kg
Dropped Booster
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[0.6 m] - Air
[6.9 m] - Hydromite
4100 Bulk NB
Wgt: 88.12 kg
[7.5 m] - Eagle 340
E*Star Booster (3/4lb)
Det:
Del: (ms)
Wgt: 0.75 kg
[8.2 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
89.62 kg
0 m
5 m
10 m

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-13
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 09/25/2020 13:22
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

ENVIRONMENT

Method Used: Decimal Degrees
Weather: Clear
Wind From: WSW
Temperature: 25 °C
Terrain: Flat
Wind Velocity: 2-20 km/h
Blast Lat./Long.: 44.6340° N -81.0006° W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 12 °
Structure Type: Dwelling
Distance: 733 m
Structure Lat./Long.: 44.6404° N -80.9987° W

LAYOUT

		Hole Depth:	8.23-8.84 m	Material Blasted:	Limestone	Total Meters Drilled:	2,088.5 m
No. of Holes:	242	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	2.44 m
No. of V.P.† Holes:	242	Face Height:	7.62-8.23 m	Spacing:	3.35 m	Stem Length:	1.37 m
No. of Rows:	12	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 8.08 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	387.2 kg	Volume Produced:	19,975.5 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	387.2 kg	Weight Produced:	47,949.2 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.112 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	96.8 kg	Powder Factor 2:	1.137 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	74.54	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	37.27		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
SMART	EVAN, C			No	Yes	Yes	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-13
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 09/25/2020 13:22
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	242.00	ea	181.50
15003	40' E*STAR Detonator - QM	242.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	22,520.00	kg	22,520.00
12981	Mini Stem Plug - 6015	242.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	2.00	ea	0.00
AB013	Labour Charge	10.00	hr	0.00
	Total Weight of Explosives (Include Primers) (kg):			22,701.50

COMMENTS / EXPLANATIONS

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-13 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 09/25/2020 13:22 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location: Middle Bench

SEISMOGRAPH 1 - 178841 GREY RD. 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	09/25/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.381 mm/s	2.2 Hz
Time:	13:22	Calibration Date:	01/17/20		Vertical:	0.381 mm/s	13.0 Hz
Distance From Blast:	768.10 m	Calibration Signal:	ok		Longitudinal:	0.381 mm/s	100.0 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	120 dB	--- Hz
Location:					Vector Sum:	0.596 mm/s	
Lat./Long.:	44.6408° N		-80.9991° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

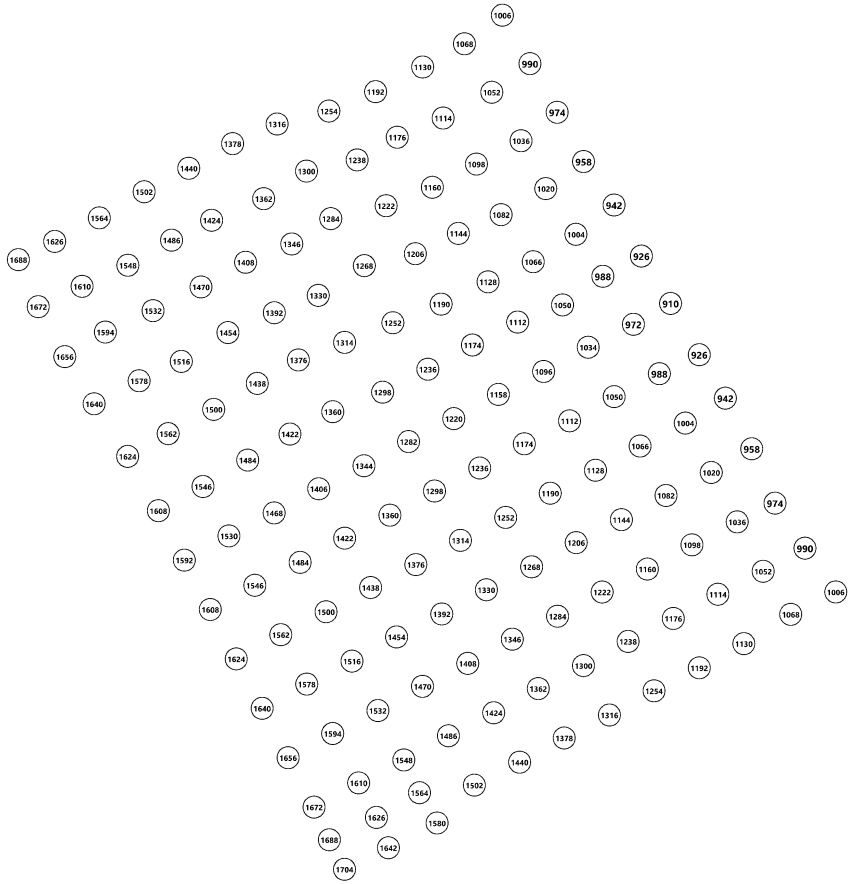
SEISMOGRAPH 2 - 178717 GREY RD 17

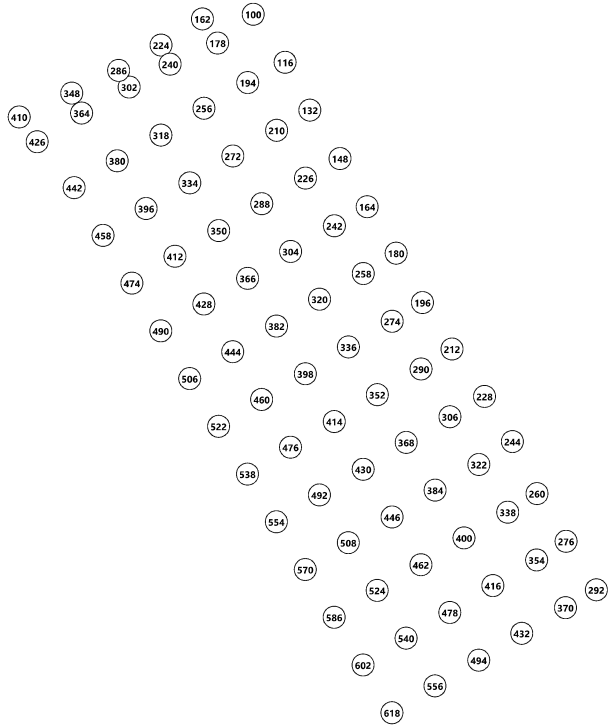
Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	09/25/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.381 mm/s	51.0 Hz
Time:	13:22	Calibration Date:	01/17/20		Vertical:	0.635 mm/s	39.0 Hz
Distance From Blast:	777.54 m	Calibration Signal:	ok		Longitudinal:	0.635 mm/s	51.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	119 dB	--- Hz
Location:					Vector Sum:	0.73 mm/s	
Lat./Long.:	44.6312° N		-80.9916° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

SEISMOGRAPH 3 - 283197 10TH CONC.

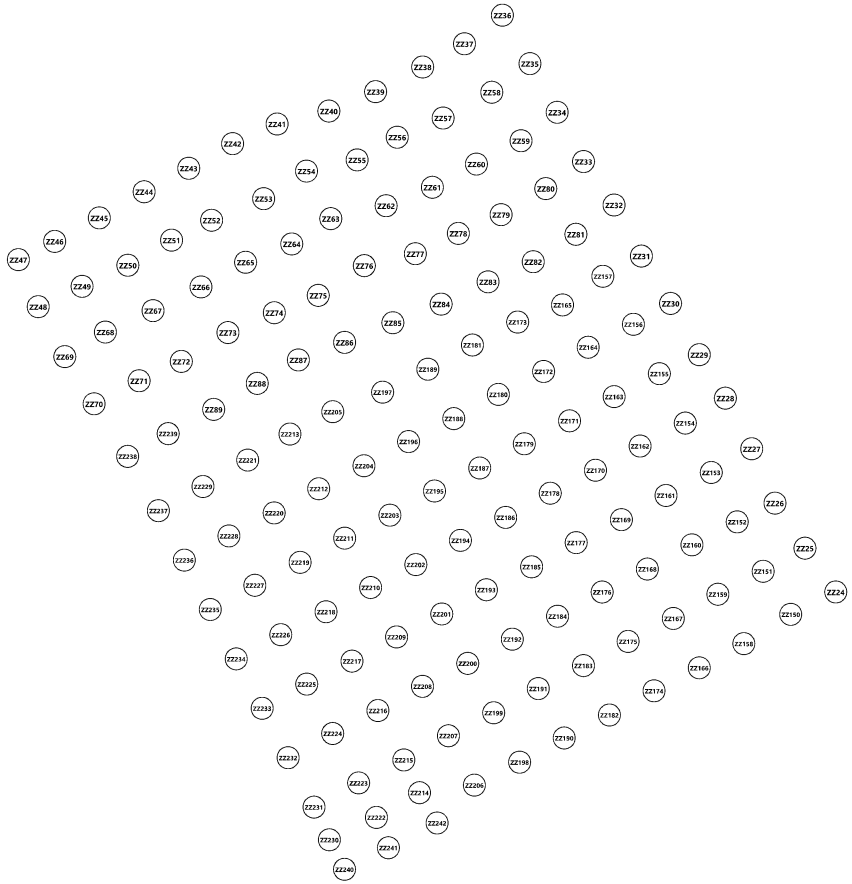
Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	09/25/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	--- Hz
Time:	13:22	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	100.0 Hz
Distance From Blast:	1,229.87 m	Calibration Signal:	ok		Longitudinal:	0.127 mm/s	100.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	115 dB	--- Hz
Location:					Vector Sum:	0.22 mm/s	
Lat./Long.:	44.6306° N		-80.9859° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Evan Smart						

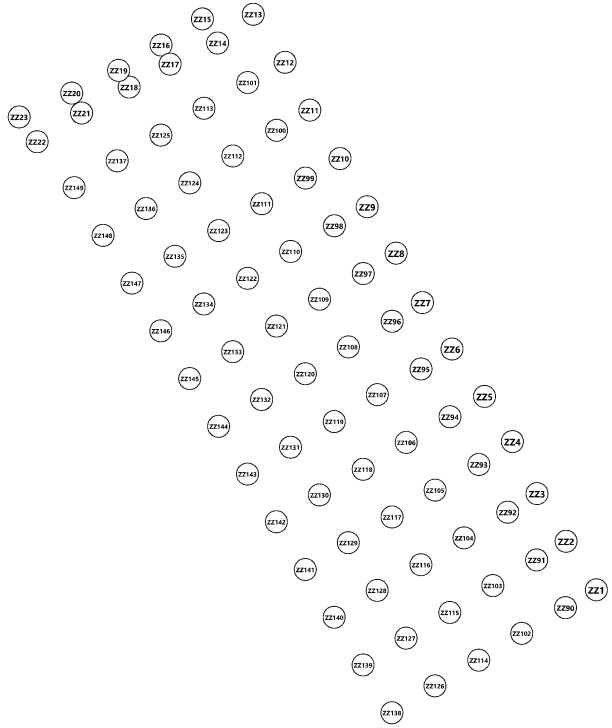
Hole Label Mode: Cumulative In-Hole Delays





Hole Label Mode: Default (A1)



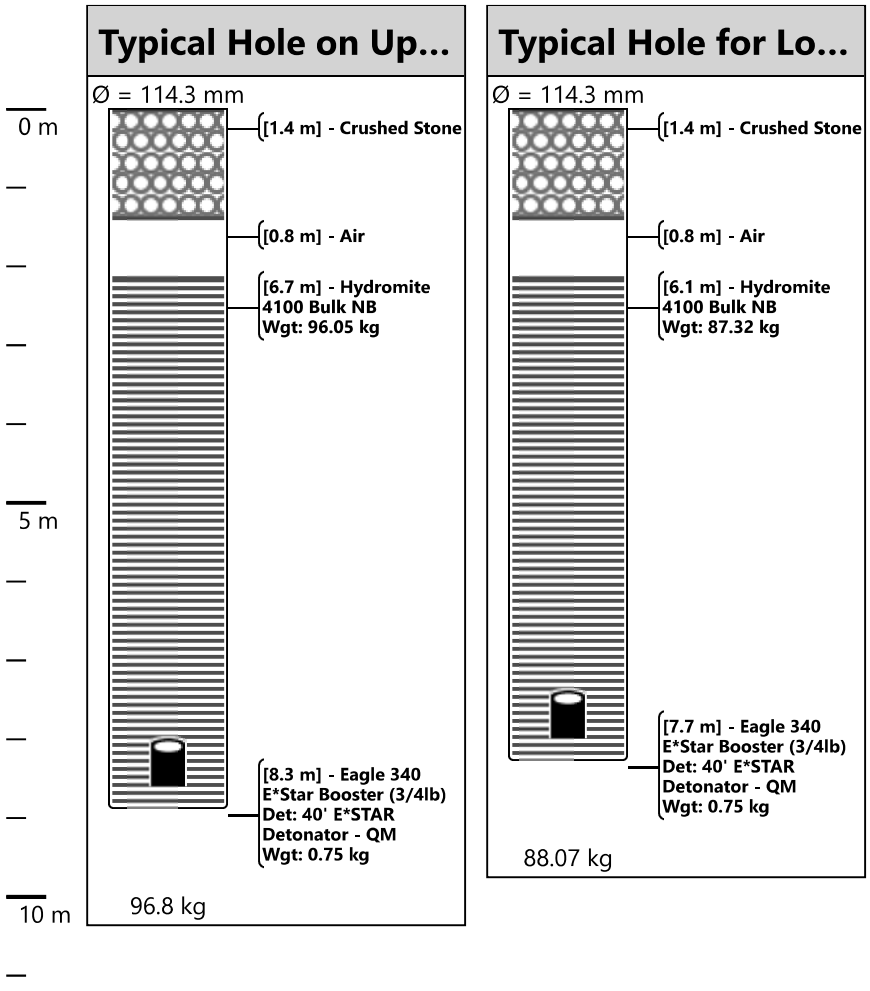


Hole	Load	Surface Delay	Deck 1 Delay
ZZ1	Typical Hole for Lower Level	0	292
ZZ2	Typical Hole for Lower Level	0	276
ZZ3	Typical Hole for Lower Level	0	260
ZZ4	Typical Hole for Lower Level	0	244
ZZ5	Typical Hole for Lower Level	0	228
ZZ6	Typical Hole for Lower Level	0	212
ZZ7	Typical Hole for Lower Level	0	196
ZZ8	Typical Hole for Lower Level	0	180
ZZ9	Typical Hole for Lower Level	0	164
ZZ10	Typical Hole for Lower Level	0	148
ZZ11	Typical Hole for Lower Level	0	132
ZZ12	Typical Hole for Lower Level	0	116
ZZ13	Typical Hole for Lower Level	0	100
ZZ14	Typical Hole for Lower Level	0	178
ZZ15	Typical Hole for Lower Level	0	162
ZZ16	Typical Hole for Lower Level	0	224
ZZ17	Typical Hole for Lower Level	0	240
ZZ18	Typical Hole for Lower Level	0	302
ZZ19	Typical Hole for Lower Level	0	286
ZZ20	Typical Hole for Lower Level	0	348
ZZ21	Typical Hole for Lower Level	0	364
ZZ22	Typical Hole for Lower Level	0	426
ZZ23	Typical Hole for Lower Level	0	410
ZZ24	Typical Hole on Upper Level	0	1006
ZZ25	Typical Hole on Upper Level	0	990
ZZ26	Typical Hole on Upper Level	0	974
ZZ27	Typical Hole on Upper Level	0	958
ZZ28	Typical Hole on Upper Level	0	942
ZZ29	Typical Hole on Upper Level	0	926
ZZ30	Typical Hole on Upper Level	0	910
ZZ31	Typical Hole on Upper Level	0	926
ZZ32	Typical Hole on Upper Level	0	942
ZZ33	Typical Hole on Upper Level	0	958
ZZ34	Typical Hole on Upper Level	0	974
ZZ35	Typical Hole on Upper Level	0	990
ZZ36	Typical Hole on Upper Level	0	1006
ZZ37	Typical Hole on Upper Level	0	1068
ZZ38	Typical Hole on Upper Level	0	1130
ZZ39	Typical Hole on Upper Level	0	1192
ZZ40	Typical Hole on Upper Level	0	1254
ZZ41	Typical Hole on Upper Level	0	1316
ZZ42	Typical Hole on Upper Level	0	1378
ZZ43	Typical Hole on Upper Level	0	1440
ZZ44	Typical Hole on Upper Level	0	1502
ZZ45	Typical Hole on Upper Level	0	1564
ZZ46	Typical Hole on Upper Level	0	1626
ZZ47	Typical Hole on Upper Level	0	1688
ZZ48	Typical Hole on Upper Level	0	1672
ZZ49	Typical Hole on Upper Level	0	1610
ZZ50	Typical Hole on Upper Level	0	1548
ZZ51	Typical Hole on Upper Level	0	1486
ZZ52	Typical Hole on Upper Level	0	1424
ZZ53	Typical Hole on Upper Level	0	1362
ZZ54	Typical Hole on Upper Level	0	1300
ZZ55	Typical Hole on Upper Level	0	1238
ZZ56	Typical Hole on Upper Level	0	1176
ZZ57	Typical Hole on Upper Level	0	1114
ZZ58	Typical Hole on Upper Level	0	1052
ZZ59	Typical Hole on Upper Level	0	1036
ZZ60	Typical Hole on Upper Level	0	1098
ZZ61	Typical Hole on Upper Level	0	1160
ZZ62	Typical Hole on Upper Level	0	1222
ZZ63	Typical Hole on Upper Level	0	1284
ZZ64	Typical Hole on Upper Level	0	1346
ZZ65	Typical Hole on Upper Level	0	1408
ZZ66	Typical Hole on Upper Level	0	1470
ZZ67	Typical Hole on Upper Level	0	1532
ZZ68	Typical Hole on Upper Level	0	1594
ZZ69	Typical Hole on Upper Level	0	1656
ZZ70	Typical Hole on Upper Level	0	1640
ZZ71	Typical Hole on Upper Level	0	1578
ZZ72	Typical Hole on Upper Level	0	1516
ZZ73	Typical Hole on Upper Level	0	1454
ZZ74	Typical Hole on Upper Level	0	1392
ZZ75	Typical Hole on Upper Level	0	1330
ZZ76	Typical Hole on Upper Level	0	1268
ZZ77	Typical Hole on Upper Level	0	1206
ZZ78	Typical Hole on Upper Level	0	1144
ZZ79	Typical Hole on Upper Level	0	1082
ZZ80	Typical Hole on Upper Level	0	1020
ZZ81	Typical Hole on Upper Level	0	1004
ZZ82	Typical Hole on Upper Level	0	1066
ZZ83	Typical Hole on Upper Level	0	1128
ZZ84	Typical Hole on Upper Level	0	1190
ZZ85	Typical Hole on Upper Level	0	1252
ZZ86	Typical Hole on Upper Level	0	1314
ZZ87	Typical Hole on Upper Level	0	1376
ZZ88	Typical Hole on Upper Level	0	1438
ZZ89	Typical Hole on Upper Level	0	1500
ZZ90	Typical Hole for Lower Level	0	370
ZZ91	Typical Hole for Lower Level	0	354
ZZ92	Typical Hole for Lower Level	0	338

Hole	Load	Surface Delay	Deck 1 Delay
ZZ93	Typical Hole for Lower Level	0	322
ZZ94	Typical Hole for Lower Level	0	306
ZZ95	Typical Hole for Lower Level	0	290
ZZ96	Typical Hole for Lower Level	0	274
ZZ97	Typical Hole for Lower Level	0	258
ZZ98	Typical Hole for Lower Level	0	242
ZZ99	Typical Hole for Lower Level	0	226
ZZ100	Typical Hole for Lower Level	0	210
ZZ101	Typical Hole for Lower Level	0	194
ZZ102	Typical Hole for Lower Level	0	432
ZZ103	Typical Hole for Lower Level	0	416
ZZ104	Typical Hole for Lower Level	0	400
ZZ105	Typical Hole for Lower Level	0	384
ZZ106	Typical Hole for Lower Level	0	368
ZZ107	Typical Hole for Lower Level	0	352
ZZ108	Typical Hole for Lower Level	0	336
ZZ109	Typical Hole for Lower Level	0	320
ZZ110	Typical Hole for Lower Level	0	304
ZZ111	Typical Hole for Lower Level	0	288
ZZ112	Typical Hole for Lower Level	0	272
ZZ113	Typical Hole for Lower Level	0	256
ZZ114	Typical Hole for Lower Level	0	494
ZZ115	Typical Hole for Lower Level	0	478
ZZ116	Typical Hole for Lower Level	0	462
ZZ117	Typical Hole for Lower Level	0	446
ZZ118	Typical Hole for Lower Level	0	430
ZZ119	Typical Hole for Lower Level	0	414
ZZ120	Typical Hole for Lower Level	0	398
ZZ121	Typical Hole for Lower Level	0	382
ZZ122	Typical Hole for Lower Level	0	366
ZZ123	Typical Hole for Lower Level	0	350
ZZ124	Typical Hole for Lower Level	0	334
ZZ125	Typical Hole for Lower Level	0	318
ZZ126	Typical Hole for Lower Level	0	556
ZZ127	Typical Hole for Lower Level	0	540
ZZ128	Typical Hole for Lower Level	0	524
ZZ129	Typical Hole for Lower Level	0	508
ZZ130	Typical Hole for Lower Level	0	492
ZZ131	Typical Hole for Lower Level	0	476
ZZ132	Typical Hole for Lower Level	0	460
ZZ133	Typical Hole for Lower Level	0	444
ZZ134	Typical Hole for Lower Level	0	428
ZZ135	Typical Hole for Lower Level	0	412
ZZ136	Typical Hole for Lower Level	0	396
ZZ137	Typical Hole for Lower Level	0	380
ZZ138	Typical Hole for Lower Level	0	618
ZZ139	Typical Hole for Lower Level	0	602
ZZ140	Typical Hole for Lower Level	0	586
ZZ141	Typical Hole for Lower Level	0	570
ZZ142	Typical Hole for Lower Level	0	554
ZZ143	Typical Hole for Lower Level	0	538
ZZ144	Typical Hole for Lower Level	0	522
ZZ145	Typical Hole for Lower Level	0	506
ZZ146	Typical Hole for Lower Level	0	490
ZZ147	Typical Hole for Lower Level	0	474
ZZ148	Typical Hole for Lower Level	0	458
ZZ149	Typical Hole for Lower Level	0	442
ZZ150	Typical Hole on Upper Level	0	1068
ZZ151	Typical Hole on Upper Level	0	1052
ZZ152	Typical Hole on Upper Level	0	1036
ZZ153	Typical Hole on Upper Level	0	1020
ZZ154	Typical Hole on Upper Level	0	1004
ZZ155	Typical Hole on Upper Level	0	988
ZZ156	Typical Hole on Upper Level	0	972
ZZ157	Typical Hole on Upper Level	0	988
ZZ158	Typical Hole on Upper Level	0	1130
ZZ159	Typical Hole on Upper Level	0	1114
ZZ160	Typical Hole on Upper Level	0	1098
ZZ161	Typical Hole on Upper Level	0	1082
ZZ162	Typical Hole on Upper Level	0	1066
ZZ163	Typical Hole on Upper Level	0	1050
ZZ164	Typical Hole on Upper Level	0	1034
ZZ165	Typical Hole on Upper Level	0	1050
ZZ166	Typical Hole on Upper Level	0	1192
ZZ167	Typical Hole on Upper Level	0	1176
ZZ168	Typical Hole on Upper Level	0	1160
ZZ169	Typical Hole on Upper Level	0	1144
ZZ170	Typical Hole on Upper Level	0	1128
ZZ171	Typical Hole on Upper Level	0	1112
ZZ172	Typical Hole on Upper Level	0	1096
ZZ173	Typical Hole on Upper Level	0	1112
ZZ174	Typical Hole on Upper Level	0	1254
ZZ175	Typical Hole on Upper Level	0	1238
ZZ176	Typical Hole on Upper Level	0	1222
ZZ177	Typical Hole on Upper Level	0	1206
ZZ178	Typical Hole on Upper Level	0	1190
ZZ179	Typical Hole on Upper Level	0	1174
ZZ180	Typical Hole on Upper Level	0	1158
ZZ181	Typical Hole on Upper Level	0	1174
ZZ182	Typical Hole on Upper Level	0	1316
ZZ183	Typical Hole on Upper Level	0	1300
ZZ184	Typical Hole on Upper Level	0	1284

Hole	Load	Surface Delay	Deck 1 Delay
ZZ185	Typical Hole on Upper Level	0	1268
ZZ186	Typical Hole on Upper Level	0	1252
ZZ187	Typical Hole on Upper Level	0	1236
ZZ188	Typical Hole on Upper Level	0	1220
ZZ189	Typical Hole on Upper Level	0	1236
ZZ190	Typical Hole on Upper Level	0	1378
ZZ191	Typical Hole on Upper Level	0	1362
ZZ192	Typical Hole on Upper Level	0	1346
ZZ193	Typical Hole on Upper Level	0	1330
ZZ194	Typical Hole on Upper Level	0	1314
ZZ195	Typical Hole on Upper Level	0	1298
ZZ196	Typical Hole on Upper Level	0	1282
ZZ197	Typical Hole on Upper Level	0	1298
ZZ198	Typical Hole on Upper Level	0	1440
ZZ199	Typical Hole on Upper Level	0	1424
ZZ200	Typical Hole on Upper Level	0	1408
ZZ201	Typical Hole on Upper Level	0	1392
ZZ202	Typical Hole on Upper Level	0	1376
ZZ203	Typical Hole on Upper Level	0	1360
ZZ204	Typical Hole on Upper Level	0	1344
ZZ205	Typical Hole on Upper Level	0	1360
ZZ206	Typical Hole on Upper Level	0	1502
ZZ207	Typical Hole on Upper Level	0	1486
ZZ208	Typical Hole on Upper Level	0	1470
ZZ209	Typical Hole on Upper Level	0	1454
ZZ210	Typical Hole on Upper Level	0	1438
ZZ211	Typical Hole on Upper Level	0	1422
ZZ212	Typical Hole on Upper Level	0	1406
ZZ213	Typical Hole on Upper Level	0	1422
ZZ214	Typical Hole on Upper Level	0	1564
ZZ215	Typical Hole on Upper Level	0	1548
ZZ216	Typical Hole on Upper Level	0	1532
ZZ217	Typical Hole on Upper Level	0	1516
ZZ218	Typical Hole on Upper Level	0	1500
ZZ219	Typical Hole on Upper Level	0	1484
ZZ220	Typical Hole on Upper Level	0	1468
ZZ221	Typical Hole on Upper Level	0	1484
ZZ222	Typical Hole on Upper Level	0	1626
ZZ223	Typical Hole on Upper Level	0	1610
ZZ224	Typical Hole on Upper Level	0	1594
ZZ225	Typical Hole on Upper Level	0	1578
ZZ226	Typical Hole on Upper Level	0	1562
ZZ227	Typical Hole on Upper Level	0	1546
ZZ228	Typical Hole on Upper Level	0	1530
ZZ229	Typical Hole on Upper Level	0	1546
ZZ230	Typical Hole on Upper Level	0	1688

Hole	Load	Surface Delay	Deck 1 Delay
ZZ231	Typical Hole on Upper Level	0	1672
ZZ232	Typical Hole on Upper Level	0	1656
ZZ233	Typical Hole on Upper Level	0	1640
ZZ234	Typical Hole on Upper Level	0	1624
ZZ235	Typical Hole on Upper Level	0	1608
ZZ236	Typical Hole on Upper Level	0	1592
ZZ237	Typical Hole on Upper Level	0	1608
ZZ238	Typical Hole on Upper Level	0	1624
ZZ239	Typical Hole on Upper Level	0	1562
ZZ240	Typical Hole on Upper Level	0	1704
ZZ241	Typical Hole on Upper Level	0	1642
ZZ242	Typical Hole on Upper Level	0	1580


Typical Hole on Up...
Ø = 114.3 mm
0 m
5 m
10 m
[1.4 m] - Crushed Stone
[0.8 m] - Air
[6.7 m] - Hydromite 4100 Bulk NB Wgt: 96.05 kg
[8.3 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
96.8 kg
Typical Hole for Lo...
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[0.8 m] - Air
[6.1 m] - Hydromite 4100 Bulk NB Wgt: 87.32 kg
[7.7 m] - Eagle 340 E*Star Booster (3/4lb) Det: 40' E*STAR Detonator - QM Wgt: 0.75 kg
88.07 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-14
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 10/13/2020 14:53
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

ENVIRONMENT

Method Used: Decimal Degrees
Weather: Clear
Wind From: WSW
Temperature: 15 °C
Terrain: Flat
Wind Velocity: 10-15 km/h
Blast Lat./Long.: 44.6336° N -80.9998° W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 6 °
Structure Type: Dwelling
Distance: 761 m
Structure Lat./Long.: 44.6404° N -80.9987° W

LAYOUT

		Hole Depth:	8.38 m	Material Blasted:	Limestone	Total Meters Drilled:	1,156.7 m
No. of Holes:	138	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	1.83 m
No. of V.P.† Holes:	138	Face Height:	7.77 m	Spacing:	3.35 m	Stem Length:	1.37 m
No. of Rows:	7	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 7.77 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	372.2 kg	Volume Produced:	10,961.2 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	372.2 kg	Weight Produced:	26,311.2 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	5	Powder Factor 1:	2.562 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	74.4 kg	Powder Factor 2:	0.937 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	88.17	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	39.43		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
KLINGSPOR	DAVID, A			No	Yes	Yes	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-14
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 10/13/2020 14:53
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	138.00	ea	103.50
15003	40' E*STAR Detonator - QM	138.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	10,170.00	kg	10,170.00
12981	Mini Stem Plug - 6015	138.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	1.00	ea	0.00
AB013	Labour Charge	6.00	hr	0.00
	Total Weight of Explosives (Include Primers) (kg):			10,273.50

COMMENTS / EXPLANATIONS

General Comments:

Imported on 10/15/2020 7:12:37 AM

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-14 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 10/13/2020 14:53 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location: Middle Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	10/13/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.381 mm/s	7.6 Hz
Time:	14:53	Calibration Date:	01/17/20		Vertical:	0.381 mm/s	26.0 Hz
Distance From Blast:	796.14 m	Calibration Signal:	ok		Longitudinal:	0.381 mm/s	0.0 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	116 dB	--- Hz
Location:					Vector Sum:	0.66 mm/s	
Lat./Long.:	44.6408° N		-80.9991° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

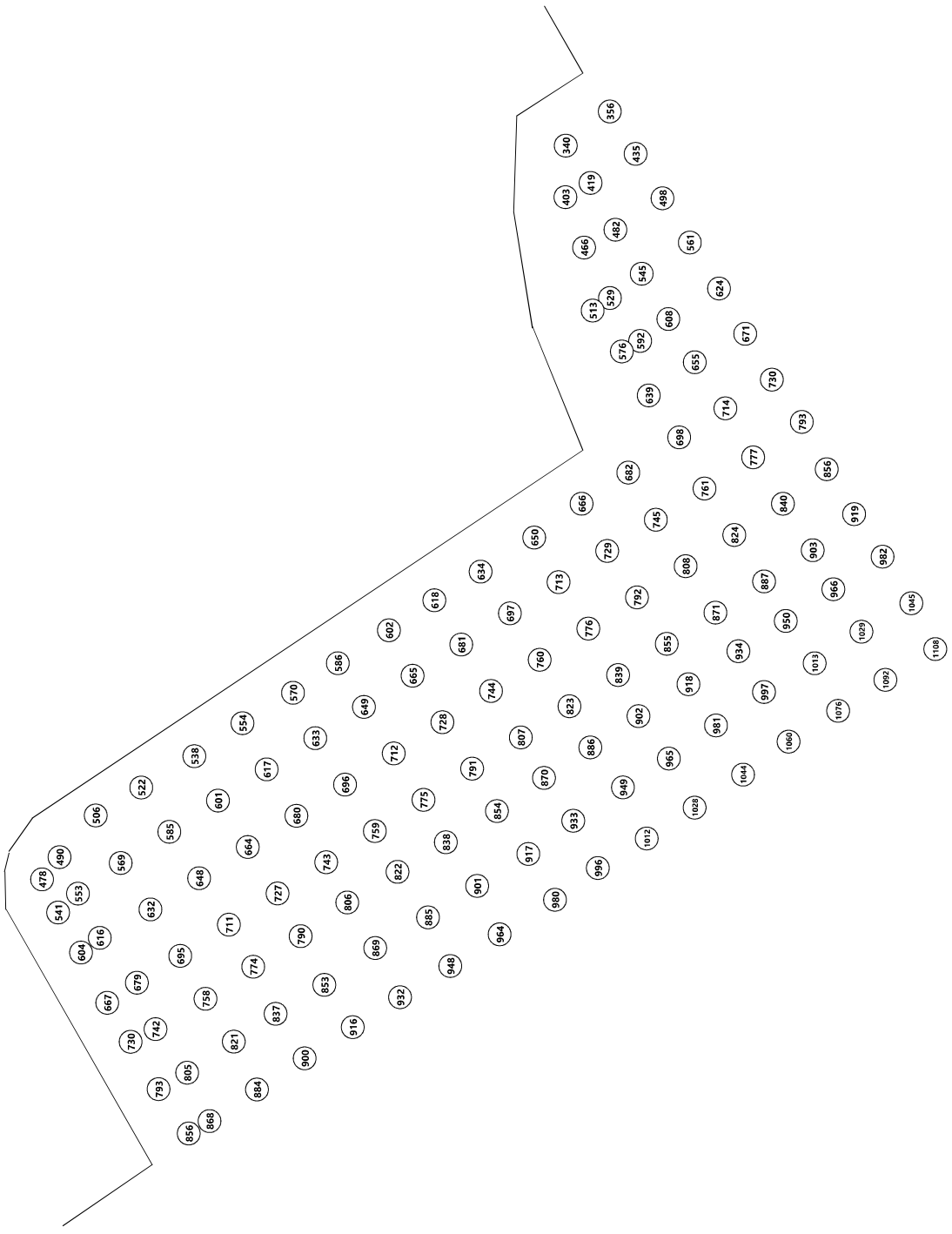
SEISMOGRAPH 2 - 178841 GREY RD. 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	10/13/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.063 mm/s	85.0 Hz
Time:	14:53	Calibration Date:	01/17/20		Vertical:	0.079 mm/s	30.0 Hz
Distance From Blast:	709.57 m	Calibration Signal:	ok		Longitudinal:	0.063 mm/s	51.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	120 dB	--- Hz
Location:					Vector Sum:	0.082 mm/s	
Lat./Long.:	44.6311° N		-80.9915° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	10/13/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	100.0 Hz
Time:	14:53	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	100.0 Hz
Distance From Blast:	1,163.73 m	Calibration Signal:	ok		Longitudinal:	0.127 mm/s	100.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	116 dB	--- Hz
Location:					Vector Sum:	0.22 mm/s	
Lat./Long.:	44.6305° N		-80.9858° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

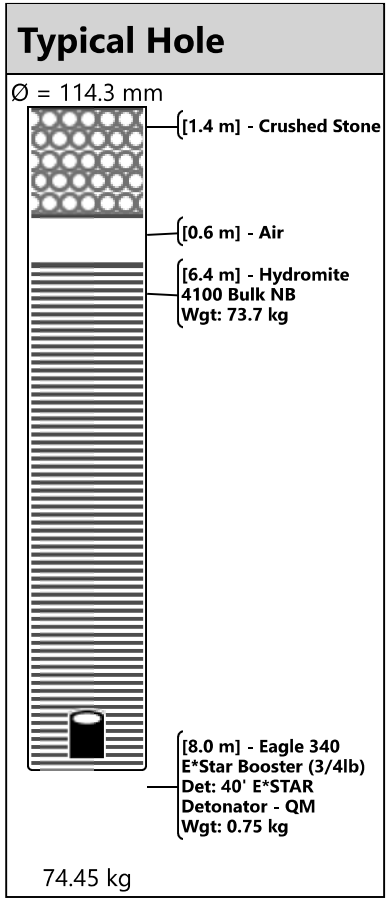
Hole Label Mode: Cumulative In-Hole Delays



Hole	Load	Surface Delay	Deck 1 Delay
ZZ61	Typical Hole	0	1029
ZZ43	Typical Hole	0	1013
ZZ103	Typical Hole	0	340
ZZ66	Typical Hole	0	933
ZZ106	Typical Hole	0	482
ZZ2	Typical Hole	0	569
ZZ93	Typical Hole	0	919
ZZ63	Typical Hole	0	981
ZZ27	Typical Hole	0	808
ZZ8	Typical Hole	0	665
ZZ99	Typical Hole	0	561
ZZ107	Typical Hole	0	466
ZZ138	Typical Hole	0	856
ZZ36	Typical Hole	0	791
ZZ88	Typical Hole	0	918
ZZ111	Typical Hole	0	592
ZZ92	Typical Hole	0	982
ZZ108	Typical Hole	0	529
ZZ5	Typical Hole	0	617
ZZ45	Typical Hole	0	884
ZZ29	Typical Hole	0	840
ZZ122	Typical Hole	0	602
ZZ22	Typical Hole	0	728
ZZ89	Typical Hole	0	934
ZZ37	Typical Hole	0	807
ZZ28	Typical Hole	0	824
ZZ16	Typical Hole	0	632
ZZ70	Typical Hole	0	869
ZZ14	Typical Hole	0	761
ZZ96	Typical Hole	0	730
ZZ115	Typical Hole	0	655
ZZ26	Typical Hole	0	792
ZZ125	Typical Hole	0	554
ZZ126	Typical Hole	0	538
ZZ75	Typical Hole	0	793
ZZ127	Typical Hole	0	522
ZZ129	Typical Hole	0	490
ZZ128	Typical Hole	0	506
ZZ130	Typical Hole	0	478
ZZ136	Typical Hole	0	667
ZZ134	Typical Hole	0	604
ZZ76	Typical Hole	0	730
ZZ131	Typical Hole	0	541
ZZ118	Typical Hole	0	682
ZZ30	Typical Hole	0	695
ZZ84	Typical Hole	0	854

Hole	Load	Surface Delay	Deck 1 Delay
ZZ42	Typical Hole	0	887
ZZ44	Typical Hole	0	618
ZZ3	Typical Hole	0	585
ZZ79	Typical Hole	0	774
ZZ73	Typical Hole	0	821
ZZ117	Typical Hole	0	698
ZZ85	Typical Hole	0	870
ZZ13	Typical Hole	0	745
ZZ32	Typical Hole	0	727
ZZ67	Typical Hole	0	917
ZZ104	Typical Hole	0	419
ZZ49	Typical Hole	0	948
ZZ119	Typical Hole	0	666
ZZ74	Typical Hole	0	805
ZZ60	Typical Hole	0	1045
ZZ1	Typical Hole	0	903
ZZ9	Typical Hole	0	681
ZZ47	Typical Hole	0	916
ZZ110	Typical Hole	0	608
ZZ38	Typical Hole	0	823
ZZ39	Typical Hole	0	839
ZZ109	Typical Hole	0	545
ZZ69	Typical Hole	0	885
ZZ91	Typical Hole	0	966
ZZ56	Typical Hole	0	1060
ZZ102	Typical Hole	0	356
ZZ132	Typical Hole	0	553
ZZ80	Typical Hole	0	790
ZZ137	Typical Hole	0	868
ZZ72	Typical Hole	0	837
ZZ17	Typical Hole	0	648
ZZ34	Typical Hole	0	759
ZZ31	Typical Hole	0	711
ZZ58	Typical Hole	0	1092
ZZ83	Typical Hole	0	822
ZZ105	Typical Hole	0	403
ZZ6	Typical Hole	0	633
ZZ78	Typical Hole	0	758
ZZ21	Typical Hole	0	712
ZZ25	Typical Hole	0	776
ZZ121	Typical Hole	0	634
ZZ116	Typical Hole	0	714
ZZ53	Typical Hole	0	1012
ZZ124	Typical Hole	0	570
ZZ94	Typical Hole	0	856
ZZ64	Typical Hole	0	965

Hole	Load	Surface Delay	Deck 1 Delay
ZZ48	Typical Hole	0	932
ZZ41	Typical Hole	0	871
ZZ77	Typical Hole	0	742
ZZ71	Typical Hole	0	853
ZZ23	Typical Hole	0	744
ZZ90	Typical Hole	0	950
ZZ113	Typical Hole	0	513
ZZ55	Typical Hole	0	1044
ZZ97	Typical Hole	0	671
ZZ33	Typical Hole	0	743
ZZ98	Typical Hole	0	624
ZZ15	Typical Hole	0	777
ZZ65	Typical Hole	0	949
ZZ114	Typical Hole	0	639
ZZ87	Typical Hole	0	902
ZZ54	Typical Hole	0	1028
ZZ4	Typical Hole	0	601
ZZ18	Typical Hole	0	664
ZZ12	Typical Hole	0	729
ZZ7	Typical Hole	0	649
ZZ95	Typical Hole	0	793
ZZ40	Typical Hole	0	855
ZZ59	Typical Hole	0	1108
ZZ62	Typical Hole	0	997
ZZ135	Typical Hole	0	679
ZZ19	Typical Hole	0	680
ZZ20	Typical Hole	0	696
ZZ100	Typical Hole	0	498
ZZ120	Typical Hole	0	650
ZZ101	Typical Hole	0	435
ZZ133	Typical Hole	0	616
ZZ86	Typical Hole	0	886
ZZ68	Typical Hole	0	901
ZZ46	Typical Hole	0	900
ZZ81	Typical Hole	0	806
ZZ82	Typical Hole	0	838
ZZ112	Typical Hole	0	576
ZZ57	Typical Hole	0	1076
ZZ10	Typical Hole	0	697
ZZ52	Typical Hole	0	996
ZZ11	Typical Hole	0	713
ZZ35	Typical Hole	0	775
ZZ51	Typical Hole	0	980
ZZ50	Typical Hole	0	964
ZZ123	Typical Hole	0	586
ZZ24	Typical Hole	0	760


Typical Hole
Ø = 114.3 mm
0 m
5 m
10 m
[1.4 m] - Crushed Stone
[0.6 m] - Air
[6.4 m] - Hydromite
4100 Bulk NB
Wgt: 73.7 kg
[8.0 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
74.45 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-15
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 10/23/2020 15:49
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

ENVIRONMENT

Method Used: Decimal Degrees
Weather: Clear
Wind From: WSW
Temperature: 23 °C
Terrain: Flat
Wind Velocity: 10-15 km/h
Blast Lat./Long.: 44.6332° N -81.0000° W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 7 °
Structure Type: Dwelling
Distance: 810 m
Structure Lat./Long.: 44.6404° N -80.9987° W

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	1,259.1 m
No. of Holes:	153	Subdrilling:	0.00 m	Burden:	3.05 m	Water Depth:	4.57 m
No. of V.P.† Holes:	153	Face Height:	8.23 m	Spacing:	3.35 m	Stem Length:	1.22 m
No. of Rows:	9	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 8.23 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	147.4 kg	Volume Produced:	12,867.5 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	147.4 kg	Weight Produced:	30,887.0 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	2.744 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	73.7 kg	Powder Factor 2:	0.875 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	94.29	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	66.67		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
FRALICK	CRAIG, A			No	No	No	No	No
SMART	EVAN, C			No	No	No	No	No
WELLS	ZACHARY, N			No	No	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-15
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 10/23/2020 15:49
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Bottom Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	306.00	ea	229.50
15030	60' E*STAR Detonator - QM/HD	306.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	11,010.00	kg	11,010.00
20334	Hydromite 880 76x400 (3x16)	8.00	st	18.16
12981	Mini Stem Plug - 6015	153.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	1.00	ea	0.00
AB013	Labour Charge	8.00	hr	0.00
		Total Weight of Explosives (Include Primers) (kg):		11,257.67

COMMENTS / EXPLANATIONS

General Comments: Imported on 10/26/2020 7:27:05 AM

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-15 | Blast Type: Stone Quarry/Stone Mine - Production | Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)

Date/Time: 10/23/2020 15:49 | Pit/Permit: KEPPEL QUARRY / SHOT SERVICE | Location: Bottom Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	10/23/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	30.1 Hz
Time:	15:49	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	5.5 Hz
Distance From Blast:	847.95 m	Calibration Signal:	ok		Longitudinal:	0.127 mm/s	15.1 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	120 dB	--- Hz
Location:					Vector Sum:	0.142 mm/s	
Lat./Long.:	44.6408° N		-80.9991° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

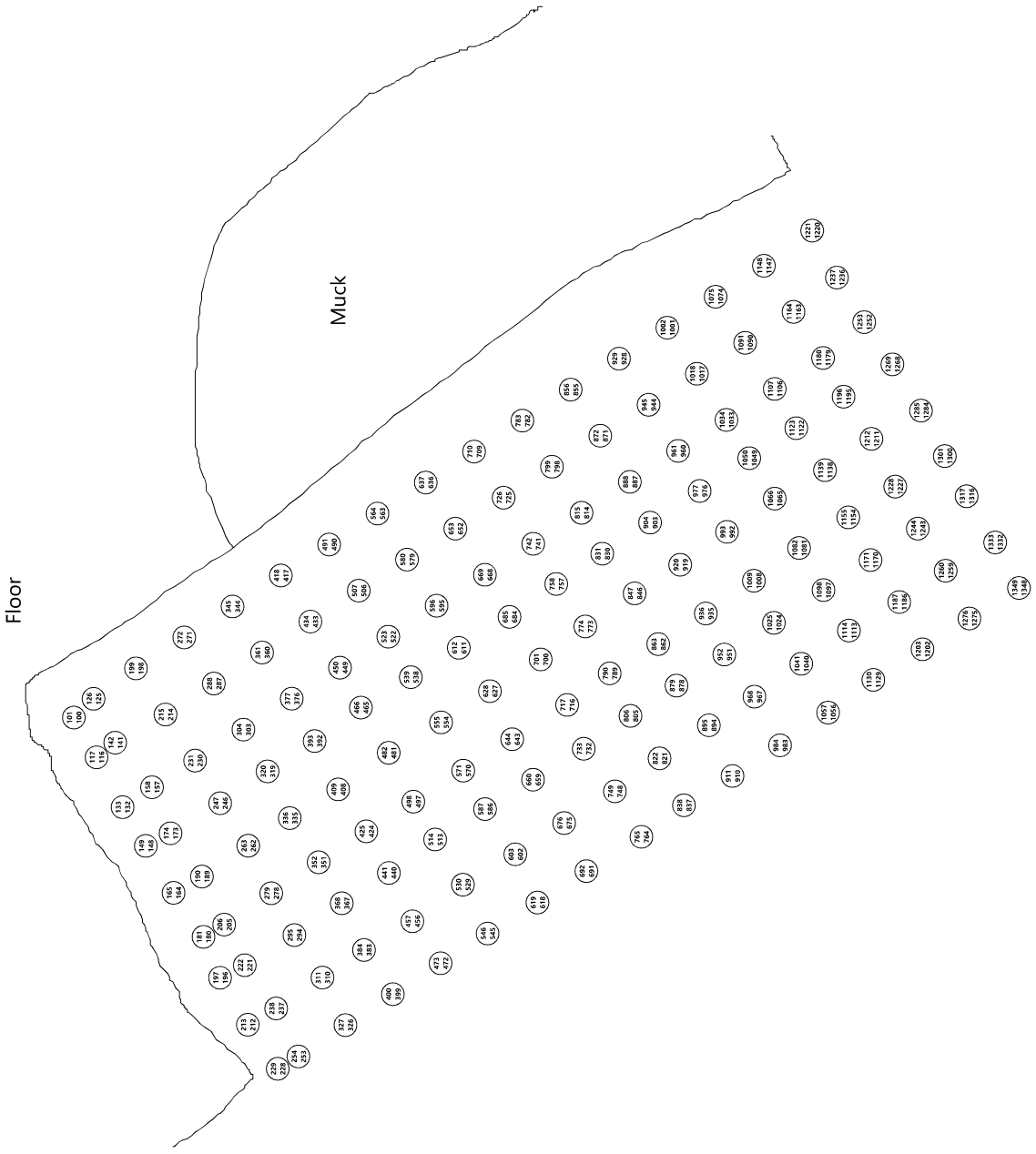
SEISMOGRAPH 2 - 178841 GREY RD. 17

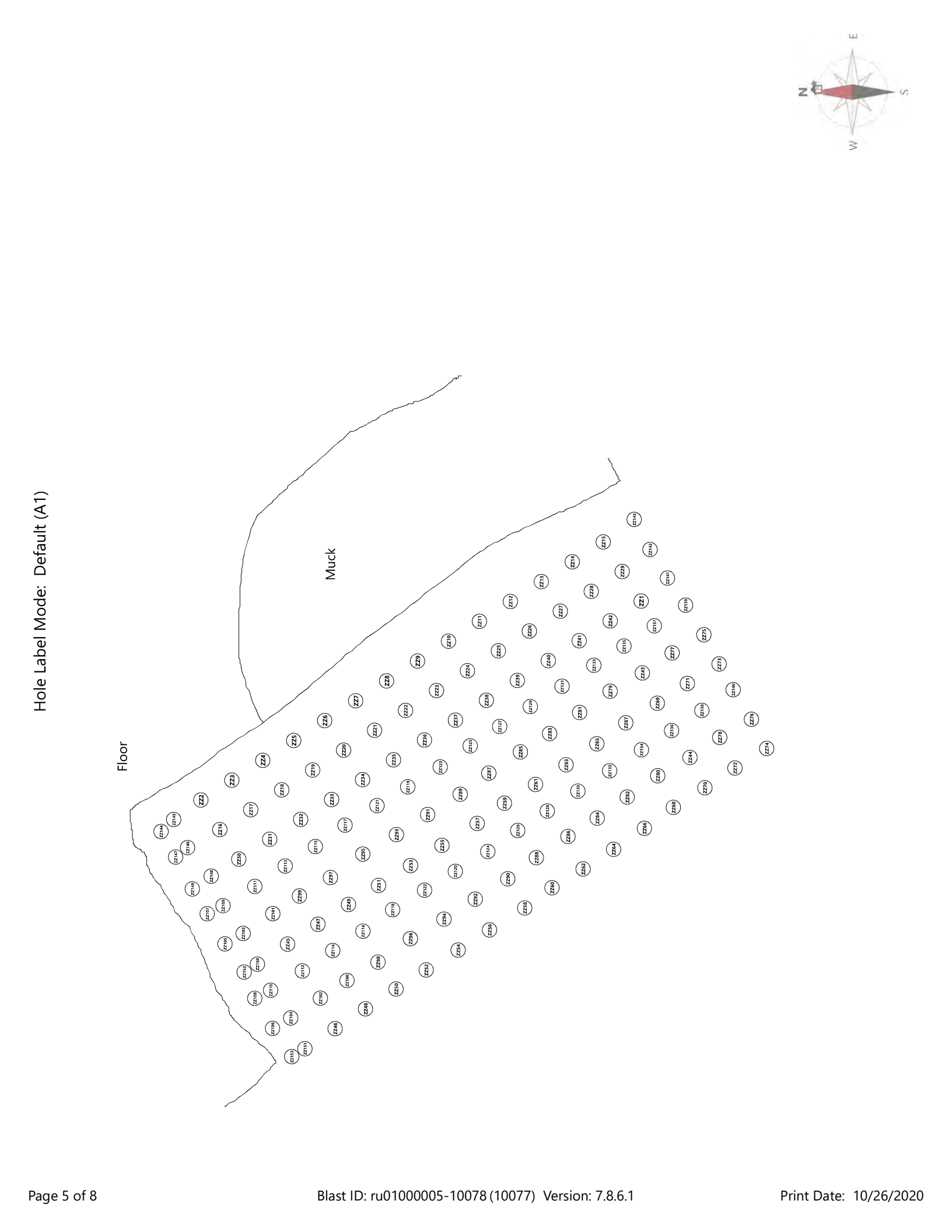
Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	10/23/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	--- Hz
Time:	15:49	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	100.0 Hz
Distance From Blast:	711.10 m	Calibration Signal:	ok		Longitudinal:	0.254 mm/s	100.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	122 dB	--- Hz
Location:					Vector Sum:	0.254 mm/s	
Lat./Long.:	44.6311° N		-80.9916° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type:	Seismic Record	Seismograph Type:	Instantel				
Date:	10/23/20	Trigger Level:	1.50 mm/s	115.00 dB	Transverse:	0.127 mm/s	100.0 Hz
Time:	15:49	Calibration Date:	01/17/20		Vertical:	0.127 mm/s	0.0 Hz
Distance From Blast:	1,173.78 m	Calibration Signal:	ok		Longitudinal:	0.127 mm/s	100.0 Hz
Direction From Blast:	E	Geophone Min. Freq.:	--- Hz				
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic:	117 dB	--- Hz
Location:					Vector Sum:	0.22 mm/s	
Lat./Long.:	44.6306° N		-80.9857° W				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Liam O'Donohoe						

Hole Label Mode: Cumulative In-Hole Delays



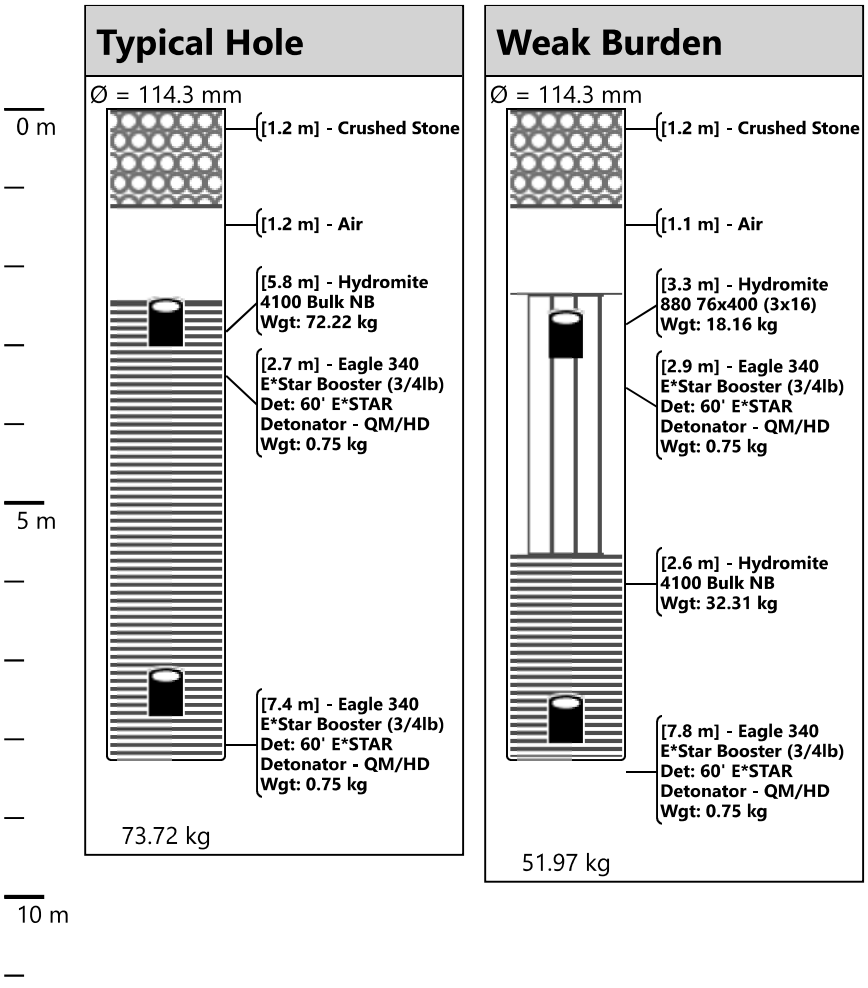

Hole Label Mode: Default (A1)
Floor
Muck
N
E
S
W

Hole	Load	Surface Delay	Deck 1 Delay
ZZ152	Typical Hole	0	180/181
ZZ149	Typical Hole	0	132/133
ZZ86	Typical Hole	0	894/895
ZZ148	Typical Hole	0	157/158
ZZ2	Typical Hole	0	198/199
ZZ15	Typical Hole	0	1147/1148
ZZ123	Typical Hole	0	684/685
ZZ91	Typical Hole	0	627/628
ZZ139	Typical Hole	0	1268/1269
ZZ133	Typical Hole	0	1049/1050
ZZ105	Typical Hole	0	164/165
ZZ147	Typical Hole	0	116/117
ZZ37	Typical Hole	0	741/742
ZZ27	Typical Hole	0	1017/1018
ZZ35	Typical Hole	0	595/596
ZZ142	Typical Hole	0	1236/1237
ZZ150	Typical Hole	0	205/206
ZZ94	Typical Hole	0	602/603
ZZ58	Typical Hole	0	764/765
ZZ83	Typical Hole	0	919/920
ZZ55	Typical Hole	0	643/644
ZZ21	Typical Hole	0	579/580
ZZ74	Typical Hole	0	1348/1349
ZZ68	Typical Hole	0	1129/1130
ZZ19	Typical Hole	0	433/434
ZZ51	Typical Hole	0	497/498
ZZ116	Typical Hole	0	440/441
ZZ132	Typical Hole	0	1024/1025
ZZ130	Typical Hole	0	951/952
ZZ113	Typical Hole	0	319/320
ZZ53	Typical Hole	0	570/571
ZZ25	Typical Hole	0	871/872
ZZ26	Typical Hole	0	944/945
ZZ47	Typical Hole	0	351/352
ZZ143	Typical Hole	0	1220/1221
ZZ28	Typical Hole	0	1090/1091
ZZ117	Typical Hole	0	465/466
ZZ75	Typical Hole	0	1284/1285
ZZ135	Typical Hole	0	1122/1123
ZZ64	Typical Hole	0	983/984
ZZ31	Typical Hole	0	303/304
ZZ108	Typical Hole	0	196/197
ZZ102	Typical Hole	0	310/311
ZZ43	Typical Hole	0	1138/1139
ZZ7	Typical Hole	0	563/564
ZZ134	Typical Hole	0	1097/1098

Hole	Load	Surface Delay	Deck 1 Delay
ZZ38	Typical Hole	0	814/815
ZZ136	Typical Hole	0	1170/1171
ZZ118	Typical Hole	0	513/514
ZZ71	Typical Hole	0	1227/1228
ZZ4	Typical Hole	0	344/345
ZZ140	Typical Hole	0	1316/1317
ZZ40	Typical Hole	0	960/961
ZZ36	Typical Hole	0	668/669
ZZ131	Typical Hole	0	976/977
ZZ82	Typical Hole	0	1040/1041
ZZ146	Typical Hole	0	141/142
ZZ126	Typical Hole	0	805/806
ZZ120	Typical Hole	0	659/660
ZZ30	Typical Hole	0	230/231
ZZ50	Typical Hole	0	472/473
ZZ6	Typical Hole	0	490/491
ZZ115	Typical Hole	0	392/393
ZZ127	Typical Hole	0	830/831
ZZ61	Typical Hole	0	862/863
ZZ48	Typical Hole	0	399/400
ZZ109	Typical Hole	0	173/174
ZZ76	Typical Hole	0	1332/1333
ZZ106	Typical Hole	0	212/213
ZZ32	Typical Hole	0	376/377
ZZ39	Typical Hole	0	887/888
ZZ84	Typical Hole	0	967/968
ZZ81	Typical Hole	0	992/993
ZZ145	Weak Burden	0	125/126
ZZ69	Typical Hole	0	1154/1155
ZZ119	Typical Hole	0	611/612
ZZ122	Typical Hole	0	586/587
ZZ42	Typical Hole	0	1106/1107
ZZ5	Typical Hole	0	417/418
ZZ138	Typical Hole	0	1243/1244
ZZ95	Typical Hole	0	481/482
ZZ52	Typical Hole	0	545/546
ZZ88	Typical Hole	0	821/822
ZZ79	Typical Hole	0	1065/1066
ZZ63	Typical Hole	0	935/936
ZZ41	Typical Hole	0	1033/1034
ZZ93	Typical Hole	0	554/555
ZZ90	Typical Hole	0	748/749
ZZ141	Typical Hole	0	1252/1253
ZZ24	Typical Hole	0	798/799
ZZ12	Typical Hole	0	928/929
ZZ66	Typical Hole	0	1056/1057

Hole	Load	Surface Delay	Deck 1 Delay
ZZ29	Typical Hole	0	1163/1164
ZZ23	Typical Hole	0	725/726
ZZ124	Typical Hole	0	732/733
ZZ101	Typical Hole	0	262/263
ZZ128	Typical Hole	0	878/879
ZZ65	Typical Hole	0	1008/1009
ZZ34	Typical Hole	0	522/523
ZZ125	Typical Hole	0	757/758
ZZ8	Typical Hole	0	636/637
ZZ54	Typical Hole	0	618/619
ZZ98	Typical Hole	0	456/457
ZZ16	Typical Hole	0	214/215
ZZ45	Typical Hole	0	278/279
ZZ121	Typical Hole	0	538/539
ZZ20	Typical Hole	0	506/507
ZZ129	Typical Hole	0	903/904
ZZ60	Typical Hole	0	837/838
ZZ99	Typical Hole	0	335/336
ZZ151	Typical Hole	0	253/254
ZZ3	Typical Hole	0	271/272
ZZ59	Typical Hole	0	789/790
ZZ10	Typical Hole	0	782/783
ZZ46	Typical Hole	0	326/327
ZZ87	Typical Hole	0	773/774
ZZ56	Typical Hole	0	691/692
ZZ18	Typical Hole	0	360/361
ZZ13	Typical Hole	0	1001/1002
ZZ107	Typical Hole	0	148/149
ZZ110	Typical Hole	0	221/222
ZZ22	Typical Hole	0	652/653
ZZ104	Typical Hole	0	237/238
ZZ80	Typical Hole	0	1113/1114
ZZ153	Typical Hole	0	228/229
ZZ57	Typical Hole	0	716/717
ZZ100	Typical Hole	0	383/384
ZZ62	Typical Hole	0	910/911
ZZ67	Typical Hole	0	1081/1082
ZZ70	Typical Hole	0	1202/1203
ZZ112	Typical Hole	0	294/295
ZZ111	Typical Hole	0	246/247
ZZ14	Typical Hole	0	1074/1075
ZZ33	Typical Hole	0	449/450
ZZ9	Typical Hole	0	709/710
ZZ103	Typical Hole	0	189/190
ZZ78	Typical Hole	0	1259/1260
ZZ96	Typical Hole	0	529/530

Hole	Load	Surface Delay	Deck 1 Delay
ZZ1	Typical Hole	0	1179/1180
ZZ77	Typical Hole	0	1211/1212
ZZ144	Typical Hole	0	100/101
ZZ73	Typical Hole	0	1300/1301
ZZ11	Typical Hole	0	855/856
ZZ89	Typical Hole	0	700/701
ZZ49	Typical Hole	0	424/425
ZZ137	Typical Hole	0	1195/1196
ZZ17	Typical Hole	0	287/288
ZZ92	Typical Hole	0	675/676
ZZ72	Typical Hole	0	1275/1276
ZZ97	Typical Hole	0	408/409
ZZ44	Typical Hole	0	1186/1187
ZZ114	Typical Hole	0	367/368
ZZ85	Typical Hole	0	846/847


Typical Hole
Ø = 114.3 mm
[1.2 m] - Crushed Stone
[1.2 m] - Air
[5.8 m] - Hydromite 4100 Bulk NB Wgt: 72.22 kg
[2.7 m] - Eagle 340 E*Star Booster (3/4lb) Det: 60' E*STAR Detonator - QM/HD Wgt: 0.75 kg
[7.4 m] - Eagle 340 E*Star Booster (3/4lb) Det: 60' E*STAR Detonator - QM/HD Wgt: 0.75 kg
73.72 kg
Weak Burden
Ø = 114.3 mm
[1.2 m] - Crushed Stone
[1.1 m] - Air
[3.3 m] - Hydromite 880 76x400 (3x16) Wgt: 18.16 kg
[2.9 m] - Eagle 340 E*Star Booster (3/4lb) Det: 60' E*STAR Detonator - QM/HD Wgt: 0.75 kg
[2.6 m] - Hydromite 4100 Bulk NB Wgt: 32.31 kg
[7.8 m] - Eagle 340 E*Star Booster (3/4lb) Det: 60' E*STAR Detonator - QM/HD Wgt: 0.75 kg
51.97 kg
0 m
5 m
10 m

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-16
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 10/30/2020 13:34
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Clear
Wind From: SE
Temperature: 0 °C
Terrain: Flat
Wind Velocity: 5-10 km/h
Blast Lat./Long.: 44° 38' 0.300" N 80° 59' 58.900" W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 5 °
Structure Type: Dwelling
Distance: 785 m
Structure Lat./Long.: 44° 38' 25.581" N 80° 59' 55.234" W

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	1,094.5 m
No. of Holes:	133	Subdrilling:	0.00 m	Burden:	3.05 m	Water Depth:	6.10 m
No. of V.P.† Holes:	133	Face Height:	8.23 m	Spacing:	3.35 m	Stem Length:	1.22 m
No. of Rows:	7	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 8.23 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	332.0 kg	Volume Produced:	11,185.4 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	332.0 kg	Weight Produced:	26,849.5 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.432 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	83.0 kg	Powder Factor 2:	0.987 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	86.11	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	43.06		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	Yes	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
SMART	EVAN, C			No	Yes	No	No	No
WELLS	ZACHARY, N			No	Yes	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-16
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 10/30/2020 13:34
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	266.00	ea	199.50
15030	60' E*STAR Detonator - QM/HD	266.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	10,840.00	kg	10,840.00
12981	Mini Stem Plug - 6015	133.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	1.00	ea	0.00
AB013	Labour Charge	8.00	hr	0.00
	Total Weight of Explosives (Include Primers) (kg):			11,039.50

COMMENTS / EXPLANATIONS

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-16
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 10/30/2020 13:34
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type: No Trigger
Seismograph Type: Instantel
Date: 10/30/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:34
Calibration Date: 01/17/20
Distance From Blast: 679.09 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 52.587" N 80° 59' 30.045" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Corey Bragan

SEISMOGRAPH 2 - 178841 GREY RD. 17

Data Type: Seismic Record
Seismograph Type: Instantel
Date: 10/30/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:34
Calibration Date: 01/17/20
Distance From Blast: 786.08 m
Calibration Signal: ok
Direction From Blast: N
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 38' 25.645" N 80° 59' 55.415" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Corey Bragan

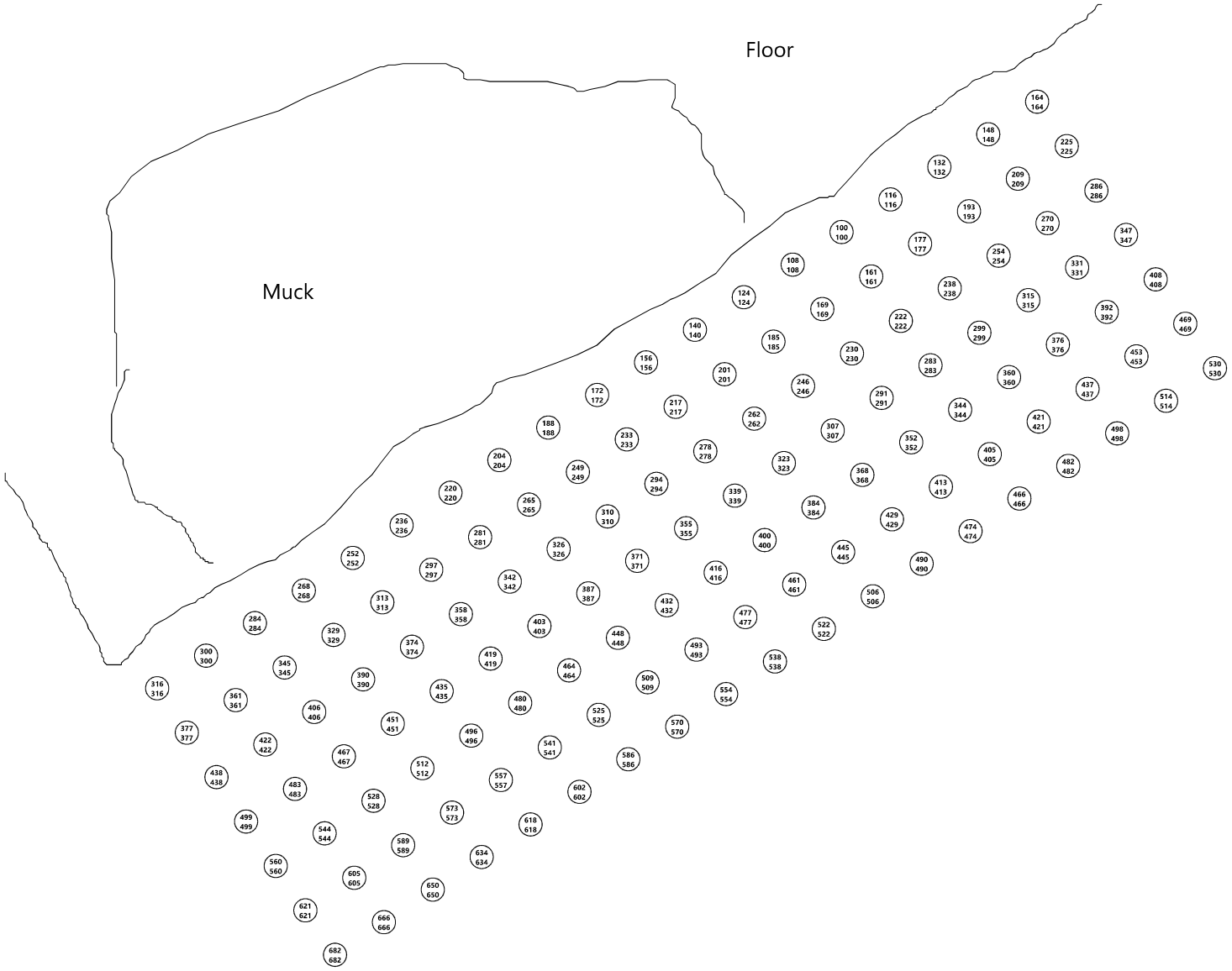
Transverse:	1.27 mm/s	30.0 Hz
Vertical:	1.651 mm/s	37.0 Hz
Longitudinal:	3.048 mm/s	28.0 Hz
Acoustic:	118 dB	--- Hz
Vector Sum:	3.113 mm/s	

SEISMOGRAPH 3 - 283197 10TH CONC.

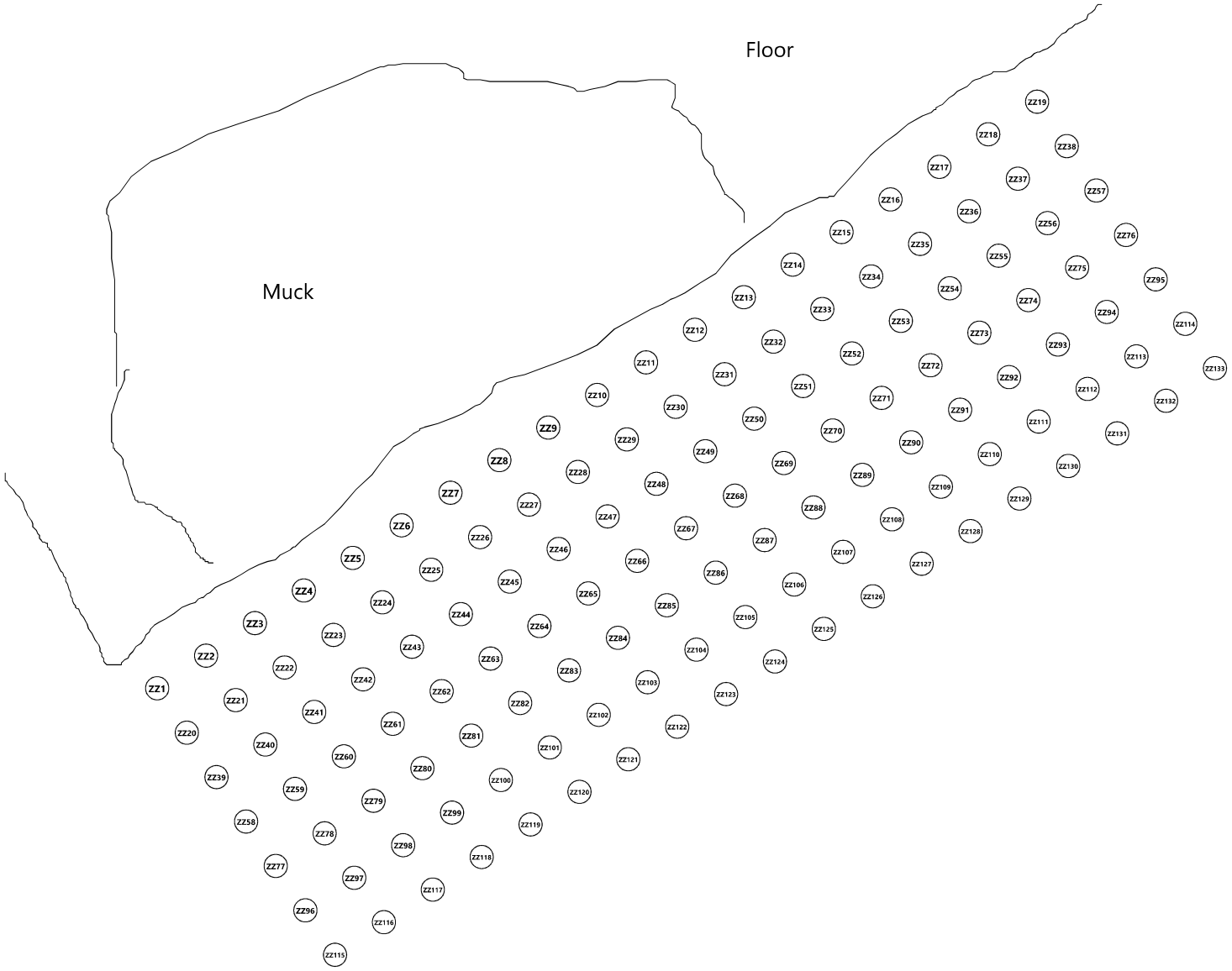
Data Type: Seismic Record
Seismograph Type: Instantel
Date: 10/30/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 13:34
Calibration Date: 01/17/20
Distance From Blast: 1,140.26 m
Calibration Signal: ok
Direction From Blast: E
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 49.798" N 80° 59' 9.304" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Corey Bragan

Transverse:	1.73 mm/s	34.0 Hz
Vertical:	0.603 mm/s	47.0 Hz
Longitudinal:	1.365 mm/s	32.0 Hz
Acoustic:	109 dB	--- Hz
Vector Sum:	2.068 mm/s	

Hole Label Mode: Cumulative In-Hole Delays



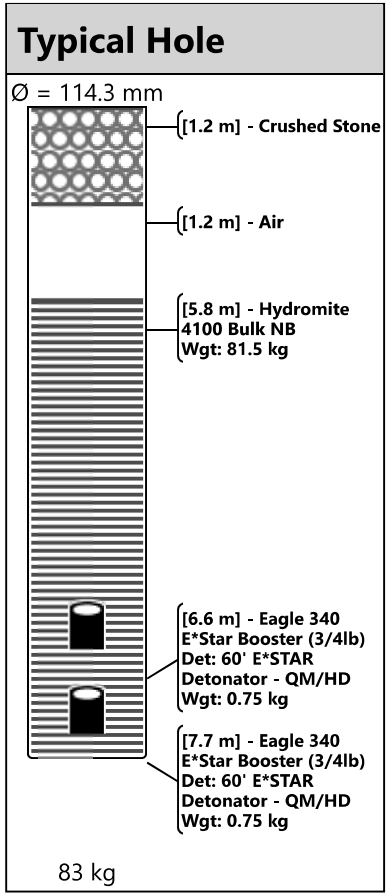
Hole Label Mode: Default (A1)



Hole	Load	Surface Delay	Deck 1 Delay
ZZ2	Typical Hole	0	300/300
ZZ53	Typical Hole	0	222/222
ZZ14	Typical Hole	0	108/108
ZZ15	Typical Hole	0	100/100
ZZ17	Typical Hole	0	132/132
ZZ16	Typical Hole	0	116/116
ZZ19	Typical Hole	0	164/164
ZZ18	Typical Hole	0	148/148
ZZ13	Typical Hole	0	124/124
ZZ7	Typical Hole	0	220/220
ZZ129	Typical Hole	0	466/466
ZZ57	Typical Hole	0	286/286
ZZ56	Typical Hole	0	270/270
ZZ86	Typical Hole	0	416/416
ZZ102	Typical Hole	0	525/525
ZZ119	Typical Hole	0	618/618
ZZ67	Typical Hole	0	355/355
ZZ118	Typical Hole	0	634/634
ZZ60	Typical Hole	0	467/467
ZZ26	Typical Hole	0	281/281
ZZ92	Typical Hole	0	360/360
ZZ114	Typical Hole	0	469/469
ZZ76	Typical Hole	0	347/347
ZZ46	Typical Hole	0	326/326
ZZ1	Typical Hole	0	316/316
ZZ72	Typical Hole	0	283/283
ZZ117	Typical Hole	0	650/650
ZZ128	Typical Hole	0	474/474
ZZ41	Typical Hole	0	406/406
ZZ87	Typical Hole	0	400/400
ZZ110	Typical Hole	0	405/405
ZZ6	Typical Hole	0	236/236
ZZ25	Typical Hole	0	297/297
ZZ104	Typical Hole	0	493/493
ZZ40	Typical Hole	0	422/422
ZZ34	Typical Hole	0	161/161
ZZ47	Typical Hole	0	310/310
ZZ49	Typical Hole	0	278/278
ZZ42	Typical Hole	0	390/390
ZZ123	Typical Hole	0	554/554
ZZ85	Typical Hole	0	432/432
ZZ65	Typical Hole	0	387/387
ZZ24	Typical Hole	0	313/313
ZZ63	Typical Hole	0	419/419
ZZ69	Typical Hole	0	323/323
ZZ98	Typical Hole	0	589/589

Hole	Load	Surface Delay	Deck 1 Delay
ZZ103	Typical Hole	0	509/509
ZZ51	Typical Hole	0	246/246
ZZ8	Typical Hole	0	204/204
ZZ68	Typical Hole	0	339/339
ZZ28	Typical Hole	0	249/249
ZZ88	Typical Hole	0	384/384
ZZ50	Typical Hole	0	262/262
ZZ84	Typical Hole	0	448/448
ZZ81	Typical Hole	0	496/496
ZZ35	Typical Hole	0	177/177
ZZ21	Typical Hole	0	361/361
ZZ30	Typical Hole	0	217/217
ZZ52	Typical Hole	0	230/230
ZZ107	Typical Hole	0	445/445
ZZ80	Typical Hole	0	512/512
ZZ73	Typical Hole	0	299/299
ZZ126	Typical Hole	0	506/506
ZZ44	Typical Hole	0	358/358
ZZ20	Typical Hole	0	377/377
ZZ36	Typical Hole	0	193/193
ZZ112	Typical Hole	0	437/437
ZZ54	Typical Hole	0	238/238
ZZ111	Typical Hole	0	421/421
ZZ78	Typical Hole	0	544/544
ZZ113	Typical Hole	0	453/453
ZZ91	Typical Hole	0	344/344
ZZ101	Typical Hole	0	541/541
ZZ94	Typical Hole	0	392/392
ZZ122	Typical Hole	0	570/570
ZZ79	Typical Hole	0	528/528
ZZ64	Typical Hole	0	403/403
ZZ99	Typical Hole	0	573/573
ZZ109	Typical Hole	0	413/413
ZZ59	Typical Hole	0	483/483
ZZ121	Typical Hole	0	586/586
ZZ9	Typical Hole	0	188/188
ZZ74	Typical Hole	0	315/315
ZZ132	Typical Hole	0	514/514
ZZ89	Typical Hole	0	368/368
ZZ33	Typical Hole	0	169/169
ZZ100	Typical Hole	0	557/557
ZZ127	Typical Hole	0	490/490
ZZ120	Typical Hole	0	602/602
ZZ62	Typical Hole	0	435/435
ZZ61	Typical Hole	0	451/451
ZZ125	Typical Hole	0	522/522

Hole	Load	Surface Delay	Deck 1 Delay
ZZ37	Typical Hole	0	209/209
ZZ55	Typical Hole	0	254/254
ZZ12	Typical Hole	0	140/140
ZZ115	Typical Hole	0	682/682
ZZ105	Typical Hole	0	477/477
ZZ4	Typical Hole	0	268/268
ZZ23	Typical Hole	0	329/329
ZZ66	Typical Hole	0	371/371
ZZ124	Typical Hole	0	538/538
ZZ22	Typical Hole	0	345/345
ZZ96	Typical Hole	0	621/621
ZZ48	Typical Hole	0	294/294
ZZ106	Typical Hole	0	461/461
ZZ5	Typical Hole	0	252/252
ZZ93	Typical Hole	0	376/376
ZZ3	Typical Hole	0	284/284
ZZ131	Typical Hole	0	498/498
ZZ83	Typical Hole	0	464/464
ZZ29	Typical Hole	0	233/233
ZZ95	Typical Hole	0	408/408
ZZ58	Typical Hole	0	499/499
ZZ133	Typical Hole	0	530/530
ZZ10	Typical Hole	0	172/172
ZZ116	Typical Hole	0	666/666
ZZ90	Typical Hole	0	352/352
ZZ27	Typical Hole	0	265/265
ZZ39	Typical Hole	0	438/438
ZZ70	Typical Hole	0	307/307
ZZ43	Typical Hole	0	374/374
ZZ108	Typical Hole	0	429/429
ZZ130	Typical Hole	0	482/482
ZZ82	Typical Hole	0	480/480
ZZ71	Typical Hole	0	291/291
ZZ38	Typical Hole	0	225/225
ZZ31	Typical Hole	0	201/201
ZZ97	Typical Hole	0	605/605
ZZ11	Typical Hole	0	156/156
ZZ32	Typical Hole	0	185/185
ZZ75	Typical Hole	0	331/331
ZZ77	Typical Hole	0	560/560
ZZ45	Typical Hole	0	342/342


Typical Hole
Ø = 114.3 mm
0 m
5 m
10 m
[1.2 m] - Crushed Stone
[1.2 m] - Air
[5.8 m] - Hydromite 4100 Bulk NB Wgt: 81.5 kg
[6.6 m] - Eagle 340 E*Star Booster (3/4lb) Det: 60' E*STAR Detonator - QM/HD Wgt: 0.75 kg
[7.7 m] - Eagle 340 E*Star Booster (3/4lb) Det: 60' E*STAR Detonator - QM/HD Wgt: 0.75 kg
83 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-17
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/10/2020 12:10
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Light Rain
Wind From: WSW
Temperature: 23 °C
Terrain: Flat
Wind Velocity: 10-20 km/h
Blast Lat./Long.: 44° 38' 0.800" N 80° 59' 57.600" W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 3 °
Structure Type: Dwelling
Distance: 767 m
Structure Lat./Long.: 44° 38' 25.581" N 80° 59' 55.234" W

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	658.4 m
No. of Holes:	80	Subdrilling:	0.00 m	Burden:	3.05 m	Water Depth:	1.52 m
No. of V.P.† Holes:	80	Face Height:	8.23 m	Spacing:	3.35 m	Stem Length:	1.41 m
No. of Rows:	8	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Deepest Hole Load

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	209.6 kg	Volume Produced:	6,728.1 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	209.6 kg	Weight Produced:	16,150.1 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.904 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	69.9 kg	Powder Factor 2:	0.826 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	91.72	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	52.95		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	No	No	No	No
BRAGAN	COREY, T			No	No	No	No	No
FRALICK	CRAIG, A			No	No	No	No	No
SMART	EVAN, C			No	Yes	No	No	No
WELLS	ZACHARY, N			No	Yes	Yes	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-17
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/10/2020 12:10
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	81.00 ea	60.75
15003	40' E*STAR Detonator - QM	81.00 ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	2.00 sp	0.00
15128	Hydromite 4100 Bulk NB	5,500.00 kg	5,500.00
12981	Mini Stem Plug - 6015	80.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	4.00 hr	0.00
	Total Weight of Explosives (Include Primers) (kg):		5,560.75

COMMENTS / EXPLANATIONS

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-17
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/10/2020 12:10
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type: No Trigger
Seismograph Type: Instantel
Date: 11/10/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 12:10
Calibration Date: 01/17/20
Distance From Blast: 658.06 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 52.587" N 80° 59' 30.045" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe

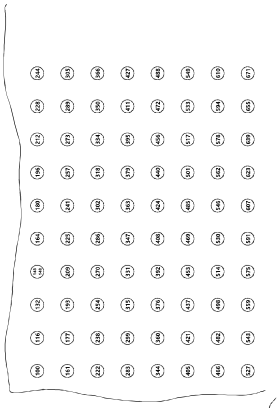
SEISMOGRAPH 2 - 178841 GREY RD. 17

Data Type: Seismic Record
Seismograph Type: Instantel
Date: 11/10/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 12:10
Calibration Date: 01/17/20
Distance From Blast: 673.61 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 52.086" N 80° 59' 29.584" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe

Transverse:	0.381 mm/s	1.0 Hz
Vertical:	0.381 mm/s	2.3 Hz
Longitudinal:	0.381 mm/s	0.0 Hz
Acoustic:	116 dB	--- Hz
Vector Sum:	0.596 mm/s	

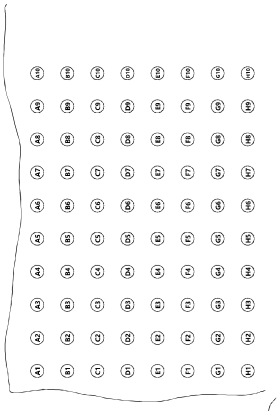
SEISMOGRAPH 3 - 283197 10TH CONC.

Data Type: No Trigger
Seismograph Type: Instantel
Date: 11/10/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 12:10
Calibration Date: 01/17/20
Distance From Blast: 1,117.40 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 49.798" N 80° 59' 9.304" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe



Floor

Hole Label Mode: Cumulative In-Hole Delays

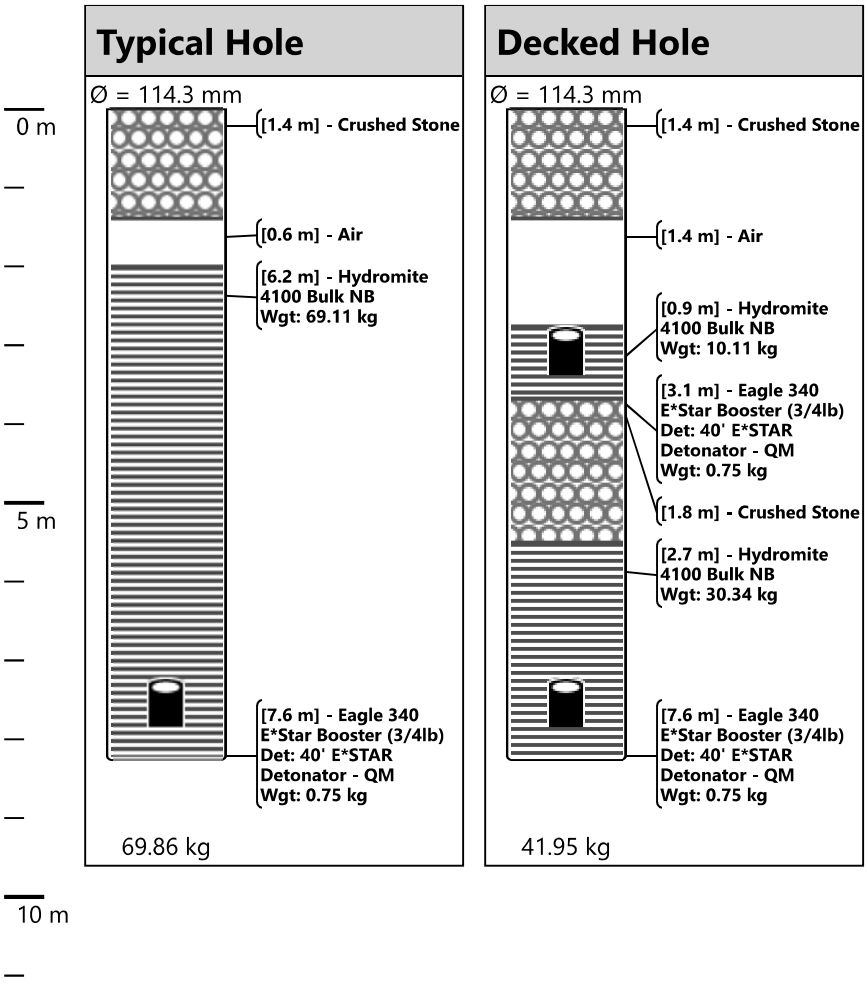


Floor

Hole Label Mode: Default (A1)

Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay
A1	Typical Hole	0	100	
A2	Typical Hole	0	116	
A3	Typical Hole	0	132	
A4	Decked Hole	0	148	148
A5	Typical Hole	0	164	
A6	Typical Hole	0	180	
A7	Typical Hole	0	196	
A8	Typical Hole	0	212	
A9	Typical Hole	0	228	
A10	Typical Hole	0	244	
B1	Typical Hole	0	161	
B2	Typical Hole	0	177	
B3	Typical Hole	0	193	
B4	Typical Hole	0	209	
B5	Typical Hole	0	225	
B6	Typical Hole	0	241	
B7	Typical Hole	0	257	
B8	Typical Hole	0	273	
B9	Typical Hole	0	289	
B10	Typical Hole	0	305	
C1	Typical Hole	0	222	
C2	Typical Hole	0	238	
C3	Typical Hole	0	254	
C4	Typical Hole	0	270	
C5	Typical Hole	0	286	
C6	Typical Hole	0	302	
C7	Typical Hole	0	318	
C8	Typical Hole	0	334	
C9	Typical Hole	0	350	
C10	Typical Hole	0	366	
D1	Typical Hole	0	283	
D2	Typical Hole	0	299	
D3	Typical Hole	0	315	
D4	Typical Hole	0	331	
D5	Typical Hole	0	347	
D6	Typical Hole	0	363	
D7	Typical Hole	0	379	
D8	Typical Hole	0	395	
D9	Typical Hole	0	411	
D10	Typical Hole	0	427	
E1	Typical Hole	0	344	
E2	Typical Hole	0	360	
E3	Typical Hole	0	376	
E4	Typical Hole	0	392	
E5	Typical Hole	0	408	
E6	Typical Hole	0	424	

Hole	Load	Surface Delay	Deck 1 Delay
E7	Typical Hole	0	440
E8	Typical Hole	0	456
E9	Typical Hole	0	472
E10	Typical Hole	0	488
F1	Typical Hole	0	405
F2	Typical Hole	0	421
F3	Typical Hole	0	437
F4	Typical Hole	0	453
F5	Typical Hole	0	469
F6	Typical Hole	0	485
F7	Typical Hole	0	501
F8	Typical Hole	0	517
F9	Typical Hole	0	533
F10	Typical Hole	0	549
G1	Typical Hole	0	466
G2	Typical Hole	0	482
G3	Typical Hole	0	498
G4	Typical Hole	0	514
G5	Typical Hole	0	530
G6	Typical Hole	0	546
G7	Typical Hole	0	562
G8	Typical Hole	0	578
G9	Typical Hole	0	594
G10	Typical Hole	0	610
H1	Typical Hole	0	527
H2	Typical Hole	0	543
H3	Typical Hole	0	559
H4	Typical Hole	0	575
H5	Typical Hole	0	591
H6	Typical Hole	0	607
H7	Typical Hole	0	623
H8	Typical Hole	0	639
H9	Typical Hole	0	655
H10	Typical Hole	0	671


Typical Hole
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[0.6 m] - Air
[6.2 m] - Hydromite
4100 Bulk NB
Wgt: 69.11 kg
[7.6 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
69.86 kg
Decked Hole
Ø = 114.3 mm
[1.4 m] - Crushed Stone
[1.4 m] - Air
[0.9 m] - Hydromite
4100 Bulk NB
Wgt: 10.11 kg
[3.1 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
[1.8 m] - Crushed Stone
[2.7 m] - Hydromite
4100 Bulk NB
Wgt: 30.34 kg
[7.6 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
41.95 kg
0 m
5 m
10 m

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-18
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/24/2020 14:47
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Overcast / Low Clouds
Wind From: WSW
Temperature: -3 °C
Terrain: Flat
Wind Velocity: 5-20 km/h
Blast Lat./Long.: 44° 38' 1.100" N 80° 59' 56.200" W

NEAREST PROTECTED STRUCTURE

Compass Point: N
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 1 °
Structure Type: Dwelling
Distance: 756 m
Structure Lat./Long.: 44° 38' 25.581" N 80° 59' 55.234" W

LAYOUT

		Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	1,119.2 m
No. of Holes:	136	Subdrilling:	0.00 m	Burden:	3.05 m	Water Depth:	3.05 m
No. of V.P.† Holes:	136	Face Height:	8.23 m	Spacing:	3.35 m	Stem Length:	1.52 m
No. of Rows:	14	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified (H = 8.23 m)

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	481.4 kg	Volume Produced:	11,437.7 m³
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	481.4 kg	Weight Produced:	27,455.1 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	6	Powder Factor 1:	2.516 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	80.2 kg	Powder Factor 2:	0.954 kg/m³
Mfg and Model:	DBM1600-2-RC	Scaled Distance Factor (max charge):	84.39	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	34.45		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	No	No	No	No
BRAGAN	COREY, T			No	No	No	No	No
KLINGSPOR	DAVID, A			No	Yes	No	No	No
WELLS	ZACHARY, N			No	No	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-18
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/24/2020 14:47
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15106	Eagle 340 E*Star Booster (3/4lb)	136.00	ea	102.00
15003	40' E*STAR Detonator - QM	136.00	ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00	sp	0.00
15128	Hydromite 4100 Bulk NB	10,810.00	kg	10,810.00
12981	Mini Stem Plug - 6015	136.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	1.00	ea	0.00
AB013	Labour Charge	6.00	hr	0.00
	Total Weight of Explosives (Include Primers) (kg):			10,912.00

COMMENTS / EXPLANATIONS

General Comments:

Imported on 11/25/2020 5:54:17 PM

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-18
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/24/2020 14:47
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Middle Bench

SEISMOGRAPH 1 - 178717 GREY RD 17

Data Type: Seismic Record
Seismograph Type: Instantel
Date: 11/24/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 14:47
Calibration Date: 01/17/20
Distance From Blast: 633.68 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 52.587" N 80° 59' 30.045" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Corey Bragan

Transverse:	1.356 mm/s	39.4 Hz
Vertical:	1.08 mm/s	46.5 Hz
Longitudinal:	1.655 mm/s	34.1 Hz
Acoustic:	113 dB	--- Hz
Vector Sum:	1.673 mm/s	

SEISMOGRAPH 2 - 283197 10TH CONC.

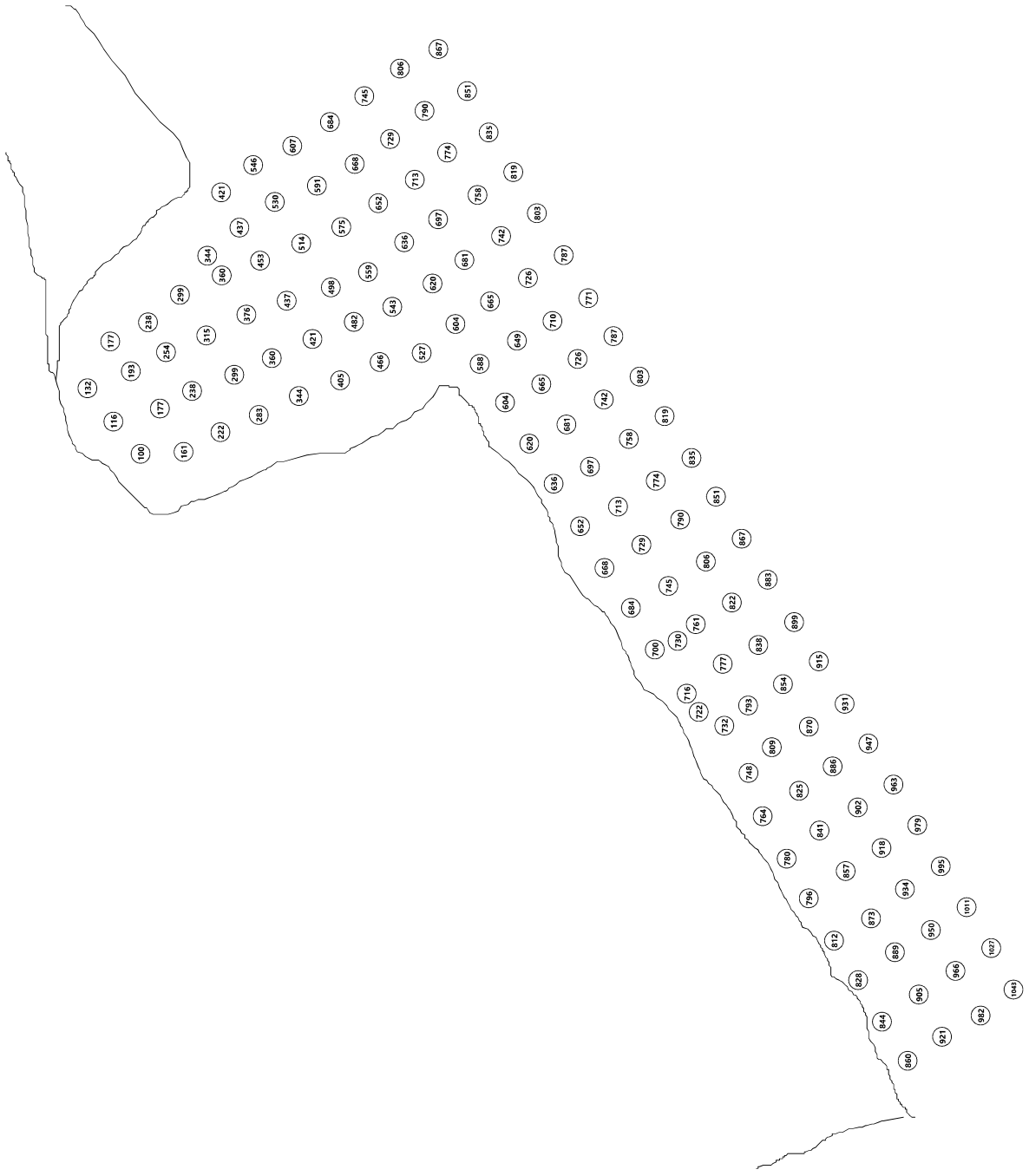
Data Type: No Trigger
Seismograph Type: Instantel
Date: 11/24/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 14:47
Calibration Date: 01/17/20
Distance From Blast: 1,090.88 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout:
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 49.798" N 80° 59' 9.304" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Corey Bragan

SEISMOGRAPH 3 - 178841 GREY RD. 17

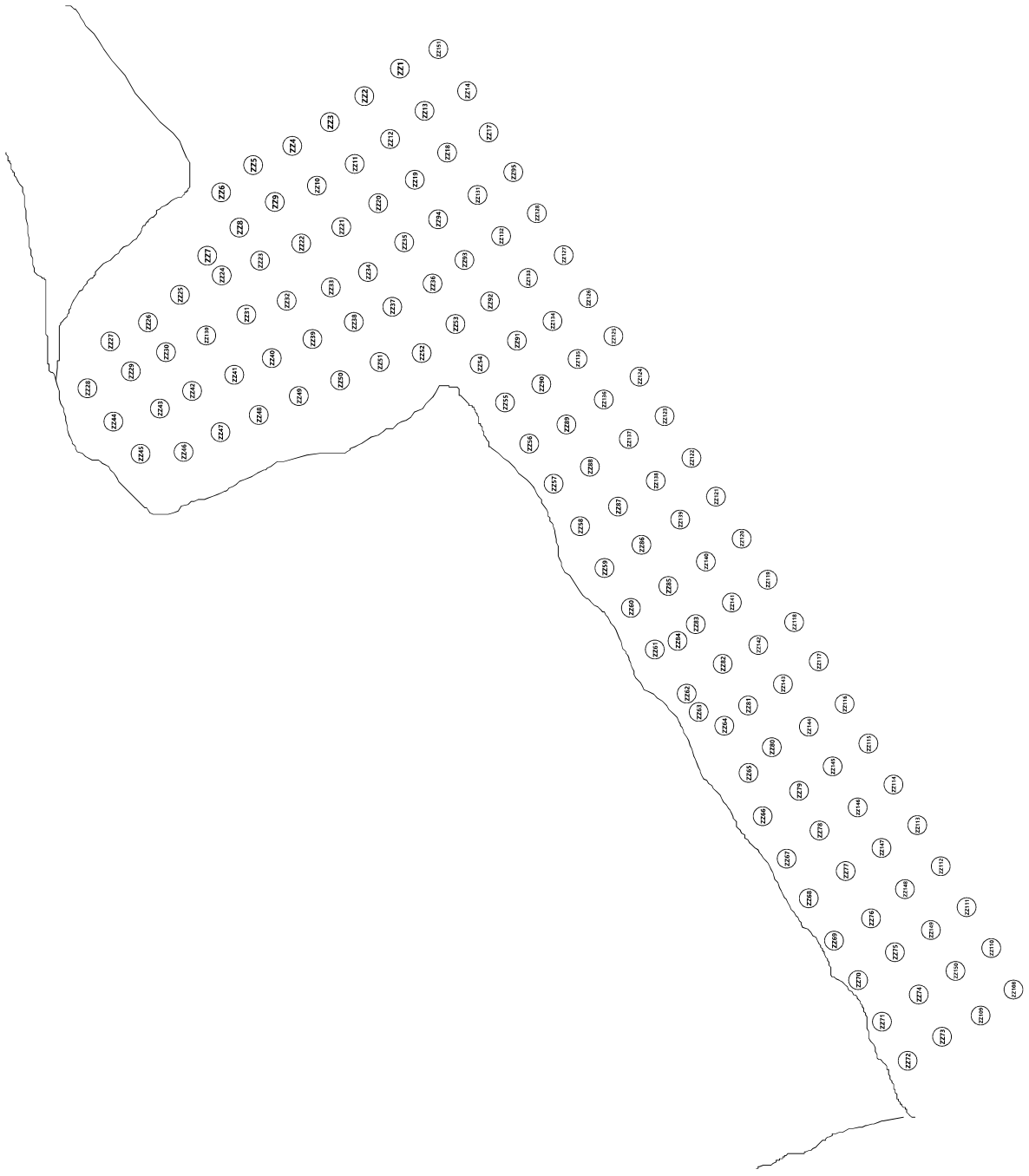
Data Type: Seismic Record
Seismograph Type: Instantel
Date: 11/24/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 14:47
Calibration Date: 01/17/20
Distance From Blast: 797.36 m
Calibration Signal: ok
Direction From Blast: N
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 38' 26.930" N 80° 59' 56.825" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Corey Bragan

Transverse:	0.889 mm/s	14.0 Hz
Vertical:	1.016 mm/s	15.0 Hz
Longitudinal:	1.524 mm/s	24.0 Hz
Acoustic:	118 dB	--- Hz
Vector Sum:	1.636 mm/s	

Hole Label Mode: Cumulative In-Hole Delays



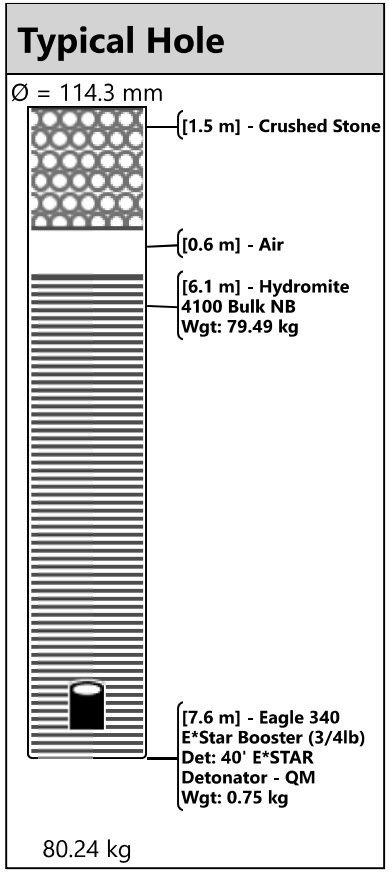
Hole Label Mode: Default (A1)



Hole	Load	Surface Delay	Deck 1 Delay
ZZ111	Typical Hole	0	1011
ZZ57	Typical Hole	0	636
ZZ65	Typical Hole	0	748
ZZ56	Typical Hole	0	620
ZZ45	Typical Hole	0	100
ZZ27	Typical Hole	0	177
ZZ71	Typical Hole	0	844
ZZ46	Typical Hole	0	161
ZZ5	Typical Hole	0	546
ZZ50	Typical Hole	0	405
ZZ70	Typical Hole	0	828
ZZ58	Typical Hole	0	652
ZZ26	Typical Hole	0	238
ZZ47	Typical Hole	0	222
ZZ52	Typical Hole	0	527
ZZ69	Typical Hole	0	812
ZZ6	Typical Hole	0	421
ZZ4	Typical Hole	0	607
ZZ54	Typical Hole	0	588
ZZ60	Typical Hole	0	684
ZZ7	Typical Hole	0	344
ZZ59	Typical Hole	0	668
ZZ67	Typical Hole	0	780
ZZ55	Typical Hole	0	604
ZZ44	Typical Hole	0	116
ZZ49	Typical Hole	0	344
ZZ61	Typical Hole	0	700
ZZ64	Typical Hole	0	732
ZZ63	Typical Hole	0	722
ZZ25	Typical Hole	0	299
ZZ62	Typical Hole	0	716
ZZ68	Typical Hole	0	796
ZZ28	Typical Hole	0	132
ZZ51	Typical Hole	0	466
ZZ72	Typical Hole	0	860
ZZ66	Typical Hole	0	764
ZZ48	Typical Hole	0	283
ZZ88	Typical Hole	0	697
ZZ114	Typical Hole	0	963
ZZ131	Typical Hole	0	758
ZZ13	Typical Hole	0	790
ZZ90	Typical Hole	0	665
ZZ33	Typical Hole	0	498
ZZ126	Typical Hole	0	771
ZZ19	Typical Hole	0	713
ZZ2	Typical Hole	0	745

Hole	Load	Surface Delay	Deck 1 Delay
ZZ8	Typical Hole	0	437
ZZ31	Typical Hole	0	376
ZZ128	Typical Hole	0	803
ZZ36	Typical Hole	0	620
ZZ89	Typical Hole	0	681
ZZ24	Typical Hole	0	360
ZZ142	Typical Hole	0	838
ZZ81	Typical Hole	0	793
ZZ93	Typical Hole	0	681
ZZ141	Typical Hole	0	822
ZZ32	Typical Hole	0	437
ZZ84	Typical Hole	0	730
ZZ74	Typical Hole	0	905
ZZ118	Typical Hole	0	899
ZZ127	Typical Hole	0	787
ZZ140	Typical Hole	0	806
ZZ150	Typical Hole	0	966
ZZ113	Typical Hole	0	979
ZZ86	Typical Hole	0	729
ZZ79	Typical Hole	0	825
ZZ148	Typical Hole	0	934
ZZ29	Typical Hole	0	193
ZZ80	Typical Hole	0	809
ZZ117	Typical Hole	0	915
ZZ10	Typical Hole	0	591
ZZ149	Typical Hole	0	950
ZZ137	Typical Hole	0	758
ZZ30	Typical Hole	0	254
ZZ3	Typical Hole	0	684
ZZ132	Typical Hole	0	742
ZZ139	Typical Hole	0	790
ZZ124	Typical Hole	0	803
ZZ110	Typical Hole	0	1027
ZZ133	Typical Hole	0	726
ZZ121	Typical Hole	0	851
ZZ18	Typical Hole	0	774
ZZ83	Typical Hole	0	761
ZZ37	Typical Hole	0	543
ZZ35	Typical Hole	0	636
ZZ116	Typical Hole	0	931
ZZ87	Typical Hole	0	713
ZZ40	Typical Hole	0	360
ZZ123	Typical Hole	0	819
ZZ43	Typical Hole	0	177
ZZ146	Typical Hole	0	902
ZZ38	Typical Hole	0	482

Hole	Load	Surface Delay	Deck 1 Delay
ZZ109	Typical Hole	0	982
ZZ76	Typical Hole	0	873
ZZ11	Typical Hole	0	668
ZZ145	Typical Hole	0	886
ZZ22	Typical Hole	0	514
ZZ42	Typical Hole	0	238
ZZ151	Typical Hole	0	867
ZZ147	Typical Hole	0	918
ZZ14	Typical Hole	0	851
ZZ78	Typical Hole	0	841
ZZ108	Typical Hole	0	1043
ZZ120	Typical Hole	0	867
ZZ122	Typical Hole	0	835
ZZ73	Typical Hole	0	921
ZZ17	Typical Hole	0	835
ZZ75	Typical Hole	0	889
ZZ135	Typical Hole	0	726
ZZ85	Typical Hole	0	745
ZZ77	Typical Hole	0	857
ZZ112	Typical Hole	0	995
ZZ21	Typical Hole	0	575
ZZ41	Typical Hole	0	299
ZZ20	Typical Hole	0	652
ZZ144	Typical Hole	0	870
ZZ9	Typical Hole	0	530
ZZ138	Typical Hole	0	774
ZZ143	Typical Hole	0	854
ZZ92	Typical Hole	0	665
ZZ125	Typical Hole	0	787
ZZ130	Typical Hole	0	315
ZZ23	Typical Hole	0	453
ZZ53	Typical Hole	0	604
ZZ94	Typical Hole	0	697
ZZ12	Typical Hole	0	729
ZZ91	Typical Hole	0	649
ZZ34	Typical Hole	0	559
ZZ82	Typical Hole	0	777
ZZ134	Typical Hole	0	710
ZZ119	Typical Hole	0	883
ZZ95	Typical Hole	0	819
ZZ115	Typical Hole	0	947
ZZ136	Typical Hole	0	742
ZZ1	Typical Hole	0	806
ZZ39	Typical Hole	0	421


Typical Hole
Ø = 114.3 mm
0 m
5 m
10 m
[1.5 m] - Crushed Stone
[0.6 m] - Air
[6.1 m] - Hydromite
4100 Bulk NB
Wgt: 79.49 kg
[7.6 m] - Eagle 340
E*Star Booster (3/4lb)
Det: 40' E*STAR
Detonator - QM
Wgt: 0.75 kg
80.24 kg

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-19
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/27/2020 15:01
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Trench

ENVIRONMENT

Method Used: Lat./Long.
Weather: Light Rain
Wind From: WSW
Temperature: 1 °C
Terrain: Flat
Wind Velocity: 5-10 km/h
Blast Lat./Long.: 44° 38' 8.800" N 80° 59' 50.200" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW
Structure Name: 178841 Grey Rd. 17
Direction/Bearing: 347 °
Structure Type: Dwelling
Distance: 530 m
Structure Lat./Long.: 44° 38' 25.581" N 80° 59' 55.234" W

LAYOUT

		Hole Depth:	3.05 m	Material Blasted:	Limestone	Total Meters Drilled:	618.7 m
No. of Holes:	203	Subdrilling:	0.00 m	Burden:	[See Below]	Water Depth:	3.05 m
No. of V.P.† Holes:	203	Face Height:	3.05 m	Spacing:	[See Below]	Stem Length:	1.98 m
No. of Rows:	[See Below]	Drilling Angle:	[See Below]	Back Fill Depth:	0.00 m	Area Type:	[See Below]
Diameter:	[See Below]	Mats Used:	No	Stem Type:	Clear Stone	Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

		Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	2,242.7 m³
Initiation:	Non-Electric	Max. Wt. of Expl. Per 8 ms Interval:	10.2 kg	Weight Produced:	5,383.3 t
Firing Device:	Other	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	2.610 t/kg
Other Method:	Electronic Blast Machine	Max. Wt. of Explosive Per Hole:	10.2 kg	Powder Factor 2:	0.920 kg/m³
Mfg and Model:	DBM1600-2-KC	Scaled Distance Factor (max charge):	166.20	Rock Density:	2.400 t/m³
Initiation Settings:		Scaled Distance Factor (per delay):	166.20		
Series Resistance (ohms):					

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No
Misfire Occurred: No
Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
O'DONOHOE	LIAM, J	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDER, A			No	No	No	No	No
BRAGAN	COREY, T			No	No	No	No	No
SMART	EVAN, C			No	Yes	No	No	No
WELLS	ZACHARY, N			No	No	No	No	No

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-19
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/27/2020 15:01
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Trench

PRODUCTS AND SERVICES

Number	Product Description	Quantity		Weight (kg)
15102	Eagle 340 Booster (3/4 lb)	203.00	ea	152.25
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	203.00	ea	0.00
15001	24' E*STAR Detonator - QM	2.00	ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	1.00	ea	0.00
11240	500' SHOCK*STAR Lead-In-Line	1.00	ea	0.00
15128	Hydromite 4100 Bulk NB	1,910.00	kg	1,910.00
12981	Mini Stem Plug - 6015	203.00	ea	0.00
A0075	Blaster Charge	1.00	ea	0.00
AB007	Bulk Truck Charge	1.00	ea	0.00
AB013	Labour Charge	6.00	hr	0.00
	Total Weight of Explosives (Include Primers) (kg):			2,062.25

COMMENTS / EXPLANATIONS

Liam O'Donohoe

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-19
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/27/2020 15:01
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Trench

Pattern: 1

No. of Holes:	80	Hole Depth:	3.05 m	Burden:	3.05 m	Area Type:	Sinking Cut/Ditch
No. of V.P.† Holes:	80	Diameter:	114.3 mm	Spacing:	2.44 m	Method:	Deepest Hole Load
No. of Rows:	40	Subdrilling:	0.00 m				
Drilling Angle:	0 °	Face Height:	3.05 m			Total volume for pattern:	883.5 m^3
† V.P. = Volume Producing						Total weight for pattern:	2,120.7 t

Pattern: 2

No. of Holes:	123	Hole Depth:	3.05 m	Burden:	3.05 m	Area Type:	Sinking Cut/Ditch
No. of V.P.† Holes:	123	Diameter:	114.3 mm	Spacing:	2.44 m	Method:	Deepest Hole Load
No. of Rows:	2	Subdrilling:	0.00 m				
Drilling Angle:	0 °	Face Height:	3.05 m			Total volume for pattern:	1,359.2 m^3
† V.P. = Volume Producing						Total weight for pattern:	3,262.6 t

Total blast volume: 2,242.7 m^3
Total weight produced: 5,383.4 t

AUSTIN POWDER LTD.
BLAST REPORT

327-Orillia
RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2020-19
Blast Type: Stone Quarry/Stone Mine - Production
Customer: HAROLD SUTHERLAND CONST.-KEPPEL (HAR1525-001)
Date/Time: 11/27/2020 15:01
Pit/Permit: KEPPEL QUARRY / SHOT SERVICE
Location: Trench

SEISMOGRAPH 1 - 178841 GREY RD. 17

Data Type: Seismic Record
Seismograph Type: Instantel
Date: 11/27/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 15:01
Calibration Date: 01/17/20
Distance From Blast: 578.51 m
Calibration Signal: ok
Direction From Blast: NNW
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 38' 26.930" N 80° 59' 56.825" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe, Austin Powder

Transverse:	0.244 mm/s	23.3 Hz
Vertical:	0.441 mm/s	12.2 Hz
Longitudinal:	0.536 mm/s	13.5 Hz
Acoustic:	121 dB	--- Hz
Vector Sum:	0.566 mm/s	

SEISMOGRAPH 2 - 283197 10TH CONC.

Data Type: Seismic Record
Seismograph Type: Instantel
Date: 11/27/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 15:01
Calibration Date: 01/17/20
Distance From Blast: 1,074.12 m
Calibration Signal: ok
Direction From Blast: ESE
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 50.030" N 80° 59' 9.172" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe, Austin Powder

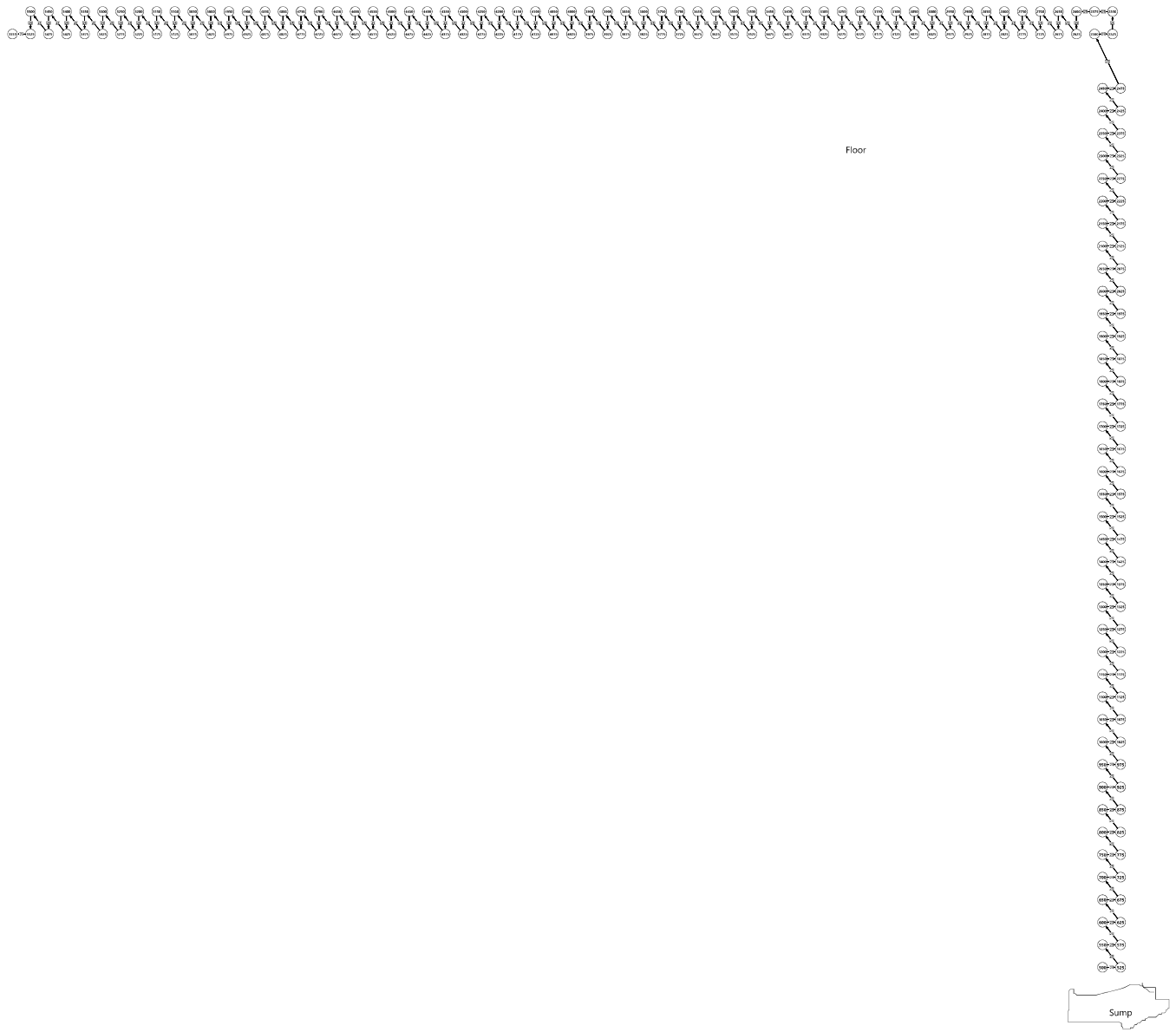
Transverse:	0.381 mm/s	57.0 Hz
Vertical:	0.381 mm/s	51.0 Hz
Longitudinal:	0.381 mm/s	51.0 Hz
Acoustic:	119 dB	--- Hz
Vector Sum:	0.554 mm/s	

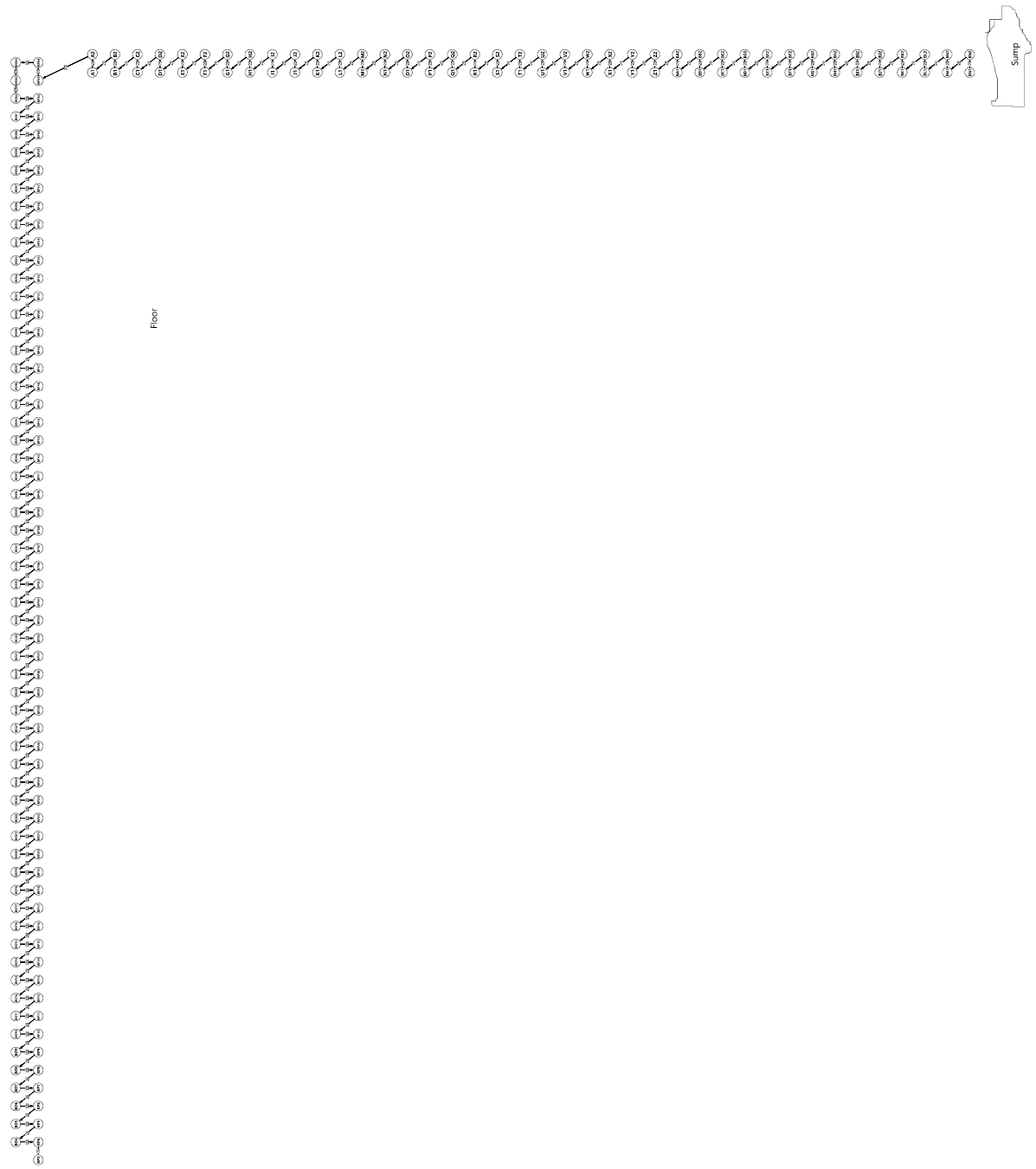
SEISMOGRAPH 3 - 178717 GREY RD 17

Data Type: Seismic Record
Seismograph Type: Instantel
Date: 11/27/20
Trigger Level: 1.50 mm/s 115.00 dB
Time: 15:01
Calibration Date: 01/17/20
Distance From Blast: 669.04 m
Calibration Signal: ok
Direction From Blast: SE
Geophone Min. Freq.: --- Hz
Readout: Printed Copy
Mic. Min. Freq.: --- Hz
Location:
Lat./Long.: 44° 37' 52.587" N 80° 59' 30.045" W
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Liam O'Donohoe, Austin Powder

Transverse:	0.205 mm/s	24.4 Hz
Vertical:	0.3 mm/s	14.6 Hz
Longitudinal:	0.504 mm/s	22.3 Hz
Acoustic:	122 dB	--- Hz
Vector Sum:	0.525 mm/s	

Hole Label Mode: Cumulative In-Hole Delays





Hole Label Mode: Default (A1)

Hole	Load	Surface Delay	Deck 1 Delay
A1	Typical Hole	1950	2450
A2	Typical Hole	1975	2475
B1	Typical Hole	1900	2400
B2	Typical Hole	1925	2425
C1	Typical Hole	1850	2350
C2	Typical Hole	1875	2375
D1	Typical Hole	1800	2300
D2	Typical Hole	1825	2325
E1	Typical Hole	1750	2250
E2	Typical Hole	1775	2275
F1	Typical Hole	1700	2200
F2	Typical Hole	1725	2225
G1	Typical Hole	1650	2150
G2	Typical Hole	1675	2175
H1	Typical Hole	1600	2100
H2	Typical Hole	1625	2125
I1	Typical Hole	1550	2050
I2	Typical Hole	1575	2075
J1	Typical Hole	1500	2000
J2	Typical Hole	1525	2025
K1	Typical Hole	1450	1950
K2	Typical Hole	1475	1975
L1	Typical Hole	1400	1900
L2	Typical Hole	1425	1925
M1	Typical Hole	1350	1850
M2	Typical Hole	1375	1875
N1	Typical Hole	1300	1800
N2	Typical Hole	1325	1825
O1	Typical Hole	1250	1750
O2	Typical Hole	1275	1775
P1	Typical Hole	1200	1700
P2	Typical Hole	1225	1725
Q1	Typical Hole	1150	1650
Q2	Typical Hole	1175	1675
R1	Typical Hole	1100	1600
R2	Typical Hole	1125	1625
S1	Typical Hole	1050	1550
S2	Typical Hole	1075	1575
T1	Typical Hole	1000	1500
T2	Typical Hole	1025	1525
U1	Typical Hole	950	1450
U2	Typical Hole	975	1475
V1	Typical Hole	900	1400
V2	Typical Hole	925	1425
W1	Typical Hole	850	1350
W2	Typical Hole	875	1375

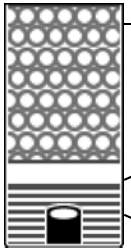
Hole	Load	Surface Delay	Deck 1 Delay
X1	Typical Hole	800	1300
X2	Typical Hole	825	1325
Y1	Typical Hole	750	1250
Y2	Typical Hole	775	1275
Z1	Typical Hole	700	1200
Z2	Typical Hole	725	1225
BA1	Typical Hole	650	1150
BA2	Typical Hole	675	1175
BB1	Typical Hole	600	1100
BB2	Typical Hole	625	1125
BC1	Typical Hole	550	1050
BC2	Typical Hole	575	1075
BD1	Typical Hole	500	1000
BD2	Typical Hole	525	1025
BE1	Typical Hole	450	950
BE2	Typical Hole	475	975
BF1	Typical Hole	400	900
BF2	Typical Hole	425	925
BG1	Typical Hole	350	850
BG2	Typical Hole	375	875
BH1	Typical Hole	300	800
BH2	Typical Hole	325	825
BI1	Typical Hole	250	750
BI2	Typical Hole	275	775
BJ1	Typical Hole	200	700
BJ2	Typical Hole	225	725
BK1	Typical Hole	150	650
BK2	Typical Hole	175	675
BL1	Typical Hole	100	600
BL2	Typical Hole	125	625
BM1	Typical Hole	50	550
BM2	Typical Hole	75	575
BN1	Typical Hole	0	500
BN2	Typical Hole	25	525
BO4	Typical Hole	5000	5500
BO5	Typical Hole	4950	5450
BO6	Typical Hole	4900	5400
BO7	Typical Hole	4850	5350
BO8	Typical Hole	4800	5300
BO9	Typical Hole	4750	5250
BO10	Typical Hole	4700	5200
BO11	Typical Hole	4650	5150
BO12	Typical Hole	4600	5100
BO13	Typical Hole	4550	5050
BO14	Typical Hole	4500	5000
BO15	Typical Hole	4450	4950

Hole	Load	Surface Delay	Deck 1 Delay
BO16	Typical Hole	4400	4900
BO17	Typical Hole	4350	4850
BO18	Typical Hole	4300	4800
BO19	Typical Hole	4250	4750
BO20	Typical Hole	4200	4700
BO21	Typical Hole	4150	4650
BO22	Typical Hole	4100	4600
BO23	Typical Hole	4050	4550
BO24	Typical Hole	4000	4500
BO25	Typical Hole	3950	4450
BO26	Typical Hole	3900	4400
BO27	Typical Hole	3850	4350
BO28	Typical Hole	3800	4300
BO29	Typical Hole	3750	4250
BO30	Typical Hole	3700	4200
BO31	Typical Hole	3650	4150
BO32	Typical Hole	3600	4100
BO33	Typical Hole	3550	4050
BO34	Typical Hole	3500	4000
BO35	Typical Hole	3450	3950
BO36	Typical Hole	3400	3900
BO37	Typical Hole	3350	3850
BO38	Typical Hole	3300	3800
BO39	Typical Hole	3250	3750
BO40	Typical Hole	3200	3700
BO41	Typical Hole	3150	3650
BO42	Typical Hole	3100	3600
BO43	Typical Hole	3050	3550
BO44	Typical Hole	3000	3500
BO45	Typical Hole	2950	3450
BO46	Typical Hole	2900	3400
BO47	Typical Hole	2850	3350
BO48	Typical Hole	2800	3300
BO49	Typical Hole	2750	3250
BO50	Typical Hole	2700	3200
BO51	Typical Hole	2650	3150
BO52	Typical Hole	2600	3100
BO53	Typical Hole	2550	3050
BO54	Typical Hole	2500	3000
BO55	Typical Hole	2450	2950
BO56	Typical Hole	2400	2900
BO57	Typical Hole	2350	2850
BO58	Typical Hole	2300	2800
BO59	Typical Hole	2250	2750
BO60	Typical Hole	2200	2700
BO61	Typical Hole	2150	2650
BO62	Typical Hole	2100	2600
BO63	Typical Hole	2075	2575
BO64	Typical Hole	2050	2550
BP3	Typical Hole	5050	5550
BP4	Typical Hole	5025	5525
BP5	Typical Hole	4975	5475
BP6	Typical Hole	4925	5425
BP7	Typical Hole	4875	5375
BP8	Typical Hole	4825	5325
BP9	Typical Hole	4775	5275
BP10	Typical Hole	4725	5225
BP11	Typical Hole	4675	5175
BP12	Typical Hole	4625	5125
BP13	Typical Hole	4575	5075
BP14	Typical Hole	4525	5025
BP15	Typical Hole	4475	4975
BP16	Typical Hole	4425	4925
BP17	Typical Hole	4375	4875
BP18	Typical Hole	4325	4825
BP19	Typical Hole	4275	4775
BP20	Typical Hole	4225	4725
BP21	Typical Hole	4175	4675
BP22	Typical Hole	4125	4625
BP23	Typical Hole	4075	4575
BP24	Typical Hole	4025	4525
BP25	Typical Hole	3975	4475
BP26	Typical Hole	3925	4425
BP27	Typical Hole	3875	4375
BP28	Typical Hole	3825	4325
BP29	Typical Hole	3775	4275
BP30	Typical Hole	3725	4225
BP31	Typical Hole	3675	4175
BP32	Typical Hole	3625	4125
BP33	Typical Hole	3575	4075
BP34	Typical Hole	3525	4025
BP35	Typical Hole	3475	3975
BP36	Typical Hole	3425	3925
BP37	Typical Hole	3375	3875
BP38	Typical Hole	3325	3825
BP39	Typical Hole	3275	3775
BP40	Typical Hole	3225	3725
BP41	Typical Hole	3175	3675
BP42	Typical Hole	3125	3625
BP43	Typical Hole	3075	3575
BP44	Typical Hole	3025	3525
BP45	Typical Hole	2975	3475

Hole	Load	Surface Delay	Deck 1 Delay
BP46	Typical Hole	2925	3425
BP47	Typical Hole	2875	3375
BP48	Typical Hole	2825	3325
BP49	Typical Hole	2775	3275
BP50	Typical Hole	2725	3225
BP51	Typical Hole	2675	3175
BP52	Typical Hole	2625	3125
BP53	Typical Hole	2575	3075
BP54	Typical Hole	2525	3025
BP55	Typical Hole	2475	2975
BP56	Typical Hole	2425	2925
BP57	Typical Hole	2375	2875
BP58	Typical Hole	2325	2825
BP59	Typical Hole	2275	2775
BP60	Typical Hole	2225	2725
BP61	Typical Hole	2175	2675
BP62	Typical Hole	2125	2625
BP63	Typical Hole	2000	2500
BP64	Typical Hole	2025	2525

Typical Hole

Ø = 114.3 mm



[2.0 m] - Gravel

[0.3 m] - Air

[0.8 m] - Hydromite 4100 Bulk NB
Wgt: 9.41 kg

[2.9 m] - Eagle 340 Booster (3/4 lb)
Det: SHOCK*STAR DualDelay 9.2m/30' 25/500
Del: 500.00 (ms)
Con: Other Hole
Wgt: 0.75 kg

0 m

5 m

10.16 kg