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EDF Renewables Ireland

KELLYSTOWN WIND FARM

Ground Vibration and Air Overpressure Blast
Monitoring for the proposed Kellystown Wind
Farm, County Louth





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KEMEK LTD

EXECUTIVE SUMMARY

WSP Ireland Consulting Limited, have been commissioned by EDF Renewables Ireland Ltd. to prepare a Ground Vibration and Air Overpressure assessment report in respect of the proposed Kellystown Wind Farm site at Kellystown, County Louth.



Kilsaran quarry at Gallstown, which measures approximately 37.5 hectares, is located off the subject site. The quarry has been granted planning permission under Louth County Council Reference Number: 22/190 to extend the area of extraction by approximately 10 hectares, which will move the operations closer to the subject site and to a depth of +60 mASL. Quarry operations will continue at a rate of 750,000 tonnes per year. This report takes account of the future expansion of the quarry.

The proposal focuses on developing an attenuation relationship (mathematical equation) for Ground Vibration and Air Overpressure in the southern region of the quarry. The attenuation relationship/ground motion model has been used in predicting the Ground Vibration and Air Overpressure at the wind turbine locations caused by future blasts in the quarry, both in the existing and future expansion areas. The findings of this report will inform the structural analysis and design of Wind Turbine Generators (WTGs) to ensure that the WTGs can withstand the impacts of the quarry's current and future blasting activity. The turbines are located to the south, southeast and southwest of Kilsaran's Gallstown quarry in County Louth.

Objectives

The different phases of this assessment involved:

- Setting up Ground and Air Overpressure monitoring instruments at the proposed WTG locations.
- Compiling blast monitoring data to develop site-specific parameters for the vibration mathematical models.
- Developing contours for the actual blasts carried out during the assessment period (July to Sept. 2024)
- Developing contours for the maximum possible Peak Particle Velocity (PPV) that may result for the worst-case scenario which could arise due to use of maximum charge and blasting taking place on the outermost bench of the quarry.
- Assessment of Peak Sound Pressure Level (PSPL) to ensure that values remain below safe limits at the proposed WTG locations.

Details of Blasts

Blast event 1: On July 10th, 2024, three blast shots were fired viz., Sump Area, Bench #1 and Bench #4. Sump Area was fired at 14:51:31 followed by Bench #4 firing with 500 ms delay. Bench #1 was fired at 14:51:36.

Blast event 2: On August 9th, 2024, two blast shots were fired concurrently viz., Bench #4 and Bench #2 at 14:06.

Blast event 3: On September 12th, 2024, a single blast shot was fired viz., Bench #4 at 14:00.

The instrument data (Ground Motion and Air Overpressure measurements) furnished by Environmental Measurements Ltd and blast details (location and blast charge) provided by Kemek Ltd were used to carry out the Ground Vibration and Air Overpressure Assessment.

Instrumentation and Data Collection

Ground Vibration and Air Overpressure monitoring instruments were installed approximate to the wind turbine locations. The civil works for instrument set up was carried out by Kercon Construction Ltd, under WSP's supervision. The monitoring instruments were set up by Environmental Measurements Ltd. These instruments remained in place for a three-month period (July, August and September) and recordings were captured when the trigger level of 0.5 mm/s was reached.

Key Findings

- **Vibration Threshold for Wind Turbine Structures**

A Peak Particle Velocity (PPV) threshold of 100 mm/s has been conservatively established for wind turbines based on engineering judgment and relevant standards, including BS ISO 4866:2010, BS 5228-2:2009, and BS 7385-2:1993. Although these standards do not specifically recommend thresholds for wind turbines, it has been selected to safeguard the structural integrity of the turbines under blasting conditions.

Wind turbines are designed with substantial Class A and Class B foundations—such as linked reinforced concrete or stiff reinforced concrete rafts—capable of withstanding significant dynamic loads, including those from wind and seismic activity. While BS 5228-2:2009 suggests a 50 mm/s limit for cosmetic damage in reinforced structures, it is considered that the higher threshold of 100 mm/s which corresponds to the potential for minor damage is a more appropriate threshold. Given the robust design of wind turbine structures, which allows them to tolerate greater dynamic forces than conventional structures, this threshold provides a conservative buffer against potential blasting vibrations.

- **Relevant Standards for Assessment**

BS ISO 4866:2010: Classifies buildings based on their probable reaction to mechanical vibrations and outlines considerations for construction types, foundation systems, and soil conditions.

BS 5228-2:2009: Sets limits for transient vibration, where cosmetic damage to buildings might occur. For reinforced structures, the typical limit is 50 mm/s. The decision to use a higher PPV for wind turbines reflects their greater structural resilience.

BS 7385-2:1993: Provides guidelines on vibration levels that may cause damage to structures, focusing on both transient and continuous vibrations. While the standard highlights limits for various building types, no specific recommendations are made for wind turbines.

- **Air Overpressure Limit (PSPL)**

Based on published literature, the threshold limit for Peak Sound Pressure Level (PSPL) was set at 180 dB. This threshold, though higher than typical thresholds for structures sensitive to air overpressure, is justified for wind turbines, which are designed to withstand large dynamic forces.

- **Blast Event Summary and Data Utilization**

Two types of blasting were conducted: Free Face Blasting and Heavily Confined Blasting. PPV values recorded at monitoring stations M01 to M05 during all blast events were below the 100 mm/s threshold set for comparison with the turbine structure's vibration tolerance. Similarly, the recorded PSPL values remained below the 180 dB threshold.

- **Mathematical Models for Vibration Prediction**

Models were developed using data from blast events 1 and 3, where distinct PPV and PSPL values could be correlated with blast shots. These models predicted that the highest expected PPV at any of the proposed Wind Turbine Generator (WTG) locations is 67.9 mm/s at T03, which remains safely within the threshold.

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TEAM

1. Chetana Ramanna, seismic engineer

Chetana is a chartered civil engineer since 2021 and holds a master's degree in Civil Engineering and a PhD in Probabilistic Seismic Hazard Analysis. She has carried out review of seismic hazard reports for sites with mining facilities. She is involved in monitoring and design of maximum instantaneous charge for quarry blasting in mines. She has also carried out design of temporary easement for transportation of wind turbine blades. She has assessed the ground vibration for the proposed wind turbines located near quarries. Chetana has also worked on general geotechnical projects that involves earthworks, slope stability of reinforced soil walls and slopes, design of sub-base for pavements, temporary works for trench support such as sheet piles, selection and arrangement of props, and design of soil nails.

2. Peter Corrigan, geotechnical engineer

Peter Corrigan is a Chartered Engineer and became a Principal of Golder Associates in 2014 before transitioning to WSP with the acquisition in 2021. Peter is involved primarily in design of tailings and waste containment infrastructure as well as heap leach facilities and safe stewardship of several mine waste facilities. This generally takes projects across Europe, Africa and Asia from pre-feasibility and feasibility stages through ground investigation, conceptual and detailed design, tender and contract management for the construction and through to commissioning of the facility, operations, as well as closure planning. Peter has also served as Engineer of Record for an Integrated Mine Waste Facilities and a conventional Tailings Storage Facilities over the last number of years.

Peter is involved in ground vibration monitoring for many Mine Waste Facilities in Ireland and Europe.

3. Mirsina Aghdam, Geospatial/Geotechnical Engineer

Mirsina Aghdam is a Senior Geospatial Engineer with a PhD in Geoscience, specializing in geospatial modelling and environmental monitoring. He has over a decade of experience in mapping and spatial analysis, using advanced technologies such as UAV-borne surveys, LIDAR, and photogrammetry. Mirsina's work focuses on high-resolution spatial data analysis for geotechnical and environmental projects, including ground vibration monitoring and environmental risk assessments. Proficient in GIS software like ArcGIS and QGIS, he excels in capturing, processing, and interpreting geospatial data to support engineering design and environmental impact studies. His expertise also includes the integration of remote sensing technologies and geostatistical modelling for precise and insightful project outcomes.

1 INTRODUCTION

The proposed wind turbine generators are located on lands to the south, west and east of the Kilsaran quarry at Gallstown, Co. Louth. Blasting carried out in the quarry causes Ground Vibrations and Air Overpressure in the surrounding areas. It was decided by EDF to determine the effect of the blasting activities on the proposed WTGs in terms of structural stability considering both the Ground Vibrations and Air Overpressure. WSP was commissioned to undertake the assessment for EDF. The Ground Vibration and Air Overpressure was determined considering the blasting activity for the existing and future expansion plans of the quarry.

At most of the turbine locations, the bedrock is at shallow depth with glacial till as overburden soil. Weathered rock above the solid bedrock is invariably encountered at all of the turbine locations.

This report outlines the blast monitoring and analysis which was carried out in compliance with procedures described in the BS ISO 4866:2010, BS 5228-2:2009 and BS 7385-2:1993. The document covers assessment criteria, monitoring methodology, monitoring locations, data analysis, and reporting.

The location of the monitoring stations and blasts from the three Blast Events on the 10th of July 2024, 09th August 2024 and 12th of September 2024 are outlined in Figure 1-1, Figure 1-2 and Figure 1-3 below.

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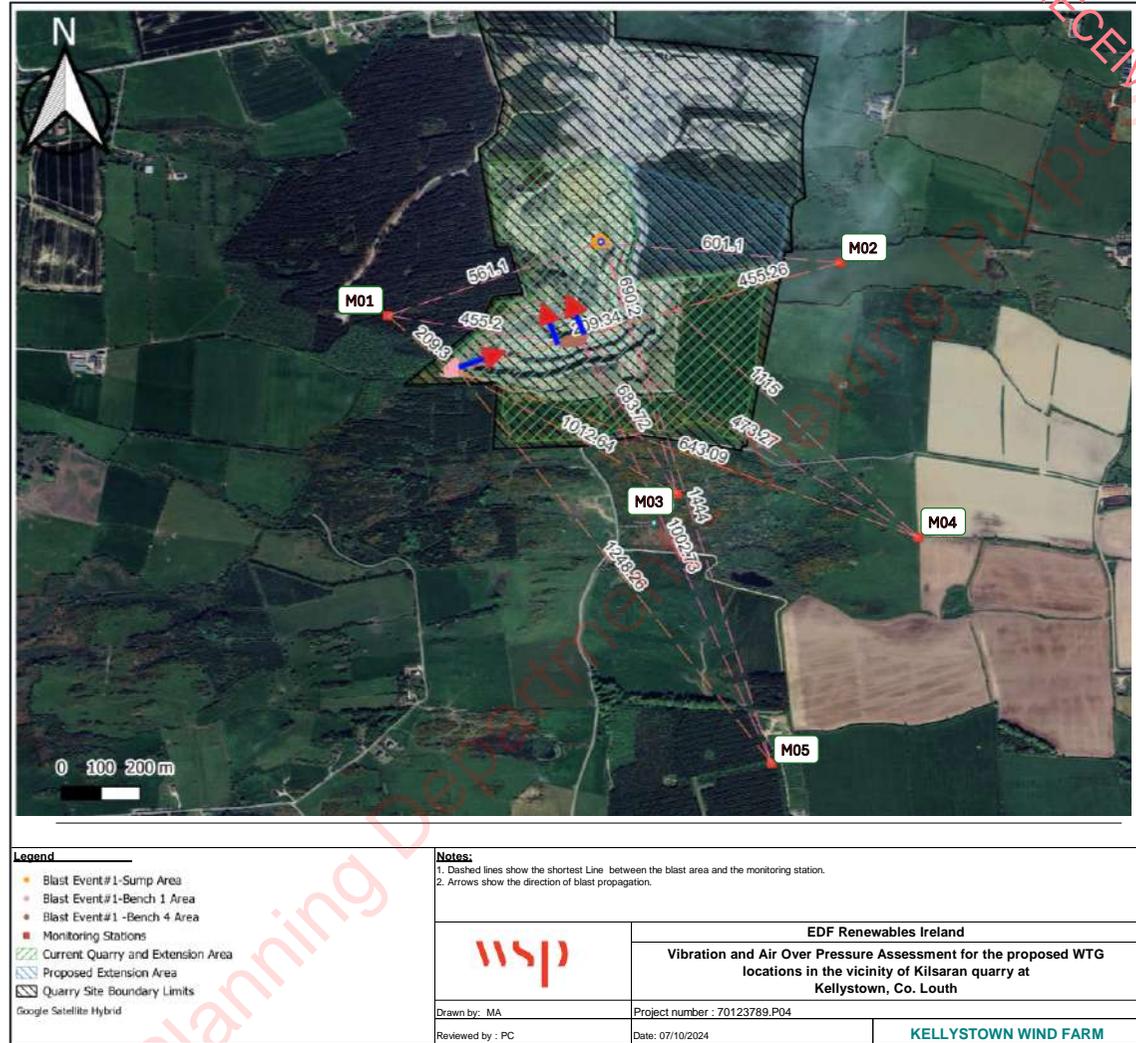


Figure 1-1 - Location of monitoring stations and blast shots for blasting carried out on July 10th, 2024

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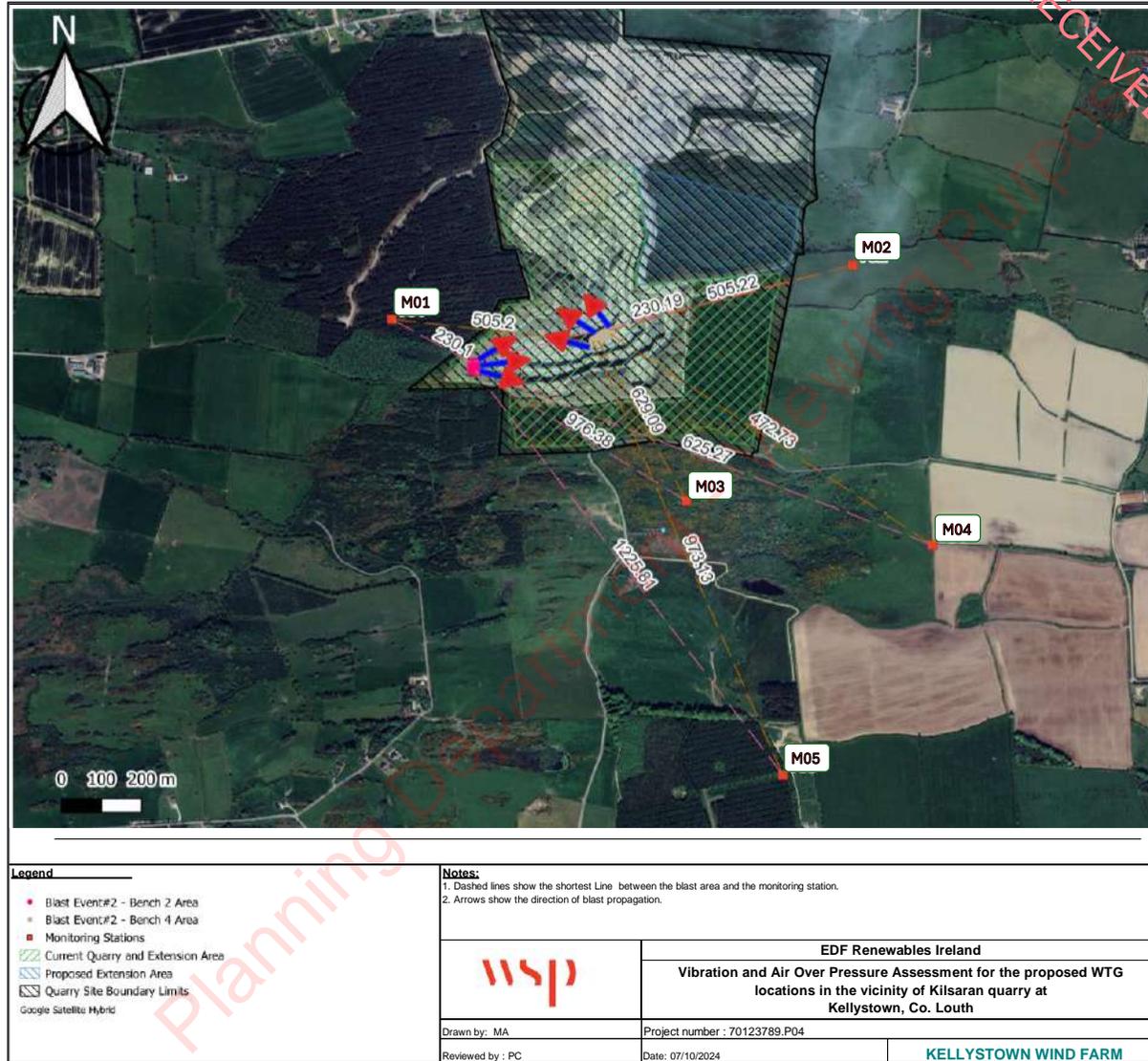


Figure 1-2 - Location of monitoring stations and blast shots for blasting carried out on Aug 9th, 2024

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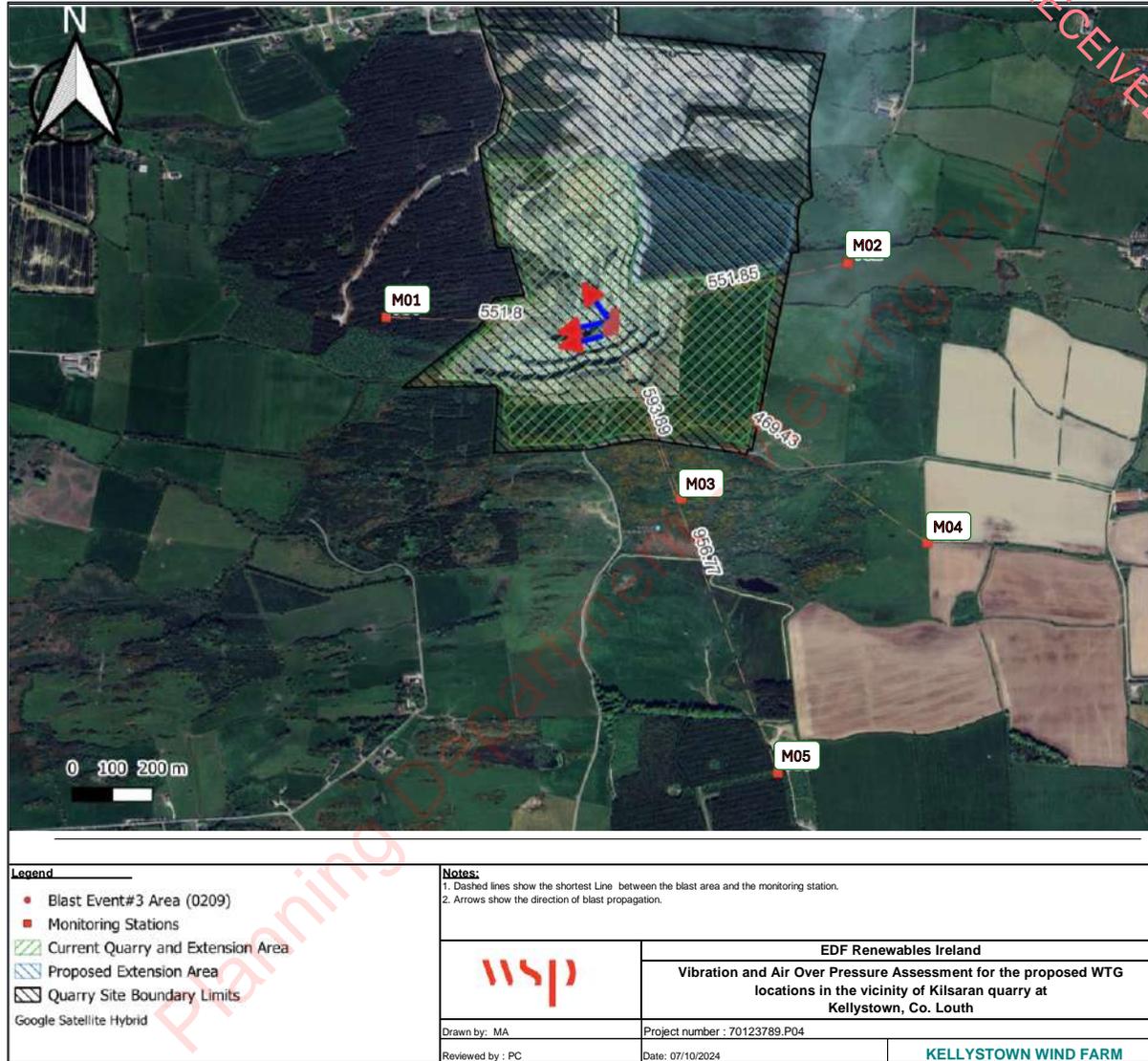


Figure 1-3 - Location of monitoring stations and blast shot for blasting carried out on Sept. 12th, 2024

1.1 GROUND VIBRATIONS

Ground vibration from blasting occurs due to the inefficient use of explosive energy. The unused energy generates seismic waves that move away from the blast area and diminish in strength with distance. These waves cause the ground surface to oscillate when they hit a free face. Blasting vibrations are a mix of body and surface waves and are typically short and impulsive, lasting under 3 seconds. While ground vibrations themselves are inaudible, they are usually accompanied by air vibrations that can be heard. Ground vibration at sensitive receptors is measured as Peak Particle Velocity (PPV) in mm/s. The PPV is the maximum instantaneous velocity of a particle at a point during a given time interval.

1.1.1. Peak Particle Velocity Threshold Limits

Ground vibration guidelines are typically established for blasting sites to prevent damage to adjacent facilities or infrastructure. These guidelines are provided by various organizations or bodies. There are no specific standards that specify the vibration threshold for wind turbines. However, in this section, requirements from the British Standards are utilized to arrive at a conservative threshold value for the wind turbine structures. The conservatism in the threshold applied is due to the fact that the British Standards are not directly applicable to wind turbine structures.

1.1.2. British Standard BS ISO 4866: 2010

BS ISO 4866: 2010 provides guidelines for classifying buildings based on their likely response to ground-borne mechanical vibrations. The classification considers soil and strata characteristics, foundation types, and building structure.

According to Annex B of BS ISO 4866: 2010, which assesses construction type, foundation, soil, and importance factors, the classifications are as follows:

- **Category of Structure:** Group 2 (Modern buildings and structures) and **Category 2** (as per Table B.1, BS ISO 4866: 2010).
- **Category of Foundation:** Two foundation types are considered, based on recommendations by Contech Engineering Solutions, USA, for Wind Turbine Generators (WTG):
 - **Class A:** Reinforced concrete structures with interlinked elements, such as linked reinforced concrete and sheet piles or stiff reinforced concrete rafts.
 - **Class B:** Isolated foundations with reinforcement only at the pile caps, e.g., independent reinforced-concrete piles and shallow foundations.
- **Type of Soil:** Three soil types are considered:
 - **Type a:** Solid rock or slightly fissured, cemented sands.
 - **Type b:** Horizontally bedded, firm, compacted non-cohesive soils.
 - **Type f:** Fill material.

The WTG shaft, a robust structure designed to withstand high wind-induced loads and vibration, aligns with **Group 2, Category 2**. Moving components and precision mechanisms of the wind turbine system are excluded from the ground vibration threshold assessment.

Building classes, based on combinations of foundation and soil types, are determined according to Table B.2 of BS ISO 4866: 2010, as shown in Table 1-1.

Table 1-1 - Classification of buildings according to their resistance to vibration and the tolerance that can be accepted for vibrational

Category of structure	Categories of foundations (upper case letter) and type of soil (lower case letter)	Class of building
2	Aa	1
	Ab	2
	Ba	N/A
	Bb	N/A

The class of building in Table B.2 of BS 4866: 2010 ranges from 1 to 14, wherein a higher class denotes a high degree of protection requirement. Based on Table 1-1 that the class of building for WTG structure falls within Class 1 to 2, indicating low protection requirements depending on the specific soil conditions.

1.1.3. British Standard BS 5228-2: 2009

This standard provides limits for transient vibration above which cosmetic damage could occur, as summarized in Table 1-2.

Table 1-2 - Transient vibration guide values for cosmetic damage

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1 Values referred to are at the base of the building.

Note 2 For line 2, at frequencies below 4 Hz, a minimum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Note 3 If dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at lower frequencies where lower guide values apply, then the guide values might need to be reduced by up to 50%.

Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 1-2, and major damage to a building structure can occur at values greater than four times the tabulated values.

In conclusion;

- Cosmetic damage, defined as the formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces, may occur at 50 mm/s or above.
- Minor damage, which includes the formation of large cracks or loosening and falling of plaster or drywall surfaces, or cracks through bricks/concrete blocks, may occur at 100 mm/s.
- Major damage, involving significant structural compromise such as damage to structural elements, cracks in support columns, loosening of joints, and splaying of masonry cracks, may occur at 200 mm/s.

1.1.4. British Standard BS 7385-2: 1993

The standard considers both transient and continuous vibrations and offers a method of assessment that takes into account the characteristics of the vibration, the building, and the measured data.

Key points from BS 7385-2: 1993 include:

- **Peak Particle Velocity (PPV):** The standard defines PPV as the maximum instantaneous velocity of a particle at a point during a given time interval.
- **Dynamic Magnification:** This is the motion measured at a given point (usually in the structure) divided by the motion measured at a reference point (usually at the base of the structure or on the foundation).
- **Frequency Range:** The standard covers a frequency range from 1 Hz to 1000 Hz, with a more limited range of 4 Hz to 250 Hz usually encountered in buildings.
- **Guide Values for Cosmetic Damage:** The standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. For example, cosmetic damage may occur at PPV levels of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz for unreinforced or light framed structures.

1.1.5. Justification for the 100 mm/s PPV Threshold

- **Design Characteristics of Wind Turbines**
Wind turbines are large, reinforced structures engineered to withstand significant dynamic loading from environmental factors, such as high wind speeds. These structures are anchored by substantial foundations, typically made of reinforced concrete or pile systems, which provide a high degree of structural resilience. Wind turbines are specifically designed to tolerate cyclic and dynamic loads from wind forces, making them inherently more resistant to additional vibrations from blasting compared to conventional buildings.
- **Conservative Nature of Relevant Standards**
BS 5228-2:2009 provides guidelines for preventing cosmetic and minor damage to buildings from transient vibrations. The standard sets a PPV threshold of 50 mm/s for reinforced or framed structures, such as industrial and commercial buildings, which are typically more vulnerable to vibrations than wind turbine structures. BS 7385-2:1993 offers guidance on vibration levels that could damage various building types. It specifies that even light-framed residential buildings can withstand up to 50 mm/s without incurring cosmetic damage, while unreinforced buildings are at risk of minor structural damage only at higher vibration levels (up

to 100 mm/s). Given the inherent strength and robust design of wind turbines, adopting a higher threshold of 100 mm/s for ground vibrations in the context of blasting operations is reasonable. This threshold ensures that the turbines remain unaffected by vibrations that might otherwise cause damage to lighter structures.

- **Vibration Resistance of Reinforced Structures**

Wind turbines are constructed from reinforced concrete or steel-framed components with significant mass and stiffness, allowing them to effectively resist energy from vibrations. The primary structural elements—such as the shaft, tower, and foundations—are designed to handle both static and dynamic loads from wind and rotor operations. Consequently, these structures are far less susceptible to damage from seismic waves generated by blasting, in contrast to lighter or less reinforced buildings.

- **Absence of Specific Wind Turbine Vibration Standards**

In the absence of specific standards for ground vibrations pertaining to wind turbines, the adoption of a 100 mm/s threshold represents a conservative approach to ensuring structural protection. This value is higher than the levels that may cause cosmetic damage to conventional buildings while remaining within a safe range to prevent any structural compromise to the turbines. Additionally, this threshold accommodates localized, temporary ground motion from blasting operations without jeopardizing the integrity of the turbine.

- **Conclusion on Cosmetic and Minor Damage**

The selection of 100 mm/s as a PPV threshold is underpinned by considerations of minor damage as outlined in relevant standards. Wind turbines are engineered to withstand dynamic forces that far exceed typical vibrations, justifying a higher threshold than those applied to conventional structures.

1.2 AIR OVERPRESSURE THRESHOLD LIMITS

Air Overpressure is energy transmitted from the blast site within the atmosphere in the form of pressure waves and is generally perceived as a loud bang. An Air Overpressure (air blast) is an atmospheric pressure wave emanating from the explosion in air. This wave comprises:

- The audible part of the air blast (acoustic): higher frequency (from 20 to 20,000 Hz).
- The sub-audible part of the air blast (infrasound): low frequency (below 20 Hz).

Unlike the audible Air Overpressure (acoustic), which is classified as noise, the Air Overpressure at frequencies below 20 Hz is called concussion. These are classified as an 'over pressure' when the air blast pressure exceeds atmospheric pressure. Air Overpressure exerts a force on structures and in turn causes a secondary and audible rattle within a structure. It is very often confused with vibrations transmitted by the ground. The severity of an Air Overpressure is dependent on the explosive charge, the distance from the source, and the explosive confinement. Air blast (Air Overpressure) noise is measured in linear decibels dB.

For quarries and similar operations where air pressure is a concern, sub-audible waves are particularly significant. High sub-audible sound waves can cause structures to rattle and, in extreme cases, might break glass and damage wall coverings. However, there are no documented instances of foundation damage from air blasts at levels near the glass breakage threshold of 140 dB, as noted by Siskin et al. (1993). Glass breakage is probabilistic; not all windows will shatter at this threshold. Air Overpressure values of 150 dB could be enough to damage a badly mounted pane, with most windows breaking at 170 dB. Structural damage may be expected at 180 dB (Bhandari S, 1997)

Assessment Criteria for Air blast Overpressure and Ground Vibration are detailed in Table 1-3. The blasts occurring in the quarry are evaluated against these thresholds.

Table 1-3 - Recommended Air Blast Overpressure and Ground Vibration Thresholds

Structure Type	Air Blast Overpressure Level dB (Linear Peak)	Peak Particle Velocity (mm/s)
WTG	180	100

1.3 FACTORS INFLUENCING AIR OVERPRESSURE AND GROUND VIBRATION

1.3.1 Air Blasts or Air Overpressure

Air blasts are influenced by several key factors:

- Explosives: Type and quantity used.
- Confinement: Degree of confinement (e.g., plaster shooting, overcharging, poor stemming).
- Initiation: Method of initiation (e.g., use of exposed detonating fuse).
- Local Geology and Topography: Characteristics of the site.
- Atmospheric Conditions: Weather and other environmental factors.
- Distance and Condition of Structures: Proximity and state of nearby buildings.

Factors such as the type and quantity of explosives, confinement, and initiation method are within the control of the site operator. By adjusting these variables, operators can partially manage the impact of atmospheric conditions on air blasts. However, local geology, atmospheric conditions, and structural factors are generally uncontrollable.

1.3.2 Ground Vibration

Ground Vibration from blasting is primarily affected by:

- Rock Mass Characteristics: The properties of the rock being blasted.
- Maximum Instantaneous Charge (MIC): The weight of explosives used per delay.
- Medium Between Blast Source and Receptor: The material and conditions between the blast and the receptor.
- Distance: The distance from the blast source to the receptor.

To control Ground Vibration, the focus is on minimizing the MIC by using time delays between charges. The level of vibration is closely linked to the maximum charge weight per delay, with numerous studies confirming that peak particle velocity (PPV) correlates with the MIC.

For effective prediction and management of Ground Vibrations, monitoring stations are set up at locations representative of sensitive areas, such as nearby residences, or at alternative sites as agreed upon with regulatory authorities. Each site is unique, and vibration control measures are tailored to specific conditions and requirements.

1.4 MONITORING STATION AND INSTRUMENTATION

The monitoring stations were located next to the trial pits that were dug at the proposed WTG locations. However, for WTG T03 and T05 where accessibility was an issue, the stations were located elsewhere in an area close to the trial pits and the ground profile being representative of the turbine locations. For accurate measurement of Ground Vibration, the monitoring instruments were laid on large heavy kellyblocks. These precast kellyblocks were preferred to cast in situ concrete due to inaccessible terrain, and they also provide firm and stable platforms for the monitoring instruments. The blocks were placed on well compacted strata and the soil around it was well compacted in layers to ensure firm fixation into the ground. It is the considered opinion of WSP that the precast Kellyblocks provides a solid base for transmissivity of vibrations which is comparable to that of a cast in situ concrete block in the same conditions.

These blocks weighted approx. 1600 kg, with plan area of 1.4 m x 0.67 m, and height of 0.7 m. The blocks were placed on stable ground after removing loose overburden material. The details of the formation level for the Kellyblocks are summarised in Table 1-4. The photographs of the formation level for the monitoring stations are provided in Appendix A. The instruments were fenced for protection.

Table 1-4 - Ground condition at the formation level of the Kellyblocks

Monitoring Station	Location	Trial pit in vicinity	Depth to formation (m bgl)	Ground condition
M01	53°47'40.8"N 6°22'13.4"W	TP 01	0.9	Weathered Siltstone/Greywacke from 0.8 m bgl
M02	53°47'44.4"N 6°21'11.2"W	TP 02	0.3	Weathered Siltstone/Greywacke from 0.1 m bgl
M03	53°47'24.8"N 6°21'35.3"W	TP 03	0.6	Weathered Siltstone/Greywacke from ?
M04	53°47'20.9"N 6°21'02.0"W	TP 04	0.4	Stiff Clay/Glacial Till
M05	53°47'01.6"N 6°21'22.0"W	TP 05	0.9	Glacial Till/Weathered rock

The vibration monitoring instrument is Micromate manufactured by Instatel. The range for geophones meant for capturing ground motion goes up to 254 mm/s with a resolution of 0.00788 mm/s. The microphones installed to record Air Overpressure has a range of up to 500 Pa (140 dB) with a resolution of 0.0156 Pa. The frequency range for both the geophone and microphone being 2 to 250 Hz. The ground motion trigger is between 0.13 to 254 mm/s and linear acoustic trigger is between 2.0 to 500 Pa. The instruments remained in place for a period of 3 months. The Ground Vibrations and Air Overpressure data were accessed remotely.

2 BLASTING AND INSTRUMENTATION DATA

2.1 BLASTING INFORMATION

2.1.1. Blast Event 1

On the 10th of July 2024, three areas were blasted sequentially within the quarry. Blasting was carried out by Kemek Ltd. The details of the blast shots are as shown in Table 2-1 and their locations in Figure 1-1. The direction of blast is also represented in this figure (arrows).

Table 2-1 - Blasting shot details for 10th July 2024

Location Name	MIC (kg)	Total Charge (kg)	No. of Holes	Blast Time
Sump Blast	60	2,320	39	14:51:31
Bench #4	307	11,489	44	14:51:31 + 500 ms
Bench #1	50	1,173	46	14:51:36

2.1.2. Blast Event 2

On the 9th of August 2024, two areas (Bench #2 and Bench #4) were blasted together (concurrent blast) within the quarry. Blasting was carried out by Kemek Ltd. The details of the blast shots are as shown in Table 2-2 and their locations in Figure 1-2. The direction of blast is also represented in this figure (arrows).

Table 2-2 - Blasting shot details for 9th August 2024

Location Name	MIC (kg)	Total Charge (kg)	No. of Holes	Blast Time
Bench #4	280	12,352	51	14:06
Bench #2	250	4,814	23	14:06

2.1.3. Blast Event 3

On 12th September 2024, a single shot was fired within the quarry. Blasting was carried out by Kemek Ltd. The details of the blast shots are as shown in Table 2-3 and their locations in Figure 1-3. The direction of blast is also represented in this figure (arrows).

Table 2-3 - Blasting shot details for 12th September 2024

Location Name	MIC (kg)	Total Charge (kg)	No. of Holes	Blast Time
Bench #4	291	16,028	70	14:00

2.2 DATA FROM MONITORING INSTRUMENTS

The instrument readings provided by Environmental Measurements (Appendix B), include detailed records of Ground Vibration and Air Overpressure during the blasting event. For blast event 1, the

Peak Particle Velocity (PPV) and Peak Sound Pressure Level (PSPL) for each of the blast shots corresponding to three different areas are summarised in Table 2-4. Similarly blast event 2 and 3, the Peak Particle Velocity (PPV) and Peak Sound Pressure Level (PSPL) for the blast shots are summarised in Table 2-5 and Table 2-6.

Table 2-4 - Summary of PPV and PSPL from monitoring stations from blast event 1

Monitoring Station	X coordinate (ITM)	Y coordinate (ITM)	Measured PPV (mm/s) for different blast shots			Measured PSPL (dB)
			Sump Area	Bench #4	Bench #1	
M01	707338	784036	4.059	5.147	4.832	116.3
M02	708488	784177	2.002	2.317	< 0.5	112.3
M03	708072.9	783562.1	1.080	5.502	< 0.5	107.8
M04	708686	783447	< 0.5	3.358	< 0.5	111.3
M05*	708340	782821	-	-	-	-

*Following the on-site investigation at location M05, Environmental Measurements reported that the power cable between the modem and the logger for that station was faulty. This caused the monitor to power off due to a low battery at 1:50pm on Wednesday 10th of July. See log attached (Appendix B). Hence, there was no data from this location for the blasts.

As the blasting happened in three shots, every shot was treated as an individual blast and the models were assessed separately.

During blast event 2, the two blast shots (Bench #4 and Bench #2) produced a combined ground motion time history resulting in a single PPV at each of the monitoring stations as shown in Table 2-5 (see Appendix B time history for ground motion for blast event 2). As Bench #4 shot was closest to the monitoring stations (except for M01), it is assumed that the major contribution to this single PPV is from Bench #4 shot.

Table 2-5 - Summary of PPV and PSPL from monitoring stations from blast event 2

Monitoring Station	X coordinate (ITM)	Y coordinate (ITM)	Measured PPV (mm/s)	Measured PSPL (dB)
M01	707338	784036	31.314	116.6
M02	708488	784177	3.271	120.5
M03	708072.9	783562.1	5.383	117.6
M04	708686	783447	3.594	118.9
M05	708340	782821	1.08	107.0



The Ground Vibrations and Air Overpressure produced by a single shot during blast event 3 are summarised in Table 2-6.

Table 2-6 – Summary of PPV and PSPL from monitoring stations from blast event 3

Monitoring Station	X coordinate (ITM)	Y coordinate (ITM)	Measured PPV (mm/s)	Measured PSPL (dB)
M01	707338	784036	2.317	124.4
M02	708488	784177	2.727	109.8
M03	708072.9	783562.1	5.998	109.3
M04	708686	783447	2.057	104.1
M05	708340	782821	1.056	<88

3 METHODOLOGY

The methodology adopted in determining the maximum Ground Motion and Air Overpressure that is likely to occur during the life of the turbines is discussed in this section. This section also outlines in detail the mathematics behind the Ground Motion and Air Overpressure models.

3.1 AIR-BLAST OVERPRESSURE CALCULATION

Peak Sound Pressure Level (PSPL) quantifies the highest sound pressure level resulting from a blast, including both audible and sub-audible components. the air-blast overpressure can be calculated using the formula.

$$P = A \left(\frac{D}{Q^{\frac{1}{3}}} \right)^a \quad \text{Equation 3-1}$$

P: Peak pressure (kPa)

A: Site constant (a value specific to the site)

a: Site exponent (a value specific to the site)

D: Distance from the blast (in meters)

Q: Charge mass per delay (in kilograms), where the maximum instantaneous charge (MIC) is the highest charge detonated within any 8 ms interval during the blast.

The Peak Sound Pressure Level (PSPL) overpressure in dB = 20 Log 10(P/Pbase), where the base pressure is equal to 0.00002 Pa (or 20µ Pa).

3.2 PEAK PARTICLE VELOCITY (PPV) CALCULATION

Peak Particle Velocity (PPV) measures the maximum velocity at which ground particles move due to a blast. the following formula can be used to estimate PPV.

$$PPV = K \left(\frac{D}{\sqrt{W}} \right)^{-b} \quad \text{Equation 3-2}$$

PPV: Peak particle velocity (in mm/s)

D: Distance from the explosive source to the monitoring point (in meters)

W: Charge per delay (in kilograms), where the maximum instantaneous charge (MIC) is the highest charge detonated within any 8 ms interval during the blast

K: Site-specific constant value

b: Site-specific constant value

3.3 TYPICAL VALUES FOR CONSTANTS

3.3.1. Peak Sound pressure Level (PSPL)

- *Site Constant (A)*: In the absence of site-specific data, 'A' is assumed to be 185 for unconfined surface charges according to ICI Handbook of blasting.
- *Site Exponent (a)*: Typically ranges from -2.4 to -1.2. An average value of -2.20 is used for medium rock conditions according to ICI Handbook of blasting.

3.3.2. Peak Particle Velocity (PPV)

The site law parameters recommended by Richards and Moore (1995) for various site and rock conditions is as shown in Table 3-1.

Table 3-1 - Typical values of site and rock exponents (Richards and Moore, 1995)

Site Constant (K)		Rock Exponent (b)	
500	Free Face – Hard Rock	2.1 – 2.4	Granite
1140	Free Face - Average to Soft Rock	2.1	Limestone
5000	Heavily Confined Site	1.9 – 3.0	Basalt

Based on WSP’s previous experience of blasting in Ireland, a ‘K’ value of 2700 (free face – average rock) was selected as preliminary estimate. This value is appropriate for Bench #1, Bench #2 and Bench #4 blast shots. The Sump Area blasting is in a heavily confined site and hence a ‘K’ value of 5000 was used. Since the area comprises limestone as bedrock, a ‘b’ value of 1.9 was selected as preliminary estimate based on WSP’s experience.

3.4 PROCEDURE ADOPTED FOR DEVELOPING GROUND VIBRATION MODELS

In order to estimate ground-borne vibration at a specified distance (D) for a blast of known maximum instantaneous charge (MIC), the following procedure was adopted:

- For each of the monitoring stations and every blast shot, the site law parameters (K and b) were determined such that the measured PPV matched the predicted/estimated PPV. Table 3-1 was used as a reference. These parameters are highly site specific.
- The mathematical models were then developed with the ‘K’ and ‘b’ constants as outlined in Section 3.2. The measured PPVs from blast events 1 and 3 were considered to determine ‘K’ and ‘b’.
- Using the so-called mathematical models, the maximum expected PPV is determined for the maximum blast charge (MIC) and closest location of the blast shot (D).
- Further, using the mathematical model, the contours for the maximum possible PPVs were developed for the study area.

3.5 PROCEDURE ADOPTED FOR DEVELOPING AIR OVER PRESSURE MODELS

As previously discussed in Section 1.3.1, the Air Overpressure is influenced by atmospheric conditions such as the wind and its direction, the atmospheric pressure and temperature. In determining the Air Overpressure model, the data from blast events 1 and 3 were utilised. Similar procedure outlined in Section 3.4 was used to develop Air Overpressure model.

3.6 GROUND MOTION MODELS

The purpose of a ground motion model is to develop a relationship between the MIC, distance and PPV. Since the maximum MIC and shortest distance to the WTG locations are known, the maximum possible PPV can be predicted for the worst combination of MIC and distance.

The measured PPVs are used in developing the ground motion models for each of the proposed locations of the WTGs. Using the reference site law parameter values discussed in the previous section (Section 3.3.2), the site specific 'K' and 'b' values for the study region were determined. The site law parameters and the corresponding calculated PPV for each monitoring station from blast event 1 and 3 are summarised in Table 3-2 to Table 3-5.

Blast event 2 was not considered in developing the ground motion model as the blast shots were fired concurrently. This resulted in a single combined ground motion time history wherein the blast shots could not be associated to the PPV from the time history.

Monitoring station M05 was not considered in developing the ground model as there were no readings from blast event 1 and it would be inconsistent to develop a model with just one reading from blast event 3. Moreover, M05 is located at significant distance to cause any PPV or Air Overpressure that would be of concern.

Table 3-2 – Estimated site law ground motion parameters (K and b) and the corresponding measured and predicted PPVs at M01 from blast event 1 and 3

Blast Event	Blast Shot	K	b	Distance from M01 to blast shot (m)	MIC (kg)	Measured PPV (mm/s)	Calculated PPV (mm/s)
1	Sump Area	5000	1.66	561	60	4.059	4.088
	Bench #4	2500	1.9	455	307	5.147	5.135
	Bench #1	3000	1.9	209	50	4.832	4.818
3	Bench #4	1700	1.9	552	291	2.317	2.299

Table 3-3 – Estimated site law ground motion parameters (K and b) and the corresponding measured and predicted PPVs at M02 from blast event 1 and 3

Blast Event	Blast Shot	K	b	Distance from M02 to blast shot (m)	MIC (kg)	Measured PPV (mm/s)	Calculated PPV (mm/s)
1	Sump Area	5000	1.8	601	60	2.002	1.983
	Bench #4	2450	1.9	683	307	2.317	2.326
	Bench #1	1700	1.9	1012	50	< 0.5	0.136*
3	Bench #4	2300	1.9	594	291	2.727	2.705

Table 3-4 – Estimated site law ground motion parameters (K and b) and the corresponding measured and predicted PPVs at M03 from blast event 1 and 3

Blast Event	Blast Shot	K	b	Distance from M03 to blast shot (m)	MIC (kg)	Measured PPV (mm/s)	Calculated PPV (mm/s)
1	Sump Area	5000	1.88	690	60	1.08	1.08
	Bench #4	2500	1.86	473	307	5.502	5.441
	Bench #1	1700	1.9	643	50	< 0.5	0.323*
3	Bench #4	3200	1.9	469	291	5.998	5.897

Table 3-5 – Estimated site law ground motion parameters (K and b) and the corresponding measured and predicted PPVs at M04 from blast event 1 and 3

Blast Event	Blast Shot	K	b	Distance from M04 to blast shot (m)	MIC (kg)	Measured PPV (mm/s)	Calculated PPV (mm/s)
1	Sump Area	5000	1.9	1155	60	< 0.5	0.200*
	Bench #4	2500	1.64	1002	307	3.358	3.281
	Bench #1	1700	1.9	1248	50	< 0.5	0.092*
3	Bench #4	4200	1.9	957	291	2.057	1.999

*Calculated PPV values are only approximate

From the above it is observed that the best estimate for 'K' value is between 1700 and 4200 for free face blasting (Bench #4 and Bench #1), while for heavily confined site (Sump Area) a 'K' value of 5000 was found appropriate. The 'b' value ranges between 1.64 to 1.9. In situations where the measured PPVs were below the trigger value of 0.5 mm/s, the site law parameters are only an approximation.

Lower value of 'K' signifies that the vibrations are recorded in front of the free face (in the direction of throw), while higher value indicates that the vibrations are recorded behind the free face (opposite to the direction of throw). Hence higher Ground Vibrations are expected opposite to the direction of throw due to confinement as opposed to vibrations in the direction of throw.

It should be noted that different combination of 'K' and 'b' may result in same PPV. However, 'K' and 'b' combination that is consistent across the monitoring stations were selected.

To summarise, the ground motion model developed are as follows:

▪ Heavily Confined Blast, $PPV = 5000 \left(\frac{D}{\sqrt{W}} \right)^{-(1.66 \text{ to } 1.9)}$ from Sump Area **Equation 3-3**

▪ Free Face Blast,

$PPV = (1700 \text{ to } 4200) \left(\frac{D}{\sqrt{W}} \right)^{-(1.64 \text{ to } 1.9)}$ from Bench #1 and Bench #4 **Equation 3-4**

The suitability of the ground models developed above (equation 3-4) was used to check for blast event 2. The blast shots were similar to the blast shots from blast event 1, hence the Ground Vibration models from blast event 1 were used. The calculated PPV and measured PPV are summarised in Table 3-6.

Table 3-6 – Calculated and measured PPV for blast event 2

Monitoring Station	Blast Shot	Distance from blast shot (m)	MIC (kg)	Measured PPV (mm/s)	Calculated PPV (mm/s)	Error (%)
M01	Bench #2	230	250	21.314*	18.53	13.0
M02	Bench #4	629	280	2.771*	2.543	8.2
M03	Bench #4	472	280	5.383	5.015	6.8
M04	Bench #4	973	280	3.594	3.192	11.2
M05	Bench #4	1222	280	1.08	1.106	2.6

Note:

* The measured PPV value has been adjusted for overlapping Ground Vibration readings.

It can be observed that the error percentage in predicting the PPV is $\leq 13\%$, which is indicative that the mathematical models developed in Section 3.6 are a good fit. This percentage error can be attributed to inaccurate distance measurements, overlapping blast shots and other uncertainties.

3.7 AIR OVERPRESSURE MODELS

The measured PSPLs are used in developing the Air Overpressure models for each of the proposed locations of the WTGs. Using the reference site law parameter values discussed in the previous section (Section 3.3.1), the site specific 'A' and 'a' values for the study region were determined. The site law parameters and the corresponding calculated PSPL for each monitoring station from blast events 1 and 3 are summarised in Table 3-7. Blast event 2 was not considered in developing the model as the blast shots were fired concurrently for reasons already mentioned in Section 3.6.

Table 3-7 - Estimated site law ground motion parameters (A and a) and the corresponding measured and predicted PSPLs from blast event 1 and 3

Blast event	Monitoring station	A	a	Distance (m)	MIC (kg)	Scaled Distance	Measured PSPL (dB)	Calculated PSPL (dB)
1	M01	145	-2.2	552	307	68.75	116.3	116.36
	M02	220	-2.2	683	307	103.19	112.3	112.23
	M03	60	-2.2	473	307	71.47	107.8	107.96
	M04	170	-2.0	1002	307	151.39	111.3	111.38
3	M01	185	-1.95	552	291	83.3	124.4	124.41

M02	130	-2.2	594	291	91.35	109.8	109.99
M03	72	-2.2	469	291	72.13	109.3	109.37
M04	190	-2.2	957	291	147.17	104.1	104.17

Air Overpressure model for M05 could not be developed as there were no readings during blast event 1 due to faulty instrument (as previously mentioned) and during blast event 3, the Air Overpressure value fell below the instrument's trigger level.

From the above it can be noted that the constant 'A' varies significantly across blast shot. This is because the Air Overpressure is greatly influenced by the atmospheric conditions and terrain. Also, monitoring station such as M01 is in the forest/woods and hence the reading noted may not depict the actual Air Overpressure at such stations.

3.8 SENSITIVITY OF GROUND MOTION AND AIR OVERPRESSURE PARAMETERS

The accuracy of ground motion model parameters **K** and **b**, and air overpressure model parameters **A** and **a**, is important for predicting Peak Particle Velocity (PPV) and Peak Sound Pressure Level (PSPL). A sensitivity analysis of these parameters demonstrates that while variations may influence predictions, they are unlikely to result in excessive PPVs or PSPLs for WTG structures due to the model's robust design and conservative parameter ranges.

- Ground Motion Parameters (K and b):**
 For the study region, **K** values range from **1700 to 5000**. Higher values (e.g., **K = 5000**), as used for heavily confined areas like the sump, reflect increased ground vibration energy in such zones, while lower values (e.g., **K = 1700**) are more appropriate for free-face blasting areas. Similarly, **b** values, which describe the rate of attenuation, vary between **1.64** and **1.9**. A minor shift in **K** or **b** within these ranges could slightly alter PPV, but not to an extent likely to exceed safe vibration levels for WTGs. For example, an increase in **b** from **1.64** to **1.9** for free-face areas could decrease PPV predictions by approximately **5-10%**, illustrating manageable sensitivity within the model.
- Air Overpressure Parameters (A and a):**
 The constant **A** values vary more significantly due to environmental factors like terrain and atmospheric conditions. For this study, **A** values range from **60 to 220** depending on station location, with lower values (e.g., **A = 60**) recorded in densely wooded areas where terrain and foliage dampen air over pressure levels. Similarly, **a** values, which reflect attenuation, range from **-1.95 to -2.2**. These values ensure appropriate modelling for each monitoring station, with a sensitivity variation that, if adjusted, would change PSPL predictions by approximately **3-7 dB**—within safe limits for WTG structures.

3.9 DETERMINING THE MAXIMUM PEAK PARTICLE VELOCITY CONSIDERING THE QUARRY IN ITS FULL EXPANDED STATE

Two types of blasting will be carried out at Kilsaran's quarry at Gallstown. One - the free face blasting for extraction of products and second – the heavily confined blasting that is restricted around sump area with 15 m buffer. Given the current locations of the proposed WTGs, the maximum PPV that the

turbines will be subjected to is determined. The ground motion mathematical models developed in the previous Section 3.6 (Equation 3-3 and 3-4) are used in determining the maximum PPVs.

In the case of the free face blasting, the maximum PPV will occur when the blasting is carried out close to the turbine location i.e., on outer most bench and with the maximum MIC. The future expansion plan of the quarry is accounted for (refer Figure 3-1 and Figure 3-2).

There is no upper limit on the MIC used at the quarry, however the max MIC is governed by the PPV being limited to 12 mm/s for the residential buildings located near the quarry as per the planning condition for the quarry under Reference Number: 22/190.

For the current scenario, a MIC of 300 kg with 10% margin is considered for calculating the maximum PPV.

For the heavily confined blasting, the maximum MIC that is proposed to be used at the quarry is 100 kg , and a 10% margin is considered for this assessment

Figure 3-1 and Figure 3-2 shows the minimum distance from each of the monitoring stations from the quarry boundary for free face blasting and heavily confined blasting zone respectively.

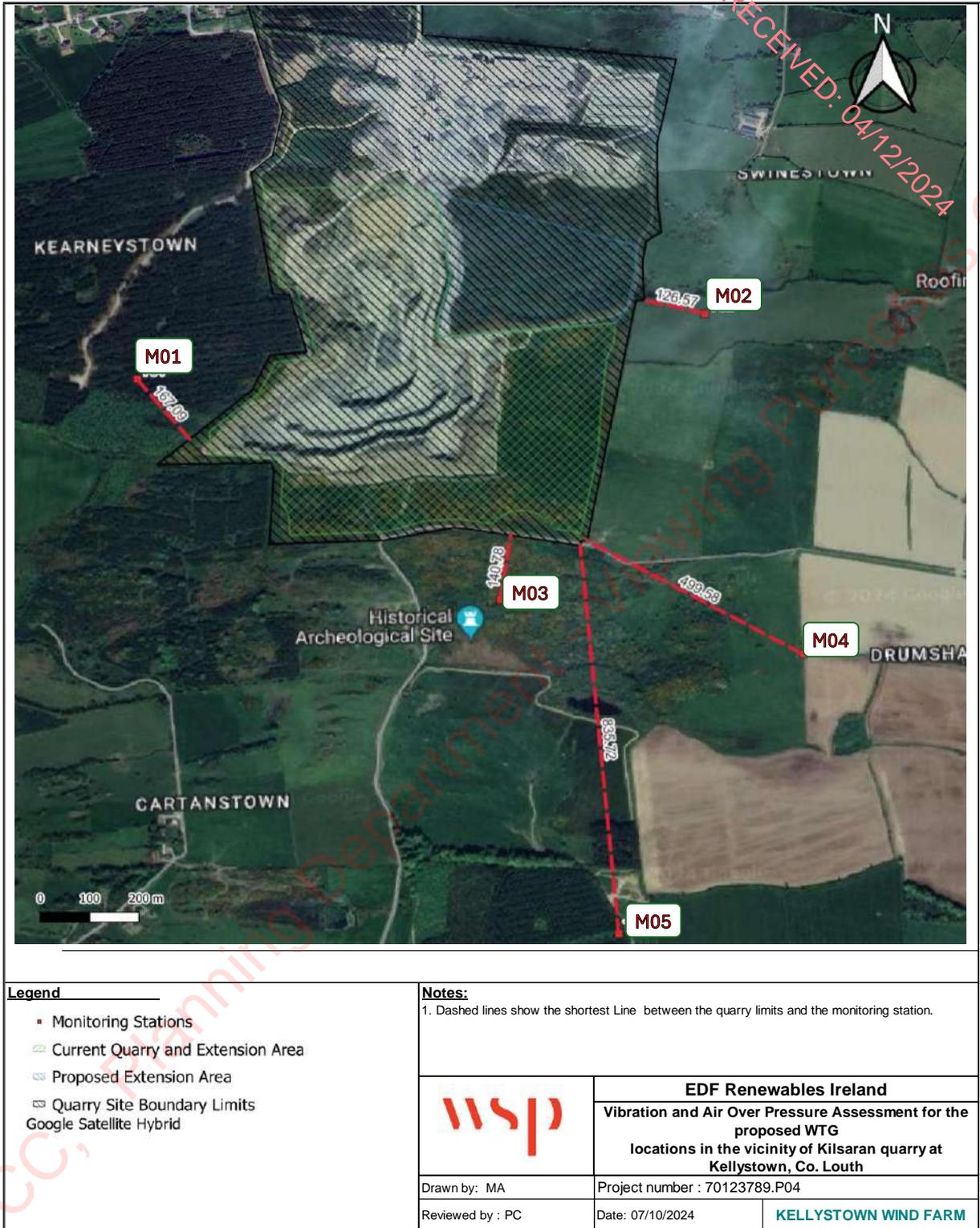


Figure 3-1 - Minimum distance from the outermost bench of the quarry to monitoring stations for free face blasting

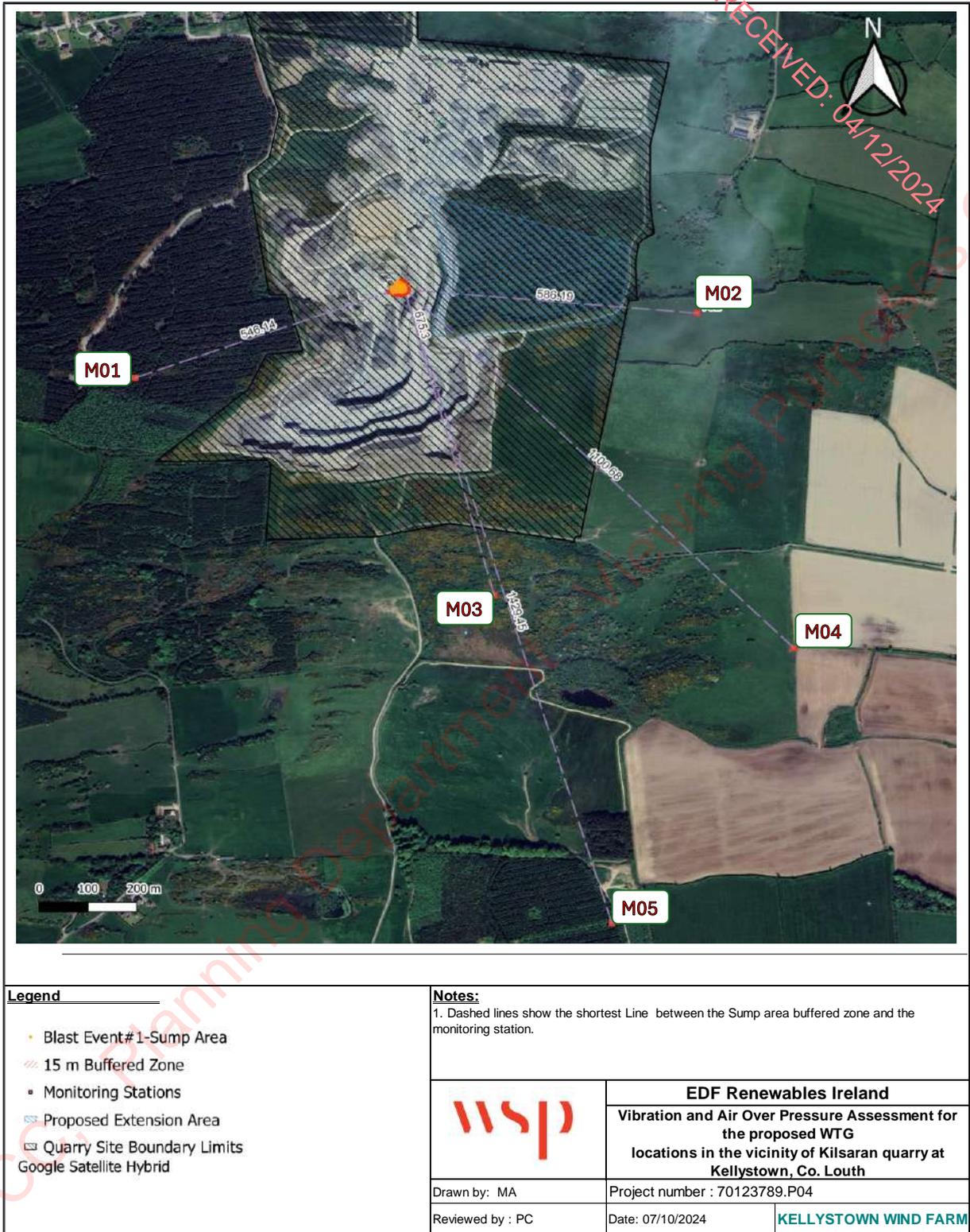


Figure 3-2 - Minimum distance from heavily confined blasting zone to the monitoring stations

The site law parameters calculated (Table 3-2 to Table 3-5) are used in determining the maximum PPV for each WTG for both the free face and heavily confined blasting conditions. The worst case for the free face blasting condition will occur when the blasting occurs closest to the WTG location with a

MIC of 330 kg and for the heavily confined condition the worst case is when the blasting occurs on the boundary of this zone with a MIC of 110 kg. Table 3-8 summarises the results for different blasting or site conditions for each WTG.

Table 3-8 – Maximum PPV for each WTG considering different blasting conditions

Monitoring Station	Minimum distance from WTG to outermost bench of the quarry (m)	Max. MIC that will be used during the operation of the WTG (kg)	Site/Blasting condition	Maximum PPV expected during operation of the WTG (mm/s)
M01	546	110	Heavily Confined	7.07
	184	330	Free Face	36.86
M02	586	110	Heavily Confined	3.58
	182	330	Free Face	30.73
M03	675	110	Heavily Confined	2.0
	164	330	Free Face	48.93
M04	1100	110	Heavily Confined	0.72*
	519	330	Free Face	10.24
M05	1429	110	Heavily Confined	0.44*
	863	330	Free Face	2.28

Note:

* These values are only approximate as they are determined using the approximate ground model

From the above table, it is observed that Heavily Confined blasting such as the one conducted for the Sump Area, generates the maximum Ground Vibration per kg of charge as compared to the Free Face blasting. However, the highest MIC that will be used is low (110 kg) for such blast shots and also the location of such blasts are restricted to the Sump Area. In terms of absolute maximum PPV, the Free Face blasting shots govern the maximum possible PPV in the study area.

The maximum Air Overpressure that may be experienced by the WTGs are summarised in **Table 3-9**.

Table 3-9 - Maximum PSPL for each WTG considering blasting events 1 and 3

Monitoring Station	Site law parameters		Distance (m)	MIC (kg)	Maximum Air Overpressure (dB)
	A	a			
M01	185	-1.95	184	330	143.7
M02	220	-2.2	182	330	137.9
M03	72	-2.2	164	330	130.2
M04	170	-2.0	519	330	123.2

Note: Measured PSPL at M05 was lower than detection limit (88 dB) so it was not possible to model the parameters for that station

The maximum PSPL determined in Table 3-9 is considering Free Face blasting. The maximum Air Overpressure is 143.7 dB which is well within the threshold pressure of 180 dB at all WTG locations.

3.10 PPV CONTOUR MAPS

The PPV contour maps display the distribution of ground motion resulting from blasting activities, specifically in terms of Peak Particle Velocity (PPV). These maps illustrate contour lines representing PPV levels ranging from 1 mm/s to 100 mm/s for each blast shot associated with blast events 1 and 3.

Figure 3-3 to Figure 3-5 show the propagation of PPV from the source of the three blast shots for blast event 1 (10th July, 2024). **Figure 3-6** shows the propagation of PPV for blast event 3 (12th Sept. 2024).

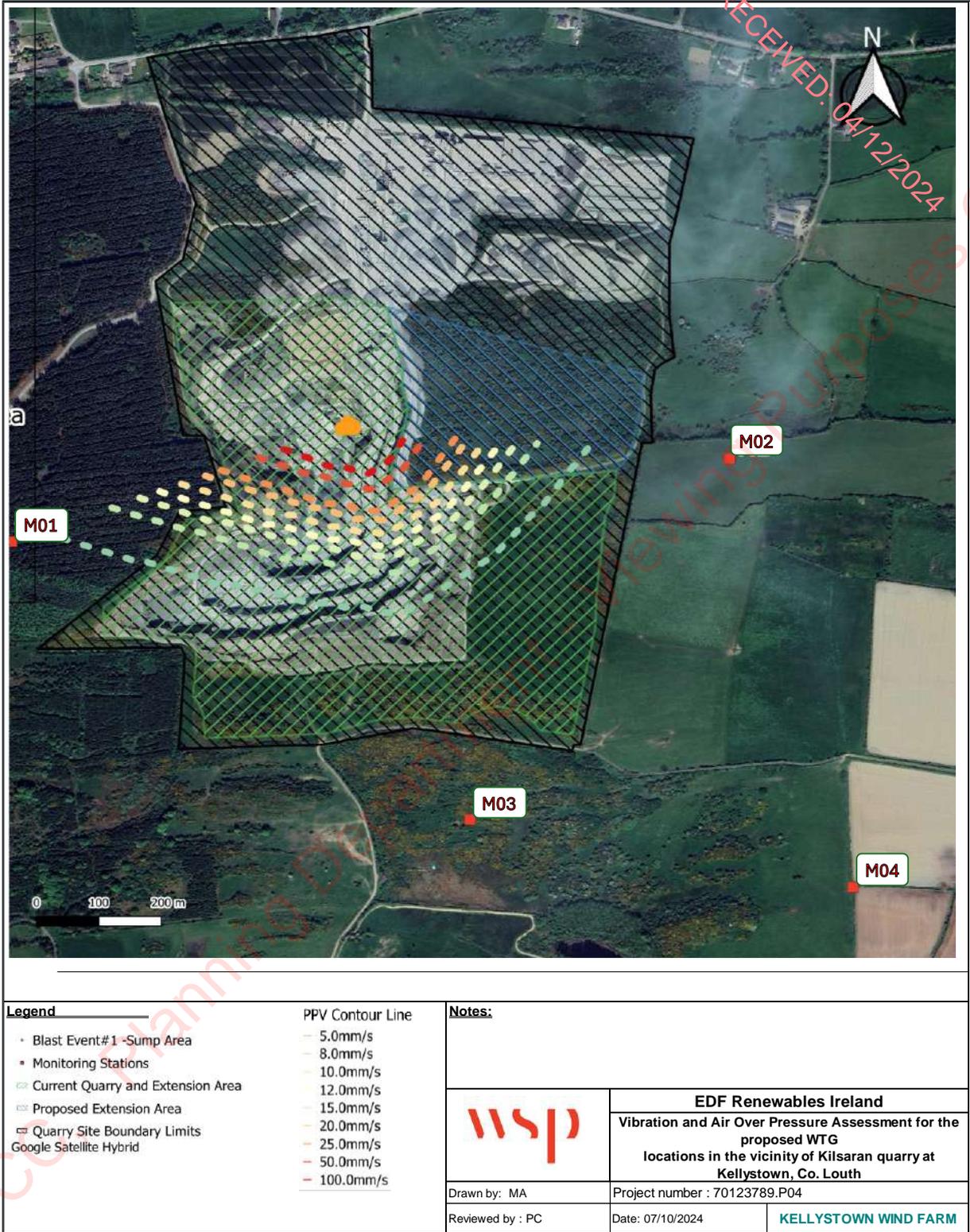


Figure 3-3 - Attenuation of ground motion in terms of PPV caused due to Sump Area blast shot from blast event 1

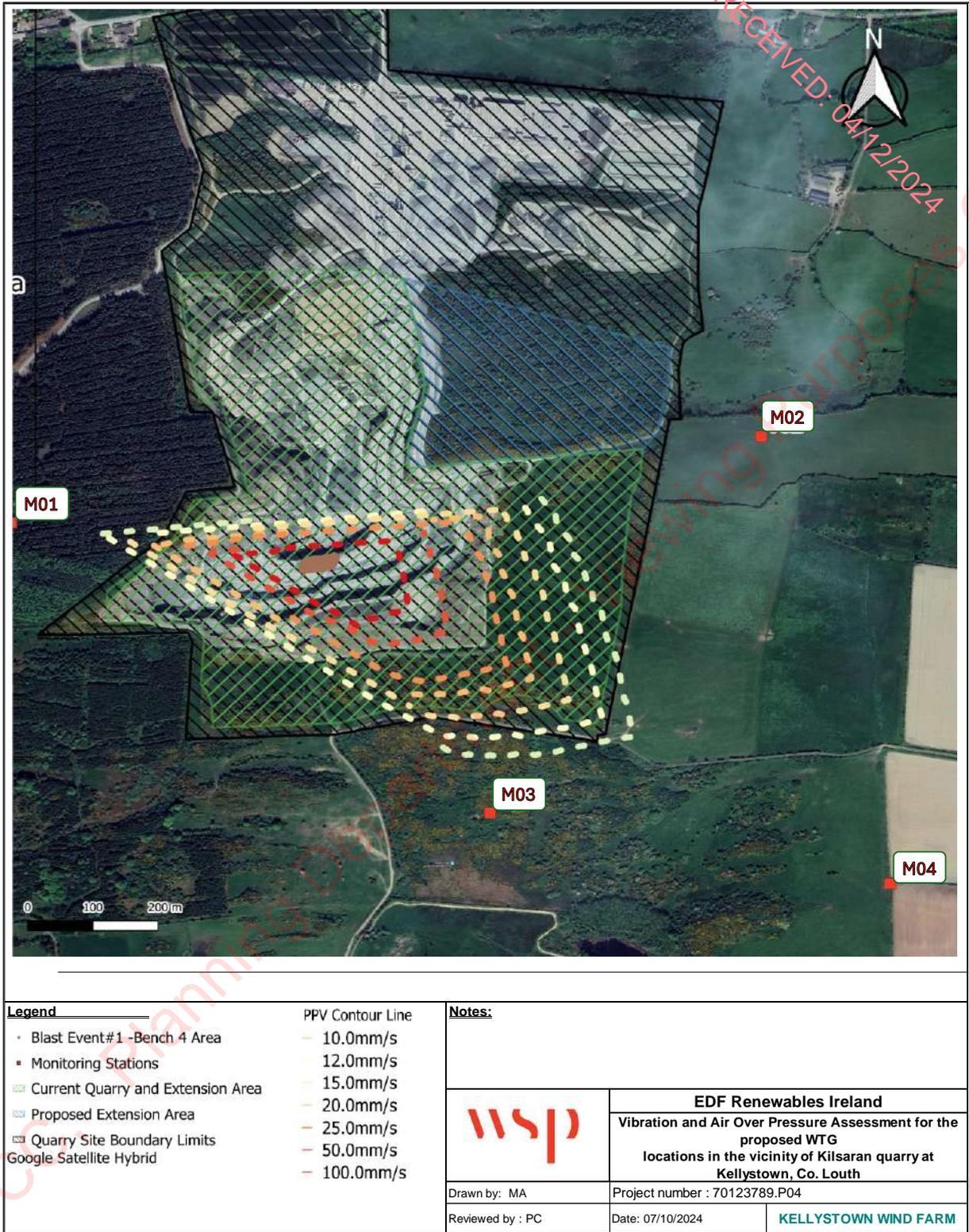
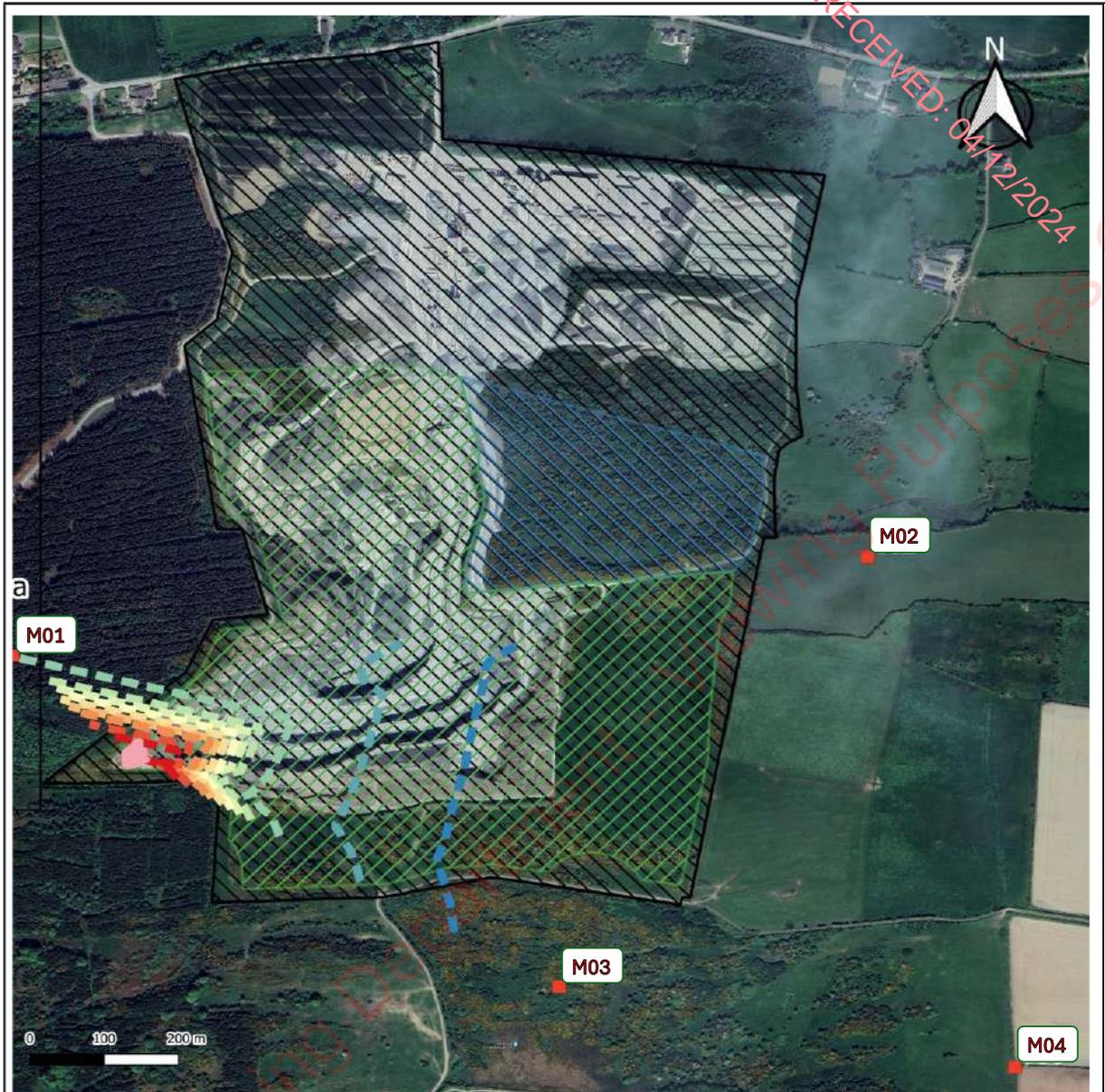
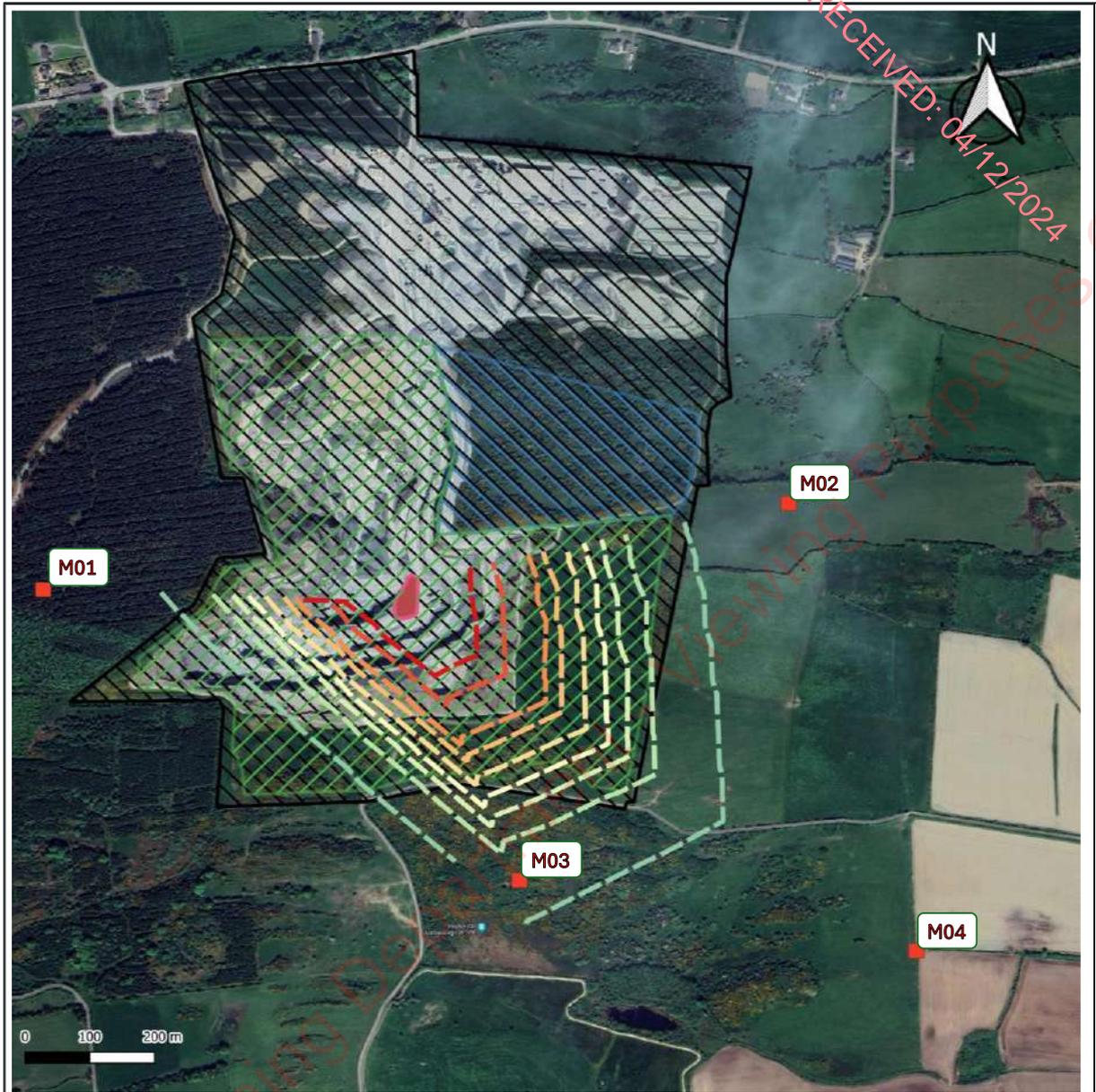


Figure 3-4 - Attenuation of ground motion in terms of PPV caused due to Bench #4 free face blast shot from blast event 1



Legend		PPV Contour Line	Notes:
•	Blast Event#1 -Bench 1 Area	— 1.0mm/s	EDF Renewables Ireland Vibration and Air Over Pressure Assessment for the proposed WTG locations in the vicinity of Kilsaran quarry at Kellystown, Co. Louth Drawn by: MA Project number : 70123789.P04 Reviewed by : PC Date: 07/10/2024 KELLYSTOWN WIND FARM
•	Monitoring Stations	— 2.0mm/s	
■	Current Quarry and Extension Area	— 5.0mm/s	
■	Proposed Extension Area	— 8.0mm/s	
■	Quarry Site Boundary Limits	— 10.0mm/s	
■	Google Satellite Hybrid	— 12.0mm/s	
		— 15.0mm/s	
		— 20.0mm/s	
		— 25.0mm/s	
		— 50.0mm/s	
		— 100.0mm/s	

Figure 3-5 - Attenuation of ground motion in terms of PPV caused due to Bench #1 free face blast shot from blast event 1



Legend		PPV Contour Line		Notes:	
• Blast Event#3 Area		— 5.0mm/s		 <p>EDF Renewables Ireland Vibration and Air Over Pressure Assessment for the proposed WTG locations in the vicinity of Kilsaran quarry at Kellystown, Co. Louth</p> <p>Drawn by : MA Project number : 70123789.P04</p> <p>Reviewed by : PC Date: 07/10/2024 KELLYSTOWN WIND FARM</p>	
• Monitoring Stations		— 8.0mm/s			
▨ Current Quarry and Extension Area		— 10.0mm/s			
▨ Proposed Extension Area		— 12.0mm/s			
▨ Quarry Site Boundary Limits		— 15.0mm/s			
Google Satellite Hybrid		— 20.0mm/s			
		— 25.0mm/s			
		— 50.0mm/s			
		— 100.0mm/s			

Figure 3-6 - Attenuation of ground motion in terms of PPV caused due to Bench #4 free face blast shot from blast event 3

4 GROUND MOTION AT BEDROCK LEVEL

The transfer of vibrations from the surface to the bedrock level can be calculated using the shear wave velocity of the overburden soil. This subsection provides an overview for performing these calculations. The Site is classified depending on the soil shear wave velocity, v_s or standard penetration test value, N or the undrained shear strength s_u as per ASCE/SEI 7-10, Table 20.3-1 and is summarised in Table 4-1 below:

Table 4-1 - Site class classification based on soil type and shear wave velocity property for the top 30 m depth

Site Class	Soil profile name	Average properties in top 30 m		
		Soil shear wave velocity, v_s , (m/s)	Standard Penetration Resistance 'N'	Soil undrained shear strength, s_u (kPa)
A	Hard Rock	$v_s > 1,500$	N/A	N/A
B	Rock	$760 < v_s \leq 1,500$	N/A	N/A
C	Very dense soil and soft rock	$360 < v_s \leq 760$	$N \geq 50$	$s_u \geq 96$
D	Stiff soil	$180 < v_s \leq 360$	$15 \leq N \leq 50$	$48 \leq s_u \leq 96$
E	Soft clay soil	$v_s < 180$	$N \leq 15$	$s_u \leq 48$
		Any profile with more than 3 m of soil with the following characteristics: 1. Plasticity index $PI > 20$, 2. Moisture content $w \geq 40\%$ and 3. Undrained shear strength $s_u < 24$		
F	Soils requiring site response analysis in accordance with Section 21.1	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading, such as liquefiable soils, quick and highly sensitive clays, and collapsible weakly cemented soils. 2. Peats and/or highly organic clays ($H > 3$ m) of peat and/or highly organic clay where H = thickness of soil. 3. Very high plasticity clays ($H > 7.6$ m with $PI > 75$). 4. Very thick, soft/medium stiff clays ($H > 37$ m) with $s_u < 48$		

The Site amplification factor to obtain the PGA values for different site conditions as per ASCE/SEI 7-10, Table 11.8-1 is summarised in **Table 4-2** below:

Table 4-2 - Amplification factor for various Site Class

Site	Peak Ground Acceleration (PGA)				
	PGA ≤ 0.1	PGA = 0.2	PGA = 0.3	PGA = 0.4	PGA ≥ 0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	A site response analysis shall be performed in accordance with ASCE/SEI 7-10				

At all monitoring stations, the Kellyblocks on which the instruments were placed rests on weathered rock or Stiff clay with boulders and cobbles (Glacial Till). Hence the Site is classified as Class C and D as per Table 4-1. The amplification factor for these classes ranges from 1.0 to 1.6 as per Table 4-2. For WTG T01, T02 and T03, the Site Class is C with amplification factor ranging from 1.0 to 1.2. For WTG T04 and T05, the Site Class is D with amplification factor ranging from 1.0 to 1.6. The effect of Kellyblocks on the incoming ground motion is negligible due to its high stiffness, hence the incoming vibration at the bedrock level as measured by the instruments is either the same or is amplified by 1.6. Taking a conservative approach, an amplification factor of 1.0 is used. In conclusion, the PPV expected at the bedrock level is the same as that measured by the monitoring instruments.

5 MAXIMUM PPV CONTOURS FOR STUDY AREA

Based on the models developed from the blast shots, the maximum expected PPV contours in the study area were developed. Figure 5-1 shows the maximum PPV contours around the quarry for the study area. These contours are developed for Free Face blasting considering the maximum possible charge of 330 kg and the blasting occurring on the outermost bench of the quarry. As shown in the figure, the future expansion of the quarry is also considered.

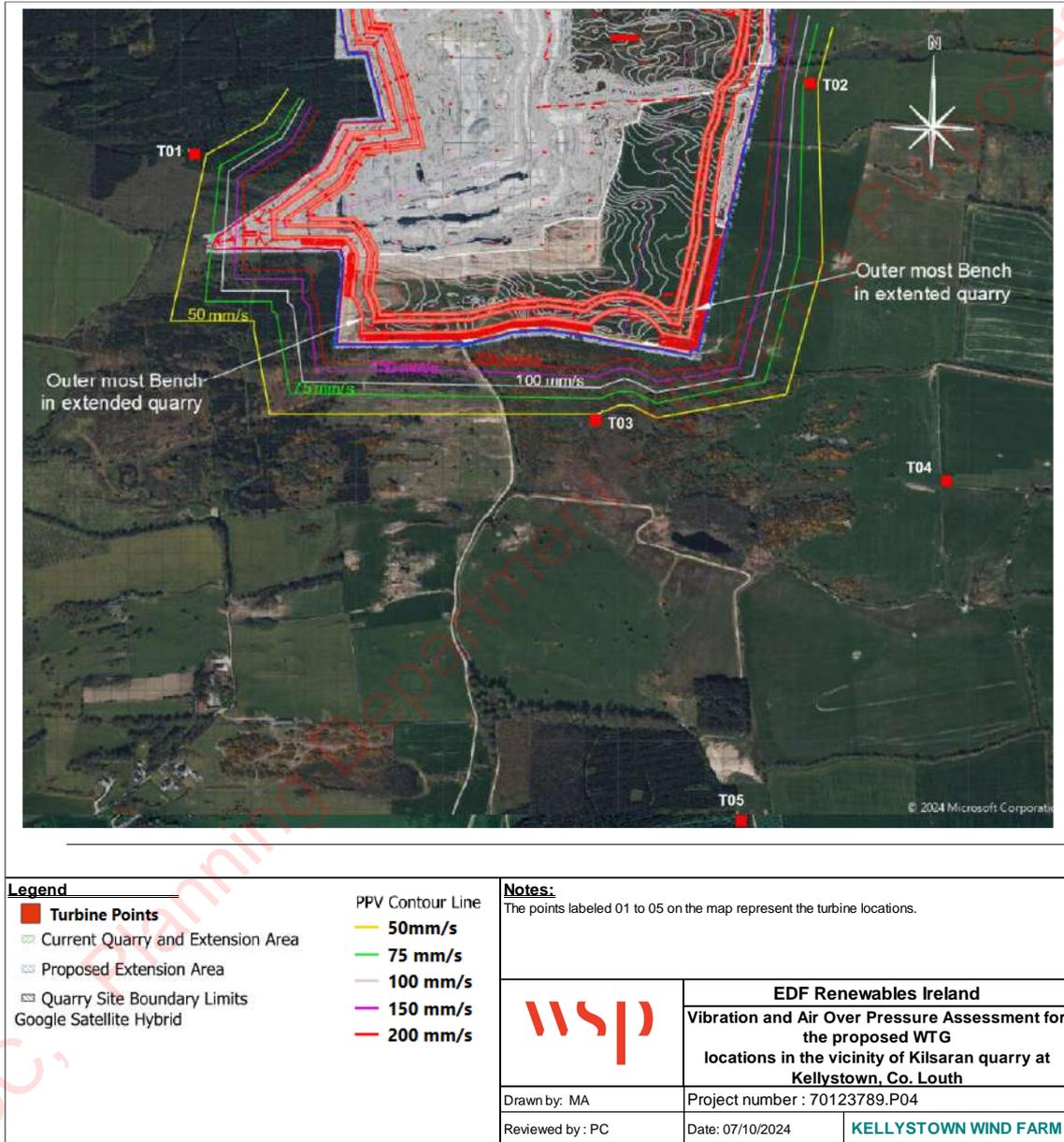


Figure 5-1 Maximum expected PPV contours for the study area

WTGs 01, 02, 03, 04 and 05 are located at approximately 65, 30, 55, 445 and 795 m respectively from the 100 mm/s contour (white line) as shown in Figure 5-1. Hence it can be concluded that the blasting activity at Kellystown quarry will not cause any structural damage to the WTGs given the proposed locations of the turbines.

6 CONCLUSION

The **Vibration and Air Overpressure Assessment Report** for the Kellystown Wind Farm project, conducted by WSP for EDF Renewables Ireland, provides a comprehensive evaluation of ground vibrations resulting from three blasting events at Kilsaran Quarry in Kellystown, Co. Louth. The assessment included blast event 1 (three shots at Bench #1, #4, and the Sump area) on July 10, 2024, blast event 2 (two shots at Bench #2 and Bench #4) on August 9, 2024, and blast event 3 (one shot at Bench #4) on September 12, 2024.

Key findings from the assessment include:

- Instrumentation and Data Collection:** Ground vibration and air overpressure monitoring instruments were successfully installed at designated monitoring points, with robust data collected for mathematical modelling. The absence of data from monitoring station M05 during blast event 1 is not concerning, as it is located further from the quarry boundary and showed minimal impact from blasting.
- Ground Vibration Readings:** The recorded Peak Particle Velocity (PPV) values for the three blast events remained within acceptable limits, specifically below the established threshold of **100 mm/s** for wind turbines. During blast event 1, the highest recorded PPV was **5.50 mm/s** at monitoring station M03. For blast event 2, the peak was **31.31 mm/s** at monitoring station M01, and for blast event 3, it reached **5.99 mm/s** at M03.
- Types of Blasting:** Both heavily confined and free face blasting techniques were utilized, with confined blasting limited to the Sump area and free face blasting extending to the quarry's outermost bench.
- Modelling and Predictions:** The developed ground models for both blasting methods demonstrated reliable predictions, with calculated PPV values closely aligning with measured data. This indicates the accuracy of the models based on site parameters consistent with standard literature and WSP's prior experience.
- Maximum PPVs at the Monitoring stations and WTGs:** The predicted maximum PPV values at the monitoring stations and wind turbine generator (WTG) locations were well below the **100 mm/s** threshold (Table 6-1). The highest anticipated PPV values include:

Table 6-1- Summary of Max PPV values

Monitoring Stations based on models		*Turbine Location	
M01	7.1 mm/s (Confined) and 36.9 mm/s (Free Face)	T01	36.9
M02	3.6 mm/s (Confined) and 30.7 mm/s (Free Face)	T02	*67.9
M03	2.0 mm/s (Confined) and 48.9 mm/s (Free Face)	T03	48.9
M04	0.72 mm/s (Confined) and 10.2 mm/s (Free Face)	T04	10.2
M05	0.44 mm/s (Confined) and 2.28 mm/s (Free Face)	T05	2.28

**Estimated based on Contour lines*

These predictions consider the worst-case scenario with a maximum explosive charge of **330 kg** for free face blasting and **110 kg** for confined blasting, alongside the minimum distance from turbine locations to the quarry.

- **Air Overpressure:** The anticipated maximum Peak Sound Pressure Level (PSPL) experienced by the turbines, given a maximum charge of **330 kg**, is **143.7 dB**, which is well below the threshold of **180 dB**.
- **Foundation Considerations:** The monitoring stations are established on weathered rock and glacial till, and the site classification as Site Class C and D led to the application of a conservative amplification factor of **1**. Thus, the ground vibrations measured are equivalent to those at bedrock level.
- **Future Monitoring:** A Vibration and Air Overpressure Assessment should be specified as required by the Designer at Detailed Design to inform the design of the foundations of the WTG structures, this assessment should take into consideration the findings from the ground investigation.

In conclusion, the proposed locations of the WTGs are projected to remain within the anticipated PPV and PSPL limits, confirming that they are situated at a safe distance. This zone is established with the understanding that the turbines will not experience any structural or cosmetic damage due to blasting activities.

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Appendix A

GROUND CONDITION AND CONSTRUCTION OF MONITORING STATIONS

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RECEIVED 04/12/2024
Landscape Purposes Only



Figure A-1 - Formation level for monitoring station T01



Figure A-2 - Weathered rock at formation level revealed by trial pit TP T01 (GI report by Whiteford)



Figure A-3 - Kellyblock for monitoring station T01



Figure A-4 - Formation level at monitoring station TP02



Figure A-5 - Weathered rock at formation level revealed by trial pit TP T02 (GI report by Whiteford)



Figure A-6 - Kellyblock for monitoring station T02



Figure A-7 - Formation level for monitoring station T03



Figure A-8 - Weathered rock at formation level revealed by trial pit TP T03 (GI report by Whiteford)



Figure A-9 - Kellyblock for monitoring station T03



Figure A-10 - Formation level for monitoring station T04

RECEIVED: 04/12/2024



Figure A-11 – Weathered rock/Glacial Till at formation level revealed by trial pit TP T04 (GI report by Whiteford)



Figure A-12 - Kellyblock for monitoring station T04



Figure A-13 - Formation level for monitoring station T05



Figure A-14 - Kellyblock for monitoring station T05



Appendix B

INSTRUMENTS READING FROM ENVIRONMENTAL MEASUREMENTS LTD

RECEIVED: 04/12/2024



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RECEIVED: 04/12/2024

**Report Blast Monitoring
For WSP**

10 July 2024

Revision	Prepared By	Date	Approved	Date
01	F. Heavey	11 Jul 2024	K. O'Brien	11 Jul 2024
02	F. Heavey	24 Jul 2024	K. O'Brien	24 Jul 2024

Louth CC, Planning Department - Viewing Purposes Only!

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RECEIVED: 04/12/2024

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1. Introduction

At the request of WSP our company Environmental Measurements has carried blast monitoring at five locations at Kellystown.

The purpose of the monitoring was to determine the vibration and air overpressure levels at each location from the blast at the Kilsaran Gallstown quarry.

Three blasts were fired on the 10th July 2024;

1. Sump area at approx. 14:51:31
2. Bench #4 at approx. 14:51:31 with a 500ms delay
3. Bench #1 at approx. 14:51:36

Five blast monitoring stations were installed at the following positions:

One Blast Station, T01, located in Kearneystown forest, west of the quarry.

One Blast Station, T02, located in the field, east of the quarry.

One Blast Station, T03, located adjacent to the Standing Stones, south of the quarry.

One Blast Station, T04, located at the bottom of the field, south east of the quarry.

One Blast Station, T05, located in the forest at Piperstown Equestrian Centre.



Figure 1. Map of Monitor Locations

2. Results

2.1 Vibration & Air Overpressure

2.1.1 T01, Located in Kearneystown Forest, West of the Quarry

Monitoring covers the blast on 10 July 2024.

The following Peak Particle Velocity (PPV) were recorded during each blast;

Blast	PPV (mm/s)
Sump Area	4.059
Bench #4	5.147
Bench #1	4.832

A Peak Air Overpressure (PSPL) of 116.3 dB(L) was recorded during these blasts.



Figure 2. Image of T01



Event Report

Waveform Trigger Source
 Trigger Level(s)
 Trigger Level (Mic)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator

Vert at July 10, 2024 14:51:17
 Geo 0.500 mm/s
 Mic 63.25 pa, 130 dB(L)
 0.25 sec/10.9 sec (Auto)
 1024 sps
 BLAST 2023.MMB
 Operator

Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name
 USB Sensor Support

UM15711
 Micromate ISEE 10.90
 3.8 volts
 September 30, 2023 by E.M.
 UM15711_20240710145117.IDFW
 Disabled

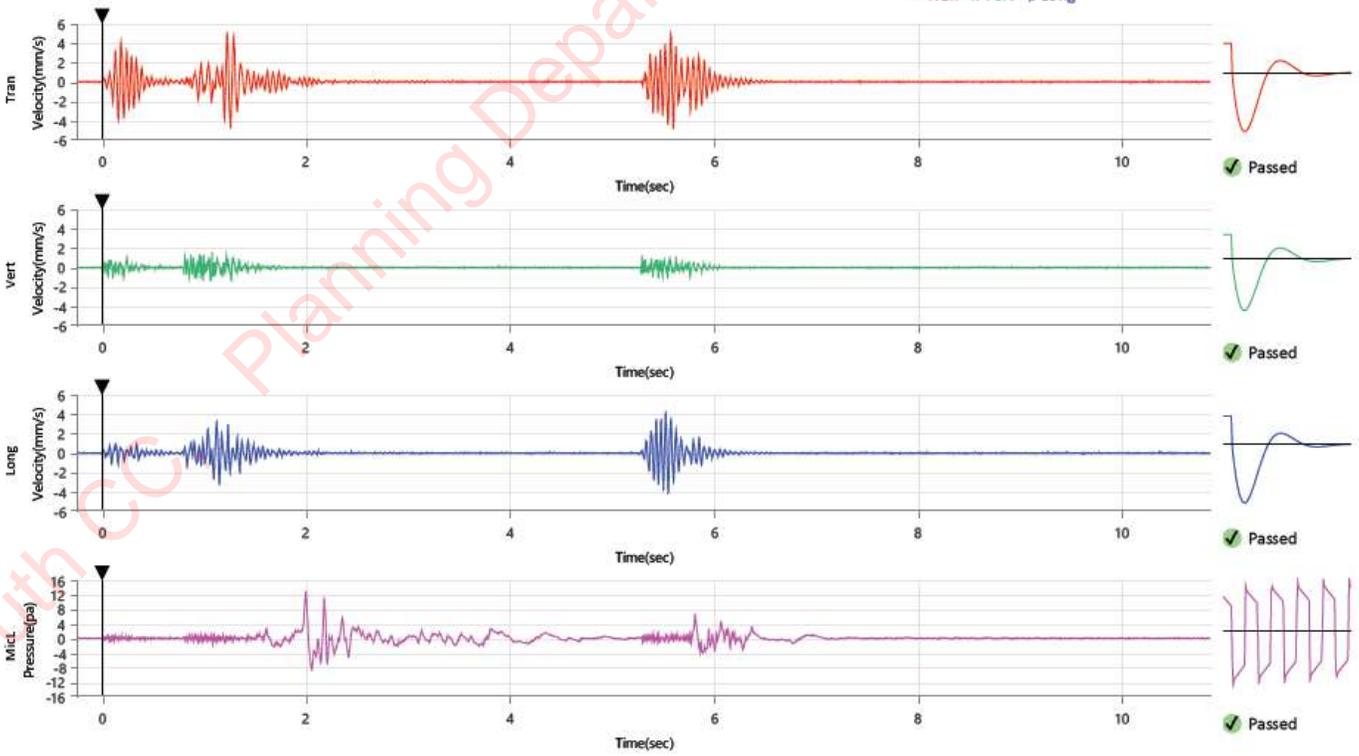
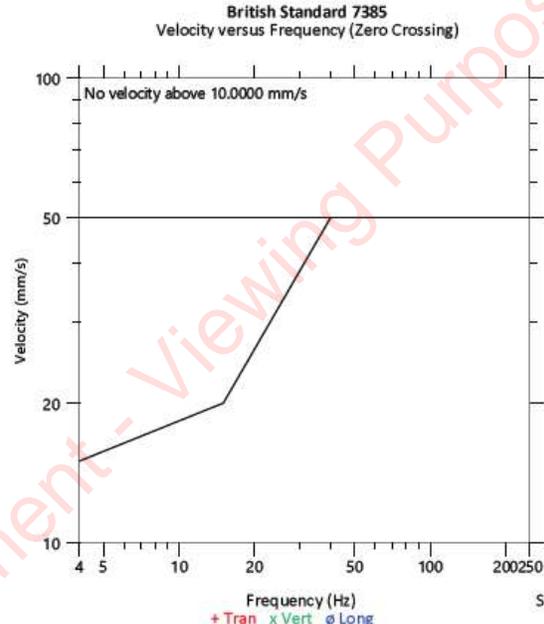
Notes
 Location:
 Client:
 User Name:
 General:

Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	5.147 mm/s	1.608 mm/s	4.288 mm/s
Zero Crossing Frequency	16.5 Hz	73.1 Hz	20.5 Hz
Time (Relative to Trigger)	1.224 sec	1.075 sec	5.526 sec
Peak Acceleration	0.131 g	0.123 g	0.099 g
Peak Displacement	0.052 mm	0.011 mm	0.033 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.3 Hz	7.3 Hz	7.3 Hz
Overswing Ratio	4.5	4.6	5.1
Peak Vector Sum	6.026 mm/s at 5.577 sec		

ISEE Linear Microphone
 Peak Sound Pressure Level
 Peak Sound Pressure Level
 Time (Relative to Trigger)
 Zero Crossing Frequency
 Sensor Check
 Frequency
 Test Amplitude

13.00 pa
 116.3 dB(L)
 1.994 sec
 2.9 Hz
 ✓ Passed
 20.5 Hz
 1374 mv



2.1.2 T02, Located in the Field, East of the Quarry

Monitoring covers the blast on 10 July 2024.

The following Peak Particle Velocity (PPV) were recorded during each blast;

Blast	PPV (mm/s)
Sump Area	2.002
Bench #4	2.317
Bench #1	< 0.5

A Peak Air Overpressure (PSPL) of 112.3 dB(L) was recorded during these blasts.



Figure 3. Image of T02



Event Report

Waveform Trigger Source
 Trigger Level(s)
 Trigger Level (Mic)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator

Vert at July 10, 2024 14:51:23
 Geo 0.500 mm/s
 Mic 141.59 pa, 137 dB(L)
 0.25 sec/6.5 sec (Auto)
 1024 sps
 BLAST.MMB
 Operator

Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name
 USB Sensor Support

UM22590
 Micromate ISEE 10.90GC
 3.8 volts
 February 22, 2024 by InstanTel
 UM22590_20240710145123.IDFW
 Disabled

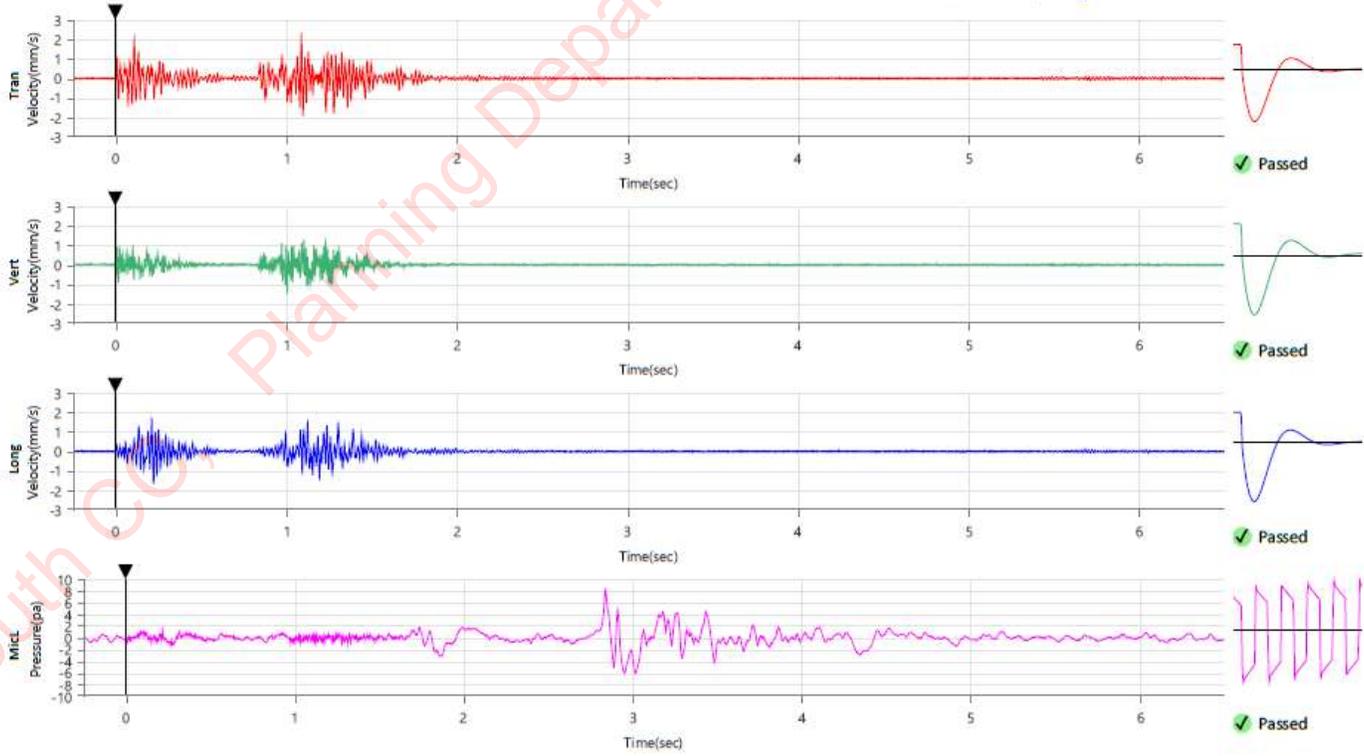
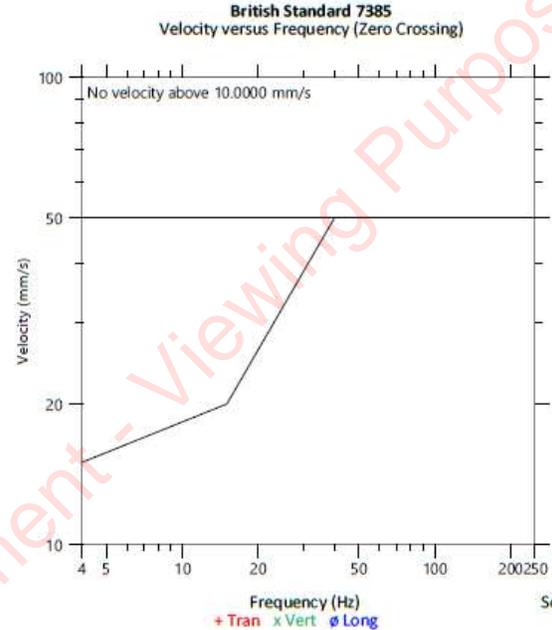
Notes
 Location:
 Client:
 User Name:
 General:

Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	2.317 mm/s	1.498 mm/s	1.695 mm/s
Zero Crossing Frequency	51.2 Hz	73.1 Hz	46.5 Hz
Time (Relative to Trigger)	1.088 sec	1.004 sec	0.221 sec
Peak Acceleration	0.159 g	0.086 g	0.055 g
Peak Displacement	0.007 mm	0.006 mm	0.007 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.3 Hz	7.5 Hz	7.5 Hz
Overswing Ratio	4.4	3.6	4.5
Peak Vector Sum	2.531 mm/s at 1.088 sec		

ISEE Linear Microphone
 Peak Sound Pressure Level
 Peak Sound Pressure Level
 Time (Relative to Trigger)
 Zero Crossing Frequency
 Sensor Check
 Frequency
 Test Amplitude

8.25 pa
 112.3 dB(L)
 2.838 sec
 3.4 Hz
 ✓ Passed
 20.5 Hz
 1479 mv



2.1.3 T03, Located Adjacent to the Standing Stones, South of the Quarry

Monitoring covers the blast on 10 July 2024.

The following Peak Particle Velocity (PPV) were recorded during each blast;

Blast	PPV (mm/s)
Sump Area	1.080
Bench #4	5.502
Bench #1	< 0.5

A Peak Air Overpressure (PSPL) of 107.8 dB(L) was recorded during these blasts.



Figure 4. Image of T03



Event Report

Waveform Trigger Source
 Trigger Level(s)
 Trigger Level (Mic)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator

Vert at July 10, 2024 14:51:21
 Geo 0.500 mm/s
 Mic 68.95 pa, 131 dB(L)
 0.25 sec/5.0 sec (Fixed)
 1024 sps
 BLAST.MMB
 Operator

Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name
 USB Sensor Support

UM11929
 Micromate ISEE 10.90
 3.8 volts
 June 7, 2024 by E.M.
 UM11929_20240710145121.IDFW
 Disabled

Notes

Location:
 Client:
 User Name:
 General:

Post Event Notes No text to be displayed.

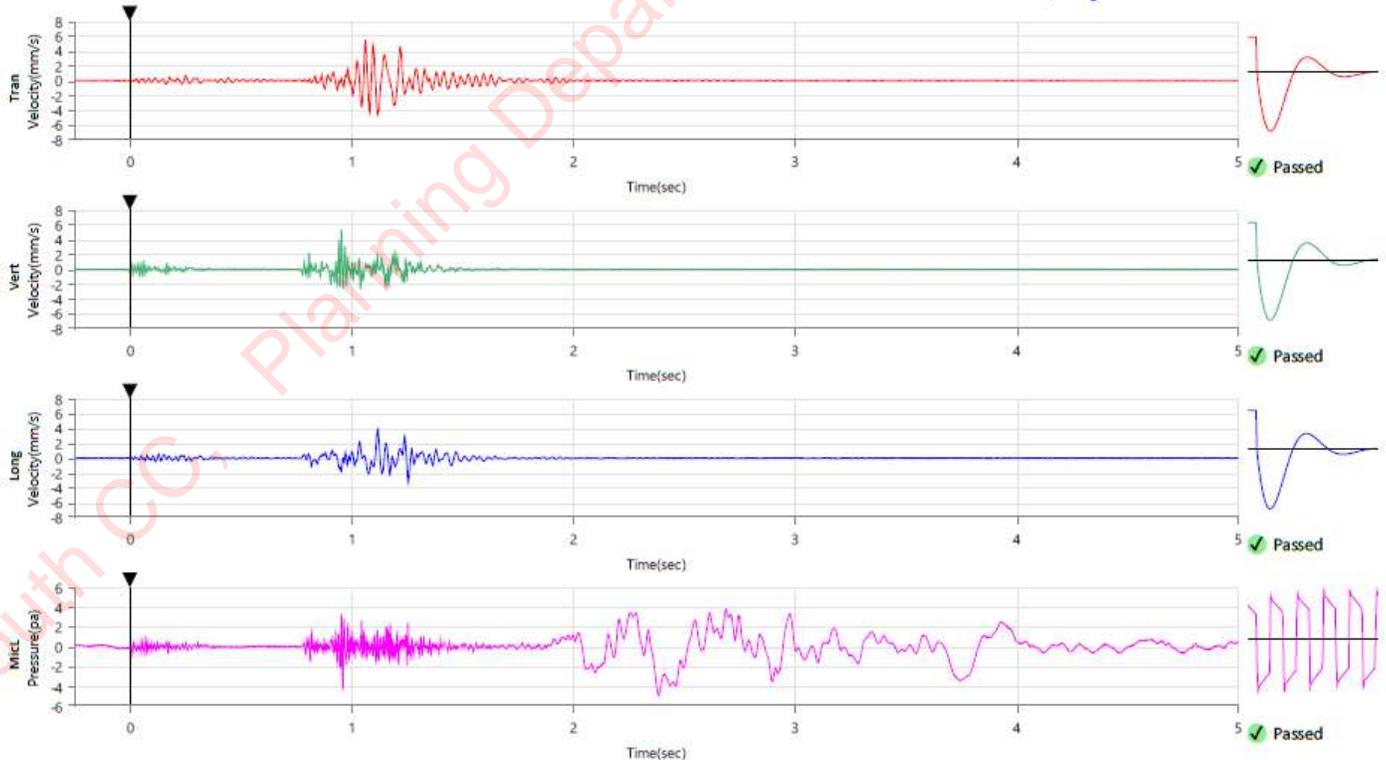
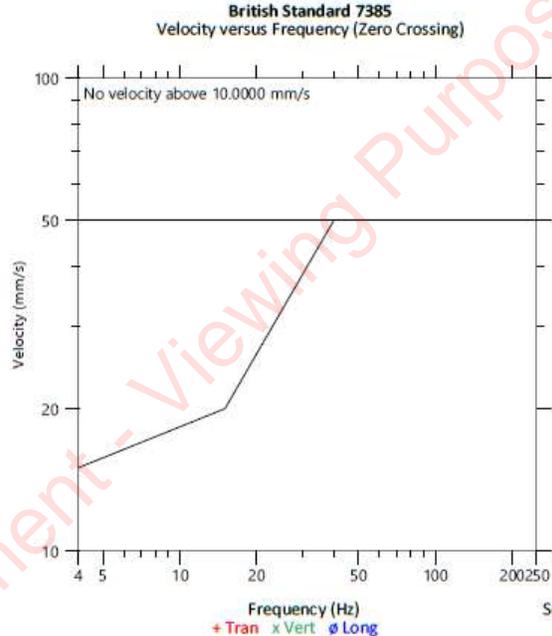
Geophone

	Tran	Vert	Long
Peak Particle Velocity	5.502 mm/s	5.297 mm/s	3.996 mm/s
Zero Crossing Frequency	26.9 Hz	64.0 Hz	24.4 Hz
Time (Relative to Trigger)	1.062 sec	0.955 sec	1.119 sec
Peak Acceleration	0.167 g	0.201 g	0.072 g
Peak Displacement	0.038 mm	0.013 mm	0.026 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.1 Hz	7.3 Hz	7.3 Hz
Overswing Ratio	3.9	3.3	3.6

Peak Vector Sum 6.258 mm/s at 1.118 sec

ISEE Linear Microphone

Peak Sound Pressure Level	4.93 pa
Peak Sound Pressure Level	107.8 dB(L)
Time (Relative to Trigger)	2.385 sec
Zero Crossing Frequency	3.0 Hz
Sensor Check	✓ Passed
Frequency	19.7 Hz
Test Amplitude	1319 mv



2.1.4 T04, Located at the Bottom of the Field, South East of the Quarry.

Monitoring covers the blast on 10 July 2024.

The following Peak Particle Velocity (PPV) were recorded during each blast;

Blast	PPV (mm/s)
Sump Area	< 0.5
Bench #4	3.358
Bench #1	< 0.5

A Peak Air Overpressure (PSPL) of 111.3 dB(L) was recorded during these blasts.



Figure 5. Image of T04



Event Report

Waveform Trigger Source
 Trigger Level(s)
 Trigger Level (Mic)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator

Vert at July 10, 2024 14:51:17
 Geo 0.500 mm/s
 Mic 63.25 pa, 130 dB(L)
 0.25 sec/6.0 sec (Auto)
 1024 sps
 BLAST.MMB
 Operator

Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name
 USB Sensor Support

UM15449
 Micromate ISEE 10.90
 3.8 volts
 June 7, 2024 by E.M.
 UM15449_20240710145117.IDFW
 Disabled

Notes

Location:
 Client:
 User Name:
 General:

Post Event Notes No text to be displayed.

Geophone

Peak Particle Velocity
 Zero Crossing Frequency
 Time (Relative to Trigger)
 Peak Acceleration
 Peak Displacement
 Sensor Check
 Frequency
 Overswing Ratio

Tran	Vert	Long
2.908 mm/s	1.482 mm/s	3.358 mm/s
21.3 Hz	26.9 Hz	20.5 Hz
0.317 sec	0.377 sec	0.380 sec
0.048 g	0.045 g	0.042 g
0.021 mm	0.008 mm	0.028 mm
✓ Passed	✓ Passed	✓ Passed
7.3 Hz	7.3 Hz	7.3 Hz
4.7	4.4	4.4

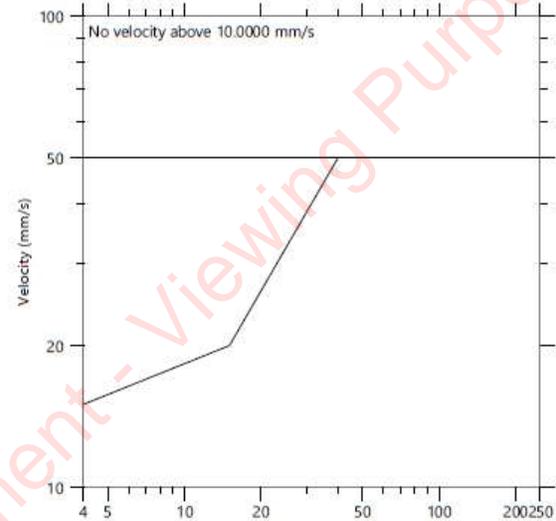
Peak Vector Sum 4.466 mm/s at 0.380 sec

ISEE Linear Microphone

Peak Sound Pressure Level
 Peak Sound Pressure Level
 Time (Relative to Trigger)
 Zero Crossing Frequency
 Sensor Check
 Frequency
 Test Amplitude

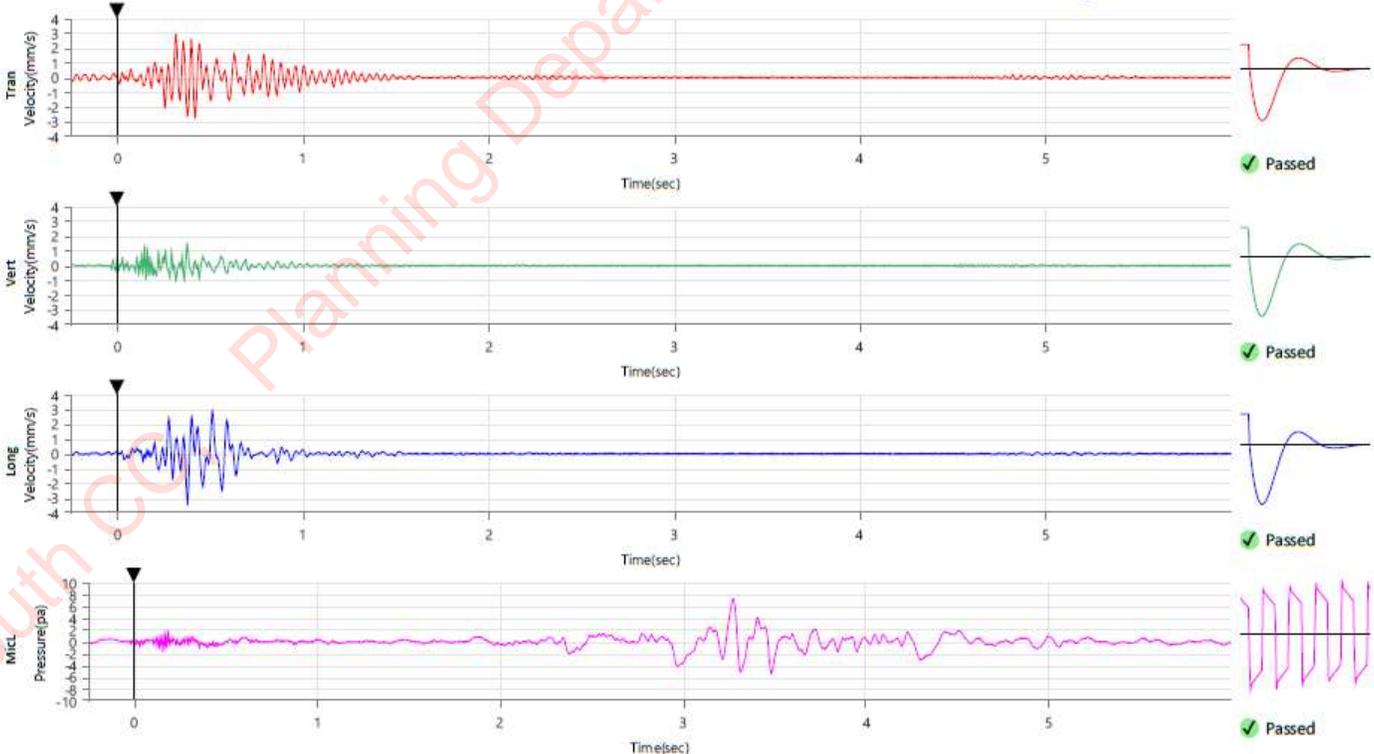
7.32 pa
 111.3 dB(L)
 3.277 sec
 8.0 Hz
 ✓ Passed
 19.7 Hz
 1413 mv

British Standard 7385
 Velocity versus Frequency (Zero Crossing)



Frequency (Hz)
 + Tran x Vert o Long

Sensor Check



2.1.5 T05, Located in the Forest at Piperstown Equestrian Centre

Results not available due to power issue.



Figure 6. Image of T05

Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:36
 Geo 0.500 mm/s
 Mic 63.25 pa, 130 dB(L)
 0.25 sec/6.0 sec (Auto)
 1024 sps
 BLAST 2023.MMB
 Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

UM15711
 Micromate ISEE 10.90
 3.8 volts
 September 30, 2023 by E.M.
 UM15711_20240809140536.IDFW
 Disabled

Notes

Location:
 Client:
 User Name:
 General:

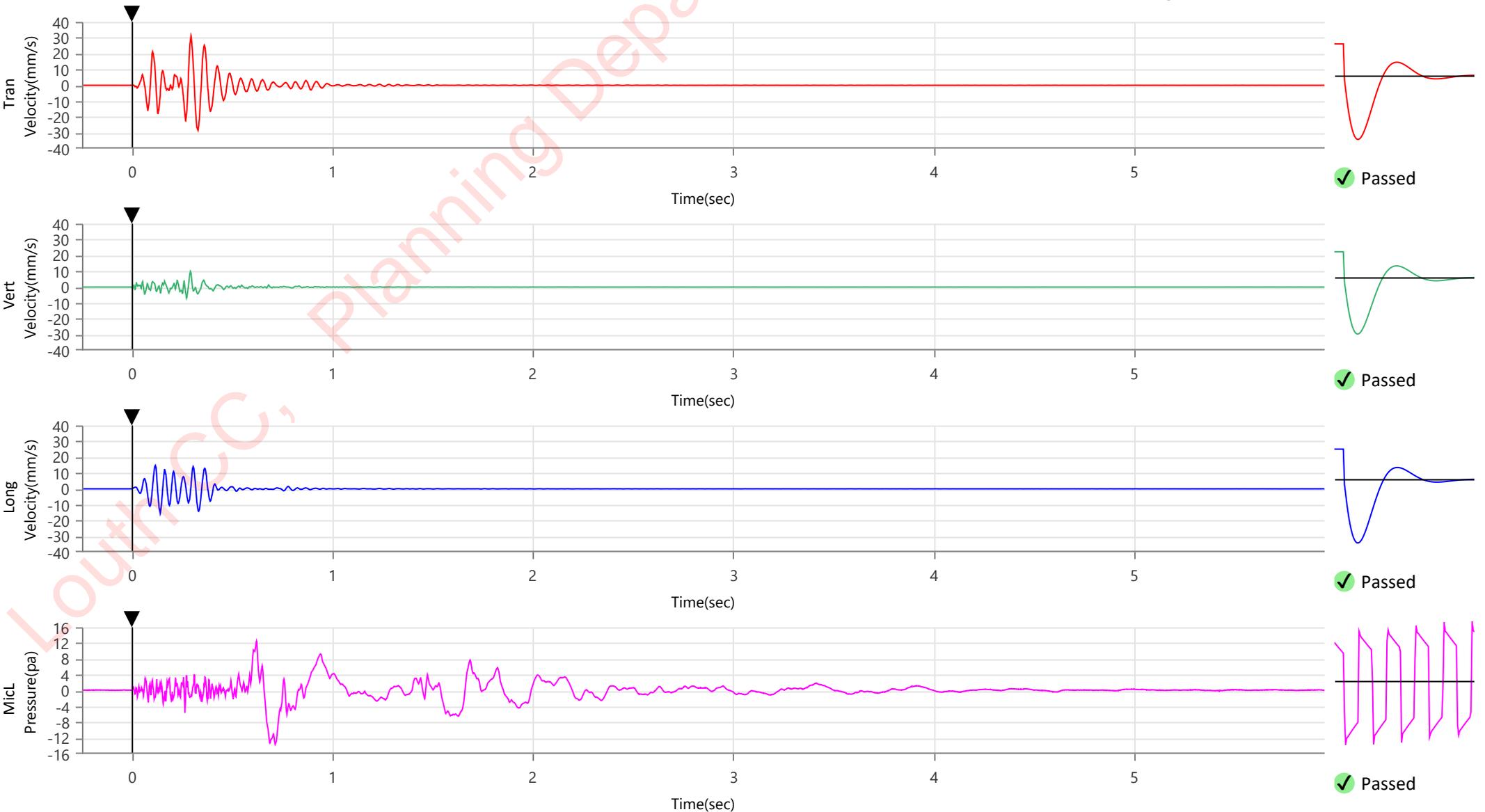
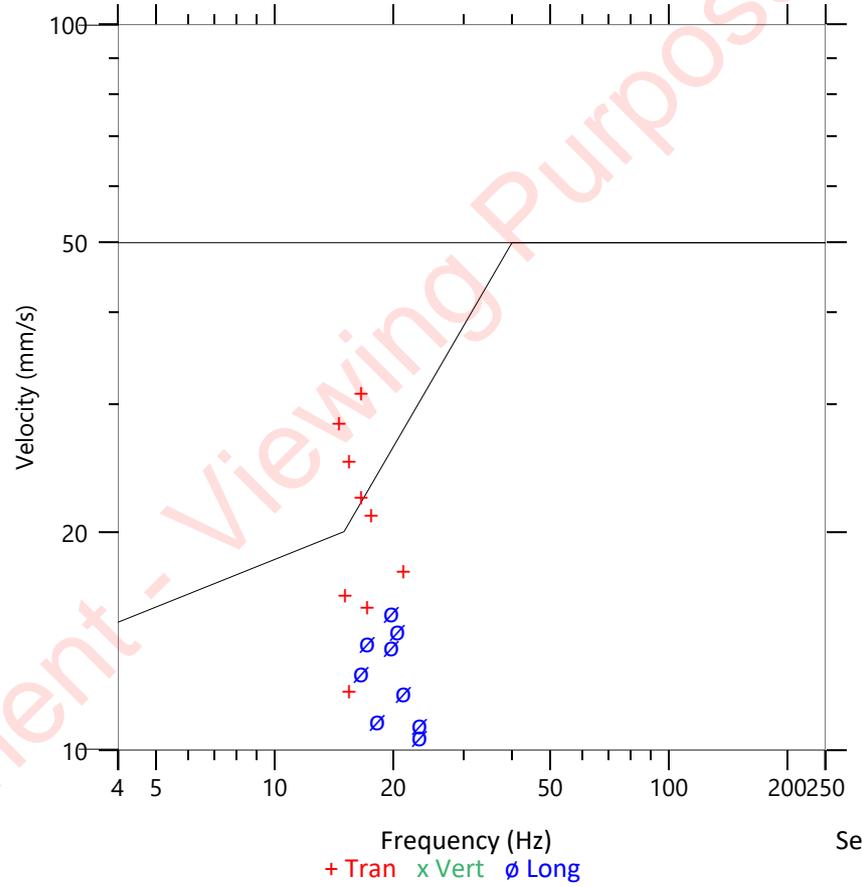
Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	31.314 mm/s	9.844 mm/s	15.574 mm/s
Zero Crossing Frequency	16.5 Hz	24.4 Hz	19.7 Hz
Time (Relative to Trigger)	0.294 sec	0.291 sec	0.141 sec
Peak Acceleration	0.571 g	0.209 g	0.403 g
Peak Displacement	0.316 mm	0.060 mm	0.134 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.3 Hz	7.3 Hz	7.3 Hz
Overswing Ratio	4.5	4.6	5.1
Peak Vector Sum	32.702 mm/s at 0.293 sec		

ISEE Linear Microphone

Peak Sound Pressure Level 13.58 pa
 Peak Sound Pressure Level 116.6 dB(L)
 Time (Relative to Trigger) 0.714 sec
 Zero Crossing Frequency 5.4 Hz
 Sensor Check ✓ Passed
 Frequency 19.7 Hz
 Test Amplitude 1427 mv

British Standard 7385
Velocity versus Frequency (Zero Crossing)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:36
 Geo 0.500 mm/s
 Mic 63.25 pa, 130 dB(L)
 0.25 sec/6.0 sec (Auto)
 1024 sps
 BLAST 2023.MMB
 Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

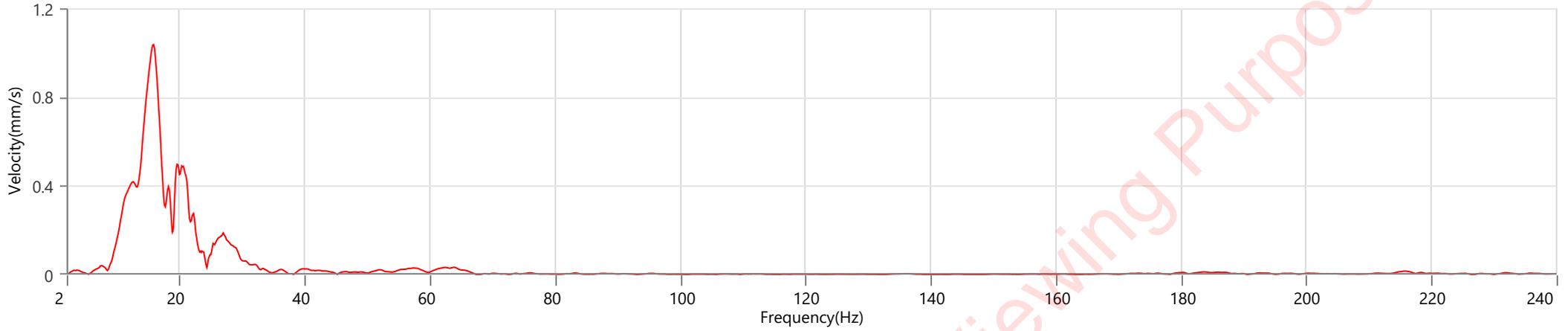
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 3.8 volts
 September 30, 2023 by E.M.
 UM15711_20240809140536.IDFW
 Disabled

Notes

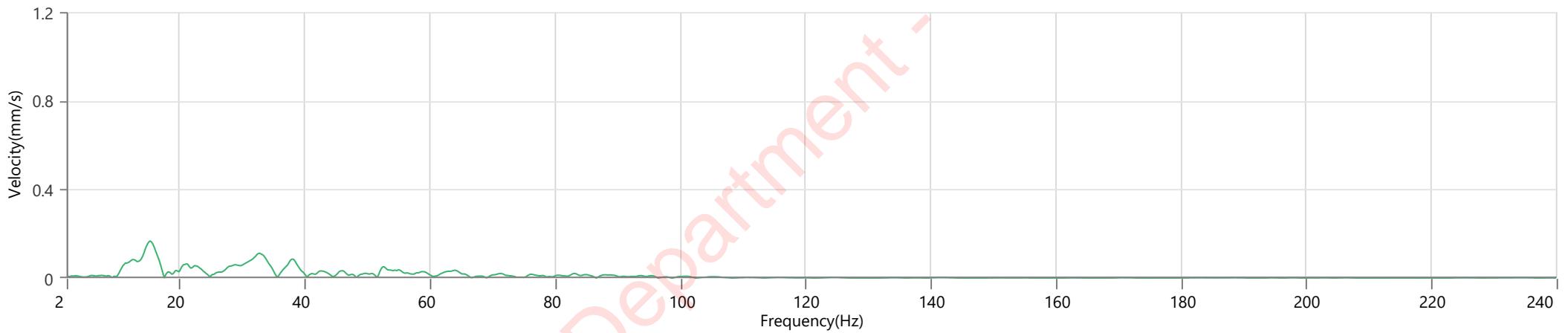
Location:
 Client:
 User Name:
 General:

Post Event Notes No text to be displayed.

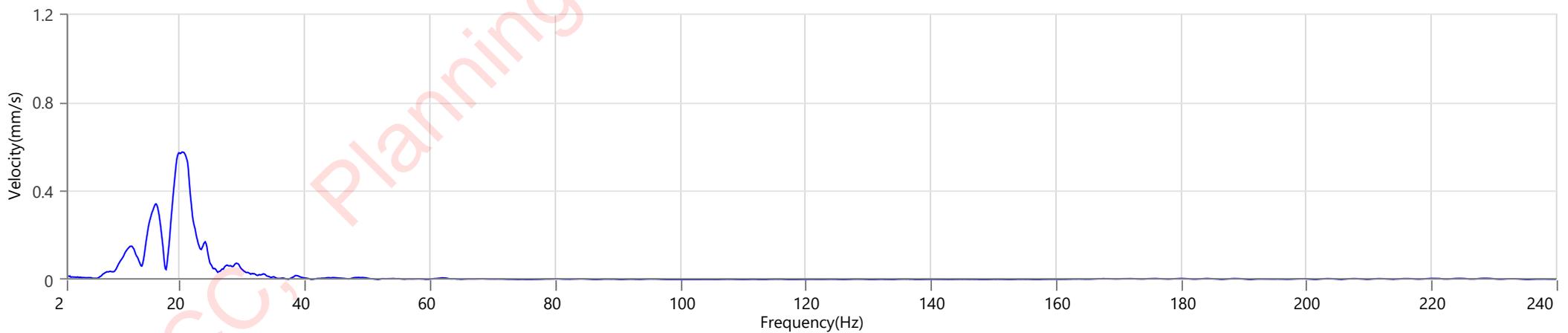
Tran - Dominant Frequency 15.9 Hz, Amplitude 1.036 mm/s (Peak Particle Velocity: 31.314 mm/s)



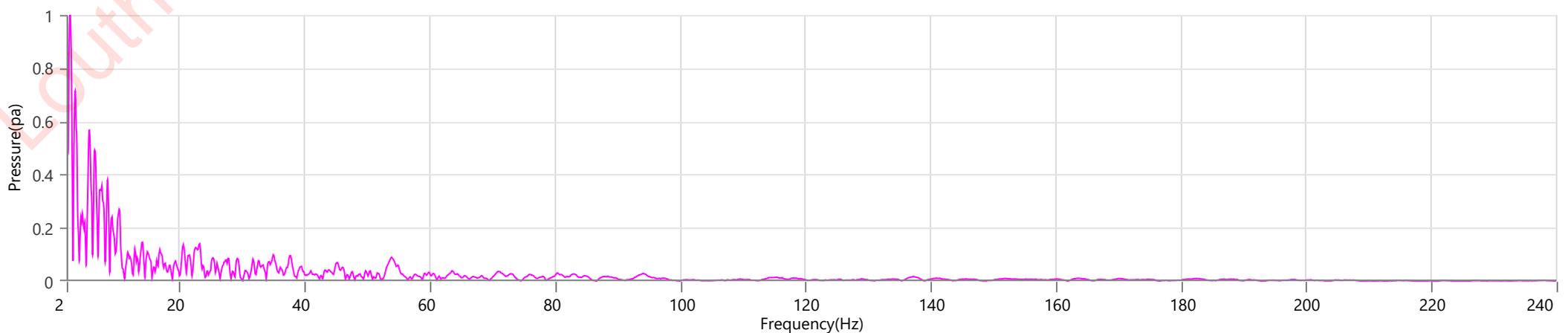
Vert - Dominant Frequency 15.2 Hz, Amplitude 0.167 mm/s (Peak Particle Velocity: 9.844 mm/s)



Long - Dominant Frequency 20.5 Hz, Amplitude 0.575 mm/s (Peak Particle Velocity: 15.574 mm/s)



MicL - Dominant Frequency 2.5 Hz, Amplitude 0.99 pa (Peak Sound Pressure Level: 13.58 pa)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:41
 Geo 0.500 mm/s
 Mic 141.59 pa, 137 dB(L)
 0.25 sec/5.8 sec (Auto)
 1024 sps
 BLAST.MMB
 Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

UM22590
 Micromate ISEE 10.90GC
 3.8 volts
 February 22, 2024 by InstanTEL
 UM22590_20240809140541.IDFW
 Disabled

Notes

Location:
 Client:
 User Name:
 General:

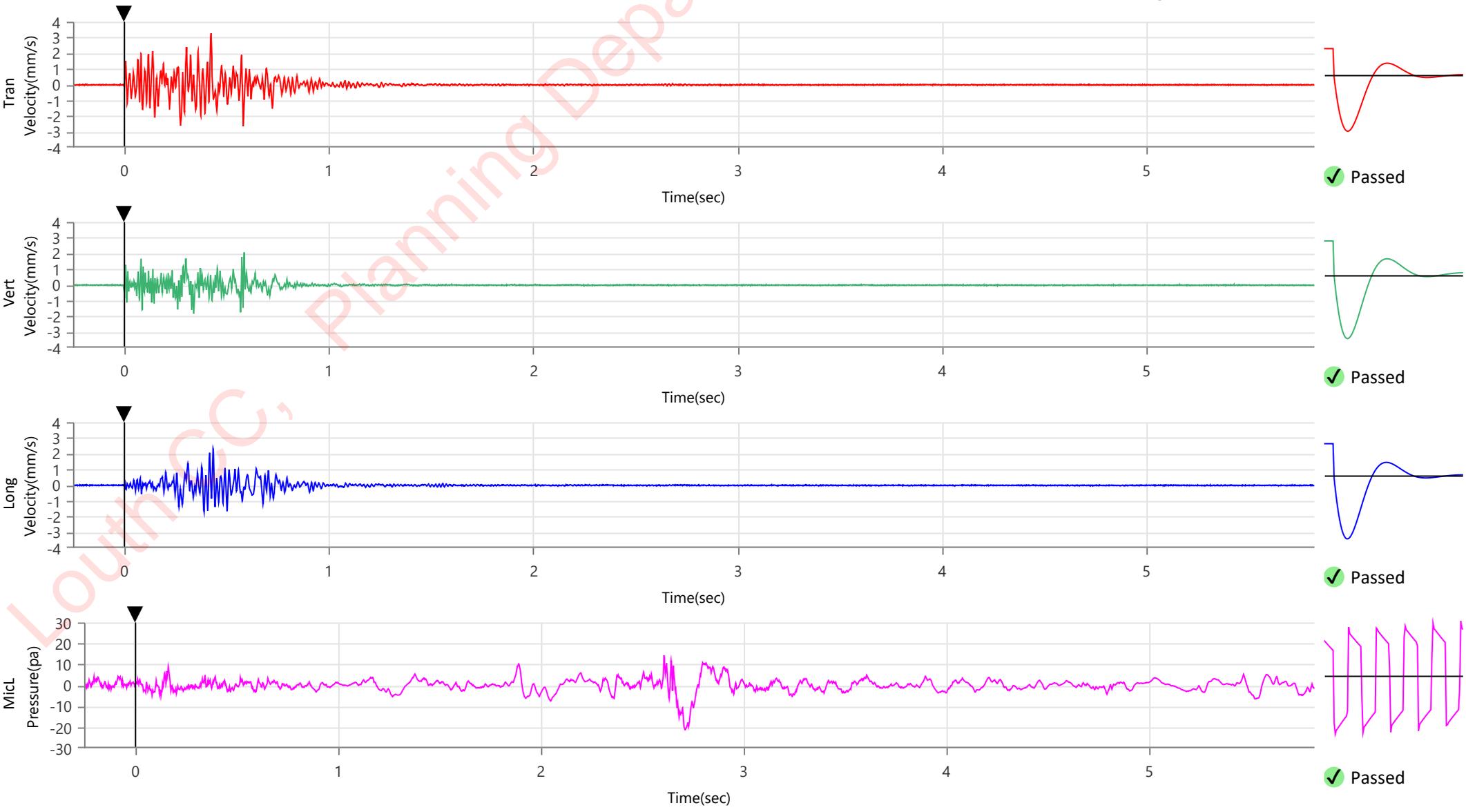
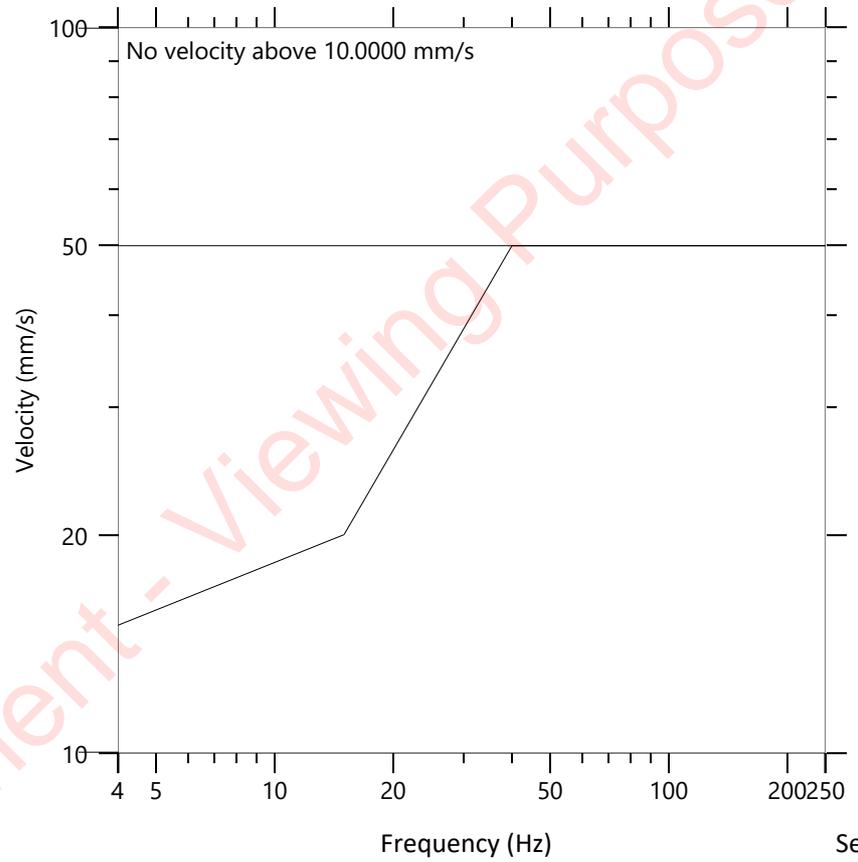
Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	3.271 mm/s	2.065 mm/s	2.317 mm/s
Zero Crossing Frequency	36.6 Hz	73.1 Hz	46.5 Hz
Time (Relative to Trigger)	0.425 sec	0.587 sec	0.435 sec
Peak Acceleration	0.175 g	0.174 g	0.067 g
Peak Displacement	0.013 mm	0.012 mm	0.012 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.3 Hz	7.5 Hz	7.3 Hz
Overswing Ratio	4.4	3.6	4.5
Peak Vector Sum	3.341 mm/s at 0.425 sec		

ISEE Linear Microphone

Peak Sound Pressure Level 21.24 pa
 Peak Sound Pressure Level 120.5 dB(L)
 Time (Relative to Trigger) 2.714 sec
 Zero Crossing Frequency 4.6 Hz
 Sensor Check ✓ Passed
 Frequency 20.5 Hz
 Test Amplitude 1515 mv

British Standard 7385
 Velocity versus Frequency (Zero Crossing)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:41
Geo 0.500 mm/s
Mic 141.59 pa, 137 dB(L)
0.25 sec/5.8 sec (Auto)
1024 sps
BLAST.MMB
Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

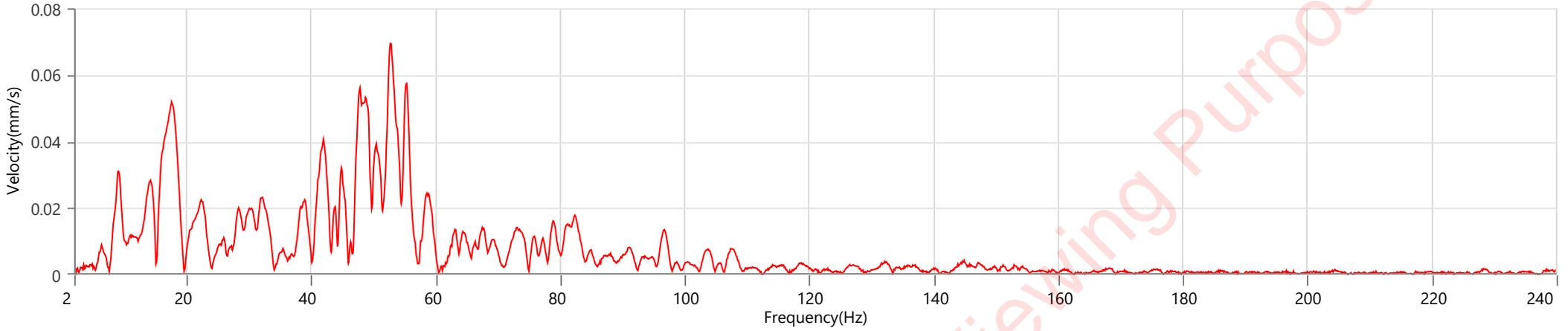
UM22590
Micromate ISEE 10.90GC
3.8 volts
February 22, 2024 by Instantel
UM22590_20240809140541.IDFW
Disabled

Notes

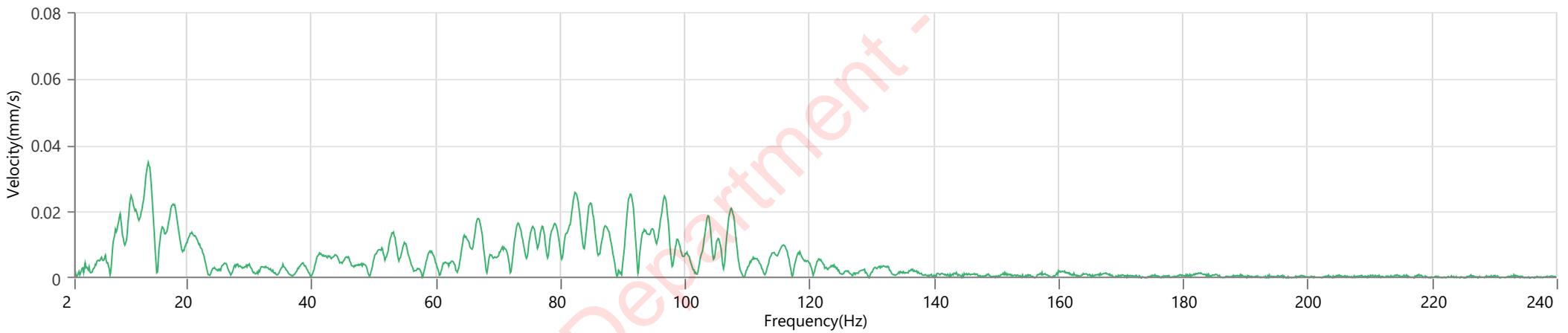
Location:
Client:
User Name:
General:

Post Event Notes No text to be displayed.

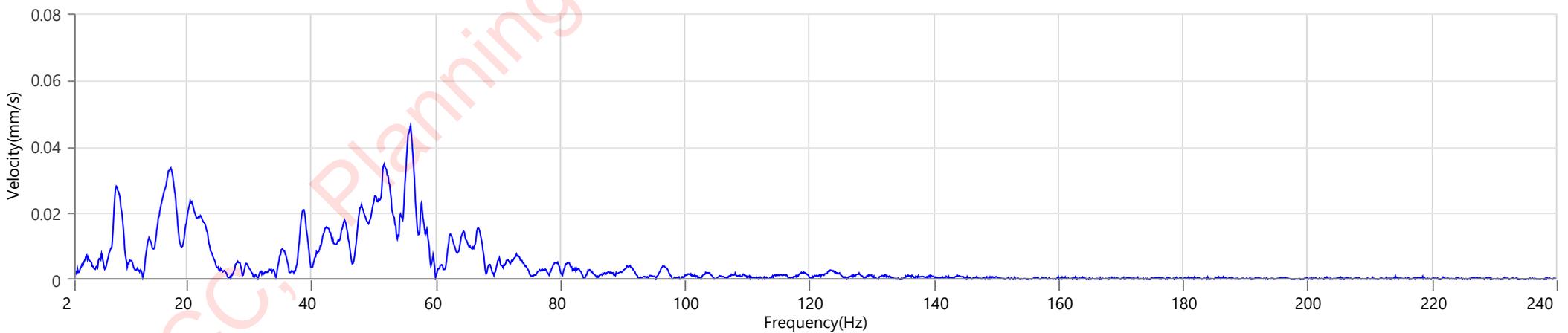
Tran - Dominant Frequency 52.8 Hz, Amplitude 0.069 mm/s (Peak Particle Velocity: 3.271 mm/s)



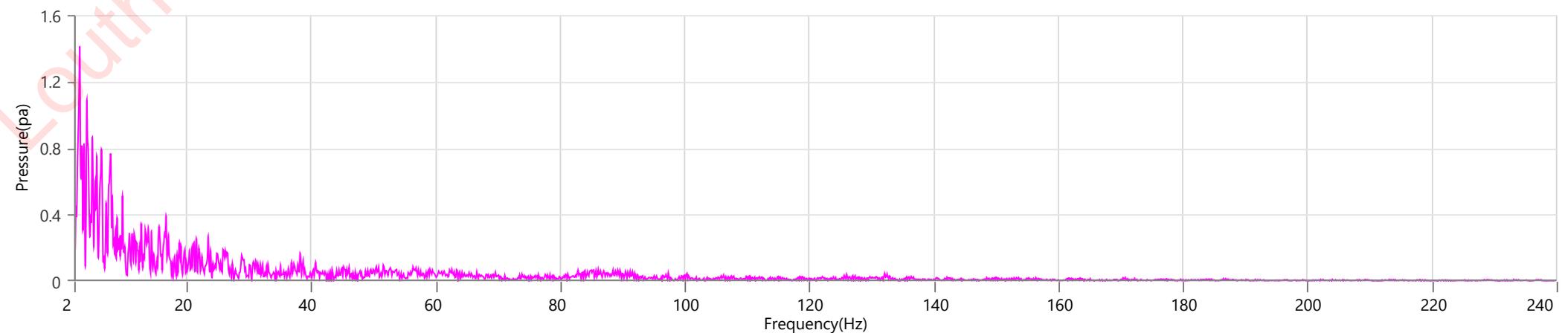
Vert - Dominant Frequency 13.9 Hz, Amplitude 0.035 mm/s (Peak Particle Velocity: 2.065 mm/s)



Long - Dominant Frequency 56.0 Hz, Amplitude 0.046 mm/s (Peak Particle Velocity: 2.317 mm/s)



MicL - Dominant Frequency 2.9 Hz, Amplitude 1.40 pa (Peak Sound Pressure Level: 21.24 pa)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:42
 Geo 0.500 mm/s
 Mic 68.95 pa, 131 dB(L)
 0.25 sec/5.0 sec (Fixed)
 1024 sps
 BLAST.MMB
 Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

UM11929
 Micromate ISEE 10.90
 3.8 volts
 June 7, 2024 by E.M.
 UM11929_20240809140542.IDFW
 Disabled

Notes

Location:
 Client:
 User Name:
 General:

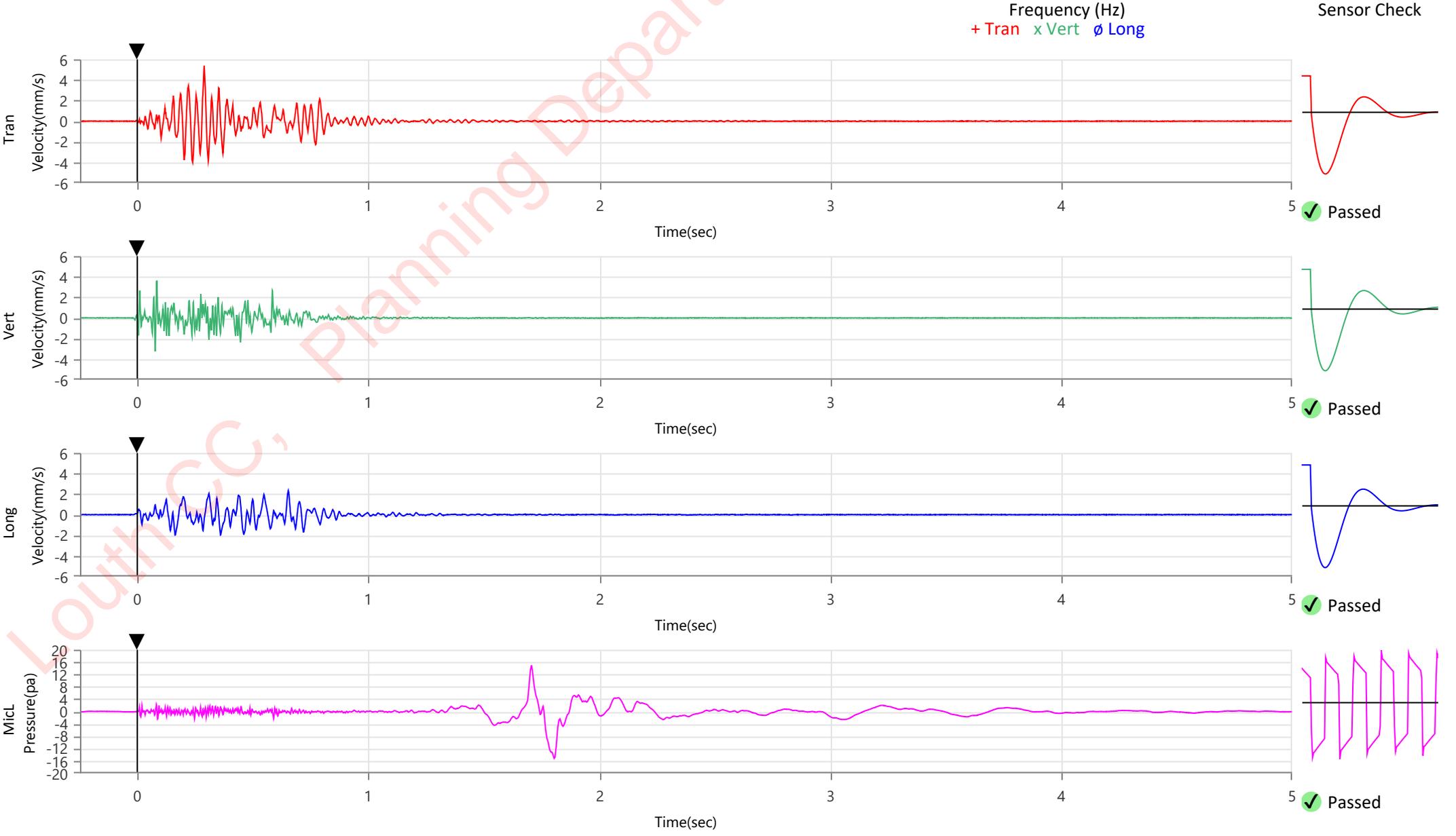
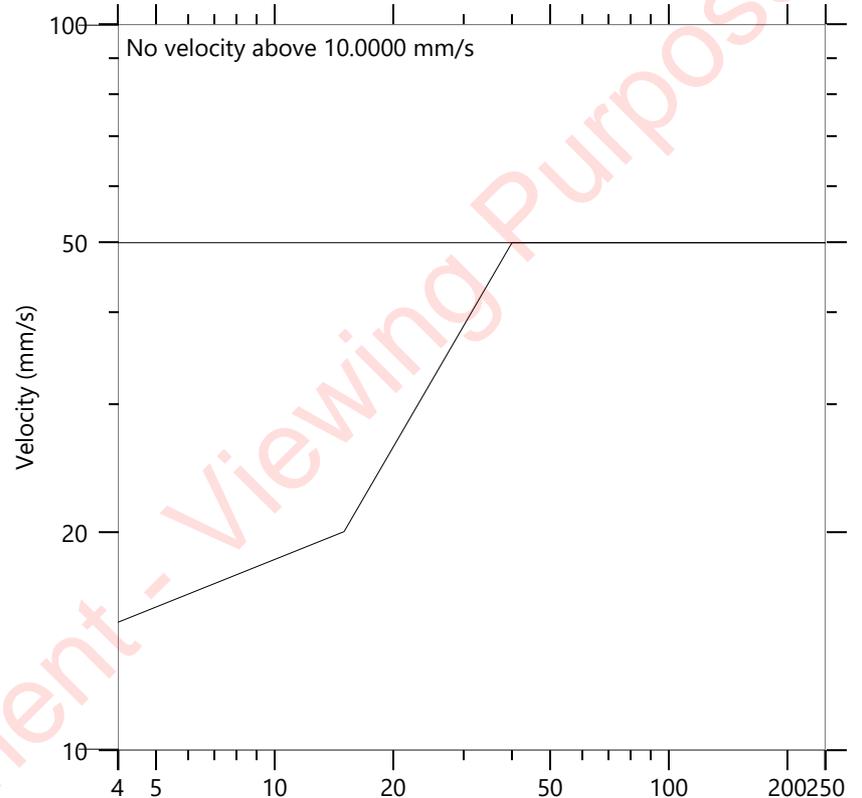
Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	5.383 mm/s	3.626 mm/s	2.333 mm/s
Zero Crossing Frequency	24.4 Hz	64.0 Hz	24.4 Hz
Time (Relative to Trigger)	0.288 sec	0.083 sec	0.652 sec
Peak Acceleration	0.152 g	0.170 g	0.063 g
Peak Displacement	0.031 mm	0.011 mm	0.018 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.1 Hz	7.3 Hz	7.3 Hz
Overswing Ratio	3.9	3.3	3.6
Peak Vector Sum	5.406 mm/s at 0.288 sec		

ISEE Linear Microphone

Peak Sound Pressure Level 15.19 pa
 Peak Sound Pressure Level 117.6 dB(L)
 Time (Relative to Trigger) 1.804 sec
 Zero Crossing Frequency 4.6 Hz
 Sensor Check ✓ Passed
 Frequency 19.7 Hz
 Test Amplitude 1319 mv

British Standard 7385
Velocity versus Frequency (Zero Crossing)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:42
Geo 0.500 mm/s
Mic 68.95 pa, 131 dB(L)
0.25 sec/5.0 sec (Fixed)
1024 sps
BLAST.MMB
Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

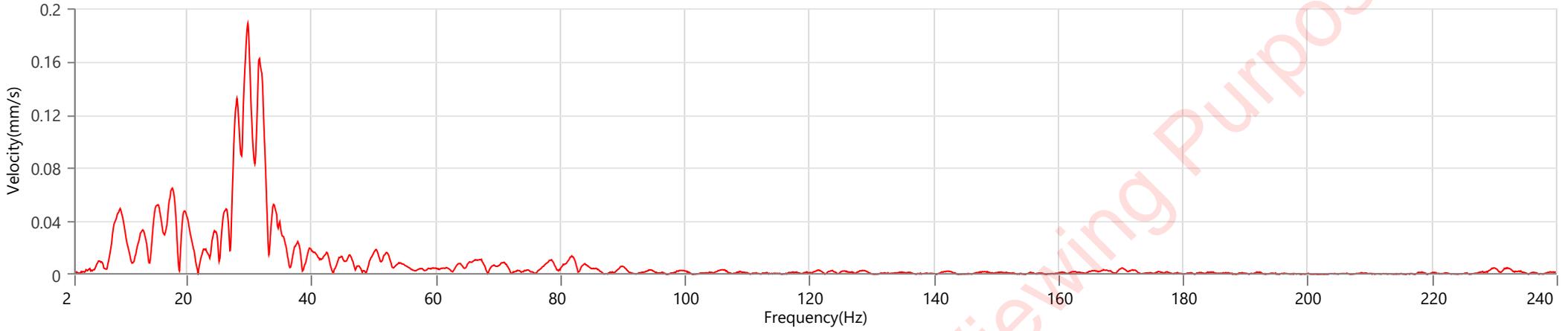
UM11929
Micromate ISEE 10.90
3.8 volts
June 7, 2024 by E.M.
UM11929_20240809140542.IDFW
Disabled

Notes

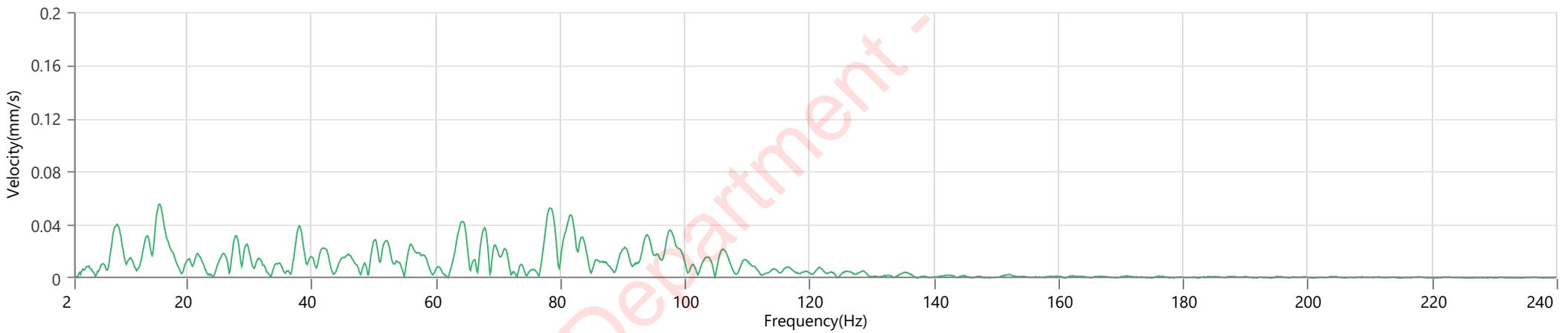
Location:
Client:
User Name:
General:

Post Event Notes No text to be displayed.

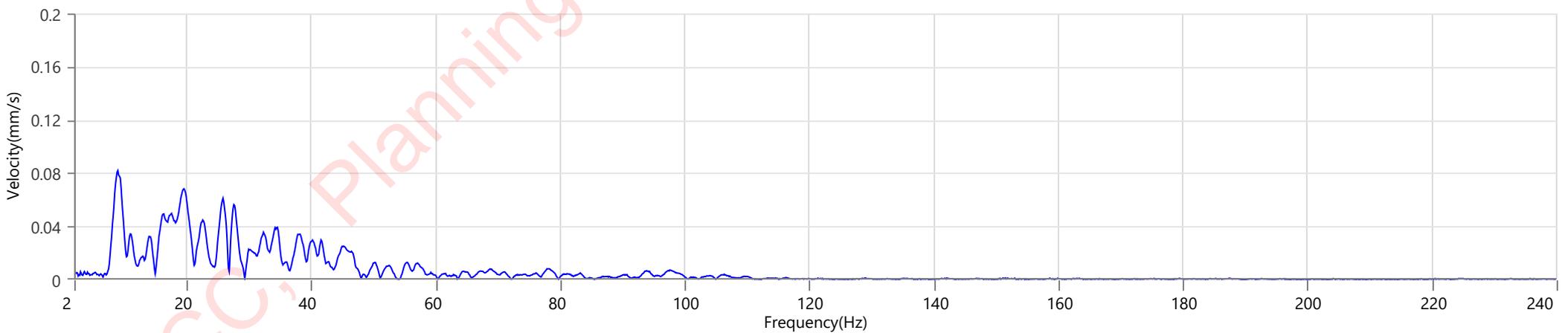
Tran - Dominant Frequency 29.9 Hz, Amplitude 0.189 mm/s (Peak Particle Velocity: 5.383 mm/s)



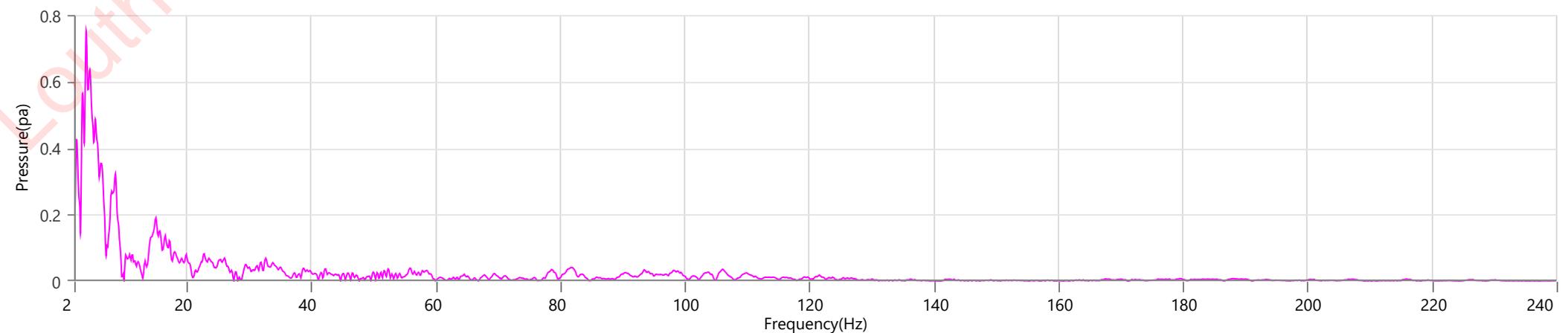
Vert - Dominant Frequency 15.6 Hz, Amplitude 0.056 mm/s (Peak Particle Velocity: 3.626 mm/s)



Long - Dominant Frequency 9.0 Hz, Amplitude 0.082 mm/s (Peak Particle Velocity: 2.333 mm/s)



MicL - Dominant Frequency 3.9 Hz, Amplitude 0.75 pa (Peak Sound Pressure Level: 15.19 pa)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:35
 Geo 0.500 mm/s
 Mic 63.25 pa, 130 dB(L)
 0.25 sec/6.0 sec (Auto)
 1024 sps
 BLAST.MMB
 Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

UM15449
 Micromate ISEE 10.90
 3.8 volts
 June 7, 2024 by E.M.
 UM15449_20240809140535.IDFW
 Disabled

Notes

Location:
 Client:
 User Name:
 General:

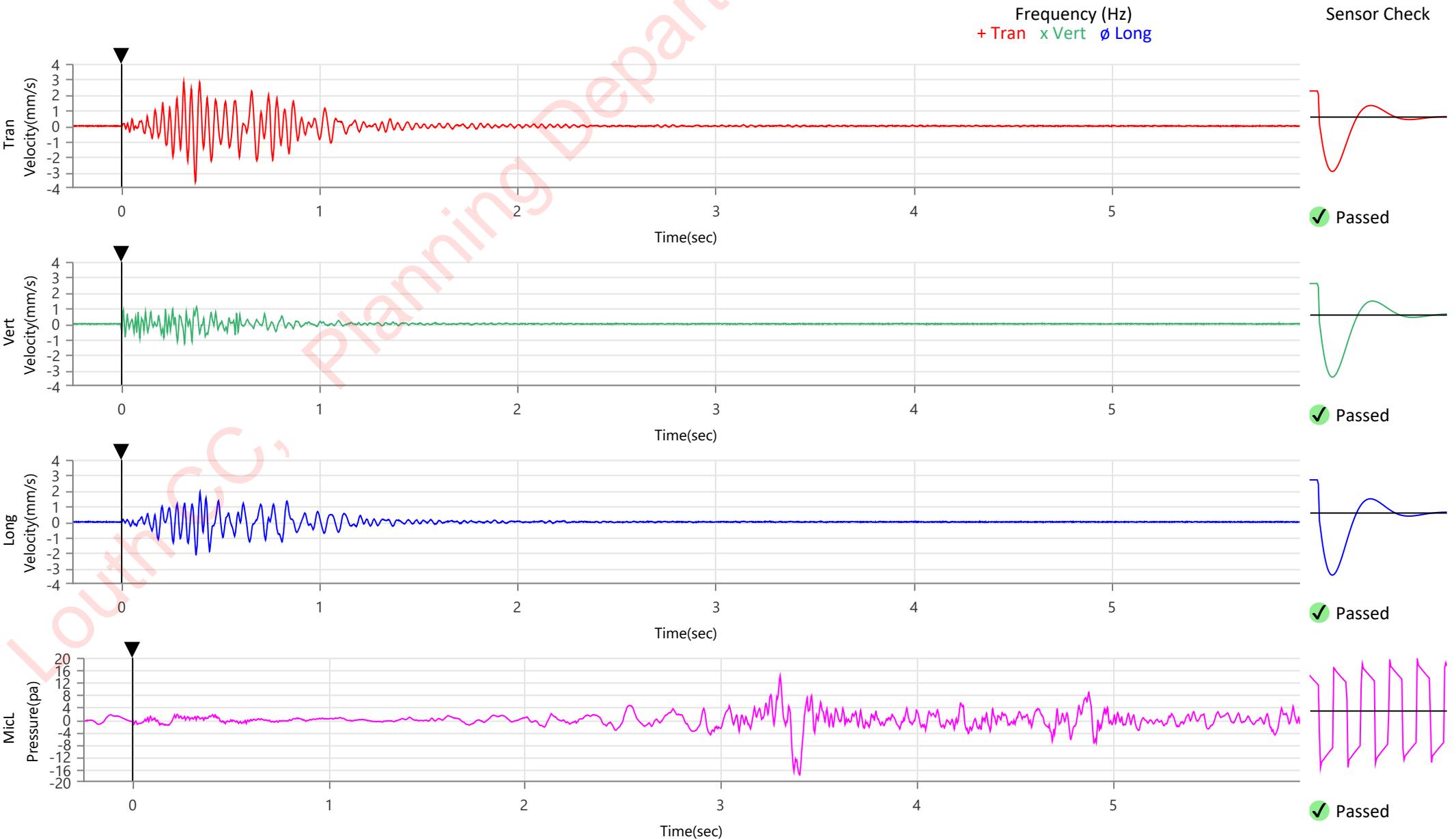
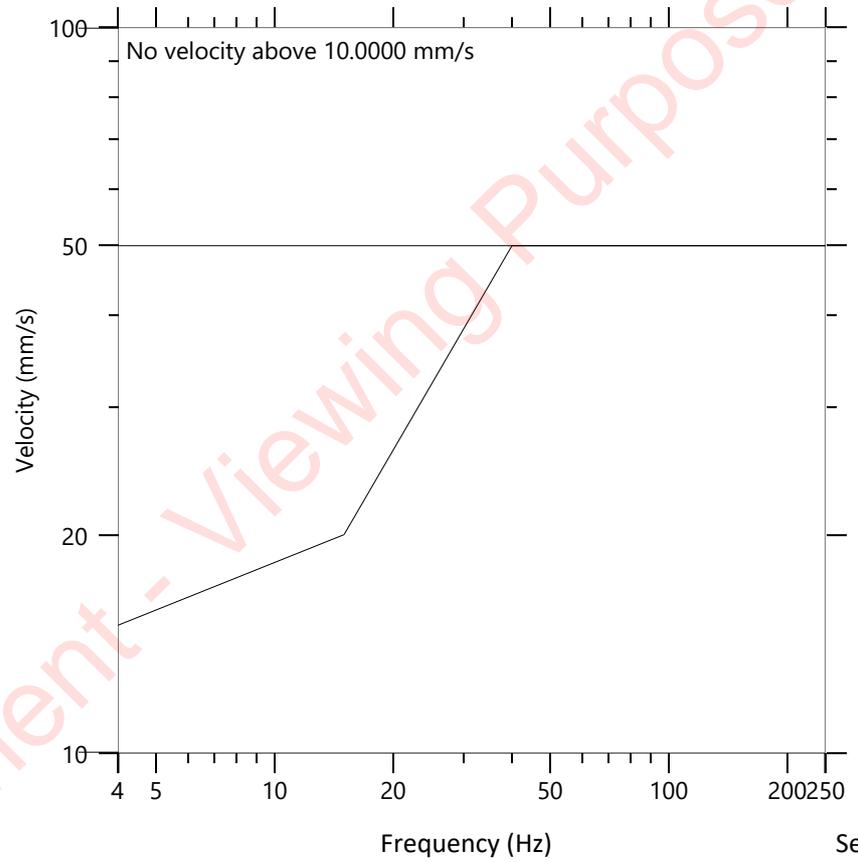
Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	3.594 mm/s	1.269 mm/s	2.112 mm/s
Zero Crossing Frequency	22.3 Hz	26.9 Hz	23.3 Hz
Time (Relative to Trigger)	0.372 sec	0.317 sec	0.376 sec
Peak Acceleration	0.052 g	0.043 g	0.033 g
Peak Displacement	0.025 mm	0.010 mm	0.017 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.3 Hz	7.3 Hz	7.5 Hz
Overswing Ratio	4.6	4.4	4.3
Peak Vector Sum	4.138 mm/s at 0.374 sec		

ISEE Linear Microphone

Peak Sound Pressure Level 17.70 pa
 Peak Sound Pressure Level 118.9 dB(L)
 Time (Relative to Trigger) 3.402 sec
 Zero Crossing Frequency 7.3 Hz
 Sensor Check ✓ Passed
 Frequency 19.7 Hz
 Test Amplitude 1351 mv

British Standard 7385
Velocity versus Frequency (Zero Crossing)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Vert at August 9, 2024 14:05:35
Geo 0.500 mm/s
Mic 63.25 pa, 130 dB(L)
0.25 sec/6.0 sec (Auto)
1024 sps
BLAST.MMB
Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

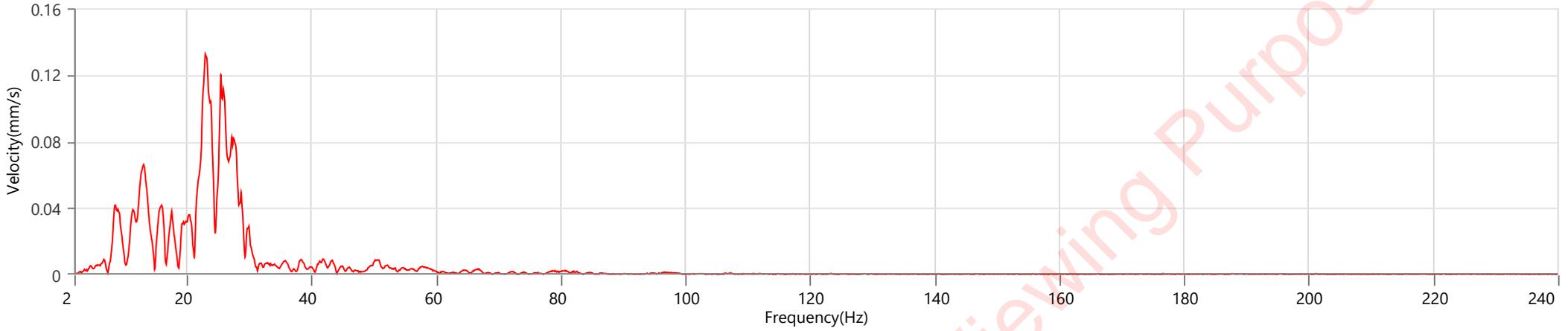
UM15449
Micromate ISEE 10.90
3.8 volts
June 7, 2024 by E.M.
UM15449_20240809140535.IDFW
Disabled

Notes

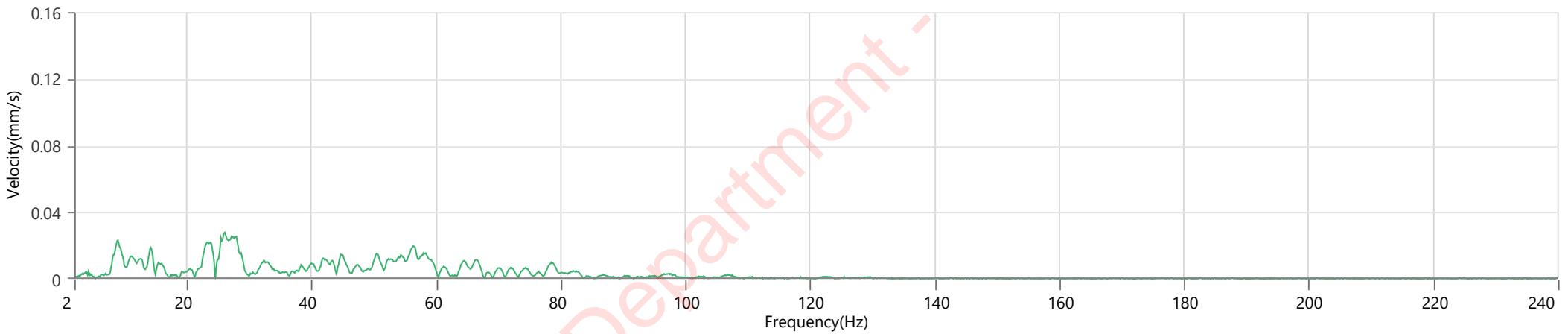
Location:
Client:
User Name:
General:

Post Event Notes No text to be displayed.

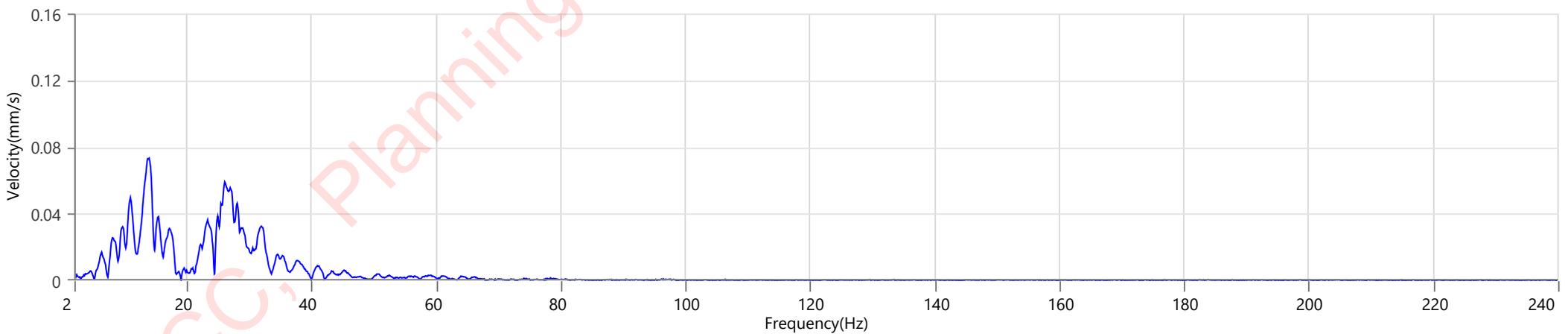
Tran - Dominant Frequency 23.0 Hz, Amplitude 0.132 mm/s (Peak Particle Velocity: 3.594 mm/s)



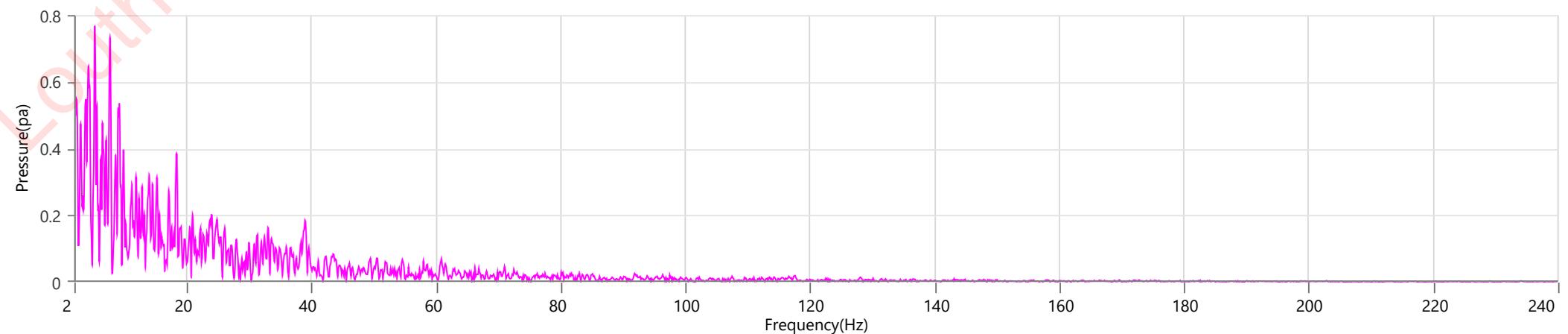
Vert - Dominant Frequency 26.1 Hz, Amplitude 0.028 mm/s (Peak Particle Velocity: 1.269 mm/s)



Long - Dominant Frequency 14.0 Hz, Amplitude 0.073 mm/s (Peak Particle Velocity: 2.112 mm/s)



MicL - Dominant Frequency 5.2 Hz, Amplitude 0.75 pa (Peak Sound Pressure Level: 17.70 pa)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Long at August 9, 2024 14:05:33
 Geo 0.500 mm/s
 Mic 68.95 pa, 131 dB(L)
 0.25 sec/5.9 sec (Auto)
 1024 sps
 BLAST SETUP.MMB
 Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

UM21700
 Micromate ISEE 10.90GC
 3.8 volts
 May 7, 2024 by E.M.
 UM21700_20240809140533.IDFW
 Disabled

Notes

Location:
 Client:
 User Name:
 General:

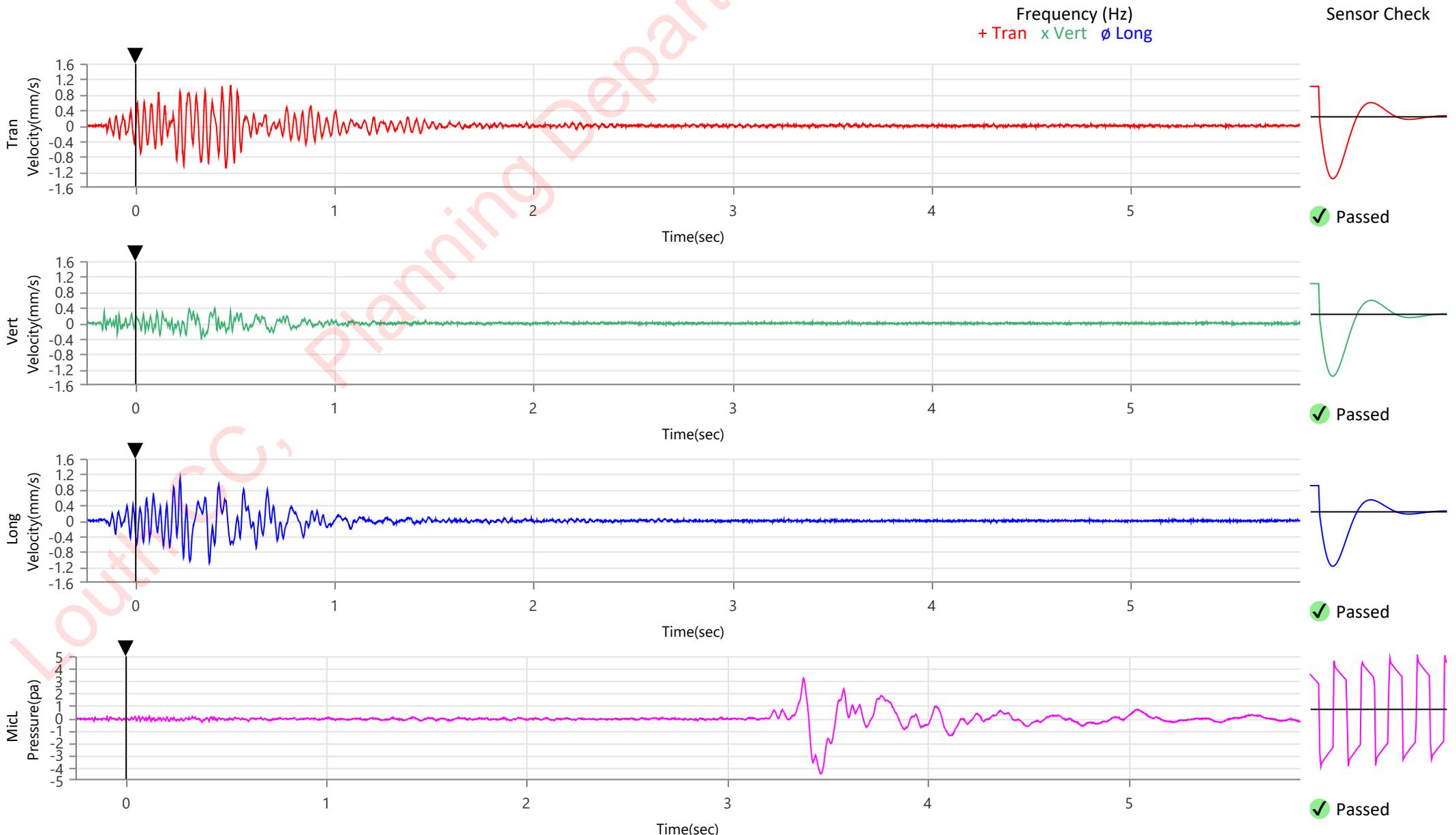
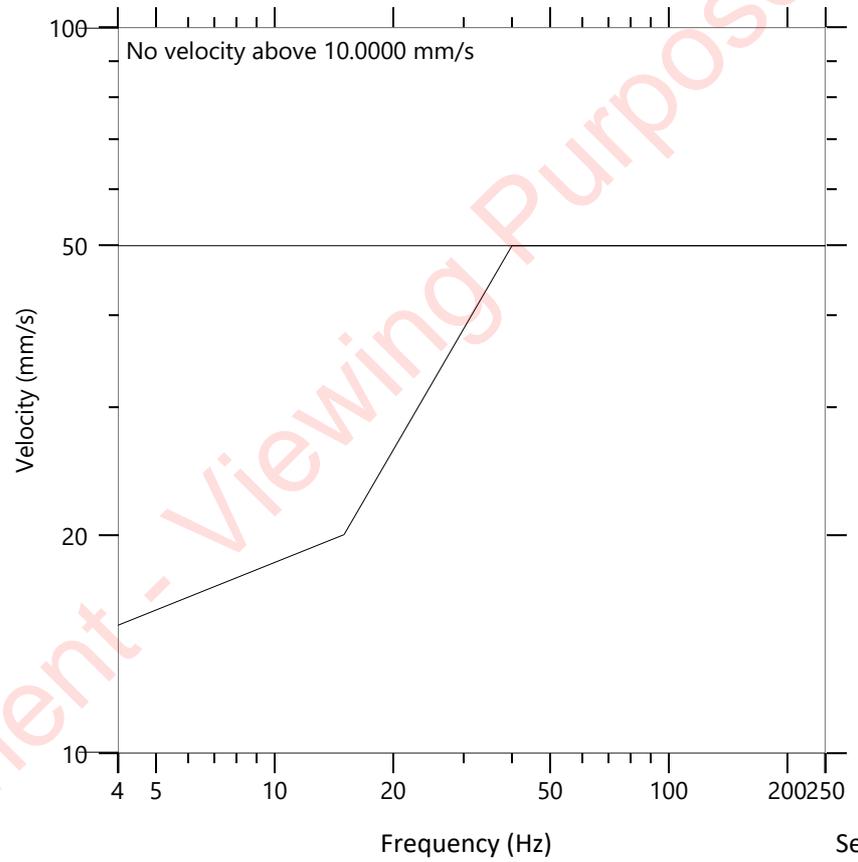
Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	1.080 mm/s	0.410 mm/s	1.103 mm/s
Zero Crossing Frequency	21.3 Hz	10.9 Hz	26.9 Hz
Time (Relative to Trigger)	0.450 sec	0.328 sec	0.222 sec
Peak Acceleration	0.036 g	0.015 g	0.024 g
Peak Displacement	0.009 mm	0.006 mm	0.013 mm
Sensor Check	✓ Passed	✓ Passed	✓ Passed
Frequency	7.5 Hz	7.3 Hz	7.5 Hz
Overswing Ratio	4.3	4.4	4.5
Peak Vector Sum	1.435 mm/s at 0.222 sec		

ISEE Linear Microphone

Peak Sound Pressure Level 4.50 pa
 Peak Sound Pressure Level 107.0 dB(L)
 Time (Relative to Trigger) 3.466 sec
 Zero Crossing Frequency 3.7 Hz
 Sensor Check ✓ Passed
 Frequency 20.5 Hz
 Test Amplitude 1480 mv

British Standard 7385
 Velocity versus Frequency (Zero Crossing)



Waveform Trigger Source
Trigger Level(s)
Trigger Level (Mic)
Pre-Trigger/Record Time
Sample Rate
Setup File Name
Operator

Long at August 9, 2024 14:05:33
 Geo 0.500 mm/s
 Mic 68.95 pa, 131 dB(L)
 0.25 sec/5.9 sec (Auto)
 1024 sps
 BLAST SETUP.MMB
 Operator

Serial Number
Model Number
Battery Level
Unit Calibration
Event File Name
USB Sensor Support

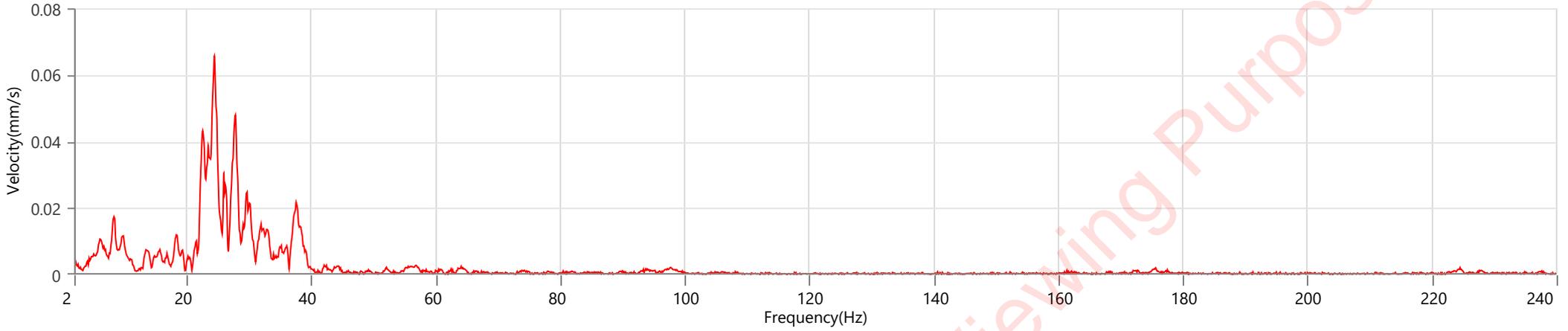
UM21700
 Micromate ISEE 10.90GC
 3.8 volts
 May 7, 2024 by E.M.
 UM21700_20240809140533.IDFW
 Disabled

Notes

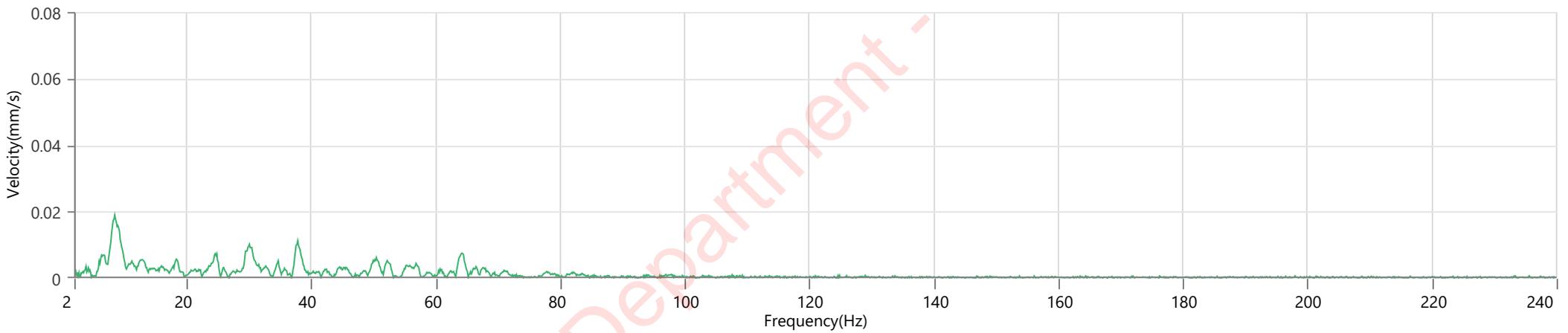
Location:
 Client:
 User Name:
 General:

Post Event Notes No text to be displayed.

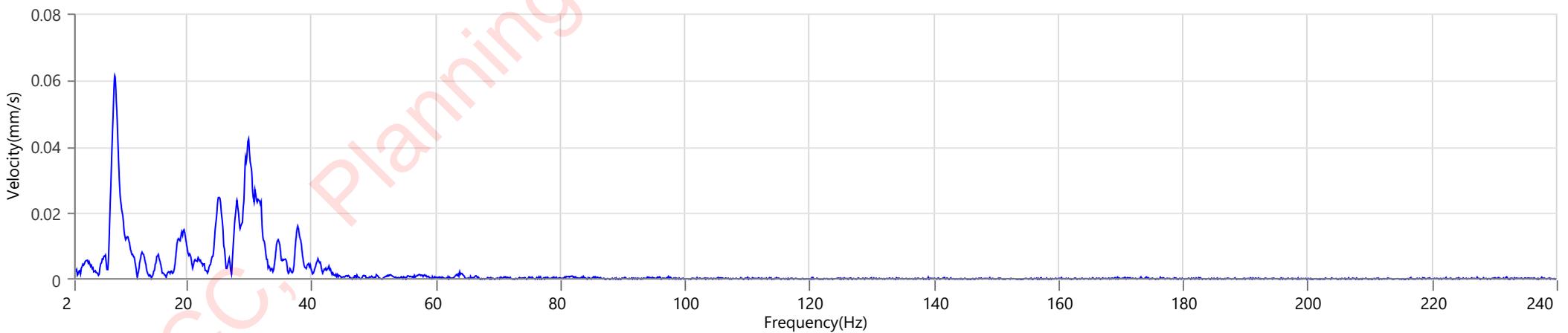
Tran - Dominant Frequency 24.5 Hz, Amplitude 0.066 mm/s (Peak Particle Velocity: 1.080 mm/s)



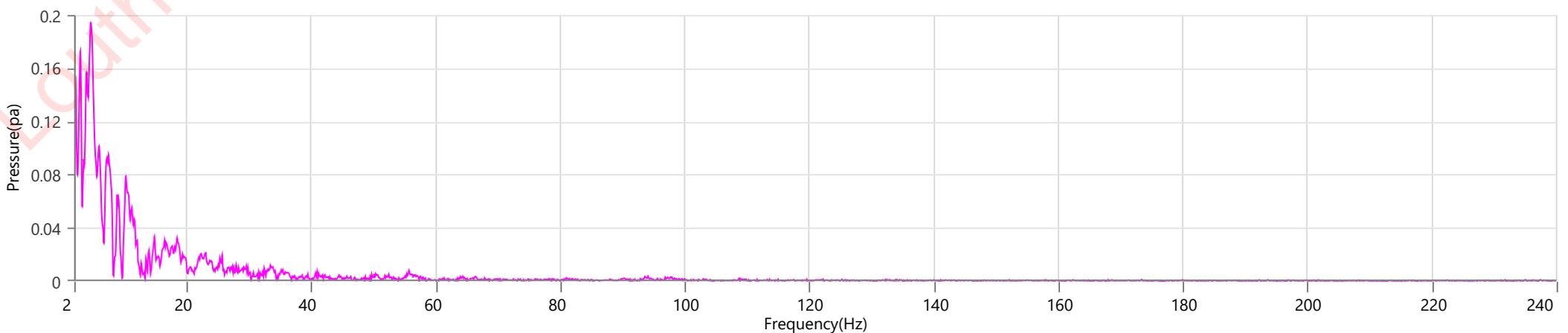
Vert - Dominant Frequency 8.5 Hz, Amplitude 0.019 mm/s (Peak Particle Velocity: 0.410 mm/s)



Long - Dominant Frequency 8.5 Hz, Amplitude 0.061 mm/s (Peak Particle Velocity: 1.103 mm/s)



MicL - Dominant Frequency 4.6 Hz, Amplitude 0.19 pa (Peak Sound Pressure Level: 4.50 pa)





RECEIVED: 04/12/2024

Appendix C

TP05 MONITORING REPORT FROM ENVIRONMENTAL MEASUREMENT LTD.



Louth CC, Planning Department - Viewing Purposes Only

Client: WSP
Location: T05 Forest at Piperstown Equestrian Centre
User: Environmental Measurements

Event Report: Monitor Log

Start Time	End Time	Status
----- Jul 2 /24 13:25:36	----- Jul 10 /24 13:50:20	SERIAL NUMBER: UM21700 Start Monitoring Waveform Geo: 0.500 mm/s
Jul 2 /24 13:25:30		No events recorded. (Battery Low Exit) Waveform Geo: 0.500 mm/s

RECEIVED: 04/12/2024

Louth CC, Planning Department - Viewing Purposes Only!



RECEIVED: 04/12/2024

Appendix D

BLAST SUMMARY REPORT FROM KEMEK LTD





KEMEK LIMITED: Blast Summary Report



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Blast Area: **Sump Blast**

Date: **10/07/24**

BLASTING PARAMETERS

Number of Holes (#):	39	Hole Diameter (mm)	110	Average Depth (m):	9.00
Burden (m):	3.00	Spacing (m):	3.00	Proposed Floor Level (m):	55.50
Subgrade Drill (m):	1.00	Estimated Rock Density (t/m ³):	2.70	Estimated Blast Tonnage (t):	7,582
Blast Ratio (t/kg):	3.27	Initiation Type:	Non-electric	Proposed Loading Rate (kg/m):	12.00
Planned M.I.C (kgs)	60	Actual M.I.C (kgs):	60	Total Explosive Charge (kg):	2,320

EXPLOSIVES ORDER INFORMATION

		Quantity			Quantity
Explosives:	Kemex 70	2,320	Detonators:	U500 x 15.0m	80
				U500 x 7.8m	1
Boosters:	Booster 420g	40		SL 17ms x 7.8m	17
				SL 25ms x 7.8m	2
				SL 42ms x 7.8m	25
				SL 67ms x 7.8m	2
Accessories:	Hole Plug	40		Starter Line 50.0m	1
				Harness Wire x 400m	1

COMMENTS

Face inspection complete, all blast holes measured and profiles were consulted before charging commenced.

Note: This blast was fired prior to the blast on bench #4 with 500ms separation.

Blast Fired at approx. 14:51:31 on 10/07/2024

APPROVAL SIGNATURES

Pre-Drill Survey: **Yes** BHS: **Yes** Shotfiring: **Yes** R.O.B.I.S.: **Yes** Vibrographs: **1**

Explosives Supervisor:

Shotfirer: **Scott Penny**

Trainee Shotfirer: **Luke O' Brien**



KEMEK LIMITED: Borehole Instruction / Survey Report



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024

Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth	
	Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted
1	9.0	9.0	0°	0°	0°	0°	21	9.0	9.0	0°	0°	0°	0°	41	-	-	-	-	-	-
2	9.0	9.0	0°	0°	0°	0°	22	9.0	9.0	0°	0°	0°	0°	42	-	-	-	-	-	-
3	9.0	9.0	0°	0°	0°	0°	23	9.0	9.0	0°	0°	0°	0°	43	-	-	-	-	-	-
4	9.0	9.0	0°	0°	0°	0°	24	9.0	9.0	0°	0°	0°	0°	44	-	-	-	-	-	-
5	9.0	9.0	0°	0°	0°	0°	25	9.0	9.0	0°	0°	0°	0°	45	-	-	-	-	-	-
6	9.0	9.0	0°	0°	0°	0°	26	9.0	9.0	0°	0°	0°	0°	46	-	-	-	-	-	-
7	9.0	9.0	0°	0°	0°	0°	27	9.0	9.0	0°	0°	0°	0°	47	-	-	-	-	-	-
8	9.0	9.0	0°	0°	0°	0°	28	9.0	9.0	0°	0°	0°	0°	48	-	-	-	-	-	-
9	9.0	9.0	0°	0°	0°	0°	29	9.0	9.0	0°	0°	0°	0°	49	-	-	-	-	-	-
10	9.0	9.0	0°	0°	0°	0°	30	9.0	9.0	0°	0°	0°	0°	50	-	-	-	-	-	-
11	9.0	9.0	0°	0°	0°	0°	31	9.0	9.0	0°	0°	0°	0°	51	-	-	-	-	-	-
12	9.0	9.0	0°	0°	0°	0°	32	9.0	9.0	0°	0°	0°	0°	52	-	-	-	-	-	-
13	9.0	9.0	0°	0°	0°	0°	33	9.0	9.0	0°	0°	0°	0°	53	-	-	-	-	-	-
14	9.0	9.0	0°	0°	0°	0°	34	9.0	9.0	0°	0°	0°	0°	54	-	-	-	-	-	-
15	9.0	9.0	0°	0°	0°	0°	35	9.0	9.0	0°	0°	0°	0°	55	-	-	-	-	-	-
16	9.0	9.0	0°	0°	0°	0°	36	9.0	9.0	0°	0°	0°	0°	56	-	-	-	-	-	-
17	9.0	9.0	0°	0°	0°	0°	37	9.0	9.0	0°	0°	0°	0°	57	-	-	-	-	-	-
18	9.0	9.0	0°	0°	0°	0°	38	9.0	9.0	0°	0°	0°	0°	58	-	-	-	-	-	-
19	9.0	9.0	0°	0°	0°	0°	39	9.0	9.0	0°	0°	0°	0°	59	-	-	-	-	-	-
20	9.0	9.0	0°	0°	0°	0°	40	-	-	-	-	-	-	60	-	-	-	-	-	-
Comments:			HOLE DIAMETER (mm):				110	Total Design Drill Metres (m)					351.0							



KEMEK LIMITED: Charging Specification



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **10/07/2024**

Single Deck Holes	Single Deck Holes
Hole Numbers: <input type="text" value="All Holes"/>	Hole Numbers: <input type="text"/>
 <p>4.00 m < Top stemming</p> <p>50 to 60 Kg of Kemex 70... (+/- 10 %)</p> <p>Booster 420g x1 U500 x 15.0m x1</p>	 <p><input type="text"/> m < Top stemming</p> <p>0 x1 U500 x 7.8m x1</p> <p><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <p>Booster 420g x1 U500 x 15.0m x1</p>

Single Deck Holes	Single Deck Holes
Hole Numbers: <input type="text"/>	Hole Numbers: <input type="text"/>
 <p><input type="text"/> m < Top stemming</p> <p>0 x1 U500 x 15.0m x1</p> <p><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <p>Booster 420g x1 U500 x 7.8m x1</p>	 <p><input type="text"/> m < Top stemming</p> <p>0 x1 U500 x 15.0m x1</p> <p><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <p>Booster 420g x1 U500 x 7.8m x1</p>

Louth CC, Planning Department - Viewing Purposes Only!

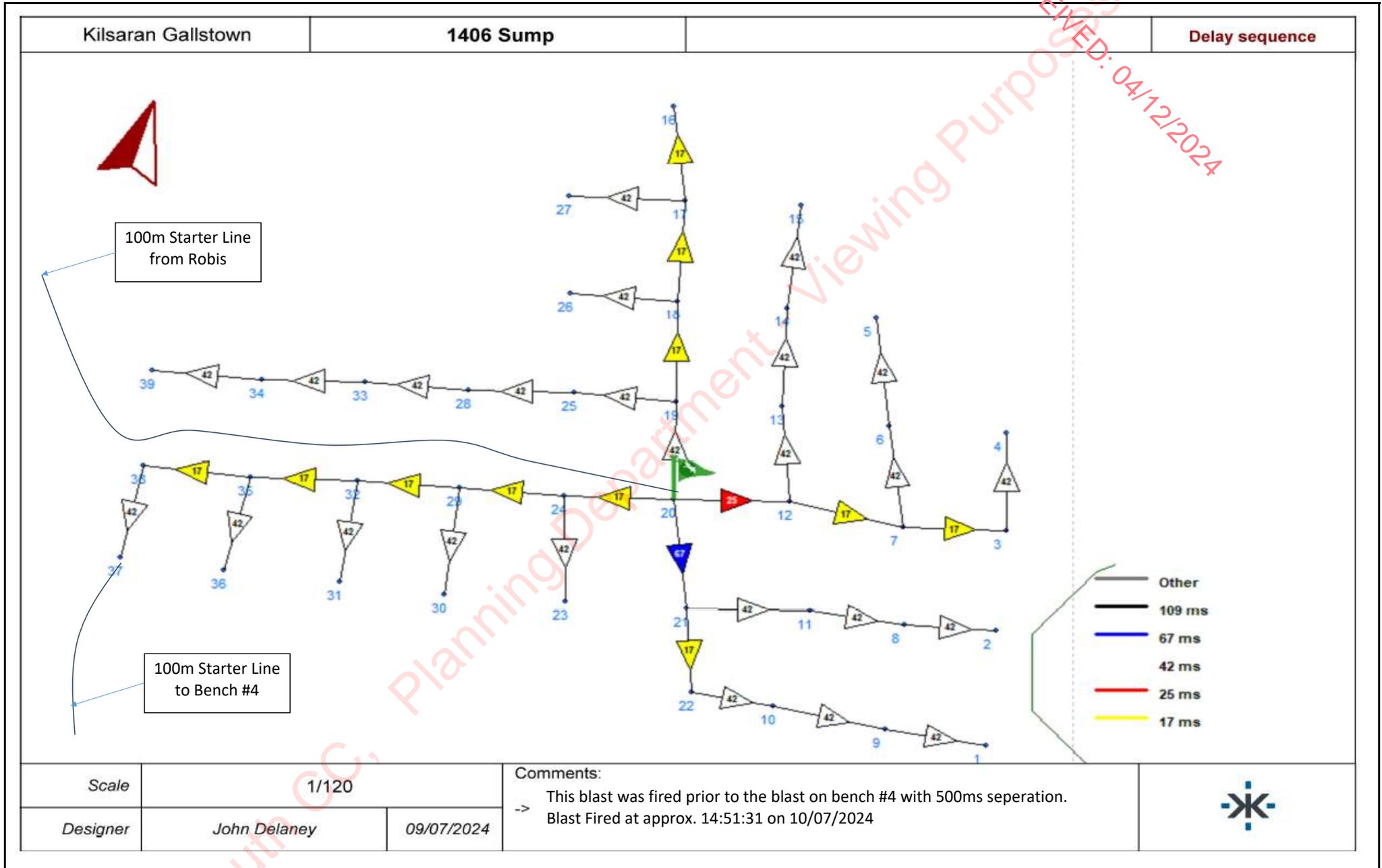
RECEIVED: 04/12/2024



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024



RECEIVED: 04/12/2024

Louth Co. Planning Department





KEMEK LIMITED - Charge Record



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **10/07/24**

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)	(kgs)	
1	9.0	50					5.0	50	
2	9.0	50					5.0	50	
3	9.0	60					4.3	60	
4	9.0	60					4.3	60	
5	9.0	60					4.3	60	
6	9.0	60					4.4	60	
7	9.0	60					4.4	60	
8	9.0	60					4.3	60	
9	9.0	60					4.3	60	
10	9.0	60					4.4	60	
11	9.0	60					4.3	60	
12	9.0	60					4.1	60	
13	9.0	60					4.2	60	
14	9.0	60					4.4	60	
15	9.0	60					4.1	60	
16	9.0	60					4.1	60	
17	9.0	60					4.3	60	
18	9.0	60					4.2	60	
19	9.0	60					4.3	60	
20	9.0	60					4.3	60	
21	9.0	60					4.4	60	
22	9.0	60					4.1	60	
23	9.0	60					4.1	60	
24	9.0	60					4.3	60	
25	9.0	60					4.2	60	
26	9.0	60					4.4	60	
27	9.0	60					4.4	60	
28	9.0	60					4.4	60	
29	9.0	60					4.2	60	
30	9.0	60					4.3	60	
31	9.0	60					4.2	60	
32	9.0	60					4.4	60	
33	9.0	60					4.4	60	
34	9.0	60					4.4	60	
35	9.0	60					4.2	60	
36	9.0	60					4.2	60	
37	9.0	60					4.2	60	
38	9.0	60					4.2	60	
39	9.0	60					4.3	60	
40	-							0	
41	-							0	
42	-							0	
43	-							0	
44	-							0	
45	-							0	
46	-							0	
47	-							0	
48	-							0	
49	-							0	
50	-							0	
Total:								2,320	



KEMEK LIMITED: Truck Charge Record (kgs)



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024

RECEIVED ONLY!
04/12/2024

Kilsaran Gallstown		1406 Sump.ext		Charge plan	
Scale	1/120		Comments:		
Designer	John Delaney	09/07/2024	->		



Louth CC, Planning Department - Viewing Purposes Only!



RECEIVED: 04/12/2024

KEMEK LIMITED BLAST VIBRATION REPORT

Customer / Location:	Kilsaran Gaulstown, Co Louth
Date:	10/07/2024
Reference #:	

WEATHER DATA

Wind Direction	Wind	Cloud Cover (%)
N/W	18km/h	99%

BLAST DATA

# of Holes	Hole size	Depth	Burden	Spacing	Total Charge	M.I.C.	Notes	Blast Time
	mm	m	m	m	Kg	Kg		
39	110	9.0	3.0	3.0	2,320	60	Sump Blast	Blast @ 14:51:31
44	127	18.8	4.0	4.2	11,489	307	Bench #4	Blast @ 14:51:31
46	110	5.0	3.0	3.5	1,173	50	Bench #1	Blast @ 14:51:36

VIBROGRAPH DATA

	Residence	Nomis	Plan Distance	Bearing	H	T	V	AOP
		unit #	m	degrees	mm/sec	mm/sec	mm/sec	dBL
Nomis #1	Gallagher	4168	748	170	<0.5	<0.5	<0.5	<117
Nomis #2				°				
Nomis #3				°				
Nomis #4				°				
Nomis #5				°				
Nomis #6				°				
Nomis #7				°				

A print-out of the vibration and AOP levels is not available when the Nomis unit is not triggered.

Signature:	<i>[Handwritten Signature]</i>
------------	--------------------------------



KEMEK LIMITED: Blast Summary Report



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Blast Area: **Bench 4**

Date: **10/07/24**

BLASTING PARAMETERS

Number of Holes (#):	44	Hole Diameter (mm)	127	Average Depth (m):	18.83
Burden (m):	4.00	Spacing (m):	4.20	Proposed Floor Level (m):	63.50
Subgrade Drill (m):	1.00	Estimated Rock Density (t/m ³):	2.70	Estimated Blast Tonnage (t):	35,595
Blast Ratio (t/kg):	3.10	Initiation Type:	Non-electric	Proposed Loading Rate (kg/m):	18.00
Planned M.I.C (kgs)	320	Actual M.I.C (kgs):	307	Total Explosive Charge (kg):	11,489

EXPLOSIVES ORDER INFORMATION

		Quantity			Quantity
Explosives:	Kemex 70	11,489	Detonators:	U450 x 24.0m	45
				U475 x 7.8m	40
				U475 x 15.0m	5
Boosters:	Booster 250g	45		SL 17ms x 7.8m	2
	Booster 420g	45		SL 25ms x 7.8m	11
				SL 67ms x 7.8m	35
Accessories:				Starter Line 100.0m	3

COMMENTS

Face inspection complete, all blast holes measured and profiles were consulted before charging commenced.

Note: This blast was fired subsequent to the blast in the sump with 500ms separation.

Blast Fired at approx 14:51:31 on 10/07/2024

APPROVAL SIGNATURES

Pre-Drill Survey: **Yes** BHS: **Yes** Shotfiring: **Yes** R.O.B.I.S.: **Yes** Vibrographs: **1**

Explosives Supervisor: 

Shotfirer: **Scott Penny**

Trainee Shotfirer: **Luke O Brien**



KEMEK LIMITED: Borehole Instruction / Survey Report



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024

Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth	
	Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted
1	18.9	19.0	0°	0°	0°	0°	21	19.5	20.0	10°	10°	349°	349°	41	18.3	18.5	0°	0°	0°	0°
2	19.0	19.0	0°	0°	0°	0°	22	19.8	20.2	0°	0°	0°	0°	42	18.2	18.2	0°	0°	0°	0°
3	19.7	20.0	3°	2°	349°	349°	23	18.4	18.5	0°	0°	0°	0°	43	18.3	18.0	0°	0°	0°	0°
4	20.3	21.0	13°	13°	349°	349°	24	18.6	19.0	0°	0°	0°	0°	44	18.3	18.0	0°	0°	0°	0°
5	19.4	22.0	10°	9°	349°	349°	25	18.3	18.5	0°	0°	0°	0°	45	18.3	18.3	0°	0°	0°	0°
6	19.3	19.0	18°	18°	349°	349°	26	18.4	18.5	0°	0°	0°	0°	46	18.5	18.5	0°	0°	0°	0°
7	19.2	19.3	12°	12°	349°	349°	27	18.2	18.5	0°	0°	0°	0°	47	18.7	18.7	0°	0°	0°	0°
8	19.2	19.3	4°	5°	349°	349°	28	18.2	18.5	5°	5°	349°	349°	48	-	-	-	-	-	-
9	18.8	19.5	4°	5°	349°	349°	29	18.2	18.5	5°	5°	349°	349°	49	-	-	-	-	-	-
10	19.0	19.0	5°	5°	349°	349°	30	18.3	18.5	0°	0°	0°	0°	50	-	-	-	-	-	-
11	19.8	20.7	0°	0°	0°	0°	31	18.3	18.5	0°	0°	0°	0°	51	-	-	-	-	-	-
12	19.9	20.8	5°	4°	304°	304°	32	18.6	18.5	0°	0°	0°	0°	52	-	-	-	-	-	-
13	20.0	20.7	0°	0°	0°	0°	33	18.7	18.5	0°	0°	0°	0°	53	-	-	-	-	-	-
14	19.9	21.0	0°	0°	0°	0°	34	19.8	21.0	0°	0°	0°	0°	54	-	-	-	-	-	-
15	18.8	19.5	0°	0°	0°	0°	35	19.8	21.0	0°	0°	0°	0°	55	-	-	-	-	-	-
16	18.8	19.5	2°	2°	349°	349°	36	18.8	19.0	0°	0°	0°	0°	56	-	-	-	-	-	-
17	18.5	18.5	2°	2°	349°	349°	37	18.7	19.5	0°	0°	0°	0°	57	-	-	-	-	-	-
18	18.4	19.0	2°	2°	349°	349°	38	18.4	18.5	0°	0°	0°	0°	58	-	-	-	-	-	-
19	18.2	18.3	10°	10°	349°	349°	39	18.2	18.5	0°	0°	0°	0°	59	-	-	-	-	-	-
20	18.2	19.0	10°	10°	349°	349°	40	18.2	18.3	0°	0°	0°	0°	60	-	-	-	-	-	-
Comments:			HOLE DIAMETER (mm):				127	Total Design Drill Metres (m)					885.2							



KEMEK LIMITED: Blast Location, Danger Zone, Sentry Points and Firing Position



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024



Key:

Danger Zone:

Blast Site:

Sentries:

Firing Position:

Direction of Throw:



KEMEK LIMITED: Charging Specification



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **10/07/2024**

Single Deck Holes	Single Deck Holes																
Hole Numbers: <input type="text" value="All Holes"/>	Hole Numbers: <input type="text"/>																
 <p>4.3 to 4.8 m < Top stemming</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table> <p style="margin-left: 20px;"><input type="text" value="240 to 307"/> Kg of Kemex 70... (+/- <input type="text" value="10"/> %)</p> <table border="1" style="margin-left: 20px; margin-top: 20px;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U475 x 7.8m	x1	Booster 420g	x1	U450 x 24.0m	x1	 <p><input type="text"/> m < Top stemming</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table> <p style="margin-left: 20px;"><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <table border="1" style="margin-left: 20px; margin-top: 20px;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U475 x 7.8m	x1	Booster 420g	x1	U450 x 24.0m	x1
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Single Deck Holes	Single Deck Holes																
Hole Numbers: <input type="text"/>	Hole Numbers: <input type="text"/>																
 <p><input type="text"/> m < Top stemming</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table> <p style="margin-left: 20px;"><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <table border="1" style="margin-left: 20px; margin-top: 20px;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U450 x 24.0m	x1	Booster 420g	x1	U475 x 7.8m	x1	 <p><input type="text"/> m < Top stemming</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table> <p style="margin-left: 20px;"><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <table border="1" style="margin-left: 20px; margin-top: 20px;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U450 x 24.0m	x1	Booster 420g	x1	U475 x 7.8m	x1
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Booster 250g	x1																
U450 x 24.0m	x1																
Booster 420g	x1																
U475 x 7.8m	x1																



KEMEK LIMITED: Quarry Face Inspection Image



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

10/07/24



Comments:-

See image above highlighting front row blast holes.



KEMEK LIMITED: Risk Assessment / Checklists



Customer / Location: Kilsaran Gaulstown, Co Louth

Date: 10/07/24

DANGER ZONE ASSESSMENT GENERAL FACTORS.

DRILLERS LOG - SIGNED	Yes	COMMUNICATION WITH SENTRIES AND MANAGER	Yes
FACE HEIGHT AND ORIENTATION - REF. SUMMARY SHEET	Yes	PROXIMITY TO FOOTPATH, ROAD, HOUSE, PLANT - SEE DANGER ZONE	Yes
FACE INSPECTION ON DAY OF BLAST - ATTACHED	Yes	FIRING POSITION WITH RESPECT - WIND & BLAST PROJECTION - SEE DANGER ZONE	Yes

CRITICAL FACTORS.

BURDEN:	MINIMUM ALLOWED FOR LOCATION (m):	4.00	BURDEN:	MINIMUM BURDEN CHARGED (m):	4.10
	WHICH HOLE NUMBER:	1		AT WHAT DEPTH IN THE HOLE (m):	11.00
	LOCAL SPECIFIC CHARGE (kg/m ³):	1.02			
SPACING:	MINIMUM ALLOWED FOR LOCATION (m):	3.00	SPACING:	MINIMUM SPACING CHARGED (m):	3.40
	BETWEEN HOLE NUMBERS :	11&12		LOCAL SPECIFIC CHARGE (kg/m ³):	0.85
EXPLOSIVES:	EXPLOSIVE TYPE USED - SEE SUMMARY SHEET:	Kemex 70	STEMMING:	PRE & POST STEMMING REVIEW WITH CREW:	Yes
	EXPECTED CHARGE MASS PER METER (kg/m):	18.0		SIZE OF STEMMING MATERIAL USED (mm):	12.0
	MAXIMUM CHARGE MASS PER METER (kg/m):	18.0		MINIMUM LENGTH OF STEMMING IN BLAST (m):	4.3

COMMENTS:

Generic Risk Assessment:									
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 2px;">Quarry Blasting Risk Assessment - BS-RA-01</td> <td style="width: 10%; text-align: center; background-color: green; color: white; padding: 2px;">Yes</td> <td style="width: 50%; padding: 2px;">Surveying Risk Assessment - BS-RA-03</td> <td style="width: 10%; text-align: center; background-color: green; color: white; padding: 2px;">Yes</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Quarry Waste Burning Risk Assessment - BS-RA-02</td> <td style="text-align: center; background-color: green; color: white; padding: 2px;">Yes</td> <td style="padding: 2px;">Environmental Monitoring RA - BS-RA-04</td> <td style="text-align: center; background-color: green; color: white; padding: 2px;">Yes</td> </tr> </table>	Quarry Blasting Risk Assessment - BS-RA-01	Yes	Surveying Risk Assessment - BS-RA-03	Yes	Quarry Waste Burning Risk Assessment - BS-RA-02	Yes	Environmental Monitoring RA - BS-RA-04	Yes
Quarry Blasting Risk Assessment - BS-RA-01	Yes	Surveying Risk Assessment - BS-RA-03	Yes						
Quarry Waste Burning Risk Assessment - BS-RA-02	Yes	Environmental Monitoring RA - BS-RA-04	Yes						

WORK AREA CHECKLIST

<p>QUARRY BENCH:</p> <p>ACCESS & EGRESS APPROPRIATE? Yes</p> <p>FALLS FROM HEIGHT- EDGE PROTECTION ERECTED? Yes</p> <p>GROUND CONDITIONS SUITABLE? Yes</p> <p>POST BLAST:</p> <p>SHOT CHECKED FOR EVIDENCE OF MISFIRE? Yes</p> <p>CHECK FOR LOOSE GROUND/UNSTABLE FACES? Yes</p> <p>SURPLUS EXPLOSIVES & ACCESSORIES DESTROYED? Yes</p>	<p>BLAST PREPARATION:</p> <p>VIBRATION LEVEL ESTIMATED & ACCEPTABLE? Yes</p> <p>BURDEN DETERMINED AROUND EACH SHOTHOLE? Yes</p> <p>CONNECTION OF INITIATION SYSTEM CHECKED? Yes</p> <p>DANGER ZONE & POSITION OF SENTRIES ESTABLISHED? Yes</p> <p>DANGER ZONE & POSITION OF SENTRIES COMMUNICATED? Yes</p> <p>DANGER ZONE CLEARED BY: Peter Ryan</p>
---	--



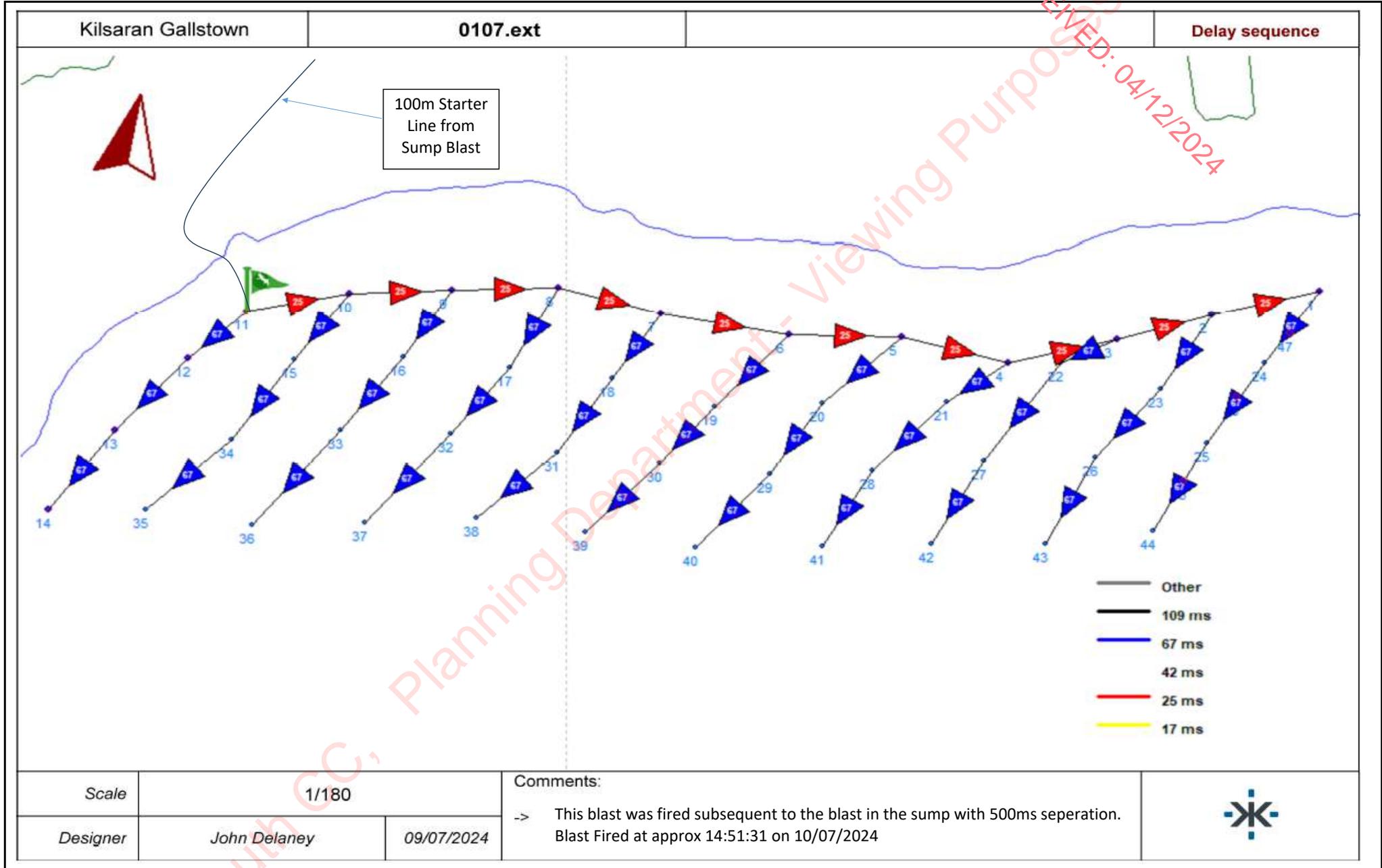
KEMEK LIMITED: Surface Connectors



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024





KEMEK LIMITED - Charge Record



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **10/07/24**

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)	(kgs)	
1	19.0	262					4.8	262	
2	19.0	257					4.8	257	
3	20.0	261					4.8	261	
4	21.0	280					4.8	280	
5	22.0	270					4.8	270	
6	19.0	258					4.8	258	
7	19.3	243					4.8	243	
8	19.3	226					4.8	226	
9	19.5	267					4.8	267	
10	19.0	256					4.8	256	
11	20.7	273					4.8	273	
12	20.8	270					4.8	270	
13	20.7	280					4.8	280	
14	21.0	280					4.8	280	
15	19.5	270					4.3	270	
16	19.5	261					4.3	261	
17	18.5	256					4.3	256	
18	19.0	240					4.3	240	
19	18.3	260					4.3	260	
20	19.0	261					4.3	261	
21	20.0	268					4.3	268	
22	20.2	268					4.3	268	
23	18.5	258					4.3	258	
24	19.0	269					4.3	269	
25	18.5	263					4.3	263	
26	18.5	255					4.3	255	
27	18.5	262					4.3	262	
28	18.5	259					4.3	259	
29	18.5	255					4.3	255	
30	18.5	245					4.3	245	
31	18.5	252					4.3	252	
32	18.5	268					4.3	268	
33	18.5	272					4.3	272	
34	21.0	280					4.3	280	
35	21.0	307					4.3	307	
36	19.0	255					4.3	255	
37	19.5	269					4.3	269	
38	18.5	250					4.3	250	
39	18.5	256					4.3	256	
40	18.3	258					4.3	258	
41	18.5	252					4.3	252	
42	18.2	250					4.3	250	
43	18.0	244					4.3	244	
44	18.0	243					4.3	243	
45	18.3	0						0	
46	18.5	0						0	
47	18.7	0						0	
48	-							0	
49	-							0	
50	-							0	
Total:								11,489	



KEMEK LIMITED: Truck Charge Record (kgs)



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024





KEMEK LIMITED: Delivery Docket



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **10/07/2024**

Delivery Docket
SO000345

kemek
BLAST EXPERTISE

Kemek Limited
Clonagh
Enfield
Co. Kildare
A83 D62
Phone +353 46 9541086
Email finance@kemekltd.com
Web www.kemekltd.com

Account No. 110102
Delivery Date 10/07/2024
Order No. SO000345
Your Ref.
Truck Reg. 222 MH 1145

Invoice Address
KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN PIERCETOWN
DUNBOYNE
CO MEATH
A86 WE20
IE
Phone: 01 8251608

Delivery Address
KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN GAULSTOWN
CO LOUTH
LOUTH
LEINSTER
IE

Description	Item Code	Employee	Quantity	UoM	Qty. Recd.
KEMEX 70 CE 0080	FE7000		14000	KG	
DUNARIT DOUBLE WELL BOOSTER 420g	AC3129	14,982	132	EACH	
Maxam 250G Boosters	AC3128		45	EACH	
EXEL U450 24M	AC9006		45	EACH	
EXEL U475 7.8M	AC9010		40	EACH	
EXEL U475 15M	AC9012		5	EACH	
EXEL U500 15M	AC9022		80	EACH	
EXEL U500 7.8M	AC9020		95	EACH	
EXEL Connectadet SL 17ms 7.8m	AC6080		16	EACH	
EXEL Connectadet SL 25ms 7.8m	AC6087		23	EACH	
EXEL Connectadet SL 67ms 7.8m	AC6081		75	EACH	
EXEL Connectadet SL 42ms 7.8m	AC6084		25	EACH	
Exel Starter 100m	AC6900		8	EACH	
Exel Starter 50m	AC6910		1	EACH	
Green Spider Stemming Plug 4.5"	AC3333		80	EACH	
Blasting Service	TS0010	JD72	1	EACH	
Blast Supervision	TS0020	SP63	1	EACH	
Remote Shotfiring Service - ROBIS	TS9999		1	EACH	
Total			14673		

Customer's Signature

Shotfirer's Signature

PT 26 222 - 11,489
PT 23 201 - 3,493

14,982



Methods for the safe destruction of small quantities of explosives can be found at:
www.kemekltd.com/document-library/

Limited Liability Company Registered in Ireland. Registration No.: 76969



QUALITY
I.S. EN ISO 9001:2015
NSAI Certified



HEALTH & SAFETY
ISO 45001:2018
NSAI Certified

RECEIVED: 04/12/2024
Viewing Purposes Only



KEMEK LIMITED: Point of Work Risk Assessment



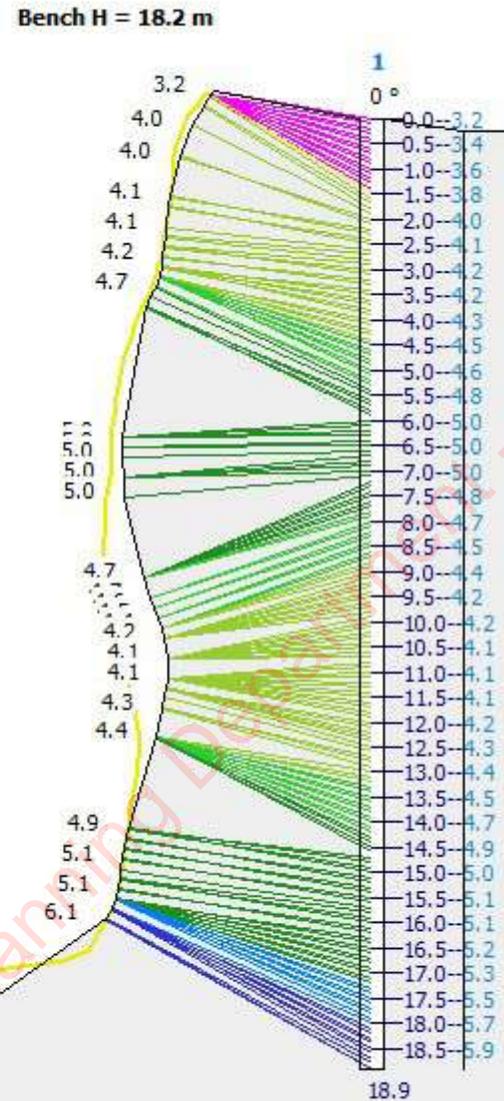
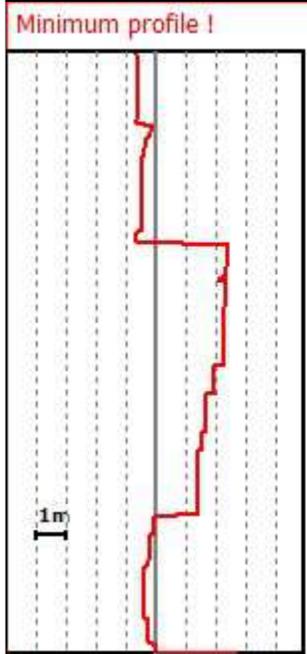
Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024

<p align="center">SURVEY AND SET OUT</p> <p align="center">1</p>	<p align="center">PROBE AND CHECK</p> <p align="center">2</p>	<p align="center">BLAST DAY</p> <p align="center">3</p>
<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22457 Name: John Delaney Date / Time Created: 01/07/2024 09:28:34</p> <p>Hazard Category: Work at Height Area of Work: Top of quarry bench Site Location: Kilsaran Gallstown Discription: Quarry face survey Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection is in place New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Intellectual Manager / Supervisor Present: No</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22488 Name: John Delaney Date / Time Created: 09/07/2024 12:21:28</p> <p>Hazard Category: Work at Height Area of Work: Top of quarry bench Site Location: Kilsaran Gallstown Discription: Measuring holes and probing holes Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection is in place New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Intellectual Manager / Supervisor Present: No</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22492 Name: John Delaney Date / Time Created: 10/07/2024 08:19:12</p> <p>Hazard Category: Work at Height Area of Work: Top of quarry bench Site Location: Kilsaran Gallstown Discription: Loading and blasting Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection is in place New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Intellectual Manager / Supervisor Present: Yes Name: John, Luke, Scott, Keith, Peter, Shane</p>

Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	1



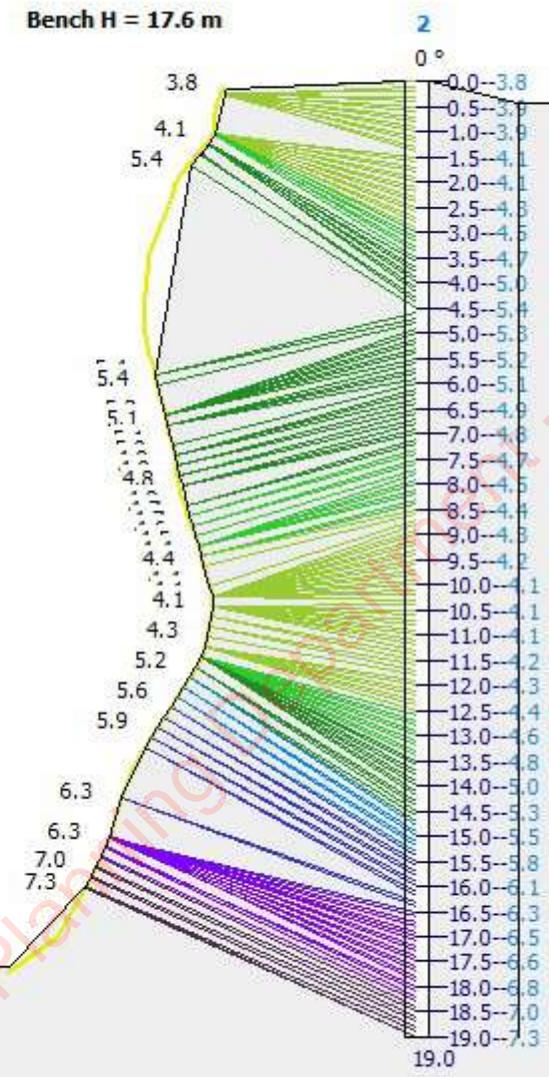
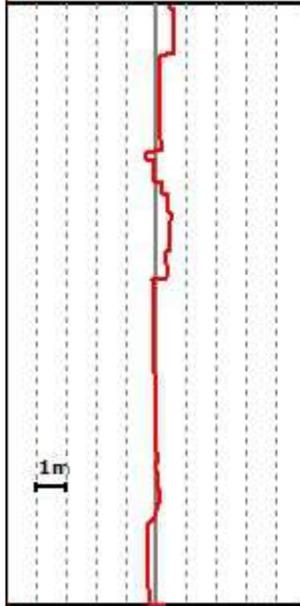
Hole 1	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.3m (-)	-0.5 m : B = 3.2 m (-)
0.6m : B = 3.4m (-)	-0.3 m : B = 3.4 m (-)
0.9m : B = 3.5m (-)	0.1 m : B = 3.7 m (-)
1.2m : B = 3.6m (-)	0.5 m : B = 3.9 m
1.5m : B = 3.8m	0.9 m : B = 3.9 m
1.8m : B = 3.9m	1.3 m : B = 3.9 m
2.2m : B = 4.1m	1.7 m : B = 4.0 m
2.6m : B = 4.1m	2.1 m : B = 4.1 m
3.0m : B = 4.2m	2.5 m : B = 4.1 m
3.4m : B = 4.2m	2.9 m : B = 4.2 m
3.8m : B = 4.3m	3.3 m : B = 4.4 m
4.2m : B = 4.4m	3.7 m : B = 4.5 m
4.6m : B = 4.5m	4.1 m : B = 4.7 m (+)
5.0m : B = 4.6m (+)	4.5 m : B = 4.8 m (+)
5.4m : B = 4.8m (+)	4.9 m : B = 5.0 m (+)
5.8m : B = 5.0m (+)	5.3 m : B = 5.0 m (+)
6.2m : B = 5.0m (+)	5.7 m : B = 5.1 m (+)
6.6m : B = 5.0m (+)	6.1 m : B = 5.1 m (+)
7.0m : B = 5.0m (+)	6.5 m : B = 5.2 m (+)
7.4m : B = 4.9m (+)	6.9 m : B = 5.2 m (+)
7.8m : B = 4.7m (+)	7.3 m : B = 5.2 m (+)
8.2m : B = 4.6m	7.7 m : B = 5.3 m (+)
8.5m : B = 4.5m	8.1 m : B = 5.3 m (+)
8.8m : B = 4.4m	8.5 m : B = 5.3 m (+)
9.1m : B = 4.3m	8.9 m : B = 5.3 m (+)
9.4m : B = 4.3m	9.3 m : B = 5.3 m (+)
9.7m : B = 4.2m	9.7 m : B = 5.3 m (+)
10.0m : B = 4.2m	10.1 m : B = 5.2 m (+)
10.3m : B = 4.1m	10.5 m : B = 5.1 m (+)
10.6m : B = 4.1m	10.9 m : B = 5.0 m (+)
10.9m : B = 4.1m	11.3 m : B = 4.8 m (+)
11.2m : B = 4.1m	11.7 m : B = 4.7 m (+)
11.5m : B = 4.1m	12.1 m : B = 4.6 m (+)
11.8m : B = 4.1m	12.5 m : B = 4.6 m
12.1m : B = 4.2m	12.9 m : B = 4.6 m (+)
12.4m : B = 4.2m	13.3 m : B = 4.7 m (+)
12.7m : B = 4.3m	13.7 m : B = 4.8 m (+)
13.0m : B = 4.4m	14.1 m : B = 4.8 m (+)
13.3m : B = 4.4m	14.5 m : B = 4.9 m (+)
13.6m : B = 4.5m	14.9 m : B = 5.0 m (+)
13.9m : B = 4.6m	15.3 m : B = 5.0 m (+)
14.2m : B = 4.7m (+)	15.7 m : B = 5.2 m (+)
14.5m : B = 4.9m (+)	16.1 m : B = 5.4 m (+)
14.8m : B = 4.9m (+)	16.5 m : B = 5.7 m (+)
15.1m : B = 5.0m (+)	16.9 m : B = 7.6 m (+)
15.4m : B = 5.0m (+)	17.3 m : B = 11.7 m (+)
15.7m : B = 5.1m (+)	17.6 m : B = 13.4 m (+)
16.0m : B = 5.1m (+)	
16.3m : B = 5.2m (+)	
16.6m : B = 5.2m (+)	
16.9m : B = 5.3m (+)	
17.2m : B = 5.4m (+)	
17.5m : B = 5.5m (+)	
17.8m : B = 5.6m (+)	
18.1m : B = 5.7m (+)	
18.4m : B = 5.9m (+)	
18.7m : B = 6.0m (+)	
19.0m : B = 6.1m (+)	

Author	John Delaney	Comments: ->
Date	09/07/2024	



Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	2

Minimum profile I



Hole 2	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.9m	0.1 m : B = 3.8 m
0.6m : B = 3.9m	0.4 m : B = 3.9 m
0.9m : B = 3.9m	0.8 m : B = 4.0 m
1.2m : B = 4.0m	1.2 m : B = 4.2 m
1.5m : B = 4.1m	1.6 m : B = 4.5 m
1.8m : B = 4.1m	2.0 m : B = 4.8 m (+)
2.2m : B = 4.2m	2.4 m : B = 4.9 m (+)
2.6m : B = 4.3m	2.8 m : B = 5.1 m (+)
3.0m : B = 4.5m	3.2 m : B = 5.2 m (+)
3.4m : B = 4.7m (+)	3.6 m : B = 5.3 m (+)
3.8m : B = 4.9m (+)	4.0 m : B = 5.4 m (+)
4.2m : B = 5.1m (+)	4.4 m : B = 5.4 m (+)
4.6m : B = 5.4m (+)	4.8 m : B = 5.4 m (+)
5.0m : B = 5.3m (+)	5.2 m : B = 5.3 m (+)
5.4m : B = 5.2m (+)	5.6 m : B = 5.3 m (+)
5.8m : B = 5.1m (+)	6.0 m : B = 5.2 m (+)
6.2m : B = 5.0m (+)	6.4 m : B = 5.0 m (+)
6.6m : B = 4.9m (+)	6.8 m : B = 4.9 m (+)
7.0m : B = 4.8m (+)	7.2 m : B = 4.9 m (+)
7.4m : B = 4.7m (+)	7.6 m : B = 4.8 m (+)
7.8m : B = 4.6m	8.0 m : B = 4.7 m (+)
8.2m : B = 4.5m	8.4 m : B = 4.6 m
8.5m : B = 4.4m	8.8 m : B = 4.5 m
8.8m : B = 4.3m	9.2 m : B = 4.3 m
9.1m : B = 4.3m	9.6 m : B = 4.2 m
9.4m : B = 4.2m	10.0 m : B = 4.1 m
9.7m : B = 4.1m	10.4 m : B = 4.0 m
10.0m : B = 4.1m	10.8 m : B = 4.1 m
10.3m : B = 4.1m	11.2 m : B = 4.2 m
10.6m : B = 4.1m	11.6 m : B = 4.4 m
10.9m : B = 4.1m	12.0 m : B = 4.6 m (+)
11.2m : B = 4.2m	12.4 m : B = 4.9 m (+)
11.5m : B = 4.2m	12.8 m : B = 5.1 m (+)
11.8m : B = 4.3m	13.2 m : B = 5.4 m (+)
12.1m : B = 4.3m	13.6 m : B = 5.6 m (+)
12.4m : B = 4.4m	14.0 m : B = 5.8 m (+)
12.7m : B = 4.5m	14.4 m : B = 5.9 m (+)
13.0m : B = 4.6m	14.8 m : B = 6.1 m (+)
13.3m : B = 4.7m (+)	15.2 m : B = 6.2 m (+)
13.6m : B = 4.8m (+)	15.6 m : B = 6.4 m (+)
13.9m : B = 5.0m (+)	16.0 m : B = 6.6 m (+)
14.2m : B = 5.1m (+)	16.4 m : B = 6.8 m (+)
14.5m : B = 5.3m (+)	16.8 m : B = 7.0 m (+)
14.8m : B = 5.4m (+)	17.2 m : B = 7.5 m (+)
15.1m : B = 5.6m (+)	17.6 m : B = 8.0 m (+)
15.4m : B = 5.8m (+)	
15.7m : B = 5.9m (+)	
16.0m : B = 6.1m (+)	
16.3m : B = 6.3m (+)	
16.6m : B = 6.4m (+)	
16.9m : B = 6.4m (+)	
17.2m : B = 6.5m (+)	
17.5m : B = 6.6m (+)	
17.8m : B = 6.8m (+)	
18.1m : B = 6.9m (+)	
18.4m : B = 7.0m (+)	
18.7m : B = 7.1m (+)	
19.0m : B = 7.3m (+)	

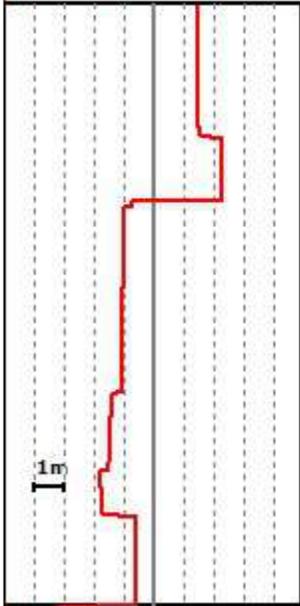
Author	John Delaney
Date	09/07/2024

Comments:
->

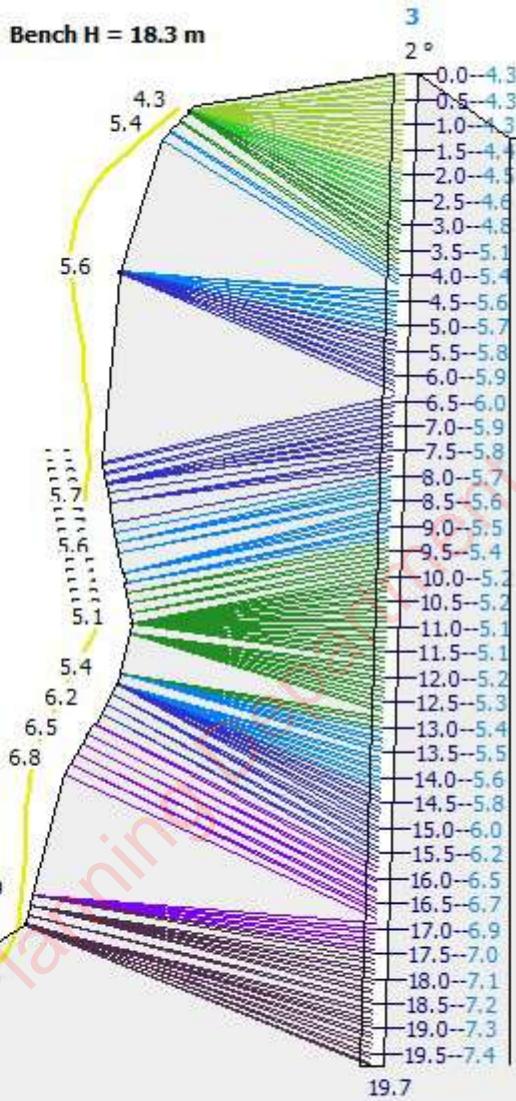


Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	3

Minimum profile !



Bench H = 18.3 m



Hole 3

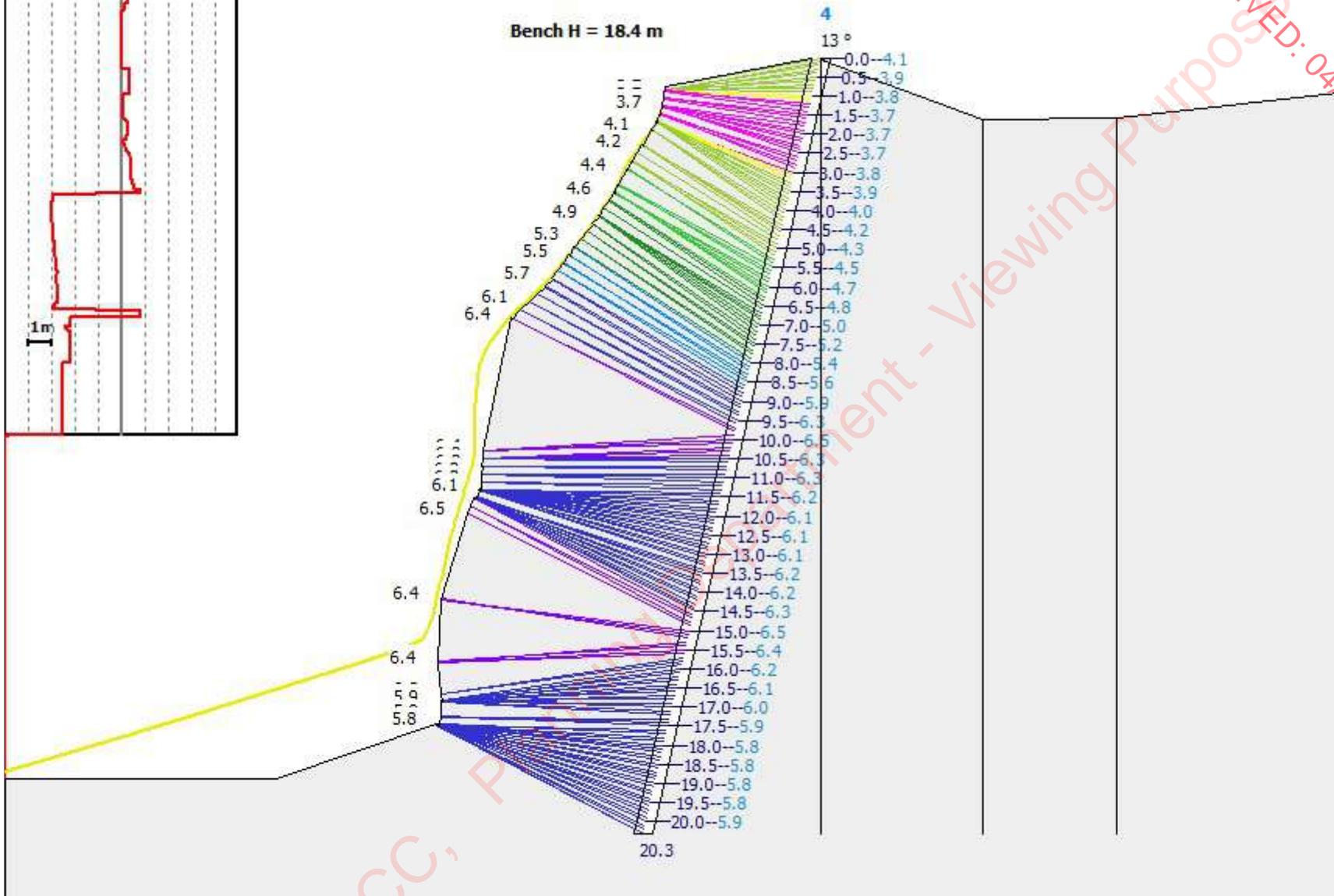
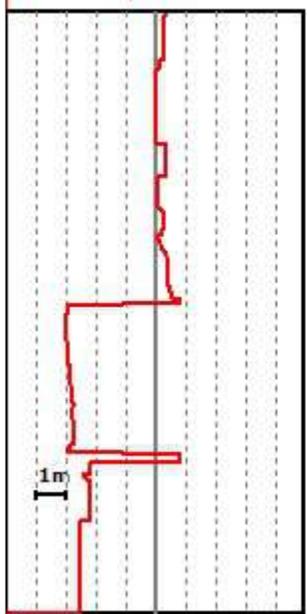
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.4m	0.8 m : B = 4.5 m
0.6m : B = 4.3m	1.1 m : B = 4.8 m (+)
0.9m : B = 4.3m	1.5 m : B = 5.2 m (+)
1.2m : B = 4.3m	1.9 m : B = 5.6 m (+)
1.5m : B = 4.4m	2.4 m : B = 6.0 m (+)
1.8m : B = 4.4m	2.8 m : B = 6.3 m (+)
2.2m : B = 4.5m	3.2 m : B = 6.4 m (+)
2.6m : B = 4.7m (+)	3.6 m : B = 6.5 m (+)
3.0m : B = 4.8m (+)	4.0 m : B = 6.5 m (+)
3.4m : B = 5.0m (+)	4.4 m : B = 6.5 m (+)
3.8m : B = 5.3m (+)	4.8 m : B = 6.4 m (+)
4.2m : B = 5.6m (+)	5.2 m : B = 6.3 m (+)
4.6m : B = 5.6m (+)	5.6 m : B = 6.3 m (+)
5.0m : B = 5.7m (+)	6.0 m : B = 6.2 m (+)
5.4m : B = 5.8m (+)	6.4 m : B = 6.2 m (+)
5.8m : B = 5.9m (+)	6.7 m : B = 6.1 m (+)
6.2m : B = 6.0m (+)	7.1 m : B = 6.1 m (+)
6.6m : B = 6.0m (+)	7.5 m : B = 6.1 m (+)
7.0m : B = 5.9m (+)	7.9 m : B = 6.0 m (+)
7.4m : B = 5.8m (+)	8.3 m : B = 6.1 m (+)
7.8m : B = 5.7m (+)	8.7 m : B = 6.1 m (+)
8.2m : B = 5.6m (+)	9.1 m : B = 6.0 m (+)
8.5m : B = 5.6m (+)	9.5 m : B = 6.0 m (+)
8.8m : B = 5.5m (+)	9.9 m : B = 5.9 m (+)
9.1m : B = 5.4m (+)	10.3 m : B = 5.8 m (+)
9.4m : B = 5.4m (+)	10.7 m : B = 5.7 m (+)
9.7m : B = 5.3m (+)	11.1 m : B = 5.7 m (+)
10.0m : B = 5.2m (+)	11.5 m : B = 5.9 m (+)
10.3m : B = 5.2m (+)	11.9 m : B = 6.1 m (+)
10.6m : B = 5.2m (+)	12.3 m : B = 6.3 m (+)
10.9m : B = 5.1m (+)	12.8 m : B = 6.5 m (+)
11.2m : B = 5.1m (+)	13.2 m : B = 6.7 m (+)
11.5m : B = 5.1m (+)	13.6 m : B = 6.8 m (+)
11.8m : B = 5.2m (+)	14.0 m : B = 7.0 m (+)
12.1m : B = 5.2m (+)	14.4 m : B = 7.0 m (+)
12.4m : B = 5.3m (+)	14.8 m : B = 7.0 m (+)
12.7m : B = 5.3m (+)	15.2 m : B = 7.0 m (+)
13.0m : B = 5.4m (+)	15.6 m : B = 7.0 m (+)
13.3m : B = 5.4m (+)	16.0 m : B = 7.0 m (+)
13.6m : B = 5.5m (+)	16.4 m : B = 7.1 m (+)
13.9m : B = 5.6m (+)	16.8 m : B = 7.1 m (+)
14.2m : B = 5.7m (+)	17.2 m : B = 7.1 m (+)
14.5m : B = 5.8m (+)	17.6 m : B = 7.3 m (+)
14.8m : B = 5.9m (+)	18.0 m : B = 7.6 m (+)
15.1m : B = 6.0m (+)	18.5 m : B = 11.7 m (+)
15.4m : B = 6.2m (+)	19.0 m : B = 18.1 m (+)
15.7m : B = 6.3m (+)	
16.0m : B = 6.5m (+)	
16.3m : B = 6.6m (+)	
16.6m : B = 6.8m (+)	
16.9m : B = 6.9m (+)	
17.2m : B = 7.0m (+)	
17.5m : B = 7.0m (+)	
17.8m : B = 7.0m (+)	
18.1m : B = 7.1m (+)	
18.4m : B = 7.1m (+)	
18.7m : B = 7.2m (+)	
19.0m : B = 7.3m (+)	
19.3m : B = 7.4m (+)	
19.6m : B = 7.5m (+)	

Author	John Delaney	Comments: ->
Date	09/07/2024	



Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	4

Minimum profile I



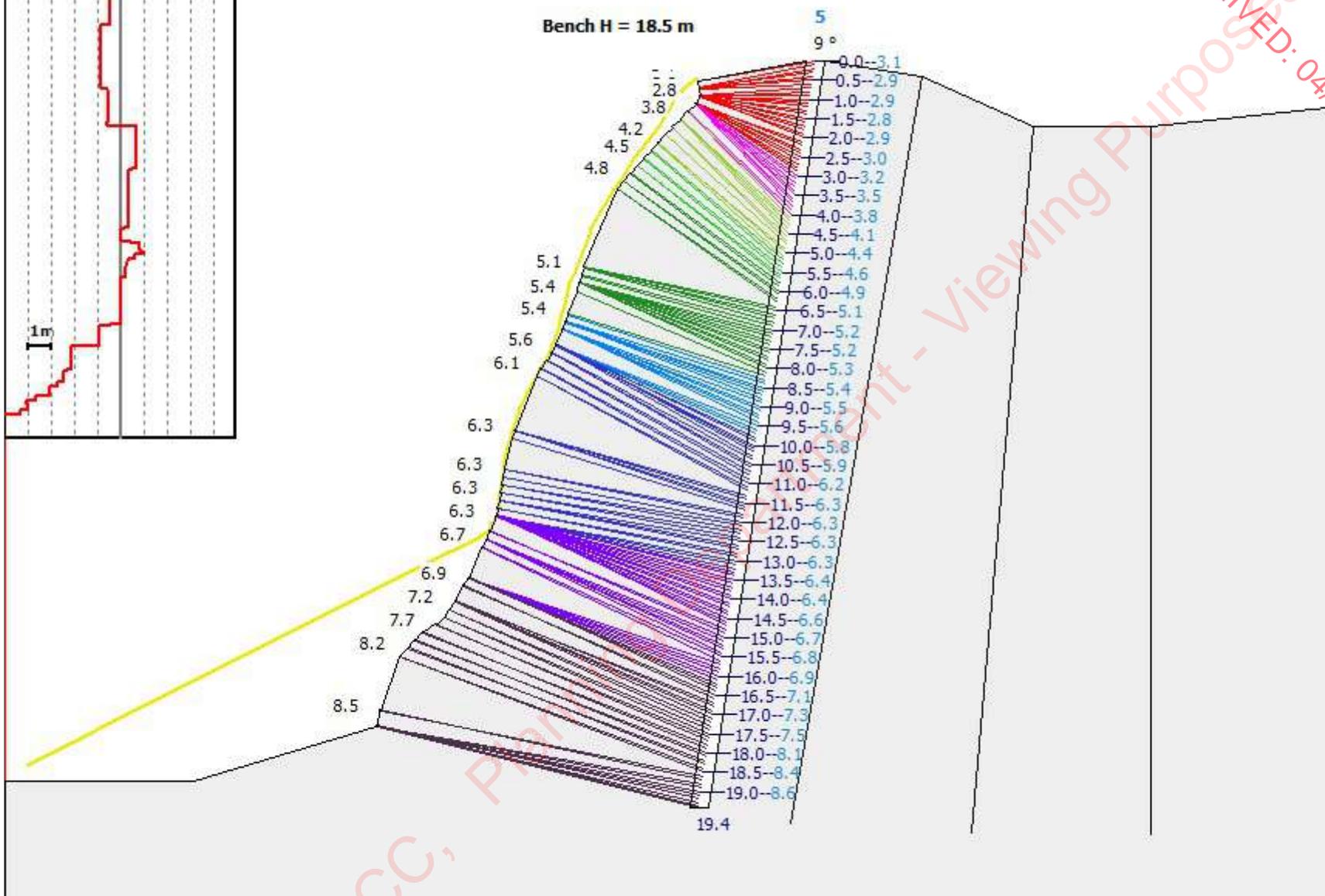
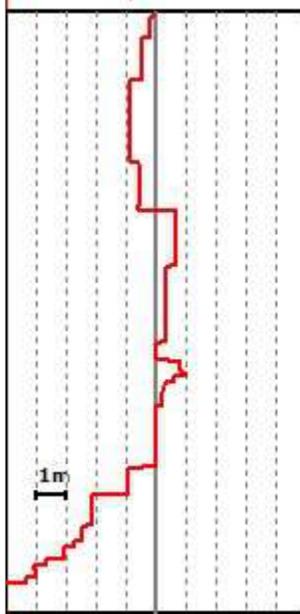
Hole 4	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.0m	2.1 m : B = 3.6 m (-)
0.6m : B = 3.9m	2.5 m : B = 3.7 m (-)
0.9m : B = 3.8m	3.0 m : B = 3.9 m
1.2m : B = 3.8m (-)	3.4 m : B = 4.1 m
1.5m : B = 3.7m (-)	3.9 m : B = 4.2 m
1.8m : B = 3.7m (-)	4.3 m : B = 4.3 m
2.2m : B = 3.7m (-)	4.7 m : B = 4.5 m
2.6m : B = 3.7m (-)	5.2 m : B = 4.6 m
3.0m : B = 3.8m (-)	5.6 m : B = 4.8 m (+)
3.4m : B = 3.8m	6.1 m : B = 5.0 m (+)
3.8m : B = 4.0m	6.6 m : B = 5.2 m (+)
4.2m : B = 4.1m	7.0 m : B = 5.5 m (+)
4.6m : B = 4.2m	7.5 m : B = 5.8 m (+)
5.0m : B = 4.3m	8.0 m : B = 6.1 m (+)
5.4m : B = 4.5m	8.5 m : B = 6.4 m (+)
5.8m : B = 4.6m	8.9 m : B = 6.6 m (+)
6.2m : B = 4.7m (+)	9.4 m : B = 6.7 m (+)
6.6m : B = 4.9m (+)	9.8 m : B = 6.7 m (+)
7.0m : B = 5.0m (+)	10.2 m : B = 6.7 m (+)
7.4m : B = 5.2m (+)	10.6 m : B = 6.6 m (+)
7.8m : B = 5.3m (+)	11.0 m : B = 6.5 m (+)
8.2m : B = 5.5m (+)	11.4 m : B = 6.4 m (+)
8.5m : B = 5.6m (+)	11.8 m : B = 6.4 m (+)
8.8m : B = 5.8m (+)	12.2 m : B = 6.4 m (+)
9.1m : B = 6.0m (+)	12.6 m : B = 6.4 m (+)
9.4m : B = 6.1m (+)	13.0 m : B = 6.4 m (+)
9.7m : B = 6.4m (+)	13.4 m : B = 6.4 m (+)
10.0m : B = 6.5m (+)	13.8 m : B = 6.5 m (+)
10.3m : B = 6.4m (+)	14.2 m : B = 6.5 m (+)
10.6m : B = 6.3m (+)	14.6 m : B = 6.5 m (+)
10.9m : B = 6.3m (+)	15.1 m : B = 6.5 m (+)
11.2m : B = 6.2m (+)	15.5 m : B = 6.5 m (+)
11.5m : B = 6.2m (+)	15.9 m : B = 6.5 m (+)
11.8m : B = 6.1m (+)	16.3 m : B = 6.5 m (+)
12.1m : B = 6.1m (+)	16.7 m : B = 6.6 m (+)
12.4m : B = 6.1m (+)	17.4 m : B = 7.5 m (+)
12.7m : B = 6.1m (+)	18.0 m : B = 8.6 m (+)
13.0m : B = 6.1m (+)	18.7 m : B = 9.8 m (+)
13.3m : B = 6.1m (+)	19.4 m : B = 10.9 m (+)
13.6m : B = 6.2m (+)	20.1 m : B = 12.1 m (+)
13.9m : B = 6.2m (+)	20.3 m : B = 13.3 m (+)
14.2m : B = 6.3m (+)	20.3 m : B = 14.6 m (+)
14.5m : B = 6.3m (+)	20.3 m : B = 15.9 m (+)
14.8m : B = 6.4m (+)	20.3 m : B = 16.7 m (+)
15.1m : B = 6.5m (+)	
15.4m : B = 6.4m (+)	
15.7m : B = 6.3m (+)	
16.0m : B = 6.2m (+)	
16.3m : B = 6.1m (+)	
16.6m : B = 6.0m (+)	
16.9m : B = 6.0m (+)	
17.2m : B = 5.9m (+)	
17.5m : B = 5.9m (+)	
17.8m : B = 5.8m (+)	
18.1m : B = 5.8m (+)	
18.4m : B = 5.8m (+)	
18.7m : B = 5.8m (+)	
19.0m : B = 5.8m (+)	
19.3m : B = 5.8m (+)	
19.6m : B = 5.8m (+)	
19.9m : B = 5.9m (+)	
20.2m : B = 6.0m (+)	

Author	John Delaney	Comments: ->
Date	09/07/2024	



Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	5

Minimum profile I



Hole 5	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.0m (-) !!!<<	0.9 m : B = 2.9 m (-) !!! <
0.6m : B = 2.9m (-) !!!<<	1.2 m : B = 3.2 m (-) !!! <
0.9m : B = 2.9m (-) !!!<<	1.7 m : B = 3.4 m (-)
1.2m : B = 2.8m (-) !!!<<	2.1 m : B = 3.6 m (-)
1.5m : B = 2.8m (-) !!!<<	2.5 m : B = 3.8 m
1.8m : B = 2.9m (-) !!!<<	3.0 m : B = 4.1 m
2.2m : B = 2.9m (-) !!!<<	3.4 m : B = 4.3 m
2.6m : B = 3.1m (-) !!!<<	3.9 m : B = 4.5 m
3.0m : B = 3.2m (-)	4.3 m : B = 4.6 m (+)
3.4m : B = 3.4m (-)	4.7 m : B = 4.8 m (+)
3.8m : B = 3.6m (-)	5.2 m : B = 5.0 m (+)
4.2m : B = 3.9m (-)	5.6 m : B = 5.1 m (+)
4.6m : B = 4.1m	6.0 m : B = 5.1 m (+)
5.0m : B = 4.4m	6.4 m : B = 5.3 m (+)
5.4m : B = 4.6m	6.8 m : B = 5.4 m (+)
5.8m : B = 4.8m (+)	7.2 m : B = 5.4 m (+)
6.2m : B = 5.0m (+)	7.6 m : B = 5.4 m (+)
6.6m : B = 5.1m (+)	8.1 m : B = 5.5 m (+)
7.0m : B = 5.2m (+)	8.5 m : B = 5.6 m (+)
7.4m : B = 5.2m (+)	8.9 m : B = 5.7 m (+)
7.8m : B = 5.3m (+)	9.3 m : B = 5.9 m (+)
8.2m : B = 5.4m (+)	9.8 m : B = 6.0 m (+)
8.5m : B = 5.4m (+)	10.2 m : B = 6.1 m (+)
8.8m : B = 5.5m (+)	10.6 m : B = 6.2 m (+)
9.1m : B = 5.5m (+)	11.0 m : B = 6.3 m (+)
9.4m : B = 5.6m (+)	11.4 m : B = 6.3 m (+)
9.7m : B = 5.7m (+)	11.8 m : B = 6.3 m (+)
10.0m : B = 5.8m (+)	12.2 m : B = 6.3 m (+)
10.3m : B = 5.9m (+)	12.6 m : B = 6.3 m (+)
10.6m : B = 6.0m (+)	13.1 m : B = 6.4 m (+)
10.9m : B = 6.1m (+)	13.5 m : B = 6.7 m (+)
11.2m : B = 6.2m (+)	14.0 m : B = 7.5 m (+)
11.5m : B = 6.3m (+)	14.6 m : B = 8.2 m (+)
11.8m : B = 6.3m (+)	15.1 m : B = 9.0 m (+)
12.1m : B = 6.3m (+)	15.6 m : B = 9.7 m (+)
12.4m : B = 6.3m (+)	16.1 m : B = 10.4 m (+)
12.7m : B = 6.3m (+)	16.6 m : B = 11.2 m (+)
13.0m : B = 6.3m (+)	17.2 m : B = 11.9 m (+)
13.3m : B = 6.4m (+)	17.7 m : B = 12.6 m (+)
13.6m : B = 6.4m (+)	18.2 m : B = 13.3 m (+)
13.9m : B = 6.4m (+)	18.7 m : B = 14.1 m (+)
14.2m : B = 6.5m (+)	19.2 m : B = 14.8 m (+)
14.5m : B = 6.6m (+)	19.4 m : B = 15.5 m (+)
14.8m : B = 6.6m (+)	19.4 m : B = 16.2 m (+)
15.1m : B = 6.7m (+)	19.4 m : B = 17.0 m (+)
15.4m : B = 6.8m (+)	19.4 m : B = 17.4 m (+)
15.7m : B = 6.9m (+)	
16.0m : B = 6.9m (+)	
16.3m : B = 7.0m (+)	
16.6m : B = 7.2m (+)	
16.9m : B = 7.3m (+)	
17.2m : B = 7.4m (+)	
17.5m : B = 7.5m (+)	
17.8m : B = 7.9m (+)	
18.1m : B = 8.1m (+)	
18.4m : B = 8.4m (+)	
18.7m : B = 8.5m (+)	
19.0m : B = 8.6m (+)	
19.3m : B = 8.6m (+)	

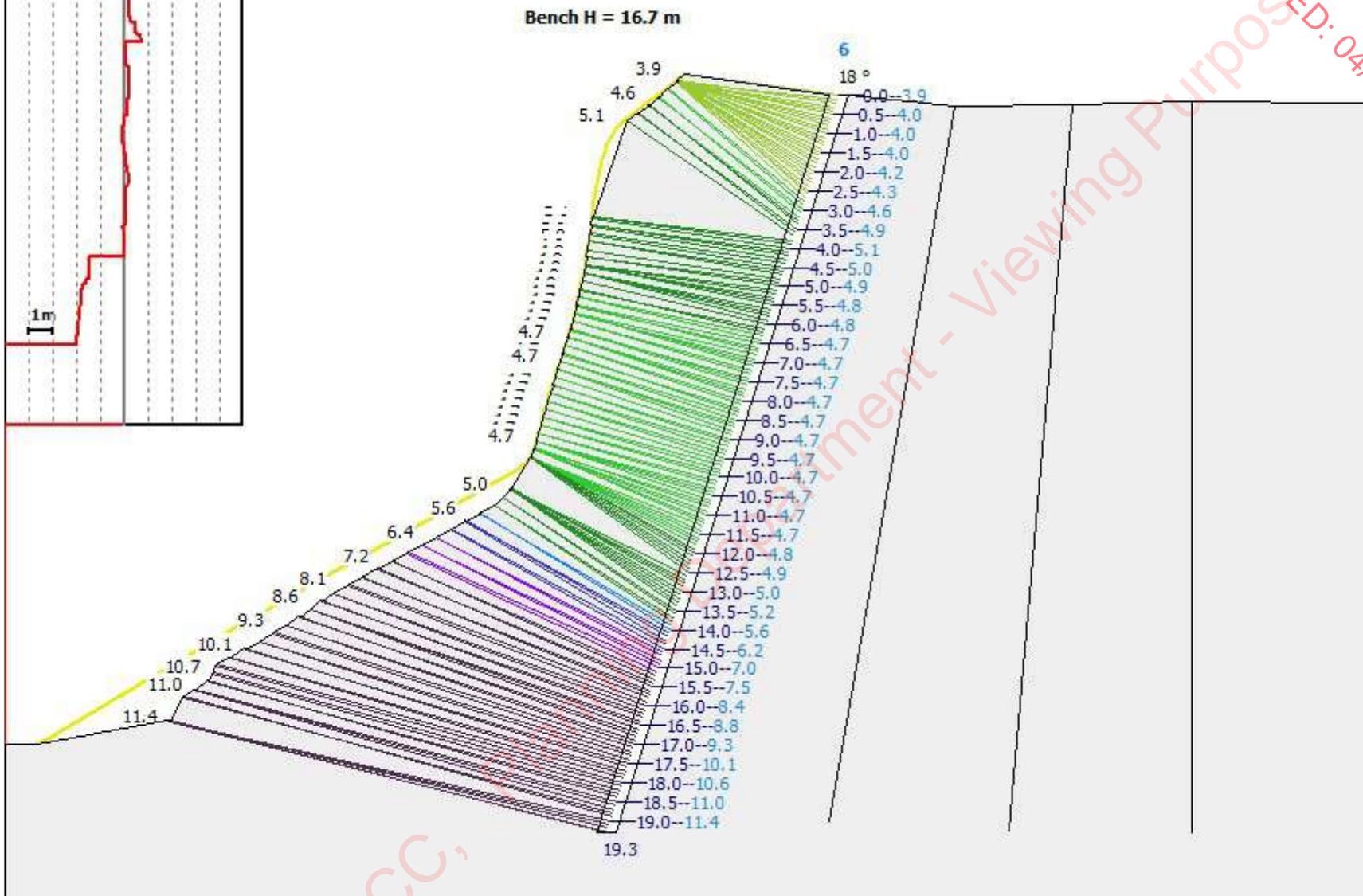
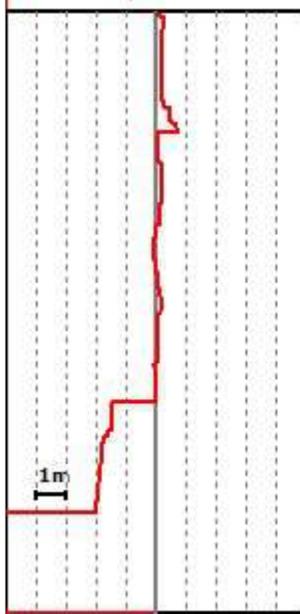
Author	John Delaney
Date	09/07/2024

Comments:
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Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	6

Minimum profile I



Hole 6	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.0m	0.7 m : B = 3.8 m
0.6m : B = 4.0m	1.2 m : B = 4.1 m
0.9m : B = 4.0m	1.7 m : B = 4.5 m
1.2m : B = 4.0m	2.2 m : B = 4.9 m (+)
1.5m : B = 4.0m	2.7 m : B = 5.1 m (+)
1.8m : B = 4.1m	3.1 m : B = 5.1 m (+)
2.2m : B = 4.2m	3.6 m : B = 5.1 m (+)
2.6m : B = 4.3m	4.0 m : B = 5.1 m (+)
3.0m : B = 4.6m	4.4 m : B = 5.0 m (+)
3.4m : B = 4.6m (+)	4.8 m : B = 4.9 m (+)
3.8m : B = 5.1m (+)	5.2 m : B = 4.9 m (+)
4.2m : B = 5.0m (+)	5.6 m : B = 4.8 m (+)
4.6m : B = 5.0m (+)	5.9 m : B = 4.7 m (+)
5.0m : B = 4.9m (+)	6.4 m : B = 4.7 m (+)
5.4m : B = 4.8m (+)	6.7 m : B = 4.7 m (+)
5.8m : B = 4.8m (+)	7.2 m : B = 4.6 m (+)
6.2m : B = 4.8m (+)	7.6 m : B = 4.6 m (+)
6.6m : B = 4.7m (+)	8.0 m : B = 4.6 m (+)
7.0m : B = 4.7m (+)	8.4 m : B = 4.6 m (+)
7.4m : B = 4.7m (+)	8.8 m : B = 4.6 m (+)
7.8m : B = 4.7m (+)	9.3 m : B = 4.6 m (+)
8.2m : B = 4.7m (+)	9.7 m : B = 4.6 m (+)
8.5m : B = 4.7m (+)	10.1 m : B = 4.6 m
8.8m : B = 4.7m (+)	10.5 m : B = 4.6 m
9.1m : B = 4.7m (+)	10.9 m : B = 4.6 m
9.4m : B = 4.7m (+)	11.5 m : B = 5.0 m (+)
9.7m : B = 4.7m (+)	12.1 m : B = 5.5 m (+)
10.0m : B = 4.7m (+)	12.7 m : B = 6.1 m (+)
10.3m : B = 4.7m (+)	13.3 m : B = 6.7 m (+)
10.6m : B = 4.7m (+)	13.8 m : B = 7.2 m (+)
10.9m : B = 4.7m (+)	14.5 m : B = 7.8 m (+)
11.2m : B = 4.7m (+)	15.1 m : B = 8.4 m (+)
11.5m : B = 4.7m (+)	15.7 m : B = 8.9 m (+)
11.8m : B = 4.7m (+)	16.3 m : B = 9.5 m (+)
12.1m : B = 4.8m (+)	16.9 m : B = 10.1 m (+)
12.4m : B = 4.9m (+)	17.5 m : B = 10.6 m (+)
12.7m : B = 5.0m (+)	18.0 m : B = 11.1 m (+)
13.0m : B = 5.0m (+)	18.6 m : B = 11.7 m (+)
13.3m : B = 5.1m (+)	19.2 m : B = 12.2 m (+)
13.6m : B = 5.2m (+)	19.3 m : B = 12.7 m (+)
13.9m : B = 5.6m (+)	19.3 m : B = 13.3 m (+)
14.2m : B = 5.9m (+)	19.3 m : B = 13.9 m (+)
14.5m : B = 6.2m (+)	19.3 m : B = 14.5 m (+)
14.8m : B = 6.7m (+)	
15.1m : B = 7.0m (+)	
15.4m : B = 7.5m (+)	
15.7m : B = 7.8m (+)	
16.0m : B = 8.4m (+)	
16.3m : B = 8.6m (+)	
16.6m : B = 8.8m (+)	
16.9m : B = 9.3m (+)	
17.2m : B = 9.5m (+)	
17.5m : B = 10.1m (+)	
17.8m : B = 10.4m (+)	
18.1m : B = 10.7m (+)	
18.4m : B = 10.7m (+)	
18.7m : B = 11.0m (+)	
19.0m : B = 11.4m (+)	
19.3m : B = 11.4m (+)	

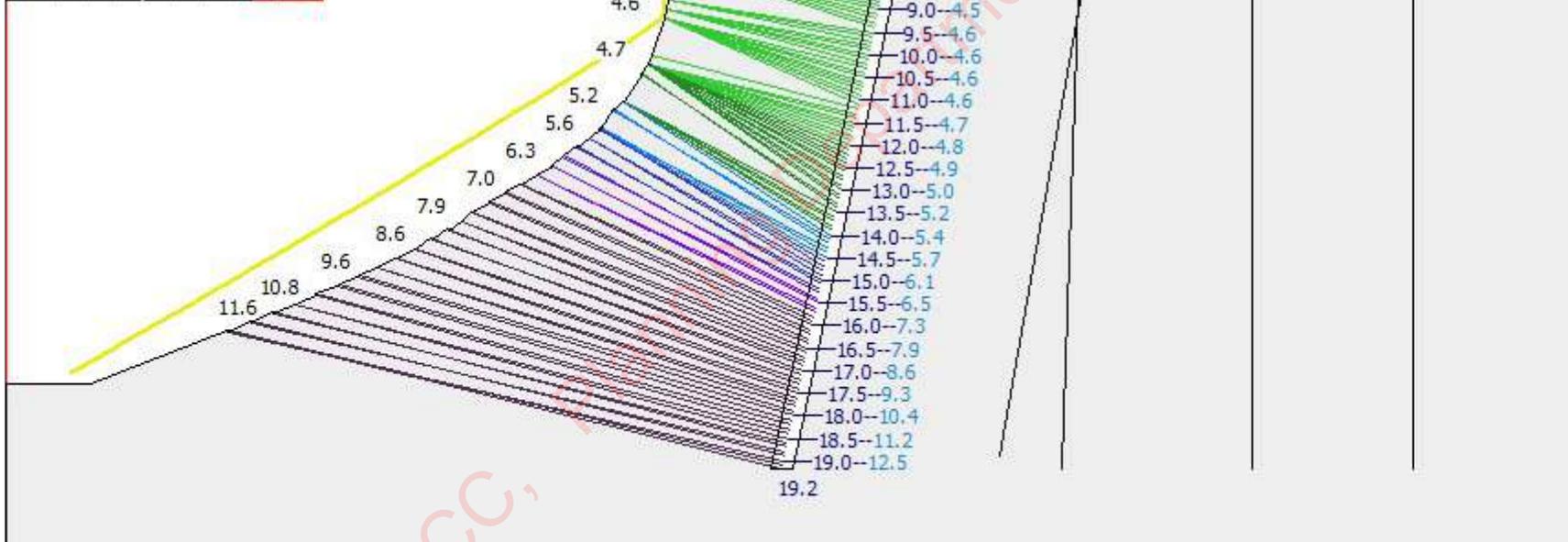
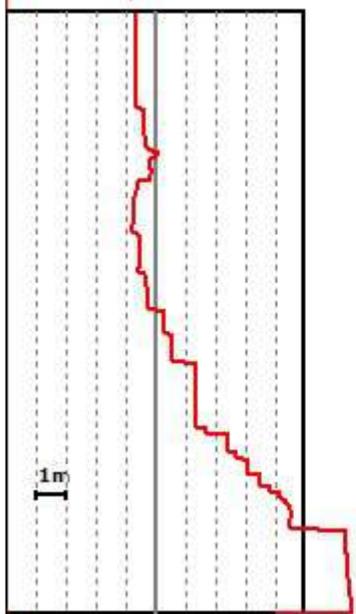
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Comments:
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Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	7

Minimum profile I



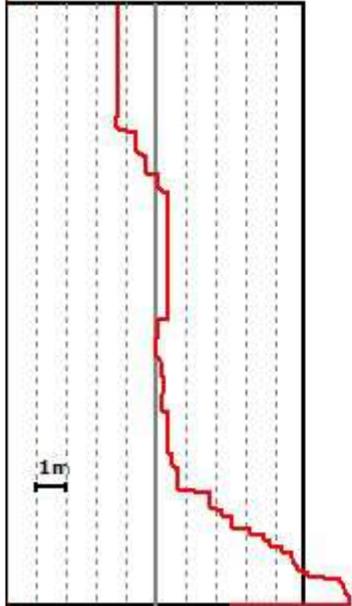
Hole 7	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.3m (-)	0.5 m : B = 3.4 m (-)
0.6m : B = 3.3m (-)	1.0 m : B = 3.5 m (-)
0.9m : B = 3.4m (-)	1.4 m : B = 3.6 m (-)
1.2m : B = 3.4m (-)	1.8 m : B = 3.7 m (-)
1.5m : B = 3.4m (-)	2.3 m : B = 3.9 m
1.8m : B = 3.5m (-)	2.7 m : B = 4.1 m
2.2m : B = 3.6m (-)	3.1 m : B = 4.2 m
2.6m : B = 3.7m (-)	3.6 m : B = 4.3 m
3.0m : B = 3.9m	4.0 m : B = 4.4 m
3.4m : B = 4.0m	4.4 m : B = 4.5 m
3.8m : B = 4.2m	4.8 m : B = 4.6 m
4.2m : B = 4.4m	5.3 m : B = 4.6 m (+)
4.6m : B = 4.5m	5.7 m : B = 4.6 m
5.0m : B = 4.6m	6.1 m : B = 4.6 m
5.4m : B = 4.6m (+)	6.5 m : B = 4.6 m
5.8m : B = 4.6m	6.9 m : B = 4.6 m
6.2m : B = 4.6m	7.3 m : B = 4.6 m
6.6m : B = 4.6m	7.7 m : B = 4.6 m
7.0m : B = 4.6m	8.1 m : B = 4.5 m
7.4m : B = 4.6m	8.5 m : B = 4.5 m
7.8m : B = 4.6m	8.9 m : B = 4.5 m
8.2m : B = 4.6m	9.3 m : B = 4.6 m
8.5m : B = 4.6m	9.8 m : B = 4.6 m
8.8m : B = 4.5m	10.2 m : B = 4.6 m
9.1m : B = 4.6m	10.7 m : B = 5.0 m (+)
9.4m : B = 4.6m	11.2 m : B = 5.6 m (+)
9.7m : B = 4.6m	11.7 m : B = 6.1 m (+)
10.0m : B = 4.6m	12.3 m : B = 6.7 m (+)
10.3m : B = 4.6m	12.8 m : B = 7.2 m (+)
10.6m : B = 4.6m	13.3 m : B = 7.8 m (+)
10.9m : B = 4.6m (+)	13.8 m : B = 8.4 m (+)
11.2m : B = 4.7m (+)	14.3 m : B = 8.9 m (+)
11.5m : B = 4.7m (+)	14.9 m : B = 9.5 m (+)
11.8m : B = 4.7m (+)	15.4 m : B = 10.1 m (+)
12.1m : B = 4.8m (+)	15.9 m : B = 10.7 m (+)
12.4m : B = 4.8m (+)	16.5 m : B = 11.3 m (+)
12.7m : B = 4.9m (+)	17.0 m : B = 11.9 m (+)
13.0m : B = 5.0m (+)	17.6 m : B = 12.5 m (+)
13.3m : B = 5.2m (+)	18.1 m : B = 13.1 m (+)
13.6m : B = 5.3m (+)	18.6 m : B = 13.7 m (+)
13.9m : B = 5.4m (+)	19.2 m : B = 14.3 m (+)
14.2m : B = 5.6m (+)	19.2 m : B = 14.9 m (+)
14.5m : B = 5.7m (+)	19.2 m : B = 15.5 m (+)
14.8m : B = 5.9m (+)	
15.1m : B = 6.1m (+)	
15.4m : B = 6.5m (+)	
15.7m : B = 6.8m (+)	
16.0m : B = 7.3m (+)	
16.3m : B = 7.6m (+)	
16.6m : B = 8.1m (+)	
16.9m : B = 8.4m (+)	
17.2m : B = 8.9m (+)	
17.5m : B = 9.3m (+)	
17.8m : B = 10.0m (+)	
18.1m : B = 10.4m (+)	
18.4m : B = 11.2m (+)	
18.7m : B = 11.6m (+)	
19.0m : B = 12.5m (+)	

Author	John Delaney	Comments: ->
Date	09/07/2024	



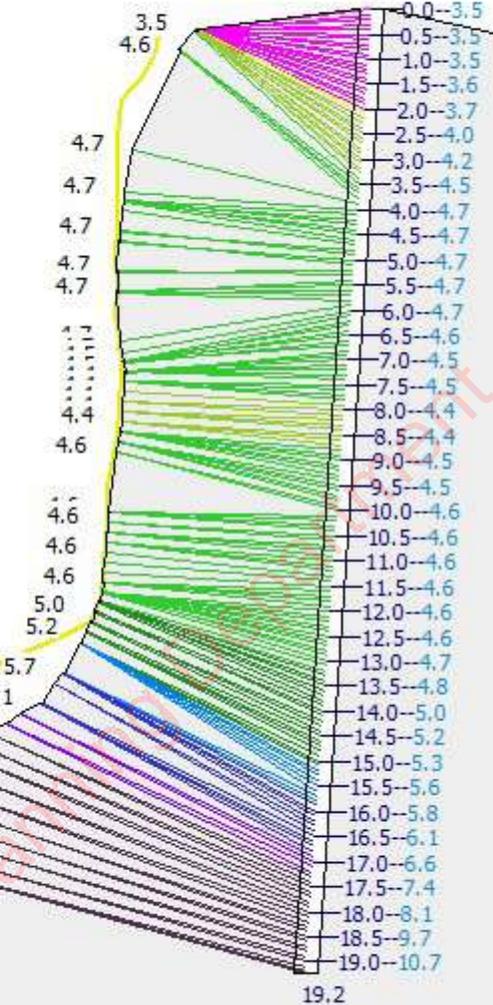
Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	8

Minimum profile I



Bench H = 17.6 m

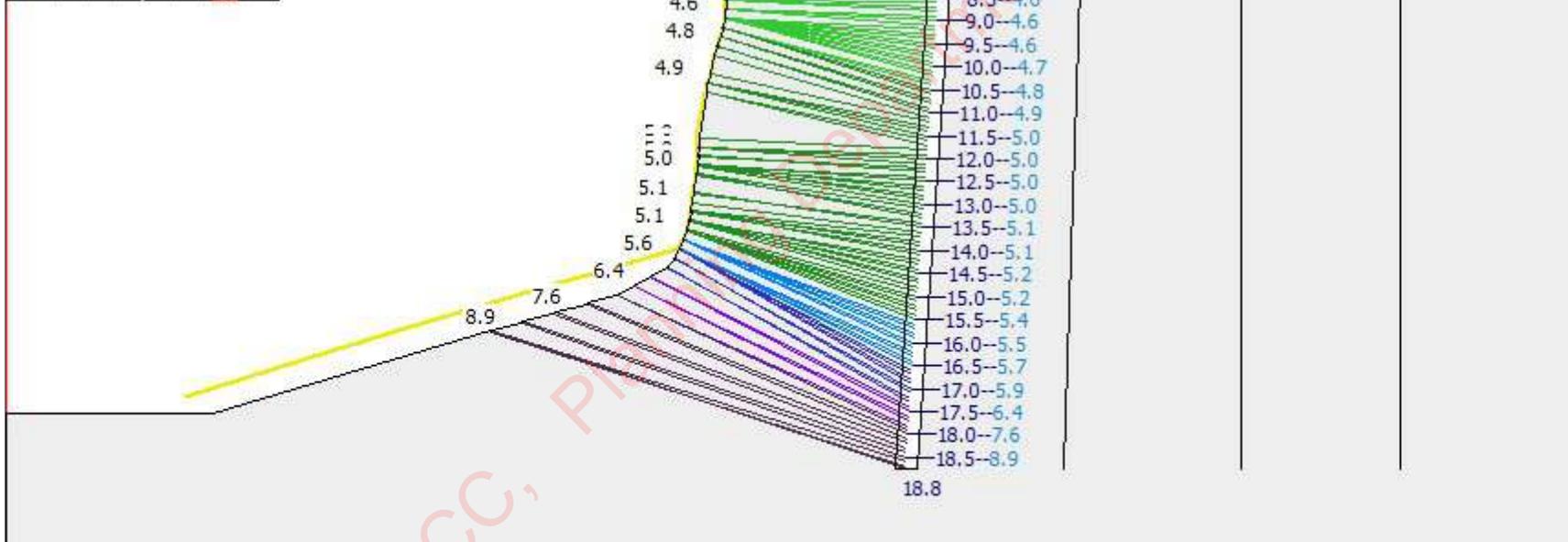
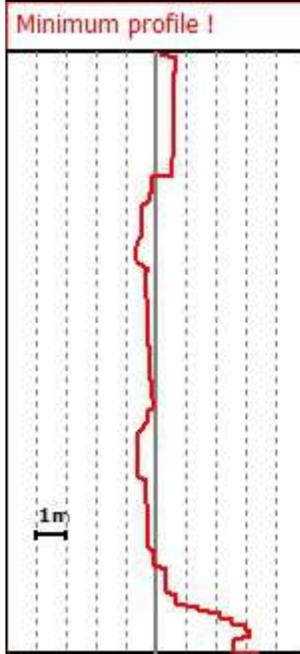
8
4°



Hole 8	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.5m (-)	0.6 m : B = 4.1 m
0.6m : B = 3.5m (-)	0.9 m : B = 4.2 m
0.9m : B = 3.5m (-)	1.3 m : B = 4.3 m
1.2m : B = 3.5m (-)	1.7 m : B = 4.5 m
1.5m : B = 3.6m (-)	2.2 m : B = 4.8 m (+)
1.8m : B = 3.7m (-)	2.6 m : B = 4.8 m (+)
2.2m : B = 3.8m	3.0 m : B = 4.9 m (+)
2.6m : B = 4.0m	3.4 m : B = 4.8 m (+)
3.0m : B = 4.2m	3.8 m : B = 4.8 m (+)
3.4m : B = 4.4m	4.2 m : B = 4.7 m (+)
3.8m : B = 4.7m (+)	4.6 m : B = 4.7 m (+)
4.2m : B = 4.7m (+)	4.9 m : B = 4.7 m (+)
4.6m : B = 4.7m (+)	5.3 m : B = 4.7 m (+)
5.0m : B = 4.7m (+)	5.7 m : B = 4.7 m (+)
5.4m : B = 4.7m (+)	6.1 m : B = 4.6 m (+)
5.8m : B = 4.7m (+)	6.5 m : B = 4.6 m (+)
6.2m : B = 4.6m (+)	6.9 m : B = 4.5 m
6.6m : B = 4.5m	7.3 m : B = 4.5 m
7.0m : B = 4.5m	7.7 m : B = 4.4 m
7.4m : B = 4.5m	8.1 m : B = 4.4 m
7.8m : B = 4.4m	8.5 m : B = 4.4 m
8.2m : B = 4.4m	8.9 m : B = 4.5 m
8.5m : B = 4.4m	9.3 m : B = 4.5 m
8.8m : B = 4.4m	9.7 m : B = 4.6 m
9.1m : B = 4.5m	10.2 m : B = 4.5 m
9.4m : B = 4.5m	10.6 m : B = 4.5 m
9.7m : B = 4.5m	11.0 m : B = 4.5 m
10.0m : B = 4.6m	11.4 m : B = 4.5 m
10.3m : B = 4.6m	11.8 m : B = 4.5 m
10.6m : B = 4.6m	12.2 m : B = 4.6 m
10.9m : B = 4.6m	12.6 m : B = 4.8 m (+)
11.2m : B = 4.6m	13.0 m : B = 5.6 m (+)
11.5m : B = 4.6m	13.5 m : B = 6.5 m (+)
11.8m : B = 4.6m	14.0 m : B = 7.4 m (+)
12.1m : B = 4.6m	14.4 m : B = 8.3 m (+)
12.4m : B = 4.6m	14.9 m : B = 9.1 m (+)
12.7m : B = 4.7m (+)	15.3 m : B = 10.0 m (+)
13.0m : B = 4.7m (+)	15.8 m : B = 10.9 m (+)
13.3m : B = 4.8m (+)	16.3 m : B = 11.8 m (+)
13.6m : B = 4.9m (+)	16.7 m : B = 12.7 m (+)
13.9m : B = 5.0m (+)	17.2 m : B = 13.7 m (+)
14.2m : B = 5.1m (+)	17.7 m : B = 14.6 m (+)
14.5m : B = 5.2m (+)	18.1 m : B = 15.5 m (+)
14.8m : B = 5.3m (+)	18.5 m : B = 16.3 m (+)
15.1m : B = 5.4m (+)	
15.4m : B = 5.5m (+)	
15.7m : B = 5.7m (+)	
16.0m : B = 5.8m (+)	
16.3m : B = 6.0m (+)	
16.6m : B = 6.1m (+)	
16.9m : B = 6.5m (+)	
17.2m : B = 6.8m (+)	
17.5m : B = 7.4m (+)	
17.8m : B = 7.6m (+)	
18.1m : B = 8.6m (+)	
18.4m : B = 9.2m (+)	
18.7m : B = 10.2m (+)	
19.0m : B = 10.7m (+)	
19.3m : B = 11.3m (+)	

Author	John Delaney	Comments: ->
Date	09/07/2024	





Hole 9	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.3m	0.4 m : B = 4.2 m
0.6m : B = 4.3m	0.8 m : B = 4.5 m
0.9m : B = 4.3m	1.3 m : B = 4.7 m (+)
1.2m : B = 4.3m	1.7 m : B = 4.8 m (+)
1.5m : B = 4.4m	2.1 m : B = 4.9 m (+)
1.8m : B = 4.5m	2.5 m : B = 5.1 m (+)
2.2m : B = 4.6m	2.9 m : B = 5.2 m (+)
2.6m : B = 4.7m (+)	3.3 m : B = 5.3 m (+)
3.0m : B = 4.9m (+)	3.7 m : B = 5.4 m (+)
3.4m : B = 5.1m (+)	4.1 m : B = 5.4 m (+)
3.8m : B = 5.3m (+)	4.5 m : B = 5.4 m (+)
4.2m : B = 5.4m (+)	4.9 m : B = 5.3 m (+)
4.6m : B = 5.3m (+)	5.3 m : B = 5.2 m (+)
5.0m : B = 5.2m (+)	5.7 m : B = 5.2 m (+)
5.4m : B = 5.2m (+)	6.1 m : B = 5.1 m (+)
5.8m : B = 5.1m (+)	6.5 m : B = 5.0 m (+)
6.2m : B = 5.0m (+)	6.9 m : B = 4.9 m (+)
6.6m : B = 4.9m (+)	7.3 m : B = 4.8 m (+)
7.0m : B = 4.8m (+)	7.7 m : B = 4.7 m (+)
7.4m : B = 4.7m (+)	8.1 m : B = 4.6 m (+)
7.8m : B = 4.7m (+)	8.5 m : B = 4.6 m
8.2m : B = 4.6m (+)	8.9 m : B = 4.6 m
8.5m : B = 4.6m (+)	9.3 m : B = 4.6 m
8.8m : B = 4.6m (+)	9.7 m : B = 4.6 m (+)
9.1m : B = 4.6m	10.1 m : B = 4.7 m (+)
9.4m : B = 4.6m (+)	10.5 m : B = 4.8 m (+)
9.7m : B = 4.6m (+)	10.9 m : B = 4.9 m (+)
10.0m : B = 4.7m (+)	11.3 m : B = 4.9 m (+)
10.3m : B = 4.7m (+)	11.7 m : B = 5.0 m (+)
10.6m : B = 4.8m (+)	12.1 m : B = 5.0 m (+)
10.9m : B = 4.9m (+)	12.5 m : B = 5.0 m (+)
11.2m : B = 4.9m (+)	12.9 m : B = 5.0 m (+)
11.5m : B = 5.0m (+)	13.3 m : B = 5.0 m (+)
11.8m : B = 5.0m (+)	13.7 m : B = 5.0 m (+)
12.1m : B = 5.0m (+)	14.1 m : B = 5.1 m (+)
12.4m : B = 5.0m (+)	14.6 m : B = 5.9 m (+)
12.7m : B = 5.0m (+)	15.0 m : B = 7.3 m (+)
13.0m : B = 5.0m (+)	15.6 m : B = 8.7 m (+)
13.3m : B = 5.0m (+)	16.1 m : B = 10.0 m (+)
13.6m : B = 5.1m (+)	16.5 m : B = 11.3 m (+)
13.9m : B = 5.1m (+)	17.1 m : B = 12.6 m (+)
14.2m : B = 5.1m (+)	17.5 m : B = 13.9 m (+)
14.5m : B = 5.2m (+)	18.0 m : B = 15.2 m (+)
14.8m : B = 5.2m (+)	18.3 m : B = 15.8 m (+)
15.1m : B = 5.3m (+)	
15.4m : B = 5.3m (+)	
15.7m : B = 5.4m (+)	
16.0m : B = 5.5m (+)	
16.3m : B = 5.6m (+)	
16.6m : B = 5.7m (+)	
16.9m : B = 5.9m (+)	
17.2m : B = 6.0m (+)	
17.5m : B = 6.4m (+)	
17.8m : B = 7.0m (+)	
18.1m : B = 7.6m (+)	
18.4m : B = 8.9m (+)	
18.7m : B = 9.5m (+)	

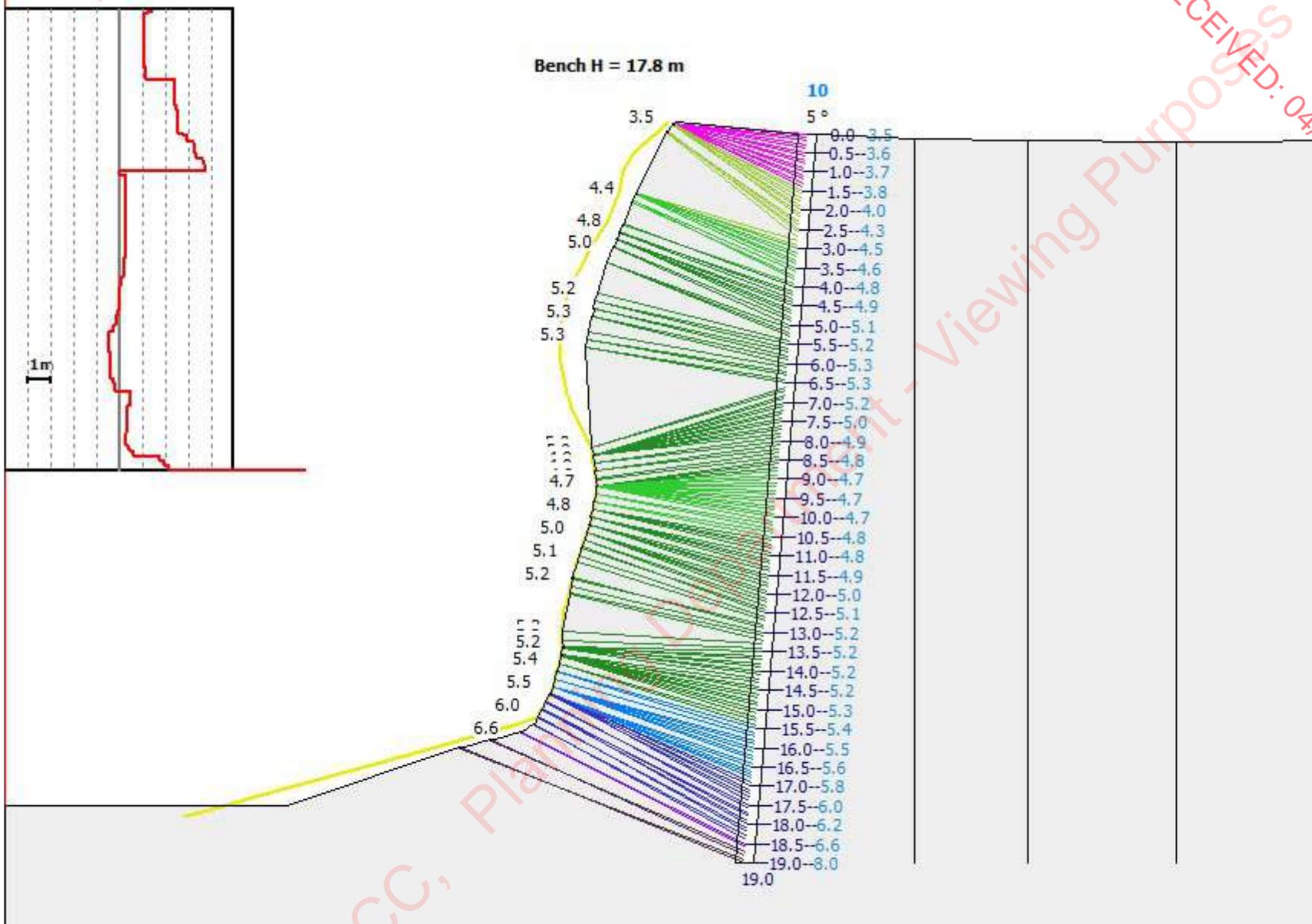
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Date	09/07/2024

Comments:
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Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	10

Minimum profile I



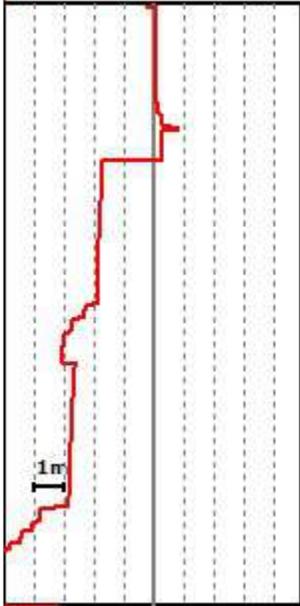
Hole 10	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.5m (-)	0.1 m : B = 3.6 m (-)
0.6m : B = 3.6m (-)	0.3 m : B = 3.8 m
0.9m : B = 3.6m (-)	0.7 m : B = 4.3 m
1.2m : B = 3.7m (-)	1.1 m : B = 4.5 m
1.5m : B = 3.8m	1.6 m : B = 4.7 m (+)
1.8m : B = 3.9m	2.0 m : B = 4.7 m (+)
2.2m : B = 4.1m	2.4 m : B = 4.8 m (+)
2.6m : B = 4.3m	2.8 m : B = 5.0 m (+)
3.0m : B = 4.5m	3.2 m : B = 5.2 m (+)
3.4m : B = 4.6m	3.6 m : B = 5.4 m (+)
3.8m : B = 4.7m (+)	4.0 m : B = 5.6 m (+)
4.2m : B = 4.8m (+)	4.5 m : B = 5.8 m (+)
4.6m : B = 4.9m (+)	4.9 m : B = 5.9 m (+)
5.0m : B = 5.1m (+)	5.3 m : B = 5.9 m (+)
5.4m : B = 5.2m (+)	5.7 m : B = 5.9 m (+)
5.8m : B = 5.2m (+)	6.1 m : B = 5.9 m (+)
6.2m : B = 5.3m (+)	6.5 m : B = 5.8 m (+)
6.6m : B = 5.3m (+)	6.9 m : B = 5.7 m (+)
7.0m : B = 5.2m (+)	7.3 m : B = 5.6 m (+)
7.4m : B = 5.1m (+)	7.7 m : B = 5.5 m (+)
7.8m : B = 5.0m (+)	8.0 m : B = 5.2 m (+)
8.2m : B = 4.9m (+)	8.4 m : B = 5.0 m (+)
8.5m : B = 4.8m (+)	8.8 m : B = 4.8 m (+)
8.8m : B = 4.8m (+)	9.2 m : B = 4.7 m (+)
9.1m : B = 4.7m (+)	9.6 m : B = 4.6 m (+)
9.4m : B = 4.7m (+)	10.0 m : B = 4.7 m (+)
9.7m : B = 4.7m (+)	10.4 m : B = 4.7 m (+)
10.0m : B = 4.7m (+)	10.8 m : B = 4.8 m (+)
10.3m : B = 4.7m (+)	11.2 m : B = 4.9 m (+)
10.6m : B = 4.8m (+)	11.6 m : B = 5.0 m (+)
10.9m : B = 4.8m (+)	12.0 m : B = 5.1 m (+)
11.2m : B = 4.8m (+)	12.4 m : B = 5.1 m (+)
11.5m : B = 4.9m (+)	12.8 m : B = 5.2 m (+)
11.8m : B = 5.0m (+)	13.2 m : B = 5.2 m (+)
12.1m : B = 5.0m (+)	13.6 m : B = 5.2 m (+)
12.4m : B = 5.1m (+)	14.0 m : B = 5.2 m (+)
12.7m : B = 5.2m (+)	14.4 m : B = 5.3 m (+)
13.0m : B = 5.2m (+)	14.9 m : B = 5.3 m (+)
13.3m : B = 5.2m (+)	15.3 m : B = 5.5 m (+)
13.6m : B = 5.2m (+)	15.7 m : B = 5.7 m (+)
13.9m : B = 5.2m (+)	16.2 m : B = 7.0 m (+)
14.2m : B = 5.2m (+)	16.7 m : B = 8.4 m (+)
14.5m : B = 5.2m (+)	17.3 m : B = 9.8 m (+)
14.8m : B = 5.3m (+)	17.8 m : B = 11.2 m (+)
15.1m : B = 5.3m (+)	18.3 m : B = 12.6 m (+)
15.4m : B = 5.4m (+)	18.8 m : B = 14.0 m (+)
15.7m : B = 5.5m (+)	
16.0m : B = 5.5m (+)	
16.3m : B = 5.6m (+)	
16.6m : B = 5.7m (+)	
16.9m : B = 5.7m (+)	
17.2m : B = 5.8m (+)	
17.5m : B = 6.0m (+)	
17.8m : B = 6.1m (+)	
18.1m : B = 6.2m (+)	
18.4m : B = 6.3m (+)	
18.7m : B = 7.3m (+)	
19.0m : B = 8.0m (+)	

Author	John Delaney	Comments: ->
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Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	11

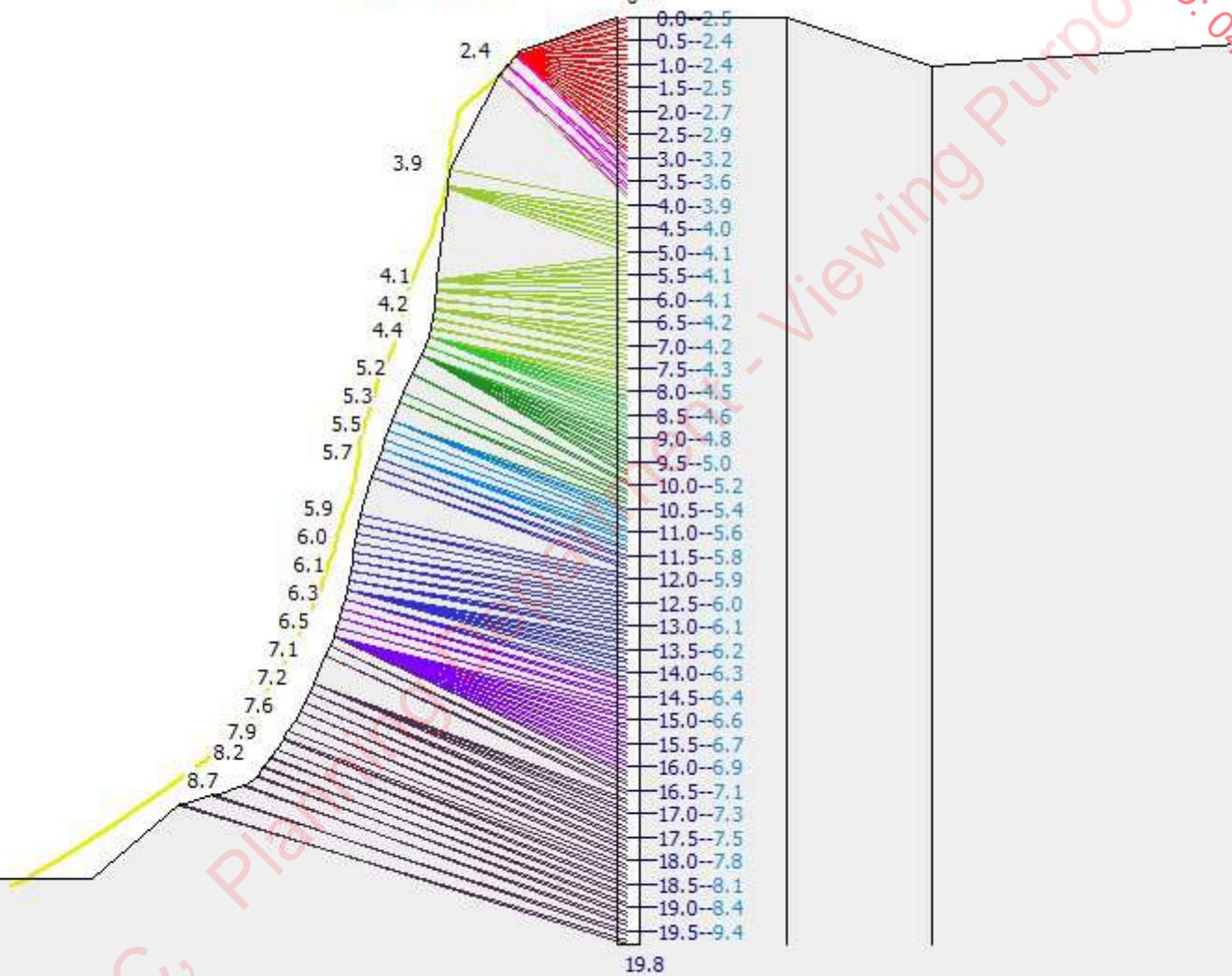
Minimum profile I



Bench H = 18.4 m

11

0°



Hole 11

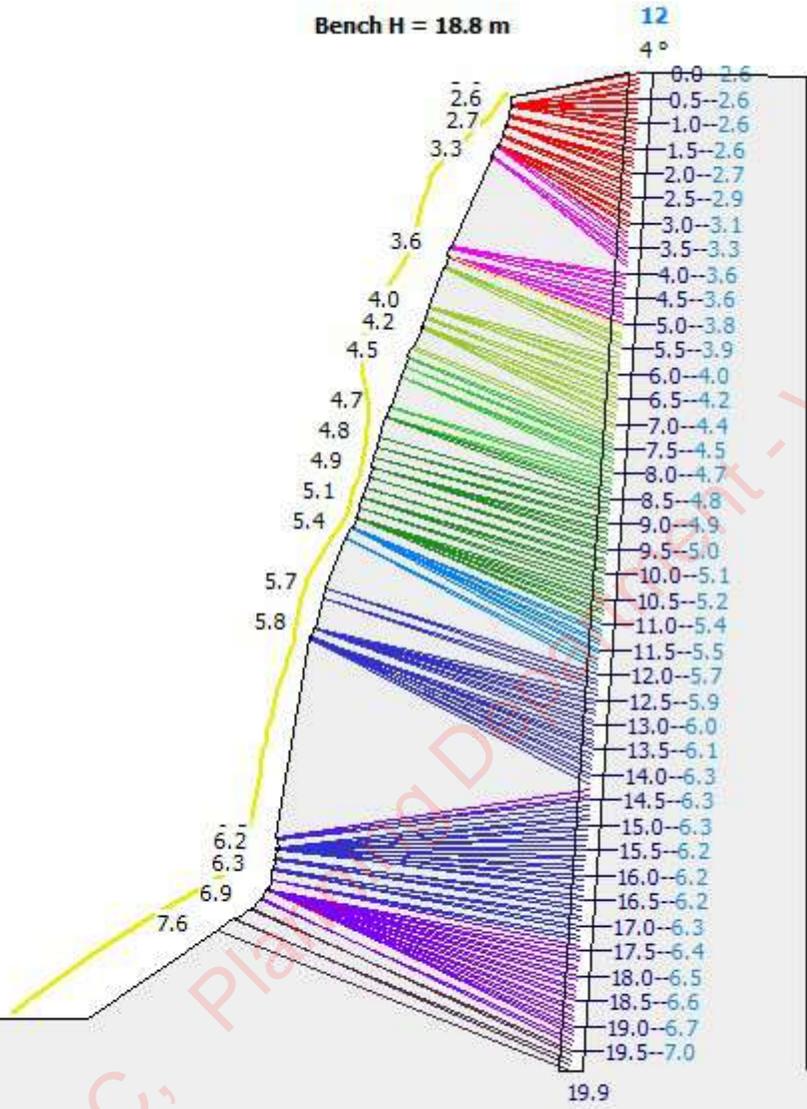
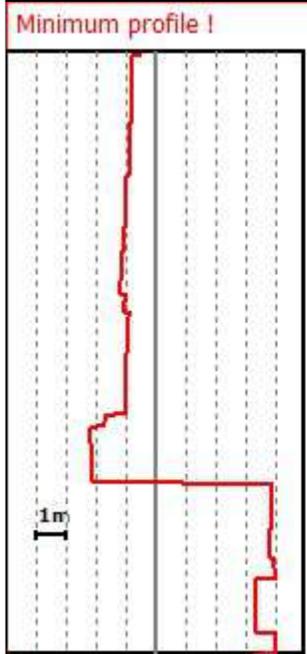
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.5m (-) !!!<	0.8 m : B = 2.3 m (-) !!! <
0.6m : B = 2.4m (-) !!!<	1.0 m : B = 2.5 m (-) !!! <
0.9m : B = 2.4m (-) !!!<	1.4 m : B = 2.9 m (-) !!! <
1.2m : B = 2.4m (-) !!!<	1.8 m : B = 3.4 m (-)
1.5m : B = 2.5m (-) !!!<	2.2 m : B = 3.6 m (-)
1.8m : B = 2.6m (-) !!!<	2.6 m : B = 3.7 m (-)
2.2m : B = 2.8m (-) !!!<	3.0 m : B = 3.8 m
2.6m : B = 3.0m (-) !!!<	3.4 m : B = 3.8 m
3.0m : B = 3.2m (-)	3.8 m : B = 3.9 m
3.4m : B = 3.5m (-)	4.2 m : B = 4.0 m
3.8m : B = 3.6m (-)	4.6 m : B = 4.1 m
4.2m : B = 3.9m (-)	5.0 m : B = 4.3 m
4.6m : B = 4.0m	5.4 m : B = 4.5 m
5.0m : B = 4.1m	5.8 m : B = 4.7 m (+)
5.4m : B = 4.1m	6.2 m : B = 4.8 m (+)
5.8m : B = 4.1m	6.6 m : B = 4.9 m (+)
6.2m : B = 4.1m	7.0 m : B = 5.0 m (+)
6.6m : B = 4.2m	7.4 m : B = 5.2 m (+)
7.0m : B = 4.2m	7.8 m : B = 5.3 m (+)
7.4m : B = 4.3m	8.2 m : B = 5.5 m (+)
7.8m : B = 4.4m	8.6 m : B = 5.6 m (+)
8.2m : B = 4.5m	9.0 m : B = 5.7 m (+)
8.5m : B = 4.6m	9.4 m : B = 5.7 m (+)
8.8m : B = 4.7m (+)	9.8 m : B = 5.8 m (+)
9.1m : B = 4.8m (+)	10.2 m : B = 5.9 m (+)
9.4m : B = 4.9m (+)	10.6 m : B = 6.0 m (+)
9.7m : B = 5.1m (+)	11.0 m : B = 6.2 m (+)
10.0m : B = 5.2m (+)	11.4 m : B = 6.3 m (+)
10.3m : B = 5.3m (+)	11.8 m : B = 6.4 m (+)
10.6m : B = 5.5m (+)	12.2 m : B = 6.6 m (+)
10.9m : B = 5.6m (+)	12.6 m : B = 6.8 m (+)
11.2m : B = 5.7m (+)	13.0 m : B = 6.9 m (+)
11.5m : B = 5.8m (+)	13.4 m : B = 7.1 m (+)
11.8m : B = 5.9m (+)	13.8 m : B = 7.4 m (+)
12.1m : B = 5.9m (+)	14.2 m : B = 7.6 m (+)
12.4m : B = 6.0m (+)	14.6 m : B = 7.9 m (+)
12.7m : B = 6.0m (+)	15.0 m : B = 8.1 m (+)
13.0m : B = 6.1m (+)	15.4 m : B = 8.4 m (+)
13.3m : B = 6.1m (+)	15.8 m : B = 9.0 m (+)
13.6m : B = 6.2m (+)	16.2 m : B = 9.5 m (+)
13.9m : B = 6.3m (+)	16.6 m : B = 10.1 m (+)
14.2m : B = 6.4m (+)	17.0 m : B = 10.7 m (+)
14.5m : B = 6.4m (+)	17.4 m : B = 11.3 m (+)
14.8m : B = 6.5m (+)	17.8 m : B = 11.9 m (+)
15.1m : B = 6.6m (+)	18.2 m : B = 12.6 m (+)
15.4m : B = 6.7m (+)	18.6 m : B = 13.2 m (+)
15.7m : B = 6.8m (+)	
16.0m : B = 6.9m (+)	
16.3m : B = 7.0m (+)	
16.6m : B = 7.2m (+)	
16.9m : B = 7.3m (+)	
17.2m : B = 7.4m (+)	
17.5m : B = 7.5m (+)	
17.8m : B = 7.7m (+)	
18.1m : B = 7.9m (+)	
18.4m : B = 8.0m (+)	
18.7m : B = 8.2m (+)	
19.0m : B = 8.4m (+)	
19.3m : B = 8.7m (+)	
19.6m : B = 9.4m (+)	
19.9m : B = 10.1m (+)	

Author	John Delaney
Date	09/07/2024

Comments:
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Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	12



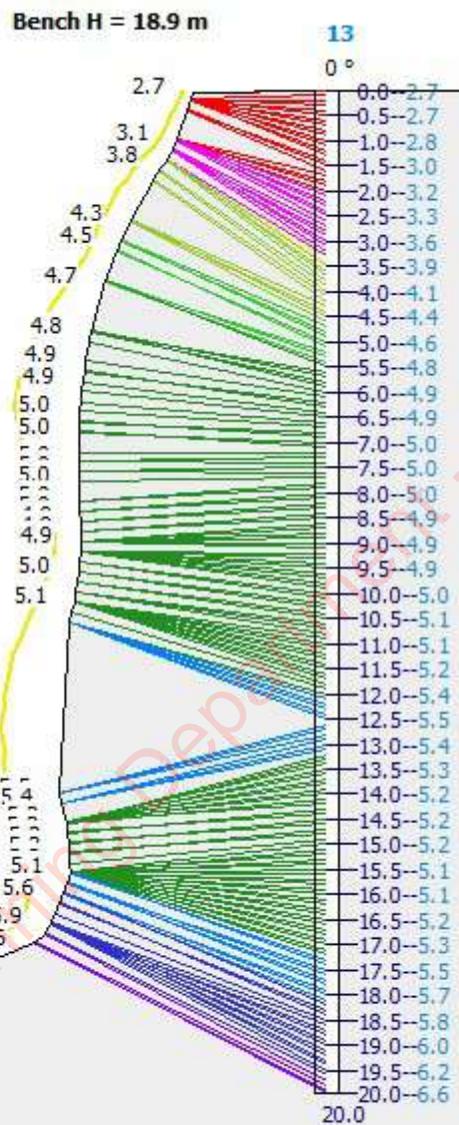
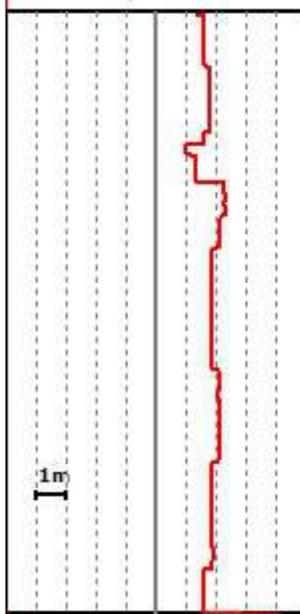
Hole 12	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.6m (-) !!!<	0.6 m : B = 2.6 m (-) !!! <
0.6m : B = 2.6m (-) !!!<	0.8 m : B = 2.8 m (-) !!! <
0.9m : B = 2.6m (-) !!!<	1.3 m : B = 3.1 m (-) !!! <
1.2m : B = 2.6m (-) !!!<	1.7 m : B = 3.5 m (-)
1.5m : B = 2.6m (-) !!!<	2.1 m : B = 3.9 m
1.8m : B = 2.7m (-) !!!<	2.5 m : B = 4.0 m
2.2m : B = 2.8m (-) !!!<	3.0 m : B = 4.1 m
2.6m : B = 2.9m (-) !!!<	3.4 m : B = 4.2 m
3.0m : B = 3.1m (-) !!!<	3.8 m : B = 4.3 m
3.4m : B = 3.3m (-)	4.2 m : B = 4.5 m
3.8m : B = 3.5m (-)	4.6 m : B = 4.7 m (+)
4.2m : B = 3.6m (-)	5.0 m : B = 5.0 m (+)
4.6m : B = 3.7m (-)	5.4 m : B = 5.1 m (+)
5.0m : B = 3.8m (-)	5.8 m : B = 5.1 m (+)
5.4m : B = 3.9m	6.2 m : B = 5.1 m (+)
5.8m : B = 4.0m	6.6 m : B = 5.0 m (+)
6.2m : B = 4.1m	7.0 m : B = 4.9 m (+)
6.6m : B = 4.2m	7.4 m : B = 4.9 m (+)
7.0m : B = 4.4m	7.8 m : B = 4.9 m (+)
7.4m : B = 4.5m	8.2 m : B = 5.0 m (+)
7.8m : B = 4.6m	8.6 m : B = 5.1 m (+)
8.2m : B = 4.7m (+)	9.0 m : B = 5.2 m (+)
8.5m : B = 4.8m (+)	9.4 m : B = 5.3 m (+)
8.8m : B = 4.9m (+)	9.9 m : B = 5.6 m (+)
9.1m : B = 4.9m (+)	10.3 m : B = 5.8 m (+)
9.4m : B = 5.0m (+)	10.7 m : B = 5.9 m (+)
9.7m : B = 5.0m (+)	11.1 m : B = 6.0 m (+)
10.0m : B = 5.1m (+)	11.5 m : B = 6.1 m (+)
10.3m : B = 5.2m (+)	11.9 m : B = 6.1 m (+)
10.6m : B = 5.3m (+)	12.3 m : B = 6.2 m (+)
10.9m : B = 5.3m (+)	12.7 m : B = 6.3 m (+)
11.2m : B = 5.4m (+)	13.1 m : B = 6.4 m (+)
11.5m : B = 5.5m (+)	13.5 m : B = 6.5 m (+)
11.8m : B = 5.7m (+)	13.9 m : B = 6.5 m (+)
12.1m : B = 5.8m (+)	14.3 m : B = 6.6 m (+)
12.4m : B = 5.8m (+)	14.7 m : B = 6.6 m (+)
12.7m : B = 5.9m (+)	15.1 m : B = 6.7 m (+)
13.0m : B = 6.0m (+)	15.5 m : B = 6.7 m (+)
13.3m : B = 6.0m (+)	16.0 m : B = 6.8 m (+)
13.6m : B = 6.1m (+)	16.4 m : B = 7.0 m (+)
13.9m : B = 6.2m (+)	16.8 m : B = 7.7 m (+)
14.2m : B = 6.3m (+)	17.3 m : B = 8.4 m (+)
14.5m : B = 6.3m (+)	17.7 m : B = 9.0 m (+)
14.8m : B = 6.3m (+)	18.1 m : B = 9.6 m (+)
15.1m : B = 6.3m (+)	18.6 m : B = 10.1 m (+)
15.4m : B = 6.2m (+)	19.0 m : B = 10.6 m (+)
15.7m : B = 6.2m (+)	19.5 m : B = 11.2 m (+)
16.0m : B = 6.2m (+)	
16.3m : B = 6.2m (+)	
16.6m : B = 6.3m (+)	
16.9m : B = 6.3m (+)	
17.2m : B = 6.3m (+)	
17.5m : B = 6.4m (+)	
17.8m : B = 6.4m (+)	
18.1m : B = 6.5m (+)	
18.4m : B = 6.6m (+)	
18.7m : B = 6.6m (+)	
19.0m : B = 6.7m (+)	
19.3m : B = 6.9m (+)	
19.6m : B = 7.1m (+)	
19.9m : B = 7.6m (+)	

Author	John Delaney	Comments: ->
Date	09/07/2024	



Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	13

Minimum profile !



Hole 13	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.7m (-) !!!<	0.0 m : B = 2.8 m (-) !!! <
0.6m : B = 2.8m (-) !!!<	0.4 m : B = 3.0 m (-) !!! <
0.9m : B = 2.8m (-) !!!<	0.8 m : B = 3.2 m (-)
1.2m : B = 2.9m (-) !!!<	1.2 m : B = 3.5 m (-)
1.5m : B = 3.0m (-) !!!<	1.6 m : B = 3.8 m
1.8m : B = 3.1m (-) !!!<	2.0 m : B = 4.1 m
2.2m : B = 3.2m (-)	2.4 m : B = 4.4 m
2.6m : B = 3.4m (-)	2.8 m : B = 4.5 m
3.0m : B = 3.6m (-)	3.2 m : B = 4.7 m (+)
3.4m : B = 3.8m (-)	3.6 m : B = 5.0 m (+)
3.8m : B = 4.0m (-)	4.0 m : B = 5.2 m (+)
4.2m : B = 4.3m (-)	4.4 m : B = 5.5 m (+)
4.6m : B = 4.4m	4.8 m : B = 5.7 m (+)
5.0m : B = 4.6m	5.2 m : B = 5.9 m (+)
5.4m : B = 4.7m (+)	5.6 m : B = 6.0 m (+)
5.8m : B = 4.8m (+)	6.0 m : B = 6.1 m (+)
6.2m : B = 4.9m (+)	6.4 m : B = 6.2 m (+)
6.6m : B = 5.0m (+)	6.8 m : B = 6.1 m (+)
7.0m : B = 5.0m (+)	7.2 m : B = 6.0 m (+)
7.4m : B = 5.0m (+)	7.6 m : B = 5.8 m (+)
7.8m : B = 5.0m (+)	8.0 m : B = 5.6 m (+)
8.2m : B = 5.0m (+)	8.4 m : B = 5.5 m (+)
8.5m : B = 4.9m (+)	8.8 m : B = 5.4 m (+)
8.8m : B = 4.9m (+)	9.2 m : B = 5.4 m (+)
9.1m : B = 4.9m (+)	9.6 m : B = 5.6 m (+)
9.4m : B = 4.9m (+)	10.0 m : B = 5.7 m (+)
9.7m : B = 4.9m (+)	10.4 m : B = 5.9 m (+)
10.0m : B = 5.0m (+)	10.8 m : B = 6.0 m (+)
10.3m : B = 5.0m (+)	11.2 m : B = 6.2 m (+)
10.6m : B = 5.1m (+)	11.6 m : B = 6.3 m (+)
10.9m : B = 5.1m (+)	12.0 m : B = 6.4 m (+)
11.2m : B = 5.2m (+)	12.4 m : B = 6.4 m (+)
11.5m : B = 5.2m (+)	12.8 m : B = 6.4 m (+)
11.8m : B = 5.3m (+)	13.2 m : B = 6.4 m (+)
12.1m : B = 5.4m (+)	13.6 m : B = 6.4 m (+)
12.4m : B = 5.5m (+)	14.0 m : B = 6.3 m (+)
12.7m : B = 5.5m (+)	14.4 m : B = 6.2 m (+)
13.0m : B = 5.4m (+)	14.8 m : B = 6.0 m (+)
13.3m : B = 5.4m (+)	15.2 m : B = 5.9 m (+)
13.6m : B = 5.3m (+)	15.6 m : B = 5.8 m (+)
13.9m : B = 5.3m (+)	16.0 m : B = 5.9 m (+)
14.2m : B = 5.2m (+)	16.4 m : B = 6.0 m (+)
14.5m : B = 5.2m (+)	16.8 m : B = 6.5 m (+)
14.8m : B = 5.2m (+)	17.2 m : B = 7.3 m (+)
15.1m : B = 5.2m (+)	17.6 m : B = 8.1 m (+)
15.4m : B = 5.1m (+)	18.0 m : B = 8.9 m (+)
15.7m : B = 5.1m (+)	18.4 m : B = 9.7 m (+)
16.0m : B = 5.2m (+)	18.8 m : B = 10.5 m (+)
16.3m : B = 5.2m (+)	19.0 m : B = 10.9 m (+)
16.6m : B = 5.2m (+)	
16.9m : B = 5.3m (+)	
17.2m : B = 5.4m (+)	
17.5m : B = 5.5m (+)	
17.8m : B = 5.6m (+)	
18.1m : B = 5.7m (+)	
18.4m : B = 5.8m (+)	
18.7m : B = 5.9m (+)	
19.0m : B = 6.0m (+)	
19.3m : B = 6.2m (+)	
19.6m : B = 6.3m (+)	
19.9m : B = 6.6m (+)	

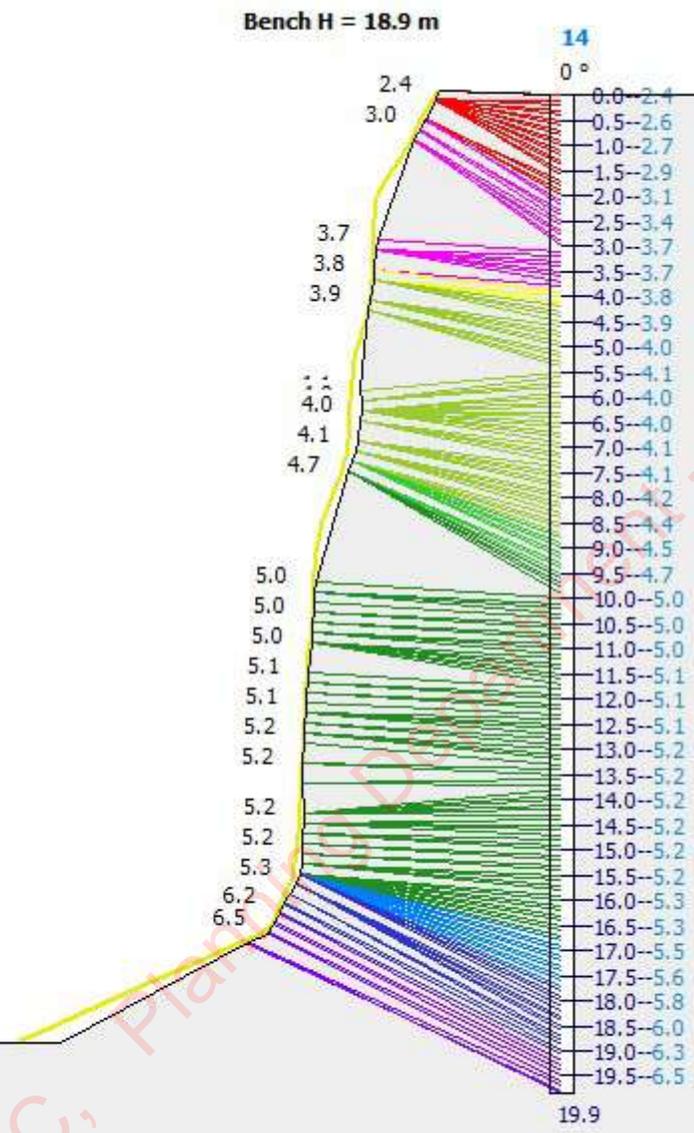
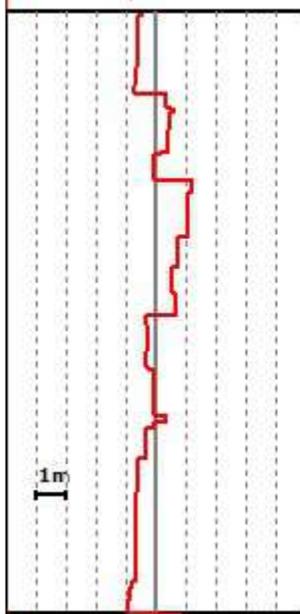
Author	John Delaney
Date	09/07/2024

Comments:
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Blast plan	0107.ext		
Site	Kilsaran Gallstown	Hole	14

Minimum profile I



Hole 14	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.5m (-) !!!<<	-0.1 m : B = 2.4 m (-) !!!
0.6m : B = 2.6m (-) !!!<<	0.3 m : B = 2.7 m (-) !!! <
0.9m : B = 2.7m (-) !!!<<	0.7 m : B = 2.9 m (-) !!! <
1.2m : B = 2.8m (-) !!!<<	1.1 m : B = 3.1 m (-) !!! <
1.5m : B = 2.9m (-) !!!<<	1.5 m : B = 3.4 m (-)
1.8m : B = 3.0m (-) !!!<<	1.9 m : B = 3.6 m (-)
2.2m : B = 3.2m (-)	2.3 m : B = 3.7 m (-)
2.6m : B = 3.4m (-)	2.7 m : B = 3.7 m (-)
3.0m : B = 3.7m (-)	3.1 m : B = 3.7 m (-)
3.4m : B = 3.7m (-)	3.5 m : B = 3.7 m (-)
3.8m : B = 3.6m (-)	3.9 m : B = 3.8 m (-)
4.2m : B = 3.8m	4.3 m : B = 3.8 m
4.6m : B = 3.9m	4.7 m : B = 3.9 m
5.0m : B = 4.0m	5.1 m : B = 4.1 m
5.4m : B = 4.0m	5.5 m : B = 4.1 m
5.8m : B = 4.0m	5.9 m : B = 4.2 m
6.2m : B = 4.0m	6.3 m : B = 4.2 m
6.6m : B = 4.0m	6.7 m : B = 4.2 m
7.0m : B = 4.1m	7.1 m : B = 4.3 m
7.4m : B = 4.1m	7.5 m : B = 4.4 m
7.8m : B = 4.2m	7.9 m : B = 4.5 m
8.2m : B = 4.3m	8.3 m : B = 4.7 m (+)
8.5m : B = 4.4m	8.7 m : B = 4.8 m (+)
8.8m : B = 4.5m	9.1 m : B = 4.9 m (+)
9.1m : B = 4.6m	9.5 m : B = 4.9 m (+)
9.4m : B = 4.7m (+)	9.9 m : B = 4.9 m (+)
9.7m : B = 4.8m (+)	10.3 m : B = 4.9 m (+)
10.0m : B = 5.0m (+)	10.7 m : B = 5.0 m (+)
10.3m : B = 5.0m (+)	11.1 m : B = 5.0 m (+)
10.6m : B = 5.0m (+)	11.5 m : B = 5.0 m (+)
10.9m : B = 5.0m (+)	11.9 m : B = 5.1 m (+)
11.2m : B = 5.0m (+)	12.3 m : B = 5.1 m (+)
11.5m : B = 5.1m (+)	12.7 m : B = 5.1 m (+)
11.8m : B = 5.1m (+)	13.1 m : B = 5.1 m (+)
12.1m : B = 5.1m (+)	13.5 m : B = 5.2 m (+)
12.4m : B = 5.1m (+)	13.9 m : B = 5.2 m (+)
12.7m : B = 5.2m (+)	14.3 m : B = 5.2 m (+)
13.0m : B = 5.2m (+)	14.7 m : B = 5.2 m (+)
13.3m : B = 5.2m (+)	15.1 m : B = 5.3 m (+)
13.6m : B = 5.2m (+)	15.5 m : B = 5.3 m (+)
13.9m : B = 5.2m (+)	15.9 m : B = 5.5 m (+)
14.2m : B = 5.2m (+)	16.3 m : B = 5.7 m (+)
14.5m : B = 5.2m (+)	16.7 m : B = 6.0 m (+)
14.8m : B = 5.2m (+)	17.1 m : B = 6.9 m (+)
15.1m : B = 5.2m (+)	17.5 m : B = 7.8 m (+)
15.4m : B = 5.2m (+)	17.9 m : B = 8.7 m (+)
15.7m : B = 5.2m (+)	18.3 m : B = 9.6 m (+)
16.0m : B = 5.3m (+)	18.7 m : B = 10.5 m (+)
16.3m : B = 5.3m (+)	
16.6m : B = 5.4m (+)	
16.9m : B = 5.4m (+)	
17.2m : B = 5.5m (+)	
17.5m : B = 5.6m (+)	
17.8m : B = 5.7m (+)	
18.1m : B = 5.9m (+)	
18.4m : B = 6.0m (+)	
18.7m : B = 6.1m (+)	
19.0m : B = 6.3m (+)	
19.3m : B = 6.4m (+)	
19.6m : B = 6.6m (+)	
19.9m : B = 7.0m (+)	

Author	John Delaney
Date	09/07/2024

Comments:
->





KEMEK LIMITED: Blast Summary Report



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Blast Area: **Bench 1**

Date: **10/07/24**

BLASTING PARAMETERS

Number of Holes (#):	46	Hole Diameter (mm)	110	Average Depth (m):	5.01
Burden (m):	3.00	Spacing (m):	3.50	Proposed Floor Level (m):	110.00
Subgrade Drill (m):	1.00	Estimated Rock Density (t/m ³):	2.70	Estimated Blast Tonnage (t):	5,232
Blast Ratio (t/kg):	4.46	Initiation Type:	Non-electric	Proposed Loading Rate (kg/m):	10.00
Planned M.I.C (kgs)	50	Actual M.I.C (kgs):	50	Total Explosive Charge (kg):	1,173

EXPLOSIVES ORDER INFORMATION

		Quantity			Quantity
Explosives:	Kemex 70	1,173	Detonators:	U500 x 7.8m	94
				SL 17ms x 7.8m	2
				SL 25ms x 7.8m	10
Boosters:	Booster 250g	0		SL 67ms x 7.8m	38
	Booster 420g	47		Starter Line 100.0m	2
Accessories:	Hole Plug	40			

COMMENTS

Face inspection complete, all blast holes measured and profiles were consulted before charging commenced.
Note: This blast was fired subsequent to the blasts in the Sump and on Bench 4 with approx. 5 seconds delay.
Blast Fired at approx 14:51:36 on 10/07/2024

APPROVAL SIGNATURES

Pre-Drill Survey: **Yes** BHS: **Yes** Shotfiring: **Yes** R.O.B.I.S.: **Yes** Vibrographs: **1**

Explosives Supervisor:  Shotfirer: **Scott Penny** Trainee Shotfirer: **Luke O' Brien**



KEMEK LIMITED: Borehole Instruction / Survey Report



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024

Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth	
	Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted
1	5.1	5.0	13°	13°	16°	16°	21	4.0	4.0	5°	5°	16°	16°	41	4.1	4.1	0°	0°	0°	0°
2	4.8	5.0	5°	5°	15°	15°	22	4.2	4.2	5°	5°	16°	16°	42	4.6	4.6	0°	0°	0°	0°
3	4.9	5.0	6°	6°	14°	14°	23	4.4	4.4	5°	5°	16°	16°	43	5.1	5.1	0°	0°	0°	0°
4	4.6	5.0	10°	10°	16°	16°	24	4.1	4.1	0°	0°	0°	0°	44	5.6	5.6	0°	0°	0°	0°
5	4.6	5.0	0°	0°	0°	0°	25	4.0	4.0	0°	0°	0°	0°	45	5.9	5.9	0°	0°	0°	0°
6	4.8	5.0	0°	0°	0°	0°	26	4.2	4.2	0°	0°	0°	0°	46	5.4	5.4	0°	0°	0°	0°
7	5.3	5.5	0°	0°	0°	0°	27	4.6	4.6	0°	0°	0°	0°	47	4.9	4.9	0°	0°	0°	0°
8	5.7	5.8	0°	0°	0°	0°	28	5.0	5.0	0°	0°	0°	0°	48	4.5	4.5	0°	0°	0°	0°
9	6.1	6.0	0°	0°	0°	0°	29	5.4	5.4	0°	0°	0°	0°	49	4.1	4.1	0°	0°	0°	0°
10	6.7	7.2	0°	0°	0°	0°	30	6.0	6.0	0°	0°	0°	0°	50	3.7	3.7	0°	0°	0°	0°
11	6.8	7.2	0°	0°	0°	0°	31	6.6	6.6	0°	0°	0°	0°	51	3.5	3.5	0°	0°	0°	0°
12	7.2	7.5	0°	0°	0°	0°	32	6.5	6.5	0°	0°	0°	0°	52	4.0	4.0	0°	0°	0°	0°
13	6.7	6.7	0°	0°	0°	0°	33	6.2	6.2	0°	0°	0°	0°	53	4.3	4.3	0°	0°	0°	0°
14	6.5	6.5	0°	0°	0°	0°	34	5.8	5.8	0°	0°	0°	0°	54	4.8	4.8	0°	0°	0°	0°
15	6.0	6.0	0°	0°	0°	0°	35	5.2	5.2	0°	0°	0°	0°	55	5.3	5.3	0°	0°	0°	0°
16	5.4	5.7	0°	0°	0°	0°	36	4.8	4.8	0°	0°	0°	0°	56	-	-	-	-	-	-
17	5.0	5.0	0°	0°	0°	0°	37	4.3	4.3	0°	0°	0°	0°	57	-	-	-	-	-	-
18	4.7	4.8	0°	0°	0°	0°	38	4.1	4.1	0°	0°	0°	0°	58	-	-	-	-	-	-
19	4.3	4.8	0°	0°	0°	0°	39	3.9	3.9	0°	0°	0°	0°	59	-	-	-	-	-	-
20	4.3	4.8	0°	0°	0°	0°	40	3.8	3.8	0°	0°	0°	0°	60	-	-	-	-	-	-
Comments:			HOLE DIAMETER (mm):				110	Total Design Drill Metres (m)					275.6							



KEMEK LIMITED: Charging Specification



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **10/07/2024**

Single Deck Holes	Single Deck Holes
Hole Numbers: <input type="text" value="All Holes"/>	Hole Numbers: <input type="text"/>
 <p>3.50 m < Top stemming</p> <p>8 to 50 Kg of Kemex 70... (+/- 10 %)</p> <p>Booster 420g x1 U500 x 7.8m x2</p>	 <p><input type="text"/> m < Top stemming</p> <p>Booster 250g x1 SL 17ms x 7.8m x1</p> <p><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <p>Booster 420g x1 U500 x 7.8m x1</p>

Single Deck Holes	Single Deck Holes
Hole Numbers: <input type="text"/>	Hole Numbers: <input type="text"/>
 <p><input type="text"/> m < Top stemming</p> <p>0 x1 U500 x 7.8m x1</p> <p><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <p>Booster 420g x1 SL 17ms x 7.8m x1</p>	 <p><input type="text"/> m < Top stemming</p> <p>0 x1 U500 x 7.8m x1</p> <p><input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)</p> <p>Booster 420g x1 SL 17ms x 7.8m x1</p>

Louth CC, Planning Department - Viewing Purposes Only!



KEMEK LIMITED: Quarry Face Inspection Image



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

10/07/24

RECEIVED FOR Viewing Purposes Only!
04/12/2024

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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Comments:-

See image above highlighting front row blast holes.

Louth CC, Planning Department



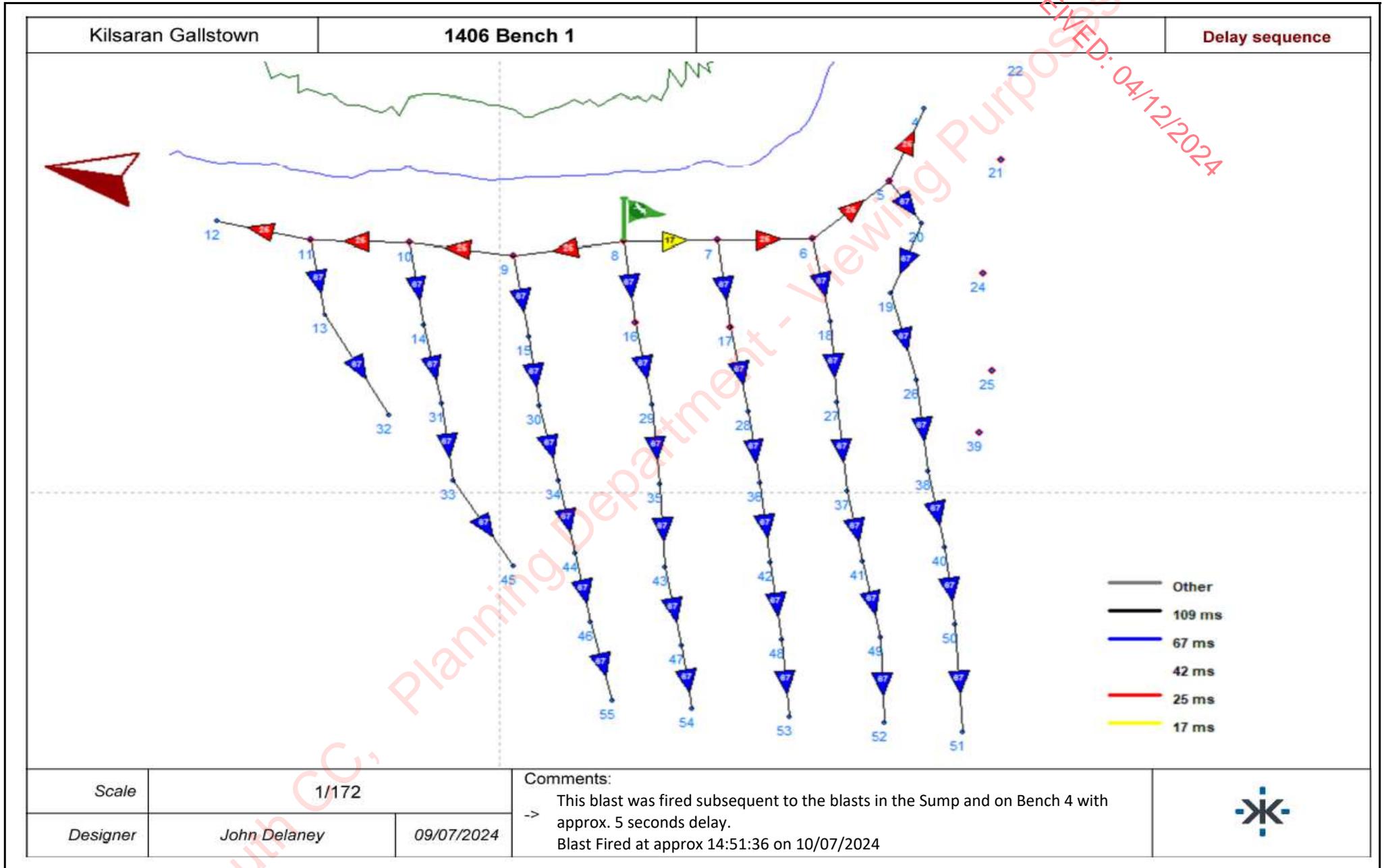
KEMEK LIMITED: Surface Connectors



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 10/07/2024





KEMEK LIMITED - Charge Record



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **10/07/24**

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)	(kgs)	
1	5.0							0	
2	5.0							0	
3	5.0							0	
4	5.0	20					3.5	20	
5	5.0	20					3.5	20	
6	5.0	25					3.5	25	
7	5.5	25					3.5	25	
8	5.8	30					3.5	30	
9	6.0	30					3.5	30	
10	7.2	40					3.5	40	
11	7.2	50					3.5	50	
12	7.5	50					3.5	50	
13	6.7	40					3.5	40	
14	6.5	35					3.5	35	
15	6.0	30					3.5	30	
16	5.7	25					3.5	25	
17	5.0	20					3.5	20	
18	4.8	17					3.5	17	
19	4.8	20					3.5	20	
20	4.8	20					3.5	20	
21	4.0							0	
22	4.2							0	
23	4.4							0	
24	4.1							0	
25	4.0							0	
26	4.2	15					3.5	15	
27	4.6	17					3.5	17	
28	5.0	20					3.5	20	
29	5.4	25					3.5	25	
30	6.0	30					3.5	30	
31	6.6	35					3.5	35	
32	6.5	35					3.5	35	
33	6.2	35					3.5	35	
34	5.8	30					3.5	30	
35	5.2	25					3.5	25	
36	4.8	25					3.5	25	
37	4.3	20					3.5	20	
38	4.1	15					3.5	15	
39	3.9							0	
40	3.8	12					3.5	12	
41	4.1	12					3.5	12	
42	4.6	25					3.5	25	
43	5.1	30					3.5	30	
44	5.6	35					3.5	35	
45	5.9	35					3.5	35	
46	5.4	35					3.5	35	
47	4.9	27					3.5	27	
48	4.5	22					3.5	22	
49	4.1	8					3.5	8	
50	3.7	8					3.5	8	
							Total:	1,073	



KEMEK LIMITED - Charge Record



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

10/07/24

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)	(kgs)	
51	3.5	5					3.5	5	
52	4.0	15					3.5	15	
53	4.3	20					3.5	20	
54	4.8	30					3.5	30	
55	5.3	30					3.5	30	
56	-							0	
57	-							0	
58	-							0	
59	-							0	
60	-							0	
61	-							0	
62	-							0	
63	-							0	
64	-							0	
65	-							0	
66	-							0	
67	-							0	
68	-							0	
69	-							0	
70	-							0	
71	-							0	
72	-							0	
73	-							0	
74	-							0	
75	-							0	
76	-							0	
77	-							0	
78	-							0	
79	-							0	
80	-							0	
81	-							0	
82	-							0	
83	-							0	
84	-							0	
85	-							0	
86	-							0	
87	-							0	
88	-							0	
89	-							0	
90	-							0	
91	-							0	
92	-							0	
93	-							0	
94	-							0	
95	-							0	
96	-							0	
97	-							0	
98	-							0	
99	-							0	
100	-							0	
Total:								1,173	

RECEIVED: 04/12/2024
Planning Department - Viewing Purposes Only



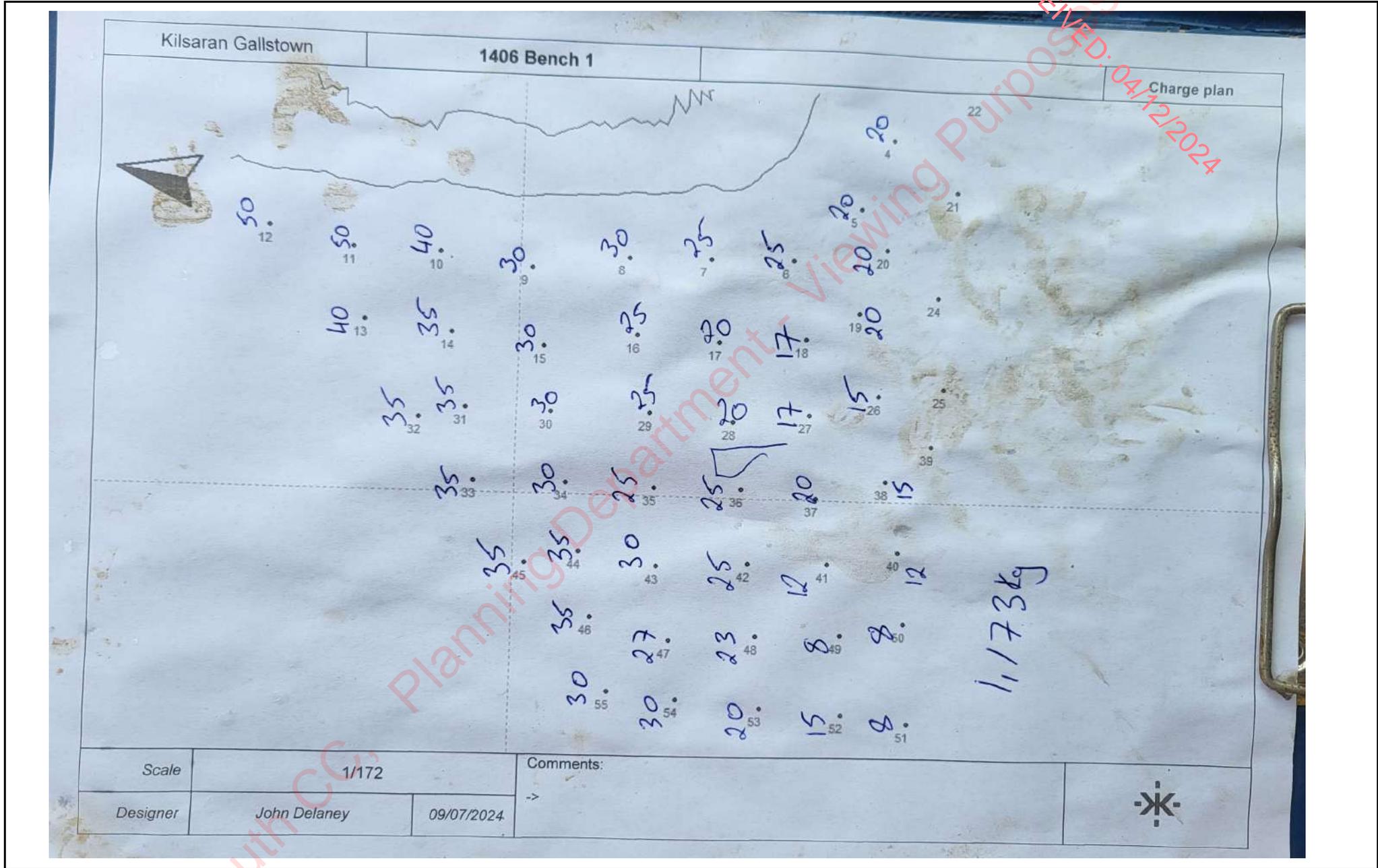
KEMEK LIMITED: Truck Charge Record (kgs)



Customer / Location:

Kilsaran Gaulstown, Co Louth

10/07/2024





KEMEK LIMITED: Blast Summary Report



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Blast Area: **2307 - Bench #4**

Date: **09/08/24**

BLASTING PARAMETERS

Number of Holes (#):	51	Hole Diameter (mm)	127	Average Depth (m):	20.08
Burden (m):	4.80	Spacing (m):	4.20	Proposed Floor Level (m):	63.00
Subgrade Drill (m):	1.00	Estimated Rock Density (t/m ³):	2.70	Estimated Blast Tonnage (t):	52,979
Blast Ratio (t/kg):	4.29	Initiation Type:	Non-electric	Proposed Loading Rate (kg/m):	18.00
Planned M.I.C (kgs)	290	Actual M.I.C (kgs):	280	Total Explosive Charge (kg):	12,352

EXPLOSIVES ORDER INFORMATION

		Quantity			Quantity
Explosives:	Kemex 70	12,352	Detonators:	U450 x 24.0m	51
				U475 x 7.8m	51
Boosters:	Booster 250g	51		SL 17ms x 7.8m	2
	Booster 420g	51		SL 25ms x 7.8m	13
				SL 67ms x 7.8m	38
Accessories:	Hole Plug				
	Harness Wire x 400m			Starter Line 100.0m	2

COMMENTS

Face inspection complete, all blast holes measured and profiles were consulted before charging commenced.

APPROVAL SIGNATURES

Pre-Drill Survey: **Yes** BHS: **Yes** Shotfiring: **Yes** R.O.B.I.S.: **Yes** Vibrographs: **1**

Explosives Supervisor: 

Shotfirer: 

Trainee Shotfirer: 



KEMEK LIMITED: Borehole Instruction / Survey Report



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 09/08/2024

Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth	
	Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted
1	20.6	20.3	13°	15°	333°	-	21	20.0	19.6	5°	-	333°	-	41	19.8	18.0	5°	-	333°	-
2	20.2	19.5	9°	11°	333°	-	22	20.2	19.7	9°	-	333°	-	42	19.9	18.0	5°	-	333°	-
3	20.3	20.0	12°	14°	333°	-	23	20.0	18.5	7°	-	333°	-	43	19.9	18.8	7°	-	333°	-
4	20.2	20.6	10°	15°	334°	-	24	20.1	0.1	8°	-	333°	-	44	19.9	19.7	7°	-	333°	-
5	20.2	19.4	9°	9°	333°	-	25	19.9	0.1	0°	-	0°	-	45	19.9	19.5	5°	-	333°	-
6	20.6	20.4	13°	13°	333°	-	26	19.9	0.5	0°	-	0°	-	46	19.9	19.5	5°	-	333°	-
7	21.2	20.7	20°	24°	333°	-	27	20.1	20.0	7°	-	333°	-	47	19.9	18.5	5°	-	333°	-
8	21.3	19.4	20°	24°	333°	-	28	20.1	20.0	7°	-	333°	-	48	20.0	19.5	5°	-	333°	-
9	20.3	18.7	9°	13°	333°	-	29	20.1	20.0	7°	-	333°	-	49	19.9	19.6	5°	-	333°	-
10	20.0	19.6	3°	5°	333°	-	30	20.0	18.7	5°	-	333°	-	50	19.9	19.6	5°	-	333°	-
11	20.1	20.0	7°	5°	333°	-	31	19.9	20.0	5°	-	333°	-	51	19.9	19.4	0°	-	0°	-
12	20.0	18.7	0°	0°	0°	-	32	19.9	20.0	5°	-	333°	-	52	-	-	-	-	-	-
13	19.9	19.6	0°	0°	0°	-	33	20.1	19.7	10°	-	333°	-	53	-	-	-	-	-	-
14	19.9	19.7	0°	0°	0°	-	34	20.2	19.8	10°	-	333°	-	54	-	-	-	-	-	-
15	19.9	19.7	0°	0°	0°	-	35	19.9	17.5	5°	-	333°	-	55	-	-	-	-	-	-
16	20.1	19.0	5°	-	335°	-	36	19.8	19.4	4°	-	333°	-	56	-	-	-	-	-	-
17	20.6	20.0	14°	-	334°	-	37	19.8	19.6	5°	-	333°	-	57	-	-	-	-	-	-
18	20.5	20.0	14°	-	333°	-	38	19.8	20.0	0°	-	0°	-	58	-	-	-	-	-	-
19	20.1	20.0	8°	-	333°	-	39	19.8	20.0	0°	-	0°	-	59	-	-	-	-	-	-
20	20.0	20.4	5°	-	333°	-	40	19.8	19.6	5°	-	333°	-	60	-	-	-	-	-	-
Comments:			HOLE DIAMETER (mm):				127	Total Design Drill Metres (m)					1024.3							



KEMEK LIMITED: Blast Location, Danger Zone, Sentry Points and Firing Position



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 09/08/2024



Key: Danger Zone: Blast Site: Sentrys: Firing Position: Direction of Throw: Floor Point: 63.000



KEMEK LIMITED: Charging Specification



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **09/08/2024**

Single Deck Holes	Single Deck Holes								
Hole Numbers: 1 to 51	Hole Numbers:								
									
<input type="text" value="4.00"/> m < Top stemming	<input type="text"/> m < Top stemming								
<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U475 x 7.8m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U475 x 7.8m	x1
Booster 250g	x1								
U475 x 7.8m	x1								
Booster 250g	x1								
U475 x 7.8m	x1								
<input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)	<input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)								
<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 420g	x1	U450 x 24.0m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 420g	x1	U450 x 24.0m	x1
Booster 420g	x1								
U450 x 24.0m	x1								
Booster 420g	x1								
U450 x 24.0m	x1								

Single Deck Holes	Single Deck Holes								
Hole Numbers:	Hole Numbers:								
									
<input type="text"/> m < Top stemming	<input type="text"/> m < Top stemming								
<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U450 x 24.0m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U450 x 24.0m	x1
Booster 250g	x1								
U450 x 24.0m	x1								
Booster 250g	x1								
U450 x 24.0m	x1								
<input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)	<input type="text"/> Kg of Kemex 70... (+/- <input type="text"/> %)								
<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 420g	x1	U475 x 7.8m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 7.8m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 420g	x1	U475 x 7.8m	x1
Booster 420g	x1								
U475 x 7.8m	x1								
Booster 420g	x1								
U475 x 7.8m	x1								

Louth CC, Planning Department - Viewing Purposes Only

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KEMEK LIMITED: Quarry Face Inspection Image



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

09/08/24



Comments:-

See image above highlighting front row blast holes.



KEMEK LIMITED: Risk Assessment / Checklists



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **09/08/24**

DANGER ZONE ASSESSMENT GENERAL FACTORS.

DRILLERS LOG - SIGNED	Yes	COMMUNICATION WITH SENTRIES AND MANAGER	Yes
FACE HEIGHT AND ORIENTATION - REF. SUMMARY SHEET	Yes	PROXIMITY TO FOOTPATH, ROAD, HOUSE, PLANT - SEE DANGER ZONE	Yes
FACE INSPECTION ON DAY OF BLAST - ATTACHED	Yes	FIRING POSITION WITH RESPECT - WIND & BLAST PROJECTION - SEE DANGER ZONE	Yes

CRITICAL FACTORS.

BURDEN:	MINIMUM ALLOWED FOR LOCATION (m):	4.00	BURDEN:	MINIMUM BURDEN CHARGED (m):	4.00
	WHICH HOLE NUMBER:	13		AT WHAT DEPTH IN THE HOLE (m):	11.00
	LOCAL SPECIFIC CHARGE (kg/m³):	1.02			
SPACING:	MINIMUM ALLOWED FOR LOCATION (m):	4.00	SPACING:	MINIMUM SPACING CHARGED (m):	4.10
	BETWEEN HOLE NUMBERS :	12 and 13		LOCAL SPECIFIC CHARGE (kg/m³):	1.00
DELAYS:	MAXIMUM DELAY PER METER SPACING (ms):	5.95	DELAYS:	MAXIMUM DELAY PER METER BURDEN (ms):	14.80
EXPLOSIVES:	EXPLOSIVE TYPE USED - SEE SUMMARY SHEET:	Kemex 70	STEMMING:	PRE & POST STEMMING REVIEW WITH CREW:	
	EXPECTED CHARGE MASS PER METER (kg/m):	18.0		SIZE OF STEMMING MATERIAL USED (mm):	12.0
	MAXIMUM CHARGE MASS PER METER (kg/m):	19.0		MINIMUM LENGTH OF STEMMING IN BLAST (m):	0.0

COMMENTS:

Generic Risk Assessment:	Quarry Blasting Risk Assessment - BS-RA-01	Yes	Surveying Risk Assessment - BS-RA-03	Yes
	Quarry Waste Burning Risk Assessment - BS-RA-02	Yes	Environmental Monitoring RA - BS-RA-04	Yes

WORK AREA CHECKLIST

QUARRY BENCH:

ACCESS & EGRESS APPROPRIATE?	Yes
FALLS FROM HEIGHT- EDGE PROTECTION ERECTED?	Yes
GROUND CONDITIONS SUITABLE?	Yes

POST BLAST:

SHOT CHECKED FOR EVIDENCE OF MISFIRE?	Yes
CHECK FOR LOOSE GROUND/UNSTABLE FACES?	Yes
SURPLUS EXPLOSIVES & ACCESSORIES DESTROYED?	Yes

BLAST PREPARATION:

VIBRATION LEVEL ESTIMATED & ACCEPTABLE?	Yes
BURDEN DETERMINED AROUND EACH SHOTHOLE?	Yes
CONNECTION OF INITIATION SYSTEM CHECKED?	Yes
DANGER ZONE & POSITION OF SENTRIES ESTABLISHED?	Yes
DANGER ZONE & POSITION OF SENTRIES COMMUNICATED?	Yes

DANGER ZONE CLEARED BY: **Peter Ryan**



KEMEK LIMITED: Drill Plan

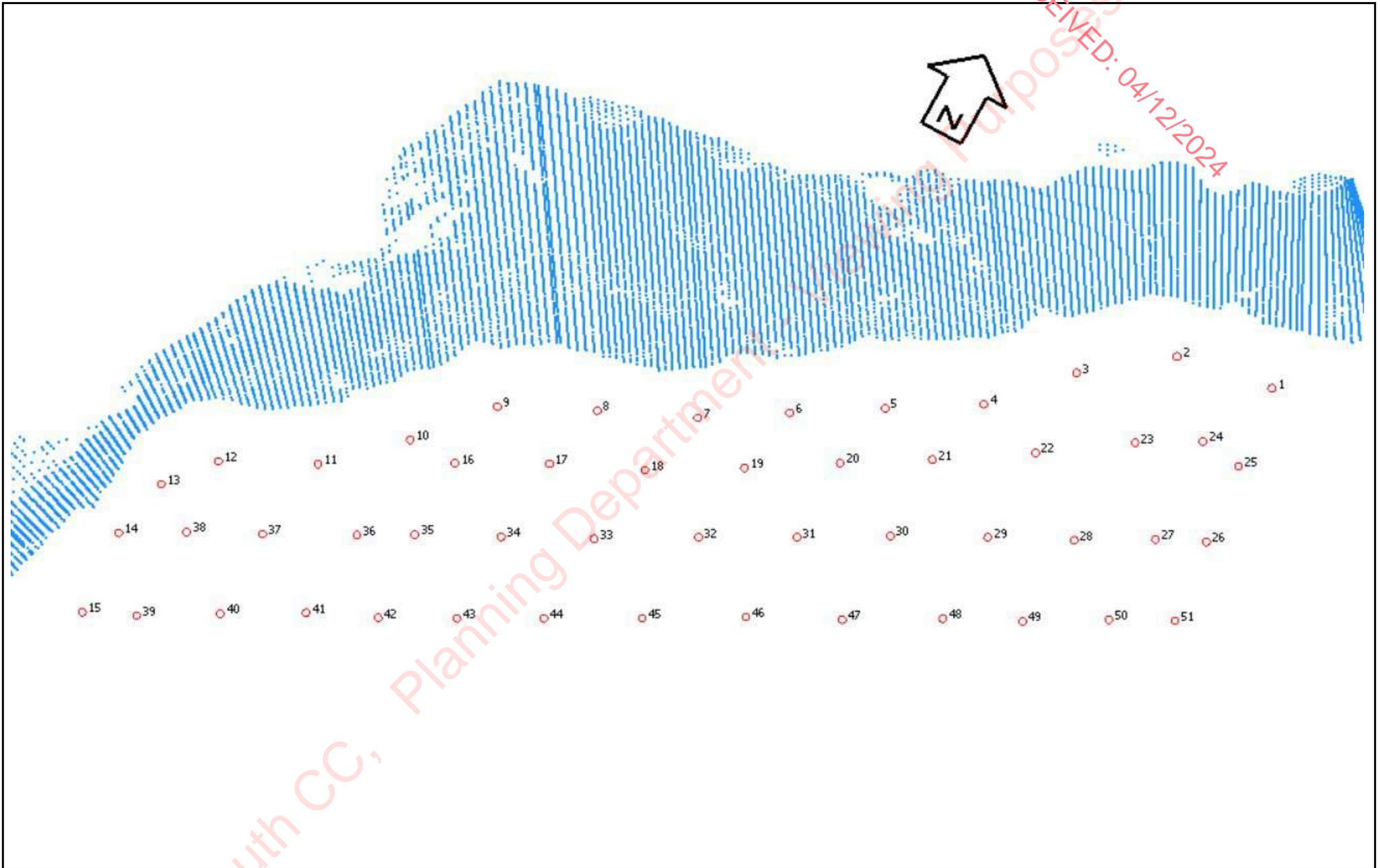


Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

09/08/2024





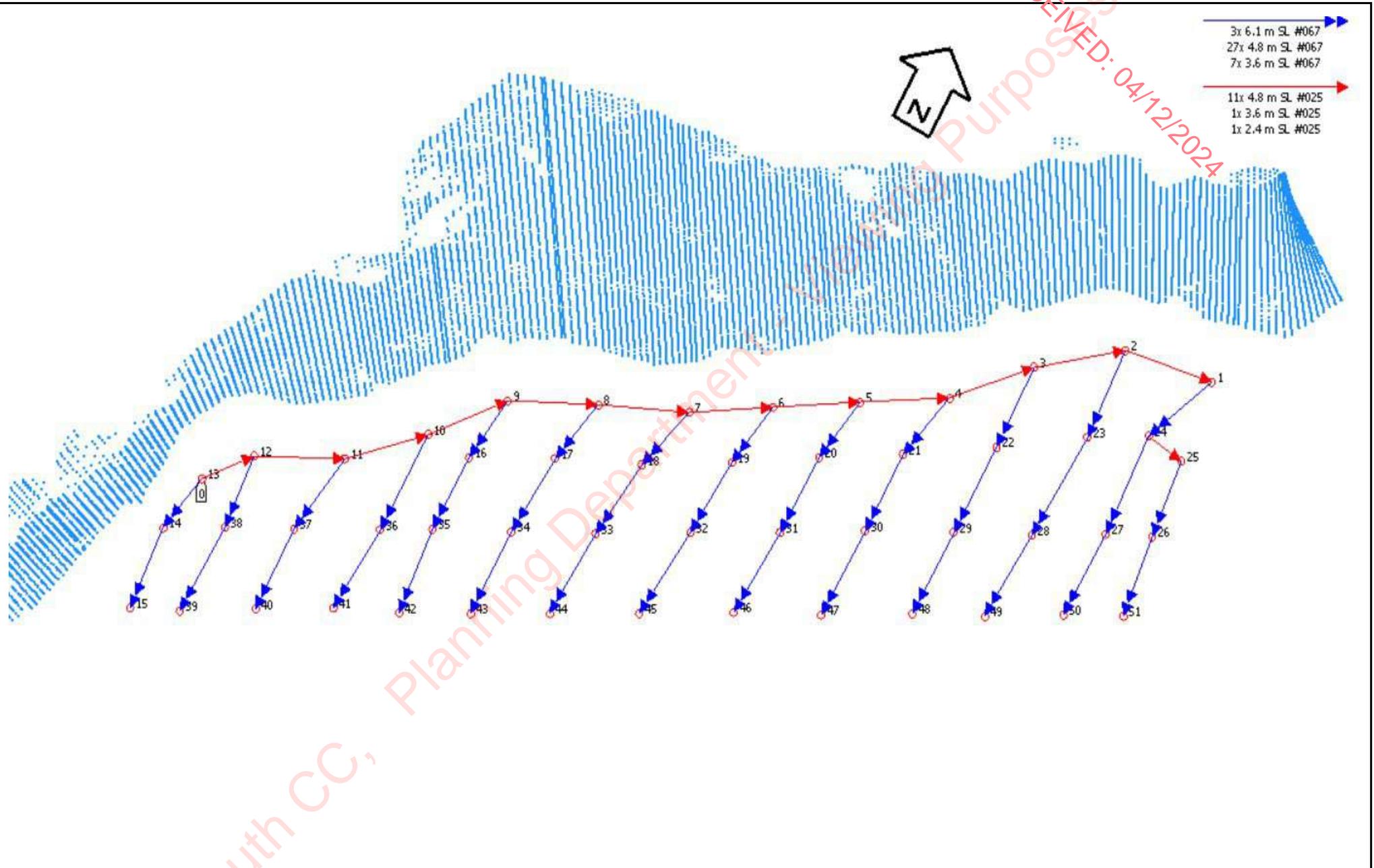
KEMEK LIMITED: Surface Connectors



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 09/08/2024





KEMEK LIMITED - Charge Record



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **09/08/24**

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)	(kgs)	
1	20.3	266					4.4	266	
2	19.5	265					4.5	265	
3	20.0	262					4.4	262	
4	20.6	245					4.5	245	
5	19.4	265					4.5	265	
6	20.4	280					4.4	280	
7	20.7	246					4.4	246	
8	19.4	277					4.5	277	
9	18.7	270					4.3	270	
10	19.6	228					4.5	228	
11	20.0	255					4.5	255	
12	18.7	230					4.5	230	
13	19.6	115					10.0	115	
14	19.7	252					4.4	252	
15	19.7	232					4.5	232	
16	19.0	242					4.2	242	
17	20.0	268					4.2	268	
18	20.0	271					4.3	271	
19	20.0	268					4.2	268	
20	20.4	280					4.2	280	
21	19.6	260					4.0	260	
22	19.7	276					4.0	276	
23	18.5	226					4.0	226	
24	0.1	0					0.0	0	
25	0.1	0					0.0	0	
26	0.5	0					0.0	0	
27	20.0	280					4.0	280	
28	20.0	280					4.0	280	
29	20.0	272					4.1	272	
30	18.7	249					4.0	249	
31	20.0	278					4.2	278	
32	20.0	273					4.2	273	
33	19.7	270					4.0	270	
34	19.8	260					4.2	260	
35	17.5	231					4.2	231	
36	19.4	270					4.0	270	
37	19.6	237					4.1	237	
38	20.0	260					4.2	260	
39	20.0	260					4.0	260	
40	19.6	263					4.0	263	
41	18.0	243					4.2	243	
42	18.0	241					4.0	241	
43	18.8	270					4.0	270	
44	19.7	273					4.2	273	
45	19.5	273					4.3	273	
46	19.5	260					4.3	260	
47	18.5	242					4.0	242	
48	19.5	278					4.2	278	
49	19.6	270					4.2	270	
50	19.6	270					4.0	270	
Total:								12,082	



KEMEK LIMITED - Charge Record



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

09/08/24

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL (kgs)	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)		
51	19.4	270					4.0	270	
52	-							0	
53	-							0	
54	-							0	
55	-							0	
56	-							0	
57	-							0	
58	-							0	
59	-							0	
60	-							0	
61	-							0	
62	-							0	
63	-							0	
64	-							0	
65	-							0	
66	-							0	
67	-							0	
68	-							0	
69	-							0	
70	-							0	
71	-							0	
72	-							0	
73	-							0	
74	-							0	
75	-							0	
76	-							0	
77	-							0	
78	-							0	
79	-							0	
80	-							0	
81	-							0	
82	-							0	
83	-							0	
84	-							0	
85	-							0	
86	-							0	
87	-							0	
88	-							0	
89	-							0	
90	-							0	
91	-							0	
92	-							0	
93	-							0	
94	-							0	
95	-							0	
96	-							0	
97	-							0	
98	-							0	
99	-							0	
100	-							0	
Total:								12,352	

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Planning Department - Viewing Purposes Only



KEMEK LIMITED: Truck Charge Record (kgs)



Customer / Location:

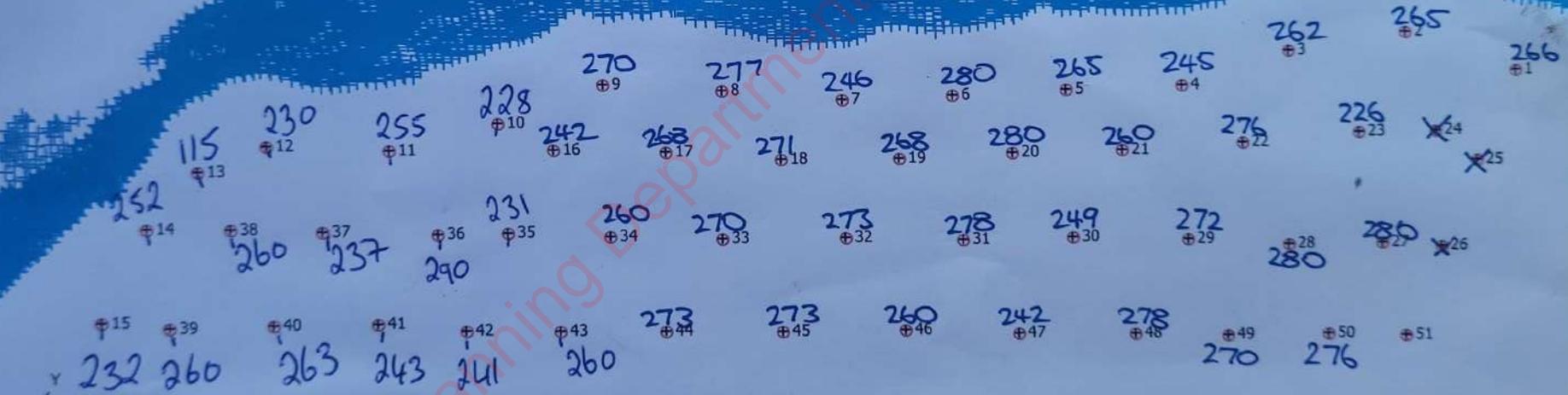
Kilsaran Gaulstown, Co Louth

Date: 09/08/2024

SHOTPlus™ Plan



RECEIVED: 04/12/2024



3572kg

SHOTPlus™ 6 Standard 6.19.1	07/08/2024
Mine	Kilsaran
Location	Gallstown
Title/author	2307 Scott Penny
Filename	
Scale	1:250





KEMEK LIMITED: Delivery Docket



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 09/08/2024

Delivery Docket
SO000447



Kemek Limited
Clonagh
Enfield
Co. Kildare
A83 D62
Phone +353 46 9541086
Email finance@kemekltd.com
Web www.kemekltd.com

Account No. 110102
Delivery Date 09/08/2024
Order No. SO000447
Your Ref.
Truck Reg. 222 MH 1145

Invoice Address

KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN PIERCETOWN
DUNBOYNE
CO MEATH
A86 WE20
IE
Phone: 01 8251608

Delivery Address

KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN GAULSTOWN
CO LOUTH
LOUTH
LEINSTER
IE

Description	Item Code	Employee	Quantity	UoM	Qty. Recd.
KEMEX 70 CE 0080	FE7000		20000	KG	
DUNARIT DOUBLE WELL BOOSTER 420g	AC3129		74	EACH	
Maxam 250G Boosters	AC3128		74	EACH	
EXEL U450 24M	AC9006		51	EACH	
EXEL U475 7.8M	AC9010		51	EACH	
EXEL U475 21M	AC9013		23	EACH	
EXEL U500 7.8M	AC9020		23	EACH	
EXEL Connectadet SL 17ms 7.8m	AC6080		4	EACH	
EXEL Connectadet SL 25ms 7.8m	AC6087		21	EACH	
EXEL Connectadet SL 67ms 7.8m	AC6081		53	EACH	
Exel Starter 100m	AC6900		4	EACH	
Blasting Service	TS0010	SP63	1	EACH	
Blast Supervision	TS0020	JD72	1	EACH	
Remote Shotfiring Service - ROBIS	TS9999		1	EACH	
Total			20381		

Customer's Signature

Shotfirer's Signature

222 = 8,780kg / 7,166 kg
241 = 8,386 kg



Methods for the safe destruction of small quantities of explosives can be found at:
www.kemekltd.com/document-library/

Limited Liability Company Registered in Ireland. Registration No.: 76969



QUALITY
NSAI Certified



HEALTH & SAFETY
NSAI Certified



KEMEK LIMITED: Point of Work Risk Assessment



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: **09/08/2024**

<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22553 Name: Scott Penny Date / Time Created: 23/07/2024 11:09:39</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 4 Site Location: Kilsaran Gallstown Discription: Surveying activities TA-RA-03 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22616 Name: Scott Penny Date / Time Created: 07/08/2024 08:54:17</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 4 Site Location: Kilsaran Gallstown Discription: Surveying activities TA-RA-03 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22627 Name: Scott Penny Date / Time Created: 09/08/2024 06:43:48</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 2 and 4 Site Location: Kilsaran Gallstown Discription: Blasting activities TA-RA-01 Monitoring TA-RA-04 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott, John, Keith, Peter, Marcus and Shane</p>
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KEMEK LIMITED BLAST VIBRATION REPORT

Customer / Location:	Kilsaran Gaulstown, Co Louth
Date:	09/08/2024
Reference #:	

WEATHER DATA

Wind Direction	Wind	Cloud Cover (%)
West	27km/h	69%

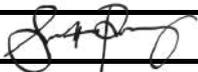
BLAST DATA

# of Holes	Hole size	Depth	Burden	Spacing	Total Charge	M.I.C.	Notes	Blast Time
	mm	m	m	m	Kg	Kg		12:06
51	127	20.1	4.8	4.2	12,352	280	Bench #4	

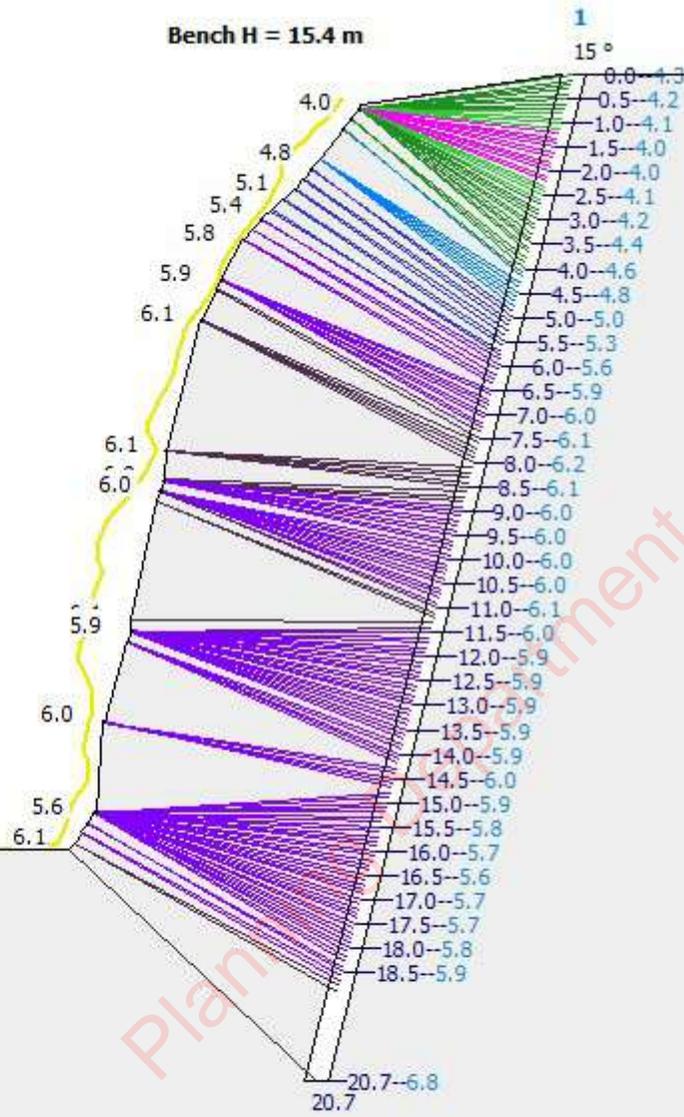
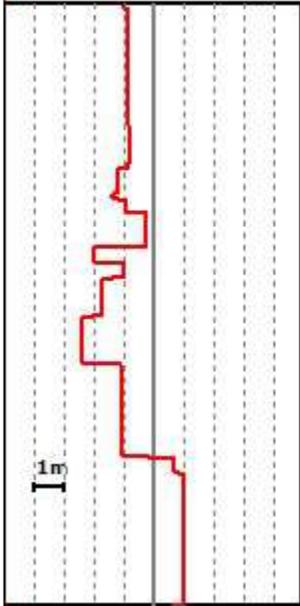
VIBROGRAPH DATA

	Residence	Nomis	Plan Distance	Bearing	H	T	V	AOP
		unit #	m	degrees	mm/sec	mm/sec	mm/sec	dBL
Nomis #1	Kellegher	4168	954	185	<0.5	<0.5	<0.5	<117
Nomis #2				°				
Nomis #3				°				
Nomis #4				°				
Nomis #5				°				
Nomis #6				°				
Nomis #7				°				

A print-out of the vibration and AOP levels is not available when the Nomis unit is not triggered.

Signature: 

Minimum profile !

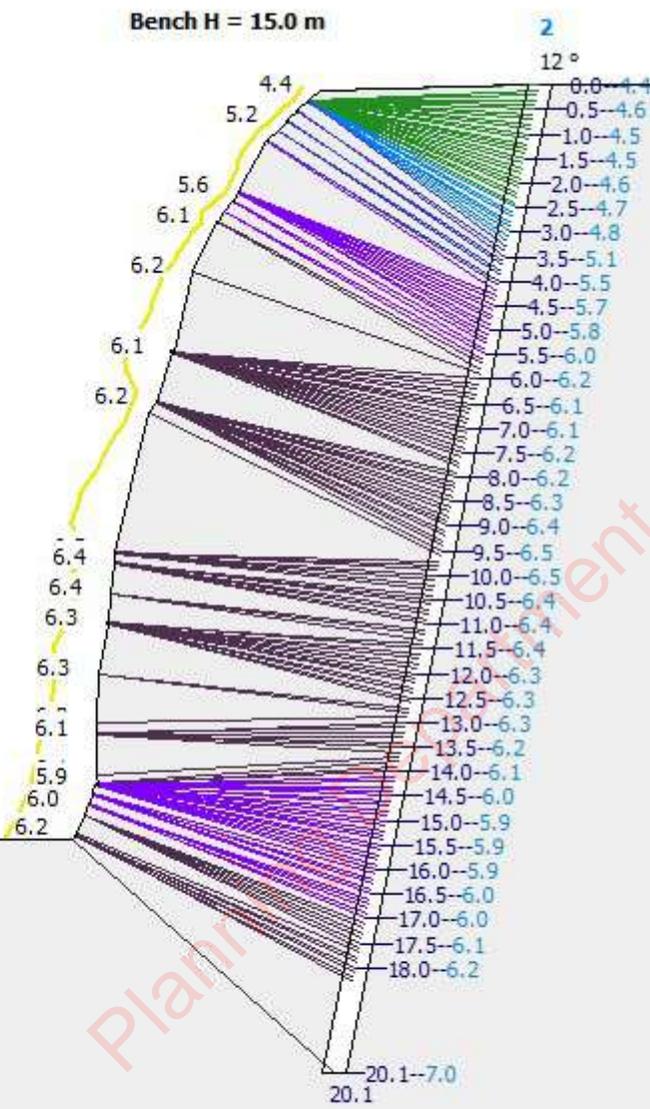
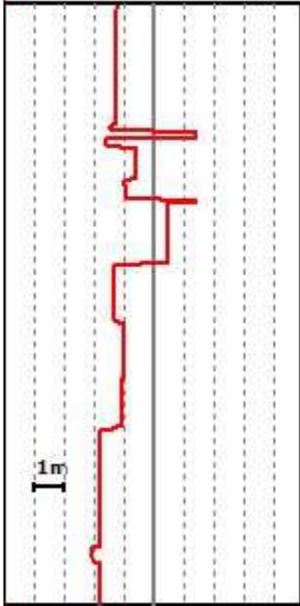


Hole 1	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.3m	1.6 m : B = 4.4 m
0.6m : B = 4.2m	1.9 m : B = 4.4 m
0.9m : B = 4.1m	2.4 m : B = 4.7 m
1.2m : B = 4.0m (-)	2.8 m : B = 5.0 m (+)
1.5m : B = 4.0m (-)	3.3 m : B = 5.2 m (+)
1.8m : B = 4.0m (-)	3.7 m : B = 5.2 m (+)
2.2m : B = 4.0m (-)	4.2 m : B = 5.4 m (+)
2.6m : B = 4.1m	4.6 m : B = 5.6 m (+)
3.0m : B = 4.2m	5.1 m : B = 5.8 m (+)
3.4m : B = 4.4m	5.5 m : B = 5.8 m (+)
3.8m : B = 4.5m	6.0 m : B = 5.9 m (+)
4.2m : B = 4.7m	6.4 m : B = 6.1 m (+)
4.6m : B = 4.8m	6.9 m : B = 6.3 m (+)
5.0m : B = 5.0m (+)	7.3 m : B = 6.3 m (+)
5.4m : B = 5.2m (+)	7.7 m : B = 6.3 m (+)
5.8m : B = 5.5m (+)	8.1 m : B = 6.3 m (+)
6.2m : B = 5.7m (+)	8.6 m : B = 6.5 m (+)
6.6m : B = 5.9m (+)	9.0 m : B = 6.5 m (+)
7.0m : B = 6.0m (+)	9.4 m : B = 6.2 m (+)
7.4m : B = 6.1m (+)	9.8 m : B = 6.3 m (+)
7.8m : B = 6.2m (+)	10.2 m : B = 6.5 m (+)
8.2m : B = 6.2m (+)	10.7 m : B = 6.7 m (+)
8.5m : B = 6.1m (+)	11.2 m : B = 6.9 m (+)
8.8m : B = 6.1m (+)	11.6 m : B = 6.8 m (+)
9.1m : B = 6.0m (+)	11.9 m : B = 6.7 m (+)
9.4m : B = 6.0m (+)	12.4 m : B = 6.7 m (+)
9.7m : B = 6.0m (+)	12.8 m : B = 6.7 m (+)
10.0m : B = 6.0m (+)	13.2 m : B = 6.7 m (+)
10.3m : B = 6.0m (+)	13.6 m : B = 6.7 m (+)
10.6m : B = 6.0m (+)	14.0 m : B = 6.5 m (+)
10.9m : B = 6.0m (+)	14.4 m : B = 6.3 m (+)
11.2m : B = 6.1m (+)	14.7 m : B = 6.1 m (+)
11.5m : B = 6.0m (+)	15.1 m : B = 6.2 m (+)
11.8m : B = 6.0m (+)	15.6 m : B = 6.1 m (+)
12.1m : B = 5.9m (+)	15.9 m : B = 5.9 m (+)
12.4m : B = 5.9m (+)	16.3 m : B = 6.0 m (+)
12.7m : B = 5.9m (+)	16.8 m : B = 6.1 m (+)
13.0m : B = 5.9m (+)	17.2 m : B = 6.1 m (+)
13.3m : B = 5.9m (+)	17.9 m : B = 7.3 m (+)
13.6m : B = 5.9m (+)	
13.9m : B = 5.9m (+)	
14.2m : B = 6.0m (+)	
14.5m : B = 6.0m (+)	
14.8m : B = 5.9m (+)	
15.1m : B = 5.9m (+)	
15.4m : B = 5.8m (+)	
15.7m : B = 5.7m (+)	
16.0m : B = 5.7m (+)	
16.3m : B = 5.7m (+)	
16.6m : B = 5.6m (+)	
16.9m : B = 5.7m (+)	
17.2m : B = 5.7m (+)	
17.5m : B = 5.7m (+)	
17.8m : B = 5.8m (+)	
18.1m : B = 5.8m (+)	
18.4m : B = 5.9m (+)	
18.7m : B = 6.0m (+)	
20.7m : B = 6.8m (+)	

Author		Comments:	
Date	08/08/2024	->	

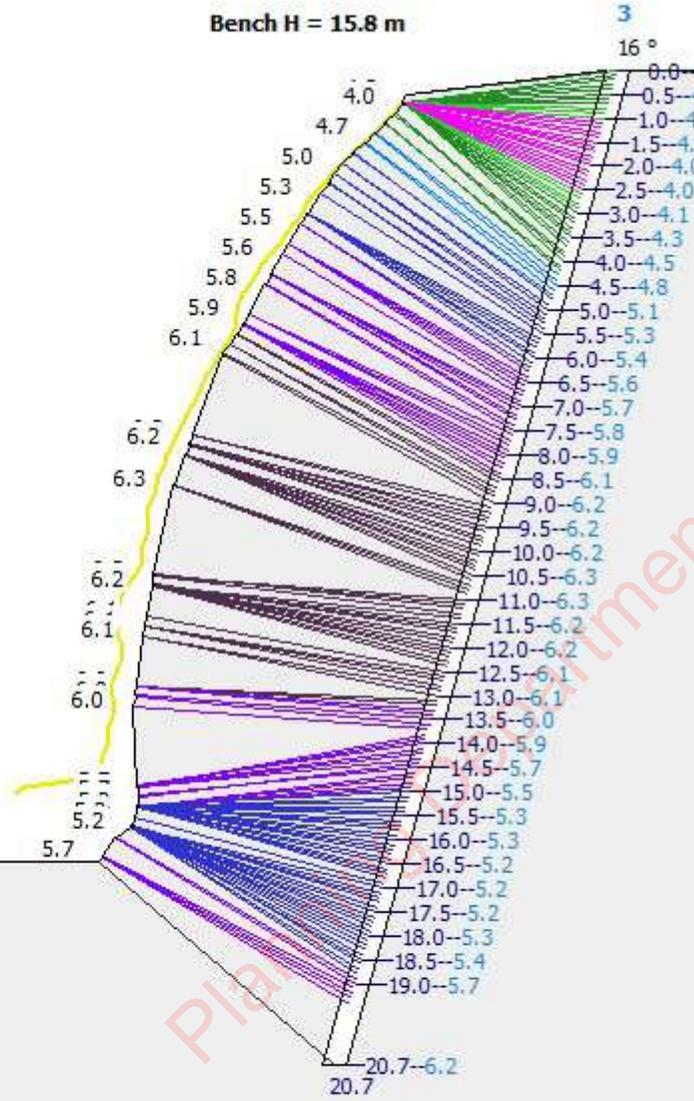
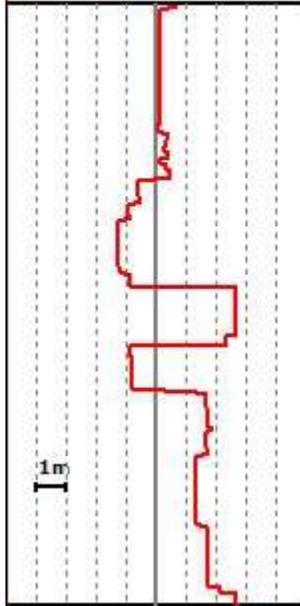


Minimum profile !



Hole 2	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.6m	1.0 m : B = 4.6 m
0.6m : B = 4.6m	1.3 m : B = 4.8 m
0.9m : B = 4.5m	1.8 m : B = 5.1 m (+)
1.2m : B = 4.5m	2.3 m : B = 5.4 m (+)
1.5m : B = 4.5m	2.7 m : B = 5.6 m (+)
1.8m : B = 4.5m	3.1 m : B = 5.7 m (+)
2.2m : B = 4.6m	3.6 m : B = 5.9 m (+)
2.6m : B = 4.7m	4.1 m : B = 6.1 m (+)
3.0m : B = 4.8m	4.5 m : B = 6.3 m (+)
3.4m : B = 5.1m (+)	5.0 m : B = 6.4 m (+)
3.8m : B = 5.3m (+)	5.4 m : B = 6.6 m (+)
4.2m : B = 5.5m (+)	5.8 m : B = 6.7 m (+)
4.6m : B = 5.7m (+)	6.3 m : B = 6.7 m (+)
5.0m : B = 5.8m (+)	6.7 m : B = 7.0 m (+)
5.4m : B = 5.9m (+)	7.1 m : B = 7.0 m (+)
5.8m : B = 6.1m (+)	7.5 m : B = 6.7 m (+)
6.2m : B = 6.2m (+)	7.9 m : B = 6.7 m (+)
6.6m : B = 6.1m (+)	8.3 m : B = 6.8 m (+)
7.0m : B = 6.1m (+)	8.8 m : B = 6.9 m (+)
7.4m : B = 6.2m (+)	9.2 m : B = 7.1 m (+)
7.8m : B = 6.2m (+)	9.6 m : B = 7.3 m (+)
8.2m : B = 6.3m (+)	10.1 m : B = 7.3 m (+)
8.5m : B = 6.3m (+)	10.5 m : B = 7.4 m (+)
8.8m : B = 6.3m (+)	10.9 m : B = 7.1 m (+)
9.1m : B = 6.4m (+)	11.2 m : B = 7.0 m (+)
9.4m : B = 6.4m (+)	11.7 m : B = 7.2 m (+)
9.7m : B = 6.5m (+)	12.1 m : B = 7.0 m (+)
10.0m : B = 6.5m (+)	12.5 m : B = 7.1 m (+)
10.3m : B = 6.5m (+)	12.9 m : B = 7.2 m (+)
10.6m : B = 6.4m (+)	13.3 m : B = 7.1 m (+)
10.9m : B = 6.4m (+)	13.7 m : B = 7.0 m (+)
11.2m : B = 6.4m (+)	14.1 m : B = 7.0 m (+)
11.5m : B = 6.4m (+)	14.5 m : B = 7.1 m (+)
11.8m : B = 6.3m (+)	14.9 m : B = 7.1 m (+)
12.1m : B = 6.3m (+)	15.3 m : B = 7.1 m (+)
12.4m : B = 6.3m (+)	15.8 m : B = 7.1 m (+)
12.7m : B = 6.3m (+)	16.2 m : B = 7.2 m (+)
13.0m : B = 6.3m (+)	16.6 m : B = 7.3 m (+)
13.3m : B = 6.2m (+)	16.9 m : B = 7.4 m (+)
13.6m : B = 6.1m (+)	
13.9m : B = 6.1m (+)	
14.2m : B = 6.0m (+)	
14.5m : B = 6.0m (+)	
14.8m : B = 5.9m (+)	
15.1m : B = 5.9m (+)	
15.4m : B = 5.9m (+)	
15.7m : B = 5.9m (+)	
16.0m : B = 5.9m (+)	
16.3m : B = 5.9m (+)	
16.6m : B = 6.0m (+)	
16.9m : B = 6.0m (+)	
17.2m : B = 6.1m (+)	
17.5m : B = 6.1m (+)	
17.8m : B = 6.2m (+)	
18.1m : B = 6.3m (+)	
20.1m : B = 7.0m (+)	

Minimum profile I

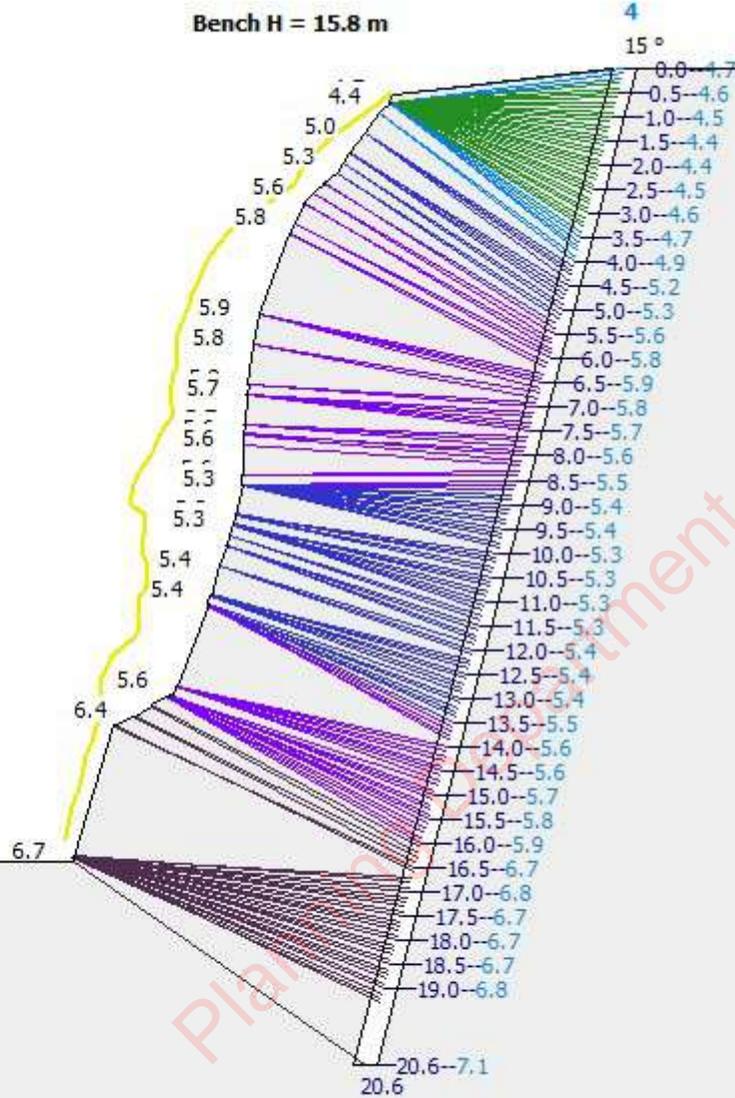
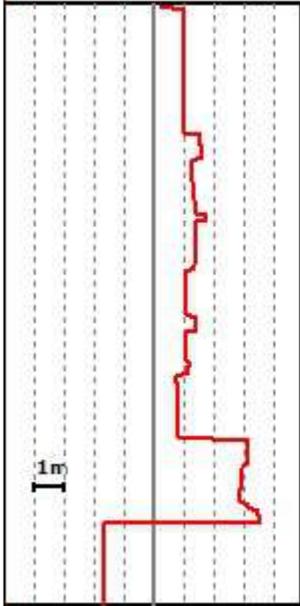


Hole 3	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.3m	1.9 m : B = 4.0 m (-)
0.6m : B = 4.2m	2.3 m : B = 4.2 m
0.9m : B = 4.1m	2.8 m : B = 4.5 m
1.2m : B = 4.0m (-)	3.3 m : B = 4.8 m
1.5m : B = 4.0m (-)	3.8 m : B = 5.0 m (+)
1.8m : B = 4.0m (-)	4.3 m : B = 5.3 m (+)
2.2m : B = 4.0m (-)	4.7 m : B = 5.4 m (+)
2.6m : B = 4.1m	5.2 m : B = 5.5 m (+)
3.0m : B = 4.1m	5.7 m : B = 5.7 m (+)
3.4m : B = 4.3m	6.2 m : B = 5.9 m (+)
3.8m : B = 4.4m	6.6 m : B = 6.0 m (+)
4.2m : B = 4.6m	7.0 m : B = 5.9 m (+)
4.6m : B = 4.8m	7.4 m : B = 6.0 m (+)
5.0m : B = 5.1m (+)	7.9 m : B = 6.1 m (+)
5.4m : B = 5.2m (+)	8.3 m : B = 6.2 m (+)
5.8m : B = 5.4m (+)	8.8 m : B = 6.3 m (+)
6.2m : B = 5.5m (+)	9.2 m : B = 6.4 m (+)
6.6m : B = 5.6m (+)	9.7 m : B = 6.5 m (+)
7.0m : B = 5.7m (+)	10.1 m : B = 6.6 m (+)
7.4m : B = 5.8m (+)	10.5 m : B = 6.6 m (+)
7.8m : B = 5.9m (+)	10.9 m : B = 6.6 m (+)
8.2m : B = 6.0m (+)	11.3 m : B = 6.5 m (+)
8.5m : B = 6.1m (+)	11.8 m : B = 6.5 m (+)
8.8m : B = 6.1m (+)	12.1 m : B = 6.4 m (+)
9.1m : B = 6.2m (+)	12.6 m : B = 6.6 m (+)
9.4m : B = 6.2m (+)	13.1 m : B = 6.6 m (+)
9.7m : B = 6.2m (+)	13.4 m : B = 6.6 m (+)
10.0m : B = 6.2m (+)	13.8 m : B = 6.3 m (+)
10.3m : B = 6.3m (+)	14.2 m : B = 6.3 m (+)
10.6m : B = 6.3m (+)	14.7 m : B = 6.3 m (+)
10.9m : B = 6.3m (+)	15.0 m : B = 6.2 m (+)
11.2m : B = 6.3m (+)	15.4 m : B = 6.1 m (+)
11.5m : B = 6.2m (+)	15.8 m : B = 6.1 m (+)
11.8m : B = 6.2m (+)	16.2 m : B = 6.1 m (+)
12.1m : B = 6.2m (+)	17.0 m : B = 7.4 m (+)
12.4m : B = 6.2m (+)	
12.7m : B = 6.1m (+)	
13.0m : B = 6.1m (+)	
13.3m : B = 6.0m (+)	
13.6m : B = 6.0m (+)	
13.9m : B = 5.9m (+)	
14.2m : B = 5.8m (+)	
14.5m : B = 5.7m (+)	
14.8m : B = 5.6m (+)	
15.1m : B = 5.5m (+)	
15.4m : B = 5.4m (+)	
15.7m : B = 5.3m (+)	
16.0m : B = 5.3m (+)	
16.3m : B = 5.2m (+)	
16.6m : B = 5.2m (+)	
16.9m : B = 5.2m (+)	
17.2m : B = 5.2m (+)	
17.5m : B = 5.2m (+)	
17.8m : B = 5.2m (+)	
18.1m : B = 5.3m (+)	
18.4m : B = 5.3m (+)	
18.7m : B = 5.4m (+)	
19.0m : B = 5.7m (+)	
19.3m : B = 5.8m (+)	
20.7m : B = 6.2m (+)	

Author		Comments:	
Date	08/08/2024	->	



Minimum profile I

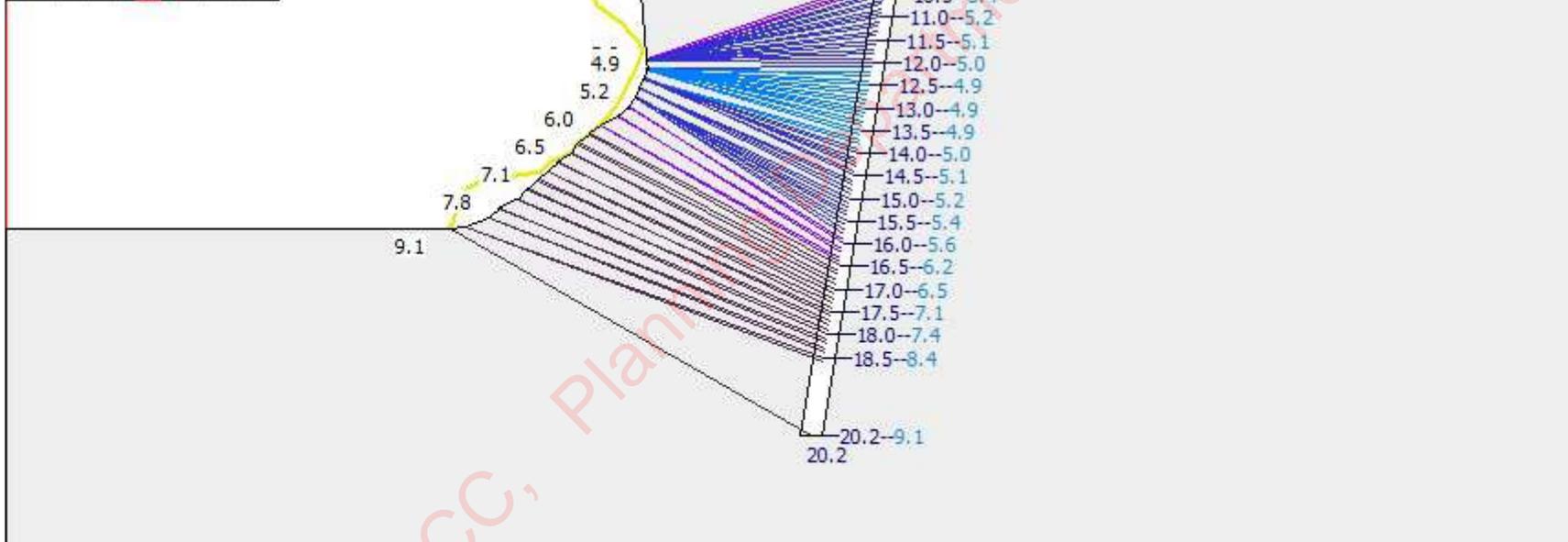
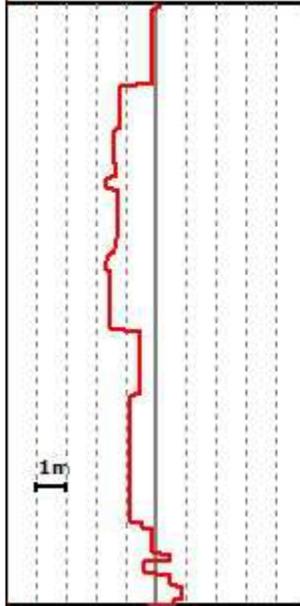


Hole 4	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.7m	1.7 m : B = 4.4 m
0.6m : B = 4.6m	1.9 m : B = 4.6 m
0.9m : B = 4.5m	2.5 m : B = 5.0 m (+)
1.2m : B = 4.5m	3.0 m : B = 5.4 m (+)
1.5m : B = 4.4m	3.5 m : B = 5.7 m (+)
2.8m : B = 4.4m	3.9 m : B = 5.8 m (+)
2.2m : B = 4.4m	4.4 m : B = 6.2 m (+)
2.6m : B = 4.5m	4.9 m : B = 6.7 m (+)
3.0m : B = 4.6m	5.4 m : B = 7.0 m (+)
3.4m : B = 4.7m	5.9 m : B = 7.1 m (+)
3.8m : B = 4.6m	6.4 m : B = 7.2 m (+)
4.2m : B = 5.0m (+)	6.8 m : B = 7.3 m (+)
4.6m : B = 5.2m (+)	7.2 m : B = 7.3 m (+)
5.0m : B = 5.3m (+)	7.6 m : B = 7.3 m (+)
5.4m : B = 5.5m (+)	8.0 m : B = 7.2 m (+)
5.8m : B = 5.8m (+)	8.4 m : B = 7.2 m (+)
6.2m : B = 5.9m (+)	8.8 m : B = 7.1 m (+)
6.6m : B = 5.9m (+)	9.2 m : B = 7.1 m (+)
7.0m : B = 5.8m (+)	9.6 m : B = 7.2 m (+)
7.4m : B = 5.8m (+)	10.1 m : B = 7.3 m (+)
7.8m : B = 5.7m (+)	10.6 m : B = 7.4 m (+)
8.2m : B = 5.6m (+)	10.9 m : B = 7.3 m (+)
8.5m : B = 5.5m (+)	11.3 m : B = 6.9 m (+)
8.8m : B = 5.5m (+)	11.7 m : B = 6.9 m (+)
9.1m : B = 5.4m (+)	12.0 m : B = 6.7 m (+)
9.4m : B = 5.4m (+)	12.4 m : B = 6.6 m (+)
9.7m : B = 5.4m (+)	12.8 m : B = 6.7 m (+)
10.0m : B = 5.3m (+)	13.3 m : B = 6.6 m (+)
10.3m : B = 5.3m (+)	13.7 m : B = 6.8 m (+)
10.6m : B = 5.3m (+)	14.2 m : B = 7.0 m (+)
10.9m : B = 5.3m (+)	14.6 m : B = 7.0 m (+)
11.2m : B = 5.3m (+)	15.0 m : B = 6.9 m (+)
11.5m : B = 5.3m (+)	15.4 m : B = 6.9 m (+)
11.8m : B = 5.4m (+)	15.8 m : B = 6.9 m (+)
12.1m : B = 5.4m (+)	16.2 m : B = 6.9 m (+)
12.4m : B = 5.4m (+)	16.7 m : B = 6.9 m (+)
12.7m : B = 5.4m (+)	17.1 m : B = 7.0 m (+)
13.0m : B = 5.4m (+)	17.5 m : B = 7.0 m (+)
13.3m : B = 5.5m (+)	17.7 m : B = 6.9 m (+)
13.6m : B = 5.5m (+)	
13.9m : B = 5.6m (+)	
14.2m : B = 5.6m (+)	
14.5m : B = 5.6m (+)	
14.8m : B = 5.7m (+)	
15.1m : B = 5.7m (+)	
15.4m : B = 5.8m (+)	
15.7m : B = 5.8m (+)	
16.0m : B = 5.9m (+)	
16.3m : B = 6.4m (+)	
16.6m : B = 6.7m (+)	
16.9m : B = 6.8m (+)	
17.2m : B = 6.8m (+)	
17.5m : B = 6.7m (+)	
17.8m : B = 6.7m (+)	
18.1m : B = 6.7m (+)	
18.4m : B = 6.7m (+)	
18.7m : B = 6.7m (+)	
19.0m : B = 6.8m (+)	
19.3m : B = 6.8m (+)	
20.6m : B = 7.1m (+)	

Author		Comments:	
Date	08/08/2024	->	



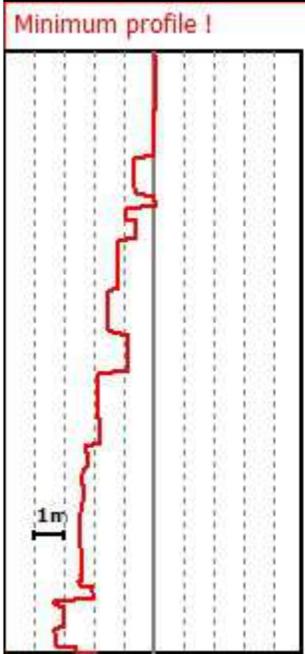
Minimum profile !



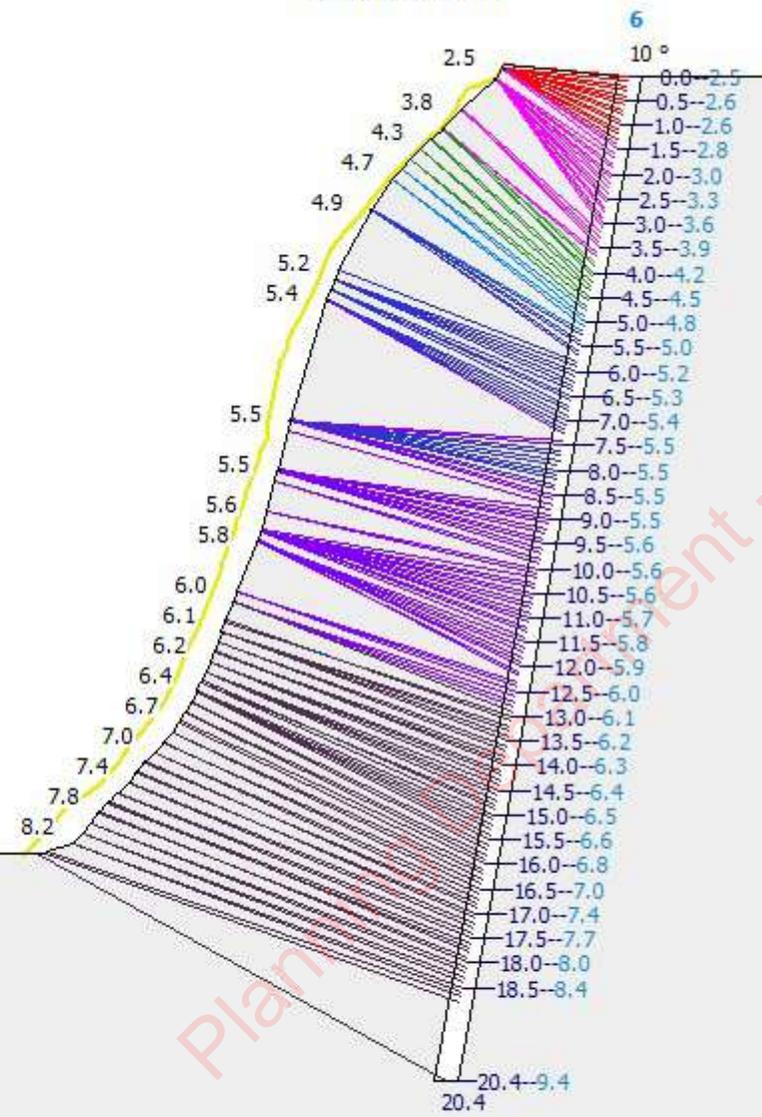
Hole 5	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.4m (-)	0.6 m : B = 3.3 m (-)
0.6m : B = 3.3m (-)	1.0 m : B = 3.6 m (-)
0.9m : B = 3.3m (-)	1.4 m : B = 4.0 m (-)
1.2m : B = 3.4m (-)	1.9 m : B = 4.4 m
1.5m : B = 3.4m (-)	2.4 m : B = 4.9 m
1.8m : B = 3.5m (-)	2.9 m : B = 5.3 m (+)
2.2m : B = 3.6m (-)	3.3 m : B = 5.4 m (+)
2.6m : B = 3.8m (-)	3.8 m : B = 5.7 m (+)
3.0m : B = 3.9m (-)	4.2 m : B = 5.9 m (+)
3.4m : B = 4.1m	4.6 m : B = 5.9 m (+)
3.8m : B = 4.4m	5.0 m : B = 6.0 m (+)
4.2m : B = 4.6m	5.4 m : B = 6.0 m (+)
4.6m : B = 4.9m	5.8 m : B = 6.0 m (+)
5.0m : B = 5.2m (+)	6.3 m : B = 6.0 m (+)
5.4m : B = 5.5m (+)	6.7 m : B = 6.0 m (+)
5.8m : B = 5.6m (+)	7.1 m : B = 6.1 m (+)
6.2m : B = 5.6m (+)	7.5 m : B = 6.1 m (+)
6.6m : B = 5.6m (+)	7.9 m : B = 6.1 m (+)
7.0m : B = 5.7m (+)	8.3 m : B = 5.9 m (+)
7.4m : B = 5.7m (+)	8.7 m : B = 5.9 m (+)
7.8m : B = 5.8m (+)	9.1 m : B = 6.0 m (+)
8.2m : B = 5.7m (+)	9.5 m : B = 6.0 m (+)
8.5m : B = 5.7m (+)	9.9 m : B = 6.0 m (+)
8.8m : B = 5.7m (+)	10.3 m : B = 6.1 m (+)
9.1m : B = 5.6m (+)	10.8 m : B = 6.2 m (+)
9.4m : B = 5.6m (+)	11.2 m : B = 6.2 m (+)
9.7m : B = 5.6m (+)	11.6 m : B = 6.2 m (+)
10.0m : B = 5.6m (+)	11.9 m : B = 5.8 m (+)
10.3m : B = 5.5m (+)	12.2 m : B = 5.3 m (+)
10.6m : B = 5.4m (+)	12.6 m : B = 5.0 m (+)
10.9m : B = 5.3m (+)	13.0 m : B = 5.1 m (+)
11.2m : B = 5.2m (+)	13.5 m : B = 5.2 m (+)
11.5m : B = 5.1m (+)	13.9 m : B = 5.4 m (+)
11.8m : B = 5.0m (+)	14.3 m : B = 5.7 m (+)
12.1m : B = 5.0m (+)	14.8 m : B = 6.1 m (+)
12.4m : B = 4.9m	15.3 m : B = 6.6 m (+)
12.7m : B = 4.9m	16.0 m : B = 8.0 m (+)
13.0m : B = 4.9m	16.4 m : B = 8.4 m (+)
13.3m : B = 4.9m	16.8 m : B = 8.5 m (+)
13.6m : B = 4.9m	17.1 m : B = 8.5 m (+)
13.9m : B = 5.0m (+)	
14.2m : B = 5.0m (+)	
14.5m : B = 5.1m (+)	
14.8m : B = 5.2m (+)	
15.1m : B = 5.2m (+)	
15.4m : B = 5.3m (+)	
15.7m : B = 5.4m (+)	
16.0m : B = 5.6m (+)	
16.3m : B = 6.0m (+)	
16.6m : B = 6.2m (+)	
16.9m : B = 6.5m (+)	
17.2m : B = 6.8m (+)	
17.5m : B = 7.1m (+)	
17.8m : B = 7.3m (+)	
18.1m : B = 7.8m (+)	
18.4m : B = 7.9m (+)	
20.2m : B = 9.1m (+)	

<i>Author</i>		<i>Comments:</i> ->
<i>Date</i>	08/08/2024	





Bench H = 15.8 m

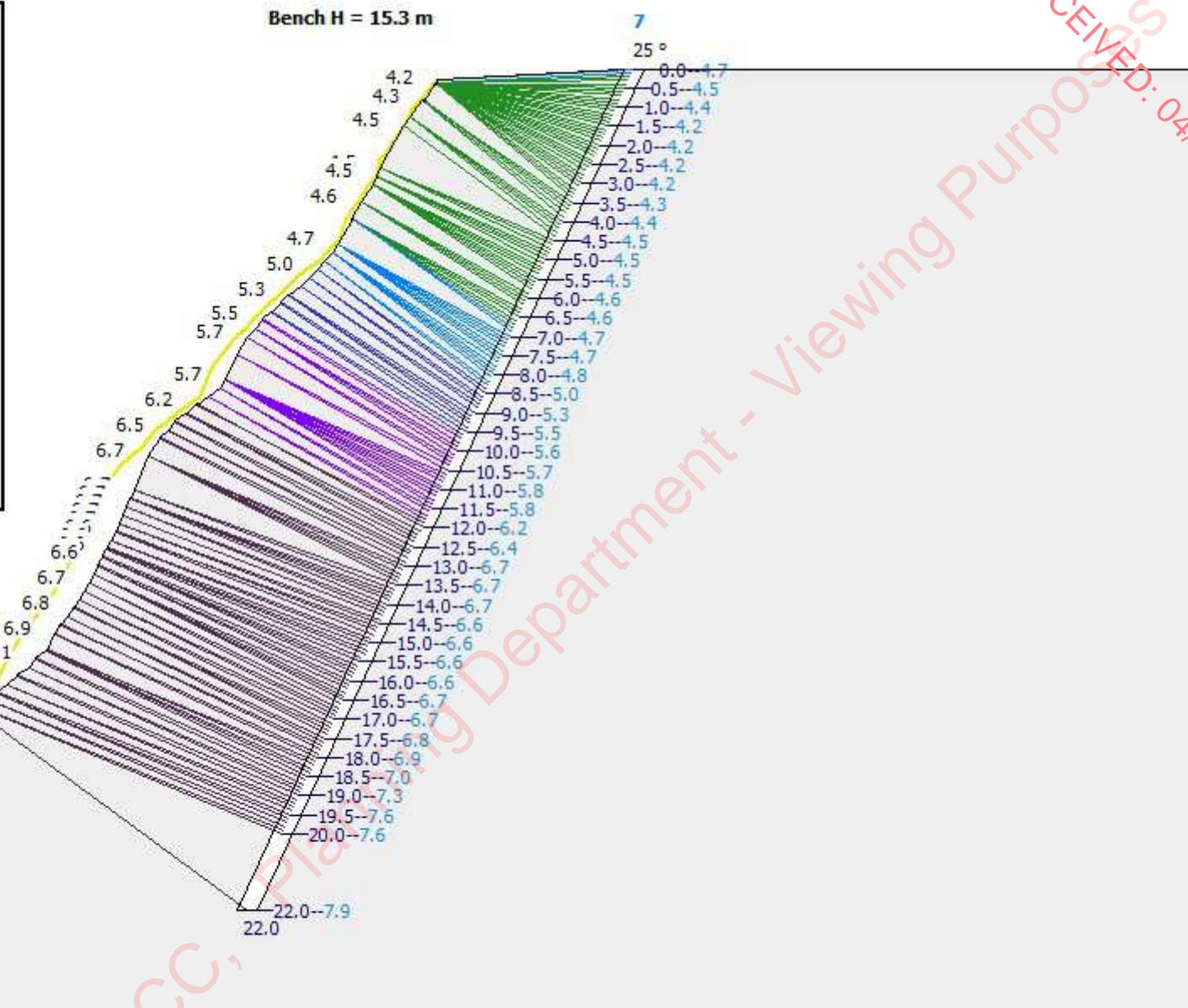
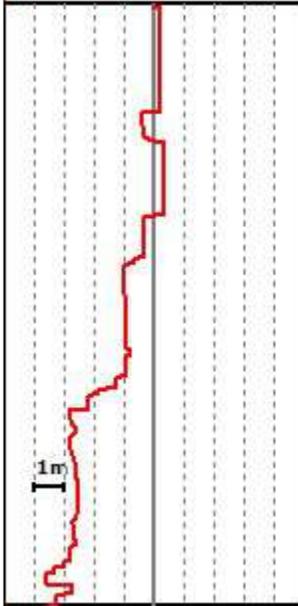


Hole 6	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.6m (-) !!!<<	0.2 m : B = 2.5 m (-) !!! <
0.6m : B = 2.6m (-) !!!<<	0.5 m : B = 2.6 m (-) !!! <
0.9m : B = 2.6m (-) !!!<<	1.1 m : B = 3.2 m (-)
1.2m : B = 2.7m (-) !!!<<	1.5 m : B = 3.4 m (-)
1.5m : B = 2.8m (-)	2.0 m : B = 3.7 m (-)
1.8m : B = 2.9m (-)	2.4 m : B = 4.0 m (-)
2.2m : B = 3.1m (-)	2.9 m : B = 4.4 m
2.6m : B = 3.4m (-)	3.4 m : B = 4.6 m
3.0m : B = 3.6m (-)	3.8 m : B = 4.9 m
3.4m : B = 3.8m (-)	4.3 m : B = 5.1 m (+)
3.8m : B = 4.1m	4.7 m : B = 5.3 m (+)
4.2m : B = 4.3m	5.1 m : B = 5.4 m (+)
4.6m : B = 4.6m	5.6 m : B = 5.5 m (+)
5.0m : B = 4.8m	6.0 m : B = 5.6 m (+)
5.4m : B = 5.0m (+)	6.4 m : B = 5.8 m (+)
5.8m : B = 5.2m (+)	6.8 m : B = 5.8 m (+)
6.2m : B = 5.2m (+)	7.2 m : B = 5.8 m (+)
6.6m : B = 5.3m (+)	7.6 m : B = 5.8 m (+)
7.0m : B = 5.4m (+)	8.1 m : B = 5.8 m (+)
7.4m : B = 5.5m (+)	8.5 m : B = 5.8 m (+)
7.8m : B = 5.5m (+)	8.9 m : B = 5.9 m (+)
8.2m : B = 5.5m (+)	9.3 m : B = 6.0 m (+)
8.5m : B = 5.5m (+)	9.7 m : B = 6.0 m (+)
8.8m : B = 5.5m (+)	10.2 m : B = 6.1 m (+)
9.1m : B = 5.5m (+)	10.6 m : B = 6.2 m (+)
9.4m : B = 5.5m (+)	11.0 m : B = 6.2 m (+)
9.7m : B = 5.6m (+)	11.4 m : B = 6.3 m (+)
10.0m : B = 5.6m (+)	11.9 m : B = 6.4 m (+)
10.3m : B = 5.6m (+)	12.3 m : B = 6.5 m (+)
10.6m : B = 5.6m (+)	12.7 m : B = 6.6 m (+)
10.9m : B = 5.7m (+)	13.1 m : B = 6.7 m (+)
11.2m : B = 5.7m (+)	13.6 m : B = 6.8 m (+)
11.5m : B = 5.8m (+)	14.0 m : B = 6.9 m (+)
11.8m : B = 5.8m (+)	14.4 m : B = 7.1 m (+)
12.1m : B = 5.9m (+)	14.9 m : B = 7.4 m (+)
12.4m : B = 6.0m (+)	15.3 m : B = 7.6 m (+)
12.7m : B = 6.0m (+)	15.8 m : B = 7.9 m (+)
13.0m : B = 6.1m (+)	16.3 m : B = 8.4 m (+)
13.3m : B = 6.1m (+)	16.8 m : B = 8.7 m (+)
13.6m : B = 6.2m (+)	17.2 m : B = 9.0 m (+)
13.9m : B = 6.2m (+)	17.5 m : B = 9.1 m (+)
14.2m : B = 6.3m (+)	
14.5m : B = 6.4m (+)	
14.8m : B = 6.4m (+)	
15.1m : B = 6.5m (+)	
15.4m : B = 6.6m (+)	
15.7m : B = 6.7m (+)	
16.0m : B = 6.8m (+)	
16.3m : B = 6.9m (+)	
16.6m : B = 7.1m (+)	
16.9m : B = 7.3m (+)	
17.2m : B = 7.5m (+)	
17.5m : B = 7.7m (+)	
17.8m : B = 7.9m (+)	
18.1m : B = 8.1m (+)	
18.4m : B = 8.3m (+)	
18.7m : B = 8.8m (+)	
20.4m : B = 9.4m (+)	

<i>Author</i>		<i>Comments:</i> ->
<i>Date</i>	08/08/2024	



Minimum profile I

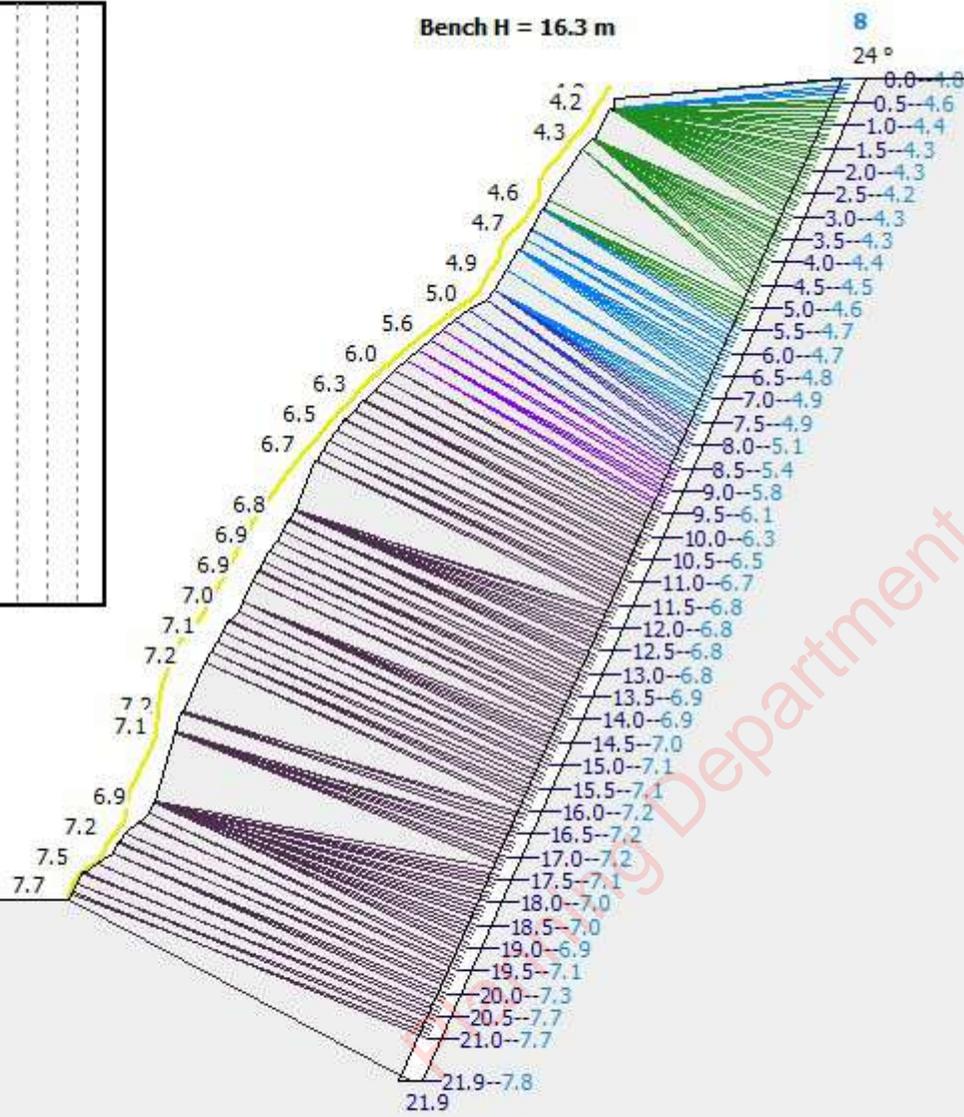
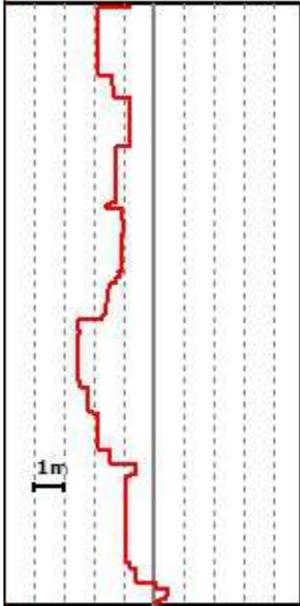


Hole 7	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.6m	2.2 m : B = 4.1 m
0.6m : B = 4.5m	2.5 m : B = 4.2 m
0.9m : B = 4.4m	3.1 m : B = 4.4 m
1.2m : B = 4.3m	3.5 m : B = 4.4 m
1.5m : B = 4.2m	4.0 m : B = 4.5 m
1.8m : B = 4.2m	4.5 m : B = 4.6 m
2.2m : B = 4.2m	4.9 m : B = 4.5 m
2.6m : B = 4.2m	5.4 m : B = 4.6 m
3.0m : B = 4.2m	5.9 m : B = 4.6 m
3.4m : B = 4.3m	6.3 m : B = 4.7 m
3.8m : B = 4.4m	6.8 m : B = 4.7 m
4.2m : B = 4.5m	7.3 m : B = 4.9 m
4.6m : B = 4.5m	7.9 m : B = 5.2 m (+)
5.0m : B = 4.5m	8.4 m : B = 5.4 m (+)
5.4m : B = 4.5m	9.0 m : B = 5.6 m (+)
5.8m : B = 4.6m	9.5 m : B = 5.8 m (+)
6.2m : B = 4.6m	10.0 m : B = 6.0 m (+)
6.6m : B = 4.6m	10.5 m : B = 6.1 m (+)
7.0m : B = 4.7m	11.0 m : B = 6.1 m (+)
7.4m : B = 4.7m	11.4 m : B = 6.1 m (+)
7.8m : B = 4.8m	12.0 m : B = 6.4 m (+)
8.2m : B = 4.9m	12.6 m : B = 6.7 m (+)
8.5m : B = 5.0m (+)	13.1 m : B = 6.9 m (+)
8.8m : B = 5.1m (+)	13.6 m : B = 7.1 m (+)
9.1m : B = 5.3m (+)	14.2 m : B = 7.3 m (+)
9.4m : B = 5.4m (+)	14.6 m : B = 7.3 m (+)
9.7m : B = 5.5m (+)	15.1 m : B = 7.3 m (+)
10.0m : B = 5.6m (+)	15.5 m : B = 7.3 m (+)
10.3m : B = 5.7m (+)	15.9 m : B = 7.3 m (+)
10.6m : B = 5.8m (+)	16.4 m : B = 7.3 m (+)
10.9m : B = 5.8m (+)	16.8 m : B = 7.3 m (+)
11.2m : B = 5.8m (+)	17.3 m : B = 7.4 m (+)
11.5m : B = 5.8m (+)	17.8 m : B = 7.5 m (+)
11.8m : B = 6.0m (+)	18.3 m : B = 7.6 m (+)
12.1m : B = 6.3m (+)	18.8 m : B = 7.6 m (+)
12.4m : B = 6.4m (+)	19.2 m : B = 7.6 m (+)
12.7m : B = 6.5m (+)	19.6 m : B = 7.7 m (+)
13.0m : B = 6.7m (+)	20.2 m : B = 7.8 m (+)
13.3m : B = 6.7m (+)	20.7 m : B = 7.9 m (+)
13.6m : B = 6.7m (+)	21.1 m : B = 8.1 m (+)
13.9m : B = 6.7m (+)	
14.2m : B = 6.7m (+)	
14.5m : B = 6.7m (+)	
14.8m : B = 6.6m (+)	
15.1m : B = 6.6m (+)	
15.4m : B = 6.6m (+)	
15.7m : B = 6.6m (+)	
16.0m : B = 6.6m (+)	
16.3m : B = 6.6m (+)	
16.6m : B = 6.7m (+)	
16.9m : B = 6.7m (+)	
17.2m : B = 6.8m (+)	
17.5m : B = 6.8m (+)	
17.8m : B = 6.9m (+)	
18.1m : B = 6.9m (+)	
18.4m : B = 7.0m (+)	
18.7m : B = 7.1m (+)	
19.0m : B = 7.3m (+)	
19.3m : B = 7.5m (+)	
19.6m : B = 7.6m (+)	
19.9m : B = 7.6m (+)	
22.0m : B = 7.9m (+)	

Blast plan	2307.ext		
Site	Gallstown	Hole	8

Drill plan

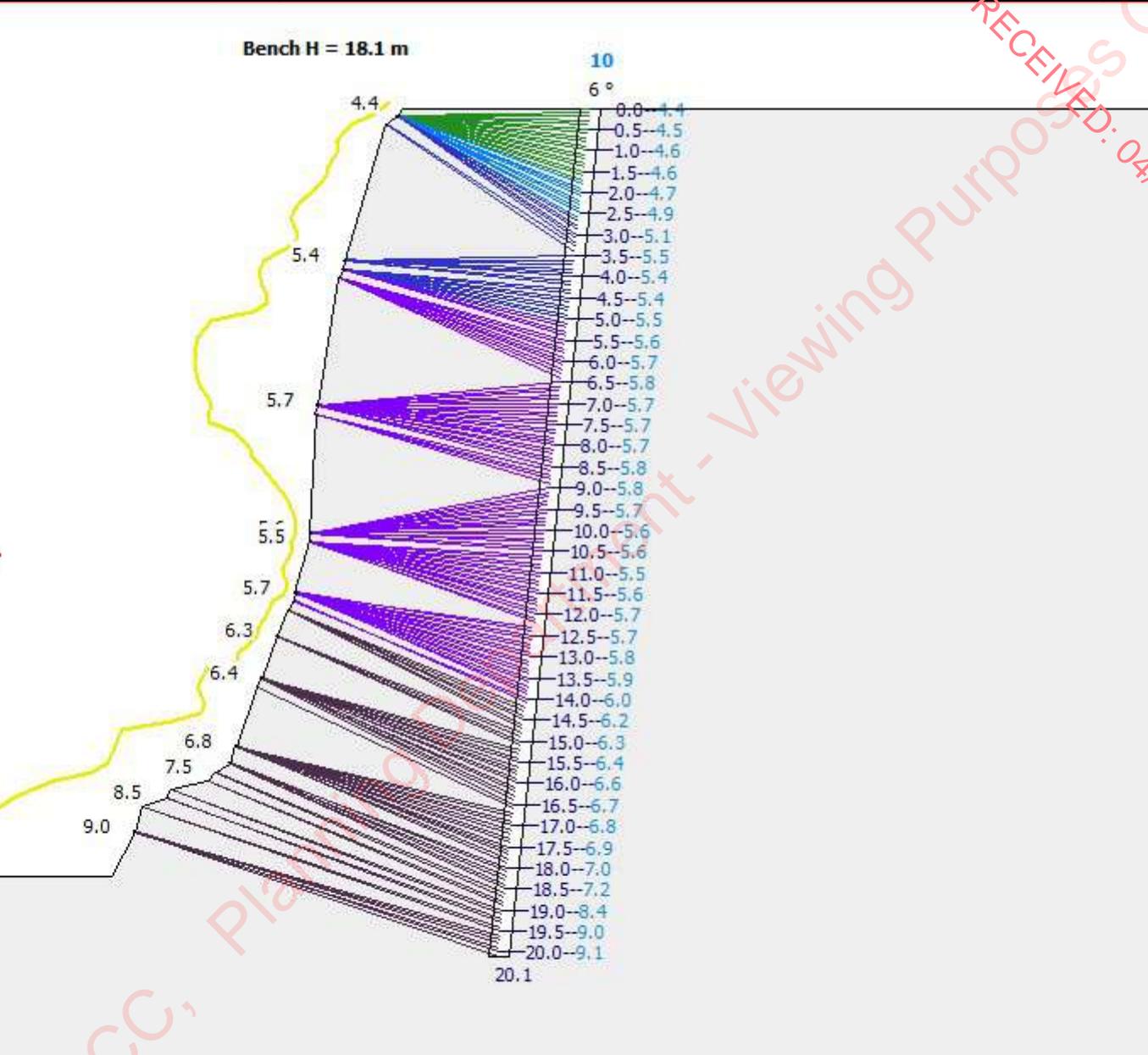
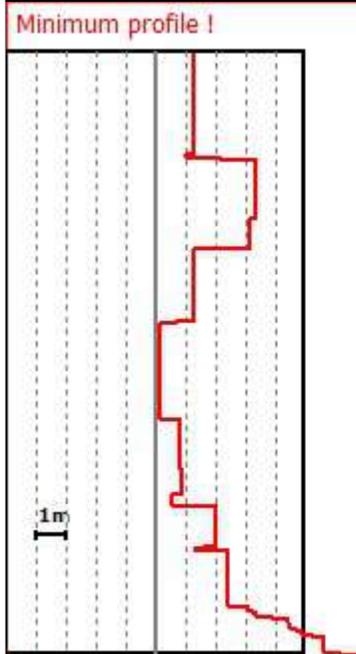
Minimum profile I



Hole 8	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.7m	2.1 m : B = 4.4 m
0.6m : B = 4.6m	2.4 m : B = 4.4 m
0.9m : B = 4.5m	2.9 m : B = 4.5 m
1.2m : B = 4.4m	3.4 m : B = 4.7 m
1.5m : B = 4.3m	3.9 m : B = 4.8 m
1.8m : B = 4.3m	4.4 m : B = 4.9 m
2.2m : B = 4.2m	4.8 m : B = 4.8 m
2.6m : B = 4.2m	5.3 m : B = 4.9 m
3.0m : B = 4.3m	5.8 m : B = 5.1 m (+)
3.4m : B = 4.3m	6.2 m : B = 5.0 m (+)
3.8m : B = 4.3m	6.7 m : B = 5.1 m (+)
4.2m : B = 4.4m	7.2 m : B = 5.2 m (+)
4.6m : B = 4.5m	7.8 m : B = 5.6 m (+)
5.0m : B = 4.6m	8.3 m : B = 5.9 m (+)
5.4m : B = 4.7m	8.9 m : B = 6.1 m (+)
5.8m : B = 4.7m	9.4 m : B = 6.4 m (+)
6.2m : B = 4.8m	10.0 m : B = 6.6 m (+)
6.6m : B = 4.8m	10.5 m : B = 6.8 m (+)
7.0m : B = 4.9m	11.0 m : B = 6.9 m (+)
7.4m : B = 4.9m	11.5 m : B = 7.1 m (+)
7.8m : B = 5.0m (+)	12.0 m : B = 7.2 m (+)
8.2m : B = 5.3m (+)	12.5 m : B = 7.3 m (+)
8.5m : B = 5.4m (+)	13.0 m : B = 7.4 m (+)
8.8m : B = 5.7m (+)	13.4 m : B = 7.4 m (+)
9.1m : B = 5.8m (+)	13.8 m : B = 7.4 m (+)
9.4m : B = 6.0m (+)	14.3 m : B = 7.5 m (+)
9.7m : B = 6.2m (+)	14.8 m : B = 7.5 m (+)
10.0m : B = 6.3m (+)	15.3 m : B = 7.6 m (+)
10.3m : B = 6.4m (+)	15.8 m : B = 7.7 m (+)
10.6m : B = 6.5m (+)	16.2 m : B = 7.7 m (+)
10.9m : B = 6.6m (+)	16.6 m : B = 7.7 m (+)
11.2m : B = 6.7m (+)	17.1 m : B = 7.6 m (+)
11.5m : B = 6.8m (+)	17.4 m : B = 7.5 m (+)
11.8m : B = 6.8m (+)	17.8 m : B = 7.4 m (+)
12.1m : B = 6.8m (+)	18.3 m : B = 7.4 m (+)
12.4m : B = 6.8m (+)	18.7 m : B = 7.5 m (+)
12.7m : B = 6.8m (+)	19.1 m : B = 7.4 m (+)
13.0m : B = 6.8m (+)	19.5 m : B = 7.3 m (+)
13.3m : B = 6.9m (+)	20.0 m : B = 7.4 m (+)
13.6m : B = 6.9m (+)	20.5 m : B = 7.5 m (+)
13.9m : B = 6.9m (+)	21.1 m : B = 7.7 m (+)
14.2m : B = 7.0m (+)	21.3 m : B = 7.7 m (+)
14.5m : B = 7.0m (+)	
14.8m : B = 7.0m (+)	
15.1m : B = 7.1m (+)	
15.4m : B = 7.1m (+)	
15.7m : B = 7.2m (+)	
16.0m : B = 7.2m (+)	
16.3m : B = 7.2m (+)	
16.6m : B = 7.2m (+)	
16.9m : B = 7.2m (+)	
17.2m : B = 7.1m (+)	
17.5m : B = 7.1m (+)	
17.8m : B = 7.0m (+)	
18.1m : B = 7.0m (+)	
18.4m : B = 7.0m (+)	
18.7m : B = 7.0m (+)	
19.0m : B = 6.9m (+)	
19.3m : B = 7.0m (+)	
19.6m : B = 7.2m (+)	
19.9m : B = 7.3m (+)	
20.2m : B = 7.3m (+)	
20.5m : B = 7.7m (+)	

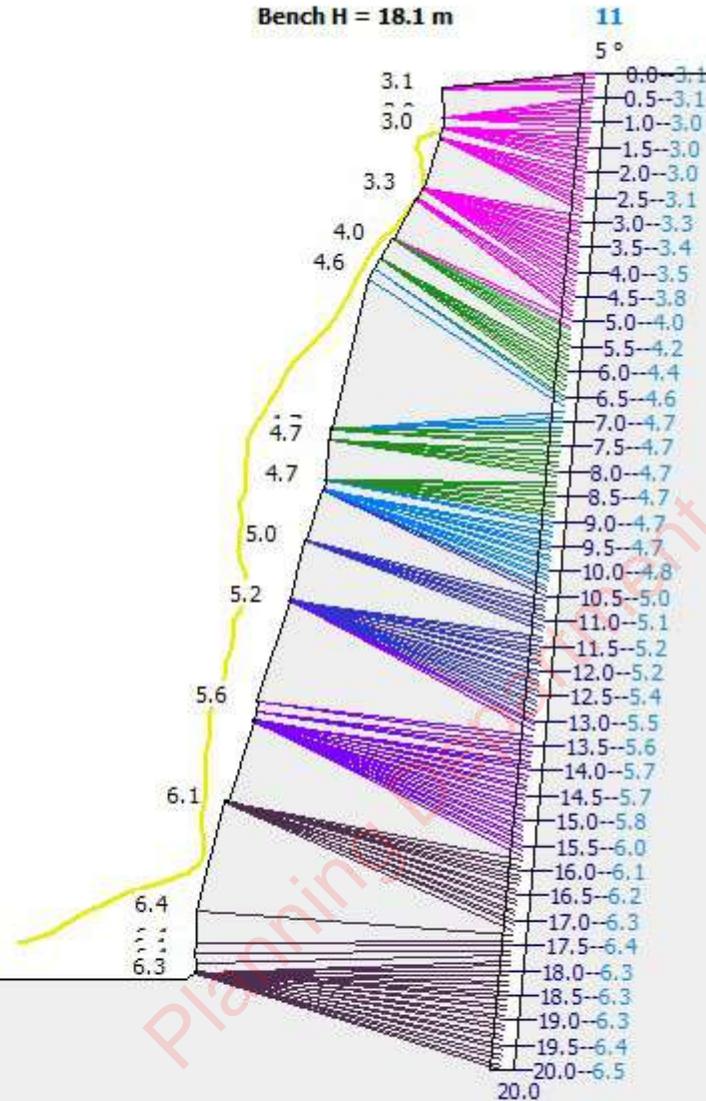
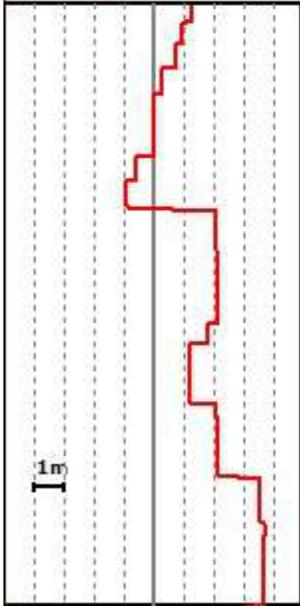
Author		Comments:
Date	08/08/2024	->





Hole 10	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.6m	0.4 m : B = 4.7 m
0.6m : B = 4.5m	0.7 m : B = 5.1 m (+)
0.9m : B = 4.6m	1.2 m : B = 5.7 m (+)
1.2m : B = 4.6m	1.6 m : B = 5.8 m (+)
1.5m : B = 4.6m	2.0 m : B = 6.0 m (+)
1.8m : B = 4.7m	2.5 m : B = 6.2 m (+)
2.2m : B = 4.8m	2.9 m : B = 6.6 m (+)
2.6m : B = 4.9m	3.3 m : B = 6.7 m (+)
3.0m : B = 5.1m (+)	3.7 m : B = 6.5 m (+)
3.4m : B = 5.4m (+)	4.2 m : B = 6.9 m (+)
3.8m : B = 5.4m (+)	4.6 m : B = 7.3 m (+)
4.2m : B = 5.4m (+)	5.0 m : B = 7.2 m (+)
4.6m : B = 5.4m (+)	5.4 m : B = 7.1 m (+)
5.0m : B = 5.5m (+)	6.0 m : B = 8.4 m (+)
5.4m : B = 5.5m (+)	6.4 m : B = 8.6 m (+)
5.8m : B = 5.6m (+)	6.8 m : B = 8.7 m (+)
6.2m : B = 5.7m (+)	7.2 m : B = 8.6 m (+)
6.6m : B = 5.8m (+)	7.6 m : B = 8.4 m (+)
7.0m : B = 5.7m (+)	7.9 m : B = 8.2 m (+)
7.4m : B = 5.7m (+)	8.3 m : B = 8.2 m (+)
7.8m : B = 5.7m (+)	8.7 m : B = 7.3 m (+)
8.2m : B = 5.7m (+)	9.0 m : B = 7.0 m (+)
8.5m : B = 5.8m (+)	9.4 m : B = 6.7 m (+)
8.8m : B = 5.8m (+)	9.8 m : B = 6.3 m (+)
9.1m : B = 5.8m (+)	10.1 m : B = 6.0 m (+)
9.4m : B = 5.7m (+)	10.5 m : B = 5.8 m (+)
9.7m : B = 5.6m (+)	10.9 m : B = 5.9 m (+)
10.0m : B = 5.6m (+)	11.3 m : B = 5.9 m (+)
10.3m : B = 5.6m (+)	11.7 m : B = 6.0 m (+)
10.6m : B = 5.6m (+)	12.1 m : B = 5.9 m (+)
10.9m : B = 5.5m (+)	12.6 m : B = 6.2 m (+)
11.2m : B = 5.6m (+)	13.0 m : B = 6.4 m (+)
11.5m : B = 5.6m (+)	13.4 m : B = 6.7 m (+)
11.8m : B = 5.6m (+)	13.9 m : B = 6.9 m (+)
12.1m : B = 5.7m (+)	14.4 m : B = 7.7 m (+)
12.4m : B = 5.7m (+)	14.8 m : B = 7.6 m (+)
12.7m : B = 5.7m (+)	15.1 m : B = 7.6 m (+)
13.0m : B = 5.8m (+)	15.8 m : B = 9.5 m (+)
13.3m : B = 5.8m (+)	16.2 m : B = 9.6 m (+)
13.6m : B = 5.9m (+)	16.6 m : B = 9.7 m (+)
13.9m : B = 6.0m (+)	17.1 m : B = 10.9 m (+)
14.2m : B = 6.1m (+)	17.6 m : B = 11.8 m (+)
14.5m : B = 6.2m (+)	18.1 m : B = 12.5 m (+)
14.8m : B = 6.3m (+)	
15.1m : B = 6.3m (+)	
15.4m : B = 6.4m (+)	
15.7m : B = 6.5m (+)	
16.0m : B = 6.6m (+)	
16.3m : B = 6.6m (+)	
16.6m : B = 6.7m (+)	
16.9m : B = 6.8m (+)	
17.2m : B = 6.8m (+)	
17.5m : B = 6.9m (+)	
17.8m : B = 7.0m (+)	
18.1m : B = 7.1m (+)	
18.4m : B = 7.2m (+)	
18.7m : B = 7.5m (+)	
19.0m : B = 8.4m (+)	
19.3m : B = 8.5m (+)	
19.6m : B = 9.0m (+)	
19.9m : B = 9.1m (+)	

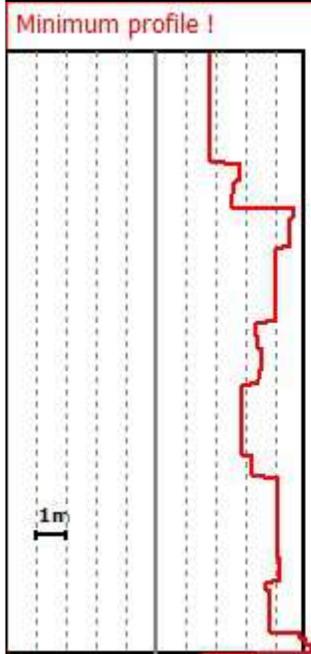
Minimum profile I



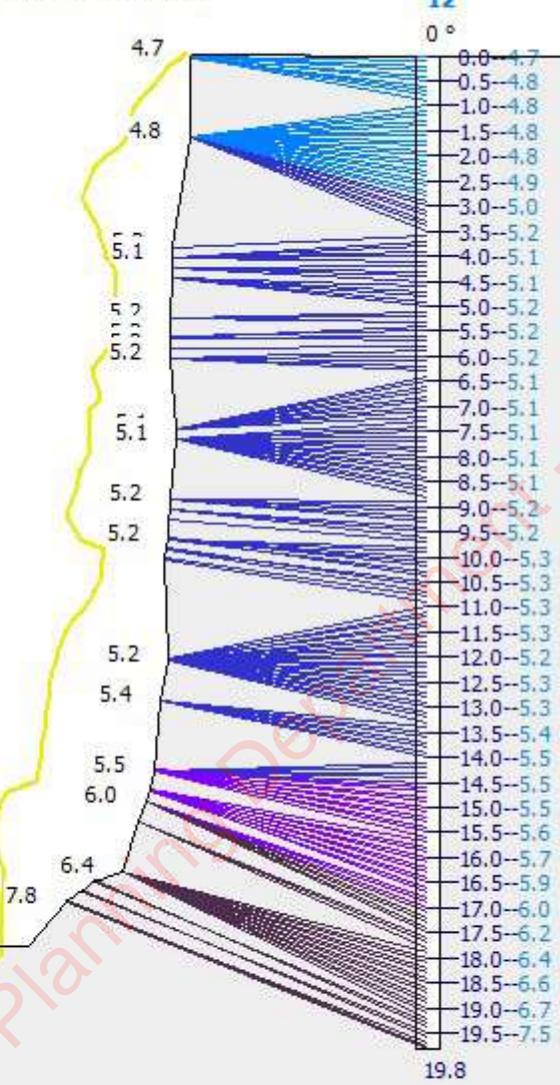
Hole 11	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.1m (-)	1.5 m : B = 3.0 m (-)
0.6m : B = 3.0m (-)	1.8 m : B = 3.4 m (-)
0.9m : B = 3.0m (-)	2.2 m : B = 3.3 m (-)
1.2m : B = 3.0m (-)	2.6 m : B = 3.2 m (-)
1.5m : B = 3.0m (-)	3.0 m : B = 3.5 m (-)
1.8m : B = 3.0m (-)	3.5 m : B = 3.7 m (-)
2.2m : B = 3.1m (-)	3.9 m : B = 4.0 m (-)
2.6m : B = 3.2m (-)	4.3 m : B = 4.3 m
3.0m : B = 3.3m (-)	4.7 m : B = 4.4 m
3.4m : B = 3.3m (-)	5.2 m : B = 4.6 m
3.8m : B = 3.5m (+)	5.6 m : B = 4.9 m
4.2m : B = 3.6m (+)	6.0 m : B = 5.3 m (+)
4.6m : B = 3.8m (-)	6.5 m : B = 5.6 m (+)
5.0m : B = 4.0m (-)	6.9 m : B = 5.8 m (+)
5.4m : B = 4.1m	7.3 m : B = 6.0 m (+)
5.8m : B = 4.3m	7.7 m : B = 6.2 m (+)
6.2m : B = 4.5m	8.2 m : B = 6.2 m (+)
6.6m : B = 4.7m	8.6 m : B = 6.2 m (+)
7.0m : B = 4.7m	8.9 m : B = 6.2 m (+)
7.4m : B = 4.7m	9.4 m : B = 6.3 m (+)
7.8m : B = 4.7m	9.7 m : B = 6.2 m (+)
8.2m : B = 4.7m	10.2 m : B = 6.2 m (+)
8.5m : B = 4.7m	10.6 m : B = 6.0 m (+)
8.8m : B = 4.7m	11.0 m : B = 6.0 m (+)
9.1m : B = 4.7m	11.4 m : B = 6.0 m (+)
9.4m : B = 4.7m	11.8 m : B = 6.1 m (+)
9.7m : B = 4.8m	12.2 m : B = 6.2 m (+)
10.0m : B = 4.8m	12.6 m : B = 6.2 m (+)
10.3m : B = 4.9m	13.0 m : B = 6.3 m (+)
10.6m : B = 5.0m (+)	13.4 m : B = 6.4 m (+)
10.9m : B = 5.1m (+)	13.8 m : B = 6.4 m (+)
11.2m : B = 5.1m (+)	14.2 m : B = 6.5 m (+)
11.5m : B = 5.2m (+)	14.6 m : B = 6.4 m (+)
11.8m : B = 5.2m (+)	15.0 m : B = 6.4 m (+)
12.1m : B = 5.3m (+)	15.4 m : B = 6.4 m (+)
12.4m : B = 5.3m (+)	15.8 m : B = 6.4 m (+)
12.7m : B = 5.4m (+)	16.2 m : B = 6.3 m (+)
13.0m : B = 5.5m (+)	16.6 m : B = 6.6 m (+)
13.3m : B = 5.6m (+)	17.2 m : B = 7.8 m (+)
13.6m : B = 5.6m (+)	17.7 m : B = 8.6 m (+)
13.9m : B = 5.6m (+)	18.1 m : B = 9.3 m (+)
14.2m : B = 5.7m (+)	18.4 m : B = 9.9 m (+)
14.5m : B = 5.7m (+)	
14.8m : B = 5.8m (+)	
15.1m : B = 5.9m (+)	
15.4m : B = 5.9m (+)	
15.7m : B = 6.0m (+)	
16.0m : B = 6.1m (+)	
16.3m : B = 6.1m (+)	
16.6m : B = 6.2m (+)	
16.9m : B = 6.3m (+)	
17.2m : B = 6.4m (+)	
17.5m : B = 6.4m (+)	
17.8m : B = 6.4m (+)	
18.1m : B = 6.3m (+)	
18.4m : B = 6.3m (+)	
18.7m : B = 6.3m (+)	
19.0m : B = 6.3m (+)	
19.3m : B = 6.4m (+)	
19.6m : B = 6.4m (+)	
19.9m : B = 6.5m (+)	

<i>Author</i>		<i>Comments:</i>	
<i>Date</i>	08/08/2024	->	





Bench H = 17.8 m

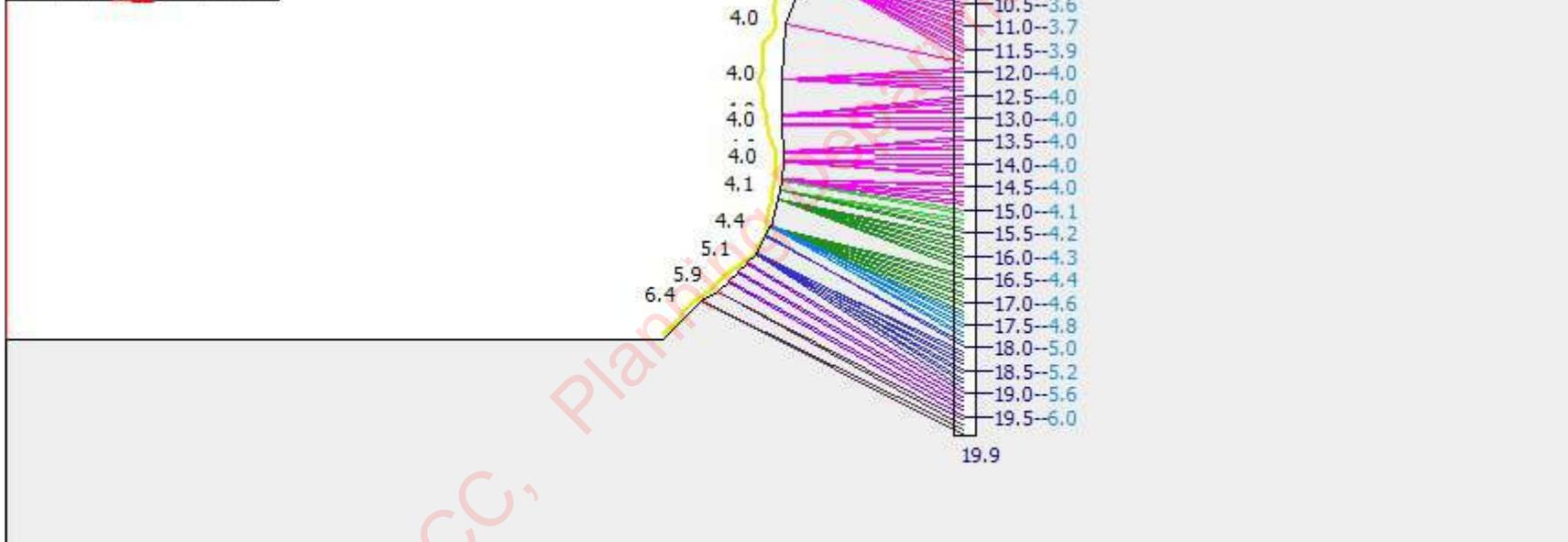
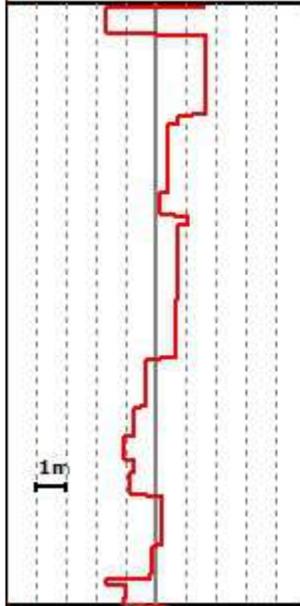


Hole 12	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.8m	-0.1 m : B = 4.8 m
0.6m : B = 4.8m	0.2 m : B = 5.2 m (+)
0.9m : B = 4.8m	0.6 m : B = 5.5 m (+)
1.2m : B = 4.8m	1.0 m : B = 5.9 m (+)
1.5m : B = 4.8m	1.4 m : B = 6.0 m (+)
1.8m : B = 4.8m	1.8 m : B = 6.2 m (+)
2.2m : B = 4.8m	2.2 m : B = 6.7 m (+)
2.6m : B = 4.9m	2.6 m : B = 6.9 m (+)
3.0m : B = 5.0m (+)	3.0 m : B = 6.9 m (+)
3.4m : B = 5.1m (+)	3.4 m : B = 6.6 m (+)
3.8m : B = 5.1m (+)	3.8 m : B = 6.5 m (+)
4.2m : B = 5.1m (+)	4.2 m : B = 6.3 m (+)
4.6m : B = 5.2m (+)	4.6 m : B = 6.3 m (+)
5.0m : B = 5.2m (+)	5.0 m : B = 6.3 m (+)
5.4m : B = 5.2m (+)	5.4 m : B = 6.3 m (+)
5.8m : B = 5.2m (+)	5.8 m : B = 6.4 m (+)
6.2m : B = 5.2m (+)	6.2 m : B = 6.7 m (+)
6.6m : B = 5.1m (+)	6.6 m : B = 6.6 m (+)
7.0m : B = 5.1m (+)	7.0 m : B = 6.8 m (+)
7.4m : B = 5.1m (+)	7.4 m : B = 6.8 m (+)
7.8m : B = 5.1m (+)	7.8 m : B = 6.8 m (+)
8.2m : B = 5.1m (+)	8.3 m : B = 6.9 m (+)
8.5m : B = 5.1m (+)	8.7 m : B = 7.0 m (+)
8.8m : B = 5.2m (+)	9.1 m : B = 7.2 m (+)
9.1m : B = 5.2m (+)	9.5 m : B = 7.1 m (+)
9.4m : B = 5.2m (+)	9.9 m : B = 6.5 m (+)
9.7m : B = 5.2m (+)	10.3 m : B = 6.5 m (+)
10.0m : B = 5.3m (+)	10.7 m : B = 6.7 m (+)
10.3m : B = 5.3m (+)	11.1 m : B = 6.9 m (+)
10.6m : B = 5.3m (+)	11.5 m : B = 7.2 m (+)
10.9m : B = 5.4m (+)	11.9 m : B = 7.4 m (+)
11.2m : B = 5.3m (+)	12.3 m : B = 7.5 m (+)
11.5m : B = 5.3m (+)	12.7 m : B = 7.6 m (+)
11.8m : B = 5.2m (+)	13.1 m : B = 7.6 m (+)
12.1m : B = 5.2m (+)	13.5 m : B = 7.7 m (+)
12.4m : B = 5.2m (+)	13.9 m : B = 7.7 m (+)
12.7m : B = 5.3m (+)	14.3 m : B = 7.8 m (+)
13.0m : B = 5.3m (+)	14.7 m : B = 8.4 m (+)
13.3m : B = 5.4m (+)	15.1 m : B = 8.6 m (+)
13.6m : B = 5.4m (+)	15.5 m : B = 8.6 m (+)
13.9m : B = 5.5m (+)	15.9 m : B = 8.7 m (+)
14.2m : B = 5.5m (+)	16.3 m : B = 8.5 m (+)
14.5m : B = 5.5m (+)	16.7 m : B = 8.5 m (+)
14.8m : B = 5.5m (+)	17.1 m : B = 8.5 m (+)
15.1m : B = 5.6m (+)	17.5 m : B = 8.5 m (+)
15.4m : B = 5.6m (+)	17.9 m : B = 8.5 m (+)
15.7m : B = 5.7m (+)	18.2 m : B = 9.0 m (+)
16.0m : B = 5.7m (+)	
16.3m : B = 5.8m (+)	
16.6m : B = 5.9m (+)	
16.9m : B = 6.0m (+)	
17.2m : B = 6.1m (+)	
17.5m : B = 6.2m (+)	
17.8m : B = 6.3m (+)	
18.1m : B = 6.4m (+)	
18.4m : B = 6.5m (+)	
18.7m : B = 6.6m (+)	
19.0m : B = 6.7m (+)	
19.3m : B = 7.3m (+)	
19.6m : B = 7.5m (+)	
19.9m : B = 7.8m (+)	

<i>Author</i>		Comments: ->
<i>Date</i>	08/08/2024	

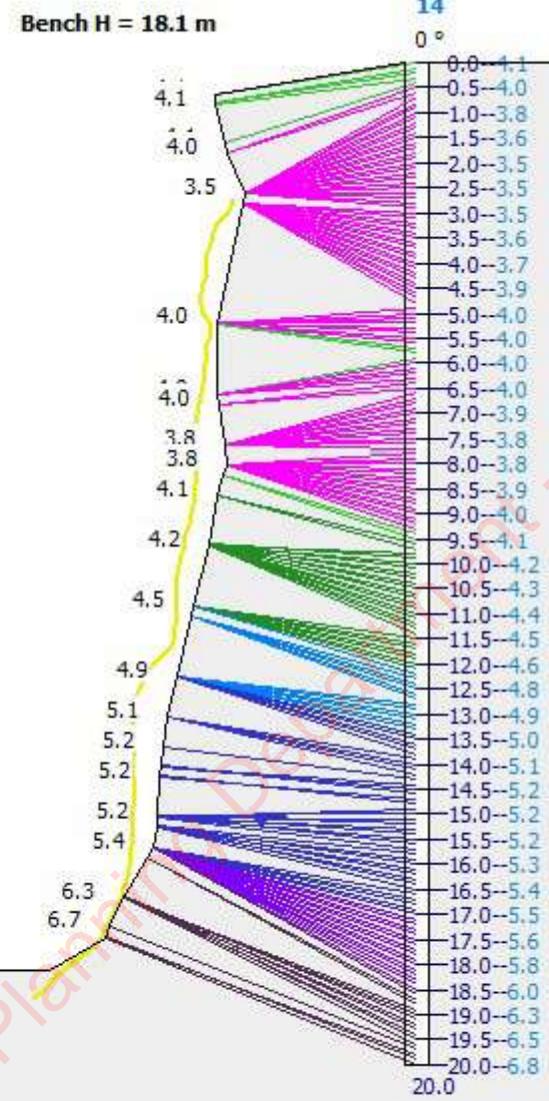
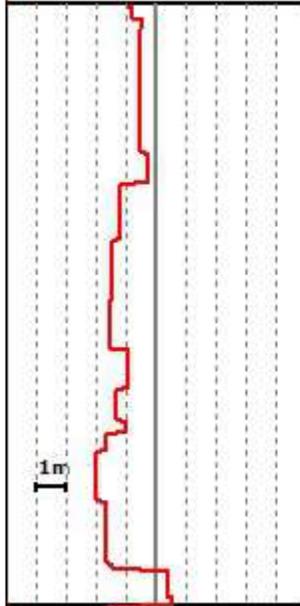


Minimum profile I



Hole 13	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.9m (-)	0.4 m : B = 4.5 m
0.6m : B = 3.9m (-)	0.7 m : B = 4.7 m
0.9m : B = 3.9m (-)	1.1 m : B = 4.9 m
1.2m : B = 3.7m (-)	1.5 m : B = 4.8 m
1.5m : B = 3.6m (-)	1.9 m : B = 4.7 m
1.8m : B = 3.5m (-)	2.3 m : B = 4.1 m
2.2m : B = 3.4m (-)	2.7 m : B = 3.9 m (-)
2.6m : B = 3.4m (-)	3.1 m : B = 4.1 m
3.0m : B = 3.4m (-)	3.5 m : B = 4.2 m
3.4m : B = 3.5m (-)	3.9 m : B = 4.1 m
3.8m : B = 3.4m (-)	4.3 m : B = 4.3 m
4.2m : B = 3.3m (-)	4.7 m : B = 4.2 m
4.6m : B = 3.2m (-)	5.1 m : B = 4.0 m (-)
5.0m : B = 3.2m (-)	5.5 m : B = 3.5 m (-)
5.4m : B = 3.1m (-)	5.9 m : B = 3.4 m (-)
5.8m : B = 3.2m (-)	6.3 m : B = 3.3 m (-)
6.2m : B = 3.2m (-)	6.7 m : B = 3.5 m (-)
6.6m : B = 3.3m (-)	7.1 m : B = 3.5 m (-)
7.0m : B = 3.3m (-)	7.5 m : B = 3.5 m (-)
7.4m : B = 3.2m (-)	7.9 m : B = 3.5 m (-)
7.8m : B = 3.2m (-)	8.3 m : B = 3.4 m (-)
8.2m : B = 3.2m (-)	8.7 m : B = 3.8 m (-)
8.5m : B = 3.2m (-)	9.1 m : B = 3.7 m (-)
8.8m : B = 3.2m (-)	9.5 m : B = 3.6 m (-)
9.1m : B = 3.3m (-)	9.9 m : B = 4.0 m (-)
9.4m : B = 3.4m (-)	10.3 m : B = 4.1 m
9.7m : B = 3.5m (-)	10.8 m : B = 4.1 m
10.0m : B = 3.5m (-)	11.2 m : B = 4.2 m
10.3m : B = 3.5m (-)	11.6 m : B = 4.4 m
10.6m : B = 3.6m (-)	12.0 m : B = 4.4 m
10.9m : B = 3.7m (-)	12.4 m : B = 4.4 m
11.2m : B = 3.8m (-)	12.8 m : B = 4.4 m
11.5m : B = 3.9m (-)	13.2 m : B = 4.3 m
11.8m : B = 4.0m (-)	13.6 m : B = 4.2 m
12.1m : B = 4.0m (-)	14.0 m : B = 4.1 m
12.4m : B = 4.0m (-)	14.4 m : B = 4.1 m
12.7m : B = 4.0m (-)	14.8 m : B = 4.2 m
13.0m : B = 4.0m (-)	15.2 m : B = 4.3 m
13.3m : B = 4.0m (-)	15.6 m : B = 4.3 m
13.6m : B = 4.0m (-)	16.0 m : B = 4.6 m
13.9m : B = 4.0m (-)	16.4 m : B = 5.1 m (+)
14.2m : B = 4.0m (-)	16.8 m : B = 5.6 m (+)
14.5m : B = 4.0m (-)	17.2 m : B = 6.1 m (+)
14.8m : B = 4.0m (-)	17.6 m : B = 6.4 m (+)
15.1m : B = 4.1m	
15.4m : B = 4.1m	
15.7m : B = 4.2m	
16.0m : B = 4.3m	
16.3m : B = 4.4m	
16.6m : B = 4.4m	
16.9m : B = 4.5m	
17.2m : B = 4.6m	
17.5m : B = 4.8m	
17.8m : B = 4.9m	
18.1m : B = 5.1m (+)	
18.4m : B = 5.2m (+)	
18.7m : B = 5.3m (+)	
19.0m : B = 5.6m (+)	
19.3m : B = 5.8m (+)	
19.6m : B = 6.1m (+)	
19.9m : B = 6.5m (+)	

Minimum profile !

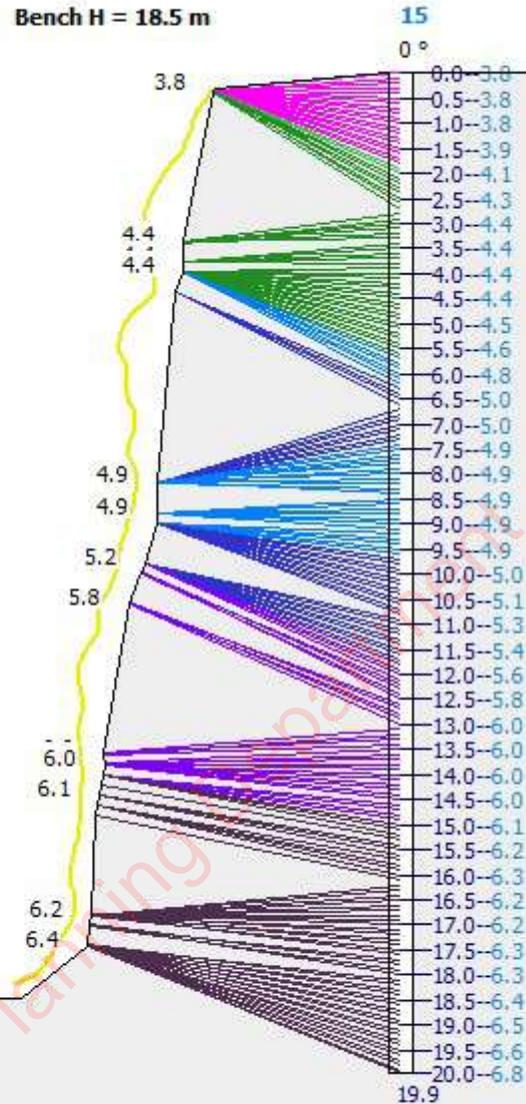
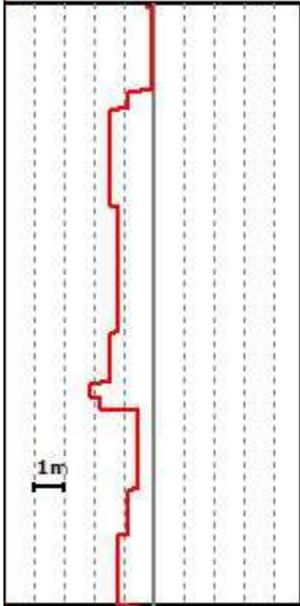


Hole 14	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.1m	2.7 m : B = 3.6 m (-)
0.6m : B = 4.0m (-)	3.0 m : B = 3.8 m (-)
0.9m : B = 3.9m (-)	3.4 m : B = 4.0 m (-)
1.2m : B = 3.7m (-)	3.8 m : B = 4.2 m
1.5m : B = 3.6m (-)	4.2 m : B = 4.2 m
1.8m : B = 3.6m (-)	4.6 m : B = 4.3 m
2.2m : B = 3.5m (-)	5.0 m : B = 4.2 m
2.6m : B = 3.5m (-)	5.4 m : B = 4.1 m
3.0m : B = 3.5m (-)	5.8 m : B = 4.2 m
3.4m : B = 3.5m (-)	6.2 m : B = 4.2 m
3.8m : B = 3.6m (-)	6.6 m : B = 4.3 m
4.2m : B = 3.8m (-)	7.0 m : B = 4.4 m
4.6m : B = 3.9m (-)	7.4 m : B = 4.4 m
5.0m : B = 4.0m (-)	7.8 m : B = 4.4 m
5.4m : B = 4.0m (-)	8.2 m : B = 4.4 m
5.8m : B = 4.1m	8.6 m : B = 4.4 m
6.2m : B = 4.0m (-)	9.0 m : B = 4.5 m
6.6m : B = 4.0m (-)	9.4 m : B = 4.6 m
7.0m : B = 3.9m (-)	9.8 m : B = 4.7 m
7.4m : B = 3.9m (-)	10.2 m : B = 4.8 m
7.8m : B = 3.8m (-)	10.6 m : B = 4.8 m
8.2m : B = 3.8m (-)	11.0 m : B = 4.8 m
8.5m : B = 3.9m (-)	11.4 m : B = 4.8 m
8.8m : B = 3.9m (-)	11.8 m : B = 5.1 m (+)
9.1m : B = 4.0m (-)	12.3 m : B = 5.4 m (+)
9.4m : B = 4.1m	12.7 m : B = 5.6 m (+)
9.7m : B = 4.2m	13.1 m : B = 5.6 m (+)
10.0m : B = 4.2m	13.5 m : B = 5.6 m (+)
10.3m : B = 4.2m	13.9 m : B = 5.6 m (+)
10.6m : B = 4.3m	14.3 m : B = 5.6 m (+)
10.9m : B = 4.4m	14.7 m : B = 5.6 m (+)
11.2m : B = 4.4m	15.1 m : B = 5.6 m (+)
11.5m : B = 4.5m	15.5 m : B = 5.7 m (+)
11.8m : B = 4.6m	15.9 m : B = 5.7 m (+)
12.1m : B = 4.7m	16.3 m : B = 5.8 m (+)
12.4m : B = 4.7m	16.7 m : B = 5.9 m (+)
12.7m : B = 4.8m	17.1 m : B = 6.1 m (+)
13.0m : B = 4.9m	17.5 m : B = 6.3 m (+)
13.3m : B = 4.9m	17.9 m : B = 6.8 m (+)
13.6m : B = 5.0m (+)	18.3 m : B = 7.3 m (+)
13.9m : B = 5.1m (+)	18.7 m : B = 7.7 m (+)
14.2m : B = 5.1m (+)	
14.5m : B = 5.2m (+)	
14.8m : B = 5.2m (+)	
15.1m : B = 5.2m (+)	
15.4m : B = 5.2m (+)	
15.7m : B = 5.2m (+)	
16.0m : B = 5.3m (+)	
16.3m : B = 5.3m (+)	
16.6m : B = 5.4m (+)	
16.9m : B = 5.5m (+)	
17.2m : B = 5.5m (+)	
17.5m : B = 5.6m (+)	
17.8m : B = 5.7m (+)	
18.1m : B = 5.8m (+)	
18.4m : B = 6.0m (+)	
18.7m : B = 6.1m (+)	
19.0m : B = 6.3m (+)	
19.3m : B = 6.5m (+)	
19.6m : B = 6.6m (+)	
19.9m : B = 6.7m (+)	

<i>Author</i>		<i>Comments:</i> ->
<i>Date</i>	08/08/2024	



Minimum profile !



Hole 15	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.8m (-)	0.3 m : B = 3.7 m (-)
0.6m : B = 3.8m (-)	0.8 m : B = 4.0 m (-)
0.9m : B = 3.8m (-)	1.2 m : B = 4.2 m
1.2m : B = 3.9m (-)	1.6 m : B = 4.3 m
1.5m : B = 3.9m (-)	2.0 m : B = 4.7 m
1.8m : B = 4.0m (-)	2.4 m : B = 4.9 m
2.2m : B = 4.2m	2.8 m : B = 5.1 m (+)
2.6m : B = 4.4m	3.2 m : B = 5.2 m (+)
3.0m : B = 4.4m	3.6 m : B = 5.2 m (+)
3.4m : B = 4.4m	4.0 m : B = 5.0 m (+)
3.8m : B = 4.4m	4.4 m : B = 4.9 m
4.2m : B = 4.4m	4.8 m : B = 5.3 m (+)
4.6m : B = 4.4m	5.2 m : B = 5.6 m (+)
5.0m : B = 4.5m	5.6 m : B = 5.6 m (+)
5.4m : B = 4.6m	6.0 m : B = 5.5 m (+)
5.8m : B = 4.7m	6.4 m : B = 5.5 m (+)
6.2m : B = 4.9m	6.8 m : B = 5.3 m (+)
6.6m : B = 5.1m (+)	7.2 m : B = 5.3 m (+)
7.0m : B = 5.0m (+)	7.6 m : B = 5.4 m (+)
7.4m : B = 4.9m	8.0 m : B = 5.2 m (+)
7.8m : B = 4.9m	8.4 m : B = 5.3 m (+)
8.2m : B = 4.9m	8.8 m : B = 5.4 m (+)
8.5m : B = 4.9m	9.2 m : B = 5.5 m (+)
8.8m : B = 4.9m	9.6 m : B = 5.6 m (+)
9.1m : B = 4.9m	10.0 m : B = 5.7 m (+)
9.4m : B = 4.9m	10.4 m : B = 5.9 m (+)
9.7m : B = 5.0m (+)	10.8 m : B = 6.0 m (+)
10.0m : B = 5.0m (+)	11.2 m : B = 6.0 m (+)
10.3m : B = 5.1m (+)	11.6 m : B = 6.3 m (+)
10.6m : B = 5.2m (+)	12.0 m : B = 6.4 m (+)
10.9m : B = 5.2m (+)	12.4 m : B = 6.4 m (+)
11.2m : B = 5.3m (+)	12.8 m : B = 6.4 m (+)
11.5m : B = 5.4m (+)	13.2 m : B = 6.4 m (+)
11.8m : B = 5.5m (+)	13.6 m : B = 6.4 m (+)
12.1m : B = 5.6m (+)	14.0 m : B = 6.4 m (+)
12.4m : B = 5.7m (+)	14.4 m : B = 6.4 m (+)
12.7m : B = 5.9m (+)	14.8 m : B = 6.4 m (+)
13.0m : B = 6.0m (+)	15.2 m : B = 6.4 m (+)
13.3m : B = 6.0m (+)	15.6 m : B = 6.5 m (+)
13.6m : B = 6.0m (+)	16.0 m : B = 6.6 m (+)
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14.2m : B = 6.0m (+)	16.8 m : B = 6.6 m (+)
14.5m : B = 6.0m (+)	17.2 m : B = 6.8 m (+)
14.8m : B = 6.0m (+)	17.6 m : B = 7.0 m (+)
15.1m : B = 6.1m (+)	18.0 m : B = 7.3 m (+)
15.4m : B = 6.1m (+)	
15.7m : B = 6.2m (+)	
16.0m : B = 6.3m (+)	
16.3m : B = 6.3m (+)	
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16.9m : B = 6.2m (+)	
17.2m : B = 6.2m (+)	
17.5m : B = 6.3m (+)	
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18.1m : B = 6.4m (+)	
18.4m : B = 6.4m (+)	
18.7m : B = 6.4m (+)	
19.0m : B = 6.5m (+)	
19.3m : B = 6.6m (+)	
19.6m : B = 6.7m (+)	
19.9m : B = 6.8m (+)	

<i>Author</i>		<i>Comments:</i>	
<i>Date</i>	08/08/2024	->	





KEMEK LIMITED: Blast Summary Report



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Blast Area: **2407 - Bench #2**

Date: **09/08/24**

BLASTING PARAMETERS

Number of Holes (#):	23	Hole Diameter (mm)	127	Average Depth (m):	17.90
Burden (m):	4.80	Spacing (m):	4.20	Proposed Floor Level (m):	94.00
Subgrade Drill (m):	1.00	Estimated Rock Density (t/m ³):	2.70	Estimated Blast Tonnage (t):	21,163
Blast Ratio (t/kg):	4.40	Initiation Type:	Non-electric	Proposed Loading Rate (kg/m):	18.00
Planned M.I.C (kgs)	290	Actual M.I.C (kgs):	250	Total Explosive Charge (kg):	4,814

EXPLOSIVES ORDER INFORMATION

		Quantity			Quantity
Explosives:	Kemex 70	4,814	Detonators:	U475 x 21.0m	23
				U500 x 7.8m	23
Boosters:	Booster 250g	23		SL 17ms x 7.8m	2
	Booster 420g	23		SL 25ms x 7.8m	8
				SL 67ms x 7.8m	15
Accessories:	Hole Plug				
	Harness Wire x 400m			Starter Line 100.0m	2

COMMENTS

Face inspection complete, all blast holes measured and profiles were consulted before charging commenced.

APPROVAL SIGNATURES

Pre-Drill Survey: **Yes** BHS: **Yes** Shotfiring: **Yes** R.O.B.I.S.: **Yes** Vibrographs:

Explosives Supervisor:

Shotfirer:

Trainee Shotfirer:



KEMEK LIMITED: Borehole Instruction / Survey Report



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 09/08/2024

Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth	
	Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted
1	18.1	19.0	5°	-	83°	-	21	17.9	16.2	0°	-	0°	-	41	-	-	-	-	-	-
2	18.2	18.3	6°	-	83°	-	22	18.0	18.0	0°	-	0°	-	42	-	-	-	-	-	-
3	18.0	17.7	3°	-	83°	-	23	18.0	0.2	0°	-	0°	-	43	-	-	-	-	-	-
4	17.8	17.7	3°	-	83°	-	24	-	-	-	-	-	-	44	-	-	-	-	-	-
5	17.9	5.7	0°	-	0°	-	25	-	-	-	-	-	-	45	-	-	-	-	-	-
6	18.0	17.8	0°	-	0°	-	26	-	-	-	-	-	-	46	-	-	-	-	-	-
7	18.2	17.6	2°	-	83°	-	27	-	-	-	-	-	-	47	-	-	-	-	-	-
8	18.0	17.6	0°	-	0°	-	28	-	-	-	-	-	-	48	-	-	-	-	-	-
9	18.0	15.8	0°	-	0°	-	29	-	-	-	-	-	-	49	-	-	-	-	-	-
10	17.9	17.4	0°	-	0°	-	30	-	-	-	-	-	-	50	-	-	-	-	-	-
11	17.8	17.1	0°	-	0°	-	31	-	-	-	-	-	-	51	-	-	-	-	-	-
12	17.8	17.4	0°	-	0°	-	32	-	-	-	-	-	-	52	-	-	-	-	-	-
13	17.9	16.9	3°	-	83°	-	33	-	-	-	-	-	-	53	-	-	-	-	-	-
14	17.9	17.5	0°	-	0°	-	34	-	-	-	-	-	-	54	-	-	-	-	-	-
15	17.8	16.2	2°	-	83°	-	35	-	-	-	-	-	-	55	-	-	-	-	-	-
16	17.7	16.3	0°	-	83°	-	36	-	-	-	-	-	-	56	-	-	-	-	-	-
17	17.8	15.4	0°	-	0°	-	37	-	-	-	-	-	-	57	-	-	-	-	-	-
18	17.7	17.3	0°	-	0°	-	38	-	-	-	-	-	-	58	-	-	-	-	-	-
19	17.6	16.9	0°	-	0°	-	39	-	-	-	-	-	-	59	-	-	-	-	-	-
20	17.8	18.3	0°	-	0°	-	40	-	-	-	-	-	-	60	-	-	-	-	-	-
Comments:			HOLE DIAMETER (mm):				127	Total Design Drill Metres (m)					411.8							

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Viewing Department 09/08/2024



KEMEK LIMITED: Blast Location, Danger Zone, Sentry Points and Firing Position



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 09/08/2024



Key: Danger Zone: Blast Site: Sentries: Firing Position: Direction of Throw: Floor Point: 94.000



KEMEK LIMITED: Charging Specification



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **09/08/2024**

Single Deck Holes	Single Deck Holes								
Hole Numbers: 1 to 23	Hole Numbers: 								
									
4.00 m < Top stemming	 m < Top stemming								
<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U500 x 7.8m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 250g	x1	U500 x 7.8m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U500 x 7.8m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 250g	x1	U500 x 7.8m	x1
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U500 x 7.8m	x1								
<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">250</td><td style="text-align: center;">Kg of Kemex 70... (+/-</td><td style="text-align: center;">)</td><td style="text-align: center;">%</td></tr> </table>	250	Kg of Kemex 70... (+/-)	%	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;"></td><td style="text-align: center;">Kg of Kemex 70... (+/-</td><td style="text-align: center;">)</td><td style="text-align: center;">%</td></tr> </table>		Kg of Kemex 70... (+/-)	%
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<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U475 x 21.0m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 420g	x1	U475 x 21.0m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U475 x 21.0m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 420g	x1	U475 x 21.0m	x1
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U475 x 21.0m	x1								
Booster 420g	x1								
U475 x 21.0m	x1								

Single Deck Holes	Single Deck Holes								
Hole Numbers: 	Hole Numbers: 								
									
 m < Top stemming	 m < Top stemming								
<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U475 x 21.0m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 250g	x1	U475 x 21.0m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U475 x 21.0m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 250g	x1	U475 x 21.0m	x1
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U475 x 21.0m	x1								
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<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U500 x 7.8m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 420g	x1	U500 x 7.8m	x1	<table border="1" style="margin: auto;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: center;">x1</td></tr> <tr><td style="text-align: center;">U500 x 7.8m</td><td style="text-align: center;">x1</td></tr> </table>	Booster 420g	x1	U500 x 7.8m	x1
Booster 420g	x1								
U500 x 7.8m	x1								
Booster 420g	x1								
U500 x 7.8m	x1								



KEMEK LIMITED: Quarry Face Inspection Image

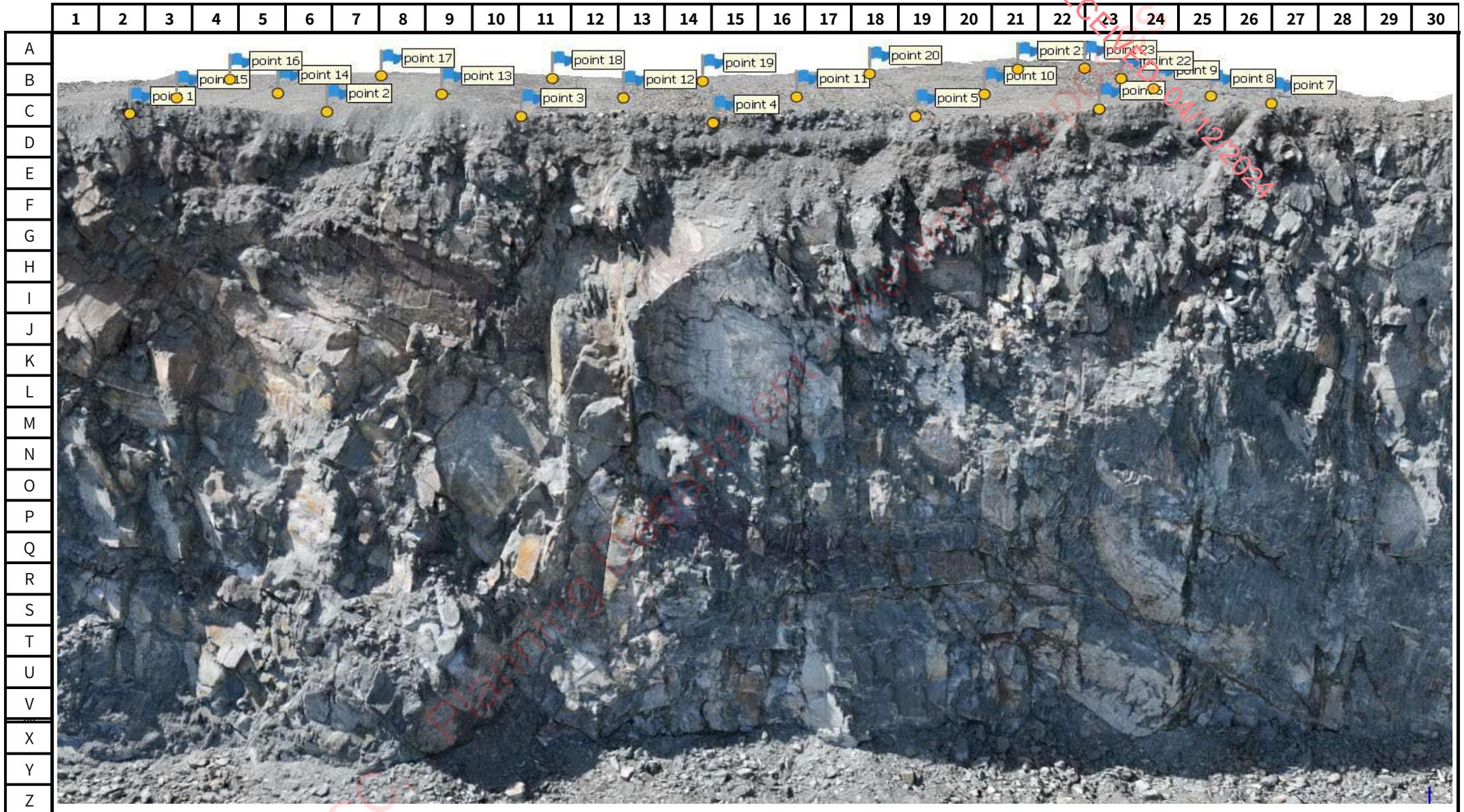


Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

09/08/24



Comments:-

See image above highlighting front row blast holes.



KEMEK LIMITED: Risk Assessment / Checklists



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **09/08/24**

DANGER ZONE ASSESSMENT GENERAL FACTORS.

DRILLERS LOG - SIGNED	Yes	COMMUNICATION WITH SENTRIES AND MANAGER	Yes
FACE HEIGHT AND ORIENTATION - REF. SUMMARY SHEET	Yes	PROXIMITY TO FOOTPATH, ROAD, HOUSE, PLANT - SEE DANGER ZONE	Yes
FACE INSPECTION ON DAY OF BLAST - ATTACHED	Yes	FIRING POSITION WITH RESPECT - WIND & BLAST PROJECTION - SEE DANGER ZONE	Yes

CRITICAL FACTORS.

BURDEN:	MINIMUM ALLOWED FOR LOCATION (m):	4.00	BURDEN:	MINIMUM BURDEN CHARGED (m):	4.30
	WHICH HOLE NUMBER:	2		AT WHAT DEPTH IN THE HOLE (m):	6.00
	LOCAL SPECIFIC CHARGE (kg/m³):	1.11			
SPACING:	MINIMUM ALLOWED FOR LOCATION (m):	3.50	SPACING:	MINIMUM SPACING CHARGED (m):	4.10
	BETWEEN HOLE NUMBERS :	6 and 7		LOCAL SPECIFIC CHARGE (kg/m³):	1.01
DELAYS:	MAXIMUM DELAY PER METER SPACING (ms):	5.95	DELAYS:	MAXIMUM DELAY PER METER BURDEN (ms):	14.80
EXPLOSIVES:	EXPLOSIVE TYPE USED - SEE SUMMARY SHEET:	Kemex 70	STEMMING:	PRE & POST STEMMING REVIEW WITH CREW:	Yes
	EXPECTED CHARGE MASS PER METER (kg/m):	18.0		SIZE OF STEMMING MATERIAL USED (mm):	10.0
	MAXIMUM CHARGE MASS PER METER (kg/m):	19.0		MINIMUM LENGTH OF STEMMING IN BLAST (m):	4.0

COMMENTS:

Generic Risk Assessment:	Quarry Blasting Risk Assessment - BS-RA-01	Yes	Surveying Risk Assessment - BS-RA-03	Yes
	Quarry Waste Burning Risk Assessment - BS-RA-02	Yes	Environmental Monitoring RA - BS-RA-04	Yes

WORK AREA CHECKLIST

QUARRY BENCH:

ACCESS & EGRESS APPROPRIATE?	Yes
FALLS FROM HEIGHT- EDGE PROTECTION ERECTED?	Yes
GROUND CONDITIONS SUITABLE?	Yes

POST BLAST:

SHOT CHECKED FOR EVIDENCE OF MISFIRE?	Yes
CHECK FOR LOOSE GROUND/UNSTABLE FACES?	Yes
SURPLUS EXPLOSIVES & ACCESSORIES DESTROYED?	Yes

BLAST PREPARATION:

VIBRATION LEVEL ESTIMATED & ACCEPTABLE?	Yes
BURDEN DETERMINED AROUND EACH SHOTHOLE?	Yes
CONNECTION OF INITIATION SYSTEM CHECKED?	Yes
DANGER ZONE & POSITION OF SENTRIES ESTABLISHED?	Yes
DANGER ZONE & POSITION OF SENTRIES COMMUNICATED?	Yes

DANGER ZONE CLEARED BY: **Peter Ryan**



KEMEK LIMITED: Drill Plan

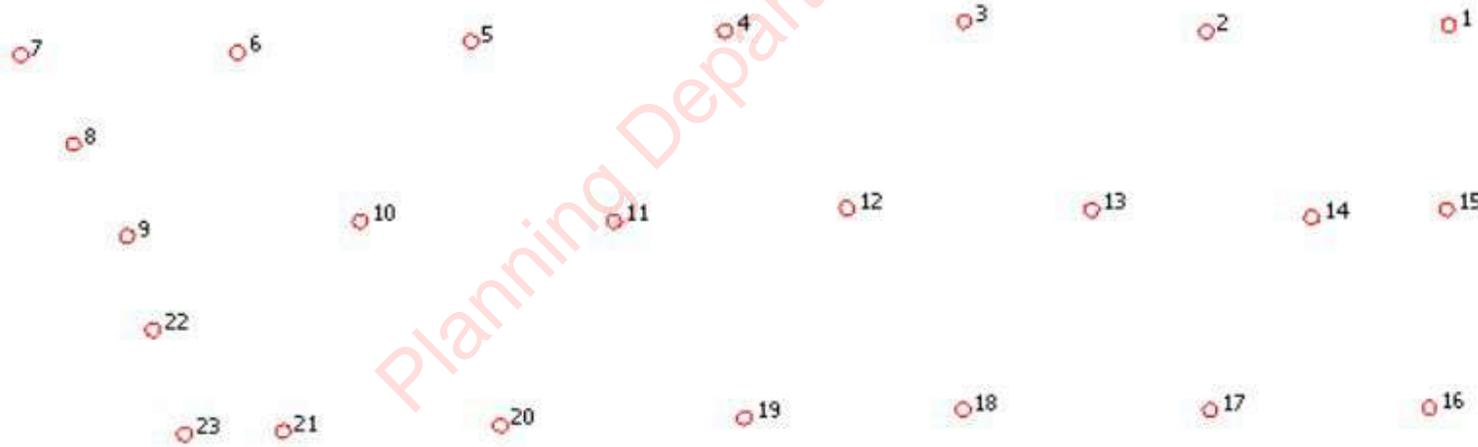


Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

09/08/2024



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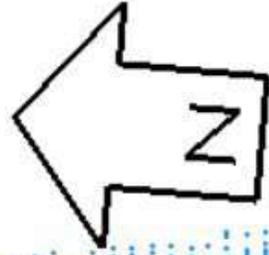
KEMEK LIMITED: Surface Connectors



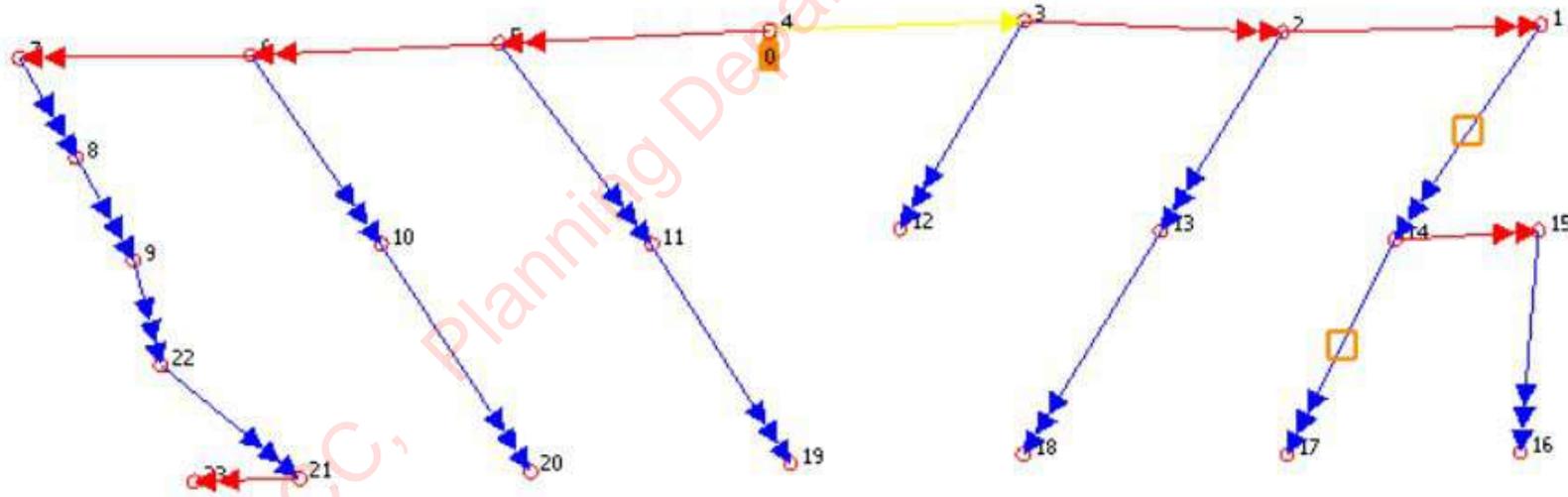
Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 09/08/2024



- 10x 4.8 m SL #067
- 1x 3.6 m SL #067
- 3x 2.4 m SL #067
- 5x 4.8 m SL #025
- 1x 3.6 m SL #025
- 1x 2.4 m SL #025
- 1x 4.8 m SL #017



RECEIVED: 04/12/2024
Louth CC, Planning Department - Viewing Purposes Only



KEMEK LIMITED - Charge Record



Customer / Location: Kilsaran Gaulstown, Co Louth

Date: 09/08/24

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)	(kgs)	
1	19.0	247					4.5	247	
2	18.3	250					4.4	250	
3	17.7	237					4.5	237	
4	17.7	236					4.6	236	
5	5.7	21					4.5	21	
6	17.8	237					4.6	237	
7	17.6	234					4.6	234	
8	17.6	234					4.6	234	
9	15.8	204					4.5	204	
10	17.4	232					4.5	232	
11	17.1	225					4.6	225	
12	17.4	233					4.5	233	
13	16.9	223					4.5	223	
14	17.5	232					4.6	232	
15	16.2	211					4.5	211	
16	16.3	212					4.5	212	
17	15.4	194					4.6	194	
18	17.3	230					4.5	230	
19	16.9	222					4.6	222	
20	18.3	249					4.5	249	
21	16.2	208					4.6	208	
22	18.0	243					4.5	243	
23	0.2	0					0.0	0	
24	-							0	
25	-							0	
26	-							0	
27	-							0	
28	-							0	
29	-							0	
30	-							0	
31	-							0	
32	-							0	
33	-							0	
34	-							0	
35	-							0	
36	-							0	
37	-							0	
38	-							0	
39	-							0	
40	-							0	
41	-							0	
42	-							0	
43	-							0	
44	-							0	
45	-							0	
46	-							0	
47	-							0	
48	-							0	
49	-							0	
50	-							0	
Total:								4,814	

RECEIVED 04/12/2024
Planning Department - Viewing Purposes Only



KEMEK LIMITED: Truck Charge Record (kgs)

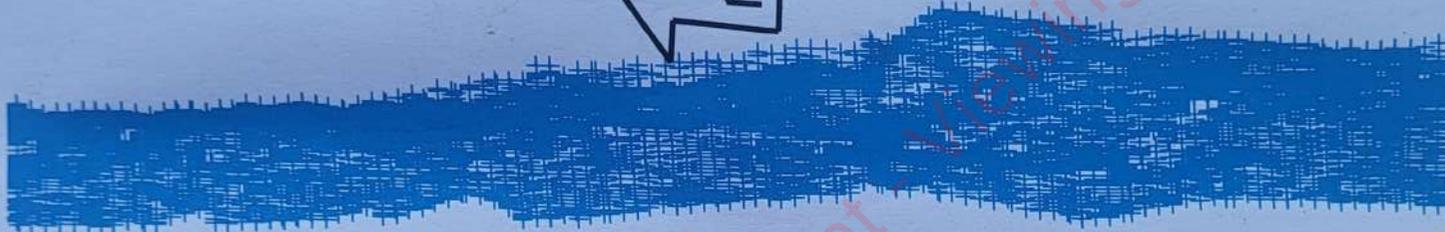
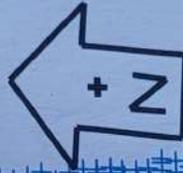


Customer / Location:

Kilsaran Gaulstown, Co Louth

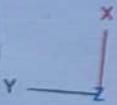
Date: 09/08/2024

SHOTPlus™ Plan



- ⊕⁷ 234
- ⊕⁶ 237
- ⊕⁵ 22
- ⊕⁴ 236
- ⊕³ 237
- ⊕² 250
- ⊕¹ 247
- ⊕⁸ 234
- ⊕⁹ 204
- ⊕¹⁰ 232
- ⊕¹¹ 225
- ⊕¹² 233
- ⊕¹³ 223
- ⊕¹⁴ 232
- ⊕¹⁵ 211
- ⊕²² 243
- ⊕²³ X
- ⊕²¹ 208
- ⊕²⁰ 249
- ⊕¹⁹ 222
- ⊕¹⁸ 230
- ⊕¹⁷ 194
- ⊕¹⁶ 212

8,386 Kg



SHOTPlus™ 6 Standard 6.19.1	07/08/2024
Mine	Kilsaran
Location	Gallstown
Title/author	2407 Scott Penny
Filename	
Scale	1:200

Louth CC, Planning Department RECEIVED: 04/12/2024



KEMEK LIMITED: Delivery Docket



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **09/08/2024**

Delivery Docket
SO000447



Kemek Limited
Clonagh
Enfield
Co. Kildare
A83 D62
Phone +353 46 9541086
Email finance@kemekltd.com
Web www.kemekltd.com

Account No. 110102
Delivery Date 09/08/2024
Order No. SO000447
Your Ref.
Truck Reg. 222 MH 1145

Invoice Address

KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN PIERCETOWN
DUNBOYNE
CO MEATH
A86 WE20
IE
Phone: 01 8251608

Delivery Address

KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN GAULSTOWN
CO LOUTH
LOUTH
LEINSTER
IE

Description	Item Code	Employee	Quantity	UoM	Qty. Recd.
KEMEX 70 CE 0080	FE7000		20000	KG	
DUNARIT DOUBLE WELL BOOSTER 420g	AC3129		74	EACH	
Maxam 250G Boosters	AC3128		74	EACH	
EXEL U450 24M	AC9006		51	EACH	
EXEL U475 7.8M	AC9010		51	EACH	
EXEL U475 21M	AC9013		23	EACH	
EXEL U500 7.8M	AC9020		23	EACH	
EXEL Connectadet SL 17ms 7.8m	AC6080		4	EACH	
EXEL Connectadet SL 25ms 7.8m	AC6087		21	EACH	
EXEL Connectadet SL 67ms 7.8m	AC6081		53	EACH	
Exel Starter 100m	AC6900		4	EACH	
Blasting Service	TS0010	SP63	1	EACH	
Blast Supervision	TS0020	JD72	1	EACH	
Remote Shotfiring Service - ROBIS	TS9999		1	EACH	
Total			20381		

Customer's Signature

Shotfirer's Signature

222 = 8,780kg / 7,166 kg
241 = 8,386 kg



Methods for the safe destruction of small quantities of explosives can be found at:
www.kemekltd.com/document-library/

Limited Liability Company Registered in Ireland. Registration No.: 76969



QUALITY
NSAI Certified



HEALTH & SAFETY
NSAI Certified



KEMEK LIMITED: Point of Work Risk Assessment



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: **09/08/2024**

<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22553 Name: Scott Penny Date / Time Created: 23/07/2024 11:09:39</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 4 Site Location: Kilsaran Gallstown Discription: Surveying activities TA-RA-03 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22616 Name: Scott Penny Date / Time Created: 07/08/2024 08:54:17</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 4 Site Location: Kilsaran Gallstown Discription: Surveying activities TA-RA-03 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22627 Name: Scott Penny Date / Time Created: 09/08/2024 06:43:48</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 2 and 4 Site Location: Kilsaran Gallstown Discription: Blasting activities TA-RA-01 Monitoring TA-RA-04 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott, John, Keith, Peter, Marcus and Shane</p>
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RECEIVED: 09/12/2024

KEMEK LIMITED BLAST VIBRATION REPORT

Customer / Location:	Kilsaran Gaulstown, Co Louth
Date:	09/08/2024
Reference #:	

WEATHER DATA

Wind Direction	Wind	Cloud Cover (%)
West	27km/h	69%

BLAST DATA

# of Holes	Hole size	Depth	Burden	Spacing	Total Charge	M.I.C.	Notes	Blast Time
	mm	m	m	m	Kg	Kg		12:07
23	127	17.9	4.8	4.2	4,814	250	Bench #2	

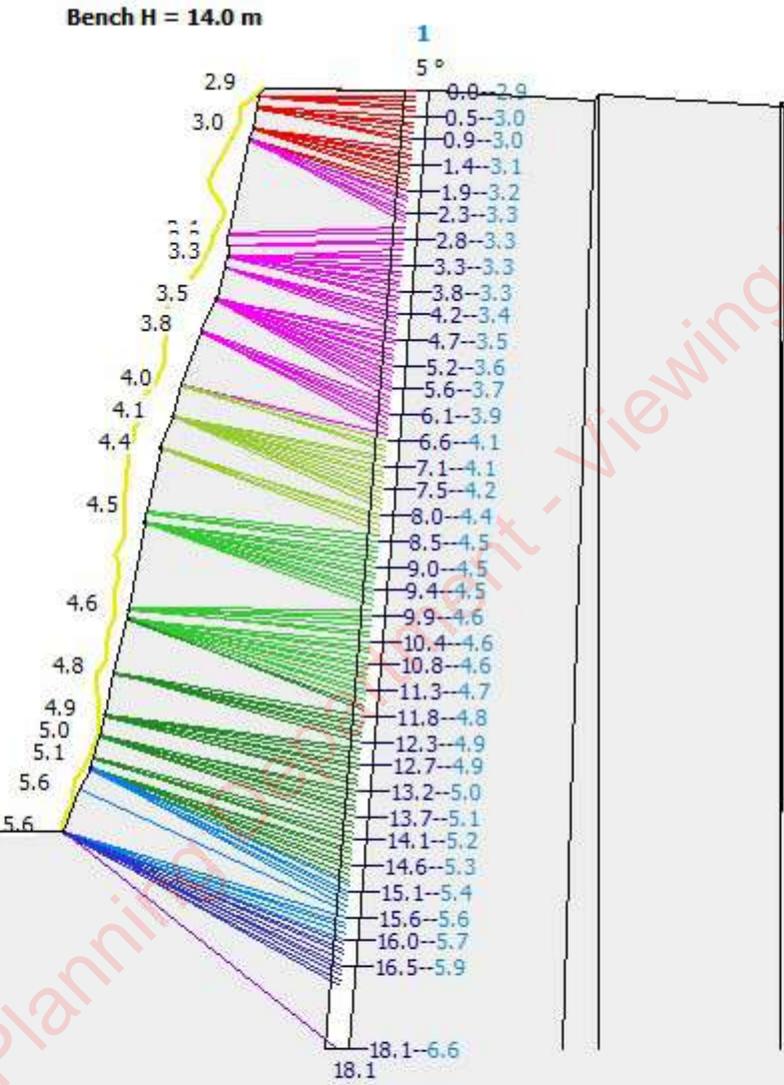
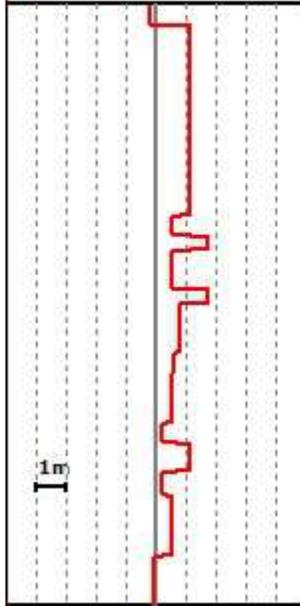
VIBROGRAPH DATA

	Residence	Nomis	Plan Distance	Bearing	H	T	V	AOP
		unit #	m	degrees	mm/sec	mm/sec	mm/sec	dBL
Nomis #1	Kellegher	4168	1110	200	<0.5	<0.5	<0.5	<117
Nomis #2				°				
Nomis #3				°				
Nomis #4				°				
Nomis #5				°				
Nomis #6				°				
Nomis #7				°				

A print-out of the vibration and AOP levels is not available when the Nomis unit is not triggered.

Signature:	
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Minimum profile I



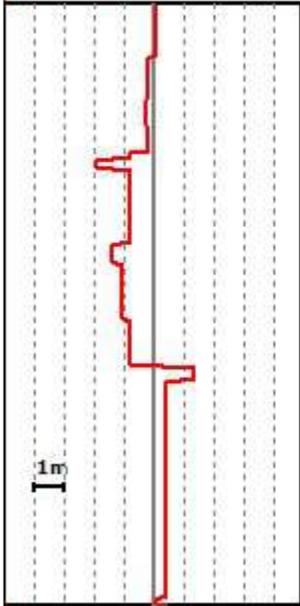
Hole 1	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m: B = 3.0m (-) !!!<-	0.2 m : B = 2.8 m (-)
0.6m: B = 3.0m (-) !!!<-	0.6 m : B = 3.2 m (-)
0.9m: B = 3.0m (-) !!!<-	1.0 m : B = 3.3 m (-)
1.2m: B = 3.0m (-) !!!<-	1.4 m : B = 3.5 m (-)
1.5m: B = 3.1m (-) !!!<-	1.8 m : B = 3.7 m (-)
1.8m: B = 3.1m (-) !!!<-	2.2 m : B = 3.6 m (-)
2.2m: B = 3.3m (-)	2.6 m : B = 3.4 m (-)
2.6m: B = 3.4m (-)	3.0 m : B = 3.6 m (-)
3.0m: B = 3.3m (-)	3.5 m : B = 3.7 m (-)
3.4m: B = 3.3m (-)	3.9 m : B = 3.9 m (-)
3.8m: B = 3.3m (-)	4.3 m : B = 4.2 m
4.2m: B = 3.4m (-)	4.7 m : B = 4.3 m
4.6m: B = 3.5m (-)	5.1 m : B = 4.3 m
5.0m: B = 3.5m (-)	5.5 m : B = 4.3 m
5.4m: B = 3.7m (-)	5.9 m : B = 4.4 m
5.8m: B = 3.8m (-)	6.3 m : B = 4.6 m
6.2m: B = 3.9m (-)	6.8 m : B = 4.7 m
6.6m: B = 4.1m	7.2 m : B = 4.8 m
7.0m: B = 4.1m	7.6 m : B = 4.8 m
7.4m: B = 4.2m	8.0 m : B = 4.8 m
7.8m: B = 4.3m	8.4 m : B = 4.8 m
8.2m: B = 4.4m	8.8 m : B = 4.7 m
8.5m: B = 4.5m	9.2 m : B = 4.9 m
8.8m: B = 4.5m	9.6 m : B = 4.8 m
9.1m: B = 4.5m	10.0 m : B = 4.8 m
9.4m: B = 4.5m	10.4 m : B = 4.8 m
9.7m: B = 4.6m	10.8 m : B = 4.9 m
10.0m: B = 4.6m	11.2 m : B = 4.9 m
10.3m: B = 4.6m	11.6 m : B = 5.0 m (+)
10.6m: B = 4.6m	12.0 m : B = 5.0 m (+)
10.9m: B = 4.7m	12.4 m : B = 4.9 m
11.2m: B = 4.7m	12.8 m : B = 5.0 m (+)
11.5m: B = 4.8m	13.2 m : B = 5.2 m (+)
11.8m: B = 4.8m	13.6 m : B = 5.3 m (+)
12.1m: B = 4.9m	14.0 m : B = 5.4 m (+)
12.4m: B = 4.9m	14.5 m : B = 5.4 m (+)
12.7m: B = 4.9m	
13.0m: B = 5.0m (+)	
13.3m: B = 5.0m (+)	
13.6m: B = 5.1m (+)	
13.9m: B = 5.1m (+)	
14.2m: B = 5.2m (+)	
14.5m: B = 5.3m (+)	
14.8m: B = 5.3m (+)	
15.1m: B = 5.4m (+)	
15.4m: B = 5.5m (+)	
15.7m: B = 5.6m (+)	
16.0m: B = 5.7m (+)	
16.3m: B = 5.8m (+)	
16.6m: B = 5.9m (+)	
16.9m: B = 6.0m (+)	
18.1m: B = 6.6m (+)	

<i>Author</i>		Comments: ->
<i>Date</i>	08/08/2024	

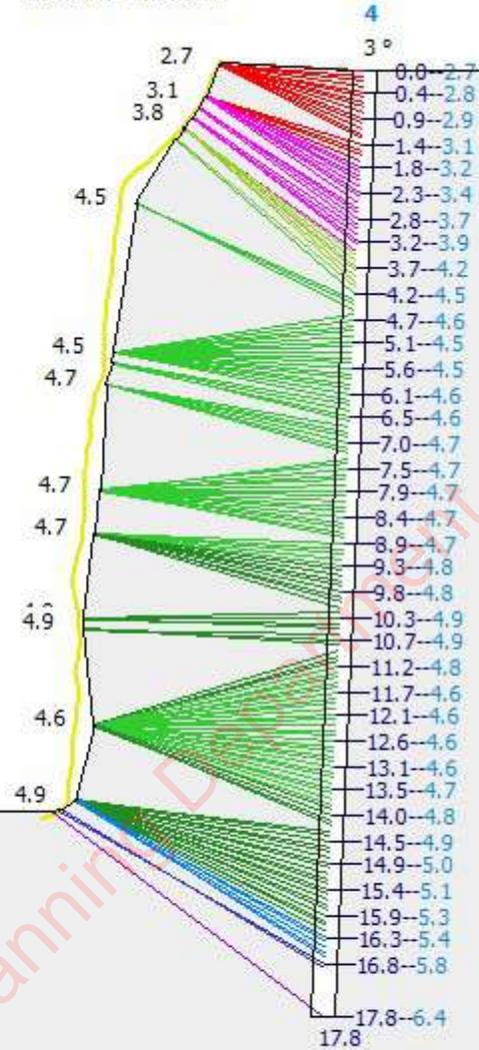


Blast plan	2407.ext			Drill plan
Site	Gallstown	Hole	4	

Minimum profile I



Bench H = 14.1 m



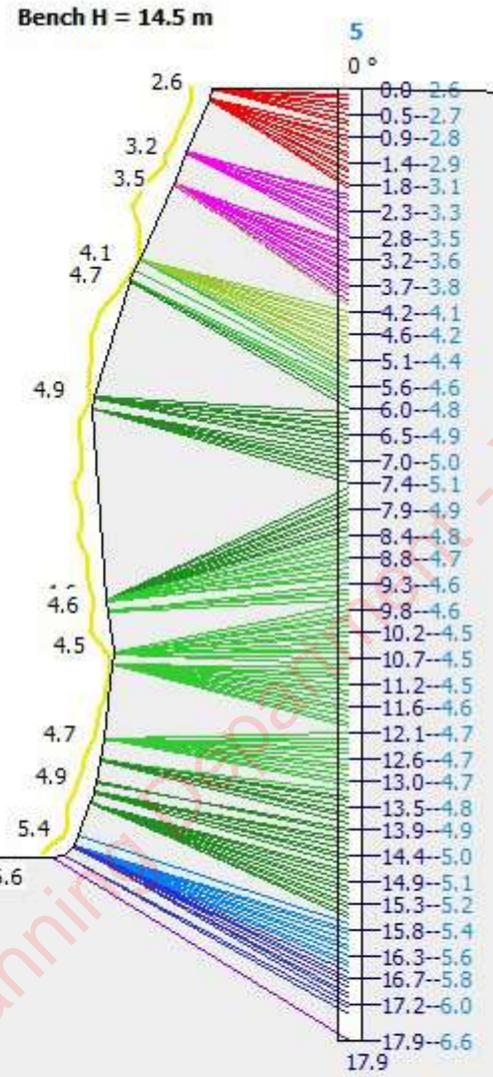
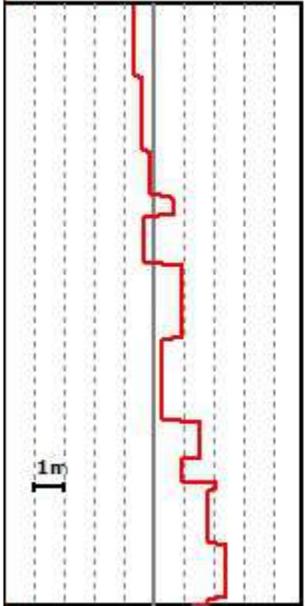
Hole 4

MIN BURDEN		CR-SEC BURDEN	
Depth / Burden		Depth / Burden	
0.3m: B = 2.8m (-) !!!<-		0.0 m : B = 2.7 m (-)	
0.6m: B = 2.8m (-) !!!<-		0.2 m : B = 2.8 m (-)	
0.9m: B = 2.9m (-) !!!<-		0.6 m : B = 3.0 m (-)	
1.2m: B = 3.0m (-) !!!<-		1.0 m : B = 3.2 m (-)	
1.5m: B = 3.1m (-) !!!<-		1.4 m : B = 3.6 m (-)	
1.8m: B = 3.2m (-)		1.9 m : B = 3.9 m (-)	
2.2m: B = 3.4m (-)		2.3 m : B = 4.4 m	
2.6m: B = 3.6m (-)		2.7 m : B = 4.5 m	
3.0m: B = 3.9m (-)		3.1 m : B = 4.5 m	
3.4m: B = 4.0m (-)		3.5 m : B = 4.5 m	
3.8m: B = 4.2m		3.9 m : B = 4.6 m	
4.2m: B = 4.5m		4.3 m : B = 4.6 m	
4.6m: B = 4.6m		4.7 m : B = 4.6 m	
5.0m: B = 4.6m		5.1 m : B = 4.6 m	
5.4m: B = 4.5m		5.5 m : B = 4.6 m	
5.8m: B = 4.5m		5.9 m : B = 4.7 m	
6.2m: B = 4.6m		6.3 m : B = 4.8 m	
6.6m: B = 4.6m		6.7 m : B = 4.8 m	
7.0m: B = 4.7m		7.1 m : B = 4.8 m	
7.4m: B = 4.7m		7.5 m : B = 4.9 m	
7.8m: B = 4.7m		7.9 m : B = 4.9 m	
8.2m: B = 4.7m		8.3 m : B = 4.9 m	
8.5m: B = 4.7m		8.7 m : B = 4.9 m	
8.8m: B = 4.7m		9.1 m : B = 4.9 m	
9.1m: B = 4.7m		9.5 m : B = 5.0 m (+)	
9.4m: B = 4.8m		10.0 m : B = 5.0 m (+)	
9.7m: B = 4.8m		10.3 m : B = 4.9 m	
10.0m: B = 4.9m		10.7 m : B = 4.9 m	
10.3m: B = 4.9m		11.1 m : B = 4.8 m	
10.6m: B = 4.9m		11.5 m : B = 4.9 m	
10.9m: B = 4.9m		11.9 m : B = 4.8 m	
11.2m: B = 4.8m		12.3 m : B = 4.8 m	
11.5m: B = 4.7m		12.8 m : B = 4.9 m	
11.8m: B = 4.6m		13.1 m : B = 4.9 m	
12.1m: B = 4.6m		13.6 m : B = 5.0 m (+)	
12.4m: B = 4.6m		13.9 m : B = 4.9 m	
12.7m: B = 4.6m		14.3 m : B = 5.4 m (+)	
13.0m: B = 4.6m			
13.3m: B = 4.6m			
13.6m: B = 4.7m			
13.9m: B = 4.8m			
14.2m: B = 4.9m			
14.5m: B = 4.9m			
14.8m: B = 4.9m			
15.1m: B = 5.0m (+)			
15.4m: B = 5.1m (+)			
15.7m: B = 5.2m (+)			
16.0m: B = 5.3m (+)			
16.3m: B = 5.4m (+)			
16.6m: B = 5.6m (+)			
16.9m: B = 5.8m (+)			
17.8m: B = 6.4m (+)			

Author		Comments: ->
Date	08/08/2024	



Minimum profile I



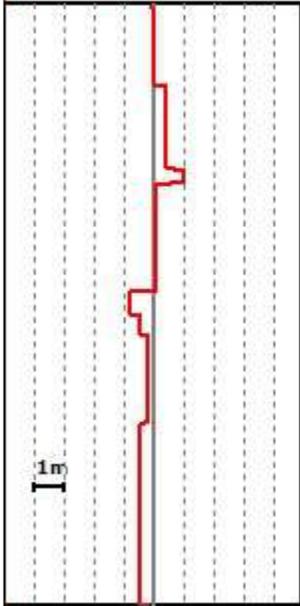
Hole 5	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m: B = 2.6m (-) !!!<-	0.0 m : B = 2.9 m (-)
0.6m: B = 2.7m (-) !!!<-	0.2 m : B = 3.0 m (-)
0.9m: B = 2.8m (-) !!!<-	0.6 m : B = 3.1 m (-)
1.2m: B = 2.8m (-) !!!<-	1.0 m : B = 3.3 m (-)
1.5m: B = 3.0m (-) !!!<-	1.4 m : B = 3.5 m (-)
1.8m: B = 3.1m (-) !!!<-	1.8 m : B = 3.9 m (-)
2.2m: B = 3.3m (-)	2.2 m : B = 4.1 m
2.6m: B = 3.4m (-)	2.6 m : B = 3.9 m (-)
3.0m: B = 3.6m (-)	3.0 m : B = 3.9 m (-)
3.4m: B = 3.7m (-)	3.4 m : B = 4.1 m
3.8m: B = 3.9m (-)	3.8 m : B = 4.3 m
4.2m: B = 4.1m	4.2 m : B = 4.7 m
4.6m: B = 4.2m	4.6 m : B = 4.8 m
5.0m: B = 4.4m	5.0 m : B = 4.8 m
5.4m: B = 4.5m	5.4 m : B = 4.9 m
5.8m: B = 4.7m	5.8 m : B = 4.9 m
6.2m: B = 4.9m	6.2 m : B = 5.1 m (+)
6.6m: B = 4.9m	6.6 m : B = 5.0 m (+)
7.0m: B = 5.0m (+)	7.0 m : B = 5.0 m (+)
7.4m: B = 5.1m (+)	7.4 m : B = 5.2 m (+)
7.8m: B = 4.9m	7.8 m : B = 5.1 m (+)
8.2m: B = 4.8m	8.2 m : B = 5.0 m (+)
8.5m: B = 4.7m	8.6 m : B = 5.0 m (+)
8.8m: B = 4.7m	9.0 m : B = 4.9 m
9.1m: B = 4.6m	9.4 m : B = 4.9 m
9.4m: B = 4.6m	9.8 m : B = 4.8 m
9.7m: B = 4.6m	10.2 m : B = 4.9 m
10.0m: B = 4.5m	10.6 m : B = 4.5 m
10.3m: B = 4.5m	11.0 m : B = 4.5 m
10.6m: B = 4.5m	11.4 m : B = 4.6 m
10.9m: B = 4.5m	11.8 m : B = 4.7 m
11.2m: B = 4.5m	12.2 m : B = 4.8 m
11.5m: B = 4.5m	12.6 m : B = 5.0 m (+)
11.8m: B = 4.6m	13.0 m : B = 5.1 m (+)
12.1m: B = 4.7m	13.4 m : B = 5.3 m (+)
12.4m: B = 4.7m	13.8 m : B = 5.3 m (+)
12.7m: B = 4.7m	14.2 m : B = 5.6 m (+)
13.0m: B = 4.7m	
13.3m: B = 4.8m	
13.6m: B = 4.8m	
13.9m: B = 4.9m	
14.2m: B = 4.9m	
14.5m: B = 5.0m (+)	
14.8m: B = 5.1m (+)	
15.1m: B = 5.2m (+)	
15.4m: B = 5.3m (+)	
15.7m: B = 5.4m (+)	
16.0m: B = 5.5m (+)	
16.3m: B = 5.6m (+)	
16.6m: B = 5.7m (+)	
16.9m: B = 5.8m (+)	
17.2m: B = 6.0m (+)	
17.9m: B = 6.6m (+)	

<i>Author</i>		<i>Comments:</i>	
<i>Date</i>	08/08/2024	->	

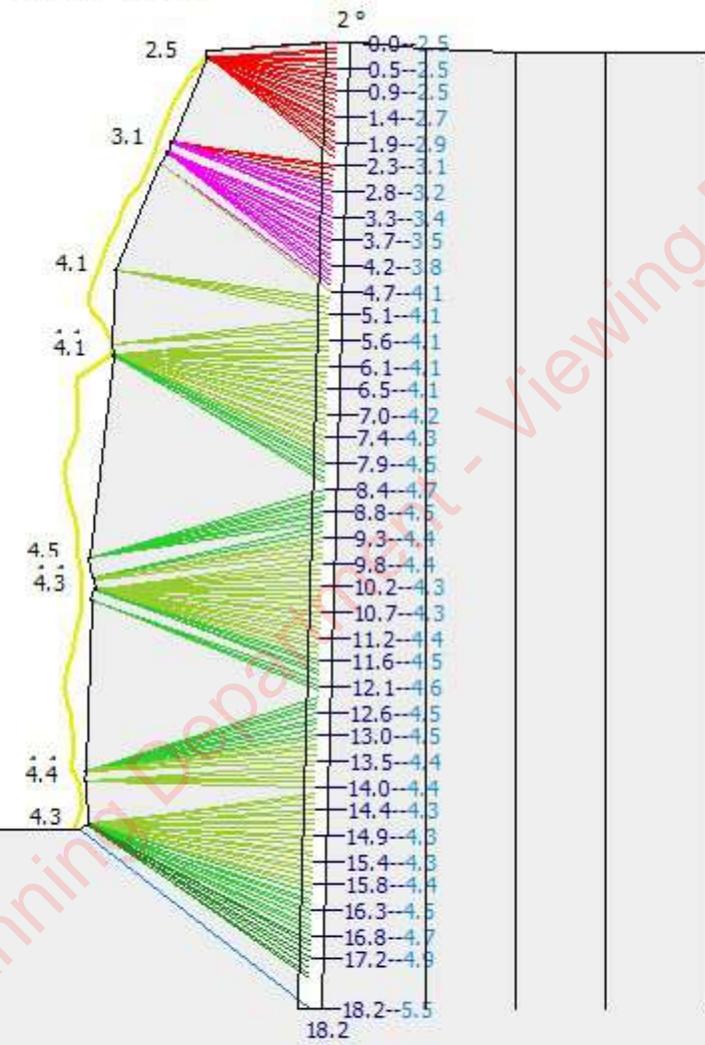


Blast plan	2407.ext			Drill plan
Site	Gallstown	Hole	7	

Minimum profile I



Bench H = 14.8 m



Hole 7

MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m: B = 2.5m (-) !!!<-	0.3 m : B = 2.4 m (-)
0.6m: B = 2.5m (-) !!!<-	0.5 m : B = 2.6 m (-)
0.9m: B = 2.5m (-) !!!<-	1.0 m : B = 2.9 m (-)
1.2m: B = 2.6m (-) !!!<-	1.4 m : B = 3.1 m (-)
1.5m: B = 2.7m (-) !!!<-	1.8 m : B = 3.2 m (-)
1.8m: B = 2.9m (-) !!!<-	2.2 m : B = 3.4 m (-)
2.2m: B = 3.1m (-) !!!<-	2.6 m : B = 3.5 m (-)
2.6m: B = 3.2m (-) !!!<-	3.0 m : B = 3.8 m (-)
3.0m: B = 3.3m (-)	3.4 m : B = 4.0 m (-)
3.4m: B = 3.4m (-)	3.8 m : B = 4.1 m
3.8m: B = 3.6m (-)	4.2 m : B = 4.3 m
4.2m: B = 3.8m (-)	4.6 m : B = 4.4 m
4.6m: B = 4.0m (-)	5.0 m : B = 4.5 m
5.0m: B = 4.1m	5.4 m : B = 4.2 m
5.4m: B = 4.1m	5.8 m : B = 4.1 m
5.8m: B = 4.1m	6.2 m : B = 4.4 m
6.2m: B = 4.1m	6.6 m : B = 4.7 m
6.6m: B = 4.1m	7.0 m : B = 4.7 m
7.0m: B = 4.2m	7.4 m : B = 4.6 m
7.4m: B = 4.3m	7.8 m : B = 4.8 m
7.8m: B = 4.5m	8.3 m : B = 4.9 m
8.2m: B = 4.6m	8.6 m : B = 4.8 m
8.5m: B = 4.6m	9.0 m : B = 4.7 m
8.8m: B = 4.5m	9.4 m : B = 4.6 m
9.1m: B = 4.5m	9.8 m : B = 4.6 m
9.4m: B = 4.4m	10.2 m : B = 4.5 m
9.7m: B = 4.4m	10.6 m : B = 4.5 m
10.0m: B = 4.3m	11.0 m : B = 4.5 m
10.3m: B = 4.3m	11.4 m : B = 4.6 m
10.6m: B = 4.3m	11.8 m : B = 4.7 m
10.9m: B = 4.3m	12.2 m : B = 4.7 m
11.2m: B = 4.4m	12.6 m : B = 4.7 m
11.5m: B = 4.4m	13.0 m : B = 4.6 m
11.8m: B = 4.5m	13.4 m : B = 4.5 m
12.1m: B = 4.6m	13.8 m : B = 4.6 m
12.4m: B = 4.6m	14.2 m : B = 4.4 m
12.7m: B = 4.5m	14.6 m : B = 4.4 m
13.0m: B = 4.5m	14.9 m : B = 4.5 m
13.3m: B = 4.4m	
13.6m: B = 4.4m	
13.9m: B = 4.4m	
14.2m: B = 4.3m	
14.5m: B = 4.3m	
14.8m: B = 4.3m	
15.1m: B = 4.3m	
15.4m: B = 4.3m	
15.7m: B = 4.4m	
16.0m: B = 4.4m	
16.3m: B = 4.5m	
16.6m: B = 4.6m	
16.9m: B = 4.8m	
17.2m: B = 4.9m	
17.5m: B = 5.1m (+)	
18.2m: B = 5.5m (+)	

Author		Comments:
Date	08/08/2024	->





KEMEK LIMITED: Blast Summary Report



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Blast Area: **0209**

Date: **12/09/24**

BLASTING PARAMETERS

Number of Holes (#):	70	Hole Diameter (mm)	127	Average Depth (m):	20.01
Burden (m):	4.50	Spacing (m):	4.20	Proposed Floor Level (m):	63.00
Subgrade Drill (m):	1.00	Estimated Rock Density (t/m ³):	2.70	Estimated Blast Tonnage (t):	67,890
Blast Ratio (t/kg):	4.24	Initiation Type:	Non-electric	Proposed Loading Rate (kg/m):	18.00
Planned M.I.C (kgs)	280	Actual M.I.C (kgs):	291	Total Explosive Charge (kg):	16,028

EXPLOSIVES ORDER INFORMATION

		Quantity			Quantity
Explosives:	Kemex 70	16,028	Detonators:	U450 x 24.0m	65
				U475 x 15.0m	5
				U475 x 7.8m	60
Boosters:	Booster 250g	65		SL 17ms x 7.8m	2
	Booster 420g	65		SL 25ms x 7.8m	15
Accessories:	Hole Plug			SL 67ms x 7.8m	50
	Harness Wire x 400m			Starter Line 100.0m	2

COMMENTS

Face inspection complete, all blast holes measured and profiles were consulted before charging commenced.

APPROVAL SIGNATURES

Pre-Drill Survey: **Yes** BHS: **Yes** Shotfiring: **Yes** R.O.B.I.S.: **Yes** Vibrographs: **1**

Explosives Supervisor:

Shotfirer:

Trainee Shotfirer:



KEMEK LIMITED: Borehole Instruction / Survey Report



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 12/09/2024

Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth	
	Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted
1	19.8	19.7	2°	1°	291°	-	21	20.2	19.7	0°	-	0°	-	41	19.9	19.4	0°	-	0°	-
2	19.8	19.7	2°	3°	286°	-	22	20.0	19.5	0°	-	0°	-	42	19.9	18.0	0°	-	0°	-
3	20.2	20.0	11°	9°	295°	-	23	20.1	19.4	0°	-	0°	-	43	19.9	19.5	0°	-	0°	-
4	20.2	20.4	8°	8°	295°	-	24	20.1	19.3	0°	-	0°	-	44	19.9	19.7	0°	-	0°	-
5	20.1	20.3	3°	4°	295°	-	25	20.1	18.2	0°	-	0°	-	45	19.9	19.0	0°	-	0°	-
6	20.0	19.7	5°	5°	286°	-	26	20.2	19.5	0°	-	0°	-	46	19.9	16.0	0°	-	0°	-
7	20.1	20.0	5°	4°	291°	-	27	20.1	17.0	0°	-	0°	-	47	19.9	19.5	0°	-	0°	-
8	20.1	20.0	2°	2°	305°	-	28	20.1	18.5	0°	-	0°	-	48	20.0	18.8	0°	-	0°	-
9	20.2	18.6	4°	0°	301°	-	29	20.0	19.5	0°	-	0°	-	49	20.0	16.0	0°	-	0°	-
10	20.3	18.5	2°	4°	295°	-	30	20.0	19.5	0°	-	0°	-	50	20.0	18.0	0°	-	0°	-
11	20.2	18.5	0°	0°	0°	-	31	20.1	0.0	0°	-	0°	-	51	20.0	0.0	0°	-	0°	-
12	20.2	13.5	2°	2°	270°	-	32	20.0	19.5	0°	-	0°	-	52	19.9	0.0	0°	-	0°	-
13	20.2	20.0	0°	0°	0°	-	33	20.0	19.5	0°	-	0°	-	53	20.0	19.5	0°	-	0°	-
14	20.1	18.7	2°	1°	270°	-	34	19.9	16.8	0°	-	0°	-	54	20.0	19.5	0°	-	0°	-
15	20.1	19.8	2°	2°	270°	-	35	20.0	19.5	0°	-	0°	-	55	20.0	19.7	0°	-	0°	-
16	20.1	20.0	0°	-	0°	-	36	19.9	19.5	0°	-	0°	-	56	19.9	19.5	0°	-	0°	-
17	20.1	19.5	0°	-	0°	-	37	20.0	19.5	0°	-	0°	-	57	19.9	19.5	0°	-	0°	-
18	20.2	20.5	0°	-	0°	-	38	19.9	19.7	0°	-	0°	-	58	19.8	19.5	0°	-	0°	-
19	20.2	19.0	0°	-	0°	-	39	19.9	19.6	0°	-	0°	-	59	19.9	19.5	0°	-	0°	-
20	20.2	18.3	0°	-	0°	-	40	19.9	19.7	0°	-	0°	-	60	19.9	19.5	0°	-	0°	-
Comments:			HOLE DIAMETER (mm):				127	Total Design Drill Metres (m)					1400.4							

Louth

Planning

View Only

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12/09/2024



KEMEK LIMITED: Borehole Instruction / Survey Report



Customer: **Kilsaran Gaulstown, Co Louth**

Date: **12/09/2024**

Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth		Hole No	Depth (m)		Inclination		Azimuth	
	Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted		Target	Blasted	Target	Blasted	Target	Blasted
61	19.8	19.5	0°	-	0°	-	81	-	-	-	-	-	-	101	-	-	-	-	-	-
62	19.8	19.5	0°	-	0°	-	82	-	-	-	-	-	-	102	-	-	-	-	-	-
63	19.8	19.7	0°	-	0°	-	83	-	-	-	-	-	-	103	-	-	-	-	-	-
64	19.7	19.7	0°	-	0°	-	84	-	-	-	-	-	-	104	-	-	-	-	-	-
65	19.7	19.7	0°	-	0°	-	85	-	-	-	-	-	-	105	-	-	-	-	-	-
66	20.1	-	0°	-	0°	-	86	-	-	-	-	-	-	106	-	-	-	-	-	-
67	20.1	-	0°	-	0°	-	87	-	-	-	-	-	-	107	-	-	-	-	-	-
68	20.0	-	0°	-	0°	-	88	-	-	-	-	-	-	108	-	-	-	-	-	-
69	20.0	-	0°	-	0°	-	89	-	-	-	-	-	-	109	-	-	-	-	-	-
70	19.9	-	0°	-	0°	-	90	-	-	-	-	-	-	110	-	-	-	-	-	-
71	-	-	-	-	-	-	91	-	-	-	-	-	-	111	-	-	-	-	-	-
72	-	-	-	-	-	-	92	-	-	-	-	-	-	112	-	-	-	-	-	-
73	-	-	-	-	-	-	93	-	-	-	-	-	-	113	-	-	-	-	-	-
74	-	-	-	-	-	-	94	-	-	-	-	-	-	114	-	-	-	-	-	-
75	-	-	-	-	-	-	95	-	-	-	-	-	-	115	-	-	-	-	-	-
76	-	-	-	-	-	-	96	-	-	-	-	-	-	116	-	-	-	-	-	-
77	-	-	-	-	-	-	97	-	-	-	-	-	-	117	-	-	-	-	-	-
78	-	-	-	-	-	-	98	-	-	-	-	-	-	118	-	-	-	-	-	-
79	-	-	-	-	-	-	99	-	-	-	-	-	-	119	-	-	-	-	-	-
80	-	-	-	-	-	-	100	-	-	-	-	-	-	120	-	-	-	-	-	-

Comments:	HOLE DIAMETER (mm):	127	Total Design Drill Metres (m)	1400.4
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KEMEK LIMITED: Borehole Instruction / Survey Report





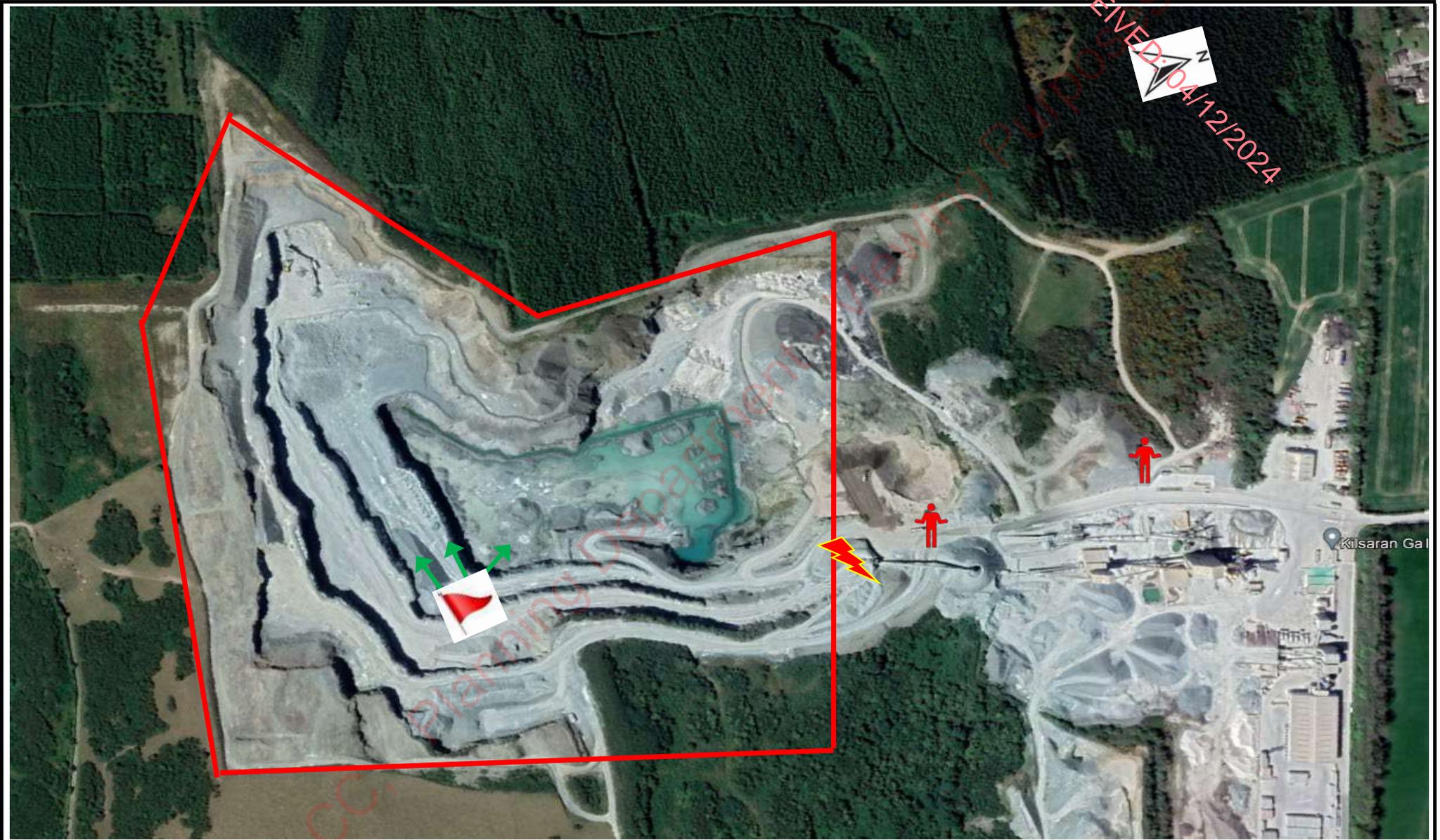
KEMEK LIMITED: Blast Location, Danger Zone, Sentry Points and Firing Position



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 12/09/2024



Key: Danger Zone: Blast Site: Sentries: Firing Position: Direction of Throw: Floor Point: 63.000



KEMEK LIMITED: Charging Specification



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **12/09/2024**

Single Deck Holes	Single Deck Holes																
Hole Numbers: 1 to 70	Hole Numbers: 																
 <p>3.80 m < Top stemming</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 15.0m</td><td style="text-align: right;">x1</td></tr> </table> <p>280 Kg of Kemex 70... (+/- 5 %)</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U475 x 15.0m	x1	Booster 420g	x1	U450 x 24.0m	x1	 <p> m < Top stemming</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 250g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U475 x 15.0m</td><td style="text-align: right;">x1</td></tr> </table> <p> Kg of Kemex 70... (+/- %)</p> <table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">Booster 420g</td><td style="text-align: right;">x1</td></tr> <tr><td style="text-align: center;">U450 x 24.0m</td><td style="text-align: right;">x1</td></tr> </table>	Booster 250g	x1	U475 x 15.0m	x1	Booster 420g	x1	U450 x 24.0m	x1
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Booster 420g	x1																
U450 x 24.0m	x1																

Single Deck Holes	Single Deck Holes																
Hole Numbers: 	Hole Numbers: 																
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U450 x 24.0m	x1																
Booster 420g	x1																
U475 x 15.0m	x1																
Booster 250g	x1																
U450 x 24.0m	x1																
Booster 420g	x1																
U475 x 15.0m	x1																

RECEIVED: 04/12/2024
Planning Department - Viewing Purposes Only



KEMEK LIMITED: Quarry Face Inspection Image

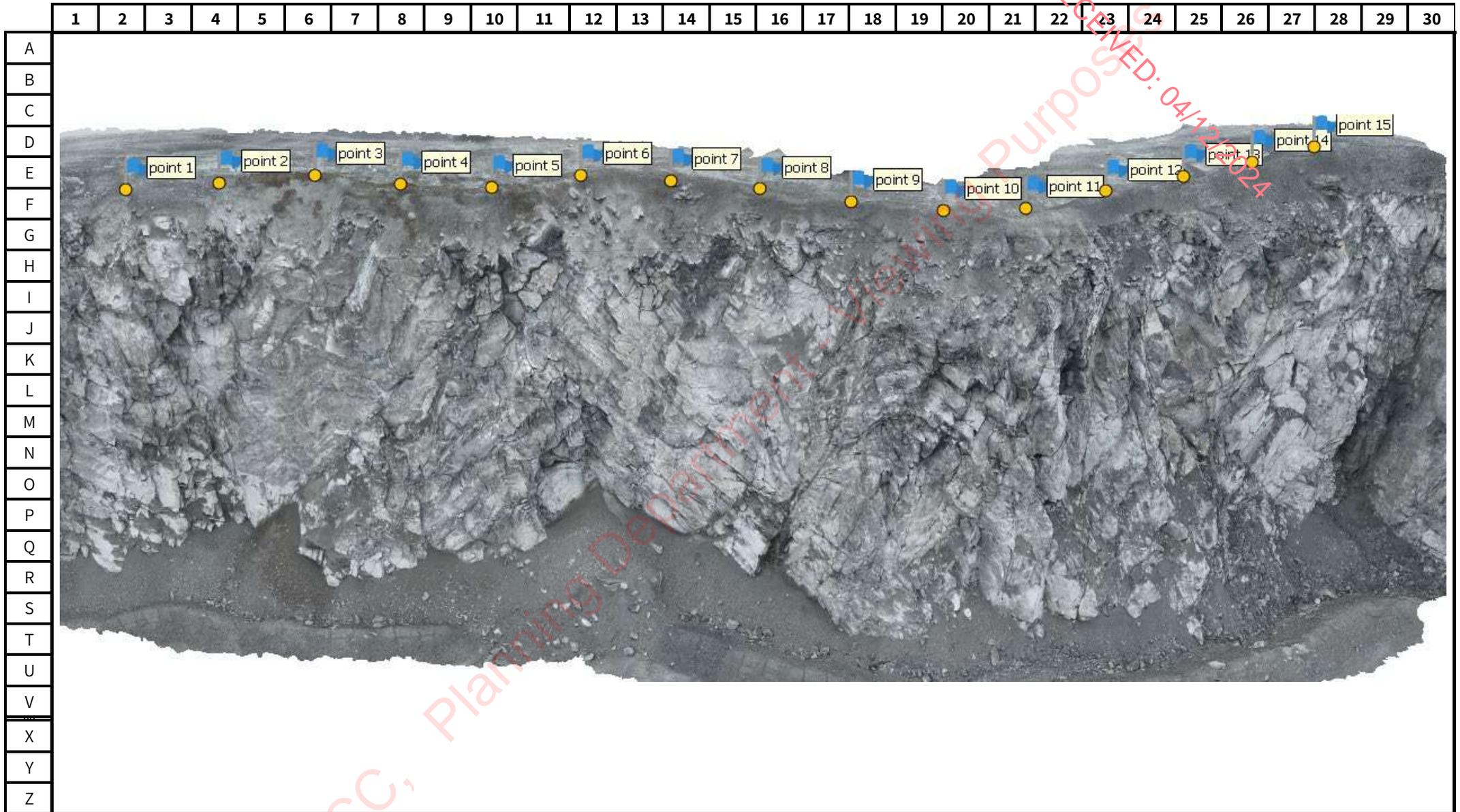


Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

12/09/24



Comments:-

See image above highlighting front row blast holes.

RECEIVED: 04/12/2024
Louth CC, Planning Department, Planning



KEMEK LIMITED: Risk Assessment / Checklists



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **12/09/24**

DANGER ZONE ASSESSMENT GENERAL FACTORS.

DRILLERS LOG - SIGNED	Yes	COMMUNICATION WITH SENTRIES AND MANAGER	Yes
FACE HEIGHT AND ORIENTATION - REF. SUMMARY SHEET	Yes	PROXIMITY TO FOOTPATH, ROAD, HOUSE, PLANT - SEE DANGER ZONE	Yes
FACE INSPECTION ON DAY OF BLAST - ATTACHED	Yes	FIRING POSITION WITH RESPECT - WIND & BLAST PROJECTION - SEE DANGER ZONE	Yes

CRITICAL FACTORS.

BURDEN:	MINIMUM ALLOWED FOR LOCATION (m):	4.00	BURDEN:	MINIMUM BURDEN CHARGED (m):	4.00
	WHICH HOLE NUMBER:	12		AT WHAT DEPTH IN THE HOLE (m):	8.00
	LOCAL SPECIFIC CHARGE (kg/m ³):	1.15			
SPACING:	MINIMUM ALLOWED FOR LOCATION (m):	4.00	SPACING:	MINIMUM SPACING CHARGED (m):	4.00
	BETWEEN HOLE NUMBERS :	4 and 5		LOCAL SPECIFIC CHARGE (kg/m ³):	1.11
DELAYS:	MAXIMUM DELAY PER METER SPACING (ms):	6.25	DELAYS:	MAXIMUM DELAY PER METER BURDEN (ms):	19.10
EXPLOSIVES:	EXPLOSIVE TYPE USED - SEE SUMMARY SHEET:	Kemex 70	STEMMING:	PRE & POST STEMMING REVIEW WITH CREW:	Yes
	EXPECTED CHARGE MASS PER METER (kg/m):	18.0		SIZE OF STEMMING MATERIAL USED (mm):	10.0
	MAXIMUM CHARGE MASS PER METER (kg/m):	19.0		MINIMUM LENGTH OF STEMMING IN BLAST (m):	3.6

COMMENTS:

Generic Risk Assessment:	Quarry Blasting Risk Assessment - BS-RA-01	Yes	Surveying Risk Assessment - BS-RA-03	Yes
	Quarry Waste Burning Risk Assessment - BS-RA-02	Yes	Environmental Monitoring RA - BS-RA-04	Yes

WORK AREA CHECKLIST

QUARRY BENCH:

ACCESS & EGRESS APPROPRIATE?	Yes
FALLS FROM HEIGHT- EDGE PROTECTION ERECTED?	Yes
GROUND CONDITIONS SUITABLE?	Yes

POST BLAST:

SHOT CHECKED FOR EVIDENCE OF MISFIRE?	Yes
CHECK FOR LOOSE GROUND/UNSTABLE FACES?	Yes
SURPLUS EXPLOSIVES & ACCESSORIES DESTROYED?	Yes

BLAST PREPARATION:

VIBRATION LEVEL ESTIMATED & ACCEPTABLE?	Yes
BURDEN DETERMINED AROUND EACH SHOTHOLE?	Yes
CONNECTION OF INITIATION SYSTEM CHECKED?	Yes
DANGER ZONE & POSITION OF SENTRIES ESTABLISHED?	Yes
DANGER ZONE & POSITION OF SENTRIES COMMUNICATED?	Yes

DANGER ZONE CLEARED BY: **Peter Ryan**



KEMEK LIMITED: Drill Plan

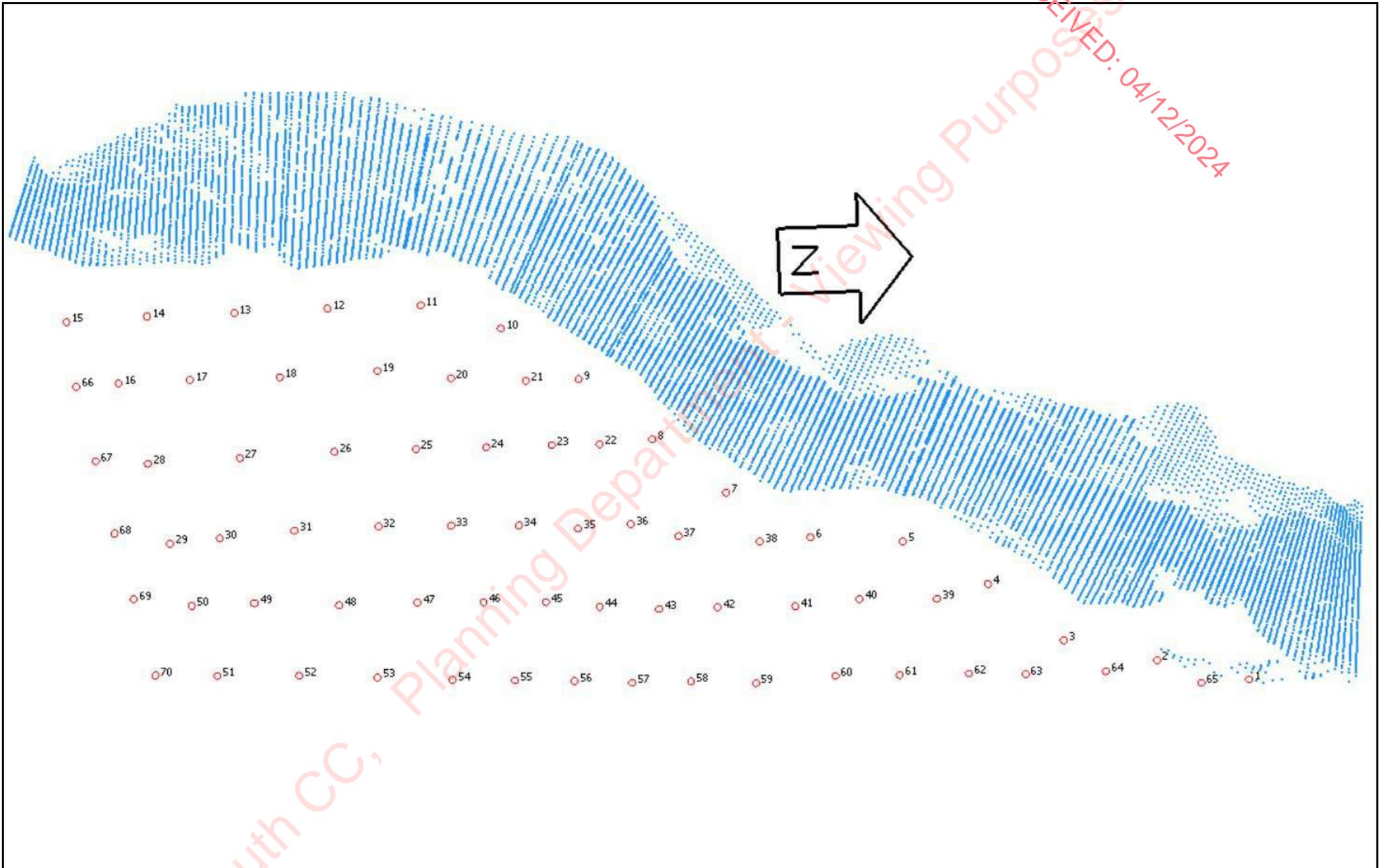


Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

12/09/2024

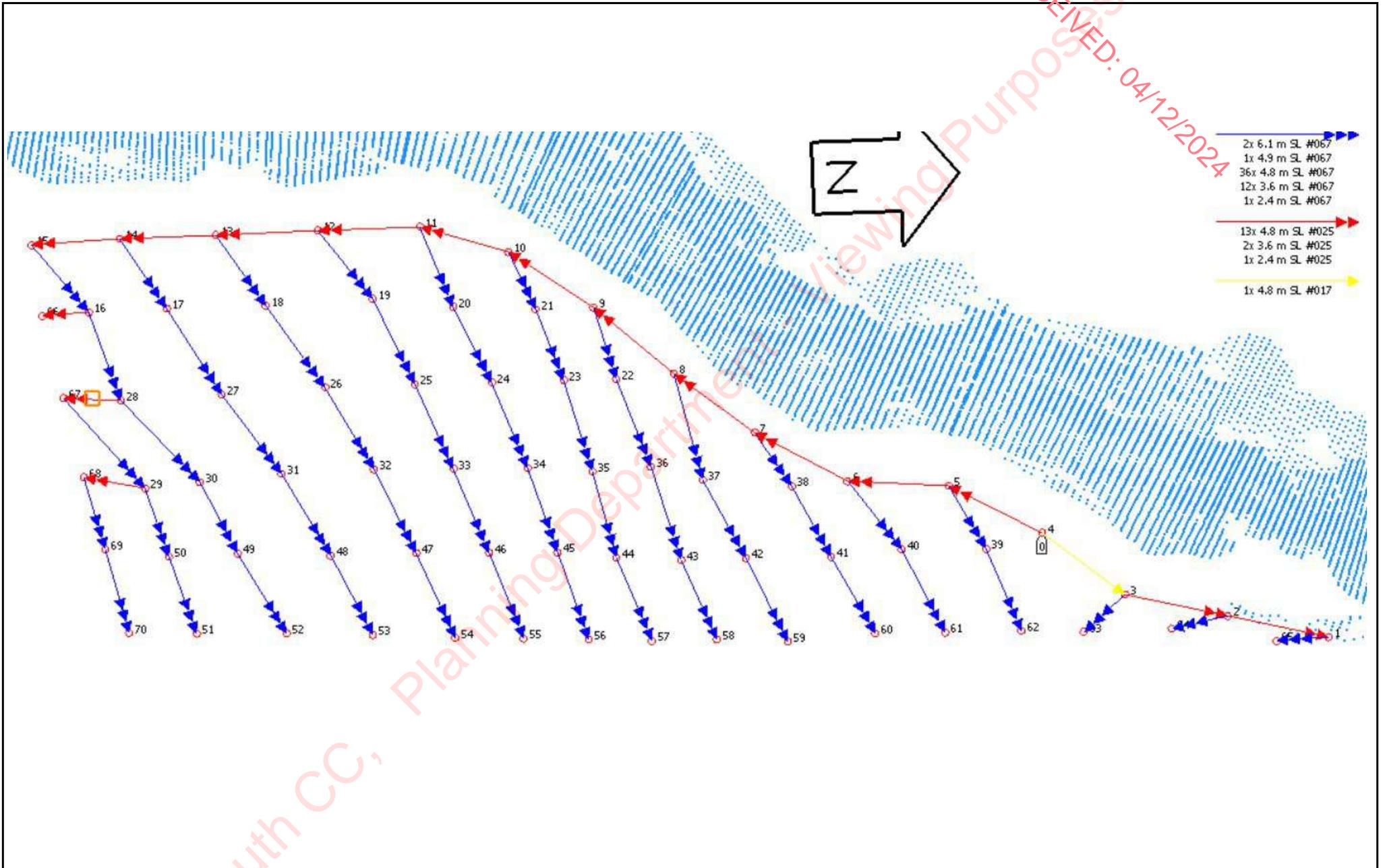




Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 12/09/2024





KEMEK LIMITED - Charge Record



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **12/09/24**

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)	(kgs)	
1	19.7	274					3.8	274	
2	19.7	272					3.8	272	
3	20.0	280					3.9	280	
4	20.4	280					3.7	280	
5	20.3	291					3.7	291	
6	19.7	280					3.8	280	
7	20.0	253					6.0	253	
8	20.0	252					6.0	252	
9	18.6	228					6.0	228	
10	18.5	242					4.0	242	
11	18.5	120					10.0	120	
12	13.5	112					9.0	112	
13	20.0	274					3.7	274	
14	18.7	249					3.8	249	
15	19.8	270					3.6	270	
16	20.0	270					3.6	270	
17	19.5	284					3.6	284	
18	20.5	280					3.6	280	
19	19.0	248					3.6	248	
20	18.3	245					3.6	245	
21	19.7	263					3.6	263	
22	19.5	241					3.6	241	
23	19.4	264					3.6	264	
24	19.3	265					3.6	265	
25	18.2	246					3.6	246	
26	19.5	249					3.6	249	
27	17.0	248					3.6	248	
28	18.5	238					3.6	238	
29	19.5	249					3.6	249	
30	19.5	271					3.6	271	
31	0.0	0						0	
32	19.5	246					3.6	246	
33	19.5	280					3.6	280	
34	16.8	221					3.6	221	
35	19.5	262					3.6	262	
36	19.5	245					3.6	245	
37	19.5	279					3.6	279	
38	19.7	280					3.6	280	
39	19.6	280					3.6	280	
40	19.7	280					3.6	280	
41	19.4	275					3.6	275	
42	18.0	257					3.6	257	
43	19.5	274					3.6	274	
44	19.7	274					3.6	274	
45	19.0	275					3.6	275	
46	16.0	199					3.6	199	
47	19.5	262					3.6	262	
48	18.8	237					3.6	237	
49	16.0	211					3.6	211	
50	18.0	271					3.6	271	
Total:								12,446	



KEMEK LIMITED - Charge Record



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date:

12/09/24

Hole Number	Depth (m)	1st Deck		2nd Deck		3rd Deck	Top Stem.	TOTAL (kgs)	Comments
		kgs	Stem. (m)	kgs	Stem. (m)	kgs	(m)		
51	0.0							0	
52	0.0							0	
53	19.5	268					3.6	268	
54	19.5	265					3.6	265	
55	19.7	280					3.6	280	
56	19.5	279					3.6	279	
57	19.5	280					3.6	280	
58	19.5	280					3.6	280	
59	19.5	280					3.6	280	
60	19.5	272					3.6	272	
61	19.5	278					3.6	278	
62	19.5	273					3.6	273	
63	19.7	280					3.6	280	
64	19.7	269					3.6	269	
65	19.7	278					3.6	278	
66	-							0	
67	-							0	
68	-							0	
69	-							0	
70	-							0	
71	-							0	
72	-							0	
73	-							0	
74	-							0	
75	-							0	
76	-							0	
77	-							0	
78	-							0	
79	-							0	
80	-							0	
81	-							0	
82	-							0	
83	-							0	
84	-							0	
85	-							0	
86	-							0	
87	-							0	
88	-							0	
89	-							0	
90	-							0	
91	-							0	
92	-							0	
93	-							0	
94	-							0	
95	-							0	
96	-							0	
97	-							0	
98	-							0	
99	-							0	
100	-							0	
Total:								16,028	

RECEIVED 04/12/2024
Louth CC Planning Department - viewing purposes only



KEMEK LIMITED: Truck Charge Record (kgs)



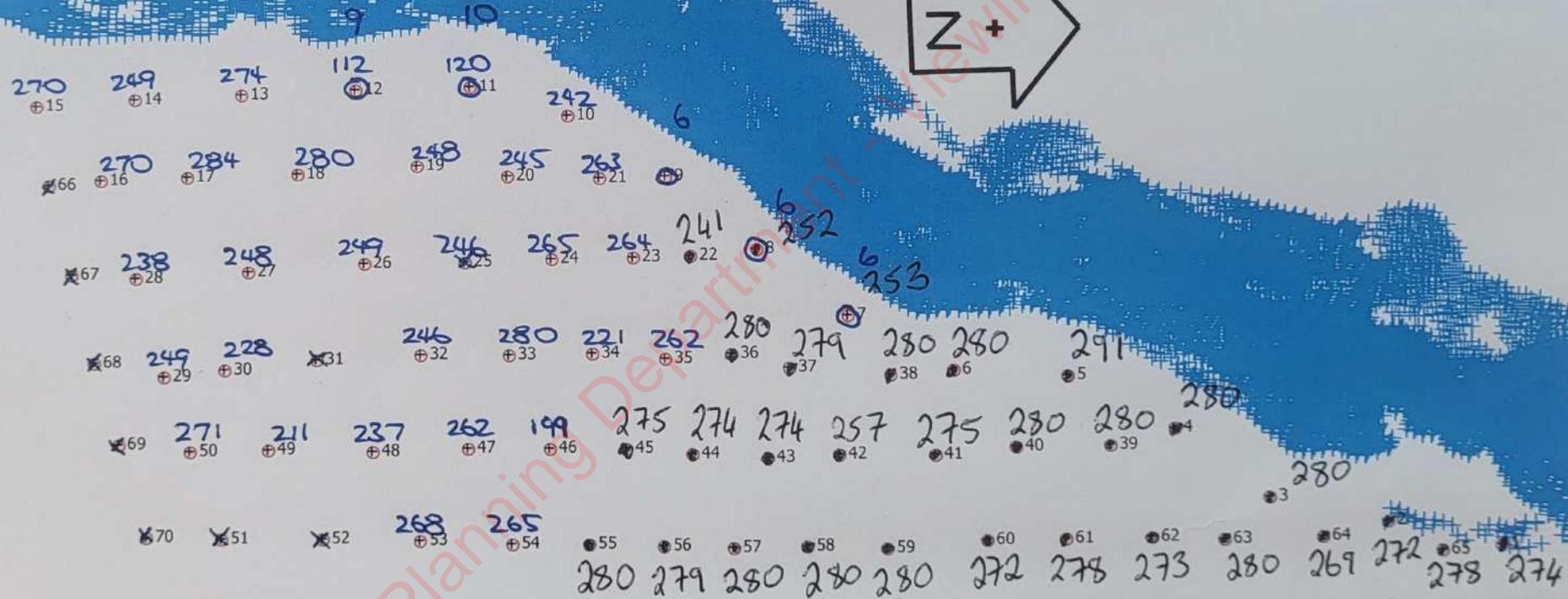
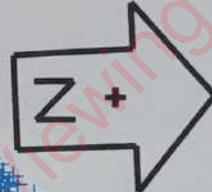
Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: 12/09/2024

PT-24 = 7,802
 PT-26 = 8,226

 16,028



SHOTPlus™ 6 Standard 6.19.2	08/09/2024
Mine	Kilsaran
Location	Gallstown
Title/author	0209 Scott Penny
Filename	
Scale	1:250

Louth CC, Planning Department - Reviewing Purposes Only!



KEMEK LIMITED: Delivery Docket



Customer / Location: **Kilsaran Gaulstown, Co Louth**

Date: **12/09/2024**

Delivery Docket
S0000576



Kemek Limited
Clonagh
Enfield
Co. Kildare
A83 D62
Phone +353 46 9541086
Email finance@kemekltd.com
Web www.kemekltd.com

Account No. 110102
Delivery Date 12/09/2024
Order No. S0000576
Your Ref.
Truck Reg. 222 MH 1145

Invoice Address

KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN PIERCETOWN
DUNBOYNE
CO MEATH
A86 WE20
IE
Phone: 01 8251608

Delivery Address

KILSARAN CONCRETE UNLIMITED COMPANY
KILSARAN GAULSTOWN
CO LOUTH
LOUTH
LEINSTER
IE

Description	Item Code	Employee	Quantity	UoM	Qty. Recd.
KEMEX 70 CE 0080	FE7000		18000	KG	
DUNARIT DOUBLE WELL BOOSTER 420g	AC3129	PT24-7,802	65	EACH	
Maxam 250G Boosters	AC3128	PT26-8,226	65	EACH	
EXEL U450 24M	AC9006		65	EACH	
EXEL U475 7.8M	AC9010		60	EACH	
EXEL U475 15M	AC9012		5	EACH	
EXEL Connectadet SL 17ms 7.8m	AC6080	16,028	2	EACH	
EXEL Connectadet SL 25ms 7.8m	AC6087		16	EACH	
EXEL Connectadet SL 67ms 7.8m	AC6081		50	EACH	
Exel Starter 100m	AC6900		2	EACH	
Blasting Service	TS0010	SP63	1	EACH	
Blast Supervision	TS0020	CH88	1	EACH	
Remote Shotfiring Service - ROBIS	TS9999	SP63	1	EACH	
Total			18333		

Customer's Signature

Shotfirer's Signature



Methods for the safe destruction of small quantities of explosives can be found at:
www.kemekltd.com/document-library/

Limited Liability Company Registered in Ireland. Registration No.: 76969



QUALITY
ISO 9001:2015
NSAI Certified



HEALTH & SAFETY
ISO 45001:2018
NSAI Certified

RECEIVED: 04/12/2024
Viewing Department - Louth CC, Planning Department



KEMEK LIMITED: Point of Work Risk Assessment



Customer / Location:

Kilsaran Gaulstown, Co Louth

Date: **12/09/2024**

<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22752 Name: Scott Penny Date / Time Created: 03/09/2024 07:58:19</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 4 Site Location: Kilsaran Gallstown Discription: Surveying activities TA-RA-03 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22803 Name: John Delaney Date / Time Created: 11/09/2024 12:37:48</p> <p>Hazard Category: Work at Height Area of Work: Top of quarry bench Site Location: Kilsaran Gallstown Discription: Measuring holes and probing holes Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection is in place New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Intellectual Manager / Supervisor Present: Yes Name: John</p>	<p>Kemek - Point of Work Risk Assessment Form Submission Reference: Kemek-SF22806 Name: Scott Penny Date / Time Created: 12/09/2024 07:50:03</p> <p>Hazard Category: Work at Height Area of Work: Top of bench 4 Site Location: Kilsaran Gallstown Discription: Blasting activities TA-RA-01 Monitoring TA-RA-04 Hazard Severity: 4 Likelihood: 4 Your risk rating: 16</p> <p>Actions: Edge protection and bunding New Hazard Severity: 4 New Likelihood: 1 New risk rating: 4</p> <p>Awareness level: Conscious Perception of risk: Acceptable Impulses: Moving Centre Manager / Supervisor Present: Yes Name: Scott, Ciaran, Keith, Ian, William, Stephen</p>
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KEMEK LIMITED BLAST VIBRATION REPORT

RECEIVED: 03/12/2024
Viewing Purposes Only

Customer / Location:	Kilsaran Gaulstown, Co Louth
Date:	12/09/2024
Reference #:	

WEATHER DATA

Wind Direction	Wind	Cloud Cover (%)
N/W	19km/h	43%

BLAST DATA

# of Holes	Hole size	Depth	Burden	Spacing	Total Charge	M.I.C.	Notes	Blast Time
	mm	m	m	m	Kg	Kg		Blast @ 14:00
70	127	20.0	4.5	4.2	16,028	291		

VIBROGRAPH DATA

	Residence	Nomis	Plan Distance	Bearing	H	T	V	AOP
		unit #	m	degrees	mm/sec	mm/sec	mm/sec	dBL
Nomis #1	Callaghan	10548	924	185	<0.5	<0.5	<0.5	<117
Nomis #2				°				
Nomis #3				°				
Nomis #4				°				
Nomis #5				°				
Nomis #6				°				
Nomis #7				°				

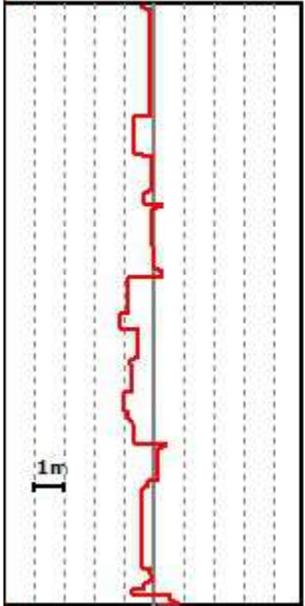
A print-out of the vibration and AOP levels is not available when the Nomis unit is not triggered.

Signature:

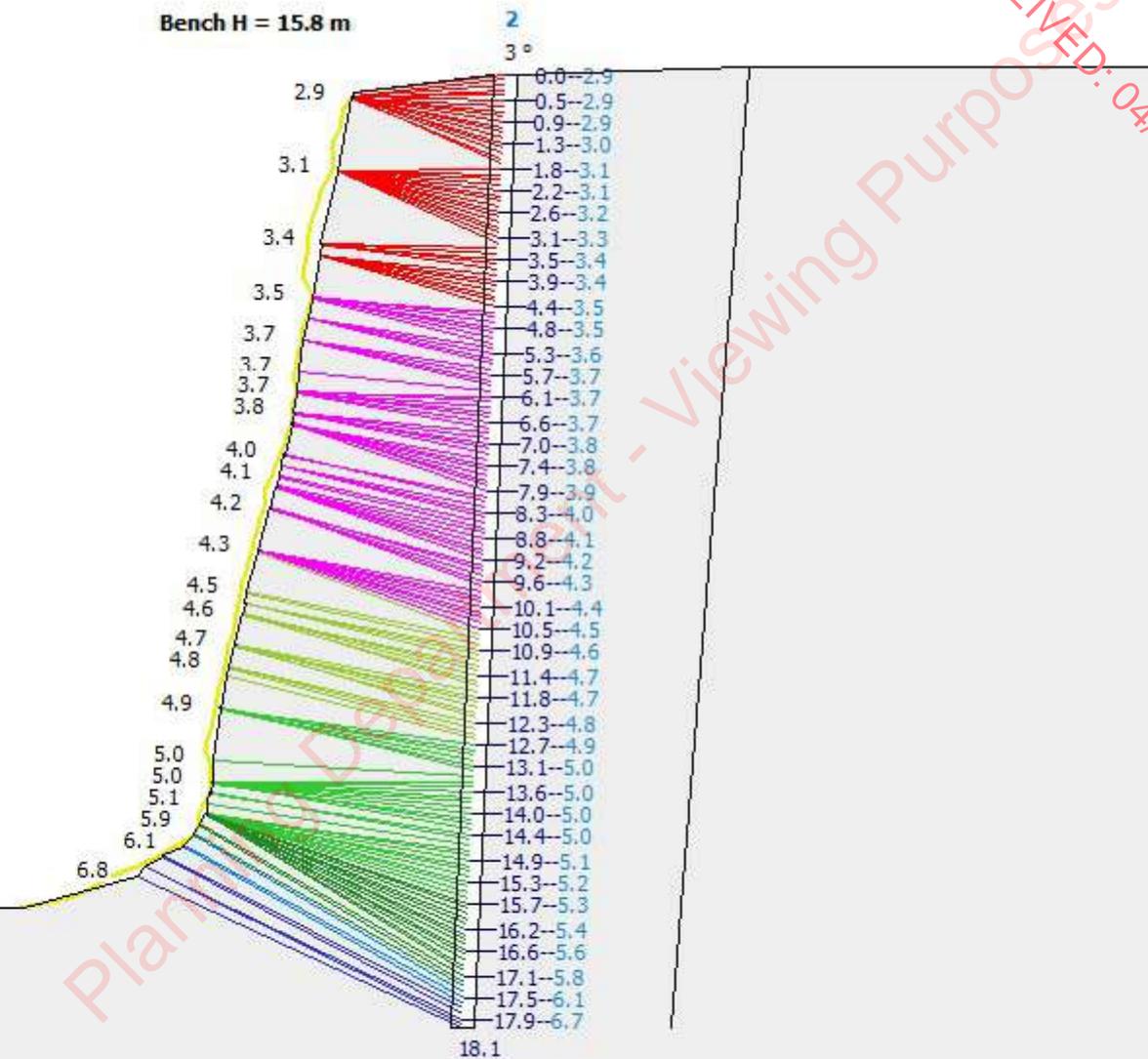
Blast plan	2024-17.ext		
Site	Platin	Hole	2

Drill plan

Minimum profile !



Bench H = 15.8 m

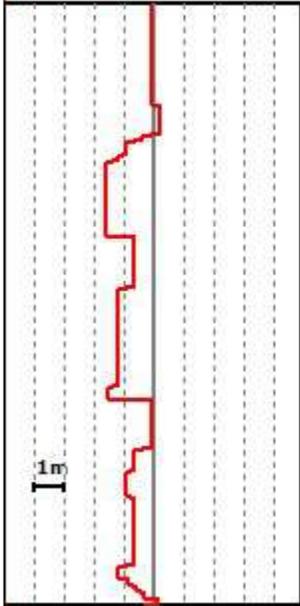


Hole 2	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.9m (-) !!!<	0.6 m : B = 2.8 m (-) !!! <
0.6m : B = 2.9m (-) !!!<	1.0 m : B = 3.0 m (-) !!! <
0.9m : B = 2.9m (-) !!!<	1.4 m : B = 3.1 m (-) !!! <
1.2m : B = 3.0m (-) !!!<	1.8 m : B = 3.1 m (-) !!! <
1.5m : B = 3.1m (-) !!!<	2.2 m : B = 3.3 m (-) !!! <
1.8m : B = 3.1m (-) !!!<	2.6 m : B = 3.4 m (-) !!! <
2.2m : B = 3.1m (-) !!!<	3.0 m : B = 3.5 m (-)
2.6m : B = 3.2m (-) !!!<	3.4 m : B = 3.6 m (-)
3.0m : B = 3.3m (-) !!!<	3.8 m : B = 3.6 m (-)
3.4m : B = 3.4m (-) !!!<	4.2 m : B = 3.5 m (-) !!! <
3.8m : B = 3.4m (-) !!!<	4.6 m : B = 3.5 m (-) !!! <
4.2m : B = 3.4m (-) !!!<	5.0 m : B = 3.6 m (-)
4.6m : B = 3.5m (-)	5.4 m : B = 3.7 m (-)
5.0m : B = 3.6m (-)	5.8 m : B = 3.7 m (-)
5.4m : B = 3.6m (-)	6.2 m : B = 3.7 m (-)
5.8m : B = 3.7m (-)	6.6 m : B = 3.7 m (-)
6.2m : B = 3.7m (-)	7.0 m : B = 3.8 m (-)
6.6m : B = 3.7m (-)	7.4 m : B = 3.9 m (-)
7.0m : B = 3.8m (-)	7.8 m : B = 4.1 m (-)
7.4m : B = 3.8m (-)	8.2 m : B = 4.2 m (-)
7.8m : B = 3.9m (-)	8.6 m : B = 4.2 m (-)
8.2m : B = 4.0m (-)	9.0 m : B = 4.3 m (-)
8.5m : B = 4.0m (-)	9.4 m : B = 4.4 m (-)
8.8m : B = 4.1m (-)	9.8 m : B = 4.5 m
9.1m : B = 4.2m (-)	10.2 m : B = 4.6 m
9.4m : B = 4.2m (-)	10.6 m : B = 4.6 m
9.7m : B = 4.3m (-)	11.0 m : B = 4.7 m
10.0m : B = 4.4m (-)	11.4 m : B = 4.8 m
10.3m : B = 4.4m (-)	11.8 m : B = 4.9 m
10.6m : B = 4.5m	12.3 m : B = 4.9 m
10.9m : B = 4.6m	12.7 m : B = 5.0 m
11.2m : B = 4.6m	13.0 m : B = 5.1 m
11.5m : B = 4.7m	13.4 m : B = 4.9 m
11.8m : B = 4.7m	13.9 m : B = 4.9 m
12.1m : B = 4.8m	14.3 m : B = 5.1 m
12.4m : B = 4.9m	14.7 m : B = 5.2 m
12.7m : B = 4.9m	15.1 m : B = 5.9 m (+)
13.0m : B = 4.9m	15.5 m : B = 6.8 m (+)
13.3m : B = 5.0m	16.0 m : B = 7.6 m (+)
13.6m : B = 5.0m	
13.9m : B = 5.0m	
14.2m : B = 5.0m	
14.5m : B = 5.1m	
14.8m : B = 5.1m	
15.1m : B = 5.1m	
15.4m : B = 5.2m	
15.7m : B = 5.3m	
16.0m : B = 5.4m	
16.3m : B = 5.5m	
16.6m : B = 5.6m (+)	
16.9m : B = 5.7m (+)	
17.2m : B = 5.9m (+)	
17.5m : B = 6.1m (+)	
17.8m : B = 6.5m (+)	
18.1m : B = 6.8m (+)	

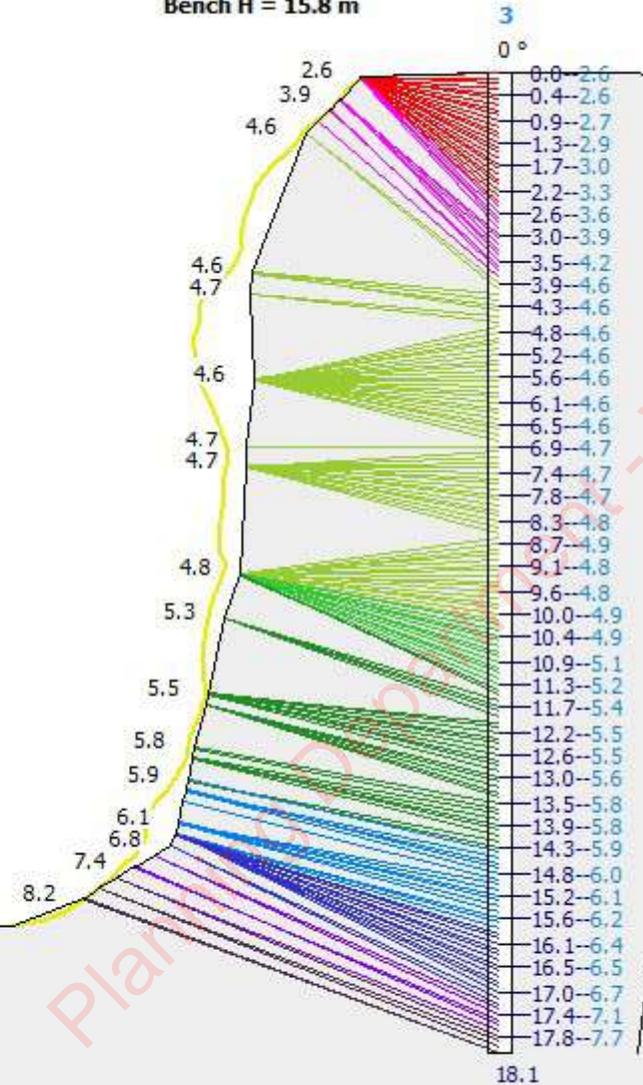
Author		Comments:
Date	11/09/2024	->



Minimum profile I



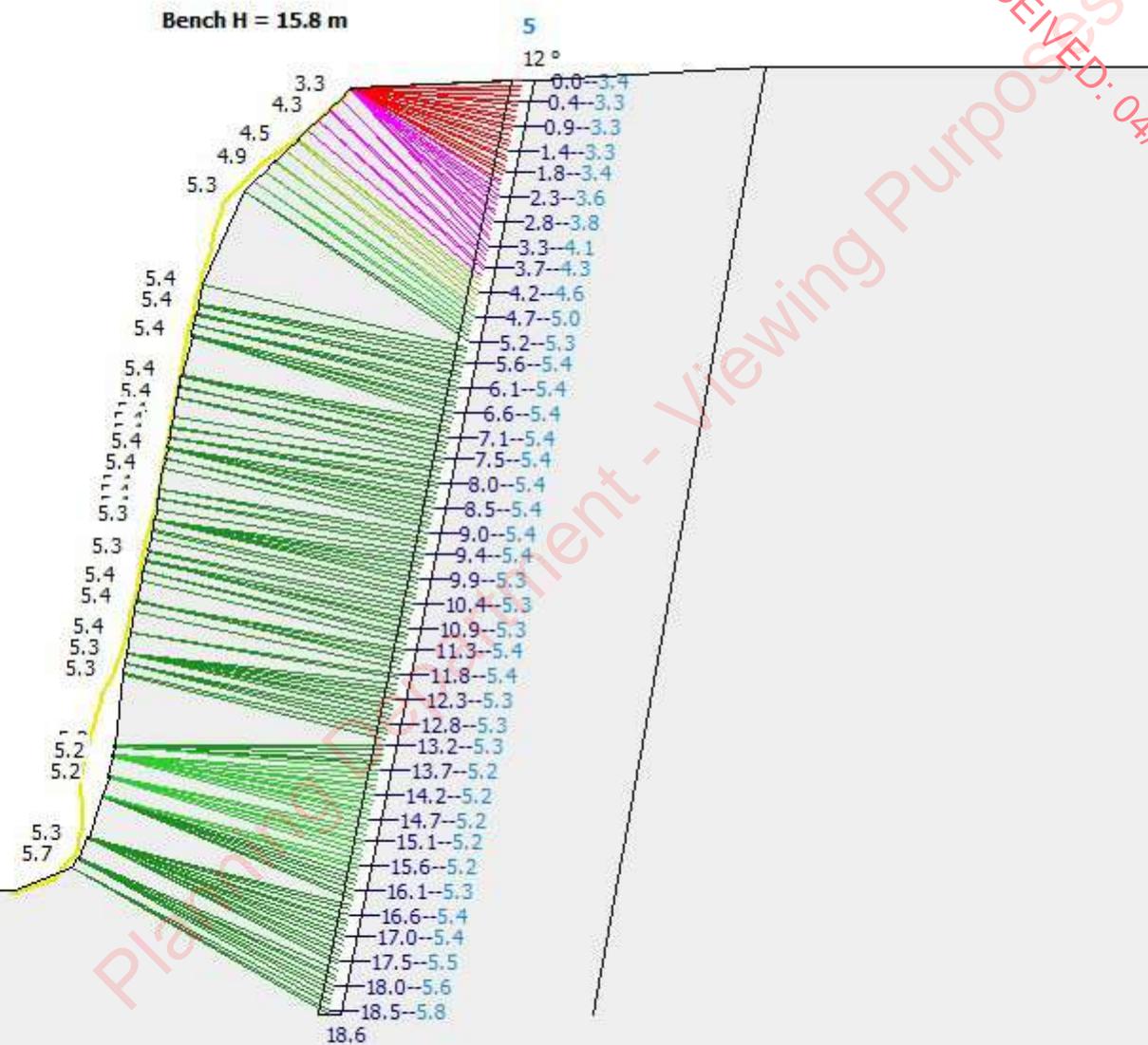
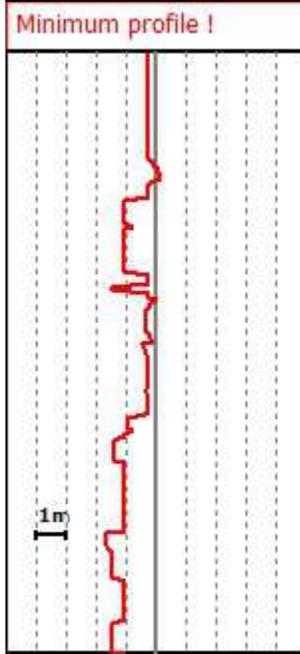
Bench H = 15.8 m



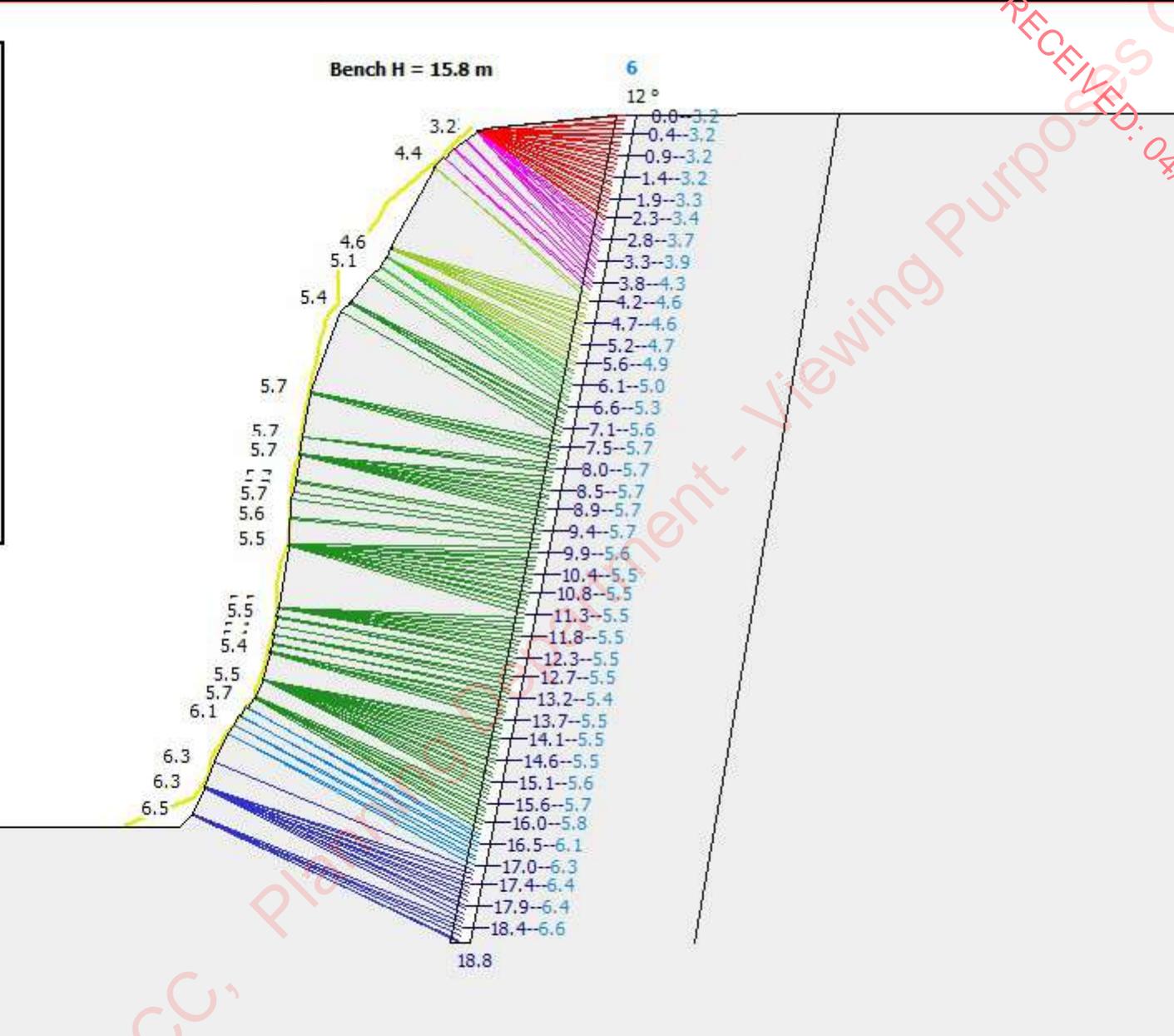
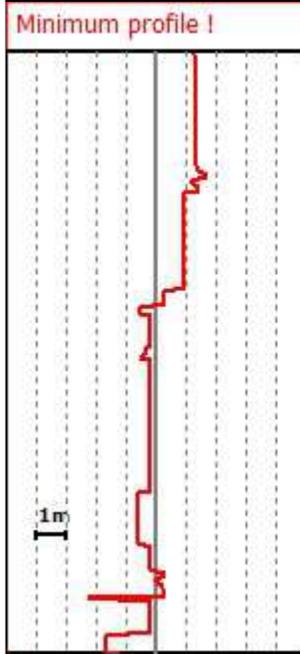
Hole 3	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.6m (-) !!!<<	0.1 m : B = 2.5 m (-) !!! <
0.6m : B = 2.6m (-) !!!<<	0.3 m : B = 2.8 m (-) !!! <
0.9m : B = 2.7m (-) !!!<<	0.7 m : B = 3.1 m (-) !!! <
1.2m : B = 2.8m (-) !!!<<	1.1 m : B = 3.6 m (-)
1.5m : B = 2.9m (-) !!!<<	1.5 m : B = 3.9 m (-)
1.8m : B = 3.1m (-) !!!<<	1.9 m : B = 4.3 m (-)
2.2m : B = 3.3m (-) !!!<<	2.3 m : B = 4.6 m
2.6m : B = 3.6m (-)	2.7 m : B = 4.7 m
3.0m : B = 3.9m (-)	3.1 m : B = 4.8 m
3.4m : B = 4.2m (-)	3.5 m : B = 4.8 m
3.8m : B = 4.5m (-)	3.9 m : B = 5.3 m
4.2m : B = 4.6m	4.3 m : B = 5.5 m (+)
4.6m : B = 4.7m	4.7 m : B = 5.6 m (+)
5.0m : B = 4.6m	5.1 m : B = 5.6 m (+)
5.4m : B = 4.6m	5.5 m : B = 5.6 m (+)
5.8m : B = 4.6m	5.9 m : B = 5.5 m
6.2m : B = 4.6m	6.3 m : B = 5.3 m
6.6m : B = 4.6m	6.7 m : B = 5.1 m
7.0m : B = 4.7m	7.1 m : B = 5.0 m
7.4m : B = 4.7m	7.5 m : B = 5.1 m
7.8m : B = 4.7m	7.9 m : B = 5.1 m
8.2m : B = 4.8m	8.3 m : B = 5.2 m
8.5m : B = 4.9m	8.7 m : B = 5.2 m
8.8m : B = 4.8m	9.1 m : B = 5.0 m
9.1m : B = 4.8m	9.5 m : B = 5.2 m
9.4m : B = 4.8m	9.9 m : B = 5.3 m
9.7m : B = 4.8m	10.3 m : B = 5.4 m
10.0m : B = 4.9m	10.7 m : B = 5.5 m
10.3m : B = 4.9m	11.1 m : B = 5.5 m
10.6m : B = 5.0m	11.5 m : B = 5.4 m
10.9m : B = 5.1m	11.9 m : B = 5.5 m (+)
11.2m : B = 5.2m	12.3 m : B = 5.7 m (+)
11.5m : B = 5.3m	12.7 m : B = 5.8 m (+)
11.8m : B = 5.4m	13.1 m : B = 6.0 m (+)
12.1m : B = 5.5m	13.5 m : B = 6.3 m (+)
12.4m : B = 5.5m (+)	13.9 m : B = 6.5 m (+)
12.7m : B = 5.6m (+)	14.3 m : B = 6.6 m (+)
13.0m : B = 5.6m (+)	14.7 m : B = 7.0 m (+)
13.3m : B = 5.7m (+)	15.1 m : B = 7.4 m (+)
13.6m : B = 5.8m (+)	15.5 m : B = 8.0 m (+)
13.9m : B = 5.8m (+)	15.8 m : B = 9.0 m (+)
14.2m : B = 5.9m (+)	
14.5m : B = 6.0m (+)	
14.8m : B = 6.0m (+)	
15.1m : B = 6.1m (+)	
15.4m : B = 6.2m (+)	
15.7m : B = 6.3m (+)	
16.0m : B = 6.3m (+)	
16.3m : B = 6.4m (+)	
16.6m : B = 6.5m (+)	
16.9m : B = 6.7m (+)	
17.2m : B = 6.8m (+)	
17.5m : B = 7.4m (+)	
17.8m : B = 7.7m (+)	
18.1m : B = 8.2m (+)	

<i>Author</i>		Comments: ->
<i>Date</i>	11/09/2024	





Hole 5	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.3m (-) !!!<<	0.9 m : B = 3.3 m (-) !!!<
0.6m : B = 3.3m (-) !!!<<	1.3 m : B = 3.5 m (-)
0.9m : B = 3.3m (-) !!!<<	1.8 m : B = 3.9 m (-)
1.2m : B = 3.3m (-) !!!<<	2.3 m : B = 4.3 m (-)
1.5m : B = 3.3m (-) !!!<<	2.8 m : B = 4.8 m
1.8m : B = 3.4m (-) !!!<<	3.3 m : B = 5.0 m
2.2m : B = 3.5m (-)	3.7 m : B = 5.2 m
2.6m : B = 3.7m (-)	4.1 m : B = 5.3 m
3.0m : B = 3.9m (-)	4.6 m : B = 5.3 m
3.4m : B = 4.1m (-)	5.0 m : B = 5.3 m
3.8m : B = 4.4m (-)	5.4 m : B = 5.3 m
4.2m : B = 4.6m (-)	5.8 m : B = 5.4 m
4.6m : B = 4.9m	6.2 m : B = 5.4 m
5.0m : B = 5.2m	6.6 m : B = 5.4 m
5.4m : B = 5.4m	7.0 m : B = 5.4 m
5.8m : B = 5.4m	7.4 m : B = 5.3 m
6.2m : B = 5.4m	7.8 m : B = 5.3 m
6.6m : B = 5.4m	8.2 m : B = 5.3 m
7.0m : B = 5.4m	8.6 m : B = 5.3 m
7.4m : B = 5.4m	9.0 m : B = 5.3 m
7.8m : B = 5.4m	9.5 m : B = 5.3 m
8.2m : B = 5.4m	9.8 m : B = 5.3 m
8.5m : B = 5.4m	10.3 m : B = 5.3 m
8.8m : B = 5.4m	10.7 m : B = 5.3 m
9.1m : B = 5.4m	11.1 m : B = 5.3 m
9.4m : B = 5.4m	11.5 m : B = 5.3 m
9.7m : B = 5.3m	11.9 m : B = 5.3 m
10.0m : B = 5.3m	12.3 m : B = 5.4 m
10.3m : B = 5.3m	12.7 m : B = 5.4 m
10.6m : B = 5.3m	13.1 m : B = 5.5 m (+)
10.9m : B = 5.3m	13.6 m : B = 5.6 m (+)
11.2m : B = 5.4m	14.0 m : B = 5.6 m (+)
11.5m : B = 5.4m	14.4 m : B = 5.6 m (+)
11.8m : B = 5.4m	14.8 m : B = 5.7 m (+)
12.1m : B = 5.3m	15.2 m : B = 5.6 m (+)
12.4m : B = 5.3m	15.6 m : B = 5.5 m
12.7m : B = 5.3m	16.0 m : B = 5.4 m
13.0m : B = 5.3m	16.4 m : B = 5.4 m
13.3m : B = 5.3m	16.9 m : B = 5.6 m (+)
13.6m : B = 5.3m	17.4 m : B = 6.3 m (+)
13.9m : B = 5.2m	
14.2m : B = 5.2m	
14.5m : B = 5.2m	
14.8m : B = 5.2m	
15.1m : B = 5.2m	
15.4m : B = 5.2m	
15.7m : B = 5.2m	
16.0m : B = 5.3m	
16.3m : B = 5.3m	
16.6m : B = 5.4m	
16.9m : B = 5.4m	
17.2m : B = 5.4m	
17.5m : B = 5.5m (+)	
17.8m : B = 5.6m (+)	
18.1m : B = 5.7m (+)	
18.4m : B = 5.7m (+)	



Hole 6

MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.2m (-) !!!<-	0.9 m : B = 3.3 m (-) !!!<
0.6m : B = 3.2m (-) !!!<-	1.3 m : B = 3.6 m (-)
0.9m : B = 3.2m (-) !!!<-	1.7 m : B = 3.8 m (-)
1.2m : B = 3.2m (-) !!!<-	2.2 m : B = 4.3 m (-)
1.5m : B = 3.2m (-) !!!<-	2.7 m : B = 4.6 m
1.8m : B = 3.3m (-) !!!<-	3.2 m : B = 4.9 m
2.2m : B = 3.4m (-) !!!<-	3.6 m : B = 5.1 m
2.6m : B = 3.6m (-)	4.1 m : B = 5.4 m
3.0m : B = 3.8m (-)	4.6 m : B = 5.5 m (+)
3.4m : B = 4.0m (-)	5.0 m : B = 5.5 m (+)
3.8m : B = 4.3m (+)	5.4 m : B = 5.4 m
4.2m : B = 4.6m (+)	5.8 m : B = 5.6 m (+)
4.6m : B = 4.6m	6.2 m : B = 5.7 m (+)
5.0m : B = 4.7m	6.6 m : B = 5.7 m (+)
5.4m : B = 4.8m	7.0 m : B = 5.7 m (+)
5.8m : B = 4.9m	7.4 m : B = 5.7 m (+)
6.2m : B = 5.1m	7.9 m : B = 5.7 m (+)
6.6m : B = 5.3m	8.2 m : B = 5.7 m (+)
7.0m : B = 5.5m (+)	8.7 m : B = 5.6 m (+)
7.4m : B = 5.7m (+)	9.0 m : B = 5.6 m (+)
7.8m : B = 5.7m (+)	9.4 m : B = 5.6 m (+)
8.2m : B = 5.7m (+)	9.9 m : B = 5.6 m (+)
8.5m : B = 5.7m (+)	10.2 m : B = 5.5 m (+)
8.8m : B = 5.7m (+)	10.7 m : B = 5.5 m
9.1m : B = 5.7m (+)	11.0 m : B = 5.5 m (+)
9.4m : B = 5.7m (+)	11.5 m : B = 5.5 m (+)
9.7m : B = 5.6m (+)	11.9 m : B = 5.5 m
10.0m : B = 5.6m (+)	12.3 m : B = 5.4 m
10.3m : B = 5.5m (+)	12.7 m : B = 5.4 m
10.6m : B = 5.5m (+)	13.1 m : B = 5.4 m
10.9m : B = 5.5m (+)	13.5 m : B = 5.4 m
11.2m : B = 5.5m (+)	13.9 m : B = 5.5 m (+)
11.5m : B = 5.5m (+)	14.3 m : B = 5.5 m (+)
11.8m : B = 5.5m	14.8 m : B = 5.8 m (+)
12.1m : B = 5.5m	15.2 m : B = 6.0 m (+)
12.4m : B = 5.5m	15.7 m : B = 6.1 m (+)
12.7m : B = 5.5m	16.1 m : B = 6.2 m (+)
13.0m : B = 5.4m	16.5 m : B = 6.3 m (+)
13.3m : B = 5.4m	17.0 m : B = 6.8 m (+)
13.6m : B = 5.5m	17.6 m : B = 7.7 m (+)
13.9m : B = 5.5m	
14.2m : B = 5.5m	
14.5m : B = 5.5m	
14.8m : B = 5.5m (+)	
15.1m : B = 5.6m (+)	
15.4m : B = 5.7m (+)	
15.7m : B = 5.7m (+)	
16.0m : B = 5.8m (+)	
16.3m : B = 6.0m (+)	
16.6m : B = 6.1m (+)	
16.9m : B = 6.2m (+)	
17.2m : B = 6.3m (+)	
17.5m : B = 6.4m (+)	
17.8m : B = 6.4m (+)	
18.1m : B = 6.5m (+)	
18.4m : B = 6.6m (+)	
18.7m : B = 6.6m (+)	

Author	
Date	11/09/2024

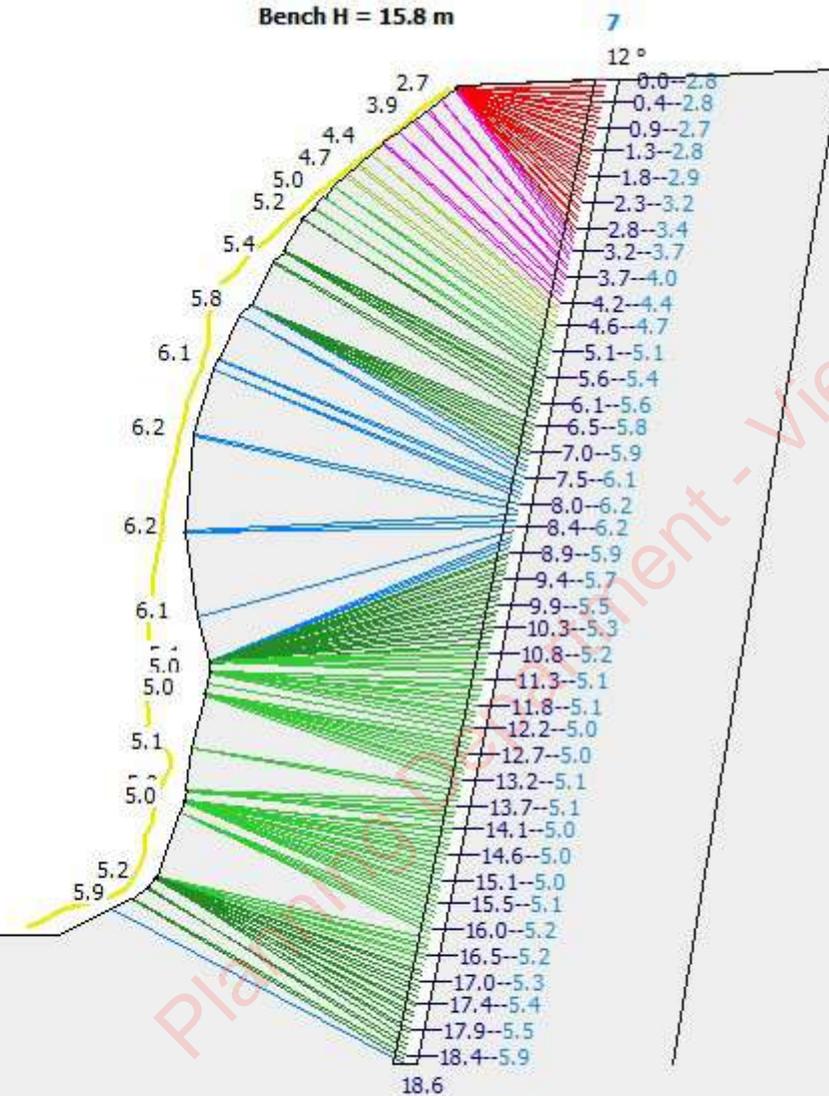
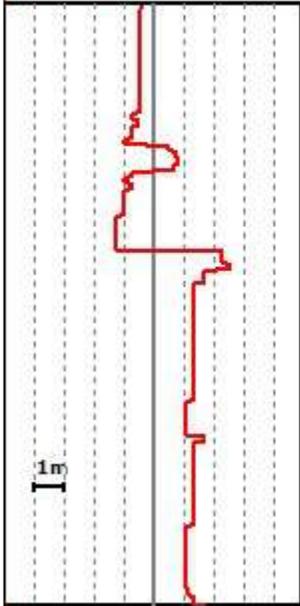
Comments:
->



Blast plan	2024-17.ext		
Site	Platin	Hole	7

Drill plan

Minimum profile I

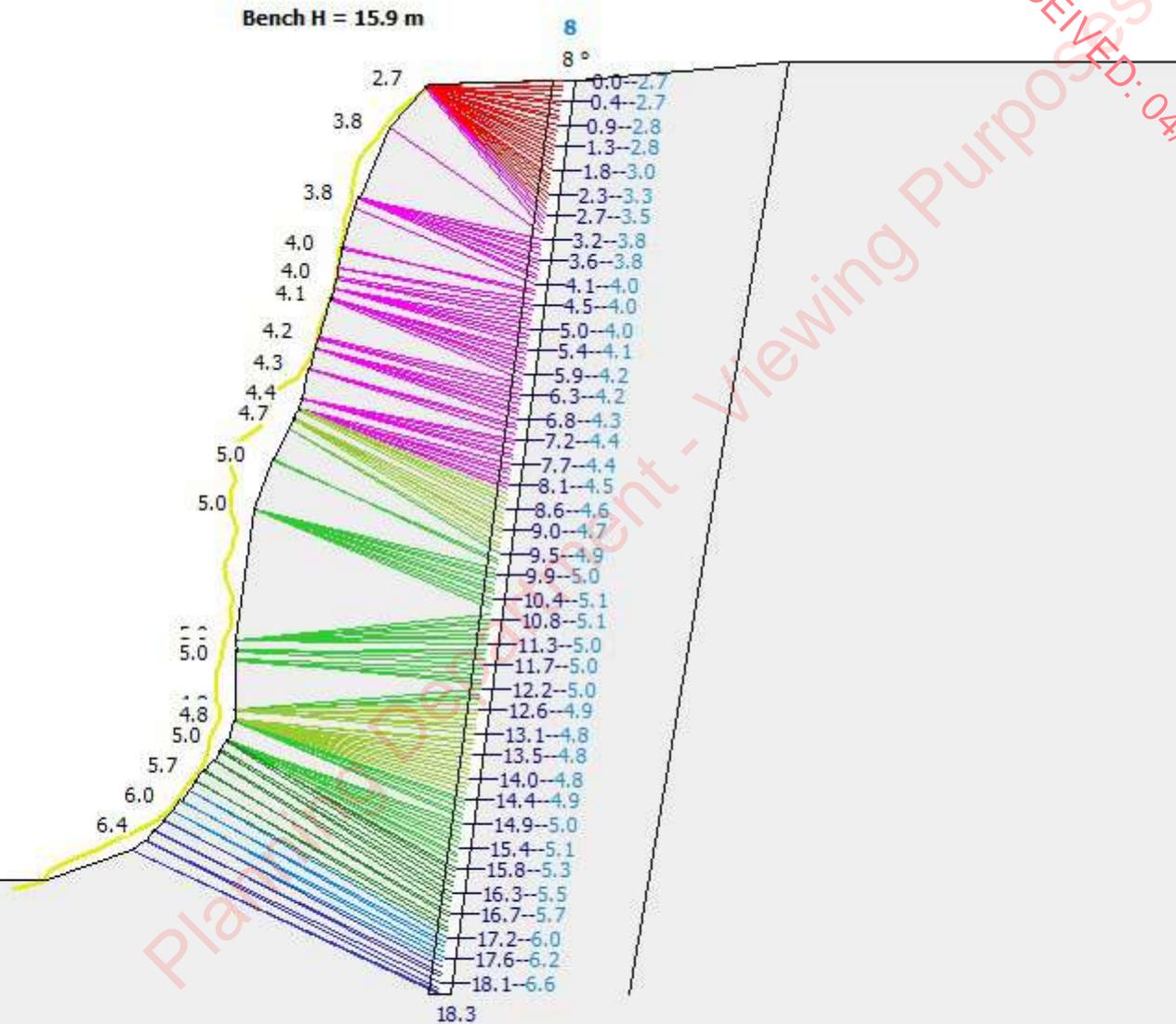
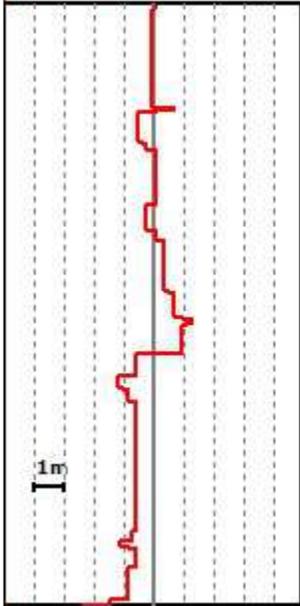


Hole 7	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.8m (-) !!!<<	0.7 m : B = 2.8 m (-) !!! <
0.6m : B = 2.7m (-) !!!<<	1.0 m : B = 3.0 m (-) !!! <
0.9m : B = 2.7m (-) !!!<<	1.5 m : B = 3.4 m (-) !!! <
1.2m : B = 2.8m (-) !!!<<	2.0 m : B = 3.8 m (-)
1.5m : B = 2.8m (-) !!!<<	2.5 m : B = 4.3 m (-)
1.8m : B = 2.9m (-) !!!<<	3.0 m : B = 4.7 m
2.2m : B = 3.1m (-) !!!<<	3.4 m : B = 5.0 m
2.6m : B = 3.3m (-) !!!<<	3.9 m : B = 5.4 m
3.0m : B = 3.6m (-)	4.4 m : B = 5.8 m (+)
3.4m : B = 3.9m (-)	4.9 m : B = 6.0 m (+)
3.8m : B = 4.1m (+)	5.3 m : B = 6.3 m (+)
4.2m : B = 4.4m (+)	5.8 m : B = 6.3 m (+)
4.6m : B = 4.7m	6.1 m : B = 6.2 m (+)
5.0m : B = 5.0m	6.6 m : B = 6.2 m (+)
5.4m : B = 5.2m	7.0 m : B = 6.3 m (+)
5.8m : B = 5.5m	7.4 m : B = 6.4 m (+)
6.2m : B = 5.6m (+)	7.8 m : B = 6.4 m (+)
6.6m : B = 5.8m (+)	8.2 m : B = 6.4 m (+)
7.0m : B = 5.9m (+)	8.6 m : B = 6.4 m (+)
7.4m : B = 6.1m (+)	9.0 m : B = 6.4 m (+)
7.8m : B = 6.2m (+)	9.4 m : B = 6.4 m (+)
8.2m : B = 6.2m (+)	9.8 m : B = 6.4 m (+)
8.5m : B = 6.1m (+)	10.2 m : B = 6.4 m (+)
8.8m : B = 6.0m (+)	10.7 m : B = 6.3 m (+)
9.1m : B = 5.8m (+)	11.0 m : B = 6.3 m (+)
9.4m : B = 5.7m (+)	11.5 m : B = 6.3 m (+)
9.7m : B = 5.6m (+)	11.8 m : B = 6.2 m (+)
10.0m : B = 5.4m	12.2 m : B = 6.0 m (+)
10.3m : B = 5.3m	12.6 m : B = 6.1 m (+)
10.6m : B = 5.3m	13.0 m : B = 6.0 m (+)
10.9m : B = 5.2m	13.4 m : B = 5.9 m (+)
11.2m : B = 5.1m	13.7 m : B = 5.5 m (+)
11.5m : B = 5.1m	14.1 m : B = 5.3 m
11.8m : B = 5.1m	14.5 m : B = 5.4 m
12.1m : B = 5.0m	14.9 m : B = 5.4 m
12.4m : B = 5.0m	15.4 m : B = 5.5 m (+)
12.7m : B = 5.0m	15.8 m : B = 5.5 m
13.0m : B = 5.0m	16.2 m : B = 5.6 m (+)
13.3m : B = 5.1m	16.7 m : B = 6.0 m (+)
13.6m : B = 5.1m	17.3 m : B = 7.1 m (+)
13.9m : B = 5.0m	
14.2m : B = 5.0m	
14.5m : B = 5.0m	
14.8m : B = 5.0m	
15.1m : B = 5.0m	
15.4m : B = 5.1m	
15.7m : B = 5.1m	
16.0m : B = 5.2m	
16.3m : B = 5.2m	
16.6m : B = 5.2m	
16.9m : B = 5.3m	
17.2m : B = 5.3m	
17.5m : B = 5.4m	
17.8m : B = 5.5m	
18.1m : B = 5.6m (+)	
18.4m : B = 5.9m (+)	

Author		Comments: ->
Date	11/09/2024	



Minimum profile I



Hole 8	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.8m (-) !!!<<	0.5 m : B = 2.6 m (-) !!! <
0.6m : B = 2.7m (-) !!!<<	0.8 m : B = 2.9 m (-) !!! <
0.9m : B = 2.8m (-) !!!<<	1.2 m : B = 3.3 m (-) !!! <
1.2m : B = 2.8m (-) !!!<<	1.6 m : B = 3.5 m (-)
1.5m : B = 2.9m (-) !!!<<	2.1 m : B = 3.8 m (-)
1.8m : B = 3.0m (-) !!!<<	2.5 m : B = 3.8 m (-)
2.2m : B = 3.2m (-) !!!<<	2.9 m : B = 3.8 m (-)
2.6m : B = 3.4m (-) !!!<<	3.3 m : B = 3.9 m (-)
3.0m : B = 3.7m (-)	3.7 m : B = 3.9 m (-)
3.4m : B = 3.9m (-)	4.1 m : B = 3.9 m (-)
3.8m : B = 4.0m (-)	4.5 m : B = 3.9 m (-)
4.2m : B = 4.0m (-)	4.9 m : B = 4.0 m (-)
4.6m : B = 4.0m (-)	5.3 m : B = 4.1 m (-)
5.0m : B = 4.0m (-)	5.7 m : B = 4.1 m (-)
5.4m : B = 4.1m (-)	6.2 m : B = 4.2 m (-)
5.8m : B = 4.1m (-)	6.6 m : B = 4.5 m (+)
6.2m : B = 4.2m (-)	7.1 m : B = 4.9 m
6.6m : B = 4.3m (-)	7.5 m : B = 5.0 m
7.0m : B = 4.3m (-)	7.9 m : B = 5.4 m
7.4m : B = 4.4m (-)	8.4 m : B = 5.6 m (+)
7.8m : B = 4.4m (-)	8.8 m : B = 5.4 m
8.2m : B = 4.5m (-)	9.2 m : B = 5.4 m
8.5m : B = 4.6m	9.5 m : B = 5.3 m
8.8m : B = 4.7m	9.9 m : B = 5.2 m
9.1m : B = 4.8m	10.4 m : B = 5.4 m
9.4m : B = 4.9m	10.7 m : B = 5.3 m
9.7m : B = 5.0m	11.1 m : B = 5.1 m
10.0m : B = 5.0m	11.5 m : B = 5.1 m
10.3m : B = 5.1m	11.9 m : B = 5.2 m
10.6m : B = 5.1m	12.4 m : B = 5.2 m
10.9m : B = 5.1m	12.7 m : B = 5.2 m
11.2m : B = 5.1m	13.1 m : B = 5.2 m
11.5m : B = 5.0m	13.5 m : B = 5.1 m
11.8m : B = 5.0m	14.0 m : B = 5.2 m
12.1m : B = 5.0m	14.3 m : B = 5.2 m
12.4m : B = 4.9m	14.8 m : B = 5.4 m
12.7m : B = 4.9m	15.2 m : B = 5.7 m (+)
13.0m : B = 4.8m	15.7 m : B = 6.0 m (+)
13.3m : B = 4.8m	16.2 m : B = 6.8 m (+)
13.6m : B = 4.8m	16.7 m : B = 7.7 m (+)
13.9m : B = 4.8m	17.2 m : B = 8.1 m (+)
14.2m : B = 4.9m	
14.5m : B = 4.9m	
14.8m : B = 5.0m	
15.1m : B = 5.1m	
15.4m : B = 5.1m	
15.7m : B = 5.2m	
16.0m : B = 5.3m	
16.3m : B = 5.5m	
16.6m : B = 5.6m (+)	
16.9m : B = 5.8m (+)	
17.2m : B = 6.0m (+)	
17.5m : B = 6.2m (+)	
17.8m : B = 6.3m (+)	
18.1m : B = 6.6m (+)	
18.4m : B = 6.8m (+)	

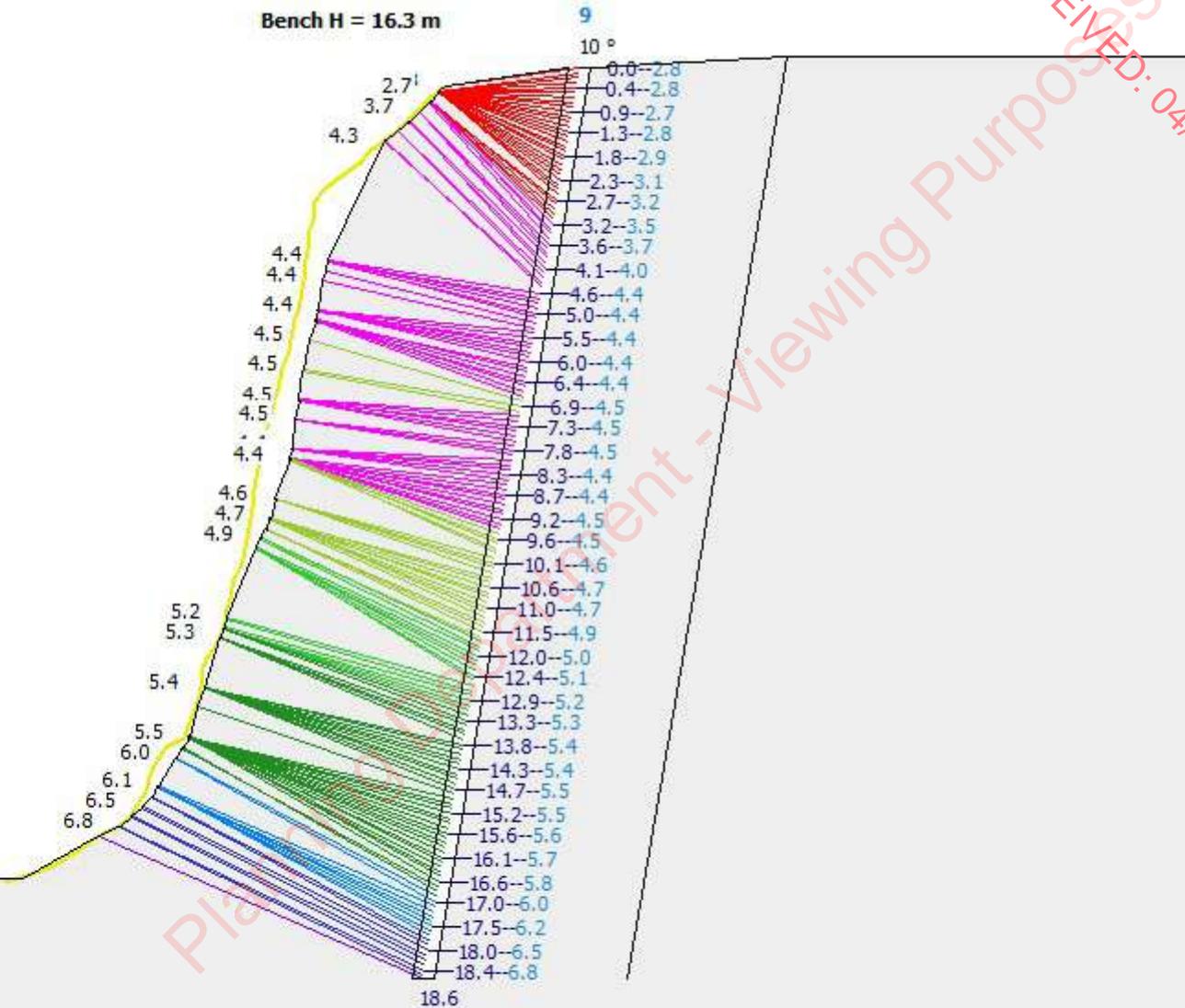
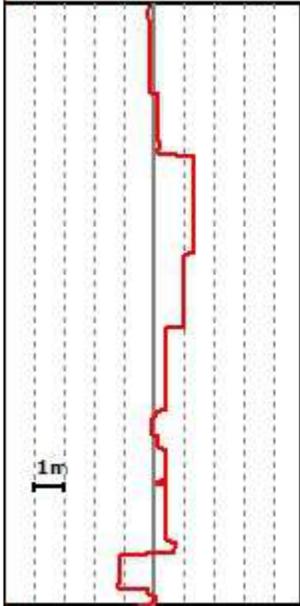
<i>Author</i>		Comments: ->
<i>Date</i>	11/09/2024	



Blast plan	2024-17.ext		
Site	Platin	Hole	9

Drill plan

Minimum profile !

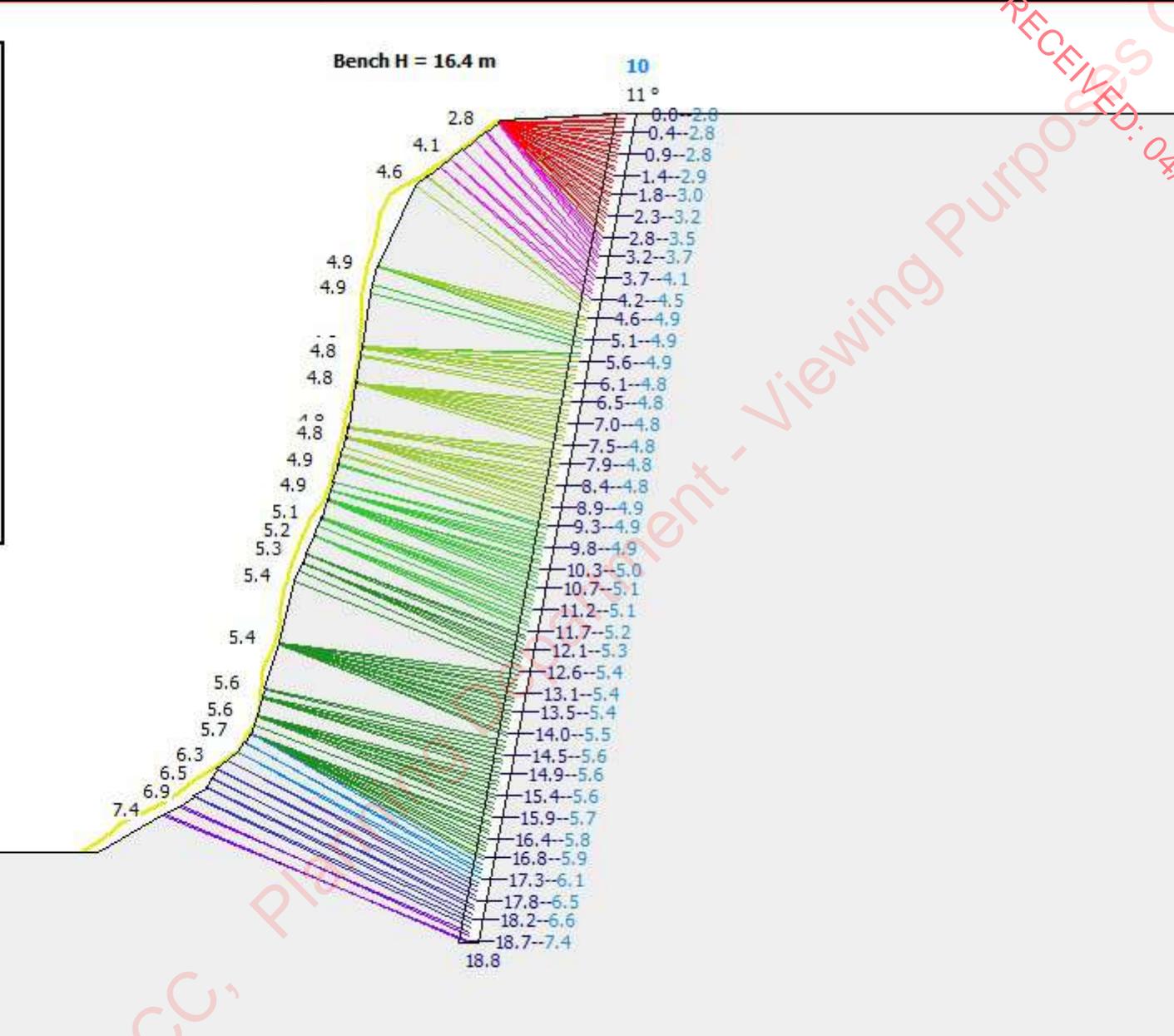
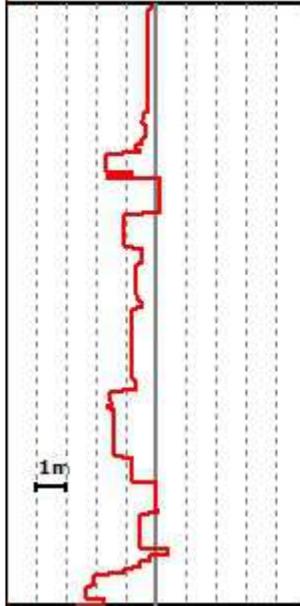


Hole 9	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.8m (-) !!!<	0.8 m : B = 2.6 m (-) !!! <
0.6m : B = 2.8m (-) !!!<	1.2 m : B = 2.9 m (-) !!! <
0.9m : B = 2.7m (-) !!!<	1.7 m : B = 3.2 m (-) !!! <
1.2m : B = 2.8m (-) !!!<	2.1 m : B = 3.6 m (-)
1.5m : B = 2.8m (-) !!!<	2.6 m : B = 4.0 m (-)
1.8m : B = 2.9m (-) !!!<	3.1 m : B = 4.4 m (-)
2.2m : B = 3.0m (-) !!!<	3.5 m : B = 4.7 m
2.6m : B = 3.2m (-) !!!<	4.0 m : B = 4.7 m
3.0m : B = 3.4m (-) !!!<	4.3 m : B = 4.7 m
3.4m : B = 3.5m (-)	4.8 m : B = 4.7 m
3.8m : B = 3.9m (-)	5.2 m : B = 4.7 m
4.2m : B = 4.1m (-)	5.5 m : B = 4.7 m
4.6m : B = 4.4m (-)	6.0 m : B = 4.7 m
5.0m : B = 4.4m (-)	6.4 m : B = 4.8 m
5.4m : B = 4.4m (-)	6.8 m : B = 4.8 m
5.8m : B = 4.4m (-)	7.2 m : B = 4.8 m
6.2m : B = 4.4m (-)	7.6 m : B = 4.9 m
6.6m : B = 4.5m (-)	8.0 m : B = 4.9 m
7.0m : B = 4.5m	8.4 m : B = 4.9 m
7.4m : B = 4.5m (-)	8.8 m : B = 4.9 m
7.8m : B = 4.5m (-)	9.2 m : B = 5.0 m
8.2m : B = 4.5m (-)	9.7 m : B = 5.0 m
8.5m : B = 4.4m (-)	10.1 m : B = 5.0 m
8.8m : B = 4.4m (-)	10.4 m : B = 5.0 m
9.1m : B = 4.5m (-)	10.9 m : B = 5.0 m
9.4m : B = 4.5m (-)	11.3 m : B = 5.1 m
9.7m : B = 4.5m	11.7 m : B = 5.1 m
10.0m : B = 4.6m	12.1 m : B = 5.1 m
10.3m : B = 4.6m	12.5 m : B = 5.2 m
10.6m : B = 4.7m	12.9 m : B = 5.3 m
10.9m : B = 4.7m	13.4 m : B = 5.4 m
11.2m : B = 4.8m	13.8 m : B = 5.4 m
11.5m : B = 4.9m	14.2 m : B = 5.5 m
11.8m : B = 5.0m	14.6 m : B = 5.5 m (+)
12.1m : B = 5.0m	15.1 m : B = 6.0 m (+)
12.4m : B = 5.1m	15.5 m : B = 6.1 m (+)
12.7m : B = 5.2m	15.9 m : B = 6.1 m (+)
13.0m : B = 5.2m	16.4 m : B = 6.4 m (+)
13.3m : B = 5.3m	16.9 m : B = 6.9 m (+)
13.6m : B = 5.3m	17.4 m : B = 7.4 m (+)
13.9m : B = 5.4m	17.9 m : B = 8.3 m (+)
14.2m : B = 5.4m	
14.5m : B = 5.4m	
14.8m : B = 5.5m	
15.1m : B = 5.5m (+)	
15.4m : B = 5.6m (+)	
15.7m : B = 5.6m (+)	
16.0m : B = 5.7m (+)	
16.3m : B = 5.8m (+)	
16.6m : B = 5.8m (+)	
16.9m : B = 6.0m (+)	
17.2m : B = 6.1m (+)	
17.5m : B = 6.2m (+)	
17.8m : B = 6.3m (+)	
18.1m : B = 6.5m (+)	
18.4m : B = 6.8m (+)	

Author		Comments:
Date	11/09/2024	->

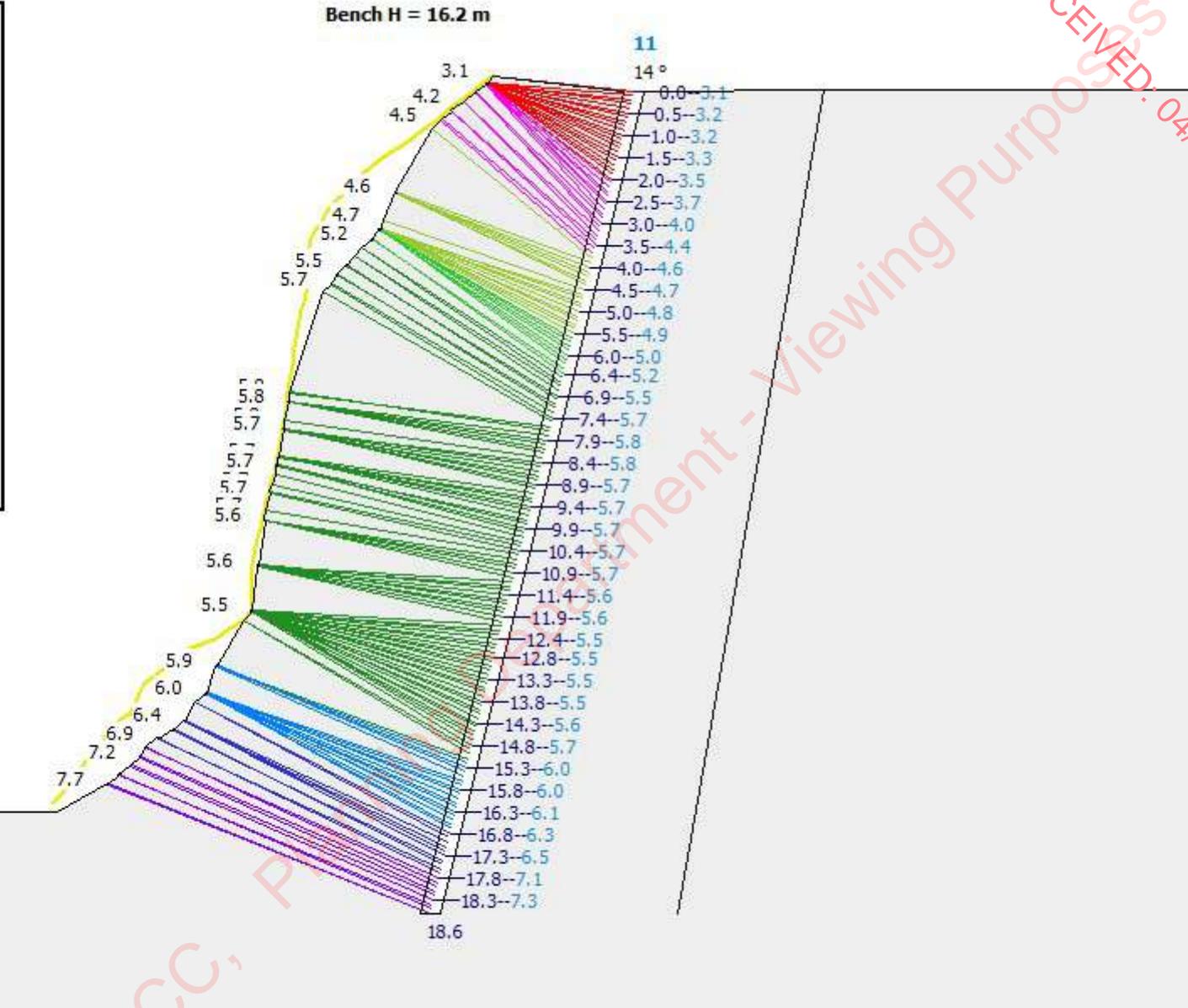
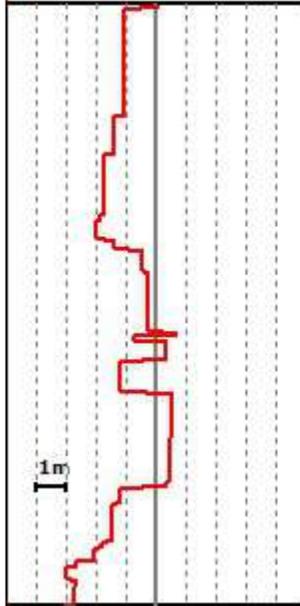


Minimum profile I

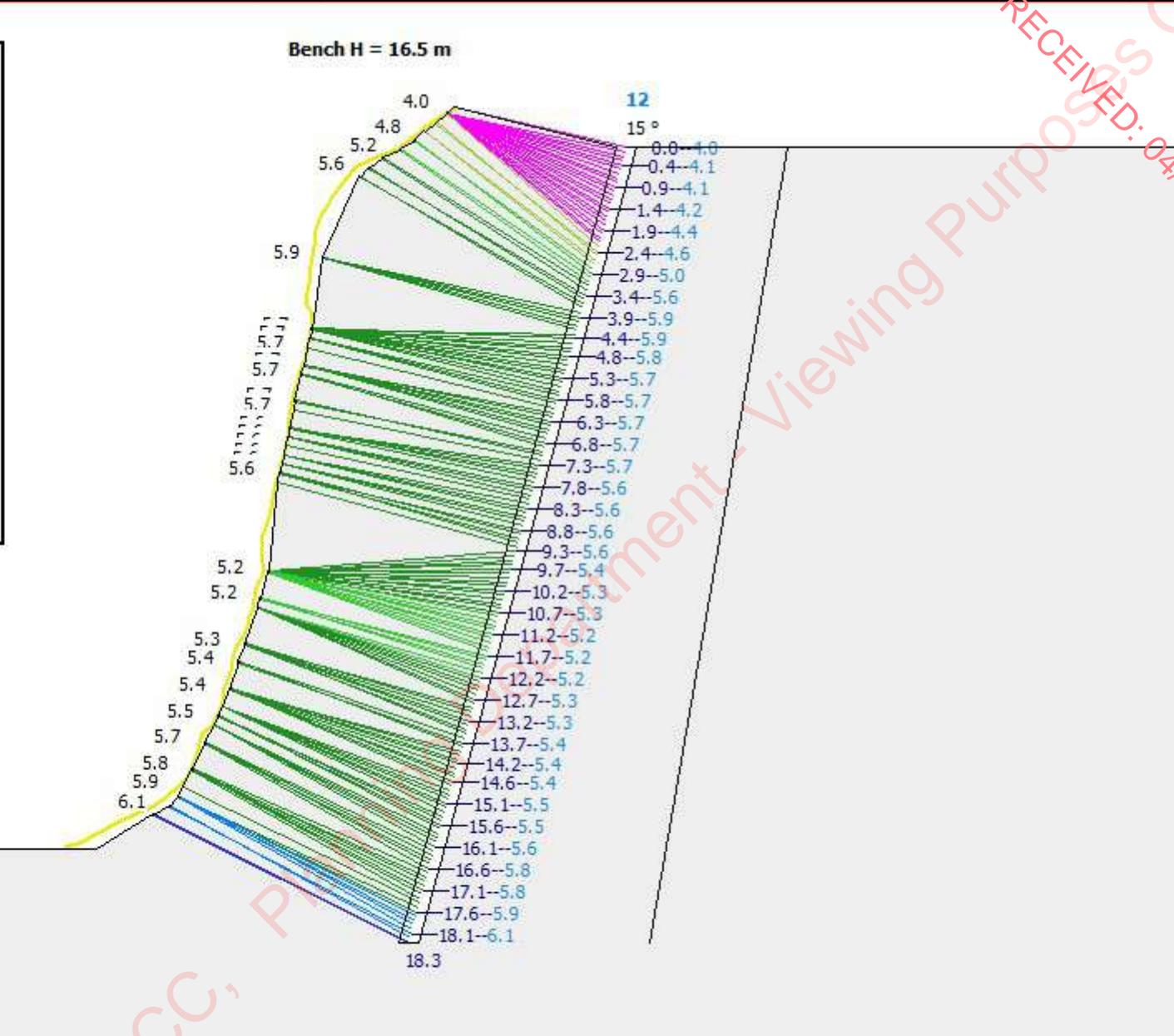
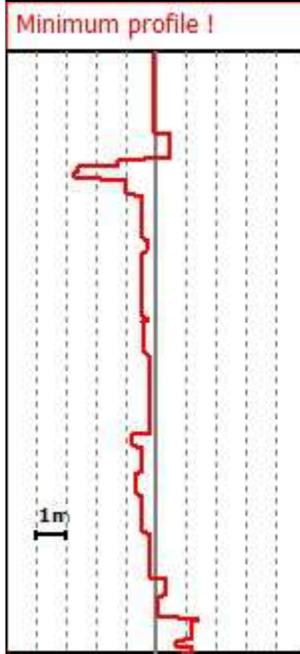


Hole 10	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.8m (-) !!!<	0.7 m : B = 2.7 m (-) !!! <
0.6m : B = 2.8m (-) !!!<	1.0 m : B = 3.0 m (-) !!! <
0.9m : B = 2.8m (-) !!!<	1.5 m : B = 3.4 m (-) !!! <
1.2m : B = 2.8m (-) !!!<	2.0 m : B = 3.9 m (-)
1.5m : B = 2.9m (-) !!!<	2.5 m : B = 4.5 m
1.8m : B = 3.0m (-) !!!<	3.0 m : B = 4.9 m
2.2m : B = 3.2m (-) !!!<	3.4 m : B = 4.9 m
2.6m : B = 3.4m (-) !!!<	3.8 m : B = 4.9 m
3.0m : B = 3.6m (-)	4.2 m : B = 5.0 m
3.4m : B = 3.8m (-)	4.6 m : B = 5.0 m
3.8m : B = 4.2m (-)	5.0 m : B = 5.0 m
4.2m : B = 4.5m (-)	5.4 m : B = 4.9 m
4.6m : B = 4.9m	5.8 m : B = 4.9 m
5.0m : B = 4.9m	6.2 m : B = 4.8 m
5.4m : B = 4.9m	6.6 m : B = 4.8 m
5.8m : B = 4.9m	7.0 m : B = 4.8 m
6.2m : B = 4.8m	7.4 m : B = 4.8 m
6.6m : B = 4.8m	7.8 m : B = 4.8 m
7.0m : B = 4.8m	8.3 m : B = 4.8 m
7.4m : B = 4.8m	8.7 m : B = 4.9 m
7.8m : B = 4.8m	9.1 m : B = 4.9 m
8.2m : B = 4.8m	9.5 m : B = 4.9 m
8.5m : B = 4.8m	9.9 m : B = 5.1 m
8.8m : B = 4.8m	10.3 m : B = 5.2 m
9.1m : B = 4.9m	10.8 m : B = 5.3 m
9.4m : B = 4.9m	11.2 m : B = 5.4 m
9.7m : B = 4.9m	11.6 m : B = 5.4 m
10.0m : B = 5.0m	12.0 m : B = 5.5 m
10.3m : B = 5.0m	12.4 m : B = 5.4 m
10.6m : B = 5.0m	12.8 m : B = 5.4 m
10.9m : B = 5.1m	13.3 m : B = 5.5 m (+)
11.2m : B = 5.1m	13.7 m : B = 5.6 m (+)
11.5m : B = 5.2m	14.1 m : B = 5.6 m (+)
11.8m : B = 5.3m	14.5 m : B = 5.5 m (+)
12.1m : B = 5.3m	14.9 m : B = 5.6 m (+)
12.4m : B = 5.4m	15.3 m : B = 5.8 m (+)
12.7m : B = 5.4m	15.8 m : B = 6.1 m (+)
13.0m : B = 5.4m	16.3 m : B = 6.6 m (+)
13.3m : B = 5.4m	16.8 m : B = 7.0 m (+)
13.6m : B = 5.5m	17.3 m : B = 7.7 m (+)
13.9m : B = 5.5m	17.8 m : B = 8.3 m (+)
14.2m : B = 5.6m (+)	18.3 m : B = 8.8 m (+)
14.5m : B = 5.6m (+)	
14.8m : B = 5.6m (+)	
15.1m : B = 5.6m (+)	
15.4m : B = 5.6m (+)	
15.7m : B = 5.7m (+)	
16.0m : B = 5.7m (+)	
16.3m : B = 5.8m (+)	
16.6m : B = 5.9m (+)	
16.9m : B = 5.9m (+)	
17.2m : B = 6.1m (+)	
17.5m : B = 6.3m (+)	
17.8m : B = 6.5m (+)	
18.1m : B = 6.6m (+)	
18.4m : B = 6.9m (+)	
18.7m : B = 7.4m (+)	

Minimum profile I



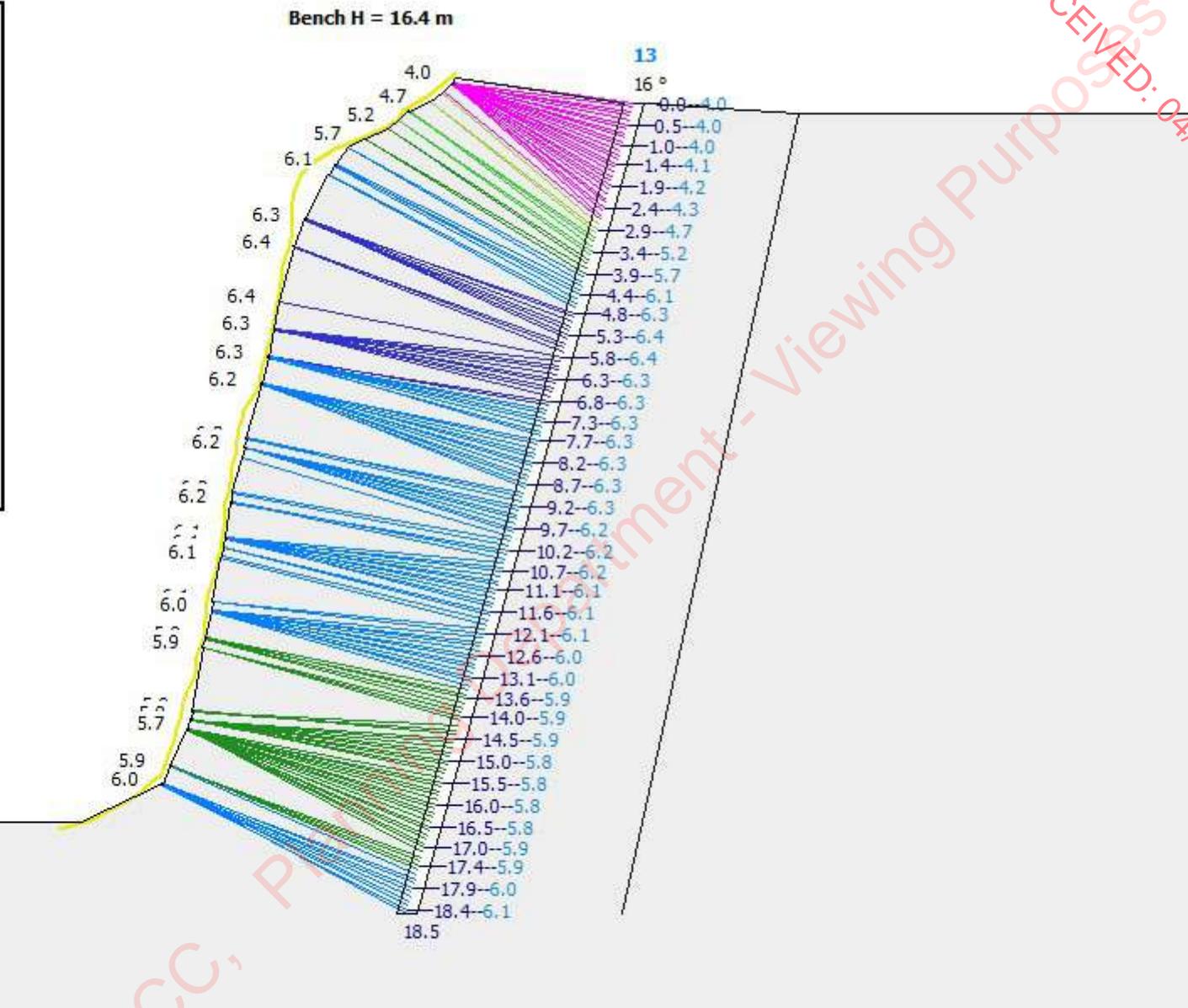
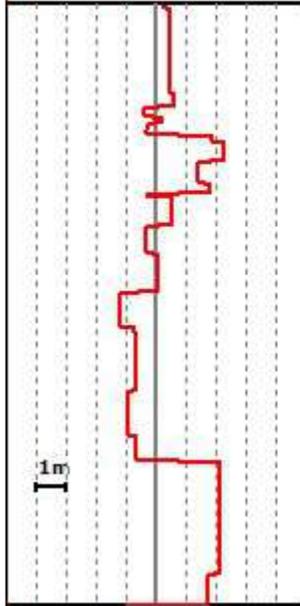
Hole 11	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.2m (-) !!!<<	0.4 m : B = 3.0 m (-) !!! <
0.6m : B = 3.2m (-) !!!<<	0.9 m : B = 3.5 m (-) !!! <
0.9m : B = 3.2m (-) !!!<<	1.4 m : B = 3.8 m (-)
1.2m : B = 3.3m (-) !!!<<	1.9 m : B = 4.2 m (-)
1.5m : B = 3.3m (-) !!!<<	2.5 m : B = 4.7 m
1.8m : B = 3.4m (-) !!!<<	3.0 m : B = 5.2 m
2.2m : B = 3.6m (-)	3.5 m : B = 5.5 m (+)
2.6m : B = 3.8m (-)	4.0 m : B = 5.8 m (+)
3.0m : B = 4.0m (-)	4.4 m : B = 5.9 m (+)
3.4m : B = 4.3m (-)	4.8 m : B = 6.1 m (+)
3.8m : B = 4.6m	5.3 m : B = 6.0 m (+)
4.2m : B = 4.7m	5.7 m : B = 6.0 m (+)
4.6m : B = 4.7m	6.0 m : B = 5.9 m (+)
5.0m : B = 4.8m	6.5 m : B = 5.9 m (+)
5.4m : B = 4.8m	6.9 m : B = 5.9 m (+)
5.8m : B = 5.0m	7.3 m : B = 5.9 m (+)
6.2m : B = 5.1m	7.7 m : B = 5.8 m (+)
6.6m : B = 5.3m	8.1 m : B = 5.8 m (+)
7.0m : B = 5.5m (+)	8.5 m : B = 5.7 m (+)
7.4m : B = 5.7m (+)	8.9 m : B = 5.7 m (+)
7.8m : B = 5.8m (+)	9.3 m : B = 5.7 m (+)
8.2m : B = 5.8m (+)	9.7 m : B = 5.6 m (+)
8.5m : B = 5.8m (+)	10.1 m : B = 5.6 m (+)
8.8m : B = 5.7m (+)	10.5 m : B = 5.7 m (+)
9.1m : B = 5.7m (+)	10.9 m : B = 5.6 m (+)
9.4m : B = 5.7m (+)	11.3 m : B = 5.6 m (+)
9.7m : B = 5.7m (+)	11.7 m : B = 5.6 m (+)
10.0m : B = 5.7m (+)	12.1 m : B = 5.6 m (+)
10.3m : B = 5.7m (+)	12.5 m : B = 5.5 m (+)
10.6m : B = 5.7m (+)	12.9 m : B = 5.4 m
10.9m : B = 5.7m (+)	13.4 m : B = 5.5 m (+)
11.2m : B = 5.6m (+)	13.9 m : B = 6.0 m (+)
11.5m : B = 5.6m (+)	14.5 m : B = 6.8 m (+)
11.8m : B = 5.6m (+)	15.0 m : B = 7.1 m (+)
12.1m : B = 5.5m (+)	15.5 m : B = 7.3 m (+)
12.4m : B = 5.5m (+)	15.9 m : B = 7.4 m (+)
12.7m : B = 5.5m	16.4 m : B = 7.8 m (+)
13.0m : B = 5.5m	16.8 m : B = 8.0 m (+)
13.3m : B = 5.5m	17.3 m : B = 8.2 m (+)
13.6m : B = 5.5m	17.8 m : B = 8.4 m (+)
13.9m : B = 5.5m (+)	18.2 m : B = 8.6 m (+)
14.2m : B = 5.6m (+)	
14.5m : B = 5.6m (+)	
14.8m : B = 5.7m (+)	
15.1m : B = 5.9m (+)	
15.4m : B = 6.0m (+)	
15.7m : B = 6.0m (+)	
16.0m : B = 6.1m (+)	
16.3m : B = 6.1m (+)	
16.6m : B = 6.2m (+)	
16.9m : B = 6.4m (+)	
17.2m : B = 6.5m (+)	
17.5m : B = 6.7m (+)	
17.8m : B = 7.1m (+)	
18.1m : B = 7.2m (+)	
18.4m : B = 7.5m (+)	
18.7m : B = 7.7m (+)	



Hole 12

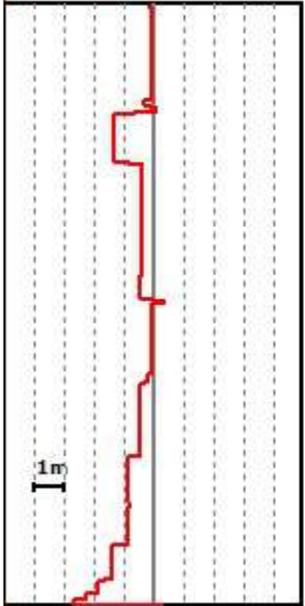
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.1m (-)	0.2 m : B = 3.9m (-)
0.6m : B = 4.1m (-)	0.6 m : B = 4.3m (-)
0.9m : B = 4.1m (-)	1.1 m : B = 4.7m
1.2m : B = 4.2m (-)	1.7 m : B = 5.4m
1.5m : B = 4.3m (-)	2.3 m : B = 5.8m (+)
1.8m : B = 4.3m (-)	2.7 m : B = 6.0m (+)
2.2m : B = 4.5m (-)	3.2 m : B = 6.1m (+)
2.6m : B = 4.8m	3.6 m : B = 6.2m (+)
3.0m : B = 5.1m	4.0 m : B = 6.1m (+)
3.4m : B = 5.3m (+)	4.4 m : B = 6.1m (+)
3.8m : B = 5.3m (+)	4.8 m : B = 6.0m (+)
4.2m : B = 5.9m (+)	5.2 m : B = 6.0m (+)
4.6m : B = 5.8m (+)	5.5 m : B = 5.7m (+)
5.0m : B = 5.8m (+)	6.0 m : B = 5.7m (+)
5.4m : B = 5.7m (+)	6.3 m : B = 5.6m (+)
5.8m : B = 5.7m (+)	6.8 m : B = 5.7m (+)
6.2m : B = 5.7m (+)	7.2 m : B = 5.7m (+)
6.6m : B = 5.7m (+)	7.6 m : B = 5.6m (+)
7.0m : B = 5.7m (+)	8.0 m : B = 5.6m (+)
7.4m : B = 5.7m (+)	8.4 m : B = 5.5m (+)
7.8m : B = 5.6m (+)	8.8 m : B = 5.5m (+)
8.2m : B = 5.6m (+)	9.2 m : B = 5.5m (+)
8.5m : B = 5.6m (+)	9.6 m : B = 5.5m (+)
8.8m : B = 5.6m (+)	10.1 m : B = 5.5m
9.1m : B = 5.6m (+)	10.4 m : B = 5.5m
9.4m : B = 5.5m (+)	10.9 m : B = 5.4m
9.7m : B = 5.4m	11.2 m : B = 5.2m
10.0m : B = 5.4m	11.6 m : B = 5.3m
10.3m : B = 5.3m	12.1 m : B = 5.3m
10.6m : B = 5.3m	12.5 m : B = 5.3m
10.9m : B = 5.2m	12.9 m : B = 5.4m
11.2m : B = 5.2m	13.3 m : B = 5.4m
11.5m : B = 5.2m	13.8 m : B = 5.4m
11.8m : B = 5.2m	14.1 m : B = 5.4m
12.1m : B = 5.2m	14.6 m : B = 5.4m
12.4m : B = 5.3m	15.0 m : B = 5.6m (+)
12.7m : B = 5.3m	15.5 m : B = 5.6m (+)
13.0m : B = 5.3m	15.9 m : B = 5.7m (+)
13.3m : B = 5.3m	16.3 m : B = 5.8m (+)
13.6m : B = 5.4m	16.9 m : B = 6.2m (+)
13.9m : B = 5.4m	17.5 m : B = 7.0m (+)
14.2m : B = 5.4m	18.1 m : B = 7.6m (+)
14.5m : B = 5.4m	
14.8m : B = 5.4m	
15.1m : B = 5.5m	
15.4m : B = 5.5m (+)	
15.7m : B = 5.6m (+)	
16.0m : B = 5.6m (+)	
16.3m : B = 5.7m (+)	
16.6m : B = 5.8m (+)	
16.9m : B = 5.8m (+)	
17.2m : B = 5.9m (+)	
17.5m : B = 5.9m (+)	
17.8m : B = 6.0m (+)	
18.1m : B = 6.1m (+)	
18.4m : B = 6.4m (+)	

Minimum profile I

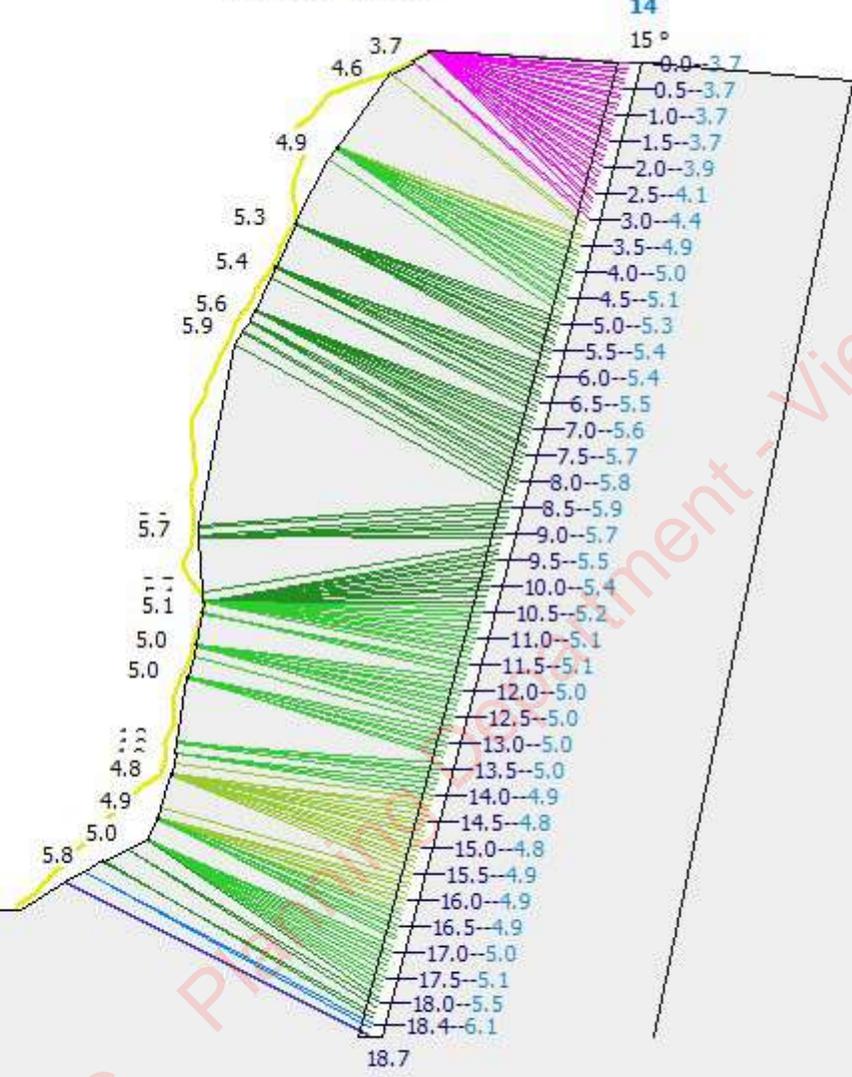


Hole 13	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.0m (-)	0.4 m : B = 3.9 m (-)
0.6m : B = 4.0m (-)	0.7 m : B = 4.1 m (-)
0.9m : B = 4.0m (-)	1.3 m : B = 4.5 m
1.2m : B = 4.0m (-)	1.8 m : B = 4.9 m
1.5m : B = 4.1m (-)	2.4 m : B = 5.6 m (+)
1.8m : B = 4.1m (-)	3.0 m : B = 6.2 m (+)
2.2m : B = 4.3m (-)	3.5 m : B = 6.6 m (+)
2.6m : B = 4.4m (-)	4.0 m : B = 6.6 m (+)
3.0m : B = 4.7m	4.3 m : B = 6.6 m (+)
3.4m : B = 5.2m	4.7 m : B = 6.4 m (+)
3.8m : B = 5.7m (+)	5.1 m : B = 6.4 m (+)
4.2m : B = 6.1m (+)	5.5 m : B = 6.4 m (+)
4.6m : B = 6.2m (+)	5.9 m : B = 6.4 m (+)
5.0m : B = 6.3m (+)	6.4 m : B = 6.3 m (+)
5.4m : B = 6.4m (+)	6.7 m : B = 6.3 m (+)
5.8m : B = 6.4m (+)	7.2 m : B = 6.3 m (+)
6.2m : B = 6.4m (+)	7.6 m : B = 6.3 m (+)
6.6m : B = 6.3m (+)	8.0 m : B = 6.3 m (+)
7.0m : B = 6.3m (+)	8.4 m : B = 6.3 m (+)
7.4m : B = 6.3m (+)	8.8 m : B = 6.4 m (+)
7.8m : B = 6.3m (+)	9.3 m : B = 6.4 m (+)
8.2m : B = 6.2m (+)	9.6 m : B = 6.3 m (+)
8.5m : B = 6.3m (+)	10.1 m : B = 6.3 m (+)
8.8m : B = 6.3m (+)	10.5 m : B = 6.3 m (+)
9.1m : B = 6.3m (+)	10.9 m : B = 6.2 m (+)
9.4m : B = 6.2m (+)	11.3 m : B = 6.2 m (+)
9.7m : B = 6.2m (+)	11.6 m : B = 6.1 m (+)
10.0m : B = 6.2m (+)	12.1 m : B = 6.0 m (+)
10.3m : B = 6.2m (+)	12.5 m : B = 6.0 m (+)
10.6m : B = 6.2m (+)	12.9 m : B = 6.1 m (+)
10.9m : B = 6.1m (+)	13.3 m : B = 6.0 m (+)
11.2m : B = 6.1m (+)	13.7 m : B = 5.9 m (+)
11.5m : B = 6.1m (+)	14.1 m : B = 5.9 m (+)
11.8m : B = 6.1m (+)	14.5 m : B = 5.9 m (+)
12.1m : B = 6.1m (+)	14.9 m : B = 5.9 m (+)
12.4m : B = 6.0m (+)	15.4 m : B = 6.0 m (+)
12.7m : B = 6.0m (+)	15.7 m : B = 5.9 m (+)
13.0m : B = 6.0m (+)	16.2 m : B = 5.9 m (+)
13.3m : B = 6.0m (+)	16.6 m : B = 5.9 m (+)
13.6m : B = 5.9m (+)	17.0 m : B = 6.0 m (+)
13.9m : B = 5.9m (+)	17.5 m : B = 6.3 m (+)
14.2m : B = 5.9m (+)	18.1 m : B = 6.9 m (+)
14.5m : B = 5.9m (+)	18.5 m : B = 7.8 m (+)
14.8m : B = 5.8m (+)	
15.1m : B = 5.8m (+)	
15.4m : B = 5.8m (+)	
15.7m : B = 5.7m (+)	
16.0m : B = 5.8m (+)	
16.3m : B = 5.8m (+)	
16.6m : B = 5.8m (+)	
16.9m : B = 5.9m (+)	
17.2m : B = 5.9m (+)	
17.5m : B = 5.9m (+)	
17.8m : B = 6.0m (+)	
18.1m : B = 6.0m (+)	
18.4m : B = 6.1m (+)	

Minimum profile I



Bench H = 15.9 m

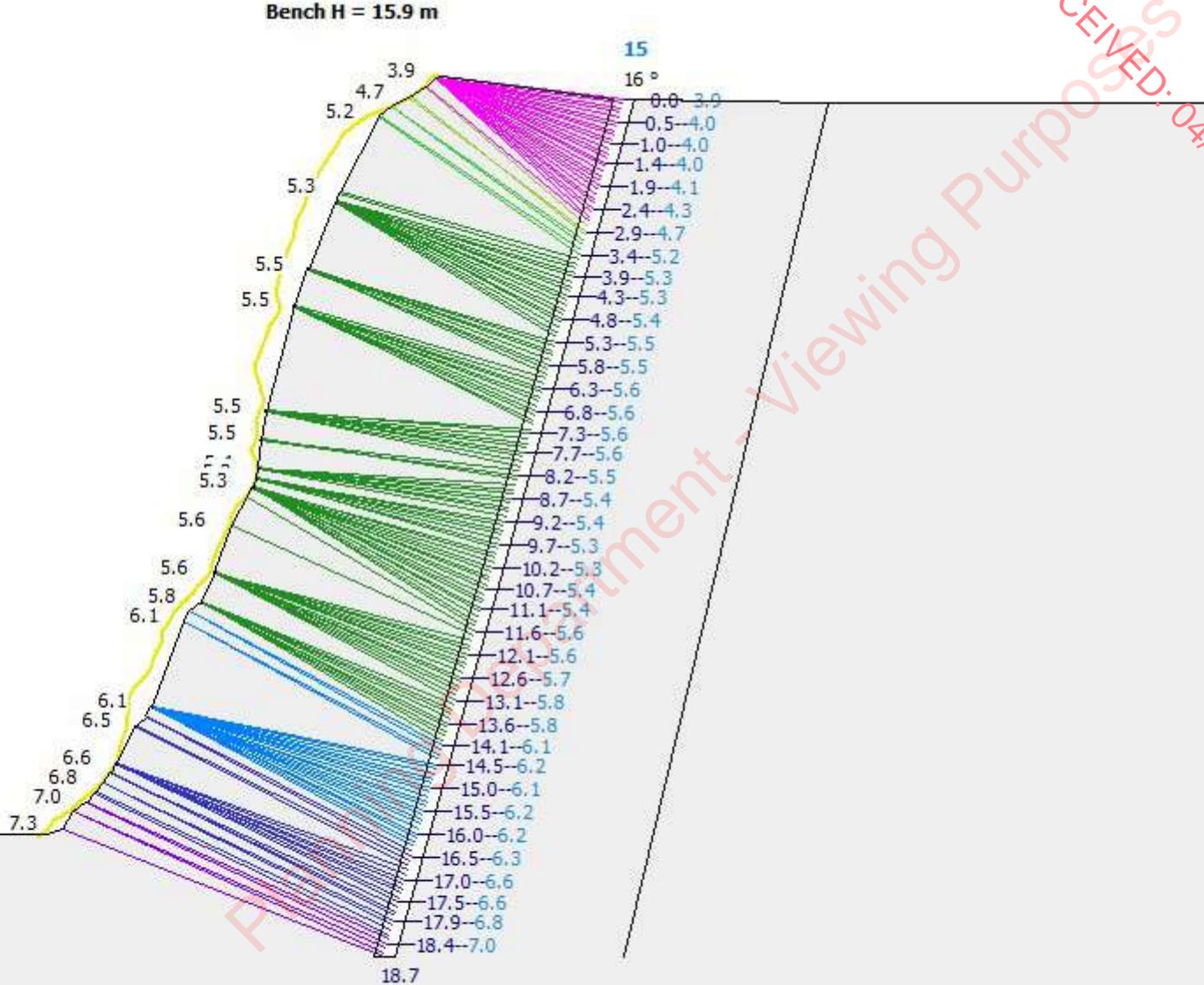
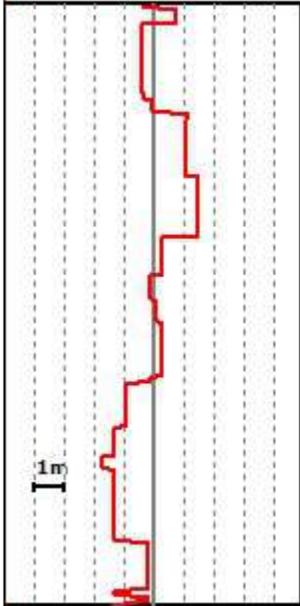


Hole 14	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.7m (-)	0.7 m : B = 3.6 m (-)
0.6m : B = 3.7m (-)	1.0 m : B = 3.9 m (-)
0.9m : B = 3.7m (-)	1.7 m : B = 4.7 m
1.2m : B = 3.7m (-)	2.2 m : B = 5.3 m
1.5m : B = 3.7m (-)	2.7 m : B = 5.6 m (+)
1.8m : B = 3.8m (+)	3.1 m : B = 5.4 m
2.2m : B = 3.9m (+)	3.5 m : B = 5.4 m
2.6m : B = 4.1m (-)	3.9 m : B = 5.4 m
3.0m : B = 4.4m (-)	4.3 m : B = 5.2 m
3.4m : B = 4.3m	4.7 m : B = 5.3 m
3.8m : B = 4.9m	5.2 m : B = 5.3 m
4.2m : B = 5.0m	5.6 m : B = 5.5 m
4.6m : B = 5.2m	6.0 m : B = 5.6 m (+)
5.0m : B = 5.3m	6.5 m : B = 5.8 m (+)
5.4m : B = 5.3m	6.9 m : B = 5.8 m (+)
5.8m : B = 5.4m	7.4 m : B = 5.9 m (+)
6.2m : B = 5.5m	7.8 m : B = 6.0 m (+)
6.6m : B = 5.5m (+)	8.2 m : B = 6.0 m (+)
7.0m : B = 5.6m (+)	8.7 m : B = 6.1 m (+)
7.4m : B = 5.7m (+)	9.0 m : B = 5.9 m (+)
7.8m : B = 5.8m (+)	9.4 m : B = 5.8 m (+)
8.2m : B = 5.9m (+)	9.8 m : B = 5.8 m (+)
8.5m : B = 5.9m (+)	10.2 m : B = 5.6 m (+)
8.8m : B = 5.8m (+)	10.5 m : B = 5.5 m (+)
9.1m : B = 5.7m (+)	11.0 m : B = 5.6 m (+)
9.4m : B = 5.6m (+)	11.4 m : B = 5.4 m
9.7m : B = 5.5m	11.7 m : B = 5.0 m
10.0m : B = 5.4m	12.1 m : B = 5.0 m
10.3m : B = 5.3m	12.5 m : B = 5.0 m
10.6m : B = 5.2m	12.9 m : B = 5.0 m
10.9m : B = 5.1m	13.4 m : B = 5.1 m
11.2m : B = 5.1m	13.7 m : B = 5.0 m
11.5m : B = 5.1m	14.1 m : B = 5.0 m
11.8m : B = 5.1m	14.6 m : B = 5.0 m
12.1m : B = 5.0m	14.9 m : B = 5.0 m
12.4m : B = 5.0m	15.5 m : B = 5.4 m
12.7m : B = 5.0m	16.0 m : B = 5.7 m (+)
13.0m : B = 5.0m	16.4 m : B = 5.9 m (+)
13.3m : B = 5.0m	16.9 m : B = 6.2 m (+)
13.6m : B = 5.0m	17.4 m : B = 6.5 m (+)
13.9m : B = 4.9m	17.9 m : B = 6.9 m (+)
14.2m : B = 4.9m	
14.5m : B = 4.8m	
14.8m : B = 4.8m	
15.1m : B = 4.8m	
15.4m : B = 4.9m	
15.7m : B = 4.9m	
16.0m : B = 4.9m	
16.3m : B = 4.9m	
16.6m : B = 4.9m	
16.9m : B = 5.0m	
17.2m : B = 5.1m	
17.5m : B = 5.1m	
17.8m : B = 5.2m	
18.1m : B = 5.5m	
18.4m : B = 6.1m (+)	
18.7m : B = 6.4m (+)	

<i>Author</i>		Comments: ->
<i>Date</i>	11/09/2024	

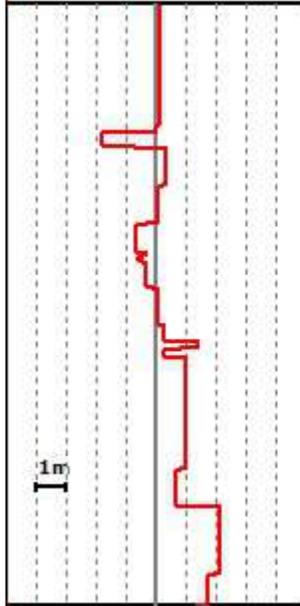


Minimum profile I

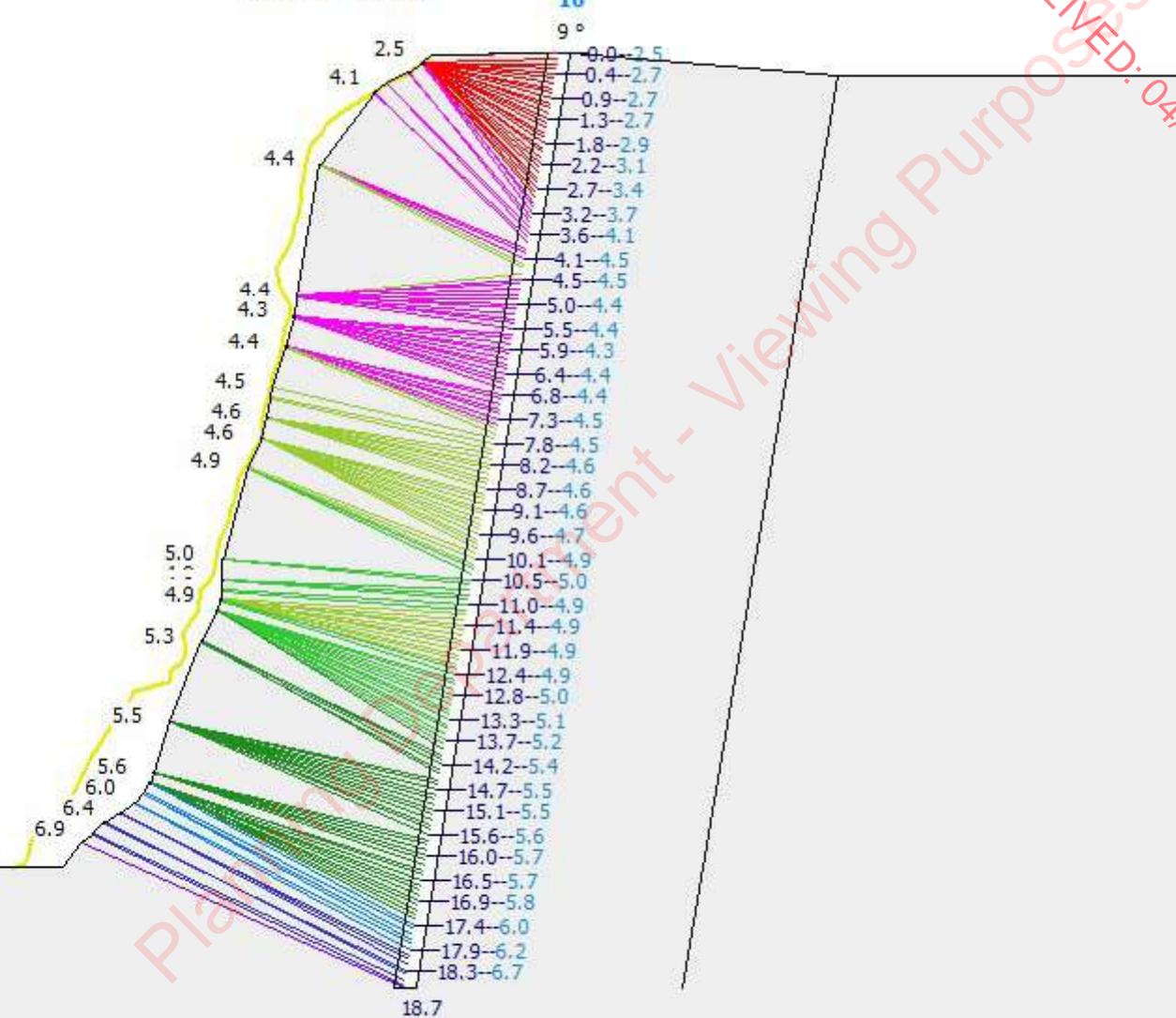


Hole 15	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 4.0m (-)	0.6 m : B = 3.9m (-)
0.6m : B = 4.0m (-)	0.9 m : B = 4.1m (-)
0.9m : B = 4.0m (-)	1.5 m : B = 4.6 m
1.2m : B = 4.0m (-)	2.1 m : B = 5.3 m
1.5m : B = 4.0m (-)	2.6 m : B = 5.5 m (+)
1.8m : B = 4.1m (+)	3.0 m : B = 5.7 m (+)
2.2m : B = 4.2m (+)	3.5 m : B = 5.8 m (+)
2.6m : B = 4.4m (-)	3.9 m : B = 5.8 m (+)
3.0m : B = 4.7m	4.3 m : B = 5.9 m (+)
3.4m : B = 5.2m	4.7 m : B = 5.9 m (+)
3.8m : B = 5.3m	5.2 m : B = 5.9 m (+)
4.2m : B = 5.3m	5.6 m : B = 5.9 m (+)
4.6m : B = 5.3m	6.0 m : B = 5.9 m (+)
5.0m : B = 5.4m	6.4 m : B = 5.8 m (+)
5.4m : B = 5.5m	6.8 m : B = 5.9 m (+)
5.8m : B = 5.5m (+)	7.2 m : B = 5.9 m (+)
6.2m : B = 5.5m (+)	7.6 m : B = 5.9 m (+)
6.6m : B = 5.6m (+)	8.0 m : B = 5.6 m (+)
7.0m : B = 5.6m (+)	8.4 m : B = 5.6 m (+)
7.4m : B = 5.6m (+)	8.8 m : B = 5.5 m
7.8m : B = 5.5m (+)	9.2 m : B = 5.5 m (+)
8.2m : B = 5.5m	9.6 m : B = 5.3 m
8.5m : B = 5.5m	9.9 m : B = 5.3 m
8.8m : B = 5.4m	10.4 m : B = 5.5 m
9.1m : B = 5.4m	10.9 m : B = 5.5 m (+)
9.4m : B = 5.3m	11.3 m : B = 5.6 m (+)
9.7m : B = 5.3m	11.7 m : B = 5.7 m (+)
10.0m : B = 5.3m	12.2 m : B = 5.8 m (+)
10.3m : B = 5.3m	12.7 m : B = 6.0 m (+)
10.6m : B = 5.4m	13.1 m : B = 6.2 m (+)
10.9m : B = 5.4m	13.5 m : B = 6.3 m (+)
11.2m : B = 5.5m	14.0 m : B = 6.3 m (+)
11.5m : B = 5.5m (+)	14.4 m : B = 6.4 m (+)
11.8m : B = 5.6m (+)	14.9 m : B = 6.6 m (+)
12.1m : B = 5.6m (+)	15.3 m : B = 6.5 m (+)
12.4m : B = 5.7m (+)	15.7 m : B = 6.5 m (+)
12.7m : B = 5.7m (+)	16.1 m : B = 6.5 m (+)
13.0m : B = 5.7m (+)	16.6 m : B = 6.6 m (+)
13.3m : B = 5.8m (+)	17.0 m : B = 6.8 m (+)
13.6m : B = 5.8m (+)	17.6 m : B = 7.2 m (+)
13.9m : B = 5.9m (+)	18.1 m : B = 7.5 m (+)
14.2m : B = 6.1m (+)	
14.5m : B = 6.2m (+)	
14.8m : B = 6.1m (+)	
15.1m : B = 6.1m (+)	
15.4m : B = 6.2m (+)	
15.7m : B = 6.2m (+)	
16.0m : B = 6.2m (+)	
16.3m : B = 6.3m (+)	
16.6m : B = 6.5m (+)	
16.9m : B = 6.6m (+)	
17.2m : B = 6.6m (+)	
17.5m : B = 6.6m (+)	
17.8m : B = 6.7m (+)	
18.1m : B = 6.9m (+)	
18.4m : B = 7.0m (+)	
18.7m : B = 7.3m (+)	

Minimum profile I



Bench H = 16.0 m

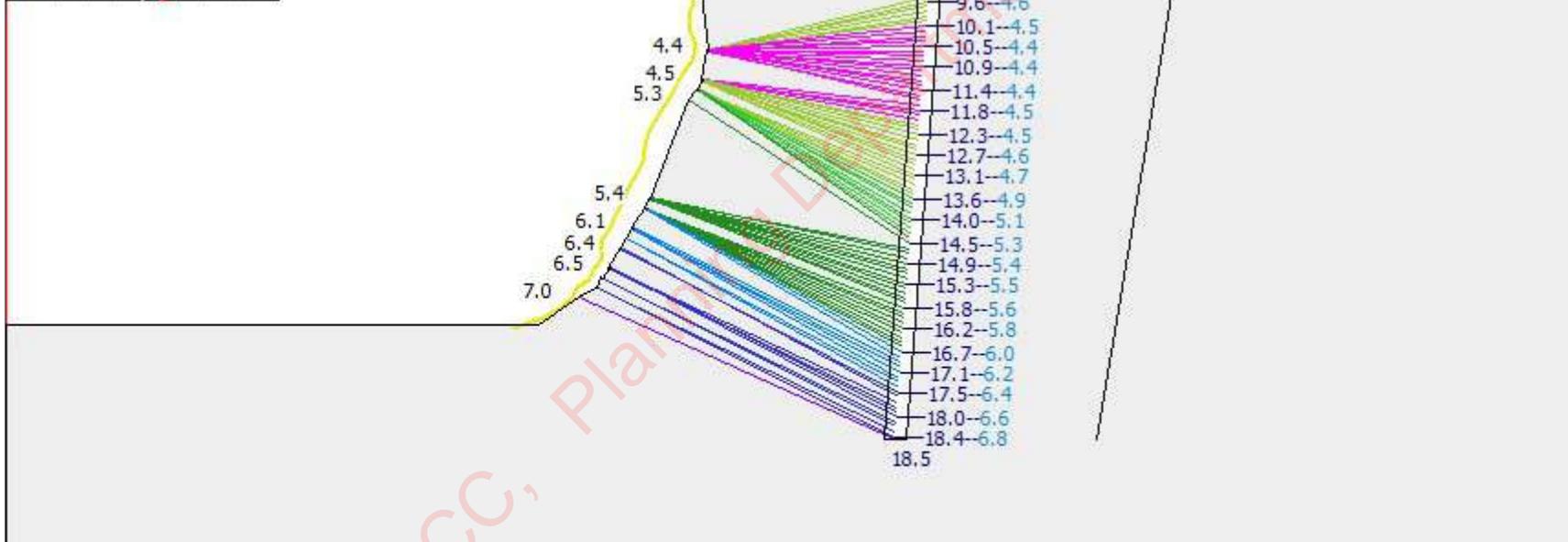
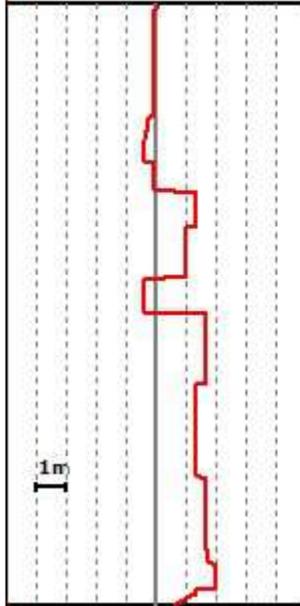


Hole 16	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.7m (-) !!!<	0.4 m : B = 2.4 m (-) !!! <
0.6m : B = 2.6m (-) !!!<	0.9 m : B = 2.8 m (-) !!! <
0.9m : B = 2.7m (-) !!!<	1.4 m : B = 3.4 m (-) !!! <
1.2m : B = 2.7m (-) !!!<	1.9 m : B = 4.0 m (-)
1.5m : B = 2.8m (-) !!!<	2.3 m : B = 4.4 m (-)
1.8m : B = 2.9m (-) !!!<	2.8 m : B = 4.5 m
2.2m : B = 3.1m (-) !!!<	3.2 m : B = 4.5 m
2.6m : B = 3.3m (-) !!!<	3.6 m : B = 4.5 m
3.0m : B = 3.5m (-)	4.0 m : B = 4.5 m
3.4m : B = 3.6m (-)	4.4 m : B = 4.6 m
3.8m : B = 3.7m (-)	4.8 m : B = 4.7 m
4.2m : B = 3.8m (-)	5.2 m : B = 4.7 m
4.6m : B = 3.9m (-)	5.6 m : B = 4.5 m
5.0m : B = 4.4m (-)	6.0 m : B = 4.3 m (-)
5.4m : B = 4.4m (-)	6.4 m : B = 4.4 m (-)
5.8m : B = 4.4m (-)	6.8 m : B = 4.4 m (-)
6.2m : B = 4.4m (-)	7.2 m : B = 4.5 m (-)
6.6m : B = 4.4m (-)	7.6 m : B = 4.5 m
7.0m : B = 4.4m (-)	8.0 m : B = 4.5 m
7.4m : B = 4.5m (-)	8.4 m : B = 4.5 m
7.8m : B = 4.5m	8.9 m : B = 4.7 m
8.2m : B = 4.6m	9.3 m : B = 4.8 m
8.5m : B = 4.6m	9.7 m : B = 4.9 m
8.8m : B = 4.6m	10.1 m : B = 4.9 m
9.1m : B = 4.6m	10.5 m : B = 5.0 m
9.4m : B = 4.7m	10.9 m : B = 5.0 m
9.7m : B = 4.8m	11.3 m : B = 5.1 m
10.0m : B = 4.9m	11.8 m : B = 5.2 m
10.3m : B = 4.9m	12.2 m : B = 5.3 m
10.6m : B = 5.0m	12.6 m : B = 5.4 m
10.9m : B = 4.9m	13.0 m : B = 5.4 m
11.2m : B = 4.9m	13.5 m : B = 5.5 m (+)
11.5m : B = 4.9m	14.0 m : B = 6.3 m (+)
11.8m : B = 4.9m	14.4 m : B = 6.5 m (+)
12.1m : B = 4.9m	14.8 m : B = 6.7 m (+)
12.4m : B = 4.9m	15.3 m : B = 6.9 m (+)
12.7m : B = 5.0m	15.7 m : B = 7.0 m (+)
13.0m : B = 5.0m	16.2 m : B = 7.1 m (+)
13.3m : B = 5.1m	16.6 m : B = 7.2 m (+)
13.6m : B = 5.2m	17.1 m : B = 7.7 m (+)
13.9m : B = 5.3m	17.5 m : B = 7.8 m (+)
14.2m : B = 5.4m	
14.5m : B = 5.5m	
14.8m : B = 5.5m	
15.1m : B = 5.5m (+)	
15.4m : B = 5.6m (+)	
15.7m : B = 5.6m (+)	
16.0m : B = 5.7m (+)	
16.3m : B = 5.7m (+)	
16.6m : B = 5.8m (+)	
16.9m : B = 5.8m (+)	
17.2m : B = 5.9m (+)	
17.5m : B = 6.0m (+)	
17.8m : B = 6.2m (+)	
18.1m : B = 6.4m (+)	
18.4m : B = 6.7m (+)	
18.7m : B = 7.0m (+)	

<i>Author</i>		<i>Comments:</i> ->
<i>Date</i>	11/09/2024	

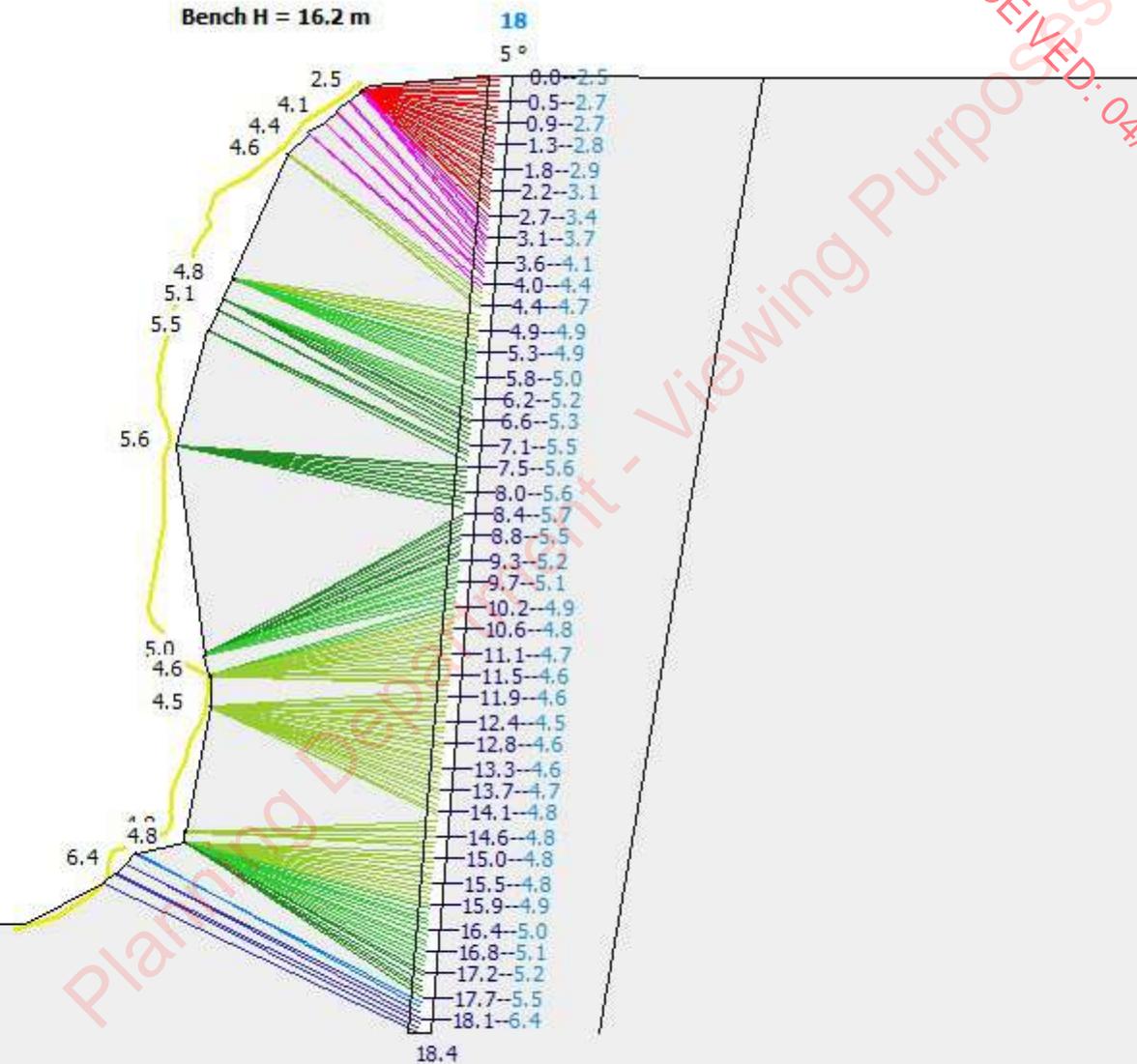
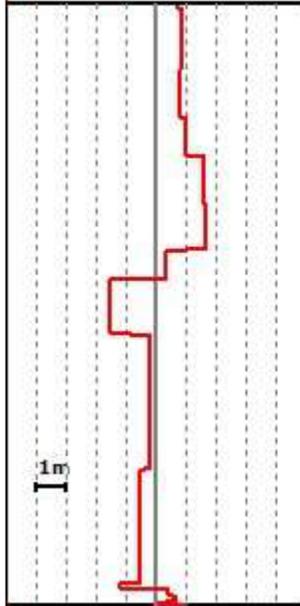


Minimum profile I



Hole 17	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.2m (-) !!!<<	0.0 m : B = 2.0 m (-) !!! <
0.6m : B = 2.2m (-) !!!<<	0.4 m : B = 2.3 m (-) !!! <
0.9m : B = 2.3m (-) !!!<<	0.8 m : B = 2.9 m (-) !!! <
1.2m : B = 2.4m (-) !!!<<	1.3 m : B = 3.3 m (-) !!! <
1.5m : B = 2.6m (-) !!!<<	1.7 m : B = 3.5 m (-) <
1.8m : B = 2.7m (-) !!!<<	2.1 m : B = 4.0 m (-) <
2.2m : B = 3.0m (-) !!!<<	2.5 m : B = 4.4 m (-) <
2.6m : B = 3.3m (-) !!!<<	2.9 m : B = 4.5 m <
3.0m : B = 3.6m (-) <	3.3 m : B = 4.6 m <
3.4m : B = 3.9m (-) <	3.8 m : B = 4.8 m <
3.8m : B = 4.2m (-) <	4.2 m : B = 5.0 m <
4.2m : B = 4.4m (-) <	4.6 m : B = 5.3 m <
4.6m : B = 4.7m <	5.0 m : B = 5.4 m <
5.0m : B = 4.9m <	5.4 m : B = 5.5 m <
5.4m : B = 5.0m <	5.8 m : B = 5.5 m (+) <
5.8m : B = 5.1m <	6.3 m : B = 5.7 m (+) <
6.2m : B = 5.0m <	6.6 m : B = 5.6 m (+) <
6.6m : B = 5.0m <	7.0 m : B = 5.4 m <
7.0m : B = 4.9m <	7.4 m : B = 5.2 m <
7.4m : B = 4.8m <	7.8 m : B = 5.3 m <
7.8m : B = 4.8m <	8.2 m : B = 5.2 m <
8.2m : B = 4.8m <	8.6 m : B = 4.9 m <
8.5m : B = 4.8m <	9.0 m : B = 4.9 m <
8.8m : B = 4.7m <	9.3 m : B = 4.8 m <
9.1m : B = 4.7m <	9.8 m : B = 4.7 m <
9.4m : B = 4.7m <	10.2 m : B = 4.7 m <
9.7m : B = 4.6m <	10.5 m : B = 4.7 m <
10.0m : B = 4.5m <	11.0 m : B = 4.6 m <
10.3m : B = 4.5m (-) <	11.4 m : B = 4.8 m <
10.6m : B = 4.4m (-) <	11.8 m : B = 4.9 m <
10.9m : B = 4.4m (-) <	12.2 m : B = 5.2 m <
11.2m : B = 4.4m (-) <	12.6 m : B = 5.4 m <
11.5m : B = 4.5m (-) <	13.0 m : B = 5.5 m <
11.8m : B = 4.5m (-) <	13.4 m : B = 5.5 m (+) <
12.1m : B = 4.5m <	13.8 m : B = 5.7 m (+) <
12.4m : B = 4.6m <	14.2 m : B = 5.9 m (+) <
12.7m : B = 4.6m <	14.7 m : B = 6.0 m (+) <
13.0m : B = 4.7m <	15.1 m : B = 6.2 m (+) <
13.3m : B = 4.8m <	15.5 m : B = 6.3 m (+) <
13.6m : B = 4.9m <	15.9 m : B = 6.6 m (+) <
13.9m : B = 5.0m <	16.3 m : B = 6.9 m (+) <
14.2m : B = 5.2m <	16.8 m : B = 7.8 m (+) <
14.5m : B = 5.3m <	
14.8m : B = 5.4m <	
15.1m : B = 5.5m <	
15.4m : B = 5.5m (+) <	
15.7m : B = 5.6m (+) <	
16.0m : B = 5.7m (+) <	
16.3m : B = 5.8m (+) <	
16.6m : B = 5.9m (+) <	
16.9m : B = 6.1m (+) <	
17.2m : B = 6.2m (+) <	
17.5m : B = 6.4m (+) <	
17.8m : B = 6.5m (+) <	
18.1m : B = 6.6m (+) <	
18.4m : B = 6.8m (+) <	

Minimum profile I

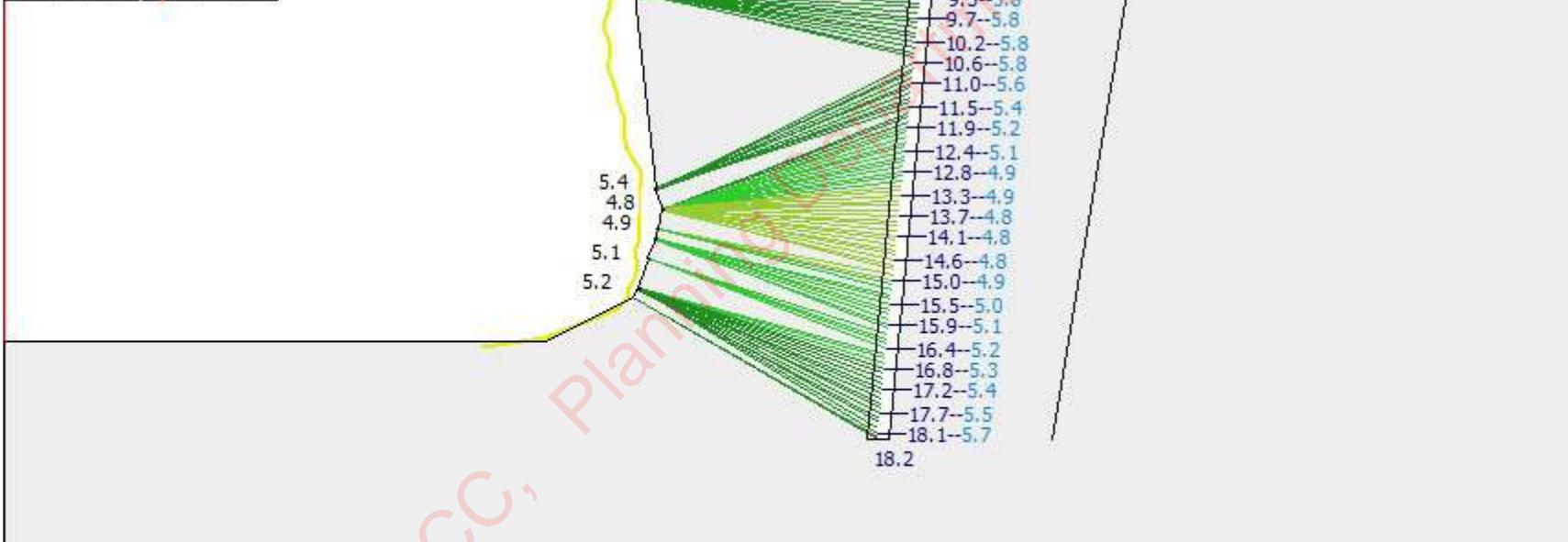
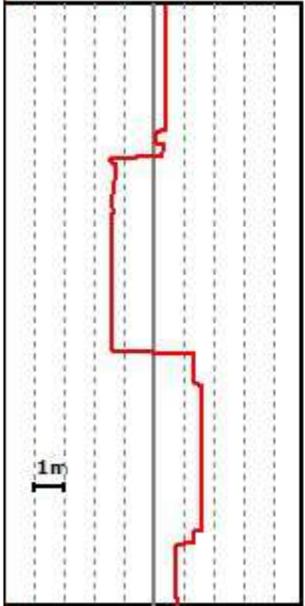


Hole 18	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.7m (-) !!!<	0.3 m : B = 2.6 m (-) !!! <
0.6m : B = 2.7m (-) !!!<	0.8 m : B = 3.1 m (-) !!! <
0.9m : B = 2.7m (-) !!!<	1.2 m : B = 3.7 m (-)
1.2m : B = 2.7m (-) !!!<	1.7 m : B = 3.9 m (-)
1.5m : B = 2.8m (-) !!!<	2.1 m : B = 4.4 m (-)
1.8m : B = 2.9m (-) !!!<	2.5 m : B = 4.9 m
2.2m : B = 3.1m (-) !!!<	3.0 m : B = 5.3 m
2.6m : B = 3.4m (-) !!!<	3.4 m : B = 5.2 m
3.0m : B = 3.6m (-)	3.8 m : B = 5.5 m (+)
3.4m : B = 3.9m (-)	4.2 m : B = 5.6 m (+)
3.8m : B = 4.2m (+)	4.6 m : B = 5.7 m (+)
4.2m : B = 4.6m (+)	5.0 m : B = 5.8 m (+)
4.6m : B = 4.8m	5.4 m : B = 5.9 m (+)
5.0m : B = 4.9m	5.8 m : B = 6.0 m (+)
5.4m : B = 4.9m	6.2 m : B = 6.0 m (+)
5.8m : B = 5.1m	6.6 m : B = 5.9 m (+)
6.2m : B = 5.2m	7.0 m : B = 5.9 m (+)
6.6m : B = 5.3m	7.4 m : B = 5.7 m (+)
7.0m : B = 5.5m	7.8 m : B = 5.8 m (+)
7.4m : B = 5.6m (+)	8.2 m : B = 5.8 m (+)
7.8m : B = 5.6m (+)	8.6 m : B = 5.7 m (+)
8.2m : B = 5.7m (+)	9.0 m : B = 5.7 m (+)
8.5m : B = 5.6m (+)	9.4 m : B = 5.7 m (+)
8.8m : B = 5.5m	9.8 m : B = 5.8 m (+)
9.1m : B = 5.3m	10.2 m : B = 5.8 m (+)
9.4m : B = 5.2m	10.6 m : B = 5.8 m (+)
9.7m : B = 5.1m	11.0 m : B = 5.7 m (+)
10.0m : B = 5.0m	11.4 m : B = 5.4 m
10.3m : B = 4.9m	11.7 m : B = 5.0 m
10.6m : B = 4.8m	12.1 m : B = 4.5 m
10.9m : B = 4.7m	12.5 m : B = 4.6 m
11.2m : B = 4.7m	12.9 m : B = 4.7 m
11.5m : B = 4.6m	13.3 m : B = 4.8 m
11.8m : B = 4.6m	13.7 m : B = 4.9 m
12.1m : B = 4.6m	14.2 m : B = 5.1 m
12.4m : B = 4.5m	14.6 m : B = 5.1 m
12.7m : B = 4.5m	14.9 m : B = 5.1 m
13.0m : B = 4.6m	15.4 m : B = 6.1 m (+)
13.3m : B = 4.6m	15.8 m : B = 6.2 m (+)
13.6m : B = 4.7m	16.3 m : B = 6.5 m (+)
13.9m : B = 4.8m	16.7 m : B = 7.1 m (+)
14.2m : B = 4.9m	17.1 m : B = 7.9 m (+)
14.5m : B = 4.8m	
14.8m : B = 4.8m	
15.1m : B = 4.8m	
15.4m : B = 4.8m	
15.7m : B = 4.9m	
16.0m : B = 4.9m	
16.3m : B = 5.0m	
16.6m : B = 5.0m	
16.9m : B = 5.1m	
17.2m : B = 5.3m	
17.5m : B = 5.4m	
17.8m : B = 6.2m (+)	
18.1m : B = 6.4m (+)	
18.4m : B = 6.7m (+)	

Author		Comments:	
Date	11/09/2024	->	

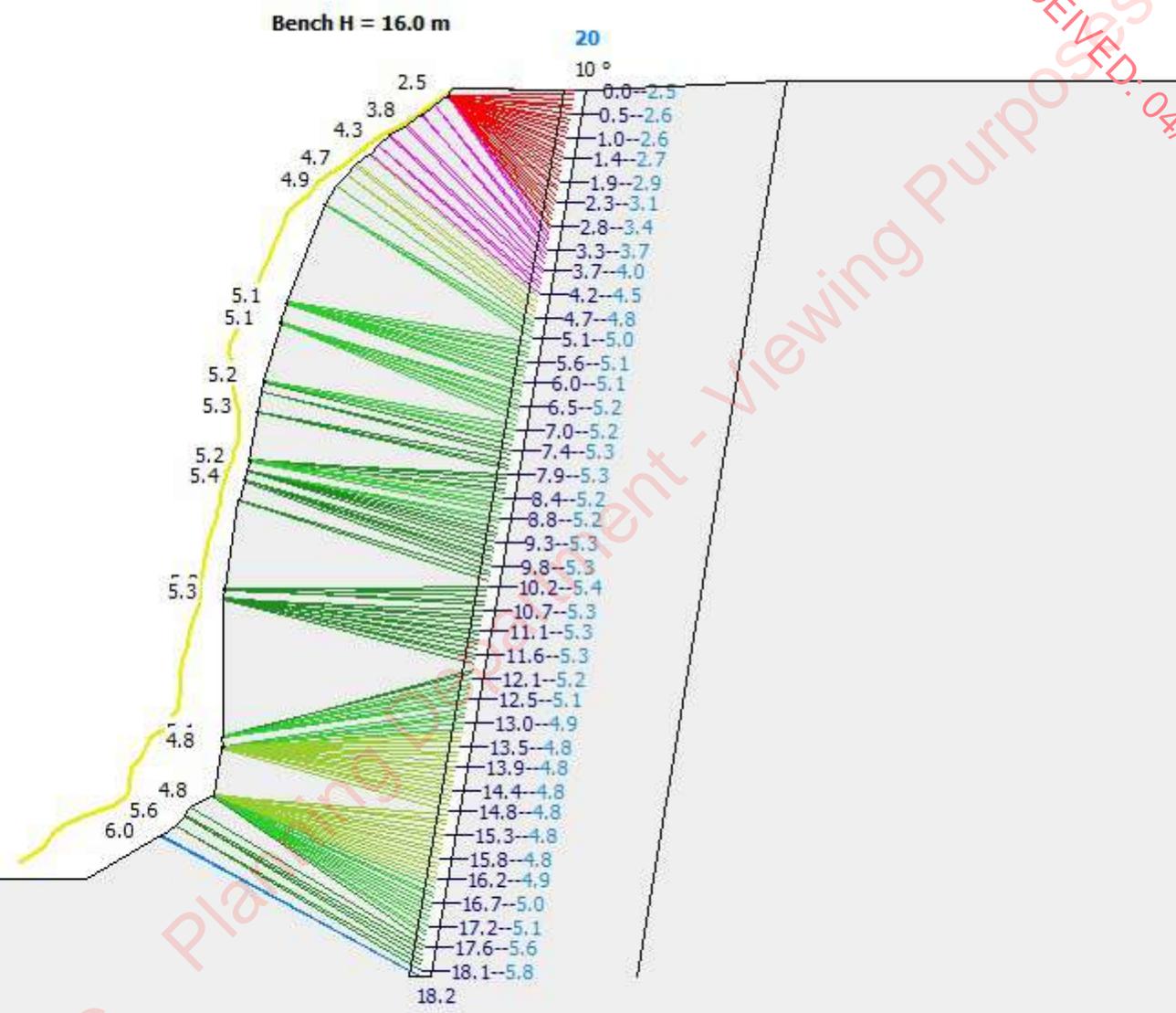
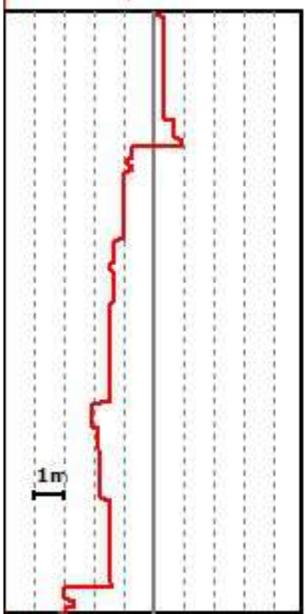


Minimum profile I



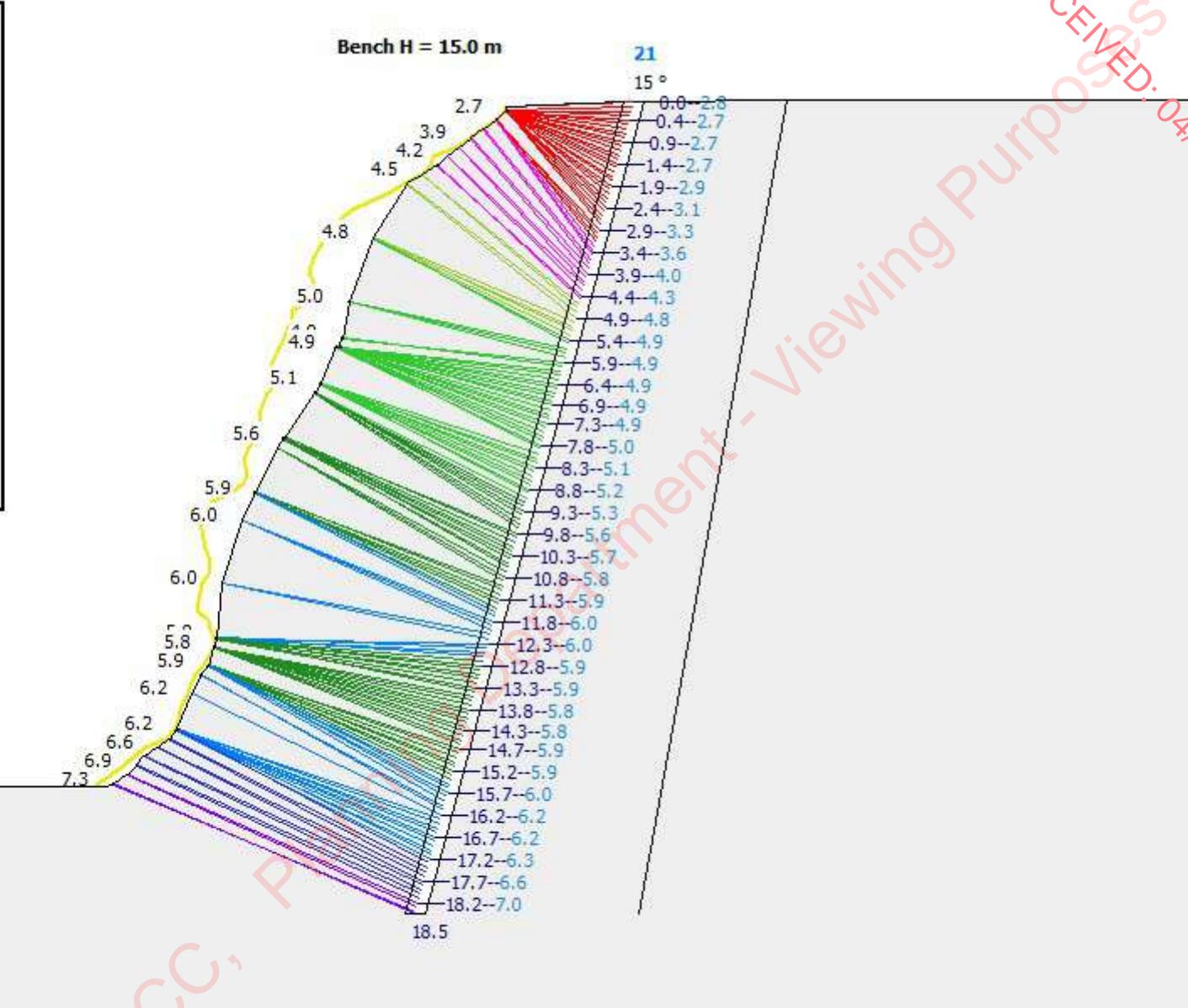
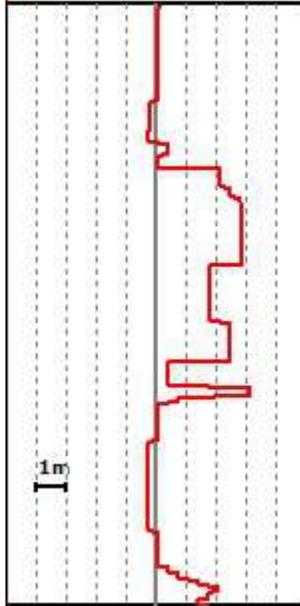
Hole 19	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.7m (-) !!!<<	0.3 m : B = 2.7 m (-) !!! <
0.6m : B = 2.8m (-) !!!<<	0.6 m : B = 3.0 m (-) !!! <
0.9m : B = 2.8m (-) !!!<<	1.0 m : B = 3.3 m (-) !!! <
1.2m : B = 2.9m (-) !!!<<	1.5 m : B = 3.7 m (-)
1.5m : B = 3.0m (-) !!!<<	1.9 m : B = 4.2 m (-)
1.8m : B = 3.1m (-) !!!<<	2.4 m : B = 4.6 m
2.2m : B = 3.3m (-) !!!<<	2.8 m : B = 4.9 m
2.6m : B = 3.5m (-)	3.2 m : B = 5.1 m
3.0m : B = 3.8m (-)	3.7 m : B = 5.2 m
3.4m : B = 4.1m (-)	4.1 m : B = 5.4 m
3.8m : B = 4.4m (+)	4.5 m : B = 5.4 m
4.2m : B = 4.8m (+)	4.9 m : B = 5.6 m (+)
4.6m : B = 5.1m	5.3 m : B = 5.8 m (+)
5.0m : B = 5.2m	5.7 m : B = 5.8 m (+)
5.4m : B = 5.3m	6.1 m : B = 6.1 m (+)
5.8m : B = 5.5m	6.5 m : B = 5.8 m (+)
6.2m : B = 5.6m (+)	6.9 m : B = 5.9 m (+)
6.6m : B = 5.6m (+)	7.4 m : B = 6.0 m (+)
7.0m : B = 5.6m (+)	7.7 m : B = 6.0 m (+)
7.4m : B = 5.6m (+)	8.1 m : B = 6.0 m (+)
7.8m : B = 5.6m (+)	8.5 m : B = 5.9 m (+)
8.2m : B = 5.6m (+)	8.9 m : B = 6.0 m (+)
8.5m : B = 5.7m (+)	9.3 m : B = 6.1 m (+)
8.8m : B = 5.7m (+)	9.7 m : B = 6.2 m (+)
9.1m : B = 5.8m (+)	10.2 m : B = 6.2 m (+)
9.4m : B = 5.8m (+)	10.6 m : B = 6.2 m (+)
9.7m : B = 5.8m (+)	10.9 m : B = 6.1 m (+)
10.0m : B = 5.8m (+)	11.4 m : B = 6.1 m (+)
10.3m : B = 5.8m (+)	11.7 m : B = 5.9 m (+)
10.6m : B = 5.8m (+)	12.1 m : B = 5.7 m (+)
10.9m : B = 5.7m (+)	12.5 m : B = 5.6 m (+)
11.2m : B = 5.5m (+)	12.9 m : B = 5.6 m (+)
11.5m : B = 5.4m	13.3 m : B = 5.3 m
11.8m : B = 5.3m	13.7 m : B = 5.2 m
12.1m : B = 5.2m	14.1 m : B = 5.2 m
12.4m : B = 5.1m	14.5 m : B = 5.1 m
12.7m : B = 5.0m	14.9 m : B = 5.2 m
13.0m : B = 4.9m	15.3 m : B = 5.1 m
13.3m : B = 4.8m	15.7 m : B = 5.3 m
13.6m : B = 4.8m	16.1 m : B = 5.4 m
13.9m : B = 4.8m	16.6 m : B = 6.4 m (+)
14.2m : B = 4.8m	17.1 m : B = 8.1 m (+)
14.5m : B = 4.8m	
14.8m : B = 4.9m	
15.1m : B = 4.9m	
15.4m : B = 4.9m	
15.7m : B = 5.0m	
16.0m : B = 5.1m	
16.3m : B = 5.2m	
16.6m : B = 5.2m	
16.9m : B = 5.3m	
17.2m : B = 5.4m	
17.5m : B = 5.4m	
17.8m : B = 5.6m (+)	
18.1m : B = 5.7m (+)	

Minimum profile !



Hole 20	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.6m (-) !!!<	0.4 m : B = 2.4 m (-) !!! <
0.6m : B = 2.6m (-) !!!<	0.8 m : B = 2.8 m (-) !!! <
0.9m : B = 2.6m (-) !!!<	1.3 m : B = 3.3 m (-) !!! <
1.2m : B = 2.6m (-) !!!<	1.8 m : B = 3.9 m (-)
1.5m : B = 2.7m (-) !!!<	2.3 m : B = 4.3 m (-)
1.8m : B = 2.8m (-) !!!<	2.8 m : B = 4.8 m
2.2m : B = 3.0m (-) !!!<	3.3 m : B = 5.1 m
2.6m : B = 3.3m (-) !!!<	3.7 m : B = 5.3 m
3.0m : B = 3.5m (-)	4.1 m : B = 5.4 m
3.4m : B = 3.6m (-)	4.5 m : B = 5.5 m (+)
3.8m : B = 3.7m (-)	5.0 m : B = 5.7 m (+)
4.2m : B = 4.5m (-)	5.4 m : B = 5.8 m (+)
4.6m : B = 4.8m	5.8 m : B = 5.9 m (+)
5.0m : B = 5.0m	6.2 m : B = 6.0 m (+)
5.4m : B = 5.1m	6.6 m : B = 5.9 m (+)
5.8m : B = 5.1m	7.0 m : B = 5.8 m (+)
6.2m : B = 5.1m	7.4 m : B = 5.6 m (+)
6.6m : B = 5.2m	7.8 m : B = 5.5 m (+)
7.0m : B = 5.2m	8.2 m : B = 5.5 m
7.4m : B = 5.3m	8.6 m : B = 5.5 m (+)
7.8m : B = 5.3m	9.0 m : B = 5.6 m (+)
8.2m : B = 5.3m	9.4 m : B = 5.6 m (+)
8.5m : B = 5.2m	9.8 m : B = 5.6 m (+)
8.8m : B = 5.2m	10.2 m : B = 5.7 m (+)
9.1m : B = 5.3m	10.7 m : B = 5.7 m (+)
9.4m : B = 5.3m	11.1 m : B = 5.7 m (+)
9.7m : B = 5.3m	11.5 m : B = 5.7 m (+)
10.0m : B = 5.4m	11.9 m : B = 5.7 m (+)
10.3m : B = 5.4m	12.3 m : B = 5.8 m (+)
10.6m : B = 5.3m	12.7 m : B = 5.8 m (+)
10.9m : B = 5.3m	13.1 m : B = 5.8 m (+)
11.2m : B = 5.3m	13.5 m : B = 5.7 m (+)
11.5m : B = 5.3m	13.9 m : B = 5.8 m (+)
11.8m : B = 5.3m	14.4 m : B = 6.2 m (+)
12.1m : B = 5.2m	14.8 m : B = 6.3 m (+)
12.4m : B = 5.1m	15.3 m : B = 6.5 m (+)
12.7m : B = 5.0m	15.6 m : B = 6.5 m (+)
13.0m : B = 4.9m	16.2 m : B = 7.3 m (+)
13.3m : B = 4.9m	16.7 m : B = 7.8 m (+)
13.6m : B = 4.8m	17.2 m : B = 8.1 m (+)
13.9m : B = 4.8m	
14.2m : B = 4.8m	
14.5m : B = 4.8m	
14.8m : B = 4.8m	
15.1m : B = 4.8m	
15.4m : B = 4.8m	
15.7m : B = 4.8m	
16.0m : B = 4.8m	
16.3m : B = 4.9m	
16.6m : B = 5.0m	
16.9m : B = 5.0m	
17.2m : B = 5.1m	
17.5m : B = 5.3m	
17.8m : B = 5.6m (+)	
18.1m : B = 5.8m (+)	

Minimum profile I

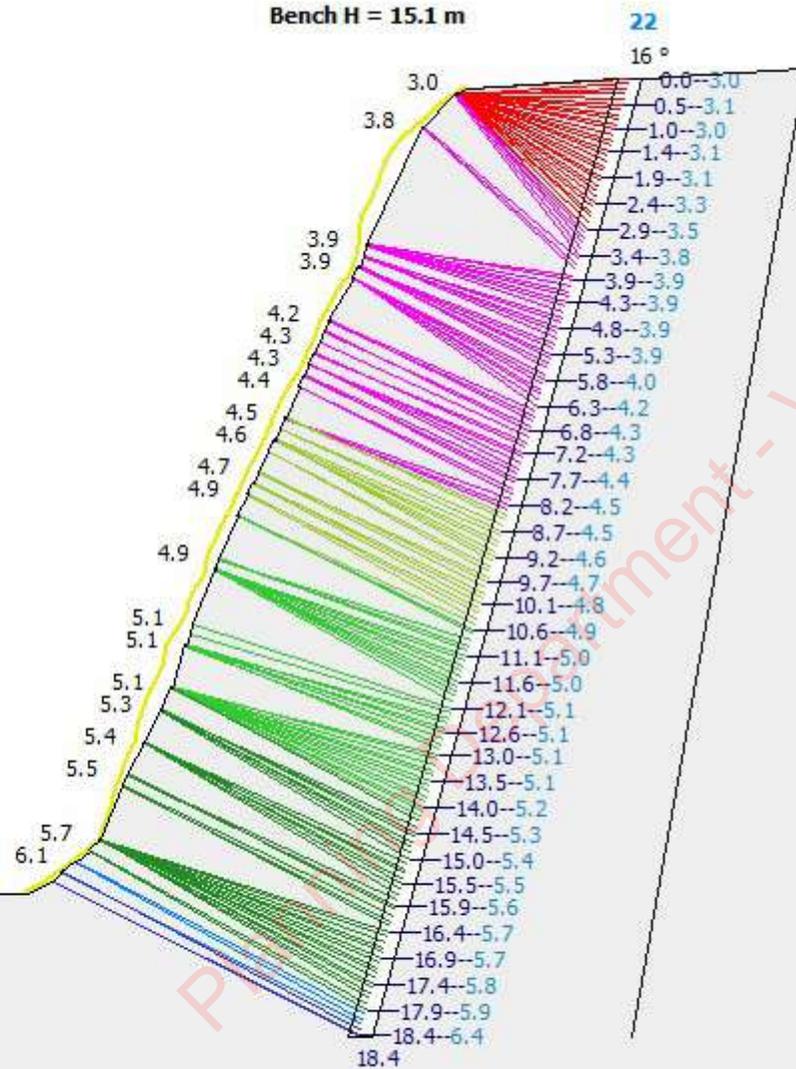
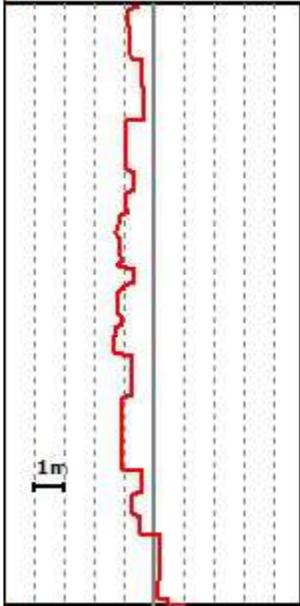


Hole 21	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 2.8m (-) !!!<	0.8 m : B = 2.6 m (-) !!! <
0.6m : B = 2.7m (-) !!!<	1.2 m : B = 2.8 m (-) !!! <
0.9m : B = 2.7m (-) !!!<	1.7 m : B = 3.3 m (-) !!! <
1.2m : B = 2.7m (-) !!!<	2.3 m : B = 3.9 m (-)
1.5m : B = 2.7m (-) !!!<	2.8 m : B = 4.1 m (-)
1.8m : B = 2.8m (-) !!!<	3.3 m : B = 4.7 m
2.2m : B = 3.0m (-) !!!<	3.9 m : B = 5.4 m
2.6m : B = 3.2m (-) !!!<	4.5 m : B = 5.7 m (+)
3.0m : B = 3.4m (-) !!!<	4.9 m : B = 5.8 m (+)
3.4m : B = 3.6m (-)	5.3 m : B = 5.9 m (+)
3.8m : B = 3.9m (-)	5.7 m : B = 5.7 m (+)
4.2m : B = 4.2m (-)	6.1 m : B = 5.8 m (+)
4.6m : B = 4.5m	6.6 m : B = 6.0 m (+)
5.0m : B = 4.8m	7.0 m : B = 6.1 m (+)
5.4m : B = 4.9m	7.5 m : B = 6.1 m (+)
5.8m : B = 5.0m	7.8 m : B = 6.1 m (+)
6.2m : B = 4.9m	8.3 m : B = 6.1 m (+)
6.6m : B = 4.9m	8.7 m : B = 6.1 m (+)
7.0m : B = 4.9m	9.1 m : B = 6.0 m (+)
7.4m : B = 5.0m	9.5 m : B = 6.2 m (+)
7.8m : B = 5.0m	9.9 m : B = 6.1 m (+)
8.2m : B = 5.1m	10.3 m : B = 6.1 m (+)
8.5m : B = 5.1m	10.9 m : B = 6.6 m (+)
8.8m : B = 5.2m	11.4 m : B = 6.7 m (+)
9.1m : B = 5.3m	11.7 m : B = 6.6 m (+)
9.4m : B = 5.3m	12.1 m : B = 6.4 m (+)
9.7m : B = 5.4m	12.5 m : B = 6.3 m (+)
10.0m : B = 5.6m (+)	12.9 m : B = 6.4 m (+)
10.3m : B = 5.7m (+)	13.3 m : B = 6.3 m (+)
10.6m : B = 5.7m (+)	13.6 m : B = 5.9 m (+)
10.9m : B = 5.8m (+)	14.0 m : B = 5.8 m (+)
11.2m : B = 5.9m (+)	14.4 m : B = 5.9 m (+)
11.5m : B = 5.9m (+)	14.9 m : B = 6.0 m (+)
11.8m : B = 6.0m (+)	15.3 m : B = 6.1 m (+)
12.1m : B = 6.0m (+)	15.7 m : B = 6.1 m (+)
12.4m : B = 6.0m (+)	16.2 m : B = 6.3 m (+)
12.7m : B = 5.9m (+)	16.7 m : B = 6.8 m (+)
13.0m : B = 5.9m (+)	17.2 m : B = 7.2 m (+)
13.3m : B = 5.9m (+)	17.6 m : B = 7.5 m (+)
13.6m : B = 5.8m (+)	
13.9m : B = 5.8m (+)	
14.2m : B = 5.8m (+)	
14.5m : B = 5.8m (+)	
14.8m : B = 5.9m (+)	
15.1m : B = 5.9m (+)	
15.4m : B = 5.9m (+)	
15.7m : B = 6.0m (+)	
16.0m : B = 6.1m (+)	
16.3m : B = 6.2m (+)	
16.6m : B = 6.2m (+)	
16.9m : B = 6.2m (+)	
17.2m : B = 6.3m (+)	
17.5m : B = 6.4m (+)	
17.8m : B = 6.8m (+)	
18.1m : B = 6.9m (+)	
18.4m : B = 7.3m (+)	

Blast plan	2024-17.ext		
Site	Platin	Hole	22

Drill plan

Minimum profile I

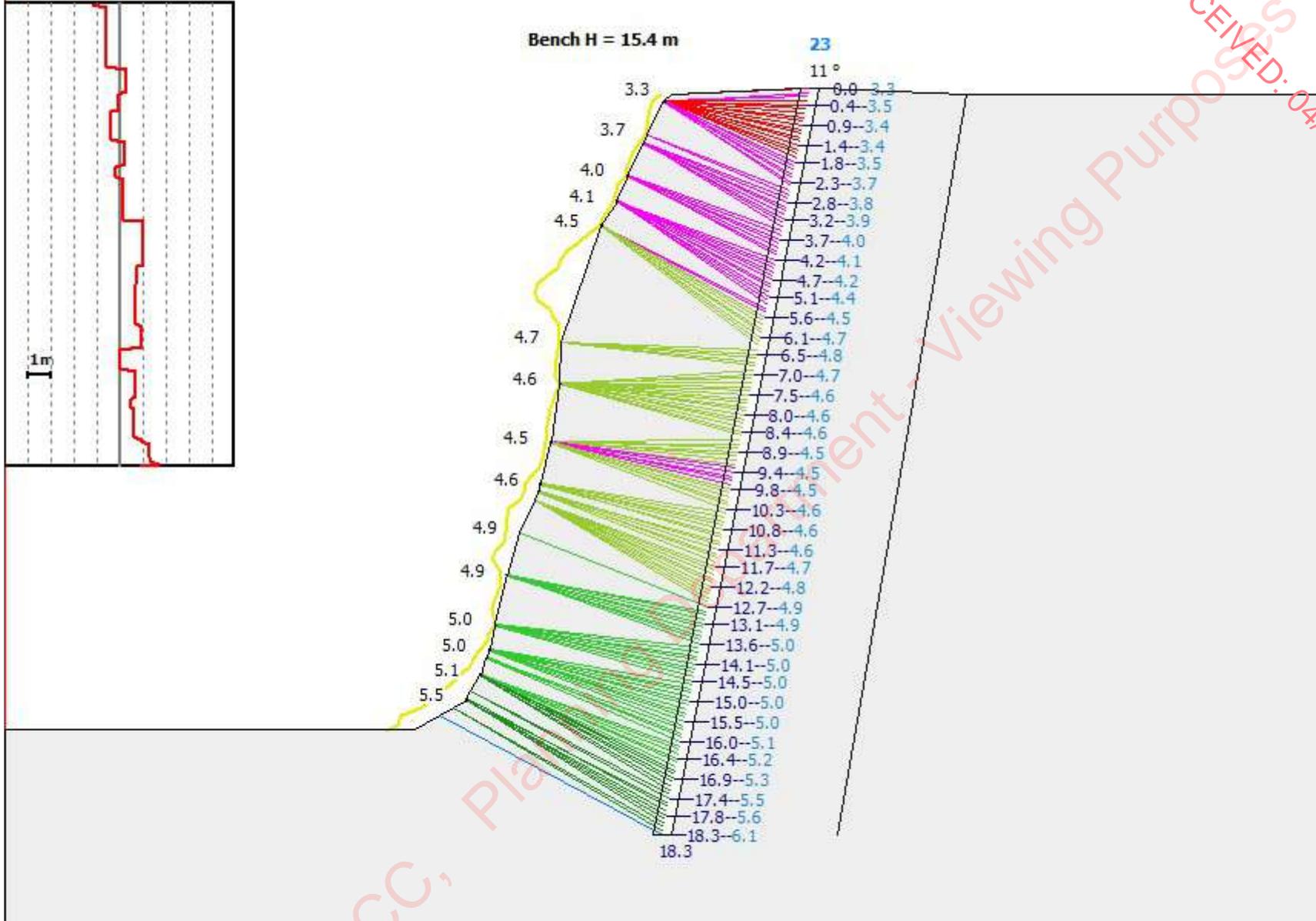
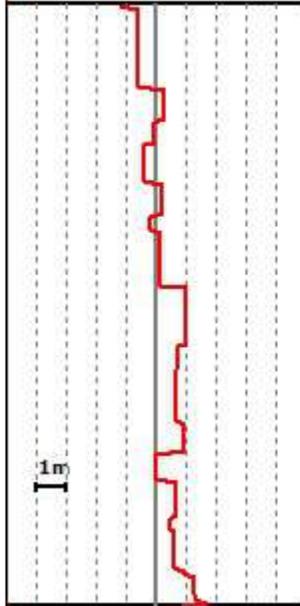


Hole 22	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.2m (-) !!!<<	0.9 m : B = 2.8 m (-) !!! <
0.6m : B = 3.1m (-) !!!<<	1.4 m : B = 3.3 m (-) !!! <
0.9m : B = 3.1m (-) !!!<<	1.9 m : B = 3.6 m (-)
1.2m : B = 3.0m (-) !!!<<	2.5 m : B = 3.8 m (-)
1.5m : B = 3.1m (-) !!!<<	2.9 m : B = 3.9 m (-)
1.8m : B = 3.1m (-) !!!<<	3.3 m : B = 4.0 m (-)
2.2m : B = 3.2m (-) !!!<<	3.8 m : B = 4.0 m (-)
2.6m : B = 3.4m (-) !!!<<	4.2 m : B = 4.0 m (-)
3.0m : B = 3.5m (-)	4.5 m : B = 4.0 m (-)
3.4m : B = 3.6m (-)	5.0 m : B = 4.0 m (-)
3.8m : B = 3.9m (-)	5.4 m : B = 4.2 m (-)
4.2m : B = 3.9m (-)	5.9 m : B = 4.2 m (-)
4.6m : B = 3.9m (-)	6.3 m : B = 4.3 m (-)
5.0m : B = 3.9m (-)	6.7 m : B = 4.4 m (-)
5.4m : B = 4.0m (-)	7.2 m : B = 4.5 m (-)
5.8m : B = 4.0m (-)	7.6 m : B = 4.6 m (-)
6.2m : B = 4.1m (-)	8.1 m : B = 4.6 m (-)
6.6m : B = 4.2m (-)	8.5 m : B = 4.7 m (-)
7.0m : B = 4.3m (-)	8.9 m : B = 4.8 m (-)
7.4m : B = 4.4m (-)	9.4 m : B = 4.9 m (-)
7.8m : B = 4.4m (-)	9.8 m : B = 5.0 m (-)
8.2m : B = 4.5m (-)	10.3 m : B = 5.0 m (-)
8.5m : B = 4.5m (-)	10.7 m : B = 5.1 m (-)
8.8m : B = 4.6m (-)	11.1 m : B = 5.1 m (-)
9.1m : B = 4.6m (-)	11.5 m : B = 5.2 m (-)
9.4m : B = 4.7m (-)	12.0 m : B = 5.2 m (-)
9.7m : B = 4.7m (-)	12.4 m : B = 5.4 m (-)
10.0m : B = 4.8m (-)	12.8 m : B = 5.3 m (-)
10.3m : B = 4.8m (-)	13.3 m : B = 5.4 m (-)
10.6m : B = 4.9m (-)	13.7 m : B = 5.5 m (-)
10.9m : B = 4.9m (-)	14.1 m : B = 5.5 m (-)
11.2m : B = 5.0m (-)	14.6 m : B = 5.5 m (-)
11.5m : B = 5.0m (-)	15.0 m : B = 5.5 m (+)
11.8m : B = 5.0m (-)	15.4 m : B = 5.6 m (+)
12.1m : B = 5.1m (-)	15.8 m : B = 5.6 m (+)
12.4m : B = 5.1m (-)	16.2 m : B = 5.6 m (+)
12.7m : B = 5.1m (-)	16.8 m : B = 6.0 m (+)
13.0m : B = 5.1m (-)	17.3 m : B = 6.4 m (+)
13.3m : B = 5.1m (-)	
13.6m : B = 5.1m (-)	
13.9m : B = 5.2m (-)	
14.2m : B = 5.2m (-)	
14.5m : B = 5.3m (-)	
14.8m : B = 5.3m (-)	
15.1m : B = 5.4m (-)	
15.4m : B = 5.5m (-)	
15.7m : B = 5.5m (+)	
16.0m : B = 5.6m (+)	
16.3m : B = 5.6m (+)	
16.6m : B = 5.7m (+)	
16.9m : B = 5.7m (+)	
17.2m : B = 5.7m (+)	
17.5m : B = 5.8m (+)	
17.8m : B = 5.9m (+)	
18.1m : B = 6.1m (+)	
18.4m : B = 6.4m (+)	

Author		Comments:
Date	11/09/2024	->



Minimum profile I



Hole 23	
MIN BURDEN	CR-SEC BURDEN
Depth / Burden	Depth / Burden
0.3m : B = 3.5m (-) !!!<--	0.8 m : B = 3.4 m (-) !!! <
0.6m : B = 3.4m (-) !!!<--	1.2 m : B = 3.6 m (-)
0.9m : B = 3.4m (-) !!!<--	1.7 m : B = 3.6 m (-)
1.2m : B = 3.4m (-) !!!<--	2.1 m : B = 3.7 m (-)
1.5m : B = 3.5m (-) !!!<--	2.5 m : B = 3.9 m (-)
1.8m : B = 3.5m (-)	2.9 m : B = 3.9 m (-)
2.2m : B = 3.6m (-)	3.4 m : B = 4.0 m (-)
2.6m : B = 3.7m (-)	3.8 m : B = 4.2 m (-)
3.0m : B = 3.8m (-)	4.2 m : B = 4.3 m (-)
3.4m : B = 3.9m (-)	4.7 m : B = 4.7 m
3.8m : B = 4.0m (-)	5.2 m : B = 5.0 m
4.2m : B = 4.1m (-)	5.6 m : B = 5.3 m
4.6m : B = 4.2m (-)	6.1 m : B = 5.5 m (+)
5.0m : B = 4.3m (-)	6.4 m : B = 5.1 m
5.4m : B = 4.5m (-)	6.7 m : B = 4.8 m
5.8m : B = 4.6m	7.2 m : B = 4.7 m
6.2m : B = 4.7m	7.5 m : B = 4.7 m
6.6m : B = 4.8m	8.0 m : B = 4.6 m
7.0m : B = 4.7m	8.3 m : B = 4.5 m
7.4m : B = 4.6m	8.8 m : B = 4.6 m
7.8m : B = 4.6m	9.2 m : B = 4.6 m
8.2m : B = 4.6m	9.6 m : B = 4.6 m
8.5m : B = 4.6m	10.0 m : B = 4.6 m
8.8m : B = 4.6m	10.4 m : B = 4.7 m
9.1m : B = 4.5m	10.8 m : B = 4.8 m
9.4m : B = 4.5m (-)	11.3 m : B = 5.1 m
9.7m : B = 4.5m (-)	11.7 m : B = 5.1 m
10.0m : B = 4.5m	12.1 m : B = 5.1 m
10.3m : B = 4.6m	12.5 m : B = 5.3 m
10.6m : B = 4.6m	12.9 m : B = 5.0 m
10.9m : B = 4.6m	13.3 m : B = 5.0 m
11.2m : B = 4.6m	13.7 m : B = 5.0 m
11.5m : B = 4.6m	14.1 m : B = 4.9 m
11.8m : B = 4.7m	14.6 m : B = 5.0 m
12.1m : B = 4.7m	15.0 m : B = 5.3 m
12.4m : B = 4.8m	15.5 m : B = 5.5 m (+)
12.7m : B = 4.9m	15.9 m : B = 5.8 m (+)
13.0m : B = 4.9m	16.4 m : B = 6.3 m (+)
13.3m : B = 4.9m	16.9 m : B = 6.7 m (+)
13.6m : B = 5.0m	
13.9m : B = 5.0m	
14.2m : B = 5.0m	
14.5m : B = 5.0m	
14.8m : B = 5.0m	
15.1m : B = 5.0m	
15.4m : B = 5.0m	
15.7m : B = 5.1m	
16.0m : B = 5.1m	
16.3m : B = 5.2m	
16.6m : B = 5.2m	
16.9m : B = 5.3m	
17.2m : B = 5.4m	
17.5m : B = 5.5m (+)	
17.8m : B = 5.6m (+)	
18.1m : B = 5.9m (+)	

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Appendix E

QUALIFICATIONS OF THE TEAM



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Appendix E.1

WSP



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CHETANA RAMANNA, SEISMIC ENGINEER

Chetana is a Chartered Civil Engineer and holds a master's degree in Civil Engineering and a PhD in Probabilistic Seismic Hazard Analysis. Apart from carrying out general geotechnical works for road infrastructure and mining industry, she has reviewed site specific seismic hazard assessment reports for areas where the mining facilities are located viz., Coka Rakita in Serbia and Abujar Gold Project in Cote D'Ivoire. She has carried out seismic stability analysis for the tailing storage facility in Ikkari Mines in Finland during the pre-feasibility study stage of the project. She also carried out desktop studies to determine the impact of blasting on the wind turbine structures for Raylees Wind Farm in Northumberland, UK and for Aughinish Alumina Limited in Co, Limerick, Ireland.

In the current project, Chetana fulfils the role of Project Manager and Seismic Engineer wherein she was required to coordinate with EDF and sub-contractors viz., Kercon Constructions Ltd and Environmental Measurements Ltd, and to carry out the Ground Vibration and Air Overpressure Assessment for the project.

PETER CORRIGAN, GEOTECHNICAL ENGINEER

Peter Corrigan is a Chartered Engineer since 2006 and a Principal of Golder Associates since 2014 (formerly an Associate from 2008). Peter is involved mainly in design of tailings and waste containment infrastructure as well as heap leach facilities. This generally takes projects across Europe, Africa and Asia from pre-feasibility and feasibility stages through ground investigation, conceptual and detailed design, tender and contract management for the construction and through to commissioning of the facility as well as closure planning. Other projects include slope stability assessments and design of remedial works, soft ground assignments, geotechnical instrumentation installation and monitoring and ground investigations.

Peter was involved in founding the materials testing laboratory in 2002. Appointed Director in 2003. Duties involved in this role during the intervening years have included Deputy Quality Manager, Radiological Protection Officer and Project Manager as well as Director.

In the current project, Peter fulfils the roles of Project Director and Technical Reviewer.

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Appendix E.2

**ENVIRONMENTAL MEASUREMENTS
LTD**





Environmental Measurements is a leading Irish company with a focus on providing Noise, Vibration and Dust Measurement equipment and services for a range of industries. They are an innovative company with internal R&D development, that provides bespoke and future proof solutions for their customers. A key strand of their business is on environmental compliance monitoring for the construction industry. Their main office is located in Dublin and have additional offices in Cork and Galway.

The principals in Environmental Measurements have been involved in the business of environmental equipment and services for a long number of years. In 1987 they took on the Irish agencies for Instantel Vibration Monitors and Larson Davis Noise Monitors and originally formed Industrial and Marine Acoustics Ltd. This company traded successfully until 1996 when it became part of a larger engineering company with offices in Dublin, Cork and the UK. In 2001 after a management buyout Environmental Measurements was formed and moved to its current premises.

Environmental Measurements approach is relationship orientated. Throughout all the years since their inception, trading, Quality and Safety has been a priority and strongly believe in the value of their people and their performance. They are flexible in developing and offering measurement solutions unique to each customer and project requirement.

In this project, Environmental Measurements set up the monitoring instruments to measure the Ground Vibrations and Air Overpressure at each of the monitoring stations. For every blast event a report was produced summarising the findings.

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Appendix E.3

KERCON CONSTRUCTIONS LTD





Kercon Construction are a Building and Civil Engineering Main Contractor located in Kells, Co. Meath. We undertake projects throughout Ireland and cover a myriad of sectors including Industrial, Commercial, Civil Engineering, Educational, Healthcare, Residential, Technological, Arts, Heritage and Culture, Boliden Tara Mines (Above Ground and Underground {No Mining}) and other General Construction Services.

We **pride** ourselves on our **reputation** and **ability** to complete projects **safely**, on time, within budget, and to the highest standards of **workmanship**. We are **proud** of the fact that the majority of our workload comes from repeat business, demonstrating **exceptional relationships** with clients build up over decades worth of projects.

Our **competitive advantage** is that we own a comprehensive range of **heavy plant, machinery** and **equipment**. Our teams consist of **skilled**, experienced, **knowledgeable** operators; which we believe is extremely **valuable** to projects across all sectors.

We have established accredited Management Systems; our Safety Management System is accredited to an **A-Grade Safe-T-Cert** and our Quality Management System is accredited **ISO 9001:2015** International Standard.

We have a **strong reputation** for our reliable execution of all projects undertaken. This is achieved through our **relentless attention to detail** and an experienced team with the **drive and customer focus** to ensure client **satisfaction** is a given on all Kercon projects.

Occupational Health, Safety & Wellbeing

We hold an **'A' Grade Safe-T-Cert** accreditation; the **highest grade** available for the implementation of our Safety Management System across all of our projects. We are focused on implementing the **best practice health and safety standards** across our sites, to ensure that everyone we share our working day with can **go home safe** every day.

Quality

Our reputation for the **quality** of our project management and finished projects is achieved through the **capability of our personnel**, our **'first time right'** approach, underpinned by our proven **ISO 9001:2015** Quality Management System which is externally audited and approved by the National Standards Authority of Ireland.

Environmental

We are committed to achieving and maintaining a **high standard of environmental quality** across all of our operations. We **plan and act** for the future – for the long-term good of our company, our clients and our environment.

In this project, Kercon installed the concrete kellyblocks for setting up the monitoring instruments.

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Appendix E.4

KEMEK LTD





Irish Industrial Explosives Ltd (IIE) founded in 1964 was later joined by Ulster Industrial Explosives Ltd (UIE) founded in 1973. Both companies are part of the [EPC Groupe](#) and have been serving the Mining, Quarrying & Civil Engineering Industries on the island of Ireland over this time. Providing customers with global safety standards and the very latest in explosive technology. In 2023, both companies rebranded to adopt a single identity, Kemek.

Our mission is to provide expert advice, superior services and products to the Quarrying, Mining and Civil Engineering industries.

Our vision is to be the leading provider of blasting expertise, superior services and products, partnering with our customers to fully unlock the potential of their operations.

In this project, Kemek carried out the blast design and operations of the blasts for Kilsaran at their quarry in Kellystown, Co. Louth. For every blast event, a report was produced giving details of the blast location, time of firing the shots, MIC used, number of holes and total charge used.



Town Centre House
Dublin Road
Naas
Co Kildare

wsp.com

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