Seriti Power (Pty) Ltd

IN-PIT DISPOSAL OF COAL DISCARD AND REJECTS AT NEW LARGO

Geochemistry Specialist Study

41106340-REP-00005
OCTOBER 2024

CONFIDENTIAL

Seriti Power (Pty) Ltd

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FINAL REPORT CONFIDENTIAL

PROJECT NO. 41106340

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EXECUTIVE SUMMARY

WSP Group Africa (Pty) Ltd (WSP) was contracted by Seriti Power (Pty) Ltd. (hereafter referred to as Seriti) to assist with environmental permitting processes for in-pit disposal of coal discard and rejects. Mining operations at New Largo have commenced in a phased manner with operations commencing in Pit D in 2020, followed by Pit F in 2022 and Pit Wilge in 2023. Seriti now plans to commence mining at Pit H and the Main Mine, which will consist of mining four pits - A&G, C, D-North. In-pit coal discard disposal is authorised for a certain areal extent; the proposed mining changes warrant additional permitting for in-pit disposal of coal discard and rejects to cover the full extents of the pits.

As part of the process, a geochemistry study was undertaken to assess the coal discard and destoning rejects material and its associated risks/impacts, especially on pit water quality. This report contains the factual findings and predictions of the geochemistry study, and a risk assessment for the in-pit disposal of coal discard and rejects at New Largo. It also interprets the results in the context of the Best Practice Guidelines of the Department of Water Affairs (BPG G4), specifically the guideline on Impact Prediction which has four questions to be answered at the stage of mine planning, for technically responsible impact prediction of a proposed mine residue disposal activity.

The static tests revealed that both samples, Welgelegen DMS Plant coal discard (SNL-Welge-CD-01) and Genet Destoning Plant rejects (SNL-PitD-Deston-02), are potentially acid generating (PAG).

In terms of the kinetic test results, this report presents the full 20-week kinetic results for the DMS Plant discard, while the cell for the Destoning Plant rejects, is still running at WSP Laboratory for the standard 20-weeks with a weekly evaluation of the leachate samples. Only the results until the 8th week are available and presented in this report. The DMS Plant discard sample (SNL-Welge-CD-01) had a pH ranging between 6.11 and 7.22 and the Destoning Plant reject sample also show neutral conditions with pH range between 7.37 and 7.73, in the 8 weeks so far which indicates some buffering capacity.

In terms of pit water qualities, all the pits are conservatively considered to have the potential to turn acidic, with long-term pH ranging between 4.5 and 6.0. This is partly influenced by the conservative laboratory method used in previous studies on the overburden, and should be revised when a geochemical assessment update is done for the pits. The DMS discard has a substantial effect on the sulfate and TDS load of pits into which it will be backfilled, with the predicted concentrations rising by between 20% and 36% in the medium-term (compared to the same pit without discard), but falling off to a lower increase (below 10% than the same pit without discard) in the long-term. The influence on the TDS is less substantial. The destoning rejects have a small influence on the sulfate concentration (10% increase or less over the same pit without rejects), except in the higher disposal scenarios of Pit D (if 10 to 15% of the material backfilled is discard). The source-terms for destoning rejects are preliminary source-terms, based on 7 of 20 weeks humidity cell data, and an update memorandum will be provided in mid-November, when the cell is completed.

It should also be noted that effect of the waste backfilling is naturally influenced by the proportion that the waste makes up of the backfill, ranging from 0.03% at Pit F to 11% at Pit A&G. In some cases, this may have a greater influence than the difference in material properties between discard and rejects.

The risk assessment indicates that in-pit disposal of the New Largo coal residue is a suitable option if the discard/reject is disposed below the final water level where no or little oxidation of pyrite will take place. This allows that, wherever possible, at least some of the discard and rejects will be lower than the post mining ground water re-charge/decant elevation, although in some pits parts of this disposal zone will be above the water table. This is done prior to dumping of overburden spoils from the next mining strip in the direction of mining. The discard/rejects which will be below the in-pit water table will have limited availability of oxygen: the maximum dissolved oxygen availability is some thirty times less than under atmospheric conditions. However, several of the pits have final in-pit water levels which are low, leaving much of the pit open to atmospheric conditions, and in other pits, the quantity of discard/rejects will result in at least some of the discard/rejects being above the in-pit water table. This does not have the geochemical advantages of sub-aqueous disposal, but still consolidates dirty water of the discard/rejects, and of the pit, into one system, managed by the same dirty water management system that the pit requires. It also decreases the amount of mined land and waste exposed at any point in time. This means that rainfall that falls onto the mineral residue does not also fall onto the pit (as it would if the two were separate) which implies that less rainfall in total is converted into dirty water, which lowers the environmental impact.

The overall effect of these risks and mitigations is summarised below:

- The highest level of geochemical risk is in Pits A&G and D North, where DMS discard will be disposed in pits with limited storage below the final in-pit water level, resulting in long-term oxidation of the discard and high sulfate and TDS concentrations.
- Pit C has moderate risk as there is more storage below the final in-pit water level for the DMS discard. Pit F also has a moderate risk due to a lower sulfate and TDS load from destoning rejects, but little disposal space below the final in-pit water level.
- Pits H and D have moderate/low risk, due to a lower sulfate and TDS load from destoning rejects, and some disposal space below the final in-pit water level.
- Pit Wilge will not have discard or rejects co-disposed with the spoils.

A backfilling plan should be developed, documenting the planned co-disposal of discard and rejects, following the below principles:

- Discard/rejects should be preferentially placed in the deepest part of the pit, and the mined-out section should then be backfilled, compacted and rehabilitated as soon as possible.
- The Discard/rejects should be placed a few meters below the decant water level (final pit water level) meaning that no or little oxidation of pyrite will take place.
- The discard/rejects should have a neutral (paste) pH when backfilled else it would immediately acidify interstitial water before being covered with water. This could be done by backfilling these coal residues while they are still fresh and ensuring they are covered promptly, ideally within a year.

The mining blocks and elevations for disposal of discard and rejects need to be marked out in the mine plan for each pit, and these should be updated as the mine plan is updated – as should the backfilling plan document itself. Furthermore, a pathway control will be required, to capture mine water before or at the decant point: dirty water from the pit must be pumped out of the pit to prevent decant post-closure. The safe operating level of the decant management system should be to keep the in-pit water level at least 2 m below the decant elevation. The water which is pumped out of the pit should be treated for reuse or discharge.

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1 BACKGROUND AND INTRODUCTION

Seriti Power (Pty) Ltd. (hereafter referred to as Seriti) owns and operates New Largo colliery, an opencast coal mine located close to the N4 and N12 highways between Bronkhorstspruit and eMalahleni. Mining operations at New Largo have commenced in a phased manner with operations commencing in Pit D in 2020, followed by Pit F in 2022 and Pit Wilge in 2023. Seriti now plans to commence mining at Pit H and the Main Mine, which will consist of mining four pits - A&G, C, D-North (see Figure 1-1 for locations of the pits).

In-pit coal discard disposal is authorised for a certain areal extent; the proposed mining changes warrant additional permitting for in-pit disposal of coal discard and rejects to cover the full extents of the pits. There are, or will be, two different types of plants contemplated for coal processing at New Largo, the destoning (air) plant and DMS (washing) plant. These plants produce mineral residues: destoning rejects and DMS discard, respectively. The disposal of fines has not been included in the project description.

WSP Group Africa (Pty) Ltd (WSP) is contracted by Seriti to assist with the permitting process. As part of the process, a geochemistry study is required to assess the coal discard and destoning rejects material and its associated risks/impacts, especially on pit water quality, and the study will also support the site-wide geohydrological model update.

This final report provides an update of the geochemistry specialist study, following a Preliminary Report dated 01 July 2024 (which was based on pre-kinetic test results and 13 weeks of kinetic leach tests), and provides the final source-terms for the New Largo backfilled pits, based on a larger kinetic data set.

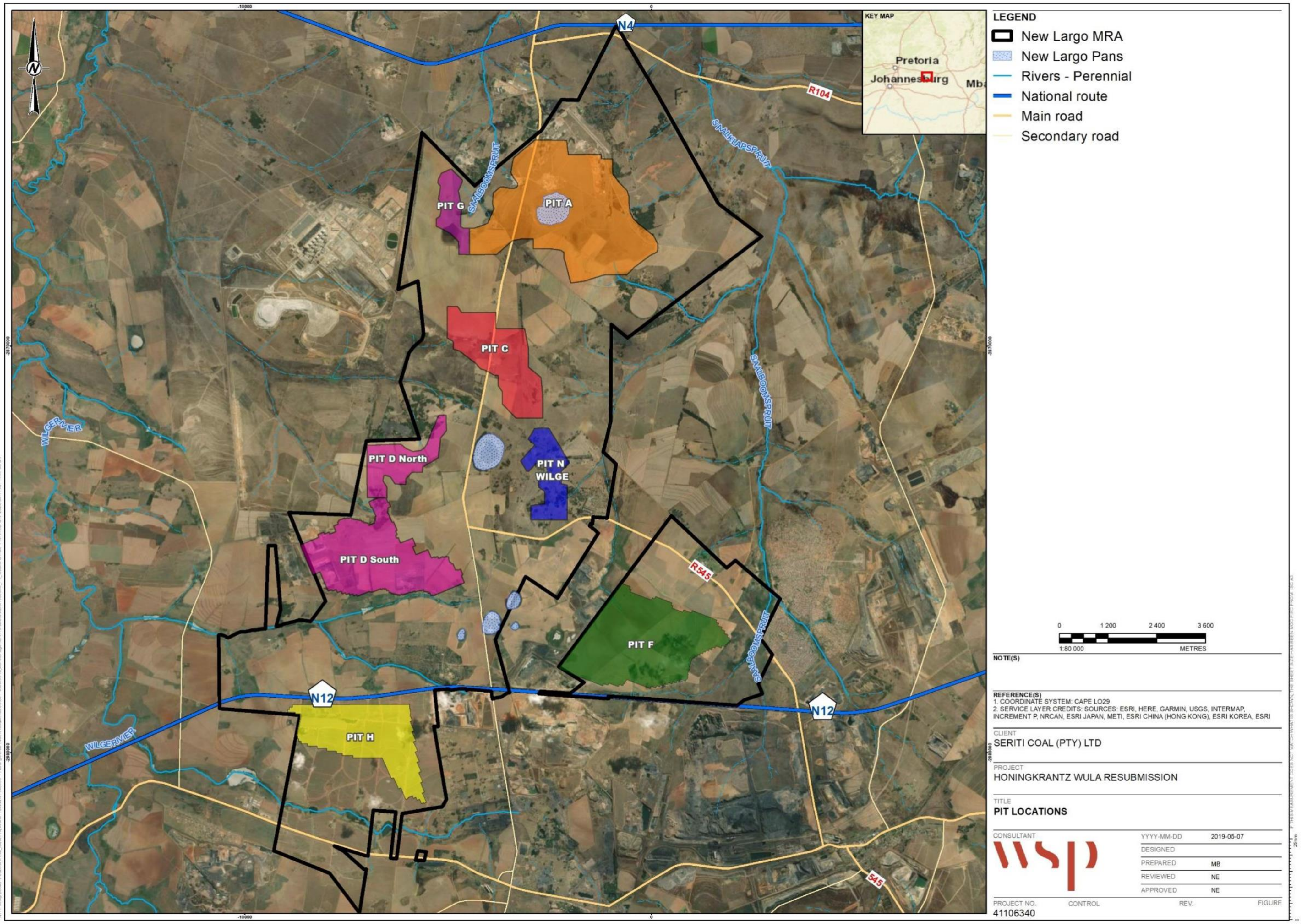

Figure 1-1 – Locations of New Largo Pits

2 PROJECT CONTEXT

According to the National Water Act, the disposal of mineral residues qualifies as a water use under Section 21(g), which addresses the disposal of waste or water containing waste in ways that could negatively affect water resources. A 2016 memorandum from the Department of Water and Sanitation (referred to as the "DWS 2016 memorandum") emphasizes the importance of a risk-based approach for each specific case. This approach allows for the consideration of alternative barrier systems, contingent upon a risk assessment. The memorandum clarifies that approval for such alternatives will depend on demonstrating that the proposed barrier system can effectively prevent the pollution of water resources.

Additional guidance on this approach is provided in the Best Practice Guideline series issued by the Department, particularly the guideline on Impact Prediction (referred to as "the BPG" from (DWAF, 2008). This guideline recommends a risk-based approach, as detailed in section 3.1, for conducting source-pathway-receptor analyses, covered in sections 3.2 to 3.5. It also advocates for the use of geochemical and geohydrological models, as discussed in section 6.0, to evaluate how contaminants move through the pathway and to assess the associated risks to receptors.

Under the National Environmental Management: Waste Act of 2008, the guidelines for pollution control measures related to mineral residues, including the design of barriers, are specified in regulations 3(3) and 3(5). These are part of the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits from Prospecting, Mining, Exploration, or Production Operations (known as the "Residue Stockpile Regulations"), initially published as GNR.632 on 24 July 2015 and later amended by GN 990 on 21 September 2018.

The Best Practice Guideline (BPG), in section 5.1, outlines four key questions that must be addressed during the mine planning phase for a technically sound impact prediction of proposed mine residue disposal activities. These questions are also aligned to meet the criteria set forth in the Residue Stockpile Regulations, ensuring a risk assessment.

This report is intended to be reviewed together with the hydrogeology report (WSP, 2024), which discusses groundwater flow, contamination, and containment issues.

Table 2-1 - In-Pit Disposal Project Context

Question 1	**BPG: Will any waste material be generated that has a potential to generate acid, neutral or saline drainage?**
	Residue Stockpile Regulations: Characterise chemical characteristics that must include the propensity to oxidise… the pH and chemical composition of the water separated from the solids, the reactivity and rate thereof, acid generating and neutralising potential. 4(2)(b)
	Approach of this study: static and long term kinetic tests on the discard and destoning rejects to fill the gaps in understanding of short-term and long-term geochemical risk posed by these mineral residues.
Question 2	**BPG: Is there a potential to separate and manage waste streams in accordance to their acid, neutral or saline drainage potential?**
	Residue Stockpile Regulations: Characterise chemical characteristics that must include the propensity to oxidise… the pH and chemical composition of the water separated from the solids, the reactivity and rate thereof, acid generating and neutralising potential. 4(2)(b)

	Approach of this study: This study considers the disposal of discard and destoning rejects, by backfilling into the opencast pits with the spoils. As the spoils (waste rock backfill) are already known to be acid-generating, there is no opportunity to separate acid vs neutral materials.
Question 3	**BPG: Are there any positive or negative consequences of storing and/or disposing of these waste materials in a specific manner on their own or in any combination?**
	Residue Stockpile Regulations: The classification of residue deposit must be undertaken on the basis of the characteristics of the residue, locations & dimension of the deposit. 5(3)
	Approach of this study: This study considers the positive or negative consequences of in-pit disposal of the coal discard and destoning rejects, in the context of the predicted pit water chemistry from the spoils (waste rock backfill).
Question 4	**BPG: How would proposed alternative mining techniques and layouts (backfill into opencast pits) affect the potential impact on the identified receptor water resource (surface and groundwater balance and quality)?**
	Residue Stockpile Regulations: The classification of residue deposit must be undertaken on the basis of the characteristics of the residue, locations & dimension of the deposit. 5(3)
	Approach of this study: This study considers the opportunities for selective placement of discard to minimise potential acidic drainage, and the role of a decant management system to avoid decant.

3 SCOPE OF WORK

The geochemistry assessment component of the work entailed the following:

- Conducting a review and gap analysis of existing information related to the project to identify key geochemical parameters and potential data deficiencies.
- Characterising the risk of acid rock drainage and metal leaching (ARDML) from the coal discard and destoning rejects to assess the potential environmental impacts and risks to surrounding ecosystems (fines were not included in the project description).
- Developing accurate and reliable source terms* of predicted mine water/seepage chemistry for pits backfilled with the discard and destoning rejects, to be utilized in the groundwater model to better understand the hydrochemical processes and potential contaminant transport.
- Performing a risk assessment based on the findings of the study. Formulating a mitigation plan to address identified risks and potential adverse effects, aiming to minimize environmental impacts and provide actionable recommendations for sustainable geochemical management and responsible mining practices, to support long-term environmental protection and compliance with relevant regulations.

*Source-terms for other sources at New Largo Colliery, such as stockpiles, pollution controls dams and other dirty areas were not included in the scope.

4 INFORMATION REVIEW

4.1 GEOLOGY

The Karoo Supergroup hosts all the South African coal deposits (Snyman, 1993) and the lithostratigraphy for New Largo is typical Ecca Group, Vryheid Formation. This Formation in the north-eastern Witbank Coalfield ranges from 80 m to 90m (Cairncross, 1986) and contains 5 coal seams, numbered from No. 1 at the base to No. 5 at the top. The lithological units consist of shale, shale- sandstone, grit, sandstone, conglomerate and coal, and cover most of the southern and south-eastern extent of the study area.

A northwest-southeast trending pre-Karoo palaeoridge (Figure 4-1) in the northern part of the resource area divides the coalfield into two discrete palaeovalleys creating a northern better-quality domain and the central and southern parts of the resource. The depth of weathering is generally between 7 m and 15 m and has a substantial influence on resources limits. In the north, No. 4 seam is prone to weathering along the subcrop owing to the high permeability of the coarse-grained, pebbly sandstone which overlies the seam in the area.

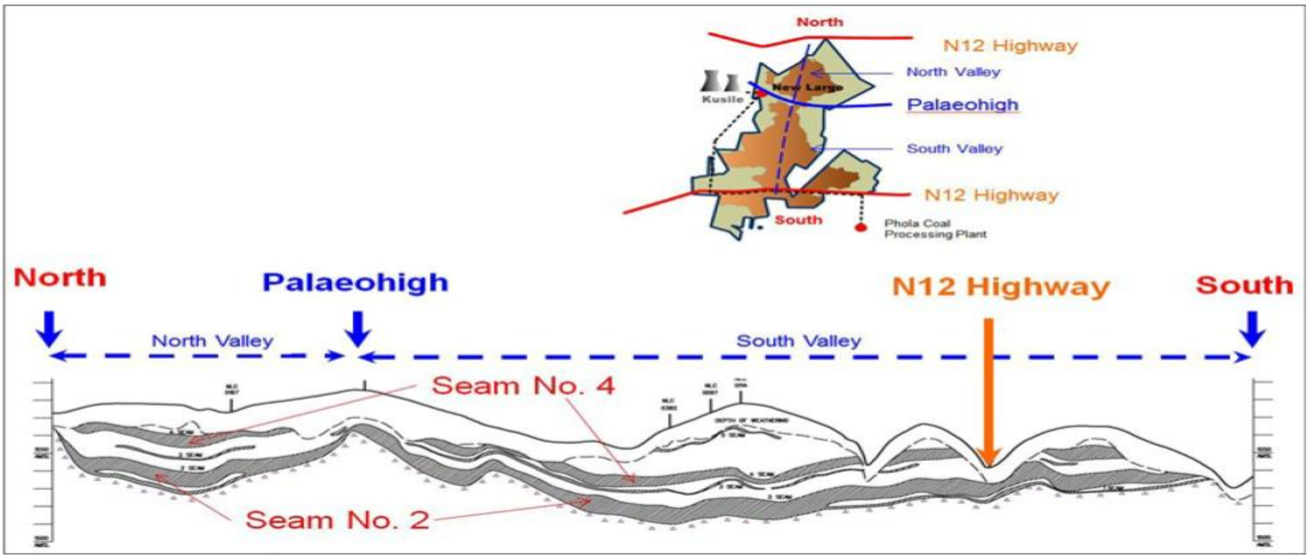

Figure 4-1 - Schematic Section through Geological Profile of the New Largo Coal Reserve (Golder, 2019)

Previous mining indicates that the southern portion of the deposit has the most structural complexity. The dyke shown detected to the south east of the New Largo deposit was suggested to be pre-Karoo in age clue to its depth of approximately 55 m relative to an average pre-Karoo depth of 30 m (AATC, 2012).

Of the five coal seams in the Vryheid Formation, only the No. 2 and No. 4 seams are relevant at New Largo (Figure 4-2). Coal seam No. 4 is found 8 to 47 m below natural ground level and is ~4.5 m thick. Coal seam No. 2 is located ~13 m below seam No. 4 and varies in thickness, from ~4.6 to ~8.2 m. Both the No. 5 seam, which occurs only sporadically in the higher lying areas and the No. 3 seam (at less than 0.5 m thick) are currently considered to be uneconomic. The No. 1 seam is considered uneconomic due to the thickness of the parting between the No. 1 and No. 2 seams (AATC, 2012).

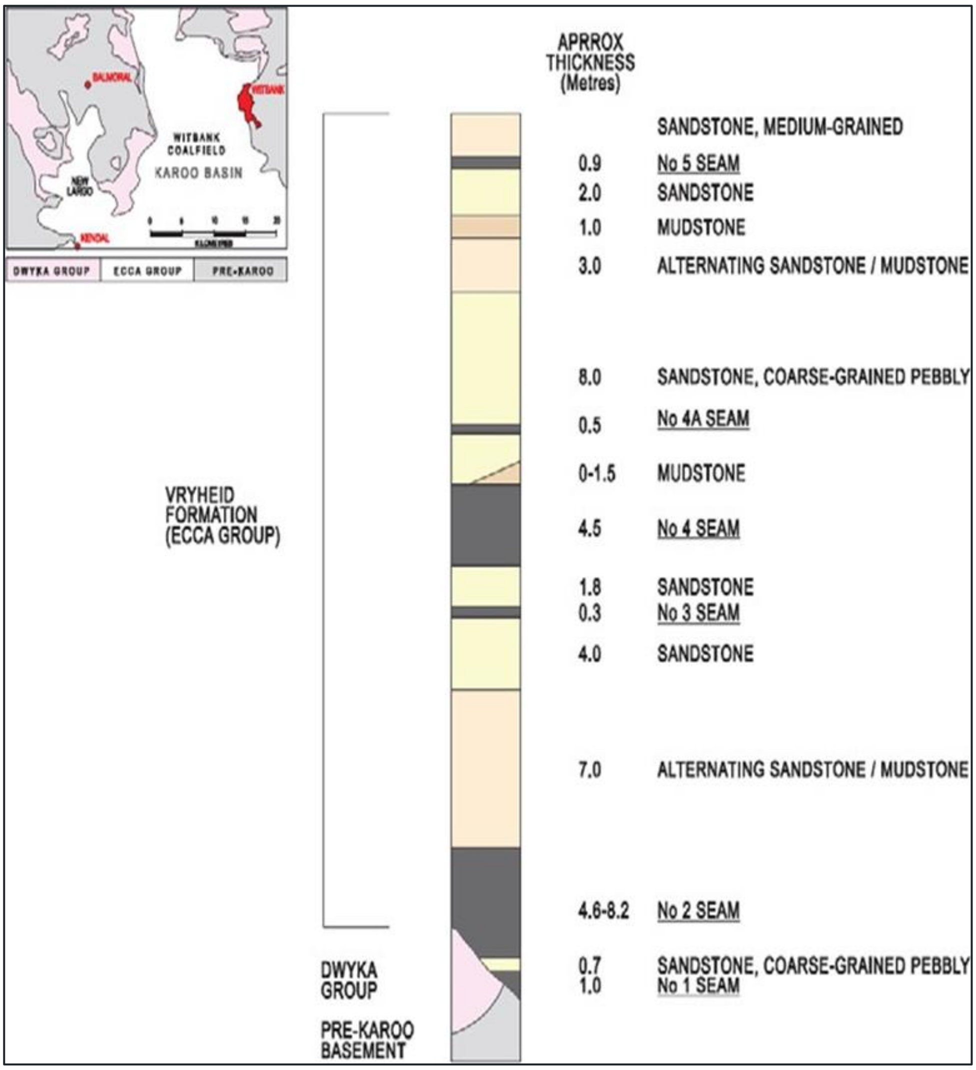

Figure 4-2 - Simplified Column for New Largo Colliery (AATC, 2012)

4.1.1 Coal Seam Stratigraphy

The No. 2 Seam ranges from a maximum of 9.21 m where plastic partings are developed (central) to an average of 5.14 m where no parting occurs. Figure 4-3 shows the stratigraphy within the Seam 2 as well as the different combination in which this seam occurs. In some cases, the P2 parting can be up to 5.30 m thick but averages 1.09 m. The PU and PL partings (above and below the P2 respectively) have also been found to attain thicknesses of up to 4.7 m and 3.9 m respectively. The average thicknesses of these partings are 0.99 m for the PU and 0.57 m for the PL and thicken in the central body portion of the deposit thereby having a profound effect on the total seam quality. The P2 consisting of predominantly sandstone and the PU and PL mudstone or shale. The Seam 2 occurs at an average depth to roof of 31.7 m.

Pyrite, in the form of nodules and lenses or a disseminated network, is developed throughout the seam and predominates in association with bright coal. Siderite invariably occurs in well-defined layers or as discrete nodules up to 2 mm in diameter but is less common than pyrite. Joints and cleats are generally filled with calcite.

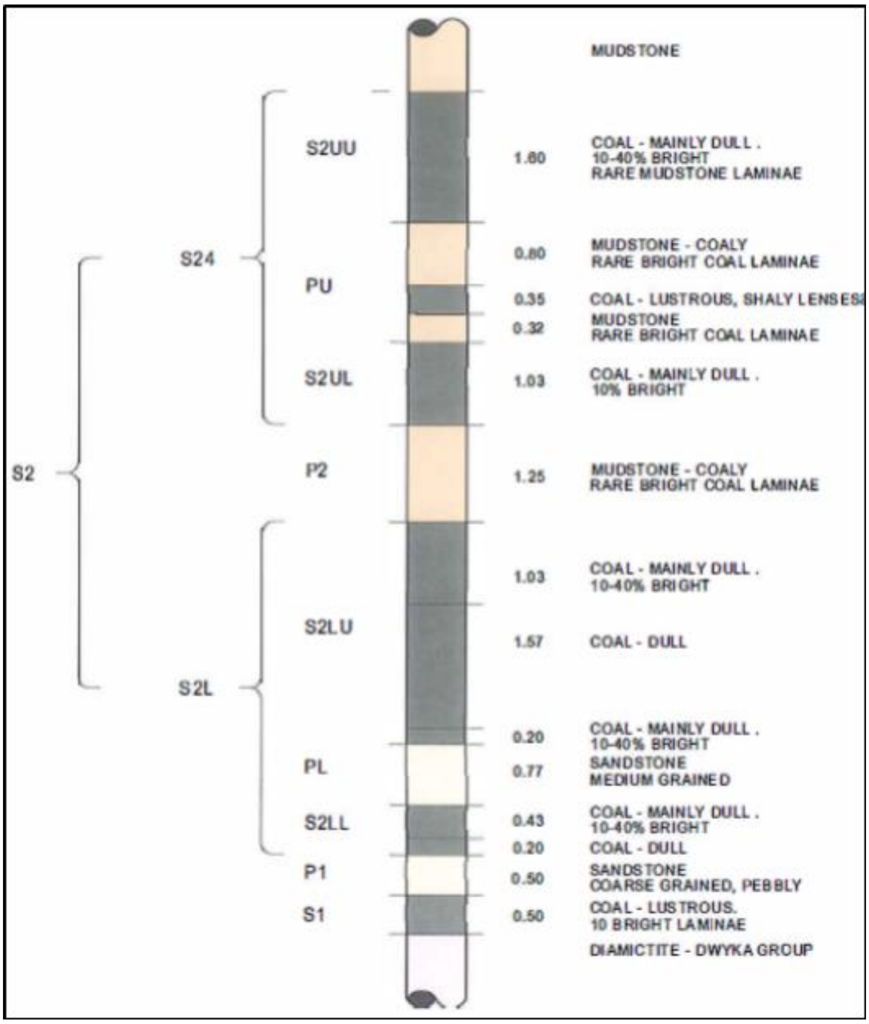

Figure 4-3 – Generalised Sedimentological Sequence for the No.2 Seam and its Inter-Seam Partings (AATC, 2012)

The No. 4 Seam is on average 4.23 m thick, varying in thickness up to 8.27 m in the east of New Largo Mine. The seam occurs at a depth of predominantly 30 m but ranging up to 50 m in the central portion where previous mining has already taken place. The No. 4 seam can be physically subdivided into a No. 4 Lower (S4L) and No. 4 Upper (S4U) sub-seam by a mudstone parting with an average thickness of 0.57 m as shown in Figure 4-4. The S4L generally consists of bands of mixed dull-lustrous and bright coal, intercalated with broad bands of dull lustrous coal with minor mud rock and sandstone partings. The average thickness for this sub-seam is 4.2 m. The upper zone (S4U) is more variable due to the number of mudrock and sandstone partings and effect of weathering.

Despite the numerous partings within Seam 4, as they consist of mudstone and/or carbonaceous material, they have not greatly decreased the quality of the total seam. Seam 4 displays a consistent trend, thinning to northwest, and then sharply at the basin edges. Seam 2 displays a less noticeable trend, thickest in the central, west and north of the deposit, thinning in between, in an isolated area to the south and then sharply at the basin edges.

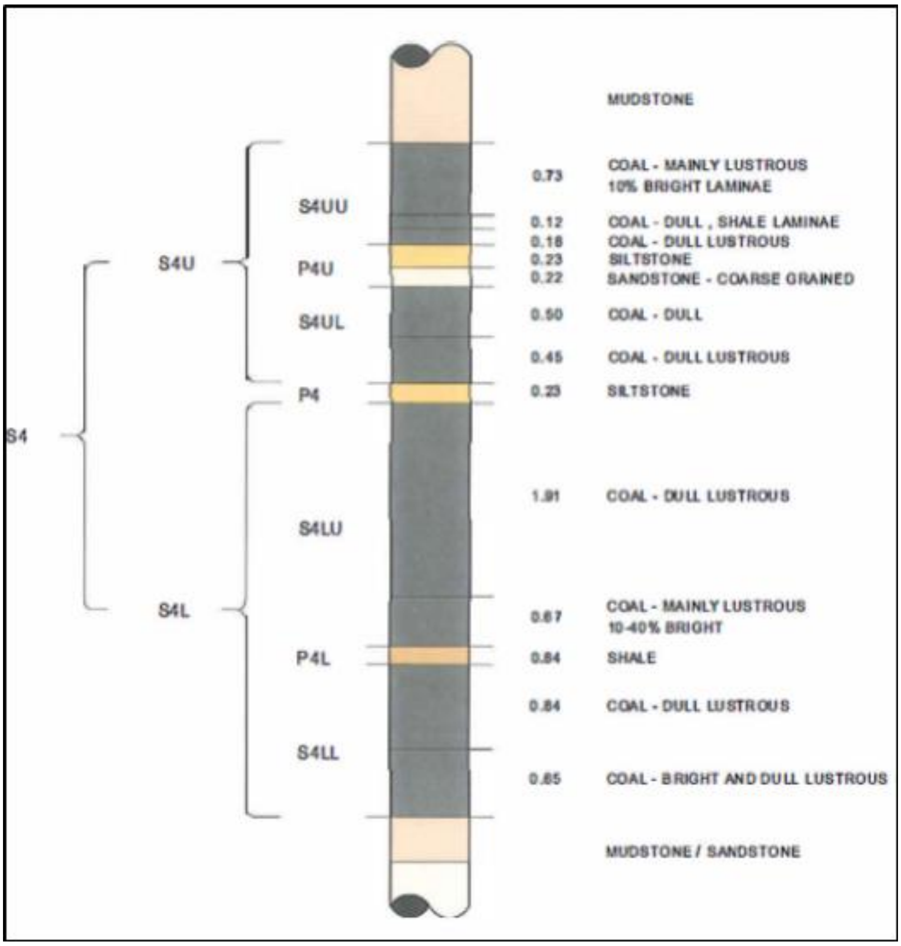

Figure 4-4 – Generalised sedimentological Sequence for the No.4 Seam and its Inter-Seam Partings (AATC, 2012)

4.2 GEOHYDROLOGY

According to (JMA, 2012), the predominant aquifer type present within the study area is the laterally extensive shallow weathered zone aquifer (average thickness of 20.77 m) which occurs within the weathered and weathering related fractured zone, within the Ecca Group, Dwyka Group and Pretoria Group host rock matrices. Localized fractured aquifers are restricted to the contact zones between the intrusive diabase bodies and the host rock within the study area. Although these semi-confined fractured aquifers may be high yielding, they will have limited storage capacities and recharge characteristics. The bulk of the water supplied by these aquifers will be drained laterally from storage within the shallow weathered zone aquifers neighbouring onto them. Table 4-1 and Figure 4-5 provides the groundwater background quality and boreholes locations, respectively (JMA, 2012).

Table 4-1 – Groundwater Background Quality (JMA, 2012)

Element /Parameter	Unit	SANS 241:2006			Statistics from a population of 103 sampling points			
		Class I	Class II	Min Value	Mean Value	Max Value	Standard Deviation	Max Value +1 Std Dev
pH		5.0-9.5	4.0-10	3.16	6.75	9.20	0.91	-
EC	mS/m	150	370	1.52	18.88	233	29.87	263
Total Dissolved Solids (TDS)	mg/L	1000	2400	10.00	119.23	1840	221.76	2062
Calcium (Ca^{2+})	mg/L	150	300	0.01	17.69	404	43.87	448
Magnesium (Mg^{2+})	mg/L	70	100	0.46	7.15	74.50	10.96	85
Sodium (Na^{+})	mg/L	200	400	0.57	10.15	111	16.28	127
Potassium (K^{+})	mg/L	50	100	0.25	2.85	33.50	3.91	37
Total Alkalinity	mg/L	-	-	0.00	52.10	249	49.07	298
Chloride (Cl^{-})	mg/L	200	600	0.11	8.19	407	33.58	441
Sulfate (SO_4^{2-})	mg/L	400	600	<0.01	28.29	1279	139.21	1418
Nitrate (NO_3)	mg/L	10	20	<0.01	2.37	35.60	4.35	40
Fluoride (F^{-})	mg/L	1.0	1.5	<0.01	0.39	7.46	0.97	8.43
Aluminum (Al^{3+})	mg/L	0.3	0.5	<0.01	0.24	17.10	1.47	18.57
Iron (Fe)	mg/L	0.2	2.0	<0.01	2.00	109	10.36	119
Manganese (Mn)	mg/L	0.1	1.0	<0.01	0.18	15.30	1.13	16.43

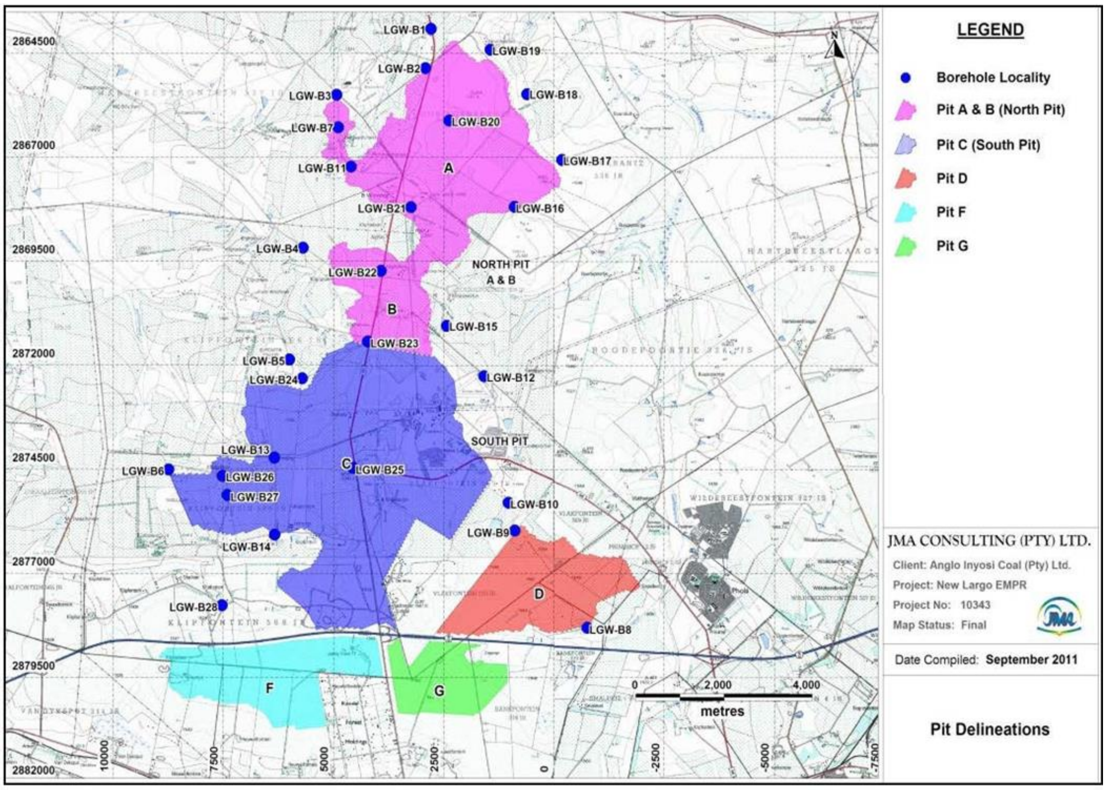

Figure 4-5 – New Largo Geohydrological Investigative Boreholes Locations and Pit Delineations (JMA, 2012)

4.3 PREVIOUS GEOCHEMISTRY STUDIES

The following reports have been reviewed and are summarised in the subsections below:

- JMA (2009). Technical Memo. Expected In-pit water qualities at the New Largo Mining Section.
- JMA (2011). Technical Memo. Expected water qualities based on additional ABA samples and latest mining schedule.
- Geostratum (2011). Geochemical Assessment of the New Largo Colliery.
- CSIR (2009). Leachate studies for acid mine drainage and prediction from coal samples – a kinetic test investigation.
- AATC (after CSIR 2012). Feasibility study - Section 6 Process metallurgy report.
- Seriti (2017). Coal washing data excel spreadsheets (received 06 August 2019).
- Golder (2009). New Largo PFS Study for Gypsum Sludge Waste.
- Golder (2011). PFS Mine Water Management Study New Largo Project.
- Jones & Wager (2013 & 2014). Water Monitoring Reports.
- Golder (2019). Geochemistry Specialist Report - New Largo Coal Bankable Feasibility Study. Report No. 18111929-329260-1.

4.3.1 JMA (2009)

As input into the 2012 environmental impact assessment (EIA) and water use licence (WUL) application, JMA conducted standard static geochemical test work on coal and overburden samples collected from five geohydrological boreholes (LGW-B2, B6, B9, B13, B20) drilled at the proposed mining area (JMA, 2009). The geochemical samples (36 samples) included:

- Slightly carbonaceous sandstone and shale.
- Carbonaceous sandstone and shale.
- Coal seams.

Some of the geochemical samples were and characterised for total composition by XRF, minerology by XRD and acid generation and acid neutralisation potential by modified Sobek (ABA test) and NAG. The following conclusions were made from the study:

- Minerology (18 samples):
  - Kaolinite and quartz were mostly present as dominant or major minerals in the coal seams and the carbonaceous shale samples.
  - Calcite ($CaCO_3$) was present as a trace (0.08%) to minor (10%) mineral in the coal seams and the carbonaceous shale. However, calcite might have been absent in some samples (especially the No. 4 coal seam samples) because of the weathering.
  - Siderite ($FeCO_3$) was found to be frequently present as a trace to minor mineral (0.15- 5.5%).
  - Pyrite (0.14- 7.6%) was detected in 17 samples.
- Acid Base Accounting (ABA) results for 36 samples are summarised in Table 4-2 Appendix B:
  - Paste pH levels ranged from 3.48 to 8.16 (average pH = 6.66) and is indicative of the initial drainage the lithological units. Carbonaceous shale, sandstone and seam 4 coal materials were recorded with acidic paste pH.
  - Low to high total S concentration (0.001% - 2.89 S%, average = 0.63 S%) resulted in Acid Generation Potential (AGP) between 0.03 kg/t $CaCO_3$ and 90.28 kg/t $CaCO_3$ with an average

value of 19.8 kg/t $CaCO_3$. The recalculated pyrite %S was determined as 0.0 - 5.4 wt.% (average =1.2 wt.%).
- The samples were found to have moderate NP (10.29 - 74.76 kg/t $CaCO_3$, average value of 10.7 kg/t $CaCO_3$), with 44% of the classified as “Potentially Acid Forming” using Net Potential Ratio (NP/AP).

- The carbonaceous sandstone and shale units overburden/spoil material was classified) as follows:
  - Shale (non/slightly carbonaceous) - Not Potentially Acid Generating (Non PAG) based on low Tot S 0.05 - 0.15% and average NPR = 2.7.
  - Sandstone (non/slightly carbonaceous).
    - The weathered sandstone above the No. 4 coal seam in the northern part of the coal reserve has low pyrite and carbonate content and is Non PAG.
    - Two sandstone samples below the No. 4 coal seam and below the No. 2 coal (Tot S = 0.29 and 0.20 respectively) is PAG based negative NNP -6.93 and -4.86 respectively.
    - Sandstone and shale (moderate to highly carbonaceous) is PAG based average negative NNP - 11.03 kg/t and average NPR = 0.83. The Tot S ranged from 0.06% to 1.60%.
- The average coal seams NPR (NP: AP) ratio was determined as follows:
  - Coal Seam 1 - NPR = 0.45 (PAG).
  - Coal Seam 2 – NPR = 1.54 (Uncertain).
  - Coal Seam 4 – NPR = 0.47 (PAG).

Based on the NPR, the coal seams have a high potential to create acidic drainage. The portions of the coal seams that will not be mined out, will together with the adjacent carbonaceous units could result in local acidic drainage from the backfilled spoils.

- Nett Acid Generation (NAG) pH for 36 coal/carbonaceous shale samples ranged between 1.90 and 6.10 (average NAG pH = 2.64), implying a risk of acidic drainage in the long-term. The ABA and NAG were used to provide initial /first order mine water qualities presented in Table 4-3.

Table 4-2 – ABA Summary for New Largo coal, interburden, and overburden (JMA, 2009).

		Paste pH	Oxidised pH	Total % S	AP (kg/t)	NP (kg/t)	NNP (kg/t)	Ratio NP:AP	Rock Type
Shale (4 Samples)	Min	6.30	2.40	0.05	1.59	1.98	0.14	1.03	III
	Max	8.16	3.70	0.15	4.56	11.66	9.10	4.55	
	Avg	7.17	3.18	0.09	2.90	7.44	4.54	2.70	
Sandstone (4 Samples)	Min	4.35	2.20	0.00	0.03	-0.99	-6.93	0.12	I to III
	Max	7.68	2.80	0.29	9.19	2.26	-1.02	31.60	
	Avg	6.04	2.45	0.16	4.91	0.57	-4.35	8.05	
Carbonaceous Shale and Sandstone (12 Samples)	Min	4.31	1.90	0.06	1.72	-10.29	-43.35	0.08	I
	Max	8.04	6.10	1.60	50.1	39.19	16.19	4.15	
	Avg	6.58	2.73	0.53	16.4	5.41	-11.03	0.83	
	Min	3.48	1.90	0.23	7.09	-1.73	-36.17	0.05	I

		Paste pH	Oxidised pH	Total % S	AP (kg/t)	NP (kg/t)	NNP (kg/t)	Ratio NP:AP	Rock Type
No. 4 Coal Seam (5 Samples)	Max	7.38	2.40	2.69	84.2	74.76	-2.64	0.89	
	Avg	5.86	2.16	1.23	38.4	22.33	-16.06	0.47	
No. 2 Coal Seam (10 Samples)	Min	5.55	2.00	0.10	2.97	0.00	-76.54	0.00	I to II
	Max	8.00	4.70	2.89	90.3	41.41	32.96	5.57	
	Avg	7.09	2.66	0.89	27.94	18.46	-9.40	1.54	
No. 1 Coal Seam (1Sample)	Avg	7.85	2.30	0.45	14.16	-6.43	-20.59	0.45	I

Table 4-3 – First Order Mine Water Qualities at Different Life Cycles for New Largo (JMA, 2009)

Chemical Constituent	Unit	Operational Phase	Post Closure Discard Backfill		
		Short Residence (no discard)	In-pit Quality (no discard)	3%S Discard	5%S Discard
pH		8.5 - 6.5	6.5 - 5.5	3 - 4	2 – 4
Total dissolved solids (TDS)	mg/L	600	2 000-4 000	3 000-6 000	4 000-8 000
Calcium (Ca^{2+})	mg/L	32-80	100-200	550-1 100	600-1 200
Magnesium (Mg^{2+})	mg/L	20	60-120	200-700	200-800
Sodium (Na^{2+})	mg/L	30	60 -150	400 -100*	400 -100*
Potassium (K^{+})	mg/L	5-10	50-80	50-100	50-150
Total Alkalinity	mg/L	250	<150	0	0
Sulfate (SO_4^{2-})	mg/L	80-150	600-1 400 Average 1 000	1 500-6 000 Average 3 000	2 000-8 000 Average 4 000
Aluminum (Al)	mg/L	0	5	>20	>20
Manganese (Mn)	mg/L	<1	5	>10	>10
Total Iron (Fe)	mg/L	<1	>5	>19	>10

Note: *Na species deplete in 25 years*

The following assumptions were made by JMA (2009) for the first order mine water qualities:

- The low-residence scenario assumes an in-pit contact time of less than 14 days and is based on CSIR (2009) shake flask kinetic test duration.
- The operational phase scenario assumes the total release of bicarbonate species for neutralisation.
- The 3%S and 5%S discard options assumes optimal placement of discard below decant levels – no mixing or spoiling below final decant elevation. A maximum of 80 million tons spread evenly over the total facility.
- A maximum of 10% discard disposal was assumed.

Changes in the first order pit water qualities estimates (Table 4-3) was revised by JMA, due to changes in mine scheduling, rate of spoiling/rehabilitation, pumping of water in and out of different pits for water management purposes, discard material placement and discard material leaching characteristics.

4.3.2 JMA (2011)

Predicted expected water qualities were done by (JMA, 2011), based on Version 5 mining schedule and additional ABA results collected by (Geostratum, 2011) comprising 79 samples from 2010 drill cores that including Seam 3 &5 and thin carbonaceous layers. The pit water quality for the following six scenarios were predicted by (JMA, 2011):

1) Short residence time for mining sequence 2014-2025 (prior to UG dewatering).
2) Long residence time for mining sequence 2014-2025 (prior to UG dewatering).
3) Combination of waste streams post 2027 (north and UG).
4) In-pit qualities long residence time post 2030 (south).
5) In-pit qualities with selective discard disposal.
6) In-pit qualities for isolated cells with 50% discard blend.

It should be noted that the Groundwater Impact Assessment Report (JMA, 2012) documents the first five scenarios only. The long-term ground water quality prediction for discard disposal ~90Mt, indicated in-pit acidification of all discard cells and is the poorest quality water to be expected in isolated areas (the first mining sections, combined with the in-pit storage of discard). The excess water make from the temporary 10Mt surface discard dump was added to this water make. This waste steam adds 5% to the total water make from 2017, gradually increasing to 25% at LOM. The short-residence time due to pump and treat water management prevents acidification of the final pit water as predicted for Scenario 5 (Table 4-4).

According to (JMA, 2011), a high level of confidence (>85%) is attached to the qualities predicted for Scenario 1 and 2. Uncertainties of static and kinetic modelling for the phases past the year 2027 included water balance changes due to change in mine plan, water use, rainfall patterns, rehabilitation rates and treatment rates, Volumes and placement position of discards and final geochemical composition of in-pit discards.

Table 4-4 – Predicted Mine Water Quality (JMA, 2011)

Scenario/ Chemical Constituent	Unit	Short Residence Time		Long Residence Time		Combination of Waste Streams Post 2027 (North & UGM)		In-Pit Qualities Long Residence Time Post 2030 (South)		In-Pit Qualities with Selective Discard Disposal		In-Pit Qualities for Isolated Cells With 50% Discard Blend	
		Range	Average	Range	Average	Range	Average	Range	Average	Operational Range	Post Closure Average	Operational Range	Post Closure Average
pH		7.3 - 6.5	7.1	7.3 - 6.3	6.8	6.5 - 4.5	5.8	5.5 - 4.0	5.0	5.0	4.5	4.5	2.5
Total Dissolved Solids (TDS)	mg/L	450 - 590	520	650 - 880	745	800- 1 100	950	1 100 – 1 500	1 250	1 700	2 400	3 900	6 800
Calcium (Ca^{2+})	mg/L	35-55	44	70 - 110	95	120 - 180	160	220 - 400	280	450	550	800	800
Magnesium (Mg^{2+})	mg/L	15-22	17	25 - 65	40	40 - 90	65	120 - 200	165	180	220	200	250
Sodium (Na^{+})	mg/L	15-30	20	40 - 60	52	40 - 60	50	80-120	100	120	100 - 0 (Depleted)	140	150 – 0 (Depleted)
Potassium (K)	mg/L	5-10	8	5 -16	10	35 - 45	40	35-45	40	50	50	80	80
Total Alkalinity	mg/L	180 - 285	225	300 - 450	360	140 - 180	160	0-120	0	0-50	0	0	0
Sulfate (SO_4^{2-})	mg/L	40 - 110	80	100 - 220	170	400-750	630	700-1 100	900	1 050	1 200	2 000	3 600
Aluminum (Al)	mg/L	0	0	0	0	1-5	2	10	10	10	10	10	10
Manganese (Mn)	mg/L	<1	<1	<1	<1	1-5	3	>3	>3	>3	>3	>3	>3
Total Iron (Fe)	mg/L	<1	<1	<1	<1	>5	>5	>5	>5	>5	>5	>5	>5

4.3.3 GEOSTRATUM (2011)

Laboratory certificates available from the study done by (Geostratum, 2011) was used as input data for the (JMA, 2011) prediction of expected pit water quality. Figure 4-6 provides the 14 borehole locations within the pit areas that were used to collect geochemical drill core samples.

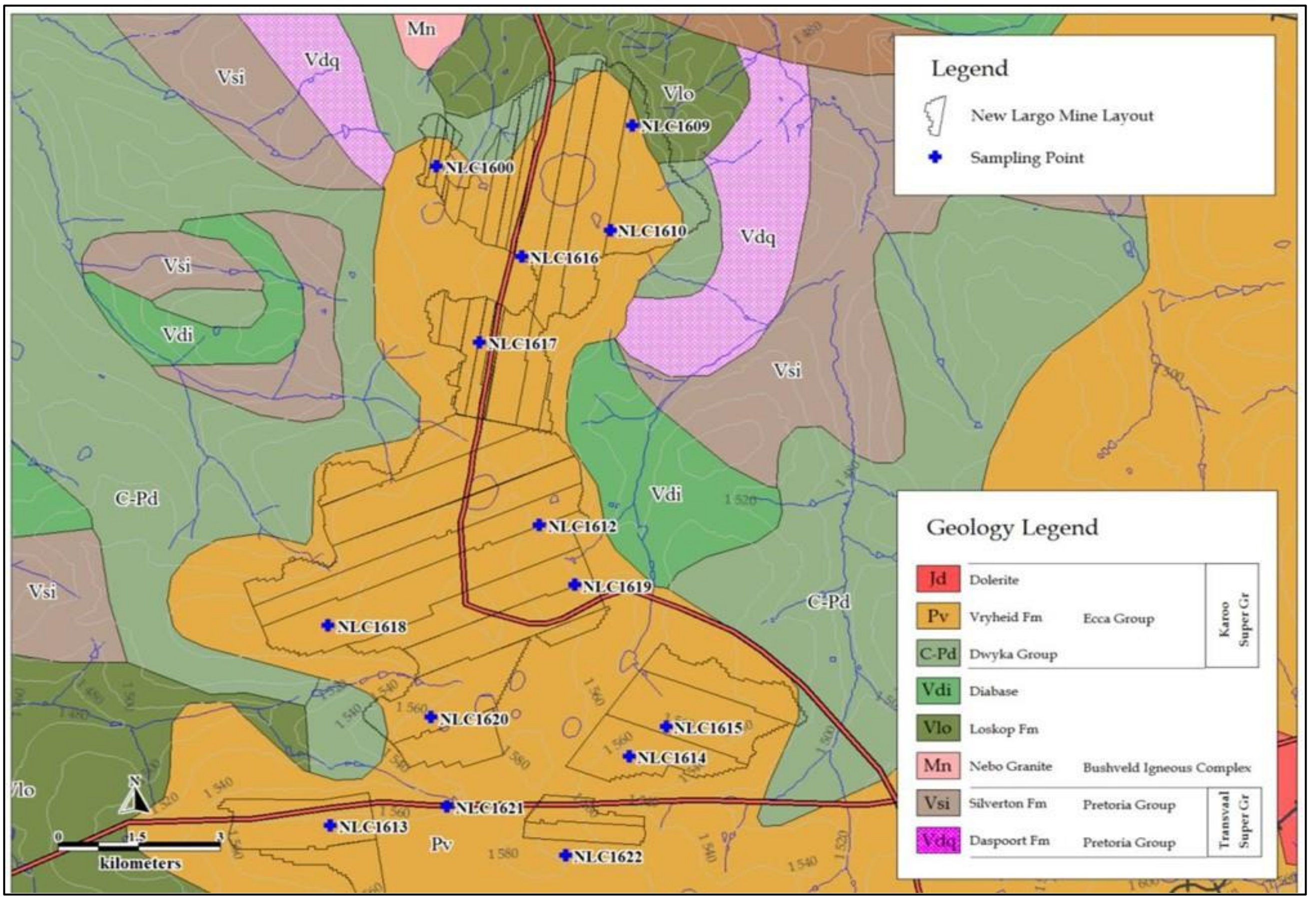

Figure 4-6 – Borehole Locations Used to Collect Geochemical Samples (Geostratum, 2011)

According to (Geostratum, 2011), 79 samples of different lithological units that were submitted for geochemical testing, were spatially distributed with the "future" New Largo open cast mine and were representative of the material for the purpose of determining its environmental geochemical character.

(Geostratum, 2011) used screening criteria as proposed by (Price et al, 1997) based on NP:AP ratio to classify the rock in terms of its potential for acid generation, and (Soregaroli et al, 1997) for samples with <0.3 % sulfide/Total sulfur that are regarded as having insufficient oxidisable sulfides to sustain long term acid generation. Material with a <0.3 %S is classified as Rock Type IV (No Potential for acid generation), and >0.3 S% is classified as Rock Type I (Likely acid generation potential).

Figure 4-7 provides the ARD classification for the 79 samples. The following conclusions were made from the Geostratum study:

- Most non-carbonaceous samples have no potential to produce acid drainage, whereas the coal and some carbonaceous shale/sandstone will generate acidic drainage over the long term.

- Table 4-5 indicates that 79% of coal will be likely/possibly acid generation. All coal seams have a substantial potential to generate acid mine drainage and coal left in the pit (e.g. uneconomical coal seams) will increase the potential of the backfill to generate acid drainage.
- The clastic rocks have a smaller potential to generate acidic drainage due to lower sulfur content with ~15% of sandstone and ~9% of the shale samples have a substantial potential to generate acid mine drainage. About 31% of sandstone and shale interlayered rock will have a substantial potential to acidify.
- Some parts of the backfill is expected to be neutral pH based on the average NP/AP=2.2 and other parts (where carbonaceous rock is dominant) will become acidic NP/AP=0.63.

The study concluded that the actual pit water quality will depend on volume of carbonaceous rock that will be present above the decant elevation (oxidation will occur) and mixing between the various rocks are present.

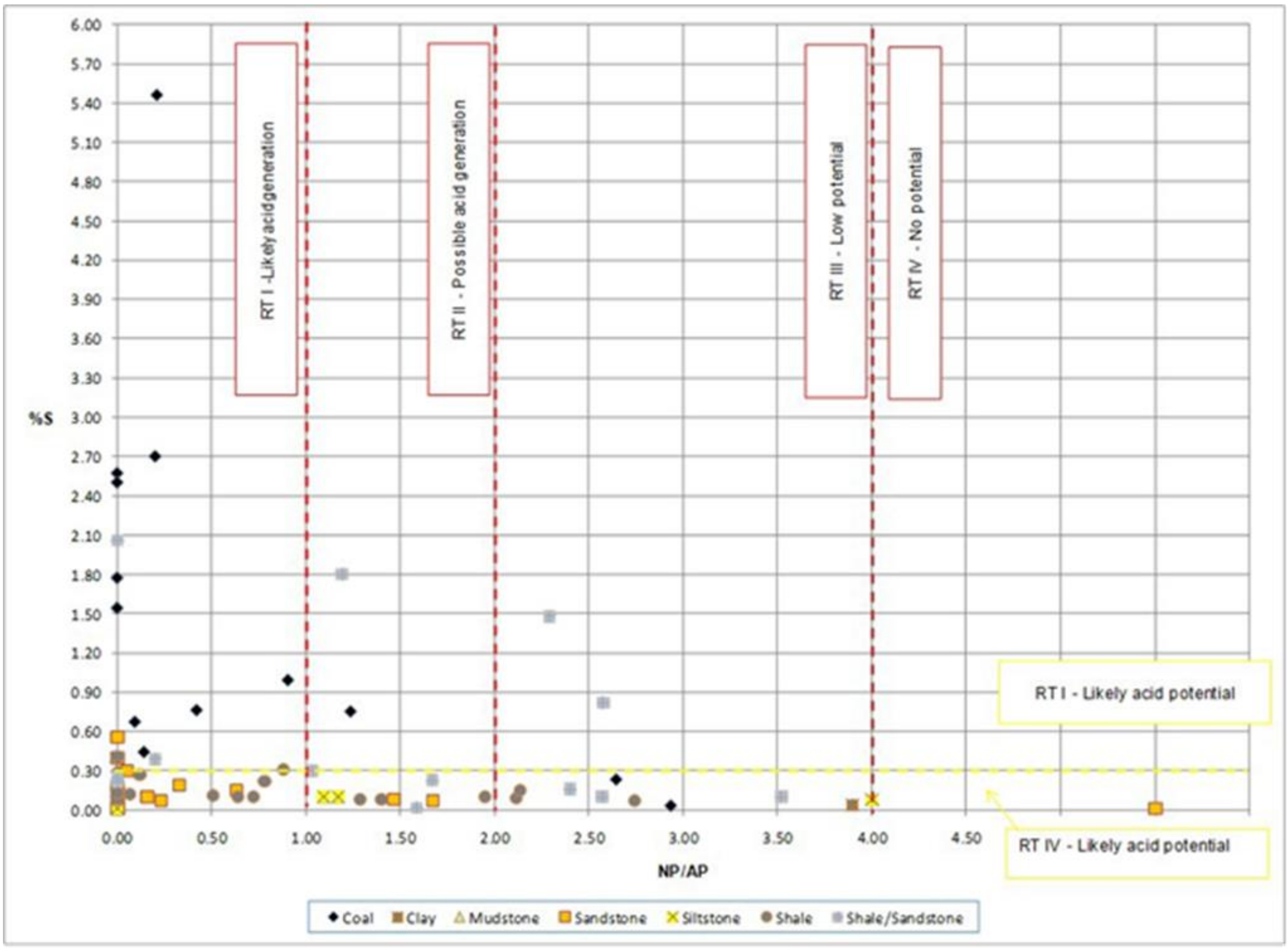

Figure 4-7 – Classification of Samples in terms of %S and NP/AP (Samples with NP/AP < 6 shown) (Geostratum, 2011)

Table 4-5 – Potential for Lithologies to Generate Acidic Drainage (Geostratum, 2011)

ARD Classification		Rock Type I > 0.3 S%		Rock Type IV < 0.3 S%	
Lithology	**No. Samples**	**Rock Type (NP/AP) I or II**	**Rock Type (NP/AP) III or IV**	**Rock Type (NP/AP) I or II**	**Rock Type (NP/AP) III or IV**
Coal	14	79	0	7	14
Sandstone	20	15	0	70	15
Shale	22	9	0	59	32
Shale/Sandstone	13	31	15	31	23
Siltstone	3	0	0	67	33
Mudstone	5	0	0	80	2
Clay	1	0	0	0	100
Potential for acid mine drainage		Likely/possibly acid generation. High salt load (Over short and long term)	Low potential for acid generation over short and long term. Low to medium salt load	Low potential for acid generation over short term. Low salt load	No potential for acidic drainage. Very low/no salt load

4.3.4 CSIR (2009)

Kinetic test work was conducted by CSIR in 2009 by shake flask kinetic tests to determine acid leaching from the coal samples over a period of two weeks.

Drainage quality parameters such as pH, acidity, alkalinity, sulfate and Fe (II) were monitored over the two- week period (CSIR, 2009). The 6 samples that were tested included:

- Seam 4 samples. 0777D-Raw coal; 0777D- Product F@1.8 and 0777D-Discard S@2.0.
- Seam 2 samples. Raw; Product F@1.8 and Discard S@2.0.

The methodology for the laboratory shake flask test involved oxidation of a 0.5 kg pulverised coal sample with 1.5 L distilled water to assess temporal variation in weathering characteristics of the sample. The tests were placed in an open Erlenmeyer flask on the shaking apparatus at room temperature. Aliquots of the liquid fraction was collected (and filtered) at regular intervals of 0, 15, 60, 120 and 420 minutes during the first day, and daily thereafter for a period of 2 weeks. The samples were analysed for pH and temperature acidity, alkalinity, sulfate and Fe (II).

The Seam 4 coal sample, raw product (float at 1.80 S.G.) and discard (sink at 2.00 S.G.) were found to leach out acid (1 750-8 550 mg/L $CaCO_3$), sulfate (1 650-7 200 mg/L), Fe (II) (28-445 mg/L) and zero alkalinity over the 2 weeks (Table 4-6). The Seam 2 samples (raw, product float at 1.80 S.G., and discard sink at 2.00 S.G.) leached out moderate acid, sulfate, Fe (II) and alkalinity concentrations.

The results also indicated that Seam 4 discard material SO_4 concentration increases over time to a maximum concertation of ~7 000 mg/L after 14 days, see Figure 4-8. The CSIR study concluded that Seam 4 samples undergo substantial pyrite oxidation in the absence of carbonate giving rise to AMD compared Seam 2 that has a surplus of NP from dissolving carbonates.

Table 4-6 - Summary of Leachate Quality from Kinetic Shake Flask Tests over 14 days (CSIR, 2009)

Material Type	Sample ID	Leachate Quality			Experiment Deductions/Notes
		Acidity	Alkalinity	Sulfate	
Coal Seam 4	0777D-Raw 0777D-Product F@1.8 0777D-Discard S @2.0	High 1 750 - 8 550 mg/L $CaCO_3$	Negligible	High 1 650 - 7 200 mg/L	pH 1.7-3.5 and Fe (II) 28-445 mg/L Indicating pyrite oxidation in absence of carbonate for test duration
Coal Seam 2	Raw	Moderate < 500 mg/L $CaCO_3$	Moderate 50 - 80 mg/L $CaCO_3$	Moderate <500 mg/L	pH ~6 (day 0 -12) increased to pH >6.5 (days 13 & 14), indicating subsequent neutralisation reactions (Ca, Mg carbonate dissolution) to buffer acidity from pyrite oxidation
	Product F@1.8			Low <100mg/L	
	Discard S@2.0			High 550 - 1 600 mg/L	

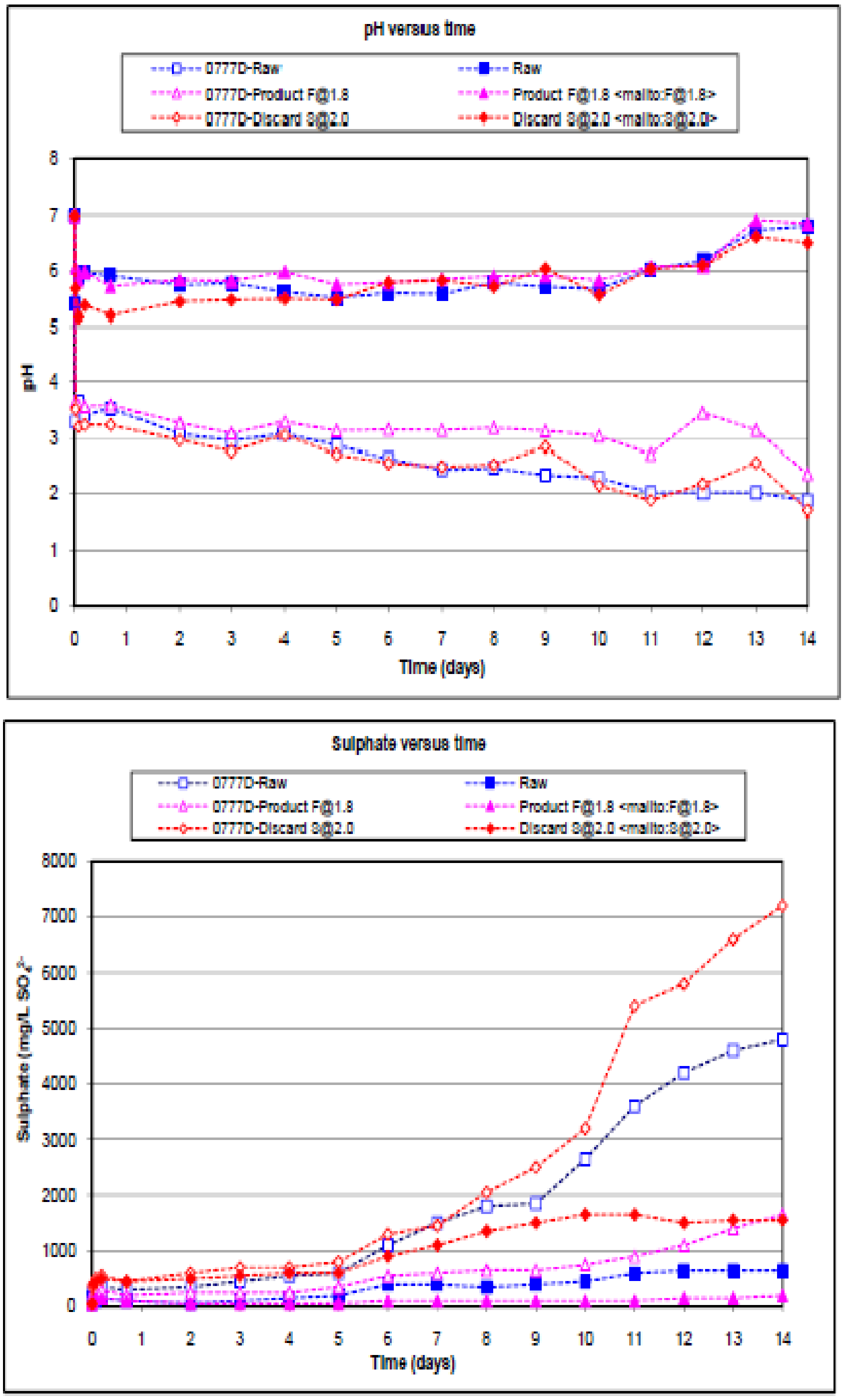

Figure 4-8 – Kinetic Shake Flask Results for a) pH and b) sulfate (CSIR, 2009)

4.3.5 AATC (2012)

Process and Metallurgy, provided in Section 6 of the Feasibility Study, provided raw coal average particle size distribution (PSD) curves (Figure 4-9) and indicates that the average raw coal has 80% particles passing 3 mm. Table 4-7 provides the PSD and Total S values for the coal sample used for coal washability test work. The slightly weathered sample was the worst coal quality in the New Largo deposit basin i.e. Seam 2 coal on the southern reserve basin associated with sub-outcrop.

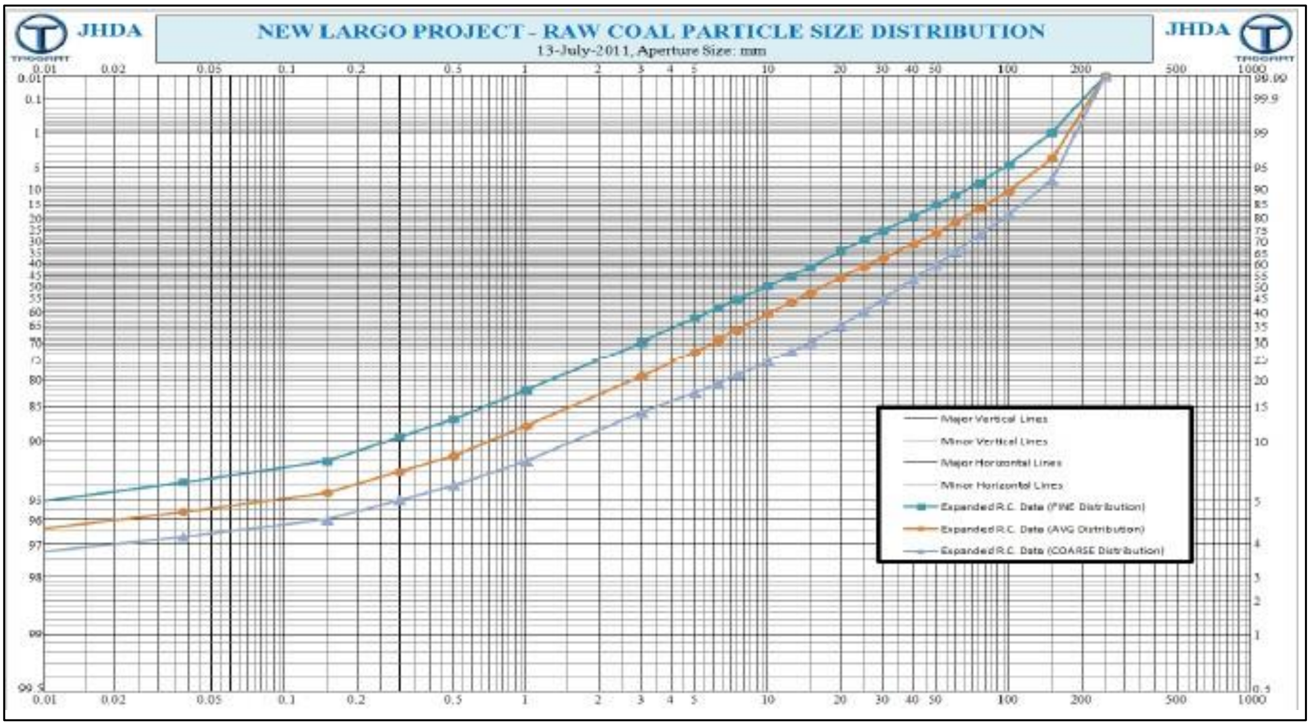

Figure 4-9 – PSD for New Largo Raw Coal (AATC, 2012)

Table 4-7 - New Largo Raw Coal Quality (AATC, 2012)

Size Fraction (mm)	CV (MJ/kg)	Ash (%)	V.M (%)	F.C (%)	S (%)
-300+150	13.6	44.1	29.1	24.8	1.4
-150+70	15.2	44.2	21.2	32.4	2.2
-70+50	15.3	43.9	20.1	33.4	1.3
-50+31.25	16.1	42.1	20	35.3	1.6
-31.25+25	15.7	42.7	18.6	36.1	0.7
-25+16	15.7	42.8	17.9	36.8	0.6
-16+12.5	15.4	43.3	17.8	36.6	0.4
-12.5+6	16.5	40.7	17.9	38.9	0.4
-6+3	16.6	39.9	18.1	39.5	0.3
+3-1	17.3	36.9	18.3	41.9	0.3
+1-0.85	16.7	37.2	18.5	40.6	0.3
-0.85	15.45	43.8	17.1	26.2	0.35

Simulations of the plant washing process was conducted by (AATC, 2012) for three variables which include: fractions size, contact time and water to coal ratio to determine the residual acidity generated. The New Largo bulk sample DMS pilot plant results is indicated in Table 4-8 (highlighted). It was concluded that bulk sample (S=0.88%) should be blended with either Seam 2 or 4 to achieve product quality of 18.80 MJ/kg.

Table 4-8 - New Largo Raw DMS Pilot Tests (AATC, 2012)

New Largo Bulk Sample LIMN Simulation Results (Cumulative)											
DMS D50	**1.3000**	**1.4000**	**1.5000**	**1.6000**	**1.7000**	**1.8000**	**1.9000**	**2.000**	**2.1000**	**2.2000**	**Raw Coal**
Yield %	42.35	44.39	45.39	52.88	61.86	74.25	83.10	87.78	90.30	91.74	100.00
Ash %	40.28	39.23	38.82	36.90	36.17	36.84	37.96	38.76	39.38	39.78	42.04
CVMJ/kg	16.46	16.88	17.04	17.80	**18.10**	17.87	17.48	17.17	16.92	16.78	15.83
S%	0.33	0.34	0.35	0.41	0.52	0.60	0.63	0.64	0.64	0.65	0.88
IM%	2.73	2.75	2.75	2.77	2.75	2.71	2.69	2.67	2.66	2.64	2.52
Vol%	17.88	18.28	18.43	19.14	19.51	19.54	19.29	19.12	19.02	18.96	19.38
FC%	39.11	39.74	39.99	41.18	41.55	40.87	40.02	39.40	38.90	38.57	36.05

Furthermore, (AATC, 2012) feasibility report documents kinetic column characterisation results as conducted by CSIR. This study was a follow up study of the CSIR (2009) six kinetic shake flask studies (Section 3) that concluded that Seam 4 samples tested leached out substantial acidity, whilst samples from Seam 2 seam leached out substantial alkalinity. Therefore, the (AATC, 2012) study assessed the possibility of utilising the Seam 2 surplus NP to neutralise Seam 4 acidity by blending the coal samples.

Thirty-six (36) samples of different fraction sizes (100-30 mm; 30-3 mm; 3-0.15 mm and 0.15-0 mm) were prepared from Seam 4, a 50-50 mixture and a 70-30 mixture of Seam 2 & 4 samples to generate raw, product and discard were received from Anglo Coal Central Laboratory (ACCL). The 70-30 sample was based on the coal resources available in the two seams. The sample fractions / mixtures investigated included:

- 50-50 mixture of Seam 2 & 4.
- 70-30 mixture of Seam 2 & 4.
- Seam 4 samples to give raw, product and discard samples for each fraction size.

Leaching was carried out in PVC columns ranging in size from 9 cm diameter by 45 cm high (small columns) up to 18 cm diameter by 90 cm high (big columns). The leachate collected after 1 minute and at 5-minute intervals before analysing for parameters of interest; pH, acidity, alkalinity, SO4 and Fe (II) for fraction sizes 100- 30 mm; 30-3 mm, 3-0.15 mm and 0.15-0 mm. The leaching for the fraction 0.15-0 mm was conducted over 150 minutes, with sampling of leachate at 10 min, 30 min, 60 min, 90 min, 120 min and 150 min. The recommended water: coal ratios for each particle size based on Brian Watters recommendations is as follows:

- 100-30 mm - 2:1 water: coal ratio, time spent with water 1.5 min.
- 30-3 mm - 5:1 water: coal ratio, time spent with water 4.5 min.
- 3-0.15 mm - 10:1 water: coal ratio, time spent with water 21.5 min.
- 0.15-0 mm - 30:1 water: coal ratio, time spent with water 141.5 min.

The larger fraction sizes with lower surface area was expected to generate alkaline/higher pH. However the pH results (Figure 4-10 and Figure 4-11) were unexpected and indicated the that as the water to coal ratio increases, the pH of sample aliquots collected from the columns increased and that dilution effects found to be less significant compared to surface area effects. From Figure 4-10 (C), the pH for coal fraction sizes 100-30 mm and 30-3 mm were acidic pH (3.5-4.0 and 5.5-7.5) for the Seam 4 discard. The relative influence three major variables, coal fraction size, time spent with water and water to coal ratio was deemed to be significant.

From the previous (CSIR, 2009) kinetic shake flask study, Seam 4 generated pH of 1.70-3.5 over a 2 week study period for a 3:1 water to coal ratio using sample size of 75 m. Based on the pH results and other water quality parameters, it was concluded that Seam 4 is acid generating.

For this study, (AATC, 2012), substantial changes in parameters such as fraction size, water to coal ratio and washing time have significantly changed the trend of data compared to the previous study (CSIR, 2009). Hence, the coal fraction sizes 100-30 mm and 30-3 mm for 4 seam- raw and the 100-30 mm and 30-3 mm for Seam 4 discard have pH values suggesting acid generation potential. However, all coal fraction sizes for the Seam 4 product have pH values > 4.5 and are not likely to generate substantial acidity during washing.

Based on the 2012 column test results, acidity generation was found to have potential significance in coal fraction sizes 100-30 mm and 30-3 mm compared to coal fraction sizes 3-0.15 mm and 0.15-0 mm over the washing period used. Although the data is unexpected based on surface area considerations and suggests that dilution effects become more significant as the water to coal ratio changes from 2:1; 5:1; 10:1 and 30:1 for the coal fractions 100-30 mm; 30-3 mm; 3-0.15 mm and 0.15-0 mm respectively. Overall, the acid generation potential for the 36 samples is not as significant as previously reported for Seam 4.

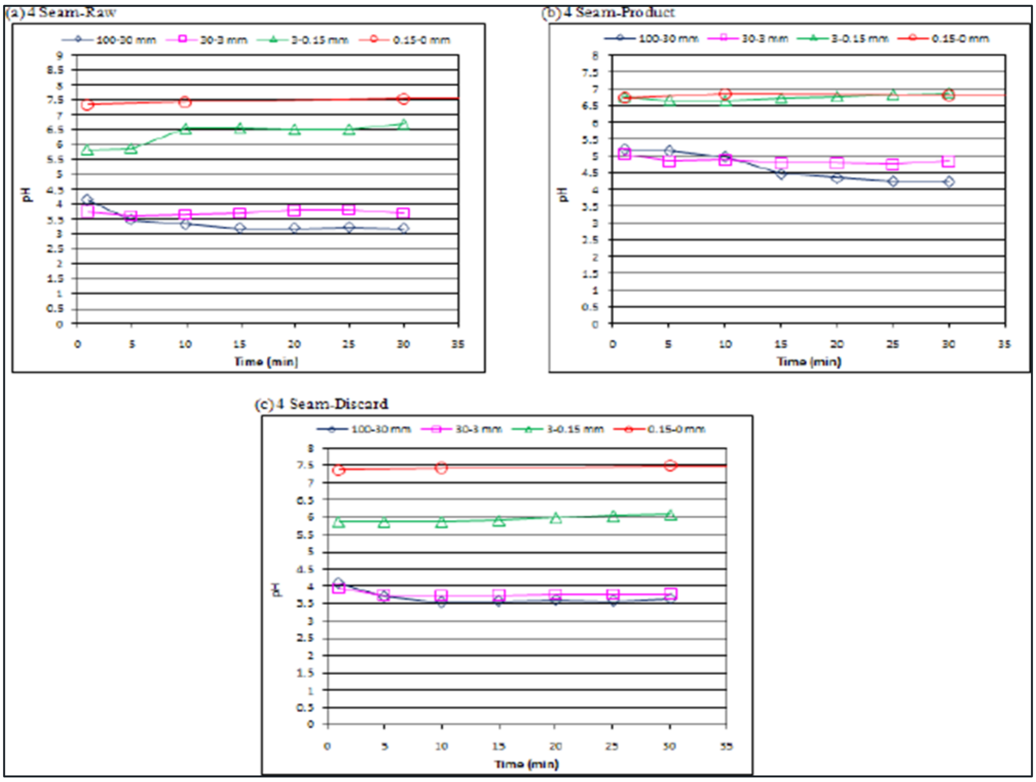

Figure 4-10 – pH versus Time for Seam 4 Coal and Discard (AATC, 2012)

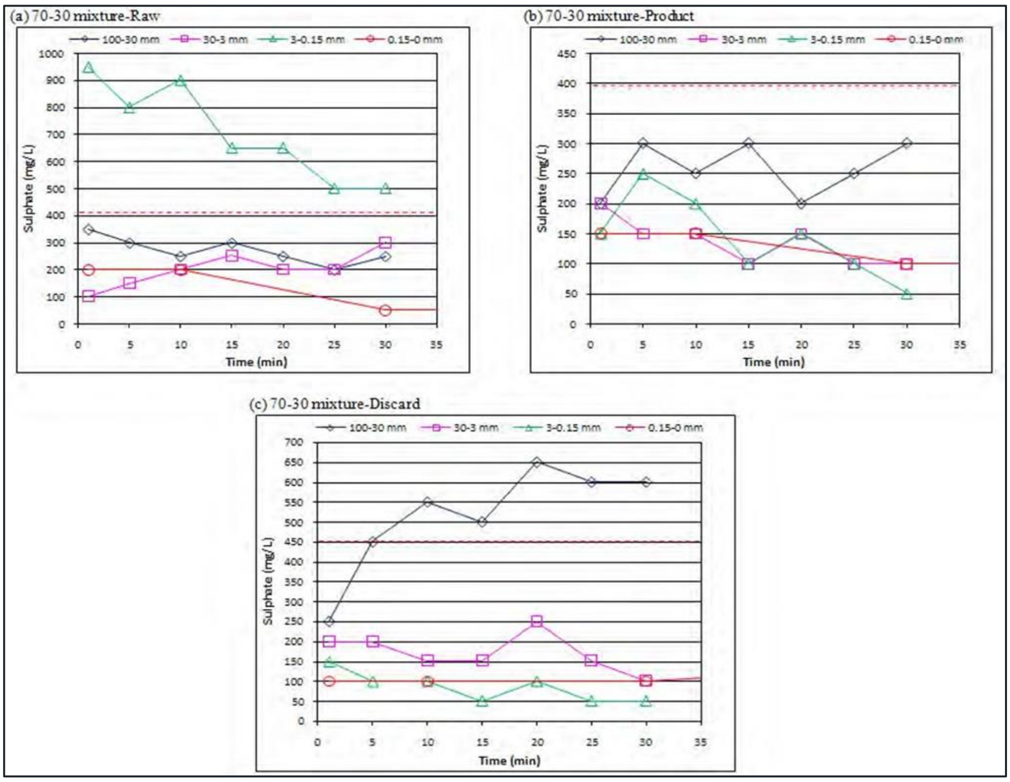

Figure 4-11 – pH versus Time for Blended Seam 4 and Seam 2 (AATC, 2012)

4.3.6 SERITI (2017)

Coal washing tests work was conducted on for different blocks for a wash density of 1.5 to 1.85 cut point RD (Seriti, 2017). According to Seriti these blocks were ran on 2017 Kusile Coal Quality Spec (Seriti email communication, 02 August 2019), The coal/ash sulfur values (CSU) for Seam 4 &2 are presented in Figure 13. The average and maximum CSU values is 0.89 % and 4.0 % for Seam 4, and 0.46 % and 4.8% for Seam 2.

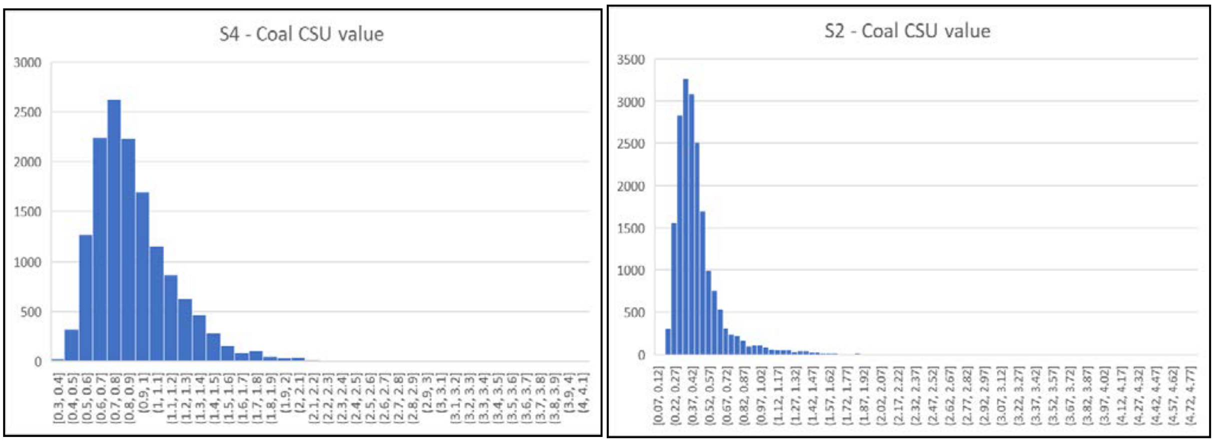

Figure 4-12 – Sulfur Values (CSU) from 2017 Coal Wash Test (Seriti, 2017)

4.3.7 GOLDER (2009)

The estimated sludge produced by the pre-treatment and desalination of the excess mine water is based on the treatment process design which was done during the 2009 Prefeasibility study (PFS) by Golder Associates and Keyplan (Golder, 2009). A summary of the waste sludge production estimates is given in Table 4-9. The sludge production is based on the treatment of a poor water quality, similar to the post closure water quality. It is not anticipated that the different sludge streams produced will be separated. The combined sludge stream (moisture content ~29%) will be predominantly gypsum sludge (~ 61%) and 0.29% SiO_2. It was assumed that the combined sludge produce by the plant will have a hazard rating of 2, according to the Department of Water Affairs' Minimum Requirements.

No brine stream is anticipated to be produced. The estimated sludge production assumes that mine water pre- treatment and desalinated treatment would take place on the site of the New Largo Mine.

Table 4-9 - Combined Dewatered Sludge Flow (Golder, 2009)

Planning Year	Treatment Plant Flow (m3/d)	Sludge Solids (t/h)	Sludge Cake Flow (m^3/h)	Sludge Cake Volume (m^3/d)
2015	4 000	1.3	2.1	51
2021	8 000	2.6	4.2	102
2026	12 000	4	6.4	153
2031	16 000	5.3	8.5	204
2041	20 000	6.6	10.6	256
2049	24 000	8	12.8	307

4.3.8 GOLDER PFS (2011)

The following conclusions and recommendations were made for the PFS mine water managements and New Largo Water Reclamation Plant (NLWRP) (Golder, 2011):

- Go-Forward Case

The selected Go-Forward Case is treatment and discharge to the Saalklapspruit and supply of potable water to Phola/Ogies as a later refinement to the project. The selected water treatment technology for the first phase of the NLWRP is based on membrane desalination. Ion exchange (IX) treatment required investigation during feasibility studies (trails and a demonstration plant recommended).

- Water Management

Initially, the North Mine will be mined, and excess water will be pumped from the pit. The annual water make from the North Mine will stabilise at approximately 6.7 Ml/d. The South Mine old workings (Seam 2) will be dewatered (Figure 4-13) before mining can commence in that area.

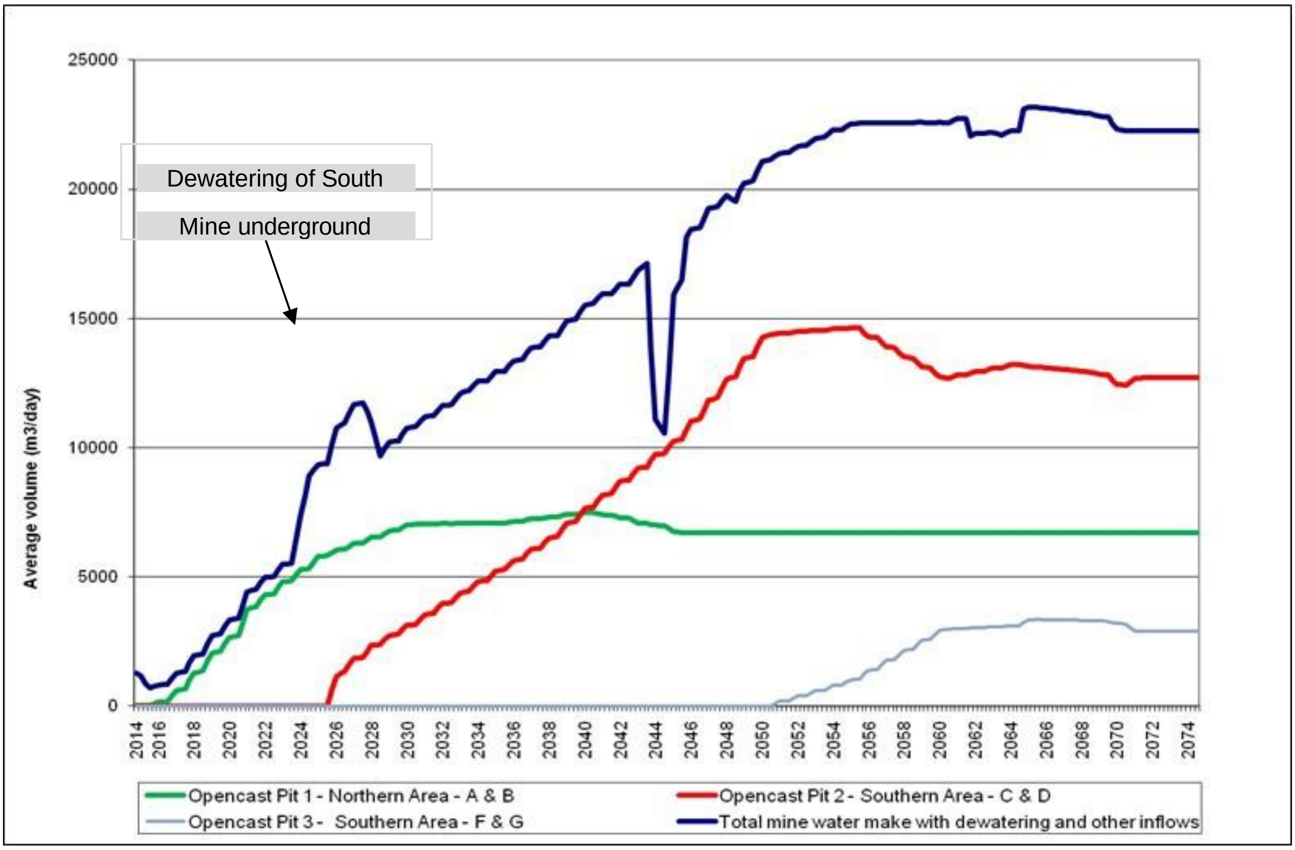

Figure 4-13 – Mine Water Make for the North Mine, South Mine, Far South Mine and Total Mine (Golder, 2011)

According to the study, the estimated stored volume of water in old underground workings is 2.19 million m^3 in Seam 2 and 5.1 million m^3 in Seam 4. As the area is mined, the rate of water makes from the South (central section) will increase and stabilise at 12.7 Ml/d after closure. The far southern portion that will be mined thereafter (year 2038) will add to the overall water make and will stabilise at 3 Ml/d after closure. The total water from New Largo Colliery at closure is estimated at approximately 22.3 Ml/d.

The optimisation of balancing storage dam size, in-pit storage, and emergency water discharge to the environment was recommended by Golder during feasibility studies.

- Water Treatment Technology:

Confirmation of the waste types (volumes & quality) produced was required. Golder indicated that based on the Go-Forward case the final water quality may prove difficult to achieve no brine.

- Potable water treatment:

The NLWRP first phase/ initial technology selected for potable water use at the mine, is based on RO-membrane treatment since the process is proven and the brine production is limited.

- Water Quality:

Groundwater collected from the project area (Table 4-10) indicated variance in mine water qualities based on exposed to air and contact with different stratigraphic/ lithology rock units.

Table 4-10 - Water Qualities from Boreholes Sampled During 2009

Parameter	Units	North Mine Water Quality		South Mine Water Quality
		BH03	BH04	M04 (Old Workings)
Temperature	°C	22.3	22.2	22.5
pH		5.7	5	7.7
Electrical Conductivity (EC)	mS/m	3.97	15.4	290
Suspended Solids	mg/L	10	0.0	0.0
Total Dissolved Solids (TDS)	mg/L	40	110	3 309
Ammonia (NH_3^+)	mg/L	0.0	0.0	0.06
Phosphate (PO_4^{3-})	mg/L	0.01	0.0	0.06
Chloride (Cl^-)	mg/L	3.9	3.7	3.7
Sulfate (SO_4^{2-})	mg/L	15.1	58.9	2 130
Aluminum (Al^{3+})	mg/L	1.29	0.01	0.0
Calcium (Ca^{2+})	mg/L	1.97	11.7	568
Iron (Fe)	mg/L	0.19	0.06	0.13
Potassium (K^+)	mg/L	0.00	0.01	0.0
Magnesium (Mg^{2+})	mg/L	0.95	5.70	196
Manganese (Mn)	mg/L	0.08	0.09	2.4
Sodium (Na^+)	mg/L	1.4	3.6	32

Predicted mine water qualities by JMA Consulting in 2012 (Table 4-11) were based on borehole samples, ABA and leachate results for the period prior to 2027, including dewatering of North Mine and initial dewatering of old underground workings in the South Mine.

Table 4-11 - Basis of Design Water Qualities for Desalination – Prior to 2027

Water Quality Variable	Units	Predicted Water Quality – Prior to 2027 (JMA, 2012)	Design Water Quality – Prior to 2027
pH		6.0 – 7.5	5.0 – 7.5
Acidity as $CaCO_3$	mg/L	0	0 - 300
Suspended Solids	mg/L	100	100
Total Dissolved Solids (TDS)	mg/L	800	1 000
Nitrate (NO_3)	mg/L	2.5	2.5
Calcium (Ca^{2+})	mg/L	35 - 110	300
Magnesium (Mg^{2+})	mg/L	15 - 65	1 501
Fluoride (F^-)	mg/L	0.8	0.8
Sodium (Na^+)	mg/L	15 - 60	80
Potassium (K^+)	mg/L	5 - 20	20
Sulfate (SO_4^{2-})	mg/L	< 200	360
Chloride (Cl^-)	mg/L	80*	100*
Total Alkalinity as $CaCO_3$	mg/L	180 - 450	20 - 450
Silica (Si)	mg/L	10	10
Iron (Fe)	mg/L	<10	<10
Manganese (Mn)	mg/L	<10	<10
Aluminium (Al)	mg/L	<10	<10

Notes: * Ionic balance adjustment

The deterioration of the mine water qualities (post 2027) when mining commences at the South Mine was predicted by JMA (Table 4-12). The following assumptions were made in predicting the operational phase water qualities from the North Mine, South Mine and underground dewatering and the design water qualities:

- Partial in-pit storage in the North Mine for the area covered by Dragline No. 1.
- Progressively total water increasing make of 4 100 – 11 500 m^3/day (2027-2044).
- Dewatering of the old underground workings at a rate of 3.5 Ml/day and at an average TDS of 1 100 mg/L for 4 years. This will influence the quality for a limited period only.
- Nett neutralization potential of shallower sandstone/siltstone units and massive bioturbated sandstone units will be depleted around 2035.
- Storage of water in all potential storage areas covered by Dragline No. 2.
- Progressively increasing total water make for the South of 1 500 – 13 000 m^3/day (2030-2070).
- Complete depletion of Neutralization Potential after 2045.

Table 4-12 - Basis of Design Water Qualities for Desalination – South Mine or Combined North/South Plant – Operational Phase post 2027

Water Quality Variable	Units	Predicted Water Quality – Post 2027	Design Water Quality – Post 2027
pH		4.0 – 5.5	3.5 – 5.5
Acidity as $CaCO_3$	mg/L	300	300
Suspended Solids	mg/L	100	100
Total Dissolved Solids (TDS)	mg/L	1 500 - 2600[1]	3 300[2]
Nitrate (NO_3)	mg/L	2.5	2.5
Calcium (Ca^{2+})	mg/L	220 - 400	500
Magnesium (Mg^{2+})	mg/L	120 - 200	250
Fluoride (F^-)	mg/L	0.8	0.8
Sodium (Na^{2+})	mg/L	80 – 120	120
Potassium (K^+)	mg/L	35 – 45	45
Sulfate (SO_4^{2-})	mg/L	700 – 1 100[1]	2 200
Chloride (Cl^-)	mg/L	80[1]	100
Total Alkalinity ($CaCO_3$)	mg/L	0	0
Silica (Si)	mg/L	10	10
Iron (Fe)	mg/L	> 5	10
Manganese (Mn)	mg/L	> 3	10
Aluminium (Al)	mg/L	10	25
Total Organic Carbon (TOC)	mg/L	TBD	TBD
Chemical Oxygen Demand (COD)	mg/L	TBD	TBD

Notes: [1]Ionic balance adjustment, [2]Calculated, TBD – To be determined

Additional water quality data to define the organic content e.g. total organic carbon (TOC) and organic carbon content and microbiological data was required to prevent biofouling of the RO membranes.

- Waste Facility

A preliminary, first order assessment of the waste facility requirements needed to deal with the waste streams from the proposed WRP at New Largo Colliery indicated sizing, phasing and methodology of disposal of the sludge waste disposal facilities to be constructed. A formal site selection process was recommended for the feasibility study (FS).

The sludge produced from the water treatment process is based on the post-closure type water quality that is of poor quality and conservative since lower sludge production rates is anticipated earlier during the LOM. The design of the sludge facility liner based on the waste produced from predicted excess mine water needed to be reviewed during FS.

Alternative sludge handling and disposal options recommended to be investigated during the Feasibility Study included; in-pit co-disposal with discard material; utilisation of the sludge as rehabilitation material during mine rehabilitation for closure and sludge marketability and selling as a valuable by-product/ beneficial use of Gypsum sludge as a resource.

Low chloride and sodium levels required in excess mine water to be discharged is expected to result in waste brine from the membrane treatment plant, implying brine pond(s) required for the disposal of brine. Alternative water treatment technologies, alternative brine reduction techniques and pilot trails to eliminate/minimise brine waste stream and reduce post-closure liabilities was recommended by Golder.

4.3.9 JONES & WAGNER (2013 & 2014)

Jones and Wagner (J&W) conducted the baseline surface water quality as part of the Environmental Impact Assessment (EIA) and subsequent annual monitoring in 2013 (one sampling event during low flow conditions) and 2014 (sampled during low and high flow conditions in March and August 2014). The following was noted on water quality:

- Surface water quality in and the ecological integrity of the Wilge River catchment is generally better than in the Saalklapspruit catchment. Within the Wilge River catchment, an existing impact has been observed upstream from the New Largo project at NL1 and NL2. This is attributed to mining activities in the upper reaches of the catchment. The water quality downstream of the New Largo mine area in the Wilge River is generally of better quality than upstream.
- The high levels of sulfate measured at NL4 on the Klipfonteinspruit (Figure 4-14), a tributary of the Wilge River and upstream points NL1 and NL2, showed poor water quality associated with mining related activities since baseline monitoring commenced in October 2010. Improvement in the water quality was noted since April 2012 and was attributed to uncontrolled decant from the underground workings of the old (closed) New Largo Colliery reporting to the Klipfonteinspruit that has greatly reduced and is no longer present.
- The large pan on the farm Klipfontein 566 JR (Pan 2) had an EC level of 298 mS/m and sulfate concentration measured as 1 983 mg/L during October 2013. This pan has been used for the storage of water pumped from the old underground workings and therefore poor water quality typical of impacted mine water is expected.
- Both the pan systems reflect impaired conditions following the November 2013 survey. The Honingkrantz pan, which was previously considered in a relatively un-impacted state. The pan was dry during the October 2013 surface water quality sampling. Adjacent sand mining activities therefore has a substantial impact on this pan.
- At the furthest downstream point, NL9, which is representative of the cumulative impact up to that point in the sub-catchment, the sulfate level is slightly elevated above the RWQO (minimum of 18.74 mg/L, maximum of 94.41 mg/L and an average of 49.77 mg/L).
- Majority of the surface water samples in the Wilge River catchment show a Ca-HCO_3 character, typical of fresh water with exception of Pan 2 which shows a Ca-SO_4 character that is typical of impacted water from the coal mining area. This pan has been used for the storage of water from the old underground workings, which explains the characteristics of the water.

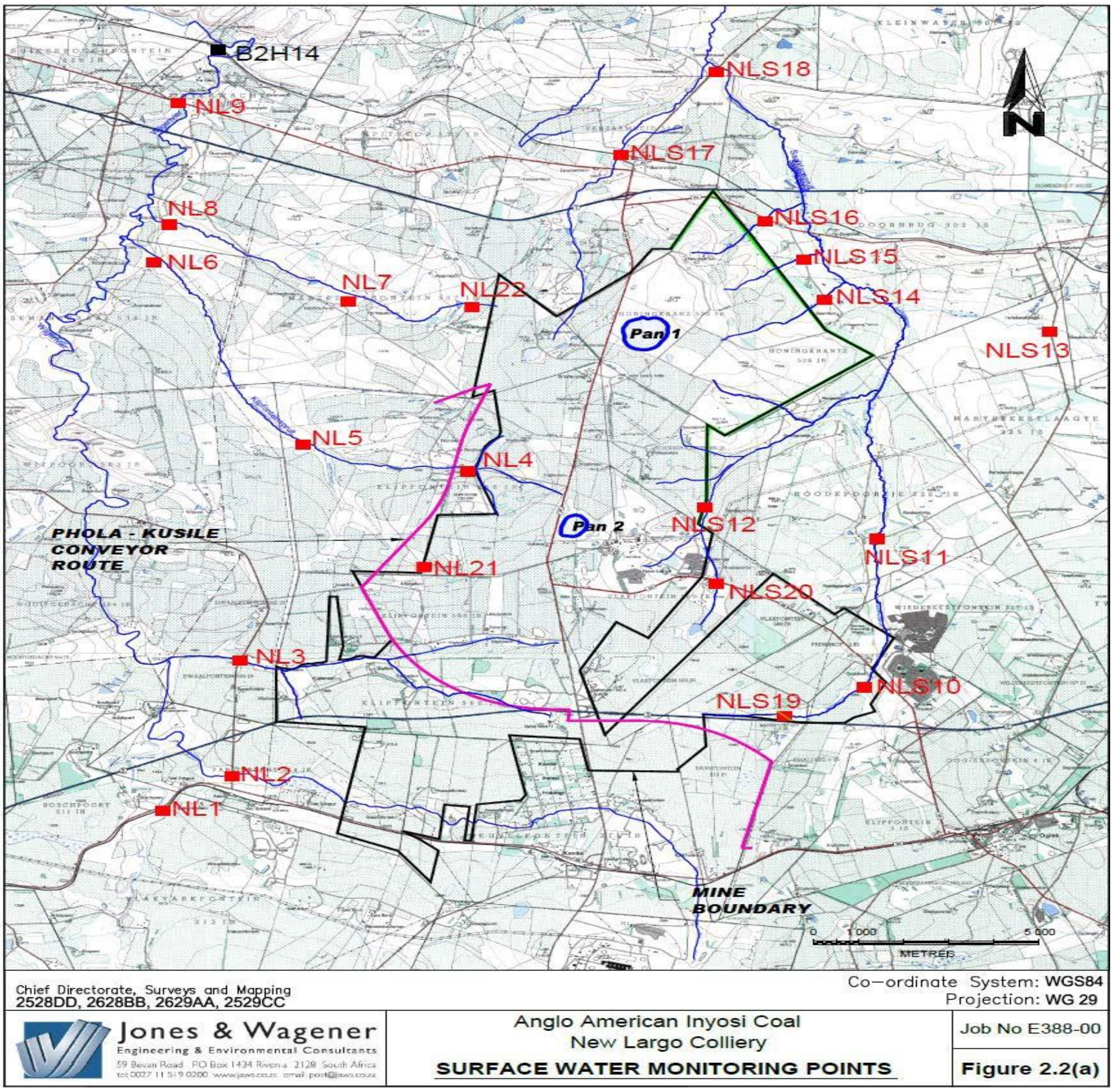

Figure 4-14 – Surface Water Monitoring (J&W, 2014) Indicating Two Large Pans Pan 1 (Located on the Farm Honingkrantz 536 JR) and Pan 2 (Located on Farm Klipfontein 566 JR) (J&W, 2013 and 2014)

4.3.10 GOLDER BFS (2019)

A Geochemistry specialist report was compiled by (Golder, 2019) in support of a bankable feasibility study. The contents of the report, in terms of the documented historic review forms part of the current study. The report highlighted mine residue material characteristics, mine water quality predictions and mine water management for New Largo project. Additionally, a preliminary waste classification and assessment was conducted on New Largo coal material (based on available data) and was included in the report.

The following were concluded from the study:

- Material Movement:
  - The 2012 EIA stated that spoils (overburden/interburden) from the box-cuts will be placed on an overburden stockpile to the west of the mining operation. After the initial box-cuts, spoils will be rolled-over.

- The total estimated discards generated is 74 116 308 Mt based on an average of 1.6 million tons/a and is less than the ~94 Mt anticipated for the 2012 feasibility study. A small discard dump is intended for placement of the discard material due to in-pit space constraints, and until the two designated backfilled sections of pit becomes accessible.
- Coal Wash Plant process design is based on the coal, product and discard material quality generated for the 2012 feasibility study that meets the revised Kusile /Eskom coal specifications. Therefore, the available characterisation results for New Largo residue materials (spoil and discard) is valid.
- Approximately 79% of coal was classified as likely/possibly acid generating. Coal left in the pit (e.g. uneconomical coal seams e.g. Seam 1/3/4A/5) and adjacent carbonaceous units will increase the potential of the backfill to generate acid drainage (local acidic drainage from the backfilled spoils).
- The combined sludge waste stream produced by the pre-treatment and desalination of the excess (poor) mine water will be predominantly gypsum sludge (~ 61%) and 0.29% SiO_2 with a moisture content of ~29%).

▪ Material characteristics

- The average particle size distribution of the raw coal indicated 80% passing 3 mm.
- Minerology results indicated the pyrite proportions in the coal seam and carbonaceous shale sample tested ranging from 0.14 to 7.6%.
- The calcite and kaolinite are expected to contribute to the NP of the coal and carbonaceous shale samples. The mineralogical results confirmed the presence of calcite (0.1 to 10%), and trace to minor amounts of siderite (0.15 – 5.5%) in the coal/ carbonaceous shale samples. The ANP depletion rate of the neutralising minerals needs to be confirmed by kinetic tests to determine the onset of acidity.
- The clastic rocks have a smaller potential to generate acidic drainage due to lower sulphur content with ~15% of sandstone and ~9% of the shale samples have a substantial potential to generate acid mine drainage. 31% of sandstone and shale interlayered rock will have a substantial potential to acidify.
- Some parts of the backfill is expected to be neutral pH based on the average NP/AP=2.2 and other parts (where carbonaceous rock is dominant) will become acidic NP/AP=0.63.
- Nett Acid Generation (NAG) pH for coal/carbonaceous shale samples ranged between 1.90 and 6.10 (average NAG pH = 2.64), implying a risk of acidic drainage in the long-term.
- Based on the coal/ carbonaceous shale NAG results, the following parameters are leachable at concentrations exceeding DWAF (1996) criteria and the Saalklapspruit objectives:
  – Saalklapspruit. pH (acidic), SO_4^{2-}, TDS, Al, Ca, Fe and Mn.
  – Aquatic AEV. pH (acidic), Al, Ca, Fe, Mn, Cu, Fe, As (WT Seam 2 sample only).
  – Domestic acceptable water quality. pH (acidic), Al, Mn, Fe and Zn.

A summary of the key ABA parameters and findings for the New Largo coal, spoils and discard materials based on the previous characterisation results is summarised below:

- Coal
  – Seam 1 /pit floor: One sample with Total S =0.45% that classified as PAG since NPR calculated as 0.45 (<1).

- Seam 2 Coal: Total S content ranged from 0.10 to 2.89 %. The Seam 2 coal has TNPR ratios of 0.03 to 5.5 and paste pH circum-neutral (paste pH 4.4-7.9) except for one sample with acidic paste pH. Seam 2 coal has likely ARD potential predominantly (46 % or 6 of 13 samples) whist the remaining classifies as Non-PAG.
- Seam 4 Coal: Total S and Paste pH ranged from 0.23 to 2.7 %S and pH =3.4 to 7.4 respectively. Seam 4 coal is predominantly acid generating (86% with likely ARD potential).
- Coal Seam 4A (Total S =1.1%) classified as PAG due to TNPR<0.01.
- Seam 3 Coal: Total S content ranged from 0.76 to 2.7 %. The Seam 4 coal has TNPR ratios of <0.01 to 0.42 and paste pH circum- neutral (paste pH 4.49 -6.5) All four sample (100%) classify as likely ARD potential
- Seam 5 Coal: Total S ranged from 0.29 to 1.7 %S and pH =5.0 to 6.1 respectively. Both samples are likely acid generating based on TNPR <0.01.

- Spoils
  - Non-carbonaceous shale: Sulphide sulphur content ranged from 0.05 to 0.40% Total (overburden/ (Bulk) NP ranges from <0.1 - 10 kg$CaCO_3$ eqv/tonne. Predominantly Non-PAG (99% of the interburden) 23 samples) due to low total S and average paste pH of pH 6.6.
  - Carbonaceous shale/sandstone: Low to likely potential to generate acidic drainage due to varying total S (0.05 - 1.9%S). Bulk NP = 0.02 kg$CaCO_3$ eqv/tonne resulting in TNPR ranging from <0.01 to 4.0. Five (5) of 11 samples classified as PAG. ARD and ML potential expected to be, as a lower than that of the coal material.

- DMS Plant Discard
  - Seam 2 discard: Initial batch kinetic pH was mildly acidic (pH~5.5) and increased to pH 6 (day 9) and pH 7 on the final day (day 14 indicating available neutralising minerals (calcite) in the sample to buffer acid generation from pyrite oxidation Alkalinity. Fe and sulphate concentrations (day 2 to day 14) ranged from 30-80 mg $CaCO_3$ eq/L. 28-69 mg Fe/L and 500-1600 mg SO4/L respectively.
  - Seam 4 discard: Acidic pH range (pH = 3.5 to 1.7) observed from the over 2 weeks indicated acidity is realised in the short-term term for the unblended Seam 4 discard material. Leached acidity, Fe and sulphate concentrations (day 2 to day 14) ranged from 1 400 to 8 550 mg/L $CaCO_3$ equiv. 28-445 mg Fe/L and 600-7 200 mg SO4/L.
  - Seam 4 and Seam 2/4 discard mixtures: Small (9 cm x 45 cm) and large (18 cm x 90 cm) column tests at various contact time, and water to coal weight ratio indicated Seam 4 is acid generating (pH ~4.5). The 50:50 Seam 2 and Seam 4 mixture follows the same trend as Seam 4 with no evidence that alkalinity from the Seam 2 portion of the mixture is realised. The pH ranges for the 50-50 mixture coal fractions for raw, product and discard were recorded as 3.0-8.5. 4.0-8.5 and 4.0-7.5 respectively
  - The 70-30 raw coal and product mixture had slightly elevated pH values for the 100-30 mm and 30-3 mm fractions implying increased in alkalinity available from Seam 2. The pH ranges for raw, product and discard during the column washing were 4.0-8.5. 5.0-9.0 and 3.0-7.5 respectively. The 70-30 mixture-discard for 100-30 mm and 30-3 mm size fractions had acid pH range (pH = 3.0-4.0).

- Summary of the preliminary waste classification and type (based on peroxide leach results):

- The sludge waste streams, and combined sludge produce by the plant has been classified as hazard rating of 2 according to DWAF (1996) and based on major chemical constituents (Golder, 2012).
- Coal classified non-hazardous (preliminary classification) based on the low leachable concentrations (peroxide leach results) for Seam2/4 coal, for major metals and metalloids. Non-hazardous classification assumed for New Largo discard materials.
- Coal and discard materials are assessed as Type 3 waste based on As; Ba; Ca; Cu; Ni; and Pb exceeding TCT 1 thresholds, and TDS; As, Cd; Cr; Mn; Ni; Pb; and SO_4^{2-} exceeding LCT 0 thresholds.
- Based on the available data form New Largo and Golder's experience with Highveld coal discard, it is likely that New Largo discard will be Type 3.

5 FIELD AND LABORATORY PROGRAMME

The geochemical characterisation of the sampled materials involved the material characterisation together with static tests, that were used to develop preliminary and final source terms for the pits at New Largo. The kinetic test was recommended to determine the long-term reactivity and leachability of the in-pit discard.

5.1 SAMPLING

Samples of coal discard and destoning rejects were collected by the New Largo personnel from the 19th to 21st of February 2024. These comprised the following residues:

- Genet destoning plant (air plant) rejects: three discrete samples, composited into sample SNL-Deston-CD-01.
- Welgelegen dense medium separation (DMS) plant (wet coal washing plant) coal discard: 3 discrete samples, which were composited into sample SNL-Welge-CD-01.
- Phola DMS plant dewatered coal discard from mixed Klipspruit and New Largo coal: 3 discrete samples, composited into sample SNL-Ph-CD-01.

5.2 STATIC TESTING

The composite samples were submitted to an accredited laboratory for static tests including Acid Base Accounting (ABA) and Net Acid Generation (NAG) tests which gives an indication of the overall potential for generation of acidic leachate and determines the balance of acid generating and acid neutralising capacity of a sample. Mineralogical analysis by X-ray diffraction (XRD) and Whole rock analyses to determine total concentrations on inorganic potential constituents of concern (PCOCs).

5.3 KINETIC TESTING

5.3.1 INTRODUCTION

SNL-Welge-CD-01 and SNL-Deston-CD-01 samples were then submitted for Kinetic testing which is used to estimate the longer-term potential of mine residue materials to generate/consume acid, produce contaminated leachate, estimate rates of oxidation and dissolution of materials (ASTM, 2018a). This is required to understand long term environmental impacts and surface and groundwater risks (ASTM, 2018b).

The two kinetic cells SNL-Welge-CD-01 and SNL-Deston-CD-01 were setup up at WSP Environmental Laboratory.

5.3.2 PRINCIPLES

Kinetic testing is carried out over a 20-week period at the WSP Earth and Environment Laboratory. According to the Word Bank Environmental Health and Safety (EHS) Guidelines, accelerated weathering tests are required from feasibility stage onwards to assess and manage potentially Acid Generating (PAG), Acid Rock Drainage (ARD) and Metal Leaching (ML) characteristics to protect the local environment (IFC, 2007). Additionally, kinetic tests are set-up to allow on-going measurements of weathering and leaching rates and/or the resulting drainage chemistry (MEND., 2009). The objectives for executing kinetic tests include:

- Determination of the rate of sulfide oxidation/acid generation.
- Determination of the rate of neutralisation potential consumption.
- Time to the onset of ARD and time taken for acid and neutralising consumption.
- Prediction of final mine residue facility seepage quality and pit water quality (ASTM, 2018b).

The kinetic test method is not a direct indication of on-site drainage chemistry but simulates accelerated material weathering rates. The difference between actual field conditions and kinetic test by humidity cells can differ by at least an order of magnitude.

5.3.3 METHOD

For each cell, a 1 kg sample was placed in each humidity cell (HC) and initial week test conducted by soaking the sample in 1000 mL of distilled water for approximately 2 hours before draining the leachate. Thereafter, the following repetitious seven-day cycle was employed:

- Pumping of dry air for the first three days.
- Pumping of humid air for the following three days (from the fourth to the sixth day).
- Rinsing of the sample with 500 mL of distilled water and collection of leachates on the seventh day.

The next cycle started on the eighth day and the tests were run over a minimum (standard) 20 weeks. The parameters that were measured in the leachate for each week cycle to facilitate analysis and interpretation of the results are presented in Table 5-1.

Table 5-1 - Parameters measured in the leachate

Material Type	Parameter Analysed	Frequency of measurement
Coal Discard and Rejects Samples	Volume of leachate added and collected	Every week from first leach (0-20)
	Humidifier temperature	Every week from first leach (0-20)
	pH, EC, TDS, alkalinity, major cations and anions	Every week from first leach (0-20)
	Trace elements	Week 0-7, 10, 15 and 20

5.4 ADDITIONAL SAMPLE AND TESTING

Once early results from SNL-Deston-CD-01 were reviewed, the sulfate load in the leachate was found to be low, and this was discussed with the New largo and Genet metallurgists. It was agreed that the Genet destoning plant (air plant) rejects sample supplied in February were not representative, having a low total sulfur and sulfate content, and hence using these samples would bias the study.

Therefore, additional discrete samples of Genet destoning plant (air plant) rejects were collected by the Client between 22nd and 26th May 2024 and sent to the Laboratory on the 28 May 2024 for the screening analysis (i.e., total sulfur). The discrete samples were then composited based on the daily total sulfur measurements recorded at the Genet plant to produce composite sample (SNL-PitD-Deston-02) which was set up and started running on the 13th of June 2024. The laboratory procedure is still on-going, and the full results presented in this report include 8 out of 20 weeks of procedure, with pH and EC available to week 13. Static tests were also carried out on composite sample SNL-PitD-Deston-02.

6 GEOCHEMICAL ASSESSMENT

6.1 STATIC TEST RESULTS

This section presents the static results of the DMS discard and destoning rejects samples, including the replacement destoning reject composite sample (SNL-PitD-Deston-02), and excluding the unrepresentative SNL-Deston-CD-01. The overburden static results forms part of the literature review presented in Section 4.

6.1.1 MINERALOGY

The mineralogical composition of the New Largo discard and rejects samples are presented in Figure 6-1 and Table 6-1. The purpose of the mineralogical analysis was to identify minerals with potential for generating acidity (i.e., sulfides and sulfates) and neutralisation potential (i.e., carbonate and silicate minerals).

The results of the mineralogical assessment are as follows:

- The XRD analysis detected nine crystalline mineral phases in the New Largo coal residue samples overall.
- The dominant mineral phases identified were kaolinite and quartz.
- Pyrite, the principal sulfide mineral linked to ARD generation, was detected in all the samples with the DMS plant discard from Phola Plant (SNL-Ph-CD-01) having higher percentage (3.2 wt.%) compared to the DMS plant discard from Welgelegen Plant (SNL-Welge-CD-01) which had 0.8 wt.%. The destoning rejects (SNL-PitD-Deston-02) had 2.9 wt.% of pyrite.
- Fast-reacting carbonates such as calcite ($CaCO_3$) and dolomite [$CaMg(CO_3)_2$], which contribute to buffering, were detected in the samples, with calcite detected in all the samples at 0.4 wt.%, 1.52 wt.%, and 1.6 wt.% for SNL-Welge-CD-01, SNL-PitD-Deston-02, and SNL-Ph-CD-01 respectively. Dolomite was only detected in SNL-Welge-CD-01 (0.1 wt.%) and SNL-Ph-CD-01 (1.1 wt.%) samples.

- Siderite $FeCO_3$ was detected in all the samples, even though it is a carbonate mineral which is supposed to add to the buffering capacity, siderite does not generate net alkalinity due to the generation of acidity when iron hydrolyses and forms, for instance, ferrihydrite.
- Silicate mineral, kaolinite, was the dominant phase in all the samples with 37.3 wt.%, 54.5 wt.%, and 42.1 wt.% for SNL-Welge-CD-01, SNL-PitD-Deston-02, and SNL-Ph-CD-01 respectively. Only SNL-PitD-Deston-02, had muscovite present at 4.99 wt.%. These silicate minerals are expected to provide buffering in the pH range of 2.2-5.1 as it slowly weathers (Blowell et.al., 2000).
- The other mineral phases in the samples are inert (i.e., quartz, anatase, and microcline).

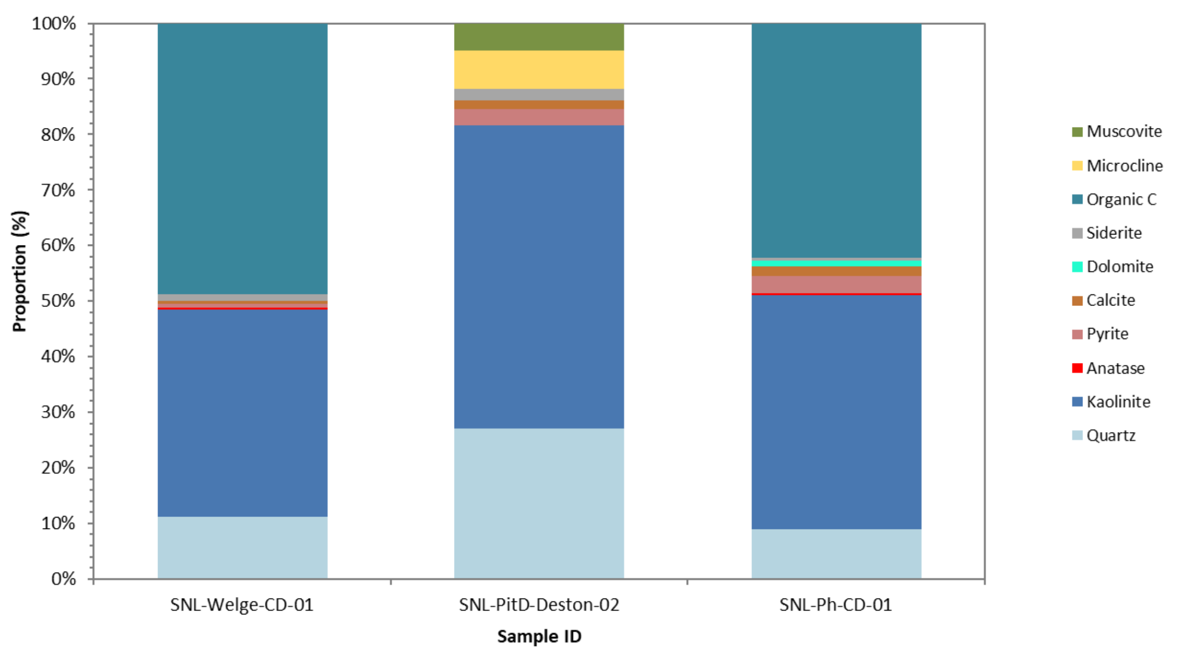

Figure 6-1 - Mineralogical Composition of New Largo Coal discard and rejects samples

Table 6-1 - Mineralogical Composition of New Largo Coal discard and rejects samples and weathering rates of individual minerals.

Weathering rate Material Type	Mineral	Chemical formula	SNL-Welge-CD-01 DMS Coal Discard	SNL-PitD-Deston-CD-02 Destoning Rejects	SNL-Ph-CD-01 DMS Coal Discard
very fast weathering	Pyrite	FeS_2	0.8	2.9	3.2
Dissolving	Calcite	$CaCO_3$	0.4	1.5	1.6
Dissolving	Dolomite	$CaMg(CO_3)_2$	0.1	0	1.1
fast weathering	Siderite	$FeCO_3$	1.1	2.1	0.5
slow weathering	Kaolinite	$Al_2Si_2O_5(OH)_4$	37.3	54.6	42.1
Inert	Quartz	SiO_2	11.3	27.1	8.9
Inert	Anatase	TiO_2	0.3	0	0.4
slow weathering	Microcline	$KAlSi_3O_8$	0	6.8	0
Slow Weathering	Muscovite	$KAl_2(Si_3Al)O_{10}(OH)_2$	0	4.99	0
Organic C	Coal macerals	various	48.9	0	42.2

6.1.2 ELEMENTAL COMPOSITION

Total metal and semi-metal concentrations in mining waste materials can be compared to the median crustal abundance for unmineralised soils (Bowen, 1979) and (INAP, 2010). The extent of enrichment is expressed as the Geochemical Abundance Index (GAI), which relates the actual concentration in a sample to the median or average crustal abundance. The GAI is calculated using the equation:

$$GAI = log2\ [Cn/1.5 \times Bn]$$

where Cn is the concentration of the element in the sample and Bn is the crustal abundance of that element.

The GAI is expressed in integer increments from 0 through to 6, where a GAI of 0 indicates the element is present at a concentration similar to or less than the crustal abundances; GAI of 3 corresponds to a 12-fold; and so forth, up to a GAI of 6, which indicating approximately 100-fold or greater enrichment above the median crustal abundances (Table 6-2).

The elements, according to their enrichment, in the New Largo samples are shown in Table 6-3. Based on the GAI, Silver (Ag), Selenium (Se), arsenic (As), bismuth (Bi) were found to be enriched (i.e., a GAI ≥ 3) in SNL-Welge-CD-01 (DMS plant discard) while boron (B), mercury (Hg), molybdenum (Mo), Se, cadmium (Cd) and tellurium (Te) were enriched in SNL-PitD-Deston-02 (destoning reject), and Ag, Se, Te, and Bi were enriched in SNL-Ph-CD-01 (Phola plant discard) sample.

It should be noted that a high concentration of elements determined by the GAI does not imply that these elements will be easily mobilized in the environment thereby resulting in environmental or health impacts, however it does give an indication of the potential source of contaminants which requires further investigation (INAP, 2010).

Table 6-2 - Geochemical Abundance Index (GAI) values and enrichment factors

GAI	Enrichment Factor
0	Less than 3-fold enrichment
1	3 – 6-fold enrichment
2	6 – 12-fold enrichment
3	12 – 24-fold enrichment
4	24 – 48-fold enrichment
5	48 – 96-fold enrichment
6	Greater than 96-fold enrichment

Table 6-3 - Geochemical Abundance Index for New Largo samples

Sample ID	Elements with GAI = 0	Elements with GAI = 1	Elements with GAI = 2	Elements with GAI = 3	Elements with GAI = 4	Elements with GAI = 5	Elements with GAI = 6
SNL-Welge-CD-01	Al, Ba, Be, C, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, Ge, K, Mg, Mn, Mo, Na, Nb, Ni, P, S, Sb, Sc, Si, Sr, Ta, Th, Ti, Tl, U, V, Zn, and Zr	B, Hf, Li, Pb, Sb, Sn, Te, and W	None	Ag and Se	As	None	Bi
SNL-PitD-Desto-02	Al, Ba, Be, C, Ca, Co, Cu, Fe, Ga, Ge, Hf, K, Mg, Mn, Na, Nb, Ni, P, S, Sc, Si, Sr, Ta, Ti, Tl, U, V, Y, Zn, and Zr	Pb, Th, and W	As and Sb	B, Hg, and Mo	Cd and Se	None	Te
SNL-Ph-CD-01	Al, Ba, Be, C, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, Ge, K, Mg, Mn, Na, Nb, Ni, P, S, Sc, Si, Sr, Ta, Th, Ti, Tl, V, Zn, and Zr	B, Hf, Mo, Pb, Sb, Sn, U, and W	As and Li	Ag, Se, and Te	None	None	Bi

6.1.3 ACID BASE ACCOUNTING

The screening criteria used in this memorandum to assess the acid generation potential of the New Largo coal discard samples is based on the guidelines from (Price et al, 1997) in conjunction with (Soregaroli et al, 1997), shown in Table 6.4, (Morin et al, 1997) and (MEND., 2009), shown in Table 6.5.

Table 6-6 presents the ABA results of New Largo samples. A brief discussion of the results is presented below:

- The results indicate that all samples had high concentrations of total sulfur at 1.25% (SNL-Welge-CD-01), 2.82% (SNL-PitD-Deston-02), and 2.74% (SNL-Ph-CD-01). High sulfur concentrations are expected in the samples since pyrite is common in coal bearing formations.
- Paste pH and sulfide sulfur content results can be used as screening tools to determine the potential for acid generation. Low potentials for acid generation are indicated by paste pH values greater than 5.5 and sulfide contents less than 0.3%. Conversely, paste pH values less than 5.5 and sulfide contents greater than 0.3% indicate a potential for acid generation. Referring to the sulfide sulfur content, all the samples exhibit a higher potential for acid generation with values at 1.09%, 2.77%, and 2.37% for SNL-Welge-CD-01, SNL-PitD-Deston-02, and SNL-Ph-CD-01 respectively. The neutral paste pH of all the samples (SNL-Welge-CD-01 - pH 6.76, SNL-PitD-Deston-02 - pH 7.03, and SNL-Ph-CD-01 - pH 7.18) indicates the presence of reactive neutralisation potential (NP).

- Two forms of neutralization potential (NP) were determined, and these are Bulk NP and carbonate NP (or CaNP). A comparison of the Bulk NP and CaNP is shown in Figure 6-2. The difference between the two is that the Bulk NP method includes the consumption of acid by both readily soluble carbonate minerals and less soluble silicate minerals, while CaNP quantifies the neutralization potential based solely on the dissolution of soluble carbonate minerals. CaNP values for the New Largo samples were generally higher than Bulk NP values, suggesting that the CaNP is an overestimate. Referring to the bulk NP, SNL-PitD-Deston-02 (43.47 kg $CaCO_3$/t) and SNL-Ph-CD-01 (35.2 kg $CaCO_3$/t) exhibits a higher NP compared to SNL-Welge-CD-01 (11.37 kg $CaCO_3$/t). This shows that SNL-Welge-CD-01 sample had less acid neutralizing minerals.
- Acid potential (AP) was calculated using sulfide sulfur (SAP) as it represents the reactive sulfur component. Total sulfur was not used as it includes the non-reactive sulfur component such organic sulfur and sulfate sulfur, which would overestimate AP. Figure 6-3 shows the SNPR (BulkNP/SAP) vs. %S (Sulfide-Sulfur) for the New Largo samples based on sulfide content. Based on the SNPR values, all samples are classified as “likely” to generate acid rock drainage (ARD).
- The paste pH vs. SNPR (BulkNP/SAP), which is based on sulfide content shown in Figure 6-4, show that all the samples are potentially acid generating (PAG).
- The Neutralisation Potential Ratio (NPR) which is defined as NP/AP was also calculated. All values, as presented in
- Table 6-6, are <1.00. Referring to assessment criteria in Table 5-4, all samples are assessed as “likely” to be acid generating, while assessment criteria set in Table 5-5, classify all samples as “acid generating”.

Table 6-4 - Acid generation potential assessment criteria, based on guidelines from (Price et al, 1997) and (Soregaroli et al, 1997)

Sulfide Sulfur	NPR (Neutralising Potential Ratio) (Bulk NP/AP)	Potential for ARD	Comments
<0.30%	---	None	No further ARD testing required provided there are no other metal leaching concerns. Exceptions: host rock with no basic minerals, sulfide minerals that are weakly acid soluble.
>0.30%	<1.00	Likely	Likely to be ARD generating
	1.00-2.00	Possibly	Possibly ARD generating if NP (Neutralisation Potential) is insufficiently reactive or is depleted at a rate faster than that of sulfides.
	2.00-4.00	Low	Not potentially ARD generating unless substantial preferential exposure of sulfides occur along fractures or extremely reactive sulfides are present together with insufficiently reactive NP.
	>4.00	None	No further ARD testing required unless materials are to be used as a source of alkalinity.

Table 6-5 - Acid generation potential assessment criteria, based on guidelines from (Morin et al, 1997) and (MEND., 2009)

Paste pH	NPR (Bulk NP/AP)	Potential for ARD	Comments
<6.00	<1.00	Acid generating	Net acid generating, and already acidic
>6.00	<1.00	Potentially acid generating	Potentially acid generating unless sulfide minerals is non-reactive. Thus, samples are net acid generating, but not yet acidic.
<6.00 and >6.00	1.00≤NPR≤2.00	Uncertain	Possibly acid generating if NP is insufficiently reactive or is depleted at a rate faster than sulfides.
>6.00	>2.00	Not potentially acid generating (non-PAG)	Not expected to generate acidity i.e., samples are net acid neutralizing.
<6.00	>2.00	---	Theoretically not possible

Table 6-6 - Summary of ABA results for New Largo coal discard samples

Sample ID	Paste pH	Total Sulfur (%)	Sulfur-Sulfide	Sulfur-Sulfate	[1]Bulk NP	[2]CaNP	[3]SAP	[4]SNNP	[5]SNPR	[6]NPR
SNL-Welge-CD-01	6.76	1.25	1.09	0.00	11.37	476.82	33.97	-22.60	0.33	0.29
SNL-PitD-Deston-02	7.03	2.82	2.77	0.05	43.47	188.47	86.56	-43.10	0.50	0.50
SNL-Ph-CD-01	7.18	2.74	2.37	0.01	35.20	289.86	74.13	-38.93	0.47	0.41

Note: [1]Bulk NP - NP measured by the modified Sobek titration and is used for the NPR calculation. [2]CaNP - carbonate neutralisation potential. [3]SAP – acid potential based on sulfide sulfur. [4]SNNP - Sulfide Net Neutralisation Potential = BulkNP - SAP. [5]SNPR – is the ratio of SAP and bulk NP. [6]NPR – is the ratio of NP and AP.

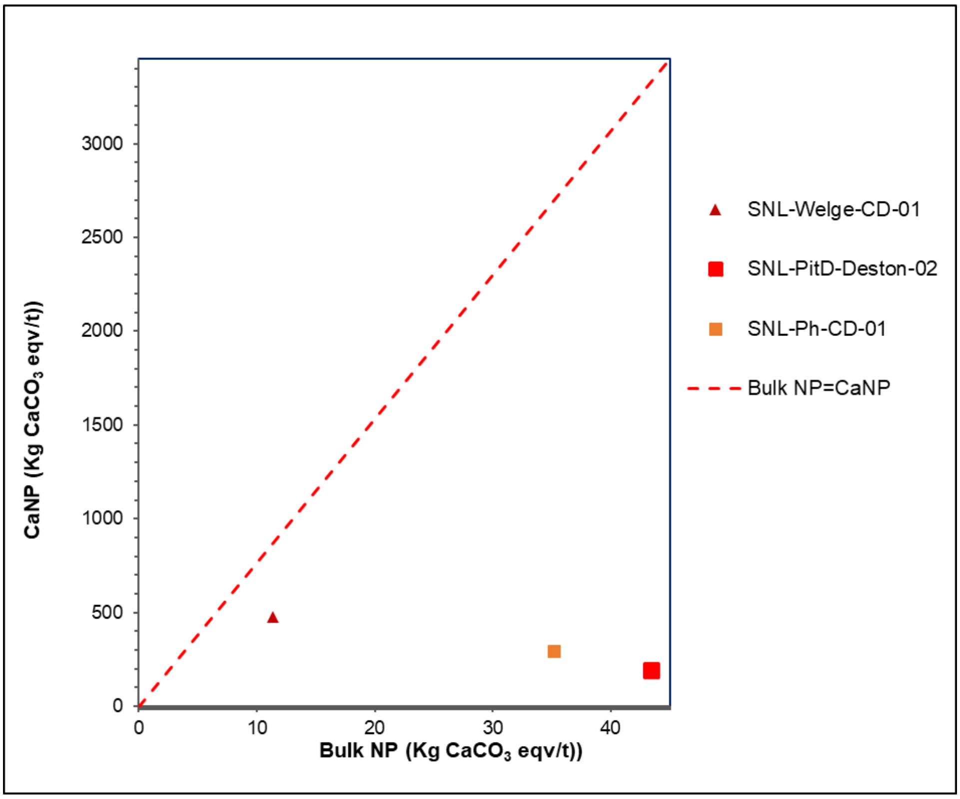

Figure 6-2 - Carbonate NP vs Bulk NP for New Largo Samples

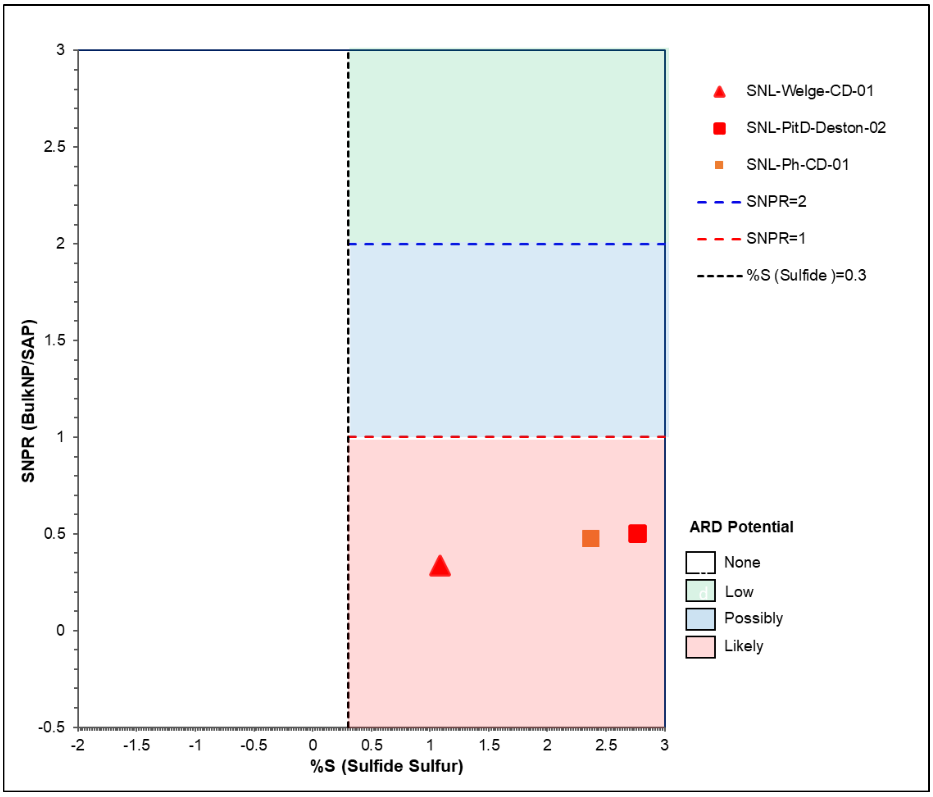

Figure 6-3 - SNPR (BulkNP/SAP) vs %Sulfur for New Largo samples

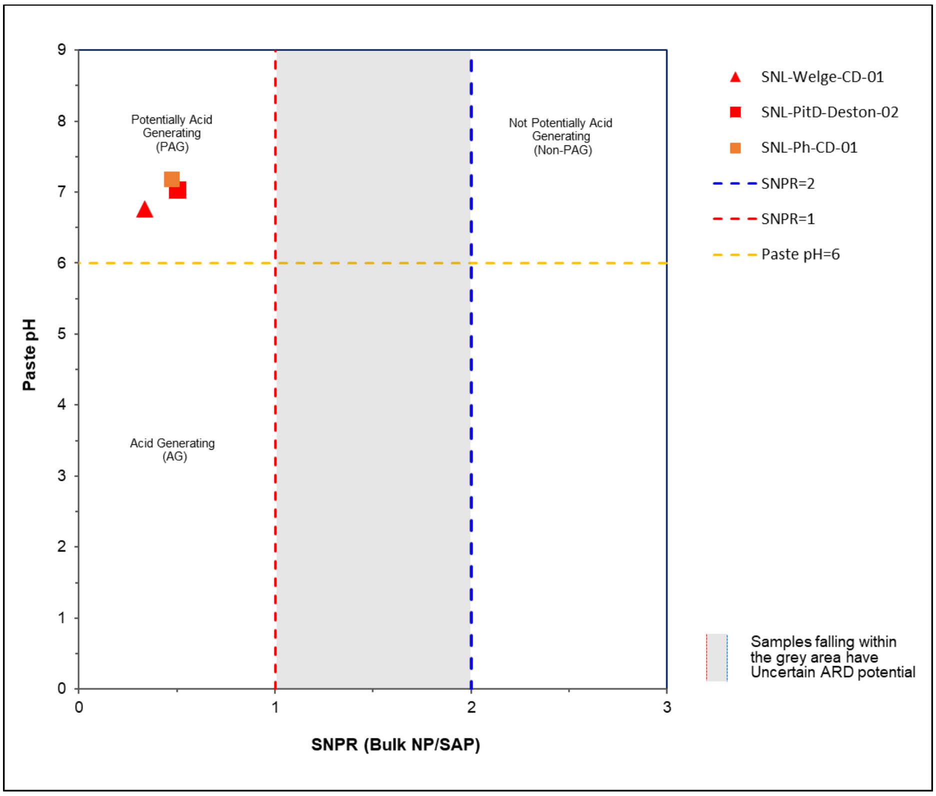

Figure 6-4 - Paste pH vs SNPR (BulkNP/SAP) for New Largo samples

6.1.4 NET ACID GENERATION (NAG)

In addition to the ABA, a NAG test was undertaken to determine the ARD potential of the New Largo coal residue samples and are presented in Table 6-7. Figure 6-5 and Figure 6-6 illustrates the NAG pH to SNPR and Paste pH respectively. In general, a NAG pH threshold of 4.5 is used to identify potentially acid-generating material. As such, NAG pH values below 4.5 indicate a potential for acid generation. The following is deduced from the NAG test results:

- Referring to Figure 6-5 which illustrates the NAG pH versus paste pH the samples, all samples plot below the NAG pH threshold of 4.5, indicating that the coal discard samples are acid generating. Furthermore, a comparison of the NAG pH and Paste pH, indicates that over the short term all the coal discard samples will have a neutral pH (between 6.76 and 7.18), as reflected by the paste pH, but under extreme oxidising conditions, as reflected by the NAG pH the pH is likely to be closer to be below 3.
- Based on SNPR (BulkNP/SAP), which considers bulk neutralisation (BulkNP) and acid potential from sulfide (SAP) to the NAG pH (Figure 6-6), all samples classify as being potentially acid generating (PAG).
- The nett acid generation potential of the DMS discard samples (SNL-Welge-CD-01 and SNL-Ph-CD-01) is consistently higher than for the destoning rejects (SNL-PitD-Deston-02).

Table 6-7 - Summary of Net Acid Generation (NAG) results for New Largo samples

Sample ID	NAG pH: (H_2O_2)	NAG at pH 4.5	NAG at pH 7.0
		kg H_2SO_4/t	kg H_2SO_4/t
SNL-Welge-CD-01	1.88	25.43	43.48
SNL-PitD-Deston-02	2.79	14.50	27.05
SNL-Ph-CD-01	2.88	29.35	39.72

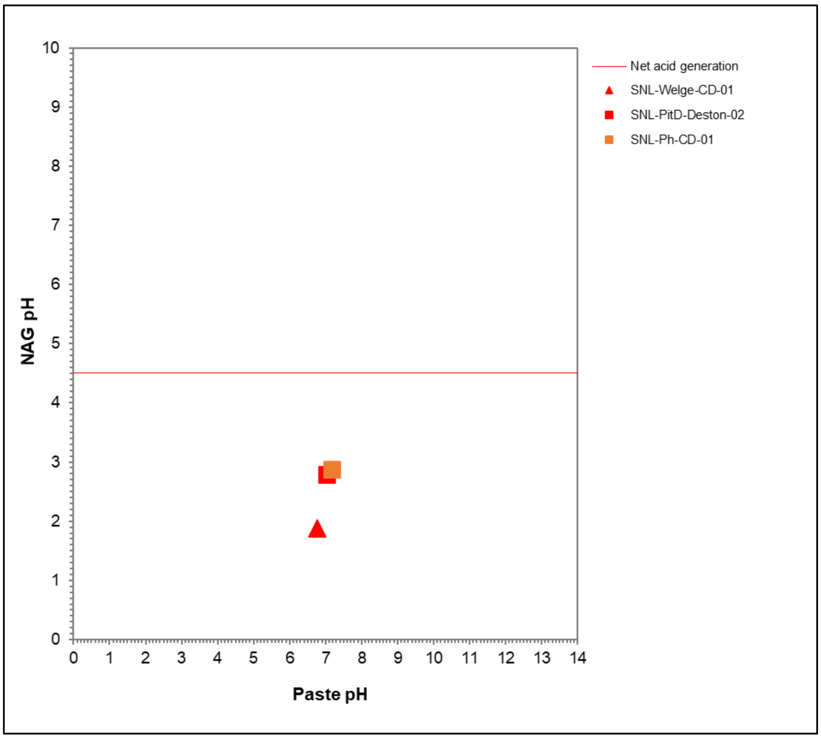

Figure 6-5 - NAG pH vs. Paste pH for New Largo samples

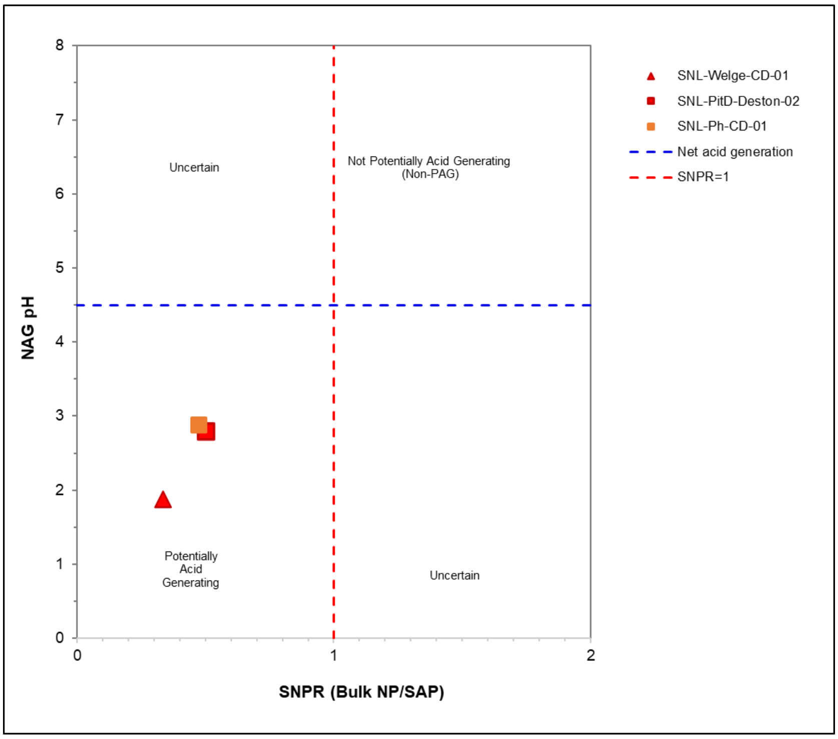

Figure 6-6 - NAG pH vs SNPR (BulkNP/SAP) for New largo samples

6.2 KINETIC RESULTS

The kinetic cell experiment was set-up to allow for the on-going measurements of weathering / leaching rates and the resulting drainage chemistry expected from the New Largo coal residue samples. Only DMS plant coal discard from Welgelegen and destoning plant rejects were set up in the two kinetic cells.

For the DMS Plant discard, weekly concentrations and rinse water volumes collected were used to determine weekly leach rates, with weekly fluctuations in volume collected (250-500 mL) occurring after leaching with 500 mL deionised water, and dissolution of minerals/salts. The 20-week kinetic results are presented in Table 11-1 in Appendix D.

In terms of the Destoning Plant rejects, the cell is still running at WSP Laboratory for the standard 20-weeks with a weekly evaluation of the leachate samples. Full results were only available until the 8th week, with EC and pH available to the 13th week. The results are presented in Table 11-2, Appendix D.

As an indication of potential environmental hazard and to put the results into context, the kinetic leach results have been compared to the water use license (WUL) limits for groundwater quality, see Table 6-8. A WUL No.04/B20G/ACFGIJ/2538, File No: 16/2/7/B200/C528) was issued to New Largo Colliery by the Department of Water and Sanitation (DWS) on 11 January 2015.

Table 6-8 – Groundwater Quality Limits (Table 9, WUL No.04/B20G/ACFGIJ/2538, 2015)

Substance/parameter	Unit	Limit
pH		7.7
Calcium (Ca^{2+})	mg/L	568
Chloride (Cl^{-})	mg/L	3.7
Fluoride (F^{-})	mg/L	0.8
Iron (Fe)	mg/L	0.13
Magnesium (Mg^{2+})	mg/L	196
Manganese (Mn)	mg/L	2.4
Potassium (K^{+})	mg/L	0.0
Sodium (Na^{2+})	mg/L	32
Sulfate (SO_4^{2-})	mg/L	2 130
Total dissolved solids (TDS)	mg/L	3 309

Only the trends for selected constituents such as pH, TDS, electrical conductivity, and sulfate are discussed, presented in Figure 6-7 to Figure 6-10, and the rest of the trends are presented in Appendix E. From the trends and screening against the groundwater WUL limits, the following is deduced:

- Referring to Figure 6-7, the DMS Plant discard sample (SNL-Welge-CD-01) had a pH = 6.91 at the start of the kinetic leach test (week 0), after which it remains within the range (pH 6.11 - 7.22), which indicates some buffering capacity. The discard sample paste pH values are within the pH ranges with the DMS plant discard paste pH of 6.76. The Destoning Plant reject sample show neutral conditions with pH range between 7.37 and 7.73, and the paste pH (7.03) within the range in the 8 weeks test period. Both the coal residue samples had pH levels that were close to the groundwater WUL limit of 7.7.
- DMS plant discard sample had the highest TDS concentrations measured (764 mg/L) in week 9, (see Figure 6-8). The TDS is shown to increase from week 0 until week 2, and decreased from week 3 until week 7, and then increased from week 8 until week 11, and a decrease from week 12 to 16. Lastly, a slight but stable increase until week 20. A similar trend can be seen in (Figure 6-9), in terms of the conductivity. Furthermore, DMS plant discard sample had the highest conductivity in week 12 (1 080 µS/cm) and showed to be variable until week 13 ranging from 81 µS/cm to 1 080 µS/cm. Destoning Plant reject sample had the highest TDS recorded in week 0 (745 mg/L), but fluctuates with the weeks with the lowest concentration (378 mg/L) recorded in week 2. Moreover, variable conductivity is observed during the 8 weeks of the experiment, ranging between 449 to 981 µS/cm. Both Samples had TDS levels that were below the specified WUL limit of 3 309 mg/L.
- Sulfate concentrations are shown to have a similar trend to TDS and conductivity for both the DMS Plant discard (range from 236 to 652 mg/L) and Destoning Plant reject (237.5 to 505 mg/L). Both the samples had concentrations that are lower than the specified WUL limit of 2 130 mg/L.
- Only chloride and iron were found to be above the specified WUL limits of 3.7 mg/L and 0.13 mg/L, respectively, in negligible number of samples. DMS plant discard had exceedances for iron concentrations during week 11 (1.38 mg/L) and 12 (0.49 mg/L), while the Destoning Plant reject

had the chloride exceedance during the initial flush (14.8 mg/L), but thereafter was below the laboratory detection limit.

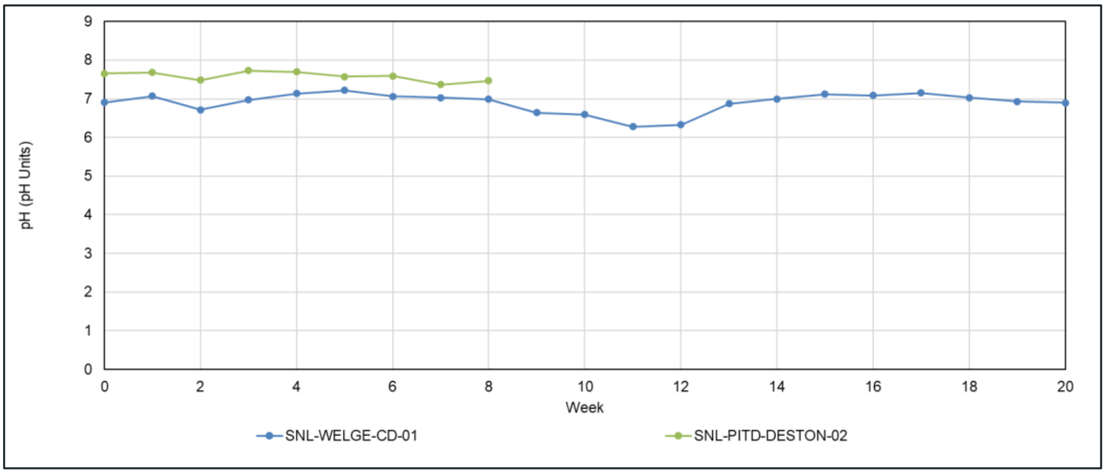

Figure 6-7 - kinetic results showing the evolution of pH for New Largo Coal residue samples

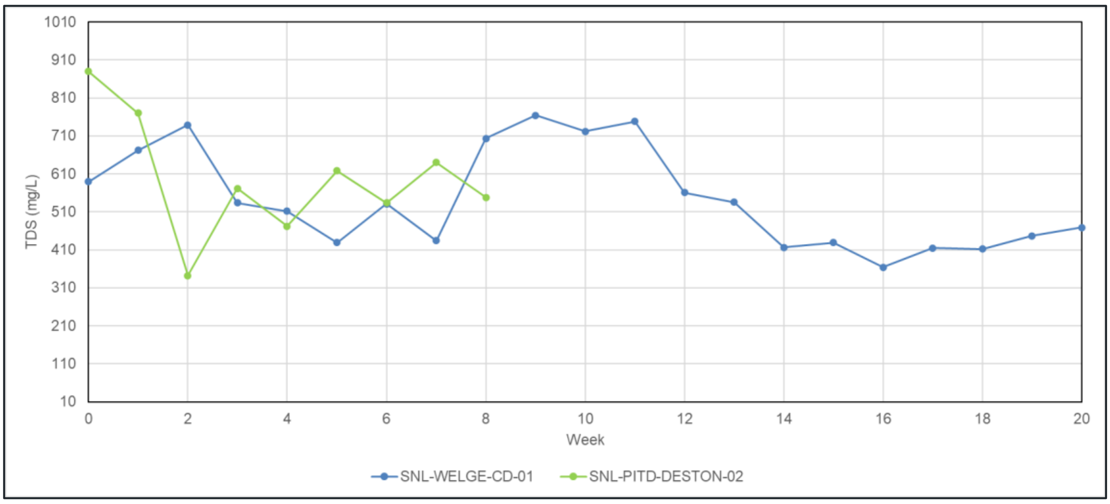

Figure 6-8 - kinetic results showing the evolution of TDS for New Largo Coal residue samples

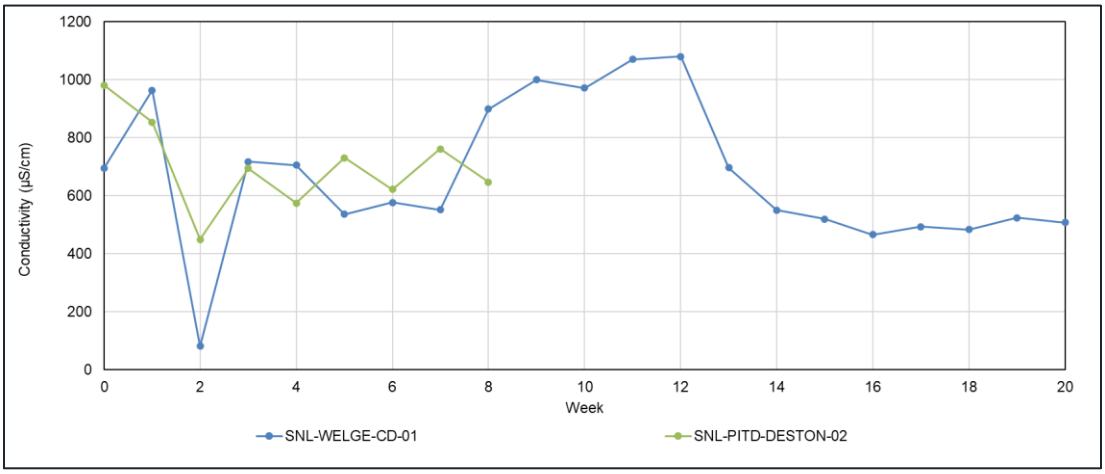

Figure 6-9 - kinetic results showing Electrical Conductivity for New Largo Coal residue samples

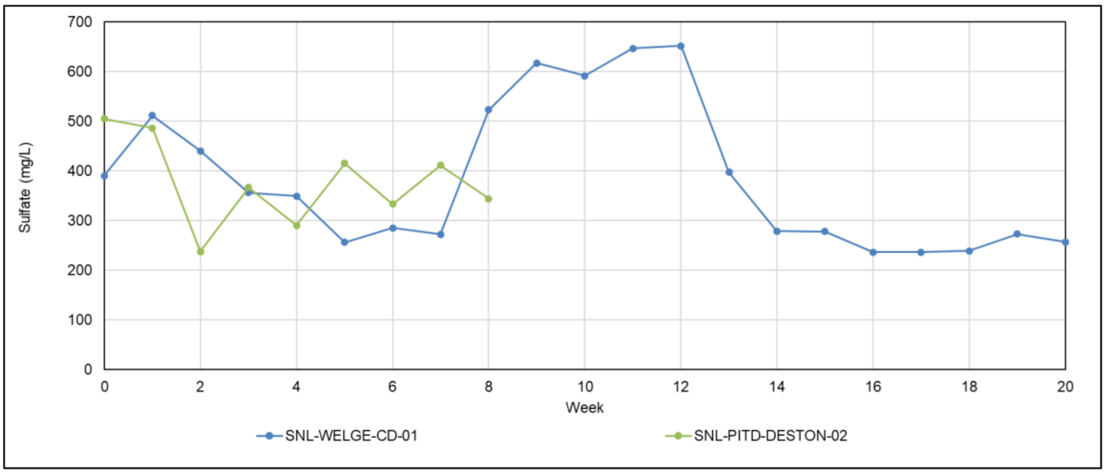

Figure 6-10 - kinetic results showing the evolution of sulfate for New Largo Coal residue samples

6.3 SOURCE TERM

6.3.1 APPROACH

The laboratory kinetic testing has run to completion (i.e. 20 weeks) for the DMS Plant discard sample (SNL-Welge-CD-01) and still on-going for the Destoning Plant rejects (SNL-PitD-Deston-02).

Therefore, final source-term predictions are completed for the New Largo opencast pits with DMS Plant discard, however, preliminary source term predictions are provided after 7 weeks of the experiment for the pits with Destoning Plant rejects, and a final source-term will be provided once the experiment has run to completion (November 2024).

The predictions were based on kinetic cell data for the DMS plant discard and destoning plant reject. For spoils, the historic short term leach test results for the overburden (JMA, 2009), were used as inputs.

Assumptions on field conditions for all sources were made to upscale the input water data from laboratory results to mine facilities. The assumptions for scaling factors were based on WSP's understanding of the project, together with an approach based on international literature on scaling factors and their application.

It should be noted that while the preliminary (i.e. Destoning Plant rejects), predictions in this document were made using the same approach as for the DMS discard, they are using results from incomplete kinetic testing (results up to week 7 were available when the modelling was done). The spoils chemistry is based on short term leach results documented by (JMA, 2009) and the available understanding of the lithologic composition of the various pits.

A description of the approach used for determining the preliminary/interim source terms for the pits is presented below:

- Initial step was to acquire source terms for all the geological material or lithologies that were likely to be found in the opencast pits. These included the DMS plant discard and destoning plant rejects in terms of in-pit disposal, and the overburden/spoil material.

6.3.1.1 DMS Plant Discard Final Drainage Quality

- Kinetic cell SNL-Welge-CD-01 leach data for full 20 weeks, was used to prepare a final source term. In the prediction of drainage chemistry, an important aspect is the upscaling of the results of laboratory scale kinetic test work to conditions typical of full-scale mine site components. The Scaling Factor (SF) applied to laboratory concentration results can be prepared by a number of different methods. According to (Morin, 2013), SF values are typically between 0.05 and 0.60. In other words, concentrations in discharges from mine facilities are typically 5 to 60% of those reported from kinetic testing leachates. For the wet plant discard, the solid to liquid ratio was the scaling factor used, based upon the recharge used for pits in the groundwater model (WSP, 2024), discard density and surface area.

6.3.1.2 Preliminary Source-term for Genet destoning plant (air plant) rejects drainage quality

- Kinetic leach data, average, for week 0 to week 7 of SNL-PITD_Deston-02 was used to approximate the drainage expected from the destoning plant reject material.
- Once early results from SNL-Deston-CD-01 were reviewed, the sulfate load in the leachate was found to be low, and the reason for this was confirmed when static tests became available. This sample contained pyrite as determined by the mineralogical analysis, to be present in a smaller quantity (0.7% FeS_2). Hence the drainage concentrations were likely to be underestimated given the general higher pyrite concentrations expected in the rejects, compared to nearby analogue sites from the same coalfield. This was discussed with the New Largo and Genet metallurgists. It was agreed that the destoning plant rejects sample supplied in February 2024 and used in SNL-Deston-CD-01 was unrepresentative, having too low total sulfur content and too low sulfate production, and this would unacceptably bias the study.

Therefore, additional destoning plant discard samples were collected by the Client between 22nd and 26th May 2024 and sent to the Laboratory on the 28th May 2024 for the screening analysis (i.e. total sulfur). Subsequently, a new kinetic cell for the destoning plant rejects, SNL-PitD-Deston-02, was setup and started running on the 13th of June 2024. Data up to week 7 as available at the time hat modelling was done.

6.3.1.3 Overburden/spoil drainage quality

- The lithological data for the New Largo pits was reviewed with reference to the information obtained from boreholes LGW-B1, LGW-B2, LGW-B3, LGW-B4, LGW-B7, LGW-B11, LGW-B15, LGW-B16, LGW-B17, LGW-B18, LGW-B19 LGW-B20, LGW-B21, LGW-B22 and LGW-B23. These boreholes had complete geological logs available in JMA 2012 report (JMA, 2012).
- From these geological logs (attached in Appendix A), lithologies representing shale, sandstone, carbonaceous shale, and grit were identified together with their thickness, which was used to determine the proportion of these lithologies present in the overall stratigraphic sequence in each pit (Table 6-9).
- (JMA, 2009) conducted standard static geochemical test (including NAG Leach Test) work on coal and overburden samples collected from five geohydrological boreholes (LGW-B2, B6, B9, B13, B20) (JMA, 2009). The geochemical samples (36 samples) included sandstone, shale, carbonaceous sandstone and shale, and coal seams. This data (supplied in Appendix B) remains the most recent data with complete leachate chemistry for overburden at new Largo, and so was scaled and used as the overburden/spoil drainage chemistry.

Table 6-9 – Lithological Proportions (%) of the different overburden/spoil material expected in the pits

Source	Borehole/s	Lithological Proportions (%)				
		Shale	Sandstone	Sandstone and shale	Grit	Total
Pit F	LGW-B8 LGW-B9	83.3	16.7	-	-	100.00
Pit A & G	LGW-B2 LGW-B21 LGW-B2 LGW-B7	34.2	22.8	-	43.0	100.00
Pit C	LGW-B22	22.7	27.3		50.0	100.00
Pit D NORTH	LGW-B13	76.5	-	11.8	11.8	100.00
Pit D	LGW-B26 LGW-B27	52.3	20.5		27.3	100.00
Pit H	LGW-B28	52.3	20.5	0.0	27.3	100.00
Pit Wilge	LGW-B22	22.7	27.3	0.0	50.0	100.00

6.3.1.4 Mix Model for Opencast Pits Source Terms

A mixing model was developed that represented the geological material that was likely to be found in the opencast pits, summarised in Table 6-10, using PHREEQC. The geochemical modelling code selected for this modelling is PHREEQC (Version 3), that was developed by the United States Geological Survey (USGS). PHREEQC (freeware) can simulate "chemical reactions and transport 'processes in natural or polluted water, in laboratory experiments, or in industrial processes" (Parkhurst & Appelo, 2013). The model is based on "equilibrium chemistry of aqueous solutions interacting with minerals, gases, solid solutions, exchange phases and sorption surfaces in which minerals and soluble species are equilibrated simultaneously" (Parkhurst & Appelo, 2013).

The PHREEQC versions 1-3, written in the C programming language capabilities include (Parkhurst & Appelo, 2013):

- Ion exchange
- Surface-complexation
- Advective transport
- Inverse modelling
- Kinetic reactions
- Solid solution reactions
- Variation of the number of exchange or surface sites in proportion to a mineral kinetic reactant
- Diffusion or dispersion in 1D transport
- 1D transport coupled with diffusion into stagnant zones
- Isotope mole balance in inverse modelling

The coal seams lithology was not considered for the source term calculation, with the assumption that the coal would not be present in the open cast pits as it would be mined and removed. The lithological proportions that were used in the Geochemical models for the opencast pits is summarised in Table 6-11.

Table 6-10 – Backfill material to be expected in the New Largo pits

PIT	Backfill
Pit A&G	DMS plant discard and overburden
Pit C	DMS plant discard and overburden
Pit D	Destoning plant rejects and overburden
Pit D-North	DMS plant discard and overburden
Pit F	Destoning plant rejects* and overburden
Pit H	Destoning plant rejects and overburden
Wilge Pit	Overburden only

*The current destoning plant at Pit F has been included in the model based upon on mine plan sheet for Pit F which was supplied to WSP. Should a decision be made to change the coal processing and residue disposal at Pit F from destoning to DMS, a new model for Pit F will be required.

Table 6-11 - Proportioned lithological units used in the mix model for opencast pits

	Lithological Proportions (%)						
Source	Shale	Sandstone	Sandstone and shale	Grit	DMS Discard	Destoning Rejects	Total
Pit F	71.08	14.22	-	-	-	14.70*	100.00
Pit A & G	30.50	20.33	-	38.41	10.75	-	100.00
Pit C	20.28	24.34	-	44.62	10.75	-	100.00
Pit D NORTH	68.25	-	10.50	10.50	10.75	-	100.00
Pit D	44.59	17.45	-	23.26	-	14.70	100.00
Pit H	50.32	19.69	-	26.25	-	3.74	100.00
Pit Wilge	22.7	27.3	-	50.0	-	-	100.00

*If a change for Pit F from destoning rejects to DMS discard is required, this will need to be remodelled and updated in the next draft of this report.

6.3.2 RESULTS

The modelling results for the New Largo pits source terms are presented in Table 6-13 (Pits with DMS Plant discard), Table 6-14 (pits with Destoning Plant rejects), and Table 6-15 (Pit Wilge) and represents the immediate and long term post closure scenario. Overall, the post closure pit water qualities predicted for the open pits, suggest lower pH levels, representing acidic conditions. Predictions were completed for the pits with the discard (in-pit disposal), and without the discard. From the results, the following is summarised:

- All pits are conservatively considered to have the potential to turn acidic, with long-term pH ranging between 4.5 and 6.0. This is partly influenced by the conservative laboratory method used in previous studies on the overburden, and should be revised when a geochemical assessment update is done for the pits.
- Referring to Table 6-13, the DMS discard has a substantial effect on the sulfate and TDS load of pits into which it will be backfilled, with the predicted concentrations rising by between 20% and

36% in the medium-term (compared to the same pit without discard), but falling off to a lower increase (below 10% than the same pit without discard) in the long-term. The influence on the TDS is less substantial.

- The destoning rejects, see Table 6-14, have a small influence on the sulfate concentration (10% increase or less over the same pit without rejects), except in the higher disposal scenarios of Pit D (if 10 to 15% of the material backfilled is discard). The source-terms for destoning rejects are preliminary source-terms, based on 7 of 20 weeks humidity cell data, and an update memorandum will be provided in mid-November, when the cell is completed.
- See Table 6-15 for predicted source terms at Pit Wilge (no discard/rejects) for the long-term post-closure.
- It should also be noted that effect of the waste backfilling is naturally influenced by the proportion that the waste makes up of the backfill, ranging from 0.03% at Pit F to 11% at Pit A&G. In some cases, this may have a greater influence than the difference in material properties between discard and rejects.
- Sulfate and calcium concentrations increased in all the pits with coal discard or rejects compared to the predicted concentrations in the pits without discard or rejects.
- Similar to sulfate, total dissolved solids, manganese, and magnesium also increased in all the pits with coal discard or rejects are compared to the predicted concentrations in the pits without discard or rejects over a medium term. However, concentration decrease is expected over a long term.
- Iron and aluminium concentrations decreased in all the pits with coal discard or rejects compared to the predicted concentrations in the pits without discard or rejects.

6.3.3 COMPARISON WITH PREVIOUS FINDINGS

Table 6-12 gives a summary of the predicted mine water quality from the current study (Final and preliminary results) compared to the 2011 study by JMA ((JMA, 2011) which predicted water qualities at New Largo based on Version 5 mining schedule and additional ABA results (Geostratum, 2011) for 79 samples from 2010 drill cores that including Seam 3 &5 and thin carbonaceous layers. (JMA, 2011) completed five different water quality predictions, but only three of the scenarios are discussed in this report, to compare with the current preliminary predictions. And these are:

- Scenario 3: "Combination of waste streams post 2021 (north and UG). This is both short, residence, longer residence, dewatering and discard disposal cell storage combined as a single waste steam. A total of 90Mt of coal discard will be disposed of in mainly the southern pit sections. This scenario is a blend of the four waste streams. This waste stream starts at zero and gradually builds up to a maximum of 28% in 2034. After that it reduces to 18% of the total waste stream."
- Scenario 4: "In-pit qualities long residence time post 2035 (south and north). Full acidification of sections has taken place over most of the early mining areas. The residence time of in-pit water is kept to a minimum due to long term pump and treat management. For this very important reason the overall qualities will not deteriorate to that of mines of similar age in the Witbank area, where ground water is allowed to have a long residence time in acidic conditions. It is assumed that this waste steam will make up about 30% of all water qualities for the period 2030 – 2065."
- Scenario 5: "Longest term in-pit qualities with total discard disposal (90Mt). This is the component of waste stream where in-pit acidification of all discard cells has taken place. It is considered the poorest quality water to be expected in isolated areas (the first mining sections, combined with

the in-pit storage of discard). The excess water make from the temporary 10Mt surface discard dump is added to this water make. This waste steam adds 5% to the total water make from 2017, gradually increasing to 25% at the total LOM. Please note that the short-residence nature (due to pump and treat) will prevent the total mine to acidify to the qualities presented for this scenario."

According to JMA, the predicted long term in-pit water qualities for post closure (post 2030) under scenario 3 showed a pH of 5, and sulfate and TDS concentrations of 900 and 1 250 mg/L respectively. The quality of in-pit water seems to deteriorate according to JMA, with addition of discard into the pits (in-pit disposal). This is apparent as the pH is expected to drop to pH=4.5 with selective in-pit coal discard disposal (Scenario 4) and pH=2.5 with 50% of the discard disposed into the pits (Scenario 5). Furthermore, the sulfate and TDS concentrations are observed to increase from 1 200 mg/L to 3 600 mg/L, and 2 400 mg/L to 6 800 mg/L, respectively, from scenario 4 to scenario 5.

Table 6-12 - Predicted Mine Water Quality (2024 Final or Preliminary Findings) Compared to JMA 2011 Predictions

Pit	Description	pH	Sulfate (SO_4^{2-})	Total Dissolved Solids (TDS)
			mg/L	mg/L
		Without Discard / Rejects		
Pit A&G (Final)	-	4.87	644	1 976
Pit C (Final)	-	4.82	654	2 097
Pit D-North (Final)	-	4.51	923	2 968
Pit H (Final)	-	4.89	650	1 918
Pit F (Final)	-	5.5	613	1 292
Pit D (Final)	-	4.89	650	1 918
Pit Wilge (Final)	-	4.82	654	2 097
		With Discard / Rejects		
Pit A&G (Final)	DMS plant discard – Medium term	5.18	877	2 170
	DMS plant discard – Long term	5.23	701	1 938
Pit C (Final)	DMS plant discard – Medium term	5.12	886	2 291
	DMS plant discard – Long term	5.16	710	2 059
Pit D-North (Final)	DMS plant discard – Medium term	4.77	1 110	3 053
	DMS plant discard – Long term	4.79	932	2 818
Pit H (Preliminary)	Destoning plant rejects	5.46	713	1 974
Pit F (Preliminary)	Destoning plant rejects*	5.28	611	1 292
Pit D (5%) (Preliminary)	Destoning plant rejects	5.81	806	2 041

Pit	Description	pH	Sulfate (SO_4^{2-})	Total Dissolved Solids (TDS)
Pit D (10%) (Preliminary)	Destoning plant rejects	5.55	726	1 964
Pit D (15%) (Preliminary)	Destoning plant rejects	5.99	889	2 126
JMA 2011 Predictions				
In-pit qualities long term post 2030 (Average)		5	900	1 250
In-pit qualities selective discard (Average)		4.5	1 200	2 400
In-pit qualities 50% discard (Average)		2.5	3 600	6 800

*If a change for Pit F from destoning rejects to DMS discard is required, this will need to be remodelled and updated in the next draft of this report.

The current final and preliminary predictions generally show that pH conditions improved slightly in the predicted pit water chemistry when coal discard or rejects are disposed in the pits. However, sulfate and TDS concentrations increased in all the pits with coal discard or rejects, compared to the predicted concentrations in the pits without discard or rejects.

The increased sulfate and TDS load predicted in the pits when disposing destoning rejects is higher than when disposing DMS discard.

The increased sulfate and TDS load predicted in the pits from the current study are similar to those predicted by JMA (2011) for pits with DMS disposal, and lower than JMA (2011) predictions for pits where destoning rejects will be disposed.

Table 6-13 - Predicted final source terms for New Largo open cast pits with DMS Plant discard over medium and term post-closure

Parameter	Units	Pit A&G			Pit C			D-North		
		Without Discard	Medium Term (DMS Plant discard)	Long Term (DMS Plant discard)	Without Discard	Medium Term (DMS Plant discard)	Long Term (DMS Plant discard)	Without Discard	Medium Term (DMS Plant discard)	Long Term (DMS Plant discard)
pH		4.87	5.18	5.23	4.82	5.12	5.16	4.51	4.77	4.79
Alkalinity	mg/L as $CaCO_3$	3.00	8.05	8.47	3.01	8.05	8.47	3.01	8.10	8.53
Chloride (Cl^-)	mg/L	782	688	696	858	764	772	1 289	1 154	1 162
Sulfate (SO_4^{2-})	mg/L	644	877	701	654	886	710	923	1 110	932
Aluminum (Al^{3+})	mg/L	1.47	1.30	1.30	1.72	1.56	1.56	10.29	9.33	9.33
Silver (Ag)	mg/L	0.000	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.001
Arseni (As)	mg/L	0.008	0.018	0.011	0.009	0.019	0.011	0.006	0.016	0.008
Boron (B)	mg/L	0.039	0.049	0.046	0.039	0.049	0.046	0.015	0.027	0.024
Barium (Ba^{2+})	mg/L	0.006	0.022	0.047	0.006	0.022	0.047	0.006	0.022	0.048
Beryllium (Be)	mg/L	0.010	0.009	0.009	0.009	0.009	0.009	0.010	0.009	0.009
Calcium (Ca^{2+})	mg/L	242	292	250	274	325	282	322	363	321
Cadmium (Cd)	mg/L	0.002	0.003	0.002	0.002	0.003	0.002	0.002	0.003	0.002
Cobalt (Co)	mg/L	0.042	0.066	0.041	0.040	0.064	0.039	0.048	0.072	0.046
Copper (Cu^{2+})	mg/L	0.166	0.151	0.148	0.168	0.153	0.150	0.284	0.258	0.256
Chrome (Cr)	mg/L	0.000	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.001
Fluoride (F^-)	mg/L	0.169	0.215	0.201	0.176	0.222	0.207	0.151	0.199	0.184
Iron (Fe)	mg/L	215	190	190	227	202	202	378	338	338
Mercury (Hg)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Potassium (K^+)	mg/L	19.0	18.4	17.3	18.1	17.6	16.5	26.4	25.1	23.9
Lithium (Li)	mg/L	0.066	0.064	0.060	0.067	0.064	0.060	0.066	0.063	0.059
Magnesium (Mg^{2+})	mg/L	95.7	106.2	97.3	98.8	109.3	100.3	192.2	192.5	183.4
Manganese (Mn)	mg/L	1.07	1.26	0.99	1.06	1.25	0.98	1.11	1.29	1.02
Molybdenum (Mo)	mg/L	0.017	0.016	0.016	0.017	0.016	0.016	0.018	0.016	0.016
Nitrate (NO_3)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sodium (Na^{2+})	mg/L	183	175	164	183	176	164	197	188	176
Nickel (Ni)	mg/L	0.088	0.111	0.083	0.086	0.109	0.081	0.094	0.116	0.088
Phosphorus (P)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lead (Pb^{2+})	mg/L	0.098	0.088	0.088	0.098	0.088	0.088	0.098	0.088	0.088
Antimony (Sb)	mg/L	0.003	0.003	0.004	0.003	0.003	0.004	0.003	0.003	0.004
Selenium (Se)	mg/L	0.004	0.004	0.006	0.004	0.004	0.006	0.004	0.004	0.005
Silicon (Si)	mg/L	3.41	3.02	3.02	3.53	3.14	3.14	5.94	5.32	5.32
Tin (Sn)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Strontium (Sr)	mg/L	0.000	0.428	0.182	0.000	0.428	0.182	0.000	0.433	0.184

	Units	Pit A&G			Pit C			D-North		
		Without Discard	Medium Term (DMS Plant discard)	Long Term (DMS Plant discard)	Without Discard	Medium Term (DMS Plant discard)	Long Term (DMS Plant discard)	Without Discard	Medium Term (DMS Plant discard)	Long Term (DMS Plant discard)
Thorium (Th)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Thallium (Tl)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Uranium (U)	mg/L	0.005	0.004	0.004	0.005	0.004	0.004	0.005	0.004	0.004
Vanadium (V)	mg/L	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Zinc (Zn^{2+})	mg/L	0.37	1.41	0.74	0.36	1.40	0.73	0.92	1.92	1.25
Total Dissolved Solids (TDS)	mg/L	1 976	2 170	1 938	2 097	2 291	2 059	2 968	3 053	2 818

Table 6-14 - Predicted preliminary source terms for New Largo open cast pits with Destoning Plant rejects over medium and term post-closure

Parameter	Units	Pit H		Pit F		Pit D			
		Without Destoning Plant rejects	Destoning plant rejects (Preliminary Source Terms with 7 weeks data)	Without Destoning Plant rejects	Destoning plant rejects (Preliminary Source Terms with 7 weeks data)	Without Destoning Plant rejects	Destoning plant rejects, 5% (Preliminary Source Terms with 7 weeks data)	Destoning plant rejects, 10% (Preliminary Source Terms with 7 weeks data)	Destoning plant rejects, 15% (Preliminary Source Terms with 7 weeks data)
pH		4.89	5.46	5.50	5.51	4.89	5.81	5.55	5.99
Alkalinity	mg/L as $CaCO_3$	3.00	15.04	3.00	3.09	3.00	33.10	18.05	48.60
Chloride (Cl^-)	mg/L	736	705	339	341	736	650	684	619
Sulfate (SO_4^{2-})	mg/L	650	713	613	611	650	806	726	889
Aluminum (Al^{3+})	mg/L	1.34	1.29	0.02	0.02	1.34	1.17	1.23	1.13
Silver (Ag)	mg/L	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
Arseni (As)	mg/L	0.008	0.010	0.009	0.009	0.008	0.012	0.010	0.014
Boron (B)	mg/L	0.039	0.062	0.043	0.044	0.039	0.095	0.067	0.124
Barium (Ba^{2+})	mg/L	0.006	0.044	0.006	0.006	0.006	0.102	0.054	0.151
Beryllium (Be)	mg/L	0.010	0.009	0.009	0.009	0.010	0.009	0.009	0.009
Calcium (Ca^{2+})	mg/L	226	239	58	58	226	256	237	277
Cadmium (Cd)	mg/L	0.002	0.003	0.002	0.002	0.002	0.004	0.003	0.005
Cobalt (Co)	mg/L	0.043	0.044	0.053	0.053	0.043	0.045	0.044	0.046
Copper (Cu^{2+})	mg/L	0.165	0.159	0.167	0.166	0.165	0.151	0.158	0.144
Chrome (Cr)	mg/L	0.000	0.002	0.000	0.000	0.000	0.005	0.003	0.008
Fluoride (F^-)	mg/L	0.166	0.226	0.159	0.159	0.166	0.315	0.240	0.394
Iron (Fe)	mg/L	209	200	177	176	209	185	195	175
Mercury (Hg)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Potassium (K^+)	mg/L	19.4	20.1	21.1	21.2	19.4	21.2	20.4	22.0
Lithium (Li)	mg/L	0.066	0.066	0.066	0.066	0.066	0.067	0.066	0.067
Magnesium (Mg^{2+})	mg/L	94.2	99.4	74.3	74.4	94.2	107.0	100.2	114.1
Manganese (Mn)	mg/L	1.08	1.15	1.24	1.24	1.08	1.25	1.17	1.34
Molybdenum (Mo)	mg/L	0.017	0.018	0.018	0.018	0.017	0.020	0.019	0.021

	Units	Pit H		Pit F		Pit D			
		Without Destoning Plant rejects	Destoning plant rejects (Preliminary Source Terms with 7 weeks data)	Without Destoning Plant rejects	Destoning plant rejects (Preliminary Source Terms with 7 weeks data)	Without Destoning Plant rejects	Destoning plant rejects, 5% (Preliminary Source Terms with 7 weeks data)	Destoning plant rejects, 10% (Preliminary Source Terms with 7 weeks data)	Destoning plant rejects, 15% (Preliminary Source Terms with 7 weeks data)
Nitrate (NO^3)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sodium (Na^{2+})	mg/L	182	179	175	175	182	173	178	168
Nickel (Ni)	mg/L	0.089	0.090	0.109	0.109	0.089	0.091	0.090	0.091
Phosphorus (P)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lead (Pb^{2+})	mg/L	0.098	0.096	0.098	0.098	0.098	0.093	0.096	0.091
Antimony (Sb)	mg/L	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.004
Selenium (Se)	mg/L	0.004	0.006	0.006	0.006	0.004	0.010	0.007	0.012
Silicon (Si)	mg/L	3.35	3.21	3.53	3.51	3.35	2.99	3.15	2.82
Tin (Sn)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002
Strontium (Sr)	mg/L	0.000	0.344	0.000	0.003	0.000	0.860	0.430	1.303
Thorium (Th)	mg/L	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Thallium (Tl)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002
Uranium (U)	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Vanadium (V)	mg/L	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Zinc (Zn^{2+})	mg/L	0.37	0.44	0.41	0.41	0.37	0.53	0.45	0.61
Total Dissolved Solids (TDS)	mg/L	1 918	1 974	1 292	1 292	1 918	2 041	1 964	2 126

Table 6-15 - Predicted final source terms for New Largo open cast Pit Wilge over short term post-closure

Parameter	Units	Pit Wilge
		Without Discard/Rejects
pH		4.82
Alkalinity	mg/L as $CaCO_3$	3.01
Chloride (Cl^-)	mg/L	858
Sulfate (SO_4^{2-})	mg/L	654
Aluminum (Al^{3+})	mg/L	1.72
Silver (Ag)	mg/L	0.000
Arseni (As)	mg/L	0.009
Boron (B)	mg/L	0.039
Barium (Ba^{2+})	mg/L	0.006
Beryllium (Be)	mg/L	0.009
Calcium (Ca^{2+})	mg/L	274
Cadmium (Cd)	mg/L	0.002
Cobalt (Co)	mg/L	0.040
Copper (Cu^{2+})	mg/L	0.168
Chrome (Cr)	mg/L	0.000
Fluoride (F^-)	mg/L	0.176
Iron (Fe)	mg/L	227
Mercury (Hg)	mg/L	0.000
Potassium (K^+)	mg/L	18.1
Lithium (Li)	mg/L	0.067
Magnesium (Mg^{2+})	mg/L	98.75
Manganese (Mn)	mg/L	1.06
Molybdenum (Mo)	mg/L	0.02
Nitrate (NO^3)	mg/L	0.00
Sodium (Na^{2+})	mg/L	183
Nickel (Ni)	mg/L	0.086
Phosphorus (P)	mg/L	0.000

Parameter	Units	Pit Wilge
Lead (Pb^{2+})	mg/L	0.098
Antimony (Sb)	mg/L	0.003
Selenium (Se)	mg/L	0.004
Silicon (Si)	mg/L	3.53
Tin (Sn)	mg/L	0.001
Strontium (Sr)	mg/L	0.000
Thorium (Th)	mg/L	0.000
Thallium (Tl)	mg/L	0.001
Uranium (U)	mg/L	0.005
Vanadium (V)	mg/L	0.002
Zinc (Zn^{2+})	mg/L	0.36
Total Dissolved Solids (TDS)	mg/L	2 097

7 RISK ASSESSMENT

7.1 CONCEPTUAL UNDERSTANDING

The reviewed information was used to develop the conceptual site understanding.

7.1.1 MINING METHOD

All the five coal seams of the Highveld coalfield exist in the New largo area but only the No. 2 and No. 4 seams are considered economic and will be mined. The coal is extracted from the pits by opencast strip mining using truck and shovel, although dragline operations could be implemented in future. The initial overburden removed to access the coal is placed as backfill inside the pits or stockpiled outside the pits. Interburden and later overburden are spoiled: rolled over to remain within the pit as new mining blocks are opened and old ones mined out.

At Pit Wilge, the mining plan avoids mining through the land on which the old Wilge Power Station infrastructure is located. The old discard dump associated with the power station will however be removed / mined-through.

There are, or will be, two different types of plants contemplated for coal processing at New Largo, the destoning (air) plant and DMS (washing) plant.

7.1.2 IN-PIT DISPOSAL

It is WSP's understanding that the coal discard and destoning rejects produced from the aforementioned plants, will be disposed back into the mined open pits. In-pit coal discard disposal is authorised for a certain areal extent and therefore the proposed mining changes warrants environmental authorisation for in-pit disposal of discard to cover the full extents of the pits.

The practice of in-pit disposal means that the coal discard and destoning rejects will be deposited into the pit after removal of all the coal and spoils, which for New Largo will be the area in suitable areas identified that was occupied by the No. 2 Seam. This allows that, wherever possible, at least some of the discard and rejects will be lower than the post mining ground water re-charge/decant elevation, although in some pits parts of this disposal zone will be above the water table (see Figure 7-1 to Figure 7-3).

This is done prior to dumping of overburden spoils from the next mining strip in the direction of mining. Overburden spoils are dumped into the pit on top of the discard and graded with light compaction. Once No. 4 Seam from the next mining strip has been removed, the interburden spoils are dumped into the pit on top of the recently added overburden, and again graded with light compaction.

At this point, the No. 2 Seam is removed, and the new void is available for discard/reject disposal. Topsoil and subsoil removed and stored previously are then used as cover material and vegetated.

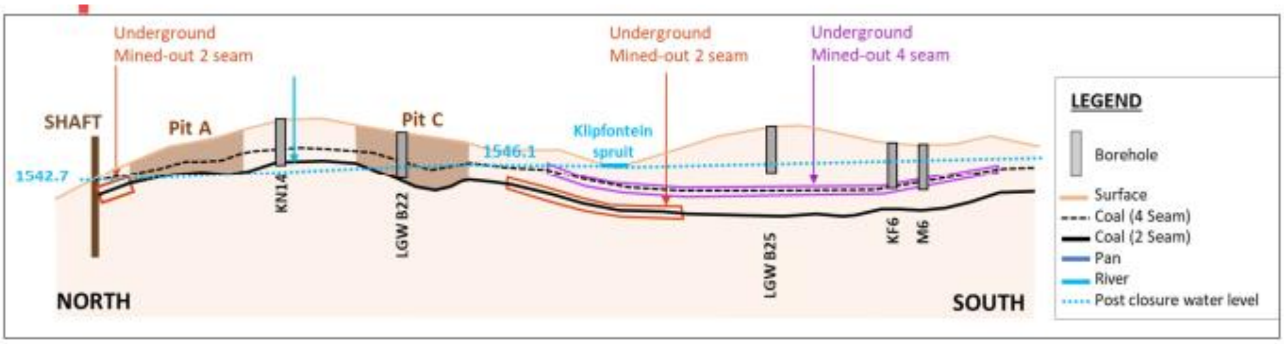

Figure 7-1 - N-S cross section through Pit A and C (WSP, 2024)

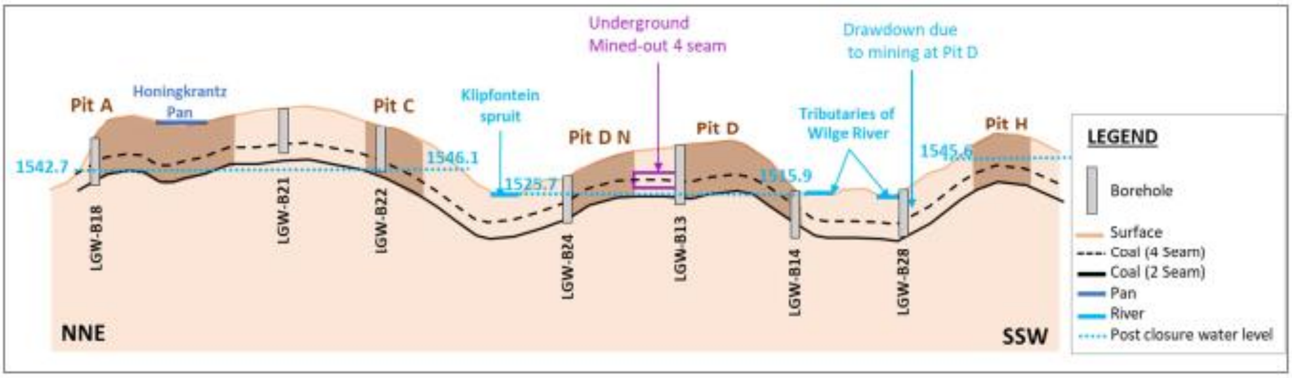

Figure 7-2 - NNE-SSW cross section through Pit A, C, D-North, D, and H (WSP, 2024)

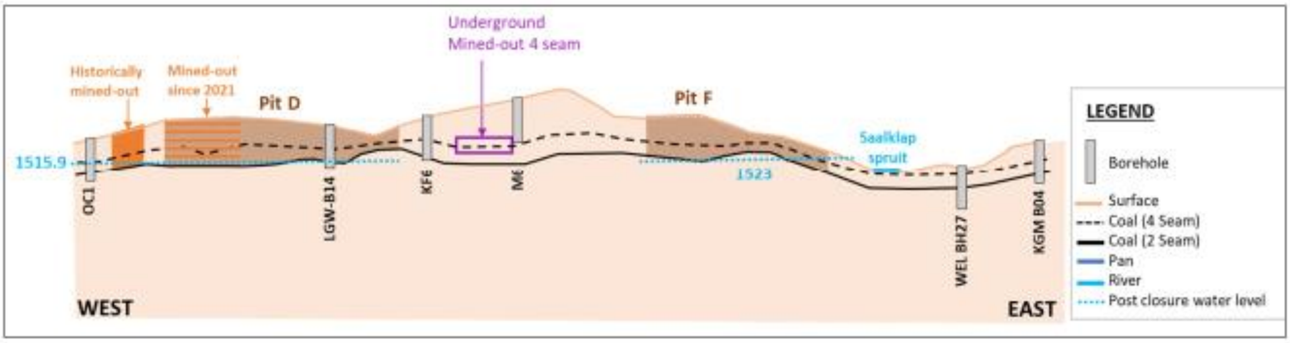

Figure 7-3 - W-E cross section through Pit D, and F (WSP, 2024)

The mining method, where all the discard/rejects from both seams end up at the bottom of the pit, means that some of the discard/rejects will be below the in-pit water table, where there is limited availability of oxygen (Love, 2024): the maximum dissolved oxygen availability is some thirty times less than under atmospheric conditions (INAP, 2010). Numerous case studies have shown that the sub-aqueous environment, by limiting the exposure of potentially acid-generating sulfide-bearing residues to oxygen, is effective in limiting acid rock drainage generation over the long-term (Cacciuttolo, 2023), (MEND, 1995), and (Oggeri, 2023). Although recent findings indicate a bacterial mechanism that can drive pyrite oxidation under anoxic conditions (Payne, 2021), this requires specific methanogenic bacteria, and extremely small grain sizes for the bacteria to attach to (Spietz, 2022).

However, at New Largo, several of the pits have final in-pit water levels which are low, leaving much of the pit open to atmospheric conditions (for example Pit F in Figure 7-3), and in other pits, the quantity of discard/rejects will result in at least some of the discard/rejects being above the in-pit water table. This does not have the geochemical advantages of sub-aqueous disposal, but still consolidates dirty water of the discard/rejects, and of the pit, into one system, managed by the same dirty water management system that the pit requires (Love, 2024). It also decreases the amount of mined land and waste exposed at any point in time (Das, 2022). This means that rainfall that falls onto the mineral residue does not also fall onto the pit (as it would if the two were separate) meaning that less rainfall in total is converted into dirty water, which is a lesser environmental impact (Love, 2024).

7.1.3 WATER MANAGEMENT

During coal mining operation, groundwater is pumped out (dewatering) of the working environment (pit) to ensure dry and safe working conditions in collieries, with strategic pumping stations located around mine workings and once mining has ceased and rehabilitation takes place, the cessation of dewatering results in the progressive rise of groundwater and flooding of the workings (groundwater rebound) (see Figure 7-4). The water levels in all the pits are expected to rebound to decant level (see Figure 7-1 to Figure 7-3 and Pit decant elevation map presented in Appendix C).

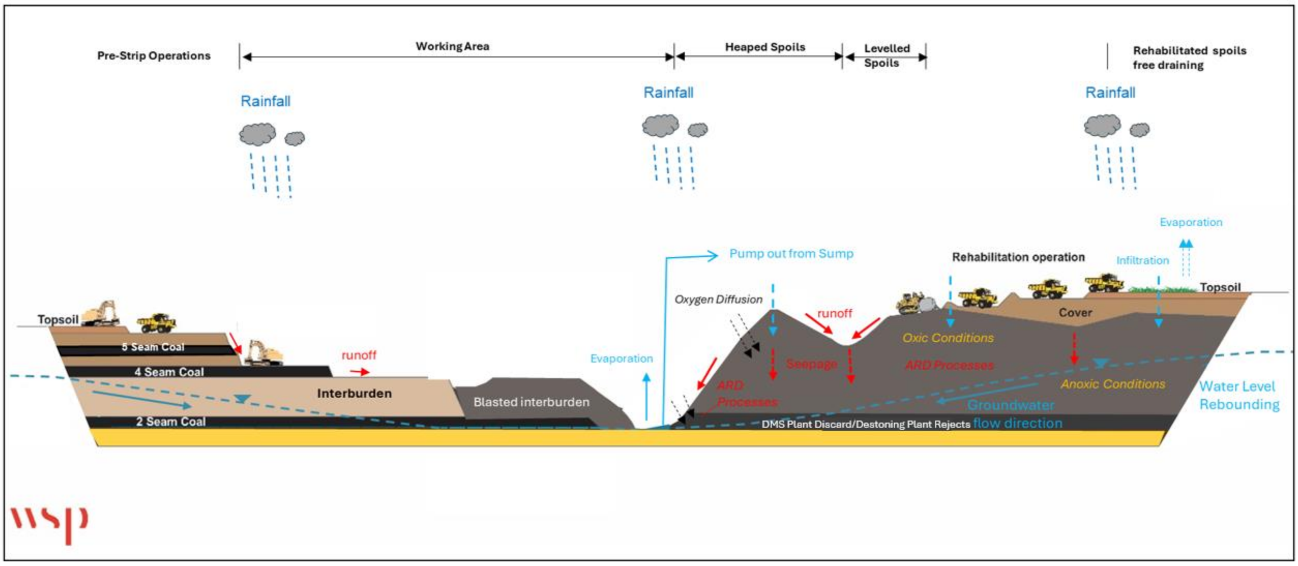

Figure 7-4 – A Conceptual model of in-pit disposal during rollover mining, rehabilitation, and post-closure (WSP, 2024A)

The Best Practice Guideline (BPG) questions as outlined in the Project Context in Section 2 of this report are addressed below:

7.2 BGP QUESTION 1

Question 1	**BPG: Will any waste material be generated that has a potential to generate acid, neutral or saline drainage?**
	Residue Stockpile Regulations: Characterise chemical characteristics that must include the propensity to oxidise… the pH and chemical composition of the water separated from the solids, the reactivity and rate thereof, acid generating and neutralising potential. 4(2)(b)
	Residue Stockpile Regulations: The classification of residue deposit must be undertaken on the basis of the characteristics of the residue, locations & dimension of the deposit. 5(3)
Findings	Yes. ▪ In terms of the sulfide sulfur content from the ABA results, all the samples exhibit a high potential for acid generation with sulfide sulfur values of 1.09% for Welgelegen DMS discard, and 2.77% for Genet destoning rejects. ▪ Furthermore, some buffering capacity is present in both the samples with a neutral pH ranging between pH 6.11 and 7.22 for the DMS Plant discard sample (SNL-Welge-CD-01), and between 7.37 and 7.73 for the Destoning Plant rejects reached over a long term. ▪ Mineralogical Results revealed the following: • Pyrite, the principal sulfide mineral linked to ARD generation, was detected in all the samples with the Genet destoning rejects (SNL-PitD-Deston-02) having a higher percentage (2.9 wt.%) of pyrite compared to the DMS plant discard from Welgelegen Plant (SNL-Welge-CD-01) which had 0.8 wt.%.

	• Fast-reacting carbonates such as calcite ($CaCO_3$) and dolomite [$CaMg(CO_3)_2$], which contribute to buffering, were detected in the samples, with calcite detected in all the samples at 0.4 wt.% and 1.6 wt.% for Welgelegen DMS plant discard and Genet Destoning Plant rejects, respectively. Dolomite was only detected in Welgelegen DMS Plant (0.1 wt.%) discard sample. Moreover, the presence of other minerals such as kaolinite and muscovite can act as a buffer, in the pH range of 2.2-5.1 as it weathers slowly, for any poor drainage that may generate. ▪ As an indication of potential environmental hazard and to put the results into context, the kinetic leach results have been compared to the water use license (WUL) limits for groundwater quality. From the results, both the coal residue samples had pH levels that were close to the groundwater WUL limit of 7.7. Only chloride and iron were found to be above the specified WUL limits of 3.7 mg/L and 0.13 mg/L, respectively, in negligible number of samples. DMS plant discard had exceedances for iron concentrations during week 11 (1.38 mg/L) and 12 (0.49 mg/L), while the Destoning Plant reject had the chloride concentration exceedance during the initial flush (week 0) with 14.8 mg/L, but thereafter was below the laboratory detection limit.

7.3 BGP QUESTION 2

Question 2	**BPG: Is there a potential to separate and manage waste streams in accordance to their acid, neutral or saline drainage potential?**
	Residue Stockpile Regulations: Characterise chemical characteristics that must include the propensity to oxidise… the pH and chemical composition of the water separated from the solids, the reactivity and rate thereof, acid generating and neutralising potential. 4(2)(b)
Findings	No. This study considers the disposal of discard/rejects, by backfilling into the opencast pits with the rollover spoils. The current final and preliminary predictions generally show that pH conditions improved slightly in the predicted pit water chemistry when coal discard or rejects are disposed in the pits. Sulfate and calcium concentrations increased in all the pits with coal discard or rejects compared to the predicted concentrations in the pits without discard or rejects (the effect is greater in pits to be backfilled with DMS discard than those with destoning rejects). Similar to sulfate, total dissolved solids, manganese, and magnesium also increased in all the pits with coal discard or rejects are compared to the predicted concentrations in the pits without discard or rejects over a medium term. However, concentration decrease is expected over a long term. Iron and aluminium concentrations decreased in all the pits with coal discard or rejects compared to the predicted concentrations in the pits without discard or rejects.

7.4 BGP QUESTION 3

Question 3	**BPG: Are there any positive or negative consequences of storing and/or disposing of these waste materials in a specific manner on their own or in any combination?**
	Residue Stockpile Regulations: The classification of residue deposit must be undertaken on the basis of the characteristics of the residue, locations & dimension of the deposit. 5(3)
Findings	The mining method, where all the discard/rejects from both seams end up at the bottom of the pit, means that some of the discard/rejects will be below the in-pit water table, where there is limited availability of oxygen (Love, 2024): the maximum dissolved oxygen

	availability is some thirty times less than under atmospheric conditions (INAP, 2010). Numerous case studies have shown that the sub-aqueous environment, by limiting the exposure of potentially acid-generating sulfide-bearing residues to oxygen, is effective in limiting acid rock drainage generation over the long-term (Cacciuttolo, 2023), (MEND, 1995), and (Oggeri, 2023). Although recent findings indicate a bacterial mechanism that can drive pyrite oxidation under anoxic conditions (Payne, 2021), this requires specific methanogenic bacteria, and extremely small grain sizes for the bacteria to attach to (Spietz, 2022). However, at New Largo, several of the pits have final in-pit water levels which are low, leaving much of the pit open to atmospheric conditions (for example Pit F in Figure 7-3), and in other pits, the quantity of discard/rejects will result in at least some of the discard/rejects being above the in-pit water table. This does not have the geochemical advantages of sub-aqueous disposal, but still consolidates dirty water of the discard/rejects, and of the pit, into one system, managed by the same dirty water management system that the pit requires (Love, 2024). It also decreases the amount of mined land and waste exposed at any point in time (Das, 2022). This means that rainfall that falls onto the mineral residue does not also fall onto the pit (as it would if the two were separate) meaning that less rainfall in total is converted into dirty water, which is a lesser environmental impact (Love, 2024). - Pit A & G: pit A may have limited storage volume below the post-closure water level towards the north area of the pit (see Figure 7-1 and Figure 7-2). - Pit C: may have storage volume below the post-closure water level (see Figure 7-1 and Figure 7-2). - Pit D-North: may have limited space towards the north of north-east of the pit, but majority of the pit does not have storage volume below the post-closure water level (see Figure 7-3). - Pit H: may have storage volume below the post-closure water level (see Figure 7-2). - Pit F: does not have storage volume below the post-closure water level (see Figure 7-3). - Pit D: may have limited space towards the south of south-west of the pit, but majority of the pit does not have storage volume below the post-closure water level (see Figure 7-3 and Figure 7-3).

7.5 BGP QUESTION 4

Question 4	**BPG: How would proposed alternative mining techniques and layouts (backfill into opencast pits) affect the potential impact on the identified receptor water resource (surface and groundwater balance and quality)?** **Residue Stockpile Regulations: The classification of residue deposit must be undertaken on the basis of the characteristics of the residue, locations & dimension of the deposit. 5(3)**
Findings	This study considers the opportunities for selective placement of discard to minimise potential acidic drainage, and the role of a decant management system to avoid decant. The practice of in-pit disposal means that the coal discard and destoning rejects will be deposited into the pit after removal of all the coal and spoils, which for New Largo will be the area in suitable areas identified that was occupied by the No. 2 Seam. This allows that, wherever possible, at least some of the discard and rejects will be lower than the post mining ground water re-charge/decant elevation, although in some pits parts of this disposal zone will be above the water table (see also question 3 above) Furthermore, the in-pit disposal is done prior to dumping of overburden spoils from the next mining strip in the direction of mining. Overburden spoils are dumped into the pit on top of the discard and graded with light compaction. Once No. 4 Seam from the next mining strip

	has been removed, the interburden spoils are dumped into the pit on top of the recently added overburden, and again graded with light compaction. At this point, the No. 2 Seam is removed, and the new void is available for discard/reject disposal. Topsoil and subsoil removed and stored previously are then used as cover material and vegetated. The receptor must be protected by decant management: dirty water from the pit must be pumped out to prevent decant post-closure. The safe operating level of the decant management system should be to keep the in-pit water level at least 2 m below the decant elevation.

7.6 SUMMARY

The combined risk assessment for each of the individual pits is considered in Table 7-1.

Table 7-1 Summarised geochemical risk assessment for each pit

Pits	Geochemical risk profile: material disposed	Geochemical risk profile: water level	Conclusion
Pit A & G	DMS plant discard: substantial effect on the sulfate (~900 mg/L) and TDS (~2 000 mg/L) concentrations	Pit A may have limited storage volume below the post-closure water level towards the north area of the pit	High risk of elevated sulfate and TDS concentrations, largely unmitigated by in-pit water level
Pit C	DMS plant discard: substantial effect on the sulfate (~900 mg/L) and TDS (~2 300 mg/L) concentrations	May have storage volume below the post-closure water level	High risk of elevated sulfate and TDS concentrations, partially mitigated by in-pit water level
Pit D-North	DMS plant discard: substantial effect on the sulfate (~1 000 mg/L) and TDS (~3 000 mg/L) concentrations	May have limited space towards the north of north-east of the pit, but majority of the pit does not have storage volume below the post-closure water level	High risk of elevated sulfate and TDS concentrations, unmitigated by in-pit water level
Pit H	Destoning plant rejects: moderate effect on sulfate (~700 mg/L) and TDS (~2 000 mg/L) concentrations	May have storage volume below the post-closure water level	Moderate/low risk of elevated sulfate and TDS concentrations, partially mitigated by in-pit water level
Pit F	Destoning plant rejects: moderate effect on sulfate (~600 mg/L) and TDS (~1 300 mg/L) concentrations	Does not have storage volume below the post-closure water level	Moderate risk of elevated sulfate and TDS concentrations, unmitigated by in-pit water level
Pit D	Destoning plant rejects: moderate effect on sulfate (~800 mg/L) and TDS (~2 000 mg/L) concentrations	May have limited space towards the south of south-west of the pit, but majority of the pit does not have storage volume below the post-closure water level	Moderate/low risk of elevated sulfate and TDS concentrations, partially mitigated by in-pit water level
Pit Wilge	No in-pit disposal	No in-pit disposal	Lower risk

8 CONCLUSIONS

The following conclusions are made based on the static analytical results of the discard samples:

- The were nine crystalline mineral phases detected in the New Largo coal residue samples, with the dominant ones being kaolinite and quartz.
- Pyrite, the principal sulfide mineral linked to ARD generation, was detected in all the samples with the DMS plant discard from Phola DMS Plant (SNL-Ph-CD-01) having higher percentage (3.2 wt.%) compared to the DMS plant discard from Welgelegen Plant (SNL-Welge-CD-01) which had 0.8 wt.%. The Genet destoning rejects (SNL-PitD-Deston-02) had 2.9 wt.% of pyrite.
- Fast-reacting carbonates such as calcite ($CaCO_3$) and dolomite [$CaMg(CO_3)_2$], which contribute to buffering, were detected in the samples, with calcite detected in all the samples at 0.4 wt.%, 1.52 wt.%, and 1.6 wt.% for Welgelegen DMS plant discard, Phola DMS Plant discard, and Genet Destoning Plant rejects respectively. Dolomite was only detected in Welgelegen DMS Plant (0.1 wt.%) and Phola Plant (1.1 wt.%) discard samples. Moreover, the presence of other minerals such as kaolinite and muscovite can act as a buffer, in the pH range of 2.2-5.1 as it weathers slowly, for any poor drainage that may generate.
- Based on Geochemical abundance index (GAI), Silver (Ag), Selenium (Se), arsenic (As), bismuth (Bi), mercury (Hg), molybdenum (Mo), and tellurium (Te) were found to be enriched (GAI ≥ 3), with all other metals and semi-metals below 3-fold enrichment.
- The differences in mineralogy and geochemical abundance between the DMS discards from Welgelegen and Phola, compared to the Genet destoning rejects, is due to the latter process producing residue containing more silicate minerals, but this does not have environmental significance due to their low reactivity.
- In terms of the sulfide sulfur content from the ABA results, all the samples exhibit a high potential for acid generation with sulfide sulfur values of 1.09% for Welgelegen DMS discard, 2.77% for Genet destoning rejects, and 2.37% for Phola DMS discard.
- The paste pH vs. SNPR (BulkNP/SAP), which is based on sulfide content revealed that all the discard samples are potentially acid generating (PAG).
- From the NAG results, all New Largo discard samples were below the NAG pH threshold of 4.5, which implies that the samples have potential for acid generation, which is consistent with the ABA results.

In terms of the kinetic test results the following is summarised:

- This report presents the full 20-week kinetic results for the DMS Plant discard, while the cell for the Destoning Plant rejects, is still running at WSP Laboratory for the standard 20-weeks with a weekly evaluation of the leachate samples. Full results until the 8th week, and pH and EC until the 13th week are available so far and presented in this report.
- The DMS Plant discard sample (SNL-Welge-CD-01) had a pH = 6.91 at the start of the kinetic leach test (week 0), after which it remains within the range (pH 6.11 - 7.22), which indicates some buffering capacity. The discard sample paste pH values are within the pH ranges with the DMS plant discard paste pH of 6.76. The Destoning Plant reject sample show neutral conditions with pH range between 7.37 and 7.73, and the paste pH (7.03) within the range in the 8 weeks so far. Both the coal residue samples had pH levels that were close to the groundwater WUL limit of 7.7.
- The DMS plant discard sample (SNL-Welge-CD-01) had the highest TDS concentrations measured (764 mg/L) in week 9. The TDS for DMS plant discard samples is shown to fluctuate

from week 0 to week 16, with a slight but stable increase from week 16 until week 20. A similar trend was observed in terms of the conductivity. Furthermore, DMS plant discard sample had the highest conductivity in week 12 (1 080 µS/cm) and showed a variable conductivity until week 13 ranging from 81 µS/cm to 1 080 µS/cm. Destoning Plant reject sample had the highest TDS recorded in week 0 (745 mg/L), but fluctuated with the weeks with the lowest concentration (378 mg/L) recorded in week 2. Moreover, variable conductivity is observed during the 8 weeks of the experiment, ranging between 449 to 981 µS/cm. Both Samples had TDS levels that were below the specified WUL limit of 3 309 mg/L.

- Sulfate concentrations are shown to have a similar trend to TDS and conductivity for both the DMS Plant discard (range from 236 to 652 mg/L) and Destoning Plant reject (237.5 to 505 mg/L). Both the samples had concentrations that are lower than the specified WUL limit of 2 130 mg/L.
- Only chloride and iron were found to be above the specified WUL limits of 3.7 mg/L and 0.13 mg/L, respectively, in negligible number of samples. DMS plant discard had exceedances for iron concentrations during week 11 (1.38 mg/L) and 12 (0.49 mg/L), while the Destoning Plant reject had the chloride exceedance during the initial flush (week 0) with 14.8 mg/L, but thereafter was below the laboratory detection limit.

In terms of pit water qualities, the following is deduced:

- The DMS plant discard and destoning rejects will be disposed in-pit. Some of the discard/rejects will end up below the final in-pit water table, and some will be above. There are advantages in decreasing environmental impact from both, but the greatest advantage is achieved by disposal below the in-pit water table.
- All pits are conservatively considered to have the potential to turn acidic, with long-term pH ranging between 4.5 and 6.0. This is partly influenced by the conservative laboratory method used in previous studies on the overburden, and should be revised when a geochemical assessment update is done for the pits, especially of the overburden that is spoiled (backfilled).
- The DMS discard has a substantial effect on the sulfate and TDS load of pits into which it will be backfilled, with the predicted concentrations rising by between 20% and 36% in the medium-term (compared to the same pit without discard), but falling off to a lower increase (below 10% more than the same pit without discard) in the long-term. The influence on the TDS is less substantial. This is largely within previously predicted ranges: the range predicted by JMA (2011): 900 – 1,200 mg/L sulfate and 1,200 – 2,400 mg/L TDS.
- The destoning rejects have a small influence on the sulfate concentration (10% increase or less over the same pit without rejects), except in the higher disposal scenarios of Pit D (if 10 to 15% of the material backfilled is discard). The source-terms for destoning rejects are preliminary source-terms, based on 7 of 20 weeks humidity cell data, and an update memorandum will be provided in mid-November, when the cell is completed.
- It should also be noted that effect of the waste backfilling is naturally influenced by the proportion that the waste makes up of the backfill, ranging from 0.03% at Pit F to 11% at Pit A&G. In some cases, this may have a greater influence than the difference in material properties between discard and rejects.

The risk assessment indicates that in-pit disposal of the New Largo coal residue is a suitable option if the discard/reject is disposed below the final water level where no or little oxidation of pyrite will take place. This allows that, wherever possible, at least some of the discard and rejects will be lower than the post mining ground water re-charge/decant elevation, although in some pits parts of this disposal zone will be above the water table. This is done prior to dumping of overburden spoils from the next mining strip in the direction of mining. The discard/rejects which will be below the in-pit water table will have limited availability of oxygen: the maximum dissolved oxygen availability is some thirty times less than under atmospheric conditions. However, several of the pits have final in-pit water levels which are low, leaving much of the pit open to atmospheric conditions, and in other pits, the quantity of discard/rejects will result in at least some of the discard/rejects being above the in-pit water table. This does not have the geochemical advantages of sub-aqueous disposal, but still consolidates dirty water of the discard/rejects, and of the pit, into one system, managed by the same dirty water management system that the pit requires. It also decreases the amount of mined land and waste exposed at any point in time. This means that rainfall that falls onto the mineral residue does not also fall onto the pit (as it would if the two were separate) meaning that less rainfall in total is converted into dirty water, which is a lesser environmental impact.

The overall effect of these risks and mitigations is summarised below:

- The highest level of geochemical risk is in Pits A&G and D North, where DMS discard will be disposed in pits with limited storage below the final in-pit water level, resulting in long-term oxidation of the discard and high sulfate and TDS concentrations.
- Pit C has moderate risk as there is more storage below the final in-pit water level for the DMS discard. Pit F also has a moderate risk due to a lower sulfate and TDS load from destoning rejects, but little disposal space below the final in-pit water level.
- Pits H and D have moderate/low risk, due to a lower sulfate and TDS load from destoning rejects, and some disposal space below the final in-pit water level.
- Wilge Pit will not have discard or rejects co-disposed with the spoils.

9 RECOMMENDATIONS

A backfilling plan should be developed, documenting the planned co-disposal of discard and rejects, following the below principles:

- Discard/rejects should be preferentially placed in the deepest part of the pit, and the mined-out section should then be backfilled, compacted and rehabilitated as soon as possible.
- The Discard/rejects should be placed a few meters below the decant water level (final pit water level) meaning that no or little oxidation of pyrite will take place.
- The discard/rejects should have a neutral (paste) pH when backfilled else it would immediately acidify interstitial water before being covered with water. This could be done by backfilling these coal residues while they are still fresh and cover them as quickly as possible – in less than a year.

The mining blocks and elevations for disposal of discard and rejects need to be marked out in the mine plan for each pit, and these should be updated as the mine plan is updated – as should the backfilling plan document itself.

Furthermore, a pathway control will be required, to capture mine water before or at the decant point: dirty water from the pit must be pumped out of the pit to prevent decant post-closure. The safe operating level of the decant management system should be to keep the in-pit water level at least 2 m below the decant elevation. The water which is pumped out of the pit should be treated for reuse or discharge. Scavenger wells outside the pit are *not* recommended, as these allow a plume to form and then be captured, whereas in-pit pumping wells contain the dirty water and prevent the formation of a plume, see Figure 9-1.

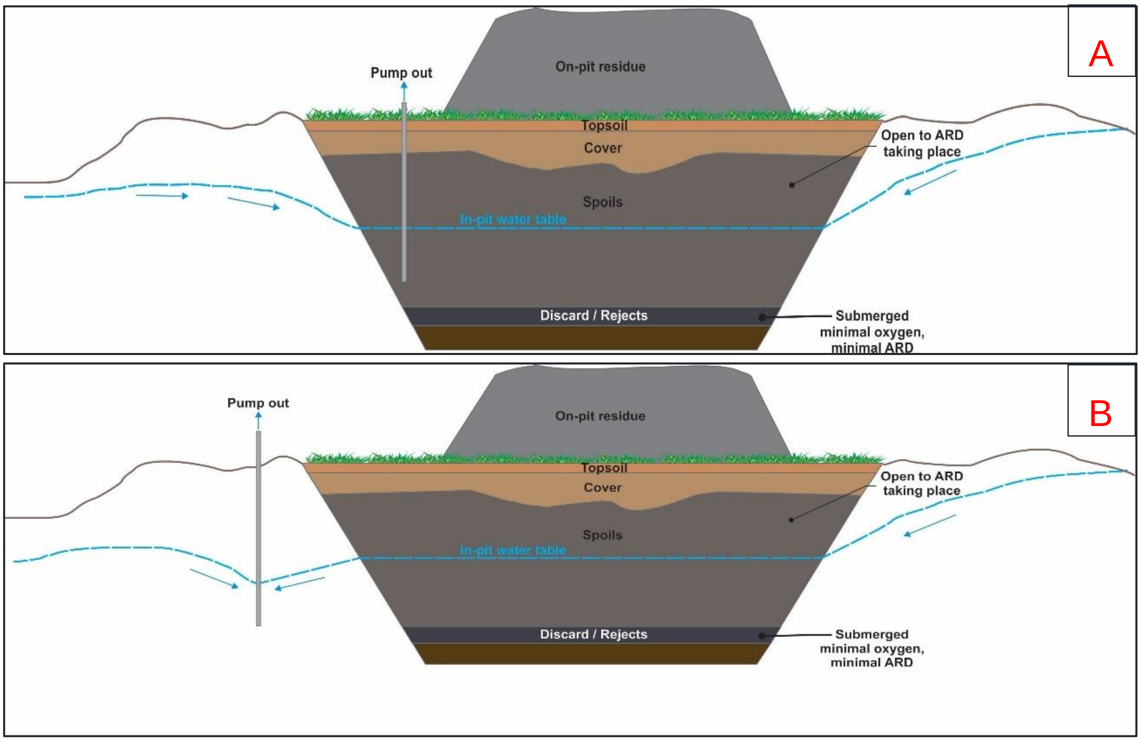

Figure 9-1 Comparison of in-pit pumping (A is recommended) and scavenger wells (B is not recommended)

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11 AUTHORSHIP AND REVIEW

This Report has been compiled by Mpule Gloria Dube (with some of the data analysis done by Motlatji Molabe), reviewed by David Love, and approved by Shameer Hareeparsad. All technical comments and queries can be directed to Shameer Hareeparsad.

Appendix A

GEOLOGICAL LOGS (JMA, 2012)

SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00001 **Number:** LGW-B1 **Site type:** Borehole

Distr./Farm No.: 534 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B1

Region Type: **Region Descr.:**

Y Coord. [m]: 2796.00	**Reg./BB.:**	**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]: 2864204.98	**G-Nr.:**	**Site status:**	In use	**Col. ht. [m]:**	0.76
Altitude [m]: 1534.00		**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.: Accurate to within 10 units		**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.: Global Positioning System		**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060908	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	24.00	215	20060908	CASED TO 165
JMA	24.00	30.00	165	20060908	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060908	0.00	14.00	165	Steel	3	Plain casing	0	0	0	0
20060908	14.00	20.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	17.00	20.00	0.42	Volumetric		Geologist, technician,	VOLUMETRIC

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Orange	Reddish		Silty	Sandy
1.00	7.00	CLAY	Orange	Reddish		Sandy	
7.00	13.00	CLAY	Orange	Reddish		Ferruginous	
13.00	18.00	LAVA	Grey			Fractured	Fractured
18.00	26.00	LAVA	Grey			Fractured	
26.00	30.00	LAVA	Grey	Dark		Fresh	Hard

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061002	1426	0.00	10.53	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00001 ***Number:*** LGW-B1 ***Site type:*** Borehole

Distr./Farm No.: 534 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B1

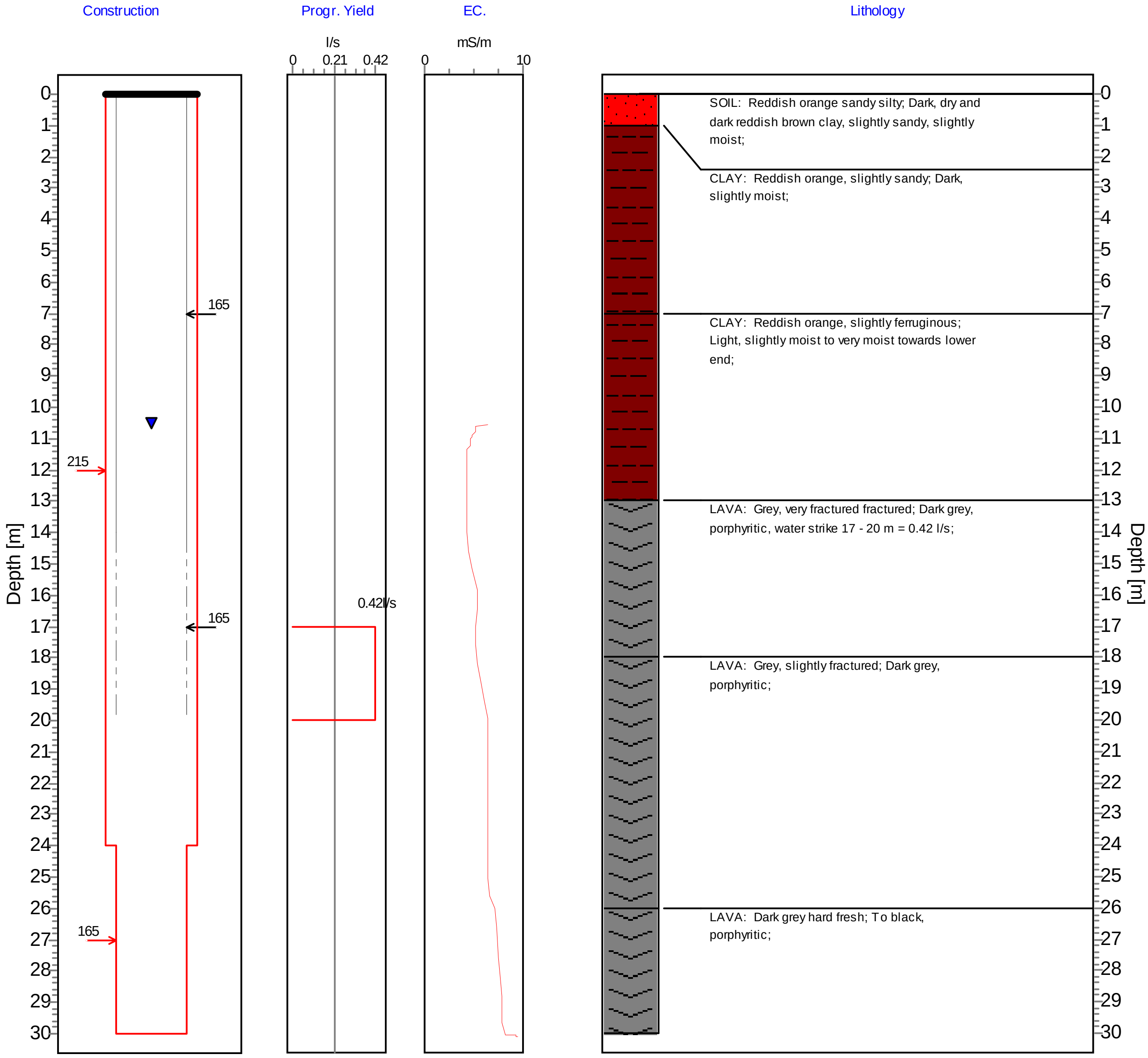
Region Type: ***Region Descr.:***

Y Coord. [m]:	2796.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2864204.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.76
Altitude [m]:	1534.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	Hole diameter [mm] (165)
Casing (plain / perforated, sloted)	Casing diameter [mm] (152)
Screen / Mesh Screen	Waterlevel measured: 02/10/06
Piezometer	Piezometer (Nr. & Diameter [mm]) (0:50)



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00002 **Number:** LGW-B2 **Site type:** Borehole

Distr./Farm No.: 536 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B2

Region Type: **Region Descr.:**

Y Coord. [m]: 2919.00	**Reg./BB.:**	**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]: 2865151.98	**G-Nr.:**	**Site status:**	In use	**Col. ht. [m]:**	0.61
Altitude [m]: 1557.00		**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.: Accurate to within 10 units		**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.: Global Positioning System		**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060907	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20060907	CASED TO 165
JMA	18.00	30.00	165	20060907	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060907	0.00	6.00	165	Steel	3	Plain casing	0	0	0	0
20060907	6.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	7.00	8.00	0.13	Estimated		Geologist, technician,	ESTIMATED
JMA	13.00	15.00	0.13	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Red	Red		Silty	Sandy
1.00	2.00	GRIT	Red	Light		Weathered	
2.00	3.00	SANDSTONE	White	Greyish	Fine	Weathered	
3.00	5.00	GRIT	Orange	Reddish		Weathered	Weathered
5.00	6.00	SANDSTONE	Brown	Reddish	Fine	Weathered	Weathered
6.00	7.00	GRIT	Orange	Reddish		Weathered	Weathered
7.00	9.00	GRIT	Orange	Reddish		Weathered	Weathered
9.00	10.00	GRIT	Orange	Reddish		Weathered	
10.00	11.00	SHALE	Black		Very fine	Weathered	
11.00	12.00	SHALE	Grey		Fine	Fresh	Weathered
12.00	13.00	SANDSTONE	Grey	Light	Fine	Fresh	
13.00	14.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
14.00	15.00	SHALE	Black		Very fine	Fresh	Weathered
15.00	16.00	SHALE	Grey		Very fine to fine	Fresh	Micaceous
16.00	17.00	SHALE	Black		Very fine	Fresh	Weathered
17.00	24.00	COAL	Black				
24.00	25.00	SHALE	Black		Very fine	Fresh	Carbonaceous
25.00	29.00	SANDSTONE	Grey	Light	Fine	Fresh	
29.00	30.00	SHALE	Grey	Dark	Fine	Fresh	Carbonaceous

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061002	1606	0.00	6.08	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00002 ***Number:*** LGW-B2 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B2

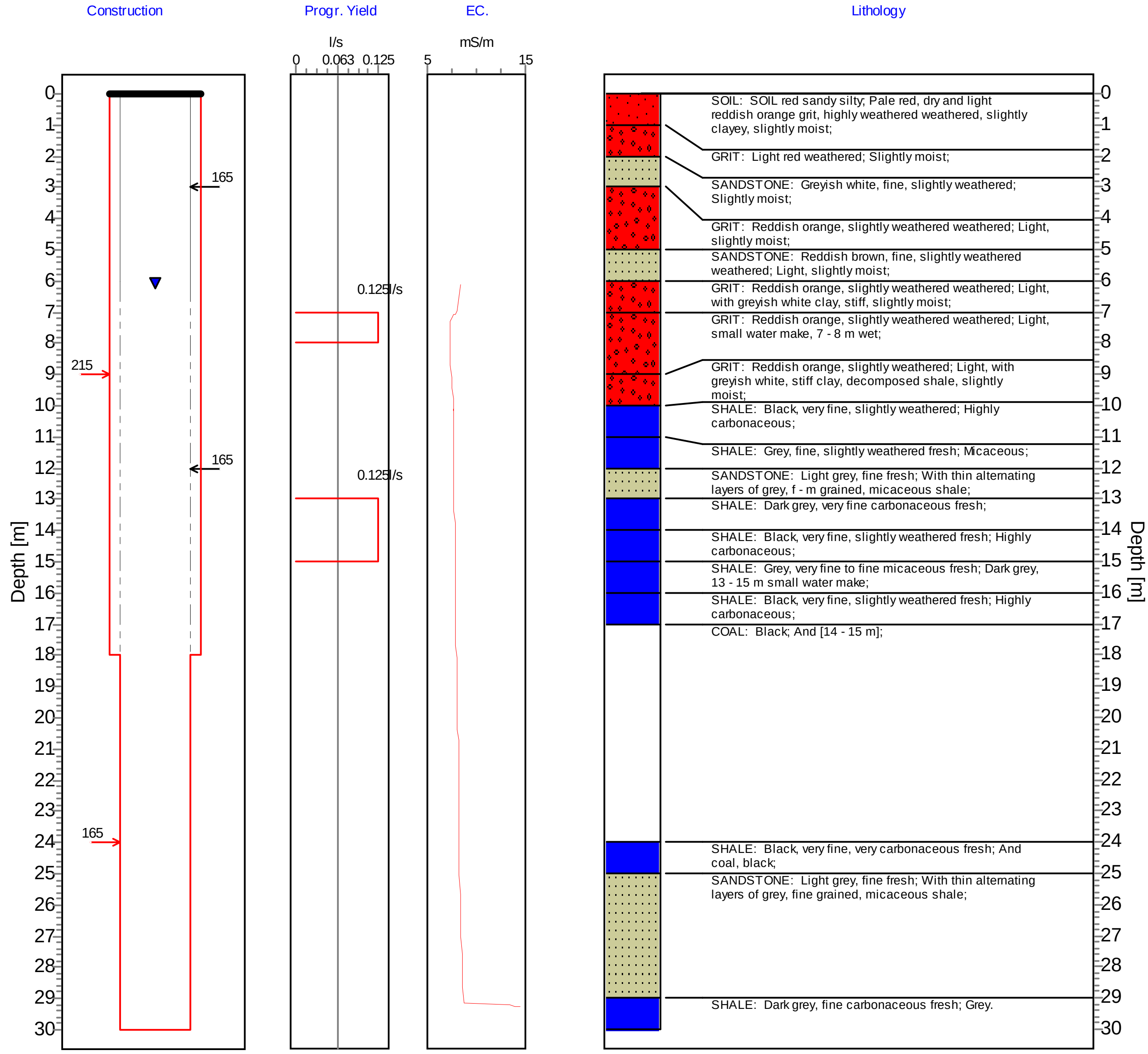
Region Type: ***Region Descr.:***

Y Coord. [m]: 2919.00	***Reg./BB.:***	***Topo-set.:*** Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2865151.98	***G-Nr.:***	***Site status:*** In use	***Col. ht. [m]:***	0.61
Altitude [m]: 1557.00		***Site purp.:*** Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:*** Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.: Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	165	Hole diameter [mm]
Casing (plain / perforated, sloted)	152	Casing diameter [mm]
Screen / Mesh Screen	▼	Waterlevel measured: 02/10/06
Piezometer	0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00003 **Number:** LGW-B3 **Site type:** Borehole

Distr./Farm No.: 537 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B3

Region Type: **Region Descr.:**

Y Coord. [m]:	4936.00	**Reg./BB.:**		**Topo-set.:** Hillside (slope)	**Depth [m]:** 30.00
X Coord. [m]:	2865792.98	**G-Nr.:**		**Site status:** In use	**Col. ht. [m]:** 0.82
Altitude [m]:	1546.00			**Site purp.:** Observation	**Diam. [mm]:** 165
Coord. acc.:	Accurate to within 10 units			**Use applic.:** Industrial - mining	**Drain. reg.:** B20G
Coord. meth.:	Global Positioning System			**Equipment:** No equipment	**Rep. inst.:** JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060911	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20060911	CASED TO 165
JMA	18.00	30.00	165	20060911	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060911	0.00	6.00	165	Steel	3	Plain casing	0	0	0	0
20060911	6.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	8.00	12.00	0.17	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Brown	Reddish		Silty	Sandy
1.00	2.00	GRIT	Red	Light		Weathered	Weathered
2.00	3.00	SANDSTONE	Orange	Reddish	Fine	Weathered	
3.00	4.00	CLAY	Orange	Reddish			
4.00	5.00	CLAY	Brown	Reddish		Micaceous	
5.00	6.00	CLAY	Brown	Reddish		Micaceous	
6.00	7.00	CLAY	White	Greyish			
7.00	8.00	CLAY	White	Greyish			
8.00	9.00	SHALE	Black			Clayey	Weathered
9.00	10.00	CLAY	Black			Carbonaceous	
10.00	11.00	CLAY	Black			Carbonaceous	
11.00	12.00	TILLITE	White	Greyish		Weathered	
12.00	13.00	TILLITE	White	Greyish		Weathered	
13.00	26.00	TILLITE	White	Greyish		Fractured	
26.00	30.00	QUARTZITE	White	Greyish		Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061002	1659	0.00	8.72	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00003 ***Number:*** LGW-B3 ***Site type:*** Borehole

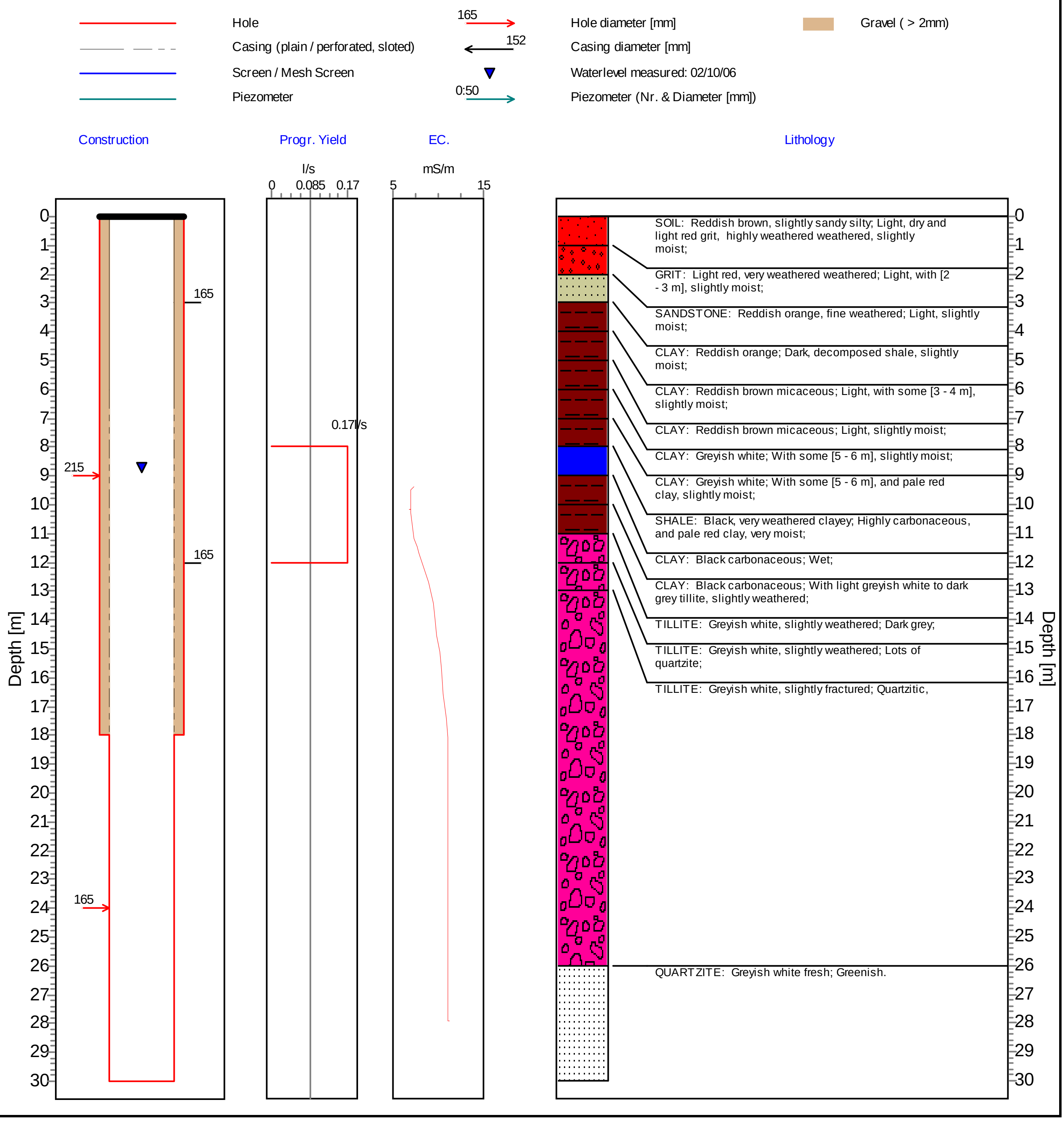
Distr./Farm No.: 537 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B3

Region Type: ***Region Descr.:***

Y Coord. [m]: 4936.00	***Reg./BB.:***	***Topo-set.:*** Hillside (slope)	***Depth [m]:*** 30.00
X Coord. [m]: 2865792.98	***G-Nr.:***	***Site status:*** In use	***Col. ht. [m]:*** 0.82
Altitude [m]: 1546.00		***Site purp.:*** Observation	***Diam. [mm]:*** 165
Coord. acc.: Accurate to within 10 units		***Use applic.:*** Industrial - mining	***Drain. reg.:*** B20G
Coord. meth.: Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:*** JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend



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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00004 ***Number:*** LGW-B4 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B4

Region Type: ***Region Descr.:***

Y Coord. [m]:	5699.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	36.00
X Coord. [m]:	2869460.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.53
Altitude [m]:	1543.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060911	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	12.00	215	20060911	CASED TO 165
JMA	12.00	36.00	165	20060911	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060911	0.00	6.00	165	Steel	3	Plain casing	0	0	0	0
20060911	6.00	12.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	22.00	30.00	6.67	Volumetric		Geologist, technician,	VOLUMETRIC
JMA	33.00	34.00	3.33	Volumetric		Geologist, technician,	VOLUMETRIC

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Red	Greyish		Silty	Sandy
1.00	2.00	CLAY	Red	Dark		Sandy	
2.00	3.00	CLAY	Red	Dark		Sandy	
3.00	4.00	GRIT	Red	Light		Clayey	Weathered
4.00	5.00	GRIT	Red	Light		Clayey	Weathered
5.00	6.00	CLAY	Orange	Reddish			
6.00	7.00	CLAY	Orange	Reddish			
7.00	8.00	CLAY	Brown	Reddish			
8.00	13.00	TILLITE	White	Greyish		Fresh	Weathered
13.00	22.50	SHALE	Brown	Reddish	Very fine	Weathered	Fractured
22.50	25.00	SHALE	Brown	Reddish	Very fine	Fractured	
25.00	30.00	SHALE	Brown	Reddish	Very fine	Fractured	Fractured
30.00	33.00	SHALE	Brown	Reddish	Very fine	Weathered	Fractured
33.00	34.00	SHALE	Brown	Reddish	Very fine	Fractured	
34.00	36.00	SHALE	Grey		Very fine	Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20060930	0955	0.00	6.74	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00004 ***Number:*** LGW-B4 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B4

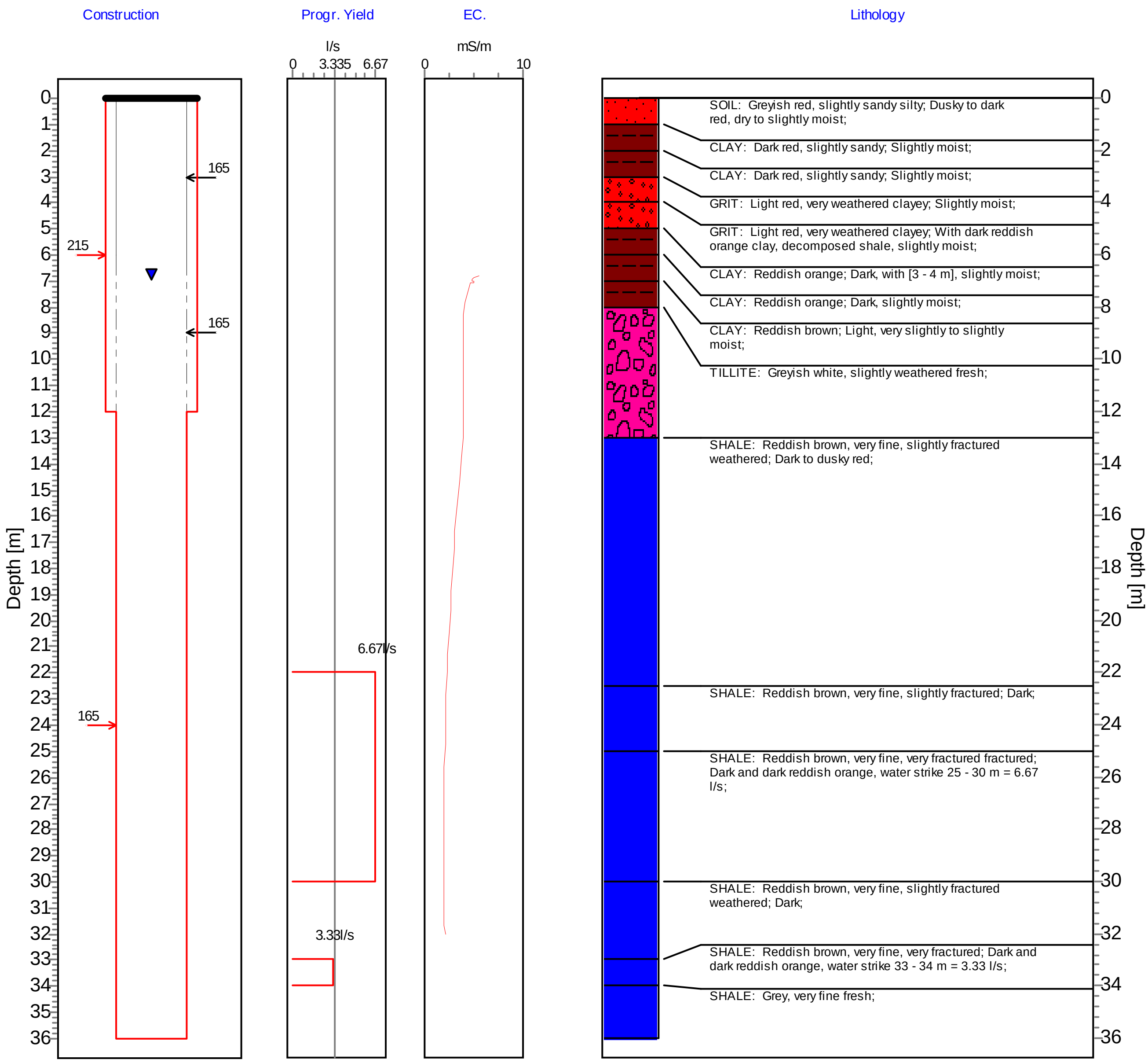
Region Type: ***Region Descr.:***

Y Coord. [m]:	5699.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	36.00
X Coord. [m]:	2869460.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.53
Altitude [m]:	1543.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole		165	Hole diameter [mm]
Casing (plain / perforated, sloted)		152	Casing diameter [mm]
Screen / Mesh Screen			Waterlevel measured: 30/09/06
Piezometer		0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00005 ***Number:*** LGW-B5 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B5

Region Type: ***Region Descr.:***

Y Coord. [m]:	6003.00	***Reg./BB.:***		***Topo-set.:*** At or in opencast mine	***Depth [m]:*** 30.00
X Coord. [m]:	2872144.98	***G-Nr.:***		***Site status:*** In use	***Col. ht. [m]:*** 0.59
Altitude [m]:	1519.00			***Site purp.:*** Observation	***Diam. [mm]:*** 165
Coord. acc.:	Accurate to within 10 units			***Use applic.:*** Industrial - mining	***Drain. reg.:*** B20F
Coord. meth.:	Global Positioning System			***Equipment:*** No equipment	***Rep. inst.:*** JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	*Contractor*	*Constr. meth.*	*Type finish*	*Development Method*	*Durat.*	*Special treatment*	*Constr. cost*
20060911	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	*Depth to Top [m]*	*Depth to Bottom [m]*	*Diameter [mm]*	*Date const.*	*Comment*
JMA	0.00	18.00	215	20060911	CASED TO 165
JMA	18.00	30.00	165	20060911	NO CASING

CASING DETAILS:

Date inst.	*Dep. to top [m]*	*Bot. [m]*	*Diam. [mm]*	*Material*	*Thickn. [mm]*	*Opening Type*	*Length*	*Width*	*Hori. dist.*	*Vert. dist.*
20060911	0.00	14.00	165	Steel	3	Plain casing	0	0	0	0
20060911	14.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	*Depth to Top [m]*	*Bot. [m]*	*Yield [l/s]*	*Method meas.*	*Aquifer type*	*Info source*	*Comment*
JMA	8.00	18.00	0.17	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	*Bot. [m]*	*Lithology code*	*Colour Primary*	*Secondary*	*Texture*	*Feature Primary*	*Secondary*
0.00	1.00	SOIL	Red	Light		Silty	Sandy
1.00	2.00	CLAY	Orange	Reddish		Sandy	
2.00	3.00	CLAY	Orange	Reddish		Sandy	Ferruginous
3.00	4.00	CLAY	Orange	Reddish		Sandy	Ferruginous
4.00	14.00	CLAY	Orange	Reddish			
14.00	18.00	TILLITE	Orange	Reddish		Weathered	Weathered
18.00	24.00	TILLITE	White	Greyish		Fresh	Weathered
24.00	30.00	TILLITE	White	Greyish		Fresh	

WATER LEVEL:

Meth. meas.	*Level status*	*Piez.*	*Info source*	*Date meas.*	*Time meas.*	*Sec.*	*Water lev. [m]*	*Comment*
Electrical contact	Static	0	Geologist,	20061003	1053	0.00	5.02	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00005 ***Number:*** LGW-B5 ***Site type:*** Borehole

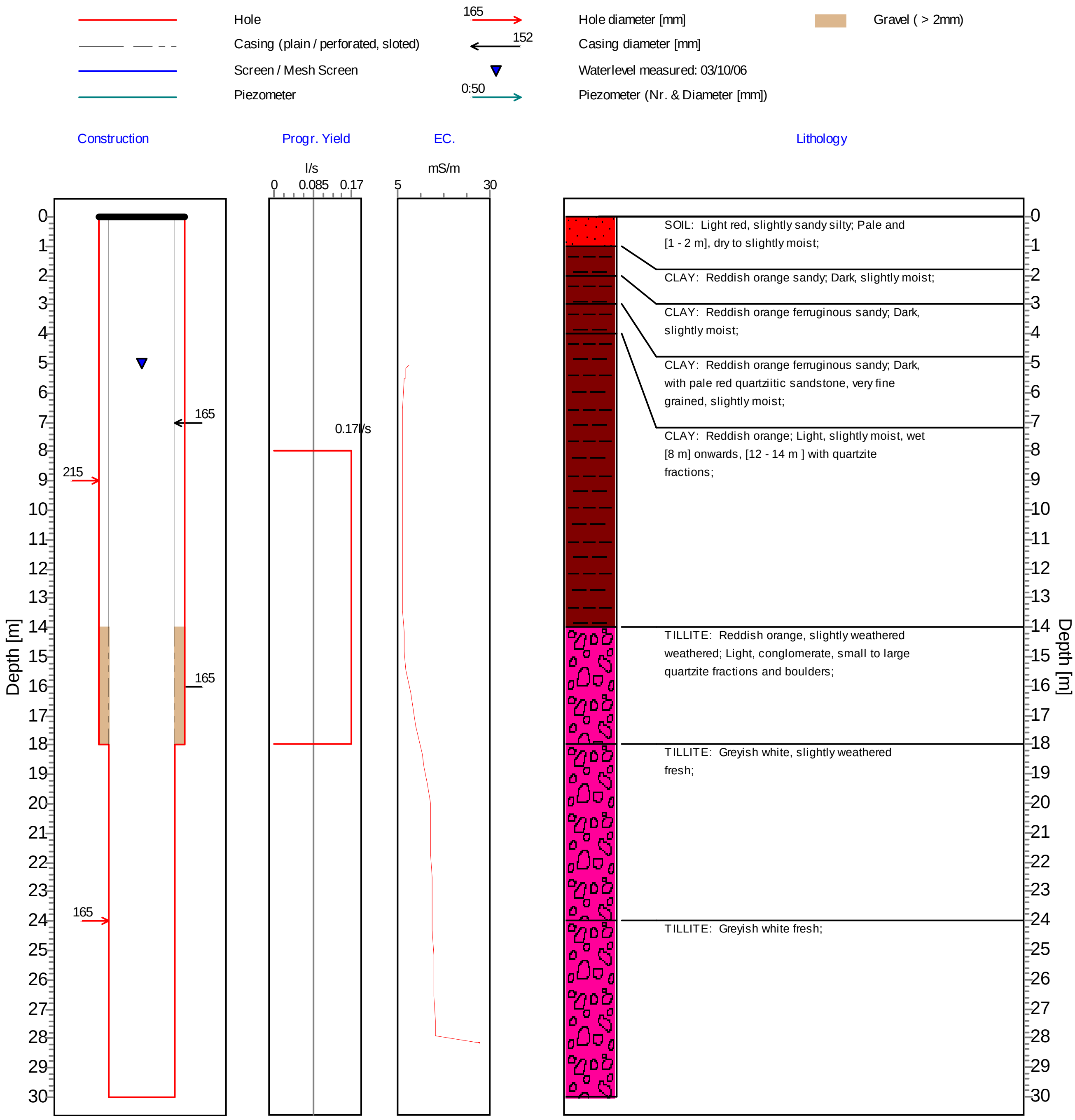
Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B5

Region Type: ***Region Descr.:***

Y Coord. [m]:	6003.00	***Reg./BB.:***		***Topo-set.:***	At or in opencast mine	***Depth [m]:***	30.00
X Coord. [m]:	2872144.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.59
Altitude [m]:	1519.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00006 **Number:** LGW-B6 **Site type:** Borehole

Distr./Farm No.: 568 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B6

Region Type: **Region Descr.:**

Y Coord. [m]:	8744.00	**Reg./BB.:**		**Topo-set.:**	At or in opencast mine	**Depth [m]:**	30.00
X Coord. [m]:	2874793.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0.63
Altitude [m]:	1536.00			**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20F
Coord. meth.:	Global Positioning System			**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060912	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20060912	CASED TO 165
JMA	18.00	30.00	165	20060912	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060912	0.00	12.00	165	Steel	3	Plain casing	0	0	0	0
20060912	12.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	13.00	14.00	0.01	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Red	Light		Silty	Sandy
1.00	6.00	CLAY	Red	Light		Sandy	
6.00	7.00	CLAY	Orange	Reddish		Sandy	
7.00	9.00	CLAY	Orange	Reddish		Micaceous	
9.00	10.00	CLAY	Brown	Reddish		Micaceous	
10.00	11.00	CLAY	Black			Carbonaceous	
11.00	12.00	SHALE	Black			Weathered	Weathered
12.00	13.00	SHALE	Black			Weathered	Weathered
13.00	14.00	COAL	Black			Weathered	
14.00	15.00	COAL	Black			Weathered	
15.00	17.00	SANDSTONE	Grey	Dark	Fine	Carbonaceous	Fractured
17.00	21.00	SANDSTONE	Grey	Light	Fine	Fresh	
21.00	30.00	TILLITE	Grey	Light		Fresh	Weathered

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061003	1311	0.00	9.22	

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Borehole Construction and Geological Log Date compiled: 2011/09/15

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00006 ***Number:*** LGW-B6 ***Site type:*** Borehole

Distr./Farm No.: 568 JR ***Site Name/Des.:*** KLIPFONTEIN

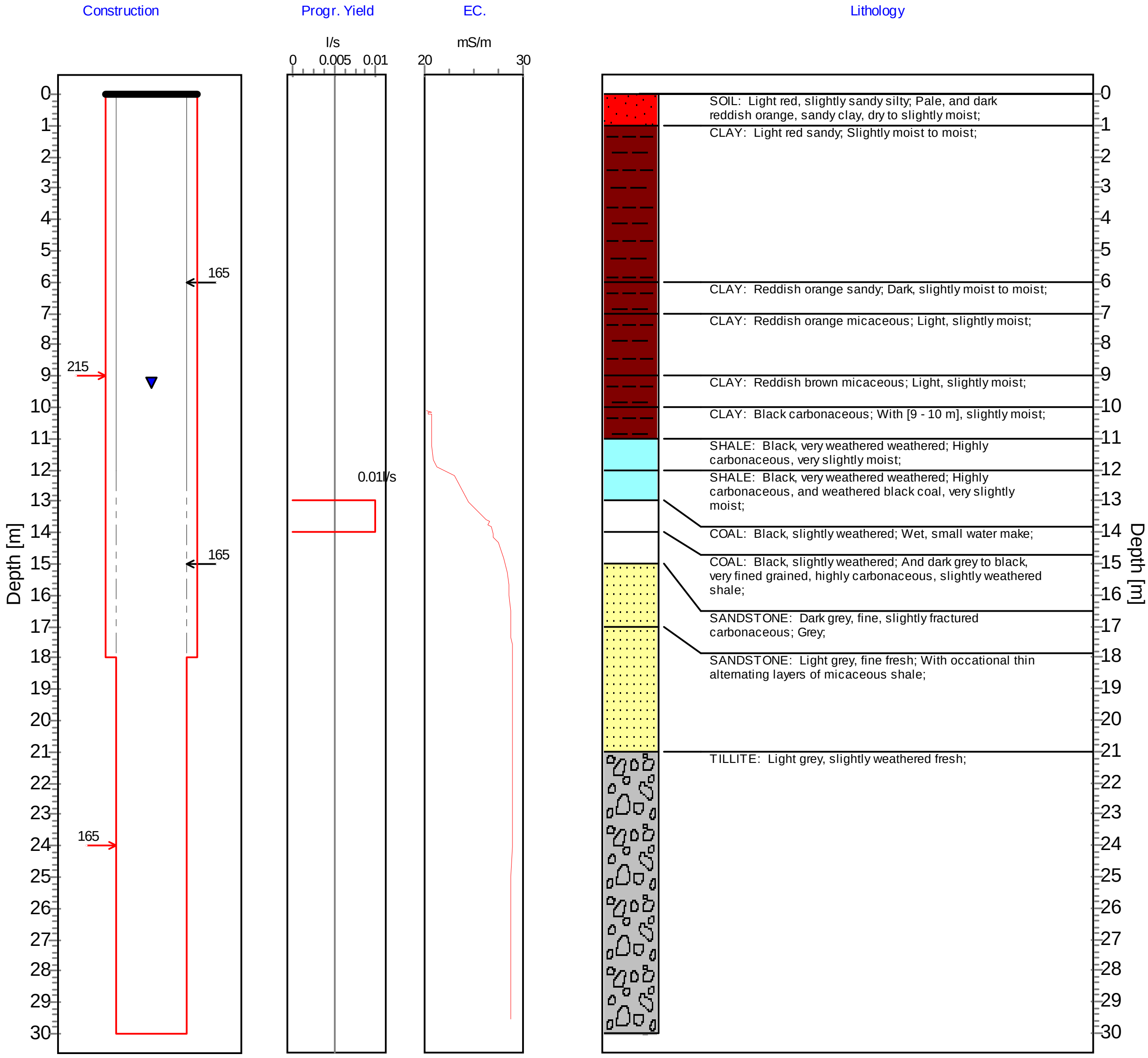
Region Type: ***Region Descr.:*** KLIPFONTEIN PORTION NR 32

Y Coord. [m]:	8744.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2874793.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.63
Altitude [m]:	1536.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B220
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

- Hole
- Casing (plain / perforated, sloted)
- Screen / Mesh Screen
- Piezometer
- 165 Hole diameter [mm]
- 152 Casing diameter [mm]
- Waterlevel measured: 03/10/06
- 0:50 Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00007 ***Number:*** LGW-B7 ***Site type:*** Borehole

Distr./Farm No.: 537 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B7

Region Type: ***Region Descr.:***

Y Coord. [m]:	4898.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2866568.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.61
Altitude [m]:	1558.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20061025	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20061025	
JMA	18.00	30.00	165	20061025	

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20061218	0.00	12.00	165	Steel	3	Plain casing	0	0		
20061218	12.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	16.00	18.00	0.15	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Orange	Reddish		Clayey	Sandy
1.00	3.00	GRIT	Orange	Reddish		Weathered	Weathered
3.00	4.00	SHALE	White	Greyish		Weathered	
4.00	5.00	SHALE	Brown	Reddish		Micaceous	Weathered
5.00	7.00	SHALE	Brown	Reddish		Micaceous	Weathered
7.00	10.00	CLAY	Orange	Reddish			
10.00	11.00	CLAY	Red	Red		Silty	Sandy
11.00	12.00	SHALE	Black			Weathered	Weathered
12.00	13.00	SHALE	Black		Very fine	Weathered	
13.00	18.00	COAL	Black				
18.00	19.00	SANDSTONE	Grey	Light	Fine	Fresh	
19.00	26.00	TILLITE	White	Greyish		Fresh	
26.00	29.00	TILLITE	White	Greyish		Fresh	
29.00	30.00	QUARTZITE	Grey	Greenish		Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Field checked	20061114	0858	0.00	13.87	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

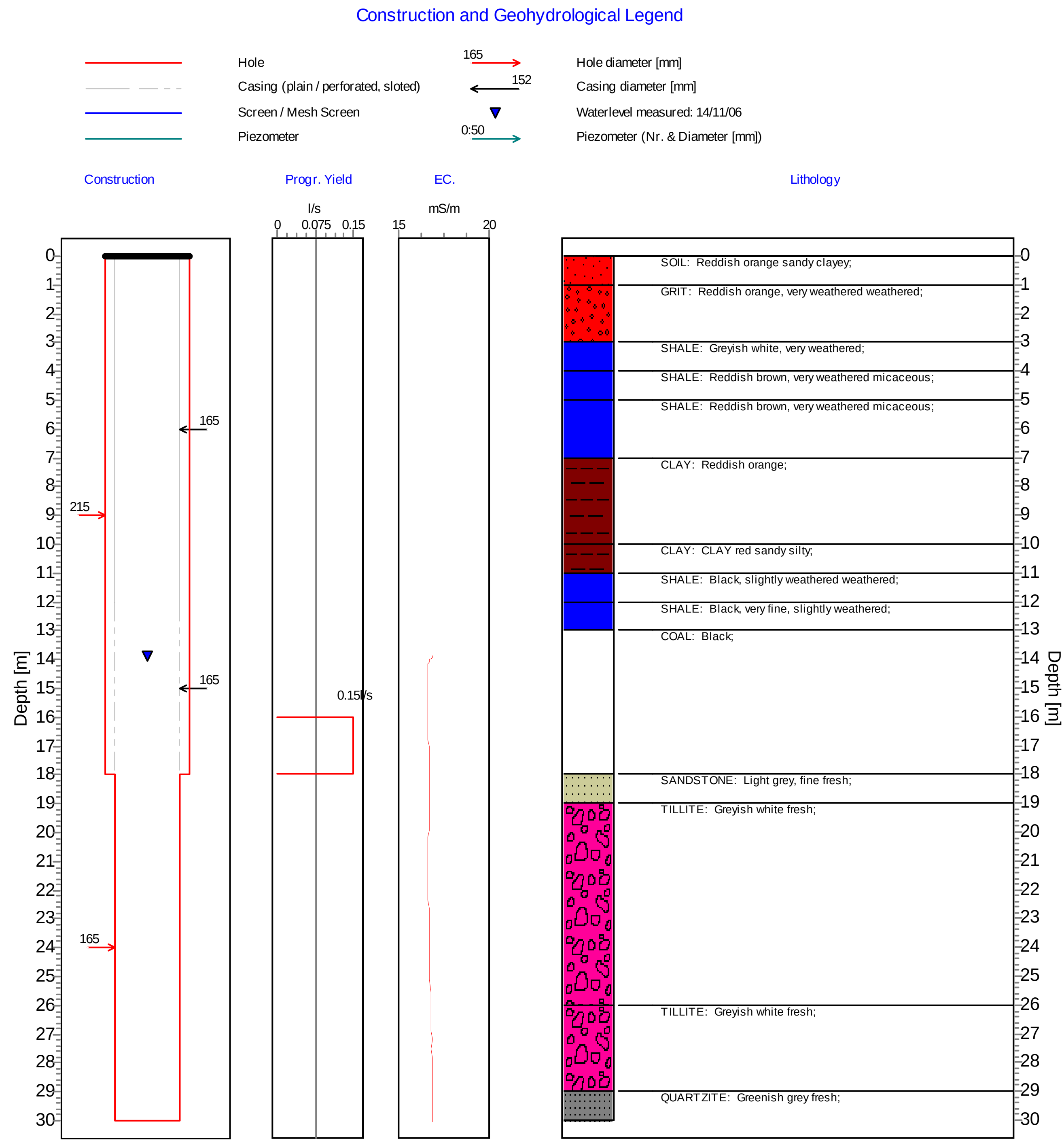
BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00007 ***Number:*** LGW-B7 ***Site type:*** Borehole

Distr./Farm No.: 537 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B7

Region Type: ***Region Descr.:***

Y Coord. [m]: 4898.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2866568.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.61
Altitude [m]: 1558.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.: Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2629AA00008 ***Number:*** LGW-B8 ***Site type:*** Borehole

Distr./Farm No.: 216 IR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B8

Region Type: ***Region Descr.:***

Y Coord. [m]:	-751.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2878590.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.72
Altitude [m]:	1520.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060905	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	12.00	215	20060905	CASED TO 165
JMA	12.00	30.00	165	20060905	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060905	0.00	9.00	165	Steel	3	Plain casing	0	0	0	0
20060905	9.00	12.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	6.00	8.00	0.05	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	CLAY	Grey	Dark		Sandy	
1.00	2.00	CLAY	White	Brownish		Sandy	
2.00	3.00	CLAY	White	Greyish		Sandy	
3.00	4.00	CLAY	White	Greyish			
4.00	5.00	CLAY	Grey	Dark			
5.00	7.00	COAL	Black			Weathered	Weathered
7.00	8.00	COAL	Black			Weathered	Weathered
8.00	9.00	SHALE	Black		Very fine	Weathered	
9.00	12.00	DIAMICTITE	White	Greyish		Fresh	
12.00	30.00	DIAMICTITE	White	Greyish		Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061002	1004	0.00	2.30	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2629AA00008 ***Number:*** LGW-B8 ***Site type:*** Borehole

Distr./Farm No.: 216 IR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B8

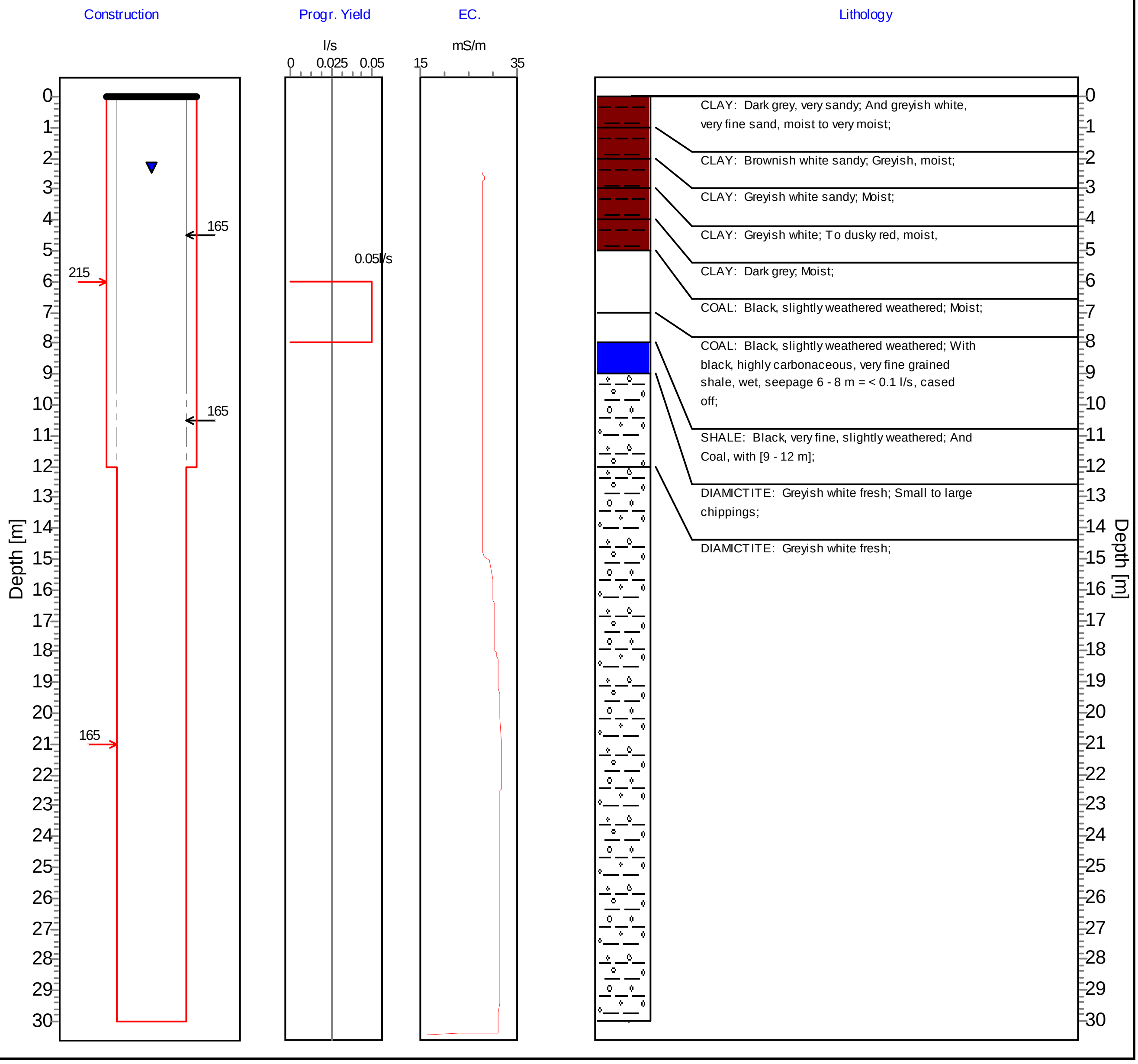
Region Type: ***Region Descr.:***

Y Coord. [m]:	-751.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2878590.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.72
Altitude [m]:	1520.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

	Hole	165	Hole diameter [mm]
	Casing (plain / perforated, sloted)	152	Casing diameter [mm]
	Screen / Mesh Screen		Waterlevel measured: 02/10/06
	Piezometer	0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00009 **Number:** LGW-B9 **Site type:** Borehole

Distr./Farm No.: 569 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B9

Region Type: **Region Descr.:**

Y Coord. [m]: 892.00	**Reg./BB.:**	**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]: 2876250.98	**G-Nr.:**	**Site status:**	In use	**Col. ht. [m]:**	0.66
Altitude [m]: 1544.00		**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.: Accurate to within 10 units		**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.: Global Positioning System		**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060906	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	24.00	215	20060906	CASED TO 165
JMA	24.00	30.00	165	20060906	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060906	0.00	12.00	165	Steel	3	Plain casing	0	0	0	0
20060906	12.00	24.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	16.00	19.00	0.77	Volumetric		Geologist, technician,	VOLUMETRIC

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Brown	Reddish		Sandy	
1.00	2.00	SILT	Brown	Reddish		Clayey	
2.00	3.00	SANDSTONE	Brown	Reddish	Coarse	Weathered	
3.00	5.00	SILT	Brown	Reddish		Clayey	
5.00	6.00	CLAY	Red	Light			
6.00	7.00	CLAY	Brown	Reddish			
7.00	8.00	CLAY	Orange	Reddish			
8.00	9.00	SHALE	Brown	Reddish		Weathered	Weathered
9.00	11.00	SHALE	Grey	Light	Fine	Weathered	Weathered
11.00	12.00	SHALE	Grey	Light	Fine	Fresh	Weathered
12.00	14.00	SHALE	Black		Very fine	Fresh	Carbonaceous
14.00	15.00	COAL	Black				
15.00	16.00	SHALE	Black		Very fine	Carbonaceous	Fresh
16.00	19.00	COAL	Black			Fractured	
19.00	20.00	SHALE	Black		Very fine	Fresh	Carbonaceous
20.00	24.00	COAL	Black				
24.00	25.00	SHALE	Black		Fine	Fresh	Carbonaceous
25.00	26.00	SANDSTONE	Grey	Light	Fine	Fresh	
26.00	27.00	TILLITE	Grey	Light		Fresh	
27.00	30.00	TILLITE	Grey	Light		Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20060930	0920	0.00	6.33	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00009 ***Number:*** LGW-B9 ***Site type:*** Borehole

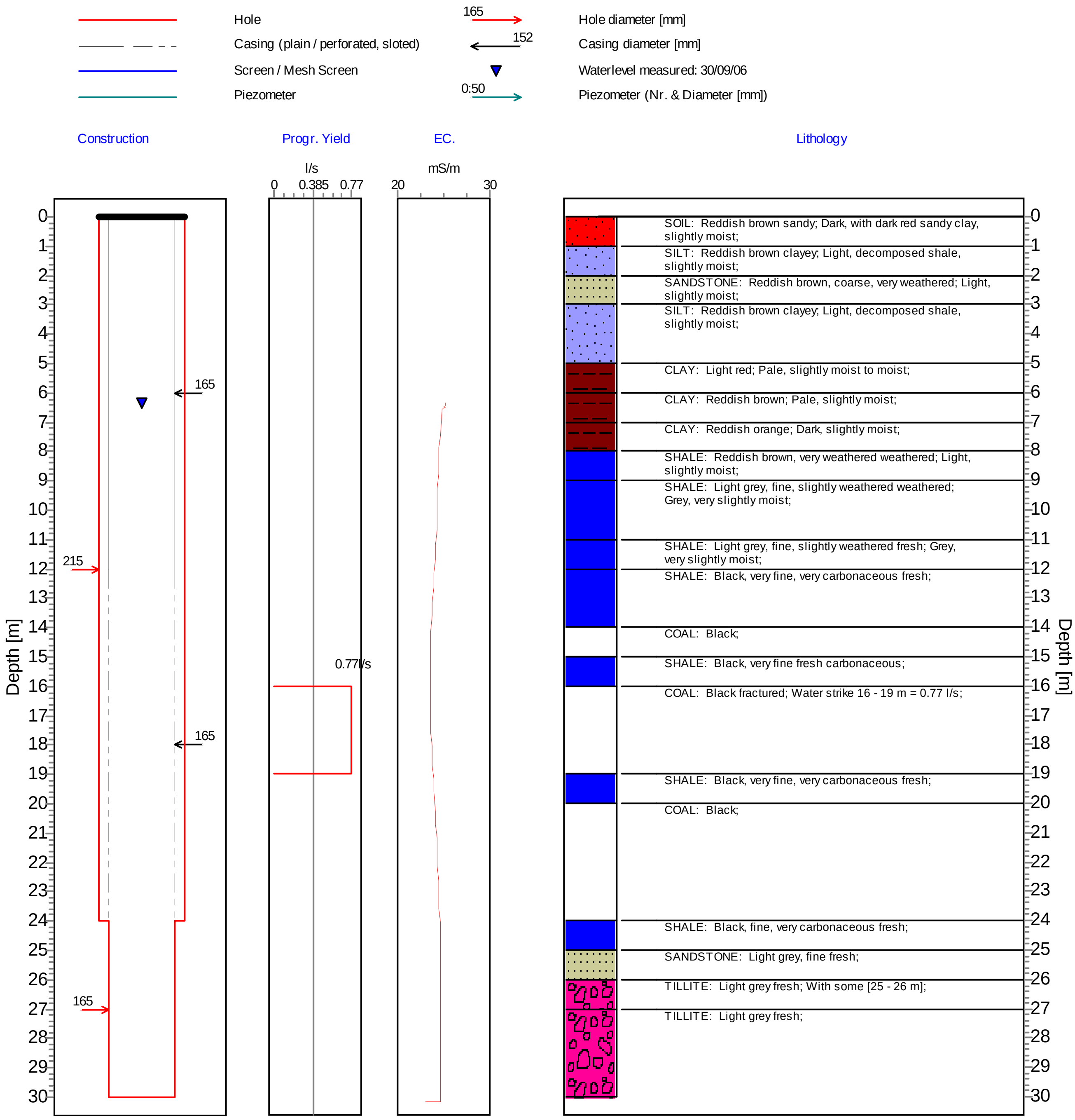
Distr./Farm No.: 569 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B9

Region Type: ***Region Descr.:***

Y Coord. [m]:	892.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2876250.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.66
Altitude [m]:	1544.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00010 ***Number:*** LGW-B10 ***Site type:*** Borehole

Distr./Farm No.: 569 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B10

Region Type: ***Region Descr.:***

Y Coord. [m]: 1033.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2875583.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.61
Altitude [m]: 1538.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units	***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System	***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060905	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20060905	CASED TO 165
JMA	18.00	30.00	165	20060905	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060905	0.00	12.00	165	Steel	3	Plain casing	0	0	0	0
20060905	12.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SAND	Grey	Dark	Very fine	Clayey	
1.00	2.00	SAND	Orange	Yellowish	Very fine		
2.00	3.00	CLAY	White	Greyish		Sandy	Sandy
3.00	4.00	CLAY	Orange	Reddish		Sandy	
4.00	5.00	CLAY	Orange	Yellowish	Very fine		
5.00	6.00	CLAY	Orange	Yellowish		Sandy	Sandy
6.00	8.00	SAND	Red	Light	Very fine		
8.00	9.00	SAND	Red	Light	Very fine		
9.00	15.00	SHALE	Red	Light		Weathered	Fractured
15.00	16.00	SHALE	Red	Light		Weathered	Fractured
16.00	17.00	SHALE	Red	Light		Weathered	Fractured
17.00	18.00	SHALE	Grey	Light		Fresh	
18.00	30.00	SHALE	Grey	Light		Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20060930	0844	0.00	2.13	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00010 ***Number:*** LGW-B10 ***Site type:*** Borehole

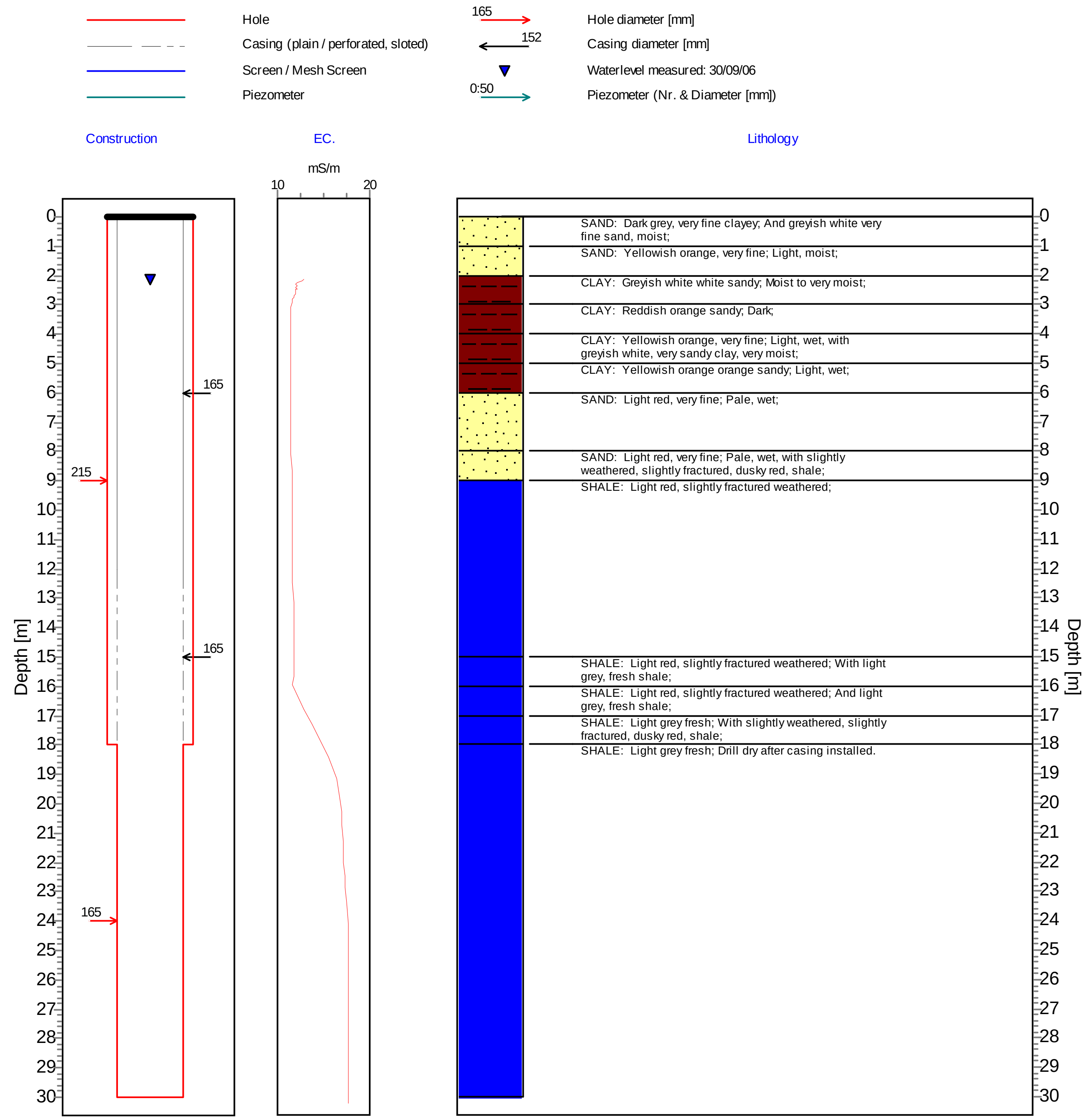
Distr./Farm No.: 569 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B10

Region Type: ***Region Descr.:***

Y Coord. [m]:	1033.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2875583.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.61
Altitude [m]:	1538.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00011 ***Number:*** LGW-B11 ***Site type:*** Borehole

Distr./Farm No.: 537 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B11

Region Type: ***Region Descr.:***

Y Coord. [m]: 4611.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2867515.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.62
Altitude [m]: 1560.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	*Contractor*	*Constr. meth.*	*Type finish*	*Development Method*	*Durat.*	*Special treatment*	*Constr. cost*
20061025	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	*Depth to Top [m]*	*Depth to Bottom [m]*	*Diameter [mm]*	*Date const.*	*Comment*
JMA	0.00	24.00	215	20061025	
JMA	24.00	30.00	165	20061025	

CASING DETAILS:

Date inst.	*Dep. to top [m]*	*Bot. [m]*	*Diam. [mm]*	*Material*	*Thickn. [mm]*	*Opening Type*	*Length*	*Width*	*Hori. dist.*	*Vert. dist.*
20061218	0.00	6.00	165	Steel	3	Plain casing				
20061218	6.00	24.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	*Depth to Top [m]*	*Bot. [m]*	*Yield [l/s]*	*Method meas.*	*Aquifer type*	*Info source*	*Comment*
JMA	12.00	19.00	0.15	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	*Bot. [m]*	*Lithology code*	*Colour Primary*	*Secondary*	*Texture*	*Feature Primary*	*Secondary*
0.00	1.00	SOIL	Red	Light		Silty	Sandy
1.00	2.00	GRIT	Orange	Reddish		Weathered	
2.00	3.00	GRIT	Orange	Reddish		Weathered	
3.00	4.00	CLAY	White	Greyish			
4.00	5.00	CLAY	Orange	Reddish			
5.00	6.00	SHALE	Grey	Dark	Very fine	Weathered	Carbonaceous
6.00	8.00	SHALE	Grey	Dark	Very fine	Fresh	Weathered
8.00	9.00	SHALE	Black		Very fine	Fresh	Weathered
9.00	10.00	SANDSTONE AND SHALE	Grey	Light	Fine	Fresh	Weathered
10.00	11.00	SHALE	Black		Very fine	Fresh	Weathered
11.00	12.00	SHALE	Black		Very fine	Fresh	Weathered
12.00	13.00	COAL	Black				
13.00	18.00	COAL	Black				
18.00	19.00	COAL	Black				
19.00	30.00	TILLITE	White	Greyish		Fresh	

WATER LEVEL:

Meth. meas.	*Level status*	*Piez.*	*Info source*	*Date meas.*	*Time meas.*	*Sec.*	*Water lev. [m]*	*Comment*
Electrical contact	Static	0	Field checked	20061114	0735	0.00	6.92	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00011 ***Number:*** LGW-B11 ***Site type:*** Borehole

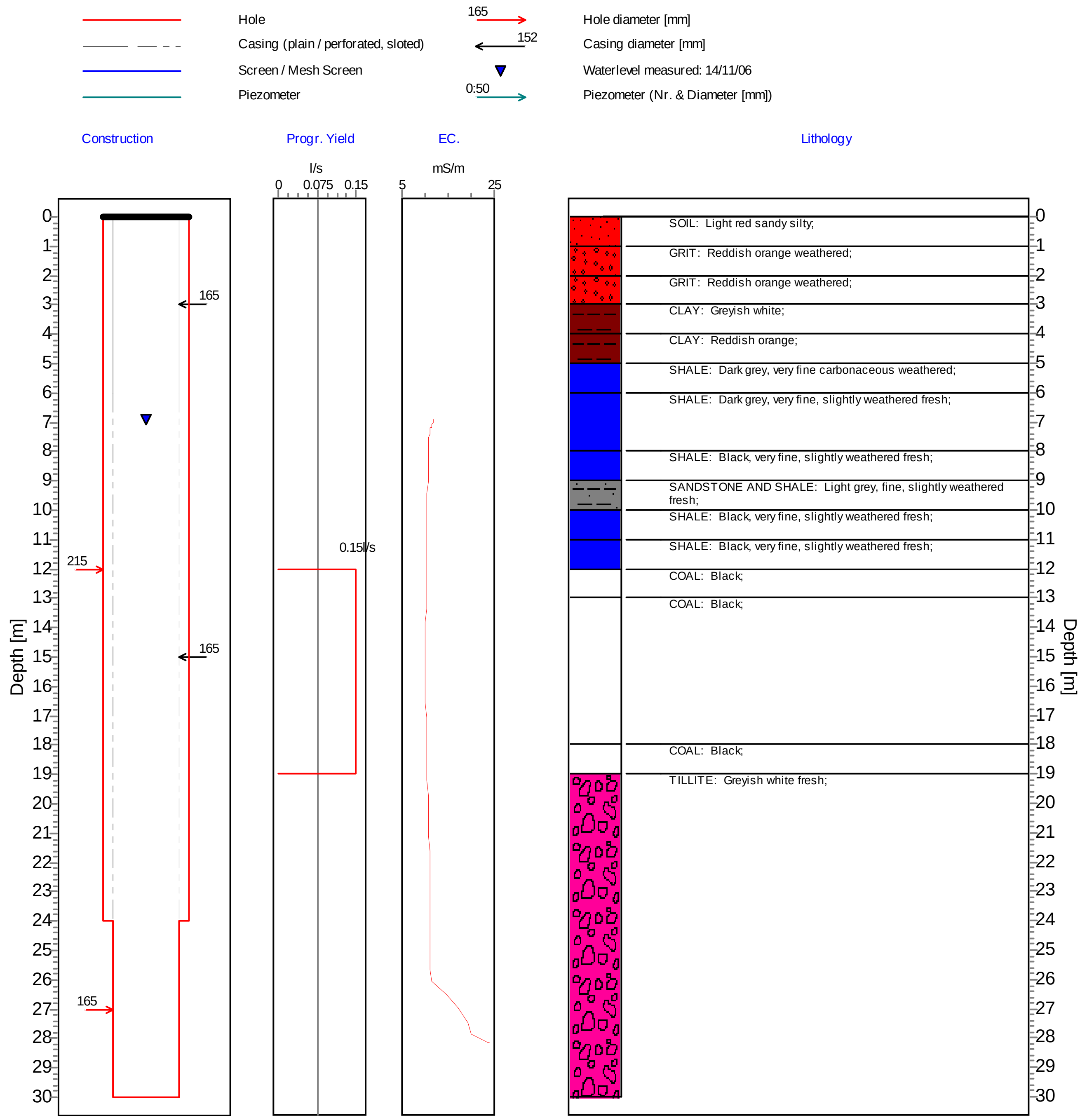
Distr./Farm No.: 537 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B11

Region Type: ***Region Descr.:***

Y Coord. [m]: 4611.00	***Reg./BB.:***	***Topo-set.:*** Hillside (slope)	***Depth [m]:*** 30.00
X Coord. [m]: 2867515.98	***G-Nr.:***	***Site status:*** In use	***Col. ht. [m]:*** 0.62
Altitude [m]: 1560.00		***Site purp.:*** Observation	***Diam. [mm]:*** 165
Coord. acc.: Accurate to within 10 units		***Use applic.:*** Industrial - mining	***Drain. reg.:*** B20G
Coord. meth.:		***Equipment:*** No equipment	***Rep. inst.:*** JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00012 **Number:** LGW-B12 **Site type:** Borehole

Distr./Farm No.: 326 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B12

Region Type: **Region Descr.:**

Y Coord. [m]:	1590.00	**Reg./BB.:**	**Topo-set.:** At or in waste disposal	**Depth [m]:**	30.00
X Coord. [m]:	2872546.98	**G-Nr.:**	**Site status:** In use	**Col. ht. [m]:**	0.65
Altitude [m]:	1525.00		**Site purp.:** Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units		**Use applic.:** Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.:	Global Positioning System		**Equipment:** No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060905	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20060905	CASED TO 165
JMA	18.00	30.00	165	20060905	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060905	0.00	12.00	165	Steel	3	Plain casing	0	0	0	0
20060905	12.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	12.00	15.00	0.24	Volumetric		Geologist, technician,	VOLUMETRIC

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Orange	Yellowish	Very fine	Silty	Sandy
1.00	5.00	CLAY	Red	Dark			
5.00	7.00	CLAY	Red	Dark			
7.00	9.00	CLAY	Red	Dark			
9.00	10.00	CLAY	Brown	Light		Gritty	
10.00	12.00	DIABASE	Brown	Light		Weathered	
12.00	15.00	DIABASE	Brown	Greyish	Fine to medium	Weathered	Weathered
15.00	17.00	DIABASE	Brown	Greyish	Fine to medium	Weathered	Weathered
17.00	18.00	DIABASE	Grey	Light	Fine to medium	Fresh	Weathered
18.00	30.00	DIABASE	Grey	Light	Fine to medium	Fresh	Hard

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061002	1335	0.00	7.70	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00012 ***Number:*** LGW-B12 ***Site type:*** Borehole

Distr./Farm No.: 326 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B12

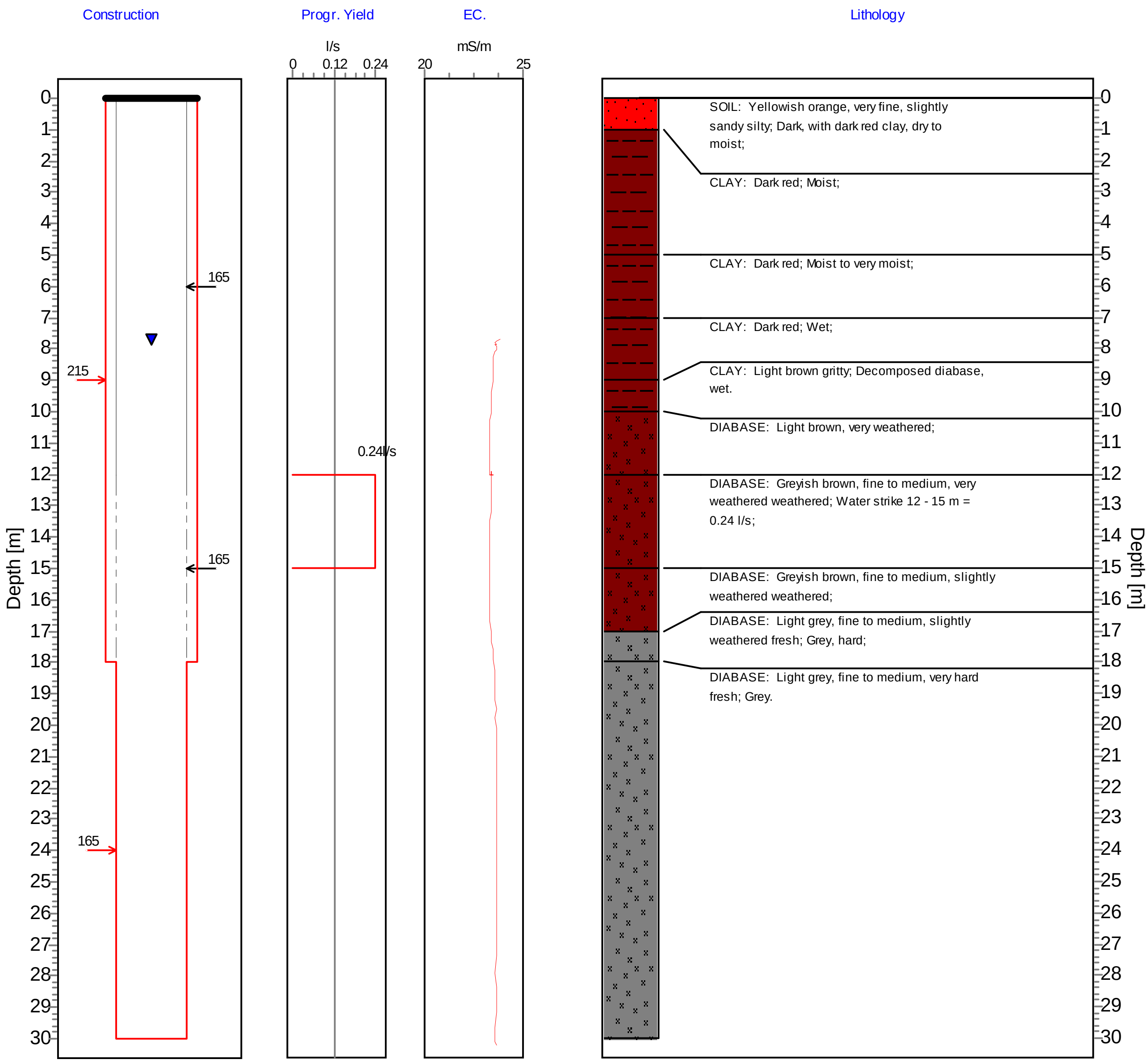
Region Type: ***Region Descr.:***

Y Coord. [m]: 1590.00	***Reg./BB.:***	***Topo-set.:*** At or in waste disposal	***Depth [m]:*** 30.00
X Coord. [m]: 2872546.98	***G-Nr.:***	***Site status:*** In use	***Col. ht. [m]:*** 0.65
Altitude [m]: 1525.00		***Site purp.:*** Observation	***Diam. [mm]:*** 165
Coord. acc.: Accurate to within 10 units		***Use applic.:*** Industrial - mining	***Drain. reg.:*** B20G
Coord. meth.: Global Positioning System		***Equipment:*** No equipment	***Rep. inst.:*** JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	Casing (plain / perforated, sloted)	Screen / Mesh Screen	Piezometer
Hole diameter [mm]	Casing diameter [mm]	Waterlevel measured: 02/10/06	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00013 **Number:** LGW-B13 **Site type:** Borehole

Distr./Farm No.: 566 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B13

Region Type: **Region Descr.:**

Y Coord. [m]:	6348.00	**Reg./BB.:**		**Topo-set.:**	Hillside (slope)	**Depth [m]:**	40.00
X Coord. [m]:	2874504.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0.68
Altitude [m]:	1552.00			**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20F
Coord. meth.:	Global Positioning System			**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060908	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20060908	CASED TO 165
JMA	18.00	40.00	165	20060908	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060908	0.00	18.00	165	Steel	3	Plain casing	0	0	0	0

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	CLAY	Brown	Reddish		Sandy	Gritty
1.00	2.00	CLAY	Orange	Reddish		Ferruginous	
2.00	3.00	CLAY	Orange	Reddish			
3.00	5.00	CLAY	Orange	Reddish		Micaceous	
5.00	6.00	CLAY	White	Greyish			
6.00	10.00	SILT	White	Greyish		Clayey	
10.00	11.00	SHALE	Grey		Very fine	Fresh	Weathered
11.00	12.00	COAL	Black				
12.00	13.00	SANDSTONE	Grey	Light	Fine to medium	Fresh	
13.00	14.00	COAL	Black				
14.00	15.00	COAL	Black				
15.00	16.00	NO SAMPLE					
16.00	18.00	NO SAMPLE					
18.00	19.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
19.00	21.00	SANDSTONE AND SHALE	Grey	Light	Fine to medium	Fresh	
21.00	22.00	SHALE	Grey		Fine to medium	Fresh	Micaceous
22.00	24.00	SHALE	Blue		Very fine to fine	Fresh	Carbonaceous
24.00	26.00	SHALE	Grey	Light	Fine	Fresh	Micaceous
26.00	28.00	SHALE	Blue		Very fine to fine	Fresh	Carbonaceous
28.00	29.00	COAL	Black				
29.00	30.00	COAL	Black				
30.00	32.00	COAL	Black				
32.00	34.00	SHALE	Blue		Very fine to fine	Fresh	Carbonaceous
34.00	35.00	SHALE	Blue		Very fine to fine	Fresh	Carbonaceous
35.00	37.00	COAL	Black				
37.00	38.00	SHALE	Grey		Fine	Fresh	Micaceous
38.00	40.00	TILLITE	Grey			Fresh	Weathered

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061003	1140	0.00	19.16	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION:

Site Identifier: 2528DD00013 ***Number:*** LGW-B13 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B13

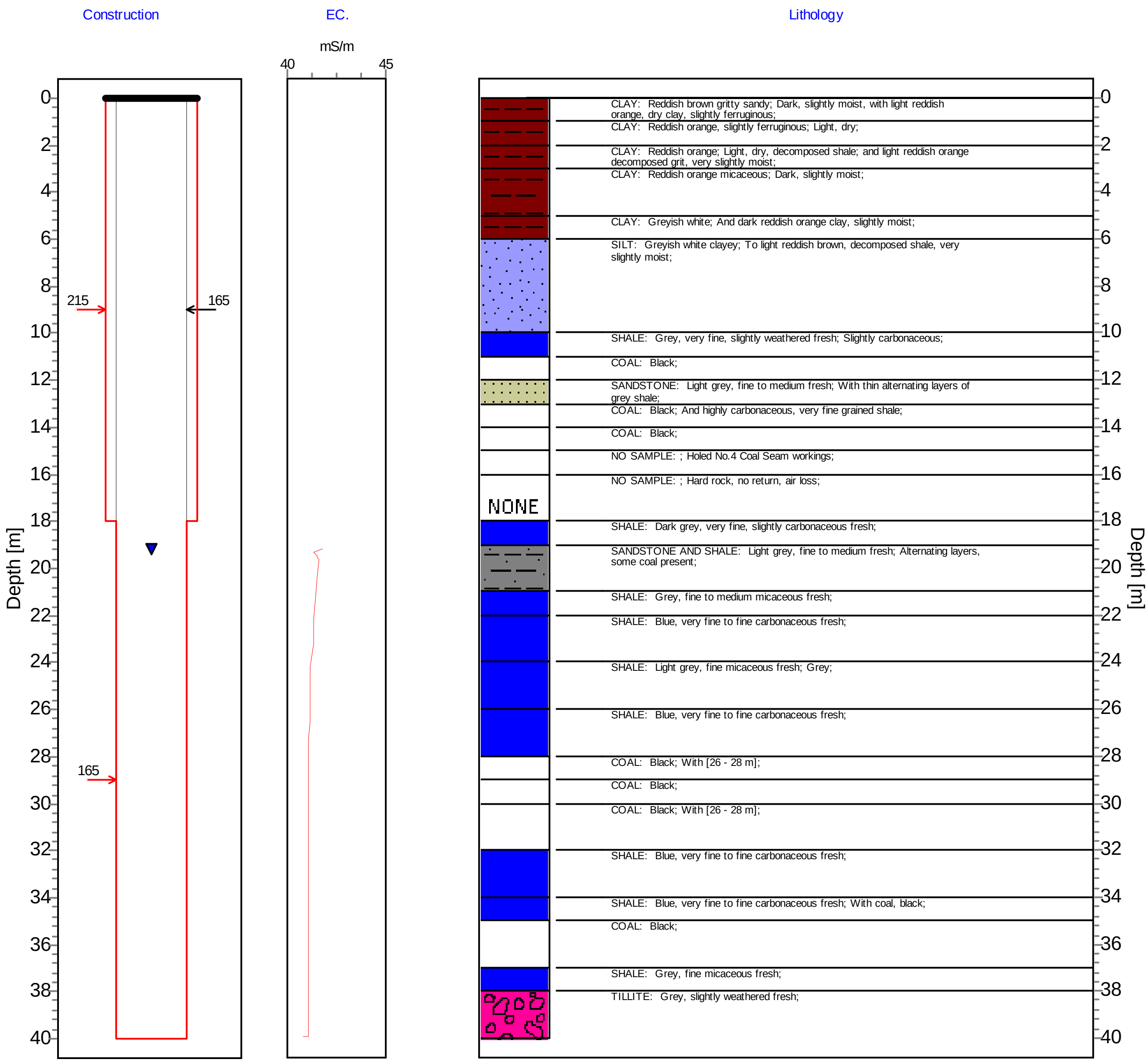
Region Type: ***Region Descr.:***

Y Coord. [m]:	6348.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	40.00
X Coord. [m]:	2874504.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.68
Altitude [m]:	1552.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

	Hole	165	Hole diameter [mm]
	Casing (plain / perforated, sloted)	152	Casing diameter [mm]
	Screen / Mesh Screen	▼	Waterlevel measured: 03/10/06
	Piezometer	0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00014 **Number:** LGW-B14 **Site type:** Borehole

Distr./Farm No.: 568 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B14

Region Type: **Region Descr.:**

Y Coord. [m]:	6337.00	**Reg./BB.:**		**Topo-set.:** Hillside (slope)	**Depth [m]:** 30.00
X Coord. [m]:	2876355.98	**G-Nr.:**		**Site status:** In use	**Col. ht. [m]:** 0.76
Altitude [m]:	1525.00			**Site purp.:** Observation	**Diam. [mm]:** 165
Coord. acc.:	Accurate to within 10 units			**Use applic.:** Industrial - mining	**Drain. reg.:** B20F
Coord. meth.:	Global Positioning System			**Equipment:** No equipment	**Rep. inst.:** JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060908	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	15.00	215	20060908	CASED TO 165
JMA	15.00	30.00	165	20060908	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060908	0.00	9.00	165	Steel	3	Plain casing	0	0	0	0
20060908	9.00	15.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	19.00	23.00	0.17	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Red	Light		Silty	Sandy
1.00	2.00	CLAY	Orange	Reddish		Sandy	
2.00	4.00	CLAY	Brown	Reddish		Sandy	
4.00	5.00	CLAY	White	Greyish			
5.00	9.00	CLAY	White	Greyish			
9.00	10.00	TILLITE	Grey			Fresh	Weathered
10.00	19.00	TILLITE	Grey			Fresh	
19.00	20.00	LAVA	Red	Greyish		Weathered	Fractured
20.00	23.00	LAVA	Red	Greyish		Fractured	
23.00	30.00	LAVA	Red	Greyish		Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061003	1226	0.00	11.55	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00014 ***Number:*** LGW-B14 ***Site type:*** Borehole

Distr./Farm No.: 568 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B14

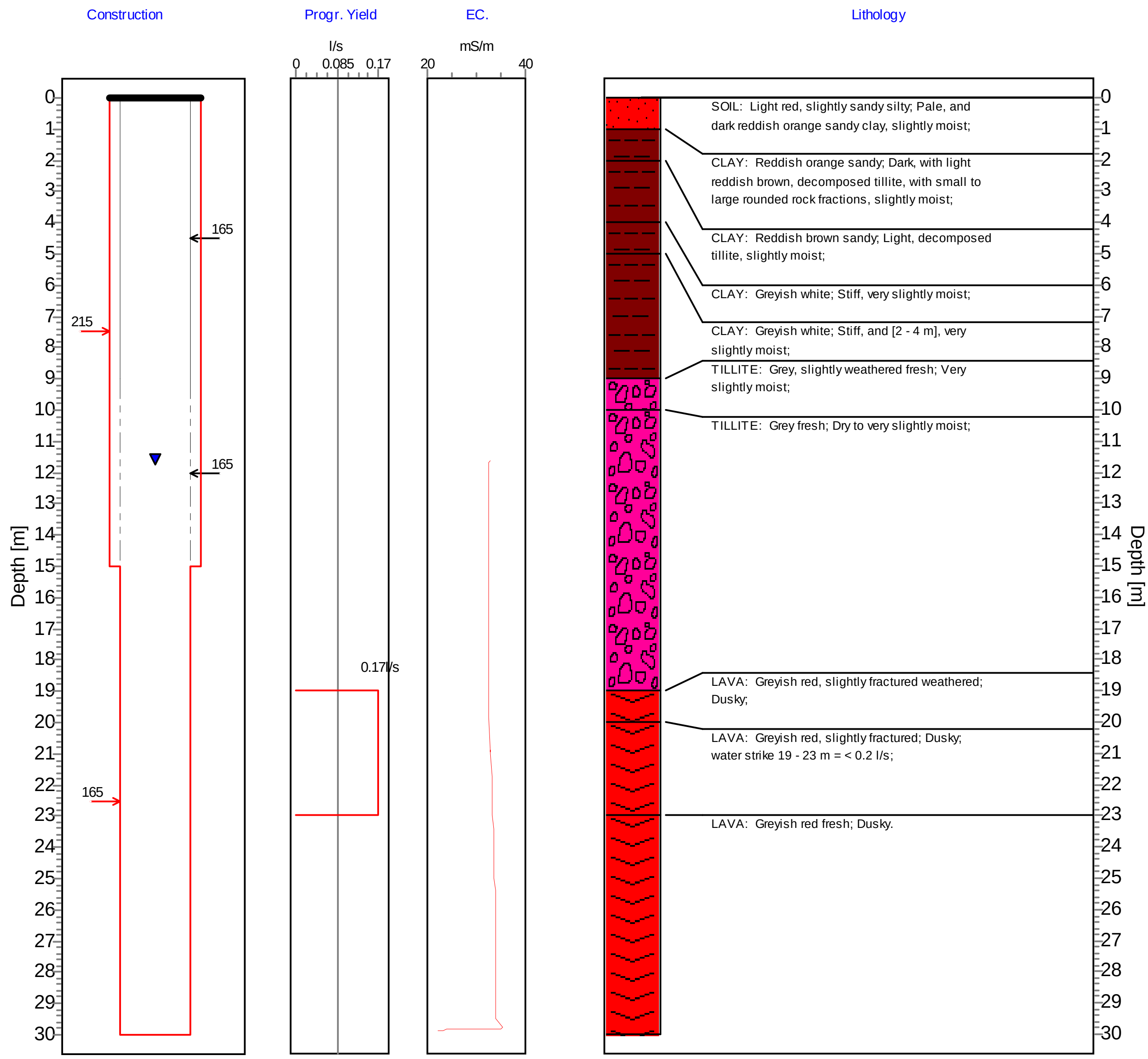
Region Type: ***Region Descr.:***

Y Coord. [m]: 6337.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2876355.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.76
Altitude [m]: 1525.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.: Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

	Hole	165	Hole diameter [mm]
	Casing (plain / perforated, sloted)	152	Casing diameter [mm]
	Screen / Mesh Screen		Waterlevel measured: 03/10/06
	Piezometer	0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00015 ***Number:*** LGW-B15 ***Site type:*** Borehole

Distr./Farm No.: 326 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B15

Region Type: ***Region Descr.:***

Y Coord. [m]:	2435.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2871334.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.66
Altitude [m]:	1538.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	*Contractor*	*Constr. meth.*	*Type finish*	*Development Method*	*Durat.*	*Special treatment*	*Constr. cost*
20060904	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	*Depth to Top [m]*	*Depth to Bottom [m]*	*Diameter [mm]*	*Date const.*	*Comment*
JMA	0.00	12.00	215	20060904	CASED TO 165
JMA	12.00	30.00	165	20060904	NO CASING

CASING DETAILS:

Date inst.	*Dep. to top [m]*	*Bot. [m]*	*Diam. [mm]*	*Material*	*Thickn. [mm]*	*Opening Type*	*Length*	*Width*	*Hori. dist.*	*Vert. dist.*
20060904	0.00	9.00	165	Steel	3	Plain casing	0	0	0	0
20060904	9.00	12.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	*Depth to Top [m]*	*Bot. [m]*	*Yield [l/s]*	*Method meas.*	*Aquifer type*	*Info source*	*Comment*
JMA	9.00	12.00	0.05	Estimated		Geologist, technician,	ESTIMATED
JMA	12.00	14.00	0.12	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	*Bot. [m]*	*Lithology code*	*Colour Primary*	*Secondary*	*Texture*	*Feature Primary*	*Secondary*
0.00	3.00	SOIL	Orange	Reddish		Silty	Sandy
3.00	4.00	SOIL	Orange	Reddish		Silty	Sandy
4.00	7.00	CLAY	Red	Light		Sandy	
7.00	9.00	CLAY	Orange	Reddish		Sandy	
9.00	12.00	CLAY	Orange	Reddish			
12.00	14.00	DIABASE	Grey	Light	Fine to medium	Fresh	Hard
14.00	15.00	DIABASE	Grey	Light	Fine to medium	Fractured	
15.00	30.00	DIABASE	Grey	Light	Fine to medium	Fresh	Hard

WATER LEVEL:

Meth. meas.	*Level status*	*Piez.*	*Info source*	*Date meas.*	*Time meas.*	*Sec.*	*Water lev. [m]*	*Comment*
Electrical contact	Static	0	Geologist,	20061002	1238	0.00	6.15	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

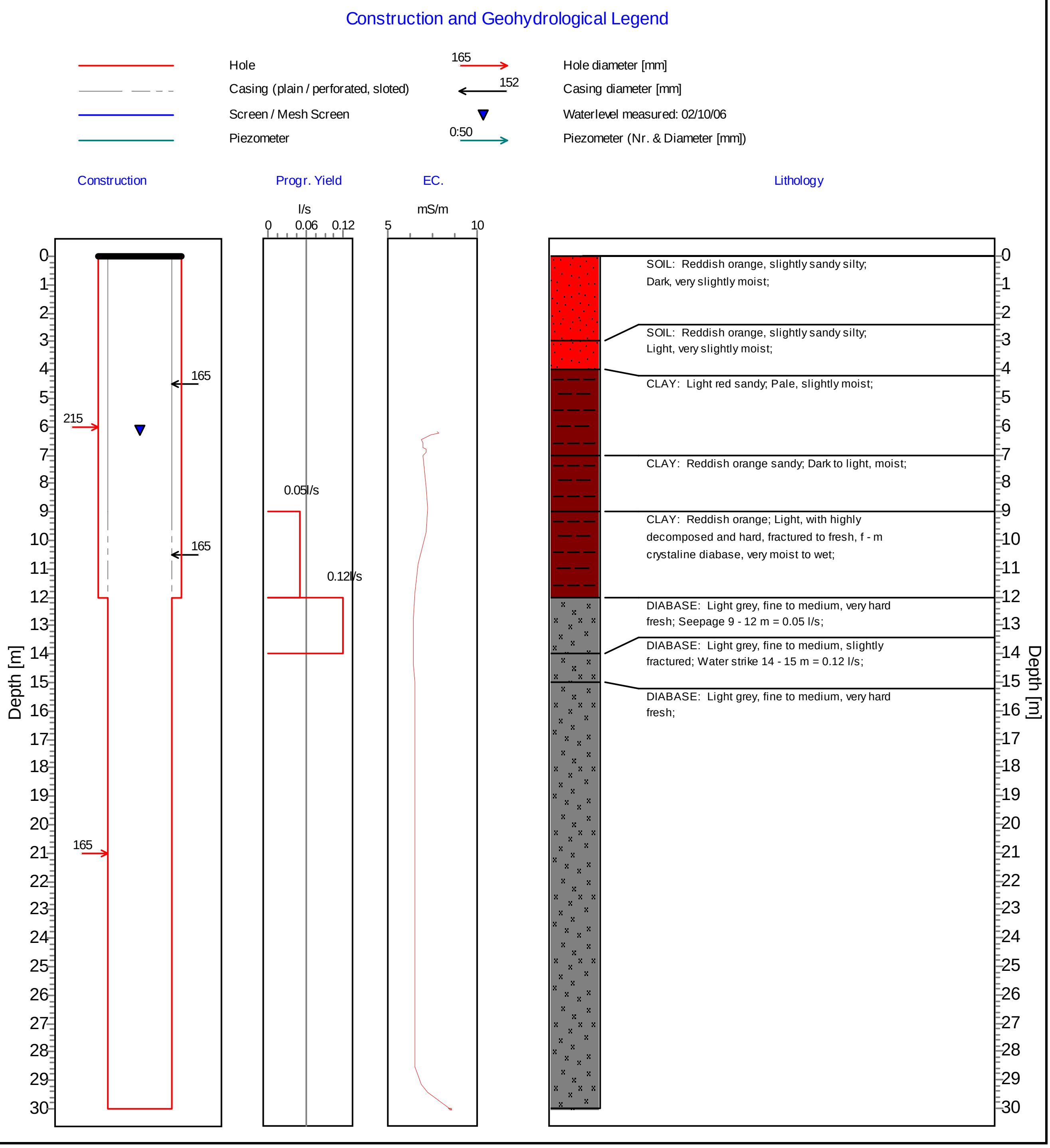
BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00015 ***Number:*** LGW-B15 ***Site type:*** Borehole

Distr./Farm No.: 326 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B15

Region Type: ***Region Descr.:***

Y Coord. [m]: 2435.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2871334.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.66
Altitude [m]: 1538.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.: Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00016 **Number:** LGW-B16 **Site type:** Borehole

Distr./Farm No.: 536 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B16

Region Type: **Region Descr.:**

Y Coord. [m]: 900.00	**Reg./BB.:**	**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]: 2868478.98	**G-Nr.:**	**Site status:**	In use	**Col. ht. [m]:**	0.48
Altitude [m]: 1541.00		**Site purp.:**	Observation	**Diam. [mm]:**	140
Coord. acc.: Accurate to within 10 units		**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.: Global Positioning System		**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060907	EDRS	Air percussion	Filter (gravel pack	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	30.00	215	20060907	CASED TO 140

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060907	0.00	12.00	140	Steel	4	Plain casing	0	0	0	0
20060907	12.00	30.00	140	Steel	4	Perforated or slotted	300	3	150	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	26.00	29.00	0.35	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Red	Greyish		Clayey	Sandy
1.00	2.00	CLAY	Orange	Reddish		Sandy	
2.00	9.00	CLAY	Red	Dark			
9.00	10.00	CLAY	Red	Dark			
10.00	11.00	CLAY	Orange	Reddish		Sandy	
11.00	12.00	CLAY	Orange	Reddish		Sandy	
12.00	14.00	TILLITE	Grey	Light		Fractured	Weathered
14.00	15.00	TILLITE	Grey	Light		Fractured	Weathered
15.00	22.00	TILLITE	Orange	Reddish		Weathered	Weathered
22.00	23.00	TILLITE	Orange	Reddish		Fractured	Fractured
23.00	27.00	TILLITE	Grey	Dark		Fractured	Hard
27.00	30.00	DIABASE	Grey	Dark	Very fine	Hard	Fractured

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061003	0919	0.00	7.79	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00016 ***Number:*** LGW-B16 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B16

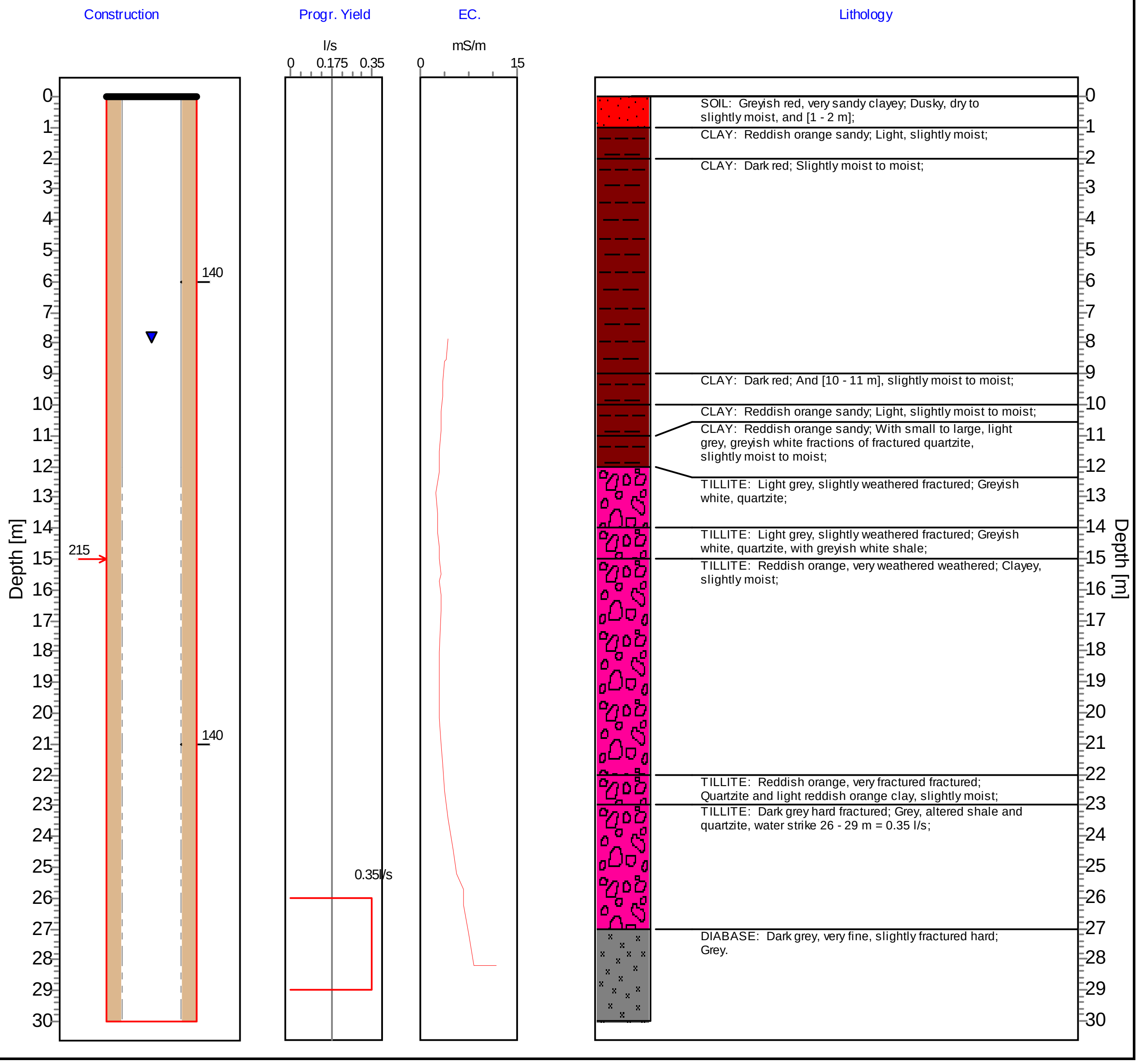
Region Type: ***Region Descr.:***

Y Coord. [m]:	900.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2868478.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.48
Altitude [m]:	1541.00			***Site purp.:***	Observation	***Diam. [mm]:***	140
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

	Hole	165	Hole diameter [mm]		Gravel (> 2mm)
	Casing (plain / perforated, sloted)	152	Casing diameter [mm]		
	Screen / Mesh Screen		Waterlevel measured: 03/10/06		
	Piezometer	0:50	Piezometer (Nr. & Diameter [mm])		



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00017 **Number:** LGW-B17 **Site type:** Borehole

Distr./Farm No.: 536 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B17

Region Type: **Region Descr.:**

Y Coord. [m]:	-176.00	**Reg./BB.:**		**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]:	2867351.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0.49
Altitude [m]:	1539.00			**Site purp.:**	Observation	**Diam. [mm]:**	140
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.:	Global Positioning System			**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060907	EDRS	Air percussion	Filter (gravel pack	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	30.00	215	20060907	CASED TO 140

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060907	0.00	6.00	140	Steel	4	Plain casing	0	0	0	0
20060907	6.00	30.00	140	Steel	4	Perforated or slotted	300	3	150	150

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Orange	Reddish		Sandy	
1.00	2.00	CLAY	Orange	Reddish		Sandy	
2.00	5.00	CLAY	Orange	Reddish		Sandy	
5.00	7.00	CLAY	Orange	Reddish		Sandy	
7.00	9.00	TILLITE	Orange	Reddish		Weathered	Weathered
9.00	11.00	TILLITE	Red	Dark		Weathered	Fractured
11.00	25.00	CLAY	Orange	Reddish		Sandy	
25.00	30.00	TILLITE	Grey			Weathered	Weathered

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00017 ***Number:*** LGW-B17 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B17

Region Type: ***Region Descr.:***

Y Coord. [m]: -176.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2867351.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.49
Altitude [m]: 1539.00		***Site purp.:***	Observation	***Diam. [mm]:***	140
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.: Global Positioning System		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole

Casing (plain / perforated, sloted)

Screen / Mesh Screen

Piezometer

165 Hole diameter [mm]

152 Casing diameter [mm]

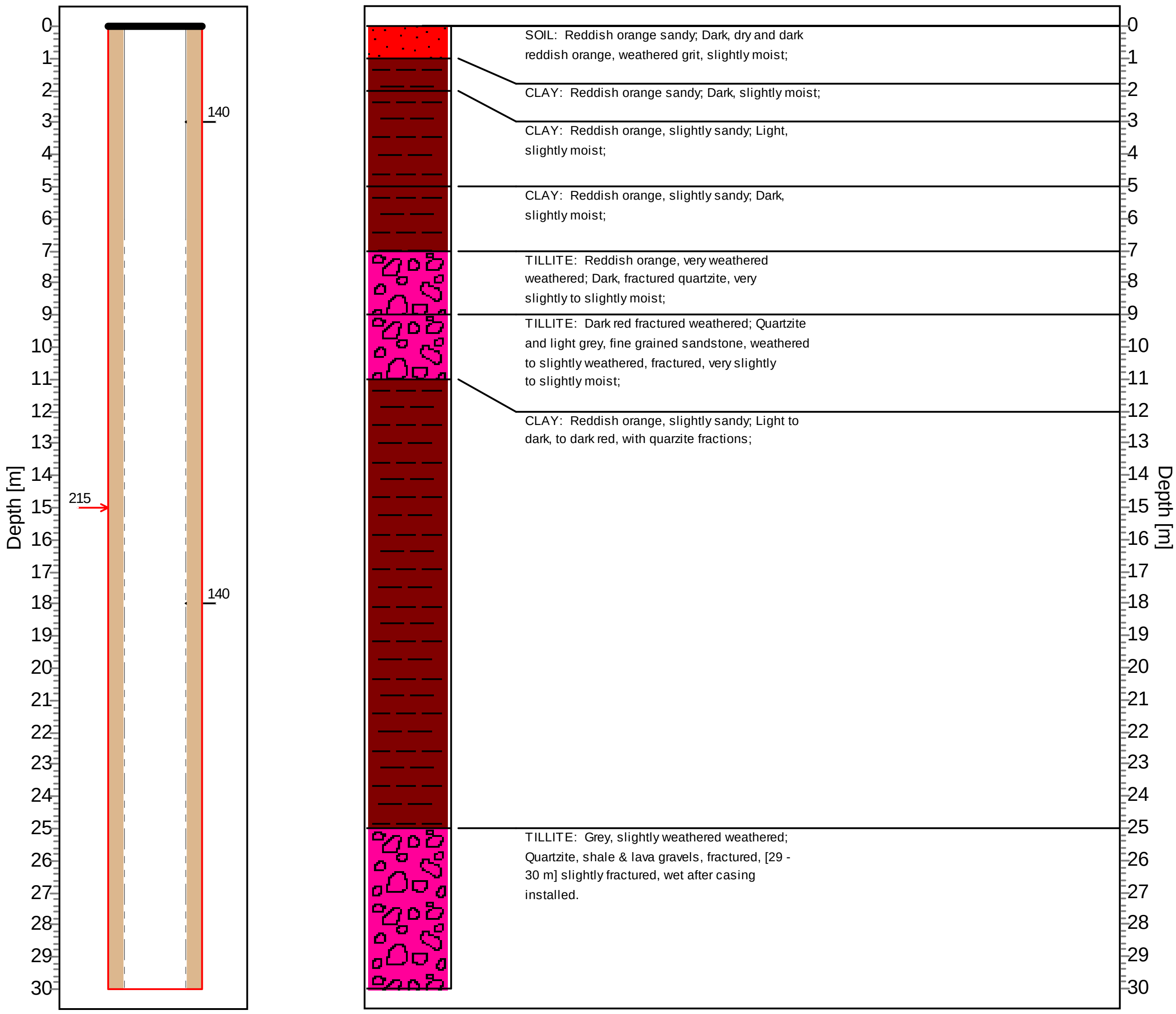
Waterlevel with date meas.

0:50 Piezometer (Nr. & Diameter [mm])

Gravel (> 2mm)

Construction

Lithology



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00018 **Number:** LGW-B18 **Site type:** Borehole

Distr./Farm No.: 536 JR **Site Name/Des.:** NEW LARGO PROJECT: LGW-B18

Region Type: **Region Descr.:**

Y Coord. [m]: 613.00	**Reg./BB.:**	**Topo-set.:**	Hillside (slope)	**Depth [m]:**	36.00
X Coord. [m]: 2865768.98	**G-Nr.:**	**Site status:**	Destroyed	**Col. ht. [m]:**	0
Altitude [m]: 1526.00		**Site purp.:**	Observation	**Diam. [mm]:**	215
Coord. acc.: Accurate to within 10 units		**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.: Global Positioning System		**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060906	EDRS	Air percussion	Air percussion	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	36.00	215	20060906	NO CASING

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Orange	Reddish		Silty	Sandy
1.00	5.00	CLAY	Orange	Reddish		Gritty	
5.00	11.00	GRIT	Orange	Yellowish		Clayey	Weathered
11.00	12.00	CLAY	Orange	Reddish		Gritty	
12.00	14.00	CLAY	Orange	Reddish			
14.00	20.00	CLAY	Brown	Reddish			
20.00	27.00	CLAY	Brown	Reddish		Sandy	
27.00	30.00	CLAY	Orange	Yellowish		Sandy	
30.00	33.00	TILLITE	Orange	Yellowish		Weathered	Weathered
33.00	36.00	TILLITE	Brown	Reddish		Weathered	Weathered

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00018 ***Number:*** LGW-B18 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B18

Region Type: ***Region Descr.:***

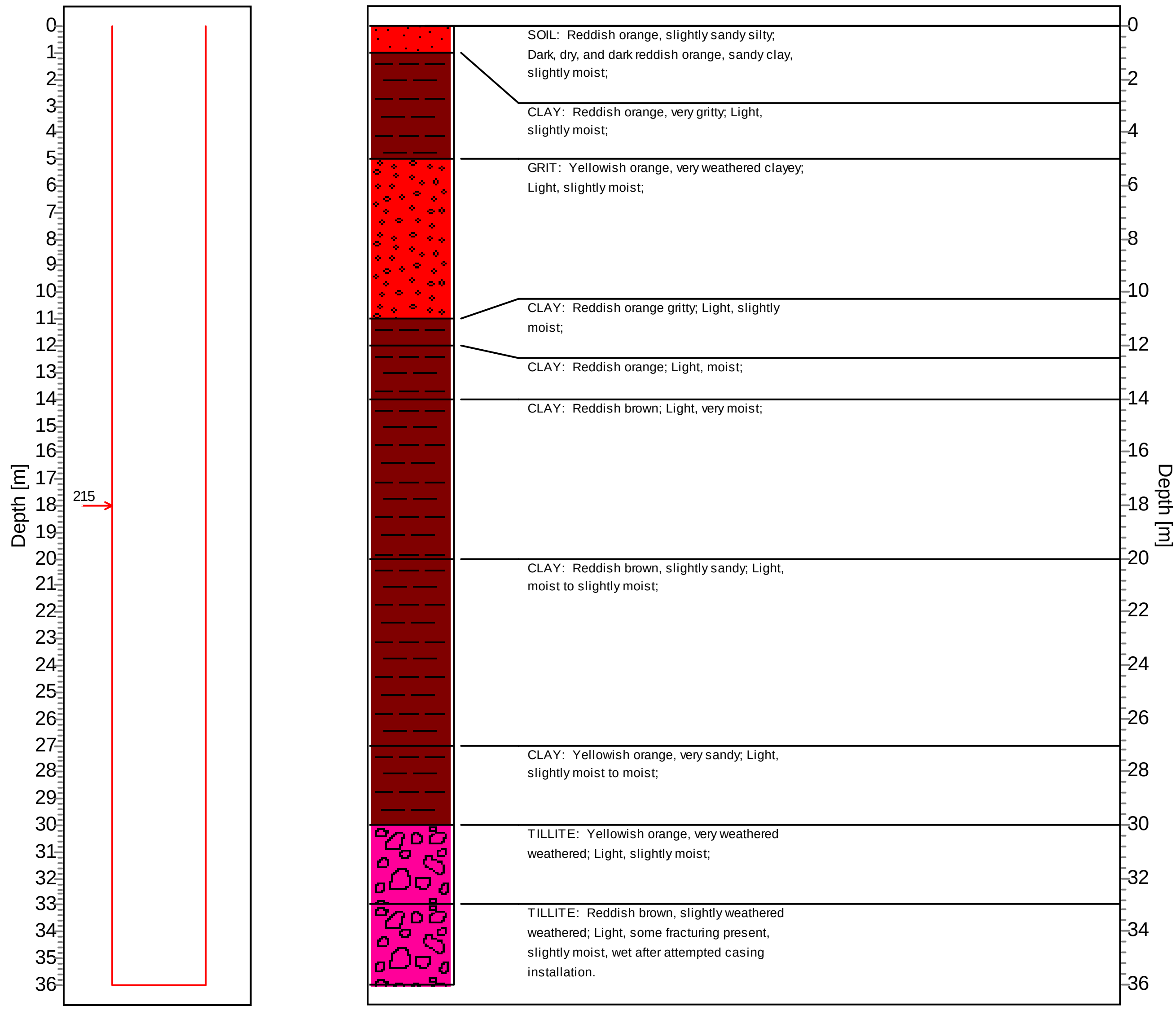
Y Coord. [m]:	613.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	36.00
X Coord. [m]:	2865768.98	***G-Nr.:***		***Site status:***	Destroyed	***Col. ht. [m]:***	0
Altitude [m]:	1526.00			***Site purp.:***	Observation	***Diam. [mm]:***	215
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

(red line)	Hole	165 →	Hole diameter [mm]
(dashed line)	Casing (plain / perforated, sloted)	← 152	Casing diameter [mm]
(blue line)	Screen / Mesh Screen	▼	Waterlevel with date meas.
(teal line)	Piezometer	0:50 →	Piezometer (Nr. & Diameter [mm])

Construction Lithology



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00019 ***Number:*** LGW-B19 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B19

Region Type: ***Region Descr.:***

Y Coord. [m]:	1448.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	24.00
X Coord. [m]:	2864701.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.51
Altitude [m]:	1553.00			***Site purp.:***	Observation	***Diam. [mm]:***	140
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	*Contractor*	*Constr. meth.*	*Type finish*	*Development Method*	*Durat.*	*Special treatment*	*Constr. cost*
20060906	EDRS	Air percussion	Filter (gravel pack	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	*Depth to Top [m]*	*Depth to Bottom [m]*	*Diameter [mm]*	*Date const.*	*Comment*
JMA	0.00	24.00	215	20060906	CASED TO 140

CASING DETAILS:

Date inst.	*Dep. to top [m]*	*Bot. [m]*	*Diam. [mm]*	*Material*	*Thickn. [mm]*	*Opening Type*	*Length*	*Width*	*Hori. dist.*	*Vert. dist.*
20060906	0.00	10.50	165	Steel	3	Plain casing	0	0	0	0
20060906	10.50	12.00	165	Steel	3	Perforated or slotted	300	3	200	150
20060906	0.00	12.00	140	Steel	4	Plain casing	0	0	0	0
20060906	12.00	24.00	140	Steel	4	Perforated or slotted	300	3	150	150

GEOLOGY:

Dep. Top [m]	*Bot. [m]*	*Lithology code*	*Colour Primary*	*Secondary*	*Texture*	*Feature Primary*	*Secondary*
0.00	1.00	SOIL	Red	Dark		Sandy	Gritty
1.00	2.00	CLAY	Red	Dark		Gritty	
2.00	5.00	CLAY	Red	Light			
5.00	6.00	CLAY	Orange	Reddish			
6.00	15.00	BOULDER CLAY	Orange	Reddish			
15.00	18.00	BOULDER CLAY	Orange	Reddish			
18.00	22.50	CLAY	Orange	Yellowish		Sandy	
22.50	24.00	DIABASE	Grey		Fine	Fresh	Hard

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00019 ***Number:*** LGW-B19 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B19

Region Type: ***Region Descr.:***

Y Coord. [m]:	1448.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	24.00
X Coord. [m]:	2864701.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.51
Altitude [m]:	1553.00			***Site purp.:***	Observation	***Diam. [mm]:***	140
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

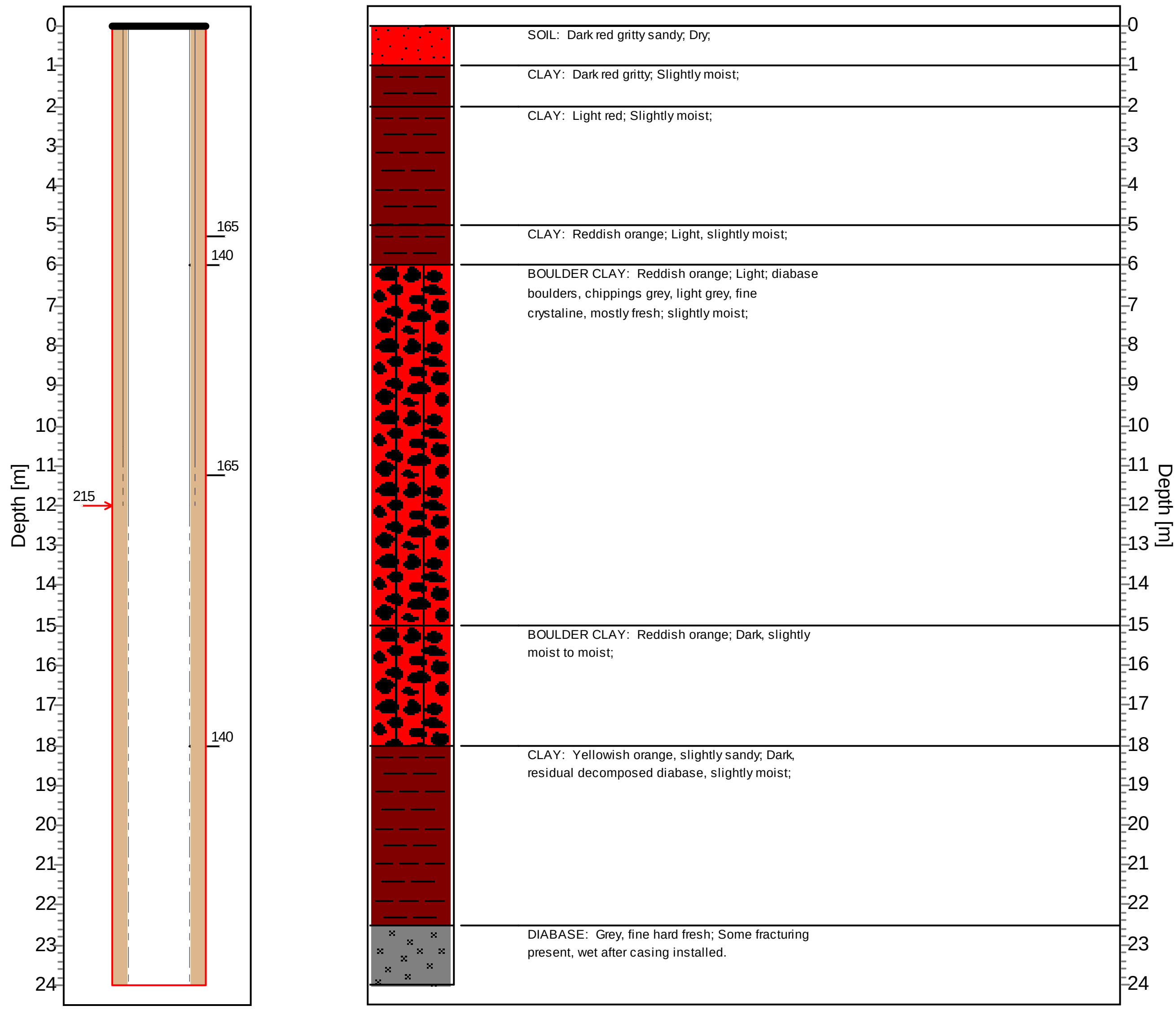
Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	Hole diameter [mm] (165)	Gravel (> 2mm)
Casing (plain / perforated, sloted)	Casing diameter [mm] (152)	
Screen / Mesh Screen	Waterlevel with date meas.	
Piezometer	Piezometer (Nr. & Diameter [mm]) (0:50)	

Construction

Lithology



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00020 ***Number:*** LGW-B20 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B20

Region Type: ***Region Descr.:***

Y Coord. [m]:	2382.00	***Reg./BB.:***		***Topo-set.:***	In or along pan	***Depth [m]:***	30.00
X Coord. [m]:	2866408.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.68
Altitude [m]:	1572.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20060906	EDRS	Air percussion	Open bottom	Pumped with air	10		0.00

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	24.00	215	20060906	CASED TO 165
JMA	24.00	30.00	165	20060906	NO CASING

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20060906	0.00	6.00	165	Steel	3	Plain casing	0	0	0	0
20060906	6.00	24.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	12.00	13.00	0.10	Estimated		Geologist, technician,	ESTIMATED
JMA	19.00	20.00	0.15	Estimated		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Brown	Reddish		Sandy	
1.00	2.00	GRIT	White	Greyish		Fresh	Weathered
2.00	3.00	GRIT	White	Greyish		Fresh	Weathered
3.00	4.00	CLAY	White	Greyish			
4.00	5.00	GRIT	White	Greyish		Fresh	Weathered
5.00	9.00	GRIT	White	Greyish		Fresh	Weathered
9.00	11.00	GRIT	White	Greyish		Fresh	Weathered
11.00	12.00	GRIT	White	Greyish		Fresh	Weathered
12.00	13.00	SHALE	Blue		Very fine	Carbonaceous	Weathered
13.00	19.00	COAL	Black				
19.00	20.00	SANDSTONE	Grey	Light	Fine	Fresh	
20.00	23.00	SANDSTONE	Grey	Light	Fine	Fresh	
23.00	24.00	SANDSTONE	Grey	Light	Coarse	Fresh	
24.00	26.00	SANDSTONE	Grey	Light	Coarse	Fresh	
26.00	27.00	SHALE	Black		Very fine	Fresh	Carbonaceous
27.00	28.00	SANDSTONE	Grey		Fine	Fresh	
28.00	30.00	SHALE	Black		Very fine	Fresh	Carbonaceous

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Geologist,	20061002	1524	0.00	5.63	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00020 ***Number:*** LGW-B20 ***Site type:*** Borehole

Distr./Farm No.: 536 JR ***Site Name/Des.:*** NEW LARGO PROJECT: LGW-B20

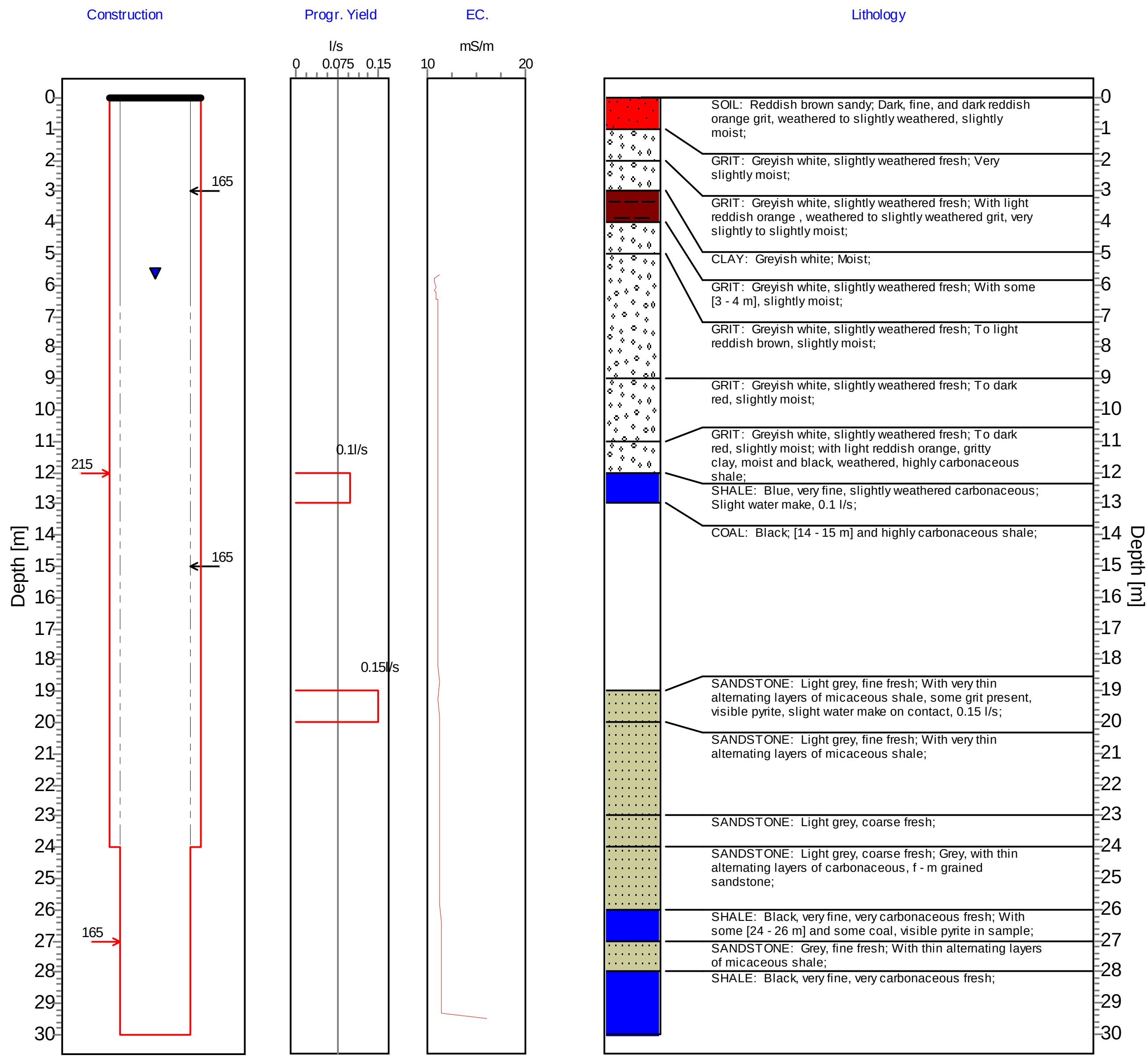
Region Type: ***Region Descr.:***

Y Coord. [m]:	2382.00	***Reg./BB.:***		***Topo-set.:***	In or along pan	***Depth [m]:***	30.00
X Coord. [m]:	2866408.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.68
Altitude [m]:	1572.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:	Global Positioning System			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	165	Hole diameter [mm]
Casing (plain / perforated, sloted)	152	Casing diameter [mm]
Screen / Mesh Screen	▼	Waterlevel measured: 02/10/06
Piezometer	0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00021 **Number:** LGW-B21 **Site type:** Borehole

Distr./Farm No.: 326 JR **Site Name/Des.:** NEW LARGO PROJECT : LGW-B21

Region Type: **Region Descr.:**

Y Coord. [m]:	3246.00	**Reg./BB.:**		**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]:	2868489.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0.79
Altitude [m]:	1586.00			**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20G
Coord. meth.:				**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20061025	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	18.00	215	20061025	
JMA	18.00	30.00	165	20061025	

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20061218	0.00	12.00	165	Steel	3	Plain casing				
20061218	12.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	Depth to Top [m]	Bot. [m]	Yield [l/s]	Method meas.	Aquifer type	Info source	Comment
JMA	18.00	26.00	0.02	Notch (V- or U-notch)		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SAND	Red	Light		Gritty	
1.00	2.00	GRIT	Red	Dark		Weathered	
2.00	3.00	GRIT	Red	Dark		Weathered	
3.00	4.00	SANDSTONE	White	Greyish	Fine to coarse	Weathered	
4.00	8.00	GRIT	White	Greyish		Weathered	
8.00	9.00	SANDSTONE	White	Greyish		Weathered	
9.00	11.00	CLAY	Red	Light		Sandy	Gritty
11.00	18.00	GRIT	Brown	Reddish		Weathered	
18.00	20.00	GRIT	Brown	Reddish		Weathered	
20.00	21.00	CLAY	Orange	Reddish			
21.00	25.00	SHALE	Black		Very fine	Weathered	Carbonaceous
25.00	26.00	SHALE	Grey		Fine	Micaceous	Weathered
26.00	27.00	SHALE	Grey		Fine	Micaceous	Weathered
27.00	28.00	SHALE	Grey		Fine	Micaceous	Weathered
28.00	30.00	SHALE	Black		Very fine	Weathered	Carbonaceous

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Field checked	20061114	0953	0.00	13.31	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00021 ***Number:*** LGW-B21 ***Site type:*** Borehole

Distr./Farm No.: 326 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B21

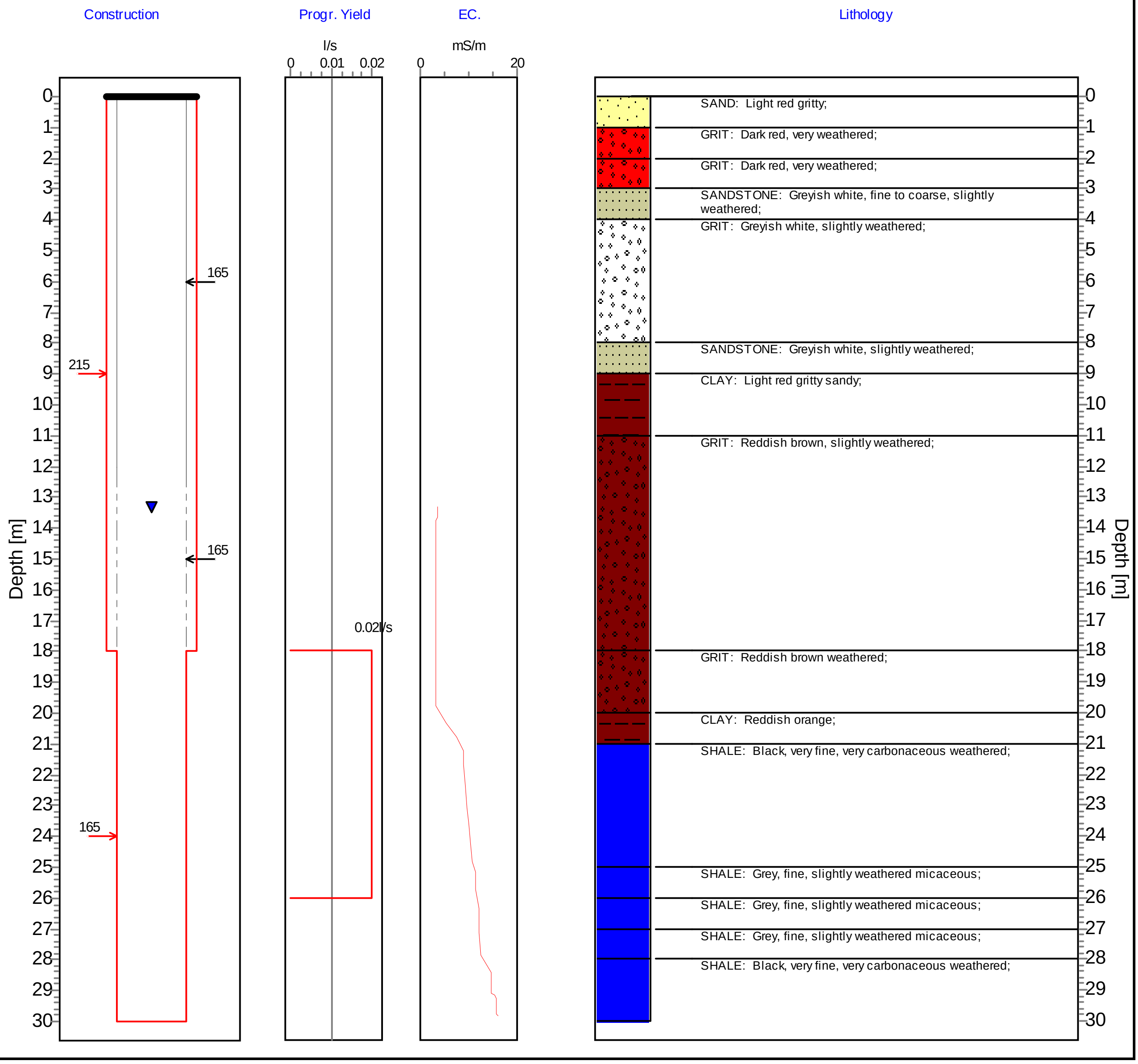
Region Type: ***Region Descr.:***

Y Coord. [m]: 3246.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2868489.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.79
Altitude [m]: 1586.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20G
Coord. meth.:		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole		165	Hole diameter [mm]
Casing (plain / perforated, sloted)		152	Casing diameter [mm]
Screen / Mesh Screen		▼	Waterlevel measured: 14/11/06
Piezometer		0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00022 **Number:** LGW-B22 **Site type:** Borehole

Distr./Farm No.: 566 JR **Site Name/Des.:** NEW LARGO PROJECT : LGW-B22

Region Type: **Region Descr.:**

Y Coord. [m]:	3927.00	**Reg./BB.:**		**Topo-set.:**	Hillside (slope)	**Depth [m]:**	36.00
X Coord. [m]:	2870016.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0.56
Altitude [m]:	1573.00			**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20D
Coord. meth.:				**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20061026	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	24.00	215	20061026	
JMA	24.00	30.00	165	20061026	

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20061218	0.00	12.00	165	Steel	3	Plain casing				
20061218	12.00	24.00	165	Steel	3	Perforated or slotted	300	3	200	150

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Red	Light		Silty	Sandy
1.00	2.00	GRIT	Red	Dark		Weathered	
2.00	3.00	GRIT	Red	Dark		Weathered	
3.00	5.00	GRIT	Red	Light		Weathered	Weathered
5.00	6.00	GRIT	Red	Light		Weathered	Weathered
6.00	7.00	CLAY	Red	Dark		Sandy	
7.00	9.00	CLAY	White	Greyish			
9.00	13.00	GRIT	White	Greyish		Fresh	
13.00	15.00	SANDSTONE	White	Greyish	Fine to coarse	Fresh	
15.00	16.00	SANDSTONE	White	Greyish	Fine to medium	Fresh	
16.00	17.00	GRIT	Orange	Reddish		Weathered	
17.00	18.00	GRIT	Orange	Reddish		Weathered	
18.00	19.00	SANDSTONE	Red	Light	Fine	Fresh	
19.00	20.00	CLAY	Red	Light			
20.00	22.00	COAL	Black				
22.00	23.00	SHALE	Black		Very fine	Fresh	Weathered
23.00	24.00	SANDSTONE	Grey		Fine	Fresh	Weathered
24.00	25.00	SANDSTONE	Grey		Fine	Fresh	
25.00	26.00	COAL	Black				
26.00	29.00	SHALE	Black		Very fine	Fresh	Carbonaceous
29.00	30.00	SHALE	Grey	Dark	Fine	Fresh	Carbonaceous

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Field checked	20061114	1055	0.00	18.46	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00022 ***Number:*** LGW-B22 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B22

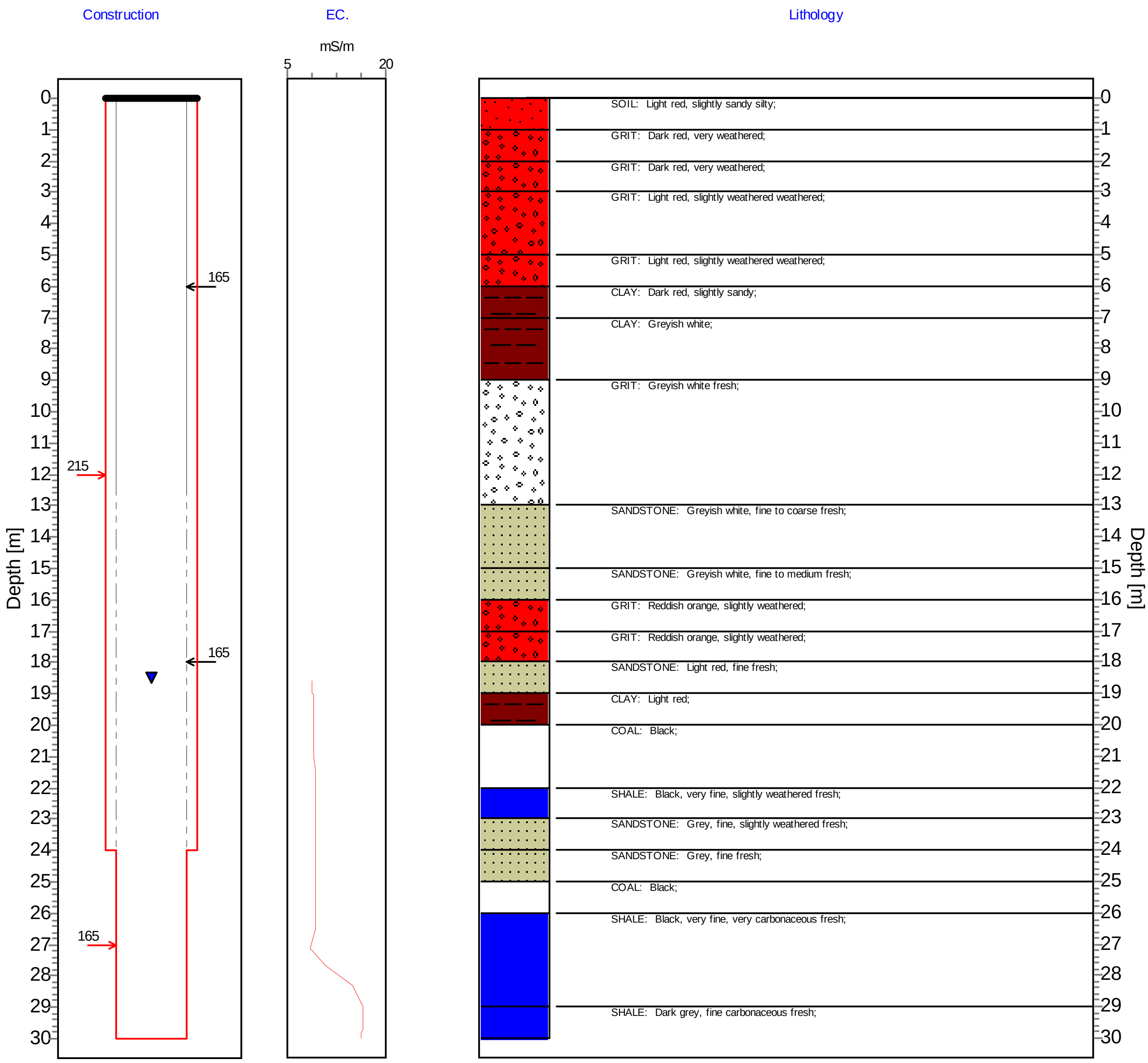
Region Type: ***Region Descr.:***

Y Coord. [m]:	3927.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	36.00
X Coord. [m]:	2870016.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.56
Altitude [m]:	1573.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20D
Coord. meth.:				***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	Casing (plain / perforated, sloted)	165	Hole diameter [mm]
Casing (plain / perforated, sloted)		152	Casing diameter [mm]
Screen / Mesh Screen			Waterlevel measured: 14/11/06
Piezometer		0:50	Piezometer (Nr. & Diameter [mm])



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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00023 ***Number:*** LGW-B23 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B23

Region Type: ***Region Descr.:***

Y Coord. [m]:	4228.00	***Reg./BB.:***	***Topo-set.:*** Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2871715.98	***G-Nr.:***	***Site status:*** In use	***Col. ht. [m]:***	0.77
Altitude [m]:	1549.00		***Site purp.:*** Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units		***Use applic.:*** Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:			***Equipment:*** No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	*Contractor*	*Constr. meth.*	*Type finish*	*Development Method*	*Durat.*	*Special treatment*	*Constr. cost*
20061026	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	*Depth to Top [m]*	*Depth to Bottom [m]*	*Diameter [mm]*	*Date const.*	*Comment*
JMA	0.00	18.00	215	20061218	
JMA	18.00	30.00	165	20061218	

CASING DETAILS:

Date inst.	*Dep. to top [m]*	*Bot. [m]*	*Diam. [mm]*	*Material*	*Thickn. [mm]*	*Opening Type*	*Length*	*Width*	*Hori. dist.*	*Vert. dist.*
20061218	0.00	12.00	165	Steel	3	Plain casing				
20061218	12.00	18.00	165	Steel	3	Perforated or slotted	300	3	200	150

GEOLOGY:

Dep. Top [m]	*Bot. [m]*	*Lithology code*	*Colour Primary*	*Secondary*	*Texture*	*Feature Primary*	*Secondary*
0.00	1.00	SOIL	Red	Light		Silty	Sandy
1.00	2.00	GRIT	Orange	Reddish		Weathered	
2.00	9.00	GRIT	Brown	Reddish		Fresh	Weathered
9.00	10.00	GRIT	Brown	Reddish		Fresh	Weathered
10.00	11.00	GRIT	Brown	Reddish		Fresh	Weathered
11.00	12.00	CLAY	Red	Light			
12.00	13.00	SANDSTONE	Grey	Light	Fine	Fresh	Weathered
13.00	14.00	SHALE	Grey	Light	Fine to medium	Fresh	Weathered
14.00	15.00	SANDSTONE	Grey	Light	Fine to coarse	Fresh	
15.00	16.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
16.00	17.00	SHALE	Grey		Fine	Fresh	Micaceous
17.00	18.00	SANDSTONE	Grey	Light	Fine	Fresh	
18.00	19.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
19.00	20.00	SHALE	Grey		Fine	Fresh	Micaceous
20.00	22.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
22.00	23.00	SHALE	Black		Very fine	Fresh	Carbonaceous
23.00	27.00	COAL	Black				
27.00	28.00	COAL	Black				
28.00	29.00	DIAMICTITE	Grey			Fresh	
29.00	30.00	TILLITE	Grey	Light		Fresh	

WATER LEVEL:

Meth. meas.	*Level status*	*Piez.*	*Info source*	*Date meas.*	*Time meas.*	*Sec.*	*Water lev. [m]*	*Comment*
Electrical contact	Static	0	Field checked	20061114	1210	0.00	9.42	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00023 ***Number:*** LGW-B23 ***Site type:*** Borehole

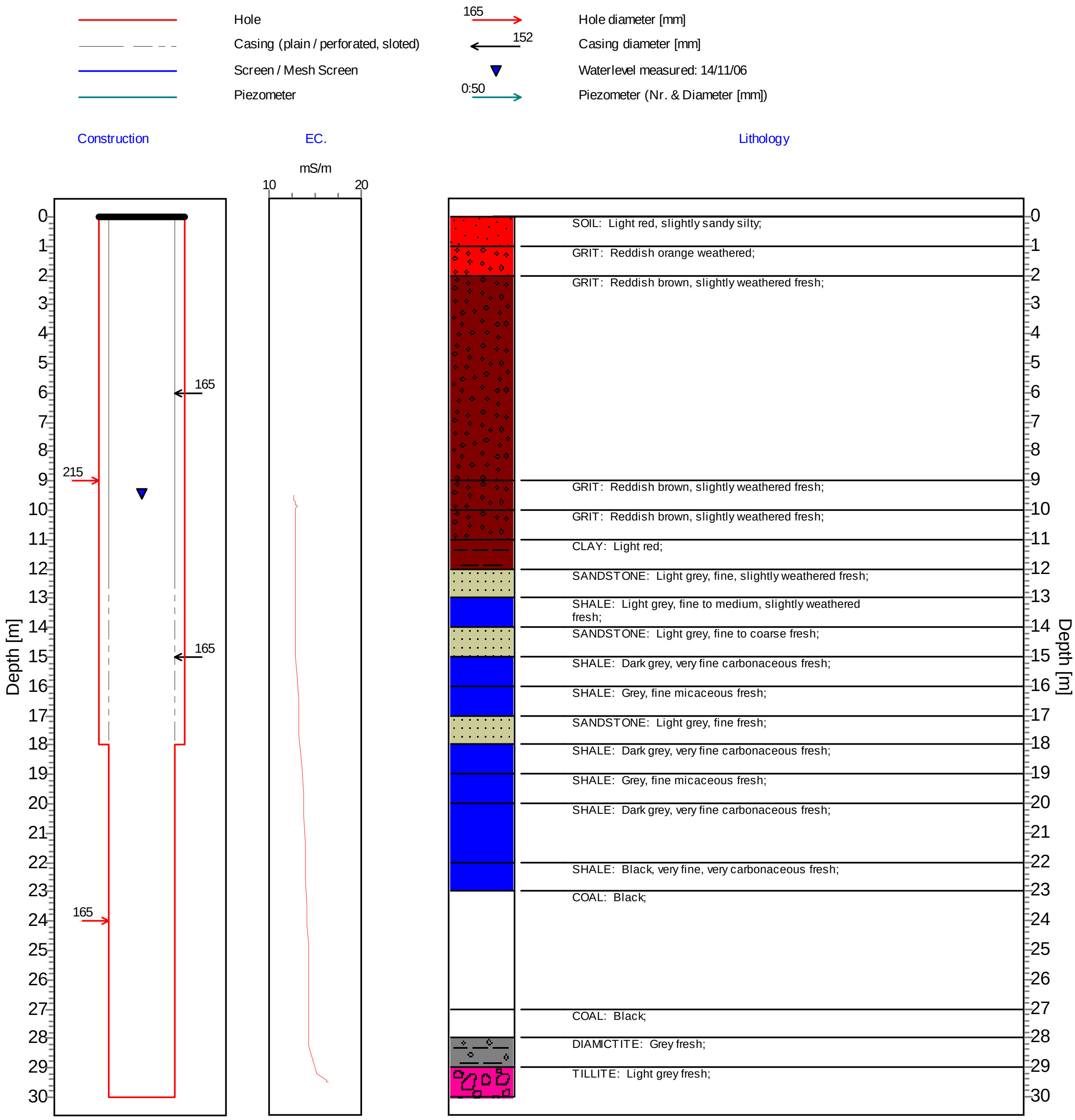
Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B23

Region Type: ***Region Descr.:***

Y Coord. [m]: 4228.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2871715.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.77
Altitude [m]: 1549.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:			***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00024 ***Number:*** LGW-B24 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B24

Region Type: ***Region Descr.:***

Y Coord. [m]:	5716.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2872597.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.57
Altitude [m]:	1530.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:				***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	*Contractor*	*Constr. meth.*	*Type finish*	*Development Method*	*Durat.*	*Special treatment*	*Constr. cost*
20061026	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	*Depth to Top [m]*	*Depth to Bottom [m]*	*Diameter [mm]*	*Date const.*	*Comment*
JMA	0.00	24.00	215	20061026	
JMA	24.00	30.00	165	20061026	

CASING DETAILS:

Date inst.	*Dep. to top [m]*	*Bot. [m]*	*Diam. [mm]*	*Material*	*Thickn. [mm]*	*Opening Type*	*Length*	*Width*	*Hori. dist.*	*Vert. dist.*
20061218	0.00	12.00	165	Steel	3	Plain casing				
20061218	12.00	24.00	165	Steel	3	Perforated or slotted	300	3	200	150

AQUIFER:

Rep. Inst.	*Depth to Top [m]*	*Bot. [m]*	*Yield [l/s]*	*Method meas.*	*Aquifer type*	*Info source*	*Comment*
JMA	12.00	14.00	0.05	Notch (V- or U-notch)		Geologist, technician,	ESTIMATED

GEOLOGY:

Dep. Top [m]	*Bot. [m]*	*Lithology code*	*Colour Primary*	*Secondary*	*Texture*	*Feature Primary*	*Secondary*
0.00	1.00	SAND	Brown	Reddish			
1.00	3.00	CLAY	Grey	Light		Sandy	
3.00	4.00	CLAY	Grey	Light		Sandy	
4.00	5.00	CLAY	Red	Dark		Ferruginous	
5.00	9.00	CLAY	Red	Dark		Ferruginous	
9.00	12.00	CLAY	Orange	Reddish		Sandy	Gritty
12.00	14.00	GRIT	Brown	Reddish		Weathered	Weathered
14.00	21.00	TILLITE	Brown	Reddish		Weathered	
21.00	26.00	TILLITE	Red	Light		Weathered	
26.00	30.00	TILLITE	Grey	Light		Fresh	

WATER LEVEL:

Meth. meas.	*Level status*	*Piez.*	*Info source*	*Date meas.*	*Time meas.*	*Sec.*	*Water lev. [m]*	*Comment*
Electrical contact	Static	0	Field checked	20061114	1300	0.00	4.95	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00024 ***Number:*** LGW-B24 ***Site type:*** Borehole

Distr./Farm No.: 566 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B24

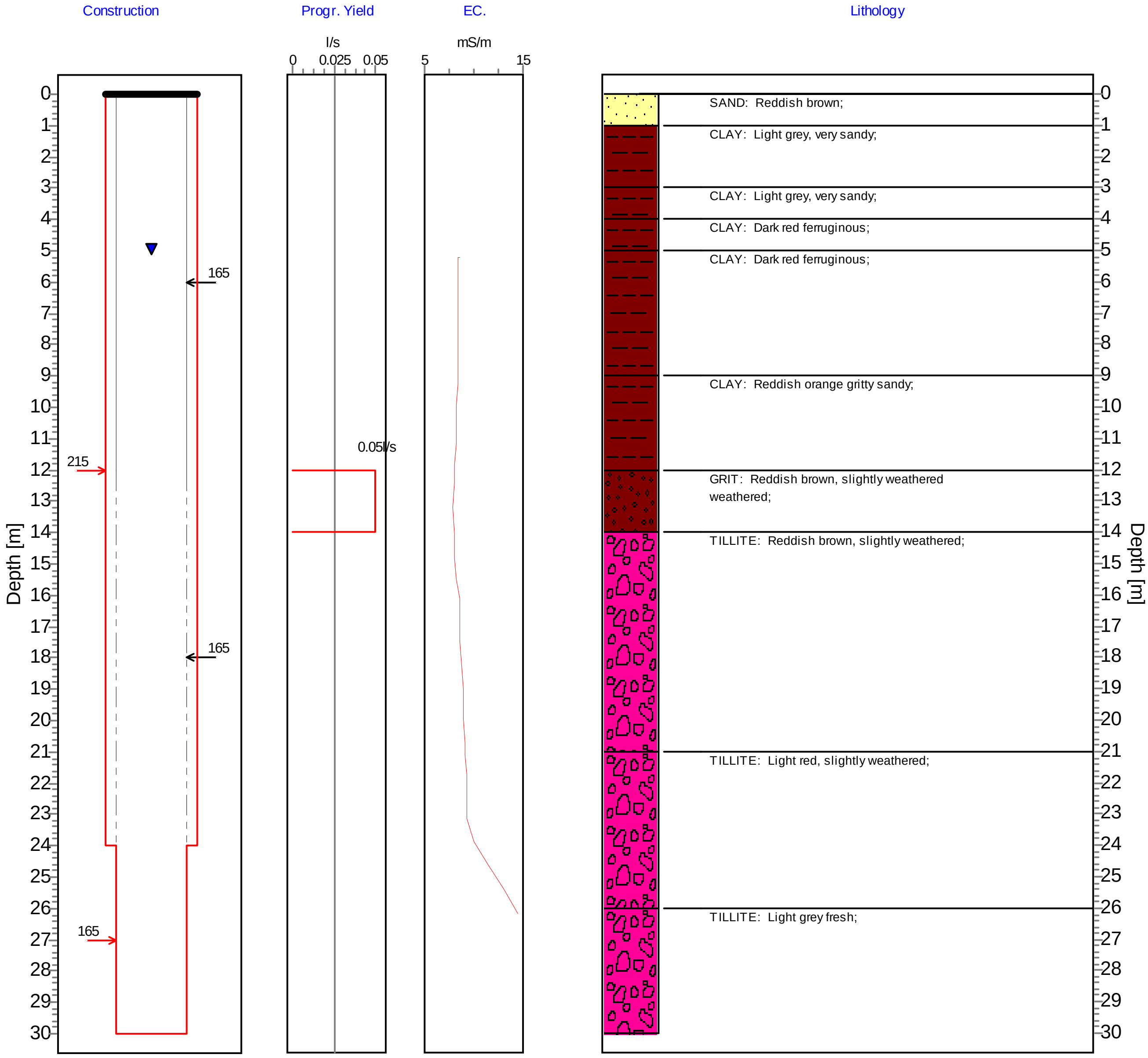
Region Type: ***Region Descr.:***

Y Coord. [m]:	5716.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2872597.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.57
Altitude [m]:	1530.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:				***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	Casing (plain / perforated, sloted)	Screen / Mesh Screen	Piezometer
165 Hole diameter [mm]	152 Casing diameter [mm]	Waterlevel measured: 14/11/06	0:50 Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00025 **Number:** LGW-B25 **Site type:** Borehole

Distr./Farm No.: 568 JR **Site Name/Des.:** NEW LARGO PROJECT : LGW-B25

Region Type: **Region Descr.:**

Y Coord. [m]:	4559.00	**Reg./BB.:**		**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]:	2874753.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0.46
Altitude [m]:	1582.00			**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20F
Coord. meth.:				**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20061025	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	12.00	215	20061025	
JMA	12.00	30.00	165	20061025	

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20061218	0.00	6.00	165	Steel	3	Plain casing				
20061218	6.00	12.00	165	Steel	3	Perforated or slotted	300	3	200	150

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Orange	Reddish		Silty	Sandy
1.00	3.00	CLAY	Red	Light		Sandy	
3.00	4.00	CLAY	Red	Light		Sandy	
4.00	15.00	SILTSTONE	Brown	Reddish		Fresh	Weathered
15.00	17.00	SILTSTONE	White	Greyish		Fresh	
17.00	18.00	SILTSTONE	White	Greyish		Fresh	
18.00	19.00	COAL	Black				
19.00	20.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
20.00	21.00	SHALE	Grey		Fine	Fresh	Micaceous
21.00	22.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
22.00	23.00	SHALE	Grey	Dark	Very fine	Fresh	Weathered
23.00	24.00	SHALE	Black		Very fine	Fresh	Weathered
24.00	27.00	SANDSTONE	White	Greyish	Coarse	Fresh	
27.00	29.00	SANDSTONE	White	Greyish	Fine to medium	Fresh	
29.00	30.00	SANDSTONE	White	Greyish	Coarse	Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Field checked	20061114	1515	0.00	3.40	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00025 ***Number:*** LGW-B25 ***Site type:*** Borehole

Distr./Farm No.: 568 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B25

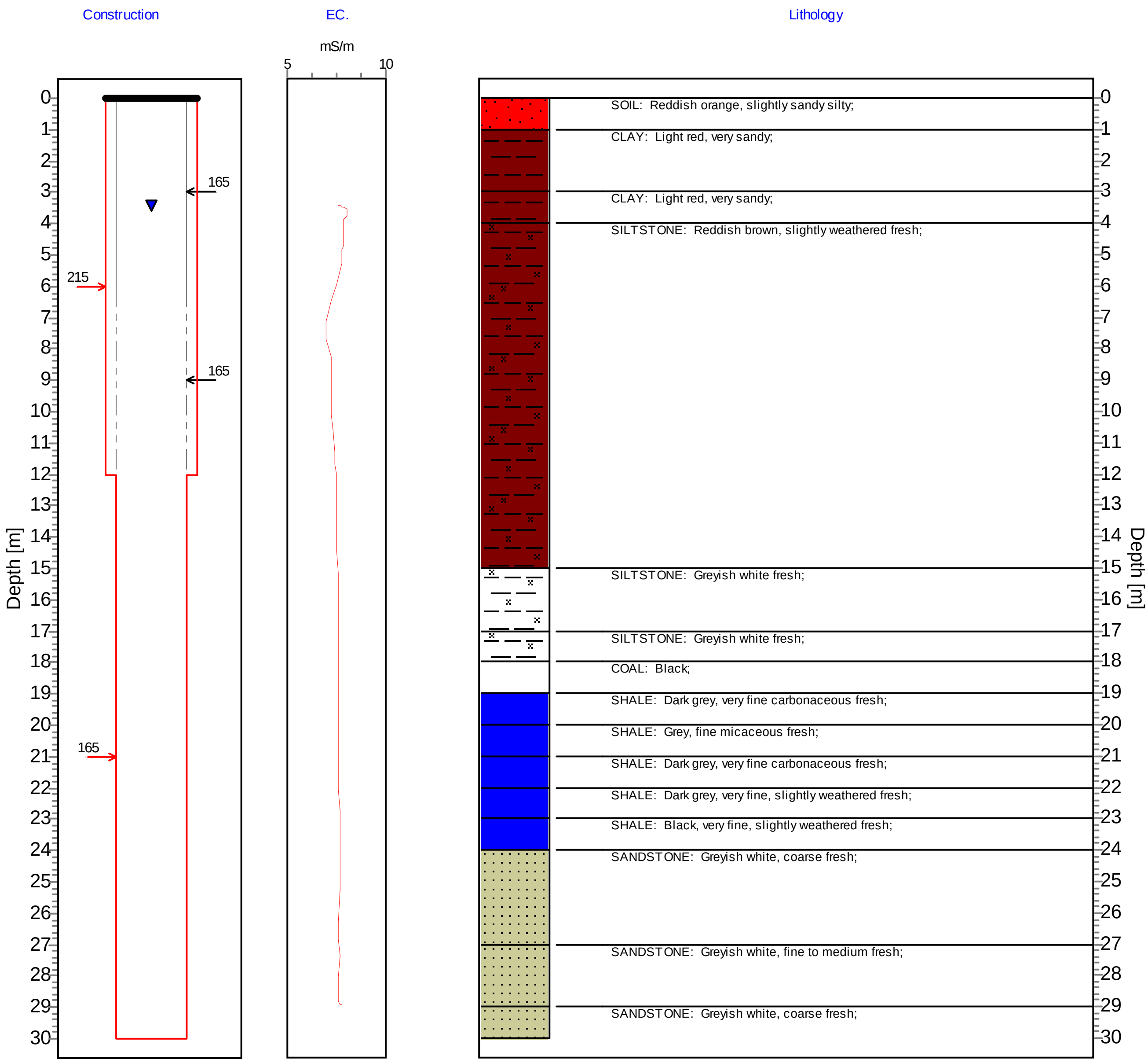
Region Type: ***Region Descr.:***

Y Coord. [m]:	4559.00
X Coord. [m]:	2874753.98
Altitude [m]:	1582.00
Coord. acc.:	Accurate to within 10 units
Coord. meth.:	
Reg./BB.:	
G-Nr.:	
Topo-set.:	Hillside (slope)
Site status:	In use
Site purp.:	Observation
Use applic.:	Industrial - mining
Equipment:	No equipment
Depth [m]:	30.00
Col. ht. [m]:	0.46
Diam. [mm]:	165
Drain. reg.:	B20F
Rep. inst.:	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

	Hole	165	Hole diameter [mm]
	Casing (plain / perforated, sloted)	152	Casing diameter [mm]
	Screen / Mesh Screen		Waterlevel measured: 14/11/06
	Piezometer	0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2528DD00026 **Number:** LGW-B26 **Site type:** Borehole

Distr./Farm No.: 568 JR **Site Name/Des.:** NEW LARGO PROJECT : LGW-B26

Region Type: **Region Descr.:**

Y Coord. [m]:	7521.00	**Reg./BB.:**		**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]:	2874943.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0.29
Altitude [m]:	1543.00			**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20F
Coord. meth.:				**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20061026	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	12.00	215	20061026	
JMA	12.00	30.00	165	20061026	

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20061218	0.00	6.00	165	Steel	3	Plain casing				
20061218	6.00	12.00	165	Steel	3	Perforated or slotted	300	3	200	150

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	4.00	GRIT	White	Greyish		Fresh	Weathered
4.00	5.00	SANDSTONE	Red	Light	Fine to coarse	Fresh	Weathered
5.00	6.00	SANDSTONE	Brown	Reddish	Fine to coarse	Fresh	Weathered
6.00	7.00	SHALE	Black		Very fine	Fresh	Carbonaceous
7.00	10.00	COAL	Black				
10.00	11.00	COAL	Black				
11.00	12.00	SANDSTONE AND SHALE	Grey		Fine	Fresh	Micaceous
12.00	13.00	SHALE	Grey		Fine	Fresh	Micaceous
13.00	14.00	SANDSTONE AND SHALE	Grey		Fine	Fresh	Micaceous
14.00	15.00	SHALE	Grey	Dark	Fine	Fresh	Carbonaceous
15.00	16.00	SANDSTONE AND SHALE	Grey		Fine	Fresh	Micaceous
16.00	17.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
17.00	18.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
18.00	19.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
19.00	21.00	SHALE	Grey		Fine	Fresh	Micaceous
21.00	22.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
22.00	23.00	SHALE	Black		Very fine	Fresh	Carbonaceous
23.00	24.00	SHALE	Black		Very fine	Fresh	Carbonaceous
24.00	25.00	SHALE	Black		Very fine	Fresh	Carbonaceous
25.00	29.00	SHALE	Black		Very fine	Fresh	Carbonaceous
29.00	30.00	COAL	Black				

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Field checked	20061114	1725	0.00	11.75	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00026 ***Number:*** LGW-B26 ***Site type:*** Borehole

Distr./Farm No.: 568 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B26

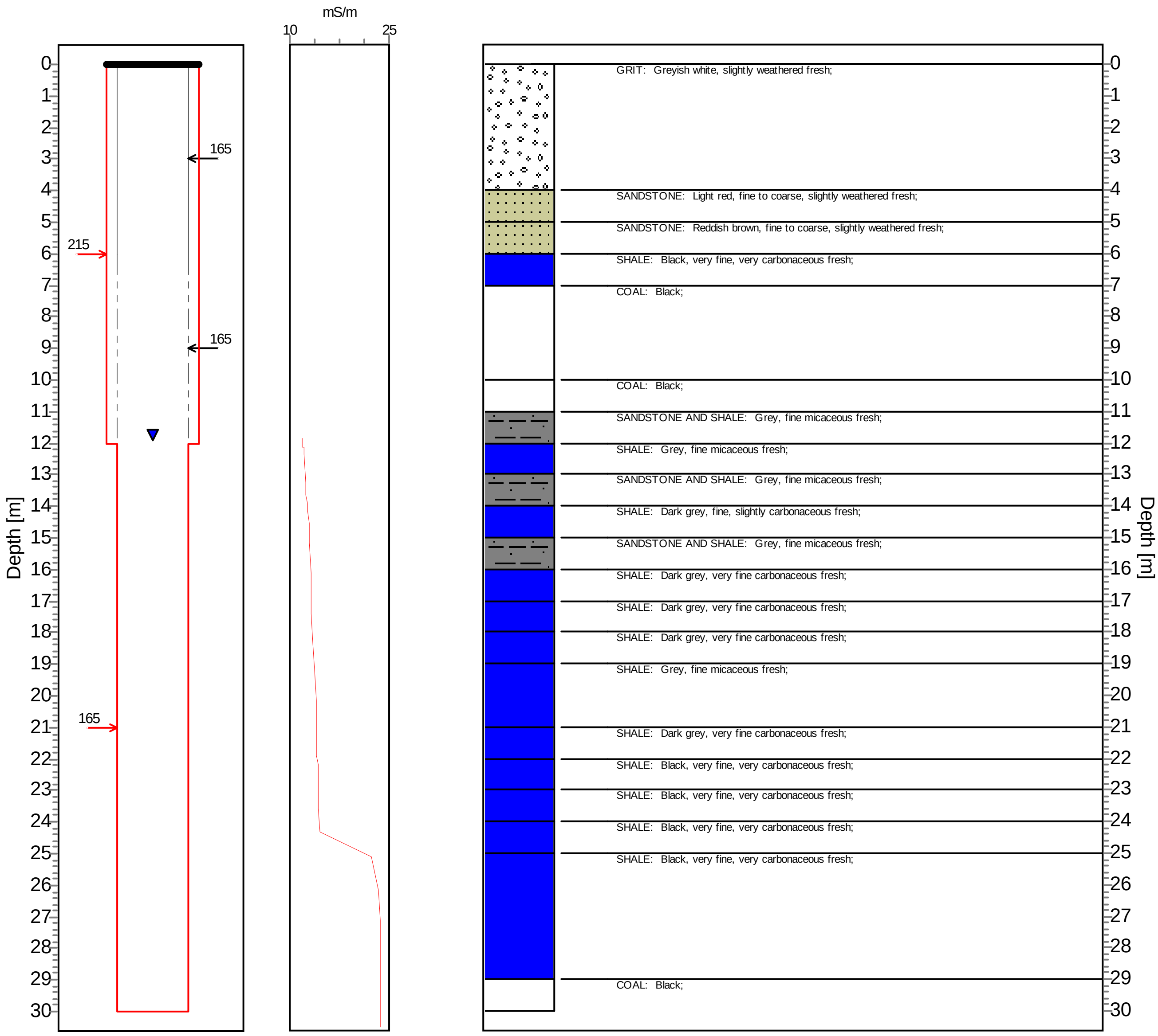
Region Type: ***Region Descr.:***

Y Coord. [m]: 7521.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2874943.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.29
Altitude [m]: 1543.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

	Hole	165	Hole diameter [mm]
	Casing (plain / perforated, sloted)	152	Casing diameter [mm]
	Screen / Mesh Screen		Waterlevel measured: 14/11/06
	Piezometer	0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00027 ***Number:*** LGW-B27 ***Site type:*** Borehole

Distr./Farm No.: 568 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B27

Region Type: ***Region Descr.:***

Y Coord. [m]: 7413.00	***Reg./BB.:***	***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]: 2875401.98	***G-Nr.:***	***Site status:***	In use	***Col. ht. [m]:***	0.75
Altitude [m]: 1550.00		***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.: Accurate to within 10 units		***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:		***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20061026	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	12.00	215	20061026	
JMA	12.00	30.00	165	20061026	

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20061218	0.00	6.00	165	Steel	3	Plain casing				
20061218	6.00	12.00	165	Steel	3	Perforated or slotted	300	3	200	150

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Red	Light		Silty	Sandy
1.00	6.00	GRIT	Orange	Reddish		Weathered	Weathered
6.00	8.00	GRIT	Brown	Reddish		Fresh	Weathered
8.00	9.00	GRIT	Brown	Reddish		Fresh	Weathered
9.00	11.00	SANDSTONE	Orange	Reddish	Fine to coarse	Fresh	Weathered
11.00	12.00	SANDSTONE	Orange	Reddish	Fine to coarse	Fresh	Weathered
12.00	14.00	SANDSTONE	Brown	Reddish	Fine to coarse	Fresh	Weathered
14.00	15.00	SHALE	Grey		Fine	Fresh	
15.00	16.00	COAL	Black				
16.00	17.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
17.00	22.00	COAL	Black				
22.00	23.00	SHALE	Grey	Dark	Very fine	Fresh	Carbonaceous
23.00	25.00	SANDSTONE	Grey		Fine to coarse	Fresh	
25.00	26.00	COAL	Black				
26.00	27.00	SHALE	Grey		Fine	Fresh	Micaceous
27.00	28.00	SHALE	Grey		Fine	Fresh	Micaceous
28.00	30.00	SHALE	Black		Very fine	Fresh	Carbonaceous

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Field checked	20061114	1635	0.00	12.51	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2528DD00027 ***Number:*** LGW-B27 ***Site type:*** Borehole

Distr./Farm No.: 568 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B27

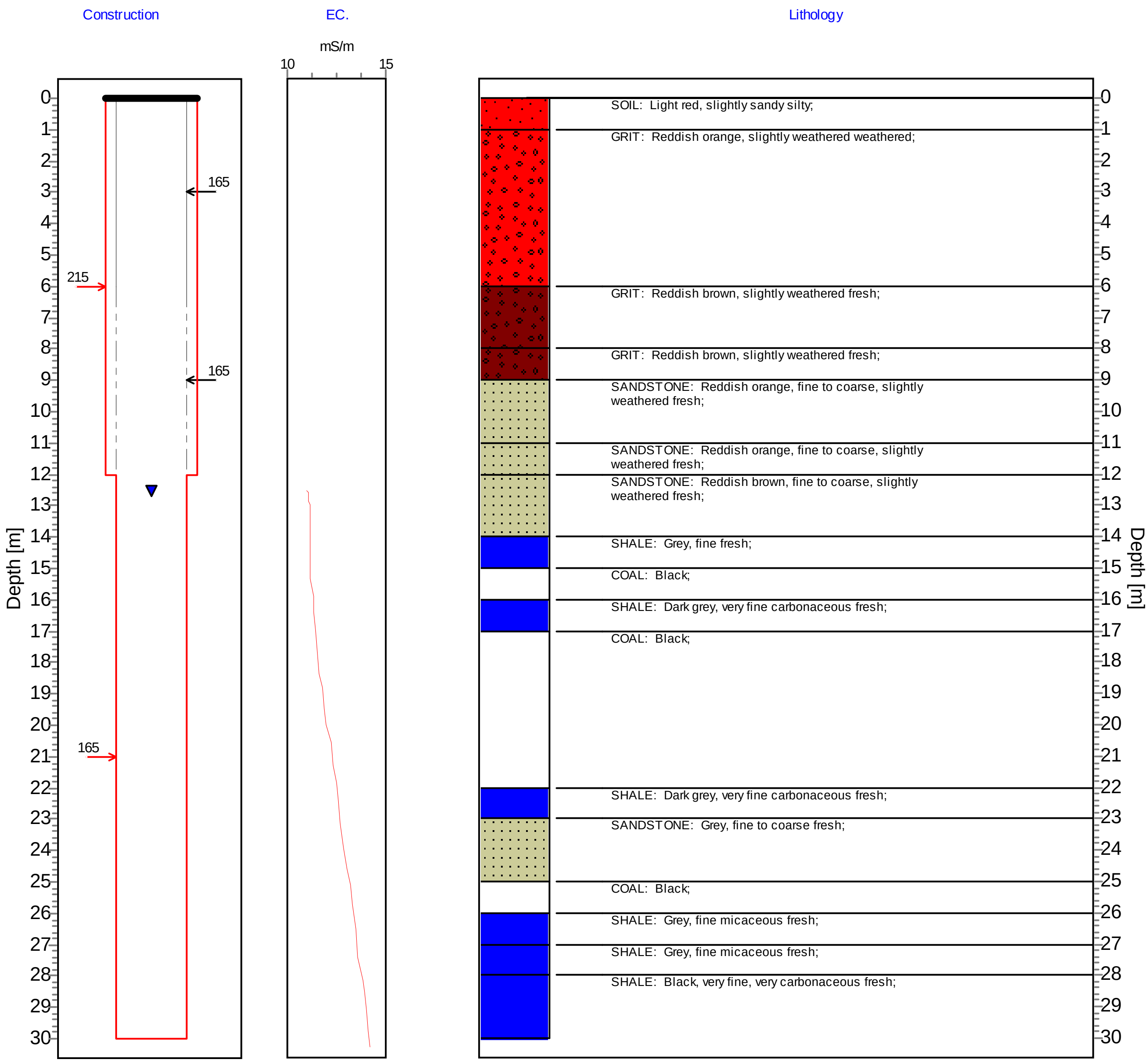
Region Type: ***Region Descr.:***

Y Coord. [m]:	7413.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2875401.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0.75
Altitude [m]:	1550.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:				***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

(red line)	Hole	165 →	Hole diameter [mm]
(dashed line)	Casing (plain / perforated, sloted)	← 152	Casing diameter [mm]
(blue line)	Screen / Mesh Screen	▼	Waterlevel measured: 14/11/06
(teal line)	Piezometer	0:50 →	Piezometer (Nr. & Diameter [mm])



COMMENT:

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SITE INFORMATION REPORT

Date compiled: 2007/03/01

BASIC SITE INFORMATION:

Site Identifier: 2629AA00028 **Number:** LGW-B28 **Site type:** Borehole

Distr./Farm No.: 568 JR **Site Name/Des.:** NEW LARGO PROJECT : LGW-B28

Region Type: **Region Descr.:**

Y Coord. [m]:	7533.00	**Reg./BB.:**		**Topo-set.:**	Hillside (slope)	**Depth [m]:**	30.00
X Coord. [m]:	2878053.98	**G-Nr.:**		**Site status:**	In use	**Col. ht. [m]:**	0
Altitude [m]:	1517.00			**Site purp.:**	Observation	**Diam. [mm]:**	165
Coord. acc.:	Accurate to within 10 units			**Use applic.:**	Industrial - mining	**Drain. reg.:**	B20F
Coord. meth.:				**Equipment:**	No equipment	**Rep. inst.:**	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

CONSTRUCTION:

Date const.	Contractor	Constr. meth.	Type finish	Development Method	Durat.	Special treatment	Constr. cost
20061110	EDRS	Air percussion	Open bottom	Pumped with air	10		

HOLE DIAMETER:

Rep. Inst.	Depth to Top [m]	Depth to Bottom [m]	Diameter [mm]	Date const.	Comment
JMA	0.00	12.00	215	20061110	
JMA	12.00	30.00	165	20061110	

CASING DETAILS:

Date inst.	Dep. to top [m]	Bot. [m]	Diam. [mm]	Material	Thickn. [mm]	Opening Type	Length	Width	Hori. dist.	Vert. dist.
20061218	0.00	6.00	165	Steel	3	Plain casing				
20061218	6.00	12.00	165	Steel	3	Perforated or slotted	300	3	200	150

GEOLOGY:

Dep. Top [m]	Bot. [m]	Lithology code	Colour Primary	Secondary	Texture	Feature Primary	Secondary
0.00	1.00	SOIL	Orange	Reddish		Silty	
1.00	2.00	CLAY	Red	Light		Sandy	
2.00	5.00	LAVA	Brown	Reddish		Weathered	Weathered
5.00	8.00	LAVA	Brown	Reddish		Weathered	
8.00	9.00	LAVA	Grey	Dark		Fresh	
9.00	20.00	LAVA	Grey	Dark		Fresh	
20.00	21.00	LAVA	Grey	Dark		Weathered	
21.00	30.00	LAVA	Grey	Dark		Fresh	

WATER LEVEL:

Meth. meas.	Level status	Piez.	Info source	Date meas.	Time meas.	Sec.	Water lev. [m]	Comment
Electrical contact	Static	0	Field checked	20061127	0845	0.00	5.19	

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Borehole Construction and Geological Log

Date compiled: 2007/03/02

BASIC SITE INFORMATION: ***Site Identifier:*** 2629AA00028 ***Number:*** LGW-B28 ***Site type:*** Borehole

Distr./Farm No.: 568 JR ***Site Name/Des.:*** NEW LARGO PROJECT : LGW-B28

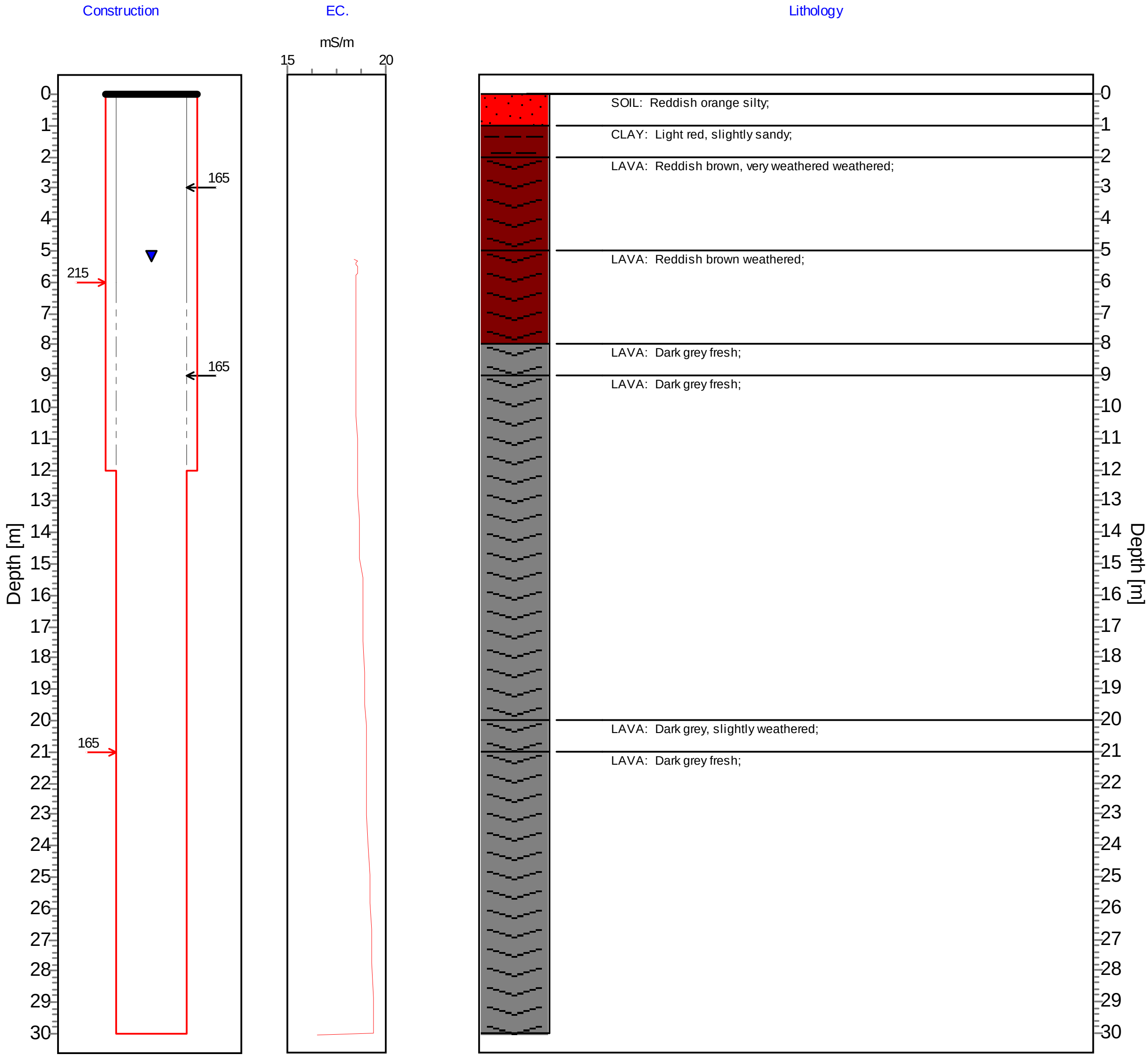
Region Type: ***Region Descr.:***

Y Coord. [m]:	7533.00	***Reg./BB.:***		***Topo-set.:***	Hillside (slope)	***Depth [m]:***	30.00
X Coord. [m]:	2878053.98	***G-Nr.:***		***Site status:***	In use	***Col. ht. [m]:***	0
Altitude [m]:	1517.00			***Site purp.:***	Observation	***Diam. [mm]:***	165
Coord. acc.:	Accurate to within 10 units			***Use applic.:***	Industrial - mining	***Drain. reg.:***	B20F
Coord. meth.:				***Equipment:***	No equipment	***Rep. inst.:***	JMA

Coordinate System: South African LO Transverse Mercator, Hartebeesthoek94 (WGS 84)

Construction and Geohydrological Legend

Hole	Casing (plain / perforated, sloted)	165	Hole diameter [mm]
Casing (plain / perforated, sloted)		152	Casing diameter [mm]
Screen / Mesh Screen			Waterlevel measured: 27/11/06
Piezometer		0:50	Piezometer (Nr. & Diameter [mm])



COMMENT:

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Appendix B

NAG LEACH DATA (JMA, 2009)

Table B5: NAG leach results (JMA, 2009)

Waterlab (Pty) Ltd P.O. Box 11508 Hatfield 0028
(T) 012-3491-044/1066 (F) 012-349-1072 (E) ldewet@waterlab.co.za

Project	Jasper Muller & Associates
Client	Mr J Fourie
Date	29/11/2006
Report No	18433
Sample Series	7934-7969
Analyses	ICP MS Scan
Order No	LET 5691
Project No	

WATERLAB

Values in black : ppb (liquid)
Values in red : mg/kg (dry solid)

Lab #	Sample ID	Extract	mple Dry Ma	Volume	Mass (g/l)	Li	Li	Be	Be	B	B	Na	Na	Mg	Mg	Al	Al	Si	Si
PEROXIDE EXTRACTS																			
7934	LGW B20 9-11	Peroxide 1:100	2.50	250	10.00	45	4.5	2	0.2	134	13.4	14152	1415	157	16	3538	354	3235	323
7935	LGW B20 11-12	Peroxide 1:100	2.50	250	10.00	66	6.6	8	0.8	119	11.9	13895	1389	636	64	12060	1206	8232	823
7936	LGW B20 13-15	Peroxide 1:100	2.50	250	10.00	70	7.0	14	1.4	131	13.1	18351	1835	1099	110	3909	391	4559	456
7937	LGW B20 15-17	Peroxide 1:100	2.50	250	10.00	71	7.1	6	0.6	176	17.6	19171	1917	13141	1314	3804	380	4025	403
7938	LGW B20 17-19	Peroxide 1:100	2.50	250	10.00	60	6.0	6	0.6	151	15.1	17569	1757	6713	671	4303	430	4851	485
7939	LGW B20 19-20	Peroxide 1:100	2.50	250	10.00	72	7.2	2	0.2	89	8.9	15149	1515	1623	162	8018	802	6214	621
7940	LGW B13 18-21	Peroxide 1:100	2.50	250	10.00	58	5.8	0	0.0	77	7.7	18730	1873	23145	2315	129	13	3979	398
7941	LGW B13 22-24	Peroxide 1:100	2.50	250	10.00	81	8.1	18	1.8	124	12.4	18485	1848	20429	2043	14376	1438	15466	1547
7942	LGW B13 24-26	Peroxide 1:100	2.50	250	10.00	90	9.0	6	0.6	88	8.8	21342	2134	17975	1797	12657	1266	13330	1333
7943	LGW B13 26-28	Peroxide 1:100	2.50	250	10.00	100	10.0	17	1.7	84	8.4	21974	2197	18979	1898	12118	1212	12350	1235
7944	LGW B13 28-29	Peroxide 1:100	2.50	250	10.00	63	6.3	11	1.1	155	15.5	18413	1841	9048	905	3969	397	4456	446
7945	LGW B13 29-30	Peroxide 1:100	2.50	250	10.00	61	6.1	3	0.3	118	11.8	17795	1779	27696	2770	2006	201	3505	350
7946	LGW B13 30-32	Peroxide 1:100	2.50	250	10.00	68	6.8	3	0.3	120	12.0	19002	1900	25394	2539	2133	213	5235	523
7947	LGW B13 32-35	Peroxide 1:100	2.50	250	10.00	81	8.1	11	1.1	134	13.4	17805	1781	6111	611	9939	994	8925	892
7948	LGW B13 35-37	Peroxide 1:100	2.50	250	10.00	66	6.6	10	1.0	189	18.9	19759	1976	9590	959	4649	465	4819	482
7949	LGW B13 37-38	Peroxide 1:100	2.50	250	10.00	72	7.2	1	0.1	92	9.2	19902	1990	8534	853	2548	255	2611	261
7950	LGW B9 9-12	Peroxide 1:100	2.50	250	10.00	65	6.5	10	1.0	39	3.9	18088	1809	7805	781	5097	510	5795	580
7951	LGW B9 12-14	Peroxide 1:100	2.50	250	10.00	82	8.2	12	1.2	64	6.4	17508	1751	7017	702	13023	1302	12943	1294
7952	LGW B9 14-15	Peroxide 1:100	2.50	250	10.00	62	6.2	11	1.1	118	11.8	16286	1629	2026	203	6538	654	5753	575
7953	LGW B9 15-16	Peroxide 1:100	2.50	250	10.00	73	7.3	5	0.5	112	11.2	13685	1368	2864	286	8131	813	9129	913
7954	LGW B9 16-19	Peroxide 1:100	2.50	250	10.00	75	7.5	18	1.8	106	10.6	14227	1423	5701	570	11191	1119	9494	949
7955	LGW B9 19-20	Peroxide 1:100	2.50	250	10.00	73	7.3	13	1.3	146	14.6	16193	1619	5010	501	11089	1109	9220	922
7956	LGW B9 20-21	Peroxide 1:100	2.50	250	10.00	68	6.8	11	1.1	98	9.8	18093	1809	7436	744	8214	821	8721	872
7957	LGW B9 21-23	Peroxide 1:100	2.50	250	10.00	65	6.5	8	0.8	149	14.9	17417	1742	10876	1088	5265	527	5017	502
7958	LGW B9 23-24	Peroxide 1:100	2.50	250	10.00	47	4.7	2	0.2	56	5.6	12880	1288	15931	1593	3217	322	3194	319
7959	LGW B9 24-25	Peroxide 1:100	2.50	250	10.00	91	9.1	12	1.2	96	9.6	23393	2339	36086	3609	19882	1988	13331	1333
7960	LGW B9 25-26	Peroxide 1:100	2.50	250	10.00	68	6.8	6	0.6	65	6.5	16041	1604	5554	555	8625	863	7510	751
7961	LGW B6 11-13	Peroxide 1:100	2.50	250	10.00	65	6.5	24	2.4	144	14.4	16424	1642	17330	1733	14224	1422	5812	581
7962	LGW B6 13-15	Peroxide 1:100	2.50	250	10.00	65	6.5	11	1.1	104	10.4	16284	1628	13493	1349	9601	960	6178	618
7963	LGW B6 15-17	Peroxide 1:100	2.50	250	10.00	65	6.5	1	0.1	129	12.9	16178	1618	2803	280	4487	449	5225	523
7964	LGW B2 13-15	Peroxide 1:100	2.50	250	10.00	99	9.9	17	1.7	90	9.0	19881	1988	18605	1860	13081	1308	11143	1114
7965	LGW B2 15-17	Peroxide 1:100	2.50	250	10.00	69	6.9	8	0.8	64	6.4	16882	1688	5695	570	6659	666	7763	776
7966	LGW B2 17-19	Peroxide 1:100	2.50	250	10.00	77	7.7	12	1.2	64	6.4	17867	1787	4935	494	7821	782	7737	774
7967	LGW B2 19-22	Peroxide 1:100	2.50	250	10.00	71	7.1	6	0.6	151	15.1	18046	1805	29201	2920	6032	603	5567	557
7968	LGW B2 22-24	Peroxide 1:100	2.50	250	10.00	71	7.1	8	0.8	91	9.1	18715	1871	15402	1540	6349	635	5736	574
7969	LGW B2 24-25	Peroxide 1:100	2.50	250	10.00	85	8.5	15	1.5	96	9.6	19460	1946	5645	565	10382	1038	10089	1009

Lab #	P	P	K	K	Ca	Ca	Cr	Cr	Mn	Mn	Fe	Fe	Co	Co	Ni	Ni	Cu	Cu	Zn	Zn
7934	30953	3095	754	75	4044	404	50	5	305	30	1005	101	12	1	17	2	71	7	246	25
7935	24632	2463	2073	207	1506	151	168	17	5201	520	6564	656	73	7	81	8	167	17	217	22
7936	38765	3876	1881	188	4725	473	142	14	2011	201	74236	7424	22	2	114	11	248	25	196	20
7937	40161	4016	774	77	340305	34030	102	10	2541	254	371384	37138	19	2	0	0	162	16	167	17
7938	49466	4947	831	83	119833	11983	105	11	1097	110	118667	11867	21	2	116	12	169	17	149	15
7939	31208	3121	1488	149	20984	2098	70	7	389	39	12836	1284	14	1	53	5	113	11	177	18
7940	18664	1866	1715	172	89273	8927	80	8	782	78	388	39	78	8	127	13	28	3	331	33
7941	24139	2414	4819	482	22618	2262	157	16	1442	144	64514	6451	101	10	196	20	491	49	1151	115
7942	34728	3473	4703	470	19339	1934	97	10	848	85	19279	1928	144	14	256	26	204	20	1020	102
7943	34176	3418	4599	460	16774	1677	121	12	1064	106	33836	3384	147	15	267	27	385	39	1364	136
7944	42226	4223	1496	150	55430	5543	87	9	445	45	17806	1781	15	1	55	5	130	13	297	30
7945	29494	2949	1195	120	88407	8841	90	9	565	56	15525	1553	25	3	79	8	97	10	191	19
7946	26667	2667	1649	165	77556	7756	109	11	426	43	5795	579	11	1	77	8	82	8	237	24
7947	30545	3054	1165	116	23055	2306	175	18	355	35	41139	4114	13	1	98	10	155	16	275	28
7948	39822	3982	870	87	47496	4750	136	14	710	71	62985	6299	30	3	170	17	180	18	262	26
7949	847	85	545	55	11339	1134	110	11	1925	192	165868	16587	154	15	1298	130	204	20	468	47
7950	30802	3080	2372	237	5625	562	83	8	1140	114	14520	1452	54	5	100	10	154	15	437	44
7951	33607	3361	3189	319	5750	575	131	13	1440	144	37512	3751	196	20	422	42	524	52	1124	112
7952	34264	3426	338	34	1776	178	100	10	171	17	81612	8161	124	12	316	32	204	20	752	75
7953	30543	3054	1422	142	4064	406	86	9	396	40	9329	933	18	2	57	6	252	25	350	35
7954	38572	3857	858	86	15661	1566	156	16	1168	117	46704	4670	21	2	71	7	209	21	199	20
7955	34068	3407	1026	103	8921	892	127	13	1324	132	39353	3935	54	5	97	10	227	23	229	23
7956	38056	3806	647	65	8707	871	121	12	3431	343	215493	21549	33	3	0	0	201	20	209	21
7957	37711	3771	195	19	13512	1351	106	11	3801	380	228046	22805	27	3	0	0	153	15	143	14
7958	1308	131	198	20	38425	3843	61	6	2383	238	227907	22791	50	5	374	37	202	20	163	16
7959	23447	2345	2363	236	14151	1415	110	11	4893	489	47695	4770	229	23	499	50	335	34	735	74
7960	23595	2360	846	85	6371	637	74	7	1732	173	32927	3293	45	4	152	15	227	23	265	26
7961	36880	3688	995	100	99704	9970	312	31	334	33	89798	8980	63	6	433	43	232	23	613	61
7962	34359	3436	651	65	34860	3486	191	19	2465	246	180618	18062	65	7	394	39	474	47	264	26
7963	29633	2963	494	49	6166	617	52	5	207	21	15568	1557	122	12	434	43	997	100	109	11
7964	218	22	2953	295	24645	2464	93	9	1773	177	139711	13971	116	12	199	20	423	42	1129	113
7965	27362	2736	2524	252	4026	403	66	7	587	59	17005	1701	176	18	274	27	234	23	1004	100
7966	24012	2401	1612	161	33254	3325	81	8	1177	118	93382	9338	162	16	227	23	351	35	844	84
7967	46619	4662	69	7	162158	16216	85	9	2313	231	203871	20387	17	2	0	0	147	15	161	16
7968	41265	4126	292	29	85967	8597	95	9	842	84	44623	4462	10	1	48	5	204	20	132	13
7969	27166	2717	769	77	28441	2844	92	9	550	55	61715	6172	50	5	160	16	505	50	511	51

Lab #	As	As	Se	Se	Br	Br	Mo	Mo	Ag	Ag	Cd	Cd	Sn	Sn	Sb	Sb	Ba	Ba	Hg	Hg	Tl	Tl	Pb	Pb	Bi	Bi	Th	Th	U	U
7934	8	0.8	8	0.8	0	0.0	8	0.8	46	4.6	0	0.0	1	0.1	1	0.1	140	14.0	0	0.0	0	0.0	9	0.9	0	0.0	1	0.1	2	0.2
7935	28	2.8	15	1.5	0	0.0	12	1.2	15	1.5	0	0.0	0	0.0	1	0.1	536	53.6	0	0.0	1	0.1	20	2.0	0	0.0	1	0.1	7	0.7
7936	20	2.0	17	1.7	0	0.0	10	1.0	9	0.9	1	0.1	2	0.2	3	0.3	126	12.6	0	0.0	0	0.0	6	0.6	1	0.1	11	1.1	8	0.8
7937	15	1.5	17	1.7	0	0.0	35	3.5	5	0.5	0	0.0	2	0.2	3	0.3	232	23.2	0	0.0	0	0.0	17	1.7	1	0.1	7	0.7	8	0.8
7938	63	6.3	5	0.5	0	0.0	14	1.4	2	0.2	0	0.0	2	0.2	4	0.4	190	19.0	0	0.0	0	0.0	30	3.0	3	0.3	4	0.4	7	0.7
7939	8	0.8	0	0.0	0	0.0	11	1.1	3	0.3	0	0.0	1	0.1	1	0.1	275	27.5	0	0.0	0	0.0	10	1.0	0	0.0	3	0.3	4	0.4
7940	3	0.3	0	0.0	0	0.0	16	1.6	2	0.2	0	0.0	0	0.0	1	0.1	26	2.6	0	0.0	0	0.0	5	0.5	1	0.1	0	0.0	0	0.0
7941	16	1.6	8	0.8	0	0.0	18	1.8	0	0.0	3	0.3	1	0.1	1	0.1	904	90.4	0	0.0	0	0.0	45	4.5	0	0.0	21	2.1	16	1.6
7942	19	1.9	0	0.0	0	0.0	23	2.3	0	0.0	0	0.0	1	0.1	1	0.1	799	79.9	0	0.0	1	0.1	31	3.1	0	0.0	4	0.4	4	0.4
7943	23	2.3	0	0.0	0	0.0	19	1.9	0	0.0	0	0.0	1	0.1	2	0.2	920	92.0	0	0.0	1	0.1	27	2.7	0	0.0	5	0.5	7	0.7
7944	5	0.5	0	0.0	0	0.0	8	0.8	0	0.0	0	0.0	3	0.3	2	0.2	606	60.6	0	0.0	0	0.0	22	2.2	2	0.2	9	0.9	9	0.9
7945	11	1.1	3	0.3	0	0.0	9	0.9	0	0.0	0	0.0	1	0.1	2	0.2	189	18.9	0	0.0	0	0.0	9	0.9	0	0.0	3	0.3	5	0.5
7946	9	0.9	7	0.7	0	0.0	10	1.0	0	0.0	0	0.0	1	0.1	2	0.2	319	31.9	0	0.0	0	0.0	13	1.3	0	0.0	4	0.4	5	0.5
7947	15	1.5	0	0.0	0	0.0	11	1.1	0	0.0	0	0.0	1	0.1	2	0.2	708	70.8	0	0.0	0	0.0	70	7.0	1	0.1	4	0.4	10	1.0
7948	53	5.3	6	0.6	0	0.0	14	1.4	0	0.0	0	0.0	5	0.5	3	0.3	575	57.5	0	0.0	3	0.3	64	6.4	3	0.3	6	0.6	6	0.6
7949	19	1.9	0	0.0	0	0.0	10	1.0	0	0.0	0	0.0	0	0.0	3	0.3	169	16.9	0	0.0	11	1.1	35	3.5	0	0.0	0	0.0	2	0.2
7950	6	0.6	3	0.3	0	0.0	8	0.8	0	0.0	0	0.0	0	0.0	1	0.1	605	60.5	0	0.0	0	0.0	12	1.2	0	0.0	0	0.0	4	0.4
7951	28	2.8	8	0.8	0	0.0	12	1.2	0	0.0	0	0.0	1	0.1	2	0.2	716	71.6	0	0.0	1	0.1	53	5.3	0	0.0	4	0.4	12	1.2
7952	108	10.8	0	0.0	0	0.0	20	2.0	0	0.0	1	0.1	3	0.3	4	0.4	213	21.3	0	0.0	20	2.0	37	3.7	1	0.1	7	0.7	12	1.2
7953	11	1.1	5	0.5	0	0.0	9	0.9	0	0.0	0	0.0	1	0.1	2	0.2	536	53.6	0	0.0	1	0.1	86	8.6	2	0.2	7	0.7	16	1.6
7954	9	0.9	3	0.3	0	0.0	7	0.7	0	0.0	1	0.1	2	0.2	2	0.2	455	45.5	0	0.0	0	0.0	47	4.7	2	0.2	11	1.1	14	1.4
7955	12	1.2	8	0.8	0	0.0	13	1.3	0	0.0	1	0.1	2	0.2	2	0.2	490	49.0	0	0.0	0	0.0	80	8.0	2	0.2	7	0.7	12	1.2
7956	33	3.3	2	0.2	0	0.0	21	2.1	0	0.0	1	0.1	2	0.2	2	0.2	383	38.3	0	0.0	2	0.2	119	11.9	2	0.2	14	1.4	10	1.0
7957	31	3.1	8	0.8	0	0.0	18	1.8	0	0.0	0	0.0	4	0.4	2	0.2	285	28.5	0	0.0	1	0.1	95	9.5	2	0.2	10	1.0	6	0.6
7958	6	0.6	1	0.1	0	0.0	8	0.8	0	0.0	0	0.0	0	0.0	1	0.1	162	16.2	0	0.0	3	0.3	94	9.4	0	0.0	1	0.1	3	0.3
7959	12	1.2	3	0.3	0	0.0	19	1.9	0	0.0	3	0.3	0	0.0	1	0.1	559	55.9	0	0.0	1	0.1	63	6.3	0	0.0	7	0.7	48	4.8
7960	26	2.6	0	0.0	0	0.0	18	1.8	0	0.0	0	0.0	0	0.0	2	0.2	388	38.8	0	0.0	1	0.1	42	4.2	0	0.0	3	0.3	5	0.5
7961	46	4.6	18	1.8	0	0.0	14	1.4	0	0.0	0	0.0	8	0.8	2	0.2	3182	318.2	0	0.0	2	0.2	117	11.7	6	0.6	75	7.5	18	1.8
7962	141	14.1	0	0.0	0	0.0	14	1.4	0	0.0	0	0.0	2	0.2	26	2.6	1308	130.8	0	0.0	3	0.3	242	24.2	1	0.1	17	1.7	9	0.9
7963	50	5.0	0	0.0	0	0.0	27	2.7	0	0.0	0	0.0	0	0.0	13	1.3	286	28.6	0	0.0	2	0.2	433	43.3	0	0.0	0	0.0	1	0.1
7964	3	0.3	1	0.1	0	0.0	8	0.8	0	0.0	0	0.0	0	0.0	1	0.1	147	14.7	0	0.0	16	1.6	38	3.8	0	0.0	2	0.2	10	1.0
7965	14	1.4	6	0.6	0	0.0	13	1.3	0	0.0	0	0.0	0	0.0	1	0.1	331	33.1	0	0.0	1	0.1	26	2.6	0	0.0	2	0.2	4	0.4
7966	56	5.6	0	0.0	0	0.0	25	2.5	0	0.0	3	0.3	1	0.1	2	0.2	242	24.2	0	0.0	7	0.7	51	5.1	1	0.1	3	0.3	8	0.8
7967	16	1.6	3	0.3	0	0.0	16	1.6	0	0.0	0	0.0	1	0.1	2	0.2	518	51.8	0	0.0	0	0.0	22	2.2	1	0.1	3	0.3	9	0.9
7968	16	1.6	8	0.8	0	0.0	15	1.5	0	0.0	0	0.0	3	0.3	2	0.2	596	59.6	0	0.0	0	0.0	101	10.1	2	0.2	8	0.8	8	0.8
7969	103	10.3	5	0.5	0	0.0	35	3.5	0	0.0	0	0.0	0	0.0	2	0.2	361	36.1	0	0.0	4	0.4	58	5.8	0	0.0	4	0.4	5	0.5

Waterlab (Pty) Ltd P.O. Box 11508 Hatfield 0028
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Project	Jasper Muller & Associates
Client	Mr J Fourie
Date	29/11/2006
Report No	18433
Sample Series	7934-7969
Analyses	pH & Sulphate
Order No	LET 5691
Project No	New Largo

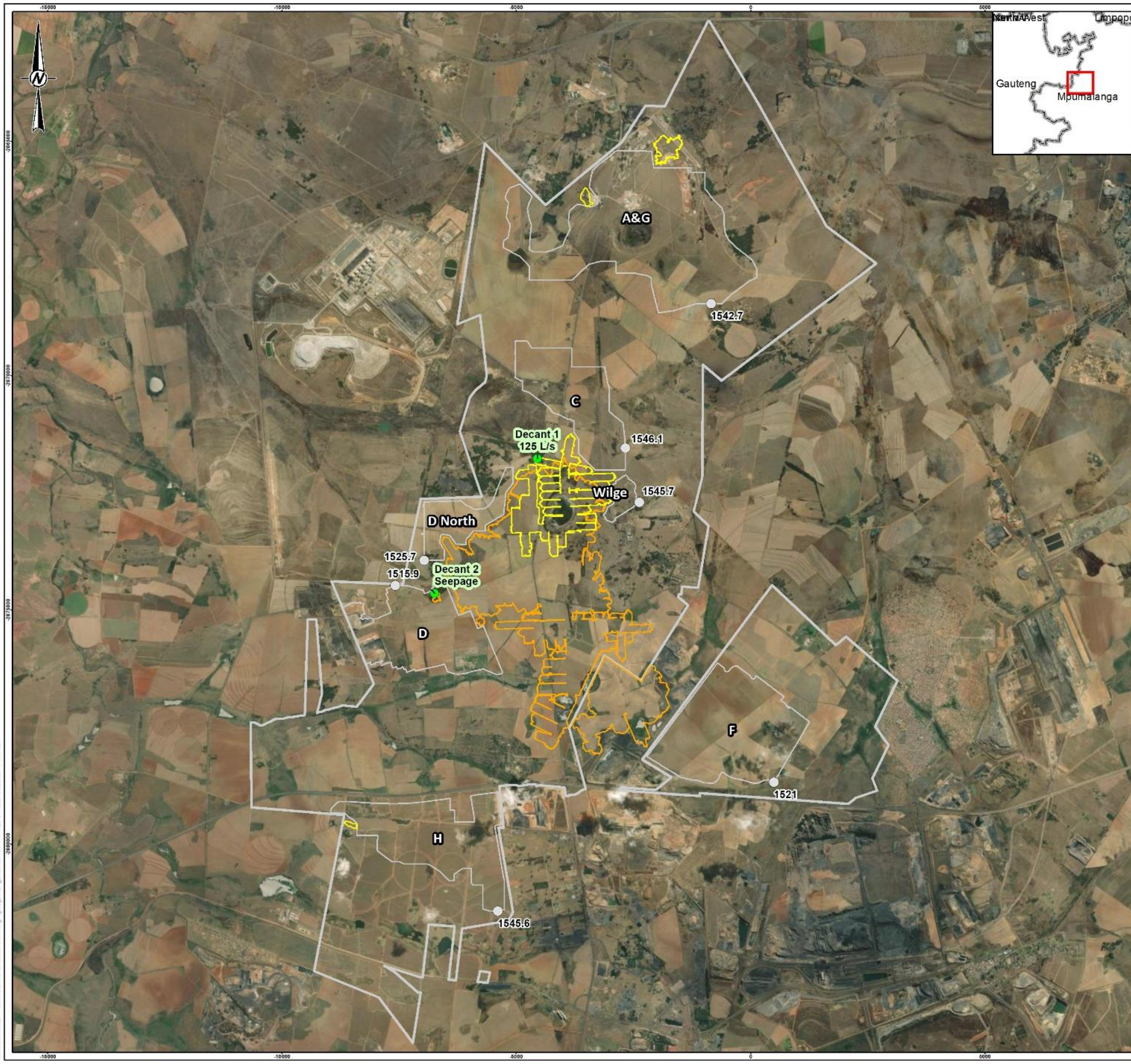
WATERLAB

Values in black : mg/l (liquid)
Values in red : mg/kg (dry solid)

Lab #	Sample ID	Extract	Sample Dry Mass	Volume	Mass (g/l)	SO4	SO4	Oxidized pH
	PEROXIDE EXTRACTS							
7934	LGW B20 9-11	Peroxide 1:100	2.50	250	10.00	15	1500	2.8
7935	LGW B20 11-12	Peroxide 1:100	2.50	250	10.00	86	8600	2.4
7936	LGW B20 13-15	Peroxide 1:100	2.50	250	10.00	229	22900	2.0
7937	LGW B20 15-17	Peroxide 1:100	2.50	250	10.00	1136	113600	2.4
7938	LGW B20 17-19	Peroxide 1:100	2.50	250	10.00	471	47100	2.2
7939	LGW B20 19-20	Peroxide 1:100	2.50	250	10.00	98	9800	2.4
7940	LGW B13 18-21	Peroxide 1:100	2.50	250	10.00	279	27900	6.1
7941	LGW B13 22-24	Peroxide 1:100	2.50	250	10.00	33	3300	3.7
7942	LGW B13 24-26	Peroxide 1:100	2.50	250	10.00	72	7200	3.7
7943	LGW B13 26-28	Peroxide 1:100	2.50	250	10.00	33	3300	3.6
7944	LGW B13 28-29	Peroxide 1:100	2.50	250	10.00	<5	<500	2.7
7945	LGW B13 29-30	Peroxide 1:100	2.50	250	10.00	76	7600	4.1
7946	LGW B13 30-32	Peroxide 1:100	2.50	250	10.00	80	8000	4.7
7947	LGW B13 32-35	Peroxide 1:100	2.50	250	10.00	183	18300	2.2
7948	LGW B13 35-37	Peroxide 1:100	2.50	250	10.00	151	15100	2.3
7949	LGW B13 37-38	Peroxide 1:100	2.50	250	10.00	561	56100	2.6
7950	LGW B9 9-12	Peroxide 1:100	2.50	250	10.00	<5	<500	2.9
7951	LGW B9 12-14	Peroxide 1:100	2.50	250	10.00	67	6700	2.7
7952	LGW B9 14-15	Peroxide 1:100	2.50	250	10.00	447	44700	2.3
7953	LGW B9 15-16	Peroxide 1:100	2.50	250	10.00	33	3300	2.5
7954	LGW B9 16-19	Peroxide 1:100	2.50	250	10.00	24	2400	1.9
7955	LGW B9 19-20	Peroxide 1:100	2.50	250	10.00	97	9700	2.0
7956	LGW B9 20-21	Peroxide 1:100	2.50	250	10.00	350	35000	2.0
7957	LGW B9 21-23	Peroxide 1:100	2.50	250	10.00	313	31300	2.0
7958	LGW B9 23-24	Peroxide 1:100	2.50	250	10.00	845	84500	2.2
7959	LGW B9 24-25	Peroxide 1:100	2.50	250	10.00	127	12700	2.2
7960	LGW B9 25-26	Peroxide 1:100	2.50	250	10.00	116	11600	2.2
7961	LGW B6 11-13	Peroxide 1:100	2.50	250	10.00	25	2500	1.9
7962	LGW B6 13-15	Peroxide 1:100	2.50	250	10.00	39	3900	2.2
7963	LGW B6 15-17	Peroxide 1:100	2.50	250	10.00	62	6200	2.3
7964	LGW B2 13-15	Peroxide 1:100	2.50	250	10.00	575	57500	2.5
7965	LGW B2 15-17	Peroxide 1:100	2.50	250	10.00	59	5900	2.4
7966	LGW B2 17-19	Peroxide 1:100	2.50	250	10.00	342	34200	2.2
7967	LGW B2 19-22	Peroxide 1:100	2.50	250	10.00	586	58600	2.2
7968	LGW B2 22-24	Peroxide 1:100	2.50	250	10.00	228	22800	2.3
7969	LGW B2 24-25	Peroxide 1:100	2.50	250	10.00	318	31800	2.1

Appendix C

PIT DECANT ELEVATION MAP



LEGEND

- Potential Decant Locations
- Decant observed by GPT (2022)
- New Largo Mine Boundary
- Pit Extent
- Underground mined-out seam 2
- Underground mined-out seam 4

0 2 000 4 000

1:80 000 METRES

NOTE(S)

REFERENCE(S)
1. COORDINATE SYSTEM: WGS LO29
2. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
SERITI COAL (PTY) LTD.

PROJECT
HONINGKRANTZ WULA RESUMISSION

TITLE
POTENTIAL AND OBSERVED DECANT LOCATIONS

CONSULTANT		
WSP	YYYY-MM-DD	2024/05/22
	DESIGNED	
	PREPARED	TS
	REVIEWED	TVZ
	APPROVED	OA

PROJECT NO.	CONTROL	REV.	FIGURE
41106340			

Appendix D

KINETIC LEACH RESULTS

Table 11-1 – 20-Weeks Kinetic Leach Test Results for DMS Plant discard sample (SNL-WELGE-CD-01).

Chemical Parameter	Unit:	WUL Limits																				
Week No.			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Input Vol. (DI Water)	mL		750	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Output Vol. (Leachate)	mL		510	400	390	430	510	430	350	450	350	340	250	300	300	360	440	430	460	470	450	430	420
pH	pH Units	7.7	6.91	7.07	6.72	6.97	7.14	7.22	7.06	7.03	6.99	6.64	6.59	6.28	6.33	6.87	7	7.12	7.09	7.15	7.03	6.93	6.9
EC	µS/cm	NL	694	964	81	717	705	536	577	551	899	1 000	971	1 070	1 080	696	550	519	466	493	483	523.7	507
TDS	mg/L	3 309	589	672	739	534	512	429	531	434	703	764	722	748	561	535	416	429	364	415	412	447	469
Alkalinity (to pH 4.5)	mg $CaCO_3$/L	NL	21	15	12.6	14.7	18.2	15	13.4	16.8	15.1	10.3	12.6	8.1	7.3	10.3	12.7	12.6	13.4	12.3	12.5	7.8	9.5
Sulfate (SO_4^{2-})	mg/L	2 130	390.3	511.3	440.6	356	349.1	256.2	284.8	272	523	617.6	591.4	646.6	652.1	397.6	278.8	277.7	236	236.5	239.2	273	256.6
Chloride (Cl^-)	mg/L	3.7	3.503	1	0.1	1	1	1	1	1	1	1	1.063	1.061	1	1	1	1	1	1	1	1	1
Aluminum (Al^{3+})	mg/L	NL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Antimony (Sb)	mg/L	NL	0.003	0.002	0.001	0.001	0.002	0.001	-	-	-	-	0.003	-	-	-	-	0.001	-	-	-	-	0.001
Arsenic (As)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.002	-	-	-	-	0.01
Barium (Ba)	mg/L	NL	0.185	0.202	0.682	0.18	0.201	0.183	-	-	-	-	0.034	-	-	-	-	0.156	-	-	-	-	0.01
Beryllium (Be)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Bismuth (Bi)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Boron (B)	mg/L	NL	0.145	0.113	0.169	0.085	0.087	0.061	-	-	-	-	0.029	-	-	-	-	0.034	-	-	-	-	0.01
Cadmium (Cd)	mg/L	NL	0.02	0.006	0.002	0.001	0.001	0.001	-	-	-	-	0.002	-	-	-	-	0.001	-	-	-	-	0.0001
Calcium (Ca^{2+})	mg/L	568	122.4	3.9	140.7	34.6	117.7	75.6	78.8	79.9	146	152.2	158.9	180.8	168.6	107.2	82.9	73.8	60.9	77.2	79.4	87.23	81
Chromium (Cr)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Cobalt (Co)	mg/L	NL	0.109	0.016	0.007	0.006	0.003	0.007	-	-	-	-	0.057	-	-	-	-	0.001	-	-	-	-	0.01
Copper (Cu^+)	mg/L	NL	0.025	0.003	0.001	0.001	0.001	0.001	-	-	-	-	0.007	-	-	-	-	0.001	-	-	-	-	0.001
Iron (Fe)	mg/L	0.13	0.005	0.01	0.005	0.005	0.005	0.005	0.01	0.005	0.01	0.05	0.005	1.38	0.49	0.01	0.005	0.005	0.01	0.01	0.03	0.02	0.005
Lead (Pb^{2+})	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Lithium (Li^+)	mg/L	NL	0.025	0.007	0.004	0.005	0.005	0.006	-	-	-	-	0.008	-	-	-	-	0.002	-	-	-	-	0.001
Magnesium (Mg^{2+})	mg/L	196	33.83	1.01	41.72	12.96	31.94	21.92	22.93	20.52	37.73	40.45	42.49	47.24	44.9	27.03	25.83	24.59	19.41	25.03	25.6	27.11	26.17
Manganese (Mn)	mg/L	2.4	1.32	0.01	0.17	0.03	0.09	0.04	0.05	0.03	0.11	0.51	0.7	0.8	0.87	0.3	0.11	0.05	0.04	0.04	0.05	0.09	0.14
Molybdenum (Mo)	mg/L	NL	0.001	0.002	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001

Week No.	Unit:	WUL Limits	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nickel (Ni)	mg/L	NL	0.199	0.04	0.03	0.026	0.016	0.036	-	-	-	-	0.08	-	-	-	-	0.008	-	-	-	-	0.01
Phosphorus (P)	mg/L	NL	0.006	0.005	0.005	0.006	0.007	0.014	0.005	0.011	0.005	0.007	0.015	0.005	0.005	0.007	0.007	0.005	0.005	0.005	0.005	0.005	0.005
Potassium (K^+)	mg/L	0	8.36	1.07	1.96	1.2	0.9	0.83	0.55	0.58	0.9	1.02	8.88	1.63	1.97	1.47	1.12	0.55	0.56	0.53	0.49	0.46	0.66
Selenium (Se)	mg/L	NL	0.001	0.026	0.007	0.009	0.009	0.001	-	-	-	-	0.001	-	-	-	-	0.006	-	-	-	-	0.001
Silver (Ag)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Sodium (Na^+)	mg/L	32	4.87	2.64	1.38	3.88	4.2	3.43	2.34	2.36	2.27	1.9	1.83	3.51	2.74	1.73	2.22	2.15	2.75	3.02	2.34	1.84	0.2
Strontium (Sr)	mg/L	NL	0.578	0.651	0.396	0.446	0.463	0.412	-	-	-	-	0.851	-	-	-	-	0.374	-	-	-	-	0.35
Tellurium (Te)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Thallium (Tl)	mg/L	NL	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	-	-	-	-	0.05	-	-	-	-	0.05
Thorium (Th)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Tin (Sn)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Titanium (Ti)	mg/L	NL	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	-	-	-	-	0.05	-	-	-	-	0.05
Uranium (U)	mg/L	NL	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	-	-	-	-	0.0001	-	-	-	-	0.0001	-	-	-	-	0.0001
Vanadium (V)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Zinc (Zn)	mg/L	NL	8.92	2.88	0.941	1.25	0.623	0.791	-	-	-	-	2.15	-	-	-	-	0.765	-	-	-	-	0.89
Zirconium (Zr)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Tungsten (W)	ug/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	-	0.001	-	-	-	-	0.001	-	-	-	-	0.001
Mercury (Hg)	ug/L	NL	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	-	-	-	-	0.0001	-	-	-	-	0.0001	-	-	-	-	0.0001

Notes:
"-" Not analysed
"NL" No WUL Limit

Table 11-2 – 7-Weeks Kinetic Leach Test Results for Destoning Plant reject sample (SNL-PITD_DESTON-02).

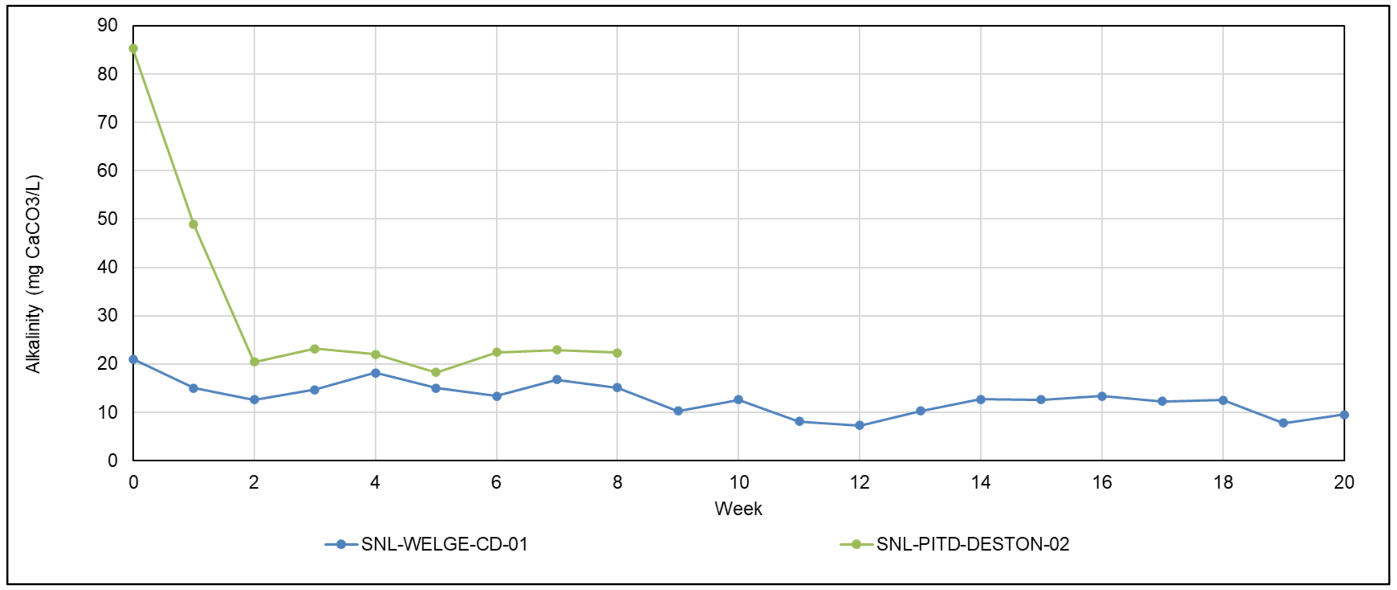
Chemical Parameter Week No.	Unit:	WUL Limits	0	1	2	3	4	5	6	7	8
Input Vol. (DI Water)	mL		750	500	500	500	500	500	500	500	500
Output Vol. (Leachate)	mL		460	500	400	400	400	370	400	350	400
pH	pH Units	7.7	7.66	7.68	7.48	7.73	7.7	7.57	7.59	7.37	7.47
EC	µS/cm	NL	981	854	449	694	574	731	622	761	647
TDS	mg/L	3 309	745	661	378	562	496	606	540	589	22.3
Alkalinity (to pH 4.5)	mg $CaCO_3$/L	NL	85.3	48.9	20.4	23.2	22	18.3	22.4	22.9	344.3
Sulfate (SO_4^{2-})	mg/L	2 130	505.1	486.3	237.5	366.8	290.2	415.3	333.3	411.2	1
Chloride (Cl^-)	mg/L	3.7	**14.836**	1	1	1	1	1	1	1	1
Aluminum (Al^{3+})	mg/L	NL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Antimony (Sb)	mg/L	NL	0.001	0.001	0.001	0.02	0.056	0.01	-	-	-
Arsenic (As)	mg/L	NL	0.01	0.01	0.06	0.01	0.01	0.01	-	-	0.01
Barium (Ba)	mg/L	NL	0.265	0.161	0.225	0.3	0.11	0.19	-	-	-
Beryllium (Be)	mg/L	NL	0.001	0.001	0.001	0.001	0.013	0.001	-	-	-
Bismuth (Bi)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Boron (B)	mg/L	NL	0.19	0.078	0.058	0.17	0.077	0.12	-	-	-
Cadmium (Cd)	mg/L	NL	0.001	0.0001	0.0001	0.01	0.0001	0.0001	-	-	-
Calcium (Ca^{2+})	mg/L	568	134.8	131	55.7	116.9	103.5	136.7	110.9	127.1	111.5
Chromium (Cr)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Cobalt (Co)	mg/L	NL	0.027	0.001	0.001	0.001	0.001	0.001	-	-	-
Copper (Cu^+)	mg/L	NL	0.013	0.001	0.001	0.001	0.001	0.001	-	-	0.001
Iron (Fe)	mg/L	0.13	0.005	0.005	0.005	0.01	0.01	0.01	0.005	0.005	0.005
Lead (Pb^{2+})	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.02	-	-	-
Lithium (Li^+)	mg/L	NL	0.025	0.006	0.002	0.01	0.021	0.001	-	-	-
Magnesium (Mg^{2+})	mg/L	196	55.65	45.21	18.18	35.45	29.6	37.65	30.71	37.23	32.15
Manganese (Mn)	mg/L	2.4	0.84	0.38	0.03	0.02	0.01	0.02	0.03	0.04	0.02
Molybdenum (Mo)	mg/L	NL	0.007	0.009	0.005	0.01	0.062	0.001	-	-	-
Nickel (Ni)	mg/L	NL	0.04	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01
Phosphorus (P)	mg/L	NL	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Potassium (K^+)	mg/L	0	9.04	6.72	2.7	3.42	2.14	2.28	2.35	1.12	1.57
Selenium (Se)	mg/L	NL	0.009	0.017	0.001	0.03	0.014	0.01	-	-	-

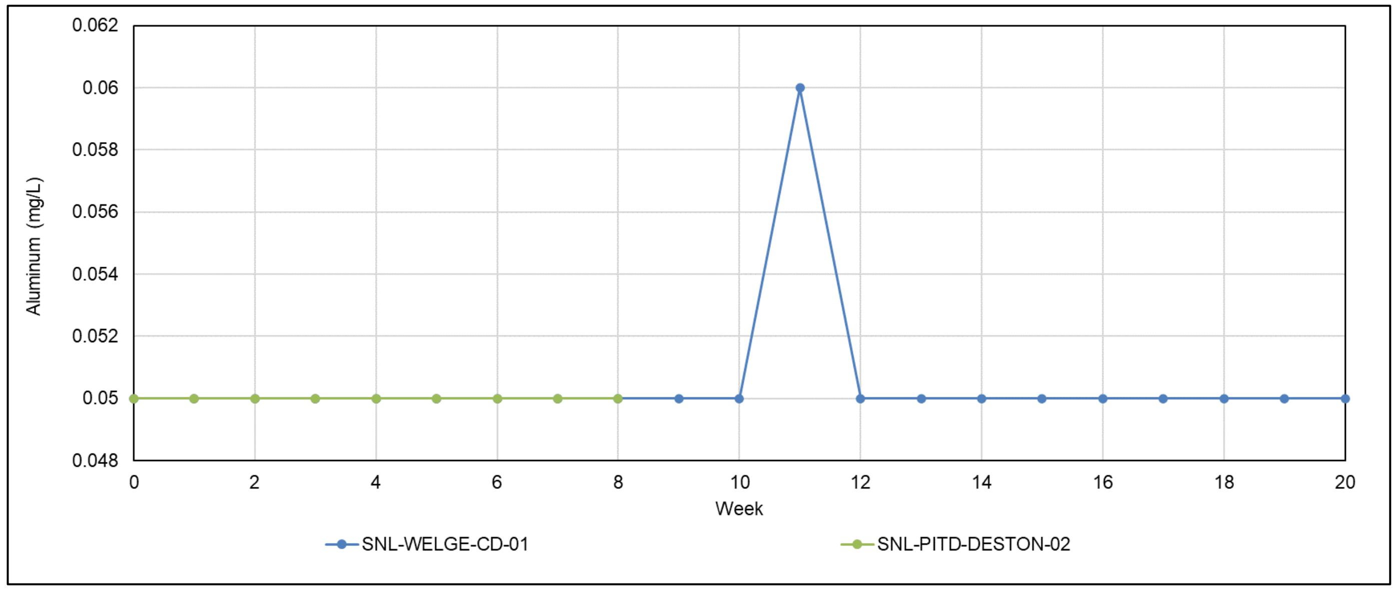
Week No.	Unit:	WUL Limits	0	1	2	3	4	5	6	7	8
Silver (Ag)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Sodium (Na^+)	mg/L	32	4.15	4.5	2.85	3.42	2.14	2.56	0.21	2.05	2.83
Strontium (Sr)	mg/L	NL	2.41	1.38	0.755	1.24	0.947	1.06	-	-	-
Tellurium (Te)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Thallium (Tl)	mg/L	NL	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	-	-	-
Thorium (Th)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Tin (Sn)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Titanium (Ti)	mg/L	NL	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-
Uranium (U)	mg/L	NL	0.0001	0.002	0.0001	0.0001	0.0001	0.0001	-	-	-
Vanadium (V)	mg/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Zinc (Zn)	mg/L	NL	0.674	0.18	0.046	0.09	0.132	0.12	-	-	-
Zirconium (Zr)	mg/L	NL	0.001	0.001	0.001	0.001	0.011	0.001	-	-	-
Tungsten (W)	ug/L	NL	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-
Mercury (Hg)	ug/L	NL	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	-	-	-

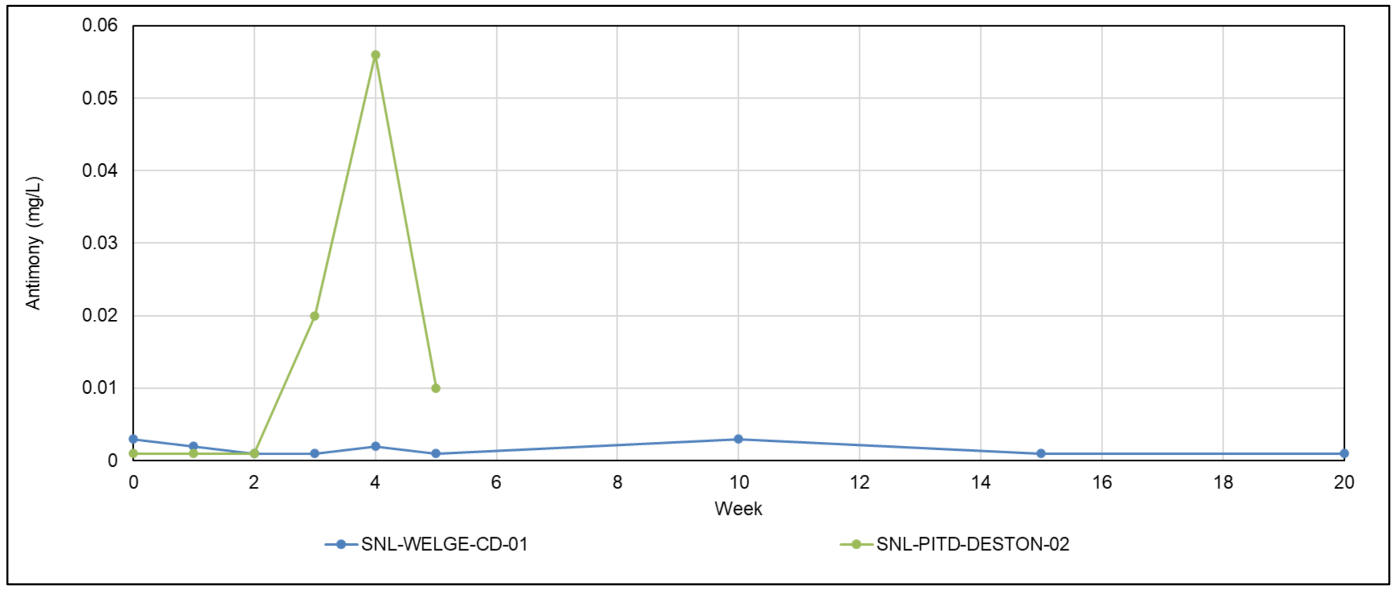
Notes:
"-" Not analysed
"NL" No WUL Limit

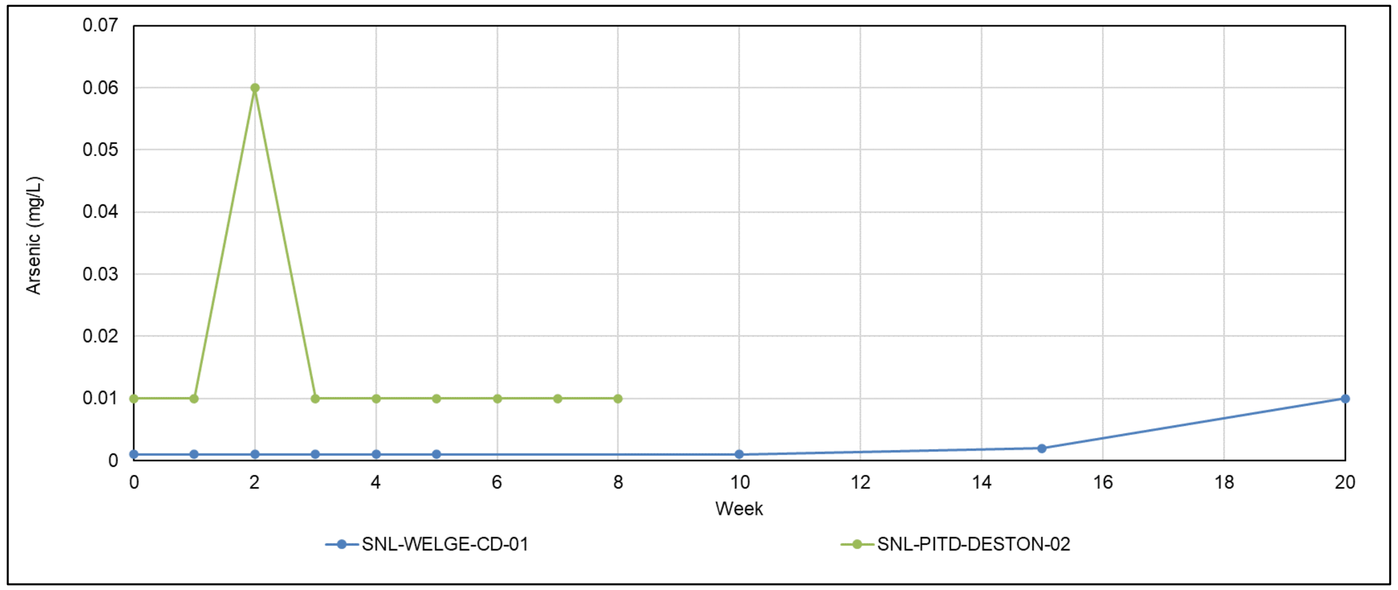
Appendix E

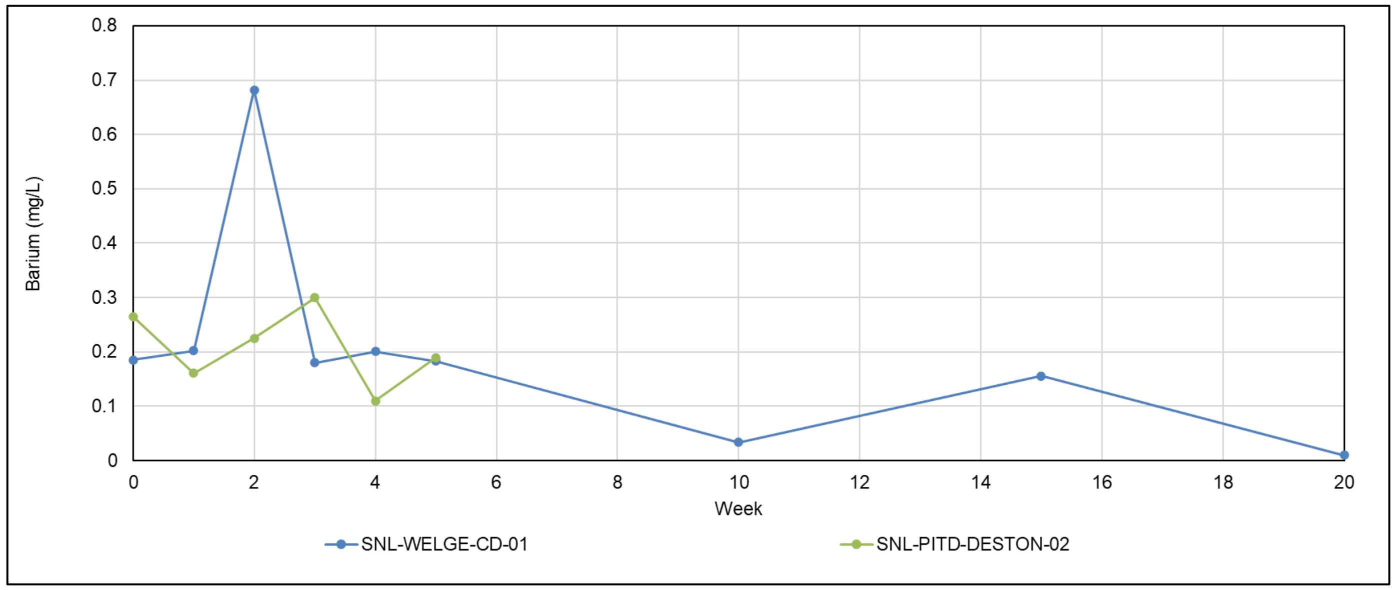
KINETIC LEACH TRENDS

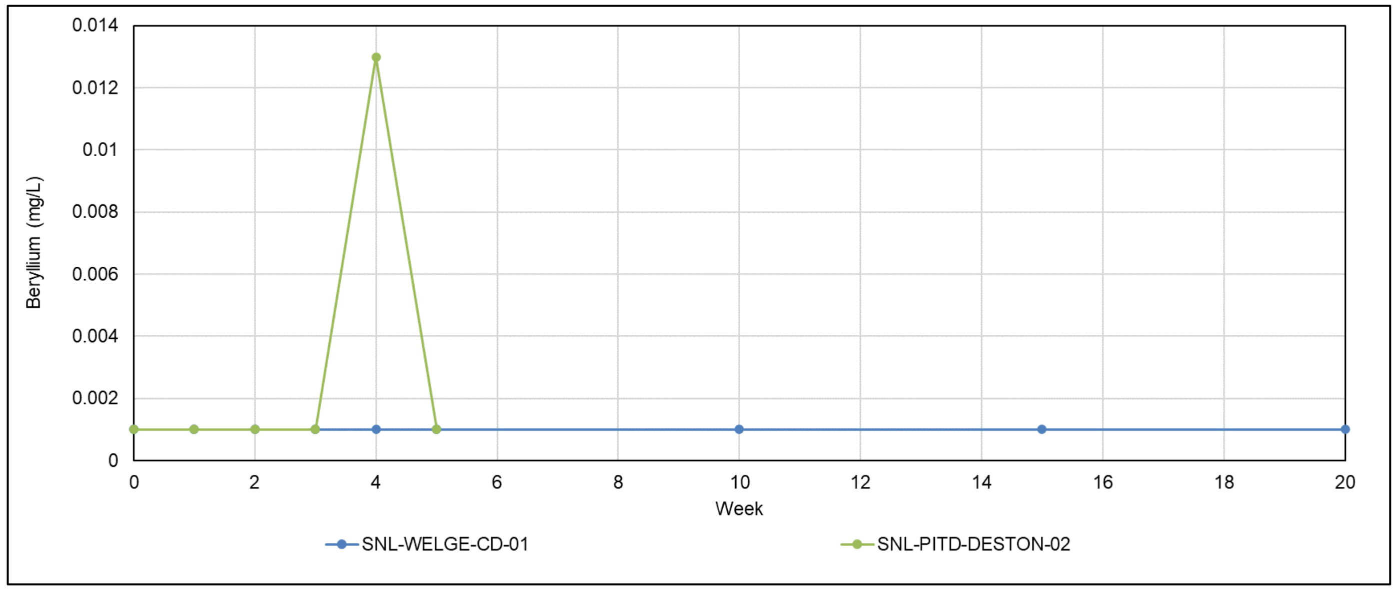

Alkalinity (mg CaCO3/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

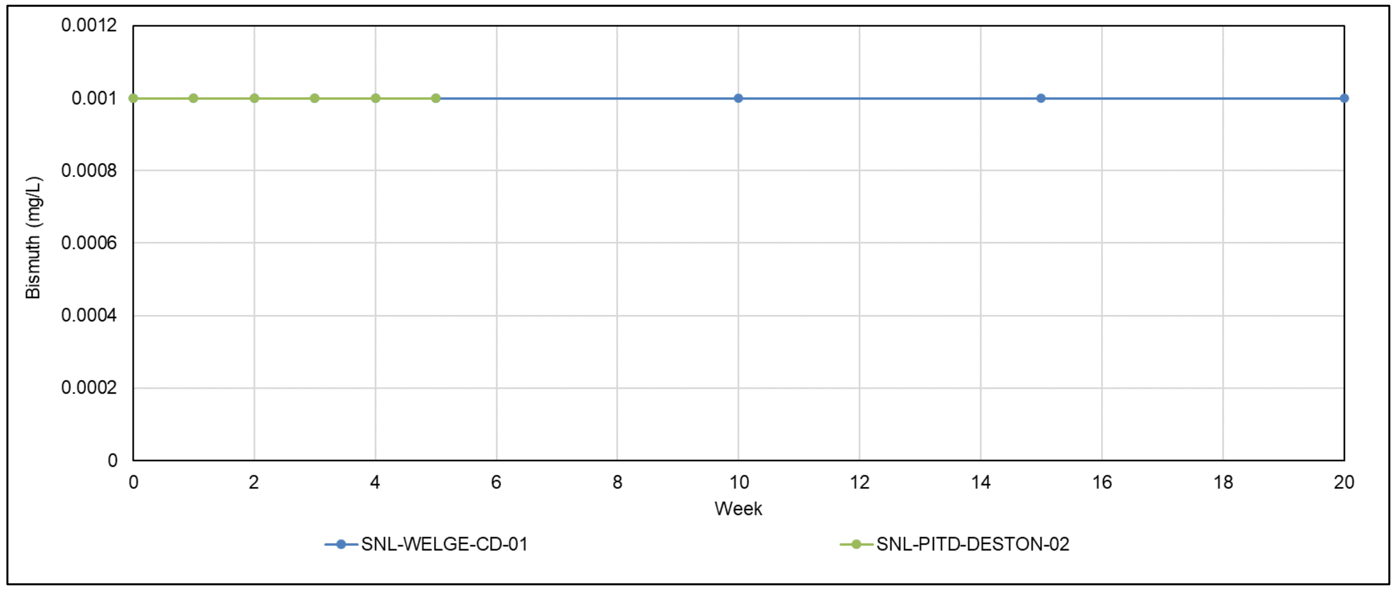

Aluminum (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

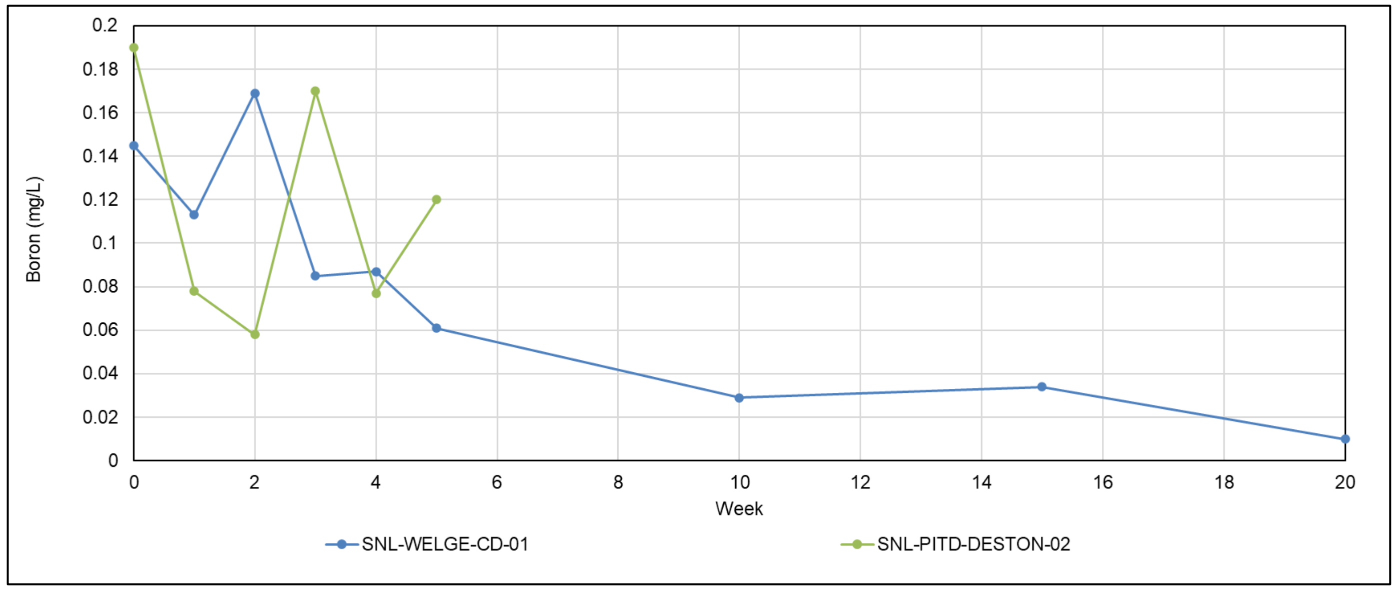

Antimony (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

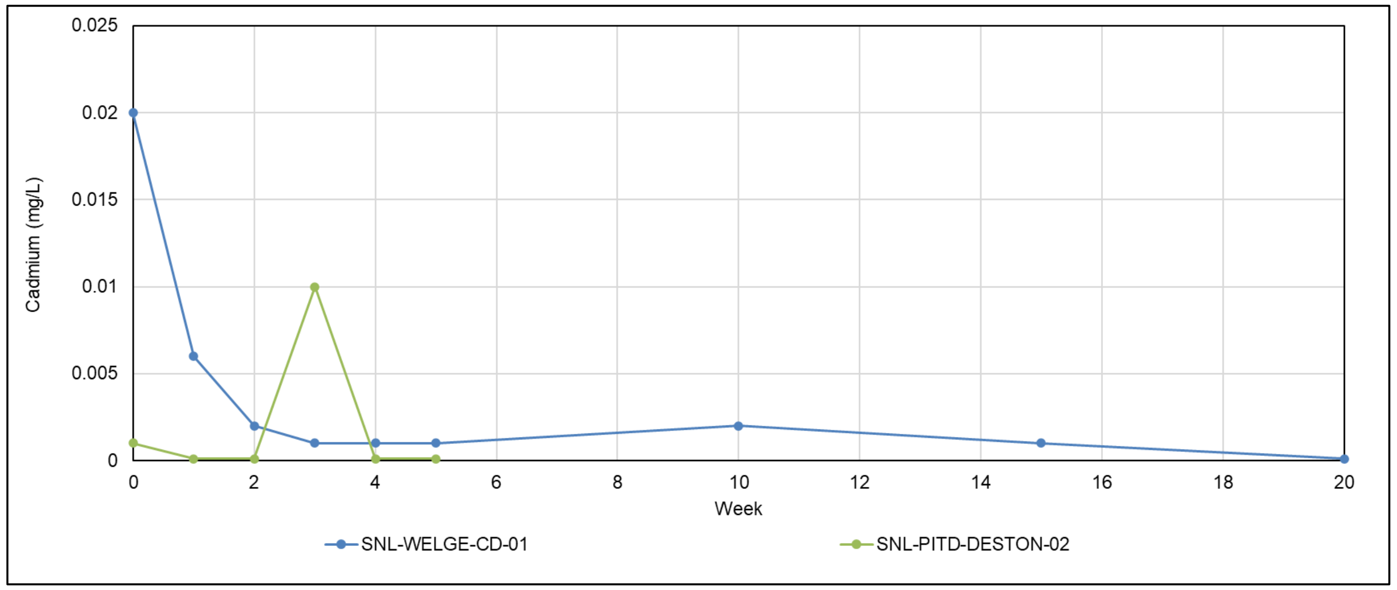

Arsenic (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

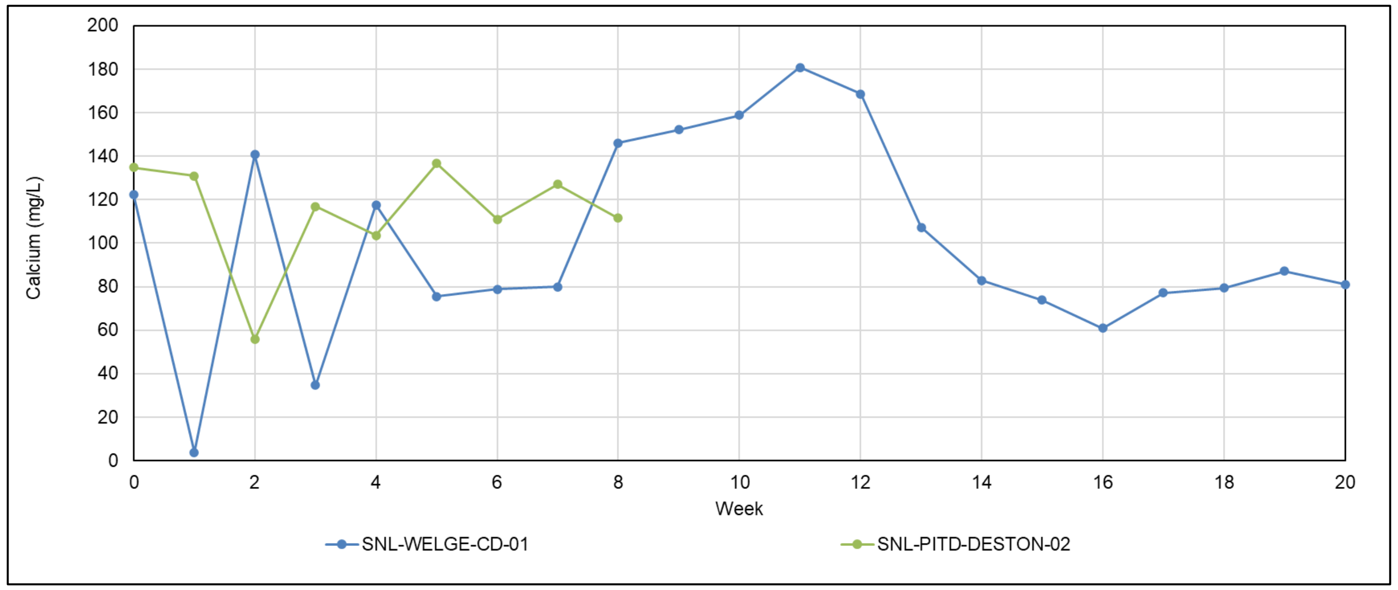

Barium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

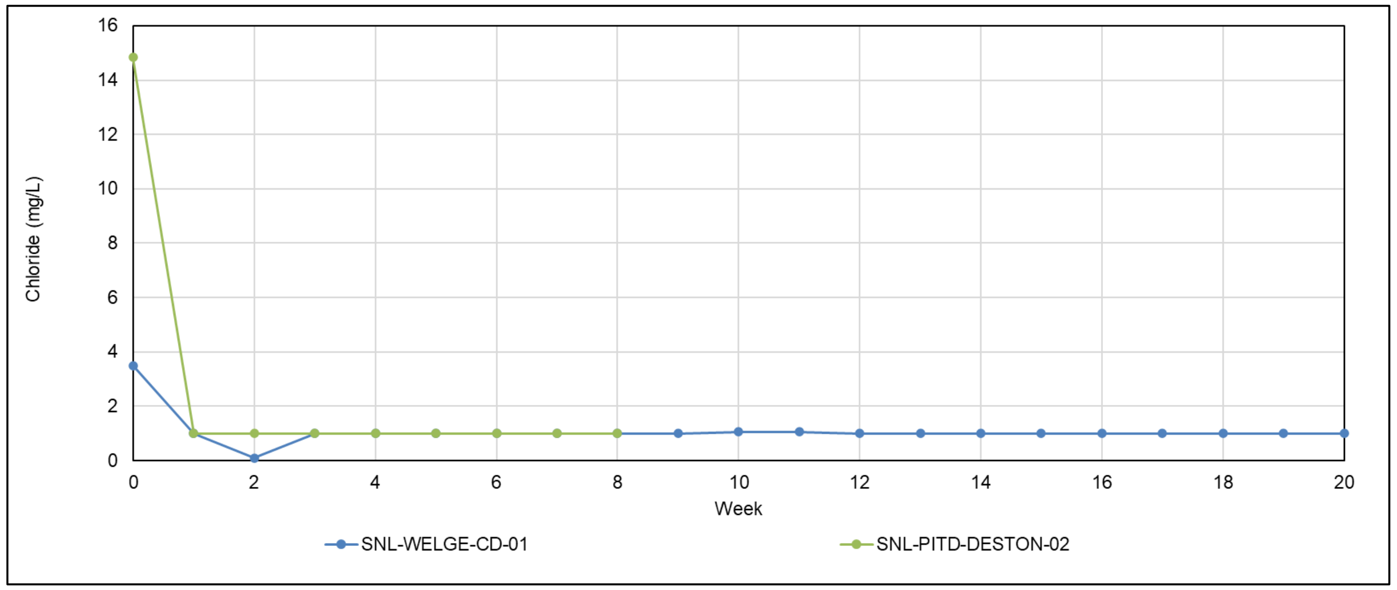

Beryllium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

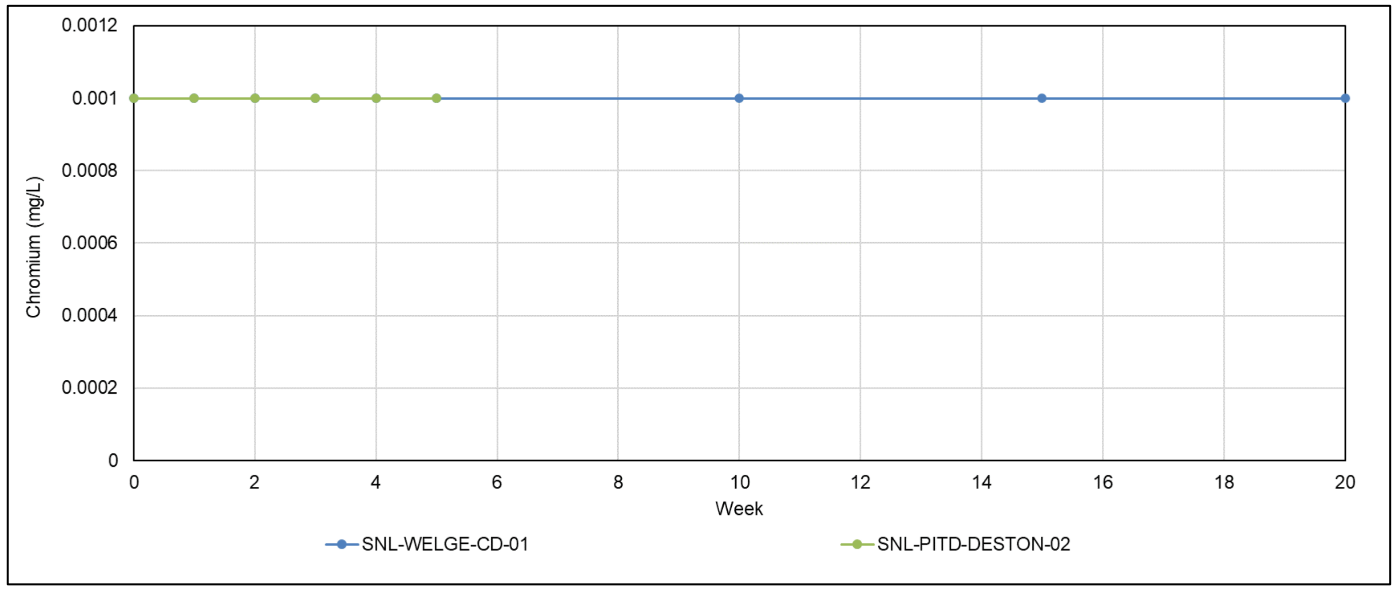

Bismuth (mg/L)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
0 2 4 6 8 10 12 14 16 18 20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

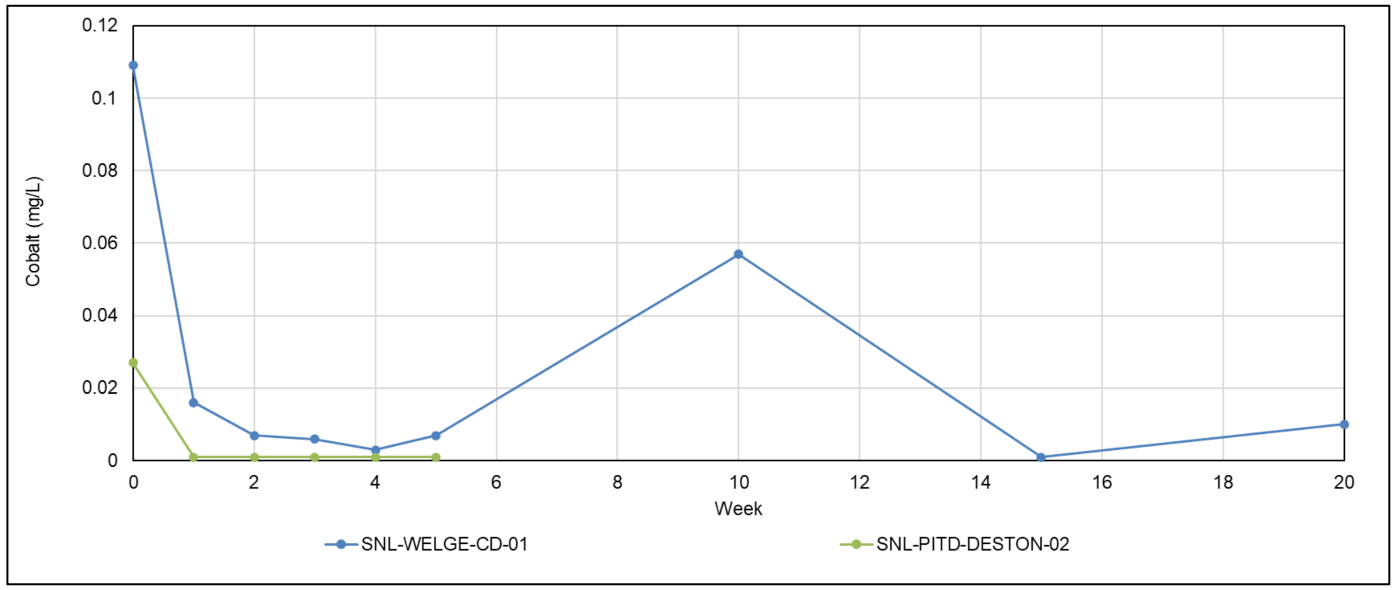

Boron (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0 2 4 6 8 10 12 14 16 18 20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

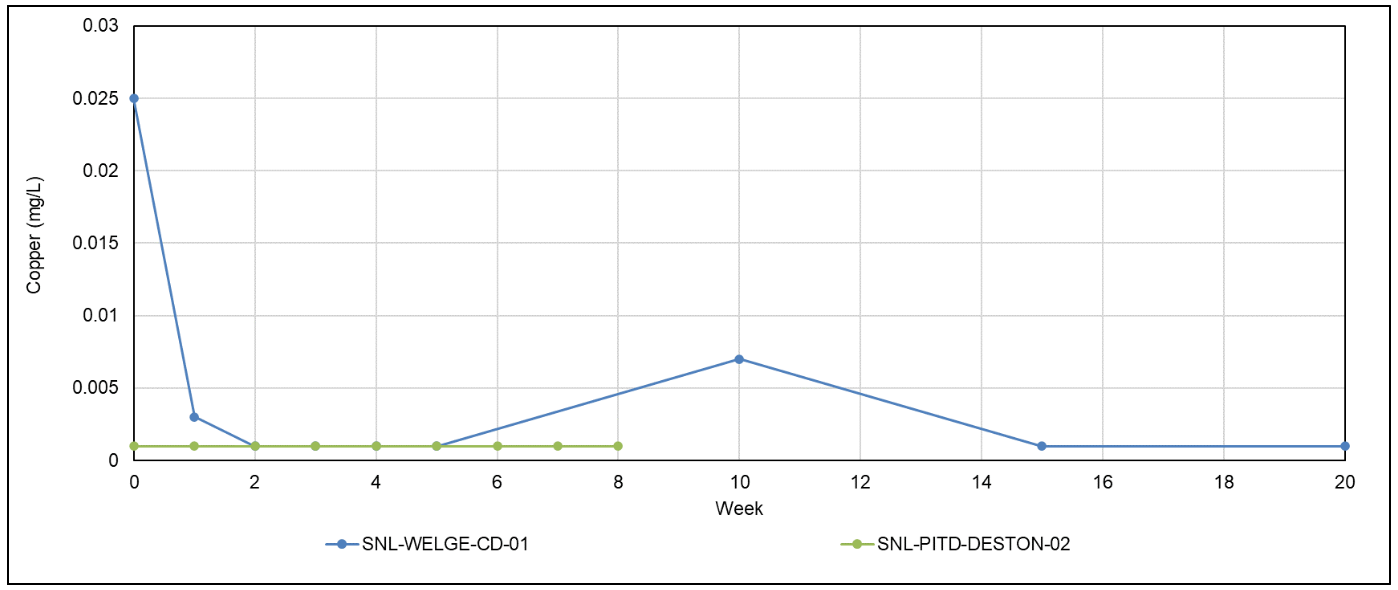

Cadmium (mg/L)
0.025
0.02
0.015
0.01
0.005
0
0 2 4 6 8 10 12 14 16 18 20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

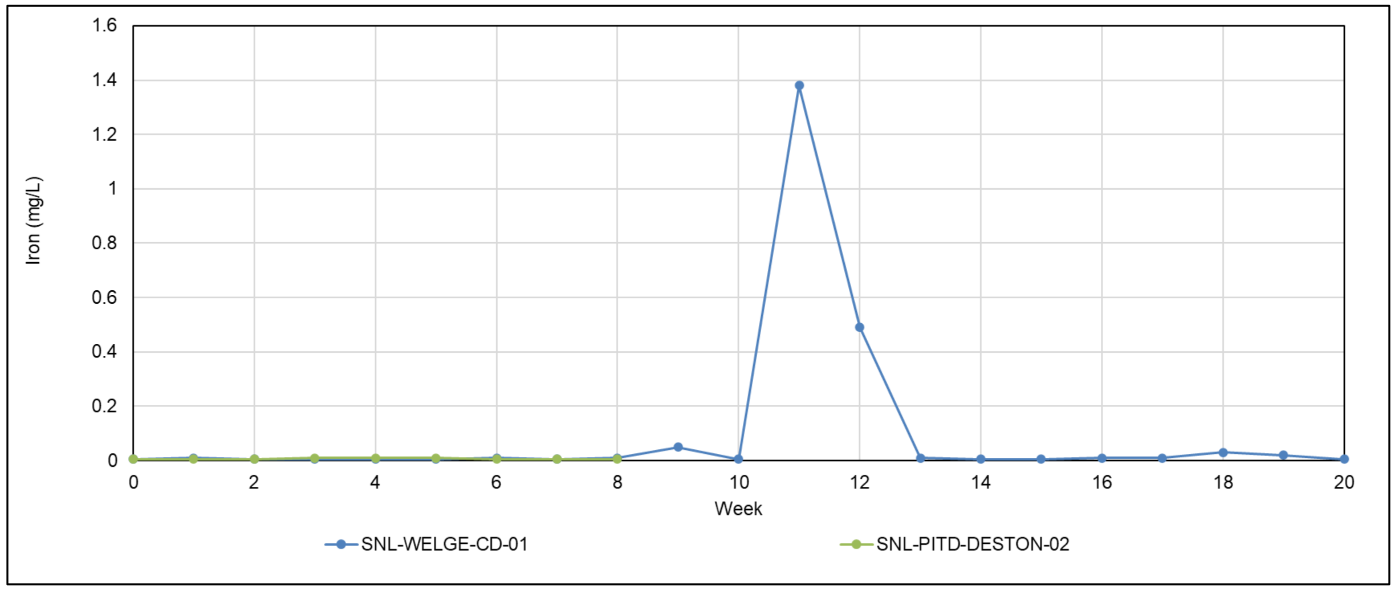

Calcium (mg/L)
200
180
160
140
120
100
80
60
40
20
0
0 2 4 6 8 10 12 14 16 18 20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

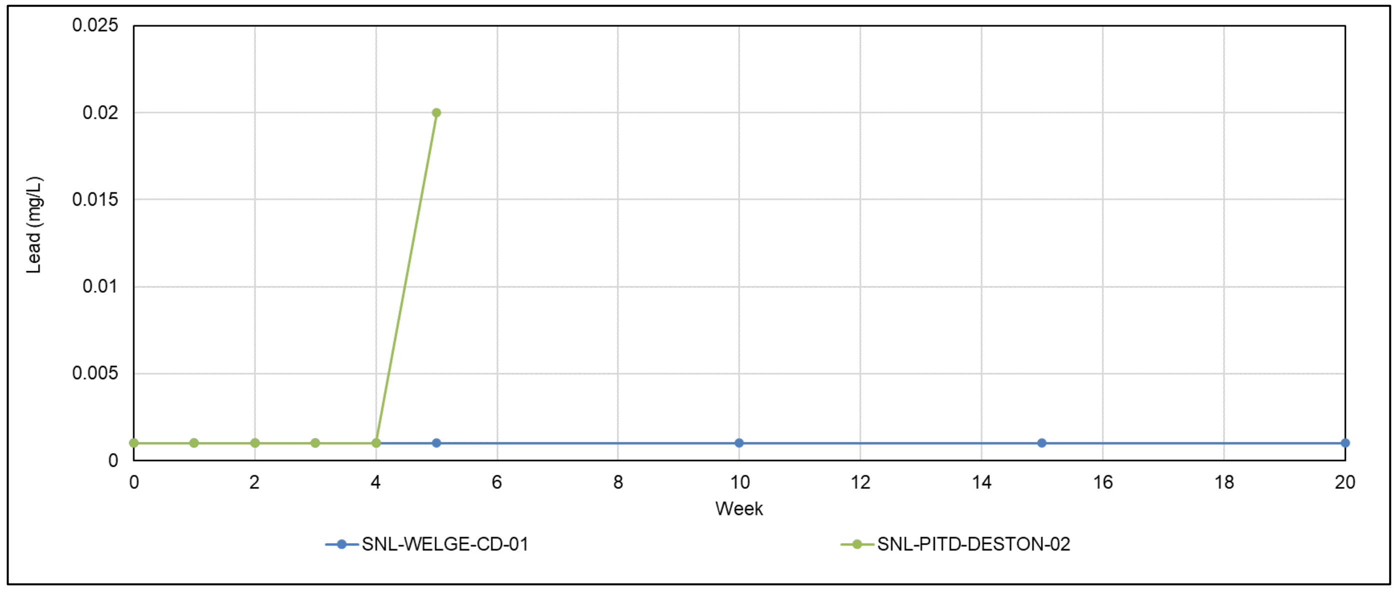

Chloride (mg/L)
16
14
12
10
8
6
4
2
0
0 2 4 6 8 10 12 14 16 18 20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

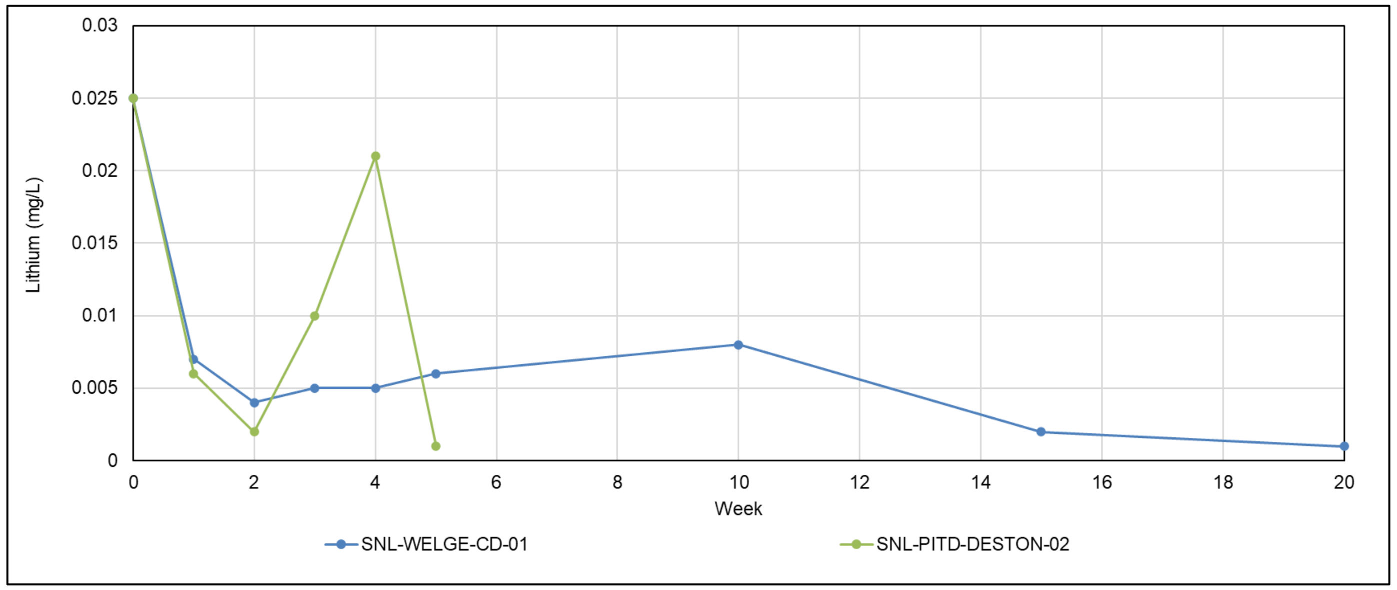

Chromium (mg/L)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
0 2 4 6 8 10 12 14 16 18 20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

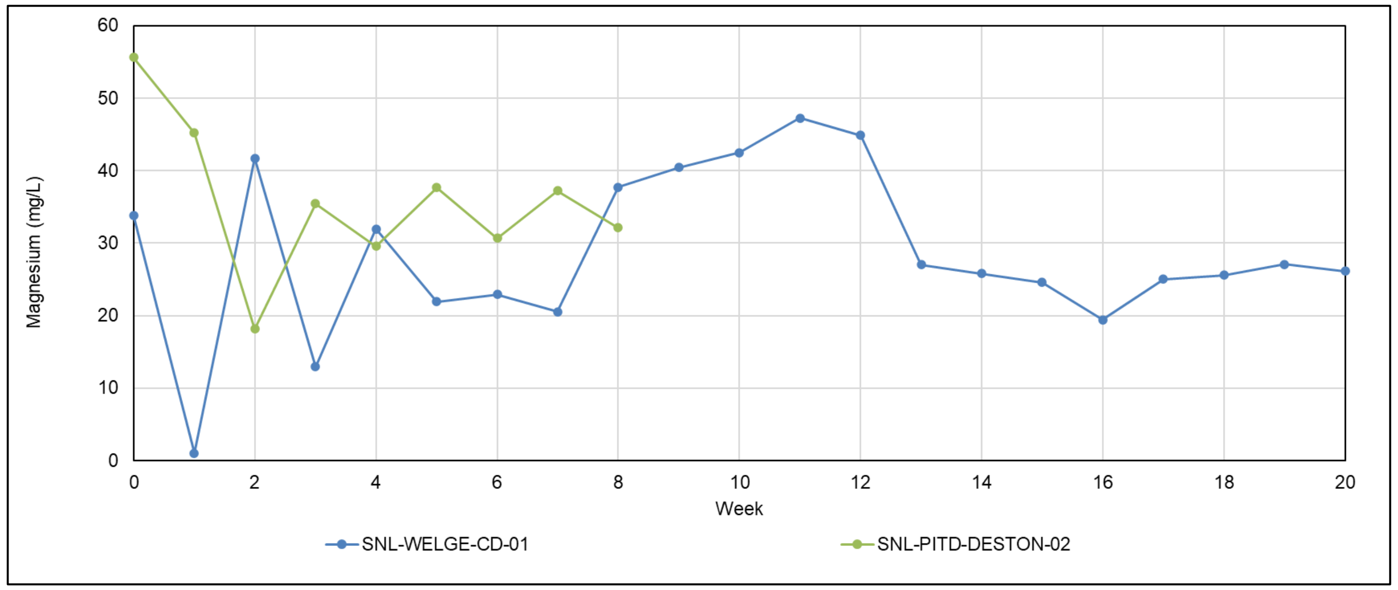

Cobalt (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

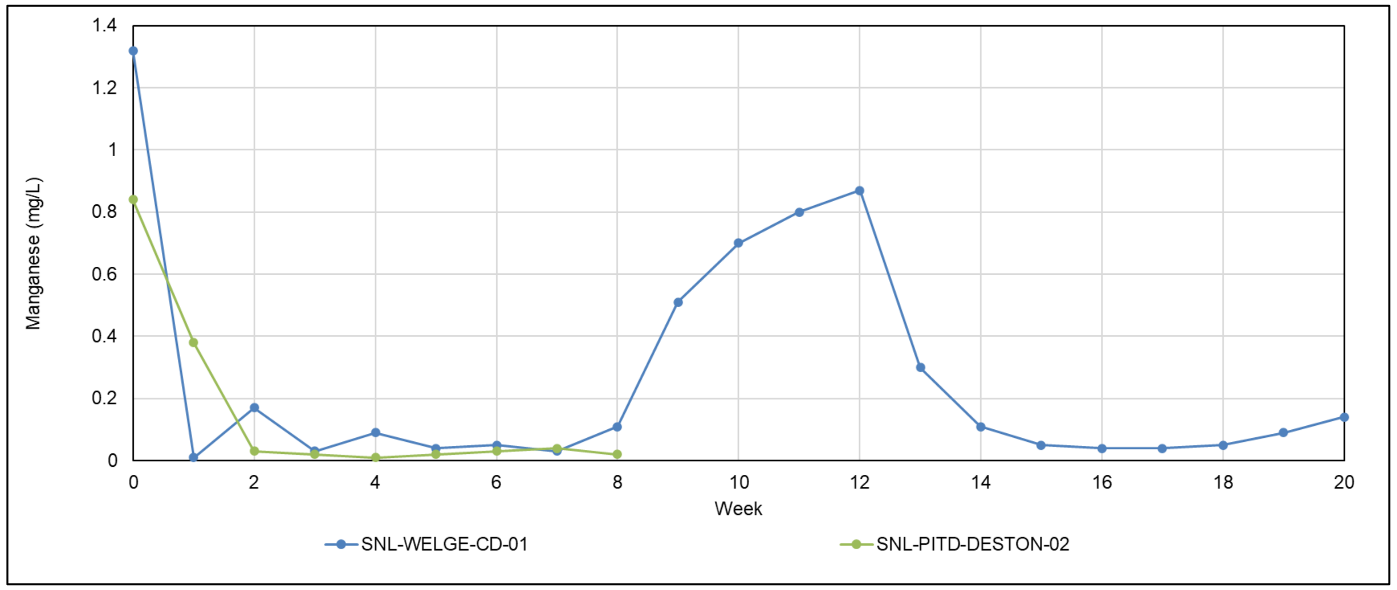

Copper (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

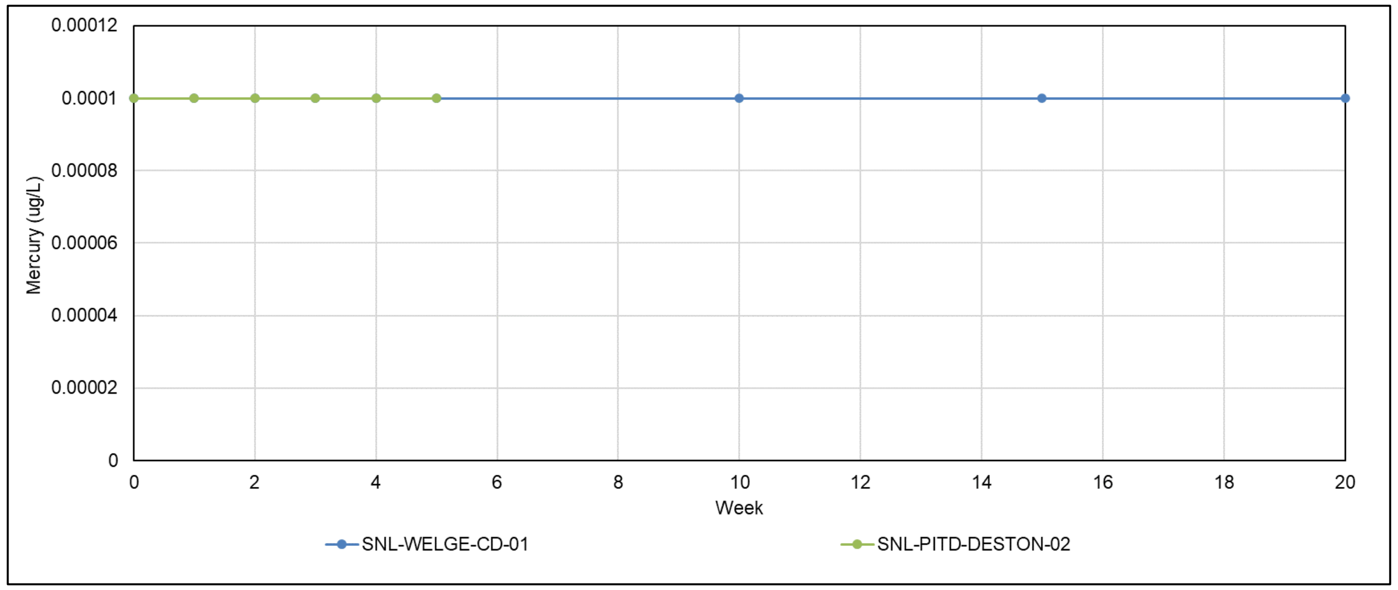

Iron (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

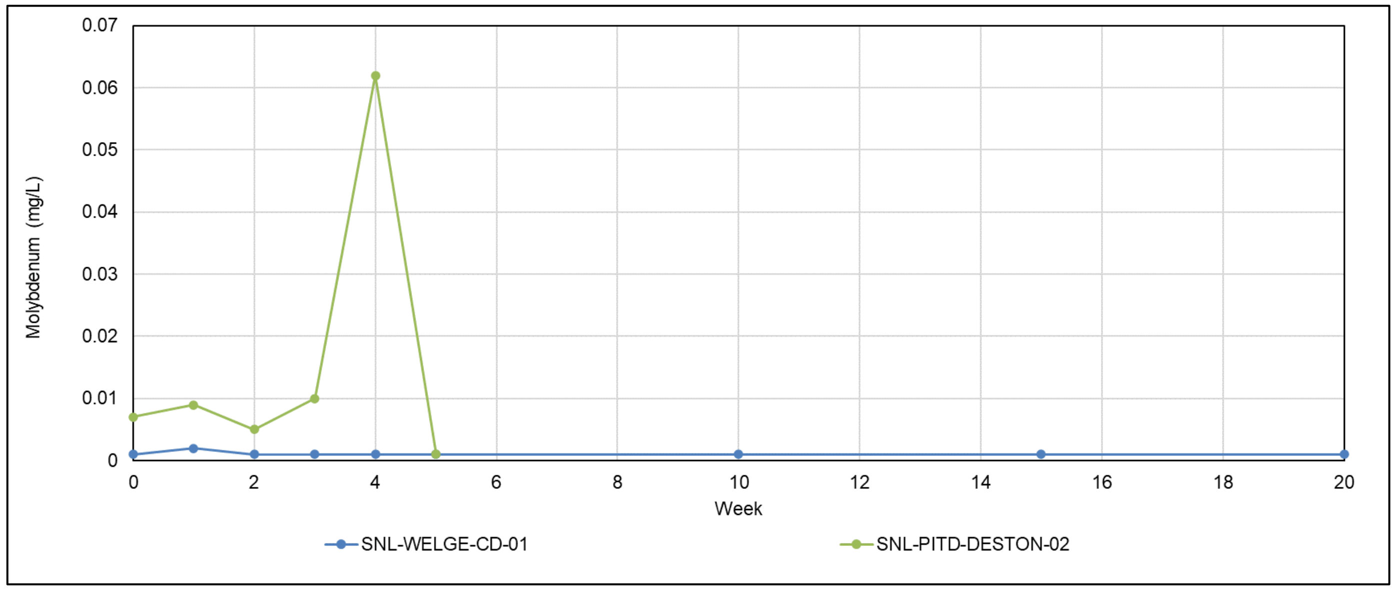

Lead (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

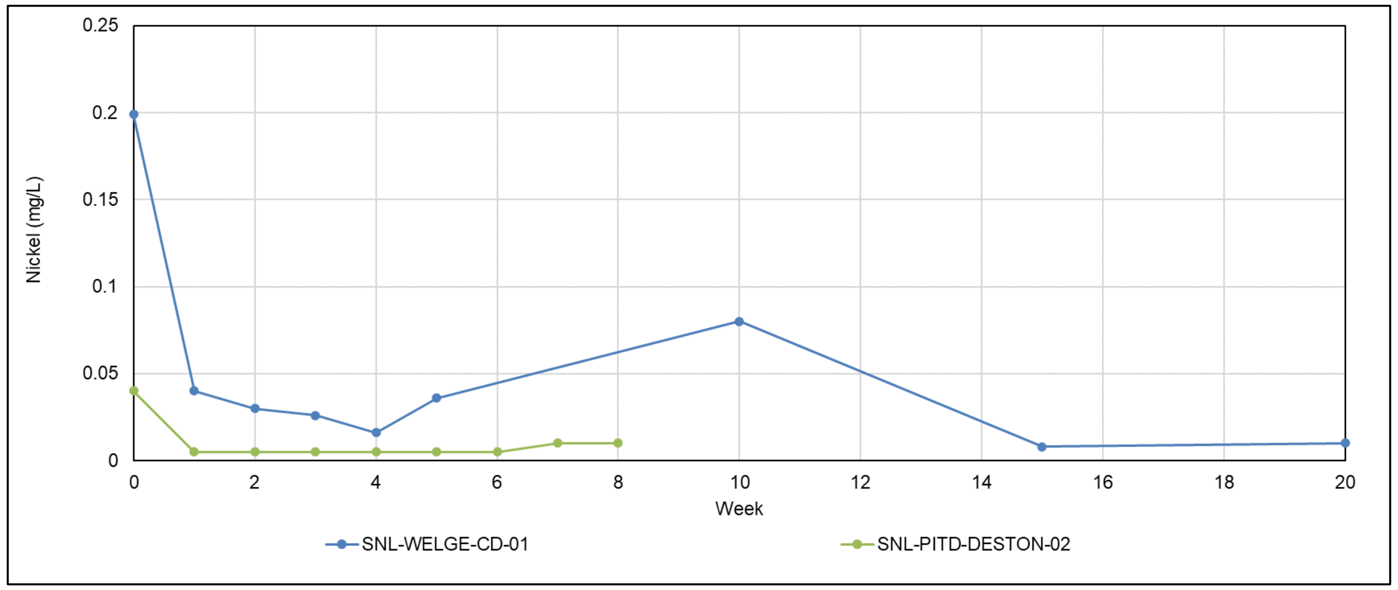

Lithium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

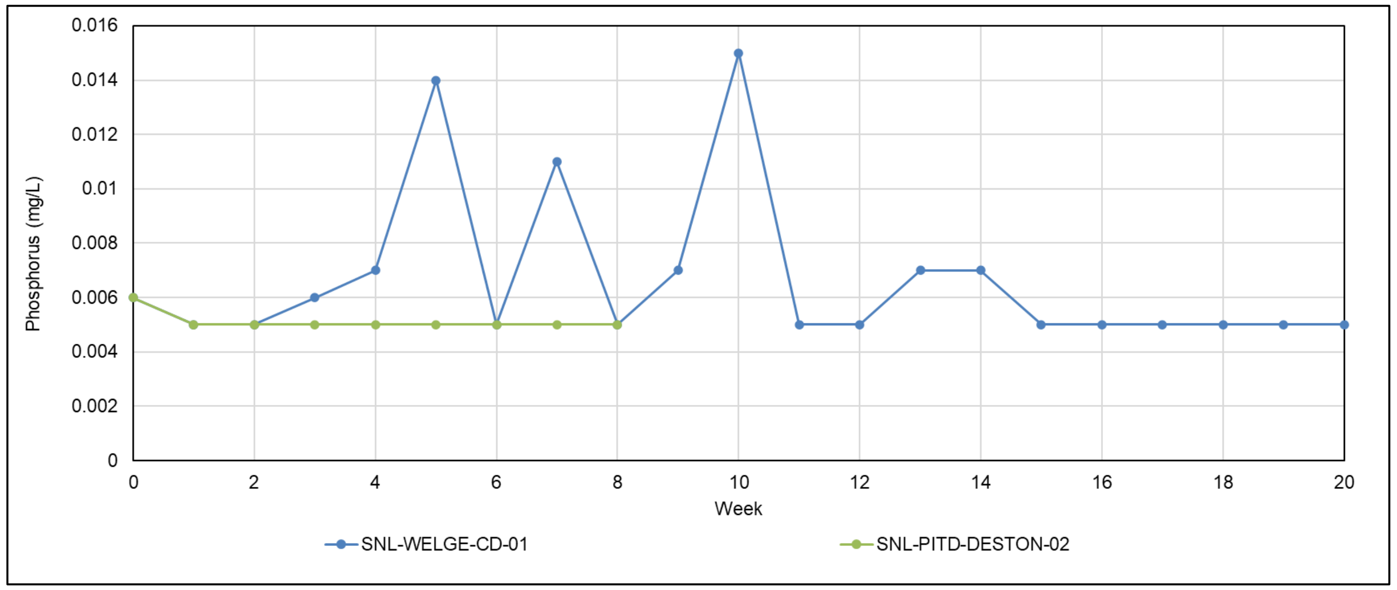

Magnesium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

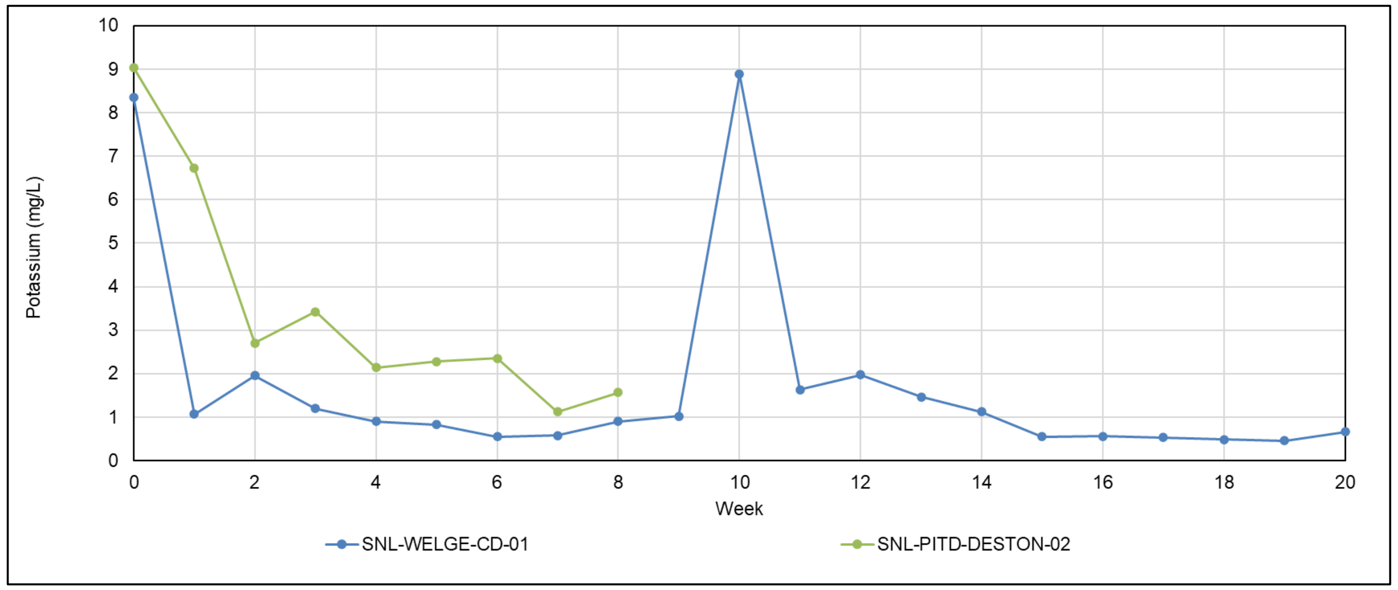

Manganese (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Mercury (ug/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Molybdenum (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Nickel (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Phosphorus (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Potassium (mg/L)
Week
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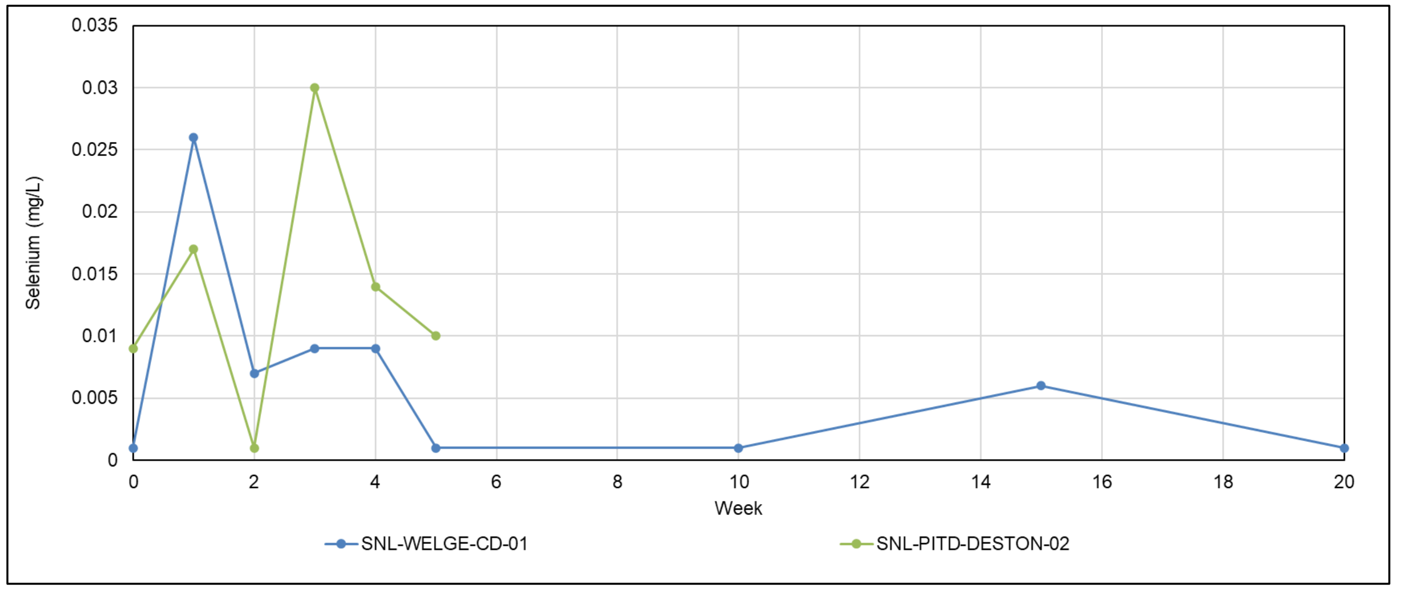
SNL-PITD-DESTON-02



Selenium (mg/L)
Week
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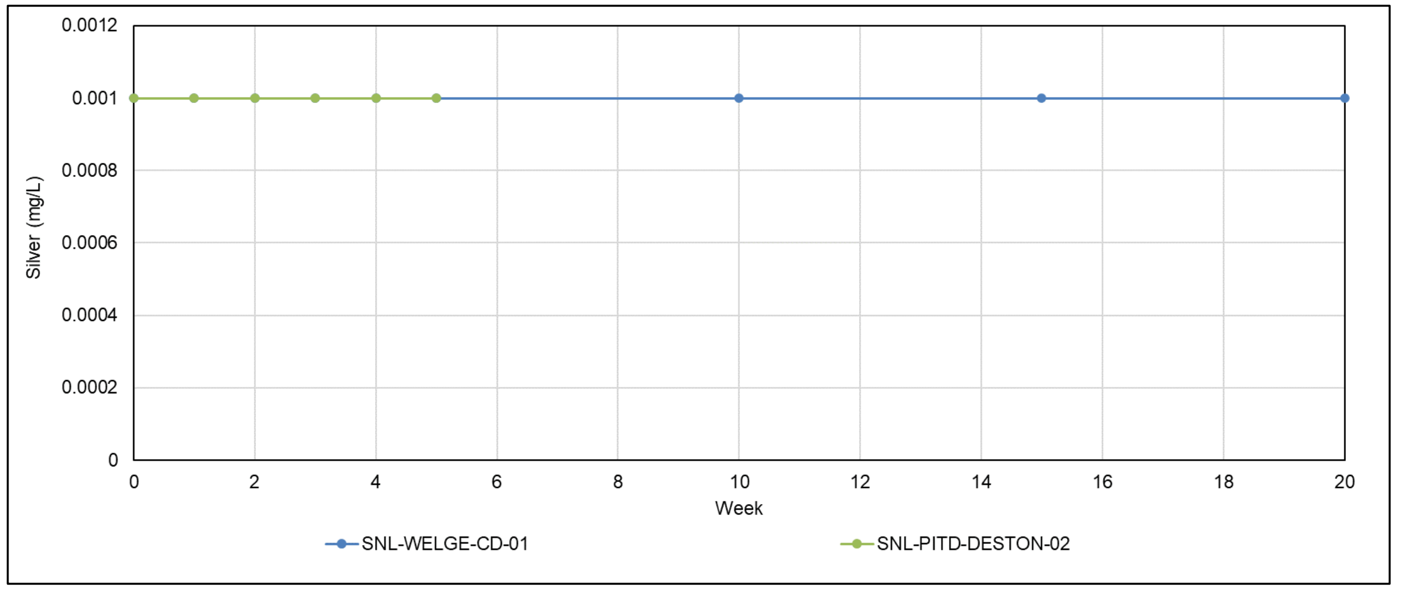
SNL-PITD-DESTON-02



Silver (mg/L)
Week
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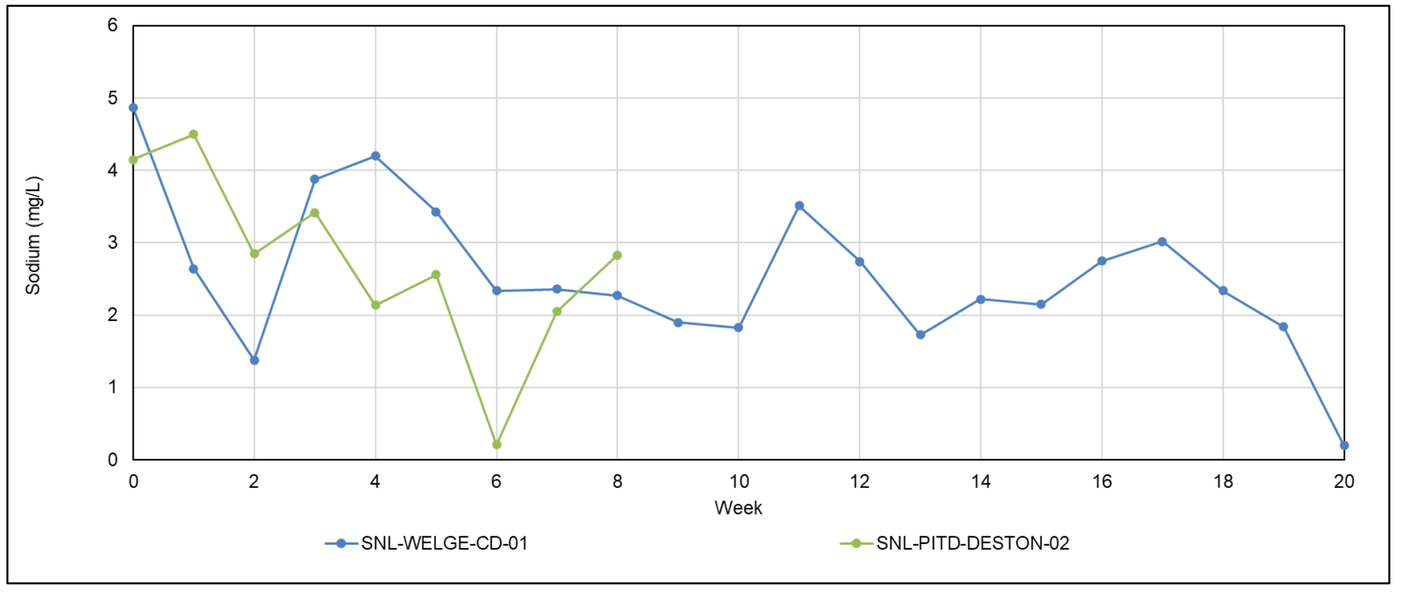
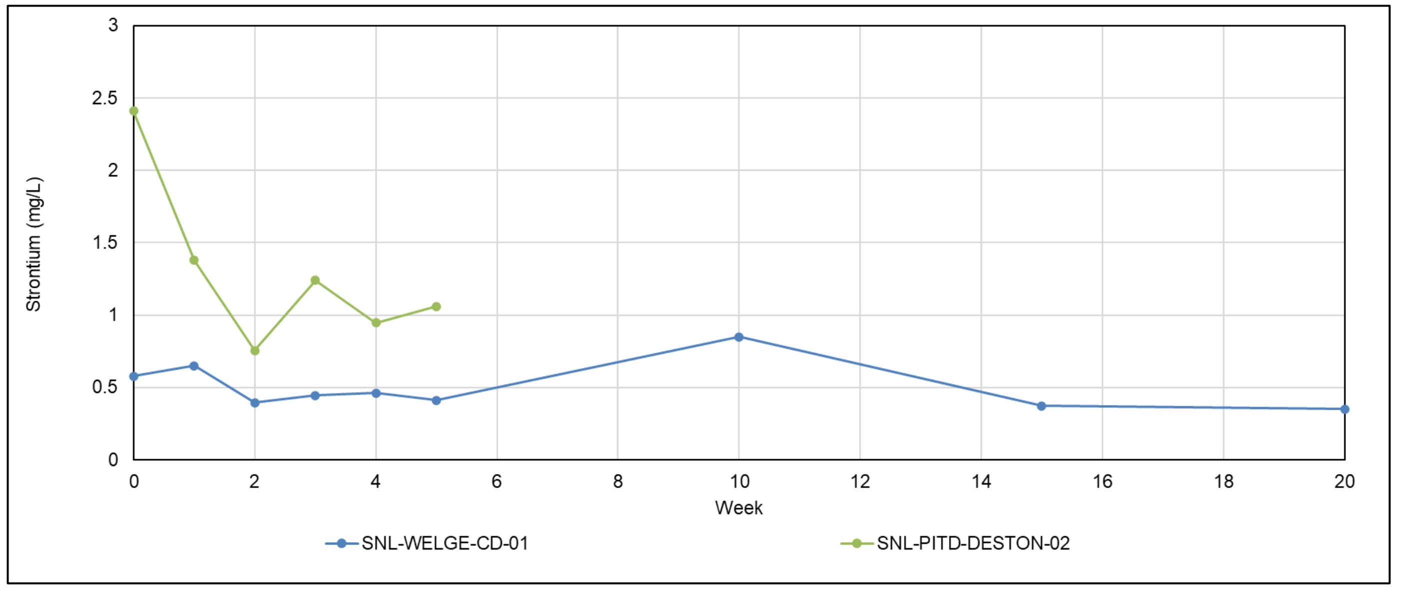
SNL-PITD-DESTON-02



Sodium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02



Strontium (mg/L)
Week
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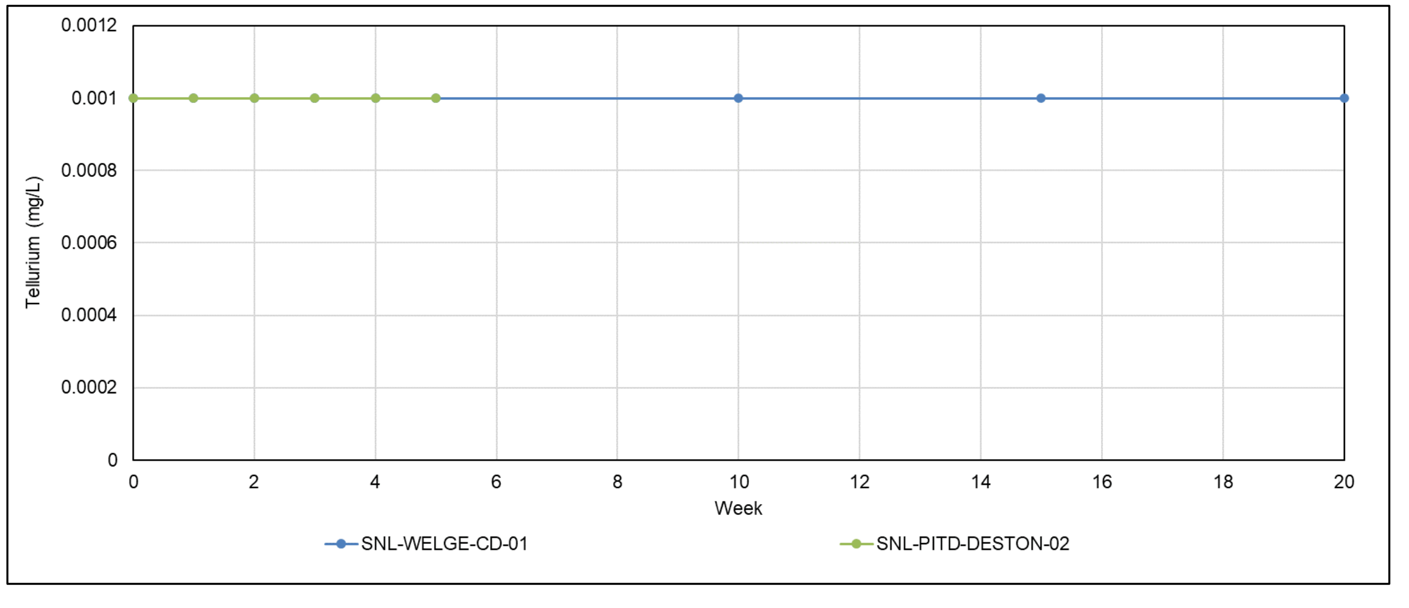
SNL-PITD-DESTON-02



Tellurium (mg/L)
Week
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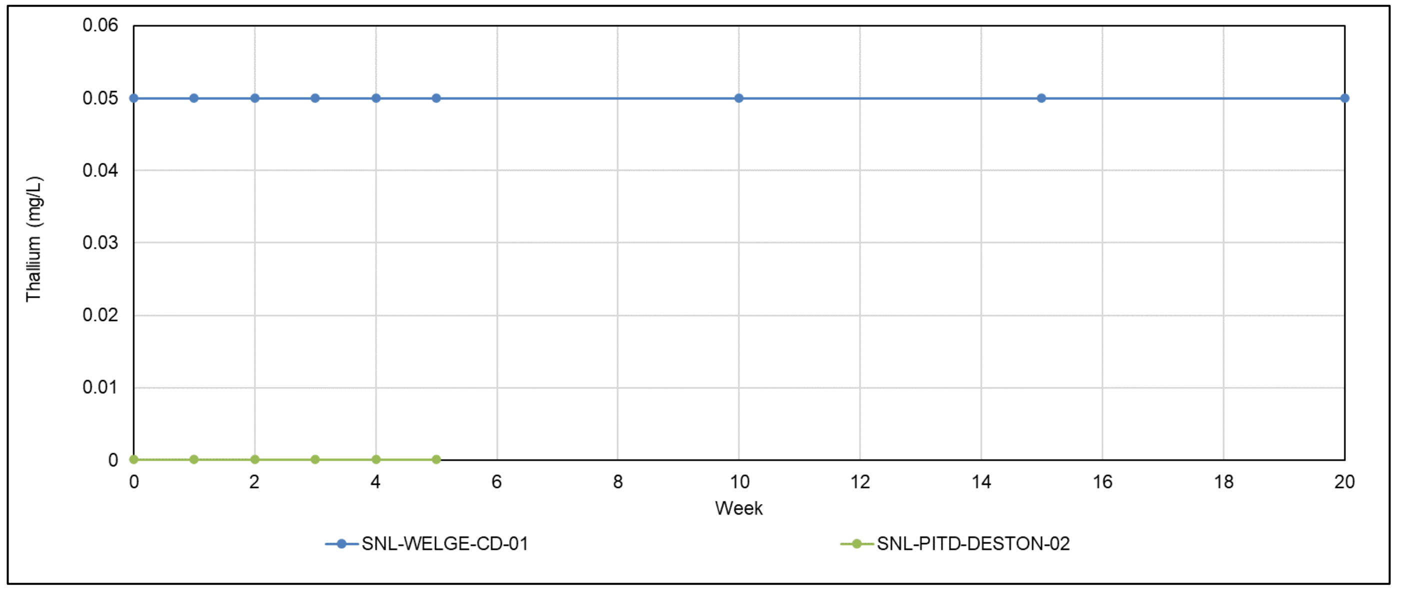
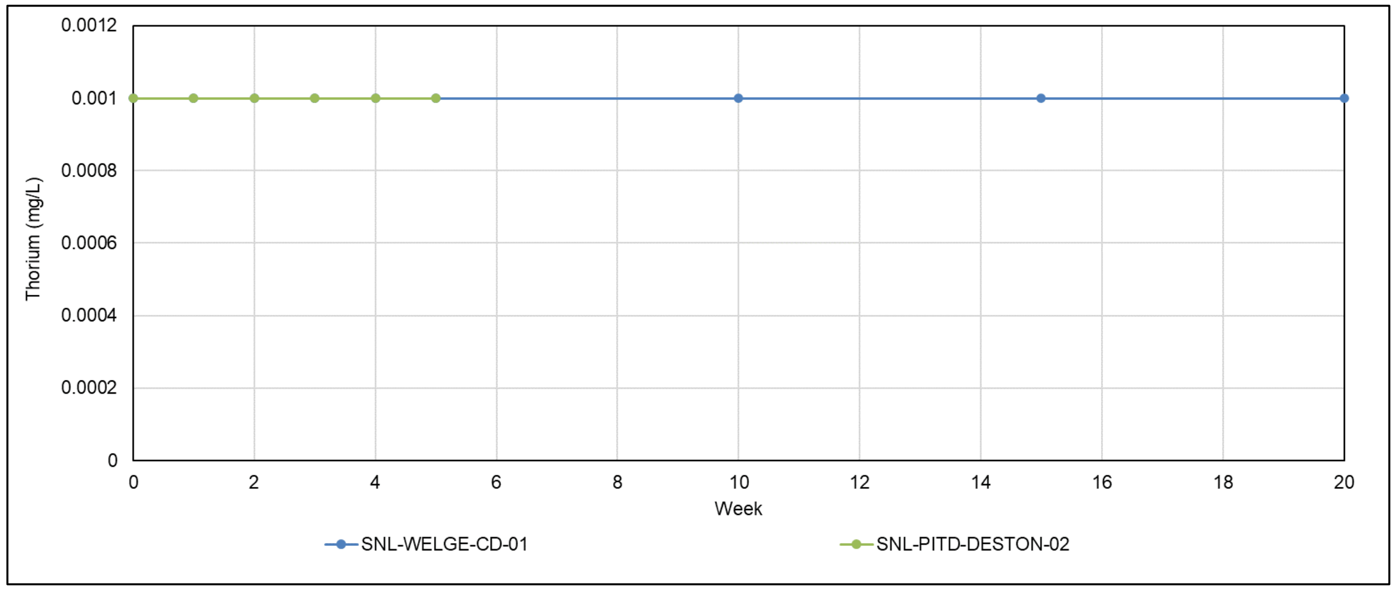
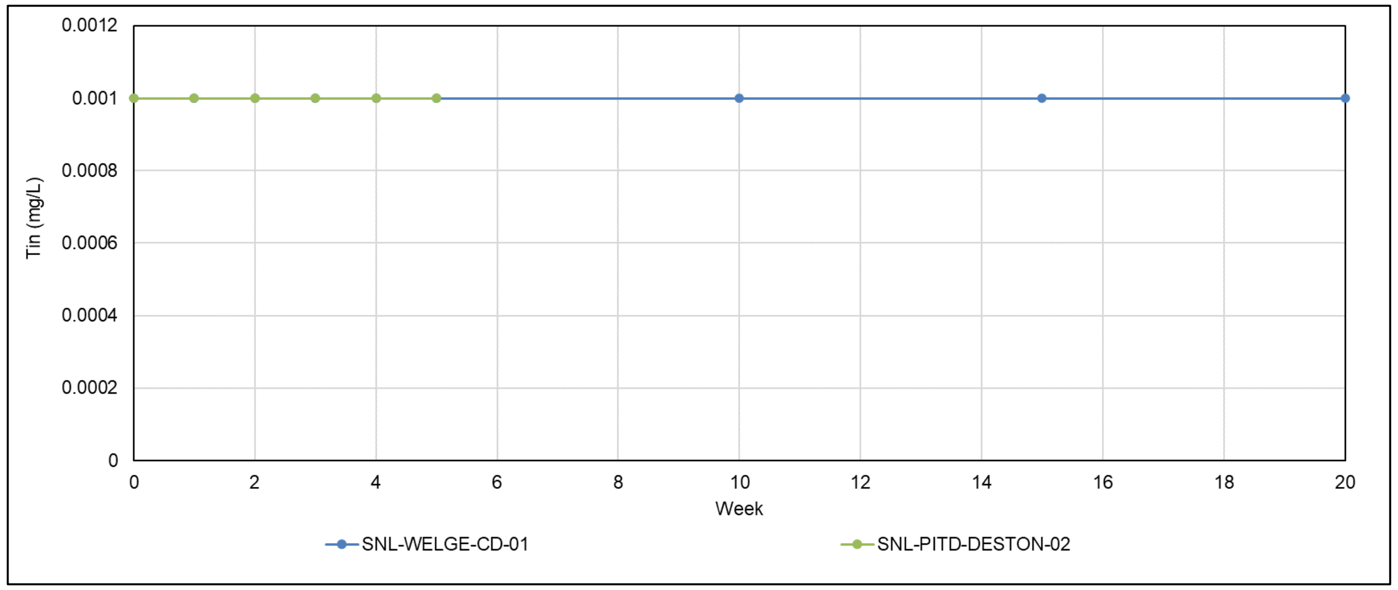
SNL-PITD-DESTON-02



Thallium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Thorium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Tin (mg/L)
Week
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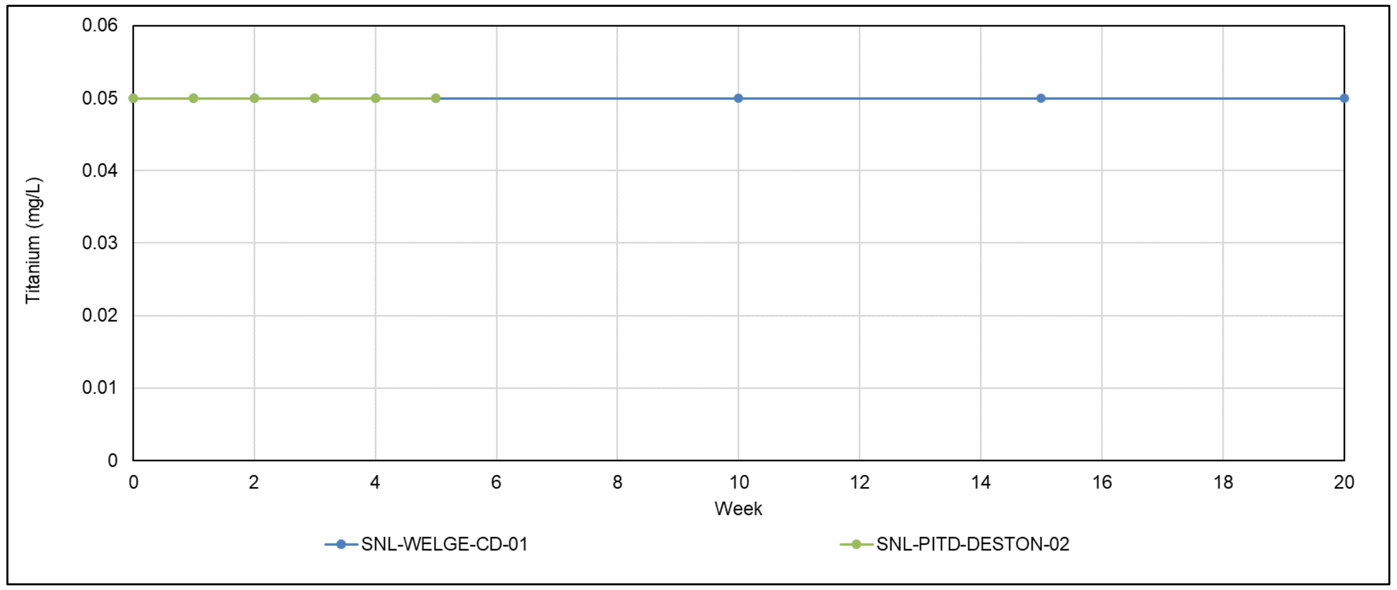
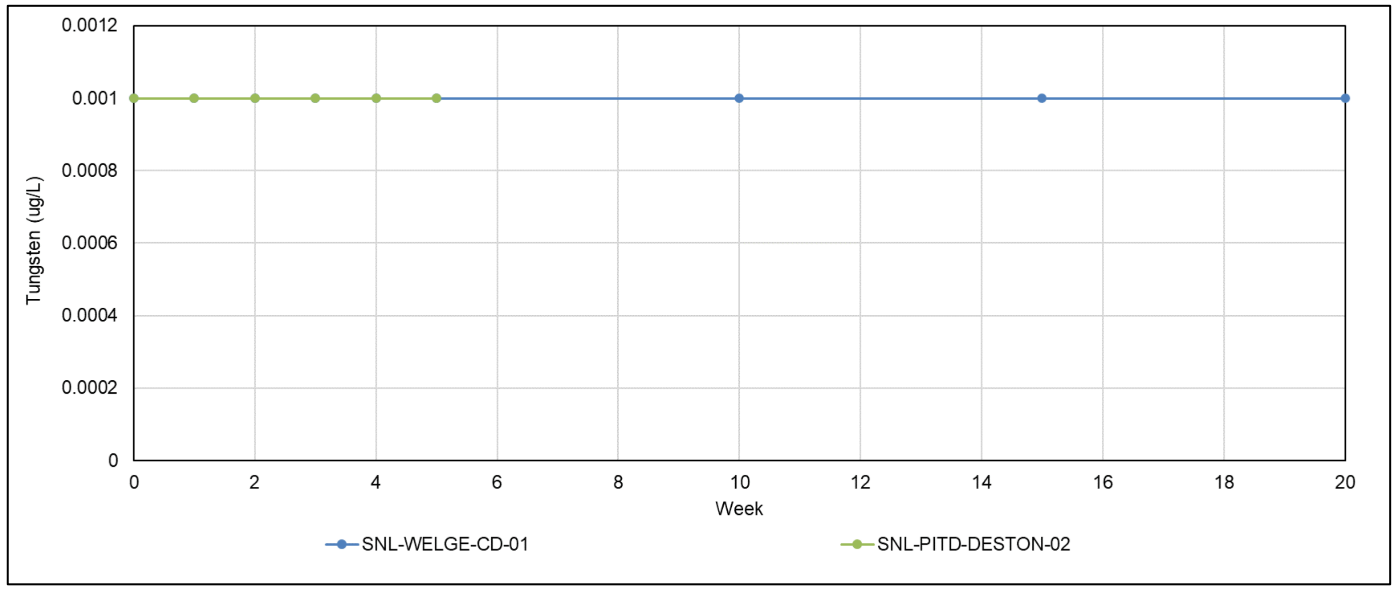
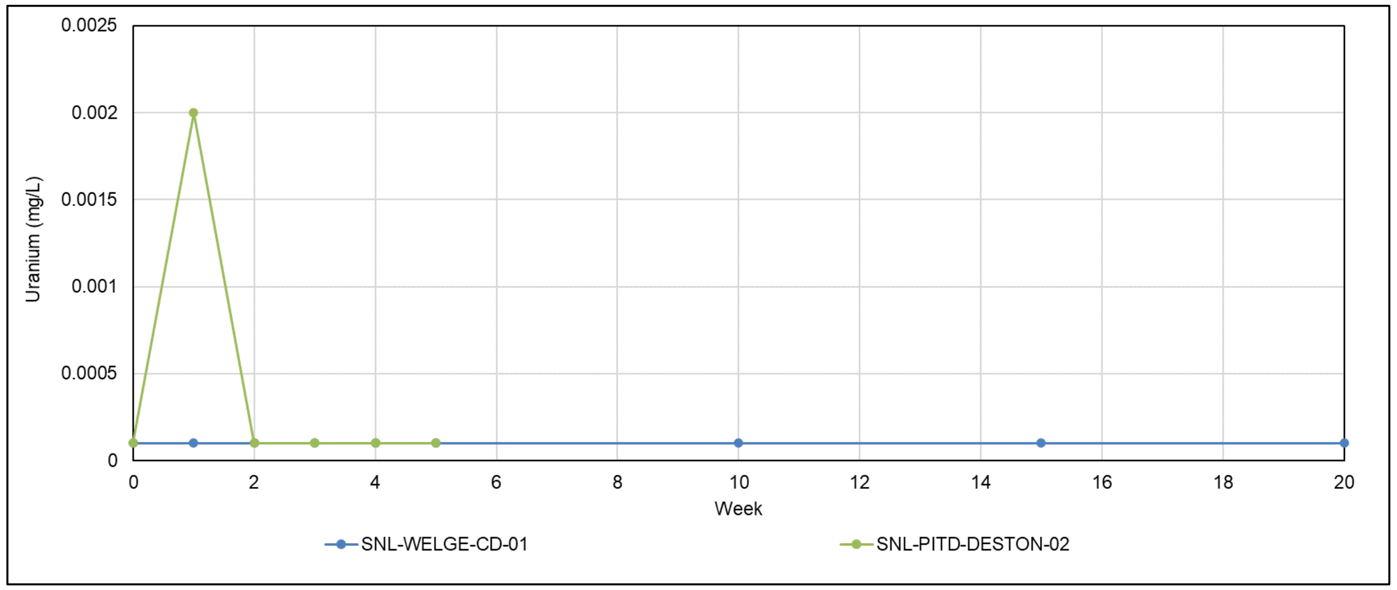

Titanium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Tungsten (ug/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02


Uranium (mg/L)
Week
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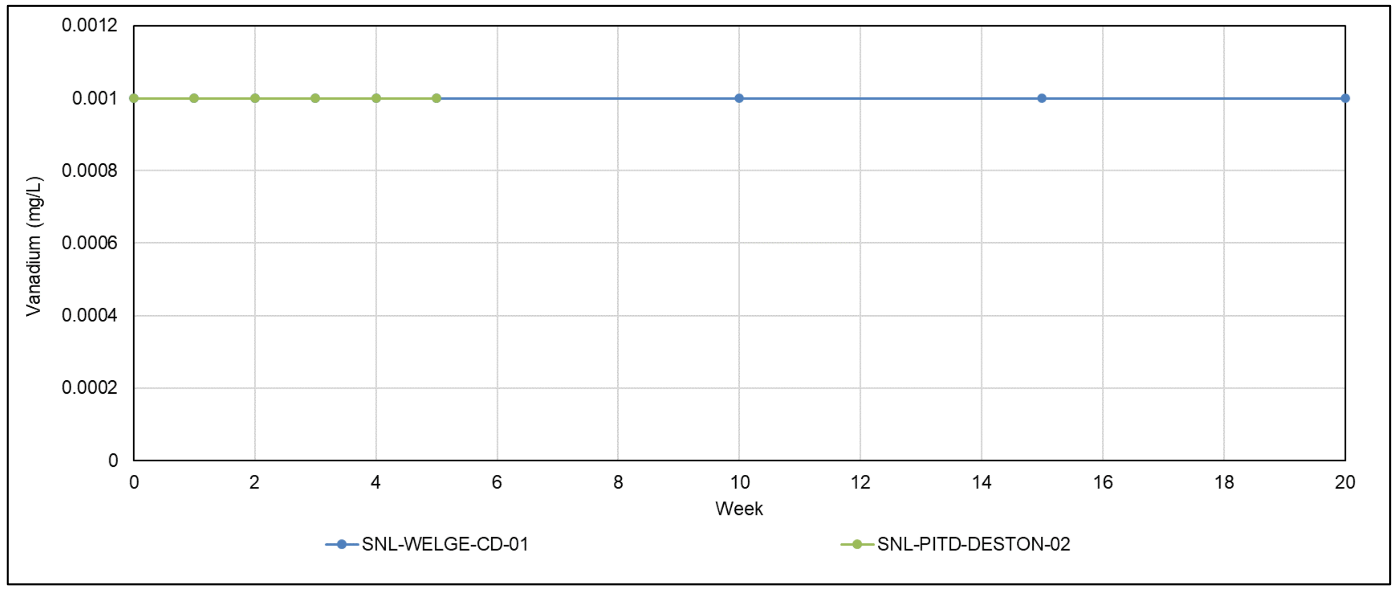
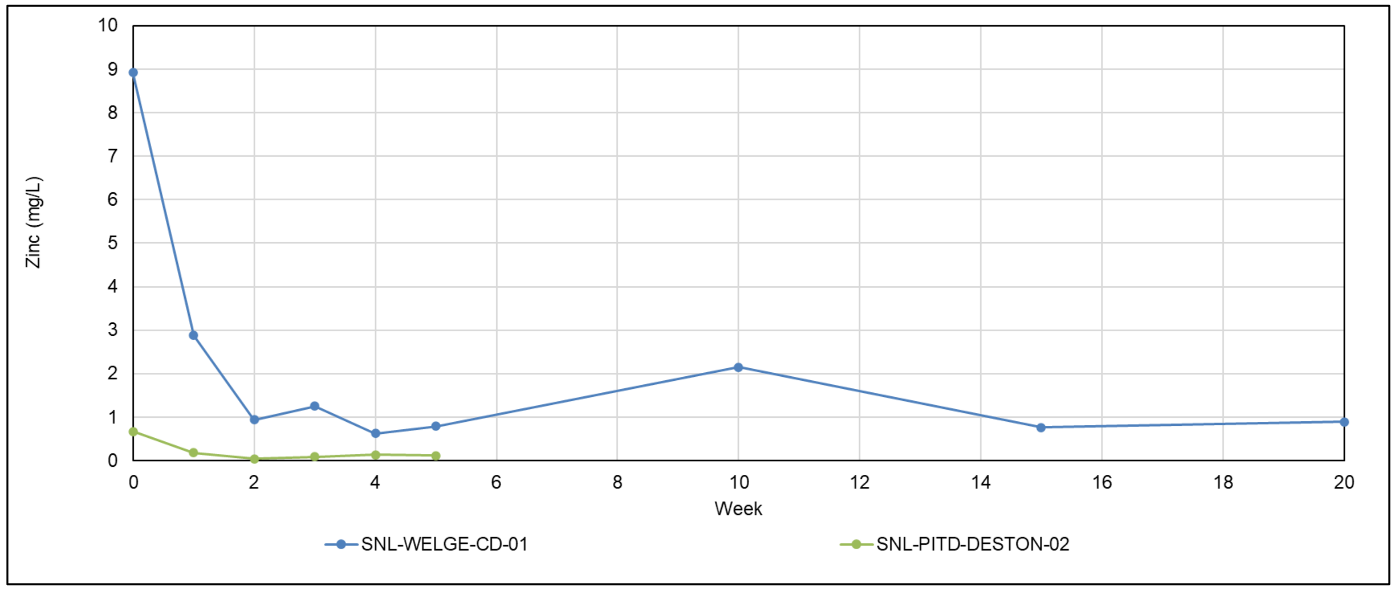
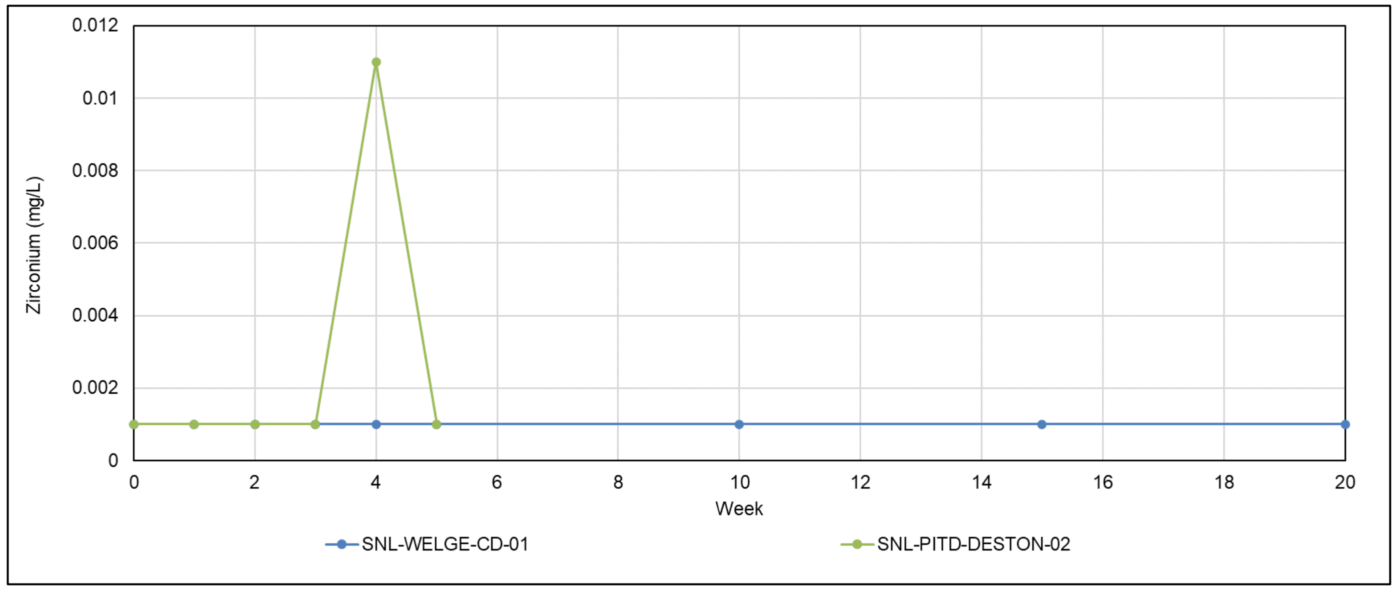
SNL-PITD-DESTON-02


Vanadium (mg/L)
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02



Zinc (mg/L)
0
1
2
3
4
5
6
7
8
9
10
0
2
4
6
8
10
12
14
16
18
20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02



Zirconium (mg/L)
0
0.002
0.004
0.006
0.008
0.01
0.012
0
2
4
6
8
10
12
14
16
18
20
Week
SNL-WELGE-CD-01
SNL-PITD-DESTON-02

Appendix F

ACRONYMS

Glossary

Term	Definition	Source
Acidity	The titratable acid as measured in accordance with standard methods. It is normally reported as milligrams per litre as calcium carbonate ($CaCO_3$).	(INAP, 2012)
Acute toxicity	Adverse effects occurring after oral or dermal administration of a single dose of a substance, or multiple doses given within 24 h, or an inhalation exposure of 4 h	(SANS, 2014)
Alkalinity	The titratable alkalinity, using a standard acid titrant, as performed in accordance with standard methods. It is normally reported as milligrams per litre as calcium carbonate ($CaCO_3$).	(INAP, 2012)
Anion	A monoatomic or polyatomic species having one or more elementary charges of the electron (negative charge).	(IUPAC, 2019)
Bioaccumulation	Net result of uptake, transformation and elimination of a substance in an organism due to all routes of exposure (air, water, sediment/soil and food)	(SANS, 2014)
Carcinogens	A chemical substance or a mixture of chemical substances which induce cancer or increase its incidence	(SANS, 2014)
Cation	A monoatomic or polyatomic species having one or more elementary charges of the proton (positive charge).	(SANS, 2014)
Composite sample	A sample made by the combination of several distinct subsamples.	(INAP, 2012)
Contaminant	Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on human and ecological receptors as well as environmental media (e.g., air, water, soil, sediment).	(INAP, 2012)
Degradation	Decomposition of organic molecules to smaller molecules and eventually to carbon dioxide, water and salts	(SANS, 2014)
Dissolved solids	The weight of both organic and inorganic matter, in solution in a stated volume of water. The amount of dissolved solids is usually determined by filtering water through a glass or 0.45 µm pore-diameter filter, weighing the filtrate residue remaining after the evaporation of the water, and drying the salts to constant weight at 180°C.	(INAP, 2012)
Electrolytic conductivity	The ability of a solution to conduct electricity. It is indicative of the concentration of ionised constituents in a water sample or soil matrix. Also referred to as electro conductivity.	(INAP, 2012)
Explosive substance	Substance in solid, liquid, paste or gelatinous form (or a mixture of substances) which is in itself capable, by chemical reaction, of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings	(SANS, 2014)

Acronyms

Acronym	Term in full
ABA	Acid Base Accounting
AP	Acid Potential
ASLP	Australian Standard Leaching Procedure (AS 4439-1997) – a STLP
ATSDR	Agency for Toxic Substances and Disease Registry
DO	Dissolved Oxygen
GAI	Geochemical Abundance Index
GARD	Global Acid Rock Drainage
GHS	Global Harmonised System
ICP –AAS	Inductively Coupled Plasma – Atomic Absorption Spectroscopy
ICP	Inductively Coupled Plasma
ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
ICP-OES	Inductively Coupled Plasma - Optical Emission Spectrometry
IUPAC	International Union of Pure and Applied Chemistry
LC	Leachable Concentration
LCT	Leachable Concentration Threshold
NP	Neutralisation Potential
NPR	Neutralisation Potential Ratio
QA/QC	Quality Assurance / Quality Control
s.d.	Standard Deviation
SANAS	South African National Accreditation System
SANS	South African National Standard
STLP (or SLP)	Short-term Leaching Procedure
TC	Total Concentration
TCT	Total Concentration Threshold
TDS	Total Dissolved Solids
WCMR	Waste Classification and Management Regulations
wt. %	Weight percentage
XRF	X-Ray Fluorescence

Appendix G

DOCUMENT LIMITATIONS

DOCUMENT LIMITATIONS

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