# WITHYHEDGE LANDFILL CELL 8 AND CELL 8/9 VALLEY

Infilling Plan

*Report Number 2563r1v3d0626*

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# 1 BACKGROUND

RML operates the Withyhedge Landfill Site at Haverfordwest, Pembrokeshire. Waste disposal activities at the site are currently active in Cell 10 after filling reached the interim maximum capacity in Cell 9. The sequence of filling was interrupted in Cell 8 in response to the emission of odorous landfill gas. The operator decided to temporarily cap the whole of Cell 8, allowing the effective capture of landfill gasses in an upgraded and extended landfill gas collection system. Cell 8 therefore is partly filled and temporarily capped, at a surface level some 7m below proposed finished levels. The cell is planned to remain in this position until monitoring records show that it can be completed without the threat of an unacceptable odour arising from the release of landfill gas.

Following the temporary capping of Cell 8, Cell 9 was developed immediately to the west, but was treated as a stand-alone cell; the waste mass in Cell 9 does not overlap onto Cell 8 (to the east) or Cells 6&7 (to the north). By developing a completely isolated cell, the ongoing waste disposal activities were separated from the parts of the site generating odourous gas in high concentrations and flows. When Cell 9 was filled to its interim maximum capacity (ie its capacity as a free-standing, separate pyramid of waste), it was temporarily capped and disposal continued to the west in Cell 10.

Currently, engineering works are ongoing in Cell 11 which lies further to the north-west, adjacent to Cell 10. For reference, Figure 1-1 shows Cells 8 and 9 within the surrounding area, with the footprint of other cells indicated.


**Figure 1-1 Cells 8 and 9 and Surrounding Cells**

RML has been monitoring gas yields and hydrogen sulphide concentrations since the temporary capping of Cell 8 at its partly complete level. The monitoring has included not only gas wells in Cell 8 but also those in the adjacent valleys between Cells 8 and 9 and between Cell 9 and Cells 6&7. The monitoring data has shown a decline in yield and concentration of gasses, reducing the risk of the escape of odorous gas when these areas are filled to final levels (which requires the progressive removal of temporary capping).

RML therefore planned to submit filling proposals to the Regulator (NRW) when the monitoring data provides confidence that the placement of waste over the existing wastes will not result in unacceptable odour in the vicinity.  A key part of this monitoring data is the concentration of hydrogen sulphide gas, as this has to be shown to have diminished sufficiently before filling on Cell 8 and the valley between Cells 8 and 9 can continue.

The problem of hydrogen sulphide gas generation in Cell 8 and the flank of Cells 6&7 has resulted in the need for extreme caution when resuming disposal activities: all parties including RML, regulators and the wider public need to have confidence that the disposal can be made without repeating the previous issues.  The filling of Cell 9 and Cell 10 to date has been carried out with a new approach to gas collection, and though hydrogen sulphide is being liberated from the wastes, it is being collected effectively and destroyed in the new gas plant.

The monitoring data gathered to date has shown a substantial decline in the concentration of hydrogen sulphide within the landfill gas on the flanks of Cells 6&7, and the gases evolved from Cell 9 are being managed effectively.  This has resulted in an infilling proposal being submitted to NRW (Geotechnology Report 2590r1v1d0925) for the valley between Cell 9 and the southern flank of Cells 6&7.  NRW has accepted the evidence presented in the report and has consented to the infilling of this valley.  Infilling works are currently underway, and waste levels in the valley are rising alongside the fill levels in Cell 10B.  To date, the infilling works have not noticeably resulted in odour release, suggesting that the works are in line with expectation.

RML wishes to continue filling up the valley between Cells 8 and 9, and then when levels are the same as Cell 8 to complete Cell 8 to restoration levels by placing the final lifts of waste over Cell 8, before permanent restoration.  If this activity is carried out directly after the infilling of the Cell 9 and Cell 6&7 valley, a very large area of the site can be restored to final levels with the installation of permanent gas extraction infrastructure.

Geotechnology has been asked to review the available data from Cell 8 to determine the current concentrations and flows of landfill gas and in particular, hydrogen sulphide.  A similar report (2563r1v1d0625) was produced in 2025, but NRW felt that the trends identified in the data needed further monitoring to confirm the reductions seen.  This report therefore presents the relevant data gathered from Cell 8 and considers whether waste disposal, subject to the safeguards described in the report, can be carried out over Cell 8 and in the valleys between Cell 9 and Cell 8 without risking further odour problems. A scheme of infilling has been developed to systematically place the waste, allowing permanent capping and restoration to be carried out.

# 2 CELL 6, 7, 8 & 9 GAS COLLECTION AND MONITORING

## 2.1 Gas Collection System

Cells 6, 7 and 8 were capped between January and May 2024, with those parts of Cells 6 and 7 that are at final levels being permanently capped and all other surfaces being temporarily capped with a welded LLDPE membrane. Cell 9 was covered with welded membrane progressively as it was filled, being completed in late 2025 before permanent vertical gas wells were installed. All of these cells are therefore encapsulated between the basal liner and the capping barrier membrane, though there is connectivity between the Cells 6,7 and 8 as those waste masses are not physically separated. There is no connectivity between Cell 8 and Cell 9, but currently waste infilling has made the connection between Cells 6&7 and Cell 9.

Landfill gases produced by the wastes in these cells are collected through permanent and temporary collection infrastructure. Those parts of the cells that are at final levels have had a permanent series of deep gas collection wells installed on a 30m triangular grid. The southern flank of Cells 6&7 has a number of shallow pin wells near the crest of the slope and a series of hoover points at the base of the slope. This allowed gas to be collected from the waste mass and flank prior to the permanent wells coming into use.

There is no permanent capping on Cell 8 as none of the waste mass has achieved final height. Instead, a series of 31 pin wells and 4 horizontal wells have been installed beneath the temporary cap. A drawing showing the existing collection infrastructure in the area is shown on Drawing 2563/15.

The gas extraction wells and hoover points are connected to the gas mains that draw gases to the gas compound to power the generators or to be destroyed by flaring. Measurements of the gas flows and concentrations are made at numerous points within the system:

- Gas concentrations are measured at well heads, hoover points and at the gas compound
- Gas flows are measured at the gas compound and the Cell 8/9 main

Cell 9 is fitted with a large number of horizontal wells as well as permanent vertical wells. The horizontal wells have been placed over the full width of the cell and are spaced at 15m apart from each other at 5m vertical intervals. Where the waste is deep enough, 5m deep pin wells are also installed. The flanks and top of Cell 9 are covered with welded LLDPE to form a barrier to gas migration and oxygen ingress. The permanent gas collection wells for Cell 9 are shown on Drawing 2563/16r1.

## 2.2 Landfill Gas Monitoring

The objective in covering the whole of Cells 6, 7, 8 and 9 with temporary or permanent capping was to separate waste gases from atmospheric gases. With a barrier in place to prevent the exchange of gases, atmospheric gases are not drawn into the waste mass and waste gases cannot escape into the atmosphere. Gas pressure within the waste mass has to be maintained below atmospheric pressure so that the barrier membrane is pressed tightly to the waste surface by atmospheric pressure.

As the temporary cap was being extended, the gas collection system did not always maintain sufficient suction in the waste and the consequence was the build-up of landfill gas beneath the cap, causing it to lift away from the surface, forming characteristic "pillows". However, once the temporary cap was complete, and the wells were all brought on line, the suction applied at the gas compound was able to reduce pressure within the waste mass, removing the excess gas and allowing atmospheric pressure to press the barrier membrane against the waste surface. At this point the gas system needed careful balancing so that the gas extraction met but did not either exceed or fall short of the landfill gas generation rate. The measurement of gas flows at the gas compound after the works were complete and the gas fields balanced therefore is a reliable measurement of the gas yield.

Landfill gas monitoring datasets include measurements of the bulk gas flows to the compound as well as the concentration of gases at each of the wells. The intensive monitoring of the gas field also allows qualitative observations of gas field and well performance. The recent addition of a gas flow meter into the Cell 8 branch of the gas main has allowed more detailed apportioning of flow. Cell 9 has also been monitored intensively since its commencement in January 2025.

## 2.3 Gas Datasets

The monitoring dataset used to examine conditions within Cell 8 is included in Appendix 1, but is summarised on the Figures in Section 3 of this report.

# 3 ANALYSIS OF LANDFILL GAS TRENDS

## 3.1 Cell 8

Gas concentrations in Cell 8 have been monitored in the 4 horizontal wells which lie within the waste mass and gas yield was measured at the gas compound where the separate Cell 8 main enters the flarestack. With the decline in gas yield from Cell 8, the main has been used to combine flows from the active cells with Cell 8. Though several gasses have been recorded, methane and hydrogen sulphide are the key gases for the purposes of this assessment.

### 3.1.1 Methane Concentration

The graph presented below as Figure 3-1 shows the variation in methane concentration with time in Cell 8, from September 2024 when there was no site activity, through January 2025 when infilling in the adjacent Cell 9 resumed through to the present (April 2026). The data shows concentrations of between 40% and 56% in the horizontal wells though the data is somewhat erratic. This behaviour likely to be caused by flow variation during balancing, opening and closing of ports, variable suction etc., but the analysis shows that the methane concentration broadly remains similar throughout, though there is a notable consistent decline in concentration since June 2025.

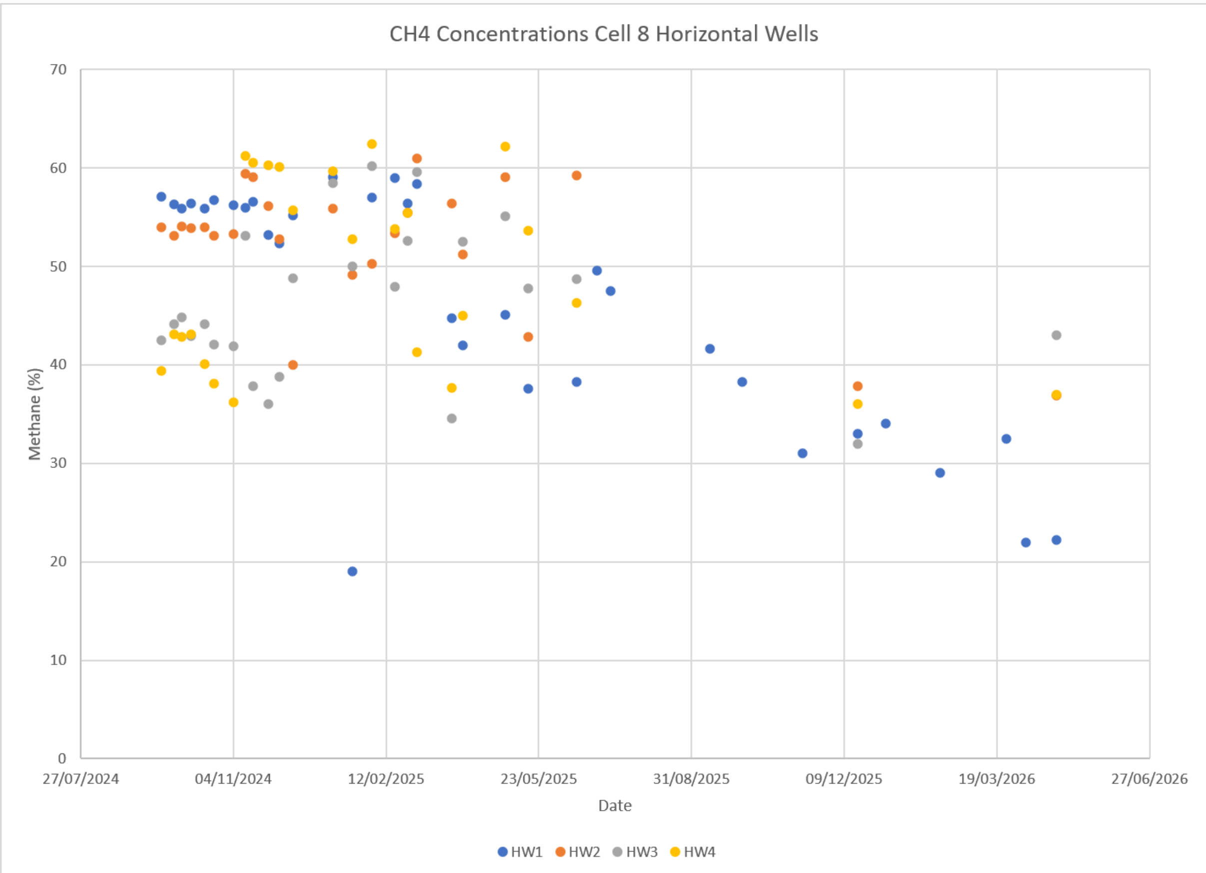


**Figure 3-1 Methane Concentration in Cell 8 Horizontal Wells**

### 3.1.2 Hydrogen Sulphide Concentration

Hydrogen sulphide data from Cell 8 is presented on Figure 3-2 below. It shows that the very highest $H_2S$ concentrations occurred early in the monitoring at HW1. The flat line at 10,000ppm represents that maximum concentration that the instrument can measure, and this is thought to be a clipping pattern caused when the $H_2S$ concentration exceeds the instrument maximum. Concentrations at the time likely exceeded 10,000 ppm, though it is not possible to estimate the actual concentration from the available data.

The graph shows a clear overall reducing trend for all horizontal wells. Collectively, the dataset indicates an initially variable concentration, but a consistent pattern of concentration reduction from the end to 2024 to present. The current concentrations vary between 37ppm and 665ppm.

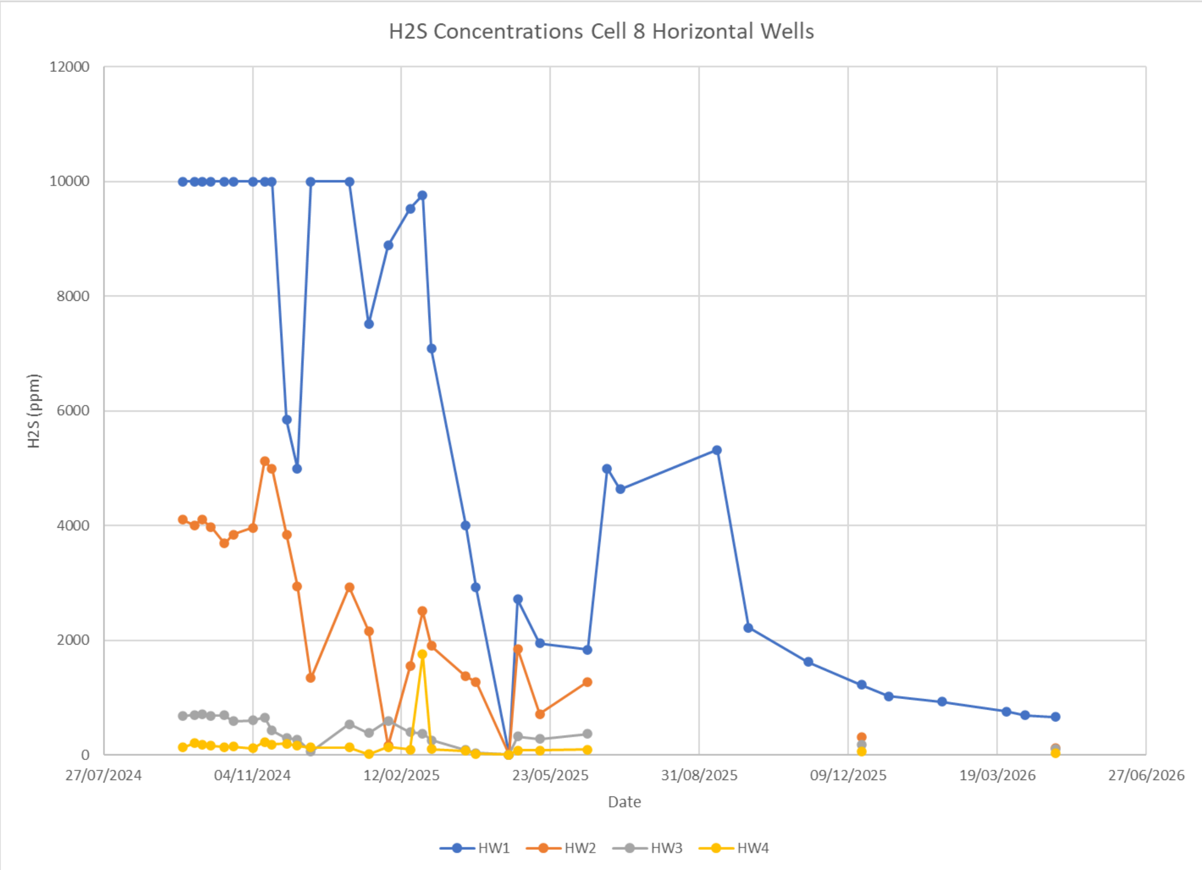


**Figure 3-2 Hydrogen Sulphide Concentrations in Cell 8 Horizontal Wells**

### 3.1.3 Methane/Hydrogen Sulphide Ratios

The ratio between Methane concentration and Hydrogen Sulphide concentration in Cell 8 is shown on Figure 3-3. The ratio is expressed on the graph as the percentage of methane divided by the percentage of Hydrogen Sulphide. This means that an increase in the ratio is a decrease in the proportion of hydrogen sulphide (or an increase in the proportion of methane). Previous graphs have shown that the methane concentrations, though a little "noisy" are essentially remaining similar or declining, whilst hydrogen sulphide concentrations are reducing. This broad conclusion is corroborated by the ratio data on Figure 3-3 which reveals that the ratio of the two gasses is changing consistently as time passes, with hydrogen sulphide reducing as a proportion of the methane.

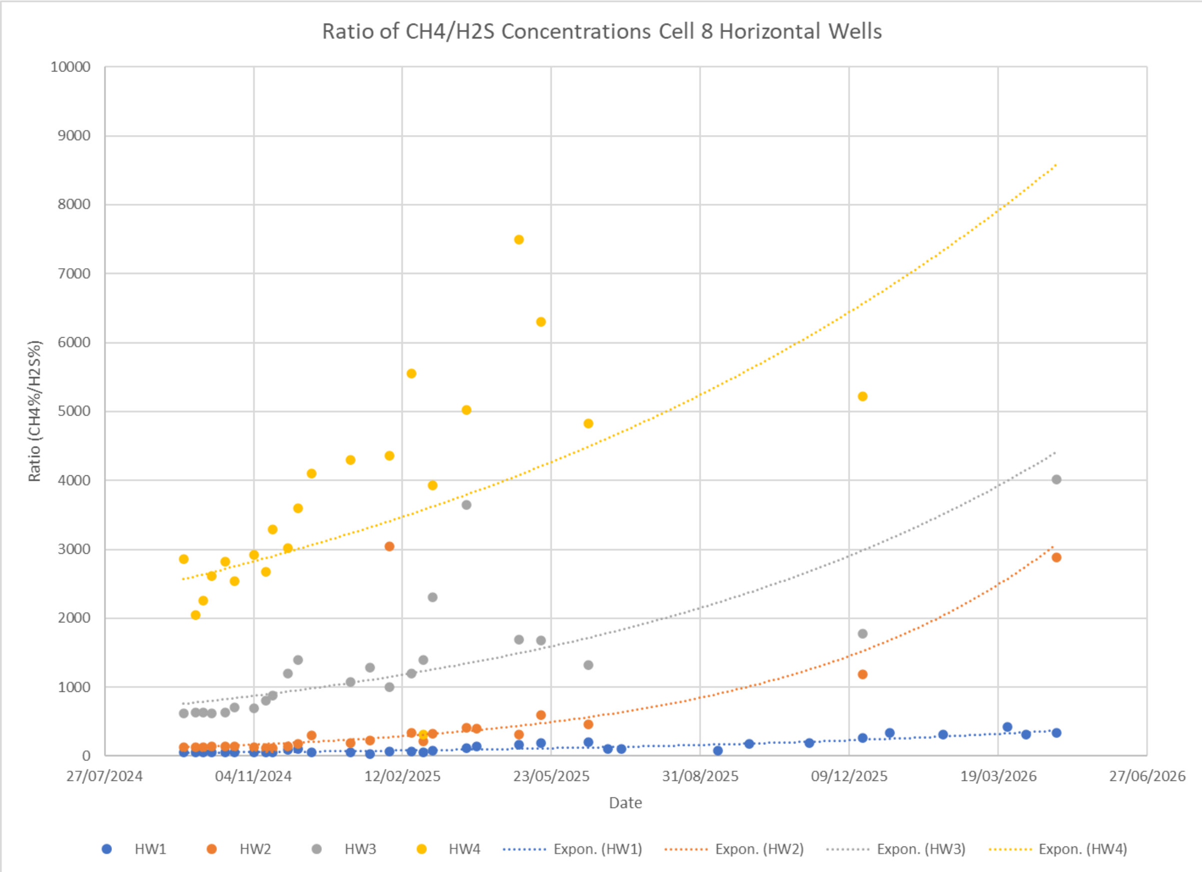


**Figure 3-3 Methane/Hydrogen Sulphide Ratios in Cell 8 Horizontal Wells**

### 3.1.4 Gas Flow

The gas flow rate was measured separately for Cell 8 when a new gas main had been laid to separate the high $H_2S$ gas from the remainder of the gas field (so that it could be treated by flaring rather than ingested into the gas engines). The Cell 8 gas yield data is presented on the graph shown on Figure 3-4. It shows a clear and dramatic reduction in gas yield from the cell over the monitoring period (Sept 2024 to December 2024), from a high of 600m$^3$/hr to a final measurement of 170m$^3$/hr. The data stops in December 2024 because by this time the flow and $H_2S$ concentration were such that the gas could be taken into the engines. Accordingly, the gas flow into the gas compound after this date includes the gases from Cell 8 and the flows are no longer recorded separately.

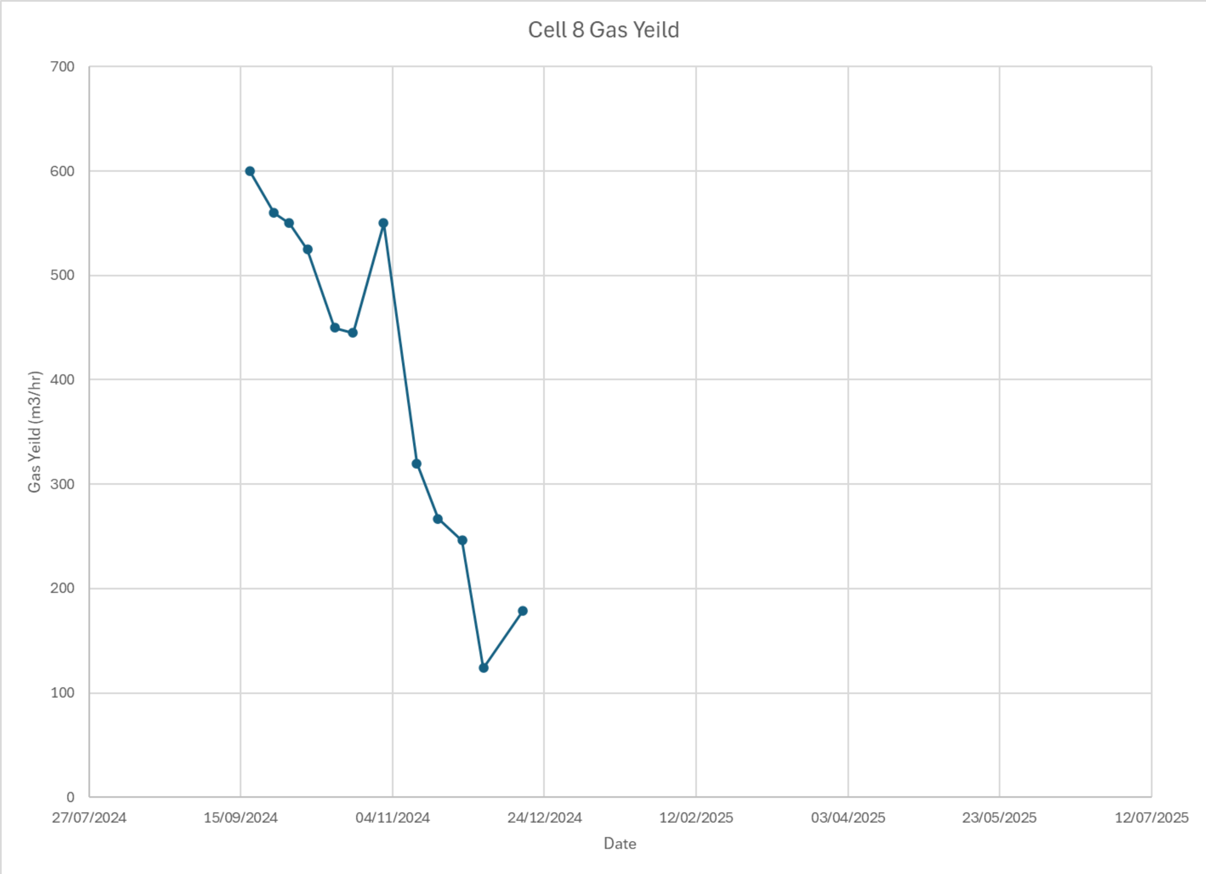


**Figure 3-4 Gas Yield from Cell 8 Measured as Total Flow to Gas Compound**

## 3.2 Gas Monitoring Conclusions

The datasets provide lines of evidence that the quantity of gas generated within Cell 8 has reduced significantly. This has been accompanied by an improvement in gas quality (measured by reducing concentrations of hydrogen sulphide). Currently hydrogen sulphide concentrations in Cell 8 is lower than that of the active cells. Cell 9 operated without any noticeable fugitive emissions and Cell 10 is also being filled without the problems previously seen at Cell 8. This leads to the conclusion that the landfill gasses currently being produced in Cell 8 are now manageable.

The Cell 8 gas main $H_2S$ concentrations recorded from gas samples with laboratory equipment have fallen from in excess of 9000 ppm to a stable 2000-3000ppm between June 2024 and May 2025, with later gas concentrations obtained using field instruments suggesting this trend has continued. The $H_2S$ concentrations recorded with site instruments for HW1 in Cell 8 has fallen from in excess of 10000ppm to current values of less than 665ppm. For other horizontal wells the concentrations are lower and falling.

Data from Cell 9, which was brought into use at the beginning of January 2024 shows hydrogen sulphide concentrations falling from initial values of 2200ppm to values of 1400ppm in mid 2025. The cell 9 wastes have been subjected to waste acceptance procedures to limit sulphate and only fully characterised waste streams are permitted, so the gas yields from Cell 9 show the behavior of a tightly controlled waste material. $H_2S$ concentrations have remained consistent and at around 20% of the values seen when odour problems were being reported in the community.

The gas collection system in Cell 9 (and 10)has proven effective at preventing fugitive emissions of landfill gas (and hydrogen sulphide), with intensive monitoring at the site and in the community failing to reveal hydrogen sulphide emissions or odour problems. The site has shown that with the current gas collection arrangements concentrations of between 1400ppm and 2200ppm can be effectively managed. This is consistent with data from the operation of Cells prior to the problems experienced in the winter of 2023/2024.

The gas yield for Cell 8 has reduced significantly, from circa 600$m^3$/hr when the Cell 8 Main flow monitoring began in September 2024 to circa 150$m^3$/hr in December 2025 when gas separation stopped. The current gas yield is not known, as the whole of Cell 8 gas is now consumed in the engines rather than flared in a separate circuit.

It was anticipated that with time, the flow and concentration of gas (particularly hydrogen sulphide) would reduce, and conditions at some point would be suitable for the resumption of disposal over the temporary capping to Cell 8 and the Valley between Cells 8 and 9. There is now compelling evidence from the monitoring data that Cell 8 is now producing lower concentrations of hydrogen sulphide and in smaller quantities. This leads to the conclusion that the completion of filling in Cell 8 and the valley between Cells 8 and 9 can now commence.

# 4 WASTE ACCEPTANCE PROCEDURES

An investigation into the wastes deposited at Withyhedge prior to the odour emissions in the winter of 2023/2024 has uncovered evidence that points to a particular waste stream causing the problems. This investigation is reported in Geotechnology report number 2473r1v1d1024 and this document provides a framework for avoiding the disposal of wastes that have the chemistry that would allow high levels of hydrogen sulphide to evolve. The revised waste acceptance procedures have been adopted since the resumption of disposal (into Cell 9) are now well established at the site.

Over the 18 months of disposal operations at close to the maximum permissible rate, the fugitive emission of hydrogen sulphide has not been identified by either detailed monitoring or odour complaints. Clearly, the combination of the revised waste acceptance procedures and the gas management implemented at the new cells has proven effective in controlling hydrogen sulphide emissions from the newly placed wastes. If the same waste acceptance procedures and gas collection systems are implemented on wastes placed over Cell 8 and into the surrounding valleys the outcome should be similar.

# 5 INFILLING METHODOLOGY

Permanent capping and restoration works to Cell 8 and the valleys surrounding Cell 9 can only be achieved when wastes have been placed to final design levels. This will require wastes to be placed over the existing temporary cap, so a means collect gasses from the newly placed wastes needs to be devised as well as a means to prevent the temporary cap from adversely influencing the flow of gas and leachate in the long term.

## 5.1 Gas Collection from Fresh Wastes

The gas collection system in Cells 9 and 10 comprises a series of closely spaced horizontal wells with a stone surround. This has proven effective at allowing gas extraction in an active disposal area, as disposal continues over the horizontal wells as the waste level increases. As the system has proven effective, it is intended to continue with this approach to all wastes placed over Cell 8 and into the valleys. There is strong evidence that this will prove effective at collecting gasses from the freshly placed wastes.

## 5.2 Gas Collection from Existing Wastes

Currently, the existing waste mass in Cell 8 is under suction from the existing gas collection system. The temporary cap is pressed flat onto the surface, proving that the atmospheric pressure exceeds the pore-space gas pressure within the waste. Extraction is therefore effective with the current arrangements. Monitoring data described in earlier sections reveals that gas yield from these wastes is dropping and that concentrations of hydrogen sulphide have fallen dramatically to very low levels. Fresh wastes will have to be placed over the existing wastes and as such a strategy to deal with the existing temporary capping will have to be devised.

The three options that have been considered to facilitate placing fresh waste over the existing temporary cap are:

1. Leave the temporary cap and existing gas collection system intact, filling over the top of the barrier membrane
2. Strip off the cap completely in sections immediately ahead of filling
3. Leave the cap in-situ but cut into it at regular intervals to facilitate the exchange of leachate and gas between the existing and new wastes

**Option 1 – Fill Over the Intact Temporary Cap**

This option has the benefit of leaving the current effective gas management arrangements in place. Whilst this will ensure that gas management remains effective, there will be leachate management implications over the whole of the disposal area. The presence of an unbroken barrier within the final waste mass will prevent leachate draining down to the basal leachate collection system. The presence of the interface on the steeper slopes could also have a stability implication. It is undesirable to hinder leachate collection and for this reason alone Option 1 is not favoured.

**Option 2 – Fill over existing wastes after the temporary cap has been completely stripped**

Option 2 reinstates the waste mass as it would have been without the placement of temporary capping. This addresses leachate collection but at the cost of exposing wastes that have proven odorous in the past. The uncovering of wastes that have previously been problematic is a risk that has to be carefully evaluated. Whilst the behaviour of these wastes in terms of gas yield and $H_2S$ concentration has now settled (to behaviour similar to the fresh wastes in Cell 9), it is unclear how the removal of the entire barrier membrane might affect the wastes. For this reason, extreme caution is required.

If the membrane is to be stripped away completely, this should be carried out piecemeal: small sections directly ahead of the tipping face should be exposed so that fresh waste can be immediately placed over the newly exposed existing waste. Once covered with the first 2m lift of fresh waste the gas extraction system for the fresh wastes can be constructed to provide collection for the fresh wastes and any gasses rising from the existing wastes beneath.

Whilst the careful and incremental removal of the temporary cap in sections is straightforward in principle, in practice this risks exposing gassing wastes to the atmosphere. The inevitable loss of suction when the atmospheric barrier is broken may also influence the effectiveness of gas collection from the existing wastes. It is uncertain how the complete removal of the temporary cap, even in stages, would influence the existing wastes and the effectiveness of gas collection within the wastes. It would be possible to investigate this in test areas first (particularly at the toe of the valley slopes, where existing gas concentrations are very low), where the atmosphere around the filling and the gas collection system in the existing wastes are very carefully monitored. If complete removal was favoured when all parties have considered the options then a careful test area should be selected first before implementing the system across the entire area.

**Option 3 – Temporary Cap remains In-situ but is Punctured by Trenches**

Option 3 attempts to find middle ground between the previous options, addressing the perched leachate in Option 1 by providing frequent and extensive breaks in the barrier to allow drainage and addressing fugitive emission risks from Option 2 by carefully digging trenches through the barrier after the first fresh waste layer has been placed. This option will see the disposal area divided into smaller increments, with disposal in each increment beginning with a 2m thick starter waste layer.

After placement of the fresh waste starter layer, a series of parallel trenches will be excavated at 10m centres through the fresh waste and the underlying temporary cap, exposing the existing wastes at the base of the trench. The fresh waste arisings will be cast back into the trench, and each will be fitted with a perforated horizontal gas well in an aggregate surround. The horizontal wells will thus be positioned directly above breaks in the temporary cap, providing the capability to draw gasses into the new collection system from the fresh wastes and any migration from the underlying existing wastes. Exposure of the wastes will be minimized.

Once the first layer and its horizontal gas wells have been placed, filling to final levels will continue above, with the next series of horizontal wells being placed 5m above at 15m centres, following the same pattern as used in Cell 9. Once final levels have been achieved, the next increment will be opened, commencing with the first lift and its horizontal gas wells.

The sequence thus continues across the whole area, progressively placing the starter layer, trenching through the temporary cap and installing horizontal wells before placing subsequent lifts of the fresh waste. Whilst the fresh wastes are being placed the gas extraction system in the existing wastes will continue to function, as the gas connections will be extended and drawn into the gas main. By progressing systematically from south to north, completed areas at finished levels become available for permanent capping, which can be carried out in the same increments.

# 6 PHASING PLAN

The filling of the remaining void space above the Cell 8 temporary cap and the valley between Cell 8 and Cell 9A is to be carried out systematically and sequentially. A series of design drawings are provided in this report to illustrate the progression of the infilling. The drawings are numbered 2563/1 to 2563/7.

Drawings 2563/1 to 2563/7 illustrate the progressive filling over the temporary cap in a series of increments. The infill commences with the filling into the valley between Cells 6&7 and 9. This is currently underway and the valley fill is progressing along with the infilling of Cell 10. The second phase of filling will see the Valley between Cells 8 and 9 filled and to facilitate this an access ramp will be formed at the southeastern corner of Cell 9 dropping to the southern end of the valley. As the valley between Cells 6&7 and Cell 9 is currently being filled, any perched leachate from the valley fill will be collected in the existing infrastructure. The north-western end of the fill area will therefore abut against the existing valley infill.

In order to provide leachate drainage into the existing leachate collection systems, a strip of temporary cap on each side of the valley will be cut to expose the leachate drainage blankets to Cells 8 and 9. Aggregate will be placed to allow positive drainage into the cell collection systems. The filling will lift levels in the valley from existing levels to the same as the sloping surface of Cell 8. A cross section through the Cell 8 and 9 Valley fill is shown on Figure 6-1.

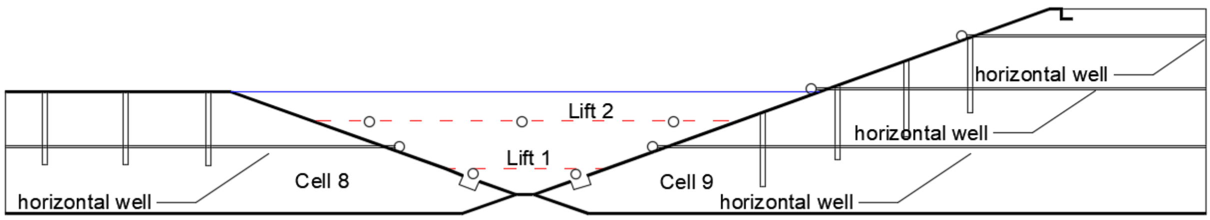


**Figure 6-1 Cross Section Through Cell 8 and Cell 9 Valley Infill**

Drawing 2563/3 to 2563/7 shows the progressive northward filling over Cell 8 and the Cell 8/9 Valley infill. Firstly, a 2m thick layer of waste is placed in a 30m wide strip across the southern edge of Cell 8. The first filling will be against the southern batter. Once the 2m thick waste layer has been placed, a series of three trenches will be dug across the whole width of the cell, with the trenches breaking through the temporary cap into the existing wastes below. The trenches will be backfilled by casting arisings into the trench, minimizing the time that the existing wastes are exposed. After the trenches have been excavated, horizontal gas wells will be placed into the trenches before backfilling to the full height of the starter layer. Once complete, filling will continue to the cell restoration final levels and another set of horizontal wells will be placed. As the first area nears final levels, the next 30m increment is opened with the 2m starter layer, as shown on Drawing 2563/4. Figure 6-2 shows a cross section through the progressive infilling at Phase 4.

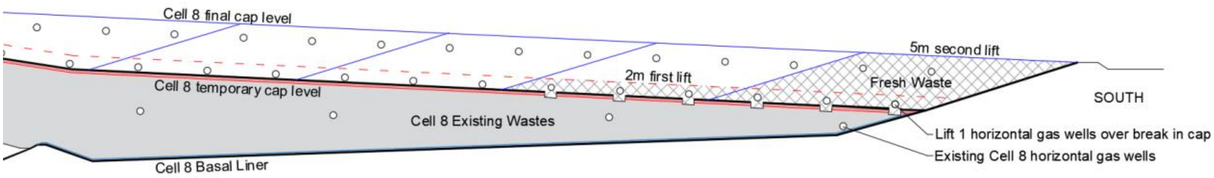


**Figure 6-2 Section Through Cell 8 Infill Showing Progressive Northward Filling**

Drawings 2563/5 to 2563/7 show how the active disposal area moves across the cell footprint, filling Cell 8 to final levels in a series of 30m strips progressing northward. Upon completion of this infilling plan, the Valley between Cells 8 and 9 as well as the surface of Cell 8 will be completed to finished restoration levels, allowing permanent restoration.

# 7 GAS INFRASTRUCTURE

## 7.1 Horizontal Wells

Gas extraction infrastructure is to be installed progressively as the fresh waste is placed over the existing wastes. Initially, the first 2m lift of fresh wastes will be placed over the temporary cap allowing the first layer of horizontal gas wells to be placed with an aggregate surround. The horizontal gas wells will be connected to the gas main so that suction can be applied and gases removed. After the first layer of gas wells are installed more fresh wastes will be placed to a thickness of 5m, when the next series of horizontal gas wells will be placed. The pattern of horizontal gas wells is shown on Figures 6-1 and 6-2.

## 7.2 Pin Wells

Pin wells driven into Cell 8 and 9 have proven to be of limited effectiveness in controlling gas within the waste, and have made a meaningful contribution only for the shallowest wastes for a short period of time. For this reason horizontal wells will be the means to control gases form the fresh wastes until the permanent cap is in place and the standard arrangement of gas wells is installed.

## 7.3 Permanent Gas Wells

When final levels are achieved permanent gas wells will be installed as shown on Drawing 2563/16r1 (noting that the Cell 9 gas wells are already installed). The wells will be spaced on a 30m triangular grid, following the same pattern as the existing gas field at the site. The wells will comprise 225mm diameter perforated SDR 18 hdpe pipes butt welded to the correct length and installed into 450mm diameter wells drilled through the waste. A standoff of 3m between the base of the well and the base of the landfill will be maintained. The wells will be connected to the header main via a spur from the main currently passing between Cell 8 and Cell 9.

## 7.4 Construction Quality Assurance

All gas infrastructure will be installed under full CQA supervision, adopting designs and procedures for the monitoring of construction described in a Gas Infrastructure CQA Plan. After each phase of works (eg Horizontal Wells at each lift, first series of gas wells) the CQA records will be made available to NRW so that as-built records accumulate progressively as the area is filled.

# 8 SURFACE WATER MANAGEMENT

Surface water runoff from Cell 8 and the Cell 8/9 Valley is currently collected in a sump at the eastern end of the Cell 6&7/9 Valley, at the location shown on Drawing 2563/1. This sump was constructed to prevent surface runoff entering the waste being placed into the Cell 6&7/9 Valley, and is referred to as Sump 1 on the drawings. It is fitted with a pump that removes accumulated runoff through a pipeline to the perimeter surface water drainage system, through which it passes to the Phase 2 pond system. The current system is to be supplemented with a rain flap to ensure all rainfall runoff is captured onto the cap of Cell 8 before flowing into the southern surface water pond and from there overspilling into the Cell 8/9 Valley.

Once the Cell 6&7/9 Valley is filled to level, filling will progress into the Cell 8/9 Valley (Drawing 2563/2), requiring Sump 1 to be decommissioned. The pumps will be relocated to the southern surface water pond in Cell 8, allowing the Cell 8/9 Valley to be filled. The existing surface water pond in Cell 8 will therefore become Sump 2. Runoff from Cell 8 will be retained by the existing edge bund, supplemented with the new rainflap and will all report to the southern surface water pond (Sump 2).

When the Cell 8/9 Valley is filled, Cell 8 will be raised to finished levels by progressively filling northward from the southern rim of the cell. The drawings show a south to north sequence of filling, so filling will commence at the surface water pond (Sump 2) meaning that it has to be decommissioned prior to the commencement of the Cell 8 infill.

The southern half of the temporary cap to Cell 8 is a gently sloping surface, whilst the northern half is a steeper, less regular surface rising from the lower plateau to the summit of the landfill. The line dividing the two topographic areas is marked by a curved bund. This was originally a toe bund beneath the steeper waste flank. The temporary liner passes over the bund and this forms surface water containment. Until now, water has been allowed to build up and eventually overspill the bund, with the overspill running across the lower plateau of Cell 8 to the southern surface water pond (Sump 2). As this forms a convenient and existing means of capture, it will be repurposed to become Sump 3.

Sump 3 will become active just before filling work commences at the southern end of Cell 8. This will allow runoff from the upper half of the cell to be collected whilst infilling progresses northward. The southern half of Cell 8 will be brought to final level whilst Sump 3 is active (Drawing 2563/6). The final stage of infilling will be the northern half of Cell 8 (Drawing 2563/7). At this stage surface water separation becomes ineffective and complex and given the relatively small volume of void space and the short duration of infilling, surface water pumping will cease.

# 9 EMERGENCY PROCEDURES

With the safeguard of robust waste acceptance procedures and a fully upgraded landfill gas management system in place it is expected that the site will behave as a normal landfill, without the unacceptable off-site odours seen in late 2023 and the first half of 2024. However, RML is determined that in the event that unexpected behaviour was to be seen it could act promptly in response to monitoring data and intervene before any issues are noticed beyond the site boundary.

RML has a range of emergency procedures that could be applied in the event that monitoring data was to show the landfill mass behaving unexpectedly. Initially, a reduction in waste inputs coupled with increased intermediate cover could be implemented quickly whilst a period of more intense monitoring is undertaken. This could include Gazomat surveys of the entire surface to examine fugitive emission, as well as increased monitoring frequencies in the fixed gas monitors and gas bag analysis. The deployment of a Jerome instrument would also likely to be used in this more intense monitoring period.

Adjustment of the gas extraction system could be a response to any unexpected gas behaviour of the waste mass. By adjusting the suction at pin wells and horizontal wells stronger extraction may be possible, though the ingress of oxygen on uncapped areas with strong suction will have to be assessed. If the Gazomat surveys reveal areas of fugitive emission where gas collection infrastructure could be improved with the provision of pin wells then these can be procured at short notice. Aggregate, bentonite and pre-fabricated well screens as well as a pin will be kept on site to ensure a speedy response should it be needed.

In the event of a significant risk that unacceptable emissions could occur, RML may decide that temporary or permanent capping is required and filling may have to be interrupted. It would normally take some time to organise specialist contractors and to procure specialist materials from European sources. RML will therefore maintain on site a stockpile of capping materials such that any part of all of the area could be capped upon mobilisation of a specialist contractor (normally available at several days or a weeks notice). This will require that 25,700m$^2$ of 1mm textured LLDPE and 7S250D/NW8 Pozidrain are kept on site from the outset.

As well as the geosynthetics, sufficient soil will have to be retained on site to perform the permanent cap (39,100 tonnes) and a thick regulating layer/intermediate cover (12,200 tonnes).

A CQA Plan for the permanent capping and temporary capping of the area will be prepared so that any emergency intervention is not awaiting documentation and authorisation.

# 10 MONITORING INFRASTRUCTURE

Gas taps will be fitted to the horizontal collection pipes to allow regular gas concentration data to be gathered. It is anticipated that weekly gas measurements will be made with a hand portable instrument. When waste levels are sufficiently high to place permanent wells the wells will also be fitted with gas taps to allow monitoring. Prior to the use of pin wells, weekly Gazomat surveys will be undertaken across the surface of the waste to quantify surface emissions.

# 11 MONITORING ODOUR

The site has a functioning AQ Mesh system to monitor hydrogen sulfide concentrations in the air at the site boundary and in the community beyond. Within the site boundary diffusion tubes are placed at critical locations and the diffusion tubes in the community continue to gather data. At the local school a high sensitivity real time monitoring system records hydrogen sulphide concentration continuously. Geotechnology will continue to visit set locations in the locality to monitor both odour and if required to use the Jerome instrument to measure hydrogen sulphide concentrations.


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LEGEND

- Prominent Contour (5.0m)
- Normal Contour (1.0m)
- Fill Area

NOTES

Background digital survey model generated using Pix4D image processing software. Background Image from May 2026 Drone Survey.

Phase 1 filling shows Cells 9 & 10 filled to final pre-settlement top of waste levels, with stable temporary sideslopes at 1v:3h gradient

PROJECT

**Withyhedge Cell 8 & 9 Phasing Plans**

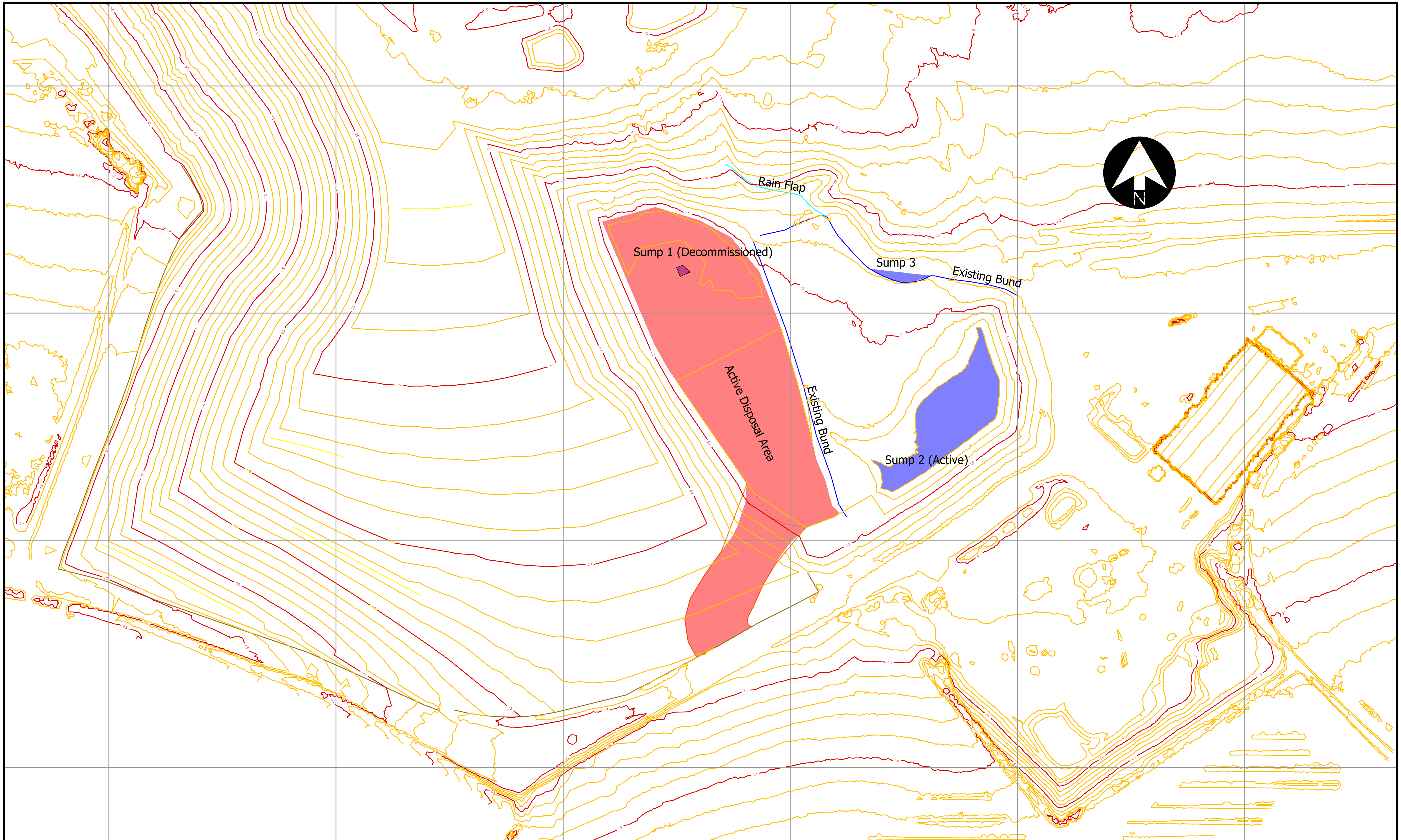
TITLE

**Cell 8 Fill Phase 1**

| DRAWING NUMBER | | |
|---|---|---|
| **2563/01** | | |
| SCALE AT A3 | DATE | DRAWN |
| **1:1500** | **06.26** | **KJT** |

NOTE

GEO TECHNOLOGY




LEGEND

| | |
|---|---|
| 60 | Prominent Contour (5.0m) |
| | Normal Contour (1.0m) |
| | Fill Area |

NOTES

Background digital survey model generated using Pix4D image processing software.

Phase 2 filling forms a ramp into the area and raises Cell 8/9 valley to 54mAOD.

PROJECT: **Withyhedge Cell 8 & 9 Phasing Plans**

TITLE: **Cell 8 & 9 Fill Phase 2**

DRAWING NUMBER: **2563/02**

SCALE AT A3: **1:1500**

DATE: **06.26**

DRAWN: **KJT**

NOTE

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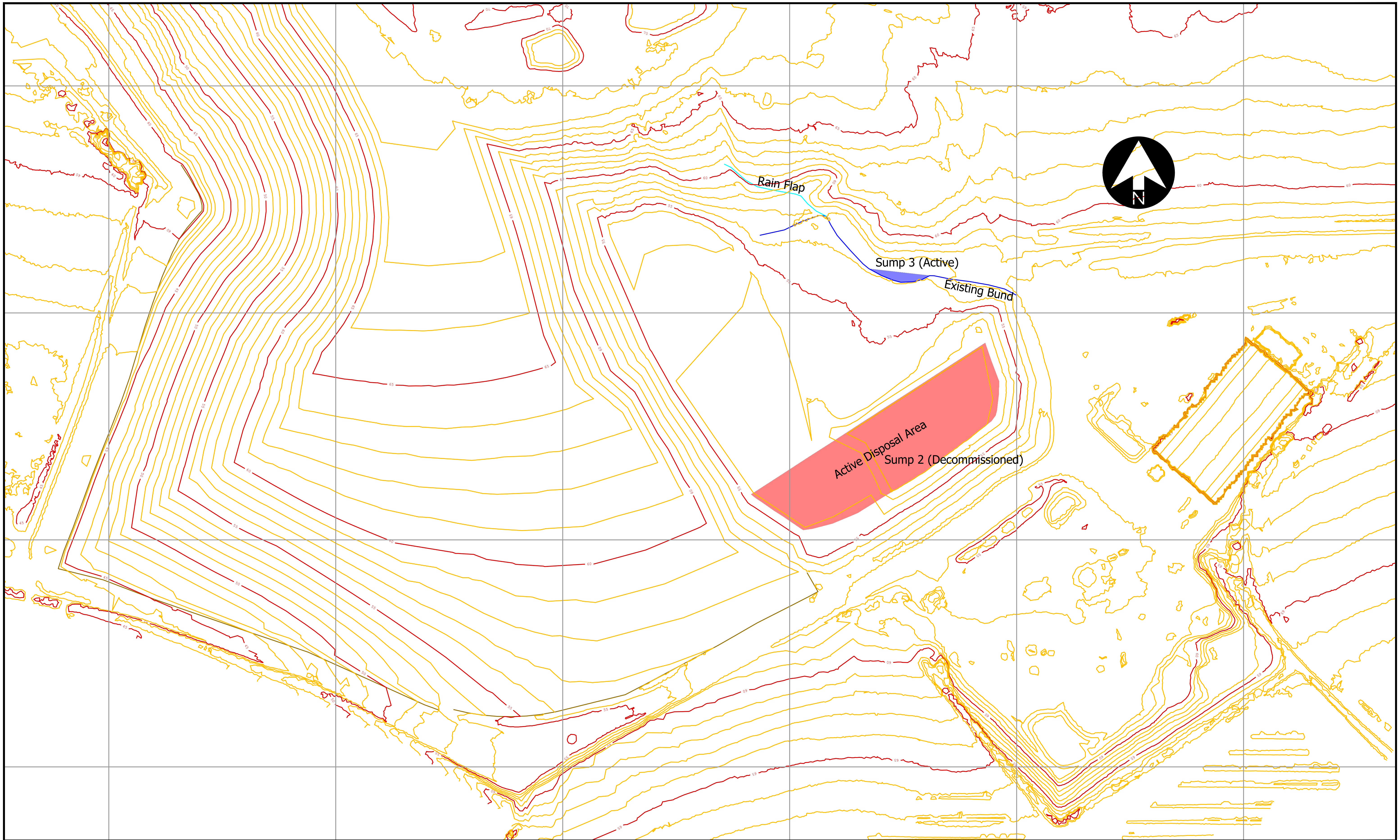
GEO TECHNOLOGY




| | |
|---|---|
| LEGEND | |
| 60 | Prominent Contour (5.0m) |
| | Normal Contour (1.0m) |
| | Fill Area |

NOTES

Background digital survey model generated using Pix4D image processing software.

Phase 3 filling of a nominal 2m starter layer on the southern strip of Cell 8.

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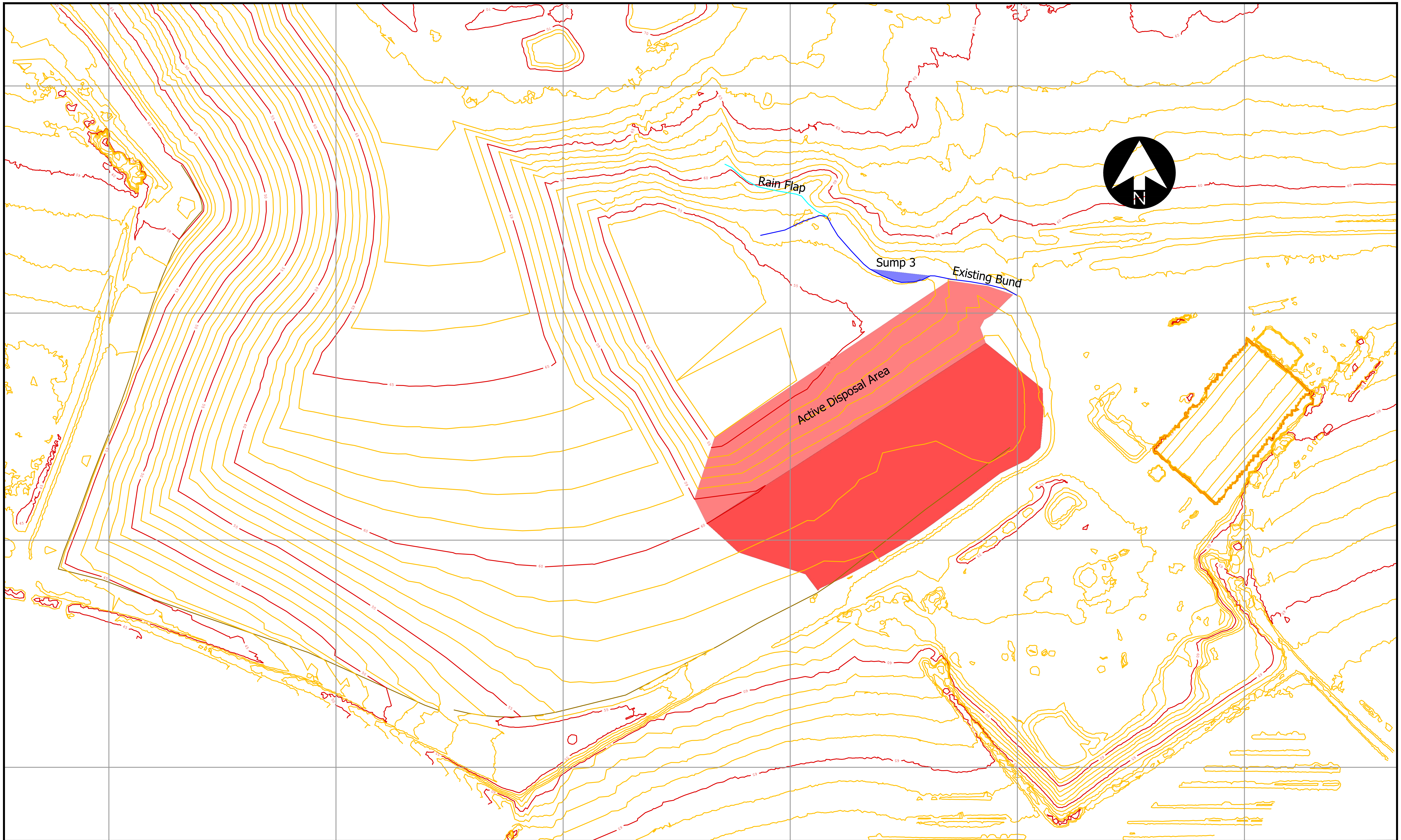
PROJECT
**Withyhedge Cell 8 & 9**
**Phasing Plans**

TITLE
**Cell 8 & 9 Fill Phase 3**

| DRAWING NUMBER | | |
|---|---|---|
| **2563/03** | | |
| SCALE AT A3 | DATE | DRAWN |
| **1:1500** | **06.26** | **KJT** |
| NOTE | | |

GEO TECHNOLOGY

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RESOURCES MANAGEMENT UK LTD

LEGEND

| | |
|---|---|
| 60 | Prominent Contour (5.0m) |
| | Normal Contour (1.0m) |
| | Fill Area |

NOTES

Background digital survey model generated using Pix4D image processing software.

Phase 4 filling raises southern strip of Cell 8 and valley to final pre-settlement top of waste levels. Variable thickness started layer placed over next strip to the north.

PROJECT

**Withyhedge Cell 8 & 9 Phasing Plans**

TITLE

**Cell 8 & 9 Fill Phase 4**

DRAWING NUMBER: **2563/04**

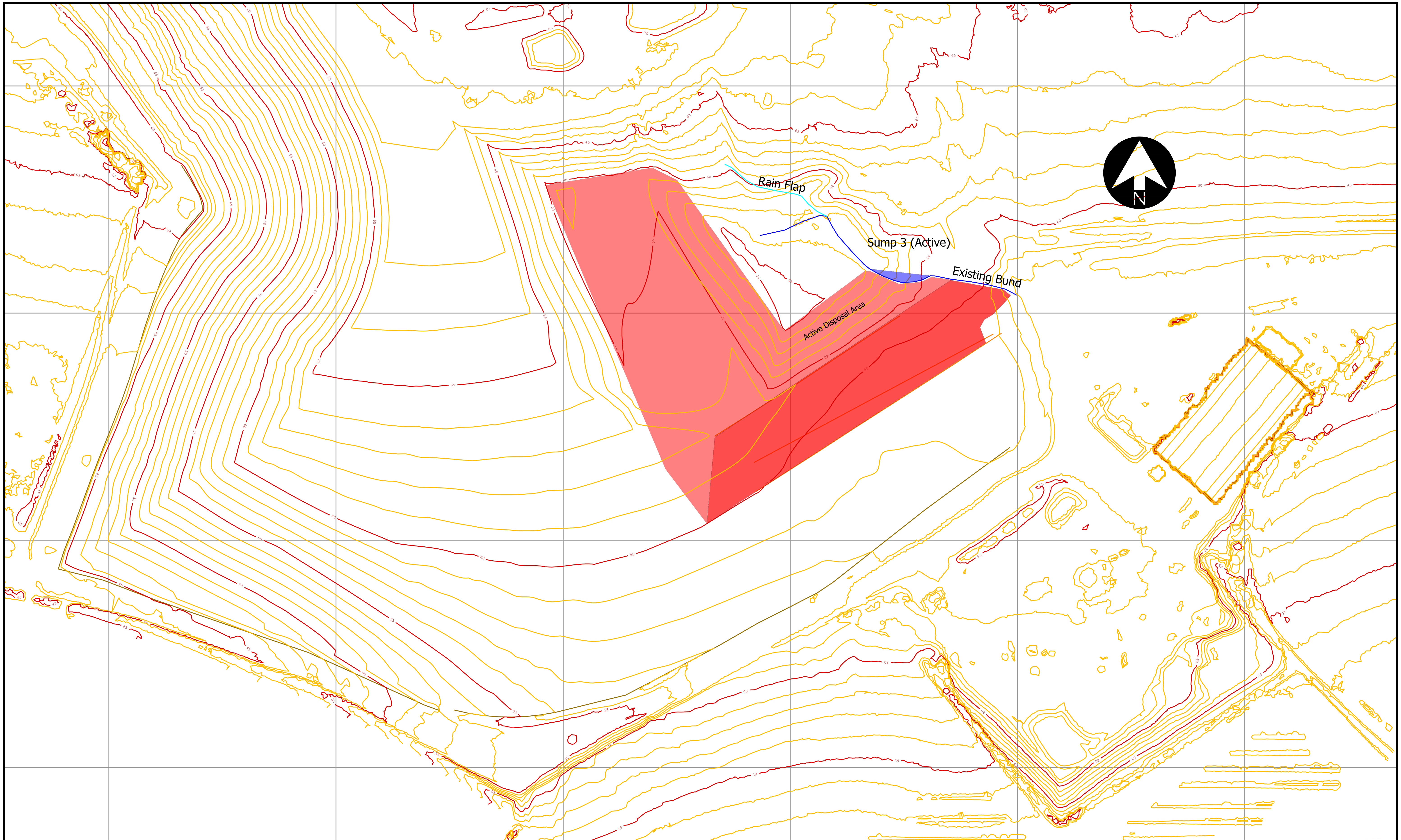
SCALE AT A3: **1:1500**

DATE: **06.26**

DRAWN: **KJT**

NOTE

Geo TECHNOLOGY




LEGEND

| | |
|---|---|
| 60 | Prominent Contour (5.0m) |
| | Normal Contour (1.0m) |
| | Fill Area |

NOTES

Background digital survey model generated using Pix4D image processing software.

Phase 5 filling raises second strip of Cell 8 and valley to final pre-settlement top of waste levels. Variable thickness started layer placed over next strip to the north.

PROJECT

**Withyhedge Cell 8 & 9 Phasing Plans**

TITLE

**Cell 8 & 9 Fill Phase 5**

DRAWING NUMBER **2563/05**

SCALE AT A3 **1:1500**

DATE **06.26**

DRAWN **KJT**

NOTE

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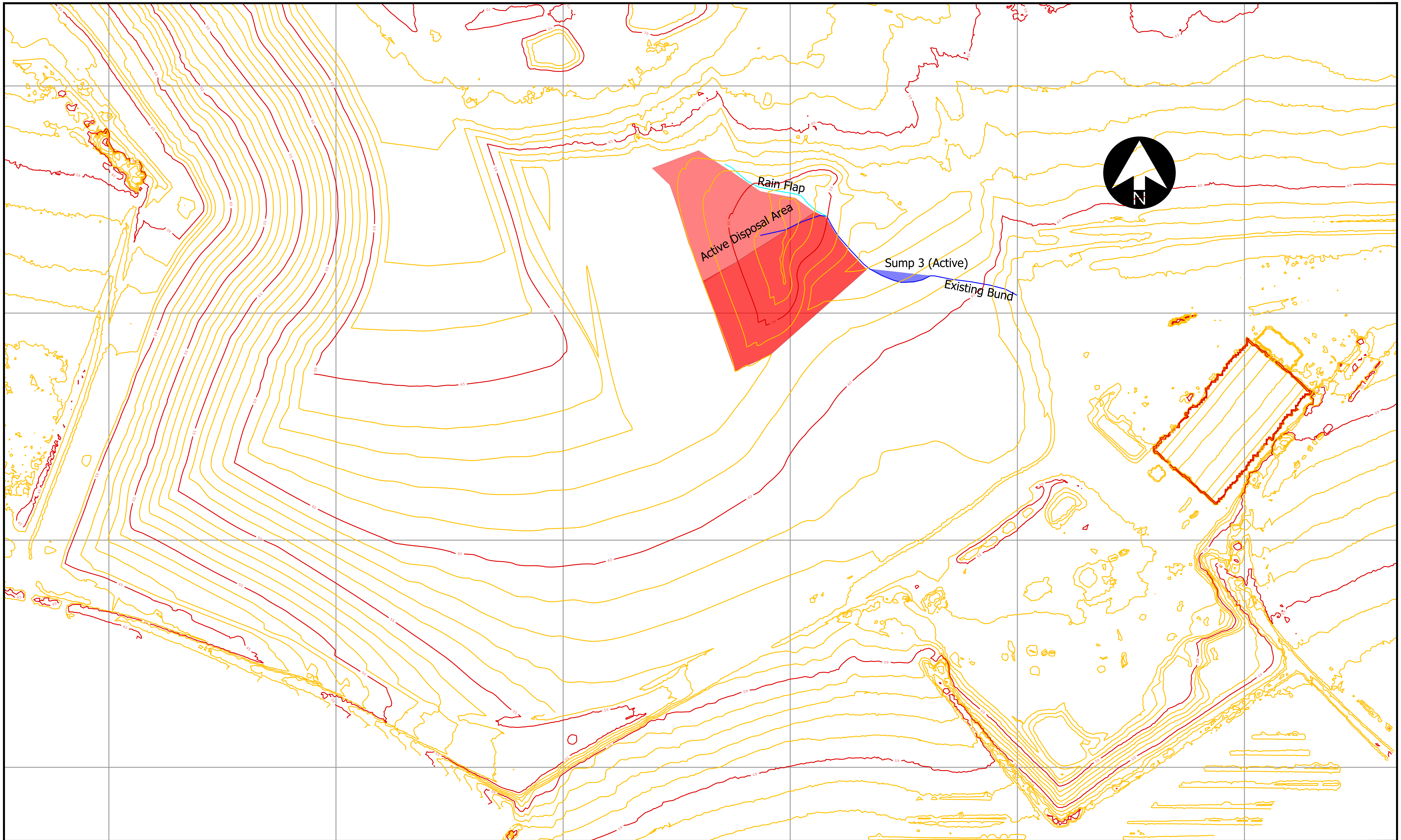
GEO TECHNOLOGY




| LEGEND | |
|---|---|
| 60 | Prominent Contour (5.0m) |
| | Normal Contour (1.0m) |
| | Fill Area |

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NOTES

Background digital survey model generated using Pix4D image processing software.

Phase 7 filling raises fourth strip of Cell 8 and valley to final pre-settlement top of waste levels. Variable thickness started layer placed over next strip to the north.

PROJECT

**Withyhedge Cell 8 & 9**
**Phasing Plans**

TITLE

**Cell 8 & 9 Fill Phase 6**

DRAWING NUMBER **2563/06**

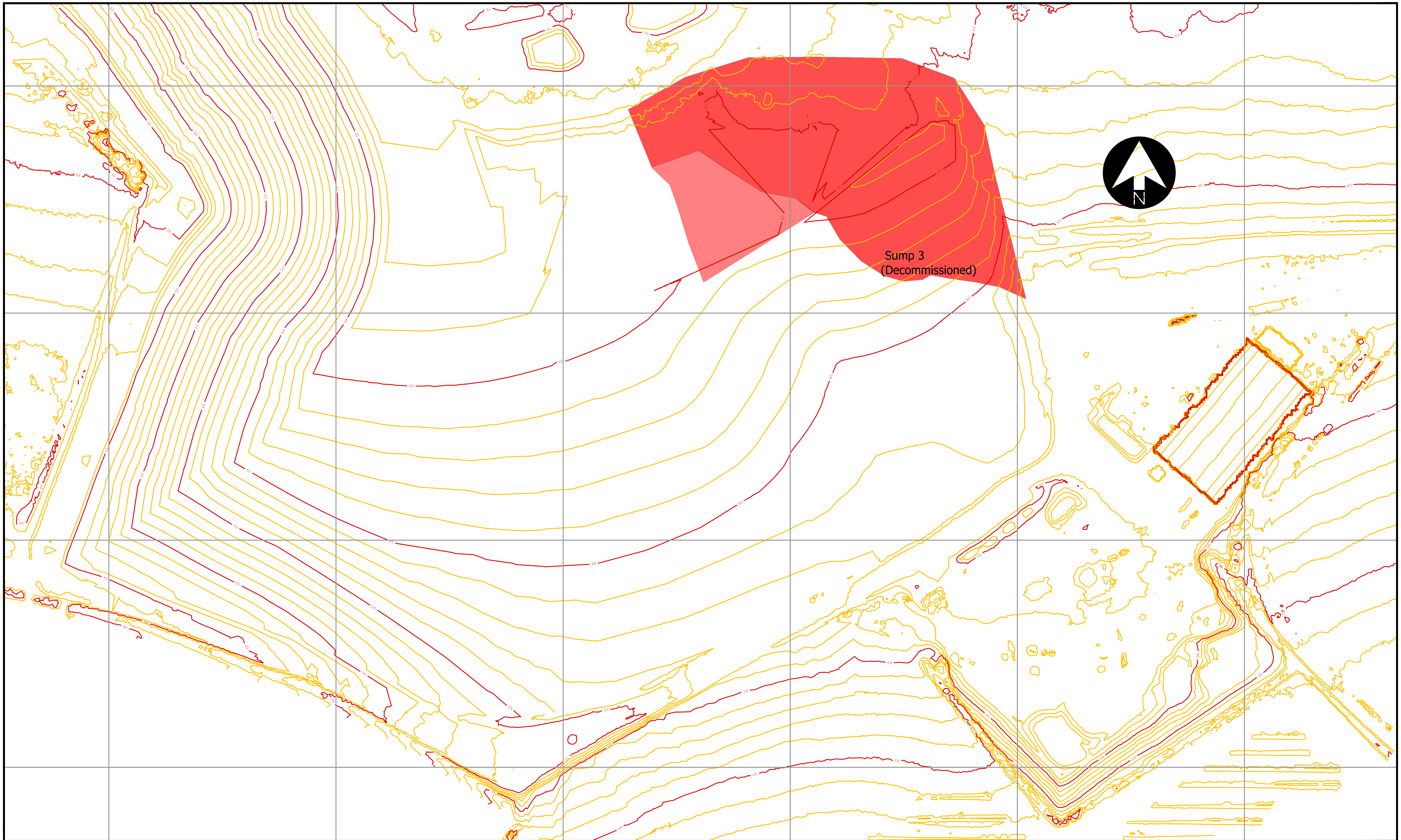
SCALE AT A3 **1:1500**

DATE **06.25**

DRAWN **KJT**

NOTE

Geo TECHNOLOGY




| | |
|---|---|
| LEGEND | |
| 60 | Prominent Contour (5.0m) |
| | Normal Contour (1.0m) |
| | Fill Area |

NOTES

Background digital survey model generated using Pix4D image processing software.

Phase 7 filling raises fourth strip of Cell 8 and valley to final pre-settlement top of waste levels. Variable thickness started layer placed over next strip to the north.

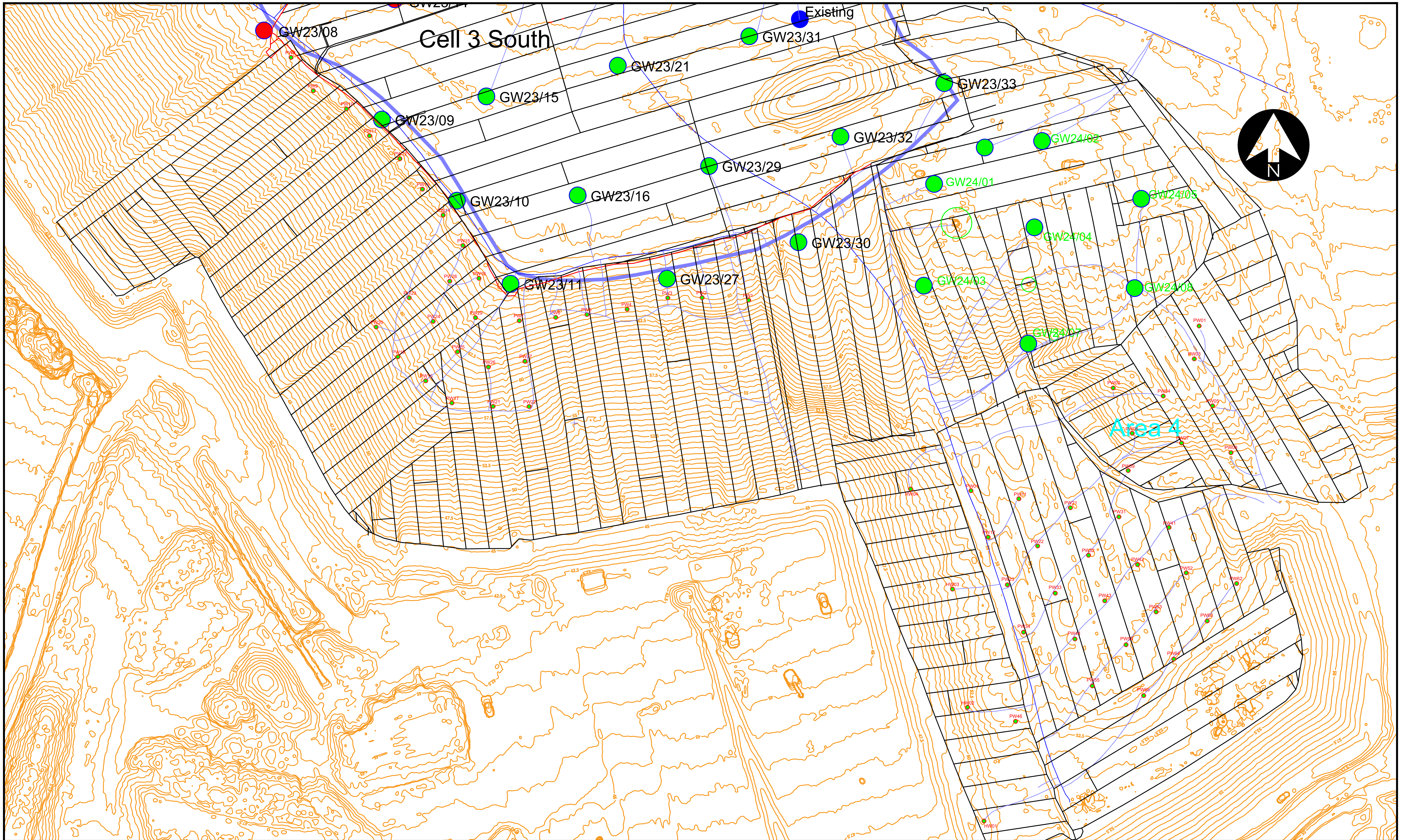
PROJECT

**Withyhedge Cell 8 & 9 Phasing Plans**

TITLE

**Cell 8 & 9 Fill Phase 7**

| DRAWING NUMBER | | |
|---|---|---|
| **2563/07** | | |
| SCALE AT A3 | DATE | DRAWN |
| **1:1500** | **06.25** | **KJT** |
| NOTE | | |

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LEGEND

GW Permanent Gas Well

PW04 Pin Well / Horizontal Well

NOTES

Existing topography from October 2023 Drone Survey at 1.0m contour interval.

PROJECT

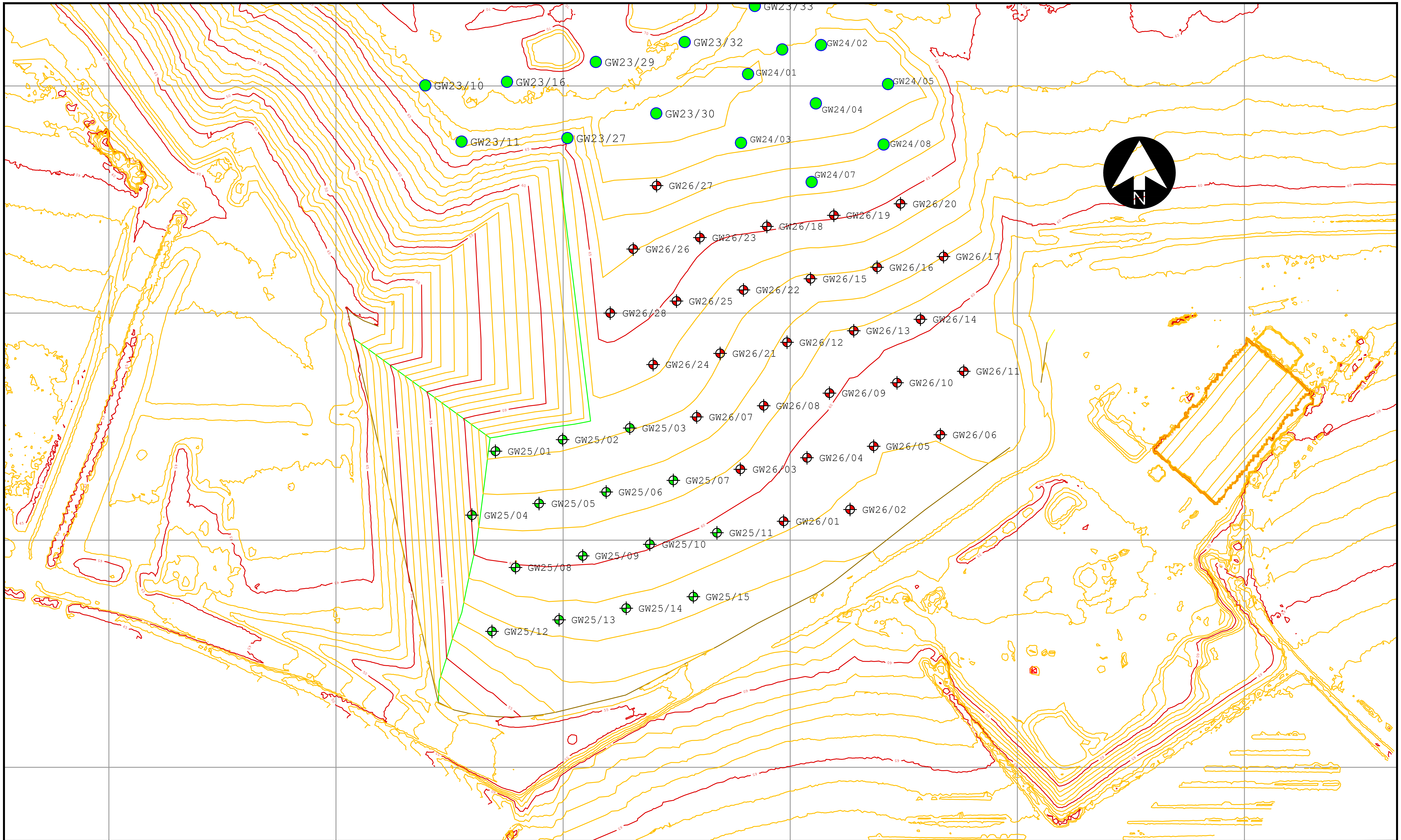
**Withyhedge Landfill**
**Phase 2 Cell 8**

TITLE

**Existing Gas Collection System, Cell 8**

| DRAWING NUMBER | | |
|---|---|---|
| **2563/15** | | |
| SCALE AT A3 | DATE | DRAWN |
| **1:1000** | **11.23** | **KJT** |
| NOTE | | |

GEO TECHNOLOGY




RML RESOURCES MANAGEMENT UK LTD

LEGEND

| | |
|---|---|
| GW24/03 | Existing Gas Well |
| GW25/03 | Cell 9 Existing Gas Well |
| GW26/07 | Cell 8 and Valleys Gas Wells |

NOTES

Background digital survey model generated using Pix4D image processing software.

PROJECT

**Withyhedge Cell 8 Infilling**

TITLE

**Cell 8 & 9 Gas Wells**

DRAWING NUMBER **2563/16r1**

SCALE AT A3 **1:1500**

DATE **05.26**

DRAWN **KJT**

NOTE

GeO TECHNOLOGY

# WITHYHEDGE LANDFILL CELL 8 AND CELL 8/9 VALLEY

Infilling Plan

Appendix 1
Gas Monitoring Data Set for Cell 8
*Report Number 2563r1v3d0626*

**Cell 8 Horizontal Well Data**

| Date | Gas | HW1 | HW2 | HW3 | HW4 |
|---|---|---|---|---|---|
| 18/09/2024 | CH4 | 57.1 | 54 | 42.5 | 39.4 |
| | O2 | 0.6 | 0.7 | 0.8 | 0.3 |
| | C0 | 26 | 29 | 16 | 8 |
| | H2s | 10000+ | 4102 | 682 | 138 |
| 26/09/2024 | CH4 | 56.3 | 53.1 | 44.1 | 43.1 |
| | O2 | 1 | 0.6 | 0.7 | 0.2 |
| | C0 | 35 | 22 | 20 | 10 |
| | H2s | 10000+ | 4008 | 702 | 210 |
| 01/10/2024 | CH4 | 55.9 | 54.1 | 44.8 | 42.8 |
| | O2 | 0.8 | 0.5 | 0.6 | 0.1 |
| | CO | 28 | 19 | 24 | 15 |
| | H2s | 10000+ | 4103 | 708 | 190 |
| 07/10/2024 | CH4 | 56.4 | 53.9 | 42.9 | 43.1 |
| | O2 | 0.6 | 0.6 | 0.5 | 0.3 |
| | C0 | 25 | 24 | 32 | 12 |
| | H2s | 10000+ | 3980 | 690 | 165 |
| 16/10/2024 | CH4 | 55.9 | 54 | 44.1 | 40.1 |
| | O2 | 0.7 | 0.5 | 0.6 | 0.4 |
| | CO | 21 | 26 | 23 | 19 |
| | H2s | 10000+ | 3695 | 695 | 142 |
| 22/10/2024 | CH4 | 56.7 | 53.1 | 42.1 | 38.1 |
| | O2 | 0.5 | 0.5 | 0.7 | 0.6 |
| | CO | 23 | 22 | 19 | 21 |
| | H2s | 9999 | 3850 | 592 | 150 |
| 04/11/2024 | CH4 | 56.2 | 53.3 | 41.9 | 36.2 |
| | O2 | 0.7 | 0.7 | 0.1 | 0.2 |
| | CO | 29 | 27 | 19 | 9 |
| | H2S | 10000+ | 3963 | 608 | 124 |
| 12/11/2024 | CH4 | 56 | 59.4 | 53.1 | 61.2 |
| | O2 | 2.7 | 0.1 | 0.1 | 0.2 |
| | C0 | 20 | 32 | 25 | 21 |
| | H2S | 9999 | 5123 | 658 | 229 |
| 17/11/2024 | CH4 | 56.6 | 59.1 | 37.8 | 60.5 |
| | O2 | 2.5 | 0.1 | 0.4 | 0.2 |
| | CO | 23 | 405 | 91 | 91 |
| | H2s | 50004 | 5000 | 433 | 184 |
| 27/11/2024 | CH4 | 53.2 | 56.1 | 36 | 60.3 |
| | O2 | 0.2 | 0.3 | 0.8 | 0.2 |
| | CO | 33 | 30 | 22 | 19 |
| | H2s | 5850 | 3850 | 300 | 200 |
| 04/12/2024 | CH4 | 52.3 | 52.8 | 38.8 | 60.1 |
| | O2 | 0.2 | 0.1 | 0.3 | 0.2 |
| | CO | 393 | 204 | 66 | 75 |
| | H2s | 5000 | 2944 | 279 | 167 |

| | | | | | |
|---|---|---|---|---|---|
| 13/12/2024 | CH4 | 55.2 | 40 | 48.8 | 55.7 |
| | O2 | 0.4 | 0.2 | 0.3 | 0.2 |
| | CO | 41 | 26 | 23 | 13 |
| | H2s | 9999 | 1343 | 60 | 136 |
| 08/01/2025 | CH4 | 59.1 | 55.9 | 58.5 | 59.7 |
| | O2 | 0.3 | 0.3 | 0.2 | 0.2 |
| | CO | 34 | 23 | 16 | 14 |
| | H2s | 9999 | 2934 | 545 | 139 |
| 21/01/2025 | CH4 | 19 | 49.1 | 50 | 52.8 |
| | O2 | 6.6 | 0.3 | 1.2 | 1.3 |
| | CO | 12 | 24 | 41 | 198 |
| | H2s | 7511 | 2163 | 388 | 21 |
| 03/02/2025 | CH4 | 57 | 50.3 | 60.2 | 62.4 |
| | O2 | 0.2 | 19.6 | 0.1 | 0.1 |
| | CO | 253 | 41 | 48 | 49 |
| | H2s | 8885 | 165 | 603 | 143 |
| 18/02/2025 | CH4 | 59 | 53.4 | 47.9 | 53.8 |
| | O2 | 0.1 | 0.2 | 0.4 | 0.2 |
| | CO | 28 | 18 | 16 | 14 |
| | H2s | 9532 | 1554 | 399 | 97 |
| 26/02/2025 | CH4 | 56.4 | 55.4 | 52.6 | 55.4 |
| | O2 | 0.1 | 0.1 | 0.4 | 0.2 |
| | CO | 493 | 176 | 67 | 64 |
| | H2s | 9763 | 2511 | 377 | 1759 |
| 04/03/2025 | CH4 | 58.4 | 61 | 59.6 | 41.3 |
| | O2 | 0.1 | 0.1 | 0.2 | 1.5 |
| | CO | 150 | 27 | 14 | 15 |
| | H2s | 7086 | 1908 | 258 | 105 |
| 27/03/2025 | CH4 | 44.7 | 56.4 | 34.6 | 37.7 |
| | O2 | 0.5 | 0.2 | 0.1 | 0.1 |
| | CO | 236 | 172 | 152 | 189 |
| | H2s | 4004 | 1374 | 95 | 75 |
| 03/04/2025 | CH4 | 42 | 51.2 | 52.5 | 45 |
| | O2 | 0.7 | 0.2 | 0.2 | 0.3 |
| | CO | 416 | 70 | 28 | 15 |
| | H2s | 2928 | 1282 | 41 | 28 |
| 25/04/2025 | CH4 | 39.5 | 49.3 | 52.9 | 59.1 |
| | O2 | 0.2 | 0.1 | 0.3 | 0.2 |
| | CO | 6 | 9 | 6 | 3 |
| | H2s | 10 | 10 | 10 | 10 |
| 01/05/2025 | CH4 | 45.1 | 59.1 | 55.1 | 62.2 |
| | O2 | 0.1 | 0.1 | 0.2 | 0.2 |
| | CO | 740 | 863 | 48 | 45 |
| | H2s | 2717 | 1856 | 327 | 83 |
| 16/05/2025 | CH4 | 37.6 | 42.8 | 47.8 | 53.6 |
| | O2 | 0.4 | 0.3 | 0.3 | 0.2 |
| | CO | 74 | 40 | 31 | 27 |

| | | | | | |
|---|---|---|---|---|---|
| | H2S | 1948 | 722 | 285 | 85 |
| 17/06/2025 | CH4 | 38.3 | 59.2 | 48.7 | 46.3 |
| | O2 | 0.1 | 0.1 | 0.2 | 0.2 |
| | CO | 217 | 102 | 40 | 35 |
| | H2S | 1837 | 1276 | 369 | 96 |
| 30/06/2026 | CH4 | 49.6 | | | |
| | O2 | 0.2 | | | |
| | CO | 13 | | | |
| | H2s | 4999 | | | |
| 09/07/2025 | CH4 | 47.5 | | | |
| | O2 | 0.2 | | | |
| | CO | 14 | | | |
| | H2S | 4638 | | | |
| | CH4 | | | | |
| | O2 | | | | |
| | CO | | | | |
| | H2S | | | | |
| 12/09/2025 | CH4 | 41.6 | | | |
| | O2 | 0.2 | | | |
| | CO | 9 | | | |
| | H2s | 5320 | | | |
| 03/10/2025 | CH4 | 38.3 | | | |
| | O2 | 0.2 | | | |
| | CO | 15 | | | |
| | H2S | 2224 | | | |
| 12/11/2025 | CH4 | 31 | | | |
| | O2 | 0.1 | | | |
| | CO | 36 | | | |
| | H2S | 1629 | | | |
| 18/12/2025 | CH4 | 33 | 37.8 | 32 | 36 |
| | O2 | 0.2 | 0.1 | 0.2 | 0.3 |
| | CO | 52 | 67 | 36 | 42 |
| | H2S | 1230 | 320 | 180 | 69 |
| 05/01/2026 | CH4 | 34 | | | |
| | O2 | 0.1 | | | |
| | CO | 232 | | | |
| | H2s | 1025 | | | |
| 10/02/2026 | CH4 | 29 | | | |
| | O2 | 0.2 | | | |
| | CO | 44 | | | |
| | H2S | 935 | | | |
| 25/03/2026 | CH4 | 32.5 | | | |
| | O2 | 0.1 | | | |
| | CO | 53 | | | |
| | H2S | 760 | | | |
| 07/04/2026 | CH4 | 22 | | | |
| | O2 | 0 | | | |

| | | | | | |
|---|---|---|---|---|---|
| | CO | 49 | | | |
| | H2S | 694 | | | |
| 27/04/2026 | CH4 | 22.2 | 36.9 | 43 | 37 |
| | O2 | 0 | 0 | 0 | 0 |
| | CO | 34 | 36 | 21 | 19 |
| | H2S | 665 | 128 | 107 | 37 |

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