

8.0 RESTORATION AND AFTERCARE

INTRODUCTION

- 8.1 A key component of landfill design is the restoration and aftercare of the landfill after it has ceased receiving wastes. The purpose of the process is to cap the site to reduce leachate generation and to facilitate environmental management and to return the landscape to beneficial use. The site will be progressively capped and restored at regular intervals during its life as detailed in Figure 8.1.
- 8.2 The capping and restoration layers are designed to contain the wastes, to control the ingress of rainfall and surface water thereby managing leachate production and to provide a suitable growing medium for restoration planting. The final contours will be designed to enable the implementation of the intended afteruse and to blend into the surrounding landscape.
- 8.3 Therefore, following completion of infilling and allowing time for settlement, groups of cells will be capped and progressively restored. Once any one phase has been capped, it will be restored in the first available soil moving season. The overall profile consists of two essential elements, a low permeability capping to minimise water infiltration of the wastes, and a layer of soils to meet the restoration objectives.

CAPPING DESIGN

- 8.4 Details of the proposed restoration and cap profile are shown on Figure 8.2. Following completion of infilling, a regulating layer will be laid over the final layer of waste. A geonet layer, will be placed on top of the prepared waste surface to act as a gas collection layer with a Geosynthetic Clay Liner (GCL) placed as the containment layer. This GCL sheets will be overlapped in accordance with the manufacturers instructions. As with the basal lining system, CQA procedures will be adopted.
- 8.5 Above the GCL a 500 mm drainage layer will be installed, to drain any water which infiltrates through the restoration sub-soils above. Finally the restoration soils will be placed. It is envisaged that a 150 mm restoration top soil layer (settled depth) will be placed above a 850 mm sub-soil layer. Appropriate additional depths of soils will be provided in the areas where tree planting is proposed over the landfill cap.

- 8.6 Placement of restoration soils on each cell will take place in the first available soil moving season following completion of capping of that cell. Soils will be placed using machinery of low load bearing weight whilst soils are dry and friable. Care will be taken to avoid unnecessary trafficking over previously placed soil.
- 8.7 Following topsoiling the surface will be prepared for seeding. The preparation carried out will depend upon the time of seeding and the circumstances of the soils (i.e. need for weed removal, stone picking etc).

SURFACE WATER DRAINAGE

- 8.8 The site has been designed to provide good surface water run-off from the site (Figure 8.3) in order to reduce the likelihood of surface water ponding.
- 8.9 Surface water run-off from the capped and profiled landfill will be collected in a peripheral drain, which will comprise a 300mm diameter perforated concrete pipe, bedded into a trench and backfilled using a 20mm clean stone. The pipe will discharge the surface water run-off into the proposed reed bed which in turn discharges into the Sruhanpollandoo stream to the north of the proposed site (Figure 8.4).

Settlement

- 8.10 Landfilled wastes will continue to settle over a protracted period due to physical compaction and biological degradation. It is, therefore necessary to estimate the amount of settlement that will occur if proposed final levels are to be achieved. Experience has shown that a settlement allowance of 15% of the overall depth should be allowed. Slopes on the restoration profile vary between 1 in 10 and 1 in 15 and as such can accommodate differential settlement within the cap without compromising the ability of the cap to shed surface water.

Post Closure Monitoring

- 8.11 All post closure monitoring will be in accordance with the requirements of the Environmental Protection Agency's Manual on Landfill Monitoring. The minimum requirements for aftercare monitoring are shown in Table 8.1. The location of the aftercare monitoring points are shown in Figure 8.5.

Table 8.1 Proposed Aftercare Monitoring Programme

Parameter	Frequency	Determinand
Surface water	Six Monthly will depend on water body and flow rate	pH, Temp, EC, DO, NH ₄ -N, Cl, COD, BOD
Groundwater	Quarterly (may be reduced to 6-monthly if there is evidence of stable conditions)	water level, pH, Temp, EC, DO, NH ₄ -N, Cl, SO ₄ , Alk, TON, TOC, Na, K, Ca, Mg, Fe, Mn, Cd, Cr, Cu, Ni, Pb, Zn, Cn, Hg
Landfill gases	Six Monthly	CH ₄ , CO ₂ , O ₂ , AP, OMD, gas pressure, Temp
Leachate levels	Monthly (reduce to quarterly if stable conditions prevail)	
Leachate Volume and Composition	Six Monthly	pH, Temp, EC, NH ₄ -N, Cl, SO ₄ , Alk, COD, BOD, TON, Na, K, Ca, Mg, Fe, Hg, Mn, Cd, Cr, Cu, Ni, Pb, Zn
Meteorological Data	Monthly	Precipitation, Temp, Wind, Evaporation, Humidity
Other parameters	Annually	Settlement

LANDSCAPING

8.12 Landscaping proposals are described in full in Section 15.0, but are summarised below as they form a key element of the site restoration proposals.

8.13 It is not proposed to carry out major areas of landscaping on the landfill site itself. This is consistent with good landfill practice, as root systems from trees and shrubs, etc, may compromise the integrity of the capping system (i.e. the GCL). However, it is recognised that the restoration of the site would benefit from the planting of hedgerows and trees both in terms of creating a visually acceptable landscape in the long term and help where possible to screen operations by advance works.

8.14 It is therefore proposed to carry out the landscaping works as shown on Figure 8.6. Perimeter planting will be initiated prior to the commencement of landfilling operations. The screening and restoration proposal will be implemented as part of the phased infilling of the site.

8.15 The species mix, plant sizes and spacing will be agreed with the EPA following the granting of a site licence but, as a matter of principle, will be predominantly native species.

Site Aftercare

8.16 Donegal County Council will assume responsibility for the aftercare management of the site. The Council will ensure that a suitable level of staffing is maintained to allow this process to continue as required.

8.17 It is envisaged that an aftercare programme will be drawn up prior to the completion of each phase of the landfill. Each restored cell will be subject to an initial aftercare period. During this period an annual inspection will take place.

8.18 The following aftercare issues are likely to be considered depending upon site conditions:

- The need for a programme of soil analysis to determine requirements for liming and fertilising during the year;
- Need for ripping or other treatment of the soils to improve drainage;
- Areas where reseeded is necessary and any changes to the rate of seed application or seed mix;
- Modifications to the mowing or grazing regime.
- Prevention of tree establishment on top of the landfill capped area.

8.19 This will be carried out in addition to the environmental monitoring, which will continue whilst the site licence is maintained.

8.20 Leachate treatment will be ongoing during site operation, restoration and closure. It is proposed that leachate recirculation should be included in this system to use the flushing effect on the waste mass. Leachate monitoring with regard to level, volume and composition will continue on the site to allow an assessment to be made on the duration of treatment post closure. The cessation of treatment will be by agreement with the EPA on the basis of the results of ongoing monitoring.

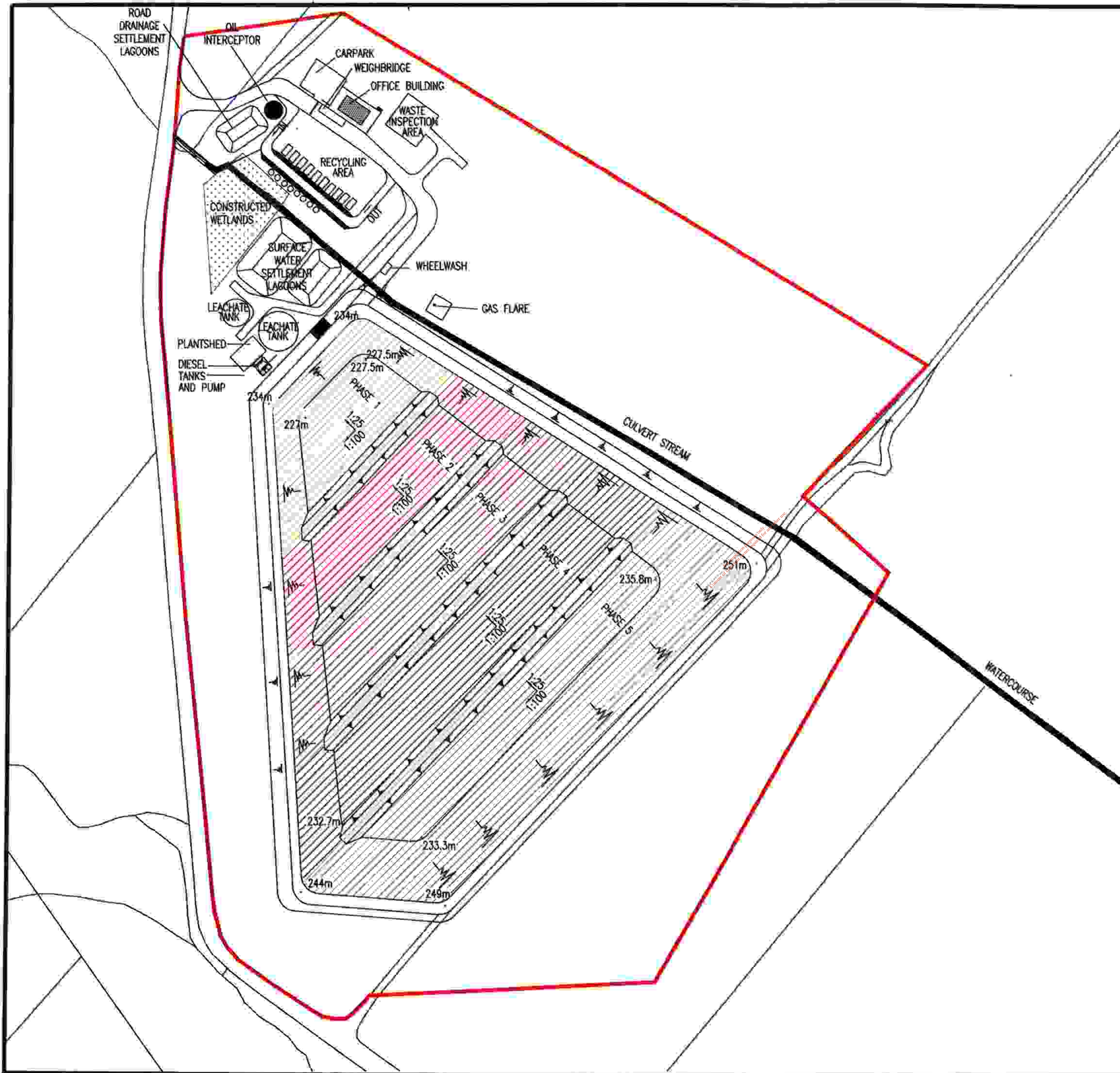
8.21 Landfill gas management will also continue on the site, be it active or passive. When management of the system ceases by agreement with the EPA the passive system will be left in place.

8.22 It is envisaged that the site building, leachate treatment plant and gas flare stack will all be retained on site post closure. Ultimately it will be possible to remove the building, leachate treatment plant and gas flare stack. The weighbridge, wheelwash and waste inspection area will be removed after completion of the final phase of restoration on the infilled area. The perimeter security fencing will be removed and replaced with post and wire fencing except for areas involved in the ongoing aftercare management of the site.

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FIGURES

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- KEY
- GENERATOR
 - ▨ PHASE 1
 - ▧ PHASE 2
 - ▩ PHASE 3
 - PHASE 4
 - PHASE 5

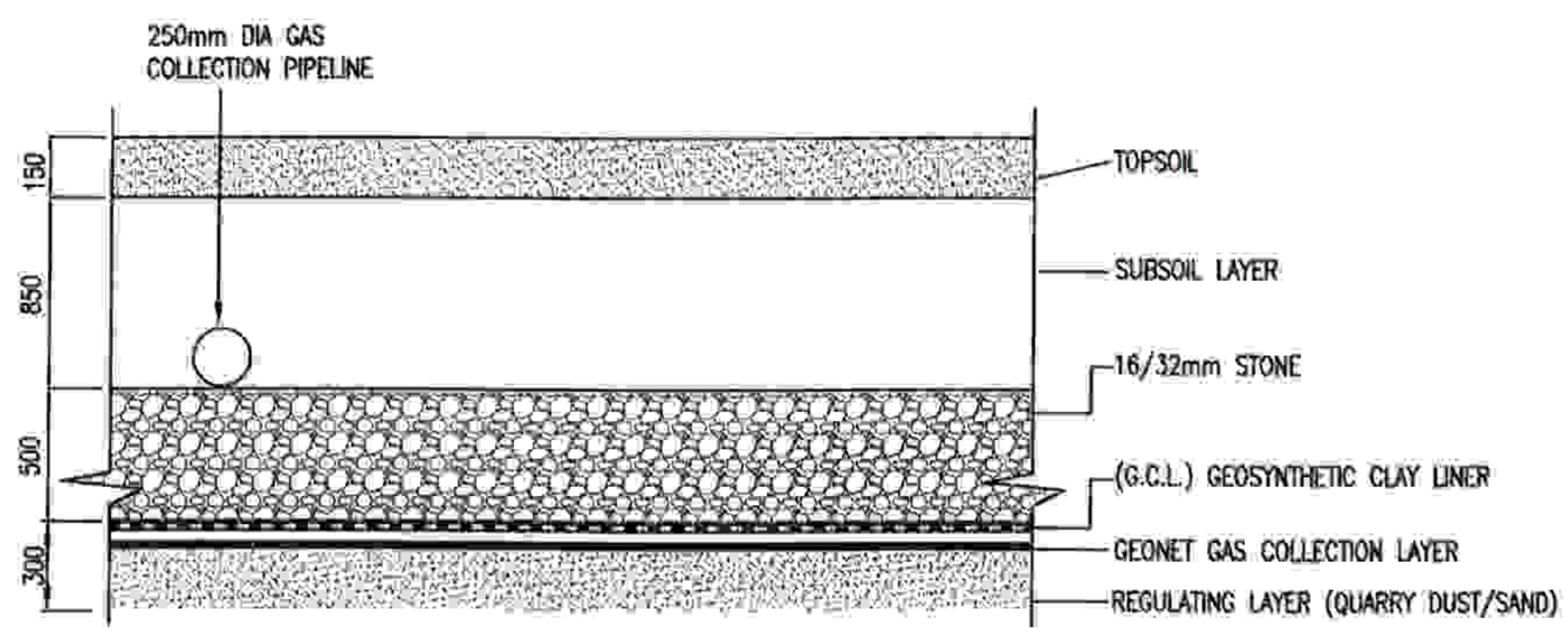
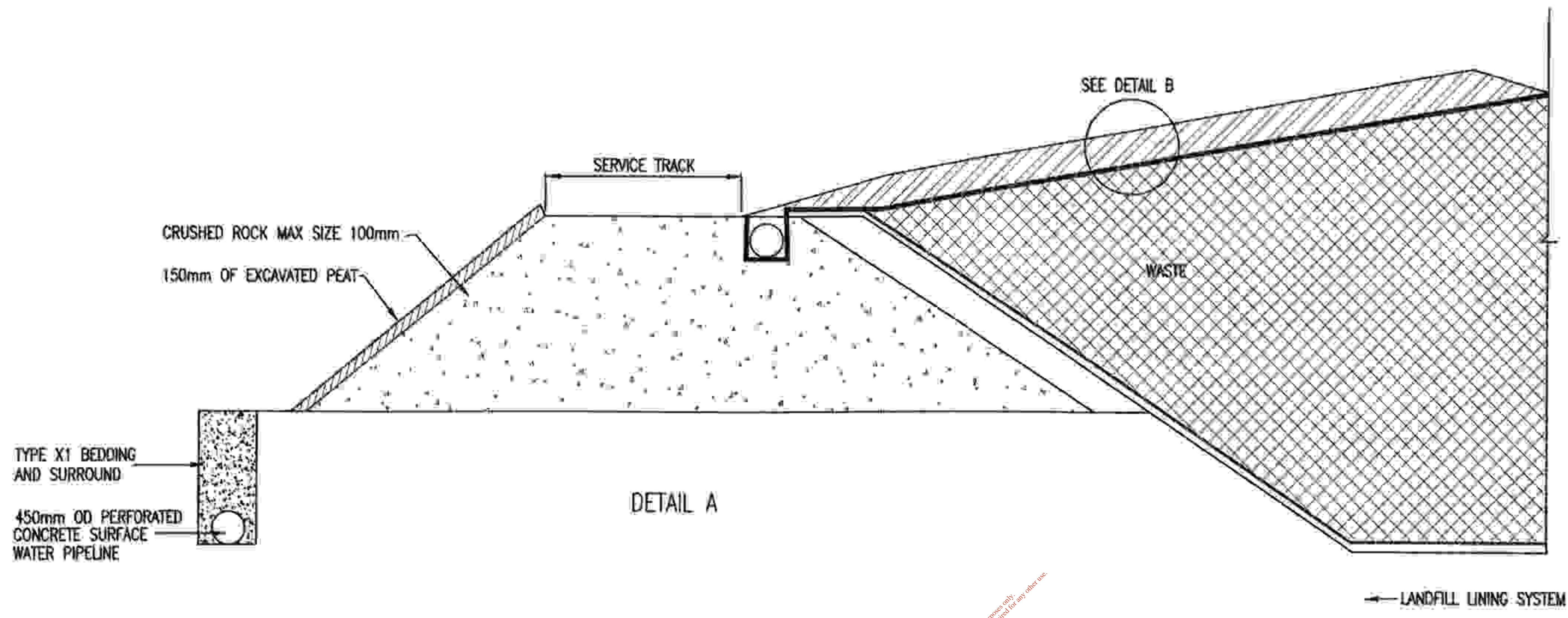
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PROJECT
MEENABOLL LANDFILL PROJECT

TITLE
SITE PHASING

FIGURE
8.1



CAPPING DETAIL (N.T.S.)
DETAIL B

SCALE: NTS

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PROJECT
MEENABOLL LANDFILL PROJECT

<p>TITLE CAPPING DETAILS</p>	<p>FIGURE 8.2</p>
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PROJECT

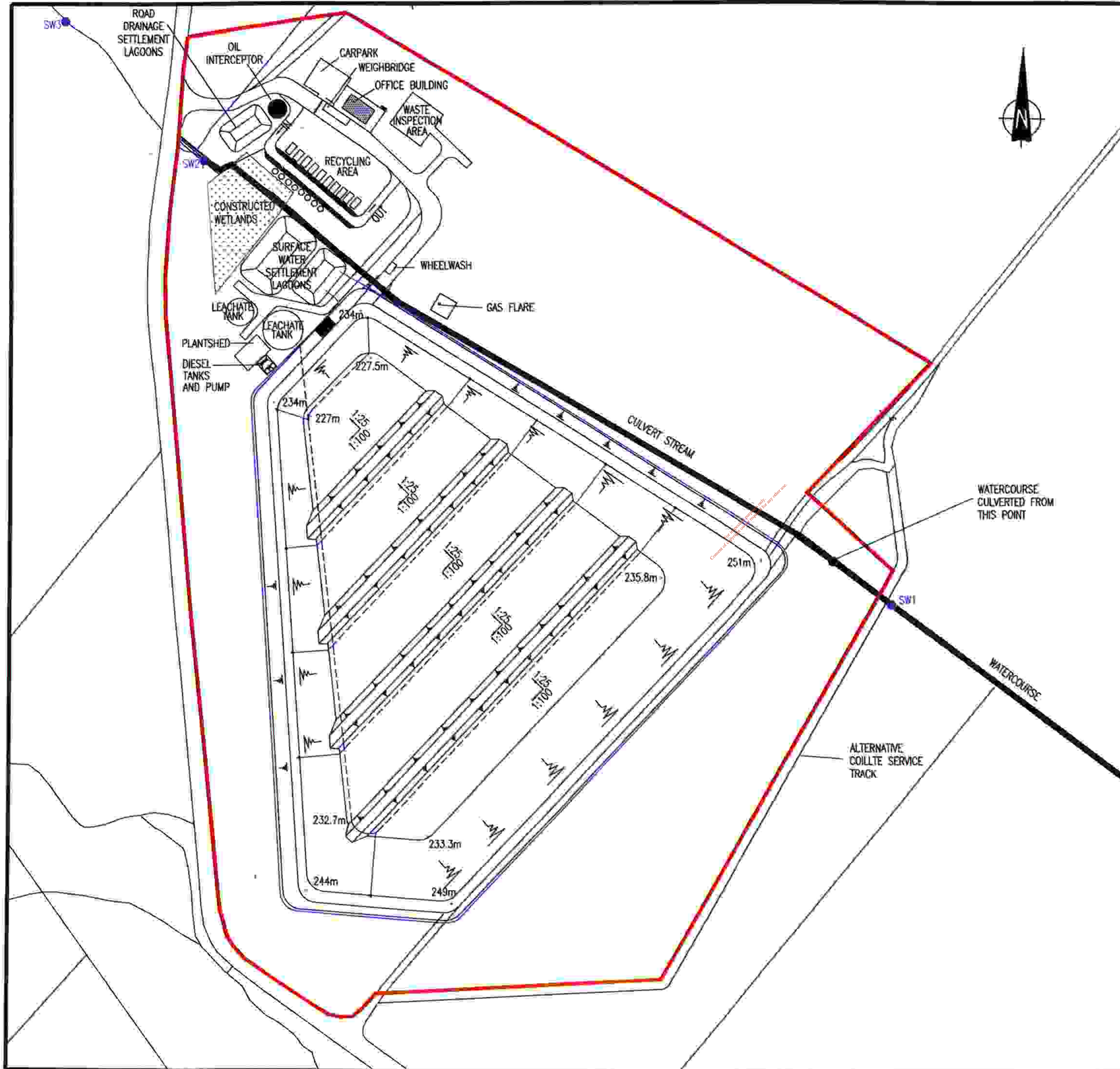
MEENABOLL LANDFILL PROJECT

TITLE

FINAL RESTORATION CONTOURS

FIGURE

8.3

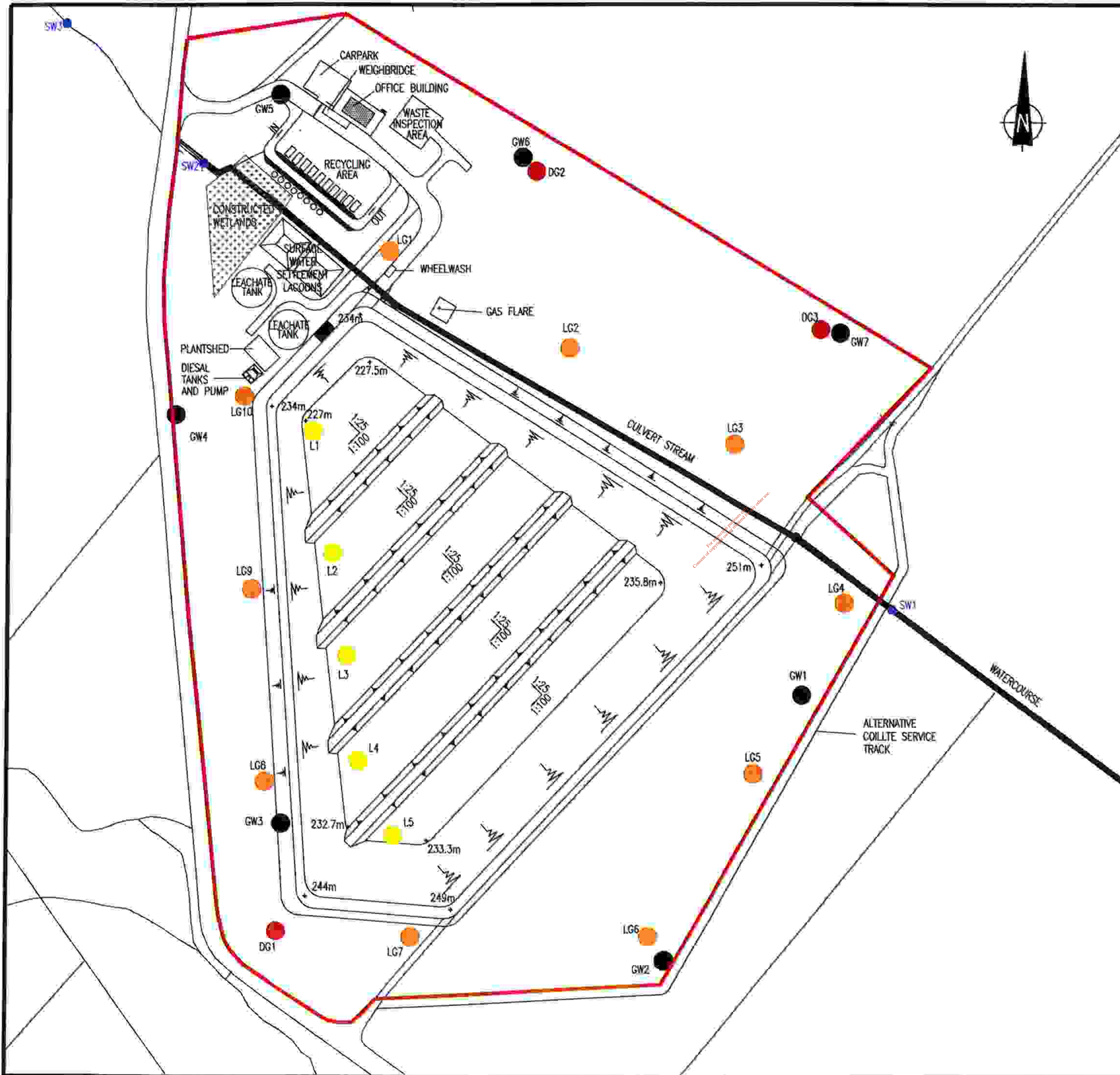


KEY

- ◆ GENERATOR
- GROUNDWATER
- SURFACE WATER PERIMETER DRAIN
- SW1 SURFACE WATER TESTING POINT

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<p>PROJECT</p> <p>MEENABOLL LANDFILL PROJECT</p>	
<p>TITLE</p> <p>SURFACE WATER AND GROUNDWATER MANAGEMENT</p>	<p>FIGURE</p> <p>8.4</p>

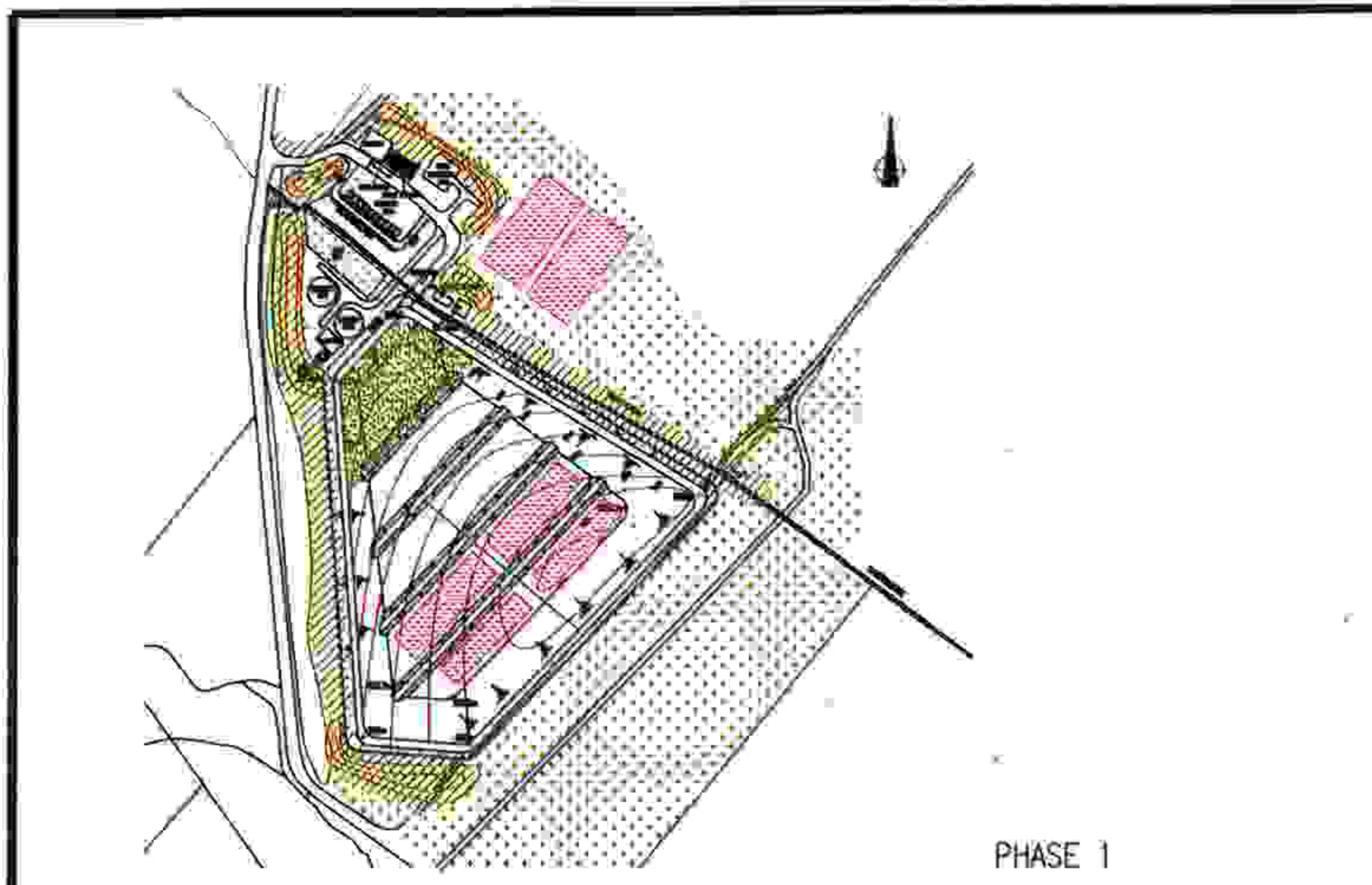


KEY

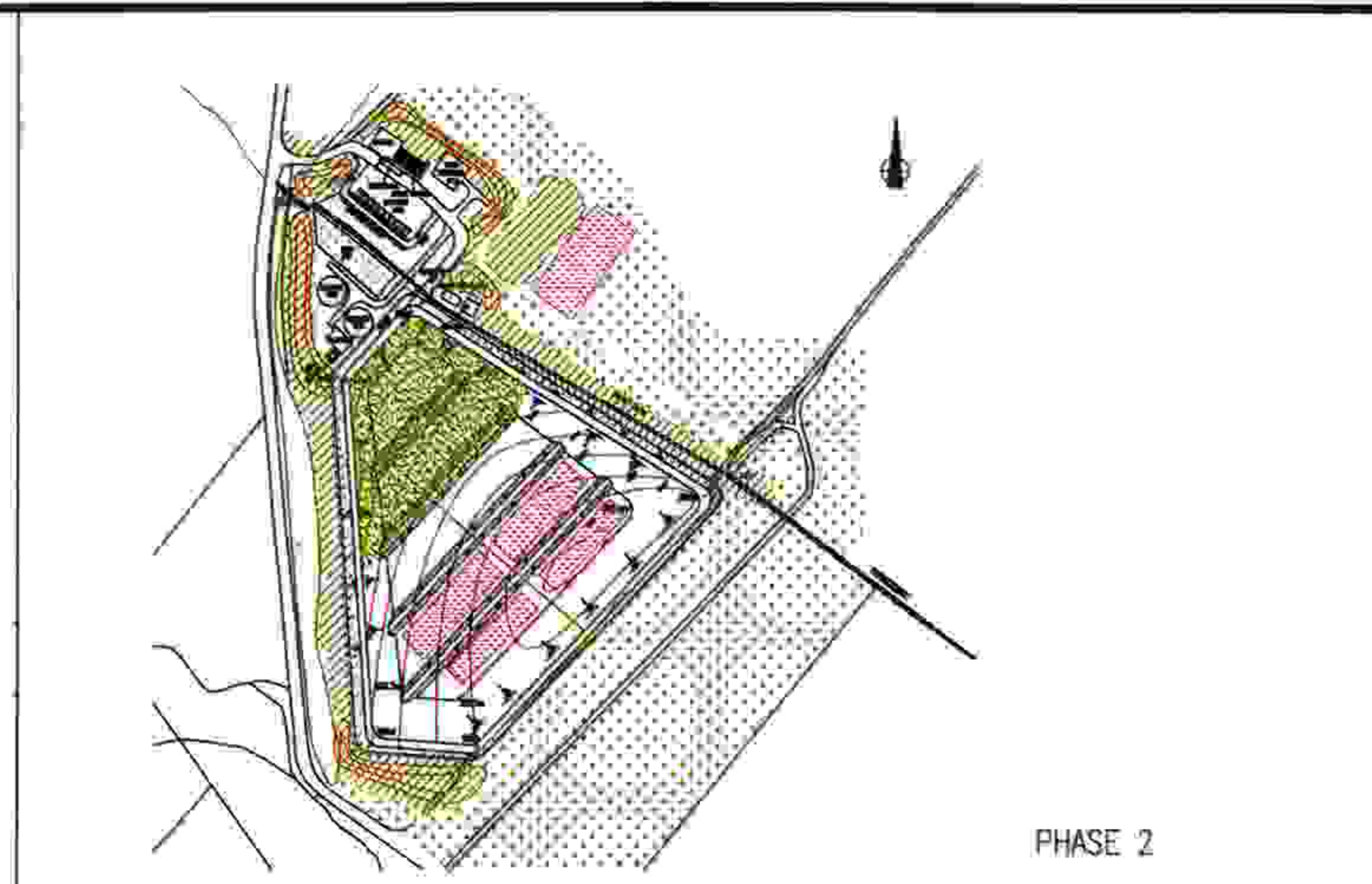
- GROUNDWATER MONITORING POINT
- GAS MONITORING POINT
- LEACHATE MONITORING POINT
- DUST MONITORING POINT
- SURFACE WATER MONITORING POINTS

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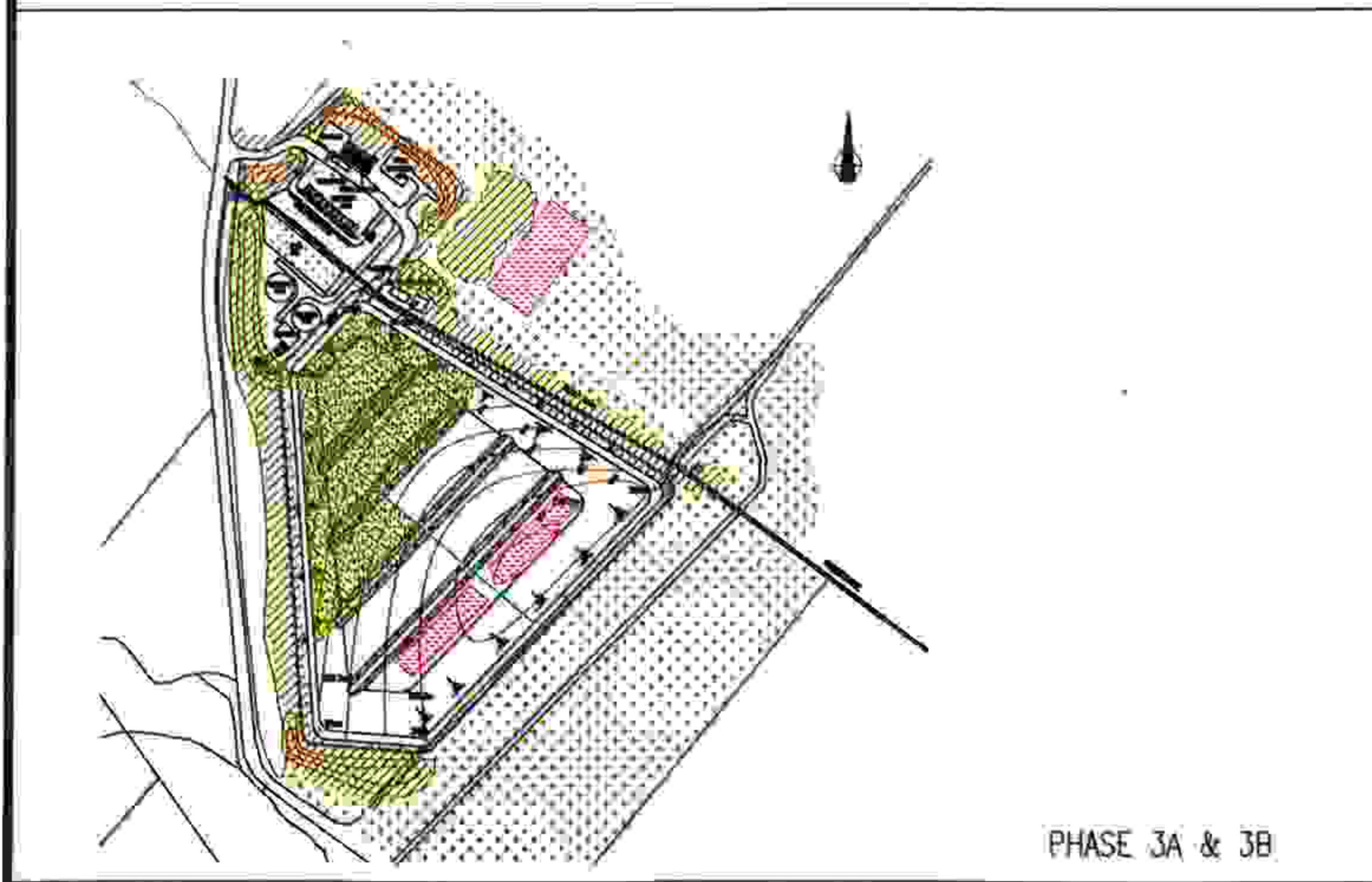
 KIRK McCLURE MORTON CONSULTING ENGINEERS	 Comhairle Chiontae Dhúin na nGall Comhairle Coillte na nGall
PROJECT MEENABOLL LANDFILL PROJECT	
TITLE PROPOSED ENVIRONMENTAL MONITORING POINTS	
FIGURE 8.5	



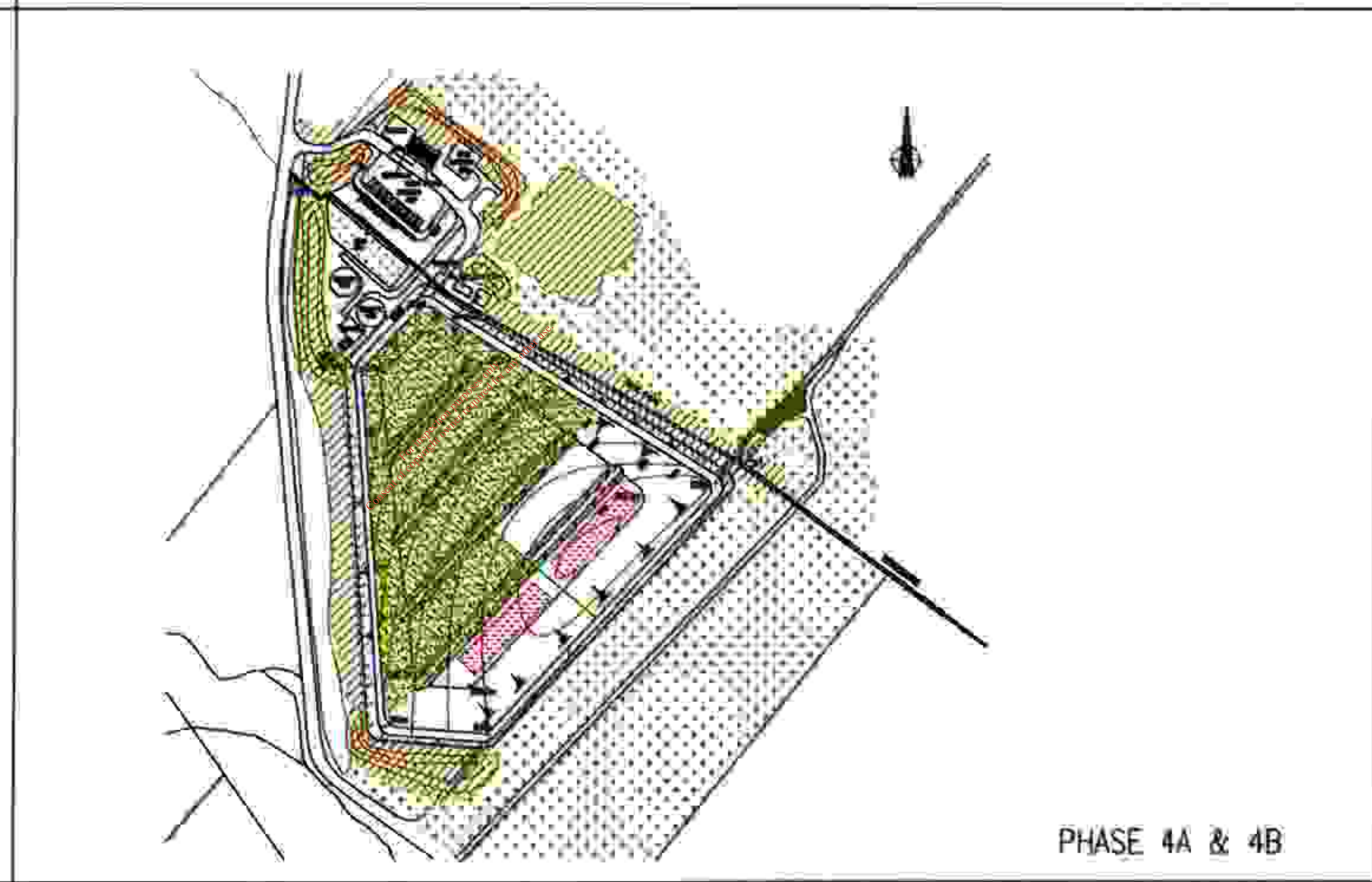
PHASE 1



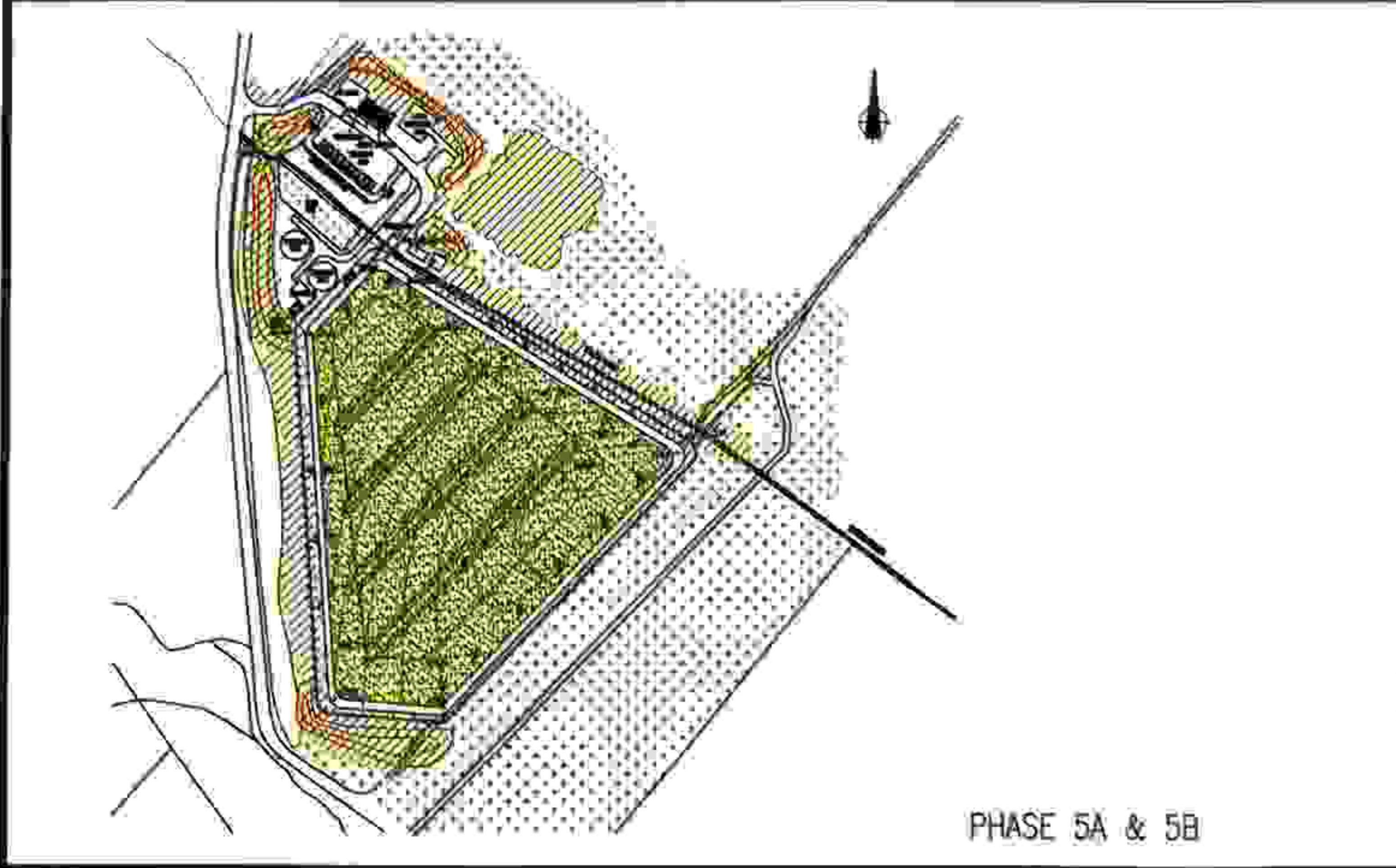
PHASE 2



PHASE 3A & 3B



PHASE 4A & 4B



PHASE 5A & 5B



TYPICAL SECTION THROUGH BUND

KEY

Phase 1
Construction of cells 1-5, perimeter bunds created and completion of perimeter screen planting works.
Progressive filling of cell 1, capping, topsoiling and grass seeding.[native species]
Construction of 3m high bunds around the leachate tanks and gas flume stack and the bunds planted with woodland screen planting.
Construction and planting of reed beds

Phase 2
Progressive filling of cell 2, capping, topsoiling and grass seeding.[native species]
Continued growth and maintenance of perimeter screen planting, along with grass maintenance.

Phase 3
Progressive filling of cells 3A and 3B, capping, topsoiling and grass seeding.
Continued growth and maintenance of perimeter screen planting, along with grass maintenance.

Phase 4
Progressive filling of cells 4A and 4B, capping, topsoiling and grass seeding.[native species]
Continued growth and maintenance of perimeter screen planting along with grass maintenance.

Phase 5
Progressive filling of cells 5A and 5B, capping, topsoiling and grass seeding.[native species]
Continued growth and maintenance of perimeter screen planting along with grass maintenance.

Continued maintenance of planting, and grass to ensure planting objectives are realized and the site is assimilated back into the landscape setting

- Existing conifer plantation.
- Proposed woodland screen planting.
- Proposed reed Beds
- Proposed native grass seeding.
- Internal service road
- Temporary spoil heaps
- Building
- Proposed contours

SCALE: NTS

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TITLE PLANTING PROPOSALS & PHASING	FIGURE 8.6
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