Appendix E

SOIL REPORTS

C.S.T.S.

REPORT

TO

ELF FARM SUPPLIES PTY LTD

ON

INCIDENT REPORT

FOR

IMPORTED FILL MATERIAL: FILL AREAS G & I and TREE CORRIDOR

AT

RAILWAY ROAD NORTH, MULGRAVE NSW

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Glendenning NSW 2761
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ABN: 44 106 976 738

Attention: Mr. N. Cockerill

ELF Farm Supplies Pty Ltd

Incident Report: Elf Substrate Plant and Elf Mushroom Farm Project
Railway Road North, Mulgrave NSW

Imported Fill Material; Fill Areas G & I and Tree Corridor

03 December 2015

Prepared by Mr Prakash Chandra

Image source: Nearmap. Image Date: 15 October 2015

C.S.T.S.
Compaction & Soil Testing Services Pty Limited
ABN 44 106 976 738
Phone: (02) 9675 7522 **Fax:** (02) 9675 7544 **Email:** office@comsoiltest.com.au
1/78 Owen Street, GLENDENNING NSW 2761

1 Introduction

Dear Neil,

This report serves to identify and outline the occurrence of events in relation to the filling of Area G, Area I and the associated tree corridor, as shown on the drawings.

2 Chronology of Filling & Associated Works

2.1 August 2012

In August 2012, Area G was stripped in preparation for filling works. Refer to aerial photograph dated 02 August 2012.

2.2 November 2012

The filling of Area G commenced on 12 November 2012. All of the material was supplied from Sydney Trains Ballast Recycling Centre, located at Chullora. Refer to aerial photograph dated 18 December 2012.

2.3 May 2013

In May 2013, eight (8) previously planted trees were removed to provide adequate space for the angle of batter at the north-western area. Refer to aerial photograph dated 18 May 2013.

2.4 September 2013

In September 2013, we continued to fill Area G. Refer to the aerial photographs.

2.5 April 2014

We were advised that an area for a bio-filter was required. After lengthy discussions, it was decided that the bio-filter would be located parallel to the railway line and extend as far as the existing dam. This additional area would keep the site under the 1.6 hectare approved volume. At this point, it was also decided to adjust the angle of the batters from a 2 to 1 slope to a 1 to 2 slope. The factors that justified this decision included; the engineering quality of the railway screened soil, with a CBR value of greater than 50 allowing for a steeper batter than a clay fill would; reducing the amount of fill required due to the height and distance westward it would need to protrude into the flood plain; and an access driveway is required beside the building, which meant that the steepness of the batter would not impact on the structural integrity of the buildings.

The area required was immediately stripped and by 24 April 2014 we had commenced moving material from area G in to area I bio filter extension as a matter of priority. Refer to aerial photograph dated 24 April 2014.

2.6 May 2014

In May 2014, material from Sydney Trains Ballast Recycling Centre, Chullora was imported to site for placement within the bio-filter area. This importation continued

through to the end of August 2014. Refer to aerial photograph dated 01 September 2014.

2.7 August 2014

Filling continued within Area G to achieve the required levels. The soil that had originally been stripped from area G and placed along the batters was removed and we also used this material to start the levelling on the tree corridor. Refer aerial photograph dated 30 December 2014.

2.8 September 2014

By September 2014, the bio filter area was cut and filled to the approximate level it is today. At the western end of the bio filter, the material that had been stripped from this area was also placed in the tree corridor. Very little disturbance was made to vegetation in this area. Refer aerial photograph dated 01 September 2014.

2.9 February 2015

We commenced importing material to level the tree corridor area. The material imported was sourced from a development site at Breakfast Point and had been validated as Excavated Natural Material by Compaction & Soil Testing Services Pty Ltd (Report No.: 659 – BAY 2149 ENV-AB). The material was transported by Jeffsann Excavations Pty Ltd.

Compaction & Soil Testing Services Pty Ltd was engaged by Mr Neil Groat to undertake quality check sampling of railway screened soil placed within Area G and I. Two (2) sampling event were undertaken with samples recovered from the surface of Area G and I. The material was confirmed to chemically comply with the requirements of the Sydney Trains Screened Soil Order 2015.

2.10 March 2015

Compaction & Soil Testing Services Pty Ltd undertook one (1) further round of soil sampling upon the surface of Area G and I. The material was confirmed to chemically comply with the requirements of the Sydney Trains Screened Soil Order 2015.

2.11 April 2015

Compaction & Soil Testing Services Pty Ltd undertook one (1) further round of soil sampling upon the surface of Area G and I. The material was confirmed to chemically comply with the requirements of the Sydney Trains Screened Soil Order 2015.

2.12 May 2015

The importation of Excavated Natural Material for use within the tree corridor was completed. Due to the weather conditions at the time, the final shaping of this area was completed in August 2015 for the planting of trees.

3 Source and Transportation of Material

3.1 Fill Material for Areas G & I

Fill material was sourced from Sydney Trains Ballast Recycling Centre, Chullora and was transported by Terra Civil Pty Ltd. The imported fill material was described as 'Sydney Trains Screened Soil' and was approved for reuse under the Protection of the Environment Operations Regulation 2005 – Specific Exemption under part 6 clause 51 and 51A; Sydney Trains Screened Soil Exemption. Approval was also granted from Hawkesbury Council for use of the material within the project. The material was utilised throughout the project due to the high engineering qualities of the material. All of the material was transported to site by Terra Civil Pty Ltd. Restricting the transportation of material to Terra Civil Pty Ltd was done to eliminate the risk of unauthorised material being placed onsite and material being placed in incorrect locations.

An overview of the dates and quantities of imported material is provided below.

Invoice Date	Tonnage	Date Delivered From	Date Delivered To	Delivered By	From
26/12/2012	5385.97	12/11/2012	22/11/2012	Terra Civil	BRC Chullora
26/12/2012	5446.70	6/11/2012	12/11/2012	Terra Civil	BRC Chullora
26/12/2012	4992.52	30/10/2012	5/11/2012	Terra Civil	BRC Chullora
26/12/2012	4974.50	28/08/2012	7/09/2012	Terra Civil	BRC Chullora
4/02/2013	5294.00	22/11/2012	28/11/2012	Terra Civil	BRC Chullora
4/02/2013	5499.76	5/12/2012	13/12/2012	Terra Civil	BRC Chullora
4/02/2013	5749.62	13/12/2012	20/12/2012	Terra Civil	BRC Chullora
5/03/2013	5799.88	7/01/2013	17/01/2013	Terra Civil	BRC Chullora
9/04/2013	5799.86	17/01/2013	24/01/2013	Terra Civil	BRC Chullora
9/04/2013	5894.28	1/02/2013	22/02/2013	Terra Civil	BRC Chullora
3/06/2013	5897.88	26/03/2013	16/04/2013	Terra Civil	BRC Chullora
24/07/2013	5891.72	9/05/2013	23/05/2013	Terra Civil	BRC Chullora
17/10/2013	5799.44	16/08/2013	26/08/2013	Terra Civil	BRC Chullora
17/10/2013	5996.82	9/08/2013	15/08/2013	Terra Civil	BRC Chullora
1/12/2013	4529.00	5/09/2013	30/09/2013	Terra Civil	BRC Chullora
1/03/2014	6189.40	8/01/2014	16/01/2014	Terra Civil	BRC Chullora
19/06/2014	5790.00	2/04/2014	2/05/2014	Terra Civil	BRC Chullora
4/08/2014	6199.76	14/05/2014	30/05/2014	Terra Civil	BRC Chullora
1/09/2014	6209.80	25/06/2014	15/07/2014	Terra Civil	BRC Chullora
24/09/2014	5500.00	17/07/2014	6/08/2014	Terra Civil	BRC Chullora
1/10/2014	6995.28	25/07/2014	13/08/2014	Terra Civil	BRC Chullora
3/12/2014	5999.92	26/09/2014	21/10/2014	Terra Civil	BRC Chullora
3/03/2015	5298.00	12/11/2014	12/12/2014	Terra Civil	BRC Chullora
1/10/2015	4999.70	30/07/2015	12/08/2015	Terra Civil	BRC Chullora
4/11/2015	4994.29	11/18/2015	3/09/2015	Terra Civil	BRC Chullora
Total	141128.10				

3.2 Fill Material for Tree Corridor

Fill material for the tree corridor was sourced from a development site at Breakfast Point and imported from February to May 2015. The fill material was classified as Excavated Natural Material by Compaction & Soil Testing Services Pty Ltd (CSTS Report: 659 – BAY 2149 ENV-AB) and was transported by Jeffsann Excavations Pty Ltd.

Transportation of material from this source was restricted to Jeffsann Excavations Pty Ltd. Restricting the transportation of material to Jeffsann Excavations Pty Ltd was done to eliminate the risk of unauthorised material being placed onsite and material being placed in incorrect locations.

4 Fill Compaction

Compaction & Soil Testing Services Pty Ltd carried out in situ density and laboratory compaction testing in accordance with Australian Standard AS3798 – 2007 on a Level 2 basis, as stated in Australian Standard AS3798 – 2007, section 8.3.

A Minimum standard density ratio of 98% with a moisture variation of +/- 2% of optimum moisture content was achieved.

Testing carried out within the Tree Corridor was to achieve a minimum density ratio of 95% with a minimum moisture variation of +/- 2% of optimum moisture content.
The quantity of tests carried exceeds the minimum requirements for a large scale earthworks project.

A summary of test results are provided below.

AREA G	
Date of testing	**Test Number**
25/09/2012	475-478
26/09/2012	479-482
4/10/2012	483-486
11/10/2012	487-490
16/10/2012	491-494
19/10/2012	495-499
25/10/2012	500-504
31/10/2012	505-509
7/11/2012	510-514
14/11/2012	515-519
19/11/2012	520-524
28/11/2012	525-529
18/12/2012	530-534
4/01/2013	535-539
10/01/2013	540-544
21/01/2013	545-549
25/01/2013	550-554
30/01/2013	555-559
6/02/2013	560-564
12/02/2013	565-569
15/02/2013	570-574
19/02/2013	575-579
26/02/2013	580-584
6/03/2013	585-589
15/03/2013	590-594
27/03/2013	595-599
9/05/2014	600-603
Total Tests	**129**
Specification	**98%**
Non conforming tests	**0**

AREA I	
Date of testing	**Test Number**
9/05/2014	604-615
20/05/2014	616-627
30/06/2014	628-633
16/07/2014	634-648
28/07/2014	649-654
14/08/2014	655-660
21/08/2014	661-663
10/12/2014	664-669
Total Tests	**66**
Specification	**98%**
Non conforming tests	**0**

AREA I	
Date of testing	**Test Number**
9/05/2014	604-615
20/05/2014	616-627
30/06/2014	628-633
16/07/2014	634-648
28/07/2014	649-654
14/08/2014	655-660
21/08/2014	661-663
10/12/2014	664-669
Total Tests	**66**
Specification	**98%**
Non conforming tests	**0**

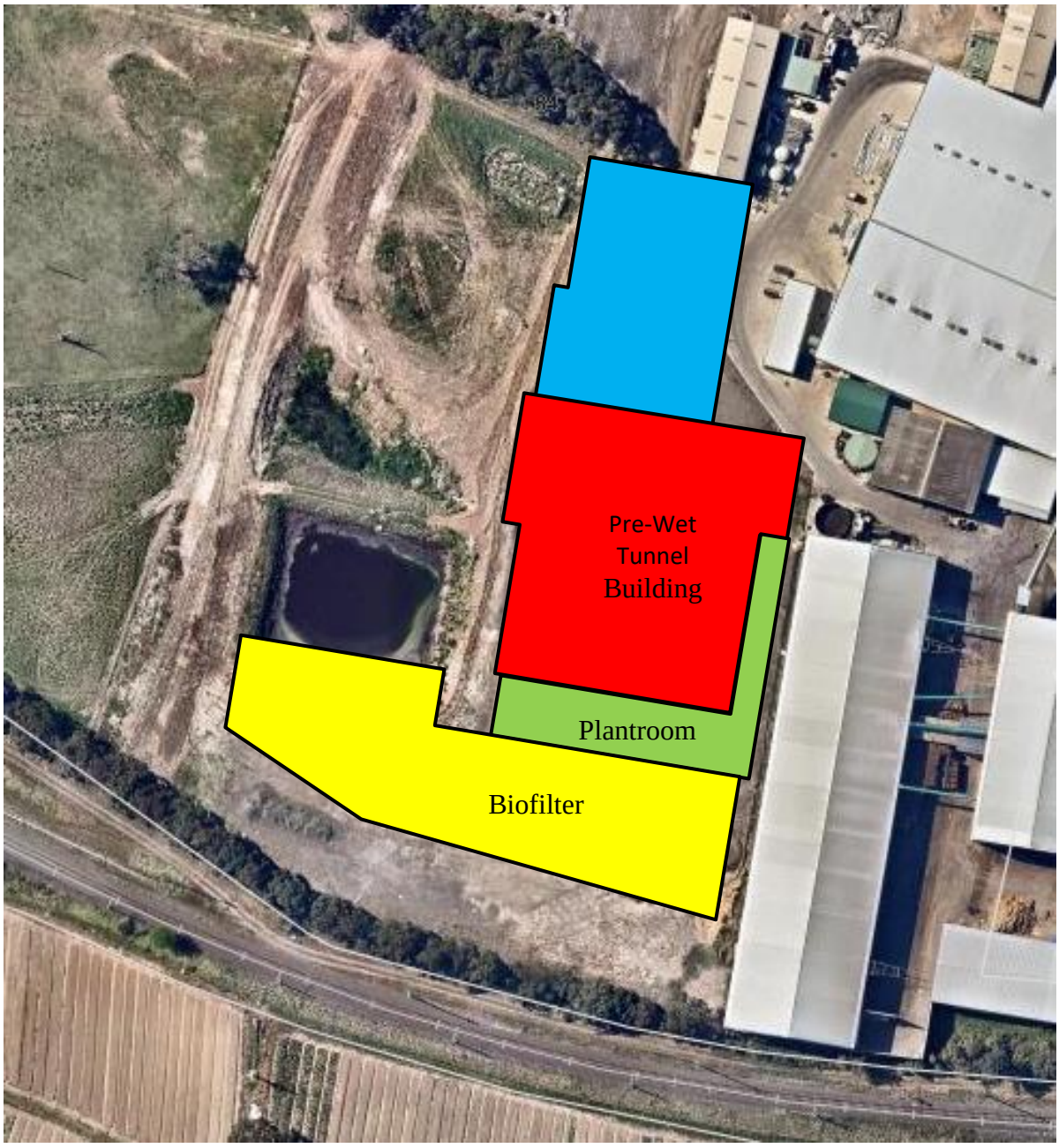
Should you have any further queries regarding this matter, please do not hesitate to contact me.

Yours truly,

Prakash Chandra
Geotechnical Director
Compaction & Soil Testing Services Pty Ltd

Attachments: Site Plans Quality Check Sampling Points, Sydney Trains Screened Soil Order 2015, Aerial Photos

Compaction & Soil Testing Services Pty Limited


Pre-Wet
Tunnel
Building
Plantroom
Biofilter


15 Oct 2015
B59
Hawkesbury Valley Way
Curtis Rd
B59
Railway Rd N
G
I


Sample Event: SCREEN
Sample Date: 05/02/1015
Image Date: 15/10/2015
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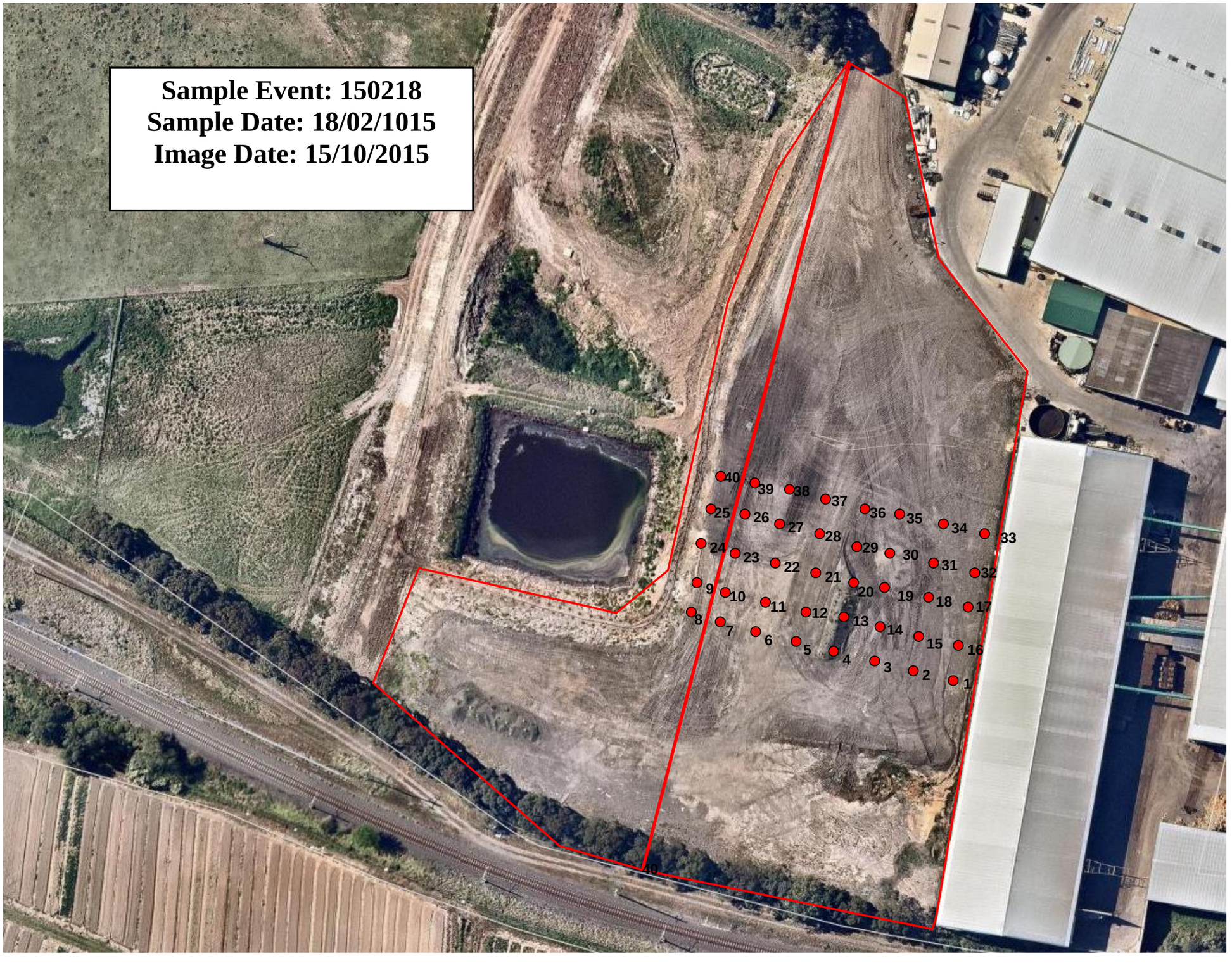
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Sample Date: 18/02/1015
Image Date: 15/10/2015
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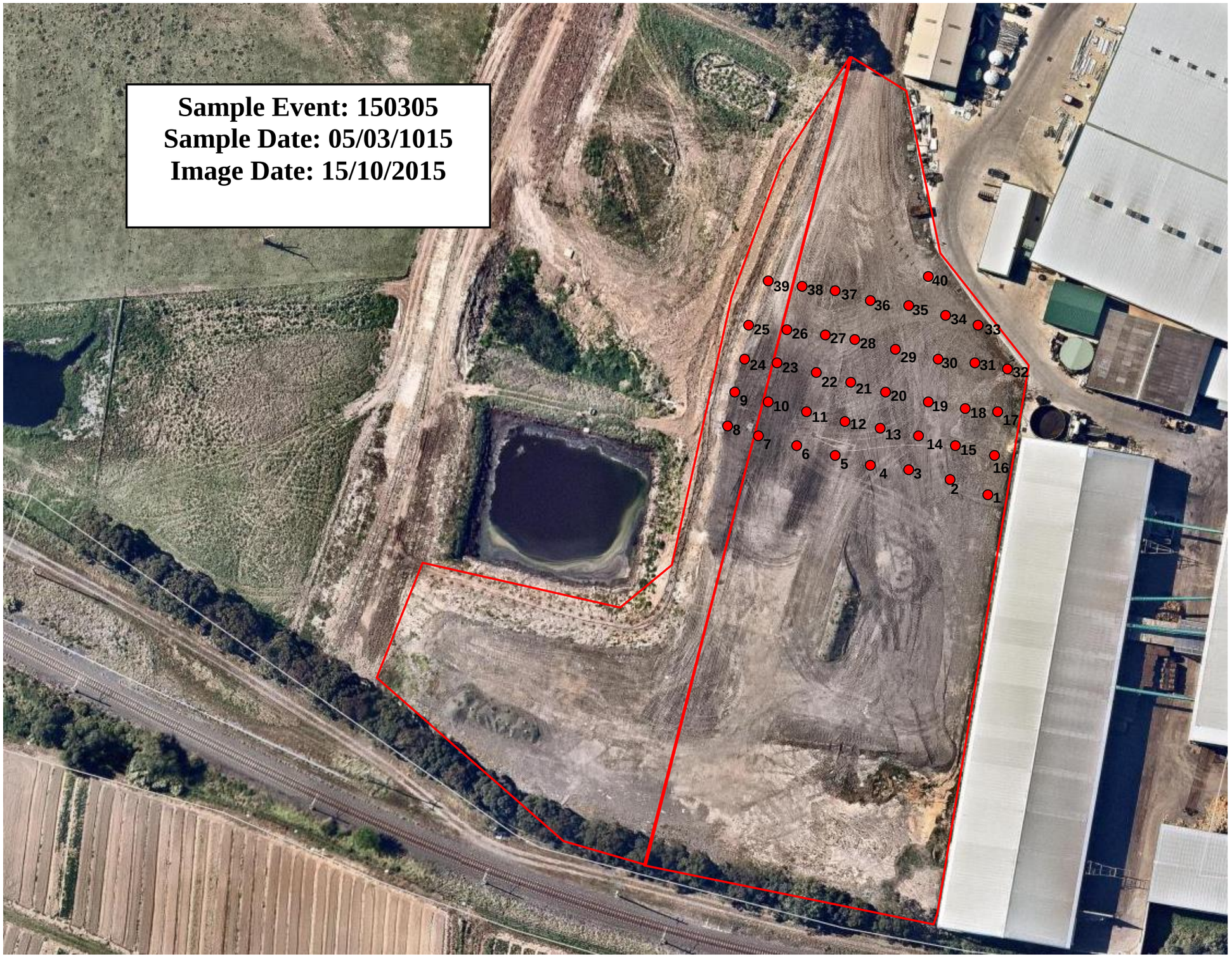
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Sample Date: 05/03/1015
Image Date: 15/10/2015
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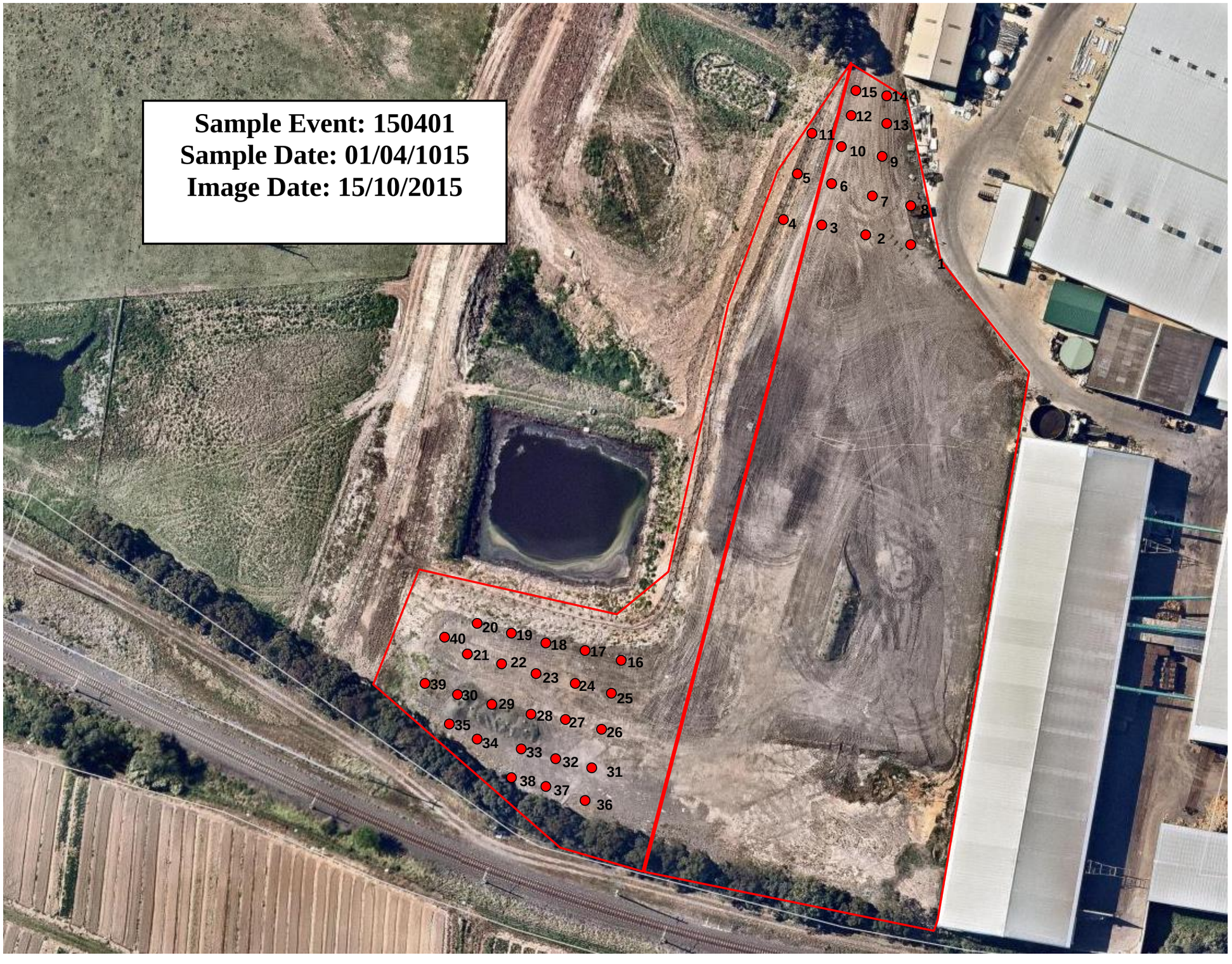
Sample Event: 150401
Sample Date: 01/04/1015
Image Date: 15/10/2015
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C.S.T.S.

SUPPLEMENTARY REPORT

TO

ELF FARM SUPPLIES PTY LTD

ON

INCIDENT REPORT

FOR

IMPORTED FILL MATERIAL: TREE CORRIDOR

AT

108 MULGRAVE ROAD, MULGRAVE NSW

Postal Address: 1/78 Owen Street
Glendenning NSW 2761
Tel: 02 9675 7522 Fax: 02 9675 7544
Email: office@comsoiltest.com.au
Website: www.comsoiltest.com.au
ABN: 44 106 976 738

Attention: Mr. N. Cockerell

ELF Farm Supplies Pty Ltd

Supplementary Report for Incident Report: Elf Substrate Plant and Elf Mushroom Farm Project
Railway Road North, Mulgrave NSW

Imported Fill Material; Tree Corridor

30 March 2016

Prepared by Mr Prakash Chandra

Image source: Nearmap. Image Date: 24 February 2016

Compaction & Soil Testing Services Pty Limited
ABN 44 106 976 738
Phone: (02) 9675 7522 **Fax:** (02) 9675 7544 **Email:** office@comsoiltest.com.au
1/78 Owen Street, GLENDENNING NSW 2761

1 Introduction

Dear Neil,

This report serves to provide further information as requested regarding the filled area running in a north/south direction, from the proposed bio filter. This filled area has been identified as the tree corridor, as shown on the drawings.

2 Chronology of Filling & Associated Works

2.1 February 2015

We commenced importing material to level the tree corridor area. The material imported was sourced from a development site at Breakfast Point and had been validated as Excavated Natural Material by Compaction & Soil Testing Services Pty Ltd (Report No.: 659 – BAY 2149 ENV-AB). The material was transported by Jeffsann Excavations Pty Ltd.

2.2 May 2015

The importation of Excavated Natural Material for use within the tree corridor was completed. Due to the weather conditions at the time, the final shaping of this area was completed in August 2015 for the planting of trees.

3 Source and Transportation of Material

3.1 Fill Material for Tree Corridor

Fill material for the tree corridor was sourced from a development site at Breakfast Point and imported from February to May 2015. The fill material was classified as Excavated Natural Material by Compaction & Soil Testing Services Pty Ltd (CSTS Report: 659 – BAY 2149 ENV-AB) and was transported by Jeffsann Excavations Pty Ltd.

Transportation of material from this source was restricted to Jeffsann Excavations Pty Ltd. Restricting the transportation of material to Jeffsann Excavations Pty Ltd was done to eliminate the risk of unauthorised material being placed onsite and material being placed in incorrect locations.

4 Fill Compaction

Compaction & Soil Testing Services Pty Ltd carried out in situ density and laboratory compaction testing in accordance with Australian Standard AS3798 – 2007 on a Level 2 basis, as stated in Australian Standard AS3798 – 2007, section 8.3.

Testing carried out within the Tree Corridor was to achieve a minimum density ratio of 95% with a minimum moisture variation of +/- 2% of optimum moisture content.

The quantity of tests carried exceeds the minimum requirements for a large scale earthworks project.

A summary of test results are provided below.

Tree Corridor	
Date of testing	**Test Number**
12/02/2015	670-672
25/02/2015	673-675
11/03/2015	676-678
09/04/2015	679-681
28/04/2015	682-684
Total Tests	**15**
Specification	**95%**
Non conforming tests	**0**

Should you have any further queries regarding this matter, please do not hesitate to contact me.

Yours truly,

Prakash Chandra
Geotechnical Director
Compaction & Soil Testing Services Pty Ltd

Attachments: Aerial Photos.


24 Feb 2016
B59
Hawkesbury Valley Way
Curtis Rd
B59
Railway Rd N


15 Oct 2015
B59
Hawkesbury Valley Way
Curtis Rd
B59
112
Railway Rd N

Appendix F

PRELIMINARY HAZARD ANALYSIS

Preliminary Hazard Assessment

Elf Farm Supplies Pty Ltd

108 Mulgrave Road

Mulgrave NSW 2756

Report Number 610.17356.00000-R01

17 October 2017

Elf Farm Supplies Pty Ltd

PO Box 615

WINDSOR NSW 2756

Version: v0.3

Preliminary Hazard Assessment

Elf Farm Supplies Pty Ltd

108 Mulgrave Road

Mulgrave NSW 2756

PREPARED BY:

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.17356.00000-R01-v0.3	17 October 2017	Craig Simpson	Nathan Redfern	Craig Simpson

Executive Summary

This document presents a Preliminary Hazard Assessment (PHA) required to fulfil the Hazard and Risk Planning requirement of the Development Application in accordance with the Multi-Level Risk Assessment Guidelines stipulated in conducting such analysis.

This PHA has been carried out in accordance with the Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning, NSW Department of Planning, (HIPAP 4) as stipulated by Planning Assessment Commission of New South Wales.

Where further analysis was required the PHA has been carried out in accordance with the Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (HIPAP 6).

The Preliminary Hazard Analysis has found that the operation of the proposed development meets the criteria laid down in HIPAP 4 Risk Criteria for Land Use Safety Planning and would not cause any risk, significant or minor, to the community.

Other spill, fire and incident events are not likely to extend significantly beyond the boundary of the site, with the exception of a major plant fire where, regardless of the type of operation there will always be a risk of potentially harmful smoke plumes downwind from a fire. In the majority of large fires the buoyant nature of a smoke plume means any potentially harmful materials are rapidly dispersed.

It is the conclusion of this PHA that the proposed development meets all the requirements stipulated by the Department of Planning and hence would not be considered, with suitable engineering controls in place, to be an offensive or hazardous development on site or would not be impacted by any hazardous incidents from adjoining facilities off site.

Table of Contents

TABLES

Table of Contents

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been engaged by Elf Farm Supplies Pty Ltd (Elf) to assess the potential impacts of the proposed further development of plant and staged increase in substrate production at the existing mushroom substrate production plant at 108 Mulgrave Road, Mulgrave NSW 2756.

The proposed "Development Site" is located to the north west of Mulgrave Railway Station, with the site boundary adjoining Mulgrave Road (see **Figure 1**).

The Substrate Plant has operated at 108 Mulgrave Road, Mulgrave since 1981 being a rural property comprising of Lots 13 and 14, DP1138749 and having an area of approximately 12.4 hectares, situated in the Hawkesbury Local Government Area (LGA). The Development Site is zoned IN2 Light Industrial (see **Figure 2**).

SLR was advised that ELF had previously conducted a Preliminary Risk Screening Assessment in accordance with Applying SEPP 33 Hazardous and Offensive Development Application Guidelines (DoP 2011). The screening indicated that the development is "potentially hazardous" based on the storage of sulfuric acid (up to 20,000L, equivalent to 36.53 tonnes; SEPP33 Screening Threshold = 25 tonnes) on site. With regards to transport of sulfuric acid the development would not be considered potentially hazardous as the number of generated traffic movements (for significant quantities of hazardous materials entering or leaving the site) is within the annual or weekly cumulative vehicle movements screening level for Class 8 Dangerous Goods being of cumulative annual vehicular movements less than 500 and peak weekly less than 30 (project requirements estimated one bulk vehicle transport movement delivering 10,000L, equivalent to 18.27 tonnes, per two weeks). Therefore a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis (DoP, 2011). The PHA should estimate the cumulative risks from the existing and proposed development.

Where SEPP 33 identifies a development as potentially hazardous and/or offensive, developments are required to undertake a PHA to determine the level of risk to people, property and the environment at the proposed location and in the presence of controls.

The purpose of the PHA is to access whether the proposed development impacts on the current surrounding land uses and or if the development is offensive or hazardous, thereby posing an unacceptable risk to the surrounding community or if the proposed development may be potentially subject to hazards or risks from existing development in the surrounding area.

1.1 Scope

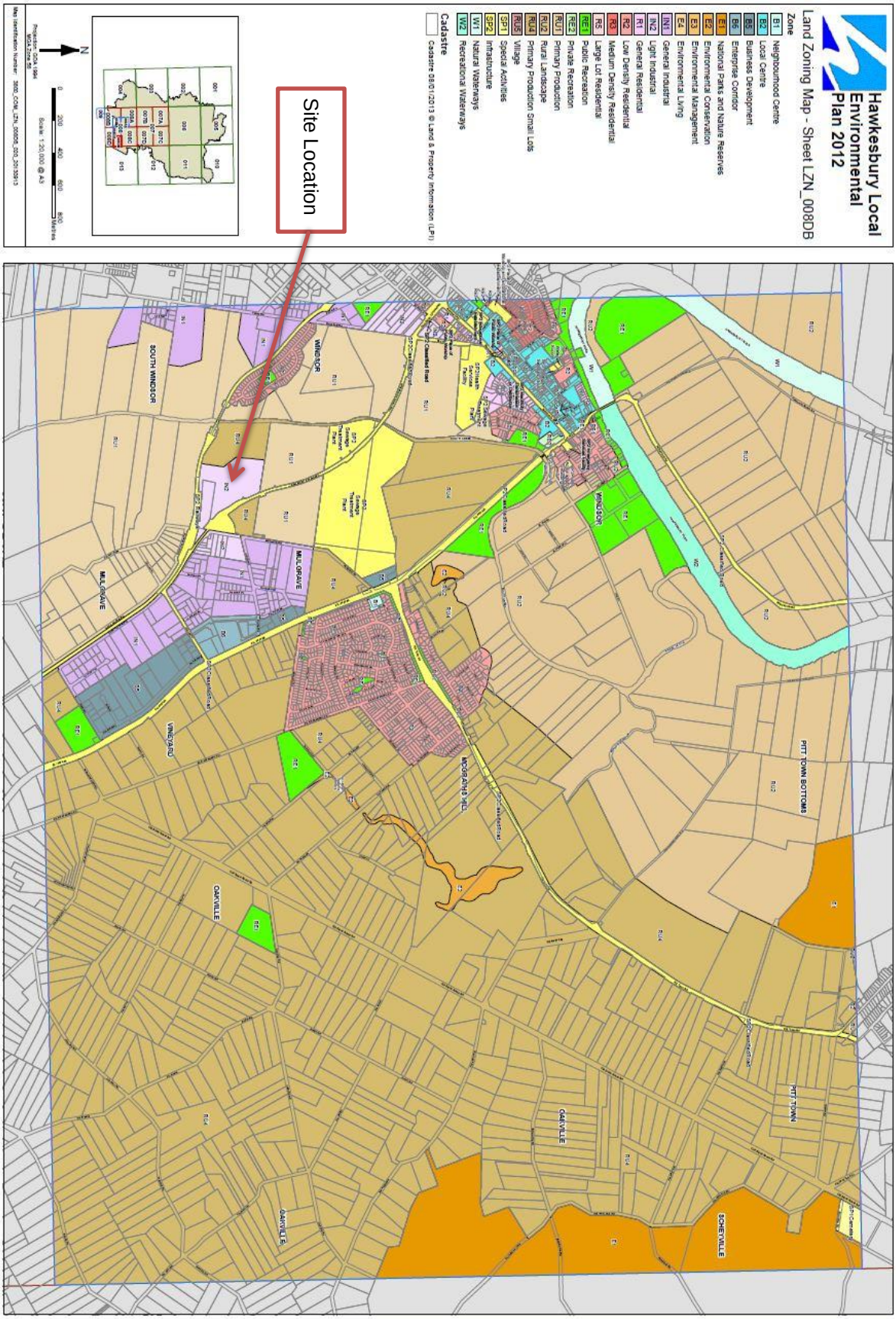
This PHA has been carried out in accordance with the *Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning, NSW Department of Planning*, (HIPAP 4) as stipulated by Planning Assessment Commission of New South Wales.

This study evaluates if potential hazards from land uses at identified surrounding sites are appropriately impact the proposed development and the impact of that hazard can be adequately controlled and not exceed the risk criteria set out in HIPAP 6 *Hazard Assessment*.

136R2 21-11-14

FIGURE 1 Mulgrave Substrate Plant

Figure 2 Hawkesbury Local Environmental Plan 2012 – Sheet LZN_008DB



2 OVERVIEW OF THE PROPOSED DEVELOPMENT

2.1 Proposed Development & Production processes

The following information was provided by Elf.

The site processes raw materials such as wheaten straw, chicken manures, gypsum, cotton seed and meals. This process mixes these materials in a wetting process and then are transferred for the composting process into tunnels to produce a substrate compost material for growing mushrooms which is later transferred to farms located in NSW and Queensland.

The following will summarise the process involved within each building on the site.

- ***Raw material storage shed***

The mushroom compost is manufactured from recycled agricultural materials including wheaten straw, poultry manure, stable bedding, cotton products and meals. These raw materials provide high quality mushroom compost.

Water is applied to bales of these raw materials and heat up is allowed to build up to remove the waxy layer from the straw and to initiate the composting process.

- ***Pre-wet shed***

After bale wetting, the bales are transferred into the pre-wet shed. Bales are broken and mixed with other ingredients using a mobile blender. Water is also added through this mixing process. The ricks are turned, blended and water added to further promote the composting process over the following days. Fresh air is supplied through air pipes underneath the ricks to keep the process aerobic. This method was first developed at the Elf Farm Supplies site and is now standard industry practice throughout the world.

- ***Phase 1***

The composting material is then moved to the phase 1 building and placed inside one of eight bunkers.

Fresh air is supplied through air pipes underneath the bunkers to control compost temperatures, oxygen levels and keep the process aerobic. The compost is blended a number of times and has water added to adjust the moisture content. Exhaust air is passed through a bio-scrubber and discharged up the stack.

- ***Phase 2 and 3***

After phase 1 is complete the composting material I moved to the phase 2/3 buildings.

3 Phase 2

Phase 2 and 3 comprises of additional tunnels.

Phase 1 compost is loaded into the tunnels. Each tunnel holds up to 200 tonnes of phase 1 compost that will finally reduce to 115 tonnes of phase 3 compost.

The phase 2 process is computer controlled using fresh, recirculated and cooled air to control compost temperatures and oxygen levels. Each tunnel has a dedicated air intake and fan system. Air is passed through a series of filters to remove particles down to 4 microns absolute. Filtration is important to prevent the introduction of competitor species.

Compost is initially levelled to a consistent temperature then heated for 8 hours to pasteurise the compost. Phase 2 is designed to kill unwanted pathogens and to create an ideal nutrient and biological medium for mushroom mycelium development. After pasteurisation, the compost is conditioned at 45-50˚C for three to four days.

4 Phase 3

The start of the Phase 3 compost involves the addition of spawn to the phase 2 compost. This operation is undertaken following intensive cleaning and disinfecting of the building and plant. It is very important to the process that 'sterile' conditions are created to prevent infection of the compost with unwanted pathogens that can impede mushroom growth.

Phase 2 material is removed from the respective tunnel and inoculated with spawn and returned to another tunnel. The phase 3 process is fully computer controlled to create environmental and biological conditions that maximise mushroom mycelium development.

Phase 3 material is later removed from the tunnels, protein supplements may be added, during the transfer from the tunnels to the trucks/blocking line. 25 tonnes trailers are then used to transport compost to farms in bulk. Some of the phase 3 compost are also manufactured into blocks prior to distribution.

The length of the process from commencement of pre-wet to ship out is approximately six to seven weeks. Mushroom harvesting commences a further two weeks after delivery to the respective farm.

New Odour Management – Bio filter

Process air from multiple areas of the plant is transferred via ductwork to six ammonia scrubbers.

The ammonia scubbers remove the ammonia from the process air before entering the bio filter. This is critical to maintain the bio-life activity of the filter.

Ammonia contaminated air is sparged with a dilute sulphuric acid solution (wash water) to remove the ammonia. The wash water pH levels are monitored to provide an effective chemical reaction with the ammonia. Acid dosing pumps are automatically started to dose concentrated sulphuric acid to maintain optimum pH levels.

Acid Storage

One piece cylindrical acid tank (sulphuric acid 70%)

- *Material – GRP/PVC*
- *Volume – 20,000L*
- *Size – 2.2m Diameter x 5.5m Height*

Safety systems

- *Level control – 2x overfill safety valves*
- *PE lined with double wall (safety basin)*
- *Eye wash and safety shower*
- *Double walled transfer/filling pipes*

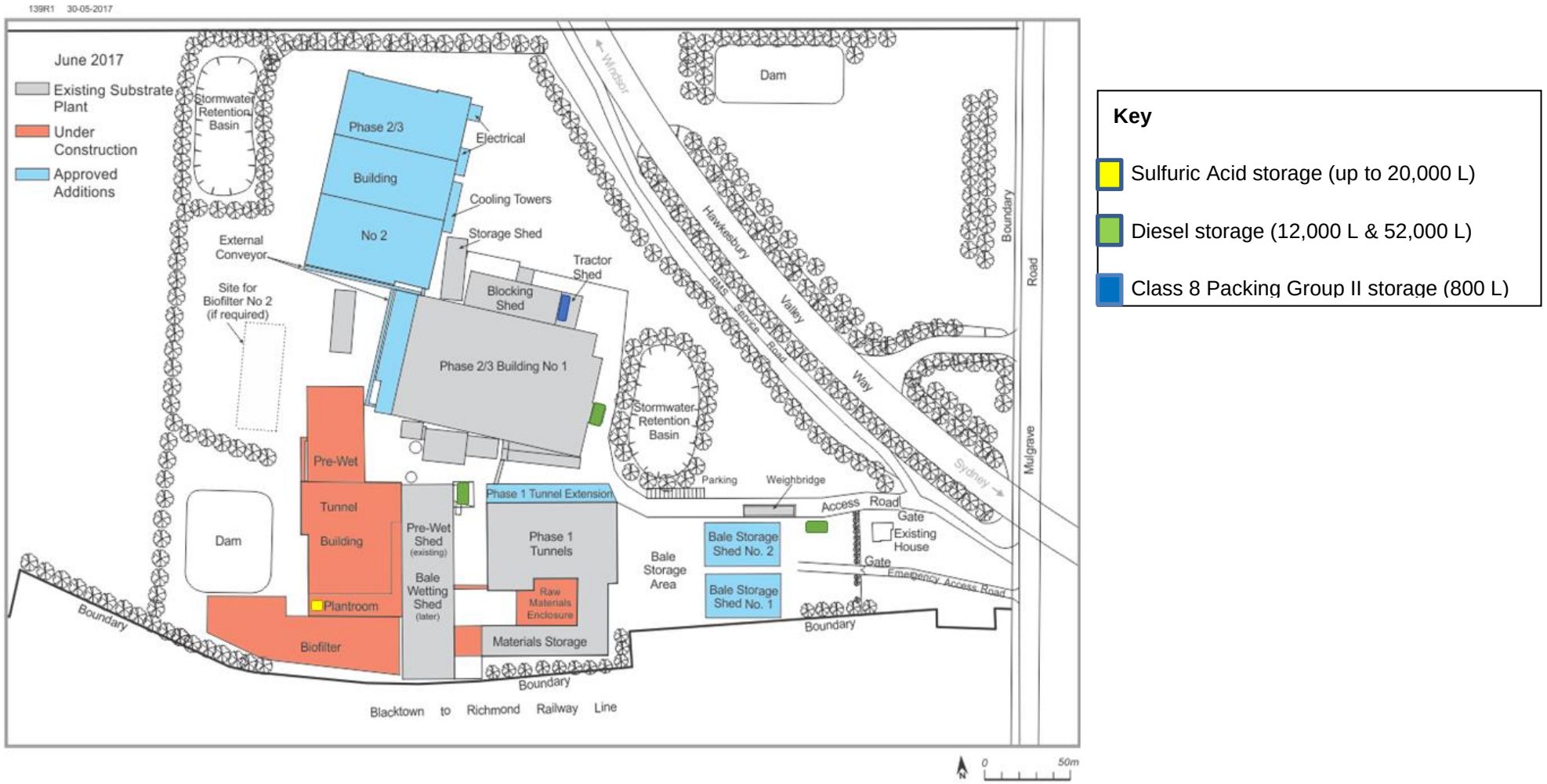
Separation Distance to boundary

- *AS3780-2008 The Storage and Handling of Corrosive Substances. Section 5.3 Location Of Bulk Containers, Table 5.1 requires separation distance from boundary to be at least 5 metres*

- *In the current project, acid storage tank and transfer points located at least 30 metres from site boundary*

Figure 3 shows the existing and approved development along with the locations of dangerous goods bulk storage and diesel storage on site.

Figure 3 Existing and Approved Development



Key

- Sulfuric Acid storage (up to 20,000 L)
- Diesel storage (12,000 L & 52,000 L)
- Class 8 Packing Group II storage (800 L)

4.1 Surrounding Land Uses and Zoning

Under the provision of the Hawkesbury Local Government Area (LGA), the Development Site is zoned IN2 Light Industrial. As evident on **Figure 2**, the land immediately to the east of the Development Site is also zoned IN2 Light Industrial or RU4 Primary Production Small Lots, with the nearest residence approximately 900 metres to the east. The land to west is zoned RU4 Primary Production Small Lots then approximately 220 metres to the west the zoning changes to R2 Low Density Residential. Land to the south is generally zoned as RU1 Primary Production with the exception of a strip of land along the site boundary in which the railway line runs, which is zoned SP2 Infrastructure (rail infrastructure facilities).

Those land uses permissible with consent in the IN2 zone are:

Depots; Funeral homes; Garden centres; Hardware and building supplies; Industrial training facilities; Kiosks; Landscaping material supplies; Light industries; Neighbourhood shops; Places of public worship; Plant nurseries; Roads; Take away food and drink premises; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4

Those land uses prohibited in the IN2 zone are:

Advertising structures; Agriculture; Air transport facilities; Airstrips; Amusement centres; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Community facilities; Eco-tourist facilities; Educational establishments; Entertainment facilities; Exhibition homes; Exhibition villages; Farm buildings; Forestry; Function centres; General industries; Health services facilities; Heavy industrial storage establishments; Heavy industries; Helipads; Highway service centres; Home-based child care; Home businesses; Home occupations; Home occupations (sex services); Jetties; Marinas; Open cut mining; Passenger transport facilities; Recreation facilities (major); Registered clubs; Residential accommodation; Restricted premises; Rural industries; Sewage treatment plants; Sex services premises; Tourist and visitor accommodation; Truck depots; Water recycling facilities; Water supply systems; Wharf or boating facilities; Wholesale supplies

5 HAZARD IDENTIFICATION

The hazard analysis and quantified risk assessment approach developed and recommended in HIPAP relies on a systematic and analytical approach to the identification and analysis of hazards and the quantification of off-site risks to assess risk tolerability and land use safety implications. HIPAP advocates a merit-based approach, the level and extent of analysis must be appropriate to the hazards present and therefore, need only progress to the extent necessary for the particular case.

5.1 Methodology

The procedures adopted by this study for assessing hazardous impacts involve the following steps:

Step 1: Hazard identification;

Step 2: Hazard analysis (consequence and probability estimations); and

Step 3: Risk evaluation and assessment against specific criteria.

The following sections of the report discuss the hazard identification and analysis process as prescribed in HIPAP.

5.2 Hazard Identification

This is the first step in the risk assessment. It involves the identification of all theoretically possible hazardous events as the basis for further quantification and analysis. This does not in any way imply that the hazard identified or its theoretically possible impact will occur in practice. Essentially, it identifies the particular characteristics and nature of hazards to be further evaluated in order to quantify potential risks.

To identify hazards, a survey of operations was carried out to isolate the events which are outside normal operating conditions and which have the potential to impact outside the boundaries of the Site. In accordance with HIPAP 4, these events do not include occurrences that are a normal part of the operation cycles of the Site but rather the atypical and abnormal, such as the occurrence of a significant liquid spill during product transfer operations.

5.3 Hazard Analysis

After a review of the events identified in the hazard identification stage and the prevention/protection measures incorporated into the design of the Site, any events which are considered to have the potential to result in impacts off-site or which have the potential to escalate to larger incidents are carried to the next stage of analysis.

5.3.1 Consequence Estimation

This aspect involves the analysis and modelling of the credible events carried forward from the hazard identification process in order to quantify their impacts outside the boundaries of the Site. These events typically include explosion, fire fume, dispersion/propagation and stormwater contamination and their potential effects on people and/or damage to property.

5.3.2 Probability Likelihood Estimation

Where necessary, the likelihood of incidents quantified as a result of **Section 5.3.1** are determined by adopting probability and likelihood factors derived from published data.

5.3.3 Risk Evaluation and Assessment

The risk analysis includes the consequences of each hazardous event and the frequencies of each initiating failure. The results of consequence calculations (radiation and overpressure contours, and toxic exposure levels) together with the probabilities and likelihood's estimated are then compared against the accepted criteria, as specified by the Department of Planning and Infrastructure applicable for the Site. Whether it is considered necessary to conduct the predictions would depend on the probabilities and likelihood estimated and if the risk criteria are exceeded.

5.4 Assessment Criteria

The risk criteria applied is specified by Hazardous Industry Planning Advisory Paper No 4 - Risk Criteria for Land Use Safety Planning (HIPAP 4). Following is a general discussion of the criteria that is used to assess the risk of a development on the surrounding community and environment.

5.4.1 Individual Fatality Risk Levels

The following paragraphs are reproduced from HIPAP 4 relating to individual fatality risk levels:

"People in hospitals, children at school or old-aged people are more vulnerable to hazards and less able to take evasive action, if need be, relative to the average residential population. A lower risk than the one in a million criteria (applicable for residential areas) may be more appropriate for such cases. On the other hand, land uses such as commercial and open space do not involve continuous occupancy by the same people.

The individual's occupancy of these areas is on an intermittent basis and the people present are generally mobile. As such, a higher level of risk (relative to the permanent housing occupancy exposure) may be tolerated. A higher level of risk still is generally considered acceptable in industrial areas".

The risk assessment criteria for individual fatality risk are presented below.

Land Use	Risk Criteria x 10^{-6}
Hospitals, schools, etc	0.5
Residential	1
Commercial	5
Sporting and active open space	10
Industrial	50

5.4.2 Injury Risk Levels

Injury risk levels from HIPAP 4 are stated below for heat of radiation.

- Incident heat flux radiation at residential areas should not exceed 4.7 kW/m2, at frequencies of more than 50 chances in a million per year.

- Incident explosion overpressure at residential areas should not exceed 7 kPa, at frequencies of more than 50 chances in a million per year.

The requirements for toxic exposure are stated as follows:

- Toxic concentrations in residential areas should not exceed a level that would be seriously injurious to sensitive members of the community following a relatively short period of exposure at maximum frequency of 10 in a million per year.

- Toxic concentrations in residential areas should not cause irritation to the eyes or throat, coughing or other acute physiological responses in sensitive members of the community over a maximum frequency of 50 in a million per year.

Please note that a risk hazard assessment only examines events that are considered to have the potential for significant off-site consequences.

5.4.3 Risk of Property Damage and Accident Propagation

HIPAP 4 indicates that siting of a hazardous installation must account for the potential for propagation of an accident causing a "domino" effect on adjoining premises. This risk would be expected within an industrial estate where siting of hazardous materials on one Site may potentially cause hazardous materials on an adjoining premises to further develop the size of the accident.

The criteria for risk to damage to property and of accident propagation are stated as follows:

- Incident heat flux at neighbouring potentially hazardous installations or at land zones to accommodate such installations should not exceed a risk of 50 in a million per year for the 23 kW/m2 heat flux level.

- Incident explosion overpressure at neighbouring potentially hazardous installations, at land zoned to accommodate such installations or at nearest public buildings should not exceed a risk of 50 in a million per year for the 14 kPa explosion overpressure level.

5.4.4 Criteria for Risk Assessment to the Biophysical Environment

HIPAP 4 indicates that siting of potentially hazardous developments also needs to consider the risk from accidental releases into the biophysical environment. Acute and chronic toxicity impacts are considered to be of most relevance.

The assessment of the ultimate effects from toxic releases into the natural ecosystem is difficult, particularly in the case of atypical accidental releases. Consequence data is limited and factors influencing the outcome variable and complex. In many cases, it may not be possible or practical to establish the final impact of any particular release. Because of such complexity, it is inappropriate to provide generalised criteria to cover any scenario. The acceptability of the risk will depend upon the value of the potentially affected zone or ecosystem to the local community and wider society.

The suggested criteria for sensitive environmental areas relate to the potential effects of an accidental release or emission on the long-term viability of the ecosystem or any species within it and are expressed as follows:

- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the effects or consequences of the more likely accidental emissions may threaten the long-term viability of the ecosystem or any species within it; and

- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the likelihood or probability of impacts that may threaten the long-term viability of the ecosystem or any species within it is not substantially lower than the existing background level threat to the ecosystem.

5.5 Potential Hazardous Incidents Identified For Further Discussion

Following a review of neighbouring properties a series of potentially hazardous events or scenarios were considered to identify if further comprehensive qualitative analysis is required. Each event or scenario shall be discussed in detail and the need for a further quantitative analysis considered.

The following potential hazards could not be eliminated through first review and require further examination:

- Sulfuric acid release

5.5.1 Sulfuric Acid

Sulfuric acid is classed as a Dangerous Goods Class 8 Corrosive Substance, Packing Group II Substance presenting medium danger.

Sulfuric acid in pure form is a clear colourless liquid and a strong acid. When concentrated sulfuric acid is mixed with water, the solution gets very hot. Concentrated sulfuric acid can catch fire or explode when it comes into contact with many chemicals including acetone, alcohols, and some finely divided metals. When heated it emits highly toxic fumes, which include sulfur trioxide (ATSDR, 1998). When exposed to air sulphur trioxide quickly reacts with water to form sulphuric acid. It is unlikely to exist in the atmosphere except as a transitory compound prior to conversion to sulphuric acid. Furthermore any sulphur trioxide inhaled by a person reacts with water and converts to sulphuric acid in the upper respiratory tract (ASTR, 1998). Accordingly, the focus of this toxicity assessment will be on sulphuric acid.

Atmospheric sulfuric acid is already present in the urban environment due to general air pollution. Much of the atmospheric sulphuric acid forms when sulphur dioxide degrades to sulphur trioxide which reacts with water in the air to form sulfuric acid. Sulfuric acid vapours can condense and form airborne particles, nuclei, which can grow in size overtime with the inclusion of water in the particles (ATSDR, 1998; WHO, 2006).

Sulfuric acid is very corrosive and irritating and cause direct local effects on the skin, eyes, and respiratory and gastrointestinal tracts when there is direct exposure to sufficient concentrations (ATSDR, 1998).

Sulfuric acid has a direct action on the tissues it contacts. Once absorbed sulphuric acid converts to salts of the sulphate ion which are excreted from the body in urine as organic sulphates, neutral sulphur or neutral sulphur compounds such as amino acids. The low toxicity of these metabolites means the main health impact from inhaled sulphuric acid will be the direct irritation of the respiratory tract (OEHHA, 2001).

Asthmatics and particularly adolescent asthmatics are the most sensitive group to the impacts of inhaled sulphuric acid. The lowest concentrations reported to illicit a physiological response in asthmatics has been 70µg/m^3, being transient changes in pulmonary function in adolescent children after 40 to 45 minutes exercise, with other studies reporting 100µg/m^3 as the lowest observable effect limit (ATSDR, 1998). In contrast, in healthy adults few lung function responses have been documented below 500µg/m^3 (Folinsbee, 1992).

The action of inhaled sulfuric acid on a person's respiratory system is dependent on the acid buffering capacity of the respiratory mucous layer. It has been estimated that a person with normal mucous buffering capacity and protein content can accommodate an exposure of approximately 300ug/m^3 for 30 minutes. In contrast asthmatics' mucous has been reported to be of lower pH and buffering capacity when compared with a healthy individual. This may explain asthmatics greater sensitivity to inhaled sulphuric acid (ATSDR, 1998).

The impact of a chemical exposure on children may vary from that experienced by adults. Children, from conception to 18 years old, are actively growing and some of their biological systems may still be developing. Children are not small adults and moreover children's behaviour may lead to different exposures to that of adults.

A number of studies have concluded that adolescent asthmatics may be more susceptible to transient sulfuric acid induced changes in respiratory function than adult asthmatics (ATSDR, 1998).

5.5.2 Sulfuric Acid – Incident Scenarios and Control Measures

Major incidents possible at the facility along with potential outcomes, consequences and control measures have been outlined below in **Table 1**.

The control measures are designed to maintain and contain the risks within the site boundary and reduce the risk to areas outside the site boundary. That is to contain the sulfuric acid spills within the site boundary wherever possible.

The technical and management safeguards required in place for sulfuric acid systems are self-evident and readily implemented as part of plant safety engineering.

Elf advised SLR that the facility operations and controls with regards to sulfuric acid will take guidance from the following guidelines *Orica Bulk Installation Guidelines – Sulfuric Acid 91-98% Concentration, Revision 1* and *Orica Bulk Chemical Delivery Requirements – Sulfuric Acid Revision 1.*

Table 1 Summary of Potential Major Incident Scenarios

Major Incident	Description	Potential Outcomes	Frequency Estimate	Likely Consequences	Controls	Action	Residual Risk Level
Sulfuric acid release – pipe rupture	Pipe rupture post storage tank, leading to release of sulfuric acid	Sulfuric acid release over a short period	Rare to Very Rare	Some potential for minor, short term off site impacts downwind from a release of fumes. Some medical treatment may be required in a worst case scenario Localised evacuation may be required	Tank situated in double walled Safety Basin Double walled tank situated in Safety Basin	Stop sulfuric acid from spreading & contains spills in Basin	Acceptable
Sulfuric acid release – storage tank failure	Sulfuric acid release.	Slow leak from of sulfuric acid from storage tank	Very Rare	Some potential for minor, short term off site impacts downwind from a release. Some medical treatment may be required in a worst case scenario Localised evacuation may be required	Periodic vessel inspection and system maintenance Tank situated in double walled Safety Basin to stop sulfuric acid from spreading Double walled tank situated in Safety Basin	Detect leaks early and correct before leaks become long term leaks or before significant amounts of sulfuric acid are released Safety Basin stops sulfuric acid from spreading & contains spills in Basin	Acceptable

Major Incident	Description	Potential Outcomes	Frequency Estimate	Likely Consequences	Controls	Action	Residual Risk Level
Sulfuric acid release – pipe leak (corrosion)	Small sulfuric acid leak, local odour noticed on site	Minor leak/plant shutdown and isolation	Rare	Minor irritation/injury to staff present – No off site impacts expected	Periodic vessel inspection and system maintenance	Detect deterioration in vessels and/or leaks early and correct before leaks become long term leaks or before significant amounts of sulfuric acid are released	Acceptable
Sulfuric acid Release – Pipework Flange/weld failure	Small leak of sulfuric acid. Will continue until leak is stopped	Minor leak/plant shutdown and isolation	Rare	Minor irritation/injury to staff present – No off site impacts expected	Periodic vessel inspection and system maintenance	Detect deterioration in vessels and/or leaks early and correct before leaks become long term leaks or before significant amounts of sulfuric acid are released	Acceptable
Sulfuric acid Release - Maintenance Operations	Maintenance error or accident	Small localised release of sulfuric acid	Unlikely	Minor irritation/injury to staff present – No off site impacts expected	All maintenance work on equipment carried out by competent personnel	Reduce the likelihood of error and accidents	Acceptable

Major Incident	Description	Potential Outcomes	Frequency Estimate	Likely Consequences	Controls	Action	Residual Risk Level
Sulfuric acid Release – Fire Impact (external)	Fire starts in another section of the building and impinges on sulfuric acid storage tank	Potential for fire to spread sulfuric acid may be released and act as additional fumes	Very Rare	Potential for downwind irritation if sulfuric acid is part of smoke plume.	Facility has appropriate fire control systems in pace.	Fire control system extinguishes or contains fire until Fire Brigade arrives. Thus fire has minimal impact of sulfuric acid storage	Acceptable
Site Fire	Fire starts in another section of the building and impinges on sulfuric acid storage tank	Potential for fire to spread, sulfuric acid may be released and act as additional fumes	Very Rare	Potential for downwind irritation if sulfuric acid is part of smoke plume.	Facility has appropriate fire control systems in pace.	Fire control system extinguishes or contains fire until Fire Brigade arrives. Thus fire has minimal impact of sulfuric acid storage	Acceptable
Sulfuric acid Release - mechanical impact on pipe/vessel	Impact causes pipe rupture or leak	Minor leak/plant shutdown and isolation	Very Rare	Minor irritation/injury to staff present – No off site impacts expected	Pipe work separated from normal operations or protected where possible.	Risk of damage to pipework reduced	Acceptable

Major Incident	Description	Potential Outcomes	Frequency Estimate	Likely Consequences	Controls	Action	Residual Risk Level
Sulfuric acid Release – during bulk delivery	Sulfuric acid release	Range from minor leak/plant shutdown and isolation to major leak	Rare to Very Rare	Some potential for minor, short term off site impacts downwind from a release. Some medical treatment may be required in a worst case scenario Localised evacuation may be required	Delivery procedures followed such as Orica Bulk Chemical Delivery Requirements – Sulfuric Acid Revision 1 or later version when available. Truck transfer bay slopes towards drain. The drain connects to all ammonia scrubber pits. Total volume capable to contain concentrate acid if double wall and safety basin breach or tanker/transfer spill.	Use of established industry procedures minimize likelihood of sulfuric acid leak during delivery In the case of a sulfuric acid spill during delivery, acid is contained in ammonia scrubber pits and does not migrate away from site	Acceptable

5.6 Assessment Criteria Applicable to the Proposed Development Application

In accordance with HIPAP 4 Risk Criteria for Land Use Safety Planning, the following is a discussion of the risk assessment criteria that shall be applied to the proposed development application.

5.6.1 Heat-Flux Radiation Criteria

As discussed above, further consequence analysis of an incident involving heat radiation from a fire from neighbouring sites is not considered necessary.

5.6.2 Explosion Over-Pressure Criteria

As discussed above, further consequence analysis of an incident involving explosion over pressure from a fire on-site is not considered necessary.

5.6.3 Toxic Exposure Criteria

The proposed development would store notable volumes of dangerous goods being sulfuric acid, which would tend to generate toxic releases in the event of a large spill. However the sulfuric acid will be in a largely closed system with well understood engineering controls in place. Furthermore the technical and management safeguards required in place for sulfuric acid systems are self-evident and readily implemented as part of plant safety engineering.

Consequently, a consequence analysis of an incident involving toxic emissions is not considered necessary.

5.6.4 Biophysical Environment Risk Criteria

A consequence analysis of an incident involving toxic releases into the biophysical environment is not considered necessary. Given that the technical and management safeguards required in place for sulfuric acid systems are self-evident and readily implemented as part of plant safety engineering.

5.6.5 Individual Fatality Risk Criteria

An estimate of the Industrial Fatality Risk Criteria is not required as the proposed development does not impact on neighbouring properties and neighbouring properties do not impact on the proposed development.

5.7 Concluding Remarks

It is considered that the operations of the proposed development with the safeguards as stipulated would not cause significant off site risks. Given the controls, the development and associated activities are not considered to be a hazardous development.

5.8 CONSEQUENCE ANALYSIS

The consequences of an accident involving a particular hazardous substance depends on the type and quantity of hazardous substance, the type of activity using the substance as well as the exposed population and/or environment.

A consequence analysis of any on-site concerns from the proposed development is not necessary as the development is not considered a hazardous development nor does it increase the potential hazard in the immediate area.

6 CONCLUSION

The Preliminary Hazard Analysis has found that the operation of the proposed development meets the criteria laid down in HIPAP 4 Risk Criteria for Land Use Safety Planning and would not cause any risk, significant or minor, to the community. Furthermore, the site's proposed operations are not an offensive or hazardous industry based on applying the planning guidelines.

Other spill, fire and incident events are not likely to extend significantly beyond the boundary of the site, with the exception of a major plant fire where, regardless of the type of operation there will always be a risk of potentially harmful smoke plumes downwind from a fire. In the majority of large fires the buoyant nature of a smoke plume means any potentially harmful materials are rapidly dispersed.

It is the conclusion of this PHA that the proposed development meets all the requirements stipulated by the Department of Planning and hence would not be considered, with suitable engineering controls in place to be an offensive or hazardous development on site or would not be impacted by any hazardous incidents from adjoining facilities off site.

7 REFERENCES

AS 3780—2008 Australian Standard, The Storage and Handling of Corrosive Substances

ATSDR, 1998 *Toxicological profile for sulphur trioxide and sulphuric acid*, Agency for Toxic Substances and Disease Registry United States Department of Health and Human Services, Public Health Service, Atlanta, GA.

Folinsbee, L.J., 1992. Human Health Effects of Air Pollution. *Environmental Health Perspectives.* 100. pp45-56

OEHHA, 2001. *Sulfuric Acid Chronic Toxicity Summary. Determination of Non-cancer Chronic Reference Exposure Levels Batch 2B, December 200*1 California Government Office of Environmental Health Hazard Assessment http://oehha.ca.gov/air/chronic_rels/pdf/sulfuric.pdf (accessed 16/12/2015)

Orica Bulk Installation Guidelines – Sulfuric Acid 91-98% Concentration, Revision 1

Orica Bulk Chemical Delivery Requirements – Sulfuric Acid Revision 1

WHO, 2006. *Air Quality Guidelines Global Update* 2005

Appendix A – NSW Department of Planning & Environment Clarifications

NSW Department of Planning & Environment asked for the following points to be clarified:

Please clarify as follows:

Question 1:
The design of the double walled safety basin- is it a single wall acid storage tank that sits in a bund with PE lining?

Answer:
The tank itself is designed to store 96% H_2S0_4. The outer body is out of composed of GFK (fibre reinforced plastics) and inner liner of 4mm PVC-U (unplasticised polyvinyl chloride). The Safety tank made of PE100 (Polyethylene), Gaskets etc. are made of EPDM (ethylene propylene diene monomer (M-class) rubber).

Question 2:
Is the overfill safety valve automatic? Will it stop the filling operation on detection of high levels?

Answer:
The tank is equipped with two level sensors. One is a radar sensor and shows the actual level (live). The second is a high-high capacitive sensor.

When the tank is filled the operator has to enable “key switch 1” then the tank can be filled to 90%. At 90% a visual light will flash and optical alarm will sound. Filling valve will shut, operator has to enable “key switch 2”, then the tank can be filled up to 95%. At 95% the valve will automatically shut and can’t be opened. This is also the level of the capacitive high-high sensor. So basically this 5% is to drain the hose of the truck

Question 3:
The design of double walled transfer/filling pipes – in the event of a pipe leak, will the acid be contained within the outer pipe?

Answer:
Yes, the outer pipe will stick a little bit into either the filling cabinet or the dosing cabinet (lowest point). There is a little drain with clear pipe so the operator can see if there is a leak.

See **Photo 1** below, the black piece in the cabinet is the outer safety pipe and has a small T-off section with clear pipe.

Question 4:
Explain how the control measures may reduce the risks and maintain the risk within the site boundary?

Answer:
The control measures are designed to maintain and contain the risks within the site boundary and reduce the risk to areas outside the site boundary. That is to contain the sulfuric acid spills within the site boundary wherever possible through the use of containment systems and procedures designed to allow early detection of leaks or deterioration of components that may lead to leaks.

For specific comments see **Table 1**, Actions column.

Photo 1 Example of pipe setup on bulk storage tank

Appendix G

STORMWATER MANAGEMEMNT

BARKER RYAN STEWART
TOTAL PROJECT SOLUTIONS
ABN 26 134 067 842

Elf Farm Supplies Pty Ltd

Stormwater Management Report

112 Mulgrave Road, Mulgrave

April 2018

PLANNING
PROJECT MANAGEMENT
ENGINEERING
CERTIFICATION

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BARKER RYAN STEWART
TOTAL PROJECT SOLUTIONS

PLANNING
PROJECT MANAGEMENT
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CERTIFICATION

ABN 26 134 067 842

Project No.	SY160127
Author	JT
Checked	GR
Approved	GJ

Rev No.	Status	Date	Comments
1	Draft	21.12.17	
2	For Issue	12.04.17	Amended to reflect detailed survey

SUSTAINABLE CERTIFICATION AS/NZS 4801 Endorsed OHS Management System
SUSTAINABLE CERTIFICATION ISO 9001: 2015 Endorsed Quality Management System
SUSTAINABLE CERTIFICATION ISO 14001 : 2015 Endorsed Environmental Management System

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TOTAL PROJECT SOLUTIONS

PLANNING
PROJECT MANAGEMENT
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TABLE OF CONTENTS

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1 Introduction

This report has been prepared to detail the results of an analysis undertaken to assess the impacts of an expansion of the mushroom composting and growing facility at 112 Mulgrave Road, Mulgrave. Details were previously submitted by Barker Ryan Stewart in support of the original proposal however as some parts of the project were altered during the course of construction, further analysis has been undertaken.

In considering the stormwater management at the site, this investigation will consider the following:

- The pre-development and post development site conditions.
- The basins installed on the site as part of the development proposal.
- Additional basins constructed on site to accommodate the altered construction works, and
- Councils On-Site Stormwater Detention requirements for development within the Hawkesbury.

2 Site Location and Development Proposal

2.1 Site Location

The site of the proposed development is described as Lot 13 and 14 in DP 1138749. This lot is known as 108 and 112 Mulgrave Road, Mulgrave.

2.2 Proposal

The site is an existing mushroom farm and mushroom substrate farm which is currently being expanded. There are existing approvals for the stormwater disposal system that are generally in place. Some of the new buildings and site works have been altered from the original approval and so the further analysis has been undertaken.

The following amendments have been made from the original approval that have impacted on the stormwater disposal system.

- The roof areas, grass areas and hardstand areas have changed for each of the four internal catchments. The catchments have been referred to as the northern catchment which drains to the north east under Hawkesbury Valley Way, the north western catchment draining to South Creek, the south west catchment which also drains to South Creek and the southern catchment which drains under the railway line.
- Additional roof area has been constructed over the work area located centrally within the site. This has reduced the hardstand area draining to the west wetting area and directed roof area to both the south catchment and the south west catchments.
- While the southern catchment has had additional roof area directed to it from the covering of the wetting area, part of the roof area of the existing bunkers is now draining to the northern catchment, which means that there is now less area draining to the south under the railway line than found to be the case in the pre developed case.
- The northern catchment has an increased area proposed to drain to it as a result of the roof area now discharging into existing basin 1and an additional area that will drain to it once land located in the south east corner of the site is filled and used for straw bale storage.
- The north west catchment draining to basin 2 will have a reduced area draining to it as a result of redirecting some of the drainage to the south western catchment. The hardstand, impervious and roof areas have changed slightly as a result of the revised proposal.
- It was previously proposed that the south west catchment was directed to a reed bed which had no detention properties, however as the works progressed the drainage system was directed into a depression that has since worked as a detention basin. This analysis proposes to formalise this into a combined reed bed / detention basin.

2.3 Altered catchment Areas

The following changes in catchment area were used for the analysis,

South catchment

Previously assessed roof area	4,470m2
Proposed roof area	3,770m2

North catchment

Previously assessed catchment area	36,280m2
Increase in roof area	1,600m2
Increase in impermeable surface	740m2
Decrease in permeable surface	920m2
Proposed catchment area	37,700m2

Northwest Catchment

Previously assessed catchment area	29,670m2
Increase in impermeable surface	13,980m2
Decrease in permeable surface	12,500m2
Proposed Catchment area	31,150m2

Southwest Catchment area

Previously assessed catchment area	18,230m2
Increase in roof area	8,470m2
Decrease in permeable surface	910m2
Increase in hardstand area	2,710m2
Proposed catchment area	28,500m2

As the roof area draining to the south has reduced and there is no basin currently on this line, no further analysis has been undertaken as the peak flows will only reduce. For the northern catchment, the area has changed and so the outlet configurations will need to be altered to ensure that the post development flows will not be greater than the respective pre-developed cases. In these cases, a discharge control pit and outlet orifice will need to be installed to account for the altered catchments.

In the case of the south western and north western catchment, a discharge control pit with orifice plate in addition to an outlet pipe through the basin wall will be required to ensure pre-development flows are met. In addition an overflow spillway will need to be constructed for both basins to ensure the basin walls are not overtopped, most likely causing a wall failure, in the case of a larger storm event.

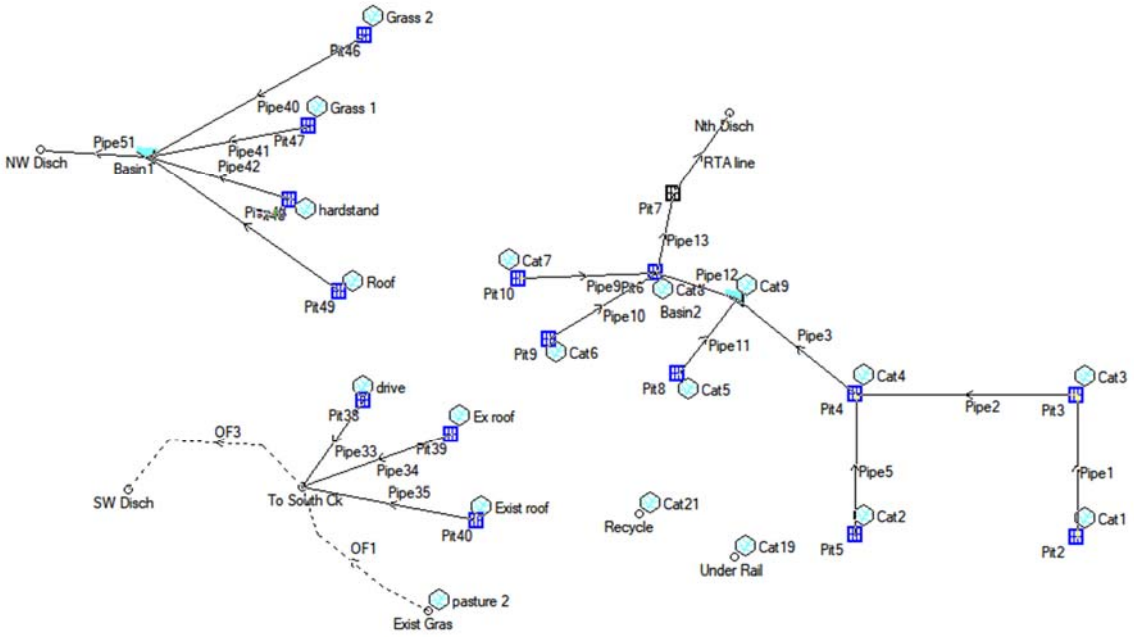
3 Discharge Requirements

3.1 General

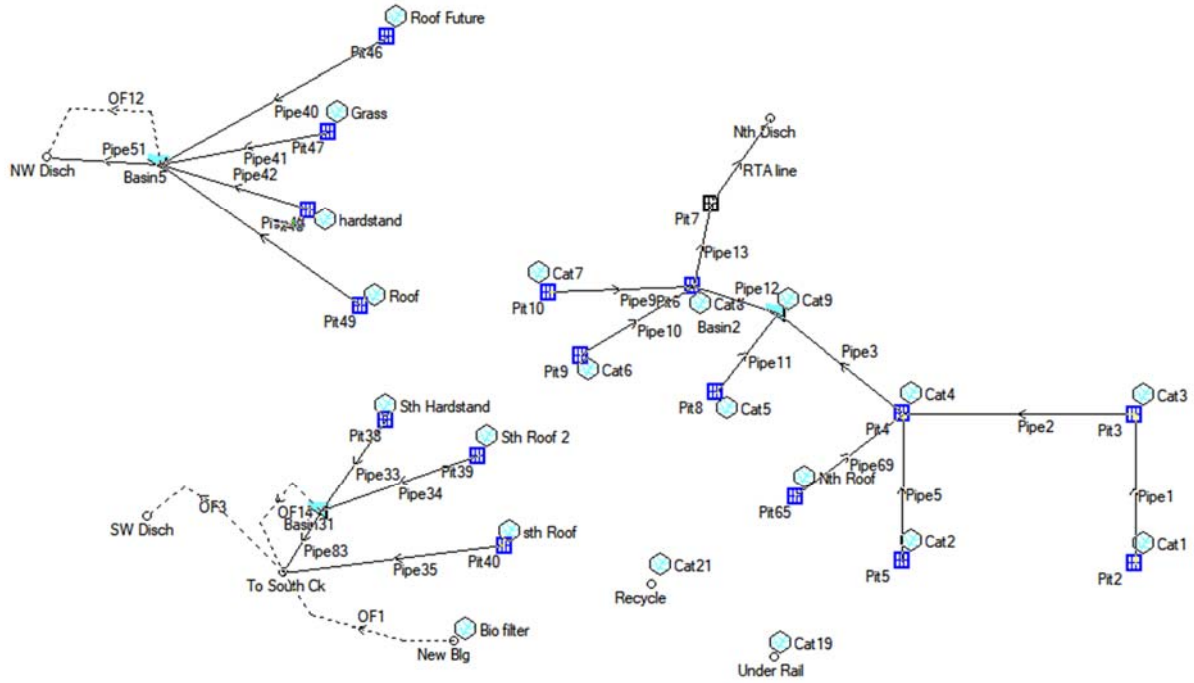
The discharge rates of for the catchment and the sizing of the on-site detention system have been calculated using the design rainfall events in AR&R. The rainfall intensities used are from Councils Engineering Design Guidelines. The modelling has been undertaken using the software DRAINS.

3.2 Drains Model

The existing pre-developed DRAINS model set up as part of the development application for the expansion of the site was used as the basis for the pre development flows that are not to be exceeded. This model was set up to reflect the site prior to the sites expansion and the results of the model are shown below in Section 3.3. A copy of the model is shown below,



The post development model also set up and submitted as part of the application process has been modified to reflect the changes that have occurred on the site, taking into consideration the varying impervious areas, roof areas and drainage construction. To ensure that the post development discharge remained at or below the pre-development model, an orifice plate was incorporated into the basin outlet and varied in size until the peak discharge rate for all storm events from the 1-year ARI up to the 100 year ARI complied. A copy of the model is shown below,



3.3 Results

It was found that

- The size of the basins for all three catchments is sufficient to cater for the onsite detention needs for the upgraded facility,
- the existing northern basin discharging under the Hawkesbury Valley Way will require a 150mm plate to be incorporated into the outlet control pit
- the existing basin discharging to the north west will require a 235mm orifice plate to be incorporated into the discharge control pit, and
- The informal basin located to the sites south west will need to be formalised with the inclusion of a discharge control pit with an orifice of 215mm in size.

The results below show the pre-developed flows compared against the post developed flows once the orifice restrictions are incorporated into the outlet pits.

ARI	Pre-Developed Case (l/S)			Post Developed Case (l/S)		
	NW catchment	SW catchment	Nth catchment	NW catchment	SW catchment	Nth catchment
1	87	175	150	86	171	150
5	371	497	401	128	285	298
20	447	562	571	151	361	401
100	531	724	653	525	430	476

The results show that with the discharge control pits restrictions in place that for the 1 year ARI rainfall event the post developed discharge is at least the same for each of the three catchments and that in events larger than this the post developed discharges are all less than the pre developed cases.

The model also shows that the pipe sizes used on site have adequate capacity to convey where necessary runoff from the 100 year ARI storm event.

4 Recommendations

The investigations undertaken in preparing this report have shown that the stormwater generated from the proposed development can be adequately managed through some minor upgrading measures within the existing basins.

The upgrading measures include

- Installing a 150mm orifice plate into a discharge control pit for the northern basin discharging under the Hawkesbury Valley Way
- Installing a 235mm orifice plate into a discharge control pit for the basin discharging to the north west in addition to a 4m wide overflow weir, and
- The informal basin located to the sites south west will need to be formalised with the inclusion of a discharge control pit with an orifice of 215mm in size in addition to a 4m wide overflow weir.

5 References

The Institution of Engineers Australia, 1987, "*Australian Rainfall and Runoff : A guide to Flood estimation"*, The Institution of Engineers Australia, Canberra

Hawkesbury Development Control Plan, 2002, "Part 1 design Specifications.
http://www.hawkesbury.nsw.gov.au

ATTACHMENT A

Civil Engineering Drawings

A1

REVISION A

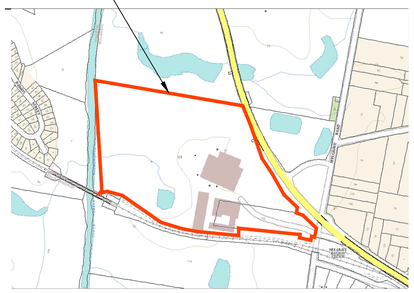
HAWKESBURY CITY COUNCIL
PROPOSED DRAINAGE WORKS
108 & 112 MULGRAVE RD, MULGRAVE
DETENTION BASIN & DRAINAGE PLANS

GENERAL NOTES

1. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH HAWKESBURY CITY COUNCIL'S WORKS SPECIFICATION CIVIL - 2002 REQUIREMENTS AND/OR AS DIRECTED BY THEIR REPRESENTATIVE.
2. THE CONTRACTOR IS TO IDENTIFY, LOCATE AND LEVEL ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION WORKS AND WHERE NECESSARY MAKE ARRANGEMENTS WITH THE RELEVANT AUTHORITY TO RELOCATE OR ADJUST WHERE NECESSARY.
3. COUNCIL'S TREE PRESERVATION ORDER MUST BE OBSERVED AND NO TREE SHALL BE FELLED, LOPPED OR REMOVED WITHOUT THE PRIOR APPROVAL OF COUNCIL.
4. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE WORK HEALTH & SAFETY ACT 2011 AND ALL RELEVANT OCCUPATIONAL HEALTH & SAFETY POLICIES AND REGULATIONS.
5. DIMENSIONS SHALL NOT BE SCALED FROM THE PLANS. CLARIFICATION OF DIMENSIONS SHALL BE SOUGHT FROM THE SUPERINTENDENT OR REFERRED TO THE DESIGNER.
6. SURVEY MARKS SHOWN THUS ◮ SHALL BE MAINTAINED AT ALL TIMES. WHERE RETENTION IS NOT POSSIBLE THE ENGINEER SHALL BE NOTIFIED AND CONSENT RECIEVED PRIOR TO THEIR REMOVAL.
7. ALL NEW WORK IS TO MAKE A SMOOTH JUNCTION WITH EXISTING CONDITIONS.
8. THE CONTRACTOR IS NOT TO ENTER UPON NOR DO ANY WORK WITHIN OR ON ADJACENT LANDS WITHOUT THE PRIOR APPROVAL OF THE SUPERINTENDENT AND THE WRITTEN PERMISSION OF THE OWNERS.
9. SEDIMENT MEASURES SHALL BE IMPLEMENTED PRIOR TO SOIL DISTURBANCE IN KEEPING WITH THE 4th EDITION OF LANDCOMS "SOILS AND CONSTRUCTION - MANAGING URBAN STORMWATER" MARCH 2004 TO THE SATISFACTION OF COUNCIL'S REPRESENTATIVE AND AS SHOWN IN THESE DRAWINGS.
10. THE CONTRACTOR SHALL CLEAR THE SITE BY REMOVING ALL RUBBISH, FENCES, OUT HOUSES, CAR BODIES, DEBRIS, ETC. THE CONTRACTOR SHALL NOT DISPOSE OF ANY DEBRIS BY BURNING OFF IN AN OPEN FIRE.
11. UNSOUND MATERIALS AS DETERMINED BY COUNCIL'S REPRESENTATIVE SHALL BE REMOVED FROM ROADS AND LOTS PRIOR TO ANY FILLING.
12. ALL SITE REGRADING AREAS SHALL BE GRADED TO THE SATISFACTION OF COUNCIL'S REPRESENTATIVE. THE CONTRACTOR SHALL TAKE LEVELS ON THE EXISTING SURFACE AFTER STRIPPING TOPSOIL AND PRIOR TO COMMENCING ANY FILL OPERATIONS.
13. SURPLUS EXCAVATED MATERIAL SHALL BE PLACED OR DISPOSED OF IN ACCORDANCE WITH THE CONTRACT, OR AS DIRECTED BY THE SUPERINTENDENT.
14. ALL SITE FILLING SHALL BE PLACED IN LAYERS NOT EXCEEDING 300mm AND COMPACTED IN ACCORDANCE WITH COUNCIL'S SPECIFICATION AND BE TESTED AT THE REQUIRED INTERVALS BY AN APPROVED N.A.T.A. GEOTECHNICAL LABORATORY.
15. MINIMUM 150mm THICK TOPSOIL SHALL BE SPREAD ON ALL FOOTPATHS, BERMS, BATTERS AND SITE REGRADING AREAS. EXCESS TOPSOIL SHALL BE DISPOSED OF AS DIRECTED BY THE SUPERINTENDENT.
16. ALL LAND DISTURBED BY EARTHWORKS SHALL BE SPRAY-GRASSED, OR SIMILARLY TREATED TO ESTABLISH GRASS COVER. SEED MIXTURES ARE TO BE APPROVED BY COUNCIL PRIOR TO SPRAYING. ALL GRASSED AREAS SHALL BE REGULARLY WATERED AND MAINTAINED UNTIL EXPIRATION OF THE MAINTENANCE PERIOD.
17. THE CONTRACTOR SHALL MAINTAIN DUST CONTROL THROUGHOUT THE DURATION OF THE PROJECT.
18. ALL PITS DEEPER THAN 1.2m SHALL HAVE STEP IRONS PROVIDED IN ACCORDANCE WITH COUNCIL'S STANDARDS.
19. ALL DRAINAGE LINES THROUGH LOTS SHALL BE CONTAINED WITHIN THEIR EASEMENTS AND CONFORM WITH COUNCIL'S STANDARDS.
20. ALL DRAINAGE LINES ON HIGH SIDE AND UNDER ROADS SHALL BE BACKFILLED WITH SHARP SAND AND HAVE 3.0m OF AGRICULTURAL LINE WRAPPED IN AN APPROVED FILTER FABRIC, DISCHARGING INTO THE DOWNSTREAM PIT.
21. SUBSOIL DRAINS SHALL BE CONSTRUCTED TO THE SATISFACTION OF COUNCIL'S REPRESENTATIVE.
22. PROVIDE VEHICULAR ENTRIES IN KERB AND GUTTER WHERE SHOWN OR WHERE DIRECTED BY THE SUPERINTENDANT.
23. GUIDE POSTS SHALL BE 100mm X 50mm HARDWOOD, PAINTED WHITE WITH REFLECTORS.
24. ERECT STREET NAME SIGNS, CONDUIT WARNING SIGNS AND NO THROUGH ROAD SIGNS WHERE SHOWN OR WHERE DIRECTED BY COUNCIL'S REPRESENTATIVE.
25. CONDUITS SHALL BE LAID AFTER POSITIONS HAVE BEEN DETERMINED BY THE RELEVANT AUTHORITIES AND BEFORE FINAL A.C. IS LAID
26. POSITION OF CONDUITS SHALL BE MARKED ON THE KERB.
27. FELLED TREES SHALL BE SALVAGED FOR RE-USE AS WOODCHIP MULCH OR LOG FORM FOR SITE REHABILITATION, NON-SALVAGEABLE MATERIAL SUCH AS STUMPS AND ROOTS SHALL BE DISPOSED OF OFF SITE.
28. THE CONTRACTOR SHALL PROVIDE MINIMUM 24 HOURS NOTICE TO COUNCIL'S REPRESENTATIVE FOR ALL INSPECTIONS.
29. THE CONTRACTOR SHALL MAINTAIN SERVICES AND ALL WEATHER ACCESS AT ALL TIMES TO THE ADJOINING PROPERTIES.
30. THE CONTRACTOR SHALL UNDERTAKE TRAFFIC CONTROL MEASURES TO COUNCIL'S SATISFACTION AND SHALL DISPLAY ALL APPROPRIATE WARNING SIGNS THROUGHOUT THE DURATION OF CONSTRUCTION.
31. ALL NATURAL SURFACE DATA HAS BEEN DETERMINED BY TERRAIN MODELLING. ALL CONSTRUCTION SITE WORKS MUST BE CARRIED OUT USING THE BENCH MARKS SHOWN ON THESE DRAWINGS.

Prepared for: ELF FARM SUPPLIES PTY LTD

LOCATION OF WORKS



LOCALITY SKETCH
NOT TO SCALE

SHEET INDEX

SHEET No.	DESCRIPTION
COVER SHEET	COVER SHEET - GENERAL NOTES, SHEET INDEX AND LEGEND
2	SITE PLAN
3	BASIN 1 PLAN & DETAIL 1
4	BASIN 2 PLAN & DETAIL 2
5	BASIN 3 PLAN & DETAIL 3
6	CATCHMENT PLAN

LEGEND

- PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE
- 24 NATURAL SURFACE CONTOUR
- EXISTING HEADWALL
- PROPOSED HEADWALL
- GRATED SURFACE INLET PIT
- SEALED PIT

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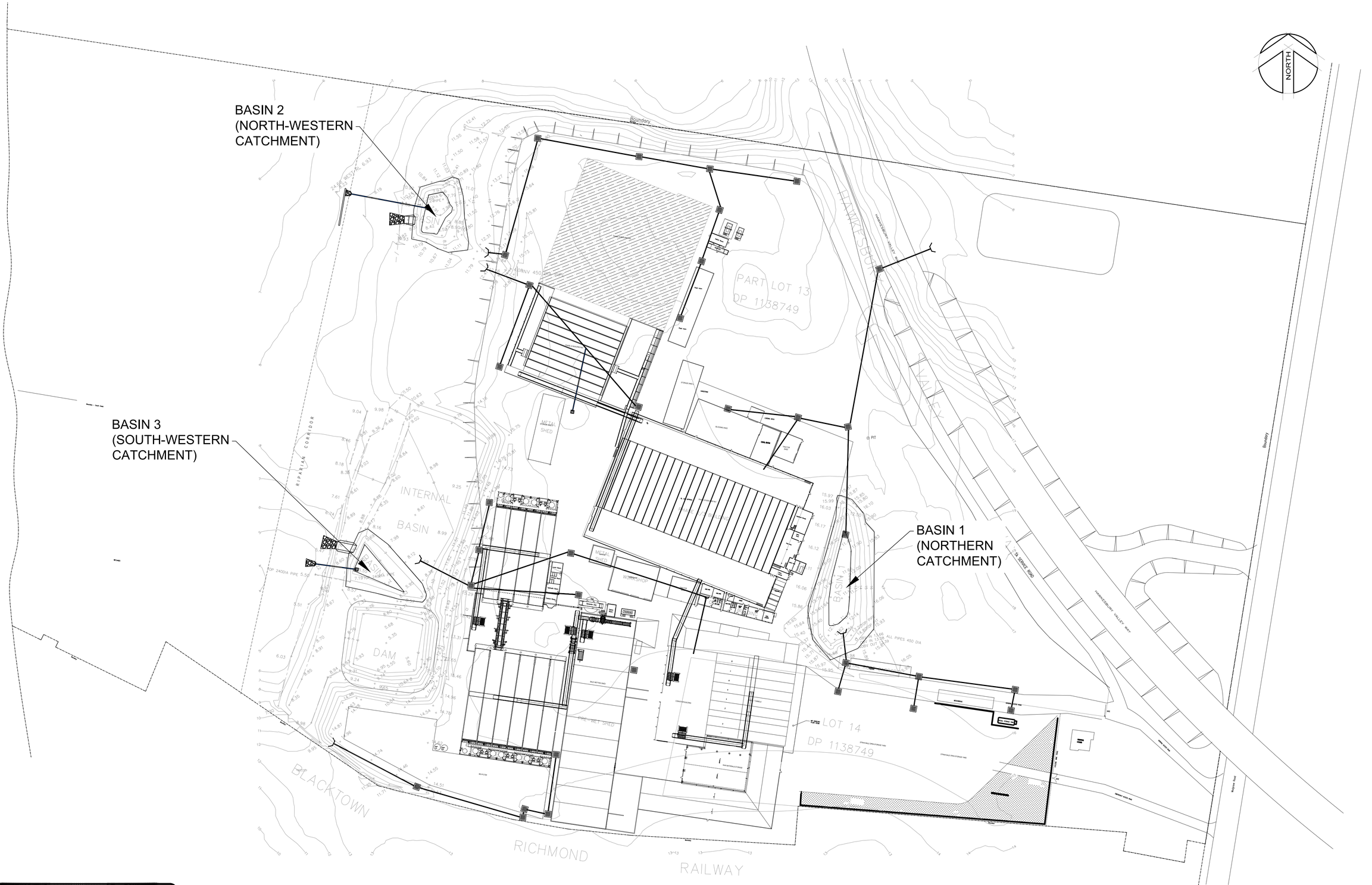
A1



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108 - 112 MULGRAVE RD, MULGRAVE
LOT 13 & 14 in DP 1138749
PROPOSED STORMWATER DETENTION BASINS

SITE PLAN

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Checked: GJR

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Vert.
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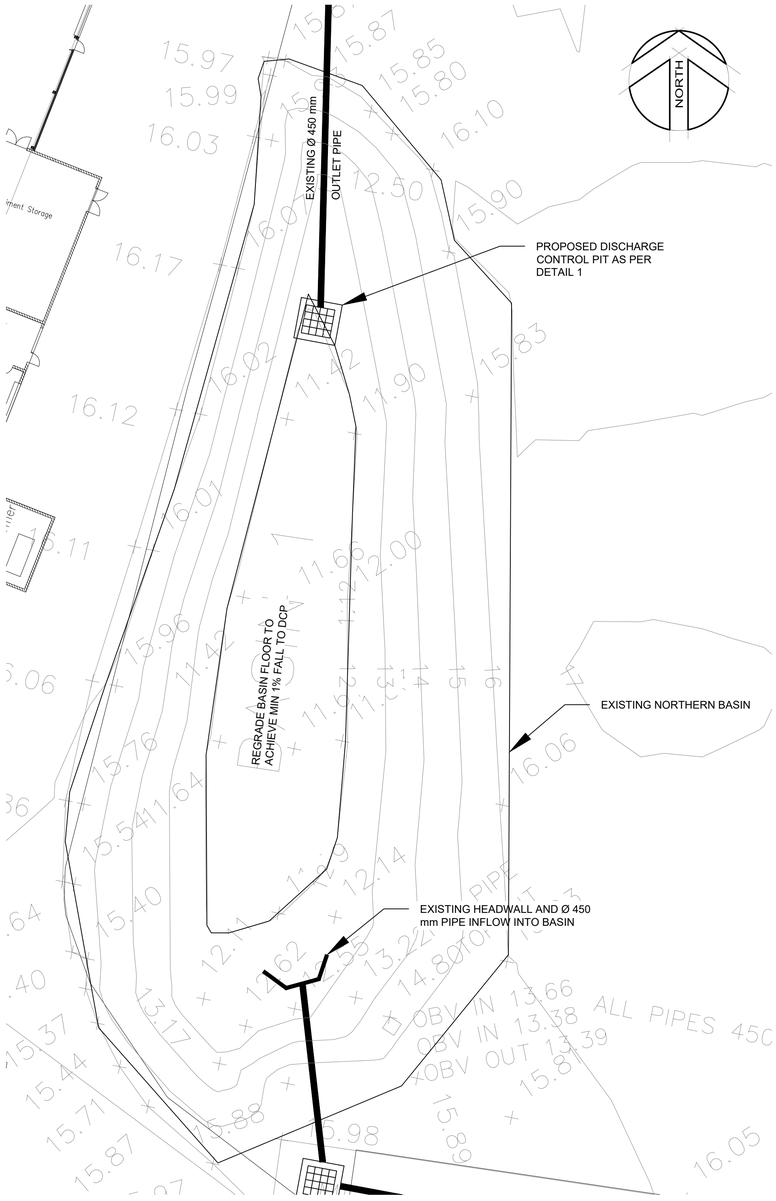

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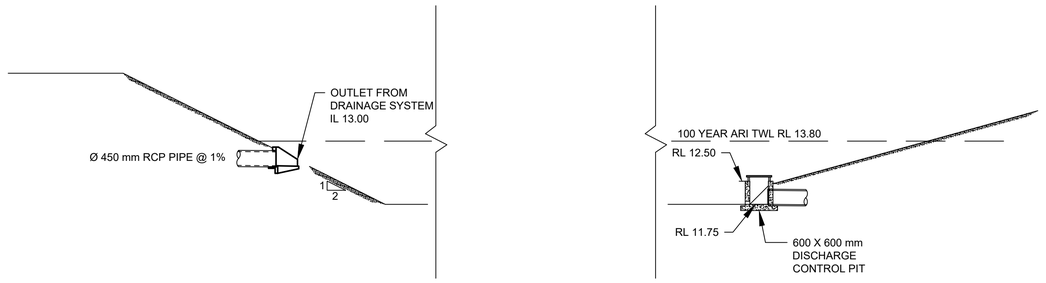

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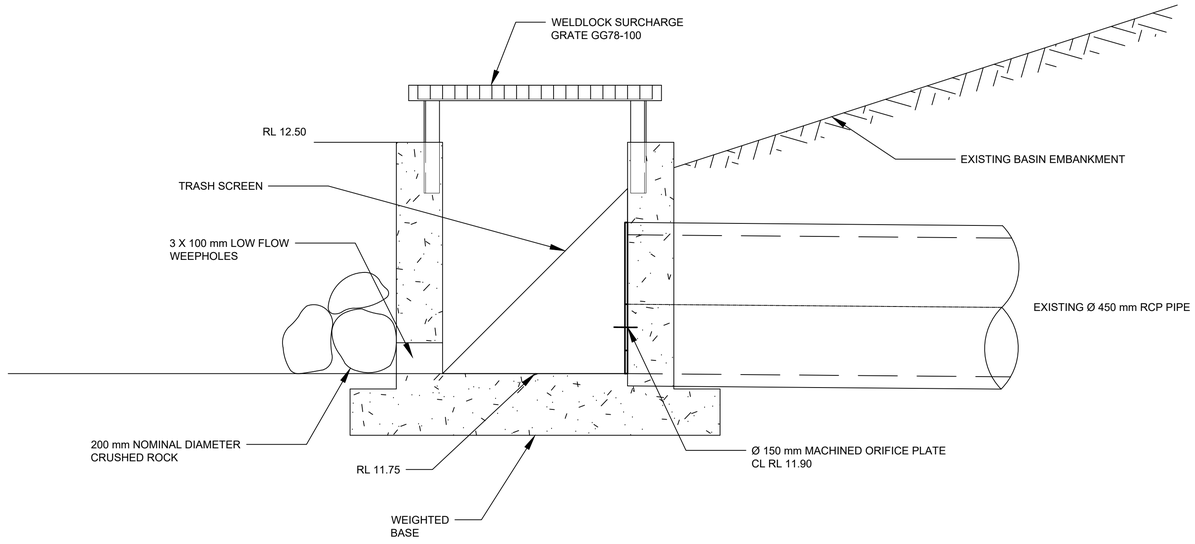

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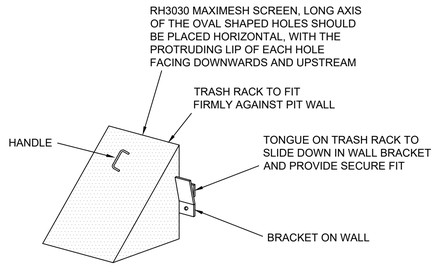

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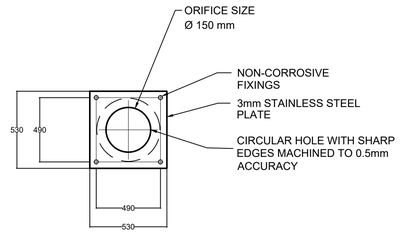

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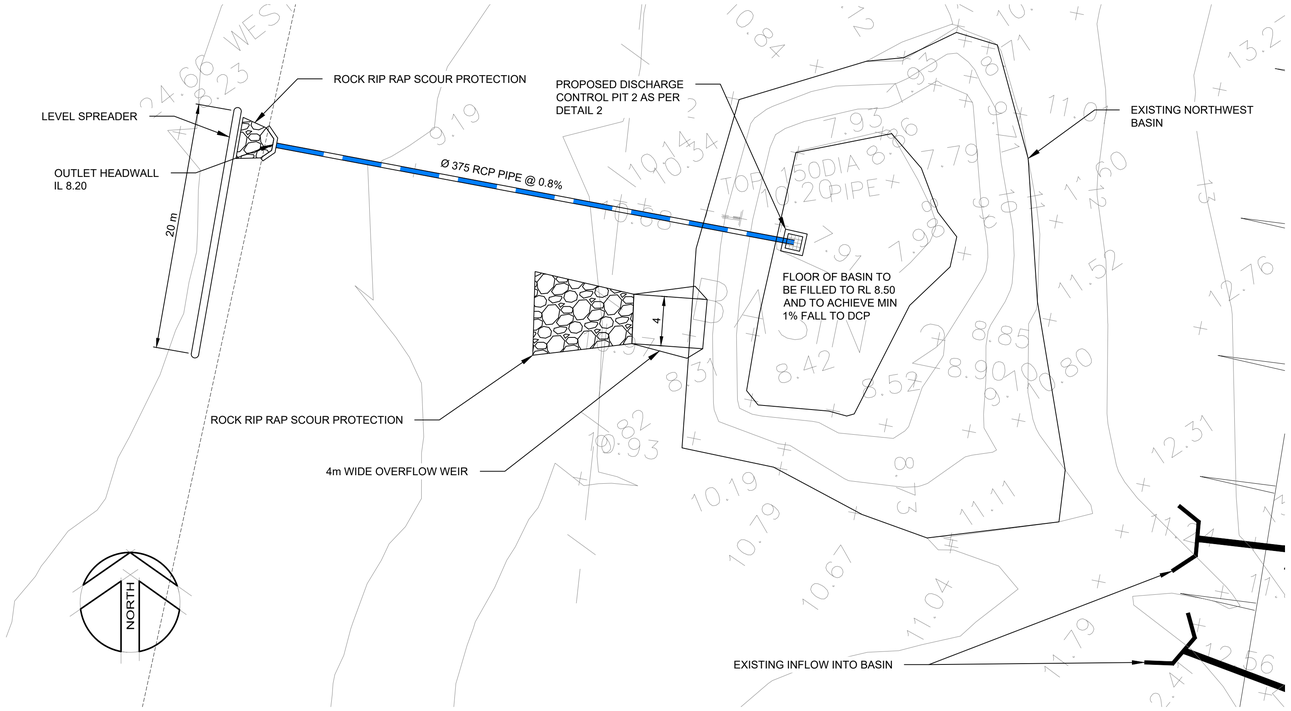

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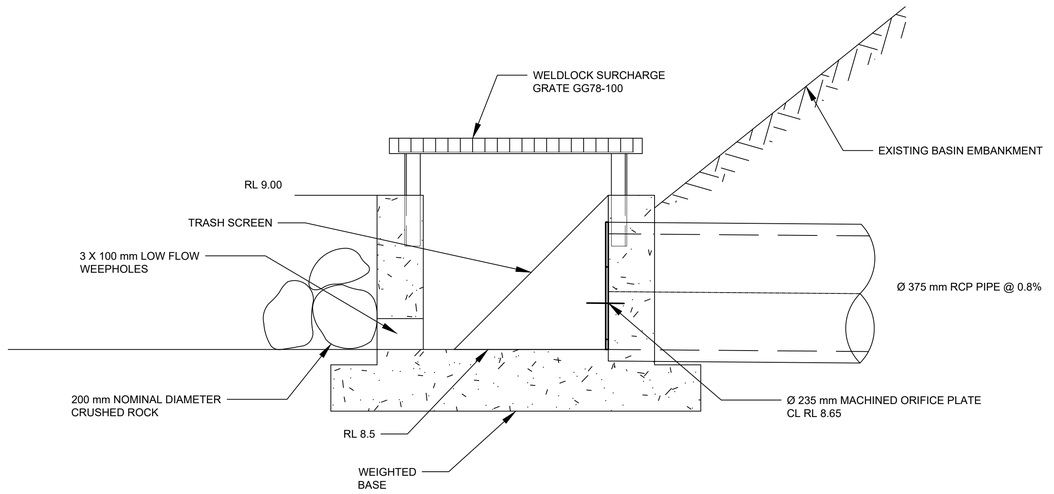

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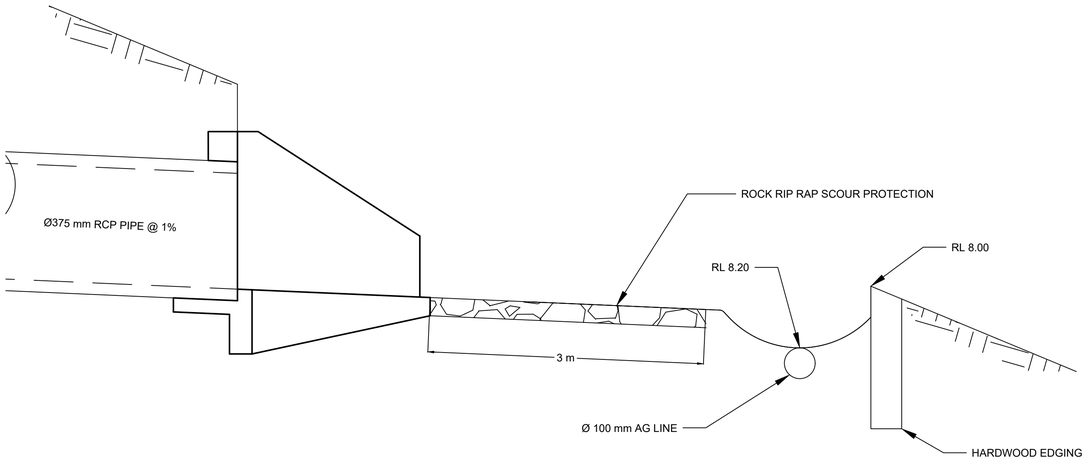

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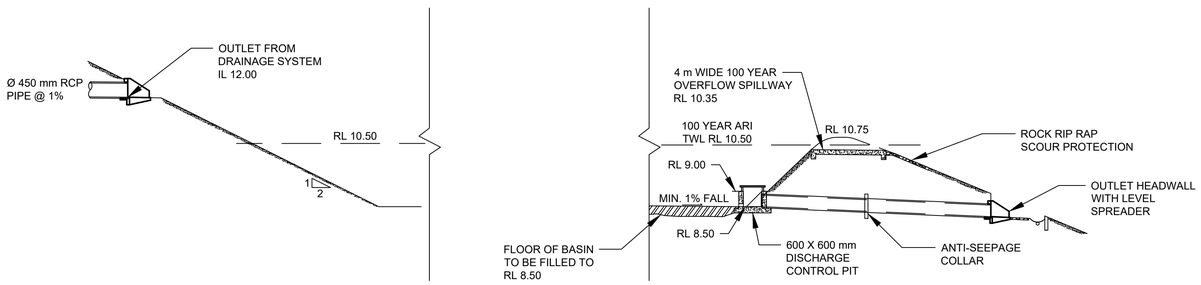

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LOT 13 & 14 in DP 1138749
PROPOSED STORMWATER DETENTION BASINS
BASIN 2 PLAN & DETAIL 3

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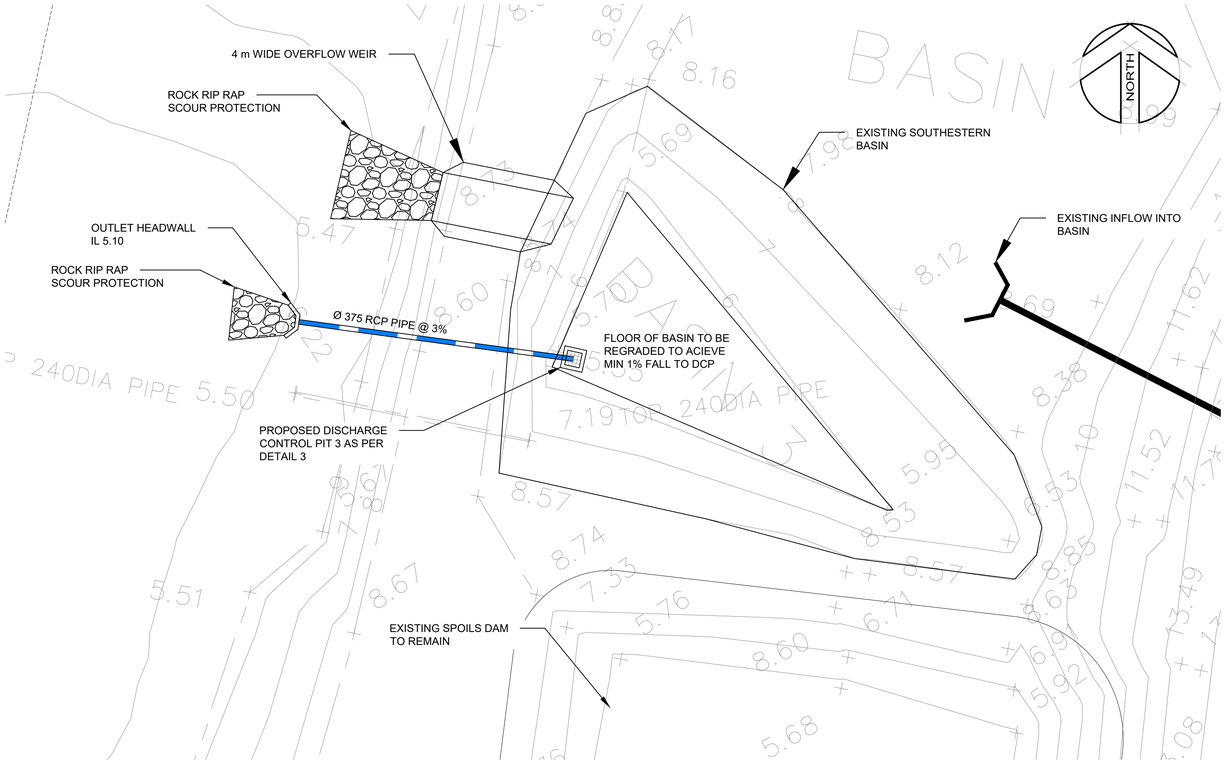

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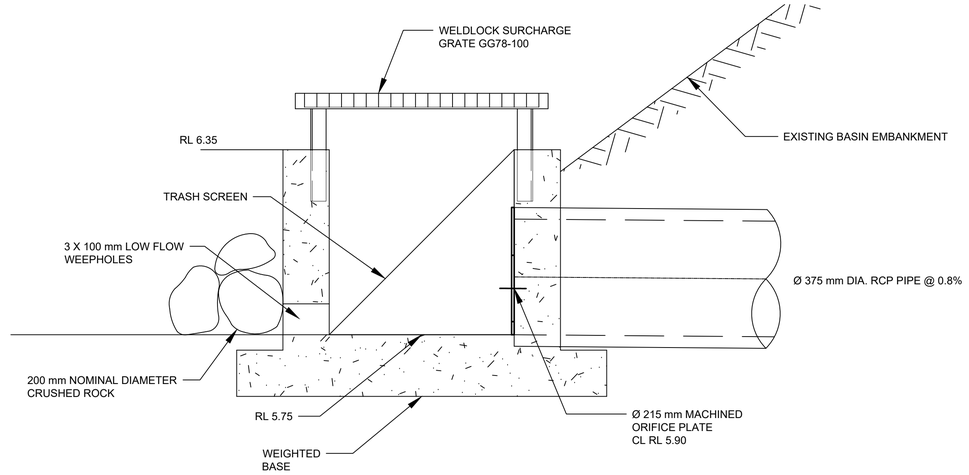

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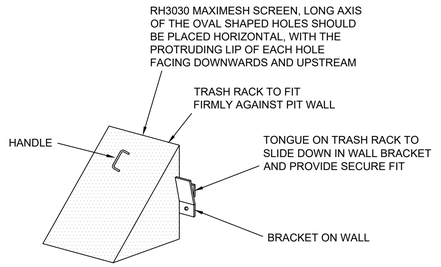

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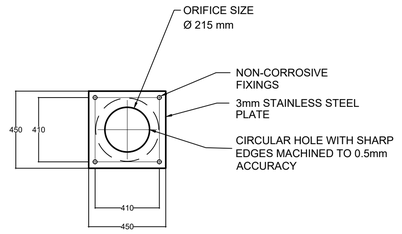

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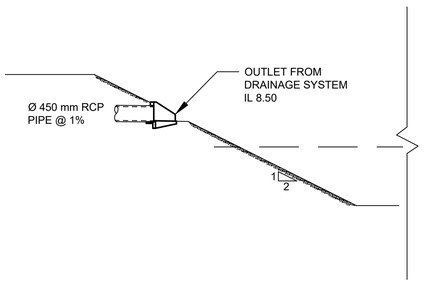

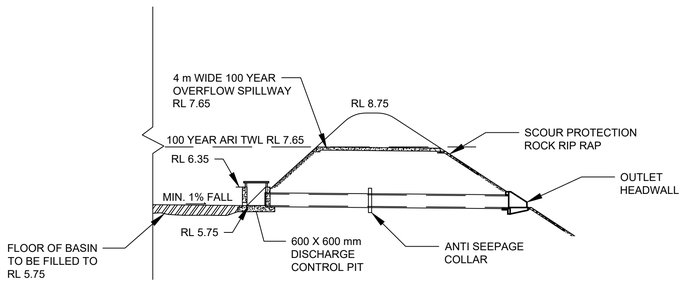

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108 - 112 MULGRAVE RD, MULGRAVE
LOT 13 & 14 in DP 1138749
PROPOSED STORMWATER DETENTION BASINS

BASIN 3 PLAN & DETAIL 3

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Scales: Plan 1:250
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Vert.
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Plan No.
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File Ref. 07166E20_CA.dwg

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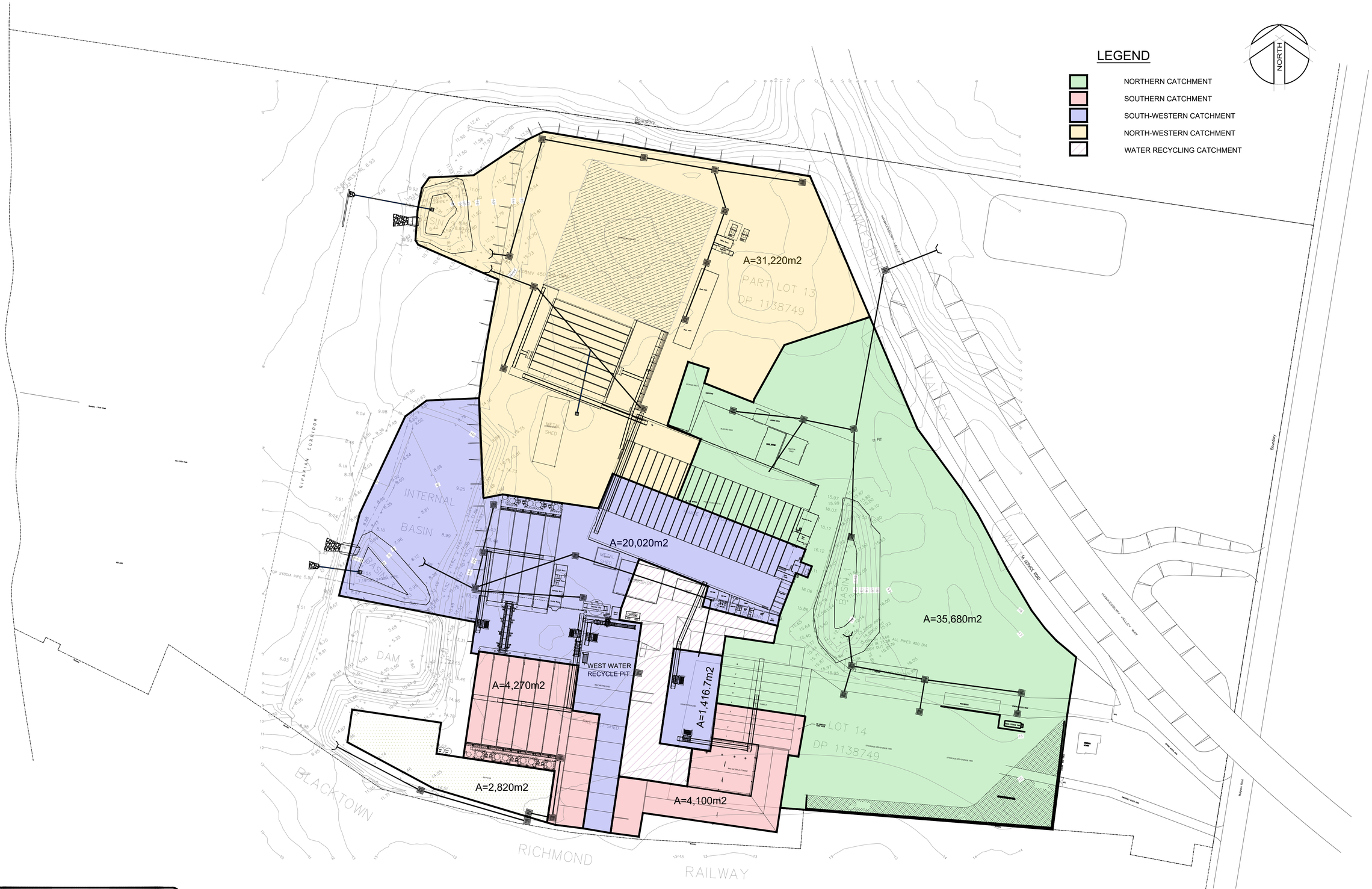

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108 - 112 MULGRAVE RD, MULGRAVE
LOT 13 & 14 in DP 1138749
PROPOSED STORMWATER DETENTION BASINS
CATCHMENT PLAN

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Vert.
X-Sect.

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